SSB HOSE
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Monel Annular Hose Series HMA

- Core and braid material is Monel 400 and meets material requirements of the Chlorine Institute Specification 135-3 and Pamphlet 6
- Pressure capability includes full vacuum to pressures shown below
- Temperatures to 800ºF. Consult Temperature Correction Factors for concurrent high temperature/high pressure applications
- Excellent chemical resistance to dry chlorine, salt water and alkalines

Series HMA — Annular, Monel, Standard Pitch Hose

Nominal Hose Size (in.)	Braid Layers/ Type	Nominal Outside Diameter	Minimum Centerline Bend Radius (in.)		Pressure ratings at 70°F (PSIG)[a]			Weight Per Foot (lb.)
			Static	Dynamic	Max. Working	Max. Test	Nominal Burst	
1/4	0 1 2	0.46 0.52 0.57	2	6	130 1701 2416	195 2552 3624	— 6805 9664	0.13 0.21 0.29
3/8	0 1 2	0.61 0.67 0.73	2	6	90 1272 1953	135 1908 2930	— 5087 7812	0.16 0.27 0.40
1/2	0 1 2	0.76 0.81 0.87	2.5	7	65 852 1346	98 1277 2019	— 3406 5385	0.19 0.31 0.43
3/4	0 1 2	1.05 1.10 1.16	2.5	8	50 709 1161	75 1063 1741	— 2835 4643	0.28 0.43 0.60
1	0 1 2	1.34 1.42 1.50	3	9	35 692 1133	52.5 1038 1700	— 2769 4533	0.50 0.77 1.08
1-1/4	0 1 2	1.78 1.86 1.94	4	10	20 611 991	30 917 1486	— 2445 3962	0.64 0.98 1.36
1-1/2	0 1 2	2.09 2.16 2.24	4	10	15 419 769	22.5 629 1153	— 1677 3075	0.78 1.18 1.62
2	0 1 2	2.54 2.63 2.73	6	11	10 313 616	15 469 924	— 1250 2463	0.97 1.45 1.99
3	0 1 2	3.89 4.01 4.13	10	20	7 300 500	10.5 450 750	— 1200 2000	1.77 2.67 3.67
4	0 1 2	4.79 4.99 5.19	12	24	4 263 438	6 394 656	— 1050 1750	2.08 3.54 5.17

a. SSB Hose, hose and corresponding braid must be used in combination to achieve pressure ratings.

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Stainless Steel Annular Hose Series HSU

- Available in 321 stainless steel hose and 304 stainless steel braid. Other materials on request
- Pressure capability includes full vacuum to pressures shown below
- Temperature rating from cryogenic to 1500ºF. Consult Temperature Correction Factors for concurrent high temperature/high pressure applications
- Meets or exceeds ISO 10380e

Series HSU — Annular, Stainless Steel, High Pressure Hose and Braid

Nominal Hose Size (in.)	Braid Layers	Nominal Outside Diameter	Minimum Centerline Bend Radius (in.)		Pressure Ratings at 70°F (PSIG)[a,b,c,]			Braid Sleeve Crimp O.D.[d] (in.)
			Static	Dynamic	Max. Working	Max. Test	Nominal Burst	
1/4[e]	1 2	0.51 0.56	2.25 3	4.5 6	2500 3250	3750 4875	10000 13000	0.58 0.59
3/8	1 2	0.67 0.73	3 4	6 8	2625 3250	3938 4875	10500 13000	0.73 0.78
1/2	1 2	0.83 0.89	4.5 6	7.5 10	2000 3200	3000 4800	8000 12800	0.90 0.93
3/4	1 2	1.16 1.26	6 8	9 12	1525 2625	2288 3938	6100 10500	1.33 1.36
1	1 2	1.43 1.54	6.75 9	10.5 14	1375 2050	2063 3075	5500 8200	1.59 1.66
1-1/4	1 2	1.87 1.98	4.5 6	13.5 18	1125 1800	1688 2700	4500 7200	1.93 2.00
1-1/2	1 2	2.19 2.25	5.25 7	16.5 22	1025 1750	1538 2625	4100 7000	2.25 2.32
2	1 2	2.65 2.78	6.75 9	18 24	850 1325	1275 1988	3400 5300	2.71 2.79
2-1/2	1 2	3.42 3.53	7.5 10	19.5 26	625 1125	938 1688	2500 4500	— —
3	1 2	3.98 4.09	11.25 15	24 32	563 1000	844 1500	2250 4000	— —
4	1 2	4.92 5.03	15 20	30 40	363 625	544 938	1450 2500	— —
6	1 2	7.12 7.26	22.5 30	45 60	275 413	413 619	1100 1650	— —
8	1 2	9.34 9.56	30 40	60 80	200 300	300 450	800 1200	— —

a. SSB Hose, hose and corresponding braid must be used in combination to achieve pressure ratings.
b. Hose sizes 3/8" through 2" meet ISO 10380 cycle life requirements of 50,000 minimum average cycles at maximum rated working pressure listed above.
c. Assemblies in sizes 2-1/2" through 8" must incorporate pullover braid with neck down design to meet listed pressure ratings. Contact SSB Hose for details on this procedure.
d. Braid sleeve must be crimped to the listed braid sleeve crimp O.D. on sizes 2" and below in order to meet pressure ratings.
e. 1/4" meets ISO 10380 cycle life requirements at ISO specified pressure.

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Stainless Steel Annular Hose Series HSS

ISO 10380 Qualified

- Available in 304, 321,316L stainless steel and other materials on request
- Pressure capability includes full vacuum to pressures shown below
- Temperature rating from cryogenic to 1500ºF. Consult Temperature Correction Factors for concurrent high temperature/high pressure applications
- Meets or exceeds ISO 10380 at maximum working pressure
- Hose corrugation is a Standard Pitch Superflex design.

Series HSS Hose — Annular, Stainless Steel, Superflex Standard Pitch Hose

Nominal Hose Size (in.)	Braid Layers[a]	Nominal Outside Diameter	Minimum Centerline Bend Radius (in.)		Pressure Ratings at 70°F (PSIG)[b]			Weight Per Foot (lb.)
			Static	Dynamic	Max. Working	Max. Test	Nominal Burst	
1/4c	0 1 2	0.46 0.51 0.56	4	6	140 2375 3125	210 3563 4688	— 9500 12500	0.09 0.18 0.27
3/8	0 1 2	0.61 0.67 0.73	2	4	100 1650 2200	150 2475 3300	— 6600 8800	0.12 0.23 0.35
1/2	0 1 2	0.76 0.81 0.87	3	5	75 1100 1625	113 1650 2438	— 4400 6500	0.16 0.26 0.37
3/4	0 1 2	1.05 1.10 1.16	4	6	50 800 1250	75 1200 1875	— 3200 5000	0.26 0.43 0.62
1	0 1 2	1.34 1.42 1.50	4.5	7	50 750 1000	75 1125 1500	— 3000 4000	0.36 0.62 0.91
1-1/4	0 1 2	1.64 1.72 1.80	4	11	25 725 1100	37.5 1088 1650	— 2900 4400	0.45 0.82 1.23
1-1/2	0 1 2	1.88 1.95 2.02	4.5	12	20 565 887	30 850 1330	— 2260 3550	0.48 0.82 1.23
2	0 1 2	2.48 2.58 2.69	5	13	16 500 750	24 750 1050	— 2000 3000	0.70 1.38 2.14
2-1/2	0 1 2	3.33 3.45 3.57	5	13	12 400 600	18 600 900	— 1600 2400	1.28 2.09 2.98
3	0 1 2	3.89 4.01 4.13	7.5	16	8 288 431	12 431 647	— 1150 1725	1.53 2.39 3.35
3-1/2	0 1 2	4.36 4.45 4.53	8	17	7.5 285 400	11 428 600	— 1140 1600	1.65 2.80 4.08
4	0 1 2	4.83 5.03 5.23	10	20	5 250 375	7.5 375 563	— 1000 1500	1.95 3.14 4.46

a. Standard braid constructions are shown without a type designation. The "BB"

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Stainless Steel Annular Hose Series HSF

- Hose assemblies utilizing SSB Formex hose allows easy installation even in the most difficult applications. This unique hose design may be bent into intricate patterns prior to installation. The hose will turn corners, bend around obstructions and may be preformed to fit your machinery without ovalizing and compromising its fluid handling capablities .
- Formex hose assemblies are available in 304, 321 or 316L stainless steel materials. The hose in normally provided with a single layer of braid and a wide variety of end fittings are available. If your application requires flexure cycle life or desirable "stay-put" bend characteristics, then SSB Formex hose may be your problem solver.
- Temperatures to 1500ºF. Consult Temperature Correction Factors for concurrent high temperature/high pressure applications
- Unique hose properties and easy installation.
- Sizes 1/4" to 2"

Series HSF Hose — Annular, Stainless Steel, Formex Standard Pitch Hose

Nominal Hose Size (in.)	Braid Layers[a]	Nominal Outside Diameter	Minimum Centerline Bend Radius (in.)		Pressure Ratings at 70°F (PSIG)[b]			Weight Per Foot (lb.)
			Static	Dynamic	Max. Working	Max. Test	Nominal Burst	
1/4c	0 1 2	0.46 0.51 0.56	4	6	140 2375 3125	210 3563 4688	— 9500 12500	0.09 0.18 0.27
3/8	0 1 2	0.61 0.67 0.73	2	4	100 1650 2200	150 2475 3300	— 6600 8800	0.12 0.23 0.35
1/2	0 1 2	0.76 0.81 0.87	3	5	75 1100 1625	113 1650 2438	— 4400 6500	0.16 0.26 0.37
3/4	0 1 2	1.05 1.10 1.16	4	6	50 800 1250	75 1200 1875	— 3200 5000	0.26 0.43 0.62
1	0 1 2	1.34 1.42 1.50	4.5	7	50 750 1000	75 1125 1500	— 3000 4000	0.36 0.62 0.91
1-1/4	0 1 2	1.64 1.72 1.80	4	11	25 725 1100	37.5 1088 1650	— 2900 4400	0.45 0.82 1.23
1-1/2	0 1 2	1.88 1.95 2.02	4.5	12	20 565 887	30 850 1330	— 2260 3550	0.48 0.82 1.23
2	0 1 2	2.48 2.58 2.69	5	13	16 500 750	24 750 1050	— 2000 3000	0.70 1.38 2.14

b. SSB Hose, hose and corresponding braid must be used in combination to achieve pressure ratings.
c. 1/4" meets ISO 10380 cycle life requirements at ISO specified pressure.

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Stainless Steel Tubular Braid and Braided Braid

- Materials available include 304, 321 and 316 stainless steel
- Wide range of constructions including 24, 36, 48, 72, 96 and 128 carrier designs
- Clean and oil-free
- Engineered for optimal hose coverage
- Manufactured on hose mandrels to ensure proper braid angle

Tubular Braid for Series 300 Hose—Stainless Steel T304, T321 and T316

Nominal Hose Size (in.)	Braid Construction	Braid I.D. (in.)	Braid Coverage (%)	Max. Working Pressure at 70°F (PSIG)[a]	Weight Per Foot (lb.)	Typical Mill Length (ft.)
1/4	24 x 6 x .012	0.46	90	2375	0.065	30–100
3/8	24 x 8 x .012	0.61	94	1650	0.098	30–100
1/2	24 x 8 x. 012	0.75	86	1100	0.101	30–100
3/4	36 x 8 x .012	1.04	90	800	0.143	30–100
1	36 x 8 x .016	1.34	88	750	0.268	30–100
1-1/4	48 x 8 x .016	1.65	97	725	0.375	30–60
1-1/2	48 x 8 x .016	1.90	96	565	0.377	30–60
2	48 x 8 x .020	2.50	96	500	0.680	30–60
2-1/2	72 x 8 x .020	3.33	90	400	0.710	30–60
3	72 x 8 x .020	3.89	86	288	0.760	30–60
3-1/2	72 x 10 x .020	4.36	86	285	1.150	30–50
4	72 x 10 x .020	4.83	84	250	1.130	30–50
5	96 x 8 x .025	5.94	87	200	1.320	30–100
6	96 x 8 x .025	6.95	82	175	1.470	50–100

a. Maximum working pressure shown is calculated for SSB Hose annular hose and corresponding single layer braid. See **Series HSA annular hose** specifications for additional information.

Braided Braid for Series 300 Hose — Stainless Steel T304

Nominal Hose Size (in.)	Braid Construction	Braid I.D. (in.)	Braid Coverage (%)	Max. Working Pressure at 70°F (PSIG)[a]	Weight Per Foot (lb.)	Typical Mill Length (ft.)
8	96 x (17 x .025)	9.08	87	212	3.41	50–100
10	96 x (29 x .025)	11.10	93	175	3.94	50–100
12	96 x (29 x .024)	13.22	91	160	5.95	50–100
14	96 x (29 x .025)	16.40	74	110	6.54	10–30

a. Maximum working pressure shown is calculated for SSB Hose annular hose and corresponding single layer braid. See **Series HSA annular hose** specifications for additional information.

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Bronze Tubular Braid

- Wide range of constructions including 24, 36, 48, and 72 carrier designs
- Clean and oil-free
- Engineered for optimal hose coverage
- Manufactured on hose mandrels to ensure proper braid angle

Bronze Tubular Braid for Series 400 Hose

Nominal Hose Size (in.)	Braid Construction	Braid I.D. (in.)	Braid Coverage (%)	Max. Working Pressure at 70°F (PSIG)[a]	Weight Per Foot (lb.)	Typical Mill Length (ft.)
1/4	24 x 5 x .014	0.46	94	934	0.100	30–100
3/8	24 x 7 x .014	0.61	97	704	0.130	30–100
1/2	24 x 8 x. 014	0.75	95	566	0.150	30–100
3/4	36 x 8 x .014	1.04	95	468	0.220	30–100
1	36 x 5 x .020	1.34	80	334	0.270	30–100
1-1/4	48 x 6 x .020	1.78	91	306	0.440	30–60
1-1/2	48 x 7 x .020	2.09	88	297	0.540	30–60
2	48 x 8 x .020	2.54	85	210	0.620	30–60
2-1/2	72 x 8 x .020	3.33	90	194	0.980	30–60
3	72 x 10 x .020	3.89	95	166	1.200	30–60
4	72 x 12 x .020	4.79	95	145	1.460	30–50

a. Maximum working pressure shown is calculated for SSB Hose bronze hose and corresponding single layer bronze braid. See **Series HBA annular bronze hose** specifications for additional information.

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Monel Tubular Braid

- Wide range of constructions including 24, 36, 48, and 72 carrier designs
- Clean and oil-free
- Engineered for optimal hose coverage
- Manufactured on hose mandrels to ensure proper braid angle

Monel Tubular Braid for Series 500 Hose

Nominal Hose Size (in.)	Braid Construction	Braid I.D. (in.)	Braid Coverage (%)	Max. Working Pressure at 70°F (PSIG)[a]	Weight Per Foot (lb.)	Typical Mill Length (ft.)
1/4	24 x 6 x .012	0.46	90	1701	0.075	30–100
3/8	24 x 8 x .012	0.61	94	1272	0.112	30–100
1/2	24 x 8 x. 012	0.75	85	852	0.116	30–100
3/4	36 x 8 x .012	1.04	89	709	0.152	30–100
1	36 x 8 x .016	1.34	88	692	0.274	30–100
1-1/4	48 x 8 x .016	1.78	90	611	0.342	30–60
1-1/2	48 x 8 x .016	2.09	84	419	0.400	30–60
2	48 x 8 x .020	2.54	88	313	0.483	30–60
3	72 x 10 x .020	3.89	95	300	1.130	30–60
4	72 x 12 x .020	4.79	95	263	1.463	30–50

a. Maximum working pressure shown is calculated for SSB Hose monel hose and corresponding single layer Monel braid. See **Series HMA annular monel hose** specifications for additional information.

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Temperature Correction Factors

As the service temperature increases, the maximum pressure a hose assembly can withstand decreases. The material from which the hose is made and the method of fitting attachment (mechanical, soldered, welded, silver brazed) determine the maximum pressure at which an assembly can be used. By using the factors given in the chart below, the approximate safe working pressure at elevated temperatures can be calculated for assemblies with welded or mechanically attached fittings.

Temperature Correction Factors						
Temp (°F)	304, 316L Stainless	321 Stainless	Bronze	Monel	Hastelloy	Inconel
Room	1.00	1.00	1.00	1.00	1.00	1.00
150	.96	.97	.92	.93	.97	.99
200	.92	.94	.89	.90	.94	.98
250	.91	.92	.86	.87	.92	.97
300	.86	.88	.83	.83	.91	.97
350	.85	.86	.81	.82	.89	.96
400	.82	.83	.78	.79	.87	.95
450	.80	.81	.75	.77	.86	.94
500	.77	.78	—	.73	.85	.94
600	.73	.74	—	.72	.84	.92
700	.69	.70	—	.71	.82	.90
800	.64	.66	—	.70	.81	.89
900	—	.62	—	—	.79	.87
1000	—	.60	—	—	.78	.86
1100	—	.58	—	—	.75	.84
1200	—	.55	—	—	.73	.82
1300	—	.50	—	—	.69	.79
1400	—	.44	—	—	.65	.77
1500	—	.40	—	—	—	.74

Saturated Steam Pressure To Temperature (PSIG)								
Saturated Steam (PSIG)	Temp (°F)		Saturated Steam (PSIG)	Temp (°F)		Saturated Steam (PSIG)	Temp (°F)	
0	212		150	366		450	460	
10	238		175	377		475	465	
20	259		200	388		500	470	
30	274		225	397		550	480	
40	287		250	406		600	489	
50	298		275	414		700	505	
60	307		300	422		800	520	
75	320		325	429		900	534	
80	324		350	436		1000	546	
90	331		375	442		1250	574	
100	338		400	448		1500	606	

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ISO 10380 Summary

ISO

ISO or International Standards Organization was created to establish worldwide standards for industry. They are responsible for formulation of standards regarding quality assurance or specific products. The ISO 10380 standard was developed to help define the industry requirements for design, manufacture and testing of corrugated metal hose and hose assemblies. The following is a summary of the various sections covered in this standard.

MATERIALS

ISO 10380 specification lists the more popular materials used in the manufacture of corrugated metal hose, braid, ferrules and end fittings. Two of the most common materials utilized for corrugated metal hose are austenitic stainless steel and copper based alloys. The specification is very clear that the material used in manufacturing the corrugated metal hose shall be selected on the basis of their suitability for forming or welding and for the application conditions under which they will operate. Materials other than those listed above may be selected by agreement between the manufacturer and the user.

CRITICAL DIMENSIONS

Details and requirements specified in this section include hose diameter, bend radii and overall length tolerances. It is common for manufacturers to list their nominal hose diameter in published literature. ISO 10380 lists the requirement that the actual hose inside diameter will be at least 98% of the nominal hose size.
The bend radius covered in the specification includes nominal static and nominal dynamic bend radius. Dynamic bend radius is used in cycle life fatigue testing. There are type 1 and 2 dynamic bend radius values in the specification. SSB Hose uses the more stringent type 1 dynamic bend radius for cycle life fatigue testing. Overall length tolerances listed in the ISO 10380 are –1% to +3%.

DESIGN

Pressure: The specification lists the maximum permissible pressure ratings to be used in testing performed in accordance with ISO 10380.

Elevated Temperatures: Pressure reduction for elevated temperature conditions is critical in applying the proper metal hose for an application. This specification provides for a method of determining the maximum service pressure for a metal hose assembly under these conditions.

Low Temperatures: The materials listed in the specification, with the exception of carbon steel, do not need to be de-rated in low temperature applications down to –392°F or –200°C. Carbon steel material used for end fittings may be used to a minimum temperature of –68°F or –20°C.

Cycle Life: Corrugated metal hose bend radius and minimum acceptable cycle life design requirements are outlined. Values and test criteria for meeting static and dynamic bend radii are also listed.

CONSTRUCTION

Hose: Manufacturing and corrugation designs are addressed by the ISO 10380 specification. Seamless or longitudinally welded tube may be corrugated into annular or helical corrugation designs. Details of methods for joining or segmenting metal hose are also listed.

Braid: ISO 10380 specifications are broad for the design of the braid.

Methods of Assembly: Many different methods of fitting attachment and unacceptable weld characteristics are outlined by the ISO 10380 specification. The use of protective covers is also addressed.

TESTING

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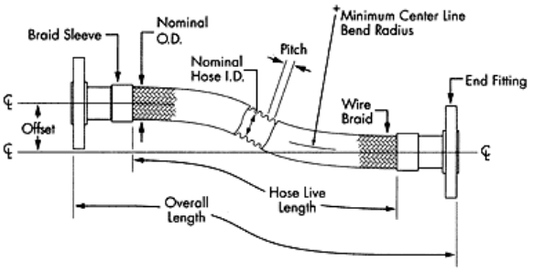
Terminology

- Metal Hose
- Braid
- Hose assembly
- Specification Chart Headings



Metal Hose

Corrugated metal hose allows for the transfer of liquids or gases, usually at high pressure and high or cryogenic temperature while remaining flexible.

Corrugation Design
Annular hose is formed from tubing into individual parallel corrugations. **Helical** hose is also formed from tubing but into a continuous spiral corrugation. Both designs allow for flexibility of the hose assembly under pressure. In addition, helical hose has unique self-draining properties.

Pitch
Corrugated metal hose is normally manufactured in **Standard Pitch** (Close Pitch). Each manufacturer specifies a standard number of corrugations per foot based on their desire to provide for acceptable flexibility while considering economic requirements.

Open Pitch hose is also available and has fewer corrugations per foot. This hose will not be as flexible as a Standard Pitch hose and will have a much lower flexing cycle life. Open Pitch hose is intended to be used in less severe applications where flexibility and cycle life are not an important requirement or as an effective method for dampening vibration.

Superflex allows SSB Hose to achieve greater flexibility without thinning the wall of the hose by increasing the number of corrugations per foot. Superflex will normally have a higher flexing cycle life and can be used in more severe applications where ease of flexibility is important.

Wall Thickness
Each manufacturer designs a hose with criteria for the wall thickness that considers flexibility, cycle life and corrosion resistance. Increasing or decreasing the wall thickness has both advantages and disadvantages to the user.

Braid

Metal wire braid on a hose assembly provides the hose assembly a higher pressure capability by acting as a restraint against hose elongation and acts to dampen vibration. A second layer of braid may be used to increase pressure ratings provided the test pressure is not exceeded which can result in permanent corrugation deformation.

Other design considerations may result in the use of a heavy braid to increase abrasion resistance characteristics.

Braid Coverage
Optimal braid coverage is engineered to contain the core under pressure and reduce the possibility of squirm. Properly designed braid coverage will balance pressure capability with flexing requirements. Minimization of braid wear on the crown of the corrugation is also provided by optimal braid coverage.

Tubular Braid
Tubular Braid is manufactured by grouping single wires and then braiding them into an intricate pattern that tightens when the braid is stretched. The group of wires is also known as a strand.

Construction of the braid is expressed as (number of carriers) x (number of wires in each group) x (wire diameter). An example would be 24 x 8 x .012 where 24 is the number of carriers on the braiding equipment, there are 8 wires in each strand of wires and the diameter of each wire

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Design Criteria Terminology

Abrasion/Erosion
Internal abrasion is the wearing away of the inside corrugations of the hose caused by the flow of the media conveyed such as wet steam or abrasive particles. External abrasion is the damage to the hose assembly caused by being rubbed on a foreign object.

Ambient Conditions
Surrounding conditions such as pressure, corrosion or temperature to which the hose assembly is exposed.

Amplitude of Vibration
The distance a hose assembly deflects laterally to one side from its installed position.

Angular Offset
The bending of the hose so that the ends are no longer parallel. Amount of movement is measured in degrees from centerline of the hose.

Annular Corrugation
Convolutions on a hose that are a series of complete circles or rings located at right angles to the longitudinal axis of the hose.

Armor/Casing
Flexible interlocked tubing placed over the entire length or in short lengths at the end of a metal hose to protect it from physical damage and/or to limit the bending radius.

Axial Motion
Compression or extension movement along the longitudinal axis of the pipeline.

Basket Weave Braid
Strands of wire are alternately crossed two over and two under.

Bend Radius
The radius of a hose measured at the hose centerline.

Braid
Metal wire braid on a hose assembly permits the hose assembly a higher pressure capability by acting as a restraint against hose elongation and acts to dampen vibrations. A second layer of braid may be used to increase pressure ratings provided the test pressure does not result in permanent corrugation deformation. Other design considerations may result in the use of a heavy braid to increase abrasion resistance characteristics.

Braid Angle
Angle formed by the braid strands and the longitudinal axis of the hose.

Braid Coverage
Optimal braid coverage is engineered to contain the core and reduce the possibility of squirm. Properly designed braid coverage will balance pressure capability with flexing requirements. Minimization of braid wear on the crown of the corrugation is also provided by optimal braid coverage.

Braid Sleeve/Ferrule
The Braid Sleeve or Ferrule is used to isolate the end of the corrugated hose and braid from flexure. The core and braid are welded to the braid sleeve or ferrule during fabrication of the hose assembly.

Braid Wear
Motion between the braid and corrugated hose normally causes wear on the crown or OD of the corrugation and the inside diameter of the braid.

Braided Braid
Braided braid is manufactured the same as a tubular braid except that wires in the strand are braided together prior to the manufacture of the braid. Braided braid is primarily used on larger diameter hose assemblies.

Brazing
A process of joining metals using a non-ferrous filler metal having a melting point that is lower than the parent metals to be joined.

Casing
Same as Armor.

Constant Flexing
Regular cyclic motion at a slow cyclic rate and constant travel. The Dynamic Minimum Centerline Bend Radius must be doubled on constant flexing applications.

Corrosion
The chemical or electro-chemical attack of a media upon a hose assembly.

Corrugation/Convolution
Annular or helical flexing member in corrugated metal hose.

Cycle Life
The number of cycles a hose is flexed before failure.

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Motion Terminology

Hose Live Length
The live length of the hose assembly must be sufficient in order for the hose to properly meet the movement requirements. A hose assembly with a live length shorter than suggested could cause premature failure.

Lateral Offset Motion
This motion occurs when the hose centerline is moved in a plane perpendicular to the longitudinal axis with the end remaining parallel. Dynamic offset motion should never be more than 25% of the minimum centerline bend radius. See page 25 for design information on lateral offset.

Angular Offset Motion
Angular movement is defined as the bending of the hose so that the ends are no longer parallel. Amount of movement is measured in degrees from centerline of the hose if were installed straight. See **Angular Offset Motion** for design information on angular offset.

Axial Movement
Axial movement is compression or elongation along the longitudinal axis. Metal hose assemblies installed in line with the longitudinal axis of the piping should not be subjected to axial movement.
Two design options are available to compensate for axial movement. The first option is installation of the metal hose assembly perpendicular to the longitudinal axis of the pipeline. As axial movement occurs, the metal hose assembly will be subjected to lateral offset. See **Lateral Offset Motion** for additional design information.
The second option is the use of a Class "B" traveling loop. See **Radial Movement** for design requirements of traveling loops.

Torsion Movement
Torsion movement occurs when the hose is twisted or torqued such as when the hose bends out of plane or during improper installation.
Twisting forces are extremely destructive and are one of the most common causes for premature failure.

Motion Frequency
The rate of flexure that the hose is subjected to in a given time period. Three basic types of motion
frequency include vibration, dynamic motion and continuous motion.

Vibration
This is low amplitude motion occurring at high frequency. Vibration is normally found in engine exhaust, pump and compressor applications. Hose resonance must be avoided to prevent premature failure. Consult SSB Hose engineering if hose resonance is anticipated or for additional vibration data.

Dynamic/Intermittent Motion
Non-continuous or intermittent motion such as the result of thermal expansion. Dynamic bend radius is used in calculations determining the hose live length for lateral offset, angular offset and radial motion during dynamic or intermittent flexing.

Static Bend
A non-moving or fixed radius bend in a hose assembly used to compensate for misalignment.

Continuous Motion
Regular cyclic motion at a slow cyclic rate and constant travel. The dynamic minimum centerline bend radius must be doubled on continuous motion applications.

Random Motion
The uncontrolled motion of a metal hose such as motion that occurs during manual handling.

Bend Radius
The minimum radius the hose can be bent and still maintain the integrity of the hose. Usually expressed as dynamic or static centerline bend radius. The bend radius is used in calculations associated with angular and lateral offset motion.

Cycle Life
The number of cycles a hose is flexed before failure. Some factors that affect cycle life include working pressure, temperature, bend radius, hose and braid materials. SSB Hose uses the ISO10380 fatigue test standard for cycle life testing. See ISO 10380 Summary for a more complete description of the ISO 10380 standard.

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Pressure Terminology

Maximum Rated Working Pressure
The maximum pressure that the hose should be subjected to on a continuous basis. SSB Hose establishes this rating by multiplying the nominal rated burst pressure by 25%. Published pressure is calculated at 70°F.

Maximum Rated Test Pressure
The maximum pressure the hose should be subjected to during proof pressure or system testing. Hose corrugation deformation will occur if the maximum rated test pressure is exceeded. The maximum rated working pressure is multiplied by 150% to determine the maximum rated test pressure.

Nominal Rated Burst Pressure
The average pressure at which the core or braid will rupture at ambient temperature. Proper hose assembly fabrication techniques must be used to ensure the hose will meet SSB Hose published pressures.

Pulsating or Shock Pressure
The performance of metal hose can be greatly reduced under this type of working pressure. Pressures are normally reduced by 50% in pulsating or shock pressure applications. Contact SSB Hose for additional information on this application.

Pressure/Temperature Correction
Metal hose pressure capabilities decrease as the temperature increases. Consult the temperature correction factor table to determine pressure rating at elevated temperatures.

Safety Factors
The maximum working pressure should not be greater than 25% of the nominal rated burst pressure after correcting for the application temperature. The safety factor is generally expressed as a ratio of 4:1.

Pressure Drop
Pressure drop occurs in long hose runs. The amount of pressure loss is approximately 3 times that of steel pipe. Contact SSB Hose if more accurate calculations are required.

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Flow Velocity

Liners
Liquid or gas applications conveying media at high velocity should incorporate an interlock liner in the hose assembly design. The liner will decrease the turbulence caused by the high velocity and reduce the resonant vibration that may occur. A liner is recommended if the velocity is greater than the following:

Media	Hose Alignment	Maximum Velocity without Liner (ft./sec.)
liquid	straight	75
liquid	45° bend	56
liquid	90° bend	37
gas	straight	150
gas	45° bend	112
gas	90° bend	75

Conversion Formulas

Definitions[a]	Feet Per Second (ft./sec.)
gph: gallons per hour	(gph ÷ ID^2) x 0.0068
gpm: gallons per minute	(gpm ÷ ID^2) x 0.4083
cfh: cubic feet per hour	(cfh ÷ ID^2) x 0.0509
cfm: cubic feet per minute	(cfm ÷ ID^2) x 3.0558
cfs: cubic feet per second	(cfs ÷ ID^2) x 183.35
[a]ID = nominal hose size in inches	

Example:

Given:
3" nominal hose size
500 gallons per minute flow
Media is water
Hose is installed in 90° bend

Computation:
From the formula above,
(gpm ÷ ID^2) x 0.4083 or
(500 ÷ 3^2) x 0.4083 = 22.68 ft./sec. flow velocity

Result:
Since the calculated flow velocity of 22.68 ft./sec. is less than 37 ft./sec., a liner is not required for this application.

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Media

The metal hose assembly designer must know what the hose will convey. Matching the application piping material is sometimes used as a guide in selecting the alloy for the metal hose. However, this practice does not necessarily mean that the alloy selected is suitable. Metal hose is manufactured from thin wall material and may not have the same total life as heavier wall tube or pipe of the same material. Some factors to be considered when designing metal hose assemblies include corrosion, abrasion and viscosity of the media conveyed.

Corrosion
Material selection of the core and braid should take into consideration the corrosive nature of the media conveyed by the hose assembly and the outside environment. Corrosion can be accelerated in many chemicals where high temperature is present.
SSB Hose does not publish corrosion resistance data because of the many variables present in metal hose applications. Many reference materials are available and provide accurate corrosion data. The Corrosion Data Survey published by the National Association of Corrosion Engineers (NACE) is considered to be one of the sources for corrosion resistance information.

Abrasion
For internal abrasion, premature failure can occur if the media is abrasive. The use of an interlock liner may extend the life of a hose assembly. For external abrasion, a protective cover may be used to extend hose life.

Viscosity
Flow of viscous media can be enhanced by incorporating the use of a jacketed hose assembly. This design utilizes an inner hose that is encapsulated by an outer hose.

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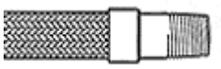
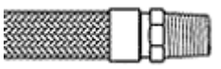
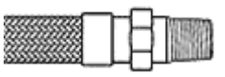
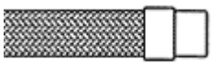
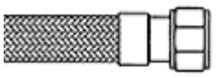
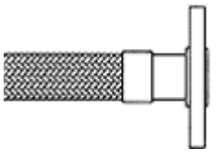
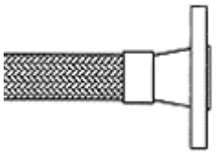
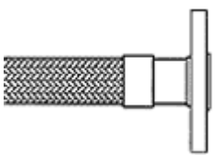
Attachment Fittings

Many different fitting designs may be attached to the hose assembly. Selection of the proper material for the end fittings must be considered. Fitting materials such as carbon steel, malleable iron, stainless steel, bronze or brass may or may not be the same as the hose assembly material. Correct attachment of the fittings is essential to the integrity of the assembly.

	Fitting	Description
	Male Pipe (Solid)	Pipe thread — Sch 40 Std Weight Sch 80 Heavy Weight
	Hex Male Pipe (Solid)	Pipe thread - with integral or attached hex
	Female Pipe (Solid)	Female pipe thread - also may be supplied with hex
	Female Union	Female pipe thread with ground joint union as specified
	Male Union	Male union thread with ground joint union as specified
	Weld-Plain Pipe End (Solid)	Pipe tube end specified by Sch 40 or Heavy Weight Sch 80
	Tube End (Solid)	Plain tube end specified by O.D. and wall thickness
	Tube with Fittings (Swivel)	Tube flared with sleeve and nut for female JIC/SAE swivel fittings, as specified. Overall length is normally measured seat to seat.
	Flange (Fixed)	a) Forged steel - per ASTM specification from 125 lb. to 600 lb. b) Plate steel - where permissible cut and drilled to 150 lb. or 300 lb. dimensions
	Flange-Weldneck (Fixed)	Forged steel - per ASTM specification from 125 lb. to 600 lb.
	Flange-Lap Joint (Floating)	a) Lap joint forges flange per ASTM specification from 125 lb. to 600 lb., must be used with MSS/ANSI "A" forged stub end Std or Extra Heavy b) Slip-on plate flange for lighter weight schedule 10 stub ends

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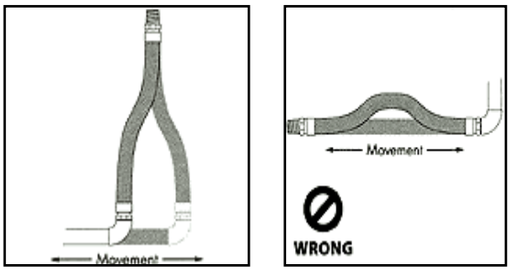
Installation Precautions

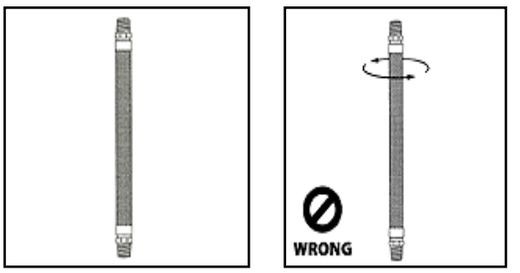
DO NOT COMPRESS OR EXTEND AXIALLY.

Corrugated metal hose installed in-line with the longitudinal axis of the piping should not be subjected to axial movement.



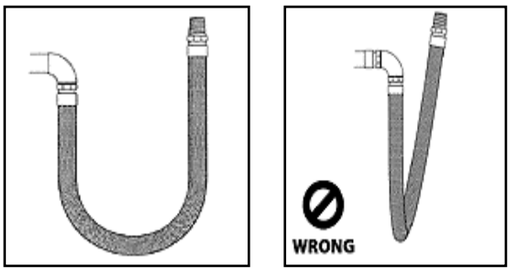
DO NOT TORQUE DURING INSTALLATION.

Metal hose assemblies should not be used to compensate for bolt hole misalignment. Floating flanges will help to minimize twisting of the metal hose. Pipe unions will help to reduce twisting during connection to the piping. The use of two wrenches will help to keep the hose from twisting when tightening the pipe union.



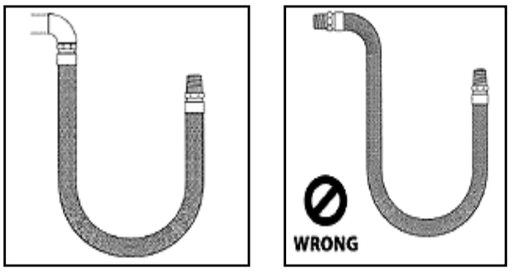
DO NOT ALLOW HOSE MOVEMENT IN MULTIPLE PLANES.

Flexing a metal hose in two separate planes of movement will torque the hose assembly. Always install the metal hose assembly so that flexing occurs in one plane only and this is the same plane in which bending occurs.



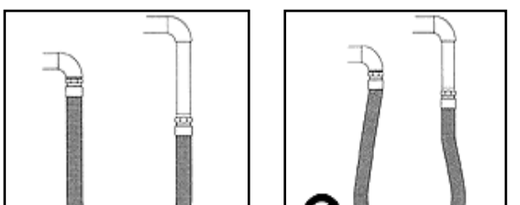
AVOID SHARP BENDS.

Use elbows to avoid severe bends near the end of the metal hose assembly.



MAINTAIN MINIMUM CENTERLINE BEND RADIUS.

The minimum centerline bend radius for dynamic flexing should never be less than the values in the product specification tables.



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Service Life Factors

The following describes various service life factors in corrugated metal hose applications. The information is based on our experience as a manufacturer of metal hose, braid products and metal hose assemblies. While this information is intended to be a general guide, each application should be evaluated individually because of the many variables that affect service life of metal hose assemblies.

General Corrosion
Uniform attack through the entire corrugated length of the metal hose assembly is mostly described as general corrosion. Attack on the alloy is affected by chemical concentration, temperature and the type of alloy from which the metal hose is manufactured. Some typical areas of attack include the root or bottom of the corrugation and in the heat affected weld area. Most stainless alloys form a protective film of stable oxides on the surface when exposed to oxygen gas. The rate of oxidation is dependent on temperature. At normal temperatures, a thin film of oxide is formed on the alloy surface. Higher temperatures will cause oxidation to proceed more rapidly.
The oxides that form on copper or nickel alloys are of a nonporous oxide formation. A nonporous oxide formation will provide a protective layer on the surface but if the layer is removed, no protection is provided to the underlying metal.
Factors when selecting piping and corrugated metal hose assembly materials should consider that the piping is a rigid member and the hose assembly will be subject to flexing. As outlined later in the Service Life Factors section, several factors associated with flexing affect the service life of metal hose.
Service life may be affected by factors external to the metal hose assembly. Consideration should be given to the chemical composition of the environment surrounding the hose assembly as well as the media being transferred when selecting an alloy.
SSB Hose does not publish corrosion resistance data because of the many variables present in metal hose applications. Many reference materials are available and provide accurate corrosion data. The Corrosion Data Survey published by the National Association of Corrosion Engineers (NACE) is one of the many sources of reference for corrosion resistance information.

High Velocity/Chemical Abrasives
Turbulent flow of abrasive chemical media over the alloy surface may cause accelerated corrosion or erosion-corrosion. Liquids or gases that have suspended solid particles will wear or remove the oxide protective film and leave the alloy exposed and more susceptible to corrosion. Some forms of flow assisted corrosion include terms such as cavitation or impingement. Reducing the velocity or incorporating a liner in the metal hose assembly may reduce the effects of this type of abrasion.

High Cycle/Chemical Media
Applied stresses such as flexing or cyclic motion may reduce the oxide film surface effectiveness against corrosion. Cracks, resulting from cycling of the hose assembly, form in the protective oxide layer on the surface of the alloy thus reducing the effectiveness against corrosion. The introduction of a corrosive environment often eliminates the fatigue limit of the alloy creating a finite life regardless of stress level.

Stress Corrosion
The detailed mechanism of stress corrosion is complicated and not well understood. The process of stress corrosion seems to be one of initial formation of corrosion pits and crevices, and subsequent fracture due to stress concentrations associated with the crevices. Stress corrosion cracks often follow crystal boundaries in the grain structure of the alloy. Visual examination of high cycle/chemical media and stress corrosion failures appears similar. Application data specifying media, temperature and movements is very useful in order to determine the exact cause of failure.
Chlorides and caustics are the media most frequently found to cause stress corrosion cracking. Relieving stresses or selection of an alloy known for resistance to the conveyed media are possible ways to reduce this type of failure.

Intergranular Corrosion/Attack
Corrosion along the grain boundaries of the metal may occur and the grains of metal separate from the mass causing loss of strength and ductility. Failure due to loss of ductility is also known as brittle fracture. Alloys such as 304L or 316L have been developed to reduce the effects of intergranular corrosion. These low carbon alloys have a grain structure that is more

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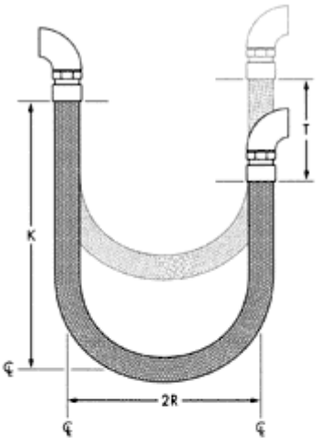
Radial Movement

This type of movement occurs when hoses are bent in a 180° arc such as in vertical or horizontal traveling loops. Traveling loops are classified as Class "A" where the bend radius remains constant and the one end of the hose moves parallel to the other end.
A Class "B" traveling loop has the hose installed in a U-shaped configuration and the ends move perpendicular to each other so as to enlarge or decrease the width of the loop.
Horizontal travelling loops must have the bottom leg of the hose supported to avoid undue stress on the end of the hose. The weight of the hose and media inside the hose will reduce the pressure capability of the hose. Weight loads should be considered when engineering corrugated metal hose assemblies for travelling loop applications.

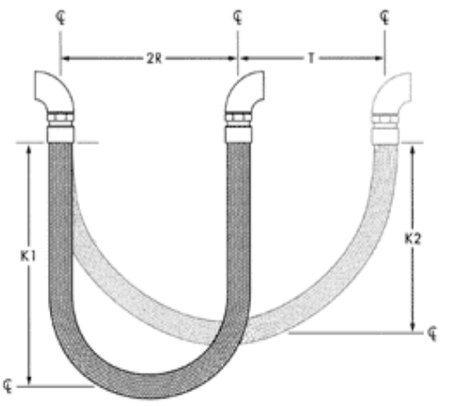
Class A Traveling Loops



$L = 4R + T/2$

$K = 1.43R + T/2$

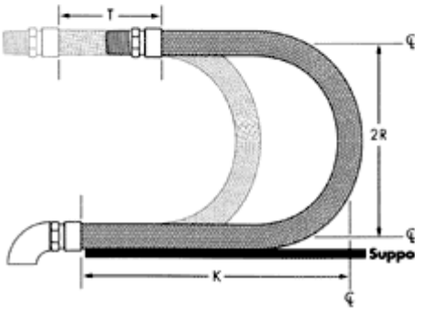
Class B Traveling Loops

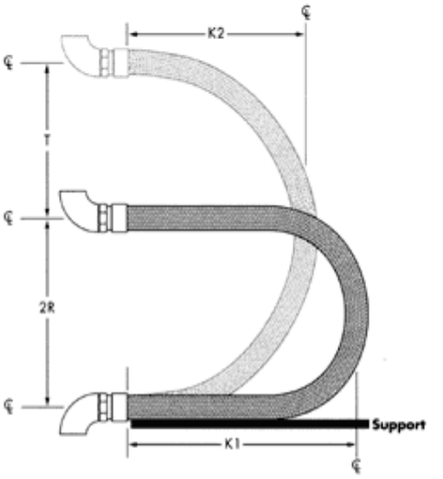


$L = 4R + 1.57T$

$K1 = 1.43R + .785T$

$K2 = 1.43R + T/2$





T = Total travel (inches)
R = Centerline bend radius (inches)
L = Hose live length (inches)
K = Loop length (inches)

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Angular Offset Motion

Angular movement is defined as the bending of the hose so that the ends are no longer parallel. Amount of movement is measured in degrees from centerline of the hose if it were installed straight.

Minimum Live Length of Hose For Angular Offset Motion

CENTERLINE BEND RADIUS (in.) = R	Degree of Angular Motion = θ													
	10	15	20	25	30	40	50	60	70	80	90	120	150	180
2	0.4	0.6	0.7	0.9	1.1	1.4	1.8	2.1	2.5	2.8	3.2	4.2	5.3	6.3
3	0.6	0.8	1.1	1.4	1.6	2.1	2.7	3.2	3.7	4.2	4.8	6.3	7.9	9.5
4	0.7	1.1	1.4	1.8	2.1	2.8	3.5	4.2	4.9	5.6	6.3	8.4	10.5	12.6
5	0.9	1.4	1.8	2.2	2.7	3.5	4.4	5.3	6.2	7.0	7.9	10.5	13.1	15.8
6	1.1	1.6	2.1	2.7	3.2	4.2	5.3	6.3	7.4	8.4	9.5	12.6	15.8	18.9
7	1.3	1.9	2.5	3.1	3.7	4.9	6.2	7.4	8.6	9.8	11.0	14.7	18.4	22.0
8	1.4	2.1	2.8	3.5	4.2	5.6	7.0	8.4	9.8	11.2	12.6	16.8	21.0	25.2
9	1.6	2.4	3.2	4.0	4.8	6.3	7.9	9.5	11.0	12.6	14.2	18.9	23.6	28.3
10	1.8	2.7	3.5	4.4	5.3	7.0	8.8	10.5	12.3	14.0	15.8	21.0	26.2	31.5
11	2.0	2.9	3.9	4.8	5.8	7.7	9.6	11.6	13.5	15.4	17.3	23.1	28.8	34.6
12	2.1	3.2	4.2	5.3	6.3	8.4	10.5	12.6	14.7	16.8	18.9	25.2	31.5	37.7
13	2.3	3.5	4.6	5.7	6.9	9.1	11.4	13.7	15.9	18.2	20.5	27.3	34.1	40.9
14	2.5	3.7	4.9	6.2	7.4	9.8	12.3	14.7	17.2	19.6	22.0	29.4	36.7	44.0
15	2.7	4.0	5.3	6.6	7.9	10.5	13.1	15.8	18.4	21.0	23.6	31.5	39.3	47.2
16	2.8	4.2	5.6	7.0	8.4	11.2	14.0	16.8	19.6	22.4	25.2	33.6	41.9	50.3
17	3.0	4.5	6.0	7.5	9.0	11.9	14.9	17.9	20.8	23.8	26.8	35.7	44.6	53.5
18	3.2	4.8	6.3	7.9	9.5	12.6	15.8	18.9	22.0	25.2	28.3	37.7	47.2	56.6
19	3.4	5.0	6.7	8.3	10.0	13.3	16.6	19.9	23.3	26.6	29.9	39.8	49.8	59.7
20	3.5	5.3	7.0	8.8	10.5	14.0	17.5	21.0	24.5	28.0	31.5	41.9	52.4	62.9
22	3.9	5.8	7.7	9.6	11.6	15.4	19.2	23.1	26.9	30.8	34.6	46.1	57.6	69.2
24	4.2	6.3	8.4	10.5	12.6	16.8	21.0	25.2	29.4	33.6	37.7	50.3	62.9	75.4
26	4.6	6.9	9.1	11.4	13.7	18.2	22.7	27.3	31.8	36.4	40.9	54.5	68.1	81.7
28	4.9	7.4	9.8	12.3	14.7	19.6	24.5	29.4	34.3	39.1	44.0	58.7	73.4	88.0
30	5.3	7.9	10.5	13.1	15.8	21.0	26.2	31.5	36.7	41.9	47.2	62.9	78.6	94.3
35	6.2	9.2	12.3	15.3	18.4	24.5	30.6	36.7	42.8	48.9	55.0	73.4	91.7	110.0
40	7.0	10.5	14.0	17.5	21.0	28.0	35.0	41.9	48.9	55.9	62.9	83.8	104.8	125.7
45	7.9	11.8	15.8	19.7	23.6	31.5	39.3	47.2	55.0	62.9	70.7	94.3	117.9	141.4
50	8.8	13.1	17.5	21.9	26.2	35.0	43.7	52.4	61.1	69.9	78.6	104.8	130.9	157.1
60	10.5	15.8	21.0	26.2	31.5	41.9	52.4	62.9	73.4	83.8	94.3	125.7	157.1	188.5
70	12.3	18.4	24.5	30.6	36.7	48.9	61.1	73.4	85.6	97.8	110.0	146.7	183.3	220.0
80	14.0	21.0	28.0	35.0	41.9	55.9	69.9	83.8	97.8	111.8	125.7	167.6	209.5	251.4
90	15.8	23.6	31.5	39.3	47.2	62.9	78.6	94.3	110.0	125.7	141.4	188.5	235.7	282.8
100	17.5	26.2	35.0	43.7	52.4	69.9	87.3	104.8	122.2	139.7	157.1	209.5	261.8	314.2

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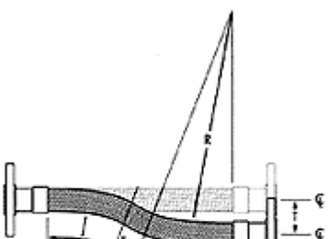
Lateral Offset Motion

This motion occurs when the hose centerline is moved in a plane perpendicular to the longitudinal axis with the end remaining parallel. Dynamic offset motion should never be more than 25% of the minimum centerline bend radius.

Minimum Live Length of Hose For Lateral Offset Motion

CENTERLINE BEND RADIUS (in.) = R	Dynamic Lateral Offset Motion (in.) = T														
	1/8	1/4	3/8	1/2	3/4	1	1-1/2	2	3	4	5	6	8	10
2	1.3	1.8	2.2	2.5	3.1	3.7	4.5	5.3	6.8	8.0	9.3	10.4	12.7	14.9
3	1.6	2.2	2.7	3.1	3.8	4.4	5.5	6.4	8.0	9.4	10.8	12.0	14.5	16.8
4	1.8	2.5	3.1	3.5	4.4	5.0	6.2	7.3	9.0	10.6	12.1	13.5	16.0	18.5
5	2.0	2.8	3.4	4.0	4.9	5.6	6.9	8.0	10.0	11.7	13.3	14.7	17.5	20.0
6	2.2	3.1	3.7	4.3	5.3	6.1	7.5	8.8	10.9	12.7	14.4	15.9	18.8	21.5
7	2.3	3.3	4.0	4.7	5.7	6.6	8.1	9.4	11.7	13.6	15.4	17.0	20.0	22.9
8	2.5	3.5	4.3	5.0	6.1	7.0	8.7	10.0	12.4	14.5	16.3	18.0	21.2	24.1
9	2.7	3.7	4.6	5.3	6.5	7.5	9.2	10.6	13.1	15.3	17.2	19.0	22.3	25.3
10	2.8	3.9	4.8	5.5	6.8	7.9	9.7	11.2	13.8	16.0	18.1	19.9	23.4	26.5
11	2.9	4.1	5.0	5.8	7.1	8.2	10.1	11.7	14.4	16.8	18.9	20.8	24.4	27.6
12	3.1	4.3	5.3	6.1	7.4	8.6	10.5	12.2	15.0	17.5	19.7	21.7	25.3	28.7
13	3.2	4.5	5.5	6.3	7.7	8.9	11.0	12.7	15.6	18.2	20.4	22.5	26.3	29.7
14	3.3	4.6	5.7	6.5	8.0	9.3	11.4	13.2	16.2	18.8	21.1	23.3	27.2	30.7
15	3.4	4.8	5.9	6.8	8.3	9.6	11.8	13.6	16.8	19.4	21.8	24.0	28.0	31.7
16	3.5	5.0	6.1	7.0	8.6	9.9	12.1	14.0	17.3	20.0	22.5	24.8	28.9	32.6
17	3.6	5.1	6.2	7.2	8.8	10.2	12.5	14.5	17.8	20.6	23.2	25.5	29.7	33.5
18	3.7	5.3	6.4	7.4	9.1	10.5	12.9	14.9	18.3	21.2	23.8	26.2	30.5	34.4
19	3.8	5.4	6.6	7.6	9.3	10.8	13.2	15.3	18.8	21.8	24.4	26.9	31.3	35.3
20	3.9	5.5	6.8	7.8	9.6	11.0	13.5	15.7	19.3	22.3	25.0	27.5	32.0	36.1
22	4.1	5.8	7.1	8.2	10.0	11.6	14.2	16.4	20.2	23.4	26.2	28.8	33.5	37.7
24	4.3	6.1	7.4	8.5	10.5	12.1	14.8	17.1	21.0	24.4	27.3	30.0	34.9	39.3
26	4.5	6.3	7.7	8.9	10.9	12.6	15.4	17.8	21.9	25.3	28.4	31.2	36.3	40.8
28	4.6	6.5	8.0	9.2	11.3	13.0	16.0	18.5	22.7	26.3	29.5	32.4	37.6	42.2
30	4.8	6.8	8.3	9.5	11.7	13.5	16.5	19.1	23.5	27.2	30.5	33.5	38.8	43.6
35	5.2	7.3	8.9	10.3	12.6	14.6	17.9	20.6	25.3	29.3	32.8	36.0	41.8	47.0
40	5.5	7.8	9.5	11.0	13.5	15.6	19.1	22.0	27.0	31.3	35.0	38.5	44.6	50.0
45	5.9	8.3	10.1	11.7	14.3	16.5	20.2	23.4	28.7	33.2	37.1	40.7	47.2	53.0
50	6.2	8.7	10.7	12.3	15.1	17.4	21.3	24.6	30.2	34.9	39.1	42.9	49.7	55.7
60	6.8	9.5	11.7	13.5	16.5	19.0	23.3	27.0	33.0	38.2	42.8	46.9	54.3	60.9
70	7.3	10.3	12.6	14.5	17.8	20.6	25.2	29.1	35.7	41.2	46.1	50.6	58.6	65.6
80	7.8	11.0	13.5	15.5	19.0	22.0	26.9	31.1	38.1	44.0	49.3	54.0	62.5	70.0
90	8.3	11.7	14.3	16.5	20.2	23.3	28.5	33.0	40.4	46.7	52.3	57.3	66.3	74.2
100	8.7	12.3	15.1	17.4	21.3	24.6	30.1	34.7	42.6	49.2	55.0	60.3	69.8	78.2



a. The offset distance (T) for dynamic flexing should never exceed 25% of the centerline bend radius (R).

b. The gray shaded area of this chart may be used only for static offset applications.

c. When the offset motion occurs to both sides of the

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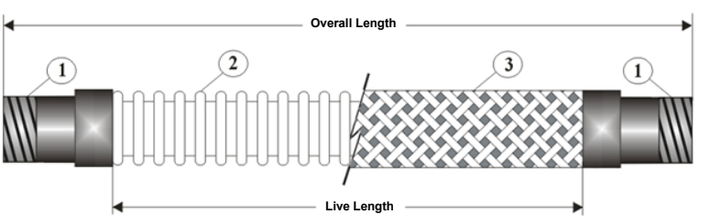
SSB Flex Connectors

SSB Flex Connectors have been designed to compensate for misalignments, dampen vibration, relieve stresses, prevent system shock and reduce noise in piping systems. The use of these SSB Flex Connectors in applications such as compressors, pumps, piping systems, and other mechanical equipment will improve and protect the overall operation of the equipment or system. These assemblies are constructed of high grade stainless steel annular corrugated metal hose with a single layer of stainless steel high tensile braid and are available in standard and non standard lengths and configurations. SSB Hose offers consistent high quality SSB Flex Connectors that are all pressure tested and accompanied with test certificates.

Standard SSB Flex Connector—CMCM

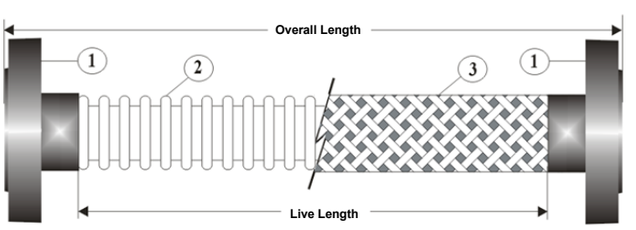
1) Carbon steel Male NPT sch40 (304 and 316 stainless steel optional)
2) 321 stainless steel annular hose (316 optional)
3) 304 stainless steel braid single layer



Size Inches	Standard Length	Live Length	Fitting Length	Working Pressure 70° F	Working Pressure 250° F	Approx. Wt. (lbs)
1/2"	12"	7"	2"	1100	1001	0.4
3/4"	12"	6 3/4"	2"	800	728	0.6
1"	12"	6 1/2"	2"	750	682	0.8
1 1/4"	12"	6 1/2"	2"	725	660	1.2
1 1/2"	12"	5 1/2"	2 1/2"	565	514	1.6
2"	12"	5 1/2"	2 1/2"	500	455	2.2
2 1/2"	14"	6"	3"	400	364	4.8
3"	14"	6"	3"	288	262	6.2

Standard SSB Flex Connector—CXCX

1) Carbon steel ANSI 150# RF flange (304 and 316 stainless steel optional)
2) 321 stainless steel annular hose (316 optional)
3) 304 stainless steel braid single layer



Size	Standard	Live	Fitting	Working Pressure	Approx.

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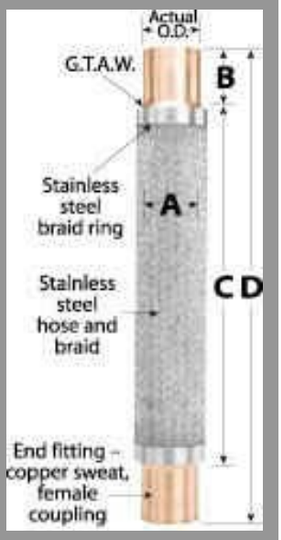
Copper Sweat Vibration Absorbers

- UL recognized for refrigeration applications
- All bronze construction and stainless with copper sweat construction
- Female sweat fittings

SSB Copper Sweat Vibration Absorbers are available to fit copper tubing O.D. sizes from 1/4" through 3-1/8". Construction utilizes copper alloy C51000 (95/5) core and commercial bronze C22000 (90/10) braid. Each Vibration Absorber is precision fabricated then cleaned, dried and sealed in bags for use on refrigeration and air-conditioning systems. Vapor barrier covers are also available.

1. Minimum burst pressure is 5 times the maximum working pressure.
2. Hose may be helical or annular type.
3. Hose = 300 series stainless Braid = 300 series stainless
4. Length =D±1/4
5. Hose Length: C=D-2B
6. Hose is not to be used with ammonia refrigerants.



ITEM NUMBER	TO FIT Copper Tube Actual O.D.	TO FIT Copper Tube Nominal Tube	"A" Nominal Hose I.D.	"B" Fitting Length	"D" Assembly Length	Maximum Working Pressure PSIG @ 70 Deg F
02H1B4BOBO8.2A	3/8	1/4	1/4	1/2	8 1/4	1000
03H1B4BOBO9A	1/2	3/8	3/8	5/8	9	1000
05H1B4BOBO9.7A	5/8	1/2	1/2	7/8	9 3/4	800
07H1B4BOBO10A	3/4	5/8	1/2	1	10	800
07H1B4BOBO11.5A	7/8	3/4	3/4	1 1/4	11 1/2	640
10H1B4BOBO13A	1 1/8	1	1	1 1/2	13	600
12H1B4BOBO14.7A	1 3/8	1 1/4	1 1/4	1 5/8	14 3/4	580
15H1B4BOBO17A	1 5/8	1 1/2	1 1/2	2	17	450
20H1B4BOBO20A	2 1/8	2	2	2 1/2	20	320
25H1B4BOBO24A	2 5/8	2 1/2	2 1/2	3	24	250
30H1B4BOBO27A	3 1/8	3	3	3 1/2	27	270
40H1B4BOBO33.3A	4 1/8	4	4	4 1/2	33 3/8	160

1. Minimum burst pressure is 5 times the maximum working pressure.
2. Hose may be helical or annular type.
3. Hose = C51000 (95/5) Braid = C22000 (90/10)
4. Length=D±1/4'
5. Hose Length: C=D-2B
6. Hose is not to be used with ammonia refrigerants.

ITEM NUMBER	TO FIT Copper Tube Actual	TO FIT Copper Tube Nominal	"A" Nominal Hose I.D.	"B" Fitting Length	"D" Assembly Length	Maximum Working Pressure PSIG @ 70 Deg F