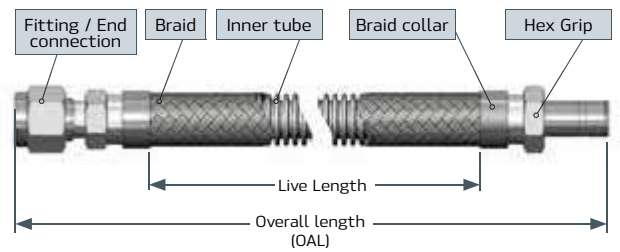
Selecting & Installing Metal Hose Assemblies

When Metal Hose Is A Proper Solution

1. **Temperature Extremes**
   The Metal Hose is the best solution for extreme hot and cold media or surrounding temperatures.
2. **Chemical Compatibility**
   Chemicals and aggressive media or corrosive environments are often better serviced by stainless metal hoses.
3. **Permeation Concerns**
   Permeation prevention of media into the surrounding atmosphere is best assured by using metal hoses.
4. **Potential for Catastrophic Failure**
   A potentially catastrophic failure effect of hose may be minimized by using metal hose that tends to develop smaller holes or cracks when failing than other hose types.
5. **Fire Safety**
   Maintaining integrity up to 1300°F (705°C) is provided by metal hoses.
6. **Achieving Full Vacuum**
   Maintaining shape under full vacuum is better assured by metal hoses.
7. **Flexibility in Fitting Configuration**
   Virtually any type of fitting can be assembled with a metal hose to perfectly meet most tubing and fitting systems.

Hose Assembly

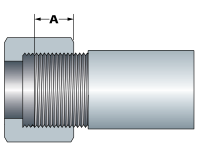


Thread Allowance

When calculating the overall length (OAL) of a hose assembly that has a pipe thread as one or both end connection(s), consideration must be given the thread engagement.

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

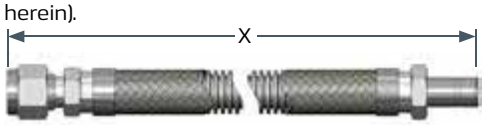
Nominal Pipe Size inch	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Thread Allowance inch (mm) -Dim "A"	0.40 (10)	0.41 (10)	0.53 (13)	0.55 (14)	0.66 (17)	0.68 (17)	0.68 (17)	0.70 (18)



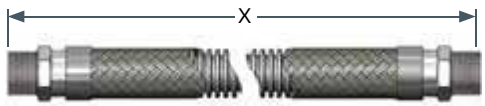
Length Considerations

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

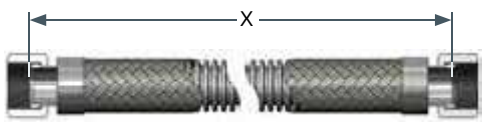
1. Verify that the installation is properly designed (see Do's & Don'ts herein)
   - Do not torque the hose
   - Do not over-bend the hose
   - Do not compress the hose
2. Calculate the live length of the assembly - The live length of the assembly is the amount of active (flexible) hoses in an assembly; that is, the hose between the braid collars (see formulas to help calculate live length for a variety of common hose installations herein).
3. The overall length of the assembly when calculating the overall length is equal to the live length plus the lengths of the braid collars and fittings.
   When adding fitting lengths, be aware that the points from which measurements should be taken vary for different fitting types. When calculating overall length for assemblies with threaded fittings, remember to account for the length of thread that is lost by threading into the mating connection (refer to Thread Allowance chart herein).



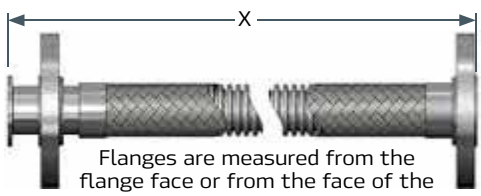
Compression fittings are measured to the end of the fitting



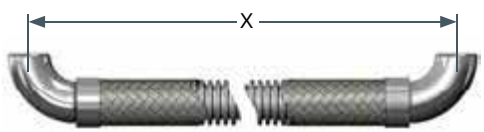
Threaded fittings are measured to the end of the fitting



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



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



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

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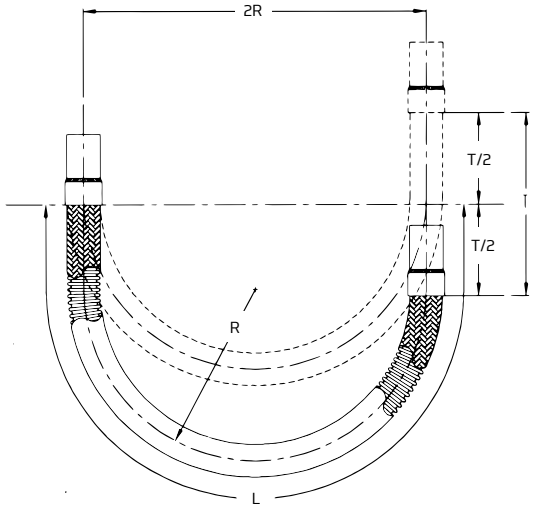
Live Length Calculations

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, messured to hose center line

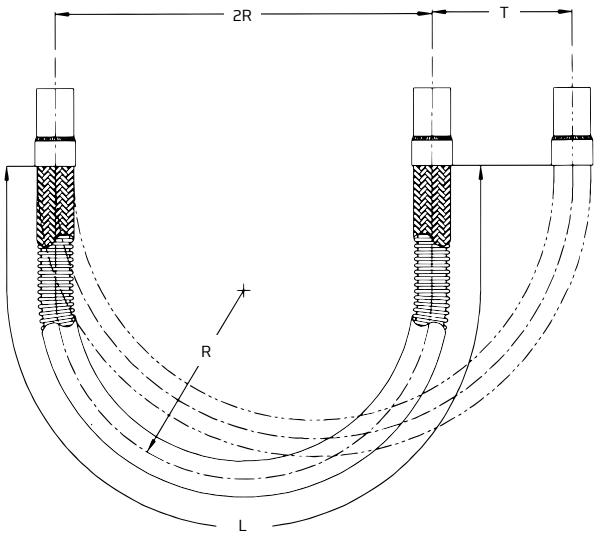
Verify that the installed radius is greater than the stated Minimum Bend Radius for the hose at the required working pressure.Verify that the centerline of the hose remains in the same plane during cycling to prevent twisting the assembly.

Constant Radius Traveling Loop (A-Loop)



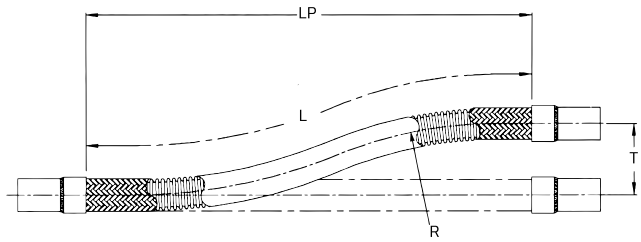
Formula: L = 4R + 1/2T

Variable Radius Traveling Loop (B-loop)



Formula: L = 4R + 1.57T

Lateral Offset

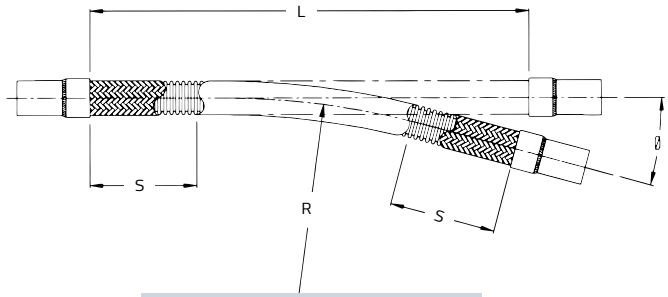


Formula: $L = \sqrt{20R \times T}$, $Lp = \sqrt{L2 - T2}$

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

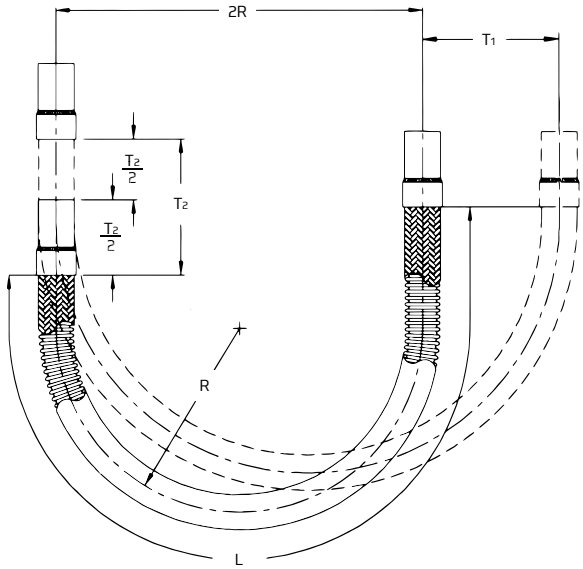
Note 2: The offset distance "T" for constant flexing should never exceed 25% of the centerline bend radius

Angular Deflection



Formula: L = 2S + (Ø/57.3)R

Vertical Loop With Movement In Two Directions (combination loop)



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

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Media Flow Velocity

When gas or liquid being conveyed in a corrugated metal hose exceeds certain limits, resonant vibration can occur. Resonance may cause a very rapid failure of the assembly. In applications where product velocities exceed the limits shown in the chart below, a revision of the assembly design might include:

1. Addition of an interlocked metal hose liner
2. An increase in the corrugated hose I.D.
3. A combination of the above

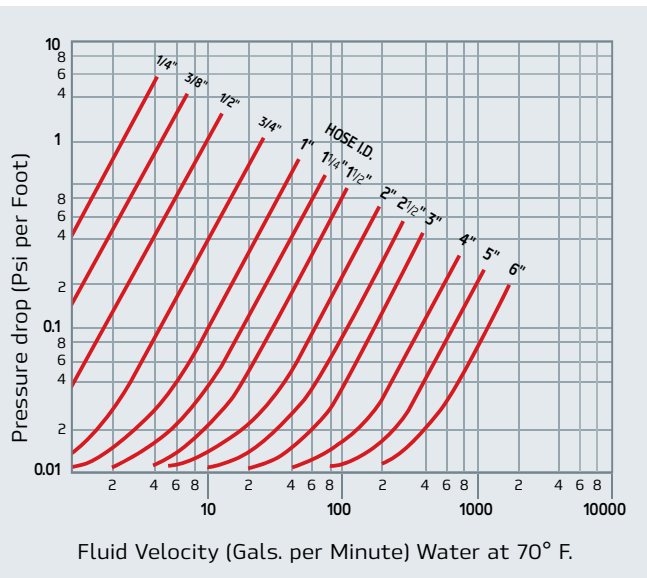
Velocity in Metal Hose

Installation Configuration	Maximum Product Velocity Feet/Second (Meter/Second)			
	Unbraided		Braided	
	Dry Gas	Liquid	Dry Gas	Liquid
Straight Run	100 (30)	50 (15)	150 (46)	75 (23)
45 Degree Bend	75 (23)	40 (12)	115 (35)	60 (18)
90 Degree Bend	50 (15)	25 (8)	75 (23)	40 (12)
180 Degree Bend	25 (8)	12 (4)	38 (12)	19 (6)

Pressure Drop

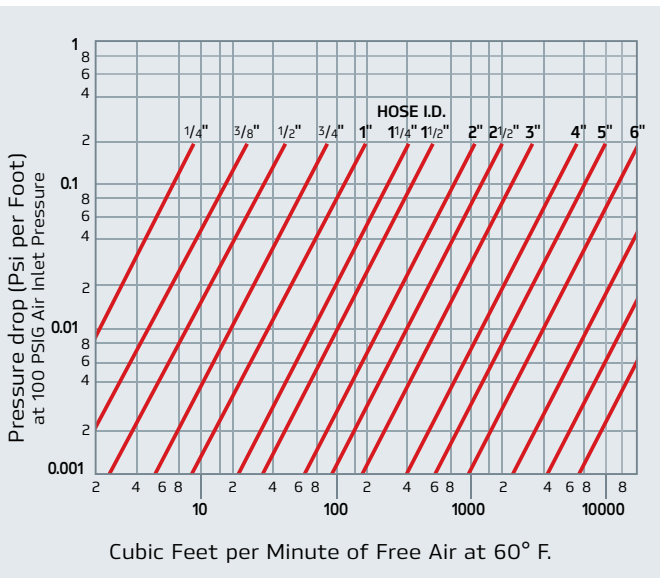
Pressure drop in a piping system is often a concern for the designer. Compared to rigid pipes, there is always a greater pressure drop in corrugated metal hoses. The following graphs are offered as aids in estimating the pressure drop in corrugated hose conveying water and air. The values derived are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

Pressure Drop Graph For Water



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

Pressure Drop Graph For Air



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

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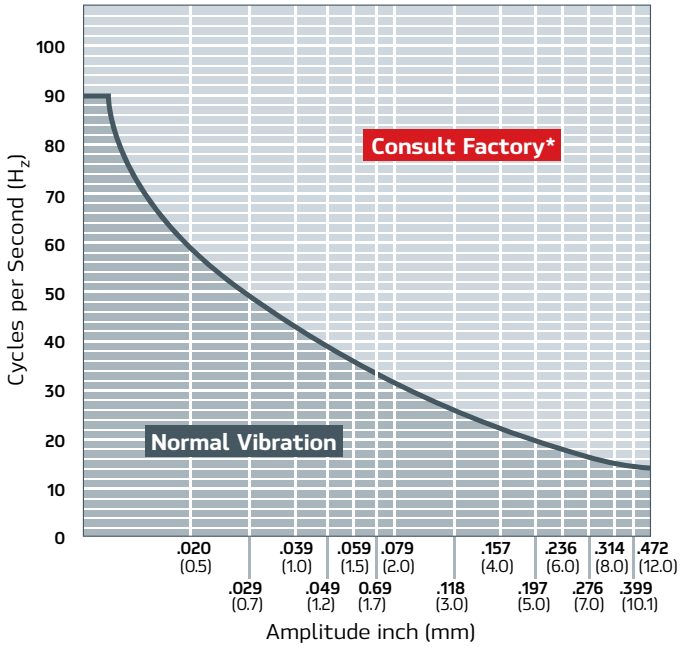
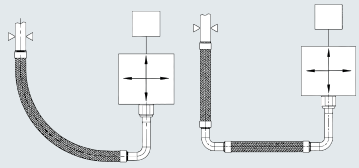
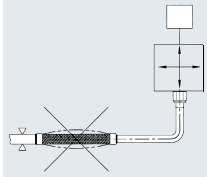
Vibration

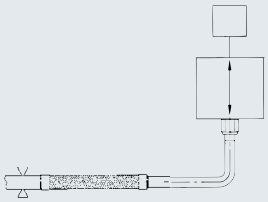
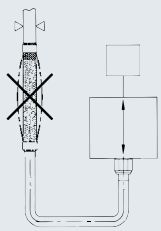
The following graph is a representative guideline for estimation purposes only.
For any questions, or if your application is near the "Consult Factory" region, please contact your HAM-LET local representative.



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

Correct	Incorrect
	

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.

Correct	Incorrect
	

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Installation Do's & Don'ts

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