



# HTC<sup>®</sup>

HI TECH COMPONENTS



**ULTRA HIGH PURITY CONNECTORS**  
ORBITAL WELD AND METAL GASKET FACE SEAL FITTINGS

## TECHNICAL INFORMATION

HAM-LET®/HTC® specializes in the design and manufacture of high quality, specially manufactured valves and fittings for High Purity and Ultra High Purity applications. HTC's expert staff of engineers and technicians have worked together to develop 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 manufacture of fittings and valves for clean industries and has consistently spearheaded significant new developments in this field. For example, the company has set new standards in the production of Ultra Pure fittings by incorporating the use of 316L Vim/Var as the standard material for the manufacture of fittings. HTC has also broken new ground in surface finishing techniques by implementing improved electro-polishing processes.

### PLATING:

Female threads are silver plated to reduce the risk of galling while improving the remark ability of the fitting. This high quality plating also reduces the torque required for fitting assembly.

Lubrication: Female nuts and caps without a dry lubricant are available as an option.

**Reference Spec: Meeting and exceeding - Mil Spec: QQ-S-365.**

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

### WELDING:

Welding options: - butt weld  
- shoulder weld  
- socket weld

**Reference Specs: All welded products are manufactured and welded according to SEMI F3-94.**

### TESTING:

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

### JAPANESE STANDARDS:

Ham-Let, upon request, manufactures the HTC product line to meet the various Japanese standards:

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

### HTC® Fittings Temperature Rating

Products	Material	F	C
HTC® Fittings	316L	1000	538
	316LV	1000	538
HTC® Gaskets	316SS	1000	538
	Nickel	1000	538
HTC® Buttweld	316L	1000	538
	316LV	1000	538

### HELIUM LEAK:

All Ham-Let Face Seal products are tested and qualified to a helium leak rate of less than  $3 \times 10^{-10}$  std cm<sup>3</sup>/sec. **Reference Spec:** SEMI F1.

### SURFACE FINISH:

**Reference Spec:** ANSI B46.1 and ISO4288

### SURFACE ANALYSIS:

SEM/EDX 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 F19-95; E49.9-0298; SEMASPEC 91060573A-STD.

### CLEANING SPECIFICATIONS:

According to # H9800.

**Reference Spec:** SEMI E49.2-0298.

### MATERIAL TRACEABILITY:

All HTC components are Heat Coded for full traceability.

### ASSEMBLY:

According to SEMI E49.6-95

### ACCESSORIES:

Grip Kit, Plastic Bead Protector, Metal Bead Protector.

### PACKAGING:

Each "E" finished component is double bagged to insure 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 9000, Certified by A.S.M.E. & S.I.I.

### HTC® Fittings Pressure Rating

Products	Material	Size	Wall Thickness	Pressure Rating	
				Psig	Bar
HTC Fittings	316L Or 316LV	1/4	0.035	5906	407
		3/8	0.035	3788	261
		1/2	0.049	3975	274
		3/4*	0.065	3488	241
		1*	0.065	2569	177

\* 3/4 & 1 inch sizes, not Standard. Manufactured per 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.

**Glands**

**GL-W 4**  
Gland Long without  
Shoulder



**GL-S 4**  
Gland Long with  
Shoulder



**GM-W 4**  
Gland Male without  
Shoulder



**GS-W 5**  
Gland Short without  
Shoulder



**GS-S 5**  
Gland Short with  
Shoulder



**MGS-W 5**  
Mini Gland Short without  
Shoulder



**MGS-S 6**  
Mini Gland Short with  
Shoulder



**AG 6**  
Adapter Gland



**MG-W 6**  
Male Gland Short Tube  
without  
Shoulder



**GSW 6**  
Gland Socket Weld



**Mini  
Buttweld**

**ME 7**  
Mini Elbow



**MER 7**  
Mini Elbow Reducer



**ME 45° 7**  
Mini Elbow 45 Degrees



**MEX 8**  
Mini Elbow Extended Le



**MT 8**  
Mini Tee



**MTR 8**  
Mini Tee Reducer



**MC 9**  
Mini Cross



**MTB 9**  
Mini Tri-EL



**RU 9**  
Reducing Union



**Shaped  
Unions**



**EU 10**  
Elbow Union



**TU 10**  
Tee Union



**CU 10**  
Cross Union



**EM 11**  
Male Elbow



**AW Shaped  
Connectors**



**EW-W 11**  
AW Elbow without  
Shoulder



**TW-W 11**  
AW Tee without  
Shoulder



**CW-W 12**  
AW Cross without  
Shoulder



**RW-W 12**  
AW Reducer without  
Shoulder



**UB-W 12**  
Union Buttweld without  
Shoulder



**UB-S 13**  
Union Buttweld with  
Shoulder



**UBL-S 13**  
Union Buttweld With Locator  
and Shoulder



**Threaded Straight  
Connectors**



**UM 14**  
Union Male



**CM 14**  
Connector Male



**RUM 14**  
Reducing Union Male



**BU 15**  
Bulkhead Union



**SBU 15**  
Short Bulkhead Union



**BCM 15**  
Bulkhead Connector Male



**MP 19**  
Male Plug



**NM 20**  
Male Nut



**CMOB 16**  
Connector Male to O-Ring Seal



**FC 16**  
Female Connector NPT



**SNM 20**  
Short Nut Male



**High Flow Connectors**

**HGL 23**  
High Flow Gland Long



**HMT 23**  
High Flow Male to Tube



**UGL 16**  
Let-Lok to Male Gland



**BUL 17**  
Bulkhead Union to Let-Lok



**Swivel Connectors**

**HNF 23**  
High Flow Nut Female



**HNM 23**  
High Flow Nut Male



**SBUL 17**  
Short Bulkhead Union to Let-Lok



**BHUT 17**  
Bulkhead Union to Tube



**UMF 20**  
Union Male to Female



**MCF 21**  
Male Connector to Female



**SBHUT 18**  
Short Bulkhead Union to Tube



**UFF 21**  
Union Female to Female



**FCF 21**  
Female Connector to Female NPT



**Caps & Nuts**

**FHTL 22**  
Female HTC to Let-Lok



**How to Order**

V - GL - 1/2 - W - E

<b>Type of Fitting Designator</b>	<b>Surface Level Designator</b>
	E - with electropolish H - without electropolish
<b>Size Designator</b>	See page 83
1/8 6mm	"E" or "H" must be added at the end of the part no. to define the level of the polish:
1/4 8mm	E - with electropolish,
3/8 10mm	H - without electropolish.
1/2 12mm	
3/4 18mm	
1	
<b>End Designator</b>	
S - With Shoulder	
W - Without Shoulder	
<b>Material Designator</b>	
P - 316L/316L VOD	
V - 316L Vim/Var	
LM - Low Manganese	
*Ni - Nickel	
*SS - Stainless Steel	

\* For Gaskets only

**Gaskets**

**CP 18**  
Coupling



**DFU 18**  
Double Female Union



**NF 19**  
Nut Female



**CF 19**  
Cap Female

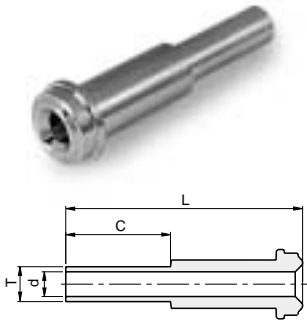


**GA 22**  
Gasket



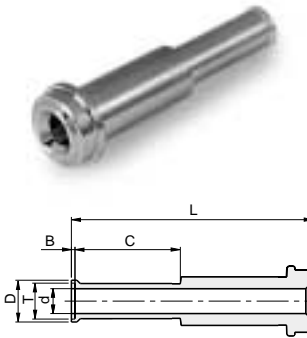
**GA-RT 22**  
Gasket Retainer





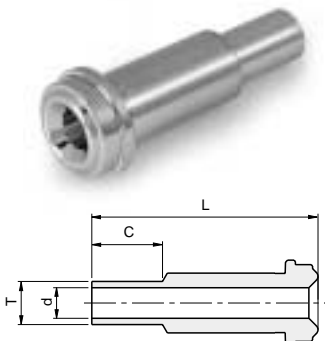
### GL-W Gland Long without shoulder

PART NO.	L		C		d		T		W.T.	
	mm	inch	mm	inch	mm	inch	inch-mm	mm	inch	
V-GL-1/8-W	36.10	1.42	19.05	0.75	1.86	0.07	1/8"	-	0.028	
V-GL-1/4X1/8-W	36.10	1.42	19.05	0.75	1.86	0.07	1/8"	-	0.028	
V-GL-1/4-W	43.20	1.70	19.05	0.75	4.56	0.18	1/4"	-	0.035	
V-GL-3/8-W	45.50	1.79	19.05	0.75	7.73	0.30	3/8"	-	0.035	
V-GL-1/2-W	45.50	1.80	19.05	0.75	10.20	0.40	1/2"	-	0.049	
V-GL-1/2-W 1.41	35.80	1.41	9.60	0.38	10.2	0.40	1/2"	-	0.049	
V-GL-1/2-W W.T.=0.065	45.50	1.80	19.05	0.75	9.40	0.37	1/2"	-	0.065	
V-GL-1/2X1/4-W	45.50	1.80	19.05	0.75	4.56	0.18	1/4"	-	0.035	
V-GL-3/4-W W.T.=0.049	51.56	2.03	19.05	0.75	16.56	0.65	3/4"	-	0.049	
V-GL-3/4-W	51.56	2.03	19.05	0.75	15.75	0.62	3/4"	-	0.065	
V-GL-1-W	58.90	2.32	19.05	0.75	22.10	0.87	1"	-	0.065	
V-GL-6MM-W	43.20	1.70	19.05	0.75	4.00	0.16	6mm	1.00	-	
V-GL-8MM-W	43.20	1.70	19.05	0.75	6.00	0.24	8mm	1.00	-	
V-GL-10MM-W	45.50	1.79	19.05	0.75	8.00	0.31	10mm	1.00	-	
V-GL-12MM-W	45.50	1.79	19.05	0.75	10.00	0.39	12mm	1.00	-	
V-GL-18MM-W	51.60	2.03	19.05	0.75	15.00	0.59	18mm	1.50	-	



### GL-S Gland Long with shoulder

PART NO.	L		C		d		B		D		T		W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch-mm	mm	inch	
V-GL-1/4-S	43.72	1.72	19.05	0.75	4.56	0.18	0.55	0.02	7.37	0.29	1/4"	-	0.035	
V-GL-3/8-S	46.23	1.82	19.05	0.75	7.73	0.30	0.76	0.03	10.40	0.41	3/8"	1.00	0.035	
V-GL-1/2-S	46.48	1.83	19.05	0.75	10.20	0.40	1.00	0.04	13.97	0.55	1/2"	-	0.049	
V-GL-1/2-S W.T.=0.065	46.48	1.83	19.05	0.75	9.40	0.37	1.00	0.04	13.97	0.55	1/2"	-	0.065	
V-GL-3/4-S W.T.=0.049	52.58	2.07	19.05	0.75	16.56	0.65	1.00	0.04	20.32	0.80	3/4"	-	0.049	
V-GL-3/4-S W.T.=0.065	52.58	2.07	19.05	0.75	15.75	0.62	1.00	0.04	20.32	0.80	3/4"	-	0.065	
V-GL-1-S W.T.=0.065	65.28	2.57	24.38	0.96	22.10	0.87	1.00	0.04	26.92	1.06	1"	-	0.065	
V-GL-6MM-S	43.70	1.72	19.05	0.75	4.00	0.16	0.50	0.02	6.80	0.27	6mm	1.00	-	
V-GL-8MM-S	46.23	1.82	19.05	0.75	6.00	0.24	0.80	0.03	8.90	0.35	8mm	1.00	-	
V-GL-10MM-S	46.23	1.82	19.05	0.75	8.00	0.31	0.80	0.03	10.90	0.43	10mm	1.00	-	
V-GL-12MM-S	46.50	1.83	19.05	0.75	10.00	0.39	1.00	0.04	13.20	0.52	12mm	1.00	-	
V-GL-18MM-S	52.60	2.07	19.05	0.75	15.00	0.59	1.00	0.04	19.30	0.76	18mm	1.50	-	

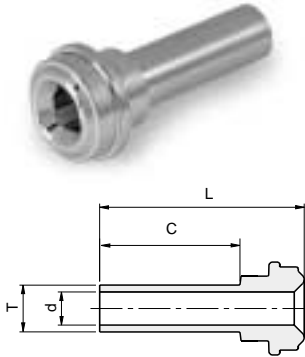


### GM-W Gland Male without shoulder

PART NO.	L		d		C		T	
	mm	inch	mm	inch	mm	inch	inch-mm	
V-GM-1/8-W	17.80	0.70	1.50	0.06	7.10	0.28	1/8"	
V-GM-1/4-W	33.30	1.31	3.00	0.12	10.40	0.41	1/4"	
V-GM-3/8-W	38.10	1.50	7.10	0.28	10.40	0.41	3/8"	
V-GM-1/2-W	38.10	1.50	10.20	0.40	12.70	0.50	1/2"	
V-GM-3/4-W	50.80	2.00	13.50	0.53	15.70	0.62	3/4"	
V-GM-1-W	56.40	2.22	19.10	0.75	20.60	0.81	1"	

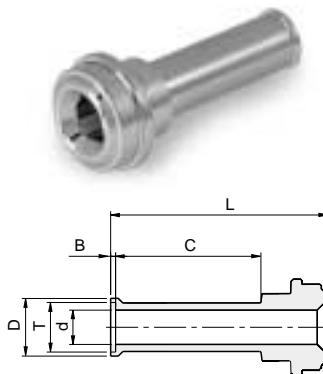
Dimensions are for reference only, and are subject to change without notice.

To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number



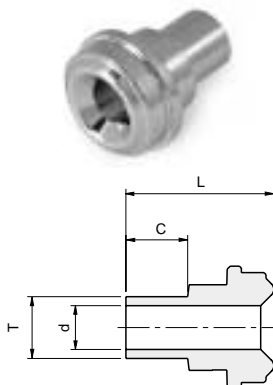
### GS -W Gland Short without Shoulder

PART NO.	L		C		d		T Tube O.D inch-mm	W.T.	
	mm	inch	mm	inch	mm	inch		mm	inch
V-GS-1/8-W	27.43	1.08	19.05	0.75	1.86	0.07	1/8"	-	0.028
V-GS-1/4-W	27.94	1.10	19.05	0.75	4.56	0.18	1/4"	-	0.035
V-GS-1/4X1/8-W	27.94	1.10	19.05	0.75	1.86	0.07	1/8"	-	0.028
V-GS - 1/4-W 0.72	18.30	0.72	9.60	0.38	4.56	0.18	1/4"	-	0.035
V-GS-3/8-W	28.40	1.12	19.05	0.75	7.73	0.30	3/8"	-	0.035
V-GS-1/2-W	28.40	1.12	19.05	0.75	10.20	0.40	1/2"	-	0.049
V-GS-1/2-W W.T.=0.065	28.40	1.12	19.05	0.75	9.40	0.37	1/2"	-	0.065
V-GS-1/2-W-0.74	18.80	0.74	9.65	0.38	10.20	0.40	1/2"	-	0.049
V-GS-1/2x1/4-W	28.40	1.12	19.05	0.75	4.50	0.18	1/4"	-	0.035
V-GS-3/4-W W.T.=0.049	28.96	1.14	19.05	0.75	16.56	0.65	3/4"	-	0.049
V-GS-3/4-W W.T.=0.065	28.96	1.14	19.05	0.75	15.75	0.62	3/4"	-	0.065
V-GS-1-W W.T.=0.065	32.10	1.26	19.05	0.75	22.10	0.87	1"	-	0.065
V-GS-6MM-W	29.46	1.16	19.05	0.75	4.00	0.16	6mm	1.00	-
V-GS-8MM-W	29.46	1.16	19.05	0.75	6.00	0.24	8mm	1.00	-
V-GS-10MM-W	29.46	1.16	19.05	0.75	8.00	0.31	10mm	1.00	-
V-GS-12MM-W	29.46	1.16	19.05	0.75	10.00	0.39	12mm	1.00	-
V-GS-18MM-W	31.00	1.22	19.05	0.75	15.00	0.59	18mm	1.50	-



### GS -S Gland Short with Shoulder

PART NO.	L		C		d		B		D		T Tube O.D inch-mm	W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		mm	inch
V-GS-1/4-S	28.45	1.12	19.05	0.75	4.56	0.18	0.55	0.02	7.37	0.29	1/4"	-	0.035
V-GS-3/8-S	29.21	1.15	19.05	0.75	7.73	0.30	0.76	0.03	10.40	0.41	3/8"	-	0.035
V-GS-1/2-S	29.46	1.16	19.05	0.75	10.20	0.40	1.00	0.04	13.97	0.55	1/2"	-	0.049
V-GS-1/2-S W.T.=0.065	29.46	1.16	19.05	0.75	9.40	0.37	1.00	0.04	13.97	0.55	1/2"	-	0.065
V-GS-3/4-S W.T.=0.049	29.96	1.18	19.05	0.75	16.56	0.65	1.00	0.04	20.32	0.80	3/4"	-	0.049
V-GS-3/4-S W.T.=0.065	29.96	1.18	19.05	0.75	15.75	0.62	1.00	0.04	20.32	0.80	3/4"	-	0.065
V-GS-1-S W.T.=0.065	32.10	1.26	19.05	0.75	22.10	0.87	1.00	0.04	26.92	1.06	1"	-	0.065
V-GS-6MM-S	30.00	1.18	19.05	0.75	4.00	0.16	0.50	0.02	6.80	0.27	6mm	1.00	-
V-GS-8MM-S	30.20	1.19	19.05	0.75	6.00	0.24	0.80	0.03	8.90	0.35	8mm	1.00	-
V-GS-10MM-S	31.00	1.22	19.05	0.75	8.00	0.31	0.80	0.03	10.90	0.43	10mm	1.00	-
V-GS-12MM-S	30.50	1.20	19.05	0.75	10.00	0.39	1.00	0.04	13.20	0.52	12mm	1.00	-
V-GS-18MM-S	31.00	1.22	19.05	0.75	15.00	0.59	1.00	0.04	19.30	0.76	18mm	1.50	-

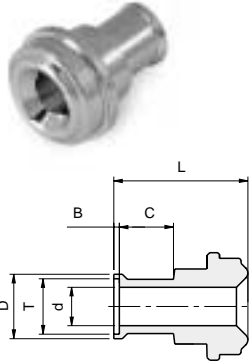


### MGS -W Mini Gland Short without Shoulder

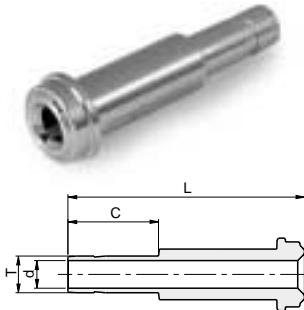
PART NO.	L		C		d		T Tube O.D inch-mm	W.T.	
	mm	inch	mm	inch	mm	inch		mm	inch
V-MGS-1/4-W	15.20	0.60	6.35	0.25	4.56	0.18	1/4"	-	0.035
V-MGS-3/8-W	15.75	0.62	6.35	0.25	7.73	0.30	3/8"	-	0.035
V-MGS-1/2-W	15.75	0.62	6.35	0.25	10.20	0.40	1/2"	-	0.049
V-MGS-1/2-W W.T.=0.065	15.75	0.62	6.35	0.25	9.40	0.37	1/2"	-	0.065
V-MGS-6MM-W	15.20	0.60	6.35	0.25	4.00	0.16	6mm	1.00	-
V-MGS-8MM-W	15.75	0.62	6.35	0.25	6.00	0.24	8mm	1.00	-
V-MGS-10MM-W	15.75	0.62	6.35	0.25	8.00	0.31	10mm	1.00	-
V-MGS-12MM-W	15.75	0.62	6.35	0.25	10.00	0.39	12mm	1.00	-

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

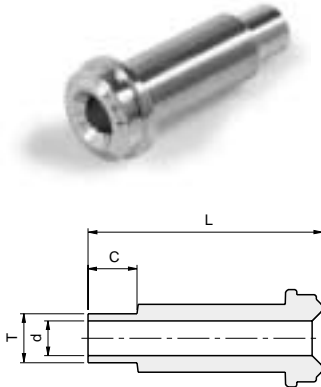
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

**MGS -S Mini Gland Short with Shoulder**


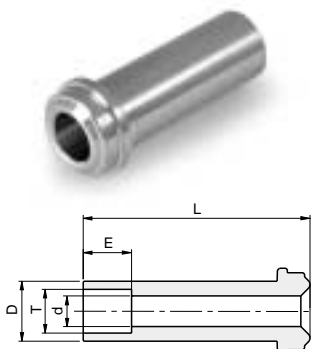
PART NO.	L		C		d		B		D		T		W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch-mm	mm	inch	Tube O.D
V-MGS-1/4-S	15.75	0.62	6.35	0.25	4.56	0.18	0.55	0.02	7.37	0.29	1/4"	-	0.035	
V-MGS-3/8-S	16.50	0.65	6.35	0.25	7.73	0.30	0.76	0.03	10.40	0.41	3/8"	-	0.035	
V-MGS-1/2-S	16.75	0.66	6.35	0.25	10.20	0.40	1.00	0.04	13.97	0.55	1/2"	-	0.049	
V-MGS-1/2-S W.T.=0.065	16.75	0.66	6.35	0.25	9.40	0.37	1.00	0.04	13.97	0.55	1/2"	-	0.065	
V-MGS-6MM-S	15.75	0.62	6.35	0.25	4.00	0.16	0.50	0.02	6.80	0.27	6mm	1.00	-	
V-MGS-8MM-S	16.50	0.65	6.35	0.25	6.00	0.24	0.80	0.03	8.90	0.35	8mm	1.00	-	
V-MGS-10MM-S	16.50	0.65	6.35	0.25	8.00	0.31	0.80	0.03	10.90	0.43	10mm	1.00	-	
V-MGS-12MM-S	16.75	0.66	6.35	0.25	10.00	0.39	1.00	0.04	13.20	0.52	12mm	1.00	-	

**AG Adapter Gland**


PART NO.	L		C		d		T	W.T.
	mm	inch	mm	inch	mm	inch	inch-mm	
P-AG-1/4	41.15	1.62	16.20	0.64	4.30	0.17	1/4"	
P-AG-3/8	46.00	1.81	17.80	0.70	6.80	0.27	3/8"	
P-AG-1/2	49.30	1.94	24.40	0.96	9.40	0.37	1/2"	
P-AG-6M	41.15	1.62	15.70	0.62	4.00	0.16	6MM	

**MG -W Male Gland Short Tube without Shoulder**


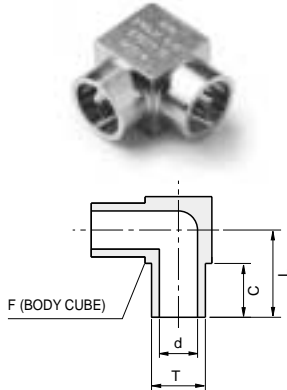
PART NO.	L		C		d		T		W.T.	
	mm	inch	mm	inch	mm	inch	inch-mm	mm	inch	
V-MG-1/4-W	30.50	1.20	6.35	0.25	4.56	0.18	1/4"	-	0.035	
V-MG-1/4-W 1.32	33.50	1.32	9.60	0.38	4.56	0.18	1/4"	-	0.035	
V-MG-3/8-W	32.80	1.29	6.35	0.25	7.73	0.30	3/8"	-	0.035	
V-MG-1/2-W	32.80	1.29	6.35	0.25	10.20	0.40	1/2"	1.00	0.049	
V-MG-6MM-W	30.50	1.20	6.35	0.25	4.00	0.16	6mm	1.00	-	
V-MG-8MM-W	30.50	1.20	6.35	0.25	6.00	0.24	8mm	1.00	-	
V-MG-10MM-W	32.80	1.29	6.35	0.25	8.00	0.31	10mm	1.00	-	
V-MG-12MM-W	32.80	1.29	6.35	0.25	10.00	0.39	12mm	-	-	

**GSW Gland Socket Weld**


PART NO.	L		d		E		D		T
	mm	inch	mm	inch	mm	inch	mm	inch	inch-mm
V-GSW-1/16	17.78	0.70	1.30	0.05	2.50	0.10	3.3	0.13	1/16"
V-GSW-1/8	17.78	0.70	2.30	0.09	2.50	0.10	5.1	0.20	1/8"
V-GSW-1/4	33.30	1.31	4.56	0.18	7.10	0.28	8.9	0.35	1/4"
V-GSW-3/8	38.10	1.50	7.73	0.30	7.90	0.31	15.2	0.60	3/8"
V-GSW-1/2	38.10	1.50	10.20	0.40	9.60	0.38	15.2	0.60	1/2"
V-GSW-3/4	50.80	2.00	15.70	0.62	11.20	0.44	22.4	0.88	3/4"
V-GSW-1	56.39	2.22	22.10	0.87	15.70	0.62	30.2	1.19	1"

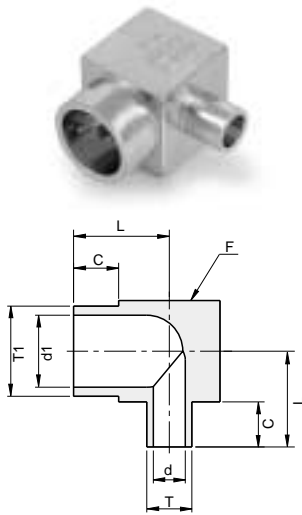
Dimensions are for reference only, and are subject to change without notice.

To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number



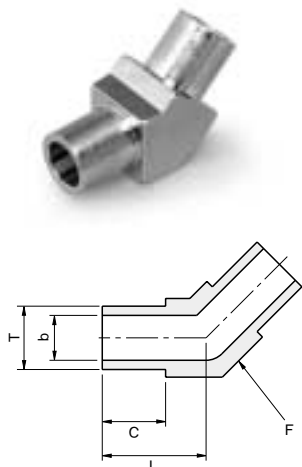
### ME Mini Elbow

PART NO.	L		C		d		F	T		W.T.
	mm	inch	mm	inch	mm	inch		Tube O.D	inch-mm	
V-ME-1/8-W	10.40	0.41	6.35	0.25	1.86	0.07	5/16	1/8"	-	0.028
V-ME-1/4-W	10.40	0.41	6.35	0.25	4.56	0.18	5/16	1/4"	-	0.035
V-ME-3/8-W	11.93	0.47	6.35	0.25	7.73	0.30	7/16	3/8"	-	0.035
V-ME-1/2-W	13.53	0.53	6.35	0.25	10.2	0.40	9/16	1/2"	-	0.049
V-ME-1/2-W W.T.=0.065	13.53	0.53	6.35	0.25	9.46	0.37	9/16	1/2"	-	0.065
P-ME-3/4-W W.T.=0.065	17.37	0.68	6.35	0.25	15.81	0.62	7/8	3/4"	-	0.065
P-ME-1-W W.T.=0.065	19.83	0.78	6.35	0.25	22.16	0.87	1-1/16	1"	-	0.065
V-ME-6MM-W	10.33	0.41	6.35	0.25	4.00	0.16	5/16	6mm	1.00	-
V-ME-8MM-W	11.93	0.47	6.35	0.25	6.00	0.24	7/16	8mm	1.00	-
V-ME-10MM-W	11.93	0.47	6.35	0.25	8.00	0.31	7/16	10mm	1.00	-
V-ME-12MM-W	13.53	0.53	6.35	0.25	10.00	0.39	9/16	12mm	1.00	-



### MER Mini Elbow Reducer

PART NO.	L		d1		d		C		F	T1		W.T. (T1)	T		W.T. (T)	
	mm	inch	mm	inch	mm	inch	mm	inch		inch	mm		inch	mm		inch
V-MER-1/4x1/8	10.40	0.41	4.56	0.18	1.86	0.07	6.35	0.25	5/16	1/4	-	0.035	-	1/8	-	0.028
V-MER-3/8X1/4	11.90	0.47	7.73	0.30	4.56	0.18	6.35	0.25	7/16	3/8	-	0.035	-	1/4	-	0.035
V-MER-1/2X1/4	13.53	0.53	10.20	0.40	4.56	0.18	6.35	0.25	9/16	1/2	-	0.049	-	1/4	-	0.035
V-MER-1/2X3/8	13.53	0.53	10.20	0.40	7.73	0.30	6.35	0.25	9/16	1/2	-	0.049	-	3/8	-	0.035
V-MER-8MMx6MM	11.93	0.47	6.00	0.24	4.00	0.16	6.35	0.25	7/16	-	8mm	1.00	-	6mm	1.00	-
V-MER-12MMx6MM	13.53	0.53	10.00	0.39	4.00	0.16	6.35	0.25	9/16	-	12mm	1.00	-	6mm	1.00	-
V-MER-12MMx8MM	13.53	0.53	10.00	0.39	6.00	0.24	6.35	0.25	9/16	-	12mm	1.00	-	8mm	1.00	-



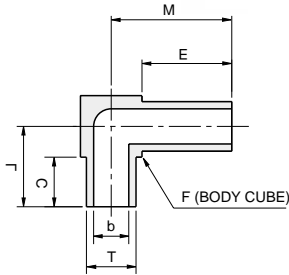
### ME 45 Mini Elbow 45°

PART NO.	L		d		C		F	T		W.T.
	mm	inch	mm	inch	mm	inch		inch	Tube O.D	
V-ME-1/8-W-45DEG	10.33	0.41	1.86	0.07	6.35	0.25	5/16	1/8"	-	0.028
V-ME-1/4-W-45DEG	10.33	0.41	4.56	0.18	6.35	0.25	5/16	1/4"	-	0.035
V-ME-3/8-W-45DEG	11.93	0.47	7.73	0.30	6.35	0.25	7/16	3/8"	-	0.035
V-ME-1/2-W-45DEG	13.53	0.53	10.2	0.40	6.35	0.25	9/16	1/2"	-	0.049
V-ME-1/2-W-45DEG W.T.=0.065	13.53	0.53	9.46	0.37	6.35	0.25	9/16	1/2"	-	0.065
V-ME-6MM-W-45DEG	10.33	0.41	4.00	0.16	6.35	0.25	5/16	6MM	1.00	-
V-ME-8MM-W-45DEG	11.93	0.47	6.00	0.24	6.35	0.25	7/16	8MM	1.00	-
V-ME-10MM-W-45DEG	11.93	0.47	8.00	0.31	6.35	0.25	7/16	10MM	1.00	-
V-ME-12MM-W-45DEG	13.53	0.53	10.00	0.39	6.35	0.25	9/16	12MM	1.00	-

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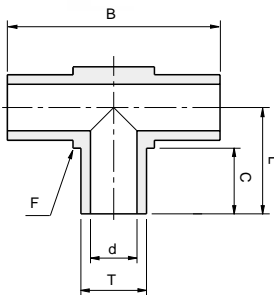
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

### MEX Mini Elbow Extended Leg



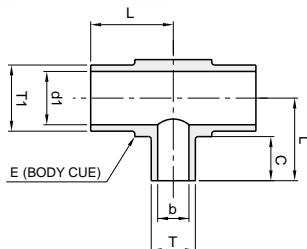
PART NO.	L		M		d		C		E		F	T		W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		inch	inch-mm	inch	mm
V-MEX-1/4-0.41X0.66	10.33	0.41	16.66	0.66	4.56	0.18	6.35	0.25	12.70	0.50	5/16	1/4"	0.035	-	
V-MEX-1/4-0.41X0.61	10.33	0.41	15.49	0.61	4.56	0.18	6.35	0.25	11.43	0.45	5/16	1/4"	0.035	-	

### MT Mini Tee



PART NO.	L		B		d		C		F	T		W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch		inch	inch-mm	mm	inch
V-MT-1/8	10.33	0.41	20.66	0.81	1.86	0.07	6.35	0.25	5/16	1/8"	-	0.028	
V-MT-1/4	10.33	0.41	20.66	0.81	4.56	0.18	6.35	0.25	5/16	1/4"	-	0.035	
V-MT-3/8	11.93	0.47	23.86	0.94	7.73	0.30	6.35	0.25	7/16	3/8"	-	0.035	
V-MT-1/2	13.53	0.53	27.06	1.07	10.2	0.40	6.35	0.25	9/16	1/2"	-	0.049	
V-MT-1/2 W.T.=0.065	13.53	0.53	27.06	1.07	9.46	0.37	6.35	0.25	9/16	1/2"	-	0.065	
P-MT-3/4 W.T.=0.065	17.37	0.68	34.74	1.37	15.81	0.62	6.35	0.25	7/8	3/4"	-	0.065	
P-MT-1 W.T.=0.065	19.83	0.78	39.66	1.56	22.16	0.87	6.35	0.25	1-1/16	1"	-	0.065	
V-MT-6MM	10.33	0.41	20.66	0.81	4.00	0.16	6.35	0.25	5/16	6MM	1.00	-	
V-MT-8MM	11.93	0.47	23.86	0.94	6.00	0.24	6.35	0.25	7/16	8MM	1.00	-	
V-MT-10MM	11.93	0.47	23.86	0.94	8.00	0.31	6.35	0.25	7/16	10MM	1.00	-	
V-MT-12MM	13.53	0.53	27.06	1.07	10.00	0.39	6.35	0.25	9/16	12MM	1.00	-	

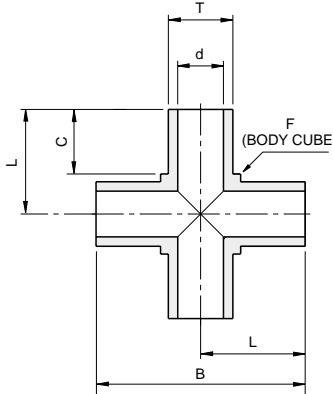
### MTR Mini Tee Reducer



PART NO.	L		B		d		d1		C		F	T1		W.T. (T1)	T		W.T. (T)
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		inch/mm	inch		mm	inch/mm	
V-MTR-1/2X1/4	13.53	0.53	27.06	1.07	4.57	0.18	10.20	0.40	6.35	0.25	9/16	1/2	0.049	-	1/4	0.035	-
V-MTR-3/8X1/4	11.93	0.47	23.86	0.94	4.57	0.18	7.70	0.30	6.35	0.25	7/16	3/8	0.035	-	1/4	0.035	1.00
V-MTR-12M6M	13.53	0.53	27.06	1.07	4.00	0.16	10.0	0.39	6.35	0.25	9/16	12MM	-	1.00	6MM	-	-

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To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

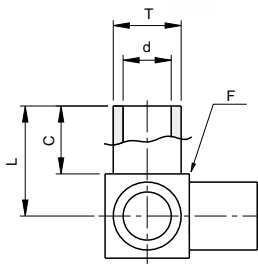


### MC Mini Cross

PART NO.	L		B		d		C		F	T		W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch-mm	mm	inch	
V-MC-1/8	10.33	0.41	20.66	0.81	1.86	0.07	6.35	0.25	5/16	1/8"	-	0.028	
V-MC-1/4	10.33	0.41	20.66	0.81	4.56	0.18	6.35	0.25	5/16	1/4"	-	0.035	
V-MC-3/8	11.93	0.47	23.86	0.94	7.73	0.30	6.35	0.25	7/16	3/8"	-	0.035	
V-MC-1/2	13.53	0.53	27.06	1.07	10.2	0.40	6.35	0.25	9/16	1/2"	-	0.049	
V-MC-1/2-W.T.=0.065	13.53	0.53	27.06	1.07	9.46	0.37	6.35	0.25	9/16	1/2"	-	0.065	
P-MC-3/4-W.T.=0.065	17.37	0.68	34.74	1.37	15.81	0.62	6.35	0.25	7/8	3/4"	-	0.065	
P-MC-1-W.T.=0.065	19.83	0.78	39.66	1.56	22.16	0.87	6.35	0.25	1-1/16	1"	-	0.065	
V-MC-6MM	10.33	0.41	20.66	0.81	4.00	0.16	6.35	0.25	5/16	6MM	1.00	-	
V-MC-8MM	11.93	0.47	23.86	0.94	6.00	0.24	6.35	0.25	7/16	8MM	1.00	-	
V-MC-10MM	11.93	0.47	23.86	0.94	8.00	0.31	6.35	0.25	7/16	10MM	1.00	-	
V-MC-12MM	13.53	0.53	27.06	1.07	10.00	0.39	6.35	0.25	9/16	12MM	1.00	-	

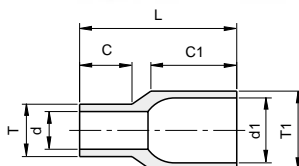
### MTB Mini Tri-EL

PART NO.	L		d		C		F	T		W.T.	
	mm	inch	mm	inch	mm	inch	inch	inch-mm	inch	mm	
V-MTB-1/8	10.33	0.41	1.86	0.07	6.35	0.25	5/16	1/8"	0.028	-	
V-MTB-1/4	10.33	0.41	4.56	0.18	6.35	0.25	5/16	1/4"	0.035	-	
V-MTB-3/8	11.93	0.47	7.73	0.30	6.35	0.25	7/16	3/8"	0.035	-	
V-MTB-1/2	13.53	0.53	10.2	0.40	6.35	0.25	9/16	1/2"	0.049	-	
V-MTB-6MM	10.33	0.41	4.00	0.16	6.35	0.25	5/16	6MM	-	1.00	
V-MTB-8MM	11.93	0.47	6.00	0.24	6.35	0.25	7/16	8MM	-	1.00	
V-MTB10MM	11.93	0.47	8.00	0.31	6.35	0.25	7/16	10MM	-	1.00	
V-MTB-12MM	13.53	0.53	10.00	0.39	6.35	0.25	9/16	12MM	-	1.00	



### RU Reducing Union

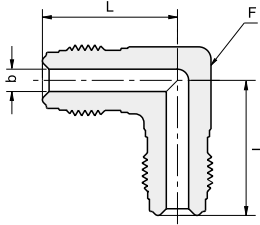
PART NO.	L		d1		d		C1		C		T1		W.T. (T1)		T		W.T. (T)	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	
V-RU-1/4x1/8	19.05	0.75	4.56	0.18	1.86	0.07	10.41	0.41	6.35	0.25	1/4	-	0.035	-	1/8	-	0.028	
V-RU-3/8x1/4	19.05	0.75	7.73	0.30	4.56	0.18	10.41	0.41	6.35	0.25	3/8	-	0.035	-	1/4	-	0.035	
V-RU-1/2x1/4	19.05	0.75	10.20	0.40	4.56	0.18	10.41	0.41	6.35	0.25	1/2	-	0.049	-	1/4	-	0.035	
V-RU-1/2x3/8	19.05	0.75	10.20	0.40	7.73	0.30	10.41	0.41	6.35	0.25	1/2	-	0.049	-	3/8	-	0.035	
P-RU-1x1/2	19.05	0.75	22.16	0.87	10.20	0.40	10.41	0.41	6.35	0.25	1	-	0.065	-	1/2	-	0.049	
V-RU-8MMx6MM	19.05	0.75	6.00	0.24	4.00	0.16	10.41	0.41	6.35	0.25	8mm	-	1.00	-	6mm	-	1.00	
V-RU-10MMx6MM	19.05	0.75	8.00	0.31	4.00	0.16	10.41	0.41	6.35	0.25	10mm	-	1.00	-	6mm	-	1.00	
V-RU-10MMx8MM	19.05	0.75	8.00	0.31	6.00	0.24	10.41	0.41	6.35	0.25	10mm	-	1.00	-	8mm	-	1.00	
V-RU-12MMx6MM	19.05	0.75	10.00	0.39	4.00	0.16	10.41	0.41	6.35	0.25	12mm	-	1.00	-	6mm	-	1.00	
V-RU-12MMx8MM	19.05	0.75	10.00	0.39	6.00	0.24	10.41	0.41	6.35	0.25	12mm	-	1.00	-	8mm	-	1.00	
V-RU-12MMx10MM	19.05	0.75	10.00	0.39	8.00	0.31	10.41	0.41	6.35	0.25	12mm	-	1.00	-	10mm	-	1.00	



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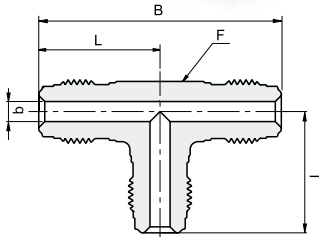
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

**EU Elbow Union**



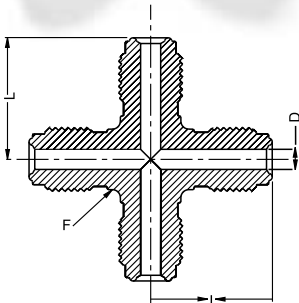
PART NO.	L		d		F	T
	mm	inch	mm	inch	inch	Tube O.D inch-mm
P-EU-1/4	27.20	1.07	4.56	0.18	1/2	1/4"
P-EU-1/2	36.83	1.45	10.20	0.40	13/16	1/2"
P-EU-3/4	48.80	1.92	15.76	0.62	1-1/4	3/4
P-EU-1	50.80	2.00	22.16	0.87	1-11/16	1"

**TU Tee Union**



PART NO.	L		M		d		F	T
	mm	inch	mm	inch	mm	inch	inch	Tube O.D inch
P-TU-1/4	27.20	1.07	54.40	2.14	4.56	0.18	1/2	1/4"
P-TU-1/2	36.83	1.45	73.66	2.90	10.20	0.40	13/16	1/2"
P-TU-3/4	48.80	1.92	97.60	3.84	15.76	0.62	1-1/4	3/4
P-TU-1	50.80	2.00	101.60	4.00	22.16	0.87	1-11/16	1"

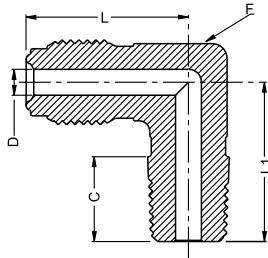
**CU Cross Union**



PART NO.	L		D		Thread Size	F	
	mm	inch	mm	inch		mm	inch
P-CU-1/4	27.20	1.07	4.56	0.18	9/16-18	12.90	1/2
P-CU-1/2	36.83	1.45	10.20	0.40	7/8-14	20.60	13/16

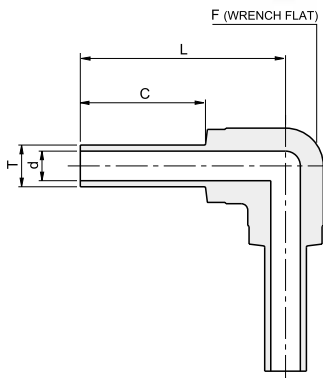
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To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number



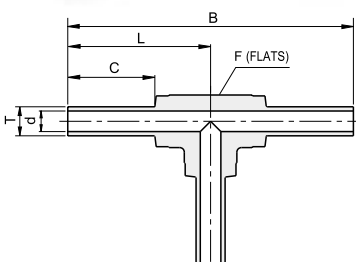
**EM Elbow Male**

PART NO.	L		L1		C		d		F	T		P
	mm	inch	mm	inch	mm	inch	mm	inch		inch-mm	inch-mm	
P-EM-1/4x1/8	27.20	1.07	22.10	0.87	9.60	0.38	4.56	0.18	1/2	1/4"	1/8"	
P-EM-1/4x1/4	27.20	1.07	26.70	1.05	14.20	0.56	4.56	0.18	1/2	1/4"	1/4"	
P-EM-1/2X1/4	36.83	1.45	32.00	1.26	14.20	0.56	10.2	0.40	15/16	1/2"	1/4"	
P-EM-1/4X1/2	31.20	1.23	33.50	1.32	19.00	0.75	4.56	0.18	15/16	1/4"	1/2"	
P-EM-1/2x3/8	36.83	1.45	32.00	1.26	14.20	0.56	10.20	0.40	13/16	1/2"	3/8"	
P-EM-1/2X1/2	36.83	1.45	36.80	1.45	19.10	0.75	10.20	0.40	13/16	1/2"	1/2"	



**EW-W Elbow AW without Shoulder**

PART NO.	L		d		C		F	T		W.T.	
	mm	inch	mm	inch	mm	inch		inch	inch-mm	inch	mm
P-EW-1/4-W	31.24	1.23	4.56	0.18	19.05	0.75	7/16	1/4"	0.035	-	
P-EW-3/8-W	30.48	1.20	7.73	0.30	19.05	0.75	7/16	3/8"	0.035	-	
P-EW-1/2-W	34.04	1.34	10.20	0.40	19.05	0.75	11/16	1/2"	0.049	-	
P-EW-1/2-W W.T.=0.065	34.04	1.34	9.46	0.37	19.05	0.75	11/16	1/2"	0.065	-	
P-EW-3/4-W	37.1	1.46	16.5	0.65	19.05	0.75	15/16	3/4"	0.049	-	
P-EW-1-W W.T.=0.065	47.00	1.85	22.16	0.87	19.05	0.75	1-3/8	1"	0.065	-	
P-EW-1-W W.T.=0.120	47.00	1.85	19.36	0.76	19.05	0.75	1-3/8	1"	0.120	-	
P-EW-6MM-W	31.24	1.23	4.00	0.16	19.05	0.75	7/16	6MM	-	1.00	
P-EW-8MM-W	30.48	1.20	6.00	0.24	19.05	0.75	7/16	8MM	-	1.00	
P-EW-10MM-W	30.48	1.20	8.00	0.31	19.05	0.75	11/16	10MM	-	1.00	
P-EW-12MM-W	34.04	1.34	10.00	0.39	19.05	0.75	11/16	12MM	-	1.00	
P-EW-12MM-W 2.00MM WT	33.00	1.30	8.00	0.31	19.05	0.75	11/16	12MM	-	1.00	

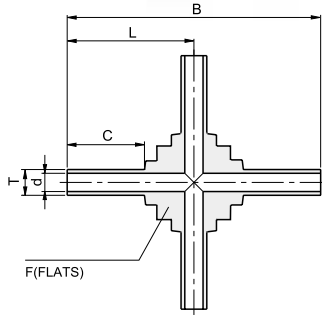


**TW-W Tee AW without Shoulder**

PART NO.	L		B		d		C		F	T		W.T. (T)	
	mm	inch	mm	inch	mm	inch	mm	inch		inch	mm	inch	mm
P-TW-1/4-W	31.24	1.23	62.48	2.46	4.56	0.18	19.05	0.75	7/16	1/4"	0.035	-	
P-TW-3/8-W	30.48	1.20	60.96	2.40	7.73	0.30	19.05	0.75	7/16	3/8"	0.035	-	
P-TW-1/2-W	34.04	1.34	68.08	2.68	10.20	0.40	19.05	0.75	11/16	1/2"	0.049	-	
P-TW-1/2-W W.T.=0.065	34.04	1.34	68.08	2.68	9.46	0.37	19.05	0.75	11/16	1/2"	0.065	-	
P-TW-1-W W.T.=0.065	47.00	1.85	94.00	3.70	22.16	0.87	19.05	0.75	1-3/8	1"	0.065	-	
P-TW-1-W W.T.=0.120	47.00	1.85	94.00	3.70	19.36	0.76	19.05	0.75	1-3/8	1"	0.120	-	
P-TW-6MM-W	31.24	1.23	62.48	2.46	4.00	0.16	19.05	0.75	7/16	6MM	-	1.00	
P-TW-8MM-W	30.20	1.23	60.96	2.40	6.00	0.24	19.05	0.75	7/16	8MM	-	1.00	
P-TW-10MM-W	34.00	1.34	60.96	2.40	8.00	0.31	19.05	0.75	11/16	10MM	-	1.00	
P-TW-12MM-W	34.00	1.34	68.08	2.68	10.00	0.39	19.05	0.75	11/16	12MM	-	1.00	

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

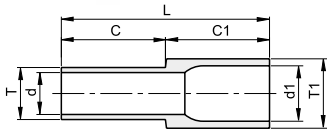
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number



**CW-W Cross AW without Shoulder**

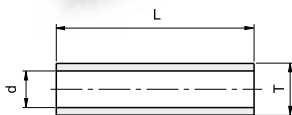
PART NO.	L		B		d		C		F	T		W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	mm	inch	mm
P-CW-1/4-W	31.24	1.23	62.48	2.46	4.56	0.18	19.05	0.75	7/16	1/4"	0.035	-	
P-CW-3/8-W	30.48	1.20	60.96	2.40	7.73	0.30	19.05	0.75	7/16	3/8"	0.035	-	
P-CW-1/2-W	34.04	1.34	68.08	2.68	10.20	0.40	19.05	0.75	11/16	1/2"	0.049	-	
P-CW-1/2-W W.T.=0.065	34.04	1.34	68.08	2.68	9.46	0.37	19.05	0.75	11/16	1/2"	0.065	-	
P-CW-1-W W.T.=0.065	47.00	1.85	94.00	3.70	22.16	0.87	19.05	0.75	1-3/8	1"	0.065	-	
P-CW-1-W W.T.=0.120	47.00	1.85	94.00	3.70	19.36	0.76	19.05	0.75	1-3/8	1"	0.120	-	
P-CW-6MM-W	31.24	1.23	62.48	2.46	4.00	0.16	19.05	0.75	7/16		6MM	-	1.00
P-CW-8MM-W	31.20	1.23	60.96	2.40	6.00	0.24	19.05	0.75	7/16		8MM	-	1.00
P-CW-10MM-W	34.00	1.34	60.96	2.40	8.00	0.31	19.05	0.75	5/8		10mm	-	1.00
P-CW-12MM-W	34.00	1.34	68.08	2.68	10.00	0.39	19.05	0.75	5/8		12MM	-	1.00

**RW-W Reducer AW without Shoulder**



PART NO.	L		d1		d		C1		C		T1		W.T.		T1		W.T.	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm
V-RW-1/4x1/8	38.1	1.50	4.56	0.18	1.86	0.07	19.05	0.75	19.05	0.75	1/4	0.035	1/8	0.028				
V-RW-3/8x1/4-W	38.1	1.50	7.73	0.30	4.56	0.18	19.05	0.75	19.05	0.75	3/8	0.035	1/4	0.035				
V-RW-1/2x1/4-W	38.1	1.50	10.20	0.40	4.56	0.18	19.05	0.75	19.05	0.75	1/2	0.049	1/4	0.035				
V-RW-1/2x3/8-W	38.1	1.50	10.20	0.40	7.73	0.30	19.05	0.75	19.05	0.75	1/2	0.049	3/8	0.035				
V-RW-1x1/2-WT.065x.049	40.46	1.59	22.16	0.87	10.26	0.40	19.05	0.75	19.05	0.75	1	0.065	1/2	0.049				
V-RW-8MMx6MM	38.1	1.50	6.00	0.24	4.00	0.16	19.05	0.75	19.05	0.75	8mm	1.00	6mm	1.00				
V-RW-10MMx6MM	38.1	1.50	8.00	0.31	4.00	0.16	19.05	0.75	19.05	0.75	10mm	1.00	6mm	1.00				
V-RW-10MMx8MM	38.1	1.50	8.00	0.31	6.00	0.24	19.05	0.75	19.05	0.75	10mm	1.00	8mm	1.00				
V-RW-12MMx6MM	38.1	1.50	10.00	0.39	4.00	0.16	19.05	0.75	19.05	0.75	12mm	1.00	6mm	1.00				
V-RW-12MMx8MM	38.1	1.50	10.00	0.39	6.00	0.24	19.05	0.75	19.05	0.75	12mm	1.00	8mm	1.00				
V-RW-12MMx10MM	38.1	1.50	10.00	0.39	8.00	0.31	19.05	0.75	19.05	0.75	12mm	1.00	10mm	1.00				

**UB-W Union Buttweld without Shoulder**

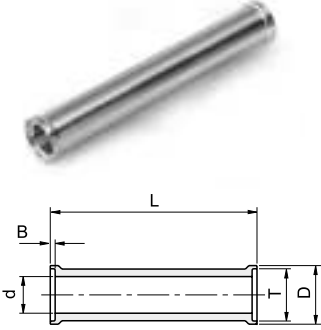


PART NO.	L		d		T		W.T.	
	mm	inch	mm	inch	inch-mm	mm	inch	
V-UB-1/4-W	24.30	0.96	4.56	0.18	1/4"	-	0.035	
V-UB-3/8-W	23.88	0.94	7.73	0.30	3/8"	-	0.035	
V-UB-1/2-W	23.37	0.92	10.2	0.40	1/2"	-	0.049	
V-UB-3/4-W	23.37	0.92	15.81	0.62	3/4"	-	0.065	
V-UB-1-W	29.72	1.17	22.16	0.87	1"	-	0.065	

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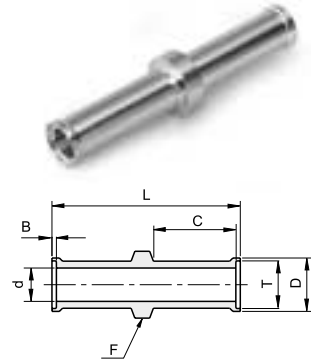
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

**UB-S Union Butt weld with Shoulder**



PART NO.	L		d		B		D		T		W.T.
	mm	inch	mm	inch	mm	inch	mm	inch	inch	Tube O.D	
V-UB-1/4-S	25.40	1.00	4.56	0.18	0.55	0.02	7.37	0.29	1/4"	-	0.035
V-UB-3/8-S	25.40	1.00	7.73	0.30	0.76	0.03	10.40	0.41	3/8"	-	0.035
V-UB-1/2-S	25.40	1.00	10.2	0.40	1.00	0.04	13.97	0.55	1/2"	-	0.049
P-UB-3/4-S	25.40	1.00	15.81	0.62	1.00	0.04	20.32	0.80	3/4"	-	0.065
V-UB-1-W-S	31.75	1.25	22.16	0.87	1.00	0.04	26.92	1.06	1"	-	0.065

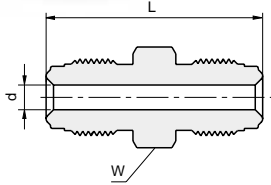
**UBL-S Union Butt weld with Locator and Shoulder**



PART NO.	L		C		d		B		D		F		T		W.T.
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	
V-UBL-1/4-S	42.93	1.69	19.05	0.75	4.56	0.18	0.55	0.022	7.37	0.29	9.14	0.36	1/4"	0.035	-
V-UBL-3/8-S	43.43	1.71	19.05	0.75	7.73	0.30	0.76	0.030	10.40	0.41	10.67	0.42	3/8"	0.035	-
V-UBL-1/2-S	43.94	1.73	19.05	0.75	10.2	0.40	1.00	0.04	13.97	0.55	15.24	0.60	1/2"	0.049	-

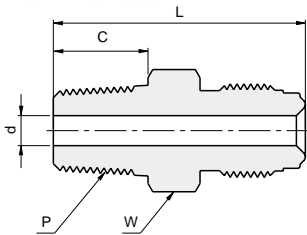
Dimensions are for reference only, and are subject to change without notice.

To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number



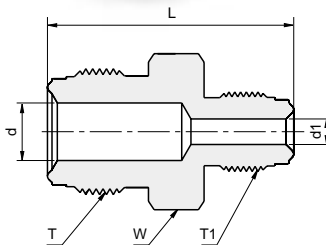
### UM Union Male

PART NO.	L		d		T	W	
	mm	inch	mm	inch	Tube O.D inch	mm	inch
P-UM 1/4	39.40	1.55	4.560	0.18	1/4	15.87	5/8
P-UM 1/2	46.70	1.84	10.20	0.40	1/2	23.81	15/16
P-UM 3/4	62.00	2.44	15.70	0.62	3/4	33.34	1-5/16
P-UM 1	65.80	2.59	22.10	0.87	1	41.28	1-5/8



### CM Connector Male to Male NPT

PART NO.	L		C		d		W	T	P
	mm	inch	mm	inch	mm	inch	inch	Tube O.D inch-mm	NPT-M inch-mm
P-CM-1/4x1/8	33.30	1.31	9.60	0.38	4.560	0.18	5/8	1/4"	1/8"
P-CM-1/4x1/4	37.80	1.49	14.20	0.56	4.560	0.18	5/8	1/4"	1/4"
P-CM 1/4 X 1/2	42.60	1.68	19.00	0.75	4.560	0.18	1"	1/4"	1/2"
P-CM-1/4XR1/4-H BSPT	37.80	1.49	14.20	0.56	4.560	0.18	5/8	1/4"	1/4" BSPT
P-CM-1/2x1/4	41.90	1.65	14.20	0.56	10.20	0.40	15/16	1/2"	1/4"
P-CM-1/2x3/8	41.90	1.65	14.20	0.56	10.20	0.40	15/16	1/2"	3/8"
P-CM-1/2X1/2	46.70	1.84	19.10	0.75	10.20	0.40	15/16	1/2"	1/2"
P-CM-3/4x3/4	55.60	2.19	19.00	0.75	15.76	0.62	1-5/16	3/4"	3/4"
P-CM-1x1	62.70	2.47	23.90	0.94	22.16	0.87	1-5/8	1"	1"



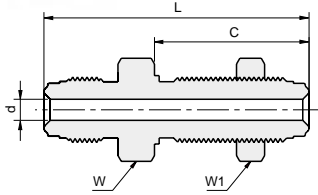
### RUM Reducing Union Male

PART NO.	T	T1	L		d		d1		T	T1	W	
	Tube size inch	Tube size inch	mm	inch	mm	inch	mm	inch	inch	inch	mm	inch
P-RUM 1/2x1/4	1/2	1/4	43.40	1.71	10.20	0.40	4.56	0.18	7/8-14	9/16-18	23.81	15/16

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

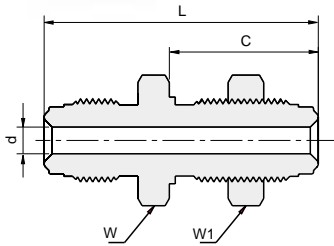
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

### BU Bulkhead Union



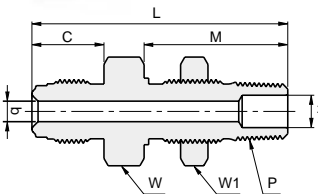
PART NO.	L		C		d		T		W		W1	
	mm	inch	mm	inch	mm	inch	Tube O.D	Thread	mm	inch	mm	inch
P-BU 1/4	56.60	2.23	33.00	1.30	4.50	0.18	1/4	9/16-18	19.05	3/4	19.05	3/4
P-BU 1/2	65.30	2.57	37.60	1.48	10.14	0.40	1/2	7/8-14	26.99	1-1/16	26.99	1-1/16

### SBU Short Bulkhead Union



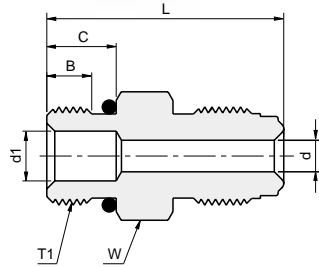
PART NO.	L		C		d		T	T1	W		W1		Panel Hole Size
	mm	inch	mm	inch	mm	inch	Tube O.D	Thread O.D	mm	inch	mm	inch	
P-SBU 1/4	46.20	1.82	25.10	0.99	4.50	0.18	1/4	9/16-18	19.05	3/4	19.05	3/4	19/32
P-SBU 1/2	54.40	2.14	28.20	1.11	10.14	0.40	1/2	7/8-14	26.99	1-1/16	26.99	1-1/16	29/32

### BCM NPT Bulkhead

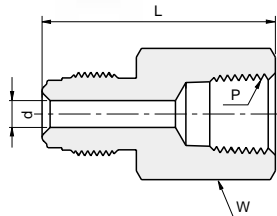


PART NO.	P Male NPT Size	L		M		C		d		d1		T	W		W1		Panel Hole Size
		mm	inch	mm	inch	mm	inch	mm	inch	mm	mm	Thread Size	mm	inch	mm	inch	
P-BCM 1/4X1/4	1/4	56.10	2.21	31.50	1.24	15.80	0.62	4.56	0.18	7.10	0.28	9/16-18	20.64	13/16	20.64	13/16	19/32
P-BCM 1/2X1/4	1/2	59.40	2.34	31.50	1.24	17.80	0.70	10.20	0.40	7.10	0.28	7/8-14	23.81	15/16	20.64	13/16	29/32

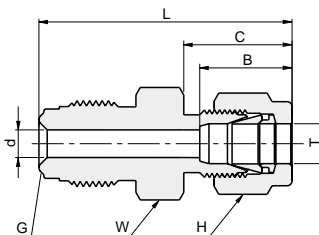
Dimensions are for reference only, and are subject to change without notice.  
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

**CMOB Connector Male to O-ring seal**


PART NO.	L		C		B		d		d1		T	T1	W		O-ring Size
	mm	inch	mm	inch	mm	inch	mm	inch	mm	mm	Tube O.D.	Thread O.D.	mm	inch	
P-CMOB 1/4X9/16	33.80	1.33	9.90	0.39	6.40	0.25	4.56	0.18	7.10	0.28	1/4	9/16-18	19.05	3/4	3-906
P-CMOB 1/2X7/8	42.20	1.66	12.70	0.50	10.20	0.40	7.10	0.28	15.0	0.59	1/2	7/8-14	25.40	1	3-910
P-CMOB 1/2X9/16	37.60	1.48	9.90	0.39	6.40	0.25	7.10	0.28	7.10	0.28	1/2	9/16-18	23.81	15/16	3-906

**FC Female Connector NPT**


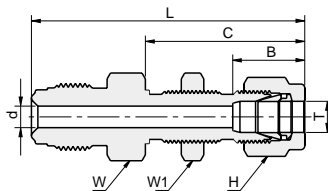
PART NO.	P	L		d		T	T	W	
	Male NPT size	mm	inch	mm	inch	Tube O.D.	Thread	mm	inch
P-FC 1/4X1/8	1/8	35.80	1.41	4.50	0.18	1/4	9/16-18	15.87	5/8
P-FC 1/4X1/4	1/4	39.10	1.54	4.50	0.18	1/4	9/16-18	19.05	3/4
P-FC 1/2X1/4	1/4	39.10	1.54	10.14	0.40	1/2	7/8-14	23.81	15/16
P-FC 1/2X3/8	3/8	44.70	1.76	10.14	0.40	1/2	7/8-14	23.81	15/16
P-FC 1/2X1/2	1/2	50.50	1.99	10.14	0.40	1/2	7/8-14	26.99	1-1/16
P-FC 3/4X3/4	3/4	59.90	2.36	15.70	0.62	3/4	1-1/4-18	33.34	1-5/16
P-FC 1X1	1	63.80	2.51	22.10	0.87	1	1-1/2-20	41.28	1-5/8

**UGL Let-Lok to Male Gland**


PART NO.	L		C		B		d		T	W		H	
	mm	inch	mm	inch	mm	inch	mm	inch	Tube O.D.	mm	inch	mm	inch
P-UGL 1/4 X 1/8	38.90	1.53	15.20	0.60	12.7	0.50	2.30	0.09	1/8	15.87	5/8	11.10	7/16
P-UGL 1/4 X 1/4	41.10	1.62	17.80	0.70	15.20	0.60	4.56	0.18	1/4	15.87	5/8	14.30	9/16
P-UGL 1/4 X 3/8	42.20	1.66	19.40	0.76	16.80	0.66	4.56	0.18	3/8	15.87	5/8	17.4	11/16
P-UGL 1/2 X 3/8	46.70	1.84	19.40	0.76	16.80	0.66	7.10	0.28	3/8	23.81	15/16	17.46	11/16
P-UGL 1/2 X 1/2	49.50	1.95	21.80	0.86	22.90	0.90	10.14	0.40	1/2	23.81	15/16	22.23	7/8

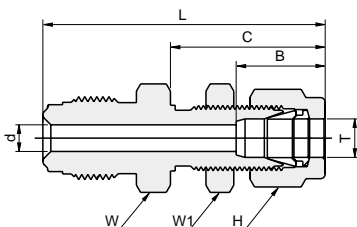
Dimensions are for reference only, and are subject to change without notice.

To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number



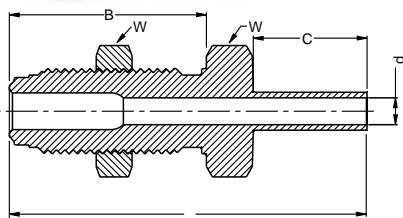
### BUL Bulkhead Union to Let-Lok

PART NO.	G		L		C		B		d		T Tube O.D.	W		W1		H	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	mm		mm	inch	mm	inch	mm	inch
P-BUL 1/4X1/4	1/4		57.20	2.25	33.50	1.32	15.20	0.60	4.56	0.18	1/4	15.87	5/8	15.87	5/8	14.30	9/16
P-BUL 1/2X3/8	1/2		64.50	2.54	36.80	1.45	16.80	0.66	7.10	0.28	1/2	23.81	15/16	19.05	3/4	17.46	11/16
P-BUL 1/2X1/2	1/2		69.90	2.74	41.90	1.65	22.90	0.90	10.14	0.40	1/2	23.81	15/16	23.81	15/16	22.23	7/8



### SBUL Short Bulkhead Union to Let-Lok

PART NO.	L		C		B		d		T Tube O.D.	W		W1		H	
	mm	inch	mm	inch	mm	inch	mm	mm		mm	inch	mm	inch	mm	inch
P-SBUL 1/4X1/4	47.80	1.88	26.70	1.05	15.20	0.60	4.56	0.18	1/4	15.87	5/8	15.87	5/8	14.30	9/16



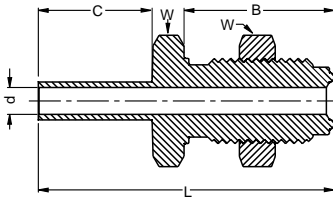
### BHUT Bulkhead Union to Tube

PART NO.	L		B		C		d		W	T Tube O.D.
	mm	inch	mm	inch	mm	inch	mm	inch		
P-BHUT-1/4	59.90	2.36	33.00	1.30	19.05	0.75	4.56	0.18	3/4	1/4
P-BHUT-1/2	66.55	2.62	37.60	1.48	19.05	0.75	10.20	0.40	1-1/16	1/2

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

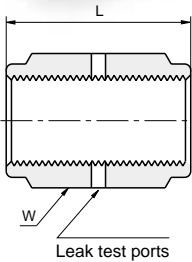
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

### SBHUT Short Bulkhead Union to Tube



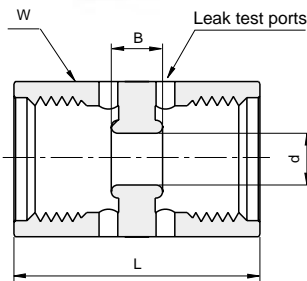
PART NO.	L		B		C		d		W	T1
	mm	inch	mm	inch	mm	inch	mm	inch	inch	Tube O.D. inch
P-SBHUT-1/4	49.50	1.95	25.14	0.99	19.05	0.75	4.56	0.18	3/4	1/4
P-SBHUT-1/2	58.96	2.31	29.74	1.17	19.05	0.75	10.14	0.40	1-1/16	1/2

### CP Coupling



PART NO.	L		Thread size	W		T
	mm	inch		mm	inch	Tube O.D.
P-CP 1/4	30.20	1.19	9/16-18	19.05	3/4	1/4
P-CP 1/2	33.30	1.31	7/8-14	27.00	1-1/16	1/2
P-CP 3/4	42.70	1.68	1-1/4-18	38.10	1-1/2	3/4
P-CP 1	51.80	2.04	1-1/2-20	44.45	1-3/4	1

### DFU Double Female Union

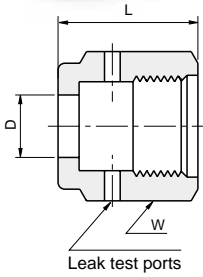


PART NO.	L		B		d		W	T
	mm	inch	mm	inch	mm	inch	inch	Tube O.D. inch
P-DFU-1/4	30.20	1.19	6.00	0.24	6.35	0.25	3/4	1/4
P-DFU-1/2	33.30	1.31	6.00	0.24	14.05	0.55	1-1/16	1/2

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

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To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

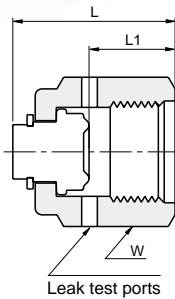


### NF Nut Female

PART NO.	L		D		Thread size	T Tube O.D.	W	
	mm	inch	mm	inch			mm	inch
P-NF 1/8	13.60	0.54	5.25	0.21	5/16-24	1/8	11.11	7/16
P-NF 1/4	20.60	0.81	9.20	0.36	9/16-18	1/4	19.05	3/4
P-NF 1/2	22.50	0.88	15.50	0.61	7/8-14	1/2	27.00	1-1/16
P-NF 3/4	28.45	1.12	22.60	0.89	1-1/4-18	3/4	38.10	1-1/2
P-NF 1	34.00	1.34	30.60	1.20	1-1/2-20	1	44.45	1-3/4

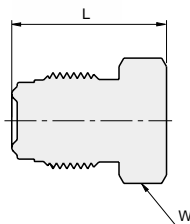
### CF Cap Female

PART NO.	L		L1		Thread size	T Tube O.D.	W	
	mm	inch	mm	inch			mm	inch
P-CF 1/8	16.60	0.65	8.4	0.33	5/16	1/8	11.11	7/16
P-CF 1/4	23.88	0.94	12.70	0.50	9/16-18	1/4	19.05	3/4
P-CF 1/2	25.55	1.01	14.20	0.56	7/8-14	1/2	27.00	1-1/16
P-CF 3/4	32.15	1.27	19.00	0.75	1-1/4-18	3/4	38.10	1-1/2
P-CF 1	38.96	1.53	23.26	0.92	1-1/2-20	1	44.45	1-3/4



### MP Male Plug

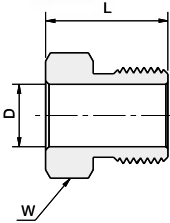
PART NO.	L		Thread size	T Tube O.D.	W	
	mm	inch			mm	inch
P-MP 1/8	17.3	0.68	5/16	1/8	9.52	3/8
P-MP 1/4	23.40	0.92	9/16-18	1/4	15.87	5/8
P-MP 1/2	27.40	1.08	7/8-14	1/2	23.81	15/16
P-MP 3/4	36.30	1.43	1-1/4-18	3/4	33.34	1-5/16
P-MP 1	38.60	1.52	1-1/2-20	1	41.28	1-5/8



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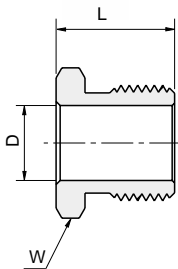
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

### NM Nut Male



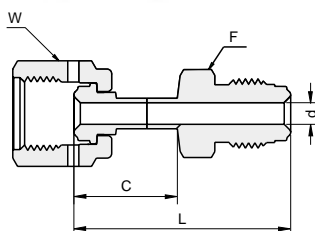
PART NO.	L		D		Thread size	T Tube O.D.	W	
	mm	inch	mm	inch			mm	inch
P-NM 1/8	12.70	0.50	5.30	0.21	5/16-24	1/8	9.53	3/8
P-NM 1/4	18.00	0.71	9.20	0.36	9/16-18	1/4	15.87	5/8
P-NM 1/2	20.60	0.81	15.50	0.61	7/8-14	1/2	23.81	15/16
P-NM 3/4	25.50	1.00	22.70	0.89	1-1/4-18	3/4	33.34	1-5/16
P-NM 1	30.20	1.19	30.50	1.20	1-1/2-20	1	41.28	1-5/8

### SNM Short Nut Male



PART NO.	L		D		Thread size	T Tube O.D.	W inch
	mm	inch	mm	inch			
P-SNM 1/4 .54	13.72	0.54	9.20	0.36	9/16-18	1/4	5/8
P-SNM 1/4 .65	16.51	0.65	9.20	0.36	9/16-18	1/4	5/8

### UMF Male to Female

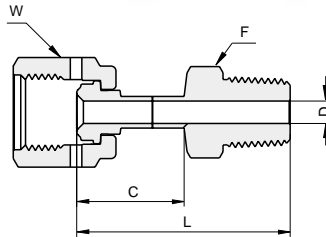


PART NO.	L		C		d		F	W	d	T Tube inch
	mm	inch	mm	inch	mm	inch	inch	inch	inch	
P-UMF-1/4	45.15	1.78	21.55	0.85	4.56	0.18	5/8	3/4	3/4	1/4
P-UMF-1/2	49.80	1.96	22.1	0.87	10.14	0.40	15/16	1-1/16	1-1/16	1/2

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

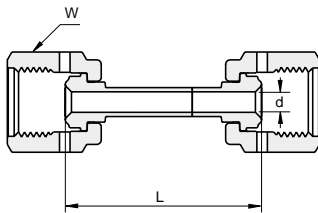
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

### MCF Male Connector to Female



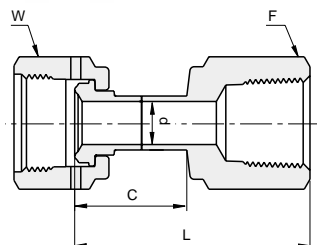
PART NO.	L		C		d		W	F	T1 Tube
	mm	inch	mm	inch	mm	inch	inch	inch	inch
P-MCF-1/4	45.50	1.79	23.40	0.92	4.56	0.18	3/4	9/16	1/4
P-MCF-1/2	53.10	2.09	25.60	1.01	10.14	0.40	1-1/16	7/8	1/2

### UFF Union Female to Female



PART NO.	L		d		W	T Tube
	mm	inch	mm	inch	inch	inch
P-UFF-1/4	43.05	1.69	4.56	0.18	3/4	1/4
P-UFF-1/2	48.55	1.91	10.14	0.40	1-1/16	1/2

### FCF Female Connector to Female NPT

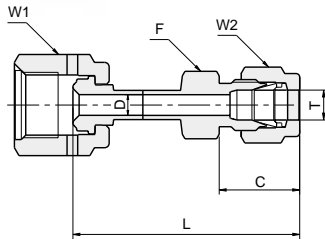


PART NO.	L		C		d		F	W	T Tube
	mm	inch	mm	inch	mm	inch	inch	inch	inch
P-FCF-1/4	45.00	1.77	23.40	0.92	4.56	0.18	3/4	3/4	1/4"
P-FCF-1/2	55.40	2.18	26.40	1.04	10.14	0.40	1-1/16	1-1/16	1/2"

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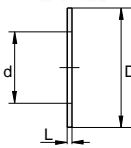
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

### FHTL Female HTC to Let-Lok



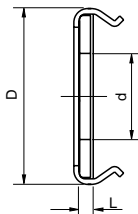
PART NO.	L		C		d		F	W1 Tube	W2 Tube	T Tube O.D.	T1 Tube
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
P-FHTL-1/4X1/4	49.30	1.94	17.80	0.70	4.56	0.18	1/2	3/4	9/16	1/4	1/4
P-FHTL-1/2X1/2	56.60	2.23	21.80	0.86	10.14	0.40	13/16	1-1/16	7/8	1/2	1/2

### GA Gasket



PART NO.	D		d		L	
	mm	inch	mm	inch	mm	inch
GA-1/4 - E	11.9	0.47	5.6	0.22	0.70	0.028
GA-1/2 - E	19.8	0.78	11.2	0.44	0.70	0.028
GA-3/4 - E	29.0	1.14	16.8	0.66	0.70	0.028
GA-1 - E	35.6	1.40	22.6	0.89	0.70	0.028

### GA-RT Gasket Retained

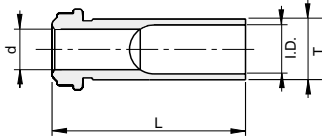


PART NO.	D		d		L	
	mm	inch	mm	inch	mm	inch
GA-1/4 - E	12.7	0.50	6.1	0.24	0.70	0.028
GA-1/2 - E	20.07	0.79	11.1	0.44	0.70	0.028
GA-3/4 - E	29.0	1.14	16.8	0.66	0.70	0.028
GA-1 - E	35.6	1.40	22.6	0.89	0.70	0.028

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

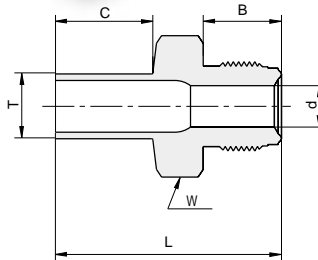
To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

**HGL - High Flow Gland Long**



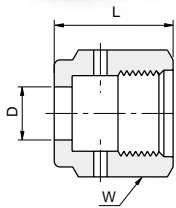
PART NO.	L		T Tube		I.D.		d	
	mm	inch	mm	inch	mm	inch	mm	inch
V-HGL-3/8 - 0.6	15.24	0.60	9.52	3/8	7.67	0.30	6.35	0.25
V-HGL-3/8 - 1.13	28.70	1.13	9.52	3/8	7.67	0.30	6.35	0.25
V-HGL-3/8 - 1.19	30.22	1.19	9.52	3/8	7.67	0.30	6.35	0.25
V-HGL-3/8 - 1.31	33.27	1.31	9.52	3/8	7.67	0.30	6.35	0.25

**HMT High Flow Male to Tube**



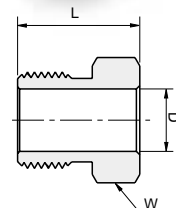
PART NO.	L		B		C		d		W	T Tube
	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch
P- HMT 1/4	42.67	1.68	15.8	0.62	19.05	0.75	6.35	0.25	5/8	3/8

**HNF High Flow Nut Female**



PART NO.	L		D		Thread size	T Tube O.D.	W	
	mm	inch	mm	inch			mm	inch
P- HNF 1/4	20.60	0.81	10.0	0.40	9/16-18	1/4	19.05	3/4

**HNM High Flow Nut Male**



PART NO.	L		D		Thread size	T Tube O.D.	W	
	mm	inch	mm	inch			mm	inch
P-NM 1/4	18.00	0.71	10.0	0.4	9/16-18	3/8	15.87	5/8

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To complete ordering number, add the surface finish designator either H or E (see Material table page 24), to the part Number

Material Table #1

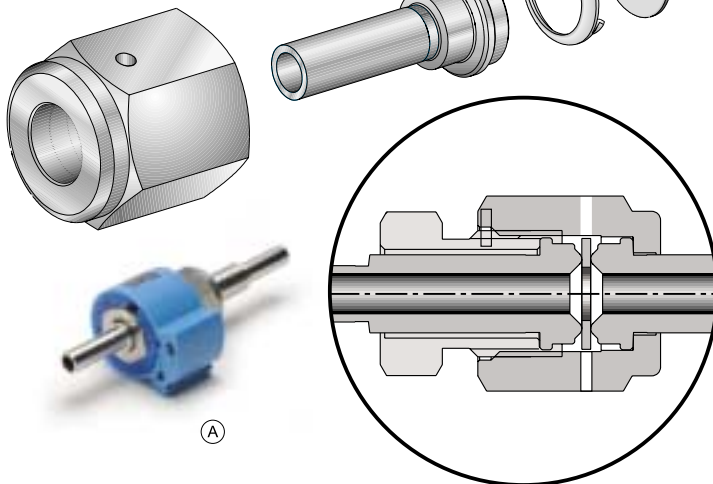
	MATERIAL	ORDERING DESIGNATOR	REFERENCE SPECIFICATIONS	LEVEL	*Ra MAX/ Ra Average μinch
<b>GLANDS</b>	316L VIM/VAR	<b>V</b>	Semi F20, ASTM A276	<b>E</b>	<b>10 / 5</b>
	316L VIM/VAR Low Mn	<b>LM</b>	JIS G 4303 SUS316L		
	316L VOD	<b>P</b>	ASTM A276, A479		
	316L	<b>P</b>	Barstock, ASTM A276		
	MONEL 400/450	<b>M</b>	ASTM -B-164, MIL-N-24106		
	HASTELLOY C276	<b>H</b>	ASME SB-574		
<b>MINI BUTTWELD</b>	316L VIM/VAR	<b>V</b>	Semi F20, ASTM A276	<b>E</b>	<b>10 / 5</b>
	316L VIM/VAR Low Mn	<b>LM</b>	Forgings, ASTM A182		
<b>AW BODIES</b>	316L VOD	<b>P</b>	ASTM A276, A479	<b>E</b>	<b>10 / 5</b>
<b>FACE SEAL FITTINGS</b>	316L VOD	<b>P</b>	ASTM A276, A479	<b>E</b>	<b>10 / 5</b>
	316L				
<b>NUTS, CAPS, PLUGS</b>	316	<b>P</b>	Barstock, ASTM A276	<b>N/A</b>	<b>N/A</b>
<b>GASKETS</b>	NICKEL 270	<b>Ni</b>	ASTM B-162	<b>E.P. ONLY</b>	<b>5 / 3</b>
	316L	<b>SS</b>	ASTM A240, A167	<b>E.P. ONLY</b>	<b>5 / 3</b>

Surface finish Reference: ANSI/ASME B 46.1 and ISO 4288

\* For "H" level the surface roughness Ra average - 10 μinch

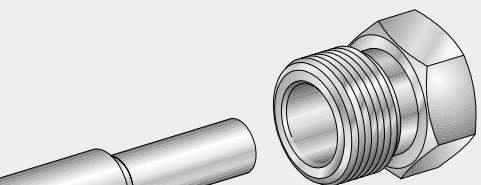
## MAKE UP OF GLANDS

- Glands offer 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's bead to bead assembly compresses a soft metal gasket to seal. This assembly can be locked by Ham-Let's Grip-Kit Ⓢ.



- Visual test and leak testing is performed through two test ports in opposite locations of the female nut.

## ASSEMBLY INSTRUCTIONS:



1. All HTC face seal fittings should be protected until 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. High purity fittings/applications dictate make up and assembly in clean environment utilizing proper clean room protocol.
3. Make up instructions:  
Tighten the female nut to the male nut/body finger tight.  
Tighten the female nut 1/8 turn past finger tight. Always torque the female nut while keeping the male nut/body stationary.  
Face seal connections are remarkable - please use a new gasket for each remarke.