

MASON-MERCER

STAINLESS STEEL or BRONZE BRAIDED HOSE

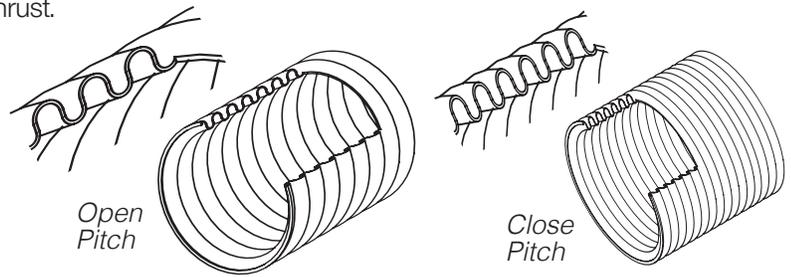


60 years ago (when the writer started), braided stainless steel hose had been in use for quite some time. As I remember, there were only a few major manufacturers, such as Chicago Metal Hose and Anaconda. For the most part, the smaller assemblers did not invest in the expensive equipment that forms straight tubing into the helical and annular forms, and certainly not in the complex braiding equipment. Thus the standards in the industry were maintained by the major firms.

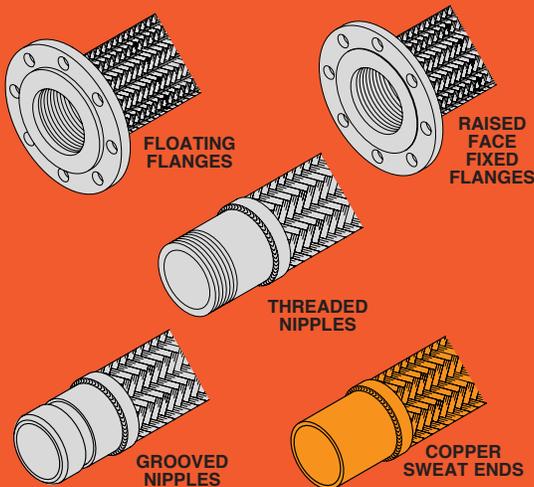
While helical hose (corrugations in a continuous helix) was still popular, the movement toward annular corrugations (each corrugation independent as in expansion joints) was moving along rapidly, because of lower stress and greater movement at a given pitch.

There were two broad descriptions of annular hose, Open and Close pitch, that described the spacing of the corrugations. In general, open pitch was used in low pressure applications where the braid was not required, and the hose might be used to take up some axial expansion as in diesel exhaust.

Close pitched hose was always used for transverse movement and applications where the stainless steel braid was required to control thrust.

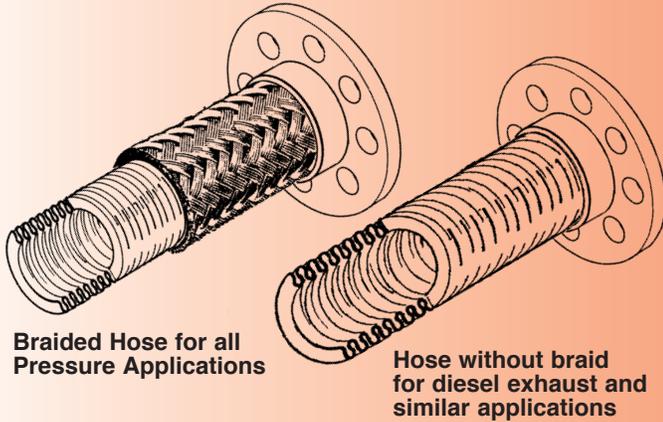


FITTING OPTIONS



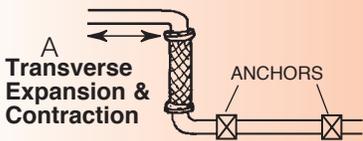
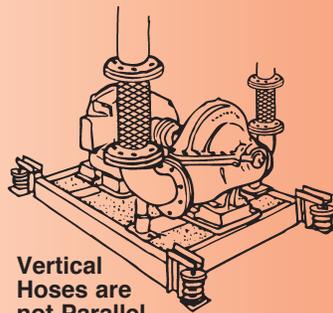
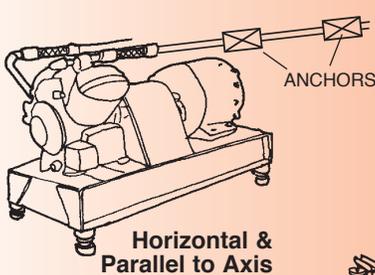
The corrugated hose provides flexibility and prevents leakage, but has virtually no resistance to pressure thrust. In a solid piping system, there is no external thrust, as the pressure on the projected area of the inside of the pipe is equalized by the two ends or bends in the pipe. The force is taken by the pipe wall. Once a flexible hose is inserted, that capability is gone.

When fluid or gas pressure is applied to each corrugation, it tends to open axially, and this adds to the thrust of the pipe area multiplied by the line pressure. As the thrust pulls on the anchored braid ends, the interwoven bias weave applies inward radial pressure to the corrugations as well. Pressure capability is largely a function of the braid. When higher pressures are needed, it is seldom accomplished by thicker tubing as you would lose flexibility. It is most often accommodated by increasing the strength of the braid, using braid with heavier wire or tighter spacing described as Double or Triple Braid or just multiple braid layers. While braid angle is an influence, a quick comparison of braid strength is to multiply the wire area by the total number of wires around the circumference.

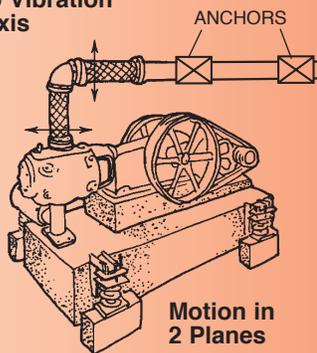


Since the braid is stretched taut by the pressure in the axial direction and kept that way, hoses cannot accept axial motion. All flexibility is at right angles to the axis, so the hose flexes transversely. Most machinery vibrates in a radial direction from the main shaft. Therefore, the hose should be installed parallel to the shaft for best performance, although it seldom is. It must be installed at a 90° angle to the motion in expansion applications. When major motion occurs in two planes, two hoses at right angles to each

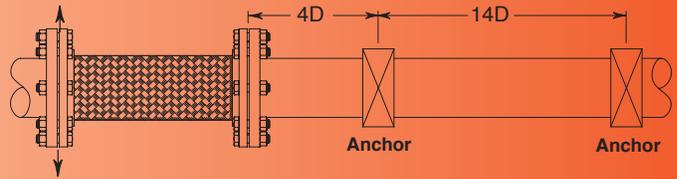
other are one way to solve the problem.



metallic hose offers more bend resistance as the pressure increases. The term "flexible" means flexure without fatigue rather than easy flexure. In many applications the pipeline must be anchored right after the hose



to force the hose to flex or the hose serves little purpose. For best results, one near the hose and the other some distance away provide a better solution, as pipe may pivot through one anchor. Spacing between anchors is a function of pipe diameter.



While we have influenced specifications over the years, our volume had always been very low, because we were not competitive. That has changed.

In setting standards for our new product range, we were dismayed to find that the term "Close Pitch" had almost become meaningless. Competitive literature does not include the number of corrugations per foot nor transverse stiffness. We are publishing pitch on all product pages and transverse stiffnesses on pages 5 & 6, so this bulletin begins to provide direction.

Do not be fooled by the salesman who bends a hose like a reed.

When most people visualize a hose flexing, the image is bending in an arc. Unfortunately, this is not true. When flanged hose is displaced, the rigid pipe flanges remain parallel. The hose remains relatively straight at both ends and takes an open "S" shape between the two ends, as shown below. Nippled hoses act the same way.



"S" Shaped Hose

Our hose has a safety factor of 4 times the rated pressure. When comparing allowable operating pressures with other manufacturers, ask for burst pressure. It may be they are working at a lower safety factor. We prefer not to.

All stainless steel hose loses strength at higher temperatures. In the interests of safety and good engineering, use the correction factors to lower ratings when lines are hot.

We arrived at our standards of corrugations per foot by buying samples from approximately six of the well known manufacturers. The variation was more than a factor of two. Our pitch matches the best of the competitors. Some other firms may have a tighter pitch, but our spacing ranks among the "quality suppliers" and makes the hose very flexible.

The question comes up as to why others do not use a tighter pitch. The answer is the fewer the corrugations, the shorter the length of the original tubing to arrive at a finished length, and the faster the forming process. This decreases cost in direct proportion to the shorter length of the original tubing. Flexibility suffers but the product is cheaper.

Our sales representatives already have a full sized photo comparing our braided copper sweat end hoses with a well known competitor's as shown below.

Our 4" live length is 68% longer than their 23/8". We stripped the braid and counted the corrugations. Their product, sold as "close pitched", had 5 active corrugations. We have 22 or 4.4 times as many.

That is why specifications and published information are so important. It is the end user's only protection.

For the past 50 years, we have based our vibration control mountings, hanger and pad recommendations on field experience. Rubber expansion joints have been tested acoustically and constantly improved for reliability. Since proper seismic restraint not only prevents property damage but more importantly saves lives, all of our seismic products are destruction tested for confirmation after design. We would not be living up to our self imposed standards without the same intense engineering attention to Stainless Steel Hose.

Based on visits to jobsites, we knew that very short hose lengths, the typical "plumbers helper", did nothing but possibly reduce misalignment stress. Holding both ends of the hose provided a sense of equal vibration with no reduction from one end to the other. Even double lengths seemed to act about the same way.

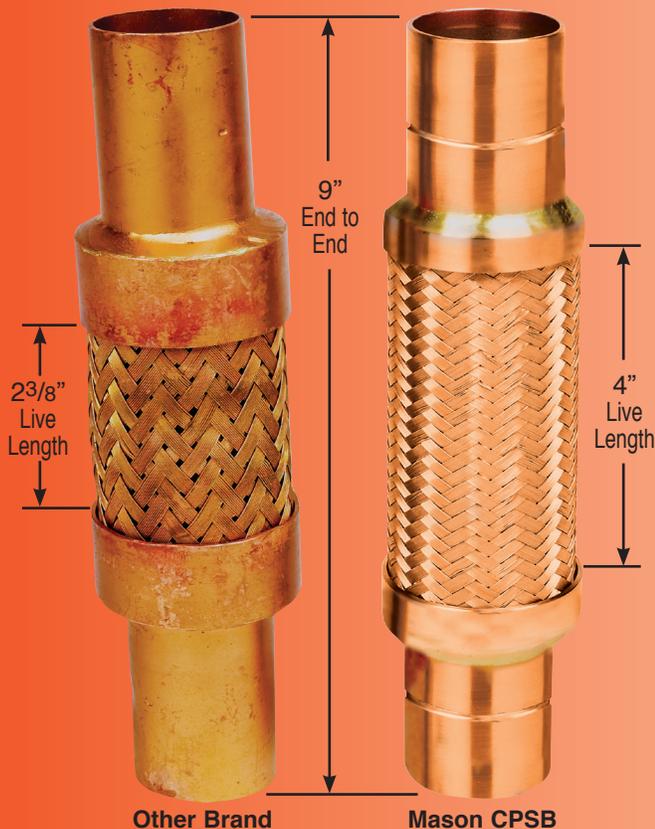
Experience always provides background for the next step. In machinery vibration control a theoretical isolator often failed to perform because the structure was not as stiff as the isolator. We solved the problem by producing isolators with lower stiffness than the structure.

We started this study by calculating transverse schedule 40 pipe stiffness. This is important as the hose faces this resistance.

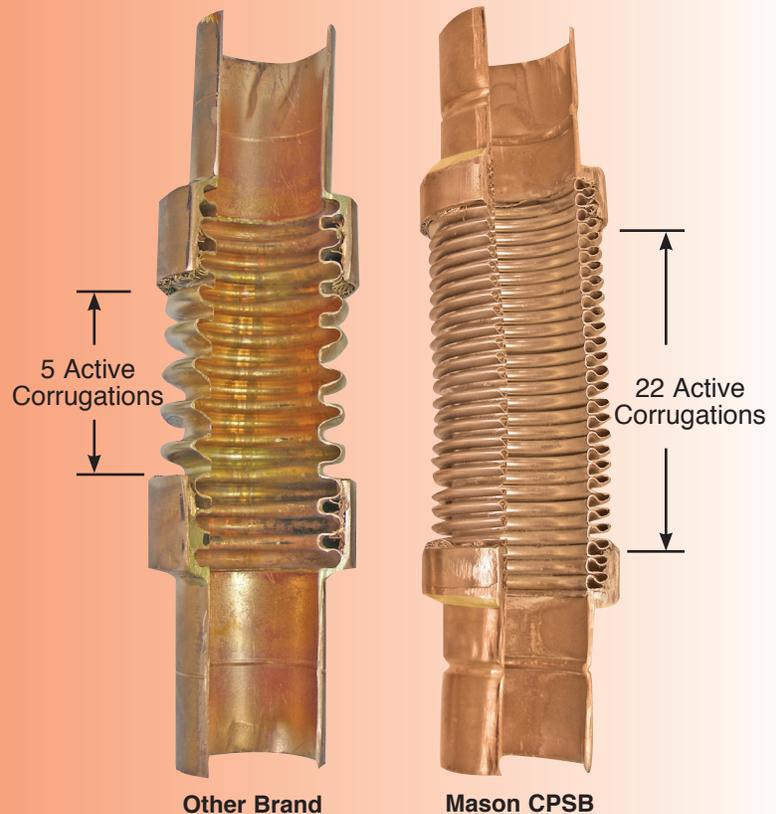
There are many manuals that provide hose designs for misalignment, misalignment and vibration amplitude or straight connectors for vibration only. However, we could find no information on the force required to move a hose transversely—the key factor in selecting a hose to reduce vibration transmission.

Pipeline vibration reduction is based on hose length, pressure and the bending resistance of the steel piping it is attached to. While a vibration amplitude of $\pm 1/8$ " would be unacceptably high, our study is based on that displacement as $\pm 1/8$ " is the industries' "Pump Connector" standard. When comparing the stiffnesses of straight pipe lengths versus flexible hoses, if the flexible hose has a transverse stiffness greater than the pipe it is connected to, there is no reason why it would reduce vibration transmission. There is the influence of the system's inertia based on the mass provided by check and shutoff valves, strainers, etc., as well as the mass of the pipe filled with water directly after the flexible hose, but that is a variable. While it must help, it is an unknown.

1 1/2" x 9" Copper Fitted Hoses



1 1/2" x 9" Cross Section of Copper Fitted Hoses (Braid Removed to Reveal Active Corrugations)



TEST DISCUSSION

Our in house capability does not include dynamic measurement. However, the following static data is the first publicized attempt to measure displacement forces as a basis for specifications. Despite recommendations to the contrary, the average pump installation has the hoses installed vertically.

The disturbing force is radial to the pump rotor. Since the hose is vertical, it is most effective when the unbalance is parallel to the floor and least when the force is vertical, as the hose is rigid in that direction. However, when the force is vertical, it is pushing or pulling the riser and in general, the riser and header are stiffer in that direction.

We continue to suggest two hoses at right angles to each other, or when only one hose is used, installed parallel to the axis of the pump, chiller, compressor, etc. While proper suggestions, we recognize piping restrictions often make it impossible.

The test results on pages 5 & 6 are the forces required to displace straight hose lengths 1/8" at three common pressures. These forces are compared to the resistance to 1/8" movement

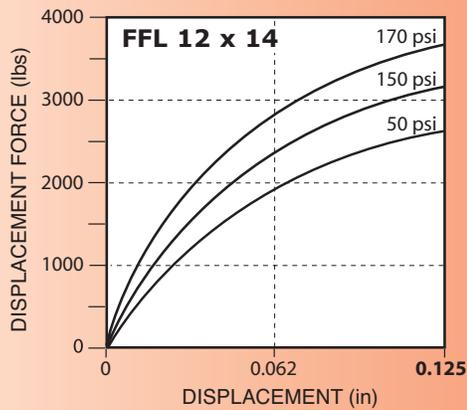
provided by 10', 8' and 6' lengths of schedule 40 Steel Pipe.

We used our computerized Baldwin Universal Tester so we could test two hoses in parallel to prevent machine distortion. Long lengths of pipes were bolted to the flanges at each end and guided through rigid rollers, so the flanges were held parallel as in the field. Water pressure was introduced by a hydraulic pump and measurements taken at 0, 50, 100, 150, 200 and 250psi. All readings were divided by 2 for single hose values. Since our hoses are all very close pitched and flexible, we believe competitive products would prove stiffer.

We tested a few hoses from the same lot and found variations. Therefore, our tabulations are only in the order of magnitude. We anticipated very large forces, but not as large as they turned out to be. Testing rig deflections lowered the 1/8" displacement values. 12" and larger data was not usable. 12", 14" and 16" numbers are extrapolations. We are rebuilding these jigs heavier and will publish corrected test information in the future. Similarly, very small sizes dropped below the testing machine's sensitivity, but they are in the proper direction.

We do not Recommend Industry Pump Connector Length.

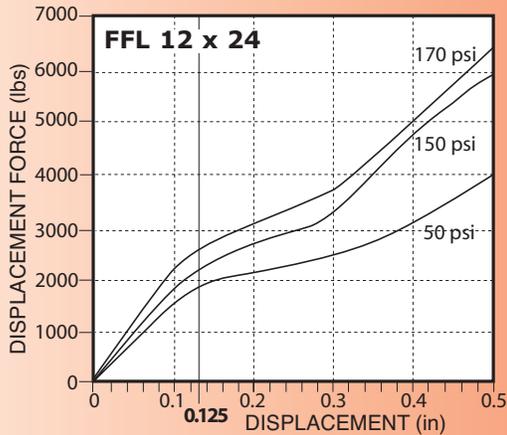
Displacement Force is 3690 lbs./0.125" at 170 psi.



Typical Short Industry Pump Connector 12" x 14" at Maximum 0.125" Offset

We also do not recommend 12 x 24 length.

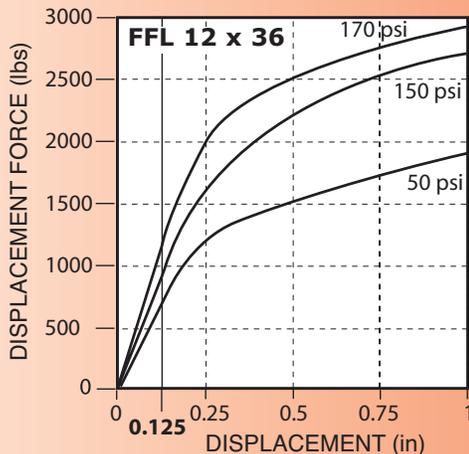
It is better than 12 x 14, but Displacement Force is still too high— 2650 lbs./0.125" at 170 psi.



FFL 12 x 24 at 0.5" Offset

Recommended Length

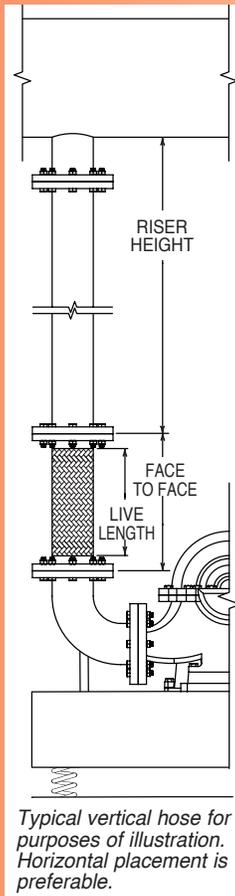
Displacement Force drops to 1150 lbs./0.125" at 170 psi.



FFL 12 x 36 at 1" Offset

In addition to corrugation count and configuration, live length rather than overall length is the stiffness control. All of our tables include this information. We have kept nipples as short as possible to maximize the flexible hose portion, but notice that a 1/2" x 6 1/2" MN has only 2 3/4" of live length, 1 1/4" x 8 1/2" only 3 1/4", 4" x 12" only 5". That is why the forces needed to move these "Pump Connector" lengths are so excessive. The live hose is so short that the connector has difficulty or finds it impossible to assume the shape shown in the bottom photograph on page 4.

The lengths suggested in our specifications are based on experience. The height of equipment rooms controls the length of the risers. The pressure depends on the height of the building. It is hard to visualize 1/2" through 2" threaded hoses that would be connected to pumps or other equipment with long risers that go to the ceiling. They might not be connected to risers at all. Small lines seldom operate at more than 150psi, because they service low buildings. Therefore, we are suggesting overall 24" lengths at 150psi. These selections show the forces needed to flex the hose are all below the stiffness of the pipe. The vibrating energy of small sized equipment is also lower and minimizes risk of serious transmission problems.



The same logic applies to the 2" through 4" sizes if we continue with the assumption that the pressure remains at 150psi. However, at 250psi, the hose stiffness increases dramatically. On virtually all major projects, the specifications allow for threaded nipples only through 2" diameter. So while we provide the force information for 2 1/2", 3" and 4" threaded nipple ends, our recommended lengths are based on flanged hoses in diameters of 2 1/2" and larger.

We have included copper pipe rather than ignoring it. However, copper tubing is both light and soft. Copper flexible hoses are better suited to allowing for thermal movement than reducing vibration.

Moving on to the larger diameter 2 1/2" through 16", we have to assume both higher pressures and longer risers. Typically a 4" pipe 8' long offers 90 lbs resistance to 1/8" movement. A 4" x 24" flanged hose at 150 psi has a resistance of 105 lbs., so it is too stiff. At 36" long, it drops to 50 lbs. and even at 250psi, 80 lbs., and still lower than the pipe stiffness. This sort of comparison is reasonable down through the study. A 36" FF length is about as long as practical because of valve heights and other problems. We are still synthesizing a great deal of information, so establishing one fixed length of 36" for 2 1/2" through 16" diameter appears to be a proper engineering choice at this time rather than an oversimplification.

BALDWIN TESTER REPORT ON FORCE REQUIRED TO DISPLACE 1/2" - 4" NIPPLED HOSES 1/8" Information provided as a general guide to magnitude

THREADED NIPPLE HOSES (American Units)

MN Hose Dia. (in)	Length End to End (in)	Live Length (in)	Corrugations per foot	Force Required for 1/8" displacement (lbs)					
				Hoses Water Pressure (psi)			Steel Pipe Schedule 40 Riser Length (feet)		
				50	150	250	6	8	10
1/2	6 1/2	2 3/4	92	6.0	14.0	20.0	0.5	0.2	0.1
1/2	12	8 1/4	92	0.8	0.8	1.0	lbs	lbs	lbs
1/2	18	14 1/4	92	1.0	1.0	1.0			
1/2	24	20 1/4	92	*0.3	0.4	0.5			
3/4	7	3 1/4	80	10.0	18.0	25.0	1.1	0.5	0.2
3/4	12	8 1/4	80	1.5	2.5	3.8	lbs	lbs	lbs
3/4	18	14 1/4	80	0.4	2.0	4.0			
3/4	24	20 1/4	80	* -	1.0	1.5			
1	8	3 3/4	72	13.0	30.0	50.0	2.5	1.1	0.6
1	12	7 3/4	72	2.0	4.0	12.0	lbs	lbs	lbs
1	18	13 3/4	72	0.5	1.5	2.5			
1	24	19 3/4	72	*0.5	1.0	1.5			
1 1/4	8 1/2	3 1/4	67	50	110	180	6	2.4	1.2
1 1/4	12	6 3/4	67	3.5	15	20	lbs	lbs	lbs
1 1/4	18	12 3/4	67	1.5	4	6.5			
1 1/4	24	18 3/4	67	-	2.5	3.5			
1 1/2	9	3 3/4	63	120	250	310	9	4	2
1 1/2	12	6 3/4	63	20	60	105	lbs	lbs	lbs
1 1/2	18	12 3/4	63	5	15	23			
1 1/2	24	18 3/4	63	3	6	8			
2	10 1/2	4 1/2	58	180	360	460	20	8	4
2	12	6	58	120	265	400	lbs	lbs	lbs
2	18	12	58	20	60	90			
2	24	18	58	6	15	23			
2 1/2	12	5	48	220	360	475	45	20	10
2 1/2	18	11	48	30	80	120	lbs	lbs	lbs
2 1/2	24	17	48	10	25	40			
3	12	5	46	350	600	750	90	35	20
3	18	11	46	100	190	250	lbs	lbs	lbs
3	24	17	46	35	70	110			
4	12	5	32	500	825	900	210	90	45
4	18	11	32	150	305	400	lbs	lbs	lbs
4	24	17	32	110	175	260			

*Adjusted for testing sensitivity.

THREADED NIPPLE HOSES (Metric Units)

MN Hose Dia. (mm)	Length End to End (mm)	Live Length (mm)	Corrugations per meter	Force Required for 3mm displacement (kg)					
				Hoses Water Pressure (kg/cm ²)			Steel Pipe Schedule 40 Riser Length (m)		
				3.4	10.3	17.2	1.8	2.4	3
15	165	70	302	2.7	6.4	9.1			
15	305	210	302	0.4	0.4	0.5	.23	.09	.05
15	457	362	302	0.5	0.5	0.5	kg	kg	kg
15	610	514	302	*0.1	0.2	0.2			
20	178	83	262	4.5	8.2	11.3	0.5	0.2	0.1
20	305	210	262	0.7	1.1	1.7	kg	kg	kg
20	457	362	262	0.2	0.9	1.8			
20	610	514	262	* -	0.5	0.7			
25	203	95	236	5.9	13.6	22.7	1.1	0.5	0.3
25	305	197	236	0.9	1.8	5.4	kg	kg	kg
25	457	349	236	0.2	0.7	1.1			
25	610	502	236	*0.2	0.5	0.7			
32	216	83	220	23	50	82	2.7	1.0	0.5
32	305	171	220	2	7	9	kg	kg	kg
32	457	234	220	1	2	3			
32	610	476	220	-	1	2			
40	229	95	207	54	113	141	4	2	0.9
40	305	171	207	9	27	48	kg	kg	kg
40	457	234	207	2	7	10			
40	610	476	207	1	3	4			
50	267	114	190	82	163	209	9	4	2
50	305	152	190	54	120	181	kg	kg	kg
50	457	305	190	9	27	41			
50	610	457	190	3	7	10			
65	305	127	157	100	163	216	20	9	4
65	457	279	157	14	36	54	kg	kg	kg
65	610	432	157	5	11	18			
75	305	127	151	159	272	340	40	17	9
75	457	279	151	45	86	113	kg	kg	kg
75	610	432	151	16	32	50			
100	305	127	105	227	374	408	96	40	21
100	457	279	105	68	138	181	kg	kg	kg
100	610	432	105	50	79	118			

BALDWIN TESTER REPORT ON FORCE REQUIRED TO DISPLACE 1 1/2" - 16" FLANGED HOSES 1/8"

Information provided as a general guide to magnitude

FLANGED END HOSES (American Units)

FFL Hose Dia. (in)	Length Face to Live (in)	Live Length (in)	Corrugations per foot	Force Required for 1/8" displacement (lbs)					
				Hoses Water Pressure (psi)			Steel Pipe Schedule 40 Riser Length (feet)		
				50	150	250	6	8	10
1 1/2	9	67/8	63	20	55	85	9	4	2
1 1/2	12	97/8	63	8	27	42	lbs	lbs	lbs
1 1/2	18	157/8	63	3	10	16			
1 1/2	24	217/8	63	2	6	6			
2	9	61/8	58	60	125	185	20	8	4
2	12	91/8	58	22	57	95	lbs	lbs	lbs
2	18	151/8	58	6	18	29			
2	24	211/8	58	3	10	15			
2 1/2	9	61/8	48	145	275	380	45	20	10
2 1/2	12	91/8	48	45	100	140	lbs	lbs	lbs
2 1/2	18	151/8	48	15	45	75			
2 1/2	24	211/8	48	7	25	35			
3	9	61/8	46	225	475	575	90	35	20
3	12	91/8	46	105	245	320	lbs	lbs	lbs
3	18	151/8	46	30	105	130			
3	24	211/8	46	15	55	80			
3	*36	331/8	46	10	35	50			
				50	100	200			
4	9	61/8	32	490	620	700	210	90	45
4	12	91/8	32	220	385	505	lbs	lbs	lbs
4	18	151/8	32	65	155	210			
4	24	211/8	32	40	105	155			
4	36	331/8	32	20	50	80			
5	12	87/8	29	440	650	750	440	190	95
5	18	147/8	29	190	355	420	lbs	lbs	lbs
5	24	207/8	29	85	195	225			
5	36	327/8	29	65	135	150			
6	12	87/8	25	675	950	1050	820	350	180
6	18	147/8	25	445	670	750	lbs	lbs	lbs
6	24	207/8	25	170	450	505			
6	36	327/8	25	70	155	180			
				50	150	180			
8	12	85/8	23	1200	1450	1680	2110	890	455
8	18	145/8	23	710	1250	1290	lbs	lbs	lbs
8	24	205/8	23	325	750	850			
8	36	325/8	23	155	400	425			
				50	150	170			
10	13	95/8	21	1870	2200	2590	4690	1980	1010
10	18	145/8	21	1345	1580	1860	lbs	lbs	lbs
10	24	205/8	21	900	1060	1250			
10	36	325/8	21	570	680	800			
12	*14	105/8	20	2670	3140	3690	8130	3430	1755
12	*24	205/8	20	1920	2250	2650	lbs	lbs	lbs
12	*36	325/8	20	830	980	1150			
14	*14	105/8	18	3970	4675	5500	10900	4600	2300
14	*36	325/8	18	2370	2780	3270	lbs	lbs	lbs
16	*16	125/8	16	5200	6120	7200	16400	6900	3500
16	*36	325/8	16	2860	3370	3960	lbs	lbs	lbs

*Not tested. Best estimates.

FLANGED END HOSES (Metric Units)

FFL Hose Dia. (mm)	Length Face to Live (mm)	Live Length (mm)	Corrugations per meter	Force Required for 3mm displacement (kg)					
				Hoses Water Pressure (kg/cm ²)			Steel Pipe Schedule 40 Riser Length (m)		
				3.4	10.3	17.2	1.8	2.4	3
40	229	175	207	9	25	39	4	2	1
40	305	251	207	4	12	19	kg	kg	kg
40	457	403	207	1	5	7			
40	607	556	207	1	2	2			
50	229	156	190	27	57	84	9	4	2
50	305	232	190	10	26	43	kg	kg	kg
50	457	384	190	3	8	13			
50	610	537	190	1	5	7			
65	229	156	157	66	125	173	21	9	5
65	305	232	157	20	45	64	kg	kg	kg
65	457	384	157	7	20	34			
65	610	537	157	3	11	16			
75	229	156	151	102	215	261	40	17	9
75	305	232	151	48	111	145	kg	kg	kg
75	457	384	151	14	48	59			
75	610	537	151	7	25	36			
75	*914	841	151	5	16	23			
				3.4	6.9	13.8			
100	229	156	105	222	281	318	96	41	21
100	305	232	105	100	175	229	kg	kg	kg
100	457	384	105	30	70	96			
100	610	537	105	18	48	70			
100	914	841	105	9	23	36			
125	305	225	95	200	295	340	201	85	44
125	457	378	95	86	161	191	kg	kg	kg
125	610	530	95	39	89	102			
125	914	835	95	30	61	68			
150	305	225	82	306	431	476	371	157	81
150	457	378	82	202	304	340	kg	kg	kg
150	610	530	82	76	204	229			
150	914	835	82	32	70	82			
				3.4	10.3	12.4			
200	305	219	75	544	658	760	958	405	207
200	457	371	75	322	567	585	kg	kg	kg
200	610	524	75	147	340	386			
200	914	829	75	70	181	193			
				3.4	10.3	11.7			
250	330	244	69	848	998	1175	2128	898	460
250	457	371	69	610	717	844	kg	kg	kg
250	610	524	69	408	481	567			
250	914	829	69	259	308	363			
300	*256	270	66	1211	1424	1674	3688	1556	797
300	*610	524	66	871	1021	1202	kg	kg	kg
300	*914	829	66	376	445	522			
350	*256	270	59	1801	2121	2495	4930	2080	1065
350	*914	829	59	1075	1261	1483	kg	kg	kg
400	*406	321	52	2359	2776	3266	7430	3134	1605
400	*914	829	52	1297	1529	1796	kg	kg	kg

SPECIFICATION

Flexible stainless steel hoses with a safety factor of 4 shall be manufactured using type 304 stainless steel braided hose with one fixed and one floating raised face carbon steel plate flange. Sizes 2 1/2" (65mm) and smaller may have threaded nipples. Copper sweat ends, 4" (100mm) and smaller, may have SS (gas service) or Bronze (water service) bodies. Grooved ends may be used in sizes 2" (50mm) through 12" (300mm). Welding is not acceptable. Minimum lengths, minimum live lengths and minimum number of convolutions per foot to assure flexibility are as tabulated. Shorter lengths are not acceptable.

Hoses shall be installed on the equipment side of the shut off valves horizontal and parallel to the equipment shafts wherever possible.

Submittals shall include original test data showing force/displacement, fittings, material, live lengths, number of corrugations per foot and safety factor at pressure ratings. Hoses shall be type **BSS** or **CPSB** as manufactured by Mason Industries, Inc.

Pipe or Tubing Size (in)	FLANGED		THREADED		GROOVED		COPPER SWEAT BRONZE*		Min. Convolutions per (foot)
	Face to Live (in)	Live Length (in)	End to Live (in)	Live Length (in)	End to Live (in)	Live Length (in)	End to Live (in)		
1/2	-	-	24	193/4	-	-	18	141/4	92
3/4	-	-	24	193/4	-	-	18	133/4	80
1	-	-	24	193/4	-	-	18	133/8	72
1 1/4	-	-	24	183/4	-	-	18	131/4	67
1 1/2	24	217/8	24	183/4	-	-	18	13	63
2	24	211/8	24	18	24	18	18	121/2	58
2 1/2	24	211/8	24	17	24	18	18	103/4	48
3	36	331/8	36	29	36	30	18	101/2	46
4	36	331/8	36	29	36	28	24	151/2	32
5	36	327/8	-	-	36	28	-	-	29
6	36	327/8	-	-	36	28	-	-	25
8	36	325/8	-	-	36	28	-	-	23
10	36	325/8	-	-	36	26	-	-	21
12	36	325/8	-	-	36	26	-	-	20
14	36	325/8	-	-	-	-	-	-	18
16	36	325/8	-	-	-	-	-	-	16

Pipe or Tubing Size (mm)	FLANGED		THREADED		GROOVED		COPPER SWEAT BRONZE*		Min. Convolutions per (meter)
	Face to Live (mm)	Live Length (mm)	End to Live (mm)	Live Length (mm)	End to Live (mm)	Live Length (mm)	End to Live (mm)		
15	-	-	610	502	-	-	457	362	302
20	-	-	610	502	-	-	457	349	262
25	-	-	610	502	-	-	457	340	236
30	-	-	610	476	-	-	457	337	220
40	610	556	610	476	-	-	457	330	207
50	610	537	610	457	610	457	457	318	190
65	610	537	610	432	610	457	457	273	157
75	914	841	914	737	914	762	457	267	151
100	914	841	914	737	914	711	457	394	105
125	914	835	-	-	914	711	-	-	95
150	914	835	-	-	914	711	-	-	82
200	914	829	-	-	914	711	-	-	75
250	914	829	-	-	914	660	-	-	69
300	914	829	-	-	914	660	-	-	66
350	914	829	-	-	-	-	-	-	59
400	914	829	-	-	-	-	-	-	52

6 *Sweat ends on bronze hose have not been tested. We believe copper lines are so ductile and light, hoses only allow for offset, so longer than Pump Connector lengths are justified, but very long lengths would be overkill.

PRODUCT TABLES

The tables on the following pages cover stock lengths. We describe capability in terms of allowable offset and normal vibration. Normal vibration is the amplitude you would expect at pump, chiller, air compressor connections, etc. These lengths do not describe what is needed for seismic motion on isolated machinery. We would be more than pleased to design to requirements for any special lengths, but the basic rule is the longer the length, the lower the transmitted vibration.

Of all fittings used with stainless steel hoses, the most common are two threaded ends or two flanges. Flexibility depends not on the overall

length, but on the live length of hose between the braid rings. In terms of vibration transmission and allowable movement, flanged connectors of the same length are superior to nipple ends of one kind or another. The nipples are longer than the flanges are thick, and the same braid ring is used in both cases. So for a given length, flanged hose has longer live hose. It is important that you know the live length you are buying, so this information is included in all of our descriptive tables.

All ratings are extremely conservative. We sometimes allow more motion for a given length when we know specifics.

ALSO AVAILABLE

Mason Vee Hoses are also available with CSA approval for natural gas, and UL approval for fire protection and potable water as follows.

CSA Series SPECIAL TESTED, INSPECTED AND TAGGED GAS HOSES



These assemblies have been "CSA" approved for use on gas pipelines. "CSA" is the current certification agency for gas industry products, assuming the authority formerly associated with the American Gas Association (AGA).

Our Certification Report is #230720-1764990. This Certification meets all requirements of ANSI/UL #536- 1997 Standards for Flexible Metal Hose.

CSAMN– SS Braided Hose with Carbon Steel Threaded Nipples

CSAWN– SS Braided Hose with Carbon Steel Weld Nipples (see p.16)

CSAFFL– SS Braided Hose with Carbon Steel Fixed and Floating Flanges

All dimensions are the same as standard products. Rated Pressure @ 70°F (21°C) is 175 psi (12kg/cm²).

MG Series HOSES CLEANED FOR MEDICAL GAS

CPSB-MG– Bronze Braided Hose with Copper Female Sweat Ends

NSF Series SPECIAL TESTED, INSPECTED AND TAGGED HOSES for WATER QUALITY ANNEX G of ANSI/NSF-61 and NSF-372



MNSS-NSF– SS Braided Hose with Stainless Steel Threaded Nipples

FFLSS-NSF– SS Braided Hose with Stainless Steel Fixed and Floating Flanges

CPSB-NSF– Bronze Braided Hose with Copper Female Sweat Ends

All dimensions are the same as standard products. Rated Pressure @ 70°F (21°C) is 175 psi (12kg/cm²).

UL Series SPECIAL TESTED, INSPECTED AND TAGGED HOSES for SPRINKLER and FIRE PROTECTION SYSTEMS



FLEXIBLE JOINT FITTINGS
3VX9



MN-UL– SS Braided Hose with Carbon Steel Threaded Nipples

FFL-UL– SS Braided Hose with Carbon Steel Fixed and Floating Flanges

GWN-UL– SS Braided Hose with Carbon Steel Grooved Weld Nipples

GWNF-UL– SS Braided Hose with Carbon Steel Grooved Nipple and Fixed Flange

CPSB-UL– Bronze Braided Hose with Copper Female Sweat Ends

MN-SS Braided Hose with Carbon Steel Threaded Nipples

Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher than our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

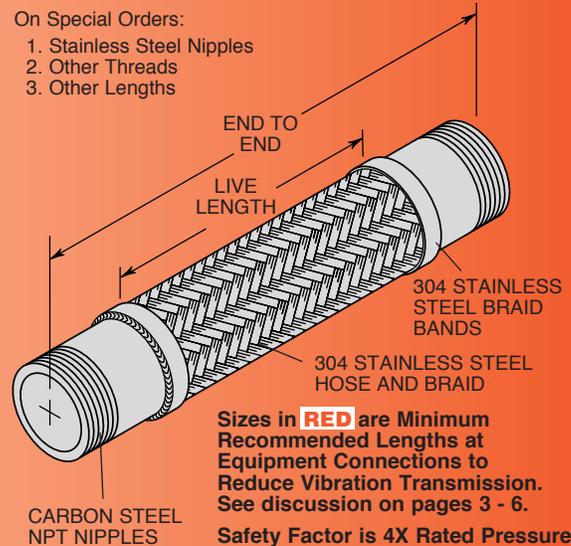
304 SS can be used up to 850°F 454°C in applications such as engine exhaust.

When using MN products in copper or brass water or steam systems, dielectric couplings must be used on each end to prevent leakage from galvanic action.

CARBON STEEL NPT NIPPLES Standard

On Special Orders:

1. Stainless Steel Nipples
2. Other Threads
3. Other Lengths



Sizes in **RED** are Minimum Recommended Lengths at Equipment Connections to Reduce Vibration Transmission. See discussion on pages 3 - 6.

Safety Factor is 4X Rated Pressure. Full Vacuum Rating— 30" 762mm Hg

RATED PRESSURES @ ELEVATED TEMPERATURES (psi) (kg/cm²)

Hose Size (in) (mm)	250°F 121°C		350°F 176°C		450°F 232°C	
	Factor 0.92	Factor 0.86	Factor 0.86	Factor 0.81	Factor 0.81	Factor 0.76
1/2 15	1010	69	950	59	890	61
3/4 20	640	44	600	41	570	39
1 25	530	36	500	34	470	32
1 1/4 32	460	32	430	30	400	28
1 1/2 40	400	28	370	26	350	24
2 50	330	23	310	21	290	20
2 1/2 65	270	19	250	17	235	16
3 80	260	18	240	16	230	16
4 100	210	15	200	14	190	12

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in) (mm)	Max Gauge (psi) (kg/cm ²)	Temp Reference (°F) (°C)
1/2 15	200 14	387 197
3/4 20	200 14	387 197
1 25	150 11	362 183
1 1/4 32	150 11	362 183
1 1/2 40	150 11	362 183
2 50	150 11	362 183
2 1/2 65	125 9	355 179
3 80	125 9	355 179
4 100	125 9	355 179

STOCK SIZES and LENGTHS

MN DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Pipe Size & End to End (in)	Live Length (in)	Corrugations per foot	Maximum Lateral Offset (in)	Force Req'd for Max. Offset at 250psi or lower Rated Pressure (lbs)	Rated Pressure @70°F (psi)
MN	1/2 x 6 1/2*	25/8	92	1/8	20	1100
MN	1/2 x 12	81/8	92	11/4	9	1100
MN	1/2 x 18	141/8	92	4	7	1100
MN	1/2 x 24	201/8	92	7 1/2	6	1100
MN	1/2 x 36	321/8	92	16	0	1100
MN	3/4 x 7*	31/8	80	1/8	25	700
MN	3/4 x 12	81/8	80	1	12	700
MN	3/4 x 18	141/8	80	2 1/4	9	700
MN	3/4 x 24	201/8	80	3 1/4	8	700
MN	3/4 x 36	321/8	80	14	0	700
MN	1 x 8*	35/8	72	1/8	50	580
MN	1 x 12	75/8	72	1	25	580
MN	1 x 18	135/8	72	3	9	580
MN	1 x 24	195/8	72	6 1/2	8	580
MN	1 x 36	315/8	72	11	0	580
MN	1 1/4 x 8 1/2*	35/8	67	1/8	180	480
MN	1 1/4 x 12	71/8	67	3/4	35	480
MN	1 1/4 x 18	131/8	67	2 1/4	18	480
MN	1 1/4 x 24	191/8	67	5	13	480
MN	1 1/4 x 36	311/8	67	10	0	480
MN	1 1/2 x 9*	41/8	63	1/8	310	450
MN	1 1/2 x 12	71/8	63	5/8	170	450
MN	1 1/2 x 18	131/8	63	2	110	450
MN	1 1/2 x 24	191/8	63	4 1/2	30	450
MN	1 1/2 x 36	311/8	63	9	0	450
MN	2 x 10 1/2*	51/4	58	1/8	460	360
MN	2 x 12	63/4	58	3/8	225	360
MN	2 x 18	123/4	58	1 1/2	125	360
MN	2 x 24	183/4	58	3 3/4	60	360
MN	2 x 36	303/4	58	8	0	360
MN	2 1/2 x 12*	5	48	1/8	475	290
MN	2 1/2 x 18	11	48	1 1/4	325	290
MN	2 1/2 x 24	17	48	3	160	290
MN	2 1/2 x 36	29	48	7	0	290
MN	3 x 12*	5	46	1/8	750	280
MN	3 x 18	11	46	1	600	280
MN	3 x 24	17	46	2 1/2	390	280
MN	3 x 36	29	46	6	0	280
MN	4 x 12*	5	32	1/8	900	225
MN	4 x 18	11	32	1/2	800	225
MN	4 x 24	17	32	3/4	450	225
MN	4 x 36	29	32	5	0	225

MN DIMENSIONS AND PRESSURE RATINGS (Metric Units)

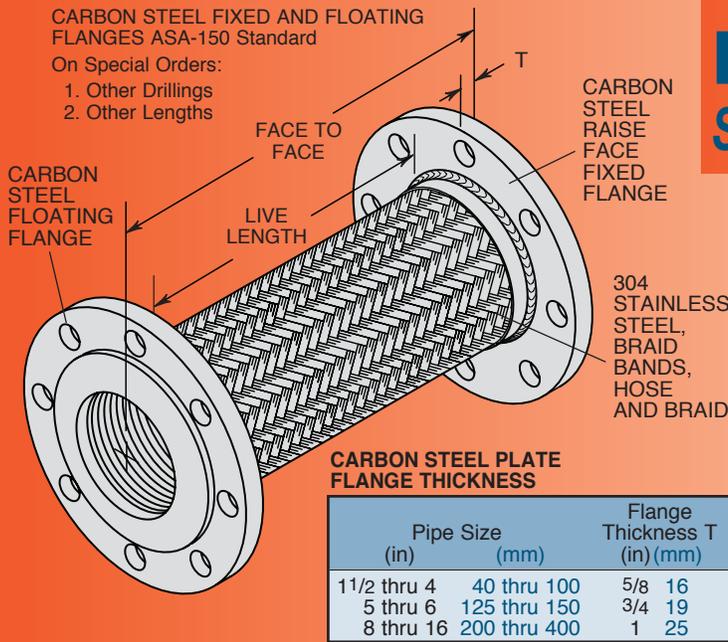
Type	Pipe Size & End to End (mm)	Live Length (mm)	Corrugations per meter	Maximum Lateral Offset (mm)	Force Req'd for Max. Offset at 17kg/cm ² or lower Rated Pressure (kg)	Rated Pressure @21°C (kg/cm ²)
MN	15 x 165*	67	302	3	9	77
MN	15 x 305	207	302	32	4	77
MN	15 x 457	359	302	102	3	77
MN	15 x 610	512	302	191	3	77
MN	15 x 914	816	302	406	3	77
MN	20 x 178*	80	262	3	11	49
MN	20 x 305	207	262	29	5	49
MN	20 x 457	359	262	89	4	49
MN	20 x 610	512	262	178	3	49
MN	20 x 914	816	262	356	0	49
MN	25 x 203*	93	236	3	23	40
MN	25 x 305	194	236	25	11	40
MN	25 x 457	347	236	76	4	40
MN	25 x 610	499	236	165	3	40
MN	25 x 914	804	236	279	0	40
MN	32 x 216*	94	220	3	82	33
MN	32 x 305	183	220	19	16	33
MN	32 x 457	335	220	57	8	33
MN	32 x 610	488	220	127	6	33
MN	32 x 914	792	220	254	6	33
MN	40 x 229*	107	207	3	141	31
MN	40 x 305	183	207	16	77	31
MN	40 x 457	335	207	51	50	31
MN	40 x 610	488	207	214	14	31
MN	40 x 914	792	207	229	0	31
MN	50 x 267*	135	190	3	209	25
MN	50 x 305	173	190	10	102	25
MN	50 x 457	325	190	38	57	25
MN	50 x 610	478	190	95	27	25
MN	50 x 914	782	190	203	0	25
MN	65 x 305*	127	157	3	215	20
MN	65 x 457	279	157	32	147	20
MN	65 x 610	432	157	76	73	20
MN	65 x 914	737	157	178	0	20
MN	80 x 305*	127	151	3	340	19
MN	80 x 457	279	151	25	272	19
MN	80 x 610	432	151	65	177	19
MN	80 x 914	737	151	152	41	19
MN	100 x 305*	127	105	3	408	15
MN	100 x 457	279	105	19	363	15
MN	100 x 610	432	105	44	204	15
MN	100 x 914	737	105	127	91	15

End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

*Industry Pump Connector Lengths are not recommended, but supplied on demand.

FFL- SS Braided Hose with Carbon Steel Fixed & Floating Flanges



FFL Braided Stainless Steel Hose has fixed and floating raised face flanges. Years ago, almost all stainless steel hose was manufactured with a floating flange on one end. It is still important because it makes lining up the holes easier during installation, and eliminates the possibility of twisting the hose, when the holes do not line up. Twisting contributes to early failure.

Raised face flanges seal better. Most competitive plate flanges have flat faces to reduce machining costs, but the raised face is the better product as sealing pressure increases by factors of 2 & 3 because of the reduced gasket area.

All of our stocked flanged hose has one floating flange.

Sizes in **RED** are Minimum Recommended Lengths at Equipment Connections to Reduce Vibration Transmission. See discussion on p.3 - 6.

For RATED PRESSURES @ ELEVATED TEMPERATURES and SATURATED STEAM RECOMMENDED PRESSURE LIMITS, see p.10.

Safety Factor is 4X Rated Pressure. Full Vacuum Rating—30" 762mm Hg

STOCK SIZES and LENGTHS

FFL DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Pipe Size & Face to Face (in)	Live Length (in)	Corrugations per foot	Maximum Lateral Offset (in)	Force Req'd for Max. Offset at 250psi or lower Rated Pressure (lbs)	Rated Pressure @70°F (psi)
FFL	1 1/2 X 9*	63/4	63	1/8	83	450
FFL	1 1/2 X 12	93/4	63	11/4	85	450
FFL	1 1/2 X 18	153/4	63	31/2	40	450
FFL	1 1/2 X 24	213/4	63	61/2	30	450
FFL	2 X 9*	63/4	58	1/8	185	360
FFL	2 X 12	93/4	58	11/8	180	360
FFL	2 X 18	153/4	58	21/2	80	360
FFL	2 X 24	213/4	58	5	45	360
FFL	2 1/2 X 9*	6	48	1/8	380	290
FFL	2 1/2 X 12	9	48	1	345	290
FFL	2 1/2 X 18	15	48	21/4	215	290
FFL	2 1/2 X 24	21	48	43/4	110	290
FFL	3 X 9*	6	46	1/8	575	280
FFL	3 X 12	93/4	46	7/8	770	280
FFL	3 X 18	153/4	46	2	335	280
FFL	3 X 24	213/4	46	4	205	280
FFL	3 X 36	333/4	46	8	100 ***	280
FFL	4 X 9*	6	32	1/8	700	225
FFL	4 X 12	93/4	32	3/4	1155	225
FFL	4 X 18	153/4	32	11/2	525	225
FFL	4 X 24	213/4	32	31/2	485	225
FFL	4 X 36	333/4	32	7	220 ***	225
FFL	5 X 12*	83/4	29	1/8	750	200
FFL	5 X 18	143/4	29	11/4	710	200
FFL	5 X 24	203/4	29	21/4	575	200
FFL	5 X 36	323/4	29	51/2	430	200
FFL	6 X 12*	83/4	25	1/8	1050	200
FFL	6 X 18	143/4	25	1	2175	200
FFL	6 X 24	203/4	25	2	1485	200
FFL	6 X 36	323/4	25	5	620	200
FFL	8 X 12*	81/2	23	1/8	1680	200
FFL	8 X 18	141/2	23	7/8	3280	200
FFL	8 X 24	201/2	23	11/2	3180	200
FFL	8 X 36	321/2	23	4	1405	200
FFL	10 X 13*	91/2	21	1/8	2590	170
FFL	10 X 18	141/2	21	3/4	3750	170
FFL	10 X 24	201/2	21	11/4	4020	170
FFL	10 X 36	321/2	21	3	2230	170
FFL	12 X 14*	101/2	20	1/8	3690	170
FFL	12 X 24	201/2	20	1	4950	170
FFL	12 X 36	321/2	20	21/2	2960	170
FFL	14 X 14*	101/2	18	1/8	5500	170
FFL	14 X 36	321/2	18	11/4	12000	170
FFL	16 X 16*	121/2	16	1/8	7200	170
FFL	16 X 36	321/2	16	1	15000	170

FFL DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Pipe Size & Face to Face (mm)	Live Length (mm)	Corrugations per meter	Maximum Lateral Offset (mm)	Force Req'd for Max. Offset at 17kg/cm² or lower Rated Pressure (kg)	Rated Pressure @21°C (kg/cm²)
FFL	40 X 229*	171	207	3	38	31
FFL	40 X 305	248	207	32	39	31
FFL	40 X 457	400	207	89	18	31
FFL	40 X 610	552	207	165	14	31
FFL	50 X 229*	171	190	3	84	25
FFL	50 X 305	248	190	29	82	25
FFL	50 X 457	400	190	64	36	25
FFL	50 X 610	552	190	127	20	25
FFL	65 X 229*	152	157	3	171	20
FFL	65 X 305	248	157	25	156	20
FFL	65 X 457	400	157	57	98	20
FFL	65 X 610	552	157	121	50	20
FFL	80 X 229*	152	151	3	259	19
FFL	80 X 305	248	151	22	349	19
FFL	80 X 457	400	151	51	152	19
FFL	80 X 610	552	151	102	93	19
FFL	80 X 914	857	151	203	45 ***	19
FFL	100 X 229*	152	105	3	319	15
FFL	100 X 305	248	105	19	524	15
FFL	100 X 457	400	105	38	238	15
FFL	100 X 610	552	105	89	220	15
FFL	100 X 914	857	105	178	100 ***	15
FFL	125 X 305*	222	95	3	340	14
FFL	125 X 457	375	95	32	322	14
FFL	125 X 610	527	95	57	261	14
FFL	125 X 914	832	95	140	195	14
FFL	150 X 305*	222	82	3	476	14
FFL	150 X 457	375	82	25	987	14
FFL	150 X 610	527	82	51	674	14
FFL	150 X 914	832	82	127	281	14
FFL	200 X 305*	216	75	3	762	14
FFL	200 X 457	368	75	22	1488	14
FFL	200 X 610	521	75	32	1442	14
FFL	200 X 914	832	75	102	637	14
FFL	250 X 330*	241	69	3	1175	11
FFL	250 X 457	368	69	19	1701	11
FFL	250 X 610	521	69	32	1823	11
FFL	250 X 914	826	69	76	1012	11
FFL	300 X 356*	267	66	3	1674	11
FFL	300 X 610	521	66	25	2245	11
FFL	300 X 914	826	66	64	1343	11
FFL	350 X 356*	267	59	3	2495	11
FFL	350 X 914	826	59	32	5443	11
FFL	400 X 406*	318	52	3	3266	11
FFL	400 X 914	826	52	25	6804	11

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.
Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.
Sizes 12" - 16" 300-400mm have double braid. **Estimated.

FFLSS- SS Braided Hose with Stainless Steel Fixed & Floating Flanges

STAINLESS STEEL FIXED AND FLOATING FLANGES ASA-150 Drilling Standard

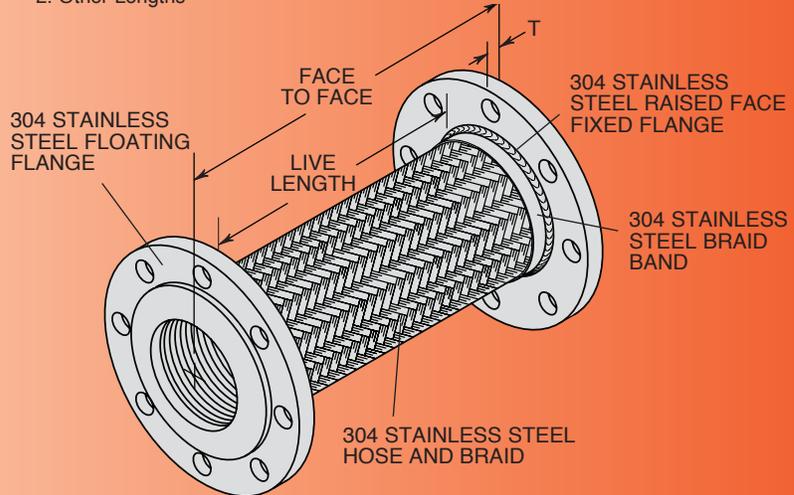
On Special Orders:

1. Other Drillings
2. Other Lengths

STAINLESS STEEL PLATE FLANGE THICKNESS

Pipe Size		Flange Thickness T
(in)	(mm)	(in) (mm)
2 thru 4	50 thru 100	5/8 16
5 thru 6	125 thru 150	3/4 19
8 thru 12	200 thru 300	1 25

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" 762mm Hg



STOCK SIZES and LENGTHS

FFLSS DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Pipe Size & Face to Face (in)	Live Length (in)	Corrugations per foot	Maximum Lateral Offset (in)	Force Req'd for Max. Offset at 250psi or lower Rated Pressure (lbs)	Rated Pressure @70°F (psi)
FFLSS	2 X 12	93/4	58	11/8	180	360
FFLSS	2 1/2 X 12	9	48	1	345	290
FFLSS	3 X 12	9	46	7/8	770	280
FFLSS	4 X 12	9	32	3/4	1155	225
FFLSS	4 X 18	15	32	1 1/2	525	225
FFLSS	5 X 18	143/4	29	1 1/8	710	200
FFLSS	6 X 18	143/4	25	1	2175	200
FFLSS	8 X 24	197/8	23	1 1/2	3180	200
FFLSS	10 X 24	197/8	21	1 1/4	4020	170
FFLSS	12 X 24	197/8	20	1	4950	170

FFLSS DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Pipe Size & Face to Face (mm)	Live Length (mm)	Corrugations per meter	Maximum Lateral Offset (mm)	Force Req'd for Max. Offset at 17kg/cm² or lower Rated Pressure (kg)	Rated Pressure @21°C (kg/cm²)
FFLSS	50 X 305	248	190	29	82	25
FFLSS	65 X 305	229	157	25	156	20
FFLSS	80 X 305	229	151	22	349	19
FFLSS	100 X 305	229	105	19	524	15
FFLSS	100 X 457	381	105	38	238	15
FFLSS	125 X 457	375	95	29	322	14
FFLSS	150 X 457	375	82	25	987	14
FFLSS	200 X 610	521	75	38	1488	14
FFLSS	250 X 610	521	69	32	1175	11
FFLSS	300 X 610	521	66	25	1674	11

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.
Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.
Sizes 12" 300mm have double braid.

NOTE: In applications calling for stainless flanges and meeting special overall vibration reduction lengths, order to specified lengths.

Rated Pressure @ Elevated Temperatures for FFL and FFLSS

RATED PRESSURES @ ELEVATED TEMPERATURES (psi) (kg/cm²)

Hose Size (in) (mm)	ELEVATED TEMPERATURES (psi) (kg/cm²)		
	250°F 121°C Factor 0.92	350°F 176°C Factor 0.86	450°F 232°C Factor 0.81
1 1/2 40	400 28	370 26	350 24
2 50	330 23	310 21	290 20
2 1/2 65	270 19	250 17	235 16
3 80	260 18	240 16	230 16
4 100	210 15	200 14	190 13
5 125	190 13	180 12	170 11
6 150	190 13	180 12	170 11
8 200	190 13	180 12	170 11
10 250	160 11	150 10	140 9
12 300	160 11	150 10	140 9
14 350	160 11	150 10	140 9
16 400	160 11	150 10	140 9

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in) (mm)	Max Gauge (psi) (kg/cm²)		Temp Reference (°F) (°C)	
	1 1/2 40	150 11	362 183	183
2 50	150 11	362 183	183	
2 1/2 65	125 9	355 179	179	
3 80	125 9	355 179	179	
4 100	125 9	355 179	179	
5 125	100 7	337 169	169	
6 150	100 7	337 169	169	
8 200	75 5	320 160	160	
10 250	60 4	307 153	153	
12 300	60 4	307 153	153	
14 350	60 4	307 153	153	
16 400	60 4	307 153	153	

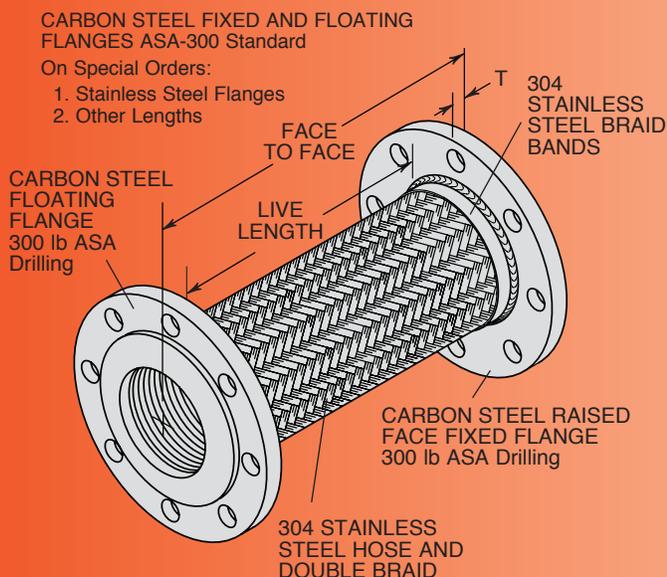
Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher than our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

304 SS can be used up to 850°F 454°C in applications such as engine exhaust with minor pressure.

When using FFL(SS) products in copper or brass water or steam systems, dielectric flanges must be used on each end to prevent leakage from galvanic action.

FFL2B300- SS Double Braided Hose with Carbon Steel 300 ASA Flanges



RATED PRESSURES @ ELEVATED TEMPERATURES (psi)(kg/cm²)

Hose Size (in) (mm)	250°F 121°C Factor 0.92	350°F 176°C Factor 0.86	450°F 232°C Factor 0.81
2 50	460 31	430 29	405 28
2 1/2 65	460 31	430 29	405 28
3 80	345 24	323 22	304 21
4 100	345 24	323 22	304 21
5 125	345 24	323 22	304 21
6 150	345 24	323 22	304 21
8 200	216 15	202 14	190 13
10 250	193 13	181 12	170 11
12 300	156 11	146 10	138 9

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in) (mm)	Max Gauge (psi) (kg/cm ²)	Temp Reference (°F) (°C)
2 50	200 14	388 198
2 1/2 65	150 10	362 183
3 80	150 10	362 183
4 100	150 10	362 183
5 125	125 9	355 179
6 150	125 9	355 179
8 200	90 6	330 166
10 250	75 5	307 153
12 300	60 4	307 153

Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher than our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

304 SS can be used up to 850°F 454°C in applications such as engine exhaust with minor pressure.

When using FFL2B300 products in copper or brass water or steam systems, dielectric flanges must be used on each end to prevent leakage from galvanic action.

CARBON STEEL PLATE FLANGE THICKNESS

Pipe Size (in) (mm)	Flange Thickness T (in) (mm)
2 thru 4 50 thru 100	3/4 19
5 thru 6 125 thru 150	1 25
8 thru 12 200 thru 300	1 1/4 32

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4. Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

STOCK SIZES and LENGTHS

FFL2B300 DIMENSIONS AND PRESSURE RATINGS (American Units)

Pipe Size & Face to Face (in)	Live Length (in)	Corrugations per foot	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)
2 X 12	93/8	58	1	500
2 1/2 X 12	87/8	48	7/8	500
3 X 12	87/8	46	3/4	375
4 X 12	87/8	32	5/8	375
4 X 18	147/8	32	1 1/4	375
5 X 18	141/4	29	1 1/8	375
6 X 18	141/4	25	7/8	375
8 X 24	191/2	23	1 1/4	235
10 X 24	191/2	21	1 1/8	210
12 X 24	191/2	20	7/8	170

FFL2B300 DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Pipe Size & Face to Face (mm)	Live Length (mm)	Corrugations per meter	Maximum Permanent Lateral Offset (mm)	Rated Pressure @21°C (kg/cm ²)
50 X 305	238	190	25	35
65 X 305	225	157	22	35
80 X 305	225	151	19	26
100 X 305	225	105	16	26
100 X 457	378	105	32	26
125 X 457	362	95	29	26
150 X 457	362	82	22	26
200 X 610	495	75	32	16
250 X 610	495	69	29	14
300 X 610	495	66	22	11

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" 762mm Hg

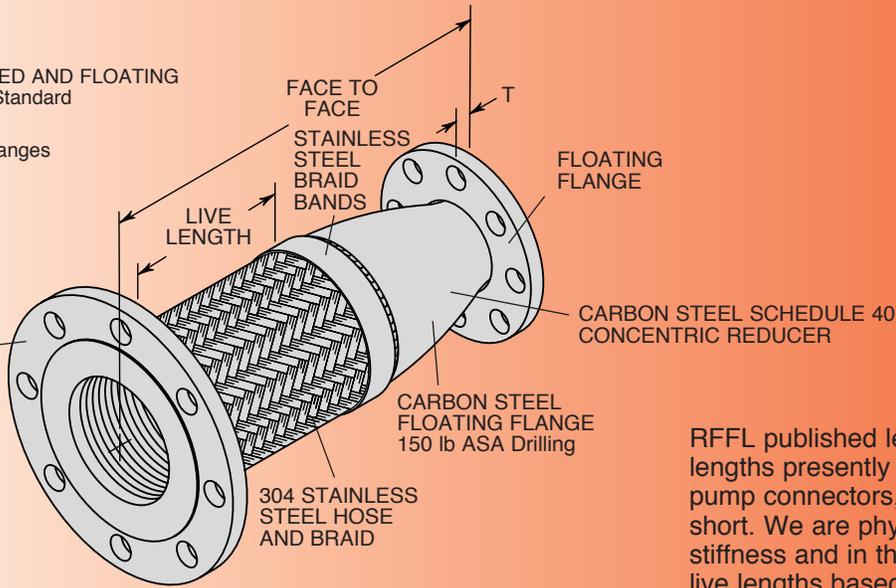
RFFL- SS Reducer with Carbon Steel Fixed & Floating Flanges

CARBON STEEL FIXED AND FLOATING FLANGES ASA-150 Standard

On Special Orders:

1. Stainless Steel Flanges
2. Other Drillings
3. Other Lengths
4. Other Reductions

CARBON STEEL RAISED FACE FIXED FLANGE
150 lb ASA
Drilling



RFFL published lengths are based on live lengths presently the industry standard for pump connectors, which we feel are too short. We are physically testing transverse stiffness and in the near future will increase live lengths based on our research.

STOCK SIZES and LENGTHS

RFFL DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Pipe Sizes— Large End X Small End (in)	Face to Face (in)	Live Length (in)	Corru- gations per foot	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)
RFFL	2 1/2 X 2	14	73/4	48	1/8	290
RFFL	3 X 2	14	73/4	46	1/8	280
RFFL	3 X 2 1/2	14	73/4	46	1/8	280
RFFL	4 X 2	14	71/4	32	1/8	225
RFFL	4 X 2 1/2	14	71/4	32	1/8	225
RFFL	4 X 3	14	71/4	32	1/8	225
RFFL	5 X 3	17	91/8	29	1/8	200
RFFL	5 X 4	17	91/8	29	1/8	200
RFFL	6 X 3	18	95/8	25	1/8	200
RFFL	6 X 4	18	95/8	25	1/8	200
RFFL	6 X 5	18	95/8	25	1/8	200
RFFL	8 X 4	18	87/8	23	1/8	200
RFFL	8 X 5	18	87/8	23	1/8	200
RFFL	8 X 6	18	87/8	23	1/8	200
RFFL	10 X 6	20	97/8	21	1/8	170
RFFL	10 X 8	20	97/8	21	1/8	170
RFFL	12 X 10	22	107/8	20	1/8	170

RFFL DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Pipe Sizes— Large End X Small End (mm)	Face to Face (mm)	Live Length (mm)	Corru- gations per meter	Maximum Permanent Lateral Offset (mm)	Rated Pressure @21°C (kg/cm ²)
RFFL	65 X 51	356	197	157	3	20
RFFL	80 X 51	356	197	151	3	19
RFFL	80 X 64	356	197	151	3	19
RFFL	100 X 51	356	184	105	3	15
RFFL	100 X 64	356	184	105	3	15
RFFL	100 X 76	356	184	105	3	15
RFFL	125 X 76	432	232	95	3	14
RFFL	125 X 102	432	232	95	3	14
RFFL	150 X 76	475	244	82	3	14
RFFL	150 X 102	475	244	82	3	14
RFFL	150 X 127	475	244	82	3	14
RFFL	200 X 102	475	225	75	3	14
RFFL	200 X 127	475	225	75	3	14
RFFL	200 X 152	475	225	75	3	14
RFFL	250 X 152	508	251	69	3	11
RFFL	250 X 203	508	251	69	3	11
RFFL	300 X 254	559	276	69	3	11

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.
Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.
Size 12" 300mm has double braid.

Rated Pressure @ Elevated Temperatures RFFL, GWNF and GWN

RATED PRESSURES @ ELEVATED TEMPERATURES (psi) (kg/cm²)

Hose Size (in) (mm)	250°F 121°C Factor 0.92		350°F 176°C Factor 0.86		450°F 232°C Factor 0.81	
	psi	kg/cm ²	psi	kg/cm ²	psi	kg/cm ²
2	50	330	23	310	21	290
2 1/2	65	270	19	250	17	235
3	80	260	18	240	16	230
4	100	210	15	200	14	190
5	125	190	13	180	12	170
6	150	190	13	180	12	170
8	200	190	13	180	12	170
10	250	160	11	150	10	140
12	300	160	11	150	10	140

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in) (mm)	Max Gauge (psi) (kg/cm ²)		Temp Reference (°F) (°C)	
	psi	kg/cm ²	°F	°C
2	50	150	11	362
2 1/2	65	125	9	355
3	80	125	9	355
4	100	125	9	355
5	125	100	7	337
6	150	100	7	337
8	200	75	5	320
10	250	60	4	307
12	300	60	4	307

Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher than our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

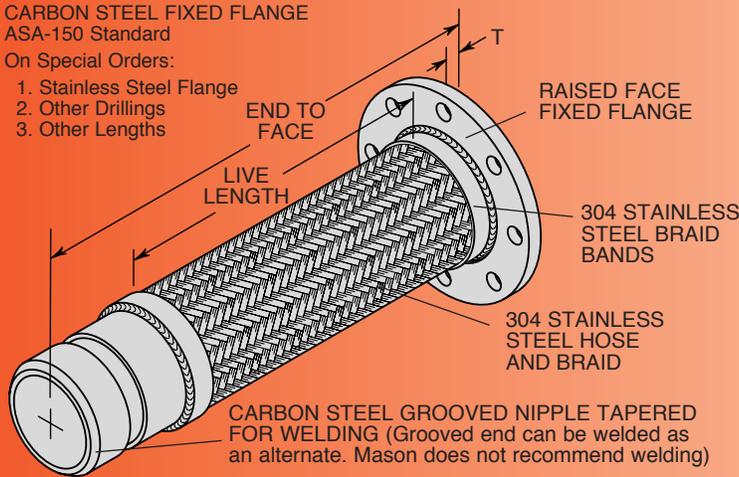
304 SS can be used up to 850°F 454°C in applications such as engine exhaust with minor pressure.

When using RFFL, GWNF or GWN products in copper or brass water or steam systems, dielectric flanges and/or couplings must be used on each end to prevent leakage from galvanic action.

CARBON STEEL FIXED FLANGE
ASA-150 Standard

On Special Orders:

1. Stainless Steel Flange
2. Other Drillings
3. Other Lengths



GWNF- SS Braided Hose with Carbon Steel Grooved Weld Nipple and Flange

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" 762mm Hg

STOCK SIZES and LENGTHS

GWNF DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Pipe Size & End to Face (in)	Live Length (in)	Corrugations per foot	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)
GWNF	2 x 13	91/8	58	1/4	360
GWNF	2 1/2 x 13	83/8	48	1/4	290
GWNF	3 x 13	83/8	46	1/4	280
GWNF	4 x 16	10 3/8	32	1/4	225
GWNF	5 x 18	12 1/4	29	1/4	200
GWNF	6 x 20	14 1/4	25	1/4	200
GWNF	8 x 22	16	23	1/4	200
GWNF	10 x 25	18	21	1/4	170
GWNF	12 x 27	20	20	1/4	170

GWNF DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Pipe Size & End to Face (mm)	Live Length (mm)	Corrugations per meter	Maximum Permanent Lateral Offset (mm)	Rated Pressure @21°C (kg/cm²)
GWNF	50 x 330	232	190	6	25
GWNF	65 x 330	213	157	6	20
GWNF	75 x 330	213	151	6	19
GWNF	100 x 406	264	105	6	15
GWNF	125 x 457	311	95	6	14
GWNF	150 x 508	362	82	6	14
GWNF	200 x 559	406	75	6	14
GWNF	250 x 635	457	69	6	11
GWNF	300 x 686	508	69	6	11

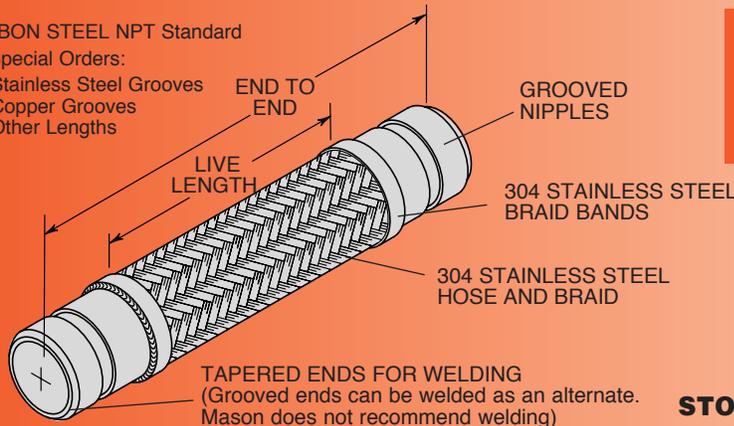
End to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%. Size 12" 300mm has double braid.

CARBON STEEL NPT Standard

On Special Orders:

1. Stainless Steel Grooves
2. Copper Grooves
3. Other Lengths



GWN- SS Braided Hose with Carbon Steel Grooved Nipples

Sizes in **RED** are Minimum Recommended Lengths at Equipment Connections to Reduce Vibration Transmission. See discussion on pages 3 - 6.

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" Hg 762mm

STOCK SIZES and LENGTHS

GWN DIMENSIONS AND PRESSURE RATINGS (American Units)

Pipe Size & End to End (in)	Live Length (in)	Corrugations per foot	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)
2 X 14	83/4	58	1	360
2 X 24	183/4	58	3/4	360
2 X 36	303/4	58	8	360
2 1/2 X 14	8	48	7/8	290
2 1/2 X 24	18	48	3	290
2 1/2 X 36	30	48	7	290
3 X 14	8	46	3/4	280
3 X 36	30	46	6	280
4 X 18	10	32	3/4	225
4 X 36	28	32	5	225
5 X 20	12	29	3/4	200
5 X 36	28	29	4	200
6 X 22	14	25	3/4	200
6 X 36	28	25	3 1/2	200
8 X 24	16	23	1/4	200
8 X 36	28	23	3	200
10 X 28	18	21	3/4	170
10 X 36	26	21	2	170
12 X 30	20	20	3/4	170
12 X 36	26	20	1 3/4	170

GWN DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Pipe Size & End to End (mm)	Live Length (mm)	Corrugations per meter	Maximum Permanent Lateral Offset (mm)	Rated Pressure @21°C (kg/cm²)
50 X 356	222	190	25	25
50 X 610	476	190	95	25
50 X 914	781	190	203	25
65 X 356	203	157	22	20
65 X 610	457	157	76	20
65 X 914	762	157	178	20
80 X 356	203	151	19	19
80 X 900	762	151	152	19
100 X 457	254	105	19	15
100 X 914	711	105	127	15
125 X 508	305	95	19	14
125 X 914	711	95	102	14
150 X 559	356	82	19	14
150 X 914	711	82	89	14
200 X 610	406	75	19	14
200 X 914	711	75	76	14
250 X 711	457	69	19	12
250 X 914	660	69	51	12
300 X 762	508	66	19	11
300 X 914	660	66	44	11

End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%. Size 12" 300mm has double braid.

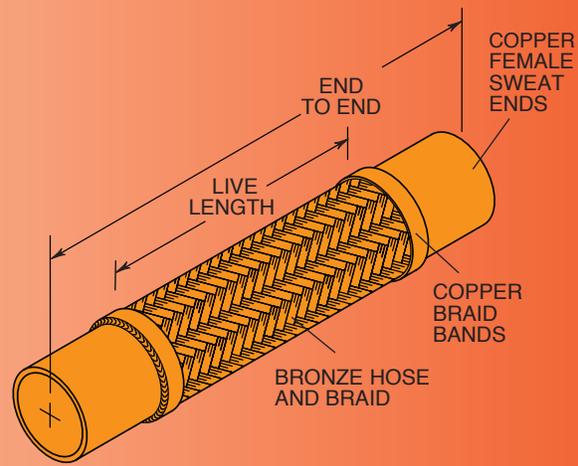
CPSB- Braided Bronze Hose with Copper Sweat Ends

ALL SERVICES EXCEPT REFRIGERANT

Copper Lines have virtually no stiffness or mass. We are recommending our longest standard lengths primarily for offset, not vibration reduction. See spec on page 6.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

NOT SUITABLE FOR STEAM.



STOCK SIZES and LENGTHS

CPSB DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Tubing Size & End to End (in)	Live Length (in)	Corrugations per foot	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)
CPSB	1/2 X 61/2*	23/4	73	1/8	500
CPSB	1/2 X 12	81/4	73	1	500
CPSB	1/2 X 18	141/4	73	3	500
CPSB	1/2 X 24	201/4	73	6	500
CPSB	1/2 X 36	321/4	73	121/2	500
CPSB	3/4 X 7*	23/4	67	1/8	470
CPSB	3/4 X 12	73/4	67	3/4	470
CPSB	3/4 X 18	133/4	67	21/2	470
CPSB	3/4 X 24	193/4	67	51/2	470
CPSB	3/4 X 36	313/4	67	11	470
CPSB	1 X 8*	33/8	58	1/8	450
CPSB	1 X 12	73/8	58	5/8	450
CPSB	1 X 18	133/8	58	21/4	450
CPSB	1 X 24	193/8	58	5	450
CPSB	1 X 36	313/8	58	81/2	450
CPSB	11/4 X 81/2*	33/4	55	1/8	400
CPSB	11/4 X 12	71/4	55	1/2	400
CPSB	11/4 X 18	131/4	55	13/4	400
CPSB	11/4 X 24	191/4	55	4	400
CPSB	11/4 X 36	311/4	55	8	400
CPSB	11/2 X 9*	4	53	1/8	335
CPSB	11/2 X 12	7	53	1/2	335
CPSB	11/2 X 18	13	53	11/2	335
CPSB	11/2 X 24	19	53	31/2	335
CPSB	11/2 X 36	31	53	71/2	335
CPSB	2 X 12*	61/2	51	1/4	235
CPSB	2 X 18	121/2	51	13/8	235
CPSB	2 X 24	181/2	51	31/4	235
CPSB	2 X 36	301/2	51	7	235
CPSB	21/2 X 12*	43/4	34	1/8	230
CPSB	21/2 X 18	103/4	34	7/8	230
CPSB	21/2 X 24	163/4	34	2	230
CPSB	21/2 X 36	283/4	34	41/2	230
CPSB	3 X 12*	41/2	30	1/8	225
CPSB	3 X 18	101/2	30	3/4	225
CPSB	3 X 24	161/2	30	11/2	225
CPSB	3 X 36	281/2	30	41/4	225
CPSB	4 X 18*	91/2	28	1/2	220
CPSB	4 X 24	151/2	28	11/4	220
CPSB	4 X 36	271/2	28	4	220

CPSB DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Tubing Size & End to End (mm)	Live Length (mm)	Corrugations per meter	Maximum Permanent Lateral Offset (mm)	Rated Pressure @21°C (kg/cm²)
CPSB	15 X 165*	70	240	3	37
CPSB	15 X 305	210	240	25	34
CPSB	15 X 457	362	240	76	34
CPSB	15 X 610	514	240	152	34
CPSB	15 X 915	819	240	318	34
CPSB	20 X 178*	70	220	3	32
CPSB	20 X 305	197	220	19	32
CPSB	20 X 457	349	220	64	32
CPSB	20 X 610	502	220	140	32
CPSB	20 X 915	806	220	279	32
CPSB	25 X 203*	86	190	3	31
CPSB	25 X 305	187	190	16	31
CPSB	25 X 457	340	190	57	31
CPSB	25 X 610	492	190	127	31
CPSB	25 X 915	797	190	216	31
CPSB	32 X 216*	95	180	3	28
CPSB	32 X 305	184	180	13	28
CPSB	32 X 457	337	180	44	28
CPSB	32 X 610	489	180	102	28
CPSB	32 X 915	793	180	203	28
CPSB	40 X 229*	102	174	3	23
CPSB	40 X 305	178	174	13	23
CPSB	40 X 457	330	174	38	23
CPSB	40 X 610	483	174	89	23
CPSB	40 X 915	787	174	191	23
CPSB	50 X 305*	165	167	6	16
CPSB	50 X 457	318	167	35	16
CPSB	50 X 610	470	167	83	16
CPSB	50 X 915	775	167	178	16
CPSB	65 X 305*	121	112	3	16
CPSB	65 X 457	273	112	22	16
CPSB	65 X 610	425	112	51	16
CPSB	65 X 915	730	112	114	16
CPSB	80 X 305*	114	98	3	15
CPSB	80 X 457	267	98	19	15
CPSB	80 X 610	419	98	38	15
CPSB	80 X 915	724	98	108	15
CPSB	100 X 457*	241	92	13	15
CPSB	100 X 610	394	92	32	15
CPSB	100 X 915	699	92	102	15

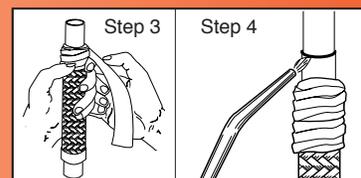
End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Female end fits over copper tubing, e.g. 1/2 x 12 (15 x 305mm) fits over 1/2" (15mm) tubing.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

INSTALLATION:

1. Thoroughly clean male and female ends using steel wool and steel brushes.
2. Apply flux.
3. Wrap base of copper fitting on connector and 2" (50mm) of the braid with a wet cloth to prevent overheating during soldering.
4. Direct the torch away from the base of the copper fitting and braided section. Avoid contact of the flame with the base of the copper fitting and braid. Heat end of copper fitting for proper flow of silver solder. Silver solder flows at approximately 430°F 221°C.
5. Use caution with brazing rod or other higher temperature techniques. Overheating will cause leaks.
6. Remove wet cloth and remove all soldering flux immediately after installation. Flux chlorides will cause premature failure of joint.

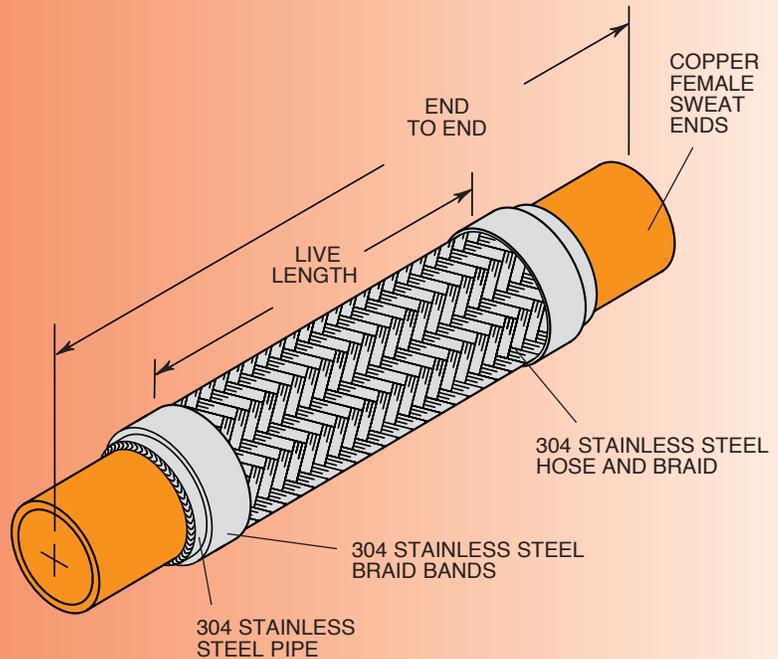


ULCPS- SS Braided Hose with Copper Sweat Ends U. L. Approved for Refrigerant Services

U.L. approved flexible hose are cleaned and bagged for refrigeration service. Do not use for water service.

Safety Factor is 5X Rated Pressure.
Full Vacuum Rating— 30" Hg 762mm

Lengths are industry standard always ordered for this service.



STOCK SIZES and LENGTHS

ULCPS DIMENSIONS AND PRESSURE RATINGS (American Units)

Stamped Code	Size & End to End (in)	Fits Over Tubing Size	Tubing OD (in)	Live Length (in)	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)
NF1	1/4 X 8 1/2	1/4	3/8	6	1/8	650
NF2	3/8 X 9	3/8	1/2	6 1/4	1/8	650
NF3	1/2 X 9 3/4	1/2	5/8	6 5/8	1/8	650
NF4	5/8 X 10 1/2	5/8	3/4	6 3/4	1/8	650
NF5	3/4 X 12	3/4	7/8	7 1/2	1/8	650
NF6	1 X 13	1	1 1/8	7 7/8	1/8	600
NF7	1 1/4 X 15 1/2	1 1/4	1 3/8	9 3/4	1/8	550
NF8	1 1/2 X 17	1 1/2	1 5/8	10 1/2	1/8	510
NF9	2 X 20 1/2	2	2 1/8	13 1/4	1/8	400
NF10	2 1/2 X 24 1/4	2 1/2	2 5/8	15 1/2	1/8	350
NF11	3 X 27	3	3 1/8	17	1/8	320
NF12	4 X 33	4	4 1/8	21	1/8	190

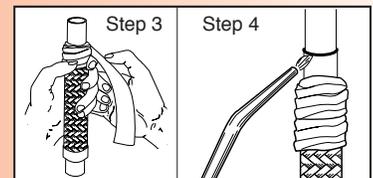
ULCPS DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Stamped Code	Size & End to End (mm)	Fits Over Tubing Size	Tubing OD (mm)	Live Length (mm)	Maximum Permanent Lateral Offset (mm)	Rated Pressure @21°C† (kg/cm²)
NF1	6 X 216	6	10	152	3	45
NF2	10 X 229	10	15	159	3	45
NF3	15 X 248	15	17	168	3	45
NF4	17 X 267	17	19	171	3	45
NF5	20 X 305	20	22	191	3	45
NF6	25 X 330	25	28	200	3	41
NF7	32 X 394	32	35	248	3	38
NF8	40 X 432	40	41	267	3	35
NF9	50 X 521	50	54	337	3	28
NF10	65 X 616	65	68	394	3	24
NF11	80 X 686	80	78	432	3	22
NF12	100 X 838	100	105	533	3	13

End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 5.
Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.
These meet or exceed the higher pressure requirements of R410A, R717 (NH₃) and R744 (CO₂).

INSTALLATION:

1. Thoroughly clean male and female ends.
2. Wrap base of copper fitting on connector and 2" (50mm) of the braid with a wet cloth to prevent overheating during brazing.
3. Direct the torch away from the base of the copper fitting and braided section. Avoid contact of the flame with the base of the copper fitting and braid. Heat end of copper fitting for proper flow of brazing filler material.
4. Use caution with brazing rod or other higher temperature techniques. Overheating will cause leaks.
5. Remove wet cloth.



CSA Series of Braided Hose

Everyone is concerned when installing flexible hose in flammable gas or liquid lines because of the risk of both asphyxiation and fire. Approved by the CSA, the successor to the American Gas Association, and complying with UL 536 provides that assurance. Tests include vibration 300 hours at 15 Hz, 90° bends at rated pressure @ 10 cpm for 20,000 cycles, elongation and tension, 450°F 232°C for 100 hours as well as flame resistance. All of our standard

hoses 1/2" through 4" diameter passed and can be used in straight, looped or Vee configurations. However, in addition to the general UL approval, all specific hoses must be rechecked with an approved thread gauge, if threaded, and retested to 50% above rated pressure using water or rated pressure using air. It must be clearly identified as a Mason product and tagged with maximum pressure rating and minimum bend radius.

CSAWN- SS Braided Hose with Carbon Steel Weld Nipples



These assemblies have been "CSA" approved for use on gas pipelines. "CSA" is the current certification agency for gas industry products, assuming the authority formerly associated with the American Gas Association (AGA).

Our Certification Report is #230720-1764990. This Certification meets all requirements of ANSI/UL #536-1997 Standards for Flexible Metal Hose.

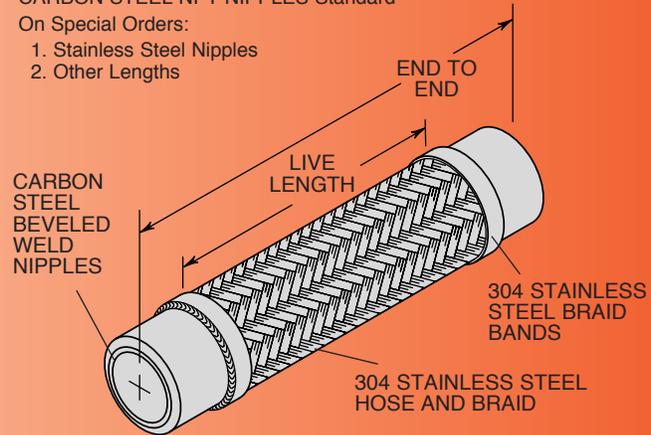
CSAMN and CSAFFL are also available.
See Standard MN (pg. 8) and FFL (pg. 9) for dimensions.
Rated Pressure @ 70°F (21°C) is 175 psi (12kg/cm²).

Max. Vacuum— 30" 762mm Hg

CARBON STEEL NPT NIPPLES Standard

On Special Orders:

1. Stainless Steel Nipples
2. Other Lengths



STOCK SIZES and LENGTHS

CSAWN DIMENSIONS AND PRESSURE RATINGS (American Units)

Pipe Size (in)	MN End to End (in)	WN End to End (in)	Live Length (in)	Corrugations per foot	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)	Min Burst Pressure (psi)	Safety Factor
1/2	12	11	8 1/4	112	11/4	175	4300	25
1/2	18	17	14 1/4	112	21/2	175	4300	25
1/2	24	23	20 1/4	112	3 1/2	175	4300	25
3/4	12	10 1/2	8 1/4	90	1	175	3168	18
3/4	18	16 1/2	14 1/4	90	2 1/4	175	3168	18
3/4	24	22 1/2	20 1/4	90	3 1/4	175	3168	18
1	12	10	7 3/4	56	3/4	175	3132	18
1	18	16	13 3/4	56	2	175	3132	18
1	24	22	19 3/4	56	3	175	3132	18
1 1/4	12	10	6 3/4	52	5/8	175	2656	15
1 1/4	18	16	12 3/4	52	1 3/4	175	2656	15
1 1/4	24	22	18 3/4	52	2 3/4	175	2656	15
1 1/2	12	10	6 3/4	46	1/2	175	2284	13
1 1/2	18	16	12 3/4	46	1 1/2	175	2284	13
1 1/2	24	22	18 3/4	46	2 1/2	175	2284	13
2	12	10	6	67	1/4	175	2120	12
2	18	16	12	67	1 3/8	175	2120	12
2	24	22	18	67	2 3/8	175	2120	12
2 1/2	18	15 1/2	11	55	1 1/4	175	1724	10
2 1/2	24	21 1/2	17	55	2	175	1724	10
3	18	15 1/2	11	29	1	175	1564	9
3	24	21 1/2	17	29	1 3/4	175	1564	9
3	36	33 1/2	29	29	3 3/4	175	1564	9
4	18	15 1/2	11	28	1/2	175	1160	7
4	24	21 1/2	17	28	3/4	175	1160	7
4	36	33 1/2	29	28	3 1/4	175	1160	7

STOCK SIZES and LENGTHS

CSAWN DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Pipe Size (mm)	MN End to End (mm)	WN End to End (mm)	Live Length (mm)	Corrugations per meter	Maximum Permanent Lateral Offset (mm)	Rated Pressure @21°C (kg/cm²)	Min Burst Pressure (kg/cm²)	Safety Factor
15	305	279	210	367	32	12	302	25
15	457	432	362	367	63	12	302	25
15	610	584	514	367	88	12	302	25
20	305	267	210	295	25	12	222	18
20	457	419	362	295	57	12	222	18
20	610	572	514	295	82	12	222	18
25	305	254	197	184	19	12	220	18
25	457	406	349	184	50	12	220	18
25	610	559	502	184	76	12	220	18
32	305	254	171	171	15	12	186	15
32	457	406	324	171	43	12	186	15
32	610	559	610	171	69	12	186	15
40	305	254	171	151	12	12	160	13
40	457	406	324	151	38	12	160	13
40	610	559	610	151	63	12	160	13
50	305	254	152	220	6	12	149	12
50	457	406	305	220	34	12	149	12
50	610	559	457	220	60	12	149	12
65	457	394	279	180	32	12	121	10
65	610	546	432	180	50	12	121	10
80	457	394	279	95	25	12	109	9
80	610	546	432	95	43	12	109	9
80	914	851	737	95	95	12	109	9
100	457	394	279	92	12	12	81	7
100	610	546	432	92	19	12	81	7
100	914	851	737	92	82	12	81	7

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

End to End Tolerance: minus 1% plus 3%.



MASON - MERCER

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