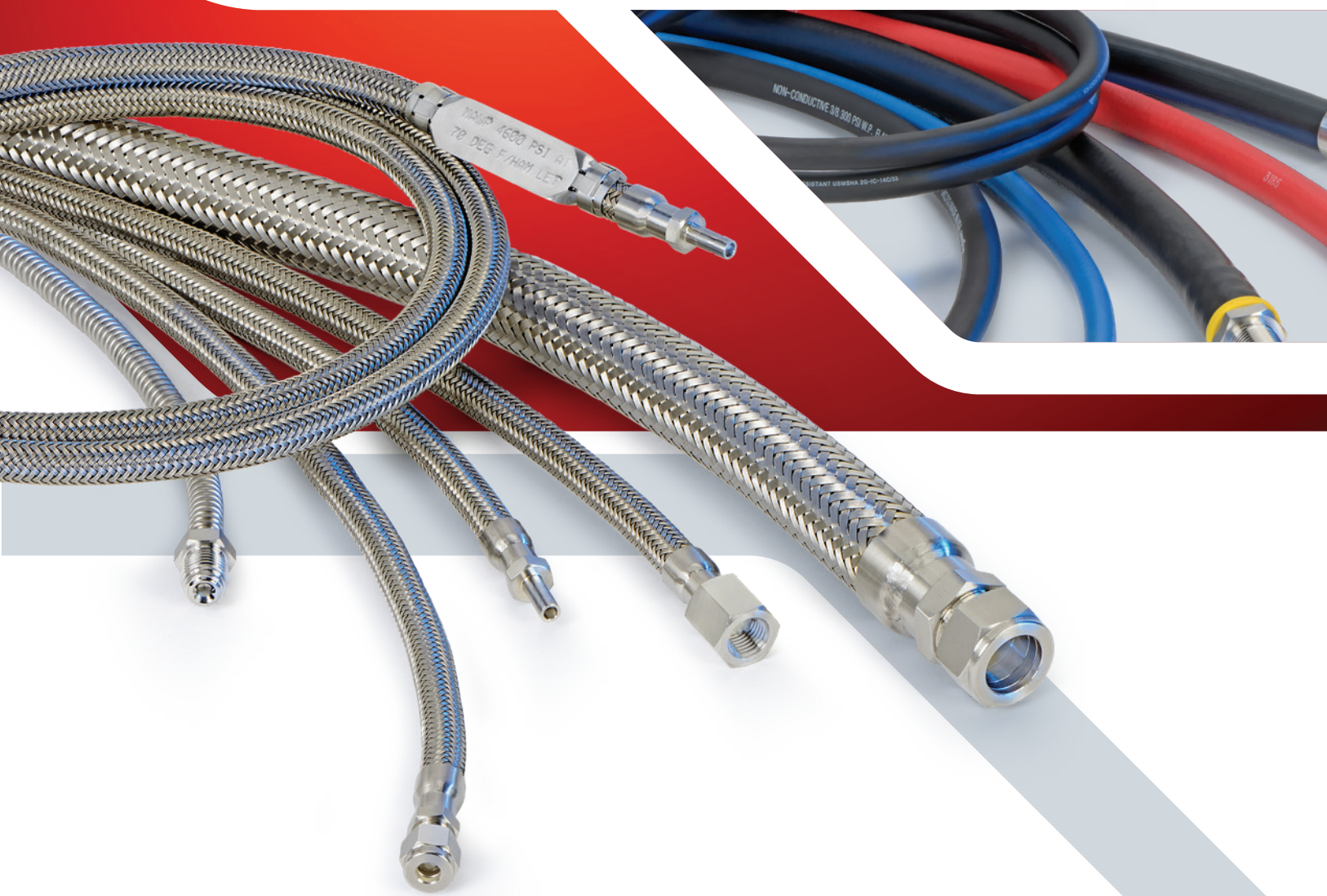
HAM-LET HOSES

METAL | PTFE | RUBBER | NYLON PFA | COMPONENTS
EXPANSION JOINTS



HAM-LET Group

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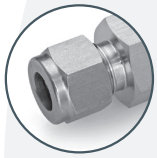
LET-LOK®



ONE-LOK®

Tube Adapter

Pre swaged tube adapter

Male NPT

Female NPT

Male BSPP

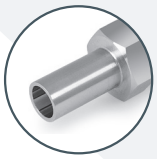
Female BSPP

Male Face Seal Swivel

Female Face Seal Swivel

Male JIC 37° Flare

Female JIC 37° Flare



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Sanitary flange

UH Line

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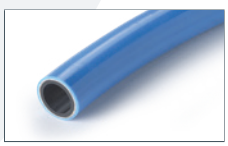

NHT SERIES 41
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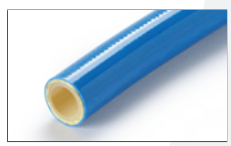

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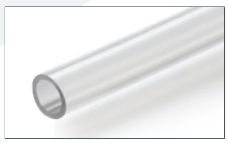
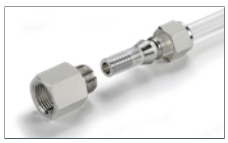


PHG SERIES*
Upon request



HAM-LET Hoses Quick Selection Guide

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)
METAL CORE																	
SHF General use Standard Metal Hose T321, T316L, T304L See page 17	0	90 (6)	4.5 (114)	70 (5)	5.0 (127)	70 (5)	5.5 (140)	43 (3)	8.0 (203)	43 (3)	9.0 (229)	43 (3)	10.0 254)	28 (2)	11.0 (279)	14 (1)	13.0 (330)
	1	1800 (124)		1558 (107)		1186 (82)		898 (62)		718 (50)		645 (44)		531 (37)		449 (31)	
	2	2700 (186)		2336 (161)		1779 123)		1347 (93)		1077 (74)		968 (67)		797 (55)		674 (46)	
SHE Extra flexible Most Flexible Hose T321, T316L, T304L See page 11	0	90 (6)	3.7 (94)	70 (5)	4.0 (102)	70 (5)	4.4 (112)	43 (3)	6.4 (163)	43 (3)	7.1 (180)	43 (3)	7.9 (201)	28 (2)	8.7 (221)	14 (1)	10.3 (262)
	1	1800 (124)		1558 (107)		1186 (82)		898 (62)		718 (50)		645 (44)		531 (37)		449 (31)	
	2	2700 (186)		2336 (161)		1779 123)		1347 (93)		1077 (74)		968 (67)		797 (55)		674 (46)	
SHJ Over flexible Higher-Pressure More Flexible T321, T316L, T304L See page 19	0	450 (31)	5.5 (140)	400 (28)	8.5 (215)	400 (28)	10.0 (254)	220 (15)	8.0 (203)	190 (13)	9.0 (229)	200 (14)	12.0 (305)	90 (6)	13.0 (330)	105 (7)	15.0 (381)
	1	3000 (207)		2400 (165)		2400 (165)		1100 (76)		1000 (69)		900 (62)		750 (52)		800 (55)	
	2	4000 (276)		3300 (226)		3200 (221)		1650 (114)		1400 (97)		1350 (93)		1200 (83)		1150 (79)	
SHU Ultra high pressure Higher Pressure T321 & T316L See page 20	0	500 (34)	4.5 (114)	400 (25)	7.0 (177)	200 (14)	8.5 (203)	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)		3500 (241)		2700 (186)		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)		5000 (344)		4500 (310)		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 Formable Stay-Put Application T321, T316L See page 21	0	90 (6)	-	70 (5)	-	70 (5)	-	43 (3)	-	43 (3)	-	43 (3)	-	28 (2)	-	14 (1)	-
	1	900 (62)		800 (55)		665 (46)		380 (26)		355 (24)		280 (19)		264 (18)		221 (15)	
SHS Standard use Industrial applications T316L See page 22	0	305 (21)	4.0 (100)	145 (10)	6.0 (150)	102 (7)	8.0 (200)	44 (3)	8.0 (200)	44 (3)	8.0 (200)	36 (2.5)	10.0 (250)	36 (2.5)	10.0 (250)	23 (1.6)	14.0 (350)
	1	1450 (100)		1305 (90)		1160 (80)		928 (64)		725 (50)		580 (40)		435 (30)		406 (28)	
SHP Industrial Gas Application T316L See page 23	1	2610 (180)	4.33 (110)	2102 (145)	5.91 (150)	2030 (140)	6.50 (165)	1232 (85)	8.86 (225)	1131 (78)	8.46 (215)	942 (65)	11.81 (300)	884 (61)	11.02 (280)	797 (55)	15.35 (390)
	2	3697 (255)		3233.5 (195)		2682 (185)		1812 (125)		1798 (124)	10.24 (260)	1667 (115)		1305 (90)	13.39 (340)	1131 (78)	
SHG Gas Application High-Pressure Clean Gases T316L See page 24	1	3625 (250)	7.5 (190)	2175 (150)	9.8 (250)	2175 (150)	11.8 (300)	1638* (113)	13.8* (350)	-	-	-	-	-	-	-	-
	2	6090 (420)		3540 (244)		3625 (225)		2726* (113)		-		-		-		-	

* Inside diameter for these hose parameters is 16mm

HAM-LET Hoses Quick Selection Guide (cont.)

Hose Series	Number of Braids	Inside Diameter inch (mm)															
		1/8 (6.35)		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)	
		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)
PTFE CORE																	
THT Smooth core See page 29	1	3750 (258)	1.5 (38)	3200 (221)	3.0 (76)	2500 (172)	5.0 (127)	2000 (138)	6.5 (165)	1000 (69)	9.0 (229)	1000 (69)	12.0 (305)	-	-	-	-
THS Silicon covered Smooth core See page 29	1	3750 (258)	1.5 (38)	3200 (221)	3.0 (76)	2500 (172)	5.0 (127)	2000 (138)	6.5 (165)	1000 (69)	9.0 (229)	1000 (69)	12.0 (305)	-	-	-	-
THC Convoluted core See page 30	1	-	-	2500 (172)	0.7 (18)	2000 (136)	0.8 (20)	1500 (103)	1.0 (25)	1100 (76)	2.5 (64)	750 (52)	3.5 (89)	700 (48)	6.0 (152)	525 (36)	7.9 (200)
THB Fiberglass braid See page 30	1	-	-	800 (55)	2.8 (70)	800 (55)	3.3 (83)	800 (55)	5.3 (133)	400 (27)	6.5 (165)	-	-	-	-	-	-
THN Convoluted Insulated PTFE Core with Aramid Braid See page 31	1	-	-	-	-	1250 (86)	2.5 (63.5)	1000 (69)	3.5 (88.9)	500 (35)	4.5 (114.3)	-	-	-	-	-	-
THP Red Silicon Covered Smooth Core See page 31	1	-	-	3000 (207)	2.0 (51)	2500 (172)	4.0 (102)	2000 (138)	5.2 (132)	-	-	-	-	-	-	-	-
THR Fiberglass braid + SS See page 32	1	-	-	3500 (241)	-	3000 (207)	4.0 (102)	1800 (124)	5.5 (140)	1000 (69)	-	1000 (69)	11.5 (292)	-	-	-	-
NYLON HOSES																	
NHG CNG gas application See page 40	-	5000 (345)	1.8 (45)	5000 (345)	3.0 (75)	5000 (345)	3.7 (95)	5000 (345)	7.3 (185)	5000 (345)	9.1 (230)	-	-	-	-	-	-
NHT Nylon reinforced SAE 100R7 See page 41	-	2900 (200)	1.4 (35)	2538 (175)	2.2 (55)	2030 (140)	3.0 (75)	1305 (90)	5.7 (145)	1015 (70)	7.9 (200)	-	-	-	-	-	-
NHT -C – NHT Conductive option See page 41	-	3306 (228)	1.6 (40)	3306 (228)	2.4 (60)	2030 (140)	3.0 (75)	1305 (90)	5.7 (145)	1015 (70)	7.9 (200)	-	-	-	-	-	-
NHP Nylon reinforced SAE 100R8 See page 42	-	5076 (350)	2.0 (50)	4061 (280)	2.8 (70)	3553 (245)	3.7 (95)	2393 (165)	5.9 (150)	2103 (145)	7.9 (200)	-	-	-	-	-	-
NHP -C – NHP Conductive option See page 42	-	5076 (350)	2.0 (50)	4061 (280)	2.8 (70)	3553 (245)	3.7 (95)	-	-	-	-	-	-	-	-	-	-
RUBBER HOSES																	
RHG Designed to use with HAM-LET HOSE END™ See page 36	1	300 (20.7)	2.6 (65)	300 (20.7)	3.0 (75)	300 (20.7)	5.1 (130)	300 (20.7)	7.1 (180)	300 (20.7)	8.0 (203)	-	-	-	-	-	-

HAM-LET Hoses End Connections Selection

End Connection Type	End Connection Size	Metal Hoses - Series SHF / SHU / SHV / SHE / SHH / SHJ / SHS / SHG I.D. inch (mm)								PTFE Hoses - Series THT / THS / THC / THL / THB / THR (○), Rubber Hose RHG (◇), Nylon Hose NHG / NHT / NHP (□) 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 (11/4-2 are preswaged)	1/4"	○	○							○◇□	◇					
	3/8"	○	○	○						○	○◇□	○◇				
	1/2"			○							○◇	○◇□	◇			
	3/4"				○	○						○◇	○◇□	○◇		
	1"				○	○						○	○	○◇□		
	1 1/4"						○									
	1 1/2"							○							○	
	2"								○							○
	6mm	○	○							○◇□			○			
	8mm	○	○	○						○◇□	◇					
	10mm	○	○	○							○◇□					
	12mm			○							◇	○◇□				
	18mm				○							○	○◇□			
	25mm					○								○◇□		
	38mm							○							○	
	50mm								○							○
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 (cont.)

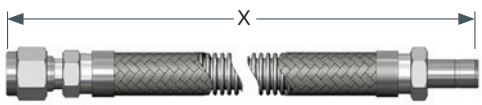
End Connection Type	End Connection Size	Metal Hoses - Series SHF / SHU / SHV / SHE / SHH I.D. inch (mm)								PTFE Hoses - Series THT / THS / THC / THL / THB / THR (○), Rubber Hose RHG (◇), Nylon Hose NHG / NHT / NHP (□) I.D. inch (mm)						
		1/4 (6.35)	3/8 (9.53)	1/2 (12.70)	3/4 (19.05)	1 (25.40)	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"						○									
	1 1/2"							○							○	
Female NPT	1/4"	○								○◇□	○					
	3/8"	○	○								○◇□					
	1/2"	○		○	○							○◇□				
	3/4"				○								○◇□			
	1"					○								○◇□		
	1 1/2"							○							○	
	2"															○
Female BSPP	1/4"	○								○◇□						
	3/8"		○								○◇□					
	1/2"			○								○◇□				
	3/4"												○◇□			
	1"													○◇□		
	1 1/2"														○	
	2"															○
Butt Weld adapter	1/4"	○		○						○◇□						
	3/8"	○	○								○◇□					
	1/2"	○		○								○◇□				
	3/4"				○	○							○◇□	○		
	1"				○	○		○						○◇□		
	1 1/4"						○									
	1 1/2"							○							○	
	2"															○
Male Face Seal Swivel	1/4"	○								○◇□						
	1/2"	○	○	○								○◇□				
	3/4"				○								○◇□			
	1"					○								○◇□		
Female Face Seal Swivel	1/4"	○								○◇□						
	1/2"	○	○	○								○◇□				
	3/4"				○								○◇□			
	1"					○		○						○◇□		
Male JIC 37° Flare	1/4"	○								○◇□						
	3/8"		○								○◇□					
	1/2"			○								○◇□				
	3/4"				○								○◇□			
	1"					○								○◇□		
	1 1/4"						○									
	1 1/2"							○							○	
	2"								○							○
Female JIC 37° Flare	1/4"	○														
	3/8"		○								○◇□					
	1/2"			○								○◇□				
	3/4"				○								○◇□			
	1"					○								○◇□		
Sanitary Flange	1/2"			○								○◇				
	3/4"				○								○◇			
	1"					○										
	1-1/2"							○								
	2"								○							

Selecting & Installing Hose Assemblies

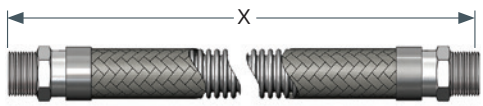
Length Considerations

To calculate the proper length of a hose assembly, you need to:

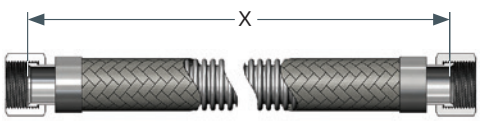
1. Verify that the installation is properly designed (see Do's & Don'ts herein)
   - Do not torque the hose
   - Do not over bend the hose
   - Do not compress the hose
2. Calculate the live length of the assembly - The live length of the assembly is the amount of active (flexible) hose in an assembly; that is, the hose between the braid collars (see formulas to help calculate live length for a variety of common hose installations herein)
3. Calculate the overall length of the assembly - 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).



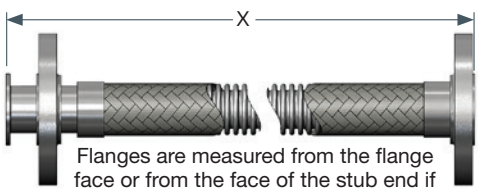
Compression fittings are measured to the end of the fitting



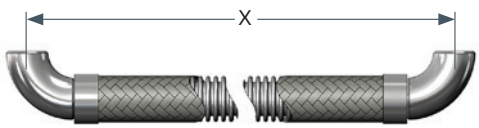
Threaded fittings are measured to the end of the fitting



JIC/SAE-type fittings are measured from the seat of the fitting

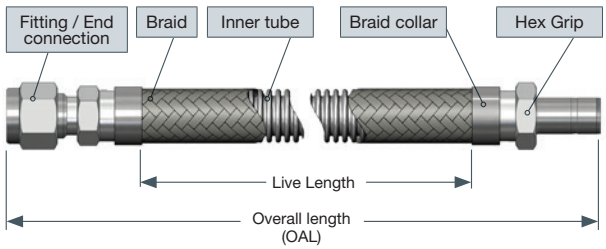


Flanges are measured from the flange face or from the face of the stub end if one is used



Elbows and other fittings with a radius are measured from the centerline of the fitting

Hose Assembly

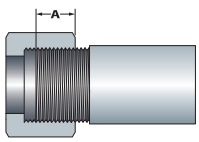


Thread Allowance

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 to thread engagement.

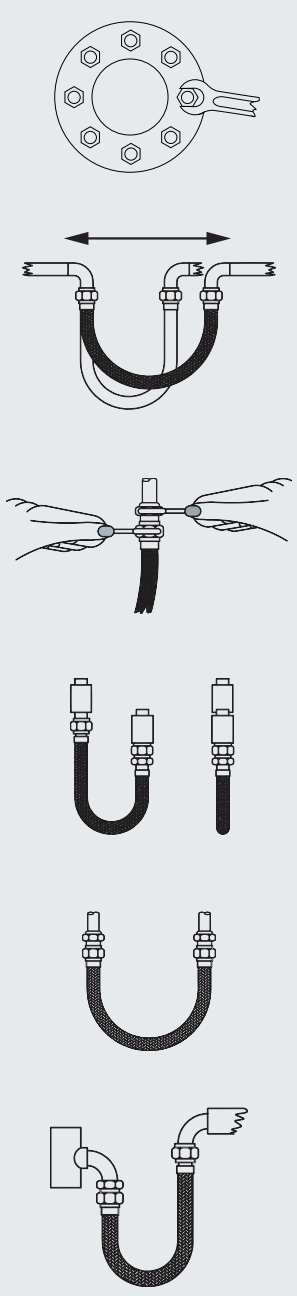
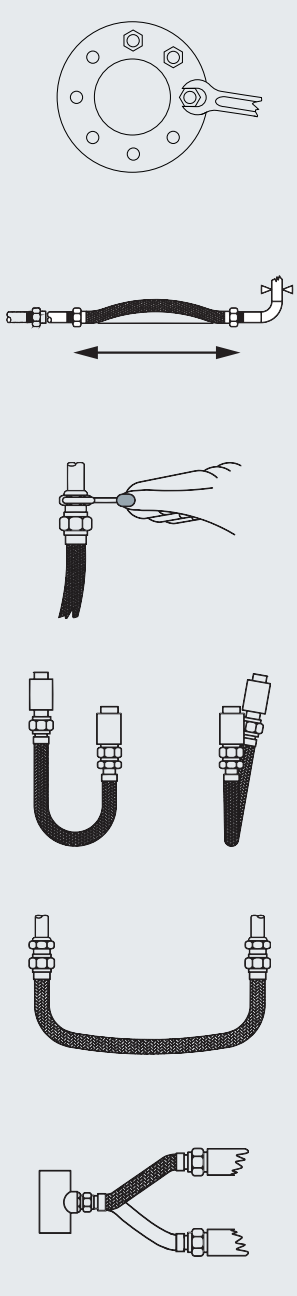
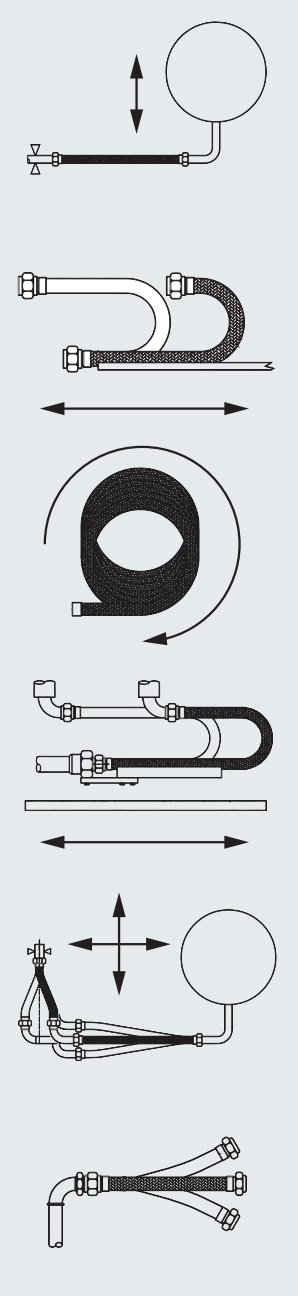
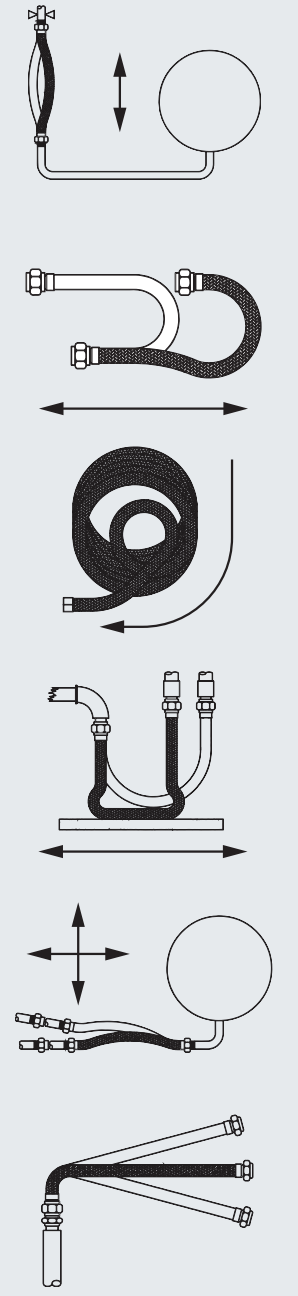
Example: using the chart below, a hose assembly with a 1" male pipe on one end would have 0.66" added to the OAL to compensate for the length of thread that will be engaged during installation.

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)



Selecting & Installing Hose Assemblies

Installation Do's & Don'ts

Do's	Don'ts	Do's	Don'ts
			

Selecting & Installing Hose Assemblies

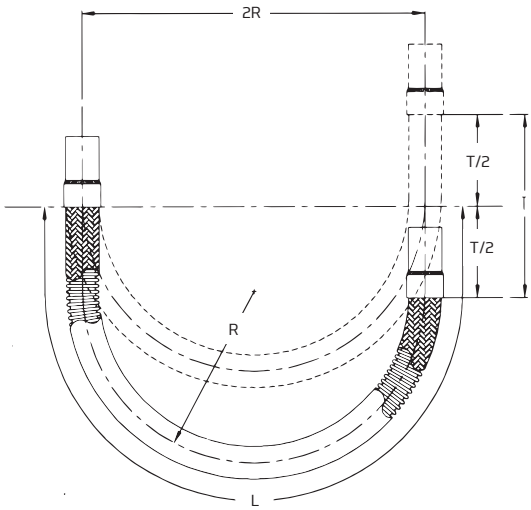
Live Length Calculations

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

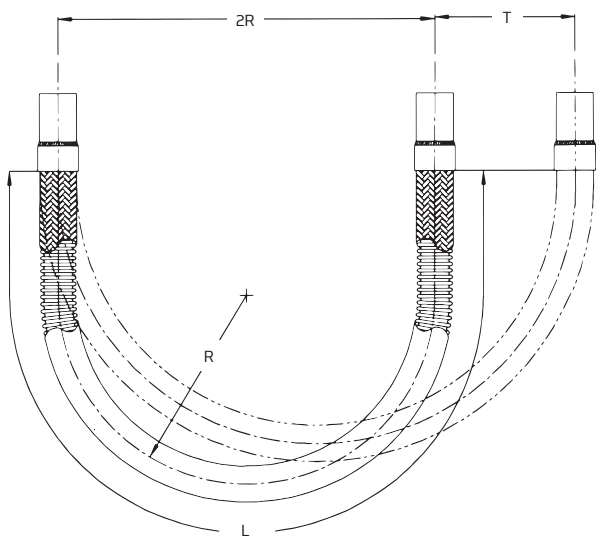
Verify that the installed radius is greater than the stated Minimum Bend Radius for the hose at the required working pressure.Verify that the centerline of the hose remains in the same plane during cycling to prevent twisting the assembly.

Constant Radius Traveling Loop (A-Loop)



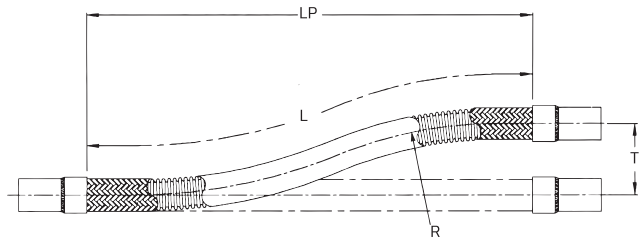
Formula: L = 4R + 1/2T

Variable Radius Traveling Loop (B-loop)



Formula: L = 4R + 1.57T

Lateral Offset

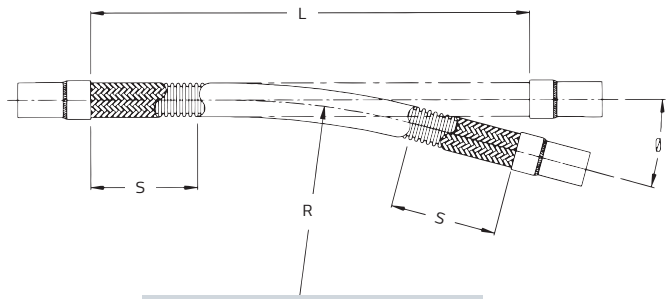


Formula: $L = \sqrt{20R \times T}$, $Lp = \sqrt{L^2 - T^2}$

Note 1: When the offset motion occurs on both sides of the hose centerline, use total travel in the formula

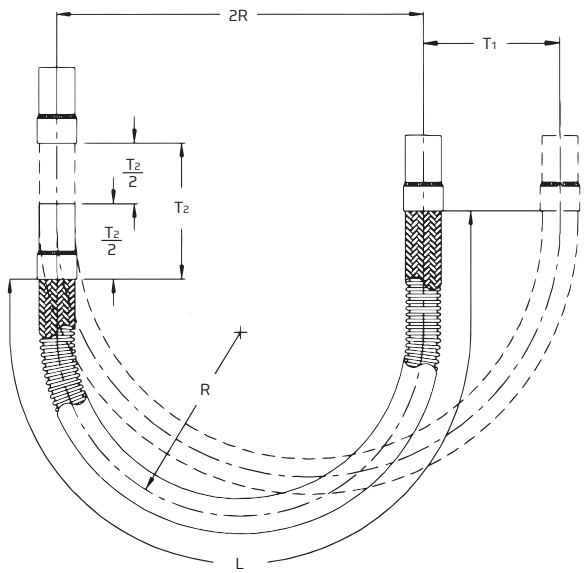
Note 2: The offset distance "T" for constant flexing should never exceed 25% of the centerline bend radius

Angular Deflection



Formula: L = 2S + (Ø/57.3)R

Vertical Loop With Movement In Two Directions (combination loop)

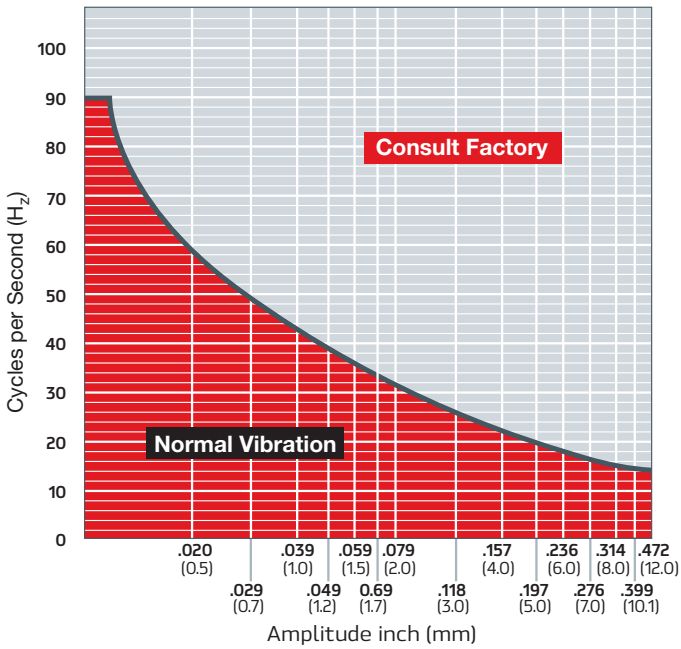


Formula: $L = 4R + 1.57T_1 + (T_2/2)$

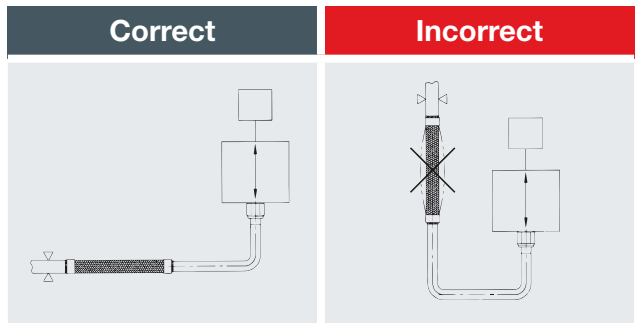
Selecting & Installing Hose Assemblies

Vibration

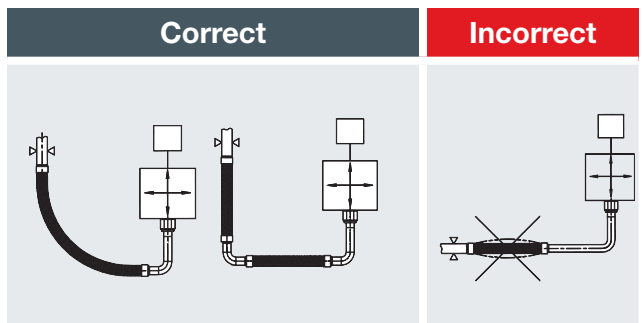
The following graph is a representative guideline for estimation purposes only.
For any questions, or if your application is near the “Consult Factory” region, please contact your HAM-LET local representative.



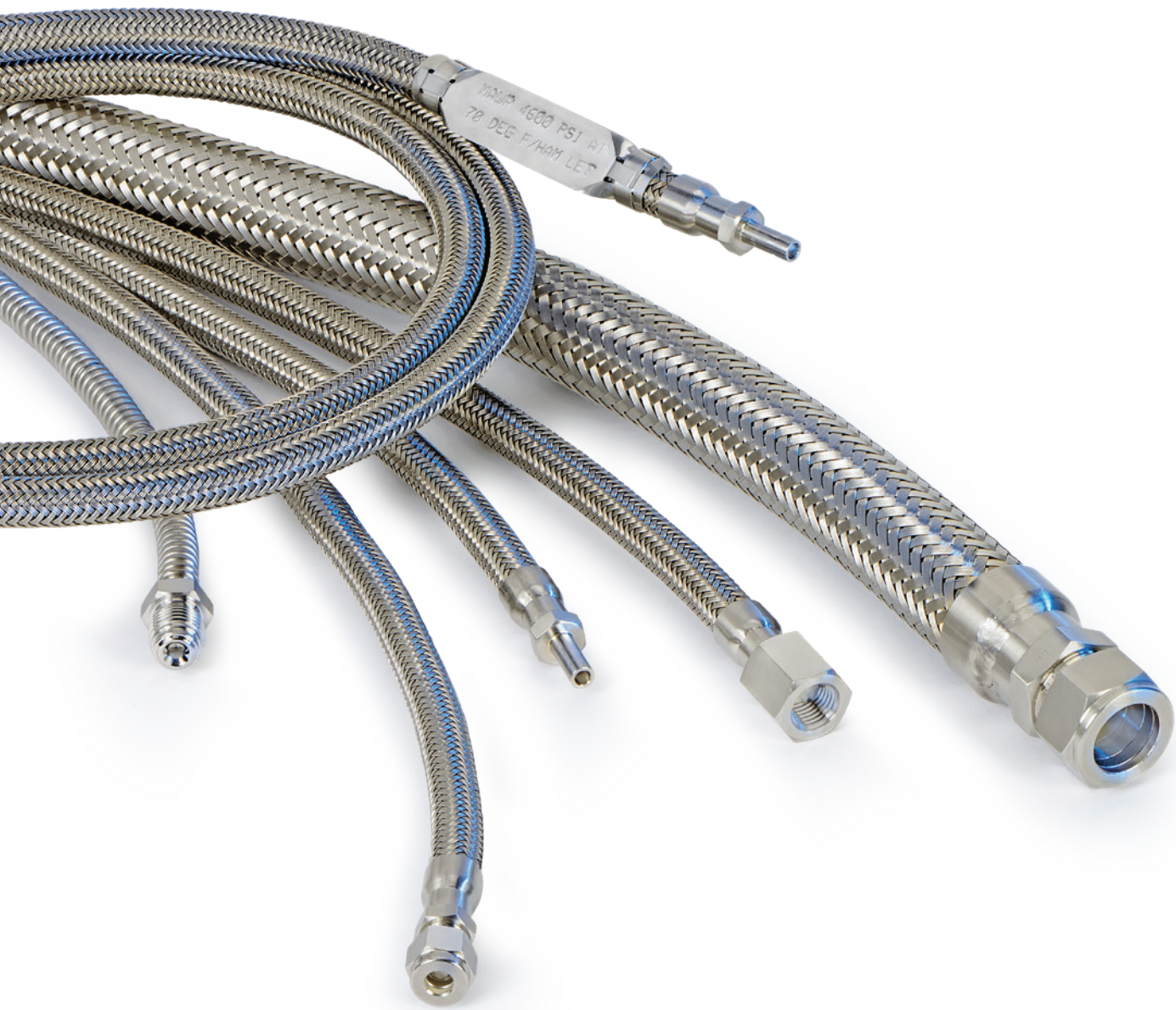
When installing a hose assembly in a vibration application, make sure to install it so the axis of the hose is perpendicular to the direction of the vibration.



If there is vibration in more than one direction, either install a longer hose bent at 90° or install a “Dog Leg” assembly.



HAM-LET METAL HOSES



HAM-LET®
ADVANCED CONTROL TECHNOLOGY

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 semicon ductors manufacturing and machinery.

The HAM-LET Metal Hose assemblies are constructed from only 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

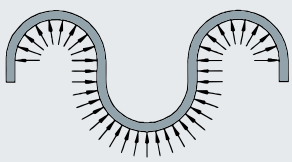
- All stainless steel assembly
- LET-LOK® , ONE-LOK®, Face seal, UH Line end fittings
- ID sizes: 1/4" up to 2"
- Pressure rating: Vacuum to 6,000 psi (414 bar), 4 to 1 safety factor
- Working temperatures -425°F (-254°C) up to 1300°F (705°C)
- Hydroformed or spirally-welded corrugated inner hose
- Machine 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 for designated items
- Pipework – Corrugated metal hoses and hose assemblies.

Metal Hoses Manufacturing Process

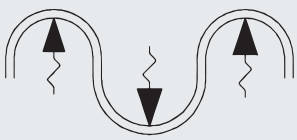
Corrugated Tube

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).
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 prolong cycle life.

Hydroformed
Evenly distributed stresses

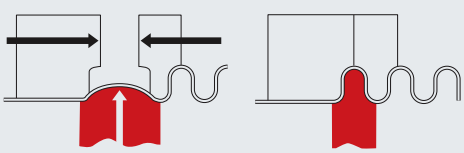


Mechanically Formed
Concentrated stresses



Hydroforming is a clean process, using water to form the hose, while most other processes require lubrication.

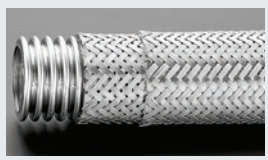
Hydroforming - HAM-LET utilizes a proprietary method of hydroforming in which corrugations are formed by expanding a section of stainless steel tube with high pressure water from inside the tube, while simultaneously feeding the tube axially into the process. Hydroforming is a clean, gentle process that enhances flexibility and cycle life, maintains wall thickness, reduces concentrated residual stress, and minimizes work hardening of materials.



Inilial Stage Final Stage

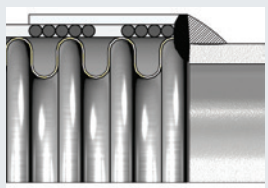
Braid

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 Braid Coverage - highest percentage of braid coverage, yielding better cycle life 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 cycle life.

Assembly



Combining top quality hose with top quality fittings together with a 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 characteristics:

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% tested,
Helium leak testing 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 inch (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		

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

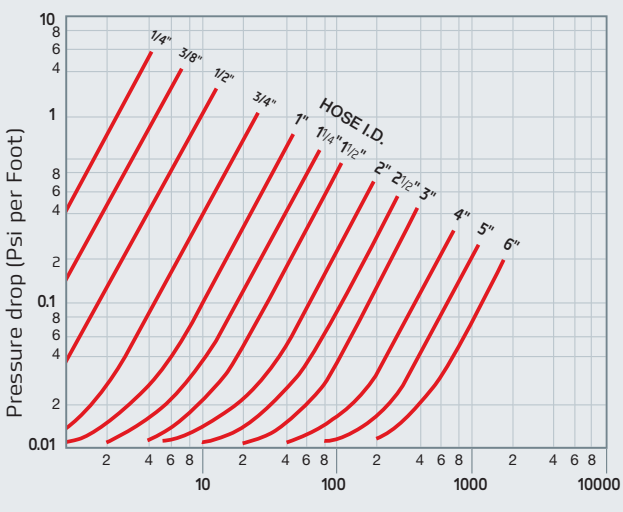
Velocity in Metal Hose

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

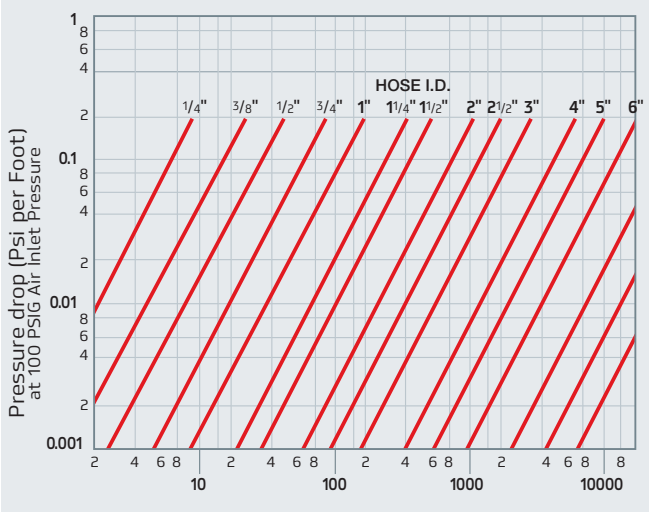
Pressure drop in a piping system is often a concern for the designer. Compared to rigid pipe, there is always a greater pressure drop in corrugated metal hose. The following graphs are offered as aids in estimating pressure drop in corrugated hose conveying water and air. The values derived are approximate and apply only to straight-line installations. Bends and fittings can increase the pressure drop.

Pressure Drop Graph For Water



Fluid Velocity (Gals. per Minute) Water at 70° F.

Pressure Drop Graph For Air



Cubic Feet per Minute of Free Air at 60° F.

SHF Series - General Use

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 environment.

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. working 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

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	4.5	114	90	6	n/a	n/a	0.04	0.06
		1	0.47	11.9					1,800	124	7,233	499	0.11	0.16
		2	0.53	13.5					2,700	186	9,100	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					1,558	107	6,230	430	0.20	0.30
		2	0.77	19.6					2,336	161	9,345	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					1,186	82	4,743	327	0.22	0.33
		2	0.89	22.6					1,779	123	7,115	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					1,205	83	4,820	332	0.33	0.49
		2	1.08	27.4					1,808	125	7,230	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	3,591	248	0.37	0.55
		2	1.28	32.5					1,347	93	5,387	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	2,872	198	0.50	0.74
		2	1.59	40.4					1,077	74	4,308	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	2,581	178	0.61	0.91
		2	1.91	48.5					968	67	3,872	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	2,125	147	0.85	1.26
		2	2.24	56.9					797	55	3,188	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	1,797	124	1.11	1.65
		2	2.77	70.4					674	46	2,696	186	1.63	2.43

Materials of Construction

Part	Material
Tube	SS 316L / SS 321
Braid	SS 304 / SS 316
End Connections	SS 316L

SHE Series - Extra Flexible

General

The SHE – Extra flexible hose series provides improved flexibility for smaller minimal static and dynamic bend radii. The extra flexibility is provided by denser corrugations while maintaining the same pressure rating.

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. working 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

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	0.42	10.7	0.9	23	3.7	94	90	6	n/a	n/a	0.07	0.10
		1	0.48	12.2					1,800	124	7,233	499	0.14	0.21
		2	0.54	13.7					2,700	186	9,100	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					1,558	107	6,230	430	0.25	0.37
		2	0.77	19.6					2,336	161	9,345	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					1,186	82	4,743	327	0.32	0.48
		2	0.89	22.6					1,779	123	7,115	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					1,205	83	4,820	332	0.37	0.55
		2	1.08	27.4					1,808	125	7,230	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	3,591	248	0.53	0.79
		2	1.28	32.5					1347	93	5,387	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	2,872	198	0.76	1.13
		2	1.63	41.4					1,077	74	4,308	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	2,581	178	1.00	1.49
		2	1.91	48.5					968	67	3,872	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	2,125	147	1.16	1.73
		2	2.24	56.9					797	55	3,188	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	1,797	124	1.44	2.14
		2	2.77	70.4					674	46	2,696	186	1.99	2.96

Materials of Construction

Part	Material
Tube	SS 316L / SS 321
Braid	SS 304 / SS 316
End Connections	SS 316L

SHJ Series - Flexible High Pressure

General

The SHJ - Higher-pressure more flexible hose series is hydroformed annular corrugated metal hose, made from heavy-wall stainless steel.
SHJ offers flexibility and dependability when higher pressures are a factor.

Features

- Braided, double braided or unbraided corrugated tube assembly
- Core tube is made of 316L stainless steel, 321stainless 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" up to 2"
- Max. working pressure 4000psi (276 bar), 4 to 1 safety rate factor
- Min. static bend radius for braided hose 1.0 inch (25mm)
- Min. dynamic bend radius for braided hose 5.5inch (140mm)
- Full range of end connections

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	0.42	10.7	1.0	25	5.5	140	450	31	N/A	N/A	0.08	0.12
		1	0.48	12.2					3,000	207	12,000	827	0.15	0.22
		2	0.54	13.7					4,000	276	16,000	1,103	0.22	0.33
3/8	9.52	0	0.655	16.64	1.5	38	8.5	216	400	28	N/A	N/A	0.12	0.05
		1	0.735	18.67					2400	166	12000	828	0.31	0.14
		2	0.815	20.70					3300	228	16000	1103	0.48	0.22
1/2	12.7	0	0.77	19.6	2.5	64	10.0	254	400	28	N/A	N/A	0.24	0.36
		1	0.85	21.6					2,400	165	9,600	662	0.40	0.6
		2	0.93	23.6					3,200	221	12,800	883	0.57	0.85
3/4	19.05	0	1.13	28.7	4.0	102	8.0	203	220	15	N/A	N/A	0.41	0.61
		1	1.19	30.2					1,100	76	4,430	305	0.58	0.86
		2	1.25	31.8					1,650	114	6,696	462	0.76	1.13
1	31.7	0	1.43	36.3	5.0	127	9.0	229	190	13	N/A	N/A	0.52	0.77
		1	1.49	37.8					1,000	69	4,187	289	0.76	1.13
		2	1.55	39.4					1,400	97	5,837	402	0.99	1.47
1 1/4	31.75	0	1.74	44.2	6.5	165	12.0	305	200	14	N/A	N/A	0.76	1.13
		1	1.82	46.2					900	62	3,758	259	1.13	1.68
		2	1.90	48.3					1,350	93	5,494	379	1.50	2.23
1 1/2	38.10	0	2.10	53.3	7.5	191	13.0	330	90	6	N/A	N/A	1.13	1.68
		1	2.18	55.4					750	52	3,070	212	1.54	2.29
		2	2.26	57.4					1,200	83	4,842	334	1.96	2.92
2	50.80	0	2.55	64.8	9.0	229	15.0	381	105	7	N/A	N/A	1.10	1.64
		1	2.68	68.1					800	55	3,304	228	2.29	3.41
		2	2.80	71.1					1,150	79	4,738	327	3.47	5.16

Materials of Construction

Part	Material
Tube	SS 316L / SS 321
Braid	SS 304 / SS 316
End Connections	SS 316L

SHU Series - Ultra High Pressure

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 321 stainless steel.
- Annular Hydroformed corrugation
- Tube ID 1/4", 3/4" up to 2"
- Max. working pressure 6000psi (414bar), 4 to 1 safety rate factor
- Min. static bend radius for braided hose 1.5 inch (38mm)
- Min. dynamic bend radius for braided hose 4.5inch (114mm)
- Full range of end connections

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	0.43	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			5,000	345	20,000	1,379	0.32	0.48
		2	0.68	17.3	1.5	38			6,000	414	24,000	1,655	0.49	0.73
3/8	9.53	0	0.67	17.03	1.5	38.13	7.0	178	400	28	1,600	110	0.18	0.27
		1	0.80	20.21	2.5	63.55			3,500	241	14,000	965	0.46	0.68
		2	0.92	23.39	2.5	63.55			5,000	345	20,000	1,379	0.77	1.14
1/2	12.70	0	0.78	19.9	2.0	51	8.5	203	200	14	n/a	n/a	0.43	0.64
		1	0.88	22.5	3.0	76			2,700	186	10,800	744	0.64	0.95
		2	0.98	25.0	3.0	76			4,500	310	18,000	1,240	0.85	1.26
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	2,650	183	10,669	736	1.09	1.62
		2	1.40	35.6	4.0	102	10.0	254	3,600	248	14,521	1,001	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	2,500	172	10,000	689	1.53	2.28
		2	1.70	43.2	5.0	127	11.0	279	3,000	207	12,083	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	1,775	122	7,119	491	2.09	3.11
		2	2.00	50.8	6.5	165	12.5	318	2,600	179	10,400	717	2.88	4.29
		3	2.13	54.1	7.0	178	14.0	356	3,000	207	12,082	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	1,450	100	5,800	400	2.64	3.93
		2	2.36	59.9	7.5	191	13.0	330	2,200	152	8,892	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	1,100	76	4,415	304	3.23	4.81
		2	2.82	71.6	9.0	229	14.0	356	1,675	115	6,710	463	4.45	6.62

Materials of Construction

Part	Material
Tube	SS 321 / SS 316L
Braid	SS 321
End Connections	SS 316L

SHV Series - Formable

General

The SHV – 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. working pressure 900psi (62bar)
- Min. static bend radius for braided hose 1.0inch (25mm)
- Full range of end connections

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	3,600	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	3,200	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	2,660	183	0.19	0.28

Materials of Construction

Part	Material
Tube	SS 321 / SS 316L
Braid	SS 304
End Connections	SS 316L

Formable stay-put hoses

SHS Series - Standard

General

The SHS – Standard Use Hose series is a basic hose for industrial applications of gas & liquid lines with high temperatures, corrosive media and harsh environments.

Features

- Braided or unbraided corrugated tube assembly
- All stainless steel Assembly
- Annular Hydroformed corrugation
- Tube ID from ¼" to 2"
- Max. working pressure 1740 psi (120 bar)
- Min. static bend radius for braided hose 1.0inch (25mm)
- Min. dynamic bend radius for braided hose 3.0 inch (85 mm)
- Full range of HAM-LET's end connections
- Manufactured according EN ISO 10380

Inside Diameter		Num-ber 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	6.2	0	0.38	9.6	1.0	25	3.35	85	305	21	1218	84	0.12	0.08
		1	0.41	10.5					1,740	120	6,960	480	0.21	0.14
3/8	10.3	0	0.56	14.3	1.5	38	5.51	140	145	10	580	40	0.17	0.11
		1	0.61	15.5					1,233	85	4,930	340	0.29	0.19
1/2	12.2	0	0.66	16.7	1.8	45	5.51	140	102	7	406	28	0.18	0.12
		1	0.70	17.8					1,088	75	4,350	300	0.32	0.21
3/4	20.2	0	1.06	26.8	2.8	70	6.69	170	44	3	174	12	0.39	0.26
		1	1.11	28.3					928	64	3,712	256	0.72	0.48
1	25.4	0	1.27	32.2	3.3	85	7.48	190	44	3	174	12	0.56	0.37
		1	1.32	33.5					725	50	2,900	200	0.98	0.65
1 1/4	34.3	0	1.62	41.1	4.1	105	10.24	260	36	2.5	145	10	0.62	0.41
		1	1.69	42.8					580	40	2,320	160	1.14	0.76
1 1/2	40.1	0	1.95	49.5	5.1	130	11.81	300	36	2.5	145	10	0.80	0.53
		1	2.02	51.2					508	35	2,030	140	1.58	1.05
2	50.3	0	2.37	60.3	6.3	160	12.60	320	23	1.6	92.8	6.4	1.02	0.68
		1	2.44	62					435	30	1740	120	2.16	1.44

Materials of Construction

Part	Material
Tube	SS 316L
Braid	SS 304
End Connections	SS 316L

SHP Series - Industrial Gas Applications Compatible

General

The SHP – Industrial Gas Application hose series is made of heavy wall and close pitch, annular corrugation obtained by hydroforming.
Dedicated to transfer chemicals, gases, steam under pressure and in high vacuum conditions.

Features

- Single or double braided corrugated tube assembly.
- Core tube is made of 316L stainless steel.
- Annular Hydroformed corrugation.
- Tube ID 1/4" up to 2".
- Max. dynamic working pressure 3698psi (255bar).
- Min. static bend radius for braided hose 1.0 inch (25mm).
- Min. dynamic bend radius for braided hose 4.3 inch (110mm).
- Full range of end connections.
- Manufactured according EN ISO 10380.

Inside Diameter		Number of Braids	Outside Diameter		Static Minimum Bend Radius		Dynamic Minimum Bend Radius		Maximum Working Pressure (static cond)		Maximum Working Pressure (dynamic cond)		Burst Pressure	
inch	mm	(#)	inch	mm	inch	mm	inch	mm	psi	bar	psi	bar	psi	bar
1/4	6	1	0.45	11.4	1.0	25	4.33	110	3,263	225	2,610	180	10,440	720
		2	0.51	13					4,249	293	3,698	255	14,790	1,020
3/8	10	1	0.70	17.8	1.5	38	5.91	150	2,407	166	2,103	145	8,410	580
		2	0.76	19.4					3,234	223	2,828	195	11,310	780
1/2	12	1	0.80	20.2	1.8	45	6.50	165	2,538	175	2,030	140	8,120	560
		2	1.21	30.7					3,089	213	2,683	185	10,730	740
3/4	20	1	1.15	29.1	2.8	70	8.86	225	1,436	99	1,233	85	4,930	340
		2	1.21	30.7					2,132	147	1,813	125	7,250	500
1	25	1	1.50	38	3.3	85	8.46	215	1,320	91	1,131	78	4,524	312
		2	1.57	40			10.24	260	2,059	142	1,798	124	7,192	496
1 1/4	32	1	1.83	46.5	4.1	105	11.81	300	1,131	78	943	65	3,770	260
		2	1.93	49					1,943	134	1,668	115	6,670	460
1 1/2	40	1	2.16	54.9	5.1	130	11.02	280	986	68	885	61	3,538	244
		2	2.26	57.4			13.39	340	1,508	104	1,305	90	5,220	360
2	50	1	2.65	67.3	6.3	160	15.35	390	899	62	798	55	3,190	220
		2	2.75	69.8					1,334	92	1,131	78	4,524	312

Materials of Construction

Part	Material
Tube	SS 316L / SS321
Braid	SS 304
End Connections	SS 316L

Cylinder Connections

End connectors	Gas Types
FA CGA 320	Carbon Dioxide, Methyl Fluoride
FA CGA 350	Arsine, Ethane, Methane, Natural Gas
FA CGA 540	Oxygen
FA CGA 580	Argon, Helium, Krypton, Neon, Nitrogen, Xenon
FA CGA 590	Sulfur Hexafluoride

SHG Series - High pressure industrial

General

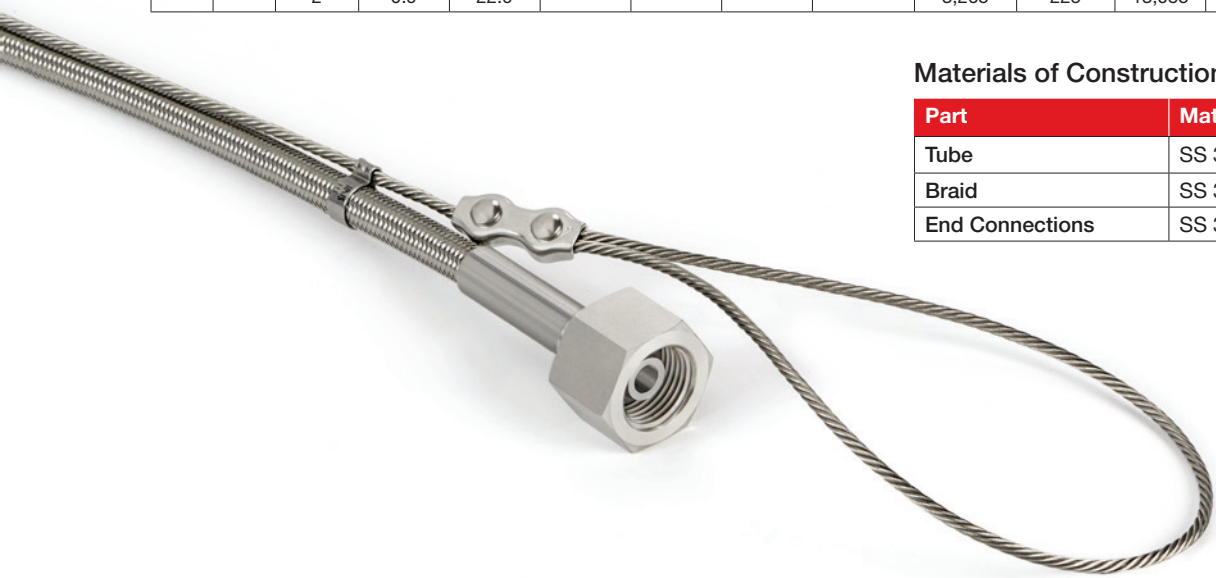
The SHG – Gas application hose specially designed for high pressure clean gases.
Gas filling stations and connection between gas cylinders and regulators are good application examples.

* Leak test - 2 bar of air under water

Features

- Braided corrugated tube assembly
- All stainless steel Assembly
- Annular Hydroformed corrugation
- Tube ID from ¼" to ½"
- Max. working pressure 6090psi (420bar)
- Min. static bend radius for braided hose 1.18inch (30mm)
- Min. dynamic bend radius for braided hose 7.48inch (190mm)
- Full range of HAM-LET's end connections
- Manufactured according EN ISO 10380

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	1	0.48	12.2	1.18	30	7.48	190	3,625	250	14,500	1,000	0.17	0.26
		2	0.57	14.4					6,090	420	24,365	1,680	0.30	0.44
3/8	9.53	1	0.71	18	1.77	45	9.84	250	2,175	150	8,700	600	0.29	0.43
		2	0.79	20.1					3,540	244	14,155	976	0.42	0.63
1/2	12.7	1	0.82	20.8	2.17	55	11.81	300	2,175	150	8,700	600	0.39	0.58
		2	0.9	22.9					3,265	225	13,055	900	0.56	0.84



Materials of Construction

Part	Material
Tube	SS 316L
Braid	SS 304
End Connections	SS 316L

Metal Hoses - Ordering Information

OPTIONAL

S	H	F	1	04	-	LK 1/4	TS 6M	-	123.4	-	
Line	Hoses	Series	Configuration	Tube ID		End Connection 1	End Connection 2		Overall Length (OAL)		Options

Line	
S	SS
A	Alloy 276

Hoses	
H	Hose

Series	
F	General use
U	Ultra high pressure
V	Formable
E	Extra flexible
S	Standard use
G	Gas application
J	HP over Flexible
P	Industrial gas application

Tube ID	
04	1/4
06	3/8
08	1/2
12	3/4
16	1
20	1 1/4
24	1 1/2
32	2

Overall Length (OAL)	
XXX	inch
XXXC	Centimeter
XXXM	Meters

Options: See page 26

End Type	
LK	LET-LOK®
TS	Tube Adapter
TP	Tube Adapter Preswaged
GF	Face Seal Female Swivel
GM	Face Seal Male Swivel
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)
FH	Female Flare 37°
MF	Male Flare 37°
TC	Sanitary flange Tri-clamp
LW	Long Butt Weld
SW	Tube Socket Weld Elbow

End Size
inch
1/4, 3/8, 1/2, 3/4, 1 1 1/4, 1 1/2 2
mm
6M, 8M, 10M, 12M, 18M, 25M, 38M

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

Series	Configuration	Tube Material	Braid Material	# of braids
S	0	316L	-	0
	1	316L	304	1
G	0	316L	304	1
	1	316L	304	2
J	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
P	0	316L	304	1
	1	316L	304	2

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	R	Protective Cover	E	EN 10380	P	Plastic Tag	None	On One End
Y	Hydraulic Test					J	Insulating Jacket			M	Metal Tag(1)	B	Both Ends
						A	Armor					Z	Crimp Ring with MWP and other standard information
						J1	Thermal Insulation Cover						
						N	Interlock bend restrictor						
						X	Anti whip external safety cable						

(1) One end metal tag with MWP marking – is supply as standard (no need to mark this option to have this tag)

Cover Options

Armor Protection

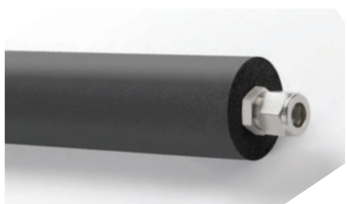
A mechanical armor can be installed with the hose assembly.
This type of armor consists of a hard metallic shell protecting the flexible regions of the hose

Protective Cover

For lighter protection of the corrugated hose and braid, plastic scuff guards can be installed with 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.



Thermal Insulation Cover

Thermal insulation of the hose exterior by adding thermal insulation cover. Reduces heat loss of media by decreasing conduction and convection heat exchanges with environment.

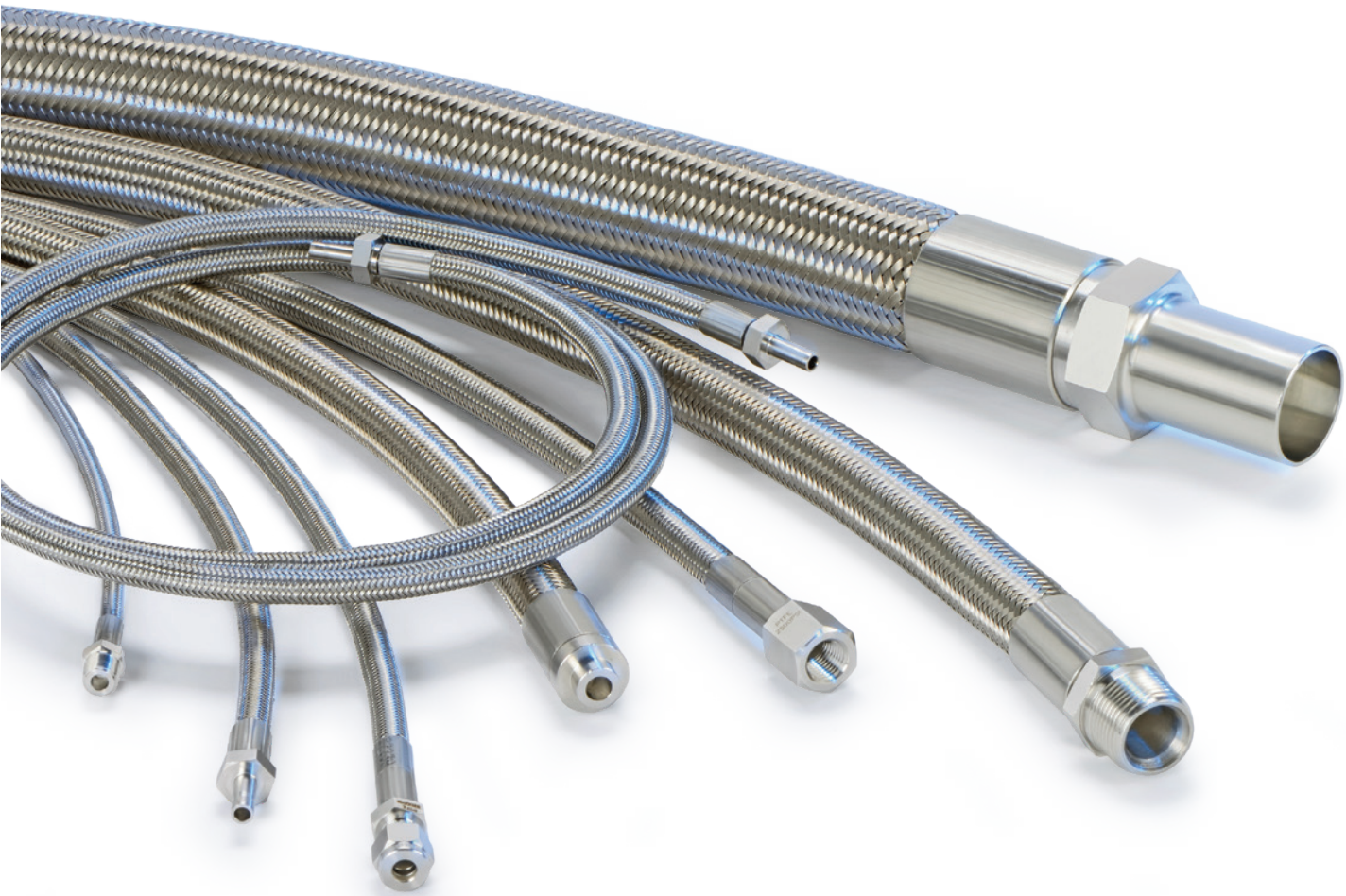
Certifications

Materials, Standard Conformance and testing certificates are available.
Other customer specific certificates are available upon request.

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.

HAM-LET PTFE HOSES



HAM-LET
ADVANCED CONTROL TECHNOLOGY

HAM-LET PTFE Hoses

General

PTFE stainless steel braided hose is an ideal solution for permanent or temporary connections for liquids. It makes fabrication easier, and it facilitates connect/disconnect and cleaning. Variable length, high flexibility, high pressure 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 HAM-LET hose assemblies are 100% tested
All Hoses are Hydrostatically tested at 1.5xMAWP.
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: 1/8" up to 2".
- Max. pressure 3250 psi (224 bar), safety factor 1 to 4.
- Working temperature: -100° ~ +450° F (-73° ~ + 232°C)
- Packed and Validated for high purity service with a corresponding fittings:
  1. Compatible DIN EN 16643 standard
  2. Approved Food and Drug Administration (FDA) 21CFR177.1550

Working pressure de-rating factor

Temp °C	De-rating
150	0
190	0.85
210	0.75
260	0.5

Chemical Compatibility:

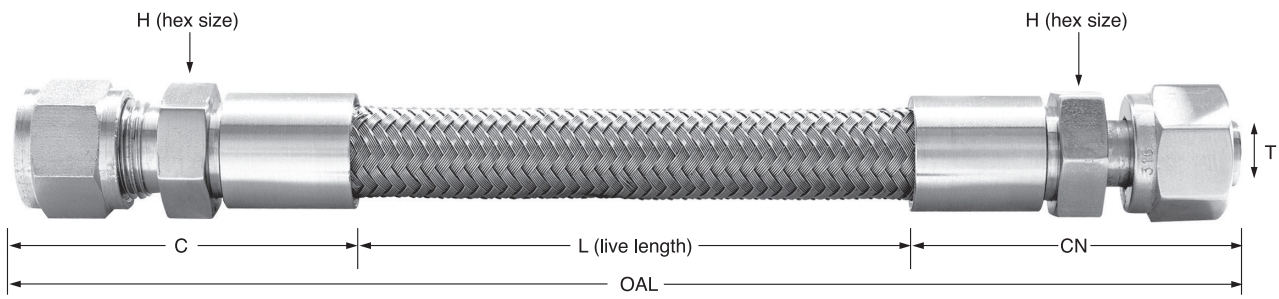
PTFE has one of the highest levels of chemical compatibility. Following is the list of materials that require some level of consideration:

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)
- Iodine Pentafluoride
- 80% and over Sodium Hydroxide
- Aluminum Chloride (at elevated temps)
- Ammonia (NH3)
- Temperature
- 70% Nitric Acid



THT Series - Smooth PTFE Core SS Braided Hose

General

General use smooth PTFE core hoses.

Features

- Tube I.D. 1/8" up to 1"
- Pressure rating: Vacuum to 3,500 psi (241 bar)
- Min Bend radius 1.5 inch (38.1mm)
- Conductive inner lining available

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)
1/8	3.18	1	3,000	258	1.5	38	0.25	6.35	12,000	827	0.05	0.07
1/4	6.35	1	3,200	221	3.0	76	0.38	9.65	12,800	884	0.1	0.15
3/8	9.53	1	2,500	172	5.0	127	0.50	12.70	10,000	688	0.12	0.18
1/2	12.70	1	2,000	138	6.5	165	0.65	16.51	7,200	500	0.16	0.24
3/4	19.05	1	1,800	69	9.0	229	0.89	22.61	4,000	276	0.22	0.33
1	25.40	1	1,000	69	12.0	305	1.14	28.96	4,000	276	0.51	0.76

Materials of Construction

Part	Material
Tube	PTFE
Braid	SS 304
End Connections	SS 316L

THS Series - Silicon Covered Smooth PTFE Core SS Braided Hose

General

Special design for pharmaceutical, Food & beverages and biotech applications. Silicon cover protect the braid from particles or other external contamination and distend high temperatures.

Features

- Tube I.D. 1/8" up to 1"
- Pressure rating: Vacuum to 3250psi (224bar)
- Min Bend radius 1.5inch (38.1mm)

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)
1/8	3.18	1	3,750	258	1.5	38	0.43	10.9	15,000	1,034	0.11	0.16
1/4	6.35	1	3,250	221	3.0	76	0.50	12.7	12,800	896	0.13	0.19
3/8	9.53	1	2,500	172	5.0	127	0.65	16.5	10,000	688	0.15	0.22
1/2	12.70	1	2,000	138	6.5	165	0.81	20.6	8,000	552	0.18	0.27
3/4	19.05	1	1,000	69	9.0	229	1.02	25.9	4,000	276	0.34	0.51
1	25.40	1	1,000	69	12.0	305	1.36	34.5	4,000	276	0.57	0.85

Materials of Construction

Part	Material
Tube	PTFE
Braid	SS 304
External cover	Silicon
End Connections	SS 316L

THC Series - Convoluted PTFE Core SS Braided Hose

General

Convoluted 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: up to 1500psi (103bar)
- Min Bend radius 2.5inch (63.5mm)
- Conductive inner lining available

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	2,500	172	0.71	18	0.48	12.3	10,000	688	-	-
3/8	9.53	1	2,000	136	0.79	20	0.60	14.75	8,000	544	-	-
1/2	12.70	1	1,500	103	0.98	25	0.74	18.80	6,000	414	0.19	0.28
3/4	19.05	1	1,100	76	2.52	64	0.97	24.64	4,400	303	0.27	0.40
1	25.40	1	750	52	3.50	89	1.29	32.77	3,000	207	0.39	0.58
1 1/2	38.10	1	700	48	5.98	152	1.90	48.26	2,800	193	0.75	1.12
2	50.80	1	525	36	7.87	200	2.42	61.47	2,100	145	0.89	1.32

Materials of Construction

Part	Material
Tube	PTFE
Braid	SS 304
End Connections	SS 316L

General

Nonmetal smooth PTFE core hoses with fiberglass braid

Features

- Tube I.D. 1/4" up to 3/4"
- Pressure rating: up to 800psi (55bar)
- Min Bend radius 2.75inch (70mm)

THB Series - Smooth PTFE Core Fiberglass 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	800	55	2.75	70	0.43	11	3,200	220	0.06	0.09
3/8	9.53	1	800	55	3.25	83	0.58	15	3,200	220	0.12	0.18
1/2	12.7	1	800	55	5.25	133	0.73	19	3,200	220	0.13	0.19
3/4	19.05	1	400	27	6.50	165	0.98	25	1,600	110	0.20	0.30

Materials of Construction

Part	Material
Tube	PTFE
Braid	Fiberglass single braid
End Connections	SS 316L

* Only for liquid applications

THN Series - Convoluted Insulated PTFE Core Aramid Braided Hose

General

Convoluted Insulated PTFE core with light weight UV resistant Aramid yarn braid. Compatible with all racing fluids and fuels.

Features

- Tube I.D. 3/8" up to 3/4"
- Pressure rating: Vacuum to 1250psi (86bar)
- Min Bend radius 2.5inch (63.5mm)
- Conductive inner lining available

Inside Diameter		Number of Braids	Maximum Working Pressure		Dynamic Minimum Bend Radius		Outside Diameter		Burst Pressure*	
inch	mm	(#)	psi	bar	inch	mm	inch	mm	psi	bar
3/8	9.53	1	1,000	69	2.50	63.5	0.73	18.54	3,000	207
1/2	12.7	1	1,000	69	3.50	88.9	0.86	21.84	3,000	207
5/8	15.89	1	750	52	4.00	101.6	0.96	24.77	2,250	156
3/4	19.05	1	500	35	4.50	114.3	1.12	28.45	1,500	105

*Pressure rating: 3 to 1 safety factory

Materials of Construction

Part	Material
Tube	PTFE
Insulating layer	Insulating wrap
Braid	Aramid yarn
End Connections	SS 316L

General

Nominal size PTFE core.
Special design for pharmaceutical, food and beverage as well as biotech applications. The red silicone cover protects the braid from particles, other external contamination and extended high temperatures.

Features

- Tube I.D. 1/4" up to 1/2"
- Pressure rating: Vacuum to 3000psi (207bar)
- Min Bend radius 1.5inch (38.1mm)

THP Series - Red 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	lbs	kg
3/16	4.76	1	3000	207	2	50.8	0.42	10.67	12000	828	0.077	0.11
1/4	6.35	1	3000	207	3	76.2	0.49	12.45	12000	828	0.098	0.15
5/16	7.94	1	2500	172	4	101.6	0.55	14.05	10000	690	0.11	0.16
3/8	9.52	1	2250	155	4.5	114.3	0.62	15.75	9000	621	0.124	0.18
13/32	10.32	1	2000	138	5.2	132.08	0.66	16.76	8000	552	0.125	0.19
1/2	12.7	1	1500	103	6.5	165.1	0.75	19.05	6000	414	0.154	0.23
5/8	15.87	1	1200	83	7.7	195.58	0.88	22.35	4800	331	0.17	0.25

Materials of Construction

Part	Material
Tube	PTFE
Braid	SS 304
End Connections	SS 316L

* Only for liquid applications

General

Smooth PTFE core hose with additional fiberglass middle layer and external stainless steel braid for increased flexibility and insulation

Features

- Tube I.D. 1/4” up to 1”
- Pressure rating Vacuum to 3,500 psi (241 bar)
- Min Bend radius 1.25 inch (32 mm)
- Conductive inner lining available

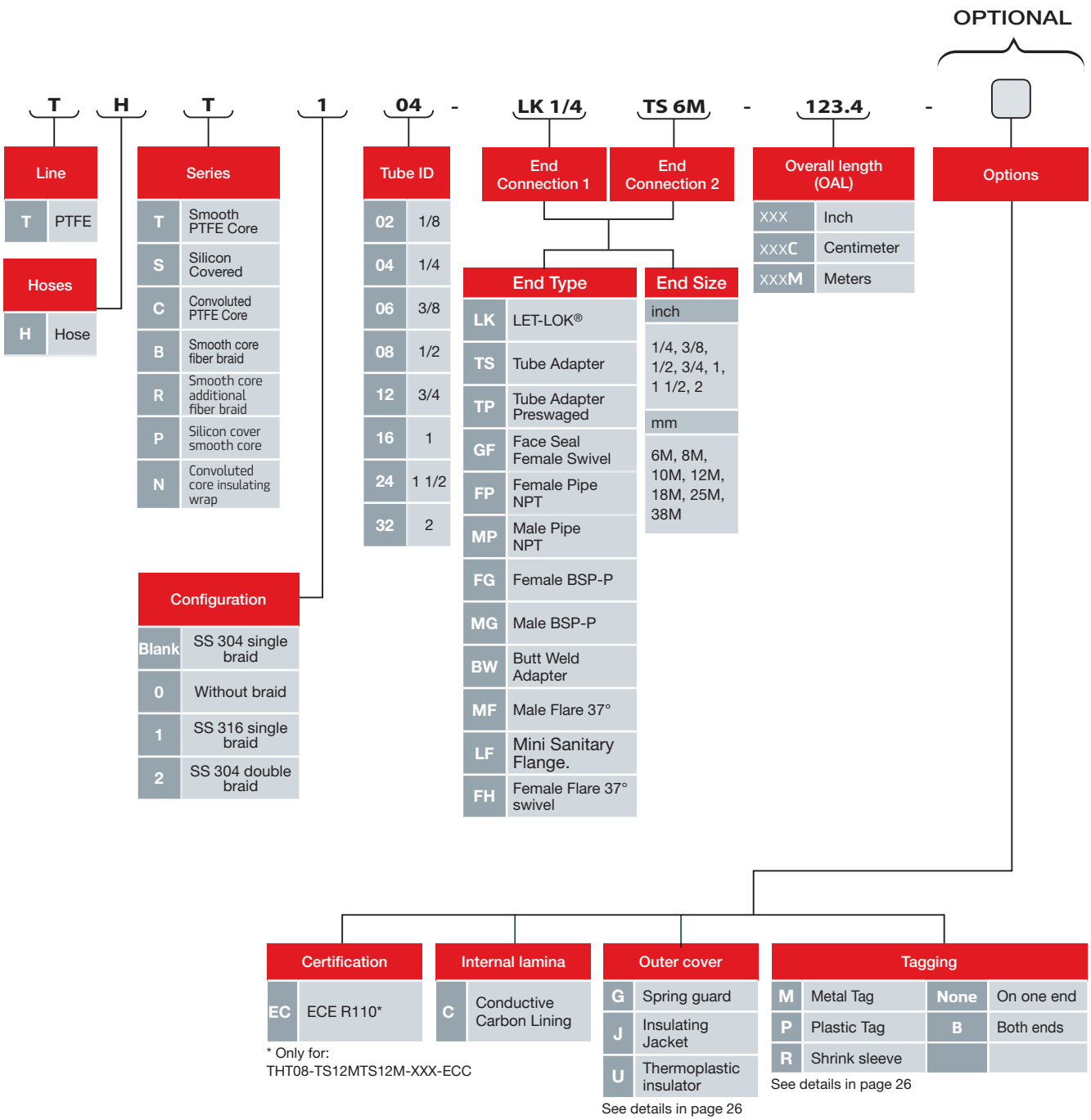
THR Series - Smooth PTFE Core Fiberglass middle layer SS Braided Hose

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	3,500	241	-	-	0.44	11.18	14,000	965	0.13	0.19
3/8	9.53	1	3,000	207	4.0	102	0.57	14.53	12,000	827	0.18	0.27
1/2	12.70	1	1,800	124	5.5	140	0.75	19.15	7,200	496	0.24	0.36
3/4	19.05	1	1,000	69	-	-	1.00	25.40	4,000	276	0.37	0.55
1	25.40	1	1,000	69	11.5	292	1.41	34.69	4,000	276	0.49	0.72

Materials of Construction

Part	Material
Tube	PTFE
Inner Braid	Fiberglass
Outer Braid	SS 304
End Connections	SS 316L

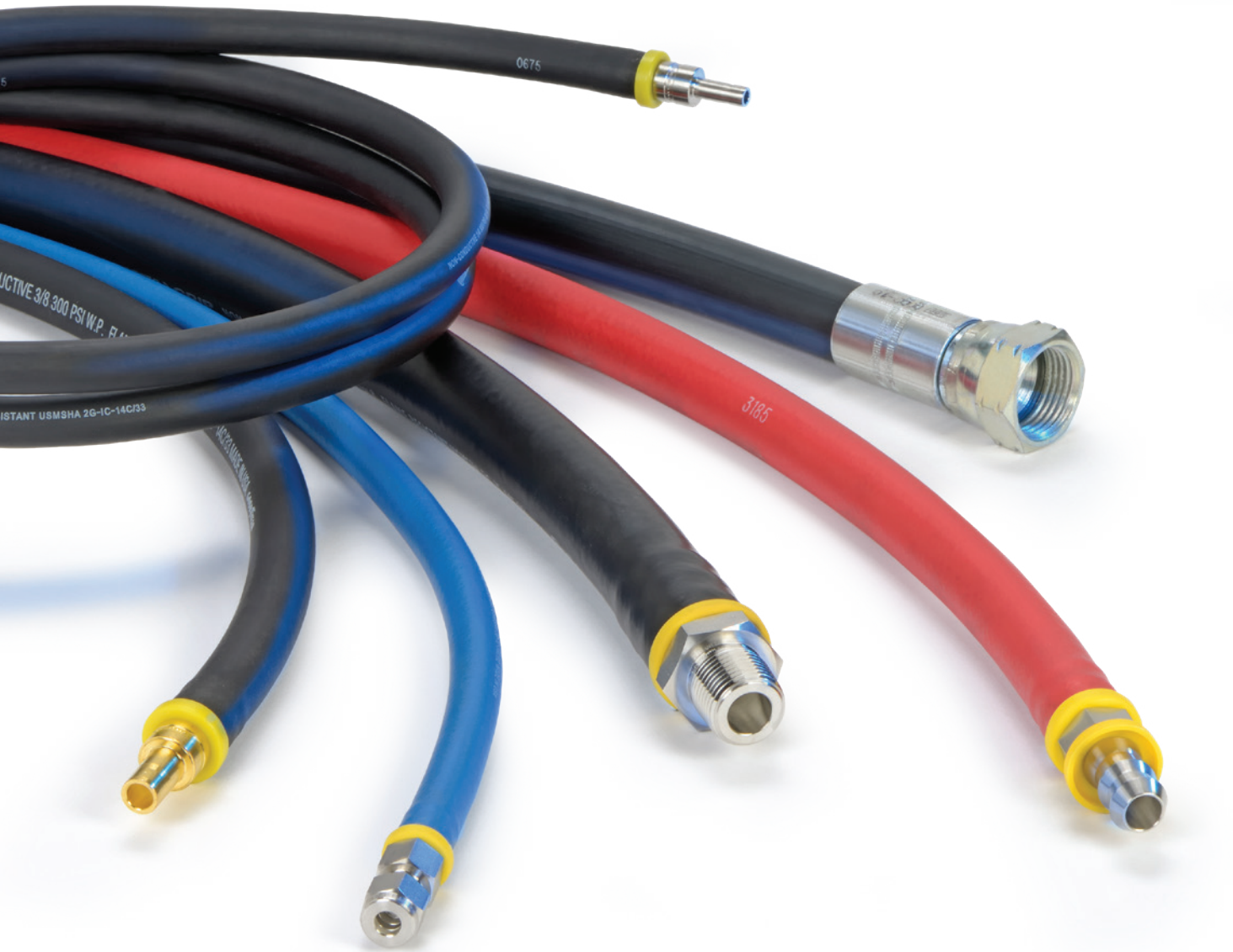
PTFE Hoses - Ordering Information



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 RUBBER HOSES



HAM-LET
ADVANCED CONTROL TECHNOLOGY

HAM-LET Rubber Hoses

General

HAM-LET RHG rubber hoses are designed for pneumatic and hydraulic applications, automotive industry, shop air systems and general industrial maintenance.
No silicone is used during hose production.
RHG Hoses are to be used with HAM-LET HOSE END™ connectors.
* For HAM-LET HOSE END™ variety, see Rubber hoses components chapter.

Testing & Packing

All Hose assemblies are Hydrostatically tested to 1.5xMWP.
All Hose assemblies are packed individually in a plastic bag, end connections are capped.

Features

- RUBBER core with all stainless steel or brass end connections assemblies per EN 16643:2016
- Available in 6 colors: Black, Blue, Red, Green, Grey and Yellow
- Easy to clean, drains easily
- True I.D.
- LET-LOK®, ONE-LOK®, NPT, BSPT, BSPP and SAE 37° Flare end connections.
- ID Sizes: ¼" up to 1"
- Minimum bend radius 2.56 inch (65mm)
- Max. pressure 300 psi (20.7 bar), safety factor 1 to 4
- Working temperature: -40° ~ +190° F (-40° ~ + 88°C)
- Inner tube oil & heat resistant synthetic rubber (RMA Class A high oil resistance)
- Cover weather, abrasion & oil resistant Nitrile synthetic rubber
- (RMA Class B medium-high oil resistance)
- External layer has excellent abrasion, weather condition and oil resistance. Flame resistance meets MSHA standards.
- Nonconductive (R > 1MΩ/inch at 1000 V DC)

RHG Series - Smooth Rubber Core Synthetic Braided Hose

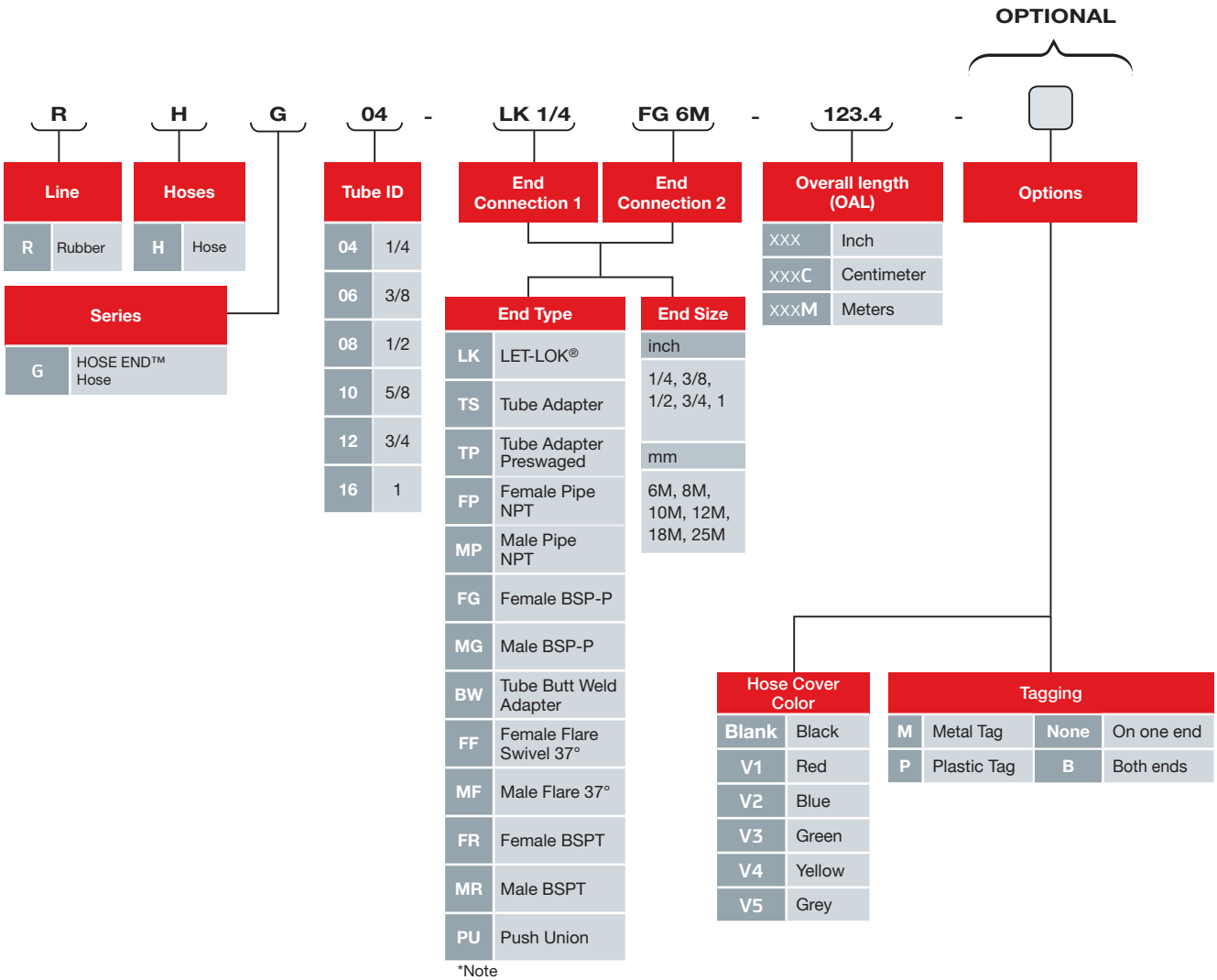
Inside Diameter		Maximum Working Pressure		Minimum Bend Radius		Outside Diameter		Burst Pressure		Weight Per Foot	Weight Per Meter
inch	mm	psi	bar	inch	mm	inch	mm	psi	bar	lbs	kg
1/4	6.35	300	20.7	2.56	65	0.54	13.7	1,200	82.7	0.09	0.13
3/8	9.53	300	20.7	2.95	75	0.69	17.5	1,200	82.7	0.14	0.21
1/2	12.7	300	20.7	5.12	130	0.81	20.6	1,200	82.7	0.17	0.25
5/8	15.88	300	20.7	5.91	150	0.93	23.6	1,200	82.7	0.2	0.30
3/4	19.05	300	20.7	7.09	180	1.07	27.2	1,200	82.7	0.26	0.39
1	25.4	300	20.7	8.0	203	1.34	34.0	1,200	82.7	0.34	0.51

Materials of Construction

Part	Material
Tube	Rubber
Braid	Single fiber braid
External Cover	Nitrile synthetic rubber
End Connections	SS 316L

Color Code	Hose Cover Color
Blank	Black
V1	Red
V2	Blue
V3	Green
V4	Yellow
V5	Grey

RUBBER HOSES - Ordering Information



* For POP geometry add "P" before end type
Example: RHG04-PLK1/4-123.4

Warning!

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HAM-LET NYLON HOSES

HAM-LET
ADVANCED CONTROL TECHNOLOGY

HAM-LET NYLON Hoses

General

Ham-Let nylon hoses designed for wide range of applications including Automotive, Fuel and Oil transfer, Hydraulic lines, Instrumentation, Compressed air and much more.
Variable length, Lightweight, Excellent flexibility, Durability for increased number of cycles, chemical and corrosion resistance and very high working pressure making Ham-Let nylon hoses great solution for your need.

Features

- ID sizes 1/4" to 1"
- Max. pressure 5000psi (345 bar), safety factor 1 to 4
- Working temperature -40° to 180° F (-40° to +82°C)

Testing & Packing

All hoses are Hydrostatically tested to 1.5 MWP.
All hoses packed individually in plastic bag, end connections are capped.

General

Special design for high pressure conduction of CNG gas

Features

- Tube I.D. 1/4" up to 1"
- Pressure rating: 13.5psi Vacuum to 5000psi (345 bar)
- Min Bend radius 1.8inch (45mm)
- On request twin-line or multi-line construction available
- Electrical resistance lower than 0.12 MOhm/m according to ISO 8031
- Working temperature -40° to 180° F (-40° to +82°C)
- External cover is micro perforated anti abrasion RED Polyurethane
- Meet or exceed ISO 15500-17 and SAE 100R8 standards

NHG Series - Nylon reinforced Hose for CNG gas

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	2	5,000	345	1.8	45	0.49	12.5	20,000	1,379	0.07	0.11
3/8	9.53	2	5,000	345	3.0	75	0.65	16.5	20,000	1,379	0.10	0.15
1/2	12.7	2	5,000	345	3.7	95	0.87	22	20,000	1,379	0.17	0.25
3/4	19.05	2	5,000	345	7.3	185	1.14	29	20,000	1,379	0.24	0.36
1	24.4	2	5,000	345	9.1	230	1.52	38.5	20,000	1,379	0.34	0.51

Materials of Construction

Part	Material
Tube	Electrically conductive Polyamide
Braid	2 textile fibers
External cover	Polyurethane
End Connections	SS 316L

NHT Series - Nylon reinforced SAE 100R7

General

Lightweight flexible hose designed for isocyanate, polyols, solvents and paints.
Pinpricked version supplied as standard.

Features

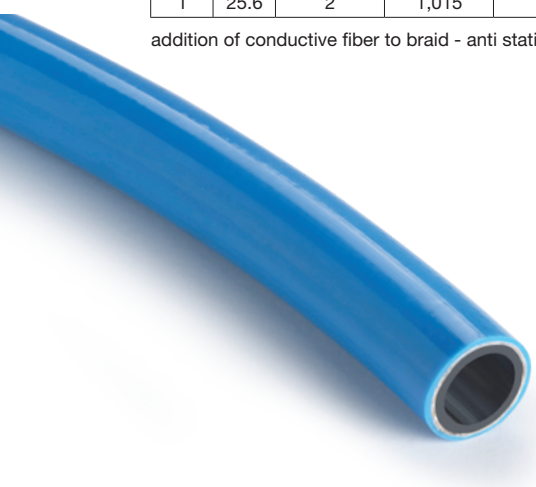
- Tube I.D. 1/4" up to 1"
- Pressure rating: 13.5psi Vacuum to 5000psi (345 bar)
- Min Bend radius 1.8inch (45mm)
- On request twin-line or multi-line construction available
- Electrical resistance lower than 0.12 MOhm/m according to ISO 8031
- Working temperature -40° to 180° F (-40° to +82°C)
- External cover is micro perforated anti abrasion Black (Blue for Conductive option) Polyurethane
- Meet or exceed ISO 15500-17 and SAE 100R8 standards

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	6.4	2	2,900	200	1.4	35	0.46	11.8	11,603	800	0.06	0.09
3/8	9.7	2	2,538	175	2.2	55	0.63	16	10,152	700	0.10	0.15
1/2	13	2	2,030	140	3.0	75	0.80	20.3	8,122	560	0.15	0.22
3/4	19.2	2	1,305	90	5.7	145	1.04	26.5	5,221	360	0.20	0.3
1	25.6	2	1,015	70	7.9	200	1.28	32.5	4,061	280	0.25	0.37

NHT Conductive option

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	6.4	2	3,306	228	1.6	40	0.50	12.7	13,227	912	0.07	0.1
3/8	9.7	2	3,306	228	2.4	60	0.68	17.3	13,227	912	0.12	0.18
1/2	13	2	2,030	140	3.0	75	0.80	20.3	8,122	560	0.14	0.21
3/4	19.2	2	1,305	90	5.7	145	1.04	26.5	5,221	360	0.2	0.3
1	25.6	2	1,015	70	7.9	200	1.28	32.5	4,061	280	0.25	0.37

addition of conductive fiber to braid - anti static hose (R<3x10^4 O/M)



Materials of Construction

Part	Material
Tube	Polyamide
Braid	Double Polyester layers
External cover	Polyurethane
End Connections	SS 316L

NHP Series - Nylon reinforced SAE 100R8

General

Lightweight flexible hose designed for isocyanate, polyols, solvents and paints.
Pinpricked version supplied as standard.

Features

- Tube I.D. 1/4" up to 1"
- Pressure rating: 13.5psi Vacuum to 5000psi (345 bar)
- Min Bend radius 1.8inch (45mm)
- On request twin-line or multi-line construction available
- Electrical resistance lower than 0.12 MOhm/m according to ISO 8031
- Working temperature -40° to 180° F (-40° to +82°C)
- External cover is micro perforated anti abrasion Black (Blue for Conductive option) Polyurethane
- Exceed ISO 3949, EN 855 and SAE 100R8 standards

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	6.4	2	5,076	350	2.0	50	0.46	11.8	20,305	1,400	0.06	0.08
3/8	9.7	2	4,061	280	2.8	70	0.63	16	16,244	1,120	0.09	0.14
1/2	13	2	3,553	245	3.7	95	0.80	20.3	14,213	980	0.15	0.22
3/4	19.2	2	2,393	165	5.9	150	1.04	26.5	9,572	660	0.23	0.34
1	25.6	2	2,103	145	7.9	200	1.37	34.7	8,412	580	0.32	0.48

NHP Conductive option

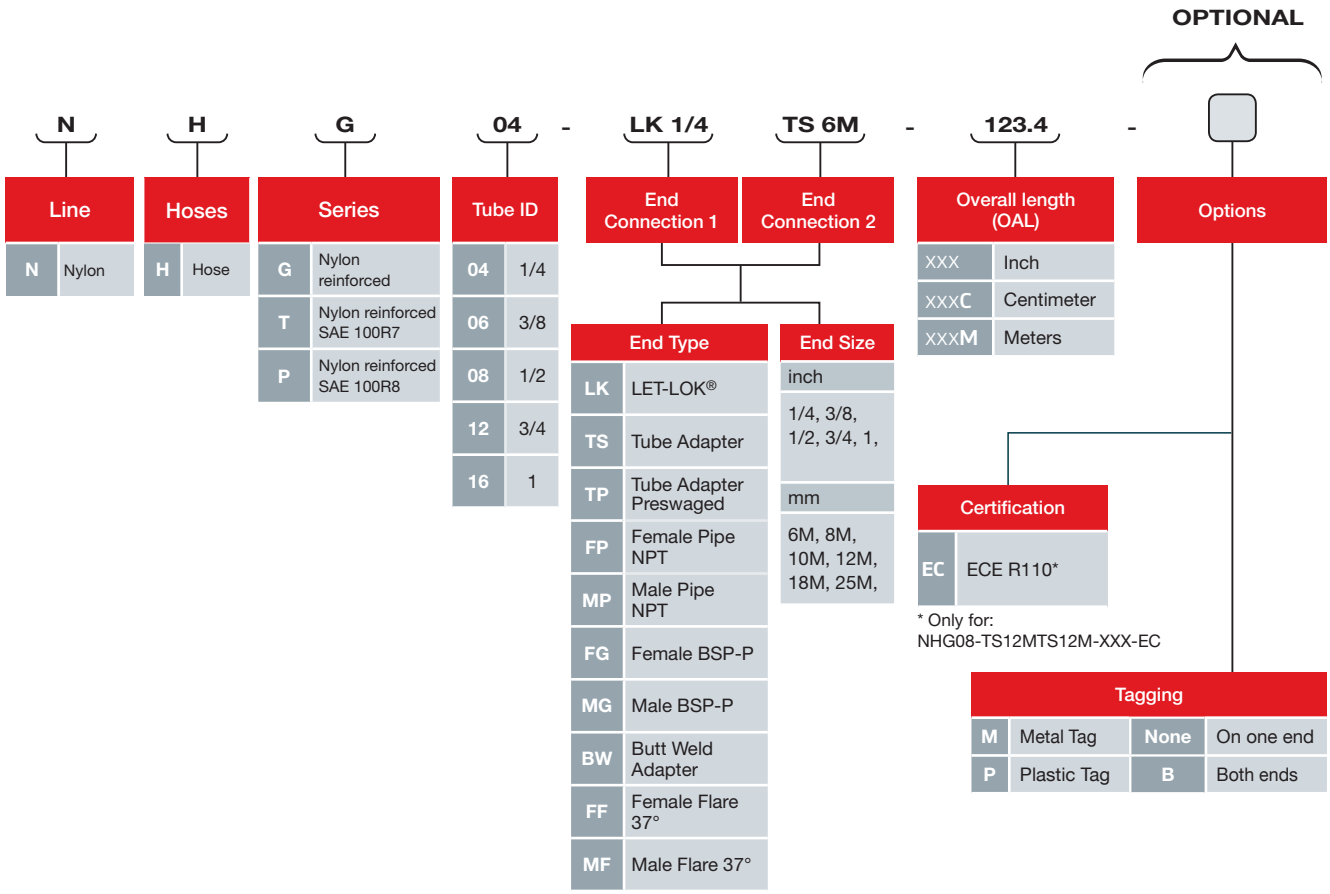
Inside Diameter		Number of Braids	Maximum Working Pressure		Dynamic Minimum Bend Radius		Outside Diameter		Burst Pressure		Weight Per Foot	Weight Per Meter
inch	mm	(#)	psi	bar	inch	mm	inch	mm	psi	bar	lbs	kg
1/4	6.4	2	5,076	350	2.0	50	0.46	11.8	20,305	1,400	0.07	0.1
3/8	9.7	2	4,061	280	2.8	70	0.66	16.7	16,244	1,120	0.11	0.17
1/2	13	2	3,553	245	3.7	95	0.80	20.3	14,213	980	0.15	0.22

addition of conductive fiber to braid - anti static hose (R<3x10^4 O/M)

Materials of Construction

Part	Material
Tube	Electrically conductive Polyamide
Braid	Double Polyester layers
External cover	Polyurethane
End Connections	SS 316L

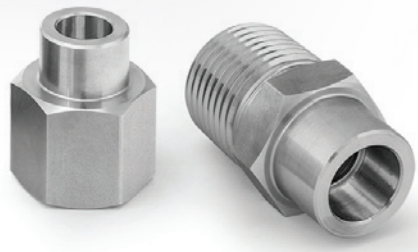
NYLON HOSES - Ordering Information



Warning!

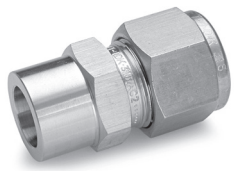
The system designer and user have the sole responsibility for selecting products suitable for their special application requirements, ensuring their safe and trouble-free installation, operation, and maintenance. Application details, material compatibility and product ratings should all be considered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

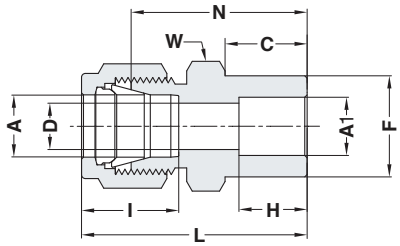
HAM-LET METAL HOSES
COMPONENTS



HAM-LET®
ADVANCED CONTROL TECHNOLOGY

LET-LOK TUBE FITTINGS
768LW





Ordering information (INCH)	A Tube O.D		A1 Hose O.D		C		D		W Hex. Flat	F		H		I		L		N	
	inch	mm	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	1/8	3.17	0.34	8.64	0.09	2.28	7/16	0.31	7.87	0.25	6.35	0.5	12.7	1.14	28.96	0.88	22.35
768LW _ 1/4 X 1/4	1/4	6.35	1/4	6.35	0.41	10.4	0.19	4.8	1/2	0.44	11.2	0.31	7.9	0.6	15.2	1.32	33.53	1.03	26.16
768LW _ 1/4 X 3/8	1/4	6.35	3/8	9.52	0.47	11.9	0.19	4.8	5/8	0.62	15.8	0.38	9.65	0.6	15.2	1.41	35.96	1.13	28.6
768LW _ 3/8 X 1/4	3/8	9.52	1/4	6.35	0.41	10.4	0.19	4.8	5/8	0.44	11.2	0.31	7.9	0.66	16.8	1.42	36.06	1.13	28.7
768LW _ 3/8 X 3/8	3/8	9.52	3/8	9.52	0.47	11.9	0.28	7.1	5/8	0.62	15.8	0.38	9.65	0.66	16.8	1.48	37.6	1.19	30.23
768LW _ 1/2 X 1/4	1/2	12.7	1/4	6.35	0.41	10.4	-	-	-	0.44	11.2	0.31	7.9	-	-	-	-	-	-
768LW _ 1/2 X 1/2	1/2	12.7	1/2	12.7	0.47	11.9	0.41	10.4	13/16	0.75	19.05	0.5	12.7	0.9	22.9	1.62	41.15	1.22	31
768LW _ 3/4 X 3/4	3/4	19.05	3/4	19.05	0.47	11.9	0.62	15.8	1 1/16	1.05	26.7	0.56	14.2	0.96	24.4	1.71	43.43	1.31	33.28
768LW _ 1 X 1	1	25.4	1	25.4	0.56	14.2	0.88	22.35	1 3/8	1.36	34.5	0.75	19.2	1.23	31.2	2.07	52.58	1.59	40.4
768LW _ 1-1/4 X 1-1/4	1-1/4	32	1-1/4	32	0.66	16.9	1.09	27.7	1 3/4	1.73	44	0.75	19.2	1.62	41.2	2.76	70.1	1.89	48
768LW _ 1-1/2 X 1-1/2	1-1/2	38.35	1-1/2	38.35	0.71	18.1	1.34	34	2 1/8	1.97	50	0.9	22.9	19.7	50	3.18	80.78	2.11	53.6
768LW _ 2 X 2	2	51.15	2	51.15	1	25.4	1.81	46	2 3/4	2.48	63	1.19	30.4	2.66	67.6	4.16	105.84	2.69	68.5

Ordering information (METRIC)	A Tube O.D	A1 Hose O.D	C	D	W Hex. Flat	F	H	I	L	N
	mm	inch	mm	mm	mm	mm	mm	mm	mm	mm
768LW _ 6MM X 1/4	6	1/4	10.4	4.8	14	11.2	7.9	15.3	32.8	25.4
768LW _ 8MM X 1/4	8	1/4	10.4	4.8	15	11.2	7.9	16.2	35	27.5
768LW _ 10MM X 3/8	10	3/8	11.9	7.1	18	15.8	9.65	17.2	38.6	31
768LW _ 12MM X 1/2	12	1/2	11.9	9.5	22	19.05	12.7	22.8	41.1	31
768LW _ 18MM X 3/4	18	3/4	11.9	15.1	27	26.7	14.2	24.4	43.5	33.4
768LW _ 20MM X 3/4	20	3/4	11.9	-	-	26.7	14.2	26	-	-
768LW _ 25MM X 1	25	1	14.2	21.8	35	34.5	19.2	31.3	52.7	40.4
768LW _ 32MM X 1-1/2	32	1-1/2	18.1	-	-	50	22.9	-	-	-
768LW _38MM X 1-1/2	38	1-1/2	18.1	33.7	55	50	22.9	49.4	83.6	56

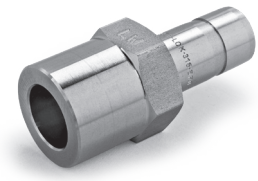
ONE-LOK® ORDERING INFORMATION

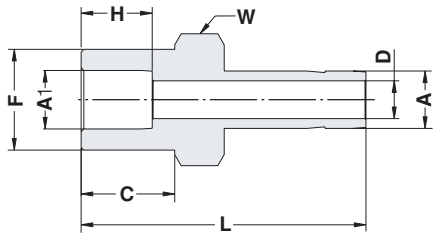
ONE-LOK® fitting part numbers are constructed from symbols that identify the type of material and size of the fitting.

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.

768HLW	SS	1/4	X	1/4
Fitting type (male connector)	**SS** = Stainless Steel	Tube O.D.		1/4 O.D. Hose
		The O.D. size is always the first to described		

TUBE ADAPTER
739 LW

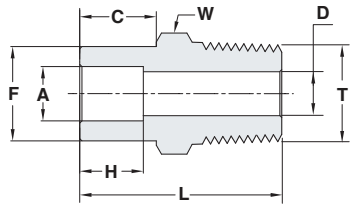




Ordering information (INCH)	A Tube O.D		A1		C		D		W Hex. Flat	F		H		L	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
739LW _ 1/4 X 1/4	1/4	6.35	1/4	6.35	0.41	10.4	0.17	4.2	1/2	0.44	11.2	0.31	7.9	1.25	31.7
739LW _ 1/4 X 3/8	1/4	6.35	3/8	9.52	0.47	11.9	0.17	4.2	5/8	0.62	15.8	0.38	9.7	1.35	34.3
739LW _ 3/8 X 3/8	3/8	9.52	3/8	9.52	0.47	11.9	0.28	7.11	5/8	0.62	15.8	0.38	9.7	1.42	36.7
739LW _ 3/8 X 1/2	3/8	9.52	1/2	12.7	0.47	11.9	0.28	7.11	13/16	0.75	19.05	0.5	12.7	1.45	36.9
739LW _ 1/2 X 1/2	1/2	12.7	1/2	12.7	0.47	11.9	0.39	9.91	13/16	0.75	19.05	0.5	12.7	1.67	42.42
739LW _ 3/4 X 3/4	3/4	19.05	3/4	19.05	0.47	11.9	0.59	15	1-1/16	1.05	26.7	0.56	14.2	1.73	43.94
739LW _ 1 X 3/4	1	25.4	3/4	19.05	0.74	11.9	0.8	20.3	1-1/16	1.05	26.7	0.56	14.2	2.12	54
739LW _ 3/4 X 1	3/4	19.05	1	25.4	0.74	11.9	0.59	15	1-3/8	1.36	34.5	0.76	19.2	2	50.8
739LW _ 1 X 1	1	25.4	1	25.4	0.74	11.9	0.8	20.3	1-3/8	1.36	34.5	0.76	19.2	2.33	59.2
739LW _ 1-1/4 X 1-1/4	1-1/4	31.75	1-1/4	31.75	0.66	16.9	1.02	26	1-3/4	1.73	44	0.76	19.2	2.94	74.7
739LW _ 1-1/2 X 1-1/2	1-1/2	38.1	1-1/2	38.1	0.71	18.1	1.24	31.6	2-1/8	1.97	50	0.9	22.9	3.54	90

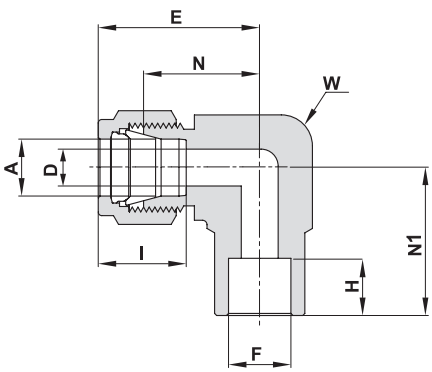
Ordering information (METRIC)	A Tube O.D	A1	C	D	W Hex. Flat		F	H	L
	mm	inch	mm	mm	inch	mm	mm	mm	mm
739LW _ 6MMX 1/4	6	1/4	10.4	4	1/2	-	11.2	7.9	31.7
739LW _ 8MM X 1/4	8	1/4	10.4	5.6	-	14	11.2	7.9	35.3
739LW _ 10MMX 1/4	10	1/4	10.4	4.8	9/16	-	11.2	7.9	34
739LW _ 10MMX 3/8	10	3/8	11.9	7.1	5/8	-	15.8	9.7	36
739LW _ 12MM X 1/2	12	1/2	11.9	8.8	13/16	-	19.05	12.7	42.5
739LW _ 18MM X 3/4	18	3/4	11.9	13.9	-	27	26.7	14.2	46.2
739LW _ 25MM X 1	25	1	11.9	19.8	-	35	34.5	19.2	58.7
739LW _ 38MM X 1-1/2	38	1-1/2	18.1	31.6	-	55	50	22.9	90

MALE NPT
IP98TS MP



Ordering information (INCH)	A Tube O.D		T Male NPT	C		D		W Hex. Flat	F		H		L	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
IP98TS04H04 TUBE 1/4X1/4	1/4	6.35	1/4	0.31	8	0.19	4.8	9/16	0.44	11.2	0.28	7.1	1.15	29.2
IP98TS04H06 TUBE 1/4X3/8	1/4	6.35	3/8	0.41	10.4	0.38	9.65	11/16	0.44	11.2	0.28	7.1	1.25	31.7
IP98TS06H06 TUBE 3/8X3/8	3/8	9.52	3/8	0.41	10.5	0.28	7.1	11/16	0.62	15.8	0.31	7.9	1.25	31.8
IP98TS06H04 TUBE 3/8X1/4	3/8	9.52	1/4	0.43	11	0.28	7.1	5/8	0.62	15.8	0.31	7.9	1.25	31.8
IP98TS06H08 TUBE 3/8X1/2	3/8	9.52	1/2	0.41	10.5	0.28	7.1	7/8	0.62	15.8	0.31	7.9	1.47	37.3
IP98TS08H06 TUBE 1/2X3/8	1/2	12.7	3/8	0.47	11.9	0.38	9.65	3/4	0.73	18.5	0.38	9.7	1.28	32.5
IP98TS04H08 TUBE 1/4X1/2	1/4	6.35	1/2	0.41	10.4	0.67	11.9	7/8	0.44	11.2	0.31	7.9	1.47	37.3
IP98TS08H08 TUBE 1/2X1/2S	1/2	12.7	1/2	0.47	12	0.41	10.4	7/8	0.73	18.5	0.38	9.7	1.53	38.9
IP98TS08H12 TUBE 1/2X3/4	1/2	12.7	3/4	0.47	11.9	0.41	10.4	1-1/16	0.75	19.05	0.5	12.7	1.61	41
IP98TS12H12 TUBE 3/4X3/4	3/4	19.05	3/4	0.47	11.9	0.62	15.75	1-1/16	1.05	26.7	0.44	11.2	1.56	39.6
IP98TS16H12 TUBE 1X3/4	1	25.4	3/4	0.56	14.2	0.62	15.75	1-3/8	1.36	34.5	0.62	15.7	1.78	45.14
IP98TS16H16 TUBE 1X1	1	25.4	1	0.56	14.2	0.86	21.8	1-3/8	1.36	34.5	0.62	15.7	1.97	50.04
IP98TS20H20 TUBE 1-1/4X1-1/4	1-1/4	31.75	1-1/4	0.66	16.9	1.09	27.7	1-3/4	1.73	44	0.75	19.2	2.18	55.5
IP98TS24H24 TUBE 1-1/2X1-1/2	1-1/2	38.1	1-1/2	0.71	18.1	1.34	34	2-1/8	1.97	50	0.90	22.9	2.44	62
IP98TS32H32 TUBE 2X2	2	50.8	2	1	25.4	1.81	45.97	2-3/4	2.53	63	1.19	30.4	3	76.2

769 LW
TUBE SOCKET WELD ELBOW

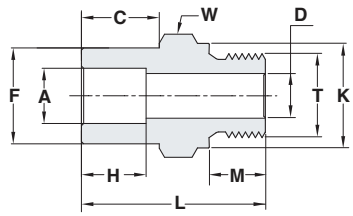


TUBE (INCH)

Ordering Information	A Tube O.D.		F Tube O.D.		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
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

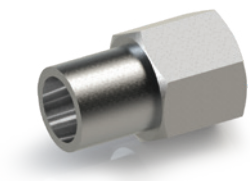
Designation:
Marking LW on Flat

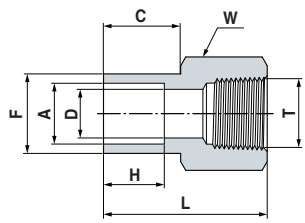
MALE BSPP
IP98TS MG



Ordering information (INCH)	A Tube O.D		T Male BSPP	C		D		W Hex. Flat	F		H		L		K		M	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
IP98TS04H04G 1/4X1/4 BSPP	1/4	6.35	1/4	0.41	10.4	0.19	4.8	3/4	0.48	12.2	0.28	7.1	1.19	30.2	0.71	18	0.44	11.2
IP98TS06H06G 3/8X3/8 BSPP	3/8	9.52	3/8	0.67	11.9	0.28	7.1	7/8	0.62	15.8	0.38	9.65	1.3	33	0.86	21.8	0.44	11.2
IP98TS08H08G 1/2X1/2 BSPP	1/2	12.7	1/2	0.67	11.9	0.41	10.4	1-1/16	0.73	18.5	0.38	9.7	1.47	37.4	1.02	26	0.56	14.2
IP98TS12H12G 3/4X3/4 BSPP	3/4	19.05	3/4	0.67	11.9	0.62	15.8	1-5/16	1.05	26.7	0.44	11.2	1.68	42.7	1.26	32	0.62	15.7
IP98TS16H16G 1X1 BSPP	1	25.4	1	0.56	14.2	0.78	19.8	1-5/8	1.36	34.5	0.75	19.2	1.88	47.75	1.53	39	0.72	18.3
IP98TS20H20G 1-1/4X1-1/4 BSPP	1-1/4	31.75	1-1/4	0.66	16.9	0.88	22.3	2-1/8	1.73	44	0.75	19.2	2.13	54.1	1.97	50	0.78	19.8
IP98TS24H24G 1-1/2X1-1/2 BSPP	1-1/2	38.1	1-1/2	0.71	18.1	1.24	31.6	2-1/4	1.97	50	0.9	22.9	2.49	63.25	2.16	55	0.87	22

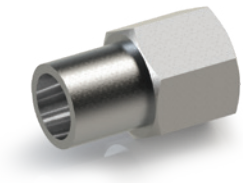
FEMALE NPT
IP96TS FP

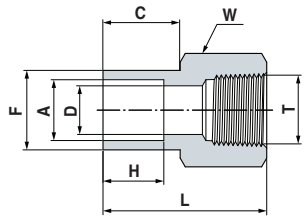




Ordering information (INCH)	A Tube O.D		T Female NPT	C		D		W Hex. Flat	F		H		L	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
IP96TS04H04 TUBE 1/4X1/4	1/4	6.35	1/4	0.39	10	0.19	4.8	3/4	0.49	12.40	0.28	7.1	1.18	30
IP96TS04H06 TUBE 3/8X3/8	3/8	9.52	3/8	0.41	10.5	0.28	7.1	7/8	0.62	15.8	0.28	6.95	1.19	30.4
IP96TS06H06 TUBE 3/8X1/4	3/8	9.52	1/4	0.41	10.5	0.28	7.1	3/4	0.62	15.8	0.31	7.9	1.24	31.5
IP96TS06H04 TUBE 1/2X1/2	1/2	12.7	1/2	0.46	11.9	0.41	10.4	1-1/16	0.73	18.5	0.38	9.7	1.59	40.4
IP96TS06H08 TUBE 3/4X3/4	3/4	19.05	3/4	0.46	11.9	0.62	15.7	1-5/16	1.04	26.4	0.44	11.2	1.72	43.9
IP96TS08H06 TUBE 1X1	1	25.4	1	0.55	14.2	0.88	22.3	1-5/8	1.36	34.5	0.61	15.7	1.95	49.53
IP96TS04H08 TUBE 1-1/2X1-1/2	1-1/2	38.1	1-1/2	0.71	18.1	1.34	34	2-3/8	1.97	50.0	0.90	22.9	2.43	61.73

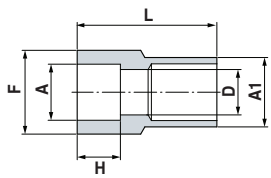
FEMALE BSPP
IP96TS FG





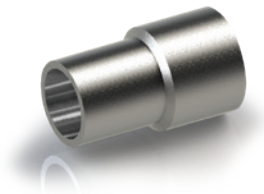
Ordering information (INCH)	A Tube O.D		T Female BSPP	C		D		W Hex. Flat	F		H		L	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm
IP96TS04H04G 1/4X1/4BSPP	1/4	6.35	1/4	0.41	10.4	0.22	5.5	3/4	0.48	12.2	0.28	7.1	1.18	30.2
IP96TS06H06G 3/8X3/8BSPP	3/8	9.52	3/8	0.41	10.5	0.26	6.5	15/16	0.62	15.8	0.38	9.65	1.18	30.0
IP96TS08H08G 1/2X1 /2BSPP	1/2	12.7	1/2	0.47	11.9	0.28	7.1	1-1/16	0.78	18.5	0.38	9.7	1.5	38.1

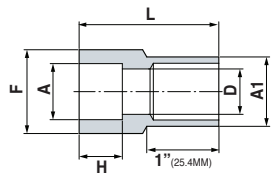
TUBE BUTT WELD ADAPTER
IP93TBW BW



Ordering information (INCH)	A Tube O.D		A1		D		F		H		L	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
IP93TBW04H04 HOSE END	1/4	6.35	1/4	6.35	0.18	4.75	0.48	12.2	0.28	7.1	1.26	32.2
IP93TBW08H04 HOSE END	1/4	6.35	1/2	12.7	0.18	4.8	0.5	12.7	0.28	7.1	1.22	31.2
IP93TBW06H04 HOSE END	1/4	6.35	3/8	9.52	0.18	4.8	0.48	12.2	0.28	7.1	1.18	30.2
IP93TBW06H06 HOSE END	3/8	9.52	3/8	9.52	0.30	7.74	0.59	15.2	0.311	7.9	1.31	33.5
IP93TBW04H08 HOSE END	1/2	12.7	1/4	6.35	0.41	10.4	0.74	19	0.38	9.7	1.34	34.1
IP93TBW08H08 HOSE END	1/2	12.7	1/2	12.7	0.40	10.21	0.72	18.5	0.38	9.7	1.53	39.1
IP93TBW12H12 HOSE END	3/4	19.05	3/4	19.05	0.65	16.56	1.03	26.4	0.44	11.2	1.51	38.5
IP93TBW16H12 HOSE END	3/4	19.05	1	25.4	0.61	22.1	1.03	26.4	0.44	11.2	1.53	39
IP93TBW16H16 HOSE END	1	25.4	1	25.4	0.87	15.7	1.35	34.5	0.61	15.7	1.71	43.5
IP93TBW20H20 HOSE END	1-1/4	31.75	1-1/4	31.75	1.07	27.23	1.73	44	0.75	19.2	1.82	46.22
IP93TBW16H24 HOSE END	1-1/2	38.1	1	25.4	1.31	33.27	1.96	50	0.90	22.9	2.12	53.85
IP93TBW24H24 HOSE END	1-1/2	38.1	1-1/2	38.1	1.31	33.27	1.96	50	0.90	22.9	1.89	48
IP93TBW32H32 HOSE END	2	50.8	2	50.8	0.78	45.2	2.48	63	1.19	30.4	2.13	54.2

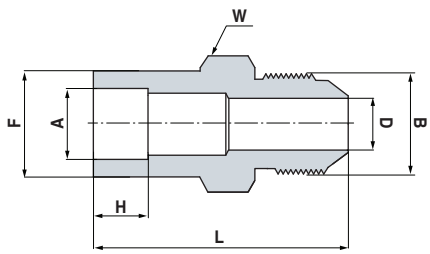
LONG BUTT WELD ADAPTER
IP93TBW LW





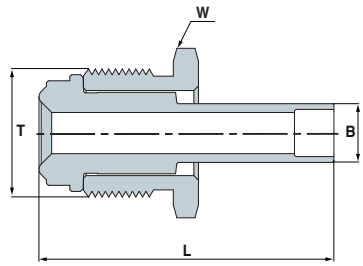
Ordering information (INCH)	A Tube O.D		A1		D		F		H		L	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
IP93TBW04H04 HOSE END L=1	1/4	6.35	1/4	6.35	0.18	4.57	0.48	12.2	0.28	7.1	1.52	38.6
IP93TBW06H06 HOSE END L=1	3/8	9.52	3/8	9.52	0.30	7.74	0.60	15.2	0.31	7.9	1.57	39.9
IP93TBW08H08 HOSE END L=1	1/2	12.7	1/2	12.7	0.40	10.21	0.73	18.5	0.38	9.7	1.79	45.5
IP93TBW12H12 HOSE END L=1	3/4	19.05	3/4	19.05	0.65	16.56	1.04	26.4	0.44	11.2	1.77	44.9
IP93TBW16H12 HOSE END L=1	3/4	19.05	1	25.4	0.87	22.1	1.04	26.4	0.44	11.2	1.79	45.4
IP93TBW16H24 HOSE END L=1	1-1/2	38.1	1	25.4	0.87	22.1	1.97	50.0	0.90	22.9	2.37	60.25

MALE JIC 37° FLARE
748HFW



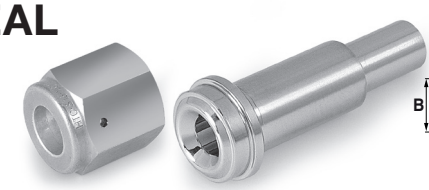
Ordering information (INCH)	A Tube O.D		B UN	D		F		H		L		W Hex flat
	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch
748HFW _ 1/4 X 1/4	1/4	6.35	7/16-20	0.17	4.4	0.48	12.2	0.32	7.9	1.18	29.9	1/2
748HFW _ 3/8 X 3/8	3/8	9.52	9/16-18	0.29	7.5	0.62	15.8	0.39	9.65	1.28	32.45	5/8
748HFW _ 1/2 X 1/2	1/2	12.7	3/4-16	0.39	9.9	0.75	19.05	0.51	12.7	1.05	26.6	13/16
748HFW _ 3/4 X 3/4	3/4	19.05	1 1/16-12	0.60	15.5	1.05	26.7	0.57	14.2	1.78	45.2	1-1/8
748HFW _ 1 X 1	1	25.4	1 5/16-12	0.84	21.5	1.36	34.5	0.77	19.22	1.94	49.3	1-3/8
748HFW _ 1-1/4 X 1-1/4	1-1/4	31.75	1 5/8-12	1.07	27.5	1.73	44	0.77	19.2	2.15	54.5	1-3/4
748HFW _ 1-1/2 X 1-1/2	1-1/2	38.1	1 7/8-12	1.31	33	1.97	50	0.92	22.9	2.48	63	2-1/8
748HFW _ 2 X 2	2	50.8	2 1/2-12	1.78	45	2.48	63	1.22	30.4	3.07	77.9	2-5/8

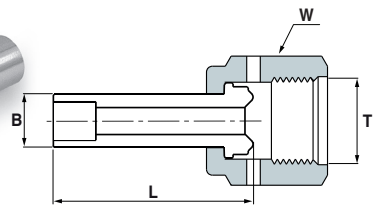
MALE SWIVEL FACE SEAL
GM



End Connection Type	Ordering information	Hose I.D. Weld pipe	End connection	T Thread-inch	W inch	L mm	B mm
Male Face Seal Swivel	V-GSW-1/4-W-H	1/4	1/4	9/6-18	5/8	33.3	8.9
	P-NM-1/4 NUT MALE						
Male Face Seal Swivel	V-GM-3/8-W-H	1/4	1/2	7/8-14	15/16	38.1	9.52
	P-NM-1/2 NUT MALE						
Male Face Seal Swivel	V-GM-1/2-W-H	3/8	1/2	7/8-141	15/16	38.1	12.7
	P-NM-1/2 NUT MALE						
Male Face Seal Swivel	V-GSW-1/2-W-H	1/2	1/2	7/8-14	15/16	38.1	15.1
	P-NM-1/2 NUT MALE						
Male Face Seal Swivel	P-GSW-3/4-W-H	3/4	3/4	1 1/4-18	1-5/16	50.8	22.3
	P-NM-3/4 NUT MALE						
Male Face Seal Swivel	P-GSW-1"-W-H	1	1	1 1/2-20	1-5/8	56.4	30.2
	P-NM-1 NUT MALE						

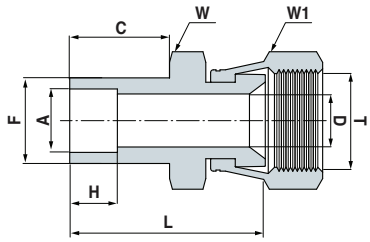
FEMALE SWIVEL FACE SEAL
GF





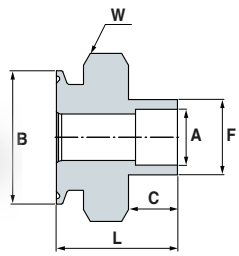
End Connection Type	Components Descriptions	Hose I.D. Weld pipe	Face seal	T Thread-inch	W inch	L mm	B mm
Female Face Seal Swivel	V-GSW-1/4-W-H	1/4	1/4	9/16-18	3/4	33.3	8.9
	P-NF-1/4 NUT FEMALE						
Female Face Seal Swivel	V-GM-3/8 -W-H	1/4	1/2	7/8-14	1-1/16	38.1	9.52
	P-NF-1/2 NUT FEMALE						
Female Face Seal Swivel	V-GM-1/2-W-H	3/8	1/2	7/8-14	1-1/16	38.1	12.7
	P-NF-1/2 NUT FEMALE						
Female Face Seal Swivel	V-GSW-1/2-W-H	1/2	1/2	7/8-14	1-1/16	38.1	15.1
	P-NF-1/2 NUT FEMALE						
Female Face Seal Swivel	P-GSW-3/4-W-H	3/4	3/4	11/4-18	1-1/2	50.8	22.3
	P-NF-3/4 NUT FEMALE						
Female Face Seal Swivel	P-GSW-1"-W-H	1	1	11/2-20	1-3/4	56.4	30.2
	P-NF-1 NUT FEMALE						
Female Face Seal Swivel	IP93TBW16H24 HOSE END	11/2	1	1 1/2-20	1-3/4	85.85	50
	P-GS-1"-W-H 0.065" W.T.						
	P-NF-1 NUT FEMALE						

FEMALE JIC 37° FLARE
746HFFW



Ordering information (INCH)	A Tube O.D.		T Female Size	C		D		W Hex. Flat	W1 Hex. Flat	F		H		L	
	inch	mm	inch	inch	mm	inch	mm	inch	inch	inch	mm	inch	mm	inch	mm
746HFFW _ 1/4 X 1/4	1/4	6.35	7/16-20	0.39	10	0.17	4.4	1/2	9/16	0.49	12.40	0.27	7.1	0.90	22.86
746HFFW _ 3/8 X 3/8	3/8	9.52	9/16-18	0.41	10.5	0.27	7.1	5/8	11/16	0.60	15.2	0.37	9.65	1.09	27.69
746HFFW _ 1/2 X 1/2	1/2	12.7	3/4.-16	0.46	11.9	0.38	9.9	13/16	7/8	0.73	18.5	0.38	9.7	1.19	30.23
746HFFW _ 3/4 X 3/4	3/4	19.05	1-1/16-12	0.46	11.9	0.61	15.5	1-1/16	1-1/4	1.04	26.4	0.44	11.2	1.32	33.53
746HFFW _ 1 X 1	1	25.4	1-5/16-12	0.55	14.2	0.84	21.5	1-3/8	1-1/2	1.36	34.5	0.61	15.7	1.61	40.9

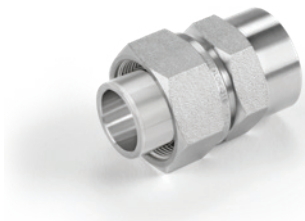
SANITARY FLANGE
768SFLW

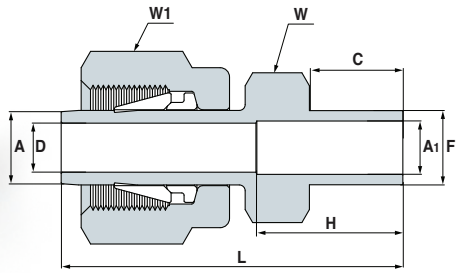


Ordering information (INCH)	A Tube O.D		B Flange size	C		W Hex. Flat	F		L	
	inch	mm	inch	inch	mm	inch	inch	mm	inch	mm
768SFLW _ 1/2 X 1/2	1/2	12.7	1/2	0.47	11.94	-	0.75	19.05	1.34	34.13
768SFLW _ 3/4 X 3/4	3/4	19.05	3/4	0.47	11.94	-	1.05	26.7	1.34	34.14
768SFLW _ 1 X 1	1	25.4	1	0.56	14.22	-	1.36	34.5	1.44	36.63
768SFLW _ 11/2 X 11/2	1-1/2	38.1	1-1/2	0.71	18.1	-	1.97	50	1.65	41.8
768SFLW _ 2 X 2	2	50.8	2	1	25.4	-	2.48	63	2.46	62.51

PRESWAGED TUBE ADAPTER

739LW





Ordering information (INCH)	A Tube O.D		A1 Tube O.D		C		D		W Hex. Flat	F		H		L		W1 Hex. Flat
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	inch
739LW _ 1/4 X 3/8 PRSW	1/4	6.35	3/8	9.52	0.47	11.9	0.17	4.2	5/8	0.62	15.8	0.38	9.7	1.35	34.3	9/16
739LW _ 3/8 X 3/8 PRSW	3/8	9.52	3/8	9.52	0.47	11.9	0.28	7.11	5/8	0.62	15.8	0.38	9.7	1.42	36.7	11/16
739LW _ 1/2 X 1/2 PRSW	1/2	12.7	1/2	12.7	0.47	11.9	0.39	9.91	13/16	0.75	19.05	0.5	12.7	1.67	42.42	7/8
739LW _ 3/4 X 3/4 PRSW	3/4	19.05	3/4	19.05	0.47	11.9	0.59	15	1-1/16	1.05	26.7	0.56	14.2	1.73	43.94	1-1/8
739LW _ 1 X 3/4 PRSW	1	25.4	3/4	19.05	0.74	11.9	0.8	20.3	1-1/16	1.05	26.7	0.56	14.2	2.12	54	1-1/2
739LW _ 1 X 1 PRSW	1	25.4	1	25.4	0.74	11.9	0.8	20.3	1-3/8	1.36	34.5	0.76	19.2	2.33	59.2	1-1/2

Ordering information (METRIC)	A Tube O.D	A1 Tube O.D	C	D	W Hex. Flat		F	H	L	W1 Hex. Flat	
	mm	inch	mm	mm	inch	MM	mm	mm	mm	mm	inch
739LW _ 6MMX 1/4 PRSW	6	1/4	10.4	4	1/2	-	11.2	7.9	31.7	14	-
739LW _ 8MM X 1/4 PRSW	8	1/4	10.4	5.6	-	14	11.2	7.9	35.3	16	-
739LW _ 10MMX 3/8 PRSW	10	3/8	11.9	7.1	5/8	-	15.8	9.7	36	-	3/4
739LW _ 12MM X 1/2 PRSW	12	1/2	11.9	8.8	13/16	-	19.05	12.7	42.5	22	-
739LW _ 18MM X 3/4 PRSW	18	3/4	11.9	13.9	-	27	26.7	14.2	46.2	30	-
739LW _ 25MM X 1 PRSW	25	1	11.9	19.8	-	35	34.5	19.2	58.7	-	1.1/2

HAM-LET PTFE HOSES
COMPONENTS

HAM-LET
ADVANCED CONTROL TECHNOLOGY

Bulk PTFE Hoses

HOW TO ORDER

Available for ordering as:

- cut length Min. 164 feet (50 meter)

OPTIONAL

T	H	T	1	04	-	M	-	
Line	Hoses	Series	Configuration	Tube ID		Bulk Hoses		Options

Line	
T	PTFE

Hoses	
H	Hose

Series	
T	Smooth PTFE Core
S	Silicon Covered
C	Convoluted PTFE Core
B	Smooth core fiber braid
R	Smooth core additional fiber braid
P	Silicon cover smooth core
N	Convoluted core insulating wrap

Configuration	
None	SS 304 single braid
0	Without braid
1	SS 316 single braid
2	SS 304 double braid

Tube ID	
02	1/8
04	1/4
06	3/8
08	1/2
12	3/4
16	1
24	1 1/2
32	2

Bulk Hoses	
M	Meter

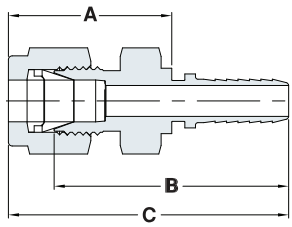
Options	
C	Conductive Carbon Lining

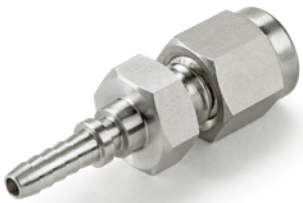
For a complete range of end connections see the following pages.

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.

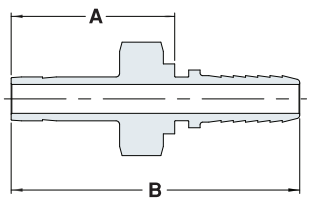
LET-LOK
130 LHT





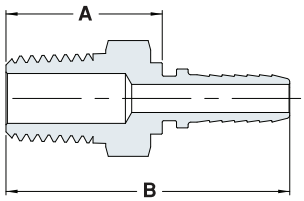
Ordering Information	Hose I.D.	Tube Size	B		C		A	
			inch	mm	inch	mm	inch	mm
INCH								
130LHT _ 1/8 X 1/8 SP	1/8	1/8	1.19	30.30	1.57	39.90	0.90	22.90
130LHT _ 1/4 X 1/4 SP	1/4	1/4	1.44	36.70	1.73	44.05	1.02	25.80
130LHT _ 3/8 X 3/8 SP	3/8	3/8	1.70	43.20	1.99	50.60	1.09	27.80
130LHT _ 1/2 X 1/2 SP	1/2	1/2	1.94	49.30	2.34	59.50	1.23	31.20
130LHT _ 3/4 X 1/2 SP	1/2	3/4	2.03	51.60	2.43	61.80	1.32	33.45
130LHT _ 3/4 X 3/4 SP	3/4	3/4	2.25	57.15	2.65	67.30	1.28	32.40
130LHT _ 1 X 1 SP	1	1	2.54	64.50	3.02	76.70	1.47	37.45
130LHT _ 1-1/2 X 1-1/2 SP	1-1/2	1-1/2	3.92	99.60	4.99	126.80	2.47	62.75
METRIC								
130LHT _ 3MM X 1/8 SP	1/8	3mm	1.18	30.00	1.45	36.90	0.90	22.90
130LHT _ 6MM X 1/4 SP	1/4	6mm	1.44	36.70	1.74	44.10	1.02	25.80
130LHT _ 8MM X 1/4 SP	1/4	8mm	1.45	36.90	1.75	44.40	1.03	26.15
130LHT _ 10MM X 3/8 SP	3/8	10mm	1.71	43.50	2.01	51.10	1.12	28.40
130LHT _ 12MM X 1/2 SP	1/2	12mm	1.94	49.30	2.34	59.40	1.22	31.10
130LHT _ 18MM X 3/4 SP	3/4	18mm	2.25	57.15	2.65	67.25	1.16	29.35
130LHT _ 25MM X 1 SP	1	25mm	2.70	68.55	3.19	80.90	1.64	41.65
130LHT _ 38MM X 1-1/2 SP	1-1/2	38mm	4.02	102.00	5.10	129.60	2.83	71.90

TUBE ADAPTER
130 LTT



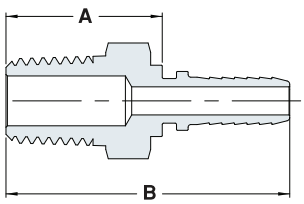
Ordering Information	Hose I.D.	Tube Size	B		A	
			inch	mm	inch	mm
INCH						
130LTT _ 1/8 X 1/8 SP	1/8	1/8	1.37	34.80	0.82	20.80
130LTT _ 1/4 X 1/8 SP	1/8	1/4	1.51	38.30	0.96	24.30
130LTT _ 1/4 X 1/4 SP	1/4	1/4	1.65	41.90	0.93	23.63
130LTT _ 3/8 X 3/8 SP	3/8	3/8	1.93	48.90	1.03	26.20
130LTT _ 3/8 X 1/2 SP	1/2	3/8	2.17	55.10	1.06	26.80
130LTT _ 1/2 X 1/2 SP	1/2	1/2	2.38	60.55	1.27	32.25
130LTT _ 3/4 X 1/2 SP	1/2	3/4	2.52	64.00	1.41	35.70
130LTT _ 3/4 X 3/4 SP	3/4	3/4	2.76	70.00	1.38	35.10
30LTT _ 5/8 X 5/8 SP	5/8	5/8	2.54	64.60	1.39	35.25
130LTT _ 3/4 X 1 SP	1	3/4	2.95	75.00	1.41	35.75
130LTT _ 1 X 3/4 SP	3/4	1	3.08	78.30	1.71	43.40
130LTT _ 1 X 1 SP	1	1	3.28	83.30	1.73	44.05
130LTT _ 1-1/2 X 1-1/2 SP	1-1/2	1-1/2	5.35	136.00	3.08	78.30
METRIC						
130LTT _ 3MM X 1/8 SP	1/8	3mm	1.37	34.80	0.82	20.80
130LTT _ 6MM X 1/4 SP	1/4	6mm	1.68	42.70	0.96	24.45
130LTT _ 8MM X 1/4 SP	1/4	8mm	1.71	43.50	0.99	25.25
130LTT _ 10MM X 3/8 SP	3/8	10mm	1.89	48.00	0.90	22.75
130LTT _ 12MM X 1/2 SP	1/2	12mm	2.39	60.70	1.28	32.40
130LTT _ 18MM X 1/2 SP	1/2	18mm	2.52	64.00	1.41	35.70
130LTT _ 18MM X 3/4 SP	3/4	18mm	2.76	70.00	1.38	35.10
130LTT _ 25MM X 1 SP	1	25mm	3.44	87.30	1.91	48.50
130LTT _ 38MM X 1-1/2 SP	1 1/2	38mm	5.35	136.00	3.08	78.30

MALE NPT
130 HMTH



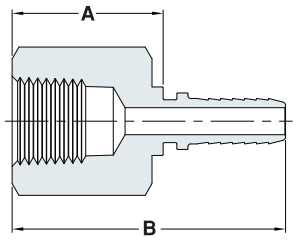
Ordering Information	Hose I.D.	Male NPT	B		A	
			inch	mm	inch	mm
130HMTH _ 1/8 X 1/8 SP	1/8	1/8	1.25	31.70	0.70	17.70
130HMTH _ 1/4 X 1/4 SP	1/4	1/4	1.60	40.55	0.88	22.40
130HMTH _ 1/4 X 3/8 SP	3/8	1/4	1.81	45.90	0.91	23.15
130HMTH _ 1/4 X 1/2 SP	1/2	1/4	2.04	51.80	0.93	23.50
130HMTH _ 3/8 X 3/8 SP	3/8	3/8	1.80	45.60	0.90	22.87
130HMTH _ 3/8 X 1/2 SP	1/2	3/8	2.04	51.80	0.93	23.50
130HMTH _ 1/2 X 1/2 SP	1/2	1/2	2.22	56.45	1.11	28.15
130HMTH _ 1/2 X 3/4 SP	3/4	1/2	2.51	63.65	1.13	28.70
130HMTH _ 3/4 X 3/4 SP	3/4	3/4	2.51	63.65	1.13	28.70
130HMTH _ 3/4 X 1 SP	1	3/4	2.72	69.10	1.18	29.85
130HMTH _ 1 X 1 SP	1	1	2.92	74.05	1.37	34.80
130HMTH _ 1-1/2 X 1-1/2 SP	1-1/2	1-1/2	4.24	107.80	1.97	50.10
130HMTH _ 2 X 2 SP	2	2	4.73	120.25	2.02	51.30

MALE BSP-P
130 HMTHG



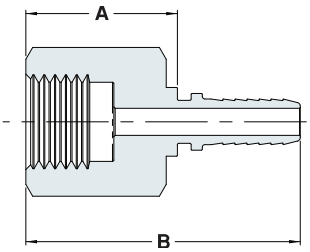
Ordering Information	Hose I.D.	Male BSPP	B		A	
			inch	mm	inch	mm
130HMTHG _ 1/8 X 1/8 SP	1/8	1/8	1.20	30.60	0.65	16.60
130HMTHG _ 1/4 X 1/4 SP	1/4	1/4	1.63	41.40	0.92	23.25
130HMTHG _ 1/4 X 3/8 SP	3/8	1/4	1.80	45.80	0.91	23.10
130HMTHG _ 1/4 X 1/2 SP	1/2	1/4	2.06	52.30	0.94	24.00
130HMTHG _ 3/8 X 3/8 SP	3/8	3/8	1.78	45.10	0.88	22.40
130HMTHG _ 3/8 X 1/2 SP	1/2	3/8	2.03	51.60	0.93	23.50
130HMTHG _ 1/2 X 1/2 SP	1/2	1/2	2.15	54.70	1.04	26.50

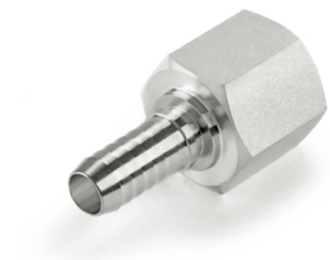
FEMALE NPT
130 HFTH



Ordering Information	Hose I.D.	Female NPT	B		A	
			inch	mm	inch	mm
130HFTH _ 1/8 X 1/8 SP	1/8	1/8	1.18	30.00	0.63	16.00
130HFTH _ 1/4 X 1/4 SP	1/4	1/4	1.60	40.55	0.88	22.40
130HFTH _ 1/4 X 3/8 SP	3/8	1/4	1.78	45.30	0.89	22.55
130HFTH _ 3/8 X 3/8 SP	3/8	3/8	1.78	45.30	0.89	22.55
130HFTH _ 1/2 X 1/2 SP	1/2	1/2	2.23	56.70	1.12	28.40
130HFTH _ 3/4 X 3/4 SP	3/4	3/4	2.51	63.80	1.14	28.90
130HFTH _ 1 X 1 SP	1	1	3.08	78.20	1.55	39.25
130HFTH _ 1-1/2 X 1-1/2 SP	1-1/2	1-1/2	3.87	98.25	1.60	40.55

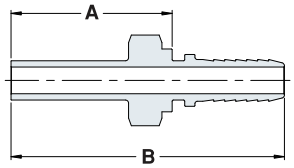
FEMALE BSP-P
130 HFTHG





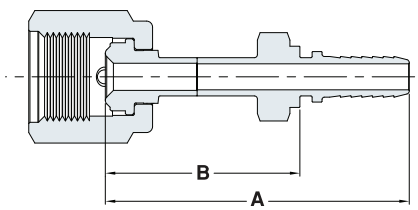
Ordering Information	Hose I.D.	Female BSPP	B		A	
			inch	mm	inch	mm
130HFTHG _ 1/8 X 1/8 SP	1/8	1/8	1.28	32.40	0.72	18.40
130HFTHG _ 1/4 X 1/4 SP	1/4	1/4	1.60	40.55	0.88	22.40
130HFTHG _ 3/8 X 3/8 SP	3/8	3/8	1.72	43.75	0.83	21.00
130HFTHG _ 1/2 X 1/2 SP	1/2	1/2	2.25	57.10	1.13	28.80
130HFTHG _ 3/4 X 3/4 SP	3/4	3/4	2.54	64.60	1.17	29.70
130HFTHG _ 1 X 1 SP	1	1	3.08	78.20	1.54	39.00

BUTT WELD ADAPTER
130 HBWTH



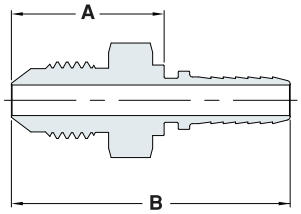
Ordering Information	Hose I.D.	Tube Size	B		A	
			inch	mm	inch	mm
130HBWTH _ 1/4 X 1/4	1/4	1/4	1.74	44.20	1.02	25.95
130HBWTH _ 3/8 X 3/8	3/8	3/8	1.95	49.50	1.05	26.75
130HBWTH _ 1/2 X 1/2	1/2	1/2	2.22	56.45	1.11	28.15
130HBWTH _ 1/2 X 3/4	1/2	3/4	2.22	56.45	1.11	28.15
130HBWTH _ 3/4 X 3/4	3/4	3/4	2.51	63.65	1.13	28.70
130HBWTH _ 1 X 3/4	1	3/4	2.73	69.30	1.18	30.05
130HBWTH _ 1 X 1	1	1	2.73	69.30	1.18	30.05
130HBWTH _ 1-1/2 X 1-1/2	1-1/2	1-1/2	3.96	100.70	2.27	57.70

FEMALE FACE SEAL SWIVEL
130 FHC



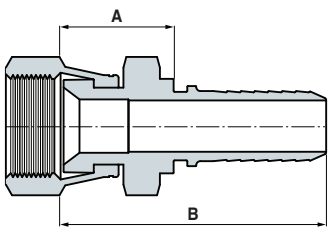
Ordering Information	Hose I.D.	Face Seal	B		A	
			inch	mm	inch	mm
130FHC _ 1/4 x 1/4	1/4	1/4	1.27	32.23	1.98	50.40
130FHC _ 3/8 x 3/8	3/8	3/8	1.67	42.50	2.57	65.25
130FHC _ 1/2 x 1/2	1/2	1/2	1.73	43.90	2.84	72.20
130FHC _ 3/4 x 3/4	3/4	3/4	2.25	57.10	3.36	85.41
130FHC _ 1 x 3/4	1	3/4	2.32	59.05	3.87	98.30
130FHC _ 1 x 1	1	1	2.44	62.05	3.99	101.30

Male JIC 37° flare
130 HFLTH



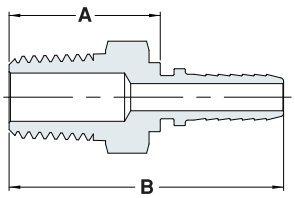
Ordering Information	Hose I.D.	Face Seal	B		A	
			inch	mm	inch	mm
130HFLTH _ 1/8 X 1/8 MALE	1/8	1/8	1.37	34.80	0.82	20.85
130HFLTH _ 1/4 X 1/4 MALE	1/4	1/4	1.58	40.15	0.86	21.90
130HFLTH _ 3/8 X 3/8 MALE	3/8	3/8	1.81	46.10	1.06	27.03
130HFLTH _ 1/2 X 1/2 MALE	1/2	1/2	2.18	55.25	1.06	26.95
130HFLTH _ 3/4 X 3/4 MALE	3/4	3/4	2.77	70.45	1.40	35.55
130HFLTH _ 1 X 1 MALE	1	1	3.08	78.20	1.53	38.95
130HFLTH _ 1-1/2X1-1/2MALE	1-1/2	1-1/2	4.19	106.35	1.92	48.65

Female JIC 37° flare
130HFLTHF



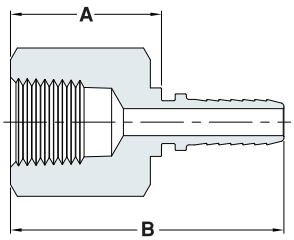
Ordering Information	Hose I.D.	Tube Size	B		A	
			inch	mm	inch	mm
130HFLTHF _ 1/8 X 1/8 FEMALE	1/8	1/8	-	-	-	-
130HFLTHF _ 1/4 X 1/4 FEMALE	1/4	1/4	1.31	33.15	0.59	14.90
130HFLTHF _ 3/8 X 3/8 FEMALE	3/8	3/8	1.58	40.20	0.69	17.45
130HFLTHF _ 1/2 X 1/2 FEMALE	1/2	1/2	1.92	48.70	0.80	20.40
130HFLTHF _ 3/4 X 3/4 FEMALE	3/4	3/4	2.23	56.60	0.85	21.70
130HFLTHF _ 1 X 1 FEMALE	1	1	2.68	68.00	1.13	28.75
130HFLTHF _ 1-1/2X1-1/2 FEMALE	1-1/2	1 -1/2	3.89	98.80	1.62	41.10

MALE BSP-T
130 HMTHR



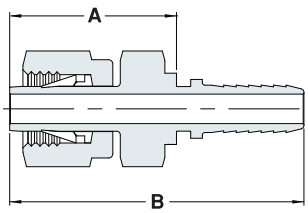
Ordering Information	Hose I.D.	Male BSPT	B		A	
			inch	mm	inch	mm
130HMTHR _ 1/8 X 1/8	1/8	1/8	1.25	31.75	0.70	17.80
130HMTHR _ 1/4 X 1/4	1/4	1/4	1.59	40.30	0.87	22.05
130HMTHR _ 3/8 X 3/8	3/8	3/8	1.77	45.05	0.88	22.30
130HMTHR _ 1/2 X 1/2	1/2	1/2	2.28	57.90	1.17	29.60
130HMTHR _ 3/4 X 3/4	3/4	3/4	2.60	66.05	1.22	31.10
130HMTHR _ 1 X 1	1	1	3.08	78.20	1.54	39.00
130HMTHR _ 1-1/2 X 1-1/2	1-1/2	1-1/2	4.24	107.70	1.97	50.00

FEMALE BSP-T
130 HFTHR



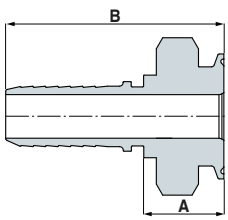
Ordering Information	Hose I.D.	Female BSPT	B		A	
			inch	mm	inch	mm
130HFTHR _ 1/8 X 1/8	1/8	1/8	1.18	29.95	0.63	16.00
130HFTHR _ 1/4 X 1/4	1/4	1/4	1.51	38.30	0.79	20.05
130HFTHR _ 3/8 X 3/8	3/8	3/8	1.74	44.30	0.85	21.55
130HFTHR _ 1/2 X 1/2	1/2	1/2	2.19	55.60	1.07	27.30
130HFTHR _ 3/4 X 3/4	3/4	3/4	2.51	63.75	1.14	28.85
130HFTHR _ 1 X 1	1	1	3.08	78.20	1.54	39.00
130HFTHR _ 1-1/2 X 1-1/2	1-1/2	1-1/2	-	-	-	-

TUBE ADAPTER PRESWAGED
130 LTT PRSW



Ordering Information	Hose I.D.	Tube Size	B		A	
			inch	mm	inch	mm
INCH						
130LTT _ 1/4X1/4PRSW SP	1/4	1/4	1.65	41.90	0.93	23.63
130LTT _ 3/8X3/8PRSW SP	3/8	3/8	1.93	48.90	1.03	26.20
130LTT _ 3/8X1/2PRSW SP	1/2	3/8	2.17	55.10	1.06	26.80
130LTT _ 1/2X1/2PRSW SP	1/2	1/2	2.38	60.55	1.27	32.25
130LTT _ 3/4X3/4PRSW SP	3/4	3/4	2.76	70.00	1.38	35.10
130LTT _ 1"X1"PRSW SP	1	1	3.28	83.30	1.73	44.05
METRIC						
130LTT _ 6MMX1/4PRSW SP	1/4	6mm	1.68	42.70	0.96	24.45
130LTT _ 8MMX1/4PRSW SP	1/4	8mm	1.71	43.50	0.99	25.25
130LTT _ 10MMX3/8PRSW SP	3/8	10mm	1.89	48.00	0.90	22.75
130LTT _ 12MMX1/2PRSW SP	1/2	12mm	2.39	60.70	1.28	32.40
130LTT _ 18MMX1/2PRSW SP	1/2	18mm	2.52	64.00	1.41	35.70
130LTT _ 18MMX3/4PRSWSP	3/4	18mm	2.76	70.00	1.38	35.10
130LTT _ 25MMX1PRSW SP	1	25mm	3.44	87.30	1.91	48.50

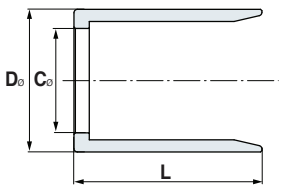
SANITARY FLANGE
130 SF



Ordering Information	Hose I.D.	Flange size	B		A	
			inch	mm	inch	mm
INCH						
130SF _ 1/2X1/2	1/2	1/2	2.09	53.05	0.97	24.75
130SF _ 3/4X3/4	3/4	3/4	2.35	59.65	0.97	24.75
130SF _ 1X1	1	1	2.55	64.83	1.01	25.60
130SF _ 1-1/2X1-1/2	1-1/2	1-1/2	3.70	94.10	1.43	36.40

CRIMP RING FOR SMOOTH PTFE CORE HOSES

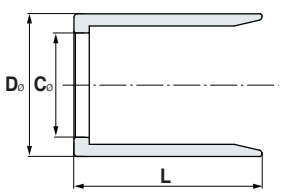
THT _ CRMP

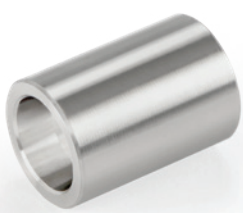


Ordering Information	L		C		D	
	inch	mm	Inch	mm	Inch	mm
THT02-CRMP-HD	-	-	-	-	-	-
THT04-CRMP-HD	0.89	22.60	0.33	8.50	0.62	15.80
THT06-CRMP-HD	0.75	19.15	0.44	11.05	0.67	17.10
THT08-CRMP-HD	1.06	27.00	0.59	15.00	0.81	20.50
THT12-CRMP-HD	1.40	35.50	0.88	22.40	1.16	29.50
THT16-CRMP-HD	1.55	39.30	1.15	29.30	1.48	37.70
THT24-CRMP-HD	-	-	-	-	-	-
THT32-CRMP-HD	-	-	-	-	-	-

CRIMP RING FOR CONVOLUTED PTFE CORE HOSES

THC _ CRMP





Ordering Information	L		C		D	
	inch	mm	Inch	mm	Inch	mm
THC02-CRMP-HD	-	-	-	-	-	-
THC04-CRMP-HD	-	-	-	-	-	-
THC06-CRMP-HD	9.06	23.00	5.47	13.90	8.86	22.60
THC08-CRMP-HD	11.5	29.20	6.18	15.70	7.64	19.40
THC12-CRMP-HD	-	-	-	-	-	-
THC16-CRMP-HD	-	-	-	-	-	-
THC24-CRMP-HD	-	-	-	-	-	-
THC32-CRMP-HD	-	-	-	-	-	-

HAM-LET RUBBER HOSES
COMPONENTS

HAM-LET
ADVANCED CONTROL TECHNOLOGY

BULK RUBBER HOSES

Available for ordering as:

- cut length Min. 164 feet (50 meter)
- Reel of fix length 500 feet (152.4 meter) for all sizes (maximum 4 pieces in a reel, 10' minimum)

HOW TO ORDER

R	H	G	04	-	M	-	OPTIONAL
Line	Hoses	Series	Tube ID		Bulk Hoses		Options

Line	
R	Rubber

Hoses	
H	Hose

Series	
G	HOSE END™ Hose

Tube ID	
04	1/4
06	3/8
08	1/2
10	5/8
12	3/4
16	1

Bulk Hoses	
M	Meter

Hose Cover Color	
Blank	Black
V1	Red
V2	Blue
V3	Green
V4	Yellow
V5	Grey

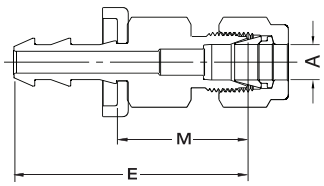
For a complete range of end connections see the following pages, or the Ham-Let catalogue.

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.

LET-LOK® TUBE FITTINGS

130 LHPO / 130 LHPOP

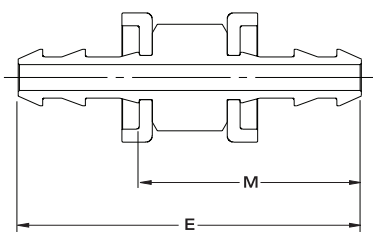


Ordering Information	Hose I.D.	A Tube O.D.	E		M	
			inch	mm	inch	mm
PO INCH						
130LHPO _ 1/4 X 1/4	1/4	1/4	1.97	42.67	1.14	23.92
130LHPO _ 3/8 X 3/8	3/8	3/8	2.11	46.22	1.17	24.52
130LHPO _ 1/2 X 1/2	1/2	1/2	2.47	52.58	1.37	26.68
130LHPO _ 3/4 X 3/4	3/4	3/4	2.96	65.05	1.32	23.3
130LHPO _ 1 X 1	1	1	3.01	64.36	1.6	28.36
PO INCH TO MM						
130LHPO _ 1/4 X 6MM	1/4	6mm	1.97	10.64	1.14	6.16
130LHPO _ 1/4 X 8MM	1/4	8mm	1.97	10.64	1.14	6.16
130LHPO _ 3/8 X 6MM	3/8	8mm	-	-	-	-
130LHPO _ 3/8 X 8MM	3/8	10mm	-	-	-	-
130LHPO _ 1/2 X 12MM	1/2	12mm	2.47	13.34	1.45	7.83
130LHPO _ 3/4 X 18MM	3/4	18mm	-	-	-	-
130LHPO _ 1 X 25MM	1	25mm	-	-	-	-

Ordering Information	Hose I.D.	A Tube O.D.	E		M	
			inch	mm	inch	mm
POP INCH						
130LHPOP _ 1/4 X 1/4	1/4	1/4	1.43	36.20	0.70	17.70
130LHPOP _ 3/8 X 3/4	3/8	3/4	2.38	60.50	0.97	24.60
130LHPOP _ 3/4 X 3/4	3/4	3/4	2.39	60.65	0.97	24.65

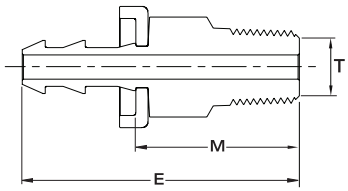
UNIONS

132 PO



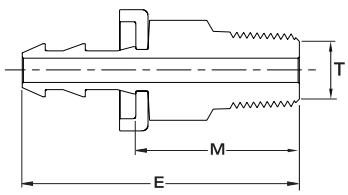
Ordering Information	Hose I.D.	Hose I.D.	E		M	
			inch	mm	inch	mm
PO						
132PO _ 1/4 X 1/4	1/4	1/4	2.07	52.6	1.33	33.85
132PO _ 3/8 X 3/8	3/8	3/8	2.25	57.2	1.4	35.5
132PO _ 1/2 X 1/2	1/2	1/2	2.61	66.3	1.59	40.4
132PO _ 3/4 X 3/4	3/4	3/4	3.82	97.1	2.18	55.35
132PO _ 1 X 1	1	1	3.57	90.8	2.16	54.8

MALE PIPE THREADS
130 HMPO / 130 HMPOP



Ordering Information	Hose I.D.	T NPT	E		M	
			inch	mm	inch	mm
PO NPT						
130HMPO _ 1/4 X 1/4	1/4	1/4	1.68	42.7	0.94	23.95
130HMPO _ 1/4 X 3/8	1/4	3/8	1.69	43.0	0.95	24.25
130HMPO _ 3/8 X 1/4	3/8	1/4	1.80	45.7	0.94	24.0
130HMPO _ 3/8 X 3/8	3/8	3/8	1.80	45.7	0.94	24.0
130HMPO _ 3/8 X 1/2	3/8	1/2	2.02	51.2	1.16	29.5
130HMPO _ 1/2 X 3/8	1/2	3/8	2.02	51.34	1.0	25.44
130HMPO _ 1/2 X 1/2	1/2	1/2	2.19	55.6	1.17	29.7
130HMPO _ 1/2 X 3/4	1/2	3/4	2.21	56.14	1.19	30.24
130HMPO _ 3/4 X 1/2	3/4	1/2	2.81	71.4	1.17	29.65
130HMPO _ 3/4 X 3/4	3/4	3/4	2.81	71.4	1.17	29.65
130HMPO _ 1 X 1	1	1	2.99	76.06	1.58	40.06
POP NPT						
130HMPOP _ 1/4X1/4	1/4	1/4	1.57	40.1	0.82	21.6
130HMPOP _ 1/4X1/2	1/4	1/2	1.9	48.3	1.17	29.8
130HMPOP _ 3/8X1/4	3/8	1/4	1.78	45.0	0.88	22.75
130HMPOP _ 3/8X3/8	3/8	3/8	1.78	45.3	0.9	23.05
130HMPOP _ 1/2X3/8	1/2	3/8	1.93	49.0	0.9	22.9
130HMPOP _ 1/2X1/2	1/2	1/2	2.18	55.5	1.16	29.4
130HMPOP _ 1/2X3/4	1/2	3/4	2.23	56.6	1.2	30.5
130HMPOP _ 3/4X1/2	3/4	1/2	2.61	66.4	1.2	30.5
130HMPOP _ 3/4X3/4	3/4	3/4	2.61	66.4	1.2	30.5
130HMPOP _ 1 X 1	1	1	3.06	78.0	1.66	42.1

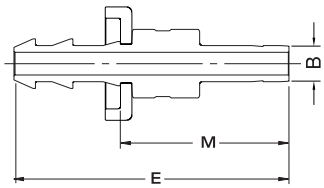
MALE PIPE THREADS
130 HMRPO / 130 HMRPOP



Ordering Information	Hose I.D.	T ISO	E		M	
			inch	mm	inch	mm
BSP Tapered						
130HMRPO _ 3/8 X 3/8	3/8	3/8	1.8	45.7	0.94	24.0
130HMRPO _ 1/2 X 1/2	1/2	1/2	2.19	55.6	1.17	29.7
130HMRPO _ 3/4 X 1/2	3/4	1/2	2.81	71.4	1.17	29.65
130HMRPO _ 3/4 X 3/4	3/4	3/4	2.81	71.4	1.17	29.65

TUBE ADAPTER

131 PO / 131 POP



Ordering Information	Hose I.D.	B Tube O.D.	E		M	
			inch	mm	inch	mm
PO INCH						
131PO _ 1/4 X 1/4	1/4	1/4	1.91	48.5	1.17	29.75
131PO _ 3/8 X 1/4	3/8	1/4	1.95	49.6	1.10	27.9
131PO _ 3/8 X 3/8	3/8	3/8	2.02	51.3	1.17	29.6
131PO _ 1/2 X 3/8	1/2	3/8	2.25	57.14	1.23	31.24
131PO _ 1/2 X 1/2	1/2	1/2	2.47	62.74	1.45	36.84
131PO _ 3/4 X 1/2	3/4	1/2	3.04	77.1	1.39	35.35
131PO _ 3/4 X 3/4	3/4	3/4	3.14	79.8	1.50	38.05
131PO _ 1 X 3/4	1	3/4	3.06	77.7	1.64	41.7
131PO _ 1 X 1	1	1	3.39	86.0	1.97	50.0
PO MM						
131PO _ 1/4 X 8MM	1/4	8mm	1.52	49.6	1.21	30.85
131PO _ 3/8 X 8 MM	3/8	8mm	2.0	50.9	1.15	29.2
131PO _ 3/8 X 12MM	3/8	12mm	2.24	56.9	1.39	35.2
131PO _ 1/2 X 12MM	1/2	12mm	2.47	62.74	1.45	36.48
131PO _ 3/4 X 18MM	3/4	18mm	3.14	79.8	1.50	38.05

Ordering Information	Hose I.D.	B Tube O.D.	E		M	
			inch	mm	inch	mm
POP INCH						
131POP _ 1/4 X 1/4	1/4	1/4	1.89	48.0	1.17	29.65
131POP _ 1/4 X 3/16	1/4	3/16	1.63	41.5	0.91	23.15

NOTE: For other end connection types and sizes please contact your local Ham-Let representative.

HAM-LET EXPANSION JOINTS

HAM-LET®
ADVANCED CONTROL TECHNOLOGY

HAM-LET EXPANSION JOINTS

General

Ham-Let offers a complete range of Pre-Engineered and Custom Designed high quality all Stainless Steel expansion joint. Expansion joints in 2" and higher diameters completes Ham-Let offering of hoses size ¼" to 2" as the solution for flexible section in tube and pipe systems.

Features

Nominal diameter 2" and above
Working pressures range Vacuum up to 1,000psi (69bar)
Working temperatures -450 F° (-268 C°)
up to 1,500 F° (815 C°)
Wide range of stainless steel and nickel alloys
construction materials available

Pre-engineered expansion joint products

Pre-engineered expansion joint products incorporate designs for common industrial applications to provide more immediate order availability. For pre-engineered expansion joint please refer to pages 6 for product designs and specifications.

Custom Designed Expansion Joints

As no two systems are identical, off-the-shelf solutions are often impractical for addressing all critical variables of the most demanding applications.
Custom designed expansion joint products start at 2" nominal diameter, and are available with an array of alloys and end fittings to suit any expansion joint application.
Because of their many options, custom designed expansion joints are engineered to suit specific needs. Please refer to pages 4-5 for product offerings and our Expansion Joint Specification Inquiry Sheet on
pages 12-13.

Pressure Thrust Balancing

Pressure-balanced expansion joints

Pressure-balanced expansion joints balance the pressure thrust within the expansion joint assembly through the addition of an opposing (or balancing) bellows. This greatly simplifies piping anchor and support requirements. Turbines and other reciprocating equipment frequently require the implementation of pressure-balanced expansion joints to eliminate nozzle loads due to pressure thrust.

Most common pressure-balanced systems require a change in piping direction. These applications use our Pressure-Balanced Single (PBS) or Pressure-Balanced Universal (PBU) styles. For those applications where there is no change in piping direction our Pressure-Balanced In-Line (PBI) style is the preferred selection. Please refer to page 4-5 for details.

Design Assistance Package

Product quotation includes a design package complete with full performance specifications and detailed engineering drawings. Cover Sheet - Lists standard manufacturing procedures and provides summary of options selected in accordance with the expansion joint design, including:

- Test and inspection criteria
- Tagging and identification specifications
- Accessories (such as lifting lugs and insulation)
- Certifications (such as agency approval, material origin, conformance, and fabrication)
- Finishing details
- Packaging and shipping accessories

Design Stress Analysis - Documents the bellows design specifications and corresponding forces acting upon the piping system in which the expansion joint will be installed.

- Expansion Joint Design Parameters (Pressure, Temperature, Design Cycle Life, Movements)
- Bellows Performance Data (Cycle Life, Operating Pressure)
- Bellows Spring Forces (Spring Rates and Resultant Force)
- Pressure Thrust (Area, Pressure, and Resultant Force)
- Individual stresses for the given bellows convolution profile
- Detailed Drawings and Components List
- Drawings completed to scale, with maximum envelope dimensions
- Component list showing all materials used in manufacturing

Expansion Joints Vs. Metal Hose

Braided metal hose assemblies and expansion joints share many similar attributes, but it is their differences in construction that determine which is best for a specific application. Braided metal hose assemblies are constructed from flexible, corrugated hose typically formed using a single layer of strip.

The number of corrugations per foot dictates the flexibility of the hose, while the outer braid layer provides its pressure bearing capability. Braided metal hoses are designed to accommodate two types of movement: either lateral (side to side), or angular (one end moving, or bending, relative to the other).

Axial movement (compression or extension) is to be avoided, as it can cause the braid to loosen from the hose, thus reducing its pressure bearing capability and leaving the hose susceptible to squirm. Because expansion joints are designed to accommodate pressure and movements without the need for braid, they are capable of handling all three types of movement: lateral, angular, and axial. Expansion joint movement and pressure bearing capabilities are determined by the number of convolutions,

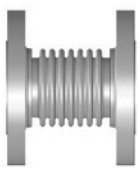
as well as material thickness, number of plies, and wall height

specified by the product's individual design.
Multi-ply expansion joints are ideally suited for applications where vibration may be present. Additionally, multi-ply designs feature lower spring rates which reduces stress on piping components, and increases cycle life for a given installation.

Expansion Joint Range

Size Range:	Alloys:	Pressure	Temperature
From 2” - 120” nominal diameter (tube sizes also available) Single and multi-ply	Stainless steels - T304, T304L, T309, T310, T321, T316, T316L Nickel - 400, 600, 625, 625LCF ,800, 800H, Nickel 200, C276 Other alloys available upon request	From full vacuum to 1,000 psi (69bar)	Range from -450ºF to 1,500º F (-268°C to 815°C)

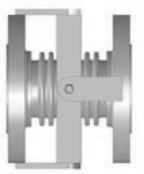
Regular



US
Unrestrained Single

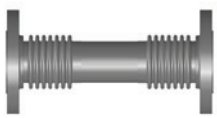
SHS
Slotted Hinged Single

LS
Limit Single

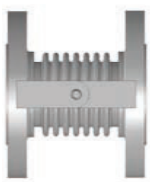


GS
Gimbaled Single

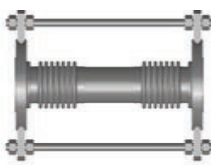
TS
Tied Single



UU
Unrestrained Universal

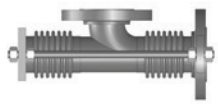


HS
Hinged Single

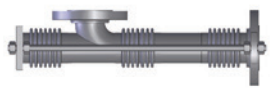


TU
Tied Universal

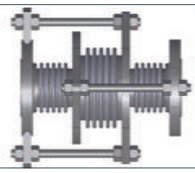
Pressure-Balanced



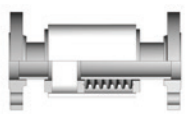
PBS
Pressure Balanced, Elbow, Single



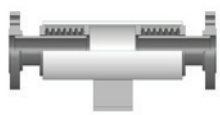
PBU
Pressure Balanced, Elbow, Universal



PBI
Pressure Balanced In-Line

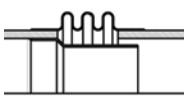


EPS
Externally Pressurized Single

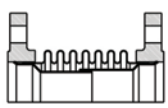


EPD
Externally Pressurized Dual

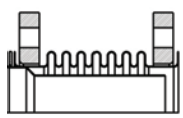
INTERNAL LINERS



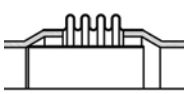
SW - Single Welded
These liners are the most common type of internal liner.



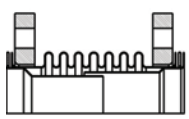
TW - Telescoping Welded
These liners are used when large axial movement is a concern.



SD - Single Drop-in
These liners can be removed for cleaning.



FW - Flush Welded
Also knows as “full-flow liners”, these offer no protrusion into flow stream and cause minimal pressure drop.



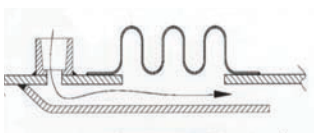
TD - Telescoping Drop-in
These liners are used for large axial movement and can be removed and cleaned.

Comparison Of Ratings, Features & Options

Expansion Joint Types	Relative Movement Capacity			Relative Spring Forces			Pressure Thrust on a Piping System	Available Features		
	Axial	Angular	Lateral	Axial	Angular	Lateral		Internal Flow Liner Types	External Cover	Redundant Ply Design
US Unrestrained Single	M	M	L	M	M	H	Yes	SW,TW, FW, SD, TD	Yes	Yes
LS Limit Single	M	M	L	M	M	H	Yes	SW,TW, FW, SD, TD	Yes	Yes
TS Tied Single	-	-	L	-	-	H	No	SW,TW, FW, SD, TD	Yes	Yes
HS Hinged Single	-	M	-	-	M	-	No	SW,TW, FW, SD, TD	Yes	Yes
SHS Slotted Hinge Single	M	M	-	M	M	-	Yes	SW,TW, FW, SD, TD	Yes	Yes
GS Gimbaled Single	-	M	-	-	M	-	No	SW,TW, FW, SD, TD	Yes	Yes
UU Unrestrained Universal	M	M	H	M	M	L	Yes	SW,TW, FW, SD, TD	Yes	Yes
TU Tied Universal	-	-	H	-	-	L	No	SW,TW, FW, SD, TD	Yes	Yes
PBS Pressure-Balanced, Elbow, Single	M	-	M	M	M	H	No	SW,TW, FW, SD, TD	Yes	Yes
PBU Pressure-Balanced, Elbow, Universal	M	-	H	M	M	L	No	SW,TW, FW, SD, TD	Yes	Yes
PBI Pressure-Balanced, In-Line	M	-	-	M	-	-	No	SW,TW, FW, SD, TD	Yes	Yes
EPS Externally-Pressurized Single	H	-	-	M	-	-	Yes	FW	incl	Yes
EPD Externally-Pressurized Dual	H	-	-	M	-	-	Yes	FW	incl	Yes

H- High **M**- Medium **L**- Low

Options



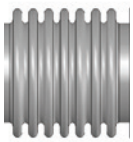
Purge Ports

Packed Bellows

Self-Draining Liner

Pre-Engineered Expansion Joint Types

There are four basic designs that are most commonly used. Each is available in 15, 50, 150, and 300 psi (1, 3.5, 10, 20 bar) design pressures and is manufactured from T321 or T316 stainless steel. Available sizes range from 2” - 30” nominal diameter.

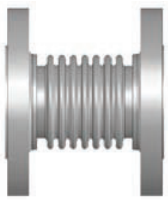


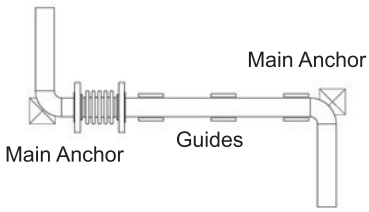
BASIC BELLOWS

A bellows can be supplied without end fittings for field installation. The skirt (straight portion at each end of the bellows) can be sized to fit a flange or pipe. Please specify skirt length and attachment type when ordering

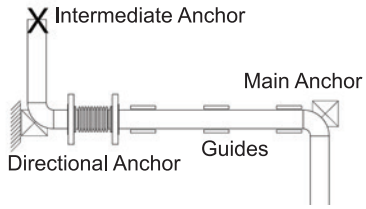
UNRESTRAINED SINGLE

An unrestrained single expansion joint is best used when piping systems are equipped with proper guides and anchors to absorb axial, angular, and a small amount of lateral movement.





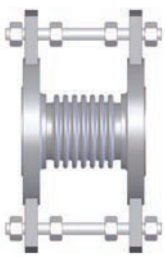
Example of an unrestrained single expansion joint used in a proper piping system to absorb axial pipeline expansion.

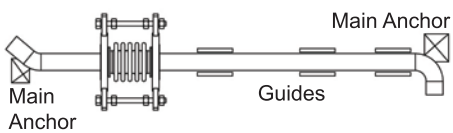


Example of an unrestrained single expansion joint used in a proper piping system to absorb lateral deflection as well as axial compression

LIMIT SINGLE

A limit single expansion joint is best used when main anchors and guides are in the pipeline. It allows for some axial movement as well as lateral movement; however, the hardware protects the expansion joint from exceeding its design movements.

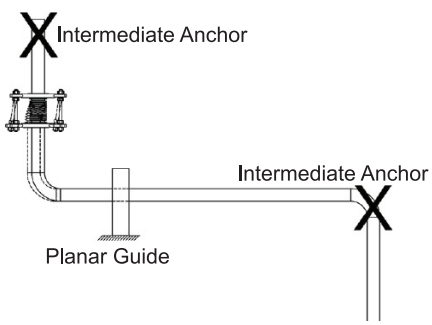




Example of a Limit Single expansion joint used in piping systems with main anchors. The limit rods prevent damage to the expansion joint and piping system by absorbing full pressure thrust.

TIED SINGLE

A tied single expansion joint is best used in piping systems without a main anchor. It allows for lateral movement only while also restraining pressure thrust.



Example of a Tied Single expansion joint where the expansion joint is installed 90° to the thermal growth of the piping. Because of the rods, the expansion joint is able to absorb lateral movement only.

15PSI Pre-Engineered Expansion Joints Products
Specifications for 800°F (427°C)

Pipe Size	No. of Conv.	Live Length	Axial Movement	Lateral Movement	Axial Spring Rate	Lateral Spring Rate	Angular Spring Rate	Bellows Weight	150# Fixed or Floating Light Weight Plate Flanges		Weld Nipples	
									OAL	Weight	OAL	Weight
Inch (mm)	#	Inch (mm)	Inch (mm)	Inch (mm)	lbs/Inch (N/mm)	lbs/Inch (N/mm)	lbs-Inch/deg (N-mm/deg)	lbs (Kg)	Inch (mm)	lbs (Kg)	Inch (mm)	lbs (Kg)
2	3	1.125 (29)	0.188 (5)	0.031 (1)	1033 (181)	8414 (1474)	16 (3)	0.30 (0.14)	2.50 (64)	8 (4)	4.13 (105)	1 (0.45)
	5	1.875 (48)	0.375 (10)	0.090 (2)	620 (109)	1817 (318)	9 (2)	0.30 (0.14)	3.25 (83)	9 (4)	4.88 (124)	1 (0.45)
	7	2.500 (64)	0.500 (13)	0.125 (3)	419 (73)	692 (121)	6 (1)	0.40 (0.18)	3.88 (99)	9 (4)	5.50 (140)	1 (0.45)
	9	3.250 (83)	0.688 (17)	0.250 (6)	330 (58)	322 (56)	5 (1)	0.50 (0.23)	4.63 (118)	9 (4)	6.25 (159)	1 (0.45)
	11	4.000 (102)	0.813 (21)	0.438 (11)	272 (48)	175 (31)	4 (1)	0.50 (0.23)	5.38 (137)	9 (4)	7.00 (178)	1 (0.45)
	13	4.750 (121)	1.000 (25)	0.563 (14)	231 (40)	106 (19)	3 (1)	0.60 (0.27)	6.13 (156)	9 (4)	7.75 (197)	2 (0.91)
	15	5.500 (140)	1.125 (29)	0.813 (21)	201 (35)	69 (12)	3 (1)	0.70 (0.32)	6.88 (175)	9 (4)	8.50 (216)	2 (0.91)
2.5	3	1.250 (32)	0.313 (8)	0.031 (1)	812 (142)	8525 (1493)	19 (3)	0.40 (0.18)	2.63 (67)	11 (5)	4.25 (108)	2 (0.91)
	5	2.000 (51)	0.500 (13)	0.063 (2)	467 (82)	1914 (335)	11 (2)	0.50 (0.23)	3.38 (86)	11 (5)	5.00 (127)	2 (0.91)
	7	2.875 (73)	0.688 (17)	0.188 (5)	342 (60)	680 (119)	8 (1)	0.60 (0.27)	4.25 (108)	11 (5)	5.88 (149)	2 (0.91)
	9	3.625 (92)	0.938 (24)	0.313 (8)	261 (46)	326 (57)	6 (1)	0.70 (0.32)	5.00 (127)	11 (5)	6.63 (168)	2 (0.91)
	11	4.500 (114)	1.125 (29)	0.500 (13)	217 (38)	176 (31)	5 (1)	0.80 (0.36)	5.88 (149)	12 (5)	7.50 (191)	2 (0.91)
	13	5.250 (133)	1.313 (33)	0.688 (17)	181 (32)	108 (19)	4 (1)	0.90 (0.41)	6.63 (168)	12 (5)	8.25 (210)	2 (0.91)
	15	6.000 (152)	1.563 (40)	0.938 (24)	156 (27)	71 (12)	4 (1)	1.00 (0.45)	7.38 (187)	12 (5)	9.00 (229)	2 (0.91)
3	3	1.375 (35)	0.438 (11)	0.031 (1)	435 (76)	5352 (937)	15 (3)	0.50 (0.23)	2.75 (70)	12 (5)	4.63 (118)	3 (1.36)
	5	2.250 (57)	0.750 (19)	0.125 (3)	256 (45)	1176 (206)	9 (2)	0.60 (0.27)	3.63 (92)	12 (5)	5.50 (140)	3 (1.36)
	7	3.125 (79)	1.125 (29)	0.250 (6)	181 (32)	432 (76)	6 (1)	0.80 (0.36)	4.50 (114)	13 (6)	6.38 (162)	3 (1.36)
	9	4.000 (102)	1.438 (37)	0.438 (11)	140 (25)	204 (36)	5 (1)	0.90 (0.41)	5.38 (137)	13 (6)	7.25 (184)	3 (1.36)
	11	4.875 (124)	1.750 (44)	0.688 (17)	115 (20)	112 (20)	4 (1)	1.10 (0.5)	6.25 (159)	13 (6)	8.13 (207)	3 (1.36)
	13	5.750 (146)	2.063 (52)	1.000 (25)	97 (17)	68 (12)	3 (1)	1.20 (0.54)	7.13 (181)	13 (6)	9.00 (229)	3 (1.36)
	15	6.625 (168)	2.438 (62)	1.313 (33)	84 (15)	44 (8)	3 (1)	1.40 (0.64)	8.00 (203)	13 (6)	9.88 (251)	3 (1.36)
4	3	1.500 (38)	0.500 (13)	0.031 (1)	537 (94)	8534 (1495)	28 (5)	0.60 (0.27)	2.88 (73)	17 (8)	4.63 (118)	3 (1.36)
	5	2.375 (60)	0.813 (21)	0.125 (3)	307 (54)	1944 (340)	16 (3)	0.80 (0.36)	3.75 (95)	17 (8)	5.50 (140)	4 (1.81)
	7	3.375 (86)	1.188 (30)	0.250 (6)	222 (39)	697 (122)	12 (2)	1.00 (0.45)	4.75 (121)	17 (8)	6.50 (165)	4 (1.81)
	9	4.375 (111)	1.500 (38)	0.438 (11)	174 (30)	325 (57)	9 (2)	1.20 (0.54)	5.75 (146)	17 (8)	7.50 (191)	4 (1.81)
	11	5.375 (137)	1.875 (48)	0.688 (17)	143 (25)	177 (31)	7 (1)	1.40 (0.64)	6.75 (171)	18 (8)	8.50 (216)	4 (1.81)
	13	6.250 (159)	2.188 (56)	0.938 (24)	119 (21)	109 (19)	6 (1)	1.60 (0.73)	7.63 (194)	18 (8)	9.38 (238)	4 (1.81)
	15	7.250 (184)	2.563 (65)	1.250 (32)	104 (18)	71 (12)	5 (1)	1.80 (0.82)	8.63 (219)	18 (8)	10.38 (264)	5 (2.27)
5	3	1.625 (41)	0.688 (17)	0.063 (2)	350 (61)	7560 (1324)	29 (5)	0.90 (0.41)	2.75 (70)	15 (7)	6.38 (162)	7 (3.18)
	5	2.750 (70)	1.188 (30)	0.125 (3)	213 (37)	1606 (281)	18 (3)	1.20 (0.54)	3.88 (99)	16 (7)	7.50 (191)	7 (3.18)
	7	3.875 (98)	1.688 (43)	0.313 (8)	153 (27)	581 (102)	13 (2)	1.50 (0.68)	5.00 (127)	16 (7)	8.63 (219)	7 (3.18)
	9	5.000 (127)	2.188 (56)	0.563 (14)	120 (21)	272 (48)	10 (2)	1.80 (0.82)	6.13 (156)	16 (7)	9.75 (248)	8 (3.63)
	11	6.125 (156)	2.688 (68)	0.875 (22)	98 (17)	149 (26)	8 (1)	2.10 (0.95)	7.25 (184)	16 (7)	10.88 (276)	8 (3.63)
	13	7.375 (187)	2.750 (70)	1.063 (27)	136 (24)	142 (25)	11 (2)	2.80 (1.27)	8.50 (216)	17 (8)	12.13 (308)	9 (4.08)
	15	8.500 (216)	3.188 (81)	1.438 (37)	118 (21)	93 (16)	10 (2)	3.20 (1.45)	9.63 (245)	18 (8)	13.25 (337)	9 (4.08)
6	3	1.625 (41)	0.750 (19)	0.031 (1)	396 (69)	11730(2055)	45 (8)	1.10 (0.5)	2.75 (70)	18 (8)	6.25 (159)	8 (3.63)
	5	2.750 (70)	1.250 (32)	0.125 (3)	239 (42)	2473 (433)	27 (5)	1.50 (0.68)	3.88 (99)	18 (8)	7.38 (187)	8 (3.63)
	7	3.875 (98)	1.750 (44)	0.313 (8)	171 (30)	892 (156)	20 (4)	1.90 (0.86)	5.00 (127)	19 (9)	8.50 (216)	9 (4.08)
	9	5.000 (127)	2.250 (57)	0.500 (13)	133 (23)	418 (73)	15 (3)	2.20 (1)	6.13 (156)	19 (9)	9.63 (245)	9 (4.08)
	11	6.125 (156)	2.750 (70)	0.750 (19)	109 (19)	228 (40)	12 (2)	2.60 (1.18)	7.25 (184)	19 (9)	10.75 (273)	9 (4.08)
	13	7.250 (184)	3.000 (76)	0.938 (24)	92 (16)	138 (24)	11 (2)	2.90 (1.32)	8.38 (213)	20 (9)	11.88 (302)	10 (4.54)
	15	8.500 (216)	3.188 (81)	1.250 (32)	134 (23)	145 (25)	15 (3)	3.90 (1.77)	9.63 (245)	21 (10)	13.13 (334)	11 (4.99)

50PSI Pre-Engineered Expansion Joints Products
Specifications for 800°F (427°C)

Pipe Size	No. of Conv.	Live Length	Axial Movement	Lateral Movement	Axial Spring Rate	Lateral Spring Rate	Angular Spring Rate	Bellows Weight	150# Fixed or Floating Light Weight Plate Flanges		Weld Nipples	
									OAL	Weight	OAL	Weight
Inch (mm)	#	Inch (mm)	Inch (mm)	Inch (mm)	lbs/Inch (N/mm)	lbs/Inch (N/mm)	lbs-Inch/ deg (N-mm/ deg)	lbs (Kg)	Inch (mm)	lbs (Kg)	Inch (mm)	lbs (Kg)
2	3	1.000 (25)	0.219 (6)	0.031 (1)	719 (126)	7394 (1295)	11 (2)	0.16 (0.07)	2.38 (60)	8 (4)	4.00 (102)	1 (0.45)
	5	1.750 (44)	0.375 (10)	0.063 (2)	440 (77)	1476 (259)	7 (1)	0.20 (0.09)	3.13 (80)	8 (4)	4.75 (121)	1 (0.45)
	7	2.500 (64)	0.563 (14)	0.188 (5)	317 (56)	522 (91)	5 (1)	0.24 (0.11)	3.88 (99)	8 (4)	5.50 (140)	1 (0.45)
	9	3.125 (79)	0.750 (19)	0.250 (6)	243 (43)	256 (45)	4 (1)	0.28 (0.13)	4.50 (114)	8 (4)	6.13 (156)	1 (0.45)
	11	3.875 (98)	0.938 (24)	0.438 (11)	195 (34)	134 (23)	3 (1)	0.32 (0.15)	5.25 (133)	9 (4)	6.88 (175)	1 (0.45)
	13	4.625 (117)	1.063 (27)	0.625 (16)	206 (36)	101 (18)	3 (1)	0.44 (0.2)	6.00 (152)	9 (4)	7.63 (194)	1 (0.45)
	15	5.375 (137)	1.063 (27)	0.688 (17)	260 (46)	94 (16)	4 (1)	0.56 (0.25)	6.75 (171)	9 (4)	8.38 (213)	1 (0.45)
2.5	3	1.125 (29)	0.313 (8)	0.031 (1)	567 (99)	7349 (1287)	14 (2)	0.22 (0.1)	2.50 (64)	11 (5)	4.13 (105)	2 (0.91)
	5	2.000 (51)	0.563 (14)	0.063 (2)	349 (61)	1430 (250)	8 (1)	0.28 (0.13)	3.38 (86)	11 (5)	5.00 (127)	2 (0.91)
	7	2.750 (70)	0.750 (19)	0.188 (5)	247 (43)	536 (94)	6 (1)	0.34 (0.15)	4.13 (105)	11 (5)	5.75 (146)	2 (0.91)
	9	3.500 (89)	1.000 (25)	0.313 (8)	191 (33)	256 (45)	5 (1)	0.40 (0.18)	4.88 (124)	11 (5)	6.50 (165)	2 (0.91)
	11	4.250 (108)	1.125 (29)	0.438 (11)	217 (38)	199 (35)	5 (1)	0.55 (0.25)	5.63 (143)	11 (5)	7.25 (184)	2 (0.91)
	13	5.125 (130)	1.188 (30)	0.563 (14)	265 (46)	167 (29)	6 (1)	0.71 (0.32)	6.50 (165)	12 (5)	8.13 (207)	2 (0.91)
	15	6.000 (152)	1.375 (35)	0.813 (21)	228 (40)	105 (18)	6 (1)	0.79 (0.36)	7.38 (187)	12 (5)	9.00 (229)	2 (0.91)
3	3	1.250 (32)	0.500 (13)	0.031 (1)	312 (55)	4648 (814)	11 (2)	0.28 (0.13)	2.63 (67)	12 (5)	4.50 (114)	2 (0.91)
	5	2.125 (54)	0.813 (21)	0.125 (3)	189 (33)	971 (170)	6 (1)	0.37 (0.17)	3.50 (89)	12 (5)	5.38 (137)	2 (0.91)
	7	3.000 (76)	1.188 (30)	0.250 (6)	135 (24)	349 (61)	5 (1)	0.46 (0.21)	4.38 (111)	12 (5)	6.25 (159)	3 (1.36)
	9	3.875 (98)	1.313 (33)	0.438 (11)	162 (28)	251 (44)	5 (1)	0.65 (0.29)	5.25 (133)	13 (6)	7.13 (181)	3 (1.36)
	11	4.750 (121)	1.438 (37)	0.563 (14)	193 (34)	199 (35)	7 (1)	0.86 (0.39)	6.13 (156)	13 (6)	8.00 (203)	3 (1.36)
	13	5.750 (146)	1.563 (40)	0.750 (19)	230 (40)	162 (28)	8 (1)	1.10 (0.5)	7.13 (181)	13 (6)	9.00 (229)	3 (1.36)
	15	6.625 (168)	1.625 (41)	0.875 (22)	255 (45)	136 (24)	9 (2)	1.39 (0.63)	8.00 (203)	13 (6)	9.88 (251)	3 (1.36)
4	3	1.375 (35)	0.500 (13)	0.031 (1)	390 (68)	7378 (1292)	20 (4)	0.36 (0.16)	2.75 (70)	16 (7)	4.50 (114)	3 (1.36)
	5	2.375 (60)	0.875 (22)	0.125 (3)	237 (42)	1503 (263)	12 (2)	0.48 (0.22)	3.75 (95)	16 (7)	5.50 (140)	3 (1.36)
	7	3.250 (83)	1.188 (30)	0.250 (6)	168 (29)	568 (99)	9 (2)	0.60 (0.27)	4.63 (118)	17 (8)	6.38 (162)	3 (1.36)
	9	4.250 (108)	1.375 (35)	0.375 (10)	201 (35)	399 (70)	10 (2)	0.83 (0.38)	5.63 (143)	17 (8)	7.38 (187)	4 (1.81)
	11	5.250 (133)	1.500 (38)	0.500 (13)	240 (42)	312 (55)	13 (2)	1.11 (0.5)	6.63 (168)	17 (8)	8.38 (213)	4 (1.81)
	13	6.250 (159)	1.625 (41)	0.688 (17)	274 (48)	251 (44)	14 (2)	1.44 (0.65)	7.63 (194)	17 (8)	9.38 (238)	4 (1.81)
	15	7.250 (184)	1.750 (44)	0.813 (21)	297 (52)	204 (36)	16 (3)	1.83 (0.83)	8.63 (219)	18 (8)	10.38 (264)	5 (2.27)
5	3	1.625 (41)	0.750 (19)	0.063 (2)	273 (48)	5890 (1032)	23 (4)	0.51 (0.23)	3.25 (83)	21 (10)	6.38 (162)	6 (2.72)
	5	2.750 (70)	1.250 (32)	0.188 (5)	162 (28)	1221 (214)	13 (2)	0.70 (0.32)	4.38 (111)	21 (10)	7.50 (191)	6 (2.72)
	7	3.875 (98)	1.563 (40)	0.313 (8)	177 (31)	673 (118)	15 (3)	1.02 (0.46)	5.50 (140)	21 (10)	8.63 (219)	7 (3.18)
	9	5.000 (127)	1.563 (40)	0.438 (11)	265 (46)	608 (106)	22 (4)	1.61 (0.73)	6.63 (168)	22 (10)	9.75 (248)	7 (3.18)
	11	6.125 (156)	1.813 (46)	0.563 (14)	289 (51)	442 (77)	24 (4)	2.10 (0.95)	7.75 (197)	22 (10)	10.88 (276)	8 (3.63)
	13	7.375 (187)	1.813 (46)	0.688 (17)	423 (74)	458 (80)	36 (6)	3.07 (1.39)	9.00 (229)	23 (10)	12.13 (308)	9 (4.08)
	15	8.625 (219)	2.000 (51)	0.938 (24)	398 (70)	307 (54)	33 (6)	3.42 (1.55)	10.25 (260)	23 (10)	13.38 (340)	9 (4.08)
6	3	1.625 (41)	0.750 (19)	0.031 (1)	313 (55)	9272 (1624)	36 (6)	0.68 (0.31)	3.25 (83)	23 (10)	6.25 (159)	8 (3.63)
	5	2.750 (70)	1.250 (32)	0.125 (3)	188 (33)	1950 (342)	22 (4)	0.90 (0.41)	4.38 (111)	23 (10)	7.38 (187)	8 (3.63)
	7	3.875 (98)	1.563 (40)	0.250 (6)	207 (36)	1080 (189)	24 (4)	1.30 (0.59)	5.50 (140)	23 (10)	8.50 (216)	8 (3.63)
	9	5.000 (127)	1.750 (44)	0.375 (10)	236 (41)	739 (129)	27 (5)	1.77 (0.8)	6.63 (168)	24 (11)	9.63 (245)	9 (4.08)
	11	6.125 (156)	1.875 (48)	0.500 (13)	271 (47)	566 (99)	31 (5)	2.32 (1.05)	7.75 (197)	24 (11)	10.75 (273)	9 (4.08)
	13	7.250 (184)	2.000 (51)	0.625 (16)	312 (55)	465 (81)	36 (6)	2.93 (1.33)	8.88 (226)	25 (11)	11.88 (302)	10 (4.54)
	15	8.625 (219)	2.063 (52)	0.813 (21)	431 (75)	459 (80)	50 (9)	4.30 (1.95)	10.25 (260)	26 (12)	13.25 (337)	11 (4.99)

150PSI Pre-Engineered Expansion Joints Products
Specifications for 800°F (427°C)

Pipe Size	No. of Conv.	Live Length	Axial Movement	Lateral Movement	Axial Spring Rate	Lateral Spring Rate	Angular Spring Rate	Bellows Weight	150# Fixed or Floating Light Weight Plate Flanges		Weld Nipples	
									OAL	Weight	OAL	Weight
Inch (mm)	#	Inch (mm)	Inch (mm)	Inch (mm)	lbs/Inch (N/mm)	lbs/Inch (N/mm)	lbs-Inch/deg (N-mm/deg)	lbs (Kg)	Inch (mm)	lbs (Kg)	Inch (mm)	lbs (Kg)
2	3	1.000 (25)	0.188 (5)	0.029 (1)	719 (126)	7394 (1295)	11 (2)	0.2 (0.09)	3.13 (80)	11 (5)	4.00 (102)	1 (0.45)
	5	1.750 (44)	0.375 (10)	0.063 (2)	440 (77)	1476 (259)	7 (1)	0.2 (0.09)	3.88 (99)	11 (5)	4.75 (121)	1 (0.45)
	6	2.000 (51)	0.313 (8)	0.063 (2)	995 (174)	2592 (454)	15 (3)	0.3 (0.14)	4.13 (105)	11 (5)	5.00 (127)	1 (0.45)
	7	2.500 (64)	0.500 (13)	0.125 (3)	317 (56)	522 (91)	5 (1)	0.2 (0.09)	4.63 (118)	11 (5)	5.50 (140)	1 (0.45)
	9	3.125 (79)	0.563 (14)	0.188 (5)	370 (65)	390 (68)	6 (1)	0.3 (0.14)	5.25 (133)	11 (5)	6.13 (156)	1 (0.45)
	11	4.000 (102)	0.625 (16)	0.313 (8)	432 (76)	278 (49)	6 (1)	0.4 (0.18)	6.13 (156)	11 (5)	7.00 (178)	1 (0.45)
	13	4.625 (117)	0.688 (17)	0.375 (10)	522 (91)	245 (43)	8 (1)	0.6 (0.27)	6.75 (171)	11 (5)	7.63 (194)	1 (0.45)
	15	5.500 (140)	0.750 (19)	0.500 (13)	587 (103)	201 (35)	9 (2)	0.7 (0.32)	7.63 (194)	11 (5)	8.50 (216)	2 (0.91)
2.5	3	1.125 (29)	0.250 (6)	0.031 (1)	787 (138)	10287 (1802)	19 (3)	0.3 (0.14)	3.50 (89)	16 (7)	4.13 (105)	3 (1.36)
	5	2.000 (51)	0.313 (8)	0.063 (2)	1078 (189)	4421 (774)	26 (5)	0.4 (0.18)	4.38 (111)	16 (7)	5.00 (127)	3 (1.36)
	7	2.750 (70)	0.625 (16)	0.125 (3)	341 (60)	747 (131)	8 (1)	0.4 (0.18)	5.13 (130)	16 (7)	5.75 (146)	3 (1.36)
	9	3.625 (92)	0.688 (17)	0.250 (6)	414 (73)	518 (91)	10 (2)	0.5 (0.23)	6.00 (152)	17 (8)	6.63 (168)	3 (1.36)
	11	4.625 (117)	0.750 (19)	0.313 (8)	490 (86)	420 (74)	12 (2)	0.7 (0.32)	7.00 (178)	17 (8)	7.63 (194)	3 (1.36)
	13	5.250 (133)	0.813 (21)	0.375 (10)	566 (99)	337 (59)	14 (2)	0.9 (0.41)	7.63 (194)	17 (8)	8.25 (210)	3 (1.36)
	15	6.500 (165)	1.063 (27)	0.688 (17)	813 (142)	316 (55)	19 (3)	1.7 (0.77)	8.88 (226)	18 (8)	9.50 (241)	4 (1.81)
3	3	1.375 (35)	0.313 (8)	0.031 (1)	1001 (175)	12307 (2156)	34 (6)	0.4 (0.18)	3.88 (99)	18 (8)	4.63 (118)	4 (1.81)
	4	1.750 (44)	0.438 (11)	0.031 (1)	818 (143)	6334 (1109)	28 (5)	0.6 (0.27)	4.25 (108)	19 (9)	5.00 (127)	4 (1.81)
	5	2.250 (57)	0.500 (13)	0.063 (2)	599 (105)	2749 (481)	20 (4)	0.6 (0.27)	4.75 (121)	19 (9)	5.50 (140)	4 (1.81)
	7	3.125 (79)	0.750 (19)	0.188 (5)	427 (75)	1017 (178)	14 (2)	0.7 (0.32)	5.63 (143)	19 (9)	6.38 (162)	4 (1.81)
	9	4.000 (102)	0.813 (21)	0.250 (6)	451 (79)	655 (115)	15 (3)	0.9 (0.41)	6.50 (165)	19 (9)	7.25 (184)	5 (2.27)
	10	4.625 (117)	0.913 (23)	0.080 (2)	436 (76)	497 (87)	15 (3)	1.0 (0.45)	7.13 (181)	19 (9)	7.88 (200)	5 (2.27)
	11	5.250 (133)	1.250 (32)	0.500 (13)	607 (106)	512 (90)	21 (4)	1.9 (0.86)	7.75 (197)	20 (9)	8.50 (216)	6 (2.72)
	13	6.250 (159)	1.313 (33)	0.688 (17)	718 (126)	426 (75)	24 (4)	2.4 (1.09)	8.75 (222)	20 (9)	9.50 (241)	6 (2.72)
	15	7.500 (191)	1.500 (38)	0.938 (24)	839 (147)	343 (60)	28 (5)	2.6 (1.18)	10.00 (254)	21 (10)	10.75 (273)	6 (2.72)
4	3	1.500 (38)	0.313 (8)	0.031 (1)	1239 (217)	19694 (3449)	65 (11)	0.6 (0.27)	4.25 (108)	26 (12)	4.63 (118)	6 (2.72)
	5	2.375 (60)	0.500 (13)	0.063 (2)	743 (130)	4709 (825)	39 (7)	0.7 (0.32)	5.13 (130)	26 (12)	5.50 (140)	6 (2.72)
	6	2.875 (73)	0.625 (16)	0.063 (2)	757 (133)	3301 (578)	40 (7)	0.9 (0.41)	5.63 (143)	26 (12)	6.00 (152)	6 (2.72)
	7	3.375 (86)	0.750 (19)	0.125 (3)	531 (93)	1667 (292)	28 (5)	0.9 (0.41)	6.13 (156)	26 (12)	6.50 (165)	6 (2.72)
	9	4.625 (117)	0.938 (24)	0.250 (6)	498 (87)	937 (164)	26 (5)	1.3 (0.59)	7.38 (187)	26 (12)	7.75 (197)	7 (3.18)
	11	5.625 (143)	1.250 (32)	0.500 (13)	710 (124)	804 (141)	37 (6)	2.5 (1.13)	8.38 (213)	28 (13)	8.75 (222)	8 (3.63)
	13	6.750 (171)	1.375 (35)	0.625 (16)	844 (148)	663 (116)	44 (8)	3.2 (1.45)	9.50 (241)	28 (13)	9.88 (251)	9 (4.08)
	15	8.250 (210)	1.500 (38)	0.875 (22)	913 (160)	480 (84)	48 (8)	4.7 (2.13)	11.00 (279)	30 (14)	11.38 (289)	10 (4.54)
5	3	1.750 (44)	0.313 (8)	0.031 (1)	2225 (390)	41387 (7249)	185 (32)	1.1 (0.5)	4.75 (121)	31 (14)	6.50 (165)	8 (3.63)
	5	2.750 (70)	0.688 (17)	0.063 (2)	713 (125)	5362 (939)	59 (10)	1.2 (0.54)	5.75 (146)	31 (14)	7.50 (191)	9 (4.08)
	7	4.000 (102)	0.813 (21)	0.125 (3)	953 (167)	3393 (594)	79 (14)	1.8 (0.82)	7.00 (178)	32 (15)	8.75 (222)	9 (4.08)
	8	4.375 (111)	1.000 (25)	0.188 (5)	740 (130)	1987 (348)	62 (11)	2.3 (1.04)	7.38 (187)	32 (15)	9.13 (232)	10 (4.54)
	9	5.125 (130)	1.063 (27)	0.250 (6)	741 (130)	1608 (282)	62 (11)	2.2 (1)	8.13 (207)	32 (15)	9.88 (251)	10 (4.54)
	11	6.875 (175)	1.375 (35)	0.500 (13)	1348 (236)	1624 (284)	112 (20)	5.1 (2.31)	9.88 (251)	35 (16)	11.63 (295)	13 (5.9)
	13	8.125 (206)	1.625 (41)	0.688 (17)	1140 (200)	984 (172)	95 (17)	5.9 (2.68)	11.13 (283)	36 (16)	12.88 (327)	13 (5.9)
	15	10.000 (254)	2.000 (51)	1.000 (25)	1466 (257)	841 (147)	123 (22)	10.1(4.58)	13.00 (330)	40 (18)	14.75 (375)	17 (7.71)
6	3	1.750 (44)	0.313 (8)	0.028 (1)	2603 (456)	66529 (11653)	297 (52)	1.4 (0.64)	5.00 (127)	39 (18)	6.38 (162)	9 (4.08)
	5	2.875 (73)	0.563 (14)	0.063 (2)	1562 (274)	14790 (2590)	178 (31)	1.9 (0.86)	6.13 (156)	40 (18)	7.50 (191)	9 (4.08)
	7	4.000 (102)	0.813 (21)	0.125 (3)	1100 (193)	5389 (944)	126 (22)	2.3 (1.04)	7.25 (184)	40 (18)	8.63 (219)	10 (4.54)
	8	4.375 (111)	0.938 (24)	0.188 (5)	877 (154)	3231 (566)	101 (18)	2.6 (1.18)	7.63 (194)	41 (19)	9.00 (229)	10 (4.54)
	9	5.125 (130)	1.000 (25)	0.188 (5)	868 (152)	2586 (453)	99 (17)	2.8 (1.27)	8.38 (213)	41 (19)	9.75 (248)	10 (4.54)
	11	6.250 (159)	1.250 (32)	0.313 (8)	710 (124)	1423 (249)	81 (14)	3.2 (1.45)	9.50 (241)	41 (19)	10.88 (276)	11 (4.99)
	13	8.125 (206)	1.625 (41)	0.625 (16)	1207 (211)	1440 (252)	139 (24)	7.4 (3.36)	11.38 (289)	45 (20)	12.75 (324)	15 (6.8)
	15	9.375 (238)	1.875 (48)	0.813 (21)	1069 (187)	957 (168)	123 (22)	8.1 (3.67)	12.63 (321)	46 (21)	14.00 (356)	16 (7.26)