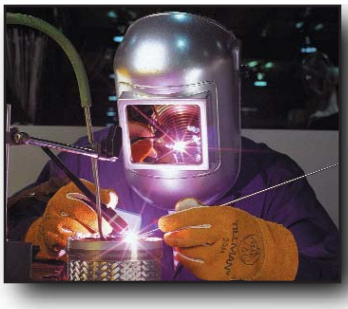
Corrugated Metal Hose *(Designing an Assembly)*

There are many components in a metal hose assembly and care should be taken when selecting each of them. Moreover, the components have their own unique technical limitations so it is important to make sure each of the components is compatible with your application. In much the same way as a “chain is as strong as its weakest link”, a metal hose assembly will only perform to the limits of its weakest component.



Once the components have been selected, the quality and skill of the fabricator assembling the components becomes important. The procedures and care used when fabricating assemblies also has a dramatic effect on the assembly’s overall performance.

Hose Master has invested a considerable amount of resources researching metal hose fabrication and developing a state-of-the-art fabricating center. In addition, we share the welding technology we have developed with our fabricating distributors. All of this is done to promote quality and consistency in fabricating metal hose assemblies.

In this section, we will discuss the various components that make up a corrugated metal hose assembly, and what information a metal hose fabricator will need in order to make an assembly for your application. If you need assistance determining the information, we have also included an explanation of how to analyze the application and make the appropriate selections.

Specifying a Metal Hose Assembly:

In order to make an assembly, the fabricator will need answers to the following five questions. For more information about any of these questions, or for a list of available options, consult the referenced pages listed next to each topic.

1. Hose (type, alloy, and size): page 11
2. End fittings (type, alloy, and size for each end): page 29
3. Length of the assembly (either overall length or live length): page 34
4. Fabrication options: page 35
5. Accessories: page 39

If you have the answers to these questions, a metal hose fabricator will be able to make the assembly. If you do not know the answers to all five questions, you will need to obtain them. The next section is designed to help you determine the answers.

Analyzing an Application:

S.T.A.M.P.E.D.

To properly design a metal hose assembly for a particular application, the following design parameters must be determined. To help remember them, they have been arranged to form the acronym "S.T.A.M.P.E.D."

1. **Size** – The diameter of the connections in which the assembly will be installed is needed to provide a proper fit. This information is required.
2. **Temperature** – As the temperature to which the assembly is exposed (internally and externally) increases, the strength of the assembly's components decreases. Also, the coldest temperature to which the hose will be exposed can affect the assembly procedure and/or fitting materials. If you do not provide this information it will be assumed that the temperatures are 70ºF.
3. **Application** – This refers to the configuration in which the assembly is installed. This includes both the dimensions of the assembly as well as the details of any movement that the assembly will experience. This information is necessary to calculate assembly length and required flexibility.
4. **Media** – Identify all chemicals to which the assembly will be exposed, both internally and externally. This is important since you must be sure that the assembly's components are chemically compatible with the media going through the hose as well as the environment in which the hose is installed. If no media is given, it will be assumed that both the media and the external environment are compatible with all of the available materials for each component.
5. **Pressure** – Identify the internal pressure to which the assembly will be exposed. Also, determine if the pressure is constant or if there are cycles or spikes. This information is important to determine if the assembly is strong enough for the application. If no pressure is given it will be assumed that the pressure is low and there are no pressure surges or spikes.
6. **End Fittings** – Identify the necessary end fittings. This is required since fittings for the assembly must be chosen to properly fit the mating connections.
7. **Dynamics** – Identify the velocity at which the media will flow through the assembly. Since corrugated metal hose does not have a smooth interior, rapid media flow can set up a resonant frequency that will cause the hose to vibrate and prematurely fail. If no velocity is given, it will be assumed that the velocity is not fast enough to affect the assembly's performance.

To make gathering this information easier, Hose Master has providied a convenient worksheet to help select components on page 78.

Corrugated Metal Hose (Hose)

Hydroformed Corrugation Process:

A. Tube

The manufacturing process of corrugated metal hose starts with stainless steel strip that is rolled and the edges welded together to form a thin-walled, gas-tight tube. Hose Master offers:

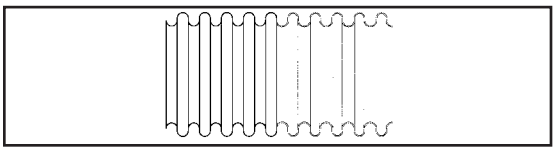
High quality steel strip

Rolled to form a tube

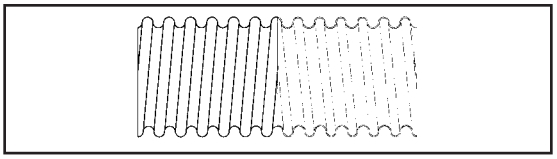
Strong, clean, non-oxidized seam weld

B. Hose

After the tube has been welded, corrugations are formed into the tube to make it flexible. There are two corrugation profiles, annular and helical.

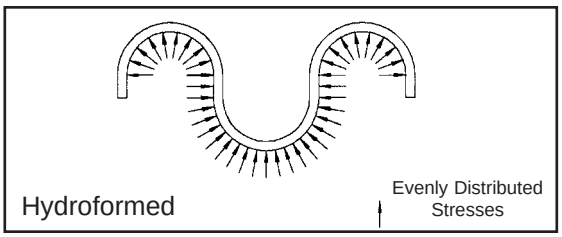


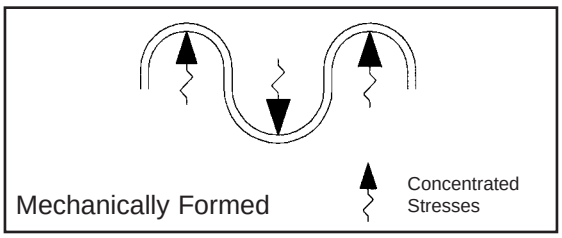
Annular profile - Independent corrugations, straight and parallel



Helical profile - One continuous corrugation that spirals around the hose.

Corrugations are formed into the tube either mechanically or hydraulically (“Hydroforming”).





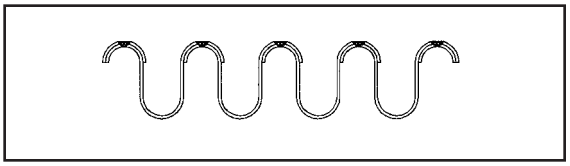
Hydroforming:

- Enhances flexibility and cycle life.
  - Maintains wall thickness.
  - Reduces concentrated residual stress.
  - Minimizes work hardening.
- Is a clean process.
  - Hydroforming uses water to form the hose while most other processes require lubrication.

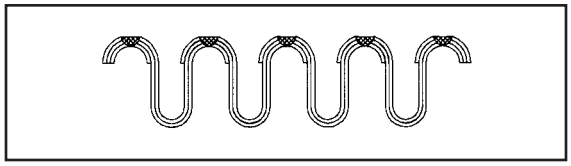
***Hose Master Inc.* is the only American metal hose manufacturer to hydroform metal hose.**

Corrugated Strip Process (Extraflex/Hydraflex):

In addition to our line of annular, corrugated hose, Hose Master offers two helical hoses specially designed to maximize performance without the drawbacks of traditional, mechanically-formed, helical hose. Rather than welding a tube and mechanically forming the corrugation, these products are made from stainless steel strip that is formed before welding. Because it is not mechanically formed from a tube, it is extremely flexible and does not contain all the residual stresses like traditional mechanically-formed helical hose.



Extraflex profile



Hydraflex profile

Both Extraflex and Hydraflex are made by pre-forming the stainless steel strip, overlapping the material, and then continuously resistance welding the seam together. While Extraflex is made with one ply of stainless steel, Hydraflex is made with two plies for higher pressure ratings.

Braiding Process:

To give corrugated hose the ability to withstand pressure, stainless steel wire is braided over the hose. Hose may be single braided (one layer of braid) or double braided (two layers of braid) to achieve even greater working pressures. Braided braid is used on large diameter hose.

Designing the proper braid for each type of corrugated hose requires sophisticated engineering to maintain the proper balance between the braid strength and the hose flexibility. Hose Master's braid packages offer several advantages:

1. High Percentage Braid Coverage – Hose Master has a high percentage of braid coverage yielding better cycle life and protection against damage to the hose.

2. Machine Braided Hose – Hose Master weaves the braid directly onto the hose ensuring that the braid fits tightly against the hose, preventing potential hose deformation or squirm.

Corrugated metal hose with double braid.

Corrugated Metal Hose *(Selecting a Hose)*

When selecting a hose, you must consider three variables: pressure carrying capability, flexibility, and chemical compatibility.

- **Pressure Carrying Capability** – The hose must be strong enough to handle the pressures to which it will be exposed. To determine hose pressure capability, consult the catalog "Maximum Working Pressure" stated for the hose. The Maximum Working Pressure must be reduced for each of the following circumstances:

  Temperature – As temperature increases, hose working pressure decreases. After you have determined the proper alloy (see "Chemical Compatibility" below) go to the "Temperature Derating" table on page 67 and match the alloy of the hose and braid with the highest temperature to which they will be exposed (either internally or externally) to obtain the proper derating factors. Then multiply the hose's Maximum Working Pressure by the most limiting temperature derating factor.

  Dynamic Pressure – Pulsating, surge, or shock pressures, like those encountered with quick opening or closing valves, can inflict severe damage on a hose. If your application entails pulsating pressures, the working pressure should be derated by 1/2. If your application entails shock pressures, derate the stated working pressure to 1/6 of its value.

Example: 1" Annuflex hose - T321 stainless steel hose and T304 stainless steel braid @ 300ºF with shock pressures.

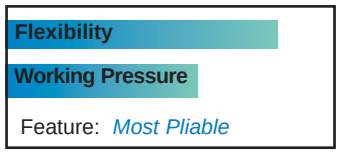
Catalog Maximum Working Pressure = 718 psi.
Temperature Derating Factor at 300º F.= 0.86; and the Pressure Derating Factor =1/6.
Maximum Application Working Pressure = 718 psi x 0.86 x 1/6 =102.91 psi.

- **Flexibility** – Confirm that the hose's minimum bend radius is less then the bend radius required. Keep in mind that the hose's minimum bend radius will change with pressure. To determine the minimum bend radius, go to the charts beginning on page 68 for the type of hose being used and match the line for the hose's I.D. with your application's pressure requirements. The chart will show you the recommended minimum bend radius. Care should also be taken for applications with vibration. Consult page 71 for recommendations.

- **Chemical Compatibility** – You must choose a material for the hose and braid that is compatible with the media being conveyed through the hose as well as the environment in which the hose is installed. When determining chemical compatibility it is important to know the temperature and concentration of the chemical(s). Although there are many resources to confirm chemical compatibility, two of the industry standards that you may use are the National Association of Corrosion Engineers (NACE) and the Compass Corrosion Guides. You may also contact our Customer Service Department which can check these sources for you.

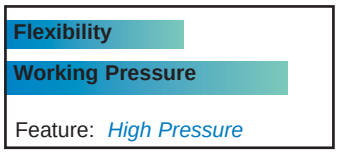
Corrugated Metal Hose *(Products)*

Annuflex is the standard of Hose Master's extensive line of high performance annular corrugated stainless steel hose. Proprietary hydroforming technology ensures the excellent cycle life of the hose, with minimum effort to flex or bend the hose 15



Masterflex is the most pliable product of the annular family of hydroformed hose 16

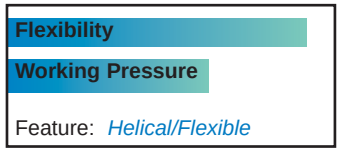
Formaflex has the "stay-put" characteristics required for stress-free connections between piping systems and rotary joints or other similar static applications 17



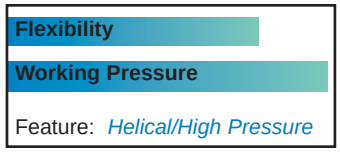
Pressureflex is Hose Master's hydroformed, annular, heavy-wall, corrugated metal hose specifically designed for higher pressure applications. 18

ChemKing® is Hose Master's chemical transfer, hydroformed hose. ChemKing® offers excellent corrosion resistance to many of the most severe applications found in chemical processing 19

Bronzeflex is a heavy-duty corrugated hose designed for use in those applications that specifically require bronze hose. 20



Extraflex is a spirally-welded, helical corrugated hose specifically designed to achieve extreme flexibility while maintaining good pressure ratings. 21

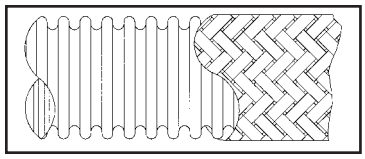


Hydraflex is a double wall, spirally-welded, helical corrugated hose specifically designed for high-pressure applications that also require good flexibility 22

Note: Product specifications are subject to change.

Corrugated Metal Hose *(Products)*

ANNUFLEX



Annuflex is the foundation of Hose Master's extensive line of annular hydroformed products. The hydroforming process produces a hose with minimal residual stress, uniform wall thickness throughout the corrugations, and minimal work hardening. This process provides a very flexible, long lasting corrugated metal hose.

Explanation of ***Annuflex*** Part Numbers:

AF _____ **7** _____
Material Code / Braid Code

Material Codes:
4 - T321 Stainless Steel
5 - T316L Stainless Steel
7 - T304L Stainless Steel

Braid Codes
00 - Unbraided
50 - T304 Single Braid
55 - T304 Double Braid
*T316 Braid avaiable upon request.

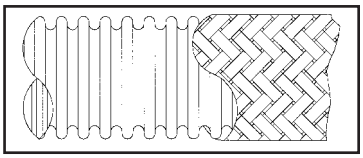
Example: AF4750 = T321 Stainless Steel, annular, corrugated metal hose with a single T304 Stainless Steel Braid.

Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Dynamic Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
1/4	0	0.41	1.0	4.5	90		0.04
	1	0.47			1800	7233	0.11
	2	0.53			2700	9100	0.18
3/8	0	0.65	1.2	5.0	70		0.10
	1	0.71			1558	6230	0.20
	2	0.77			2336	9345	0.30
1/2	0	0.77	1.5	5.5	70		0.11
	1	0.83			1186	4743	0.22
	2	0.89			1779	7115	0.33
5/8	0	0.96	1.8	7.0	57		0.17
	1	1.02			1205	4820	0.33
	2	1.08			1808	7230	0.49
3/4	0	1.16	2.1	8.0	43		0.19
	1	1.22			898	3591	0.37
	2	1.28			1347	5387	0.55
1	0	1.47	2.7	9.0	43		0.26
	1	1.53			718	2872	0.50
	2	1.59			1077	4308	0.74
1 1/4	0	1.75	3.1	10.0	43		0.29
	1	1.83			645	2581	0.61
	2	1.91			968	3872	0.93
1 1/2	0	2.08	3.9	11.0	28		0.47
	1	2.16			531	2125	0.85
	2	2.24			797	3188	1.23
2	0	2.61	5.1	13.0	14		0.59
	1	2.69			449	1797	1.11
	2	2.77			674	2696	1.63
2 1/2	0	3.40	6.8	16.0	14		0.84
	1	3.50			417	1669	1.64
	2	3.60			626	2504	2.44
3	0	3.88	7.8	18.0	14		1.18
	1	3.98			346	1384	2.06
	2	4.08			519	2076	2.94
4	0	4.96	9.8	22.0	14		1.41
	1	5.06			299	1194	2.47
	2	5.16			448	1791	3.53
5	0	6.00	12.8	28.0	14		2.18
	1	6.12			275	1099	3.61
	2	6.24			412	1649	5.04
6	0	7.01	14.8	32.0	11		2.69
	1	7.13			210	839	4.44
	2	7.25			315	1259	6.19
8*	0	9.08	20.0	40.0	3		5.32
	1	9.44			212	850	7.66
10*	0	11.10	25.0	50.0	2		8.71
	1	11.49			175	700	12.65
12*	0	13.22	30.0	60.0	2		11.58
	1	13.51			160	640	17.53

Supplied with braided braid.

Notes: The minimum bend radius is measured from the centerline of the hose. The minimum bend radius increases with pressure (see chart on page 68). The working pressure decreases with temperature (obtain derating factor on page 67). For rapid pressure fluctuations consult the factory.

MASTERFLEX



Masterflex is manufactured using the same high quality process used to make Annuflex hose, but the number of corrugations per foot is increased to allow for greater flexibility.

Explanation of ***Masterflex*** Part Numbers:

AF _____ **5** _____
Material Code / Braid Code

Material Codes:
4 - T321 Stainless Steel
5 - T316L Stainless Steel
7 - T304L Stainless Steel

Braid Codes
00 - Unbraided
50 - T304 Single Braid
55 - T304 Double Braid
*T316 Braid avaiable upon request.

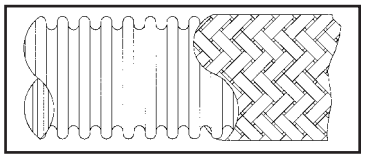
Example: AF4550 = T321 Stainless Steel, annular, corrugated metal hose with a single T304 Stainless Steel Braid.

Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Dynamic Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
1/4	0	0.42	0.9	3.7	90		0.07
	1	0.48			1800	7233	0.14
	2	0.54			2700	9100	0.21
3/8	0	0.65	1.0	4.0	70		0.20
	1	0.71			1558	6230	0.30
	2	0.77			2336	9345	0.40
1/2	0	0.77	1.2	4.4	70		0.22
	1	0.83			1186	4743	0.33
	2	0.89			1779	7115	0.44
5/8	0	0.96	1.4	5.6	57		0.31
	1	1.02			1205	4820	0.47
	2	1.08			1808	7230	0.63
3/4	0	1.16	1.7	6.4	43		0.33
	1	1.22			898	3591	0.51
	2	1.28			1347	5387	0.69
1	0	1.47	2.1	7.1	43		0.45
	1	1.53			718	2872	0.69
	2	1.63			1077	4308	0.93
1 1/4	0	1.75	2.5	7.9	43		0.56
	1	1.83			645	2581	0.88
	2	1.91			968	3872	1.20
1 1/2	0	2.08	3.1	8.7	28		0.82
	1	2.16			531	2125	1.20
	2	2.24			797	3188	1.58
2	0	2.61	4.0	10.3	14		0.95
	1	2.69			449	1797	1.47
	2	2.77			674	2696	1.99
2 1/2	0	3.40	5.4	12.8	14		1.29
	1	3.50			417	1669	2.09
	2	3.60			626	2504	2.89
3	0	3.88	6.3	14.5	14		1.84
	1	3.98			346	1384	2.72
	2	4.08			519	2076	3.60
4	0	4.96	7.7	17.4	14		2.33
	1	5.06			299	1194	3.39
	2	5.16			448	1791	4.45
5	0	6.00	10.0	21.9	14		3.64
	1	6.12			275	1099	5.07
	2	6.24			412	1649	6.50
6	0	7.01	11.6	25.0	11		4.16
	1	7.13			210	839	5.91
	2	7.25			315	1259	7.66

Notes: The minimum bend radius is measured from the centerline of the hose. The minimum bend radius increases with pressure (see chart on page 68). The working pressure decreases with temperature (obtain derating factor on page 67). For rapid pressure fluctuations consult the factory.

Corrugated Metal Hose (Products)

FORMAFLEX



Formaflex is Hose Master's "stay-put" annular corrugated metal hose. Formaflex is designed to bend and stay in one position, providing a stress-free connection between piping systems.

Explanation of ***Formaflex*** Part Numbers:

AF _____ **9** _____
Material Code / Braid Code

Material Codes:
4 - T321 Stainless Steel
5 - T316L Stainless Steel

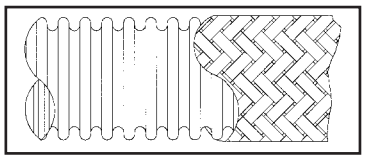
Braid Codes
00 - Unbraided
50 - T304 Single Braid
55 - T304 Double Braid

Example: AF4950 = T321 Stainless Steel, annular, corrugated metal hose with a single T304 Stainless Steel Braid.

Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
1/4	0	0.41	1.0	90		0.04
	1	0.47		900	3600	0.11
3/8	0	0.65	1.2	70		0.10
	1	0.71		800	3200	0.17
1/2	0	0.77	1.5	70		0.11
	1	0.83		665	2660	0.19
5/8	0	0.96	1.8	57		0.17
	1	1.02		500	2000	0.26
3/4	0	1.16	2.1	43		0.19
	1	1.22		380	1520	0.29
1	0	1.47	2.7	43		0.26
	1	1.53		355	1420	0.42
1 1/4	0	1.75	3.1	43		0.29
	1	1.81		280	1120	0.47
1 1/2	0	2.08	3.9	28		0.47
	1	2.14		264	1056	0.71
2	0	2.61	5.1	14		0.59
	1	2.69		221	884	0.90

Notes: The minimum bend radius is measured from the centerline of the hose.

PRESSUREFLEX



Pressureflex is Hose Master's high-pressure annular corrugated metal hose. With all the advantages of a hydroformed hose, Pressureflex is made from heavy wall T321 Stainless Steel. Pressureflex offers flexibility and dependability when higher pressures are a factor.

Explanation of ***Pressureflex*** Part Numbers:

AF 8 7 _____
Braid Code

Braid Codes
00 - Unbraided
50 - T304 Single Braid
55 - T304 Double Braid
*T316 Braid avaiable upon request.

Example: AF8750 = T321 Stainless Steel, annular, corrugated metal hose with a single T304 Stainless Steel Braid.

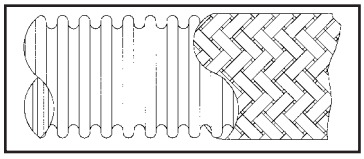
Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Dynamic Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
3/4	0	1.13	2.2	8.0	45		0.32
	1	1.21			1142	4569	0.58
	2	1.29			1713	6854	0.84
1	0	1.44	2.8	10.0	45		0.38
	1	1.54			929	3717	0.74
	2	1.64			1394	5576	1.11
1 1/4	0	1.72	3.1	11.0	45		0.58
	1	1.82			766	3065	0.99
	2	1.92			1149	4598	1.40
1 1/2	0	2.05	3.9	13.0	28		0.75
	1	2.15			717	2866	1.29
	2	2.25			1075	4299	1.84
2	0	2.58	5.1	15.0	28		1.15
	1	2.70			649	2596	1.94
	2	2.82			974	3894	2.72
2 1/2	0	3.36	6.9	17.0	28		1.64
	1	3.48			507	2029	2.66
	2	3.60			761	3044	3.67
3	0	3.84	7.9	20.0	28		1.78
	1	3.96			369	1476	2.85
	2	4.08			554	2214	3.92
4	0	4.92	9.8	25.0	28		2.80
	1	5.04			330	1319	4.27
	2	5.16			495	1979	5.74
5*	0	5.96	12.8	34.0	28		3.03
	1	6.13			331	1324	5.14
6*	0	6.97	14.8	40.0	23		3.74
	1	7.22			285	1140	6.44

Supplied with braided braid.

Notes: The minimum bend radius is measured from the centerline of the hose. The minimum bend radius increases with pressure (see chart on page 69). The working pressure decreases with temperature (obtain derating factor on page 67). For rapid pressure fluctuations consult the factory.

Corrugated Metal Hose (Products)

ChemKing®



ChemKing® is Hose Master's chemical resistant annular corrugated metal hose. Hydroformed from a special 276 alloy, ChemKing® provides superior flexibility and excellent corrosion resistance. Used in a variety of industries, ChemKing® is the solution for many of the most severe chemical transfer applications.

Explanation of ***ChemKing®*** Part Numbers:

AF 6 7 _____
Braid Code

Braid Codes
00 - Unbraided
40 - T316 Single Braid
44 - T316 Double Braid

Example: AF6740 = 276 annular, corrugated metal hose with a single T316 Stainless Steel Braid.

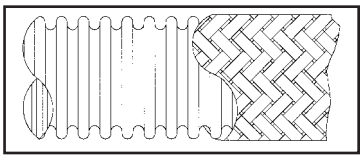
Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Dynamic Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
1/2	0	0.77	1.5	5.5	70		0.11
	1	0.83			1186	4743	0.22
	2	0.89			1779	7115	0.33
3/4	0	1.16	2.1	8.0	43		0.19
	1	1.22			898	3591	0.37
	2	1.28			1347	5387	0.55
1	0	1.47	2.7	9.0	43		0.26
	1	1.53			718	2872	0.50
	2	1.59			1077	4308	0.74
1 1/2	0	2.08	3.9	11.0	28		0.47
	1	2.16			531	2125	0.85
	2	2.24			797	3188	1.23
2	0	2.61	5.1	13.0	14		0.59
	1	2.69			449	1797	1.11
	2	2.77			674	2696	1.63
3	0	3.88	7.8	18.0	14		1.18
	1	3.98			346	1384	2.06
	2	4.08			519	2076	2.94
4*	0	4.96	9.8	22.0	14		1.41
	1	5.06			299	1194	2.47
	2	5.16			448	1791	3.53
5*	0	6.00	12.8	28.0	14		2.18
	1	6.12			275	1099	3.61
	2	6.24			412	1649	5.04
6*	0	7.01	14.8	32.0	11		2.69
	1	7.13			210	839	4.44
	2	7.25			315	1259	6.19

**** Consult factory for delivery.***

Notes: The minimum bend radius is measured from the centerline of the hose. The minimum bend radius increases with pressure (see chart on page 69). The working pressure decreases with temperature (obtain derating factor on page 67). For rapid pressure fluctuations consult the factory.

Braid is T316 stainless steel. Monel braid is available upon request. When Monel braid is used, stated pressure ratings need to be reduced by 0.75. Part numbers for Monel braid are AF6780 (single braid), and AF6788 (double braid).

BRONZEFLEX



Bronzeflex is Hose Master's heavy-duty corrugated hose designed for use in those applications that specifically require bronze hose.

Explanation of ***Bronzeflex*** Part Numbers:

BF 11 _____
Braid Code

Braid Codes
00 - Unbraided
10 - Bronze Single Braid
11 - Bronze Double Braid

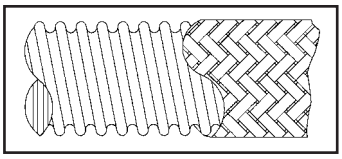
Example: BF1110 = Bronze, annular, corrugated metal hose with a single Bronze Braid.

Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Dynamic Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
3/8	0	0.63			60		0.18
	1	0.69	2.0	6.0	704	2816	0.31
	2	0.75			936	3744	0.44
1/2	0	0.77			50		0.23
	1	0.83	2.2	7.0	566	2264	0.43
	2	0.89			753	3012	0.63
3/4	0	1.13			30		0.47
	1	1.19	2.5	8.0	468	1872	0.81
	2	1.26			622	2488	1.15
1	0	1.42			26		0.56
	1	1.50	3.0	10.0	334	1336	0.97
	2	1.58			444	1776	1.38
1 1/4	0	1.81			16		0.79
	1	1.89	3.5	12.0	306	1224	1.34
	2	1.97			407	1628	1.69
1 1/2	0	2.13			15		1.04
	1	2.23	4.0	13.5	297	1188	1.74
	2	2.34			395	1580	2.44
2	0	2.64			10		1.15
	1	2.75	6.0	17.0	210	840	2.41
	2	2.85			279	1116	3.67
2 1/2	0	3.25			8		1.99
	1	3.37	8.5	22.0	194	776	3.33
	2	3.49			258	1032	4.67
3	0	3.70			5		2.68
	1	3.85	12.0	24.0	166	664	4.16
	2	3.95			221	884	5.64

Notes: The minimum bend radius is measured from the centerline of the hose. The minimum bend radius increases with pressure (see chart on page 69). The working pressure decreases with temperature (obtain derating factor on page 67). For rapid pressure fluctuations consult the factory.

Corrugated Metal Hose (Products)

EXTRAFLEX



Extraflex is Hose Master's spirally-welded corrugated metal hose, specifically designed to maximize flexibility while maintaining good pressure ratings. The helical design facilitates draining and reduces in-line turbulence.

Explanation of ***Extraflex*** Part Numbers:

EF _____ **0** _____
Material Code / Braid Code

Material Codes:
9 - T321 Stainless Steel
3 - T316L Stainless Steel

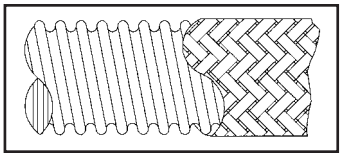
Braid Codes
00 - Unbraided
50 - T304 Single Braid
55 - T304 Double Braid
*T316 Braid avaiable upon request.

Example: EF9050 = T321 Stainless Steel, annular, corrugated metal hose with a single T304 Stainless Steel Braid.

Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Dynamic Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
1/4	0	0.39	0.4	2.2	71	7112	0.09
	1	0.45			1778		0.13
	2	0.51			2489	9956	0.19
5/16	0	0.47	0.6	2.4	43	5688	0.10
	1	0.53			1422		0.18
	2	0.59			1991	7964	0.26
3/8	0	0.55	0.6	2.8	36	4552	0.11
	1	0.61			1138		0.19
	2	0.67			1707	6828	0.28
1/2	0	0.67	0.8	3.1	28	3640	0.14
	1	0.73			910		0.26
	2	0.79			1422	5688	0.39
5/8	0	0.85	1.2	3.9	28	3640	0.19
	1	0.91			910		0.32
	2	0.96			1422	5688	0.46
3/4	0	1.02	1.4	5.1	14	2844	0.22
	1	1.08			711		0.38
	2	1.18			1138	4552	0.55
1	0	1.22	1.8	6.3	11	2276	0.26
	1	1.28			569		0.54
	2	1.34			910	3640	0.83
1 1/4	0	1.57	2.4	7.9	9	1820	0.45
	1	1.65			455		0.76
	2	1.73			711	2844	1.09
1 1/2	0	1.89	3.0	9.4	7	1424	0.65
	1	1.97			356		1.02
	2	2.05			569	2276	1.40
2	0	2.36	3.5	11.0	6	1136	0.71
	1	2.44			284		1.22
	2	2.52			455	1820	1.75

Notes: The minimum bend radius is measured from the centerline of the hose. The minimum bend radius increases with pressure (see chart on page 70). The working pressure decreases with temperature (obtain derating factor on page 67). For rapid pressure fluctuations consult the factory.

HYDRAFLEX



Hydraflex is Hose Master's T316 double-walled spirally-welded corrugated metal hose. Specially designed to maintain extreme pressure and flexibility, Hydraflex is self-draining and generates minimal in-line turbulence.

Explanation of ***Hydraflex*** Part Numbers:

HF 34 _____
Braid Code

Braid Codes
00 - Unbraided
50 - T304 Single Braid
55 - T304 Double Braid
*T316 Braid avaiable upon request.

Example: HF3450 = T316 Stainless Steel, helical, corrugated metal hose with a single T304 Stainless Steel Braid.

Inside Diameter (in.)	Number of Braids (#)	Outside Diameter (in.)	Static Min. Bend Radius (in.)	Dynamic Min. Bend Radius (in.)	Maximum Working Pressure (psi)	Burst Pressure (psi)	Weight Per Foot (lbs.)
1/4	1	0.52	1.1	5.0	4600	18400	0.21
	2	0.62			5800	23200	0.32
5/16	1	0.62	1.2	5.1	4000	16000	0.29
	2	0.74			4800	19200	0.45
3/8	1	0.70	1.4	5.5	3800	15200	0.36
	2	0.82			4000	16000	0.57
1/2	1	0.82	1.6	5.7	2600	10400	0.43
	2	0.94			3700	14800	0.69
5/8	1	0.97	2.2	6.1	2400	9600	0.51
	2	1.09			2700	10800	0.82
3/4	1	1.19	2.8	6.5	2000	8000	0.64
	2	1.31			2200	8800	1.03
1	1	1.39	3.5	7.9	1500	6000	0.78
	2	1.51			2000	8000	1.25
1 1/4	1	1.75	4.1	9.4	1100	4400	1.15
	2	1.87			1600	6400	1.70
1 1/2	1	2.07	5.1	12.2	1000	4000	1.45
	2	2.19			1500	6000	2.16
2	1	2.55	6.7	14.6	750	3000	1.97
	2	2.67			1100	4400	2.83

Notes: The minimum bend radius is measured from the centerline of the hose. The minimum bend radius increases with pressure (see chart on page 70). The working pressure decreases with temperature (obtain derating factor on page 67). For rapid pressure fluctuations consult the factory.

Corrugated Metal Hose (Specification by Diameter)

Hose Type and Inside Diameter (in.)	Number of Braids (#)	Static Minimum Bend Radius (in.)	Dynamic Minimum Bend Radius (in.)	Maximum Working Pressure (psi)
1/4"				
Annuflex	0			90
available in T321, T316L, T304L Stainless Steel	1	1.0	4.5	1800
refer to page 15	2			2700
Masterflex	0			90
available in T321, T316L, T304L Stainless Steel	1	0.9	3.7	1800
refer to page 16	2			2700
Formaflex	0	1.0	N/A*	90
available in T321 and T316L Stainless Steel	1			900
refer to page 17				
Extraflex	0			71
available in T321 and T316L Stainless Steel	1	0.4	2.2	1778
refer to page 21	2			2489
Hydraflex				
available in T316 Stainless Steel	1	1.1	5.0	4600
refer to page 22	2			5800
5/16"				
Extraflex	0			43
available in T321 and T316L Stainless Steel	1	0.6	2.4	1422
refer to page 21	2			1991
Hydraflex				
available in T316 Stainless Steel	1	1.2	5.1	4000
refer to page 22	2			4800
3/8"				
Annuflex	0			70
available in T321, T316L, T304L Stainless Steel	1	1.2	5.0	1558
refer to page 15	2			2336
Masterflex	0			70
available in T321, T316L, T304L Stainless Steel	1	1.0	4.0	1558
refer to page 16	2			2336
Formaflex	0	1.2	N/A*	70
available in T321 and T316L Stainless Steel	1			800
refer to page 17				
Bronzeflex	0			60
Bronze corrugated metal hose	1	2.0	6.0	704
refer to page 20	2			936
Extraflex	0			36
available in T321 and T316L Stainless Steel	1	0.6	2.8	1138
refer to page 21	2			1707
Hydraflex				
available in T316 Stainless Steel	1	1.4	5.5	3800
refer to page 22	2			4000

•N/A - non-applicable

Corrugated Metal Hose (Specification by Diameter)

Hose Type and Inside Diameter (in.)	Number of Braids (#)	Static Minimum Bend Radius (in.)	Dynamic Minimum Bend Radius (in.)	Maximum Working Pressure (psi)
1/2"				
Annuflex	0			70
available in T321, T316L, T304L Stainless Steel	1	1.5	5.5	1186
refer to page 15	2			1779
Masterflex	0			70
available in T321, T316L, T304L Stainless Steel	1	1.2	4.4	1186
refer to page 16	2			1779
Formaflex	0	1.5	N/A*	70
available in T321 and T316L Stainless Steel	1			665
refer to page 17				
ChemKing®	0			70
available in 276	1	1.5	5.5	1186
refer to page 19	2			1779
Bronzeflex	0			50
Bronze corrugated metal hose	1	2.2	7.0	566
refer to page 20	2			753
Extraflex	0			28
available in T321 and T316L Stainless Steel	1	0.8	3.1	910
refer to page 21	2			1422
Hydraflex				
available in T316 Stainless Steel	1	1.6	5.7	2600
refer to page 22	2			3700
5/8"				
Annuflex	0			57
available in T321, T316L, T304L Stainless Steel	1	1.8	7.0	1205
refer to page 15	2			1808
Masterflex	0			57
available in T321, T316L, T304L Stainless Steel	1	1.4	5.6	1205
refer to page 16	2			1808
Formaflex	0	1.8	N/A*	57
available in T321 and T316L Stainless Steel	1			500
refer to page 17				
Extraflex	0			21
available in T321 and T316L Stainless Steel	1	1.2	3.9	910
refer to page 21	2			1422
Hydraflex				
available in T316 Stainless Steel	1	2.2	6.1	2400
refer to page 22	2			2700

•N/A - non-applicable

Corrugated Metal Hose (Specification by Diameter)

Hose Type and Inside Diameter (in.)	Number of Braids (#)	Static Minimum Bend Radius (in.)	Dynamic Minimum Bend Radius (in.)	Maximum Working Pressure (psi)
3/4"				
Annuflex	0			43
available in T321, T316L, T304L Stainless Steel	1	2.1	8.0	898
refer to page 15	2			1347
Masterflex	0			43
available in T321, T316L, T304L Stainless Steel	1	1.7	6.4	898
refer to page 16	2			1347
Formaflex	0	2.1	N/A*	43
available in T321 and T316L Stainless Steel	1			380
refer to page 17				
Pressureflex	0			45
available in T321 Stainless Steel	1	2.2	8.0	1142
refer to page 18	2			1713
ChemKing®	0			43
available in 276	1	2.1	8.0	898
refer to page 19	2			1347
Bronzeflex	0			30
Bronze corrugated metal hose	1	2.5	8.0	468
refer to page 20	2			622
Extraflex	0			14
available in T321 and T316L Stainless Steel	1	1.4	5.1	711
refer to page 21	2			1138
Hydraflex				
available in T316 Stainless Steel	1	2.8	6.5	2000
refer to page 22	2			2200
1"				
Annuflex	0			43
available in T321, T316L, T304L Stainless Steel	1	2.7	9.0	718
refer to page 15	2			1077
Masterflex	0			43
available in T321, T316L, T304L Stainless Steel	1	2.1	7.1	718
refer to page 16	2			1077
Formaflex	0	2.7	N/A*	43
available in T321 and T316L Stainless Steel	1			355
refer to page 17				
Pressureflex	0			45
available in T321 Stainless Steel	1	2.8	10.0	929
refer to page 18	2			1394
ChemKing®	0			43
available in 276	1	2.7	9.0	718
refer to page 19	2			1077
Bronzeflex	0			26
Bronze corrugated metal hose	1	3.0	10.0	334
refer to page 20	2			444
Extraflex	0			11
available in T321 and T316L Stainless Steel	1	1.8	6.3	569
refer to page 21	2			910
Hydraflex				
available in T316 Stainless Steel	1	3.5	7.9	1500
refer to page 22	2			2000

•N/A - non-applicable

Corrugated Metal Hose (Specification by Diameter)

Hose Type and Inside Diameter (in.)	Number of Braids (#)	Static Minimum Bend Radius (in.)	Dynamic Minimum Bend Radius (in.)	Maximum Working Pressure (psi)
1 1/4"				
Annuflex	0			43
available in T321, T316L, T304L Stainless Steel	1	3.1	10.0	645
refer to page 15	2			968
Masterflex	0			43
available in T321, T316L, T304L Stainless Steel	1	2.5	7.9	645
refer to page 16	2			968
Formaflex	0	3.1	N/A*	43
available in T321 and T316L Stainless Steel	1			280
refer to page 17				
Pressureflex	0			45
available in T321 Stainless Steel	1	3.1	11.0	766
refer to page 18	2			1149
Bronzeflex	0			16
Bronze corrugated metal hose	1	3.5	12.0	306
refer to page 20	2			407
Extraflex	0			9
available in T321 and T316L Stainless Steel	1	2.4	7.9	455
refer to page 21	2			711
Hydraflex				
available in T316 Stainless Steel	1	4.1	9.4	1100
refer to page 22	2			1600
1 1/2"				
Annuflex	0			28
available in T321, T316L, T304L Stainless Steel	1	3.9	11.0	531
refer to page 15	2			797
Masterflex	0			28
available in T321, T316L, T304L Stainless Steel	1	3.1	8.7	531
refer to page 16	2			797
Formaflex	0	3.9	N/A*	28
available in T321 and T316L Stainless Steel	1			264
refer to page 17				
Pressureflex	0			28
available in T321 Stainless Steel	1	3.9	13.0	717
refer to page 18	2			1075
ChemKing®	0			28
available in 276	1	3.9	11.0	531
refer to page 19	2			797
Bronzeflex	0			15
Bronze corrugated metal hose	1	4.0	13.5	297
refer to page 20	2			395
Extraflex	0			7
available in T321 and T316L Stainless Steel	1	3.0	9.4	356
refer to page 21	2			569
Hydraflex				
available in T316 Stainless Steel	1	5.1	12.2	1000
refer to page 22	2			1500

•N/A - non-applicable

Corrugated Metal Hose (Specification by Diameter)

Hose Type and Inside Diameter (in.)	Number of Braids (#)	Static Minimum Bend Radius (in.)	Dynamic Minimum Bend Radius (in.)	Maximum Working Pressure (psi)
2"				
Annuflex	0			14
available in T321, T316L, T304L Stainless Steel	1	5.1	13.0	449
refer to page 15	2			674
Masterflex	0			14
available in T321, T316L, T304L Stainless Steel	1	4.0	10.3	449
refer to page 16	2			674
Formaflex	0	5.1	N/A*	14
available in T321 and T316L Stainless Steel	1			221
refer to page 17				
Pressureflex	0			28
available in T321 Stainless Steel	1	5.1	15.0	649
refer to page 18	2			974
ChemKing®	0			14
available in 276	1	5.1	13.0	449
refer to page 19	2			674
Bronzeflex	0			10
Bronze corrugated metal hose	1	6.0	17.0	210
refer to page 20	2			279
Extraflex	0			6
available in T321 and T316L Stainless Steel	1	3.5	11.0	284
refer to page 21	2			455
Hydraflex				
available in T316 Stainless Steel	1	6.7	14.6	750
refer to page 22	2			1100
2 1/2"				
Annuflex	0			14
available in T321, T316L, T304L Stainless Steel	1	6.8	16.0	417
refer to page 15	2			626
Masterflex	0			14
available in T321, T316L, T304L Stainless Steel	1	5.4	12.8	417
refer to page 16	2			626
Pressureflex	0			28
available in T321 Stainless Steel	1	6.9	17.0	507
refer to page 18	2			761
Bronzeflex	0			8
Bronze corrugated metal hose	1	8.5	22.0	194
refer to page 20	2			258
3"				
Annuflex	0			14
available in T321, T316L, T304L Stainless Steel	1	7.8	18.0	346
refer to page 15	2			519
Masterflex	0			14
available in T321, T316L, T304L Stainless Steel	1	6.3	14.5	346
refer to page 16	2			519
Pressureflex	0			28
available in T321 Stainless Steel	1	7.9	20.0	369
refer to page 18	2			554
ChemKing®	0			14
available in 276	1	7.8	18.0	346
refer to page 19	2			519
Bronzeflex	0			5
Bronze corrugated metal hose	1	12.0	24.0	166
refer to page 20	2			221

•N/A - non-applicable

Corrugated Metal Hose (Specification by Diameter)

Hose Type and Inside Diameter (in.)	Number of Braids (#)	Static Minimum Bend Radius (in.)	Dynamic Minimum Bend Radius (in.)	Maximum Working Pressure (psi)
4"				
Annuflex	0			14
available in T321, T316L, T304L Stainless Steel	1	9.8	22.0	299
refer to page 15	2			448
Masterflex	0			14
available in T321, T316L, T304L Stainless Steel	1	7.7	17.4	299
refer to page 16	2			448
Pressureflex	0			28
available in T321 Stainless Steel	1	9.8	25.0	330
refer to page 18	2			495
ChemKing®	0			14
available in 276	1	9.8	22.0	299
refer to page 19	2			448
5"				
Annuflex	0			14
available in T321, T316L, T304L Stainless Steel	1	12.8	28.0	275
refer to page 15	2			412
Masterflex	0			14
available in T321, T316L, T304L Stainless Steel	1	10.0	21.9	275
refer to page 16	2			412
Pressureflex	0	12.8	34.0	28
available in T321 Stainless Steel	1			331
refer to page 18				
ChemKing®	0			14
available in 276	1	12.8	28.0	275
refer to page 19	2			412
6"				
Annuflex	0			11
available in T321, T316L, T304L Stainless Steel	1	14.8	32.0	210
refer to page 15	2			315
Masterflex	0			11
available in T321, T316L, T304L Stainless Steel	1	11.6	25.0	210
refer to page 16	2			315
Pressureflex	0	14.8	40.0	23
available in T321 Stainless Steel	1			285
refer to page 18				
ChemKing®	0			11
available in 276	1	14.8	32.0	210
refer to page 19	2			315
8"				
Annuflex	0	20.0	40.0	3
available in T321, T316L, T304L Stainless Steel	1			212
refer to page 15				
10"				
Annuflex	0	25.0	50.0	2
available in T321, T316L, T304L Stainless Steel	1			175
refer to page 15				
12"				
Annuflex	0	30.0	60.0	2
available in T321, T316L, T304L Stainless Steel	1			160
refer to page 15				

•N/A - non-applicable

Corrugated Metal Hose *(Fittings)*

Metal hose is more versatile than other hose in that virtually any fitting can be attached to metal hose. Other types of hose require special shanks and collars in order to attach fittings. For metal hose, any fitting made from a weldable material can be attached without the need for special features. This versatility also means that multiple fittings can be welded together to make custom solutions for difficult applications.

Selecting the proper fittings for an application is largely determined by the mating fittings to which the hose assembly will be attached. Once the mating fittings have been identified, the hose fittings should complement the mating fittings in type, size, and alloy. Even though the selection of hose fittings is determined by the mating fittings, it is a good idea to confirm that the fittings used in the application are appropriate for the application and any necessary changes made. Ensure that the fittings are chemically compatible with and are able to withstand the pressure and temperatures of both the media and the surrounding environment.

The following pages show commonly used fittings for corrugated metal hose assemblies.

Please contact Hose Master's Customer Service Department for end connections that are not listed.

Male Pipe Nipple

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel, 276
- **Sizes** - 1/8" thru 8"
- **Schedules** - 40 and 80

Hex Male

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel, Brass
- **Sizes** - 1/4" thru 4"

Victaulic Fitting

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel
- **Sizes** - 1" thru 8"
- **Schedule** - 40

LiveLink® Swivel Fitting

- **Alloys** - T304 Stainless Steel
- **Sizes** - 1/4” thru 2”

Female Union (Threaded/Socket Weld)

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel, Malleable Iron, Brass
- **Sizes** - 1/4” thru 4”
- **Class** - 125#, 150#, 3000# (Carbon Steel Only)

Female Half Coupling (Threaded/Socket Weld)

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel
- **Sizes** - 1/4” thru 4”
- **Class** - 150#, 3000#

1, 2, or 3 Piece SAE (JIC)

- **Alloys** - T316 Stainless Steel, Carbon Steel, Brass (nut only)
- **Sizes** - 1/4” thru 2”

45º and 90º SAE (JIC)

- **Alloys** - Stainless Steel, Carbon Steel
- **Sizes** - 1/2” thru 2”

Corrugated Metal Hose *(Fittings)*

Sanitary Flange

- **Alloys** - T304 and T316 Stainless Steel
- **Sizes** - 1” thru 3”

Slip-on Flange

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel
- **Sizes** - 1/2” thru 12”
- **Class** - 150#, 300#

Plate Flange

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel
- **Sizes** - 1/2” thru 12”
- **Class** - 150#

Weld Neck Flange

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel
- **Sizes** - 1/2” thru 6”
- **Class** - 150#, 300#

TTMA Flange

- **Alloys** - T316 Stainless Steel, Carbon Steel
- **Sizes** - 2” thru 6”

C Stub with Floating Flange

- **Alloys** - T304 and T316 Stainless Steel
- **Sizes** - 1/2” thru 10”
- **Schedule** - 10

A Stub with Lap Joint Flange

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel, 276
- **Sizes** - 1/2” thru 8”
- **Schedules** - 10, 40

TTMA C Stub Swivel

- **Alloys** - T304 and T316 Stainless Steel
- **Sizes** - 4” thru 6”
- **Schedule** - 10

Part A and Part D (Cam-Lock)

- **Alloys** - T316 Stainless Steel, Brass, Aluminum
- **Sizes** - 1/2” thru 8”

Tube End

- **Alloys** - T304, T316, and T321 Stainless Steel, Carbon Steel
- **Sizes** - 1/8” thru 8” (seamless and welded)
- **Wall Thickness** - Various

Corrugated Metal Hose *(Fittings)*

Short and Long Radius Elbows (45º and 90º)

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel, 276
- **Sizes** - 1/4” thru 6”

Reducer

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel
- **Sizes** - 3/4” thru 6”
- **Schedule** - 10, 40 (Carbon Steel)

Beveled Pipe End

- **Alloys** - T304 and T316 Stainless Steel, Carbon Steel, 276
- **Sizes** - 1/8” thru 8”
- **Schedules** - Various

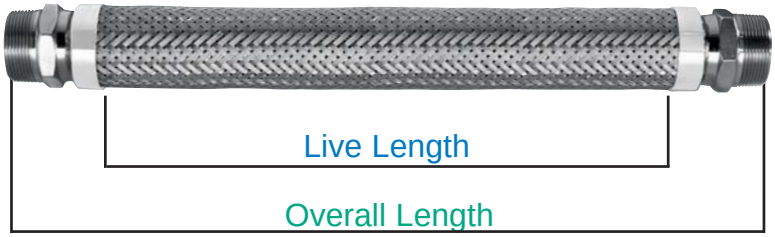
Ground Joint Female

- **Alloys** - Carbon Steel
- **Sizes** - 1/2” thru 4”

Specialty Gas Nuts

- **Alloys** - Brass
- **Sizes** - A, B, C, D
- **Thread Type** - SAE and BSP

Corrugated Metal Hose *(Length)*



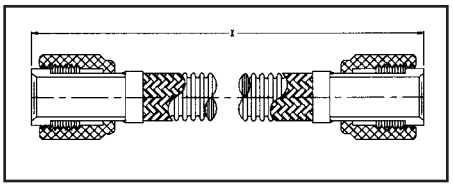
To calculate the proper length of a hose assembly:

- **Verify that the installation is properly designed** – Page 72 illustrates the right and wrong ways to install a hose assembly. Basically, there are three considerations:

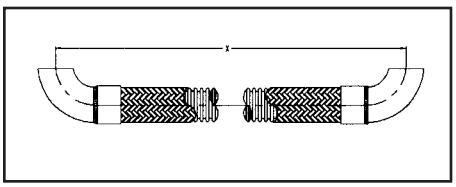
    1. Do not torque the hose.
    2. Do not overbend the hose.
    3. Do not compress the hose.

- **Calculate the live length of the assembly** – The live length of the assembly is the amount of active (flexible) hose in an assembly; that is, the hose between the braid collars. Pages 73 - 75 give formulas to calculate live length for a variety of common hose installations.

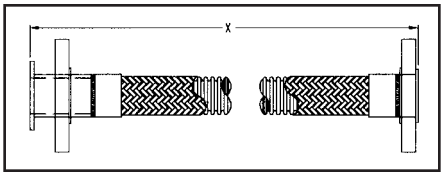
- **Calculate the overall length of the assembly** – Overall length is equal to the live length plus the lengths of the braid collars and fittings. When adding fitting lengths be aware that the points from which measurements should be taken vary for different fitting types. When calculating overall length for assemblies with threaded fittings, remember to account for the length of thread that is lost by threading into the mating connection (see Thread Allowance chart on page 72).



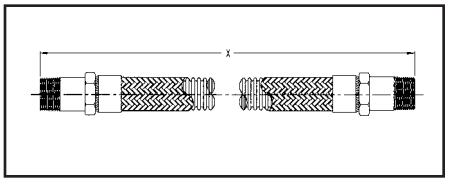
JIC/SAE type fittings are measured from the seat of the fitting.



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



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



Threaded fittings are measured to the end of the fitting.

For assistance in making any calculation or for dimensional information on fittings, please contact Hose Master's Customer Service Department.

Corrugated Metal Hose *(Fabrication Options)*

Corrugated metal hose is used in a very broad spectrum of applications. Just as the hose, fittings, and other assembly parts must be tailored to suit the demands of the service, so must the methods of joining these components. While standard production joining methods work very well for the majority of service demands, the following extremes may dictate special joining or fabrication techniques:

- Pressures
- Temperatures
- Corrosion
- Other conditions

Hose Master has developed specialized welding, brazing, joining, and fabrication procedures to assure the integrity and serviceability of metal hose assemblies in even the most extreme applications.

The fabrication options to be considered are:

A. Specialized attachment techniques

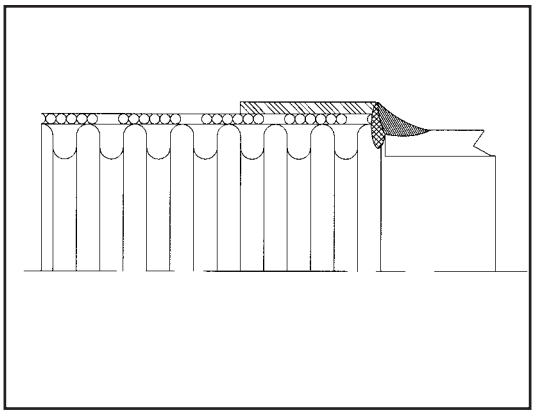
B. Testing options

C. Additional cleaning requirements

D. Packaging

In each of the following sections, the standard method and available options are explained. Select the options best suited for your application.

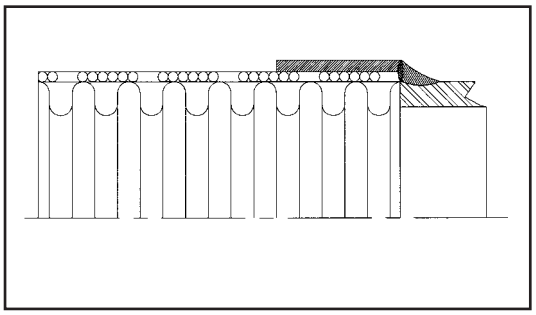
A. Specialized Attachment Techniques:



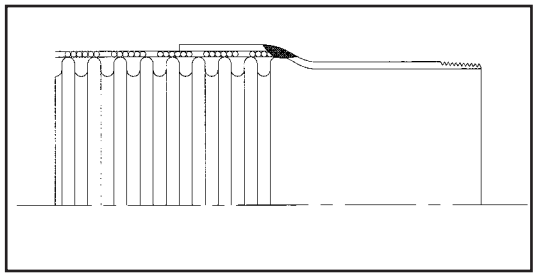
Industry Standard ***- This method will be used unless another method is specified.***

Standard fabrication of an assembly generally consists of:

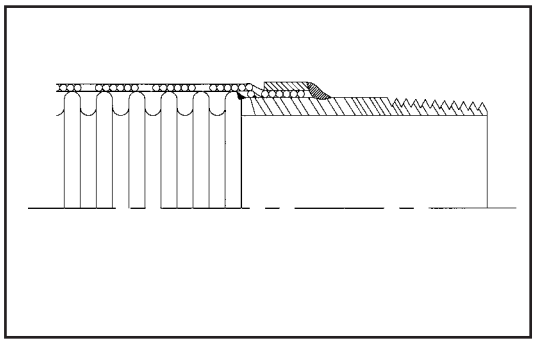
- Cutting the hose and braid through a hose corrugation valley.
- Installation of a braid collar over each end of the hose.
- Trimming of any excess braid.
- "Cap" welding the hose, braid, and braid collar together.
- Cleaning the cap weld surface.
- Placement and alignment of a fitting on the cap weld.
- "Attachment" welding the fitting to the cap weld.
- Silver brazing is also available. Consult factory.



Half-Corrugation - Standard fabrication sometimes leaves a portion of the cut corrugation, or corrugation "lip", just under the base of the fitting. In specialized applications this residual lip may not be desirable. To prevent any exposed corrugation edges from causing damage, the hose can be specially prepared for welding by cutting the corrugation on the crest, rather than in the valley, thereby removing the lip.



Smooth Transition Weld - For applications in which corrosion is a concern, all crevices and fissures must be minimized. Specialized hose and fitting preparation, in conjunction with proprietary welding techniques, is available to provide a full penetration hose-to-fitting weld that is smooth and crevice free.



Braid-Over Construction - Assemblies operating at the upper limits of their rated working pressure or in severe service may benefit from a braid-over construction. The fitting is first welded to the unbraided hose. Then a special metal reinforcing ring is installed over the fitting and next to the weld. Finally the braid is drawn over the end of the hose and the ring, and welded to the side of the fitting. This technique reduces the amount of heat introduced into the braid wires, nearly eliminates the heat effected zones of the cap and attachment welds, and maximizes the wire strength. Braid-over construction may also be used for specific high cycle applications.

Corrugated Metal Hose *(Fabrication Options)*

B. Testing Options:

Standard Leak Testing - Every corrugated hose assembly is leak tested prior to shipment. Standard testing consists of pressurizing the assembly with air and then submerging the entire assembly under water. This method is reliable and sufficient for the majority of applications.

Hydrostatic Testing - While the standard test is designed to detect leaks, hydrostatic testing is designed to test the assembly's strength. Testing of an assembly to its full permissible test pressure can be economically and accurately accomplished by filling the assembly with liquid while concurrently evacuating all air. The assembly is then hydrostatically pressurized using high pressure pumps. The test pressure is maintained for a predetermined period of time.

High Pressure Gas - Testing with air under water, at pressures of up to 2500 psi, is available for specialized applications. For a more sensitive test, the use of gases such as nitrogen or helium can be requested.

Dye Penetrant - Dye penetrant testing is available for both leak and for weld bead inspection, in accordance with Hose Master procedures or to customer specified standards.

Helium Mass Spectrometer - This is the most sensitive leak detection method generally available. The standard test method is to attach the assembly to a mass spectrometer and generate a very high vacuum in the assembly. The exterior of the assembly is then flooded with helium. The relatively tiny helium atoms penetrate even very small openings and are drawn into the mass spectrometer where they are detected and the leak size quantified. Helium Mass Spectrometer testing can be modified to satisfy customer or regulatory agency requirements.

Note: Always test an assembly with a medium that has a smaller molecular or atomic size than the service required.

C. Additional Cleaning Requirements:

The hydroforming method of corrugated hose manufacturing inherently yields a very clean product. However, specialized cleaning for specific applications is available upon request. Contact Hose Master's Customer Service Department for details.

D. Packaging:

All assemblies are shipped with protectors over sealing surfaces such as threads and flange faces. Spacer bars are installed on all shorter double-flanged assemblies to prevent compression of the assembly during shipping and handling. Special packaging is available to suit customer requirements, including crating, plastic bagging, labeling, and custom fitting protectors.

Corrugated Metal Hose *(Accessories)*

Metal hose assemblies often require special accessories or components in order to provide long service life in severe applications or make the assemblies easier to use. There are many accessories that may be specified including:

- Guard, made from metal and other materials, can be provided to protect an assembly from overbending, abrasion, impact, and thermal damage.
- Jacket and tracer hoses are incorporated into corrugated hose assemblies in order to keep certain media at elevated or reduced temperatures so that it can be easily conveyed.
- A sacrificial bronze braid can be inserted between the hose and the stainless steel braid to improve cycle life.

One or several accessories can be easily combined with an assembly to more efficiently transport media, protect the assembly, or both.

The following pages list some common accessories along with a brief explanation of the benefits each accessory offers. This is not an exhaustive list of all possible accessories. Please contact Hose Master's Customer Service Department with your specific requirements.

Spring Guard - When there is potential for damaging an assembly in service, a guard can be easily installed during fabrication. This type of guard consists of a metal spring that is attached behind the fitting. The style of guard can be tailored to meet the application and the type of hose.

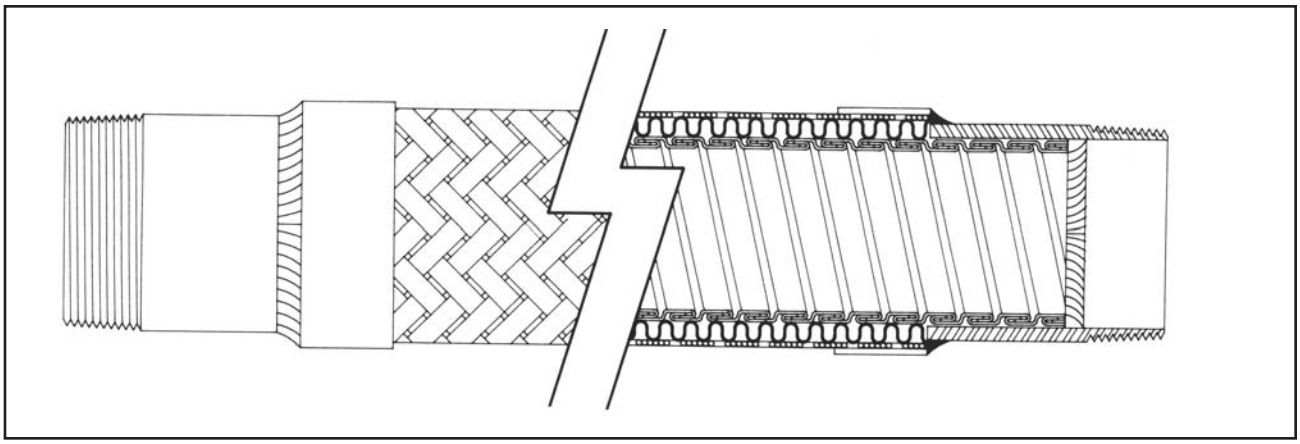
Protective Cover - If the potential for impact or high temperature damage is not severe, or if the additional weight and bulk of a full metal guard is unacceptable, rubber or plastic scuff guards can be installed to protect the corrugated hose and braid.

Insulating Jackets - If the corrugated hose is to convey hot media, and there is a potential for skin contact, an insulated, protective jacket is available. The jacket consists of a tubular braided fiberglass insulation, covered and impregnated with silicone rubber. The jacket is installed over the corrugated hose and metal banded in place. The jacket can also be used to insulate the corrugated assembly and either prevent ambient heat from being conveyed to the media or to reduce heat loss.

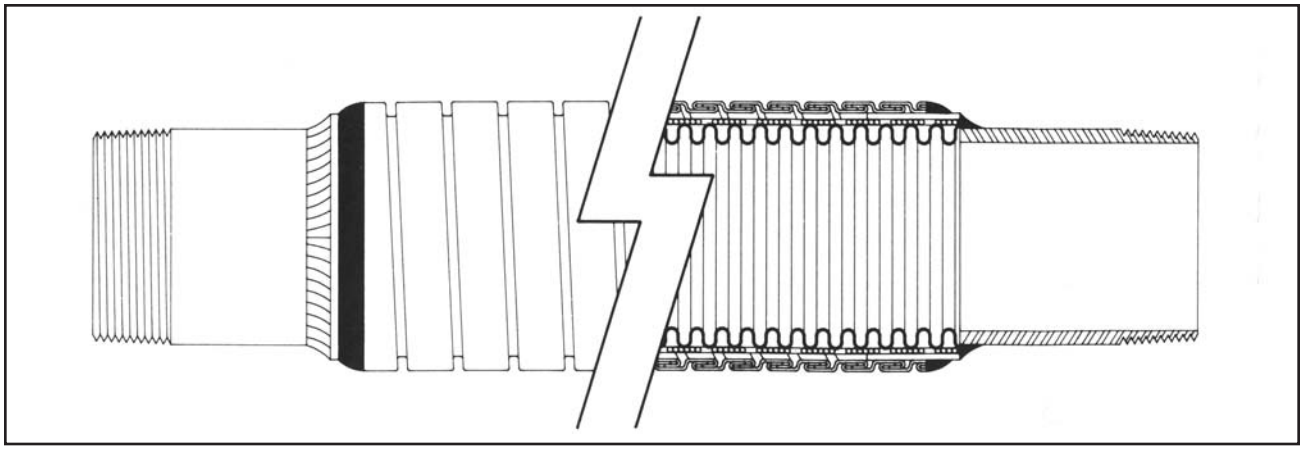
Tagging - A variety of tags and identifications can be affixed to assemblies. These include cardboard, plastic, and metal tags. Serial numbers, application information, assembly performance capabilities, and other customer specific information can be provided either on tags or permanently engraved onto one or both braid collars.

Certifications - Standard written certifications for materials or inspections can be supplied for corrugated hose or assemblies. Certifications of conformance to specific customer requirements such as military certifications are also available.

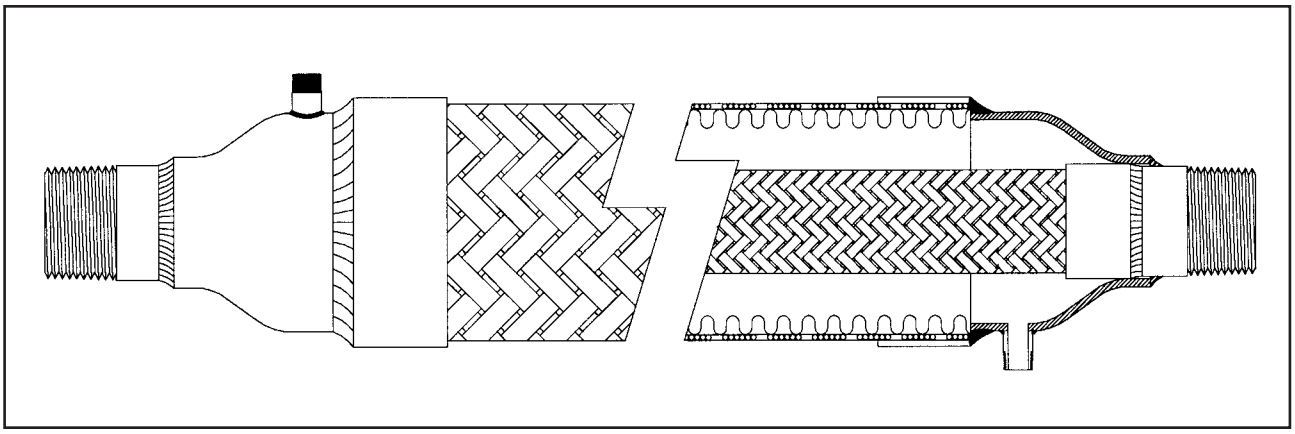
Corrugated Metal Hose *(Accessories)*



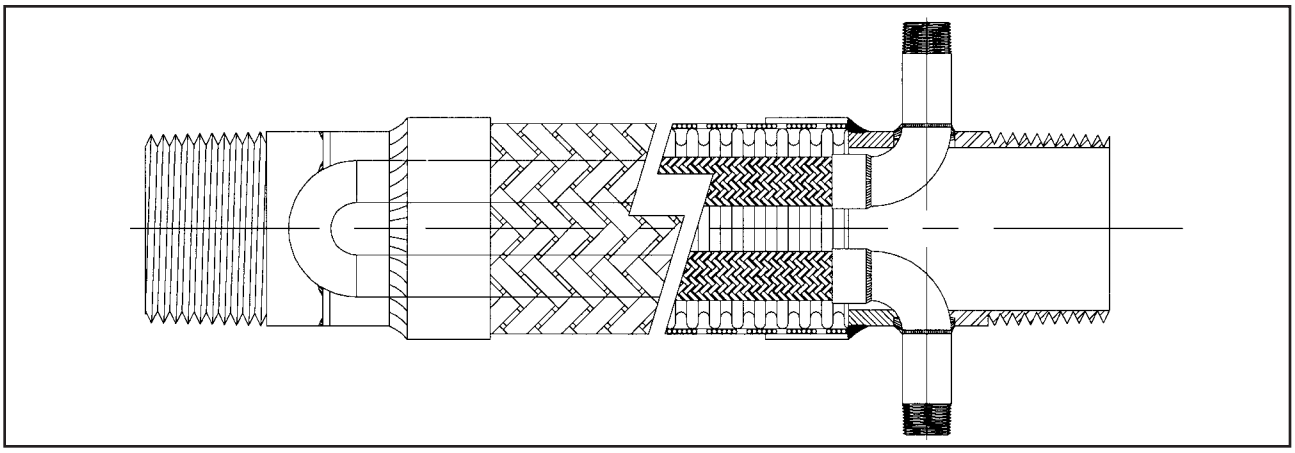
Liners - An interlocked hose or liner is often installed inside a corrugated hose assembly. The liner commonly serves two additional purposes, while still maintaining the full working pressure of the corrugated hose. The first is to protect the hose corrugations from excessive media velocities. Media speeds can induce resonant vibrations in the corrugations causing rapid fatigue and subsequent fracturing of the hose wall (see page 67 for recommended flow velocities). The liner provides a relatively smooth surface for the media and, by avoiding the media impacting on the corrugation valleys, reduces the chances of harmonic resonance. The second purpose for a liner is for abrasion resistance. Even slightly abrasive media flowing at medium to high speeds can cause premature wear of the corrugated hose interior surfaces. The liner provides a smooth flow path as well as a relatively thick layer of abrasion resistant metal between the media and the corrugated hose. The liner will also help reduce pressure loss due to friction between the media and corrugated hose. Proper fit between the hoses is essential for good performance. Because Hose Master makes both the corrugated hose and liners, perfect fit is assured.



Armor Guard / Bend Restricter - Applications in which the corrugated hose is subject to external abrasion, molten material splash, or impact damage may require a protective armor or guard along all or a portion of its length. A guard is typically made from interlocked or squarelocked metal hose and is welded to the assembly. Note that the bend restricter has a bend diameter equal to or greater than the corrugated hose it is protecting.



Jacketed Assemblies - A jacketed assembly consists of a "hose within a hose." An inner or primary media conveying hose is enclosed or jacketed by a larger diameter hose. The hoses are joined at each end by specially designed fittings so that there is no media pathway between the two hoses. Jacketed assemblies are often specified when the primary media must be kept at either an elevated or cryogenic temperature. Steam is often circulated through the jacket hose to keep a viscous material in the inner hose hot and easily conveyed. A vacuum can also be pulled on the jacket hose to insulate cryogenic liquids being conveyed in the inner hose.



Tracers - Traced assemblies are similar in concept to jacketed assemblies in that there is an inner, smaller diameter hose encased by a single larger diameter hose. Where jacketed assemblies surround the media with heat or cold, traced assemblies have the media surround the hose containing the heating or cooling element. The tracer, or inner hose, may also be installed in a long "U" shaped loop within the outer hose, with the steam inlet and outlet at the same end of the assembly.