



HAM-LET VALVES & FITTINGS



SERVING INDUSTRIES AROUND THE WORLD



Founded in 1950, the HAM-LET Group specializes in the design, development, production, and marketing of high quality instrumentation valves and fittings in a wide variety of materials for high pressure, temperature and vacuum applications. An accent on quality combined with ongoing research and development has given the company an international reputation for excellence. As a result, the HAM-LET Group today is the fastest growing company in this industry. Despite this growth, customers still receive personal attention, with the best quality products and good delivery schedules.

Our products are used around the world in a wide range of industries, including Petrochemical, Semiconductor, Energy, Food, Biotechnology, Pharmaceutical, Defense, Pulp and Paper, and Mining.



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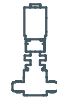
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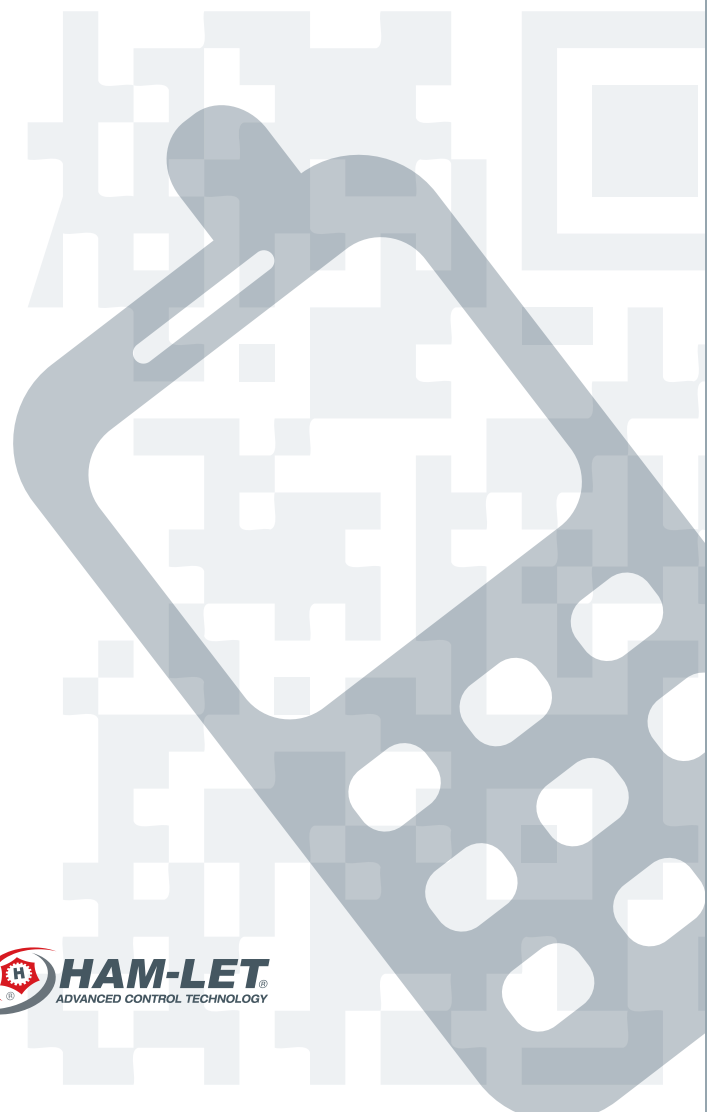
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ULTRA FAST
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REGISTERED COMPANY

ISO 9001

QUALITY YOU CAN TRUST

Quality is an integral part of the development, engineering, production and planning processes at the HAM-LET Group. It is incorporated into the project starting from raw materials inspection, followed by ongoing quality assurance during production using Statistical Process Control (SPC) 6 and Total Quality Management (TQM), and finally through testing of the final product before delivery.

HAM-LET Group quality levels meet the highest standards including: ISO 9001, Lloyds, DNV, S.A.E. CE (P.E.D.), ISO 15500, ECE Regulation 110, ASME Standards and ASTM Standards.



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COMPRESSION TUBE FITTINGS **LET-LOK**[®]

1/16" THROUGH 2" 2 MM THROUGH 50 MM



LET-LOK® TUBE FITTINGS DESCRIPTION

The **HAM-LET** GROUP has produced high quality tube and pipe fittings in various materials for high pressure applications since its establishment in 1950.

As a result of tremendous efforts in research and development during the last five decades, **HAM-LET** has gained an excellent reputation as a leading manufacturer of high pressure instrumentation products.

The **LET-LOK**® range of connectors has been developed to fill the rapidly increasing demand for tube fittings suitable for high pressure use in environments such as petrochemical, fluid, power, nuclear, electronic, as well as other major industrial settings.

LET-LOK® tube fittings have been carefully manufactured to withstand the persistent demands for high-performance tube fittings. Each one has passed a stringent tolerance test for high pressure, impulse, vibration, vacuum and temperature. These precision-machined fittings are manufactured to exacting standards, employing the most modern state-of-the-art computerized automation. All **LET-LOK**® fittings are backed by **HAM-LET**'s commitment to the highest quality-control standards and skilled craftsmanship.

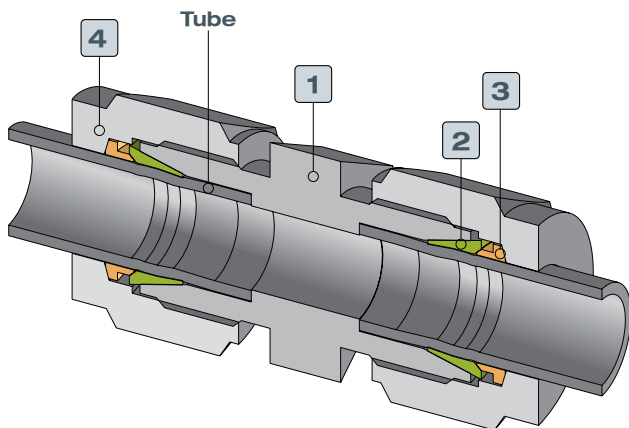
LET-LOK® HOW DOES IT WORK?

The **LET-LOK**® tube fitting is a mechanism used both to seal and to grip tubing. The mechanical advantage and geometry of this kind of fitting produces a leak-tight assembly.

To assemble, simply insert the tube into the complete assembly until the tube bottoms-out against the shoulder of the fitting body(1). The two ferrules are driven forward between the nut (4) and fitting body using the mechanical force created by rotating the nut clockwise. The back ferrule (3) is driven against the tapered rear of the front ferrule (2) and the front ferrule is driven by force into the tapered mouth of the body.

The rear ferrule is swaged radially inwards on the tube while lifting the front ferrule out to form a full-faced seal on the tapered surface of the body.

The 1 1/4 turn of the nut from the hand tight position assures consistent drive of the sealing members. This ensures an effective seal against high pressure as well as ultra high vacuum conditions.



LET-LOK® TUBE FITTINGS CONSISTS OF FOUR PARTS:
1. BODY 2. FRONT FERRULE 3. BACK FERRULE 4. NUT



LET-LOK® FITTINGS INSTALLATION INSTRUCTIONS

LET-LOK® fittings are supplied, assembled and finger tight. Disassembly before use can allow the entry of dirt or other particles.



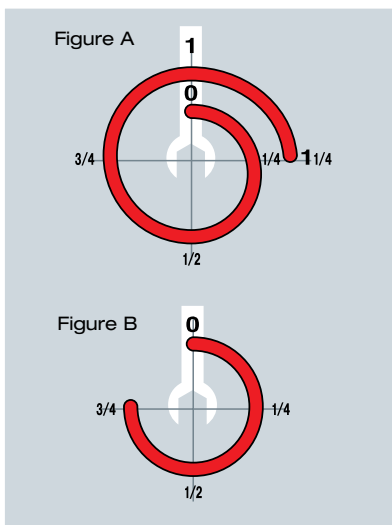
Insert the tubing into the LET-LOK® fitting.

Check that the tube rests firmly on the fitting shoulder and that the nut is finger tight. At this point it is recommended that a scribe mark be drawn on the hex of the nut extending onto the fitting body. This mark will serve as an indicator for the starting point and proper pull-up.



Tighten the nut.

1-1/4 turns of the nut are required for 1/4" (6 mm) and higher (see Fig. A). 3/4 turn of the nut is required for 3/16" (4 mm) and lower (see Fig. B).



REASSEMBLY INSTRUCTIONS

LET-LOK® connections may be disconnected and remade repeatedly, without the loss of the leaktight seal.

1. Before disconnecting, mark the position of the nut in relation to the fitting body.
2. To reassemble, use a wrench to tighten the nut to the original position.
3. Tighten slightly with a wrench until a slight rise in torque is felt.

TUBE CUTTING

Two different methods can be used to cut tubes

1. Tube Cutter
2. Hacksaw

TUBE CUTTER

To attain a leak free connection, the tubing must be cut squarely. A good quality tube cutter with an appropriate blade for tubing material is recommended. Do not try to reduce the time of cutting by taking deep cuts with each turn of the cutter. This will work harden the tube.

The end of the tube must be deburred to avoid damage to the fitting and to ensure that the tube reaches the bottom of the fitting.

HACKSAW CUTTING

In order to cut the tube with a hacksaw and get square ends, the tube must be cut with guide blocks.

This method of cutting necessitates deburring of the tube ends.

Warning

Do not hold the tube in a vise in the place where it will be inserted into the fitting (the vise will leave a mark on the tube that may cause leaks, and might cause ovality).

TUBE HANDLING

Scratches on the tube might cause leaks. It is, therefore, important to handle the tube carefully to reduce the risk of leaks.

SOME PRECAUTIONS TO BE TAKEN

1. Tubes must not be dragged on the floor.
2. Tubes must not be dragged out of a tubing rack, especially in cases of large O.D. tubes.

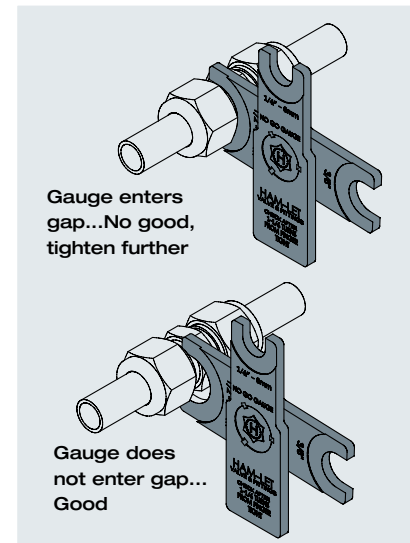
COPPER TUBING

If using copper tubing from a roll, hold the end of the tube and roll the roll outwards, allowing the tubing to lie on a flat surface.

INSPECTION GAUGE

Use: This is a "No-Go" gauge and should be used as follows:

1. Make up the fitting according to the following instructions:
1/4 inch (6mm), 3/8 inch, 1/2 inch (12mm) make up 1-1/4 turns from the finger tight position.
2. Check gap between nut and body, using the appropriate sized gauge. If the gauge slides easily into the gap, tighten the nut further until gauge cannot enter the gap.



For Gauge Ordering Information: see page 91.

LET-LOK® FITTINGS INSTALLATION INSTRUCTIONS

PHYSICAL DIFFERENCES AND MARKINGS

LET-LOK® METRIC FITTINGS:

Tee & Elbow (see Fig. 1)
Body marked: MM
Straight Connectors: (see Fig. 2)
Body: Stepped shoulder
Marked: LET-LOK® 316 AV1⁽²⁾
Nut: (see Figs.1 & 2) Stepped shoulder
Marked: LET-LOK® 316 6M⁽¹⁾ SD8⁽²⁾

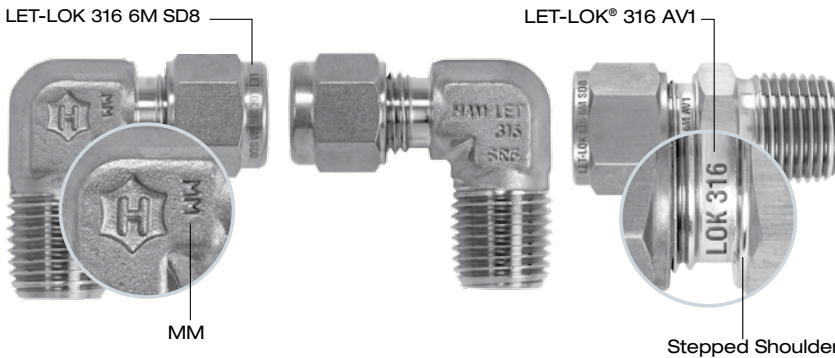


Fig. 1
Back side

Fig. 1
Front side

Fig. 2
Stepped Shoulder

⁽¹⁾ Tube O.D. ⁽²⁾ Material Batch

LET-LOK® INCH FITTINGS:

Tee & Elbow: (See Fig. 3)
Straight Fittings: (see Fig. 4)
Body: Shoulder marked:
 LET-LOK 316 AV2⁽²⁾
Nut: (See Fig. 3 & 4): Shoulder marked
 LET-LOK 316 1/2⁽¹⁾ BU2⁽²⁾



Fig. 3
Back side

Fig. 3
Front side

Fig. 4

⁽¹⁾ Tube O.D. ⁽²⁾ Material Batch

TUBING DATA FOR LET-LOK® FITTINGS

In order to assure maximum fitting reliability and performance, great care should be given when selecting the tubing for each application.

TUBE SELECTION

Four variables must be considered when ordering tube for use with LET-LOK® fittings:

1. Material
2. Tube wall thickness
3. Tube surface finish
4. Tube hardness

Tubing should comply with standard ASTM A213 or ASTM A269, be seamless, and fully annealed.

The tube must be free of scratches and suitable for bending and flaring.

TUBE O.D. TOLERANCES

1/16" - 1/8"	} ±	0.003"
2mm - 3 mm		0.076 mm
3/16" - 1 1/4"	} ±	0.005"
4mm - 25 mm		0.127 mm
1 1/2" - 2"	} ±	0.006"
38mm - 50 mm		0.152 mm

The ovality of twice the O.D. tolerance is not suitable for LET-LOK® fittings. The tube must be reasonably round. The ends of the tube must be free of burrs.

Tubing hardness: The hardness of the tube must be lower than the hardness of the fitting material.

The hardness must not exceed Rockwell 90 HRB (200HV).

HIGH SAFETY

In applications where severe conditions and high pressure exist, we recommend the following installation procedures:

1. Check that the nut is finger tight.
2. Insert the tube (up to the shoulder).
3. Rotate the nut with a wrench until the tube does not rotate freely.
4. Mark the position of the nut.
5. Rotate the nut 1-1/4 turns.

This method ensures that even if the tube O.D. is at the minimum tolerance, the ferrules will be in contact with the tube for the full 1-1/4 rotation.

TUBING DATA

TABLE 1: STAINLESS STEEL INCH TUBING

Tubing O.D.	WALL THICKNESS OF TUBE IN INCH															
inch	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120	0.134	0.156	0.188
1/16	5600	6860	8150	9480	11890											
1/8						8550	10730									
3/16						5500	7100	10150								
1/4						4100	5200	7600	10150							
5/16							4100	5900	7975							
3/8							3350	4850	6525							
1/2							2650	3750	5150	6525						
5/8								2950	4050	5250	5945					
3/4								2450	3350	4250	4950	5655				
7/8								2050	2850	3650	4250	4843				
1									2100	2700	3200	3700	3987			
1 1/4										2400	2800	3300	3600	4100	4785	
1 1/2											2300	2700	3000	3400	4000	4785
2												2000	2200	2500	2900	3600

Working pressure (psig) for seamless tubing;
Multiply pressure rating by .80 for single welded tubing.
Multiply pressure rating by .85 for double welded tubing.

Annealed 304 or 316 stainless steel tubing complying with ASTM A213, A269 or equivalent specifications. For metal temp. from -20°F - 100°F (-29°C - 37°C). Suggested ordering information: Fully annealed high quality (Type 304 or 316) stainless steel hydraulic tubing ASTM A269 or A213 or equivalent, seamless or welded and drawn with a hardness of 90HRB (200HV) or less. Tubing should be without scratches and suitable for flaring and bending.

TABLE 2: STAINLESS STEEL METRIC TUBING

Tubing O.D.	WALL THICKNESS OF TUBE IN MM														
mm	0.8	1.0	1.2	1.5	1.8	2.0	2.2	2.5	2.8	3.0	3.5	4.0	4.5	5.0	
3	670														
6	310	420	540	710											
8		310	390	520											
10		240	300	400	510										
12		200	250	330	410	470									
14		160	200	270	340	380	430								
15		150	190	250	310	360	400								
16			170	230	290	330	370	400							
18			150	200	260	290	320	370							
20			140	180	230	260	290	330	380						
22			120	160	200	230	260	300	340						
25					180	200	230	260	290	320					
38							140	160	190	200	240	270	310		
50										150	180	210	240	270	

Working pressure (bar) for seamless tubing;
Multiply pressure rating by .80 for single welded tubing.
Multiply pressure rating by .85 for double welded tubing.

Annealed 304 or 316 stainless steel tubing complying with ASTM A213, A269 or equivalent specifications. For metal temp. from -20°F - 100°F (-29°C - 37°C). Suggested ordering information: Fully annealed high quality (Type 304 or 316) stainless steel hydraulic tubing ASTM A269 or A213 or equivalent, seamless or welded and drawn with a hardness of 90HRB (200HV) or less. Tubing should be without scratches and suitable for flaring and bending.

WARNING! The system designer and user have the sole responsibility to select products suitable for their special application requirements and to ensure the proper installation, operation and maintenance of the product. Please consider application details, material compatibility and product ratings when making your selection. Improper selection or use of products can cause property damage or personal injury.

TUBING DATA

TABLE 3: COPPER TUBING WALL THICKNESS OF TUBE IN INCHES

Tubing O.D.		0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
mm	inch								
2	1/8	2700	3600						
3	3/16	1800	2300	3400					
6	1/4	1300	1600	2500	3500				
8	5/16		1300	1900	2700				
10	3/8		1000	1600	2200				
12	1/2		800	1100	1600	2100			
16	5/8			900	1200	1600	1900		
20	3/4			700	1000	1300	1500	1800	
22	7/8			600	800	1100	1300	1500	
25	1			500	700	900	1100	1300	1500

Annealed copper seamless tubing complying with ASTM B68 and ASTM B75 specified in temper designation O60. Based on ultimate tensile strength of 30,000 psi (2067 bar). For metal temperatures from -20°C to 37°C. Suggested ordering information: High quality soft annealed seamless copper tubing ASTM B75 or equivalent.

TABLE 4: FACTORS USED TO DETERMINE ALLOWABLE PRESSURE AT HIGHER TEMPERATURES

°F	°C	A.I.S.I. 316	Copper
200	93	1	0.80
400	204	0.96	0.50
600	316	0.85	-
800	427	0.79	-
1000	538	0.76	-
1200	649	0.37	-

To determine allowable pressure at higher temperatures, multiply allowable working pressure from Tables 1 & 2 & 3 by factor shown in Table 4.

For example: The allowable pressure for Type 316 stainless steel, size 1/2" OD x .049" wall at 800°F (427°C) would be equivalent to 3750 psi x 0.79 = 2962.5 psi.

TABLE 5: GAS APPLICATION TUBING

INCH		METRIC	
Tubing O.D.	Min. Nominal Wall Thickness	Tubing O.D.	Min. Nominal Wall Thickness
1/8"	0.028"	3 mm	0.8 mm
3/16"	0.028"	6 mm	0.8 mm
1/4"	0.028"	8 mm	1.0 mm
5/16"	0.035"	10 mm	1.0 mm
3/8"	0.035"	12 mm	1.0 mm
1/2"	0.049"	14 mm	1.2 mm
5/8"	0.065"	16 mm	1.5 mm
3/4"	0.065"	18 mm	1.5 mm
7/8"	0.083"	20 mm	1.8 mm
1"	0.083"	22 mm	2.0 mm
1 1/4"	0.109"	25 mm	2.2 mm
1 1/2"	0.134"	38 mm	3.5 mm
2"	0.188"	50 mm	5.0 mm

Gases are characterized by small molecules, which can escape through the smallest leak path. For gas applications, we recommend to select tubing with greater wall thickness. Table 5 shows the recommended wall thicknesses for greater safety and efficiency.

WARNING! For Your Safety The system designer and user have the sole responsibility to select products suitable for their special application requirements and to ensure the proper installation, operation and maintenance of the product. Please consider application details, material compatibility and product ratings when making your selection. Improper selection or use of products can cause property damage or personal injury.

PRESSURE RATINGS

Pressure Ratings for HAM-LET Tube Fittings

To ensure leak-tight systems, it is important to carefully select high-quality tubing (see page 11 - allowable working pressure).

Pipe End Thread (NPT and ISO 7) Pressure Ratings

Allowable pressure for male and female tapered pipe thread ends: Stainless Steel 316 and Brass.

TABLE 6: PRESSURE RATINGS

NPT / ISO Pipe Size	Stainless Steel 316		Brass	
	Male	Female	Male	Female
inch	psi			
1/16	11000	6700	5500	3300
1/8	10000	6500	5000	3200
1/4	8000	6600	4000	3300
3/8	7800	5300	3900	2600
1/2	7700	4900	3800	2400
3/4	7300	4600	3600	2300
1	5300	4400	2600	2200
1 1/4	6000	5000	3000	2500
1 1/2	5000	4600	2500	2300
2	3900	3900	1900	1900

Note: If the pressure on the LET-LOK® end is higher than the pipe side, then the pipe side needs a heavier wall thickness of the tapered pipe thread side.

Pressure Ratings for End Fittings per SAE J1926 (LOB) Surrounding Temperature

Pressure ratings are based on SAE J1926 at surrounding temperature.

TABLE 7: PRESSURE RATINGS

(LOB) SAE J1926 Thread Size	Stainless Steel 316	
	Nonpositionable	Positionable
inch	psi	
5/16 - 24	4568	4568
7/16 - 20	4568	4568
1/2 - 20	4568	4568
9/16 - 18	4568	3626
3/4 - 16	4568	3626
7/8 - 14	3626	2900
1 1/16 - 12	3626	2900
1 3/16 - 12	2900	2320
1 5/16 - 12	2900	2320
1 5/8 - 12	2320	1813
1 7/8 - 12	2320	1813
2 1/2 - 12	1813	1450

Note: 37° FLARE (AN) and LO ends can have lower pressure

O-Seal Pressure Ratings (page 45)

Stainless steel 316 O-seal fittings up to 1" and 25 mm are rated to 3000 psi.





































Positionable, ISO/BSP Parallel Thread (G) Pressure Ratings









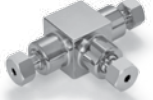
















Pressure ratings are at surrounding temperature.

TABLE 8: PRESSURE RATINGS

(G) ISO / BSPP Male Pipe Size	Stainless Steel 316
inch	psi
1/8	4568
1/4	4568
3/8	4568
1/2	2320
3/4	2320
1	2320

LET-LOK® INDEX

BACK FERRULE 760 LB 	16	FEMALE CONNECTOR 766 LG 	30	TUBE SOCKET WELD UNION 768 LW 	48
FRONT FERRULE 760 LF 	16	REDUCER 767 LT 	31	MALE ELBOW 769 L 	49
TUBE INSERT 760 LI 	17	REDUCING PORT CONNECTOR 767 LM 	34	MALE ELBOW 769 LR 	51
NUT 761 L 	17	PORT CONNECTOR 767 LP 	35	MALE PIPE WELD ELBOW 769 LN 	52
UNION 762 L 	18	MALE CONNECTOR 768 L 	36	TUBE SOCKET WELD ELBOW 769 LW 	53
REDUCING UNION 763 L 	19	MALE CONNECTOR 768 LR 	39	REDUCING ELBOW 769 LT 	53
UNION TEE 764 L 	21	MALE CONNECTOR 768 LG 	41	FEMALE ELBOW 770 L 	54
REDUCING TEE 764 LR 	22	MALE CONNECTOR 768 LOK 	43	MALE RUN TEE 771 L 	55
UNION ELBOW 765 L 	24	MALE CONNECTOR 768 LOB 	44	FEMALE RUN TEE 771 LF 	56
REDUCING UNION ELBOW 765 LR 	25	MALE CONNECTOR 768 LOP 	46	MALE BRANCH TEE 772 L 	57
FEMALE CONNECTOR 766 L 	26	MALE CONNECTOR 768 LO 	47	FEMALE BRANCH TEE 772 LF 	58
FEMALE CONNECTOR 766 LR 	28	MALE PIPE WELD CONNECTOR 768 LN 	47	BULKHEAD UNION 774 L 	59

BULKHEAD FEMALE CONNECTOR 774 LF	60		MALE ADAPTER TUBE TO PIPE 739 LMG	71		UNION 962 L	77	
BULKHEAD REDUCER 774 LT	60		WELD ADAPTER TUBE TO PIPE 739 LN	72		REDUCING UNION 963 L	77	
BULKHEAD MALE CONNECTOR 774 LM	61		SOCKET WELD ADAPTER 739 LW	72		UNION TEE 964 L	77	
BULKHEAD REDUCING UNION 775 L	62		MALE ADAPTER TUBE TO PIPE 739 LMOB	73		POSITIONABLES	78	
UNION CROSS 7102 L	63		LET-LOK® TO AN ADAPTER 761 LFL	74		UNION DIELECTRIC 762 L Dielectric	85	
CAP 7108 L	64		LET-LOK® TO AN UNION 762 LFL	74		ALLOY 400 CONNECTOR	87	
PLUG 7121 L	65		LET-LOK® TO AN BULKHEAD UNION 774 LFL	74		ALLOY C-276 CONNECTOR	89	
FEMALE ADAPTER TUBE TO PIPE 739 LF	66		MALE ADAPTER TUBE TO AN 739 LTFL	75		ACCESSORIES	91	
MALE ADAPTER TUBE TO PIPE 739 LM	68		PARALLEL THREADS SEALING	76		STOP COLLAR	95	
MALE ADAPTER TUBE TO PIPE 739 LMR	70		MALE NUT 961 L	77				

LET-LOK® MATERIAL DESCRIPTION

EXAMPLE:

768L

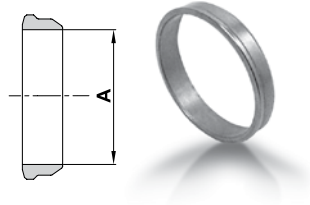
Material Description	
SS	- Stainless Steel 316
B	- Brass
M	- Alloy 400
HC	- Alloy C-276

1/4 X 1/4

All orders should include material description and ordering information (see product table).



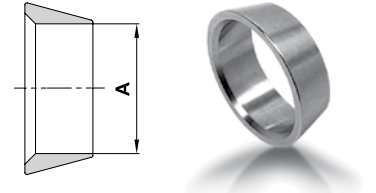
760 LB BACK FERRULE



METRIC		INCH		
Ordering Information	A Tube O.D.	Ordering Information	A Tube O.D.	
	mm		inch	mm
760LB _ 2	2	760LB _ 1/16	1/16	1.58
760LB _ 3	3	760LB _ 1/8	1/8	3.17
760LB _ 4	4	760LB _ 3/16	3/16	4.76
760LB _ 6	6	760LB _ 1/4	1/4	6.35
760LB _ 8	8	760LB _ 5/16	5/16	7.93
760LB _ 10	10	760LB _ 3/8	3/8	9.52
760LB _ 12	12	760LB _ 1/2	1/2	12.70
760LB _ 14	14	760LB _ 5/8	5/8	15.87
760LB _ 15	15	760LB _ 3/4	3/4	19.05
760LB _ 16	16	760LB _ 7/8	7/8	22.22
760LB _ 18	18	760LB _ 1	1	25.40
760LB _ 20	20	760LB _ 1 1/4 *	1 1/4	31.75
760LB _ 22	22	760LB _ 1 1/2 *	1 1/2	38.10
760LB _ 25	25	760LB _ 2 *	2	50.80
760LB _ 38 *	38			
760LB _ 50 *	50			

*Without Ferrule Set.

760 LF FRONT FERRULE



METRIC		INCH		
Ordering Information	A Tube O.D.	Ordering Information	A Tube O.D.	
	mm		inch	mm
760LF _ 2	2	760LF _ 1/16	1/16	1.58
760LF _ 3	3	760LF _ 1/8	1/8	3.17
760LF _ 4	4	760LF _ 3/16	3/16	4.76
760LF _ 6	6	760LF _ 1/4	1/4	6.35
760LF _ 8	8	760LF _ 5/16	5/16	7.93
760LF _ 10	10	760LF _ 3/8	3/8	9.52
760LF _ 12	12	760LF _ 1/2	1/2	12.70
760LF _ 14	14	760LF _ 5/8	5/8	15.87
760LF _ 15	15	760LF _ 3/4	3/4	19.05
760LF _ 16	16	760LF _ 7/8	7/8	22.22
760LF _ 18	18	760LF _ 1	1	25.40
760LF _ 20	20	760LF _ 1 1/4 *	1 1/4	31.75
760LF _ 22	22	760LF _ 1 1/2 *	1 1/2	38.10
760LF _ 25	25	760LF _ 2 *	2	50.80
760LF _ 38 *	38			
760LF _ 50 *	50			

*Without Ferrule Set.

FERRULE SETS

All LET-LOK® Ferrules are available as sets. Ferrule sets simplify stocking and assembly. Ferrule sets prevent damage of single ferrules during shipping.

The back and front ferrules are arranged as pairs in the set; ready for easy assembly.

Note: Can be supplied also with Nuts.
Example: 760LNS SS 1/4

ORDERING INFORMATION FOR FERRULE SETS

EXAMPLE: **760LS**

SS

1/4

SS = Stainless Steel 316
B = Brass
M = Alloy 400
HC = Alloy C-276
T = PTFE

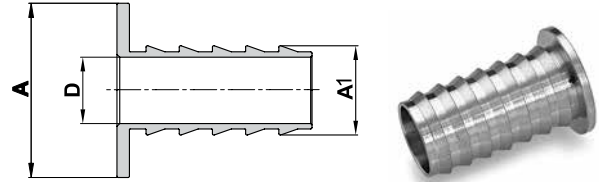
Ferrules Material

Tube O.D.

The O.D. size is always the first to be described

Dimensions are for reference only, and are subject to change without notice.

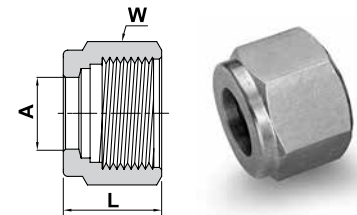
760 LI TUBE INSERT



METRIC			
Ordering Information	A	A1	D
	Tube O.D.	Tube I.D.	
	mm	mm	mm
760LI_ 6 X 4	6	4	2.8
760LI_ 8 X 6	8	6	4.4
760LI_ 10 X 8	10	8	6.4
760LI_ 12 X 8	12	8	6.4
760LI_ 12 X 10	12	10	8.3

INCH						
Ordering Information	A		A1		D	
	Tube O.D.		Tube I.D.			
	inch	mm	inch	mm	inch	mm
760LI_ 3/16 X 1/8	3/16	4.76	1/8	3.17	.09	2.30
760LI_ 1/4 X 1/8	1/4	6.35	1/8	3.17	.09	2.30
760LI_ 1/4 X 0.17	1/4	6.35	.17	4.32	.11	2.70
760LI_ 1/4 X 3/16	1/4	6.35	3/16	4.76	.12	3.10
760LI_ 5/16 X 1/8	5/16	7.93	1/8	3.17	.09	2.30
760LI_ 5/16 X 3/16	5/16	7.93	3/16	4.76	.12	3.00
760LI_ 5/16 X 1/4	5/16	7.93	1/4	6.35	.18	4.65
760LI_ 3/8 X 3/16	3/8	9.52	3/16	4.76	.12	3.10
760LI_ 3/8 X 1/4	3/8	9.52	1/4	6.35	.18	4.65
760LI_ 1/2 X 1/4	1/2	12.70	1/4	6.35	.18	4.65
760LI_ 1/2 X 3/8	1/2	12.70	3/8	9.52	.31	7.80
760LI_ 5/8 X 3/8	5/8	15.87	3/8	9.52	.31	7.80
760LI_ 5/8 X 1/2	5/8	15.87	1/2	12.70	.44	11.10
760LI_ 3/4 X 1/2	3/4	19.05	1/2	12.70	.44	11.10
760LI_ 3/4 X 5/8	3/4	19.05	5/8	15.87	.56	14.20
760LI_ 1 X 3/4	1	25.40	3/4	19.05	.69	17.50

761 L NUT

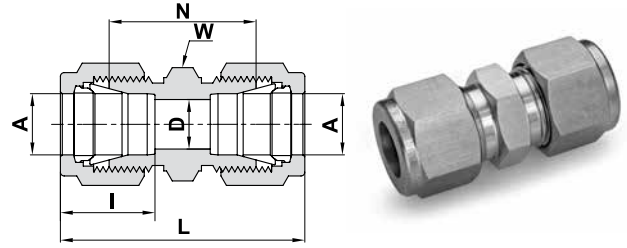


METRIC			
Ordering Information	A	W	L
	Tube O.D.	Hex. Flat	
	mm	mm	mm
761L_ 2	2	12	11.9
761L_ 3	3	12	11.9
761L_ 4	4	12	11.9
761L_ 6	6	14	12.7
761L_ 8	8	16	13.5
761L_ 10	10	19	15.1
761L_ 12	12	22	17.4
761L_ 14	14	25	17.4
761L_ 15	15	25	17.4
761L_ 16	16	25	17.4
761L_ 18	18	30	17.4
761L_ 20	20	32	17.4
761L_ 22	22	32	17.4
761L_ 25	25	38	20.6
761L_ 38	38	60	40.6
761L_ 50	50	3 inch	54.0

INCH				
Ordering Information	A		W	L
	Tube O.D.		Hex. Flat	
	inch	mm	inch	inch
761L_ 1/16	1/16	1.58	5/16	.31
761L_ 1/8	1/8	3.17	7/16	.47
761L_ 3/16	3/16	4.76	1/2	.47
761L_ 1/4	1/4	6.35	9/16	.50
761L_ 5/16	5/16	7.93	5/8	.53
761L_ 3/8	3/8	9.52	11/16	.56
761L_ 1/2	1/2	12.70	7/8	.69
761L_ 5/8	5/8	15.87	1	.69
761L_ 3/4	3/4	19.05	1 1/8	.69
761L_ 7/8	7/8	22.22	1 1/4	.69
761L_ 1	1	25.40	1 1/2	.81
761L_ 1 1/4	1 1/4	31.75	1 7/8	1.25
761L_ 1 1/2	1 1/2	38.10	2 1/4	1.50
761L_ 2	2	50.80	3	2.06

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

762 L UNION



TUBE (METRIC) TO TUBE (METRIC)

Ordering Information	A Tube O.D.		D		W Hex. Flat	N		L		I	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
762L _ 2	2		1.7		12		22.4		35.6		12.9
762L _ 3	3		2.4		12		22.1		35.3		12.9
762L _ 4	4		2.4		12		24.1		37.3		13.7
762L _ 6	6		4.8		14		26.2		41.0		15.3
762L _ 8	8		6.4		15		28.2		43.2		16.2
762L _ 10	10		7.9		18		31.0		46.2		17.2
762L _ 12	12		9.5		22		31.0		51.2		22.8
762L _ 14	14		11.1		24		31.8		52.0		24.4
762L _ 15	15		11.9		24		31.8		52.0		24.4
762L _ 16	16		12.7		24		31.8		52.0		24.4
762L _ 18	18		15.1		27		33.3		53.5		24.4
762L _ 20	20		15.9		30		34.8		55.0		26.0
762L _ 22	22		18.3		30		34.8		55.0		26.0
762L _ 25	25		21.8		35		40.4		65.0		31.3
762L _ 38	*38		33.7		55		58.4		114.0		49.4
762L _ 50	*50		45.2		3 inch		71.7		146.0		65.0

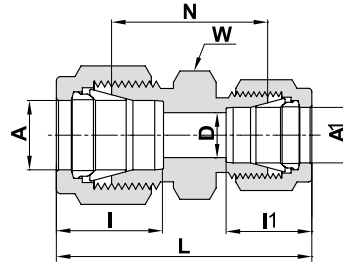
TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		D		W Hex. Flat	N		L		I	
	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
762L _ 1/16	1/16	1.58	.05	1.27	5/16	.69	17.52	.99	25.14	.34	8.6
762L _ 1/8	1/8	3.17	.09	2.28	7/16	.88	22.35	1.40	35.56	.50	12.7
762L _ 3/16	3/16	4.76	.12	3.04	7/16	.95	24.13	1.47	37.33	.54	13.7
762L _ 1/4	1/4	6.35	.19	4.82	1/2	1.03	26.16	1.61	40.89	.60	15.2
762L _ 5/16	5/16	7.93	.25	6.35	9/16	1.11	28.19	1.69	42.92	.64	16.2
762L _ 3/8	3/8	9.52	.28	7.11	5/8	1.19	30.22	1.77	44.95	.66	16.8
762L _ 1/2	1/2	12.70	.41	10.41	13/16	1.22	30.98	2.02	51.30	.90	22.9
762L _ 5/8	5/8	15.87	.50	12.70	15/16	1.25	31.75	2.05	52.07	.96	24.4
762L _ 3/4	3/4	19.05	.62	15.75	1 1/16	1.31	33.27	2.11	53.59	.96	24.4
762L _ 7/8	7/8	22.22	.72	18.28	1 3/16	1.37	34.80	2.17	55.11	1.02	25.9
762L _ 1	1	25.40	.88	22.35	1 3/8	1.59	40.38	2.55	64.77	1.23	31.2
762L _ 1 1/4	*1 1/4	31.75	1.09	27.70	1 3/4	1.89	48.00	3.63	92.20	1.62	41.2
762L _ 1 1/2	*1 1/2	38.10	1.34	34.00	2 1/8	2.11	53.60	4.25	107.95	1.97	50.0
762L _ 2	*2	50.80	1.81	45.97	2 3/4	2.94	74.67	5.88	149.35	2.66	67.6

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

763 L REDUCING UNION



TUBE (METRIC) TO TUBE (METRIC)

Ordering Information	A	A1	D	W	N	L	I	I1
	Tube O.D. mm	Tube O.D. mm	mm	Hex. Flat mm	mm	mm	mm	mm
763L _ 3 X 2	3	2	1.7	12	22.1	35.3	12.9	12.9
763L _ 6 X 2	6	2	1.7	14	24.6	38.6	15.3	12.9
763L _ 6 X 3	6	3	2.4	14	24.6	38.6	15.3	12.9
763L _ 6 X 4	6	4	2.4	14	25.4	39.4	15.3	13.7
763L _ 8 X 6	8	6	4.8	15	27.4	42.3	16.2	15.3
763L _ 10 X 6	10	6	4.8	18	29.5	44.5	17.2	15.3
763L _ 10 X 8	10	8	6.4	18	30.0	45.1	17.2	16.2
763L _ 12 X 6	12	6	4.8	22	29.5	47.0	22.8	15.3
763L _ 12 X 8	12	8	6.4	22	30.2	47.8	22.8	16.2
763L _ 12 X 10	12	10	7.9	22	31.0	48.7	22.8	17.2
763L _ 16 X 10	16	10	7.9	24	31.8	49.5	24.4	17.2
763L _ 16 X 12	16	12	9.5	24	31.8	52.0	24.4	22.8
763L _ 18 X 12	18	12	9.5	27	33.3	53.5	24.4	22.8
763L _ 25 X 18	25	18	15.1	35	38.6	61.0	31.3	24.4
763L _ 25 X 20	25	20	15.9	35	39.9	62.3	31.3	26.0
763L _ 38 X 20	*38	20	15.9	55	49.8	87.5	49.4	26.0
763L _ 38 X 25	*38	25	21.8	55	55.5	95.4	49.4	31.3

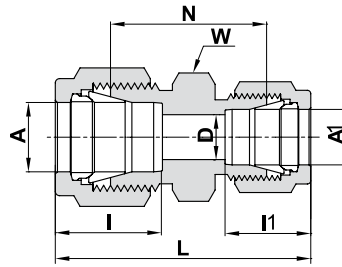
TUBE (METRIC) TO TUBE (INCH)

Ordering Information	A	A1	D	W	N	L	I	I1
	Tube O.D. mm	Tube O.D. inch	mm	Hex. Flat mm	mm	mm	mm	mm
763L _ 2 X 1/4	2	1/4	1.7	14	24.6	38.6	12.9	15.2
763L _ 3 X 1/8	3	1/8	2.4	12	22.1	35.2	12.9	12.7
763L _ 4 X 1/8	4	1/8	2.4	12	23.4	36.5	13.7	12.7
763L _ 4 X 1/4	4	1/4	2.4	14	25.4	39.4	13.7	15.2
763L _ 6 X 1/8	6	1/8	2.4	14	24.6	38.5	15.3	12.7
763L _ 6 X 1/4	6	1/4	4.8	14	26.2	41.0	15.3	15.2
763L _ 6 X 5/16	6	5/16	4.8	14	27.4	42.3	15.3	16.2
763L _ 8 X 1/8	8	1/8	2.4	15	25.7	39.8	16.2	12.7
763L _ 8 X 1/4	8	1/4	4.8	15	27.4	42.3	16.2	15.2
763L _ 8 X 3/8	8	3/8	6.4	16	29.5	44.3	16.2	16.8
763L _ 10 X 1/8	10	1/8	2.4	18	27.7	41.8	17.2	12.7
763L _ 10 X 1/4	10	1/4	4.8	18	29.5	44.5	17.2	15.2
763L _ 10 X 5/16	10	5/16	6.4	18	30.0	45.1	17.2	16.2
763L _ 10 X 3/8	10	3/8	7.1	18	31.0	45.9	17.2	16.8
763L _ 12 X 5/16	12	5/16	6.4	22	30.2	47.8	22.8	16.2
763L _ 12 X 3/8	12	3/8	7.1	22	31.0	48.4	22.8	16.8
763L _ 12 X 1/2	12	1/2	9.5	22	31.0	51.2	22.8	22.9
763L _ 15 X 1/2	15	1/2	10.3	24	31.8	52.0	24.4	22.9
763L _ 16 X 5/8	16	5/8	12.7	24	31.8	52.0	24.4	24.4
763L _ 18 X 3/4	18	3/4	15.1	27	33.3	53.5	24.4	24.4

* Including low friction paste, see page 91 "D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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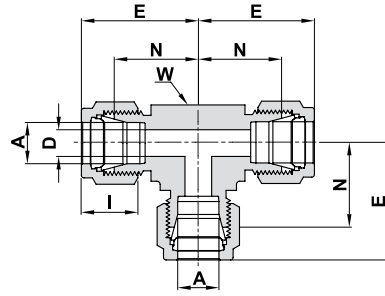
763 L REDUCING UNION (Cont'd)



TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		D		W Hex. Flat	N		L		I		I1	
	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm
763L_ 1/8 X 1/16	1/8	3.17	1/16	1.58	.05	1.27	7/16	.81	20.57	1.22	30.98	.50	12.7	.34	8.6
763L_ 3/16 X 1/16	3/16	4.76	1/16	1.58	.05	1.27	7/16	.86	21.84	1.27	32.26	.54	13.7	.34	8.6
763L_ 3/16 X 1/8	3/16	4.76	1/8	3.17	.09	2.28	7/16	.92	23.36	1.44	36.57	.54	13.7	.50	12.7
763L_ 1/4 X 1/16	1/4	6.35	1/16	1.58	.05	1.27	1/2	.91	23.11	1.35	34.29	.60	15.2	.34	8.6
763L_ 1/4 X 1/8	1/4	6.35	1/8	3.17	.09	2.28	1/2	.97	24.63	1.52	38.60	.60	15.2	.50	12.7
763L_ 1/4 X 3/16	1/4	6.35	3/16	4.76	.12	3.04	1/2	1.00	25.40	1.55	37.37	.60	15.2	.54	13.7
763L_ 5/16 X 1/8	5/16	7.93	1/8	3.17	.09	2.28	9/16	1.01	25.65	1.56	39.62	.64	16.2	.50	12.7
763L_ 5/16 X 1/4	5/16	7.93	1/4	6.35	.19	4.82	9/16	1.08	27.43	1.66	42.16	.64	16.2	.60	15.2
763L_ 3/8 X 1/16	3/8	9.52	1/16	1.58	.05	1.27	5/8	1.00	25.40	1.44	36.58	.66	16.8	.34	8.6
763L_ 3/8 X 1/8	3/8	9.52	1/8	3.17	.09	2.28	5/8	1.06	26.92	1.61	40.89	.66	16.8	.50	12.7
763L_ 3/8 X 1/4	3/8	9.52	1/4	6.35	.19	4.82	5/8	1.12	28.44	1.70	43.18	.66	16.8	.60	15.2
763L_ 3/8 X 5/16	3/8	9.52	5/16	7.93	.25	6.35	5/8	1.16	29.46	1.74	44.19	.66	16.8	.64	16.2
763L_ 1/2 X 1/8	1/2	12.70	1/8	3.17	.09	2.28	13/16	1.12	28.44	1.78	45.21	.90	22.9	.50	12.7
763L_ 1/2 X 1/4	1/2	12.70	1/4	6.35	.19	4.82	13/16	1.16	29.46	1.85	46.99	.90	22.9	.60	15.2
763L_ 1/2 X 3/8	1/2	12.70	3/8	9.52	.28	7.11	13/16	1.22	30.98	1.91	48.51	.90	22.9	.66	16.8
763L_ 5/8 X 3/8	5/8	15.87	3/8	9.52	.28	7.11	15/16	1.25	31.75	1.94	49.27	.96	24.4	.66	16.8
763L_ 5/8 X 1/2	5/8	15.87	1/2	12.70	.41	10.41	15/16	1.25	31.75	2.05	52.07	.96	24.4	.90	22.9
763L_ 3/4 X 1/4	3/4	19.05	1/4	6.35	.19	4.82	1 1/16	1.25	31.75	1.94	49.28	.96	24.4	.60	15.2
763L_ 3/4 X 3/8	3/4	19.05	3/8	9.52	.28	7.11	1 1/16	1.31	33.27	2.00	50.80	.96	24.4	.66	16.8
763L_ 3/4 X 1/2	3/4	19.05	1/2	12.70	.41	10.41	1 1/16	1.31	33.27	2.11	53.59	.96	24.4	.90	22.9
763L_ 3/4 X 5/8	3/4	19.05	5/8	15.87	.50	12.70	1 1/16	1.31	33.27	2.11	53.59	.96	24.4	.96	24.4
763L_ 1 X 1/2	1	25.4	1/2	12.70	.41	10.41	1 3/8	1.50	38.10	2.38	60.45	1.23	31.2	.90	22.9
763L_ 1 X 3/4	1	25.4	3/4	19.05	.62	15.75	1 3/8	1.50	38.10	2.38	60.45	1.23	31.2	.96	24.4

764 L UNION TEE



ALL TUBE (METRIC)

Ordering Information	A Tube O.D.		D		W Wrench Flat		N		E		I	
	mm	mm	mm	mm	inch	mm	mm	mm	mm	mm	mm	mm
764L _ 2	2		1.7		3/8	9.5		15.7		22.3		12.9
764L _ 3	3		2.4		3/8	9.5		15.7		22.3		12.9
764L _ 4	4		2.4		1/2	12.7		18.8		25.4		13.7
764L _ 6	6		4.8		1/2	12.7		19.6		27.0		15.3
764L _ 8	8		6.4		5/8	15.9		22.4		29.9		16.2
764L _ 10	10		7.9		11/16	17.5		23.9		31.5		17.2
764L _ 12	12		9.5		13/16	20.6		25.9		36.0		22.8
764L _ 14	14		11.1		15/16	23.8		28.7		38.8		24.4
764L _ 15	15		11.9		15/16	23.8		28.7		38.8		24.4
764L _ 16	16		12.7		15/16	23.8		28.7		38.8		24.4
764L _ 18	18		15.1		1 1/16	27.0		29.7		39.8		24.4
764L _ 20	20		15.9		1 3/8	34.9		34.5		44.6		26.0
764L _ 22	22		18.3		1 3/8	34.9		34.5		44.6		26.0
764L _ 25	25		21.8		1 3/8	34.9		36.8		49.1		31.3
764L _ 38	*38		33.7		-	55.0		56.4		84.0		49.4
764L _ 50	*50		45.2		2 3/4	69.9		68.9		106.0		65.0

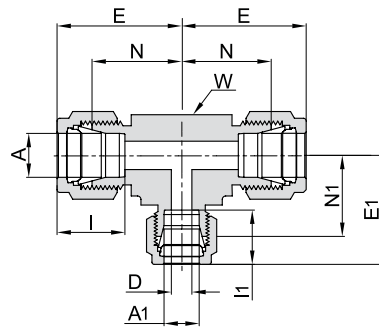
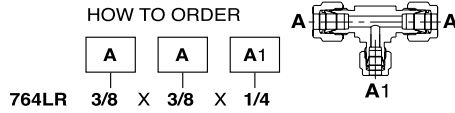
ALL TUBE (INCH)

Ordering Information	A Tube O.D.		D		W Wrench Flat		N		E		I	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
764L _ 1/16	1/16	1.58	.05	1.27	3/8	9.5	.55	14.00	.70	17.80	.34	8.6
764L _ 1/8	1/8	3.17	.09	2.28	3/8	9.5	.62	15.74	.88	22.35	.50	12.7
764L _ 3/16	3/16	4.76	.12	3.04	1/2	12.7	.70	17.80	.96	24.40	.54	13.7
764L _ 1/4	1/4	6.35	.19	4.82	1/2	12.7	.77	19.55	1.06	26.90	.60	15.2
764L _ 5/16	5/16	7.93	.25	6.35	5/8	15.9	.88	22.35	1.17	29.71	.64	16.2
764L _ 3/8	3/8	9.52	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	.66	16.8
764L _ 1/2	1/2	12.70	.41	10.41	13/16	20.6	1.02	25.90	1.42	36.06	.90	22.9
764L _ 5/8	5/8	15.87	.50	12.70	15/16	23.8	1.13	28.70	1.53	38.90	.96	24.4
764L _ 3/4	3/4	19.05	.62	15.74	1 1/16	27.0	1.17	29.70	1.57	39.90	.96	24.4
764L _ 7/8	7/8	22.22	.72	18.29	1 3/8	34.9	1.36	34.54	1.76	44.70	1.02	25.9
764L _ 1	1	25.40	.88	22.35	1 3/8	34.9	1.45	36.83	1.93	49.00	1.23	31.2
764L _ 1 1/4	*1 1/4	31.75	1.09	27.7	1 11/16	42.9	1.75	44.50	2.62	66.55	1.62	41.2
764L _ 1 1/2	*1 1/2	38.10	1.34	34.0	2	50.8	2.00	50.80	3.07	77.98	1.97	50.0
764L _ 2	*2	50.80	1.81	45.97	2 3/4	69.9	2.75	69.85	4.22	107.19	2.66	67.6

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

764 LR REDUCING TEE



ALL TUBE (METRIC)

Ordering Information	A Tube O.D.		A1 Tube O.D.		E		E1		I		I1		D		W Wrench Flat		N		N1		
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm	mm	
764LR_8MMX8MMX6MM	8	6	6	6	29.9	29.8	16.2	15.3	4.8	5/8	15.9	22.4	22.4								
764LR_10MMX10MMX6MM	10	6	6	6	31.5	31.3	17.2	15.3	4.8	11/16	17.5	23.9	23.9								
764LR_12MMX12MMX6MM	12	6	6	6	36.0	31.8	22.8	15.3	4.8	13/16	20.6	25.9	24.4								
764LR_12MMX12MMX10MM	12	10	10	10	36.0	33.5	22.8	17.2	7.9	13/16	20.6	25.9	25.9								
764LR_14MMX14MMX10MM	14	10	10	10	38.8	36.3	24.4	17.2	7.9	15/16	23.8	28.7	28.7								
764LR_18MMX18MMX12MM	18	12	12	12	39.8	39.8	24.4	22.8	9.5	1 1/16	27.0	29.7	29.7								
764LR_50MMX50MMX38MM	*50	*38	*38	*38	106.0	96.2	65.0	49.4	33.7	2 3/4	69.9	68.9	68.6								

ALL TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		E		E1		I		I1		D		W Wrench Flat		N		N1	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
764LR_1/4 X 1/4 X 1/8	1/4	6.35	1/8	3.17	1.06	26.9	1.03	26.2	.60	15.2	.50	12.7	.09	2.28	1/2	12.7	.77	19.6	.77	19.6
764LR_3/8 X 3/8 X 1/4	3/8	9.52	1/4	6.35	1.20	30.5	1.14	29.0	.66	16.8	.60	15.2	.19	4.82	5/8	15.9	.91	23.1	.85	21.6
764LR_1/2 X 1/2 X 1/4	1/2	12.70	1/4	6.35	1.42	36.1	1.25	31.8	.90	22.9	.60	15.2	.19	4.82	13/16	20.6	1.02	25.9	.96	24.4
764LR_1/2 X 1/2 X 3/8	1/2	12.70	3/8	9.52	1.42	36.1	1.31	33.3	.90	22.9	.66	16.8	.28	7.11	13/16	20.6	1.02	25.9	1.02	25.9
764LR_5/8 X 5/8 X 3/8	5/8	15.88	3/8	9.52	1.53	38.9	1.42	36.1	.96	24.4	.66	16.8	.28	7.11	15/16	23.8	1.13	28.7	1.13	28.7
764LR_3/4 X 3/4 X 1/4	3/4	19.05	1/4	6.35	1.57	39.9	1.46	37.1	.96	24.4	.60	15.2	.19	4.82	1 1/16	27.0	1.17	29.7	1.17	29.7
764LR_3/4 X 3/4 X 3/8	3/4	19.05	3/8	9.52	1.57	39.9	1.46	37.1	.96	24.4	.66	16.8	.28	7.11	1 1/16	27.0	1.17	29.7	1.17	29.7
764LR_3/4 X 3/4 X 1/2	3/4	19.05	1/2	12.70	1.57	39.9	1.57	39.9	.96	24.4	.90	22.9	.41	10.41	1 1/16	27.0	1.17	29.7	1.17	29.7
764LR_1 X 1 X 3/8	1	25.4	3/8	9.52	1.93	49.0	1.65	41.9	1.23	31.2	.66	16.8	.28	7.11	1 3/8	34.9	1.45	36.8	1.36	34.5
764LR_1 X 1 X 1/2	1	25.4	1/2	12.70	1.93	49.0	1.76	44.7	1.23	31.2	.90	22.9	.41	10.41	1 3/8	34.9	1.45	36.8	1.36	34.5
764LR_1 X 1 X 3/4	1	25.4	3/4	19.05	1.93	49.0	1.76	44.7	1.23	31.2	0.96	24.4	.62	15.75	1 3/8	34.9	1.45	36.8	1.36	34.5
764LR_1 1/4 X 1 1/4 X 1	*1 1/4	31.75	1	25.40	2.67	67.8	2.17	55.1	1.62	41.2	1.23	31.2	.88	22.35	1 11/16	42.9	1.75	44.5	1.69	42.9
764LR_1 1/2 X 1 1/2 X 1	*1 1/2	38.10	1	25.40	3.10	78.7	2.36	59.9	1.97	50.0	1.23	31.2	.88	22.35	2	50.8	2.00	50.8	1.88	47.8

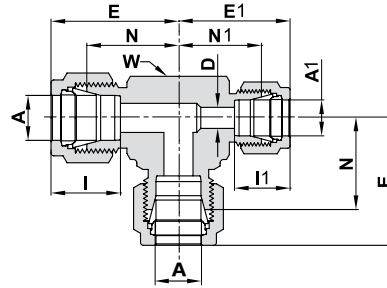
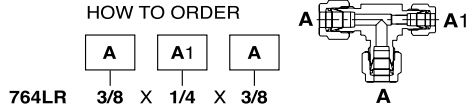
* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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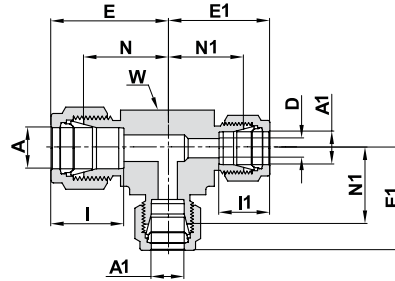
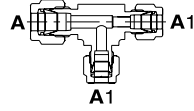
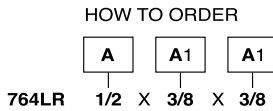
764 LR REDUCING TEE

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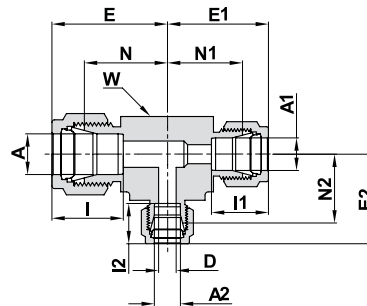
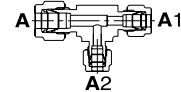
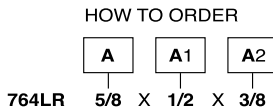
ALL TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		E		E1		I		I1		D		W Wrench Flat		N		N1	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
764LR_ 1/4 X 1/8 X 1/4	1/4	6.35	1/8	3.17	1.06	26.9	1.03	26.2	.60	15.2	.50	12.7	.09	2.28	1/2	12.7	.77	19.6	.77	19.6
764LR_ 3/8 X 1/4 X 3/8	3/8	9.25	1/4	6.35	1.20	30.5	1.14	29.0	.66	16.8	.60	15.2	.19	4.82	5/8	15.9	.91	23.1	.85	21.6
764LR_ 1/2 X 1/4 X 1/2	1/2	12.7	1/4	6.35	1.42	36.1	1.31	33.3	.90	22.9	.60	15.2	.19	4.82	13/16	20.6	1.02	25.9	1.02	25.9
764LR_ 1/2 X 3/8 X 1/2	1/2	12.7	3/8	9.52	1.42	36.1	1.31	33.3	.90	22.9	.66	16.8	.28	7.11	13/16	20.6	1.02	25.9	1.02	25.9
764LR_ 3/4 X 3/8 X 3/4	3/4	19.05	3/8	9.52	1.57	39.9	1.46	37.1	.96	24.4	.66	16.8	.28	7.11	1 1/16	27.0	1.17	29.7	1.17	29.7



ALL TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		E		E1		I		I1		D		W Wrench Flat		N		N1	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
764LR_ 1/2 X 3/8 X 3/8	1/2	12.70	3/8	9.52	1.42	36.1	1.31	33.3	.90	22.9	.66	16.8	.28	7.1	13/16	20.6	1.02	25.9	1.02	25.9
764LR_ 5/8 X 3/8 X 3/8	5/8	15.87	3/8	9.52	1.53	38.9	1.42	36.1	.96	24.4	.66	16.8	.28	7.1	15/16	23.8	1.13	28.7	1.13	28.7
764LR_ 3/4 X 3/8 X 3/8	3/4	19.05	3/8	9.52	1.57	39.9	1.46	37.1	.96	24.4	.66	16.8	.28	7.1	1 1/16	27.0	1.17	29.7	1.17	29.7

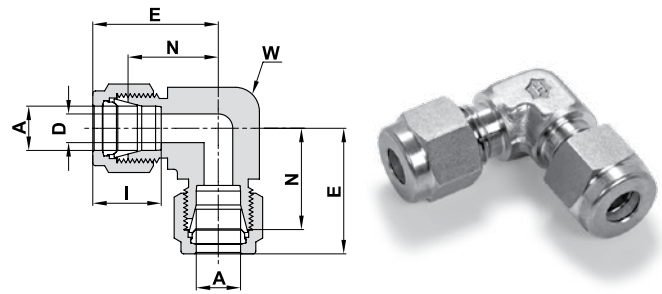


ALL TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		A2 Tube O.D.		E		E1		E2		I		I1		I2		D		W Wrench Flat		N		N1&N2	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
764LR_ 5/8 X 1/2 X 3/8	5/8	15.87	1/2	12.70	3/8	9.52	1.53	38.9	1.53	38.9	1.42	36.1	.96	24.4	.90	22.9	.66	16.8	.28	7.11	15/16	23.8	1.13	28.7	1.13	28.7
764LR_ 3/4 X 1/2 X 3/8	3/4	19.05	1/2	12.70	3/8	9.52	1.57	39.9	1.57	39.9	1.46	37.1	.96	24.4	.90	22.9	.66	16.8	.28	7.11	1 1/16	27.0	1.17	29.7	1.17	29.7
764LR_ 1 X 3/4 X 3/8	1	25.40	3/4	19.05	3/8	9.52	1.93	49.0	1.76	44.7	1.65	41.9	1.23	31.2	.96	24.4	.66	16.8	.28	7.11	1 3/8	34.9	1.45	36.8	1.36	34.5

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

765 L UNION ELBOW



TUBE (METRIC) TO TUBE (METRIC)

Ordering Information	A Tube O.D.		D		W Wrench Flat		N		E		I	
	mm	mm	mm	mm	inch	mm	mm	mm	mm	mm	mm	mm
765L _ 3	3		2.4		3/8	9.5		15.7		22.3		12.9
765L _ 4	4		2.4		1/2	12.7		18.8		25.4		13.7
765L _ 6	6		4.8		1/2	12.7		19.6		27.0		15.3
765L _ 8	8		6.4		9/16	14.3		21.3		28.8		16.2
765L _ 10	10		7.9		11/16	17.5		23.9		31.5		17.2
765L _ 12	12		9.5		13/16	20.6		25.9		36.0		22.8
765L _ 14	14		11.1		15/16	23.8		27.9		38.0		24.4
765L _ 15	15		11.9		15/16	23.8		27.9		38.0		24.4
765L _ 16	16		12.7		15/16	23.8		27.9		38.0		24.4
765L _ 18	18		15.1		1 1/16	27.0		29.7		39.8		24.4
765L _ 20	20		15.9		1 3/8	34.9		34.5		44.6		26.0
765L _ 22	22		18.3		1 3/8	34.9		34.5		44.6		26.0
765L _ 25	25		21.8		1 3/8	34.9		36.8		49.1		31.3
765L _ 38	*38		33.7		-	55.0		56.4		84.0		49.4
765L _ 50	*50		45.2		2 3/4	69.9		68.9		106.0		65.0

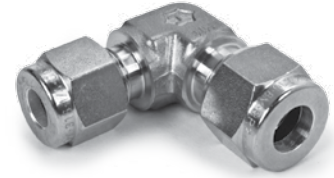
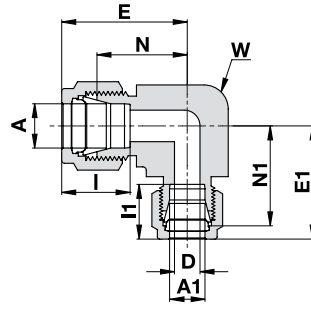
TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		D		W Wrench Flat		N		E		I	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
765L _ 1/16	1/16	1.58	.05	1.27	3/8	9.5	.55	14.00	.70	17.80	.34	.86
765L _ 1/8	1/8	3.17	.09	2.28	3/8	9.5	.62	15.74	.88	22.35	.50	12.7
765L _ 3/16	3/16	4.76	.12	3.04	1/2	12.7	.74	18.80	1.00	25.40	.54	13.7
765L _ 1/4	1/4	6.35	.19	4.82	1/2	12.7	.77	19.55	1.06	26.92	.60	15.2
765L _ 5/16	5/16	7.93	.25	6.35	9/16	14.3	.84	21.33	1.13	28.70	.64	16.2
765L _ 3/8	3/8	9.52	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	.66	16.8
765L _ 1/2	1/2	12.70	.41	10.41	13/16	20.6	1.02	25.90	1.42	36.06	.90	22.9
765L _ 5/8	5/8	15.87	.50	12.70	15/16	23.8	1.10	27.94	1.50	38.10	.96	24.4
765L _ 3/4	3/4	19.05	.62	15.74	1 1/16	27.0	1.17	29.70	1.57	39.90	.96	24.4
765L _ 7/8	7/8	22.22	.72	18.29	1 3/8	34.9	1.36	34.54	1.76	44.70	1.02	25.9
765L _ 1	1	25.40	.88	22.35	1 3/8	34.9	1.45	36.83	1.93	49.00	1.23	31.2
765L _ 1 1/4	*1 1/4	31.75	1.09	27.70	1 11/16	42.9	1.75	44.50	2.62	66.55	1.62	41.2
765L _ 1 1/2	*1 1/2	38.10	1.34	34.00	2	50.8	2.00	50.80	3.07	77.98	1.97	50.0
765L _ 2	*2	50.80	1.81	45.97	2 3/4	69.9	2.75	69.85	4.22	107.19	2.66	67.6

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**765 LR
REDUCING UNION ELBOW**



TUBE (METRIC) TO TUBE (INCH)

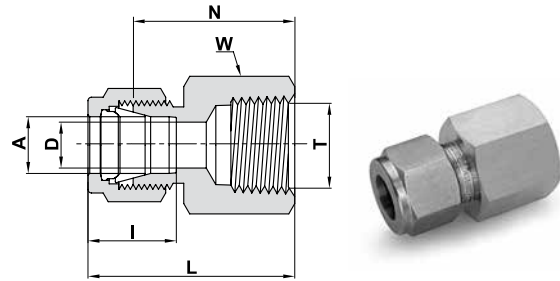
Ordering Information	A Tube O.D.		A1 Tube O.D.		E		E1		I		I1		D		W Wrench Flat		N		N1	
	mm	inch	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	in	mm	mm	mm	mm	mm	mm
765LR_6 X 1/4	6	1/4			27.0		26.9		15.3		15.2		4.8	1/2	12.7		19.6		19.6	
765LR_8 X 1/4	8	1/4			28.8		28.7		16.2		15.2		4.8	9/16	14.3		21.3		21.3	

TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		E		E1		I		I1		D		W Wrench Flat		N		N1	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
765LR_3/8 X 1/4	3/8	9.52	1/4	6.35	1.20	30.48	1.20	30.48	.66	16.8	.60	15.2	.19	4.82	5/8	15.9	.91	23.11	.91	23.11
765LR_5/8 X 3/8	5/8	15.87	3/8	9.52	1.50	38.10	1.39	35.31	.96	24.4	.66	16.8	.28	7.11	15/16	23.8	1.10	27.94	1.10	27.94

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

766 L FEMALE CONNECTOR



TUBE (METRIC) TO FEMALE NPT THREAD

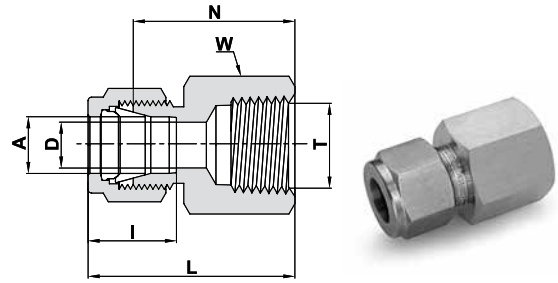
Ordering Information	A	T	D	W	N	L	I
	Tube O.D. mm	(NPT) inch	mm	Hex. Flat mm	mm	mm	mm
766L _ 3 X 1/8	3	1/8	2.4	14	22.1	28.7	12.9
766L _ 3 X 1/4	3	1/4	2.4	19	26.9	33.5	12.9
766L _ 4 X 1/8	4	1/8	2.4	14	23.1	29.7	13.7
766L _ 6 X 1/8	6	1/8	4.8	14	23.9	31.3	15.3
766L _ 6 X 1/4	6	1/4	4.8	19	28.4	35.8	15.3
766L _ 6 X 3/8	6	3/8	4.8	22	30.2	37.6	15.3
766L _ 6 X 1/2	6	1/2	4.8	27	35.1	42.5	15.3
766L _ 8 X 1/8	8	1/8	6.4	15	24.6	32.1	16.2
766L _ 8 X 1/4	8	1/4	6.4	19	29.5	37.0	16.2
766L _ 8 X 3/8	8	3/8	6.4	22	31.0	38.5	16.2
766L _ 8 X 1/2	8	1/2	6.4	27	35.8	43.3	16.2
766L _ 10 X 1/4	10	1/4	7.9	19	30.2	37.8	17.2
766L _ 10 X 3/8	10	3/8	7.9	22	31.8	39.4	17.2
766L _ 10 X 1/2	10	1/2	7.9	27	36.6	44.2	17.2
766L _ 12 X 1/4	12	1/4	9.5	22	30.2	40.3	22.8
766L _ 12 X 3/8	12	3/8	9.5	22	31.8	41.9	22.8
766L _ 12 X 1/2	12	1/2	9.5	27	36.6	46.7	22.8
766L _ 15 X 1/2	15	1/2	11.9	27	36.6	46.7	24.4
766L _ 16 X 1/2	16	1/2	12.7	27	36.8	46.9	24.4
766L _ 20 X 1/2	20	1/2	15.9	30	37.8	47.9	26.0
766L _ 20 X 3/4	20	3/4	15.9	35	39.6	49.7	26.0
766L _ 22 X 3/4	22	3/4	18.3	35	39.6	49.7	26.0
766L _ 22 X 1	22	1	18.3	41	47.8	57.9	26.0
766L _ 25 X 3/4	25	3/4	21.8	35	41.1	53.4	31.3
766L _ 25 X 1	25	1	21.8	41	50.0	62.3	31.3

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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766 L FEMALE CONNECTOR

(Cont'd)



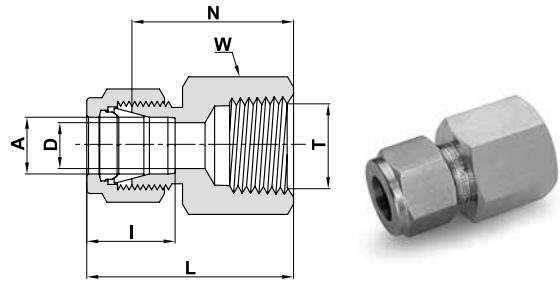
TUBE (INCH) TO FEMALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Hex Flat	N		L		I	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm	inch	mm
766L_ 1/16 X 1/16	1/16	1.58	1/16	.05	1.27	7/16	.78	19.81	.93	23.62	.34	8.6
766L_ 1/16 X 1/8	1/16	1.58	1/8	.05	1.27	9/16	.81	20.57	.96	24.38	.34	8.6
766L_ 1/8 X 1/8	1/8	3.17	1/8	.09	2.28	9/16	.87	22.10	1.13	28.70	.50	12.7
766L_ 1/8 X 1/4	1/8	3.17	1/4	.09	2.28	3/4	1.06	26.92	1.32	33.52	.50	12.7
766L_ 3/16 X 1/8	3/16	4.76	1/8	.12	3.04	9/16	.91	23.11	1.17	29.71	.54	13.7
766L_ 1/4 X 1/8	1/4	6.35	1/8	.19	4.82	9/16	.94	23.87	1.23	31.24	.60	15.2
766L_ 1/4 X 1/4	1/4	6.35	1/4	.19	4.82	3/4	1.12	28.44	1.41	35.81	.60	15.2
766L_ 1/4 X 3/8	1/4	6.35	3/8	.19	4.82	7/8	1.19	30.22	1.48	37.59	.60	15.2
766L_ 1/4 X 1/2	1/4	6.35	1/2	.19	4.82	1 1/16	1.38	35.00	1.67	42.42	.60	15.2
766L_ 5/16 X 1/8	5/16	7.93	1/8	.25	6.35	9/16	.97	24.63	1.26	32.00	.64	16.2
766L_ 5/16 X 1/4	5/16	7.93	1/4	.25	6.35	3/4	1.16	29.46	1.45	36.83	.64	16.2
766L_ 3/8 X 1/8	3/8	9.52	1/8	.28	7.11	5/8	1.00	25.40	1.29	32.76	.66	16.8
766L_ 3/8 X 1/4	3/8	9.52	1/4	.28	7.11	3/4	1.19	30.22	1.48	37.59	.66	16.8
766L_ 3/8 X 3/8	3/8	9.52	3/8	.28	7.11	7/8	1.25	31.75	1.54	39.11	.66	16.8
766L_ 3/8 X 1/2	3/8	9.52	1/2	.28	7.11	1 1/16	1.44	36.57	1.73	43.94	.66	16.8
766L_ 3/8 X 3/4	3/8	9.52	3/4	.28	7.11	1 5/16	1.59	40.40	1.88	47.75	.66	16.8
766L_ 1/2 X 1/4	1/2	12.70	1/4	.41	10.41	13/16	1.19	30.22	1.59	40.38	.90	22.9
766L_ 1/2 X 3/8	1/2	12.70	3/8	.41	10.41	7/8	1.25	31.75	1.65	41.91	.90	22.9
766L_ 1/2 X 1/2	1/2	12.70	1/2	.41	10.41	1 1/16	1.44	36.57	1.84	46.73	.90	22.9
766L_ 1/2 X 3/4	1/2	12.70	3/4	.41	10.41	1 5/16	1.50	38.10	1.90	48.26	.90	22.9
766L_ 5/8 X 3/8	5/8	15.87	3/8	.50	12.70	15/16	1.25	31.75	1.65	41.91	.96	24.4
766L_ 5/8 X 1/2	5/8	15.87	1/2	.50	12.70	1 1/16	1.44	36.57	1.84	46.73	.96	24.4
766L_ 5/8 X 3/4	5/8	15.87	3/4	.50	12.70	1 5/16	1.50	38.10	1.90	48.26	.96	24.4
766L_ 3/4 X 1/2	3/4	19.05	1/2	.62	15.75	1 1/16	1.44	36.57	1.84	46.73	.96	24.4
766L_ 3/4 X 3/4	3/4	19.05	3/4	.62	15.75	1 5/16	1.50	38.10	1.90	48.26	.96	24.4
766L_ 7/8 X 3/4	7/8	22.22	3/4	.72	18.28	1 5/16	1.56	39.62	1.96	49.78	1.02	25.9
766L_ 1 X 3/4	1	25.40	3/4	.88	22.35	1 3/8	1.62	41.14	2.10	53.34	1.23	31.2
766L_ 1 X 1	1	25.40	1	.88	22.35	1 5/8	1.97	50.03	2.45	62.23	1.23	31.2
766L_ 1 1/4 X 1 1/4	*1 1/4	31.75	1 1/4	1.09	27.70	2 1/4	2.07	52.59	2.94	74.68	1.62	41.2
766L_ 1 1/2 X 1 1/2	*1 1/2	38.10	1 1/2	1.34	34.00	2 3/8	2.21	56.13	3.28	83.31	1.97	50.0
766L_ 2 X 2	*2	50.80	2	1.81	45.97	2 7/8	2.53	64.26	4.00	101.60	2.66	67.6

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

766 LR FEMALE CONNECTOR



TUBE (METRIC) TO FEMALE ISO TAPERED THREAD

Ordering Information	A	T	D	W	N	L	I
	Tube O.D.	(ISO)		Hex. Flat			
	mm	inch	mm	mm	mm	mm	mm
766LR _ 3 X 1/8	3	R-1/8	2.4	14	22.1	28.7	12.9
766LR _ 6 X 1/8	6	R-1/8	4.8	14	23.9	31.3	15.3
766LR _ 6 X 1/4	6	R-1/4	4.8	19	28.4	35.8	15.3
766LR _ 6 X 3/8	6	R-3/8	4.8	22	30.2	37.6	15.3
766LR _ 6 X 1/2	6	R-1/2	4.8	27	35.1	42.5	15.3
766LR _ 8 X 1/8	8	R-1/8	6.4	15	24.6	32.1	16.2
766LR _ 8 X 1/4	8	R-1/4	6.4	19	29.5	37.0	16.2
766LR _ 8 X 3/8	8	R-3/8	6.4	22	31.0	38.5	16.2
766LR _ 8 X 1/2	8	R-1/2	6.4	27	35.8	43.3	16.2
766LR _ 10 X 1/8	10	R-1/8	7.9	18	25.4	33.0	17.2
766LR _ 10 X 1/4	10	R-1/4	7.9	19	30.2	37.8	17.2
766LR _ 10 X 3/8	10	R-3/8	7.9	22	31.8	39.4	17.2
766LR _ 10 X 1/2	10	R-1/2	7.9	27	36.6	44.2	17.2
766LR _ 12 X 1/8	12	R-1/8	8.3	22	25.4	35.5	22.8
766LR _ 12 X 1/4	12	R-1/4	9.5	22	30.2	40.3	22.8
766LR _ 12 X 3/8	12	R-3/8	9.5	22	31.8	41.9	22.8
766LR _ 12 X 1/2	12	R-1/2	9.5	27	36.6	46.7	22.8
766LR _ 12 X 3/4	12	R-3/4	9.5	35	38.9	49.0	22.8
766LR _ 15 X 3/8	15	R-3/8	11.9	24	31.8	41.9	24.4
766LR _ 15 X 1/2	15	R-1/2	11.9	27	36.6	46.7	24.4
766LR _ 20 X 1/2	20	R-1/2	15.9	30	37.8	47.9	26.0
766LR _ 20 X 3/4	20	R-3/4	15.9	35	39.6	49.7	26.0
766LR _ 22 X 3/4	22	R-3/4	18.3	35	39.6	49.7	26.0
766LR _ 22 X 1	22	R-1	18.3	41	47.8	57.9	26.0
766LR _ 25 X 3/4	25	R-3/4	21.8	35	41.1	53.4	31.3
766LR _ 25 X 1	25	R-1	21.8	41	50.0	62.3	31.3

Reference Specifications:

DIN -2999
BS -21
JIS -B0203
ISO -7/1-BSP-T

Designation:

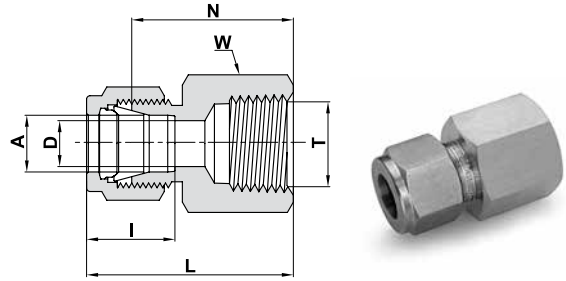
Marking LR on Hex.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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766 LR FEMALE CONNECTOR

(Cont'd)



TUBE (INCH) TO FEMALE ISO TAPERED THREAD

Ordering Information	A Tube O.D.		T (ISO)	D		W Hex Flat	N		L		I	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm	inch	mm
766LR _ 1/16 X 1/16	1/16	1.58	R-1/16	.05	1.27	7/16	.78	19.81	.93	23.62	.34	8.6
766LR _ 1/16 X 1/8	1/16	1.58	R-1/8	.05	1.27	9/16	.81	20.57	.96	24.38	.34	8.6
766LR _ 1/8 X 1/8	1/8	3.17	R-1/8	.09	2.28	9/16	.87	22.10	1.13	28.70	.50	12.7
766LR _ 1/8 X 1/4	1/8	3.17	R-1/4	.09	2.28	3/4	1.06	26.92	1.32	33.52	.50	12.7
766LR _ 3/16 X 1/8	3/16	4.76	R-1/8	.12	3.04	9/16	.91	23.11	1.17	29.71	.54	13.7
766LR _ 1/4 X 1/8	1/4	6.35	R-1/8	.19	4.82	9/16	.94	23.87	1.23	31.24	.60	15.2
766LR _ 1/4 X 1/4	1/4	6.35	R-1/4	.19	4.82	3/4	1.12	28.44	1.41	35.81	.60	15.2
766LR _ 1/4 X 3/8	1/4	6.35	R-3/8	.19	4.82	7/8	1.19	30.22	1.48	37.59	.60	15.2
766LR _ 1/4 X 1/2	1/4	6.35	R-1/2	.19	4.82	1 1/16	1.38	35.00	1.67	42.42	.60	15.2
766LR _ 5/16 X 1/4	5/16	7.93	R-1/4	.25	6.35	3/4	1.16	29.46	1.45	36.83	.64	16.2
766LR _ 3/8 X 1/8	3/8	9.52	R-1/8	.28	7.11	5/8	1.00	25.40	1.29	32.76	.66	16.8
766LR _ 3/8 X 1/4	3/8	9.52	R-1/4	.28	7.11	3/4	1.19	30.22	1.48	37.59	.66	16.8
766LR _ 3/8 X 3/8	3/8	9.52	R-3/8	.28	7.11	7/8	1.25	31.75	1.54	39.11	.66	16.8
766LR _ 3/8 X 1/2	3/8	9.52	R-1/2	.28	7.11	1 1/16	1.44	36.57	1.73	43.94	.66	16.8
766LR _ 1/2 X 1/4	1/2	12.70	R-1/4	.41	10.41	13/16	1.19	30.20	1.59	40.38	.90	22.9
766LR _ 1/2 X 3/8	1/2	12.70	R-3/8	.41	10.41	7/8	1.25	31.75	1.65	41.91	.90	22.9
766LR _ 1/2 X 1/2	1/2	12.70	R-1/2	.41	10.41	1 1/16	1.44	36.57	1.84	46.73	.90	22.9
766LR _ 5/8 X 1/2	5/8	15.87	R-1/2	.50	12.70	1 1/16	1.44	36.57	1.84	46.73	.96	24.4
766LR _ 3/4 X 1/2	3/4	19.05	R-1/2	.62	15.75	1 1/16	1.44	36.57	1.84	46.73	.96	24.4
766LR _ 3/4 X 3/4	3/4	19.05	R-3/4	.62	15.75	1 5/16	1.50	38.10	1.90	48.26	.96	24.4
766LR _ 1 X 3/4	1	25.40	R-3/4	.88	22.35	1 3/8	1.62	41.14	2.10	53.34	1.23	31.2
766LR _ 1 X 1	1	25.40	R-1	.88	22.35	1 5/8	1.97	50.03	2.45	62.23	1.23	31.2

Reference Specifications:

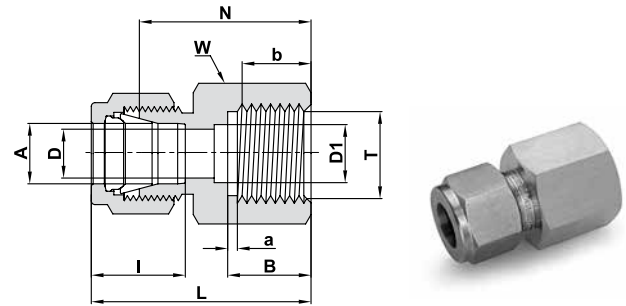
DIN -2999
BS -21
JIS -B0203
ISO -7/1-BSP-T

Designation:

Marking LR on Hex.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

766 LG FEMALE CONNECTOR



TUBE (METRIC) TO FEMALE ISO PARALLEL THREAD

Ordering Information	A Tube O.D.		T (ISO)	D	D1	W Hex. Flat	B	b Min	a Min	N	L	I
	mm	inch	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm
766LG _ 3 X 1/4	3		G-1/4	2.4	5.5	19	13.0	9.5	1.6	28.7	35.3	12.9
766LG _ 6 X 1/8	6		G-1/8	4.0	4.0	14	10.0	7.0	1.6	25.0	32.4	15.3
766LG _ 6 X 1/4	6		G-1/4	4.8	5.5	19	13.0	9.5	1.6	30.2	37.6	15.3
766LG _ 6 X 3/8	6		G-3/8	4.8	6.5	24	14.1	10.0	1.6	30.2	37.6	15.3
766LG _ 6 X 1/2	6		G-1/2	4.8	7.0	27	19.0	15.0	1.6	36.1	43.5	15.3
766LG _ 8 X 1/4	8		G-1/4	5.5	5.5	19	13.0	9.5	1.6	31.0	38.5	16.2
766LG _ 8 X 3/8	8		G-3/8	6.4	6.4	24	14.1	10.0	1.6	28.7	36.2	16.2
766LG _ 8 X 1/2	8		G-1/2	7.0	7.0	27	19.0	15.0	1.6	33.5	41.0	16.2
766LG _ 10 X 1/4	10		G-1/4	5.5	5.5	19	13.0	9.5	1.6	31.8	39.4	17.2
766LG _ 10 X 3/8	10		G-3/8	6.5	6.5	24	14.1	10.0	1.6	31.2	38.8	17.2
766LG _ 10 X 1/2	10		G-1/2	7.0	7.0	27	19.0	15.0	1.6	34.5	42.1	17.2
766LG _ 12 X 1/4	12		G-1/4	5.5	5.5	22	13.0	9.5	1.6	31.8	41.9	22.8
766LG _ 12 X 3/8	12		G-3/8	6.5	6.5	24	14.1	10.0	1.6	34.3	44.4	22.8
766LG _ 12 X 1/2	12		G-1/2	7.0	7.0	27	19.0	15.0	1.6	38.1	48.2	22.8
766LG _ 20 X 1/2	20		G-1/2	7.0	7.0	30	19.0	15.0	1.6	44.2	54.3	26.0
766LG _ 22 X 1/2	22		G-1/2	7.0	7.0	30	19.0	15.0	1.6	44.2	54.3	26.0

TUBE (INCH) TO FEMALE ISO PARALLEL THREAD

Ordering Information	A Tube O.D.		T (ISO)	D		D1		W Hex. Flat	B		b Min		a Min		N		L		I	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
766LG _ 1/8 X 1/4	1/8	3.17	G-1/4	.09	2.3	.22	5.5	3/4	.51	13.0	.37	9.5	.06	1.6	1.13	28.7	1.39	35.3	.50	12.7
766LG _ 1/4 X 1/8	1/4	6.35	G-1/8	.16	4.0	.16	4.0	9/16	.40	10.0	.28	7.0	.06	1.6	.98	25.0	1.27	32.4	.60	15.2
766LG _ 1/4 X 1/4	1/4	6.35	G-1/4	.19	4.8	.22	5.5	3/4	.51	13.0	.37	9.5	.06	1.6	1.19	30.2	1.48	37.6	.60	15.2
766LG _ 1/4 X 3/8	1/4	6.35	G-3/8	.19	4.8	.26	6.5	15/16	.56	14.1	.39	10.0	.06	1.6	1.19	30.2	1.48	37.6	.60	15.2
766LG _ 1/4 X 1/2	1/4	6.35	G-1/2	.19	4.8	.28	7.0	1 1/16	.74	19.0	.59	15.0	.06	1.6	1.42	36.1	1.71	43.4	.60	15.2
766LG _ 5/16 X 1/4	5/16	7.93	G-1/4	.22	5.5	.22	5.5	3/4	.51	13.0	.37	9.5	.06	1.6	1.22	31.0	1.51	38.4	.64	16.2
766LG _ 5/16 X 1/2	5/16	7.93	G-1/2	.28	7.0	.28	7.0	1 1/16	.74	19.0	.59	15.0	.06	1.6	1.32	33.5	1.61	40.9	.64	16.2
766LG _ 3/8 X 1/4	3/8	9.52	G-1/4	.22	5.5	.22	5.5	3/4	.51	13.0	.37	9.5	.06	1.6	1.25	31.8	1.54	39.1	.66	16.8
766LG _ 3/8 X 3/8	3/8	9.52	G-3/8	.26	6.6	.26	6.6	15/16	.56	14.1	.39	10.0	.06	1.6	1.23	31.2	1.52	38.6	.66	16.8
766LG _ 3/8 X 1/2	3/8	9.52	G-1/2	.28	7.0	.28	7.0	1 1/16	.74	19.0	.59	15.0	.06	1.6	1.36	34.5	1.65	41.9	.66	16.8
766LG _ 1/2 X 3/8	1/2	12.7	G-3/8	.26	6.5	.26	6.5	15/16	.56	14.1	.39	10.0	.06	1.6	1.35	34.3	1.75	44.5	.90	22.9
766LG _ 1/2 X 1/2	1/2	12.7	G-1/2	.28	7.0	.28	7.0	1 1/16	.74	19.0	.59	15.0	.06	1.6	1.50	38.1	1.90	48.2	.90	22.9

Reference Specifications:

DIN -ISO 228/1
BS -2779
JIS -B0202
ISO -228/1-BSP-P

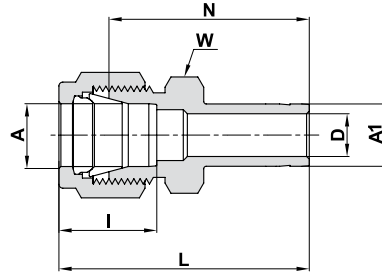
Designation:

Marking LG on Hex.

For Parallel Threads Sealing, see page 76

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

767 LT REDUCER



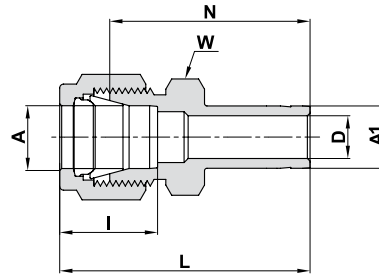
TUBE (METRIC) TO STUB (METRIC)

Ordering Information	A	A1	D	W	N	L	I
	Tube O.D.	Tube O.D.	mm	Hex. Flat	mm	mm	mm
	mm	mm	mm	mm	mm	mm	mm
767LT_2 X 3	2	3	1.7	12	26.9	33.5	12.9
767LT_3 X 4	3	4	2.2	12	28.4	35.0	12.9
767LT_3 X 6	3	6	2.4	12	29.5	36.1	12.9
767LT_3 X 10	3	10	2.4	14	31.8	38.4	12.9
767LT_4 X 6	4	6	2.4	12	30.5	37.1	13.7
767LT_6 X 3	6	3	2.1	14	29.5	36.9	15.3
767LT_6 X 8	6	8	4.8	14	32.5	39.9	15.3
767LT_6 X 10	6	10	4.8	14	33.3	40.7	15.3
767LT_6 X 12	6	12	4.8	14	38.9	46.3	15.3
767LT_6 X 18	6	18	4.8	22	42.2	49.6	15.3
767LT_8 X 6	8	6	4.0	15	32.8	40.3	16.2
767LT_8 X 10	8	10	6.4	15	34.5	42.0	16.2
767LT_8 X 12	8	12	6.4	15	40.1	47.6	16.2
767LT_10 X 6	10	6	4.0	18	34.8	42.4	17.2
767LT_10 X 8	10	8	5.6	18	35.8	43.4	17.2
767LT_10 X 12	10	12	7.9	18	42.2	49.8	17.2
767LT_10 X 15	10	15	7.9	18	43.7	51.3	17.2
767LT_10 X 18	10	18	7.9	22	43.7	51.3	17.2
767LT_12 X 6	12	6	4.0	22	34.8	44.9	22.8
767LT_12 X 8	12	8	5.6	22	35.8	45.9	22.8
767LT_12 X 10	12	10	7.1	22	36.6	46.7	22.8
767LT_12 X 16	12	16	9.5	22	43.7	53.8	22.8
767LT_12 X 18	12	18	9.5	22	43.7	53.8	22.8
767LT_12 X 20	12	20	9.5	22	46.0	56.1	22.8
767LT_12 X 22	12	22	9.5	24	46.0	56.1	22.8
767LT_12 X 25	12	25	9.5	27	52.3	62.4	22.8
767LT_16 X 12	16	12	8.8	24	42.9	53.0	24.4
767LT_18 X 12	18	12	8.8	27	44.5	54.6	24.4
767LT_18 X 16	18	16	12.7	27	46.0	56.1	24.4
767LT_18 X 20	18	20	15.1	27	47.5	57.6	24.4
767LT_18 X 22	18	22	15.1	27	47.5	57.6	24.4
767LT_18 X 25	18	25	15.1	27	52.3	62.4	24.4
767LT_20 X 16	20	16	12.7	30	47.8	57.9	26.0
767LT_20 X 18	20	18	13.9	30	47.8	57.9	26.0
767LT_20 X 22	20	22	15.9	30	49.3	59.4	26.0
767LT_20 X 25	20	25	15.9	30	54.1	64.2	26.0
767LT_22 X 18	22	18	13.9	30	47.8	57.9	26.0
767LT_22 X 20	22	20	15.1	30	49.3	59.4	26.0
767LT_22 X 25	22	25	18.3	30	54.1	64.2	26.0
767LT_25 X 18	25	18	13.9	35	50.8	63.1	31.3
767LT_25 X 20	25	20	15.1	35	52.3	64.6	31.3

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

Cont'd next page

767 LT REDUCER (cont'd)

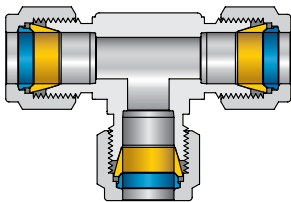


TUBE (METRIC) TO STUB (INCH)

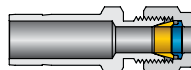
Ordering Information	A	A1	D	W	N	L	I
	Tube O.D. mm	Tube O.D. inch	mm	Hex. Flat mm	mm	mm	mm
767LT_2 X 1/8	2	1/8	2.0	12	26.9	33.5	12.9
767LT_3 X 1/8	3	1/8	2.0	12	26.9	33.5	12.9
767LT_3 X 1/4	3	1/4	2.4	12	29.5	36.1	12.9
767LT_4 X 1/4	4	1/4	2.4	12	30.5	37.1	13.7
767LT_6 X 1/8	6	1/8	2.2	14	29.5	36.9	15.3
767LT_6 X 5/16	6	5/16	4.8	14	32.5	39.9	15.3
767LT_6 X 3/8	6	3/8	4.8	14	33.3	40.7	15.3
767LT_6 X 1/2	6	1/2	4.8	14	38.9	46.3	15.3
767LT_8 X 3/8	8	3/8	6.4	15	34.5	42.0	16.2
767LT_8 X 1/2	8	1/2	6.4	15	40.1	47.6	16.2
767LT_10 X 3/8	10	3/8	6.8	18	36.6	44.2	17.2
767LT_10 X 1/2	10	1/2	7.9	18	42.2	49.8	17.2
767LT_12 X 1/2	12	1/2	9.4	22	42.2	52.3	22.8
767LT_12 X 3/4	12	3/4	9.4	22	43.7	53.8	22.8
767LT_18 X 3/4	18	3/4	15.0	27	46.0	56.1	24.4
767LT_18 X 1	18	1	15.1	27	52.3	62.4	24.4
767LT_25 X 1	25	1	20.3	35	57.2	69.5	31.3

HEAT EXCHANGER TEE; INFORMATION

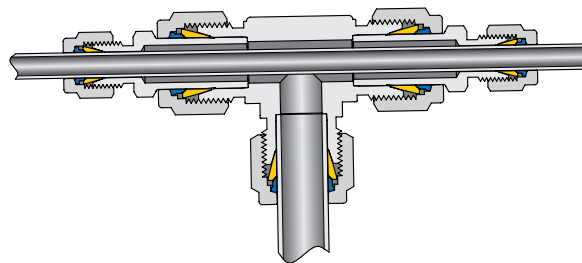
UNION TEE - 764 L



REDUCER - 767 LT



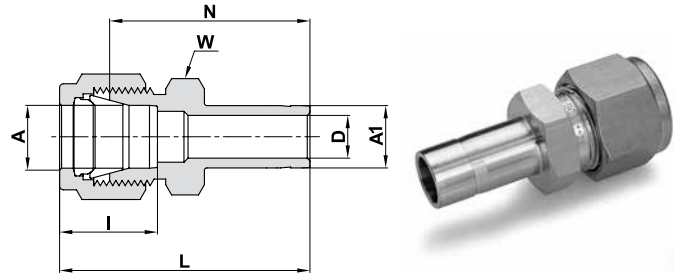
Heat exchanger tee made with
Let-Lok® tube fittings:



"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

Cont'd next page

767 LT
REDUCER (Cont'd)

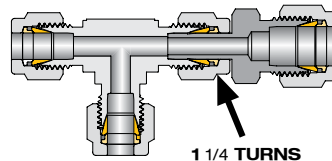


TUBE (INCH) TO STUB (INCH)

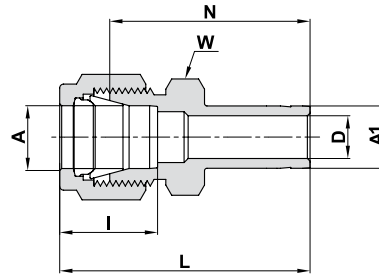
Ordering Information	A Tube O.D.		A1 Tube O.D.		D		W Hex Flat	N		L		I	
	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
767LT _ 1/16 X 1/8	1/16	1.58	1/8	3.17	.05	1.27	5/16	1.00	25.40	1.15	29.21	.34	8.6
767LT _ 1/16 X 1/4	1/16	1.58	1/4	6.35	.05	1.27	5/16	1.09	27.68	1.24	31.50	.34	8.6
767LT _ 1/8 X 1/16	1/8	3.17	1/16	1.58	.03	.76	7/16	.88	22.35	1.14	28.96	.50	12.7
767LT _ 1/8 X 1/8	1/8	3.17	1/8	3.17	.08	2.03	7/16	1.06	26.92	1.32	33.52	.50	12.7
767LT _ 1/8 X 3/16	1/8	3.17	3/16	4.76	.09	2.28	7/16	1.09	27.68	1.35	34.29	.50	12.7
767LT _ 1/8 X 1/4	1/8	3.17	1/4	6.35	.09	2.28	7/16	1.16	29.46	1.42	36.06	.50	12.7
767LT _ 1/8 X 3/8	1/8	3.17	3/8	9.52	.09	2.28	7/16	1.22	30.98	1.48	37.59	.50	12.7
767LT _ 1/8 X 1/2	1/8	3.17	1/2	12.70	.09	2.28	9/16	1.48	37.59	1.74	44.20	.50	12.7
767LT _ 3/16 X 1/8	3/16	4.76	1/8	3.17	.08	2.03	7/16	1.11	28.19	1.37	34.80	.54	13.7
767LT _ 3/16 X 1/4	3/16	4.76	1/4	6.35	.12	3.04	7/16	1.20	30.48	1.46	37.08	.54	13.7
767LT _ 1/4 X 1/8	1/4	6.35	1/8	3.17	.08	2.03	1/2	1.16	29.46	1.45	36.83	.60	15.2
767LT _ 1/4 X 3/16	1/4	6.35	3/16	4.76	.12	3.04	1/2	1.19	30.22	1.48	37.59	.60	15.2
767LT _ 1/4 X 1/4	1/4	6.35	1/4	6.35	.17	4.20	1/2	1.25	31.75	1.54	39.11	.60	15.2
767LT _ 1/4 X 5/16	1/4	6.35	5/16	7.93	.19	4.82	1/2	1.28	32.51	1.57	39.87	.60	15.2
767LT _ 1/4 X 3/8	1/4	6.35	3/8	9.52	.19	4.82	1/2	1.31	33.27	1.60	40.64	.60	15.2
767LT _ 1/4 X 1/2	1/4	6.35	1/2	12.70	.19	4.82	9/16	1.53	38.86	1.82	46.22	.60	15.2
767LT _ 1/4 X 5/8	1/4	6.35	5/8	15.87	.19	4.82	11/16	1.60	40.64	1.89	48.00	.60	15.2
767LT _ 1/4 X 3/4	1/4	6.35	3/4	19.05	.19	4.82	13/16	1.59	40.39	1.88	47.75	.60	15.2
767LT _ 5/16 X 3/8	5/16	7.93	3/8	9.52	.25	6.35	9/16	1.36	34.54	1.65	41.91	.64	16.2
767LT _ 5/16 X 1/2	5/16	7.93	1/2	12.70	.25	6.35	9/16	1.58	40.13	1.87	47.49	.64	16.2
767LT _ 3/8 X 1/4	3/8	9.52	1/4	6.35	.17	4.20	5/8	1.34	34.03	1.63	41.40	.66	16.8
767LT _ 3/8 X 3/8	3/8	9.52	3/8	9.52	.27	6.85	5/8	1.41	35.81	1.70	43.18	.66	16.8
767LT _ 3/8 X 1/2	3/8	9.52	1/2	12.70	.28	7.11	5/8	1.62	41.14	1.91	48.51	.66	16.8
767LT _ 3/8 X 5/8	3/8	9.52	5/8	15.87	.28	7.11	11/16	1.69	42.92	1.98	50.29	.66	16.8
767LT _ 3/8 X 3/4	3/8	9.52	3/4	19.05	.28	7.11	13/16	1.69	42.92	1.98	50.29	.66	16.8
767LT _ 1/2 X 1/4	1/2	12.70	1/4	6.35	.17	4.20	13/16	1.37	34.80	1.77	44.96	.90	22.9
767LT _ 1/2 X 3/8	1/2	12.70	3/8	9.52	.27	6.85	13/16	1.44	36.58	1.84	46.74	.90	22.9
767LT _ 1/2 X 1/2	1/2	12.70	1/2	12.70	.37	9.40	13/16	1.66	42.16	2.06	52.32	.90	22.9
767LT _ 1/2 X 5/8	1/2	12.70	5/8	15.87	.41	10.41	13/16	1.72	43.68	2.12	53.84	.90	22.9
767LT _ 1/2 X 3/4	1/2	12.70	3/4	19.05	.41	10.41	13/16	1.72	43.68	2.12	53.84	.90	22.9
767LT _ 1/2 X 1	1/2	12.70	1	25.40	.41	10.41	1 1/16	1.97	50.03	2.37	60.19	.90	22.9
767LT _ 5/8 X 3/4	5/8	15.87	3/4	19.05	.50	12.70	15/16	1.75	44.45	2.15	54.61	.96	24.4
767LT _ 5/8 X 7/8	5/8	15.87	7/8	22.22	.50	12.70	15/16	1.81	45.97	2.21	56.13	.96	24.4
767LT _ 5/8 X 1	5/8	15.87	1	25.40	.50	12.70	1 1/16	2.00	50.80	2.40	60.96	.96	24.4
767LT _ 3/4 X 1/2	3/4	19.05	1/2	12.70	.37	9.40	1 1/16	1.75	44.45	2.15	54.61	.96	24.4
767LT _ 3/4 X 1	3/4	19.05	1	25.40	.62	15.75	1 1/16	2.06	52.32	2.46	62.48	.96	24.4
767LT _ 1 X 1 1/4	1	25.40	*1 1/4	31.75	.88	22.35	1 3/8	2.69	68.33	3.17	80.52	1.23	31.2
767LT _ 1 X 1 1/2	1	25.40	*1 1/2	38.10	.88	22.35	1 5/8	3.03	76.96	3.51	89.15	1.23	31.2
767LT _ 1 1/4 X 1 1/2	1 1/4	31.75	*1 1/2	38.10	1.09	27.7	1 3/4	3.23	82.00	4.10	104.1	1.62	41.2

ASSEMBLY INSTRUCTIONS: Reducer tube to stub 767 LT

*Supplied assembled on tube stub end (A1) nut+front & back ferrule. Tighten the nut on the body 1/2 a turn with a wrench. Low friction paste, see page 91.
"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.



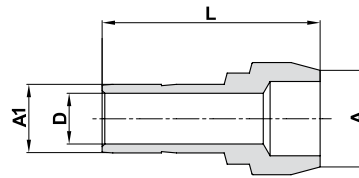
**767 LT
REDUCER** (Cont'd)



TUBE (INCH) TO STUB (METRIC)

Ordering Information	A Tube O.D.		A1 Tube O.D.	D		W Hex. Flat	N		L		I	
	inch	mm	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
767LT _ 1/8 X 6	1/8	3.17	6	.09	2.30	7/16	1.16	29.46	1.42	36.06	.50	12.7
767LT _ 1/4 X 6	1/4	6.35	6	.16	4.00	1/2	1.25	31.75	1.54	39.11	.60	15.2
767LT _ 3/8 X 8	3/8	9.52	8	.22	5.60	5/8	1.42	36.06	1.71	43.43	.66	16.8
767LT _ 3/8 X 12	3/8	9.52	12	.28	7.11	5/8	1.62	41.15	1.91	48.51	.66	16.8

**767 LM
REDUCING PORT
CONNECTOR**



CONNECTS TWO LET-LOK® PORTS (METRIC)

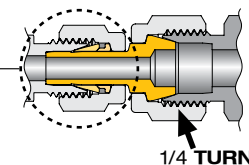
Ordering Information	A Tube O.D.		A1 Tube O.D.	D	L
	mm	mm	mm	mm	mm
767LM _ 6 X 3	6		3	2.1	22.9
767LM _ 8 X 6	8		6	4.0	24.7
767LM _ 10 X 6	10		6	4.0	25.8
767LM _ 10 X 8	10		8	5.6	26.1
767LM _ 12 X 6	12		6	4.0	29.1
767LM _ 12 X 8	12		8	5.6	29.8
767LM _ 12 X 10	12		10	7.1	30.6
767LM _ 16 X 12	16		12	8.8	37.5
767LM _ 38 X 25	*38		25	19.8	65.8

CONNECTS TWO LET-LOK® PORTS (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		D		L	
	inch	mm	inch	mm	inch	mm	inch	mm
767LM _ 1/8 X 1/16	1/8	3.17	1/16	1.58	.03	0.75	.68	17.3
767LM _ 1/4 X 1/16	1/4	6.35	1/16	1.58	.03	0.75	.71	18.0
767LM _ 1/4 X 1/8	1/4	6.35	1/8	3.17	.08	2.03	.89	22.6
767LM _ 3/8 X 1/8	3/8	9.52	1/8	3.17	.08	2.03	.91	23.2
767LM _ 3/8 X 1/4	3/8	9.52	1/4	6.35	.17	4.20	.98	24.9
767LM _ 1/2 X 1/4	1/2	12.70	1/4	6.35	.17	4.20	1.15	29.2
767LM _ 1/2 X 3/8	1/2	12.70	3/8	9.52	.28	7.10	1.20	30.5
767LM _ 3/4 X 1/2	3/4	19.05	1/2	12.70	.39	9.90	1.49	37.9

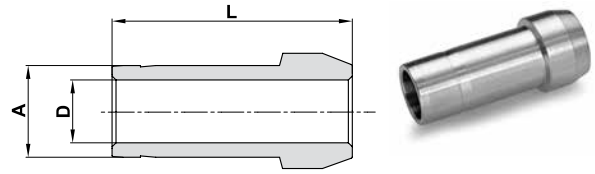
ASSEMBLY INSTRUCTIONS
Reducer Port Connector 767 LM

Tighten the nut.
1-1/4 turns of the nut are required for 1/4" (6 mm) and higher.
A 3/4 turn of the nut is required for 3/16" (4 mm) and lower.



* Including low friction paste, see page 91
"D" - Dimension is minimum opening.
Dimensions are for reference only, and are subject to change without notice.

767 LP PORT CONNECTOR



CONNECTS TWO LET-LOK® PORTS (METRIC)

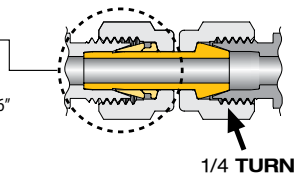
Ordering Information	A Tube O.D.		D		L	
	mm		mm		mm	
767LP_3	3		2.1		22.2	
767LP_6	6		4.0		25.0	
767LP_8	8		5.6		25.9	
767LP_10	10		7.1		27.1	
767LP_12	12		8.8		36.2	
767LP_16	16		12.7		37.4	
767LP_18	18		13.9		37.4	
767LP_38	*38		31.6		81.9	
767LP_50	*50		42.8		114.0	

CONNECTS TWO LET-LOK® PORTS (INCH)

Ordering Information	A Tube O.D.		D		L	
	inch	mm	inch	mm	inch	mm
767LP_1/16	1/16	1.58	.03	0.75	.54	13.7
767LP_1/8	1/8	3.17	.08	2.03	.88	22.4
767LP_1/4	1/4	6.35	.17	4.20	.98	24.9
767LP_5/16	5/16	7.93	.24	6.00	1.02	25.9
767LP_3/8	3/8	9.52	.27	6.85	1.03	26.2
767LP_1/2	1/2	12.70	.37	9.40	1.41	35.8
767LP_3/4	3/4	19.05	.59	15.00	1.47	37.3
767LP_1	1	25.40	.80	20.30	1.90	48.1
767LP_1 1/4	*1 1/4	31.75	1.02	26.00	2.72	69.1
767LP_1 1/2	*1 1/2	38.10	1.25	31.60	3.31	84.1
767LP_2	*2	50.80	1.72	43.67	4.56	115.8

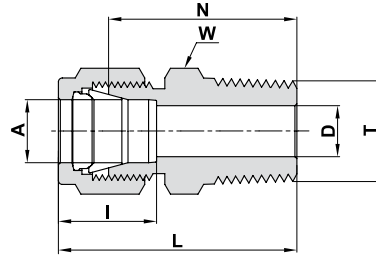
Port Connector 767LP

Tighten the nut.
1-1/4 turns of the nut are required for 1/4" (6 mm) and higher.
A 3/4 turn of the nut is required for 3/16" (4 mm) and lower.



* Supplied assembled with Nuts and Ferrules. Low friction paste, see page 91
"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

768 L MALE CONNECTOR



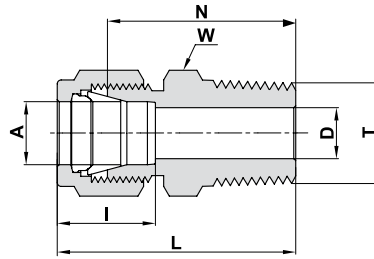
TUBE (METRIC) MALE NPT THREAD

Ordering Information	A	T	D	W	N	L	I
	Tube O.D.	(NPT)		Hex. Flat			
	mm	inch	mm	mm	mm	mm	mm
768L _ 2 X 1/8	2	1/8	1.7	12	23.9	30.5	12.9
768L _ 3 X 1/8	3	1/8	2.4	12	23.9	30.5	12.9
768L _ 3 X 1/4	3	1/4	2.4	14	29.0	35.6	12.9
768L _ 4 X 1/8	4	1/8	2.4	12	24.6	31.2	13.7
768L _ 4 X 1/4	4	1/4	2.4	14	29.7	36.3	13.7
768L _ 6 X 1/8	6	1/8	4.8	14	25.4	32.8	15.3
768L _ 6 X 1/4	6	1/4	4.8	14	30.5	37.9	15.3
768L _ 6 X 3/8	6	3/8	4.8	18	31.0	38.4	15.3
768L _ 6 X 1/2	6	1/2	4.8	22	37.3	44.7	15.3
768L _ 8 X 1/8	8	1/8	4.8	15	26.7	34.2	16.2
768L _ 8 X 1/4	8	1/4	6.4	15	31.2	38.7	16.2
768L _ 8 X 3/8	8	3/8	6.4	18	31.8	39.3	16.2
768L _ 8 X 1/2	8	1/2	6.4	22	38.1	45.6	16.2
768L _ 10 X 1/8	10	1/8	4.8	18	28.7	36.3	17.2
768L _ 10 X 1/4	10	1/4	7.9	18	33.3	40.9	17.2
768L _ 10 X 3/8	10	3/8	7.9	18	33.3	40.9	17.2
768L _ 10 X 1/2	10	1/2	7.9	22	38.9	46.5	17.2
768L _ 10 X 3/4	10	3/4	7.9	27	40.4	48.0	17.2
768L _ 12 X 1/8	12	1/8	4.8	22	28.7	38.8	22.8
768L _ 12 X 1/4	12	1/4	7.1	22	33.3	43.4	22.8
768L _ 12 X 3/8	12	3/8	9.5	22	33.3	43.4	22.8
768L _ 12 X 1/2	12	1/2	9.5	22	38.9	49.0	22.8
768L _ 12 X 3/4	12	3/4	9.5	27	40.4	50.5	22.8
768L _ 14 X 1/4	14	1/4	7.1	24	34.0	44.1	24.4
768L _ 14 X 3/8	14	3/8	9.5	24	34.0	44.1	24.4
768L _ 14 X 1/2	14	1/2	11.1	24	38.9	49.0	24.4
768L _ 15 X 1/2	15	1/2	11.9	24	38.9	49.0	24.4
768L _ 16 X 3/8	16	3/8	9.5	24	34.0	44.1	24.4
768L _ 16 X 1/2	16	1/2	11.9	24	38.9	49.0	24.4
768L _ 16 X 3/4	16	3/4	12.7	27	40.4	50.5	24.4
768L _ 18 X 1/2	18	1/2	11.9	27	40.4	50.5	24.4
768L _ 18 X 3/4	18	3/4	15.1	27	40.4	50.5	24.4
768L _ 20 X 1/2	20	1/2	11.9	30	42.2	52.3	26.0
768L _ 20 X 3/4	20	3/4	15.9	30	42.2	52.3	26.0
768L _ 22 X 3/4	22	3/4	15.9	30	42.2	52.3	26.0
768L _ 22 X 1	22	1	18.3	35	47.0	57.1	26.0
768L _ 25 X 1/2	25	1/2	11.9	35	45.2	57.5	31.3
768L _ 25 X 3/4	25	3/4	15.9	35	45.2	57.5	31.3
768L _ 25 X 1	25	1	21.8	35	50.0	62.3	31.3
768L _ 38 X 1 1/2	*38	1 1/2	33.7	55	64.0	91.6	49.4
768L _ 50 X 2"	*50	2	45.2	3 inch	76.2	113.3	65.0

* Supplied assembled with Nuts and Ferrules. For low friction paste, see page 91
 "D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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768 L
MALE CONNECTOR (Cont'd)



CONNECTORS

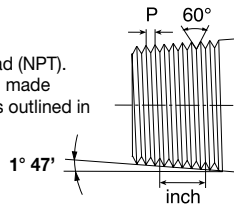
TUBE (INCH) MALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Hex. Flat	N		L		I	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm	inch	mm
768L_ 1/16 X 1/16	1/16	1.58	1/16	.05	1.27	5/16	.79	20.10	.94	23.88	.34	8.6
768L_ 1/16 X 1/8	1/16	1.58	1/8	.05	1.27	7/16	.88	22.35	1.03	26.10	.34	8.6
768L_ 1/16 X 1/4	1/16	1.58	1/4	.05	1.27	9/16	1.07	27.17	1.22	30.98	.34	8.6
768L_ 1/8 X 1/16	1/8	3.17	1/16	.09	2.28	7/16	.91	23.11	1.17	29.71	.50	12.7
768L_ 1/8 X 1/8	1/8	3.17	1/8	.09	2.28	7/16	.94	23.90	1.20	30.48	.50	12.7
768L_ 1/8 X 1/4	1/8	3.17	1/4	.09	2.28	9/16	1.14	28.95	1.40	35.56	.50	12.7
768L_ 1/8 X 3/8	1/8	3.17	3/8	.09	2.28	11/16	1.15	29.21	1.41	35.81	.50	12.7
768L_ 1/8 X 1/2	1/8	3.17	1/2	.09	2.28	7/8	1.40	35.56	1.66	42.16	.50	12.7
768L_ 3/16 X 1/8	3/16	4.76	1/8	.12	3.04	7/16	.97	24.63	1.23	31.24	.54	13.7
768L_ 3/16 X 1/4	3/16	4.76	1/4	.12	3.04	9/16	1.17	29.72	1.43	36.32	.54	13.7
768L_ 1/4 X 1/16	1/4	6.35	1/16	.12	3.04	1/2	1.00	25.40	1.29	32.76	.60	15.2
768L_ 1/4 X 1/8	1/4	6.35	1/8	.19	4.82	1/2	1.00	25.40	1.29	32.76	.60	15.2
768L_ 1/4 X 1/4	1/4	6.35	1/4	.19	4.82	9/16	1.20	30.50	1.49	37.85	.60	15.2
768L_ 1/4 X 3/8	1/4	6.35	3/8	.19	4.82	11/16	1.22	30.98	1.51	38.35	.60	15.2
768L_ 1/4 X 1/2	1/4	6.35	1/2	.19	4.82	7/8	1.47	37.34	1.76	44.70	.60	15.2
768L_ 1/4 X 3/4	1/4	6.35	3/4	.19	4.82	1 1/16	1.53	38.86	1.82	46.22	.60	15.2
768L_ 5/16 X 1/8	5/16	7.93	1/8	.19	4.82	9/16	1.05	26.67	1.34	34.03	.64	16.2
768L_ 5/16 X 1/4	5/16	7.93	1/4	.25	6.35	9/16	1.23	31.24	1.52	38.60	.64	16.2
768L_ 5/16 X 3/8	5/16	7.93	3/8	.25	6.35	11/16	1.25	31.75	1.54	39.11	.64	16.2
768L_ 3/8 X 1/8	3/8	9.52	1/8	.19	4.82	5/8	1.10	27.90	1.39	35.30	.66	16.8
768L_ 3/8 X 1/4	3/8	9.52	1/4	.28	7.11	5/8	1.28	32.51	1.57	39.87	.66	16.8
768L_ 3/8 X 3/8	3/8	9.52	3/8	.28	7.11	11/16	1.28	32.51	1.57	39.87	.66	16.8
768L_ 3/8 X 1/2	3/8	9.52	1/2	.28	7.11	7/8	1.53	38.90	1.82	46.23	.66	16.8
768L_ 3/8 X 3/4	3/8	9.52	3/4	.28	7.11	1 1/16	1.59	40.38	1.88	47.75	.66	16.8
768L_ 3/8 X 1	3/8	9.52	1	.28	7.11	1 3/8	1.85	46.99	2.14	54.35	.66	16.8
768L_ 1/2 X 1/8	1/2	12.70	1/8	.19	4.82	13/16	1.13	28.70	1.53	38.86	.90	22.9
768L_ 1/2 X 1/4	1/2	12.70	1/4	.28	7.11	13/16	1.31	33.27	1.71	43.43	.90	22.9
768L_ 1/2 X 3/8	1/2	12.70	3/8	.38	9.65	13/16	1.31	33.27	1.71	43.43	.90	22.9
768L_ 1/2 X 1/2	1/2	12.70	1/2	.41	10.41	7/8	1.53	38.90	1.93	49.02	.90	22.9
768L_ 1/2 X 3/4	1/2	12.70	3/4	.41	10.41	1 1/16	1.59	40.38	1.99	50.54	.90	22.9
768L_ 1/2 X 1	1/2	12.70	1	.41	10.41	1 3/8	1.85	47.00	2.25	57.15	.90	22.9

Reference Specifications:

- 60° Thread angle
- Pitch measured in inches
- Truncation of root and crest is flat
- Taper angle 1° 47'

American Standard Pipe Thread (NPT).
 NPT (National Pipe Tapered) is made according to the specifications outlined in ANSI B1.20.1.

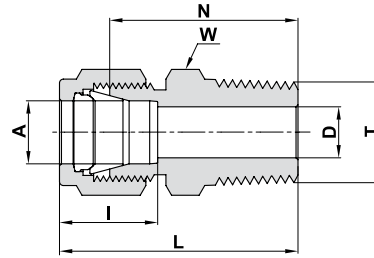


Thermoelement (see Page 38)

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

Cont'd next page

768 L MALE CONNECTOR (Cont'd)



TUBE (INCH) MALE NPT THREAD

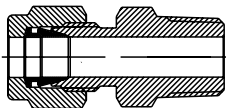
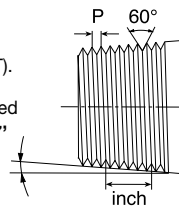
Ordering Information	A Tube O.D.		T (NPT)	D		W Hex. Flat	N		L		I	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm	inch	mm
768L _ 5/8 X 1/4	5/8	15.87	1/4	.28	7.11	15/16	1.34	34.03	1.74	44.19	.96	24.4
768L _ 5/8 X 3/8	5/8	15.87	3/8	.38	9.65	15/16	1.34	34.03	1.74	44.19	.96	24.4
768L _ 5/8 X 1/2	5/8	15.87	1/2	.47	11.90	15/16	1.53	38.86	1.93	49.02	.96	24.4
768L _ 5/8 X 3/4	5/8	15.87	3/4	.50	12.70	1 1/16	1.59	40.38	1.99	50.54	.96	24.4
768L _ 3/4 X 3/8	3/4	19.05	3/8	.38	9.50	1 1/16	1.38	35.05	1.78	45.21	.96	24.4
768L _ 3/4 X 1/2	3/4	19.05	1/2	.47	11.90	1 1/16	1.59	40.38	1.99	50.54	.96	24.4
768L _ 3/4 X 3/4	3/4	19.05	3/4	.62	15.75	1 1/16	1.59	40.38	1.99	50.54	.96	24.4
768L _ 3/4 X 1	3/4	19.05	1	.62	15.75	1 3/8	1.85	47.00	2.25	57.15	.96	24.4
768L _ 7/8 X 1/2	7/8	22.22	1/2	.47	11.90	1 3/16	1.59	40.38	1.99	50.54	1.02	25.9
768L _ 7/8 X 3/4	7/8	22.22	3/4	.62	15.75	1 3/16	1.59	40.38	1.99	50.54	1.02	25.9
768L _ 7/8 X 1	7/8	22.22	1	.72	18.28	1 3/8	1.85	46.99	2.25	57.15	1.02	25.9
768L _ 1 X 1/2	1	25.40	1/2	.47	11.90	1 3/8	1.78	45.21	2.26	57.40	1.23	31.2
768L _ 1 X 3/4	1	25.40	3/4	.62	15.75	1 3/8	1.78	45.21	2.26	57.40	1.23	31.2
768L _ 1 X 1	1	25.40	1	.88	22.35	1 3/8	1.97	50.03	2.45	62.23	1.23	31.2
768L _ 1 1/4 X 1	*1 1/4	31.75	1	.86	21.80	1 3/4	2.17	55.12	3.04	77.22	1.62	41.2
768L _ 1 1/4 X 1 1/4	*1 1/4	31.75	1 1/4	1.09	27.70	1 3/4	2.17	55.12	3.04	77.22	1.62	41.2
768L _ 1 1/2 X 1 1/2	*1 1/2	38.10	1 1/2	1.34	34.00	2 1/8	2.43	61.72	3.50	88.90	1.97	50.0
768L _ 2 X 2	*2	50.80	2	1.81	45.97	2 3/4	3.00	76.20	4.47	113.54	2.66	67.6

* Including low friction paste, See page 91

Reference Specifications:

- 60° Thread angle
- Pitch measured in inches
- Truncation of root and crest is flat
- Taper angle 1° 47'

American Standard Pipe Thread (NPT).
NPT (National Pipe Tapered) is made according to the specifications outlined in ANSI B1.20.1.

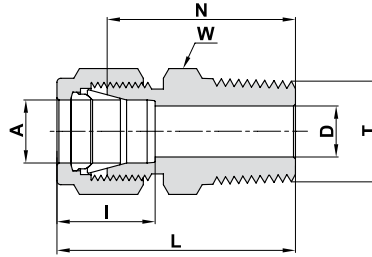


Thermoelement

For ordering: use the catalog number of the selected fitting and add the suffix TC.
Example: 768 L SS 1/4 x 1/4 **TC**

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

768 LR MALE CONNECTOR



TUBE (METRIC) ISO TAPERED THREAD

Ordering Information	A Tube O.D.	T (ISO)	D	W Hex. Flat	N	L	I
	mm	inch	mm	mm	mm	mm	mm
768LR _ 2 X 1/8	2	R-1/8	1.7	12	23.9	30.5	12.9
768LR _ 3 X 1/8	3	R-1/8	2.4	12	23.9	30.5	12.9
768LR _ 3 X 1/4	3	R-1/4	2.4	14	29.0	35.6	12.9
768LR _ 4 X 1/8	4	R-1/8	2.4	12	24.6	31.2	13.7
768LR _ 4 X 1/4	4	R-1/4	2.4	14	29.7	36.3	13.7
768LR _ 6 X 1/8	6	R-1/8	4.8	14	25.4	32.8	15.3
768LR _ 6 X 1/4	6	R-1/4	4.8	14	30.5	37.9	15.3
768LR _ 6 X 3/8	6	R-3/8	4.8	18	31.0	38.4	15.3
768LR _ 6 X 1/2	6	R-1/2	4.8	22	37.3	44.7	15.3
768LR _ 8 X 1/8	8	R-1/8	4.8	15	26.7	34.2	16.2
768LR _ 8 X 1/4	8	R-1/4	6.4	15	31.2	38.7	16.2
768LR _ 8 X 3/8	8	R-3/8	6.4	18	31.8	39.2	16.2
768LR _ 8 X 1/2	8	R-1/2	6.4	22	38.1	45.6	16.2
768LR _ 10 X 1/8	10	R-1/8	4.8	18	28.7	36.3	17.2
768LR _ 10 X 1/4	10	R-1/4	7.9	18	33.3	40.9	17.2
768LR _ 10 X 3/8	10	R-3/8	7.9	18	33.3	40.9	17.2
768LR _ 10 X 1/2	10	R-1/2	7.9	22	38.9	46.5	17.2
768LR _ 10 X 3/4	10	R-3/4	7.9	27	40.4	48.0	17.2
768LR _ 12 X 1/4	12	R-1/4	7.1	22	33.3	43.4	22.8
768LR _ 12 X 3/8	12	R-3/8	9.5	22	33.3	43.4	22.8
768LR _ 12 X 1/2	12	R-1/2	9.5	22	38.9	49.0	22.8
768LR _ 12 X 3/4	12	R-3/4	9.5	27	40.4	50.5	22.8
768LR _ 14 X 1/4	14	R-1/4	7.1	24	34.0	44.1	24.4
768LR _ 14 X 3/8	14	R-3/8	9.5	24	34.0	44.1	24.4
768LR _ 15 X 1/2	15	R-1/2	11.9	24	38.9	49.0	24.4
768LR _ 16 X 1/4	16	R-1/4	7.1	24	34.0	44.1	24.4
768LR _ 16 X 3/8	16	R-3/8	9.5	24	34.0	44.1	24.4
768LR _ 16 X 1/2	16	R-1/2	11.9	24	38.9	49.0	24.4
768LR _ 16 X 3/4	16	R-3/4	12.7	27	40.4	50.5	24.4
768LR _ 18 X 1/2	18	R-1/2	11.9	27	40.4	50.5	24.4
768LR _ 18 X 3/4	18	R-3/4	15.1	27	40.4	50.5	24.4
768LR _ 20 X 1/2	20	R-1/2	11.9	30	42.2	52.3	26.0
768LR _ 20 X 3/4	20	R-3/4	15.9	30	42.2	52.3	26.0
768LR _ 22 X 3/4	22	R-3/4	15.9	30	42.2	52.3	26.0
768LR _ 22 X 1	22	R-1	18.3	35	47.0	57.1	26.0
768LR _ 25 X 1/2	25	R-1/2	11.9	35	45.2	57.5	31.3
768LR _ 25 X 3/4	25	R-3/4	15.9	35	45.2	57.5	31.3
768LR _ 25 X 1	25	R-1	21.8	35	45.2	57.5	31.3
768LR _ 38 X 1 1/2	*38	R-1 1/2	33.7	55	64.0	91.6	49.4
768LR _ 50 X 2"	*50	R-2	45.2	3 inch	76.2	113.3	65.0

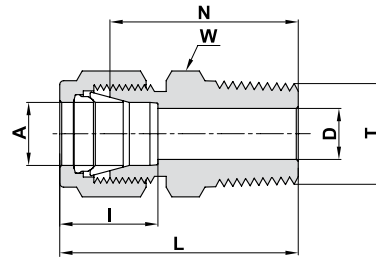
Designation:
Marking LR on Hex

Reference Specifications: DIN -ISO 2999
BS - 21
JIS - B0203
ISO - 7/1-BSP-T

Thermoelement
(See Page 38)

* Including low friction paste, see page 91
"D" - Dimension is minimum opening.
Dimensions are for reference only, and are
subject to change without notice.

768 LR MALE CONNECTOR (cont'd)



TUBE (INCH) ISO TAPERED THREAD

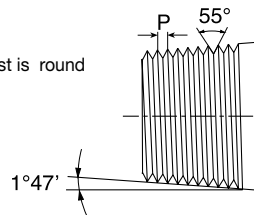
Ordering Information	A Tube O.D.		T (ISO)	D		W Hex. Flat	N		L		I	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm	inch	mm
768LR_ 1/8 X 1/8	1/8	3.17	R-1/8	.09	2.28	7/16	.94	23.90	1.20	30.48	.50	12.70
768LR_ 1/8 X 1/4	1/8	3.17	R-1/4	.09	2.28	9/16	1.14	28.95	1.40	35.56	.50	12.70
768LR_ 1/4 X 1/8	1/4	6.35	R-1/8	.19	4.82	1/2	1.00	25.40	1.29	32.76	.60	15.20
768LR_ 1/4 X 1/4	1/4	6.35	R-1/4	.19	4.82	9/16	1.20	30.50	1.49	37.85	.60	15.20
768LR_ 1/4 X 3/8	1/4	6.35	R-3/8	.19	4.82	11/16	1.22	30.98	1.51	38.35	.60	15.20
768LR_ 1/4 X 1/2	1/4	6.35	R-1/2	.19	4.82	7/8	1.47	37.34	1.76	44.70	.60	15.20
768LR_ 5/16 X 1/8	5/16	7.93	R-1/8	.19	4.82	9/16	1.05	26.67	1.34	34.03	.64	16.20
768LR_ 5/16 X 1/4	5/16	7.93	R-1/4	.25	6.35	9/16	1.23	31.24	1.52	38.60	.64	16.20
768LR_ 3/8 X 1/8	3/8	9.52	R-1/8	.19	4.82	5/8	1.10	27.90	1.39	35.30	.66	16.80
768LR_ 3/8 X 1/4	3/8	9.52	R-1/4	.28	7.11	5/8	1.28	32.51	1.57	39.87	.66	16.80
768LR_ 3/8 X 3/8	3/8	9.52	R-3/8	.28	7.11	11/16	1.28	32.51	1.57	39.87	.66	16.80
768LR_ 3/8 X 1/2	3/8	9.52	R-1/2	.28	7.11	7/8	1.53	38.90	1.82	46.23	.66	16.80
768LR_ 3/8 X 3/4	3/8	9.52	R-3/4	.28	7.11	1 1/16	1.59	40.38	1.88	47.75	.66	16.80
768LR_ 1/2 X 1/4	1/2	12.70	R-1/4	.28	7.11	13/16	1.31	33.27	1.71	43.43	.90	22.90
768LR_ 1/2 X 3/8	1/2	12.70	R-3/8	.38	9.65	13/16	1.31	33.27	1.71	43.43	.90	22.90
768LR_ 1/2 X 1/2	1/2	12.70	R-1/2	.41	10.41	7/8	1.53	38.90	1.93	49.02	.90	22.90
768LR_ 1/2 X 3/4	1/2	12.70	R-3/4	.41	10.41	1 1/16	1.59	40.38	1.99	50.54	.90	22.90
768LR_ 5/8 X 1/2	5/8	15.87	R-1/2	.47	11.90	15/16	1.53	38.86	1.93	49.02	.96	24.40
768LR_ 3/4 X 3/4	3/4	19.05	R-3/4	.62	15.74	1 1/16	1.59	40.38	1.99	50.54	.96	24.40
768LR_ 3/4 X 1	3/4	19.05	R-1	.62	15.74	1 3/8	1.85	47.00	2.25	57.15	.96	24.40
768LR_ 1 X 3/4	1	25.40	R-3/4	.63	15.90	1 3/8	1.78	45.21	2.26	57.40	1.23	31.20
768LR_ 1 X 1	1	25.40	R-1	.88	22.35	1 3/8	1.97	50.03	2.45	62.23	1.23	31.20
768LR_ 1 1/4 X 1 1/4	*1 1/4	31.75	R-1 1/4	1.09	27.70	1 3/4	2.17	55.12	3.04	77.22	1.62	41.20

* Including low friction paste, See page 91

Reference Specifications:

DIN -ISO 2999
BS - 21
JIS - B0203
ISO - 7/1-BSP-T

55° Thread angle
Truncation of root and crest is round
Taper angle 1°47'



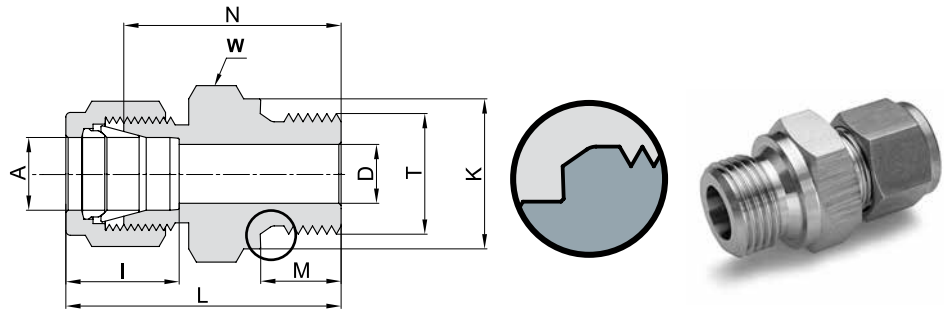
Designation:

Marking LR on Hex

Thermoelement (see Page 38)

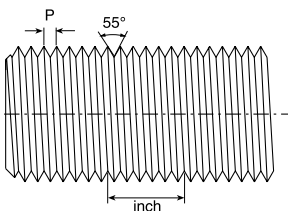
"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

768 LG MALE CONNECTOR



TUBE (METRIC) ISO PARALLEL THREAD

Ordering Information	A	T	D	K	W	N	M	L	I
	Tube O.D. mm	(P-ISO) inch	mm	mm	Hex. Flat mm	mm	mm	mm	mm
768LG _ 2 X 1/8	2	G-1/8	1.7	13.8	14	23.4	7.1	30.0	12.9
768LG _ 3 X 1/8	3	G-1/8	2.4	13.8	14	23.4	7.1	30.0	12.9
768LG _ 3 X 1/4	3	G-1/4	2.4	18.0	19	28.7	11.2	35.3	12.9
768LG _ 4 X 1/8	4	G-1/8	2.4	13.8	14	24.1	7.1	30.7	13.7
768LG _ 6 X 1/8	6	G-1/8	4.0	13.8	14	24.9	7.1	32.3	15.3
768LG _ 6 X 1/4	6	G-1/4	4.8	18.0	19	30.2	11.2	37.6	15.3
768LG _ 6 X 3/8	6	G-3/8	4.8	21.8	22	31.5	11.2	38.9	15.3
768LG _ 6 X 1/2	6	G-1/2	4.8	26.0	27	37.3	14.2	44.7	15.3
768LG _ 8 X 1/8	8	G-1/8	4.0	13.8	15	25.7	7.1	33.2	16.2
768LG _ 8 X 1/4	8	G-1/4	6.4	18.0	19	31.0	11.2	38.5	16.2
768LG _ 8 X 3/8	8	G-3/8	6.4	21.8	22	32.3	11.2	39.8	16.2
768LG _ 8 X 1/2	8	G-1/2	6.4	26.0	27	38.1	14.2	45.6	16.2
768LG _ 10 X 1/4	10	G-1/4	5.9	18.0	19	31.8	11.2	39.4	17.2
768LG _ 10 X 3/8	10	G-3/8	7.9	21.8	22	33.0	11.2	40.6	17.2
768LG _ 10 X 1/2	10	G-1/2	7.9	26.0	27	38.9	14.2	46.5	17.2
768LG _ 12 X 1/4	12	G-1/4	5.9	18.0	22	32.5	11.2	42.6	22.8
768LG _ 12 X 3/8	12	G-3/8	7.9	21.8	22	33.0	11.2	43.1	22.8
768LG _ 12 X 1/2	12	G-1/2	9.5	26.0	27	37.4	14.2	47.5	22.8
768LG _ 12 X 3/4	12	G-3/4	9.5	32.0	35	42.7	15.7	52.8	22.8
768LG _ 14 X 3/8	14	G-3/8	7.9	21.8	24	33.8	11.2	43.9	24.4
768LG _ 14 X 1/2	14	G-1/2	11.1	26.0	27	38.9	14.2	49.0	24.4
768LG _ 15 X 3/8	15	G-3/8	7.9	21.8	24	33.8	11.2	43.9	24.4
768LG _ 15 X 1/2	15	G-1/2	11.9	26.0	27	37.4	14.2	47.5	24.4
768LG _ 15 X 3/4	15	G-3/4	11.9	32.0	35	42.1	15.7	52.8	24.4
768LG _ 16 X 3/8	16	G-3/8	7.9	21.8	24	33.8	11.2	43.9	24.4
768LG _ 16 X 1/2	16	G-1/2	11.9	26.0	27	38.9	14.2	49.0	24.4
768LG _ 16 X 3/4	16	G-3/4	12.7	32.0	35	42.1	15.7	52.8	24.4
768LG _ 18 X 1/2	18	G-1/2	11.9	26.0	27	38.9	14.2	49.0	24.4
768LG _ 18 X 3/4	18	G-3/4	15.1	32.0	35	42.7	15.7	52.8	24.4
768LG _ 20 X 1/2	20	G-1/2	11.9	26.0	30	40.4	14.2	50.5	26.0
768LG _ 20 X 3/4	20	G-3/4	15.9	32.0	35	42.7	15.7	52.8	26.0
768LG _ 22 X 3/4	22	G-3/4	15.9	32.0	35	42.7	15.7	52.8	26.0
768LG _ 22 X 1	22	G-1	18.3	39.0	41	45.2	18.3	55.3	26.0
768LG _ 25 X 3/4	25	G-3/4	15.9	32.0	35	45.2	15.7	57.5	31.3
768LG _ 25 X 1	25	G-1	19.8	39.0	41	47.8	18.3	60.1	31.3
768LG _ 38 X 1 1/2	*38	G-1 1/2	31.8	54.7	55	63.2	22.1	90.9	49.4



Reference Specifications:

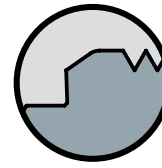
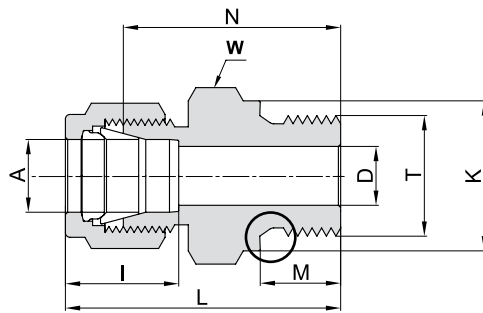
Designation: Marking LG on Hex.

For Parallel Threads Sealing,
see page 76

* Including low friction paste, See page 91.
"D" - Dimension is minimum opening.
Dimensions are for reference only, and are
subject to change without notice.

768 LG MALE CONNECTOR

(Cont'd)



TUBE (INCH) TO ISO PARALLEL THREAD

Ordering Information	A Tube O.D.		T (P-ISO)	D		K		W Hex. Flat	N		M		L		I	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm
768LG _ 1/8 X 1/8	1/8	3.17	G-1/8	0.09	2.30	0.54	13.80	9/16	0.92	23.40	0.28	7.10	1.18	30.00	0.50	12.7
768LG _ 1/8 X 1/4	1/8	3.17	G-1/4	0.09	2.30	0.71	18.00	3/4	1.13	28.70	0.44	11.20	1.39	35.30	0.50	12.7
768LG _ 1/8 X 3/8	1/8	3.17	G-3/8	0.09	2.30	0.86	21.80	7/8	1.17	29.72	0.44	11.20	1.43	36.32	0.50	12.7
768LG _ 1/8 X 1/2	1/8	3.17	G-1/2	0.09	2.30	1.02	26.00	1 1/16	1.40	35.70	0.56	14.20	1.66	42.16	0.50	12.7
768LG _ 3/16 X 1/8	3/16	4.76	G-1/8	0.12	3.10	0.54	13.80	9/16	0.95	24.10	0.28	7.10	1.21	30.70	0.54	13.7
768LG _ 1/4 X 1/8	1/4	6.35	G-1/8	0.16	4.10	0.54	13.80	9/16	0.98	24.90	0.28	7.10	1.27	32.26	0.60	15.2
768LG _ 1/4 X 1/4	1/4	6.35	G-1/4	0.19	4.80	0.71	18.00	3/4	1.19	30.20	0.44	11.20	1.48	37.60	0.60	15.2
768LG _ 1/4 X 3/8	1/4	6.35	G-3/8	0.19	4.80	0.86	21.80	7/8	1.24	31.50	0.44	11.20	1.50	38.10	0.60	15.2
768LG _ 1/4 X 1/2	1/4	6.35	G-1/2	0.19	4.80	1.02	26.00	1 1/16	1.47	37.30	0.56	14.20	1.76	44.70	0.60	15.2
768LG _ 5/16 X 1/4	5/16	7.93	G-1/4	0.23	5.80	0.71	18.00	3/4	1.22	31.00	0.44	11.20	1.51	38.36	0.64	16.2
768LG _ 5/16 X 3/8	5/16	7.93	G-3/8	0.25	6.40	0.86	21.80	7/8	1.27	32.30	0.44	11.20	1.56	39.66	0.64	16.2
768LG _ 3/8 X 1/8	3/8	9.52	G-1/8	0.16	4.00	1.26	32.0	5/8	1.05	26.7	0.28	7.10	1.34	34.03	0.66	16.8
768LG _ 3/8 X 1/4	3/8	9.52	G-1/4	0.23	5.80	0.71	18.00	3/4	1.25	31.75	0.44	11.20	1.54	39.11	0.66	16.8
768LG _ 3/8 X 3/8	3/8	9.52	G-3/8	0.28	7.10	0.86	21.80	7/8	1.30	33.00	0.44	11.20	1.59	40.40	0.66	16.8
768LG _ 3/8 X 1/2	3/8	9.52	G-1/2	0.28	7.10	1.02	26.00	1 1/16	1.53	38.86	0.56	14.20	1.82	46.22	0.66	16.8
768LG _ 1/2 X 1/4	1/2	12.70	G-1/4	0.23	5.80	0.71	18.00	13/16	1.28	32.50	0.44	11.20	1.68	42.67	0.90	22.9
768LG _ 1/2 X 3/8	1/2	12.70	G-3/8	0.31	7.90	0.86	21.80	7/8	1.30	33.00	0.44	11.20	1.70	43.18	0.90	22.9
768LG _ 1/2 X 1/2	1/2	12.70	G-1/2	0.41	10.40	1.02	26.00	1 1/16	1.47	37.40	0.56	14.20	1.87	47.56	0.90	22.9
768LG _ 1/2 X 3/4	1/2	12.70	G-3/4	0.41	10.40	1.26	32.00	1 5/16	1.68	42.70	0.62	15.70	2.08	52.86	0.90	22.9
768LG _ 5/8 X 3/8	5/8	15.87	G-3/8	0.31	7.90	0.86	21.80	24mm	1.33	33.80	0.44	11.20	1.73	43.96	0.96	24.4
768LG _ 5/8 X 1/2	5/8	15.87	G-1/2	0.47	11.90	1.02	26.00	1 1/16	1.53	38.90	0.56	14.20	1.93	49.10	0.96	24.4
768LG _ 3/4 X 1/2	3/4	19.05	G-1/2	0.47	11.90	1.02	26.00	1 1/16	1.53	38.86	0.56	14.20	1.93	49.00	0.96	24.4
768LG _ 3/4 X 3/4	3/4	19.05	G-3/4	0.62	15.80	1.26	32.00	1 5/16	1.68	42.70	0.62	15.70	2.08	52.83	0.96	24.4
768LG _ 1 X 1/2	1	25.40	G-1/2	0.47	11.90	1.02	26.00	1 3/8	1.72	43.70	0.56	14.20	2.20	55.80	1.23	31.2
768LG _ 1 X 3/4	1	25.40	G-3/4	0.62	15.90	1.26	32.00	1 3/8	1.78	45.20	0.62	15.70	2.26	57.40	1.23	31.2
768LG _ 1 X 1	1	25.40	G-1	0.78	19.80	1.54	39.00	1 5/8	1.88	47.80	0.72	18.30	2.36	59.94	1.23	31.2

For Parallel Threads Sealing, see page 76

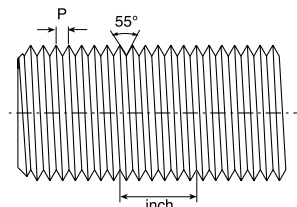
Designation:

Marking LG on Hex.

Reference Specifications:

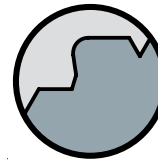
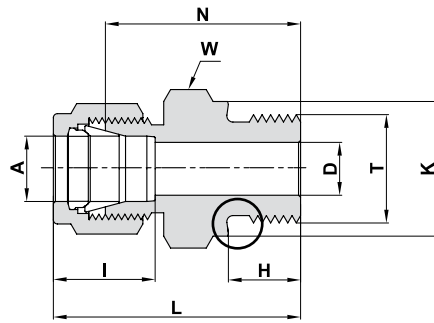
DIN - ISO 228/1
 BS - 2779
 JIS - B0202
 ISO - 228/1-BSP-P

- 55° Thread angle
- Pitch measured in inches
- Truncation of root and crest is round
- Diameter measured in inches



"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

768 LOK MALE CONNECTOR



TUBE (METRIC) ISO PARALLEL THREAD

Ordering Information	A	T	D	K	W	N	H	L	I
	Tube O.D. mm	(P-ISO) inch	mm	mm	Hex. Flat mm	mm	mm	mm	mm
768LOK_ 3 X 1/8	3	G-1/8A	2.4	13.8	14	26.7	7.1	33.3	12.9
768LOK_ 3 X 1/4	3	G-1/4A	2.4	18.0	19	28.7	11.2	35.3	12.9
768LOK_ 4 X 1/8	4	G-1/8A	2.4	13.8	14	24.1	7.1	30.7	13.7
768LOK_ 6 X 1/8	6	G-1/8A	4.0	13.8	14	24.9	7.1	32.3	15.3
768LOK_ 6 X 1/4	6	G-1/4A	4.8	18.0	19	30.2	11.2	37.6	15.3
768LOK_ 6 X 3/8	6	G-3/8A	4.8	21.8	22	31.5	11.2	38.9	15.3
768LOK_ 6 X 1/2	6	G-1/2A	4.8	26.0	27	37.3	14.2	44.7	15.3
768LOK_ 8 X 1/8	8	G-1/8A	4.0	13.8	15	25.7	7.1	33.2	16.2
768LOK_ 8 X 1/4	8	G-1/4A	6.4	18.0	19	31.0	11.2	38.5	16.2
768LOK_ 8 X 3/8	8	G-3/8A	6.4	21.8	22	32.3	11.2	39.8	16.2
768LOK_ 8 X 1/2	8	G-1/2A	6.4	26.0	27	38.1	14.2	45.6	16.2
768LOK_ 10 X 1/4	10	G-1/4A	6.4	18.0	19	31.8	11.2	39.4	17.2
768LOK_ 10 X 3/8	10	G-3/8A	7.9	21.8	22	33.0	11.2	40.6	17.2
768LOK_ 10 X 1/2	10	G-1/2A	7.9	26.0	27	38.9	14.2	46.5	17.2
768LOK_ 12 X 1/4	12	G-1/4A	5.9	18.0	22	32.5	11.2	42.6	22.8
768LOK_ 12 X 3/8	12	G-3/8A	7.9	21.8	22	33.0	11.2	43.1	22.8
768LOK_ 12 X 1/2	12	G-1/2A	9.5	26.0	27	38.9	14.2	49.0	22.8
768LOK_ 12 X 3/4	12	G-3/4A	9.5	32.0	35	42.7	15.7	52.8	22.8
768LOK_ 15 X 1/2	15	G-1/2A	11.9	26.0	27	38.9	14.2	49.0	24.4
768LOK_ 16 X 3/8	16	G-3/8A	7.9	21.8	24	33.8	11.2	43.9	22.4
768LOK_ 16 X 1/2	16	G-1/2A	11.9	26.0	27	38.9	14.2	49.0	22.4
768LOK_ 18 X 1/2	18	G-1/2A	11.9	26.0	27	38.9	14.2	49.0	22.4
768LOK_ 18 X 3/4	18	G-3/4A	15.1	32.0	35	42.2	15.7	52.3	22.4
768LOK_ 20 X 1/2	20	G-1/2A	11.9	26.0	30	40.4	14.2	50.5	26.0
768LOK_ 20 X 3/4	20	G-3/4A	15.9	32.0	35	42.7	15.7	52.8	26.0
768LOK_ 22 X 3/4	22	G-3/4A	15.9	32.0	35	42.7	15.7	52.8	26.0
768LOK_ 22 X 1	22	G-1A	18.3	39.0	41	45.2	18.3	55.3	26.0
768LOK_ 25 X 3/4	25	G-3/4A	15.9	32.0	35	45.2	15.7	57.5	31.3
768LOK_ 25 X 1	25	G-1A	19.8	39.0	41	47.8	18.3	60.1	31.3
768LOK_ 38X1/2	*38	G-1 1/2A	31.8	54.7	55	64.9	20.6	92.1	49.4

* Including low friction paste, see page 91

For Parallel Threads Sealing, see page 76

Reference Specifications:

DIN - ISO 228/1
BS - 2779
JIS - B0202
ISO - 228/1-BSP-P

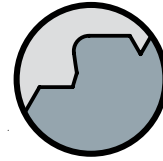
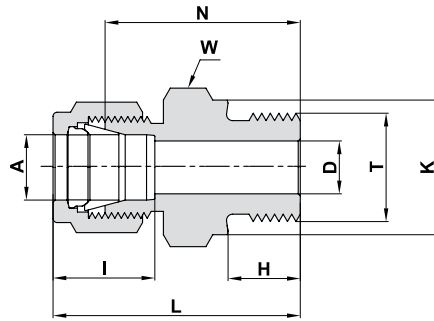
Designation:

Marking LOK on Hex.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

768 LOK MALE CONNECTOR

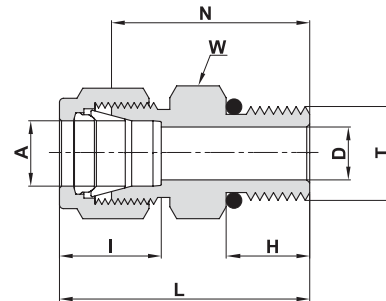
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TUBE (INCH) TO ISO PARALLEL THREAD

Ordering Information	A Tube O.D.		T Straight Thread UN	D		K		W Hex. Flat	N		H		L		I	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm
768LOK _ 1/8 X 1/8	1/8	3.17	G-1/8A	0.09	2.30	0.54	13.80	9/16	0.92	23.40	0.28	7.10	1.18	30.00	0.50	12.7
768LOK _ 1/8 X 1/4	1/8	3.17	G-1/4A	0.09	2.30	0.71	18.00	3/4	1.13	28.70	0.44	11.20	1.39	35.30	0.50	12.7
768LOK _ 1/4 X 1/8	1/4	6.35	G-1/8A	0.16	4.10	0.54	13.80	9/16	0.98	24.90	0.28	7.10	1.27	32.26	0.60	15.2
768LOK _ 1/4 X 1/4	1/4	6.35	G-1/4A	0.19	4.80	0.71	18.00	3/4	1.19	30.20	0.44	11.20	1.48	37.60	0.60	15.2
768LOK _ 1/2 X 3/8	1/2	12.70	G-3/8A	0.31	7.90	0.86	21.80	7/8	1.30	33.00	0.44	11.20	1.70	43.18	0.90	22.9
768LOK _ 1/2 X 1/2	1/2	12.70	G-1/2A	0.41	10.40	1.02	26.00	1-1/16	1.53	39.86	0.56	14.20	1.93	49.02	0.90	22.9
768LOK _ 3/4 X 1/2	3/4	19.05	G-1/2A	0.47	11.90	1.02	26.00	1-1/16	3.65	41.91	0.56	14.20	2.05	52.07	0.96	24.4
768LOK _ 3/4 X 3/4	3/4	19.05	G-3/4A	0.62	15.80	1.26	32.00	1 3/8	1.68	42.70	0.62	15.70	2.08	52.83	0.96	24.4
768LOK _ 1 X 1	1	25.40	G-1A	0.78	19.80	1.54	39.00	1 5/8	1.88	47.80	0.72	18.30	2.36	59.94	1.23	31.2

For Parallel threads Sealing, See page 76



768 LOB MALE CONNECTOR

SAE/MS STRAIGHT THREAD BOSS***

Ordering Information	A Tube O.D.	T Straight Thread UN	D	W Hex. Flat	N	H	L	I	O-Ring**
	mm	inch	mm	mm	mm	mm	mm	mm	
768LOB _ 3 X 5/16-24	3	5/16-24	2.4	7/16"	23.4	7.6	30.0	12.9	-902
768LOB _ 3 X 9/16-18	3	9/16-18	2.4	18	26.7	9.9	33.3	12.9	-906
768LOB _ 6 X 1/2-20	6	1/2-20	4.8	17	27.4	9.1	34.8	15.3	-905
768LOB _ 6 X 9/16-18	6	9/16-18	4.8	18	28.2	9.9	35.6	15.3	-906
768LOB _ 6 X 7/8-14	6	7/8-14	4.8	27	33.3	12.7	40.7	15.3	-910
768LOB _ 8 X 1/2-20	8	1/2-20	6.4	17	27.4	9.1	34.9	16.2	-905
768LOB _ 8 X 9/16-18	8	9/16-18	6.4	18	29.1	9.9	36.6	16.2	-906
768LOB _ 10 X 9/16-18	10	9/16-18	7.1	18	29.7	9.9	37.3	17.2	-906
768LOB _ 10 X 3/4-16	10	3/4-16	7.9	22	31.8	11.2	39.4	17.2	-908
768LOB _ 12 X 7/16-20	12	7/16-20	5.2	22	30.5	9.1	40.6	22.8	-904
768LOB _ 12 X 9/16-18	12	9/16-18	7.1	22	29.0	9.9	39.1	22.8	-906
768LOB _ 12 X 3/4-16	12	3/4-16	9.5	22	31.8	11.2	41.9	22.8	-908
768LOB _ 16 X 9/16-18	16	9/16-18	7.1	24	21.2	9.9	31.3	24.4	-906
768LOB _ 25 X 1 1/16-12	25	1 1/16-12	16.7	35	41.2	15.0	53.5	31.3	-912

Designation: Marking LOB on Hex.

*** Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

Reference Specifications:

DIN - ISO 228/1

BS - 2779

JIS - B0202

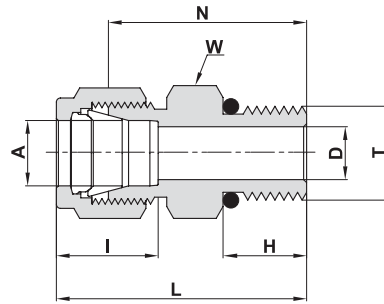
ISO - 228/1-BSP-P

Designation:

Marking LOK on Hex.

768 LOB MALE CONNECTOR

(Cont'd)



SAE/MS STRAIGHT THREAD BOSS***

Ordering Information	A Tube O.D.		T Straight Thread UN	D		W Hex. Flat	N		H		L		I		O-RING**
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	
768LOB_ 1/8 X 5/16-24	1/8	3.17	5/16-24	.09	2.28	7/16	.92	23.37	.30	7.62	1.18	29.97	.50	12.7	-902
768LOB_ 1/8 X 7/16-20	1/8	3.17	7/16-20	.09	2.28	9/16	.98	24.89	.36	9.14	1.24	31.50	.50	12.7	-904
768LOB_ 1/8 X 9/16-18	1/8	3.17	9/16-18	.09	2.28	11/16	1.05	26.67	.39	9.90	1.31	33.27	.50	12.7	-906
768LOB_ 1/4 X 5/16-24	1/4	6.35	5/16-24	.09	2.28	9/16	.92	23.37	.30	7.62	1.21	30.73	.60	15.2	-902
768LOB_ 1/4 X 7/16-20	1/4	6.35	7/16-20	.19	4.82	9/16	1.05	26.67	.36	9.14	1.34	34.03	.60	15.2	-904
768LOB_ 1/4 X 9/16-18	1/4	6.35	9/16-18	.19	4.82	11/16	1.11	28.19	.39	9.90	1.40	35.56	.60	15.2	-906
768LOB_ 1/4 X 3/4 -16	1/4	6.35	3/4 -16	.19	4.82	7/8	1.19	30.20	.44	11.17	1.48	37.59	.60	15.2	-908
768LOB_ 1/4 X 7/8-14	1/4	6.35	7/8-14	.19	4.82	1	1.31	33.27	.50	12.70	1.60	40.64	.60	15.2	-910
768LOB_ 5/16 X 1/2-20	5/16	7.93	1/2-20	.25	6.40	5/8	1.08	27.43	.36	9.14	1.37	34.80	.64	16.2	-905
768LOB_ 3/8 X 7/16-20	3/8	9.52	7/16-20	.20	5.10	5/8	1.11	28.19	.36	9.14	1.40	35.56	.66	16.8	-904
768LOB_ 3/8 X 9/16-18	3/8	9.52	9/16-18	.28	7.11	11/16	1.17	29.71	.39	9.90	1.46	37.02	.66	16.8	-906
768LOB_ 3/8 X 3/4 -16	3/8	9.52	3/4 -16	.28	7.11	7/8	1.25	31.75	.44	11.17	1.54	39.11	.66	16.8	-908
768LOB_ 3/8 X 7/8-14	3/8	9.52	7/8-14	.28	7.11	1	1.37	34.80	.50	12.70	1.66	42.16	.66	16.8	-910
768LOB_ 1/2 X 9/16-18	1/2	12.70	9/16-18	.28	7.11	13/16	1.14	28.95	.39	9.90	1.54	39.11	.90	22.9	-906
768LOB_ 1/2 X 3/4 -16	1/2	12.70	3/4 -16	.41	10.41	7/8	1.25	31.75	.44	11.17	1.65	41.91	.90	22.9	-908
768LOB_ 1/2 X 7/8-14	1/2	12.70	7/8-14	.41	10.41	1	1.37	34.80	.50	12.70	1.77	44.96	.90	22.9	-910
768LOB_ 1/2 X 1 1/16-12	1/2	12.70	1 1/16-12	.41	10.41	1 1/4	1.53	38.86	.59	14.98	1.93	49.02	.90	22.9	-912
768LOB_ 5/8 X 3/4 -16	5/8	15.87	3/4 -16	.42	10.66	15/16	1.25	31.75	.44	11.17	1.65	41.91	.96	22.4	-908
768LOB_ 5/8 X 7/8 -14	5/8	15.87	7/8 -14	.50	12.70	1	1.38	35.05	.50	12.70	1.78	45.21	.96	22.4	-910
768LOB_ 3/4 X 3/4 -16	3/4	19.05	3/4 -16	.42	10.66	1 1/16	1.41	35.81	.44	11.17	1.81	46.0	.96	22.4	-908
768LOB_ 3/4 X 1 1/16 -12	3/4	19.05	1 1/16 -12	.62	15.74	1 1/4	1.53	38.86	.59	14.98	1.93	49.02	.96	22.4	-912
768LOB_ 3/4 X 1 5/16-12	3/4	19.05	1 5/16-12	.62	15.74	1 1/2	1.66	42.16	.59	14.98	2.06	52.32	1.02	25.9	-916
768LOB_ 7/8 X 1 3/16 -12	7/8	22.22	1 3/16 -12	.72	18.29	1 3/8	1.53	38.86	.59	14.98	1.93	49.02	1.02	25.9	-914
768LOB_ 1 X 1 1/16 -12	1	25.40	1 1/16 -12	.66	16.76	1 3/8	1.62	41.20	.59	14.98	2.10	53.34	1.23	31.2	-912
768LOB_ 1 X 1 5/16 -12	1	25.40	1 5/16 -12	.88	22.35	1 1/2	1.66	42.16	.59	14.98	2.14	54.35	1.23	31.2	-916
768LOB_ 1 1/4 X 1 5/8 -12	*1 1/4	31.75	1 5/8 -12	1.09	27.70	1 7/8	1.82	46.23	.59	15.10	2.69	68.33	1.62	41.2	-920
768LOB_ 1 1/2 X 1 7/8 -12	*1 1/2	38.10	1 7/8 -12	1.34	34.00	2 1/8	1.99	50.55	.59	15.10	3.06	77.72	1.97	50.0	-924
768LOB_ 2 X 2 1/2 -12	*2	50.80	2 1/2 -12	1.81	45.97	2 3/4	2.53	64.26	.59	15.10	4.00	101.60	2.66	67.6	-932

Designation: Marking LOB on Hex.

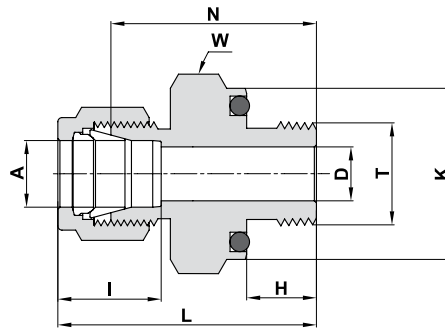
*** Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

768 LOP MALE CONNECTOR



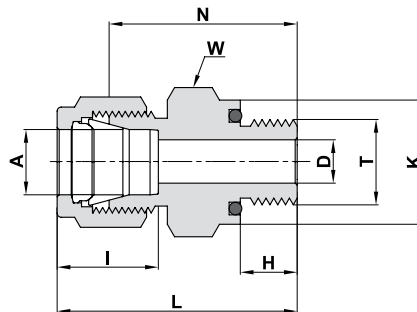
O-SEAL NPT TAPERED THREAD

Ordering Information	A Tube O.D.		T (NPT) Short		D Hex. Flat		K		W Hex. Flat		N		H		L		I		O-RING**
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		
768LOP_ 1/8 X 1/8	1/8	3.17	1/8	.09	2.28	.74	18.79	3/4	1.03	26.16	.28	7.11	1.29	32.76	.50	12.7		-111	
768LOP_ 1/4 X 1/8	1/4	6.35	1/8	.19	4.82	.74	18.79	3/4	1.09	27.70	.28	7.11	1.38	35.05	.60	15.2		-111	
768LOP_ 1/4 X 1/4	1/4	6.35	1/4	.19	4.82	.93	23.62	15/16	1.22	31.00	.38	9.65	1.51	38.40	.60	15.2		-113	
768LOP_ 3/8 X 1/4	3/8	9.52	1/4	.28	7.11	.93	23.62	15/16	1.28	32.51	.38	9.65	1.57	39.88	.66	16.8		-113	
768LOP_ 3/8 X 3/8	3/8	9.52	3/8	.28	7.11	1.12	28.45	1 1/8	1.34	34.04	.41	10.41	1.63	41.40	.66	16.8		-116	
768LOP_ 3/8 X 1/2	3/8	9.52	1/2	.28	7.11	1.30	33.02	1 5/16	1.56	39.62	.53	13.46	1.85	46.99	.66	16.8		-212	
768LOP_ 1/2 X 1/2	1/2	12.70	1/2	.41	10.41	1.30	33.02	1 5/16	1.56	39.62	.53	13.46	1.96	49.78	.90	22.9		-212	

Designation: Marking LOP on Hex.

** O-rings used are BUNA 70 Durometer.

768 LO MALE CONNECTOR



O-SEAL MALE UN THREAD

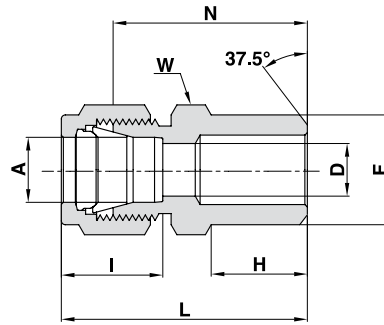
Ordering Information	A Tube O.D.		T Straight Thread UN		D		K		W Hex. Flat		N		H		L		I		O-RING**
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		
768LO_ 1/16 X 5/16-24	1/16	1.58	5/16-24	.05	1.27	.55	14.0	9/16	.90	22.86	.34	8.63	1.05	26.67	.34	8.6		-011	
768LO_ 1/8 X 5/16-24	1/8	3.17	5/16-24	.09	2.28	.55	14.0	9/16	1.03	26.20	.34	8.63	1.29	32.77	.50	12.7		-011	
768LO_ 3/16 X 3/8-24	3/16	4.76	3/8-24	.12	3.04	.62	15.75	5/8	1.09	27.70	.38	9.65	1.35	34.29	.54	12.7		-012	
768LO_ 1/4 X 7/16-20	1/4	6.35	7/16-20	.19	4.82	.74	18.80	3/4	1.22	31.00	.41	10.41	1.51	38.35	.60	15.2		-111	
768LO_ 5/16 X 1/2-20	5/16	7.93	1/2-20	.25	6.35	.86	21.84	7/8	1.31	33.30	.44	11.17	1.60	40.64	.64	16.2		-112	
768LO_ 3/8 X 9/16-18	3/8	9.52	9/16-18	.28	7.11	.93	23.62	15/16	1.38	35.05	.47	11.93	1.67	40.89	.66	16.8		-113	
768LO_ 1/2 X 3/4-16	1/2	12.70	3/4-16	.41	10.41	1.12	28.45	1 1/8	1.41	35.81	.47	11.93	1.81	45.77	.90	22.9		-116	
768LO_ 3/4 X 1 1/16-12	3/4	19.05	1 1/16-12	.62	15.74	1.49	37.85	1 1/2	1.66	42.20	.56	14.22	2.06	52.32	.96	24.4		-215	
768LO_ 1 X 1 5/16-12	1	25.40	1 5/16-12	.88	22.35	1.74	44.20	1 3/4	1.81	45.97	.56	14.22	2.29	58.17	1.23	32.2		-219	

Designation: Marking LO on Hex.

** O-rings used are BUNA 70 Durometer.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

768 LN
MALE PIPE WELD
CONNECTOR



TUBE (METRIC)

Ordering Information	A		F		D	W	N	H	L	I
	Tube O.D.		Pipe Size							
	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm
768LN_ 3 X 1/8	3	1/8	10.30	2.4	12	23.9	9.7	30.5	12.9	
768LN_ 4 X 1/8	4	1/8	10.30	2.4	12	24.6	9.7	31.2	13.7	
768LN_ 6 X 1/8	6	1/8	10.30	4.8	14	25.4	9.7	32.8	15.3	
768LN_ 6 X 1/4	6	1/4	13.70	4.8	14	30.5	14.2	37.9	15.3	
768LN_ 8 X 1/8	8	1/8	10.30	5.1	15	26.7	9.7	34.2	16.2	
768LN_ 8 X 1/4	8	1/4	13.70	6.4	15	31.2	14.2	38.7	16.2	
768LN_ 8 X 1/2	8	1/2	21.34	6.4	22	38.1	19.0	45.6	16.2	
768LN_ 10 X 1/4	10	1/4	13.70	7.1	18	33.3	14.2	40.9	17.2	
768LN_ 10 X 3/8	10	3/8	17.10	7.9	18	33.3	14.2	40.9	17.2	
768LN_ 10 X 1/2	10	1/2	21.34	7.9	22	38.9	19.0	46.5	17.2	
768LN_ 12 X 1/4	12	1/4	13.70	7.1	22	33.3	14.2	43.4	22.8	
768LN_ 12 X 3/8	12	3/8	17.10	9.5	22	33.3	14.2	43.4	22.8	
768LN_ 12 X 1/2	12	1/2	21.34	9.5	22	38.9	19.0	49.0	22.8	
768LN_ 12 X 3/4	12	3/4	26.67	9.5	27	40.4	19.0	50.5	22.8	
768LN_ 14 X 3/8	14	3/8	17.10	10.4	24	34.0	14.2	44.1	24.4	
768LN_ 15 X 1/2	15	1/2	21.34	11.9	24	38.9	19.0	49.0	24.4	
768LN_ 16 X 1/2	16	1/2	21.34	12.7	24	38.9	19.0	49.0	24.4	
768LN_ 18 X 1/2	18	1/2	21.34	13.5	27	40.4	19.0	50.5	24.4	
768LN_ 38 X 1 1/2	*38	1 1/2	48.30	33.7	55	64.0	26.2	91.2	49.4	

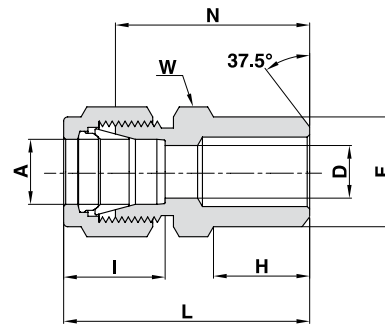
Designation: Marking LN on Hex.
 * Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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768 LN MALE PIPE WELD CONNECTOR

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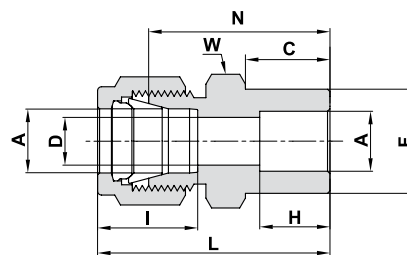


TUBE (INCH)

Ordering Information	A Tube O.D.		F Pipe Size		D		W Hex. Flat	N		H		L		I	
	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm
768LN _ 1/8 X 1/8	1/8	3.17	1/8	10.30	.09	2.28	7/16	.94	23.88	.38	9.65	1.20	30.48	.50	12.7
768LN _ 3/16 X 1/8	3/16	4.76	1/8	10.30	.12	3.04	7/16	.97	24.60	.38	9.65	1.23	31.25	.54	13.7
768LN _ 1/4 X 1/8	1/4	6.35	1/8	10.30	.19	4.82	1/2	1.00	25.40	.38	9.65	1.29	32.77	.60	15.2
768LN _ 1/4 X 1/4	1/4	6.35	1/4	13.70	.19	4.82	9/16	1.20	30.48	.56	14.22	1.49	37.85	.60	15.2
768LN _ 5/16 X 1/8	5/16	7.93	1/8	10.30	.20	5.08	9/16	1.05	26.67	.38	9.65	1.34	34.04	.64	16.2
768LN _ 5/16 X 1/4	5/16	7.93	1/4	13.70	.25	6.35	9/16	1.23	31.24	.56	14.22	1.52	38.61	.64	16.2
768LN _ 3/8 X 1/4	3/8	9.52	1/4	13.70	.28	7.11	5/8	1.28	32.51	.56	14.22	1.57	39.87	.66	16.8
768LN _ 3/8 X 3/8	3/8	9.52	3/8	17.10	.28	7.11	11/16	1.28	32.51	.56	14.22	1.57	39.87	.66	16.8
768LN _ 3/8 X 1/2	3/8	9.52	1/2	21.34	.28	7.11	7/8	1.53	38.86	.75	19.05	1.82	46.22	.66	16.8
768LN _ 3/8 X 3/4	3/8	9.52	3/4	26.67	.28	7.11	1 1/16	1.59	40.38	.75	19.05	1.88	47.75	.66	16.8
768LN _ 1/2 X 3/8	1/2	12.70	3/8	17.10	.41	10.41	13/16	1.31	33.27	.56	14.22	1.71	44.43	.90	22.9
768LN _ 1/2 X 1/2	1/2	12.70	1/2	21.34	.41	10.41	7/8	1.53	38.86	.75	19.05	1.93	49.00	.90	22.9
768LN _ 1/2 X 3/4	1/2	12.70	3/4	26.67	.41	10.41	1 1/16	1.59	40.40	.75	19.05	1.99	50.55	.90	22.9
768LN _ 1/2 X 1	1/2	12.70	1	33.40	.41	10.41	1 3/8	1.87	47.50	.94	23.87	2.27	57.65	.90	22.9
768LN _ 5/8 X 1/2	5/8	15.87	1/2	21.34	.50	12.70	15/16	1.53	38.86	.75	19.05	1.93	49.02	.96	24.4
768LN _ 3/4 X 1/2	3/4	19.05	1/2	21.34	.53	13.46	1 1/16	1.53	38.86	.75	19.05	1.93	49.00	.96	24.4
768LN _ 3/4 X 3/4	3/4	19.05	3/4	26.67	.62	15.74	1 1/16	1.59	40.40	.75	19.05	1.99	50.55	.96	24.4
768LN _ 1 X 1	1	25.40	1	33.40	.88	22.35	1 3/8	1.97	50.03	.94	23.87	2.45	62.23	1.23	31.2
768LN _ 1 1/4 X 1 1/4	*1 1/4	31.75	1 1/4	42.16	1.09	27.70	1 3/4	2.17	55.12	.94	23.88	3.04	77.22	1.62	41.2
768LN _ 1 1/2 X 1 1/2	*1 1/2	38.10	1 1/2	48.26	1.34	34.00	2 1/8	2.43	61.72	1.03	26.16	3.50	88.90	1.97	50.0
768LN _ 2 X 2	*2	50.80	2	60.33	1.81	45.97	2 3/4	3.00	76.20	1.06	26.92	4.47	113.34	2.66	67.6

Designation: Marking LN on Hex.

768 LW TUBE SOCKET WELD UNION



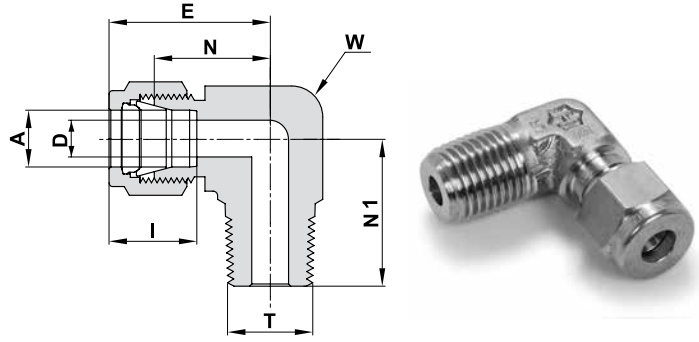
TUBE (INCH)

Ordering Information	A Tube O.D.		C		D		W Hex. Flat	F		H		I		L		N	
	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
768LW _ 1/8 X 1/8	1/8	3.17	.34	8.64	.09	2.28	7/16	.31	7.87	.25	6.35	.50	12.70	1.14	28.96	.88	22.35
768LW _ 1/4 X 1/4	1/4	6.35	.41	10.41	.19	4.80	1/2	.44	11.18	.31	7.90	.60	15.20	1.32	33.53	1.03	26.16
768LW _ 3/8 X 3/8	3/8	9.52	.47	11.94	.28	7.10	5/8	.62	15.75	.38	9.65	.66	16.80	1.48	37.60	1.19	30.23
768LW _ 1/2 X 1/2	1/2	12.70	.47	11.94	.41	10.40	13/16	.75	19.05	.50	12.70	.90	22.90	1.62	41.15	1.22	31.00
768LW _ 3/4 X 3/4	3/4	19.05	.47	11.94	.62	15.80	1 1/16	1.05	26.67	.56	14.20	.96	24.40	1.71	43.43	1.31	33.28
768LW _ 1 X 1	1	25.40	.56	14.22	.88	22.35	1 3/8	1.36	34.54	.75	19.05	1.23	31.20	2.07	52.58	1.59	40.40

Designation: Marking LW on Hex.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**769 L
MALE ELBOW**



TUBE (METRIC) MALE NPT THREAD

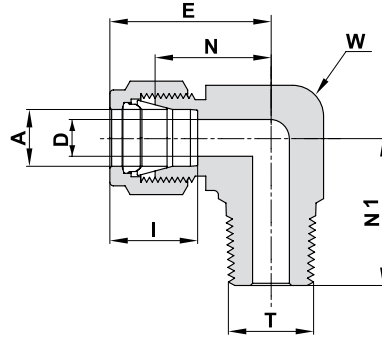
Ordering Information	A	T	D	W		N	E	N1	I
	Tube O.D.	(NPT)		Wrench Flat					
	mm	inch	mm	inch	mm	mm	mm	mm	mm
769L_ 3 X 1/8	3	1/8	2.4	7/16	11.1	17.0	23.6	17.8	12.9
769L_ 3 X 1/4	3	1/4	2.4	1/2	12.7	18.0	24.6	23.4	12.9
769L_ 4 X 1/8	4	1/8	2.4	1/2	12.7	18.8	25.4	18.8	13.7
769L_ 4 X 1/4	4	1/4	2.4	1/2	12.7	18.8	25.4	23.4	13.7
769L_ 6 X 1/8	6	1/8	4.8	1/2	12.7	19.6	27.0	18.8	15.3
769L_ 6 X 1/4	6	1/4	4.8	1/2	12.7	19.6	27.0	23.4	15.3
769L_ 6 X 3/8	6	3/8	4.8	11/16	17.5	22.4	29.8	26.2	15.3
769L_ 6 X 1/2	6	1/2	4.8	13/16	20.6	24.4	31.8	33.0	15.3
769L_ 8 X 1/8	8	1/8	4.8	9/16	14.3	21.3	28.8	19.8	16.2
769L_ 8 X 1/4	8	1/4	6.4	9/16	14.3	21.3	28.8	24.4	16.2
769L_ 8 X 3/8	8	3/8	6.4	11/16	17.5	23.1	30.6	26.2	16.2
769L_ 8 X 1/2	8	1/2	6.4	13/16	20.6	25.1	32.6	33.0	16.2
769L_ 10 X 1/8	10	1/8	4.8	11/16	17.5	23.9	31.5	21.6	17.2
769L_ 10 X 1/4	10	1/4	7.1	11/16	17.5	23.9	31.5	26.2	17.2
769L_ 10 X 3/8	10	3/8	7.9	11/16	17.5	23.9	31.5	26.2	17.2
769L_ 10 X 1/2	10	1/2	7.9	13/16	20.6	25.9	33.5	33.0	17.2
769L_ 12 X 1/8	12	1/8	4.8	13/16	20.6	25.9	36.0	23.6	22.8
769L_ 12 X 1/4	12	1/4	7.1	13/16	20.6	25.9	36.0	28.2	22.8
769L_ 12 X 3/8	12	3/8	9.5	13/16	20.6	25.9	36.0	28.2	22.8
769L_ 12 X 1/2	12	1/2	9.5	13/16	20.6	25.9	36.0	33.0	22.8
769L_ 12 X 3/4	12	3/4	9.5	1 1/16	27.0	29.7	39.8	36.8	22.8
769L_ 15 X 1/2	15	1/2	11.9	15/16	23.8	27.9	38.0	35.1	24.4
769L_ 16 X 3/8	16	3/8	9.5	15/16	23.8	27.9	38.0	30.2	24.4
769L_ 16 X 1/2	16	1/2	11.9	15/16	23.8	27.9	38.0	35.1	24.4
769L_ 16 X 3/4	16	3/4	12.7	1 1/16	27.0	29.7	39.8	36.8	24.4
769L_ 18 X 1/2	18	1/2	11.9	1 1/16	27.0	29.7	39.8	36.8	24.4
769L_ 18 X 3/4	18	3/4	15.1	1 1/16	27.0	29.7	39.8	36.8	24.4
769L_ 20 X 1/2	20	1/2	11.9	1 3/8	34.9	34.5	44.6	41.7	26.0
769L_ 20 X 3/4	20	3/4	15.9	1 3/8	34.9	34.5	44.6	41.7	26.0
769L_ 22 X 3/4	22	3/4	15.9	1 3/8	34.9	34.5	44.6	41.7	26.0
769L_ 22 X 1	22	1	18.3	1 3/8	34.9	34.5	44.6	46.5	26.0
769L_ 25 X 3/4	25	3/4	15.9	1 3/8	34.9	36.8	49.1	41.7	31.3
769L_ 25 X 1	25	1	21.8	1 3/8	34.9	36.8	49.1	46.5	31.3
769L_ 38 X 1 1/2	*38	1 1/2	33.7	-	55.0	56.4	84.0	60.4	49.4

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

769 L MALE ELBOW

(Cont'd)



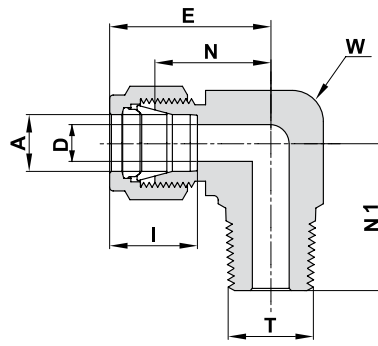
TUBE (INCH) MALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
769L_ 1/16 X 1/16	1/16	1.58	1/16	.05	1.27	7/16	11.1	.60	15.24	.75	19.05	.70	17.78	.34	8.6
769L_ 1/16 X 1/8	1/16	1.58	1/8	.05	1.27	7/16	11.1	.60	15.24	.75	19.05	.70	17.78	.34	8.6
769L_ 1/8 X 1/16	1/8	3.17	1/16	.09	2.28	7/16	11.1	.67	17.02	.93	23.62	.70	17.78	.50	12.7
769L_ 1/8 X 1/8	1/8	3.17	1/8	.09	2.28	7/16	11.1	.67	17.02	.93	23.62	.70	17.78	.50	12.7
769L_ 1/8 X 1/4	1/8	3.17	1/4	.09	2.28	1/2	12.7	.71	18.03	.97	24.64	.92	23.37	.50	12.7
769L_ 3/16 X 1/8	3/16	4.76	1/8	.12	3.04	1/2	12.7	.74	18.80	1.00	25.40	.74	18.80	.54	13.7
769L_ 3/16 X 1/4	3/16	4.76	1/4	.12	3.04	1/2	12.7	.74	18.80	1.00	25.40	.92	23.37	.54	13.7
769L_ 1/4 X 1/16	1/4	6.35	1/16	.12	3.04	1/2	12.7	.77	19.56	1.06	26.92	.74	18.80	.60	15.2
769L_ 1/4 X 1/8	1/4	6.35	1/8	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.74	18.80	.60	15.2
769L_ 1/4 X 1/4	1/4	6.35	1/4	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.92	23.37	.60	15.2
769L_ 1/4 X 3/8	1/4	6.35	3/8	.19	4.82	11/16	17.5	.88	22.35	1.17	29.71	1.03	26.16	.60	15.2
769L_ 1/4 X 1/2	1/4	6.35	1/2	.19	4.82	13/16	20.6	.96	24.38	1.25	31.75	1.30	33.02	.60	15.2
769L_ 5/16 X 1/8	5/16	7.93	1/8	.19	4.82	9/16	14.3	.84	21.34	1.13	28.70	.78	19.81	.64	16.2
769L_ 5/16 X 1/4	5/16	7.93	1/4	.25	6.35	9/16	14.3	.84	21.34	1.13	28.70	.96	24.38	.64	16.2
769L_ 5/16 X 3/8	5/16	7.93	3/8	.25	6.35	11/16	17.5	.91	23.11	1.20	30.48	1.03	26.16	.64	16.2
769L_ 3/8 X 1/8	3/8	9.52	1/8	.19	4.82	5/8	15.9	.91	23.11	1.20	30.48	.82	20.83	.66	16.8
769L_ 3/8 X 1/4	3/8	9.52	1/4	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	1.00	25.40	.66	16.8
769L_ 3/8 X 3/8	3/8	9.52	3/8	.28	7.11	11/16	17.5	.94	23.87	1.23	31.24	1.03	26.16	.66	16.8
769L_ 3/8 X 1/2	3/8	9.52	1/2	.28	7.11	13/16	20.6	1.02	25.90	1.31	33.28	1.30	33.02	.66	16.8
769L_ 3/8 X 3/4	3/8	9.52	3/4	.28	7.11	1 1/16	27.0	1.17	29.71	1.46	37.08	1.45	36.83	.66	16.8
769L_ 1/2 X 1/4	1/2	12.70	1/4	.28	7.11	13/16	20.6	1.02	25.90	1.42	36.07	1.11	28.19	.90	22.9
769L_ 1/2 X 3/8	1/2	12.70	3/8	.38	9.50	13/16	20.6	1.02	25.90	1.42	36.07	1.11	28.19	.90	22.9
769L_ 1/2 X 1/2	1/2	12.70	1/2	.41	10.41	13/16	20.6	1.02	25.90	1.42	36.07	1.30	33.02	.90	22.9
769L_ 1/2 X 3/4	1/2	12.70	3/4	.41	10.41	1 1/16	27.0	1.17	29.71	1.57	39.88	1.45	36.83	.90	22.9
769L_ 5/8 X 3/8	5/8	15.87	3/8	.38	9.61	15/16	23.8	1.10	27.94	1.50	38.10	1.19	30.23	.96	24.4
769L_ 5/8 X 1/2	5/8	15.87	1/2	.47	11.94	15/16	23.8	1.10	27.94	1.50	38.10	1.38	35.05	.96	24.4
769L_ 5/8 X 3/4	5/8	15.87	3/4	.50	12.70	1 1/16	27.0	1.17	29.71	1.57	39.88	1.45	36.83	.96	24.4
769L_ 3/4 X 1/2	3/4	19.05	1/2	.47	11.94	1 1/16	27.0	1.17	29.71	1.57	39.88	1.45	36.83	.96	24.4
769L_ 3/4 X 3/4	3/4	19.05	3/4	.62	15.74	1 1/16	27.0	1.17	29.71	1.57	39.88	1.45	36.83	.96	24.4
769L_ 7/8 X 3/4	7/8	22.22	3/4	.62	15.74	1 3/8	34.9	1.36	34.54	1.76	44.70	1.64	41.66	1.02	25.9
769L_ 1 X 3/4	1	25.40	3/4	.62	15.74	1 3/8	34.9	1.45	36.83	1.93	49.02	1.64	41.66	1.23	31.2
769L_ 1 X 1	1	25.40	1	.86	21.84	1 3/8	34.9	1.45	36.83	1.93	49.02	1.83	46.48	1.23	31.2
769L_ 1 1/4 X 1 1/4	*1 1/4	31.75	1 1/4	1.09	27.70	1 11/16	42.9	1.75	44.45	2.62	66.50	1.88	47.75	1.62	41.2
769L_ 1 1/2 X 1 1/2	*1 1/2	38.10	1 1/2	1.34	34.00	2	50.8	2.00	50.80	3.07	78.00	2.38	60.45	1.97	50.0
769L_ 2 X 2	*2	50.80	2	1.81	45.97	2 3/4	69.9	2.75	69.85	4.22	107.19	2.78	70.61	2.66	67.6

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**769 LR
MALE ELBOW**



TUBE (METRIC) ISO TAPERED THREAD

Ordering Information	A	T	D	W		N	E	N1	I
	Tube O.D.	(ISO)		Wrench Flat					
	mm	inch	mm	inch	mm	mm	mm	mm	mm
769LR_ 3 X 1/8	3	R-1/8	2.4	7/16	11.1	17.0	23.6	17.8	12.9
769LR_ 3 X 1/4	3	R-1/4	2.4	1/2	12.7	18.0	24.6	23.4	12.9
769LR_ 4 X 1/8	4	R-1/8	2.4	1/2	12.7	18.8	25.4	18.8	13.7
769LR_ 4 X 1/4	4	R-1/4	2.4	1/2	12.7	18.8	25.4	23.4	13.7
769LR_ 6 X 1/8	6	R-1/8	4.8	1/2	12.7	19.6	27.0	18.8	15.3
769LR_ 6 X 1/4	6	R-1/4	4.8	1/2	12.7	19.6	27.0	23.4	15.3
769LR_ 6 X 3/8	6	R-3/8	4.8	11/16	17.5	22.4	29.8	26.2	15.3
769LR_ 6 X 1/2	6	R-1/2	4.8	13/16	20.6	24.4	31.8	33.0	15.3
769LR_ 8 X 1/8	8	R-1/8	4.8	9/16	14.3	21.3	28.8	19.8	16.2
769LR_ 8 X 1/4	8	R-1/4	6.4	9/16	14.3	21.3	28.8	24.4	16.2
769LR_ 8 X 3/8	8	R-3/8	6.4	11/16	17.5	23.1	30.6	26.2	16.2
769LR_ 8 X 1/2	8	R-1/2	6.4	13/16	20.6	25.1	32.6	33.0	16.2
769LR_ 10 X 1/8	10	R-1/8	4.8	11/16	17.5	23.9	31.5	21.6	17.2
769LR_ 10 X 1/4	10	R-1/4	7.1	11/16	17.5	23.9	31.5	26.2	17.2
769LR_ 10 X 3/8	10	R-3/8	7.9	11/16	17.5	23.9	31.5	26.2	17.2
769LR_ 10 X 1/2	10	R-1/2	7.9	13/16	20.6	25.9	33.5	33.0	17.2
769LR_ 12 X 1/8	12	R-1/8	4.8	13/16	20.6	25.9	36.0	23.6	22.8
769LR_ 12 X 1/4	12	R-1/4	7.1	13/16	20.6	25.9	36.0	28.2	22.8
769LR_ 12 X 3/8	12	R-3/8	9.5	13/16	20.6	25.9	36.0	28.2	22.8
769LR_ 12 X 1/2	12	R-1/2	9.5	13/16	20.6	25.9	36.0	33.0	22.8
769LR_ 12 X 3/4	12	R-3/4	9.5	1 1/16	27.0	29.7	39.8	36.8	22.8
769LR_ 14 X 1/2	14	R-1/2	11.0	15/16	23.8	27.9	38.0	35.0	24.4
769LR_ 15 X 1/2	15	R-1/2	11.9	15/16	23.8	27.9	38.0	35.1	24.4
769LR_ 16 X 3/8	16	R-3/8	9.5	15/16	23.8	27.9	38.0	30.2	24.4
769LR_ 16 X 1/2	16	R-1/2	11.9	15/16	23.8	27.9	38.0	35.1	24.4
769LR_ 18 X 1/2	18	R-1/2	11.9	1 1/16	27.0	29.7	39.8	36.8	24.4
769LR_ 18 X 3/4	18	R-3/4	15.1	1 1/16	27.0	29.7	39.8	36.8	24.4
769LR_ 20 X 1/2	20	R-1/2	11.9	1 3/8	34.9	34.5	44.6	41.7	26.0
769LR_ 20 X 3/4	20	R-3/4	15.9	1 3/8	34.9	34.5	44.6	41.7	26.0
769LR_ 22 X 3/4	22	R-3/4	15.9	1 3/8	34.9	34.5	44.6	41.7	26.0
769LR_ 22 X 1	22	R - 1	18.3	1 3/8	34.9	34.5	44.6	46.5	26.0
769LR_ 25 X 3/4	25	R-3/4	15.9	1 3/8	34.9	36.8	49.1	41.7	31.3
769LR_ 25 X 1	25	R - 1	21.8	1 3/8	34.9	36.8	49.1	46.5	31.3

Reference Specifications:

- DIN - 2999
- BS - 21
- JIS - B0203
- ISO - 7/1-BSP-T

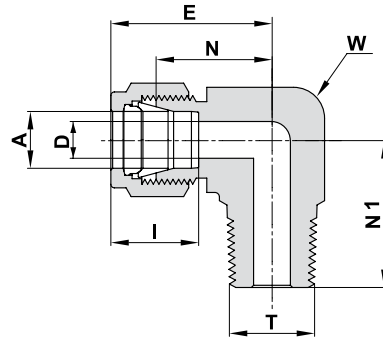
Designation:

Marking LR on Flat

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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769 LR MALE ELBOW (Cont'd)



TUBE (INCH) ISO TAPERED THREAD

Ordering Information	A Tube O.D.		T (ISO)	D		W Wrench Flat		N		E		N1		I	
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
769LR_ 1/8 X 1/8	1/8	3.17	R-1/8	.09	2.28	7/16	11.1	.67	17.02	.93	23.62	.70	17.78	.50	12.7
769LR_ 1/8 X 1/4	1/8	3.17	R-1/4	.09	2.28	1/2	12.7	.71	18.03	.97	24.64	.92	23.37	.50	12.7
769LR_ 1/4 X 1/8	1/4	6.35	R-1/8	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.74	18.80	.60	15.2
769LR_ 1/4 X 1/4	1/4	6.35	R-1/4	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.92	23.37	.60	15.2
769LR_ 1/4 X 3/8	1/4	6.35	R-3/8	.19	4.82	11/16	17.5	.88	22.35	1.17	29.71	1.03	26.16	.60	15.2
769LR_ 1/4 X 1/2	1/4	6.35	R-1/2	.19	4.82	13/16	20.6	.96	24.38	1.25	31.75	1.30	33.02	.60	15.2
769LR_ 5/16 X 1/4	5/16	7.93	R-1/4	.25	6.35	9/16	14.3	.84	21.34	1.13	28.70	.96	24.38	.64	16.2
769LR_ 3/8 X 1/8	3/8	9.52	R-1/8	.19	4.82	5/8	15.9	.91	23.11	1.20	30.48	.82	20.83	.66	16.8
769LR_ 3/8 X 1/4	3/8	9.52	R-1/4	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	1.00	25.40	.66	16.8
769LR_ 3/8 X 3/8	3/8	9.52	R-3/8	.28	7.11	11/16	17.5	.94	23.87	1.23	31.24	1.03	26.16	.66	16.8
769LR_ 1/2 X 1/4	1/2	12.70	R-1/4	.28	7.11	13/16	20.6	1.02	25.90	1.42	36.07	1.11	28.19	.90	22.9
769LR_ 1/2 X 3/8	1/2	12.70	R-3/8	.38	9.50	13/16	20.6	1.02	25.90	1.42	36.07	1.11	28.19	.90	22.9
769LR_ 1/2 X 1/2	1/2	12.70	R-1/2	.41	10.41	13/16	20.6	1.02	25.90	1.42	36.07	1.30	33.02	.90	22.9
769LR_ 3/4 X 1/2	3/4	19.05	R-1/2	.47	11.94	1 1/16	27.0	1.17	29.71	1.57	39.88	1.45	36.83	.96	24.4
769LR_ 1 X 1	1	25.40	R-1	.86	21.84	1 3/8	34.9	1.45	36.83	1.93	49.02	1.83	46.48	1.23	31.2

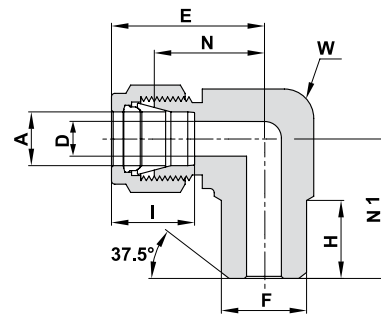
Reference Specifications:

DIN - 2999
BS - 21
JIS - B0203
ISO - 7/1-BSP-T

Designation:

Marking LR on Flat

769 LN MALE PIPE WELD ELBOW



TUBE (INCH)

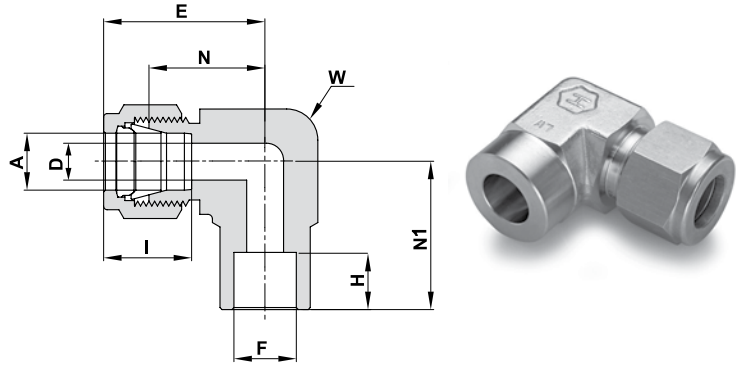
Ordering Information	A Tube O.D.		F Pipe Size		D		W Wrench Flat		N		H		E		N1		I	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
769LN_ 1/4 X 1/8	1/4	6.35	1/8	10.30	.19	4.82	1/2	12.7	.77	19.56	.38	9.65	1.06	26.92	.74	18.8	.60	15.2
769LN_ 1/4 X 1/4	1/4	6.35	1/4	13.70	.19	4.82	1/2	12.7	.77	19.56	.56	14.22	1.06	26.92	.92	23.37	.60	15.2
769LN_ 3/8 X 1/4	3/8	9.52	1/4	13.70	.28	7.11	5/8	15.9	.91	23.11	.56	14.22	1.20	30.48	1.00	25.40	.66	16.8
769LN_ 1/2 X 1/2	1/2	12.70	1/2	21.34	.41	10.41	13/16	20.6	1.02	25.90	.75	19.05	1.42	36.06	1.30	33.02	.90	22.9
769LN_ 3/4 X 3/4	3/4	19.05	3/4	26.67	.62	15.75	1 1/16	27.0	1.17	29.72	.75	19.05	1.57	39.88	1.45	36.83	.96	24.4

Designation:

Marking LN on Flat

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

769 LW
TUBE SOCKET WELD
ELBOW

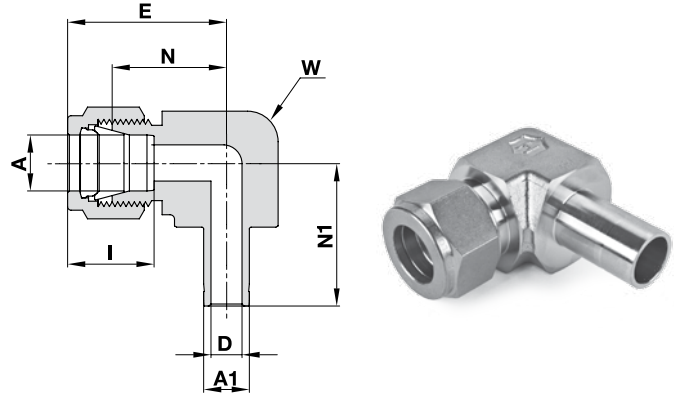


TUBE (INCH)

Ordering Information	A		F		D		W		N		H		E		N1		I	
	Tube O.D.		Tube O.D.				Wrench Flat											
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
769LW _ 1/4 X 1/4	1/4	6.35	1/4	6.35	.19	4.82	1/2	12.7	.77	19.60	.31	7.87	1.06	26.98	.77	19.60	.60	15.2
769LW _ 3/8 X 3/8	3/8	9.52	3/8	9.52	.28	7.11	5/8	15.9	.91	23.11	.38	9.65	1.20	30.98	.91	23.11	.66	16.8
769LW _ 1/2 X 1/2	1/2	12.70	1/2	12.70	.41	10.41	15/16	23.8	1.02	25.90	.50	12.70	1.42	36.06	1.02	25.90	.90	22.9
769LW _ 3/4 X 3/4	3/4	19.05	3/4	19.05	.62	15.74	1 1/16	27.0	1.17	29.71	.56	14.22	1.57	39.87	1.17	29.71	.96	24.4
769LW _ 1 X 1	1	25.40	1	25.40	.88	22.35	1 3/8	34.9	1.45	36.83	.75	19.05	1.93	49.02	1.45	36.83	1.23	31.2

Designation:
 Marking LW on Flat

769 LT
REDUCING ELBOW



TUBE (METRIC) TO STUB (METRIC)

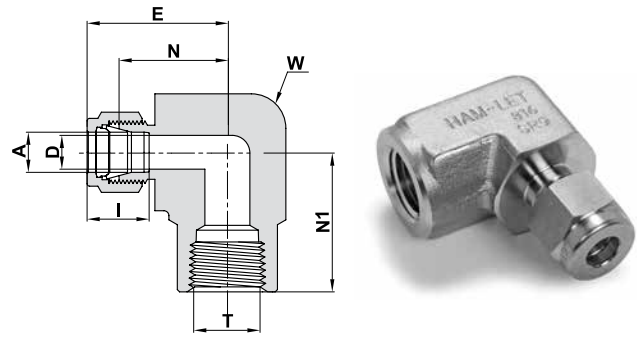
Ordering Information	A		A1		D		W		N		E		N1		I	
	Tube O.D.		Tube O.D.				Wrench Flat									
	mm	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm
769LT _ 6 X 6	6	6	6	6	4.0	4.0	1/2	12.7	19.6	19.6	27.0	27.0	23.8	23.8	15.3	15.3
769LT _ 12 X 12	12	12	12	12	8.8	8.8	1 1/8	28.6	27.9	27.9	38.0	38.0	40.4	40.4	22.8	22.8
769LT _ 15 X 15	15	15	15	15	12.0	12.0	1 1/8	28.6	27.9	27.9	38.0	38.0	41.0	41.0	24.4	24.4
769LT _ 22 X 22	22	22	22	22	18.3	18.3	1 3/8	34.9	34.5	34.5	44.6	44.6	50.0	50.0	26.0	26.0

TUBE (INCH) TO STUB (INCH)

Ordering Information	A		A1		D		W		N		E		N1		I	
	Tube O.D.		Tube O.D.				Wrench Flat									
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
769LT _ 1/4 X 3/8	1/4	6.35	3/8	9.52	.19	4.82	5/8	15.9	.91	23.1	1.20	30.5	1.24	31.5	.60	15.2
769LT _ 1/4 X 1/2	1/4	6.35	1/2	12.7	.19	4.82	5/8	15.9	.91	23.1	1.20	30.5	1.28	32.5	.60	15.2

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

770 L FEMALE ELBOW



TUBE (METRIC) TO FEMALE NPT THREAD

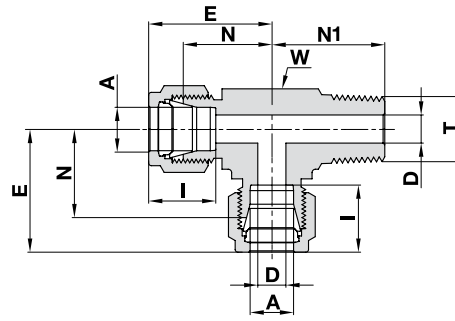
Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I
	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
770L_6 X 1/8	6		1/8	4.8	1/2	12.7		19.6		27.0		19.0		15.3
770L_6 X 1/4	6		1/4	4.8	11/16	17.5		22.4		29.8		22.4		15.3
770L_6 X 1/2	6		1/2	4.8	1 1/16	27.0		27.2		34.6		28.4		15.3
770L_8 X 1/4	8		1/4	6.4	11/16	17.5		23.1		30.6		22.4		16.2
770L_10 X 1/8	10		1/8	7.9	11/16	17.5		23.9		31.5		19.0		17.2
770L_10 X 1/4	10		1/4	7.9	13/16	20.6		25.9		33.5		22.4		17.2
770L_12 X 1/4	12		1/4	9.5	13/16	20.6		25.9		36.0		22.4		22.8
770L_12 X 1/2	12		1/2	9.5	1 1/16	27.0		28.7		38.8		28.4		22.8
770L_16 X 1/2	16		1/2	12.7	1 1/16	27.0		29.7		39.8		28.4		24.4

TUBE (INCH) TO FEMALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
770L_1/8 X 1/8	1/8	3.17	1/8	.09	2.28	1/2	12.7	.71	18.03	.97	24.64	.75	19.05	.50	12.7
770L_1/8 X 1/4	1/8	3.17	1/4	.09	2.28	11/16	17.5	.82	20.80	1.08	27.43	.88	22.40	.50	12.7
770L_3/16 X 1/8	3/16	4.76	1/8	.12	3.04	1/2	12.7	.74	18.80	1.00	25.40	.75	19.05	.54	13.7
770L_1/4 X 1/8	1/4	6.35	1/8	.19	4.82	1/2	12.7	.77	19.55	1.06	26.92	.75	19.05	.60	15.2
770L_1/4 X 1/4	1/4	6.35	1/4	.19	4.82	11/16	17.5	.88	22.40	1.17	29.72	.88	22.40	.60	15.2
770L_1/4 X 3/8	1/4	6.35	3/8	.19	4.82	15/16	23.8	.96	24.38	1.25	31.75	.88	22.40	.60	15.2
770L_1/4 X 1/2	1/4	6.35	1/2	.19	4.82	1 1/16	27.0	1.07	27.18	1.36	34.54	1.12	28.45	.60	15.2
770L_5/16 X 1/8	5/16	7.93	1/8	.25	6.35	9/16	14.3	.84	21.30	1.13	28.70	.75	19.05	.64	16.2
770L_5/16 X 1/4	5/16	7.93	1/4	.25	6.35	11/16	17.5	.91	23.11	1.20	30.48	.88	22.40	.64	16.2
770L_3/8 X 1/8	3/8	9.52	1/8	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	.75	19.05	.66	16.8
770L_3/8 X 1/4	3/8	9.52	1/4	.28	7.11	11/16	17.5	0.94	23.87	1.23	31.24	.88	22.40	.66	16.8
770L_3/8 X 3/8	3/8	9.52	3/8	.28	7.11	15/16	23.8	1.02	25.90	1.31	33.27	.88	22.40	.66	16.8
770L_3/8 X 1/2	3/8	9.52	1/2	.28	7.11	1 1/16	27.0	1.13	28.70	1.42	36.07	1.12	28.45	.66	16.8
770L_1/2 X 1/4	1/2	12.70	1/4	.41	10.41	13/16	20.6	1.02	25.90	1.42	36.07	.88	22.40	.90	22.9
770L_1/2 X 3/8	1/2	12.70	3/8	.41	10.41	15/16	23.8	1.02	25.90	1.42	36.07	.88	22.40	.90	22.9
770L_1/2 X 1/2	1/2	12.70	1/2	.41	10.41	1 1/16	27.0	1.13	28.70	1.53	36.86	1.12	28.45	.90	22.9
770L_5/8 X 3/8	5/8	15.87	3/8	.50	12.70	15/16	23.8	1.10	27.90	1.50	38.10	.88	22.40	.96	24.4
770L_5/8 X 1/2	5/8	15.87	1/2	.50	12.70	1 1/16	27.0	1.17	29.70	1.57	39.86	1.12	28.45	.96	24.4
770L_3/4 X 1/2	3/4	19.05	1/2	.62	15.74	1 1/16	27.0	1.17	29.70	1.57	39.86	1.12	28.45	.96	24.4
770L_3/4 X 3/4	3/4	19.05	3/4	.62	15.74	1 3/8	34.9	1.36	34.54	1.76	44.70	1.25	31.75	.96	24.4
770L_7/8 X 3/4	7/8	22.22	3/4	.72	18.28	1 3/8	34.9	1.36	34.54	1.76	44.70	1.25	31.75	1.02	25.9
770L_1 X 3/4	1	25.40	3/4	.88	22.35	1 3/8	34.9	1.45	36.83	1.93	49.02	1.25	31.75	1.23	31.2
770L_1 X 1	1	25.40	1	.88	22.35	1 1/16	42.9	1.63	41.40	2.11	53.59	1.50	38.10	1.23	31.2

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

771 L
MALE RUN TEE



TUBE (METRIC) TO MALE NPT THREAD

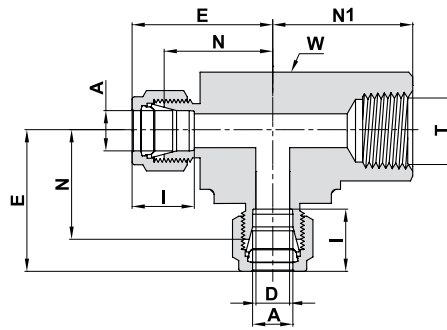
Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	mm	mm	inch	mm	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm
771L_6 X 1/8	6	6	1/8	4.8	4.8	1/2	12.7	19.6	19.6	27.0	27.0	18.8	18.8	15.3	15.3
771L_6 X 1/4	6	6	1/4	4.8	4.8	1/2	12.7	19.6	19.6	27.0	27.0	23.4	23.4	15.3	15.3
771L_8 X 1/8	8	8	1/8	4.8	4.8	5/8	15.9	22.4	22.4	29.9	29.9	20.8	20.8	16.2	16.2
771L_8 X 1/4	8	8	1/4	6.4	6.4	5/8	15.9	22.4	22.4	29.9	29.9	25.4	25.4	16.2	16.2
771L_10 X 1/4	10	10	1/4	7.1	7.1	13/16	20.6	25.9	25.9	33.5	33.5	28.2	28.2	17.2	17.2
771L_12 X 1/4	12	12	1/4	7.1	7.1	13/16	20.6	25.9	25.9	36.0	36.0	28.2	28.2	22.8	22.8
771L_12 X 3/8	12	12	3/8	9.5	9.5	13/16	20.6	25.9	25.9	36.0	36.0	28.2	28.2	22.8	22.8
771L_12 X 1/2	12	12	1/2	9.5	9.5	13/16	20.6	25.9	25.9	36.0	36.0	33.0	33.0	22.8	22.8
771L_16 X 1/2	16	16	1/2	11.9	11.9	15/16	23.8	27.9	27.9	38.0	38.0	35.0	35.0	24.4	24.4

TUBE (INCH) TO MALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
771L_1/8 X 1/8	1/8	3.17	1/8	.09	2.28	7/16	11.1	.67	17.02	.93	23.62	.70	17.78	.50	12.7
771L_1/8 X 1/4	1/8	3.17	1/4	.09	2.28	1/2	12.7	.71	18.03	.97	24.64	.92	23.40	.50	12.7
771L_3/16 X 1/8	3/16	4.76	1/8	.12	3.05	7/16	11.1	.70	17.78	.96	24.38	.70	17.78	.54	13.7
771L_1/4 X 1/8	1/4	6.35	1/8	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.74	18.8	.60	15.2
771L_1/4 X 1/4	1/4	6.35	1/4	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.92	23.37	.60	15.2
771L_5/16 X 1/8	5/16	7.93	1/8	.19	4.82	5/8	15.9	.88	22.35	1.17	29.71	.82	20.83	.64	16.2
771L_3/8 X 1/4	3/8	9.52	1/4	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	1.00	25.40	.66	16.8
771L_3/8 X 3/8	3/8	9.52	3/8	.28	7.11	13/16	20.6	1.02	25.91	1.31	33.27	1.11	28.19	.66	16.8
771L_1/2 X 3/8	1/2	12.70	3/8	.38	9.5	13/16	20.6	1.02	25.91	1.42	36.07	1.11	28.19	.90	22.9
771L_1/2 X 1/2	1/2	12.70	1/2	.41	10.41	13/16	20.6	1.02	25.91	1.42	36.07	1.30	33.00	.90	22.9
771L_5/8 X 1/2	5/8	15.87	1/2	.47	11.94	15/16	23.8	1.10	27.94	1.50	38.1	1.38	35.05	.96	24.4
771L_3/4 X 3/4	3/4	19.05	3/4	.62	15.75	1 1/16	27.0	1.17	29.72	1.57	39.88	1.45	36.83	.96	24.4

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

771LF FEMALE RUN TEE



TUBE (METRIC) TO FEMALE NPT THREAD

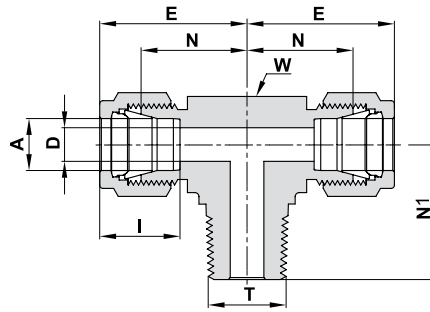
Ordering Information	A		T (NPT)		D		W Wrench Flat		N		E		N1		I	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
771LF _ 6 X 1/8	6	1/8	4.8	5/8	15.9	19.6	27.0	19.0	15.3							
771LF _ 6 X 1/4	6	1/4	4.8	13/16	20.6	22.4	29.8	22.4	15.3							
771LF _ 8 X 1/8	8	1/8	6.4	5/8	15.9	22.4	29.9	22.4	16.2							
771LF _ 8 X 1/4	8	1/4	6.4	13/16	20.6	23.1	30.6	26.0	16.2							
771LF _ 10 X 1/4	10	1/4	7.9	13/16	20.6	25.9	33.5	22.4	17.2							
771LF _ 12 X 1/4	12	1/4	9.5	13/16	20.6	25.9	36.0	22.4	22.8							
771LF _ 12 X 3/8	12	3/8	9.5	15/16	23.8	25.9	36.0	22.4	22.8							
771LF _ 12 X 1/2	12	1/2	9.5	1 1/16	27.0	29.7	39.8	28.4	22.8							
771LF _ 16 X 1/2	16	1/2	12.7	1 1/16	27.0	29.7	39.8	28.4	24.4							

TUBE (INCH) TO FEMALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)		D		W Wrench Flat		N		E		N1		I	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
771LF _ 1/8 X 1/8	1/8	3.17	1/8	.09	2.28	5/8	15.9	.71	18.00	.97	24.63	.75	19.05	.50	12.7	
771LF _ 1/4 X 1/8	1/4	6.35	1/8	.19	4.82	5/8	15.9	.77	19.55	1.06	26.92	.75	19.05	.60	15.2	
771LF _ 1/4 X 1/4	1/4	6.35	1/4	.19	4.82	13/16	20.6	.88	22.35	1.17	29.71	.88	22.35	.60	15.2	
771LF _ 3/8 X 1/4	3/8	9.52	1/4	.28	7.11	13/16	20.6	.94	23.87	1.23	31.24	.88	22.35	.66	16.8	
771LF _ 1/2 X 3/8	1/2	12.70	3/8	.41	10.41	15/16	23.8	1.02	25.9	1.42	36.07	.88	22.35	.90	22.9	
771LF _ 1/2 X 1/2	1/2	12.70	1/2	.41	10.41	1 1/16	27.0	1.17	29.72	1.57	39.88	1.12	28.45	.90	22.9	
771LF _ 3/4 X 3/4	3/4	19.05	3/4	.62	15.75	1 3/8	34.9	1.36	34.54	1.76	44.70	1.25	31.75	.96	24.4	
771LF _ 1 X 3/4	1	25.4	3/4	.88	22.35	1 3/8	34.9	1.45	36.83	1.93	49.02	1.25	31.75	1.23	31.2	
771LF _ 1 X 1	1	25.4	1	.88	22.35	1 11/16	42.9	1.63	41.40	2.11	53.59	1.50	38.10	1.23	31.2	

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

772 L
MALE BRANCH TEE



TUBE (METRIC) TO MALE NPT THREAD

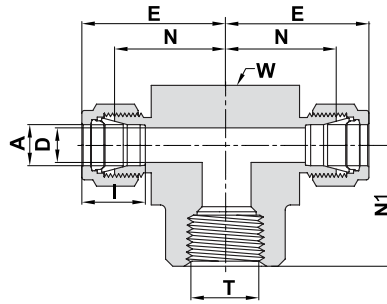
Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	mm	mm	inch	mm	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm
772L_ 6 X 1/8	6	6	1/8	4.8	4.8	1/2	12.7	19.6	19.6	27.0	27.0	18.8	18.8	15.3	15.3
772L_ 6 X 1/4	6	6	1/4	4.8	4.8	1/2	12.7	19.6	19.6	27.0	27.0	23.4	23.4	15.3	15.3
772L_ 8 X 1/8	8	8	1/8	4.8	4.8	5/8	15.9	22.4	22.4	29.9	29.9	20.8	20.8	16.2	16.2
772L_ 8 X 1/4	8	8	1/4	6.4	6.4	5/8	15.9	22.4	22.4	29.9	29.9	25.4	25.4	16.2	16.2
772L_ 10 X 1/4	10	10	1/4	7.1	7.1	13/16	20.6	25.9	25.9	33.5	33.5	28.2	28.2	17.2	17.2
772L_ 12 X 1/4	12	12	1/4	7.1	7.1	13/16	20.6	25.9	25.9	36.0	36.0	28.2	28.2	22.8	22.8
772L_ 12 X 3/8	12	12	3/8	9.5	9.5	13/16	20.6	25.9	25.9	36.0	36.0	28.2	28.2	22.8	22.8
772L_ 12 X 1/2	12	12	1/2	9.5	9.5	13/16	20.6	25.9	25.9	36.0	36.0	33.0	33.0	22.8	22.8
772L_ 16 X 1/2	16	16	1/2	11.9	11.9	15/16	23.8	28.7	28.7	38.8	38.8	35.8	35.8	24.4	24.4

TUBE (INCH) TO MALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
772L_ 1/8 X 1/8	1/8	3.17	1/8	.09	2.28	7/16	11.1	.67	17.02	.93	23.62	.70	17.78	.50	12.7
772L_ 1/8 X 1/4	1/8	3.17	1/4	.09	2.28	1/2	12.7	.71	18.03	.97	24.64	.92	23.37	.50	12.7
772L_ 3/16 X 1/8	3/16	4.76	1/8	.12	3.04	7/16	11.1	.70	17.78	.96	24.38	.70	17.78	.54	13.7
772L_ 1/4 X 1/8	1/4	6.35	1/8	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.74	18.80	.60	15.2
772L_ 1/4 X 1/4	1/4	6.35	1/4	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	.92	23.37	.60	15.2
772L_ 5/16 X 1/8	5/16	7.93	1/8	.19	4.82	5/8	15.9	.88	22.35	1.17	29.71	.82	20.83	.64	16.2
772L_ 3/8 X 1/4	3/8	9.52	1/4	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	1.00	25.40	.66	16.8
772L_ 3/8 X 3/8	3/8	9.52	3/8	.28	7.11	13/16	20.6	1.02	25.91	1.31	33.27	1.11	28.19	.66	16.8
772L_ 1/2 X 3/8	1/2	12.70	3/8	.38	9.65	13/16	20.6	1.02	25.91	1.42	36.07	1.11	28.19	.90	22.9
772L_ 1/2 X 1/2	1/2	12.70	1/2	.41	10.41	13/16	20.6	1.02	25.91	1.42	36.07	1.30	33.02	.90	22.9
772L_ 5/8 X 1/2	5/8	15.87	1/2	.47	11.94	15/16	23.8	1.13	28.7	1.53	38.86	1.41	35.81	.96	24.4
772L_ 3/4 X 3/4	3/4	19.05	3/4	.62	15.75	1 1/16	27.0	1.17	29.72	1.57	39.88	1.45	36.83	.96	24.4

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

772 LF FEMALE BRANCH TEE



TUBE (METRIC) TO FEMALE NPT THREAD

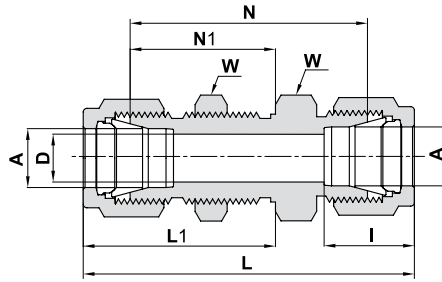
Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	mm	mm	inch	mm	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	
772LF_ 6 X 1/8	6	6	1/8	4.8	4.8	5/8	15.9	19.6	19.6	27.0	27.0	19.0	19.0	15.3	
772LF_ 6 X 1/4	6	6	1/4	4.8	4.8	13/16	20.6	22.4	22.4	29.8	29.8	22.4	22.4	15.3	
772LF_ 8 X 1/8	8	8	1/8	6.4	6.4	5/8	15.9	22.4	22.4	29.9	29.9	19.0	19.0	16.2	
772LF_ 8 X 1/4	8	8	1/4	6.4	6.4	13/16	20.6	23.1	23.1	30.6	30.6	22.4	22.4	16.2	
772LF_ 10 X 1/4	10	10	1/4	7.9	7.9	13/16	20.6	25.9	25.9	33.5	33.5	22.4	22.4	17.2	
772LF_ 10 X 3/8	10	10	3/8	7.9	7.9	15/16	23.8	25.9	25.9	33.5	33.5	22.4	22.4	17.2	
772LF_ 12 X 1/4	12	12	1/4	9.5	9.5	13/16	20.6	25.9	25.9	36.0	36.0	22.4	22.4	22.8	
772LF_ 12 X 3/8	12	12	3/8	9.5	9.5	15/16	23.8	25.9	25.9	36.0	36.0	22.4	22.4	22.8	
772LF_ 12 X 1/2	12	12	1/2	9.5	9.5	1 1/16	27.0	28.7	28.7	38.8	38.8	28.4	28.4	22.8	
772LF_ 16 X 1/2	16	16	1/2	12.7	12.7	1 1/16	27.0	28.7	28.7	38.8	38.8	28.4	28.4	24.4	

TUBE (INCH) TO FEMALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Wrench Flat		N		E		N1		I	
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
772LF_ 1/8 X 1/8	1/8	3.17	1/8	.09	2.28	5/8	15.9	.70	18.00	.97	24.64	.75	19.05	.50	12.7
772LF_ 1/4 X 1/8	1/4	6.35	1/8	.19	4.82	5/8	15.9	.77	19.56	1.06	26.96	.75	19.05	.60	15.2
772LF_ 1/4 X 1/4	1/4	6.35	1/4	.19	4.82	13/16	20.6	.88	22.35	1.17	29.71	.88	22.35	.60	15.2
772LF_ 3/8 X 1/4	3/8	9.52	1/4	.28	7.11	13/16	20.6	.94	23.88	1.23	31.24	.88	22.35	.66	16.8
772LF_ 3/8 X 3/8	3/8	9.52	3/8	.28	7.11	15/16	23.8	1.02	25.90	1.31	33.27	.88	22.35	.66	16.8
772LF_ 3/8 X 1/2	3/8	9.52	1/2	.28	7.11	1 1/16	27.0	1.13	28.70	1.42	36.07	1.12	28.45	.66	16.8
772LF_ 1/2 X 1/4	1/2	12.70	1/4	.41	10.41	13/16	20.6	1.02	25.90	1.42	36.07	.88	22.35	.90	22.9
772LF_ 1/2 X 3/8	1/2	12.70	3/8	.41	10.41	15/16	23.8	1.02	25.90	1.42	36.07	.88	22.35	.90	22.9
772LF_ 1/2 X 1/2	1/2	12.70	1/2	.41	10.41	1 1/16	27.0	1.13	28.70	1.53	38.86	1.12	28.45	.90	22.9
772LF_ 5/8 X 1/2	5/8	15.87	1/2	.50	12.70	1 1/16	27.0	1.13	28.70	1.53	38.86	1.12	28.44	.96	24.4
772LF_ 3/4 X 3/4	3/4	19.05	3/4	.62	15.74	1 3/8	34.9	1.36	34.50	1.76	44.70	1.25	31.75	.96	24.4
772LF_ 1 X 3/4	1	25.4	3/4	.88	22.35	1 3/8	34.9	1.45	36.83	1.93	49.02	1.25	31.75	1.23	31.2
772LF_ 1 X 1	1	25.4	1	.88	22.35	1 1/16	42.9	1.63	41.40	2.11	53.60	1.50	38.10	1.23	31.2

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

774 L
BULKHEAD UNION



TUBE (METRIC) TO TUBE (METRIC)

Ordering Information	A Tube O.D.		D		W Hex. Flat		N		N1		L		L1		I		Panel Hole Drill Size	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
774L_3	3	2.4	14	38.1	24.6	51.3	31.2	12.9	8.30	12.7								
774L_4	4	2.4	14	40.4	25.4	53.6	32.0	13.7	9.90	12.7								
774L_6	6	4.8	16	42.9	26.2	57.7	33.6	15.3	11.50	10.2								
774L_8	8	6.4	18	46.0	28.6	61.0	36.1	16.2	13.10	11.2								
774L_10	10	7.9	22	48.5	29.4	63.7	37.0	17.2	16.25	11.2								
774L_12	12	9.5	24	50.8	31.8	71.0	41.9	22.8	19.50	12.7								
774L_14	14	11.0	27	52.3	32.5	72.5	42.6	24.4	22.80	12.7								
774L_15	15	11.9	27	52.3	32.5	72.5	42.6	24.4	22.80	12.7								
774L_16	16	12.7	27	52.3	32.5	72.5	42.6	24.4	22.80	12.7								
774L_18	18	15.1	30	58.7	37.3	78.9	47.4	24.4	26.00	16.8								
774L_20	20	15.9	35	64.3	42.9	84.5	53.0	26.0	29.00	19.0								
774L_25	25	21.8	41	71.4	45.2	96.0	57.5	31.3	33.70	19.0								
774L_38	*38	33.7	60	89.8	51.9	145.0	79.5	49.4	50.50	19.0								

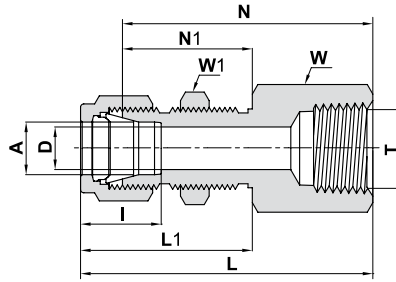
TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		D		W Hex. Flat		N		N1		L		L1		I		Panel Hole Drill Size		
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
774L_1/16	1/16	1.58	.05	1.27	5/16	.94	23.88	.53	13.46	1.24	31.5	.68	17.3	.34	8.6	13/64	5.16	.12	3.05
774L_1/8	1/8	3.17	.09	2.28	1/2	1.50	38.10	.97	24.63	2.02	51.30	1.23	31.24	.50	12.7	21/64	8.33	.50	12.70
774L_3/16	3/16	4.76	.12	3.04	9/16	1.59	40.38	1.00	25.40	2.11	53.59	1.26	32.00	.54	13.7	25/64	9.92	.50	12.70
774L_1/4	1/4	6.35	.19	4.82	5/8	1.69	42.92	1.03	26.16	2.27	57.65	1.32	33.52	.60	15.2	29/64	11.50	.40	10.16
774L_5/16	5/16	7.93	.25	6.35	11/16	1.81	45.97	1.12	28.44	2.39	60.70	1.41	35.81	.64	16.2	33/64	13.09	.44	11.17
774L_3/8	3/8	9.52	.28	7.11	3/4	1.87	47.5	1.16	29.46	2.45	62.2	1.45	36.83	.66	16.8	37/64	14.68	.44	11.17
774L_1/2	1/2	12.70	.41	10.41	15/16	2.00	50.80	1.25	31.75	2.80	71.12	1.65	41.91	.90	22.9	49/64	19.44	.50	12.70
774L_5/8	5/8	15.87	.50	12.70	1 1/16	2.06	52.32	1.28	32.51	2.86	72.64	1.68	42.67	.96	24.4	57/64	22.62	.50	12.70
774L_3/4	3/4	19.05	.62	15.75	1 3/16	2.31	58.67	1.47	37.33	3.11	78.99	1.87	47.49	.96	24.4	1 1/64	25.79	.66	16.76
774L_1	1	25.40	.88	22.35	1 5/8	2.81	71.37	1.78	45.21	3.77	95.76	2.26	57.40	1.23	31.2	1 21/64	33.73	.75	19.05
774L_1 1/4	*1 1/4	31.75	1.09	27.70	1 7/8	3.11	79.00	1.88	47.75	4.85	123.19	2.75	69.85	1.62	41.2	1 41/64	41.67	.75	19.05
774L_1 1/2	*1 1/2	38.10	1.34	34.00	2 1/4	3.34	84.80	1.94	49.28	5.48	139.19	3.01	76.45	1.97	50.0	1 61/64	49.61	.75	19.05
774L_2	*2	50.80	1.81	45.97	2 3/4	4.16	105.66	2.22	56.39	7.10	180.34	3.69	93.73	2.66	67.6	2 41/64	67.07	.75	19.05

* Including low friction paste, see page 91

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774 LF
BULKHEAD FEMALE
CONNECTOR



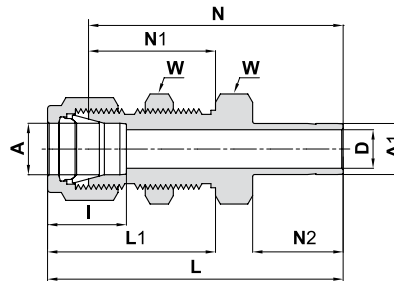
TUBE (METRIC) TO FEMALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)		D		W Hex. Flat		W1 Hex. Flat		N		N1		L		L1		I		Panel Hole Drill Size		Panel Hole Drill Size		
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
774LF_6 X 1/4	1/8	3.17	1/8	.09	2.28	9/16	1/2	1.50	38.10	.97	24.63	1.76	44.70	1.23	31.24	.50	12.7	21/64	8.33	.50	12.70				
774LF_12 X 1/2	1/2	12.70	1/2	.41	10.41	1 1/16	15/16	2.22	56.38	1.25	31.75	2.62	66.54	1.65	41.91	.90	22.9	49/64	19.44	.50	12.70				

TUBE (INCH) TO FEMALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)		D		W Hex. Flat		W1 Hex. Flat		N		N1		L		L1		I		Panel Hole Drill Size		Panel Hole Drill Size		
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
774LF_1/8X1/8	1/8	3.17	1/8	.09	2.28	9/16	1/2	1.50	38.10	.97	24.63	1.76	44.70	1.23	31.24	.50	12.7	21/64	8.33	.50	12.70				
774LF_1/4X1/8	1/4	6.35	1/8	.19	4.82	5/8	5/8	1.56	39.62	1.03	26.16	1.85	46.99	1.32	33.52	.60	15.2	29/64	11.50	.40	10.16				
774LF_1/4X1/4	1/4	6.35	1/4	.19	4.82	3/4	5/8	1.75	44.45	1.03	26.16	2.04	51.81	1.32	33.52	.60	15.2	29/64	11.50	.40	10.16				
774LF_3/8X1/4	3/8	9.52	1/4	.28	7.11	3/4	3/4	1.88	47.75	1.16	29.46	2.17	55.11	1.45	36.83	.66	16.8	37/64	14.68	.44	11.17				
774LF_1/2X3/8	1/2	12.70	3/8	.41	10.41	15/16	15/16	2.03	51.56	1.25	31.75	2.43	61.72	1.65	41.91	.90	22.9	49/64	19.44	.50	12.70				
774LF_1/2X1/2	1/2	12.70	1/2	.41	10.41	1 1/16	15/16	2.22	56.38	1.25	31.75	2.62	66.54	1.65	41.91	.90	22.9	49/64	19.44	.50	12.70				

774 LT
BULKHEAD REDUCER

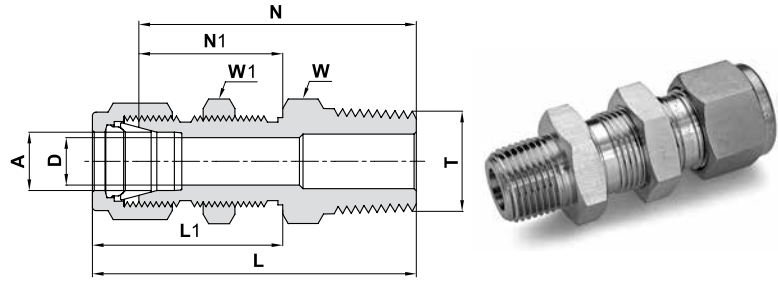


TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		D		W Hex. Flat		N		N1		N2		L		L1		I		Panel hole drill size		Max. Panel thickness	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
774LT_1/8X1/8	1/8	3.17	1/8	.08	2.03	1/2	1.69	42.92	.97	24.63	.53	13.46	1.95	49.53	1.23	31.24	.50	12.7	21/64	8.33	.50	12.70		
774LT_1/4X1/4	1/4	6.35	1/4	.17	4.20	5/8	1.91	48.50	1.03	26.16	.62	15.74	2.20	55.88	1.32	33.52	.60	15.2	29/64	11.50	.40	10.16		
774LT_3/8X3/8	3/8	9.52	3/8	.28	7.11	3/4	2.12	53.85	1.16	29.46	.69	17.52	2.41	61.21	1.45	36.83	.66	16.8	37/64	14.68	.44	11.17		
774LT_1/2X1/2	1/2	12.7	1/2	.39	9.90	15/16	2.47	62.73	1.25	31.75	.91	23.11	2.87	72.89	1.65	41.91	.90	22.9	49/64	19.44	.50	12.70		
774LT_5/8X5/8	5/8	15.87	5/8	.50	12.70	1 1/16	2.56	65.02	1.28	32.51	.97	24.64	2.96	75.18	1.68	42.67	.96	24.4	57/64	22.62	.50	12.70		
774LT_3/4X3/4	3/4	19.05	3/4	.59	15.00	1 3/16	2.81	71.37	1.47	37.33	.97	24.64	3.21	81.53	1.87	47.49	.96	24.4	1 1/64	25.79	.66	16.76		
774LT_1X1	1	25.40	1	.80	20.30	1 5/8	3.47	88.14	1.78	45.21	1.30	33.02	3.95	100.33	2.26	57.40	1.23	31.2	1 21/64	33.73	.75	19.05		

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

774 LM
BULKHEAD MALE
CONNECTOR



TUBE (METRIC) TO MALE NPT THREAD

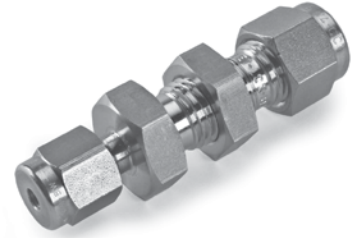
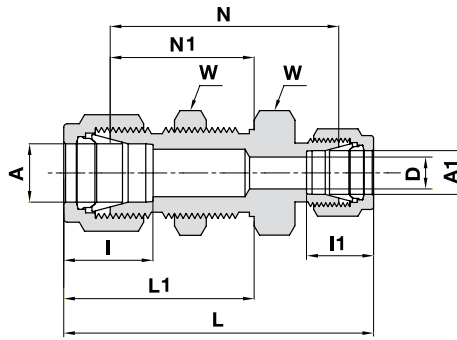
Ordering Information	A Tube O.D.		T (NPT)	D		W Hex. Flat	W1 Hex. Flat	N		N1	L		L1	Panel Hole Drill Size		Max. Panel Thickness	
	mm	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
774LM_6 X 1/8	6	6	1/8	4.8	4.8	16	16	42.2	42.2	26.2	49.6	33.6	11.5	11.5	11.5	10.2	10.2
774LM_6 X 1/4	6	6	1/4	4.8	4.8	16	16	46.2	46.2	26.2	53.6	33.6	11.5	11.5	11.5	10.2	10.2
774LM_12 X 1/2	12	12	1/2	9.5	9.5	24	24	58.7	58.7	31.8	68.8	41.9	19.5	19.5	19.5	12.7	12.7

TUBE (INCH) TO MALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Hex. Flat	W1 Hex. Flat	N		N1	L		L1	Panel Hole Drill Size		Max. Panel Thickness			
	inch	mm	inch	inch	mm	inch	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		
774LM_1/8 X 1/8	1/8	3.17	1/8	.09	2.28	1/2	1/2	1.57	39.90	.97	24.60	1.83	46.48	1.23	31.24	21/64	8.33	.50	12.70
774LM_1/4 X 1/8	1/4	6.35	1/8	.19	4.82	5/8	5/8	1.66	42.20	1.03	26.20	1.95	49.53	1.32	33.52	29/64	11.50	.40	10.16
774LM_1/4 X 1/4	1/4	6.35	1/4	.19	4.82	5/8	5/8	1.84	46.70	1.03	26.16	2.13	54.10	1.32	33.52	29/64	11.50	.40	10.16
774LM_3/8 X 1/4	3/8	9.52	1/4	.28	7.11	3/4	3/4	1.97	50.00	1.16	29.46	2.26	57.40	1.45	36.83	37/64	14.68	.44	11.17
774LM_3/8 X 3/8	3/8	9.52	3/8	.28	7.11	3/4	3/4	1.97	50.04	1.16	29.46	2.26	57.40	1.45	36.83	37/64	14.68	.44	11.17
774LM_3/8 X 1/2	3/8	9.52	1/2	.28	7.11	7/8	3/4	2.22	56.39	1.16	29.46	2.51	63.75	1.45	36.83	37/64	14.68	.44	11.17
774LM_1/2 X 3/8	1/2	12.70	3/8	.40	10.40	15/16	15/16	2.09	53.10	1.25	31.75	2.49	63.25	1.65	41.91	49/64	19.44	.50	12.70
774LM_1/2 X 1/2	1/2	12.70	1/2	.40	10.40	15/16	15/16	2.31	58.70	1.25	31.70	2.71	68.83	1.65	41.91	49/64	19.44	.50	12.70
774LM_3/4 X 3/4	3/4	19.05	3/4	.62	15.74	1 3/16	1 3/16	2.60	66.04	1.47	37.33	3.00	76.20	1.87	47.49	1 1/64	25.79	.66	16.76
774LM_1 X 1	1	25.4	1	.88	22.35	1 5/8	1 5/8	3.19	81.02	1.78	45.21	3.67	93.21	2.26	57.40	1 21/64	33.73	.75	19.05

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

775 L BULKHEAD REDUCING UNION



TUBE (METRIC) TO TUBE (INCH)

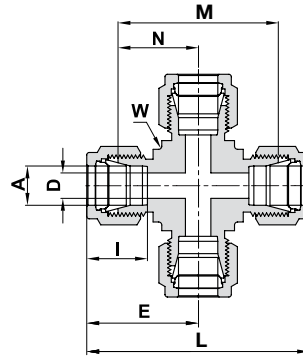
Ordering Information	A Tube O.D.		A1 Tube O.D.		D		W Hex. Flat		N		N1		L		L1		I		I1		Panel Hole Drill Size		Max. Panel Thickness	
	mm	inch	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
775L_ 6 X 1/8	6	1/8	2.4	16	41.1	26.2	55.1	33.6	15.3	12.7	11.5	10.2												
775L_ 6 X 1/4	6	1/4	4.8	16	42.9	26.2	57.7	33.6	15.3	15.2	11.5	10.2												
775L_ 12 X 1/2	12	1/2	9.5	24	50.8	31.8	71.1	41.9	22.8	22.9	19.5	12.7												
775L_ 18 X 3/4	18	3/4	15.1	30	58.7	37.3	79.0	47.4	24.4	24.4	26.0	16.8												

TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Tube O.D.		D		W Hex. Flat		N		N1		L		L1		I		I1		Panel Hole Drill Size		Max. Panel Thickness	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
775L_ 1/8 X 1/16	1/8	3.17	1/16	1.58	.05	1.27	1/2	1.44	36.57	.97	24.64	1.85	46.99	1.23	31.24	.50	12.7	.34	8.6	21/64	8.33	.50	12.70	
775L_ 3/16 X 1/4	3/16	4.76	1/4	6.35	.12	3.04	9/16	1.62	41.15	1.00	25.40	2.17	55.12	1.26	32.00	.54	13.7	.60	15.2	25/64	9.92	.50	12.70	
775L_ 1/4 X 1/8	1/4	6.35	1/8	3.17	.09	2.28	5/8	1.62	41.15	1.03	26.16	2.17	55.12	1.32	33.53	.60	15.2	.50	12.7	29/64	11.50	.40	10.16	
775L_ 1/4 X 3/8	1/4	6.35	3/8	9.52	.19	4.82	5/8	1.74	44.20	1.03	26.16	2.61	66.29	1.32	33.53	.60	15.2	.66	16.8	29/64	11.50	.40	10.16	
775L_ 3/8 X 1/4	3/8	9.52	1/4	6.35	.19	4.82	3/4	1.81	45.97	1.16	29.46	2.39	60.71	1.45	36.83	.66	16.8	.60	15.2	37/64	14.68	.44	11.17	
775L_ 1/2 X 1/4	1/2	12.70	1/4	6.35	.19	4.82	15/16	1.94	49.28	1.25	31.75	2.63	66.80	1.65	41.91	.90	22.9	.60	15.2	49/64	19.44	.50	12.70	
775L_ 1/2 X 5/8	1/2	12.70	5/8	15.87	.41	10.41	15/16	2.03	51.56	1.25	31.75	2.83	71.88	1.65	41.91	.90	22.9	.60	15.2	49/64	19.44	.50	12.70	
775L_ 5/8 X 3/8	5/8	15.87	3/8	9.52	.28	7.11	1 1/16	2.06	52.32	1.28	32.51	2.75	69.85	1.68	42.67	.96	24.4	.66	16.8	57/64	22.62	.50	12.70	

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

7102 L UNION CROSS



ALL TUBES (METRIC)

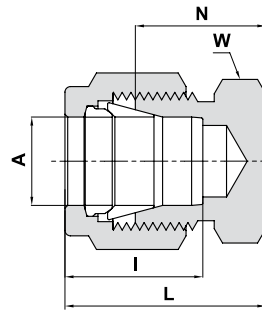
Ordering Information	A Tube O.D.		D		W Wrench Flat		N		E		M		L		I	
	mm	mm	inch	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
7102L_3	3	2.4	3/8	9.5	15.7	22.3	31.5	44.7	12.9							
7102L_6	6	4.8	1/2	12.7	19.6	27.0	39.1	53.9	15.3							
7102L_8	8	6.4	5/8	15.9	22.4	29.9	44.7	59.7	16.2							
7102L_10	10	7.9	13/16	20.6	25.9	33.5	51.8	67.0	17.2							
7102L_12	12	9.5	13/16	20.6	25.9	36.0	51.8	72.0	22.8							
7102L_16	16	12.7	15/16	23.8	26.9	37.0	53.8	74.0	24.4							
7102L_18	18	15.1	1 1/16	27.0	28.2	38.3	56.4	76.6	24.4							
7102L_20	20	15.9	1 3/8	34.9	34.5	44.6	69.0	89.3	26.0							
7102L_22	22	18.3	1 3/8	34.9	34.6	44.7	69.1	89.4	26.0							
7102L_25	25	21.8	1 3/8	34.9	36.8	49.1	73.7	98.3	31.3							

ALL TUBES (INCH)

Ordering Information	A Tube O.D.		D		W Wrench Flat		N		E		M		L		I	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
7102L_1/8	1/8	3.17	.09	2.28	3/8	9.5	.62	15.74	.88	22.35	1.24	31.48	1.76	44.70	.50	12.7
7102L_1/4	1/4	6.35	.19	4.82	1/2	12.7	.77	19.56	1.06	26.92	1.54	39.12	2.12	53.84	.60	15.2
7102L_5/16	5/16	7.93	.25	6.35	5/8	15.9	.88	22.35	1.17	29.71	1.76	44.70	2.34	59.42	.64	16.2
7102L_3/8	3/8	9.52	.28	7.11	5/8	15.9	.91	23.11	1.20	30.48	1.82	46.22	2.40	60.96	.66	16.8
7102L_1/2	1/2	12.70	.41	10.41	13/16	20.6	1.02	25.9	1.42	36.07	2.04	51.80	2.84	72.14	.90	22.9
7102L_3/4	3/4	19.05	.62	15.74	1 1/16	27.0	1.17	29.72	1.57	39.88	2.34	59.44	3.14	79.76	.96	24.4
7102L_1	1	25.40	.88	22.35	1 3/8	34.9	1.45	36.8	1.93	49.02	2.90	73.60	3.86	98.04	1.23	31.2

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

7108 L CAP



CAPPING END OF TUBE (METRIC)

Ordering Information	A Tube O.D.		W Hex. Flat	N		L		I	
	mm	mm	mm	mm	mm	mm	mm	mm	mm
7108L_2	2		12	13.5		20.1		12.9	
7108L_3	3		12	13.5		20.1		12.9	
7108L_4	4		12	14.7		21.3		13.7	
7108L_6	6		14	15.7		23.1		15.3	
7108L_8	8		15	17.0		24.5		16.2	
7108L_10	10		18	19.0		26.6		17.2	
7108L_12	12		22	19.0		29.1		22.8	
7108L_14	14		24	19.8		29.9		24.4	
7108L_15	15		24	19.8		29.9		24.4	
7108L_16	16		24	19.8		29.9		24.4	
7108L_18	18		27	21.3		31.4		24.4	
7108L_20	20		30	23.9		34.0		26.0	
7108L_22	22		30	23.9		34.0		26.0	
7108L_25	25		35	26.2		38.5		31.3	
7108L_38	*38		55	37.8		65.4		49.4	

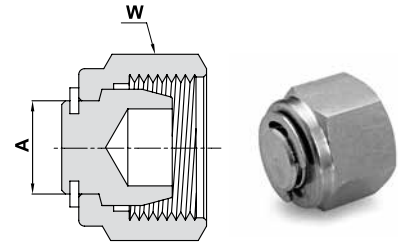
CAPPING END OF TUBE (INCH)

Ordering Information	A Tube O.D.		W Hex. Flat	N		L		I	
	inch	mm	inch	inch	mm	inch	mm	inch	mm
7108L_1/16	1/16	1.58	5/16	.44	11.17	.59	14.98	.34	8.6
7108L_1/8	1/8	3.17	7/16	.53	13.46	.79	20.06	.50	12.7
7108L_3/16	3/16	4.76	7/16	.58	14.73	.84	21.84	.54	13.7
7108L_1/4	1/4	6.35	1/2	.63	16.00	.92	23.37	.60	15.2
7108L_5/16	5/16	7.93	9/16	.67	17.01	.96	24.38	.64	16.2
7108L_3/8	3/8	9.52	5/8	.72	18.28	1.01	26.65	.66	16.8
7108L_1/2	1/2	12.70	13/16	.75	19.05	1.15	29.21	.90	22.9
7108L_5/8	5/8	15.87	15/16	.78	19.81	1.18	29.97	.96	24.4
7108L_3/4	3/4	19.05	1 1/16	.84	21.33	1.24	31.49	.96	24.4
7108L_7/8	7/8	22.22	1 3/16	.94	23.88	1.34	34.04	1.02	25.9
7108L_1	1	25.40	1 3/8	1.03	26.16	1.51	38.35	1.23	31.2
7108L_1 1/4	*1 1/4	31.75	1 3/4	1.23	31.24	2.10	53.34	1.62	41.2
7108L_1 1/2	*1 1/2	38.10	2 1/8	1.47	37.33	2.54	64.52	1.97	50.0
7108L_2	*2	50.80	2 3/4	1.94	49.28	3.41	86.61	2.66	67.6

* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**7121 L
PLUG**



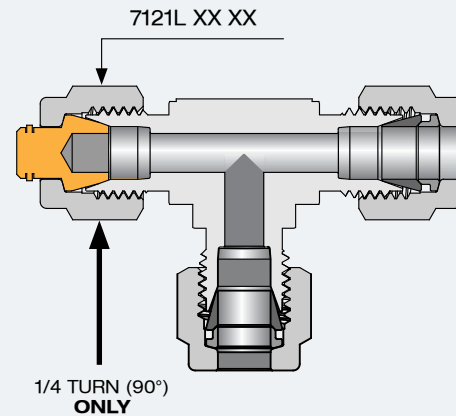
PLUGGING UNUSED PORT OF FITTING (METRIC)

Ordering Information	A		W
	mm		Hex. Flat mm
7121L_2	2		14
7121L_3	3		12
7121L_4	4		12
7121L_6	6		14
7121L_8	8		16
7121L_10	10		19
7121L_12	12		22
7121L_14	14		25
7121L_15	15		25
7121L_16	16		25
7121L_18	18		30
7121L_20	20		32
7121L_22	22		32
7121L_25	25		38
7121L_38	*38		60
7121L_50	*50		3 inch

PLUGGING UNUSED PORT OF FITTING (INCH)

Ordering Information	A		W
	inch	mm	Hex. Flat inch
7121L_1/16	1/16	1.58	5/16
7121L_1/8	1/8	3.17	7/16
7121L_3/16	3/16	4.76	1/2
7121L_1/4	1/4	6.35	9/16
7121L_5/16	5/16	7.93	5/8
7121L_3/8	3/8	9.52	11/16
7121L_1/2	1/2	12.70	7/8
7121L_5/8	5/8	15.87	1
7121L_3/4	3/4	19.05	1 1/8
7121L_7/8	7/8	22.22	1 1/4
7121L_1	1	25.40	1 1/2
7121L_1 1/4	*1 1/4	31.75	1 7/8
7121L_1 1/2	*1 1/2	38.10	2 1/4
7121L_2	*2	50.80	3

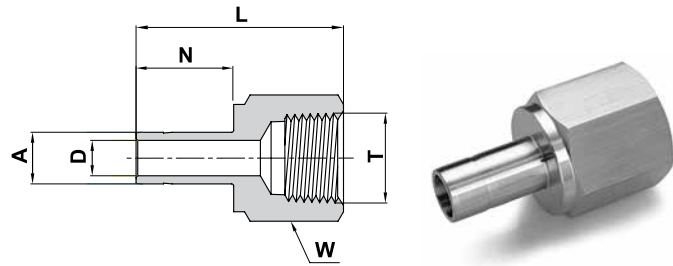
PLUG ASSEMBLY INSTRUCTIONS



* Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

739 LF FEMALE ADAPTER TUBE TO PIPE



TUBE (METRIC) FEMALE PIPE

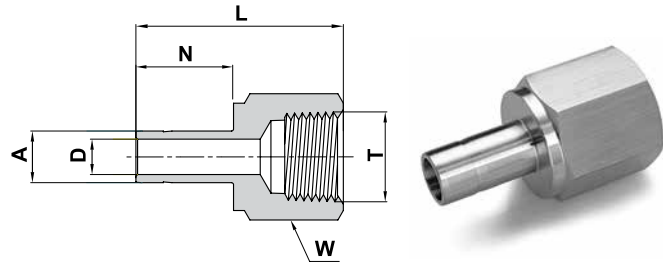
Ordering Information	A Tube O.D.	T (NPT)	D	W Hex. Flat	N	L
	mm	inch	mm	mm	mm	mm
739LF_ 3 X 1/8	3	1/8	2.1	14	13.5	31.5
739LF_ 3 X 1/4	3	1/4	2.1	19	13.5	35.3
739LF_ 4 X 1/4	4	1/4	2.2	19	14.2	35.0
739LF_ 6 X 1/8	6	1/8	4.0	14	15.7	32.5
739LF_ 6 X 1/4	6	1/4	4.0	19	15.7	37.1
739LF_ 6 X 3/8	6	3/8	4.0	22	15.7	39.6
739LF_ 6 X 1/2	6	1/2	4.0	27	15.7	45.5
739LF_ 8 X 1/8	8	1/8	5.6	14	16.8	34.3
739LF_ 8 X 1/4	8	1/4	5.6	19	16.8	37.6
739LF_ 8 X 1/2	8	1/2	5.6	27	16.8	46.0
739LF_ 10 X 1/4	10	1/4	7.1	19	17.5	38.1
739LF_ 10 X 3/8	10	3/8	7.1	22	17.5	40.1
739LF_ 10 X 1/2	10	1/2	7.1	27	17.5	46.5
739LF_ 12 X 1/4	12	1/4	8.8	19	23.1	43.4
739LF_ 12 X 3/8	12	3/8	8.8	22	23.1	45.5
739LF_ 12 X 1/2	12	1/2	8.8	27	23.1	52.3
739LF_ 16 X 3/8	16	3/8	12.7	24	24.7	48.0
739LF_ 16 X 1/2	16	1/2	12.7	27	24.7	53.1
739LF_ 20 X 1/2	20	1/2	15.1	27	26.6	56.0
739LF_ 20 X 3/4	20	3/4	15.1	35	26.6	56.0

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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739 LF FEMALE ADAPTER TUBE TO PIPE

(Cont'd)



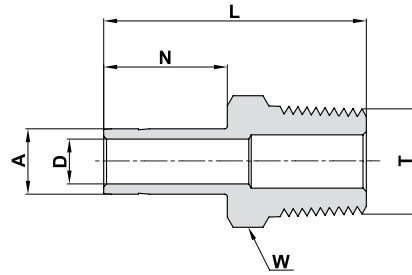
TUBE (INCH) FEMALE PIPE

Ordering Information	A Tube O.D.		T (NPT)	D		W Hex. Flat	N		L	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm
739LF_ 1/8 X 1/8	1/8	3.17	1/8	.08	2.0	9/16	.53	13.45	1.24	31.5
739LF_ 1/8 X 1/4	1/8	3.17	1/4	.08	2.0	3/4	.53	13.45	1.39	35.3
739LF_ 3/16 X 1/4	3/16	4.76	1/4	.12	3.0	3/4	.56	14.20	1.41	35.8
739LF_ 1/4 X 1/8	1/4	6.35	1/8	.17	4.2	9/16	.62	15.75	1.30	33.0
739LF_ 1/4 X 1/4	1/4	6.35	1/4	.17	4.2	3/4	.62	15.75	1.46	37.1
739LF_ 1/4 X 3/8	1/4	6.35	3/8	.17	4.2	7/8	.62	15.75	1.55	39.4
739LF_ 1/4 X 1/2	1/4	6.35	1/2	.17	4.2	1 1/16	.62	15.75	1.79	45.5
739LF_ 5/16 X 1/4	5/16	7.93	1/4	.22	5.6	3/4	.66	16.75	1.48	37.6
739LF_ 3/8 X 1/8	3/8	9.52	1/8	.27	6.9	9/16	.69	17.50	1.35	34.3
739LF_ 3/8 X 1/4	3/8	9.52	1/4	.27	6.9	3/4	.69	17.50	1.50	38.1
739LF_ 3/8 X 3/8	3/8	9.52	3/8	.27	6.9	7/8	.69	17.50	1.59	40.4
739LF_ 3/8 X 1/2	3/8	9.52	1/2	.27	6.9	1 1/16	.69	17.50	1.84	46.7
739LF_ 1/2 X 1/4	1/2	12.70	1/4	.37	9.4	3/4	.91	23.10	1.71	43.4
739LF_ 1/2 X 3/8	1/2	12.70	3/8	.37	9.4	7/8	.91	23.10	1.79	45.5
739LF_ 1/2 X 1/2	1/2	12.70	1/2	.37	9.4	1 1/16	.91	23.10	2.05	52.1
739LF_ 5/8 X 1/2	5/8	15.87	1/2	.50	12.7	1 1/16	.97	24.65	2.09	53.1
739LF_ 3/4 X 1/2	3/4	19.05	1/2	.59	15.0	1 1/16	.97	24.65	2.08	52.8
739LF_ 3/4 X 3/4	3/4	19.05	3/4	.59	15.0	1 5/16	.97	24.65	2.16	54.9
739LF_ 3/4 X 1	3/4	19.05	1	.59	15.0	1 5/8	.97	24.65	2.30	58.4
739LF_ 1 X 3/4	1	25.40	3/4	.80	20.3	1 5/16	1.23	31.20	2.39	60.7
739LF_ 1 X 1	1	25.40	1	.80	20.3	1 5/8	1.23	31.20	2.53	64.3
739LF_ 1 1/4 X 1 1/4	* 1 1/4	31.75	1 1/4	1.02	25.9	2 1/8	1.73	43.82	3.06	77.7
739LF_ 1 1/2 X 1 1/2	* 1 1/2	38.10	1 1/2	1.25	31.8	2 3/8	2.14	54.33	3.50	88.9

* Supplied assembled with Nut and Ferrules. Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

739 LM MALE ADAPTER TUBE TO PIPE



TUBE (METRIC) MALE PIPE

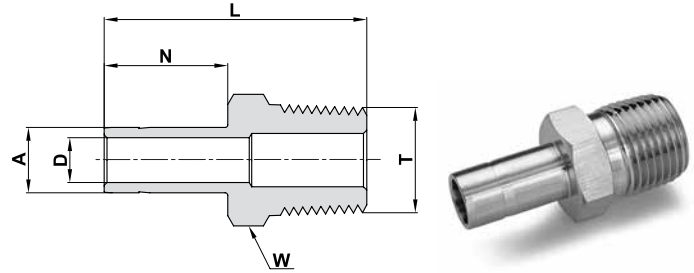
Ordering Information	A	T	D	W	N	L
	Tube O.D.	(NPT)		Hex. Flat		
	mm	inch	mm	mm	mm	mm
739LM _ 3 X 1/8	3	1/8	2.1	12	13.5	30.0
739LM _ 3 X 1/4	3	1/4	2.1	14	13.5	35.3
739LM _ 6 X 1/8	6	1/8	4.0	12	15.7	32.8
739LM _ 6 X 1/4	6	1/4	4.0	14	15.7	38.1
739LM _ 6 X 3/8	6	3/8	4.0	18	15.7	37.0
739LM _ 6 X 1/2	6	1/2	4.0	22	15.7	43.4
739LM _ 8 X 1/8	8	1/8	4.8	12	16.8	33.5
739LM _ 8 X 1/4	8	1/4	5.6	14	16.8	39.1
739LM _ 8 X 3/8	8	3/8	5.6	11/16 inch	16.8	37.8
739LM _ 8 X 1/2	8	1/2	5.6	22	16.8	43.0
739LM _ 10 X 1/4	10	1/4	7.1	9/16 inch	17.5	39.9
739LM _ 10 X 3/8	10	3/8	7.1	18	17.5	40.6
739LM _ 10 X 1/2	10	1/2	7.1	22	17.5	46.2
739LM _ 12 X 1/4	12	1/4	7.1	16	23.1	46.5
739LM _ 12 X 3/8	12	3/8	8.8	18	23.1	46.5
739LM _ 12 X 1/2	12	1/2	8.8	22	23.1	52.0
739LM _ 16 X 1/2	16	1/2	11.9	22	24.7	50.5
739LM _ 20 X 3/4	20	3/4	15.1	27	26.6	54.3

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

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739 LM
MALE ADAPTER
TUBE TO PIPE

(Cont'd)



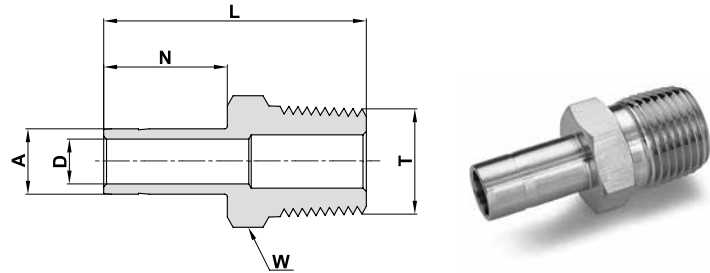
TUBE (INCH) MALE PIPE

Ordering Information	A Tube O.D.		T (NPT)	D		W Hex. Flat	N		L	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm
739LM _ 1/8 X 1/8	1/8	3.17	1/8	.08	2.0	7/16	.53	13.45	1.16	29.5
739LM _ 1/8 X 1/4	1/8	3.17	1/4	.08	2.0	9/16	.53	13.45	1.37	34.8
739LM _ 3/16 X 1/8	3/16	4.76	1/8	.12	3.0	7/16	.56	14.20	1.19	30.2
739LM _ 3/16 X 1/4	3/16	4.76	1/4	.12	3.0	9/16	.56	14.20	1.40	35.6
739LM _ 1/4 X 1/8	1/4	6.35	1/8	.17	4.2	7/16	.62	15.75	1.25	31.8
739LM _ 1/4 X 1/4	1/4	6.35	1/4	.17	4.2	9/16	.62	15.75	1.46	37.1
739LM _ 1/4 X 3/8	1/4	6.35	3/8	.17	4.2	11/16	.62	15.75	1.49	37.9
739LM _ 1/4 X 1/2	1/4	6.35	1/2	.17	4.2	7/8	.62	15.75	1.71	43.4
739LM _ 5/16 X 1/8	5/16	7.93	1/8	.22	5.6	7/16	.66	16.75	1.29	32.7
739LM _ 5/16 X 1/4	5/16	7.93	1/4	.22	5.6	9/16	.66	16.75	1.50	38.1
739LM _ 3/8 X 1/8	3/8	9.52	1/8	.27	6.9	7/16	.69	17.50	1.32	33.5
739LM _ 3/8 X 1/4	3/8	9.52	1/4	.27	6.9	9/16	.69	17.50	1.53	38.9
739LM _ 3/8 X 3/8	3/8	9.52	3/8	.27	6.9	11/16	.69	17.50	1.56	39.6
739LM _ 3/8 X 1/2	3/8	9.52	1/2	.27	6.9	7/8	.69	17.50	1.78	45.2
739LM _ 1/2 X 1/4	1/2	12.70	1/4	.28	7.1	9/16	.91	23.10	1.75	44.5
739LM _ 1/2 X 3/8	1/2	12.70	3/8	.37	9.4	11/16	.91	23.10	1.78	45.2
739LM _ 1/2 X 1/2	1/2	12.70	1/2	.37	9.4	7/8	.91	23.10	2.0	50.8
739LM _ 5/8 X 3/8	5/8	15.87	3/8	.37	9.5	11/16	.97	24.65	1.81	47.6
739LM _ 5/8 X 1/2	5/8	15.87	1/2	.47	11.9	7/8	.97	24.65	2.06	52.3
739LM _ 5/8 X 3/4	5/8	15.87	3/4	.50	12.7	1 1/16	.97	24.65	2.06	52.3
739LM _ 3/4 X 1/2	3/4	19.05	1/2	.47	11.9	7/8	.97	24.65	2.06	52.3
739LM _ 3/4 X 3/4	3/4	19.05	3/4	.59	15.0	1 1/16	.97	24.65	2.06	52.3
739LM _ 3/4 X 1	3/4	19.05	1	.59	15.0	1 3/8	.97	24.65	2.28	57.3
739LM _ 7/8 X 3/4	7/8	22.22	3/4	.60	15.9	1 1/16	1.05	26.60	2.09	54.3
739LM _ 1 X 3/4	1	25.40	3/4	.60	15.8	1 1/16	1.30	33.00	2.31	58.7
739LM _ 1 X 1	1	25.40	1	.80	20.3	1 3/8	1.30	33.00	2.60	66.0
739LM _ 1 1/4 X 1 1/4	* 1 1/4	31.75	1 1/4	1.02	25.9	1 3/4	1.73	43.82	3.16	80.3
739LM _ 1 1/2 X 1 1/2	* 1 1/2	38.10	1 1/2	1.25	31.6	2 1/8	2.14	54.33	3.72	94.5

* Supplied assembled with Nut and Ferrules. Including low friction paste, see page 91

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

739 LMR MALE ADAPTER TUBE TO PIPE



TUBE (METRIC) MALE PIPE

Ordering Information	A Tube O.D.		T (ISO)	D		W Hex. Flat	N		L
	mm	inch	inch	mm	mm	mm	mm	mm	
739LMR _ 6 X 1/8	6		R-1/8	4.0		12		15.7	32.8
739LMR _ 6 X 1/4	6		R-1/4	4.0		14		15.7	38.1
739LMR _ 6 X 1/2	6		R-1/2	4.0		22		15.7	43.4
739LMR _ 8 X 1/8	8		R-1/8	4.8		12		16.8	33.5
739LMR _ 8 X 1/4	8		R-1/4	5.6		14		16.8	39.1
739LMR _ 8 X 3/8	8		R-3/8	5.6		11/16 inch		16.8	37.8
739LMR _ 10 X 1/4	10		R-1/4	7.1		14		17.5	39.9
739LMR _ 10 X 3/8	10		R-3/8	7.1		18		17.5	40.6
739LMR _ 10 X 1/2	10		R-1/2	7.1		22		17.5	46.2
739LMR _ 12 X 1/4	12		R-1/4	7.1		16		23.1	46.5
739LMR _ 12 X 3/8	12		R-3/8	8.8		18		23.1	46.2
739LMR _ 12 X 1/2	12		R-1/2	8.8		22		23.1	52.0
739LMR _ 20 X 3/4	20		R-3/4	15.1		27		26.6	54.3

TUBE (INCH) MALE PIPE

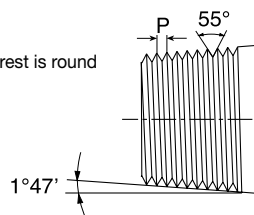
Ordering Information	A Tube O.D.		T (ISO)	D		W Hex. Flat	N		L	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm
739LMR _ 1/8 X 1/8	1/8	3.17	R-1/8	.08	2.0	7/16	.53	13.45	1.16	29.5
739LMR _ 1/8 X 1/4	1/8	3.17	R-1/4	.08	2.0	9/16	.53	13.45	1.37	34.8
739LMR _ 1/4 X 1/8	1/4	6.35	R-1/8	.17	4.2	7/16	.62	15.75	1.25	31.8
739LMR _ 1/4 X 1/4	1/4	6.35	R-1/4	.17	4.2	9/16	.62	15.75	1.46	37.1
739LMR _ 1/4 X 3/8	1/4	6.35	R-3/8	.17	4.2	11/16	.62	15.75	1.49	37.9
739LMR _ 1/4 X 1/2	1/4	6.35	R-1/2	.17	4.2	7/8	.62	15.75	1.71	43.4
739LMR _ 3/8 X 1/4	3/8	9.52	R-1/4	.27	6.9	9/16	.69	17.50	1.53	38.9
739LMR _ 3/8 X 3/8	3/8	9.52	R-3/8	.27	6.9	11/16	.69	17.50	1.56	39.6
739LMR _ 3/8 X 1/2	3/8	9.52	R-1/2	.27	6.9	7/8	.69	17.50	1.78	45.2
739LMR _ 1/2 X 1/4	1/2	12.70	R-1/4	.28	7.1	9/16	.91	23.10	1.75	44.5
739LMR _ 1/2 X 3/8	1/2	12.70	R-3/8	.37	9.4	11/16	.91	23.10	1.78	45.2
739LMR _ 1/2 X 1/2	1/2	12.70	R-1/2	.37	9.4	7/8	.91	23.10	20.0	50.8
739LMR _ 5/8 X 1/2	5/8	15.87	R-1/2	.47	11.9	7/8	.97	24.65	2.06	52.3
739LMR _ 3/4 X 1/2	3/4	19.05	R-1/2	.47	11.9	7/8	.97	24.65	2.06	52.3
739LMR _ 3/4 X 3/4	3/4	19.05	R-3/4	.59	15.0	1 1/16	.97	24.65	2.06	52.3
739LMR _ 1 X 1	1	25.40	R-1	.80	20.3	1 3/8	1.30	33.00	2.60	66.0

Reference Specifications:

DIN -ISO 2999
BS - 21JIS - B0203ISO - 7/1-BSP-T

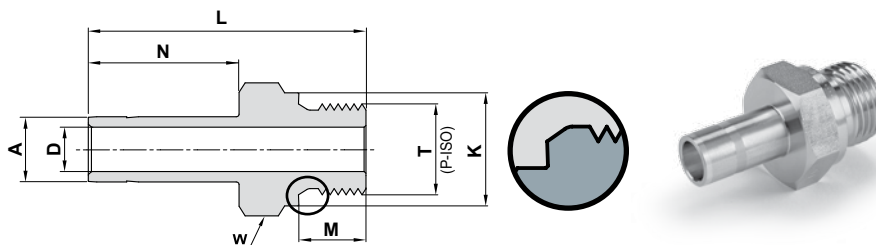
55° Thread angle
Truncation of root and crest is round
Taper angle 1°47'

Designation:
Marking LR on Hex



"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**739 LMG
MALE ADAPTER
TUBE TO PIPE**



TUBE (METRIC) TO ISO PARALLEL THREAD

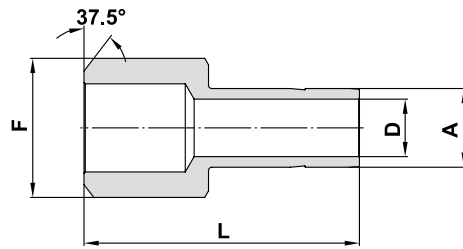
Ordering Information	A TUBE O.D.		T (ISO)	D	K	W Hex. Flat	N	M	L
	mm	inch	mm	mm	mm	mm	mm	mm	mm
739LMG _ 6 X 1/8	6	G-1/8	4.0	13.8	9/16	15.7	7.1	30.4	
739LMG _ 6 X 1/4	6	G-1/4	4.0	18.0	19	15.7	11.2	38.9	
739LMG _ 8 X 1/4	8	G-1/4	5.6	18.0	19	16.8	11.2	40.1	
739LMG _ 10 X 1/4	10	G-1/4	5.9	18.0	19	17.5	11.2	40.9	
739LMG _ 10 X 3/8	10	G-3/8	7.1	21.8	22	17.5	11.2	41.7	
739LMG _ 10 X 1/2	10	G-1/2	7.1	26.0	27	17.5	14.2	44.7	
739LMG _ 12 X 1/4	12	G-1/4	6.4	18.0	19	23.1	11.2	47.0	
739LMG _ 12 X 3/8	12	G-3/8	7.9	21.8	22	23.1	11.2	47.2	
739LMG _ 12 X 1/2	12	G-1/2	8.8	26.0	27	23.1	14.2	50.5	
739LMG _ 18 X 1/2	18	G-1/2	11.9	26.0	27	24.6	14.2	51.3	
739LMG _ 18 X 3/4	18	G-3/4	13.9	32.0	35	24.6	15.7	55.9	
739LMG _ 38 X 1 1/2	38	G-1 1/2	31.6	54.7	55	52.8	22.1	91.9	

TUBE (INCH) TO ISO PARALLEL THREAD

Ordering Information	A TUBE O.D.		T (ISO)	D		K		W Hex. Flat	N		M		L	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
739LMG _ 1/8 X 1/8	1/8	3.17	G-1/8	.08	2.0	.54	13.8	9/16	.53	13.45	.28	7.1	1.22	31.0
739LMG _ 1/8 X 1/4	1/8	6.35	G-1/4	.08	2.0	.71	18.0	3/4	.53	13.45	.44	11.2	1.41	35.8
739LMG _ 1/4 X 1/8	1/4	3.17	G-1/8	.16	4.0	.54	13.8	9/16	.62	15.75	.28	7.1	1.20	30.5
739LMG _ 1/4 X 1/4	1/4	6.35	G-1/4	.17	4.2	.71	18.0	3/4	.62	15.75	.44	11.2	1.42	36.0
739LMG _ 3/8 X 1/4	3/8	6.35	G-1/4	.23	5.8	.71	18.0	3/4	.69	17.50	.44	11.2	1.57	39.9
739LMG _ 3/8 X 3/8	3/8	9.52	G-3/8	.27	6.9	.86	21.8	7/8	.69	17.50	.44	11.2	1.60	40.6
739LMG _ 1/2 X 1/4	1/2	6.35	G-1/4	.23	5.8	.71	18.0	3/4	.91	23.10	.44	11.2	1.85	47.0
739LMG _ 1/2 X 3/8	1/2	9.52	G-3/8	.31	7.9	.86	21.8	7/8	.91	23.10	.44	11.2	1.88	47.7
739LMG _ 1/2 X 1/2	1/2	12.70	G-1/2	.37	9.4	1.02	26.0	1 1/16	.91	23.10	.56	14.2	1.96	49.8
739LMG _ 3/4 X 3/4	3/4	19.05	G-3/4	.59	15.0	1.26	32.0	1 5/16	.97	24.65	.62	15.7	2.16	54.9
739LMG _ 1 X 1	1	25.40	G-1	.78	19.8	1.54	39.0	1 5/8	1.23	31.20	.72	18.3	2.59	65.8

For Parallel Threads Sealing, see page 76

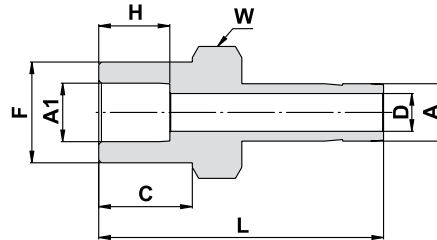
739 LN WELD ADAPTER TUBE TO PIPE



TUBE (INCH)

Ordering Information	A Tube O.D.		F Pipe Size		D		L	
	inch	mm	inch	mm	inch	mm	inch	mm
739LN _ 1/4 X 1/4	1/4	6.35	1/4	13.70	.17	4.20	1.14	28.96
739LN _ 3/8 X 1/2	3/8	9.52	1/2	21.34	.27	6.85	1.46	37.08
739LN _ 1/2 X 1/2	1/2	12.7	1/2	21.34	.37	9.40	1.66	42.15
739LN _ 1/2 X 3/4	1/2	12.7	3/4	26.67	.37	9.40	1.68	42.67
739LN _ 3/4 X 3/4	3/4	19.05	3/4	26.67	.59	15.00	1.87	47.50

739 LW SOCKET WELD ADAPTER



TUBE (METRIC) TO TUBE (INCH)

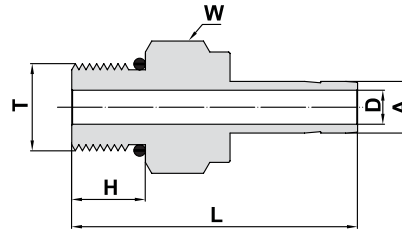
Ordering Information	A Tube O.D.	A1 Pipe Size	C	D	W	F	H	L
	mm	inch	mm	mm	inch	mm	mm	mm
739LW _ 6 X 1/4	6	1/4	10.4	4.0	1/2	11.2	7.9	31.7
739LW _ 10 X 1/4	10	1/4	10.4	4.8	9/16	11.2	7.9	34.0
739LW _ 10 X 3/8	10	3/8	11.9	7.1	5/8	15.8	9.7	36.0

TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		A1 Pipe Size		C		D		W		F		H		L	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
739LW _ 1/4 X 1/4	1/4	6.35	1/4	6.35	.41	10.41	.17	4.20	1/2	12.7	.44	11.18	.31	7.90	1.25	31.70
739LW _ 3/8 X 3/8	3/8	9.52	3/8	9.52	.47	11.94	.28	7.11	5/8	15.9	.62	15.75	.38	9.65	1.42	36.70
739LW _ 1/2 X 1/2	1/2	12.7	1/2	12.7	.47	11.94	.39	9.91	13/16	20.6	.75	19.05	.50	12.7	1.67	42.42

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**739 LMOB
MALE ADAPTER**



TUBE (INCH) TO SAE/MS STRAIGHT THREAD BOSS***

Ordering Information	A		T	D		W		H		L		O-Ring**
	Tube O.D.		Straight Thread UN									
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	
739LMOB_ 1/8 X 5/16-24	1/8	3.18	5/16-24	.08	2.03	7/16	11.1	.30	7.62	1.20	30.48	-902
739LMOB_ 1/4 X 7/16-20	1/4	6.35	7/16-20	.17	4.20	9/16	14.3	.36	9.14	1.39	35.3	-904
739LMOB_ 1/4 X 9/16-18	1/4	6.35	9/16-18	.17	4.20	11/16	17.5	.39	9.90	1.42	36.07	-906
739LMOB_ 3/8 X 7/16-20	3/8	9.52	7/16-20	.20	5.10	9/16	14.3	.36	9.14	1.46	37.08	-904
739LMOB_ 3/8 X 9/16-18	3/8	9.52	9/16-18	.27	6.85	11/16	17.5	.39	9.90	1.52	38.61	-906
739LMOB_ 3/8 X 3/4-16	3/8	9.52	3/4-16	.27	6.85	7/8	22.2	.44	11.17	1.60	40.64	-908
739LMOB_ 1/2 X 9/16-18	1/2	12.7	9/16-18	.28	7.11	11/16	17.5	.39	9.90	1.74	44.20	-906
739LMOB_ 1/2 X 3/4-16	1/2	12.7	3/4-16	.37	9.40	7/8	22.2	.44	11.17	1.82	46.23	-908
739LMOB_ 5/8 X 7/8-14	5/8	15.87	7/8-14	.47	11.94	1	25.4	.50	12.70	1.94	49.28	-910
739LMOB_ 3/4 X 1 1/16-12	3/4	19.05	1 1/16-12	.59	15.00	1 1/4	31.8	.59	14.98	2.10	53.34	-912
739LMOB_ 1 X 1 5/16-12	1	25.40	1 5/16-12	.80	20.32	1 1/2	38.1	.59	14.98	2.41	61.21	-916
739LMOB_ 1 1/4 X 1 5/8-12	* 1 1/4	31.75	1 5/8-12	1.02	26.00	1 7/8	47.6	.59	15.10	2.81	71.37	-920
739LMOB_ 1 1/2 X 1 7/8-12	*1 1/2	38.10	1 7/8-12	1.25	31.60	2 1/8	54.0	.59	15.10	3.28	83.31	-924

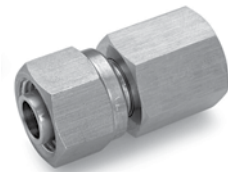
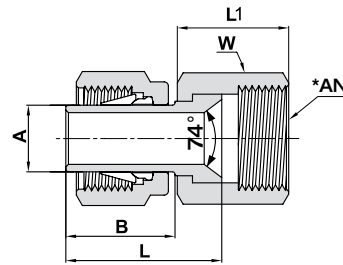
Designation: Marking LOB on Hex.

*** Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

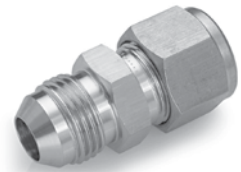
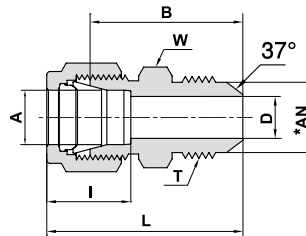
** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

* Supplied assembled with Nut + Front and Back Ferrule. Including low friction paste, see page 91.

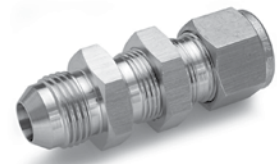
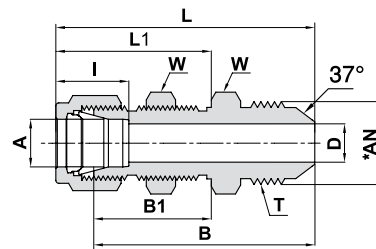
"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

761 LFL**LET-LOK® TO AN ADAPTER**

Ordering Information	A Tube O.D.		*AN Tube Flare Size		W Hex. Flat		L		L1		B	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
761LFL _ 1/8 X 1/8	1/8	3.17	1/8	3.17	3/8	.75	19.05	.54	13.71	.53	13.46	
761LFL _ 1/8 X 1/4	1/8	3.17	1/4	6.35	9/16	.75	19.05	.61	15.50	.53	13.46	
761LFL _ 1/4 X 1/4	1/4	6.35	1/4	6.35	9/16	.84	21.33	.61	15.50	.62	15.75	
761LFL _ 3/8 X 3/8	3/8	9.52	3/8	9.52	11/16	.98	24.89	.72	18.30	.69	17.53	
761LFL _ 1/2 X 1/2	1/2	12.70	1/2	12.70	7/8	1.25	31.75	.84	21.30	.91	23.11	

762 LFL**LET-LOK® TO AN UNION****TUBE (INCH) TO TUBE (INCH)**

Ordering Information	A Tube O.D.		*AN Tube Flare size		D		W Hex. Flat		B		L		I		T Straight Thread
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
762LFL _ 1/16 X 1/8	1/16	1.58	1/8	3.17	.05	1.27	7/16	.92	23.36	1.07	27.18	.34	8.6	5/16-24	
762LFL _ 1/8 X 1/8	1/8	3.17	1/8	3.17	.06	1.52	7/16	1.01	25.65	1.27	32.26	.50	12.7	5/16-24	
762LFL _ 1/8 X 1/4	1/8	3.17	1/4	6.35	.09	2.28	1/2	1.12	28.44	1.38	35.05	.50	12.7	7/16-20	
762LFL _ 1/4 X 1/4	1/4	6.35	1/4	6.35	.17	4.31	1/2	1.19	30.22	1.48	37.59	.60	15.2	7/16-20	
762LFL _ 3/8 X 1/4	3/8	9.52	1/4	6.35	.17	4.31	5/8	1.27	32.25	1.56	39.62	.66	16.8	7/16-20	
762LFL _ 3/8 X 3/8	3/8	9.52	3/8	9.52	.28	7.11	5/8	1.27	32.25	1.56	39.62	.66	16.8	9/16-18	
762LFL _ 1/2 X 1/2	1/2	12.70	1/2	12.70	.39	9.90	13/16	1.41	35.8	1.81	45.96	.90	22.9	3/4-16	
762LFL _ 3/4 X 3/4	3/4	19.05	3/4	19.05	.61	15.49	1 1/8	1.70	43.18	2.10	53.34	.96	24.4	1 1/16-12	
762LFL _ 1 X 1	1	25.40	1	25.40	.84	21.34	1 3/8	1.94	49.28	2.42	61.47	1.23	31.2	1 5/16-12	

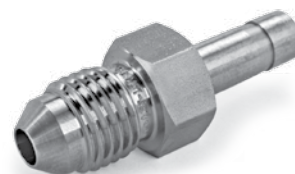
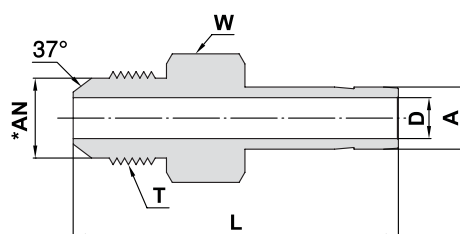
774 LFL**LET-LOK® TO AN
BULKHEAD UNION****TUBE (INCH) TO TUBE (INCH)**

Ordering Information	A Tube O.D.		*AN Tube Flare size		D		W Hex. Flat		B		B1		L		L1		T Straight Thread	Panel hole drill size		Max. panel thickness		I	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
774LFL _ 1/4 X 1/4	1/4	6.35	1/4	6.35	.17	4.30	5/8	15.9	1.83	46.48	1.03	26.16	2.12	53.84	1.32	33.52	7/16-20	29/64	11.50	.40	10.16	.60	15.2
774LFL _ 3/8 X 3/8	3/8	9.52	3/8	9.52	.28	7.11	3/4	19.1	1.96	49.78	1.16	29.46	2.25	57.15	1.45	36.83	9/16-18	37/64	14.68	.44	11.17	.66	16.8
774LFL _ 1/2 X 1/2	1/2	12.70	1/2	12.70	.39	9.90	15/16	23.8	2.19	55.63	1.25	31.75	2.59	65.79	1.65	41.91	3/4-16	49/64	19.45	.50	12.70	.90	22.9
774LFL _ 3/4 X 3/4	3/4	19.05	3/4	19.05	.61	15.49	1 3/16	30.2	2.71	68.83	1.47	37.34	3.11	78.99	1.87	47.50	1 1/16-12	1 1/64	25.80	.66	16.76	.96	24.4
774LFL _ 1 X 1	1	25.40	1	25.40	.84	21.33	1 5/8	41.3	3.16	80.26	1.78	45.21	3.64	92.46	2.26	57.40	1 5/16-12	1 21/64	33.73	.75	19.05	.23	31.2

* Flare 37° per SAE J514.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**739 LTFL
MALE ADAPTER
TUBE TO AN**



TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		*AN Thread Flare Size		D		W		L		T Straight Thread
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
739LTFL_ 1/4 X 1/4	1/4	6.35	1/4	6.35	.17	4.20	1/2	12.7	1.46	37.08	7/16-20
739LTFL_ 3/8 X 1/4	3/8	9.52	1/4	6.35	.17	4.20	1/2	12.7	1.53	38.86	7/16-20
739LTFL_ 3/8 X 3/8	3/8	9.52	3/8	9.52	.28	7.11	5/8	15.9	1.56	39.62	9/16-18
739LTFL_ 1/2 X 1/2	1/2	12.7	1/2	12.7	.39	9.90	13/16	20.6	1.91	48.51	3/4-16
739LTFL_ 5/8 X 5/8	5/8	15.87	5/8	15.87	.484	12.30	15/16	23.8	2.10	53.20	7/8-14
739LTFL_ 3/4 X 3/4	3/4	19.05	3/4	19.05	.59	15.00	1 1/8	28.6	2.21	56.13	1 1/16-12
739LTFL_ 1 X 1	1	25.40	1	25.40	.80	20.32	1 3/8	34.9	2.58	65.53	1 5/16-12

* Flare 37° per SAE J514.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

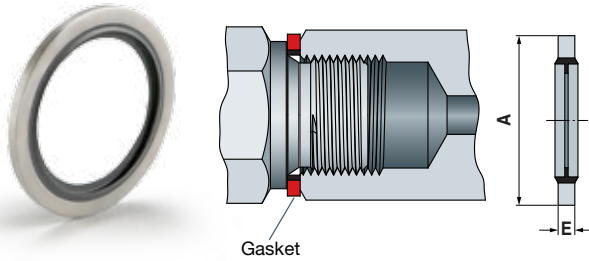
PARALLEL THREADS SEALING

Sealing the parallel thread as 228/1 is done on the shoulder, metal on metal or with the gasket (See labels below)

REFERENCE SPECIFICATIONS:

DIN - ISO 228/1
BS - 2779
JIS - B0202
ISO - 228/1-BSP-P

SEALING WASHER FOR LG END Bonded Stainless Steel / Carbon Steel Washer



ordering information		ISO Thread Size	A		E
Stainless Steel 316	Carbon Steel		mm	inch	
SS-GA-LG-1/8	S-GA-LG-1/8	1/8	15.88	2.03	2.03
SS-GA-LG-1/4	S-GA-LG-1/4	1/4	20.57	2.03	2.03
SS-GA-LG-3/8	S-GA-LG-3/8	3/8	23.80	2.03	2.03
SS-GA-LG-1/2	S-GA-LG-1/2	1/2	28.58	2.49	2.49
SS-GA-LG-3/4	S-GA-LG-3/4	3/4	34.93	2.49	2.49
SS-GA-LG-1	S-GA-LG-1	1	42.80	2.49	2.49

HOW TO ORDER:

Example:

Material Description

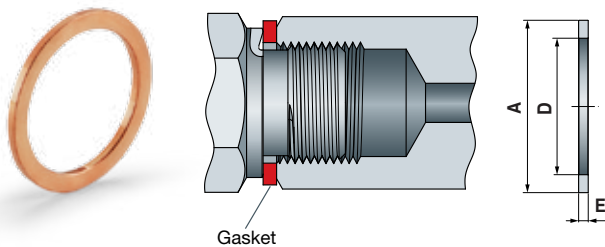
SS - Stainless Steel 316
S - Carbon Steel

Inner Ring

Fluorocarbon FKM
Buna

All orders should include material description and ordering information (see product table).

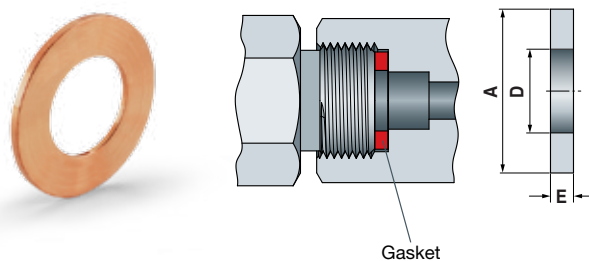
COPPER SEAL GASKET LOK* MALE END



Ordering information	ISO Thread Size	A		D		E	
		mm	inch	mm	inch	mm	inch
COPPER SEAL GASKET LOK 1/8	1/8	15.0	0.59	9.9	0.39	1.0	0.04
COPPER SEAL GASKET LOK 1/4	1/4	18.8	0.75	13.5	0.52	1.5	0.06
COPPER SEAL GASKET LOK 3/8	3/8	22.9	0.91	17.0	0.66	1.5	0.06
COPPER SEAL GASKET LOK 1/2	1/2	27	1.06	21.3	0.83	1.5	0.06
COPPER SEAL GASKET LOK 3/4	3/4	33.0	1.30	26.7	1.05	2.0	0.08
COPPER SEAL GASKET LOK 1	1	40.6	1.58	33.5	1.31	2.0	0.08

* Note: Can be used on LG ends

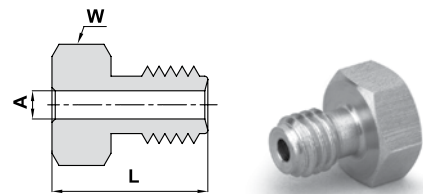
COPPER SEAL GASKET LG FEMALE END



Ordering information	ISO Thread Size	A		D		E	
		mm	inch	mm	inch	mm	inch
COPPER SEAL GASKET LG 1/4	1/4	10.7	0.42	7.6	0.30	1.8	0.07
COPPER SEAL GASKET LG 3/8	3/8	14.2	0.56	8.6	0.34	2.3	0.09
COPPER SEAL GASKET LG 1/2	1/2	17.8	0.70	9.1	0.36	2.5	0.10

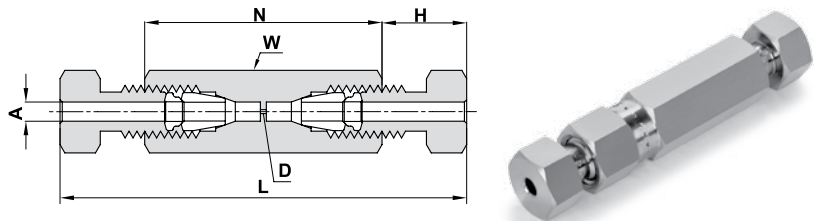
CHROMATOGRAPH FITTINGS

961 L MALE NUT (INCH)



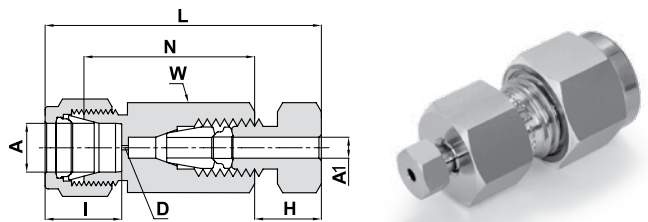
Ordering Information	A Tube O.D.		W Hex. Flat		L	
	inch	mm	inch	mm	inch	mm
961L_ 1/16	1/16	1.58	1/4		.38	9.50

962 L UNION (INCH)



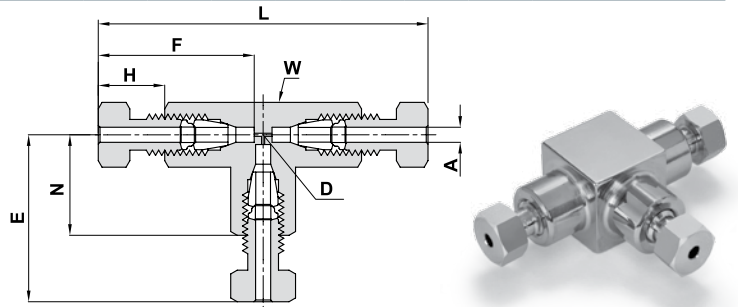
Ordering Information	A Tube O.D.		D		W Hex. Flat		N		H		L		Dead Space
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
962L_ 1/16	1/16	1.58	.013	.33	1/4		.84	21.34	.20	5.08	1.25	31.75	6.6 X 10 ⁻⁵ CC

963 L REDUCING UNION (INCH)



Ordering Information	A Tube O.D.		A1 Tube O.D.		D		W Hex. Flat		N		L		H		I		Dead Space
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
963L_ 1/4 X 1/16	1/4	6.35	1/16	1.58	.013	.33	1/2		.75	19.05	1.24	31.50	.20	5.08	.60	15.2	6.8 X 10 ⁻⁵ CC
963L_ 3/8 X 1/16	3/8	9.52	1/16	1.58	.013	.33	5/8		.81	20.57	1.30	33.02	.20	5.08	.66	16.8	6.8 X 10 ⁻⁵ CC

964 L UNION TEE (INCH)

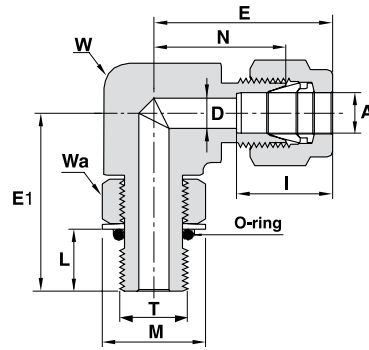


Ordering Information	A Tube O.D.		D		W Wrench Flat		N		H		F		E		L		Dead Space
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
964L_ 1/16	1/16	1.58	.013	.33	3/8	9.52	.45	11.43	.20	5.08	.61	15.49	.65	16.51	1.30	33.02	2.8 X 10 ⁻⁴ CC

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

POSITIONABLESPER SAE J1926 AND MS 16142

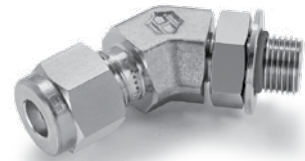
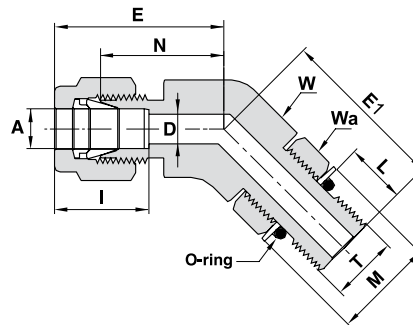
769 LOB MALE ELBOW



TUBE TO SAE/MS STRAIGHT THREAD BOSS (POSITIONABLE)*

Ordering Information	A		T	D		W		Wa	N		E		E1		L		M		I	O-ring**	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.
769LOB SS 1/4 X 7/16-20 POS.	1/4	6.35	7/16-20	.19	4.8	1/2	12.7	9/16	.83	21.10	1.12	28.45	1.12	28.45	.39	9.9	.65	16.5	.60	15.2	-904
769LOB SS 1/4 X 9/16-18 POS.	1/4	6.35	9/16-18	.19	4.8	5/8	15.9	11/16	.91	23.11	1.20	30.48	1.27	32.26	.44	11.2	.79	20.1	.60	15.2	-906
769LOB SS 3/8 X 7/16-20 POS.	3/8	9.52	7/16-20	.20	5.1	5/8	15.9	9/16	.97	24.64	1.26	32.00	1.12	28.45	.39	9.9	.65	16.5	.66	16.8	-904
769LOB SS 3/8 X 9/16-18 POS.	3/8	9.52	9/16-18	.28	7.1	5/8	15.9	11/16	.97	24.64	1.26	32.00	1.27	32.26	.44	11.2	.79	20.1	.66	16.8	-906
769LOB SS 3/8 X 3/4-16 POS.	3/8	9.52	3/4-16	.28	7.1	13/16	20.6	7/8	1.08	27.43	1.37	34.80	1.49	37.85	.50	12.7	1.01	25.7	.66	16.8	-908
769LOB SS 1/2 X 9/16-18 POS.	1/2	12.70	9/16-18	.28	7.1	13/16	20.6	11/16	1.08	27.43	1.48	37.59	1.38	35.05	.44	11.2	.79	20.1	.90	22.9	-906
769LOB SS 1/2 X 3/4-16 POS.	1/2	12.70	3/4-16	.41	10.4	13/16	20.6	7/8	1.08	27.43	1.48	37.59	1.49	37.85	.50	12.7	1.01	25.7	.90	22.9	-908
769LOB SS 3/4 X 1 1/16-12 POS.	3/4	19.05	1 1/16-12	.62	15.8	1 1/16	27.0	1 1/4	1.23	31.24	1.63	41.40	1.92	48.77	.66	16.8	1.44	36.7	.96	24.4	-912
769LOB SS 1 X 1 1/16-12 POS.	1	25.40	1 1/16-12	.62	15.8	1 3/8	34.9	1 1/4	1.51	38.35	1.99	50.55	2.05	52.07	.66	16.8	1.44	36.7	1.23	31.2	-912
769LOB SS 1 X 1 5/16-12 POS.	1	25.40	1 5/16-12	.88	22.3	1 3/8	34.9	1 1/2	1.51	38.35	1.99	50.55	2.11	53.59	.66	16.8	1.73	44.0	1.23	31.2	-916

769 LOB 45° MALE ELBOW 45°



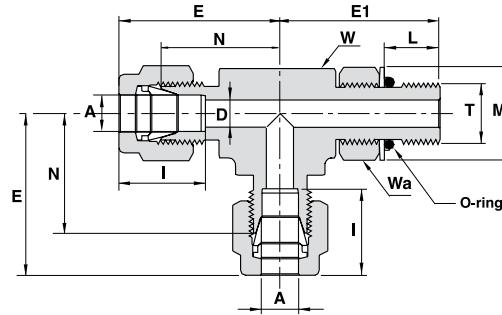
TUBE TO SAE/MS STRAIGHT THREAD BOSS (POSITIONABLE)*

Ordering Information	A		T	D		W		Wa	N		E		E1		L		M		I	O-ring**	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.
769LAOB SS 1/4 X 7/16-20 POS.	1/4	6.35	7/16-20	.19	4.8	9/16	14.3	9/16	.72	18.29	1.01	25.65	1.01	25.65	.39	9.9	.65	16.5	.60	15.2	-904
769LAOB SS 3/8 X 9/16-18 POS.	3/8	9.52	9/16-18	.28	7.1	13/16	20.6	11/16	.81	20.57	1.10	27.94	1.06	27.00	0.40	10.2	.79	20.1	.66	16.8	-906

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions. ** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.
"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

POSITIONABLES
PER SAE J1926 AND MS 16142

771 LOB
MALE RUN TEE



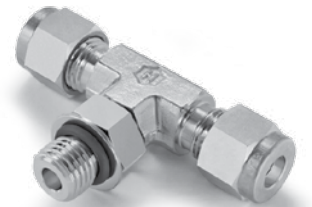
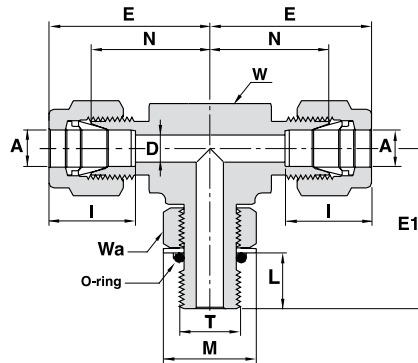
TUBE TO SAE/MS STRAIGHT THREAD BOSS (POSITIONABLE)*

Ordering Information	A Tube O.D.		T SAE/MS	D		W Wrench Flat		Wa Hex. Flat	N		E	E1		L		M	I		O-ring**		
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.		
771LOB SS 1/4 X 7/16-20 POS.	1/4	6.35	7/16-20	.19	4.8	1/2	12.7	9/16	.83	21.10	1.12	28.45	1.12	28.45	.39	9.9	.65	16.5	.60	15.2	-904
771LOB SS 3/8 X 9/16-18 POS.	3/8	9.52	9/16-18	.28	7.1	5/8	15.9	11/16	.97	24.64	1.26	32.00	1.27	32.26	.44	11.2	.79	20.1	.66	16.8	-906

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

772 LOB
MALE BRANCH TEE



TUBE TO SAE/MS STRAIGHT THREAD BOSS (POSITIONABLE)*

Ordering Information	A Tube O.D.		T SAE/MS	D		W Wrench Flat		Wa Hex. Flat	N		E	E1		L		M	I		O-ring**		
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.		
772LOB SS 1/4 X 7/16-20 POS.	1/4	6.35	7/16-20	.19	4.8	1/2	12.7	9/16	.83	21.10	1.12	28.45	1.12	28.45	.39	9.9	.65	16.5	.60	15.2	-904
772LOB SS 3/8 X 9/16-18 POS.	3/8	9.52	9/16-18	.28	7.1	5/8	15.9	11/16	.97	24.64	1.26	32.00	1.27	32.26	.44	11.2	.79	20.1	.66	16.8	-906

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

CONNECTORS

DIMENSIONS

FOR SAE J1926 &
MS 16142 BOSS

MOUNTING DIMENSIONS FOR O-SEAL CONNECTORS (SAE/MS)

TUBE O.D.		D1 Thread Size	D2 Min Diameter ±0.05	D3 Min Diameter	D4 Min	D5 ±0.05	L1 ±0.20	L2 Min	L3 Max	L4 Min Full Thread	Z° ±1°
inch	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	
1/8	3.17	5/16 - 24 UNF - 2B	17	1.6	11	9.15	2.1	12	1.6	10	12
3/16	4.76	3/8 - 24 UNF - 2B	19	3.5	13	10.75	2.1	12	1.6	10	12
1/4	6.35	7/16 - 20 UNF - 2B	21	4.5	15	12.45	2.6	14	1.6	11.5	12
5/16	7.93	1/2 - 20 UNF - 2B	23	6	16	14.05	2.6	14	1.6	11.5	12
3/8	9.52	9/16 - 18 UNF - 2B	25	7.5	18	15.70	2.7	15.5	1.6	12.7	12
1/2	12.70	3/4 - 16 UNF - 2B	30	10	22	20.65	2.7	17.5	2.4	14.3	15
5/8	15.87	7/8 - 14 UNF - 2B	34	12.5	26	24	2.7	20	2.4	16.7	15
3/4	19.05	1 1/16 - 12 UNF - 2B	41	16	32	29.2	3.5	23	2.4	19	15
7/8	22.22	1 3/16 - 12 UN - 2B	45	18	35	32.4	3.5	23	2.4	19	15
1	25.40	1 5/16 - 12 UN - 2B	49	21	38	35.55	3.5	23	3.2	19	15
1 1/4	31.75	1 5/8 - 12 UN - 2B	58	27	48	43.55	3.5	23	3.2	19	15
1 1/2	38.10	1 7/8 - 12 UN - 2B	65	33	54	49.9	3.5	23	3.2	19	15
2	50.80	2 1/2 - 12 UN - 2B	88	45	70	65.75	3.5	23	3.2	19	15

INSTALLATION INSTRUCTIONS

Figure 1	Figure 2	Figure 3	Figure 4
Locking backed off	Fitting install hand tight	Fittings backed-off for alignment (1 turn maximum)	Fitting locknut tightly to appropriate torque
Lubricate the O-ring by inserting it into the groove adjacent to the face of the metal back-up washer which is assembled at the extreme end of the groove as shown in Figure 1.	Install the fitting into the S.A.E. straight thread boss, figure 2, until the metal back-up washer contacts the face of the boss as shown in Figure 2.	Position the fitting by turning it counter clockwise up to a maximum of one turn (see Figure 3).	Holding the pad of the fitting with a spanner, tighten the locknut and washer against the face as shown in Figure 4.

Dimensions are for reference only, and are subject to change without notice.

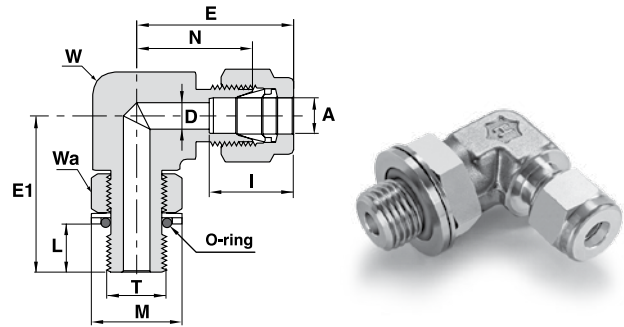
80 **LET-LOK**® COMPRESSION TUBE FITTINGS

POSITIONABLES

ISO PARALLEL THREAD

769 LG

MALE ELBOW



TUBE (METRIC) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A Tube O.D.		T (ISO)	D Wrench Flat		Wa Hex. Flat		N		E		E1		L		M		I	O-ring**
	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.
769LG SS 6 X 1/8 POS.	6		G-1/8-28	4.0	1/2	12.7	9/16	19.6		27.0		26.4		8.1		17.3		15.3	***
769LG SS 6 X 1/4 POS.	6		G-1/4-19	4.8	5/8	15.9	3/4	21.6		29.0		32.2		9.1		22.9		15.3	-111
769LG SS 8 X 1/8 POS.	8		G-1/8-28	4.0	5/8	15.9	9/16	21.3		28.8		27.4		8.1		17.3		16.2	***
769LG SS 8 X 1/4 POS.	8		G-1/4-19	5.9	5/8	15.9	3/4	22.4		29.9		32.2		9.1		22.9		16.2	-111
769LG SS 10 X 1/4 POS.	10		G-1/4-19	5.9	13/16	20.6	3/4	25.9		33.5		35.0		9.1		22.9		17.2	-111
769LG SS 10 X 3/8 POS.	10		G-3/8-19	7.9	13/16	20.6	7/8	25.9		33.5		37.1		9.4		26.4		17.2	-113
769LG SS 12 X 1/4 POS.	12		G-1/4-19	5.9	13/16	20.6	3/4	25.9		36.0		35.0		9.1		22.9		22.8	-111
769LG SS 12 X 3/8 POS.	12		G-3/8-19	7.9	13/16	20.6	7/8	25.9		36.0		37.1		9.4		26.4		22.8	-113
769LG SS 12 X 1/2 POS.	12		G-1/2-14	9.5	15/16	23.8	1 1/16	27.9		38.0		43.4		13.0		32.0		22.8	-593

TUBE (INCH) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A Tube O.D.		T (ISO)	D Wrench Flat		Wa Hex. Flat		N		E		E1		L		M		I	O-ring**		
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.	
769LG SS 1/4 X 1/8 POS.	1/4	6.35	G-1/8-28	.16	4.0	1/2	12.7	9/16	.77	19.60	1.06	26.9	1.04	26.4	.32	8.1	.68	17.3	.60	15.2	***
769LG SS 1/4 X 1/4 POS.	1/4	6.35	G-1/4-19	.19	4.8	5/8	15.9	3/4	.85	21.60	1.14	28.9	1.27	32.2	.36	9.1	.90	22.9	.60	15.2	-111
769LG SS 1/4 X 1/2 POS.	1/4	6.35	G-1/2-14	.19	4.8	15/16	23.8	1 1/16	.96	24.38	1.25	31.8	1.71	43.4	.51	13.0	1.26	32.0	.60	15.2	-593
769LG SS 3/8 X 1/4 POS.	3/8	9.52	G-1/4-19	.23	5.9	5/8	15.9	3/4	.91	23.11	1.20	30.5	1.27	32.2	.36	9.1	.90	22.9	.66	16.8	-111
769LG SS 3/8 X 3/8 POS.	3/8	9.52	G-3/8-19	.28	7.1	13/16	20.6	7/8	1.02	25.91	1.31	33.3	1.46	37.1	.37	9.4	1.04	26.4	.66	16.8	-113
769LG SS 1/2 X 1/4 POS.	1/2	12.70	G-1/4-19	.23	5.9	13/16	20.6	3/4	1.02	25.91	1.42	36.1	1.27	32.2	.36	9.1	.90	22.9	.90	22.9	-111
769LG SS 1/2 X 3/8 POS.	1/2	12.70	G-3/8-19	.31	7.9	13/16	20.6	7/8	1.02	25.91	1.42	36.1	1.46	37.1	.37	9.4	1.04	26.4	.90	22.9	-113
769LG SS 1/2 X 1/2 POS.	1/2	12.70	G-1/2-14	.41	10.4	15/16	23.8	1 1/16	1.10	27.94	1.50	38.1	1.71	43.4	.51	13.0	1.26	32.0	.90	22.9	-593
769LG SS 5/8 X 1/2 POS.	5/8	15.87	G-1/2-14	.47	11.9	15/16	23.8	1 1/16	1.10	27.94	1.50	38.1	1.71	43.4	.51	13.0	1.26	32.0	.96	24.4	-593

* Per: DIN - ISO 228/1
BS - 2779
JIS - B0202
ISO - 228/1-BSP-P

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

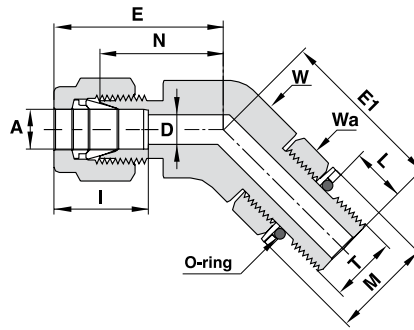
*** Not standard O-ring size.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

POSITIONABLES

ISO PARALLEL THREAD

769 LG 45° MALE ELBOW 45°



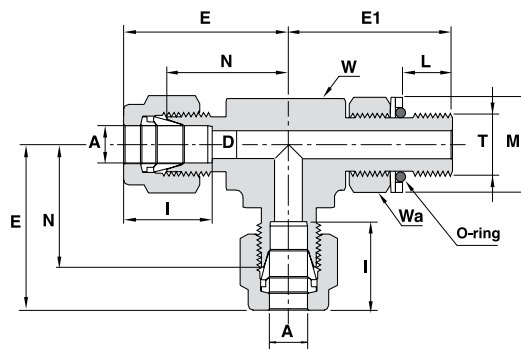
TUBE (METRIC) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A Tube O.D.		T (ISO)	D		W Wrench Flat		Wa Hex. Flat	N		E		E1		L		M		I	O-ring**
	mm	inch	inch	mm	mm	inch	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Dash No.	
769LAG SS 6 X 1/8 POS.	6		G-1/8-28	4.0		9/16	14.3	9/16	17.5		24.9		24.0		8.1		17.3		15.3	***

TUBE (INCH) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A Tube O.D.		T (ISO)	D		W Wrench Flat		Wa Hex. Flat	N		E		E1		L		M		I	O-ring**	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.
769LAG SS 1/4X1/8 POS.	1/4	6.35	G-1/8-28	.16	4.0	9/16	14.3	9/16	.69	17.5	.98	24.9	.94	24.0	.32	8.1	.68	17.3	.60	15.2	***

771 LG MALE RUN TEE



TUBE (METRIC) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A Tube O.D.		T (ISO)	D		W Wrench Flat		Wa Hex. Flat	N		E		E1		L		M		I	O-ring**
	mm	inch	inch	mm	mm	inch	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Dash No.	
771LG SS 6 X 1/8 POS.	6		G-1/8-28	4.0		1/2	12.7	9/16	19.6		27.0		26.4		8.1		17.3		15.3	***
771LG SS 6 X 1/4 POS.	6		G-1/4-19	4.8		5/8	15.9	3/4	21.6		29.0		32.2		9.1		22.9		15.3	-111
771LG SS 8 X 1/4 POS.	8		G-1/4-19	5.9		5/8	15.9	3/4	22.4		29.9		32.2		9.1		22.9		16.2	-111
771LG SS 10 X 1/4 POS.	10		G-1/4-19	5.9		15/16	23.8	3/4	25.9		33.5		35.0		9.1		22.9		17.2	-111

TUBE (INCH) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A Tube O.D.		T (ISO)	D		W Wrench Flat		Wa Hex. Flat	N		E		E1		L		M		I	O-ring**	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.
771LG SS 1/4 X 1/8 POS.	1/4	6.35	G-1/8-28	.16	4.0	1/2	12.7	9/16	.77	19.6	1.06	26.9	1.04	26.4	.32	8.1	.68	17.3	.60	15.2	***
771LG SS 1/4 X 1/4 POS.	1/4	6.35	G-1/4-19	.19	4.8	5/8	15.9	3/4	.85	21.6	1.14	28.9	1.27	32.2	.36	9.1	.90	22.9	.60	15.2	-111
771LG SS 3/8 X 1/4 POS.	3/8	9.52	G-1/4-19	.23	5.9	5/8	15.9	3/4	.91	23.1	1.20	30.5	1.27	32.2	.36	9.1	.90	22.9	.66	16.8	-111

* Per: DIN - ISO 228/1
BS - 2779
JIS - B0202
ISO - 228/1-BSP-P

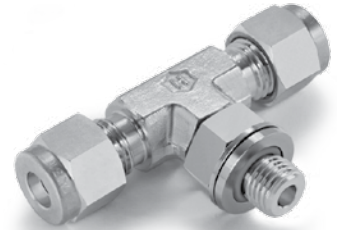
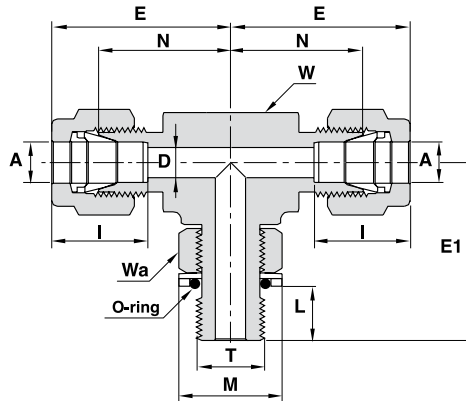
** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

*** Not standard O-ring size.

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

POSITIONABLES
ISO PARALLEL THREAD

772 LG
MALE BRANCH TEE



CONNECTORS

TUBE (METRIC) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A		T	D		W		Wa	N		E	E1		L		M	I	O-ring**
	Tube O.D.		(ISO)	inch	mm	inch	mm	Hex. Flat	inch	mm	mm	mm	mm	mm	mm	mm	mm	Dash No.
772LG SS 6 X 1/8 POS.	6		G-1/8-28	4.0	1/2	12.7	9/16	19.6	27.0	26.4	8.1	17.3	15.3	***				
772LG SS 6 X 1/4 POS.	6		G-1/4-19	4.8	5/8	15.9	3/4	21.6	29.0	32.2	9.1	22.9	15.3	-111				
772LG SS 8 X 1/4 POS.	8		G-1/4-19	5.9	5/8	15.9	3/4	22.4	29.9	32.2	9.1	22.9	16.2	-111				
772LG SS 10 X 1/4 POS.	10		G-1/4-19	5.9	15/16	23.8	3/4	25.9	33.5	35.0	9.1	22.9	17.2	-111				

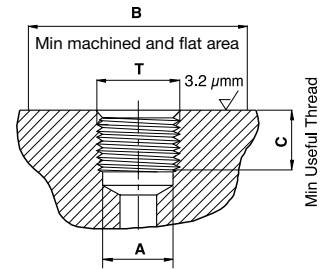
TUBE (INCH) TO ISO PARALLEL THREAD (POSITIONABLE)*

Ordering Information	A		T	D		W		Wa	N		E	E1		L		M	I	O-ring**			
	Tube O.D.		(ISO)	inch	mm	inch	mm	Hex. Flat	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Dash No.		
772LG SS 1/4 X 1/8 POS.	1/4	6.35	G-1/8-28	0.16	4.0	1/2	12.7	9/16	0.77	19.6	1.06	26.9	1.04	26.4	0.32	8.1	0.68	17.3	0.60	15.2	***
772LG SS 1/4 X 1/4 POS.	1/4	6.35	G-1/4-19	0.19	4.8	5/8	15.9	3/4	0.85	21.6	1.14	28.9	1.27	32.2	0.36	9.1	0.90	22.9	0.60	15.2	-111
772LG SS 3/8 X 1/4 POS.	3/8	9.52	G-1/4-19	0.23	5.9	5/8	15.9	3/4	0.91	23.1	1.20	30.5	1.27	32.2	0.36	9.1	0.90	22.9	0.66	16.8	-111

* Per: DIN - ISO 228/1
BS - 2779
JIS - B0202
ISO - 228/1-BSP-P

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.
*** Not standard O-ring size.
"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

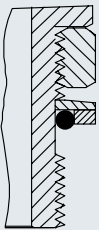
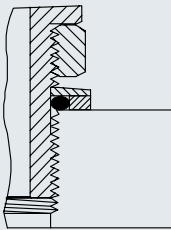
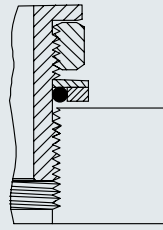
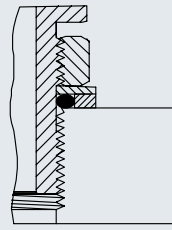
ISO PARALLEL THREAD PER B.S. 2779



MOUNTING DIMENSIONS CONNECTORS

T Female	A Thread Minor Diameter				B Min Machined and Flat Area		C Min Useful Thread	
	max		min		inch	mm	inch	mm
	inch	mm	inch	mm				
G-1/8-28	.337	8.566	.348	8.848	.68	17.3	.31	7.87
G-1/4-19	.450	11.445	.468	11.890	.90	22.9	.47	11.94
G-3/8-19	.588	14.950	.606	15.395	1.04	26.4	.47	11.94
G-1/2-14	.733	18.631	.755	19.172	1.26	32.0	.55	13.97

INSTALLATION INSTRUCTIONS

Figure 1	Figure 2	Figure 3	Figure 4
Locking backed off	Fitting install hand tight	Fittings backed-off for alignment (1 turn maximum)	Fitting locknut tightly to appropriate torque
			
Lubricate the O-ring by inserting it in the groove adjacent to the face of the metal back-up washer, which is assembled at the extreme end of the groove as shown in Figure 1.	Install the fitting into the S.A.E. straight thread boss, Figure 2, until the metal back-up washer contacts the face of the boss as shown in Figure 2.	Position the fitting by turning counter clockwise up to maximum of one turn. See Figure 3.	Holding the pad of the fitting with a wrench, tighten the locknut and washer against the face as shown in Figure 4.

HAM-LET DIELECTRIC FITTINGS

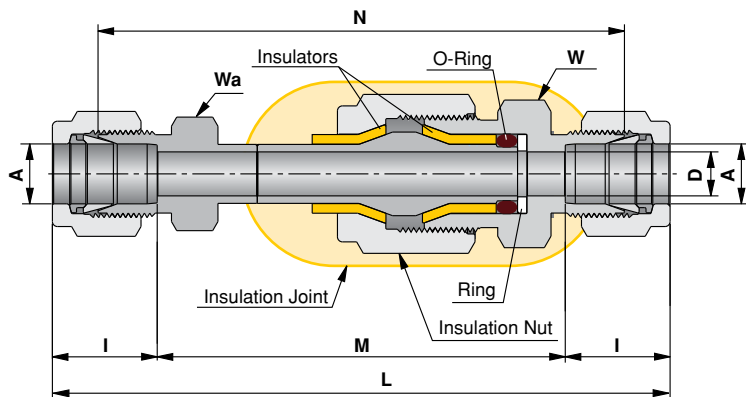
Dielectric fittings are designed to insulate subsystems from electrical current, voltages and static charges.

MATERIAL OF CONSTRUCTION

1. Body: A.I.S.I. 316.
2. Insulators: Polyamide-Imide.
3. O-Ring: Fluorocarbon FKM 70 Durometer.
4. Ring: PTFE.

WORKING CONDITIONS:

1. Pressure rating: 5000 psi
2. Temperature rating: -40°C to 93°C (-40°F to 200°F).
3. Electrical resistance at 20°C-25°C (68°F-77°F): $10 \times 10^6 \Omega$ at 30V DC.



TUBE (METRIC) TO TUBE (METRIC)

Ordering Information	A Tube O.D.		D		W Hex. Flat	Wa Hex. Flat	M		I		N		L	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
762L _ 10 mm Dielectric	10		7.1		22	18	65.85		17.2		84.85		100.3	
762L _ 12 mm Dielectric	12		7.1		22	22	61.70		22.8		87.10		107.3	

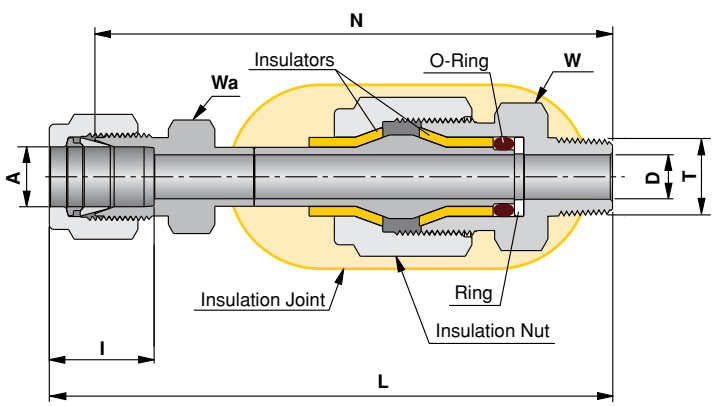
TUBE (INCH) TO TUBE (INCH)

Ordering Information	A Tube O.D.		D		W Hex. Flat	Wa Hex. Flat	M		I		N		L	
	inch	mm	inch	mm	inch	inch	inch	mm	inch	mm	inch	mm	inch	mm
762L _ 1/8 Dielectric	1/8	3.17	.09	2.28	13/16	1/2	2.56	65.10	.50	12.7	3.07	77.94	3.59	91.1
762L _ 1/4 Dielectric	1/4	6.35	.19	4.80	13/16	1/2	2.57	65.30	.60	15.2	3.19	81.02	3.77	95.8
762L _ 3/8 Dielectric	3/8	9.52	.28	7.11	13/16	5/8	2.59	65.80	.66	16.8	3.34	84.87	3.92	99.6
762L _ 1/2 Dielectric	1/2	12.70	.28	7.11	13/16	13/16	2.37	60.20	.90	22.9	3.37	85.68	4.17	106.0

"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

TUBE (INCH) TO MALE NPT THREAD

Ordering Information	A Tube O.D.		T (NPT)	D		W Hex. Flat	Wa Hex. Flat	I		N		L	
	inch	mm	inch	inch	mm	inch	inch	inch	mm	inch	mm	inch	mm
	768L_ 3/8 X 1/4 Dielectric	3/8	9.52	1/4	.28	7.11	7/8	5/8	.66	16.8	3.44	87.4	3.73

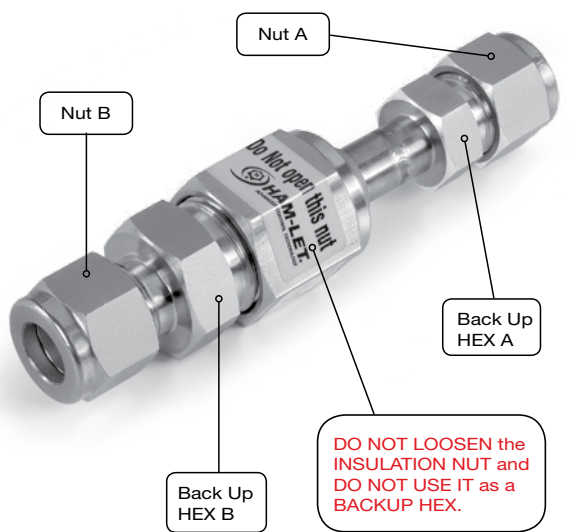


Assembly Instructions for Dielectric Fittings

1. Hold Hex A (Back-Up) and tighten nut A according to the LET-LOK® assembly instructions (see the LET-LOK® catalog for more information).
2. Hold Hex B (Back-Up) and tighten nut B according to the LET-LOK® assembly instructions.
CAUTION: DO NOT LOOSEN the INSULATION NUT and DO NOT USE IT as a BACK UP HEX.

Notes:

1. If the end connection is a Taper Pipe Thread - apply pipe sealant on thread and use Hex A or B as wrenching or as the Backup Hex.
2. For additional types of end connection, please contact



Warning!

The system designer and user have the sole responsibility to select products suitable for their special application requirements and to ensure the proper installation, operation and maintenance of the product. Please consider application details, material compatibility and product ratings when making your selection. Improper selection or use of products can cause property damage or personal injury.

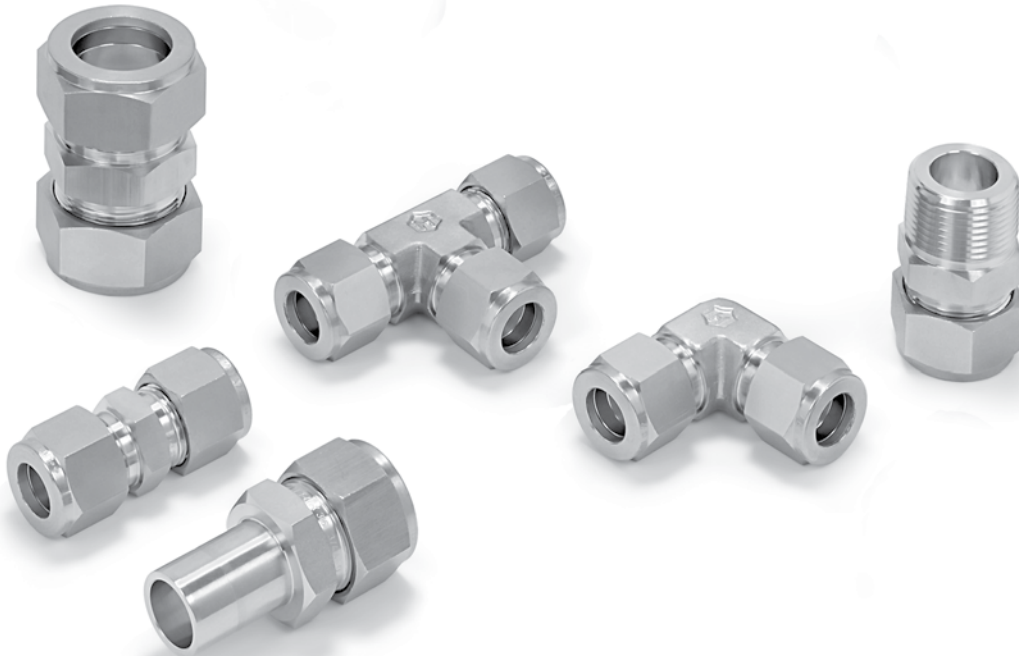
"D" - Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

HAM-LET

Alloy 400 NICKEL-COPPER

ALLOY 400/R-405

CONNECTORS




Alloy 400, made of nickel-copper is a solid-solution alloy that can be hardened only by cold working. It has high strength and toughness over a wide temperature range and excellent resistance to many corrosive environments. Alloy 400 is widely used in many fields, especially marine and chemical processing.

Alloy 400 MATERIAL STD

Barstock	Forging
ASTM B 164	ASTM B 564

760LB - Back Ferrule*

	Ordering info.		Tube O.D.
	760LB M 1/4		1/4
	760LB M 3/8		3/8
	760LB M 1/2		1/2

760LF - Front Ferrule*

	Ordering info.		Tube O.D.
	760LF M 1/4		1/4
	760LF M 3/8		3/8
	760LF M 1/2		1/2


761L - Nut

	Ordering info.		Tube O.D.
	761L M 1/4		1/4
	761L M 3/8		3/8
	761L M 1/2		1/2


762L - Union

	Ordering info.		Tube O.D.
	762L M 1/4		1/4
	762L M 3/8		3/8
	762L M 1/2		1/2


764L - Union Tee

	Ordering info.		Tube O.D.
	764L M 1/4		1/4
	764L M 3/8		3/8
	764L M 1/2		1/2


765L - Union Elbow

	Ordering info.		Tube O.D.
	765L M 1/4		1/4
	765L M 3/8		3/8
	765L M 1/2		1/2

767LP - Port Connector









	Ordering info.		Tube O.D.
	767LP M 1/4		1/4
	767LP M 3/8		3/8
	767LP M 1/2		1/2

7108L - Cap

	Ordering info.		Tube O.D.
	7108L M 1/4		1/4
	7108L M 3/8		3/8
	7108L M 1/2		1/2

Dimensions are for reference only, and are subject to change without notice.

ALLOY 400/R-405

774L - Bulkhead Union		7121L - Plug		767LT - Reducer					
	Ordering info.	Tube O.D.		Ordering info.	Tube O.D.		Ordering info.	Tube O.D.	Tube O.D.
	774L M 1/4	1/4		7121L M 1/4	1/4		767LT M 1/4 x 1/4	1/4	1/4
	774L M 3/8	3/8		7121L M 3/8	3/8		767LT M 1/4 x 3/8	1/4	3/8
			7121L M 1/2	1/2	767LT M 1/4 x 1/2		1/4	1/2	
					767LT M 3/8 x 1/4		3/8	1/4	
					767LT M 3/8 x 3/8		3/8	3/8	
					767LT M 3/8 x 1/2		3/8	1/2	
					767LT M 1/2 x 1/4		1/2	1/4	
					767LT M 1/2 x 3/8		1/2	3/8	
					767LT M 1/2 x 1/2		1/2	1/2	
769L - Male Elbow				766L - Female Connector					
	Ordering info.	Tube O.D.	Male pipe size		Ordering info.	Tube O.D.	Female pipe size		
	769L M 1/4 x 1/4	1/4	1/4		766L M 1/4 x 1/4	1/4	1/4		
	769L M 3/8 x 1/4	3/8	1/4		766L M 3/8 x 1/4	3/8	1/4		
	769L M 1/2 x 1/2	1/2	1/2						
739LF - Female Adapter				768L - Male Connector					
	Ordering info.	Tube O.D.	Female pipe size		Ordering info.	Tube O.D.	Male pipe size		
	739LF M 1/4 x 1/8	1/4	1/8		768L M 1/4 x 1/8	1/4	1/8		
	739LF M 1/4 x 1/4	1/4	1/4		768L M 1/4 x 1/4	1/4	1/4		
	739LF M 1/4 x 1/2	1/4	1/2		768L M 1/4 x 3/8	1/4	3/8		
	739LF M 3/8 x 1/4	3/8	1/4		768L M 1/4 x 1/2	1/4	1/2		
	739LF M 3/8 x 1/2	3/8	1/2		768L M 3/8 x 1/4	3/8	1/4		
	739LF M 1/2 x 1/4	1/2	1/4		768L M 3/8 x 3/8	3/8	3/8		
	739LF M 1/2 x 1/2	1/2	1/2		768L M 3/8 x 1/2	3/8	1/2		
			768L M 1/2 x 1/4		1/2	1/4			
			768L M 1/2 x 3/8		1/2	3/8			
			768L M 1/2 x 1/2		1/2	1/2			
			768L M 1/2 x 3/4		1/2	3/4			
739LM - Male Adapter									
	Ordering info.	Tube O.D.	Male pipe size						
	739LM M 1/4 x 1/8	1/4	1/8						
	739LM M 1/4 x 1/4	1/4	1/4						
	739LM M 1/4 x 1/2	1/4	1/2						
	739LM M 3/8 x 1/4	3/8	1/4						
	739LM M 3/8 x 1/2	3/8	1/2						
	739LM M 1/2 x 1/4	1/2	1/4						
	739LM M 1/2 x 1/2	1/2	1/2						

LET-LOK TUBING DATA FOR ALLOY 400

Alloy 400 tubes should be ordered according to ASTM B-165. Hydraulic tubing is suitable for flaring and bending.	Tube O.D. inch	0.028	0.035	0.049	0.065	Allowable working pressure in psig at -20° to 100°F (-28° to 37°C)
	1/4	3700	4800	7000	9500	
	3/8		3100	4400	6100	
	1/2		2300	3200	4400	
Tubing should be seamless and annealed. Hardness: 75 HRB maximum.	GAS APPLICATION TUBING					
	Tube O.D.	Min. Nominal wall thickness				
	1/2"	.035"				

Dimensions are for reference only, and are subject to change without notice.

HAM-LET

ALLOY C-276 CONNECTORS

In aggressive/corrosive service, when nothing else works, many industries have traditionally turned to **Alloy C-276**. Many years of outstanding performance in a variety of industrial applications have confirmed the advantages of using this alloy.

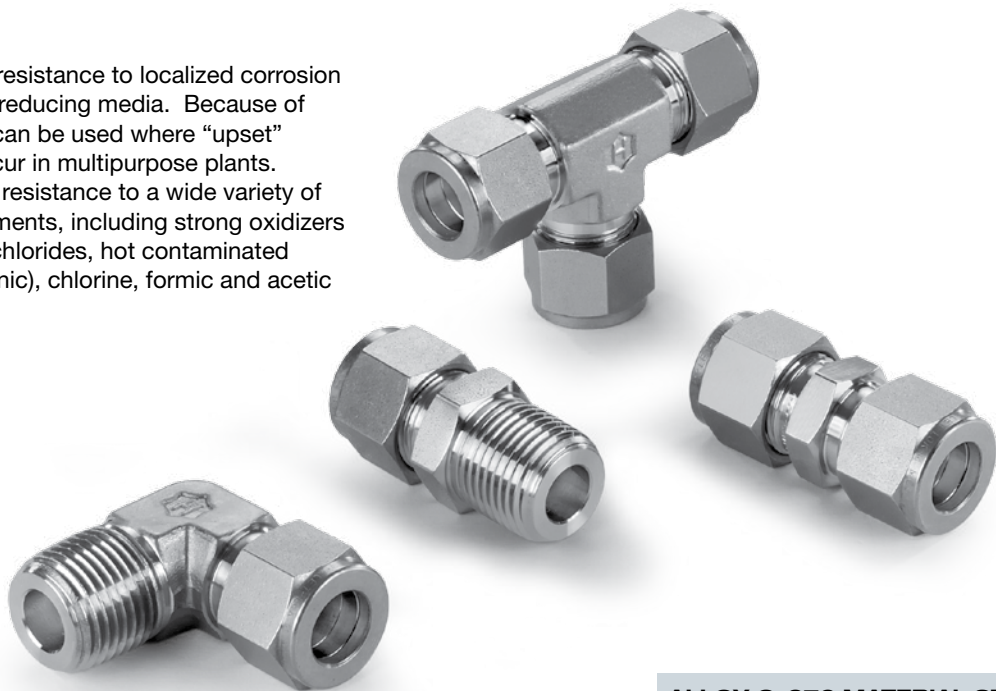
Excellent Resistance to Corrosion

Alloy C-276 is a nickel-molybdenum-chromium wrought alloy that is generally considered a versatile corrosion-resistant alloy.

C-276 alloy has excellent resistance to localized corrosion and to both oxidizing and reducing media. Because of its versatility, C-276 alloy can be used where “upset” conditions are likely to occur in multipurpose plants.

Alloy C-276 has excellent resistance to a wide variety of chemical process environments, including strong oxidizers such as ferric and cupric chlorides, hot contaminated media (organic and inorganic), chlorine, formic and acetic


acids, acetic anhydride, and seawater and brine solutions. It is used in flue gas desulfurization systems because of its excellent resistance to sulfur compounds and chloride ions encountered in most scrubbers. **C-276** alloy has excellent resistance to pitting and to stress-corrosion cracking. It is also one of the few materials that withstands the corrosive effects of wet chlorine gas, hypochlorite and chlorine dioxide.




ALLOY C-276 MATERIAL STD

Barstock	Forging
ASTM B574	ASTM B564


760LB - Back Ferrule*

	Ordering info.		Tube O.D.
	760LB HC 1/4		1/4
	760LB HC 3/8		3/8
	760LB HC 1/2		1/2


760LF - Front Ferrule*

	Ordering info.		Tube O.D.
	760LF HC 1/4		1/4
	760LF HC 3/8		3/8
	760LF HC 1/2		1/2


761L - Nut

	Ordering info.		Tube O.D.
	761L HC 1/4		1/4
	761L HC 3/8		3/8
	761L HC 1/2		1/2


762L - Union

	Ordering info.		Tube O.D.
	762L HC 1/4		1/4
	762L HC 3/8		3/8
	762L HC 1/2		1/2


764L - Union Tee

	Ordering info.		Tube O.D.
	764L HC 1/4		1/4
	764L HC 3/8		3/8
	764L HC 1/2		1/2


765L - Union Elbow

	Ordering info.		Tube O.D.
	765L HC 1/4		1/4
	765L HC 3/8		3/8
	765L HC 1/2		1/2

767LP - Port Connector

	Ordering info.		Tube O.D.
	767LP HC 1/4		1/4
	767LP HC 3/8		3/8
	767LP HC 1/2		1/2









7108L - Cap

	Ordering info.		Tube O.D.
	7108L HC 1/4		1/4
	7108L HC 3/8		3/8
	7108L HC 1/2		1/2

* All LET-LOK ferrules are available as sets.

Dimensions are for reference only, and are subject to change without notice.

ALLOY C-276

774L - Bulkhead Union		7121L - Plug		767LT - Reducer					
	Ordering info.	Tube O.D.		Ordering info.	Tube O.D.				
	774L HC 1/4	1/4		7121L HC 1/4	1/4		Ordering info.	Tube O.D.	Tube O.D.
	774L HC 3/8	3/8		7121L HC 3/8	3/8		767LT HC 1/4 x 1/4	1/4	1/4
			7121L HC 1/2	1/2	767LT HC 1/4 x 3/8		1/4	3/8	
					767LT HC 1/4 x 1/2		1/4	1/2	
					767LT HC 3/8 x 1/4		3/8	1/4	
					767LT HC 3/8 x 3/8		3/8	3/8	
					767LT HC 3/8 x 1/2		3/8	1/2	
					767LT HC 1/2 x 1/4		1/2	1/4	
					767LT HC 1/2 x 3/8		1/2	3/8	
					767LT HC 1/2 x 1/2	1/2	1/2		
769L - Male Elbow				766L - Female Connector					
	Ordering info.	Tube O.D.	Male pipe size		Ordering info.	Tube O.D.	Female pipe size		
	769L HC 1/4 x 1/4	1/4	1/4		766L HC 1/4 x 1/4	1/4	1/4		
	769L HC 3/8 x 1/4	3/8	1/4		766L HC 3/8 x 1/4	3/8	1/4		
	769L HC 1/2 x 1/2	1/2	1/2						
739LF - Female Adapter				768L - Male Connector					
	Ordering info.	Tube O.D.	Female pipe size		Ordering info.	Tube O.D.	Male pipe size		
	739LF HC 1/4 x 1/8	1/4	1/8		768L HC 1/4 x 1/8	1/4	1/8		
	739LF HC 1/4 x 1/4	1/4	1/4		768L HC 1/4 x 1/4	1/4	1/4		
	739LF HC 1/4 x 1/2	1/4	1/2		768L HC 1/4 x 3/8	1/4	3/8		
	739LF HC 3/8 x 1/4	3/8	1/4		768L HC 1/4 x 1/2	1/4	1/2		
	739LF HC 3/8 x 1/2	3/8	1/2		768L HC 3/8 x 1/4	3/8	1/4		
	739LF HC 1/2 x 1/4	1/2	1/4		768L HC 3/8 x 3/8	3/8	3/8		
	739LF HC 1/2 x 1/2	1/2	1/2		768L HC 3/8 x 1/2	3/8	1/2		
			768L HC 1/2 x 1/4		1/2	1/4			
			768L HC 1/2 x 3/8		1/2	3/8			
			768L HC 1/2 x 1/2		1/2	1/2			
			768L HC 1/2 x 3/4		1/2	3/4			
739LM - Male Adapter									
	Ordering info.	Tube O.D.	Male pipe size						
	739LM HC 1/4 x 1/8	1/4	1/8						
	739LM HC 1/4 x 1/4	1/4	1/4						
	739LM HC 1/4 x 1/2	1/4	1/2						
	739LM HC 3/8 x 1/4	3/8	1/4						
	739LM HC 3/8 x 1/2	3/8	1/2						
	739LM HC 1/2 x 1/4	1/2	1/4						
	739LM HC 1/2 x 1/2	1/2	1/2						

LET-LOK® TUBING DATA FOR ALLOY

Alloy C-276 tubes should be ordered according to ASTM B-622. Hydraulic tubing is suitable for flaring and bending.	Tube O.D. inch	0.035	0.049	0.065	
	1/4	5100	7500	10200	
	3/8	3300	4800	6500	
	1/2	2600	3700	5100	
Tubing should be seamless and annealed. Hardness: 100 HRB maximum.	GAS APPLICATION TUBING				
	Tube O.D.	Min. Nominal wall thickness			
	1/2"	.035"			

Dimensions are for reference only, and are subject to change without notice.

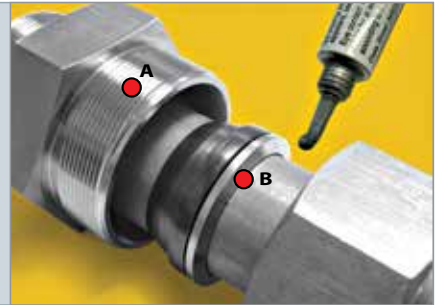
ACCESSORIES

G-RAPID PLUS LOW FRICTION PASTE

**INSTALLATION
INSTRUCTIONS FOR
LET-LOK® FITTINGS**
38mm–50mm
1 1/4"–2"



1. Close the nut and ferrules on the tube with a hydraulic tool.
2. Open and release from the tool.
3. Apply the G-Rapid paste on areas A and B.
4. Tighten the nut on body 1/2 a turn with a wrench



To order:
use part No. 3900753



GOLDEN GAUGE

SIZE:

GAUGE	
PART NO.	AVAILABLE ONLY IN
3900098	1/4" (6mm), 3/8", 1/2" (12mm)

HIGH SAFETY SIDE

HIGH SAFETY

In applications where severe conditions and high pressure exist, we recommend the following installation procedures:

1. Check that the nut is finger tight.
2. Insert the tube (up to the shoulder).
3. Rotate the nut with a wrench until the tube does not rotate freely.
4. Mark position of the nut.
5. Rotate the nut 1-1/4 turns.

This method ensures that even if the tube O.D. is at the minimum tolerance, the ferrules will be in contact with the tube for the full 1-1/4 rotation.

ADDITIONAL SIZES:

GOLDEN GAUGE	
PART NO.	LET-LOK® SIZE
3901508	Golden Gauge 1/16"
3901509	Golden Gauge 1/8"–2–3 mm
3901510	Golden Gauge 3/16"– 4 mm
3901513	Golden Gauge 5/16"– 8 mm
3901511	Golden Gauge 10 mm
3901247	Golden Gauge 5/8"–14–15–16 mm
3901246	Golden Gauge 3/4"–18 mm
3901512	Golden Gauge 7/8"–20–22 mm
3901245	Golden Gauge 1"–25 mm

Dimensions are for reference only, and are subject to change without notice.

HAM-LET PREASSEMBLY TOOL

In constrained installation areas, LET-LOK® fittings can be assembled with the preassembly tool and a second step on the system.

PART NO.	LET-LOK® SIZE
3902419	PREASSEMBLY TOOL 1/8
3901658	PREASSEMBLY TOOL 1/4
3901659	PREASSEMBLY TOOL 3/8
3901660	PREASSEMBLY TOOL 1/2
3902719	PREASSEMBLY TOOL 5/8
3902402	PREASSEMBLY TOOL 6MM
3902420	PREASSEMBLY TOOL 8MM
3902421	PREASSEMBLY TOOL 10MM
3902422	PREASSEMBLY TOOL 12MM
3902720	PREASSEMBLY TOOL 14MM
3902721	PREASSEMBLY TOOL 15MM
3902538	PREASSEMBLY TOOL 16MM

Instruction for using "Preassembly Tool" 6mm-16mm, 1/4"-5/8"

1. Assemble HAM-LET ferrules and nut on the Preassembly Tool, tighten the nut to finger tight position.
2. Insert the tube through the nut and ferrules until the tube touches the bottom (shoulder).
3. From the finger tight position, rotate the nut 1-1/4 turns (450°).
4. Release the nut from the Preassembly Tool; pull out the tube with the ferrules swaged into the tube.
5. Insert tube with swaged ferrules into the fitting body.
6. Tighten the nut to the finger tight position (mark the place).
7. To assemble on the fitting, use a wrench to tighten the nut to the original position. An increase of torque will be felt, from this point turn the wrench slightly.

Tightening to the original position depends on the tube size.

A large tube size will need more tightening than a small size, and the wall thickness has some effect on the tightening.

Note:

1. When using the Preassembly Tool, make sure the tool is free of damage and is clean prior to use.
2. Usage of the Preassembly Tool is limited, after permanent use please send tool to HAM-LET for evaluation.
3. Soft tubing and tubing at the maximum diameter tolerance can cause the tube to stick to Preassembly Tool.
In order to remove the stuck tube, please rock the tube back and forth until the tube gets released from the tool.



Instruction for using "Preassembly Tool" 1/8"-3/16", 2mm-4mm

1. Assemble HAM-LET ferrules and nut on the Preassembly Tool, tighten the nut to the finger tight position.
2. Insert the tube through the nut and ferrules until the tube touches the bottom (shoulder).
3. From the finger tight position, rotate the nut 3/4 of a turn (270°).
4. Release the nut from the Preassembly Tool; pull out the tube with the ferrules swaged into the tube.
5. Insert tube with swaged ferrules into the fitting body.
6. Tighten the nut to the finger tight position (mark the place).
7. To assemble on the fitting, use a wrench to tighten the nut to the original position. An increase of torque will be felt, from this point turn the wrench slightly.

Tightening to the original position depends on tube size.

A large tube size will need more tightening than a small size, and the wall thickness has some effect on the tightening.

ACCESSORIES



STAINLESS STEEL TUBE CUTTER

Ordering Information	Capacity	
	inch	mm
Tube Cutter	3/16-1	5-25
Replacement Wheel	3/16-1	5-25



REAMERS, DEBURRING TOOLS

Ordering Information	Capacity
In.Out.Reamer 1/4"-1 1/4"	1/4" (5mm) through 1 1/4" (36mm)
In.Out.Reamer 1/2"-2"	1/2" (12mm) through 2" (54mm)



LEVER TUBE BENDERS

Ordering Information	Capacity	
	Tube Size	Bend Radius
Lever Bender 3/16	3/16"	5/8"
Lever Bender 1/4	1/4"	5/8"
Lever Bender 5/16	5/16"	15/16"
Lever Bender 3/8	3/8"	15/16"
Lever Bender 1/2	1/2"	1 1/2"
Lever Bender 6	6mm	16mm
Lever Bender 8	8mm	24mm
Lever Bender 10	10mm	24mm
Lever Bender 12	12mm	38mm

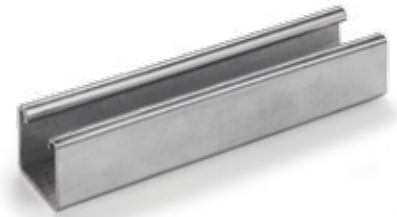
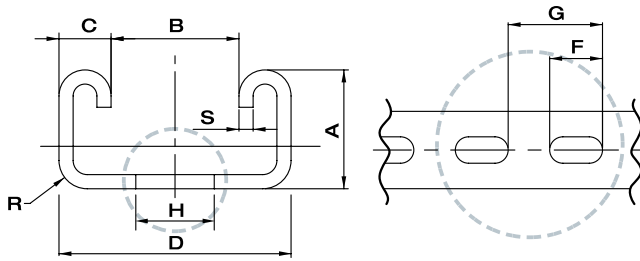


HYDRAULIC PRE-ASSEMBLY TOOL

Ordering Information	Description	
HPAT- Large	Full large size tool - 1", 1 1/4", 1 1/2"	
HPAH - 1"	1"	Pre Assembly Head
HPAH - 1 1/4"	1 1/4"	
HPAH - 1 1/2"	1 1/2"	

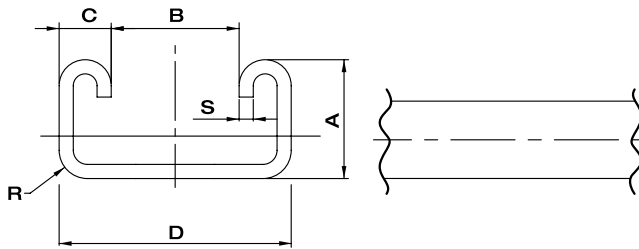


TUBE HOLDERS



PERFORATED STAINLESS STEEL TUBE HOLDER SUPPORT

HL / PN	A, mm	B, mm	C, mm	D, mm	L, m	S, mm	R, mm	F, mm	G, mm	H, mm
P-L-G	41.0	22.6	9.2	41.0	6.0	2.5	5.0	28.0	50.0	14.0
P-S-G	21.0	22.6	9.2	41.0	6.0	2.5	5.0	28.0	50.0	14.0
P-L-Z	41.0	22.6	9.2	41.0	6.0	2.5	5.0	28.0	50.0	14.0
P-S-Z	21.0	22.6	9.2	41.0	6.0	2.5	5.0	28.0	50.0	14.0



BLANK STAINLESS STEEL TUBE HOLDER SUPPORT

HL / PN	A, mm	B, mm	C, mm	D, mm	L, m	S, mm	R, mm
B-L-G	41.0	22.6	9.2	41.0	6.0	2.5	5.0
B-S-G	21.0	22.6	9.2	41.0	6.0	2.5	5.0
B-L-Z	41.0	22.6	9.2	41.0	6.0	2.5	5.0
B-S-Z	21.0	22.6	9.2	41.0	6.0	2.5	5.0

ORDERING INFORMATION

Perforation

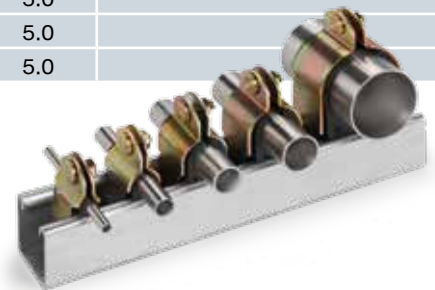
P = Perforated
B = Blank

Size

S = Small
L = Large

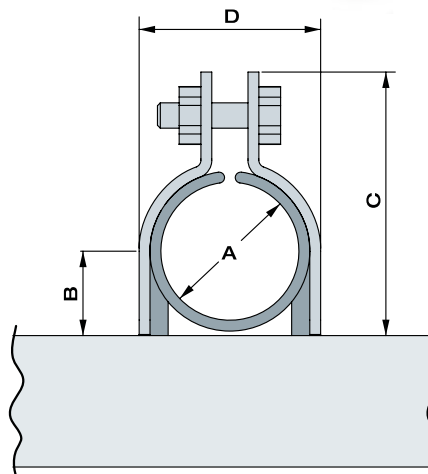
Finish Type

Z = Zink Coating Yellow
G = Hot dip galvanized

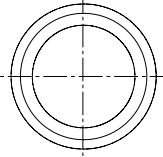



CLAMPED TUBE HOLDERS

HL / PN	A, mm	B, mm	C, mm	D, mm
CTH-1/4	1/4	5.7	29.2	18.2
CTH-3/8	3/8	7.3	32.2	23.0
CTH-1/2	1/2	7.8	36.6	23.7
CTH-5/8	5/8	22.6	41.7	25.0
CTH-3/4	3/4	13.8	48.3	32.7
CTH-7/8	7/8	22.6	51.2	34.0
CTH-1	1	16.8	53.8	40.8
CTH-1 1/8	1-1/8	22.6	59.4	40.9
CTH-1 5/8	1-5/8	22.6	71.8	58.3
CTH-2	2	30.4	82.0	64.1



STOP COLLAR

LET-LOK®			D	Assembly Instructions - Stop Collar	
inch	inch	mm			
1/4	.69	17.5	1. Remove the nut and ferrules from the fitting. 2. Insert the stop collar. 3. Assemble the nut and ferrules until finger tight. 4. Make up the fitting until the stop collar no longer rotates (feel with finger). At this stage it is guaranteed that the fitting is assembled correctly.		
3/8	.84	20.6			
1/2	1.10	27.0			
3/4	1.31	33.3			
1	1.68	42.7			

ORDERING INFORMATION FOR ASSEMBLED STOP COLLAR (WITH FITTING)

768L	SS	1/4	X	1/4	SC
Fitting Type	SS = Stainless Steel 316 B = Brass M = Alloy 400 HC = Alloy C-276	Tube O.D. The O.D. size is always the first to be described		1/4 NPT	Stop Collar
Male LET-LOK® Connector Male End Connection	Fitting Material				

HOW TO ORDER STOP COLLAR ONLY

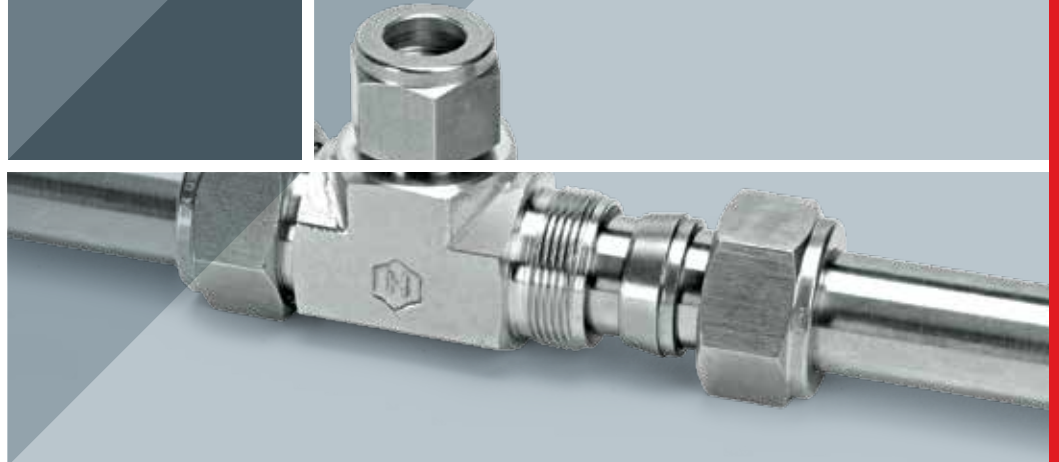
STOP COLLAR	1/4
Stop Collar	Tube O.D. The O.D. size is always the first to be described

Dimensions are for reference only, and are subject to change without notice.

Let-Lok® tube Fittings, Rev.02, January



SINGLE FERRULE FITTINGS
ONE-LOK[®]



TUBE FITTINGS 1/16" THROUGH 1"



THE PRINCIPLE

HAM-LET ONE-LOK® is designed to provide leak-proof, secure connections that can withstand high pressure, vibration and vacuum applications. To this end, ONE-LOK® tube fittings are made up of three parts that are precision engineered and machined: body, ferrule and nut.

APPLICATIONS

ONE-LOK® is designed for use in control systems, process and instrumentation devices and in industrial equipment used in various applications. For example:

- Pulp & paper mills
- Petroleum process plants
- Chemical process plants
- Chromatography
- Power generation plants

ONE-LOK® offers a simple, high-quality tube fitting with excellent performance and reliability.

MATERIALS

ONE-LOK® standard single-ferrule fittings are offered in 316 Stainless Steel. Cold-drawn finished bar stock is machined to produce the straight fittings. Close-grain forgings are used for the machining of the shaped bodies. For other material options, please contact your HAM-LET distributor or HAM-LET on-line: www.ham-let.com

REMAKEABILITY

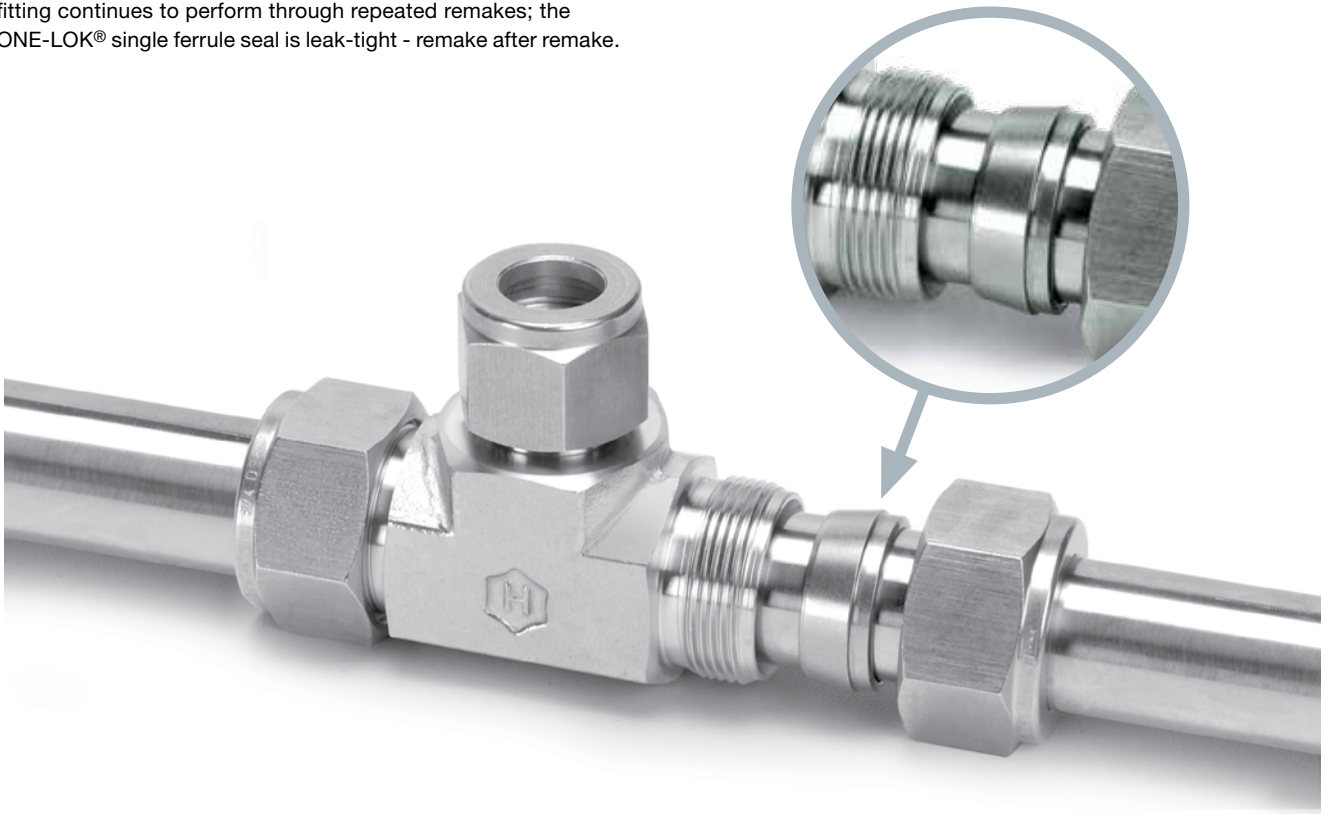
Owing to the single ferrule design, HAM-LET ONE-LOK® tube fitting continues to perform through repeated remakes; the ONE-LOK® single ferrule seal is leak-tight - remake after remake.

TEMPERATURE CHANGES

The ONE-LOK® single ferrule is capable of bowing during make-up. This feature introduces a 'live' element, allowing the device to maintain a leak-tight seal, despite expansion and contraction due to temperature changes.

UNIQUE HEAT CODE TRACING NUMBER (MATERIAL CODE)

HAM-LET stamps or etches all ONE-LOK stainless steel body fittings with a unique heat-code tracing number. This is particularly valuable for critical applications. Full documentation can be made available via this code in order to trace the St.St. material back to the original melt or cast.



ONE-LOK® TUBING SELECTION

To ensure the installation of safe, leak-free systems, it is important to choose the appropriate ONE-LOK® single ferrule for your application. ONE-LOK® fittings are engineered to the highest standards.

The table below lists tube sizes, which have been tested to bursting pressure with both maximum and minimum wall thickness.

Correctly assembled ONE-LOK® fittings were installed and no leaks or other failures were noted at the connection points. If you plan to use tubing with different wall thicknesses than those noted in this

For Stainless Steel Tubing Data, see page 9

chart, please contact the HAM-LET Technical Department for advice regarding the appropriate working pressure.

Note: Use fully annealed, high-quality stainless steel tubing of ASTM A269 or of equivalent standard.

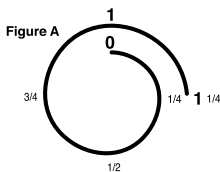
Working pressure: Based on laboratory and field tests using ASTM A269 tubing with a safety factor of 4:1 in a metal temperature range of -20° to +100°c. However, it is the customer's responsibility to ensure safe product selection that is based upon the total system design and function.

INSTALLATION INSTRUCTIONS

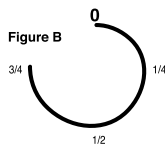


ONE-LOK® fittings are supplied assembled and finger tight. Disassembly before use can allow the entry of dirt or other particles.

1. Insert the tubing into the ONE-LOK® fitting. Check that the tube rests firmly on the fitting shoulder and that the nut is finger tight.



2. Tighten the nut. 1-1/4 turns of the nut is required for 1/4" (6 mm) and higher (See Figure A). 3/4 turns of the nut is required for 1/8" (See Figure B).



Reassembly Instructions:

ONE-LOK® connections may be disconnected and remade repeatedly, without the loss of the leaktight seal.

1. Before disconnecting, mark the position of the nut in relation to the fitting body.
2. To reassemble, use a wrench to tighten the nut to the original position.
3. Tighten slightly with the wrench until a slight rise in torque is felt.

Tube Cutting

Two different methods can be used to cut tubes:

1. Tube cutter
2. Hacksaw cutting

Tube Cutter

To attain a leak free connection, the tubing must be cut squarely. A good quality tube cutter with an appropriate blade for tubing material is recommended.

Do not try to reduce the time of cutting by taking deep cuts with each turn of the cutter. This will work harden the tube.

The end of the tube must be deburred to avoid damage to the fitting and to ensure that the tube reaches the bottom of the fitting.

Hacksaw Cutting

In order to cut the tube with a hacksaw and get square ends, the tube must be cut with guide blocks.

This method of cutting necessitates deburring of the tube ends.

Warning

Do not hold the tube in a vise in the place where it will be inserted into the fitting (the vise will leave a mark on the tube that may cause leaks, and might cause ovality).

Tube Handling

Scratches on the tube might cause leaks. It is therefore important to handle the tube carefully to reduce the risk of leaks.

Some Precautions to be Taken:

1. Tubes must not be dragged on the floor.
2. Tubes must not be dragged out of a tubing rack, especially in case of large O.D. tubes.

ONE-LOK® ORDERING INFORMATION

ONE-LOK® fitting part numbers are constructed from symbols that identify the type of material and size of the fitting.

The ONE-LOK® part numbering system is the same as our LET-LOK® Tube Fittings, with the exception that you add an "H" between the prefix number and the "L" to designate the one ferrule design.

768HL

Fitting type
(male connector)

SS

SS = Stainless Steel

1/4

Tube O.D.

The O.D. size is always the first to be described

x

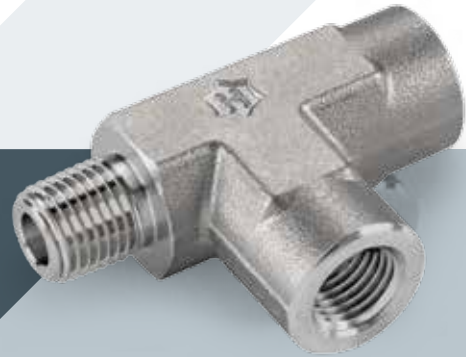
1/4

1/4 NPT



HAM-LET PRECISION INSTRUMENT PIPE FITTINGS

PIPELINE



GENERAL

The HAM-LET Pipeline range of connectors is manufactured for typical applications in chemical and petrochemical processing plants, as well as oil, gas and power generation industries.

FEATURE

- Sizes range from 1/16" to 2".
- Fittings are properly packaged with the exposed threads protected to ensure they are not damaged during delivery.
- All pipe threads meet the requirements of **ASME/ANSI B1.20.1** (1983) for tapered pipe threads (NPT).
- Working pressures are calculated in accordance with Power Piping Code **ANSI B 31.1**, Refiner Piping Code **ASME/ANSI B 31.3** and section VIII of **ASME** Boiler & Pressure Vessel Code.

PRESSURE RATINGS (PSI)

NPT or BSPT/ISO size	STAINLESS STEEL 316		BRASS	
	male	female	male	female
1/16	11000	6700	5500	3300
1/8	10000	6500	5000	3200
1/4	8000	6600	4000	3300
3/8	7800	5300	3900	2600
1/2	7700	4900	3800	2400
3/4	7300	4600	3600	2300
1	5300	4400	2600	2200
1 1/4	6000	5000	3000	2500
1 1/2	5000	4600	2500	2300
2	3900	3900	1900	1900

MATERIALS

MATERIAL	Specifications	
	Barstock	Forgings
STAINLESS STEEL 316	ASTM A-276	ASTM A-182
	ASTM A-479	
BRASS	ASTM B-453	ASME B-283
	ASTM B-16	
	DIN 176.60	

INSTALLATION INSTRUCTIONS

To ensure a leak-tight seal, HAM-LET recommends the use of a pipe thread sealant on all NPT threads. The most effective sealing method is PTFE tape. Tape should be used only on male tapered pipe threads.

Do not use tape on flared, coned or tube fitting ends!

Clean both male and female tapered threads. Wrap tape in the direction of the male tapered thread spiral.

Note: Two wraps are suggested for stainless steel tapered pipe threads. Make sure tape does not overhang the first thread, as the tape might shred and enter the fluid system. Cut off excess tape. The connection is now ready for proper makeup.

ORDERING INFORMATION

EXAMPLE:

120H**Material Description****SS** - Stainless Steel 316**B** - Brass**1/2**

x

1/4

All orders should include ordering information and material description.

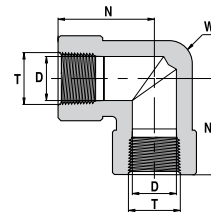
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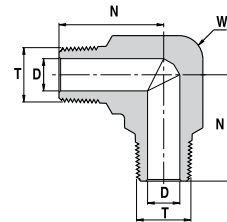
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100 H ELBOW



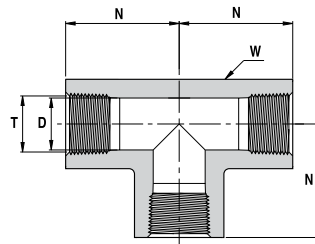
Ordering Information	T Female NPT size	N		D Min. Opening		W Wrench Flat
		inch	mm	inch	mm	inch
100H _ 1/8	1/8	1.04	26.4	0.31	7.8	5/8
100H _ 1/4	1/4	1.17	29.7	0.41	10.5	11/16
100H _ 3/8	3/8	1.42	36.1	0.56	14.2	15/16
100H _ 1/2	1/2	1.56	39.6	0.69	17.4	1 1/8
100H _ 3/4	3/4	1.92	48.8	0.90	22.9	1 3/8
100H _ 1	1	1.91	48.5	1.13	28.7	1 11/16

100 HM MALE ELBOW



Ordering Information	T Male NPT Size	N		D Min. Opening		W Wrench Flat
		inch	mm	inch	mm	inch
100HM _ 1/8	1/8	0.88	22.4	0.19	4.8	1/2
100HM _ 1/4	1/4	1.05	26.7	0.28	7.1	5/8
100HM _ 3/8	3/8	1.17	29.7	0.38	9.6	13/16
100HM _ 1/2	1/2	1.45	36.8	0.47	11.9	15/16

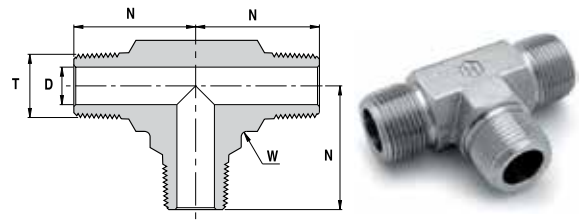
101 H TEE



Ordering Information	A Female NPT Size	N		D Min. Opening		W Wrench Flat
		inch	mm	inch	mm	inch
101H _ 1/8	1/8	1.04	26.4	0.31	7.8	5/8
101H _ 1/4	1/4	1.17	29.7	0.41	10.5	13/16
101H _ 3/8	3/8	1.42	36.1	0.56	14.2	15/16
101H _ 1/2	1/2	1.56	39.6	0.69	17.4	1 1/8
101H _ 3/4	3/4	1.92	48.8	0.90	22.9	1 3/8
101H _ 1	1	1.91	48.5	1.13	28.7	1 11/16

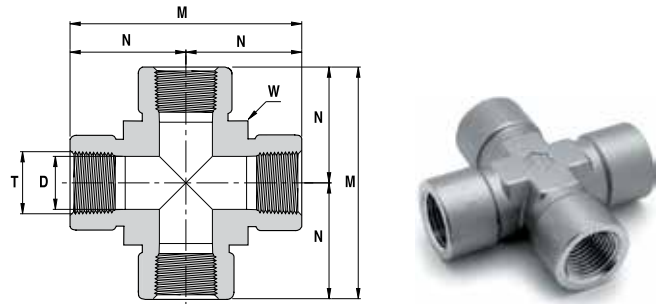
"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

101 HM MALE TEE



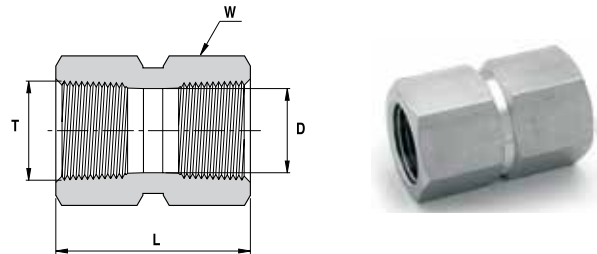
Ordering Information	T Male NPT Size	N		D Min. Opening		W Wrench Flat
		inch	mm	inch	mm	inch
		101HM _ 1/8	1/8	0.88	22.4	0.19
101HM _ 1/4	1/4	1.05	26.7	0.28	7.1	5/8
101HM _ 3/8	3/8	1.17	29.7	0.38	9.6	13/16
101HM _ 1/2	1/2	1.45	36.8	0.47	11.9	15/16

102 H CROSS



Ordering Information	T Female NPT Size	N		M		D Min. Opening		W Wrench Flat
		inch	mm	inch	mm	inch	mm	inch
		102H _ 1/8	1/8	1.04	26.4	2.08	52.8	0.31
102H _ 1/4	1/4	1.17	29.7	2.34	59.4	0.41	10.5	11/16
102H _ 3/8	3/8	1.42	36.1	2.84	72.2	0.56	14.2	13/16
102H _ 1/2	1/2	1.56	39.6	3.12	79.2	0.69	17.4	1
102H _ 3/4	3/4	1.92	48.8	3.84	97.6	0.90	22.9	1 1/4
102H _ 1	1	1.91	48.5	3.82	97.0	1.13	28.7	1 11/16

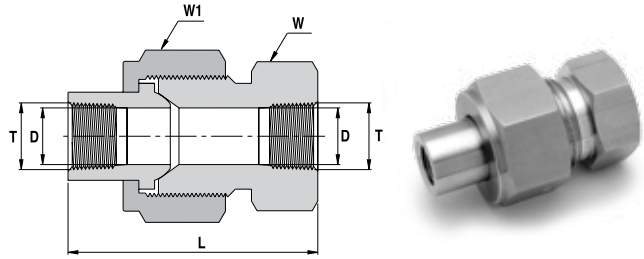
103 H HEX COUPLING



Ordering Information	T Female NPT Size	L		D Min. Opening		W Hex. Flat
		inch	mm	inch	mm	inch
		103H _ 1/8	1/8	0.81	20.6	0.31
103H _ 1/4	1/4	1.19	30.2	0.41	10.5	3/4
103H _ 3/8	3/8	1.31	33.3	0.56	14.2	7/8
103H _ 1/2	1/2	1.56	39.6	0.69	17.4	1 1/16
103H _ 3/4	3/4	1.62	41.1	0.90	22.9	1 5/16
103H _ 1	1	2.00	50.8	1.13	28.7	1 5/8

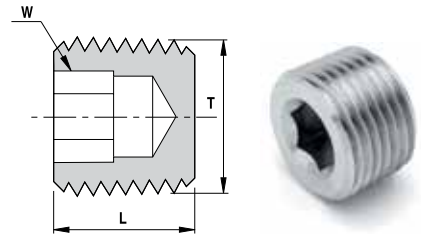
“D” Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

104 H UNION RECORD



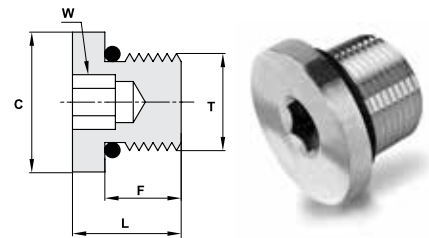
Ordering Information	T Female NPT Size	L		D Min. Opening		W Hex. Flat		W1 Hex. Flat
		inch	mm	inch	mm	inch	mm	
104H _ 1/8	1/8	1.81	46.0	0.27	6.9	15/16	23.81	1 1/8
104H _ 1/4	1/4	2.34	59.4	0.36	9.1	1 3/16	30.16	1 3/8
104H _ 3/8	3/8	2.50	63.5	0.52	13.2	1 5/16	33.34	1 1/2
104H _ 1/2	1/2	2.69	68.3	0.62	15.7	1 5/8	41.28	1 3/4
104H _ 3/4	3/4	3.12	79.2	0.87	22.1	1 7/8	47.63	2
104H _ 1	1	3.56	90.4	1.03	26.2	2 3/8	60.33	2 1/2

107 H HOLLOW HEX PLUGS



Ordering Information	T Male NPT Size	L		W Hex. Flat
		inch	mm	inch
107H _ 1/8	1/8	0.29	7.4	3/16
107H _ 1/4	1/4	0.44	11.3	1/4
107H _ 3/8	3/8	0.44	11.3	5/16
107H _ 1/2	1/2	0.61	15.5	3/8

107HOB HOLLOW HEX PLUG SAE/MS STRAIGHT THREAD BOSS *

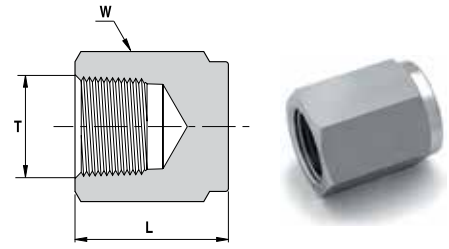


Ordering Information	T Straight Thread UN	L		F		C		W Hex. Flat	O-Ring**
		inch	mm	inch	mm	inch	mm		
107HOB _ 7/16-20	7/16-20	0.45	11.4	0.36	9.1	0.56	14.2	3/16	-904
107HOB _ 1/2-20	1/2-20	0.45	11.4	0.36	9.1	0.63	15.9	3/16	-905
107HOB _ 9/16-18	9/16-18	0.48	12.2	0.39	9.9	0.69	17.5	1/4	-906
107HOB _ 3/4-16	3/4-16	0.56	14.2	0.44	11.2	0.88	22.4	5/16	-908

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

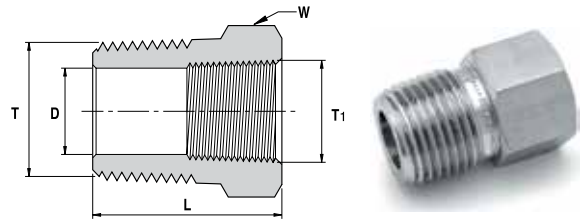
** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

108 H PIPE CAP



Ordering Information	T Female NPT Size	L		W Hex. Flat
		inch	mm	inch
108H_ 1/8	1/8	0.75	19.1	9/16
108H_ 1/4	1/4	0.91	23.1	3/4
108H_ 3/8	3/8	1.03	26.2	7/8
108H_ 1/2	1/2	1.34	34.0	1 1/16
108H_ 3/4	3/4	1.44	36.6	1 5/16
108H_ 1	1	1.62	41.1	1 5/8

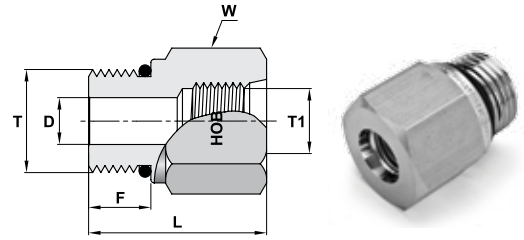
110 H REDUCING BUSHING



Ordering Information	T Male NPT Size	T1 Female NPT Size	L		D Min. Opening		W Hex. Flat
			inch	mm	inch	mm	inch
110H_ 1/8 X 1/16	1/8	1/16	1.03	26.2	0.19	4.8	7/16
110H_ 1/4 X 1/8	1/4	1/8	1.06	26.9	0.28	7.1	9/16
110H_ 3/8 X 1/8	3/8	1/8	0.86	21.8	0.34	8.6	11/16
110H_ 3/8 X 1/4	3/8	1/4	1.19	30.2	0.38	9.6	3/4
110H_ 1/2 X 1/8	1/2	1/8	1.08	27.4	0.34	8.6	7/8
110H_ 1/2 X 1/4	1/2	1/4	1.08	27.4	0.41	10.5	7/8
110H_ 1/2 X 3/8	1/2	3/8	1.41	35.8	0.47	11.9	7/8
110H_ 3/4 X 1/4	3/4	1/4	1.08	27.4	0.45	11.4	1 1/16
110H_ 3/4 X 3/8	3/4	3/8	1.08	27.4	0.56	14.2	1 1/16
110H_ 3/4 X 1/2	3/4	1/2	1.63	41.4	0.62	15.7	1 1/16
110H_ 1 X 1/4	1	1/4	1.37	34.8	0.41	10.5	1 3/8
110H_ 1 X 3/8	1	3/8	1.37	34.8	0.56	14.2	1 3/8
110H_ 1 X 1/2	1	1/2	1.37	34.8	0.69	17.4	1 3/8
110H_ 1 X 3/4	1	3/4	1.85	47.0	0.87	22.1	1 3/8
110H_ 1 1/4 X 1/2	1 1/4	1/2	1.46	37.1	0.69	17.4	1 3/4
110H_ 1 1/4 X 3/4	1 1/4	3/4	1.47	37.3	0.90	22.9	1 3/4
110H_ 1 1/4 X 1	1 1/4	1	1.94	49.3	1.09	27.8	1 3/4
110H_ 1 1/2 X 1/2	1 1/2	1/2	1.61	40.9	0.72	18.3	2 1/8
110H_ 1 1/2 X 3/4	1 1/2	3/4	1.61	40.9	0.90	22.9	2 1/8
110H_ 1 1/2 X 1	1 1/2	1	1.61	40.9	1.17	29.7	2 1/8
110H_ 1 1/2 X 1 1/4	1 1/2	1 1/4	2.31	58.7	1.50	38.1	2 1/8
110H_ 2 X 1/2	2	1/2	1.83	46.5	0.73	18.5	2 3/4
110H_ 2 X 3/4	2	3/4	1.83	46.5	0.94	23.9	2 3/4
110H_ 2 X 1	2	1	1.83	46.5	1.17	29.7	2 3/4
110H_ 2 X 1 1/4	2	1 1/4	1.83	46.5	1.50	38.1	2 3/4
110H_ 2 X 1 1/2	2	1 1/2	1.83	46.5	1.73	43.9	2 3/4

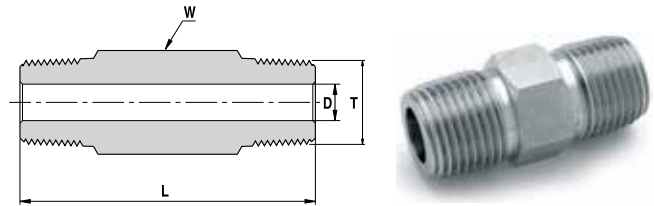
"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

110HOB REDUCING BUSHING SAE/MS STRAIGHT THREAD BOSS *



Ordering Information	T Straight Thread UN	T1 Straight Thread UN	D		L		F		W Hex. Flat inch	O-Ring**
			inch	mm	inch	mm	inch	mm		
110HOB _ 9/16-18 X 7/16-20	9/16-18	7/16-20	0.28	7.1	1.12	28.4	0.36	9.1	13/16	-906
110HOB _ 3/4-16 X 7/16-20	3/4-16	7/16-20	0.24	6.0	1.30	33.0	0.44	11.2	15/16	-908
110HOB _ 3/4-16 X 9/16-18	3/4-16	9/16-18	0.42	10.7	1.19	30.2	0.44	11.2	1	-908
110HOB _ 3/4-16 X 7/8-14	3/4-16	7/8-14	0.42	10.7	1.60	40.6	0.44	11.2	1 1/2	-908
110HOB _ 7/8-14 X 9/16-18	7/8-14	9/16-18	0.50	12.7	1.10	27.9	0.50	12.7	1	-910
110HOB _ 7/8-14 X 3/4-16	7/8-14	3/4-16	0.50	12.7	1.42	36.1	0.50	12.7	1 3/16	-910
110HOB _ 1 1/16-12 X 3/4-16	1 1/16-12	3/4-16	0.65	16.5	1.27	32.3	0.59	15.0	1 1/4	-912
110HOB _ 1 5/16-12 X 1 1/16-12	1 5/16-12	1 1/16-12	0.87	22.1	1.61	40.9	0.59	15.0	1 5/8	-916
110HOB _ 1 5/8-12 X 1 5/16-12	1 5/8-12	1 5/16-12	1.09	27.7	1.98	50.3	0.59	15.0	2 1/8	-920
110HOB _ 1 7/8-12 X 1 5/16-12	1 7/8-12	1 5/16-12	1.23	31.2	1.27	32.3	0.59	15.0	2 1/8	-924

113 H HEX LONG NIPPLE



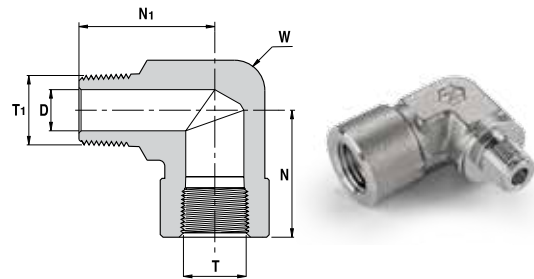
Ordering Information	T Male NPT Size	L Available Lengths (inch)						D Min. Opening		W Hex. Flat inch
		1.50	2.00	2.50	3.00	4.00	6.00	inch	mm	
113H _ 1/8 X 1.5 / 2 / 2.5 / 3	1/8	✓	✓	✓	✓	-	-	0.19	4.8	7/16
113H _ 1/4 X 1.5 / 2 / 2.5 / 3 / 4	1/4	✓	✓	✓	✓	✓	-	0.28	7.1	9/16
113H _ 3/8 X 1.5 / 2 / 2.5 / 3 / 4	3/8	✓	✓	✓	✓	✓	-	0.38	9.6	11/16
113H _ 1/2 X 2 / 3 / 4	1/2	-	✓	-	✓	✓	✓	0.47	11.9	7/8
113H _ 3/4 X 2 / 3 / 4	3/4	-	✓	-	✓	✓	-	0.62	15.8	1 1/16
113H _ 1 X 3 / 4	1	-	-	-	✓	✓	-	0.88	22.4	1 3/8

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

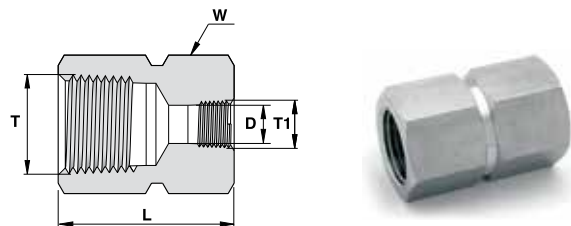
"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

116 H STREET ELBOW



Ordering Information	T Female NPT Size	T1 Male NPT Size	N		N1		D Min. Opening		W Wrench Flat
			inch	mm	inch	mm	inch	mm	inch
			116H _ 1/16 X 1/16	1/16	1/16	0.86	21.8	0.88	22.4
116H _ 1/8 X 1/16	1/8	1/16	1.04	26.4	0.87	22.1	0.12	3.10	5/8
116H _ 1/8 X 1/8	1/8	1/8	1.04	26.4	0.87	22.1	0.19	4.80	5/8
116H _ 1/4 X 1/8	1/4	1/8	1.17	29.7	1.00	25.4	0.19	4.80	11/16
116H _ 1/4 X 1/4	1/4	1/4	1.17	29.7	1.17	29.7	0.28	7.10	11/16
116H _ 3/8 X 1/4	3/8	1/4	1.42	36.1	1.26	32.0	0.28	7.10	15/16
116H _ 3/8 X 3/8	3/8	3/8	1.42	36.1	1.26	32.0	0.38	9.60	15/16
116H _ 1/2 X 1/4	1/2	1/4	1.56	39.6	1.38	35.1	0.28	7.10	1 1/8
116H _ 1/2 X 3/8	1/2	3/8	1.56	39.6	1.38	35.1	0.38	9.60	1 1/8
116H _ 1/2 X 1/2	1/2	1/2	1.56	39.6	1.56	39.6	0.47	11.9	1 1/8
116H _ 3/4 X 3/4	3/4	3/4	1.92	48.8	1.67	42.4	0.62	15.8	1 3/8
116H _ 1 X 1	1	1	1.83	46.5	1.94	49.3	0.86	21.8	1 11/16

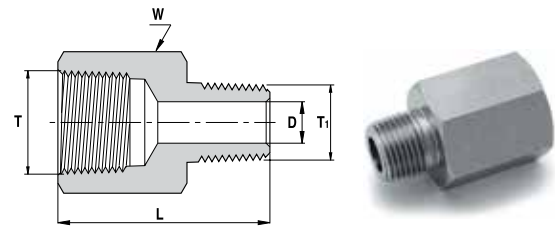
119 H HEX REDUCING COUPLING



Ordering Information	T Female NPT Size	T1 Female NPT Size	L		D Min. Opening		W Hex. Flat
			inch	mm	inch	mm	inch
			119H _ 1/4 X 1/8	1/4	1/8	1.22	31.0
119H _ 3/8 X 1/4	3/8	1/4	1.38	35.1	0.41	10.5	7/8
119H _ 1/2 X 1/8	1/2	1/8	1.56	39.6	0.31	7.8	1 1/16
119H _ 1/2 X 1/4	1/2	1/4	1.75	44.5	0.41	10.5	1 1/16
119H _ 1/2 X 3/8	1/2	3/8	1.78	45.2	0.56	14.2	1 1/16
119H _ 3/4 X 1/4	3/4	1/4	1.81	46.0	0.41	10.5	1 5/16
119H _ 3/4 X 1/2	3/4	1/2	2.06	52.3	0.69	17.4	1 5/16
119H _ 1 X 1/2	1	1/2	2.19	55.6	0.69	17.4	1 5/8
119H _ 1 X 3/4	1	3/4	2.25	57.2	0.90	22.9	1 5/8

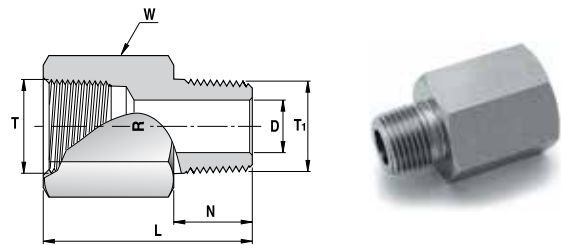
“D” Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

120 H ADAPTER NPT



Ordering Information	T Female NPT Size	T1 Male NPT Size	L		D Min. Opening		W Hex. Flat inch
			inch	mm	inch	mm	
120H _ 1/8 X 1/16	1/8	1/16	1.09	27.7	0.12	3.0	9/16
120H _ 1/8 X 1/8	1/8	1/8	1.10	27.9	0.19	4.8	9/16
120H _ 1/4 X 1/8	1/4	1/8	1.26	32.0	0.19	4.8	3/4
120H _ 1/4 X 1/4	1/4	1/4	1.40	35.6	0.28	7.1	3/4
120H _ 3/8 X 1/8	3/8	1/8	1.33	33.8	0.19	4.8	7/8
120H _ 3/8 X 1/4	3/8	1/4	1.50	38.1	0.28	7.1	7/8
120H _ 3/8 X 3/8	3/8	3/8	1.51	38.4	0.38	9.6	7/8
120H _ 1/2 X 1/8	1/2	1/8	1.58	40.1	0.19	4.8	1 1/16
120H _ 1/2 X 1/4	1/2	1/4	1.76	44.7	0.28	7.1	1 1/16
120H _ 1/2 X 3/8	1/2	3/8	1.75	44.5	0.37	9.5	1 1/16
120H _ 1/2 X 1/2	1/2	1/2	1.94	49.3	0.47	11.9	1 1/16
120H _ 3/4 X 1/4	3/4	1/4	1.85	47.0	0.28	7.1	1 5/16
120H _ 3/4 X 3/8	3/4	3/8	1.82	46.2	0.37	9.5	1 5/16
120H _ 3/4 X 1/2	3/4	1/2	2.02	51.3	0.47	11.9	1 5/16
120H _ 3/4 X 3/4	3/4	3/4	2.02	51.3	0.62	15.8	1 5/16
120H _ 1 X 1/4	1	1/4	1.96	49.8	0.28	7.1	1 5/8
120H _ 1 X 1/2	1	1/2	2.16	54.9	0.47	11.9	1 5/8
120H _ 1 X 3/4	1	3/4	2.17	55.1	0.62	15.7	1 5/8
120H _ 1 X 1	1	1	2.28	57.9	0.86	21.8	1 5/8

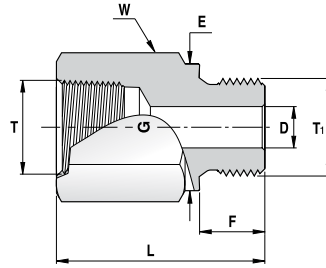
120 HNR ADAPTER NPT TO BSPT



Ordering Information	T Female NPT Size	T1 Male BSPT ISO 7/1, BS21 Size	L		N		D Min. Opening		W Hex. Flat inch
			inch	mm	inch	mm	inch	mm	
120HNR _ 1/8	1/8	1/8-28	1.09	27.7	0.38	9.7	0.19	4.8	9/16
120HNR _ 1/4	1/4	1/4-19	1.42	36.1	0.56	14.2	0.28	7.1	3/4
120HNR _ 3/8	3/8	3/8-19	1.50	38.1	0.56	14.2	0.38	9.6	7/8
120HNR _ 1/2	1/2	1/2-14	1.94	49.3	0.75	19.0	0.47	11.9	1 1/16
120HNR _ 3/4	3/4	3/4-14	2.02	51.3	0.75	19.0	0.62	15.8	1 5/16
120HNR _ 1	1	1-11	2.30	58.4	0.94	23.9	0.88	22.4	1 5/8

“D” Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

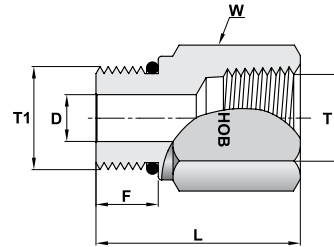
120 HNG ADAPTER NPT TO BSPP



Ordering Information	T	T1	L		F		E		D		W
	Female NPT Size	Male BSPP ISO 228/1, BS 2779	inch	mm	inch	mm	inch	mm	inch	mm	Hex. Flat inch
120HNG _ 1/8	1/8	1/8-28	0.99	25.1	0.28	7.1	0.54	13.8	0.16	4.1	9/16
120HNG _ 1/4	1/4	1/4-19	1.32	33.5	0.44	11.2	0.70	18.0	0.23	5.8	3/4
120HNG _ 3/8	3/8	3/8-19	1.41	35.8	0.44	11.2	0.85	21.8	0.31	7.9	7/8
120HNG _ 1/2	1/2	1/2-14	1.74	44.2	0.56	14.2	1.02	26.0	0.47	11.9	1 1/16
120HNG _ 3/4	3/4	3/4-14	1.89	48.0	0.62	15.7	1.26	32.0	0.62	15.7	1 5/16
120HNG _ 1	1	1-11	2.10	53.3	0.72	18.3	1.53	39.0	0.78	19.8	1 5/8

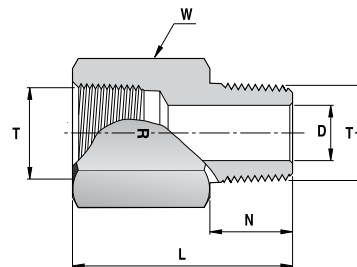
For Parallel Threads Sealing, see page 76

120HNOB ADAPTER NPT TO SAE/MS STRAIGHT THREAD BOSS *



Ordering Information	T	T1	D		L		F		W	O-Ring**
	Female NPT Size	Straight Thread UN	inch	mm	inch	mm	inch	mm	Hex. Flat inch	
120HNOB _ 1/4 X 7/16-20	1/4	7/16-20	0.20	5.1	1.32	33.5	0.36	9.1	3/4	-904
120HNOB _ 3/8 X 9/16-18	3/8	9/16-18	0.28	7.1	1.39	35.3	0.39	9.9	15/16	-906
120HNOB _ 1/2 X 3/4-16	1/2	3/4-16	0.42	10.7	1.76	44.7	0.44	11.2	1 1/16	-908
120HNOB _ 3/4 X 1 1/16-12	3/4	1 1/16-12	0.66	16.7	1.99	50.5	0.59	15.0	1 3/8	-912
120HNOB _ 1 X 1 5/16-12	1	1 5/16-12	0.88	22.3	2.12	53.8	0.59	15.0	1 5/8	-916

120 HRN ADAPTER BSPT TO NPT



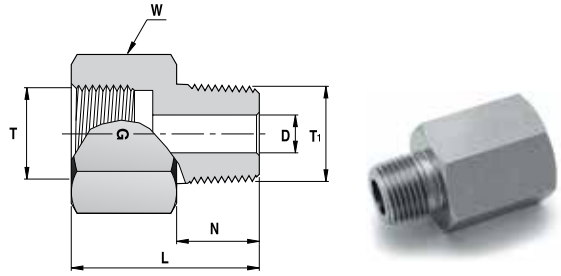
Ordering Information	T	T1	L		N		D		W
	Female BSPT ISO 7/1, BS21	Male NPT size	inch	mm	inch	mm	inch	mm	Hex. Flat inch
120HRN _ 1/4	1/4-19	1/4	1.43	36.3	0.56	14.2	0.28	7.1	3/4
120HRN _ 3/8	3/8-19	3/8	1.51	38.4	0.56	14.2	0.38	9.6	7/8
120HRN _ 1/2	1/2-14	1/2	1.96	49.8	0.75	19.1	0.47	11.9	1 1/16

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

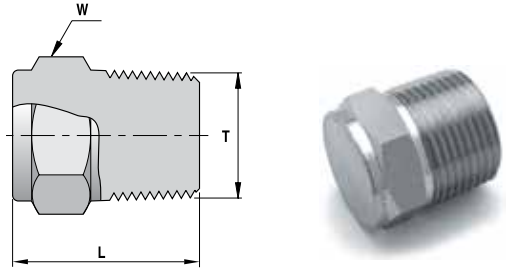
120 HGN GAUGE ADAPTER BSPP TO NPT



Ordering Information	T Female BSPP ISO 228/1, BS 2779 Size	T1 Male NPT Size	L		N		D Min. Opening		W Hex. Flat
			inch	mm	inch	mm	inch	mm	inch
120HGN _ 1/4	1/4-19	1/4	1.19	30.2	0.56	14.2	0.22	5.6	3/4
120HGN _ 3/8	3/8-19	3/8	1.27	32.3	0.56	14.2	0.26	6.6	15/16
120HGN _ 1/2	1/2-14	1/2	1.65	41.9	0.75	19.0	0.28	7.1	1 1/16

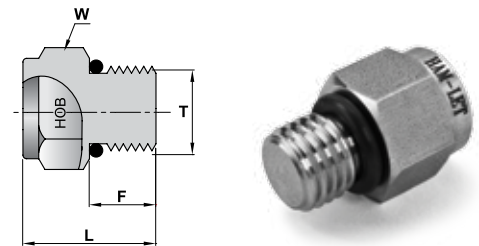
For Parallel Threads Sealing, see page 76

121 H PIPE PLUG NPT



Ordering Information	T Male NPT Size	L		W Hex. Flat
		inch	mm	inch
121H _ 1/16	1/16	0.75	19.0	5/16
121H _ 1/8	1/8	0.75	19.0	7/16
121H _ 1/4	1/4	0.96	24.4	9/16
121H _ 3/8	3/8	0.99	25.2	11/16
121H _ 1/2	1/2	1.21	30.7	7/8
121H _ 3/4	3/4	1.21	30.7	1 1/16
121H _ 1	1	1.50	38.1	1 3/8

121HOB HEX HEAD PLUG SAE/MS STRAIGHT THREAD BOSS*



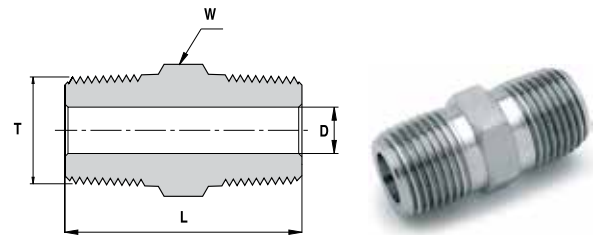
Ordering Information	T Straight Thread UN	L		F		W Hex. Flat	O-Ring**
		inch	mm	inch	mm	inch	
121HOB _ 5/16-24	5/16-24	0.70	17.8	0.30	7.6	7/16	-902
121HOB _ 7/16-20	7/16-20	0.76	19.3	0.36	9.1	9/16	-904
121HOB _ 9/16-18	9/16-18	0.82	20.8	0.39	9.9	11/16	-906
121HOB _ 3/4-16	3/4-16	0.89	22.6	0.44	11.2	7/8	-908
121HOB _ 1 1/16-12	1 1/16-12	1.12	28.4	0.59	15.0	1 1/4	-912
121HOB _ 1 5/16-12	1 5/16-12	1.18	30.0	0.59	15.0	1 1/2	-916

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

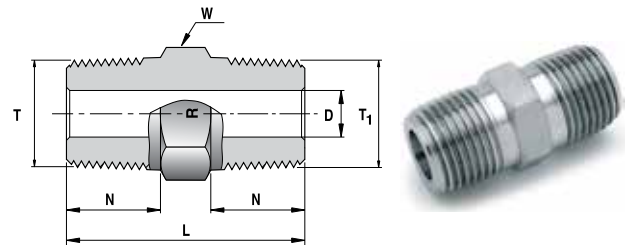
"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

**122 H
HEX NIPPLE**



Ordering Information	T Male NPT Size	L		D Min. Opening		W Hex. Flat inch
		inch	mm	inch	mm	
122H _ 1/16	1/16	1.01	25.7	0.12	3.0	5/16
122H _ 1/8	1/8	1.01	25.7	0.19	4.8	7/16
122H _ 1/4	1/4	1.40	35.6	0.28	7.1	9/16
122H _ 3/8	3/8	1.43	36.3	0.38	9.6	11/16
122H _ 1/2	1/2	1.84	46.7	0.47	11.9	7/8
122H _ 3/4	3/4	1.84	46.7	0.62	15.8	1 1/16
122H _ 1	1	2.32	58.9	0.87	22.1	1 3/8

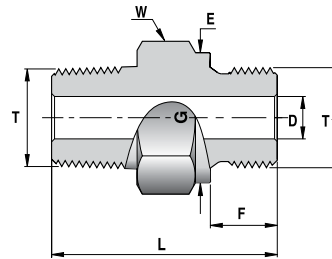
**122 HNR
HEX NIPPLE NPT TO BSPT**



Ordering Information	T Male NPT Size	T1 Male BSPT ISO 7/1, BS21 Size	L		N		D Min. Opening		W Hex. Flat inch
			inch	mm	inch	mm	inch	mm	
122HNR _ 1/8	1/8	1/8-28	1.01	25.6	0.38	9.7	0.19	4.8	7/16
122HNR _ 1/4	1/4	1/4-19	1.40	35.6	0.56	14.2	0.28	7.1	9/16
122HNR _ 3/8	3/8	3/8-19	1.43	36.3	0.56	14.2	0.38	9.6	11/16
122HNR _ 1/2	1/2	1/2-14	1.84	46.7	0.75	19.0	0.47	11.9	7/8
122HNR _ 3/4	3/4	3/4-14	1.84	46.7	0.75	19.0	0.62	15.8	1 1/16
122HNR _ 1	1	1-11	2.32	58.9	0.94	23.9	0.87	22.1	1 3/8

“D” Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

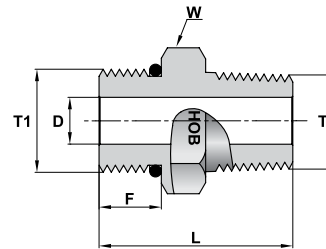
122 HNG HEX NIPPLE NPT TO BSPP



Ordering Information	T Male NPT Size	T1 Male BSPP ISO 228/1, BS 2779	L		F		E		D Min. Opening		W Hex. Flat inch
			inch	mm	inch	mm	inch	mm	inch	mm	
122HNG _ 1/8	1/8	1/8-28	1.07	27.2	0.28	7.1	0.54	13.8	0.16	4.1	9/16
122HNG _ 1/4	1/4	1/4-19	1.44	36.6	0.44	11.2	0.71	18.0	0.23	5.8	3/4
122HNG _ 3/8	3/8	3/8-19	1.47	37.3	0.44	11.2	0.85	21.8	0.31	7.9	7/8
122HNG _ 1/2	1/2	1/2-14	1.78	45.2	0.56	14.2	1.02	26.0	0.47	11.9	1 1/16
122HNG _ 3/4	3/4	3/4-14	1.95	49.5	0.62	15.7	1.26	32.0	0.62	15.8	1 5/16
122HNG _ 1	1	1-11	2.26	57.4	0.72	18.3	1.53	39.0	0.78	19.8	1 5/8

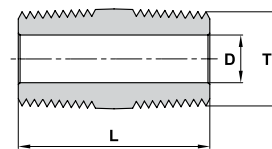
For Parallel Threads Sealing, see page 76

122HNOB HEX NIPPLE NPT TO SAE/MS STRAIGHT THREAD BOSS *



Ordering Information	T Male NPT Size	T1 Straight Thread UN	D		L		F		W Hex. Flat inch	O-Ring**
			inch	mm	inch	mm	inch	mm		
122HNOB _ 1/4 X 7/16-20	1/4	7/16-20	0.20	5.1	1.20	30.5	0.36	9.1	9/16	-904
122HNOB _ 3/8 X 9/16-18	3/8	9/16-18	0.28	7.1	1.26	32.0	0.39	9.9	11/16	-906
122HNOB _ 1/2 X 3/4-16	1/2	3/4-16	0.42	10.7	1.53	38.9	0.44	11.2	7/8	-908
122HNOB _ 3/4 X 1 1/16-12	3/4	1 1/16-12	0.62	15.7	1.75	44.4	0.59	15.0	1 1/4	-912
122HNOB _ 1 X 1 5/16-12	1	1 5/16-12	0.88	22.4	2.00	50.8	0.59	15.0	1 1/2	-916

122HCN CLOSE NIPPLE



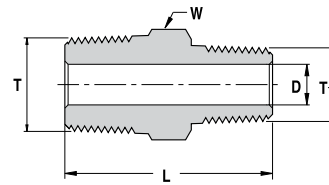
Ordering Information	T Male NPT Size	D		L	
		inch	mm	inch	mm
122HCN _ 1/8	1/8	0.19	4.8	0.75	19.1
122HCN _ 1/4	1/4	0.28	7.1	1.12	28.4
122HCN _ 3/8	3/8	0.38	9.6	1.12	28.4
122HCN _ 1/2	1/2	0.47	11.9	1.50	38.1
122HCN _ 3/4	3/4	0.62	15.7	1.50	38.1
122HCN _ 1	1	0.88	22.4	1.88	47.8

* Per SAE J1926 and MS 16142. See page 80 for mounting dimensions.

** O-rings used are Fluorocarbon FKM 90 Durometer. Other O-ring materials are available on request.

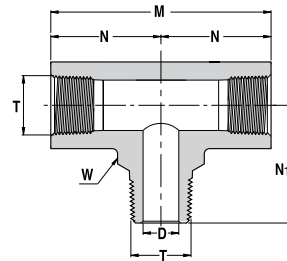
"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

123 H
REDUCING NIPPLE



Ordering Information	T Male NPT Size	T1 Male NPT Size	L		D Min. Opening		W Hex. Flat inch
			inch	mm	inch	mm	
123H _ 1/8 X 1/16	1/8	1/16	1.01	25.7	0.12	3.0	7/16
123H _ 1/4 X 1/8	1/4	1/8	1.22	31.0	0.19	4.8	9/16
123H _ 3/8 X 1/8	3/8	1/8	1.25	31.8	0.19	4.8	11/16
123H _ 3/8 X 1/4	3/8	1/4	1.43	36.3	0.28	7.1	11/16
123H _ 1/2 X 1/8	1/2	1/8	1.47	37.3	0.19	4.8	7/8
123H _ 1/2 X 1/4	1/2	1/4	1.65	41.9	0.28	7.1	7/8
123H _ 1/2 X 3/8	1/2	3/8	1.65	41.9	0.38	9.6	7/8
123H _ 3/4 X 1/4	3/4	1/4	1.65	41.9	0.28	7.1	1 1/16
123H _ 3/4 X 1/2	3/4	1/2	1.84	46.7	0.47	11.9	1 1/16
123H _ 1 X 1/2	1	1/2	2.13	54.1	0.47	11.9	1 3/8
123H _ 1 X 3/4	1	3/4	2.13	54.1	0.62	15.8	1 3/8

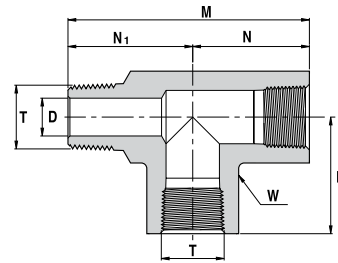
3600 H
BRANCH TEE



Ordering Information	T Male & Female NPT	M		N		N1		D		W Wrench Flat inch
		inch	mm	inch	mm	inch	mm	inch	mm	
3600H _ 1/8	1/8	2.08	52.8	1.04	26.4	0.87	22.1	0.19	4.8	5/8
3600H _ 1/4	1/4	2.34	59.4	1.17	29.7	1.17	29.7	0.28	7.1	13/16
3600H _ 3/8	3/8	2.84	72.1	1.42	36.1	1.26	32.0	0.38	9.6	15/16
3600H _ 1/2	1/2	3.12	79.2	1.56	39.6	1.56	39.6	0.47	11.9	1 1/8

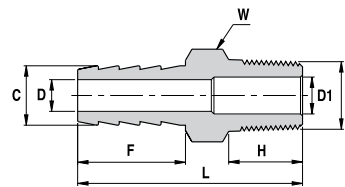
“D” Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

3750 H STREET TEE



Ordering Information	T Male & Female NPT	M		N		N1		D Min. Opening		W Wrench Flat
		inch	mm	inch	mm	inch	mm	inch	mm	inch
3750H _ 1/8	1/8	1.91	48.5	1.04	26.4	0.87	22.1	0.19	4.8	5/8
3750H _ 1/4	1/4	2.34	59.4	1.17	29.7	1.17	29.7	0.28	7.1	13/16
3750H _ 3/8	3/8	2.68	68.1	1.42	36.1	1.26	32.0	0.38	9.6	15/16
3750H _ 1/2	1/2	3.12	79.2	1.56	39.6	1.56	39.6	0.47	11.9	1 1/8

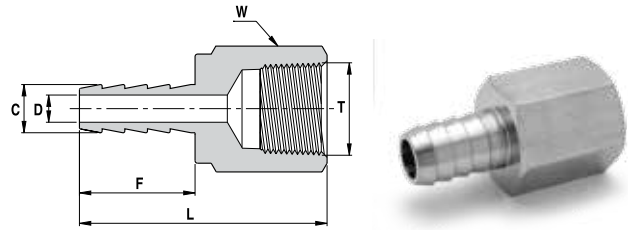
130 HM MALE TO HOSE CONNECTOR



Ordering Information	Hose I.D.	T Male NPT Size	C		D		D1		F		H		L		W Hex. Flat
			inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
130HM _ 1/8 X 1/8	1/8	1/8	0.15	3.80	0.08	2.0	0.19	4.80	0.40	10.2	0.38	9.70	1.08	27.4	7/16
130HM _ 1/8 X 1/4	1/8	1/4	0.15	3.80	0.08	2.0	0.28	7.10	0.40	10.2	0.56	14.2	1.26	32.0	9/16
130HM _ 3/16 X 1/8	3/16	1/8	0.23	5.84	0.12	3.0	0.12	3.00	0.59	15.0	0.38	9.70	1.27	32.3	7/16
130HM _ 3/16 X 1/4	3/16	1/4	0.23	5.84	0.12	3.0	0.28	7.10	0.59	15.0	0.56	14.2	1.45	36.8	9/16
130HM _ 1/4 X 1/8	1/4	1/8	0.30	7.62	0.19	4.8	0.19	4.80	0.79	20.1	0.38	9.70	1.47	37.3	7/16
130HM _ 1/4 X 1/4	1/4	1/4	0.30	7.62	0.19	4.8	0.19	4.80	0.79	20.1	0.56	14.2	1.65	41.9	9/16
130HM _ 1/4 X 3/8	1/4	3/8	0.30	7.62	0.19	4.8	0.19	4.80	0.79	20.1	0.56	14.2	1.66	42.2	11/16
130HM _ 1/4 X 1/2	1/4	1/2	0.30	7.62	0.19	4.8	0.47	11.9	0.79	20.1	0.75	19.0	1.85	47.0	7/8
130HM _ 5/16 X 1/8	5/16	1/8	0.38	9.65	0.19	4.8	0.19	4.80	0.87	22.1	0.38	9.70	1.55	39.4	7/16
130HM _ 5/16 X 1/4	5/16	1/4	0.38	9.65	0.19	4.8	0.19	4.80	0.87	22.1	0.56	14.2	1.73	43.9	9/16
130HM _ 5/16 X 3/8	5/16	3/8	0.38	9.65	0.19	4.8	0.37	9.50	0.87	22.1	0.56	14.2	1.74	44.2	11/16
130HM _ 5/16 X 1/2	5/16	1/2	0.38	9.65	0.19	4.8	0.47	11.9	0.87	22.1	0.75	19.0	1.96	49.8	7/8
130HM _ 3/8 X 1/4	3/8	1/4	0.45	11.43	0.30	7.6	0.30	7.60	0.87	22.1	0.56	14.2	1.73	43.9	9/16
130HM _ 3/8 X 3/8	3/8	3/8	0.45	11.43	0.30	7.6	0.30	7.60	0.87	22.1	0.56	14.2	1.74	44.2	11/16
130HM _ 3/8 X 1/2	3/8	1/2	0.45	11.43	0.30	7.6	0.30	7.60	0.87	22.1	0.75	19.0	1.96	49.8	7/8
130HM _ 1/2 X 1/4	1/2	1/4	0.60	15.24	0.37	9.5	0.28	7.10	0.94	23.8	0.56	14.2	1.80	45.7	11/16
130HM _ 1/2 X 3/8	1/2	3/8	0.60	15.24	0.37	9.5	0.37	9.50	0.94	23.8	0.56	14.2	1.81	46.0	11/16
130HM _ 1/2 X 1/2	1/2	1/2	0.60	15.24	0.37	9.5	0.37	9.50	0.94	23.8	0.75	19.0	2.03	51.6	7/8
130HM _ 5/8 X 1/2	5/8	1/2	0.75	19.10	0.47	11.9	0.47	11.9	0.98	24.9	0.75	19.0	2.07	52.6	1 1/16
130HM _ 5/8 X 3/4	5/8	3/4	0.75	19.10	0.50	12.7	0.63	16.0	0.98	24.9	0.75	19.0	2.07	52.6	1 1/16
130HM _ 3/4 X 1/2	3/4	1/2	0.90	22.86	0.63	16.0	0.47	11.9	1.05	26.7	0.75	19.0	2.14	54.4	1 1/16
130HM _ 3/4 X 3/4	3/4	3/4	0.90	22.86	0.63	16.0	0.63	16.0	1.05	26.7	0.75	19.0	2.14	54.4	1 1/16
130HM _ 3/4 X 1	3/4	1	0.90	22.86	0.63	16.0	0.88	22.4	1.05	26.7	0.94	23.9	2.43	61.7	1 3/8
130HM _ 1 X 3/4	1	3/4	1.2	30.48	0.88	22.4	0.63	16.0	1.19	30.2	0.75	19.0	2.38	60.5	1 3/8
130HM _ 1 X 1	1	1	1.2	30.48	0.88	22.4	0.88	22.4	1.19	30.2	0.94	23.9	2.57	65.3	1 3/8

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

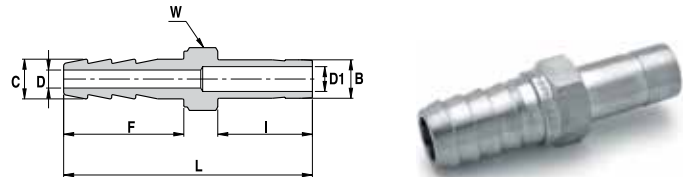
**130 HF
FEMALE HOSE
CONNECTOR**



Ordering Information	Hose I.D.	T NPT Size	C		D		F		L		W Hex. Flat
			inch	mm	inch	mm	inch	mm	inch	mm	
130HF _ 1/8 X 1/8	1/8	1/8	0.15	3.80	0.08	2.00	0.40	10.2	1.11	28.2	9/16
130HF _ 1/8 X 1/4	1/8	1/4	0.15	3.80	0.08	2.00	0.40	10.2	1.26	32.0	3/4
130HF _ 3/16 X 1/8	3/16	1/8	0.23	5.84	0.12	3.00	0.59	15.0	1.29	32.8	9/16
130HF _ 3/16 X 1/4	3/16	1/4	0.23	5.84	0.12	3.00	0.59	15.0	1.44	36.6	3/4
130HF _ 1/4 X 1/8	1/4	1/8	0.30	7.62	0.19	4.80	0.79	20.1	1.47	37.3	9/16
130HF _ 1/4 X 1/4	1/4	1/4	0.30	7.62	0.19	4.80	0.79	20.1	1.64	41.7	3/4
130HF _ 1/4 X 3/8	1/4	3/8	0.30	7.62	0.19	4.80	0.79	20.1	1.71	43.4	7/8
130HF _ 5/16 X 1/4	5/16	1/4	0.38	9.65	0.19	4.80	0.87	22.1	1.73	43.9	3/4
130HF _ 5/16 X 3/8	5/16	3/8	0.38	9.65	0.19	4.80	0.87	22.1	1.82	46.2	7/8
130HF _ 3/8 X 1/4	3/8	1/4	0.45	11.43	0.30	7.60	0.87	22.1	1.69	42.9	3/4
130HF _ 3/8 X 3/8	3/8	3/8	0.45	11.43	0.30	7.60	0.87	22.1	1.78	45.2	7/8
130HF _ 3/8 X 1/2	3/8	1/2	0.45	11.43	0.30	7.60	0.87	22.1	2.03	51.6	1 1/16
130HF _ 1/2 X 1/2	1/2	1/2	0.60	15.24	0.38	9.70	0.94	23.9	2.13	54.1	1 1/16

“D” Dimension is minimum opening.

**130 LT
TUBE TO
HOSE CONNECTOR**



Ordering Information	Hose I.D.	B Tube Size	C		D		D1		F		I		L		W Hex. Flat
			inch	mm	inch	mm	inch	mm	inch	mm	inch	mm			
130LT _ 1/8 X 1/8	1/8	1/8	0.15	3.80	0.08	2.00	0.08	2.00	0.40	10.2	0.53	13.5	1.35	34.3	5/16
130LT _ 1/8 X 1/4	1/8	1/4	0.15	3.80	0.08	2.00	0.17	4.20	0.40	10.2	0.62	15.7	1.44	36.6	3/8
130LT _ 1/4 X 1/4	1/4	1/4	0.30	7.62	0.19	4.80	0.17	4.20	0.79	20.1	0.62	15.7	1.83	46.5	7/16
130LT _ 1/4 X 3/8	1/4	3/8	0.30	7.62	0.19	4.80	0.27	6.85	0.79	20.1	0.69	17.5	1.90	48.3	7/16
130LT _ 1/4 X 6 MM	1/4	6mm	0.30	7.62	0.19	4.80	0.16	4.00	0.79	20.1	0.62	15.7	1.86	47.2	7/16
130LT _ 5/16 X 1/4	5/16	1/4	0.37	9.40	0.19	4.80	0.17	4.20	0.87	22.1	0.62	15.7	1.91	48.5	7/16
130LT _ 3/8 X 3/8	3/8	3/8	0.45	11.43	0.30	7.60	0.27	6.85	0.87	22.1	0.69	17.5	1.98	50.3	9/16
130LT _ 3/8 X 1/2	3/8	1/2	0.45	11.43	0.30	7.60	0.37	9.40	0.87	22.1	0.91	23.1	2.20	55.9	5/8
130LT _ 1/2 X 3/8	1/2	3/8	0.60	15.24	0.38	9.70	0.27	6.85	0.94	23.9	0.69	17.5	2.05	52.1	11/16
130LT _ 1/2 X 1/2	1/2	1/2	0.60	15.24	0.38	9.70	0.37	9.40	0.94	23.9	0.91	23.1	2.27	57.7	11/16
130LT _ 3/4 X 3/4	3/4	3/4	0.90	22.86	0.63	16.0	0.59	15.0	1.05	26.7	0.97	24.6	2.44	62.0	1 1/16

Dimensions are for reference only, and are subject to change without notice.

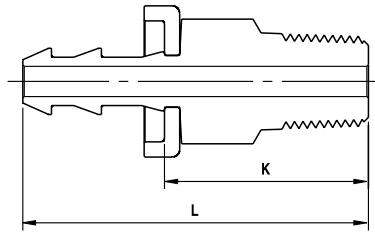


HAM-LET HOSE CONNECTORS

HOSE-END™

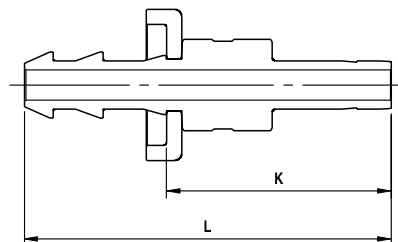


130 HMPO MALE PIPE THREADS



Ordering Information	Hose I.D.	T Male NPT Size	K		L	
			inch	mm	inch	mm
130HMPO _ 1/4 X 1/4	1/4	1/4	0.95	24.00	1.68	42.70
130HMPO _ 3/8 X 1/4	3/8	1/4	0.95	24.00	1.80	45.70
130HMPO _ 3/8 X 3/8	3/8	3/8	0.95	24.00	1.80	45.70
130HMPO _ 1/2 X 1/2	1/2	1/2	1.17	29.70	2.19	55.60
130HMPO _ 3/4 X 3/4	3/4	3/4	1.17	29.70	2.81	71.40

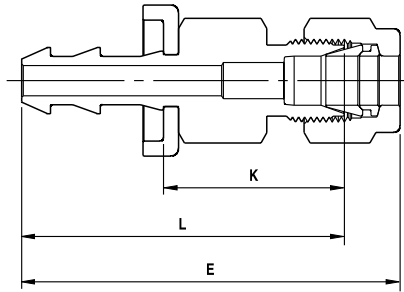
131 PO TUBE ADAPTERS



INCH						
Ordering Information	Hose I.D.	B Tube Size	L		K	
			inch	mm	inch	mm
131PO _ 1/4 X 1/4	1/4	1/4	1.91	48.50	1.17	29.70
131PO _ 3/8 X 3/8	3/8	3/8	2.02	51.30	1.17	29.70
131PO _ 1/2 X 1/2	1/2	1/2	2.47	62.70	1.45	36.80
131PO _ 3/4 X 3/4	3/4	3/4	3.14	79.80	1.50	38.05

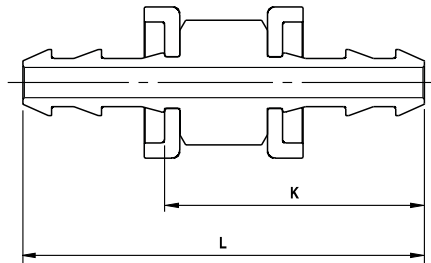
METRIC						
Ordering Information	Hose I.D.	B Tube Size	L		K	
			mm		mm	
131PO _ 1/4 X 6mm	1/4	6mm	48.50		29.70	
131PO _ 3/8 X 10mm	3/8	10mm	51.60		30.10	

**130 LHPO
LET-LOK® TUBE FITTINGS**



Ordering Information	A Tube O.D.	Hose I.D.	E		K		L	
			inch	mm	inch	mm	inch	mm
130LHPO _ 1/4 X 1/4	1/4	1/4	1.97	50.00	0.95	24.00	1.68	42.65
130LHPO _ 3/8 X 3/8	3/8	3/8	2.11	53.60	0.97	24.60	1.82	46.25
130LHPO _ 1/2 X 1/2	1/2	1/2	2.47	62.70	1.05	26.70	2.07	52.55

**132 PO
UNIONS**



Ordering Information	Hose I.D.	Hose I.D.	L		K	
			inch	mm	inch	mm
132PO _ 1/4 X 1/4	1/4	1/4	2.07	52.60	1.33	33.90
132PO _ 3/8 X 3/8	3/8	3/8	2.25	57.20	1.40	35.50
132PO _ 1/2 X 1/2	1/2	1/2	2.61	66.30	1.59	40.40
132PO _ 3/4 X 3/4	3/4	3/4	3.83	97.30	2.18	55.60

ASSEMBLY INSTRUCTIONS

- Cut a square edge with a hose cutter.
- Push **HOSE-END™** into end connection.
- Continue pushing until **HOSE-END™** reaches plastic cap.

Diagram illustrating the assembly process: 1. A hose is cut with a square edge. 2. The HOSE-END™ fitting is pushed into the hose. 3. The fitting is pushed further until it reaches the plastic cap.

DISASSEMBLY INSTRUCTIONS

- Slit **HOSE-END™** as described.
- Bend and pull hose out from **HOSE-END™** connector.

Diagram illustrating the disassembly process: 1. A utility knife is used to slit the HOSE-END™ fitting. 2. The hose is bent and pulled out from the connector.



3-PIECE TUBE ASSEMBLY **SAE37°FLARE**



STAINLESS STEEL
HIGH PRESSURE 37°
TUBE FITTINGS
1/8" TO 2"



MEETS SAE STANDARD J514

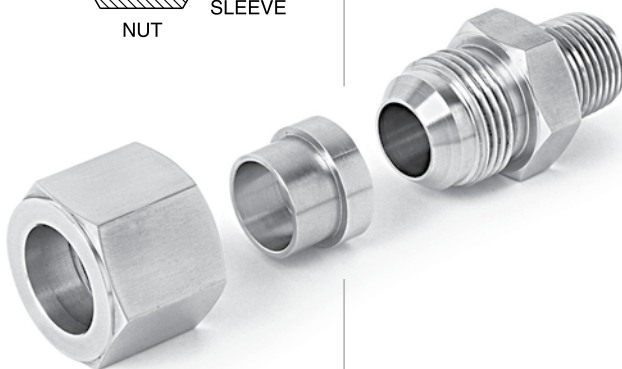
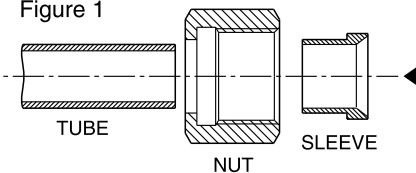
If necessary, see SAE Standard J514 for a complete list of dimensions. NPT Tapered Pipe Threads meet the requirements of ASME/ANSI B.1.20.1.

All 37° Flared Tube Fittings 3-Piece Tube Assembly can be used with a metric tube by using a metric 37° sleeve, instead of an inch sleeve. Each dimension table shows which metric sleeve should be used for every size.

ASSEMBLY INSTRUCTIONS

1. Cut the tube to the proper length.
2. Slide the nut and sleeve onto the tube. (see Fig.1).
3. With a special flaring tool, form the flare to 37° dimension according to SAE STD. J533. (see Fig.2 page 125).
4. Screw the nut onto the body until finger tight.
5. From this position, tighten the nut with a wrench 1/4" turn in order to make a leakproof metal-to-metal connection.

Figure 1



TUBING DATA FOR 37° FLARE THREE-PIECE TUBE ASSEMBLY

In order to ensure maximum fitting reliability and performance, please take great care when selecting the tube for each application. Tubing should be fully annealed, seamless and drawn, suitable for bending and flaring, according to standard ASTM-269, A.I.S.I. 316 or 304.

QUALITY

Lengths of finished tubing should be reasonably straight and have smooth ends, free from burrs. Tubing should be free from scale and injurious defects, and it should have a workmanlike finish. Surface imperfections such as handling marks, die marks, or shallow pits will not be considered injurious defects provided the imperfections are within the tolerances specified for diameter and wall thickness. The removal of such imperfections is not required. (Quality SAE J524).

TUBE HANDLING

Scratches on the tube might cause leaks. It is, therefore, important to handle the tube carefully to reduce the risk of leaks.

1. Tubes must not be dragged on the floor.
2. Tubes must not be dragged out of a tubing rack, especially in cases of large OD tubes.

TUBE CUTTING

Two different methods can be used to cut tubes:

1. Tube cutter
2. Hacksaw

Tube Cutter

To attain a leakfree connection, the tubing must be cut squarely. A good quality tube cutter with an appropriate blade for tubing material is recommended.

Do not try to reduce the time of cutting by taking deep cuts with each turn of the cutter.

The end of the tube must be deburred to avoid damage to the fitting and to ensure that the tube reaches the bottom of the fitting.

Hacksaw cutting

In order to cut the tube with a hacksaw and to attain square ends, the tube must be cut with guide blocks. This method of cutting requires deburring of the tube ends.

WARNING

Do not hold the tube in a vise in the place where it will be inserted into the fitting. The vise will leave a mark on the tube that may cause leaks and might cause ovality.

ASSEMBLY INSTRUCTIONS

Perform flaring according to SAE J533. See Fig. 2.
See Table 1 below for dimensions.

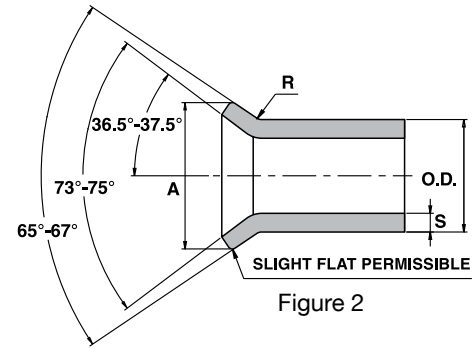


Figure 2

TABLE 1: FLARING

Nominal Tube O.D.	A Single Flare Diameter				R		S		DEBURRING PRIOR TO FLARING
	inch		mm		inch	mm	inch	mm	
	Max	Min	Max	Min	±0.02	±0.5	Max	Min	
1/8	0.20	0.18	5.08	4.58	0.03	0.8	0.035	0.88	To ensure satisfactory flare production, tube end deburring might be required prior to flaring. It is usually necessary to break the inside corner smoothly before single flaring. In addition, some non-ferrous tubing is normally required to eliminate the cutoff burr, which might otherwise create leakage paths across a substantial portion of the flare. Smoothly breaking the outside corner prior to single flaring, or both the outside and inside corners prior to double flaring, is acceptable for any tube material to minimize splitting.
3/16	0.28	0.26	7.11	6.61	0.03	0.8	0.035	0.88	
1/4	0.36	0.34	9.14	8.64	0.03	0.8	0.065	1.65	
5/16	0.43	0.40	10.92	10.16	0.03	0.8	0.065	1.65	
3/8	0.49	0.46	12.44	11.69	0.04	1.0	0.065	1.65	
1/2	0.66	0.63	16.76	16.01	0.06	1.5	0.083	2.1	
5/8	0.79	0.76	20.06	19.31	0.06	1.5	0.095	2.41	
3/4	0.95	0.92	24.13	23.37	0.08	2.0	0.109	2.76	
7/8	1.07	1.04	27.17	26.42	0.08	2.0	0.109	2.76	
1	1.20	1.17	30.48	29.72	0.09	2.3	0.12	3.04	
1 1/8	1.38	1.35	35.05	34.29	0.09	2.3	0.12	3.04	
1 1/4	1.51	1.48	38.35	37.60	0.09	2.3	0.12	3.04	
1 1/2	1.73	1.70	43.94	43.18	0.11	2.8	0.12	3.04	

Dimensions are for reference only, and subject to change without notice.

TABLE 2: ALLOWABLE WORKING PRESSURE RATINGS
(CAPABLE OF 4" TO 1" MIN. BURST)

Nom. SAE Dash Size	Nom. Tube O.D. Inches	37° Flare Straight Thread	Nom. Pipe Size	SAE St.Threads Union and Bulkhead	Fittings with Pipe Threads	NOTE:
2	1/8	5/16" - 24	1/8"	5000	5000	As many factors influence the pressure at which a system will or will not perform satisfactorily, values shown in Table 2 should not be construed as guaranteed minimum.
3	3/16	3/8" - 24	1/8"	5000	5000	
4	1/4	7/16" - 20	1/8"	5000	5000	
5	5/16	1/2" - 20	1/8"	5000	5000	
6	3/8	9/16" - 18	1/4"	5000	5000	
8	1/2	3/4" - 16	3/8"	4500	4000	
10	5/8	7/8" - 14	1/2"	3500	3000	
12	3/4	1 1/16" - 12	3/4"	3500	3000	
14	7/8	1 3/16" - 12	3/4"	3000	2500	
16	1	1 5/16" - 12	1"	3000	2000	
20	1 1/4	1 5/8" - 12	1 1/4"	2500	1150	
24	1 1/2	1 7/8" - 12	1 1/2"	2000	1000	
32	2	2 1/2" - 12	2"	1500	1000	

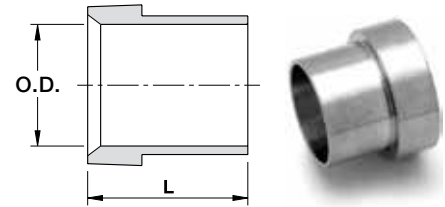
37° FLARE INDEX

SLEEVE _____ 127 For 3-piece tube assembly S.A.E. 070115 740HF 	FEMALE CONNECTOR _____ 132 S.A.E. 070103 746HF 	FEMALE RUN TEE _____ 139 S.A.E. 070426 771HFL 
NUT _____ 127 For 3-piece tube assembly S.A.E. 070110 741HF 	MALE CONNECTOR _____ 133 S.A.E. 070102 748HF 	FEMALE BRANCH TEE _____ 140 S.A.E. 070427 772HFL 
REDUCING ADAPTER _____ 128 S.A.E. 070123 741HFL 	MALE CONNECTOR _____ 134 S.A.E. 070120 748HOB 	BULKHEAD UNION _____ 141 S.A.E. 070601 774HFL 
UNION _____ 129 S.A.E. 070101 742HF 	MALE ELBOW _____ 135 S.A.E. 070202 749HF 	BULKHEAD LOCKNUT _____ 141 S.A.E. 070118 774HFLN 
LARGE HEX UNION _____ 129 S.A.E. 070119 742HFL 	FEMALE ELBOW _____ 136 S.A.E. 070203 750HF 	CROSS _____ 142 S.A.E. 070501 7102HFL 
UNION TEE _____ 130 S.A.E. 070401 744HF 	MALE RUN TEE _____ 137 S.A.E. 070424 751HF 	TUBE PLUG _____ 143 S.A.E. 070109 7639HF 
MALE BRANCH TEE _____ 131 S.A.E. 070425 745HF 	UNION ELBOW _____ 138 S.A.E. 070201 755HF 	CAP _____ 143 S.A.E. 070112 7640HF 

All 37° Flared Tube Fittings 3-Piece Tube Assembly can be used with a metric tube by using a metric 37° sleeve, instead of an inch sleeve. Each dimension table shows which metric sleeve should be used for every size.

740 HF
SLEEVE FOR 3-PIECE
TUBE ASSEMBLY

S.A.E. 070115



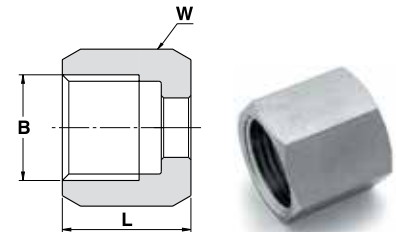
INCH SLEEVE			
Ordering Information	Tube O.D.		L
	inch	inch	mm
740HF SS 1/8"	1/8	0.34	8.6
740HF SS 3/16"	3/16	0.34	8.6
740HF SS 1/4"	1/4	0.41	10.4
740HF SS 5/16"	5/16	0.44	11.2
740HF SS 3/8"	3/8	0.50	12.7
740HF SS 1/2"	1/2	0.56	14.2
740HF SS 5/8"	5/8	0.66	16.8
740HF SS 3/4"	3/4	0.68	17.3
740HF SS 7/8"	7/8	0.76	19.3
740HF SS 1"	1	0.78	19.8
740HF SS 1 1/4"	1 1/4	0.91	23.1
740HF SS 1 1/2"	1 1/2	1.12	28.4
740HF SS 2"	2	1.19	30.2

METRIC SLEEVE		
Ordering Information	Tube O.D.	
	mm	mm
	-	-
	-	-
740HF SS 6MM	6	10.4
740HF SS 8MM	8	11.2
740HF SS 10MM	10	12.7
740HF SS 12MM	12	14.2
740HF SS 16MM	16	16.8
740HF SS 18MM	18	17.3
740HF SS 20MM	20	19.3
740HF SS 25MM	25	19.8
740HF SS 32MM	32	23.1
740HF SS 38MM	38	28.4

Metric sleeves are used with standard nuts & bodies.

741 HF
NUT FOR 3-PIECE
TUBE ASSEMBLY

S.A.E. 070110

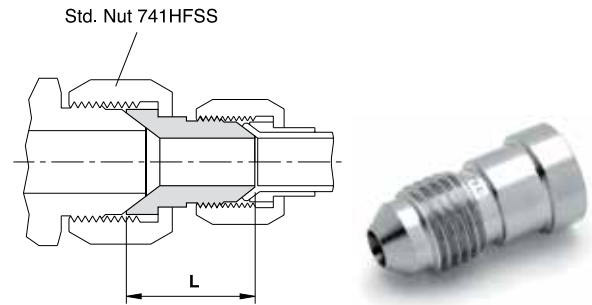


Ordering Information	Tube O.D.		B UN	W	L	
	inch	mm		Hex. Flat	inch	mm
				inch	inch	mm
741HF SS 1/8"	1/8	-	5/16 -24	3/8	0.54	13.7
741HF SS 3/16"	3/16	-	3/8 -24	7/16	0.60	15.2
741HF SS 1/4" / 6MM	1/4	6	7/16 -20	9/16	0.61	15.5
741HF SS 5/16" / 8MM	5/16	8	1/2 -20	5/8	0.67	17.0
741HF SS 3/8" / 10MM	3/8	10	9/16 -18	11/16	0.72	18.3
741HF SS 1/2" / 12MM	1/2	12	3/4 -16	7/8	0.84	21.3
741HF SS 5/8" / 16MM	5/8	16	7/8 -14	1	0.97	24.6
741HF SS 3/4" / 18MM	3/4	18	1 1/16 -12	1 1/4	1.02	25.9
741HF SS 7/8" / 20MM	7/8	20	1 3/16 -12	1 3/8	1.08	27.4
741HF SS 1" / 25MM	1	25	1 5/16 -12	1 1/2	1.12	28.4
741HF SS 1 1/4" / 32MM	1 1/4	32	1 5/8 -12	2	1.22	31.0
741HF SS 1 1/2" / 38MM	1 1/2	38	1 7/8 -12	2 1/4	1.41	35.8
741HF SS 2"	2	-	2 1/2 -12	2 7/8	1.74	44.2

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

741 HFL REDUCING ADAPTER

S.A.E. 070123



TUBE (INCH)

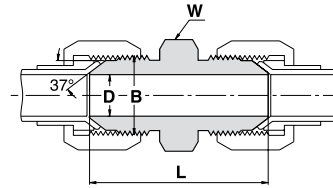
Ordering Information	Tube O.D.	B UN	L	
	inch		inch	mm
741HFL SS 3/8" X 1/4"	3/8 to 1/4	7/16 - 20	0.97	24.6
741HFL SS 1/2" X 1/4"	1/2 to 1/4	7/16 - 20	1.00	25.4
741HFL SS 1/2" X 3/8"	1/2 to 3/8	9/16 - 18	1.00	25.4
741HFL SS 5/8" X 1/4"	5/8 to 1/4	7/16 - 20	1.03	26.2
741HFL SS 5/8" X 3/8"	5/8 to 3/8	9/16 - 18	1.03	26.2
741HFL SS 3/4" X 1/4"	3/4 to 1/4	7/16 - 20	1.09	27.7
741HFL SS 3/4" X 3/8"	3/4 to 3/8	9/16 - 18	1.09	27.7
741HFL SS 3/4" X 1/2"	3/4 to 1/2	3/4 - 16	1.19	30.2
741HFL SS 3/4" X 5/8"	3/4 to 5/8	7/8 - 14	1.66	42.1
741HFL SS 7/8" X 3/8"	7/8 to 3/8	9/16 - 18	1.13	28.7
741HFL SS 7/8" X 5/8"	7/8 to 5/8	7/8 - 14	1.33	33.7
741HFL SS 7/8" X 3/4"	7/8 to 3/4	1 1/16 - 12	1.84	46.7
741HFL SS 1" X 3/4"	1 to 3/4	1 1/16 - 12	1.47	37.3
741HFL SS 1" X 7/8"	1 to 7/8	1 3/16 - 12	1.91	48.5
741HFL SS 1 1/4" X 3/4"	1 1/4 to 3/4	1 1/16 - 12	1.53	38.8
741HFL SS 1 1/4" X 1"	1 1/4 to 1	1 5/16 - 12	1.59	40.3
741HFL SS 1 1/2" X 1 1/4"	1 1/2 to 1 1/4	1 5/8 - 12	1.69	42.9

TUBE (MM)

Ordering Information	Tube O.D.	B UN	L	
	inch to mm		inch	mm
741HFL SS 3/8" X 6MM	3/8 to 6	7/16 - 20	0.97	24.6
741HFL SS 1/2" X 6MM	1/2 to 6	7/16 - 20	1.00	25.4
741HFL SS 1/2" X 10MM	1/2 to 10	9/16 - 18	1.00	25.4
741HFL SS 5/8" X 6MM	5/8 to 6	7/16 - 20	1.03	26.2
741HFL SS 5/8" X 10MM	5/8 to 10	9/16 - 18	1.03	26.2
741HFL SS 5/8" X 12MM	5/8 to 12	3/4 - 16	1.44	36.5
741HFL SS 3/4" X 6MM	3/4 to 6	7/16 - 20	1.09	27.7
741HFL SS 3/4" X 10MM	3/4 to 10	9/16 - 18	1.09	27.7
741HFL SS 3/4" X 12MM	3/4 to 12	3/4 - 16	1.19	30.2
741HFL SS 3/4" X 16MM	3/4 to 16	7/8 - 14	1.66	42.1
741HFL SS 7/8" X 10MM	7/8 to 10	9/16 - 18	1.13	28.7
741HFL SS 7/8" X 16MM	7/8 to 16	7/8 - 14	1.33	33.7
741HFL SS 7/8" X 18MM	7/8 to 18	1 1/16 - 12	1.84	46.7
741HFL SS 1" X 18MM	1 to 18	1 1/16 - 12	1.47	37.3
741HFL SS 1" X 20MM	1 to 20	1 3/16 - 12	1.91	48.5
741HFL SS 1 1/4" X 18MM	1 1/4 to 18	1 1/16 - 12	1.53	38.8
741HFL SS 1 1/4" X 25MM	1 1/4 to 25	1 5/16 - 12	1.59	40.3
741HFL SS 1 1/2" X 32MM	1 1/2 to 32	1 5/8 - 12	1.69	42.9

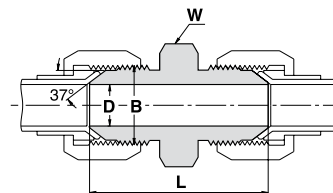
"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

742 HF
UNION
 S.A.E. 070101



Ordering Information	Tube O.D.		B UN	D		W Hex. Flat	L	
	inch	mm		inch	mm		inch	inch
742HF SS 1/8"	1/8	-	5/16 - 24	0.062	1.6	7/16	1.17	29.7
742HF SS 3/16"	3/16	-	3/8 - 24	0.125	3.2	7/16	1.23	31.2
742HF SS 1/4" / 6MM	1/4	6	7/16 - 20	0.172	4.4	1/2	1.37	34.8
742HF SS 5/16" / 8MM	5/16	8	1/2 - 20	0.234	6.0	9/16	1.37	34.8
742HF SS 3/8" / 10MM	3/8	10	9/16 - 18	0.297	7.5	5/8	1.41	35.8
742HF SS 1/2" / 12MM	1/2	12	3/4 - 16	0.391	9.9	13/16	1.62	41.1
742HF SS 5/8" / 16MM	5/8	16	7/8 - 14	0.484	12.3	15/16	1.88	47.8
742HF SS 3/4" / 18MM	3/4	18	1 1/16 - 12	0.609	15.5	1 1/8	2.16	54.9
742HF SS 7/8" / 20MM	7/8	20	1 3/16 - 12	0.719	18.3	1 1/4	2.21	56.1
742HF SS 1" / 25MM	1	25	1 5/16 - 12	0.844	21.5	1 3/8	2.25	57.2
742HF SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	1.078	27.5	1 11/16	2.43	61.7
742HF SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	1.312	33.0	2	2.75	69.8
742HF SS 2"	2	-	2 1/2 - 12	1.781	45.0	2 5/8	3.04	86.4

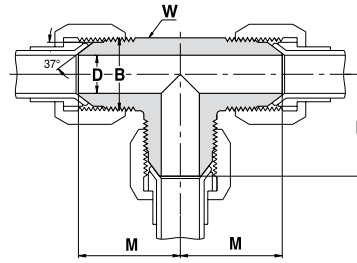
742 HFL
LARGE HEX UNION
 S.A.E. 070119



Ordering Information	Tube O.D.		B UN	D		W Hex. Flat	L	
	inch	mm		inch	mm		inch	inch
742HFL SS 1/8"	1/8	-	5/16 - 24	0.062	1.6	9/16	1.17	29.7
742HFL SS 3/16"	3/16	-	3/8 - 24	0.125	3.2	5/8	1.23	31.2
742HFL SS 1/4" / 6MM	1/4	6	7/16 - 20	0.172	4.4	11/16	1.37	34.8
742HFL SS 5/16" / 8MM	5/16	8	1/2 - 20	0.234	6.0	3/4	1.37	34.8
742HFL SS 3/8" / 10MM	3/8	10	9/16 - 18	0.297	7.5	13/16	1.41	35.8
742HFL SS 1/2" / 12MM	1/2	12	3/4 - 16	0.391	9.9	1	1.62	41.1
742HFL SS 5/8" / 16MM	5/8	16	7/8 - 14	0.484	12.3	1 1/8	1.88	47.8
742HFL SS 3/4" / 18MM	3/4	18	1 1/16 - 12	0.609	15.5	1 3/8	2.16	54.9
742HFL SS 7/8" / 20MM	7/8	20	1 3/16 - 12	0.719	18.3	1 1/2	2.21	56.1
742HFL SS 1" / 25MM	1	25	1 5/16 - 12	0.844	21.5	1 5/8	2.25	57.2
742HFL SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	1.078	27.5	1 7/8	2.43	61.7
742HFL SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	1.312	33.0	2 1/8	2.75	69.8
742HFL SS 2"	2	-	2 1/2 - 12	1.781	45.0	2 3/4	3.04	86.4

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

744 HF
UNION TEE
 S.A.E. 070401



Ordering Information	Tube O.D.		B UN	D		W Wrench Flat	M	
	inch	mm		inch	mm		inch	inch
744HF SS 1/8"	1/8	-	5/16 - 24	0.062	1.6	7/16	0.77	19.6
744HF SS 3/16"	3/16	-	3/8 - 24	0.125	3.2	1/2	0.83	21.1
744HF SS 1/4" / 6MM	1/4	6	7/16 - 20	0.172	4.4	1/2	0.89	22.6
744HF SS 5/16" / 8MM	5/16	8	1/2 - 20	0.234	6.0	5/8	0.95	24.1
744HF SS 3/8" / 10MM	3/8	10	9/16 - 18	0.297	7.5	5/8	1.06	26.9
744HF SS 1/2" / 12MM	1/2	12	3/4 - 16	0.391	9.9	15/16	1.25	31.8
744HF SS 5/8" / 16MM	5/8	16	7/8 - 14	0.484	12.3	15/16	1.45	36.8
744HF SS 3/4" / 18MM	3/4	18	1 1/16 - 12	0.609	15.5	1 3/8	1.66	42.2
744HF SS 7/8" / 20MM	7/8	20	1 3/16 - 12	0.719	18.3	1 3/8	1.80	45.7
744HF SS 1" / 25MM	1	25	1 5/16 - 12	0.844	21.5	1 3/8	1.81	46.0
744HF SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	1.078	27.5	2	2.06	52.3
744HF SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	1.312	33.0	*2	2.33	59.2
744HF SS 2"	2	-	2 1/2 - 12	1.781	45.0	*2 5/8	3.06	77.7

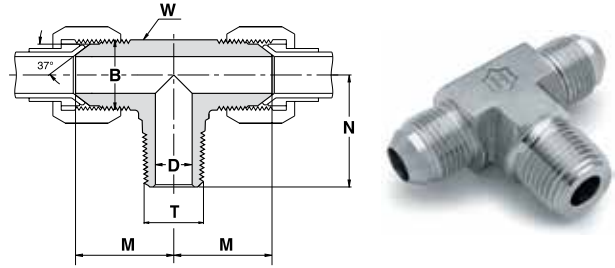
*Not from Forging

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

745 HF

MALE BRANCH TEE

S.A.E. 070425



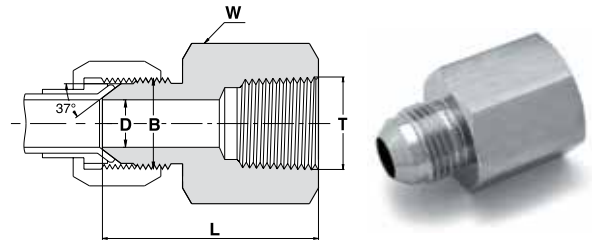
Ordering Information	Tube O.D.		B UN	T NPT	D		W Wrench Flat	M		N	
	inch	mm			inch	mm		inch	mm	inch	mm
745HF SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	7/16	0.77	19.6	0.72	18.3
745HF SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	1/2	0.83	21.1	0.72	18.3
745HF SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	1/2	0.89	22.6	0.78	19.8
745HF SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	5/8	1.06	26.9	1.09	27.7
745HF SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.190	4.8	5/8	0.95	24.1	0.78	19.8
745HF SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	5/8	1.06	26.9	1.09	27.7
745HF SS 3/8" / 10MM X 1/8"	3/8	10	9/16 - 18	1/8 - 27	0.190	4.8	5/8	1.06	26.9	0.90	22.8
745HF SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.280	7.1	5/8	1.06	26.9	1.09	27.7
745HF SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	13/16	1.14	29.0	1.22	31.0
745HF SS 3/8" / 10MM X 1/2"	3/8	10	9/16 - 18	1/2 - 14	0.297	7.5	15/16	1.23	31.2	1.47	37.3
745HF SS 1/2" / 12MM X 1/4"	1/2	12	3/4 - 16	1/4 - 18	0.280	7.1	15/16	1.25	31.8	1.22	31.0
745HF SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.380	9.5	15/16	1.25	31.8	1.22	31.0
745HF SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	15/16	1.33	33.7	1.47	37.3
745HF SS 1/2" / 12MM X 3/4"	1/2	12	3/4 - 16	3/4 - 14	0.391	9.9	1 1/8	1.42	36.0	1.59	40.4
745HF SS 5/8" / 16MM X 3/8"	5/8	16	7/8 - 14	3/8 - 18	0.380	9.5	15/16	1.45	36.8	1.30	33.0
745HF SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.470	11.9	15/16	1.45	36.8	1.47	37.3
745HF SS 5/8" / 16MM X 3/4"	5/8	16	7/8 - 14	3/4 - 14	0.484	12.3	1 1/8	1.53	38.9	1.59	40.4
745HF SS 3/4" / 18MM X 1/2"	3/4	18	1 1/16 - 12	1/2 - 14	0.470	11.9	1 1/8	1.66	41.0	1.59	40.4
745HF SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 1/8	1.66	41.0	1.59	40.4
745HF SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.73	43.9	1.69	42.9
745HF SS 1" / 25MM X 3/4"	1	25	1 5/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.81	46.0	1.78	45.2
745HF SS 1" / 25 MM X 1"	1	25	1 5/16 - 12	1-11.5	0.844	21.5	1 3/8	1.81	46.0	1.97	50.0
745HF SS 1 1/4" / 32 MM X 1"	1 1/4	32	1 5/8 - 12	1-11.5	0.844	21.5	*2	2.06	52.3	2.35	59.6
745HF SS 1 1/4" / 32 MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 -11.5	1.078	27.5	*2	2.06	52.3	2.38	60.5
745HF SS 1 1/2" / 38 MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 -11.5	1.312	33.0	*2	2.33	59.2	2.64	67.1
745HF SS 2" X 2"	2	-	1 7/8 - 12	2-11.5	1.781	45.0	*2 5/8	3.06	77.7	3.00	76.2

*Not from Forging

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

746 HF**FEMALE CONNECTOR**

S.A.E. 070103



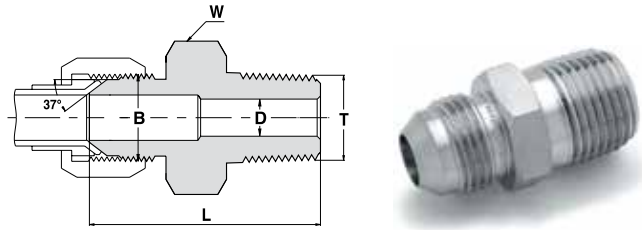
Ordering Information	Tube O.D.		B UN	T NPT	D		W Hex. Flat	L	
	inch	mm			inch	mm		inch	mm
746HF SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	9/16	1.12	28.4
746HF SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	9/16	1.13	28.7
746HF SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	9/16	1.19	30.2
746HF SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	3/4	1.39	35.3
746HF SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.234	6.0	9/16	1.17	29.7
746HF SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	3/4	1.39	35.3
746HF SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.297	7.5	3/4	1.40	35.6
746HF SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	7/8	1.46	37.1
746HF SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.391	9.9	7/8	1.56	39.6
746HF SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	1 1/8	1.79	45.6
746HF SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.484	12.3	1 1/8	1.89	48.0
746HF SS 3/4" / 18MM X 1/2"	3/4	18	1 1/16 - 12	1/2 - 14	0.609	15.5	1 1/8	2.05	52.1
746HF SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 3/8	2.06	52.3
746HF SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 3/8	2.06	52.3
746HF SS 1" / 25MM X 1"	1	25	1 5/16 - 12	1 - 11.5	0.844	21.5	1 5/8	2.35	59.7
746HF SS 1 1/4" / 32MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 - 11.5	1.078	27.5	2	2.49	63.2
746HF SS 1 1/2" / 38MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 - 11.5	1.312	33.0	2 3/8	2.62	66.5
746HF SS 2" X 2"	2	-	2 1/2 - 12	2 - 11.5	1.781	45.0	2 7/8	2.97	75.4

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

748 HF

MALE CONNECTOR

S.A.E. 070102

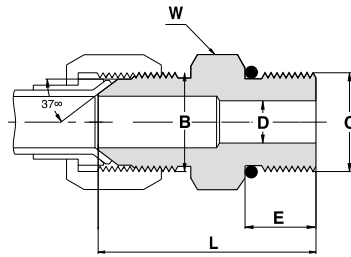


Ordering Information	Tube O.D.		B UN	T NPT	D		W Hex. Flat	L	
	inch	mm			inch	mm		inch	mm
748HF SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	7/16	1.11	28.2
748HF SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	7/16	1.14	29.0
748HF SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	1/2	1.22	31.0
748HF SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	9/16	1.42	36.0
748HF SS 1/4" / 6MM X 1/2"	1/4	6	7/16 - 20	1/2 - 14	0.172	4.4	7/8	1.61	41.0
748HF SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.190	4.8	9/16	1.22	31.0
748HF SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	9/16	1.42	36.1
748HF SS 3/8" / 10MM X 1/8"	3/8	10	9/16 - 18	1/8 - 27	0.190	4.8	5/8	1.25	31.8
748HF SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.280	7.1	5/8	1.43	36.3
748HF SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	3/4	1.43	36.3
748HF SS 3/8" / 10MM X 1/2"	3/8	10	9/16 - 18	1/2 - 14	0.297	7.5	7/8	1.69	42.5
748HF SS 1/2" / 12MM X 1/4"	1/2	12	3/4 - 16	1/4 - 18	0.280	7.1	13/16	1.53	38.9
748HF SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.380	9.5	13/16	1.53	38.9
748HF SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	7/8	1.79	45.4
748HF SS 1/2" / 12MM X 3/4"	1/2	12	3/4 - 16	3/4 - 14	0.391	9.9	1 1/8	1.85	47.0
748HF SS 5/8" / 16MM X 3/8"	5/8	16	7/8 - 14	3/8 - 18	0.380	9.5	15/16	1.70	43.1
748HF SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.484	11.9	15/16	1.89	48.0
748HF SS 5/8" / 16MM X 3/4"	5/8	16	7/8 - 14	3/4 - 14	0.470	12.3	1 1/8	1.95	49.5
748HF SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 1/8	2.06	52.3
748HF SS 3/4" / 18MM X 1"	3/4	18	1 1/16 - 12	1 - 11.5	0.609	15.5	1 3/8	2.25	57.1
748HF SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 1/4	2.09	53.1
748HF SS 1" / 25MM X 3/4"	1	25	1 5/16 - 12	3/4 - 14	0.719	18.3	1 3/8	2.11	53.5
748HF SS 1" / 25MM X 1"	1	25	1 5/16 - 12	1 - 11.5	0.844	21.5	1 3/8	2.30	58.4
748HF SS 1 1/4" / 32MM X 1"	1 1/4	32	1 5/8 - 12	1 - 11.5	0.844	21.5	1 3/4	2.42	61.5
748HF SS 1 1/4" / 32MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 - 11.5	1.078	27.5	1 3/4	2.45	62.2
748HF SS 1 1/2" / 38MM X 1 1/4"	1 1/2	38	1 7/8 - 12	1 1/4 - 11.5	1.312	33.0	2	2.68	68.1
748HF SS 1 1/2" / 38MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 - 11.5	1.312	33.0	2	2.68	68.1
748HF SS 2" X 2"	2	-	2 1/2 - 12	2 - 11.5	1.781	45.0	2 5/8	3.11	79.0

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

748 HOB**MALE CONNECTOR**

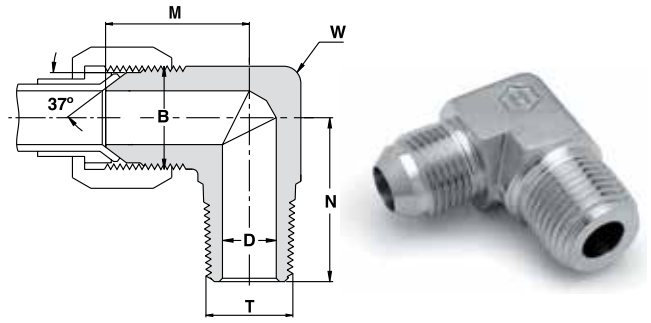
SAE straight thread boss connects flared tube ends to straight thread boss S.A.E. 070120



Ordering Information	Tube O.D.		B UN	C UN	D		W Hex. Flat	E		L		O-Ring STD. Dash No.
	inch	mm			inch	mm		inch	mm	inch	mm	
748HOB SS 1/8" X 5/16"-24	1/8	-	5/16 - 24	5/16 - 24	0.062	1.6	7/16	0.30	7.5	1.06	26.9	-902
748HOB SS 3/16" X 3/8"-24	3/16	-	3/8 - 24	3/8 - 24	0.125	3.2	1/2	0.30	7.5	1.10	27.9	-903
748HOB SS 1/4" / 6MM X 7/16"-20	1/4	6	7/16 - 20	7/16 - 20	0.172	4.4	9/16	0.36	9.1	1.23	31.2	-904
748HOB SS 1/4" / 6MM X 1/2"-20	1/4	6	7/16 - 20	1/2 - 20	0.172	4.4	5/8	0.36	9.1	1.23	31.2	-905
748HOB SS 1/4" / 6MM X 9/16"-18	1/4	6	7/16 - 20	9/16 - 18	0.172	4.4	11/16	0.39	9.9	1.30	33.0	-906
748HOB SS 1/4" / 6MM X 3/4"-16	1/4	6	7/16 - 20	3/4 - 16	0.172	4.4	7/8	0.44	11.1	1.37	34.8	-908
748HOB SS 5/16" / 8MM X 1/2"-20	5/16	8	1/2 - 20	1/2 - 20	0.234	6.0	5/8	0.36	9.1	1.23	31.2	-905
748HOB SS 3/8" / 10MM X 9/16"-18	3/8	10	9/16 - 18	9/16 - 18	0.280	7.1	11/16	0.39	9.9	1.30	33.0	-906
748HOB SS 3/8" / 10MM X 3/4"-16	3/8	10	9/16 - 18	3/4 - 16	0.297	7.5	7/8	0.44	11.1	1.38	35.1	-908
748HOB SS 3/8" / 10MM X 7/8"-14	3/8	10	9/16 - 18	7/8 - 14	0.297	7.5	1	0.50	12.7	1.50	38.1	-910
748HOB SS 1/2" / 12MM X 3/4"-16	1/2	12	3/4 - 16	3/4 - 16	0.391	9.9	7/8	0.44	11.1	1.48	37.6	-908
748HOB SS 1/2" / 12MM X 9/16"-18	1/2	12	3/4 - 16	9/16 - 18	0.280	7.1	13/16	0.39	9.9	1.44	36.6	-906
748HOB SS 1/2" / 12MM X 7/8"-14	1/2	12	3/4 - 16	7/8 - 14	0.391	9.9	1	0.50	12.7	1.60	40.6	-910
748HOB SS 1/2" / 12MM X 1 1/16"-12	1/2	12	3/4 - 16	1 1/16 - 12	0.391	9.9	1 1/4	0.59	15.1	1.76	44.7	-912
748HOB SS 5/8" / 16MM X 7/8"-14	5/8	16	7/8 - 14	7/8 - 14	0.484	12.3	1	0.50	12.7	1.70	43.2	-910
748HOB SS 5/8" / 16MM X 3/4"-16	5/8	16	7/8 - 14	3/4 - 16	0.484	12.3	15/16	0.44	11.1	1.60	40.6	-908
748HOB SS 5/8" / 16MM X 1 1/16"-12	5/8	16	7/8 - 14	1 1/16 - 12	0.484	12.3	1 1/4	0.59	15.1	1.86	47.2	-912
748HOB SS 3/4" / 18MM X 1 1/16"-12	3/4	18	1 1/16 - 12	1 1/16 - 12	0.609	15.5	1 1/4	0.59	15.1	1.97	50.0	-912
748HOB SS 3/4" / 18MM X 3/4"-16	3/4	18	1 1/16 - 12	3/4 - 16	0.420	10.7	1 1/8	0.44	11.1	1.78	45.2	-908
748HOB SS 3/4" / 18MM X 7/8"-14	3/4	18	1 1/16 - 12	7/8 - 14	0.50	12.7	1 1/8	0.50	12.7	1.83	46.4	-910
748HOB SS 3/4" / 18MM X 1 5/16"-12	3/4	18	1 1/16 - 12	1 5/16 - 12	0.609	15.5	1 1/2	0.59	15.1	2.00	50.8	-916
748HOB SS 7/8" / 20MM X 1 3/16"-12	7/8	20	1 3/16 - 12	1 3/16 - 12	0.719	18.3	1 3/8	0.59	15.1	1.99	50.5	-914
748HOB SS 7/8" / 20MM X 1 5/16"-12	7/8	20	1 3/16 - 12	1 5/16 - 12	0.719	18.3	1 1/2	0.59	15.1	2.02	51.3	-916
748HOB SS 1" / 25MM X 1 1/16"-12	1	25	1 5/16 - 12	1 1/16 - 12	0.650	16.7	1 3/8	0.59	15.1	2.01	51.1	-912
748HOB SS 1" / 25MM X 1 3/16"-12	1	25	1 5/16 - 12	1 3/16 - 12	0.719	18.3	1 3/8	0.59	15.1	2.04	51.8	-914
748HOB SS 1" / 25MM X 1 5/16"-12	1	25	1 5/16 - 12	1 5/16 - 12	0.844	21.5	1 1/2	0.59	15.1	2.04	51.8	-916

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

749 HF
MALE ELBOW
 S.A.E. 070202

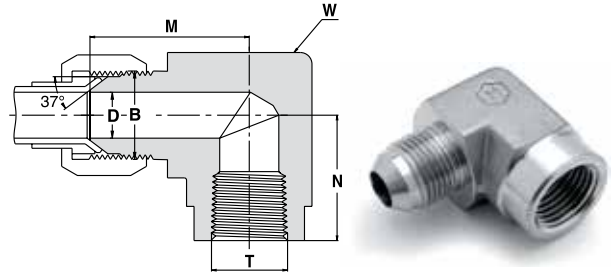


Ordering Information	Tube O.D.		B UN	T NPT	D		W Wrench Flat	M		N	
	inch	mm			inch	mm		inch	mm	inch	mm
749HF SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	7/16	0.77	19.6	0.72	18.3
749HF SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	1/2	0.83	21.1	0.72	18.3
749HF SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	1/2	0.89	22.6	0.78	19.8
749HF SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	5/8	1.06	26.9	1.09	27.7
749HF SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.190	4.8	5/8	0.95	24.1	0.78	19.8
749HF SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	5/8	1.06	26.9	1.09	27.7
749HF SS 3/8" / 10MM X 1/8"	3/8	10	9/16 - 18	1/8 - 27	0.190	4.8	5/8	1.06	26.9	0.90	22.8
749HF SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.280	7.1	5/8	1.06	26.9	1.09	27.7
749HF SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	13/16	1.14	29.0	1.22	31.0
749HF SS 3/8" / 10MM X 1/2"	3/8	10	9/16 - 18	1/2 - 14	0.297	7.5	15/16	1.23	31.2	1.47	37.3
749HF SS 1/2" / 12MM X 1/4"	1/2	12	3/4 - 16	1/4 - 18	0.280	7.1	15/16	1.25	31.8	1.22	31.0
749HF SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.380	9.5	15/16	1.25	31.8	1.22	31.0
749HF SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	15/16	1.33	33.7	1.47	37.3
749HF SS 1/2" / 12MM X 3/4"	1/2	12	3/4 - 16	3/4 - 14	0.391	9.9	1 1/8	1.42	36.0	1.59	40.4
749HF SS 5/8" / 16MM X 3/8"	5/8	16	7/8 - 14	3/8 - 18	0.380	9.5	15/16	1.45	36.8	1.30	33.0
749HF SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.470	11.9	15/16	1.45	36.8	1.47	37.3
749HF SS 5/8" / 16MM X 3/4"	5/8	16	7/8 - 14	3/4 - 14	0.484	12.3	1 1/8	1.53	38.9	1.59	40.4
749HF SS 3/4" / 18MM X 1/2"	3/4	18	1 1/16 - 12	1/2 - 14	0.470	11.9	1 1/8	1.66	41.0	1.59	40.4
749HF SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 1/8	1.66	41.0	1.59	40.4
749HF SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.73	43.9	1.69	42.9
749HF SS 1" / 25MM X 3/4"	1	25	1 5/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.81	46.0	1.78	45.2
749HF SS 1" / 25MM X 1"	1	25	1 5/16 - 12	1-11.5	0.844	21.5	1 3/8	1.81	46.0	1.97	50.0
749HF SS 1 1/4" / 32MM X 1"	1 1/4	32	1 5/8 - 12	1-11.5	0.844	21.5	2	2.06	52.3	2.35	59.6
749HF SS 1 1/4" / 32MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 - 11.5	1.078	27.5	2	2.06	52.3	2.38	60.5
749HF SS 1 1/2" / 38MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 - 11.5	1.312	33.0	*2	2.33	59.2	2.64	67.1
749HF SS 2" X 2"	2	-	2 1/2 - 12	2 - 11.5	1.781	45.0	*2 5/8	3.06	77.7	3.00	76.2

*Not from Forging

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750 HF
FEMALE ELBOW
 S.A.E. 070203

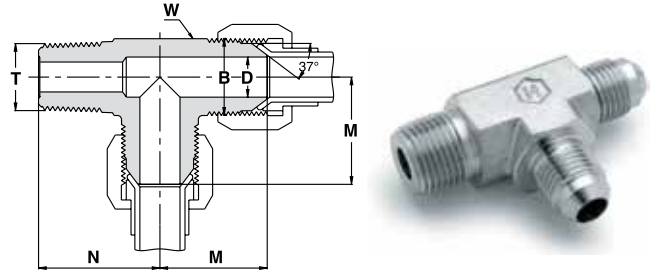


Ordering Information	Tube O.D.		B UN	T NPT	D		W Wrench Flat	M		N	
	inch	mm			inch	mm		inch	mm	inch	mm
750HF SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	5/8	1.00	25.4	0.66	16.8
750HF SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	5/8	1.03	26.2	0.66	16.8
750HF SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	5/8	1.08	27.4	0.66	16.8
750HF SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	13/16	1.22	30.9	0.88	22.4
750HF SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.234	6.0	5/8	1.08	27.4	0.66	16.8
750HF SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	13/16	1.22	30.9	0.88	22.4
750HF SS 3/8" / 10MM X 1/8"	3/8	10	9/16 - 18	1/8 - 27	0.297	7.5	5/8	1.06	26.9	0.66	16.8
750HF SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.297	7.5	13/16	1.23	31.2	0.88	22.4
750HF SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	15/16	1.31	33.2	1.02	25.9
750HF SS 1/2" / 12MM X 1/4"	1/2	12	3/4 - 16	1/4 - 18	0.391	9.9	13/16	1.25	31.6	0.88	22.4
750HF SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.391	9.9	15/16	1.42	36.1	1.02	25.9
750HF SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	1 1/8	1.42	36.1	1.23	31.2
750HF SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.484	12.3	1 1/8	1.64	41.5	1.23	31.2
750HF SS 3/4" / 18MM X 1/2"	3/4	18	1 1/16 - 12	1/2 - 14	0.609	15.5	1 3/8	1.66	42.1	1.23	31.2
750HF SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 3/8	1.89	48.0	1.36	34.5
750HF SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.86	47.2	1.42	36.1
750HF SS 1" / 25MM X 1"	1	25	1 5/16 - 12	1 - 11.5	0.844	21.5	1 5/8	2.17	55.1	1.62	41.1
750HF SS 1 1/4" / 32MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 - 11.5	1.078	27.5	*2 1/8	2.33	59.2	1.70	43.2
750HF SS 1 1/2" / 38MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 - 11.5	1.312	33.0	*2 3/8	2.89	73.4	2.08	52.8
750HF SS 2" X 2"	2	-	2 1/2 - 12	2 - 11.5	1.781	45.0	*2 7/8	3.30	83.8	2.39	60.7

*Not from Forging

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

751 HF
MALE RUN TEE
 S.A.E. 070424

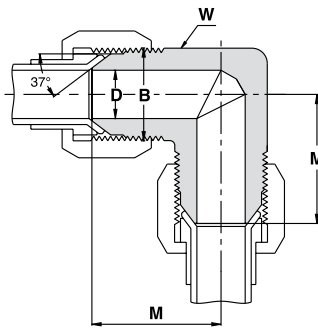


Ordering Information	Tube O.D.		B UN	T NPT	D		W Wrench Flat	M		N	
	inch	mm			inch	mm		inch	mm	inch	mm
751HF SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	7/16	0.77	19.6	0.72	18.3
751HF SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	1/2	0.83	21.1	0.72	18.3
751HF SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	1/2	0.89	22.6	0.78	19.8
751HF SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	5/8	1.06	26.9	1.09	27.7
751HF SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.190	4.8	5/8	0.95	24.1	0.78	19.8
751HF SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	5/8	1.06	26.9	1.09	27.7
751HF SS 3/8" / 10MM X 1/8"	3/8	10	9/16 - 18	1/8 - 27	0.190	4.8	5/8	1.06	26.9	0.90	22.8
751HF SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.280	7.1	5/8	1.06	26.9	1.09	27.7
751HF SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	13/16	1.14	29.0	1.22	31.0
751HF SS 3/8" / 10MM X 1/2"	3/8	10	9/16 - 18	1/2 - 14	0.297	7.5	15/16	1.23	31.2	1.47	37.3
751HF SS 1/2" / 12MM X 1/4"	1/2	12	3/4 - 16	1/4 - 18	0.280	7.1	15/16	1.25	31.8	1.22	31.0
751HF SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.380	9.5	15/16	1.25	31.8	1.22	31.0
751HF SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	15/16	1.33	33.7	1.47	37.3
751HF SS 1/2" / 12MM X 3/4"	1/2	12	3/4 - 16	3/4 - 14	0.391	9.9	1 1/8	1.42	36.0	1.59	40.4
751HF SS 5/8" / 16MM X 3/8"	5/8	16	7/8 - 14	3/8 - 18	0.380	9.5	15/16	1.45	36.8	1.30	33.0
751HF SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.470	11.9	15/16	1.45	36.8	1.47	37.3
751HF SS 5/8" / 16MM X 3/4"	5/8	16	7/8 - 14	3/4 - 14	0.484	12.3	1 1/8	1.53	38.9	1.59	40.4
751HF SS 3/4" / 18MM X 1/2"	3/4	18	1 1/16 - 12	1/2 - 14	0.470	11.9	1 1/8	1.66	41.0	1.59	40.4
751HF SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 1/8	1.66	41.0	1.59	40.4
751HF SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.73	43.9	1.69	42.9
751HF SS 1" / 25MM X 3/4"	1	25	1 5/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.81	46.0	1.78	45.2
751HF SS 1" / 25MM X 1"	1	25	1 5/16 - 12	1 - 11.5	0.844	21.5	1 3/8	1.81	46.0	1.97	50.0
751HF SS 1 1/4" / 32MM X 1"	1 1/4	32	1 5/8 - 12	1 - 11.5	0.844	21.5	*2	2.06	52.3	2.35	59.6
751HF SS 1 1/4" / 32MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 - 11.5	1.078	27.5	*2	2.06	52.3	2.38	60.5
751HF SS 1 1/2" / 38MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 - 11.5	1.312	33.0	*2	2.33	59.2	2.64	67.1
751HF SS 2" X 2"	2	-	2 1/2 - 12	2 - 11.5	1.781	45.0	*2 5/8	3.06	77.7	3.00	76.2

*Not from Forging

"D" Dimension is minimum opening. Dimensions are for reference only, and are subject to change without notice.

755 HF
UNION ELBOW
 S.A.E. 070201

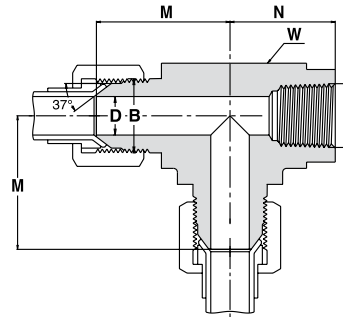


Ordering Information	Tube O.D.		B UN	D		W Wrench Flat	M	
	inch	mm		inch	mm		inch	inch
755HF SS 1/8"	1/8	-	5/16 - 24	0.062	1.6	7/16	0.77	19.6
755HF SS 3/16"	3/16	-	3/8 - 24	0.125	3.2	1/2	0.83	21.1
755HF SS 1/4" / 6MM	1/4	6	7/16 - 20	0.172	4.4	1/2	0.89	22.6
755HF SS 5/16" / 8MM	5/16	8	1/2 - 20	0.234	6.0	5/8	0.95	24.1
755HF SS 3/8" / 10MM	3/8	10	9/16 - 18	0.297	7.5	5/8	1.06	26.9
755HF SS 1/2" / 12MM	1/2	12	3/4 - 16	0.391	9.9	15/16	1.25	31.8
755HF SS 5/8" / 16MM	5/8	16	7/8 - 14	0.484	12.3	15/16	1.45	36.8
755HF SS 3/4" / 18MM	3/4	18	1 1/16 - 12	0.609	15.5	1 3/8	1.66	42.2
755HF SS 7/8" / 20MM	7/8	20	1 3/16 - 12	0.719	18.3	1 3/8	1.80	45.7
755HF SS 1" / 25MM	1	25	1 5/16 - 12	0.844	21.5	1 3/8	1.81	46.0
755HF SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	1.078	27.5	2	2.06	52.3
755HF SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	1.312	33.0	*2	2.33	59.2
755HF SS 2"	2	-	2 1/2 - 12	1.781	45.0	*2 5/8	3.06	77.7

*Not from Forging

"D" Dimension is the minimum opening. Dimensions are for reference only, and are subject to change without

771 HFL
FEMALE RUN TEE
 S.A.E. 070426



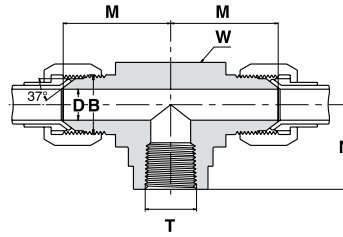
Ordering Information	TUBE O.D.		B UN	T NPT	D		W Wrench Flat	M		N	
	inch	mm			inch	mm		inch	mm	inch	mm
771HFL SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	5/8	1.00	25.4	0.66	16.8
771HFL SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	5/8	1.03	26.2	0.66	16.8
771HFL SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	5/8	1.08	27.4	0.66	16.8
771HFL SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	13/16	1.22	30.9	0.88	22.4
771HFL SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.234	6.0	5/8	1.08	27.4	0.66	16.8
771HFL SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	13/16	1.22	30.9	0.88	22.4
771HFL SS 3/8" / 10MM X 1/8"	3/8	10	9/16 - 18	1/8 - 27	0.297	7.5	5/8	1.06	26.9	0.66	16.8
771HFL SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.297	7.5	13/16	1.23	31.2	0.88	22.4
771HFL SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	15/16	1.31	33.2	1.02	25.9
771HFL SS 1/2" / 12MM X 1/4"	1/2	12	3/4 - 16	1/4 - 18	0.391	9.9	13/16	1.25	31.6	0.88	22.4
771HFL SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.391	9.9	15/16	1.42	36.1	1.02	25.9
771HFL SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	1 1/8	1.42	36.1	1.23	31.2
771HFL SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.484	12.3	1 1/8	1.64	41.5	1.23	31.2
771HFL SS 3/4" / 18MM X 1/2"	3/4	18	1 1/16 - 12	1/2 - 14	0.609	15.5	1 3/8	1.66	42.1	1.23	31.2
771HFL SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 3/8	1.89	48.0	1.36	34.5
771HFL SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.86	47.2	1.42	36.1
771HFL SS 1" / 25MM X 1"	1	25	1 5/16 - 12	1 - 11.5	0.844	21.5	*1 5/8	2.17	55.1	1.62	41.1
771HFL SS 1 1/4" / 32MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 - 11.5	1.078	27.5	*2 1/8	2.33	59.2	1.70	43.2
771HFL SS 1 1/2" / 38MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 - 11.5	1.312	33.0	*2 3/8	2.89	73.4	2.08	52.8
771HFL SS 2" X 2"	2	-	2 1/2 - 12	2 - 11.5	1.781	45.0	*2 7/8	3.30	83.8	2.39	60.7

*Not from Forging

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772 HFL**FEMALE BRANCH TEE**

S.A.E. 070427

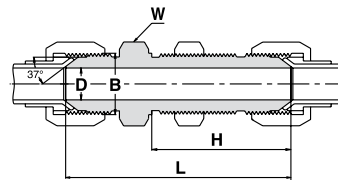


Ordering Information	Tube O.D.		B UN	T NPT	D		W Wrench Flat	M		N	
	inch	mm			inch	mm		inch	mm	inch	mm
772HFL SS 1/8" X 1/8"	1/8	-	5/16 - 24	1/8 - 27	0.062	1.6	5/8	1.00	25.4	0.66	16.8
772HFL SS 3/16" X 1/8"	3/16	-	3/8 - 24	1/8 - 27	0.125	3.2	5/8	1.03	26.2	0.66	16.8
772HFL SS 1/4" / 6MM X 1/8"	1/4	6	7/16 - 20	1/8 - 27	0.172	4.4	5/8	1.08	27.4	0.66	16.8
772HFL SS 1/4" / 6MM X 1/4"	1/4	6	7/16 - 20	1/4 - 18	0.172	4.4	13/16	1.22	30.9	0.88	22.4
772HFL SS 5/16" / 8MM X 1/8"	5/16	8	1/2 - 20	1/8 - 27	0.234	6.0	5/8	1.08	27.4	0.66	16.8
772HFL SS 5/16" / 8MM X 1/4"	5/16	8	1/2 - 20	1/4 - 18	0.234	6.0	13/16	1.22	30.9	0.88	22.4
772HFL SS 3/8" / 10MM X 1/8"	3/8	10	9/16 - 18	1/8 - 27	0.297	7.5	5/8	1.06	26.9	0.66	16.8
772HFL SS 3/8" / 10MM X 1/4"	3/8	10	9/16 - 18	1/4 - 18	0.297	7.5	13/16	1.23	31.2	0.88	22.4
772HFL SS 3/8" / 10MM X 3/8"	3/8	10	9/16 - 18	3/8 - 18	0.297	7.5	15/16	1.31	33.2	1.02	25.9
772HFL SS 1/2" / 12MM X 1/4"	1/2	12	3/4 - 16	1/4 - 18	0.391	9.9	13/16	1.25	31.6	0.88	22.4
772HFL SS 1/2" / 12MM X 3/8"	1/2	12	3/4 - 16	3/8 - 18	0.391	9.9	15/16	1.42	36.1	1.02	25.9
772HFL SS 1/2" / 12MM X 1/2"	1/2	12	3/4 - 16	1/2 - 14	0.391	9.9	1 1/8	1.42	36.1	1.23	31.2
772HFL SS 5/8" / 16MM X 1/2"	5/8	16	7/8 - 14	1/2 - 14	0.484	12.3	1 1/8	1.64	41.5	1.23	31.2
772HFL SS 3/4" / 18MM X 1/2"	3/4	18	1 1/16 - 12	1/2 - 14	0.609	15.5	1 3/8	1.66	42.1	1.23	31.2
772HFL SS 3/4" / 18MM X 3/4"	3/4	18	1 1/16 - 12	3/4 - 14	0.609	15.5	1 3/8	1.89	48.0	1.36	34.5
772HFL SS 7/8" / 20MM X 3/4"	7/8	20	1 3/16 - 12	3/4 - 14	0.719	18.3	1 3/8	1.86	47.2	1.42	36.1
772HFL SS 1" / 25MM X 1"	1	25	1 5/16 - 12	1 - 11.5	0.844	21.5	*1 5/8	2.17	55.1	1.62	41.1
772HFL SS 1 1/4" / 32MM X 1 1/4"	1 1/4	32	1 5/8 - 12	1 1/4 - 11.5	1.078	27.5	*2 1/8	2.33	59.2	1.70	43.2
772HFL SS 1 1/2" / 38MM X 1 1/2"	1 1/2	38	1 7/8 - 12	1 1/2 - 11.5	1.312	33.0	*2 3/8	2.89	73.4	2.08	52.8
772HFL SS 2" X 2"	2	-	2 1/2 - 12	2 - 11.5	1.781	45.0	*2 7/8	3.30	83.8	2.39	60.7

*Not from Forging

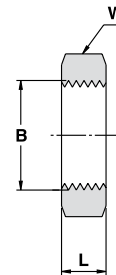
"D" Dimension is the minimum opening. Dimensions are for reference only, and are subject to change without

774 HFL
BULKHEAD UNION
 S.A.E. 070601



Ordering Information	Tube O.D.		B UN	D		W Hex. Flat	H		L	
	inch	mm		inch	mm		inch	mm	inch	mm
774HFL SS 3/16"	3/16	-	3/8 - 24	0.125	3.2	5/8	1.11	28.2	1.90	48.3
774HFL SS 1/4" / 6MM	1/4	6	7/16 - 20	0.172	4.4	11/16	1.20	30.5	2.07	52.6
774HFL SS 5/16" / 8MM	5/16	8	1/2 - 20	0.234	6.0	3/4	1.20	30.5	2.07	52.6
774HFL SS 3/8" / 10MM	3/8	10	9/16 - 18	0.297	7.5	13/16	1.28	32.5	2.18	55.4
774HFL SS 1/2" / 12MM	1/2	12	3/4 - 16	0.391	9.9	1	1.44	36.6	2.44	62.0
774HFL SS 5/8" / 16MM	5/8	16	7/8 - 14	0.484	12.3	1 1/8	1.58	40.1	2.74	69.6
774HFL SS 3/4" / 18MM	3/4	18	1 1/16 - 12	0.609	15.5	1 3/8	1.75	44.4	3.09	78.5
774HFL SS 7/8" / 20MM	7/8	20	1 3/16 - 12	0.719	18.3	1 1/2	1.75	44.4	3.12	79.2
774HFL SS 1" / 25MM	1	25	1 5/16 - 12	0.844	21.5	1 5/8	1.75	44.4	3.14	79.8
774HFL SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	1.078	27.5	1 7/8	1.80	45.7	3.31	84.1
774HFL SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	1.312	33.0	2 1/8	1.81	46.0	3.52	89.4
774HFL SS 2"	2	-	2 1/2 - 12	1.781	45.0	2 3/4	2.09	53.1	4.20	106.7

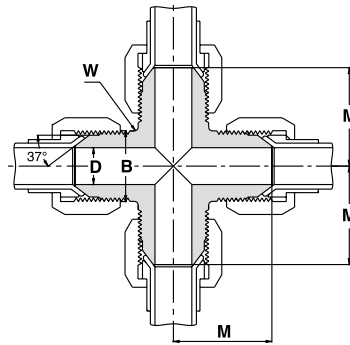
774 HFLN
BULKHEAD LOCKNUT
 S.A.E. 070118



Ordering Information	Tube O.D.	B UNF	W Hex. Flat	L	
	inch		inch	inch	mm
774HFLN SS 3/16"	3/16	3/8 - 24	5/8	0.22	5.6
774HFLN SS 1/4" / 6MM	1/4	7/16 - 20	11/16	0.25	6.4
774HFLN SS 5/16" / 8MM	5/16	1/2 - 20	3/4	0.25	6.4
774HFLN SS 3/8" / 10MM	3/8	9/16 - 18	13/16	0.27	6.9
774HFLN SS 1/2" / 12MM	1/2	3/4 - 16	1	0.31	7.9
774HFLN SS 5/8" / 16MM	5/8	7/8 - 14	1 1/8	0.36	9.1
774HFLN SS 3/4" / 18MM	3/4	1 1/16 - 12	1 3/8	0.41	10.4
774HFLN SS 7/8" / 20MM	7/8	1 3/16 - 12	1 1/2	0.41	10.4
774HFLN SS 1" / 25MM	1	1 5/16 - 12	1 5/8	0.41	10.4
774HFLN SS 1 1/4" / 32MM	1 1/4	1 5/8 - 12	1 7/8	0.41	10.4
774HFLN SS 1 1/2" / 38MM	1 1/2	1 7/8 - 12	2 1/8	0.41	10.4
774HFLN SS 2"	2	1 1/2 - 12	2 3/4	0.41	10.4

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7102 HFL
CROSS
 S.A.E. 070501

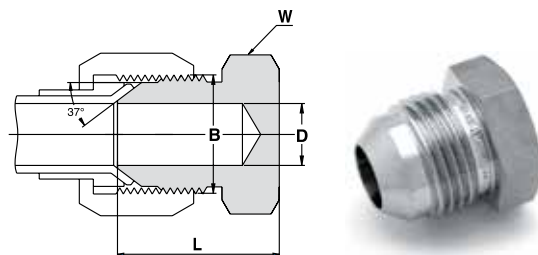


Ordering Information	Tube O.D.		B UN	D		W Wrench Flat	M	
	inch	mm		inch	mm		inch	inch
7102HFL SS 1/8"	1/8	-	5/16 - 24	0.062	1.6	7/16	0.77	19.6
7102HFL SS 3/16"	3/16	-	3/8 - 24	0.125	3.2	1/2	0.83	21.1
7102HFL SS 1/4" / 6MM	1/4	6	7/16 - 20	0.172	4.4	1/2	0.89	22.6
7102HFL SS 5/16" / 8MM	5/16	8	1/2 - 20	0.234	6.0	5/8	0.95	24.1
7102HFL SS 3/8" / 10MM	3/8	10	9/16 - 18	0.297	7.5	5/8	1.06	26.9
7102HFL SS 1/2" / 12MM	1/2	12	3/4 - 16	0.391	9.9	13/16	1.25	31.8
7102HFL SS 5/8" / 16MM	5/8	16	7/8 - 14	0.484	12.3	*15/16	1.45	36.8
7102HFL SS 3/4" / 18MM	3/4	18	1 1/16 - 12	0.609	15.5	*1 1/8	1.66	42.2
7102HFL SS 7/8" / 20MM	7/8	20	1 3/16 - 12	0.719	18.3	*1 3/8	1.80	45.7
7102HFL SS 1" / 25MM	1	25	1 5/16 - 12	0.844	21.5	*1 3/8	1.81	46.0
7102HFL SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	1.078	27.5	*1 11/16	2.06	51.0
7102HFL SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	1.312	33.0	*2	2.33	59.2
7102HFL SS 2"	2	-	2 1/2 - 12	1.781	45.0	*2 5/8	3.06	77.7

*Not from Forging

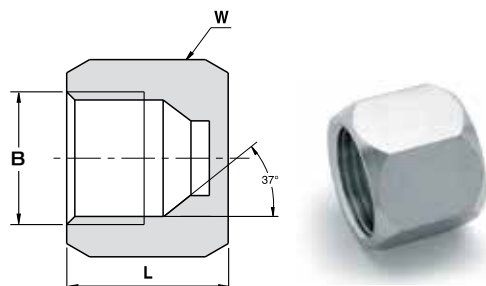
"D" Dimension is the minimum opening. Dimensions are for reference only, and are subject to change without

7639 HF
TUBE PLUG
 S.A.E. 070109



Ordering Information	Tube O.D.		B UN	D		W Hex. Flat	L	
	inch	mm		inch	mm		inch	mm
7639HF SS 1/8"	1/8	-	5/16 - 24	0.062	1.6	7/16	0.70	17.8
7639HF SS 3/16"	3/16	-	3/8 - 24	0.125	3.2	7/16	0.73	18.5
7639HF SS 1/4" / 6MM	1/4	6	7/16 - 20	0.172	4.4	1/2	0.80	20.3
7639HF SS 5/16" / 8MM	5/16	8	1/2 - 20	0.234	6.0	9/16	0.80	20.3
7639HF SS 3/8" / 10MM	3/8	10	9/16 - 18	0.297	7.5	5/8	0.84	21.3
7639HF SS 1/2" / 12MM	1/2	12	3/4 - 16	0.391	9.9	13/16	0.94	23.9
7639HF SS 5/8" / 16MM	5/8	16	7/8 - 14	0.484	12.3	15/16	1.10	27.9
7639HF SS 3/4" / 18MM	3/4	18	1 1/16 - 12	0.609	15.5	1 1/8	1.28	32.5
7639HF SS 7/8" / 20MM	7/8	20	1 3/16 - 12	0.719	18.3	1 1/4	1.31	33.3
7639HF SS 1" / 25MM	1	25	1 5/16 - 12	0.844	21.5	1 3/8	1.33	33.8
7639HF SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	1.078	27.5	1 11/16	1.45	36.8
7639HF SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	1.312	33.0	2	1.65	41.9
7639HF SS 2"	2	-	2 1/2 - 12	1.781	45.0	2 5/8	2.05	52.1

7640 HF
CAP
 S.A.E. 070112



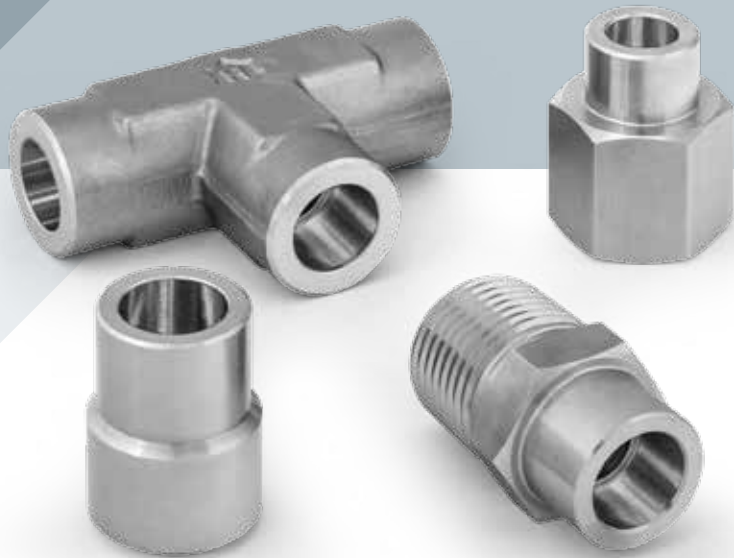
Ordering Information	TUBE O.D.		B UN	W Hex. Flat		L	
	inch	mm		inch	inch	mm	
7640HF SS 1/8"	1/8	-	5/16 - 24	3/8	0.550	12.7	
7640HF SS 3/16"	3/16	-	3/8 - 24	7/16	0.562	14.3	
7640HF SS 1/4" / 6MM	1/4	6	7/16 - 20	9/16	0.594	15.1	
7640HF SS 5/16" / 8MM	5/16	8	1/2 - 20	5/8	0.609	15.5	
7640HF SS 3/8" / 10MM	3/8	10	9/16 - 18	11/16	0.625	15.9	
7640HF SS 1/2" / 12MM	1/2	12	3/4 - 16	7/8	0.750	19.0	
7640HF SS 5/8" / 16MM	5/8	16	7/8 - 14	1	0.844	21.4	
7640HF SS 3/4" / 18MM	3/4	18	1 1/16 - 12	1 1/4	0.906	23.0	
7640HF SS 7/8" / 20MM	7/8	20	1 3/16 - 12	1 3/8	0.969	24.6	
7640HF SS 1" / 25MM	1	25	1 5/16 - 12	1 1/2	1.016	25.8	
7640HF SS 1 1/4" / 32MM	1 1/4	32	1 5/8 - 12	2	1.062	27.0	
7640HF SS 1 1/2" / 38MM	1 1/2	38	1 7/8 - 12	2 1/4	1.188	30.2	
7640HF SS 2"	2	-	1 1/2 - 12	2 7/8	1.438	36.5	

"D" Dimension is the minimum opening. Dimensions are for reference only, and are subject to change without



HAM-LET PRECISION
INSTRUMENT WELD FITTINGS

WELDLINE



HAM-LET WELDLINE FITTINGS

MATERIAL

Standard material is 316L stainless steel and is in accordance with ASTM A479 and ASTM A276. 316 / 316L Stainless steel SHAPED items are manufactured from material in Accordance with ASTM A182. Cleaning requirements: Per HAM-LET STD Cleaning SOP 8184.

HOW TO ORDER:

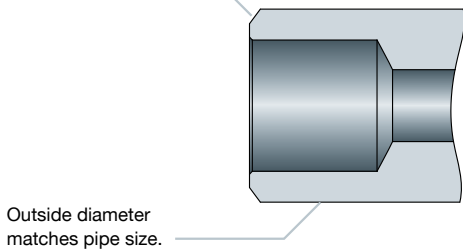
EXAMPLE:

I		P		94 TS		04H04	
INCH / MM		Material		Fittings Designator		Size Designator	
I -	Inch	P -	Stainless Steel 316	TS	Tube Socket weld	inch	mm
M -	mm			TBW	Tube Butt Weld	04 = 1/4	06 = 6mm
				PT	Pipe Butt weld to Tube Socket Weld	06 = 3/8	08 = 8mm
				PS	Pipe Socket weld	08 = 1/2	10 = 10mm
				PBW	Pipe Butt weld	12 = 3/4	12 = 12mm
						16 = 1"	

All orders should include material description and ordering information (see product table).

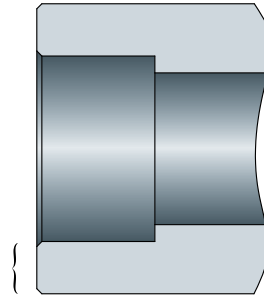
PBW - PIPE BUTT WELD

37.5° chamfer for proper weld Fillet



PS - PIPE SOCKET WELD

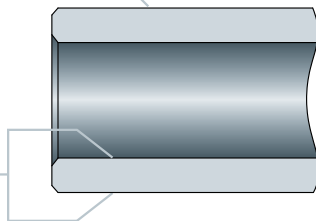
Heavy wall plus strength of material assures long life in severe service application



TBW - TUBE BUTT WELD

Male tube weld

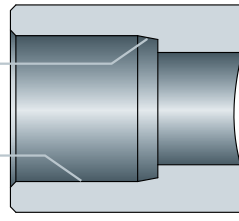
Quality machining of all surfaces assures consistent welding to tube



TS - TUBE SOCKET WELD

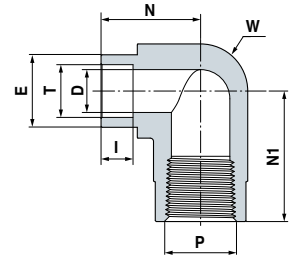
Tapered socket speeds layout, assembly & alignment

Precise machining of socket assures proper tube fit



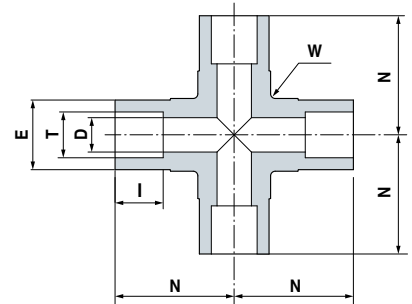
Accurate socket depth assures proper tube support & consistent assembly

IP90TS
TUBE SOCKET WELD
FEMALE ELBOW



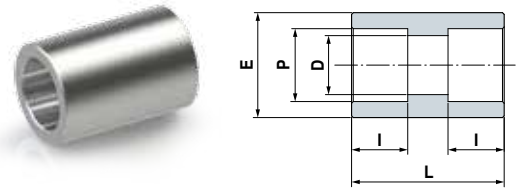
Ordering Information	T Tube O.D.	P NPT	N		N1		I		D Min. Opening		E		W Wrench Flat		Working Pressure [Psi]
			inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
IP90TS04H04	1/4	1/4	0.9	22.9	1.17	29.7	0.28	7.1	0.19	4.8	0.48	12.2	13/16	20.6	6600
IP90TS06H04	3/8	1/4	0.99	25.1	1.17	29.7	0.31	7.9	0.28	7.1	0.60	15.2	13/16	20.6	5300
IP90TS06H08	3/8	1/2	1.13	28.7	1.56	39.6	0.31	7.9	0.28	7.1	0.60	15.2	1 1/8	28.6	4900
IP90TS08H08	1/2	1/2	1.19	30.2	1.56	39.6	0.38	9.7	0.41	10.4	0.73	18.5	1 1/8	28.6	4900

IP91TS
TUBE SOCKET WELD
UNION CROSS



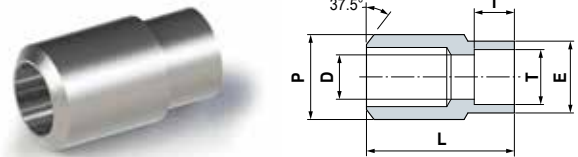
Ordering Information	T Tube O.D.	N		I		D Min. Opening		E		W Wrench Flat		Working Pressure [Psi]
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
IP91TS04H00	1/4	0.86	21.8	0.28	7.1	0.19	4.8	0.53	13.5	5/8	15.8	10300
IP91TS06H00	3/8	1.04	26.4	0.31	7.9	0.28	7.1	0.64	16.3	13/16	20.6	8100
IP91TS08H00	1/2	1.13	28.7	0.38	9.7	0.41	10.4	0.81	20.6	13/16	20.6	6600
IP91TS12H00	3/4	1.49	37.9	0.44	11.2	0.62	15.7	1.20	30.5	1 3/8	34.9	5900
IP91TS16H00	1	1.92	48.8	0.62	15.7	0.88	22.4	1.45	36.8	1 11/16	42.9	5600

IP92PS PIPE SOCKET WELD UNION



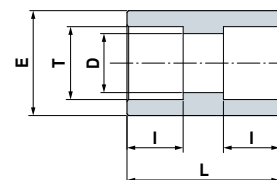
Ordering Information	P Pipe Size.	L		I		D Min. Opening		E		Working Pressure [Psi]
		inch	mm	inch	mm	inch	mm	inch	mm	
IP92PS04H00	1/4	1.06	26.9	0.39	9.9	0.36	9.1	0.88	22.4	8100
IP92PS06H00	3/8	1.12	28.4	0.39	9.9	0.49	12.4	1.03	26.2	7100
IP92PS08H00	1/2	1.12	28.4	0.39	9.9	0.62	15.7	1.25	31.8	6800
IP92PS12H00	3/4	1.75	44.5	0.51	13.0	0.82	20.8	1.47	37.3	5800
IP92PS16H00	1	1.75	44.5	0.51	13.0	1.05	26.7	1.86	47.2	6100

IP92PT PIPE BUTT WELD TO TUBE SOCKET WELD



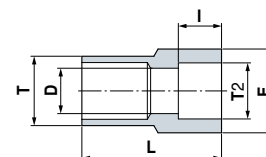
Ordering Information	P Pipe Size	T Tube O.D.	L		I		D Min. Opening		E		Working Pressure [Psi]
			inch	mm	inch	mm	inch	mm	inch	mm	
IP92PT04H04	1/4	1/4	0.88	22.4	0.28	7.1	0.19	4.8	0.48	12.2	10300
IP92PT06H06	3/8	3/8	1.03	26.2	0.31	7.9	0.28	7.1	0.60	15.2	8100
IP92PT06H08	3/8	1/2	1.00	25.4	0.38	7.9	0.41	10.4	0.73	18.5	6600
IP92PT08H04	1/2	1/4	1.12	28.4	0.28	7.1	0.19	4.8	0.48	12.2	7800
IP92PT08H06	1/2	3/8	1.12	28.4	0.31	7.9	0.28	7.1	0.60	15.2	7800
IP92PT08H08	1/2	1/2	1.19	30.2	0.38	9.7	0.41	10.4	0.73	18.5	6600
IP92PT12H06	3/4	3/8	1.50	38.1	0.31	7.9	0.28	7.1	0.60	15.2	6600
IP92PT12H08	3/4	1/2	1.50	38.1	0.38	9.7	0.41	10.4	0.73	18.5	6600
IP92PT12H12	3/4	3/4	1.50	38.1	0.44	11.2	0.62	15.7	1.05	26.7	5900
IP92PT16H06	1	3/8	1.38	35.1	0.31	7.9	0.28	7.1	0.60	15.2	6000
IP92PT16H08	1	1/2	1.56	39.6	0.38	9.7	0.41	10.4	0.73	18.5	6000

IP92TS
TUBE SOCKET
WELD UNION



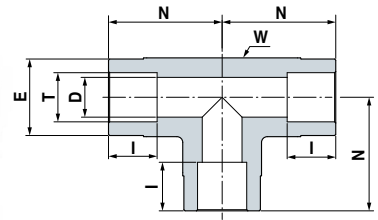
Ordering Information	T Tube O.D.	L		I		D Min. Opening		E		Working Pressure [Psi]
		inch	mm	inch	mm	inch	mm	inch	mm	
IP92TS04H00	1/4	0.75	19.1	0.28	7.1	0.19	4.8	0.48	12.2	10300
IP92TS06H00	3/8	0.88	22.4	0.31	7.9	0.28	7.1	0.60	15.2	8100
IP92TS08H00	1/2	1.06	26.9	0.38	9.7	0.41	10.4	0.73	18.5	6600
IP92TS12H00	3/4	1.31	33.3	0.44	11.2	0.62	15.7	1.04	26.4	5900
IP92TS16H00	1	1.44	36.6	0.62	15.7	0.88	22.4	1.36	34.6	5600

IP93TBW
TUBE BUTT WELD TO
TUBE SOCKET WELD



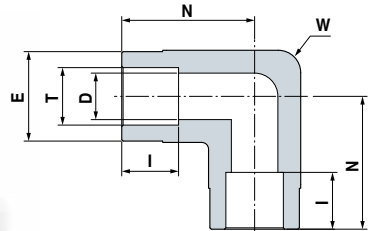
Ordering Information	T Tube O.D.	T2 Tube O.D.	L		I		D Min. Opening		E		Working Pressure [Psi]
			inch	mm	inch	mm	inch	mm	inch	mm	
IP93TBW04H02	1/4	1/8	0.56	14.9	0.10	2.5	0.09	2.3	0.29	7.4	12600
IP93TBW06H04	3/8	1/4	0.75	19.1	0.28	7.1	0.19	4.8	0.48	12.2	8200
IP93TBW08H04	1/2	1/4	0.88	22.4	0.28	7.1	0.19	4.8	0.50	12.7	7500
IP93TBW08H06	1/2	3/8	0.88	22.4	0.31	7.9	0.33	8.4	0.60	15.2	7500
IP93TBW12H08	3/4	1/2	1.12	28.4	0.38	9.7	0.41	10.4	0.75	19.1	6300
IP93TBW16H08	1	1/2	1.38	35.1	0.38	9.7	0.41	10.4	0.73	18.5	5300

IP94TS TUBE SOCKET WELD UNION TEE



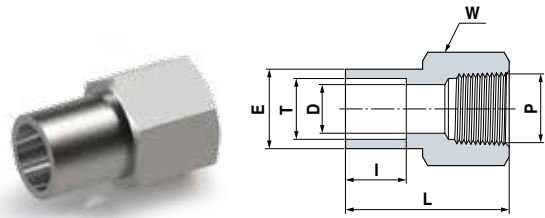
Ordering Information	T Tube O.D.	N		I		D Min. Opening		E		W Wrench Flat		Working Pressure [Psi]
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
IP94TS02H00	1/8	0.59	15.0	0.10	2.5	0.09	2.3	0.35	9.0	7/16	11.1	12600
IP94TS04H00	1/4	0.86	21.8	0.28	7.1	0.19	4.8	0.53	13.5	5/8	15.9	10300
IP94TS06H00	3/8	1.04	26.4	0.31	7.9	0.28	7.1	0.69	17.5	11/16	17.5	8100
IP94TS08H00	1/2	1.17	29.7	0.38	9.7	0.41	10.4	0.81	20.6	13/16	20.6	6600
IP94TS12H00	3/4	1.56	39.6	0.44	11.2	0.62	15.7	1.13	28.6	1 1/8	28.6	5900
IP94TS16H00	1	1.92	48.8	0.62	15.7	0.88	22.4	1.45	36.8	1 11/16	42.9	5600

IP95TS TUBE SOCKET WELD UNION ELBOW



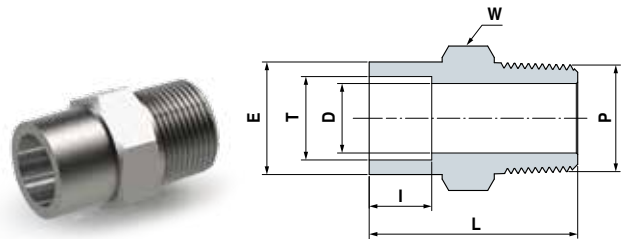
Ordering Information	T Tube O.D.	N		I		D Min. Opening		E		W Wrench Flat		Working Pressure [Psi]
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
IP95TS04H00	1/4	0.86	21.8	0.28	7.1	0.19	4.8	0.53	13.5	5/8	15.8	10300
IP95TS06H00	3/8	1.00	25.4	0.31	7.9	0.28	7.1	0.69	17.5	11/16	17.5	8100
IP95TS08H00	1/2	1.17	29.7	0.38	9.7	0.41	10.4	0.81	20.6	13/16	20.6	6600
IP95TS12H00	3/4	1.56	39.6	0.44	11.2	0.62	15.7	1.13	28.6	1 1/8	28.6	5900
IP95TS16H00	1	1.92	48.8	0.62	15.7	0.88	22.4	1.45	36.8	1 11/16	42.9	5600

IP96TS
TUBE SOCKET WELD
FEMALE CONNECTOR



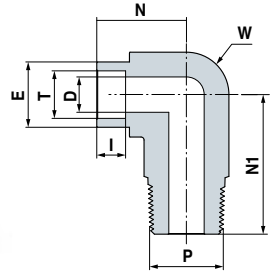
Ordering Information	T TUBE O.D.	P NPT	L		I		D Min. Opening		E		W Hex Flat	Working Pressure [Psi]
			inch	mm	inch	mm	inch	mm	inch	mm		
IP96TS02H02	1/8	1/8	0.83	21.1	0.10	2.5	0.09	2.3	0.29	7.4	9/16	6500
IP96TS04H02	1/4	1/8	1.05	26.7	0.28	7.1	0.19	4.8	0.48	12.2	9/16	6500
IP96TS04H04	1/4	1/4	1.18	30.0	0.28	7.1	0.19	4.8	0.48	12.2	3/4	6600
IP96TS06H04	3/8	1/4	1.24	31.5	0.31	7.9	0.28	7.1	0.60	15.2	3/4	6600
IP96TS08H06	1/2	3/8	1.36	34.5	0.38	9.7	0.41	10.4	0.73	18.5	7/8	5300
IP96TS08H08	1/2	1/2	1.59	40.4	0.38	9.7	0.41	10.4	0.73	18.5	1 1/16	4900
IP96TS12H12	3/4	3/4	1.73	43.9	0.44	11.2	0.62	15.7	1.04	26.4	1 5/16	4600

IP98TS
TUBE SOCKET WELD
MALE CONNECTOR



Ordering Information	T TUBE O.D.	P NPT	L		I		D Min. Opening		E		W Hex Flat	Working Pressure [Psi]
			inch	mm	inch	mm	inch	mm	inch	mm		
IP98TS04H04	1/4	1/4	1.15	29.2	0.28	7.1	0.19	4.8	0.48	12.2	9/16	8000
IP98TS06H04	3/8	1/4	1.25	31.8	0.31	7.9	0.28	7.1	0.62	15.8	5/8	8000
IP98TS06H06	3/8	3/8	1.25	31.8	0.31	7.9	0.28	7.1	0.62	15.8	11/16	7800
IP98TS06H08	3/8	1/2	1.47	37.3	0.31	7.9	0.28	7.1	0.62	15.8	7/8	7700
IP98TS08H04	1/2	1/4	1.31	33.3	0.38	9.7	0.28	7.1	0.73	18.5	3/4	6600
IP98TS08H06	1/2	3/8	1.31	33.3	0.38	9.7	0.38	9.7	0.73	18.5	3/4	6600
IP98TS08H08	1/2	1/2	1.53	38.9	0.38	9.7	0.41	10.4	0.73	18.5	7/8	6600

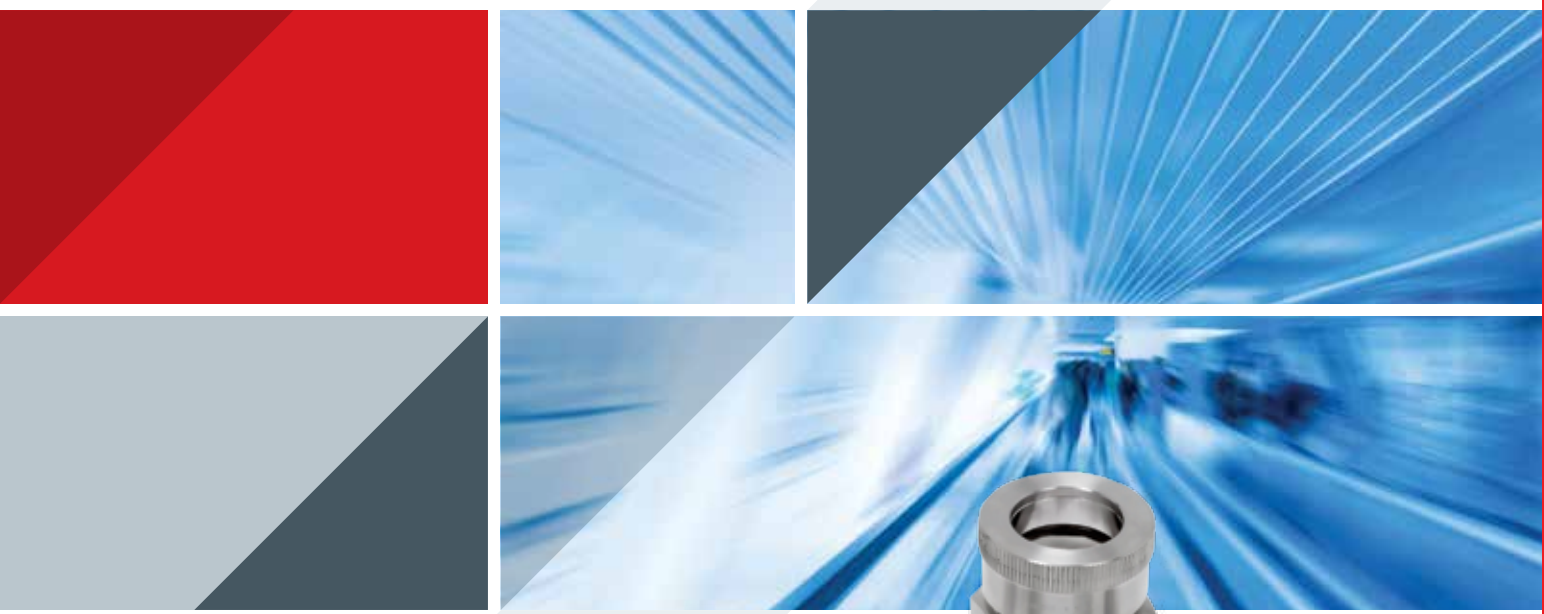
IP99TS
**TUBE SOCKET WELD
 MALE ELBOW**



Ordering Information	T Tube O.D.	P NPT	N		N1		I		D Min. Opening		E		W Wrench Flat		Working Pressure [Psi]
			inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
IP99TS04H04	1/4	1/4	0.79	20.1	0.94	24.0	0.28	7.1	0.19	4.8	0.48	12.2	1/2	12.7	8000
IP99TS06H04	3/8	1/4	1.04	26.4	1.05	26.7	0.31	7.9	0.28	7.1	0.64	16.3	11/16	17.5	8000
IP99TS06H06	3/8	3/8	0.97	24.6	1.03	26.2	0.31	7.9	0.28	7.1	0.60	15.2	11/16	17.5	7800
IP99TS06H08	3/8	1/2	1.02	25.9	1.45	36.9	0.31	7.9	0.28	7.1	0.60	15.2	13/16	20.6	7700
IP99TS08H08	1/2	1/2	1.08	27.4	1.45	36.9	0.38	9.7	0.41	10.4	0.73	18.5	13/16	20.6	6600

UHLINE SERIES

FOR ULTRA VACUUM SYSTEMS



UH LINE SERIES

The HAM-LET "UH" Series is designed for ultra-vacuum systems.

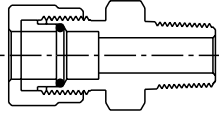
Following are some of its special features:

- Finger-tight assembly (with knurled nut)
- Easy removal, easy repositioning in a system
- Helium leak tested to 4X10⁻⁹ ATM.cc/sec
- Maximum temperature: 242°C
- Available factory assembly for many HAM-LET Valves:
Ball Valve, Needle Valve, Diaphragm Valve, Filter, Check Valve
- All metal parts are 316 Stainless Steel, O-ring - Fluorocarbon FKM.
- Full range of sizes from 1/4" to 1"



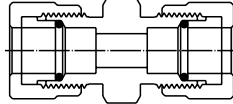
768 UH

Male Connector



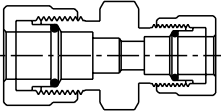
762 UH

Union



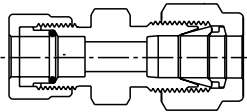
763 UH

Reducing Union



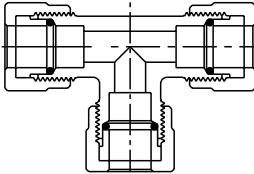
763 LUH

LET-LOK® to UH Line



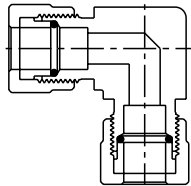
764 UH

Union Tee



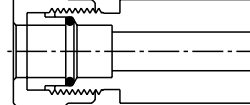
765 UH

Union Elbow

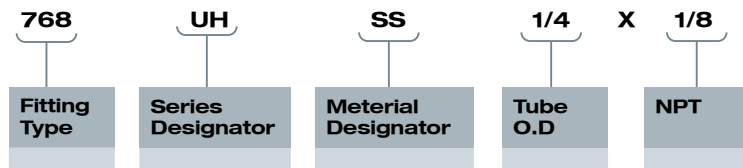


767 UH

UH Line to Tube Adapter



ORDERING INFORMATION



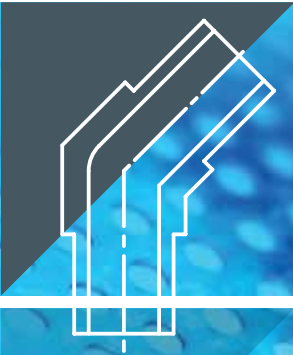
* Available bored through. Add "R" to the Cat. No.

* Parts can be assembled and packed in a cleanroom class 100, if specified.

* Only items priced in HAM-LET's up-to-date price list are standard.

* Price and delivery of non-stocked items provided on request.

HTC[®]



ORBITAL WELD AND METAL GASKET FACE SEAL FITTINGS



CONNECTORS

TECHNICAL INFORMATION

HAM-LET/HTC® specializes in the design and production of high-quality, specially manufactured valves and fittings for High Purity and Ultra-High Purity applications.

A joint effort of **HTC®**'s expert engineers and technicians resulted in the development a complete line that reflects the company's deep understanding of the critical requirements of the semiconductor, biotech, and pharmaceutical industries.

HAM-LET/HTC® is a leader in the manufacturing of fittings and valves for clean industries and has consistently spearheaded significant new developments in this field. **HTC®** has broken new ground in surface-finishing techniques by implementing improved electro-polishing processes.

PLATING

Female threads are silver plated in order to reduce the risk of galling and to improve the remakeability of the fitting. This high-quality plating also reduces the torque required for the fitting assembly. Reference Spec: Meeting and exceeding - Mil Spec: QQ-S-365.

Note: Do not apply any type of cleaning acid and/or electropolishing solutions to any female threads. These solutions damage the silver plating and invalidate any expressed or implied warranty.

WELDING

Options: butt weld, shoulder weld, socket weld. Reference Specs: All welded products are manufactured and welded according to SEMI F75,F81.

TESTING

HAM-LET follows the relevant ASTM, ANSI, ASME, ISO, SEMI & SEMASPEC standards for testing and for qualifying processes and results.

JAPANESE STANDARDS

HAM-LET, upon request, manufactures the **HTC®** product line to meet Japanese standards:

- Low Manganese Material Specifications (JIS)
- Wall thickness
- Hardness

TEMPERATURE RATING

PRODUCTS	MATERIAL	F	C
HTC®Face Seal Fittings	SS316L	1000	538
	SS316L Var or Vim / Var ⁽¹⁾	1000	538
HTC® Welding Fittings	SS316L	1000	538
	SS316L Var or Vim / Var ⁽¹⁾	1000	538
HTC® Gaskets	SS316	1000	538
	NICKEL	1000	538

HELIUM LEAK

All HAM-LET Face Seal products are tested and qualified to a helium leak rate of less than 3x10⁻¹⁰ std cm³/sec. Reference Spec: SEMI F1.

SURFACE FINISH

Reference Spec: ANSI B46.1 and ISO 4288.

SURFACE ANALYSIS

SEM/EDX/AES analysis is used to monitor surface defects per ASTM F1372 and ASTM F1375.

MOISTURE ANALYSIS

Based on ASTM F1397.

PARTICLE CONTRIBUTION TEST

Based on Semaspec 90120390 B.

SURFACE CHEMISTRY

All UHP products are electropolished with a proprietary process for achieving and exceeding the Sematec Standards of surface cleanliness and anticorrosion requirements. Parameters are measured by SEM, AUGER, ESCA.

Reference Spec: SEMI F19; E49.9; SEMASPEC 91060573A-STD.

CLEANING SPECIFICATIONS

According to # H9800.

Reference Spec: SEMI E49.3.

MATERIAL TRACEABILITY

All **HTC®** components are Heat Coded for full traceability.

ASSEMBLY

According to SEMI E49.6.

ACCESSORIES

Grip Kit, Plastic Bead Protector.

PACKAGING: Each "E" finished component is double bagged to ensure component cleanliness and to protect it from environmental contamination. The inner bag is Nylon 6 and vacuum sealed. The outer bag is polyethylene. Reference Spec: SEMI E49.1

INTERNATIONAL CERTIFICATIONS

ISO 9001, Certified by S.I.I.

HTC® FITTINGS PRESSURE RATING

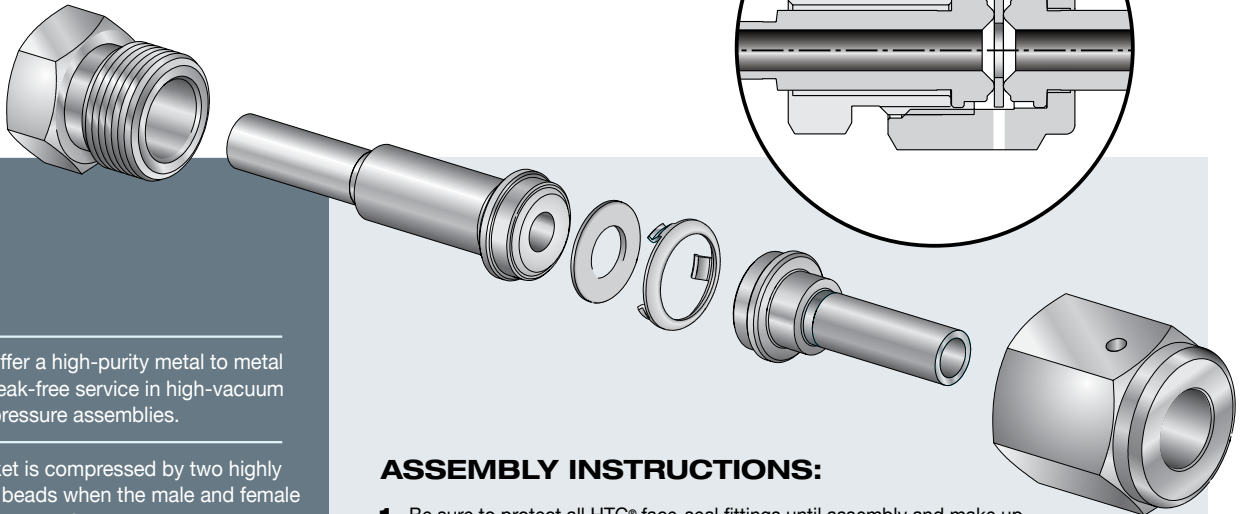
Products	Material	Size	Wall Thickness	Pressure Rating	
				psig	bar
HTC® Fittings	316L or 316LV	1/8	0.028	8550	590
		1/4	0.035	5200	359
		3/8	0.035	3350	231
		1/2	0.049	3750	259
		3/4*	0.065	3350	231
		3/4*	0.049	2400	165
		1*	0.065	2400	165

* 3/4" & 1" sizes are not standard, but can be manufactured on request

Pressure ratings are calculated in accordance with ANSI Code for Pressure Piping ANSI B-31, for stainless steel fittings. All working pressures are at 4:1 safety factor. Pressure indicated in the catalogue is at room temp.

⁽¹⁾ Per SEMI F20-0305

MAKE UP OF GLANDS



Glands offer a high-purity metal to metal seal for leak-free service in high-vacuum or high-pressure assemblies.

The gasket is compressed by two highly polished beads when the male and female nuts are engaged.

The gland bead-to-bead assembly compresses a soft-metal gasket-to-seal. This assembly can be locked by the HAM-LET Grip-Kit (see A below).

Visual test and leak testing are performed through two test ports in opposite locations from the female nut.

ASSEMBLY INSTRUCTIONS:

1. Be sure to protect all HTC® face-seal fittings until assembly and make up. Exercise great care so that the sealing surfaces are not scratched, damaged or contaminated in any way during handling and assembly.
2. Always use a clean environment, and always employ proper cleanroom protocol for the make up and assembly of high-purity fittings and applications.
3. Make up instructions:
Tighten the female nut to the male nut/body the finger tight.
Tighten the female nut 1/8 turn past the finger tight point.
Always torque the female nut while keeping the male nut/body stationary.
Face seal connections are remakable - please use a new gasket for each remake.



GRIPKIT Ordering Information
See page 186

MATERIAL

PRODUCTS	LEVEL "E"			LEVEL "H"		
	TREATMENT	Ra (Microinch)		TREATMENT	Ra (Microinch)	
		MAX	AVERAGE		MAX	AVERAGE
GLANDS	ELECTROPOLISHED	10	5	NON- ELECTROPOLISHED	15	10
MINI BUTTWELD	ELECTROPOLISHED	10	5	NON- ELECTROPOLISHED	15	10
SHAPED UNIONS	ELECTROPOLISHED	10	5	NON- ELECTROPOLISHED	20	15
LONG WELD SHAPED CONNECTORS	ELECTROPOLISHED	10	5	NON- ELECTROPOLISHED	15	10
THREADED STRAIGHT CONNECTORS	ELECTROPOLISHED	10	5	NON- ELECTROPOLISHED	20	15

* "E" level - Electropolished ** "H" level - Not Electropolished

GLANDS

LONG GLAND 160
Without shoulder
GL-W



LONG GLAND 160
With shoulder
GL-S



MALE GLAND 161
Without shoulder
GM-W



SHORT GLAND 161
Without shoulder
GS-W



SHORT GLAND 162
With shoulder
GS-S



MINI SHORT GLAND 162
Without shoulder
MGS-W



MINI SHORT GLAND 163
With shoulder
MGS-S



GLAND ADAPTER TO LET-LOK® 163
AG



MALE GLAND 163
Short tube without shoulder
MG-W



SOCKET WELD GLAND 164
GSW



MINI BUTTWELDS

MINI ELBOW 164
Without shoulder
ME-W



MINI ELBOW REDUCER 165
Without shoulder
MER-W



MINI ELBOW 165
45°
Without shoulder
ME-45°-W



MINI ELBOW 166
With extended leg
Without shoulder
MEX-W



MINI TEE 166
Without shoulder
MT-W



MINI TEE REDUCER 167
Without shoulder
MTR-W



MINI CROSS 167
Without shoulder
MC-W



MINI TRI-EL 168
Without shoulder
MTB-W



REDUCING UNION 168
Without shoulder
RU-W



SHAPED UNIONS

ELBOW UNION 169
EU



TEE UNION 169
TU



CROSS UNION 170
CU



MALE ELBOW 170
EM



LONG WELD SHAPED CONNECTORS

ELBOW 171
Without shoulder
EW-W



TEE 171
Without shoulder
TW-W



TEE REDUCER 172
Without shoulder
TWR-W



CROSS 172
Without shoulder
CW-W



REDUCER 173
Without shoulder
RW-W



BUTTWELD UNION 173
Without shoulder
UB-W



BUTTWELD UNION 174
With shoulder
UB-S



BUTTWELD UNION 174
With locator and shoulder
UBL-S



THREADED STRAIGHT CONNECTORS

MALE UNION 175
UM



MALE TO MALE NPT CONNECTOR 175
CM



MALE REDUCING UNION 176
RUM



BULKHEAD UNION 176
BU



SHORT BULKHEAD UNION 176
SBU

MALE TO NPT BULKHEAD CONNECTOR 177
BCM

MALE PLUG 181
MP

MALE NUT 181
NM

MALE TO SEAL O-RING CONNECTOR 177
CMOB

MALE TO FEMALE NPT CONNECTOR 177
FC

TAPERED MALE NUT 181
TNM

SHORT MALE NUT 182
SNM

HIGH FLOW CONNECTORS

LONG HIGH FLOW GLAND 185
HGL

HIGH FLOW MALE TO TUBE 185
HMT

MALE TO LET-LOK UNION 178
UGL

MALE TO BULKHEAD LET-LOK UNION 178
BUL

SWIVEL CONNECTORS

HIGH FLOW FEMALE NUT 185
HNF

HIGH FLOW MALE NUT 185
HNM

MALE TO SHORT BULKHEAD LET-LOK UNION 178
SBUL

BULKHEAD TO TUBE UNION Without shoulder 179
BHUT-W

FEMALE TO MALE UNION 182
UMF

FEMALE TO MALE NPT CONNECTOR 182
MCF

SHORT BULKHEAD TO TUBE UNION Without shoulder 179
SBHUT-W

FEMALE TO FEMALE UNION 183
UFF

FEMALE TO FEMALE NPT CONNECTOR 183
FCF

FEMALE TO LET-LOK CONNECTOR 183
FHTL

ORDERING INFORMATION

V - GL - 1/2 - W - E

Type of Fitting Designator	Surface Level Designator
Size Designator	To indicate the desired level of polish, please add "E" or "H" to the part Number:
1/8 6 mm	E - With Electropolish
1/4 8 mm	H - Without Electropolish
3/8 10 mm	
1/2 12 mm	
3/4 18 mm	
1	
End Designator	
S - With Shoulder	
W - Without Shoulder	

CAPS, NUTS & PLUGS

COUPLING 179
CP

DOUBLE FEMALE UNION 180
DFU

GASKETS

FEMALE NUT 180
NF

FEMALE CAP 180
CF

GASKET 184
GA

RETAINED GASKET 184
GA-RT

Material Designator

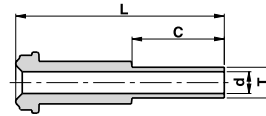
- P** - 316L/316L VOD (AOD)
- V** - SS316L Var or Vim/Var⁽¹⁾
- LM** - Low Manganese
- H** - Alloy C-276
- *NI** - Nickel
- *SS** - Stainless Steel

* For Gaskets only
⁽¹⁾ Per SEMI F20-0305

GL-W

LONG GLAND

Without shoulder

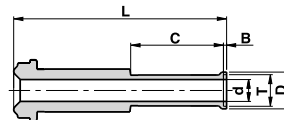


Ordering Information	Face Seal Size	L		C		d		T Tube O.D	W.T.	
		inch	mm	inch	mm	inch	mm		inch	mm
V-GL-1/8-W	1/8	36.1	1.42	19.1	0.75	1.9	0.07	1/8"	-	0.028
V-GL-1/4 X 1/8-W	1/4	36.1	1.42	19.1	0.75	1.9	0.07	1/8"	-	0.028
V-GL-1/4-W	1/4	43.2	1.70	19.1	0.75	4.6	0.18	1/4"	-	0.035
V-GL-3/8-W	1/2	45.5	1.79	19.1	0.75	7.7	0.30	3/8"	-	0.035
V-GL-1/2-W	1/2	45.5	1.79	19.1	0.75	10.2	0.40	1/2"	-	0.049
V-GL-1/2-W 1.41	1/2	35.8	1.41	9.6	0.38	10.2	0.40	1/2"	-	0.049
V-GL-1/2-W W.T.=0.065	1/2	45.5	1.79	19.1	0.75	9.5	0.37	1/2"	-	0.065
V-GL-1/2 X 1/4-W	1/2	45.5	1.79	19.1	0.75	4.6	0.18	1/4"	-	0.035
P-GL-3/4-W W.T.=0.049	3/4	51.6	2.03	19.1	0.75	16.6	0.65	3/4"	-	0.049
P-GL-3/4-W W.T.=0.065	3/4	51.6	2.03	19.1	0.75	15.8	0.62	3/4"	-	0.065
P-GL-1-W W.T.=0.065	1	58.9	2.32	19.1	0.75	22.1	0.87	1"	-	0.065
V-GL-6MM-W	1/4	43.2	1.70	19.1	0.75	4.0	0.16	6mm	1.00	-
V-GL-8MM-W	1/4	43.2	1.70	19.1	0.75	6.0	0.24	8mm	1.00	-
V-GL-10MM-W	1/2	45.5	1.79	19.1	0.75	8.0	0.31	10mm	1.00	-
V-GL-12MM-W	1/2	45.5	1.79	19.1	0.75	10.0	0.39	12mm	1.00	-
P-GL-18MM-W	3/4	51.6	2.03	19.1	0.75	15.0	0.59	18mm	1.50	-

GL-S

LONG GLAND

With shoulder



Ordering Information	Face Seal Size	L		C		d		B		D		T Tube O.D	W.T.	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		inch	mm
V-GL-1/4-S	1/4	43.7	1.72	19.1	0.75	4.6	0.18	0.6	0.02	7.4	0.29	1/4"	-	0.035
V-GL-3/8-S	1/2	46.2	1.82	19.1	0.75	7.7	0.30	0.8	0.03	10.4	0.41	3/8"	-	0.035
V-GL-1/2-S	1/2	46.5	1.83	19.1	0.75	10.2	0.40	1.0	0.04	14.0	0.55	1/2"	-	0.049
V-GL-1/2-S W.T.=0.065	1/2	46.5	1.83	19.1	0.75	9.5	0.37	1.0	0.04	14.0	0.55	1/2"	-	0.065
P-GL-3/4-S W.T.=0.049	3/4	52.6	2.07	19.1	0.75	16.6	0.65	1.0	0.04	20.3	0.80	3/4"	-	0.049
P-GL-3/4-S W.T.=0.065	3/4	52.6	2.07	19.1	0.75	15.8	0.62	1.0	0.04	20.3	0.80	3/4"	-	0.065
P-GL-1-S W.T.=0.065	1	65.3	2.57	19.1	0.75	22.1	0.87	1.0	0.04	26.9	1.06	1"	-	0.065
V-GL-6MM-S	1/4	43.7	1.72	19.1	0.75	4.0	0.16	0.5	0.02	7.0	0.27	6mm	1.00	-
V-GL-8MM-S	1/4	46.2	1.82	19.1	0.75	6.0	0.24	0.8	0.03	8.9	0.35	8mm	1.00	-
V-GL-10MM-S	1/2	46.2	1.82	19.1	0.75	8.0	0.31	0.8	0.03	10.9	0.43	10mm	1.00	-
V-GL-12MM-S	1/2	46.5	1.83	19.1	0.75	10.0	0.39	1.0	0.04	13.2	0.52	12mm	1.00	-
P-GL-18MM-S	3/4	52.6	2.07	19.1	0.75	15.0	0.59	1.0	0.04	19.3	0.76	18mm	1.50	-

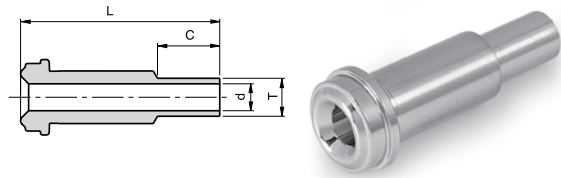
Dimensions are for reference only, and are subject to change without notice.

When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

GM-W

MALE GLAND

Without shoulder

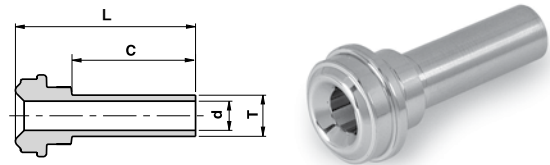


Ordering Information	Face Seal size	L		C		d		T
	inch	mm	inch	mm	inch	mm	inch	Tube O.D inch
V-GM-1/8-W	1/8	17.8	0.70	7.1	0.28	1.9	0.07	1/8
V-GM-1/4-W	1/4	33.3	1.31	10.4	0.41	3.0	0.12	1/4
V-GM-3/8-W	1/2	38.1	1.50	10.4	0.41	7.1	0.28	3/8
V-GM-1/2-W	1/2	38.1	1.50	12.7	0.50	10.2	0.40	1/2
P-GM-3/4-W	3/4	50.8	2.00	15.7	0.62	13.5	0.53	3/4
P-GM-1-W	1	56.4	2.22	20.6	0.81	19.1	0.75	1

GS-W

SHORT GLAND

Without shoulder



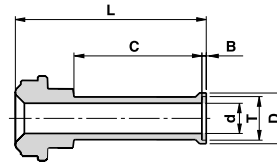
Ordering Information	Face Seal Size	L		C		d		T	W.T.	
	inch	mm	inch	mm	inch	mm	inch	inch / mm	mm	inch
V-GS-1/8-W	1/8	27.4	1.08	19.1	0.75	1.9	0.07	1/8"	-	0.028
V-GS-1/4-W	1/4	27.9	1.10	19.1	0.75	4.6	0.18	1/4"	-	0.035
V-GS-1/4 X 1/8 -W	1/4	27.9	1.10	19.1	0.75	1.9	0.07	1/8"	-	0.028
V-GS -1/4-W 0.72	1/4	18.3	0.72	9.6	0.38	4.6	0.18	1/4"	-	0.035
V-GS-3/8-W	1/2	28.4	1.12	19.1	0.75	7.7	0.30	3/8"	-	0.035
V-GS-1/2-W	1/2	28.4	1.12	19.1	0.75	10.2	0.40	1/2"	-	0.049
V-GS-1/2-W W.T.=0.065	1/2	28.4	1.12	19.1	0.75	9.5	0.37	1/2"	-	0.065
V-GS-1/2-W-0.74	1/2	18.8	0.74	9.7	0.38	10.2	0.40	1/2"	-	0.049
V-GS-1/2 X 1/4-W	1/2	28.4	1.12	19.1	0.75	4.6	0.18	1/4"	-	0.035
P-GS-3/4-W W.T.=0.049	3/4	29.0	1.14	19.1	0.75	16.6	0.65	3/4"	-	0.049
P-GS-3/4-W W.T.=0.065	3/4	29.0	1.14	19.1	0.75	15.8	0.62	3/4"	-	0.065
P-GS-1-W W.T.=0.065	1	32.0	1.26	19.1	0.75	22.1	0.87	1"	-	0.065
V-GS-6MM-W	1/4	29.4	1.16	19.1	0.75	4.0	0.16	6mm	1.00	-
V-GS-8MM-W	1/4	29.5	1.16	19.1	0.75	6.0	0.24	8mm	1.00	-
V-GS-10MM-W	1/2	29.4	1.16	19.1	0.75	8.0	0.31	10mm	1.00	-
V-GS-12MM-W	1/2	29.4	1.16	19.1	0.75	10.0	0.39	12mm	1.00	-
P-GS-18MM-W	3/4	31.0	1.22	19.1	0.75	15.0	0.59	18mm	1.50	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

GS-S

SHORT GLAND

With shoulder

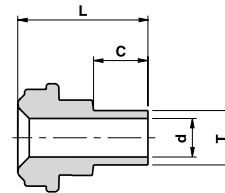


Ordering Information	Face Seal Size	L		C		d		B		D		T	W.T.	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch / mm	mm	inch
V-GS-1/4-S	1/4	28.5	1.12	19.1	0.75	4.6	0.18	0.6	0.02	7.4	0.29	1/4"	-	0.035
V-GS-3/8-S	1/2	29.2	1.15	19.1	0.75	7.7	0.30	0.8	0.03	10.4	0.41	3/8"	-	0.035
V-GS-1/2-S	1/2	29.4	1.16	19.1	0.75	10.2	0.40	1.0	0.04	14.0	0.55	1/2"	-	0.049
V-GS-1/2-S W.T.=0.065	1/2	29.4	1.16	19.1	0.75	9.5	0.37	1.0	0.04	14.0	0.55	1/2"	-	0.065
P-GS-3/4-S W.T.=0.049	3/4	30.0	1.18	19.1	0.75	16.6	0.65	1.0	0.04	20.3	0.80	3/4"	-	0.049
P-GS-3/4-S W.T.=0.065	3/4	30.0	1.18	19.1	0.75	15.8	0.62	1.0	0.04	20.3	0.80	3/4"	-	0.065
P-GS-1-S W.T.=0.065	1	32.1	1.26	19.1	0.75	22.1	0.87	1.0	0.04	26.9	1.06	1"	-	0.065
V-GS-6MM-S	1/4	30.0	1.18	19.1	0.75	4.0	0.16	0.5	0.02	7.0	0.27	6mm	1.00	-
V-GS-8MM-S	1/4	30.2	1.19	19.1	0.75	6.0	0.24	0.8	0.03	8.9	0.35	8mm	1.00	-
V-GS-10MM-S	1/2	31.0	1.22	19.1	0.75	8.0	0.31	0.8	0.03	10.9	0.43	10mm	1.00	-
V-GS-12MM-S	1/2	30.5	1.20	19.1	0.75	10.0	0.39	1.0	0.04	13.2	0.52	12mm	1.00	-
P-GS-18MM-S	3/4	31.0	1.22	19.1	0.75	15.0	0.59	1.0	0.04	19.3	0.76	18mm	1.50	-

MGS-W

MINI SHORT GLAND

Without shoulder



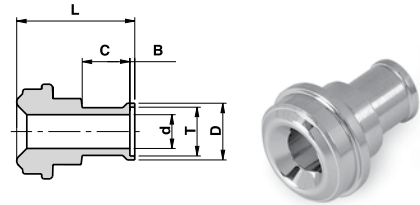
Ordering Information	Face Seal Size	L		C		d		T	W.T.	
	inch	mm	inch	mm	inch	mm	inch	inch / mm	mm	inch
V-MGS-1/4-W	1/4	15.2	0.60	6.4	0.25	4.6	0.18	1/4"	-	0.035
V-MGS-3/8-W	1/2	15.8	0.62	6.4	0.25	7.7	0.30	3/8"	-	0.035
V-MGS-1/2-W	1/2	15.8	0.62	6.4	0.25	10.2	0.40	1/2"	-	0.049
V-MGS-1/2-W W.T.=0.065	1/2	15.8	0.62	6.4	0.25	9.5	0.37	1/2"	-	0.065
V-MGS-6MM-W	1/4	15.2	0.60	6.4	0.25	4.0	0.16	6mm	1.00	-
V-MGS-8MM-W	1/4	15.8	0.62	6.4	0.25	6.0	0.24	8mm	1.00	-
V-MGS-10MM-W	1/2	15.8	0.62	6.4	0.25	8.0	0.31	10mm	1.00	-
V-MGS-12MM-W	1/2	15.8	0.62	6.4	0.25	10.0	0.39	12mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

MGS-S

MINI SHORT GLAND

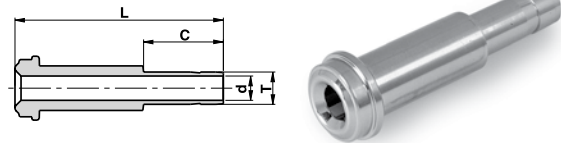
With shoulder



Ordering Information	Face Seal Size	L		C		d		B		D		T	W.T.	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch / mm	mm	inch
V-MGS-1/4-S	1/4	15.8	0.62	6.4	0.25	4.6	0.18	0.6	0.02	7.4	0.29	1/4"	-	0.035
V-MGS-3/8-S	1/2	16.5	0.65	6.4	0.25	7.7	0.30	0.8	0.03	10.4	0.41	3/8"	-	0.035
V-MGS-1/2-S	1/2	16.8	0.66	6.4	0.25	10.2	0.40	1.0	0.04	14.0	0.55	1/2"	-	0.049
V-MGS-1/2-S W.T.=0.065	1/2	16.8	0.66	6.4	0.25	9.5	0.37	1.0	0.04	14.0	0.55	1/2"	-	0.065
V-MGS-6MM-S	1/4	15.8	0.62	6.4	0.25	4.0	0.16	0.5	0.02	7.0	0.27	6mm	1.00	-
V-MGS-8MM-S	1/4	16.5	0.65	6.4	0.25	6.0	0.24	0.8	0.03	8.9	0.35	8mm	1.00	-
V-MGS-10MM-S	1/2	16.5	0.65	6.4	0.25	8.0	0.31	0.8	0.03	10.9	0.43	10mm	1.00	-
V-MGS-12MM-S	1/2	16.8	0.66	6.4	0.25	10.0	0.39	1.0	0.04	13.2	0.52	12mm	1.00	-

AG

GLAND ADAPTER TO LET-LOK®

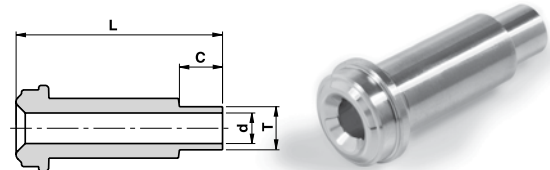


Ordering Information	Face Seal Size	L		C		d		T
	inch	mm	inch	mm	inch	mm	inch	inch/mm
V-AG-1/4	1/4	41.2	1.62	15.9	0.62	4.3	0.17	1/4"
P-AG-3/8	1/2	46.0	1.81	17.5	0.69	6.8	0.27	3/8"
V-AG-1/2	1/2	49.3	1.94	24.4	0.96	9.4	0.37	1/2"
V-AG-6M	1/4	41.2	1.62	15.7	0.62	4.0	0.16	6mm

MG-W

MALE GLAND

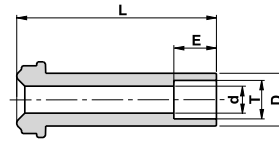
Short tube without shoulder



Ordering Information	Face Seal Size	L		C		d		T	W.T.	
	inch	mm	inch	mm	inch	mm	inch	inch / mm	mm	inch
V-MG-1/4-W	1/4	30.5	1.20	6.4	0.25	4.6	0.18	1/4"	-	0.035
V-MG-1/4-W 1.32	1/4	33.5	1.32	9.6	0.38	4.6	0.18	1/4"	-	0.035
V-MG-3/8-W	1/2	32.8	1.29	6.4	0.25	7.7	0.30	3/8"	-	0.035
V-MG-1/2-W	1/2	32.8	1.29	6.4	0.25	10.2	0.40	1/2"	-	0.049
V-MG-6MM-W	1/4	30.5	1.20	6.4	0.25	4.0	0.16	6mm	1.00	-
V-MG-8MM-W	1/4	30.5	1.20	6.4	0.25	6.0	0.24	8mm	1.00	-
V-MG-10MM-W	1/2	32.8	1.29	6.4	0.25	8.0	0.31	10mm	1.00	-
V-MG-12MM-W	1/2	32.8	1.29	6.4	0.25	10.0	0.39	12mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

GSW

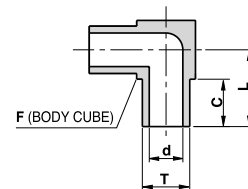
SOCKET WELD GLAND

Ordering Information	Face Seal Size	L		d		E		D		T
	inch	mm	inch	mm	inch	mm	inch	mm	inch	Tube O.D
V-GSW-1/8	1/8	17.8	0.70	2.4	0.09	2.5	0.10	5.1	0.20	1/8
V-GSW-1/4	1/4	33.3	1.31	4.6	0.18	7.1	0.28	8.9	0.35	1/4
V-GSW-1/4-W-0.75"	1/4	19.1	0.75	4.6	0.18	7.1	0.28	8.9	0.35	1/4
V-GSW-1/4-W-0.50"	1/4	12.7	0.50	4.6	0.18	7.1	0.28	8.9	0.35	1/4
V-GSW-3/8	1/2	38.1	1.50	7.1	0.28	7.9	0.31	15.2	0.60	3/8
V-GSW-1/2	1/2	38.1	1.50	10.2	0.40	9.6	0.38	15.2	0.60	1/2
P-GSW-3/4	3/4	50.8	2.00	15.7	0.62	11.2	0.44	22.4	0.88	3/4
P-GSW-1	1	56.4	2.22	22.1	0.87	15.7	0.62	30.2	1.19	1

ME-W

MINI ELBOW

Without shoulder



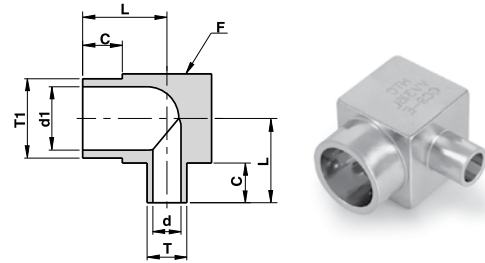
Ordering Information	L		C		d		F	T	W.T.	
	mm	inch	mm	inch	mm	inch	inch	inch / mm	mm	inch
V-ME-1/8-W	10.3	0.41	6.4	0.25	1.9	0.07	5/16	1/8"	-	0.028
V-ME-1/4-W	10.3	0.41	6.4	0.25	4.6	0.18	5/16	1/4"	-	0.035
V-ME-3/8-W	11.9	0.47	6.4	0.25	7.7	0.30	7/16	3/8"	-	0.035
V-ME-1/2-W	13.5	0.53	6.4	0.25	10.2	0.40	9/16	1/2"	-	0.049
V-ME-1/2-W W.T.=0.065	13.5	0.53	6.4	0.25	9.5	0.37	9/16	1/2"	-	0.065
V-ME-6MM-W	10.3	0.41	6.4	0.25	4.0	0.16	5/16	6mm	1.00	-
V-ME-8MM-W	11.9	0.47	6.4	0.25	6.0	0.24	7/16	8mm	1.00	-
V-ME-10MM-W	11.9	0.47	6.4	0.25	8.0	0.31	7/16	10mm	1.00	-
V-ME-12MM-W	13.5	0.53	6.4	0.25	10.0	0.39	9/16	12mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

MER-W

MINI ELBOW REDUCER

Without shoulder

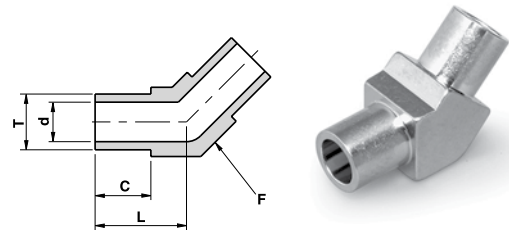


Ordering Information	L		C		d1		d		F	T1 Tube O.D	W.T. (T1)	T Tube O.D	W.T. (T)		
	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch/mm	mm	inch	inch/mm	mm	inch
V-MER-1/4 X 1/8-W	10.3	0.41	6.4	0.25	4.6	0.18	1.9	0.07	5/16	1/4"	-	0.035	1/8"	-	0.028
V-MER-3/8 X 1/4-W	11.9	0.47	6.4	0.25	7.7	0.30	4.6	0.18	7/16	3/8"	-	0.035	1/4"	-	0.035
V-MER-1/2 X 1/4-W	13.5	0.53	6.4	0.25	10.2	0.40	4.6	0.18	9/16	1/2"	-	0.049	1/4"	-	0.035
V-MER-1/2 X 3/8-W	13.5	0.53	6.4	0.25	10.2	0.40	7.7	0.30	9/16	1/2"	-	0.049	3/8"	-	0.035
V-MER-8MM X 6MM-W	11.9	0.47	6.4	0.25	6.0	0.24	4.0	0.16	7/16	8mm	1.00	-	6mm	1.00	-
V-MER-12MM X 6MM-W	13.5	0.53	6.4	0.25	10.0	0.39	4.0	0.16	9/16	12mm	1.00	-	6mm	1.00	-
V-MER-12MM X 8MM-W	13.5	0.53	6.4	0.25	10.0	0.39	6.0	0.24	9/16	12mm	1.00	-	8mm	1.00	-

ME-45°-W

MINI ELBOW 45°

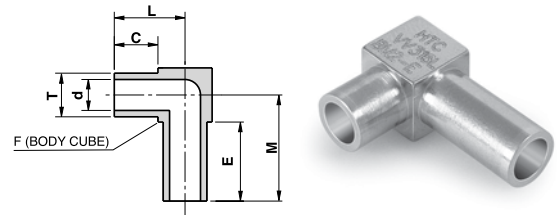
Without shoulder



Ordering Information	L		C		d		F	T Tube O.D	W.T.	
	mm	inch	mm	inch	mm	inch	inch	inch / mm	mm	inch
V-ME-1/4-W-45DEG	10.3	0.41	6.4	0.25	4.6	0.18	5/16	1/4"	-	0.035
V-ME-3/8-W-45DEG	11.9	0.47	6.4	0.25	7.7	0.30	7/16	3/8"	-	0.035
V-ME-1/2-W-45DEG	13.5	0.53	6.4	0.25	10.2	0.40	9/16	1/2"	-	0.049
V-ME-1/2-W-45DEG W.T.=0.065	13.5	0.53	6.4	0.25	9.5	0.37	9/16	1/2"	-	0.065
V-ME-6MM-W-45DEG	10.3	0.41	6.4	0.25	4.0	0.16	5/16	6mm	1.00	-
V-ME-8MM-W-45DEG	11.9	0.47	6.4	0.25	6.0	0.24	7/16	8mm	1.00	-
V-ME-10MM-W-45DEG	11.9	0.47	6.4	0.25	8.0	0.31	7/16	10mm	1.00	-
V-ME-12MM-W-45DEG	13.5	0.53	6.4	0.25	10.0	0.39	9/16	12mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

MEX-W

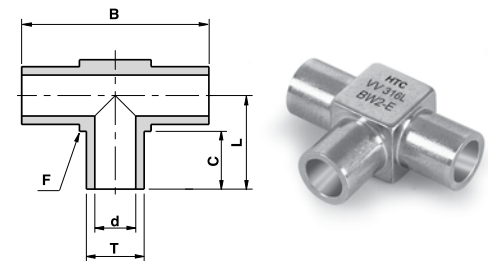
MINI ELBOWWith extended leg
Without shoulder

Ordering Information	L		C		M		E		d		F	T	W.T.
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch
V-MEX-1/4-W 0.41X0.66	10.3	0.41	6.4	0.25	16.8	0.66	12.7	0.50	4.6	0.18	5/16	1/4	0.035
V-MEX-1/4-W 0.41X0.61	10.3	0.41	6.4	0.25	15.4	0.61	11.4	0.45	4.6	0.18	5/16	1/4	0.035
V-MEX-1/4-W 0.66X0.66"	16.8	0.66	12.7	0.50	16.8	0.66	12.7	0.50	4.6	0.18	5/16	1/4	0.035

MT-W

MINI TEE

Without shoulder



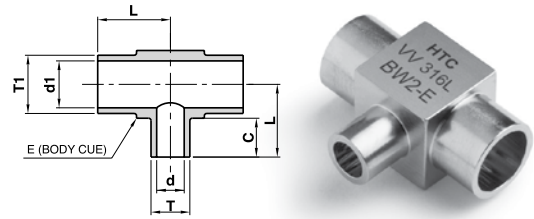
Ordering Information	L		B		C		d		F	T	W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch / mm	mm	inch
V-MT-1/8-W	10.3	0.41	20.7	0.81	6.4	0.25	1.9	0.07	5/16	1/8"	-	0.028
V-MT-1/4-W	10.3	0.41	20.7	0.81	6.4	0.25	4.6	0.18	5/16	1/4"	-	0.035
V-MT-3/8-W	11.9	0.47	23.9	0.94	6.4	0.25	7.7	0.30	7/16	3/8"	-	0.035
V-MT-1/2-W	13.5	0.53	27.1	1.07	6.4	0.25	10.2	0.40	9/16	1/2"	-	0.049
V-MT-1/2-W W.T.=0.065	13.5	0.53	27.1	1.07	6.4	0.25	9.5	0.37	9/16	1/2"	-	0.065
V-MT-6MM-W	10.3	0.41	20.7	0.81	6.4	0.25	4.0	0.16	5/16	6mm	1.00	-
V-MT-8MM-W	11.9	0.47	23.9	0.94	6.4	0.25	6.0	0.24	7/16	8mm	1.00	-
V-MT-10MM-W	11.9	0.47	23.9	0.94	6.4	0.25	8.0	0.31	7/16	10mm	1.00	-
V-MT-12MM-W	13.5	0.53	27.1	1.07	6.4	0.25	10.0	0.39	9/16	12mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

MTR-W

MINI TEE REDUCER

Without shoulder

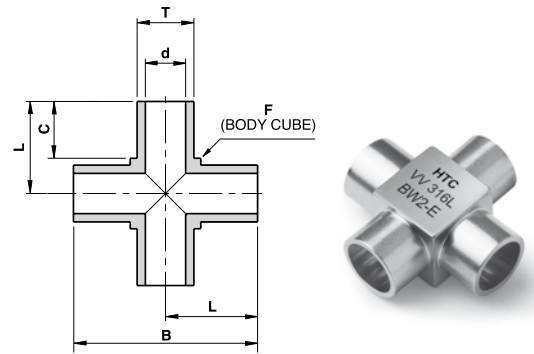


Ordering Information	L		B		C		d1		d		F	T1	W.T. (T1)		T	W.T. (T)	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch / mm	mm	inch	inch / mm	mm	inch
V-MTR-1/2 X 1/4-W	13.5	0.53	27.1	1.07	6.4	0.25	10.2	0.40	4.6	0.18	9/16	1/2"	-	0.049	1/4"	-	0.035
V-MTR-1/2 X 3/8-W	13.5	0.53	27.1	1.07	6.4	0.25	10.2	0.40	7.7	0.30	9/16	1/2"	-	0.049	3/8"	-	0.035
V-MTR-3/8 X 1/4-W	11.9	0.47	23.9	0.94	6.4	0.25	7.7	0.30	4.6	0.18	7/16	3/8"	-	0.035	1/4"	-	0.035
V-MTR-8MMX6MM-W	11.9	0.47	23.9	0.94	6.4	0.25	6.0	0.24	4.0	0.16	7/16	8mm	1.00	-	6mm	1.00	-
V-MTR-12MMX6MM-W	13.5	0.53	27.1	1.07	6.4	0.25	10.0	0.39	4.0	0.16	9/16	12mm	1.00	-	6mm	1.00	-
V-MTR-12MMX8MM-W	13.5	0.53	27.1	1.07	6.4	0.25	10.0	0.39	6.0	0.24	9/16	12mm	1.00	-	8mm	1.00	-

MC-W

MINI CROSS

Without shoulder



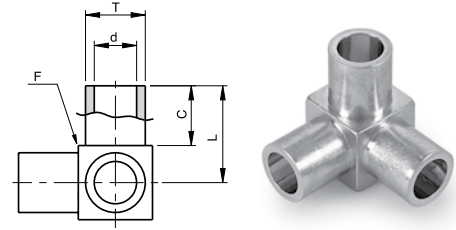
Ordering Information	L		B		C		d		F	T	W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch / mm	mm	inch
V-MC-1/8-W	10.3	0.41	20.7	0.81	6.4	0.25	1.9	0.07	5/16	1/8"	-	0.028
V-MC-1/4-W	10.3	0.41	20.7	0.81	6.4	0.25	4.6	0.18	5/16	1/4"	-	0.035
V-MC-3/8-W	11.9	0.47	23.9	0.94	6.4	0.25	7.7	0.30	7/16	3/8"	-	0.035
V-MC-1/2-W	13.5	0.53	27.1	1.07	6.4	0.25	10.2	0.40	9/16	1/2"	-	0.049
V-MC-1/2-W W.T.=0.065	13.5	0.53	27.1	1.07	6.4	0.25	9.5	0.37	9/16	1/2"	-	0.065
V-MC-6MM-W	10.3	0.41	20.7	0.81	6.4	0.25	4.0	0.16	5/16	6mm	1.00	-
V-MC-8MM-W	11.9	0.47	23.9	0.94	6.4	0.25	6.0	0.24	7/16	8mm	1.00	-
V-MC-10MM-W	11.9	0.47	23.9	0.94	6.4	0.25	8.0	0.31	7/16	10mm	1.00	-
V-MC-12MM-W	13.5	0.53	27.1	1.07	6.4	0.25	10.0	0.39	9/16	12mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

MTB-W

MINI TRI-EL

Without shoulder

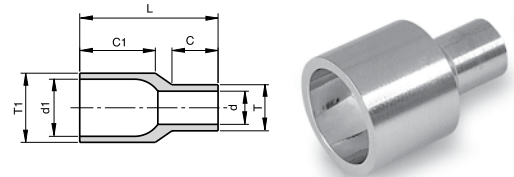


Ordering Information	L		C		d		F	T Tube O.D	W.T.	
	mm	inch	mm	inch	mm	inch	inch	inch / mm	mm	inch
V-MTB-1/8-W	10.3	0.41	6.4	0.25	1.9	0.07	5/16	1/8"	-	0.028
V-MTB-1/4-W	10.3	0.41	6.4	0.25	4.6	0.18	5/16	1/4"	-	0.035
V-MTB-3/8-W	11.9	0.47	6.4	0.25	7.7	0.30	7/16	3/8"	-	0.035
V-MTB-1/2-W	13.5	0.53	6.4	0.25	10.2	0.40	9/16	1/2"	-	0.049
V-MTB-6MM-W	10.3	0.41	6.4	0.25	4.0	0.16	5/16	6mm	1.00	-
V-MTB-8MM-W	11.9	0.47	6.4	0.25	6.0	0.24	7/16	8mm	1.00	-
V-MTB-10MM-W	11.9	0.47	6.4	0.25	8.0	0.31	7/16	10mm	1.00	-
V-MTB-12MM-W	13.5	0.53	6.4	0.25	10.0	0.39	9/16	12mm	1.00	-

RU-W

REDUCING UNION

Without shoulder

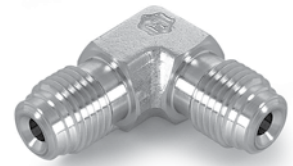
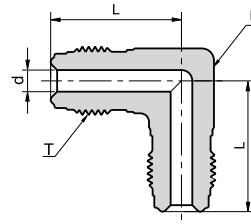


Ordering Information	L		C1		C		d1		d		T1 Tube O.D	W.T. (T1)		T Tube O.D	W.T. (T)	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch/ mm	mm	inch	inch/ mm	mm	inch
V-RU-1/4 X 1/8-W	19.1	0.75	10.4	0.41	6.4	0.25	4.6	0.18	1.9	0.07	1/4"	-	0.035	1/8"	-	0.028
V-RU-3/8 X 1/4-W	19.1	0.75	10.4	0.41	6.4	0.25	7.7	0.30	4.6	0.18	3/8"	-	0.035	1/4"	-	0.035
V-RU-1/2 X 1/4-W	19.1	0.75	10.4	0.41	6.4	0.25	10.2	0.40	4.6	0.18	1/2"	-	0.049	1/4"	-	0.035
V-RU-1/2 X 3/8-W	19.1	0.75	10.4	0.41	6.4	0.25	10.2	0.40	7.7	0.30	1/2"	-	0.049	3/8"	-	0.035
P-RU- 1 X 1/2-W	19.1	0.75	10.4	0.41	6.4	0.25	22.1	0.87	10.2	0.40	1"	-	0.065	1/2"	-	0.049
V-RU- 8MM X 6MM-W	19.1	0.75	10.4	0.41	6.4	0.25	6.0	0.24	4.0	0.16	8mm	1.00	-	6mm	1.00	-
V-RU- 10MM X 6MM-W	19.1	0.75	10.4	0.41	6.4	0.25	8.0	0.31	4.0	0.16	10mm	1.00	-	6mm	1.00	-
V-RU- 10MM X 8MM-W	19.1	0.75	10.4	0.41	6.4	0.25	8.0	0.31	6.0	0.24	10mm	1.00	-	8mm	1.00	-
V-RU- 12MM X 6MM-W	19.1	0.75	10.4	0.41	6.4	0.25	10.0	0.39	4.0	0.16	12mm	1.00	-	6mm	1.00	-
V-RU- 12MM X 8MM-W	19.1	0.75	10.4	0.41	6.4	0.25	10.0	0.39	6.0	0.24	12mm	1.00	-	8mm	1.00	-
V-RU- 12MM X 10MM-W	19.1	0.75	10.4	0.41	6.4	0.25	10.0	0.39	8.0	0.31	12mm	1.00	-	10mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.

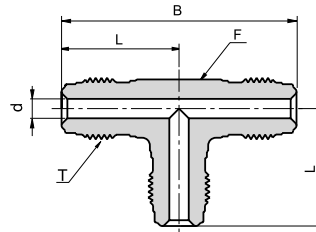
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

EU
ELBOW UNION



Ordering Information	Face Seal Size	L		d		F	T
	inch	mm	inch	mm	inch	inch	Thread Size
P-EU-1/4	1/4	27.2	1.07	4.6	0.18	1/2	9/16-18
P-EU-1/2	1/2	36.8	1.45	10.2	0.40	13/16	7/8-14
P-EU-3/4	3/4	48.8	1.92	15.8	0.62	1 1/4	1 1/4 -18
P-EU-1	1	50.8	2.00	22.1	0.87	1 11/16	1 1/2 -20

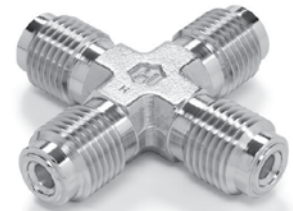
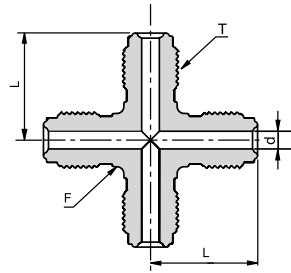
TU
TEE UNION



Ordering Information	Face Seal Size	L		B		d		F	T
	inch	mm	inch	mm	inch	mm	inch	inch	Thread Size
P-TU-1/4	1/4	27.2	1.07	54.4	2.14	4.6	0.18	1/2	9/16-18
P-TU-1/2	1/2	36.8	1.45	73.6	2.90	10.2	0.40	13/16	7/8-14
P-TU-3/4	3/4	48.8	1.92	97.6	3.84	15.8	0.62	1 1/4	1 1/4 -18
P-TU-1	1	50.8	2.00	101.6	4.00	22.1	0.87	1 11/16	1 1/2 -20

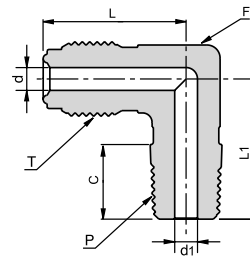
Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

CU

CROSS UNION

Ordering Information	Face Seal Size	L		d		F	T
	inch	mm	inch	mm	inch	inch	Thread Size inch
P-CU-1/4	1/4	27.2	1.07	4.6	0.18	1/2	9/16-18
P-CU-1/2	1/2	36.8	1.45	10.2	0.40	13/16	7/8-14

EM

MALE ELBOW

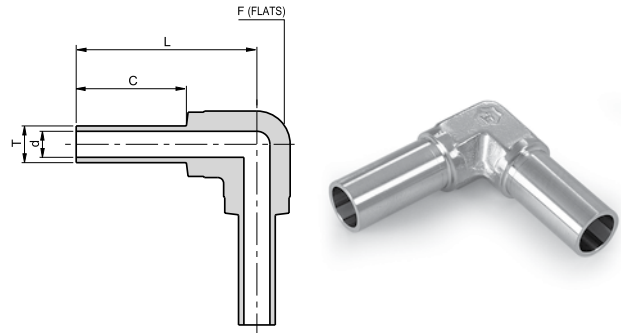
Ordering Information	Face Seal Size	L		L1		C		d		d1		F	T	P
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	Thread Size inch	NPT-M inch
P-EM-1/4 X 1/8	1/4	27.2	1.07	22.1	0.87	9.6	0.38	4.6	0.18	4.6	0.18	1/2	9/16-18	1/8
P-EM-1/4 X 1/4	1/4	27.2	1.07	26.7	1.05	14.2	0.56	4.6	0.18	4.6	0.18	1/2	9/16-18	1/4
P-EM-1/4 X 1/2	1/4	31.2	1.45	33.5	1.26	19.0	0.56	4.6	0.40	9.5	0.37	13/16	9/16-18	1/2
P-EM-1/2 X 1/4	1/2	36.8	1.23	32.0	1.32	14.2	0.75	10.2	0.18	4.6	0.40	13/16	7/8-14	1/4
P-EM-1/2 X 3/8	1/2	36.8	1.45	32.0	1.26	14.2	0.56	10.2	0.40	9.5	0.37	13/16	7/8-14	3/8
P-EM-1/2 X 1/2	1/2	36.8	1.45	36.8	1.45	19.0	0.75	10.2	0.40	10.2	0.40	13/16	7/8-14	1/2

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

EW-W

ELBOW

Without shoulder

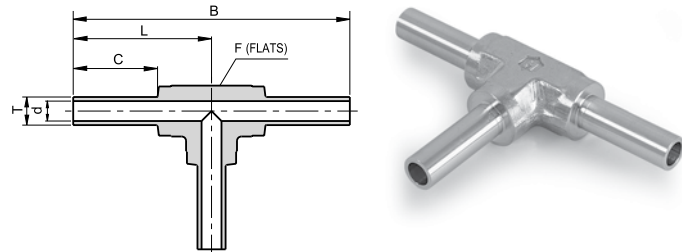


Ordering Information	L		C		d		F	T	W.T.	
	mm	inch	mm	inch	mm	inch	inch	inch/mm	mm	inch
P-EW-1/4-W	31.2	1.23	19.1	0.75	4.6	0.18	7/16	1/4"	-	0.035
P-EW-3/8-W	30.5	1.20	19.1	0.75	7.7	0.30	7/16	3/8"	-	0.035
P-EW-1/2-W	34.0	1.34	19.1	0.75	10.2	0.40	11/16	1/2"	-	0.049
P-EW-1/2-W W.T.=0.065	34.0	1.34	19.1	0.75	9.5	0.37	11/16	1/2"	-	0.065
P-EW-3/4-W W.T.=0.049	37.1	1.46	19.1	0.75	16.6	0.65	15/16	3/4"	-	0.049
P-EW-3/4-W W.T.=0.065	37.1	1.46	19.1	0.75	15.8	0.62	15/16	3/4"	-	0.065
P-EW-1-W W.T.=0.065	47.0	1.85	24.4	0.96	22.1	0.87	1 3/8	1"	-	0.065
P-EW-1-W W.T.=0.120	47.0	1.85	24.4	0.96	19.4	0.76	1 3/8	1"	-	0.120
P-EW-6M-W	31.2	1.23	19.1	0.75	4.0	0.16	7/16	6mm	1.00	-
P-EW-8MM-W	31.2	1.23	19.1	0.75	6.0	0.24	7/16	8mm	1.00	-
P-EW-10MM-W	34.0	1.34	19.1	0.75	8.0	0.31	11/16	10mm	1.00	-
P-EW-12MM-W	34.0	1.34	19.1	0.75	10.0	0.39	11/16	12mm	1.00	-

TW-W

TEE

Without shoulder



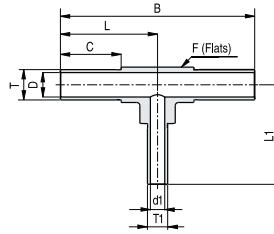
Ordering Information	L		B		C		d		F	T	W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch/mm	mm	inch
P-TW-1/4-W	31.2	1.23	62.5	2.46	19.1	0.75	4.6	0.18	7/16	1/4"	-	0.035
P-TW-3/8-W	30.5	1.20	61.0	2.40	19.1	0.75	7.7	0.30	7/16	3/8"	-	0.035
P-TW-1/2-W	34.0	1.34	68.1	2.68	19.1	0.75	10.2	0.40	11/16	1/2"	-	0.049
P-TW-1/2-W W.T.=0.065	34.0	1.34	68.1	2.68	19.1	0.75	9.5	0.37	11/16	1/2"	-	0.065
P-TW-3/4-W W.T.=0.065	37.1	1.46	74.2	2.92	19.1	0.75	15.8	0.62	15/16	3/4"	-	0.065
P-TW-3/4-W W.T.=0.049	37.1	1.46	74.2	2.92	19.1	0.75	16.6	0.65	15/16	3/4"	-	0.049
P-TW-1-W W.T.=0.065	47.0	1.85	94.0	3.70	24.4	0.96	22.1	0.87	1 3/8	1"	-	0.065
P-TW-1-W W.T.=0.120	47.0	1.85	94.0	3.70	24.4	0.96	19.4	0.76	1 3/8	1"	-	0.120
P-TW-6MM-W	31.2	1.23	62.5	2.46	19.1	0.75	4.0	0.16	7/16	6mm	1.00	-
P-TW-8MM-W	31.2	1.23	62.5	2.46	19.1	0.75	6.0	0.24	7/16	8mm	1.00	-
P-TW-10MM-W	34.0	1.34	68.1	2.68	19.1	0.75	8.0	0.31	11/16	10mm	1.00	-
P-TW-12MM-W	34.0	1.34	68.1	2.68	19.1	0.75	10.0	0.39	11/16	12mm	1.00	-

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

TWR-W

TEE REDUCER

Without shoulder

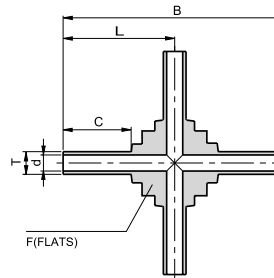


Ordering Information	L		L1		B		C		d		d1		F		T	W.T.	T1	W.T.
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch/mm	inch/mm	inch/mm	inch/mm	inch/mm	inch/mm
P-TWR-3/8X1/4 W	30.5	1.20	31.2	1.23	61.0	2.40	19.1	0.75	7.7	0.30	4.6	0.18	7/16	3/8"	0.035"	1/4"	0.035"	
P-TWR-1/2X1/4 W	34.0	1.34	34.0	1.34	68.0	2.68	19.1	0.75	10.2	0.40	4.6	0.18	11/16	1/2"	0.049"	1/4"	0.035"	
P-TWR-1/2X3/8 W	34.0	1.34	34.0	1.34	68.0	2.68	19.1	0.75	10.2	0.40	7.7	0.30	11/16	1/2"	0.049"	3/8"	0.035"	
P-TWR-3/4X1/4 W W.T.= 0.049 X 0.035	37.1	1.46	37.1	1.46	74.2	2.92	19.1	0.75	16.6	0.65	4.6	0.18	15/16	3/4"	0.049"	1/4"	0.035"	
P-TWR-3/4X1/4 W W.T.=0.065 X 0.035	37.1	1.46	37.1	1.46	74.2	2.92	19.1	0.75	15.8	0.62	4.6	0.18	15/16	3/4"	0.065"	1/4"	0.035"	
P-TWR-3/4X1/2 W W.T.=0.049	37.1	1.46	37.1	1.46	74.2	2.92	19.1	0.75	16.6	0.65	10.2	0.40	15/16	3/4"	0.049"	1/2"	0.049"	
P-TWR-12MMX6MM W	34.0	1.34	34.0	1.34	68.0	2.68	19.1	0.75	10.0	0.39	4.0	0.16	11/16	12mm	1.00mm	6mm	1.00mm	

CW-W

CROSS

Without shoulder



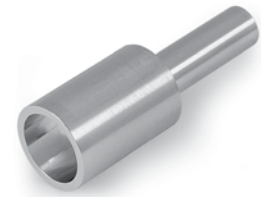
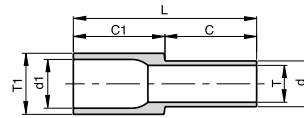
Ordering Information	L		B		C		d		F		T	W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	inch/mm	inch/mm	mm	inch	inch
P-CW-1/4-W	31.2	1.23	62.5	2.46	19.1	0.75	4.6	0.18	17mm	1/4"	-	0.035	
P-CW-3/8-W	30.5	1.20	61.0	2.40	19.1	0.75	7.7	0.30	17mm	3/8"	-	0.035	
P-CW-1/2-W	31.0	1.22	62.0	2.44	19.1	0.75	10.2	0.40	17mm	1/2"	-	0.049	
P-CW-1/2-W W.T.=0.065	31.0	1.22	62.0	2.44	19.1	0.75	9.5	0.37	17mm	1/2"	-	0.065	
P-CW-6MM-W	31.2	1.23	62.5	2.46	19.1	0.75	4.0	0.16	17mm	6mm	1.00	-	
P-CW-8MM-W	30.5	1.20	61.0	2.40	19.1	0.75	6.0	0.24	17mm	8mm	1.00	-	
P-CW-10MM-W	31.0	1.22	62.0	2.44	19.1	0.75	8.0	0.31	17mm	10mm	1.00	-	
P-CW-12MM-W	31.0	1.22	62.0	2.44	19.1	0.75	10.0	0.39	17mm	12mm	1.00	-	

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

RW-W

REDUCER

Without shoulder



Ordering Information	L		C1		C		d1		d		T1 Tube O.D.	W.T. (T1)		T Tube O.D.	W.T. (T)	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch/mm	mm	inch	inch/mm	mm	inch
V-RW-1/4X1/8-W	38.1	1.50	19.1	0.75	19.1	0.75	4.6	0.18	1.9	0.07	1/4"	-	0.035	1/8"	-	0.028
V-RW-3/8X1/4-W	38.1	1.50	19.1	0.75	19.1	0.75	7.7	0.30	4.6	0.18	3/8"	-	0.035	1/4"	-	0.035
V-RW-1/2X1/4-W	38.1	1.50	19.1	0.75	19.1	0.75	10.2	0.40	4.6	0.18	1/2"	-	0.049	1/4"	-	0.035
V-RW-1/2X3/8-W	38.1	1.50	19.1	0.75	19.1	0.75	10.2	0.40	7.7	0.30	1/2"	-	0.049	3/8"	-	0.035
V-RW-3/4X1/2 W W.T.=0.049	38.5	1.51	19.1	0.75	19.1	0.75	16.6	0.65	10.2	0.40	3/4"	-	0.049	1/2"	-	0.049
P-RW-3/4X1/2 W W.T.=0.065X0.049	38.5	1.51	19.1	0.75	19.1	0.75	15.8	0.62	10.2	0.40	3/4"	-	0.065	1/2"	-	0.065
P-RW-3/4X1/4 W W.T.=0.049X0.035	38.5	1.51	19.1	0.75	19.1	0.75	16.6	0.65	4.6	0.18	3/4"	-	0.049	1/4"	-	0.049
P-RW-1X1/2 W W.T.= 0.065X0.049	40.5	1.59	19.1	0.75	19.1	0.75	22.1	0.87	10.2	0.40	1"	-	0.065	1/2"	-	0.049
V-RW-8MM X 6MM-W	38.1	1.50	19.1	0.75	19.1	0.75	6.0	0.24	4.0	0.16	8mm	1.00	-	6mm	1.00	-
V-RW-10MM X 6MM-W	38.1	1.50	19.1	0.75	19.1	0.75	8.0	0.31	4.0	0.16	10mm	1.00	-	6mm	1.00	-
V-RW-10MM X 8MM-W	38.1	1.50	19.1	0.75	19.1	0.75	8.0	0.31	6.0	0.24	10mm	1.00	-	8mm	1.00	-
V-RW-12MM X 6MM-W	38.1	1.50	19.1	0.75	19.1	0.75	10.0	0.39	4.0	0.16	12mm	1.00	-	6mm	1.00	-
V-RW-12MM X 8MM-W	38.1	1.50	19.1	0.75	19.1	0.75	10.0	0.39	6.0	0.24	12mm	1.00	-	8mm	1.00	-
V-RW-12MM X 10MM-W	38.1	1.50	19.1	0.75	19.1	0.75	10.0	0.39	8.0	0.31	12mm	1.00	-	10mm	1.00	-

UB-W

BUTTWELD UNION

Without shoulder



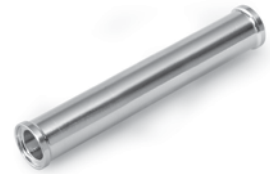
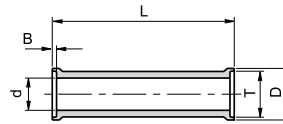
Ordering Information	L		d		T Tube O.D	W.T.
	mm	inch	mm	inch	inch	inch
V-UB-1/4-W	24.3	0.96	4.6	0.18	1/4	0.035
V-UB-3/8-W	23.9	0.94	7.7	0.30	3/8	0.035
V-UB-1/2-W	23.4	0.92	10.2	0.40	1/2	0.049
P-UB-3/4-W W.T.=0.049	23.4	0.92	16.6	0.65	3/4	0.049
P-UB-3/4-W W.T.=0 .065	23.4	0.92	15.8	0.62	3/4	0.065
P-UB-1-W W.T.=0 .065	29.7	1.17	22.1	0.87	1	0.065

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

UB-S

BUTTWELD UNION

With shoulder

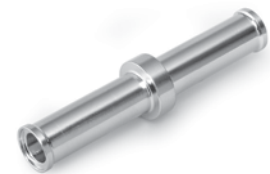
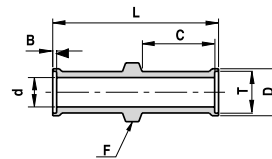


Ordering Information	L		d		B		D		T	W.T.
	mm	inch	mm	inch	mm	inch	mm	inch	Tube O.D.	inch
V-UB-1/4-S	25.4	1.00	4.6	0.18	0.55	0.02	7.4	0.29	1/4	0.035
V-UB-3/8-S	25.4	1.00	7.7	0.30	0.76	0.03	10.4	0.41	3/8	0.035
V-UB-1/2-S	25.4	1.00	10.2	0.40	1.00	0.04	14.0	0.55	1/2	0.049
P-UB-3/4-S W.T.=0 .049	25.4	1.00	16.5	0.65	1.00	0.04	20.3	0.80	3/4	0.049
P-UB-3/4-S W.T.=0 .065	25.4	1.00	15.8	0.62	1.00	0.04	20.3	0.80	3/4	0.065
P-UB-1-S W.T.=0 .065	31.8	1.25	22.1	0.87	1.00	0.04	26.9	1.06	1	0.065

UBL-S

BUTTWELD UNION

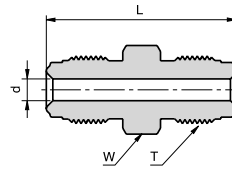
With locator and shoulder



Ordering Information	L		C		d		B		D		F		T	W.T.
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Tube O.D.	inch
V-UBL-1/4-S	42.9	1.69	19.1	0.75	4.6	0.18	0.6	0.02	7.4	0.29	9.1	0.36	1/4	0.035
V-UBL-3/8-S	43.4	1.71	19.1	0.75	7.7	0.30	0.8	0.03	10.4	0.41	10.7	0.42	3/8	0.035
V-UBL-1/2-S	43.9	1.73	19.1	0.75	10.2	0.40	1.0	0.04	14.0	0.55	15.2	0.60	1/2	0.049

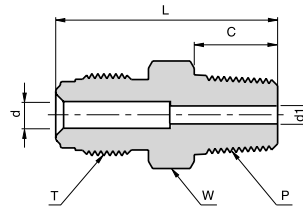
Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

UM
MALE UNION



Ordering Information	Face Seal Size	L		d		W	T
	inch	mm	inch	mm	inch	inch	Thread Size
P-UM 1/4	1/4	39.4	1.55	4.6	0.18	5/8	9/16 - 18
P-UM 1/2	1/2	46.7	1.84	10.2	0.40	15/16	7/8 - 14
P-UM 3/4	3/4	62.0	2.44	15.8	0.62	1 5/16	1 1/4 - 18
P-UM 1	1	65.8	2.59	22.2	0.87	1 5/8	1 1/2 - 20

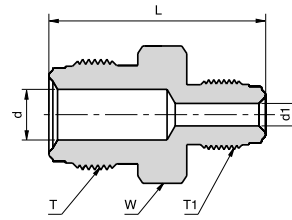
CM
**MALE TO MALE
NPT CONNECTOR**



Ordering Information	Face Seal Size	L		C		d		d1		W	T	P
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	Thread Size	NPT-M
P-CM-1/4 X 1/8	1/4	33.3	1.31	9.6	0.38	4.6	0.18	4.6	0.18	5/8	9/16 - 18	1/8
P-CM-1/4 X 1/4	1/4	37.8	1.49	14.2	0.56	4.6	0.18	4.6	0.18	5/8	9/16 - 18	1/4
P-CM-1/4 X R1/4 BSPT	1/4	37.8	1.49	14.2	0.56	4.6	0.18	4.6	0.18	5/8	9/16 - 18	1/4 BSPT
P-CM-1/2 X 1/4	1/2	41.9	1.65	14.2	0.56	10.2	0.40	7.1	0.28	15/16	7/8 - 14	1/4
P-CM-1/2 X 3/8	1/2	41.9	1.65	14.2	0.56	9.6	0.38	9.6	0.38	15/16	7/8 - 14	3/8
P-CM-1/2 X 1/2	1/2	46.7	1.84	19.0	0.75	10.2	0.40	10.2	0.40	15/16	7/8 - 14	1/2
P-CM-3/4 X 3/4	3/4	55.6	2.19	19.0	0.75	15.8	0.62	15.8	0.62	1 5/16	1 1/4 - 18	3/4
P-CM-1 X 1	1	62.7	2.47	23.9	0.94	22.2	0.87	22.2	0.87	1 5/8	1 1/2 - 20	1

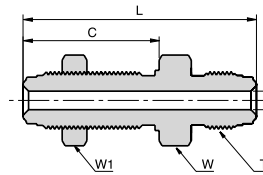
Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

RUM

MALE REDUCING UNION

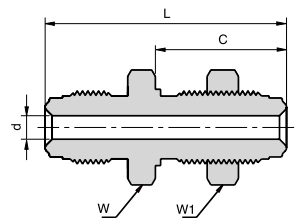
Ordering Information	Face Seal Size	Face Seal Size ¹	L		d		d1		W	T Thread Size	T1 Thread Size
	inch	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch
P-RUM 1/4 X 1/8	1/4	1/8	34.8	1.37	4.6	0.18	2.4	0.09	5/8	9/16-18	5/16-24
P-RUM 1/2 X 1/4	1/2	1/4	43.4	1.71	10.2	0.40	4.6	0.18	15/16	7/8-1/4	9/16-18

BU

BULKHEAD UNION

Ordering Information	Face Seal Size	L		C		d		W	W1	T Thread Size	Panel hole drill Size
	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch
P-BU 1/4	1/4	56.6	2.23	33.0	1.30	4.6	0.18	3/4	3/4	9/16-18	19/32
P-BU 1/2	1/2	65.3	2.57	37.6	1.48	10.2	0.40	1 1/16	1 1/16	7/8-14	29/32

SBU

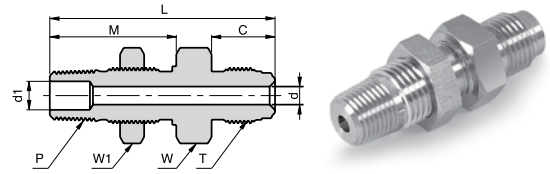
SHORT BULKHEAD UNION

Ordering Information	Face Seal Size	L		C		d		W	W1	T Thread Size	Panel hole drill Size
	inch	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch
P-SBU 1/4	1/4	46.2	1.82	25.1	0.99	4.6	0.18	3/4	3/4	9/16-18	19/32
P-SBU 1/2	1/2	54.4	2.14	28.2	1.11	10.2	0.40	1 1/16	1 1/16	7/8-14	29/32

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

BCM

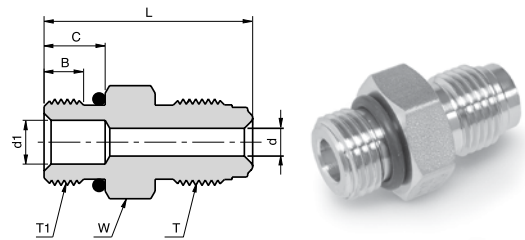
**MALE TO NPT
BULKHEAD CONNECTOR**



Ordering Information	Face Seal Size	L		C		d		M		d1		W	W1	T Thread Size	P NPT-M	Panel hole drill Size
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
P-BCM 1/4 X 1/4	1/4	56.1	2.21	15.8	0.62	4.6	0.18	31.5	1.24	7.1	0.28	13/16	13/16	9/16 -18	1/4	19/32
P-BCM 1/2 X 1/4	1/2	59.4	2.34	17.8	0.70	10.2	0.40	31.5	1.24	7.1	0.28	15/16	13/16	7/8 -14	1/4	19/32

CMOB

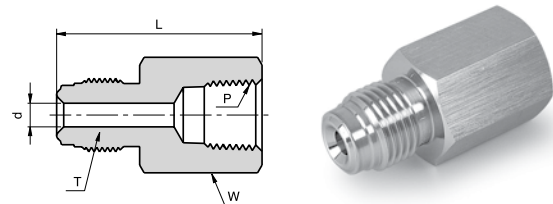
**MALE TO SEAL
O-RING CONNECTOR**



Ordering Information	Face Seal Size	L		C		B		d		d1		W	T Thread size	T1 Thread size	O-Ring Size
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	
P-CMOB 1/4 X 9/16	1/4	33.8	1.33	9.9	0.39	6.4	0.25	4.6	0.18	7.1	0.28	3/4	9/16 -18	9/16 -18	3-906
P-CMOB 1/2 X 7/8	1/2	42.2	1.66	12.7	0.50	10.2	0.40	7.1	0.28	15.0	0.59	1	7/8 -14	7/8 -14	3-910
P-CMOB 1/2 X 9/16	1/2	37.6	1.48	9.9	0.39	6.4	0.25	7.1	0.28	7.1	0.28	15/16	7/8 -14	9/16 -18	3-906

FC

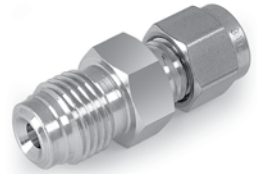
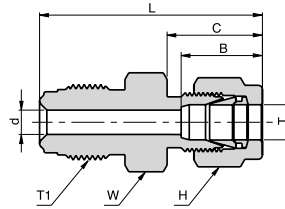
**MALE TO FEMALE
NPT CONNECTOR**



Ordering Information	Face Seal Size	L		d		W	T Thread Size	P NPT-F
	inch	mm	inch	mm	inch	inch	inch	inch
P-FC 1/4 X 1/8	1/4	35.8	1.41	4.6	0.18	5/8	9/16 -18	1/8
P-FC 1/4 X 1/4	1/4	39.1	1.54	4.6	0.18	3/4	9/16 -18	1/4
P-FC 1/2 X 1/4	1/2	39.1	1.54	10.2	0.40	15/16	7/8 -14	1/4
P-FC 1/2 X 3/8	1/2	44.7	1.76	10.2	0.40	15/16	7/8 -14	3/8
P-FC 1/2 X 1/2	1/2	50.5	1.99	10.2	0.40	1 1/16	7/8 -14	1/2
P-FC 3/4 X 3/4	3/4	59.9	2.36	15.8	0.62	1 5/16	1 1/4 -18	3/4
P-FC 1 X 1	1	63.8	2.51	22.1	0.87	1 5/8	1 1/2 -20	1

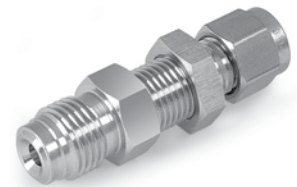
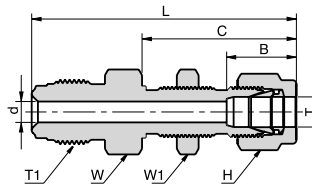
Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

UGL

**MALE TO
LET-LOK UNION**

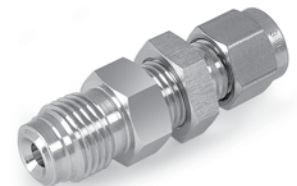
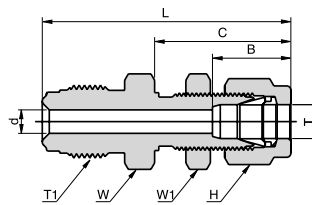
Ordering Information	Face Seal Size	L		C		B		d		W	H	T Tube O.D.	T1 Thread Size
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch
P-UGL 1/4 X 1/8	1/4	38.9	1.53	15.2	0.60	12.7	0.50	4.6	0.18	5/8	7/16	1/8	9/16 - 18
P-UGL 1/4 X 1/4	1/4	41.1	1.62	17.8	0.70	15.2	0.60	4.6	0.18	5/8	9/16	1/4	9/16 - 18
P-UGL 1/4 X 3/8	1/4	42.1	1.66	19.4	0.76	16.8	0.66	4.6	0.18	5/8	11/16	3/8	9/16 - 18
P-UGL 1/2 X 3/8	1/2	46.7	1.84	19.4	0.76	16.8	0.66	7.1	0.28	15/16	11/16	3/8	7/8 - 14
P-UGL 1/2 X 1/2	1/2	49.5	1.95	21.8	0.86	22.9	0.90	10.2	0.40	15/16	7/8	1/2	7/8 - 14

BUL

**MALE TO BULKHEAD
LET-LOK® UNION**

Ordering Information	Face Seal Size	L		C		B		d		W	W1	H	T Tube O.D.	T1 Thread Size	Panel hole drill Size
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch	inch
P-BUL 1/4 X 1/4	1/4	57.2	2.25	33.5	1.32	15.2	0.60	4.6	0.18	5/8	5/8	9/16	1/4	9/16 - 18	29/64
P-BUL 1/2 X 3/8	1/4	64.5	2.54	36.8	1.45	16.8	0.66	7.1	0.28	15/16	3/4	11/16	3/8	7/8 - 14	37/64
P-BUL 1/2 X 1/2	1/2	69.9	2.74	19.4	1.65	22.9	0.90	10.2	0.40	15/16	15/16	7/8	1/2	7/8 - 14	49/64

SBUL

**MALE TO SHORT BULKHEAD
LET-LOK UNION**

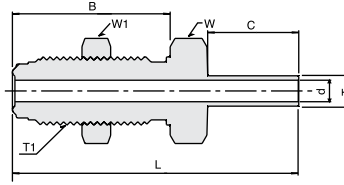
Ordering Information	Face Seal Size	L		C		B		d		W	W1	H	T Tube O.D.	T1 Thread Size	Panel hole drill Size
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch	inch
P-SBUL 1/4 X 1/4	1/4	47.8	1.88	26.7	1.05	15.2	0.60	4.6	0.18	5/8	5/8	9/16	1/4	9/16-18	29/64

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

BHUT-W

BULKHEAD TO TUBE UNION

Without shoulder

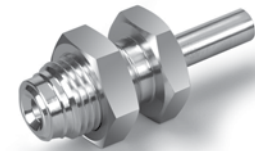
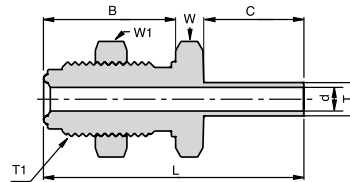


Ordering Information	Face Seal Size	L		B		C		d		W	W1	T Tube O.D.	T1 Thread Size	Panel hole drill Size
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
P-BHUT- 1/4 X 1/4-W	1/4	59.9	2.36	33.0	1.30	19.1	0.75	4.6	0.18	3/4	3/4	1/4	9/16 - 18	19/32
P-BHUT- 1/2 X 1/2-W	1/2	66.6	2.62	37.6	1.48	19.1	0.75	10.2	0.40	1 1/16	1 1/16	1/2	7/8 - 14	29/32

SBHUT-W

SHORT BULKHEAD TO TUBE UNION

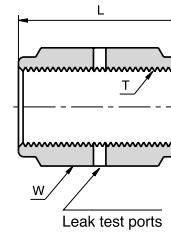
Without shoulder



Ordering Information	Face Seal Size	L		B		C		d		W	W1	T Tube O.D.	T1 Thread Size	Panel hole drill Size
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
P-SBHUT- 1/4 X 1/4-W	1/4	49.5	1.95	25.1	0.99	19.1	0.75	4.6	0.18	3/4	3/4	1/4	9/16 - 18	19/32
P-SBHUT- 1/2 X 1/2-W	1/2	58.7	2.31	29.7	1.17	19.1	0.75	10.2	0.40	1 1/16	1 1/16	1/2	7/8 - 14	29/32

CP

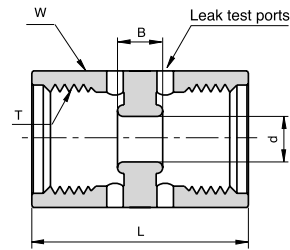
COUPLING



Ordering Information	Face Seal Size	L		W	T Thread Size
	inch	mm	inch	inch	inch
P-CP 1/4	1/4	30.2	1.19	3/4	9/16 - 18
P-CP 1/2	1/2	33.3	1.31	1 1/16	7/8 - 14
P-CP 3/4	3/4	42.7	1.68	1 1/2	1 1/4 - 18
P-CP 1	1	51.8	2.04	1 3/4	1 1/2 - 20

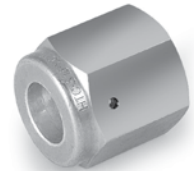
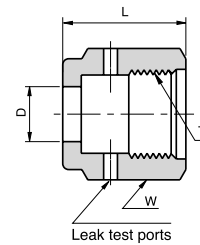
Dimensions are for reference only, and are subject to change without notice. When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

DFU

DOUBLE FEMALE UNION

Ordering Information	Face Seal Size	L		B		d		W	T Thread Size
	inch	mm	inch	mm	inch	mm	inch	inch	inch
P-DFU-1/4	1/4	30.2	1.19	6.0	0.24	6.4	0.25	3/4	9/16 - 18
P-DFU-1/2	1/2	33.3	1.31	6.0	0.24	14.0	0.55	1 1/16	7/8 - 14

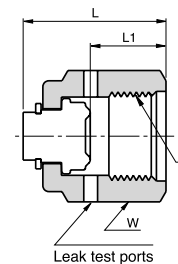
Caution: This fitting should be used with a swivel male connector only.



NF

FEMALE NUT

Ordering Information	Face Seal Size	L		D		W	T Thread Size
	inch	mm	inch	mm	inch	inch	inch
P-NF 1/8	1/8	13.6	0.54	5.3	0.21	7/16	5/16-24
P-NF 1/4	1/4	20.6	0.81	9.2	0.36	3/4	9/16-18
P-NF 1/2	1/2	22.5	0.88	15.5	0.61	1 1/16	7/8-14
P-NF 3/4	3/4	28.5	1.12	22.6	0.89	1 1/2	1 1/4-18
P-NF 1	1	34.0	1.34	30.6	1.20	1 3/4	1 1/2-20



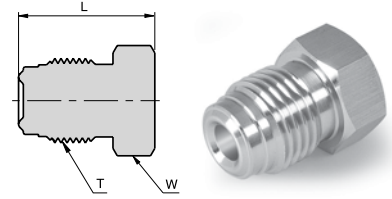
CF

FEMALE CAP

Ordering Information	Face Seal Size	L		L1		W	T Thread Size
	inch	mm	inch	mm	inch	inch	inch
PCF1/8	1/8	16.6	0.65	8.4	0.33	7/16	5/16-24
P-CF 1/4	1/4	23.9	0.94	12.7	0.50	3/4	9/16-18
P-CF 1/2	1/2	25.6	1.01	14.2	0.56	1 1/16	7/8-14
P-CF 3/4	3/4	32.3	1.27	19.1	0.75	1 1/2	1 1/4-18
P-CF 1	1	39.0	1.53	23.4	0.92	1 3/4	1 1/2-20

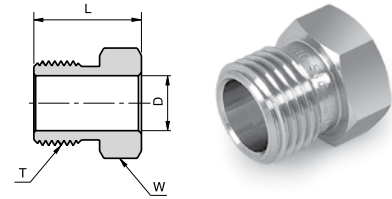
Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

MP
MALE PLUG



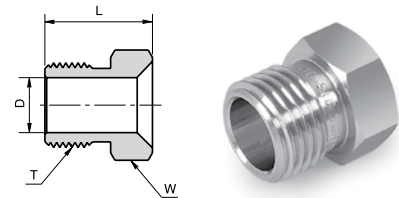
Ordering Information	Face Seal Size	L		W	T
	inch	mm	inch	inch	Thread Size
P-MP 1/8	1/8	17.3	0.68	3/8	5/16 - 24
P-MP 1/4	1/4	23.4	0.92	5/8	9/16 -18
P-MP 1/2	1/2	27.4	1.08	15/16	7/8 -14
P-MP 3/4	3/4	36.3	1.43	1 5/16	1 1/4 -18
P-MP 1	1	38.6	1.52	1 5/8	1 1/2 - 20

NM
MALE NUT



Ordering Information	Face Seal Size	L		D		W	T
	inch	mm	inch	mm	inch	inch	Thread Size
P-NM 1/8	1/8	12.7	0.50	5.3	0.21	3/8	5/16-24
P-NM 1/4	1/4	18.0	0.71	9.2	0.36	5/8	9/16-18
P-NM 1/2	1/2	20.6	0.81	15.5	0.61	15/16	7/8-14
P-NM 3/4	3/4	25.4	1.00	22.7	0.89	1 5/16	1 1/4-18
P-NM 1	1	30.2	1.19	30.5	1.20	1 5/8	1 1/2-20

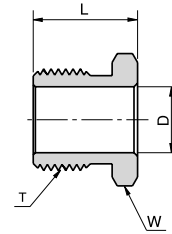
TNM
TAPERED MALE NUT



Ordering Information	Face Seal Size	L		D		W	T
	inch	mm	inch	mm	inch	inch	Thread Size
P-NM 1/4	1/4	18.0	0.71	9.2	0.36	5/8	9/16-18

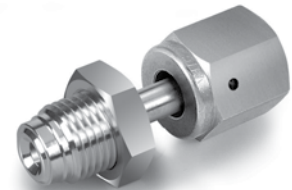
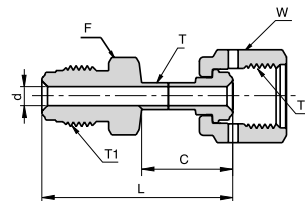
Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

SNM

SHORT MALE NUT

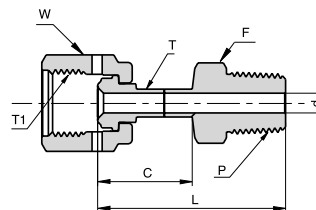
Ordering Information	Face Seal Size	L		D		W	T
	inch	mm	inch	mm	inch	inch	Thread Size
P-SNM 1/4 .54	1/4	13.7	0.54	9.2	0.36	5/8	9/16-18
P-SNM 1/4 .65	1/4	16.5	0.65	9.2	0.36	5/8	9/16-18

UMF

FEMALE TO MALE UNION

Ordering Information	Face Seal Size	L		C		d		F	W	T	T1	T2
	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
P-UMF-1/4 X 1/4	1/4	45.2	1.78	21.6	0.85	4.6	0.18	5/8	3/4	1/4	9/16 - 18	9/16 - 18
P-UMF-1/2 X 1/2	1/2	49.8	1.96	22.1	0.87	10.2	0.40	15/16	1-1/16	1/2	7/8 - 14	7/8 - 14

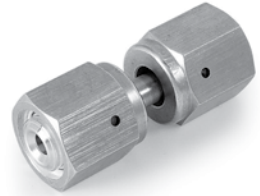
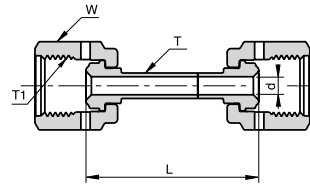
MCF

FEMALE TO MALE NPT CONNECTOR

Ordering Information	Face Seal Size	L		C		d		F	W	T	T1	P
	inch	mm	inch	mm	inch	mm	inch	inch	inch	Tube O.D.	Thread Size	NPT-M
P-MCF-1/4 X 1/4	1/4	45.5	1.79	23.4	0.92	4.6	0.18	9/16	3/4	1/4	9/16 - 18	1/4
P-MCF-1/2 X 1/2	1/2	53.1	2.09	25.6	1.01	10.2	0.40	7/8	1 1/16	1/2	7/8 - 14	1/2

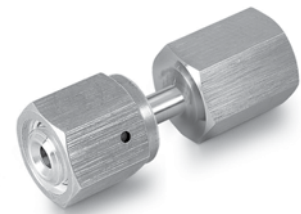
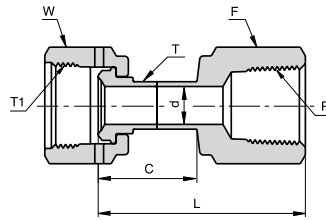
Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

UFF

FEMALE TO FEMALE UNION

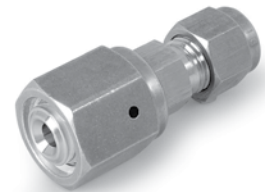
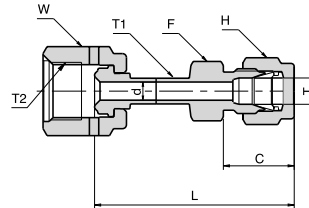
Ordering Information	Face Seal Size	L		d		W	T Tube O.D.	T1 Thread Size
	inch	mm	inch	mm	inch	inch	inch	inch
P-UFF-1/4 X 1/4	1/4	43.0	1.69	4.6	0.18	3/4	1/4	9/16 - 18
P-UFF-1/2 X 1/2	1/2	44.1	1.73	10.2	0.40	1 1/16	1/2	7/8 - 14

FCF

FEMALE TO FEMALE NPT CONNECTOR

Ordering Information	Face Seal Size	L		C		d		F	W	T Tube O.d.	T Thread Size	P NPT-F
	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
P-FCF-1/4 X 1/4	1/4	45.0	1.77	23.4	0.92	4.6	0.18	3/4	3/4	1/4	9/16 - 18	1/4
P-FCF-1/2 X 1/2	1/2	54.8	2.16	26.4	1.04	10.2	0.40	1 1/16	1 1/16	1/2	7/8 - 14	1/2

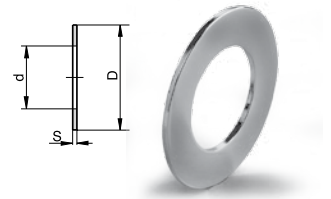
FHTL

FEMALE TO LET-LOK CONNECTOR

Ordering Information	Face Seal Size	L		C		d		F	W	H	T Tube O.D.	T1 Tube O.D.	T2 Thread Size
	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch	inch
P-FHTL-1/4 X 1/4	1/4	49.3	1.94	17.8	0.70	4.6	0.18	1/2	3/4	9/16	1/4	1/4	9/16 - 18
P-FHTL-1/2 X 1/2	1/2	56.6	2.23	21.8	0.86	10.2	0.40	13/16	1 1/16	7/8	1/2	1/2	7/8 - 14

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

GA GASKET



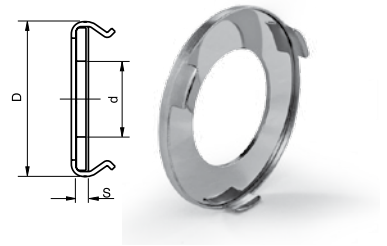
UNPLATED GASKETS

Ordering Information	Face Seal Size	D		d		S	
	inch	mm	inch	mm	inch	mm	inch
GA-1/4 - E	1/4	11.9	0.47	5.6	0.22	0.7	0.028
GA-1/2 - E	1/2	19.8	0.78	11.2	0.44	0.7	0.028

SILVER PLATED GASKETS

Ordering Information	Face Seal Size	D		d		S	
	inch	mm	inch	mm	inch	mm	inch
GA-1/4 SILVER PLATED	1/4	11.9	0.47	5.6	0.22	0.7	0.028
GA-1/2 SILVER PLATED	1/2	19.8	0.78	11.2	0.44	0.7	0.028
GA-3/4 SILVER PLATED	3/4	29.0	1.14	16.8	0.66	0.7	0.028
GA-1 SILVER PLATED	1	35.6	1.40	22.6	0.89	0.7	0.028

GA-RT RETAINED GASKET



UNPLATED RETAINED GASKETS

Ordering Information	Face Seal Size	D		d		S	
	inch	mm	inch	mm	inch	mm	inch
GA-1/4 -RT- E	1/4	12.7	0.50	6.1	0.24	0.7	0.028
GA-1/2 -RT- E	1/2	20.1	0.79	11.1	0.44	0.7	0.028

SILVER PLATED RETAINED GASKETS

Ordering Information	Face Seal Size	D		d		S	
	inch	mm	inch	mm	inch	mm	inch
GA-1/4-RT SILVER PLATED	1/4	12.7	0.50	6.1	0.24	0.7	0.028
GA-1/2-RT SILVER PLATED	1/2	20.1	0.79	11.1	0.44	0.7	0.028
GA-3/4-RT SILVER PLATED	3/4	29.0	1.14	16.8	0.66	0.7	0.028
GA-1-RT SILVER PLATED	1	35.6	1.40	22.6	0.89	0.7	0.028

HOW TO ORDER:

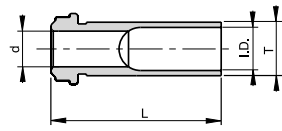
Example:

SS	-	GA-1/4
Material Description		
SS	-	Stainless Steel
NI	-	Nickel

Dimensions are for reference only, and are subject to change without notice. When ordering, be sure to add the Surface-Finish Designator (either H or E) to the part Number. (See Material Table, page 157).

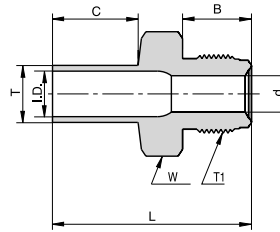
All orders should include the material description and ordering information (see product table).

HGL

LONG HIGH FLOW GLAND

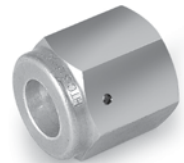
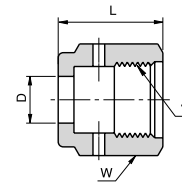
Ordering Information	Face Seal Size	L		d		T	I.D.	
	inch	mm	inch	mm	inch	inch	mm	inch
V-HGL-3/8 - 0.6	1/4	15.2	0.60	6.4	0.25	3/8	7.7	0.30
V-HGL-3/8 - 1.13	1/4	28.7	1.13	6.4	0.25	3/8	7.7	0.30
V-HGL-3/8 - 1.19	1/4	30.2	1.19	6.4	0.25	3/8	7.7	0.30
V-HGL-3/8 - 1.31	1/4	33.3	1.31	6.4	0.25	3/8	7.7	0.30

HMT

HIGH FLOW MALE TO TUBE

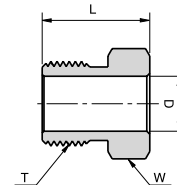
Ordering Information	Face Seal Size	L		B		C		d		W	T	T1	I.D.	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	mm	inch
P- HMT 1/4	1/4	42.7	1.68	15.8	0.62	19.1	0.75	6.4	0.25	5/8	3/8	9/16 - 18	7.7	0.30

HNF

HIGH FLOW FEMALE NUT

Ordering Information	Face Seal Size	L		D		W	T
	inch	mm	inch	mm	inch	inch	inch
P - HNF 1/4	1/4	20.6	0.81	10.0	0.39	3/4	9/16 - 18

HNM

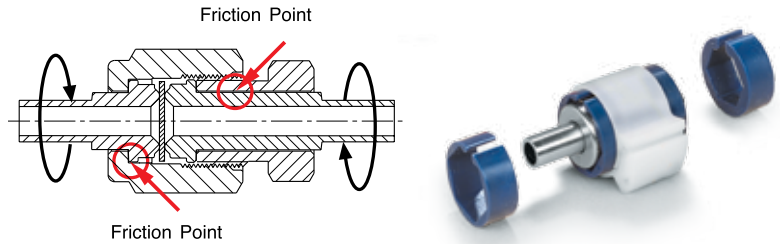
HIGH FLOW MALE NUT

Ordering Information	Face Seal Size	L		D		T	W
	inch	mm	inch	mm	inch	inch	inch
P - HNM 1/4	1/4	18.0	0.71	10.0	0.39	9/16 - 18	5/8

Dimensions are for reference only, and are subject to change without notice.
When ordering, be sure to add the Surface-Finish Designator (either H or E) to the Part Number. (See Material Table, page 157).

GRIPKIT

Gripkit is a patented product designed to help preventing potential leaks in metal-gasket face-seal fittings. The Gripkit is designed for use with critical, semiconductor-industry ultra-pure and high-purity gas applications, as well as vacuum delivery systems. The product is color coded for easy identification within the system and is engineered to be used with the fitting components of most major manufacturers.



MATERIAL Gripkit® consists of three components:		
Part Number	Description	Material
GK-NY-M4	5/8" Hex male crescent adapter	Blue Nylon
GK-NY-F4	3/4" Hex female crescent adapter	Blue Nylon
GK-1-CL-WH	White color coded clamp	Acetyl
GK-1-CL-BL	Blue color coded clamp	Acetyl
GK-1-CL-YL	Yellow color coded clamp	Acetyl
GK-1-CL-RD	Red color coded clamp	Acetyl
GK-1-CL-GR	Green color coded clamp	Acetyl



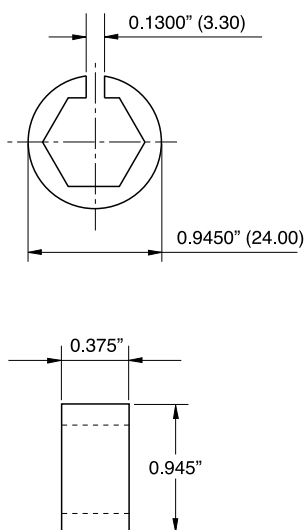
HOW IT WORKS

The Gripkit® fixes the position of the male nut relative to the female nut, and therefore, the distance between the two sealing glands. Consequently, when torque is applied to either side of the fitting connection, it does not cause the nuts to rotate in opposition and lose their compression on the gasket. In extreme cases, when very high torque is applied to the fitting joint, the glands may rotate within the fixed nuts, but the connector will remain intact. Gripkit will prevent the kind of catastrophic leak that results from the loss of gland compression on the gasket.

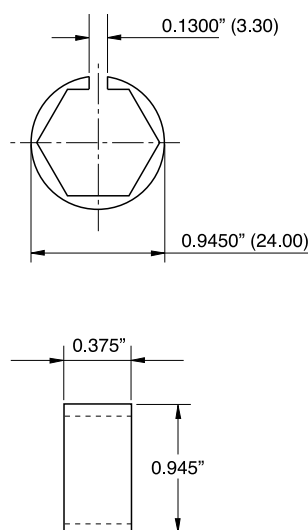
WHY USE GRIPKIT ?

When pipe fitters, maintenance technicians and operators work on gas distribution systems, they can accidentally "torque" the system, causing fittings down-line to come apart. Most veteran gas system engineers recognize this common phenomenon. Another widespread problem occurs when a fitting connection "shakes apart" because it is mounted on, or near, vibrating equipment. Sources of system vibration include pumps, motors, pneumatic actuators, as well as mobile equipment. Gripkit® offers a very inexpensive solution to these real and potentially costly problems.

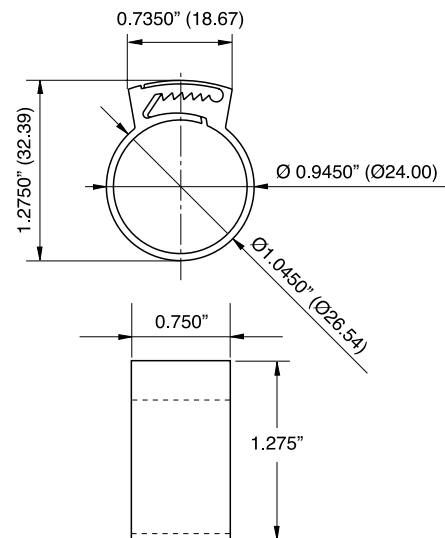
1" x 5/8" CRESCENT SECTION



1" x 3/4" CRESCENT SECTION



1" CLAMP SECTION



HAM-LET FLANGE ADAPTERS



FLANGE ADAPTERS

Flange connectors to
LET-LOK®, NPT Male / Female fittings up to 2".
One piece not welded.
Flange meets ASME, DIN, EN, JIS.

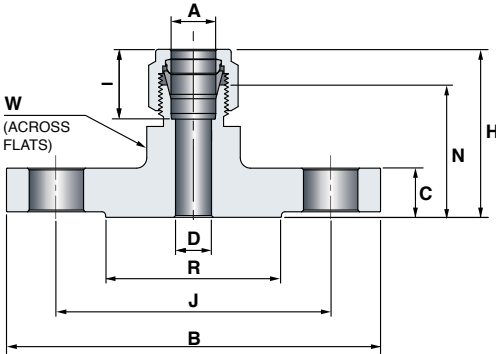


FLANGE CONNECTIONS

- Per ASME B 16.5, NPS 1/2" through NPS 2".
Flange with pressure rating class designation 150 to 2500.
- DIN EN 1092, Sizes DN 15 to 50.
Flange with pressure rating class PN 40 to 100.
- JIS B 2220, Sizes DN 15 to 50.
Flange with pressure rating 10K - 63K.

END CONNECTIONS

LET-LOK® 1/16"-2" , 2mm-50mm.
NPT Male / Female 1/16"-2".



CHARACTERISTIC

Sealing Faces, Flat Face, Raised Face, RTJ, Tongue or Groove.

Material : ST,ST, Full sizes.

Alloy 400. sizes: 1/4" , 3/8" , 1/2".

Alloy C-276-C sizes: 1/4" , 3/8" , 1/2".

REGULATORY COMPLIANCE

ANSI Flange complies to class 2500.

TUV type test approval 359.11.2012 and TA-LUFT 2002 leakage.

Cleaning requirements: per HAM-LET STD cleaning SOP 8184.

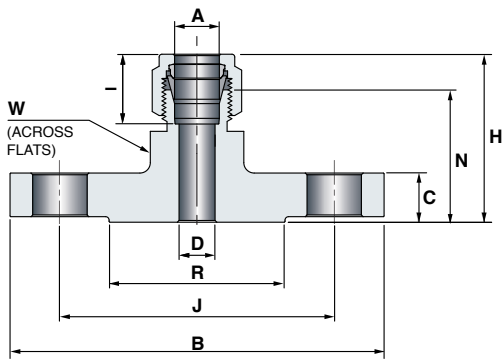


DIN FLANGES, PRESSURE CLASS PN 40

Ordering Information	A	DIN Flange Size DN	B	N	H	C	R	W	D	J	I	Bolts Qty	Bolt Hole
	Tube O.D.		mm	mm	mm	mm	mm	mm	mm	mm	mm		
FLN DIN-DN25-40-Cx 6MM LL	6MM	25	115.0	40.1	47.5	18.0	68.0	20.0	4.8	85.0	15.4	4	14.0
FLN DIN-DN15-40-Cx12MM LL	12MM	15	95.0	38.4	48.5	16.0	45.0	20.0	9.5	65.0	22.8	4	14.0
FLN DIN-DN25-40-Cx12MM LL	12MM	25	115.0	40.4	50.5	18.0	68.0	20.0	9.5	85.0	22.8	4	14.0
FLN DIN-DN50-40-Cx12MM LL	12MM	50	165.0	45.2	55.3	20.0	102.0	20.0	9.5	125.0	22.8	4	18.0
FLN DIN-DN15-40-Cx18MM LL	18MM	15	95.0	41.7	51.8	16.0	45.0	32.0	15.1	65.0	24.4	4	14.0
FLN DIN-DN25-40-Cx18MM LL	18MM	25	115.0	43.7	53.8	18.0	68.0	32.0	15.1	85.0	24.4	4	14.0
FLN DIN-DN25-40-Cx25MM LL	25MM	25	115.0	51.8	64.1	18.0	68.0	35.0	21.8	85.0	31.3	4	14.0
FLN DIN-DN50-40-Cx38MM LL	38MM	50	165.0	62.7	90.3	20.0	102.0	55.0	33.7	125.0	49.3	4	18.0
FLN DIN-DN50-40-Cx50MM LL	50MM	50	165.0	66.3	103.4	20.0	102.0	70.0	45.2	125.0	65.0	4	18.0

EN FLANGES, PRESSURE CLASS PN 40

Ordering Information	A	EN Flange Size DN	B	N	H	C	R	W	D	J	I	Bolts Qty	Bolt Hole
	Tube O.D.		mm	mm	mm	mm	mm	mm	mm	mm	mm		mm
FLN EN-DN25-40-B1x 6MM LL	6MM	25	115.0	40.1	47.5	18.0	68.0	20.0	4.8	85.0	15.4	4	14.0
FLN EN-DN15-40-B1x12MM LL	12MM	15	95.0	38.4	48.5	16.0	45.0	20.0	9.5	65.0	22.8	4	14.0
FLN EN-DN25-40-B1x12MM LL	12MM	25	115.0	40.4	50.5	18.0	68.0	20.0	9.5	85.0	22.8	4	14.0
FLN EN-DN50-40-B1x12MM LL	12MM	50	165.0	45.2	55.3	20.0	102.0	20.0	9.5	125.0	22.8	4	18.0
FLN EN-DN15-40-B1x18MM LL	18MM	15	95.0	41.7	51.8	16.0	45.0	32.0	15.1	65.0	24.4	4	14.0
FLN EN-DN25-40-B1x18MM LL	18MM	25	115.0	43.7	53.8	18.0	68.0	32.0	15.1	85.0	24.4	4	14.0
FLN EN-DN25-40-B1x25MM LL	25MM	25	115.0	51.8	64.1	18.0	68.0	35.0	21.8	85.0	31.3	4	14.0
FLN EN-DN50-40-B1x38MM LL	38MM	50	165.0	62.7	90.3	20.0	102.0	55.0	33.7	125.0	49.3	4	18.0
FLN EN-DN50-40-B1x50MM LL	50MM	50	165.0	66.3	103.4	20.0	102.0	70.0	45.2	125.0	65.0	4	18.0



JIS FLANGES, PRESSURE CLASS 10K

Ordering Information	A Tube O.D.		JIS Flange Size DN	B		N		H		C		R		W		D		J		I		Bolt Hole mm
	inch	mm		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
FLN JIS 15 X 1/4LL-10K-RF	1/4"	6.35	15	3.74	95.0	1.37	34.8	1.66	42.2	0.47	12.0	2.01	51.0	13/16"	0.19	4.8	2.76	70.0	0.60	15.2	15.0	
FLN JIS 15 X 3/8LL-10K-RF	3/8"	9.52	15	3.74	95.0	1.43	36.3	1.72	43.7	0.47	12.0	2.01	51.0	13/16"	0.28	7.1	2.76	70.0	0.66	26.8	15.0	
FLN JIS 15 X 1/2LL-10K-RF	1/2"	12.70	15	3.74	95.0	1.43	36.3	1.83	46.5	0.47	12.0	2.01	51.0	13/16"	0.41	10.4	2.76	70.0	0.90	22.9	15.0	
FLN JIS 15 X 3/4LL-10K-RF	3/4"	19.05	15	3.74	95.0	1.51	38.4	1.91	48.5	0.47	12.0	2.01	51.0	1-1/4"	0.62	15.8	2.76	70.0	0.96	24.4	15.0	
FLN JIS 25 X 1 LL-10K-RF	1"	25.40	25	4.92	125.0	1.92	48.8	2.40	61.0	0.55	14.0	2.64	67.0	1-3/8"	0.88	22.3	3.54	90.0	1.23	31.2	19.0	
FLN JIS 50 X 2 LL-10K-RF	2"	50.80	50	6.10	155.0	2.54	64.5	4.01	101.9	0.63	16.0	3.78	96.0	2-3/4"	1.81	46.0	4.72	120.0	2.66	67.6	19.0	

Ordering Information	A Tube O.D.		JIS Flange Size DN	B	N	H	C	R	W	D	J	I	Bolt Hole mm
	mm	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	
FLN JIS 15 X12MMLL-10K-RF	12MM	15	95.0	36.3	46.5	12.0	51.0	20.0	9.5	70.0	22.8	15.0	
FLN JIS 15 X18MMLL-10K-RF	18MM	15	95.0	38.4	48.5	12.0	51.0	32.0	15.1	70.0	24.4	15.0	
FLN JIS 25 X25MMLL-10K-RF	25MM	25	125.0	48.8	61.0	14.0	67.0	35.0	21.8	90.0	31.3	19.0	

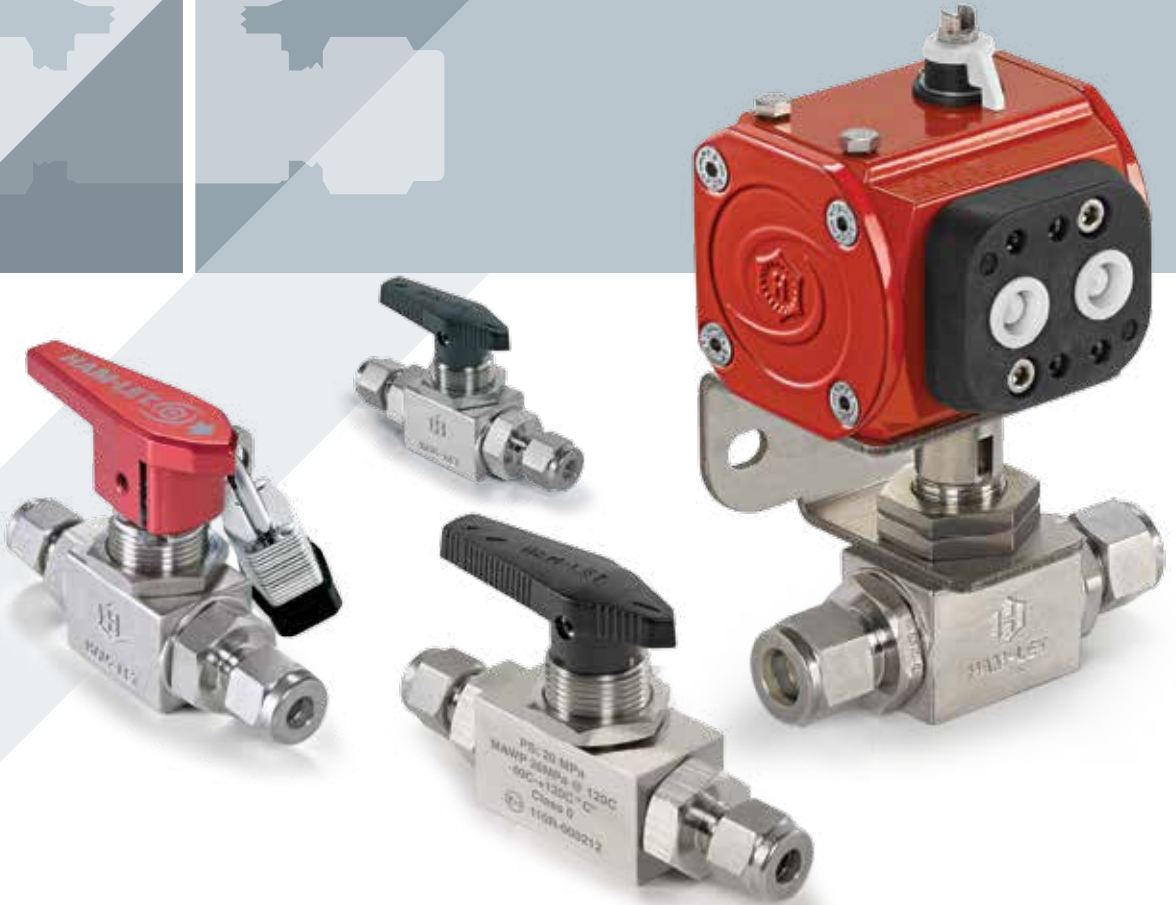
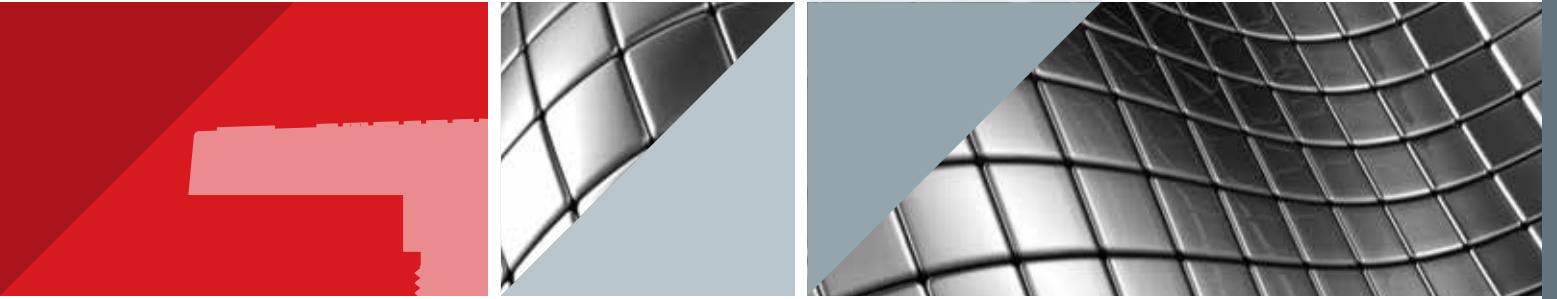
ANSI FLANGES

Ordering Information	A Tube O.D.		ANSI Flange NPS	Flange CLASS	B		N		H		C		R		W		D		J		I		Bolt Hole	
	inch	mm			inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
FLN NPS 1/2 X 1/4LL-150-RF	1/4"	6.35	1/2"	150	3.50	88.9	1.32	33.5	1.61	40.9	0.44	11.2	1.38	35.1	13/16"	0.19	4.8	2.38	60.5	0.60	15.3	0.62	15.7	
FLN NPS 1/2 X 3/8LL-300-RF	3/8"	9.52	1/2"	300	3.75	95.2	1.50	38.1	1.79	45.5	0.56	14.2	1.38	35.1	13/16"	0.28	7.1	2.62	66.6	0.66	16.9	0.62	15.7	
FLN NPS 1/2 X 1/2LL-150-RF	1/2"	12.70	1/2"	150	3.50	88.9	1.38	35.1	1.78	45.2	0.44	11.2	1.38	35.1	13/16"	0.41	10.4	2.38	60.5	0.90	22.9	0.62	15.7	
FLN NPS 1 X 1/2LL-150-RF	1/2"	12.70	1"	150	4.25	108.0	1.50	38.1	1.90	48.3	0.56	14.2	2.00	50.8	13/16"	0.41	10.4	3.12	79.2	0.90	22.9	0.62	15.7	
FLN NPS 2 X 1/2LL-150-RF	1/2"	12.70	2"	150	6.00	152.4	1.92	48.9	2.32	59.0	0.75	19.1	3.62	92.0	13/16"	0.41	10.4	4.75	120.7	0.90	22.9	0.75	19.1	
FLN NPS 1 X 3/4LL-150-RF	3/4"	19.05	1"	150	4.25	108.0	1.58	40.1	1.98	50.3	0.56	14.2	2.00	50.8	1-1/4"	0.62	15.8	3.12	79.2	0.96	24.5	0.62	15.7	
FLN NPS 1 X 1 LL-150-RF	1"	25.40	1"	150	4.25	108.0	1.90	48.3	2.38	60.5	0.56	14.2	2.00	50.8	1-3/8"	0.88	22.3	3.12	79.2	1.23	31.2	0.62	15.7	
FLN NPS 2 X 1-1/2 LL-150-RF	1-1/2"	38.10	2"	150	6.00	152.4	2.33	59.2	3.40	86.4	0.75	19.1	3.62	92.0	2-1/8"	1.34	34.0	4.75	120.7	1.97	50.1	0.75	19.1	
FLN NPS 2 X 2 LL-150-RF	2"	50.80	2"	150	6.00	152.40	3	72.40	4.32	110	0.75	19.1	3.62	92.0	2-3/4"	1.81	46.0	4.75	120.7	2.65	67.6	0.75	19.1	



HIGH PERFORMANCE BALL VALVES

H-6800 & H-6800 CNG SERIES



H-6800 FEATURES

- Certified for ISO 15848-1:2006(E)
- On/off-service ball valve with 2-way pattern
- Diverter-service ball valve with 3-way pattern
- Stainless Steel and Brass construction
- MAWP* 6000 psi (413 bar)
- MAWT* 500°F (260°C)
- Variable end connection types and sizes from 1/16" to 3/4" (3mm to 18mm)
- Operation with colored Nylon handles, metal handle, color anodized aluminum ISLT** (locking device) handles and pneumatically actuated

* Maximum Allowed Working Pressure, Maximum Allowed Working Temperature.

** ISLT – Integral Safety Lock-out Tag-out Patent pending

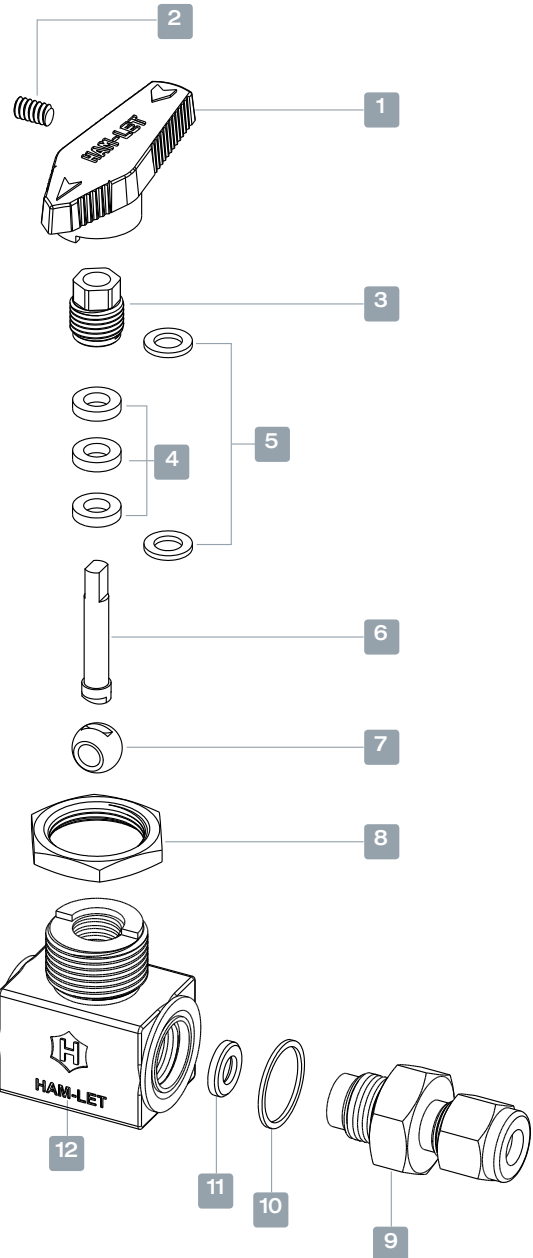
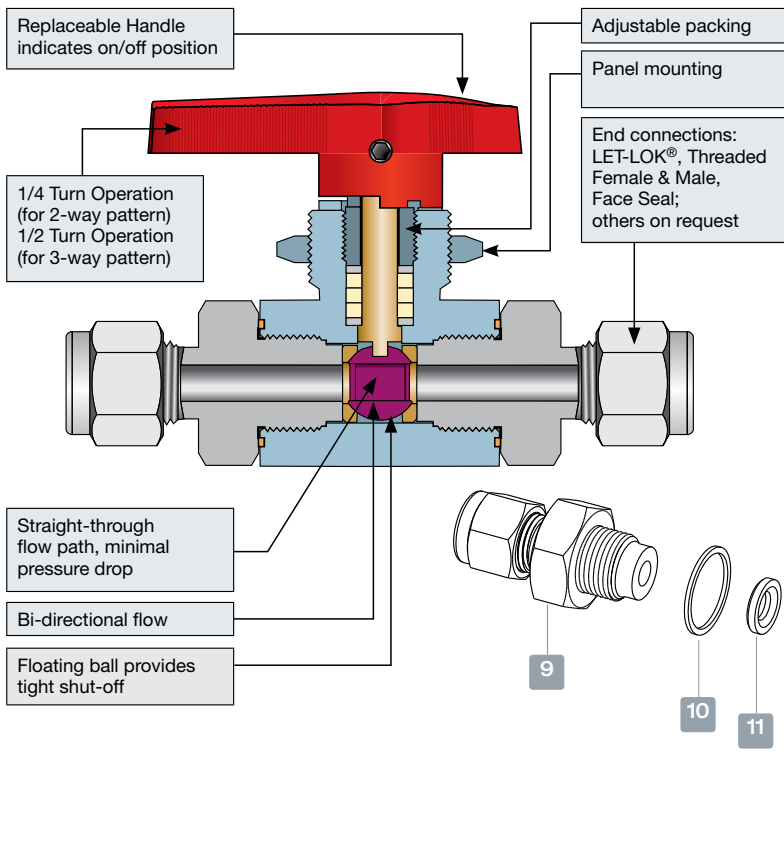
GENERAL

The H-6800 Series is a high-performance instrumentation ball valve for general service and instrumentation panels. The valves offer a tight shutoff*, long-life service and a low operating torque. The H-6800 Series is rated to max. 6000psig and performs on/off or as a diverter service.

*3-Way H-6800 is designed for diverting only and not for shutoff service. Inlet is from the bottom only. 3-Way H-6800 is designed to be fully opened to any of the side ports.

MATERIAL OF CONSTRUCTION

No.	Part	Qty	Maximum allowed working pressure	
			Up to 3000 psig	Up to 6000 psig
1	Handle	1	Nylon / Metal / ISLT	Nylon / Metal / ISLT
2	Handle Set Screw	1	St.St.304	St.St.304
3	Packing Bolt	1	St.St.316	St.St.316
4	Packing	3	Modified PTFE	PCTFE / PEEK
5	Gland	2	St.St.304	St.St.304
6	Stem	1	St.St.316	St.St.316
7	Ball	1	St.St.316	St.St.316
8	Panel Nut	1	St.St.303 / Brass	St.St.303
9	End Cap	2	St.St.316 / Brass	St.St.316
10	Body Seal	2	Virgin PTFE	PTFE / PEEK
11	Seat	2	Modified PTFE	PCTFE / PEEK
12	Body	1	St.St. ASTM A351 Gr.CF8M Brass ASTM B-16	St.St. ASTM A-276



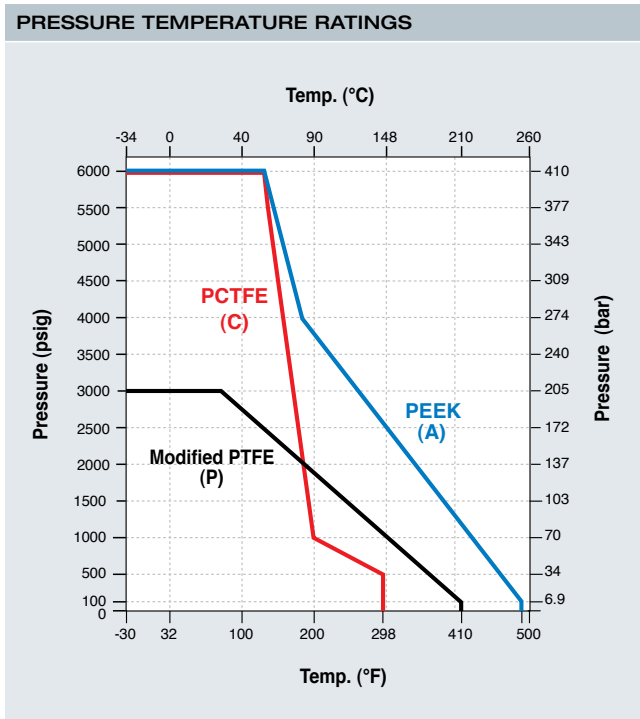
TESTING

The H-6800 design has been tested for Burst and Proof. Standard testing for each H-6800 valve includes testing with nitrogen at 80 & 1000 psig. Each valve is tested for leakage through the shell, packing and ball seats. The maximum allowable leakage across the ball seats is 0.1 std cc/min.

CLEANING & PACKAGING

Every H-6800 series ball valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Lubricant free cleaned valves have significantly higher actuation torque.



Note: The maximum allowed working pressure that is marked on the valve may be limited according to the pressure limitations that are recommended by the tubing /piping standards (Reference: Let-Lok tube fittings General Information).

SEAT MATERIAL CHARACTERISTICS

MODIFIED PTFE

Excellent seat material for purity applications. Very low residual material during operation. Lower deformation ratio than PTFE, but higher pressure and temperature ratings than PTFE. Rated up to 410°F (210°C). Chemical resistance equal to PTFE material.

PCTFE

Excellent seat material for low temperature applications such as Oxygen and Nitrogen. Suitable for low temperature applications down to -40°C (-40°F).

PEEK (PolyEtherEtherKeton)

Excellent seat material for high-pressure and high-temperature applications. Excellent chemical resistance. Can be used continuously up to 500°F (260°C) and in hot water or steam without permanent loss in physical properties. High strength for hostile environments and high pressure.

Warning: Combination of PEEK seats and hot water can be critical for valve operating torque.

PACKING ADJUSTMENT

Due to the varied service applications of the valve, packing adjustment may be occasionally necessary. Packing is factory adjusted to 1000 psig service. Initial adjustment is recommended after installation and prior to start-up. Please find more information in the installation instruction chapter. HAM-LET Ball Valves are designed for operation in the fully closed or fully open position.

BODY & SEAT MATERIAL COMBINATIONS

Body Material	MAWP*	MAWT**	Seat Material
St.St. ASTM A351 Gr. CF8M	3000psi (206bar)	410°F (210°C)	Modified PTFE
St.St. ASTM A-276	6000psi (410bar)	500°F (260°C)	PEEK***
St.St. ASTM A-276	6000psi (410bar)	298°F (148°C)	PCTFE
Brass ASTM B-16	3000psi (206bar)	410°F (210°C)	Modified PTFE

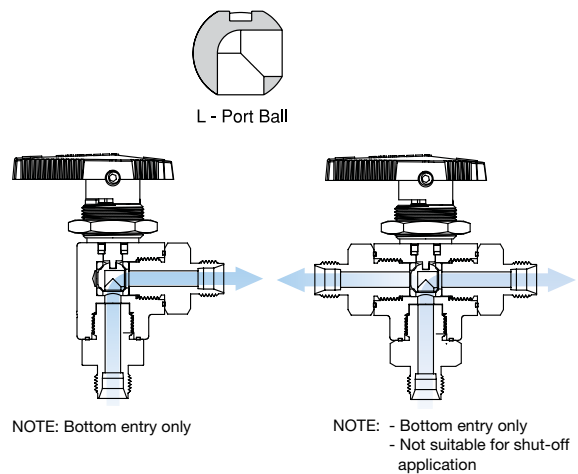
For other body and seat combinations, please contact our customer service.

* Maximum Allowed Working Pressure.

** Maximum Allowed Working Temperature.

*** Lubricant free cleaned valves with PEEK seats, MAWP is 3000 psi.

ANGLE AND T-TYPE VALVE



SEAT MATERIAL CHARACTERISTICS

MODIFIED PTFE

Excellent seat material for purity applications. Very low residual material during operation. Lower deformation ratio than PTFE, but higher pressure and temperature ratings than PTFE. Rated up to 410°F (210°C). Chemical resistance equal to PTFE material.

PCTFE

Excellent seat material for low temperature applications such as Oxygen and Nitrogen. Suitable for low temperature applications down to -40°C (-40°F).

PEEK (PolyEtherEtherKeton)

Excellent seat material for high-pressure and high-temperature applications. Excellent chemical resistance. Can be used continuously up to 500°F (260°C) and in hot water or steam without permanent loss in physical properties. High strength for hostile environments and high pressure.

Warning: Combination of PEEK seats and hot water can be critical for valve operating torque.

MANUAL OPERATION

S - Black Handle*

B - Blue Handle

R - Red Handle

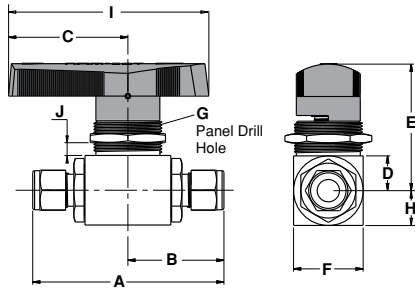
G - Green Handle

Y - Yellow Handle

Metal Handle

*Black nylon handle with brass insert is standard

STRAIGHT PORT VALVE



STRAIGHT PORT, STANDARD CONFIGURATION DIMENSIONS

Size	End Connection		Orifice		Cv	A		B		C		D		E		F		G		H		I*		J**	
	mm	inch	mm	inch		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
1/16"	Let-Lok® Inch		1.3	0.051	0.1	70.2	2.76	35.1	1.38	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/8"			2.4	0.094	0.2	78.6	3.09	39.3	1.55	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/4"			4.8	0.189	1.5	83.6	3.29	41.8	1.65	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
3/8"			4.8	0.189	1.5	86.3	3.40	43.15	1.70	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/2"			10.3	0.409	12	102.5	4.04	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
3/4"			10.3	0.409	6.5	102.5	4.04	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
3mm	Let-Lok® Metric		2.4	0.094	0.2	78.6	3.09	39.3	1.55	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
6mm			4.8	0.189	1.5	83.6	3.29	41.8	1.65	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
8mm			4.8	0.189	1.5	84.8	3.34	42.4	1.67	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
10mm			4.8	0.189	1.5	86.4	3.40	43.2	1.70	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
12mm			10.3	0.409	12	102.5	4.04	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
18mm			10.3	0.409	6.5	102.5	4.04	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
1/8"	Female NPT/BSPT		4.8	0.189	1.2	63.6	2.50	31.8	1.25	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/4"			4.8	0.189	0.9	64.0	2.52	32.0	1.26	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
3/8"			4.8	0.189	0.6	69.6	2.74	34.8	1.37	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/2"			10.3	0.409	6.3	87.4	3.44	43.7	1.72	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
3/4"			10.3	0.409	6.1	91.0	3.58	45.5	1.79	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
1/8"	Female BSPP		4.8	0.189	1.2	63.6	2.50	31.8	1.25	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/4"			4.8	0.189	0.9	64.0	2.52	32.0	1.26	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
3/8"			4.8	0.189	0.6	69.6	2.74	34.8	1.37	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/2"			10.3	0.409	6.3	87.4	3.44	43.7	1.72	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
3/4"			10.3	0.409	6.1	91.0	3.58	45.5	1.79	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
1/8"	Male NPT/BSPT		4.8	0.189	1.5	67.6	2.66	33.8	1.33	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/4"			4.8	0.189	1.2	76.6	3.02	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
3/8"			4.8	0.189	0.9	76.6	3.02	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/2"			10.3	0.409	8.2	92.4	3.64	46.2	1.82	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
3/4"			10.3	0.409	4.5	94.4	3.71	47.2	1.86	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
1/8"	Male BSPP		4.8	0.189	1.5	65.4	2.57	32.7	1.29	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/4"			4.8	0.189	1.2	76.6	3.02	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
3/8"			4.8	0.189	0.9	76.6	3.02	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/2"			10.3	0.409	8.2	92.4	3.64	46.2	1.82	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
3/4"			10.3	0.409	4.5	94.4	3.71	47.2	1.86	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255
1/4"	Face Seal Male		4.5	0.18	2.4	75.0	2.95	37.5	1.47	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	11.1	0.44	50.0	1.96	6.5	0.255
1/2"			10.3	0.409	12	93.8	3.69	46.9	1.85	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	16.0	0.63	80.0	3.15	6.5	0.255

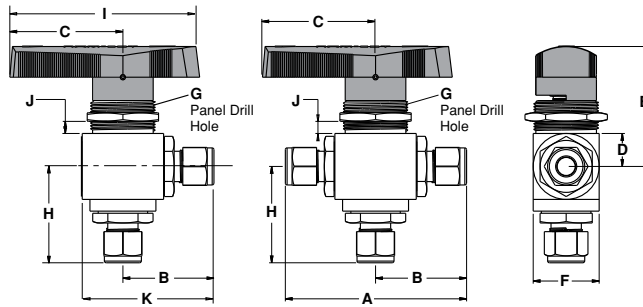
Face to face dimensions for LET-LOK® end connections (dimensions A and B) are finger tight.

* Refers to standard nylon handle.

** Maximum panel thickness.

Dimensions are for reference only, and are subject to change.

ANGLE & 3-PORT VALVE

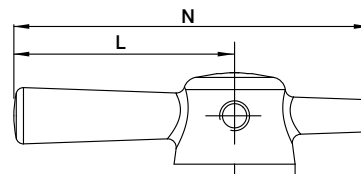


ANGLE & 3-PORT, STANDARD CONFIGURATION DIMENSIONS

Size	End Connection		Orifice		Cv	A		K		B		C		D		E		F		G		H		I*		J**	
	mm	inch	mm	inch		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
1/16"	Let-Lok® Inch	1.3	0.051	0.08	70.2	2.76	46.2	1.82	35.1	1.38	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	37.9	1.49	50.0	1.96	6.5	0.255	
1/8"		2.4	0.094	0.15	78.6	3.09	50.4	1.95	39.3	1.55	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	42.1	1.66	50.0	1.96	6.5	0.255	
1/4"		4.8	0.189	0.90	83.6	3.29	52.9	2.08	41.8	1.65	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	44.6	1.76	50.0	1.96	6.5	0.255	
3/8"		4.8	0.189	0.60	86.3	3.40	54.25	2.13	43.15	1.70	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	46.0	1.81	50.0	1.96	6.5	0.255	
1/2"		10.3	0.40	4.6	102.5	4.04	67.3	2.65	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	57.5	2.26	80.0	3.15	6.5	0.255	
3/4"		10.3	0.40	3.8	102.5	4.04	67.3	2.65	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	57.5	2.26	80.0	3.15	6.5	0.255	
3mm	Let-Lok® Metric	2.4	0.094	0.15	78.6	3.09	52.0	2.05	39.3	1.55	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	42.1	1.66	50.0	1.96	6.5	0.255	
6mm		4.8	0.189	0.90	83.6	3.29	52.8	2.08	41.8	1.65	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	44.6	1.76	50.0	1.96	6.5	0.255	
8mm		4.8	0.189	0.80	84.8	3.34	53.5	2.1	42.4	1.67	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	45.2	1.78	50.0	1.96	6.5	0.255	
10mm		4.8	0.189	0.60	86.4	3.40	54.3	2.14	43.2	1.70	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	46.0	1.81	50.0	1.96	6.5	0.255	
12mm		10.3	0.40	4.6	102.5	4.04	67.3	2.65	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	57.5	2.11	80.0	3.15	6.5	0.255	
18mm		10.3	0.40	2.5	102.5	4.04	67.3	2.65	51.25	2.02	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	57.5	1.19	80.0	3.15	6.5	0.255	
1/8"	Female NPT/ BSPT	4.8	0.189	0.3	63.6	2.50	42.9	1.7	32.0	1.26	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	34.6	1.36	50.0	1.96	6.5	0.255	
1/4"		4.8	0.189	0.75	64.0	2.52	43.1	1.69	31.8	1.25	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	34.8	1.37	50.0	1.96	6.5	0.255	
3/8"		4.8	0.189	0.5	69.6	2.74	45.9	1.8	34.8	1.37	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	37.6	1.48	50.0	1.96	6.5	0.255	
1/2"		10.3	0.40	3.5	87.4	3.44	59.7	2.35	43.7	1.72	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	50.0	1.97	80.0	3.15	6.5	0.255	
3/4"	10.3	0.40	2.5	91.0	3.58	61.5	2.42	45.5	1.79	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	50.0	1.97	80.0	3.15	6.5	0.255		
1/8"	Female BSPP	4.8	0.189	0.3	63.6	2.50	42.9	1.7	32.0	1.26	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	34.6	1.36	50.0	1.96	6.5	0.255	
1/4"		4.8	0.189	0.75	64.0	2.52	43.1	1.69	31.8	1.25	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	34.8	1.37	50.0	1.96	6.5	0.255	
3/8"		4.8	0.189	0.5	69.6	2.74	45.9	1.8	34.8	1.37	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	37.6	1.48	50.0	1.96	6.5	0.255	
1/2"		10.3	0.40	3.5	87.4	3.44	59.7	2.35	43.7	1.72	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	50.0	1.97	80.0	3.15	6.5	0.255	
3/4"	10.3	0.40	2.5	91.0	3.58	61.5	2.42	45.5	1.79	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	50.0	1.97	80.0	3.15	6.5	0.255		
1/8"	Male NPT/ BSPT	4.8	0.189	0.9	67.6	2.66	44.9	1.76	33.8	1.33	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	36.6	1.44	50.0	1.96	6.5	0.255	
1/4"		4.8	0.189	0.6	76.6	3.02	49.4	1.94	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	41.1	1.62	50.0	1.96	6.5	0.255	
3/8"		4.8	0.189	0.35	76.6	3.02	49.4	1.94	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	41.1	1.62	50.0	1.96	6.5	0.255	
1/2"		10.3	0.40	3.0	92.4	3.64	62.2	2.45	46.2	1.82	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	52.5	2.07	80.0	3.15	6.5	0.255	
3/4"	10.3	0.40	2.0	94.4	3.71	63.2	2.49	47.2	1.86	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	53.5	2.1	80.0	3.15	6.5	0.255		
1/8"	Male BSPP	4.8	0.189	0.9	65.4	2.57	43.8	1.72	32.7	1.29	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	36.6	1.44	50.0	1.96	6.5	0.255	
1/4"		4.8	0.189	0.6	76.6	3.02	49.4	1.94	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	41.1	1.62	50.0	1.96	6.5	0.255	
3/8"		4.8	0.189	0.35	76.6	3.02	49.4	1.94	38.3	1.51	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	41.1	1.62	50.0	1.96	6.5	0.255	
1/2"		10.3	0.40	3.0	92.4	3.64	62.2	2.45	46.2	1.82	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	52.5	2.07	80.0	3.15	6.5	0.255	
3/4"	10.3	0.40	2.0	94.4	3.71	63.2	2.49	47.2	1.86	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	53.5	2.1	80.0	3.15	6.5	0.255		
1/4"	Face Seal Male	4.5	0.18	0.9	75.0	2.95	48.6	1.91	37.5	1.47	31.0	1.22	11.1	0.44	38.85	1.53	22.2	0.87	19.3	0.76	40.3	1.58	50.0	1.96	6.5	0.255	
1/2"		10.3	0.40	4.6	93.8	3.69	62.9	2.47	46.9	1.85	50.0	1.97	16.0	0.63	50.0	1.97	32.0	1.26	20.8	0.82	53.2	2.09	80.0	3.15	6.5	0.255	

DIMENSIONS FOR METAL HANDLE

VALVE END CONNECTIONS	Handle Designator	N	L
Up to 3/8 ends	M	50 MM	31 MM
Up to 3/8 ends	M7	70 MM	45 MM
From 1/2 to 3/4 ends	M	110 MM	80 MM



See Ordering Information

H-6800 CNG FOR THE CNG / NGV

FEATURES

- ECE R110, Class 0 approved for the CNG / NGV
- MAWP* 3770 psig (260 barg)
- Temperature range: -40°C (-40°F) to 120°C (248°F)
- Variable LET-LOK® end connection sizes: 1/4", 3/8", 6mm, 8mm, 10mm
- Stainless Steel construction with spring loaded seats
- ECE Approved for 20,000 cycles

* Maximum Allowed Working Pressure.

MATERIAL OF CONSTRUCTION

No.	Part	Qty	Material
1	Handle	1	Nylon
2	Panel Nut	1	St.St.316 ASTM A-276 / A-479
3	Packing Bolt	1	St.St.316 ASTM A-276 / A-479
4	Stem washer	1	PEEK
5	Stem	1	St.St.316 ASTM A-276 / A-479
6	Stem Upper packing	1	PEEK
7	Stem Lower packing	1	PTFE
8	Stem O-Ring	1	Low temperature Fluorocarbon FKM
9	Packing bolt Gasket	1	Silver plated St.St.316
10	Body	1	St.St. ASTM A-479
11	Ball	1	St.St.316 ASTM A-276 / A-479
12	Seats	2	PEEK
13	Seat back up Sealing	4	PTFE
14	Seat O-Rings	2	Low temperature Fluorocarbon FKM
15	Seat Gasket	2	St.St.316 ASTM A-276 / A-479
16	Seat Spring	2	St.St.316 ASTM A-276 / A-479
17	Body Seal gasket	2	Silver plated St.St.316
18	End Cap	2	St.St.316 ASTM A-276 / A-479

ORDERING INFORMATION:

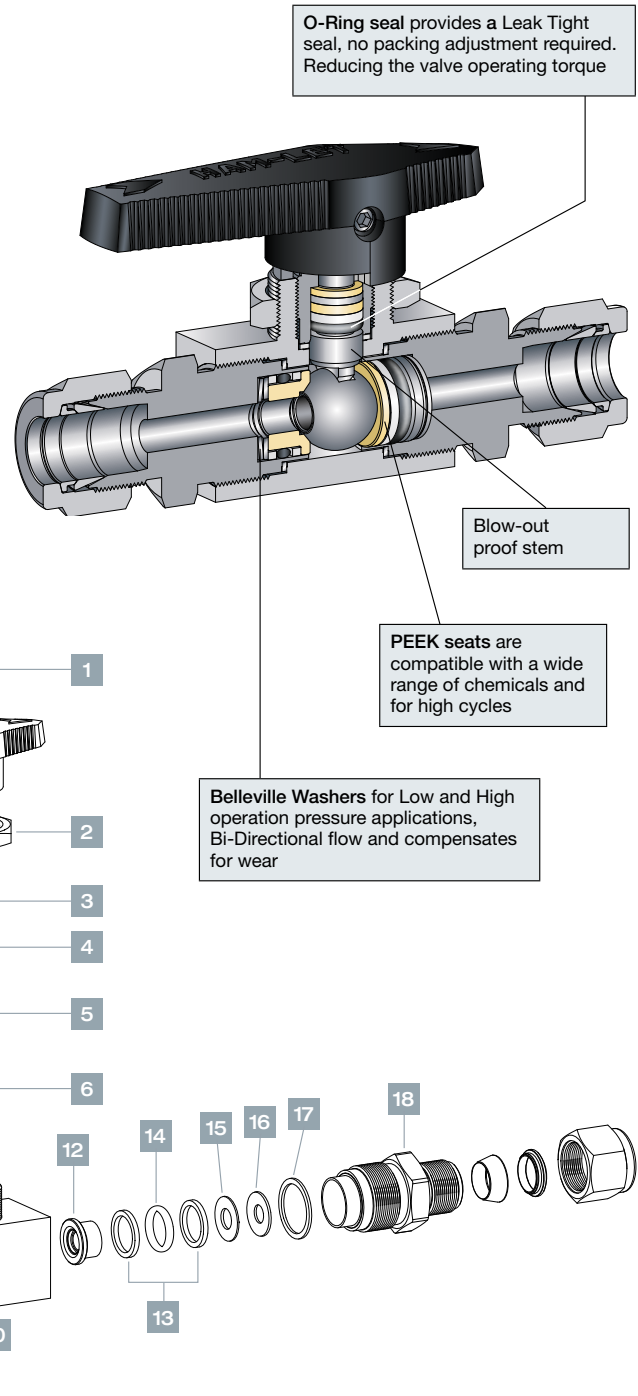
H 6800 SS L 3/8 A S S CNG

End Connection Size

- 3/8
- 1/4
- 6MM
- 8MM
- 10MM

GENERAL

The H-6800 CNG Series is a high-performance instrumentation manual ball valve for the CNG / NGV with ECE R110-type approval. The valves offer a tight shutoff, long-life service and low operating torque. The H-6800 CNG Series ball valve is rated to max. 3770 psig and performs as a manual on/off service.



H-6800 - PNEUMATIC ACTUATED VALVES

FEATURES

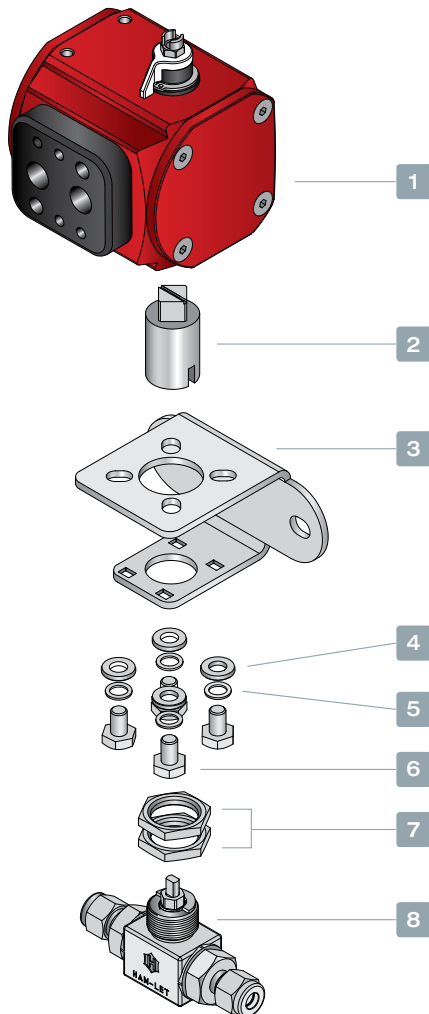
- 90° Actuation for 2-way valves (Straight & Angle)
- 180° Actuation for T-type valves
- Actuators comply with industry standards for interface with ISO 5211, NAMUR and VDI/VDE 3845
- Actuated valves are available factory assembled or separately, actuator and mounting kits
- Limit switches, proximity sensors, position indicators, Solenoid valves, and other accessories are available upon request
- Standard Temperature range: -32°C to 90°C (-25.6°F to 194°F)
Optional: High Temperature, Low Temperature

MATERIAL OF CONSTRUCTION

No.	Part	Qty	Material
1	Actuator	1	AL 356-T5
2	Coupling	1	St.St.316
3	Bracket	1	St.St.304
4	Washer Flat	4	St.St.304
5	Washer Spring	4	St.St.304
6	Screw	4	St.St.304
7	Panel Nut	2	St.St.316
8	H6800	1	St.St.316 / Brass *

* Body material: St.St. ASTM A-276;
St.St. ASTM A351 Gr. CF8M; Brass ASTM B-16

90° Actuator on 2-way valve



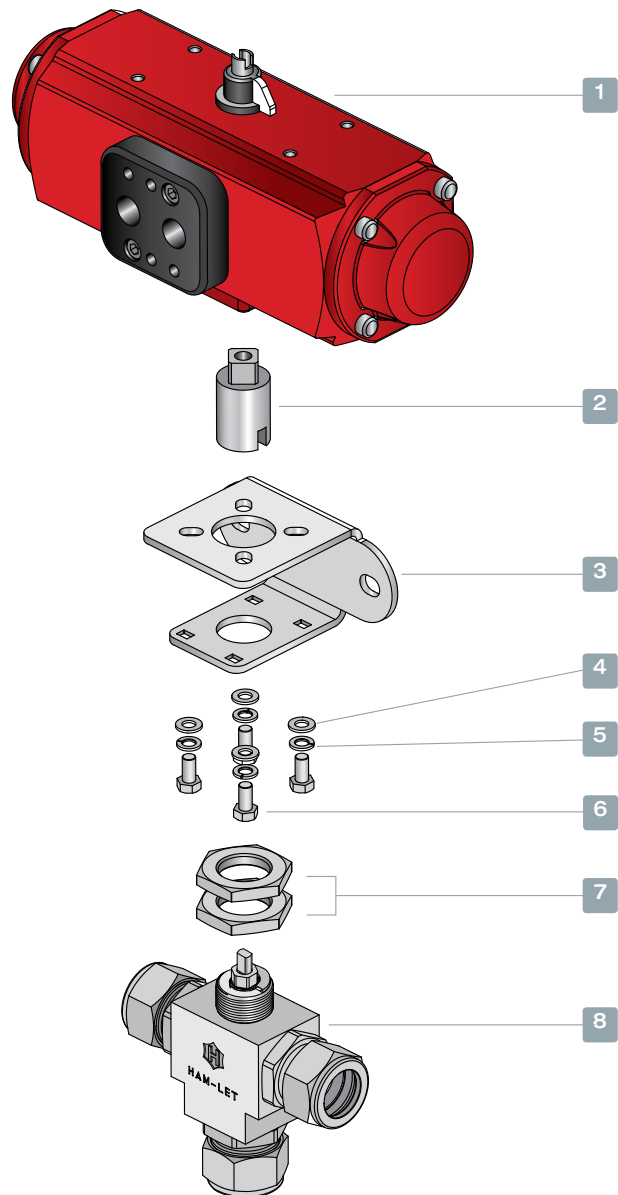
GENERAL

Four standard actuator sizes are available upon request: Mini (designator "A1"), Small (designator "A2"), Medium (designator "A3"), Large (designator "A4") and 180° Actuator (designator "A2T").

Improved operational speed enables better valve opening and closing control.

ATEX certification of Valves-Actuators assemblies are available on request at the time of order quotation.

180° Actuator on T-type valve



ACTUATED H-6800 SERIES



The selection of Valve-Actuator assemblies provided herein is based on:

- Valve maximum allowable working pressure
- Ambient temperature (50 to 100°F /10 to 37°C)
- Actuator fits to valve based on operating pressure of 6 bar, as per table A.

To order H-6800 ball valve factory assembled with an actuator, add the actuator designator to the valve part number / description per the below table.

Example:

H6800SSL1/4PSS with standard Double Acting Aluminum Actuator

H6800SSL1/4PS-A1

To order an actuator and mounting kit for field assembly:

Double acting Actuator ordering number: Z-A1

Corresponding mounting kit: Z-6800-MK-1/4-F03-F04-A1

Lubricant free Valves:

For Spring Return Actuator - select one size bigger then offered in the table

below. Example: If the offered actuator in the table is A2C, select A3C

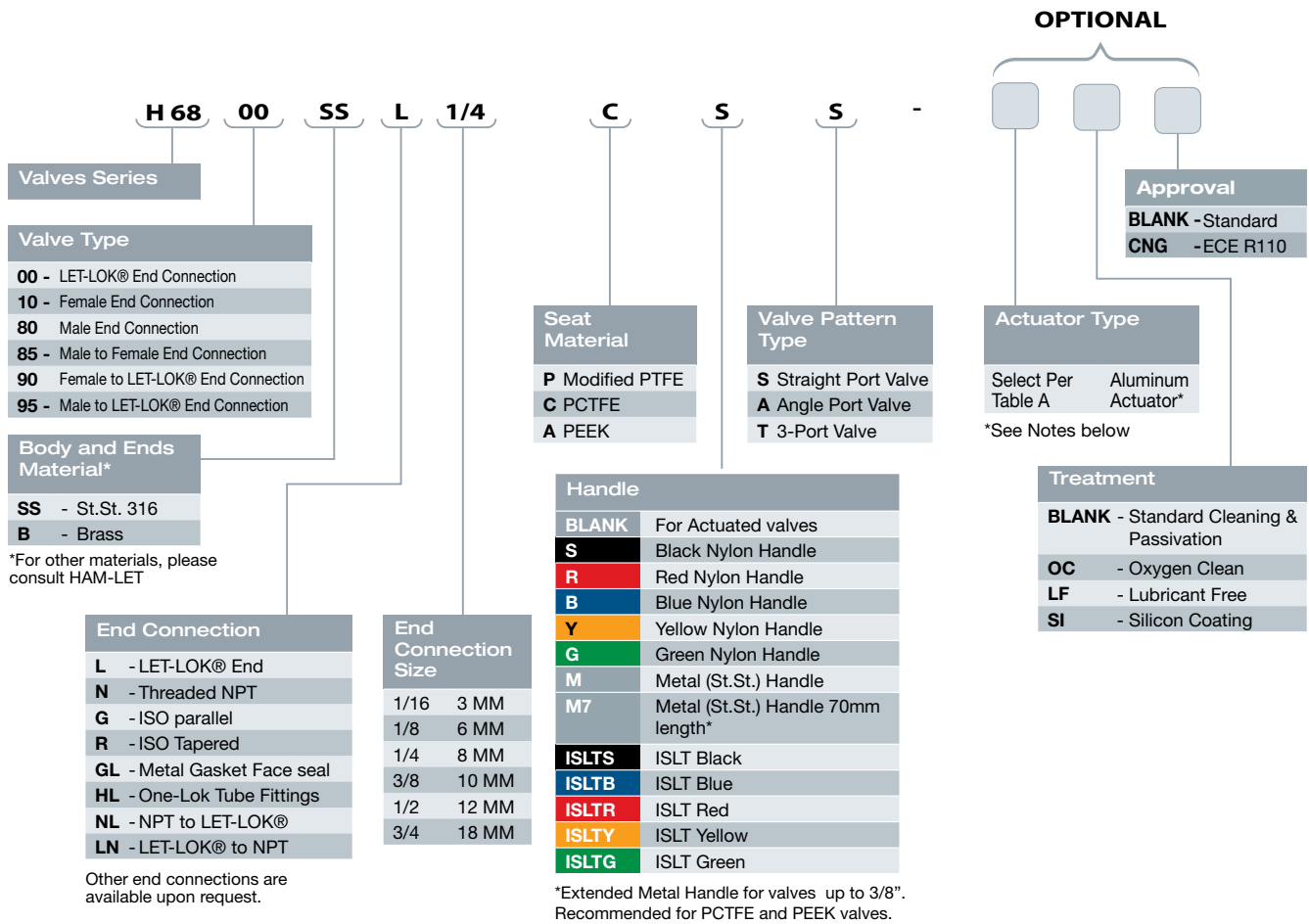
For Double Acting Actuator - please contact your local representative

Table A: Ordering information for Actuated Valves

Series	Ends Size	Seats	Minimum Actuator Operating Pressure Bar (Psi)	Actuator Designators (Factory assembled)			Actuator Ordering Code		Mounting Kit Ordering Info
				Spring Return		Double Acting	Spring Return	Double Acting	
				NO	NC				
H-6800	1/16"-3/8" (3mm-10mm)	Modified PTFE	5 (72.5)	A1O	A1C	A1	Z-A1S	Z-A1	Z-6800-MK-1/4"-F03-F04-A1
		PCTFE	5 (72.5)	A2O	A2C		Z-A2S		Z-6800-MK-1/4"-F03-F04-A2
	1/2"-3/4" (12mm-18mm)	Modified PTFE	5 (72.5)	A1O	A1C	A1	Z-A1S	Z-A1	Z-6800-MK-1/2"-F03-F04-A1
		PCTFE	5 (72.5)	A2O	A2C		Z-A2S		Z-6800-MK-1/2"-F03-F04-A2
		PEEK	5 (72.5)	A3O	A3C	A2	NC: Z-A3S	Z-A2	Z-6800-MK-1/2"-F03-F04-A3
							NO: Z-A3O		
H-6800 T-type	1/16"-3/8" (3mm-10mm)	Modified PTFE	5 (72.5)	A2TS	A2TS	A2T	Z-A2TS	Z-A2T	Z-6800-MK- 1/4"-F03-F04-A2
	1/2"-3/4" (12mm-18mm)	PCTFE							Z-6800-MK-1/2"-F03-F04-A2
		PEEK							

Note: For dimensions of Actuators assembled on the H-6800 series, please refer to the HPA section.

H-6800 SERIES ORDERING INFORMATION



For Actuated Valves

- If special cleaning is required, LF / OC will be added in the end and be applicable for the Valve only.
Example: H6800SSL1/4PS - A1 - OC
- For ordering information of actuators for high temperature please refer to HAM-LET Pneumatic Actuator Catalog
- For double mounting actuators, please contact your local representative
- For actuators accessories (Limit Switch, Solenoid Valve) please refer to HAM-LET Pneumatic Actuator Catalog.
- For Stainless Steel Actuator or Electric Actuator please contact your local representative

ORDERING INFORMATION FOR SPARE KITS

SEAL KIT

Seal Kit includes seats, stem packings, body seals and lable.

Z - **6800** - **SK** - **1/4** - **A** - **2 WAY**

Kit Type	Body Designator per End Connection	Seat Material	Valve Pattern														
SK Seal Kit	<table border="1"> <tr> <td>1/4</td> <td>1/16 to 3/8 3MM to 10MM</td> </tr> <tr> <td>1/2</td> <td>1/2 to 3/4 12MM to 18MM</td> </tr> </table>	1/4	1/16 to 3/8 3MM to 10MM	1/2	1/2 to 3/4 12MM to 18MM	<table border="1"> <tr> <td>P</td> <td>Modified PTFE</td> </tr> <tr> <td>C</td> <td>PCTFE</td> </tr> <tr> <td>A</td> <td>PEEK</td> </tr> </table>	P	Modified PTFE	C	PCTFE	A	PEEK	<table border="1"> <tr> <td>2 Way</td> <td>For straight and angle Valves</td> </tr> <tr> <td>3 Way</td> <td>For T Port Valves</td> </tr> </table>	2 Way	For straight and angle Valves	3 Way	For T Port Valves
1/4	1/16 to 3/8 3MM to 10MM																
1/2	1/2 to 3/4 12MM to 18MM																
P	Modified PTFE																
C	PCTFE																
A	PEEK																
2 Way	For straight and angle Valves																
3 Way	For T Port Valves																

NOTE:

For Seal kits for "Old Design" valves, please contact a HAM-LET representative.

HANDLE KIT

Handle kit includes handle and set screw. To order a spare-parts kit, use the following format:

Z - **6800** - **HK** - **1/4** - **S**

Kit Type	Body Designator per End Connection	Handle Type																												
HK Handle Kit	<table border="1"> <tr> <td>1/4</td> <td>1/16 to 3/8 3MM to 10MM</td> </tr> <tr> <td>1/2</td> <td>1/2 to 3/4 12MM to 18MM</td> </tr> </table>	1/4	1/16 to 3/8 3MM to 10MM	1/2	1/2 to 3/4 12MM to 18MM	<table border="1"> <tr> <td>S</td> <td>Black Nylon Handle</td> </tr> <tr> <td>R</td> <td>Red Nylon Handle</td> </tr> <tr> <td>B</td> <td>Blue Nylon Handle</td> </tr> <tr> <td>Y</td> <td>Yellow Nylon Handle</td> </tr> <tr> <td>G</td> <td>Green Nylon Handle</td> </tr> <tr> <td>M</td> <td>Metal (St.St.) Handle</td> </tr> <tr> <td>M7</td> <td>Metal St.St Handle 70 mm*</td> </tr> <tr> <td>ISLTS</td> <td>ISLT Black**</td> </tr> <tr> <td>ISLTB</td> <td>ISLT Blue**</td> </tr> <tr> <td>ISLTR</td> <td>ISLT Red**</td> </tr> <tr> <td>ISLTY</td> <td>ISLT Yellow**</td> </tr> <tr> <td>ISLTG</td> <td>ISLT Green**</td> </tr> </table>	S	Black Nylon Handle	R	Red Nylon Handle	B	Blue Nylon Handle	Y	Yellow Nylon Handle	G	Green Nylon Handle	M	Metal (St.St.) Handle	M7	Metal St.St Handle 70 mm*	ISLTS	ISLT Black**	ISLTB	ISLT Blue**	ISLTR	ISLT Red**	ISLTY	ISLT Yellow**	ISLTG	ISLT Green**
1/4	1/16 to 3/8 3MM to 10MM																													
1/2	1/2 to 3/4 12MM to 18MM																													
S	Black Nylon Handle																													
R	Red Nylon Handle																													
B	Blue Nylon Handle																													
Y	Yellow Nylon Handle																													
G	Green Nylon Handle																													
M	Metal (St.St.) Handle																													
M7	Metal St.St Handle 70 mm*																													
ISLTS	ISLT Black**																													
ISLTB	ISLT Blue**																													
ISLTR	ISLT Red**																													
ISLTY	ISLT Yellow**																													
ISLTG	ISLT Green**																													

*Extended Metal Handle for valves up to 3/8". Recommended for PCTFE and PEEK valves.
 ** Does not fit the standard valve.

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

COMPACT ONE-PIECE BALL VALVES

H-800 SERIES



H-800 FEATURES

- Certified for ISO 15848-1:2006(E)
- Encapsulated Ball Stem design
- On/off-service, one-piece Ball Valve with 2-way pattern
- Diverter and on/off-service, one-piece Ball Valve with 3-way pattern
- Stainless Steel construction
- Allows bi-directional flow in 2-way straight pattern
- Has virtually no dead volume
- One-piece Ball Stem ensures alignment of stem and orifice
- MAWP 3000 psi (206 bar) ; MAWT 300°F (149°C)
- Panel mountable
- Vent options
- Variable end connection types and sizes from 1/16" to 1/2", 3mm to 12mm
- Operation with colored Nylon handles, metal handle and pneumatically actuated

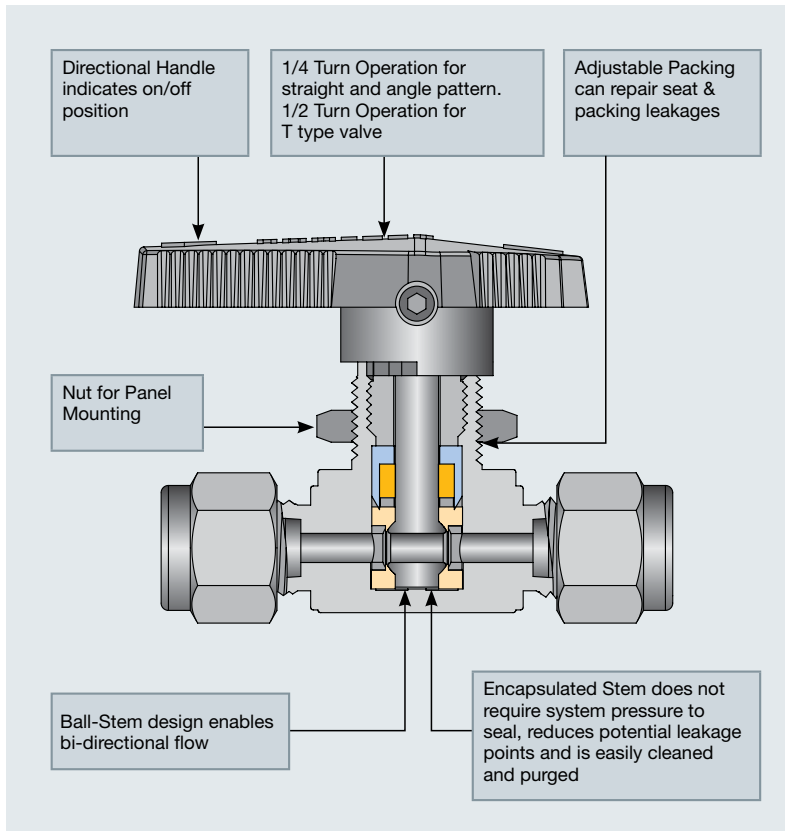
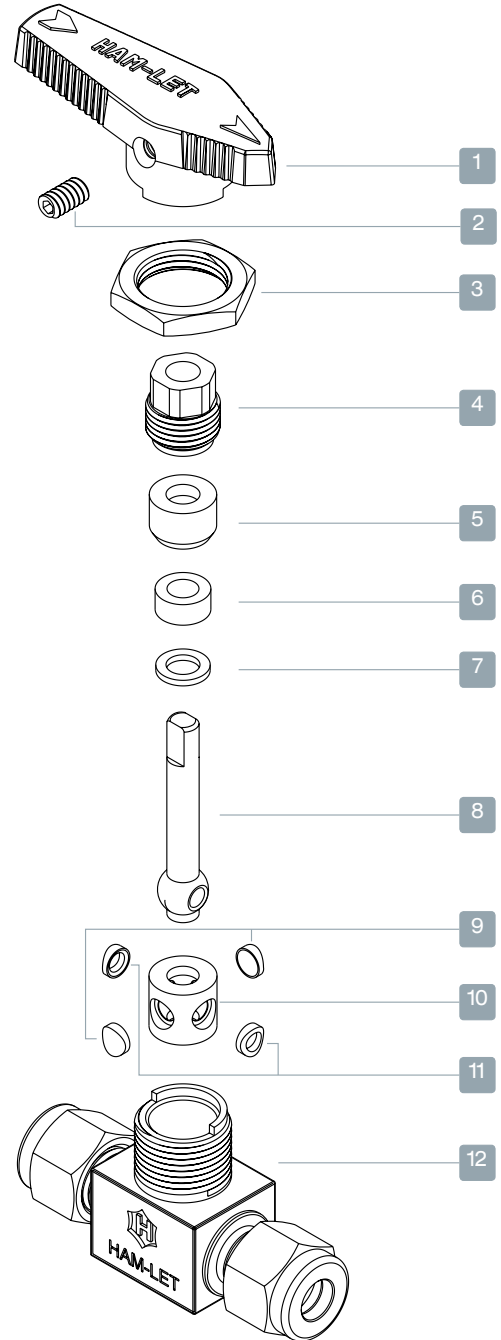
H-800 GENERAL

The H-800, one-piece Ball Valve series is designed for general service and instrumentation panels. Valve design enables low and high working pressure and accommodates a wide temperature range with high life cycle. One-piece body design reduces possibility of shell leakage. The valves offer tight shutoff, long-life service and low operating torque.

HAM-LET H-800 Ball Valves are designed for fully open or fully closed operations only. After a period of non-operation, the valve's braking torque may rise.

MATERIALS OF CONSTRUCTION

No.	Components	Qty	Material
1	Handle	1	Nylon + Glass Fiber
2	Set Screw	1	St.St.304
3	Panel Nut	1	St.St.304
4	Packing Bolt	1	St.St.316
5	Gland	1	St.St.304
6	Stem Packing	1	Virgin PTFE
7	Washer	1	St.St.304
8	Ball Stem	1	St.St.316
9	Seat Disc	2	St.St.304 (PTFE coated)
10	Seat	1	PFA
11	Seat Ring	2	St.St.304 (PTFE coated)
12	Body	1	St.St. ASTM A351 Gr. CF8M



TESTING

The H-800 design has been tested for Burst and Proof. Standard testing for each H-800 valve includes testing with nitrogen at 80 & 1000 psig. Each valve is tested for leakage through the shell, packing and ball seats. The maximum allowable leakage across the ball seats is 0.1 std cc/min.

CLEANING & PACKAGING

Every H-800 series ball valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Lubricant free cleaned valves have significantly higher actuation torque.

PACKING ADJUSTMENT

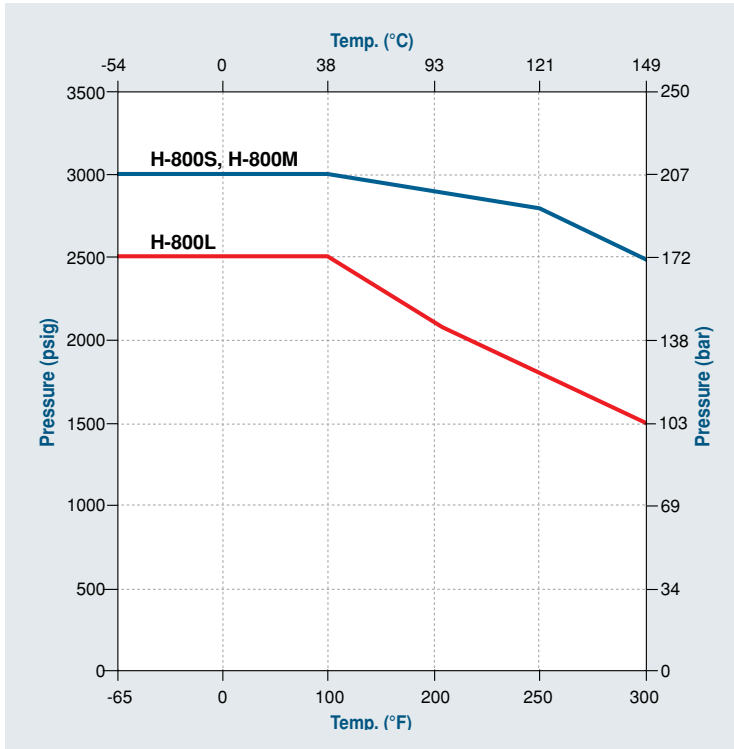
Due to the varied service applications of the valve, packing adjustment may occasionally be necessary.

Packing adjustment for this valve can fix not only leakage through stem but also leakage through the seats.

Packing is factory adjusted to 1000 psig service. Initial adjustment is recommended after installation and prior to start-up.

HAM-LET Ball Valves are designed for operation in fully closed or fully open position only.

PRESSURE TEMPERATURE RATING



For LF Services MAWP: Body size Large → 500psi
Body size Small and Medium → 1000psi

H-800 COLORED AND METAL HANDLES

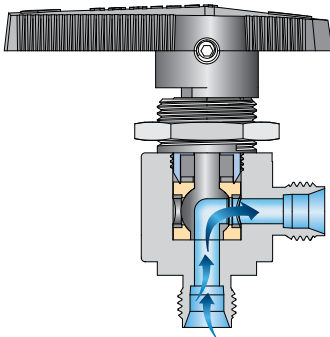


MANUAL OPERATION

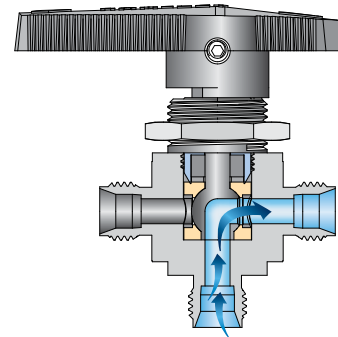
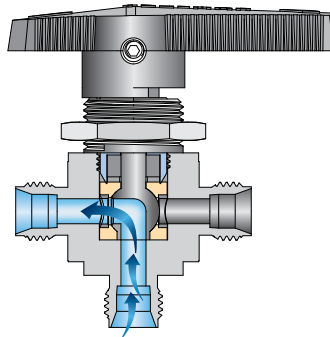
- S - Black Handle*
 - B - Blue Handle
 - R - Red Handle
 - G - Green Handle
 - Y - Yellow Handle
 - M - Metal Handle
- * Black Nylon handle is standard.

FLOW DIRECTION

H-800 Angle-Type

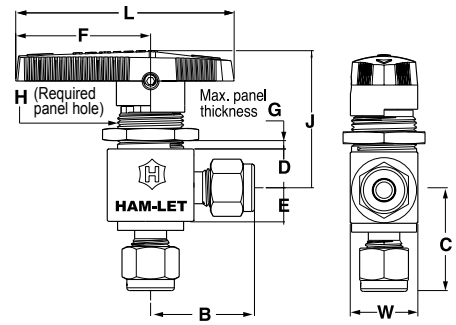
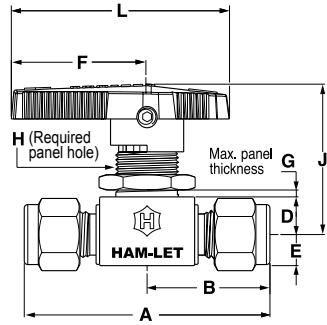


H-800 T-Type



NOTE: Side entry is allowed and limited to 1500 psi for all sizes

STRAIGHT PORT VALVE & ANGLE PATTERN

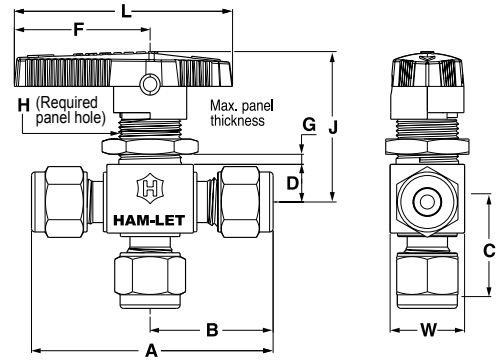


STANDARD CONFIGURATION DIMENSIONS

End Connection		Body Size Designator	Orifice		CV straight	CV angle	DIMENSIONS																											
Type	Size		mm	inch			A				B				C (Angle)				D		E		F		L		G		H (Diameter)		J		W	
							mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
Let-Lok® Imperial	1/16	S	1.3	0.051	0.1	-	42.7	1.68	21.35	0.84	20.6	0.81																						
	1/8	S	2.4	0.094	0.2	0.15	51.1	2.01	25.70	1.01	24.6	0.97	8.6	0.34	7.1	0.28	31.0	1.22	50	1.97	6.4	0.25	15.1	0.59	34.5	1.36	17	0.67						
			3.2	0.126	0.6	0.35	56.1	2.21	28.05	1.10	27.2	1.07																						
	1/4	M	4.8	0.189	1.4	0.9	60.7	2.39	30.50	1.20	29.7	1.17																						
			1.5	0.9	65.5	2.58	32.75	1.29	32.8	1.29																								
	3/8	L	6	2	77.5	3.05	38.60	1.52	36.3	1.43	14.2	0.56	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12								
7.1			0.279	6	4.6	83.12	3.27	41.56	1.63	39.16	1.54	14.2	0.56	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12							
Let-Lok® Metric	3mm	S	2.4	0.094	0.2	0.15	51.1	2.01	25.70	1.01	24.6	0.97	8.6	0.34	7.1	0.28	31.0	1.22	50	1.97	6.4	0.25	15.1	0.59	34.5	1.36	17	0.67						
	6mm	M	3.2	0.126	0.6	0.35	56.1	2.21	28.05	1.10	27.2	1.07																						
			4.8	0.189	1.4	0.9	60.7	2.39	30.35	1.20	29.7	1.17	11.2	0.44	9.7	0.38	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78						
	8mm	L	1.5	0.9	62.5	2.46	31.25	1.23	30.5	1.2																								
	10mm	L	7.1	0.279	6	2	78.0	3.07	38.90	1.53	36.3	1.43	14.2	0.56	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12						
12mm	L	7.1	0.279	6	4.6	83.12	3.27	41.56	1.63	39.16	1.54	14.2	0.56	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12							
F-NPT	1/8	S	3.2	0.126	0.5	0.3	41.4	1.63	20.60	0.81	20.6	0.81	8.6	0.34	7.1	0.28	31.0	1.22	50	1.97	6.4	0.25	15.1	0.59	34.5	1.36	17	0.67						
			1.2	0.7	50.8	2.00	25.40	1.00	25.4	1.00	11.2	0.44	9.7	0.38	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78								
	1/4	M	0.9	0.75	52.3	2.06	26.20	1.03	26.2	1.03	11.2	0.44	9.7	0.38	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78												
			3	1.7	63.5	2.50	31.75	1.25	31.75	1.25	14.2	0.56	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12								
3/8	L	7.1	0.279	2.6	1.5	63.5	2.50	31.75	1.25	31.75	1.25	14.2	0.56	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12							
M-NPT	1/4			1.2	0.75	50.8	2.00	25.40	1.00	26.2																								
M-NPT to Let-Lok®	1/4	M	4.8	0.189	1.6	0.75	55.9	2.20	30.5	1.20	26.2	1.03	11.2	0.44	9.7	0.38	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78						
Female ISO 7-1 tapered	1/4			0.9	-	52.3	2.06	26.15	1.03	26.15																								
O-Ring Face Seal	1/4	S	3.2	0.126	0.6	0.35	44.4	1.75	22.40	0.88																								
			4.8	0.189	2.4	0.9	47.8	1.88	23.90	0.94	23.9	0.94	11.2	0.44																				
Face Seal Male	1/4	S	3.2	0.126	0.6	0.35	54.1	2.13	27.05	1.06	27.7	1.09	11.2	0.44																				
			4.8	0.189	2.4	0.9																												
	1/2	L	7.1	0.279	6	-	73.2	2.88	36.60	1.44	-	-	14.2	0.56	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	38.1	1.5						

Dimensions are for reference only, and are subject to change.

3-WAY VALVE



STANDARD CONFIGURATION DIMENSIONS																									
End Connection		Body Size Designator	Orifice		CV	DIMENSIONS																			
Type	Size		mm	inch		A		B		C		D		F		L		G		H (Diameter)		J		W	
						mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
Let-Lok® Imperial	1/16	S	1.3	0.051	0.08	42.7	1.68	21.35	0.84	20.6	0.81	8.6	0.34	31.0	1.22	50	1.97	6.4	0.25	15.1	0.59	34.5	1.36	17	0.67
	1/8		2.4	0.094	0.15	51.1	2.01	25.70	1.01	24.6	0.97														
			3.2	0.126	0.35	56.1	2.21	28.05	1.10	27.2	1.07														
	1/4	M	4.8	0.189	0.9	60.7	2.39	30.50	1.20	29.7	1.17	11.2	0.44	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78
	3/8		65.5	2.58	32.75	1.29	33.0	1.3	14.2	0.56	50.8														
	1/2	L	7.1	0.279	4.6	73.4	2.89	36.80	1.45	36.3	1.43	14.2	0.56	50.8	2.0	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12
Let-Lok® Metric	3mm	S	2.4	0.094	0.15	51.1	2.01	25.70	1.01	24.6	0.97	8.6	0.34	31.0	1.22	50	1.97	6.4	0.25	15.1	0.59	34.5	1.36	17	0.67
	6mm		3.2	0.126	0.35	56.1	2.21	27.90	1.10	27.2	1.07														
	8mm	M	4.8	0.189	0.9	60.7	2.39	30.50	1.20	29.7	1.17	11.2	0.44	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78
	10mm	0.8	62.5	2.46	31.25	1.23	30.5	1.2	14.2	0.56	50.8														
	12mm	L	7.1	0.279	4.6	73.4	2.89	36.80	1.45	36.3	1.43	14.2	0.56	50.8	2.0	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12
F-NPT	1/8	S	3.2	0.126	0.3	41.4	1.63	20.60	0.81	20.6	0.81	8.6	0.34	31.0	1.22	50	1.97	6.4	0.25	15.1	0.59	34.5	1.36	17	0.67
	1/4	M	4.8	0.189	0.75	52.3	2.06	26.20	1.03	26.2	1.03	11.2	0.44	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78
		L	7.1	0.279	1.7	63.5	2.50	31.75	1.25	31.75	1.25	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12
3/8		1.5	63.5	2.50	31.75	1.25	31.75	1.25	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12			
M-NPT to Let-Lok	1/4	M	4.8	0.189	0.8	60.7	2.39	30.50	1.20	26.2	1.03	11.2	0.44	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78
Female ISO 7-1 tapered	1/4				0.75	52.3	2.06	26.15	1.03	26.15															
3/8	L	7.1	0.279	1.5	63.5	2.50	31.75	1.25	31.75	1.25	14.2	0.56	50.8	2	82.3	3.24	9.5	0.38	28.6	1.13	52.6	2.07	28.4	1.12	
Face Seal Male	1/4	S	3.2	0.126	0.35	54.1	2.13	27.05	1.06	27.7	1.09	11.2	0.44	31.0	1.22	50	1.97	3.2	0.13	15.1	0.59	34.5	1.36	19.8	0.78
		M	4.8	0.189	0.9							11.2	0.44	38.9	1.53	63	2.48	4.8	0.19	19.8	0.78	37.3	1.47	19.8	0.78

Dimensions are for reference only, and are subject to change.

H-800 - PNEUMATIC ACTUATED VALVES

FEATURES

- 90° Actuation for 2-way valves (Straight & Angle)
- 180° Actuation for T-type valves
- Actuators comply with industry standards for interface with ISO 5211, NAMUR and VDI/VDE 3845
- Actuated valves are available factory assembled or separately, actuator and mounting kits
- Limit switches, proximity sensors, position indicators, solenoid valves, and other accessories are available upon request
- Standard Temperature range: -32°C to 90°C (-25.6°F to 194°F)
Optional: High Temperature, Low Temperature

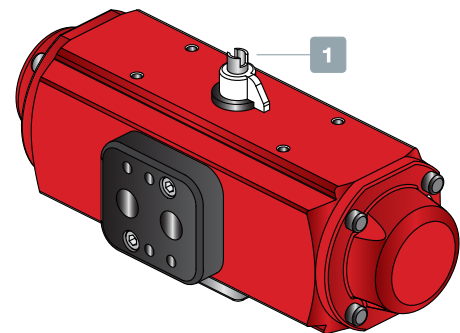
GENERAL

Four standard actuator sizes are available upon request: Mini (designator "A1"), Small (designator "A2"), Medium (designator "A3"), Large (designator "A4") and 180° actuator (designator "A2T"). Improved operational speed enables better valve opening and closing control. ATEX certification of Valves-Actuators assemblies are available on request at the time of order quotation.

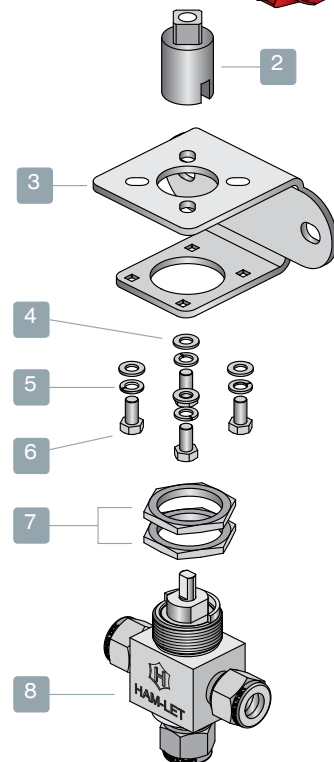
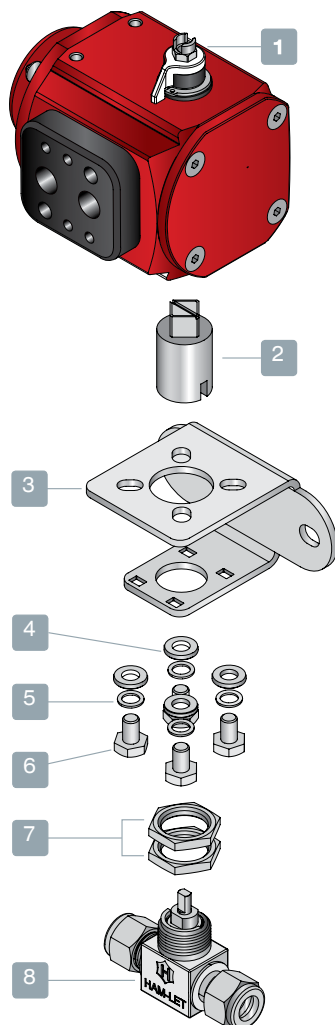
MATERIAL OF CONSTRUCTION

No.	Part	Qty	Material
1	Actuator	1	AL 356-T5
2	Coupling	1	St.St.316
3	Bracket	1	St.St.304
4	Washer Flat	4	St.St.304
5	Washer Spring	4	St.St.304
6	Screw	4	St.St.304
7	Panel Nut	2	St.St.316
8	H-800	1	St.St.316

180° Actuator on T-type valve



90° Actuator on 2-way valve



ACTUATED H-800 SERIES



The selection of Valve-Actuator assemblies provided herein is based on:

- Valve maximum allowable working pressure
- Ambient temperature (50 to 100°F / 10 to 37°C)
- Actuator fits to valve based on operating pressure of 6 bar, as per table A.

To order H-800 ball valve factory assembled with an actuator, the actuator designator shall be added to the valve part number / description per the below table.

Example:

H-800S-SS-L-1/4 with standard Spring Return Aluminum Actuator Normally Closed
H-800S-SS-L-1/4-A1C

To order an actuator and mounting bracket kit for field assembly: Spring Return Actuator ordering number: **Z-A1S** Corresponding mounting bracket kit:

Z-800S-MK-F03-F04-A1

Lubricant free Valves:

For spring return actuator - select one size bigger then offered in the table below.

Example: If the offered actuator in the table is A2C, select A3C

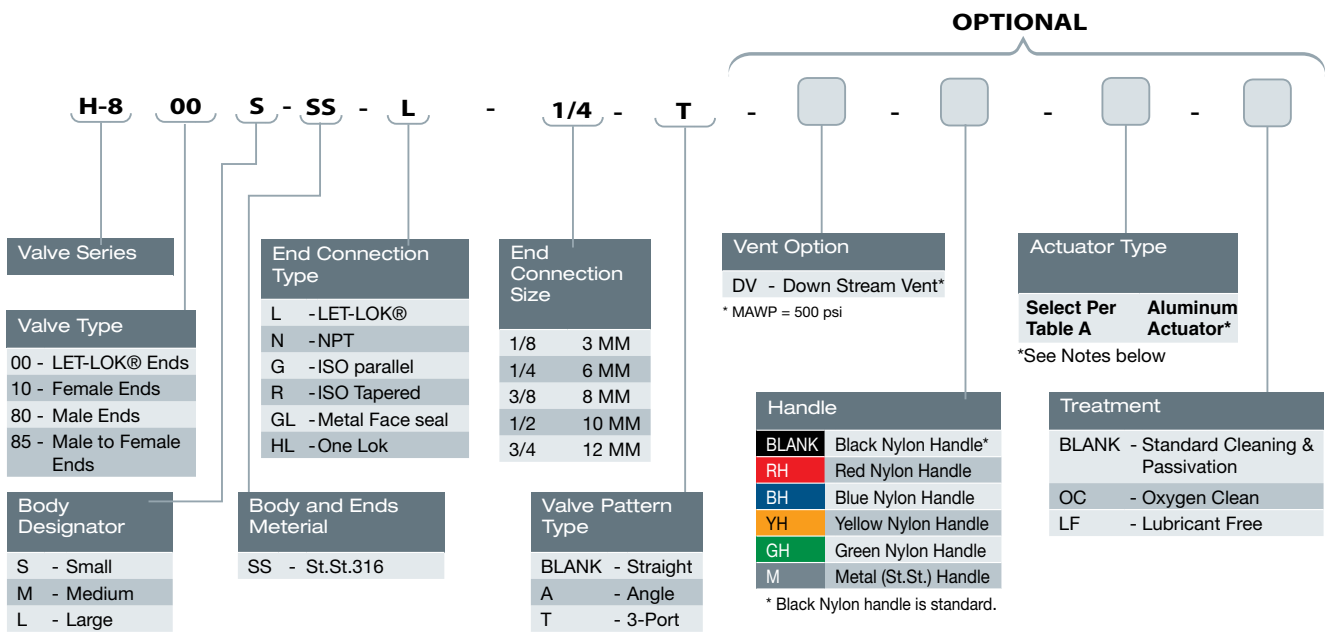
For double acting actuator - Please contact your local representative

Table A: Ordering information for Actuated Valves

Series	Ends Size	Seats	Minimum Actuator Operating Pressure Bar (Psi)	Actuator Designators (Factory Assembled)			Actuator Ordering Code		Mounting Kit Ordering info
				Spring Return		Double Acting	Spring Return	Double Acting	
				NO	NC				
H-800	S	PFA	5 (72.5)	A1O	A1C	A1	Z-A1S	Z-A1	Z-800S-MK-F03-F04-A1
	M			A1O	A1C		Z-A1S		Z-800M-MK-F03-F04-A1
	L			A2O	A2C		Z-A2S		SR: Z-800L-MK-F03-F04-A2 DA: Z-800L-MK-F03-F04-A1
H-800 T-Type	S	PFA	5 (72.5)	A2TS	A2TS	A2T	Z-A2TS	Z-A2T	Z-800S-MK-F03-F04-A2
	M								Z-800M-MK-F03-F04-A2
	L								Z-800L-MK-F03-F04-A2

Note: For dimensions of Actuators assembled on the H-800 series, please refer to the HPA section.

H-800 SERIES ORDERING INFORMATION

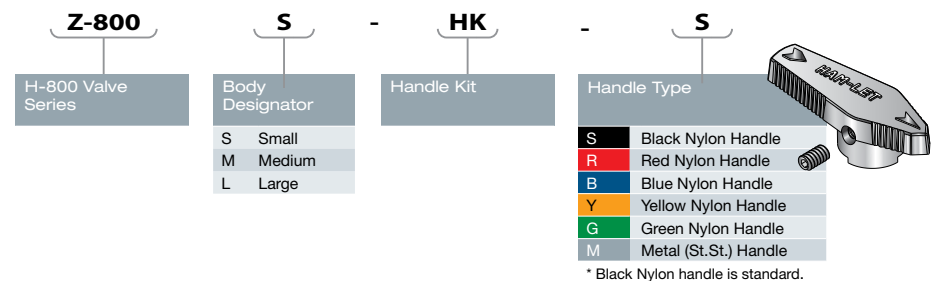


For Actuated Valves

- If special cleaning is required, LF / OC will be added in the end, and be applicable for the Valve only.
Example: H - 800S - SS - L - 1/4 - A1 - OC
- For ordering information of actuators for high temperatures, please refer to HAM-LET Pneumatic Actuator Catalog
- For double mounting actuators, please contact your local representative
- Actuators Accessories (Limit Switch, Solenoid Valve) please refer to HAM-LET Pneumatic Actuator Catalog
- For Stainless Steel Actuators or Electric Actuators please contact your local representative

HANDLE KIT

Handle kit contains handle and set screw

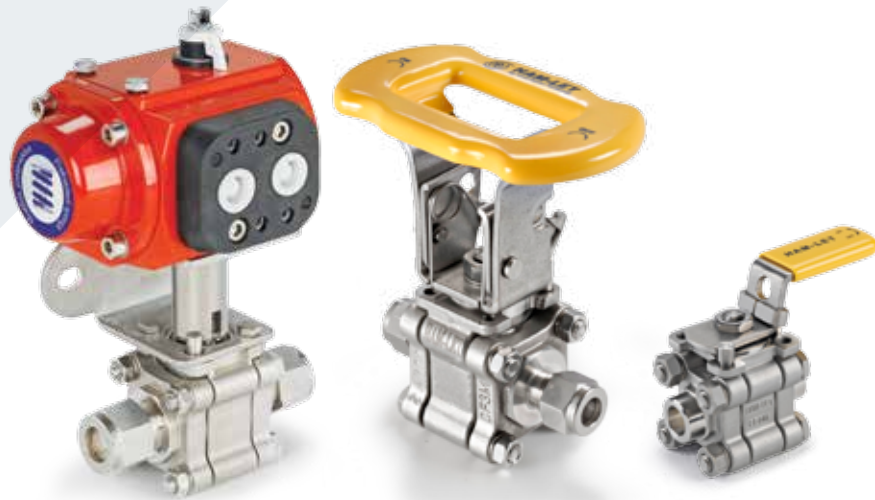


Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

THREE-PIECE BALL VALVES

H-500 SERIES



H-500 FEATURES

3-piece heavy-duty ball valves with:

- Certified for ISO 15848-1:2006(E)
- Precision Investment cast body in CF8M stainless steel
- Precision Investment cast end caps in CF3M stainless steel
- Blow-out proof stem with Belleville washer design for long life stem sealing
- Manual Operation with integral locking device
- Flow coefficient (Cv) from 1.2 to 24.0
- MAWP 3000 psig (206 Barg), 2000 psig (137 Barg) for “-FP” option
- MAWT 450°F (232°C)
- H-500S seat material is Modified PTFE as standard

MATERIALS OF CONSTRUCTION

No.	Components	Material	Qty
1	Handle	St.St. 304	1
2	Stem Nut	St.St. 304	2
3	Stem Washer	St.St. 316	1
4	Lock Saddle	St.St. 304	1
5	Belleville Washer	St.St. 304	2
6	Gland	St.St. 304	1
7	Stem Packing	MG1241 / PTFE	1
8	Stem Seal	MG1241	2
9	Stem	St.St. 316	1
10	Locking Device	St.St. 316	1
11	Handle Sleeve	Vinyl	1
12	Stop Pin	St.St. 304	1
13	Tightening Bolt	St.St. 304	4
14	End Cap	ASTM A351 Gr. CF3M	2
15	Joint Gasket	PTFE	2
16	Seat	PTFE	2
17	Body	ASTM A351 Gr. CF8M	1
18	Ball	St.St. 316	1
19	Washer	St.St. 316	4
20	Bolt Nut	St.St. 316	4

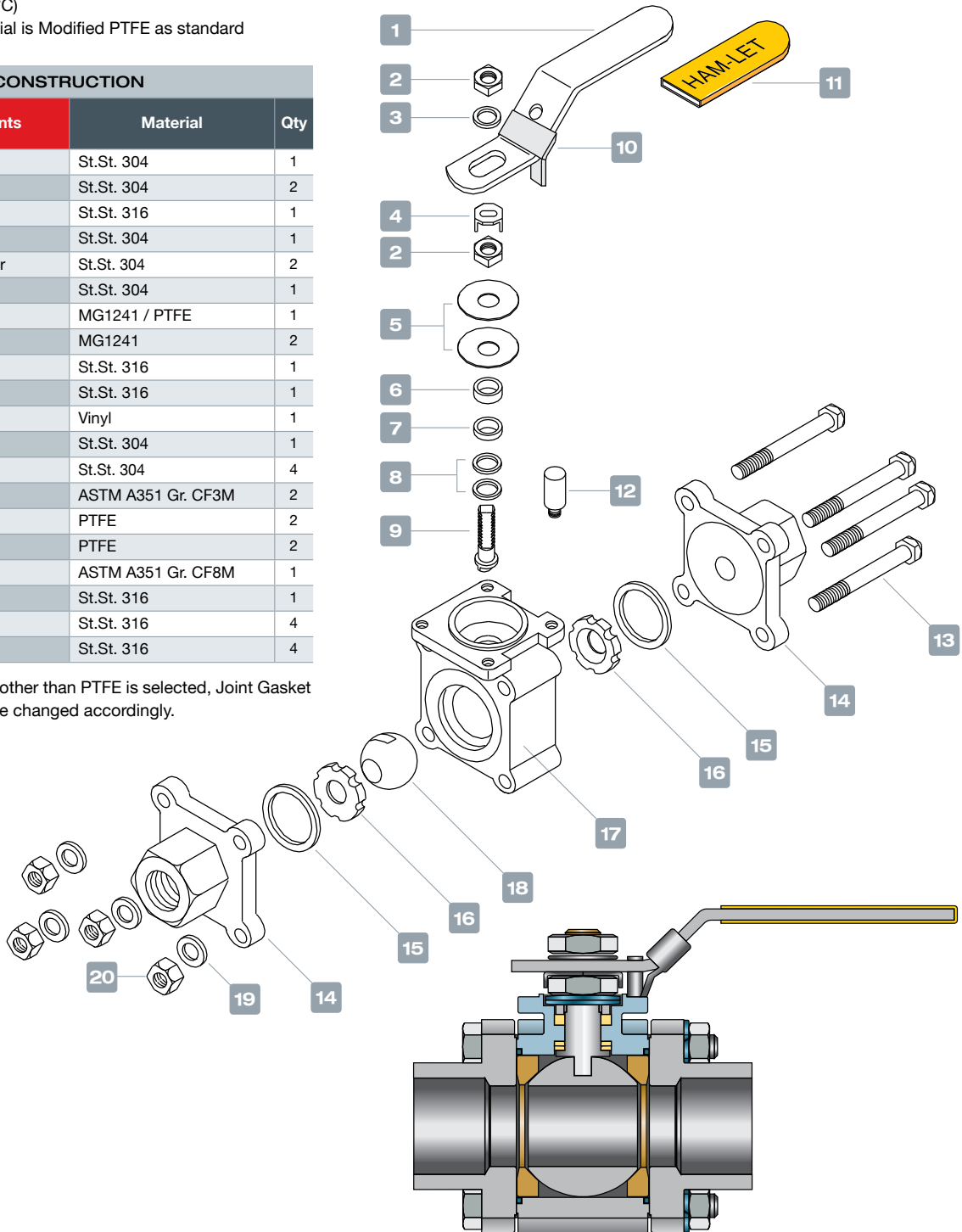
Note: If seat material other than PTFE is selected, Joint Gasket and Stem Packing are changed accordingly.

GENERAL

The H-500 Series is a moderate-pressure instrumentation Ball Valve for general service and instrumentation panels.

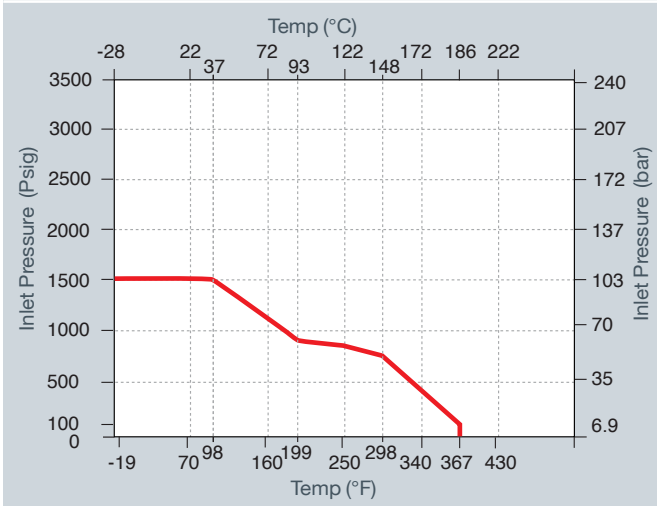
The valves offer large ports for high flow, tight shutoff, long-life service and low operating torque.

The H-500 Series can be used for bi-directional flow, is rated to max. 3000 psig (204 Bar) and performs as on/off service.



PRESSURE TEMPERATURE RATING

VIRGIN PTFE SEAT

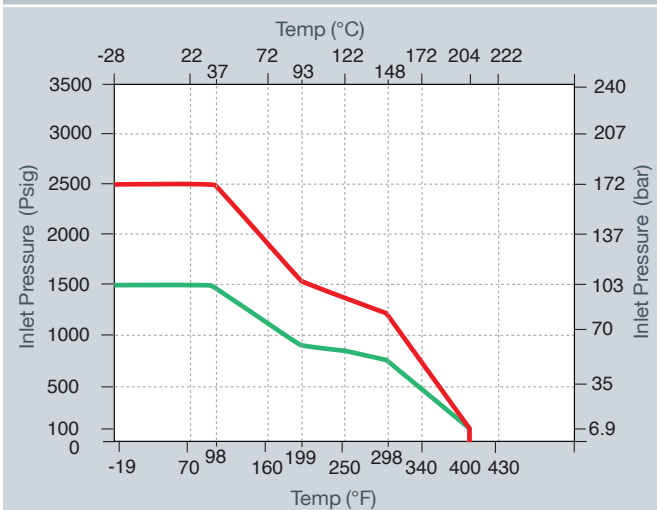


PTFE (Virgin PTFE) Color - White

PTFE is a good all around, general-purpose seat material. PTFE has outstanding resistance to chemical attacks by a broad range of organic chemicals, inorganic chemicals and solvents, and is generally considered chemically inert. PTFE is a self lubricating polymer with a very low coefficient of friction, which makes an excellent seat material

— For all sizes

MODIFIED PTFE SEATS

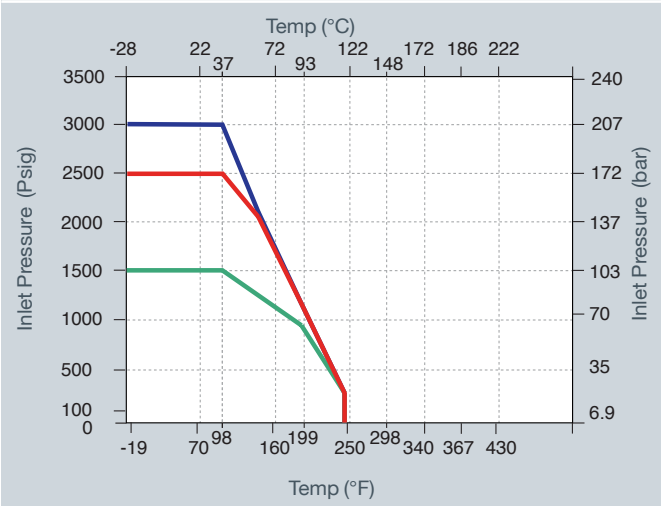


MODIFIED PTFE - (PFA and PTFE composite) Color - Bright White

MODIFIED PTFE is an excellent seat material for purity applications and has very low residual material during operation. It has a lower deformation ratio than PTFE, but a higher pressure and temperature rating than PTFE. Chemical resistance is equal to PTFE material.

— 1/4" to 1" — 1-1/4" to 2"

UHMWPE SEAT



UHMWPE Ultra-high-molecular-weight polyethylene

UHMWPE is a very tough material, highly resistant to corrosive chemicals and suitable for low-radiation service. UHMWPE is self-lubricating, highly resistant to abrasion, has an extremely low moisture absorption and a very low coefficient of friction. UHMWPE meets the requirements for the tobacco industry.

— Up to 1/2" — 3/4" to 1" — 1-1/4" to 2"

PACKING ADJUSTMENT

Due to the varied service applications of the valve, packing adjustment may occasionally be necessary. Packing is factory adjusted to 1000 psig service. Initial packing adjustment is recommended after installation and prior to start-up. Please find more information on H-500 under Installation Instructions.

HAM-LET Ball Valves are designed for operation in the fully closed or fully open position.

TESTING

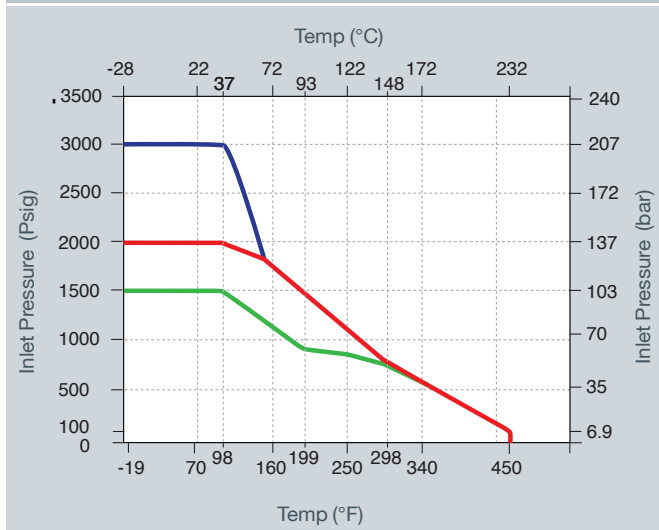
The H-500 design has been tested for Burst and Proof. Standard testing for each H-500 valve includes testing with nitrogen at 80 & 1000 psig. Each valve is tested for leakage through the shell, packing and ball seats. The maximum allowable leakage across the ball seats is 0.1 std cc/min.

CLEANING & PACKAGING

Every H-500 series ball valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Lubricant free cleaned valves have significantly higher actuation torque.

ST. ST. POWDER 50% FILLED PTFE SEATS



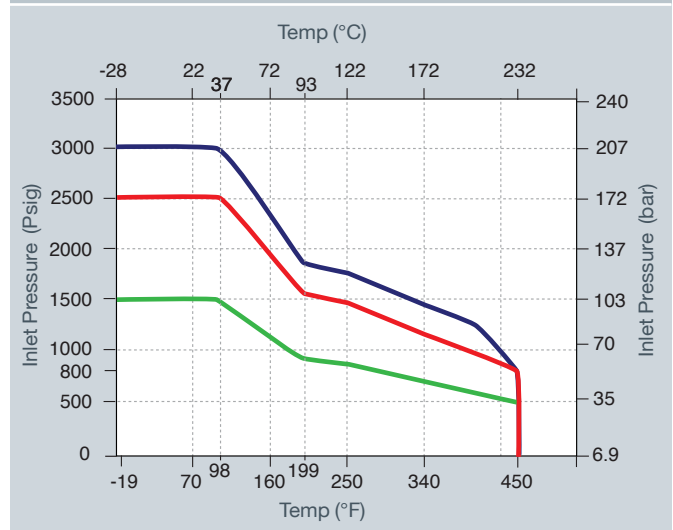
St. St. Powder Filled PTFE Color - Gray

Excellent seat material for general applications to prevent over expansion and seat extrusion.

It has a lower deformation ratio than PTFE, but a higher pressure and temperature rating. Chemical resistance is equal to PTFE material.

— Up to 1/2" — 3/4" to 1" — 1-1/4" to 2"

PEEK SEATS



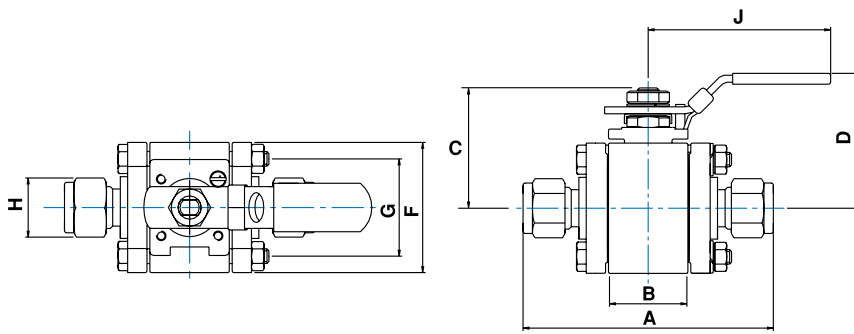
PEEK (Poly Ether Ether Keton) Color - Offwhite

Excellent seat material for high-pressure and high-temperature applications. Excellent chemical resistance.

Can be used continuously to 450°F (232°C) and in hot water or steam without permanent loss in physical properties.

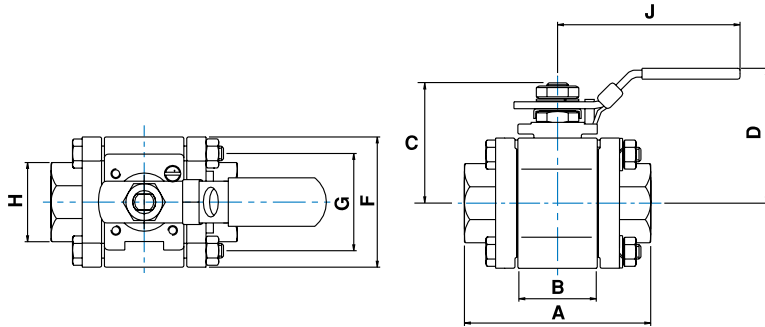
High strength for hostile environment and high pressure.

— Up to 1/2" — 3/4" to 1" — 1-1/4" to 2"



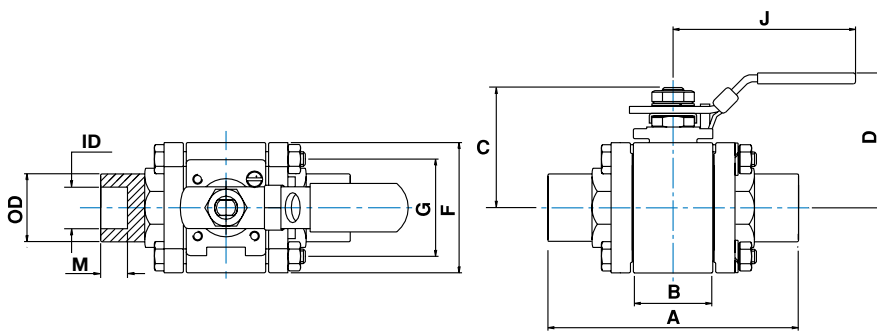
H-500 LET-LOK® STANDARD CONFIGURATION DIMENSIONS

SERIES	End Connection		Orifice		Cv	Ball ID		A		B		F		C		D		H		J		G	
	mm	inch	mm	inch		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
H-500S	6	1/4"	4.8	0.19	1.2	4.8	0.19	80.5	3.17	15.1	0.59	38.5	1.52	33.2	1.31	48.0	1.89	14.3	0.56	61.0	2.40	25.5	1.00
	10	3/8"	7.1	0.28	3.7	7.1	0.28	80.5	3.17	15.1	0.59	38.5	1.52	33.2	1.31	48.0	1.89	17.5	0.69	61.0	2.40	25.5	1.00
H-500	12	1/2"	10.3	0.40	7.6	11.0	0.43	92.3	3.63	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	22.2	0.87	121.5	4.78	32.0	1.26
	20	3/4"	13.0	0.51	13.6	14.1	0.56	92.7	3.65	24.6	0.97	50.8	2.00	44.0	1.73	60.0	2.36	28.6	1.13	121.5	4.78	38.2	1.50
	25	1"	20.0	0.79	36.0	20.0	0.79	124.4	4.90	31.8	1.25	60.0	2.36	56.7	2.23	74.5	2.93	38.1	1.50	151	5.94	44.0	1.73



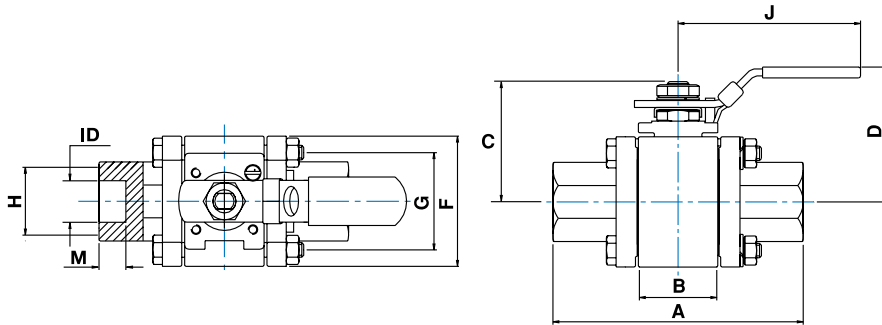
H-510 FEMALE NPT / BSPT STANDARD CONFIGURATION DIMENSIONS

SERIES	End Connection	Orifice		Cv	Ball ID		A		B		F		C		D		H		J		G	
		mm	inch		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
H-510S	1/4"	7.1	0.28	1.2	7.1	0.28	54.9	2.16	15.1	0.59	38.5	1.52	33.2	1.31	48.0	1.89	19.0	0.75	61.0	2.40	25.5	1.00
	3/8"	11.0	0.43	10	11.0	0.43	70.0	2.76	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	27.0	1.06	121.5	4.78	32.0	1.26
H-510	1/2"	11.0	0.43	10	11.0	0.43	70.0	2.76	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	27.0	1.06	121.5	4.78	32.0	1.26
	3/4"	14.1	0.56	12.0	14.1	0.56	74.0	2.91	24.6	0.97	50.8	2.00	44.0	1.73	60.0	2.36	33.0	1.30	121.5	4.78	38.2	1.50
	1"	20.0	0.79	36.0	20.0	0.79	99.0	3.90	31.8	1.25	60.0	2.36	56.7	2.23	74.5	2.93	42.0	1.65	151	5.94	44.0	1.73



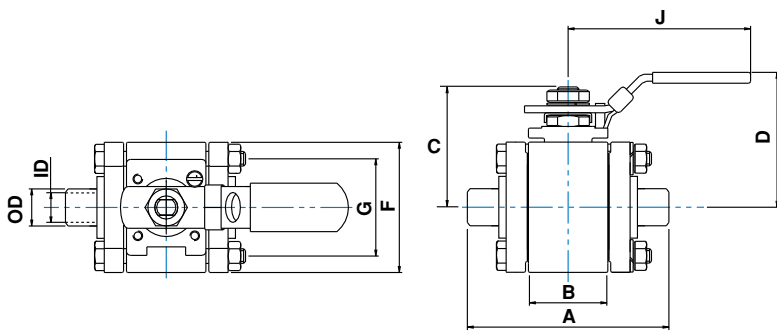
H-510 TUBE SOCKET WELD STANDARD CONFIGURATION DIMENSIONS

SERIES	End Connection		Orifice		Cv	Ball ID		A		B		F		C		D		OD		J		G		ID		M	
	mm	inch	mm	inch		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
H-510S	6	1/4"	4.8	0.19	1.2	4.8	0.19	54.9	2.16	15.1	0.59	38.5	1.52	33.2	1.31	48.0	1.89	19.0	0.75	61.0	2.40	25.5	1.00	4.80	0.19	7.10	0.28
	10	3/8"	7.1	0.28	3.7	7.1	0.28	54.9	2.16	15.1	0.59	38.5	1.52	33.2	1.31	48.0	1.89	19.0	0.75	61.0	2.40	25.5	1.00	7.10	0.28	7.90	0.31
H-510	12	1/2"	10.3	0.40	7.5	11.0	0.43	70.0	2.76	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	20.5	0.81	121.5	4.78	32.0	1.26	12.85	0.51	12.7	0.50
	20	3/4"	14.1	0.56	12.0	14.1	0.56	74.0	2.91	24.6	0.97	50.8	2.00	44.0	1.73	60.0	2.362	27.0	1.06	121.5	4.78	38.2	1.50	19.2	0.76	14.2	0.56
	25	1"	22.35	0.88	38.0	22.35	0.88	99.0	3.90	31.8	1.25	60.0	2.36	56.7	2.23	74.5	2.93	34.0	1.34	151.0	5.94	44.0	1.73	25.55	1.08	19.2	0.76



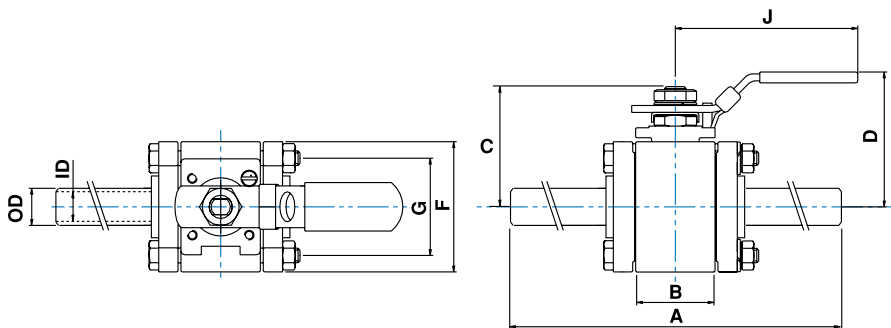
H-510 PIPE SOCKET WELD STANDARD CONFIGURATION DIMENSIONS

SERIES	End Connection	Orifice		Cv	Ball ID		A		B		F		C		D		H		J		G		ID		M	
		mm	inch		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
H-510	1/4"	11.0	0.43	10	11.0	0.43	70.0	2.76	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	27.0	1.06	121.5	4.78	32.0	1.26	14.1	0.56	9.70	0.38
	3/8"	11.0	0.43	10	11.0	0.43	70.0	2.76	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	27.0	1.06	121.5	4.78	32.0	1.26	17.5	0.69	11.0	0.43
	1/2"	11.0	0.43	10	11.0	0.43	70.0	2.76	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	27.0	1.06	121.5	4.78	32.0	1.26	22.2	0.87	9.50	0.37
	3/4"	14.1	0.56	12.0	14.1	0.56	74.0	2.91	24.6	0.97	50.8	2.00	44.0	1.73	60.0	2.36	33.0	1.30	121.5	4.78	38.2	1.50	27.4	1.08	14.3	0.56
	1"	20.0	0.79	36.0	20.0	0.79	99.0	3.90	31.8	1.25	60.0	2.36	56.7	2.23	74.5	2.93	42.0	1.65	151	5.94	44.0	1.73	34.2	1.35	15.9	0.63



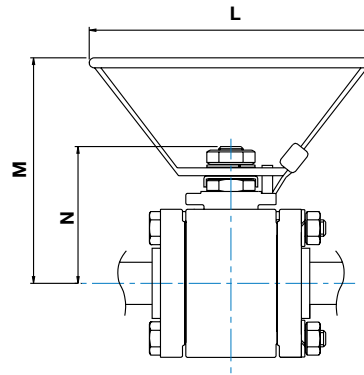
H-580 PIPE BUTTWELD STANDARD CONFIGURATION DIMENSIONS

SERIES	End Connection	Orifice		Cv	Ball ID		A		B		F		C		D		OD		ID		J		G	
		mm	inch		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
H-580S	1/4"	7.1	0.28	3.7	7.1	0.28	52.8	2.08	15.1	0.59	38.5	1.52	33.2	1.31	48.0	1.89	13.7	0.54	9.20	0.36	61.0	2.40	25.5	1.00
	3/8"	7.1	0.28	3.7	7.1	0.28	52.8	2.08	15.1	0.59	38.5	1.52	33.2	1.31	48.0	1.89	17.1	0.67	10.7	0.42	61.0	2.40	25.5	1.00
H-580	1/2"	11	0.43	10	11.0	0.43	71.6	2.82	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	21.3	0.84	15.8	0.62	121.5	4.78	32.0	1.26
	3/4"	14.1	0.56	12	14.1	0.56	72.0	2.83	24.6	0.97	50.8	2.00	44.0	1.73	60.0	2.36	27.1	1.07	21.0	0.83	121.5	4.78	38.2	1.50
	1"	20	0.79	36	20.0	0.79	97.0	3.82	31.8	1.25	60.0	2.36	56.7	2.23	74.5	2.93	33.4	1.32	26.6	1.05	151	5.94	44.0	1.73



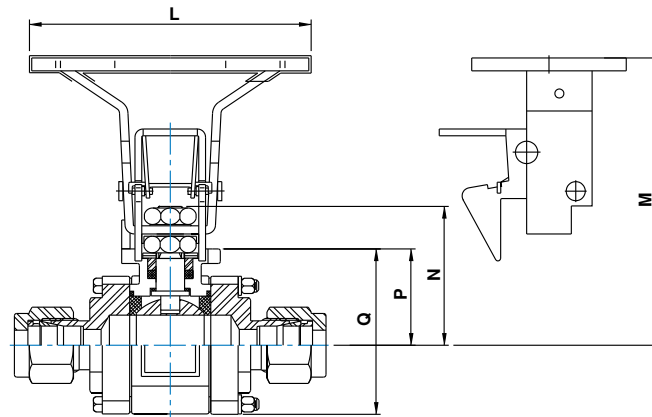
H-580 EXTENDED AND SHORT TUBE BUTTWELD STANDARD CONFIGURATION DIMENSIONS

SERIES	End Connection	Orifice		Cv	Ball ID		A extended		A short		B		F		C		D		OD		J		G		ID	
		mm	inch		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
H-580	6 1/4"	4.4	0.17	1	9.4	0.37	-	-	71.5	2.81	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	6.4	0.25	121.5	4.78	32.0	1.26	4.40	0.17
	10 3/8"	7.7	0.3	3.8	9.4	0.37	-	-	71.5	2.81	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	9.57	0.38	121.5	4.78	32.0	1.26	7.70	0.30
	12 1/2"	9.4	0.37	7	9.4	0.37	140	5.5	64.6	2.54	20.6	0.81	44.4	1.75	40.5	1.59	56.5	2.22	12.7	0.5	121.5	4.78	32.0	1.26	9.40	0.37
	20 3/4"	15.75	0.62	18	15.8	0.87	150	5.9	-	-	24.6	0.97	50.8	2.00	44.0	1.73	60.0	2.36	19.05	0.75	121.5	4.78	38.2	1.50	15.75	0.62
	25 1"	22.1	0.87	38	22.35	0.88	161.2	6.35	-	-	31.8	1.25	60.0	2.36	56.7	2.23	74.5	2.93	25.4	1	151	5.94	44.0	1.73	22.1	0.87



H-500 OVAL HANDLE

End Connection	N		L		M	
	mm	inch	mm	inch	mm	inch
1/4", 3/8", 1/2" 6mm, 10mm, 12mm	40.5	1.6	105.0	4.13	66	2.6
3/4" 20mm	44	1.73	105.0	4.13	70	2.75
1" 25mm	56.7	2.23	105.0	4.13	88.7	3.49



H-500 GRIP HANDLE (OVAL)

End Connection	L		M		N		P		Q	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
1/4", 3/8", 1/2" 6mm, 10mm, 12mm	104	4.09	94.5	3.72	40.5	1.59	27.5	1.08	49.5	1.95
3/4" 20mm	104	4.09	98	3.86	44	1.73	30.5	1.2	56	2.2

H-500 - PNEUMATIC ACTUATED VALVES

FEATURES

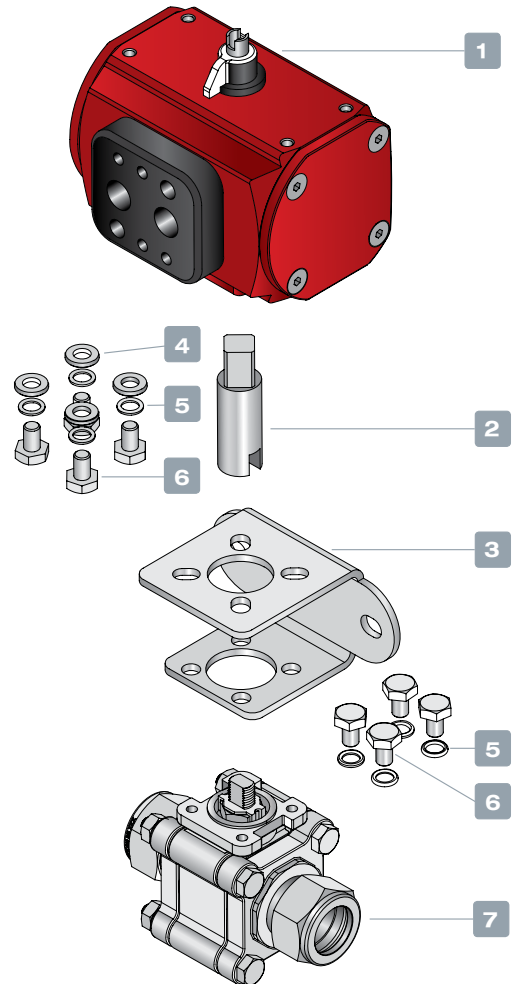
- 90° Actuation for 2-way valves
- Actuators comply with industry standards for interface with ISO 5211, NAMUR and VDI/VDE 3845
- Actuated valves are available factory assembled or separately, actuator and mounting kits
- Limit switches, proximity sensors, position indicators, solenoid valves and other accessories are available upon request
- Standard Temperature range: -32°C to 90°C (-25.6°F to 194°F)
Optional: High Temperature, Low Temperature

MATERIAL OF CONSTRUCTION

No.	Part	Qty	Material
1	Actuator	1	AL 356-T5
2	Coupling	1	St.St.316
3	Bracket	1	St.St.304
4	Washer Flat	4	St.St.304
5	Washer Spring	8	St.St.304
6	Screw	8	St.St.304
7	H500	1	St.St.316

GENERAL

Four standard actuator sizes are available upon request: Mini (designator "A1"), Small (designator "A2"), Medium (designator "A3"), and Large (designator "A4"). Improved operational speed enables better valve opening and closing control. ATEX certification of Valves-Actuators' assemblies are available on request at the time of order quotation.



HAM-LET PNEUMATIC ACTUATORS



ACTUATED H-500 SERIES

The selection of Valve-Actuator assemblies provided herein is based on:

- Valve maximum allowable working pressure
- Ambient temperature (50 to 100°F / 10 to 37°C)
- Actuator fits to valve based on operating pressure of 6 bar, in accordance with table A.

To order H-500 ball valve factory assembled with an actuator, the actuator designator shall be added to the valve part number/description per the below table.

Example:

H-500-SS-L-3/4-T with standard Double Acting Aluminum Actuator

H-500-SS-L-3/4-T-A2

To order an actuator and mounting kit for field assembly:

Double Acting Actuator ordering number: **Z-A2**

Corresponding mounting kit: **Z-500-MK-3/4 -F03-F04-A2**

Lubricant free Valves:

For Spring Return Actuator - select one size bigger then offered in the table below.

Example: If the offered actuator in the table is A2C, select A3C

For Double Acting Actuator - please contact your local representative

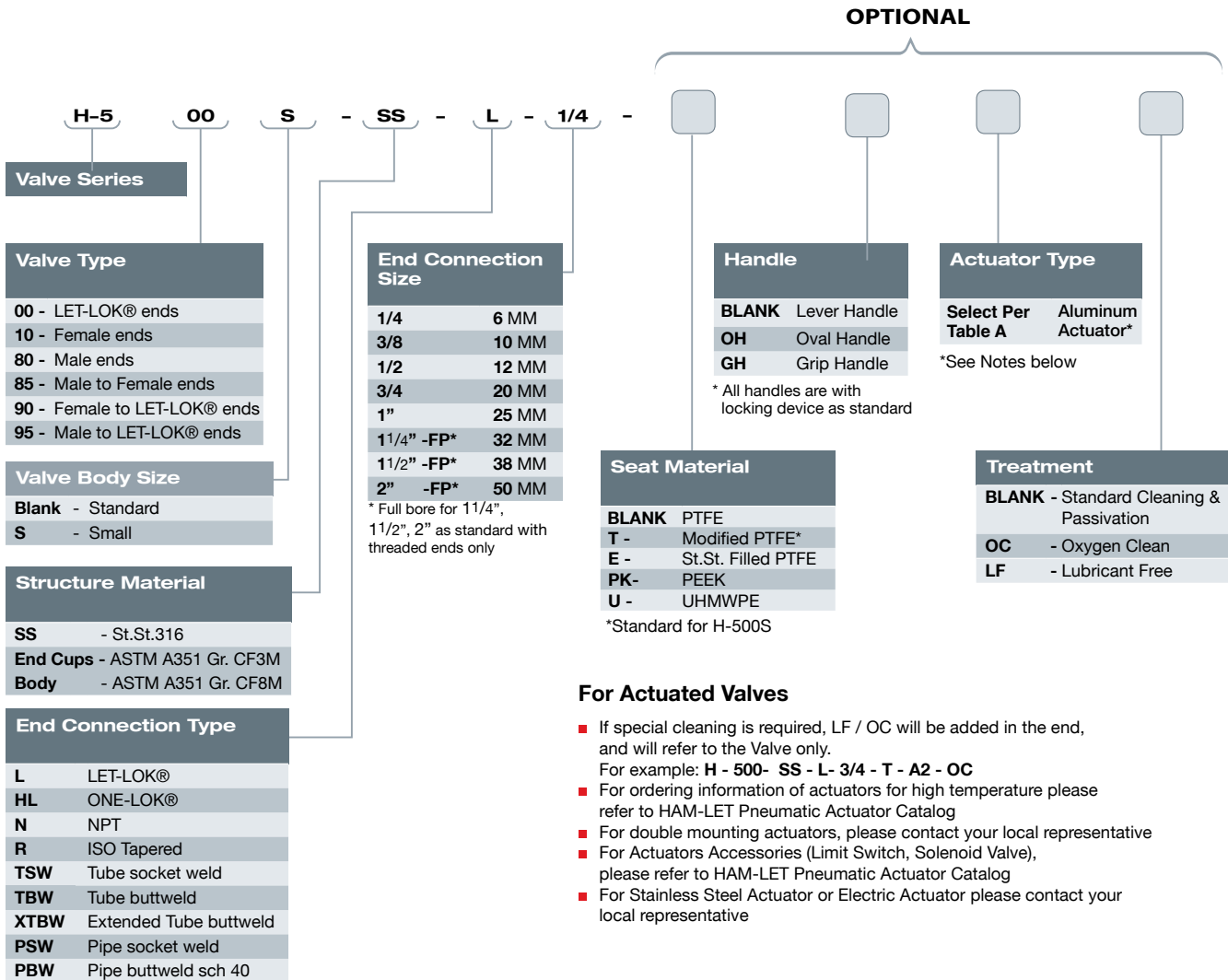


Table A: Ordering information for Actuated Valves

Series	Ends Size	Seats	Minimum Actuator Operating Pressure Bar (Psi)	Actuator Designators (Factory Assembled)		Actuator Ordering Code		Mounting Kit Ordering Info	
				Spring Return		Double Acting	Spring Return		Double Acting
				NO	NC				
H-500S	1/4", 3/8" (6 mm, 10 mm)	Modified PTFE	5 (72.5)	A10	A1C	A1	Z-A1S	Z-A1	Z-500-MK-1/4"-F03-F04-A1
		PTFE Modified PTFE	5 (72.5)	A20	A2C	A1	Z-A2S	Z-A1	SR: Z-500-MK-1/2"-F03-F04-A2 DA: Z-500-MK-1/2"-F03-F04-A1
H-500	1/4"-1/2" (6 mm-12 mm)	St.St. PTFE	5 (72.5)	A20	A2C	A2	Z-A2S	Z-A2	Z-500-MK-1/2"-F03-F04-A2
		PEEK	5 (72.5)	A40	A4C	A3	Z-A4S	Z-A3	SR: Z-500-MK-1/2"-F05-F07-A4 DA: Z-500-MK-1/2"-F04-F05-A3
		PTFE Modified PTFE	5 (72.5)	A20	A2C	A2	Z-A2S	Z-A2	Z-500-MK-3/4"-F03-F04-A2
	3/4" (20 mm)	St.St. PTFE	5 (72.5)	A30	A3C	A2	Z-A3S	Z-A2	SR: Z-500-MK-3/4"-F04-F05-A3 DA: Z-500-MK-3/4"-F03-F04-A2
		PEEK	5 (72.5)	A40	A4C	A4	Z-A4S	Z-A4	Z-500-MK-3/4"-F05-F07-A4
		PTFE Modified PTFE	5 (72.5)	A40	A4C	A3	Z-A4S	Z-A3	SR: Z-500-MK-1"-F05-F07-A4 DA: Z-500-MK-1"-F04-F05-A3
	1" (25 mm)	St.St. PTFE	5 (72.5)	A40	A4C	A3	Z-A4S	Z-A3	SR: Z-500-MK-1"-F05-F07-A4 DA: Z-500-MK-1"-F04-F05-A3
		PEEK	5 (72.5)	A50	A5C	A4	Z-A5S	Z-A4	SR: Z-500-MK-1"-F05-F07-A5 DA: Z-500-MK-1"-F05-F07-A4

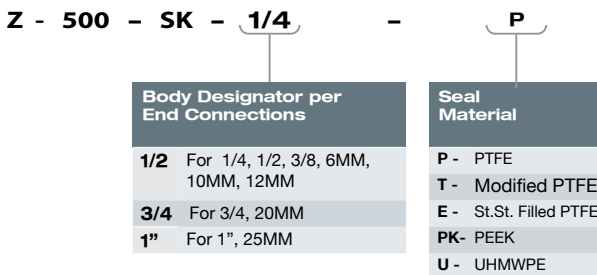
Note: For dimensions of Actuators assembled on the H-500 series, please refer to the HPA section.

H-500 SERIES ORDERING INFORMATION

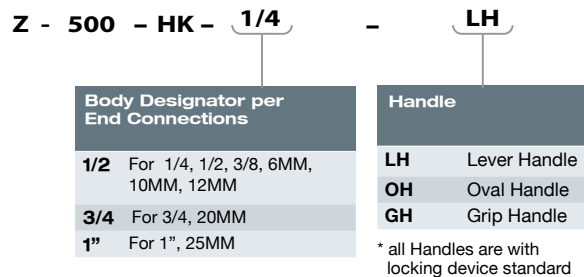


ORDERING INFORMATION FOR SEAL KITS

The kit includes gaskets, seats, stem packing and stem seal.



ORDERING INFORMATION FOR HANDLE KITS



Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.



TWO-PIECE BALL VALVES

H-700 SERIES



FEATURES

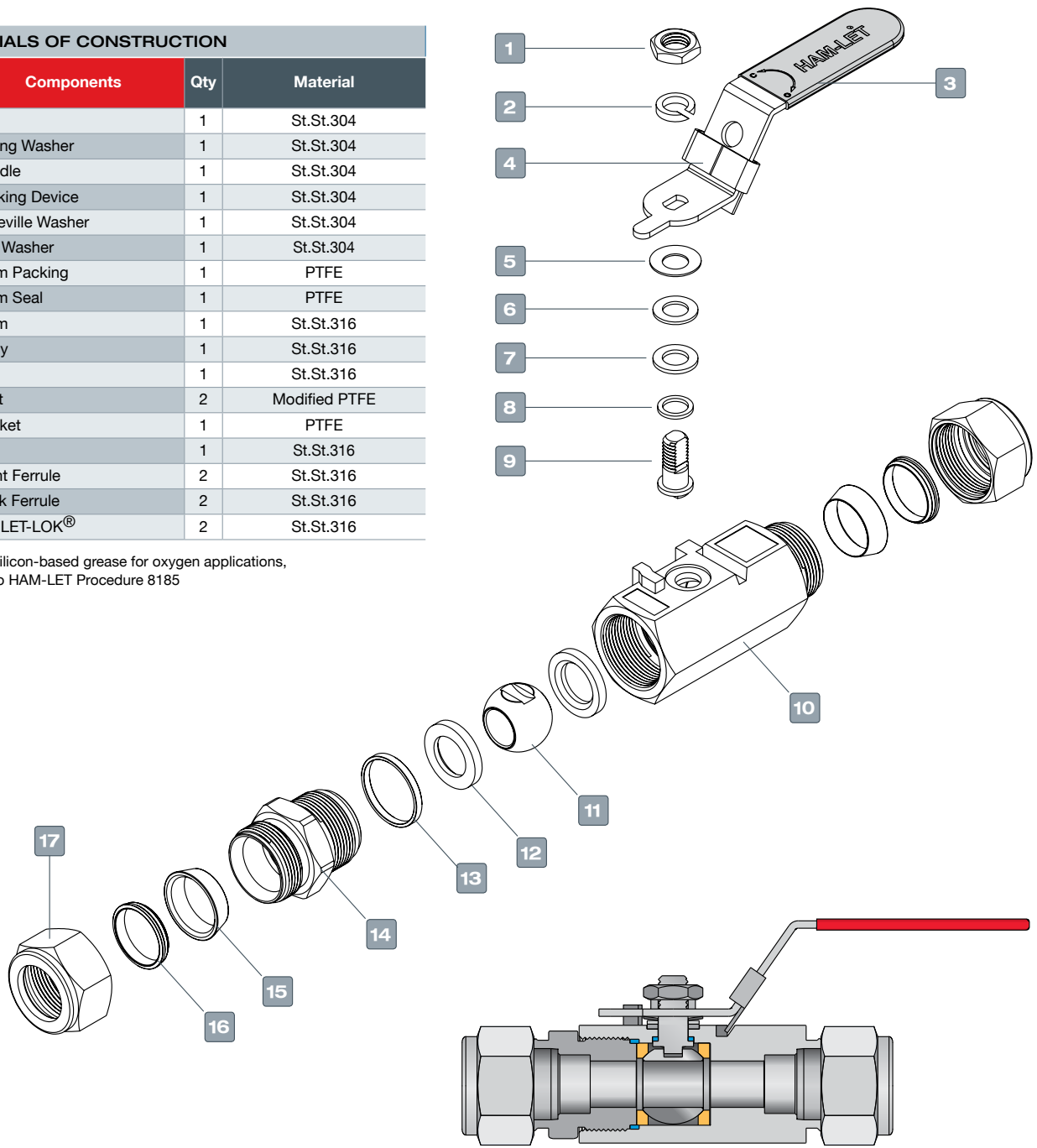
- Certified for ISO 15848-1 :2006(E)
- Blow-out Proof Stem
- Stainless Steel Constructions
- Locking Handle in On and Off positions
- MAWP 2000 psi (137 Barg)
- MAWT 400°F (204°C)
- Flow coefficient (Cv) 1.25 to 17.35
- Size range: 1/4" to 1" or 6mm to 25mm

GENERAL

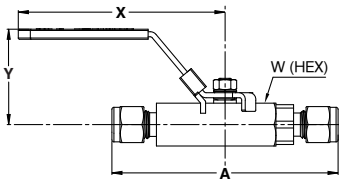
The H-700 Series is a moderate-pressure ball valve for general service. These valves are compact in size and structure. They have relatively large ports for a high flow, tight shutoff, a long-life service, and a low operating torque. The H-700 Series can be used for bi-directional flow in a fully open or fully closed position only. The series is rated to a max. of 2000 psig (135 bar) and performs as on/off service.

MATERIALS OF CONSTRUCTION			
No.	Components	Qty	Material
1	Nut	1	St.St.304
2	Spring Washer	1	St.St.304
3	Handle	1	St.St.304
4	Locking Device	1	St.St.304
5	Belleville Washer	1	St.St.304
6	Flat Washer	1	St.St.304
7	Stem Packing	1	PTFE
8	Stem Seal	1	PTFE
9	Stem	1	St.St.316
10	Body	1	St.St.316
11	Ball	1	St.St.316
12	Seat	2	Modified PTFE
13	Gasket	1	PTFE
14	End	1	St.St.316
15	Front Ferrule	2	St.St.316
16	Back Ferrule	2	St.St.316
17	Nut LET-LOK®	2	St.St.316

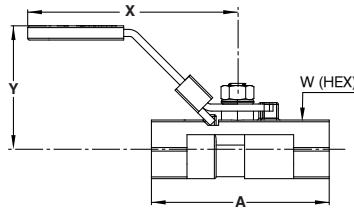
Lubricant: silicon-based grease for oxygen applications, according to HAM-LET Procedure 8185



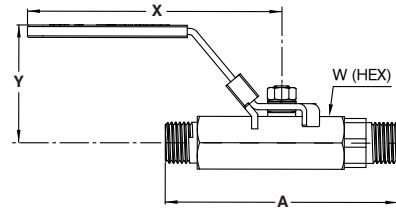
H-700



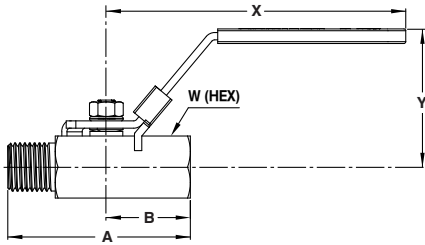
H-710



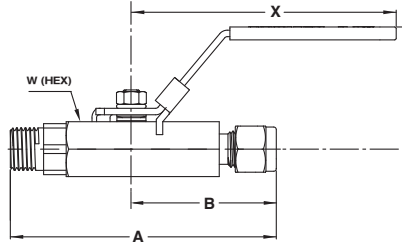
H-780



H-785



H-795



STANDARD CONFIGURATION DIMENSIONS

End Connection		Valve Type	Body Material	Cv	Orifice		A		B		X		Y		W (HEX)				
Type	Size				mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch			
Fractional Let-Lok® Tube Fittings	1/4	H-700	ASTM A276 Gr.316	1.25	4.8	0.19	90	3.54			82	3.23	38	1.5	17				
	3/8			2.5	7.2	0.28	90	3.54			82	3.23	40	1.57	21				
	1/2		ASTM A351 Gr.CF8M	9.25	9.2	0.36	95.3	3.75			82	3.23	40.7	1.6	25				
	3/4			12.65	12.5	0.49	113.4	4.46			82	3.23	44.5	1.75	32				
	1			17.35	15	0.59	129.6	5.1			102	4.02	50	1.97	38				
Metric Let-Lok® Tube Fittings	6MM		H-700	ASTM A276 Gr.316	1.25	4.8	0.19	90	3.54			82	3.23	38	1.5	17			
	8MM				1.35	4.8	0.19	90	3.54			82	3.23	40	1.57	17			
	10MM			ASTM A351 Gr.CF8M	2.6	7.2	0.28	90	3.54			82	3.23	40	1.57	17		13/16	
	12MM				9.25	9.2	0.36	95.3	3.75			82	3.23	40.7	1.6	25			
	25MM				17.35	15	0.59	129.6	5.1			102	4.02	50	1.97	38			
Female NPT	1/4	H-710		ASTM A351 Gr.CF8M	1.35	5	0.2	50	1.97			67	2.64	47	1.85	16.5			
	3/8				2.6	7	0.28	60	2.36			67	2.64	49	1.93		13/16		
	1/2				9.25	9	0.35	75	2.95			82.5	3.25	42.9	1.69	25			
	3/4				12.65	12.5	0.49	59	2.32			85	3.35	44	1.73	32			
	1				17.35	15	0.59	71	2.8			102	4.02	50	1.97	41			
Male NPT	1/4		H-780		ASTM A276 Gr.316	1.35	5	0.2	75.0	2.95			82	3.23	38	1.5	17		
	3/8					2.5	7	0.28	75.0	2.95			82	3.23	40	1.57	21		
	1/2				9.25	9.2	0.36	75.0	2.95			82	3.23	40.7	1.6	25			
Male to Female NPT	1/4				H-785	ASTM A276 Gr.316	1.35	5	0.2	50	1.97	24.85	0.98	82	3.23	38	1.5	17	
	1/2					ASTM A351 Gr.CF8M	9.25	9	0.35	70	2.95	37.5	1.47	82	3.23	56.6	2.23	27	
	1	17.35		15			0.59	90	3.54	45.5	1.79	102	4.02	53	2.09		1-3/4		
Male NPT to Let-Lok® Tube Fittings	1/4	H-795	ASTM A351 Gr.CF8M	1.25	5	0.2	70.15	2.76	45.0	1.77	82	3.23	38	1.5	17				
	3/8			2.5	7	0.28	82.3	2.99	45.0	1.77	82	3.23	40	1.57	21				
	1/2			9.25	9.2	0.36	85	3.35	47.7	1.88	82	3.23	40.7	1.6	25				
	3/4			12.65	12.5	0.49	104.66	4.12	56.7	2.23	82	3.23	44.5	1.75	32				
	1			17.35	15	0.59	117.4	4.62	64.8	2.55	102	4.02	50	1.97	38				

CLEANING & PACKAGING

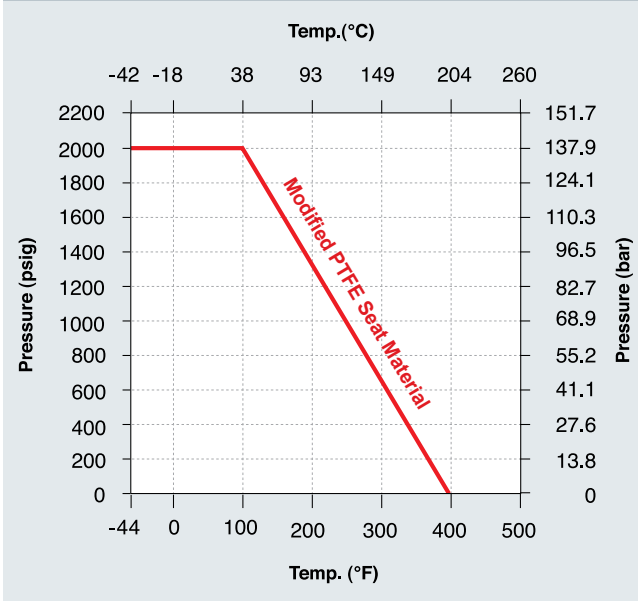
Every H-700 series ball valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Lubricant free cleaned valves have significantly higher actuation torque.

TESTING

The H-700 design has been tested for Burst and Proof. Standard testing for each H-700 valve includes testing with nitrogen at 80 & 1000 psig. Each valve is tested for leakage through the shell, packing and ball seats. The maximum allowable leakage across the ball seats is 0.1 std cc/min.

H-700 PRESSURE TEMPERATURE RATING



SEAT MATERIAL CHARACTERISTICS

Modified PTFE-(PFA and PTFE composite)-Color: Bright white.

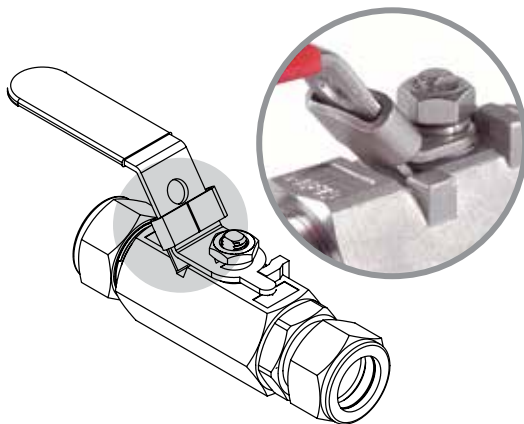
Modified PTFE is an excellent seat material for purity applications and has a very low residual material during operation. It has a lower deformation ratio than PTFE, but a higher pressure and temperature rating. Chemical resistance is equal to PTFE material.

PACKING ADJUSTMENT

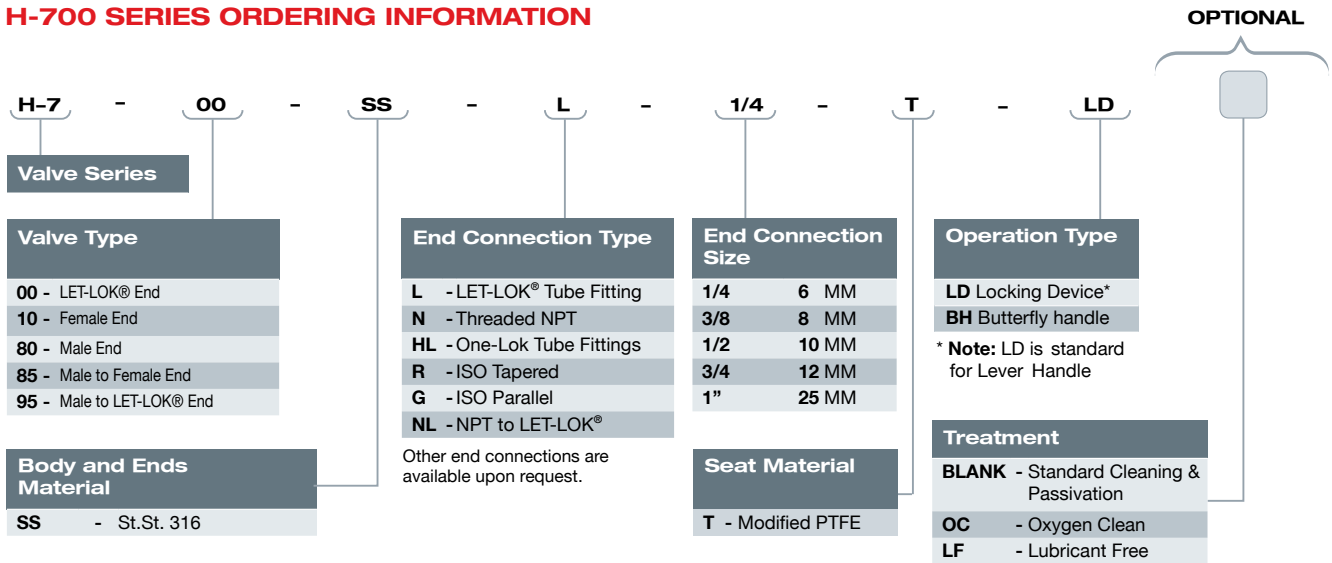
Due to the varied service applications of the valve, packing adjustment may occasionally be necessary. Packing is factory adjusted to 1000 psig service. Initial packing adjustment is recommended after installation and prior to start-up. Please find more information on H-700 under the installation instructions.

HAM-LET Ball Valves are designed to be operated in the fully closed or fully open position.

LOCKING DEVICE MECHANISM



H-700 SERIES ORDERING INFORMATION



ORDERING INFORMATION FOR SPARE KITS

Valve Type	End Connection Size	Seal Kit* Order No.	Handle Kit** Order No.
H-700	1/4", 6mm	Z-700-SK-1/4-T	Z-700-HK-1/4-LH
	3/8", 8mm, 10mm	Z-700-SK-3/8-T	Z-700-HK-3/8-LH
	1/2", 12mm	Z-700-SK-1/2-T	Z-700-HK-1/2-LH
	3/4"	Z-700-SK-3/4-T	Z-700-HK-3/4-LH
	1", 25mm	Z-700-SK-1"-T	Z-700-HK-1"-LH
H-710	1/4"	Z-710-SK-1/4-T	Z-710-HK-1/4-LH
	3/8"	Z-710-SK-3/8-T	Z-710-HK-3/8-LH
	1/2"	Z-710-SK-1/2-T	Z-710-HK-1/2-LH
	3/4"	Z-710-SK-3/4-T	Z-710-HK-3/4-LH
	1"	Z-710-SK-1"-T	Z-710-HK-1"-LH
H-780	1/4"	Z-700-SK-1/4-T	Z-700-HK-1/4-LH
	3/8"	Z-700-SK-3/8-T	Z-700-HK-3/8-LH
	1/2"	Z-700-SK-1/2-T	Z-700-HK-1/2-LH
H-795	1/4"	Z-700-SK-1/4-T	Z-700-HK-1/4-LH
	3/8"	Z-700-SK-3/8-T	Z-700-HK-3/8-LH
	1/2"	Z-700-SK-1/2-T	Z-700-HK-1/2-LH
H-785	1/4"	Z-710-SK-1/4-T	Z-710-HK-1/4-LH
	1/2"	Z-710-SK-1/2-T	Z-710-HK-1/2-LH

* The kit includes gaskets, seats, stem packing and stem seal.

** The kit includes Handle, Spring washer, Handle nut, Ball and Stem

Warning!

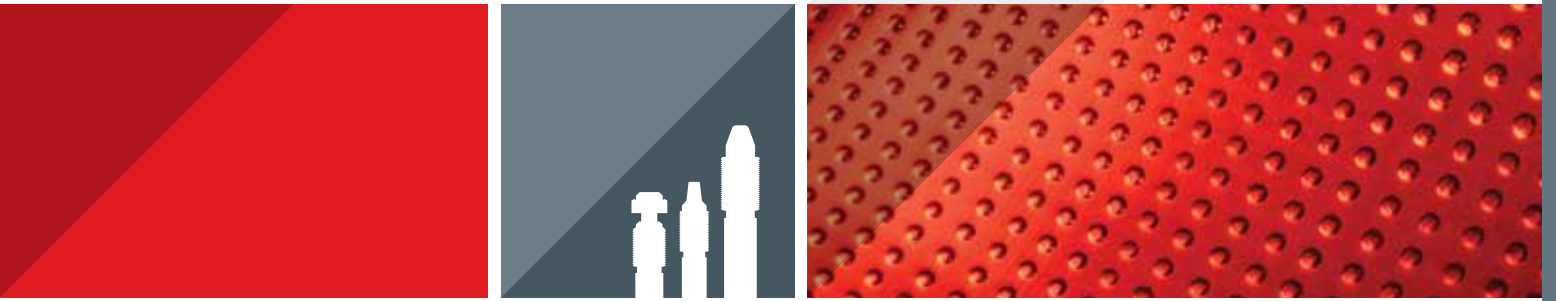
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-700, Rev.09, January 2015



SCREWED BONNET NEEDLE VALVES

H-99 SERIES



FEATURES

- Blowout-Proof Stem
- MAWP* up to 10,000 psi (690 bar)
- MAWT* up to 648°C (1200°F)
- End connection size range: 1/4" to 1" or 6mm to 25mm
- Flow Coefficient (Cv) 0 to 1.5
- Variety of stem types
- Packing bolt for easy panel mounting, no packing disassembling is required

* Maximum Allowed Working Pressure, Maximum Allowed Working Temperature.

GENERAL

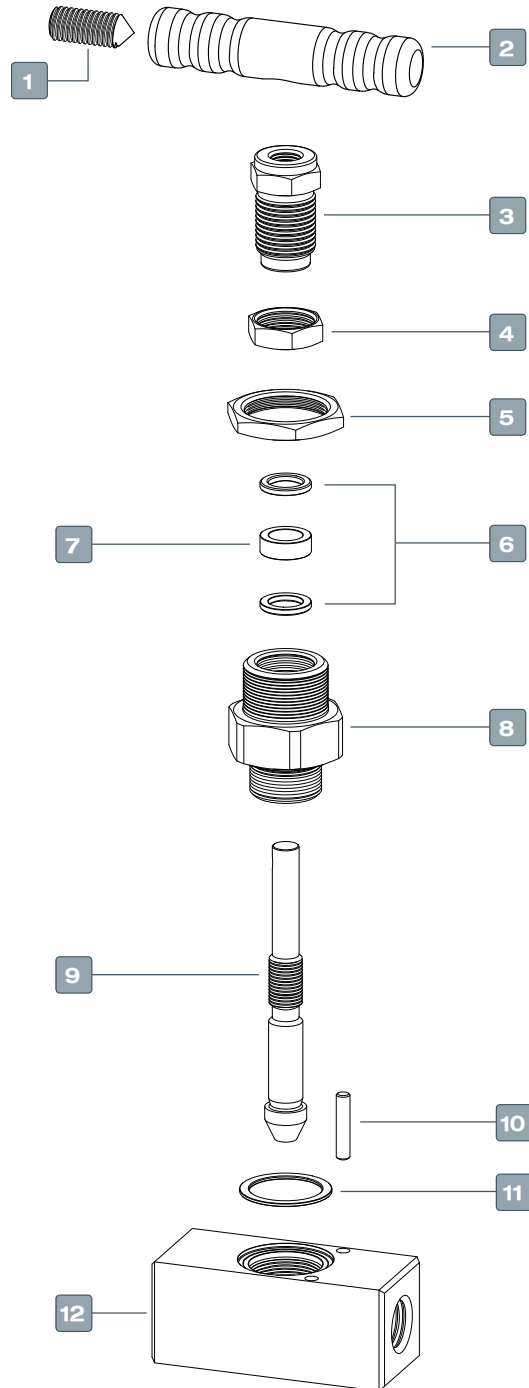
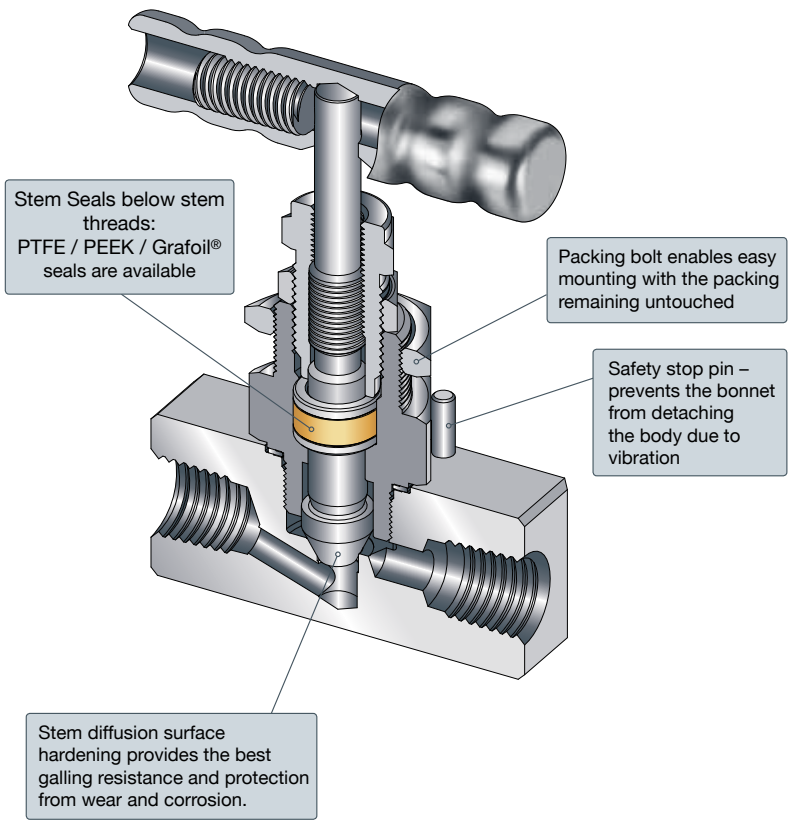
The H-99 Series offers a general-service valve of rugged design and construction. It is available in stainless steel to suit a wide range of services.

Capable of withstanding high pressures (10,000 psig max) and high temperatures.

This valve is typically used in a severe environments, high pressure sampling systems, high pressure shut-down systems and test stands.

MATERIALS OF CONSTRUCTION			
No.	Components	Qty	Material
1	Set Screw	1	St.St. 18-8
2	Handle	1	St.St.316 ASTM A-276 / A-479
3	Upper Bonnet	1	St.St.316 ASTM A-276 / A-479
4	Lock Nut	1	St.St.316 ASTM A-276 / A-479
5	Panel Nut	1	St.St.316 ASTM A-276 / A-479
6	Stem Washer	2	St.St.316 ASTM A-276 / A-479
7	Packing	1	PTFE / PEEK / Grafoil®
8	Bonnet	1	St.St.316 ASTM A-276 / A-479
9	Stem	1	St.St.316 ASTM A-276 / A-479
10	Safety Pin	1	St.St. 304
11	Gasket	1	St.St.316
12	Body*	1	St.St.316 ASTM A-479

*For weld ends valves, body is made of low carbon stainless steel



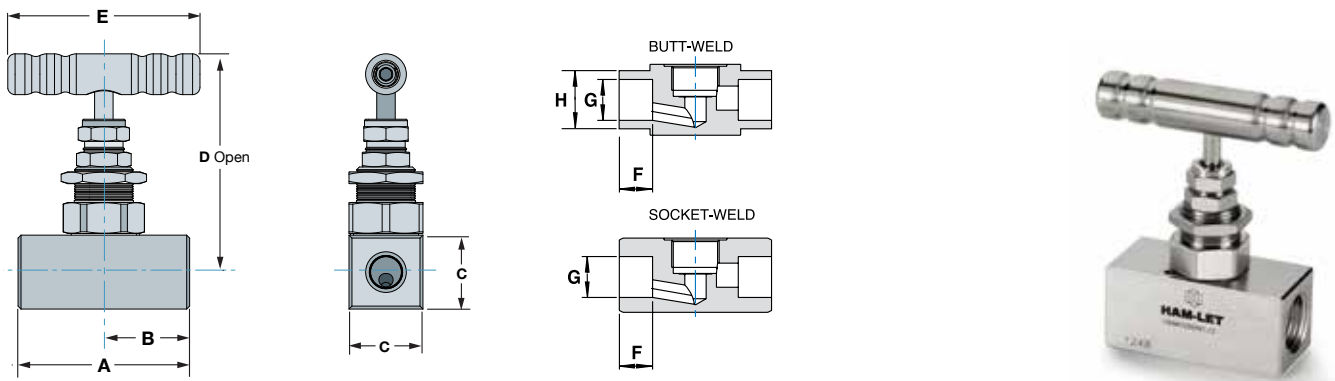


Table 1

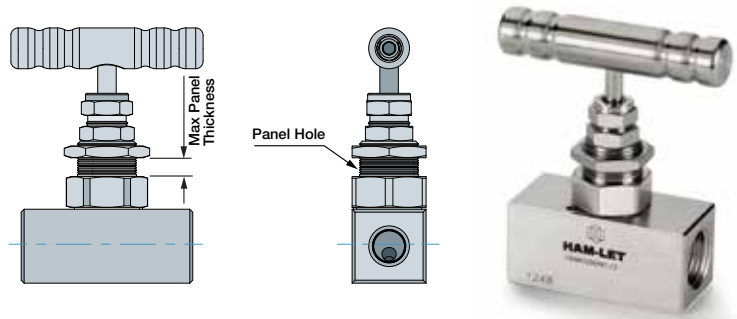
STANDARD CONFIGURATION DIMENSIONS																													
End		Body	Orifice		A		B		C		D		E		F		G		H										
Connection	Size	Size	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in									
Let-Lok® Inch	1/4"	S	6.35	0.25	72.7	2.9	36.4	1.4	25.0	1.0	78.9	3.1	65.0	2.6															
	3/8"				72.7	2.9	36.4	1.4																					
	1/2"				78.3	3.1	39.2	1.5																					
	3/4"				85.3	3.4	42.7	1.7																					
Let-Lok® Metric	6mm	S	6.35	0.25	72.8	2.9	36.4	1.4	25.0	1.0	78.9	3.1	65.0	2.6															
	8mm				73.0	2.9	36.5	1.4																					
	10mm				73.2	2.9	36.6	1.4																					
	12mm				78.2	3.1	39.1	1.5																					
Female Thread (NPT/ISO)	1/8"	S	6.35	0.25	58.0	2.3	29.0	1.1	25.0	1.0	78.9	3.1	65.0	2.6															
	1/4"				58.0	2.3	29.0	1.1																					
	3/8"				58.0	2.3	29.0	1.1																					
	1/2"				M	6.35	0.25	65.0													2.6	32.5	1.3	30.0	1.2	81.4	3.2	80.0	3.2
	3/4"				L	9.50	0.375	70.0													2.8	35.0	1.4	35.0	1.4	92.5	3.6	80.0	3.2
1"	XL	9.50	0.375	80.0	3.1	40.0	1.6	45.0	1.8	99.6	3.9	80.0	3.2																
Tube Socket Weld Inch	1/4"	S	6.35	0.25	58.0	2.3	29.0	1.1	25.0	1.0	78.9	3.1	65.0	2.6	6.4	0.25	6.5	0.26											
	3/8"				9.7	0.38	9.7	0.38																					
	1/2"				12.7	0.50	12.9	0.51																					
	3/4"				M	6.35	0.25	65.0							2.6	32.5	1.3	30.0			1.2	81.4	3.2	80.0	3.2	14.2	0.56	19.2	0.76
	1"				L	9.50	0.375	70.0							2.8	35.0	1.4	35.0			1.4	92.5	3.6	80.0	3.2	19.2	0.76	25.6	1.01
Tube Socket Weld Metric	6mm	S	6.35	0.25	58.0	2.3	29.0	1.1	25.0	1.0	78.9	3.1	60.0	2.6	6.0	0.24	6.2	0.24											
	8mm				7.9	0.31	8.2	0.32																					
	10mm				12.7	0.50	10.2	0.40																					
	12mm				12.7	0.50	12.2	0.48																					
	25mm				L	9.50	0.375	70.0							2.8	35.0	1.4	35.0			1.4	92.5	3.6	80.0	3.2	19.2	0.76	25.2	0.99
Pipe Socket Weld	1/8"	S	6.35	0.25	58.0	2.3	29.0	1.1	25.0	1.0	78.9	3.1	60.0	2.6	9.0	0.35	10.8	0.43											
	1/4"				14.0	0.55	14.0	0.55																					
	3/8"				14.0	0.55	17.5	0.69																					
	1/2"				M	6.35	0.25	65.0							2.6	32.5	1.3	30.0			1.2	81.4	3.2	80.0	3.2	16.5	0.65	22.0	0.87
	3/4"				L	9.50	0.375	70.0							2.8	35.0	1.4	35.0			1.4	92.5	3.6	80.0	3.2	18.0	0.71	27.5	1.08
1"	XL	9.50	0.375	80.0	3.1	40.0	1.6	45.0	1.8	99.6	3.9	80.0	3.2	20.0	0.79	34.5	1.36												
Tube Butt Weld Inch	1/4"	S	6.35	0.25	58.0	2.3	29.0	1.1	25.0	1.0	78.9	3.1	60.0	2.6	6.4	0.25	3.1	0.12	6.4	0.25									
	3/8"				6.0	0.24	6.2	0.24							9.5	0.37													
	1/2"				6.0	0.24	8.5	0.33							12.7	0.50													
	3/4"				M	6.35	0.25	65.0							2.6	32.5	1.3	30.0	1.2	81.4	3.2	80.0	3.2	8.0	0.31	13.5	0.53	19.1	0.75
	1"				L	9.50	0.375	70.0							2.8	35.0	1.4	35.0	1.4	92.5	3.6	80.0	3.2	10.0	0.39	19.3	0.76	25.4	1.00
Tube Butt Weld Metric	6mm	S	6.35	0.25	58.0	2.3	29.0	1.1	25.0	1.0	78.9	3.1	60.0	2.6	6.0	0.24	3.1	0.12	6.0	0.24									
	8mm				7.9	0.31	4.8	0.19							8.0	0.31													
	10mm				6.0	0.24	6.7	0.26							10.0	0.39													
	12mm				6.0	0.24	7.8	0.31							12.0	0.47													
	25mm				L	9.50	0.375	70.0							2.8	35.0	1.4	35.0	1.4	92.5	3.6	80.0	3.2	10.0	0.39	18.9	0.74	25.0	0.98
Pipe (S40) Butt Weld	1/8"	S	6.35	0.25	58.0	2.3	29.0	1.1	25.0	1.0	78.9	3.1	60.0	2.6	6.0	0.24	7.1	0.28	10.5	0.41									
	1/4"				9.2	0.36	13.7	0.54																					
	3/8"				12.5	0.49	17.1	0.67																					
	1/2"				M	6.35	0.25	65.0							2.6	32.5	1.3	30.0	1.2	81.4	3.2	80.0	3.2	8.0	0.31	15.8	0.62	21.3	0.84
	3/4"				L	9.50	0.375	70.0							2.8	35.0	1.4	35.0	1.4	92.5	3.6	80.0	3.2	10.0	0.39	21.0	0.83	26.7	1.05
1"	XL	9.50	0.375	80.0	3.1	40.0	1.6	45.0	1.8	99.6	3.9	80.0	3.2	12.0	0.47	26.6	1.04	33.4	1.31										
Male Thread to Female Thread (NPT/ISO)	1/4"	S	6.35	0.25	60.0	2.4	29.0	1.1	25.0	1.0	78.9	3.1	60.0	2.6															
	3/8"				60.0	2.4	29.0	1.1																					
	1/2"				M	6.35	0.25	70.0													2.8	32.5	1.3	30.0	1.2	81.4	3.2	80.0	3.2
	3/4"				L	9.50	0.375	75.0													3.0	35.0	1.4	35.0	1.4	92.5	3.6	80.0	3.2
1"	XL	9.50	0.375	85.0	3.3	40.0	1.6	45.0	1.8	99.6	3.9	80.0	3.2																

Body Dimensions: S - 25mm / M - 30mm / L - 35mm / XL - 45mm.

Dimensions are for reference only, and are subject to change. Face to face dimensions for LET-LOK® end connections (dimensions A and B) are finger tight.

HIGH PERFORMANCE NEEDLE VALVE FOR EASY MOUNTING

H-99 SERIES

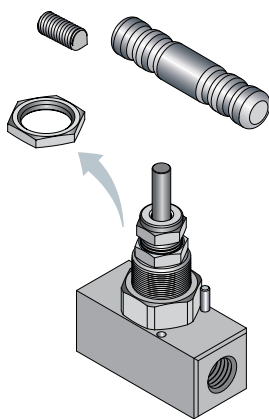


MOUNTING CONFIGURATION DIMENSIONS											
End		Body	Panel Hole		Max Panel Thick-						
Connection	Size	Size	mm	in	mm	in					
Let-Lok® Inch	1/4"	S	22.0	0.87	6.35	0.25					
	3/8"										
	1/2"										
	3/4"										
Let-Lok® Metric	6mm	S	22.0	0.87	6.35	0.25					
	8mm										
	10mm										
	12mm										
Female Thread (NPT/ISO)	1/8"	S	22.0	0.87	6.35	0.25					
	1/4"										
	3/8"										
	1/2"						M	25.0	0.98	6.35	0.25
	3/4"										
1"	L	27.0	1.06	6.35	0.25						
Tube Socket Weld Inch	1/4"	S	22.0	0.87	6.35	0.25					
	3/8"										
	1/2"										
	3/4"						M	25.0	0.98	6.35	0.25
1"											
Tube Socket Weld Metric	6mm	S	22.0	0.87	6.35	0.25					
	8mm										
	10mm										
	12mm										
	25mm						L	25.0	0.98	6.35	0.25

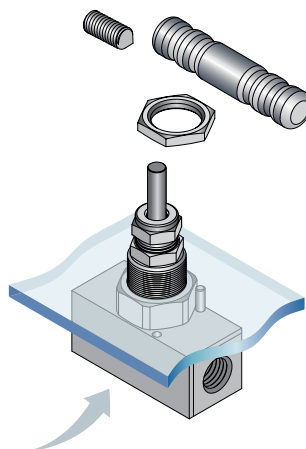
Body Dimensions: **S** - 25mm / **M** - 30mm / **L** - 35mm / **XL** - 45mm.

MOUNTING CONFIGURATION DIMENSIONS											
End		Body	Panel Hole		Max Panel Thick-						
Connection	Size	Size	mm	in	mm	in					
Pipe Socket Weld	1/8"	S	22.0	0.87	6.35	0.25					
	1/4"										
	3/8"										
	1/2"						M	25.0	0.98	6.35	0.25
	3/4"										
Tube Butt Weld Inch	1/4"	S	22.0	0.87	6.35	0.25					
	3/8"										
	1/2"										
	3/4"						M	25.0	0.98	6.35	0.25
1"											
Tube Butt Weld Metric	6mm	S	22.0	0.87	6.35	0.25					
	8mm										
	10mm										
	12mm										
	25mm						L	25.0	0.98	6.35	0.25
Pipe (S40) Butt Weld	1/8"	S	22.0	0.87	6.35	0.25					
	1/4"										
	3/8"										
	1/2"						M	25.0	0.98	6.35	0.25
	3/4"										
Male Thread to Female Thread (NPT/ISO)	1/4"	S	22.0	0.87	6.35	0.25					
	3/8"										
	1/2"						M	25.0	0.98	6.35	0.25
	3/4"										
	1"						L	27.0	1.06	6.35	0.25

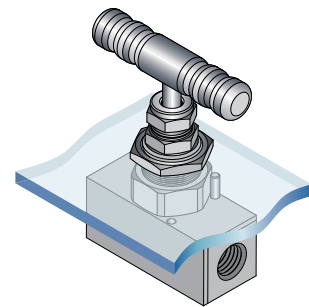
EASY MOUNTING PROCEDURE



1. Disassemble the handle, using an appropriate hex key. Take off the panel nut.



2. Insert the valve into the panel hole and reassemble the panel nut. Firmly tighten the nut.



3. Reassemble the handle. Firmly tighten the hex screw.

CLEANING & PACKAGING

Every H-99 series needle valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Lubricant free cleaned valves have significantly higher actuation torque.

TESTING

The H-99 Series Needle Valve design have been tested for Proof and Burst.

Every H-99 Needle Valve is factory tested with Nitrogen at 1000 psi (69 bar).

The maximum allowable leakage across the seat is 0.1 std cc/min.

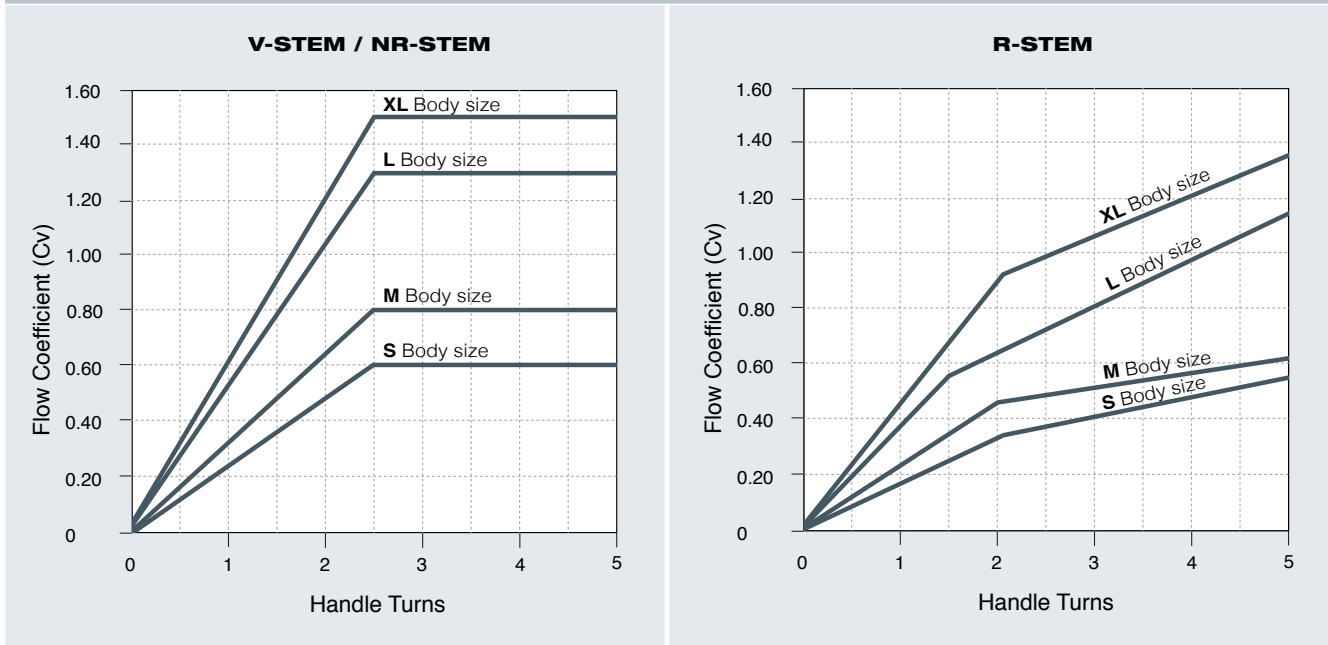
PACKING ADJUSTMENT

Due to the varied service applications of the valve, packing adjustment may be occasionally necessary.

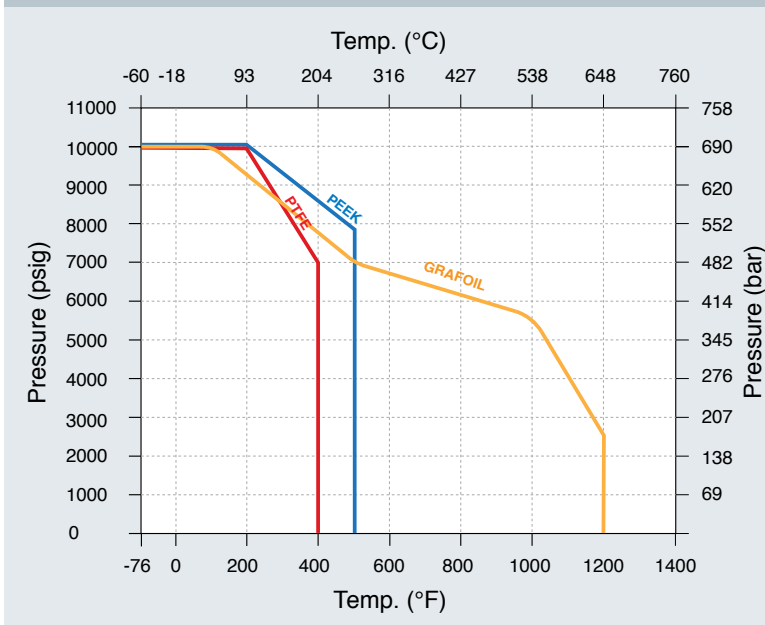
Valve Packing is factory preadjusted to 1000 psig service.

Initial packing adjustment is recommended after installation and prior to start-up.

FLOW DATA AT 100°F (37°C)



PRESSURE TEMPERATURE RATING THREADED & WELD CONNECTION



MAX. PRESSURE RATING AT 70°F (21°C)

Body Raw Material	Pressure	
	psi	bar
St.St.316 ASTM A-479	10000	690

MAX. ALLOWED WORKING TEMPERATURE

Packing Material	Max. Temperature	
	°C	°F
PTFE	204	400
PEEK	260	500
GRAFOIL®	648	1200

The max. allowable pressure of welded connected valve is limited to the max. allowed working pressure of the tube.

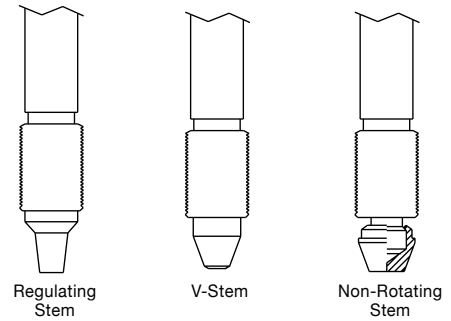
ALTERNATIVE STEMS

HAM-LET Needle Valves are available with a choice of stem-tip options to allow greater flexibility.

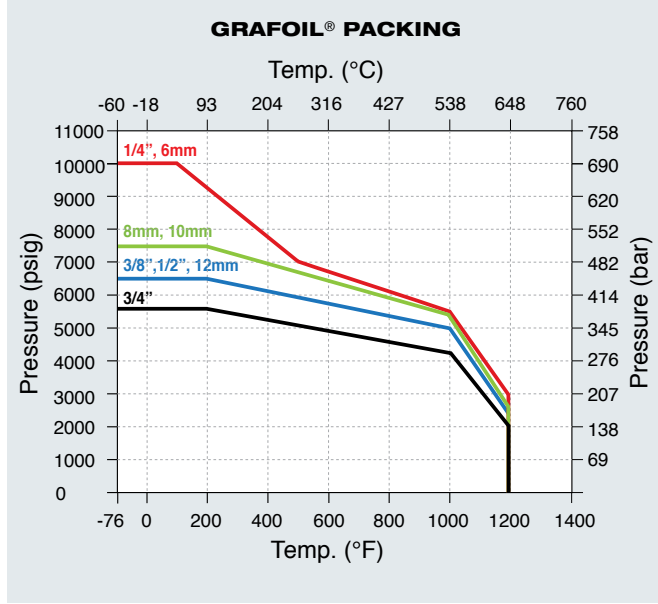
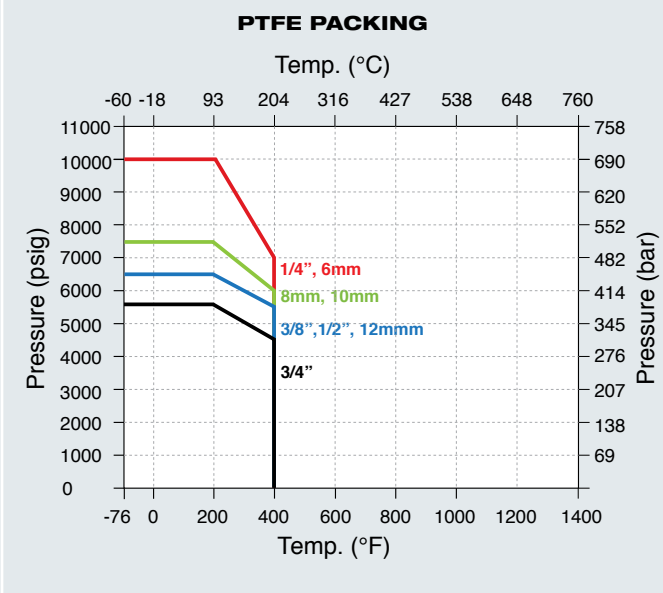
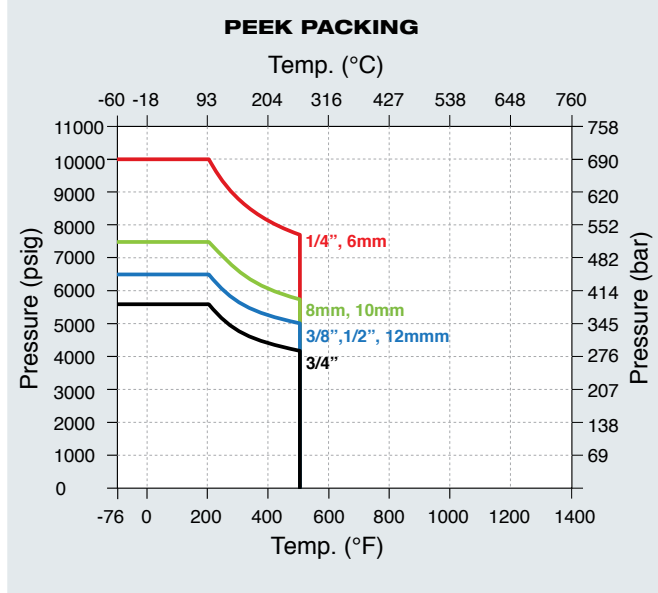
V- Stem: Standard stem tip used for the on/off operation in general-purpose liquids and gas service.

R- Regulating: Used where some degree of flow control is required.

NR- Non-Rotating: Typically used in high-cycle applications to extend valve life and prevent stem rotation inside the body tip, a suitable selection for gaseous high pressure applications.



PRESSURE TEMPERATURE RATING LET-LOK CONNECTION



MAX. PRESSURE RATING AT 70°F (21°C)

Pressure per LET-LOK® Size			
in	Pressure	mm	Pressure
1/4	10000 psi	6	10000 psi
3/8	6500 psi	8	7500 psi
1/2	6500 psi	10	7500 psi
3/4	5650 psi	12	6500 psi
1"	4000 psi	25	4700 psi

Note: The maximum allowed working pressure that is marked on the valve may be limited according to the pressure limitations that are recommended by the tubing /piping standards (Reference: Let-Lok tube fittings General Information).

Note: Valves with Let-Lok ends are always made of bar stock body.

H-99 SERIES ORDERING INFORMATION

H-99 - L - 00 - SS - L - V - 1/2 - [] - []

OPTIONAL

Body Designator	Valve Type	Material	End Connection Type	Stem	Size	Packing
S - Small	00 - LET-LOK® End	St.St. 316	L - LET-LOK®	V - V Stem	1/4 6MM	Blank - PTFE
M - Medium	10 - Female End		N - Threaded NPT	R - Regulating Stem	3/8 8MM	PK - PEEK
L - Large	15 - Female to Male End		R - ISO Taper	NR - Non Rotating	1/2 10MM	G - Grafoil®
XL - Extra Large	80 - Male End		G - ISO Parallel		3/4 12MM	
	85 - Male to Female End		TBW - Tube Butt-Weld		1" 25MM	
			TSW - Tube Socket-Weld			
			PBW - Pipe Butt-Weld (Schedule 40)			
			PSW - Pipe Socket Weld			

Treatment
BLANK - Standard Cleaning & Passivation
OC - Oxygen Clean
LF - Lubricant Free

SEAL KIT

Included: Packing & Label

Z - 99 - M - SK - PT

Body's size		
S	Small	(25mm)
M	Medium	(30mm)
L	Large	(35mm)
XL	Extra Large	(45mm)

Packing
PT - PTFE
PK - PEEK
G - Grafoil®

HANDLE KIT

Z - 99 - SS - HK - 65mm

SIZE	
65mm	For S body size
80mm	For M body size
90mm	For L / XL body size

Warning!

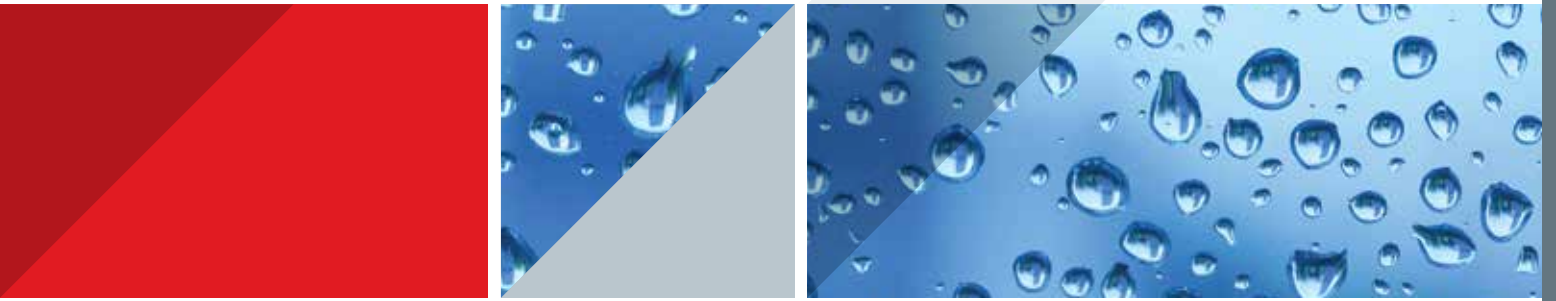
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-99, Rev.00, February 2015



INTEGRAL-BONNET NEEDLE VALVES

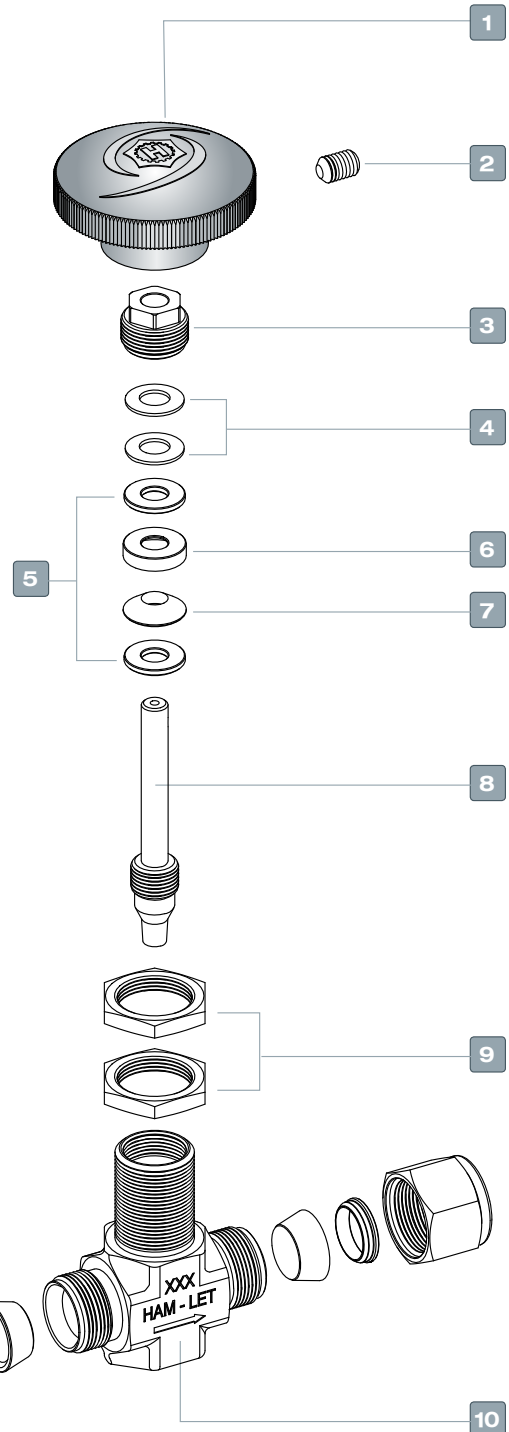
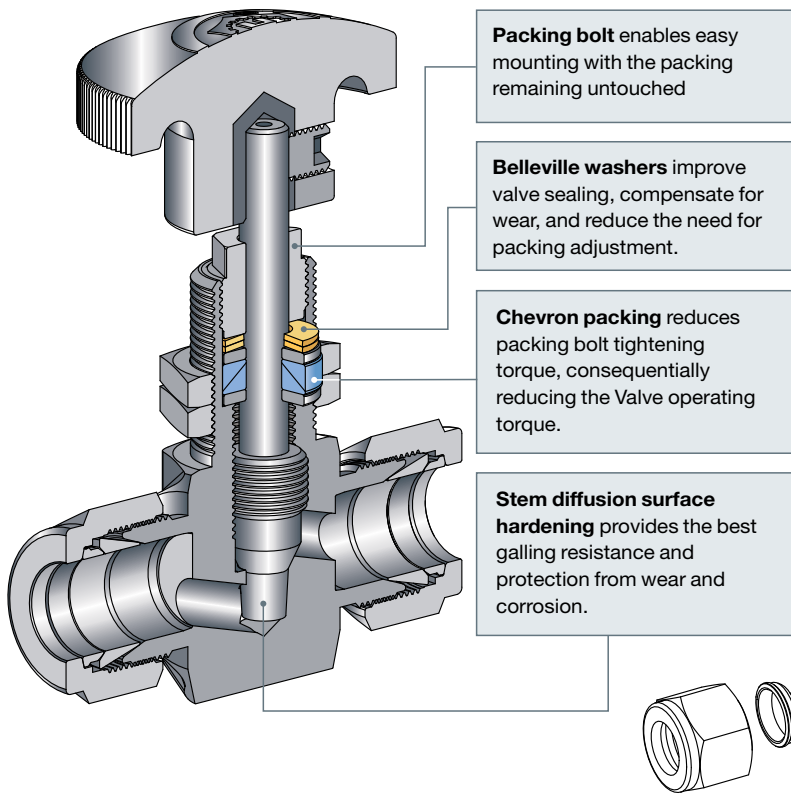
H-300U SERIES



FEATURES

- Certified for ISO 15848-1:2006(E)
- Straight and angle pattern
- Stainless steel and brass construction
- MAWP 5000 psi (345 bar), MAWT 446°F (230°C)
- Flow coefficient (Cv) 0.09 to 1.8
- Sizes: 1/8" to 3/4" (3mm-12mm)
- Round plastic, round aluminum, and metal bar handles
- Variety of stem types
- Packing bolt for easy panel mounting, no packing disassembling is required
- Chevron stem packing provides lowest operation torques
- Belleville washers to compensate packing wear
- Special synthetic, anti-seize stem lubricant for best resistance to hot media

MATERIAL OF CONSTRUCTION			
No.	Component	Qty.	Material
1	Handle	1	Phenolic
2	Set Screw	1	St.St.316
3	Packing Bolt	1	St.St.316
4	Belleville Washer	2	St.St.302
5	Gland	2	St.St.316
6	Upper Packing	1	PTFE
7	Bottom Packing	1	PTFE
8	A Regulating Stem	1	St.St.316 with surface treatment
	B V-Stem	1	St.St.316 with surface treatment
	C Non-Rotatin Stem	1	St.St.316 with surface treatment
	D Soft Seat Stem	1	St.St.316 with surface treatment
9	Panel Nut	2	St.St.316
10	Body	1	St.St.316



GENERAL

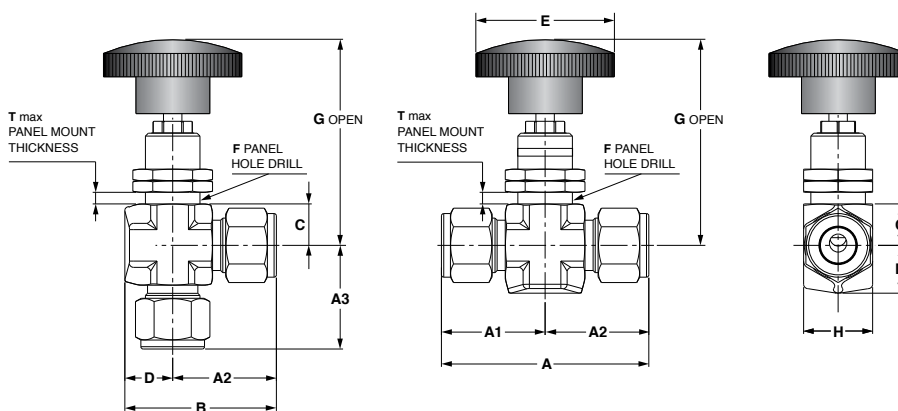
The H-300U Series is an advanced high pressure instrumentation needle valve for shut-off service, its packing bolt design for easy mounting being the best solution for instrumentation panels.

This compact valve enables a relatively high level of flow regulation and long-life service.

Special stem surface treatment, based on low temperature carbon diffusion, enables higher surface hardness with improved wear resistance, resistance to system contaminations and optimal operational torque.

STANDARD CONFIGURATION DIMENSIONS																					
Basic Ordering Number	Orifice mm (in) S/A	Cv	Connection Size		A		A1		A2		A3		B		C	D	E	F	G	H	T max
			Inlet	Outlet	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
H-300	2.0 (0.08)	0.09	3mm LET-LOK®	3mm LET-LOK®	50.8	2.00	25.4	1.00	25.4	1.00	25.4	1.00	33.4	1.31	10.0 (0.39")	7.95 (0.31")	35.1 (1.38")	13.0 (0.51")	63.5 (2.50")	15.9 (5/8")	10.0 (0.39")
H-300			1/8" LET-LOK®	1/8" LET-LOK®	50.8	2.00	25.4	1.00	25.4	1.00	25.4	1.00	33.4	1.31							
H-395			1/8" MNPT	1/8" LET-LOK®	45.3	1.78	19.9	0.78	25.4	1.00	19.9	0.78	33.4	1.31							
H-300	4.4 (0.172)	0.37	1/4" LET-LOK®	1/4" LET-LOK®	58.8	2.31	29.4	1.16	29.4	1.16	29.4	1.16	37.3	1.47	14.3 (0.56")	16.5 (0.65")	47.8 (1.88")	20.0 (0.79")	78.4 (3.09")	23.8 (15/16")	12.0 (0.49")
H-300			6mm LET-LOK®	6mm LET-LOK®	58.8	2.31	29.4	1.16	29.4	1.16	29.4	1.16	37.3	1.47							
H-300			8mm LET-LOK®	8mm LET-LOK®	58.8	2.31	29.4	1.16	29.4	1.16	29.4	1.16	37.3	1.47							
H-310			1/8" FNPT	1/8" FNPT	41.2	1.62	20.6	0.81	20.6	0.81	20.6	0.81	28.5	1.12							
H-380			1/8" MNPT	1/8" MNPT	50.8	2.00	25.4	1.00	25.4	1.00	25.4	1.00	33.3	1.31							
H-380			1/4" MNPT	1/4" MNPT	50.8	2.00	25.4	1.00	25.4	1.00	25.4	1.00	33.3	1.31							
H-395			1/4" MNPT	1/4" LET-LOK®	54.8	2.16	25.4	1.00	29.4	1.16	25.4	1.00	37.3	1.47							
H-300	6.4 (0.25)	0.73	3/8" LET-LOK®	3/8" LET-LOK®	66.0	2.60	33.0	1.30	33.0	1.30	33.0	1.30	49.5	1.95	19.5 (0.77")	20.0 (0.79")	47.8 (1.88")	26.0 (1.02")	105.6 (4.16")	30.2 (1-3/16")	22.0 (0.87")
H-300			10mm C	10mm LET-LOK®	66.4	2.62	33.2	1.31	33.2	1.31	33.2	1.31	49.7	1.96							
H-300			1/2" LET-LOK®	1/2" LET-LOK®	71.6	2.82	35.8	1.41	35.8	1.41	35.8	1.41	52.3	2.06							
H-300			12mm LET-LOK®	12mm LET-LOK®	71.6	2.82	35.8	1.41	35.8	1.41	35.8	1.41	52.3	2.06							
H-310			1/4" FNPT	1/4" FNPT	54.0	2.12	27.0	1.06	27.0	1.06	27.0	1.06	43.5	1.71							
H-380			3/8" MNPT	3/8" MNPT	57.0	2.24	28.5	1.12	28.5	1.12	28.5	1.12	45.0	1.77							
H-385			1/4" MNPT	1/4" FNPT	58.5	2.30	31.5	1.24	27.0	1.06	28.5	1.12	43.5	1.71							
H-385			3/8" MNPT	3/8" FNPT	56.5	2.22	28.5	1.12	28.0	1.10	28.5	1.12	44.5	1.75							
H-395	3/8" MNPT	3/8" LET-LOK®	61.5	2.42	28.5	1.12	33.0	1.30	28.5	1.12	49.5	1.95									
H-300	9.5 (0.375)	1.8	3/4" LET-LOK®	3/4" LET-LOK®	97.0	3.82	48.5	1.91	48.5	1.91	48.5	1.91	68.5	2.70	19.5 (0.77")	20.0 (0.79")	47.8 (1.88")	26.0 (1.02")	105.6 (4.16")	30.2 (1-3/16")	22.0 (0.87")
H-310			3/8" FNPT	3/8" FNPT	76.2	3.00	38.1	1.50	38.1	1.50	38.1	1.50	58.1	2.29							
H-310			1/2" FNPT	1/2" FNPT	76.2	3.00	38.1	1.50	38.1	1.50	38.1	1.50	58.1	2.29							
H-380			1/2" MNPT	1/2" MNPT	76.2	3.00	38.1	1.50	38.1	1.50	38.1	1.50	58.1	2.29							
H-385			1/2" MNPT	1/2" FNPT	76.2	3.00	38.1	1.50	38.1	1.50	38.1	1.50	58.1	2.29							

* Dimensions for metal handle option



STEM OPTIONS

H-300U needle valves are available with a choice of stem tips:



8A Regulating:
Used where some degree of flow control is required.



8B V-Stem:
Standard stem tip used for the on/off operation in general-purpose liquids and gas service.

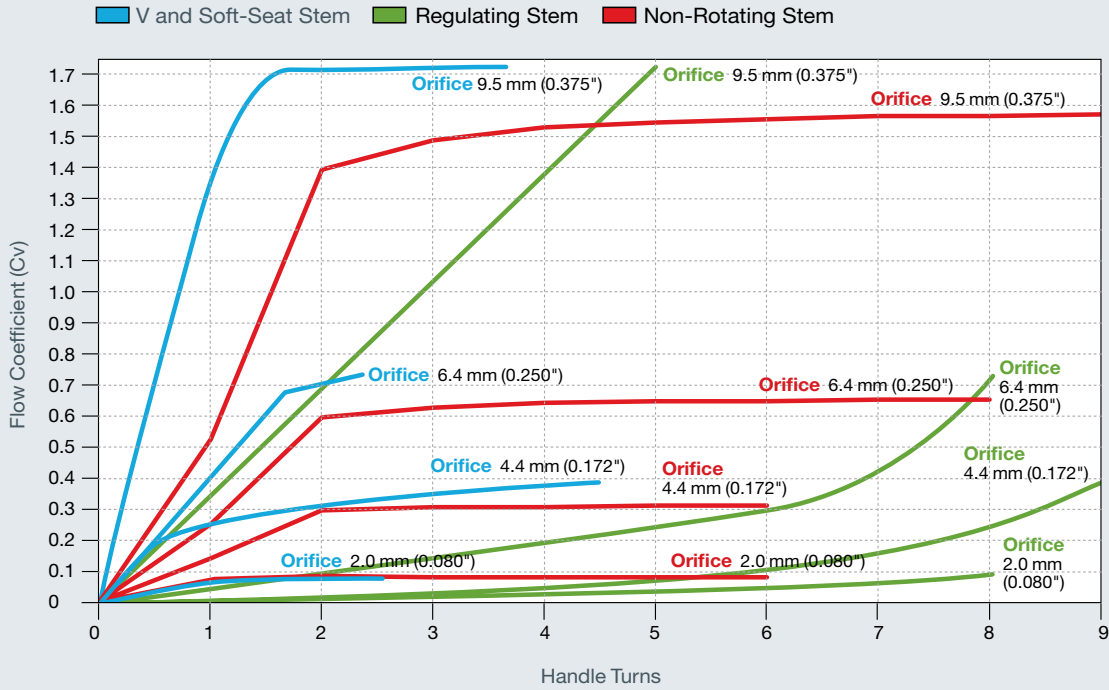


8C Non-Rotating Stem:
Typically used in high-cycle applications to extend valve life and prevent stem rotation inside the body tip, a suitable selection for gaseous high pressure applications.

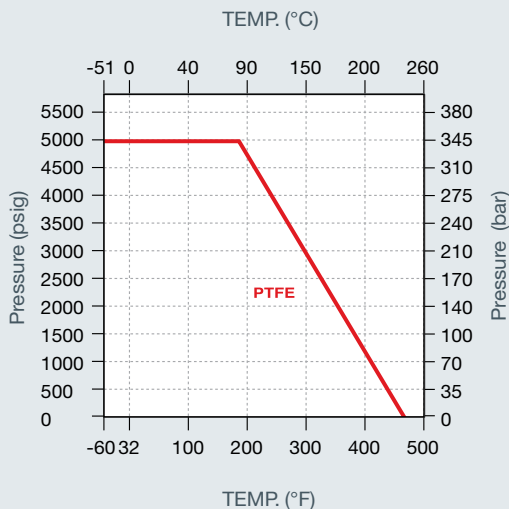


8D Soft Seat:
A soft seat tip requires a lower seating torque than a metal stem tip; the best choice for clean gaseous high pressure applications; MAWT is 200°F (93°C).

FLOW DATA: FLOW COEFFICIENT VS. HANDLE TURNS



PRESSURE TEMPERATURE RATING



TECHNICAL DATA

The following table contains the temperature and pressure ratings for a standard valve with PTFE packing.

Body Material	Stem Type	Rating	
		Temperature	Pressure
316 St.St.	All St.St. Stems	-51°C to 230°C (-60°F to 446°F)	5000 psi
	PCTFE	-46°C to 93°C (-51°F to 200°F)	5000 psi
Brass	Regulating & V-Stem	-46°C to 200°C (-51°F to 392°F)	3000 psi
	PCTFE	-46°C to 93°C (-51°F to 200°F)	3000 psi

* Extreme temperature fluctuations may require packing adjustment.

Notes:

- The H-300U was designed for high pressure services where moderately uncontaminated media is used
- For steam applications, it is recommended to select one of HAM-LET severe service needle valves
- For oxygen applications, select the oxygen clean treatment option.
- For relatively high pressure pure oxygen applications, assure that the selected valve is tested and found to meet the specific application requirements

CLEANING & PACKAGING

Every H-300U series needle valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Lubricant free cleaned valves have significantly higher actuation torque.

TESTING

The H-300U Series Needle Valve design has been tested for Proof and Burst. Every H-300U Needle Valve is factory tested with nitrogen at 1000 psi (69 bar). The maximum allowable leakage across the seat is 0.1 std cc/min.

PACKING ADJUSTMENT

Due to the varied service applications of the valve, packing adjustment may occasionally be necessary. Packing is factory adjusted to 1000 psig service. Initial packing adjustment is recommended after installation and prior to start-up. See packing adjustment procedure No.3901882 on the website.

H-300U SERIES ORDERING INFORMATION

OPTIONAL

H-3 **00 U-** **SS** - **L** - **V** - **1/4** - **RS** -

Valve Series	End Connection	Stem Designator	End Connection Size	Handle Type	Pattern Designer
Valve Type	L - LET-LOK®	V - V Stem	1/8 3MM	RS -Black Plastic	Blank - Straight
00 - LET-LOK® End	N - NPT	R - Regulating Stem	1/4 6MM	RAS -Black Aluminum	A - Angle
10 - Female End	R - ISO Tapered	K - Soft Seat PCTFE Stem	3/8 8 MM	RAR -Red Aluminum	
15 - Female to Male End	NL - NPT to LET-LOK®	NR - Non-Rotating Stem	1/2 10MM	RAB -Blue Aluminum	
80 - Male End	HL - Single Ferrule		3/4 12MM	RAG -Green Aluminum	
85 - Male to Female End	G - ISO Parallel			RAY -Yellow Aluminum	
95 - Male to LET-LOK®	GL - Face Seal Ends			M -Metal Bar SS316	

Body Material

SS - 316SS
B - Brass

Spare Round-Handle Kits are available for each valve.

Treatment

BLANK - Standard Cleaning & Passivation
OC - Oxygen Clean
LF - Lubricant Free

SPARE KITS

Series	End Size	Seal Kit*	Handle Kit**
H-380U Male to Male	1/8, 1/4	Z-300U-SK-1/4-P	Z-300U-HK-1/4- <input type="checkbox"/>
	3/8	Z-300U-SK-1/2-P	Z-300U-HK-1/2- <input type="checkbox"/>
	1/2, 3/4	Z-300U-SK-3/4-P	Z-300U-HK-3/4- <input type="checkbox"/>
H-310U Female to Female	1/8	Z-300U-SK-1/4-P	Z-300U-HK-1/4- <input type="checkbox"/>
	1/4	Z-300U-SK-1/2-P	Z-300U-HK-1/2- <input type="checkbox"/>
	3/8, 1/2	Z-300U-SK-3/4-P	Z-300U-HK-3/4- <input type="checkbox"/>
H-395U Male to LET-LOK®	1/8, 1/4	Z-300U-SK-1/4-P	Z-300U-HK-1/4- <input type="checkbox"/>
	3/8	Z-300U-SK-1/2-P	Z-300U-HK-1/2- <input type="checkbox"/>
H-385U Male to Female	1/4	Z-300U-SK-1/2-P	Z-300U-HK-1/2- <input type="checkbox"/>
	3/8	Z-300U-SK-1/2-P	Z-300U-HK-1/2- <input type="checkbox"/>
	1/2	Z-300U-SK-3/4-P	Z-300U-HK-3/4- <input type="checkbox"/>
H-300U LET-LOK®	1/8, 1/4, 3MM, 6MM, 8MM	Z-300U-SK-1/4-P	Z-300U-HK-1/4- <input type="checkbox"/>
	3/8, 1/2, 10MM, 12MM	Z-300U-SK-1/2-P	Z-300U-HK-1/2- <input type="checkbox"/>
	3/4	Z-300U-SK-3/4-P	Z-300U-HK-3/4- <input type="checkbox"/>

*Seal Kit contains packing and packing instructions

**Handle Kit contains handle and set screw.

Handle type per "How to Order"

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-300U, Rev.03, January 2015



TOGGLE VALVES

H-1200 SERIES



FEATURES

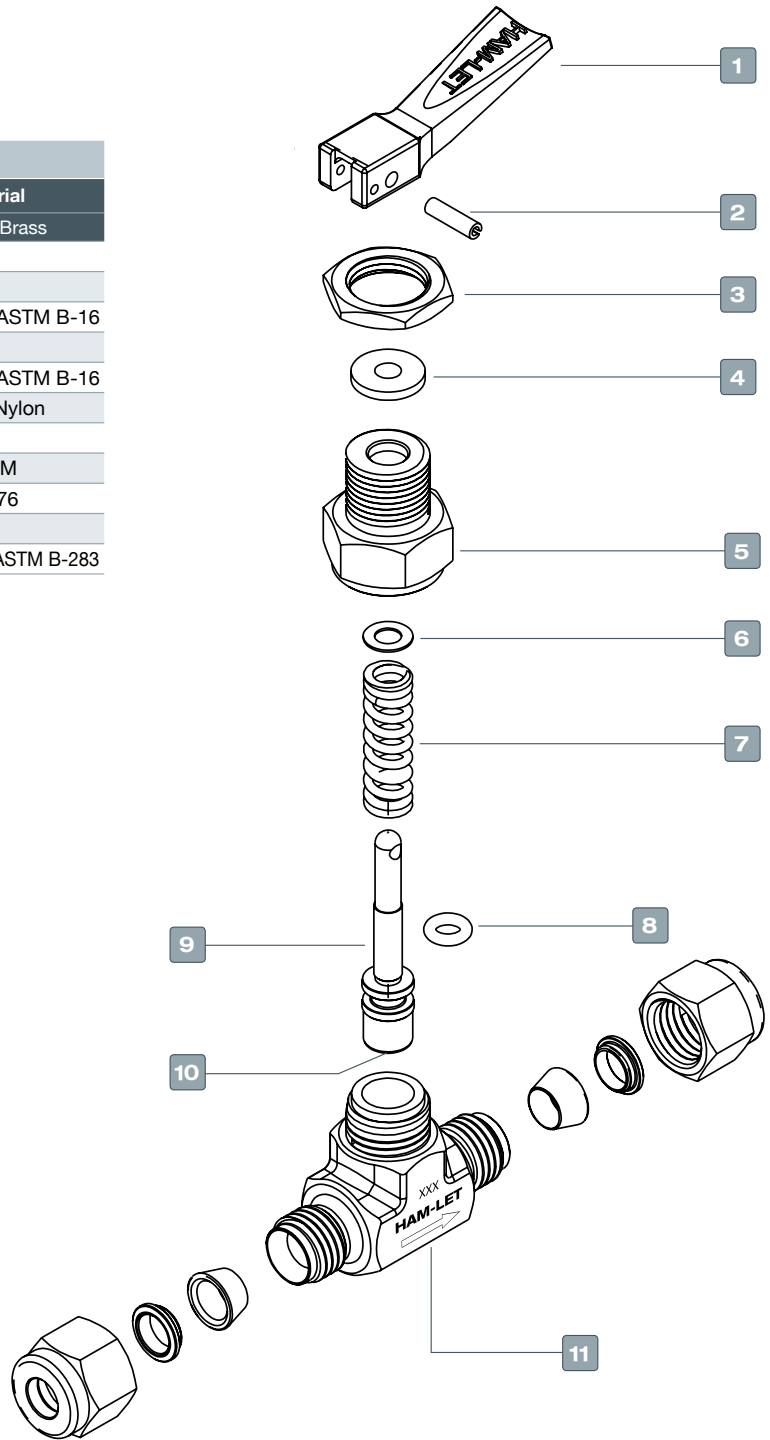
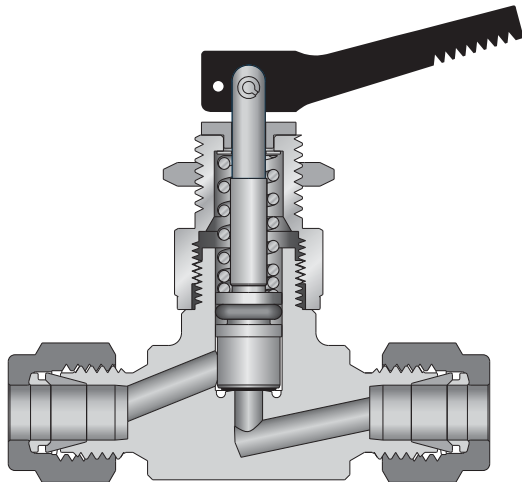
- Compact rugged design
- Stainless Steel and Brass Construction
- Panel mountable
- Quick On/Off service
- Straight and angle patterns available
- Sizes: 1/8" & 1/4"
- LET-LOK , male and female NPT ends
- MAWP 300 psig (20 Bar) at 20°C (70°F)
- Temperature rating: -20°F to 200°F (-28°C to 93°C)
- Flow coefficient (Cv) 0.11 to 0.2
- Colored Nylon Handles

GENERAL

The H-1200 Series standard toggle valve is a compact design for normally closed and quick on/off service. Moving the handle 90 degrees upwards opens the valve to full flow and stops it firmly in the open position. Shifting the handle position downwards shuts off the valve by spring return. The PTFE soft seat at the tip of the stem provides a positive repetitive seal.

MATERIALS OF CONSTRUCTION

Item	Components	Qty.	Valve Body Material	
			316 St.St.	Brass
1	Handle	1	Nylon	
2	Roll Pin	1	St.St. 420 SS	
3	Panel Nut	1	St.St. ASTM A-276	Brass ASTM B-16
4	Washer	1	Nylon	
5	Packing Nut	1	St.St. ASTM A-276	Brass ASTM B-16
6	Thrust Washer	1	N/A	Nylon
7	Spring	1	302SS / A313	
8	O-ring	1	Fluorocarbon FKM	
9	Stem	1	St.St. ASTM A-276	
10	Stem Seat	1	PTFE	
11	Body	1	St.St. ASTM A-182	Brass ASTM B-283

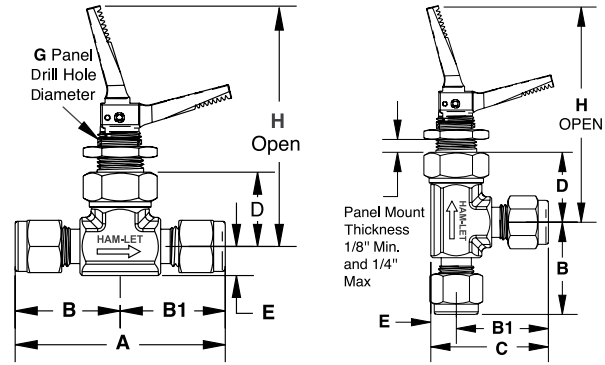


TESTING

All H-1200 Series designs have been tested and approved for Burst and Proof. All valves are factory tested with Nitrogen pressure at 300 psig (20.7 bar) for shell, stem and across-the-seat leak detection. Each valve is tested for leak tight performance.

CLEANING & PACKAGING

Every H-1200 series needle valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.



STANDARD CONFIGURATION DIMENSIONS

End connection		Cv	Orifice		A		B		B1		C		D		E		G		H (Open)	
Type	Size		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Female NPT	1/8	0.20	3.28	0.13	41.2	1.66	20.6	0.81	20.6	0.81	N/A	N/A	21.8	0.85	7.95	0.31	13.5	0.53	65.5	2.57
Male NPT	1/8	0.11	2.50	0.10	43.7	1.72	21.8	0.86	21.9	0.86	29.7	1.17								
Male NPT	1/4	0.20	3.28	0.13	49.8	1.96	24.9	0.98	24.9	0.98	32.8	1.29								
Let-Lok®	1/8	0.11	2.30	0.09	49.8	1.96	24.9	0.98	24.9	0.98	32.8	1.29								
Let-Lok®	1/4	0.20	3.28	0.13	57.4	2.26	28.7	1.13	28.7	1.13	36.5	1.44								
Male to Let-Lok®	1/4	0.20	3.28	0.13	53.6	2.11	24.9	0.98	28.7	1.13	32.8	1.29								

H-1200 SERIES ORDERING INFORMATION

H - 12 00 - SS - N - 1/8 - A - [] - []

Valve Series
H - 12 00

Body Material
SS - 316 SS
B - Brass

Size Designator
3 mm 1/8
6 mm 1/4

Handle Type
BLANK - Black Nylon Handle
RH - Red Nylon Handle
BH - Blue Nylon Handle
YH - Yellow Nylon Handle
GH - Green Nylon Handle
OH - Orange Nylon Handle

O-ring Material
BU - Buna N
EP - EPDM
NE - Polychloroprene (CR)
KZ - Perfluor
Fluorocarbon FKM O-ring is standard

End Connection
L - LET-LOK®
N - NPT

Pattern Designator
BLANK - Straight
A - Angle

Treatment
BLANK - Standard Cleaning & Passivation
OC - Oxygen Clean
LF - Lubricant Free

OPTIONAL

SEAL KIT

Z - 1200 - SK - 1/4 - VI

Body Designator per End Connection
1/4 for all ends connections

O-ring Material
VI - Fluorocarbon FKM
BU - Buna N
EP - EPDM
NE - Polychloroprene (CR)
KZ - Perfluor

HANDLE KIT

Z - 1200 - HK - 1/4 - S

Body Designator per End Connection
1/4 for all ends connections

Handle Type
S - Black Nylon Handle
R - Red Nylon Handle
B - Blue Nylon Handle
Y - Yellow Nylon Handle
G - Green Nylon Handle
O - Orange Nylon Handle

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-1200, Rev.10, January 2015



METERING VALVES

H-1300 SERIES



H, HF & HXF-1300 SERIES FEATURES

- Forged-body 316 St.St.or Brass Construction
- Straight and Angle Patterns and Panel Mounting
- MAWP 2000 psig - (137 Barg) For HXF
- MAWP 1000 psig - (68 Barg) For H, HF
- MAWT 400°F (204°C)
- Flow coefficients (Cv) from 0.004 to 0.15
- Round & Slotted Handles with Screwdriver Slots
- HAM-LET LET-LOK® Ends, Male & Female NPT, HTC® Face Seal Bead End Connections
- 1°, 3° and 5° Stem Taper for required flow control
- Stem with Stopper Shoulder for maximum life

HXF-1300 MATERIALS OF CONSTRUCTION

Item No.	Components	Qty	Valve Body Material	
			316 St.St.	Brass
1	Handle Set Screw*	1	18-8 Stainless Steel	
2	Flow Fixing Screw	1	18-8 Stainless Steel	
3	Handle	1	St.St. ASTM A-276	Brass ASTM B-16
4	Panel Nut	1	St.St. ASTM A-276	Brass ASTM B-16
5	Safety Bonnet Sleeve	1	St.St. ASTM A-276	Brass ASTM B-16
6	Bonnet	1	St.St. ASTM A-276	Brass ASTM B-16
7	Stem	1	St.St. 174PH/A564	
8	Stem Ring	1	Glass-filled TFE	
9	O-ring	1	Fluorocarbon FKM	
10	Guide Ring	1	Glass-filled TFE	
11	Orifice	1	St.St. ASTM A-276	Brass ASTM B-16
12	Body	1	St.St. ASTM A-182	Brass ASTM B-283

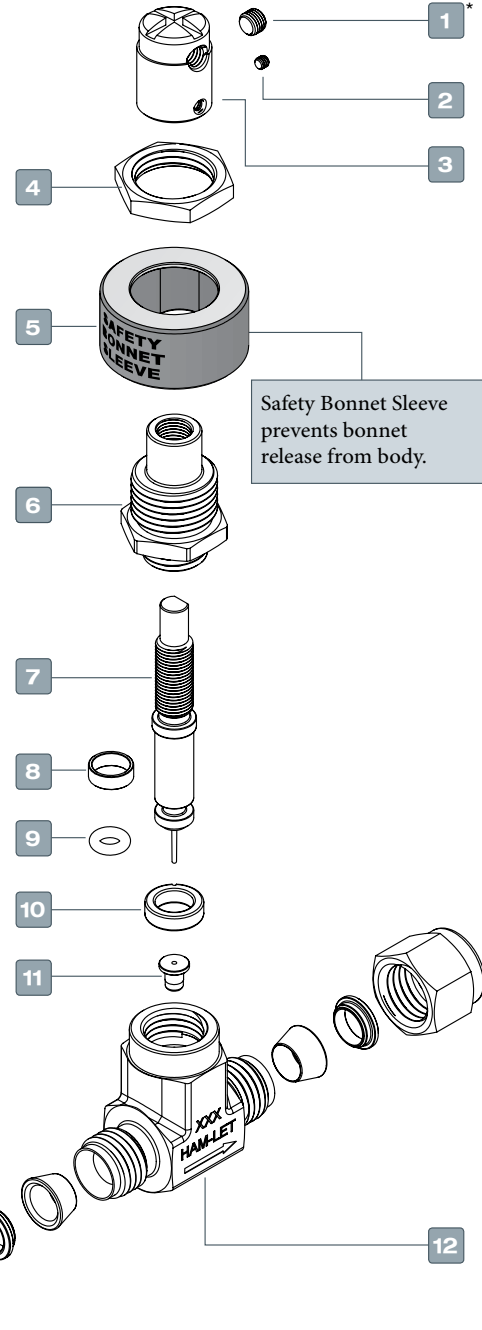
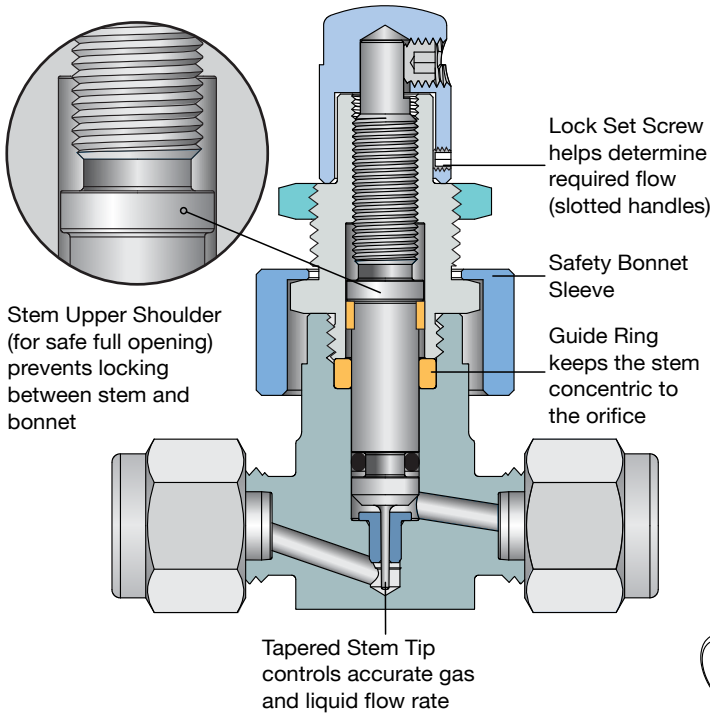
* **Warning:** Handle Set Screw is factory calibrated and should not be adjusted in order to defend the HF and HXF stem from being harmed

GENERAL

The H-1300 Series is a moderate-pressure instrumentation flow-regulating needle valve. It is generally used for instrumentation panels, sampling systems and accurate applications.

The valves are compact in size and structure and offer reliable low and moderate flow regulation with long service life.

HXF SERIES STRAIGHT VALVE



CLEANING & PACKAGING

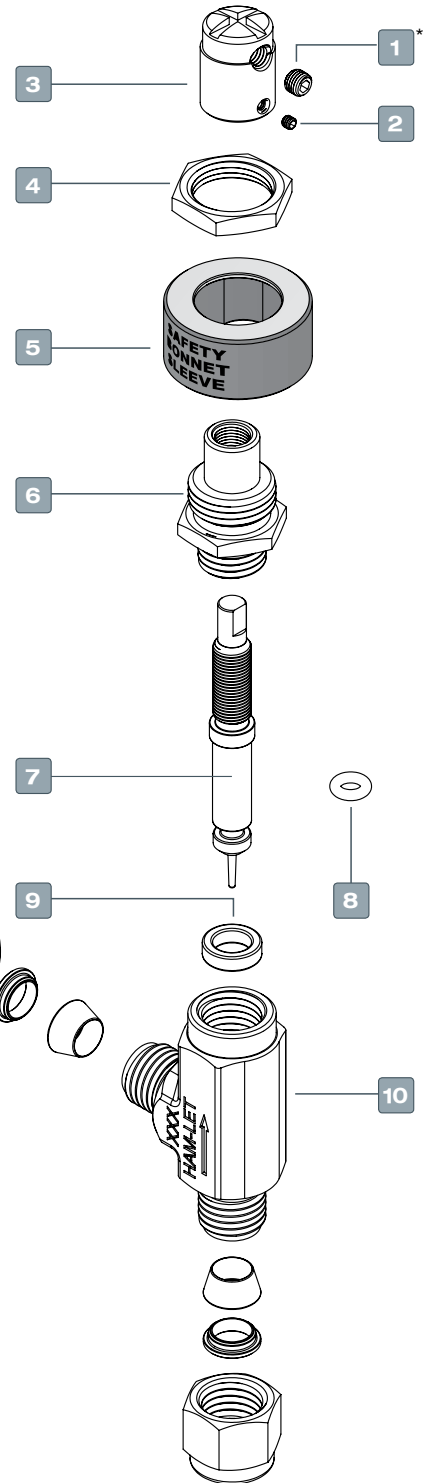
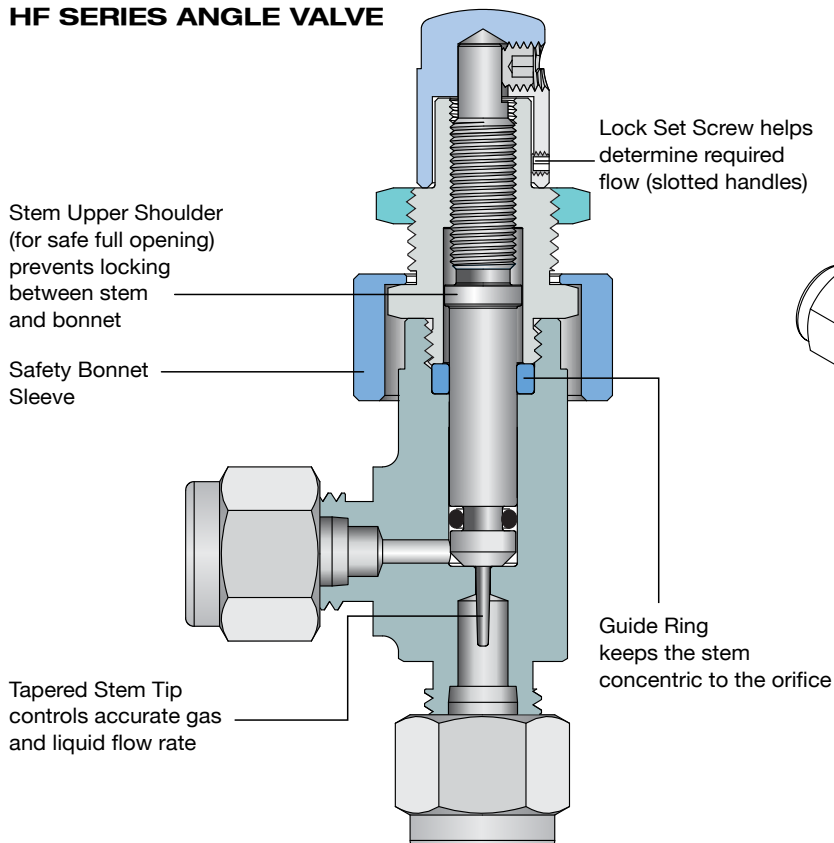
Every H-1300 series needle valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option. Lubricant free cleaned valves have significantly higher actuation torque and MAWP* at 1000 Psi.

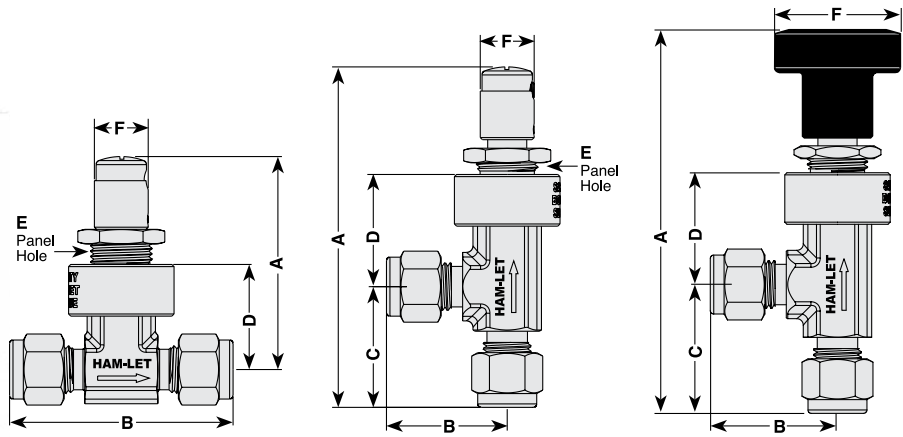
* Maximum Allowed Working Pressure.

H&HF-1300 MATERIALS OF CONSTRUCTION				
Item No.	Components	Qty	Valve Body Material	
			316 St.St.	Brass
1	Handle Set Screw*	1	St.St. ASTM A-276	Brass ASTM B-16
2	Flow Fixing Screw	1	18-8 Stainless Steel	
3	Handle	1	St.St. ASTM A-276	
4	Panel Nut	1	St.St. ASTM A-276	Brass ASTM B-16
5	Safety Bonnet Sleeve	1	St.St. ASTM A-276	Brass ASTM B-16
6	Bonnet	1	St.St. ASTM A-276	Brass ASTM B-16
7	Stem	1	St.St. 174PH/A564	
8	O-ring	1	Fluorocarbon FKM	
9	Guide Ring	1	Glass-filled TFE	
10	Body	1	St.St. ASTM A-182	Brass ASTM B-283

* **Warning:** Handle Set Screw is factory calibrated and should not be adjusted in order to defend the HF and HXF stem from being harmed

HF SERIES ANGLE VALVE





STANDARD CONFIGURATION DIMENSIONS

Basic Ordering Number	Stem Taper Angle	Orifice mm/in	Cv	Inlet	Outlet	A-Open		B		C		D		E		F	
						mm	in	mm	in	mm	in	mm	in	mm	in		
H-1300 Angle	5°	3.3mm 0.13"	0.13 Max	1/4" LET-LOK®	1/4" LET-LOK®	95.7	3.77	29.6	1.17	30.0	1.18	26.0	1.02	14.8	0.58	29 mm 1.14"	
				6MM LET-LOK®	6MM LET-LOK®	95.7	3.77	29.6	1.17	30.0	1.18	26.0	1.02	14.8	0.58		
H-1300 Straight	5°	3.3mm 0.13"	0.13 Max	1/4" LET-LOK®	1/4" LET-LOK®	71.5	2.81	59.5	2.34	-	-	32.0	1.26	14.8	0.58		
				3/8" LET-LOK®	3/8" LET-LOK®	71.5	2.81	62.4	2.46	-	-	32.0	1.26	14.8	0.58		
				6MM LET-LOK®	6MM LET-LOK®	71.5	2.81	59.5	2.34	-	-	32.0	1.26	14.8	0.58		
				1/4" Male NPT	1/4" Male NPT	71.5	2.81	50.8	2.00	-	-	32.0	1.26	14.8	0.58		
HF-1300 Angle	3°	1.4mm 0.055"	0.03 Max	1/8" LET-LOK®	1/8" LET-LOK®	83.5	3.29	25.8	1.02	25.8	1.02	27.0	1.06	14.8	0.58		12.5 mm 0.5"
				1/4" LET-LOK®	1/4" LET-LOK®	85.0	3.35	28.0	1.10	28.0	1.10	27.0	1.06	14.8	0.58		
				3MM LET-LOK®	3MM LET-LOK®	83.5	3.29	25.8	1.02	25.8	1.02	27.0	1.06	14.8	0.58		
				6MM LET-LOK®	6MM LET-LOK®	85.0	3.35	28.0	1.10	28.0	1.10	27.0	1.06	14.8	0.58		
				1/8" Male NPT	1/8" Male NPT	77.0	3.03	19.0	0.75	19.0	0.75	27.0	1.06	14.8	0.58		
				1/4" Male NPT	1/4" Male NPT	83.0	3.27	25.0	0.98	26.0	1.02	27.0	1.06	14.8	0.58		
				1/8" Male NPT	1/8" LET-LOK®	77.0	3.03	25.8	1.02	19.0	0.75	27.0	1.06	14.8	0.58		
				1/4" Male NPT	1/4" LET-LOK®	81.5	3.2	28.3	1.11	23.5	0.92	27.0	1.06	14.8	0.58		
				1/8" Female NPT	1/8" Female NPT	82.5	3.25	24.9	0.98	24.9	0.98	27.0	1.06	14.8	0.58		
				1/8" LET-LOK®	1/8" LET-LOK®	70.6	2.78	51.3	2.02	-	-	27.0	1.06	14.8	0.58		
HF-1300 Straight	3°	1.4mm 0.055"	0.03 Max	3MM LET-LOK®	3MM LET-LOK®	70.6	2.78	51.3	2.02	-	-	27.0	1.06	14.8	0.58		
				6MM LET-LOK®	6MM LET-LOK®	70.6	2.78	55.9	2.20	-	-	27.0	1.06	14.8	0.58		
				1/4" LET-LOK®	1/4" LET-LOK®	70.6	2.78	55.9	2.20	-	-	27.0	1.06	14.8	0.58		
				1/8" Male NPT	1/8" Male NPT	70.6	2.78	38.1	1.50	-	-	27.0	1.06	14.8	0.58		
				1/4" Male NPT	1/4" Male NPT	70.6	2.78	49.8	1.96	-	-	27.0	1.06	14.8	0.58		
				1/8" Female NPT	1/8" Female NPT	70.6	2.78	49.3	1.94	-	-	27.0	1.06	14.8	0.58		
HXF-1300 Angle	1°	0.8 mm 0.03"	0.004 Max	1/8" LET-LOK®	1/8" LET-LOK®	84.4	3.23	24.8	0.98	24.8	0.98	23.4	0.92	14.8	0.58	12.5 mm 0.5"	
				1/4" LET-LOK®	1/4" LET-LOK®	85.0	3.35	26.0	1.02	26.0	1.02	23.4	0.92	14.8	0.58		
				3MM LET-LOK®	3MM LET-LOK®	84.4	3.32	24.8	0.98	24.8	0.98	23.4	0.92	14.8	0.58		
				1/8" Male NPT	1/8" LET-LOK®	77.5	3.05	24.8	0.98	24.8	0.98	23.4	0.92	14.8	0.58		
				1/4" Male NPT	1/4" LET-LOK®	82	3.22	27.3	1.07	24.8	0.98	23.4	0.92	14.8	0.58		
				1/8" Male NPT	1/8" Male NPT	84.4	3.32	24.9	0.98	24.9	0.98	23.4	0.92	14.8	0.58		
				1/4" Male NPT	1/4" Male NPT	84.4	3.32	24.9	0.98	24.9	0.98	23.4	0.92	14.8	0.58		
				1/8" LET-LOK®	1/8" LET-LOK®	59.6	2.34	48.0	1.89	-	-	24.4	0.96	14.8	0.58		
				1/4" LET-LOK®	1/4" LET-LOKv	59.6	2.34	51.9	2.04	-	-	24.4	0.96	14.8	0.58		
				3MM LET-LOK®	3MM LET-LOK®	59.6	2.34	48.0	1.89	-	-	24.4	0.96	14.8	0.58		
HXF-1300 Straight	1°	0.8 mm 0.03"	0.004 Max	6MM LET-LOK®	6MM LET-LOK®	59.6	2.34	51.9	2.04	-	-	24.4	0.96	14.8	0.58		12.5 mm 0.5"
				1/4" Male NPT	1/4" Male NPT	59.6	2.34	48.0	1.89	-	-	24.4	0.96	14.8	0.58		
				1/4" Male Face Seal	1/4" Male Face Seal	59.6	2.34	52.0	2.05	-	-	24.4	0.96	14.8	0.58		

Dimensions are for reference only, and are subject to change.

MAX PANEL THICKNESS

“HXF” Series - 4.3 mm (0.17")

“H” and “HF” - 3.3 mm (0.13")

TESTING

The H, HF and HXF Series metering valve designs have been tested for Proof and Burst.

Every H, HF & HXF-1300 metering valve is factory tested with Nitrogen at 1000 psig (69 bar) for proper assembly, using leak detection.

FLOW SETTING

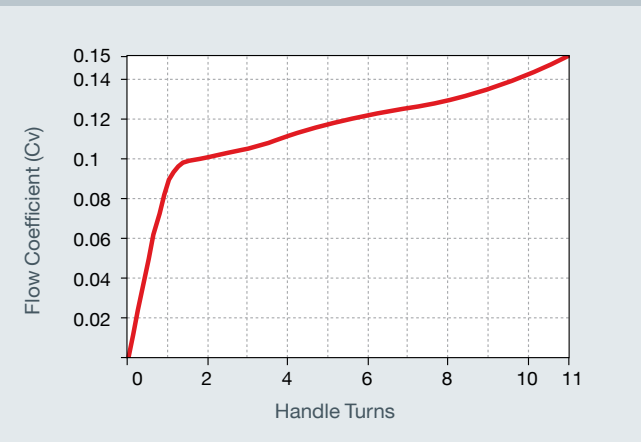
H-1300 series metering valve is tested for bubble tight shut-off at 100 psig (6.8 bar) differential pressure.

HF-1300 series metering valve handle dead stop is set at 4 to 10 std cm³/min with 5 psig (0.34 bar) inlet pressure.

HXF-1300 series metering valve handle dead stop is set at 4 to 10 std cm³/min with 15 psig (1.0 bar) inlet pressure.

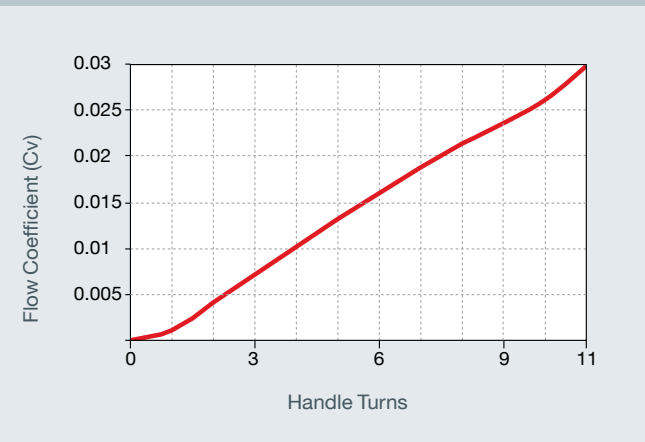
FLOW DATA AT 70°F (20°C)

H-1300 METERING VALVE 5° STEM



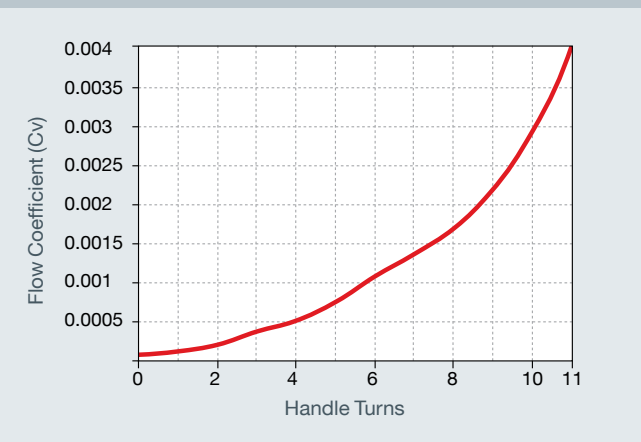
	Pressure Drop to Atmosphere psi (bar)	Water Flow U.S gal/min (L/min)	Air Flow std ft ³ / min (std L / min)
Maximum Flow Coefficient (Cv) 0.15	10 (0.68)	0.47 (1.7)	1.6 (45.3)
	50 (3.4)	1.0 (3.7)	4.5 (127)
	100 (6.8)	1.5 (5.6)	7.9 (223)

HF-1300 METERING VALVE 3° STEM

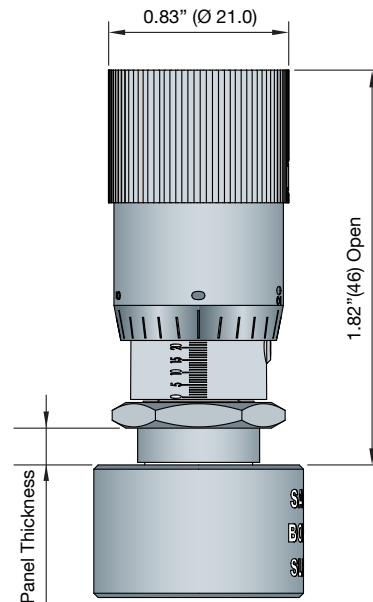


	Pressure Drop to Atmosphere psi (bar)	Water Flow U.S gal/min (L/min)	Air Flow std ft ³ / min (std L / min)
Maximum Flow Coefficient (Cv) 0.03	10 (0.68)	0.09 (0.34)	0.33 (9.3)
	50 (3.4)	0.21 (0.79)	0.9 (25.4)
	100 (6.8)	0.3 (1.1)	1.5 (42.4)

HXF-1300 METERING VALVE 1° STEM



	Pressure Drop to Atmosphere psi (bar)	Water Flow U.S gal/min (L/min)	Air Flow std ft ³ / min (std L / min)
Maximum Flow Coefficient (Cv) 0.004	10 (0.68)	0.01 (0.03)	0.04 (1.1)
	50 (3.4)	0.02 (0.07)	0.1 (2.8)
	100 (6.8)	0.04 (0.15)	0.2 (5.5)



TECHNICAL DATA							
Series	Pressure - Temperature Ratings			Orifice		Shutoff Service	Angle
	O-ring Material	Temperature Rating °F (°C)	Pressure psig (bar)	inch	mm		
H	Buna N	-10 to 300 (-23 to 149)	1000 (68.9)	0.13	3.3	*Yes	5°
	Ethylene Propylene	-10 to 300 (-23 to 149)					
HF	Fluorocarbon FKM	-15 to 400 (-26 to 204)	1000 (68.9)	0.055	1.4	No	3°
HXF	Perfluor	-0 to 300 (-18 to 149)	2000 (138)	0.03	0.8	No	1°
	Polychloroprene (CR)	-10 to 250 (-23 to 121)					

Fluorocarbon FKM is a standard O-ring for H, HF, HXF-1300

***Shutoff Service:** In Stainless Steel constructions only.
 H-1300 Series valves are not recommended for shutoff in vacuum or gas service or for repetitive shutoff in liquid service.

HANDLE OPTIONS

Vernier Handle



Optional for H, HF & HXF

Round Aluminum Handle*



Standard for H
 * Black is Standard.
 Colored Handles are available upon request, see "Ordering Information"

Metal Slotted Handle



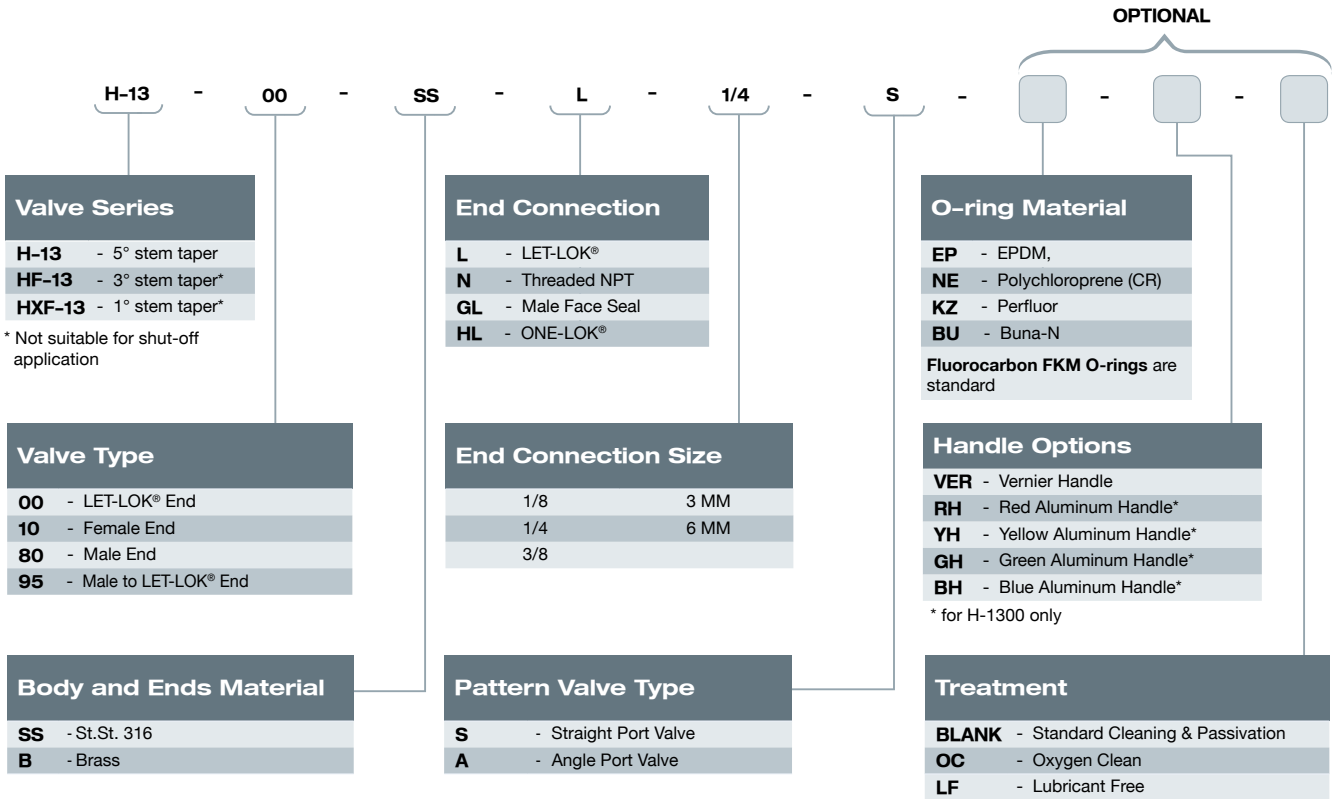
Standard for HF. Optimal for H.

Metal Slotted Handle



Standard for HXF.

H-1300 ORDERING INFORMATION



SEAL KIT

Seal Kit contains O-ring

Z - 1300 - SK - 1/4 - VI

Body Designator per end connection	
1/4	for all end connections

O-Ring material	
VI	Fluorocarbon FKM
EP	EPDM
NE	Polychloroprene (CR)
KZ	Perfluor
BU	Buna-N

HANDLE KIT

Handle Kit contains handle + set screw.

Z - 1300 - HK - 1/4 - VER

Handle Options	
1/4	For all end connections

Handle Options	
VER	- Vernier Handle
RH	- Red Aluminum Handle*
YH	- Yellow Aluminum Handle*
GH	- Green Aluminum Handle*
BH	- Blue Aluminum Handle*
MF	- Metal slotted Handle**
MXF	- Metal slotted Handle***

* For H-1300 only
 **For HF-1300 only
 ***For HXF-1300 only

Warning!

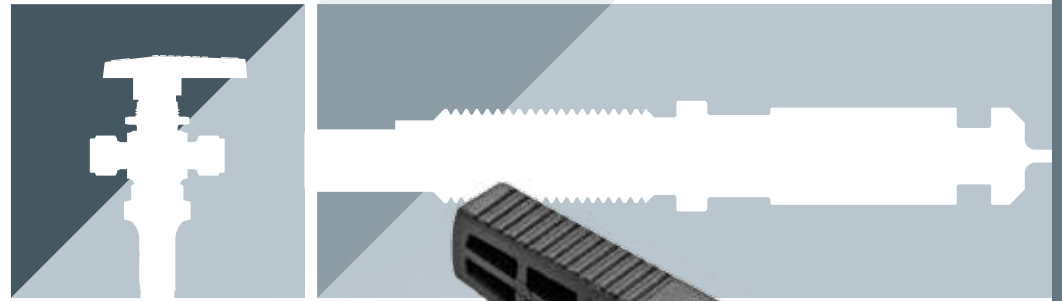
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-1300, Rev 10 January 2015



METERING BALL VALVES

MBV SERIES



Patent No. 8590569



METERING BALL VALVE (MBV) SERIES

FEATURES

- On/Off and Metering service
- PFA Encapsulated Ball Stem design
- Panel Mounting as standard
- MAWP 2000 psi (137 Barg)
- MAWT 300°F (150°C)
- End Connections: LET-LOK 1/16", 1/8", 1/4", 3/8"; FNPT 1/8"; MNPT 1/8"; Male Face Seal 1/4"
- 1°, 3° and 5° Stem Taper for required flow control
- Stem with Stopper shoulder for long life service

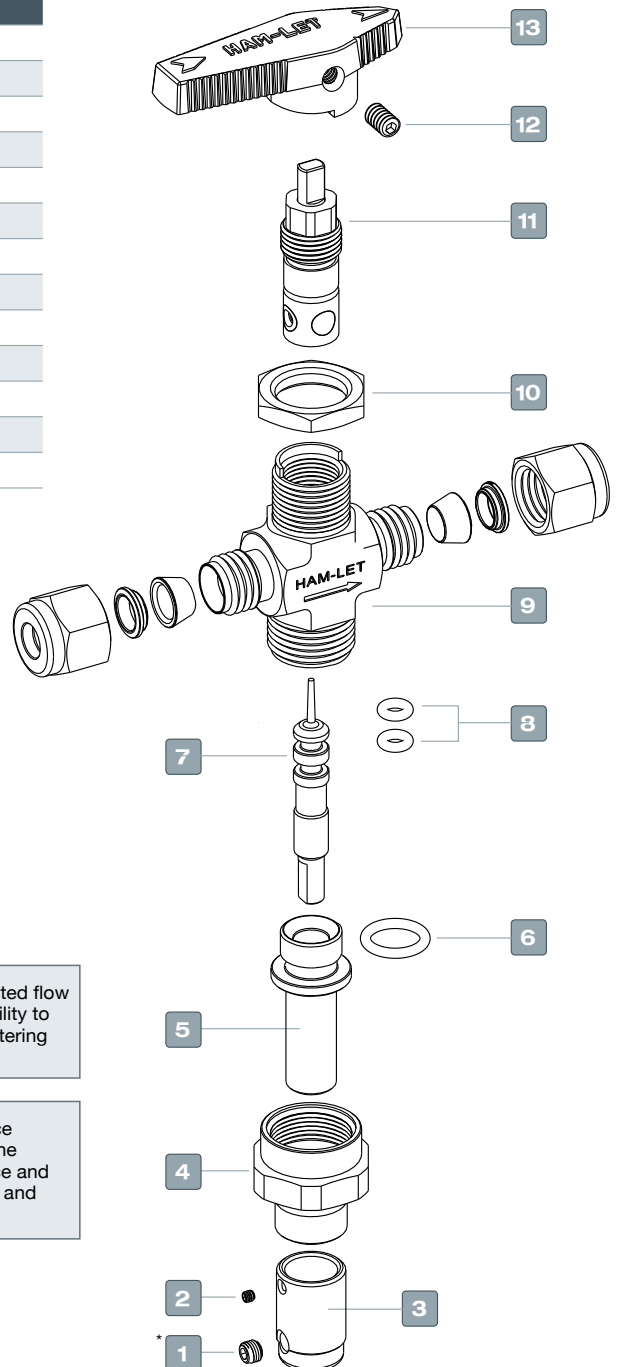
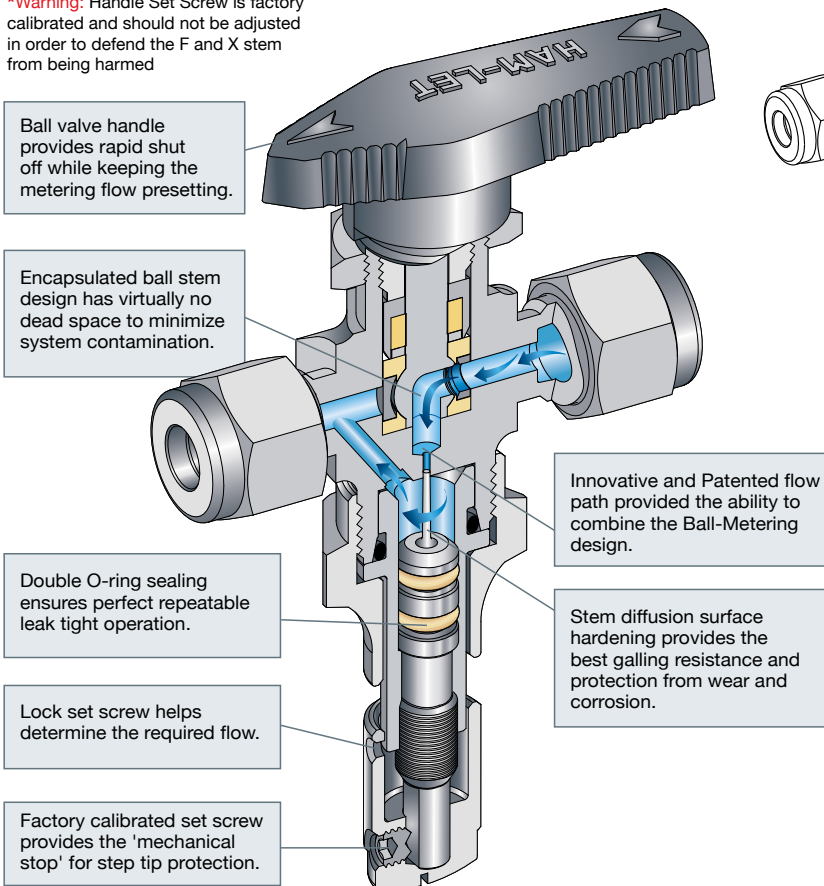
GENERAL

The Shut-off Metering Ball Valve Series provides the highest degree of precision metering for moderate pressure applications. This series features innovative and unique shut-off capability and allows full control of the process from complete shut-off to extra fine regulation. A choice of three precision stem tapers enables metering at flow capacities as low as CV= 0.001 with up to 11 handle turns. This valve is the ultimate solution for precision flow control.

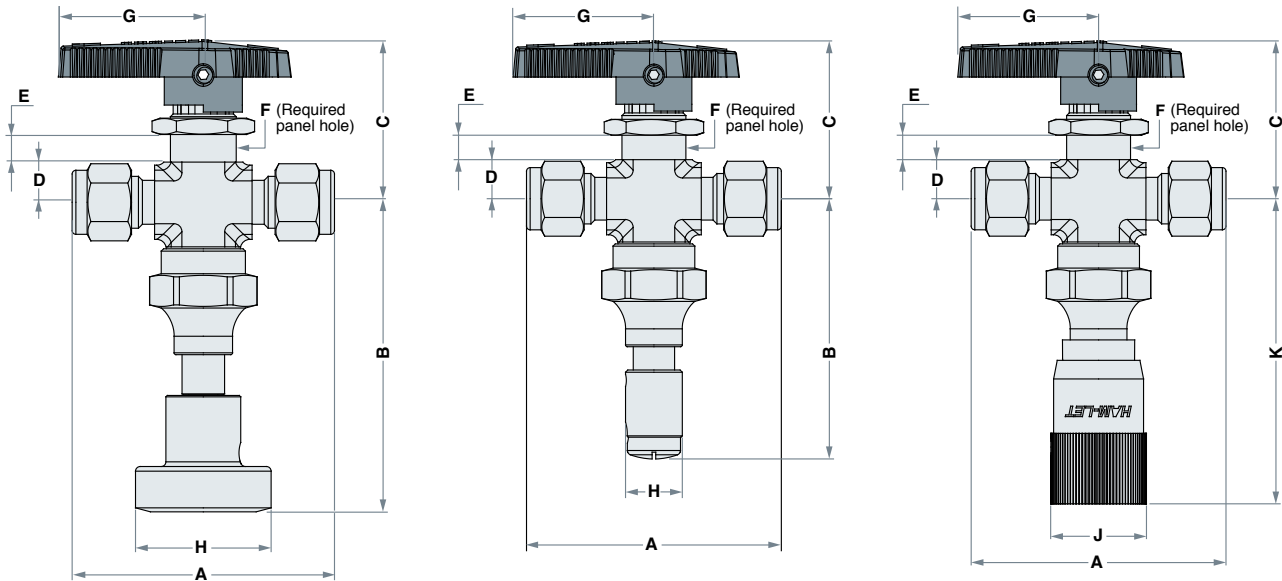
MATERIAL OF CONSTRUCTION

No.	Component	Qty.	Material
1	Handle Set Screw*	1	18-8 Stainless Steel
2	Flow Fixing Screw	1	18-8 Stainless Steel
3	Handle	1	St.St. ASTM A-276
4	Bonnet Nut	1	St.St. ASTM A-276
5	Bonnet	1	St.St. ASTM A-276
6	O-Ring	1	Fluorocarbon FKM
7	Stem	1	St.St. 174PH/A564
8	O-Ring	2	Fluorocarbon FKM
9	Body	1	St.St. ASTM A-182
10	Panel Nut	1	St.St. ASTM A-276
11	Ball Stem assembly	1	St.St. ASTM A-276 + PFA
12	Set Screw	1	St.St.304
13	Handle	1	Nylon + Glass Fiber

***Warning:** Handle Set Screw is factory calibrated and should not be adjusted in order to defend the F and X stem from being harmed



METERING BALL VALVE DIMENSIONS



Basic Ordering Number	Stem Taper Angle	Orifice		Cv	End Connections	A		B		C		D		E		F		G		H		J		K	
		mm	in			mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
MBV-H	5°	3.3	0.13	max	1/8" LET-LOK®	54.6	2.15	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
					1/4" LET-LOK	56.1	2.21	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
					3MM LET-LOK	54.6	2.15	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
					6MM LET-LOK®	56.1	2.21	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
					1/8" Female NPT	41.4	1.63	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
					1/4" Male Face Seal	54.1	2.13	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
					3/8" LET-LOK®	64.92	2.55	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
					1/8" Male NPT	41.8	1.64	65.7	2.59	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	29	1.14	21.1	0.83	72	2.83
MBV-F	3°	1.4	0.055	max	1/8" LET-LOK®	54.6	2.15	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/4" LET-LOK®	56.1	2.21	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					3MM LET-LOK®	54.6	2.15	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					6MM LET-LOK®	56.1	2.21	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/8" Female NPT	41.4	1.63	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/4" Male Face Seal	54.1	2.13	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					3/8" LET-LOK®	64.92	2.55	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/8" Male NPT	41.8	1.64	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
MBV-X	1°	0.8	0.03	max	1/8" LET-LOK®	54.6	2.15	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/4" LET-LOK®	56.1	2.21	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					3MM LET-LOK®	54.6	2.15	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					6MM LET-LOK®	56.1	2.21	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/8" Female NPT	41.4	1.63	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/4" Male Face Seal	54.1	2.13	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					3/8" LET-LOK®	64.92	2.55	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83
					1/8" Male NPT	41.8	1.64	60	2.36	34.8	1.37	8.6	0.34	5.9	0.23	15.1	0.59	31	1.22	12.5	0.49	21.1	0.83	72	2.83

Dimensions are for reference only, and are subject to change.

TESTING

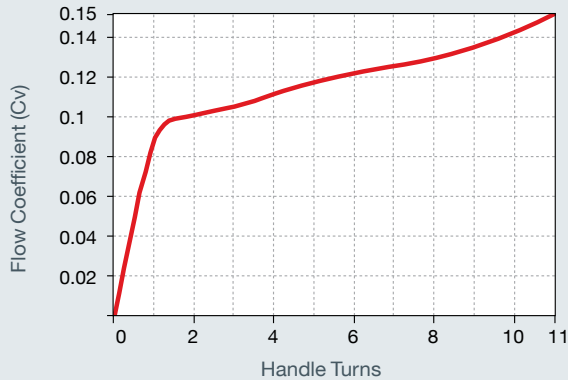
The H, F and X Series metering ball valve designs have been tested for Proof and Burst.
Every MBV - H, F & X metering valve is factory tested with Nitrogen at 1000 psig (69 bar) for proper assembly, using leak detection.

FLOW SETTING

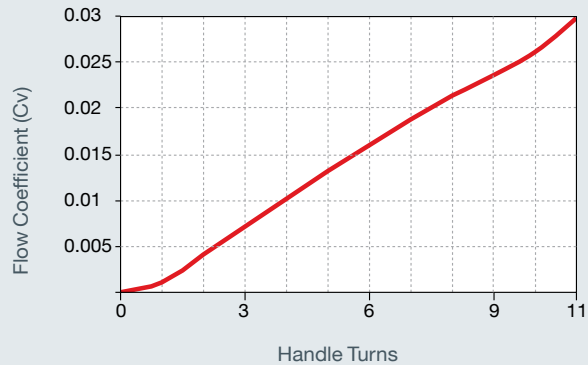
MBV-H series metering valve is tested for bubble tight shut-off at 100 psig (6.8 bar) differential pressure.
MBV-F series metering valve handle dead stop is set at 4 to 10 std cm³/min with 5 psig (0.34 bar) inlet pressure.
MBV-X series metering valve handle dead stop is set at 4 to 10 std cm³/min with 15 psig (1.0 bar) inlet pressure.

FLOW DATA AT 70°F (20°C)

MBV-H METERING BALL VALVE 5° STEM



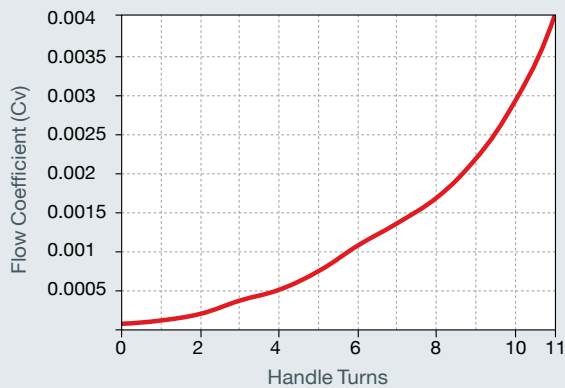
MBV-F METERING BALL VALVE 3° STEM



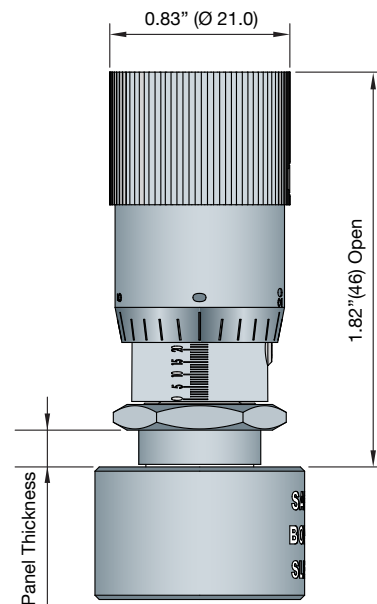
	Pressure Drop to Atmosphere psi (bar)	Water Flow U.S gal/min (L/min)	Air Flow std ft ³ / min (std L / min)
Maximum Flow Coefficient (Cv) 0.13	10 (0.68)	0.47 (1.7)	1.6 (45.3)
	50 (3.4)	1.0 (3.7)	4.5 (127)
	100 (6.8)	1.5 (5.6)	7.9 (223)

	Pressure Drop to Atmosphere psi (bar)	Water Flow U.S gal/min (L/min)	Air Flow std ft ³ / min (std L / min)
Maximum Flow Coefficient (Cv) 0.03	10 (0.68)	0.09 (0.34)	0.33 (9.3)
	50 (3.4)	0.21 (0.79)	0.9 (25.4)
	100 (6.8)	0.3 (1.1)	1.5 (42.4)

MBV-X METERING BALL VALVE 1° STEM



	Pressure Drop to Atmosphere psi (bar)	Water Flow U.S gal/min (L/min)	Air Flow std ft ³ / min (std L / min)
Maximum Flow Coefficient (Cv) 0.004	10 (0.68)	0.01 (0.03)	0.04 (1.1)
	50 (3.4)	0.02 (0.07)	0.1 (2.8)
	100 (6.8)	0.04 (0.15)	0.2 (5.5)



CLEANING & PACKAGING

Every MBV series Metering ball valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option. **Lubricant free cleaned valves** have significantly higher actuation torque.

TECHNICAL DATA							
Series	Pressure - Temperature Ratings			Orifice		Shutoff Service	Angle
	O-ring Material*	Temperature Rating °F (°C)	Pressure psig (bar)	inch	mm		
H	Buna N	-10 to 300 (-23 to 149)	2000 (138)	0.13	3.3	Yes	5°
	Ethylene Propylene	-10 to 300 (-23 to 149)					
F	Fluorocarbon FKM	-15 to 300 (-26 to 149)	2000 (138)	0.055	1.4	Yes	3°
	Perfluor	-0 to 300 (-18 to 149)					
X	Polychloroprene (CR)	-10 to 250 (-23 to 121)	2000 (138)	0.03	0.8	Yes	1°

Fluorocarbon FKM is a standard O-ring for MBV-H, F, X

METERING HANDLE OPTIONS

Vernier Handle



Optional for H, F & X

Round Aluminum Handle*



Standard for H

* Black is Standard. Colored Handles are available upon request, see "Ordering Information"

Metal Slotted Handle



Standard for F. Optional for H.

Metal Slotted Handle



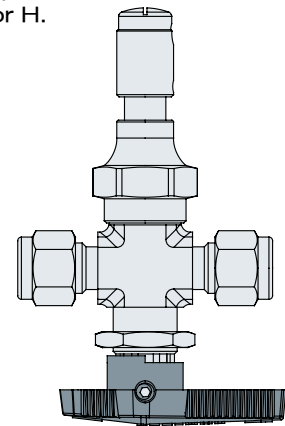
Standard for X.

BALL HANDLE OPTIONS

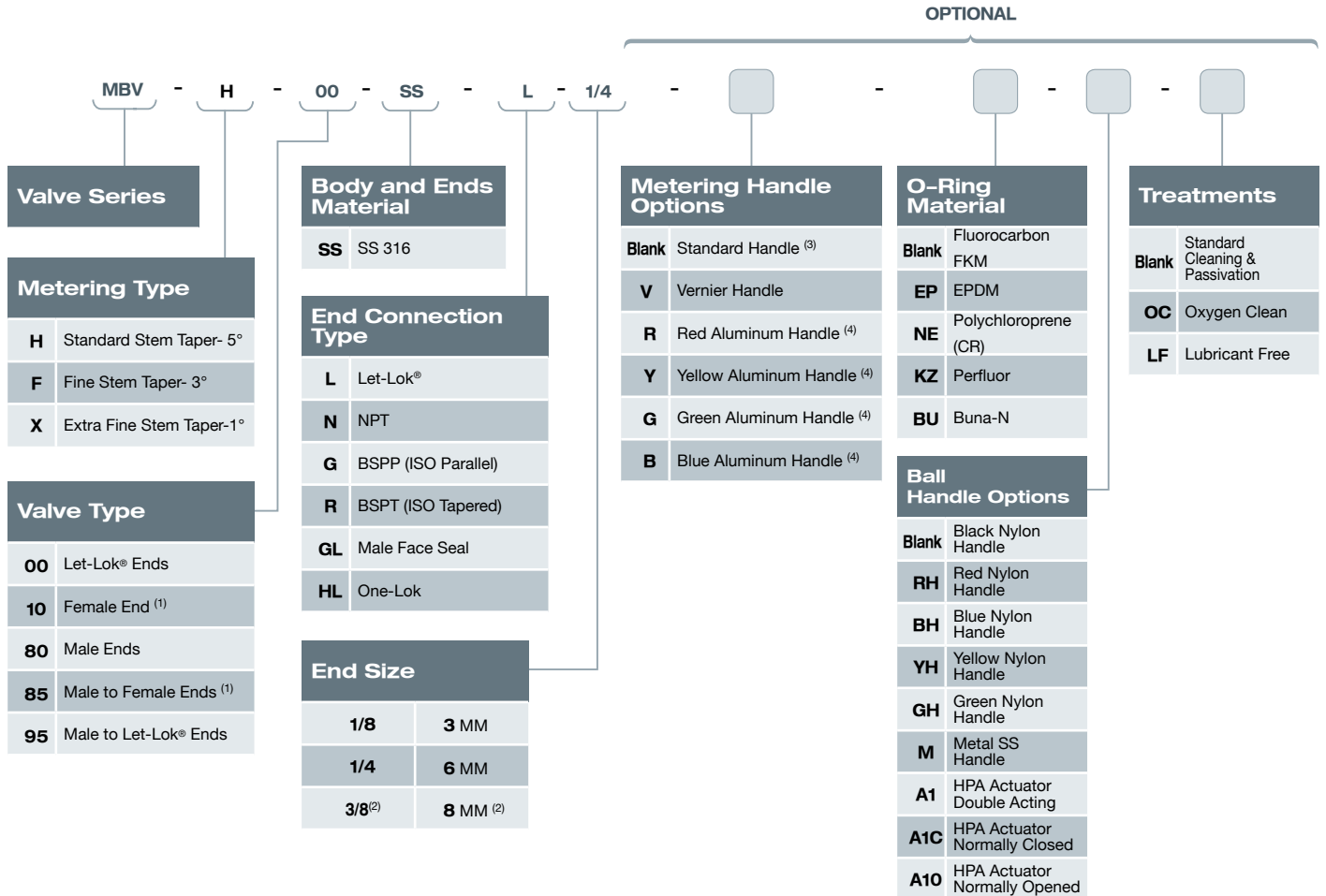


MANUAL OPERATION

- S** - Black Handle*
 - B** - Blue Handle
 - R** - Red Handle
 - G** - Green Handle
 - Y** - Yellow Handle
 - M** - Metal Handle
- * Black Nylon handle is standard.



METERING BALL VALVE ORDERING INFORMATION



- (1) Female threaded end connections available up to size 1/8"
- (2) 3/8" and 8MM size available only for Let-Lok and One-Lok end connections types.
- (3) Black Aluminum Handle is standard for H type metering ball valve.
Metal slotted handle is standard for F & X type metering ball valve.
- (4) Colored Aluminum handles available for H type metering ball valves only.

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

CHECK VALVES

H-400 SERIES



H-400

General purpose fixed cracking pressure check valve (MAWP 3000 psig)

H-400 HP

High performance fixed cracking pressure check valve (MAWP 6000 psig)

H-400 CNG

ECE R110 Approved for the CNG / NGV fixed cracking pressure check valve (MAWP 3770 psig)

H-400 OP

Compact one-piece fixed cracking pressure check valve (MAWP 3000 psigs)

H-400 OPA

One-piece adjustable cracking pressure check valve (MAWP 3000 psig)

H-400 A

Adjustable cracking pressure check valve (MAWP 3000 psig)



FEATURES

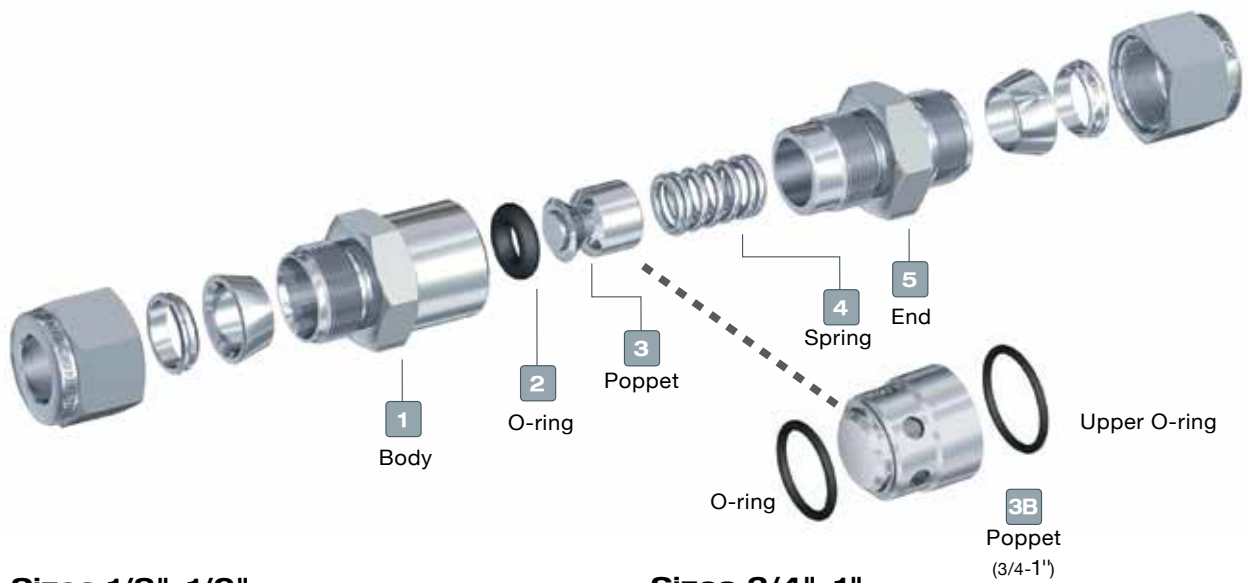
- 316 St.St. and Brass construction
- Moderate Pressure Characteristics up to 3000 psi (206 bar)
- Compact Design
- Variable fixed cracking-pressure springs
- HAM-LET LET-LOK®, Male & Female NPT, and HTC® Face-Seal Bead Ends.

GENERAL

The H-400 Series is a compact design for instrumentation panels and systems, which provides an accurate operating point. H-400 valves are normally closed. When differential pressure between the inlet and outlet is higher than the set pressure of the spring, the loaded poppet will move backwards and will enable a free passage of flow through the valve. For vacuum applications please select H-400HP series.

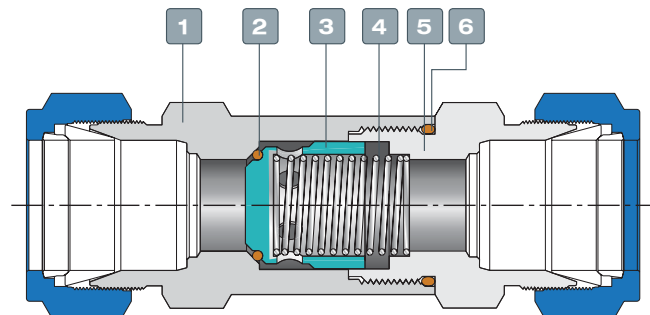
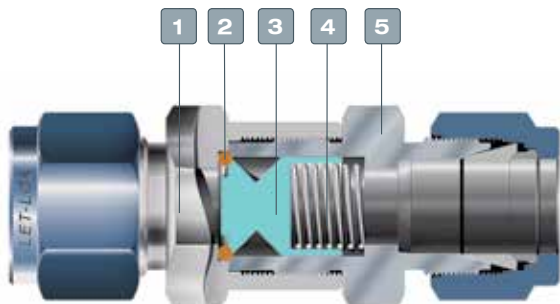
MATERIALS OF CONSTRUCTION for sizes 1/8"-1/2"				
Item No.		Components	Qty.	Valve Body Material
1		Body	1	St.St. 316
2		O-ring	1	Fluorocarbon FKM
3		Poppet	1	St.St. 316
4	A	Spring 1/3 psi	1	St.St. 302
	B	Spring 3 psi	1	St.St. 302
	C	Spring 10 psi	1	St.St. 302
	D	Spring 25 psi	1	St.St. 302
5		End	1	St.St. 316

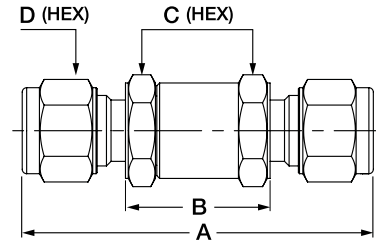
MATERIALS OF CONSTRUCTION for sizes 3/4"-1"				
Item No.		Components	Qty.	Valve Body Material
1		Body	1	St.St. 316
2		O-ring	1	Fluorocarbon FKM
3B		Poppet	1	St.St. 316
4	A	Spring 1/3 psi	1	St.St. 302
	B	Spring 3 psi	1	St.St. 302
	C	Spring 10 psi	1	St.St. 302
	D	Spring 25 psi	1	St.St. 302
5		End	1	St.St. 316
6		Upper O-ring	1	Fluorocarbon FKM



Sizes 1/8"-1/2"

Sizes 3/4"-1"





STANDARD CONFIGURATION DIMENSIONS

Valve Type	Connection / Size		Cv	A		B		C		D	
	Inlet	Outlet		mm	in	mm	in	mm	in	mm	in
H-400	1/8" LET-LOK®	1/8" LET-LOK®	0.1	56.0	2.20	25.3	1.00	15.88	5/8	11.11	7/16
H-400	1/4" LET-LOK®	1/4" LET-LOK®	0.47	60.5	2.38	25.0	0.98	15.88	5/8	14.28	9/16
H-400	6 MM LET-LOK®	6 MM LET-LOK®	0.47	60.5	2.38	25.0	0.98	15.88	5/8	14.00	
H-400	3/8" LET-LOK®	3/8" LET-LOK®	1.47	63.5	2.50	24.9	0.98	17.46	11/16	17.46	11/16
H-400	8 MM LET-LOK®	8 MM LET-LOK®	1.47	63.3	2.49	24.9	0.98	17.5	11/16	16.00	
H-400	10 MM LET-LOK®	10MM LET-LOK®	1.68	64.0	2.52	24.9	0.98	17.46	11/16	19.00	
H-400	1/2" LET-LOK®	1/2" LET-LOK®	1.68	77.0	3.03	32.6	1.28	23.8	15/16	22.23	7/8
H-400	12 MM LET-LOK®	12 MM LET-LOK®	1.68	77.0	3.03	32.8	1.28	23.8	15/16	22.00	
H-400	3/4" LET-LOK®	3/4" LET-LOK®	4.48	88.5	3.48	44.4	1.75	28.6	1-1/8	28.60	1-1/8
H-400	1" LET-LOK®	1" LET-LOK®	4.48	120	4.72	67.2	2.65	34.9	1-3/8	38.10	1-1/2
H-410	1/8" Female NPT	1/8" Female NPT	0.1	44.0	1.73	25.4	1.00	15.88	5/8		
H-410	1/4" Female NPT	1/4" Female NPT	0.47	52.5	2.07	28.0	1.10	19.05	3/4		
H-410	3/8" Female NPT	3/8" Female NPT	1.47	51.5	2.03	34.1	1.34	22.23	7/8		
H-410	1/2" Female NPT	1/2" Female NPT	1.68	76.5	3.01	43.4	1.71	28.6	1-1/8		
H-410	3/4" Female NPT	3/4" Female NPT	4.48	86.0	3.39	56.0	2.20	34.9	1-3/8		
H-410	1" Female NPT	1" Female NPT	4.48	107	4.21	73.0	2.87	41.28	1-5/8		
H-480	1/8" Male NPT	1/8" Male NPT	0.1	44.3	1.74	24.9	0.98	15.88	5/8		
H-480	1/4" Male NPT	1/4" Male NPT	0.47	55.7	2.19	25.0	0.98	19.05	3/4		
H-480	3/8" Male NPT	3/8" Male NPT	1.47	53.1	2.09	24.9	0.98	17.46	11/16		
H-480	1/2" Male NPT	1/2" Male NPT	1.68	70.4	2.77	32.6	1.28	23.8	15/16		
H-480	1/4" Male Face Seal	1/4" Male Face Seal	0.47	56.4	2.22	24.9	0.98	15.88	5/8		
H-480	1/2" Male Face Seal	1/2" Male Face Seal	1.68	68.2	2.69	32.6	1.28	23.8	15/16		
H-485	1/8" Male NPT	1/8" Female NPT	0.1	44.3	1.74	25.4	1.0	15.88	5/8		
H-485	1/4" Male NPT	1/4" Female NPT	0.47	53.7	2.11	27.3	1.07	19.05	3/4		

Dimensions are for reference only, and are subject to change.



CRACKING PRESSURE

The differential pressure between the inlet and outlet, at which an initial flow is passing through the valve.

RESEAL PRESSURE

The differential pressure between the outlet and inlet, at which no flow is passing through the valve.
Lubricant free cleaned valves have higher reseal pressure.

BACK PRESSURE

Maximum allowable back pressure is rated to 1000 psi (69 bar) for 1/4, 200 psi (14 bar) for 3/8 to 1". For higher back pressure please select valve from the H-400HP Series.

O-RINGS*	
O-ring Material	Temperature Rating °F (°C)
Buna N	-10 to 250 (-23 to 121)
EPDM	-50 to 300 (-45 to 148)
Fluorocarbon FKM	-10 to 375 (-23 to 190)
Perfluor	-15 to 500 (-26 to 260)
Polychloroprene (CR)	-40 to 250 (-40 to 121)

MAWP PRESSURE AT 21°C (70°F)		
SIZE	BRASS psi (bar)	AISI 316 psi (bar)
1/8, 1/4, 3/8, 1/2, 5/8, 6mm, 8mm, 10mm, 12mm	3000 (207)	3000 (207)
3/4, 1", 16mm, 20mm, 22 mm	1500 (103)	2000 (138)

*Different materials are available for special applications.

CRACKING AND RESEAL PRESSURE		
Nominal Cracking Pressure	Cracking Pressure Range	Reseal Pressure
psi (bar)	psi (bar)	psi (bar)
1/3 (0.02)	Up to 3 (0.2)	Up to 6 (0.40) back pressure
1 (0.06)	Up to 4 (0.27)	Up to 6 (0.41) back pressure
5 (0.34)	3 to 9 (0.20 to 0.62)	Up to 2 (0.13) back pressure
10 (0.68)	7 to 15 (0.48 to 1.0)	3 (0.2) or more inlet pressure
25 (1.7)	20 to 30 (1.3 to 2.0)	17 (1.1) or more inlet pressure

PRESSURE - TEMPERATURE RATING FOR STANDARD CONFIGURATIONS

1/8 TO 1/2 INCH, 3MM TO 12 MM		
Material	316St.St.	Brass
Temperature F° (C°)	Working Pressure, psi (bar)	
-10 (-23) to 100 (37)	3000 (206)	3000 (206)
200 (93)	2575 (177)	2600 (179)
250 (121)	2450 (168)	2405 (165)
300 (148)	2325 (160)	-
375 (190)	2185 (150)	-

3/4 TO 1 INCH, 18MM TO 25MM		
Material	316St.St.	Brass
Temperature F° (C°)	Working Pressure, psi (bar)	
-10 (-23) to 100 (37)	2000 (137)	1500 (103)
200 (93)	1715 (118)	1300 (89.5)
250 (121)	1630 (112)	1200 (82.6)
300 (148)	1545 (106)	-
375 (190)	1450 (99.9)	-

Note: Ratings based on Fluorocarbon FKM O-ring.

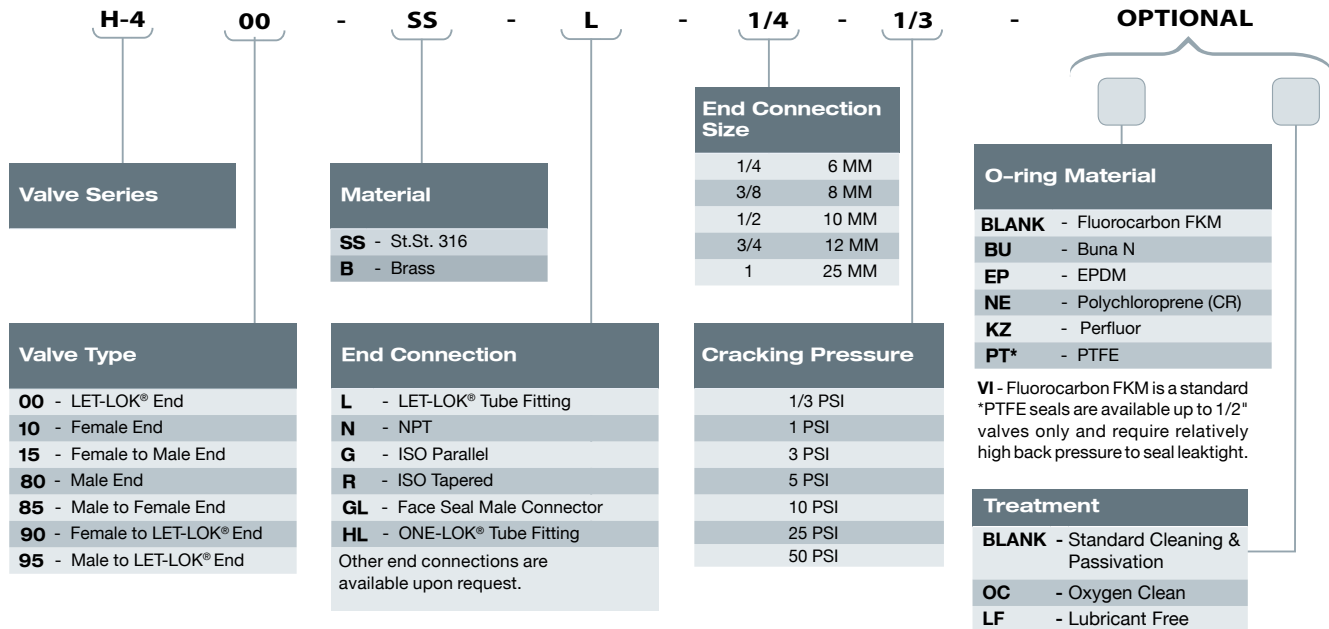
CLEANING & PACKAGING

Every H-400 series Check valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

TESTING

The H-400 valve designs have been tested for Proof and Burst. Every H-400 valve is factory tested for proper assembly, by leakage detection at 1000 psig (68 bar) for 10 seconds. Every H-400 valve is factory tested for functionality at the relevant cracking pressure, 5 cycles each.

H-400 SERIES ORDERING INFORMATION



SPARE KITS

Series	End Size	Spring Kit*	O-Ring Kit**
H-410 Female Ends H-490 Female to Let-Lok®	1/8	Z-400-SPK-1/4- X PSI	Z-400-SK-1/4- □
	1/4, 3/8	Z-400-SPK-3/8- X PSI	Z-400-SK-3/8- □
	1/2	Z-410-SPK-1/2- X PSI	Z-410-SK-1/2- □
	3/4	Z-410-SPK-3/4- X PSI	Z-410-SK-3/4- □
	1	Z-410-SPK-1"- X PSI	Z-410-SK-1"- □
H-485 Male to Female H-415 Female to Male	1/8	Z-400-SPK-1/4- X PSI	Z-400-SK-1/4- □
	1/4, 3/8	Z-400-SPK-3/8- X PSI	Z-400-SK-3/8- □
	1/2	Z-410-SPK-1/2- X PSI	Z-410-SK-1/2- □
	3/4	Z-410-SPK-3/4- X PSI	Z-410-SK-3/4- □
H-400 Let-Lok® H-480 Male Ends H-495 Male to Let-Lok	1/8, 1/4, 6mm	Z-400-SPK-1/4- X PSI	Z-400-SK-1/4- □
	3/8, 8mm, 10mm	Z-400-SPK-3/8- X PSI	Z-400-SK-3/8- □
	1/2, 12mm	Z-400-SPK-1/2- X PSI	Z-400-SK-1/2- □
	3/4	Z-400-SPK-3/4- X PSI	Z-400-SK-3/4- □
	1	Z-400-SPK-1- X PSI	Z-400-SK-1- □

* Spring Kit includes Spring and lable
** O-ring Kit includes O-ring and lable

X =spring type per "How To Order"
□ =O-Ring material per "How To Order"

HAM-LET Check Valves should never be used as safety relief devices. These valves are not designed for pressure release.

HIGH PERFORMANCE FIXED CRACKING PRESSURE CHECK VALVE H-400HP SERIES

FEATURES

- 316 St.St. construction
- High Pressure Characteristics up to 6000 psi (413 bar)
- Small Size
- Variable Fixed Cracking Pressure
- HAM-LET LET-LOK®, Male & Female NPT, and HTC Face Seal Bead Ends
- Suitable for vacuum applications
- ECE R110 approved for the CNG/NGV as an option

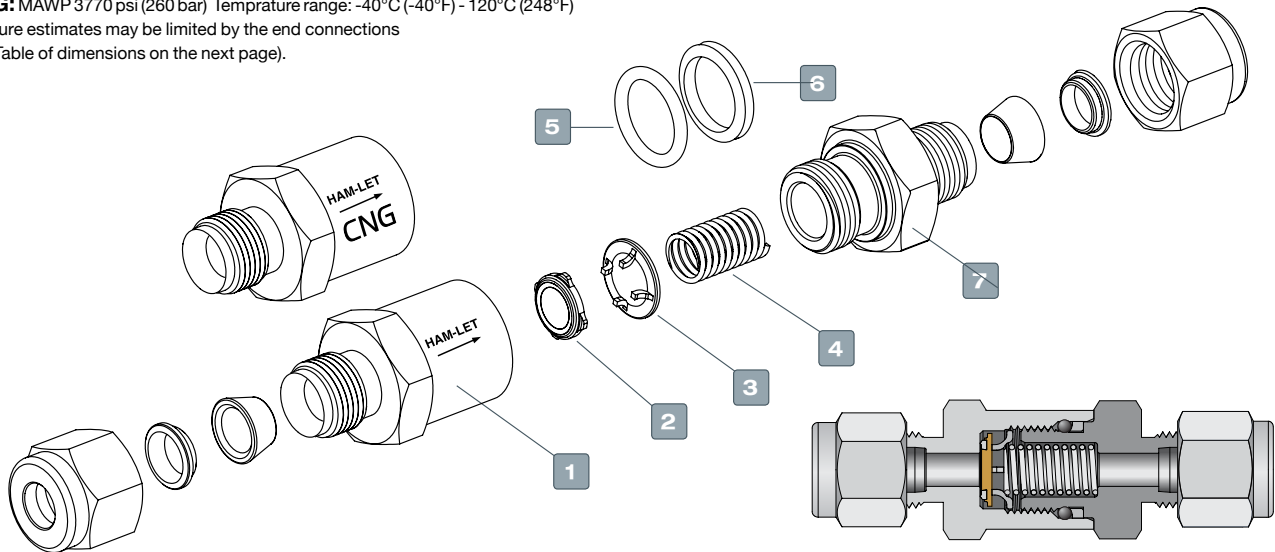
GENERAL

The H-400HP Series is a compact, robust and heavy duty design for high-pressure (up to 6000 psi) instrumentation panels and systems, which provides an accurate operating point. H-400HP valves are normally closed. When the differential pressure between the inlet and the outlet is higher than the set pressure of the spring, the loaded poppet will move backwards and provide a free passage of flow through the valve. H-400HP CNG is specially designed for the CNG/NGV

MATERIALS OF CONSTRUCTION				
No.	Components	Qty.	Standard	CNG*
1	Body	1	St.St. ASTM A-276	St.St. ASTM A-276
2	Bonded Poppet	1	Fluorocarbon FKM Bonded on 316 St.St.	Low temperature Fluorocarbon FKM Bonded on 316 St.St.
3	Pusher	1	St.St. ASTM A-276	St.St. ASTM A-276
4	Spring	1	St.St. 304	St.St. 304
5	O-ring	1	Fluorocarbon FKM	Low temperature Fluorocarbon FKM
6	Back Up	1	Fluorocarbon FKM	Fluorocarbon FKM
7	End	1	St.St. ASTM A-276	St.St. ASTM A-276

PRESSURE TEMPERATURE RATING*		
Material Size	316SS	
	1/8, 1/4, 3/8, 1/2", 6,8,10,12mm	22&25mm , 3/4&1"
Temperature F° (C°)	Working Pressure, psi (bar)	
-10 (-23) to 100 (37)	6000 (413)	5000 (344)
200 (93)	5160 (355)	4290 (296)
250 (121)	4910 (338)	4080 (281)
300 (148)	4660 (321)	3875 (267)
400 (204)	4280 (295)	3560 (245)

*CNG: MAWP 3770 psi (260 bar) Temperature range: -40°C (-40°F) - 120°C (248°F)
Pressure estimates may be limited by the end connections
(See Table of dimensions on the next page).



CRACKING AND RESEAL PRESSURE		
Nominal Cracking Pressure	Cracking Pressure Range	Reseal Pressure
psi (bar)	psi (bar)	psi (bar)
1/3 (0.02)	Up to 3 (0.2)	Up to 6 (0.40) back pressure
1 (0.06)	Up to 4 (0.27)	Up to 4 (0.27) back pressure
5 (0.34)	3 to 9 (0.20 to 0.62)	Up to 2 (0.13) back pressure
10 (0.68)	7 to 15 (0.48 to 1.0)	3 (0.2) or more inlet pressure
25 (1.7)	20 to 30 (1.3 to 2.0)	17 (1.1) or more inlet pressure

TECHNICAL DATA			
Connection Sizes	Max. Flow Coefficient (Cv)	Nominal Cracking Pressure psi (bar)	Back Pressure at 70°F (20°C) psi (bar)
1/8, 1/4, 6mm	0.67	1/3, 1, 5, 10 & 25	6000 (413)
3/8, 1/2, 8-12 mm	1.80	(0.02, 0.06, 0.34,	
3/4, 1, 22mm, 25mm	4.7	0.68, and 7.1)	5000 (344)

CRACKING PRESSURE

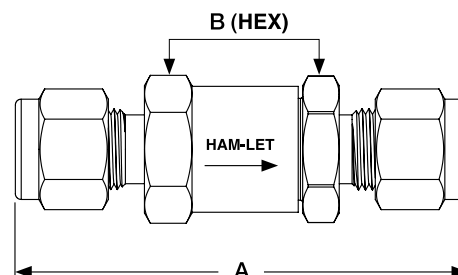
The differential pressure between the inlet and outlet, at which an initial flow is passing through the valve.

RESEAL PRESSURE

The differential pressure between the outlet and inlet, at which no flow is passing through the valve. Lubricant free cleaned valves have higher reseal pressure.

CLEANING & PACKAGING

Every H-400HP series Check valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.



STANDARD CONFIGURATION DIMENSIONS

Valve Type	Inlet	Outlet	Pressure Ratings at 100F° / 37C° psig (bar)	Dimensions			
				A		B	
				mm	in	in	
H-400HP	1/8" LET-LOK®	1/8" LET-LOK®	6000 (413)	57.8	2.28	11/16	
	1/4" LET-LOK®	1/4" LET-LOK®		61.8	2.43		
	3/8" LET-LOK®	3/8" LET-LOK®		70.0	2.76	1	
	1/2" LET-LOK®	1/2" LET-LOK®		75.3	2.96		
	3/4" LET-LOK®	3/4" LET-LOK®	5000 (344)	89.5	3.52	1 5/8	
	1" LET-LOK®	1" LET-LOK®	4700 (323)	98.5	3.88		
	6MM LET-LOK®	6MM LET-LOK®	6000 (413)	61.8	2.43	11/16	
	8MM LET-LOK®	8MM LET-LOK®		68.5	2.70		
	10MM LET-LOK®	10MM LET-LOK®		71.1	2.80	1	
	12MM LET-LOK®	12MM LET-LOK®		75.3	2.96		
	22MM LET-LOK®	22MM LET-LOK®	5000 (344)	88.5	3.48	1 5/8	
	25MM LET-LOK®	25MM LET-LOK®	4700 (323)	98.5	3.88		
H-410HP	1/4" Female NPT/BSPT	1/4" Female NPT/BSPT	6000 (413)	54.1	2.13	11/16	
	3/8" Female NPT/BSPT	3/8" Female NPT/BSPT	5000 (344)	64.8	2.55	1	
	1/2" Female NPT/BSPT	1/2" Female NPT/BSPT	4600 (316)	83.6	3.03	1	
	3/4" Female NPT/BSPT	3/4" Female NPT/BSPT	4300 (296)	90.1	3.23	1 5/8	
	1" Female NPT/BSPT	1" Female NPT/BSPT	4100 (282)	97.3	3.83		
	1/4" Female BSPP	1/4" Female BSPP	6000 (413)	58.0	2.28	11/16	
	1/2" Female BSPP	1/2" Female BSPP	4600 (316)	83.5	3.29	1	
	3/4" Female BSPP	3/4" Female BSPP	4300 (296)	90.1	3.55	1 5/8	
	1" Female BSPP	1" Female BSPP	4100 (282)	97.4	3.83		
	1/2" Female SAE/MS	1/2" Female SAE/MS	4600 (316)	69.5	2.74	1	
H-480HP	1/8" Male NPT/BSPT	1/8" Male NPT/BSPT	6000 (413)	45.6	1.80	11/16	
	1/4" Male NPT/BSPT	1/4" Male NPT/BSPT	6000 (413)	55.0	2.17		
	3/8" Male NPT/BSPT	3/8" Male NPT/BSPT		60.0	2.36	1	
	1/2" Male NPT/BSPT	1/2" Male NPT/BSPT		6000 (413)	69.2		2.72
	3/4" Male NPT/BSPT	3/4" Male NPT/BSPT	5000 (344)	83.5	3.29	1 5/8	
	1" Male NPT/BSPT	1" Male NPT/BSPT		93.3	3.67		
	1/4" Male BSPP	1/4" Male BSPP	6000 (413)	55.0	2.17	3/4	
	1/2" Male BSPP	1/2" Male BSPP		69.2	2.72	1	
	3/4" Male BSPP	3/4" Male BSPP	5000 (344)	85.2	3.35	1 5/8	
	1" Male BSPP	1" Male BSPP		93.3	3.67		
	1/2" Male SAE/MS	1/2" Male SAE/MS	6000 (413)	63.0	2.48	1	
	1/4" Male HO Fitting	1/4" Male HO Fitting		50.4	1.98	11/16	
	1/2" Male HO Fitting	1/2" Male HO Fitting		59.8	2.35	1	
	3/4" Male HO Fitting	3/4" Male HO Fitting		5000 (344)	73.6	2.90	1 5/8
	1" Male HO Fitting	1" Male HO Fitting			73.6	2.90	
	1/4" Male Face Seal	1/4" Male Face Seal		6000 (413)	58.0	2.28	11/16
	1/2" Male Face Seal	1/2" Male Face Seal		3500 (241)	69.2	2.72	1
	3/4" Male Face Seal	3/4" Male Face Seal		3000 (206)	96.1	3.78	1 5/8

Dimensions are for reference only and are subject to change.

HIGH PERFORMANCE FIXED CRACKING PRESSURE CHECK VALVE H-400HP SERIES



O-RINGS

Different materials are available for special applications.

O-ring Material	Temperature Rating °F (°C)
Buna N	-10 to 250 (-23 to 121)
EPDM	-50 to 300 (-45 to 148)
Fluorocarbon FKM	-10 to 400 (-23 to 204)
Polychloroprene (CR)	-40 to 250 (-40 to 121)

TESTING

The H-400HP valve designs have been tested for Proof and Burst. Every H-400HP valve is factory tested for proper assembly, by leakage detection at 1000 psig (68 bar) for 10 seconds. Every H-400HP valve is factory tested for functionality at the relevant cracking pressure, 5 cycles each.

H-400HP SERIES ORDERING INFORMATION

H-4

Valve Series

00HP

-

SS

Material

SS - St.St.316

-

L

-

1/4

End Connection Size

1/8	6 MM
1/4	8 MM
3/8	10 MM
1/2	
3/4	22 MM
1	25 MM

-

1/3

OPTIONAL

Approval

BLANK - Standard

CNG - ECE R110

Treatment

BLANK - Standard Cleaning & Passivation

OC - Oxygen Clean

LF - Lubricant Free

Valve Type
00HP - LET-LOK® End
10HP - Female End
15HP - Female to Male End
80HP - Male End
85HP - Male to Female End
90HP - Female to LET-LOK® End
95HP - Male to LET-LOK® End

End Connection Type
L - LET-LOK® Tube Fitting
N - NPT
G - ISO parallel
R - ISO Tapered
GL - Metal Face Seal Male
HO - O-ring Face Seal Male
HL - ONE-LOK®
OB - SAE/MS

Cracking Pressure
1/3 PSI
1 PSI
3 PSI
5 PSI
10 PSI
25 PSI

Seal Material
BLANK - Fluorocarbon FKM Seals are standard.
BU - Buna N
EP - EPDM
NE - Polychloroprene (CR)

Note: Check valves are designed and suitable for direct flow control only. These valves are not meant for pressure release.

ORDERING INFORMATION SPARE-PARTS KIT / REPAIR KIT

SEAL KIT

The kit includes O-ring, Back-up & Bonded Poppet and Label.

Z - 400HP - SK - 1/4 - VI

Body Designator per End Connection

1/4	For 1/8, 1/4, 6MM
1/2	For 3/8, 1/2, 10MM, 12MM
3/4	For 3/4, 1", 25MM

Seal Material

VI	- Fluorocarbon FKM
BU	- Buna N
NE	- Polychloroprene (CR)
EP	- EPDM

SPRING KIT

The kit includes Spring & Label.

Z - 400HP - SPK - 1/4 - 1/3

Body Designator per End Connection

1/4	For 1/8, 1/4, 6MM
1/2	For 3/8, 1/2, 10MM, 12MM
3/4	For 3/4, 1", 25MM

Cracking Pressure

1/3 PSI
1 PSI
3 PSI
5 PSI
10 PSI
25 PSI

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

HAM-LET Check Valves should never be used as safety relief devices.

COMPACT ONE PIECE FIXED CRACKING PRESSURE CHECK VALVE H-400OP SERIES

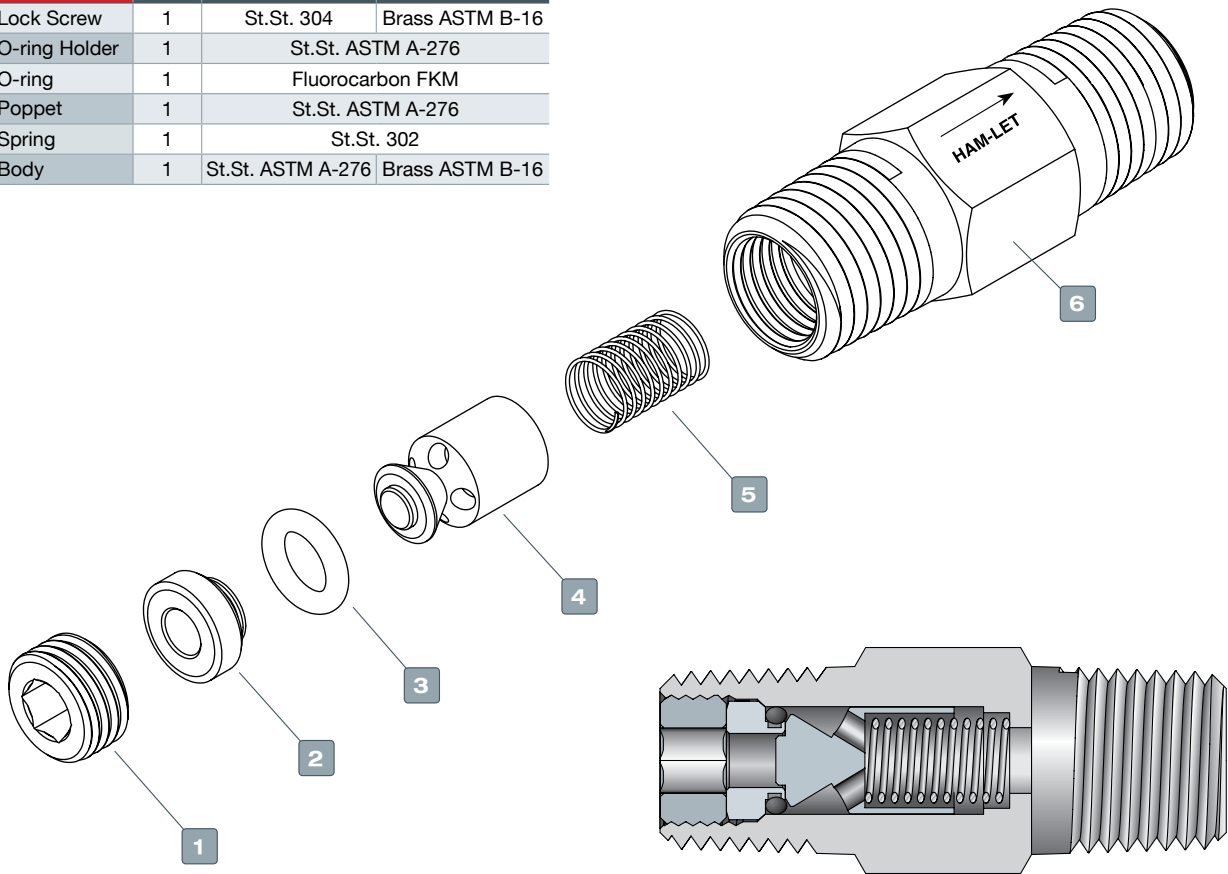
GENERAL

The H-400OP Series is a compact one-piece design for moderate pressure (up to 3000 psi) instrumentation panels and systems, which provides a fixed operating point. H-400OP valves are normally closed. When the differential pressure between the inlet and the outlet is higher than the set pressure of the spring, the loaded poppet will move backwards and provide a free passage for flow through the valve.

For vacuum applications, please select the H-400HP series.



MATERIALS OF CONSTRUCTION				
Item No.	Components	Qty.	Valve Body Material	
			316 St.St.	Brass
1	Lock Screw	1	St.St. 304	Brass ASTM B-16
2	O-ring Holder	1	St.St. ASTM A-276	
3	O-ring	1	Fluorocarbon FKM	
4	Poppet	1	St.St. ASTM A-276	
5	Spring	1	St.St. 302	
6	Body	1	St.St. ASTM A-276	Brass ASTM B-16



O-RINGS	
Different materials are available for special applications.	
O-ring Material	Temperature Rating °F (°C)
Buna N	-10 to 250 (-23 to 121)
Ethylene Propylene (EPDM)	-50 to 300 (-45 to 148)
Fluorocarbon FKM	-10 to 375 (-23 to 190)
Perfluor	-15 to 500 (-26 to 260)
Polychloroprene (CR)	-40 to 250 (-40 to 121)

TECHNICAL DATA			
Connection Sizes	Max. Flow Coefficient (Cv)	Nominal Cracking Pressure psi (bar)	Back Pressure at 70°F (20°C) psi (bar)
1/4	0.35	1/3, 1, 10 & 25	3000 (207)
1/2	1.20	(0.02, 0.06, 0.68, and 7.1)	

CLEANING & PACKAGING

Every H-400OP series Check valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

TESTING

The H-400OP valve designs have been tested for Proof and Burst. Every H-400OP valve is factory tested for proper assembly, by leakage detection at 100 psig (6.8bar) for 10 seconds. Every H-400OP valve is factory tested for functionality at the relevant cracking pressure, 5 cycles each.

STANDARD CONFIGURATION DIMENSIONS				
End Connection Inlet / Outlet	Size	Dimensions		
		A		B
		mm	in	in
Female NPT	1/4	61.0	2.4	3/4
	1/2	94.0	3.7	1 1/16
Male NPT	1/4	41.0	1.61	9/16
	1/2	58.0	2.28	7/8
Female / Male NPT	1/4	58.0	2.28	3/4
Male / Female NPT	1/4	44.5	1.75	3/4
	1/2	72.0	2.83	1 1/16
Female BSPT	1/4	61.0	2.54	3/4
Male BSPT	1/2	41.0	1.61	9/16

Dimensions are for reference only and are subject to change.

PRESSURE TEMPERATURE RATING		
Material	316 St.St.	Brass
Temperature F° (C°)	Working Pressure, psi (bar)	
-10 (-23) to 100 (37)	3000 (206)	3000 (206)
200 (93)	2575 (177)	2600 (179)
250 (121)	2450 (168)	2405 (165)
300 (148)	2325 (160)	-
375 (190)	2185 (150)	-

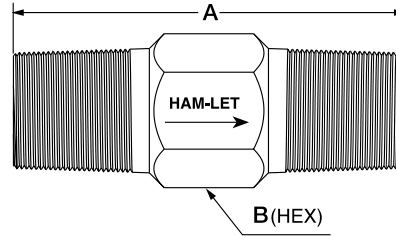
CRACKING AND RESEAL PRESSURE		
Nominal Cracking Pressure	Cracking Pressure Range	Reseal Pressure
psi (bar)	psi (bar)	psi (bar)
1/3 (0.02)	Up to 3 (0.2)	6 to 20 (0.41 to 1.3) back pressure
1 (0.06)	Up to 4 (0.27)	5 to 20 (0.34 to 1.3) back pressure
10 (0.68)	7 to 13 (0.48 to 0.89)	3 to 10 (0.2 to 0.68) back pressure
25 (1.7)	21 to 29 (1.4 to 1.9)	5 (0.34) or more inlet pressure

CRACKING PRESSURE

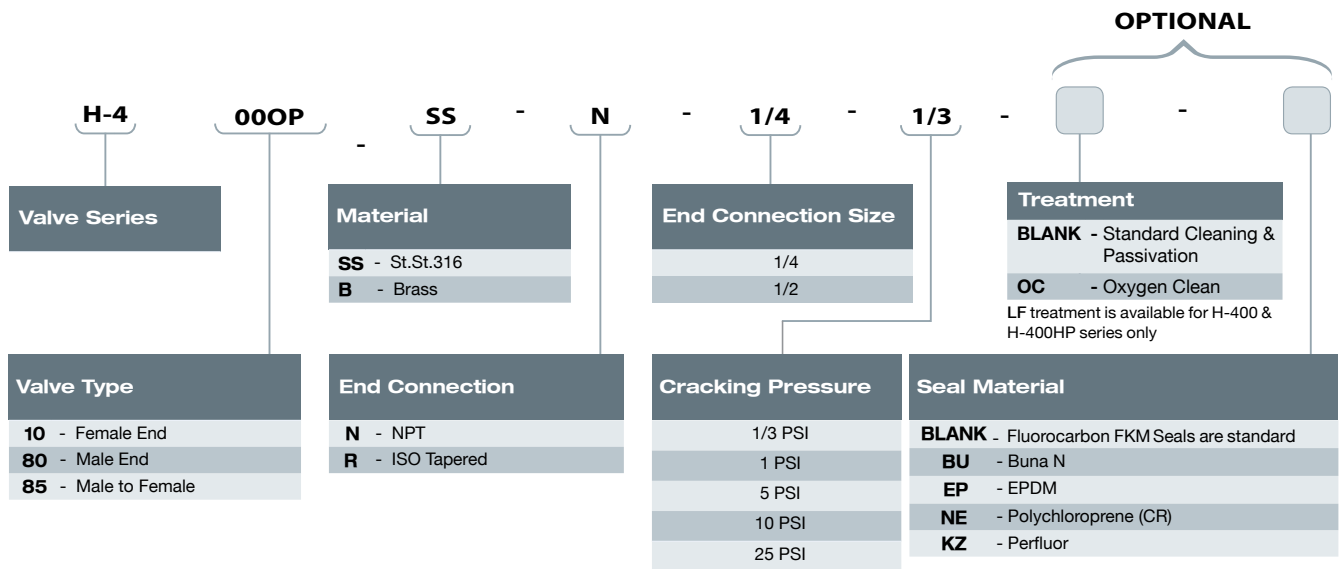
The differential pressure between the inlet and outlet, at which an initial flow is passing through the valve.

RESEAL PRESSURE

The differential pressure between the outlet and inlet, at which no flow is passing through the valve.



H-400P SERIES ORDERING INFORMATION



Note: Check valves are designed and suitable for direct flow control only. These valves are not meant for pressure release.

ORDERING INFORMATION SPARE KITS

SEAL KIT

The kit includes O-Ring and label

Z - 400OP - SK - 1/4 - VI

Body Designator per End Connection	Seal Material
1/4	VI - Fluorocarbon FKM
1/2	BU - Buna N
	EP - EPDM
	NE - Polychloroprene (CR)
	KZ - Perfluor

SPRING KIT

The kit includes Spring & label

Z - 400OP - SPK - 1/4 - 1/3

Body Designator per End Connection	Cracking Pressure
1/4	1/3 PSI
1/2	1 PSI
	5 PSI
	10 PSI
	25 PSI
Springs for other cracking pressures are available upon request.	

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

*Dimensions are for reference only, and are subject to change

ONE PIECE ADJUSTABLE CRACKING PRESSURE CHECK VALVE H-400OPA SERIES

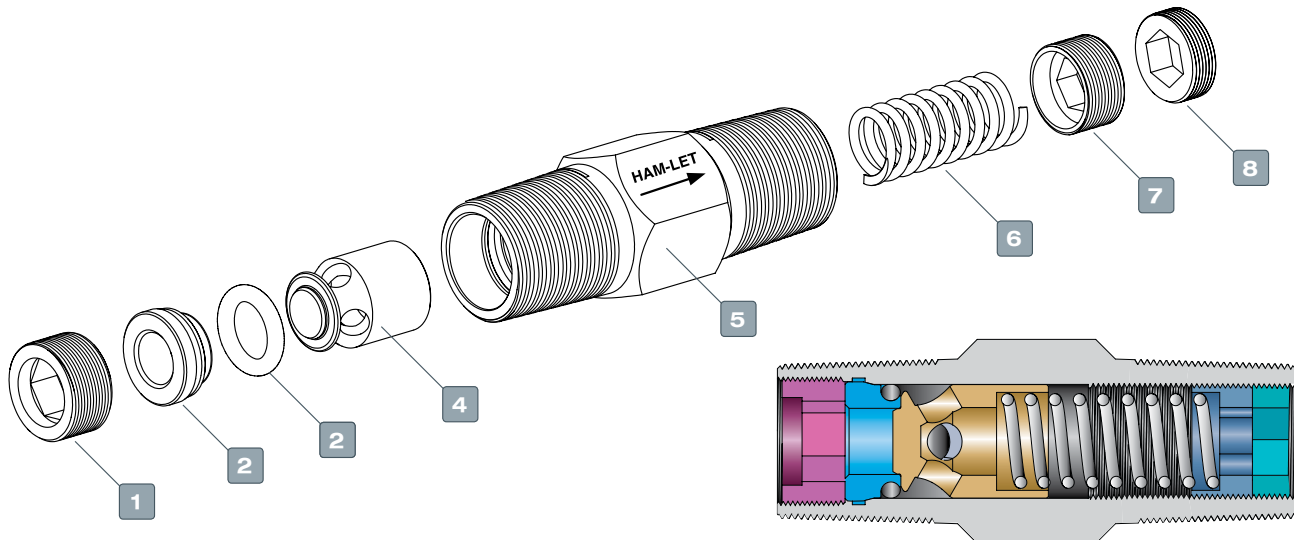
FEATURES

- One-piece Body
- 316 St.St. or Brass Construction
- Variable Adjustable Cracking Pressure Ranges
- Pressure Characteristics: up to 3000 psi
- HAM-LET Male & Female NPT, Male BSPT

GENERAL

The H-400OPA Series is a compact one-piece design for moderate-pressure up to 3000 psi (206 bar) instrumentation panels and systems, which provides an accurate and adjustable operating point. H-400OPA valves are normally closed. When the differential pressure between the inlet and the outlet is higher than the set pressure of the spring, the loaded poppet will move backwards and provide a free passage for flow through the valve. For vacuum applications, please select the H-400HP series.

MATERIALS OF CONSTRUCTION				
Item No.	Components	Qty.	Valve Body Material	
			316 St.St.	Brass
1	Inlet Lock Screw	1	St.St. 304	Brass ASTM B-16
2	O-ring Holder	1	St.St. ASTM A-276	Brass ASTM B-16
3	O-ring	1	Fluorocarbon FKM	
4	Poppet	1	St.St. ASTM A-276	
5	Body	1	St.St. ASTM A-276	Brass ASTM B-16
6	Spring	1	St.St. 302	
7	Adjusting Screw	1	St.St. 304	
8	Lock Screw	1	St.St. 304	



PRESSURE TEMPERATURE RATING		
Material Size	316St.St.	Brass
Temperature F° (C°)	Working Pressure, psig (bar)	
-10 (-23) to 100 (37)	3000 (206)	3000 (206)
200 (93)	2575 (177)	2600 (179)
250 (121)	2450 (168)	2405 (165)
300 (148)	2325 (160)	-
375 (190)	2185 (150)	-

O-RINGS	
Different materials are available for special applications.	
O-ring Material	Temperature Rating °F (°C)
Buna N	-10 to 250 (-23 to 121)
EPDM	-50 to 300 (-45 to 148)
Fluorocarbon FKM	-10 to 375 (-23 to 190)
Perfluor	-15 to 500 (-26 to 260)
Polychloroprene (CR)	-40 to 250 (-40 to 121)

ONE PIECE ADJUSTABLE CRACKING PRESSURE CHECK VALVE H-400OPA SERIES

CLEANING & PACKAGING

HAM-LET H-400OPA valves are treated with HAM-LET Passivation, Cleaning and Packaging (Procedure 8075).

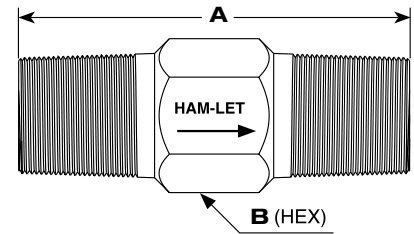
HAM-LET H-400OPA valves with face-seal end connections are treated with HAM-LET Oxygen Cleaning and Packaging (Procedure 8055). Oxygen Cleaning and Packaging for other end connections are available as an option.

CLEANING & PACKAGING

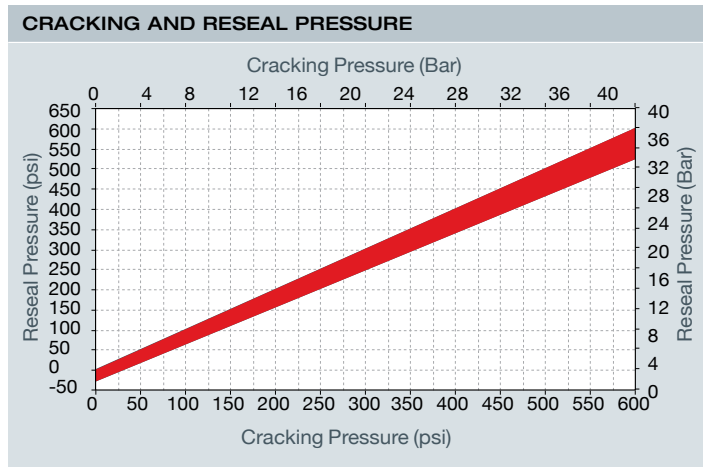
Every H-400OPA series Check valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

STANDARD CONFIGURATION DIMENSIONS				
End Connection	Size Inlet / Outlet	Dimensions		
		A		B
		mm	in	in
Female NPT	1/4	75.5	2.97	3/4
	1/2	65	2.55	7/8
Male NPT	1/4	41	1.61	9/16
	1/2	65	2.55	7/8
Male BSPT	1/4	41	1.61	9/16
	1/2	65	2.55	7/8

Dimensions are for reference only and are subject to change.



TECHNICAL DATA			
End Connection Size	Max. Flow Coefficient (Cv)	Nominal Cracking Pressure psi (bar)	Back Pressure at 70°F (20°C) psi (bar)
1/4	0.35	3 to 50 (0.2 to 3.4)	3000 (207)
		50 to 150 (3.4 to 10.3)	
1/2	1.20	150 to 350 (10.3 to 24.1)	
		350 to 600 (24.1 to 41.3)	



H-400OPA SERIES ORDERING INFORMATION

H-4 **100PA** - **SS** - **N** - **1/4** - **3** - **OPTIONAL**

Valve Series

Valve Type

10 - Female End
80 - Male End

Material

SS - St.St. 316
B - Brass

End Connection

N - NPT
R - ISO Tapered

End Connection Size

1/4
1/2

Cracking Pressure

Designator	Values (psi)
3	3-50
50	50-150
150	150-350
350	350-600
C*	3-600

Treatment

BLANK - Standard Cleaning & Passivation
OC - Oxygen Clean

LF treatment is available for H-400 & H-400HP series only

O-ring Material

BLANK - Fluorocarbon FKM Seals are standard
BU - Buna N
EP - EPDM
NE - Polychloroprene (CR)
KZ - Perfluor

***Factory Calibration Designator**

3-600 Psi
Example: H-480OPA-SS-N-1/4-C100
 Will be Calibrated to 100 Psi

Note: Check valves are designed and suitable for direct flow control only. These valves are not meant for pressure release.

ORDERING INFORMATION SPARE KITS

SEAL KIT

The kit includes O-Ring & label

Z - **400OPA** - **SK** - **1/4** - **VI**

Body Designator per End Connection

1/4
1/2

Seal Material

VI - Fluorocarbon FKM
BU - Buna N
NE - Polychloroprene (CR)
KZ - Perfluor
EP - EPDM

SPRING KIT

The kit includes Spring & label.

Z - **400OPA** - **SPK** - **1/4** - **3**

Body Designator per End Connection

1/4
1/2

Cracking Pressure

Designator	Values (psi)
3	3-50
50	50-150
150	150-350
350	350-600

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

ADJUSTABLE CRACKING PRESSURE CHECK VALVE H-400A SERIES

FEATURES

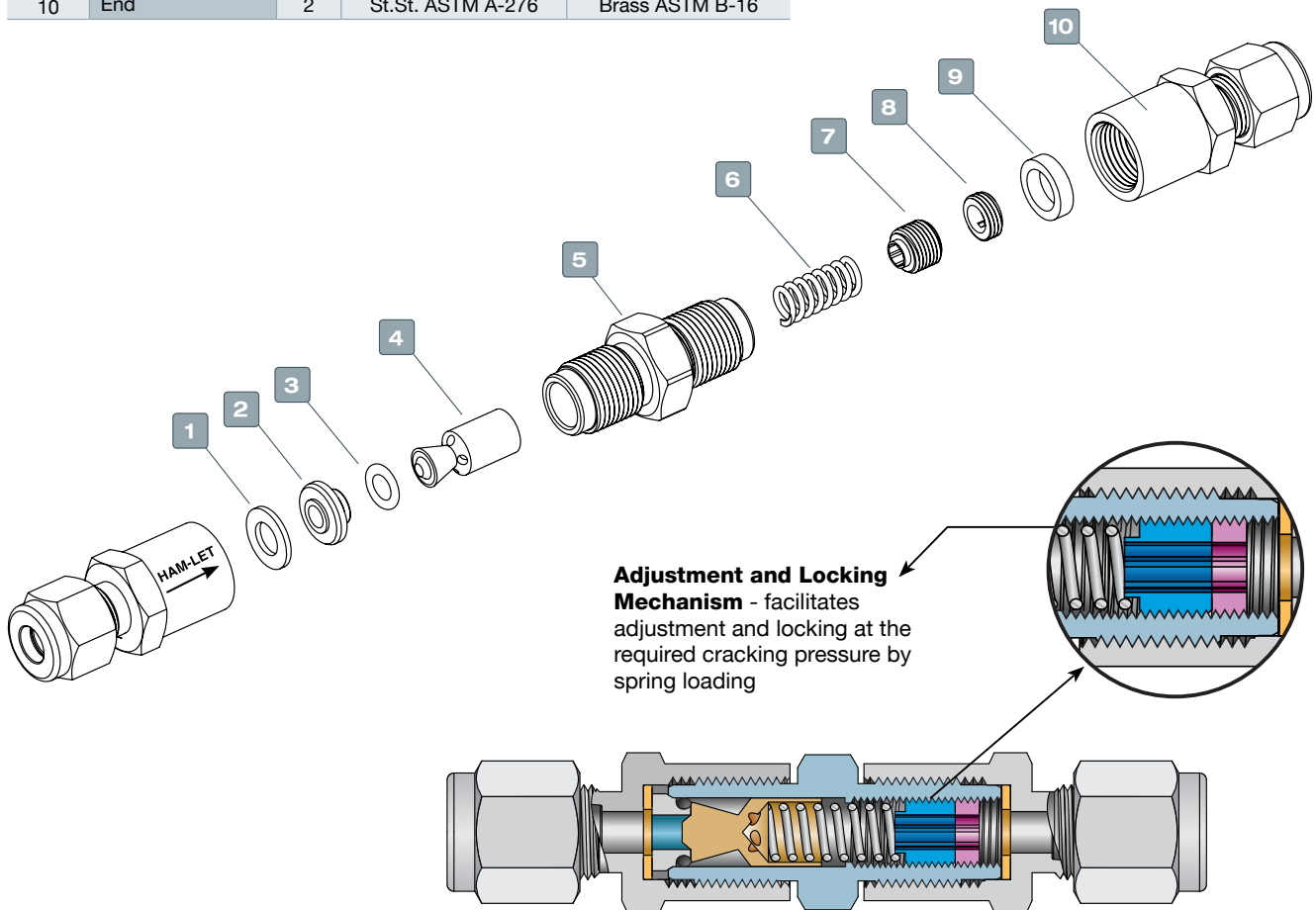
- 316 St.St. or Brass Construction
- Variable Adjustable Cracking Pressure Ranges
- Pressure Characteristics: up to 3000 psi
- HAM-LET LET-LOK® Fittings, Male NPT, and HTC® Face Seal Bead

GENERAL

The H-400A Series is a compact design for moderate-pressure (up to 3000 psi) instrumentation panels and systems, which provides an accurate and adjustable operating point. H-400A valves are normally closed. When the differential pressure between the inlet and the outlet is higher than the set pressure of the spring, the loaded poppet will move backwards and provide a free passage for flow through the valve.

MATERIALS OF CONSTRUCTION				
Item No.	Components	Qty.	Valve Body Material	
			316 St.St.	Brass
1	Gasket	1	316 St.St. Silver plated	Al-6061 Silver plated
2	O-ring Holder	1	St.St. ASTM A-276	Brass ASTM B-16
3	O-ring	1	Fluorocarbon FKM	
4	Poppet	1	St.St. ASTM A-276	
5	Body	1	St.St. ASTM A-276	Brass ASTM B-16
6	Spring	1	St.St. 302	
7	Adjusting Screw	1	St.St. 304	
8	Lock Screw	1	St.St. 304	
9	Gasket	1	316 St.St. Silver plated	Al-6061 Silver plated
10	End	2	St.St. ASTM A-276	Brass ASTM B-16

PRESSURE - TEMPERATURE RATING FOR STANDARD CONFIGURATIONS		
Material Size	316St.St.	Brass
Temperature F° (C°)	Working Pressure, psi (bar)	
-10 (-23) to 100 (37)	3000 (206)	3000 (206)
200 (93)	2575 (177)	2600 (179)
250 (121)	2450 (168)	2405 (165)
300 (148)	2325 (160)	-
375 (190)	2185 (150)	-



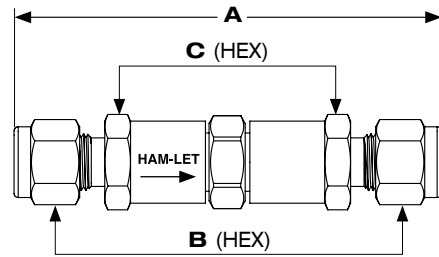
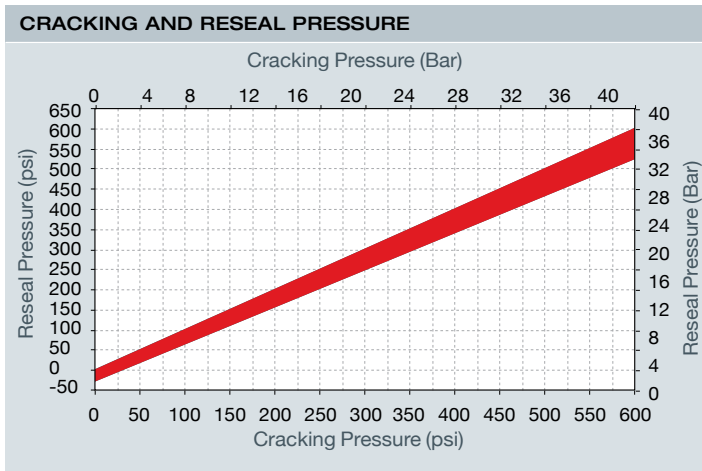
CLEANING & PACKAGING

Every H-400OA series Check valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

DIMENSIONS					
Inlet	Outlet	A		B	C
		mm	in	Hex	Hex
1/4 Let-Lok®	1/4 Let-Lok®	82.5	3.25	9/16	5/8
6MM Let-Lok®	6MM Let-Lok®	82.5	3.25	14MM	5/8
8MM Let-Lok®	8MM Let-Lok®	84.4	3.32	16MM	5/8
1/4 Male NPT	1/4 Let-Lok®	79.3	3.12	9/16	5/8
1/4 Male Face Seal	1/4 Male Face Seal	78.4	3.09	-	5/8
1/4 Male NPT	1/4 Male NPT	75.7	2.98	-	5/8

Dimensions are for reference only and are subject to change.

TECHNICAL DATA			
Connection Size	Max. Flow Coefficient (Cv)	Nominal Cracking Pressure psi (bar)	Back Pressure at 70°F (20°C) psi (bar)
1/4, 6mm, 8mm	0.37	3 to 50 (0.2 to 3.4)	3000 (413)
		50 to 150 (3.4 to 10.3)	
		150 to 350 (10.3 to 24.1)	
		350 to 600 (24.1 to 41.3)	



O-RINGS

Different materials are available for special applications.

O-ring Material	Temperature Rating °F (°C)
Buna N	-10 to 250 (-23 to 121)
EPDM	-50 to 300 (-45 to 148)
Fluorocarbon FKM	-10 to 375 (-23 to 190)
Perfluor	-15 to 500 (-26 to 260)
Polychloroprene (CR)	-40 to 250 (-40 to 121)

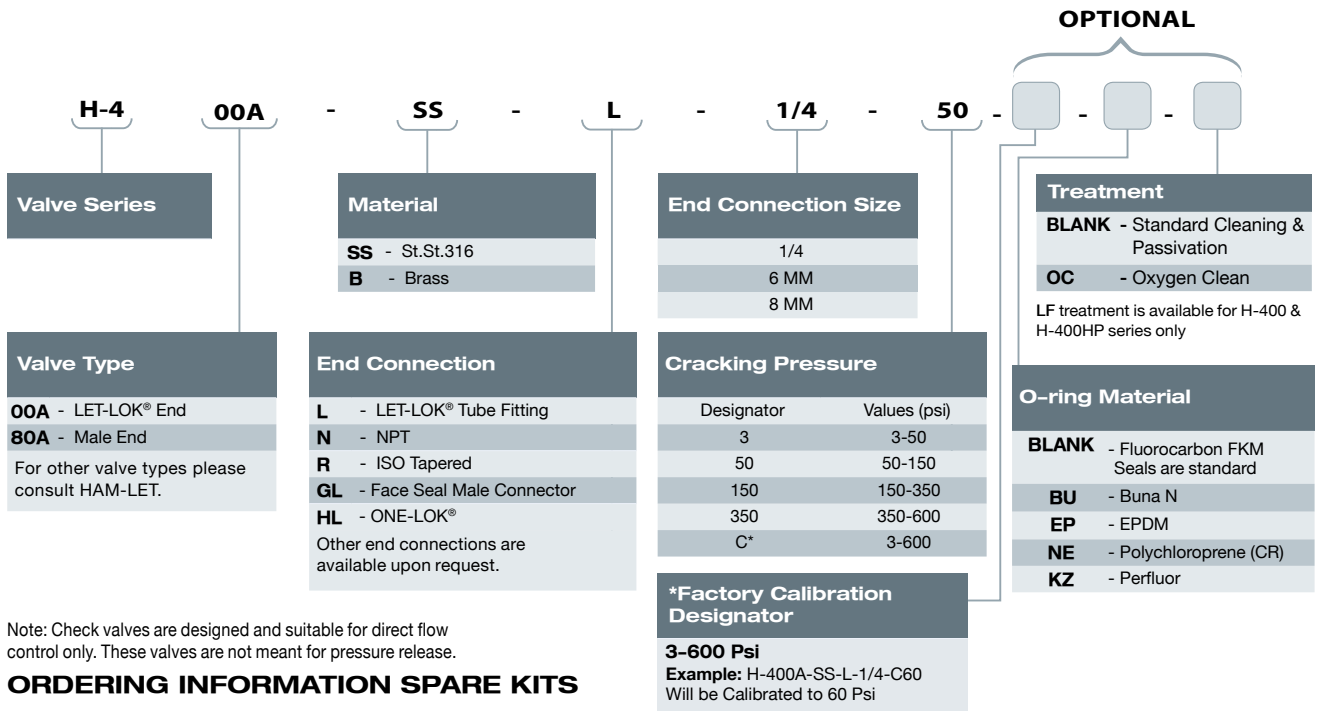


ADJUSTABLE CRACKING PRESSURE CHECK VALVE H-400A SERIES

TESTING

The H-400A valve designs have been tested for Proof and Burst. Every H-400A valve is factory tested for proper assembly by leak detection at 1000 psig (68 bar) for 10 seconds. Every H-400A valve is factory tested for functionality at the relevant cracking pressure, 5 cycles each.

H-400A SERIES ORDERING INFORMATION

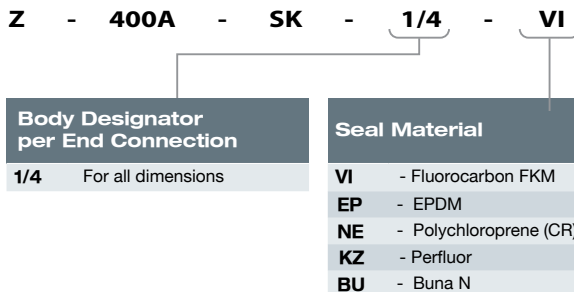


Note: Check valves are designed and suitable for direct flow control only. These valves are not meant for pressure release.

ORDERING INFORMATION SPARE KITS

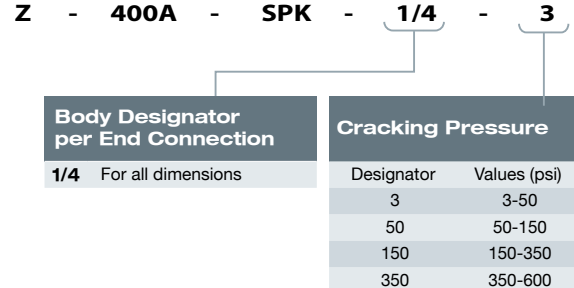
SEAL KIT

The kit includes O-ring & Label .



SPRING KIT

The kit includes Spring & Label.



Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

HAM-LET Check Valves should never be used as safety relief devices.

H-400, Rev 09, January 2015

INDUSTRIAL EXCESS FLOW VALVES

H-911 SERIES



FEATURES

- Stainless Steel Construction
- MAWP 6000 psi (413 bar)
- MAWT 400°F (204°C)
- Variable connection sizes (1/8 to 1/2" & 6 to 12mm)
- Cv = 0.5 ; 1.1
- Safety System Shutoff Device

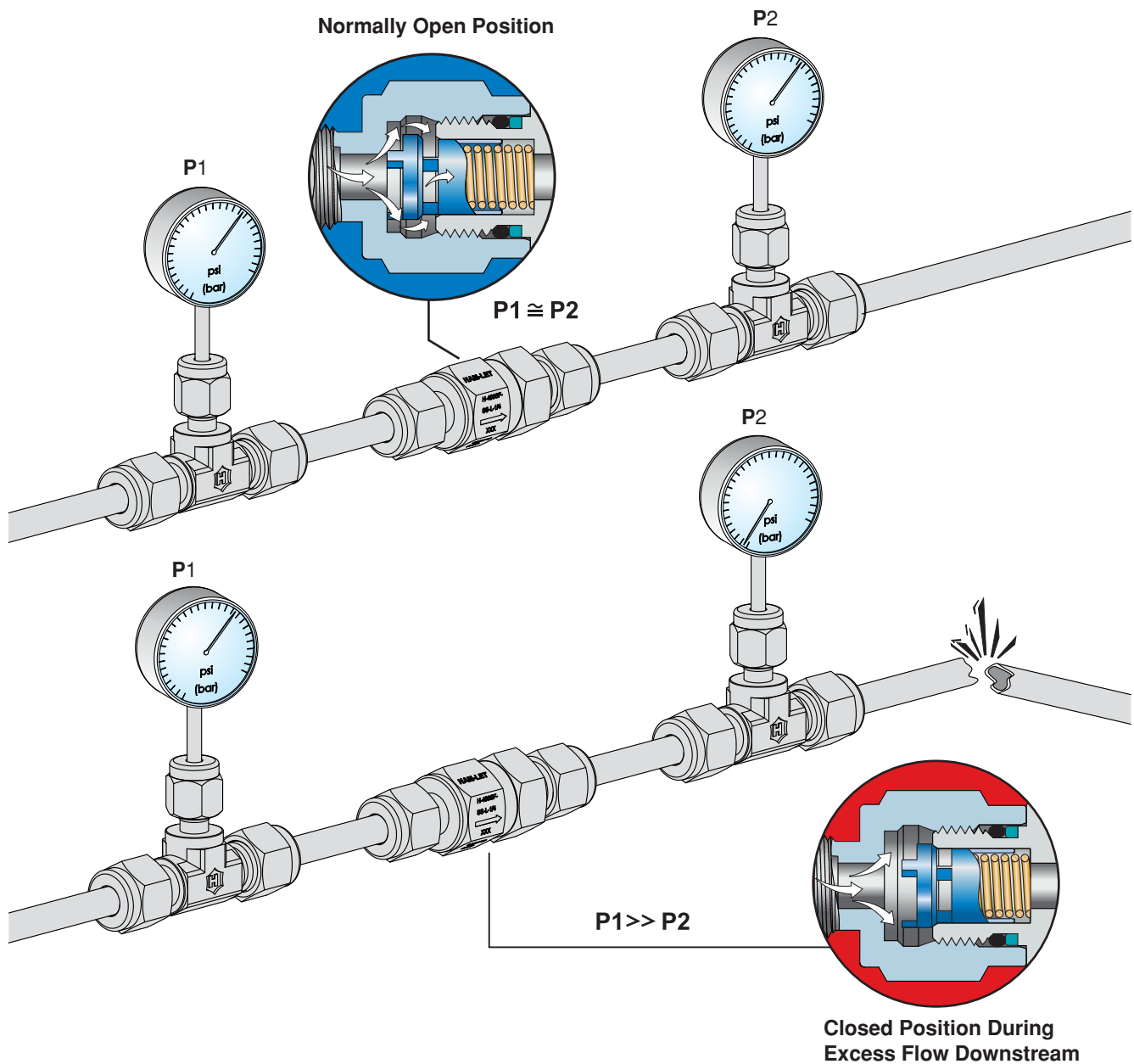
GENERAL

1. The poppet is loaded by a spring in a normally open position as long as the system is balanced.
2. If the system becomes unbalanced and the downstream pressure drops, the poppet moves towards the sealing area and prevents free, uncontrolled excess flow from the line.
3. If the downstream pressure increases, the ventilation outlet ("bleeding") enables the system to balance the pressures and (with the help of the spring) reset the system. In this situation, the poppet reverts back to Normally Open.

Excellent for Automatic Safety Shutoff in a wide range of areas:

- Fuel systems ■ Toxic Media Systems ■ Gas Systems ■ Valued Media Systems
- Hydraulic & Pneumatic Systems.

OPERATING PRINCIPLE



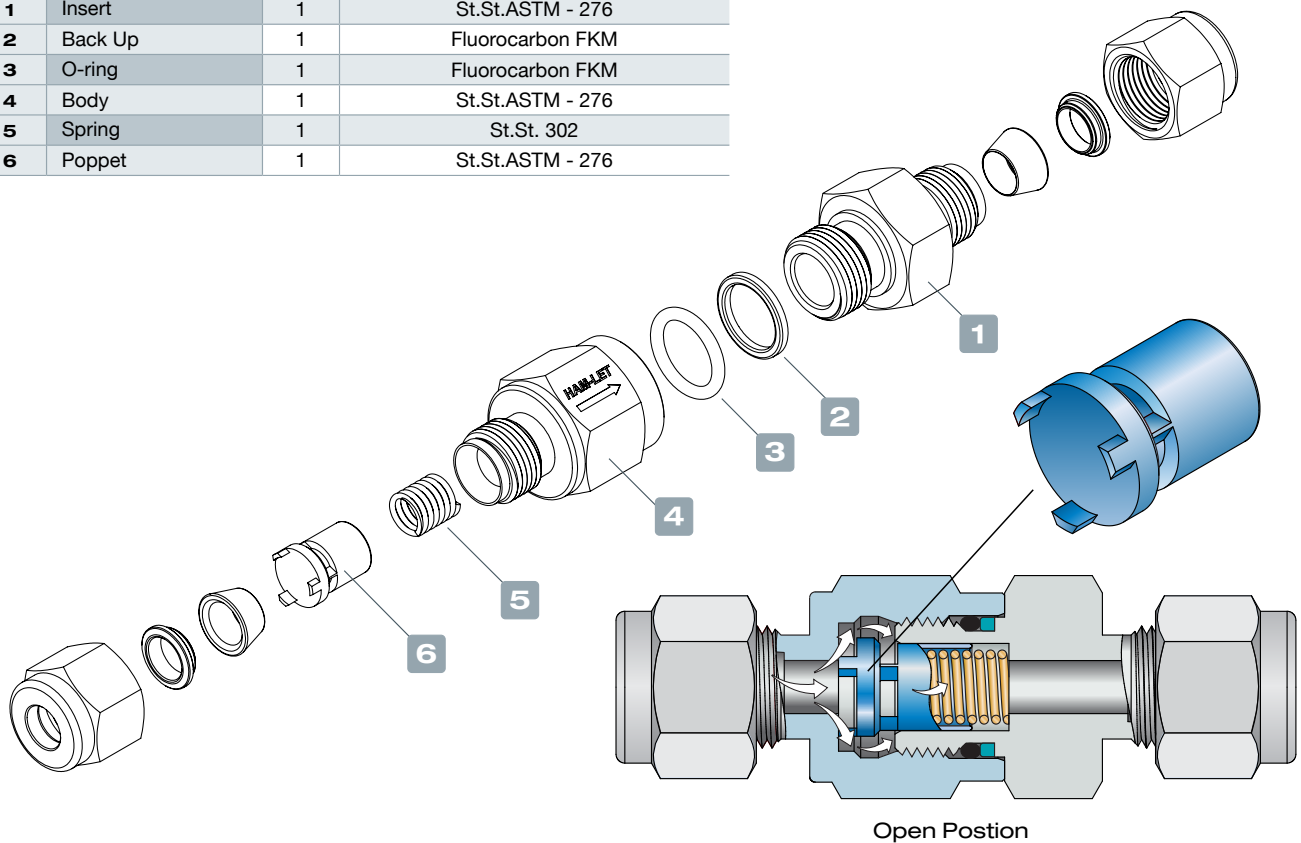
CLEANING & PACKAGING

Every H-911 series Excess flow valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

TESTING

The design of the H-911 Valves has been tested for Proof and Burst. Every assembled valve is tested for proper functionality.

MATERIALS OF CONSTRUCTION			
Item.	Components	Qty.	Valve Body Material
1	Insert	1	St.St.ASTM - 276
2	Back Up	1	Fluorocarbon FKM
3	O-ring	1	Fluorocarbon FKM
4	Body	1	St.St.ASTM - 276
5	Spring	1	St.St. 302
6	Poppet	1	St.St.ASTM - 276



5 Spring

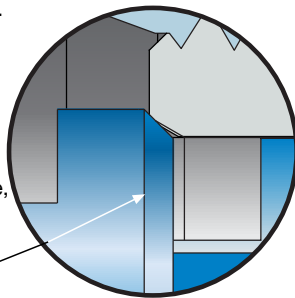
Resets the system back to the normally open position when the downstream pressure equalizes the upstream pressure.

6 Poppet

- Produced from stainless steel.
- Enables high flow rates.
- Improves reliability and performance.

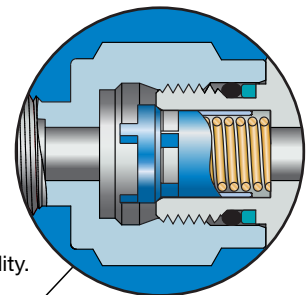
Vent "Bleeding"

Enables "information transfer" between the two sides of the valve, and automatically resets the system.



Metal Sealing

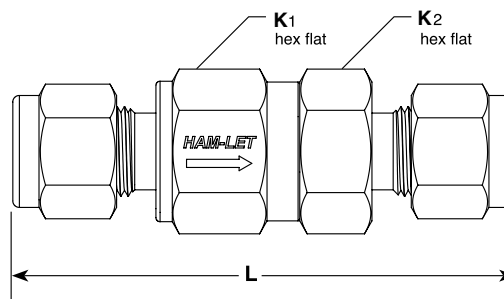
Improves stability and repeatability. Does not need maintenance.



Closed Position

PRESSURE TEMPERATURE RANGES

- The estimate refers to O-Rings and back up made from Fluorocarbon FKM.
- For O-Rings made from other materials, see ordering information.
- 5000 psi (344 bar) for the H-911 Series with end connections 3/8 NPT female.
- 4600 psi (316 bar) for the H-911 Series with end connection 1/2 NPT female.



PRESSURE TEMPERATURE RANGES FOR 316 St.St

Temperature F° (C°)	Working Pressure, psi (bar)
-10 (-23) to 100 (37)	6000 (413)
200 (93)	5160 (355)
250 (121)	4910 (338)
300 (148)	4660 (321)
400 (204)	4280 (294)

PRESSURE TEMPERATURE RANGES

O-ring Material	Temperature Rating F° (C°)
Fluorocarbon FKM	-15° to 400 (-26 to 204)
Buna-N	-40° to 250 (-40 to 121)
Ethylene propylene	-50° to 300 (-45 to 148)
Perfluor	-10° to 400 (-23 to 204)
Polychloroprene (CR)	-40° to 250 (-40 to 121)

Fluorocarbon FKM O-Rings are standard.

For other O-Ring materials, see ordering information.

For O-Ring materials that are not in this table, please consult HAM-LET.

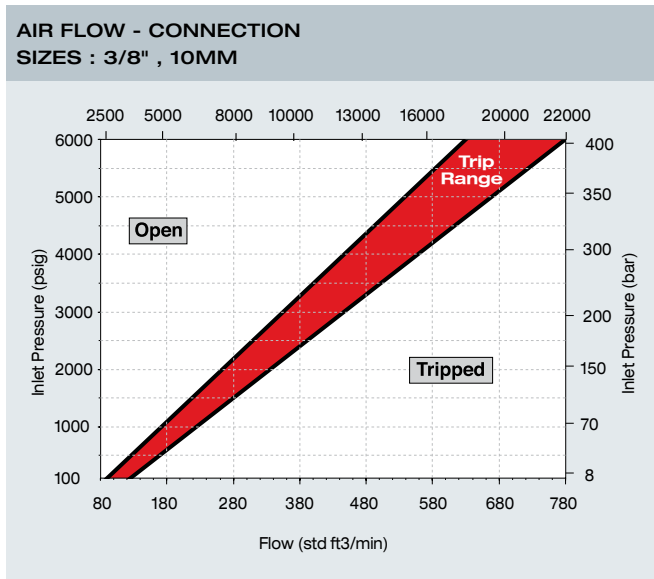
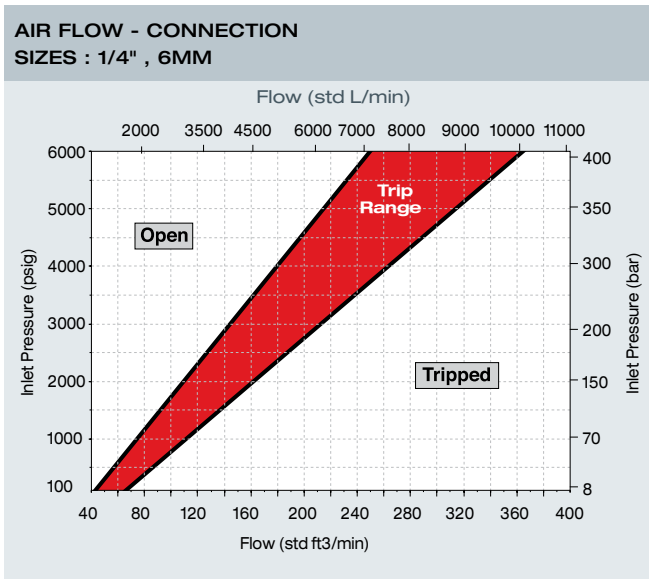
STANDARD CONFIGURATION DIMENSIONS

End Connection		Dimensions: inch (mm)		
Type	Size	L	K1	K2
LET-LOK® Tube Fittings	1/4"	2.43 (61.7)	11/16	11/16
	3/8"	2.75 (69.9)	1	1
	1/2"	2.97 (75.4)		
	6 mm	2.43 (61.7)	11/16	11/16
	8 mm	2.70 (68.6)	1	1
	10 mm	2.80 (71.1)		
	12 mm	2.96 (75.2)		
Female NPT	1/8"	1.87 (47.5)	11/16	11/16
	1/4"	2.12 (53.8)	11/16	11/16
	3/8"	2.55 (64.8)	1	1
	1/2"	3.03 (77.0)		
Male NPT	1/8"	1.79 (45.5)	11/16	11/16
	1/4"	2.17 (55.1)		
	3/8"	2.36 (59.9)	1	1
	1/2"	2.73 (69.3)		
Male NPT to LET-LOK® Tube Fittings	1/4"	2.30 (58.4)	11/16	11/16
	3/8"	2.56 (65.0)	1	1
	1/2"	2.85 (72.4)		
Male to Female NPT	1/4"	2.13 (54.1)	11/16	11/16
	3/8"	2.46 (62.5)	1	1
	1/2"	2.89 (73.4)		
Male Face Seal	1/4"	2.28 (57.9)	11/16	11/16
	1/2"	2.73 (69.3)	1	1

Dimensions are for reference only, and are subject to change.

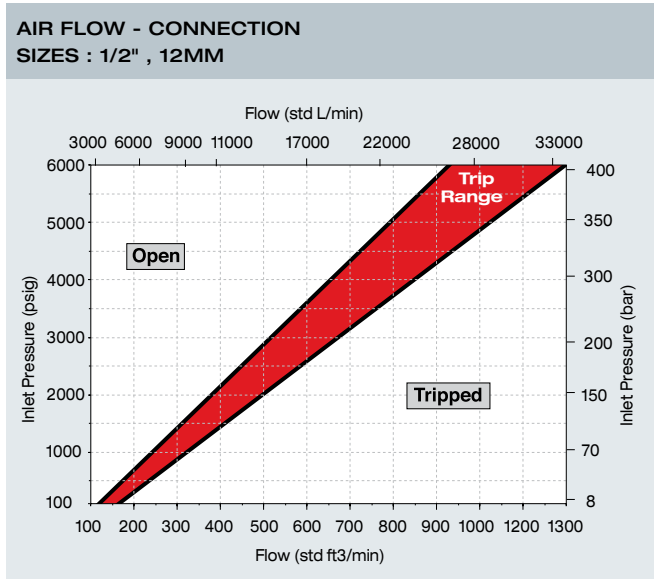
FLOW DATA AT 70°F (20°C)

For springs with other trip ranges, consult a HAM-LET representative.

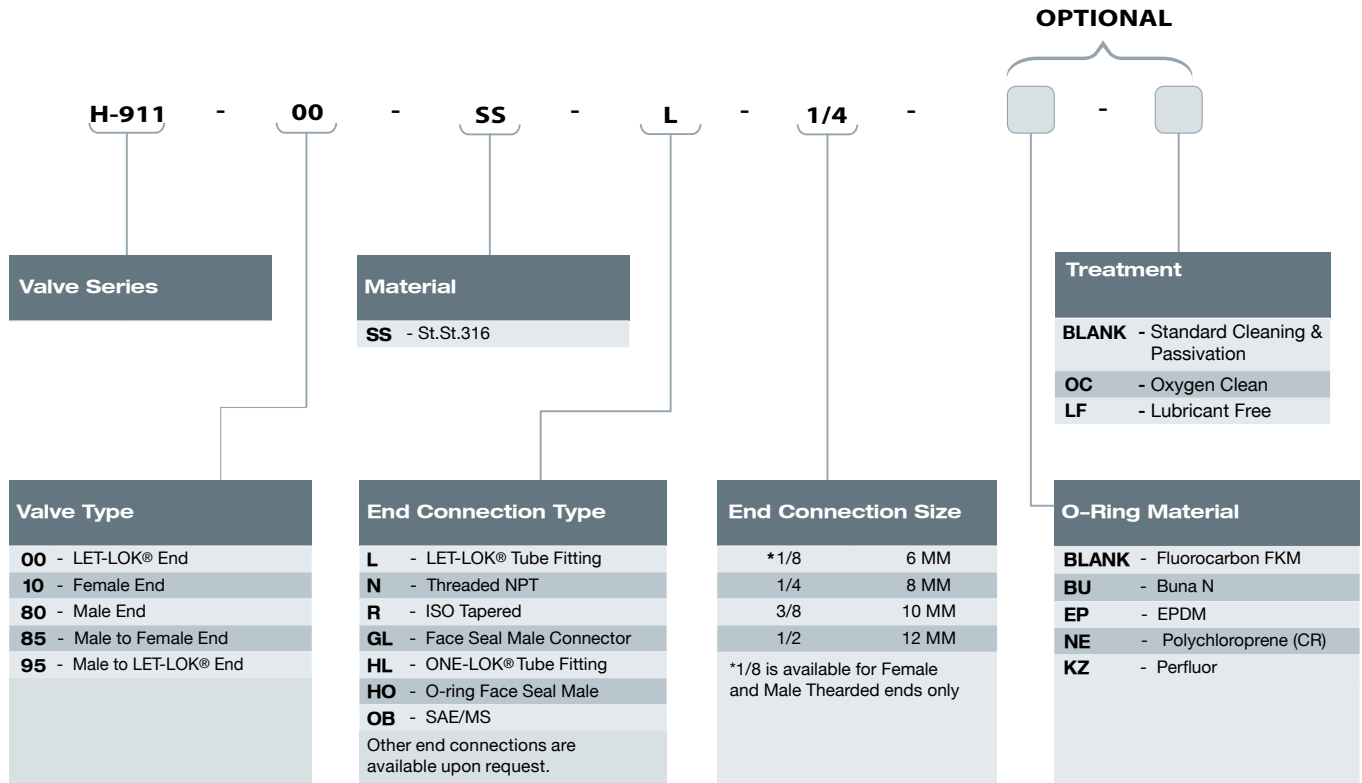


WATER FLOW

Connection Size	CV	Trip Range U.S. gal/min (L/min)
1/8, 1/4, 6mm	0.5	3.9 to 5.8 (14.7 to 21.9)
3/8, 8mm, 10mm	1.1	8.2 to 10.0 (31.0 to 37.9)
1/2, 12mm		11.2 to 14.9 (42.4 to 56.4)



H-911 SERIES ORDERING INFORMATION



Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-911, Rev.08, January 2014

RELIEF VALVES

H-900 SERIES



VALVES & ACTUATORS



FEATURES

- H-900 is available as CE/PED products
- 316 St.St. Construction
- Service 10-225 psi
- MAWP* 300 psi
- One spring for all set pressure range
- Available in all pipe threads and LET-LOK® connectors
- Sizes: 1/4" or 6mm

* Maximum Allowed Working Pressure.

GENERAL

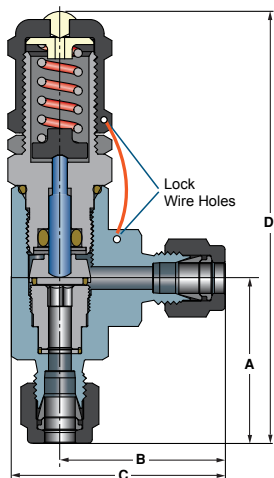
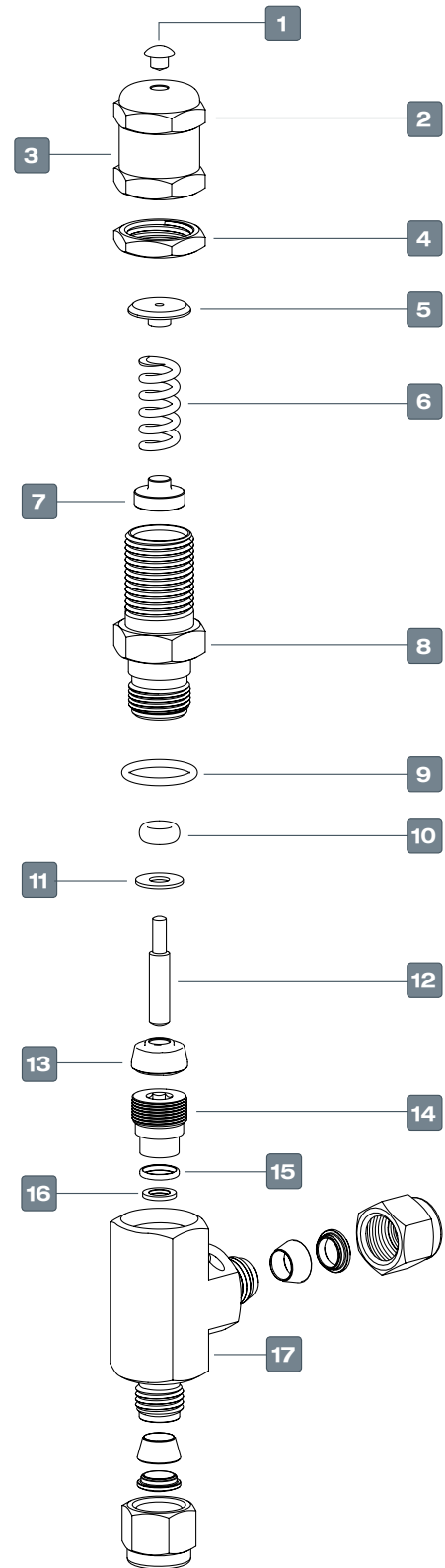
The H-900 series is a relief valve for low pressure service. The valve is normally closed. It will open when the system pressure reaches the set level. It will re-close when the system pressure falls below the set level.

MATERIALS OF CONSTRUCTION

Item No.	Components	Qty.	Valve Body Material
1	Cap Plug	1	Polypropylene
2	Adjustment Cap	1	St.St. 316
3	Cap Lable	1	Polyester
4	Locking Nut	1	St.St. 316
5	Upper Spring Button	1	St.St. 316
6	Spring	1	St.St. 302
7	Lower Spring Button	1	St.St. 316
8	Bonnet	1	St.St. 316
9	O-ring	1	Fluorocarbon FKM
10	O-ring	1	Fluorocarbon FKM
11	Retaining Ring	1	PH15 - 7 Mo
12	Stem	1	St.St. 316
13	Bonded Poppet	1	St.St. 316 Bonded with Fluorocarbon FKM
14	Insert	1	St.St. 316
15	Packing	1	PTFE
16	Ring	1	St.St. 316
17	Body	1	St.St. 316

STANDARD CONFIGURATION DIMENSIONS

Description	Connection / size		Orifice		Dimensions							
	Inlet	Outlet			A		B		C		D	
			mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
H-900	1/4 LET-LOK®	1/4 LET-LOK®	4.8	0.19	37	1.45	39	1.53	50	1.97	96	3.78
H-900	6MM LET-LOK®	6MM LET-LOK®			37	1.45	39	1.53	50	1.97	96	3.78
H-985	1/4 Male NPT	1/4 Female NPT			32	1.26	30	1.18	40	1.57	88.6	3.49
H-995	1/4 Male NPT	1/4 LET-LOK®			32	1.26	39	1.53	50	1.97	88.6	3.49



CLEANING & PACKAGING

Every H-900 series Relief valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

TESTING

The HAM-LET H-900 Relief Valve designs have been tested for Proof and Burst.

Every H-900 Relief Valve is factory tested for proper set and resealing performance.

SETTING AND RESEALING PRESSURE

- Upstream set pressure is the first indicator of flow process. Every pressure relief after the first indication is repeatable within a deviation of 5% at room temperature.
- Blocked upstream set pressure is the first indicator of a stopped flow process and is always lower than the set pressure.
- Calculation of set pressure valve design demands back pressure consideration as the system back pressure increases the set pressure. To balance the system, the back pressure must be multiplied by 0.8 and the result shall be subtracted from the required set pressure.
- Lubricant free cleaned valves have higher reseal pressure

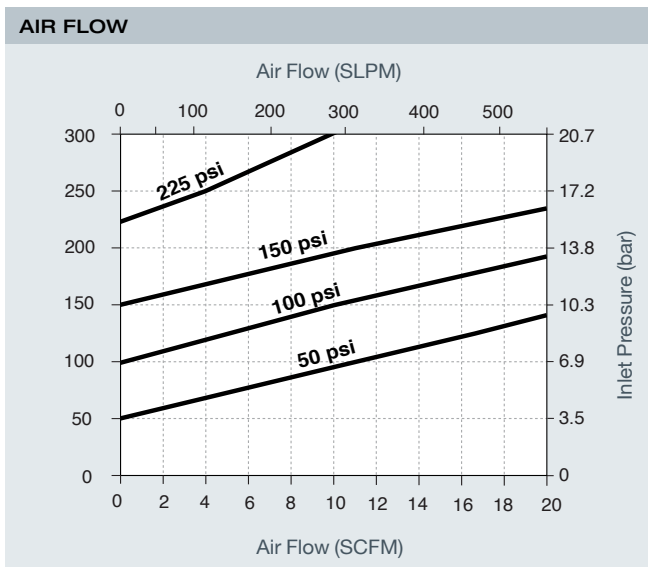
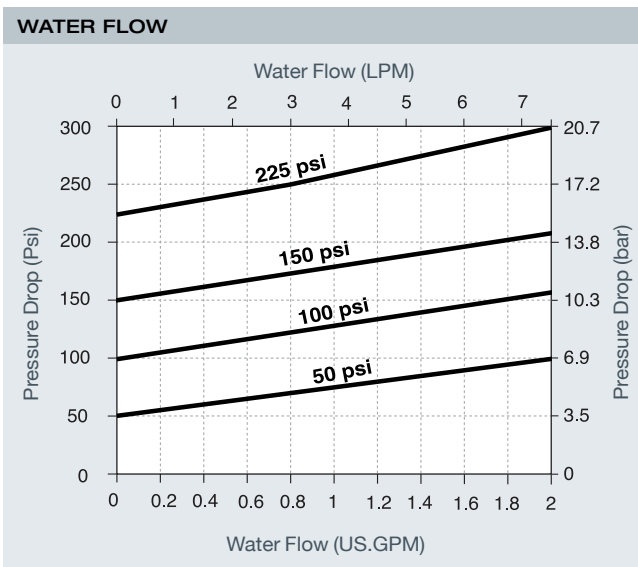
PRESSURE TEMPERATURE RATING				
Series	H-900 Size: 1/4"			
Seal Material	Fluorocarbon FKM	Buna N	Polychloroprene (CR)	EPDM
TEMP °C (°F)	MAX SET PRESSURE psig (bar)			
-40 (-40)	-	-	-	225 (15.5)
-34 (-30)	-	-	-	
-23 (-10)	-	-	-	
-18 (0)	225 (15.5)	225 (15.5)	225 (15.5)	
-12 (10)				
-4 (25)				
-1 (30)				
10 (50)				
65 (150)				
93 (200)				
121 (250)				
135 (275)	-	-	-	
148 (300)	-	-	-	

FLOW DATA AT 70°F (20°C)

Orifice in fully open mode is 4.8mm (0.19 inch)

SPRING 10-225psig

H900 RESEAL PRESSURE		
Series	Test Set Pressure psig (bar)	Min Resealing Pressure as a Percentage of set pressure, %
H-900	10 - 20 (0.68 to 1.3)	50
	175 - 225 (12.0 to 15.5)	90



APPLICATIONS

H-900 relief valves gradually open when pressure increases.

As such, they are not certified to ASME due to not having capacity rating at a given pressure rise (accumulation).

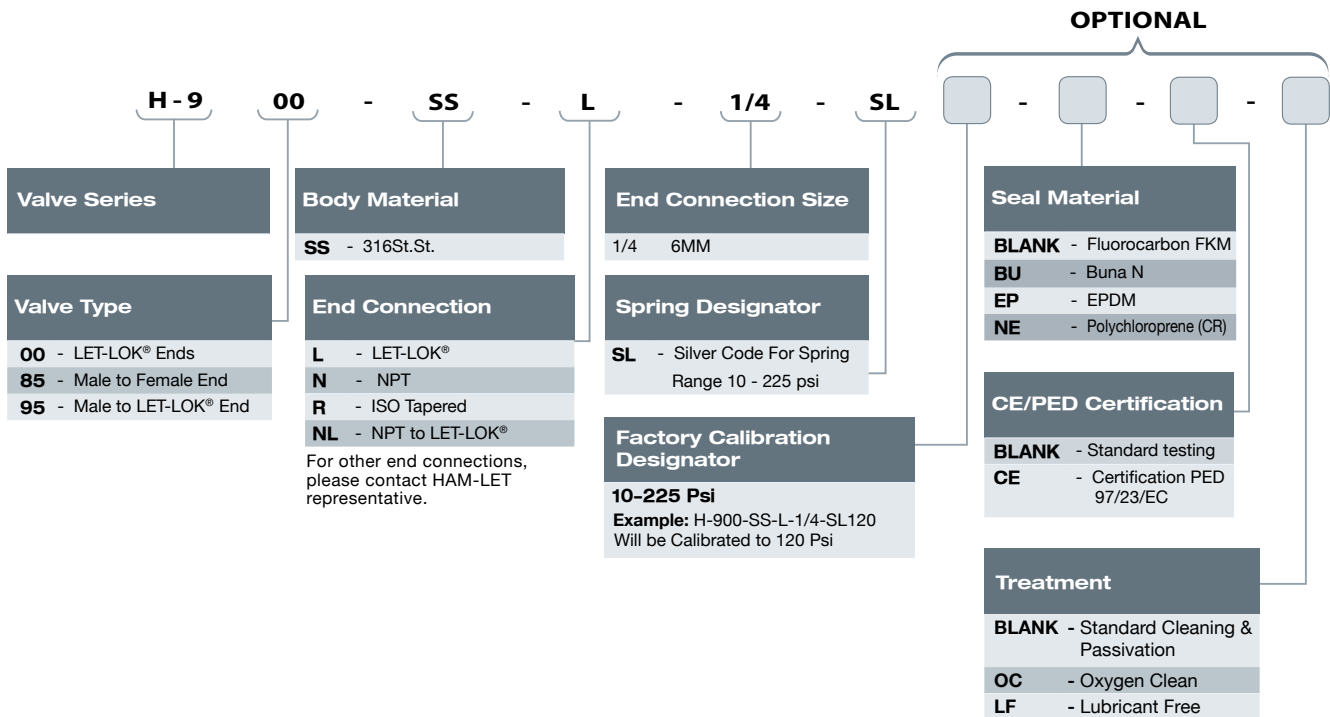
OPERATION

H-900 relief valves open when the system pressure gets to the set pressure and close when the system pressure drops below the set pressure.

Warning

- Valves that were not actuated for some time may contain pressure higher than the set pressure.
- System designer and users shall determine what system applications require using relief valves to meet specific safety codes and which valves conform to such codes.

H-900 SERIES ORDERING INFORMATION



ORDERING INFORMATION FOR SPARE KITS

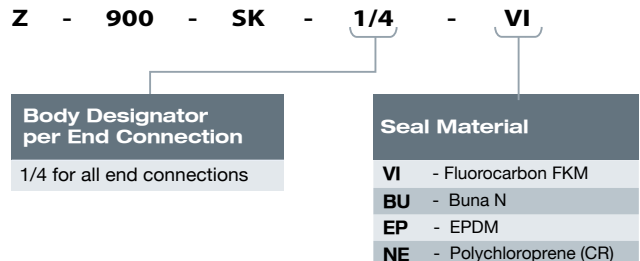
SPRING KIT

Includes: Spring, Label, Wire and Lock



SEAL KIT

Includes: O-rings, Bonded Poppet and Label



For oxygen applications work shall be carried out according to procedures for working with oxygen. In case spare kits are ordered for oxygen clean valves, such kits have to be ordered as oxygen clean by adding "-OC" designator. Example: Z-900-SK-1/4-VI-OC

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-900, Rev.11, January 2015

HIGH-PRESSURE RELIEF VALVES

H-900HP SERIES



FEATURES

- H-900HP is available as CE/PED products
- 316St.St. Construction
- Service up to 6000 psi
- Set Pressure from 50 psig to 6000 psig (3.50 to 414 bar)
- Identifying colored springs for each pressure range
- Replaceable springs for a variable pressure range
- Available in all pipe threads and LET-LOK® connectors
- Sizes: 1/4" or 6mm

GENERAL

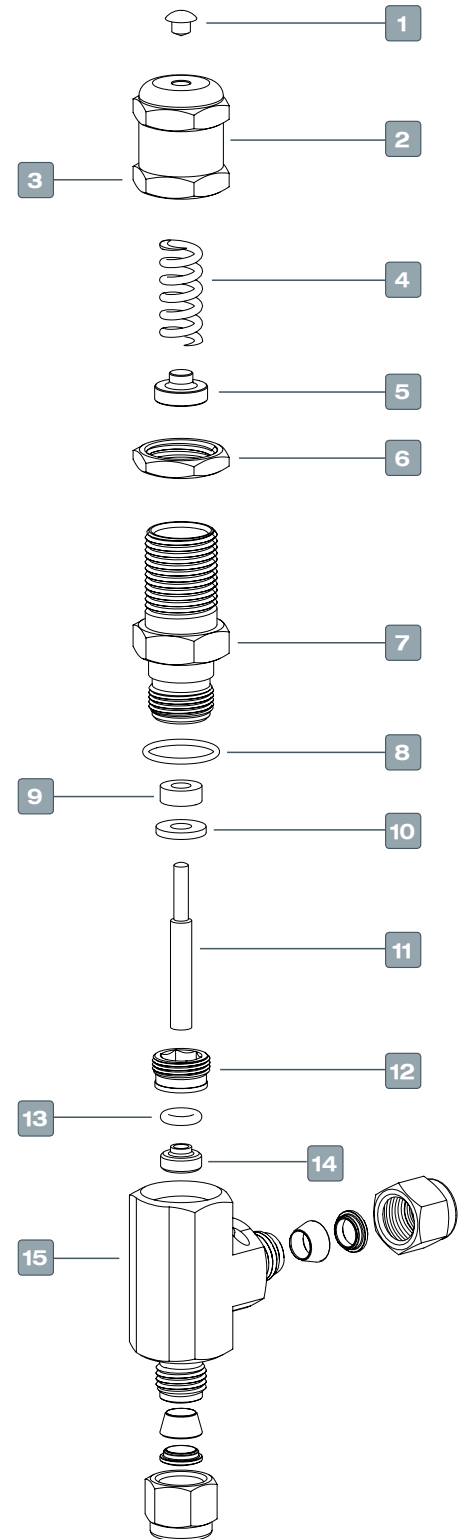
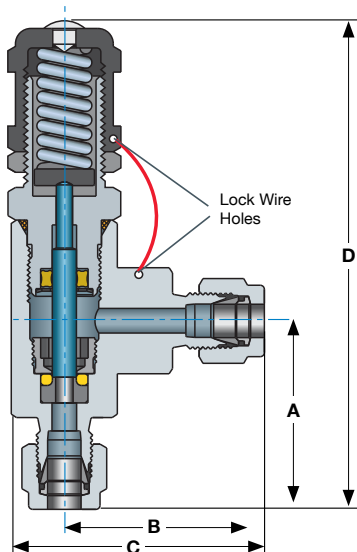
H-900 HP is a series of relief valves for high-pressure service. The valve is normally closed. It will open when the system pressure reaches the set level. It will re-close when the system pressure falls below the set level.

MATERIALS OF CONSTRUCTION

Item No.	Components	Qty.	Valve Body Material
1	Cap Plug	1	PTFE
2	Label	1	Polyester
3	Adjustment Cap	1	St.St 316
4	Spring	1	St.St. 302,17-7PH
5	Lower Spring Button	1	St.St 316
6	Locking Nut	1	St.St 316
7	Bonnet	1	St.St 316
8	O-Ring	1	Fluorocarbon FKM
9	Quad Ring	1	Fluorocarbon FKM
10	Retaining Ring	1	PH15-7Mo
11	Poppet	1	St.St 316
12	Clamps Screw	1	St.St 316
13	O-Ring	1	Fluorocarbon FKM
14	Insert	1	St.St 316
15	Body	1	St.St 316

STANDARD CONFIGURATION DIMENSIONS

Description	Connection / size		Dimensions							
	inlet	outlet	A		B		C		D	
			mm	inch	mm	inch	mm	inch	mm	inch
H-900HP	1/4 LET-LOK®	1/4 LET-LOK®	37	1.45	39	1.53	50	1.97	96.0	3.78
H-900HP	6MM LET-LOK®	6MM LET-LOK®	37	1.45	39	1.53	50	1.97	96.0	3.78
H-985HP	1/4 Male NPT	1/4 Female NPT	32	1.26	30	1.18	40	1.57	88.6	3.49
H-995HP	1/4 Male NPT	1/4 LET-LOK®	32	1.26	39	1.53	50	1.97	88.6	3.49



CLEANING & PACKAGING

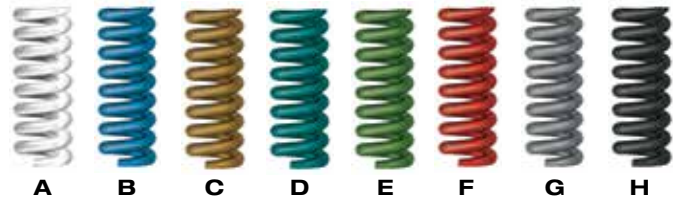
Every H-900HP series Relief valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

TESTING

The HAM-LET H-900HP Relief Valves design has been tested for Proof and Burst.

Every H-900HP Relief Valve is factory tested for proper set and resealing performance.

NOMINAL CRACKING PRESSURE RANGE			
psig	Bar	Spring Designator	Color
50-350	3.4 - 24	A	White
350-750	24 - 51.5	B	Blue
750-1500	51.5 - 103	C	Gold
1500-2250	103 - 155	D	Turquoise
2250-3000	155 - 206	E	Green
3000-4000	206 - 275	F	Red
4000-5000	275 - 344	G	Silver
5000-6000	344 - 413	H	Black



PRESSURE TEMPERATURE RATING				
Series	H-900HP Size: 1/4"			
Seal Material	Fluorocarbon FKM	Buna N	Polychloroprene (CR)	EPDM
TEMP °C (°F)	MAX SET PRESSURE psig (bar)			
-40 (-40)	-	-	-	-
-34 (-30)				
-23 (-10)				
-18 (0)				
-12 (10)	6000 (413)	6000 (413)	6000 (413)	6000 (413)
-4 (25)				
-1 (30)				
10 (50)	6000 (413)	5600 (386)	5600 (386)	5600 (386)
65 (150)				
93 (200)				
121 (250)				
135 (275)				
148 (300)	-	-	4700 (324)	-

SETTING AND RESEALING PRESSURE

- Upstream set pressure is the first indicator of flow process. Every pressure relief after the first is repeatable within a deviation of 5% at room temperature.
- Blocked upstream set pressure is the first indicator of a stopped flow process and is always lower than the set pressure.
- Lubricant free cleaned valves have higher reseat pressure.

H-900HP RESEAL PRESSURE		
Series	Test Set Pressure psig (bar)	Min Resealing Pressure as a Percentage of set pressure, %
H-900HP	100 - 200 (6.8 to 13.7)	50
	850 - 1000 (58.5 to 68.9)	84

FLOW DATA AT 70°F (20°C)

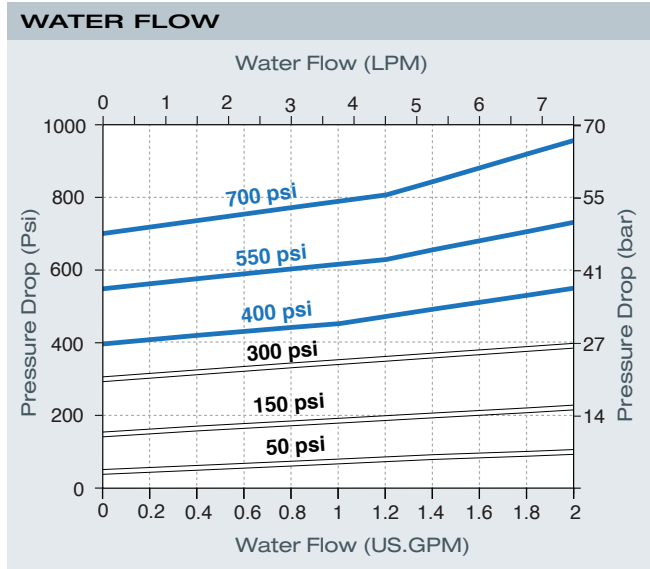
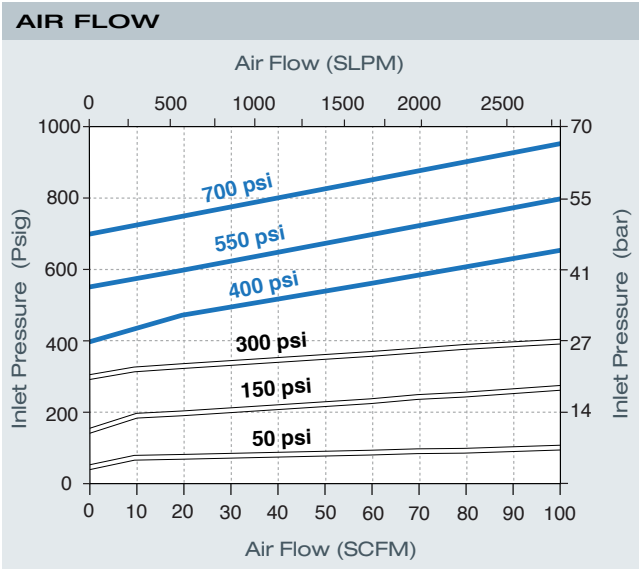
Orifice in fully open mode is 3.6mm (0.14 inch)



A
SPRING 50-350psig



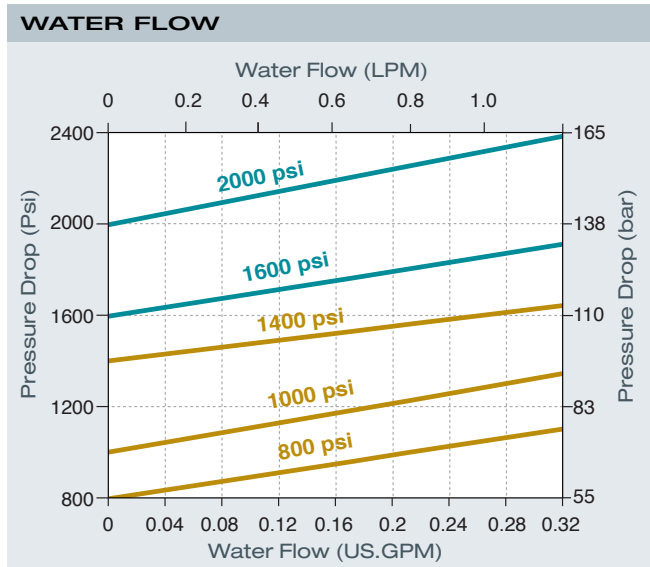
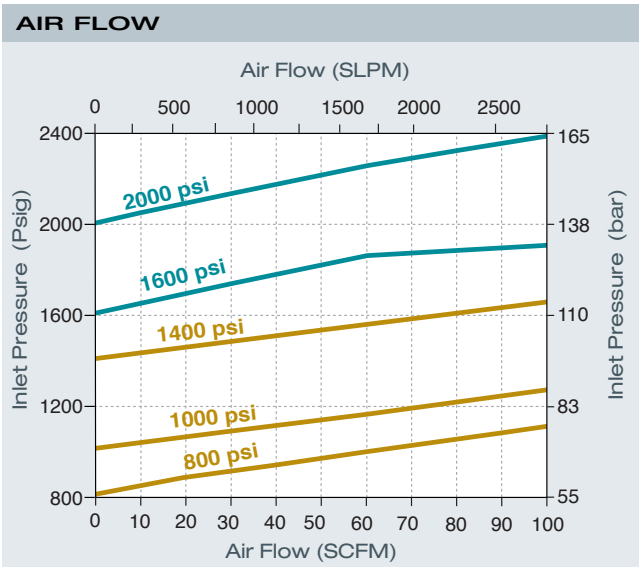
B
SPRING 350-750psig



C
SPRING 750-1500psig



D
SPRING 1500-2250psig



FLOW DATA AT 70°F (20°C)

Orifice in fully open mode is 3.6mm (0.14 inch)



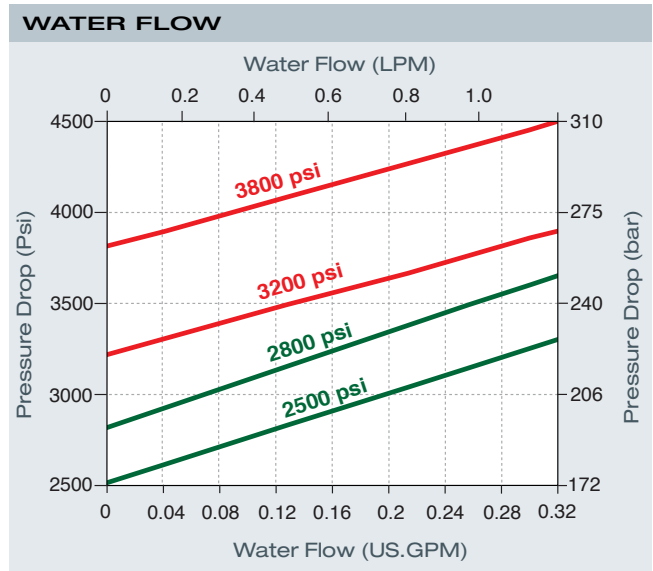
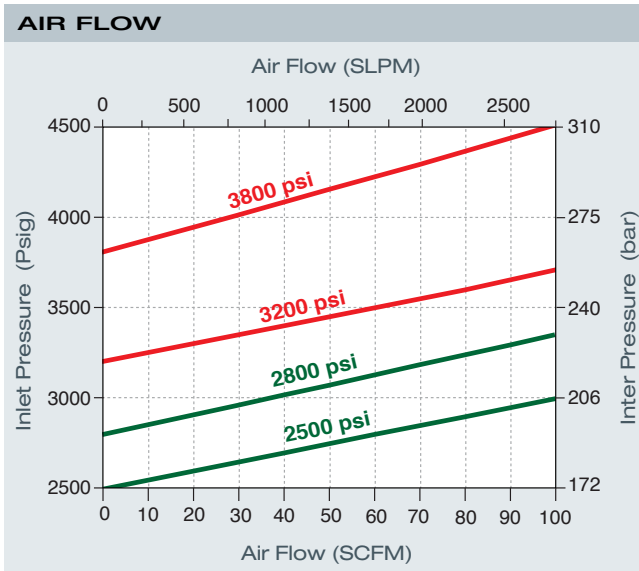
E

SPRING 2250-3000psig



F

SPRING 3000-4000psig



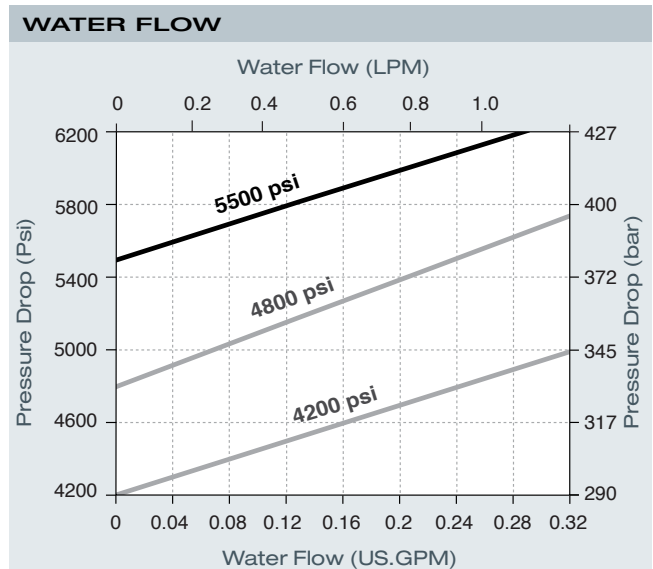
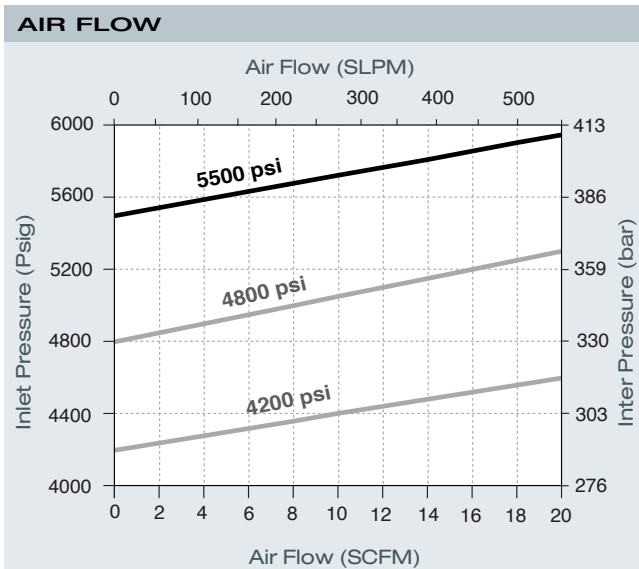
G

SPRING 4000-5000psig



H

SPRING 5000-6000psig



APPLICATIONS

H-900HP relief valves gradually open when pressure increases. As such, they are not certified to ASME due to not having capacity rating at a given pressure rise (accumulation).

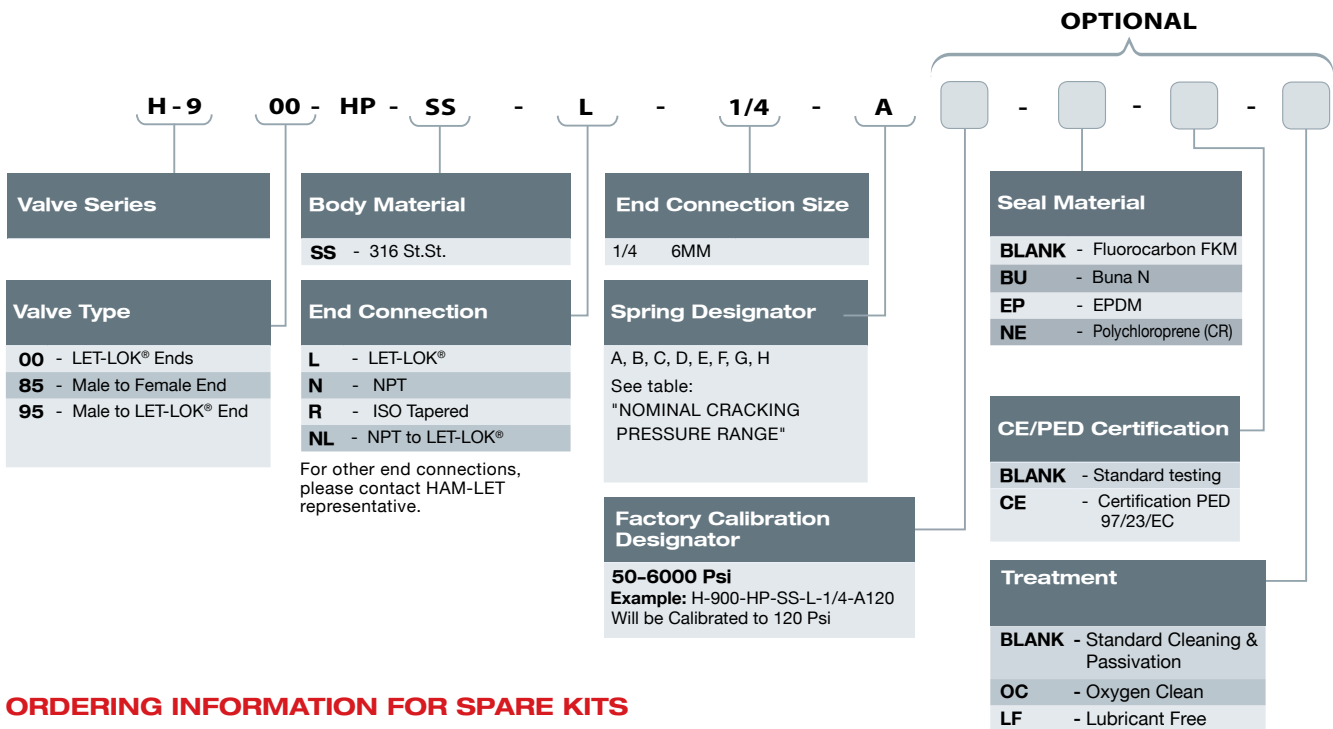
OPERATION

H-900HP relief valves open when system pressure gets to the set pressure and close when system pressure drops below the set pressure.

Warning

- Valves that were not actuated for some time may contain pressure higher than the set pressure.
- System designer and users shall determine what system applications require using relief valves for meeting specific safety codes and which valves conform to such codes.

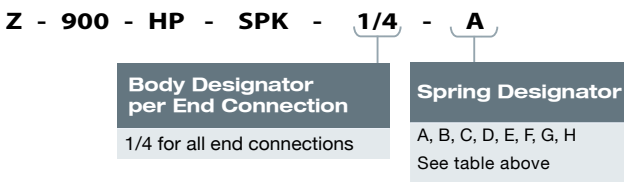
H-900HP ORDERING INFORMATION



ORDERING INFORMATION FOR SPARE KITS

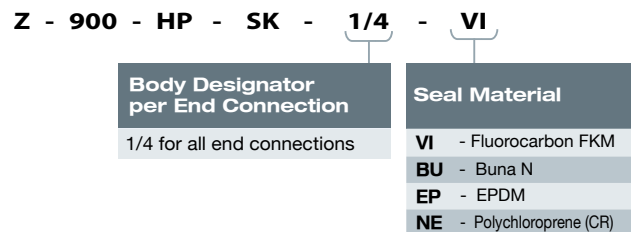
SPRING KIT

Includes:
Spring (specific to desired set pressure range) and label.



SEAL KIT

Includes: O-Rings and label



■ For oxygen applications work shall be carried out according to procedures for working with oxygen. In case spare kits are ordered for oxygen clean valves, such kits have to be ordered as oxygen clean by adding "-OC" designator.
Example: Z-900-HP-SK-1/4-VI-OC

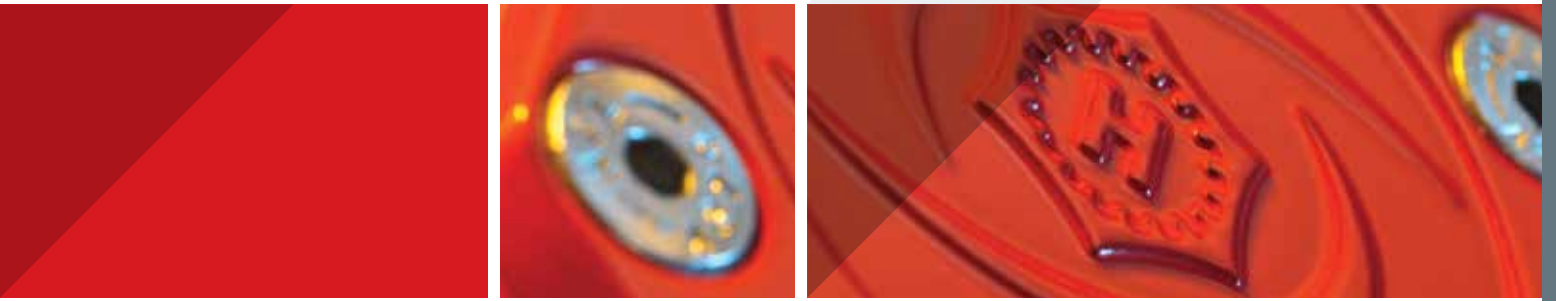
Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-900HP, Rev.10, January 2015

PNEUMATIC RACK AND PINION ACTUATORS

Advanced torque to size ratio



HAM-LET PNEUMATIC ACTUATORS



FEATURES:

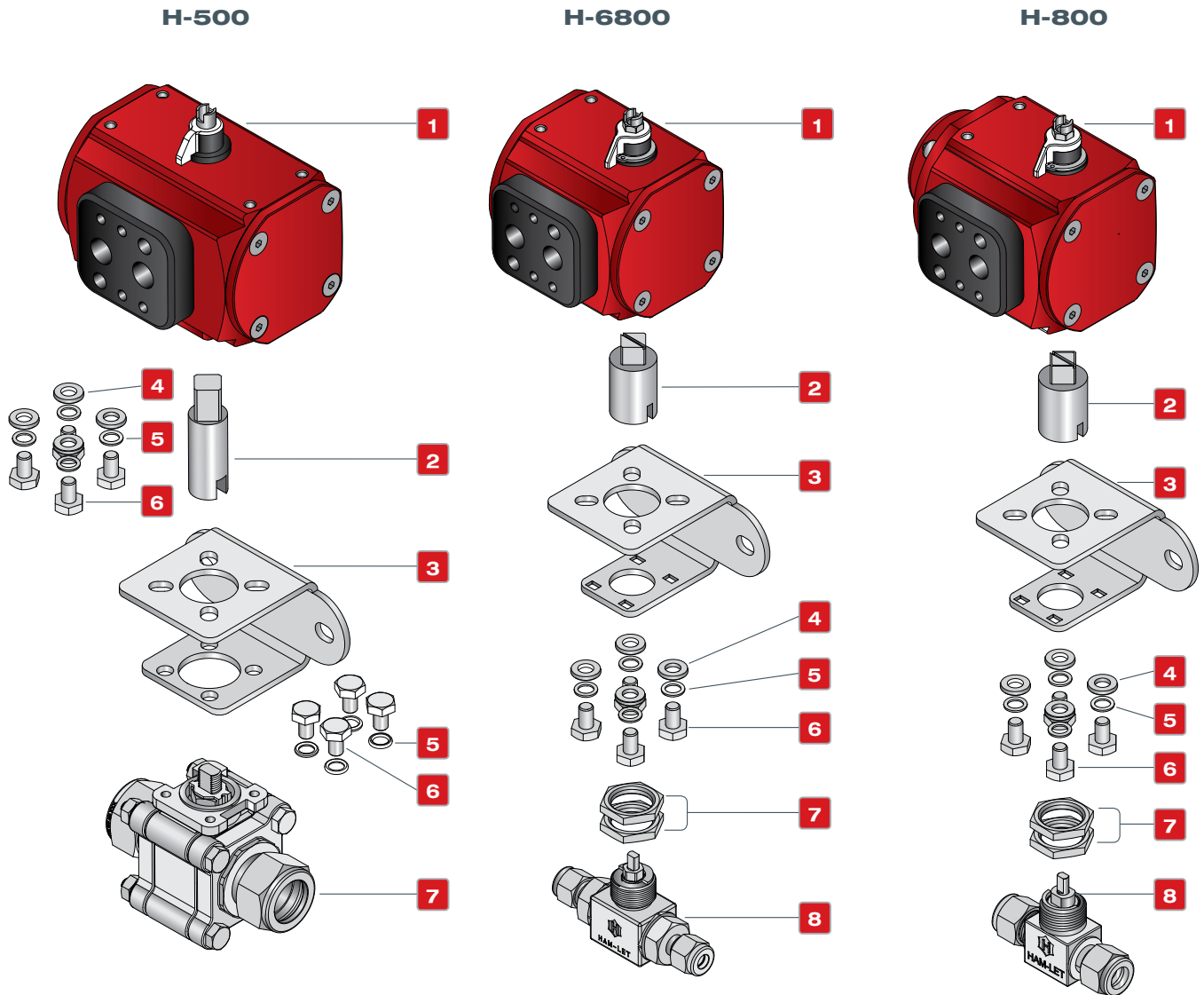
- Pneumatic Rack and Pinion Actuators
- 90° Actuation for 2-way valves (Straight & Angle)
- 180° Actuation for 3-way (T-type) valves
- Actuators comply with industry standards for interface with ISO 5211, NAMUR and VDI/VDE 3845
- Actuated valves are available factory assembled or separately, actuator and mounting kits
- Aluminum actuators are available as standard, Stainless Steel and Electric actuators are available upon request
- Limit switches, proximity sensors, position indicators, pilot valves and other accessories are available upon request
- Standard Temperature range: -32°C to 90°C (-25.6°F to 194°F)
Optional: High Temperature: -30°C to 120°C (-22°F to 248°F)
Low Temperature: -50°C to 80°C (-58°F to 176°F)

GENERAL

- Four standard actuator sizes are available upon request: Mini (designator "A1"), Small (designator "A2") and 180° actuator (designator "A2T"), Medium (designator "A3"), and Large (designator "A4").
- Improved operational speed enables better valve opening and closing control.
- ATEX certification of Valves-Actuators assemblies is available on request at the time of order quotation.



MATERIAL OF CONSTRUCTION



No.	H-500 SERIES			H-6800 SERIES			H-800 SERIES		
	Part	Qty.	Material	Part	Qty.	Material	Part	Qty.	Material
1	Actuator	1	Al 356-T5	Actuator	1	Al 356-T5	Actuator	1	Al 356-T5
2	Coupling	1	St.St.316	Coupling	1	St.St.316	Coupling	1	St.St.316
3	Bracket	1	St.St.304	Bracket	1	St.St.304	Bracket	1	St.St.304
4	Washer flat	4	St.St.304	Washer flat	4	St.St.304	Washer flat	4	St.St.304
5	Washer spring	8	St.St.304	Washer spring	4	St.St.304	Washer spring	4	St.St.304
6	Screw	8	St.St.304	Screw	4	St.St.304	Screw	4	St.St.304
7	H-500	1	St.St.316	Panel nut	2	St.St.316	Panel nut	2	St.St.316
8	-	-	-	H-6800	1	St.St.316	H-800	1	St.St.316

H-6800 SERIES

H-6800 High Performance Ball Valves features, materials of construction, and technical data are available in the H-6800 valves section.

The selection of Valve-Actuator assemblies provided herein is based on:

- Valve maximum allowable working pressure
- Ambient temperature (50 to 100°F /10 to 37°C)
- Actuator fits to valve based on operating pressure of 6 bar, as per table A.

To order H-6800 ball valve factory assembled with an actuator, add the actuator designator to the valve part number / description per the below table.

Example:

H6800SSL1/4PSS with standard Double Acting Aluminum Actuator

H6800SSL1/4PS-A1

To order an actuator and mounting kit for field assembly:

Double acting Actuator ordering number: Z-A1

Corresponding mounting kit: Z-6800-MK-1/4-F03-F04-A1

Lubricant free Valves:

For Spring Return Actuator - select one size bigger then offered in the table below.

Example: If the offered actuator in the table is A2C, select A3C

For Double Acting Actuator - please contact your local representative

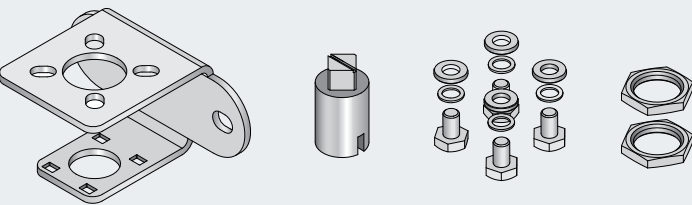


Table 1

Series	Ends Size	Seats	Minimum Actuator Operating Pressure Bar (Psi)	Actuator Designators (Factory assembled)			Actuator Ordering Code		Mounting Kit Ordering Info
				Spring Return		Double Acting	Spring Return	Double Acting	
				NO	NC				
H-6800	1/16"-3/8" (3mm-10mm)	Modified PTFE PCTFE	5 (72.5)	A1O	A1C	A1	Z-A1S	Z-A1	Z-6800-MK-1/4"-F03-F04-A1
		PEEK	5 (72.5)	A2O	A2C		Z-A2S	Z-6800-MK-1/4"-F03-F04-A2	
	1/2"-3/4" (12mm-18mm)	Modified PTFE	5 (72.5)	A1O	A1C	A1	Z-A1S	Z-A1	Z-6800-MK-1/2"-F03-F04-A1
		PCTFE	5 (72.5)	A2O	A2C		Z-A2S	Z-A2	Z-6800-MK-1/2"-F03-F04-A2
		PEEK	5 (72.5)	A3O	A3C		Z-A3S	Z-A2	Z-6800-MK-1/2"-F03-F04-A3
H-6800 T-type	1/16"-3/8" (3mm-10mm)	Modified PTFE PCTFE PEEK	5 (72.5)	A2TS	A2TS	A2T	Z-A2TS	Z-A2T	Z-6800-MK- 1/4"-F03-F04-A2
	1/2"-3/4" (12mm-18mm)								Z-6800-MK-1/2"-F03-F04-A2

Ham-Let ISO 5211 mounting kits for H-6800 Series contain:

Part	Qty	Material
Coupling	1	St.St 316
Bracket	1	St.St 304
Screw	4	St.St 304
Washer spring	4	St.St 304
Washer flat	4	St.St 304
Panel nut	2	St.St 316
Mounting instructions	1	-



Mounting Kit ordering Information describes interface per ISO 5211.
for example: Z-6800-MK-1/2-F03-F04 complies with: ISO 5211 flange types F03-F04

H-800 SERIES

H-800 One Piece Ball Valves features, materials of construction, and technical data, are available in the H-800 valves section.

The selection of Valve-Actuator assemblies provided herein is based on:

- Valve maximum allowable working pressure
- Ambient temperature (50 to 100°F / 10 to 37°C)
- Actuator fits to valve based on operating pressure of 6 bar, as per table A.

To order H-800 ball valve factory assembled with an actuator, the actuator designator shall be added to the valve part number / description per the below table.

Example:

H-800S-SS-L-1/4 with standard Spring Return Aluminum Actuator Normally Closed
H-800S-SS-L-1/4-A1C

To order an actuator and mounting bracket kit for field assembly: Spring Return Actuator ordering number: **Z-A1S** Corresponding mounting bracket kit: **Z-800S-MK-F03-F04-A1**

Lubricant free Valves:

For spring return actuator - select one size bigger then offered in the table below.

Example: If the offered actuator in the table is A2C, select A3C

For double acting actuator - Please contact your local representative

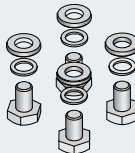
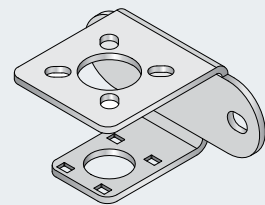


Table 2

Series	Ends Size	Seats	Minimum Actuator Operating Pressure Bar (Psi)	Actuator Designators (Factory Assembled)			Actuator Ordering Code		Mounting Kit Ordering info
				Spring Return		Double Acting	Spring Return	Double Acting	
				NO	NC				
H-800	S	PFA	5 (72.5)	A1O	A1C	A1	Z-A1S	Z-A1	Z-800S-MK-F03-F04-A1
	M			A1O	A1C		Z-A1S		Z-800M-MK-F03-F04-A1
	L			A2O	A2C		Z-A2S		SR: Z-800L-MK-F03-F04-A2 DA: Z-800L-MK-F03-F04-A1
H-800 T-Type	S	PFA	5 (72.5)			A2T		Z-A2T	Z-800S-MK-F03-F04-A2
	M			A2TS	A2TS		Z-A2TS		Z-800M-MK-F03-F04-A2
	L								Z-800L-MK-F03-F04-A2

Ham-Let ISO 5211 mounting kits for H-800 Series contain:

Part	Qty	Material
Coupling	1	St.St 316
Bracket	1	St.St 304
Screw	4	St.St 304
Washer spring	4	St.St 304
Washer flat	4	St.St 304
Panel nut	2	St.St 316
Mounting instructions	1	-



Mounting Kit ordering Information describes interface per ISO 5211.
 for example: Z-800M-MK-F03-F04-A2 complies with: ISO 5211 flange types F03-F04

H-500 SERIES

H-500 Three Piece Ball Valves features, materials of construction, and technical data, are available in the H-500 valves section.

The selection of Valve-Actuator assemblies provided herein is based on:

- Valve maximum allowable working pressure
- Ambient temperature (50 to 100°F / 10 to 37°C)
- Actuator fits to valve based on operating pressure of 6 bar, in accordance with table A.

To order H-500 ball valve factory assembled with an actuator, the actuator designator shall be added to the valve part number/description per the below table.

Example:

H-500-SS-L-3/4-T with standard Double Acting Aluminum Actuator

H-500-SS-L-3/4-T-A2

To order an actuator and mounting kit for field assembly: Double Acting Actuator ordering number: **Z-A2** Corresponding mounting kit: **Z-500-MK-3/4 -F03-F04-A2**

Lubricant free Valves:

For Spring Return Actuator - select one size bigger then offered in the table below.

Example: If the offered actuator in the table is A2C, select A3C

For Double Acting Actuator - please contact your local representative

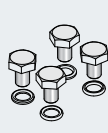
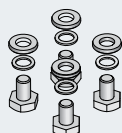
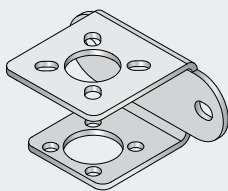


Table 3

Series	Ends Size	Seats	Minimum Actuator Operating Pressure Bar (Psi)	Actuator Designators (Factory Assembled)		Actuator Ordering Code		Mounting Kit Ordering Info	
				Spring Return	Double Acting	Spring Return	Double Acting		
									NO
H-500S	1/4", 3/8" (6 mm, 10 mm)	Modified PTFE	5 (72.5)	A1O	A1C	A1	Z-A1S	Z-A1	Z-500-MK-1/4"-F03-F04-A1
H-500	1/4"-1/2" (6 mm-12 mm)	PTFE Modified PTFE	5 (72.5)	A2O	A2C	A1	Z-A2S	Z-A1	SR: Z-500-MK-1/2"-F03-F04-A2 DA: Z-500-MK-1/2"-F03-F04-A1
		St.St. PTFE	5 (72.5)	A2O	A2C	A2	Z-A2S	Z-A2	Z-500-MK-1/2"-F03-F04-A2
		PEEK	5 (72.5)	A4O	A4C	A3	Z-A4S	Z-A3	SR: Z-500-MK-1/2"-F05-F07-A4 DA: Z-500-MK-1/2"-F04-F05-A3
	3/4" (20 mm)	PTFE Modified PTFE	5 (72.5)	A2O	A2C	A2	Z-A2S	Z-A2	Z-500-MK-3/4"-F03-F04-A2
		St.St. PTFE	5 (72.5)	A3O	A3C	A2	Z-A3S	Z-A2	SR: Z-500-MK-3/4"-F04-F05-A3 DA: Z-500-MK-3/4"-F03-F04-A2
		PEEK	5 (72.5)	A4O	A4C	A4	Z-A4S	Z-A4	Z-500-MK-3/4"-F05-F07-A4
	1" (25 mm)	PTFE Modified PTFE St.St. PTFE	5 (72.5)	A4O	A4C	A3	Z-A4S	Z-A3	SR: Z-500-MK-1"-F05-F07-A4 DA: Z-500-MK-1"-F04-F05-A3
		PEEK	5 (72.5)	A5O	A5C	A4	Z-A5S	Z-A4	SR: Z-500-MK-1"-F05-F07-A5 DA: Z-500-MK-1"-F05-F07-A4

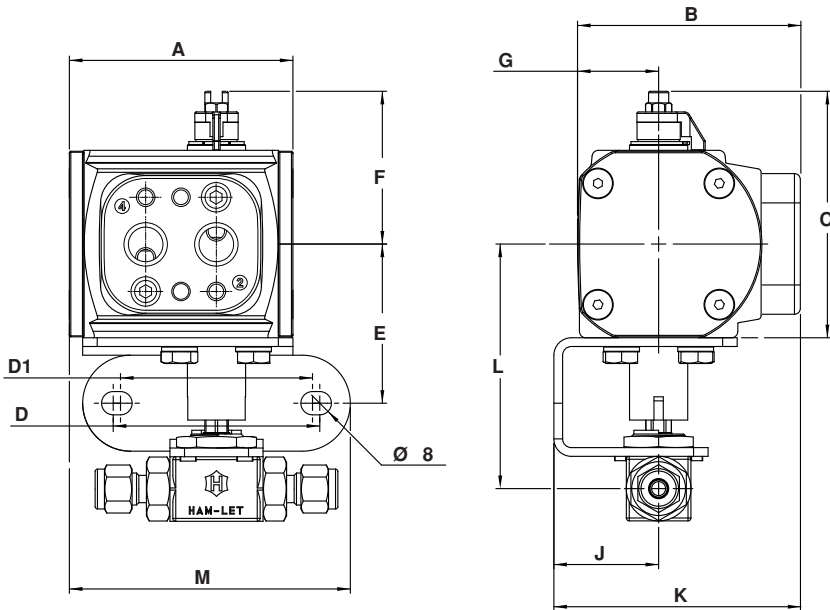
Ham-Let ISO 5211 mounting kits for H-500 Series contain:

Note: Mounting Kit ordering Information describes interface per ISO 5211. For example: Z-500-MK-3/4-F03-F04 complies with: ISO 5211 flange types F03-F04



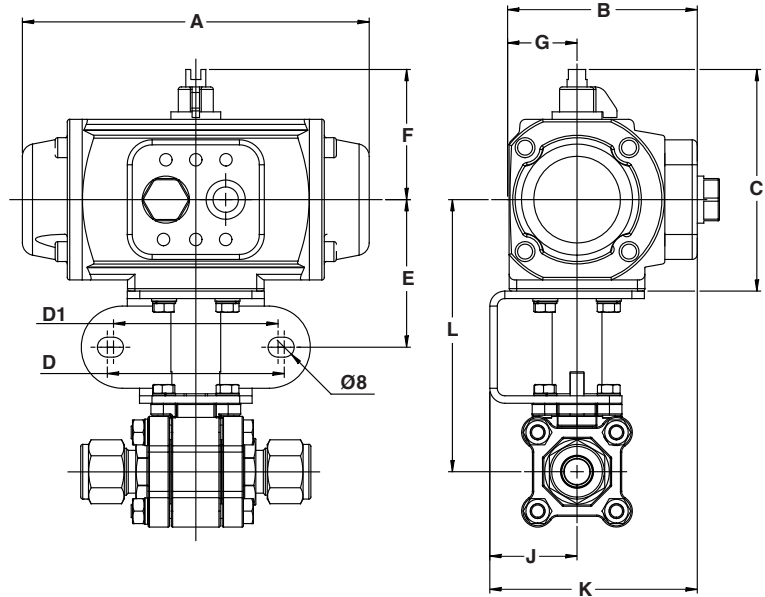
Part	Qty	Material
Coupling	1	St.St 316
Bracket	1	St.St 304
Screw	8	St.St 304
Washer spring	8	St.St 304
Washer flat	4	St.St 304
Panel nut	1	St.St 316
Mounting instructions	1	-

Dimensions for Assembled Actuators - H-800 & H-6800 2-WAY VALVE SERIES



Series	Body Designator	Ends Size	Seats Material	Actuator Model	Units	A	B	C	D	D1	E	F	G	J	K	L	M	
H-6800	1/4"	1/16"-3/8" (3mm-10mm)	Modified PTFE PCTFE	SR A1S	mm	96.5	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	88.5	116.2	
				inch	3.8	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.48	4.57		
			DA A1	mm	76.8	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	88.5	96.6		
			inch	3.02	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.48	3.8			
	PEEK	SR A2S	mm	140.2	76.1	88.6	71	66	59.2	51.8	27.9	35	83.2	92.8	x			
		inch	5.52	3.0	3.49	2.8	2.6	2.33	2.04	1.1	1.38	3.27	3.65	x				
	DA A1	mm	76.8	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	88.5	96.6				
		inch	3.02	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.48	3.8				
	H-6800	1/2"	1/2"-3/4" (12mm-18mm)	Modified PTFE PCTFE	SR A1S	mm	96.5	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	93.2	116.2
					inch	3.8	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.67	4.57	
DA A1				mm	76.8	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	93.2	96.6		
inch				3.02	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.67	3.8			
PCTFE				SR A2S	mm	140.2	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	97.7	x	
				inch	5.52	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.85	x		
DA A2		mm	101	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	97.7	x				
		inch	3.97	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.85	x				
PEEK		SR A3S	mm	152.3	84.1	111.3	71	66	65.7	68.1	31.9	44	96.2	104.2	x			
			inch	6.0	3.31	4.38	2.8	2.6	2.58	2.68	1.25	1.73	3.79	4.10	x			
	DA A2	mm	101	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	97.7	x				
		inch	3.97	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.85	x				
H-800	S	1/16"-1/4" (3mm-6mm)	PFA	SR A1S	mm	96.5	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	85.8	116.2	
				inch	3.8	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.38	4.57		
				DA A1	mm	76.8	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	85.8	96.6	
	inch	3.02		3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.38	3.8				
	M	1/4"-3/8" (6mm-8mm)		SR A1S	mm	96.5	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	88.4	116.2	
				inch	3.8	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.48	4.57		
				DA A1	mm	76.8	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	88.4	96.6	
	inch	3.02		3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.48	3.8				
	L	3/8"-1/2" (10mm-12mm)		SR A2S	mm	140.2	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	95.9	x	
inch			5.52	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.77	x				
DA A1			mm	76.8	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	91.4	96.6			
inch	3.02	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	3.6	3.8						

Dimensions for Assembled Actuators - H-500 SERIES

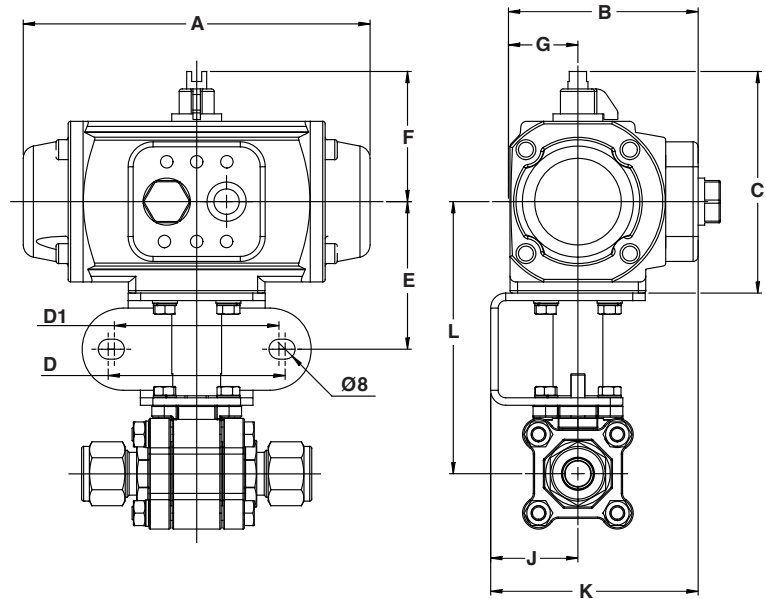


Series	Body Designator	Ends Size	Seats Material	Actuator Model		Units	A	B	C	D	D1	E	F	G	J	K	L
							mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
H-500S	1/4"	1/4", 3/8" (6mm, 10mm)	Modified PTFE	SR	A1S	mm	95.8	76.1	84.1	33.0	29.0	48.2	51.8	27.9	31.0	79.2	88.2
				inch	3.77	3.00	3.31	1.30	1.14	1.90	2.04	1.10	1.22	3.12	3.47		
			DA	A1	mm	76.9	76.1	84.1	33.0	29.0	48.2	51.8	27.9	31.0	79.2	88.2	
						inch	3.03	3.00	3.31	1.30	1.14	1.90	2.04	1.10	1.22	3.12	3.47
H-500	1/2"	1/4"-1/2" (6mm-12mm)	PTFE Modified PTFE	SR	A2S	mm	140.2	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	109.2
				inch	5.52	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	4.3		
			DA	A1	mm	76.8	76.1	84.1	71	66	54.7	51.8	27.9	35	83.2	104.7	
			inch	3.02	3.0	3.31	2.8	2.6	2.15	2.04	1.1	1.38	3.27	4.12			
			St.St. PTFE	SR	A2S	mm	140.2	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	109.2
				inch	5.52	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	4.3		
			DA	A2	mm	101	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	109.2	
			inch	3.97	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	4.3			
			PEEK	SR	A4S	mm	200.8	109.4	128.5	71.0	66.0	71.7	79.2	47.7	44.0	105.7	121.7
				inch	7.91	4.31	5.06	2.80	2.60	2.82	3.12	1.88	1.73	4.16	4.79		
			DA	A3	mm	152.3	84.1	111.3	71	66	65.7	68.1	31.9	44	96.2	115.7	
			inch	6.0	3.31	4.38	2.8	2.6	2.58	2.68	1.25	1.73	3.79	4.55			
	3/4"	3/4" (18mm)	PTFE Modified PTFE	SR	A2S	mm	140.2	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	112.5
				inch	5.52	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	4.43		
			DA	A2	mm	101	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	112.5	
			inch	3.97	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	4.43			
			St.St. PTFE	SR	A3S	mm	152.3	84.1	111.3	71	66	65.7	68.1	31.9	44	96.2	119
				inch	6.0	3.31	4.38	2.8	2.6	2.58	2.68	1.25	1.73	3.79	4.68		
			DA	A2	mm	101	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	112.5	
			inch	3.97	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	4.43			
			PEEK	SR	A4S	mm	200.8	109.4	128.5	71.0	66.0	71.7	79.2	47.7	44.0	105.7	125.0
				inch	7.91	4.31	5.06	2.80	2.60	2.82	3.12	1.88	1.73	4.16	4.92		
			DA	A4	mm	200.8	109.4	128.5	71.0	66.0	71.7	79.2	47.7	44.0	105.7	125.0	
			inch	7.91	4.31	5.06	2.80	2.60	2.82	3.12	1.88	1.73	4.16	4.92			



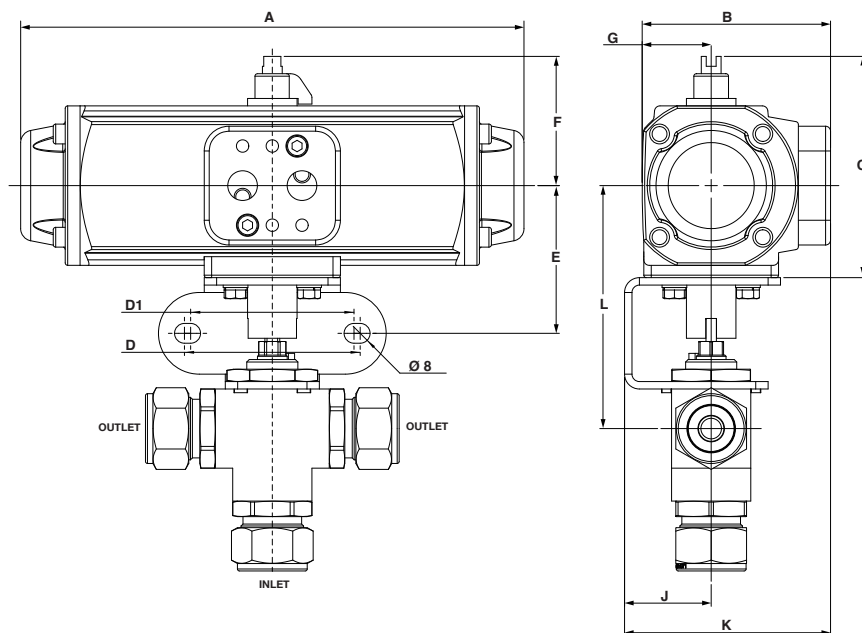
Dimensions for Assembled Actuators - H-500 SERIES

(Cont'd)



Series	Body Designator	Ends Size	Seats Material	Actuator Model	Units	A	B	C	D	D1	E	F	G	J	K	L		
						mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
H-500	1"	1" (25 mm)	St.St. PTFE PTFE Modified PTFE	SR	A4S	mm	200.8	109.4	128.5	71.0	66.0	71.7	79.2	47.7	44.0	105.7	131.7	
						inch	7.91	4.31	5.06	2.80	2.60	2.82	3.12	1.88	1.73	4.16	5.19	
				PEEK	DA	A3	mm	152.3	84.1	111.3	71	66	65.7	68.1	31.9	44	96.2	125.7
							inch	6.0	3.31	4.38	2.8	2.6	2.58	2.68	1.25	1.73	3.79	4.95
					SR	A4S	mm	200.8	109.4	128.5	71.0	66.0	71.7	79.2	47.7	44.0	105.7	131.7
							inch	7.91	4.31	5.06	2.80	2.60	2.82	3.12	1.88	1.73	4.16	5.19
			DA	A4	mm	200.8	109.4	128.5	71.0	66.0	71.7	79.2	47.7	44.0	105.7	131.7		
					inch	7.91	4.31	5.06	2.80	2.60	2.82	3.12	1.88	1.73	4.16	5.19		

Dimensions for Assembled 180° Actuators - H-800 T-TYPE & H-6800 T-TYPE SERIES



Series	Body Designator	Ends Size	Seats Material	Actuator Model	Units	A	B	C	D	D1	E	F	G	J	K	L
						mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
H-6800 T-type	1/4"	1/16"-3/8" (3mm-10mm)	Modified PTFE PCTFE PEEK	SR	A2ST	204.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	93.0
					inch	8.05	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.66
				DA	A2T	165.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	93.0
					inch	6.51	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.66
	1/2"	1/2"-3/4" (12mm-18mm)	Modified PTFE	SR	A2ST	204.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	97.7
					inch	8.05	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.85
DA	A2T	mm	165.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	97.7			
		inch	6.51	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.85			
H-800 T-type	S	1/16"-1/4" (3mm-6mm)	PFA	SR	A2ST	204.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	90.3
					inch	8.05	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.55
				DA	A2T	165.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	90.3
					inch	6.51	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.55
	M	1/4"-3/8" (6mm-8mm)		SR	A2ST	204.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	92.9
					inch	8.05	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.66
				DA	A2T	165.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	92.9
					inch	6.51	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.66
	L	3/8"-1/2" (10mm-12mm)		SR	A2ST	204.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	95.9
					inch	8.05	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.77
				DA	A2T	165.4	76.1	88.6	71	66	59.7	51.8	27.9	35	83.2	95.9
					inch	6.51	3.0	3.49	2.8	2.6	2.35	2.04	1.1	1.38	3.27	3.77

ALUMINUM PNEUMATIC ACTUATOR - TECHNICAL DATA

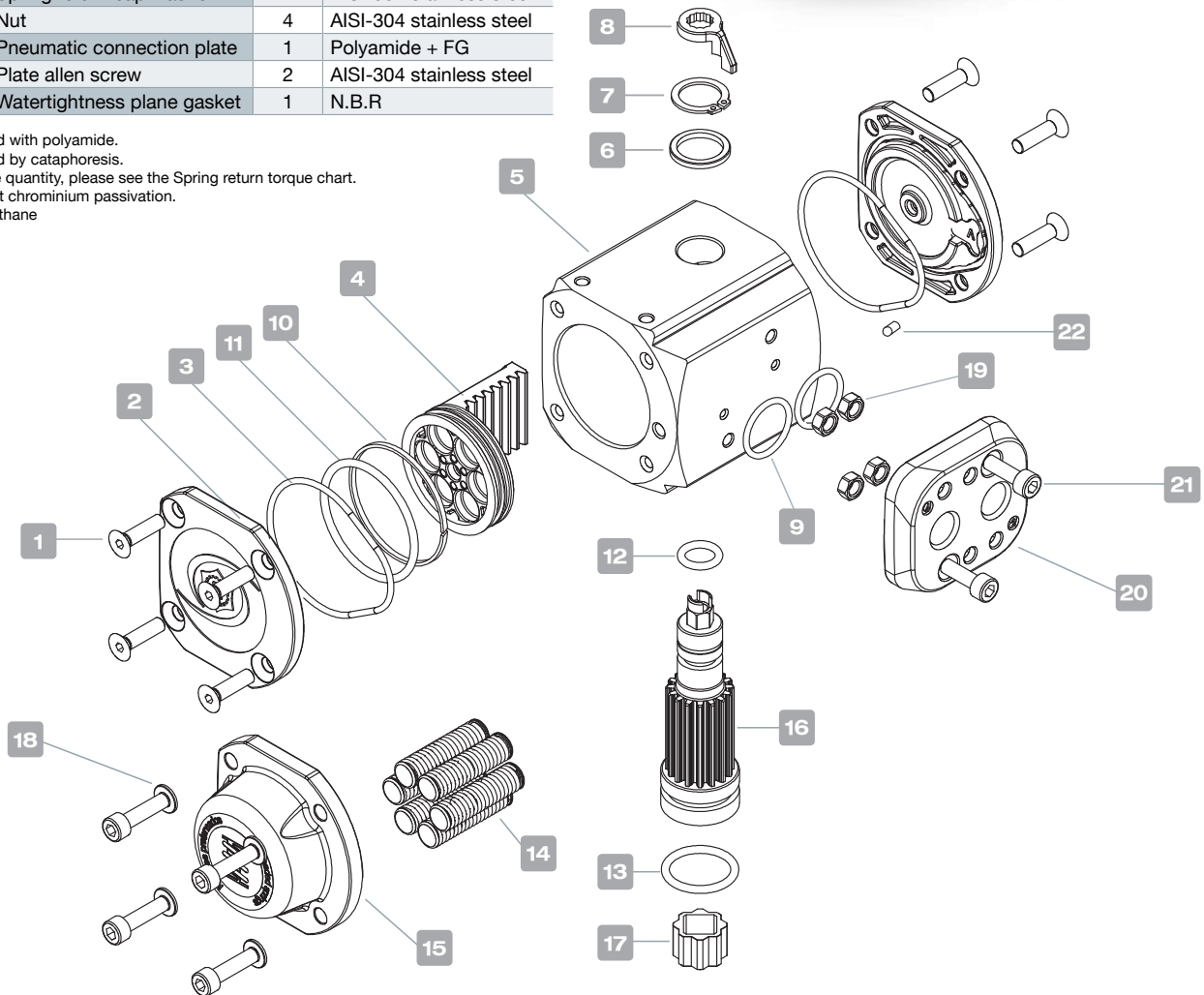
A1S: SPRING RETURN

A1: DOUBLE ACTING

DISASSEMBLY

No.	Description	Qty	Material
1	Cap allen screw	8	AISI-304 stainless steel
2	Double acting cap	2	Aluminum alloy (2)+(5)
3	Cap O-ring	2	N.B.R.
4	Piston	1	Polyaramide
5	Cylinder	1	Aluminum alloy (2)+(1)
6	Washer	1	Polyamide 6
7	Spring clip	1	Stainless steel
8	Position indicator	1	Polyacetal
9	Plate O-ring	2	N.B.R.
10	Guide ring	1	Polyacetal + mb
11	Piston O-ring	1	N.B.R.
12	Shaft O-ring	1	N.B.R.
13	Shaft O-ring	1	N.B.R.
14	Preloaded springs	6	DIN-17223-c (3) (4)
15	Spring return cap	1	Aluminum alloy (2) + (5)
16	Shaft	1	Polyamide + S.S.Insert
17	Drive adapter	1	AISI-316 stainless steel
18	Spring return cap washer	4	AISI-304 stainless steel
19	Nut	4	AISI-304 stainless steel
20	Pneumatic connection plate	1	Polyamide + FG
21	Plate allen screw	2	AISI-304 stainless steel
22	Watertightness plane gasket	1	N.B.R.

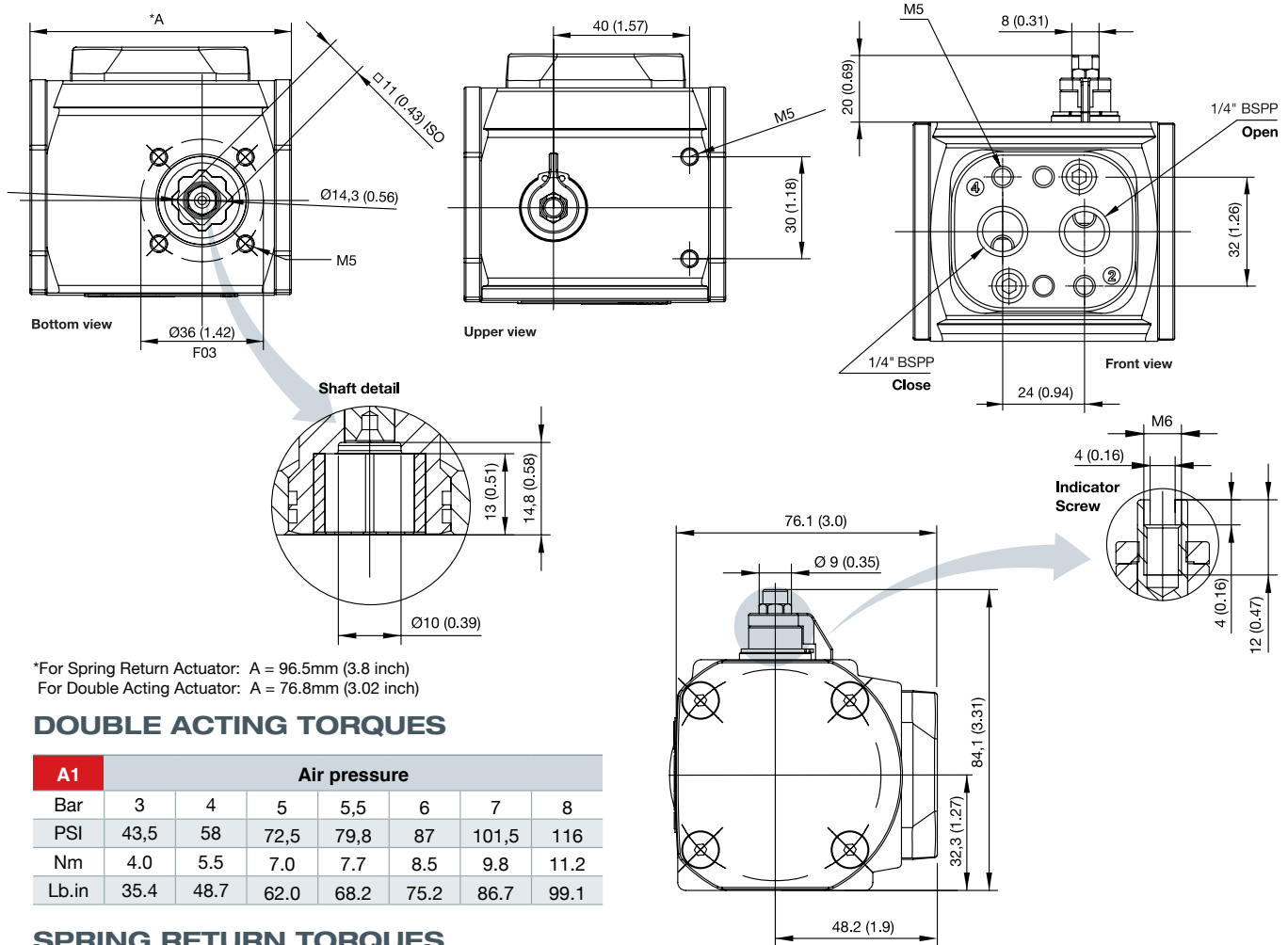
1. Covered with polyamide.
2. Covered by cataphoresis.
3. Variable quantity, please see the Spring return torque chart.
4. Trivalent chromium passivation.
5. Polyurethane



Model	Cycle time in (sec)		Weight		Capacity in litres	
	To open	To close	Kg.	Lb.	To open	To close
A1	0,1	0,1	0,65	1.43	0,07	0,03
A1S	0,15	0,15	0.72	1.58	0,07	

Cycle time w/o resistant torque at 6 bar.
Dimensions in mm.

To calculate the consumption, multiply the above figures by the real working pressure.



*For Spring Return Actuator: A = 96.5mm (3.8 inch)
For Double Acting Actuator: A = 76.8mm (3.02 inch)

DOUBLE ACTING TORQUES

A1	Air pressure						
Bar	3	4	5	5,5	6	7	8
PSI	43,5	58	72,5	79,8	87	101,5	116
Nm	4.0	5.5	7.0	7.7	8.5	9.8	11.2
Lb.in	35.4	48.7	62.0	68.2	75.2	86.7	99.1

SPRING RETURN TORQUES

A1S	Spring Torques		Air torque at indicated pressure														
			3		4		5		5,5		6		7		8		bar
			43,5		58		72,5		79,8		87		101,5		116		p.s.i
N	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	
6*	5.8	4					3	1.2	3.7	1.9	4.5	2.7	5.8	4	7.2	5.4	Nm
	51.3	35.6					26.4	10.6	32.6	16.8	39.7	23.9	51.2	35.4	63.5	47.8	Lb.in
5	4.9	3.4			2.1	0.6	3.6	2.1	4.3	2.8	5.1	3.6	6.4	4.9	7.8	6.3	Nm
	43.4	30.1			18.6	5.3	31.9	18.6	38.1	24.8	45.1	31.9	56.6	43.4	69	55.8	Lb.in
4	4	2.8			2.7	1.5	4.2	3	4.9	3.7	5.7	4.5	7	5.8	8.4	7.2	Nm
	35.6	24.4			24.3	13.1	37.5	26.3	43.7	32.5	50.8	39.6	62.3	51.1	74.7	63.5	Lb.in
3	3.2	2.1	1.9	0.8	3.4	2.3	4.9	3.8	5.6	4.5	6.4	5.3	7.7	6.6			Nm
	28	18.6	16.8	7.4	30.1	20.7	43.4	34	49.6	40.2	56.6	47.2	68.2	58.7			Lb.in
2	2.3	1.4	2.6	1.7	4.1	3.2	5.6	4.7	6.3	5.4	7.1	6.2					Nm
	20.4	12.4	23	15	36.3	28.3	49.6	41.6	55.8	47.8	62.8	54.9					Lb.in

N: Number of springs per side

* Standard number of springs



ALUMINUM PNEUMATIC ACTUATOR - TECHNICAL DATA

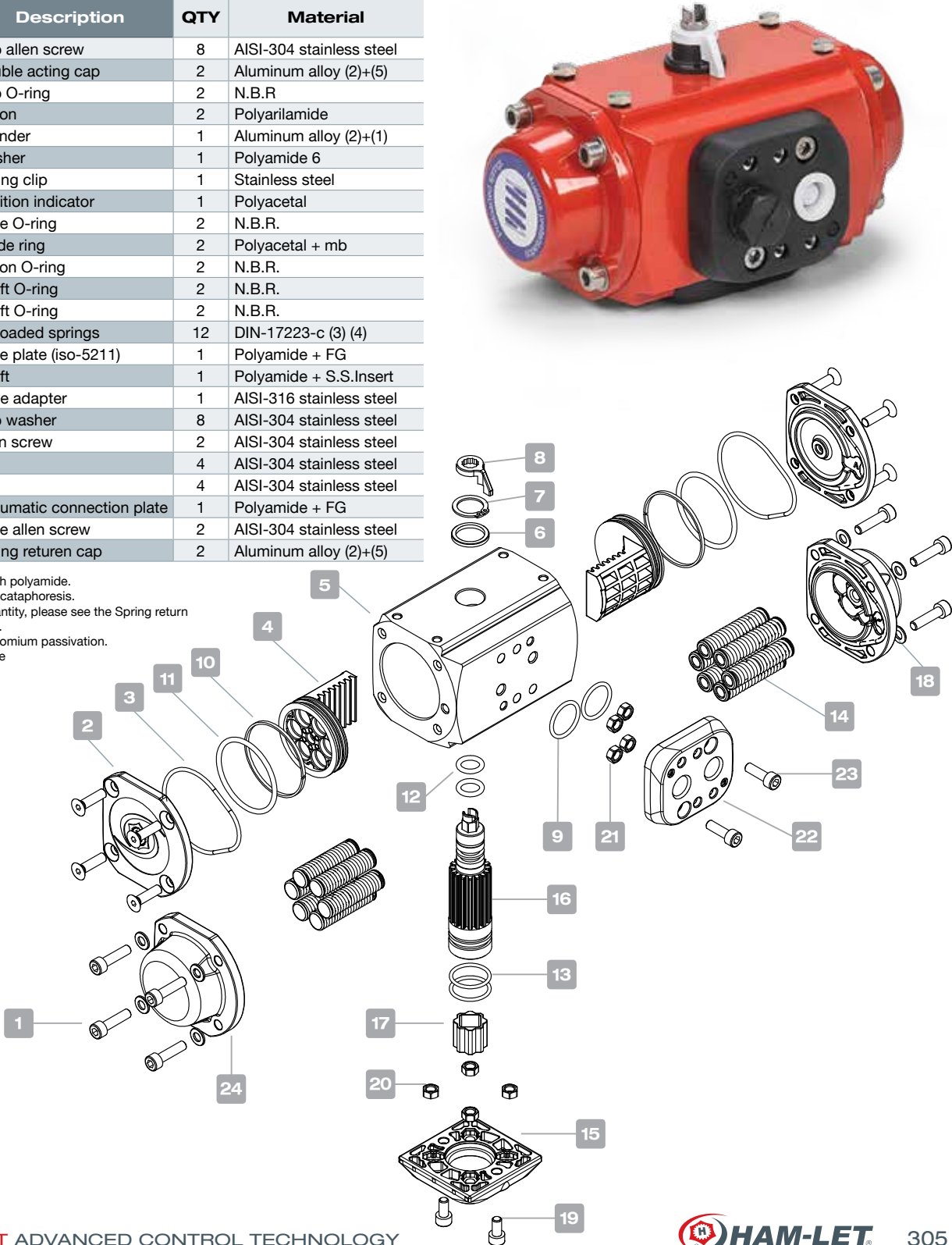
A2: DOUBLE ACTING

A2S: SPRING RETURN

DISASSEMBLY

No.	Description	QTY	Material
1	Cap allen screw	8	AISI-304 stainless steel
2	Double acting cap	2	Aluminum alloy (2)+(5)
3	Cap O-ring	2	N.B.R
4	Piston	2	Polyarilamide
5	Cylinder	1	Aluminum alloy (2)+(1)
6	Washer	1	Polyamide 6
7	Spring clip	1	Stainless steel
8	Position indicator	1	Polyacetal
9	Plate O-ring	2	N.B.R.
10	Guide ring	2	Polyacetal + mb
11	Piston O-ring	2	N.B.R.
12	Shaft O-ring	2	N.B.R.
13	Shaft O-ring	2	N.B.R.
14	Preloaded springs	12	DIN-17223-c (3) (4)
15	Base plate (iso-5211)	1	Polyamide + FG
16	Shaft	1	Polyamide + S.S.Insert
17	Drive adapter	1	AISI-316 stainless steel
18	Cap washer	8	AISI-304 stainless steel
19	Allen screw	2	AISI-304 stainless steel
20	Nut	4	AISI-304 stainless steel
21	Nut	4	AISI-304 stainless steel
22	Pneumatic connection plate	1	Polyamide + FG
23	Plate allen screw	2	AISI-304 stainless steel
24	Spring return cap	2	Aluminum alloy (2)+(5)

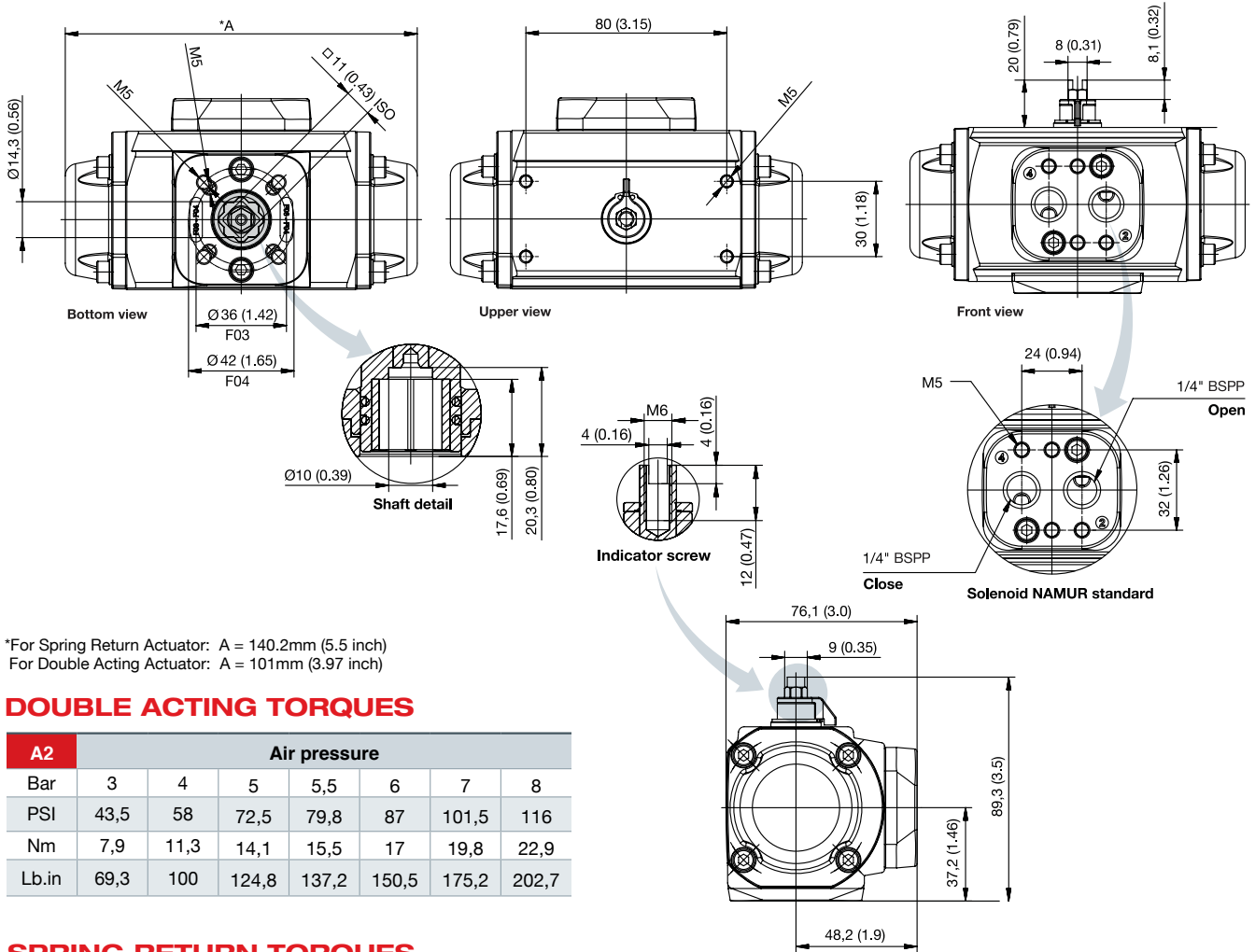
1. Covered with polyamide.
2. Covered by cataphoresis.
3. Variable quantity, please see the Spring return torque chart.
4. Trivalent chromium passivation.
5. Polyurethane



Model	Cycle time in (sec)		Weight		Capacity in litres	
	To open	To close	Kg.	Lb.	To open	To close
A2	0,1	0,1	0,92	2,02	0,075	0,11
A2S	0,15	0,15	1	2,20	0,075	

Cycle time w/o resistant torque at 6 bar.
Dimensions in mm.

To calculate the consumption, multiply the above figures by the real working pressure.



*For Spring Return Actuator: A = 140,2mm (5.5 inch)
For Double Acting Actuator: A = 101mm (3.97 inch)

DOUBLE ACTING TORQUES

A2	Air pressure						
Bar	3	4	5	5,5	6	7	8
PSI	43,5	58	72,5	79,8	87	101,5	116
Nm	7,9	11,3	14,1	15,5	17	19,8	22,9
Lb.in	69,3	100	124,8	137,2	150,5	175,2	202,7

SPRING RETURN TORQUES

A2S	Spring Torques		Air torque at indicated pressure														bar	p.s.i
			3		4		5		5,5		6		7		8			
N	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End		
6*	10	6,7					7,4	4,1	8,8	5,5	10,3	7	13,1	9,8	16,2	12,9		Nm
	88,5	59,3					65,5	36,3	77,9	48,7	91,2	62	115,9	86,7	143,4	114,2		Lb.in
5	8,5	5,8			5,5	2,8	8,3	5,6	9,7	7	11,2	8,5	14	11,3	17,1	14,4		Nm
	75,2	51,3			48,7	24,8	73,5	49,6	85,9	62	99,1	75,2	123,9	100	151,3	127,5		Lb.in
4	7	4,6	3,3	0,9	6,7	4,3	9,5	7,1	10,9	8,5	12,4	10	15,2	12,8	18,3	15,9		Nm
	62	40,7	29,2	8	59,3	38,1	84,1	62,8	96,5	75,2	109,7	88,5	134,5	113,3	162	140,7		Lb.in
3	5,5	3,6	4,3	2,4	7,7	5,8	10,5	8,6	11,9	10	13,4	11,5	16,2	14,3				Nm
	48,7	31,9	38,1	21,2	68,2	51,3	92,9	76,1	105,3	88,5	118,6	101,8	143,4	126,6				Lb.in
2	4	2,4	5,5	3,9	8,9	7,3	11,7	10,1	13,1	11,5	14,6	13						Nm
	35,4	21,2	48,7	34,5	78,8	64,6	103,6	89,4	115,9	101,8	129,2	115,1						Lb.in

N: Number of springs per side

* Standard number of springs

ALUMINUM PNEUMATIC ACTUATOR - TECHNICAL DATA

A3:

DOUBLE ACTING

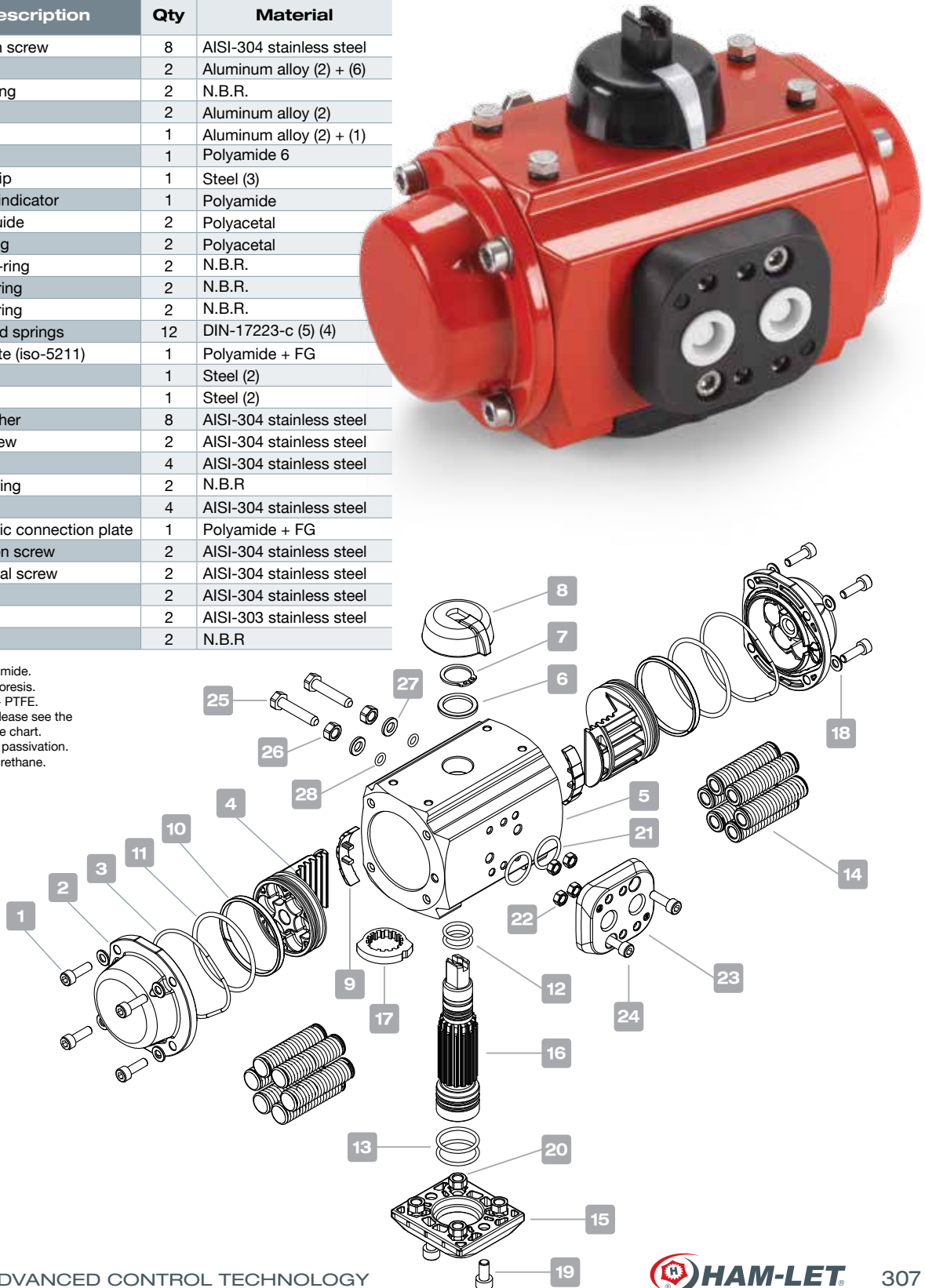
A3S:

SPRING RETURN

DISASSEMBLY

No.	Description	Qty	Material
1	Cap allen screw	8	AISI-304 stainless steel
2	Cap	2	Aluminum alloy (2) + (6)
3	Cap-O-ring	2	N.B.R.
4	Piston	2	Aluminum alloy (2)
5	Cylinder	1	Aluminum alloy (2) + (1)
6	Washer	1	Polyamide 6
7	Spring clip	1	Steel (3)
8	Position indicator	1	Polyamide
9	Piston guide	2	Polyacetal
10	Guide ring	2	Polyacetal
11	Piston O-ring	2	N.B.R.
12	Shaft O-ring	2	N.B.R.
13	Shaft O-ring	2	N.B.R.
14	Preloaded springs	12	DIN-17223-c (5) (4)
15	Base plate (iso-5211)	1	Polyamide + FG
16	Shaft	1	Steel (2)
17	Cam	1	Steel (2)
18	Cap washer	8	AISI-304 stainless steel
19	Allen screw	2	AISI-304 stainless steel
20	Nut	4	AISI-304 stainless steel
21	Plate O-ring	2	N.B.R.
22	Nut	4	AISI-304 stainless steel
23	Pneumatic connection plate	1	Polyamide + FG
24	Plate allen screw	2	AISI-304 stainless steel
25	Hexagonal screw	2	AISI-304 stainless steel
26	Nut	2	AISI-304 stainless steel
27	Bushing	2	AISI-303 stainless steel
28	O-ring	2	N.B.R.

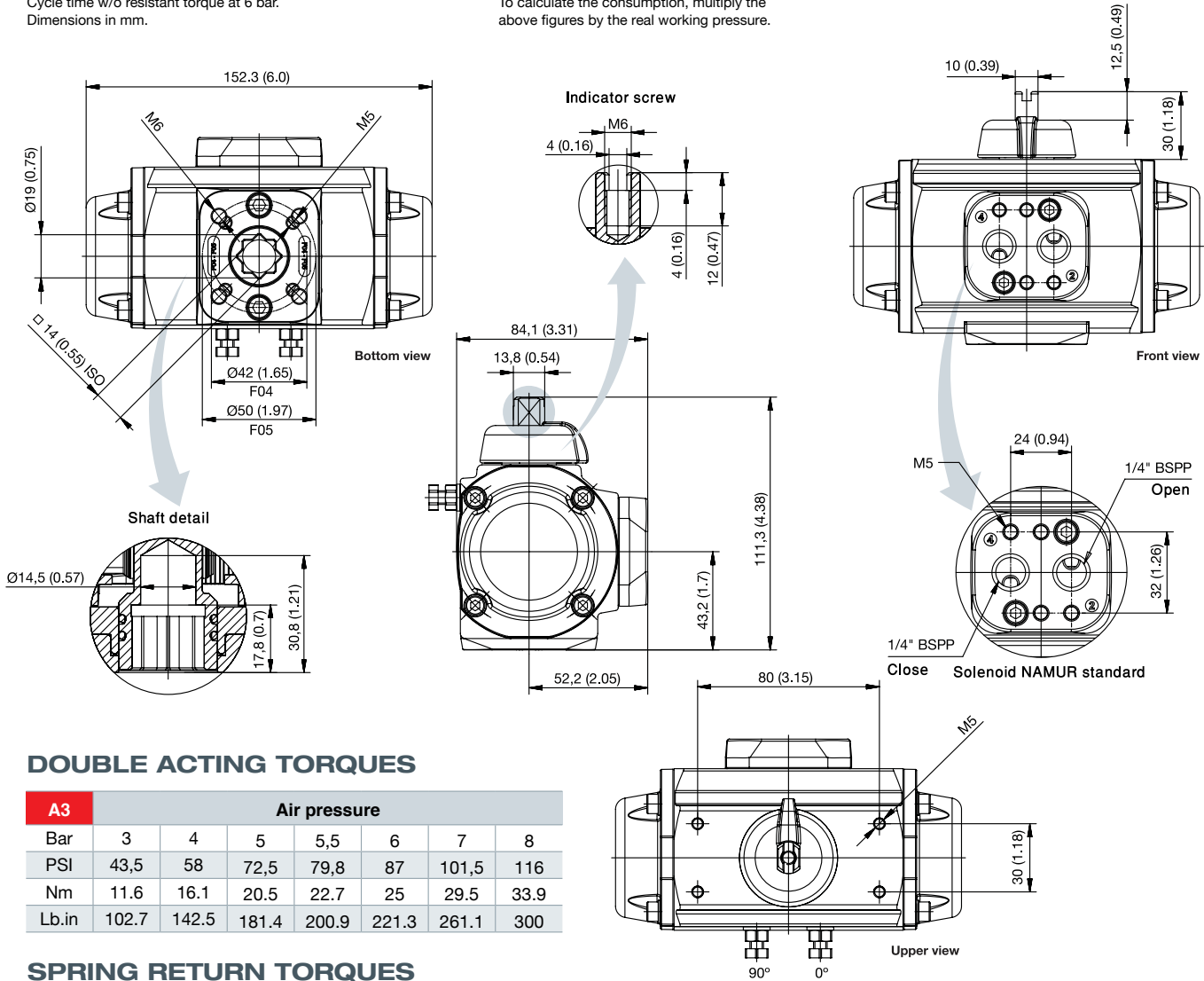
1. Covered with polyamide.
2. Covered by cataphoresis.
3. Covered by nickel - PTFE.
4. Variable quantity, please see the Spring return torque chart.
5. Trivalent chromium passivation.
6. Covered with polyurethane.



Model	Cycle time in (sec)		Weight		Capacity in litres	
	To open	To close	Kg.	Lb.	To open	To close
A3	0,15	0,15	1.40	3.09	0,15	0,18
A3S	0,2	0,2	1.625	3.58	0,15	

Cycle time w/o resistant torque at 6 bar.
Dimensions in mm.

To calculate the consumption, multiply the
above figures by the real working pressure.



DOUBLE ACTING TORQUES

A3	Air pressure						
Bar	3	4	5	5,5	6	7	8
PSI	43,5	58	72,5	79,8	87	101,5	116
Nm	11.6	16.1	20.5	22.7	25	29.5	33.9
Lb.in	102.7	142.5	181.4	200.9	221.3	261.1	300

SPRING RETURN TORQUES

A3S	Spring Torques	Air torque at indicated pressure															
		3		4		5		5,5		6		7		8		bar	
		43,5	58	72,5	79,8	87	101,5	116								p.s.i	
N	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	
6*	16,5	11,1					9,4	4	11,6	6,2	13,9	8,5	18,4	13	22,8	17,4	17,4Nm
	146	98,2					83,2	35,4	102,7	54,9	123	75,2	162,9	115,1	201,8	154	Lb.in
5	13,8	9,4			6,7	2,3	11,1	6,7	13,3	8,9	15,6	11,2	20,1	15,7	24,5	20,1	Nm
	122,1	83,2			59,3	20,4	98,2	59,3	117,7	78,8	138,1	99,1	177,9	139	216,8	177,9	Lb.in
4	11,1	7,6			8,5	5	12,9	9,4	15,1	11,6	17,4	13,9	21,9	18,4	26,3	22,8	Nm
	98,2	67,3			75,2	44,3	114,2	83,2	133,6	102,7	154	123	177,9	162,9	232,8	201,8	Lb.in
3	8,5	5,8	5,8	3,1	10,3	7,6	14,7	12	16,9	14,2	19,2	16,5	23,7	21			Nm
	75,2	51,3	51,3	27,4	91,2	67,3	130,1	106,2	149,6	125,7	169,9	146	209,8	185,9			Lb.in
2	5,8	3,6	8	5,8	12,5	10,3	16,9	14,7	19,1	16,9	21,4	19,2					Nm
	51,3	31,9	70,8	51,3	110,6	91,2	149,6	130,1	169	149,6	189,4	169,9					Lb.in

N: Number of springs per side

* Standard number of springs



ALUMINUM PNEUMATIC ACTUATOR - TECHNICAL DATA

A4: DOUBLE ACTING

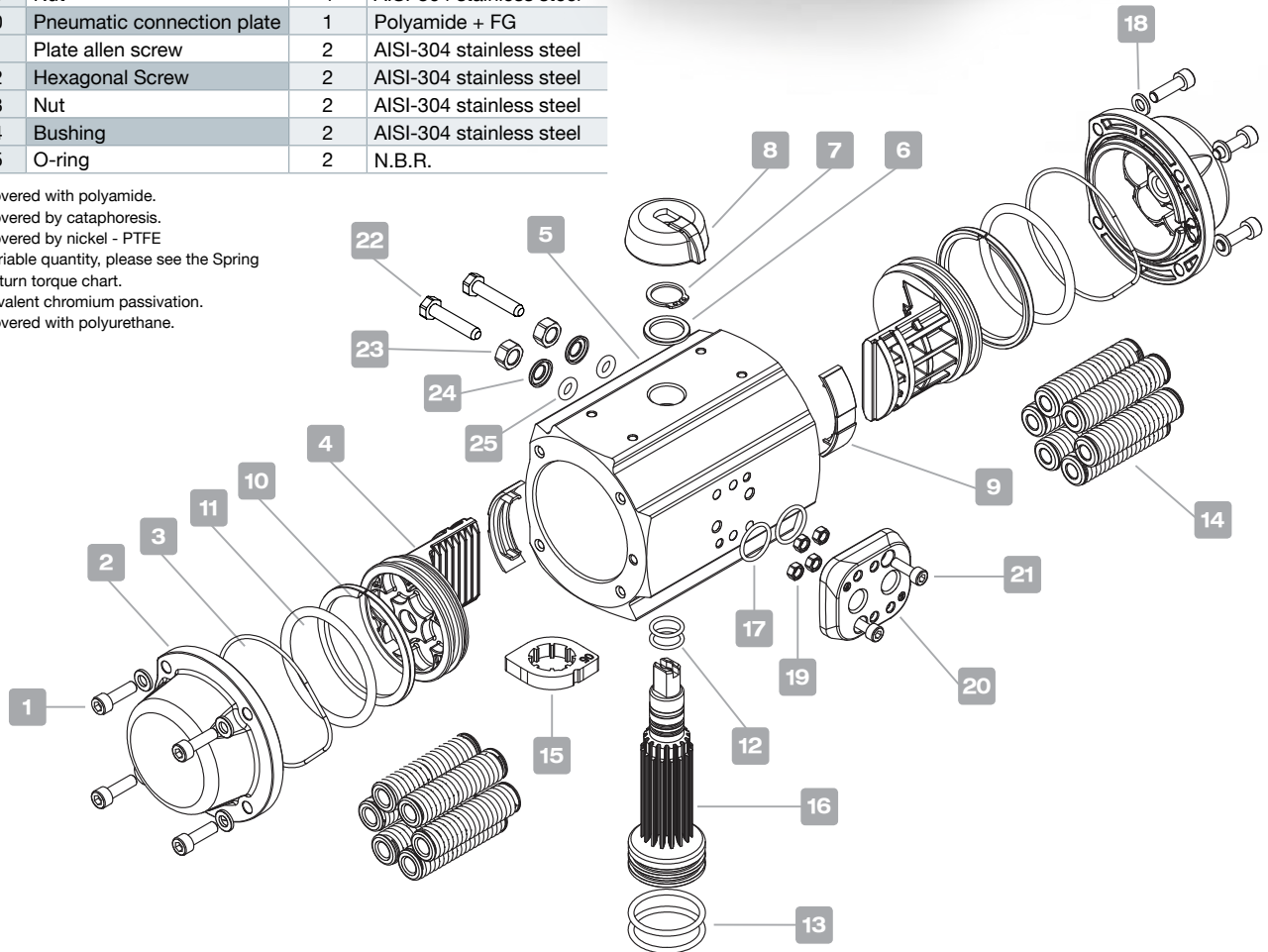
A4S: SPRING RETURN

DISASSEMBLY

No.	Description	Qty	Material
1	Cap allen screw	8	AISI-304 stainless steel
2	Cap	2	Aluminum alloy (2) + (6)
3	Cap-O-ring	2	N.B.R.
4	Piston	2	Aluminum alloy (2)
5	Cylinder	1	Aluminum alloy (2) + (1)
6	Washer	1	Polyamide 6
7	Spring clip	1	Steel (3)
8	Position indicator	1	Polyamide
9	Piston guide	2	Polyacetal
10	Guide ring	2	Polyacetal
11	Piston O-ring	2	N.B.R.
12	Shaft O-ring	2	N.B.R.
13	Shaft O-ring	2	N.B.R.
14	Preloaded springs	12	DIN-17223-c (5) (4)
15	Cam	1	Steel (2)
16	Shaft	1	Steel (2)
17	Plate O-ring	2	N.B.R.
18	Cap washer	8	AISI-304 stainless steel
19	Nut	4	AISI-304 stainless steel
20	Pneumatic connection plate	1	Polyamide + FG
21	Plate allen screw	2	AISI-304 stainless steel
22	Hexagonal Screw	2	AISI-304 stainless steel
23	Nut	2	AISI-304 stainless steel
24	Bushing	2	AISI-304 stainless steel
25	O-ring	2	N.B.R.



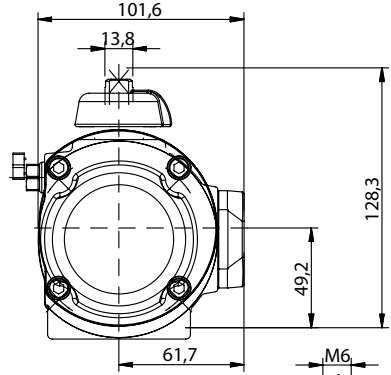
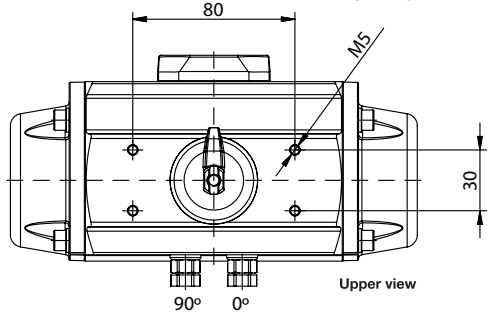
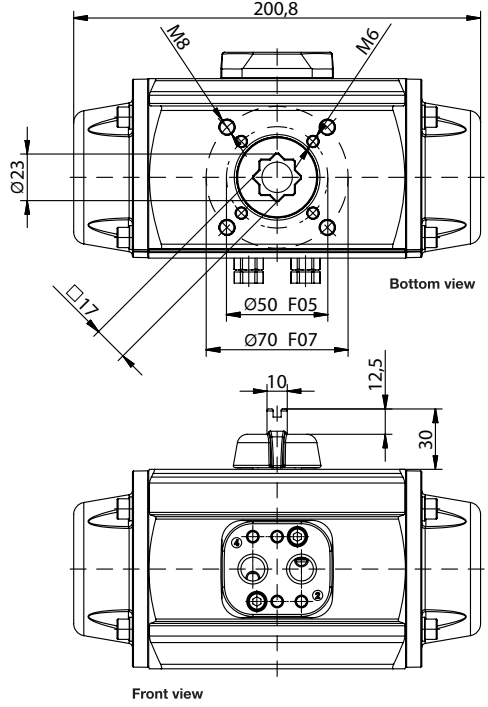
1. Covered with polyamide.
2. Covered by cataphoresis.
3. Covered by nickel - PTFE
4. Variable quantity, please see the Spring return torque chart.
5. Trivalent chromium passivation.
6. Covered with polyurethane.



Model	Cycle time in (sec)		Weight		Capacity in litres	
	To open	To close	Kg.	Lb.	To open	To close
A4	0.2	0,2	2.57	5.67	0,28	0.37
A4S	0,25	0,25	2.94	6.49	0,28	

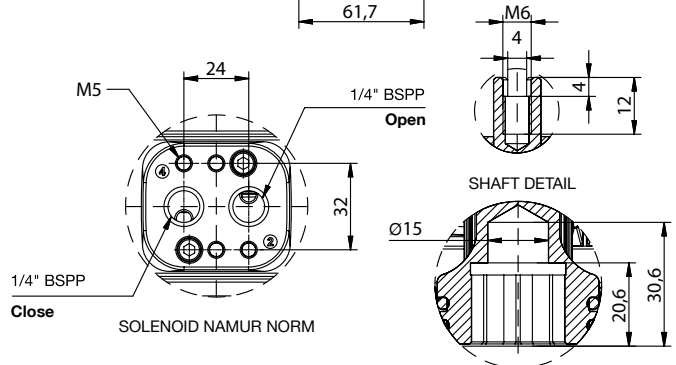
Cycle time w/o resistant torque at 6 bar.
Dimensions in mm.

To calculate the consumption, multiply the above figures by the real working pressure.



DOUBLE ACTING TORQUES

A4	Air pressure						
Bar	3	4	5	5,5	6	7	8
PSI	43,5	58	72,5	79,8	87	101,5	116
Nm	23.5	32.3	41.0	45.3	49.7	58.4	67.1
Lb.in	280	286	363	401	440	517	594



SPRING RETURN TORQUES

A4S	Spring Torques		Air torque at indicated pressure														bar
			3		4		5		5,5		6		7		8		
N	Initial	End	Initial	End	Initial	End	Initial	End	Initial	19,4	Initial	End	Initial	End	Initial	End	
6*	31.4	20.9					20.1	9.6	24.4	13.9	28.8	18.3	37.5	27.0	46.2	35.7	Nm
	277.9	185					177.9	85.0	216	123	254.9	162	331.9	239	408.9	316	Lb.in
5	27	17.4			14.9	5.3	23.6	14	27.9	18.36	32.3	22.7	41	31.4	49.7	41	Nm
	239	154			131.9	46.9	208.9	123.9	246.9	162	285.9	200.9	362.9	277.9	439.9	354.9	Lb.in
4	21.8	13.9	9.6	1.7	18.4	10.5	27.1	19.2	31.4	23.5	35.8	27.9	44.5	36.6	53.2	54.3	Nm
	192.9	123	85	15	162.9	92.9	239.9	169.9	277.9	208	316.9	246.9	393.9	323.9	470.9	400.9	Lb.in
3	18.3	11.3	12.2	5.2	21	14	29.7	22.7	34	27	38.4	31.4	47.1	40.1			Nm
	162	100	108	46	185.9	123.9	262.9	200.9	300.9	239	339.9	277.9	416.9	354.9			Lb.in
2	12.2	7.8	15.7	11.3	24.5	20.1	33.2	28.8	37.5	33.1	41.9	37.5					Nm
	108	69	139	100	216.8	177.9	293.8	254.9	331.9	293	370.8	331.9					Lb.in

N: Number of springs per side

* Standard number of springs



180° PNEUMATIC ACTUATOR - TECHNICAL DATA

DISASSEMBLY

No.	Description	Qty	Material
1	Cap screw	8	AISI-304 stainless steel
2	Duabel acting cap	2	Aluminium alloy (2) + (4)
3	Cap O-ring	2	N.B.R.
4	Piston	2	Aluminium alloy (2)
5	Cylinder	1	Aluminium alloy (2) + (1)
6	Washer	1	Polyamide 6
7	Spring clip	1	Stainless Steel (3)
8	Position indicator	1	Polyacetal
9	Piston guide	2	Polyacetal
10	Guide ring	2	Polyacetal + Mb
11	Piston O-ring	2	N.B.R.
12	Shaft O-ring	2	N.B.R.
13	Shaft O-ring	2	N.B.R.
14	Springs set	2	DIN-17223-c (2) (3)
15	Base plate (ISO-5211)	1	Polyamide + FG
16	Shaft	1	Polyamide + S.S. Insert
17	Drive adapter	1	AISI-316 stainless steel
18	Cap washer	8	AISI-304 stainless steel
19	Allen screw	2	AISI-304 stainless steel
20	Nut	4	AISI-304 stainless steel
21	Nut	4	AISI-304 stainless steel
22	Pneumatic connection plate	1	Polyamide + FG
23	Plate allen screw	2	AISI-304 stainless steel
24	Plate O-ring	2	N.B.R
25	Spring return cap	2	Aluminium alloy (2) + (4)

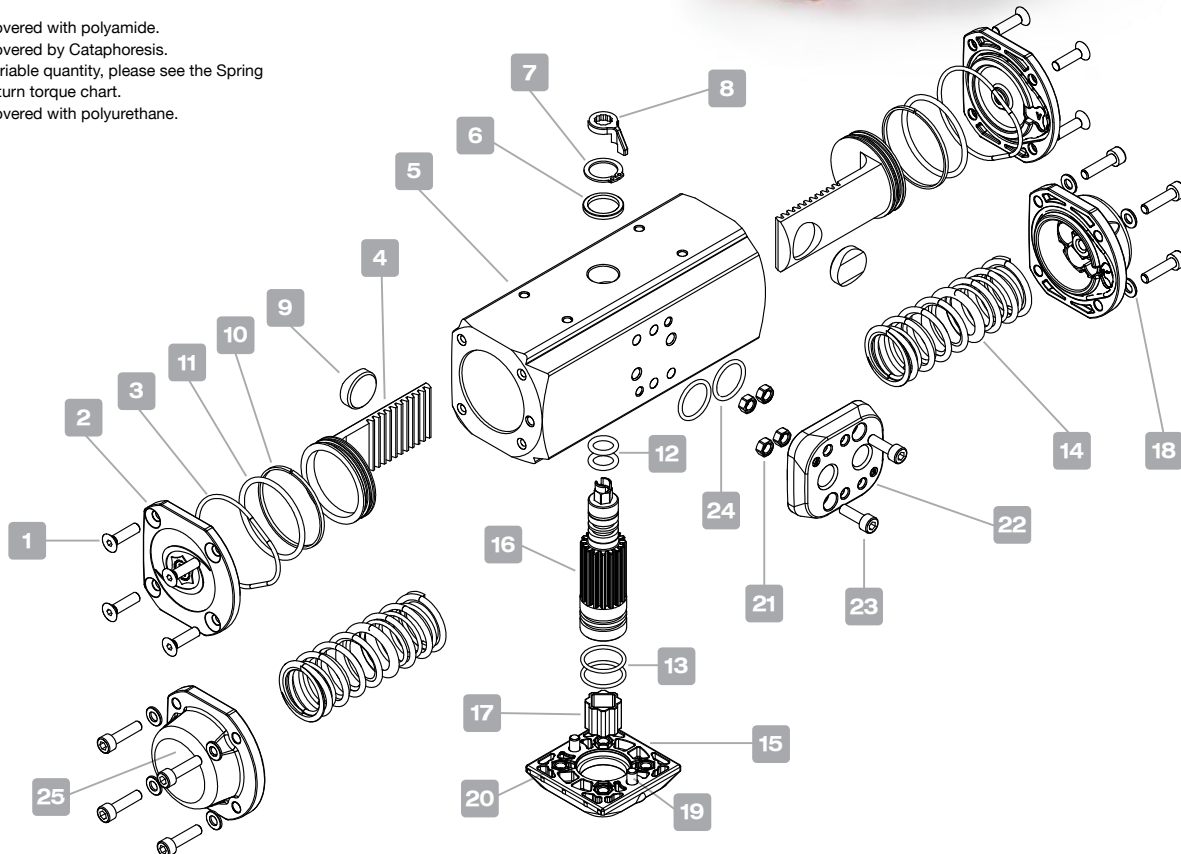
A2T: DOUBLE ACTING



A2ST: SPRING RETURN



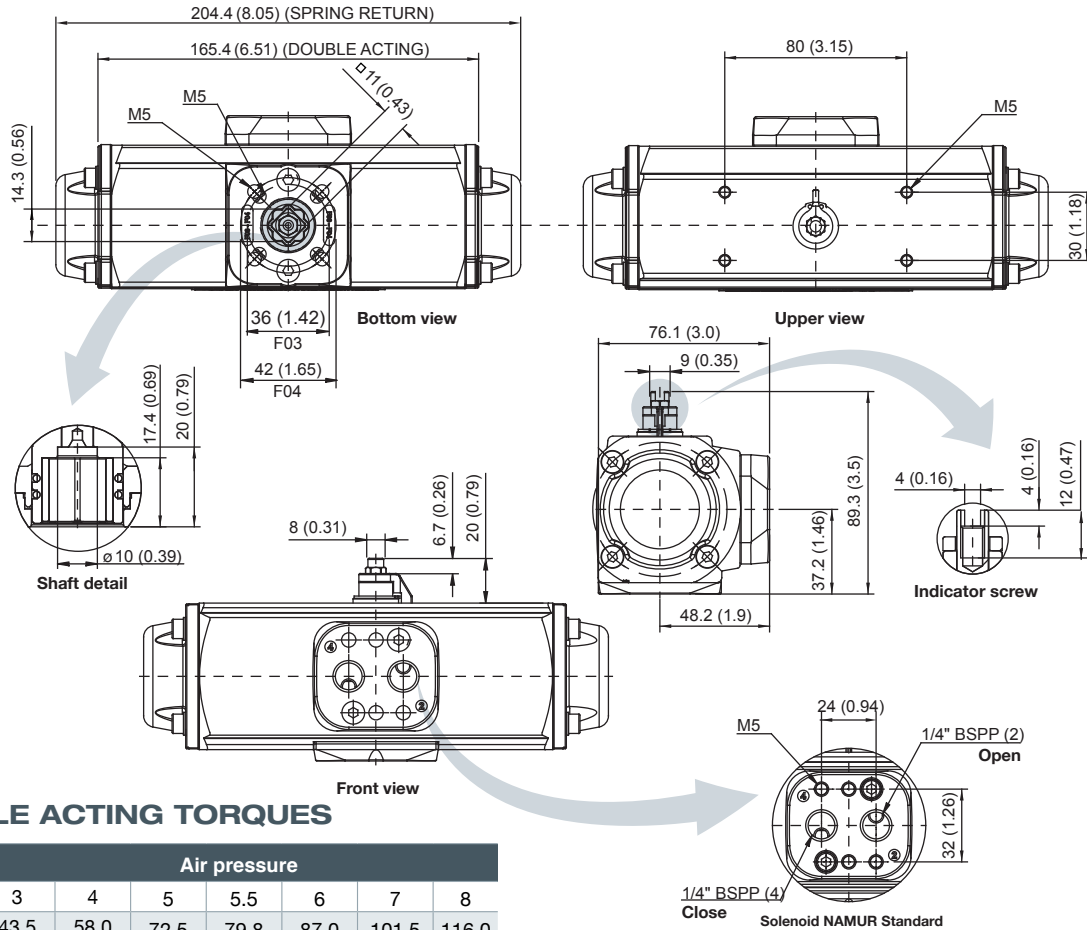
- (1) Covered with polyamide.
- (2) Covered by Cataphoresis.
- (3) Variable quantity, please see the Spring return torque chart.
- (4) Covered with polyurethane.



Model	Cycle time in (sec)		Weight		Capacity in litres	
	To open	To close	Kg.	Lb.	To open	To close
A2T	0.13	0.13	1.3	2.76	0.123	0.158
A2ST	0.20	0.20	1.5	3.31	0.123	

Cycle time w/o resistant torque at 6 bar.
Dimensions in mm.

To calculate the consumption, multiply the above figures by the real working pressure.



DOUBLE ACTING TORQUES

A2T	Air pressure						
Bar	3	4	5	5.5	6	7	8
PSI	43.5	58.0	72.5	79.8	87.0	101.5	116.0
Nm	7.9	11.3	14.1	15.5	17.0	19.8	22.9
Lb.in	69.9	100	124.8	137.2	150.5	175.2	202.7

SPRING RETURN TORQUES

A2ST	Spring Torques		Air torque at indicated pressure														
			3		4		5		5.5		6		7		8		bar
			43.5	58	72.5	79.8	87	101.5	116								p.s.i
N	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	Initial	End	
4*	9.7	6.1					8	4.4	9.4	5.8	10.9	7.3	13.7	10.1	16.8	13.2	Nm
	86.1	53.8					71	38.7	83.4	51.1	96.6	64.3	121.4	89.1	148.9	116.6	Lb.in
3	8.8	5.5			5.8	2.5	8.6	5.3	10	6.7	11.5	8.2	14.3	11	17.4	14.1	Nm
	78.1	48.4			51.6	21.9	76.4	46.7	88.8	59.1	102	72.4	126.8	97.2	154.3	124.6	Lb.in
2	6.7	4.3	3.6	1.2	7	4.6	9.8	7.4	11.2	8.8	12.7	10.3	15.5	13.1			Nm
	59	37.7	32.2	10.7	62.3	40.8	87.1	65.6	99.5	78	112.8	91.3	137.5	116			Lb.in
1	4.3	2.4	5.5	3.6	8.9	7	11.7	9.8	13.1	11.2	14.6	12.7					Nm
	37.7	21.5	48.4	32.2	78.5	62.3	103.3	87.1	115.7	99.5	129	112.8					Lb.in

N: Number of springs per side

* Standard number of springs



ACCESSORIES KITS



Standard 90 degrees. Aluminum pneumatic actuator, Operating Pressure: max. 8 bar (116 PSI). Standard working temperature -32°C to 90°C (-25.6°F to 194°F)



Inductive limit switch for visual and electric indication of actuator position voltage: 8V DC, Enclosure IP67



Electric actuator has been designed to control valve with 90 deg rotation 15W, IP66.
Option 1: 90-240V, 50/60HZ, 90-350V DC,
Option 2: 15-30V, 50/60HZ, 12-48V DC



ATEX mechanical limit switch for use in hazardous locations zone 2, temp range (-20°C to 60°C) (-4°F to 140°F)

(ATEX Inductive limit switch is available as an option).



Electro Mechanical limit switch for visual and electric indication of actuator position. Enclosure IP67, voltage: AC: 250V 16A, 125V 16A
DC: 250V 0.3A, 125V 0.6A, 30V 10V



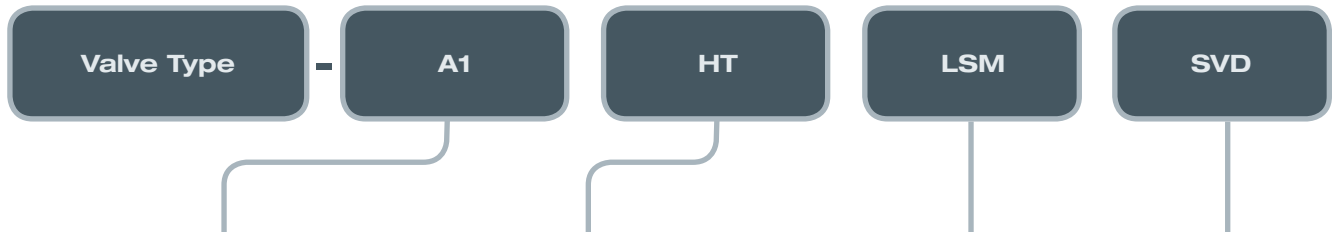
Solenoid valve, attached to the actuator to create an electro pneumatically actuated ball valve. DC 24V, 2.5W 4/2 Way for double acting and spring return. Enclosure IP65
Option for: 110VAC, 50HZ.
Option for: 3/2, 5/2 Way.

For more information please contact your local representative.



90 degree Stainless Steel pneumatic actuator, operating pressure max. 8 bar (116 PSI). Standard working temperature -32°C to 90°C (-25.6°F to 194°F)

Ordering information for Factory Assembled Accessories



Actuator Type	
Per Tables (1,2,3)	Aluminum Actuator*
6S1	St.St. Actuator**
E1 E1D	Electric Actuator**

Temp Range °C (°F)	
Blank	Standatd Actuator
HT	High Temperature Actuator
LT	Low Temperature Actuator

Limit Switch Type	
Blank	No Limit Switch
LSM	Electromechanical Limit Swith
LSI	Inductive Limit Switch
LSMAX	Electromechanical Limit Switch ATEX
LSIAX	Inductive Limit Switch ATEX

Solenoid Valve	
Blank	No Solenoid Valve
SVA	Solenoid Valve (AC)
SVD	Solenoid Valve (DC)

* Please refer to page 302, 303, 304.

** Please contact your Local Representative to fit Actuator to Valve.

Mounting Kits for field assembly of Limit Switches:

Actuator Type	Mounting Kit Description
A1 /A1S	Z-LS-MK-A1
A2 /A2S	Z-LS-MK-A2
A3 /A3S	Z-LS-MK-A3
A4 /A4S	Z-LS-MK-A4

- If special cleaning is required, LF / OC will be added in the end, and will refer to the Valve Only.
For example: **H - 800S-SS - L - 1/4 - A1-LSM - OC**
- In case of request for Actuated valve with LS and Solenoid Valve, The order is as follows: Valve, Actuator, LS, Solenoid
For example: **H - 800S-SS - L - 1/4 - A1-LSM-SVD**
- For double mounting actuators, please contact your local representative.

Ordering Information for Accessories Kits for field assembly

Aluminum actuators for filed assembly	Electro Mechanical Limit Switch	Inductive Limit Switch (Contains one inductive limit switch)	Electro Mechanical / Inductive Limit Switch ATEX	Stainless Steel Actuator*	Electric Actuator*	Solenoid Valve 4/2 Way Option: 5/2, 3/2 Way
See Tables (1,2,3)	Z - LSM	Z - LSI	Z - LSMAX Z - LSIAX	Z - 6S1	Z - E1A (AC) Z - E1D (DC)	Z - SVA (AC) Z - SVD (DC)

* For Stainless Steel Actuator or Electric Actuator Please contact your local representative.

Warning! For your safety

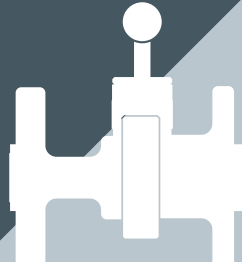
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HAM-LET HPA catalog Rev_06 January 2014

ASTAVA

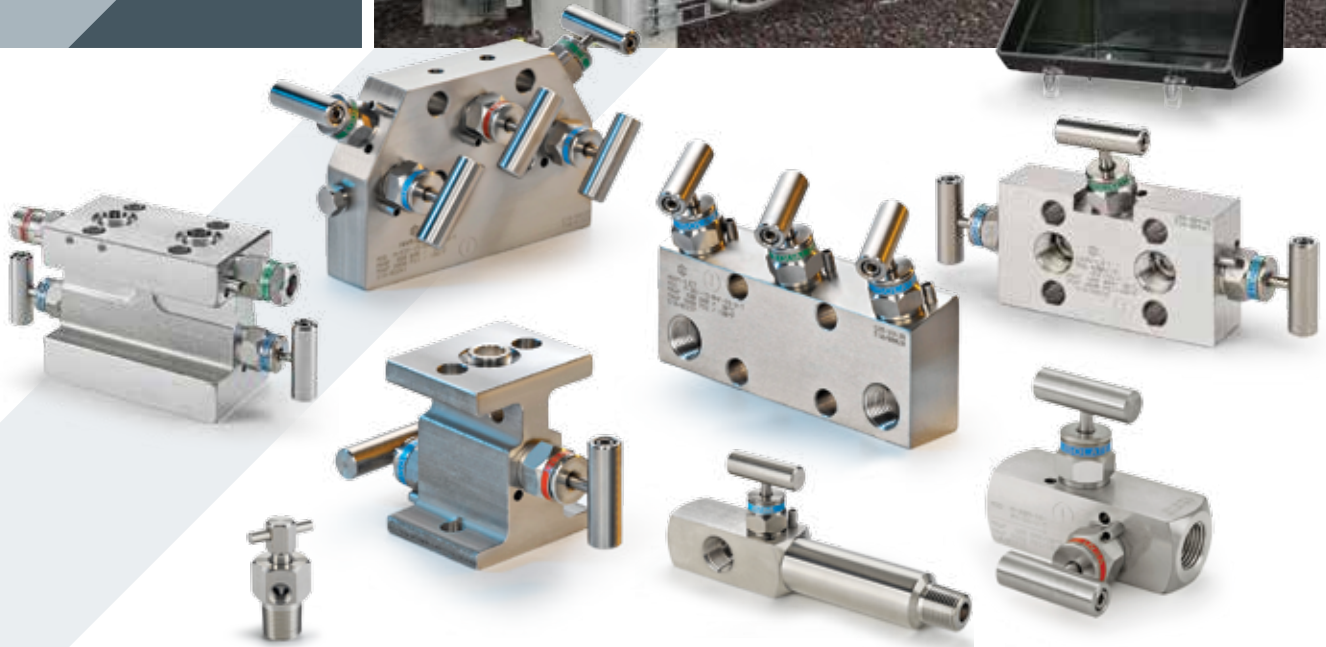
HAM-LET ASTAVA

MANIFOLDS | INSTRUMENT ENCLOSURES



1|2|3|4|5

WAY MANIFOLDS



MANIFOLDS

OVERVIEW

HAM-LET ASTAVA offers a broad line of 1,2,3,4,5 instrument manifolds, all are available in a wide range of materials and are fully compatible with the requirements of the Oil & Gas, Petro-Chemical and Chemical industries.

Beside this standard range of products, HAM-LET ASTAVA has over 3,500 different types of valves and manifolds available.

HAM-LET ASTAVA draws from a strong engineering heritage, as well as seasoned business management, we offer a broad range of products – valves and manifolds suitable for gas and liquid services - as well as full-service solutions, that include custom engineering, design and manufacture of Instrument enclosures, modular mounting systems, hook-ups and interlocking solutions for critical conditions and temperatures.

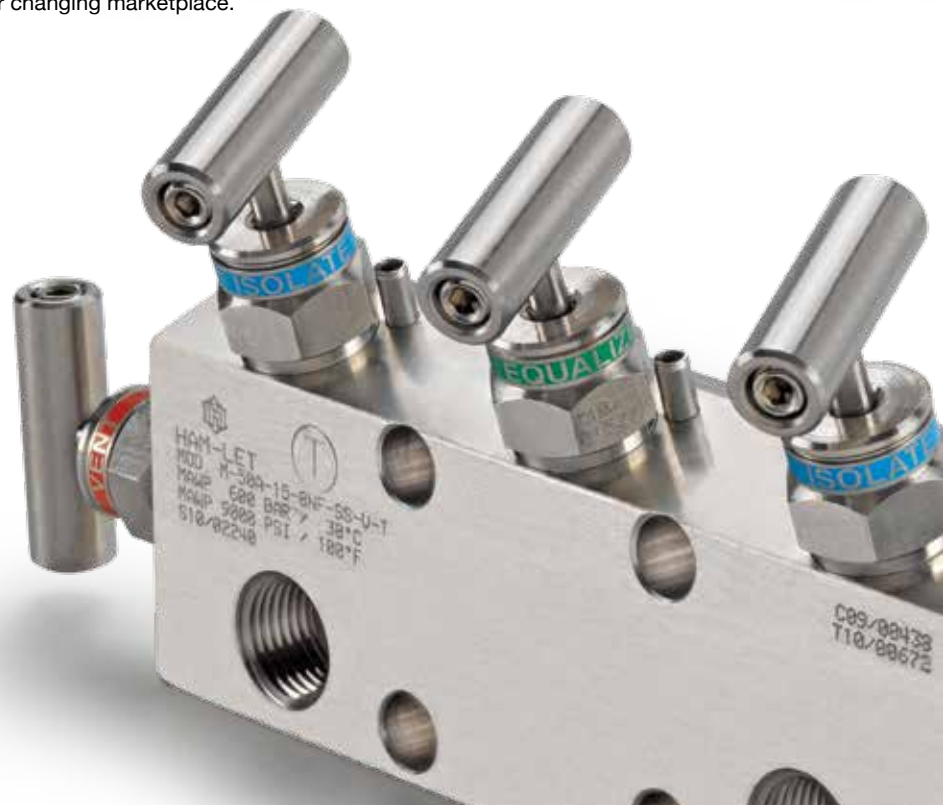
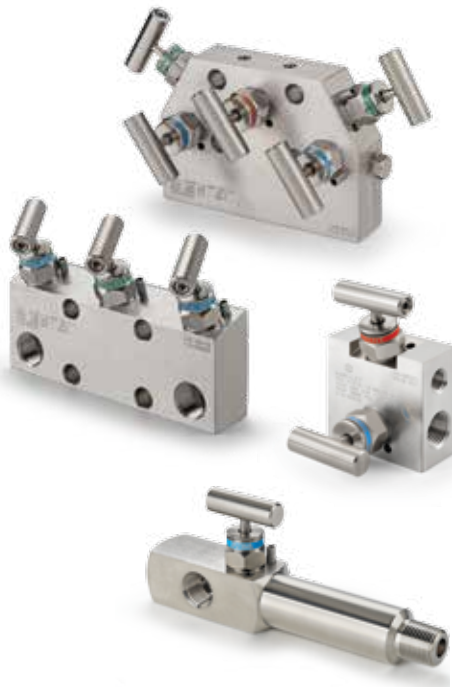


As a customer-focused company, HAM-LET ASTAVA provides high-quality products and engineering solutions that address our customers' business and technical requirements.

For the HAM-LET ASTAVA line, we can offer scalability to design:

- Choice of materials from AISI 316 to special alloy solutions for highly toxic areas
- Connections, Pressure and Temperature ratings varieties
- Bonnet assemblies offer different stem, seal and material selections
- Option for standard packing, O-Ring sealing and fugitive emissions bonnets
- Extensive range of valve configurations and flow schemes
- Fully equipped instrument enclosures

With over 50 years of designing and manufacturing reliable products and solutions, HAM-LET ASTAVA has acquired an outstanding reputation for quality and customer service. We are always inspired by the need to evolve and stay ahead of the ever changing marketplace.



MANIFOLD FEATURES AND BENEFITS

The following unique features of the HAM-LET ASTAVA Line of Instrument Manifolds enable tailoring our high-quality products to the exact requirement of the customer and application:

NACE MR-01-75 / MR-01-03

All Manifolds comply to NACE MR-01-75 / MR-01-03 as standard.

FULL TRACEABILITY

All products are fully traceable to its components.

WIDE VARIETY OF SEALING MATERIALS

PTFE; Grafoil®; Fluorocarbon FKM; NBR; EPDM; Silicon; perfluorelastomer – provides wide coverage of applications.

CERAMIC STEM BALL TIP Al_2O_3

Superior hardness prevents deformation of the sealing tip and wear, significantly increasing the lifetime of the product for isolation purposes.



BONNET SELECTIONS

O-ring stem-seal bonnet

1. No packing adjustment
2. Extremely low operating torque
3. Compact design
4. Long life cycle
5. Sealing below stem thread
6. Metal-to-Metal bonnet option

Packing stem-seal bonnet

1. Wide chemical compatibility range
2. High temperature option (Grafoil®)
3. Low operating torque
4. Sealing below stem thread

STEM MATERIAL

ST. ST. 316 Ti with chromium carbide diffusion coating

1. Long life cycle
2. Prevent galling

Features

- Certified for ISO 15848-1:2006(E), (With PEEK or Polyimide seals)
- Blowout-proof stem
- Integrated back seat on stem for a secondary seal in the fully opened position
- Safety stop pin – prevents the bonnet from detaching the body due to vibration
- Stem seals below stem threads
- A choice of O-ring materials
- Oxygen clean per ASTM G-93 as an option
- 100% Factory Tested Compliance with MSS-SP-99
- Direct mount flange design per IEC61518 / DIN19213 (MAWP 6000 psig)
- Working pressure range up to 690 bar (10,000 psig)
- Working Temperature range up to 550°C (1022°F)

BONNET AND STEM CONCEPT

The special sealing design applied in all HAM-LET ASTAVA Instrument Manifolds features a non-rotating ceramic ball tip.

The chemical composition of a ceramic ball tip is superior in hardness and functionality to a metal ball tip, eliminating sealing tip deformation and significantly increasing the life time of the product.

The stem threads are rolled and an integrated back seat design is applied to the packing type of bonnet. Applying a Stainless Steel 316 Ti stem with a chromium carbide diffusion coating results in maximum operation cycles and minimal risk of stem galling. Both packing and O-ring bonnets are designed with sealing below stem threads for maximum protection of the stem threads.

For maximum safety, the bonnet design prevents stem blowout, and a locking pin prevents unintentional disassembling of the bonnet.

HAM-LET'S VALVE BONNETS HAVE COLOR CODED RING LABELS FOR SERVICE IDENTIFICATION:

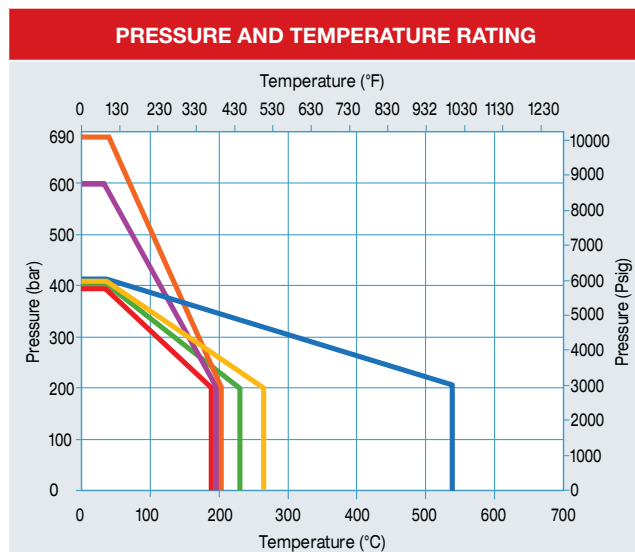


Red:
Vent Valves

Blue:
Isolate Valves

Green:
Equalize Valves

For severe-service applications, HAM-LET ASTAVA Manifolds can be configured with a metal-to-metal seal below the bonnet thread. A dust-ring is attached to the bonnet thread or tack-weld on the locking pin for extreme vibrating conditions.



HANDLE OPTIONS

The standard handle of the HAM-LET ASTAVA Line of Instrument Manifolds is a Stainless Steel T-bar. For high pressure applications of 10,000 psi (690 bar) an extended T-bar or hand wheel can be applied. Anti-tamper bonnet and key* lock options assure that the manifold is operated by qualified personnel only.

*Not included in order of Anti-Tampered bonnet manifold. This key should be separately ordered.

CLEANING

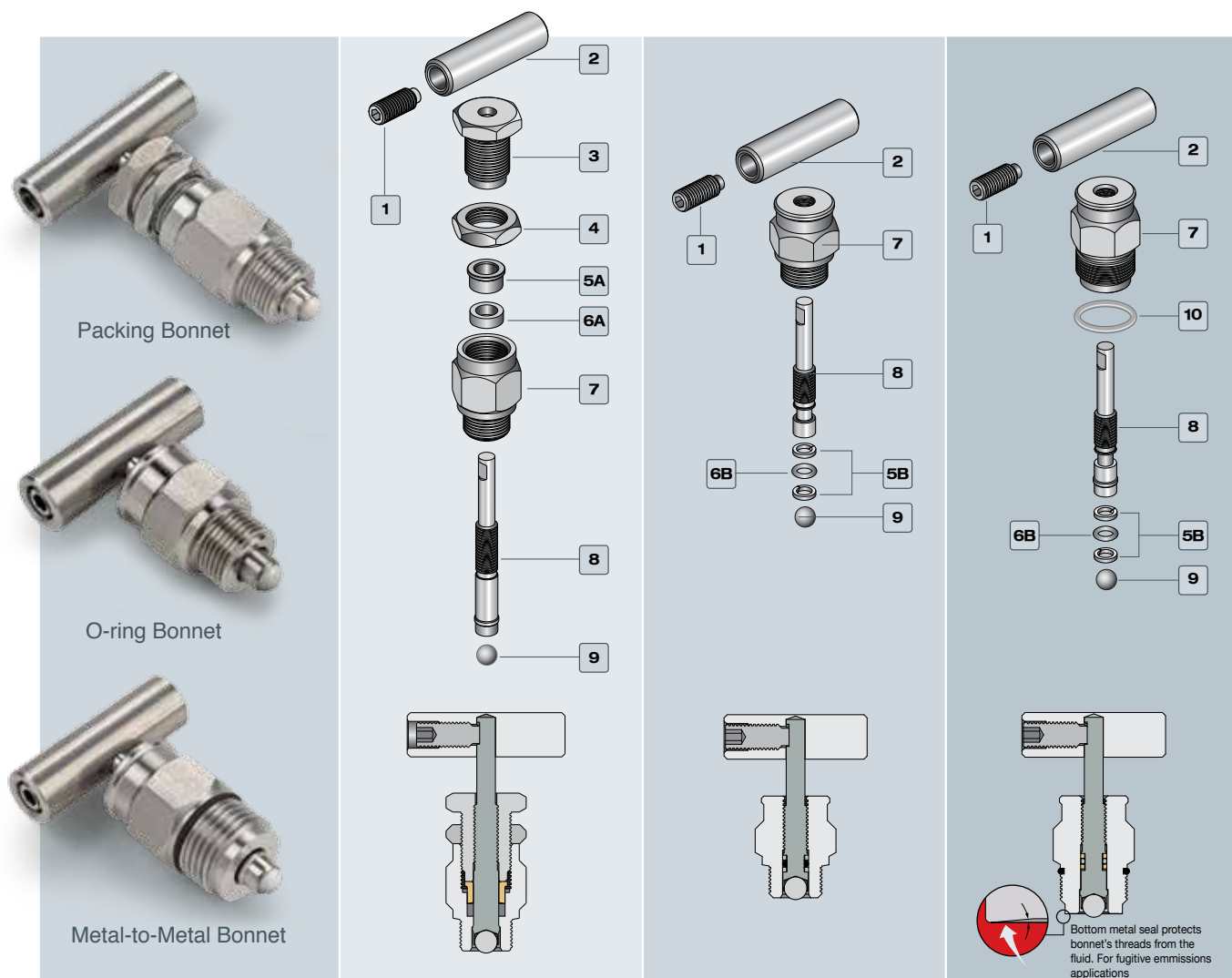
All HAM-LET instrument manifolds are cleaned in accordance with ASTAVA cleaning procedure WIQ-016. Oxygen clean is available in accordance with ASTM G-93.

TESTING

All HAM-LET instrument manifolds are factory tested with Nitrogen at 800 psig (55 bar) based on MSS-SP-99. Seats have a maximum allowable leak rate of 0.1 std cm³ /min. The Hydrostatic and Helium leak test is available upon request.

Packing Material	Material	Temperature Range
	Grafoi®	Down to -60°C (-76°F)
	PTFE	Down to -60°C (-76°F)
	PEEK	Down to -60°C (-76°F)
	Polyimide	Down to -10°C (14°F)
O-Ring Material	Material	Temperature Range
	Fluorocarbon FKM	Down to -20°C (-4°F)
	NBR	Down to -34°C (-29°F)
	Perfluor	Down to -40°C (-40°F)
	EPDM	Down to -45°C (-49°F)
	10,000 psi (690 bar)	Available upon request

MATERIAL OF CONSTRUCTION

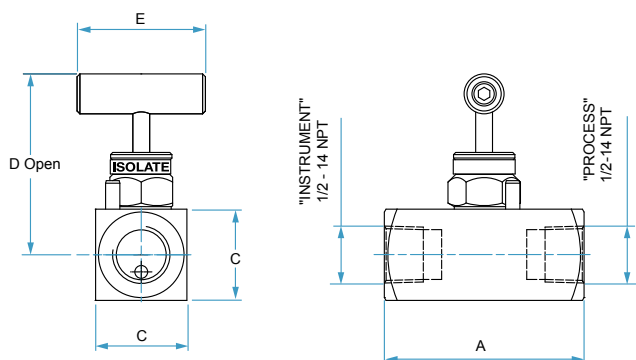


				Packing Bonnet		O-ring Bonnet		Metal-to-Metal Bonnet	
No	Part	Qty.	Material	Qty.	Material	Qty.	Material	Qty.	Material
1	Set Screw	1	St.St. 304	1	St.St. 304	1	St.St. 304	1	St.St. 304
2	Bar Handle	1	St.St. 316L	1	St.St. 316L	1	St.St. 316L	1	St.St. 316L
3	Gland	1	St.St. 316L	-	-	-	-	-	-
4	Locking Nut	1	St.St. 316L	-	-	-	-	-	-
5A	Pressure ring	1	St.St. 316L	-	-	-	-	-	-
5B	Back-up ring	-	-	2	Virgin PTFE	2	Virgin PTFE	-	-
6A	Stem Packing	1	Virgin PTFE	-	-	-	-	-	-
6B	Stem O-ring	-	-	1	Fluorocarbon FKM	1	Fluorocarbon FKM	1	Fluorocarbon FKM
7	Bonnet	1	St.St. 316L	1	St.St. 316L	1	St.St. 316L	1	St.St. 316L
8	Stem	1	St.St. 316Ti Chrome-Carbide diffusion coated	1	St.St. 316Ti Chrome-Carbide diffusion coated	1	St.St. 316Ti Chrome-Carbide diffusion coated	1	St.St. 316Ti Chrome-Carbide diffusion coated
9	Ball	1	Ceramic (Al ₂ O ₃)	1	Ceramic (Al ₂ O ₃)	1	Ceramic (Al ₂ O ₃)	1	Ceramic (Al ₂ O ₃)
10	Dust Protector	-	-	-	-	-	-	1	Fluorocarbon FKM

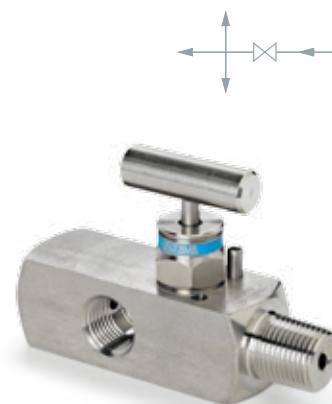
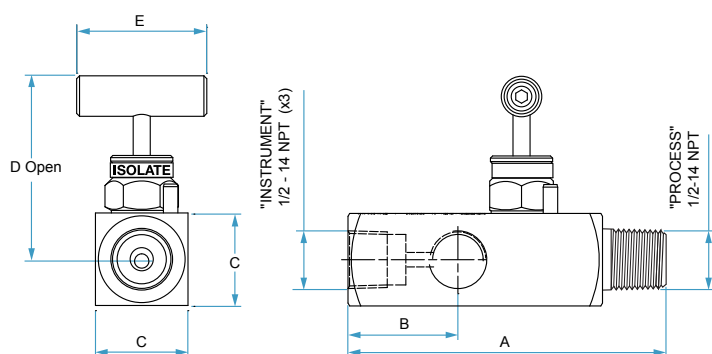
STANDARD CONFIGURATION DIMENSIONS 1 WAY MANIFOLDS

Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions									
	Process	Instrument	Vent / Bleed		A		B		C		D		E	
					mm	in	mm	in	mm	in	mm	in	mm	in
Remote Mount	1/2" FNPT	1/2" FNPT	-	M-10S-10-8N-SS-V-T	70.0	2.76	-	-	32.0	1.26	63.0	2.48	45.0	1.77
	1/2" FNPT	1/2" FNPT	-	M-10S-10-8N-SS-TT	70.0	2.76	-	-	32.0	1.26	79.0	3.11	50.0	1.97
	1/2" MNPT	1/2" FNPT	1/2" FNPT	M-11S-85-8N-SS-V-T	110.0	4.33	38.0	1.50	32.0	1.26	63.0	2.48	45.0	1.77
	1/2" MNPT	1/2" FNPT	1/2" FNPT	M-11S-85-8N-SS-TT	110.0	4.33	38.0	1.50	32.0	1.26	79.0	3.11	50.0	1.97

NEEDLE VALVE M-10S-10-8N-SS-V-T



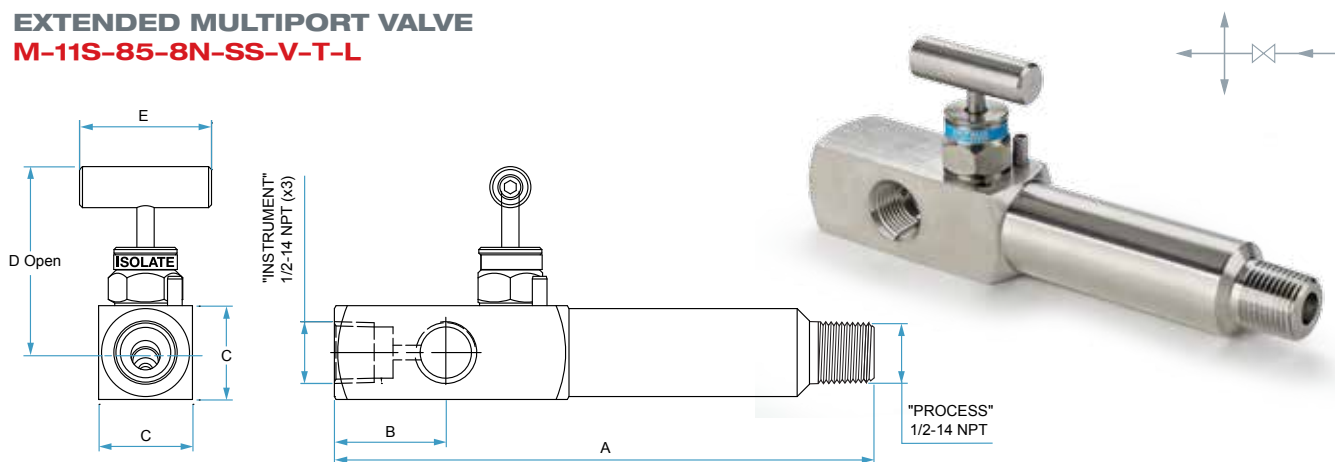
MULTIPOINT VALVE M-11S-85-8N-SS-V-T



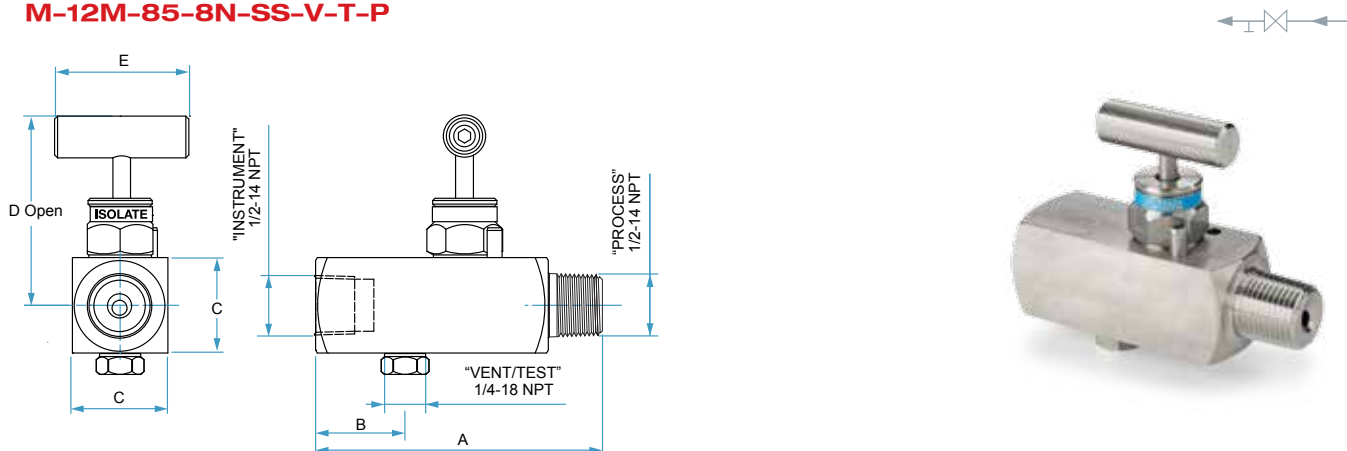
STANDARD CONFIGURATION DIMENSIONS 1 WAY MANIFOLDS

Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions									
					A		B		C		D		E	
	Process	Instrument	Vent / Bleed		mm	in	mm	in	mm	in	mm	in	mm	in
Remote Mount	1/2" MNPT	1/2" FNPT	1/2" FNPT	M-11S-85-8N-SS-V-T-L	184.0	7.24	38.0	1.50	32.0	1.26	63.0	2.48	45.0	1.77
	1/2" MNPT	1/2" FNPT	1/2" FNPT	M-11S-85-8N-SS-T-TL	184.0	7.24	38.0	1.50	32.0	1.26	79.0	3.11	50.0	1.97
	1/2" MNPT	1/2" FNPT	1/4" FNPT	M-12M-85-8N-SS-V-T-P	100.0	3.54	30.0	1.18	32.0	1.26	63.0	2.48	45.0	1.77
	1/2" MNPT	1/2" FNPT	1/4" FNPT	M-12M-85-8N-SS-T-T-P	100.0	3.54	30.0	1.18	32.0	1.26	79.0	3.11	50.0	1.97

EXTENDED MULTI-PORT VALVE M-11S-85-8N-SS-V-T-L



GAUGE VALVE M-12M-85-8N-SS-V-T-P



ORDERING INFORMATION 1 WAY MANIFOLDS

Family		End Connection		Type End Connection		Body Material		Packing		Option	
M-1	1 Way Manifold	00	Female Integral Let-Lok®	N	NPT	SS	SS 316	T	PTFE	OC	Oxygen Clean
Flow Scheme		10	Female to Female	G	BSPP	M	Alloy 400	G	Grafoil®	HYD	Hydrostatic pressure test
0S	Straight	80	Male to Male	R	BSPT	D	Duplex 1.4462	PK	PEEK	K	10,000 psi (690 bar)
1S	Straight	85	Male to Female	L	Female integral Let-Lok®	HC	Alloy C-276	PI	Polyimide	L	Extended Inlet
2M	Angle Square	75	Female to Male			T	Titanium	V	Fluorocarbon FKM	B	Bleed valve
(See table A)		Size				SD	SuperDuplex	EP	EPDM	P	Blind plug
		4	1/4"			A6	Alloy 625	BU	NBR		
		6	3/8"			A8	Alloy 825	KZ	Perfluorelastomer		
		8	1/2"					Handle			
								T	T bar		
								AT	Anti Tamper*		
								LD	Locking device*		

TABLE A: FLOW SCHEMATIC AND VALVE POSITION

Designator	Flow Schematic	Sketch
0S		
1S		
2M		

Warning!
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

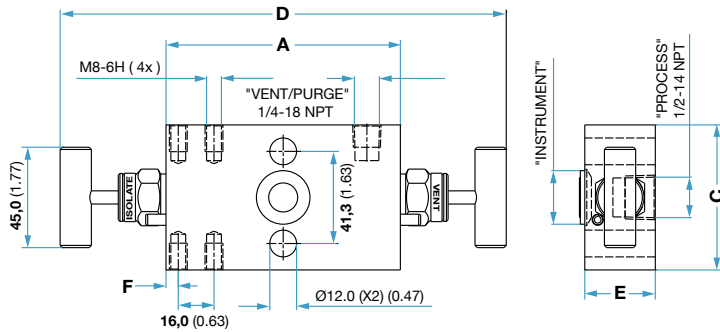
* Key should be separately ordered

STANDARD CONFIGURATION DIMENSIONS 2 WAY DIRECT MOUNT

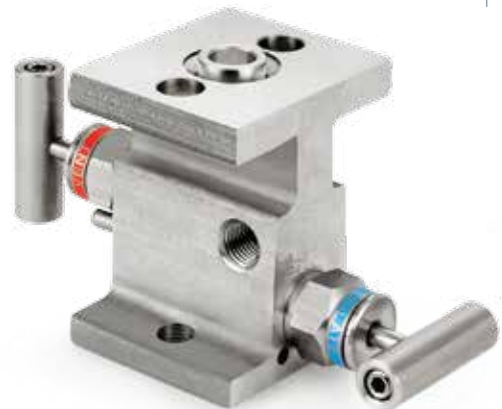
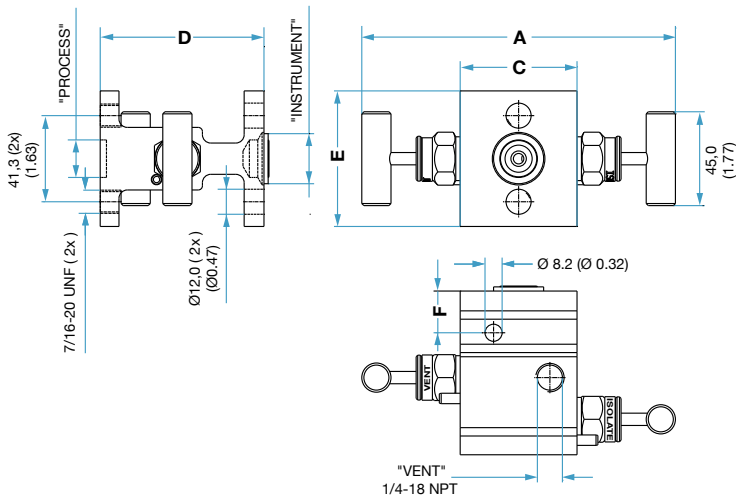
Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
	Process	Instrument	Vent / Bleed		A		B		C		D		E		F	
					mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Direct Mount	1/2" FNPT	*Flange	1/4" FNPT	M-20S-15-8NF-SS-V-T	85	3.35	-	-	65.0	2.56	182	7.17	32.0	1.26	5.0	0.20
	*Flange	*Flange	1/4" FNPT	M-20H-90-FF-SS-V-T	153	6.02	-	-	56.0	2.20	78	3.07	65.0	2.56	20.0	0.79

* Flange Standard per IEC 61518-A

M-20S-15-8NF-SS-V-T



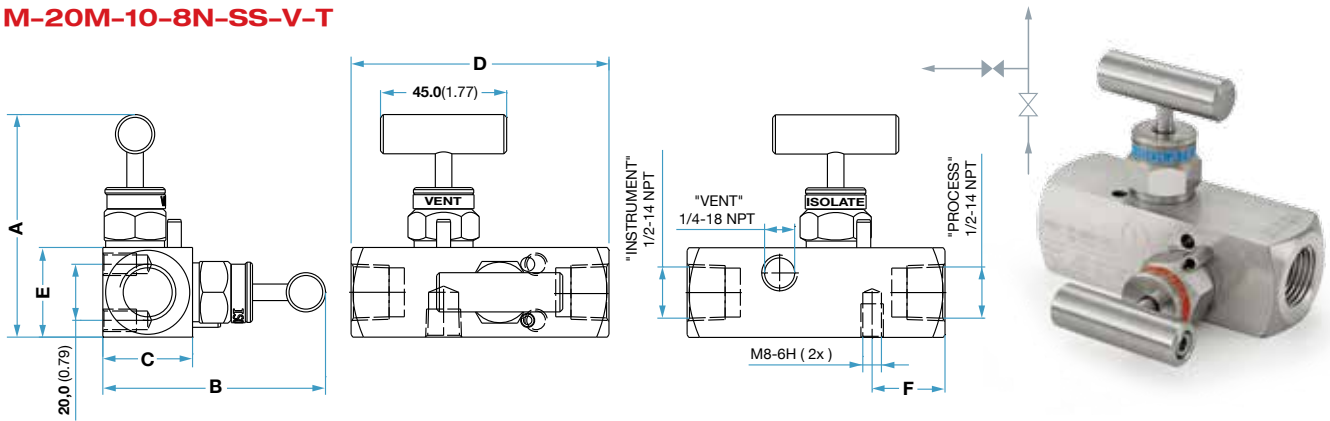
M-20H-90-FF-SS-V-T



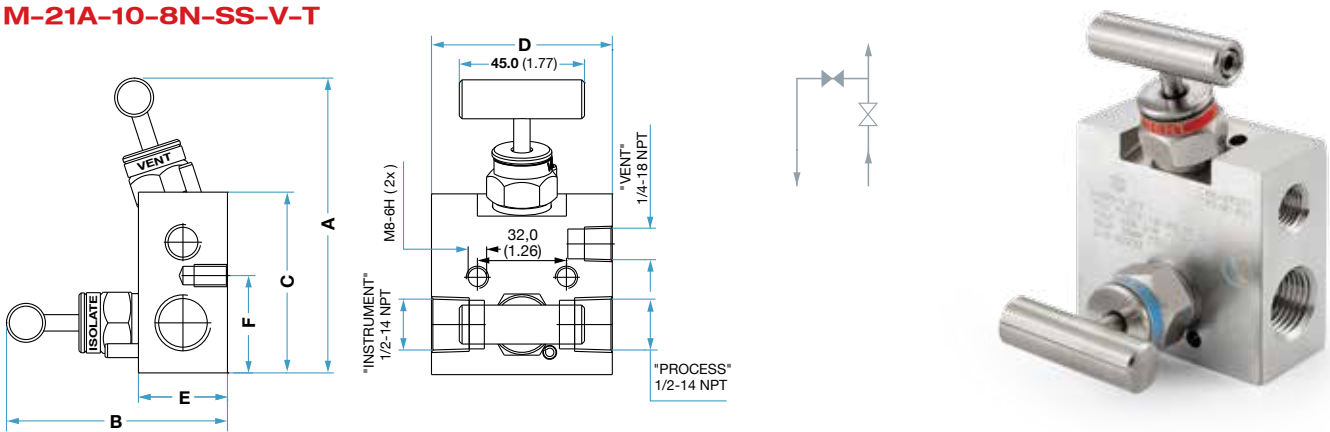
STANDARD CONFIGURATION DIMENSIONS 2 WAY REMOTE MOUNT

Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
	Process	Instrument	Vent / Bleed		A		B		C		D		E		F	
					mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Remote Mount	1/2" FNPT	1/2" FNPT	1/4" FNPT	M-20M-10-8N-SS-V-T	79	3.11	79.0	3.11	32.0	1.26	92.0	3.62	32	1.26	26	1.02
	1/2" FNPT	1/2" FNPT	1/4" FNPT	M-21A-10-8N-SS-V-T	107	4.21	79.4	3.13	65.0	2.56	65.0	2.56	32	1.26	35	1.38
	1/2" FNPT	1/2" FNPT	1/4" FNPT	M-21S-10-8N-SS-V-T	156	6.14	-	-	65.0	2.56	59.0	2.32	32	1.26	18	0.71

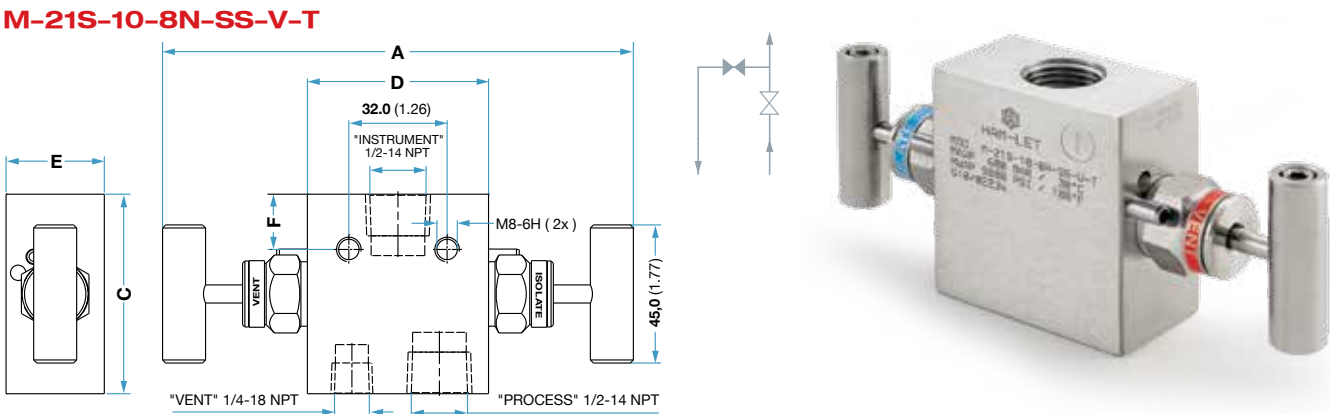
M-20M-10-8N-SS-V-T



M-21A-10-8N-SS-V-T



M-21S-10-8N-SS-V-T



ORDERING INFORMATION 2 WAY MANIFOLDS

Family		End Connection		Type End Connection		Body Material		Packing		Option	
M-2	2 Way Manifold	00	Female integral Let-Lok*	FF	Flange*	SS	SS 316	T	PTFE	OC	Oxygen Clean
Flow Scheme 0M Angle Square 0I In-line 0H H-Type 0S Straight 1S Straight 1A Angle Flat		10	Female to Female	N	NPT	M	Alloy 400	G	Grafoil®	HYD	Hydrostatic pressure test
		80	Male to Male*	G	BSPP	D	Duplex 1.4462	PK	PEEK	K	10,000 psi (690 bar)
		85	Male to Female*	R	BSPT	HC	Alloy C-276	PI	Polyimide	V	Vent port 1/2"
		15	Female to Flange	NF	NPT to Flange*	T	Titanium	V	Fluorocarbon FKM	B	Bleed valve
		90	Flange to Flange	RF	BSPT to Flange*	SD	SuperDuplex	EP	EPDM	P	Blind plug
				* M-20M & M-20I Only		GF	BSPP to Flange*			BU	NBR
		Size		L	Female integral Let-Lok*			KZ	Perfluorelastomer		
		4	1/4"	* Flange Standard per IEC 61518-A							
		6	3/8"								
		8	1/2"								
								Handle			
								T	T bar		
								AT	Anti Tamper*		
								LD	Locking device*		

(See table A)

TABLE A: FLOW SCHEMATIC AND VALVE POSITION

Designator	Flow Schematic	Sketch
0M		
0I		
0H		
0S		
1S		
1A		

* Key should be separately ordered

Warning!

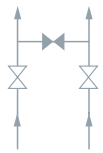
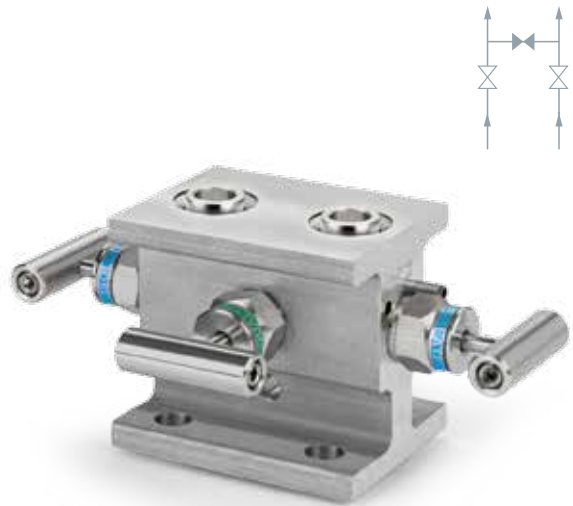
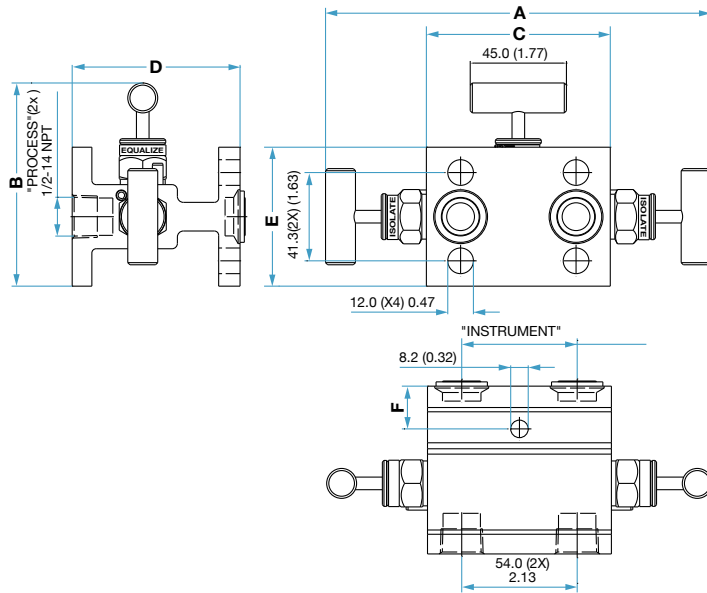
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STANDARD CONFIGURATION DIMENSIONS 3 WAY DIRECT MOUNT

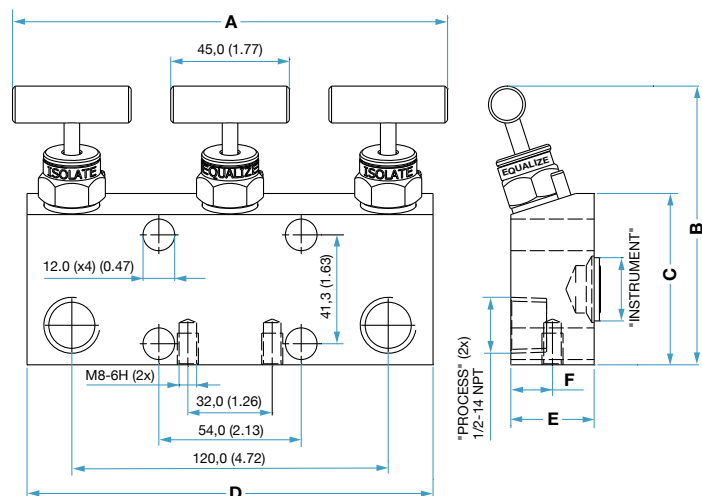
Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
					A		B		C		D		E		F	
	Process	Instrument	Vent / Bleed		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Direct Mount	1/2" FNPT	*Flange	-	M-30H-15-8NF-SS-V-T	181.0	7.13	95.0	3.74	86.0	3.39	79.0	3.11	66.0	2.60	20.0	0.79
	1/2" FNPT	*Flange	-	M-30I-15-8NF-SS-V-T	161.0	6.34	107.0	4.21	65.0	2.56	150.0	5.91	32.0	1.26	16.0	0.63

M-30H-15-8NF-SS-V-T

* Flange Standard per IEC 61518-A



M-30I-15-8NF-SS-V-T

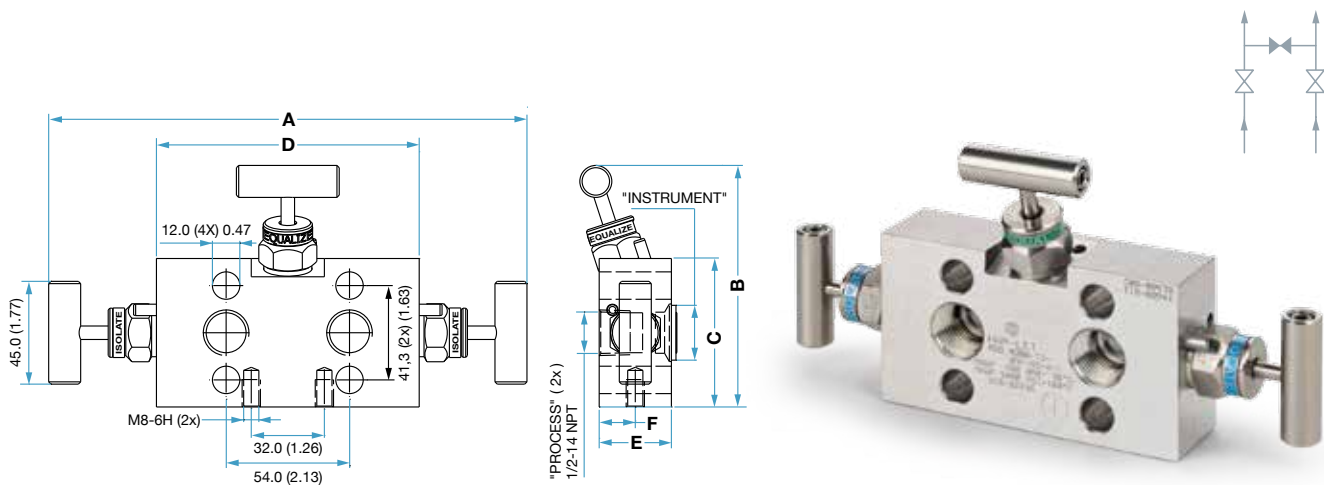


STANDARD CONFIGURATION DIMENSIONS 3 WAY DIRECT MOUNT

Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
					A		B		C		D		E		F	
	Process	Instrument	Vent / Bleed		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Direct Mount	1/2" FNPT	*Flange	-	M-30A-15-8NF-SS-V-T	210.0	8.27	106.0	4.17	65.0	2.56	115.0	4.53	32.0	1.26	16.0	0.63
	*Flange	*Flange	-	M-30H-90-FF-SS-V-T	181.0	7.13	95.0	3.74	86.0	3.39	79.0	3.11	66.0	2.60	-	-

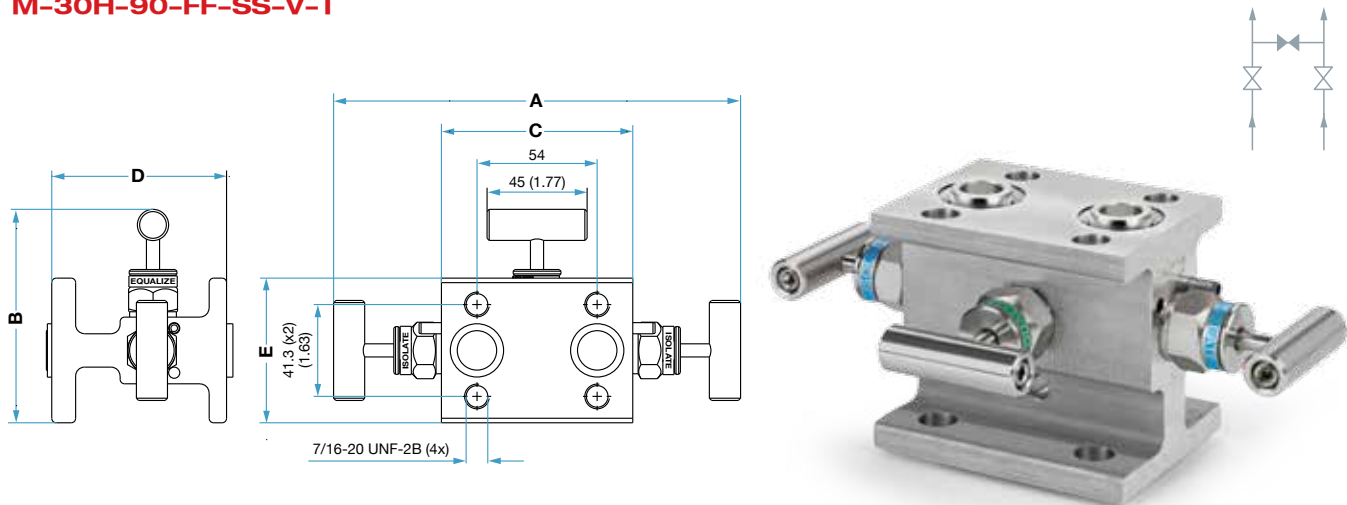
* Flange Standard per IEC 61518-A

M-30A-15-8NF-SS-V-T



* Optimal vent / test ports

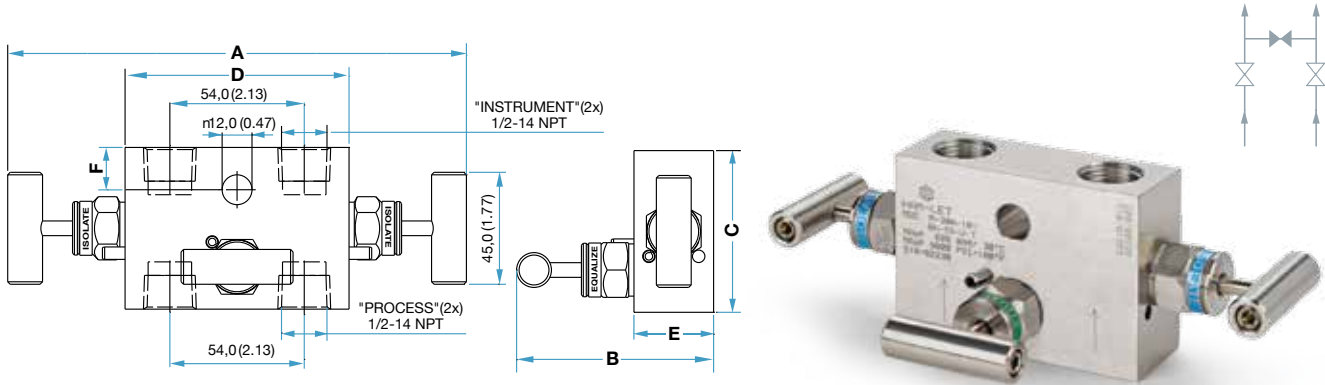
M-30H-90-FF-SS-V-T



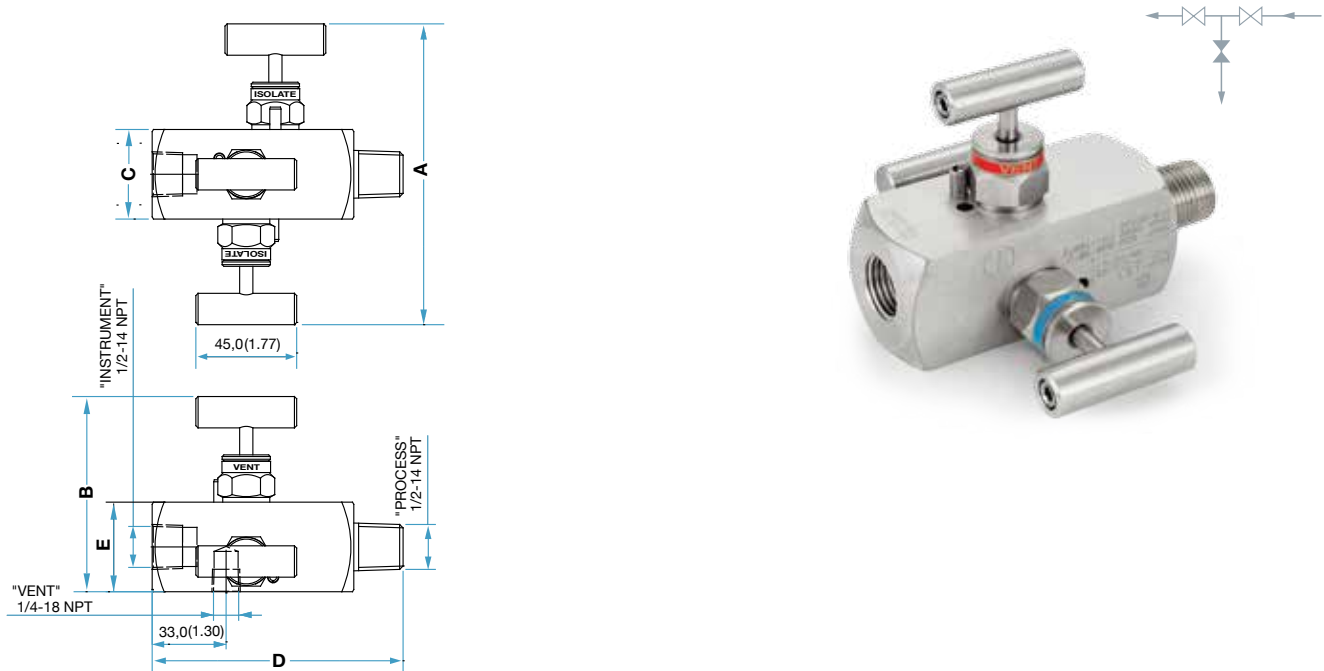
STANDARD CONFIGURATION DIMENSIONS 3 WAY REMOTE MOUNT

Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
					A		B		C		D		E		F	
	Process	Instrument	Vent / Bleed		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Remote Mount	1/2" FNPT	1/2" FNPT	-	M30S-10-8N-SS-V-T	185.0	7.28	79.0	3.11	65.0	2.56	90.0	3.54	32.0	1.26	17.0	0.67
	1/2" MNPT	1/2" FNPT	1/4" FNPT	M32M-85-8N-SS-V-T	135.0	5.31	87.0	3.43	40.0	1.57	112.0	4.41	40.0	1.57	-	-

M-30S-10-8N-SS-V-T



M-32M-85-8N-SS-V-T-K



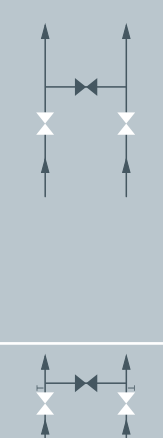
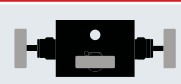
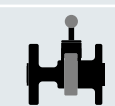
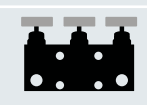
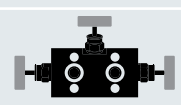
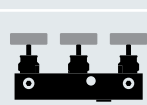

ORDERING INFORMATION

3 WAY MANIFOLDS

Family		End Connection		Type End Connection		Body Material		Packing		Option	
M-3	3 Way Manifold	00	Female integral Let-Lok®	FF	Flange*	SS	SS 316	T	PTFE	OC	Oxygen Clean
Flow Scheme		10	Female to Female	N	NPT	M	Alloy 400	G	Grafoil®	HYD	Hydrostatic pressure test
		80	Male to Male*	G	BSPP	D	Duplex 1.4462	PK	PEEK	K	10,000 psi (690 bar)
		85	Male to Female*	R	BSPT	HC	Alloy C-276	PI	Polyimide	V	Vent port 1/2"
		15	Female to Flange	NF	NPT to Flange*	T	Titanium	V	Fluorocarbon FKM	P	Blind plug
		90	Flange to Flange	RF	BSPT to Flange*	SD	SuperDuplex	EP	EPDM	Handle	
Size		GF	BSPP to Flange*	BU	NBR	T	T bar				
4	1/4"	L	Female integral Let-Lok*	KZ	Perfluorelastomer	AT	Anti Tamper*				
Flow Scheme		0A	Angle Flat	* M-32M Only							
		0S	Straight								
		0I	In-line								
0H	H- Type	* Flange Standard per IEC 61518-A									
1I	In - line										
2M	Angle Square										
(See table A)											

* Key should be separately ordered

TABLE A: FLOW SCHEMATIC AND VALVE POSITION

Designator	Flow Schematic	Valves Position	Sketch
0S		S	
0H		H	
0I		I	
0A		A	
1I		I	
2M	M		

Warning!

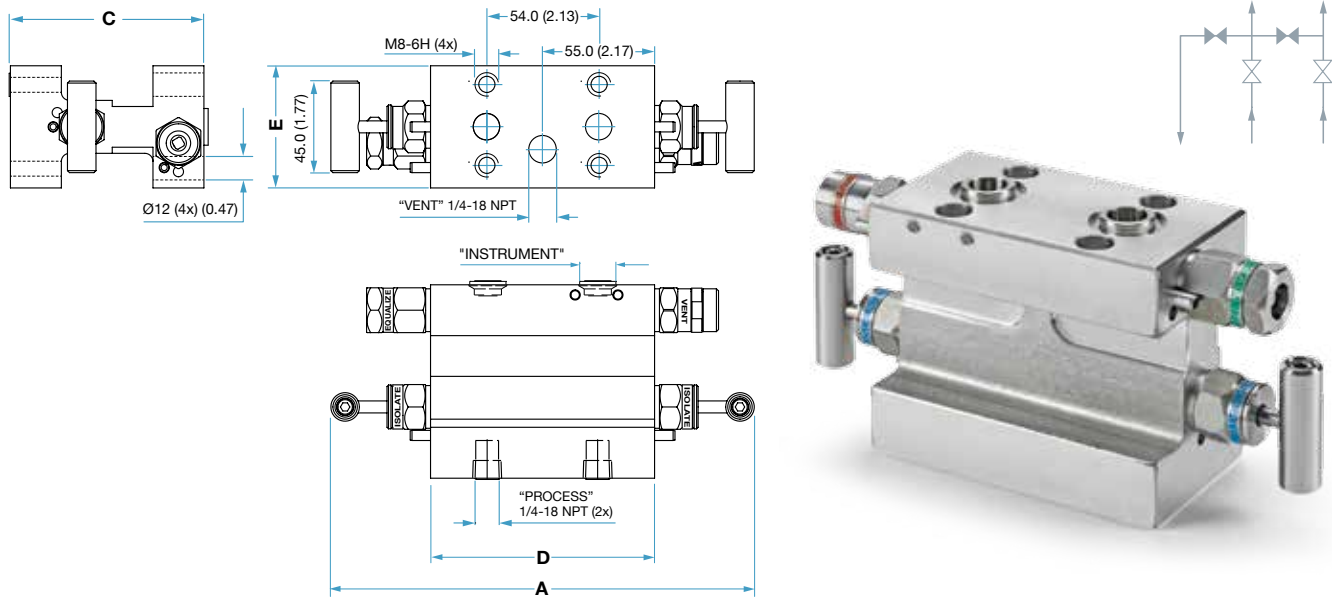
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STANDARD CONFIGURATION DIMENSIONS 4 WAY REMOTE MOUNT

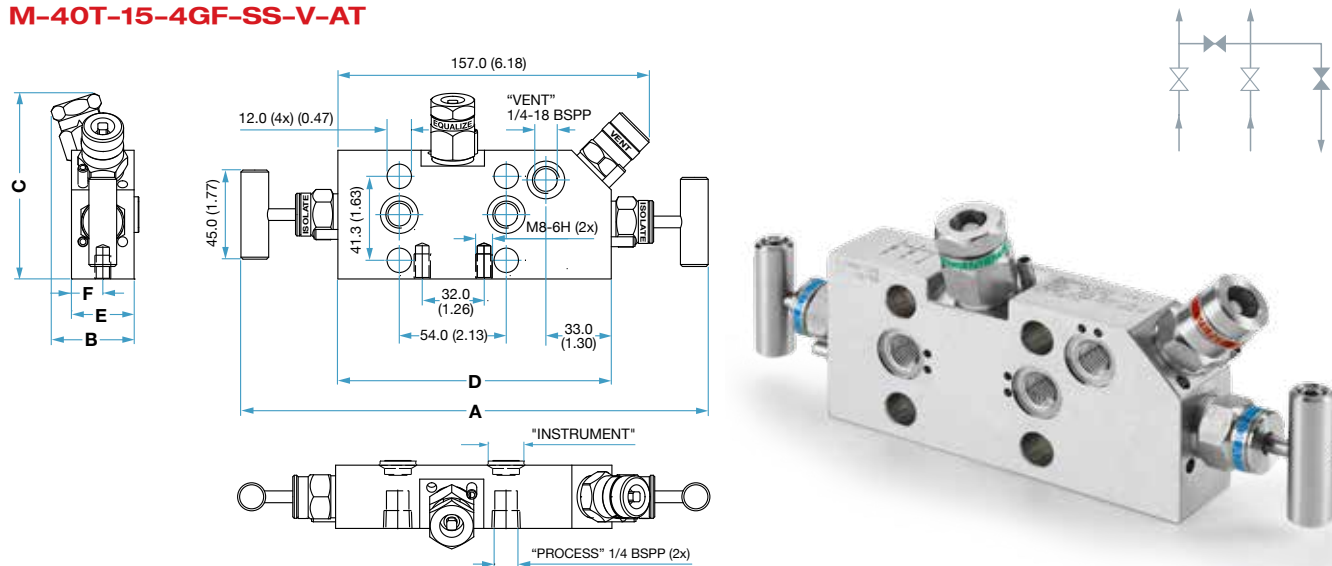
Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
					A		B		C		D		E		F	
	Process	Instrument	Vent / Bleed		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Direct Mount	1/4" FNPT	*Flange	1/4" FNPT	M-40H-15-4NF-SS-V-AT	208.0	8.18	-	-	95.0	3.74	110.0	4.33	60.0	2.36	-	-
	1/4" BSPP	*Flange	1/4" BSPP	M-40T-15-4GF-SS-V-AT	236.0	6.29	42.0	1.65	94.0	3.69	138.0	5.43	32.0	1.24	16.0	0.63

* Flange Standard per IEC 61518-A

M-40H-15-4NF-SS-V-AT



M-40T-15-4GF-SS-V-AT

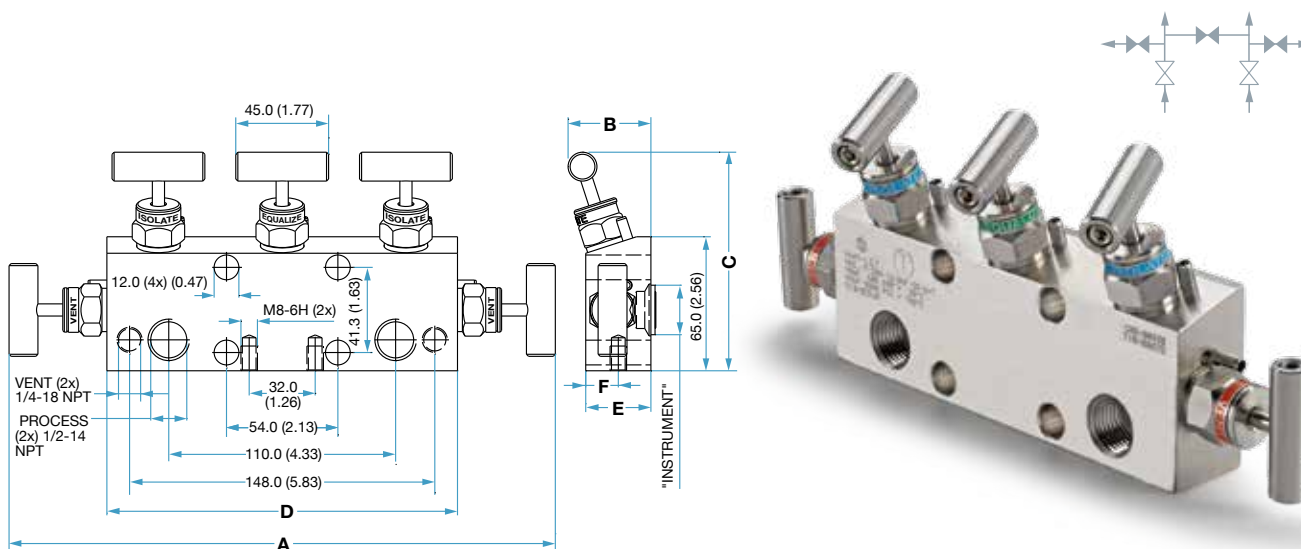


STANDARD CONFIGURATION DIMENSIONS 5 WAY DIRECT MOUNT

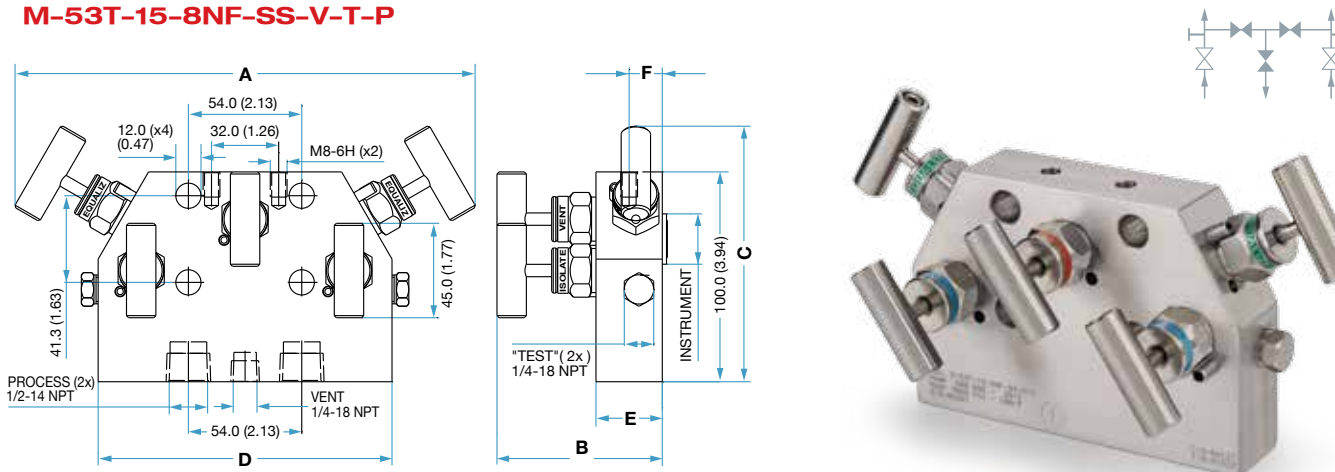
Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
					A		B		C		D		E		F	
	Process	Instrument	Vent / Bleed		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Direct Mount	1/2" FNPT	*Flange	1/4" FNPT	M-50A-15-8NF-SS-V-T	265.0	10.43	41.0	1.61	106.0	4.17	170.0	6.69	32.0	1.26	16.0	0.63
	1/2" FNPT	*Flange	1/4" FNPT	M-53T-15-8NF-SS-V-T	220.0	8.66	79.0	3.11	122.0	4.80	140.0	5.51	32.0	1.26	16.0	0.63

* Flange Standard per IEC 61518-A

M-50A-15-8NF-SS-V-T



M-53T-15-8NF-SS-V-T-P

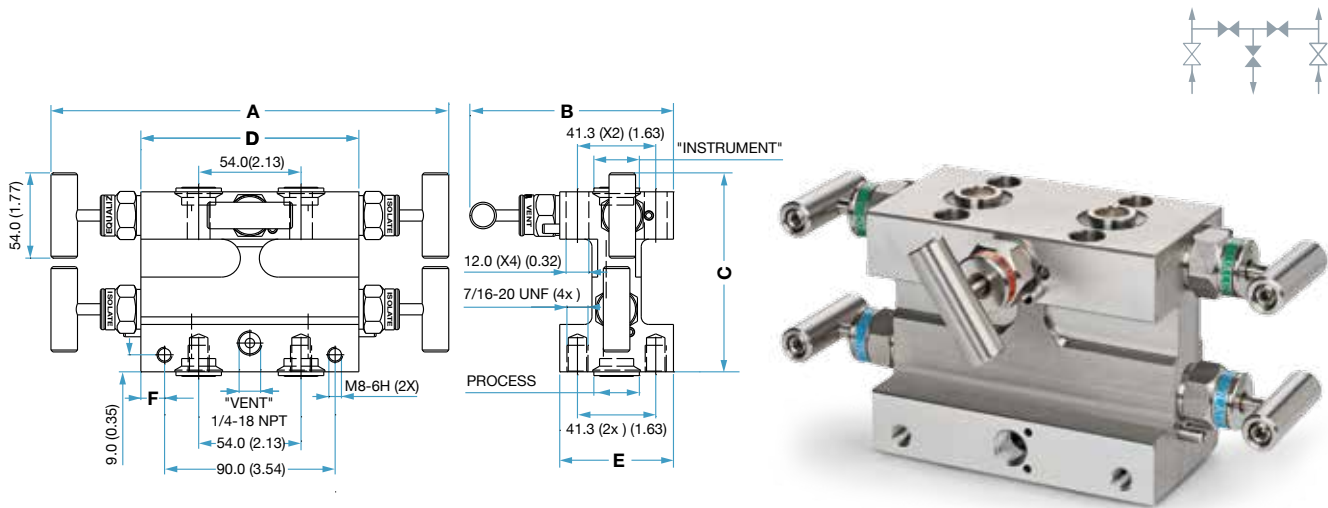


STANDARD CONFIGURATION DIMENSIONS 5 WAY DIRECT MOUNT

Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
	Process	Instrument	Vent / Bleed		A		B		C		D		E		F	
					mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Direct Mount	*Flange	*Flange	1/4" FNPT	M-54H-90-FF-SS-V-T	210.0	8.27	108.0	4.25	105.0	4.13	115.0	4.53	60.0	2.36	12.5	0.49

M-54H-90-FF-SS-V-T

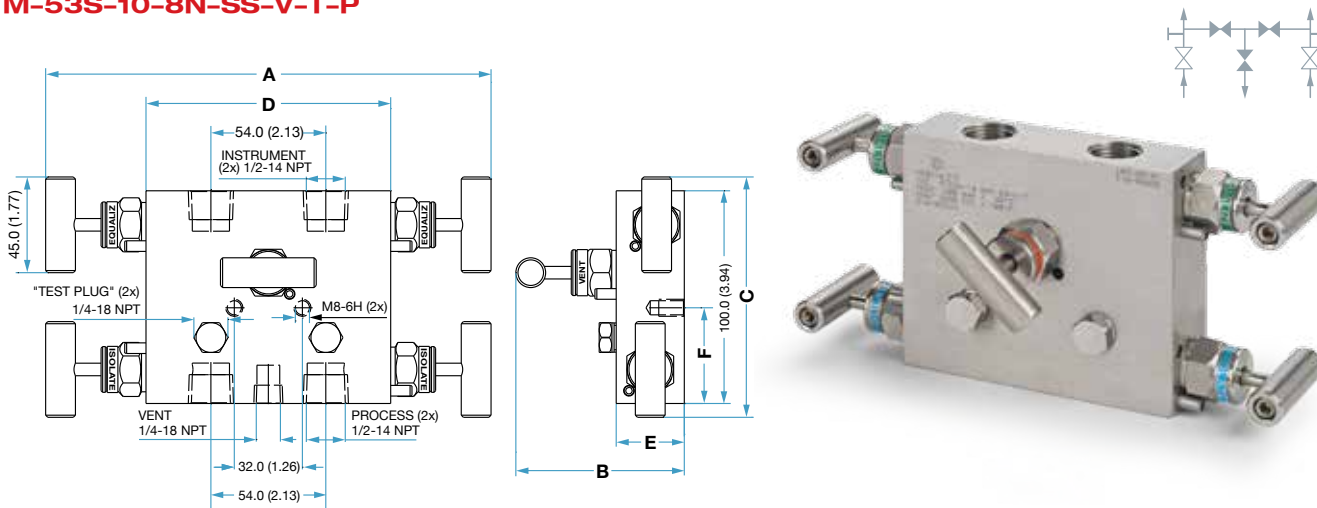
* Flange Standard per IEC 61518-A



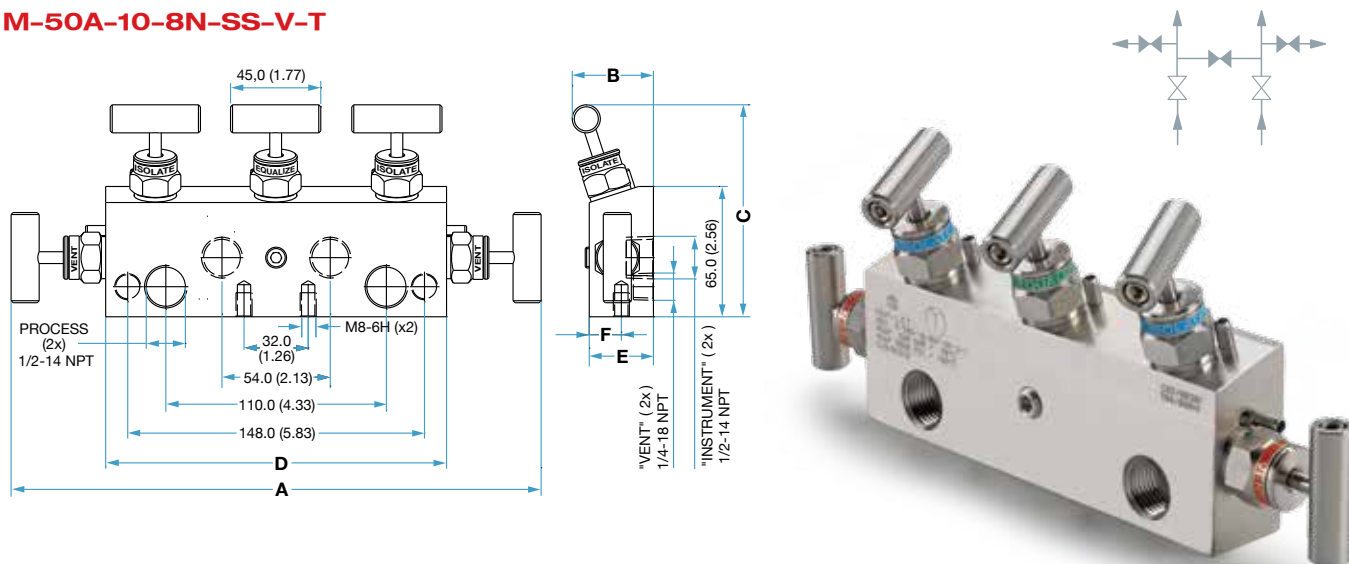
STANDARD CONFIGURATION DIMENSIONS 5 WAY REMOTE MOUNT

Instrument Mount Type	End Connection			HAM-LET Ordering Description	Dimensions											
					A		B		C		D		E		F	
	Process	Instrument	Vent / Bleed		mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
Remote Mount	1/2" FNPT	1/2" FNPT	1/4" FNPT	M-53S-10-8N-SS-V-T	210.0	8.27	80.0	3.15	113.0	4.45	115.0	4.53	32.0	1.26	45.0	1.77
	1/2" FNPT	1/2" FNPT	1/4" FNPT	M-50A-10-8N-SS-V-T	265.0	10.43	41.0	1.61	106.0	4.17	170.0	6.69	32.0	1.26	16.0	0.63

M-53S-10-8N-SS-V-T-P



M-50A-10-8N-SS-V-T



ORDERING INFORMATION 5 WAY MANIFOLDS

M-5		0A		- 10 -		8		N		- SS -		T		LD		- OC	
Family		End Connection		Type End Connection		Body Material		Packing		Option							
M-5	5 Way Manifold	10	Female to Female	FF	Flange*	SS	SS 316	T	PTFE	OC	Oxygen Clean						
		15	Female to Flange	N	NPT	M	Alloy 400	G	Grafoil®	HYD	Hydrostatic pressure test						
		90	Flange to Flange	G	BSPP	D	Duplex 1.4462	PK	PEEK	K	10,000 psi (690 bar)						
		Size		R	BSPT	HC	Alloy C-276	PI	Polyimide	V	Vent port 1/2"						
		4	1/4"	NF	NPT to Flange*	T	Titanium	V	Fluorocarbon FKM	P	Blind plug						
		6	3/8"	RF	BSPT to Flange*	SD	SuperDuplex	EP	EPDM	Handle							
		8	1/2"	GF	BSPP to Flange*			BU	NBR	T	T bar						
				L	Female integral Let-Lok*			KZ	Perfluorelastomer	AT	Anti Tamper*						
										LD	Locking device*						

Flow Scheme	
0A	Angle Flat
1A	Angle Flat
2T	Taper
3T	Taper
3S	Straight
4H	H- Type
4A	Angle Flat
4I	In-line

(See table A)

* Flange Standard per IEC 61518-A

TABLE A: FLOW SCHEMATIC AND VALVE POSITION

Designator	Flow Schematic	Sketch
0A		
1A		
2T		
3T		
3S		
4H		
4A		
4I		

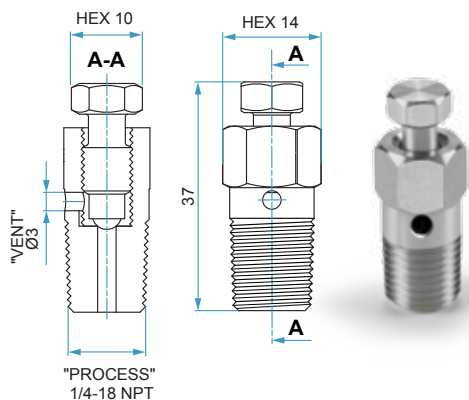
* Key should be separately ordered

Warning!

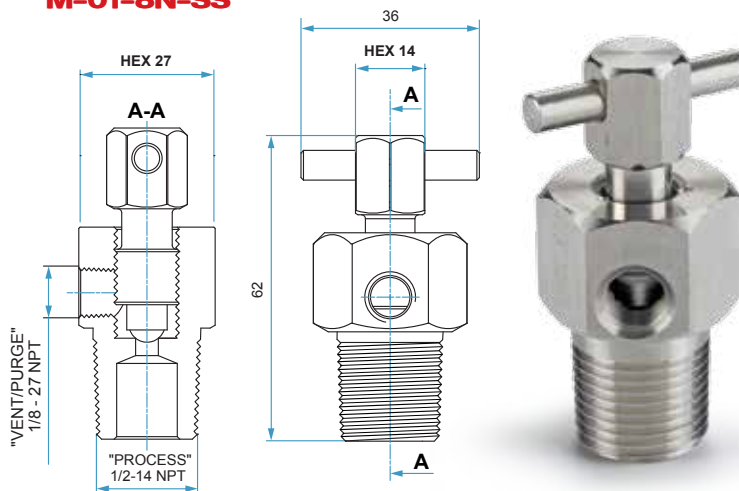
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BLEED VALVE

1/4" MNPT
M-01-4N-SS

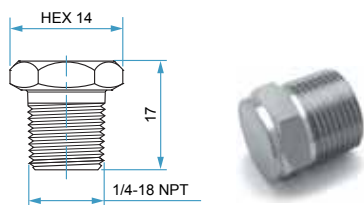


1/2" MNPT
M-01-8N-SS

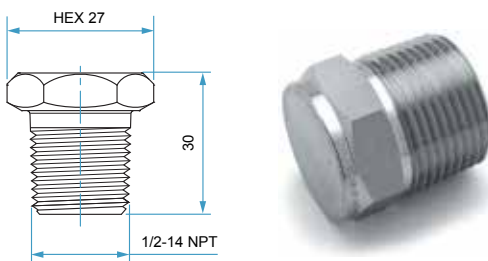


BLIND PLUG

1/4" MNPT
M-02-4N-SS

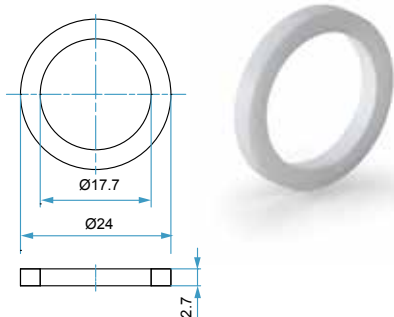


1/2" MNPT
M-02-8N-SS



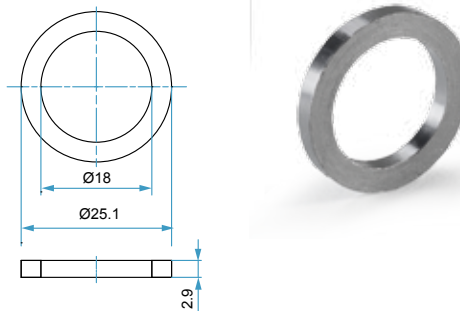
MOUNTING GASKET IEC 61518-A

PTFE
M-03-GK-IECA-T



Kit contains: 2 Gaskets

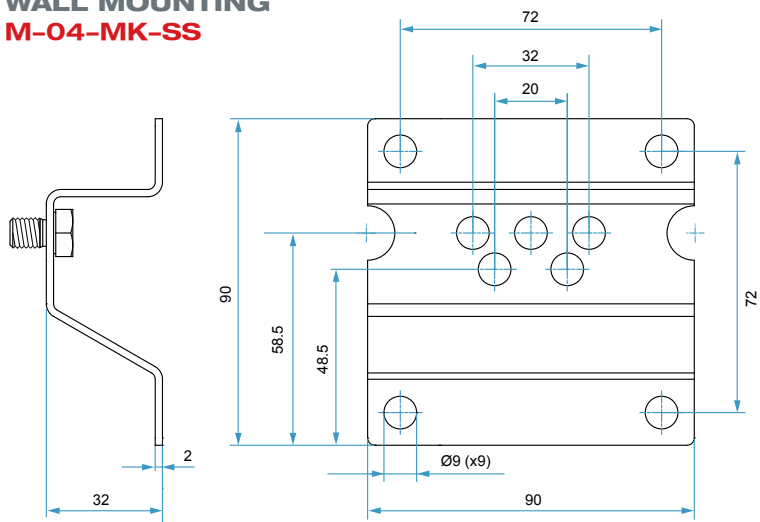
GRAFOIL®
M-03-GK-IECA-G



Kit contains: 2 Gaskets

MOUNTING BRACKET - AISI 316

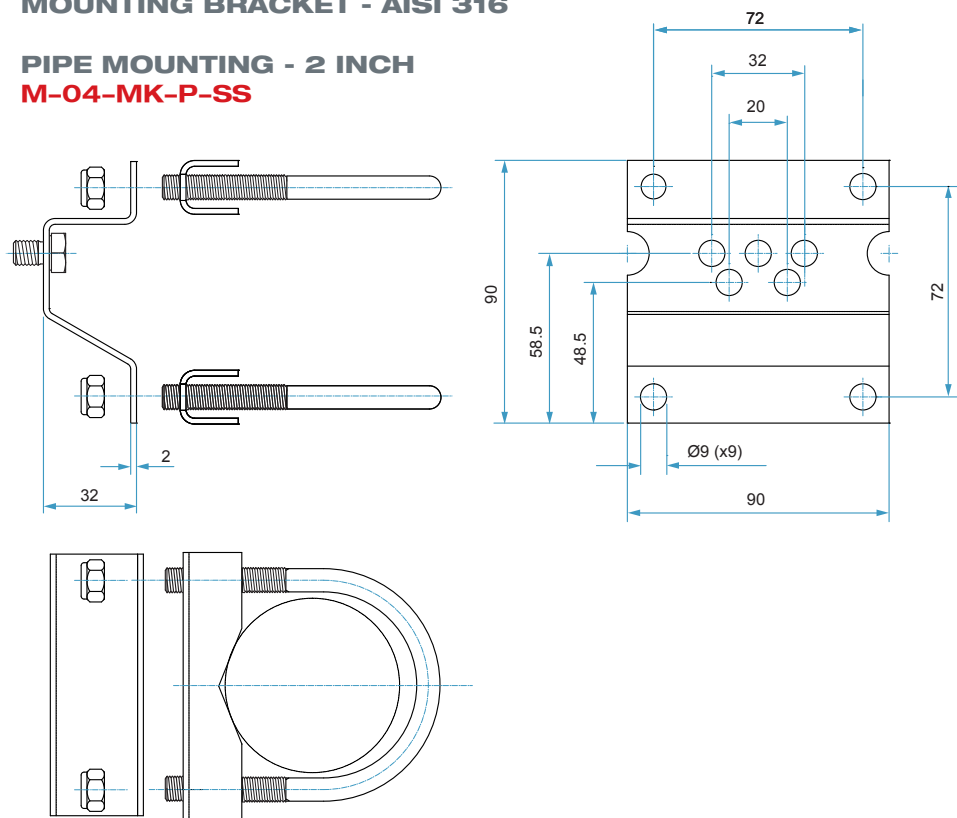
WALL MOUNTING
M-04-MK-SS



Kit contains: Bracket, 2x Bolts M8X12.
Upon order, please make sure that the Manifold is suitable for bracket mounting.

MOUNTING BRACKET - AISI 316

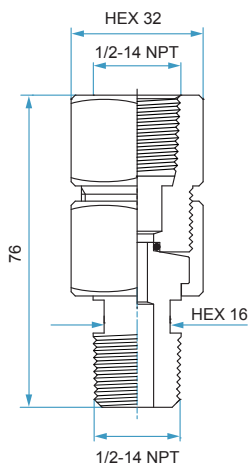
PIPE MOUNTING - 2 INCH
M-04-MK-P-SS



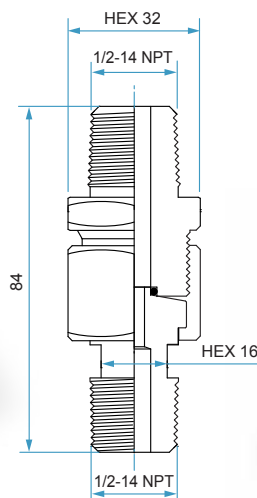
Kit contains: Bracket, 2x Bolts M8X12, 2x Tie rod, 2x Tie rod brackets, 4x Snapnut M8.
Upon order, please make sure that the Manifold is suitable for bracket mounting.

GAUGE CONNECTOR

**360° POSITIONING MALE TO FEMALE
M-05-85-8N-SS-V**



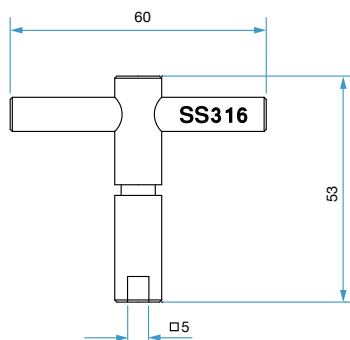
**360° POSITIONING MALE TO MALE
M-05-80-8N-SS-V**



(Fluorocarbon FKM O-ring)

ANTI TAMPER KEY

**5 MM
M-06-KEY-5MM-SS**



Not included in order of Anti-Tampered bonnet manifold.
This key should be separately ordered.

© Grafoil – TM UCAR Carbon Company Inc.

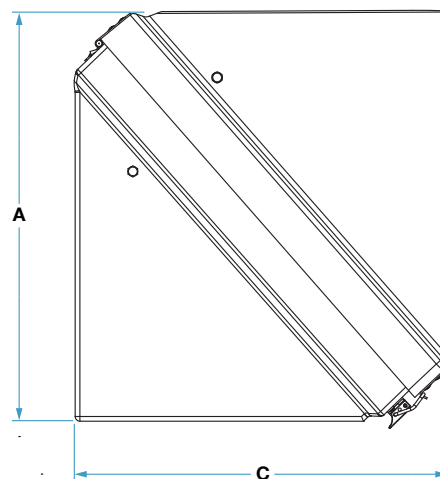
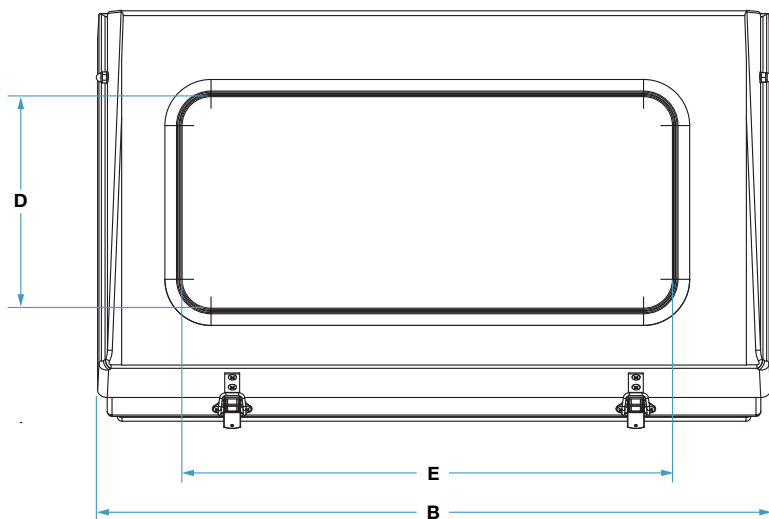
STANDARD CONFIGURATION DIMENSIONS INSTRUMENT ENCLOSURES

Technical Specification:

- Body material: Glass Reinforced Polyester (GRP)
- Toggle clamps, hinges material: Stainless Steel 316
- Sealing: Polychloroprene (CR) closed cell sealing
- Surface resistance: Anti static, EN 50014 compliance (<1.10 9 Ohm)
- Flame retardant: DIN 4102 Class B2
- Ingress protection: IP 65

Type	Material / Color	Weight (Kg)	Enclosure Dimensions (mm)			Safety Glass Window Dimensions (mm)		
			A	B	C	Type	D	E
4	GRP Black	19	500	500	650	R	290	290
5	GRP Black	14	550	500	500	R	290	290
6	GRP Black	14	430	700	390	L	210	500
7	GRP Black	9	430	430	390	S	210	210
8	GRP Blue	8	400	375	400	S	210	210
9	GRP Black	20	530	700	390	L	210	500
10	GRP Black	19	530	430	390	S	210	210

For other colors, please contact your local HAM-LET representative.



EQUIPPED INSTRUMENT ENCLOSURES

1 Body options:

- Full body GRP enclosures
- Half body GRP enclosures
- Full body AISI 316 enclosures

2 Heating options

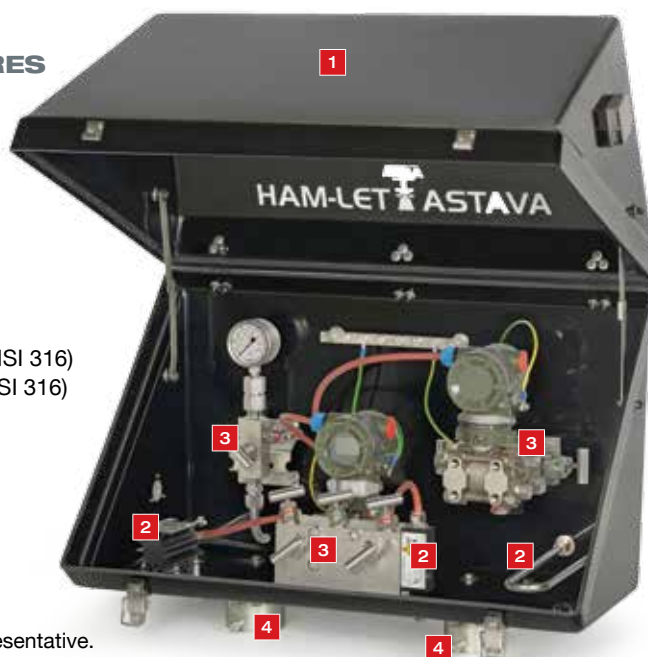
- Steam heater
- Electrical space heater (Black anodized aluminum, AISI 316)
- Electrical block heater (Black anodized aluminum, AISI 316)
- Thermostat (Black anodized aluminum)

3 Manifolds:

- According to customer application

4 Mounting accessories:

- According to ordering information



For mounting accessories, heating options, junction boxes and accessories, please contact your local HAM-LET representative.

ORDERING INFORMATION INSTRUMENT ENCLOSURES

Family		WINDOW (HxW)		INSULATION		SPECIAL LAY OUT		MOUNTING ACCESSORIES	
HA	Enclosure	N	Blind enclosure	N	No Insulation	Blank	No option	00	no options
SIZE (HxWxD)		S	Safety glass window (210x210)	I	Insulation 20 mm polyurethane	C	4x Clasps stainless steel for removable toplid	01	2" mounting bracket outside in galv. carbon steel (HA7,8,10)
4	500x500x650	L	Safety glass window (210x500)					02	2" mounting bracket outside in AISI 316 (HA7,8,10)
5	550x500x500	R	Safety glass window (290x290)					04	2" mounting brackets on backside of cabinet in AISI 316
6	430x700x390	T	Safety glass window (310x540)					05	2" mounting bracket outside in AISI 316 large support plate (HA4, HA5)
7	430x430x390							21	2x 2" mounting bracket outside in galv. carbon steel (C-C can be specified)
8	400x375x400							22	2x 2" mounting bracket outside in AISI 316I (C-C can be specified)
9	530x700x390							A	2" pipe 300mm with two pairs of rails inside carbon steel
10	530x430x390							B	2x 2" Pipe 300mm with two pairs of rails inside carbon steel
								D	2" pipe AISI 316 inside cabinet 300 mm
								E	2" pipe Galv. Carbon steel inside cabinet 300 mm
								F	2x 2" pipe AISI 316 inside cabinet 300 mm

Warning!

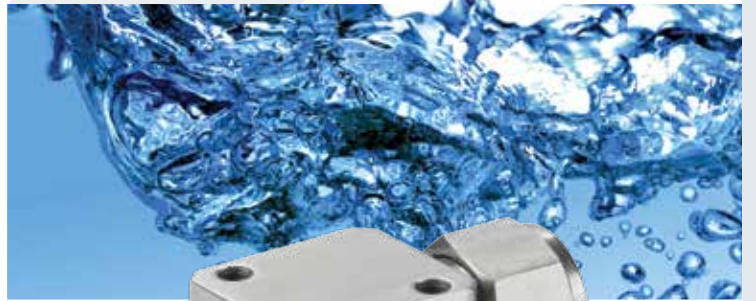
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HAM-LET ASTAVA Manifolds, Rev.05, January 2015



T-TYPE & IN-LINE FILTERS

H-600R, H-600R CNG & H-600 SERIES



H-600R FEATURES

- Bar Stock 316 St.St. or Brass Construction
- On-line Maintenance
- High-Pressure Characteristics 6000 psi (413 bar) in 316St.St. and 2000 psi (137 bar) in brass
- HAM-LET LET-LOK® Ends, Male & Female NPT, and HTC® Face Seal
- Replaceable sintered filtration elements are available in 0.1, 0.5, 2, 7, 15, 40, 60, 90, µm.
- Replaceable strainer filtration elements are available in 140, 230, 440µm
- ECE R110 Approved for the CNG / NGV as an option

T-TYPE FILTERS MATERIALS OF CONSTRUCTION

No.	Components	Qty	Material	
			316 St. St.	Brass
1	Body	1	St.St.ASTM A-276	Brass ASTM B-16
2	Filtration Element	1	316 St.St. (Sintered) / Strainer	
3	Gasket Ring	1	316St.St. (Silver Plated)	Aluminum / B 209
4	Spring	1	St.St. 302	
5	Insert	1	St.St.ASTM A-276	Brass ASTM B-16
6	Nut	1	316St.St.(Silver Plated)	Brass ASTM B-16
7	Locking Ring	1	St.St 304	

T-TYPE FILTERS PRESSURE TEMPERATURE RATING

Temperature °F (°C)		All 316 St.St.		All Brass	
		Allowed Working Pressure, psig / bar			
Min.	Max.	psig	bar	psig	bar
-20 (-28)	100 (37)	6000	414	2000	138
	200 (93)	5160	356	1730	119
	300 (148)	4660	321	1470	101
	400 (204)	4280	295	-	-
	500 (260)	3980	274	-	-
	600 (315)	3760	259	-	-
	650 (343)	3700	255	-	-
	700 (371)	2600	248	-	-
	750 (398)	3520	243	-	-
	800 (426)	3460	239	-	-
850 (454)	3380	233	-	-	
900 (482)	3280	223	-	-	

Note: The maximum allowed working pressure that is marked on the valve may be limited according to the pressure limitations that are recommended by the tubing /piping standards (Reference: Let-Lok tube fittings General Information).

T-TYPE FILTERS FOR THE CNG / NGV PRESSURE TEMPERATURE RATING

Temperature °F (°C)		All 316 St.St.	
		Allowed Working Pressure, psig / bar	
Min.	Max.	psig	bar
-40 (-40)	248 (120)	3770	260

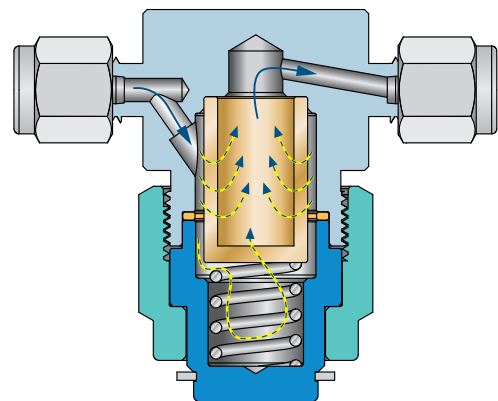
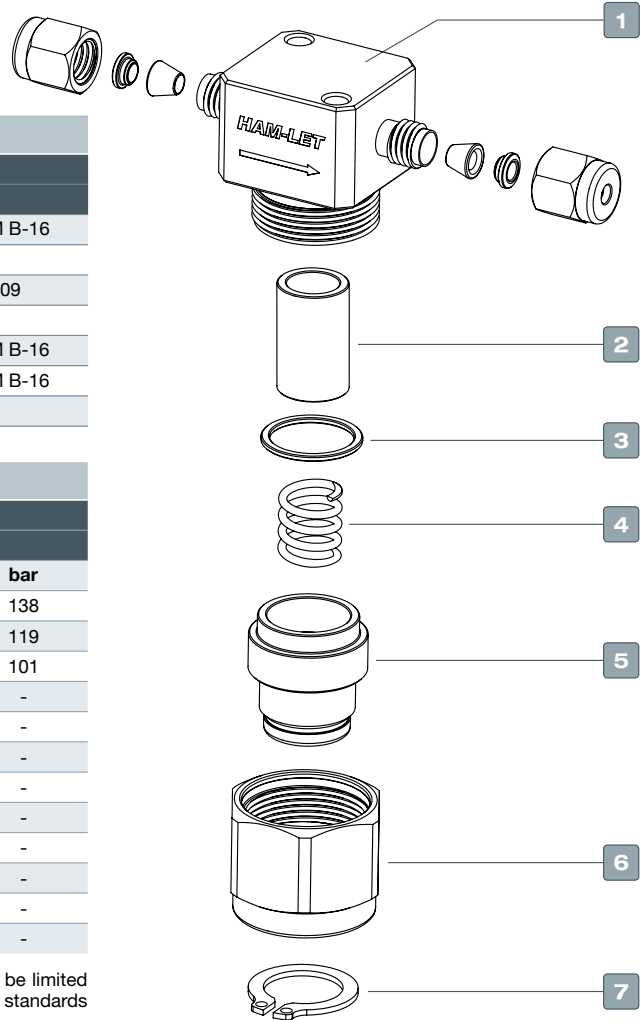
T-TYPE FILTERS FILTRATION AREA

	Connection Size	Sintered element	Strainer element
		in ² (mm ²)	in ² (mm ²)
T-type Filters	1/8, 1/4, 3mm ,6mm	1.3 (830)	1.0 (640)
	3/8, 1/2, 8-12mm	2 (1280)	1.7 (1090)

GENERAL

The H-600R Series is a T-type filtration device, which will protect system components from fluid particles and contaminants.

The H-600R provides easy on-line maintenance without disassembling it from the system.



CLEANING & PACKAGING

Every H-600 Series valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

TESTING

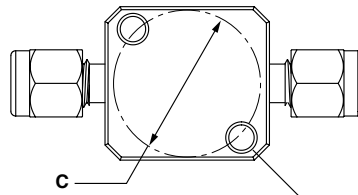
The H-600 and H-600R series designs have been tested for Proof and Burst. Each HAM-LET filter is Nitrogen tested for leakage at 1000 psi.

T-TYPE FILTERS, PRESSURE DROP

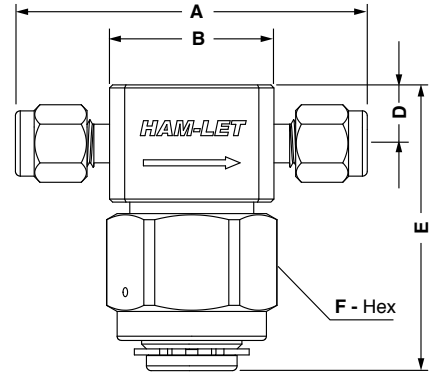
Nominal Element Pore Size μm	Inlet Pressure, psig (bar)						Pressure Drop, psig (bar)					
	5 (0.34)		10 (0.68)		15 (1.0)		10 (0.68)		50 (3.4)		100 (6.8)	
	Air flow						Water flow					
	std ft3/min	std L/min	std ft3/min	std L/min	std ft3/min	std L/min	US gal/min	L/min	US gal/min	L/min	US gal/min	L/min
Connection Size: 1/8", 3MM						Connection Size: 1/8", 3MM						
0.5	0.04	1.1	0.06	1.7	0.12	3.4	0.004	0.15	0.17	0.6	0.29	1.1
2	0.2	5.7	0.4	11.3	0.6	17.0	0.008	0.3	0.24	0.9	0.4	1.5
7	0.5	14.2	0.9	25.5	1.2	34.0	0.1	0.4	0.3	1.1	0.48	1.8
15	0.8	22.7	1.3	36.8	1.5	42.5	0.12	0.5	0.36	1.4	0.58	2.2
40	1.6	45.3	2.0	56.6	2.2	62.3	0.14	0.53	0.4	1.5	0.6	2.3
60	1.7	48.1	2.2	62.3	2.4	68.0	0.15	0.6	0.5	1.9	0.6	2.3
90	1.8	51.0	2.2	62.3	2.6	73.6	0.2	0.8	0.5	1.9	0.6	2.3
140, 230, 440	1.8	51.0	2.3	65.1	2.6	73.6	0.2	0.8	0.5	1.9	0.7	2.6
Connection Size: 1/4", 6MM						Connection Size: 1/4", 6MM						
0.5	0.12	3.4	0.26	7.4	0.48	13.6	0.004	0.15	0.17	0.6	0.29	1.1
2	0.6	17.0	1.14	39.6	2.3	65.1	0.24	0.9	0.86	3.3	1.3	4.9
7	1.2	34.0	2.9	82.1	4.7	133.1	0.4	1.5	1.3	4.9	2	7.6
15	1.4	39.6	2.9	82.1	4.7	133.1	0.5	1.9	1.3	4.9	2.1	7.9
40	2.3	65.0	4.7	133	7.4	210	0.65	2.45	2.0	7.6	3.1	11.8
60	3.1	87.8	5.9	167.1	8.5	240.7	0.8	3.0	2.7	10.2	3.9	14.8
90	4.1	116.1	7.5	212.4	10	283.2	1.1	4.2	3.4	12.9	4.9	18.5
140, 230, 440	4.7	133.1	8.8	249.2	12	339.8	1.2	4.5	4.2	15.9	5.6	21.2
Connection Size: 3/8", 1/2", 8-12MM						Connection Size: 3/8", 1/2", 8-12MM						
0.5	0.36	10.2	0.86	24.4	1.6	45.3	0.09	0.3	0.4	1.5	0.76	2.9
2	1.4	39.6	2.8	79.3	4	113.3	0.26	1.0	1.1	4.2	1.6	6.1
7	1.8	51.0	4.2	118.9	6.8	192.6	0.64	2.4	2.2	8.3	3.5	13.2
15	1.8	51.0	4.9	138.8	7.9	223.7	0.84	3.2	2.6	9.8	4.1	15.5
40	4.2	119	9.1	257.5	14	396	1.3	4.9	4.2	15.9	5.9	22.3
60	5.1	144.4	10	283.2	15	424.8	1.5	5.7	4.8	18.2	6.7	25.4
90	6.1	172.7	11	311.5	16	453.1	1.7	6.4	5.5	20.8	7.6	28.8
140, 230, 440	7.2	203.9	14	396.4	20	566.3	2.4	9.1	7.2	27.3	10	37.9

Outlet is open to atmosphere.

H-600R T-TYPE



2 mounting holes
M5 X0.8 threads
7mm (0.275") deep



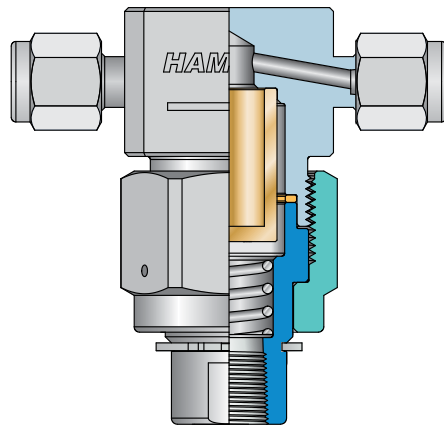
T-TYPE STANDARD CONFIGURATION DIMENSIONS

Orifice		Connection Size		A		B		C		D		E		F	
mm	inch	Inlet	Outlet	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
2.39	0.094	1/8" LET-LOK®	1/8" LET-LOK®	57.6	2.27	27.1	1.07	25.4	1.00	9.80	0.39	47.4	1.87	25.4	1.00
4.41	0.174	1/4" LET-LOK®	1/4" LET-LOK®	62.8	2.47	26.8	1.06	25.4	1.00	9.80	0.39	47.4	1.87	25.4	1.00
5.41	0.213	3/8" LET-LOK®	3/8" LET-LOK®	72.2	2.84	33.6	1.32	28.8	1.13	11.6	0.46	56.0	2.20	28.6	11/8
6.35	0.250	1/2" LET-LOK®	1/2" LET-LOK®	77.3	3.04	33.4	1.31	28.8	1.13	11.6	0.46	56.0	2.20	28.6	11/8
4.41	0.174	6MM LET-LOK®	6MM LET-LOK®	62.4	2.46	26.8	1.06	25.4	1.00	9.80	0.39	47.6	1.87	25.4	1.00
5.41	0.213	8MM LET-LOK®	8MM LET-LOK®	72.2	2.84	35.2	1.39	28.8	1.13	11.6	0.46	56.0	2.20	28.6	11/8
6.35	0.250	10MM LET-LOK®	10MM LET-LOK®	72.5	2.85	33.3	1.31	28.8	1.13	11.6	0.46	56.0	2.20	28.6	11/8
6.35	0.250	12MM LET-LOK®	12MM LET-LOK®	77.3	3.04	33.4	1.31	28.8	1.13	11.6	0.46	56.0	2.20	28.6	11/8
4.41	0.174	1/8" Female NPT	1/8" Female NPT	50.7	2.00	25.4	1.00	25.4	1.00	9.80	0.39	47.6	1.87	25.4	1.00
4.41	0.174	1/4" Female NPT	1/4" Female NPT	54.2	2.13	25.4	1.00	25.4	1.00	9.80	0.39	47.6	1.87	25.4	1.00
4.41	0.174	1/4" Male NPT	1/4" Male NPT	54.2	2.13	25.4	1.00	25.4	1.00	9.80	0.39	47.6	1.87	25.4	1.00
6.35	0.250	3/8" Male NPT	3/8" Male NPT	60.4	2.38	31.7	1.25	28.8	1.13	11.6	0.46	56.0	2.20	28.6	11/8
6.35	0.250	1/2" Male NPT	1/2" Male NPT	70.0	2.76	31.7	1.25	28.8	1.13	11.6	0.46	56.0	2.20	28.6	11/8
4.41	0.174	1/4" Male Face Seal	1/4" Male Face Seal	58.8	2.31	27.2	1.07	25.4	1.00	9.80	0.39	47.6	1.87	25.4	1.00

Dimensions are for reference only, and are subject to change without notice.

H-600R SERIES BY-PASS/PURGE

(Please see ordering information)



H-600 FEATURES

- Bar Stock 316St.St. or Brass Construction
- Moderate Pressure Characteristics 3000 psi (206 bar) in 316 St.St. and 1000 psi (68 bar) in Brass
- HAM-LET LET-LOK® Ends, Male & Female NPT, and HTC® Face-Seal Bead
- Replaceable sintered filtration elements are available in 0.1, 0.5, 2, 7, 15, 40, 60, 90, μm .
- Replaceable strainer filtration elements are available in 140, 230, 440 μm .

GENERAL

The H-600 Series is an In-Line filtration device. It will be installed in a system to protect the system components from fluid particles and contaminants.

IN-LINE FILTER MATERIALS OF CONSTRUCTION

No.	Qty	Qty	Material	
			316 St. St.	Brass
1	Body	1	St.St.ASTM A-276	Brass ASTM B-16
2	Filtration Element	1	316 St.St.	
3	Spring	1	316 St.St.	
4	Gasket Ring	1	316St.St. (Silver Plated)	Aluminum / B 209
5	End	1	St.St.ASTM A-276	Brass ASTM B-16
6	Front Ferulle	2	St.St.ASTM A-276	Brass ASTM B-16
7	Back Ferulle	2	St.St.ASTM A-276	Brass ASTM B-16
8	Nut	2	St.St.ASTM A-276	Brass ASTM B-16

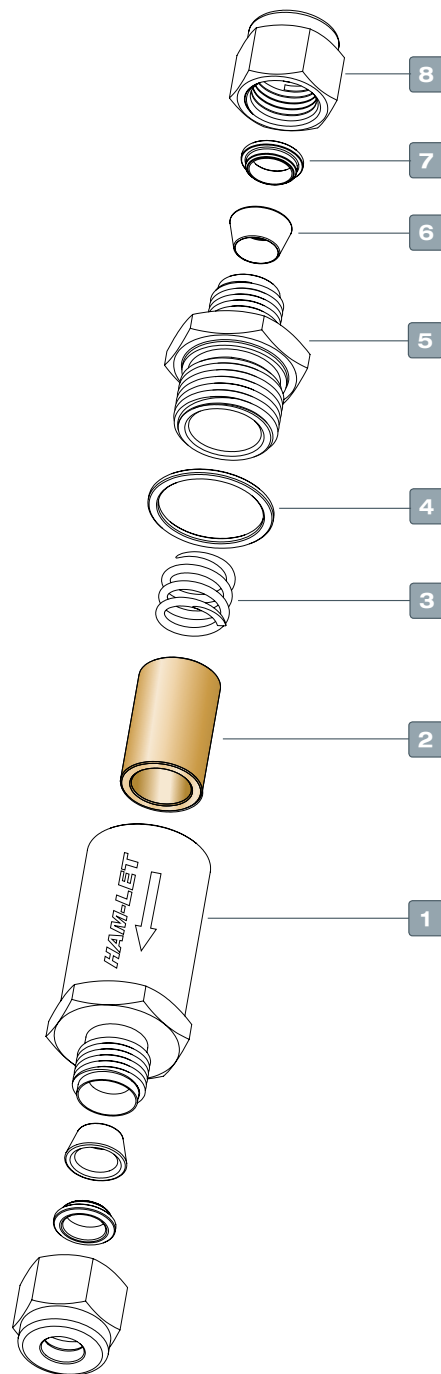
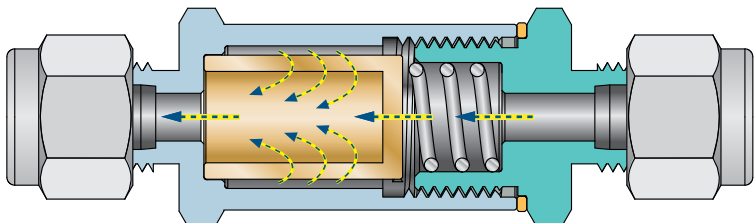
IN-LINE FILTER PRESSURE TEMPERATURE RATING

Connection Size		1/8", 1/4", 3mm, 6mm		3/8", 1/2", 8-12mm		All	
Material Temp. °F (°C)		316St.St.		316St.St.		Brass	
		Allowed Working Pressure, psig / bar					
Min.	Max.	psig	bar	psig	bar	psig	bar
-20 (-28)	100 (37)	3000	207	2500	172	1000	69
	200 (93)	2580	178	2150	148	780	54
	300 (148)	2330	161	1940	134	680	47
	400 (204)	2140	148	1780	123	-	-
	500 (260)	1990	137	1660	114	-	-
	600 (315)	1880	130	1560	108	-	-
	650 (343)	1845	127	1540	106	-	-
	700 (371)	1800	124	1500	103	-	-
	750 (398)	1760	121	1460	101	-	-
	800 (426)	1725	119	1440	99	-	-
	850 (454)	1690	117	1410	97	-	-
	900 (482)	1640	113	1360	94	-	-

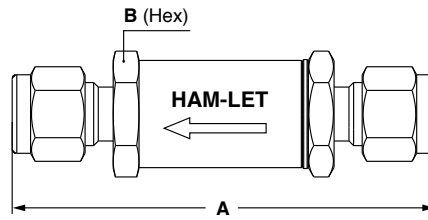
Note: The maximum allowed working pressure that is marked on the valve may be limited according to the pressure limitations that are recommended by the tubing /piping standards (Reference: Let-Lok tube fittings General Information).

IN-LINE FILTRATION AREA

	Connection Size	Sintered element	Strainer element
		in ² (mm ²)	in ² (mm ²)
In-Line Filters	1/8, 3mm	0.55 (350)	-
	1/4, 6mm	1.3 (830)	1.0 (640)
	3/8, 1/2, 8-12mm	2 (1280)	1.7 (1090)



H-600 IN-LINE



IN-LINE FILTER STANDARD CONFIGURATION DIMENSIONS

Orifice		Conection Size		A		B (Hex)	
mm	inch	Inlet	Outlet	mm	inch	mm	inch
2.39	0.094	1/8" LET-LOK®	1/8" LET-LOK®	57.5	2.26	14.4	9/16
4.75	0.187	1/4" LET-LOK®	1/4" LET-LOK®	74.7	2.94	19.05	3/4
7.14	0.281	3/8" LET-LOK®	3/8" LET-LOK®	81.4	3.20	25.4	1
10.30	0.406	1/2" LET-LOK®	1/2" LET-LOK®	88.5	3.48	25.4	1
2.39	0.094	3MM LET-LOK®	3MM LET-LOK®	57.5	2.26	14.4	9/16
4.75	0.187	6MM LET-LOK®	6MM LET-LOK®	74.9	2.95	19.05	3/4
6.40	0.252	8MM LET-LOK®	8MM LET-LOK®	80.1	3.15	25.4	1
7.90	0.311	10MM LET-LOK®	10MM LET-LOK®	81.9	3.22	25.4	1
2.39	0.094	1/8" Female NPT	1/8" Female NPT	55.0	2.17	14.4	9/16
4.75	0.187	1/4" Female NPT	1/4" Female NPT	73.0	2.87	19.05	3/4
10.30	0.406	1/2" Female NPT	1/2" Female NPT	85.5	3.36	26.69	1 1/16
4.75	0.187	1/4" Male NPT	1/4" Male NPT	68.2	2.69	19.05	3/4
9.50	0.374	3/8" Male NPT	3/8" Male NPT	71.1	2.8	25.4	1
4.75	0.187	1/4" Male Face Seal	1/4" Male Face Seal	71.5	2.81	19.05	3/4
10.3	0.406	1/2" Male Face Seal	1/2" Male Face Seal	78.4	3.08	25.4	1

IN-LINE FILTER PRESSURE DROP

Nominal Element Pore Size μm	Inlet Pressure, psig (bar)						Pressure Drop, psig (bar)					
	5 (0.34)		10 (0.68)		15 (1.0)		10 (0.68)		50 (3.4)		100 (6.8)	
	Air flow						water flow					
	std ft3/min	std L/min	std ft3/min	std L/min	std ft3/min	std L/min	US gal/min	L/min	US gal/min	L/min	US gal/min	L/min
Connection Size: 1/8", 3MM						Connection Size: 1/8", 3MM						
0.5	0.04	1.1	0.06	1.7	0.12	3.4	0.01	0.03	0.04	0.15	0.12	0.5
2	0.2	5.7	0.4	11.3	0.6	17.0	0.08	0.3	0.24	0.9	0.4	1.5
7	0.5	14.2	0.9	25.5	1.2	34.0	0.1	0.4	0.3	1.1	0.48	1.8
15	0.8	22.7	1.3	36.8	1.5	42.5	0.12	0.5	0.36	1.4	0.58	2.2
60	1.7	48.1	2.2	62.3	2.4	68.0	0.15	0.6	0.5	1.9	0.6	2.3
90	1.8	51.0	2.2	62.3	2.6	73.6	0.2	0.8	0.5	1.9	0.7	2.6
Connection Size: 1/4", 6MM						Connection Size: 1/4", 6MM						
0.5	0.12	3.4	0.26	7.4	0.48	13.6	0.04	0.2	0.17	0.64	0.29	1.1
2	0.6	17.0	1.4	39.6	2.3	65.1	0.24	0.9	0.68	3.25	1.3	4.9
7	1.2	34.0	2.9	82.1	4.7	133.1	0.4	1.5	1.3	4.92	2	7.6
15	1.4	39.6	2.9	82.1	4.7	133.1	0.5	1.9	1.3	4.92	2.1	7.9
40	2.2	62.3	4.7	133	7.3	206.5	0.75	2.8	2.6	9.84	4.1	15.5
60	3.1	87.8	5.9	167.1	8.5	240.7	0.9	3.4	3.3	12.49	4.6	17.4
90	4.1	116.1	7.5	212.4	10	283.2	1.2	4.5	4.2	15.89	6.1	23.1
140, 230, 440	4.7	133.1	8.8	249.2	12	339.8	1.7	6.4	5.6	21.19	7.8	29.5
Connection Size: 3/8", 1/2", 8-12MM						Connection Size: 3/8", 1/2", 8-12MM						
0.5	0.36	10.2	0.86	24.4	1.6	45.3	0.09	0.34	0.4	1.5	0.76	2.9
2	1.4	39.6	2.8	79.3	4	113.3	0.26	1.0	1.1	4.1	1.6	6.1
7	1.8	51.0	4.2	118.9	6.8	192.6	0.64	2.4	2.2	8.3	3.5	13.2
15	1.8	51.0	4.9	138.8	7.9	223.7	0.84	3.2	2.6	9.8	4.1	15.5
40	4.2	119	9.1	257.5	14	396	1.5	5.67	5.9	22.3	9.1	34.4
60	5.1	144.4	10	283.3	15	424.8	2	7.5	6.7	25	10	37.9
90	6.1	172.7	11	311.5	16	453.1	2.3	8.7	7.6	28	11	41.6
40, 140, 200	7.2	203.9	14	396.4	20	566.3	4.8	18	15	56	19	71.9

Outlet is open to atmosphere.

H-600 IN-LINE FILTER & H-600R T-TYPE FILTER ORDERING INFORMATION

H-6 **00** **R** - **SS** - **L** - **1/4** - **2** - **OPTIONAL**

Filter Series

Valve Type (Inlet-Outlet)

00	LET-LOK® End
10	Female End
80	Male End

* For other Filter types, please consult HAM-LET representative

Body Type

BLANK	In Line
R	T Type

Body and Ends Material

SS	St.St. 316
B	Brass

End Connection Type

L	LET-LOK® End
N	Threaded NPT
G	ISO Parallel
R	ISO Tapered
GL	Metal Gasket Face seal
HO	Male O-ring Face seal

Other end connections are available upon request.

End Connection Size

1/8	3 MM
1/4	6 MM
	8 MM
3/8	10 MM
1/2	12 MM

Filtration Level (Micron)

0.1
0.5
2
7
15
40
60
90
140
230
440
LE

LE - Less Element

Approval

BLANK	- Standard
CNG	- ECE R110

Treatment

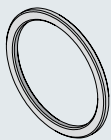
BLANK	- Standard Cleaning & Passivation
OC	- Oxygen Clean
LF	- Lubricant Free

Purge Options

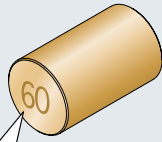
BLANK Standard - No bypass

BYPASS DESIGNATOR - See table 1

SPARE KIT



Gasket
Kit includes gasket ring, disassembly and reassembly instructions.



Filtration Element
Kit includes element, disassembly and reassembly instructions.

Filtration Level is marked on the element (µm)

Series	End connection size	Filtration Element Kit Ordering Number	Gasket Ring Kit Ordering Number	
		Stainless & Brass Filters	Stainless Filters	Brass Filters
H-600	1/8", 3MM	Z-600-FK-1/8-XX	Z-600-GK-1/8	Z-600-GK-1/8-B
	1/4", 6MM	Z-600-FK-1/4-XX	Z-600-GK-1/4	Z-600-GK-1/4-B
	3/8", 1/2" 8MM, 10MM, 12MM	Z-600-FK-1/2-XX	Z-600-GK-1/2	Z-600-GK-1/2-B
H-600R	1/8", 1/4", 3MM, 6MM	Z-600-FK-1/4-XX	Z-600R-GK-1/4	Z-600R-GK-1/4-B
	3/8", 1/2" 8MM, 10MM, 12MM	Z-600-FK-1/2-XX	Z-600R-GK-1/2	Z-600R-GK-1/2-B

XX - Means filtration level.

Filtration kit ordering example: 2micron Filtration Element Kit for H-600R 3mm : Z-600-FK-1/4-2

Gasket kit ordering example: Gasket Kit for H-600 3mm : Z-600-GK-1/8

For Oxygen and Lubricant free service, add OC designator to the end of the kit ordering number

Table 1:

H600-R T-TYPE SERIES BYPASS/PURGE

Port enables sampling or purging

Series	Valve End Connection Size	Bypass/purge port end connection	Overall Height in (mm)	Desig.
H-600R	1/8", 1/4", 3mm, 6mm	1/8" LET-LOK®	2.36 (60.0)	B1
		1/8" Female NPT	2.08 (53.0)	B2
		1/4" LET-LOK®	2.81 (71.5)	B3
	3/8", 1/2", 8mm, 10mm, 12mm	1/8" Female NPT	2.46 (62.5)	B4
		1/4" LET-LOK®	3.15 (80.0)	B5
		3/8" LET-LOK®	3.19 (81.0)	B6
		1/2" LET-LOK®	3.42 (87.0)	B7

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-600 & H600R, Rev.12, January 2015



VENT PROTECTOR FITTINGS

VEP



DESCRIPTION

The Vent Protector Fitting (VEP) is used to protect tubes that are exposed to atmospheric pressure, instruments that are open to atmospheric pressure and every tube outlet that is open to atmospheric pressure.

CLEANING & PACKAGING

Every VEP is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184).

TESTING

The VEP designs have been tested for Proof, Burst and Leakage. Every VEP is factory tested for proper assembly.

MATERIALS OF CONSTRUCTION			
No.	Components	Qty	Material
1	Vent Fitting Filter Body	1	St.St. 316
2	Vent Fitting Filter Grid 40 Mesh	1	St.St. 316
3	Spring clip 20 DIN472	1	St.St.

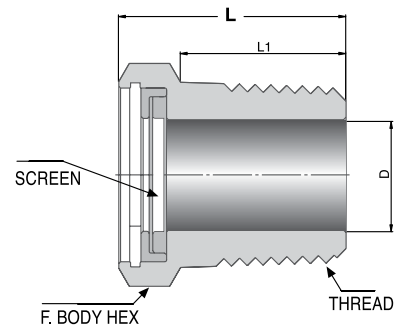
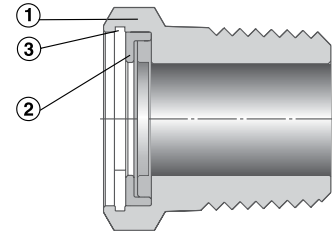
METHOD OF OPERATION

The end of the fitting has a filter screen of 40 mesh, made of 316 St.St. This screen prevents foreign objects such as insects, from entering the system and causing damage.

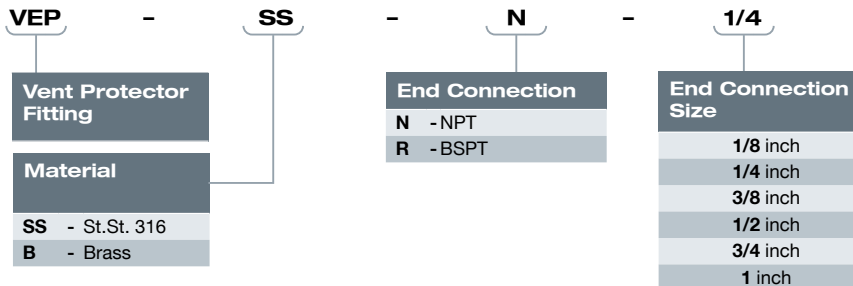
This fitting is available in 316 st.st and in brass, in sizes from 1/8" to 1".

The threads are NPT, BSPT or others, according to request.

STANDARD CONFIGURATION DIMENSIONS									
Description	T Thread	L		L1		D Min Opening		F	
		in	mm	in	mm	in	mm	in	mm
VEP-SS-N-1/8	1/8	0.56	14.22	0.38	9.65	0.19	4.82	1/2	12.7
VEP-SS-N-1/4	1/4	0.78	19.81	0.56	14.22	0.28	7.11	9/16	14.3
VEP-SS-N-1/2	1/2	1.03	26.16	0.75	19.05	0.50	12.7	7/8	22.2
VEP-SS-N-3/8	3/8	0.81	20.57	0.56	14.22	0.41	10.41	11/16	17.5
VEP-SS-N-3/4	3/4	1.06	26.92	0.75	19.05	0.72	18.28	1-1/16	27.0
VEP-SS-N-1"	1	1.34	34.03	0.94	23.87	0.88	22.35	1-3/8	34.9



ORDERING INFORMATION



Warning!

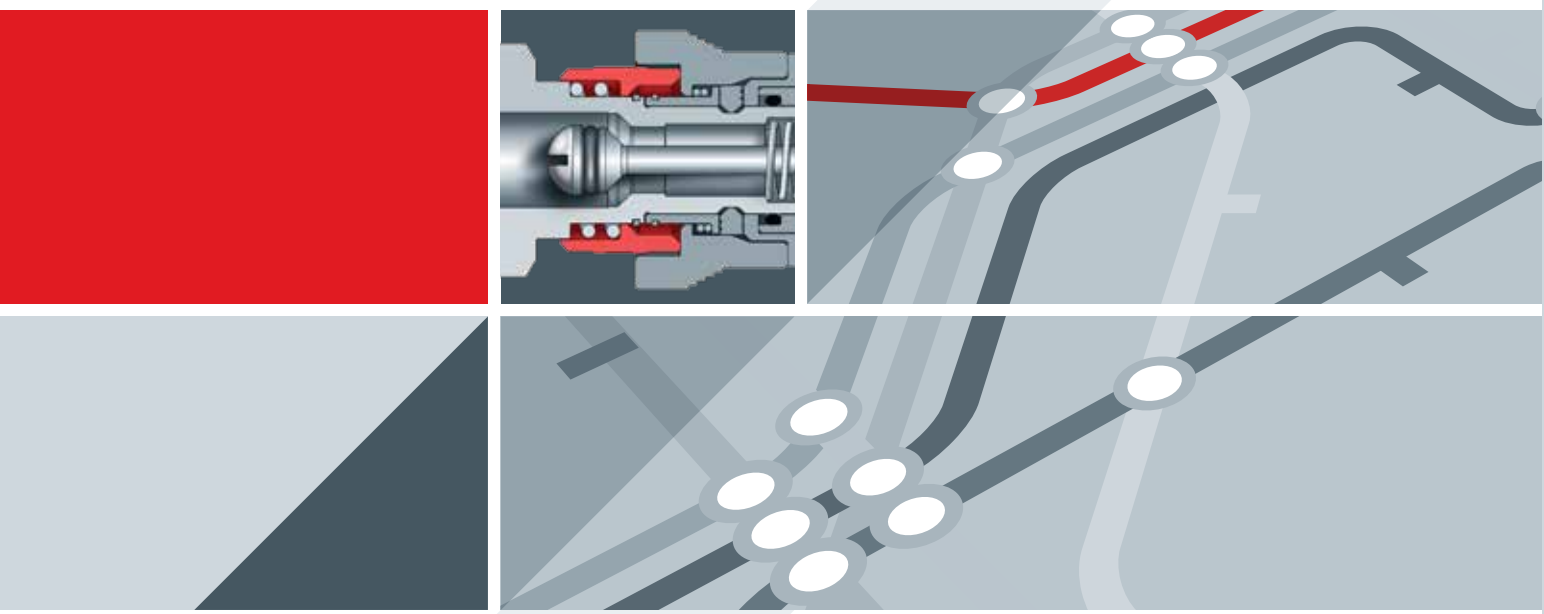
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

VEP, Rev 07. January 2014

QCLOK[®]

INSTRUMENTATION QUICK CONNECTORS

QUICK CONNECTORS



 **HAM-LET[®]**
ADVANCED CONTROL TECHNOLOGY

FEATURES

- Valved and non-valved stems available
- Working pressure rating: up to 3,000 psig (206 bar)
- Interchangeable and intermixable with major manufacturers' Instrumentation Quick Connectors
- Fluorocarbon FKM O-Rings as standard, other O-rings are available per request
- Smooth and safe connection between the QC-LOK® Connector valves is reached by a simple pushing operation due to a smart heavy duty locking mechanism
- The QC-LOK® Instrumentation Quick Connectors validation tests are based on ANSI/B93.51M-1980

GENERAL

The HAM-LET QC-LOK® Instrumentation Quick Connectors are designed for service in a large variety of applications, with a MAWP of up to 3,000 psig (206 bar).

Single and Double End Shutoff Stems

Single-end shutoff (SESO) - Stems have no valve and remain open when uncoupled.

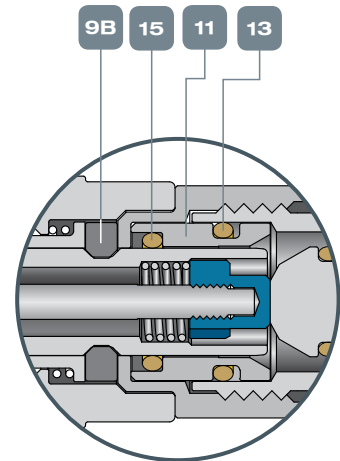
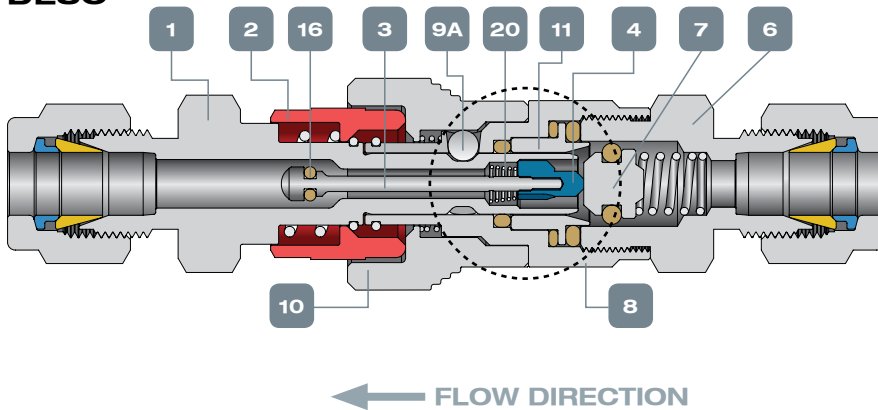
Double-end shutoff (DESO) - Stems have valve and shut off when uncoupled.

MATERIALS OF CONSTRUCTION			MATERIALS OF CONSTRUCTION				
	Components	Material		Components	Material		
Valved and Non-Valved Stems	1	Body	316SS	O-Rings	12	Poppet seal	Fluorocarbon FKM
	2	Sleeve	316SS		13	End connection seal	Fluorocarbon FKM
	3	Stem	316SS		14A*	Body seal	Fluorocarbon FKM
	4	Stem nut	316SS		15	Stem seal	Fluorocarbon FKM
	5	Extender	316SS		16	Stem Internal seal	Fluorocarbon FKM
Body	6	End connection	316SS	Springs	17	Poppet spring	316SS
	7	Poppet	316SS		18	Body sleeve spring	316SS
	8	Body	316SS		19	Stem sleeve spring	316SS
	9A*	Locking Balls	302SS		20	Stem spring	316SS
	9B**	Locking Dogs	316SS		21	Stem sleeve locking ring	316SS
	10	Sleeve	316SS		22	Body sleeve locking ring	316SS
	11	Internal body	316SS				

*A - QC4 Only **B - QC6 and QC8 Only

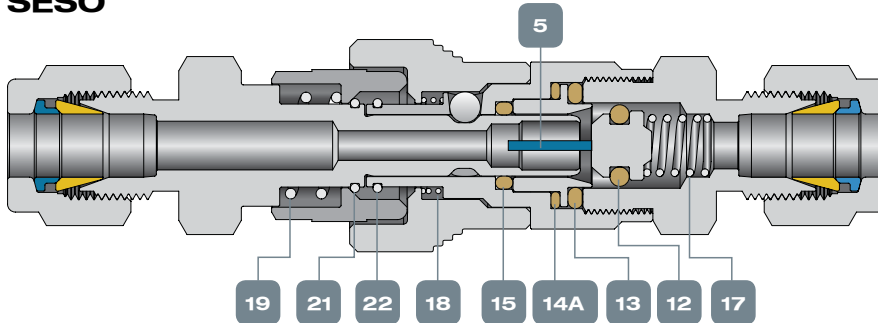
QC4 CROSS SECTION

DESO



Detailed view QC6 and QC8

SESO



CLEANING & PACKAGING

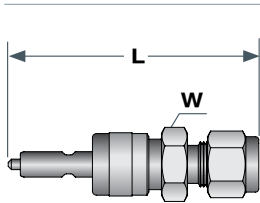
Every Quick connector is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

TESTING

The Quick Connectors designs have been tested for Proof and Burst. Every Quick Connector is factory tested for proper assembly by leakage detection at 1000 psig (68 bar) or its maximum working pressure if less than 1000 psig (68 bar). The maximum allowable leakage is 0.1 std cc/min.

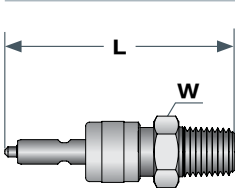
QC-LOK® SERIES DIMENSIONS - STEM

Let-Lok® Stem



Fitting Size	Basic Ordering Numbers		Series	Flow Coefficient (Cv)		Dimensions		
	SESO	DESO		SESO	DESO	L		W
						SESO	DESO	
Dimensions, in. (mm)								
1/8"	QC4-SS-S-L-1/8	NA	QC4	0.08	-	2.27 (57.8)	-	5/8
1/4"	QC4-SS-S-L-1/4	QC4-SS-D-L-1/4	QC4	0.3	0.2	2.36 (59.9)	2.42 (61.5)	5/8
3/8"	QC6-SS-S-L-3/8	QC6-SS-D-L-3/8	QC6	1.0	0.5	2.52 (64.0)	2.64 (67.1)	3/4
1/2"	QC8-SS-S-L-1/2	QC8-SS-D-L-1/2	QC8	2.4	1.5	2.96 (75.2)	3.16 (80.3)	15/16
Dimensions, mm (in.)								
6	QC4-SS-S-L-6MM	QC4-SS-D-L-6MM	QC4	0.3	0.2	59.9 (2.36)	61.5 (2.42)	16
10	QC6-SS-S-L-10MM	QC6-SS-D-L-10MM	QC6	1.0	0.5	67.3 (2.65)	70.4 (2.77)	22
12	QC8-SS-S-L-12MM	QC8-SS-D-L-12MM	QC8	2.4	1.5	75.2 (2.96)	80.3 (3.16)	24

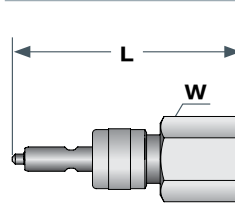
Male Pipe Thread Stem



Fitting Size	Basic Ordering Numbers		Series	Flow Coefficient (Cv)		Dimensions, in. (mm)		
	SESO	DESO		SESO	DESO	L		W inch
						SESO	DESO	
NPT (ISO Tapered, BSPT*)								
1/8"	QC4-SS-S-MN-1/8	QC4-SS-D-MN-1/8	QC4	0.3	0.2	2.07 (52.6)	2.13 (54.1)	5/8
1/4"	QC4-SS-S-MN-1/4	QC4-SS-D-MN-1/4	QC4	0.3	0.2	2.22 (56.4)	2.28 (57.9)	5/8
3/8"	QC6-SS-S-MN-3/8	QC6-SS-D-MN-3/8	QC6	0.8	0.5	2.35 (59.7)	2.47 (62.7)	3/4
1/2"	QC8-SS-S-MN-1/2	QC8-SS-D-MN-1/2	QC8	2.0	1.3	2.84 (72.1)	3.04 (77.2)	15/16
ISO Parallel, BSPP								
1/8"	QC4-SS-S-MG-1/8	QC4-SS-D-MG-1/8	QC4	0.3	0.2	2.07 (52.6)	2.13 (54.1)	5/8
1/4"	QC4-SS-S-MG-1/4	QC4-SS-D-MG-1/4	QC4	0.3	0.2	2.22 (56.4)	2.28 (57.9)	3/4
3/8"	QC6-SS-S-MG-3/8	QC6-SS-D-MG-3/8	QC6	0.8	0.5	2.35 (59.7)	2.47 (62.7)	3/4
1/2"	QC8-SS-S-MG-1/2	QC8-SS-D-MG-1/2	QC8	2.0	1.3	2.84 (72.1)	3.04 (77.2)	15/16

* For ISO Tapered (BSPT) change MN to MR

Female Pipe Thread Stem

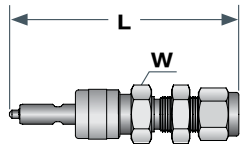


Fitting Size	Basic Ordering Numbers		Series	Flow Coefficient (Cv)		Dimensions, in. (mm)		
	SESO	DESO		SESO	DESO	L		W inch
						SESO	DESO	
NPT (ISO Tapered, BSPT*)								
1/8"	QC4-SS-S-FN-1/8	QC4-SS-D-FN-1/8	QC4	0.3	0.2	2.01 (51.1)	2.07 (52.6)	5/8
1/4"	QC4-SS-S-FN-1/4	QC4-SS-D-FN-1/4	QC4	0.3	0.2	2.26 (57.4)	2.32 (58.9)	3/4
3/8"	QC6-SS-S-FN-3/8	QC6-SS-D-FN-3/8	QC6	0.8	0.5	2.35 (59.7)	2.47 (62.7)	7/8
1/2"	QC8-SS-S-FN-1/2	QC8-SS-D-FN-1/2	QC8	2.0	1.3	2.82 (71.6)	3.02 (76.7)	1 1/16
ISO Parallel, BSPP								
1/8"	QC4-SS-S-FG-1/8	QC4-SS-D-FG-1/8	QC4	0.3	0.2	2.01 (51.1)	2.07 (52.6)	5/8
1/4"	QC4-SS-S-FG-1/4	QC4-SS-D-FG-1/4	QC4	0.3	0.2	2.26 (57.4)	2.32 (58.9)	3/4
3/8"	QC6-SS-S-FG-3/8	QC6-SS-D-FG-3/8	QC6	0.8	0.5	2.35 (59.7)	2.47 (62.7)	7/8
1/2"	QC8-SS-S-FG-1/2	QC8-SS-D-FG-1/2	QC8	2.0	1.3	2.82 (71.6)	3.02 (76.7)	1 1/16

* For ISO Tapered (BSPT) change FN to FR

QC-LOK® SERIES DIMENSIONS - STEM

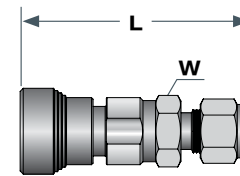
Let-Lok® Bulkhead Stem



Fitting Size	Basic Ordering Numbers		Series	Flow Coef- ficient (Cv)		Dimensions				
	SESO	DESO		SESO	DESO	L		W	Max Panel Thickness	Min Panel Hole Dia
Dimensions, in. (mm)										
1/4"	QC4-SS-S-LB-1/4	QC4-SS-D-LB-1/4	QC4	0.3	0.2	2.74 (69.6)	2.80 (71.1)	5/8	0.25 (6.4)	15/32 (11.9)
3/8"	QC6-SS-S-LB-3/8	QC6-SS-D-LB-3/8	QC6	1.0	0.5	2.92 (74.2)	3.07 (78.0)	3/4	0.44 (11.17)	19/32 (15.1)
1/2"	QC8-SS-S-LB-1/2	QC8-SS-D-LB-1/2	QC8	2.4	1.5	3.43 (87.1)	3.63 (92.2)	15/16	0.50 (12.7)	25/32 (19.8)
Dimensions, mm (in.)										
6	QC4-SS-S-LB-6MM	QC4-SS-D-LB-6MM	QC4	0.3	0.2	69.6 (2.74)	71.1 (2.80)	16	6.4 (0.25)	11.9 (15/32)
10	QC6-SS-S-LB-10MM	QC6-SS-D-LB-10MM	QC6	1.0	0.5	77.7 (3.06)	78.7 (3.10)	22	11.2 (0.44)	16.7 (21/32)
12	QC8-SS-S-LB-12MM	QC8-SS-D-LB-12MM	QC8	2.4	1.5	87.1 (3.43)	92.2 (3.63)	24	12.7 (0.50)	19.6 (49/64)

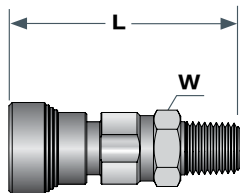
QC-LOK® SERIES DIMENSIONS - BODY

Let-Lok® Body



Fitting Size	Basic Ordering Number	Series	Dimensions	
			L	W
Dimensions, in. (mm)				
1/8"	QC4-SS-B-L-1/8	QC4	2.26 (57.4)	5/8
1/4"	QC4-SS-B-L-1/4	QC4	2.30 (58.4)	5/8
3/8"	QC6-SS-B-L-3/8	QC6	2.58 (65.5)	3/4
1/2"	QC8-SS-B-L-1/2	QC8	3.09 (78.5)	15/16
Dimensions, mm (in.)				
6	QC4-SS-B-L-6MM	QC4	58.4 (2.30)	16
10	QC6-SS-B-L-10MM	QC6	68.1 (2.68)	22
12	QC8-SS-B-L-12MM	QC8	78.5 (3.09)	24

Male Pipe Thread Body



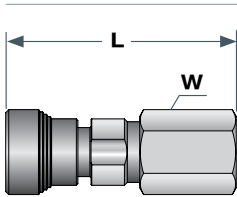
Fitting Size	Basic Ordering Number	Series	Dimensions, in. (mm)	
			L	W
NPT (ISO Tapered, BSPT*)				
1/8"	QC4-SS-B-MN-1/8	QC4	2.01 (51.1)	5/8
1/4"	QC4-SS-B-MN-1/4	QC4	2.16 (54.9)	5/8
3/8"	QC6-SS-B-MN-3/8	QC6	2.38 (60.5)	3/4
1/2"	QC8-SS-B-MN-1/2	QC8	2.97 (75.4)	15/16
ISO Parallel, BSPP				
1/8"	QC4-SS-B-MG-1/8	QC4	2.01 (51.1)	5/8
1/4"	QC4-SS-B-MG-1/4	QC4	2.16 (54.9)	3/4
3/8"	QC6-SS-B-MG-3/8	QC6	2.38 (60.5)	3/4
1/2"	QC8-SS-B-MG-1/2	QC8	2.97 (75.4)	15/16

* For ISO Tapered (BSPT) change MN to MR



QC-LOK® SERIES DIMENSIONS - BODY

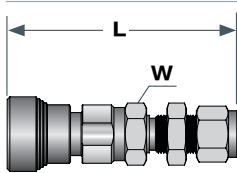
Female Pipe Thread Body



Fitting Size	Basic Ordering Number	Series	Dimensions, in. (mm)	
			L	W
NPT (ISO Tapered, BSPT*)				
1/8"	QC4-SS-B-FN-1/8	QC4	2.16 (54.9)	5/8
1/4"	QC4-SS-B-FN-1/4	QC4	2.42 (61.5)	3/4
3/8"	QC6-SS-B-FN-3/8	QC6	2.57 (65.3)	7/8
1/2"	QC8-SS-B-FN-1/2	QC8	3.22 (81.8)	1 1/16
ISO Parallel, BSPP				
1/8"	QC4-SS-B-FG-1/8	QC4	2.16 (54.9)	5/8
1/4"	QC4-SS-B-FG-1/4	QC4	2.42 (61.5)	3/4
3/8"	QC6-SS-B-FG-3/8	QC6	2.57 (65.3)	7/8
1/2"	QC8-SS-B-FG -1/2	QC8	3.22 (81.8)	1 1/16

* For ISO Tapered (BSPT) change FN to FR

Let-Lok® Bulkhead Body



Fitting Size	Basic Ordering Number	Series	Dimensions		Max Panel Thickness	Min Panel Hole Dia
			L	W		
Dimensions, in. (mm)						
1/4"	QC4-SS-B-LB-1/4	QC4	2.67 (67.8)	5/8	0.25 (6.4)	15/32 (11.9)
3/8"	QC6-SS-B-LB-3/8	QC6	2.98 (75.7)	3/4	0.44 (11.17)	19/32 (15.1)
1/2"	QC8-SS-B-LB-1/2	QC8	3.56 (90.4)	15/16	0.50 (12.7)	25/32 (19.8)
Dimensions, mm (in.)						
6	QC4-SS-B-LB-6MM	QC4	67.8 (2.67)	16	6.4 (0.25)	11.9 (15/32)
10	QC6-SS-B-LB-10MM	QC6	75.9 (2.99)	22	11.2 (0.44)	16.7 (21/32)
12	QC8-SS-B-LB-12MM	QC8	90.4 (3.56)	24	12.7 (0.50)	19.6 (49/64)

Overall Length Calculation for QC Series

To calculate the overall length in the coupled position, subtract the insertion depth from any overall Stem and Body combination length

- SESO 1/4" : 28.6 mm (0.89 inch)
- DESO 1/4" :30.2 mm (0.95 inch)
- SESO 3/8" : 30.0 mm (1.18 inch)
- DESO 3/8" :33.0 mm (1.3 inch)
- SESO 1/2" : 37.6 mm (1.48 inch)
- DESO 1/2" : 42.7 mm (1.68 inch)

Dimensions are for reference only, and are subject to change without notice

RECOMMENDATIONS

- It is recommended to install a filter ahead of the QC-LOK®
- Hanging hoses or other accessories should be supported in order to prevent side loads
- The QC-LOK® should be coupled or uncoupled at room temperature, and while the bodies and stems are aligned
- Stem seal O-Rings should be lubricated from time to time

Pressure-Temperature Ratings	
Coupled	*MAWP QC4 3000 psig (206 bar) @ 70°F (21°C)
	*MAWP QC6 1500 psig (103 bar) @ 70°F (21°C)
	*MAWP QC8 750 psig (51.7 bar) @ 70°F (21°C)
	*MAWT 400°F (204°C) @ 250 psig (17.2 bar)
Uncoupled and When Coupling and Uncoupling	*MAWP 250 psig (17.2 bar) @ 70°F (21°C)

*MAWP - Maximum Allowable Working Pressure

*MAWT - Maximum Allowable Working Temperature

Note:

Uncoupled QC-LOK is rated up to 70°F (21°C)

Pressure & Temperature ratings are for stainless steel construction and Fluorocarbon FKM Seals

Spillage and Air Inclusion		
Size	Spillage CM ³	Air Inclusion CM ³
1/4"	0.3	0.3
3/8"	1.0	1.0
1/2"	3.0	3.0

Definitions:

Spillage: Volume of flowing media that will be released from the system while disconnecting the DESO (only) Quick Connector.

Air Inclusion: Volume of air that will be entered to the system while connecting the DESO (only) Quick Connector.

Maximum Flow Rate	
Size	Water Flow U.S. gal/min (L/min) at 70°F (20°C)
QC4	4 (15)
QC6	6 (22)
QC8	10 (37)

O-RINGS

Different materials are available for special applications

O-Ring Material	Temperature Rating °F (°C)
Buna N	-35 to 250 (-37 to 121)
Ethylene Propylene (EPDM)	-70 to 250 (-57 to 121)
Fluorocarbon FKM	-15 to 400 (-26 to 204)
Polychloroprene (CR)	-35 to 225 (-37 to 107)
Perfluoroelastomer	-15 to 500 (-26 to 260)

WARNING

- Always take notice of pressure rating restrictions that apply to coupling or uncoupling
- SESO should not be uncoupled under pressure
- QC-LOK® should not be rotated while coupled

QC4 SERIES ORDERING INFORMATION

QC4 - SS - B - L - 1/4 - [] - []

Series	Material	Connector Type	End Connection	Size	O - Ring
QC4- 1/4" Body	SS - 316	B - Body	L - LET-LOK® (Tube)	1/8 6MM	BLANK - Fluorocarbon FKM
QC6- 3/8" Body		S - SESO Stem	LB - LET-LOK® Bulkhead	1/4 6MM	BU - BUNA N
QC8- 1/2" Body		D - DESO Stem	NB - NPT Bulkhead	3/8 10MM	EP - EPDM
			MN - Male NPT	1/2 12MM	NE - Polychloroprene (CR)
			FN - Female NPT	DES0 Stems can't be made with 1/8" ends	
			MG - Male ISO Parallel		
			FG - Female ISO Parallel		
			MR - Male ISO Tapered		
			FR - Female ISO Tapered		
			H - Hose Connector		
			HL - ONE-LOK®		

OPTIONAL

O - Ring
 BLANK - Fluorocarbon FKM
 BU - BUNA N
 EP - EPDM
 NE - Polychloroprene (CR)
 KZ - Perfluoroelastomer



Treatment
 OC - Oxygen Clean
 LF - Lubricant Free

High-Flow Quick Connectors

The full-flow option contains a full flow body and a SESO stem. To order a full flow body, please select the relevant letters and "HF".
Example: QC4-SS-B-FN-1/4-HF

BODY AND STEM PROTECTORS

Body & stem protectors prevent entry of contaminants & damages caused upon uncoupling of the bodies and stems. The protectors do not contain pressure.

STEM PROTECTOR	BODY PROTECTOR
QC4-SS-SP QC6-SS-SP QC8-SS-SP	QC4-SS-BP QC6-SS-BP QC8-SS-BP
	

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

QC-LOK, Rev.05, January 2014



HAM-LET INDUSTRIAL MECHANICAL Pressure Gauges

PRESSURE GAUGES



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IMPH

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Safety Pattern/
Solid Front
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IMPP

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Process Gauge
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series

Low Pressure
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HAM-LET Pressure Gauges Process Connections



BSP-P Thread



NPT Thread



HAM-LET
Tube adapter



HAM-LET Face Seal
Male swivel



HAM-LET Face Seal
Female swivel

HAM-LET Pressure Gauges Selection Guide

Series	Type	Configuration			Liquid Fillable	Solid Front	Safety Glass Window	Adjustable Pointer	Accuracy	Case Size	Measurement Range
		C	B	L						mm (inch)	
Heavy Duty	H	Yes	-	Yes	Yes	-	Yes	-	1.6% ± EN 837 Class 1.6 (Class 2.5 for 0-600 & 0-1000 bar range)	40 (1.5)	Vacuum: -1 - 0 bar Pressure: 0 - 600 bar
		Yes	Yes	Yes	Yes	-	Yes	Yes	1.0% ± EN 837 Class 1.0	63 (2.5)	Vacuum: -1 - 0 bar Pressure: 0 - 1000 bar
		-	Yes	Yes	Yes	-	Yes	Yes		100 (4)	
		-	Yes	Yes	Yes	Yes	-	Yes	Yes	160 (6)	
General use	G	Yes	-	Yes	Yes	-	-	-	± 1.6% EN 837 Class 1.6 (Class 2.5 for 0-600 & 0-1000 bar range)	50 (2)	Vacuum: -1 - 0 bar Pressure: 0 - 600 bar
		Yes	Yes	Yes	Yes	-	Yes	-		63 (2.5)	Vacuum: -1 - 0 bar Pressure: 0 - 1000 bar
		-	Yes	Yes	Yes	Yes	-	Yes	-	± 1.0% EN 837 Class 1.0	100 (4)
Safety Pattern / Solid Front	S	-	Yes	Yes	Yes	Yes	Yes	Yes	± 1.6% EN 837 Class 1.6 (Class 2.5 for 0-600 & 0-1000 bar range)	63 (2.5)	Vacuum: -1 - 0 bar Pressure: 0 - 1000 bar
		-	Yes	Yes	Yes	Yes	Yes	Yes	± 1.0% EN 837 Class 1.0	100 (4)	
		-	-	Yes	Yes	Yes	Yes	Yes	Yes	160 (6)	
Process	P	-	-	Yes	Yes	Yes	Yes	Yes	± 0.5% ASME B40.1 Grade 2A	115 (4.5)	Vacuum: -1 - 0 bar Pressure: 0 - 1000 bar
Low Pressure	L	Yes	-	Yes	Yes	-	Yes	-	± 1.6% EN 837 Class 1.6	63 (2.5)	Vacuum: -25 - 0 mbar Pressure: 0 - 600 mbar
		Yes	-	Yes	Yes	-	Yes	Yes		100 (4)	

Industrial Mechanical Pressure gauges:

Bourdon Tube Measuring Element



Coiled type



C type

General:

The Industrial Mechanical Pressure gauges are measuring devices constructed from only high quality materials, by the highest quality standards and methods.

The IMP gauge guarantee long life with durability for in-door and out-door industrial, process and instrumentation applications.

💡 The IMP product variety in the catalog covers standard gauges, extensive options are available

Features:

- Nominal case sizes: 40, 50, 63, 100, 115, 160 mm (1½", 2", 2½", 4", 4½", 6").
- Pressure, Vacuum and Compound measuring ranges.
- Pressure ranges of
0-1 inH₂O up to 0-250 inH₂O (0-2.5 mbar up to 0-600 mbar),
0-10 up to 0-15,000 psi (0-0.6 up to 0-1000bar) and above.
- Accuracy of ± 0.5/1/1.6/2.5 % of span (EN 837-1 Class 1/1.6/2.5, ASME B40.1 Grade 1A/2A /B/C).
- Manufactured in accordance to EN 837 and ASME B40.1 standards.
- All wetted parts made of 316L Stainless Steel (Alloy 400 as an option).
- Connections include threaded, tube adapter and face seal.

Cleaning:

- Special cleaning of wetted parts is available upon request -
- Lubricants free.
 - Silicon free.
 - Cleaned for Oxygen service.

Testing & Calibration:

All IMP gauges are factory calibrated and bubble tested for leakage. Helium leak test is available.

Selecting Pressure Gauge For Your Application

Selecting the proper gauge to withstand application pressures, temperature, media's chemical effects and environmental conditions is a prime concern for the system engineer. The EN 837-2 or ASME B40.1 standard should be considered as a guideline for proper selection. For assistance in matching the proper pressure gauge for your application, please consult a HAM-LET local representative.

Filling:

Gauge cases are often liquid filled to protect the internals against damages caused by severe vibrations or pressure pulsations and exclude condensation in outdoor installations. All IMP gauges can be filled or unfilled as ordered, the gauges are always fillable.

- Standard filling is Glycerin (99%) .
- Glycerin (86%) for low ambient temperatures, Silicon oil, other filling as an option.

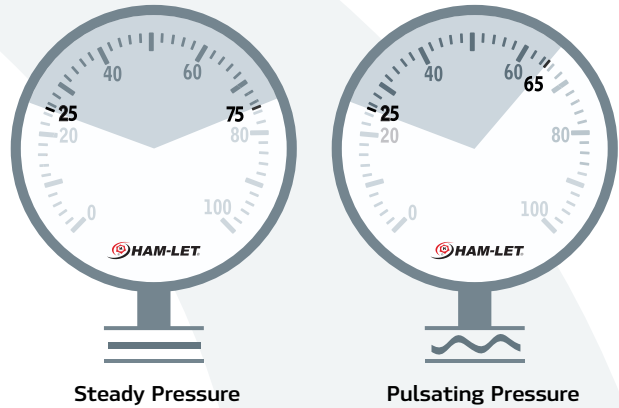
Warning!

Glycerin and Silicon oil must be avoided where Oxygen or other strong oxidizing agents are present.

Scale Selection And Load Limits:

General recommendation for working measured pressure is to be in the range of 25-65% for pulsating pressures and 25-75% for steady pressures out of the maximal dial range.

Recommended working pressure range



Maximal pressure load limits for operation without loss of accuracy:

Case size: 100, 115, 160 mm (4", 4½", 6")	
Type of load	Pressure load limit out of full scale
Steady	100%
Pulsating (cyclic)	90%
Overpressure (temporary)	130%

Case size: 40, 50, 63 mm (1½", 2", 2½")	
Type of load	Pressure load limit out of full scale
Steady	75%
Pulsating (cyclic)	65%
Over pressure (temporary)	100%

- 💡 The IMP gauges are constructed to withstand up to 300% full scale temporary over pressure without system failure.
- 💡 With low pressure gauges (L series), up to 1000% full scale over pressure protection can be supplied as an option.

Process Connections:

Stainless steel process connections maximal pressure

Connection		Maximal Pressure
Type	Size	
BSP-P	1/8"	6,000 psi (400 bar)
NPT		
BSP-P	1/4"	15,000psi (1000 bar)
NPT		
FACE SEAL	1/4"	5,200psi (359 bar)
NPT	1/2"	15,000psi (1000 bar)
BSP-P	1/2"	20,000psi (1600 bar)
HP		
Tube Adapter	1/4", 6mm	10,000psi (600 bar)
	3/8", 1/2", 10mm, 12mm	6,000 psi (400 bar)



Temperature limitations

Temperature Limitations	Unfilled	Glycerin (99%) Filled	Glycerin (86%) Low Temperature Filled
Storage	-40 to +158 °F	-4 to +158 °F	-4 to +158 °F
	(-40 to +70 °C)	(-20 to +70 °C)	(-20 to +70 °C)
Ambient	-40 to +140 °F	-4 to +140 °F	-40 to +140 °F
	(-40 to +60 °C)	(-20 to +60 °C)	(-40 to +60 °C)
Media Max. H,G,S Series	+392 °F	+212 °F	+212 °F
	(+200 °C)	(+100 °C)	(+100 °C)
Media Max. P,L Series	+212 °F	+158 °F	+158 °F
	(+100 °C)	(+70 °C)	(+70 °C)

Reference Temperature:

The measuring device is calibrated for working temperature of +68 °F (+20 °C).

A 0.4% deviation in the measured pressure for each +18 °F (+10 °C) temperature change should be expected.



For extreme ambient or media temperatures, please consult a HAM-LET local representative.

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.



Heavy Duty
Pressure Gauges

IMPH series



IMPH series

Data Sheet:

General:

The industrial mechanical, **H**-Heavy duty pressure gauges series is designed to be used in industrial, instrumentation and process applications that require long durability with accuracy and easy maintainability for indoor, outdoor and harsh environments.

The H series pressure gauges are bourdon tube mechanical devices. Case sizes 40, 63, 100, 160mm (1½", 2½", 4", 6") are suitable for vacuum to pressure up to 1000bar (15,000psi).

Features:

- All stainless steel case and wetted parts.
- Bayonet ring and adjustable pointer for easy adjustment.
- Safety laminated glass front.
- Case is filled or fillable dry.
- Case protection: IP 65 (IP 54 for 160mm (6") case with range 30psi (2.5bar) and below).
- Safety category (EN 837-1) S1 for pressure gauges with blow-out device 100mm (4") and 63mm (2½") cases.
- **Measuring Ranges**
 - Vacuum: 30" Hg Vac. to 0 psi (-1 to 0 bar)
 - Compound: 30" Hg Vac. through 0 to 300 psi (-1 through 0 to 15 bar)
 - Pressure: 0 to 15,000 psi (0 to 1,000 bar), 40mm (1½") case up to 10,000psi (600 bar)

Materials Of Construction

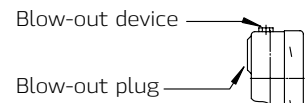
Part		Material
Wetted Parts	Process connection	SS 316L
	Bourdon Tube	
Case		SS 304
Window		Laminated safety glass
Movement		Stainless steel
Dial		Aluminum (black figures, white background)
Pointer		Aluminum (black)



Technical data

Case Size		40mm (1½")	63mm (2½")	100mm (4")	160mm (6")
Accuracy	Up to 6,000psi (400 bar)	±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade B	±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade B	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A
	10,000psi (600bar) and above (4)	±2.5% of span EN 837-1 Class 2.5 ASME B40.1 Grade C	±2.5% of span EN 837-1 Class 2.5 ASME B40.1 Grade C	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A
Case Configurations	Process connection position				
	Mounting device (Optional)				
Process Connection	½", 12mm Tube adapter			+	
	3/8", 10mm Tube adapter	+ (1)	+		
	¼", 6mm Tube adapter	+	+		
	½" BSP-P/NPT			+	+
	¼" BSP-P/NPT	+ (1)	+	+	+
	1/8" BSP-P/NPT	+	+		
	M20x1.5			+	+
M12x1.5	+ (1)	+	+	+	
Blow-Out Device	¼" face seal Male/Female swivel	+ (1)	+		
	Blow-out device at the top of the case				+
	Blow-out plug in the back of the case, Ø 40mm (1½")			+	
Case Ventilation	Blow-out plug at the top of the case		+		
	By blow-out device / Plug		+		+
Weight ⁽³⁾ Pound (Kg.)	Internal pressure compensation by pressure equalizing membrane	+ (2)		+	
	Unfilled	0.15 (0.07)	0.40 (0.18)	1.33 (0.60)	2.43 (1.10)
	Filled	0.22 (0.10)	0.55 (0.25)	2.10 (0.95)	4.30 (1.95)

- (1) Center back only
- (2) For pressure ranges up to 0-200psi (0-16bar)
- (3) Approx. without mounting device
- (4) See Maximal pressure per connection type, page 370

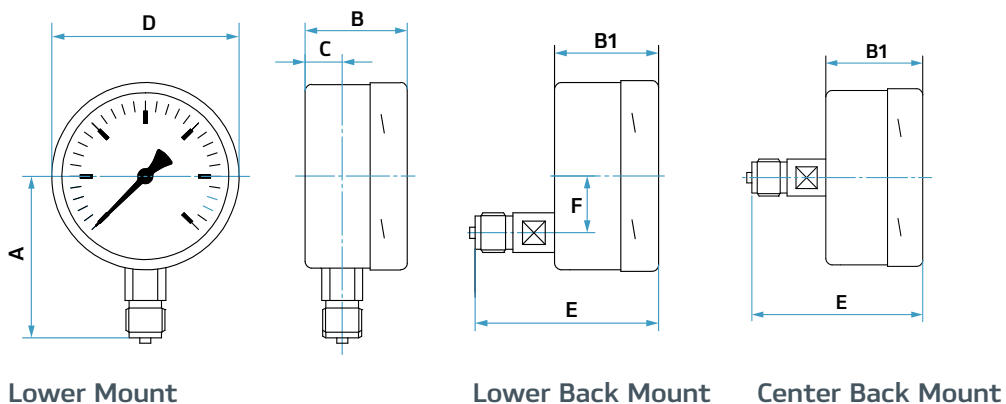




HAM-LET IMP gauges **H** Series

PRESSURE GAUGES

Configuration And Mounting Dimensions



Lower Mount

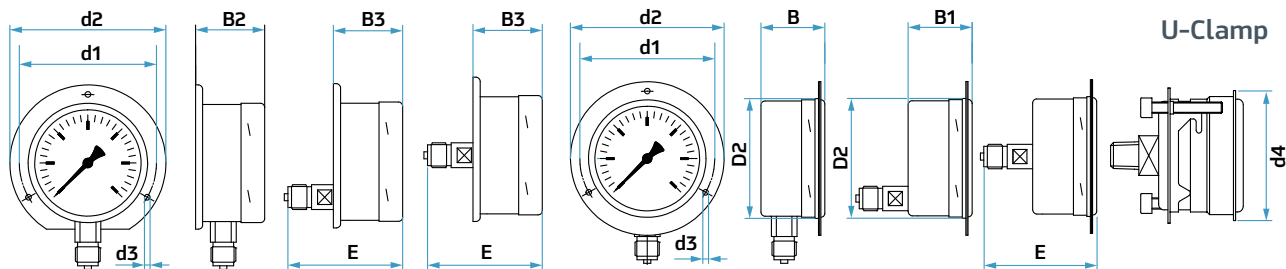
Lower Back Mount

Center Back Mount

Case Size		A		B		B1		C		D		E		F	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
40	1 1/2	34.5	1.36	28	1.1	30	1.18	10	0.4	40	1.57	47	1.85	-	-
63	2 1/2	54	2.13	33	1.3	37	1.46	10	0.39	64	2.52	59	2.32	18	0.71
100	4	87	3.43	55	2.17	55	2.17	20	0.79	101	3.98	97	3.82	30	1.18
160	6	115	4.53	51	2.01	51	2.01	15.5	0.61	161	6.34	92.5	3.64	30	1.18

Back Flange Mounting

Front Flange Mounting



Case Size		B2		B3		D2		d1		d2		d3		d4	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
40	2/11	-	-	-	-	41.8	1.64	51	2.01	61	2.4	3.6	0.14	46	1.81
63	2/12	36	1.42	40	1.57	66	2.6	75	2.95	85	3.35	3.6	0.14	-	-
100	4	58.5	2.3	58.5	2.3	103	4.06	116	4.57	132	5.2	4.8	0.19	-	-
160	6	54	2.13	54	2.13	163	6.42	178	7.01	196	7.72	5.8	0.23	-	-



General Use
Pressure Gauges

IMPG series



HAM-LET IMP gauges **G** Series



IMP**G** series

Data Sheet:

General:

The Industrial, G – General Use pressure gauges series guarantee long life and durability for indoor, outdoor and harsh surroundings, industrial, instrumentation and process applications.

The G series pressure gauge is a bourdon tube mechanical device, Case sizes 50, 63, 100, 160mm (2", 2½", 4", 6") suitable for vacuum to pressure up to 1000bar (15,000psi).

Features:

- All stainless steel case and wetted parts.
- Polished Crimped-on ring for firm window sealing.
- Safety laminated glass front.
- Case is filled or fillable dry.
- Case protection: IP 65 (IP 54 for 160mm (6") case with range 30psi (2.5bar) and below).
- Safety category (EN 837-1) S1 for pressure gauges with blow-out device.
- **Measuring Ranges**
 - Vacuum: 30" Hg Vac. to 0 psi (-1 to 0 bar)
 - Compound: 30" Hg Vac. through 0 to 300 psi (-1 through 0 to 15 bar)
 - Pressure: 0 to 15,000 psi (0 to 1,000 bar), 50mm (2") case up to 10,000psi (600 bar)

Materials Of Construction

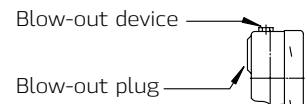
Part		Material
Wetted Parts:	Process Connection	SS 316L
	Bourdon Tube	
Case		SS 304L
Window		Laminated safety glass
Movement		Stainless steel
Dial		Aluminum (black figures, white background)
Pointer		Aluminum (black)



Technical data

Case Size		50mm (2")	63mm (2½")	100mm (4")	160mm (6")
Accuracy	Up to 6,000psi (400 bar)	±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade B	±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade B	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A
	10,000psi (600bar) and above (2)	±2.5% of span EN 837-1 Class 2.5 ASME B40.1 Grade C	±2.5% of span EN 837-1 Class 2.5 ASME B40.1 Grade C	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A
Case Configurations	Process connection position				
	Mounting device (Optional)				
Process Connection	½", 12mm Tube adapter			+	
	3/8", 10mm Tube adapter	+	+		
	¼", 6mm Tube adapter	+	+		
	½" BSP-P/NPT			+	+
	¼" BSP-P/NPT	+	+	+	+
	1/8" BSP-P/NPT	+	+		
	M20x1.5			+	+
M12x1.5	+	+		+	
Blow-Out Device	¼" face seal Male/Female swivel	+	+ (3)		
	Blow-out device at the top of the case				+
	Blow-out plug in the back of the case, Ø 40mm (1½")			+	
Case Ventilation	Blow-out plug at the top of the case		+		
	By blow-out device / Plug	+	+		+
Weight (1) Pound (Kg.)	Internal pressure compensation by pressure equalizing membrane			+	
	Unfilled	0.198 (0.09)	0.40 (0.18)	1.33 (0.60)	2.43 (1.10)
	Filled	0.286 (0.13)	0.55 (0.25)	1.98 (0.90)	3.75 (1.70)

(1) Approx. without mounting device
 (2) See Maximal pressure per connection type, page 370
 (3) Center back mount only

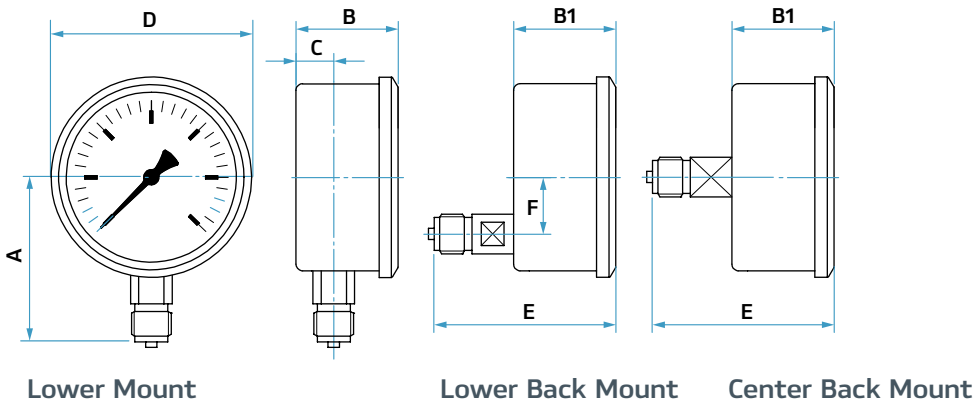




HAM-LET IMP gauges **G** Series

PRESSURE GAUGES

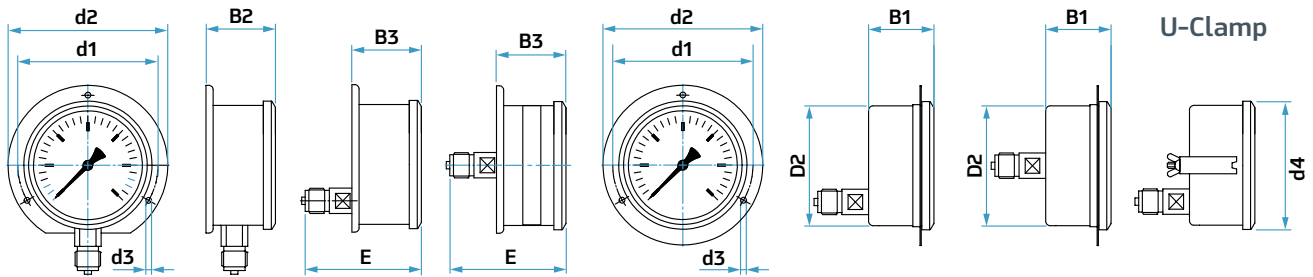
Configuration And Mounting Dimensions



Case Size		A		B		B1		C		D		E		F	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
50	2	45	1.77	29	1.14	31	1.22	10	0.4	54	2.13	50	1.97	-	-
63	2 1/2	54	2.13	33	1.3	37	1.46	10	0.40	67	2.63	60	2.36	18	0.71
100	4	87	3.43	54	2.13	54	2.13	20	0.79	106	4.17	96	3.78	30	1.18
160	6	115	4.53	50	1.97	55	2.17	15	0.59	167	6.57	97	3.82	30	1.18

Back Flange Mounting

Front Flange Mounting



Case Size		B2		B3		D2		d1		d2		d3		d4	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
50	2	-	-	-	-	51	2.01	60	2.36	71	2.8	3.6	0.14	71	2.8
63	2/12	36	1.42	40	1.57	64	2.52	75	2.95	85	3.35	3.6	0.14	-	-
100	4	57.5	2.26	57.5	2.26	101	3.98	116	4.57	132	5.2	4.8	0.19	-	-
160	6	53	2.09	58	2.28	-	-	178	7.01	196	7.72	5.8	0.23	-	-





Safety Pattern/Solid Front
Pressure gauges

IMPS
series



IMPS series data sheet:

General:

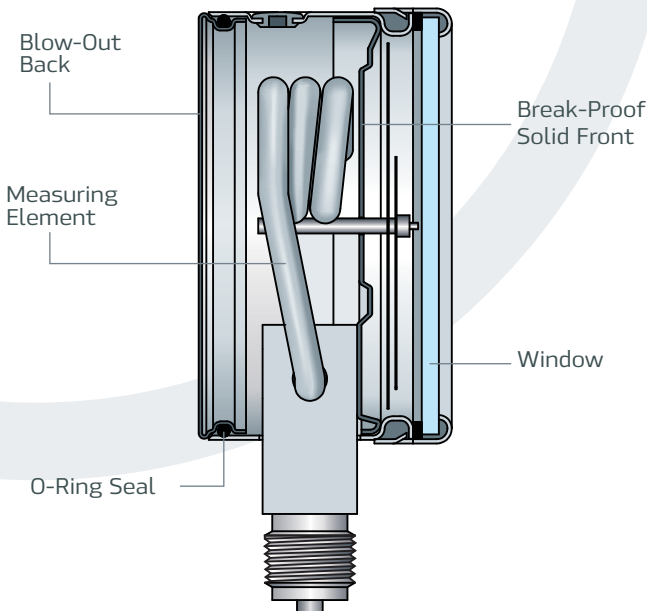
The Industrial, S-Safety Pattern / Solid Front pressure gauges series is a heavy duty pressure gauge with a special case and a laminated safety glass window delivering a safer usage for the end system user while maintaining the long usability and durability for indoor, outdoor and harsh surroundings, industrial, instrumentation and process applications. The safety pattern / Solid Front case has a break-proof solid front (a firm partition between the pressure element and the window) and a pressure relief back (blow-out back). The S series gauges are marked with the ® symbol on the dial. The S series pressure gauge is a bourdon tube mechanical device, case sizes 63, 100, 160mm (2½", 4", 6") suitable for vacuum to pressure up to 1000bar (15,000psi).

Features:

- All stainless steel case and wetted parts.
- Bayonet ring and adjustable pointer for easy adjustment
- Break-proof solid front case with blow-out back.
- Safety laminated glass front.
- Case is filled or fillable dry.
- Case Protection: IP 65.
- Safety Category (EN 837-1) S3.
- **Measuring Ranges**
 - Vacuum: 30" Hg Vac. to 0 psi (-1 to 0 bar)
 - Compound: 30" Hg Vac. through 0 to 300 psi (-1 through 0 to 15 bar)
 - Pressure: 0 to 15,000 psi (0 to 1,000 bar)







Materials of Construction

Part	Material	
Wetted Parts:	Process Connection	SS 316L
	Bourdon Tube	
Case		SS 304L
Window		Laminated safety glass
Movement		Stainless Steel
Dial		Aluminum (black figures, white background)
Pointer		Aluminum (black)





Technical Data S Series

Case Size		63mm (2½")	100mm (4")	160mm (6")
Accuracy	Up to 6,000psi (400 bar)	±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade B	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A
	10,000psi (600bar) and above (2)	±2.5% of span EN 837-1 Class 2.5 ASME B40.1 Grade c	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A	±1.0% of span EN 837-1 Class 1.0 ASME B40.1 Grade 1A
Case Configurations	Process connection position			
	Mounting device (Optional)			
Process Connection	½", 12mm Tube adapter		+	
	3/8", 10mm Tube adapter	+		
	¼", 6mm Tube adapter	+		
	½" BSP-P/NPT		+	+
	¼" BSP-P/NPT	+	+	+
	1/8" BSP-P/NPT	+		
	M20x1.5		+	+
M12x1.5	+	+	+	
Blow-Out Device	Blow-out back	+	+	+
	Screw with ventilation bore	+	+	+
Case Ventilation	Internal pressure compensation by pressure equalizing membrane	+	+	
Weight (1) Pound (Kg.)	Unfilled	0.39 (0.18)	1.40 (0.65)	3.30 (1.50)
	Filled	0.55 (0.25)	2.20 (1.00)	6.5 (2.95)

(1) Approx. without mounting device

(2) See Maximal pressure per connection type, page 370

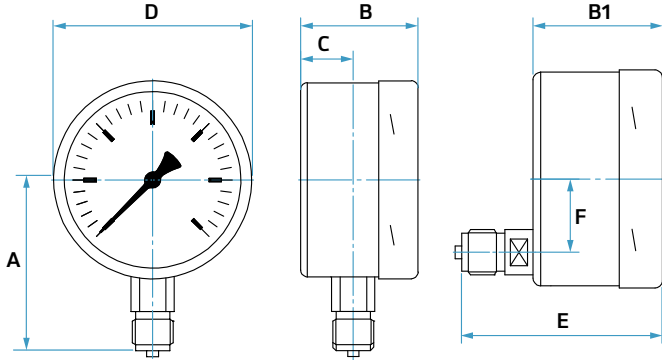
(3) Lower back connection available only for dry option



HAM-LET IMP gauges **S** Series

PRESSURE GAUGES

Configuration And Mounting Dimensions



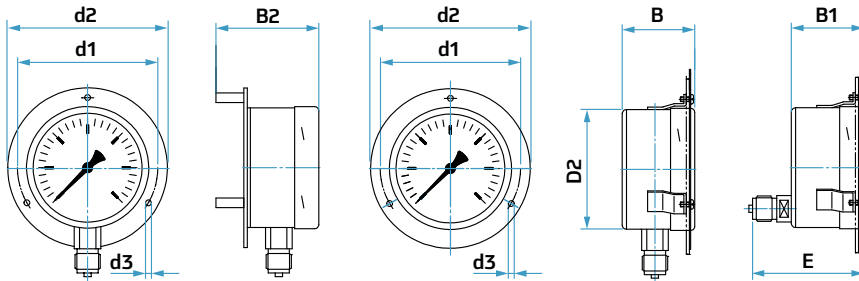
Lower Mount

Lower Back Mount

Case Size		A		B		B1		C		D		E		F	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
63	2 1/2	54	2.13	41	1.61	41	1.61	18	0.71	64	2.52	63	2.48	18	0.71
100	4	87	3.43	60	2.36	60	2.36	27	1.06	101	3.98	93	3.66	34	1.34
160	6	115	4.53	78	3.07	78	3.07	40	1.57	161	6.34	-	-	-	-

Back Flange Mounting

Front Flange Mounting



Case Size		B2		d1		d2		d3	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
63	2/1 2	61	2.4	75	2.95	85	3.35	3.6	0.14
100	4	85	3.35	116	4.57	132	5.2	4.8	0.19
160	6	108	4.25	178	7.01	196	7.72	5.8	0.23





Process
Pressure gauges

IMP P
series



HAM-LET IMP gauges **P** Series

IMPP series

data sheet:

General:

The Industrial, P - Process pressure gauge is a heavy duty pressure gauge with a special thermoplastic safety case for process industries, chemical, petro-chemical, gas and oil, and power plant applications with accordance to the ASME B40.1 standard.

The reinforced thermoplastic case and stainless steel wetted parts make the P pressure gauge suitable for service in corrosive areas and with aggressive media while maintaining a long life and durability for indoor and outdoor process applications.

The safety pattern case has a break-proof solid front (a firm partition between the pressure element and the window) and a pressure relief back (blow-out back).

The P series pressure gauge is a bourdon tube mechanical devices, of case sizes 4½" (115 mm), suitable for vacuum to pressure up to 1000bar (15,000psi).

Features:

- Thermoplastic case with back mounting design.
- Stainless steel wetted parts.
- Adjustable pointer (Micro pointer) for easy adjustment.
- Break-proof solid front case with blow-out back.
- Safety laminated glass front.
- Case is filled or fillable.
- Case protection: IP 65.
- Compliance to ASME B40.1 standard grade 2A .
- Fire retardant and impact resistance according UL 94 VO.

Measuring ranges



- Vacuum: 30" Hg Vac. to 0 psi (-1 to 0 bar)
- Compound: 30" Hg Vac. through 0 to 300 psi (-1 through 0 to 15 bar)
- Pressure: 0 to 15,000 psi (0 to 1,000 bar).



Materials Of Construction

Part		Material
Wetted Parts:	Process connection	SS 316L
	Bourdon tube	
Case		Thermoplastic PBTP Black
Window		Laminated safety glass
Movement		Stainless Steel
Dial		Aluminum (black figures, white background)
Pointer		Aluminum (black)

Technical Data P Series

Case Size		4½" (115 mm)
Accuracy	Up to 15,000psi (1000 bar) (2)	±0.5% of span EN 837-1 Class 1.0 ASME B40.1 Grade 2A
Case Configurations	Process connection position	
	Built in Mounting	
Process Connection	½", 12mm Tube adapter	+
	½" BSP-P/NPT	+
	¼" BSP-P/NPT	+
Blow-Out Device	Blow-out back	+
Compensation Diaphragm	By blow-out device / Plug	+
	Internal Elastomer	+
Weight (1) Pound (Kg.)	Unfilled	1.88 (0.85)
	Filled	2.76 (1.25)

(1) Approx. without mounting device

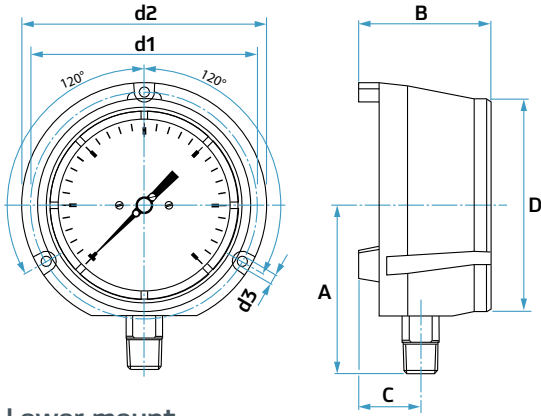
(2) See Maximal pressure per connection type, page 370



HAM-LET IMP gauges **P** Series

PRESSURE GAUGES

Configuration And Mounting Dimensions



Lower mount

Case Size		A		B		C		D		d1		d2		d3	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
115	4 1/2	102	4.02	80	3.15	375	1.48	129	5.08	137	5.39	148	5.83	6.1	0.24



Low pressures
Pressure gauges

IMPL series



IMPL series

data sheet:

General:

The Industrial, L - Low pressures gauge series are gaseous media positive and negative low pressures measurement devices with long usability and durability for indoor, outdoor and harsh surroundings, industrial, instrumentation and process applications.

The L series pressure gauges is a capsule mechanical device, Case sizes 63, 100, 160mm (2½", 4", 6") are suitable for vacuum to pressure up to 250inchH2O (600mbar)

Features:

- All stainless steel case and wetted parts.
- Bayonet ring.
- Front-sided screw for zero point adjustment with an adjusting range of ±5%.
- Case is filled or dry.
- Case protection: IP 54.
- **Measuring ranges**
 - Vacuum/ Pressure: 0-1inchH2O up to 0-250inchH2O (0-2.5mbar up to 0-600mbar)
 - For case size 63mm (2½") 0-25inchH2O (0-25mbar) and up.
 - Compound: -0.4-06inchH2O up to -150-100inchH2O (-1-1.5mbar up to -400-200mbar)
 - For case size 63mm (2½") -4-6inchH2O (-10-15mbar) and up.

Materials of Construction

Part		Material
Wetted Parts:	Process Connection	SS 316L
	Bourdon Tube	
Case		SS 304L
Window		Laminated safety glass
Movement		Stainless Steel
Dial		Aluminum (black figures, white background)
Pointer		Aluminum (black)

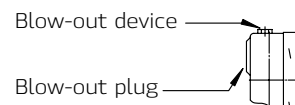


Technical Data L Series

Case Size		63mm (2½")	100mm (4")	160mm (6")
Accuracy		±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade B	±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade 1A	±1.6% of span EN 837-1 Class 1.6 ASME B40.1 Grade 1A
Case Configurations	Process connection position			
	Mounting device (Optional)			
Process Connection	½", 12mm Tube adapter		+	
	3/8", 10mm Tube adapter	+		
	¼", 6mm Tube adapter	+		
	½" BSP-P/NPT		+	+
	¼" BSP-P/NPT	+	+	+
	1/8" BSP-P/NPT	+		
	M20x1.5		+	+
M12x1.5	+	+	+	
Case Ventilation Filled Only	By blow -out device		+	
Weight ⁽¹⁾ Pound (Kg.)	Unfilled	0.44 (0.20)	1.32 (0.60)	2.20 (1.00) ⁽²⁾
	Filled	0.57 (0.26)	2.09 (0.95)	3.97 (1.80) ⁽²⁾

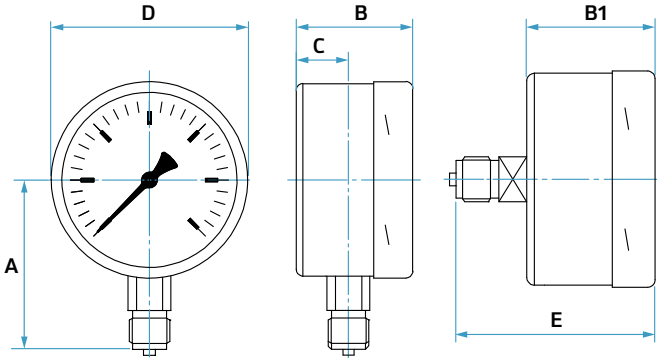
(1) Approx. without mounting device.

(2) For 160mm (6") ≥ 25mbar - Unfilled 2.09 (0.95), Filled 3.97 (1.80).





Configuration And Mounting Dimensions



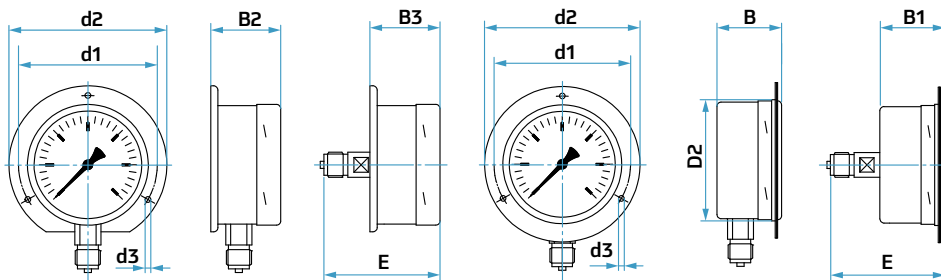
Lower Mount

Lower Back Mount

Case Size		A		B		B1		C		D		E	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
63	2 1/2	54	2.13	38 (1)	1.5(1)	37	1.46	10	0.4	64	2.52	60	2.36
100	4	87	3.43	55	2.17	55	2.17	20 (2)	0.79 (2)	101	3.98	85	3.35
160	6	115	4.53	55	2.17	55	2.17	15	0.59	161	6.34	85	3.35
≤6 inCH ₂ O (16mbar)				51	2.01	51	2.01	15	0.59	161	6.34	81	3.18
160	6	115	4.53	51	2.01	51	2.01	15	0.59	161	6.34	81	3.18
≥10 inCH ₂ O (25 mbar)													

Back Flange Mounting

Front Flange Mounting



Case Size		B2		B3		D2		d1		d2		d3	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
63	2 1/2	41 (1)	1.61 (1)	40	1.57	66	2.6	75	2.95	85	3.35	3.6	0.14
100	4	59	2.32	59	2.32	103	4.06	116	4.57	132	5.20	4.8	0.19
160	6	58	2.28	58	2.28	163	6.42	178	7.01	196	7.72	5.8	0.23
≤6 inCH ₂ O (16mbar)				54	2.13	54	2.13	163	6.42	178	7.01	196	7.72
160	6	54	2.13	54	2.13	163	6.42	178	7.01	196	7.72	5.8	0.23
≥10 inCH ₂ O (25 mbar)													

(1) For case size 63 filled: B=47 mm (1.85 inch), B2=50 mm (1.97 inch)

(2) For range ≤ 6 inCH₂O (16mbar): C=15.5 mm (0.61 inch)



Ordering Information For Industrial Mechanical Pressure Gauges

OPTIONAL

See page 393

IMP - Industrial Mechanical Pressure gauge

H - Series

Gauge size	
mm	inch
40	1 1/2
50	2
63	2 1/2
10	4
11	4 1/2
16	6

10 - Gauge size

L - Process Connection Type

Process Connection Type	
Connection type	Connection Size
P - BSP-P	1/8, 1/4, 1/2 inch
N - NPT	1/8, 1/4, 1/2 inch
M - Metric (Mx1.5)	12M, 20M mm
T - Tube adapter	06M, 10M, 12M mm 1/4, 3/8, 1/2 inch
V - Face Seal Male swivel	1/4 inch
F - Face Seal Female swivel	1/4 inch
H - High pressure Male	916 (9/16) inch
High pressure Female	1/4 inch 16m mm

1/4 - Process Connection Type

N - Mounting Device

Mounting Device	
N - None	
R - Rear Flange	
F - Front Flange	
U - U - Clamp	

B - Dial Range Units*

Dial Range Units*	
B - bar	
P - psi	
M - milibar	
K - kPa	
I - MPa	
H - inH ₂ O	
A - psi/bar	
C - psi/kPa	
D - psi/kgf/cm ²	
E - bar/psi	
F - MPa/bar	
G - kPa/H ₂ O	
T - Meter	
L - kgf/cm ²	
O - mm H ₂ O	
S - Atmosphere	

P025 - Case

Case	
D - Dry	
E - Fillable (Empty)	
G - Glycerin (99%)	
L - Low Temperature Glycerin (86%)	
S - Silicon Oil	

E - Dial Range

See Table page 392

Process Connection Location

Location	Description	Diagram
L	Lower mount	
B	Lower Back mount	
C	Center Back mount	

Series

H - Heavy duty
G - General use
S - Safety pattern
L - Low pressures
P - Process

Dial Range

See Table page 392

***Primary / Secondary units**

Primary
Black outer scale, defines the gauge range

Secondary
Red inner scale, corresponds with gauge range

Ordering Information For Certification

Accuracy, Material and various standards conformance certifications are available for ordering.

IMP - Industrial Mechanical Pressure gauge

C - Certificate

31 - Class

Class	
00 - General	
21 - 2.1 ⁽¹⁾ - Pass / fail	
22 - 2.2 ⁽¹⁾ - Inspection	
31 - 3.1 ⁽¹⁾⁽²⁾ - Test Results, Item approval	

M - Category

Category	
A - Accuracy ⁽³⁾	
M - Material ⁽²⁾⁽⁴⁾	
S - Standard conformance ⁽⁵⁾	
T - Quality Test	

Blank - Type

Type	
Blank - General	
GC - GOST - Customs declaration Russia	
GR - GOST - R	
TR - GOST-Type Russia	
TU - GOST-Type Ukraine	
TK - GOST-Type Kazakhstan	
S - Standard conformance	
BP600 - Up to 600 bar (10,000 psi) scale	
BP01K - Up to 1000 bar (15,000 psi) scale	

(1) According EN10204 **(2)** Material certificate 3.1 is available for 63mm & up. **(3)** Per item (serial No.) **(4)** Per item type **(5)** Per order.

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

Dial Range Ordering Codes

H,G,S,P Series								
bar			psi			MPa		
Code	Min.	Max.	Code	Min.	Max.	Code	Min.	Max.
V001	-1	0	V001	30" Hg vac.	0	V000	-0.1	0.00
VP60	-0.6	0	C015	30" Hg vac.	15			
CP60	-1	0.6	C030	30" Hg vac.	30	CP06	-0.1	0.06
C1P5	-1	1.5	C060	30" Hg vac.	60	CP15	-0.1	0.15
C003	-1	3	C100	30" Hg vac.	100	CP30	-0.1	0.30
C005	-1	5	C160	30" Hg vac.	160	CP50	-0.1	0.50
C009	-1	9	C200	30" Hg vac.	200	CP90	-0.1	0.90
C015	-1	15				C1P5	-0.1	1.50
			P315	3	15			
PP21	0.2	1	P010	0	10			
PP60	0	0.6	P015	0	15			
P001	0	1				PP10	0	0.1
P1P6	0	1.6	P030	0	30	PP16	0	0.16
P2P5	0	2.5	P060	0	60	PP25	0	0.25
P004	0	4	P100	0	100	PP40	0	0.40
P006	0	6	P160	0	160	PP60	0	0.60
P010	0	10	P200	0	200	P001	0	1
P016	0	16	P300	0	300	P1P6	0	1.6
P025	0	25	P600	0	600	P2P5	0	2.5
P040	0	40	P800	0	800	P004	0	4
P060	0	60	P01k	0	1,000	P006	0	6
			P1k5	0	1,500			
P100	0	100	P02k	0	2,000	P010	0	10
P160	0	160	P03k	0	3,000	P016	0	16
P250	0	250	P04k	0	4,000	P025	0	25
			P05k	0	5,000			
P400	0	400	P06k	0	6,000	P040	0	40
			P10k	0	10,000			
P600	0	600				P060	0	60
P01k	0	1,000	P15k	0	15,000	P100	0	100

L Series								
Milibar			kPa			in H2O		
Code	Min.	Max.	Code	Min.	Max.	Code	Min.	Max.
V600	-600	0						
			V050	-50	0	V200	-200	0
V400	-400	0						
V250	-250	0				V100	-100	0
			V020	-20	0			
V160	-160	0						
			V015	-15	0	V060	-60	0
V100	-100	0						
			V007	-7	0	V030	-30	0
V060	-60	0						
			V005	-5	0	V020	-20	0
V040	-40	0	V004	-4	0	V015	-15	0
V025	-25	0						
V016	-16	0						
V010	-10	0						
V006	-6	0						
V004	-4	0						
V2P5	-2.5	0						
C200	-400	200						
C400	-200	400						
C150	-250	150						
C250	-150	250						
C100	-150	100						
C115	-100	150						
C160	-100	60						
C610	-60	100						
C040	-60	40						
C060	-40	60						
C020	-40	20						
C240	-20	40						
C015	-25	15						
C025	-15	25						
C010	-15	10						
C105	-10	15						
P003	0	3						
P004	0	4						
P006	0	6						
P010	0	10						
P016	0	16						
P025	0	25						
P040	0	40	P004	0	4	P015	0	15
			P005	0	5	P020	0	20
P060	0	60						
			P007	0	7	P030	0	30
P100	0	100						
			P015	0	15	P060	0	60
P160	0	160						
			P020	0	20			
P250	0	250				P100	0	100
P400	0	400						
			P050	0	50	P200	0	200
P600	0	600						

Options Ordering Codes

P		T		L		N		E		Y		6		X		R	
Additional elements		Blank None		Specials		Blank		Blank None		Blank None		Restriction screw		Variations		Special compatibility	
Blank None	Blank None	L - Lubricant free	N - Alloy 400 wetted parts	E - Helium leak test	Y - Vibration resistant movement	0 - Ø 0.0mm	X - Oxygen version	G - GOST - version									
P - Fix Pointer	T - Measuring point SS Plate	S - Silicon free				3 - Ø 0.3mm	W - Pure gases	R - GOST-T - Russia									
M - Min/Max Pointer						4 - Ø 0.4mm	A - Absolute pressure	U - GOST-T - Ukraine									
						6 - Ø 0.6mm	Z - Grade 3A (ASME)	K - GOST-T - Kazakhstan									
						8 - Ø 0.8mm											


Additional Elements

Fix Pointer: additional red pointer pointing to a designated pressure on the dial. The fix pointer does not move with the measured pressure changes and it is used to point a fixed measure on the dial for the user.

Min/Max Pointer: additional red pointer pointing to the minimal or maximal pressure that was pointed to by the gauge main pointer. The Min/Max pointer has a mechanism to reset its position to the initial read ("0" read). The Min/Max pointer is moves with the main gauge pointer to the minimal or maximal pointing position and remains in this position when the pressure read is raised / drops respectively and it is used to point to the minimal / maximal pressure read over time.

Material heat stamp: is required whenever a Material certificate level 3.1 is requested to be supplied with the gauge. (See "Certification" for more information on Material certificate).

Specials

Lubricant free: The gauge is specially cleaned to have no oil leftovers on its internals. The lubricant free gauge is marked with a  icon on its dial.

Silicon free: The gauge is specially cleaned to have no silicon leftovers on its internals.

Alloy 400 wetted parts: The gauge wetted parts are made of Alloy 400. Alloy 400 wetted parts are frequently used for measuring highly corrosive media. Other special wetted parts materials are available.

Helium leak test: The gauge is tested for leakage of up to 10⁻⁹ mbar l/s using pressurized Helium.

Restriction Screw:

A restriction screw with the designated bore is installed at the gauge media inlet, the restriction screw installation

and firmly fixing is done at the manufacturing plant. The restriction screw is one mean of protecting the gauge from pulsating or temporary high pressures and it slows down the gauge pointer reaction to pressure changes. A gauge with a restriction screw should be more carefully checked for its inlet being free of blockage by particles, viscous media or other obstacles.

Variations

Oxygen version: The gauge is specially made to be used for oxygen measurement.

Special Compatibility:

The Gauge is manufactured to be compatible to the designated standard or regulation. A special compatible gauge is marked as required by the designated standard.

Mounting Device

Rear Flange: The metal flange on the back of the gauge case is used to firmly mount the gauge on a panel/wall or any other fixing. The back flange is a firmly welded part of the gauge case and it guarantees the best support for the gauge.

Front Flange: The metal flange on the front of the gauge case is used to firmly mount the gauge on a panel or any other fixing with a hole to host the gauge. The front flange is a firmly welded part of the gauge case and it guarantees the best support for the gauge.

U-Clamp: The metal U shaped clamped with two fixing bolts supports the gauge from the back side of a panel hosting the gauge.





Accessories

Flame Arrester (ATEX Approved)

Flame Penetration Protection

Function

The Flame arrester avoids a flame penetration at deflagrations of potentially explosive vapor-air-resp. gas-air mixtures of explosion hazardous IIA, IIB and IIC in an upstreamed volume (e.g. pressure measuring instruments, chemical seals or similar).

Explosion Protection

The deflagration volume protection device corresponds as non-electrical equipment for potentially explosive areas with the harmonized norm DIN EN ISO 16852 "Flame Penetration Protection". It is examined and approved as flame penetration protected at deflagration of flammable gases and liquids, according to EC-Type Examination Certificate / Approval PTB 12 ATEX 4001 X Explosion Protection Class IIG IIC. The corresponding marking according to ATEX 94/9/EG is made at a suitable position of the instrument.

Construction:

as screw-adapter
1/2" BSP-P internal x 1/2" BSP-P
(others upon request)



HAM-LET
ASTAVA
Manifolds
see page 321

Pressure Gauge Cocks

Cocks Models

Class	DIN 16262		DIN 16263	
Type	M20x1.5	1/2" BSP-P	Test Flange 60x25x10mm (2.36x0.98x0.39 inch)	Test Connection Male Thread M 20x1.5
Process Connection	Male thread M 20x1.5	Male thread 1/2" BSP-P		
Instrument Connection	Clamping sleeve female M20x1.5	Clamping sleeve female 1/2" BSP-P		
Nominal Pressure	PN 16			
Handle	Plastic			
Material	- Brass (Clamping sleeve alloy steel phosphatized) - Alloy steel - Stainless steel 316 (1.4571)			

Applications

Fluid or gaseous media resp. steam at temperatures between -10 °C to +50 °C (14 °F to 122 °F) ;
For connecting to a pressure gauge with flat sealing ring EN 837 (DIN 16 258).

Over Range Protector

The over range protector is a piston valve. The piston will remain in an "open" position as long as the pressure of the medium is lower than the back pressure imposed on the piston by the spring. As medium pressure accedes the spring back pressure, the piston will move towards the spring and the piston valve closes. After the medium pressure decreases by approximately 25% below the set closing pressure, the valve opens and the spring force causes the piston to return to its original "open" position.

The over range protector has been designed to protect pressure gauges against a pressure overload higher than the measuring range. It allows putting several gauges with different pressure ranges in ascending stages and makes it possible to read even low ranges in a precise way, when the total range is in fact much higher.

The valves are not suitable for use as regulators.

Models: Brass, Stainless steel.

Available Ranges:

PSI	BAR
3-35	0.4-2.5
30-85	2-6
75-350	5-25
300-850	20-30
750-3600	50-250
3500-5800	240-400

Pressure Gauge Valves

According to DIN 16270, DIN 16271 with Male Test Connection, and with Test Flange

Valves Models

Versions	Type	Process Connection	Gauge Connection	Test Connections
DIN 16 270	BSP-P	½" BSP-P male	adjusting nut ½" BSP-P female	M 20x1,5
	Metric	M20x1,5 male	adjusting nut M20x1,5 female	
DIN 16 270 with fitting for gauge holder bracket	BSP-P	½" BSP-P male	turnable nut ½" BSP-P female	
DIN 16 271	BSP-P	½" BSP-P male	adjusting nut ½" BSP-P female	
	Metric	M20x1,5 male	adjusting nut M20x1,5 female	
DIN 16 271 with fitting for gauge holder bracket	BSP-P	½" BSP-P male	turnable nut ½" BSP-P female	
Similar to DIN 16 271 with test flange	BSP-P	½" BSP-P male	adjusting nut ½" BSP-P female	flange 60 x 25 x 10 mm

Material of construction

Versions		Brass	Alloy Steel	Stainless Steel
All Models	Components:	Material (DIN material numbers)		
	Body	Brass	SS (1.0460)	SS (1.4571)
	Valve spindle	SS (1.4104)		
	Valve cone	SS (1.4034 hardened)		
	Packing	PTFE	Graphite	PTFE
	Union nut	Alloy steel		
	Adjusting nut	Alloy steel		
	Turnable nut	Brass	Alloy steel	SS (1.4571)
	Vent screw	SS (1.4104)		
	Hand wheel	Plastic		
Temperature rating	-10 / + 120 °C (14 / 248 °F)		-40 / +200 °C (-40 / +392 °F)	

Ball Shock Absorber

Ball shock absorbers are designed to protect pressure instruments against re impacts.

In case of pressure drops or pressure peaks the media moves the stainless steel ball within the inlet port and damps the appropriate bore. The counter direction has free flow. In case of order it must be clarified if the ball shock absorber is used for pressure peaks (marked with + on the

body) or pressure drops (marked with - on the body)

Construction:

Made of 316L stainless steel or brass with male and female thread ½" BSP or NPT.

Application:

Material test machines, hydraulic accumulators, hydraulic clamping devices.



ULTRA-CLEAN DIAPHRAGM VALVES



UCV[®] SERIES



 **HAM-LET[®]**
ADVANCED CONTROL TECHNOLOGY



INDEX - ULTRA-CLEAN DIAPHRAGM VALVES

COMPACT MODEL 402
2LE



HP GRADE HIGH PRESSURE VALVE 410
EVH



COMPACT SURFACE-MOUNT SERIES 427
HMSC



FLOW CONTROL 403
2LM



STANDARD METAL SEAT MODEL 411
3LD



COST EFFICIENT ULTRA CLEAN METAL DIAPHRAGM VALVE 430
HMC



STANDARD MODEL 404
2LD



HIGH TEMP. METAL SEAT 412
3LT



AIR OPERATED, MANUAL OVERRIDE 431
2LN (HYBRID)



3/4" HIGH-FLOW 405
2LDS12



COMPACT MODEL METAL SEAT 413
3LE



ECONOMIC DIAPHRAGM VALVE 432
HD



LOW-PRESSURE MODEL 406
EV



HIGH PRESSURE HIGH FLOW METAL SEAT 414
3LS



HIGH PRESSURE DIAPHRAGM VALVE 434
HP



GENERAL PURPOSE 407
EVZ



HIGH PRESSURE METAL SEAT 415
3LH



MULTI PORT MONOBLOCK VALVE 438
HMB/2BE



HIGH-PRESSURE 408
2LH



DIAPHRAGM AIR-OPERATED VALVES 421
HM



ULTRA FAST DIAPHRAGM VALVE 444
UF / UFS



HIGH PRESSURE HIGH-FLOW 409
2LS



SURFACE-MOUNT SERIES 426
HMS



COMPACT WELDED CHECK VALVE 450
CMW



ULTRA CLEAN VALVES

UCV MODEL SELECTION TABLE

Make the initial choice, taking the application parameters into account.

Pressure	Temperature	Gas	Seat Material	Cv	Valve Type	
					UHP Grade	HP Grade
Low-Pressure ≤ 1MPa (150 psi)	-10~60°C (14~140°F)		PCTFE	~0.1	2LE	
					2LM	
				~0.3	2LD	EV
					2LC	EVZ
					HM*	HD*
				~0.7	2LD	EV
						EVZ
				~2.5	2LDS12	
	-10~150°C (14~300°F)	Inert Gas	PI	~0.1	2LE	
					2LM	
~0.3				2LD	EV	
					2LC	EVZ
				~0.7	2LD	EV
						EVZ
Active Gas	METAL	~0.3	HMS			
		~0.1	3LE			
		~0.3	3LD			
				3LN		
			~0.7	3LD		
-10~200°C (14~392°F)		PFA	~0.25	UF		
					UF	
-10~250°C (14~480°F)		METAL	~0.7	3LT		
High-Pressure ≤ 21MPa (3060 psi)	-10~60°C (14~140°F)	PCTFE	~0.1	2LH**	EVH**	
				~0.23	HP	
	-10~40°C (14~100°F)	PCTFE + 316L Stainless Steel	~0.3	2LS		
	-10~150°C (14~300°F)	Inert Gas	PI	~0.1	2LH**	EVH**
			~0.3	2LS		
Active Gas	METAL	~0.1	3LH			
			~0.3	3LS		

* 300 psi as an option
** 2300 psi as a standard

HP - High Purity
UHP - Ultra High Purity

BASIC UCV STRUCTURES, GRADES AND SPECIFICATIONS

- UCVs are metallic diaphragm-operated valves. The diaphragm is made of a Ni-Co Alloy.
- UCVs are available with the following valve structures to meet ultra-high purity (UHP) and high-purity (HP) grades:

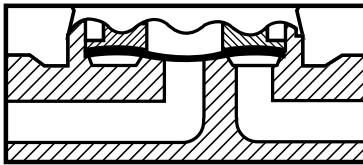
A. All-metallic valves - the highest UHP grade.

These valves are designed to be the ultimate solution, with polymer materials eliminated from their gas contact areas. Ideally suited for use with high-reactivity gases and in applications requiring fast gas replacement. It is also best suited for use as supply system valves for high-reactivity

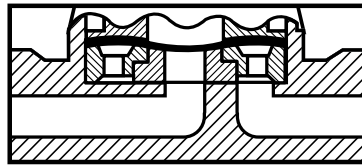
- B.** Soft-seat valves, standard UHP grade/standard HP grade. HAM-LET MOTOYAMA Japan's standard line of valves using PCTFE (polymonochlorotrifluoroethylene) in the standard valve seats. The seat holders minimize the dead volume on the seat bottom, designed for enhanced reliability.

- C.** Caulked-seat valves, general-purpose HP grade. HP valves using PCFTE (polymonochlorotrifluoroethylene) seats. Minimized seat volumes ease the problems of outgassing and seat creeping in line with the traditional design philosophy of UCV's.

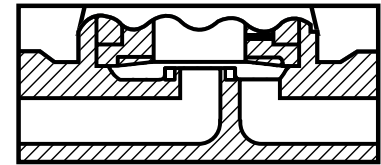
A. All-metallic valve



B. Soft-seat valve



C. Caulked-seat valve



HIGHEST UHP** GRADE, 3L SERIES

Type	Size (inch)	Cv	Max. Working Pressure	Working Temp.	Application	Drive	Feature
3LD	1/4 - 1/2	0.25 - 0.7	1MPa/150psi	-10~150°C	On-Off	Manual and Pneumatic	Multiuse
3LS	1/4 - 1/2	0.23 - 0.25	21MPa/3060 psi	-10~150°C	On-Off	Manual and Pneumatic	High-Pressure High Flow
3LT	1/2	0.7	1MPa/150 psi	-10~250°C	On-Off	Manual and Pneumatic	High-Temperature Use
3LH	1/8- 1/4	0.1	16MPa/2300 psi	-10~150°C	On-Off	Manual and Pneumatic	High-Pressure Use
3LE	1/8- 1/4	0.05-0.1	1MPa/150 psi	-10~150°C	On-Off	Manual and Pneumatic	Compact

STANDARD UHP** GRADE, 2L SERIES

Polyimide (PI) seat is optionally selectable: working tmp.=-10 to 150°C

Type	Size (inch)	Cv	Max. Working Pressure	Working Temp.	Application	Drive	Feature
2LE	1/4	0.05 - 0.1	1MPa/150 psi	-10~60°C	On-Off	Manual and Pneumatic	Compact
2LM	1/4	0.05 - 0.1	1MPa/150 psi	-10~60°C	Flow Control	Graduated Manual	Compact
2LD	1/4 - 1/2, 3/4	0.3 - 0.7, 2.2	1MPa/150 psi	-10~60°C	On-Off	Manual and Pneumatic	Multiuse
2LH	1/4	0.05 - 0.1	16.2MPa/2300 psi Option: 21MPa/3060 psi	-10~60°C	On-Off	Manual and Pneumatic	High-Pressure Use
HM	1/4	0.3	1MPa/150 psi Option: 2MPa/300 psi	-10~60°C	On-Off	Manual and Pneumatic	Multiuse
HMC	1/4	0.25	1MPa/150 psi	-10~60°C	On-Off	Manual and Pneumatic	Multiuse
HMS	1/4	0.3	1MPa/150 psi Option: 2MPa/300 psi	-10~60°C	On-Off	Manual and Pneumatic	Multiuse
HMSC	1/4	0.27	1MPa/150 psi	-10~60°C	On-Off	Pneumatic	Multiuse
2LN HB	1/4	0.3	1MPa/150 psi Option: 2MPa/300 psi	-10~60°C	On-Off	Manual and Pneumatic	Multiuse
HMB	1/4	0.3	1MPa/150 psi Option: 2MPa/300 psi	-10~60°C	On-Off	Manual and Pneumatic	Multiuse

STANDARD HP* GRADE, EV & EVZ SERIES

Polyimide(PI) seat is optionally selectable: working tmp.=-10 to 150°C

Type	Size (inch)	Cv	Max. Working Pressure	Working Temp.	Application	Drive	Feature
EV	1/4 - 1/2	0.3 - 0.7	1MPa/150 psi	-10~60°C	On-Off	Manual and Pneumatic	Multiuse
EVH	1/4	0.1	16.2MPa/2300 psi Option: 21MPa/3060 psi	-10~60°C	On-Off	Manual and Pneumatic	High-Pressure Use
EVZ	1/4-1/2	0.27-0.65	1MPa/150 psi	-10~80°C	On-Off	Manual	Caulked Seat

NOTE: Choose your valve seat material from the Valve Seat Selection Table (page 417) in this catalog.

*HP - High Purity

**UHP - Ultra High Purity

2LE SERIES COMPACT MODEL

Metal Diaphragm Valves

Compact models from the Ultra Clean Valve series are made according to UHP specifications.

These models come with connection joints in 1/4", as a standard.

These valves fit into applications to which a minimum footprint is required.

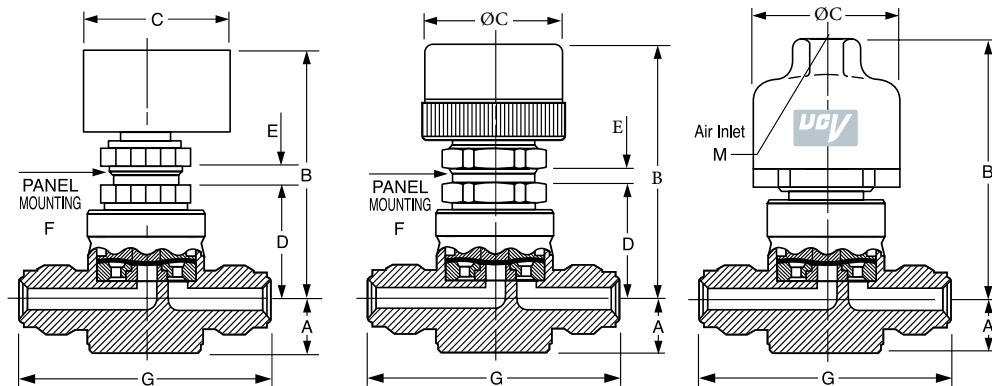
- Compact designs for minimum footprint.
- Electropolished surfaces



For details, please contact one of our field representatives.

STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	I	J	K	M
2LES4Q-W	1/4	Extended Butt Weld	11	(52)	30	24.5	(4)	17	47			17	
2LEA4R-BV	1/4	Male HTC®	11	(54)	30	24.5	(4)	17		26	45	17	
2LES4C-FV	1/4	Swivel Female HTC®	11	(54)	32					66		17	Rc1/8



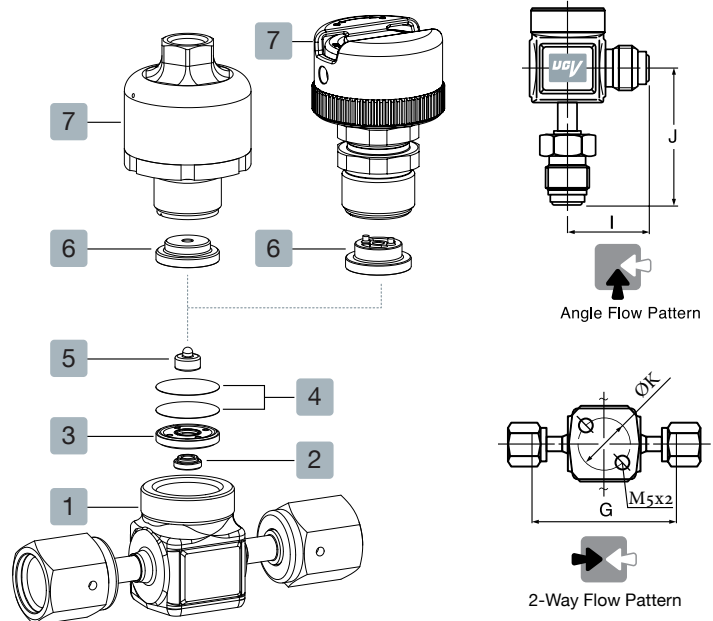
SPECIFICATIONS					
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	1MPa (150 psi)	-10 to 60°C (PCTFE) -10 to 150°C (PI)	0.1	3X10 ⁻¹² pa•m ³ /sec Helium	3X10 ⁻¹⁰ pa•m ³ /sec Helium

STRUCTURE		
Parts	Material	
1 Body	Stainless steel, 316L Var or Vim/Var (1)	
2 Seat	PCTFE/PI (Polyimide)	
3 Seat Holder	Stainless steel, 316L Var or Vim/Var (1)	
4 Diaphragm	Co-Cr-Ni Alloy	
5 Act. Button	304 Stainless Steel	
6 Act. Button Holder	Stainless Steel, ASTM 630 H900	
7 Actuation Device	Aluminum	

(1) Per SEMI F20-0305

ORDERING INFORMATION

For ordering, see page 416



2LM SERIES FLOW CONTROL

Metal Diaphragm Valves

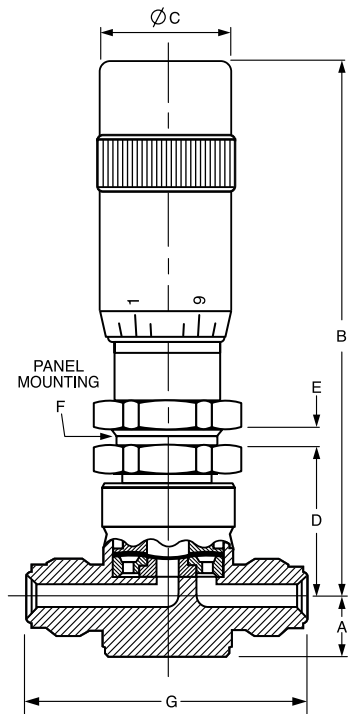
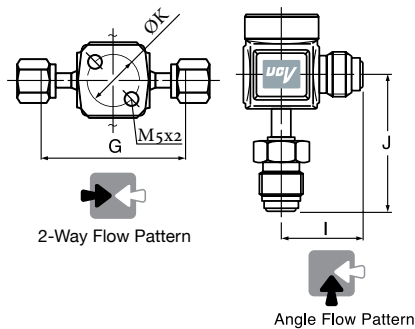
Flow control models from the Ultra-Clean Valve Series are made according to UHP specifications. These models come with connection joints in 1/4", as a standard. Each valve is furnished with a handle-lock set screw with a vernier scale.

- Broad flow-control range of six and a half turns of the handle.
- A handle-lock set screw on the handle side.
- Electropolished surfaces

As these valves are designed to handle flow control tasks, the valve seat is not fully closed even at the position of division 0 on the vernier scale. Do not operate the handle in the direction in which the valve seat is closed past the position of division 0 on the vernier scale.



STANDARD CONFIGURATION DIMENSIONS												
Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	I	J	K
2LMS4V-W	1/4	Extended Butt Weld	11	(98)	23	26	(2.5)	20	47			17
2LMS4V-BW	1/4	Short Butt Weld	11	(98)	23	26	(2.5)	20	44.4			17
2LMA4V-BV	1/4	Male HTC®	11	(98)	23	26	(2.5)	20		26	45	17
2LMS4V-FV	1/4	Swivel Female HTC®	11	(98)	23	26	(2.5)	20	66			17



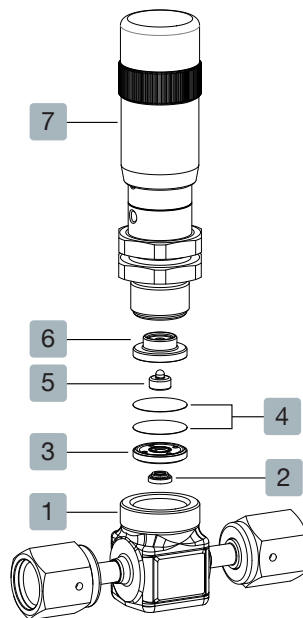
SPECIFICATIONS					
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	1MPa (150 psi)	-10 to 60°C (PCTFE) -10 to 150°C (PI)	0.1	3X10 ⁻¹² pa•m ³ /sec Helium	Not a Shutoff Valve

STRUCTURE		
Parts	Material	
1 Body	Stainless steel, 316L Var or Vim/Var (1)	
2 Seat	PCTFE/PI (Polyimide)	
3 Seat Holder	Stainless steel, 316L Var or Vim/Var (1)	
4 Diaphragm	Co-Cr-Ni Alloy	
5 Act. Button	304 Stainless Steel	
6 Act. Button Holder	Stainless Steel, ASTM 630 H900	
7 Actuation Device	Aluminum	

(1) Per SEMI F20-0305

ORDERING INFORMATION

For ordering, see page 416



2LD SERIES STANDARD MODEL

Metal Diaphragm Valves

Standard models from the Ultra-Clean Valve Series are made according to UHP specifications.

This model comes with connection joints in three sizes 1/4", 3/8" & 1/2" as a standard.

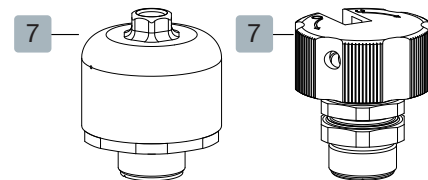
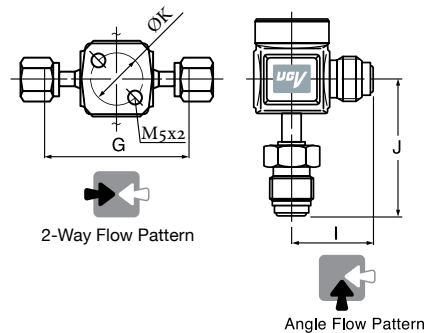
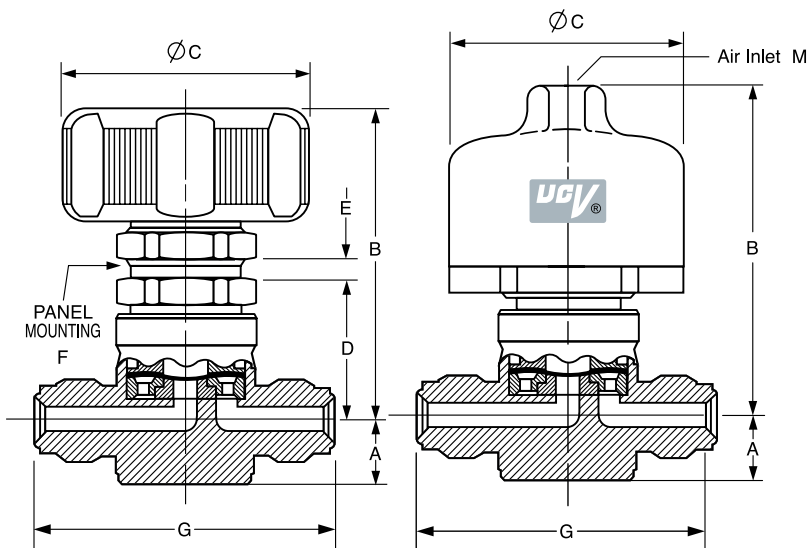
This valve comfortably fits into high-flow applications.

- Unique seat structure offers superb leak performance.
- Compact designs for a minimum foot print.
- Electropolished surfaces



STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	H	I	J	K	M
2LDA4R-BV	1/4	Male HTC®	11	(63)	45	29	(4)	23	58	25	29	45	25	
2LDS4C-W	1/4	Extended Butt Weld	11	(65)	46				89				25	Rc1/8
2LDS4C-BW	1/4	Short Butt Weld	11	(65)	46				44.4				25	Rc1/8
2LDS6R-W	3/8	Extended Butt Weld	17.5	(67.5)	45	32.5	(4)	23	105	38			28	
2LDS8C-FV	1/2	Female HTC®	17.5	(73.5)	56				100				28	Rc1/8
2LDS8C-W	1/2	Extended Butt Weld	17.5	(73.5)	56				105				28	Rc1/8



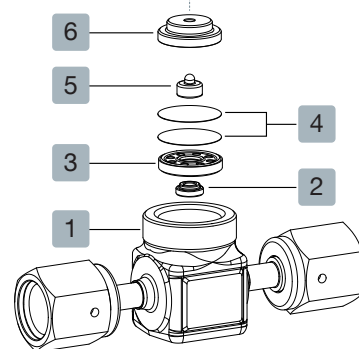
SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	1MPa (150 psi)	-10 to 60°C (PCTFE) -10 to 150°C (PI)	0.3	3X10 ⁻¹²	3X10 ⁻¹⁰
3/8			0.7	pa•m ³ /sec Helium	pa•m ³ /sec Helium
1/2			0.7		

STRUCTURE

Parts	Material
1 Body	Stainless steel, 316L Var or Vim/Var ⁽¹⁾
2 Seat	PCTFE/PI (Polyimide)
3 Seat Holder	Stainless steel, 316L Var or Vim/Var ⁽¹⁾
4 Diaphragm	Co-Cr-Ni Alloy
5 Act. Button	304 Stainless Steel
6 Act. Button Holder	Stainless Steel, ASTM 630 H900
7 Actuation Device	Aluminum

⁽¹⁾ Per SEMI F20-0305



ORDERING INFORMATION

For ordering, see page 416

2LDS12 SERIES

3/4" HIGH-FLOW

Metal Diaphragm Valves

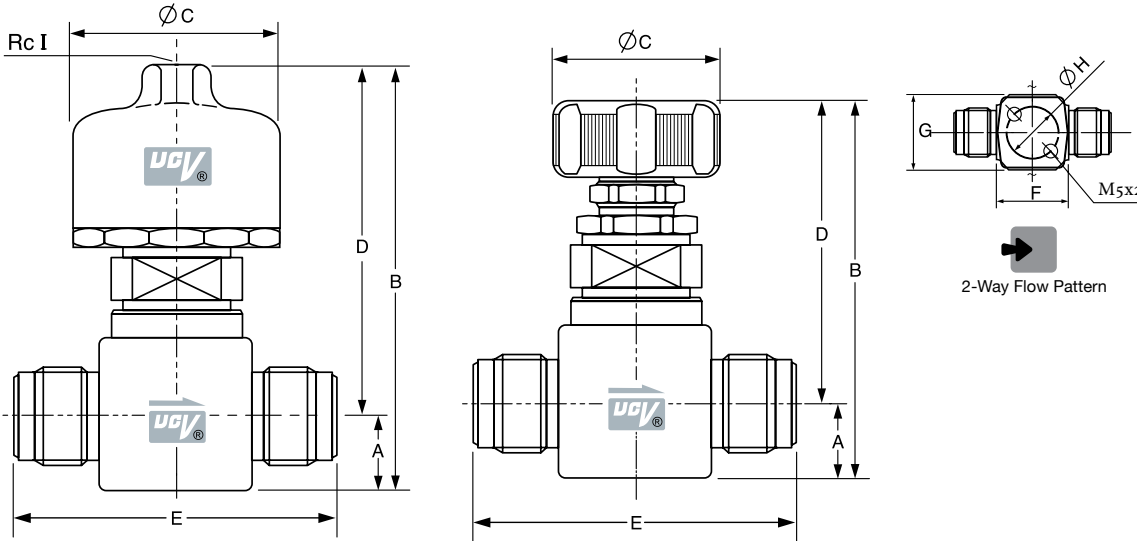
Standard models from the Ultra-Clean Valve Series are made according to UHP specifications. This model comes with connection joints in 3/4" as a standard. This valve comfortably fits into high-flow applications.

- Unique seat structure offers superb leak performance.
- Compact designs for minimum foot print.
- Electropolished surfaces



STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	H	I
2LDS12R-BV	3/4	Male HTC®	23	109	45	86	97	46	45	35	
2LDS12R-FV	3/4	Swivel Female HTC®	23	109	45	86	146	46	45	35	
2LDS12R-W	3/4	Extended Butt Weld	23	109	45	86	146	46	45	35	
2LDS12C-BV	3/4	Male HTC®	23	118	56	95	97	46	45	35	Rc 1/8
2LDS12C-FV	3/4	Swivel Female HTC®	23	118	56	95	146	46	45	35	Rc 1/8
2LDS12C-W	3/4	Extended Butt Weld	23	118	56	95	146	46	45	35	Rc 1/8



SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
3/4	1MPa (150 psi)	-10 to 60°C	2.2	3X10 ⁻¹² pa•m ³ /sec Helium	3X10 ⁻⁹ pa•m ³ /sec Helium

STRUCTURE

	Parts	Material
1	Body	316L Stainless Steel
2	Seat	PCTFE/PI (Polyimide)
3	Diaphragm	Co-Cr-Ni Alloy
4	Handle/Act	Aluminum

ORDERING INFORMATION
For ordering, see page 416

EV SERIES

LOW-PRESSURE MODEL

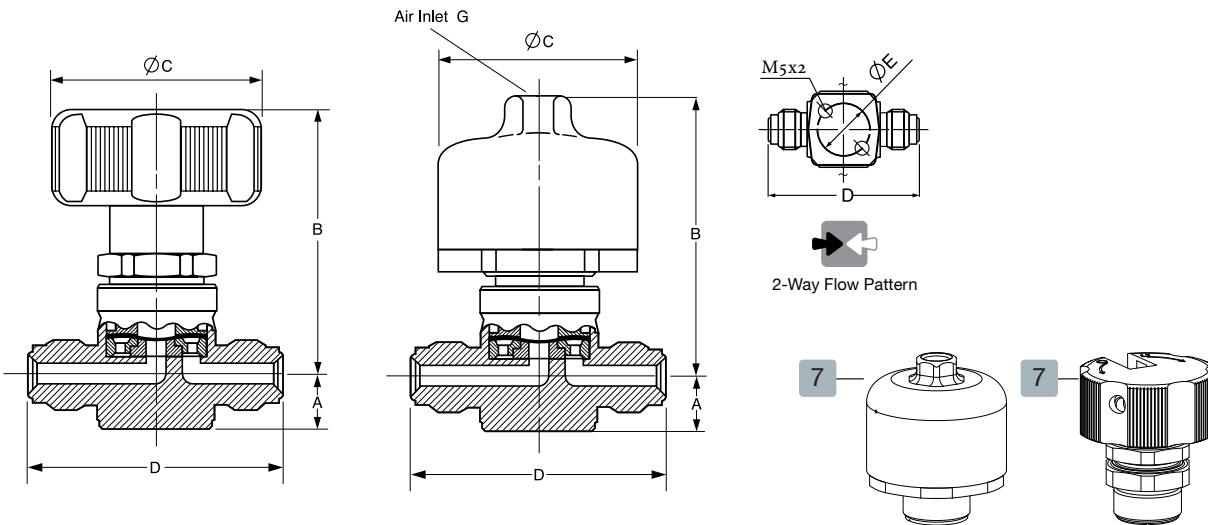
Metal Diaphragm Valves

The EV Series is a family of standard models from the Ultra Clean Valve Series, which are made according to HP specifications. These models come with connection joints in three sizes, 1/4", 3/8" and 1/2", as standard. These valves implement the traditional UCV 2LD Series design concept of high reliability.

- Surface roughness of the gas contact area held to $Ry \leq 2.5$ micro meter as standard.
- Standard with a 240-degree rotary handle with an open/close indicator.
- Operable over a wide range of flow rates up to 1 MPa/150 psi.
- Electropolish surfaces as an option ("-EP").



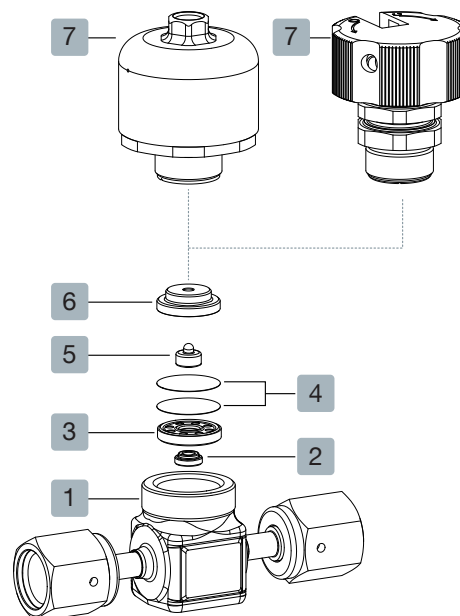
STANDARD CONFIGURATION DIMENSIONS								
Part Number/ep	Size	End Connection	A	B	C	D	E	G
EV4-I	1/4	LET-LOK®	11	(63)	45	(63.5)	25	
EV4C-FV	1/4	Swivel Female HTC®	11	(65)	46	70.6	25	Rc1/8
EV4-BV	1/4	Male HTC®	11	(63)	45	58	25	
EV6-I	3/8	LET-LOK®	17.5	(67.5)	45	(79.4)	28	
EV8-I	1/2	LET-LOK®	17.5	(67.5)	45	(86)	28	
EV8C-FV	1/2	Swivel Female HTC®	17.5	(73.5)	56	100	28	Rc1/8
EV8-BV	1/2	Male HTC®	17.5	(67.5)	45	76	28	



SPECIFICATIONS					
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	1MPa (150 psi)	-10 to 60°C (PCTFE)	0.3	3 X 10 ⁻¹²	3 X 10 ⁻¹⁰
3/8		-10 to 150°C (PI)	0.7	Pa m3/sec Helium	Pa m3/sec Helium
1/2			0.7		

STRUCTURE		
Parts	Material	
1	Body	316L Stainless Steel (1)
2	Seat	PCTFE/PI (Polyimide)
3	Seat Holder	316L Stainless Steel
4	Diaphragm	Co-Cr-Ni Alloy
5	Act. Button	304 Stainless Steel
6	Act. Button Holder	Stainless Steel, ASTM 630 H900
7	Actuation Device	Aluminum

(1) Single melt - VOD



ORDERING INFORMATION
For ordering, see page 416

EVZ SERIES

GENERAL PURPOSE

Metal Diaphragm Valves

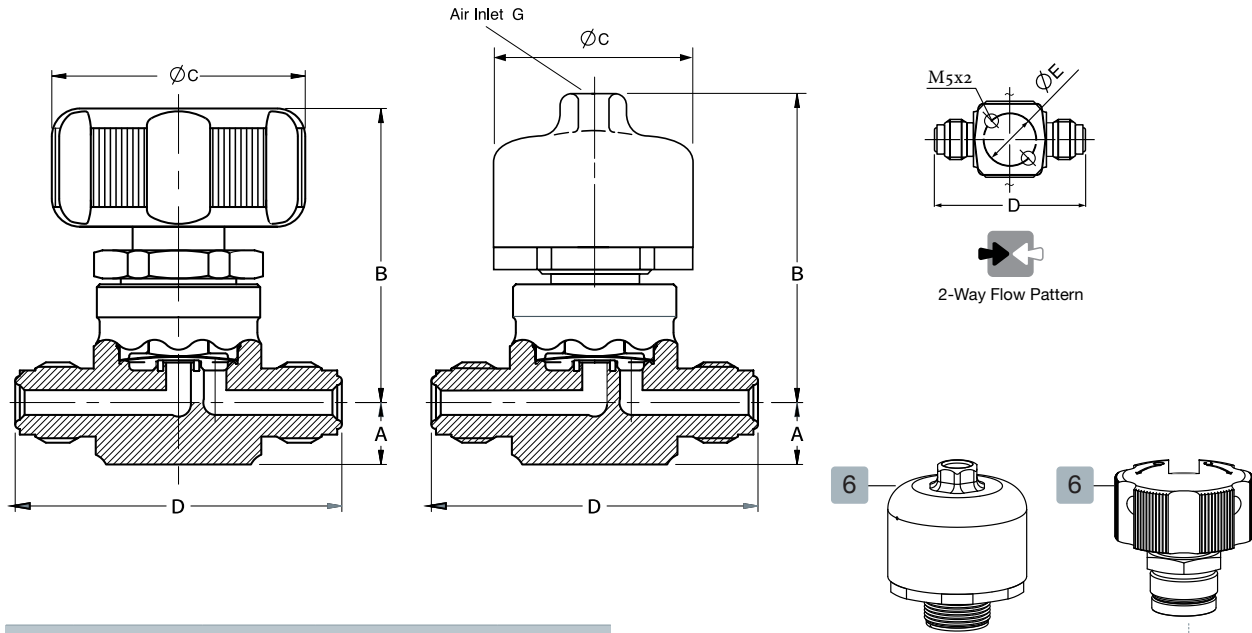
Economic implementations of Ultra-Clean Valves follow the traditions of HMJ UCV technologies.

- Available in sizes from 1/4" to 1/2" to support a wide range of connections.
- Standard with a 240-degree rotary handle with an open/close indicator.
- Over 20,000 open/close cycles.
- Electropolished item standard (LET-LOK® joint unpolished).
- Aluminum handle for compact, lightweight geometry.



The open/close indicator works on a follow-up basis. When opening or closing the valve, operate the handle until the handle hits the stopper.

PART NUMBER / DIMENSIONS							
Part Number/ep	Size	End Connection	A	B	C	D	E
EVZS4R-BV	1/4	Male HTC®	11	(53)	45	58	25
EVZS4R-FV	1/4	Swivel Female HTC®	11	(53)	45	70.6	25
EVZS4R-I	1/4	LET-LOK®	11	(53)	45	(63.5)	25
EVZS6R-I	3/8	LET-LOK®	17.5	(58)	45	(79.5)	28
EVZS8R-BV	1/2	Male HTC®	17.5	(58)	45	76	28
EVZS8R-FV	1/2	Swivel Female HTC®	17.5	(58)	45	100	28
EVZS8R-I	1/2	LET-LOK®	17.5	(58)	45	(86)	28



SPECIFICATIONS					
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	1MPa (150 psi)	-10 to 80°C	0.27	3X10 ⁻¹²	3X10 ⁻¹⁰
3/8				pa•m ³ /sec Helium	pa•m ³ /sec Helium
1/2			0.65		

STRUCTURE		
Parts	Material	
1	Body	316L Stainless Steel (1)
2	Seat (Caulked)	PCTFE
3	Diaphragm	Co-Cr-Ni Alloy
4	Act. Button	304 Stainless Steel
5	Act. Button Holder	Stainless Steel, ASTM 630 H900
6	Actuation Device	Aluminum

(1) Single melt - VOD

ORDERING INFORMATION
For ordering, see page 416

2LH SERIES HIGH-PRESSURE

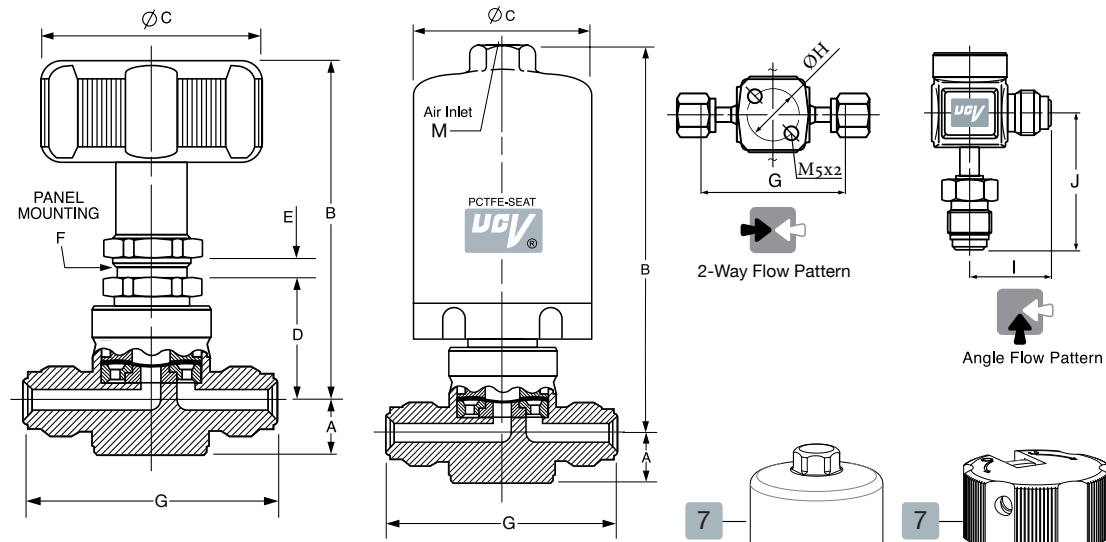
Metal Diaphragm Valves

High-pressure standard models from the Ultra-Clean Valve Series are made according to UHP specifications. These models come with connection joints in 1/4", as a standard. Features include a compact drive geometry and a highly reliable seat structure.

- Can be used as shutoff valves for high-pressure fluids at up to 16.2 MPa/2300 psi.
 - Compact designs for minimum footprint.
 - Electropolished surfaces
 - Optionally ready for 21 MPa/3060 psi (*For 3060 psi, add "-210K" to the valve description).
- For more information, please contact one of our field representatives.



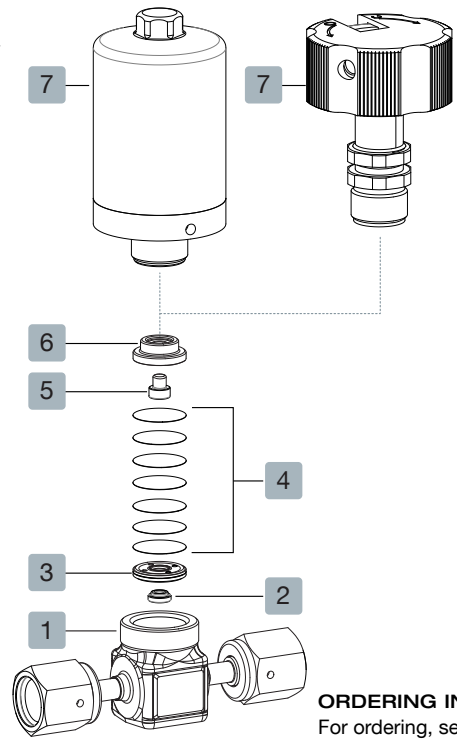
STANDARD CONFIGURATION DIMENSIONS													
Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	H	I	J	M
2LHS4R-W	1/4	Extended Butt Weld	11	(68)	45	25	(2.5)		47	17			
2LHS4R-BW	1/4	Short Butt Weld	11	(68)	45	25	(2.5)		44.4	17			
2LHA4R-BV	1/4	Male HTC®	11	(68)	45		(2.5)			17	26	45	
2LHS4C-FV	1/4	Swivel Female HTC®	11	(85)	40	25		26	66	17			Rc1/8



SPECIFICATIONS					
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	16.2MPa (2300 psi) OPTION: 21MPa/3060 psi	-10 to 60°C (PCTFE) -10 to 150°C (PI)	0.1	3X10 ⁻¹² pa•m ³ /sec Helium	3X10 ⁻¹⁰ pa•m ³ /sec Helium

STRUCTURE		
Parts	Material	
1 Body	Stainless steel, 316L Var or Vim/Var (1)	
2 Seat	PCTFE/PI (Polyimide)	
3 Seat Holder	Stainless steel, 316L Var or Vim/Var (1)	
4 Diaphragm	Co-Cr-Ni Alloy	
5 Act. Button	304 Stainless Steel	
6 Act. Button Holder	Stainless Steel, ASTM 630 H900	
7 Actuation Device	Aluminum	

(1) Per SEMI F20-0305



ORDERING INFORMATION:
For ordering, see page 416

2LS SERIES

HIGH-PRESSURE - HIGH-FLOW

Metal Diaphragm Valves

High-Pressure High-Flow models from the Ultra-Clean Valve Series are made according to UHP specifications. These models come with connection joints in two alternative sizes, 1/4" and 1/2", as a standard. With their compact designs, these valves comfortably fit into High-Pressure High-Flow applications.

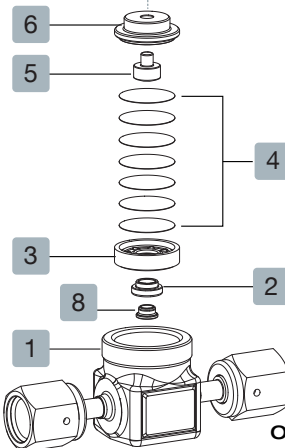
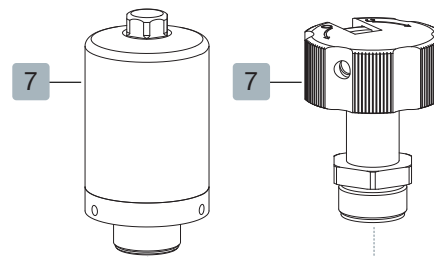
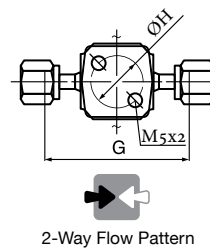
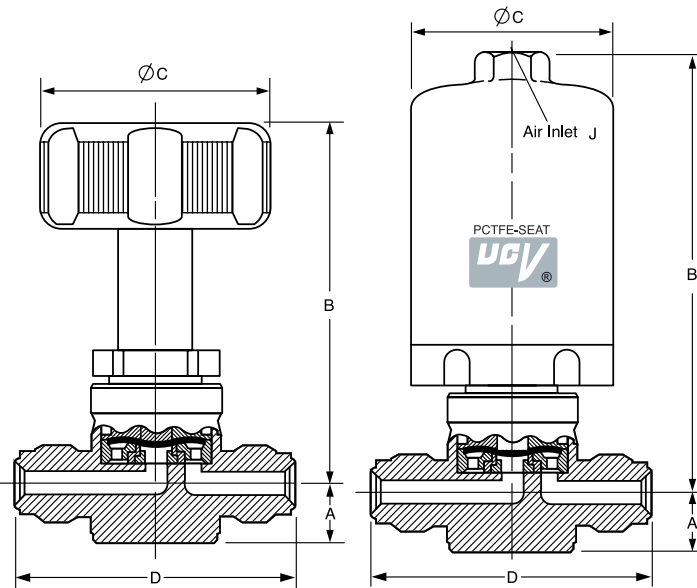
- Can be used as shutoff valves for high-pressure fluids at up to 21 MPa/3060 psi.
- Electropolished surfaces



For more information, please contact one of our field representatives.

STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	H	J
2LSS4C-BW	1/4	Short Butt Weld	11	(89)	40	44.4		25	Rc1/8
2LSS4C-FV	1/4	Swivel Female HTC®	11	(89)	40	70.6		25	Rc1/8
2LSS8C-W	1/2	Extended Butt Weld	17.5	(92.5)	40	105		28	Rc1/8
2LSS8C-BW	1/2	Short Butt Weld	17.5	(92.5)	40	55		28	Rc1/8



SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	21MPa / 3060 psi	-10 to 40°C (PCTFE)	0.25	3X10 ⁻¹² pa•m ³ /sec Helium	3X10 ⁻¹⁰ pa•m ³ /sec Helium
1/2		-10 to 150°C (PI)			

STRUCTURE

Parts	Material
1 Body	Stainless steel, 316L Var or Vim/Var (1)
2 Seat	PCTFE/PI (Polyimide)
3 Seat Holder	Stainless steel, 316L Var or Vim/Var (1)
4 Diaphragm	Co-Cr-Ni Alloy
5 Act. Button	304 Stainless Steel
6 Act. Button Holder	Stainless Steel, ASTM 630 H900
7 Actuation Device	Aluminum
8 Seat Retainer	Stainless steel, 316L Var or Vim/Var (1)

(1) Per SEMI F20-0305

ORDERING INFORMATION:
For ordering, see page 416

EVH SERIES HP-GRADE, HIGH-PRESSURE VALVE

Metal Diaphragm Valves

High-pressure standard models from the Ultra-Clean Valve Series are made according to HP specifications. Features include a 2LH-like compact drive geometry and a highly reliable seat structure.

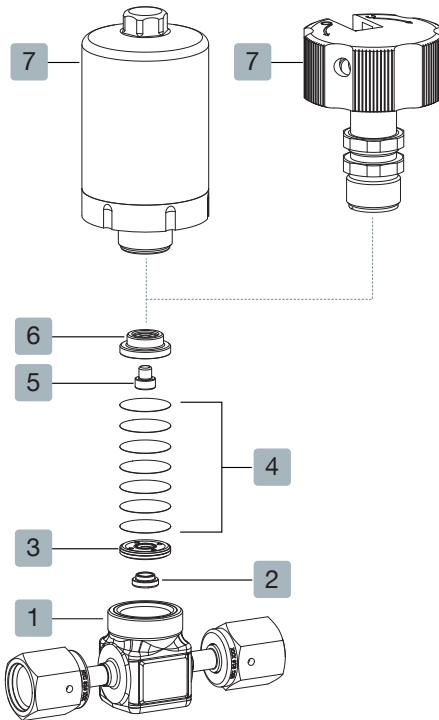
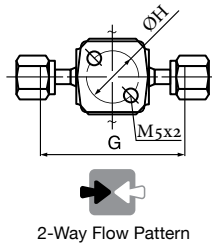
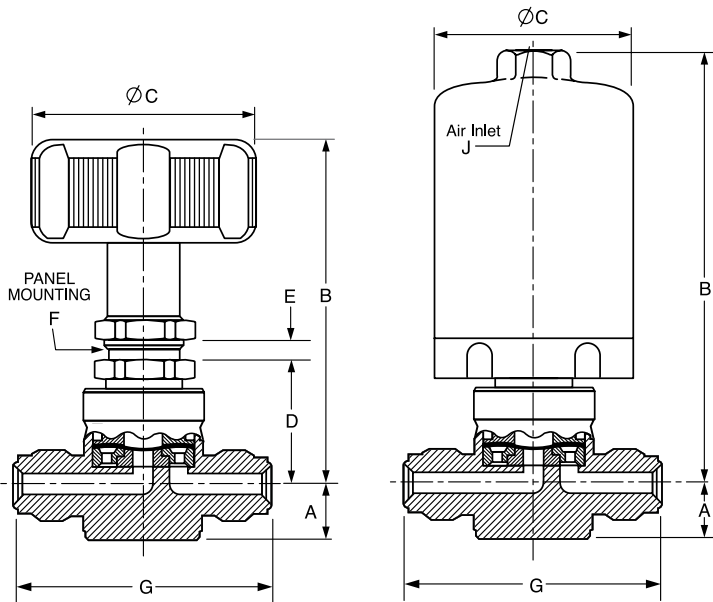
- Can be used as shutoff valves for high-pressure fluids at up to 20.6 MPa/3060 psi*.
- Compact designs for minimum footprint.
- Electropolish surfaces as an option ("-EP").

*For 3060 psi, add "-210K" to the valve description



STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	H	J
EVH4-I	1/4	LET-LOK®	11	(68)	45	25	(2.5)	17	(63.5)	17	
EVH4-V	1/4	Male HTC®	11	(68)	45	25	(2.5)	17	52	17	
HVH4C-FV	1/4	Swivel Female HTC®	11	(85)	40				66	17	Rc1/8



SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	16.2MPa (2300 psi) OPTION: 21MPa/3060 psi	-10 to 60°C (PCTFE) -10 to 150°C (PI)	0.1	3X10 ⁻¹² pa•m ³ /sec Helium	3X10 ⁻¹⁰ pa•m ³ /sec Helium

STRUCTURE

Parts	Material
1 Body	316L Stainless Steel (1)
2 Seat	PCTFE/PI (Polyimide)
3 Seat Holder	316L Stainless Steel
4 Diaphragm	Co-Cr-Ni Alloy
5 Act. Button	304 Stainless Steel
6 Act. Button Holder	Stainless Steel, ASTM 630 H900
7 Actuation Device	Aluminum

(1) Single melt - VOD

ORDERING INFORMATION:
For ordering, see page 416

3LD

STANDARD METAL SEAT MODEL

Metal Diaphragm Valves

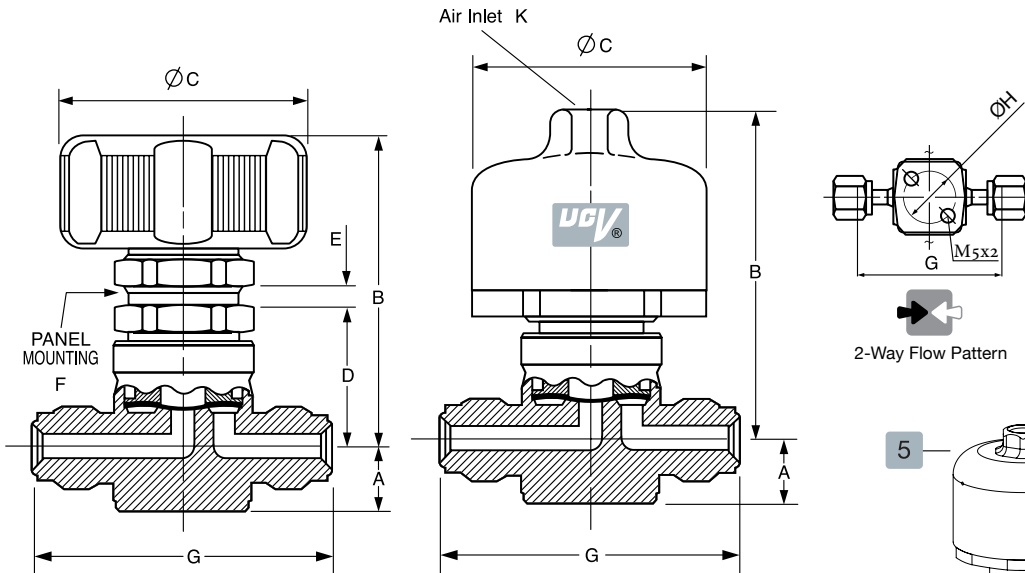
Standard models from the Ultra-Clean Valve Series are made according to UHP specifications. They are the ultimate in metallic diaphragm-operated valves with resins completely removed from their gas contact areas. Available in connection joint sizes of 1/4", 3/8" and 1/2", as a standard.

- High-speed replacement of media in a gas or liquid state.
- Extensive records of proven performance on corrosive gases (such as HCl and F2).
- Designs can be customized to meet specific needs.
- Electropolished surfaces



STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	H	k
3LDS4R-BV	1/4	Male HTC®	11	(63)	45	29	(4)	23	58	25	
3LDS4C-W	1/4	Extended Butt Weld	11	(89)	34				89	25	Rc1/8
3LDS4C-BW	1/4	Short Butt Weld	11	(89)	34				44.4	25	Rc1/8
3LDS6R-W	3/8	Extended Butt Weld	17.5	(67.5)	45	32.5	(4)	23	105	28	
3LDS8C-FV	1/2	Swivel Female HTC®	17.5	(92.5)	40				100	28	Rc1/8
3LDS8C-W	1/2	Extended Butt Weld	17.5	(92.5)	40				105	28	Rc1/8



SPECIFICATIONS

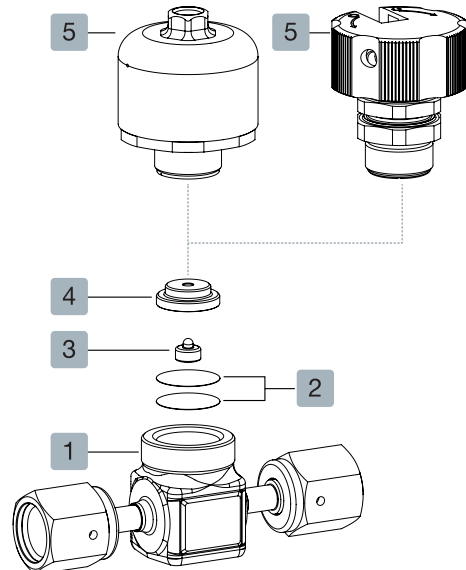
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	1MPa (150 psi)	-10 to 150°C	0.3	3X10 ⁻¹²	2X10 ⁻⁸
3/8			0.7	pa•m ³ /sec Helium	pa•m ³ /sec Helium
1/2			0.7		

STRUCTURE

Parts	Material
1 Body	Stainless steel, 316L Var or Vim/Var (1)
2 Diaphragm	Co-Cr-Ni Alloy
3 Act. Botton	304 Stainless Steel
4 Act. Botton Holder	Stainless Steel, ASTM 630 H900
5 Actuation Device	Aluminum

(1) Per SEMI F20-0305

ORDERING INFORMATION:
For ordering, see page 416



3LT SERIES

HIGH-TEMPERATURE METAL SEAT

Metal Diaphragm Valves

The highest-ranking grade of high-temperature models from the Ultra-Clean Valve Series are made according to UHP specifications. It is the ultimate in metallic diaphragm-operated valves with resins completely removed from their gas-contact areas. These valves can be used at temperatures of up to 250°C.

- Best suited for use as MOCVD changeover valves.



STANDARD CONFIGURATION DIMENSIONS

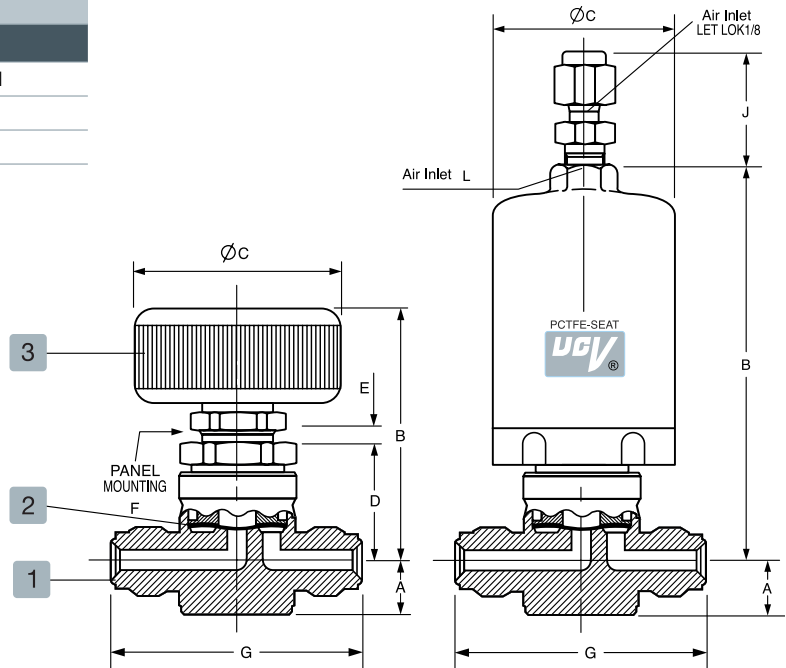
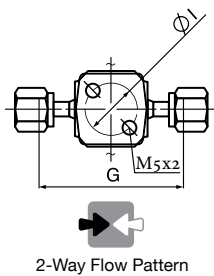
Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	I	J	L
3LTS8D-BV	1/2	Male HTC®	17.5	(67.5)	45	32.5	(4)	23	76	28		
3LTS8C-W	1/2	Extended Butt Weld	17.5	(92.3)	40				105	28	29.2	Rc1/8
3LTS8C-BW	1/2	Short Butt Weld	17.5	(92.3)	40				55	28	29.2	Rc1/8

SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/2	1MPa (150 psi)	-10 to 250°C	0.7	3X10 ⁻¹² pa•m ³ /sec Helium	2X10 ⁻⁶ pa•m ³ /sec Helium

STRUCTURE

	Parts	Material
1	Body	316L Stainless Steel
2	Diaphragm	Co-Cr-Ni Alloy
3	Handle/Act	Aluminum



ORDERING INFORMATION:

For ordering, see page 416

3LE SERIES

COMPACT METAL SEAT MODEL

Metal Diaphragm Valves

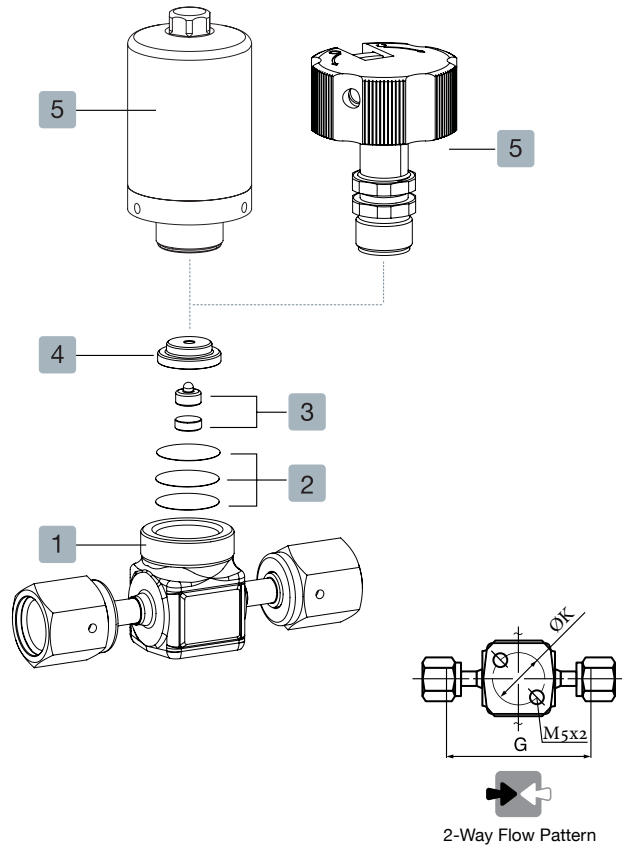
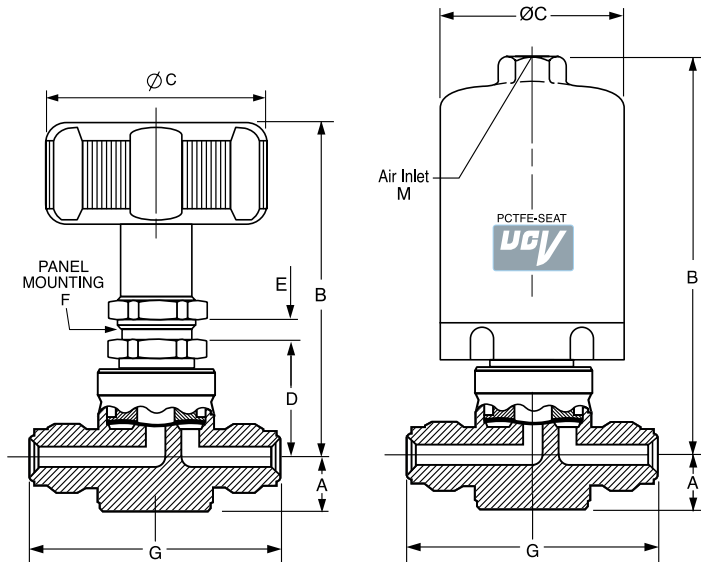
The highest-ranking grade of compact models from the Ultra-Clean Valve Series are made according to UHP specifications. It is the ultimate in metallic diaphragm-operated valves with resins completely removed from their gas-contact areas. Their minimized valve internal volumes also best recommended them for use in liquid source supply applications.

- Compact designs for minimum footprint.
- High-speed replacement of fluids in a gas or liquid state.
- Electropolished surfaces.

For details, please contact one of our field representatives.



STANDARD CONFIGURATION DIMENSIONS											
Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	K	M
3LES2R-BV-U	1/8	Male HTC®	8	(51)	30	23	(4)	15	41	15	
3LES4R-W-U	1/4	Extended ButtWeld	11	(52)	30	24.5	(4)	17	47	17	
3LES4C-BW-U	1/4	Short ButtWeld	11	(86.2)	32	24.5	(4)	17	44.4	17	Rc1/8
3LES4C-FV-U	1/4	Swivel Female HTC®	11	(86.2)	32				66	17	Rc1/8



SPECIFICATIONS					
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/8	1MPa (150 psi)	-10 to 150°C	0.05	3X10 ⁻¹² pa•m ³ /sec Helium	1X10 ⁻⁹ pa•m ³ /sec Helium
1/4			0.1		

STRUCTURE		
Parts	Material	
1 Body	Stainless steel, 316L Var or Vim/Var ⁽¹⁾	
2 Diaphragm	Co-Cr-Ni Alloy	
3 Act. Button Set	304 Stainless Steel	
4 Act. Button Holder	Stainless Steel, ASTM 630 H900	
5 Actuation Device	Aluminum	

⁽¹⁾ Per SEMI F20-0305

ORDERING INFORMATION

For ordering, see page 416

3LS SERIES
HIGH-PRESSURE-HIGH-FLOW
METAL SEAT

Metal Diaphragm Valves

The highest-ranking grade of high-pressure-high-flow models from the Ultra-Clean Valve Series are made according to UHP specifications. It is the ultimate in metallic diaphragm-operated valves with resins completely removed from their gas-contact areas. With their compact designs, these valves comfortably fit into high-pressure high-flow applications.

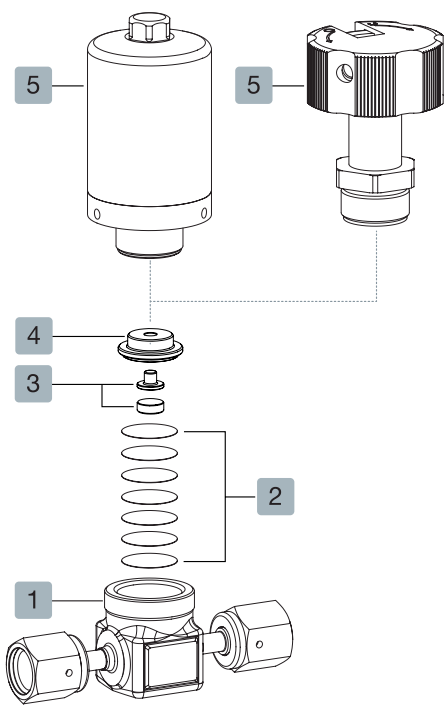
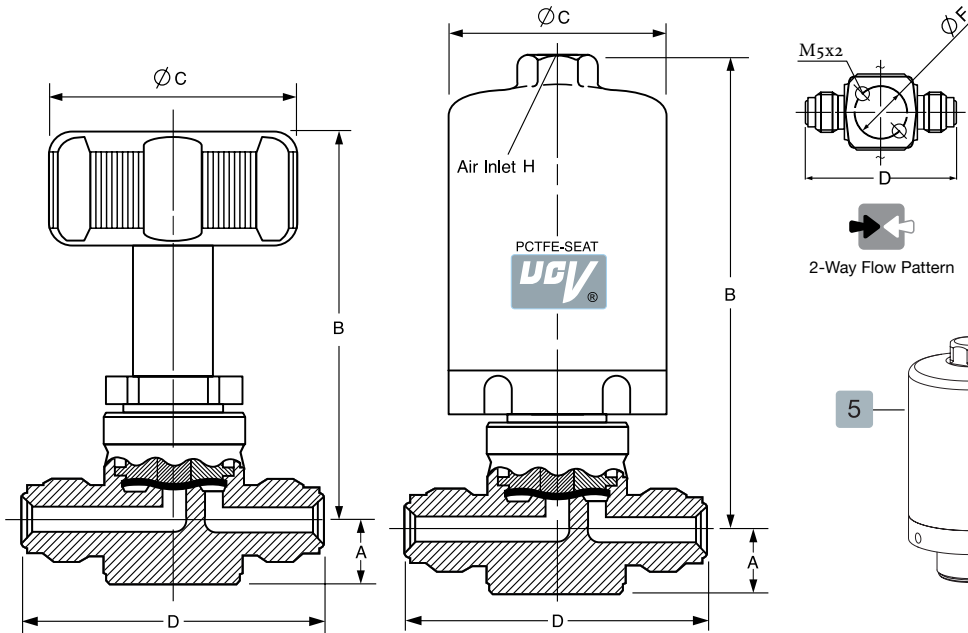
- Can be used as shutoff valves for high-pressure fluids at up to 21 MPa/3060 psi.
- Compact designs for minimum footprint.
- Extensive records of proven performance on corrosive gases (such as HCl and F2).
- Electropolished surfaces

For more information, please contact one of our field representatives.



STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	F	G	H
3LSS4R-W	1/4	Extended Butt Weld	11	(71)	45	89	25	M5	
3LSS4R-BW	1/4	Butt Weld	11	(71)	45	44.4	25	M5	
3LSS4C-FV	1/4	Swivel Female HTC®	11	(89)	40	70.6	25	M5	Rc1/8
3LSS8C-W	1/2	Extended Butt Weld	17.5	(92.5)	40	105	28	M5	Rc1/8
3LSS8C-BW	1/2	Short Butt Weld	17.5	(92.5)	40	55	28	M5	Rc1/8



SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	21MPa / 3060 psi	-10 to 150°C	0.25	3 X 10 ⁻¹² Pa m ³ /sec Helium	7 X 10 ⁻¹⁰ Pa m ³ /sec Helium
1/2				0.27	

STRUCTURE

Parts	Material
1 Body	Stainless steel, 316L Var or Vim/Var(1)
2 Diaphragm	Co-Cr-Ni Alloy
3 Act. Botton Set	304 Stainless Steel
4 Act. Botton Holder	Stainless Steel, ASTM 630 H900
5 Actuation Device	Aluminum

ORDERING INFORMATION:
 For ordering, see page 416

(1) Per SEMI F20-0305

3LH SERIES

HIGH-PRESSURE METAL SEAT

Metal Diaphragm Valves

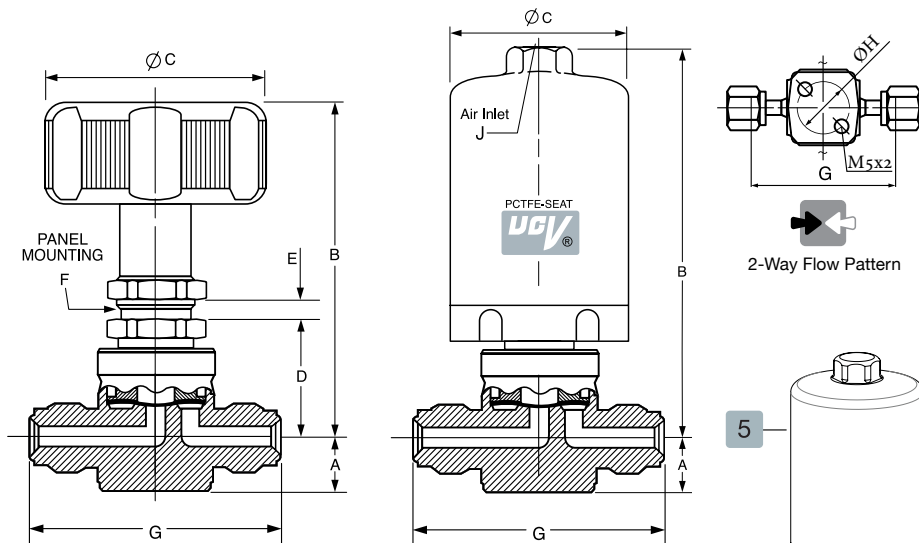
The highest-ranking grade of high-pressure-high-flow models from the Ultra-Clean Valve Series are made according to UHP specifications. It is the ultimate in metallic diaphragm-operated valves with resins completely removed from their gas-contact areas. It can be used to supply corrosive gases (such as HCl and F2) at high pressures.

- Can be used as shutoff valves for high-pressure fluids at up to 16.2 MPa/2300 psi.
 - Compact designs for minimum footprint.
 - Electropolished surfaces
 - Optionally ready for 21 MPa/3060 psi (*For 3060 psi, add "-210K" to the valve description).
- For more information, please contact one of our field representatives.



STANDARD CONFIGURATION DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	H	J
3LHS2R-BV	1/8	Male HTC®	8	(67)	43	23	(2.5)	16	41	15	
3LHS4R-W	1/4	Extended Butt Weld	11	(68)	45	25	(2.5)	17	47	17	
3LHS4R-BW	1/4	Short Butt Weld	11	(68)	45	25	(2.5)	17	44.4	17	
3LHS4C-FV	1/4	Swivel Female HTC®	11	(85)	40				66	17	Rc1/8

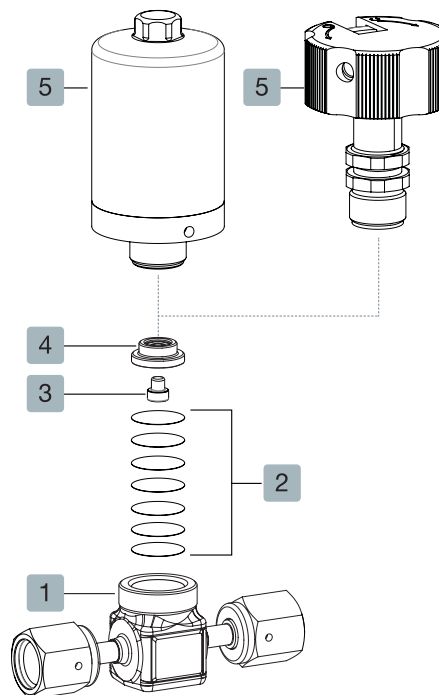


SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	16.2MPa (2300 psi) OPTION: 21MPa/3060 psi	-10 to 150°C	0.1	3X10 ⁻¹² pa•m ³ /sec Helium	3X10 ⁻¹⁰ pa•m ³ /sec Helium

STRUCTURE

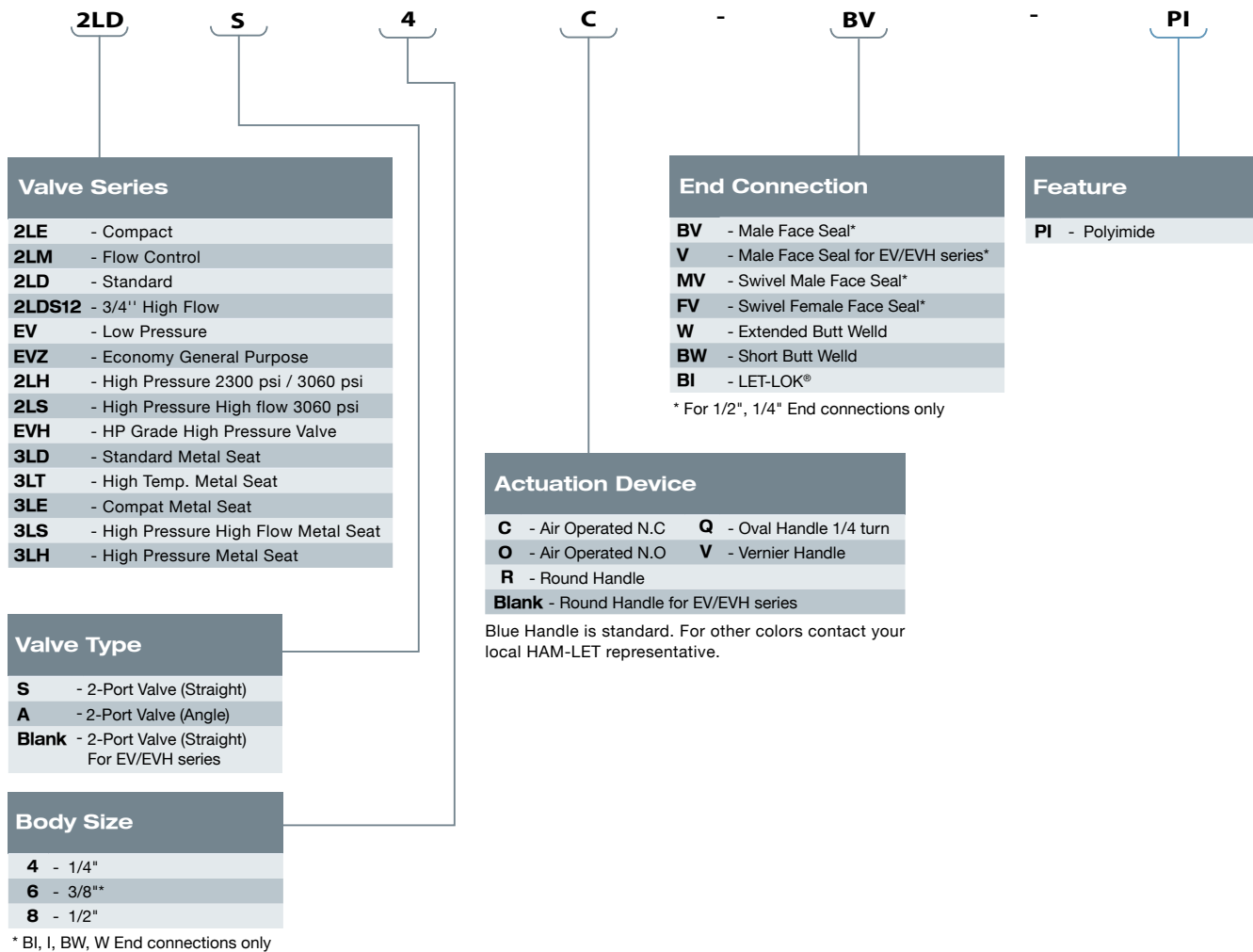
Parts	Material
1 Body	Stainless steel, 316L Var or Vim/Var(1)
2 Diaphragm	Co-Cr-Ni Alloy
3 Act. Button	304 Stainless Steel
4 Act. Button Holder	Stainless Steel, ASTM 630 H900
5 Actuation Device	Aluminum



ORDERING INFORMATION:
For ordering, see page 416

(1) Per SEMI F20-0305

ORDERING INFORMATION



- Standad seat: PCTFE.
- For valves that are made of bar stock, see Ordering Information page 425 & 428

For your convenience, port conversion of old HMJ valves to current HM series:
A = 30 | B = 35 | C = 33 | D = 31 | E = 32 | F = 34

Warning! For your safety

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

SEAT MATERIAL SELECTION

Gas	Molecular Formula	State*	Seat Materials** Diaphragm Valve		
			PCTFE	Pi	Metal
AMMONIA	NH ₃	L.G	⊙	△	⊙
ARGON	Ar	G	⊙	⊙	⊙
ARSINE	ASH ₃	C.G	⊙	⊙	⊙
BORON TRICHLORIDE	BCl ₃	L.G	○	△	⊙
BORON TRICHLORIDE	BF ₃	C.G	○	△	⊙
CHLORINE	Cl ₂	L.G	○	X	⊙
DIBORANE	B ₂ H ₆	C.G	○	○	⊙
DICHLORO SILANE	SiH ₂ Cl ₂	L.G	○	△	⊙
DISILANE	Si ₂ H ₆	G	○	○	⊙
DI-CHLORO DI-FLUORO METHANE	CCl ₂ F ₂	L.G	⊙	△	⊙
MONO-CHLORO TRI-FLUORO METHANE	CClF ₃	L.G	⊙	△	⊙
TETRA FLUORO METHANE	CF ₄	G	⊙	⊙	⊙
TRI FLUORO METHANE	CHF ₃	L.G	⊙	⊙	⊙
HEXA-FLUORO METHANE	C ₂ F ₆	L.G	⊙	⊙	⊙
HELIUM	He	G	⊙	⊙	⊙
HYDROGEN	H ₂	G	⊙	⊙	⊙
HYDROGEN BROMIDE	HBr	C.G	△	[X]	⊙
HYDROGEN CHLORIDE	HCl	L.G	○	X	⊙
HYDROGEN SULFIDE	H ₂ S	L.G	○	X	⊙
NITROGEN	N ₂	G	⊙	⊙	⊙
NITROGEN TRIFLUORIDE	NF ₃	G	⊙	⊙	⊙
NITROGEN OXIDE	N ₂ O	L.G	△	○	⊙
OXIGEN	O ₂	G	⊙	⊙	⊙
PHOSPHINE	PH ₃ :PURE PH ₃ :MIX	G	○	○	⊙
SILANE	SiH ₄	G	○	○	⊙
SILICON TERACHLORID	SiCl ₄	L.G	○	△	⊙
SULFER HEXAFLORIDE	SF ₆	L.G	○	○	⊙
TUNGSTEN HEXAFLUORIDE	WF ₆	L.G	○	△	⊙

* STATE-L.G: LIQUEFIED GAS C.G: COMPRESSED GAS G:GAS

** SEAT MATERIALS - ⊙: VERY GOOD ○: GOOD △: CAUTION X: POOR

Warning! For your safety

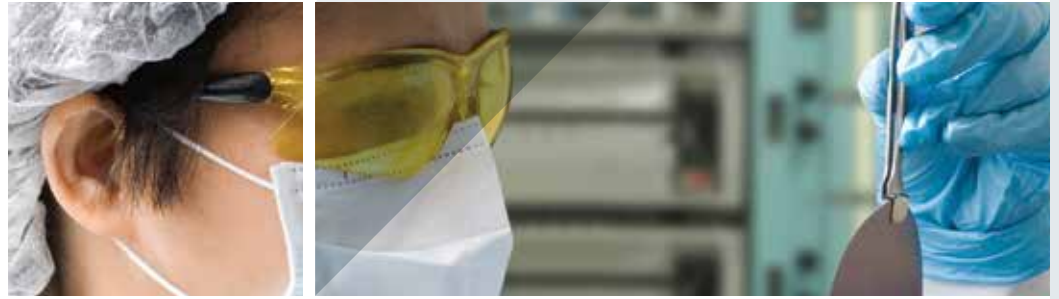
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

UCV, Rev 05, January 2015



UCV[®] HM SERIES

ULTRA-HIGH PURITY,
METAL-DIAPHRAGM VALVES
FOR GAS DELIVERY SYSTEMS



HM & HMS SERIES

METAL DIAPHRAGM VALVES

The HM & HMS Valve Series includes Metal-Diaphragm, Ultra-Clean Valves, size 1/4". The HM & HMS Series is suitable for low and high-pressure applications in multi-port configurations (2- port, L-port, 3-port, 4-port). The valves can be operated manually or pneumatically. UCV® valves are assembled, inspected, tested and packaged in a Class 10 Clean Room. Each valve is individually assembled and submitted to pressure testing, functionality tests and a helium leak test.



THE UCV HM & HMS SERIES SPECIFICATIONS

MATERIAL

UCV® Series Valves meet the chemical composition and the mechanical properties of Stainless Steel 316L, according to the ASTM A276 specification. Chemical Composition: The body material of the UCV Series complies with SEMI F20 - the sulfur content is lower or equal to 0.01 percent.

MECHANICAL SIZE - DIMENSIONAL SPECIFICATION

UCV® Series Valves meet the end-to-end length and overall envelope and comply with SEMATECH Technology Transfer 96063137-ENG.

PACKAGING

HAM-LET standard for packing the UCV® Series Valves is a double bag. The inner bag contains ultra-pure nitrogen. All end fittings, threads and sealing surfaces are protected with a cap to prevent any damage.

ELECTROPOLISHED SURFACES - SURFACE FINISH

UCV Valves meet a surface defect level of maximum of 25 for any location with a maximum average of 15. This test is done in accordance with SEMASPEC 90120401-STD.

UCV® Valves meet the Chromium Enhancement ratio of chromium-to-iron ratio of 2:1 and chromium oxide-to-iron oxide ratio of 3:1. This test is done in accordance with SEMASPEC 90120403-STD. UCV® Valves meet the oxide layer depth and surface contamination of 20 angstroms after subtraction of the carbon layer. The carbon layer is 10 angstroms.

MAXIMUM SURFACE CONTAMINATIONS	
Element	Atomic Percentage
Carbon	30.0
Sulfur	1.0
Phosphorus	2.0
Silicon	1.5
Nitrogen	2.0

SURFACE ROUGHNESS

All wetted parts of the UCV® Series Valves have an average surface roughness (Ra avg) of 5 microinch Ra, and maximum surface roughness (Ra max) of 10 microinch Ra, complying with ISO 4288.

HELIUM LEAK TEST

All UCV® Series Valves are 100% helium leak tested. Helium-leak tests are performed using a helium-leak detector machine with a sensitivity of 0.1×10^{-10} atm cc He/sec. The standard leak-rate tests are listed below.

(Lower leak rates are optional on request)

Maximum Helium (He) leak ratings:

Inboard leak integrity 3×10^{-11} atm cc/sec. Complies with SEMI F1. Leak across the seat 1×10^{-9} atm cc/sec. This test is done in accordance with SEMASPEC 90120391B-STD (held for at least 15 seconds).

PARTICLES

The particles standard for UCV® Series Valves is: less than 5 particles/ft³ for particles 0.1µm and 20 particles 0.02 µm for static and dynamic tests, according to SEMASPEC 90120390-STD.

MOISTURE TESTING

The standard moisture level is 20 ppbv H2O in Nitrogen baseline or less, within 2 hours after 2 ppmv spike for 1 minute at flow rate of 1.5 SLM or less, according to SEMASPEC 90120397-STD.

CLEANING

All CNC machined valve parts are cleaned to ensure that they are free of emulsion composition and residues involved in the machining process.

RELIABILITY

The valves demonstrate a MTTF of more than 1 million cycles for pneumatic valves and more than 100,000 cycles for manual valves, in accordance with SEMASPEC 90120395-STD and 90120390-STD.

HM SERIES

METAL DIAPHRAGM MANUAL HANDLE VALVES

The manually operated Ultra-Clean Diaphragm Valves are for high and low-pressure applications. The HM series is designed and manufactured per SEMI F-20 material specifications. The valves include a flexible port design with butt weld and face-seal end connections.



MATERIALS

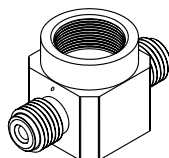
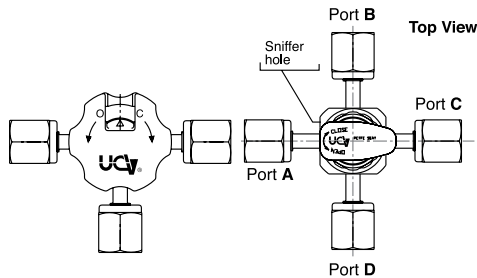
Item No.	Part No.	Material
1*	Body	**Stainless steel, 316L Var or Vim/Var ⁽¹⁾
2*	Seat	**PTFE, Polyimide
3*	Seat Holder	**Stainless steel, 316L Var or Vim/Var ⁽¹⁾
4*	Diaphragm	Co-Cr-Ni Alloy
5	Act. Button	Stainless steel, AISI 304, ball AISI 440C
6	Act. Button Holder	Stainless steel, ASTM 630 H900
7	Handle & Stem Assembly	A6061T6, ASTM 630 H900

*Wetted parts ** Standard material

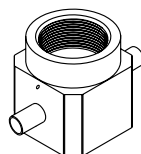
PANEL MOUNTING

Each manual valve has an upper panel mounting as well as a bottom mounting, as a standard. The upper panel mounting has a stainless steel nut, which requires a minimum width of 0.04" for panel.

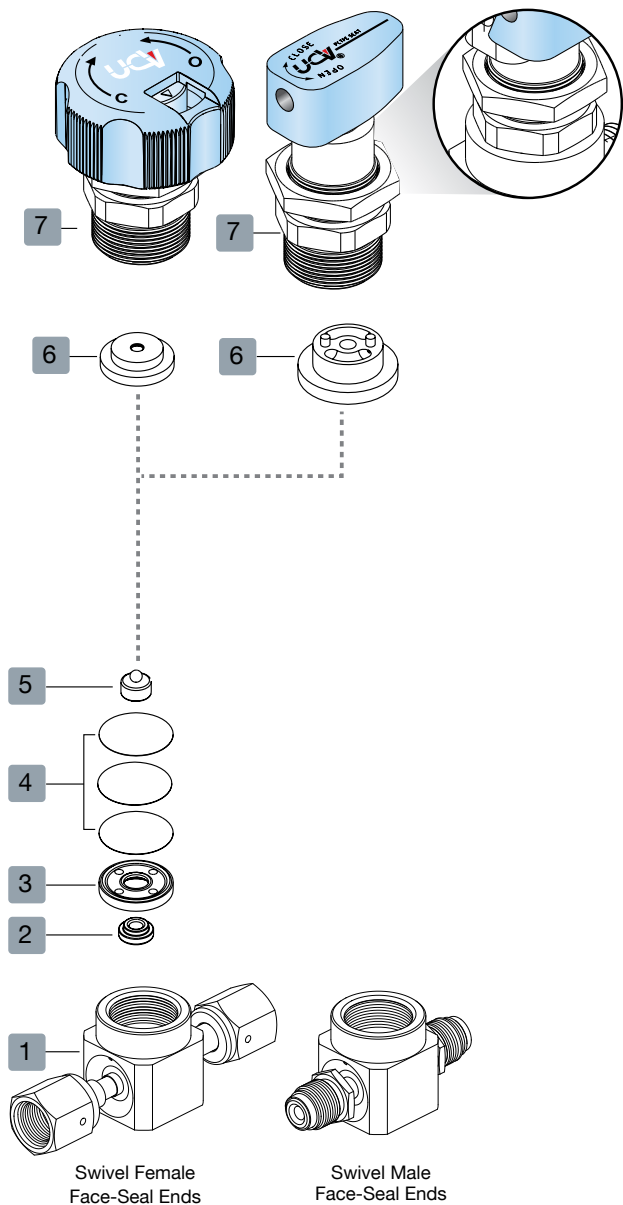
For multi port valves, select the End Connection for each port, starting with port A, which is indicated by the sniffer hole in the body. Continue with the other ports (B,C,D).



Male Face-Seal Ends



Butt Weld Ends



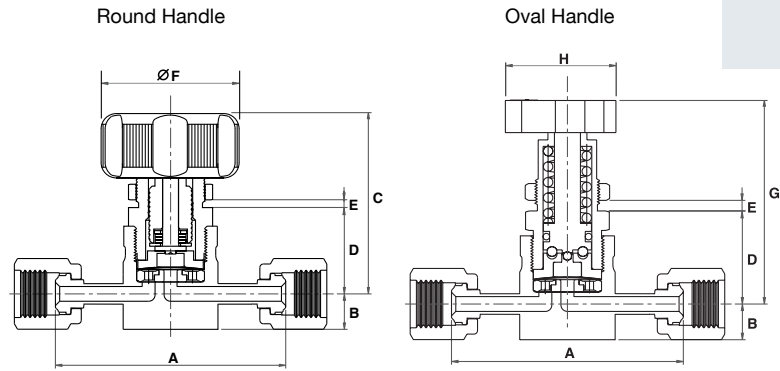
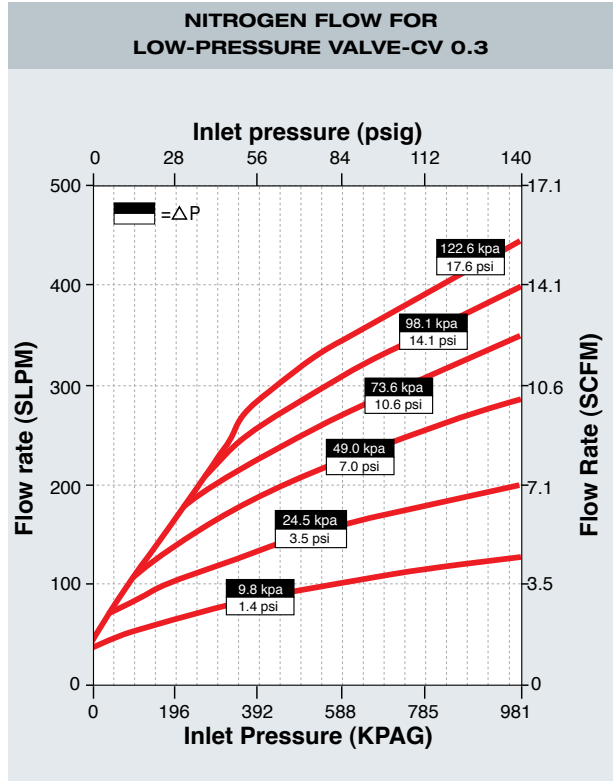
⁽¹⁾ Per SEMI F20-0305

HM SERIES
**METAL DIAPHRAGM
 MANUAL HANDLE VALVES**

ULTRA CLEAN VALVES

UCV SPECIFICATIONS	
Structure	Direct-seal metal-diaphragm valve without seal packing Manually operated
Pressure	Vacuum to 300 psi (20 bar)
Temperature: Standard	14 to 140°F, -10 to 60°C (PCTFE Seat)
Available	14 to 302°F, -10 to 150°C (*Polyimide Seat)
Leakage: Inboard Leakage across the seat	$\leq 3 \times 10^{-11}$ atm cc He/sec $\leq 1 \times 10^{-9}$ atm cc He/sec
Particle	No particle detected above 0.1µm.
Operated	Round handle 3/4 turn Oval handle 1/4 turn
Connections	Face seal or tube weld
CV value - Low Pressure	0.3
Valve Lift	0.024", 0.6 mm
Direction	2 port straight, 2 port L, 3 port, 4 port
Surface Finish Ra (Ave)-Standard	5µin
Surface Finish Ra (Max)-Standard	10µin

*Used with Fluorocarbon FKM O-ring LP-Low pressure



VALVE DIMENSIONS- inch, mm		A		B		C		D		E*		F		G		H	
Size	Connection	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1/4"	Swivel Female Face-Seal	2.78	70.6	0.44	11.0	2.48	63.0	1.14	29.0	0.04	1.00	1.77	45.0	2.68	68.0	1.34	34.0
1/4"	Male Face-Seal	2.30	58.4	0.44	11.0	2.48	63.0	1.14	29.0	0.04	1.00	1.77	45.0	2.68	68.0	1.34	34.0
1/4"	Swivel Male Face-Seal	2.78	70.6	0.44	11.0	2.48	63.0	1.14	29.0	0.04	1.00	1.77	45.0	2.68	68.0	1.34	34.0
1/4"	Butt Weld	1.75	44.4	0.44	11.0	2.48	63.0	1.14	29.0	0.04	1.00	1.77	45.0	2.68	68.0	1.34	34.0

Dimensions are for reference only, and are subject to change.

*Minimum height for panel

HM SERIES

METAL DIAPHRAGM AIR-OPERATED VALVES

The pneumatically operated Ultra-Clean Diaphragm Valve is for high and low-pressure applications. The HM series is designed and manufactured per SEMI F-20 material specifications, and it offers a flexible port design with butt-weld and face-seal end connections.



ULTRA CLEAN VALVES

UCV SPECIFICATIONS

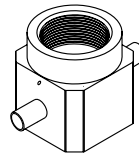
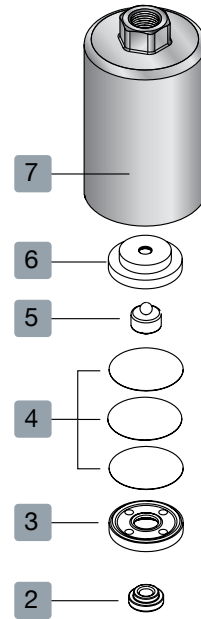
Structure	Direct-seal metal-diaphragm valve without seal packing Pneumatically operated
Pressure	Vacuum to 300 psi (20 bar)
Temperature: Standard	14 to 140°F, -10 to 60°C (PCTFE Seat)
Available	14 to 302°F, -10 to 150°C (*Polyimide Seat)
Leakage: Inboard Leakage	≤ 3x10 ⁻¹¹ atm cc He/sec
across the seat	≤ 1x10 ⁻⁹ atm cc He/sec
Particle	No particle detected above 0.1µm.
Operated	Pneumatic, NC/NO**
Connections	Face Seal or Tube Weld
CV value - Low Pressure	0.3
Valve Lift	0.6mm (0.024")
Direction	2-port straight, 2-port L, 3-port, 4-port
Surface Finish Ra (Ave)-Standard	5µin
Surface Finish Ra (Max)-Standard	10µin
Air Supply	60-90 psig , 4 - 6 bar
Air Connection	1/8" NPT

*Used with Fluorocarbon FKM O-ring **NC-Normally Closed LP-Low pressure
NO-Normally Open

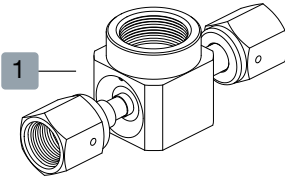
MATERIALS

Item No.	Part No.	Material
1*	Body	**Stainless steel, 316L Var or Vim/Var ⁽¹⁾
2*	Seat	**PCTFE, Polyimide
3*	Seat Holder	**Stainless steel, 316L Var or Vim/Var ⁽¹⁾
4*	Diaphragm	Co-Cr-Ni Alloy
5	Act. Button	Stainless steel, AISI 304, ball AISI 440C
6	Act. Button Holder	Stainless steel, ASTM 630 H900
7	Actuator Assembly	A6061T6

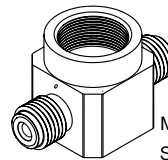
*Wetted parts ** Standard material



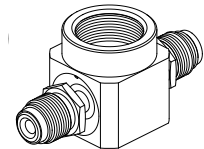
Butt Weld Ends



Swivel Female Face-Seal Ends



Male Face-Seal Ends



Swivel Male Face-Seal Ends

⁽¹⁾ Per SEMI F20-0305

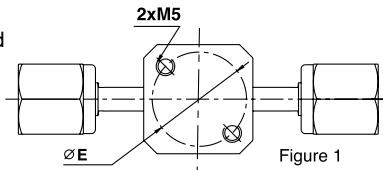
**HM SERIES
METAL DIAPHRAGM
AIR OPERATED VALVES**

VALVE DIMENSIONS - INCH (MM)													
Size	Connection	A		B		C		D		E*		F	
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1/4"	Swivel Female Face-Seal	2.78	70.6	0.44	11.0	1.16	29.4	1.16	29.4	1.00	25.4	1.40	35.3
1/4"	Male Face-Seal	2.30	58.4	0.44	11.0	1.16	29.4	1.16	29.4	1.00	25.4	1.15	29.2
1/4"	Swivel Male Face-Seal	2.78	70.6	0.44	11.0	1.16	29.4	1.16	29.4	1.00	25.4	1.40	35.3
1/4"	Butt Weld	1.75	44.4	0.44	11.0	1.16	29.4	1.16	29.4	1.00	25.4	0.87	22.2

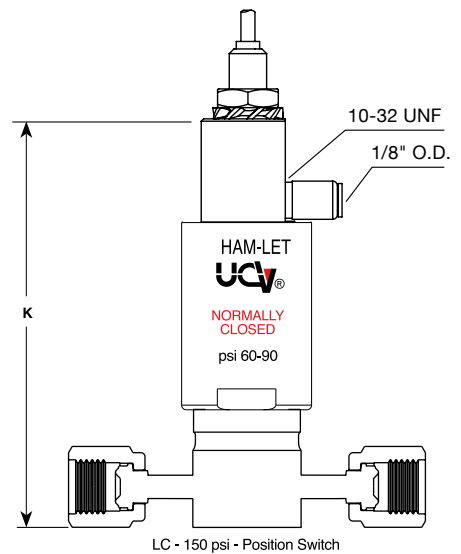
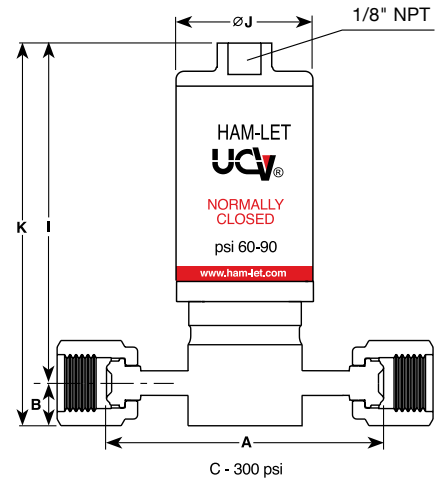
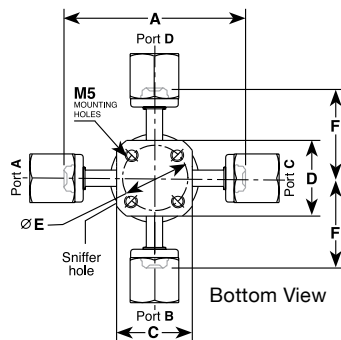
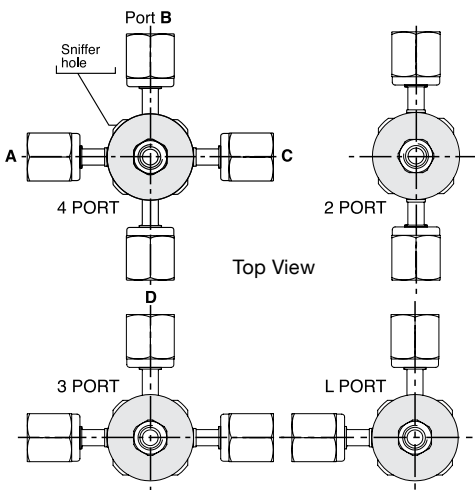
ACTUATOR DIMENSIONS - INCH (MM)					
Actuator type	I	∅J	K	Effective Area	Output Force
Low Pressure	2.86 (72.7)	1.33 (34)	3.29 (83.7)	1.58 in ²	550 psig
High Pressure	3.50 (89)	1.57 (40)	3.93 (100)	1.58 in ²	550 psig
AO-Position switch			3.78 (96)		

STANDARD PANEL MOUNTING FOR TWO-PORT STRAIGHT VALVE

- Optional, four threaded holes (two as standard).
- All the other valve types have standard four threaded holes.
- According to SEMATECH 96063137-ENG.



The M5 threaded mounting holes will accept 10-32 screws.



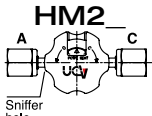
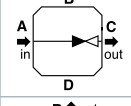
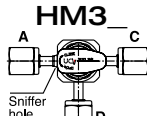
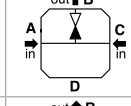
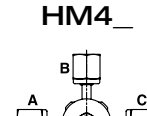
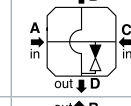
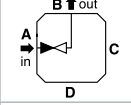
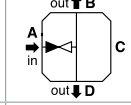
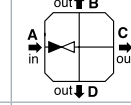
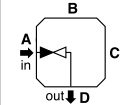
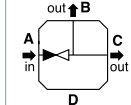
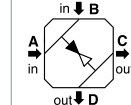
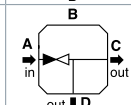
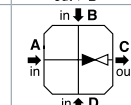
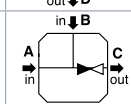
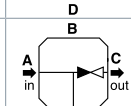
* The dimensions apply to pneumatic and manual valves. Dimensions are for reference only, and are subject to change.

ORDERING INFORMATION - HM SERIES

Valve Description Example:

HM	2	1 - 4	V	K	LR	BW 4 GF 4 - LS
Valve Series	Port Designator	Body Material		Actuation Device		End Size
HM - UCV Valves	0, 1, 2, 3, 4, 5	V - SS316L Var or Vim/Var ⁽¹⁾ (Bar Stock) Standard		LC - Air Operated N.C. 150 psi C - Air Operated N.C. 300 psi LO - Air Operated N.O. 150 psi O - Air Operated N.O. 300 psi LR - Round Handle 3/4 turn 300 psi* LQ - Oval Handle 1/4 turn 300 psi		4 - 1/4" 6 - 3/8"* 8 - 1/2" 6mm*
				* Blue color is a standart Handle color can be delivered by request. NC-Normally close, NO- Normally open.		* BW, LL End connections only
Valve Type	Body Size	Seat Material		End Connection		Features
2 - 2-Port Valve	4 - 1/4	K - PCTFE		BW - Butt Weld		LD - Locking Device
3 - 3-Port Valve		S* - Polyimide		GF - Swivel female Face-seal**		ISLT - LOTO handle
4 - 4-Port Valve		K Standard, *Available		GM - Swivel male Face-seal**		LS - For limit switch indicator on AOP Valve, contact your local HAM-LET representative
				M - Male Face-seal**		
				LL - Let-Lok®		
** 1/4", 1/2" End connection size only						

ULTRA CLEAN VALVES

PORT DESIGNATOR - (TOP VIEW)								
Valve Configuration	Port Designator	Schematic Flow Chart	Valve Configuration	Port Designator	Schematic Flow Chart	Valve Configuration	Port Designator	Schematic Flow Chart
2 Port Valve HM2 	0		3 Port Valve HM3 	0		4 Port Valve HM4 	0	
	1 L-Port			1			1	
	2 L-Port			2			2	
				3			3	
				4				
				5				

⁽¹⁾ Per SEMI F20-0305

HMS SERIES SURFACE-MOUNT SERIES

The Ultra Clean Valves Series offer a surface mount body design. The surface mount design complies with SEMI PR 3.1 for 1.125" C-seal. HMS Series is manufactured according to UHP specifications of SEMI F-20 with manual and pneumatic operating mechanisms.



MATERIALS

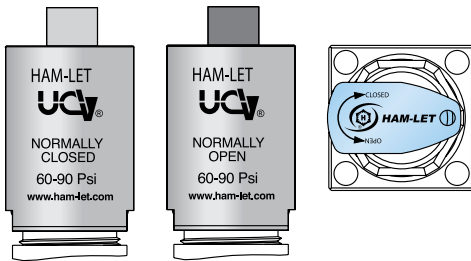
Item No.	Part No.	Material
1	Body	Stainless steel, 316L Var or Vim/Var ⁽¹⁾
2	Seat	PCTFE, Polyimide
3	Seat Holder	Stainless steel, 316L Var or Vim/Var ⁽¹⁾
4	Diaphragm	Co-Cr-Ni Alloy
5	Actuation Device	Manual A6061T6
		Pneumatic A6061T6

UCV SPECIFICATIONS

Structure	Direct-seal, metal-diaphragm valve without seal packing, manually and pneumatically operated
Pressure	Vacuum to 150 psi (10 bar)
Operating Temperature: Standard	14 to 140°F, -10 to 60°C (PCTFE Seat)
	Available 14 to 302°F, -10 to 150°C *(Polyimide Seat)
Leakage: Inboard Leakage across the seat	≤ 3x10 ⁻¹¹ atm cc He/sec
	≤ 1x10 ⁻⁹ atm cc He/sec
Particle	No particles detected above 0.1µm.
CV value	0.3
Surface Finish Ra (Ave)-Standard	5µin
Actuator Air Supply (Pneumatic)	60-90 psig, 4 - 6 bar
Air Connection (Pneumatic)	Thread 10-32 UNF

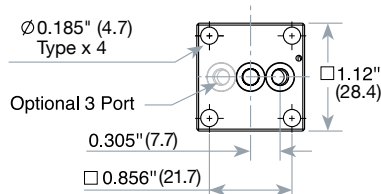
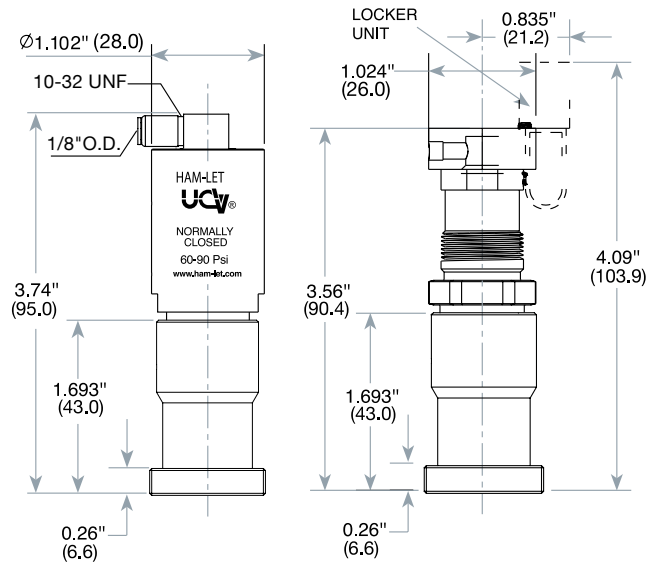
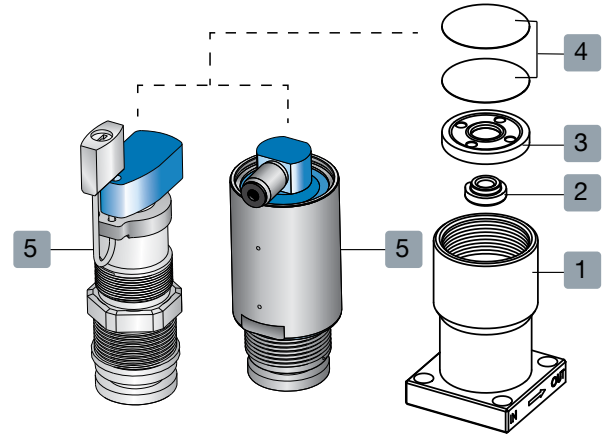
* Used with Fluorocarbon FKM O-ring for actuation device

ACTUATION DEVICE - MARKING



Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.



- The dimensions apply to pneumatic and manual valves.
- Dimensions are for reference only, and are subject to change.

⁽¹⁾ Per SEMI F20-0305

HMSC COMPACT SURFACE-MOUNT SERIES

The Ultra Clean Valve Series offer a surface mount body design. The surface mount design complies with SEMI PR 3.1 for 1.125" C-seal. This valve is a low profile body design with an Integral Safety Lockout Tag-out (ISLT[®]) handle. (Pat. No. 165393).



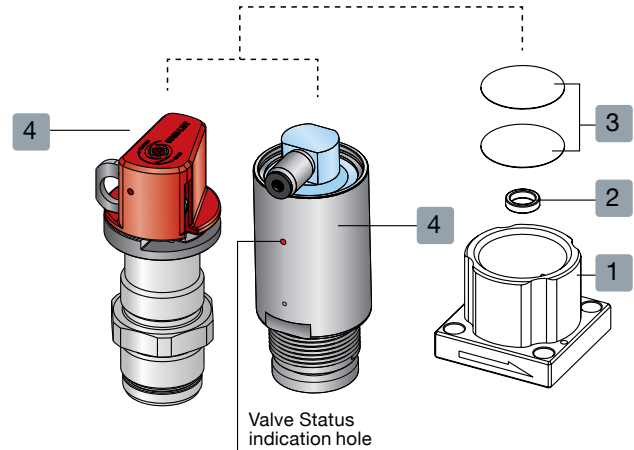
MATERIALS

Item No.	Part No.	Material
1	Body	Stainless steel, 316L Var or Vim/Var ⁽¹⁾
2	Seat	PCTFE, Polyimide
3	Diaphragm	Co-Cr-Ni Alloy
4	Actuation Device	Manual A6061T6
		Pneumatic A6061T6

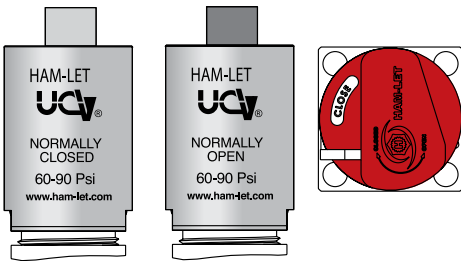
UCV SPECIFICATIONS

Pressure	Vacuum to 150 psi (10 bar)
Operating Temperature: Standard	14 to 140°F, -10 to 60°C (PCTFE Seat)
	Available 14 to 302°F, -10 to 150°C *(Polyimide Seat)
Leakage: Inboard Leakage	≤ 3x10 ⁻¹¹ atm cc He/sec
	Across the seat ≤ 1x10 ⁻⁹ atm cc He/sec
Particle	No particles detected above 0.1µm.
CV value	0.3
Surface Finish Ra (Ave)-Standard	5µin
Actuator Air Supply (Pneumatic)	60-90 psig, 4 - 6 bar
Air Connection (Pneumatic)	Thread 10-32 UNF

* Used with Fluorocarbon FKM O-ring for actuation device

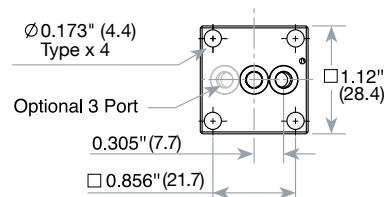
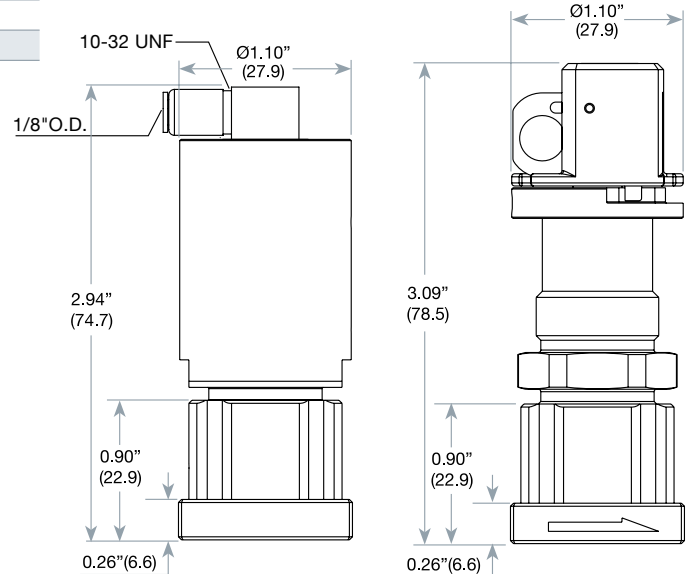


ACTUATION DEVICE - MARKING



Warning!

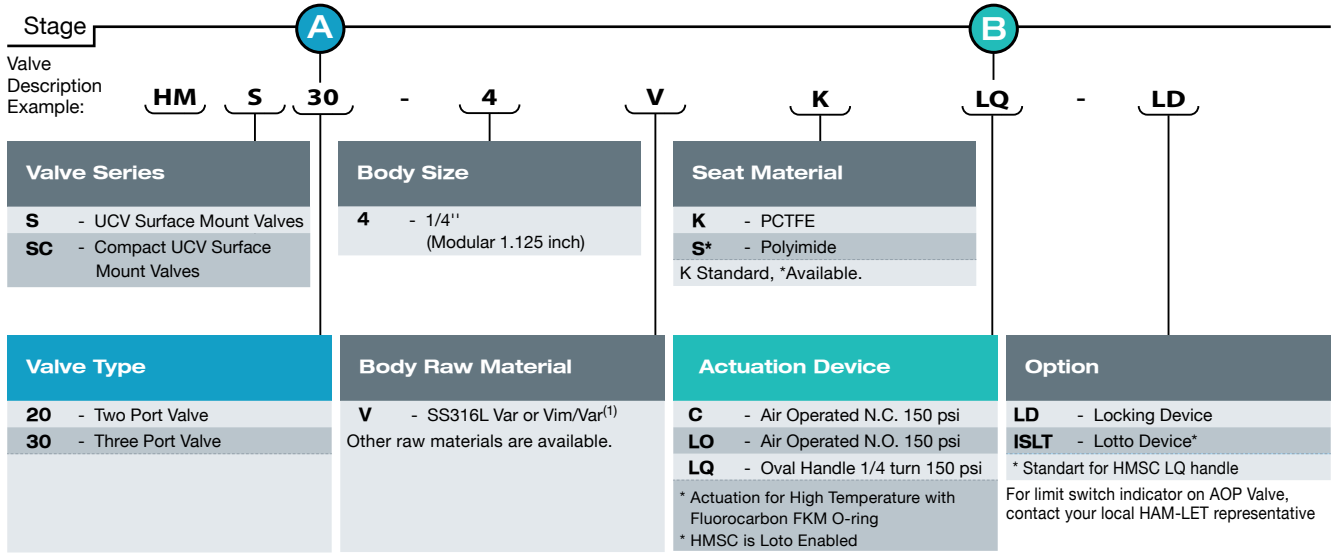
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.



- The dimensions apply to pneumatic and manual valves.
- Dimensions are for reference only, and are subject to change.

⁽¹⁾ Per SEMI F20-0305

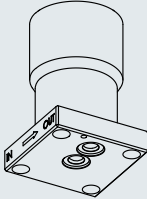
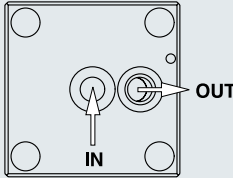
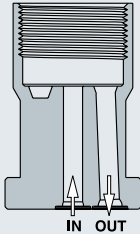
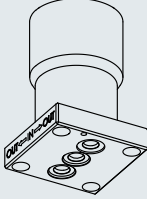
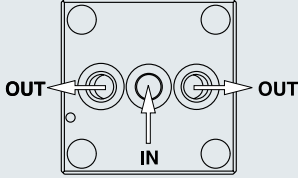
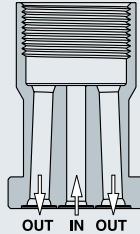
ORDERING INFORMATION - HMS & HMSC

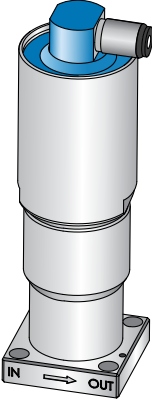
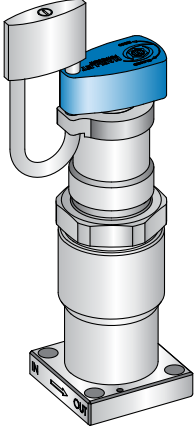


ORDERING EXAMPLES					
	HMS30 - 4VSLQ -LD			HMS20 - 4VKC	
Valve Type - Stage A	30	Surface Mounted Valve - Three Port		20	Surface Mounted Valve - Two Port
Body Size	4	1/4" (Modular 1.125 inch)		4	1/4" (Modular 1.125 inch)
Body Material	V	SS316L Var or Vim/Var ⁽¹⁾		V	SS316L Var or Vim/Var ⁽¹⁾
Seat Material	S	Polyimide		K	PCTFE
Actuation Device - Stage B	LQ	Oval Handle 1/4 turn 150 psi		C	Air Operated N.C. 150 psi
Features	LD	Locking Device			

⁽¹⁾ Per SEMI F20-0305

TWO STAGES FOR ORDERING SURFACE-MOUNT VALVES **A** **B**

STAGE A VALVE TYPE			
	Flow Direction Body View	Schematic Flow Chart	Flow Direction
HMS(C)20 Two Port Valve			
HMS(C)30 Three Port Valve			

STAGE B ACTUATION DEVICE*					
Actuation Type	Actuation Mode	Description	Actuation Type	Actuation Mode	Description
Pneumatic	C	Normally Closed 150 psi Normally Opened 150 psi  * Blue Actuation Cap indicates Normally Closed. ** Red Actuation Cap indicates Normally Opened.	Manual	LD	Oval Handle 1/4 turn 150 psi with Locking Device  * The Actuation Device for the manual valve does not include: locking device or locker unit as standard.

HMC SERIES

COST EFFICIENT ULTRA CLEAN METAL DIAPHRAGM VALVE FOR GENERAL PURPOSE

Metal Diaphragm Valves

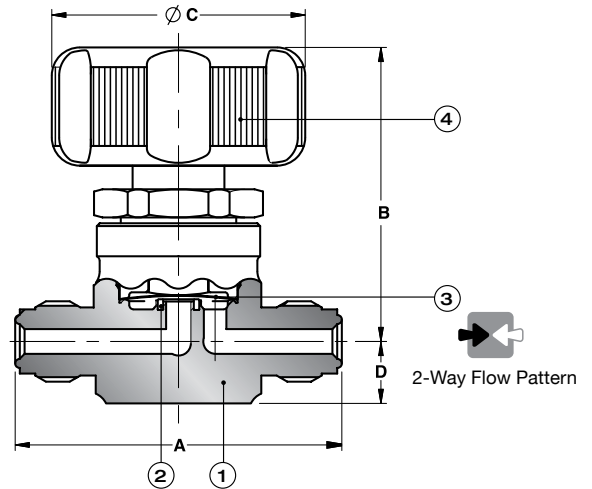
- Compact design
- Manual 3/4 turn handle and position indicator (open/close), 300 PSI
- Safety clip; Locking device for manual round 3/4 turn handle
- Pneumatically actuated, Normally Closed and Normally Open version, 150 PSI
- Electropolished surfaces as standard
- Standard panel mounting



PART NUMBER / DIMENSIONS

Actuation type	End Connection	A	B	C	D	E	G
		mm	mm	mm	mm	mm	mm
Air Operated NC / NO	Butt Weld 1/4	44.4	56.9	32			
	Male HTC 1/4	58.4					
	Let-Lok 1/4	64.7*					
	Female HTC 1/4	70.6					
	Swivel Male HTC 1/4	70.6					
Round 3/4 Turn Handle	Butt Weld 1/4	44.4	51.4	45	11	25.4	29.4
	Male HTC 1/4	58.4					
	Let-Lok 1/4	64.7*					
	Female HTC 1/4	70.6					
	Swivel Male HTC 1/4	70.6					
Oval Directional 1/4 Turn Handle	Butt Weld 1/4	44.4	68	34			
	Male HTC 1/4	58.4					
	Let-Lok 1/4	64.7*					
	Female HTC 1/4	70.6					
	Swivel Male HTC 1/4	70.6					

* LET-LOK® configuration length including nuts and ferrules fingers tight

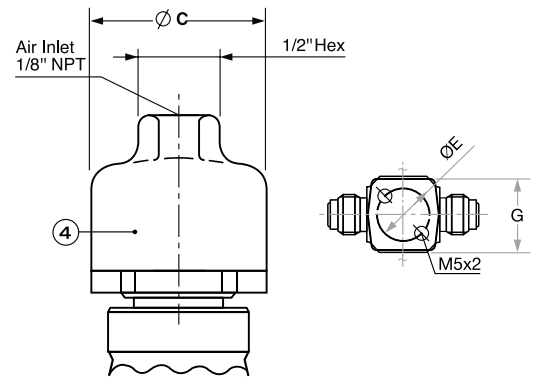


SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	Vacuum to 300 psi (20.7 bar)	-10~60°C 14~140°F	0.25	≤ 3 X10 ⁻¹¹ Atm cc/sec Helium	≤ 3 X10 ⁻⁹ Atm cc/sec Helium

STRUCTURE

Parts	Material
① Body	316L Stainless Steel / SS316L Var or Vim/Var ⁽¹⁾
② Seat	PCTFE
③ Diaphragm	Co-Cr-Ni Alloy
④ Handle/Act	Aluminum Anodize



ORDERING INFORMATION

Valve Description Example:	HMC	20	4	L	K	ER	M4
Valve Type	Body Size	Body Material	Seat Material	Actuation Type	End Connection		
2 - 2-port	4 - 1/4	L - St.St. 316L A - SS316L Var or Vim/Var ⁽¹⁾	K - PCTFE	ER - Round 3/4 turn Handle 300 psi EC - Air operated Normally Close 150 psi EO - Air operated Normally Open 150 psi EQ - Oval Directional 300 psi	M4 - 1/4 Male Face Seal BW4 - 1/4 Tube Butt-Weld LL4 - 1/4 Let-Lok GM4 - 1/4 Swivel Male Face Seal GF4 - 1/4 Swivel Female Face Seal		

HMC20 is standard. For other configuration contact HAM-LET customer service

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

⁽¹⁾ Per SEMI F20-0305

2LN SERIES (HYBRID)

AIR OPERATED, MANUAL OVERRIDE

Metal Diaphragm Valves

Surface-mount models from the Ultra Clean Valve specifications are ready for SEMI PR 3.1, 1.125" C seal connections. These valves implement Cv 0.3 for their compact designs.



VALVE DIMENSIONS - INCH (MM)

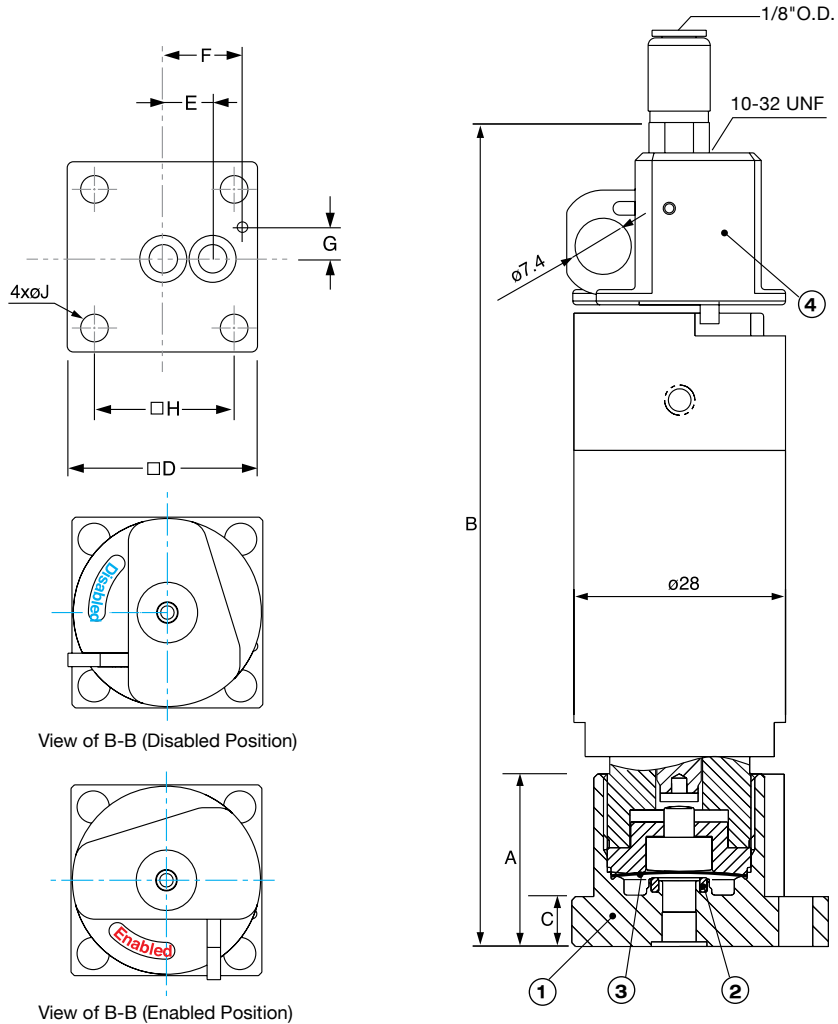
Part Number/ep	Size	End Connection	A		B		C		D		E		F		G		H		J	
			in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
2LNS4C-CM2-HB	1/4"	1.125"	0.89	22.8	4.4	111.0	0.25	6.6	1.12	28.4	0.30	7.75	0.50	12.7	0.19	5	0.85	21.74	0.17	4.4

SPECIFICATIONS

Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
1/4	1MPa (150 psi)	-10 60°C	0.3	3 X 10 ⁻¹² Pa ¹ m ³ /sec Helium	3 X 10 ⁻¹⁰ Pa ¹ m ³ /sec Helium

STRUCTURE

Parts	Material
① Body	316L Stainless Steel
② Seat	PCTFE/PI (Polyimide)
③ Diaphragm	Co-Cr-Ni Alloy
④ Handle/Act	Aluminum



ORDERING INFORMATION

2LNS4C-CM2-HB

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

HD SERIES

ECONOMIC DIAPHRAGM VALVES

The HD series of manual and pneumatically operated diaphragm valves provides a cost effective solution for low pressure applications up to 300 psi (20 bar). This unique diaphragm valve series was specifically designed to meet the pressure, finish and cleanliness requirements of Photo Voltaic panels and LED manufacturing as well as several Semiconductor applications. The HD20 valve series is the latest addition to HAM-LET high quality and economic solutions.



HD20 SERIES SPECIFICATIONS

Structure	Direct-seal metal-diaphragm valve manually & pneumatic operated
Pressure: Manual Aluminum round handle ¼ turn	300 psi (20bar)
Air Operated	150psi (10bar)
Air Operated	300psi (20bar)
Temperature	14 to 140°F, -10 to 60°C (PCTFE Seat)
Leakage: Inboard Leakage	Less Than 3x10 ⁻¹¹ atm cc He/sec
Across the seat	Less Than 1x10 ⁻⁹ atm cc He/sec
End Connections	Swivel Female Face-Seal, Male Face Seal, Swivel Male Face Seal, Butt-weld, Let-Lok
Cv value	0.3 (for high flow available Cv = 0.42)
Direction	2 port straight
Surface Finish Ra (Ave)-Standard	10µin, No Electro Polish

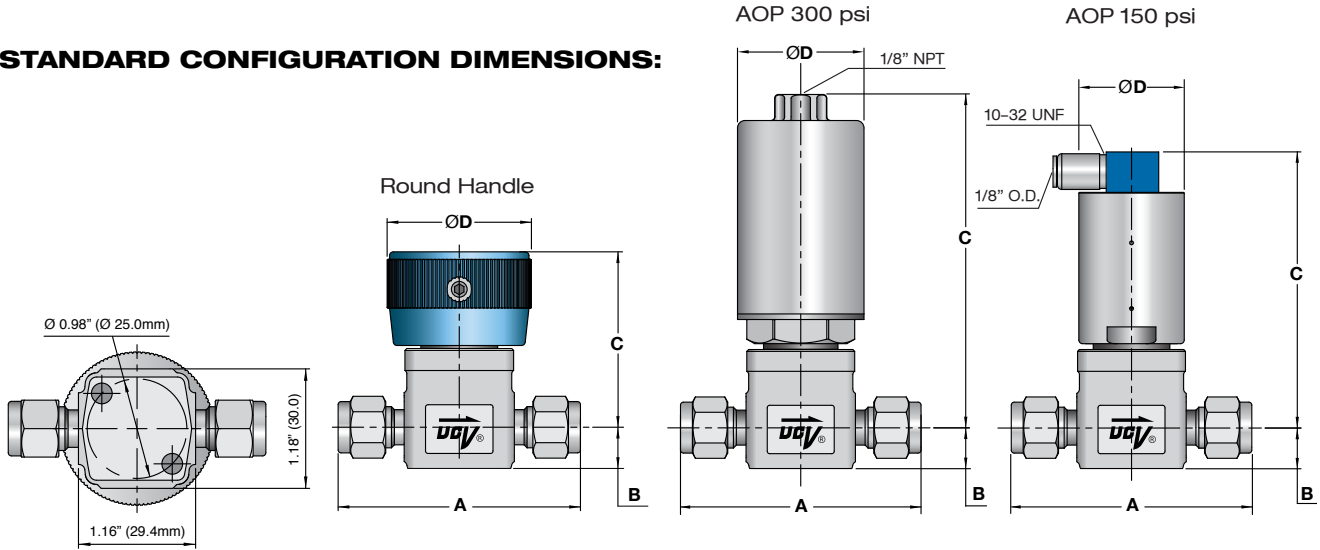


AOP 150 psi



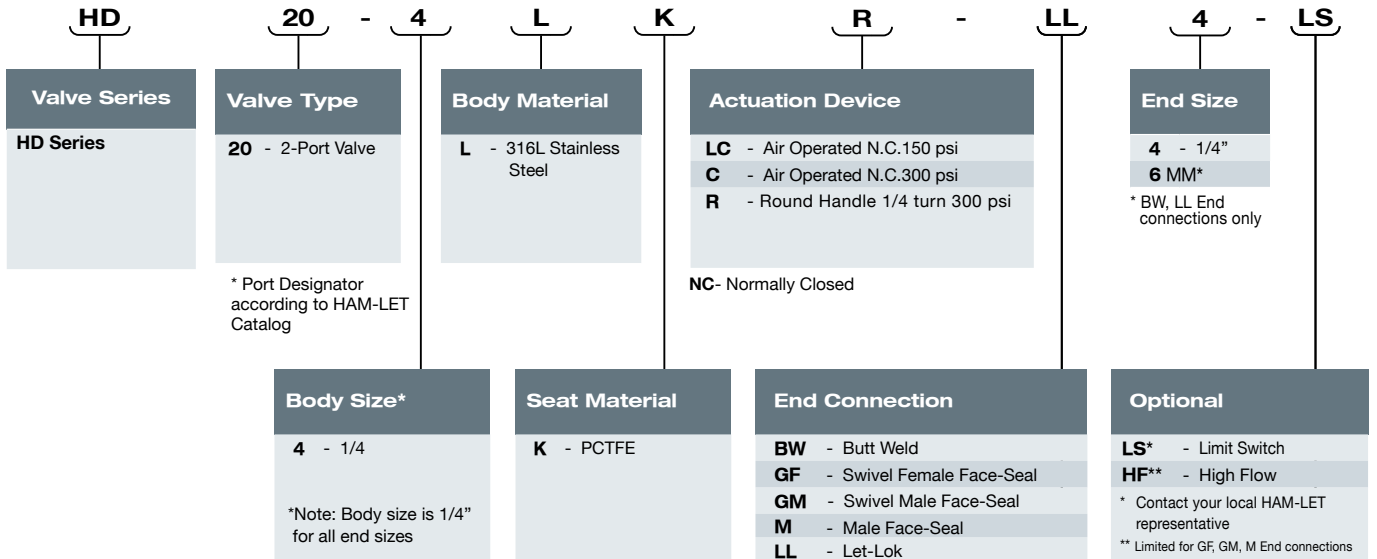
AOP 300 psi

STANDARD CONFIGURATION DIMENSIONS:



End Connections	Description	A		B		C		D	
		mm	inch	mm	inch	mm	inch	mm	inch
Swivel Female Face-Seal	HD20-4LKR-GF4	70.6	2.78	11	0.43	46.8	1.84	38	1.5
	HD20-4LKLC-GF4					72.2	2.84	28.2	1.11
	HD20-4LKC-GF4					90	3.54	34	1.34
Swivel Male Face-Seal	HD20-4LKR-GM4	70.6	2.78			46.8	1.84	38	1.5
	HD20-4LKLC-GM4					72.2	2.84	28.2	1.11
	HD20-4LKC-GM4					90	3.54	34	1.34
Male Face-Seal	HD20-4LKR-M4	58	2.28			46.8	1.84	38	1.5
	HD20-4LKLC-M4					72.2	2.84	28.2	1.11
	HD20-4LKC-M4					90	3.54	34	1.34
Buttweld	HD20-4LKR-BW4	44.4	1.75	46.8	1.84	38	1.5		
	HD20-4LKLC-BW4			72.2	2.84	28.2	1.11		
	HD20-4LKC-BW4			90	3.54	34	1.34		
Let-Lok®	HD20-4LKR-LL4	64.7	2.55	46.8	1.84	38	1.5		
	HD20-4LKLC-LL4			72.2	2.84	28.2	1.11		
	HD20-4LKC-LL4			90	3.54	34	1.34		

ORDERING INFORMATION HD SERIES



**HP SERIES
HIGH PRESSURE DIAPHRAGM VALVES**



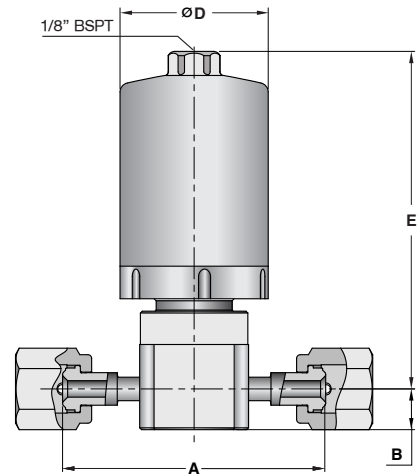
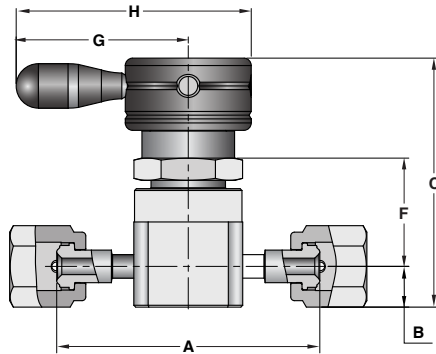
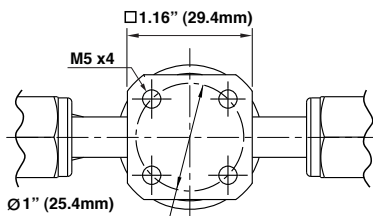
HP20 SERIES SPECIFICATIONS

Structure	Direct-seal metal-diaphragm valve manually & pneumatic operated
Pressure	Vacuum to 3060 psi (210 bar)
Temperature	14 to 104°F, -10 to 60°C (PTFE Seat)
Leakage: Inboard Leakage	Less Than 3x10 ⁻¹¹ atm cc He/sec
Across the seat	Less Than 1x10 ⁻⁹ atm cc He/sec
Operated	Manual : Lever 1/4 turn Pneumatic : NC/NO
End Connections	Swivel Female Face-Seal, Male Face Seal, Swivel Male Face Seal, Butt weld, Let-Lok
CV Value	0.27
Direction	2 port straight, 2 port L, 3 port, 4 port
Surface Finish Ra (Ave)-Standard	5µin
Air Supply	60-90 psig, 4-6 bar
Air Connection	BSPT 1/8" (NPT 1/8" as an option)

**STANDARD CONFIGURATION DIMENSIONS:
MANUAL HANDLE & PNEUMATIC, NC/NO**

Bottom

Four mounting holes, M5 X 0.8 thread, 0.25" (6.5mm) deep, M5x0.8 holes are compatible with 10-32 mounting screws.



End Connections	Description	A	B	C	D	E	F	G	H
		mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
Swivel Female Face-Seal	HP20-4VKHL-GF4	70.6 (2.78)	11 (0.43)	67.2 (2.65)	40 (1.57)	90 (3.54)	29.2 (1.15)	46.5 (1.83)	63.5 (2.5)
	HP20-4VKHC-GF4								
	HP20-4VKHO-GF4								
Male Face-Seal	HP20-4VKHL-M4	58.4 (2.3)	11 (0.43)	67.2 (2.65)	40 (1.57)	90 (3.54)	29.2 (1.15)	46.5 (1.83)	63.5 (2.5)
	HP20-4VKHC-M4								
	HP20-4VKHO-M4								
Swivel Male Face-Seal	HP20-4VKHL-GM4	70.6 (2.78)	11 (0.43)	67.2 (2.65)	40 (1.57)	90 (3.54)	29.2 (1.15)	46.5 (1.83)	63.5 (2.5)
	HP20-4VKHC-GM4								
	HP20-4VKHO-GM4								
Buttweld	HP-20-4VKHL-BW4	44.4 (1.75)	11 (0.43)	67.2 (2.65)	40 (1.57)	90 (3.54)	29.2 (1.15)	46.5 (1.83)	63.5 (2.5)
	HP20-4VKHC-BW4								
	HP20-4VKHO-BW4								

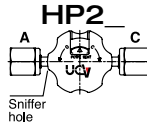
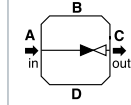
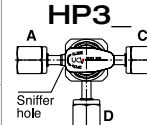
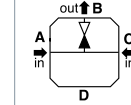
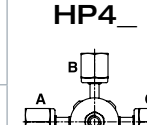
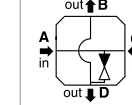
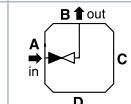
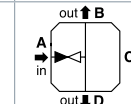
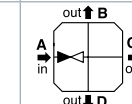
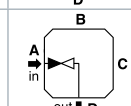
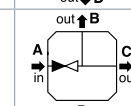
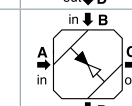
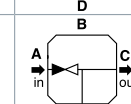
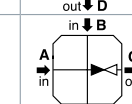
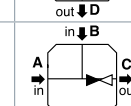

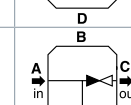

ORDERING INFORMATION HP SERIES

Valve Description Example:

HP	2	1	4	V	K	HL	BW	4	GF	4	LS
Valve Series	Port Designator*		Body Material		Actuation Device		End Size				
UCV Valves High Pressure	0, 1, 2, 3, 4, 5 *Port Designator per HM Series in the catalog		V- SS316L Var or Vim/Var ⁽¹⁾ (Bar Stock)		HL - Blue Lever Handle HC - Air Operated N.C. 3060 psi HO - Air Operated N.O. 3060 psi NC-Normally Closed, NO-Normally Open		4 - 1/4" 6 - 3/8** 8 - 1/2" 6 mm* 10 mm* 12 mm*				
										* BW, LL End connections only	
Valve Type	Body Size*		Seat Material		End Connection		Features				
2 - 2-Port Valve 3 - 3-Port Valve 4 - 4-Port Valve	4 - 1/4 *Note: Body size is 1/4" for all end sizes		K - PCTFE		BW - Butt Weld GF - Swivel Female Face-Seal** GM - Swivel Male Face-Seal** M - Male Face-Seal** LL - Let-Lok		For limit switch indicator on AOP Valve, contact your local HAM-LET representative				

** 1/4", 1/2" End connection size only

PORT DESIGNATOR - (TOP VIEW)

Valve Configuration	Port Designator	Schematic Flow Chart	Valve Configuration	Port Designator	Schematic Flow Chart	Valve Configuration	Port Designator	Schematic Flow Chart
2 Port Valve HP2 	0		3 Port Valve HP3 	0		4 Port Valve HP4 	0	
	1 L-Port			1			1	
	2 L-Port			2			2	
				3			3	
				4				
				5				

(1) Per SEMI F20-0305

UCV HM, Rev.06, January 2015



MULTI-PORT
MONOBLOCK VALVE
HMB&2BE SERIES

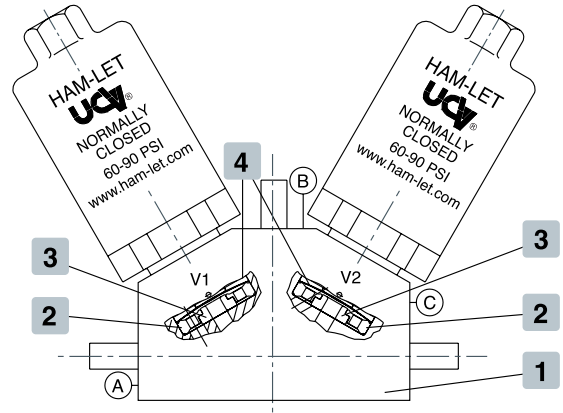


MATERIALS OF CONSTRUCTION - WETTED PARTS		
Item No.	Parts	Material
1	Body	SS316L Var or Vim/Var ⁽¹⁾
2	Seat Holder	SS316L Var or Vim/Var ⁽¹⁾
3	Seat	PCTFE, *Polyimide
4	Diaphragm	Co-Cr-Ni Alloy

* Optional

UCV - HM SPECIFICATIONS	
Structure	Direct-seal metal-diaphragm valve without seal packing manually and pneumatically operated
Item Pressure	Vacuum to 150psi (10bar)/300psi (20 bar)
Operating Temperature: Standard	14 to 140°F, -10 to 60°C (PCTFE Seat)
Operating Temperature: Available	14 to 302°F, -10 to 150°C (*Polyimide Seat)
Leakage: Inboard Leakage	≤ 3x10 ⁻⁹ atm cc He/sec
Leakage: Outboard Leakage	≤ 1x10 ⁻⁹ atm cc He/sec
Leakage: Across the Seat Leakage	≤ 1x10 ⁻⁹ atm cc He/sec
Particle	No particle detected above 0.1µm.
Connections	Face seal or tube weld
CV Value	0.3
Surface Finish Ra (Ave)- Standard	5 µin
Air Connection (Pneumatic)	1/8" NPT
Actuator Air Supply (Pneumatic)	60 to 90 psig (4 to 6 bar)

⁽¹⁾Used with Fluorocarbon FKM O-ring



PANEL MOUNTING - STANDARD

Standard, eight threaded holes (M5).

Warning!

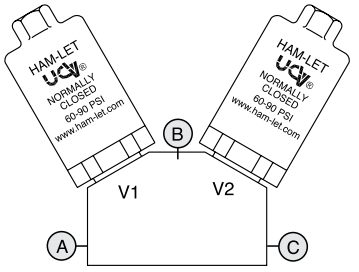
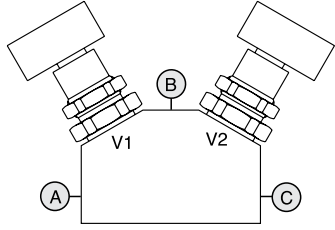
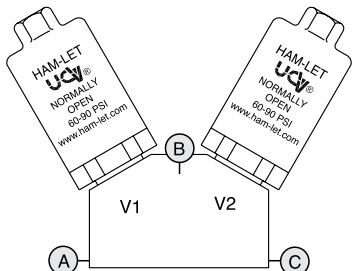
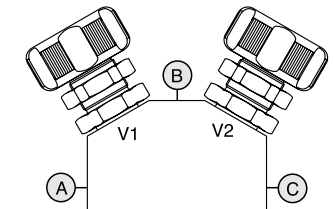
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THREE STAGES FOR ORDERING MONOBLOCK VALVES			
STAGE A FLOW PATTERN			
	Schematic Flow Path	Schematic Flow Chart	Flow Direction
HMB1			
HMB2			

V1, V2 are the inside valves
 (A) (B) (C) are valves port sides

“IN” – defined as a port connected to the region below the valve seat.
 “OUT” – defined as a port connected to the region above the valve seat.

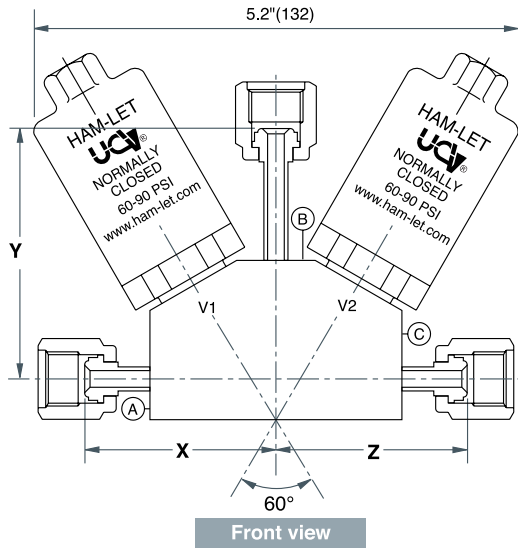
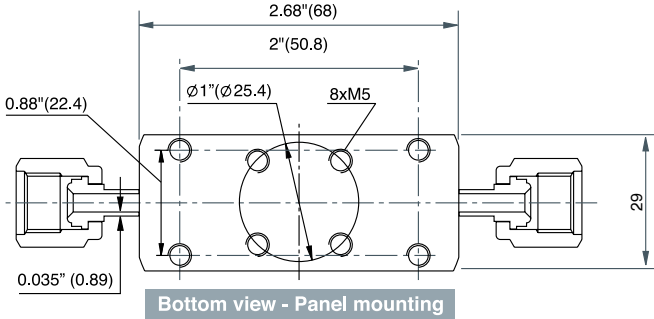
⁽¹⁾ Per SEMI F20-0305

STAGE B ACTUATION DEVICE*					
Actuation Type	Actuation Mode	Description	Actuation Type	Actuation Mode	Description
Pneumatic	C	Air Operated Normally Closed 	Manual	LQ	Ovel Handle 1/4 turn 
	O	Air Operated Normally Open 		LR	Round Handle 3/4 turn 

STAGE C END CONNECTIONS AND DIMENSIONS								
Connection Type	Size	End Connection	X		Y		Z	
			in	mm	in	mm	in	mm
Butt Weld	1/4"	BW4	1.64	41.7	1.56	39.7	1.64	41.7
Swivel Female Face-Seal	1/4"	GF4	2.03	51.6	2.66	67.6	2.03	51.6
Swivel Male Face-Seal	1/4"	GM4	2.39	60.7	3.35	85.1	2.39	60.7

Dimensions are for standard monoblock valves.
For special customer dimensions, please consult HAM-LET.

Dimensions are for reference only, and are subject to change.

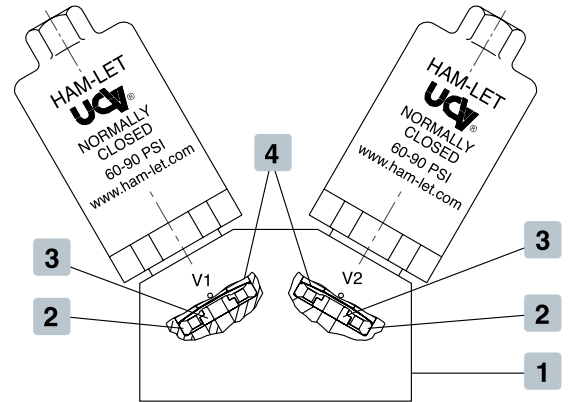


MATERIALS OF CONSTRUCTION - WETTED PARTS		
Item No.	Part	Material
1	Body	SS316L Var or Vim/Var ⁽¹⁾
2	Seat Holder	SS316L Var or Vim/Var ⁽¹⁾
3	Seat	PCTFE, *Polyimide
4	Diaphragm	Co-Cr-Ni Alloy

* Optional

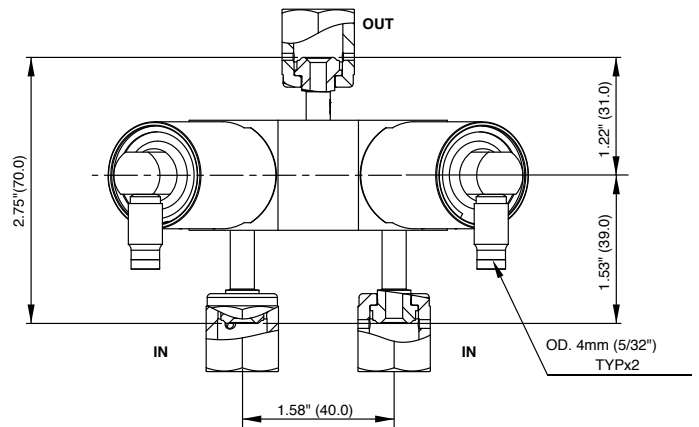
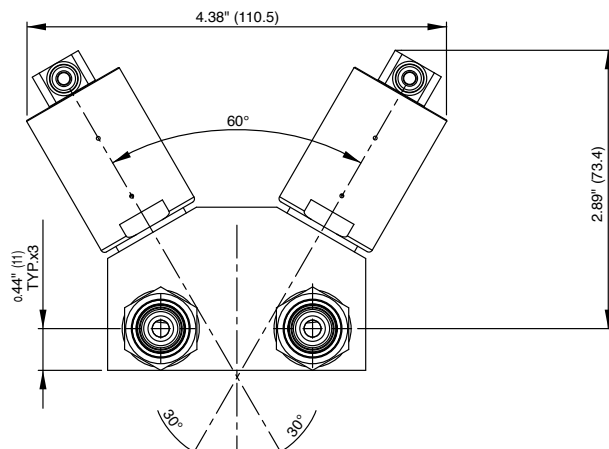
UCV - HM SPECIFICATIONS	
Structure	Direct-seal metal-diaphragm valve without seal packing manually and pneumatically operated
Item Pressure	Vacuum to 150psi (10bar)/300psi (20 bar)
Operating Temperature: Standard	14 to 140°F, -10 to 60°C (PCTFE Seat)
Available	14 to 302°F, -10 to 150°C (*Polyimide Seat)
Leakage: Inboard Leakage	$\leq 3 \times 10^{-9}$ atm cc He/sec
Outboard Leakage	$\leq 1 \times 10^{-9}$ atm cc He/sec
Across the Seat Leakage	$\leq 1 \times 10^{-9}$ atm cc He/sec
Particle	No particle detected above 0.1µm.
Connections	Face seal or tube weld
CV Value	0.3
Surface finish Ra (Ave)- Standard	5 µin
Air Connection (Pneumatic)	1/8" NPT
Actuator Air Supply (Pneumatic)	60 to 90 psig (4 to 6 bar)

*Used with Fluorocarbon FKM O-ring



PANEL MOUNTING - STANDARD

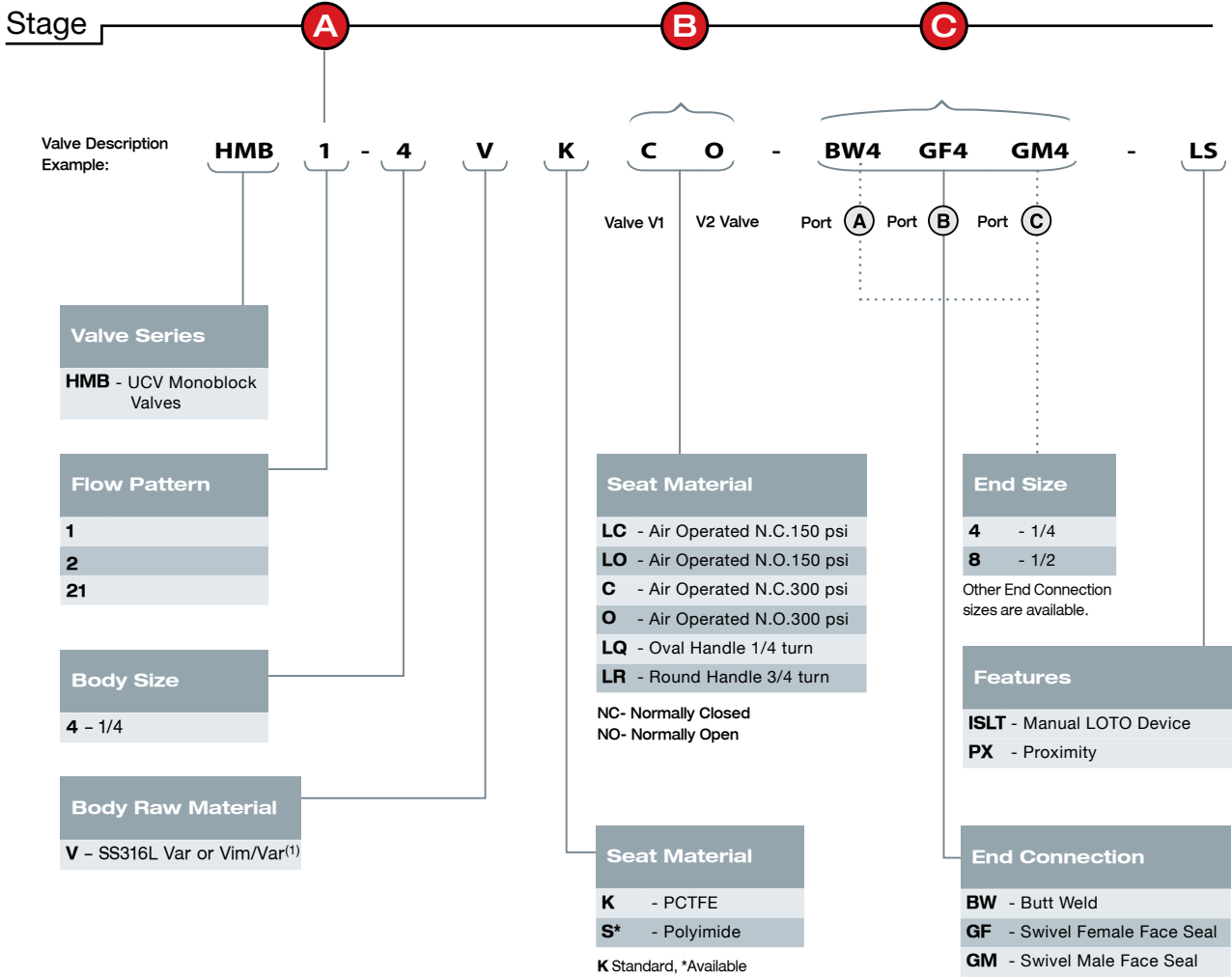
Standard, eight threaded holes (M5).



*Can also be used for reversed flow

⁽¹⁾ Per SEMI F20-0305

ORDERING INFORMATION



MATERIALS OF CONSTRUCTION - WETTED PARTS			
		HMB1 - 4VKCO - BW4GF4GM4	HMB2 - 4VSLQLQ - GF4*
Flow Pattern - Stage A	1	Flow Pattern - 1	2
Body Size	4	1/4	4
Body Material	V	SS316L Var or Vim/Var ⁽¹⁾	V
Seat Material	K	PCTFE	S
Actuation device - Stage B	C	Valve V1 - Air Operated, Normally Closed	LQ
	O	Valve V2 -Air Operated, Normally Open	LQ
End connection - Stage C	BW	Port (A) Butt Weld	GF
	GF	Port (B) Swivel Female Face Seal	GF
	GM	Port (C) Swivel Male Face Seal	GF
End Size	4	1/4	4

⁽¹⁾ Per SEMI F20-0305

* If the end connections are the same, use the end connection description only once.

DIAPHRAGM MONOBLOCK VALVE 2BE SERIES

Metal Diaphragm Valves

Standard models from the Ultra Clean Valve Series made according to UHP specifications.

These models come with a connection joint size of 1/4" as a standard.

The seat structure offers superb leak performance for enhanced reliability.



PART NUMBER / DIMENSIONS

Part Number/ep	Size	End Connection	A	B	C	D	E	F	G	H	I	J	K
2BEV4R-MV	1/4	Male HTC®	62.5	62.5	62.5	45	11	(53.5)	12	40	(53.5)	40	12
2BEF4R-MV	1/4	Male HTC®	62.5	62.5	62.5	45	11	(53.5)	12	40	(53.5)	40	12
2BEH4R-FV	1/4	Female HTC®	57.5	57.5	57.5	35	11	(53.5)	12	40	(53.5)	40	12
2BEV4C-FV	1/4	Female HTC®	57.5	57.5	57.5	35	11	(50)	12	40	(50)	40	12
2BEF4C-FV	1/4	Female HTC®	57.5	57.5	57.5	35	11	(50)	12	40	(50)	40	12
2BEH4C-MV	1/4	Male HTC®	62.5	62.5	62.5	45	11	(50)	12	40	(50)	40	12

SPECIFICATIONS

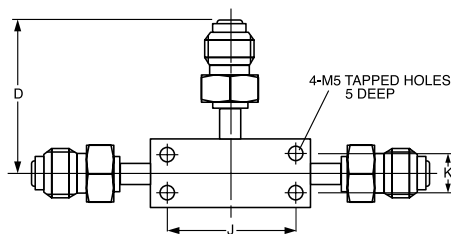
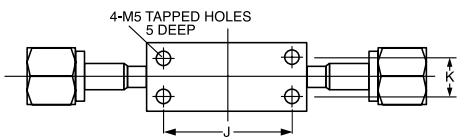
Size	Pressure	Temp.	Cv	Leak Rates	
				Inboard	Across Seat
E 1/4	1MPa	-10 60°C	0.1	3 X 10 ⁻¹²	3 X 10 ⁻¹⁰
D 3/8				Pa m ³ /sec	Pa m ³ /sec
H 1/2	16.2MPa		0.1	Helium	Helium

STRUCTURE

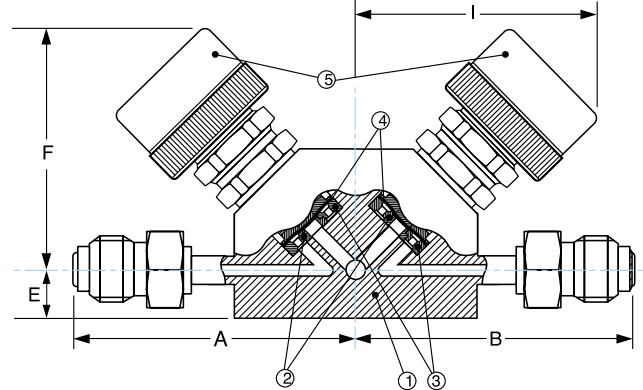
Item No.	Parts	Material
1	Body	316L Stainless Steel
2	Seat	PCTFE
3	Seat Holder	316L Stainless Steel
4	Diaphragm	Ni-Co Alloy
5	Handle/Act	Aluminum

ORDERING INFORMATION

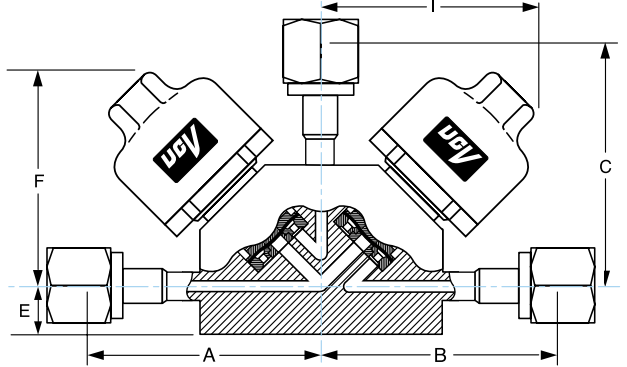
2BH	V	4	C	-	MV
Specification	Flow Pattern	Size	Operation		End Connection
E - 1MPa	V - V-Flow	4 - 1/4	R - Round Handle		MV - Male HTC®
D - 1MPa	H - H-Flow		C - Normally Closed		FV - Female HTC®
H - 16.2MPa	F - F-Flow		O - Normally Open		



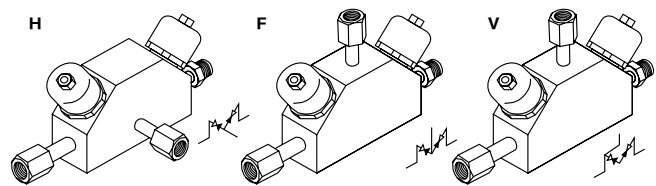
PORT DESIGNATOR- F



PORT DESIGNATOR- V



PORT DESIGNATOR



To make a safe choice when selecting your product, review the entire design of your system implementation to ensure safe, trouble-free system operations. Relevant system considerations should cover functionality, suitability of materials to specific applications and numeric data. Correct installation, handling and maintenance of valves is the responsibility of the systems designer and the user.

UCV HMB, Rev.05, January 2014



ULTRA FAST DIAPHRAGM VALVE



Patent pending
US 61/910,079

ULTRA-HIGH PURITY DIAPHRAGM
VALVES FOR ATOMIC
LAYER DEPOSITION AND FAST
SWITCHING APPLICATIONS



ULTRA CLEAN VALVES





IN-LINE METAL DIAPHRAGM PNEUMATICALLY-OPERATED ULTRA FAST VALVES

The Ultra-Fast series is designed for atomic layer deposition applications, high cycling, high temperature and ultra-high purity processes, under severe repeatability demands. With its unique (patent pending No. US61/910,079) flow adjustment mechanism, this series allows flow fine-tuning during operation. Optional extended bonnet and cooling fin provide superb solution for high temperature applications.



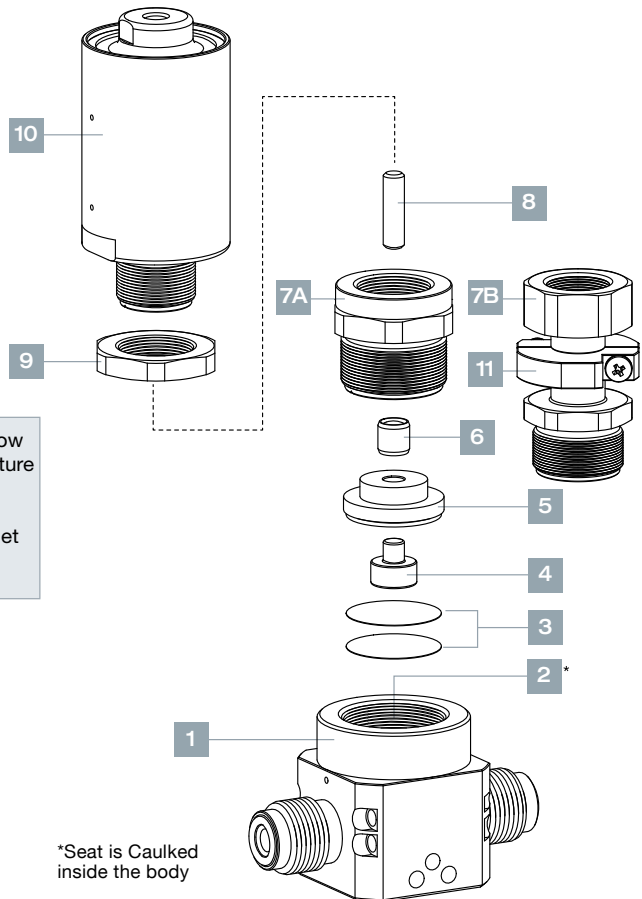
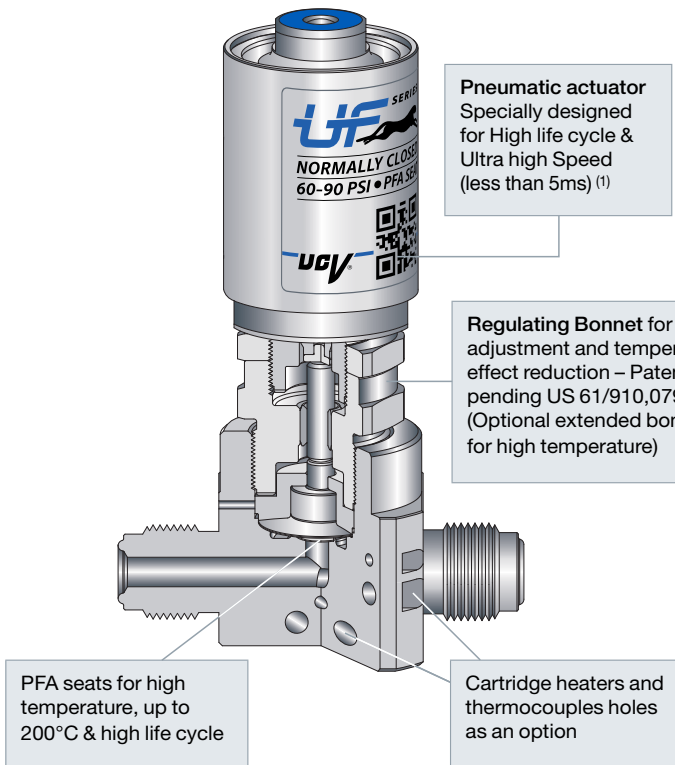
IN-LINE VALVE SPECIFICATIONS	
Structure	Direct-seal metal-diaphragm valve without seal packing Pneumatically operated
Pressure	Vacuum to 150 psi (10 bar)
Temperature: Standard bonnet	14 to 248°F (-10 to 120°C)
Extended bonnet	14 to 392°F (-10 to 200°C)
Leakage: Inboard Leakage	≤ 3x10 ⁻¹¹ atm cc He/sec
Across the seat	≤ 1x10 ⁻⁹ atm cc He/sec (1)
Particle	No particle detected above 0.1µm.
Operated	High speed Pneumatic, NC*
CV value (1/4" / 1/2")	0.25 / 0.6, Adjustable
Port configurations	2-port straight, 2-port L, 3-port, 4-port
Surface Finish Ra (Ave)-Standard	5µin, Electropolished surface
Air Supply	60-90 psig (4 - 6 bar)
Valve Response Time	Less than 5ms (1)
Air Connection	M5

MATERIALS		
Item No.	Part No.	Material
1*	Body	Stainless steel, 316L VAR or VIM/VAR**
2*	Seat (Caulked)	PFA
3*	Diaphragm	Co-Cr-Ni Alloy
4	Act. Button	Stainless steel, 316L
5	Act. Button Holder	Stainless steel, ASTM 630 H900
6	Bushing	Carbon steel + PTFE
7A	Regulating Bonnet	Stainless steel, 316L
7B	Extended Regulating Bonnet	Stainless steel, 316L
8	Connection Rod	Stainless steel, 304
9	Locking Nut	Stainless steel, 304
10	Actuator Assembly	Stainless steel, 316L
11	Cooling Fin	Aluminium 6061

*Wetted parts ** Per SEMI F20

ULTRA CLEAN VALVES

(1) For 1/4" body size, for valve only
*NC-Normally Closed





SURFACE-MOUNT, METAL DIAPHRAGM PNEUMATICALLY-OPERATED ULTRA FAST VALVES

The surface mount design complies with SEMI PR 3.1 for 1.125", 1.5" C-seal. This series is manufactured according to UHP specifications of SEMI F-20 with pneumatic operating mechanisms.



SURFACE-MOUNT VALVE SPECIFICATIONS

Structure	Direct-seal metal-diaphragm valve without seal packing Pneumatically operated
Pressure	Vacuum to 150 psi (10 bar)
Temperature: Standard bonnet	14 to 248°F (-10 to 120°C)
Extended bonnet	14 to 392°F (-10 to 200°C)
Leakage: Inboard Leakage	$\leq 3 \times 10^{-11}$ atm cc He/sec
Across the seat	$\leq 1 \times 10^{-9}$ atm cc He/sec (1)
Particle	No particle detected above 0.1µm.
Operated	High speed Pneumatic, NC*
CV value (1/4" / 1/2")	0.25 / 0.6, Adjustable
Port configurations	2-port, 3-port
Surface Finish Ra (Ave)-Standard	5µin, Electropolished surface
Air Supply	60-90 psig (4 - 6 bar)
Valve Response Time	Less than 5ms (1)
Air Connection	M5

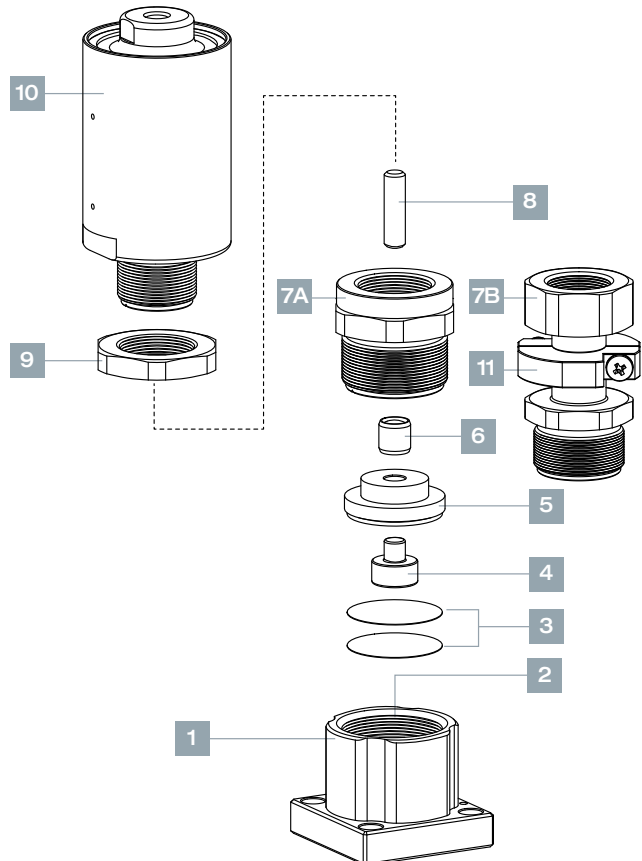
(1) For 1/4" body size, for valve only

*NC-Normally Closed

MATERIALS

Item No.	Part No.	Material
1*	Body	Stainless steel, 316L VAR or VIM/VAR**
2*	Seat (Caulked)	PFA
3*	Diaphragm	Co-Cr-Ni Alloy
4	Act. Button	Stainless steel, 316L
5	Act. Button Holder	Stainless steel, ASTM 630 H900
6	Bushing	Carbon steel + PTFE
7A	Regulating Bonnet	Stainless steel, 316L
7B	Extended Regulating Bonnet	Stainless steel, 316L
8	Connection Rod	Stainless steel, 304
9	Locking Nut	Stainless steel, 304
10	Actuator Assembly	Stainless steel, 316L
11	Cooling Fin	Aluminium 6061

*Wetted parts ** Per SEMI F20



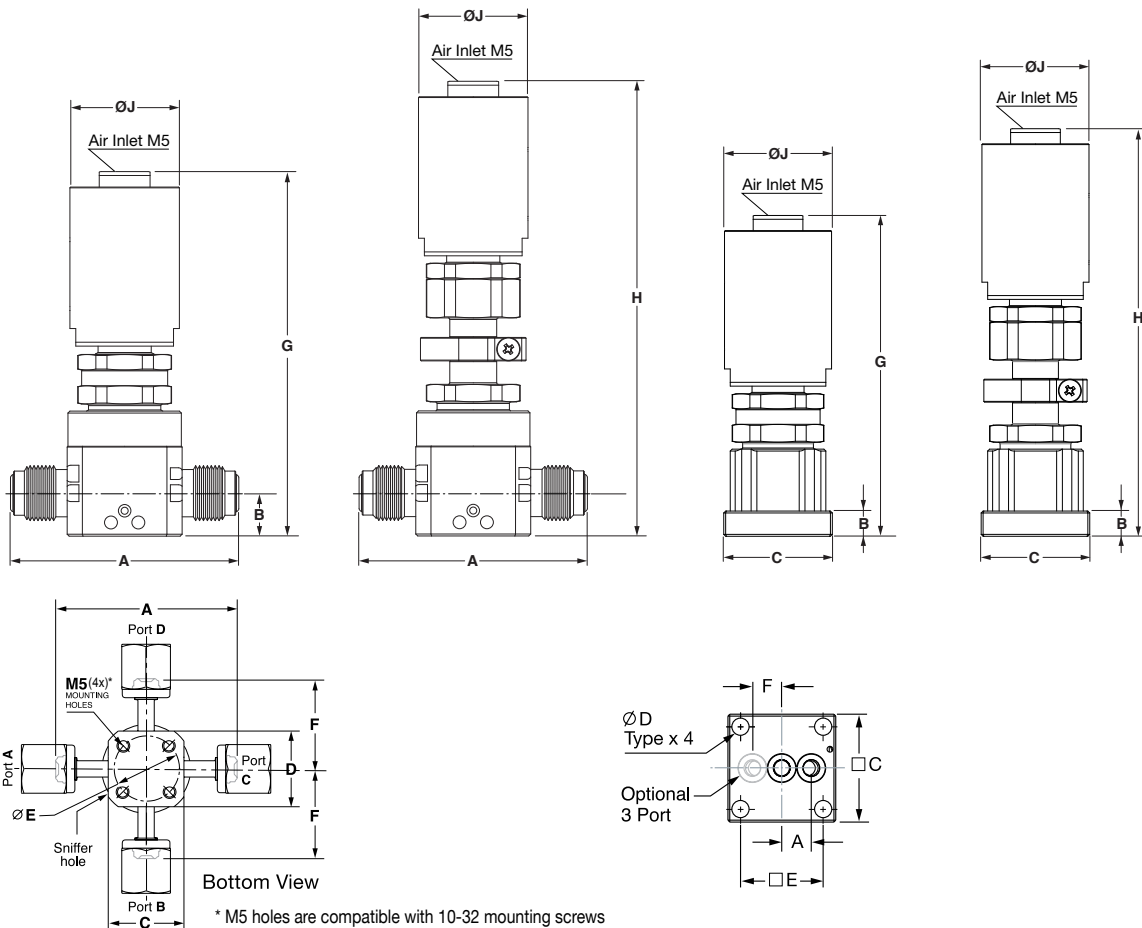
ULTRA CLEAN VALVES

STANDARD CONFIGURATION DIMENSIONS

VALVE DIMENSIONS - INCH (MM)

Body Size	SERIES	End Connection	A		B		C		D		E		F		G		H		J		
			in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	
1/4"	UF	Male face seal	2.30	58.4									1.15	29.2							
		Swivel male face seal	2.78	70.6	0.43	11.0	1.16	29.4	1.16	29.4	1.00	25.4	1.39	35.3	3.69	93.8	4.62	117.3	1.10	28.0	
		Swivel female face seal	2.78	70.6									1.39	35.3							
		Butt weld	1.75	44.4									0.88	22.2							
	UFS	Surface mount	0.30	7.7	0.26	6.6	1.12	28.4	0.17	4.4	0.85	21.7	0.30	7.7	3.33	84.6	4.26	108.1	1.10	28.0	
1/2"	UF	Male face seal	2.99	76.0									1.50	38.0							
		Swivel male face seal	4.17	106.0	0.69	17.5	1.46	37.0	1.46	37.0	1.10	28.0	1.97	50.0	5.07	128.8	5.86	148.8	1.34	34.0	
		Swivel female face seal	4.17	106.0									1.97	50.0							
		Butt weld	2.16	55.0									1.08	27.5							
	UFS	Surface mount	0.46	11.6	0.31	8.0	1.50	38.1	0.20	5.2	1.19	30.2	0.46	11.6	4.6	116.8	5.38	136.8	1.34	34.0	

Dimensions are for reference only, and are subject to change.



ORDERING INFORMATION

Valve Description Example:

OPTIONAL

UF 2 1 - 4 V F LC - BW 4 GF 4

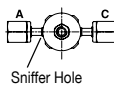
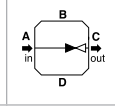
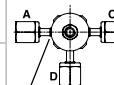
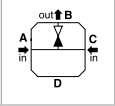
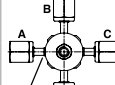
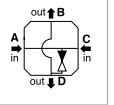
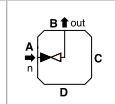
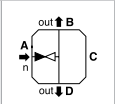
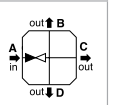
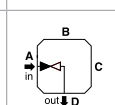
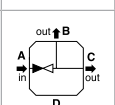
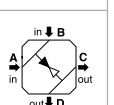
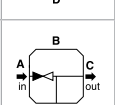
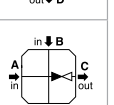
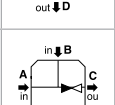
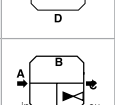
Port (A) Port (B)

Valve Series		Port Designator		Body Material		Actuation Device		End Size		High temp. Options		Heating Option ⁽³⁾	
UF	Inline	0,1,2,3,4,5		V	SS316L VAR or VIM/VAR ⁽¹⁾	LC	Air Operated N.C.	4	1/4"	X	Extender	H	Cartridge Holes for Thermocouple and Heater
UFS	Surface mount							6*	3/8"	F	Extender with fin	H1	Cartridge Holes with Thermocouple
								8	1/2"	Control options		H2	Cartridge Holes with Heater
										D	Solenoid valve, DC	H3	Cartridge Holes with Thermocouple and Heater
										LS	Limit switch		

Valve Type	Body Designator	Seat Material	End Connection ⁽²⁾
2 2-Port Valve	4 1/4" Body	F PFA	BW Butt Weld
3 3-Port Valve	8 1/2" Body		GF Swivel female Face-seal
4 4-Port Valve ⁽²⁾			GM Swivel male Face-seal
			M Male Face-seal

* For BW Only

(1) Per SEMI F20-0305 | (2) For inline valves only | (3) 1/8 in. through holes For UF20 valves only

PORT DESIGNATOR - (TOP VIEW)								
Valve Configuration	Port Designator	Schematic Flow Chart	Valve Configuration	Port Designator	Schematic Flow Chart	Valve Configuration	Port Designator	Schematic Flow Chart
2 Port Valve UF2_ 	0		3 Port Valve UF3_ 	0		4 Port Valve UF4_ 	0	
	1 L-Port			1			1	
	2 L-Port			2			2	
				3			3	
				4				
				5				

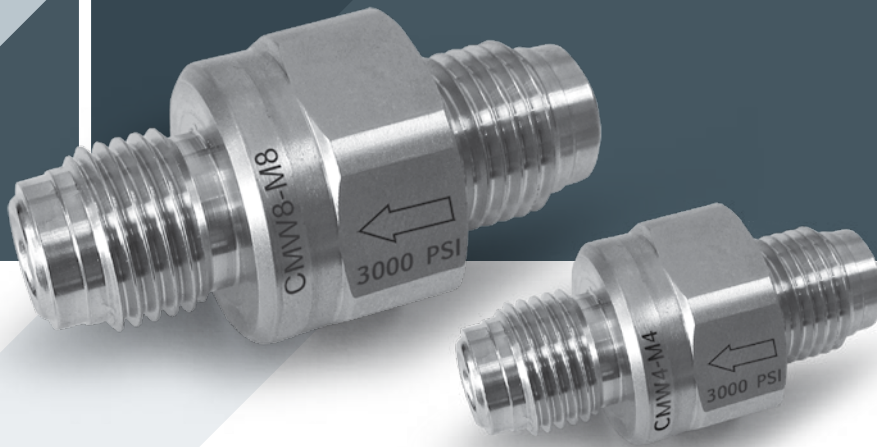
Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

UCV UF, Rev.01, January 2015



COMPACT WELDED
CHECK VALVES
CMW



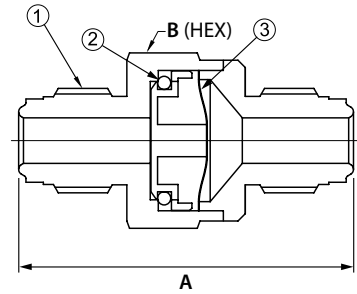
ULTRA CLEAN VALVES



CMW SERIES

COMPACT WELDED CHECK VALVES

- All-welded design ensures reliable system fluid containment
- Maximum allowable working pressure: 3000psi (206bar)
- Maximum allowable back pressure: 3000psi (206bar)
- Cracking pressure less than 2 psig (0.14 bar)
- Back pressure for valve resealing is less than 4 psig (0.28 bar)
- Surface finish options:
Electro polish Ra(avg.) =5 µinch or machanical finish Ra(avg.) =10 µinch



STANDARD CONFIGURATION DIMENSIONS						
Part Number	End Size	End Connection	A		B	
			inch	mm	inch	mm
CMW4 - M4	1/4"	Male Face Seal	1.80	45.8	0.87	22
CMW8 - M8	1/2"	Male Face Seal	2.06	52.3	1.06	27
CMW4 - BW4	1/4"	Buttweld	1.24	31.5	0.87	22
CMW8 - BW8	1/2"	Buttweld	1.24	31.5	1.06	27
CMW4 - GF4	1/4"	Swivel Female Face Seal	2.43	61.7	0.95	24.2
CMW4 - M4GF4	1/4"	Male Face Seal to Swivel Female Face Seal	2.11	53.7	0.87	22

SPECIFICATIONS				
Size	Pressure	Temp.	Cv	Leak Rates Inboard
1/4"	20.6MPa (3000 psi)	-10 to 80°C	0.55	1X ⁹ -10 atm•cc/sec Helium
1/2"			0.7	

Flow Data at 20°C		
Pressure Drop (bar)	Air Flow (std L/min)	
	CMW4	CMW8
0.68 (9.86 psi)	168	218
3.4 (49.30 psi)	447	580
6.8 (98.6 psi)	818	1026

STRUCTURE		
	Parts	Material
1	Body	316L Stainless Steel
2	O-Ring	Fluorocarbon FKM (FPM)
3	Spring	Alloy C-22

ORDERING INFORMATION

CMW	4	-	M	4	-	P	-	OPTIONAL
Series	Body Size		End Connection	End Size		Surface Finish		O-ring Material
CMW	4 - 1/4" 8 - 1/2"		M - Male Face Seal BW - Buttweld GF - Swivel Female Face Seal	4 - 1/4" 8 - 1/2"		BLANK - Mechanical Polish P - Electro Polish		BLANK - Fluorocarbon FKM are standard NE - Polychloroprene (CR) KZ - Perfluorelastomer EP - EPDM

Warning!
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

CMW, Rev.04, January 2015



HAM-LET HOSES



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HAM-LET METAL HOSES	450
SELECTING & INSTALLING METAL HOSE ASSEMBLIES	457
METAL HOSES - ORDERING INFORMATION	462
HAM-LET PTFE HOSES - GENERAL	464
PTFE HOSES - ORDERING INFORMATION	469

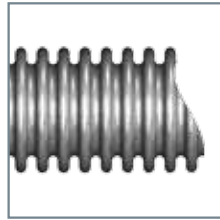
Metal Hoses



SHF Series
General use series
Page 452



SHU Series
Ultra high pressure series
Page 453



SHV Series
Vacuum/Formable series
Page 454

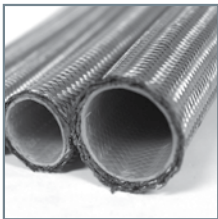


SHE Series
Extra flexible series
Page 455



SHH Series
High pressure series
Page 456

PTFE Hoses



THT Series
Smooth core
Page 466



THS Series
Silicon covered Smooth core
Page 467



THC Series
Convuluted core
Page 468

Expansion Joints



Expansion Joints
All Stainless Steel
Page 470

Hoses End Connections



LET-LOK®



Tube Adapter



ONE-LOK®



UH Line



Male NPT



Male BSPP



Female NPT



Female BSPP



Butt Weld



Male Face Seal Swivel



Female Face Seal Swivel



Male/Female JIC 37° Flare

HAM-LET Hoses Quick Selection Guide

See Ordering information on page 462

Hose Series	Number of Braids	Inside Diameter inch (mm)															
		1/4 (6.35)		3/8 (9.53)		1/2 (12.70)		3/4 (19.05)		1 (25.40)		1 1/4 (31.75)		1 1/2 (38.10)		2 (50.80)	
		Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)	Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)	Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)	Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)	Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)	Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)	Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)	Working Pressure psi (bar)	Dynamic Bend Radius inch (mm)
SHF General Use Standard Product T321, T316L (See page 458)	0	90 (6)		70 (5)		70 (5)		43 (3)		43 (3)		43 (3)		28 (2)		14 (1)	
	1	1800 (124)	4.5 (114)	1558 (107)	5.0 (127)	1186 (82)	5.5 (140)	898 (62)	8.0 (203)	718 (50)	9.0 (229)	645 (44)	10.0 (254)	531 (37)	11.0 (279)	449 (31)	13.0 (330)
	2	2700 (186)		2336 (161)		1779 (123)		1347 (93)		1077 (74)		968 (67)		797 (55)		674 (46)	
SHU Ultra High Pressure T321 & T316L (See page 459)	0	500 (34)						250 (17)	4.5 (114)	180 (12)	7.0 (178)	190 (13)	9.5 (241)	110 (8)	11.5 (292)	100 (7)	12.0 (305)
	1	5000 (345)	4.5 (114)	-	-	-	-	2650 (182)	10.0 (254)	2500 (172)	11.0 (279)	1775 (122)	12.5 (318)	1450 (100)	13.0 (330)	1100 (76)	14.0 (356)
	2	6000 (414)						3600 (248)	10.0 (254)	3000 (207)	11.0 (279)	2600 (179)	12.5 (318)	2200 (152)	13.0 (330)	1675 (115)	14.0 (356)
	3	-						-	-	-	-	3000 (207)	14.0 (356)	-	-	-	-
SHV Vacuum / Formable Stay-Put Application T321, T316L (See page 460)	0	90 (6)		70 (5)		70 (5)											
	1	900 (62)		800 (55)		665 (46)											
SHE Extra Flexible Most Flexible T321, T316L, T304L (See page 461)	0	90 (6)		70 (5)		70 (5)		43 (3)		43 (3)		43 (3)		28 (2)		14 (1)	
	1	1800 (124)	3.7 (94)	1558 (107)	4.0 (102)	1186 (82)	4.4 (112)	898 (62)	6.4 (163)	718 (50)	7.1 (180)	645 (44)	7.9 (201)	531 (37)	8.7 (221)	449 (31)	10.3 (262)
	2	2700 (186)		2336 (161)		1779 (123)		1347 (93)		1077 (74)		968 (67)		797 (55)		674 (46)	
SHH High Pressure Helical High-Pressure T316L (See page 462)	1	4600 (317)		3800 (262)		2600 (179)		-		-		-		-		-	
	2	5800 (400)	5.0 (127)	4000 (276)	5.5 (140)	3700 (255)	5.7 (145)	-		-		-		-		-	
THT Smooth Core PTFE Metal Braided Hose (See page 472)	1	3200 (221)	1.5 (38)	2500 (172)	2.0 (51)	2000 (138)	3.0 (76)	1000 (69)	8.2 (208)	1000 (69)	12.0 (305)	-	-	-	-	-	-
THS Silicon Covered Smooth Core PTFE Metal Braided Hose (See page 473)	1	3250 (224)	1.5 (38)	2500 (172)	2.0 (51)	2000 (138)	3.0 (76)	1000 (69)	8.2 (208)	1000 (69)	12.0 (305)	-	-	-	-	-	-
THC Convolute Core PTFE Metal Braided Hose (See page 474)	1	-	-	-	-	1500 (103)	2.5 (64)	1100 (76)	3.0 (76)	1000 (69)	5.5 (140)	-	-	700 (48)	6.0 (152)	525 (36)	7.5 (191)

HAM-LET Hoses End Connections Selection

End Connection Type	End Connection Size	Metal Hoses - Series SHF / SHU / SHV / SHE / SHH I.D. inch (mm)								PTFE Hoses - Series THT / THS / THC I.D. inch (mm)							
		1/4 (6.35)	3/8 (9.53)	1/2 (12.70)	3/4 (19.05)	1 (25.40)	1 1/4 (31.75)	1 1/2 (38.10)	2 (50.80)	1/4 (6.35)	3/8 (9.53)	1/2 (12.70)	3/4 (19.05)	1 (25.40)	1 1/2 (38.10)	2 (50.80)	
LET-LOK®	1/4"	○								○							
	3/8"	○	○								○						
	1/2"			○							○						
	3/4"				○							○					
	1"					○							○				
	1 1/4"						○										
	1 1/2"							○							○		
	2"															○	
	6mm	○									○						
	8mm	○															
	10mm		○									○					
	12mm			○									○				
	18mm				○									○			
	25mm					○									○		
38mm								○							○		
Tube Adapter (1 1/4-2 are preswaged)	1/4"	○															
	3/8"		○														
	1/2"			○													
	3/4"				○							○	○				
	1"					○						○	○				
	1 1/4"						○										
	1 1/2"							○							○		
	6mm	○															
	8mm	○															
	10mm		○														
	12mm			○													
	18mm				○												
	25mm					○											
	38mm								○							○	
ONE-LOK®	1/4"	○															
	3/8"	○	○														
	1/2"			○													
	6mm	○															
	8mm	○															
	10mm		○														
	12mm			○													
UH Line (for vacuum only)	1/4"	○															
	3/8"	○	○														
	1/2"			○													
	3/4"				○												
	1"					○											
Male NPT	1/4"	○	○														
	3/8"		○	○													
	1/2"	○	○	○													
	3/4"				○								○	○			
	1"					○								○			
	1 1/4"						○										
	1 1/2"							○							○		
	2"															○	

HAM-LET Hoses End Connections Selection

End Connection Type	End Connection Size	Metal Hoses - Series SHF / SHU / SHV / SHE / SHH I.D. inch (mm)							PTFE Hoses - Series THT / THS / THC I.D. inch (mm)							
		1/4 (6.35)	3/8 (9.53)	1/2 (12.70)	3/4 (19.05)	1 (25.40)	1 1/4 (31.75)	1 1/2 (38.10)	2 (50.80)	1/4 (6.35)	3/8 (9.53)	1/2 (12.70)	3/4 (19.05)	1 (25.40)	1 1/2 (38.10)	2 (50.80)
Male BSPP	1/4"	○							○							
	3/8"		○							○						
	1/2"			○							○					
	3/4"				○							○				
	1"					○							○			
	1 1/4"						○									
Female NPT	1/4"	○							○							
	3/8"		○							○						
	1/2"			○							○					
	3/4"				○							○				
	1"					○							○			
	1 1/2"							○						○		
Female BSPP	1/4"	○							○							
	3/8"		○							○						
	1/2"			○							○					
	3/4"				○							○				
	1"					○							○			
	1 1/2"							○						○		
Butt Weld adapter	1/4"	○							○							
	3/8"		○							○						
	1/2"			○							○					
	3/4"				○							○				
	1"					○							○			
	1 1/4"							○								
Male Face Seal Swivel	1/4"	○							○							
	1/2"			○												
	3/4"				○											
	1"					○										
Female Face Seal Swivel	1/4"	○							○							
	3/8"		○							○						
	1/2"			○							○					
	3/4"				○							○				
Male JIC 37° Flare	1/4"	○							○							
	3/8"		○							○						
	1/2"			○							○					
	3/4"				○							○				
	1"					○							○			
	1 1/4"							○								
Female JIC 37° Flare	1/4"	○							○							
	3/8"		○							○						
	1/2"			○							○					
	3/4"				○							○				

HAM-LET Metal Hoses

General

The HAM-LET Metal Hoses are top quality all Stainless Steel factory welded assemblies that are manufactured and tested to meet industry demands and regulation for chemical, process, Oil & Gas, Power generation, Pumps & Vacuum, instrumentation, gases and semiconductors manufacturing and machinery.

The HAM-LET Metal Hose assemblies are constructed from only the best materials and components and by the most advanced corrugating and welding technologies for leak free durable performances.

HAM-LET Metal Hoses are the best solution for flexible connection of Gas & Liquid lines where vibrating, moving parts and installations involve high temperatures, chemicals and aggressive media, high pressures and full vacuum.

Features

- All stainless steel assembly
- LET-LOK®, ONE-LOK®, Face seal, UH Line end fittings among others
- ID sizes: 1/4" up to 2"
- Pressure rating: Vacuum to 6,000 psi (414 bar), 4 to 1 safety factor
- Working temperatures -425°F (-254°C) up to 1300°F (705°C)
- Hydroformed or spirally-welded corrugated inner hose
- Machine braided (braid is woven directly on inner hose)
- Maximum Working Pressure marked on metal tag as standard.
- Manufactured in accordance to
 - NAHAD - Corrugated Metal Hose Assembly specification guidelines
 - DIN ISO 10380:2013 (ISO 10380:2012 for designated items)- Pipework - Corrugated metal hoses and hose assemblies.

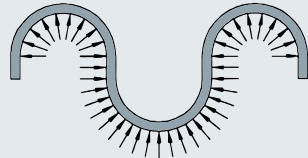
Metal Hoses Manufacturing Process

Corrugated Tube

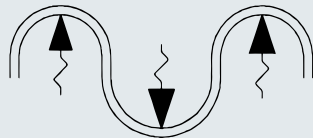
A high quality stainless steel thin walled tube is specifically manufactured. As a second stage, corrugations are formed into the tube to make it flexible. Corrugations are formed into the tube hydraulically using a unique process called "Hydroforming" (rather than the commonly used mechanical method).

The hydroforming process evenly distributes stresses on the tube wall. This unique method maintains wall thickness, reduces concentrated residual stress, and minimizes work hardening, resulting in enhanced flexibility and prolonged life cycle.

Hydroformed
Evenly distributed stresses



Mechanically Formed
Concentrated stresses



Hydroforming is a clean process, using water to form the hose, while most other processes require lubrication.

There are two corrugation profiles:



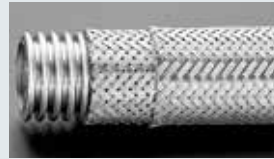
Annular Profile
Independent corrugations, straight and parallel



Helical Profile
One continuous corrugation that spirals around the hose

Braid

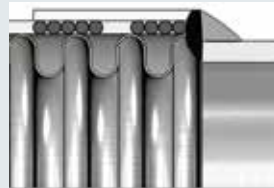
As a third (optional) stage, stainless steel wire is braided over the hose, enabling the corrugated hose the ability to withstand higher pressures. Hoses may be single braided (one layer of braid) or double braided (two layers of braid) to achieve even greater working pressures.



Braiding Superiority - A High Percentage of Braid Coverage- it has the highest percentage of braid coverage, yielding better life cycle and protection against damage to the hose.

Machine Braided - The braid is woven directly onto the hose, ensuring that the braid fits tightly against the hose, preventing potential hose deformation or squirm. Machine Braided Hose also offers repeatable performance and longer life cycle.

Assembly



Combining top quality hoses with top quality fittings together with specialized welding, brazing, joining, fabrication procedures, and severe testing assures compatibility, integrity and serviceability of metal hose

assemblies in even the most extreme applications and demanding industries.

Standard assembly process consists of:

- Cutting the hose and braid through a hose corrugation valley.
 - Installing a braid collar over each end of the hose.
 - Trimming of any excess braid.
 - "Cap" welding the hose, braid, and braid collar together.
 - Cleaning the cap weld surface.
 - Placement and alignment of a fitting on the cap weld.
 - "Attachment" welding the fitting to the cap weld.
- The assembled hose is tested, cleaned, marked and packed as required.

Metal Hose Selecting Considerations:

When selecting a Flexible Metal Hose, consider the following 5 variables:

1. Temperature

As the media or ambient temperature increases, the hose working pressure decreases. With your selected hose construction materials, go to "Working Pressure De-Rating Factor" table and match the alloy of the hose and braid with the highest temperature to which they will be exposed (either internally or externally) to obtain the proper de-rating factors. Then multiply the hose maximum working pressure by the most limiting temperature de-rating factor, Maximum Working Pressures marked on metal tag as standard.

2. Dynamic Pressure

Pulsating, surge or shock pressures, like those encountered by quick opening or closing valves, can inflict severe damage on a hose. If your application entails pulsating pressures, the working pressure should be de-rated by 1/2. If your application entails shock pressures, de-rate the stated working pressure to 1/6 of its value.

Example : 1/4" hose - T316L stainless steel hose and T304 stainless steel braid at 500°F with the shock pressures:
 Catalog Maximum Working Pressure = 1800 psi
 Temperature De-rating Factor at 500°F = 0.86
 Pressure De-rating Factor = 1/6 Maximum Application Working
 Actual allowable working pressure = 1800 PSI x 0.86 x 1/6 = 258 psi

3. Flexibility

Verify that the minimum bend radius of the hose is less than the bend radius required.
 Larger installation radius reduces fatigue on the hose for a longer assembly life.

4. Chemical Compatibility

The material that you choose for the hose and braid must be compatible with the media that will flow through the hose, as well as the environment in which the hose is installed. When determining chemical compatibility, be sure that you know the temperature and concentration of the chemical or chemicals. Although there are many resources to confirm chemical compatibility, two of the industry standards that you may find useful are the National Association of Corrosion Engineers (NACE) and the Compass Corrosion Guides.

5. Accessories

Optional accessories available include spring guards, protective covers, insulating covers and protective armor.

Cleaning & Packing

The hydroforming hose manufacturing process yields a very clean product.

Clean and Degrease to CGA G-4.1 "Oxygen Clean" is available.

Ultrasonic Cleaning for Pharmaceutical application is available. Each hose is packed in a plastic bag, end connections are capped.

Testing

All HAM-LET hose assemblies are 100% Helium leak tested up to 1x10⁻⁶ Std. CC/Sec.

Helium leak testing up to 1x10⁻⁹ Std. CC/Sec is available.

Other test such as Hydrostatic testing, Nitrogen/Helium bubble test are available.

*Helium leak test is available to hoses up to 100' (30m)

Working pressure de-rating factor:

Temp. in		304	304L	316	316L	321	C276
Degrees F	Degrees C						
70	20	1.00	1.00	1.00	1.00	1.00	1.00
100	40	1.00	1.00	1.00	1.00	1.00	1.00
200	95	1.00	1.00	1.00	1.00	1.00	1.00
300	150	1.00	1.00	1.00	1.00	1.00	1.00
400	205	0.94	0.93	0.97	0.93	1.00	1.00
500	260	0.88	0.86	0.90	0.86	0.96	0.99
600	315	0.82	0.81	0.85	0.81	0.91	0.93
650	345	0.81	0.79	0.84	0.79	0.89	0.90
700	370	0.80	0.77	0.82	0.77	0.87	0.88
750	400	0.78	0.75	0.81	0.75	0.86	0.86
800	430	0.76	0.74	0.80	0.74	0.84	0.84
850	455	0.75	0.72	0.79	0.72	0.84	0.83
900	480	0.73	0.71	0.78	0.71	0.83	0.82
950	510	0.72	0.69	0.77	0.69	0.81	0.81
1000	540	0.69	0.67	0.77	0.67	0.81	0.80
1050	565	0.61	0.65	0.73	0.65	0.70	0.68
1100	595	0.49	0.62	0.62	0.61	0.55	0.55
1150	620	0.39	0.53	0.49	0.52	0.41	0.47
1200	650	0.30	0.38	0.37	0.38	0.32	0.36
1250	675	0.24	0.28	0.28	0.28	0.25	0.29
1300	705		0.21	0.21	0.21		

General

The SHF - General Use Hose series is the basic hose for industrial applications of gas & liquid lines with high temperatures, corrosive media and harsh environments.

Features

- Braided, double braided or unbraided corrugated tube assembly
- Core tube is made of 316L stainless steel, 321 stainless steel core tube is available.
- Braid is made of 304 stainless steel, 316 stainless steel braid is available.
- Annular Hydroformed corrugation
- Tube ID from ¼" to 2"
- Max. pressure 2700psi (186bar)
- Min. static bend radius for braided hose 1.0inch (25mm)
- Min. dynamic bend radius for braided hose 4.5inch (114mm)
- Full range of end connections

SHF Series - General Use

Inside Diameter		Number of Braids	Outside Diameter		Static Minimum Bend Radius		Dynamic Minimum Bend Radius		Maximum Working Pressure		Burst Pressure		Weight Per Foot (lbs)	Weight Per Meter (kg)
(inch)	(mm)		(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)	(psi)	(bar)		
1/4	6.35	0	0.41	10.4	1.0	25	4.5	114	90	6	n/a	n/a	0.04	0.06
		1	0.47	11.9					1800	124	7233	499	0.11	0.16
		2	0.53	13.5					2700	186	9100	627	0.18	0.27
3/8	9.53	0	0.65	16.5	1.2	30	5.0	127	70	5	n/a	n/a	0.10	0.15
		1	0.71	18.0					1558	107	6230	430	0.20	0.30
		2	0.77	19.6					2336	161	9345	644	0.30	0.45
1/2	12.70	0	0.77	19.6	1.5	38	5.5	140	70	5	n/a	n/a	0.11	0.16
		1	0.83	21.1					1186	82	4743	327	0.22	0.33
		2	0.89	22.6					1779	123	7115	491	0.33	0.49
5/8	15.88	0	0.96	24.4	1.8	46	7.0	178	57	4	n/a	n/a	0.17	0.25
		1	1.02	25.9					1205	83	4820	332	0.33	0.49
		2	1.08	27.4					1808	125	7230	498	0.49	0.73
3/4	19.05	0	1.16	29.5	2.1	53	8.0	203	43	3	n/a	n/a	0.19	0.28
		1	1.22	31.0					898	62	3591	248	0.37	0.55
		2	1.28	32.5					1347	93	5387	371	0.55	0.82
1	25.40	0	1.47	37.3	2.7	69	9.0	229	43	3	n/a	n/a	0.26	0.39
		1	1.53	38.9					718	50	2872	198	0.50	0.74
		2	1.59	40.4					1077	74	4308	297	0.74	1.10
1 1/4	31.75	0	1.75	44.5	3.1	79	10.0	254	43	3	n/a	n/a	0.29	0.43
		1	1.83	46.5					645	44	2581	178	0.61	0.91
		2	1.91	48.5					968	67	3872	267	0.93	1.38
1 1/2	38.10	0	2.08	52.8	3.9	99	11.0	279	28	2	n/a	n/a	0.47	0.70
		1	2.16	54.9					531	37	2125	147	0.85	1.26
		2	2.24	56.9					797	55	3188	220	1.23	1.83
2	50.80	0	2.61	66.3	5.1	130	13.0	330	14	1	n/a	n/a	0.59	0.88
		1	2.69	68.3					449	31	1797	124	1.11	1.65
		2	2.77	70.4					674	46	2696	186	1.63	2.43



Materials of Construction

Part	Material
Tube	SS 316L / SS 321
Braid	SS 304 / SS 316
End Connections	SS 316L

General

The SHU - Ultra high pressure hose series is hydroformed annular, heavy-wall corrugated metal hose, specifically designed for ULTRA-high-pressure applications.

The SHU hoses offer superior flexibility and are made from heavy-wall 321 stainless steel.

Features

- Braided, double braided or unbraided corrugated tube assembly
- Core tube is made of 321 stainless steel, 316L stainless steel core tube is available.
- Braid is made of 304 stainless steel, 316 stainless steel braid is available.
- Annular Hydroformed corrugation
- Tube ID 1/4", 3/4" up to 2"
- Max. pressure 6000psi (414bar), 4 to 1 safety rate factor
- Min. static bend radius for braided hose 0.9 inch (23mm)
- Min. dynamic bend radius for braided hose 4.5inch (114mm)
- Full range of end connections

SHU Series - Ultra High Pressure

Inside Diameter		Number of Braids	Outside Diameter		Static Minimum Bend Radius		Dynamic Minimum Bend Radius		Maximum Working Pressure		Burst Pressure		Weight Per Foot (lbs)	Weight Per Meter (kg)
(inch)	(mm)		(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)	(psi)	(bar)		
1/4	6.35	0	0.43	10.9	0.5	13	4.5	114	500	34	n/a	n/a	0.15	0.22
		1	0.56	14.1	1.5	38			5000	345	20000	1379	0.32	0.48
		2	0.68	17.3	1.5	38			6000	414	24000	1655	0.49	0.73
3/4	19.05	0	1.15	29.2	2.5	64	4.5	114	250	17	n/a	n/a	0.63	0.94
		1	1.28	32.5	4.0	102	10.0	254	2650	183	10669	736	1.09	1.62
		2	1.40	35.6	4.0	102	10.0	254	3600	248	14521	1001	1.58	2.35
1	25.40	0	1.45	36.8	3.25	83	7.0	178	180	12	n/a	n/a	0.84	1.25
		1	1.57	39.9	5.0	127	11.0	279	2500	172	10000	689	1.53	2.28
		2	1.70	43.2	5.0	127	11.0	279	3000	207	12083	833	2.25	3.35
1 1/4	31.75	0	1.75	44.5	5.0	127	9.5	241	190	13	n/a	n/a	1.32	1.96
		1	1.88	47.8	6.5	165	12.5	318	1775	122	7119	491	2.09	3.11
		2	2.00	50.8	6.5	165	12.5	318	2600	179	10400	717	2.88	4.29
		3	2.13	54.1	7.0	178	14.0	356	3000	207	12082	833	3.71	5.52
1 1/2	38.10	0	2.11	53.6	6.0	152	11.5	292	110	8	n/a	n/a	1.75	2.60
		1	2.23	56.6	7.5	191	13.0	330	1450	100	5800	400	2.64	3.93
		2	2.36	59.9	7.5	191	13.0	330	2200	152	8892	613	3.57	5.31
2	50.80	0	2.57	65.3	7.5	191	12.0	305	100	7	n/a	n/a	2.04	3.04
		1	2.70	68.6	9.0	229	14.0	356	1100	76	4415	304	3.23	4.81
		2	2.82	71.6	9.0	229	14.0	356	1675	115	6710	463	4.45	6.62



Materials of Construction

Part	Material
Tube	SS 321 / SS 316L
Braid	SS 321
End Connections	SS 316L

General

The SHV - Vacuum /Formable Hoses series are hand formable tubes that keep their formation. These hoses are designed to bend and stay in one position, providing a stress-free connection between piping systems. SHV hose can be compressed or stretched to fit into an exact space in the system.

Features

- Braided or unbraided corrugated tube assembly.
- Core tube is made of 321 stainless steel, 316L stainless steel core tube is available.
- Braid is made of 304 stainless steel
- Annular Hydroformed corrugation
- Tube ID 1/4", 3/8", 1/2"
- Max. pressure 900psi (62bar)
- Min. static bend radius for braided hose 1.0inch (25mm)
- Full range of end connections

SHV Series - Vacuum/Formable

Inside Diameter		Number of Braids	Outside Diameter		Static Minimum Bend Radius		Dynamic Minimum Bend Radius		Maximum Working Pressure		Burst Pressure		Weight Per Foot	Weight Per Meter
(inch)	(mm)		(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)	(psi)	(bar)	(lbs)	(kg)
1/4	6.35	0	0.41	10.4	1.0	25	n/a	n/a	90	6	n/a	n/a	0.04	0.06
		1	0.47	11.9					900	62	3600	248	0.11	0.16
3/8	9.53	0	0.65	16.5	1.2	30	n/a	n/a	70	5	n/a	n/a	0.10	0.15
		1	0.71	18.0					800	55	3200	221	0.17	0.25
1/2	12.70	0	0.77	19.6	1.5	38	n/a	n/a	70	5	n/a	n/a	0.11	0.16
		1	0.83	21.1					665	46	2660	183	0.19	0.28



Materials of Construction

Part	Material
Tube	SS 321 / SS 316L
Braid	SS 304
End Connections	SS 316L



Formable hoses

General

The SHE - Extra Flexible Hose series combines the same pressure rating performances as the SHF - general use series with improved flexibility for smaller minimal static and dynamic bend radiuses.

The extra flexibility is provided by denser corrugations while maintaining the same production process and material specifications.

Features

- Braided, double braided or unbraided corrugated tube assembly
- Core tube is made of 316L stainless steel, 321 stainless steel core tube is available.
- Braid is made of 304 stainless steel, 316 stainless steel braid is available.
- Annular Hydroformed corrugation
- Tube ID from 1/4" to 2"
- Max. pressure 2700psi (186bar)
- Min. static bend radius for braided hose 0.9inch (23mm)
- Min. dynamic bend radius for braided hose 3.7inch (94mm)
- Full range of end connections

SHE Series - Extra Flexible

Inside Diameter		Number of Braids	Outside Diameter		Static Minimum Bend Radius		Dynamic Minimum Bend Radius		Maximum Working Pressure		Burst Pressure		Weight Per Foot (lbs)	Weight Per Meter (kg)
(inch)	(mm)		(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)	(psi)	(bar)		
1/4	6.35	0	0.42	10.7	0.9	23	3.7	94	90	6	n/a	n/a	0.07	0.10
		1	0.48	12.2					1800	124	7233	499	0.14	0.21
		2	0.54	13.7					2700	186	9100	627	0.20	0.30
3/8	9.53	0	0.65	16.5	1.0	25	4.0	102	70	5	n/a	n/a	0.15	0.22
		1	0.71	18.0					1558	107	6230	430	0.25	0.37
		2	0.77	19.6					2336	161	9345	644	0.36	0.54
1/2	12.70	0	0.77	19.6	1.2	30	4.4	112	70	5	n/a	n/a	0.18	0.27
		1	0.83	21.1					1186	82	4743	327	0.32	0.48
		2	0.89	22.6					1779	123	7115	491	0.47	0.70
5/8	15.88	0	0.96	24.4	1.4	36	5.6	142	57	4	n/a	n/a	0.19	0.28
		1	1.02	25.9					1205	83	4820	332	0.37	0.55
		2	1.08	27.4					1808	125	7230	498	0.54	0.80
3/4	19.05	0	1.16	29.5	1.7	43	6.4	163	43	3	n/a	n/a	0.31	0.46
		1	1.22	31.0					898	62	3591	248	0.53	0.79
		2	1.28	32.5					1347	93	5387	371	0.74	1.10
1	25.40	0	1.47	37.3	2.1	53	7.1	180	43	3	n/a	n/a	0.41	0.61
		1	1.53	38.9					718	50	2872	198	0.76	1.13
		2	1.63	41.4					1077	74	4308	297	1.11	1.65
1 1/4	31.75	0	1.75	44.5	2.5	64	7.9	201	43	3	n/a	n/a	0.63	0.94
		1	1.83	46.5					645	44	2581	178	1.00	1.49
		2	1.91	48.5					968	67	3872	267	1.37	2.04
1 1/2	38.10	0	2.08	52.8	3.1	79	8.7	221	28	2	n/a	n/a	0.70	1.04
		1	2.16	54.9					531	37	2125	147	1.16	1.73
		2	2.24	56.9					797	55	3188	220	1.63	2.43
2	50.80	0	2.61	66.3	4	102	10.3	262	14	1	n/a	n/a	0.88	1.31
		1	2.69	68.3					449	31	1797	124	1.44	2.14
		2	2.77	70.4					674	46	2696	186	1.99	2.96



Materials of Construction

Part	Material
Tube	SS 316L / SS 321
Braid	SS 304 / SS 316
End Connections	SS 316L

General

The SHH - High Pressure Hose series are spirally-welded corrugated all Stainless Steel metal hose.

The SHH hoses are specially designed to maintain extreme pressure and flexibility the spiral corrugation inner tube is self-draining and generates minimal in-line turbulence.

Features

- Braided corrugated tube assembly.
- Core tube is made of 316L stainless steel, 321 stainless steel core tube is available.
- Braid is made of 304 stainless steel, 316 stainless steel braid is available
- Spiral double-walled welded corrugation
- Tube ID 1/4", 3/8", 1/2"
- Max. pressure 5800psi (400bar)
- Min. static bend radius for braided hose 1.1inch (28mm)
- Min. dynamic bend radius for braided hose 5.0inch (127mm)
- Full range of end connections

SHH Series - High Pressure

Inside Diameter		Number of Braids	Outside Diameter		Static Minimum Bend Radius		Dynamic Minimum Bend Radius		Maximum Working Pressure		Burst Pressure		Weight Per Foot (lbs)	Weight Per Meter (kg)
(inch)	(mm)		(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)	(psi)	(bar)		
1/4	6.35	1	0.52	13.2	1.1	28	5.0	127	4600	317	18400	1269	0.21	0.31
		2	0.62	15.7					5800	400	23200	1600	0.32	0.48
3/8	9.53	1	0.70	17.8	1.4	36	5.5	140	3800	262	15200	1048	0.36	0.54
		2	0.82	20.8					4000	276	16000	1103	0.57	0.85
1/2	12.70	1	0.82	20.8	1.6	41	5.7	145	2600	179	10400	717	0.43	0.64
		2	0.94	23.9					3700	255	14800	1020	0.69	1.03



Materials of Construction

Part	Material
Tube	SS 316L
Braid	SS 304
End Connections	SS 316L

Selecting & Installing Metal Hose Assemblies

When Metal Hose Is A Proper Solution

1. Temperature Extremes

The Metal Hose is the best solution for extreme hot and cold media or surrounding temperatures.

2. Chemical Compatibility

Chemicals and aggressive media or corrosive environments are often better serviced by stainless metal hoses.

3. Permeation Concerns

Permeation prevention of media into the surrounding atmosphere is best assured by using metal hoses.

4. Potential for Catastrophic Failure

A potentially catastrophic failure effect of hose may be minimized by using metal hose that tends to develop smaller holes or cracks when failing than other hose types.

5. Fire Safety

Maintaining integrity up to 1300°F (705°C) is provided by metal hoses.

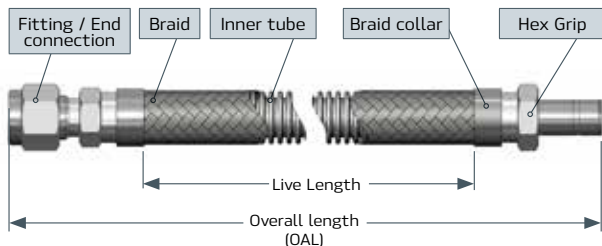
6. Achieving Full Vacuum

Maintaining shape under full vacuum is better assured by metal hoses.

7. Flexibility in Fitting Configuration

Virtually any type of fitting can be assembled with a metal hose to perfectly meet most tubing and fitting systems.

Hose Assembly

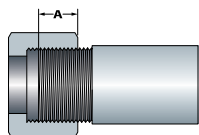


Thread Allowance

When calculating the overall length (OAL) of a hose assembly that has a pipe thread as one or both end connection(s), consideration must be given the thread engagement.

Example: using the chart below, a hose assembly with a 1" male pipe on one end would have 0.66" added to the OAL to compensate for the length of thread that will be engaged during installation.

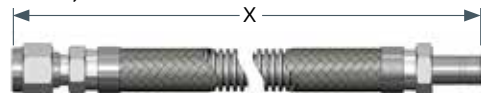
Nominal Pipe Size inch	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Thread Allowance inch (mm) -Dim "A"	0.40 (10)	0.41 (10)	0.53 (13)	0.55 (14)	0.66 (17)	0.68 (17)	0.68 (17)	0.70 (18)



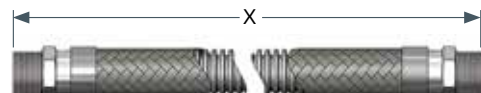
Length Considerations

To calculate the proper length of a hose assembly, you need to:

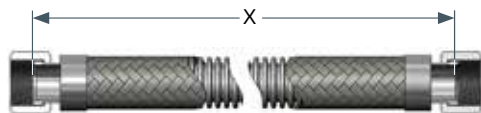
1. Verify that the installation is properly designed (see Do's & Don'ts herein)
 - Do not torque the hose
 - Do not over-bend the hose
 - Do not compress the hose
2. Calculate the live length of the assembly - The live length of the assembly is the amount of active (flexible) hoses in an assembly; that is, the hose between the braid collars (see formulas to help calculate live length for a variety of common hose installations herein).
3. The overall length of the assembly when calculating the overall length is equal to the live length plus the lengths of the braid collars and fittings. When adding fitting lengths, be aware that the points from which measurements should be taken vary for different fitting types. When calculating overall length for assemblies with threaded fittings, remember to account for the length of thread that is lost by threading into the mating connection (refer to Thread Allowance chart herein).



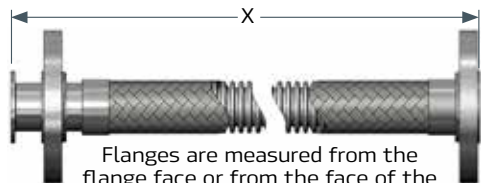
Compression fittings are measured to the end of the fitting



Threaded fittings are measured to the end of the fitting



JIC/SAE-type fittings are measured from the seat of the fitting



Flanges are measured from the flange face or from the face of the stub end if one is used



Elbows and other fittings with a radius are measured from the centerline of the fitting

Selecting & Installing Metal Hose Assemblies

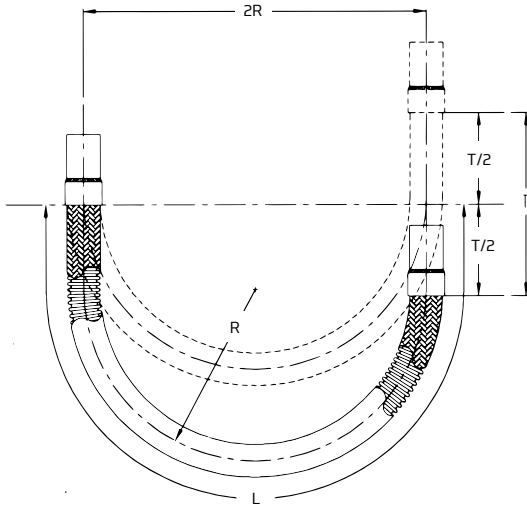
Live Length Calculations

For the following formulas:

L	Live length of hose (inches/mm)
T	Travel (inches/mm)
S	Hose outside diameter (see product data pages herein)
R	Bend radius, measured to hose center line

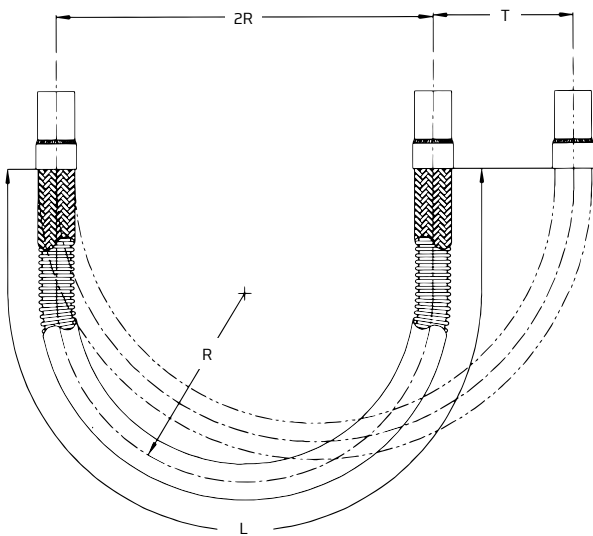
Verify that the installed radius is greater than the stated Minimum Bend Radius for the hose at the required working pressure. Verify that the centerline of the hose remains in the same plane during cycling to prevent twisting the assembly.

Constant Radius Traveling Loop (A-Loop)



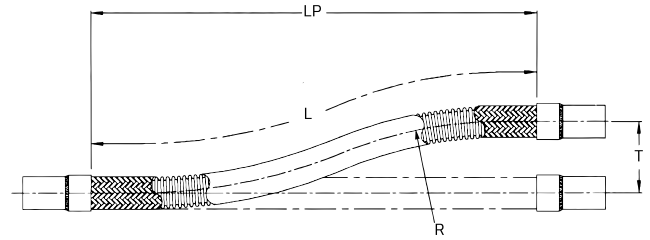
Formula: $L = 4R + 1/2T$

Variable Radius Traveling Loop (B-loop)



Formula: $L = 4R + 1.57T$

Lateral Offset

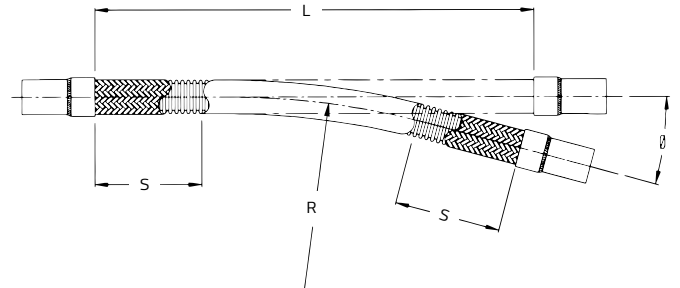


Formula: $L = \sqrt{20R \times T}$, $L_p = \sqrt{L^2 - T^2}$

Note 1: When the offset motion occurs on both sides of the hose centerline, use total travel in the formula

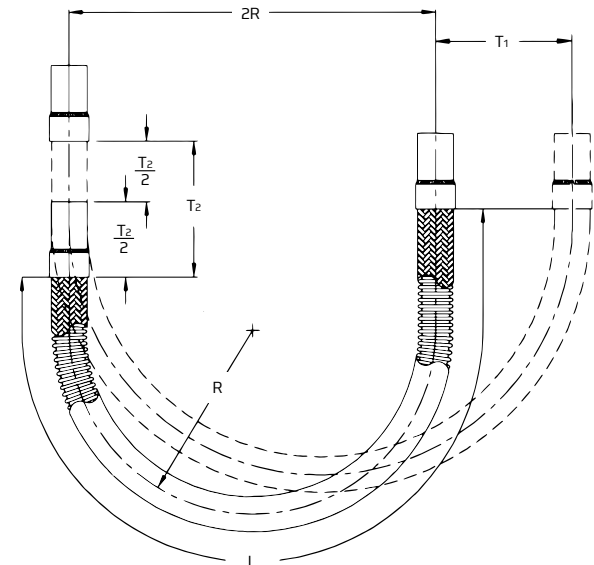
Note 2: The offset distance "T" for constant flexing should never exceed 25% of the centerline bend radius

Angular Deflection



Formula: $L = 2S + (\theta/57.3)R$

Vertical Loop With Movement In Two Directions (combination loop)



Formula: $L = 4R + 1.57T_1 + (T_2/2)$

Selecting & Installing Metal Hose Assemblies

Media Flow Velocity

When gas or liquid being conveyed in a corrugated metal hose exceeds certain limits, resonant vibration can occur. Resonance may cause a very rapid failure of the assembly. In applications where product velocities exceed the limits shown in the chart below, a revision of the assembly design might include:

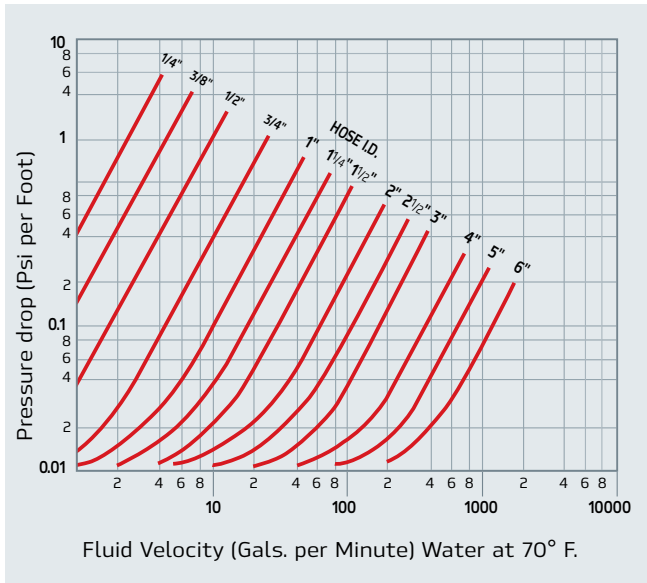
1. Addition of an interlocked metal hose liner
2. An increase in the corrugated hose I.D.
3. A combination of the above

Velocity in Metal Hose				
Installation Configuration	Maximum Product Velocity Feet/Second (Meter/Second)			
	Unbraided		Braided	
	Dry Gas	Liquid	Dry Gas	Liquid
Straight Run	100 (30)	50 (15)	150 (46)	75 (23)
45 Degree Bend	75 (23)	40 (12)	115 (35)	60 (18)
90 Degree Bend	50 (15)	25 (8)	75 (23)	40 (12)
180 Degree Bend	25 (8)	12 (4)	38 (12)	19 (6)

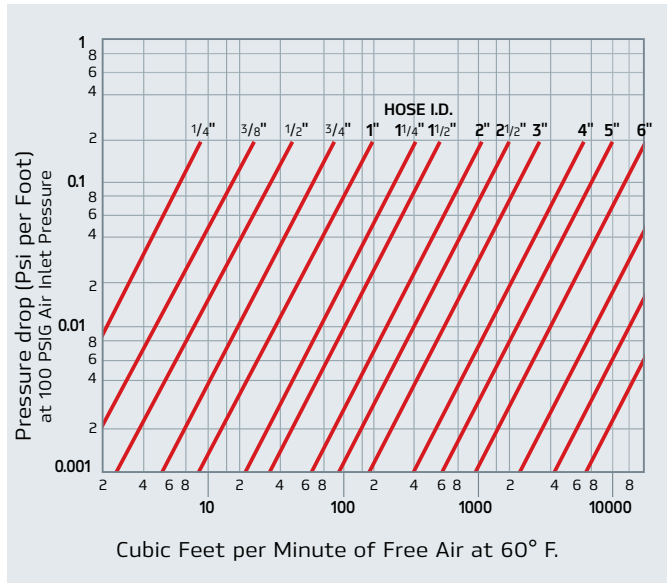
Pressure Drop

Pressure drop in a piping system is often a concern for the designer. Compared to rigid pipes, there is always a greater pressure drop in corrugated metal hoses. The following graphs are offered as aids in estimating the pressure drop in corrugated hose conveying water and air. The values derived are approximate and apply only to straight-line installations. Bends and fittings can increase the pressure drop.

Pressure Drop Graph For Water



Pressure Drop Graph For Air

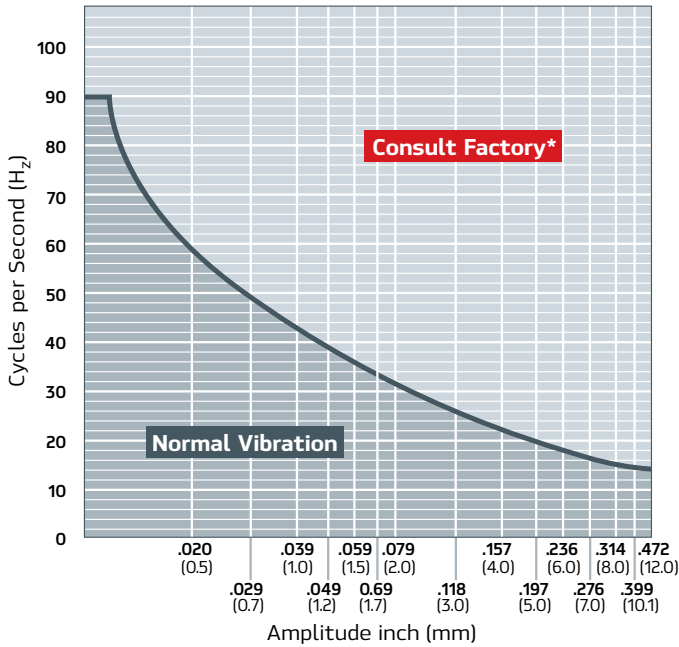


Selecting & Installing Metal Hose Assemblies

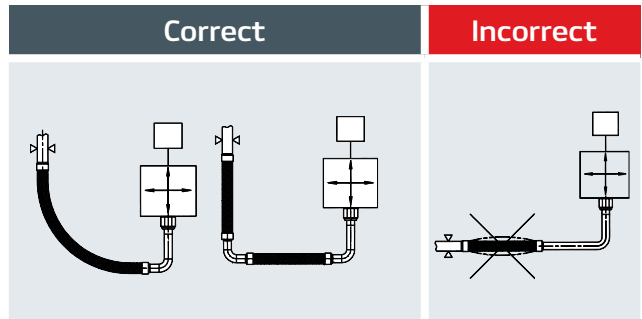
Vibration

The following graph is a representative guideline for estimation purposes only.

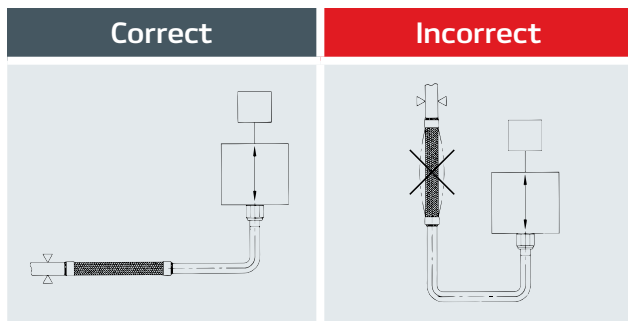
For any questions, or if your application is near the "Consult Factory" region, please contact your HAM-LET local representative.



If there is vibration in more than one direction, either install a longer hose bent at 90° or install a "Dog Leg" assembly.

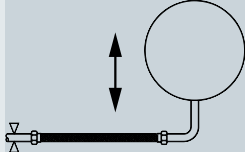
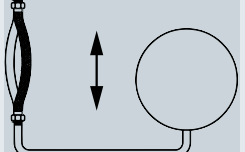
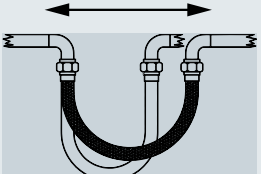

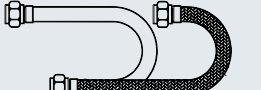
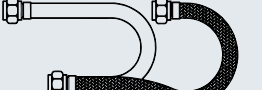
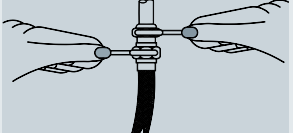
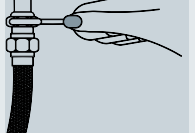

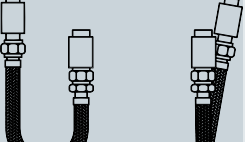
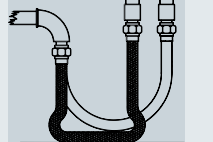

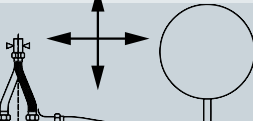
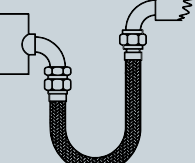
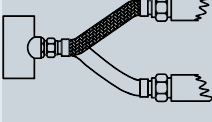
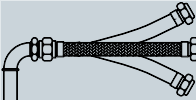


When installing a hose assembly in a vibration application, make sure to install it so the axis of the hose is perpendicular to the direction of the vibration.



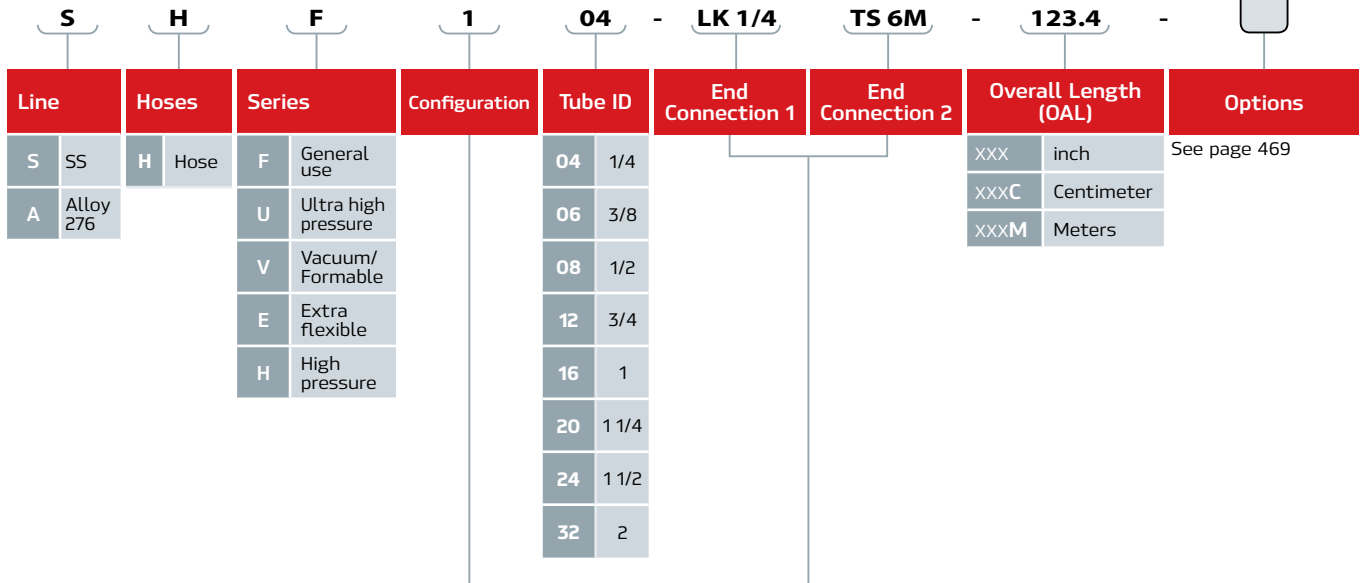
Selecting & Installing Metal Hose Assemblies

Installation Do's & Don'ts

Do's	Don'ts	Do's	Don'ts
			
			
			
			
			
			

Metal Hoses - Ordering Information

OPTIONAL



Line		Hoses		Series		Configuration	Tube ID		End Connection 1	End Connection 2	Overall Length (OAL)		Options
S	SS	H	Hose	F	General use		04	1/4			XXX	inch	See page 469
A	Alloy 276			U	Ultra high pressure		06	3/8			XXXC	Centimeter	
				V	Vacuum/Formable		08	1/2			XXXM	Meters	

Configuration

Series	Configuration	Tube Material	Braid Material	# of braids
F	0	316L	-	0
	1	316L	304	1
	2	316L	304	2
	3	321	-	0
	4	321	304	1
	5	321	304	2
	6	316L	316	1
	7	316L	316	2
	8	321	316	1
9	321	316	2	
U	0	321	-	0
	1	321	321	1
	2	321	321	2
	3	316L	-	0
	4	316L	321	1
5	316L	321	2	
V	0	321	-	0
	1	321	304	1
	2	316L	-	0
	3	316L	304	1
E	0	316L	-	0
	1	316L	304	1
	2	316L	304	2
	3	321	-	0
	4	321	304	1
	5	321	304	2
	6	316L	316	1
	7	316L	316	2
	8	321	316	1
9	321	316	2	
H	0	316	-	0
	1	316	304	1
	2	316	304	2

End Type		End Size
LK	LET-LOK®	inch
TS	Tube Adapter	1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2
TP	Tube Adapter Preswaged	2
GF	Face Seal Female Swivel	mm
GM	Face Seal Male Swivel	6M, 8M, 10M, 12M, 16M, 25M, 38M
FP	Female Pipe NPT	
MP	Male Pipe NPT	
FG	Female BSP-P	
MG	Male BSP-P	
BW	Butt Weld Adapter	
HL	ONE-LOK®	
UH	UH-Line (Vacuum only)	
FF	Female Flare 37°	
MF	Male Flare 37°	

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

Metal Hoses - Options

Test		Cleaning		Internal Lamina		Outer Cover		Special Type		Tagging			
H	Helium Leak Test 1x10 ⁻⁹ Std. CC/Sec	O	Oxygen Cleaning	L	Liner	G	Spring Guard	E	EN 10380 Certified	T	Paper Tag	None	On One End
						R	Protective Cover			M	Metal Tag ⁽¹⁾	B	Both Ends
Y	Hydraulic Test					J	Insulating Jacket			P	Plastic Tag		
						A	Armor						
						N	Interlock bend restrictor						

(1) One end metal tag with MWP marking - is supply as standard (no need to mark this option to have this tag)



Spring Guard

A mechanical guard can be installed with the hose assembly. This type of guard consists of a metal spring that is attached behind the fitting.



Protective Cover

For lighter protection of the corrugated hose and braid, plastic scuff guards can be installed with the hose.



Insulating Jacket

High temperature insulation of the hose exterior is available by adding an insulated protective jacket. The jacket consists of braided fiberglass insulation, covered and impregnated with silicone rubber that is then installed over the corrugated hose and sealed. The Insulation jacket can also be used to prevent ambient heat from being conveyed to the media or to reduce media heat loss.



Tagging

Customer or system information can be marked on hose assemblies using cardboard, plastic, and metal tags or permanently engraved onto braid collars. Tags and markings can be applied on single or both ends of assemblies.



Certifications

Materials, Standard Conformance and testing certificates are available. Other customer specific certificates are available upon request.

HAM-LET PTFE Hoses

General

PTFE stainless steel braided hose is an ideal solution for permanent or temporary connections of gases or liquid line. It makes fabrication easier, and it facilitates connect/disconnect and cleaning. Variable length, high flexibility, high pressures and broad chemical compatibility are among the features that make this hose the preferred solution for many applications.

HAM-LET PTFE hoses are available in smooth, convoluted or conductive carbon lined core with stainless-steel braid or silicon covered stainless-steel braided.

Testing & Packing

All Hoses are Hydrostatically tested at 1000 psi (69 bar) or maximum working pressure.

All Hoses packed individually in a plastic bag, end connections are capped.

Features

- PTFE core with all stainless steel braid and connections
- Non-contaminating, Non-absorbent, will not impart taste or odor
- Non-aging & non-stick surface
- Easy to clean, drain easily
- True I.D., Low friction
- LET-LOK®, ONE-LOK®, Male & Female NPT, Mini Sanitary Flange.
- ID Sizes: 1/4" up to 2".
- Max. pressure 3250 psi (224 bar), safety factor 1 to 4.
- Working temperature: -100° ~ +450° F (-73° ~ + 232°C)
- Pack and Validated for high purity service:
 1. Approved U.S. Pharmacopoeia Class VI
 2. Approved Food and Drug Administration (FDA) 21CFR177.1550
 3. Exceeds 3A Sanitary Standards
 4. U.S.D.A. Approved

Where Can A PTFE Hose Be Used?

Almost anywhere! It can handle high pressures; it withstands hundreds of thousands of flex cycles; it is unaffected by weather or age; and it conveys almost any media. PTFE is non-stick and temperature resistant. There is no limit to steam clean/sterilization cycles.

There is no material with a broader range of chemical compatibility than PTFE. The only known classes of chemicals that attack PTFE are molten alkali metals such as Sodium, Lithium, and Potassium. Halogenated chemicals such as fluorine gas or chlorine tri-fluoride are not recommended because certain Halogen compounds such as Freon can permeate (diffuse) through the PTFE tubing.

Chemical Compatibility:

PTFE has one of the highest levels of chemical compatibility. Following is the list of materials that require some level of consideration:

The following materials are not recommended for use with PTFE hosing:

- Elemental Sodium
- Elemental Potassium
- Elemental Lithium

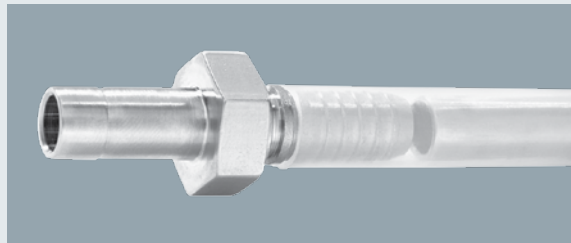
The materials listed below are only questionable if conveyed in conjunction with high temperature and pressure and/or a combination thereof:

- Fluorine (F2)
- Chlorine Tri-Fluoride (ClF3)
- Borane (B2H6) (Only at 400°F to 500°F)
- Iodine Pentafluoride
- Oxygen Difluoride
- Chlorine Difluoride
- 80% and over Sodium Hydroxide
- Bromine (Br2) - only at 400°F to 500°F
- Aluminum Chloride (at elevated temps)
- Ammonia (NH3)
- Aluminum (R-NH2) - at elevated Temperature
- Imines (R-NH)
- 70% Nitric Acid

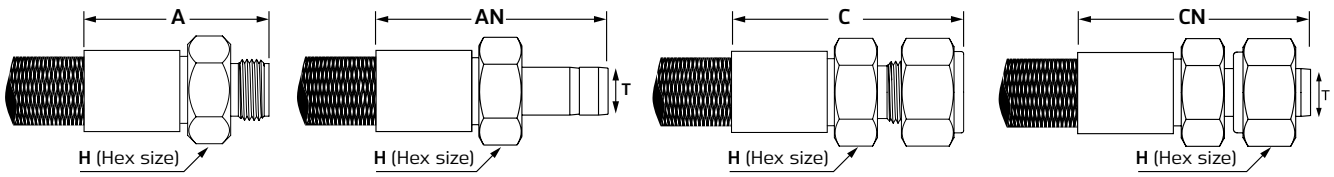
Full Size Inside Diameter:

- Not tube size!
- 1/4" is 0.250 (1/4") inside diameter - not 0.187 (3/16") id and 1/2" is 0.500 (1/2") not 0.406 (13/32")
- HAM-LET hose yields the highest flow rate per size because of its full size tube so fittings can be machined with a bigger inside diameter; a diameter that mates identically with connected tubing.

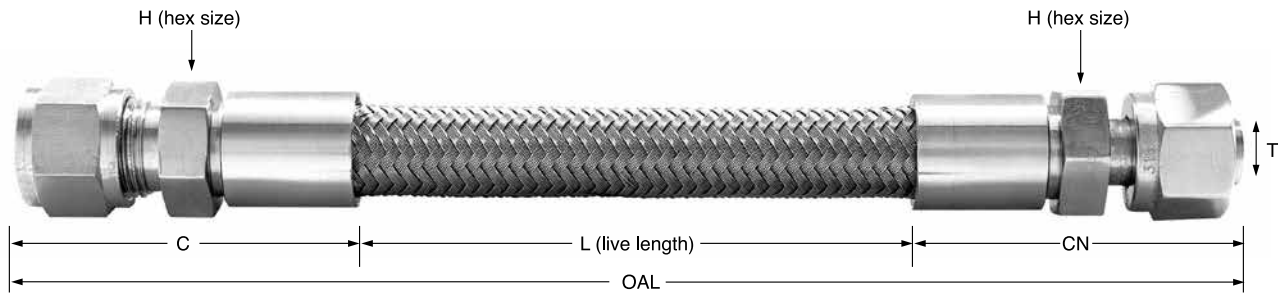
The result is minimal or no pressure drop due to dimensional differences. The internal surface of the fitting can be machined with no steps, which is where corrosion starts, bacterial growth begins and flow is disrupted.



End Connector Dimensions



Hose Size	Minimum Flow Diameter	T Diameter	A Length	An Length	C Length	Cn Length	H Hex Size
in	in	in	in	in	in	in	in
1/4	0.190	1/4	1.48	1.70	1.73	1.70	0.562
3/8	0.280	3/8	1.78	2.00	2.08	2.00	0.687
1/2	0.375	1/2	2.07	2.53	2.48	2.53	0.875
3/4	0.630	3/4	2.50	3.04	2.81	3.04	1.125
1	0.860	1	2.75	3.28	2.96	3.28	1.375



General

General use smooth PTFE core hoses.

Features

- Tube I.D. 1/4" up to 1"
- Pressure rating Vacuum to 3200psi (240 bar)
- Min Bend radius 1.5inch (38.1mm)
- Conductive inner lining available

THT Series - Smooth PTFE Core SS Braided Hose

Inside Diameter		Number of Braids	Maximum Working Pressure		Dynamic Minimum Bend Radius		Outside Diameter		Burst Pressure		Weight Per Foot	Weight Per Meter
(inch)	(mm)		(psi)	(bar)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)	(lbs)	(kg)
1/4	6.35	1	3200	221	1.5	38	0.41	10.4	12,800	883	0.1	0.15
3/8	9.53	1	2500	172	2.0	51	0.53	13.5	10,000	689	0.12	0.18
1/2	12.70	1	2000	138	3.0	76	0.67	17.0	8,000	552	0.16	0.24
3/4	19.05	1	1000	69	8.2	208	0.87	22.1	4500	310	0.22	0.33
1	25.40	1	1000	69	12.0	305	1.19	30.2	4000	276	0.51	0.76



Materials Of Construction

Part	Material
Tube	PTFE
Braid	SS 304
End Connections	SS 316L

General

Special design for pharmaceutical, food & beverages and biotech applications. Silicon cover protects the braid from particles or other external contamination and distends high temperatures.

Features

- Tube I.D. 1/4" up to 1"
- Pressure rating Vacuum to 3250psi (224bar)
- Min Bend radius 1.5inch (38.1mm)

THS Series - Silicon Covered Smooth PTFE Core SS Braided Hose

Inside Diameter		Number of Braids	Maximum Working Pressure		Dynamic Minimum Bend Radius		Outside Diameter		Burst Pressure		Weight Per Foot	Weight Per Meter
(inch)	(mm)		(psi)	(bar)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)		
1/4	6.35	1	3250	224	1.5	38	0.5	12.7	13000	896	0.13	0.19
3/8	9.53	1	2500	172	2.0	51	0.65	16.5	10,000	689	0.15	0.22
1/2	12.70	1	2000	138	3.0	76	0.81	20.6	8,000	552	0.18	0.27
3/4	19.05	1	1000	69	8.2	208	1.02	25.9	4500	310	0.34	0.51
1	25.40	1	1000	69	12.0	305	1.36	34.5	4000	276	0.57	0.85



Tube - PTFE
Braid - SS304
External cover - Silicon
End Connection - SS316

Materials of Construction

Part	Material
Tube	PTFE
Braid	SS 304
External cover	Silicon
End Connections	SS 316L

General

Convuluted PTFE core for extra flexibility with larger IDs. Completely drainable hose. Durable for high pressures and high temperatures with lower profile.

Features

- Tube I.D. 1/2" up to 2"
- Pressure rating Vacuum to 1500psi (103bar)
- Min Bend radius 2.5inch (63.5mm)

THC Series - Convuluted PTFE Core SS Braided Hose

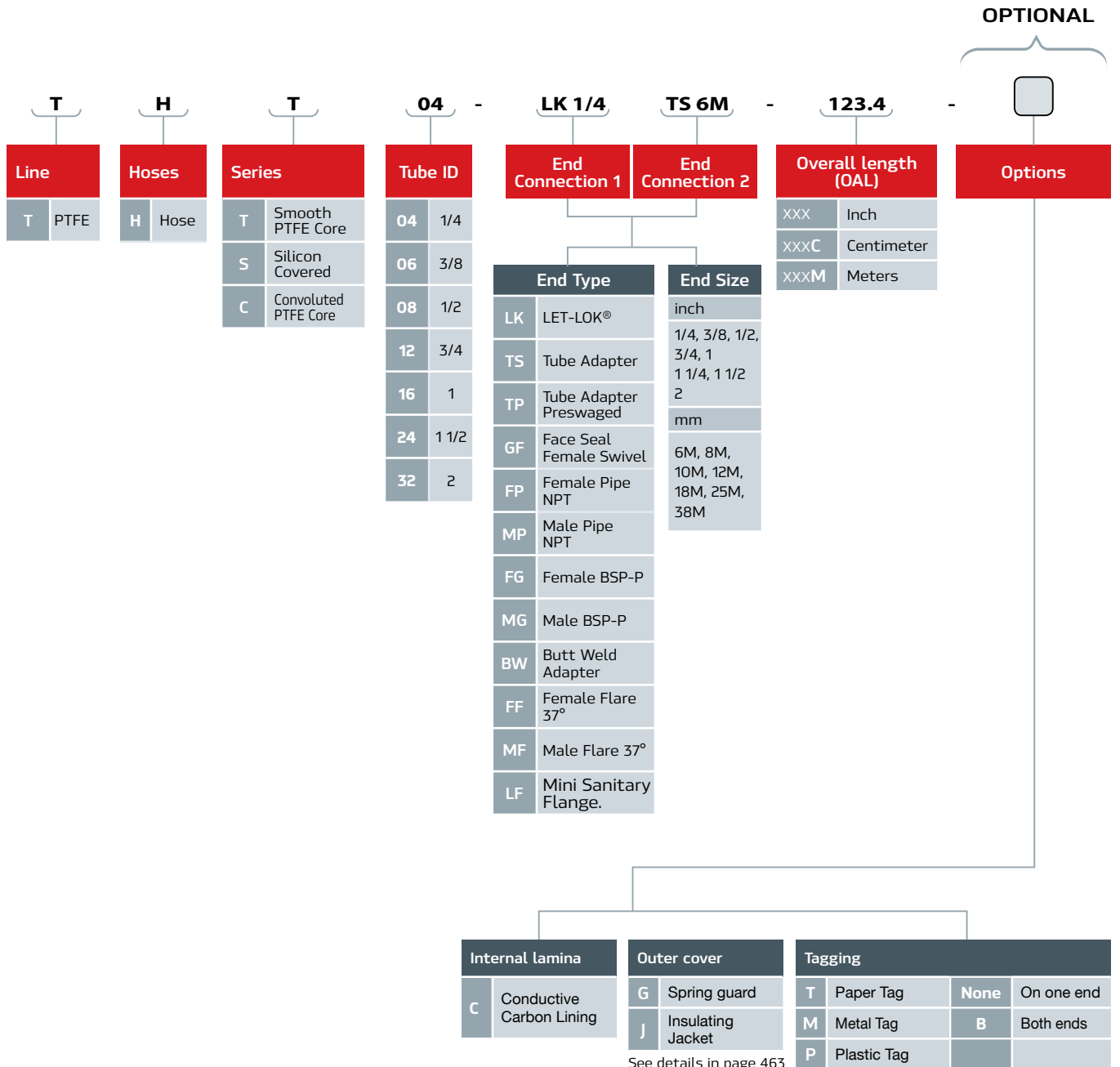
Inside Diameter		Number of Braids	Maximum Working Pressure		Dynamic Minimum Bend Radius		Outside Diameter		Burst Pressure		Weight Per Foot	Weight Per Meter
(inch)	(mm)		(psi)	(bar)	(inch)	(mm)	(inch)	(mm)	(psi)	(bar)	(lbs)	(kg)
1/2	12.70	1	1500	103	2.5	64	0.76	19.3	6000	414	0.19	0.28
3/4	19.05	1	1100	76	3.0	76	1.00	25.4	4400	303	0.27	0.40
1	25.40	1	1000	69	5.5	140	1.32	33.5	4000	276	0.39	0.58
1 1/2	38.10	1	700	48	6.0	152	2.03	51.6	2800	193	0.75	1.12
2	50.80	1	525	36	7.5	191	2.46	62.5	2100	145	0.89	1.32



Materials of Construction

Part	Material
Tube	PTFE
Braid	SS 304
End Connections	SS 316L

PTFE Hoses - Ordering Information



Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

HAM-LET Hoses, Rev.02, December 2014

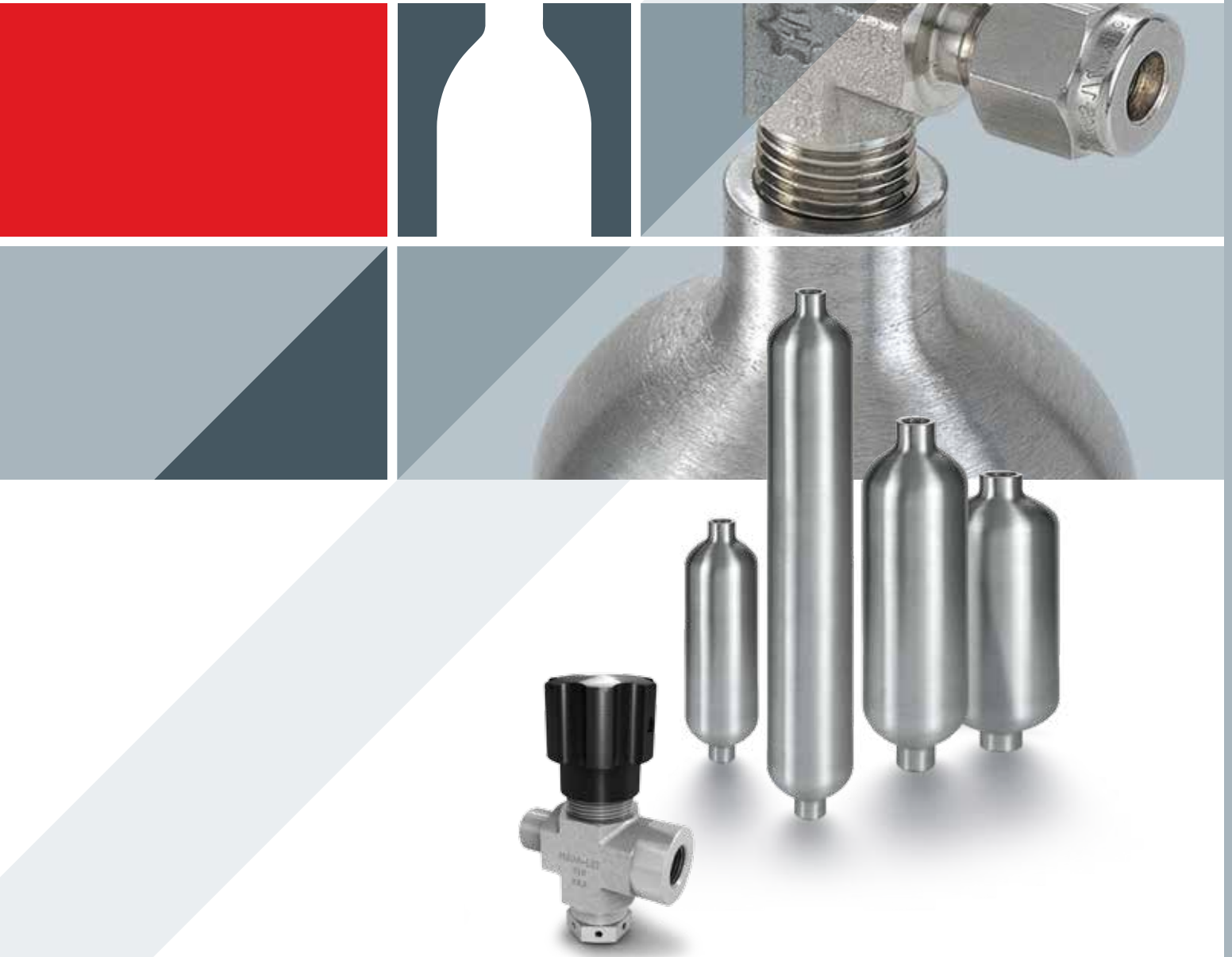
Expansion Joints



A wide variety of custom-made Expansion Joints are available for different sizes, designs and materials. All specifically designed to meet your system requirements by our expert team and well proven manufacturing capabilities that are subject to the highest testing and quality assurance practices.

For more information: contact your HAM-LET Local Representative

SAMPLE CYLINDERS AND NEEDLE VALVE WITH RUPTURE DISC



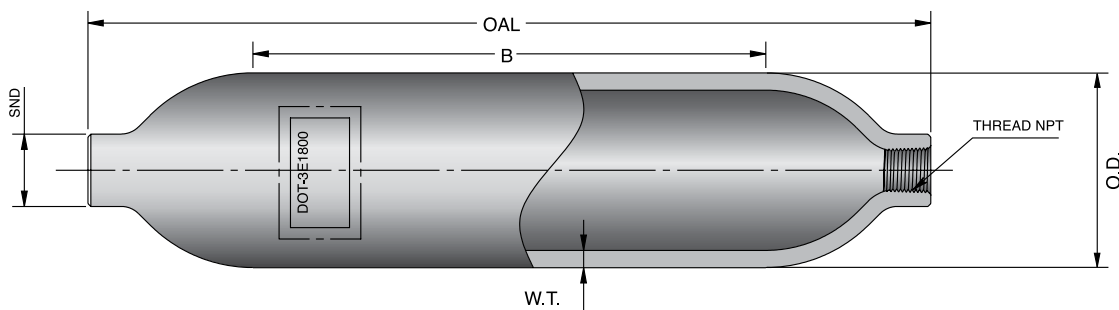
APPLICATION:

Sampling Cylinders permit the extraction of a sample from a remote process location and provide safe containment for storage and transportation to the laboratory for analysis. These cylinders are rated to 1800 psi at room temperature for liquids and gases. Some applications include hydrocarbon sampling in refineries, gas sampling in chromatography and condensate sampling in fossil-fuel and nuclear-power plants. In similar

applications, petrochemical facilities and gas processing plants utilize sample cylinders. Pressure surge accumulators or reaction vessels are other common uses for sample cylinders.

PROPERTIES: TABLE 1

No.	Description	Material	Pressure Rating (psi)	DOT Stand	Min. Volume	Max. Weight	B	OAL	SND	Thread (NPT)	O.D.	W.T.
1	HSSC15-1BH	St.St.316	1800	3E	50 CC (3.05 IN ³)	0.5 LBS	1.64"	3.80"	0.72"	1/4-18	1.5"	0.083"
2	HSSC15-2BH				75 CC (4.6 IN ³)	0.6 LBS	2.72"	4.88"				
3	HSSC15-3BH				150 CC (9.2 IN ³)	1.0 LBS	6.09"	8.25"				
4	HSSC15-4BH				150 CC (9.2 IN ³)	1.0 LBS	6.09"	8.54"	0.85"	3/8-18		
5	HSSC20-1BH				300 CC (18.3 IN ³)	1.8 LBS	6.79"	9.25"	0.74"	1/4-18	2"	0.095"
6	HSSC20-2BH				500 CC (30.5 IN ³)	2.5 LBS	11.42"	13.88"	0.74"			



Material Traceability

Raw material is heat code traceable. This traceability follows each cylinder through manufacturing, heat treating, cleaning and pressure testing.

Cylinder Manufacturing Standards

DOT CFFC, FRP-1, FRP-2, 3A, 3AA, 3AL, 3E, 3HT, 39, NGV2, FMVSS, HSE FW1/FW2, TUV, KHK, MIL-C-7905, MS26545, MIL-R-8573, EN1975, 12245 and others.

Applicable Valves with Sample Cylinders

HAM-LET H-285 Needle Valve with Rupture disc.

■ The Sample Cylinders product variety in the catalog covers our standard line. Extensive options are available per request.

Notes:

1. Dimensioning and tolerancing per ANSI Y 14.5M.
2. Cylinder manufactured and inspected in accordance with DOT '49 CFR 178.42 Specification 3E.
3. Material: seamless cold-finished stainless steel tubing per ASTM A269.
4. Lot size 500 cylinders.
5. Heads formed using spinning process.
6. Sandblast inside surfaces.
7. Thread ends per ANSI B1.20.1.
8. Part is free of grease, machine oil & other debris inside and out. Acid wash and rinse with deionized water.
9. Rotation sand entire cylindrical outer surface to finish 32µInch.
10. Destructive acceptance criteria (one cylinder per lot) per DOT 3E: - Cylinder burst between 6,000 and 12,000 psi without fragmentation; or - Cylinder holds 12,000 psi for 30 seconds without burst, and withstands flattening test to six times the wall thickness without cracking.
11. Non-destructive acceptance criteria (all cylinders) per DOT 3E: hydrostatic proof test at 3,000 +100/- 0 psi for 30 seconds minimum without failure or evidence of defect.
12. Minimum water volume: see table 1.
13. Maximum cylinder weight: see table 1.
14. Cylinder operating pressure: 1800 psi.

NEEDLE VALVE WITH RUPTURE DISC

FEATURES

- Soft Seat Non rotating Stem
- MAWP 3000 psi (206 bar)
- MAWT 122 Deg C (255 Deg F) with PCTFE seat.
- rupture disc pressure ratings: 1900 psi (131 bar), 2850 (196 bar)
- orifice size :5.6 mm (0.218 inch)

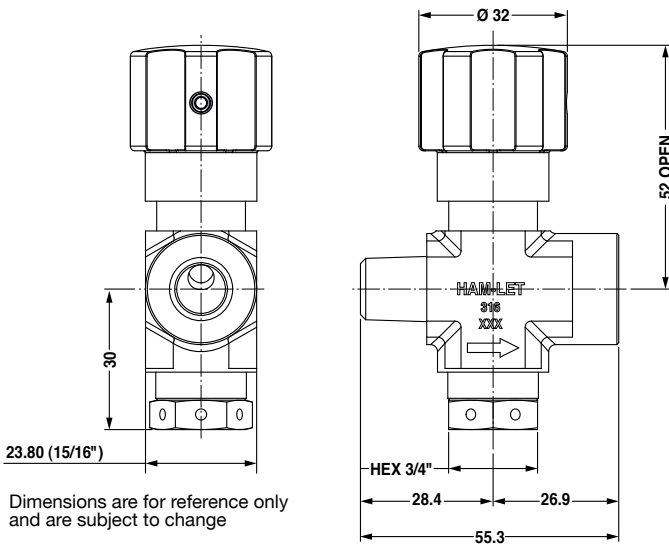
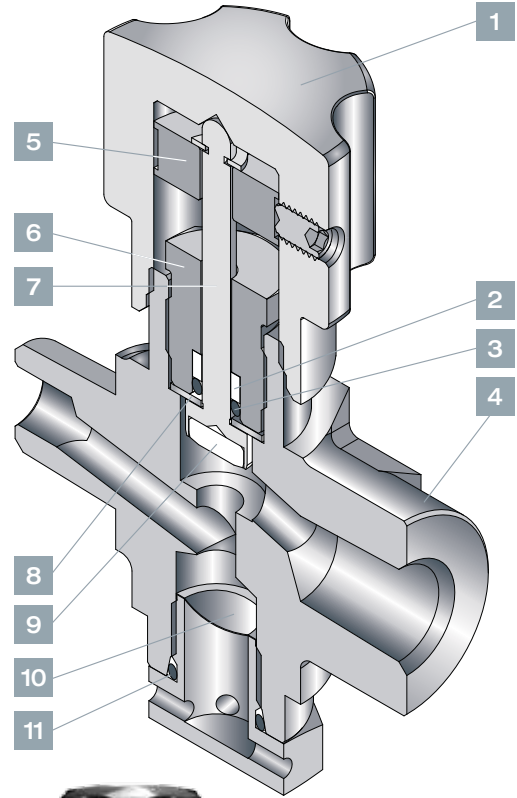
Precautions

This device should be assembled and tested by a trained person only. Be sure to keep all needed precautions of compressed gas cylinders in accordance to the required specifications.

GENERAL

HAM-LET Needle Valves with Rupture discs were designed to be mounted on HAM-LET sample cylinders, the Rupture disc provides protection against over pressure in sampling units by venting the media to the atmosphere. The Rupture disc element is welded to a carrier that is assembled to the Valve with an O-Ring seal. A Rupture Disc unit can be easily replaced in the field while the valve remains connected to the sampling unit.

MATERIAL OF CONSTRUCTION			
No.	Component	Qty.	Material
1	Handle	1	Aluminium 6061
2	Back up O-Ring	1	PTFE
3	O-Ring	1	Buna-N
4	Body	1	St.St. ASTM A-182
5	Spool	1	Aluminium 6061
6	Packing Bolt	1	St.St. ASTM A-276
7	Stem	1	St.St. ASTM A-276
8	Washer	1	PEEK
9	Stem Tip	1	PEEK
10	Rupture Disc Unit	1	St.St. ASTM A-276 + Alloy 600/B168
11	O-Ring	1	Fluorocarbon FKM



Dimensions are for reference only and are subject to change



ORDERING INFORMATION

H - 285 - SS - N - P - 1/4 - RD1900

Stem Tip Material	Rupture Pressure
P PEEK	1900 1900 Psi 2850 2850 Psi

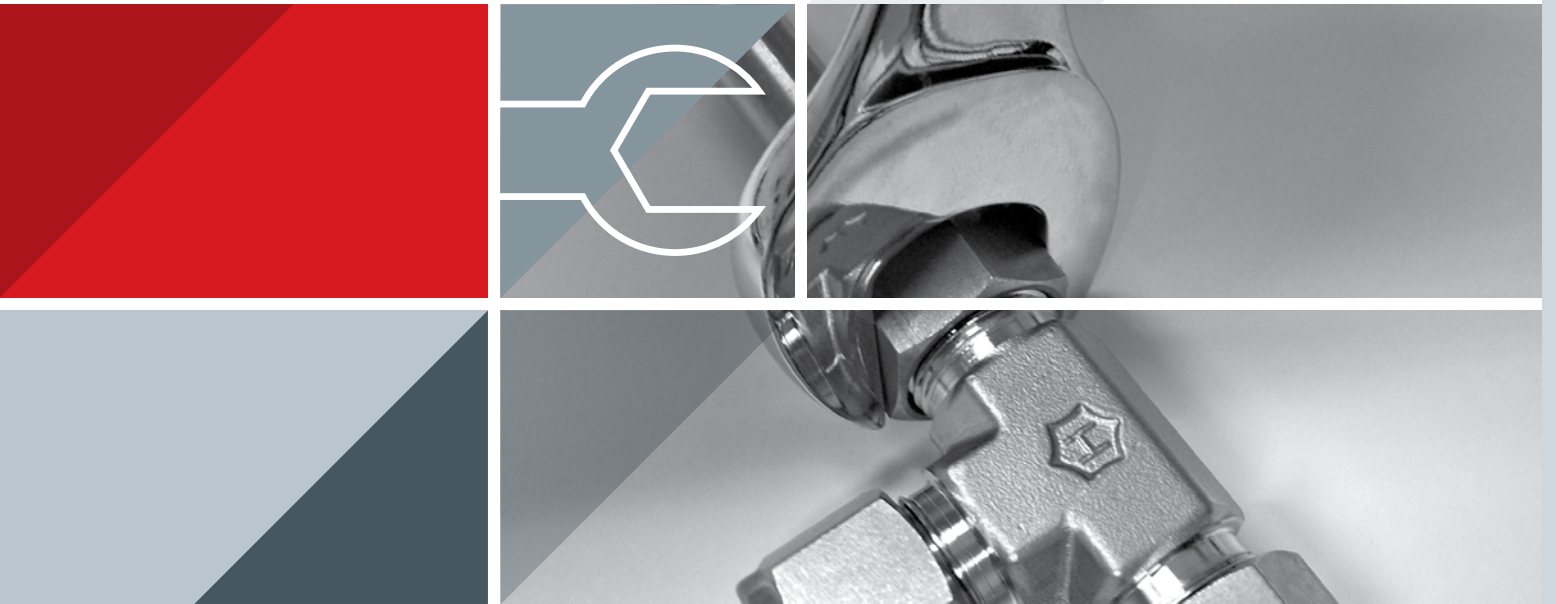
Z - RDU - 1/4 - 1900

Rupture Pressure	Pressure rating
1900 1900 Psi 2850 2850 Psi	± 100 Psi @ 20°C ± 100 Psi @ 20°C

Sample Cylinder | Rupture Disc, Rev.01, January 2014

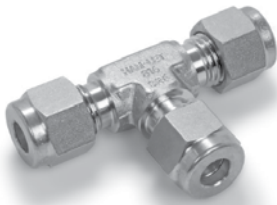


INSTALLATION INSTRUCTIONS



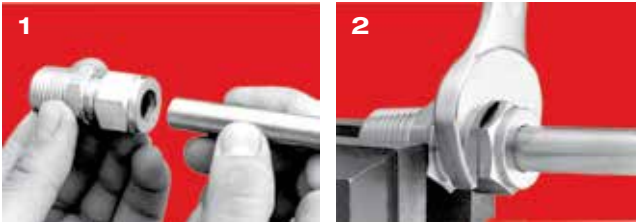
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<p>ONE-LOK TUBE FITTINGS 484 1/4", 3/8", 1/2", 3/4" 1"</p> 	<p>H-400 SERIES CHECK VALVES 488</p> 	<p>H900-HP SERIES HIGH PRESSURE RELIEF VALVES 497</p> 
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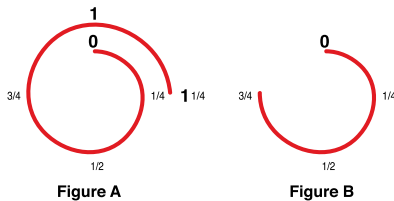
LET-LOK® TUBE FITTINGS

1/16" through 1" - Inch, 2 mm through 25 mm - Metric



LET-LOK® fittings are supplied assembled and finger tight. Disassembly before use can allow the entry of dirt or other particles.

1. Insert the tubing into the LET-LOK® fitting.
Check that the tube rests firmly on the fitting shoulder and that the nut is finger tight.
2. Tighten the nut.
1 1/4 turns of the nut are required for 1/4" (6 mm) and higher. (See Figure A.) 3/4 of a turn of the nut is required for 3/16" (4 mm) and lower. (See Figure B.)



Reassembly Instructions

LET-LOK® connections may be disconnected and remade repeatedly without loss of the leaktight seal.

1. Before disconnecting, mark the position of the nut in relation to the fitting body.
2. To reassemble, use a wrench to tighten the nut to original position.
3. Tighten slightly with a wrench until you feel a slight rise in torque.

Tube Cutting

There are two ways to cut tubes:

1. Tube cutter
2. Hacksaw

Tube Cutter

To attain a leak-free connection, cut the tubing squarely. Use a good quality tube cutter with the appropriate blade for the tubing.

Do not try to reduce the time of cutting by taking deep cuts with each turn of the cutter. This will work-harden the tube. Deburr the end of the tube to avoid damage to the fitting and to ensure that the tube reaches the bottom of the fitting.

Hacksaw Cutting

In order to cut the tube with a hacksaw and get square ends, cut the tube with guide blocks.

If you use this method of cutting, you will need to deburr the tube ends.

Warning!

Do not hold the tube in a vise at the place where it will be inserted into the fitting (the vise will leave a mark on the tube that may cause leaks, and might cause ovality).

Tube Handling

Scratches on the tube might cause leaks. Therefore, use caution in handling the tube in order to reduce the possibility of leaks.

Some precautions to be taken:

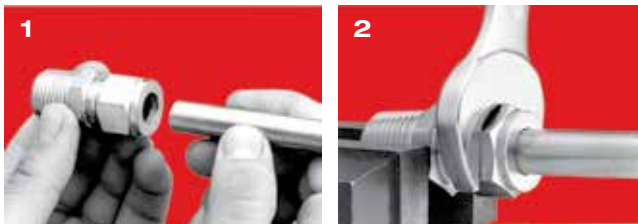
1. Tubes must not be dragged on the floor.
2. Tubes must not be dragged out of a tubing rack, especially in case of large OD tubes.

Copper Tubing

If you use copper tubing on a ro, be sure to hold the end of the tube, then, move the tubing away from you, so that it can lie on a flat surface.

ONE-LOK® TUBE FITTINGS

1/4", 3/8", 1/2", 3/4", 1"



ONE-LOK® fittings are supplied assembled and finger tight. Disassembly before use can allow the entry of dirt or other particles.

1. Insert the tubing into the ONE-LOK® fitting.
Check that the tube rests firmly on the fitting shoulder and that the nut is finger tight.
2. Tighten the nut.
1 1/4 turns of the nut are required.
(See Figure A.)

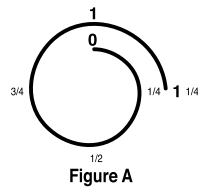
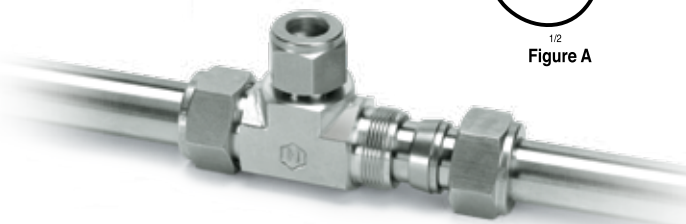


Figure A



Reassembly Instructions

ONE-LOK® connections may be disconnected and remade repeatedly without loss of the leaktight seal.

1. Before disconnecting, mark the position of the nut in relation to the fitting body.
2. To reassemble, use a wrench to tighten the nut to original position.
3. Tighten slightly with a wrench until you feel a slight rise in torque.

Tube Cutting

There are two ways to cut tubes:

1. Tube cutter
2. Hacksaw

Tube Cutter

To attain a leak-free connection, cut the tubing squarely. Use a good quality tube cutter with the appropriate blade for the tubing.

Do not try to reduce the time of cutting by taking deep cuts with each turn of the cutter. This will work-harden the tube.

Deburr the end of the tube to avoid damage to the fitting and to ensure that the tube reaches the bottom of the fitting.

Hacksaw Cutting

In order to cut the tube with a hacksaw and get square ends, cut the tube with guide blocks.

If you use this method of cutting, you will need to deburr the tube ends.

Warning!

Do not hold the tube in a vise at the place where it will be inserted into the fitting (the vise will leave a mark on the tube that may cause leaks, and might cause ovality).

Tube Handling

Scratches on the tube might cause leaks. Therefore, use caution in handling the tube in order to reduce the possibility of leaks.

Some precautions to be taken:

1. Tubes must not be dragged on the floor.
2. Tubes must not be dragged out of a tubing rack, especially in case of large OD tubes.

Copper Tubing

If you use copper tubing on a roof, be sure to hold the end of the tube, then, move the tubing away from you, so that it can lie on a flat surface.



PIPELINE

HAM-LET PRECISION INSTRUMENTATION PIPE FITTINGS

To ensure a leak-tight seal, HAM-LET recommends that you use a pipe-thread sealant on all NPT threads. The most effective sealing method is PTFE tape. Tape should be used only on male tapered pipe threads.

Do not use tape on flared, coned or tube fitting ends!

Clean both male and female tapered threads. Wrap tape in the direction of the male tapered thread spiral.

Note: We suggest two wraps for stainless-steel tapered pipe threads. Make sure the tape does not overhang the first thread. Otherwise, the tape could shred and enter the fluid system.

Cut off excess tape.

The connection is now ready for proper makeup.



HTC[®] HI-TECH COMPONENTS

MAKE UP OF GLANDS

- Glands offer a high-purity metal to metal seal for leak-free service in high-vacuum or high-pressure assemblies.
- The gasket is compressed by two highly polished beads when the male and female nuts are engaged.
- The gland bead-to-bead assembly compresses a soft-metal gasket-to-seal. This assembly can be locked by the HAM-LET Grip-Kit (see A below).
- Visual test and leak testing are performed through two test ports in opposite locations from the female nut.

ASSEMBLY INSTRUCTIONS

1. Be sure to protect all HTC face-seal fittings until the assembly and make up. Exercise great care that the sealing surfaces are not scratched, damaged or contaminated in any way during handling and assembly.
2. Always use a clean environment, and always employ proper clean-room protocol for make up and assembly of high-purity fittings and applications.

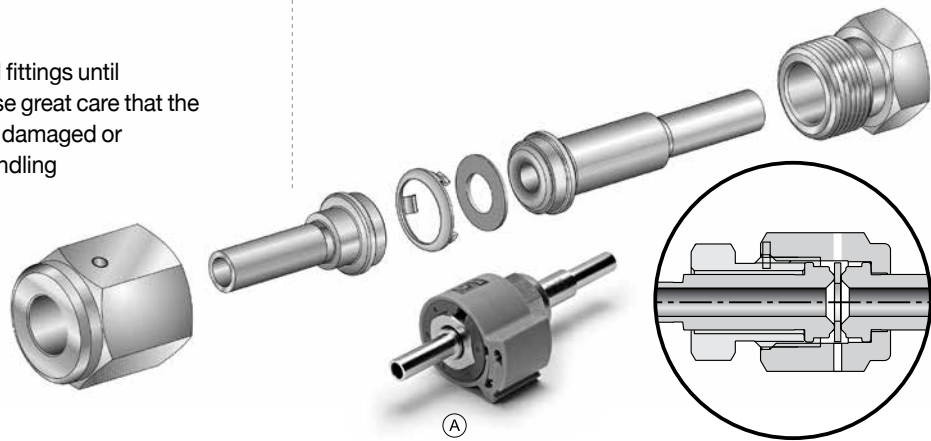
3. Make up instructions:

Tighten the female nut to the male nut/body until it is finger tight.

Tighten the female nut 1/8 of a turn past the finger-tight point.

Always torque the female nut while keeping the male nut/body stationary.

Face seal connections are remakable - please use a new gasket for each remake.





NEEDLE VALVES H-300U SERIES

1. Use

For maximum valve life, use the valve only within the stated pressure and temperature range, and in accordance with the corrosion resistance of the material.

2. Operation

To open the valve, rotate the handle until it comes in contact with the lower gland. This will allow maximum flow through the valve. To close the valve, rotate the handle until the stem tip comes into contact with the seat.

Do not use excessive force when closing the valve. Excessive torque applied to the handle may damage both the seat and stem tip, particularly the soft seat option.

3. Cleaning The Valve

Liquids can be trapped within the valve. If the valve has been used with hazardous media, it must be de-contaminated before disassembly. All personnel involved in the removal and disassembly of the valve should wear appropriate protective clothing, such as face shields, aprons, gloves, etc.

4. Replacing Seat And Stem Seals

If there are signs of leakage through the stem area, and further adjustment is not possible, replace the stem seal. If there are signs of leakage across the seat, replace the stem.

5. Disassembly Procedures

With the valve clamped firmly in a vise:

- Remove the set screw (2) with the appropriate Allen wrench, and remove the handle (1).
- Remove the packing bolt (3).
- Rotate stem counter clockwise until the stem is free from the body.

Note: The stem will be complete with Belleville washers (4) gland (5) upper packing (6) and lower packing (7). Clean and inspect all metal parts for nicks, scratches, etc., particularly the stem tip and the valve seat. Discard any parts that are damaged, and replace them with authorized HAM-LET parts.

- Discard the stem packings and replace it with authorized HAM-LET parts.

Re-Assembly

Reverse the steps above, taking care to lubricate all parts with an appropriate lubricant.

Note: Factory valves are tested at 1,000 psig using N₂.

No leakage from the seat or the stem is allowable after 1 minute with the valve immersed in water.

6. Threaded Valves Installation

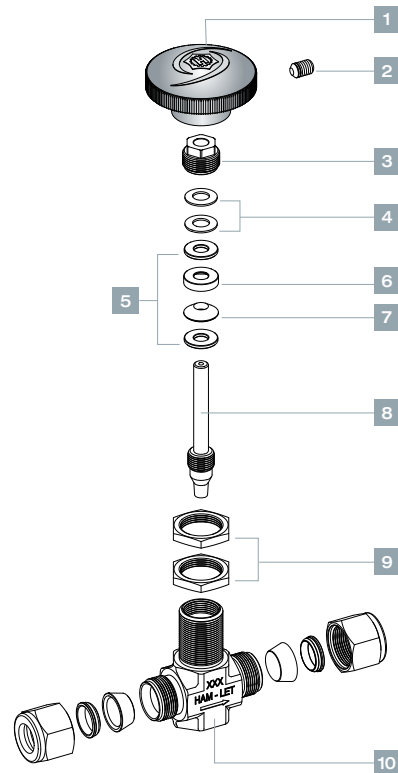
- On tapered threads, use a conventional thread sealant such as PTFE tape or an appropriate alternative that is compatible with the application.
- Apply a wrench to the body and connecting nut. Do not use the handle to tighten the connection.

LET-LOK® Valves

- Ensure the tubing is cut square and that it is de-burred.
- Ensure the tubing is located firmly in the connection.
- From the finger-tight position, rotate the nut a full 1 1/4 turn.

Note: For sizes 3/16 inch (4mm) or less, rotate the nut 3/4 turn only.

V Apply a wrench to the body and connecting nut. Do not use the handle to tighten the connection.





SCREWED BONNET NEEDLE VALVES H-99/H-99HP

1. Use

For maximum valve life, use the valve only within the stated pressure and temperature range, and in accordance with the corrosion resistance of the material.

2. Operation

To open the valve, rotate the handle until it comes in contact with the lower gland. This will allow maximum flow through the valve.

To close the valve, rotate the handle until the stem tip comes into contact with the seat.

Do not use excessive force when closing the valve. Excessive torque applied to the handle may damage both the seat and the stem tip.

3. Cleaning The Valve

Liquids can be trapped within the valve.

If the valve has been used with hazardous media, it must be de-contaminated before disassembly.

All personnel involved in the removal and disassembly of the valve should wear appropriate protective clothing, such as face shields, aprons, gloves, etc.

4. Replacing Seat and Stem Seals

If there are signs of leakage through the stem area, and further adjustment is not possible, replace the stem seal. If there are signs of leakage across the seat, replace the stem.

5. Procedures Disassembly

With the valve clamped firmly in a vise:

- Remove the set screw (1) with the appropriate Allen wrench, and remove the handle (2).
- Remove the packing nut (3).
- Rotate the stem counter clockwise until the stem is free from the body.

Note: The stem will be complete with upper gland (4) the packing (5).

- Clean and inspect all metal parts for nicks, scratches, etc., particularly the stem tip and the valve seat. Discard any parts that are damaged, and replace them with authorized HAM-LET parts.

- Discard the stem packing and replace it with authorized HAM-LET parts.

Re-Assembly

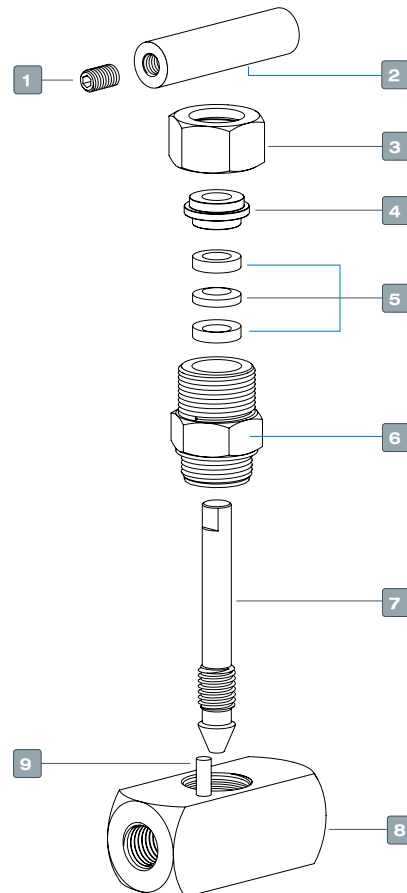
Reverse the steps above, taking care to lubricate all parts with an appropriate lubricant.

Note: Factory valves are tested at 1,000 psig using N₂. No leakage from the seat or the stem is allowable after 1 minute with the valve immersed in water.

6. Installation

Disassembly

- On taper threads, use a conventional thread sealant such as PTFE tape or an appropriate alternative that is compatible with the application.
- Apply a wrench to the body and connecting nut. Do not use the handle to tighten the connection. LET-LOK® Valves
- Ensure the tubing is cut square and that it is de-burred.
- Ensure the tubing is located firmly in the connection.
- From the finger-tight position, rotate the nut a full 1 1/4 turn.
Note: For sizes 3/16 inch (4mm) or less, rotate the nut 3/4 turn only.
- Apply a wrench to the body and connecting nut. Do not use the handle to tighten the connection.





H-400 SERIES CHECK VALVES

1. Use

For maximum valve life, use the valve only within the stated pressure and temperature range, and in accordance with the corrosion resistance of the material. Give particular attention to the compatibility of the O-ring material.

2. Disassembling and Cleaning the Valve

A non-return valve can trap fluids within the body. If the valve has been used in hazardous media service, remove with great care and take appropriate decontamination measures.

All persons involved in the removal and disassembly of the valve should wear proper protective clothing, such as gloves, aprons, face shields, etc.

3. Replacing Seats, Seals and Springs

H-400 valves are designed to give optimum life. Should the valve reveal leaks across the seat:

- A.** Place the body securely in a vise, holding on the hexagon flats.

With an appropriate size wrench, unscrew the end.

Remove the upper (body) and poppet O-rings.

Clean and dry all parts, taking particular care that the seat is not damaged.

- B.** To rebuild the valve:

Replace O-rings. Lubricate the threads and outer surface of the poppet with Halocarbon 27 oil, or an alternative as appropriate for the flowing medium.

Reassemble the poppet and the spring into the body.

Reassemble the end to the body using a torque wrench set to 33 ft. lb (45 NM).

- C.** Should the valve exhibit an opening at less than the stated cracking pressure, follow steps 3A and 3B, replacing the spring with a factory-supplied component.

4. Testing

Test all valves for functionality before placing them into service.

Using clean, dry nitrogen, pressurize the inlet of the valve to cracking pressure. Acceptance criterion: the valve does not pass the nitrogen at $\pm 20\%$ of cracking pressure when immersed in water for one (1) minute.

Using clean, dry nitrogen, pressurize the outlet of the valve to 2000 psig.

Acceptance criterion: no leakage from the body/end connection when it is immersed in water for one (1) minute.

5. Installation

Apply wrench on the hexagon adjacent to the end being connected. Do not grip the body with vise grips or similar tools.

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.





H-500 SERIES 3-PIECE BALL VALVES

1. Use:

- 1.1 For maximum valve life, use the valve only within the stated pressure and temperature range, and in accordance with the corrosion resistance of the material. Give particular attention to the compatibility of the O-ring material.

2. Manual Operation

- 2.1 To open or close the valve, turn the handle 1/4 of a turn (90 degrees).
 - A. When the valve is in the Open Position, the handle is parallel (in-line) with the valve or pipeline.
 - B. When the valve is in the Closed Position, the handle is perpendicular (crossed) to the valve or pipeline.

3. Automated Operation

- 3.1 Check any valve with an actuator for valve-stem alignment. Angular or linear misalignment will result in high operational torque and unnecessary wear on the stem seal.

4. Disassembling & Cleaning of the Valve:

A ball valve can trap fluids in the ball cavity when it is in the closed position. If the valve has been used in a hazardous medium, decontaminate it before disassembly.

- A. Relieve the line pressure.
- B. Place the valve in the half-open position and flush the line to remove any hazardous material from the valve.
- C. All persons involved in the removal and disassembly of the valve should wear proper protective clothing, such as face shields, gloves, aprons, etc.

5. Replacing Seats, Joint Gaskets, Stem Seal and Stem Packing

Model H-500 is designed with Belleville washers for automatic seal wear compensation. If there is any sign of leakage from the stem, replace the stem packing and the stem seal. If there is any sign of internal leakage, replace the ball seats.

- 5.1 When replacing the seats and joint gaskets, refer to the assembly diagram.
 - A. Follow the above Disassembling & Cleaning Instructions (number 4, above). Make sure the pipeline is de-pressurized.
 - B. With the valve in the open position (lever parallel to the axis of the pipe), loosen all the nuts on the body bolting. Remove all the bolts except one. Swing

the body outside the pipe.

- C. Turn the handle to the half-open position to assist in the removal of the seats.
 - D. Replace with a new set of seats and joint gaskets.
 - E. Swing the body back into position. Replace the removed bolt, and tighten the bolts according to the Bolt Tightening Specification Table on the next page.
- 5.2 When replacing the stem seal and stem packing, refer to the assembly diagram.
 - A. Follow the direction for replacing the seats and joint gaskets from 5.1.A to 5.1.C.
 - B. To assist in loosening the stem nut, place a rod of a diameter smaller than the ball orifice into the ball orifice. Loosen and remove the top stem nut with a wrench. Remove the stem washer, handle and lock saddle. Place all removed parts in a clean and secure place.
 - C. Loosen and remove the second stem nut with a wrench. Remove the set of Belleville washers. Place all removed parts in a clean and secure place.
 - D. Remove the rod. Turn the valve to the closed position (handle perpendicular to the pipeline). Remove the seats and gaskets. The ball should slide out with a gentle push. Place all removed parts in a clean and secure place.
 - E. Push the stem downward. It should come out through the center body. Remove the stem, then remove the stem seal. Thoroughly clean the stem. Replace it with a new stem seal.
 - F. Remove the stem packing from the center body cavity. Thoroughly clean the center body. Insert a new stem packing.
 - G. Replace the stem, the Belleville washers and the gland. Replace the first stem nut. To tighten the nut, hold the stem in place and tighten the nut with a wrench. When tightening the stem nuts, make sure they are snug and the Belleville washer is compressed to the maximum extent. Replace the lock saddle, the stem handle, the stem washer and the top stem nut. Tighten the top stem nut with a wrench.
 - H. Turn the valve to the closed position (handle perpendicular to the pipeline). Replace the ball. Turn the valve to the open position (handle parallel to the pipeline). Replace the seats and joint gaskets.
 - I. Swing the center body back into position. Replace the removed bolts and nuts. Tighten the nuts according to the Bolt Tightening Specification Table.



H-500 SERIES 3-PIECE BALL VALVES

6. General Information for On-Site Installation:

- 6.1 The valve may be fitted in any position on the pipeline.
- 6.2 To prevent damage to the seats and ball surface, make sure the pipeline is flushed, free of dirt, burrs and welding residues before installing the valve.

7. Installation of Threaded Valves

- 7.1 Use a conventional sealant, such as a hemp core, PTFE, etc.
- 7.2 Apply a wrench to the hexagon end of the valve only. Tightening by using the valve body or handle can seriously damage the valve.
- 7.3 For applications where the screwed end valves are back-welded on site, dismantle these valves according to the instructions for weld end valves.

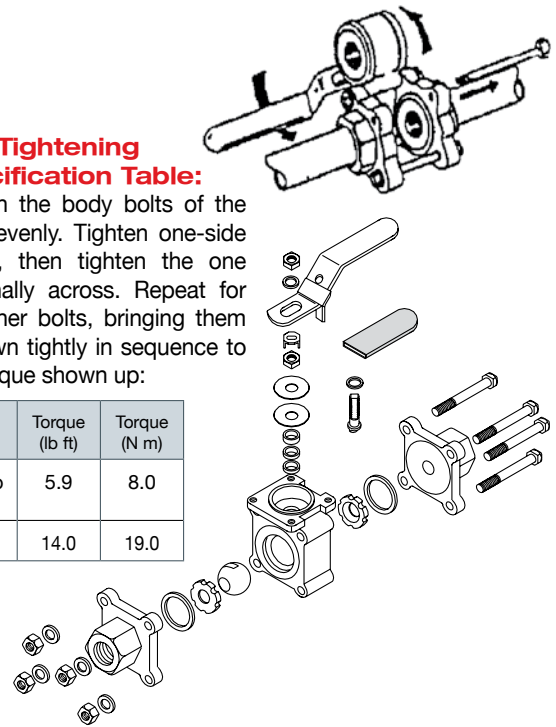
8. Installation Of Weld End Valves

- 8.1 Tack-weld the valve onto the pipe in four points on both end caps.
- 8.2 With the valve in the open position (lever parallel to the axis of the pipe), loosen all of the nuts on the body bolts. Remove all of the bolts except one. Swing the body outside the pipe.
- 8.3 Turn the handle to the half-open position to assist in the removal of the seats and joint gaskets.
- 8.4 Turn the handle to the closed position and remove the ball.
- 8.5 Place all removed parts in a clean and secure place.
- 8.6 Replace the body and the removed bolt. Tighten all nuts slightly.
To prevent any leakage to the body joints after welding, make sure that the body and the end caps remain perfectly parallel.
- 8.7 Finish welding both end caps onto the pipe.
- 8.8 After the pipeline and valve cool, clean the end caps, then remove the previous, and replace the bolt. Swing out the body.
Turn the valve to the closed position, then replace the ball. Turn the valve to the open position and replace the seats and joint gaskets.
- 8.9 After you have replaced the seats, joint gaskets and ball, swing the body into position, replace the removed bolts and nuts, and tighten the nuts according to the Bolt Tightening Specification Table.

Bolt Tightening Specification Table:

Tighten the body bolts of the valve evenly. Tighten one-side snugly, then tighten the one diagonally across. Repeat for the other bolts, bringing them all down tightly in sequence to the torque shown up:

Valve Size	Torque (lb ft)	Torque (N m)
1/4" to 3/4"	5.9	8.0
1"	14.0	19.0



Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.



H-700 SERIES BALL VALVES WITH LOCKING DEVICE

1. Use

For maximum valve life, use the valve only within the stated pressure and temperature range, and in accordance with the corrosion resistance of the material.

2. Operation

To open or close the valve, turn the handle 1/4 of a turn (90°).

3. Cleaning the Valve

A ball valve can trap fluids in the ball cavity when it is in the closed position. If the valve has been used in the hazardous medium, decontaminate it before disassembly.

All persons involved in the removal and disassembly of the valve should wear appropriate protective clothing, such as face shields, aprons, gloves, etc.

4. Replacing Seats and Stem Seals.

Type H-700 is designed with Belleville washers for automatic stem-seal wear compensation. If there are signs of leakage through the stem area, replace the stem seals.

If there are signs of internal leakage, replace the seat seals.

5. Procedures Disassembly

With the valve clamped firmly in a vise:

- Remove the nut, spring washer, handle, Belleville washer, thrust washer and top packing. Place in a secure, clean area.
- Remove the end connection/internal nut and body seal.
- Rotate the ball to the closed position and remove the ball and seat seals. Inspect the ball for any surface damage. If there are no nicks, scratches or other surface damage, place the ball in a clean, secure area.
- Remove the stem, and lower the packing from the body cavity.
- Scrap all plastic parts and replace them with authorized HAM-LET parts.
- Clean and inspect all metal parts, and replace as necessary with authorized HAM-LET parts.

Reassembly

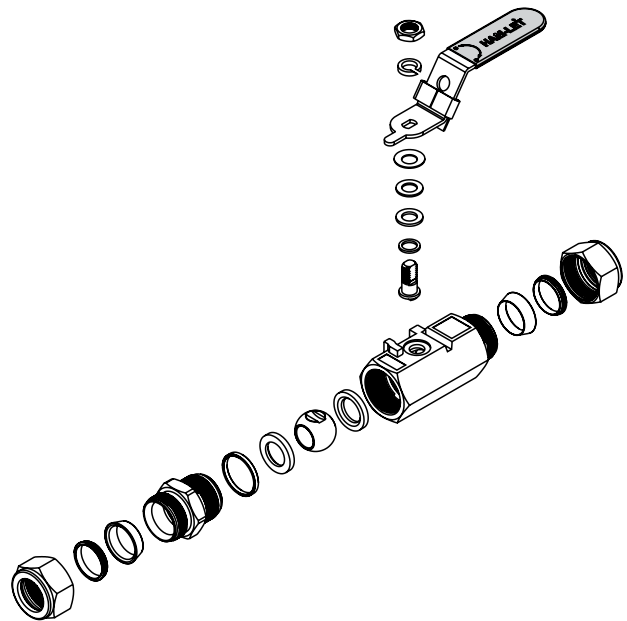
Reverse the steps above, taking care to lubricate all of the parts with an appropriate lubricant.

Notes:

- The end connection/internal nut must be firmly closed.
- The stem nut must be closed with sufficient torque to deflect the belleville washer.

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.





H-6800 SERIES INSTRUMENTATION BALL VALVES

General Note

When a ball valve is removed or installed in a tube system, a back-up wrench (spanner) must be used on the end connector, NOT on the valve body.

Tube Fitting Connectors (LET-LOK® Twin-Ferrule Compression Fittings)

1. Insert the tubing, nesting it in the counterbore.
2. Ensure that the nut is finger tight, and mark the nut for reference.
3. Now tighten the nut 1 1/4 turns.

Note: For sizes 1/16 to 3/16 inch (2 to 4 mm), tighten 3/4 of a turn only from the finger tight position.

Taper Threaded Connectors

(NPT, BSPT, Male or Female)

1. On the male thread of the connector, apply PTFE tape or high-quality sealing compound. When PTFE tape is used, no more than two full turns of the tape should be applied. The tape must not overhang the end of the connector.
2. Screw until the valve and connector together until they are hand tight.
3. With the proper size wrench (spanner), holding both sides of the connector (not the valve body), continue to tighten until a leak-tight joint is achieved.

Welded Connectors

1. We recommend disassembling all valves prior to welding in order to avoid damage to seats and seals.
2. If the valve must be welded when fully assembled, put the valve in the full open position, and continuously purge it with cool gas. People who have been trained in established procedures should perform all the welding tasks.
3. For socket weld ports: insert the tube into the connector until it bottoms out against the stop, then pull it back approximately 1/16 of an inch (1.5 mm) and weld. This will help avoid excess static stress.

Packing Adjustment

Due to the varied service applications of the valve, packing adjustment may occasionally be necessary. We recommend initial adjustment after installation and prior to start-up.

1. Remove the handle by turning the set screw counter clockwise using the appropriate hex-socket tool.
2. Tighten the packing nut 1/8 to 1/4 of a turn.
3. Replace the handle and retighten the set screw.

Installation of Panel-Mounted Valves

Valve Size	Max. Panel Thickness	Panel Hole Diameter
1/4	6.5 mm	19.3 mm
1/2	6.5 mm	20.8 mm

1. Remove the handle by turning the set screw counter-clockwise using the appropriate hex-socket tool.
2. Insert the valve through the panel hole and assemble the panel nut.

Note: If the valve is mounted to a thin panel, it may be necessary to fit a spacer (washer) to the valve to allow proper engagement of the panel nut.

3. If required, adjust the stem packing as explained above.
4. Replace the handle and retighten the set screw.

Maximum Allowable Working Pressures and Temperatures

Seat Material	Valve Body Material	
	Brass	Stainless Steel
Modified PTFE (PTFE)	3,000 psig@100°F	3,000 psig@100°F
PCTFE	3,000 psig@100°F	6,000 psig@100°F
PEEK	3,000 psig@100°F	6,000 psig@100°F

For allowable pressure at various temperatures, see the graph in main the catalogue.

Warning!

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H-900 SERIES RELIEF VALVES

INTRODUCTION

The H-900 Series Relief Valves are designed and tested in accordance with MSS standard SP-99-1994 (R2005) - (Instrument Valves). This type of valves is intended for use under relatively low operating pressures (ranging from 10 psig to 225 psig), in unfavorable working conditions and can be implemented in either gas or liquid applications. The valves are manufactured from ASTM-A276 body construction and are available in male and female NPT / BSPT pipe threads and LET-LOK (compression) connectors.

General

H-900 series is a relief valve intended for use in low-pressure applications. The valve is normally closed and opens when the system pressure reaches a set level. It then returns to the closed position when the system pressure falls below the set level.

Features

- Made from St.St 316.
- Service pressure up to 300psig.
- Available set pressures between 10 psig and 225 psig (0.69 to 15.5 Bar).
- Available in male and female NPT / BSPT pipe threads and Let-Lok (compression) connectors.
- Available sizes: 1/4" or 6mm.

Cleaning & Packaging

Every H-900 series Relief valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Testing

The designs of the HAM-LET H-900 Series Relief Valves have been tested for proof, burst and leakage. Every relief valve is factory-tested for proper set and resealing performance.

SAFETY INSTRUCTIONS

General

- All installation and/or maintenance operations must be obtained when the system pressure is fully relieved.
- All installation and/or maintenance operations must follow User Manual Instructions.
- Use only appropriate tools, which are designed and built for the specific operation.
- Plan your action carefully in advance, especially when dealing with extreme temperature, pressure and corrosive materials.
- Use proper protection and safety devices during maintenance.

Volume Considerations

While evaluating the volume to be relieved, all system volumes should be considered, i.e.: system lines, pumps, bulk tanks, etc.

Oxygen Applications

For oxygen applications, work shall be carried out according to the procedures for working with oxygen. In a case where spare kits are ordered for oxygen clean valves, such kits have to be ordered as "oxygen clean" by adding the "- OC" designator. Example: Z-900-SK-1/4-VI-OC

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

All safety valves which are intended to be used by 'end users' located within the European Community must be 'CE' marked. The distributor of the valves bears the responsibility for the follow-up of the above-mentioned issue, in case he is not the 'end user'.



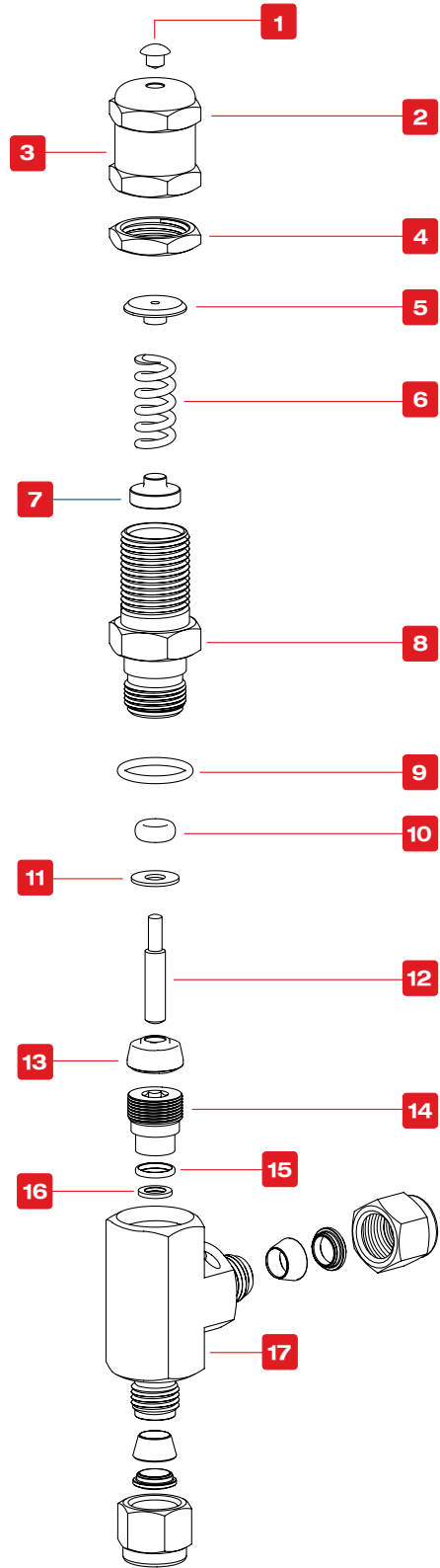
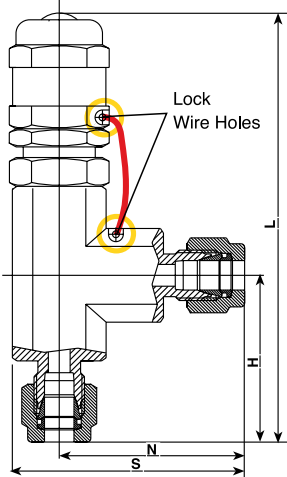
H-900 SERIES (Cont'd) RELIEF VALVES

H-900 - MATERIALS

No.	Part	Qty.	Valve Body Material
1	Cap Plug	1	Polypropylene
2	Adjustment Cap	1	St.St. 316
3	Cap Lable	1	Polyester
4	Spring	1	St.St. 302
5	Locking Nut	1	St.St. 316
6	Spring Support Disc	1	St.St. 316
7	Bonnet	1	St.St. 316
8	O-Ring	1	Fluorocarbon FKM
9	Stem	1	St.St. 316
10	O-Ring	1	Fluorocarbon FKM
11	Retaining Ring	1	PH1-57 Mo
12	Poppet	1	St.St. 316
13	Seal	1	Fluorocarbon FKM
14	Insert	1	St.St. 316
15	Packing	1	PTFE
16	Ring	1	St.St. 316
17	Body	1	St.St. 316

DIMENSIONS

Description	Connection / size		Dimensions mm:			
	inlet	outlet	H	N	S	L
H900	1/4 LET-LOK®	1/4 LET-LOK®	37	39	50	105
H900	6MM LET-LOK®	6MM LET-LOK®	37	39	50	105
H985	1/4 Male NPT	1/4 Female NPT	32	30	40	100
H995	1/4 Male NPT	1/4 LET-LOK®	32	39	50	100





H-900 SERIES (Cont'd) RELIEF VALVES

MAINTENANCE

Tool Requirement

- 3/4" wrench.
- 5/16" Allen (Hex) key.
- O-ring installation and removal tools.
- Retaining ring installation and removal tool.

Cracking Pressure Adjustment

1. Thread the adjustment cap (3) onto the bonnet (7) - 9 full turns.
2. Tighten the locking nut (5) against the adjustment cap (2) and test for set pressure.
3. Relieve the system pressure; unthread the adjustment cap (2) as needed (use the manual or a 3/4" wrench). Repeat the procedure as necessary to obtain the desired set pressure.
 - 3.1 A clockwise rotation of the adjustment cap (2) will increase the spring force and the cracking pressure of the valve.
 - 3.2 A counter-clockwise rotary of the adjustment cap (2) will decrease the spring force and the cracking pressure of the valve.
4. Tighten the locking nut (5) against the adjustment cap (2).
5. Lock wire the adjustment cap (2) and the valve body (17) to maintain the relief setting.

H-900 Series - Spring Installation / Replacement

Warning: Relieve the system pressure before any valve maintenance.

Content:

- 1 x Spring (4)
- 1 x Label (3)
- 1 x Lock wire
- 1 x Lead

1. Select the desired spring according to the Nominal Cracking Pressure Range as shown at the "material of construction" section above.
2. Loosen the locking nut (5) with a 3/4" wrench (clockwise) and remove the adjustment cap (2) with a 3/4" wrench (counter-clockwise) from the bonnet (7).
3. Remove the spring (4).
4. Make sure all of the components are clean of burrs.
5. Insert the selected spring (4) inside the bonnet (7).

6. Replace the existing cracking pressure range label (3) with a new one. Ensure that the pressure range, which is written on the Label (3), is in compliance with the installed spring (4) range.
7. Screw the adjustment cap (2) onto the bonnet (7) with a 3/4" wrench.
8. Perform the Cracking Pressure Adjustment procedure described above.

Valve Testing Guidelines.

1. Connect the Relief Valve inlet to the pressure source.
2. Connect the Relief Valve outlet to any leak detecting device.
3. Increase the inlet pressure slowly.
4. Verify that an initial flow from the outlet will occur at the pre-set pressure.
5. Repeat the adjustment procedure as necessary to set the desired cracking pressure.

Note:

For proper maintenance of the H-900 Series Relief Valves, a service cycle and setting validation of at least once each 1/2 year is recommended. The inspection, maintenance and testing can be incorporated into the annual inspection procedure to ensure proper operation and many years of trouble-free service.

The life span of the main valve seal depends upon varied factors, such as:

- Chemical resistance of the seal to the system medium
- The volume of fluid, passed through the valve.
- The operating pressure
- The quantity of dirt and other foreign particles present.

H-900 SERIES SEAL KIT REPLACEMENT.

Content:

- 1 x O-ring (8)
- 1 x O-ring (10)
- 1 x Retaining ring (11)
- 1 x Bonded poppet (12)

Oxygen Applications

For oxygen applications, work shall be carried out according to the procedures for working with oxygen. In a case where spare kits are ordered for "oxygen clean" valves, such kits have to be ordered as oxygen clean by adding the "-OC" designator. Example: Z-900-SK-1/4-VI-OC



H-900 SERIES (Cont'd) RELIEF VALVES

Disassembly and Seal Removal

Warning: Relieve the system pressure before any valve maintenance.

1. Clamp the valve body in a vise.
2. Remove the adjustment cap (2).
3. Remove the bonnet (7) from the body (17) - use a 3/4" wrench and rotate counter-clockwise for opening.
4. Remove stem (9) by pulling it from the bonnet (7) bore.
5. Remove the O-ring (8) from the bonnet (7).
6. Remove carefully the retaining ring (11) from the bonnet (7).
Caution: The retaining ring is a spring stainless clip. Do not direct it at a person.
7. Remove the O-ring (10) from the bonnet (7).
8. Remove the bonded poppet (12) by turning the valve upside down.
9. Discard all soft (wetted) parts.
10. Inspect all parts for nicks, scratches and dents. Discard as appropriate. Replace with HAM-LET parts only.

Reassembly And Seal Installation

1. Clamp the valve body in a vise.
2. Make sure all parts are clean before installation.
3. Install a new bonded poppet (12) in the body (7) (upright position), when the seal of the bonded poppet is faced downward.
4. Install a new O-ring (10) (lubricate with system compatible lubricant) into the bonnet (7).
5. Install new retaining ring (11) (make sure the teeth are pointing away from the quad-ring).
6. Insert the stem (9) into the bonnet (7) through o-ring (9) until it bottoms.
7. Install new o-ring (8) on the bonnet (7) (Lubricate with system compatible lubricant).
8. Install the bonnet (7) into the body (17) and tighten the bonnet to 68N*m (600lb.*in).
9. Perform the adjustment procedure before installing in the system.

Troubleshooting

Warning: Relieve system pressure before any valve maintenance.

Symptom	Possible Causes	Corrective Action
Relief valve remains open	Leakage through bonded poppet seal (13)	Replace bonded poppet (12)
Relief valve opens below set pressure	Loss of spring force/Mechanical grip.	Remove adjustment cap (2). Clean spring (4), bonnet (7) and adjustment cap (2) from particles.
Relief valve opens above set pressure	Friction on the mechanical working mechanism. Leakage through any attached auxiliary system such as emergency shutdown system, remote operators, etc.	Check auxiliary systems for leaks, and readjust pressure. Disassemble, clean parts and perform cracking pressure adjustment procedure.
Unable to control the valve for shut-off	The spring range is too low.	Choose H-900HP Series valve with higher-pressure range spring.
Unable to relieve the pressure from the system after cracking	Relief valve too small. Too much gas capacity to complete cycle.	Choose a larger size of Relief valve.

For oxygen applications, work shall be carried out according to the procedures for working with oxygen. In a case where spare kits are ordered for "oxygen clean" valves, such kits have to be ordered as oxygen clean.



H-900 HP SERIES HIGH-PRESSURE RELIEF VALVES



INTRODUCTION

The H-900HP Series Relief Valves are designed and tested in accordance with MSS standard SP-99-1994 (R2005) - (Instrument Valves). This type of valves is intended for use under extremely high operating pressures (ranging from 50 psig to 6000 psig) and in unfavorable working conditions, and can be implemented in either gas or liquid applications. The valves are manufactured from ASTM-A276 body construction, and are available in male and female NPT / BSPT pipe threads and LET-LOK (compression) connectors.

General

H-900HP series is a relief valve intended for use in high-pressure applications. The valve is normally closed and opens when the system pressure reaches a set level. It then returns to the closed position when the system pressure falls below the set level.

Features

- Made from St.St 316.
- Service pressure up to 6000 psig.
- Available set pressures between 50 psig and 6,000 psig (3.44 to 413.8 Bar).
- Color-coded springs for each pressure range
- Replaceable springs for a wide range of pressures
- Available in male and female NPT / BSPT pipe threads and LET-LOK (compression) connectors.
- Available sizes: 1/4" or 6mm.

Cleaning & Packaging

Every H-900HP series Relief valve is cleaned in accordance with Standard Cleaning and Packaging (procedure 8184). Oxygen Clean & Lubricant Free Cleaning and packaging, in accordance with Special Cleaning and Packaging (procedure 8185), is available as an option.

Testing

The designs of the HAM-LET H-900HP Series Relief Valves have been tested for proof, burst and leakage. Every relief valve is factory-tested for proper set and resealing performance.

SAFETY INSTRUCTIONS

General

- All installation and/or maintenance operations must be obtained when the system pressure is fully relieved.
- All installation and/or maintenance operations must follow User Manual Instructions.
- Use only appropriate tools, which are designed and built for the specific operation.
- Plan your action carefully in advance, especially when dealing with extreme temperature, pressure and corrosive materials.
- Use proper protection and safety devices during maintenance.

Volume considerations

While evaluating the volume to be relieved, all system volumes should be considered, i.e.: system lines, pumps, bulk tanks, etc.

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

All safety valves which are intended to be used by 'end users' located within the European Community must be 'CE' marked. The distributor of the valves bears the responsibility for the follow-up of the above-mentioned issue, in case he is not the 'end user'.



H-900 HP SERIES (Cont'd) HIGH-PRESSURE RELIEF VALVES



H-900 HP MATERIALS

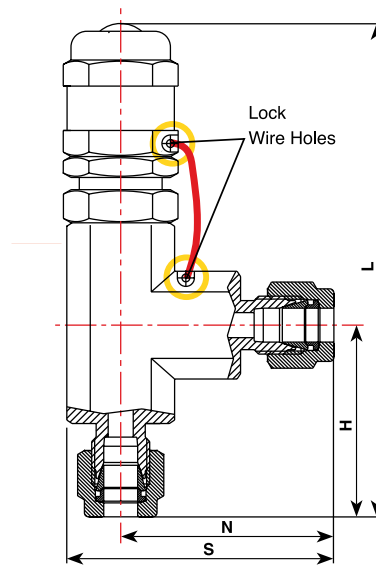
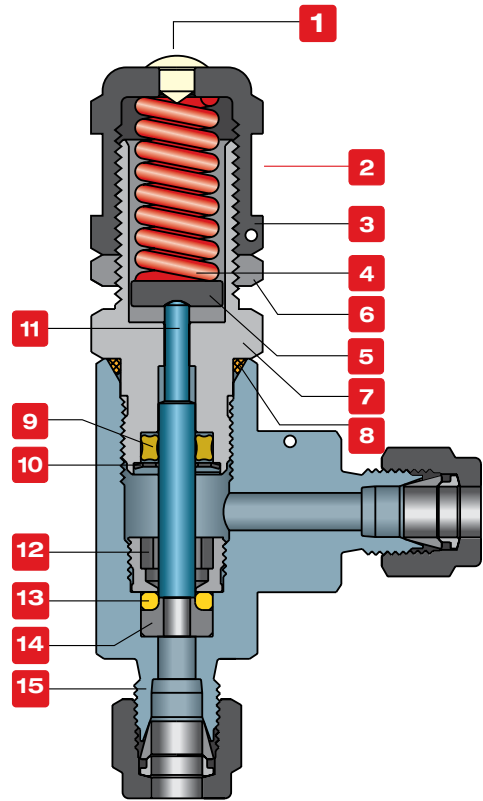
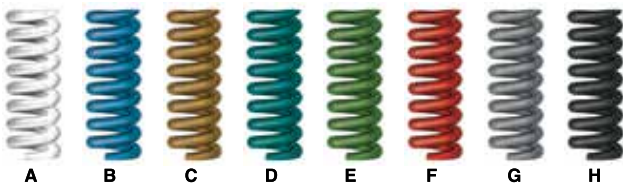
No.	Part	Qty.	Valve Body Material
1	Cap Plug	1	PTFE
2	Label	1	PVC
3	Adjustment Cap	1	St.St 316
4	Spring	1	St.St. 302, 17-7PH
5	Lower Spring Button	1	St.St 316
6	Locking Nut	1	St.St 316
7	Bonnet	1	St.St 316
8	O-Ring	1	Fluorocarbon FKM
9	Quad Ring	1	Fluorocarbon FKM
10	Retaining Ring	1	PH15-7Mo
11	Poppet	1	St.St 316
12	Clamps Screw	1	St.St 316
13	O-Ring	1	Fluorocarbon FKM
14	Insert	1	St.St 316
15	Body	1	St.St 316

DIMENSIONS

Description	Connection / size		Dimensions mm:			
	inlet	outlet	H	N	S	L
H900-HP	1/4 LET-LOK®	1/4 LET-LOK®	37	39	50	105
H900-HP	6MM LET-LOK®	6MM LET-LOK®	37	39	50	105
H985-HP	1/4 Male NPT	1/4 Female NPT	32	30	40	100
H995-HP	1/4 Male NPT	1/4 LET-LOK®	32	39	50	100

NOMINAL CRACKING - PRESSURE RANGE

psig	Bars	Spring Designator	Color
50-350	24 - 3.4	A	White
350-750	24 - 51.5	B	Blue
750-1500	103 - 51.5	C	Gold
1500-2250	103 - 155	D	Turquoise
2250-3000	206 - 155	E	Green
3000-4000	206 - 275	F	Red
4000-5000	344 - 275	G	Silver
5000-6000	344 - 413	H	Black





H-900 HP SERIES (Cont'd) HIGH-PRESSURE RELIEF VALVES



MAINTENANCE

Tool Requirement

- 3/4" wrench.
- 1/4" Allen (Hex) key.
- O-Ring installation and removal tools.
- Retaining ring installation and removal tool.

Cracking Pressure Adjustment

1. Thread the adjustment cap (3) onto the bonnet (7) - 9 full turns.
2. Tighten the locking nut (6) against the adjustment cap (3) and test for set pressure.
3. Relieve the system pressure; unthread the adjustment cap (3) as needed (use the manual or a 3/4" wrench). Repeat the procedure as necessary to obtain the desired set pressure.
 - 3.1 A clockwise rotation of the adjustment cap (3) will increase the spring force and the cracking pressure of the valve.
 - 3.2 A counter-clockwise rotation of the adjustment cap (3) will decrease the spring force and the cracking pressure of the valve.
4. Tighten the locking nut (6) against the adjustment cap (3).
5. Lock wire the adjustment cap (3) and the valve body (15) to maintain the relief setting.

H-900 HP Series

Spring Installation / Replacement

Warning: Relieve the system pressure before any valve maintenance.

Content:

- 1 x Spring (4)
- 1 x Label (3)
- 1 x Lock wire
- 1 x Lead

1. Select the desired spring according to the Nominal Cracking Pressure Range as shown at the "material of construction" section above.
2. Loosen the locking nut (6) with a 3/4" wrench (clockwise) and remove the adjustment cap (3) with a 3/4" wrench (counter-clockwise) from the bonnet (7).
3. Remove the spring (4).
4. Make sure all of the components are clean of burrs.
5. Insert the selected spring (4) inside the bonnet (7).

6. Replace the existing cracking pressure range label (2), with a new one. Ensure that the pressure range, which is written on the Label (2), is in compliance with the installed spring (4) range.
7. Screw the adjustment cap (3) onto the bonnet (7) with a 3/4" wrench.
8. Perform the Cracking Pressure Adjustment procedure described above.

Valve Testing Guidelines.

1. Connect the Relief valve's inlet to the pressure source.
2. Connect the Relief valve's outlet to any leak detecting device.
3. Increase the inlet pressure slowly.
4. Verify that an initial flow from the outlet will occur at the pre-set pressure.
5. Repeat the adjustment procedure as necessary to set the desired cracking pressure.

Note:

For proper maintenance of the H-900HP Series Relief Valves, a service cycle and setting validation of at least once each 1/2 year is recommended. The inspection, maintenance and testing can be incorporated into the annual inspection procedure to ensure proper operation and many years of trouble-free service.

The life span of the main valve seal depends upon varied factors, such as:

- Chemical resistance of the seal to the system medium
- The volume of fluid, passed through the valve.
- The operating pressure
- The quantity of dirt and other foreign particles present.

H-900 HP SERIES SEAL KIT REPLACEMENT.

Content:

- 1 x O-Ring (8)
- 1 x Quad-ring (9)
- 1 x Retaining ring (10)
- 1 x O-Ring (13)

Oxygen Applications

For oxygen applications, work shall be carried out according to the procedures for working with oxygen. In a case where spare kits are ordered for "oxygen clean" valves, such kits have to be ordered as "oxygen clean" by adding "-OC" designator. Example: Z-900-HP-SK-1/4-VI-OC



H-900 HP SERIES (Cont'd) HIGH-PRESSURE RELIEF VALVES



Disassembly and Seal Removal

Warning: Relieve the system pressure before any valve maintenance.

1. Clamp the valve body in a vise.
2. Remove the adjustment cap (3).
3. Remove the bonnet (7) from the body (15) - use a 3/4" wrench and rotate counter-clockwise for opening.
4. Remove the poppet (11) by pulling it from the bonnet (7) bore.
5. Remove the O-ring (8) from the bonnet (7).
6. Remove carefully the retaining ring (10) from the bonnet (7).
Caution: The retaining ring is a spring stainless clip. Do not direct it at a person.
7. Remove the Quad-ring (9) from the bonnet (7).
8. Remove the clamp screw (12) from the body (15). Rotate the clamp screw counter-clockwise for opening. Use a 1/4" Allen (hex) key.
9. Remove the O-ring (13) from the body (7).
10. Discard all soft (wetted) parts.
11. Inspect all parts for nicks, scratches and dents.
Discard as appropriate. Replace with HAM-LET parts only

Reassembly And Seal Installation

1. Clamp the valve body in a vise.
2. Make sure all parts are clean before installation.
3. Install a new O-ring (13) in the body (7) (lubricate with system compatible lubricant).
4. Thread clamp screw (12) in the body (15). Tight permanently with 1/4" Allen (hex) key.
5. Install new quad-ring (9) (Lubricate with system compatible lubricant) into the bonnet (7).
6. Install new retaining ring (10) (make sure the teeth are pointing away from the quad-ring).
7. Insert the poppet (11) into the bonnet (7) through the quadring (9) until it bottoms.
8. Install new o-ring (8) on the bonnet (7) (Lubricate with system compatible lubricant).
9. Install the bonnet (7) into body (15) and tighten bonnet to 68N*m (600lb.*in).
10. Perform the adjustment procedure before installing in the system.

Troubleshooting

Warning: Relieve system pressure before any valve maintenance.

Symptom	Possible Causes	Corrective Action
Relief valve remains open	Leakage through O-Ring seal (13)	Replace O-Ring (13)
Relief valve opens below set pressure	Loss of spring force/ Mechanical grip.	Remove adjustment cap (3). Clean spring (4), bonnet (7) and adjustment cap (3) from particles.
Relief valve opens above set pressure	Friction on the mechanical working mechanism. Leakage through any attached auxiliary system such as emergency shutdown system, remote operators, etc.	Check auxiliary systems for leaks, and readjust pressure. Disassemble, clean parts and perform cracking pressure adjustment procedure.
Unable to control the valve for cracking	The spring range is too high.	Choose a spring with lower pressure range.
Unable to control the valve for shut-off	The spring range is too low.	Choose a spring with higher-pressure range.
Unable to relieve the pressure from the system after cracking	Relief valve too small. Too much gas capacity to complete cycle.	Choose a larger size of Relief valve.

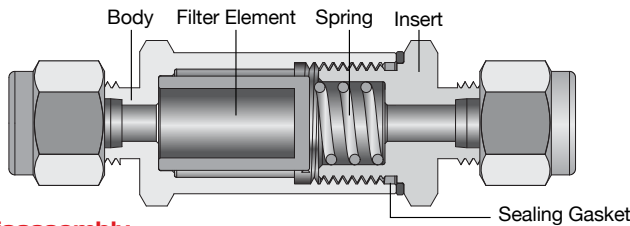
■ For oxygen applications, work should be carried out according to the procedures for working with oxygen. In a case where spare kits are ordered for "oxygen clean" valves, such kits have to be ordered as oxygen clean.



H-600 SERIES T-TYPE & IN-LINE FILTERS

H-600 IN-LINE FILTER

Customer's Instructions for Disassembly and Reassembly



Disassembly

Use a suitable wrench to loosen the body from the insert, then remove the element, spring and sealing gasket.

Reassembly

1. Prior to reassembly, clean the filter house and make sure that all other components are clean and free of contaminants.
2. Place the element in the filter body so that the open end of the element is parallel to the element seat diameter.
3. Lubricate the sealing gasket gently. The recommended oil: Fluorolube grade T-80. Put the sealing gasket in its place.
4. Mount the sealing gasket on the insert.
5. Place the spring inside the insert.
6. Close the nut manually. Make sure that the sealing gasket is correctly placed.
7. Use a moment wrench to affix the insert more tightly onto the body, according to the Table below.
8. Connect the filter to the pressure line and check the filter for correct operation. Use liquid leak detectors to ensure there is no leakage.

Table Nut Tightening Moment lb ft (Nm)

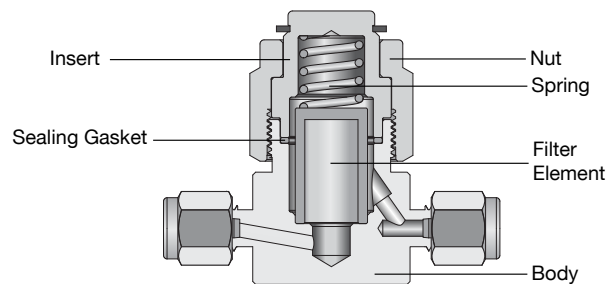
	Standard Assembly		With no lubrication on the sealing gasket (used for special applications)	
	SS	Brass	SS	Brass
)H-600 -1/8 H-600-3mm	7.4 (10)	5.9 (8)	11.8 (16)	5.9 (8)
H-600 -1/4 H-600 - 6mm	19.9 (27)	11.0 (15)	33.2 (45)	16.2 (22)
H-600 -3/8 H-600 -8mm H-600 -10mm H-600 -12mm H-600 -1/2	44.3 (60)	23.6 (32)	73.8(100)	33.2 (45)

Warning!

The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered for each selected product. Improper selection, installation or use of products can cause property damage or personal injury.

H-600 FILTER T-TYPE

Customer Instructions for Disassembly and Reassembly



Disassembly

Use a suitable wrench to loosen the body from the insert, then remove the element, spring and sealing gasket.

Reassembly

1. Prior to reassembly, clean the filter house and make sure that all other components are clean and free of contaminants.
2. Place the element in the filter body so that the open end of the element is parallel to the element seat diameter.
3. Lubricate the sealing gasket gently. The recommended oil: Fluorolube grade T-80. Put the sealing gasket in its place.
4. Place the spring inside the insert.
5. Close the nut manually.
6. Use a moment wrench to tighten the nut, according to the Table below.
7. Connect the filter to the pressure line and check the filter for correct operation. Use liquid leak detectors to ensure there is no leakage.

Table Nut Tightening Moment lb ft (Nm)

	Standard Assembly		With no lubrication on the sealing gasket (used for special applications)	
	SS	Brass	SS	Brass
H-600R -1/8 H-600R-3mm H-600R -1/4 H-600R - 6mm	44.3 (60)	39.1 (53)	47.9 (65)	39.1 (53)
H-600R -3/8 H-600R -8mm H-600R -10mm H-600R -12mm H-600R -1/2	52.4 (71)	39.1 (53)	56.8 (77)	39.1 (53)

SCOPE

The information provided in these Operating and Installation Instructions guide supply information and guidelines relating to the selection, application, set-up options, installation and operation applies to pressure gauges with an elastic sensing element.

The information in this guide is to be used as guideline recommendations and is not in any way replacing the user's

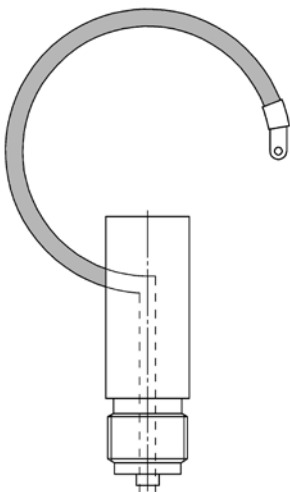
responsibility to verify and carefully select the suitable products, connections, pressure ranges and any other aspect of its application and process to ensure a safe and reliable use of the products referred by this guide.

The EN873 or ASME B40.1 standards are advised to be used as reference guidelines for the selection, installation and operation of pressure gauges.

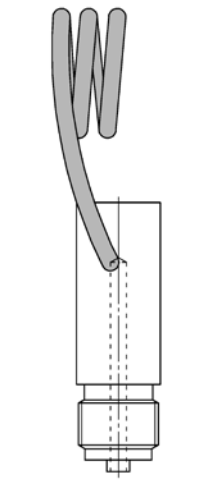
PRESSURE GAUGES INTERNALS AND CONSTRUCTION

ELASTIC ELEMENTS

Bourdon Tube Types:

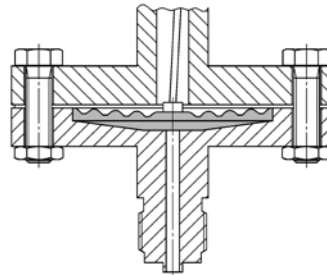


C-Type Bourdon Tube

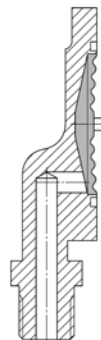


Helical Bourdon Tube

Diaphragm Type:

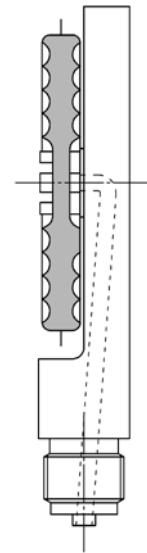


Horizontal



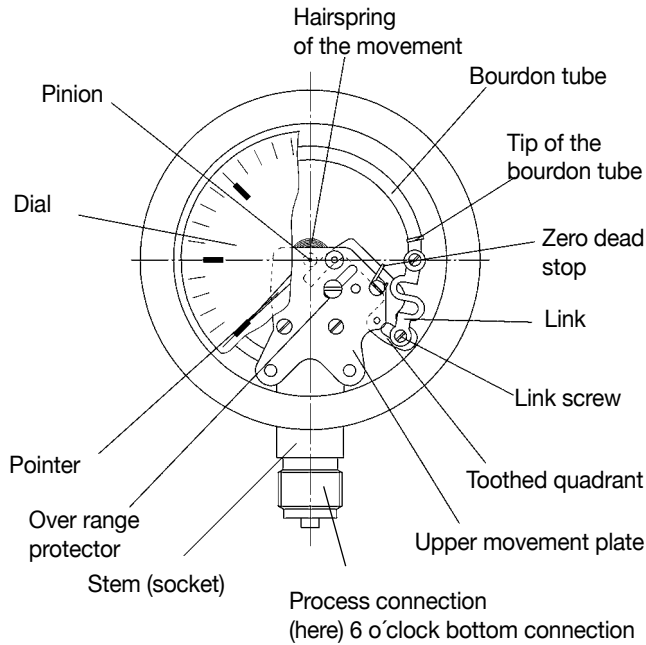
Vertical

Capsule Type:

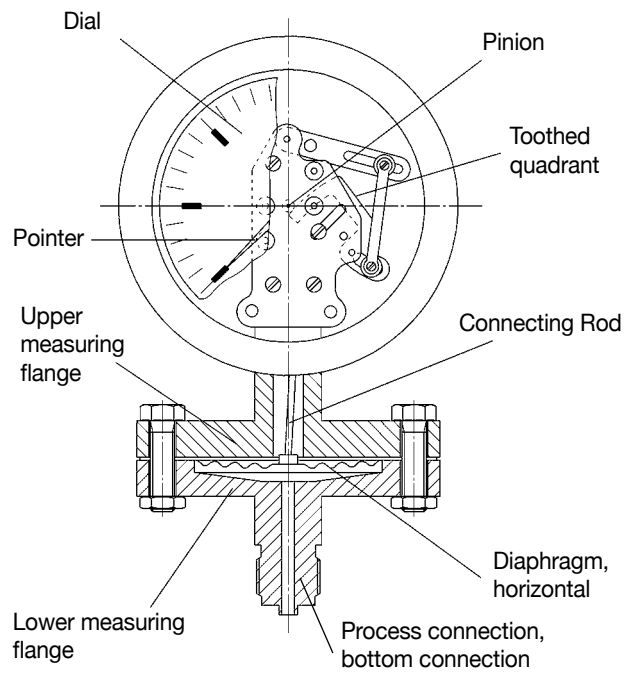


CONSTRUCTION OF PRESSURE GAUGES

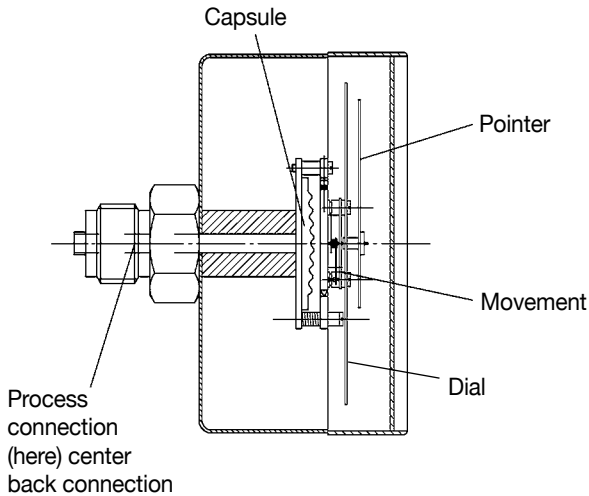
PRESSURE GAUGE WITH C-TYPE BOURDON TUBE:



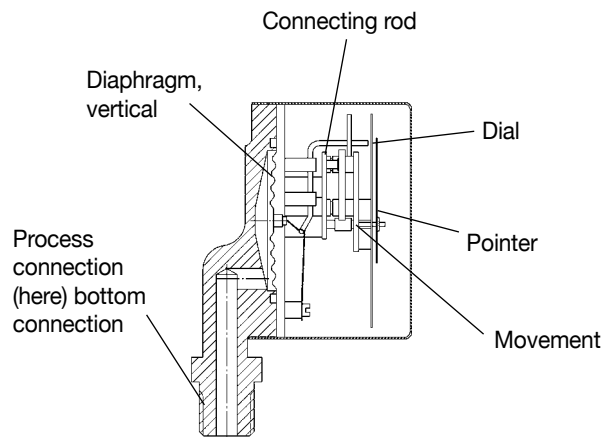
PRESSURE GAUGE WITH HORIZONTAL DIAPHRAGM:



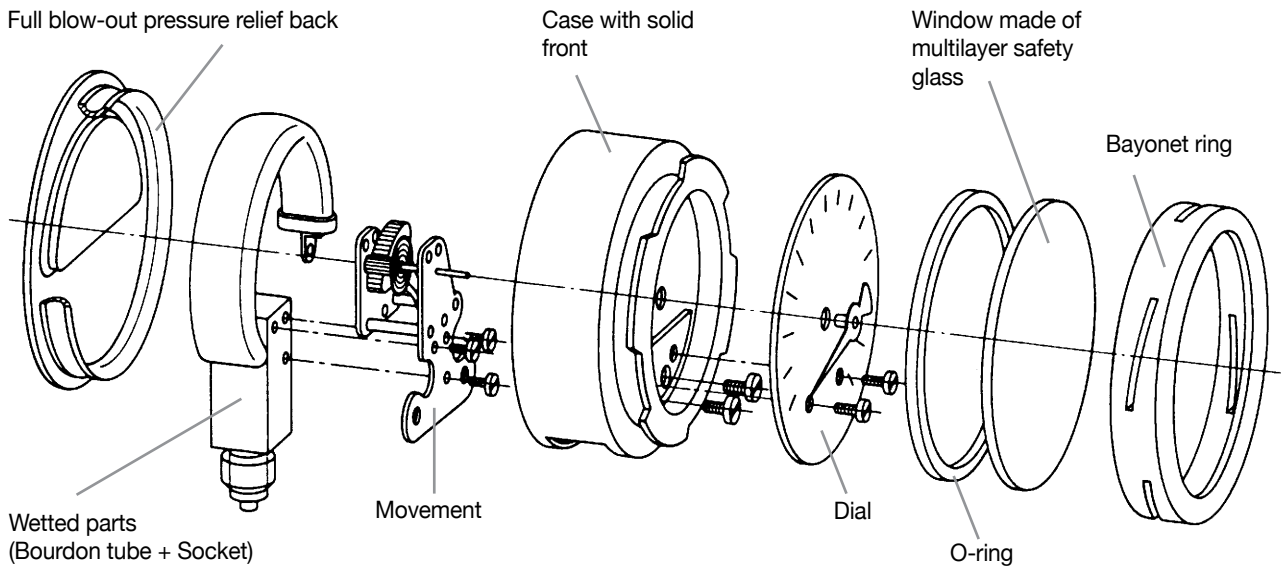
PRESSURE GAUGE WITH DIAPHRAGM CAPSULE



PRESSURE GAUGE WITH VERTICAL DIAPHRAGM

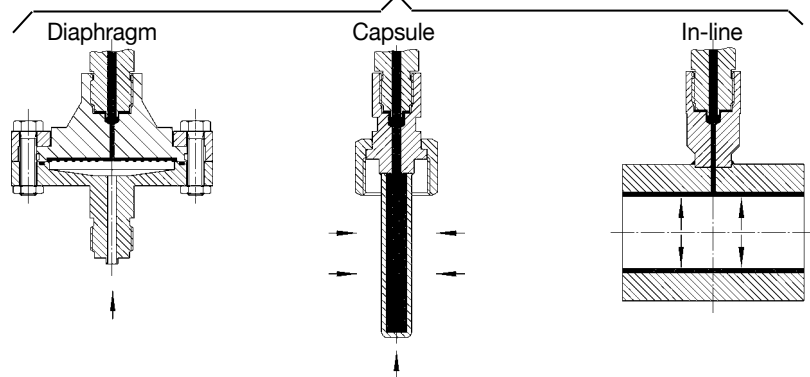
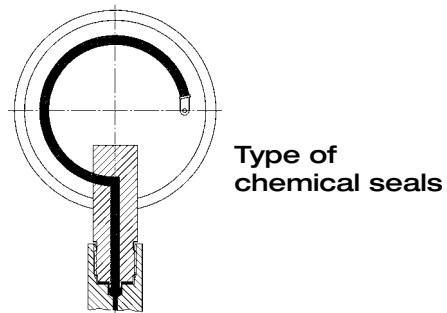


PRESSURE GAUGE IN LINE WITH SAFETY REQUIREMENTS ACCORDING TO EN 837-1, S3



Chemical Seals

Diaphragm/Chemical seals are used to detach the measured media and the bourdon tube in applications where the type of media requires a total separation between it and the pressure gauge internals (the wetted parts). Chemical seals can serve higher pressures than diaphragms.



PRINCIPLES OF MEASUREMENT

The pressure gauges described in these Operating Instructions contain components which are subjected to elastic deformation when exposed to pressure. This motion is transferred to a movement with a pointer. Because of their ruggedness and simple usage, these pressure gauges are widely used throughout the industry.

The elastic elements themselves are generally made of stainless steel or other steel alloys.

Pressure Gauges With Bourdon Tube

Bourdon tubes are oval tubes bent into a circular arc. The pressure which is to be measured acts upon the interior of the tube so that the tube's oval cross section becomes approximately circular. The edge stress produced through this deforming effect causes the arc of the Bourdon tube to open. The end of the Bourdon tube which is not affixed performs a motion, this motion being a measure for the pressure. For pressure ranges up to 40 bar, Bourdon tubes bent into a circular arc over angle of 270 degrees are commonly used, for higher pressure ranges, helical Bourdon tubes having several turns are employed. Bourdon tubes have a relatively low restoring force. This must be taken into account when using additional accessories like indicating pointers, limit switches or potentiometric transducers since these will affect the readings obtained. Pressure gauges with a Bourdon tube can normally only be protected in a limited way against overloading by supporting the elastic element at a specific pressure limit. Bourdon tube pressure gauges of accuracy grades between 0.6 and 2.5 are commonly used for measurements in the range between 0.6 bar to 4000 bar. The influence of temperature changes on the indication depends mainly on the temperature coefficient (TEC= change in stiffness caused by change in temperature) that is specific for the elastic modulus of the Bourdon tube. Depending on the material used, the accuracy error caused by temperatures differing from the reference temperature will amount to between 0.3 % and 0.4 % per 10 K.

Diaphragm Pressure Gauges

The diaphragms are corrugated in circles. The pressure is applied to one side of the diaphragm. The degree of flexing is a measure for the pressure. Diaphragms have a relatively high restoring force. For this reason the influence of additional accessories is less compared to gauges using Bourdon tubes. Through the annular fixing arrangement for the diaphragm it is less sensitive to vibrations. By supporting means it is possible to protect the diaphragms against severe overloading. By means of coatings or foils in front of the diaphragm, the diaphragm itself may be protected against corrosive pressure

media. Diaphragm gauges have an advantage when used for highly viscous and crystallizing pressure media, since optimum cleaning conditions may be provided through extended connection bores, open connection flanges or purge holes. There exist gauges with a horizontally arranged diaphragm and gauges with a vertically arranged diaphragm, i.e. where the diaphragm is placed in parallel to the dial. Generally, for pressure ranges below 0.6 bar, diaphragms that have a diameter of 160 mm are used for pressure gauges with horizontal diaphragms, whereas diaphragms that have a diameter of 100mm are used for higher pressure ranges. Owing to the annular fixing arrangement of the diaphragm, the inaccuracy caused by temperature changes is significantly greater compared to gauges with a Bourdon tube. Diaphragm pressure gauges are applied for pressure ranges between 10 mbar up to 25bar with standard accuracy grades of 1.6 or 2.5, in exceptional cases also 4.0.

Capsule Pressure Gauges

A diaphragm capsule consists of two circular corrugated diaphragms or a diaphragm and a base plate joined in a pressure-tight matter at the rim. The pressure is introduced at the center of one or of a diaphragms and acts upon the inside of the capsule. The resulting movement is a measure for the pressure. Capsule pressure gauges are not suited for liquid pressure media. They are available for pressure ranges from 2.5 mbar to 600 mbar, in accuracy grades from 0.6 to 1.6. The deviation in the readings in response to temperature changes amounts to between 0.3 % and 0.4 % per 10 K, depending on the material used.

Conditions of Usage

When selecting pressure gauges, the selection criteria and installation recommendations in accordance with EN 837-2 (ASME B40.1 standard), as well as the instructions provided herein, must be observed. The use of pressure gauges which do not meet the requirements encountered in practice can cause great consequential damage.

Accuracy Limits

The accuracy limits for pressure gauges have been defined in EN 837-1 for Bourdon gauges, and in EN 837-3 for capsule and diaphragm gauges (ASME B40.1 standard). Pressure gauges belonging to grade 0.1 to 0.6 and higher are preferably used in laboratories and workshops. Pressure gauges of grades 1.0 and 1.6 are mainly used for measurements on machines and production facilities. Pressure gauges belonging to grade 2.5 and 4.0 are used in monitoring measurements, where accuracy requirements are not that high.

PRINCIPLES OF MEASUREMENT

Pressure Ranges

The operating pressure should be in the mid. third of the pressure range specified for the gauge. The maximum pressure load should not exceed 75 % of full scale value at static loads, or 65 % of full scale value for pulsating loads.

Pressure Media Properties March of Pressure

The actual elastic element must not be suddenly exposed to rapid pressure changes or pressure spikes. In the case of pressure spikes, the pressure limits specified for the gauge must not be exceeded. If required overload protection means must be provided upstream. Pressure changes in excess of 10% of the full scale value per second will impair the readings. Moreover, this will severely impair the service life of the gauges. In such cases attenuators must be provided. Through throttling components (restrictor screw or adjustable snubber) the cross section at the inlet can be much reduced in order to delay the transmission of the pressure change to the gauge. Fitting of a throttling line (a line with a reduced cross section) ahead of the gauge is also possible. In both cases the increased risk of accumulating contamination is a disadvantage. Attenuating components at the movement will only delay the movement of the pointer. Filling the case with fluids will attenuate the movement of the elastic element and will help to reduce wear on moving parts.

Media Temperature

If the temperature of the pressure medium at the point where it is measured deviates from the operating temperature specified for the pressure gauge (refer to EN 837, ASME B40.1), then a sufficiently long measuring line, a siphon or a chemical seal with a capillary line, must be mounted to the pressure gauge. The influence on the reading owing to temperatures deviating from +20 °C must be observed.

Highly Viscous, Crystallizing and Solids Containing Media

When wanting to run measurements on highly viscous, crystallizing or solids containing pressure media, the use of diaphragm or Bourdon tube pressure gauges with attached chemical seal is recommended.

Corrosive Pressure Media

If corrosive pressure media can be kept away by separating means from the elastic element, then standard gauges may be used. Otherwise, the selection of a suitable material is mandatory, whereby the user must provide the manufacturer with all of the information on the materials which under the given conditions are compatible with the pressure medium (refer to EN 837-2 4.3). Because of the restricted choice of materials for the elastic elements, diaphragm pressure gauges

with a protective lining will possibly have to be used, or chemical seals made of pressure media resistant materials need to be mounted to a Bourdon tube pressure gauge.

Safety

There is an increased risk combined with gases and fluids under high pressure. For example, in case of developing leaks or bursting of pressurized components, persons in front of the viewing window of the instrument must not be injured by the pressure medium escaping to the front. Safety pressure gauges with a blow-out device on the rear, fitted for example with a pressure relief

SELECTION CRITERIA

on the back, will here offer the required degree of protection. When using hazardous pressure media, for example:

- oxygen
- acetylene
- combustible substances
- toxic substances

as well as refrigerating units, compressors etc.

The applicable regulations must be observed. Fluid filled pressure gauges should be equipped with blow-out devices.

Ambient Conditions

Vibrations

If an exposure of the pressure gauge to vibrations cannot be avoided by way of a suitable installation, gauges equipped with damping devices for the movement, or gauges with a fluid filling, must be used.

Ambient Temperature

The accuracy limit given on the dial applies at a reference temperature of +20 °C. Deviating temperature will have an influence on the reading. The magnitude of the influence will depend on the principle of measurement used. At outdoor services, the prevailing ambient conditions must be taken into account through the selection of a suitable gauge or by introducing suitable protection means in order to prevent the formation of ice on the pressure gauge at temperatures below 0 °C, for example.

For liquid filled instruments it has to be considered that the viscosity of the fluid will increase as the temperature drops, causing a delayed reading. The ambient temperature also needs to be taken into account regarding the maximum allowed operating temperature specified for the pressure gauge.

Corrosive Atmosphere

For services at corrosive atmospheres, suitable casings and components made of corrosion resistant materials must be provided. Also, special surface finishing may help to protect the outside of the pressure gauges.

SETUP A GAUGE CONSIDERATIONS

Chemical Seals

In the case of aggressive, hot, highly viscous or crystallizing pressure media, chemical seals may be used as separating means ahead of Bourdon gauges in order to prevent the ingress of such pressure media into the elastic element. A neutral fluid serves the purpose of transmitting the pressure to the elastic element. The fluid must be selected depending on the measuring range, temperature, viscosity and other influences. Special emphasis must be placed on the compatibility of the fluid with the pressure medium. Chemical seals are available in a variety of different types, whereby the diaphragm seal is the most popular. In-line seals and flange type diaphragm seals must be mounted together at works suitable for the fitting position at the measuring point.

The connection between the pressure gauge and the chemical seal must not be separated. Potential sources of inaccuracy by installing a chemical seal ahead of the pressure gauge need to be considered.

Overpressure Protection Facilities

If for operational reasons the pressure range of the gauge had to be chosen below the maximum operating pressure, overpressure protection devices ahead of the pressure gauge may be used to protect it against damages. In the event of pressure spikes, the over range protector will shut-down immediately, but only gradually at a slowly rising pressure. The closing pressure which needs to be set up therefore depends on the specific pressure change with time.

However, highly viscous and much contaminating pressure media may impair proper operation of the over range protector or render these ineffective. Capsule and diaphragm pressure gauges may be designed so that they themselves will be capable of resisting overpressures (up to a factor of 3, 5 or 10) without additional devices.

Holding Devices for the Pressure Gauge

If the line to which the gauge is connected is not strong enough to support it without introducing vibrations, then a suitable holding device for the pressure gauge should be provided.

Siphons use sufficiently long lines ahead of the pressure gauge or siphons to protect the shut-off fittings and the gauge against being heated up by hot pressure media (steam, for example).

Shut-off Fittings for Pressure Gauges

It is recommended to fit shut-off devices between the measuring point and the pressure gauge. This will allow an exchange of the pressure gauge and checks on the zero setting while the system remains operative.

Depending on the application, either cocks or valves are used. Cocks have three positions:

Vent: The supply line is shut-off and the gauge is connected to the atmosphere. The zero setting may be checked.

Operation: The supply line is open and the gauge is pressurized.

Blow-out: The supply line is open and the pressure medium is allowed to escape into the atmosphere. The gauge is not working.

In the case of valves a venting screw is usually provided between the valve seat and the pressure gauge. Venting into the atmosphere must be arranged in a way that any persons present close by are not endangered by the escaping pressure medium.

Potential hazards to the environment must be avoided. In certain applications (steam boilers, for example), the shut-off fitting must have a test port so that the pressure gauge can be checked without having to remove it from the system. For system with high media pressure, a high pressure block and bleed valves or manifold is to be installed between the media line and the gauge.

Different types of manifolds provide a safe means of blocking the media flow to the gauge, to releasing the pressure in the gauge and to ventilating wetted gauge parts to the atmosphere or to a drain line.

SETUP ARRANGEMENTS

General:

Well proven measuring arrangements and proposals for components are advised in several standards and technical guidelines. The overview of some arrangements is shown in the following table:

State of the pressure medium	fluid			gaseous		
State of the Filling in the Measuring Line	Fluid	Partly degassing	Fully degassing	Gaseous	Partly condensed (humid)	Fully Condensed
Examples	Condensate	Boiling Fluids	"liquid gases"	Dry Air	Moist Air Fuel Gas	Water Vapor
A Pressure gauge above the measurement port	1	2	3	4	5	6
B Pressure gauge below the measurement port	7	8		9	10	11
Arrangements 3, 4, 5, 7, 8 and 11 are to be preferred						

Pressure Measuring Ports

The pressure measuring port should be located at a point where the flow is not impaired in any way and where constant conditions can be ensured for the measurements. It is recommended to provide a sufficiently large bore at the point of the pressure measurement and to provide some means for shutting the pressure measuring port off.

Measuring Line

The connection between the pressure measuring port and the pressure gauges is the measuring line. The inside diameter of this measuring line should be sufficiently wide in order to avoid the risk of blockages. The measuring line should have a steady slope (recommended is a slope of 1:15). With gases as the pressure medium, a drain should be provided at the lowest point and with high-viscosity fluids a

vent should be provided at the highest point. In the case of gases containing solids or fluids, separators which may be demounted from the running system for emptying, should be provided. The measuring line should be designed and fitted in a way that it will be capable of sustaining the occurring loads caused by expansion, vibration or thermal effects.

Shut-off Fittings

Shut-off fittings at the pressure gauge serve the purpose of checking the zero setting or exchanging the pressure gauge while the system remains operational.

Gauge

The pressure gauge needs to be mounted so that it will not be subjected to vibrations and shocks and so that the dial can be read easily. When reading the dial, parallax errors should be avoided. It must be ensured that possibly present blow-out devices of the pressure gauge are not blocked. The pressure gauge must be arranged in such a manner that the temperature of the gauge will not drop below or exceed the permissible operating temperature range. In doing so, the influences of convection and thermal radiation should be taken into account. Whenever the elastic element of a pressure gauge will be filled with water or a water mixture, the instrument must be protected against frost. Usually, the pressure gauge will be fitted with the dial arranged vertically. In all other cases the position indicating symbol according to EN 837 applies. A difference in height between the port at which the pressure is measured and the pressure gauge will cause a shift at the beginning of the reading if the pressure medium in the measuring line is of a different density compared to the ambient air. This shift D_p at the beginning of the reading results from the difference in density ($\rho_M - \rho_L$) and the difference in height Δh : $10^{-5} \cdot (\rho_M - \rho_L) \cdot g \cdot \Delta h$

Δp = Shift at the beginning of the reading (bar)

ρ_M = Density of the pressure medium kg/m³

ρ_L = Density of the air (1.205 at 20 °C) kg/m³

Δh = Difference in height m

g = Acceleration due to gravity m/s²

(mean acceleration due to gravity =9.81 m/s²)

The reading is reduced by D_p if the pressure gauge is located above the pressure measurement port and increased by D_p if below the pressure measurement port.

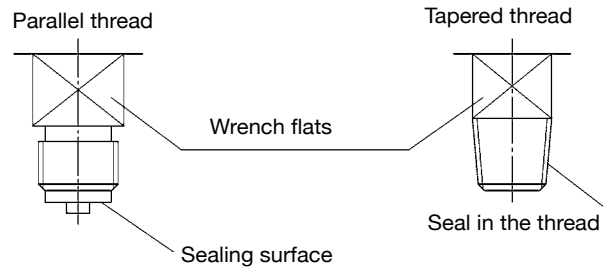
INSTALLATION

The installation of pressure gauges should be left to skilled staff. For applying arrangement see set up arrangement above. During installation or removal, never apply any force to the case of the pressure gauges; instead apply the wrench to the wrench flats provided. It must be ensured that the matching process connection has been selected (nominal width, suitable sealing face, if required), in order to position the pressure gauge so that it may be read perfectly.

A HAM-LET tube adapter process connection is the preferred solution, allowing free positioning when connecting to a HAM-LET LET-LOK® fitting or valve connection.



In the case of flange joints, the pressure gauge is placed on the mating flange, and the flanges are joined using suitable bolts. It must be ensured that the bolts are tightened firmly. The joints must be leak tight. For this reason, it is mandatory that suitable gaskets made of a material resistant to the pressure medium will be used in the connections. For sealing connections with a parallel thread, for example, flat gaskets in accordance with EN 837-1 or profile seals must be fitted, or on the other hand, the corresponding sealing lens has to be provided in the case of a high pressure connection. Tapered threads (for example NPT threads) are sealed off with additional sealants like PTFE tape, for example: For pressure gauges with a pressure relief vent of \varnothing 13 mm at the top of the case, it is recommended for pressure ranges < 6 bar to cut off the nipple at the filling plug so that the gauge can be vented in order to compensate for the internal pressure. If the pressure gauge is located below the pressure measurement port, the measuring line should be well purged well before starting operation so as to remove any foreign objects which might be present in the line.



During pressure tests on pipes or vessels, the pressure gauge must not be exposed to excessively high pressures, as indicated by the pressure limit indicating mark ▼ on the dial, resp. The limits for a static pressure specified for the pressure gauge must not be exceeded.

When using diaphragm gauges, the clamping bolts for the upper and lower flange must not be loosened. In the case of instruments with attached chemical seals, the connection between the gauge and the chemical seal and possibly also the connection between the chemical seal and the capillary line must not be disconnected.

Before disconnecting and removing the pressure gauge unit from the measuring point, it must be depressurized first. If required, the pressure in the measuring line must be relieved. Residues of the pressure medium in pressure gauges which have been removed may present a hazard to personnel, facilities and the environment. For this reason, suitable safety precautions must be introduced.

Shut-off devices may only be opened slowly in order to avoid sudden pressure spikes during start-up.

OPERATION

Specified Usage


The usable range for static loads is indicated on the dial of many pressure gauges. Bourdon tube pressure gauges, having a nominal size of 100, 160 or 250, may be subjected to the respective full scale pressure if the load is static. If the pressure load is of a pulsating nature, pressure peaks amounting to only 0.9 of the full scale pressure are permissible, and for the pressure ranges of 0/2500 bar and 0/4000 bar, pressures amounting only to 2/3 of the full scale pressure may be applied. Bourdon tube pressure gauges can be overloaded up to 1.3 of their full scale value (instruments 0/2500 bar and 0/4000 bar can only be overloaded up to their full scale value!), Bourdon tube pressure gauges having a nominal size of 40, 50, 63 and 80, may only be subjected to pressures of up to 3/4 of the full span if the pressure is static, and if the pressure is of a pulsating nature, the maximum load is restricted to 2/3 of the full scale value, and the full scale pressure may be applied only briefly.

In the case of diaphragm pressure gauges with a vertical diaphragm, pressures up to the full scale value may be applied if static, and if the pressure is of a pulsating nature, the limit will be 0.9 of the full scale level.

Diaphragm pressure gauges with a horizontal diaphragm can sustain overpressures of up to five times their full scale value (custom-built instruments even more), but a pressure of 40 bar must never be exceeded.

Capsule pressure gauges can also be operated at their specified full scale pressure, provided the pressure is static. If the pressure pulsates, the maximum load is only 0.9 times the full scale value. Just like Bourdon tube pressure gauges, they are able to sustain overpressures of up to a factor of 1.3 (custom-built instruments can handle even higher overpressures).

Zero Check

In order to check the zero setting of the pressure gauge during operation of the system, the required shut-off device has to be closed and the pressure in the gauge has to be relieved. The pointer must come to rest within the zero range indicated by . If the pointer comes to rest

outside of this range, then a persisting deformation of the elastic element must be assumed so that the gauge will have to be checked in order to avoid accidents owing to incorrect measurements. In such a case the pressure gauge should, for this reason, be replaced and returned to the manufacturer for checking and repair, if required.

Pressure Range Check

If the readings supplied by the pressure gauge need to be checked while the remainder of the system is operating, the pressure gauge has to be separated from the process via the required shut-off device with the test port and a test pressure has to be applied to the gauge. The error limits according to EN 837-1 resp. EN 837-3 apply.

Temperature Resistance

The permissible operating temperature for the pressure gauge must not be exceeded.

The respectively temperature resistance for the permissible operating temperature ranges are generally from -40 °C to +60 °C (compare to EN 837-1 and EN 837-3), at which unfilled gauges with a silver-brazed bourdon tube are capable up to +100 °C or argon arc welded bourdon tube are capable up to +200 °C in stainless steel cases. Special versions can be suitable for higher temperatures.

Note: These are only information on the temperature resistance of the materials respectively the soldered joints or welded seams. The information on indication errors due to deviations from the reference temperature have to be regarded. More information can be found in our pressure gauges catalogue.

OPERATION

Cleaning Temperature

Also, when purging the measuring line, the permissible operating temperature for the pressure gauge (refer to above) must not be exceeded. If required, the gauge will have to be shut-off or removed. In the case of pressure gauges with attached chemical seals, the maximum cleaning temperature must not be exceeded.

Maintenance and Repair

Generally, pressure gauges will not require any maintenance. These instruments may only be repaired by the manufacturer. Before returning an instrument for repair, all parts of the instrument in contact with the pressure medium must be cleaned with care, especially when hazardous pressure media were used before.

It is a good idea to always include with the repair order a description of the pressure medium resp. a Declaration of Contamination.

Electrical Accessories

The electrical connections should be made only by skilled staff and qualified personnel. Instruments equipped with electric accessories have an adhesive label from which it is apparent how the instrument is to be electrically connected. Load limits must be observed.

Exceeding of load limits could cause greater damage. During installation, initial operation and operation of the instruments the national and international safety regulations must be observed. It must be ensured that the cable diameters match the nominal widths of the sealing inlets of the cable feed throughs. Screwed joints must be tightened firmly.

Compliance with the certified protection standards can only be ensured in this way. In the case of designs with right-angled plug connectors, universal plug connectors or terminal boxes, the centrally arranged fixing screws must be tightened manually. In connection with the DMU type pressure transducers shielded cables must be used throughout, the shield of which must be connected to housing or the ground terminal on the right-angled plug connector so as to ensure full electromagnetic compatibility (EMC).

In the case of equipment with a magnetic contact it must be noted that the CE mark in accordance with EMC guidelines will only apply if a switching frequency of 5 actuations per minute is not exceeded.

Inasmuch specified, a suitable output unit or multifunctional relay must be used (for example for instruments with inductive limit switches). The current Operating Instructions must be observed.

Storage

When keeping pressure gauges in stock before mounting installation instructions, Rev.04, January 2014

they should be left in the original packaging and should be maintained in stock well protected against damage by external influences. If the pressure gauge was taken out of its packaging and inspected briefly (for testing, for example) it should be carefully placed back in the same packaging before returning it to stock. While the pressure gauge is in stock the general temperature limits of $-40\text{ }^{\circ}\text{C}$ and $+60\text{ }^{\circ}\text{C}$ should not be exceeded.

If in doubt or if anything remains unclear please get in touch with the manufacturer.

Installation In Potentially Explosive Areas

General Information:

Pressure Gauges are mechanical pressure measuring instruments and do not show any ignition sources when operating as intended. Versions that are made of stainless steel and contain laminated safety glass are suitable for the use in areas of category 2 and 3 according to ATEX Standard 94/ 9/EG.

Only pressure measuring instruments with integrated construction type proved deflagration volume protection, our Flame arrester, are suitable for the use as category-1 instrument.

This protection system prevents a flame penetration at deflagration of explosive vapor-air, respectively gas-air mixtures of explosion hazardous IIA, IIB and IIC in an up streamed volume of a maximum of 0.2 l. The deflagration volume protection Flame arrester is certified IIG IIC PTM 12 ATEX 4001 X on condition that the operating pressure does not exceed 1.1 bar abs. and the operating temperature does not exceed $60\text{ }^{\circ}\text{C}$ ($140\text{ }^{\circ}\text{F}$).

To avoid warming up the measuring elements of bourdon tube pressure gauges a dynamic load with gaseous media is not allowed!

For additional information and more technical support please contact your Ham-Let representative.

www.ham-let.com



HAM-LET Catalog
qr.ham-let.com/flip

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