



**HOSE MASTER Inc.**

*Manufacturing Capability*

*Technical Expertise*

*Custom Design*

*Great Service*

## **EXPANSION JOINT**

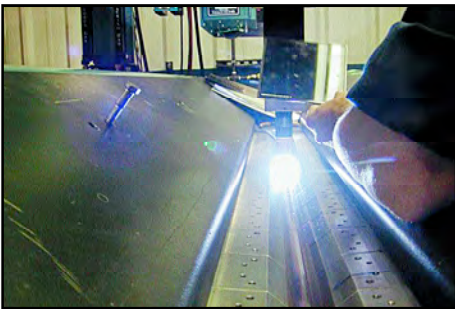
**Products and Capabilities  
Brochure**





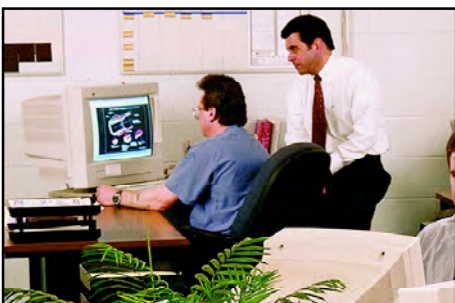
## ***Hose Master Inc.***

is a premier manufacturer of metal hose and expansion joints with facilities located in both Cleveland, Ohio and Houston, Texas. Hose Master was the first domestic metal hose manufacturer to be ISO 9000 registered and is widely recognized for technical expertise and innovation. Using the winning formula that made us the industry leader for engineered metal hose and assemblies, Hose Master provides the same superior engineering, precisely controlled manufacturing processes, expert quality control, and extraordinary customer service to the art of expansion joints.



## ***Engineering and Manufacturing***

At the heart of Hose Master's success is technical expertise. Proprietary equipment, designed and built in-house, makes the difference between ordinary products and superior, value engineered products.



Hose Master's expertise goes beyond manufacturing with a team of skilled engineers ready to assist you in designing an expansion joint for almost any application.



## **Quality Assurance**

Quality is not just a word, but a passion at Hose Master. Designs conform to the latest editions of EJMA, ASME B31.1, ASME B31.3, or ASME Section 8. Customer specifications can be verified through Finite Element Analysis (FEA) or 3D CAD modeling. Expansion joints may be tested using pneumatic, hydrostatic, high pressure gas, or liquid penetrant methods, as well as helium mass spectrometry and radiography.

## **Failure Analysis**

A key to permanently solving any tough EJ application is to accurately identify the root cause(s) of a past failure. Our in-house failure analysis and forensics laboratory can quickly identify various failure modes, whether the failure occurred as a result of fatigue, corrosion, deformation, or any of a host of other possible causes. Hose Master is the only metal hose and expansion joint manufacturer in North America that offers this service in-house.



## **Quick Deliveries**

An aggressive material stocking program and dedicated Hose Master employees provide the exceptional service our customers deserve. When you need solutions quickly, Hose Master offers the best standard delivery time and often expedites for next day delivery.

## Expansion Joint Options

**US** Unrestrained Single



**TS** Tied Single



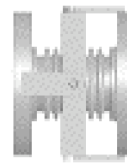
**HS** Hinged Single



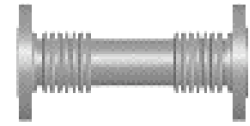
**SHS** Slotted Hinged Single



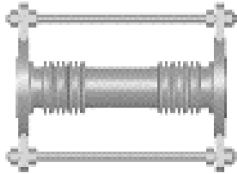
**GS** Gimbale Single



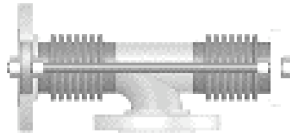
**UU** Unrestrained Universal



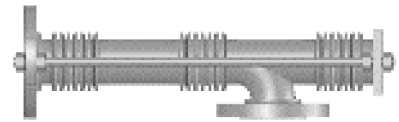
**TU** Tied Universal



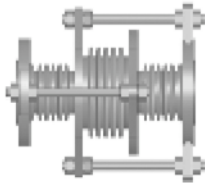
**PBS** Pressure-Balanced, Elbow, Single



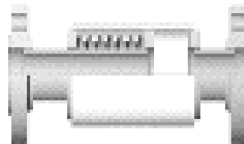
**PBU** Pressure-Balanced, Elbow, Universal



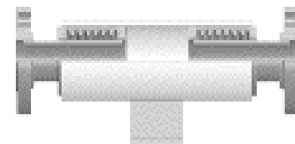
**PBI** Pressure-Balanced In-Line



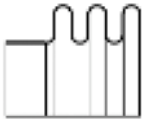
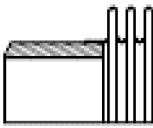
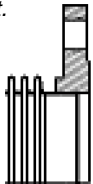
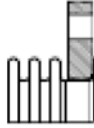
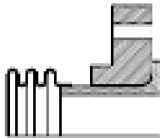
**EPS** Externally-Pressurized Single



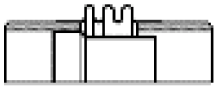




**EPD** Externally-Pressurized Dual



## End Connections

<p><b>BB - Banded Bellows</b></p> <p><i>Ideal for slipping over pipe and welding in place.</i></p> 	<p><b>WE - Welded End</b></p> <p><i>Beveled to facilitate pipe-to-pipe welding. Most common end connection.</i></p> 	<p><b>FF - Fixed Flange</b></p> <p><i>Recommended for ease of replacement. Requires accurate flange hole alignment.</i></p> 	<p><b>VF - Vanstone Flange</b></p> <p><i>Economical solution for piping systems with misaligned bolt holes.</i></p> 	<p><b>LJ - Lap-Joint Flange</b></p> <p><i>Commonly used when vanstone flanges are not an option.</i></p> 
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## Internal Liners

<p><b>SW - Single Welded Liner</b></p> <p><i>Most common type of internal liner. Maximum durability.</i></p> 	<p><b>TW - Telescoping Welded Liner</b></p> <p><i>For large axial movements.</i></p> 	<p><b>FW - Flush Welded Liner</b></p> <p><i>No protrusion into flow-stream. Minimal pressure drop. Recommended for refractory-lined pipe.</i></p> 	<p><b>SD - Single Drop-In Liner</b></p> <p><i>Can be removed and cleaned.</i></p> 	<p><b>TD - Telescoping Drop-In Liner</b></p> <p><i>For large axial movements. Can be removed and cleaned.</i></p> 
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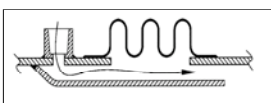
# A Comparison of Ratings, Features, and Available Options

EJ Styles	Relative Movement Capability			Relative Spring Forces			Pressure Thrust Piping System	Available Features			
	Axial	Angular	Lateral	Axial	Angular	Lateral		Internal Flow Liner Types	External Cover	Redundant Ply Design	End Connection Types
<b>US</b> Unrestrained Single	↔	↔	↓	↔	↔	↑	YES	SW, TW, FW, SD, TD	YES	YES	BB, WE, F,F VF, LJ
<b>TS</b> Tied Single	-	-	↓	-	-	↑	NO	SW, TW, FW, SD, TD	YES	YES	BB, WE, FF, VF, LJ
<b>HS</b> Hinged Single	-	↔	-	-	↔	-	NO	SW, TW, FW, SD, TD	YES	YES	WE, FF, VF, LJ
<b>SHS</b> Slotted Hinge Single	↔	↔	-	↔	↔	-	YES	SW, TW, FW, SD, TD	YES	YES	WE, F,F V,F LJ
<b>GS</b> Gimbaled Single	-	↔	-	-	↔	-	NO	SW, TW, FW, SD, TD	YES	YES	WE, FF, VF, LJ
<b>UU</b> Unrestrained Universal	↔	↔	↑	↔	↔	↓	YES	SW, TW, FW, SD, TD	YES	YES	BB, WE, FF, VF, LJ
<b>TU</b> Tied Universal	-	-	↑	-	-	↓	NO	SW, TW, FW, SD, TD	YES	YES	WE, FF, VF, LJ
<b>PBS</b> Pressure-Balanced, Elbow, Single	↔	-	↔	↔	↔	↑	NO	SW, TW, FW, SD, TD	YES	YES	WE, FF, VF, LJ
<b>PBU</b> Pressure-Balanced, Elbow, Universal	↔	-	↑	↔	↔	↓	NO	SW, TW, FW, SD, TD	YES	YES	WE, FF, VF, LJ
<b>PBI</b> Pressure-Balanced In-Line	↔	-	-	↔	-	-	NO	SW, TW, FW, SD, TD	YES	YES	WE, FF, VF, LJ
<b>EPS</b> Externally-Pressurized Single	↑	-	-	↔	-	-	YES	FW	INCL	YES	WE, FF, LJ
<b>EPD</b> Externally-Pressurized Dual	↑	-	-	↔	-	-	YES	FW	INCL	YES	WE, FF, LJ

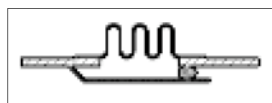
**Legend:**    ↑ *Higher*    ↔ *Moderate*    ↓ *Lower*    - *Not Applicable*

## Options

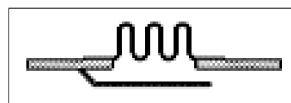
Purge Ports



Packed Liner



Self Draining Liner





## Size Range

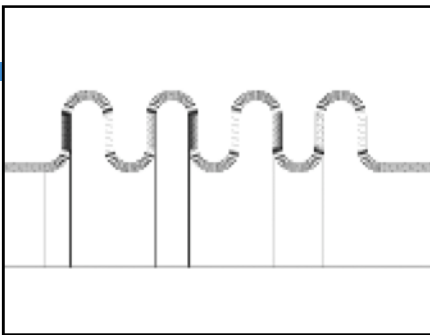
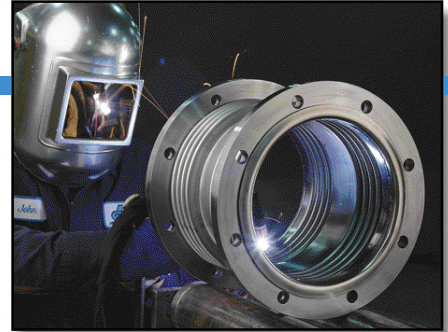
2" through 96" diameter pipe sizes (tube sizes also available). Hose Master can form single ply bellows up to 0.125" thick and multi-ply bellows up to 0.150" total thickness (e.g. 6 plies of 0.025" thick stainless steel).

## Available Alloys

Stainless steels including - T304, T304L, T309, T310, T321, T316, T316L

Nickel alloys including - 400, 600, 625, 625LCF, 800, 800H, Nickel 200, C276

*Note: Other alloys are available upon request.*

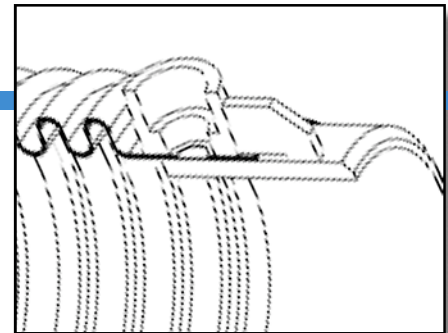


## Multi-Ply Bellows

These are designed by nesting together multiple, thin, concentric tubes. They withstand pressure as a single thickness equal to the sum of the plies, but for deflection are stressed individually. The result is a much more flexible bellows with lower spring rates and higher cycle life. For example, a bellows made from three plies of 0.010" thick T321 SS has the same pressure rating as a single ply of 0.030" thick T321 SS but will compress with 1/7th the force and has a rated cycle life 160 times the single ply design.

## Redundant Ply Bellows

This design is used for critical applications where safety or preventing down time are the most important considerations. Like multi-ply bellows, this design includes separate plies. However, for this style, each ply is designed to handle the working parameters of the application. An access port to the space between the two plies allows for installation of a leak monitoring device. The redundant ply also provides for leak containment should the inner ply fail.



## Customer Training Seminars

Our trainers have decades of field experience, have performed hundreds of expansion joint surveys, and solved problems in every major industry. Call for more information on how to arrange a personalized presentation.

## Industries Served



- Power Generation
- Chemical Processing
- Pulp & Paper
- Hot Metal Industries
- Ship Building



- HVAC
- Water Treatment
- OEM



## Sampling of Applications

Exhaust Bellows



Chemical Processing



Hot Metals



Power Generation



Engine Exhaust • District Heating • Industrial Piping Systems • Heat Exchangers • Steam Distribution

## The Importance of Pressure Thrust

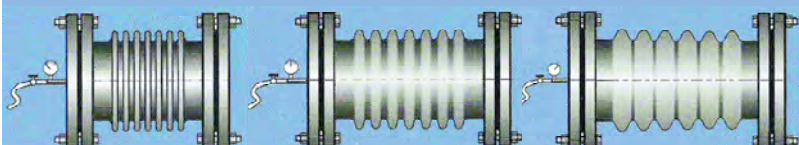
Expansion joints must be very flexible in order to absorb axial movement. This inherent flexibility prevents the expansion joint from restraining longitudinal pressure loads and results in a force being exerted on the piping system. This force is known as pressure thrust.

Pressure thrust is calculated by multiplying the effective area of the bellows by the system pressure. With larger diameter bellows and/or higher pressure applications, the pressure thrust exerted by the bellows can be quite significant - tens of thousands of pounds. The concept of pressure thrust is illustrated below.

If the ends of an expansion joint were capped and it was then pressurized, the bellows would extend freely until it formed a tube (its original shape). This type of unrestrained extension would destroy the expansion joint. To maintain the structural integrity of the piping system, the pressure thrust must be balanced or restrained. Often, pipe anchors can be designed to withstand the pressure thrust. If there is no axial movement required, tie rods can be installed on the expansion joint to contain the pressure thrust. In some situations, where there is axial movement required and pipe anchors are not practical, a pressure-balanced expansion joint is the solution.

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

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



# Expansion Joint Specification Inquiry Sheet

Date: \_\_\_\_\_

Company Name: \_\_\_\_\_ Contact: \_\_\_\_\_

Inquiry Number: \_\_\_\_\_ Contact Number: \_\_\_\_\_

<b>Design Information</b>		Item #1	Item #2	Item #3
<i>* Denotes Minimum Required Information</i>				
*1	Quantity			
*2	Nominal Size / ID Pipe / Tube			
*3	EJ Type (Single, Universal, etc)			
*4	End Fittings Inlet Outlet			
5	Media			
6	Velocity			
7	Installation Position Vertical or Horizontal			
*8	Design Pressure			
*9	Design Temperature			
10	Material - Bellows / Liner			
11	Material - Fittings			
12	Material - Hardware			
13	Tie Rods / Limit Rods			
14	Cover (check to request) if checked, removeable or fixed			
<b>Design Movements</b>				
15	Axial Compression			
16	Axial Extension			
17	Lateral			
18	Angular (degrees)			
19	Number of Cycles			
<b>Dimensional Limitations</b>				
20	Overall Length			
21	Overall OD			
22	Flow Liner			
23	Spring Rate			
24	QA Requirements - NDE			
25	Design Code (EJMA, B31.3, etc.)			
<b>Special Flange Design</b>				
26	Facing (Machining)			
27	O.D.			
28	I.D.			
29	Thickness			
30	B.C. Diameter			
31	Number of Holes			
32	Hole Diameter			

Upon completion please fax to (216) 481-7557 or email request to [ejquotes@hosemaster.com](mailto:ejquotes@hosemaster.com)



## HOSE MASTER Inc.

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