# REAL HYDROFIT & CO.®

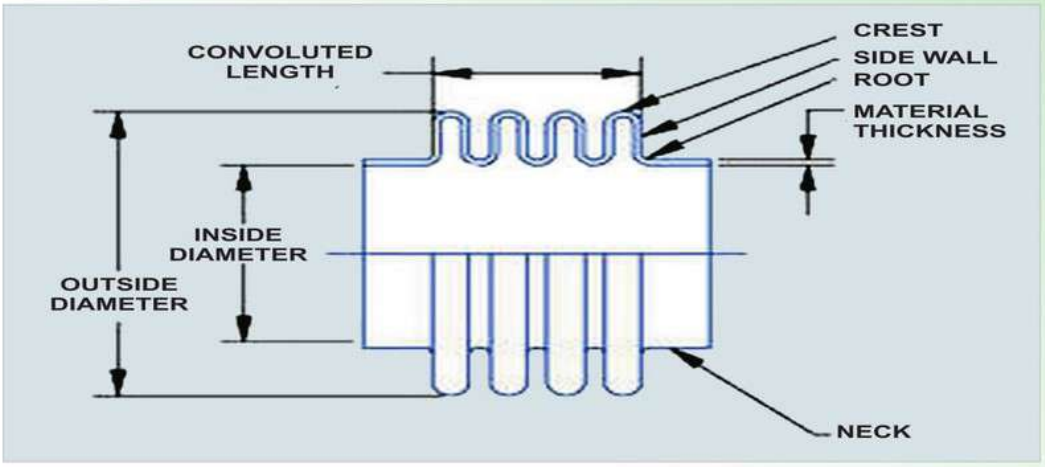
# EXPANSION JOINTS

M4960112IN

**ISO 9001:2008 CERTIFIED COMPANY**

# REAL HYDROFIT & CO.®

## DIAGRAM OF EXPANSION JOINT




# EXPANSION JOINT

Expansion control in pipe lines, ducting and vessels which carry hot or cold fluids, or which are exposed to the large variations in ambient temperature, is a major problem confronting designers.

As the metal temperature increases or decreases, the dimensional changes due to thermal expansion or contraction will enduce excessive stresses in the piping ducting or vessel and large forces will be transmitted to anchors and connected equipment.

For controlling such stresses and bring them to allowable values for the materials used in piping, ducting and vessels, several different methods are available, such as the use of pipe bends and expansion loops.

However, most modern designers prefer the use of metal Expansion Joints, because they require less spaces than bends and loops and because their inherent flexibility enables them to absorb movements in more than one direction, thereby permitting greater freedom in design.

Furthermore, Expansion Joints prove to be more economical than other devices, so their use results in lower initial costs for piping and construction work, operating costs being reduced as well.

All other components of Expansion Joints such as flanged or weld ends, internal sleeves, flanges, anchors, hinges are defined in accordance with the required working and design conditions.

A fabrication control is performed on each Expansion Joint, according to the installation class for which it has been designed.

Each Expansion Joint manufactured in our works is hydrostatically tested in our shops.

**Bellows Definitions**

The flexible element of and Expansion Joint, consisting of one or more convolutions obtained by the mechanical forming of a stainless steel shell, which may also be in nickel alloy, aluminum alloy or other, of a grade suitable for the required duty.

Bellows are welded to tube ends or flanges to constitute different models of Expansion Joint assemblies.

Internal sleeve

A device which is also referred to as liner, telescoping sleeve, etc., designed to avoid head losses or trubulences.

This component is required in case of a fluid flowing through it at high velocity.

Ends

The ends of an Expansion Joint, which may be either equipped with flanges or suitably bevelled for welding to adjacent equipment or piping.

They are in compliance with applicable standards in force.

The rods, hinges and similar accessories

In a piping system containing Expansion Joints, it may be impractical to use main anchors to absorb the pressure thrust.

In such cases, the use of Expansion Joints provided with tie rods, hinges or gimbals can solve the problem.







# Operating Conditions - Single Expansion Joint On A Piping System

The selection of one or several Expansion Joints will depend upon the direction and the magnitude of the movements resulting from the expansion or the contraction of a piping section and the piping configuration.

An Expansion Joint will always be located between two pipe anchors.
Such anchors must be designed to withstand the forces acting upon them, due to Expansion Joints and piping.

**Main pipe anchor**

An anchor which must withstand the full bellows thrust due to pressure flow, spring forces etc.,

**Directional anchor**

An anchor which is designed to absorb loading in one direction while permitting motion in another.

**Pipe guide**

An element which permits the pipe line to move freely in either direction.

## CALCULATION OF MAIN ANCHORS

**Static thrust**

Action of internal pressure on the effective area of bellows (constant per pressure Bar. specified in the following tabular data), calculated with the following formula

Fs (daN)=P (daN/cm2)xa(cm2)

where:

Fs = static thrust due to internal pressure

P = highest internal line pressure

a = effective area, cm2 corresponding to the mean diameter of the convolution.

The selection of hinged Expansion Joints can avoid such load on anchors.

**Bellows spring rate**

The force required (daN/mm) to compress or extend a bellows of a certain length, expressed in the following formula :

FM (daN) = f (daN/mm) x Δ1 (mm)

where:

FM = the total force required

f = bellows initial spring rate per convolution

Δ1 = axial movement in compression or extension.

**Frictional forces**

The forces due to the displacement of the pipe section on its guides.

## Selection of Expansion Joints

**Typical applications**

Dimensional changes such as those caused by thermal expansion or contraction of a pipeline are exerted on Expansion Joints in the following directions:

- **axial movement**
- **lateral deflection**
- **angular rotation**

or any combination of these movements

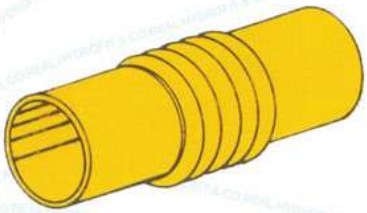
Here are some typical applications for the use of Expansion Joints :

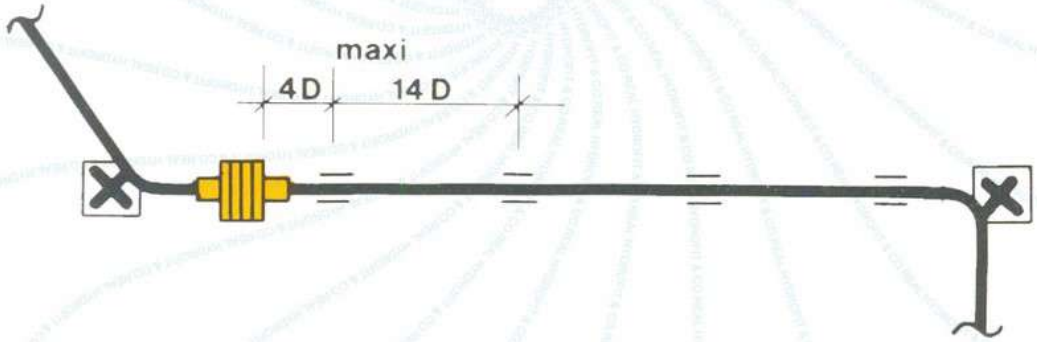
## Types of Expansion Joints

Bellows, which are the flexible element of and Expansion Joint, may be subjected to axial movement, angular rotation, lateral deflection, or any combination of these movements.
Therefore, different types of Expansion Joints may be required according to the expected application :

## Single Expansion Joint (RH 110-SEJ)

A single bellow construction, designed to absorb the axial expansion or contraction of a pipeline.






Single Expansion Joint

Single Expansion Joint designed to absorb axial pipe line movement. Note the nearness of the Expansion Joint to an anchor, in order to avoid a tendency to sagging of the pipe section. First pipe guide must be located within a distance of four pipe diameters from the end of the bellance of fourteen pipe diameters from the first guide. Other intermediate pipe guides to be spaced according to usual standards.





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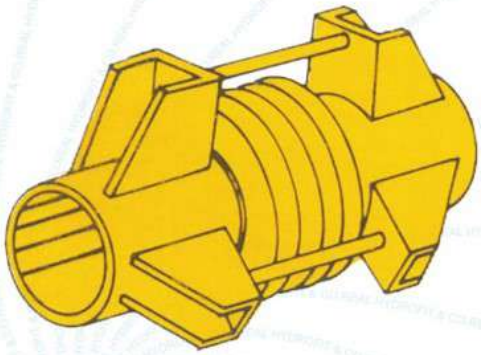
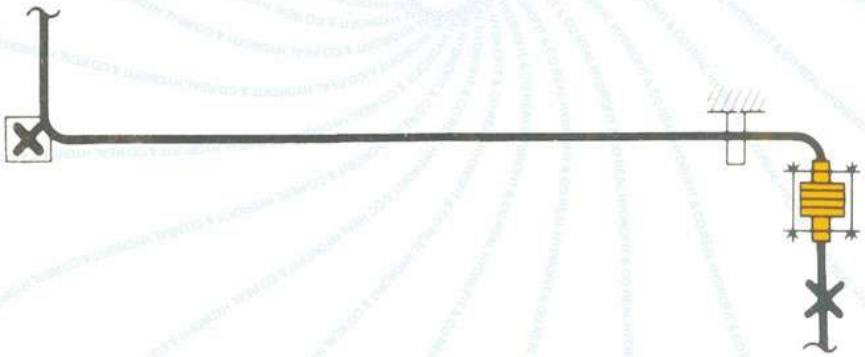
# Single Lateral Expansion Joint
## (RH 111-SLEJ)

**A single Expansion Joint provided with tie rods to absorb a movement perpendicular to the piping axis by a slight lateral deflection of bellows.**



**Lateral deflection**
**Single lateral joint**



**This type of Expansion Joint is used most frequently in applications offering a very limited possible space or with unimportant movement.**

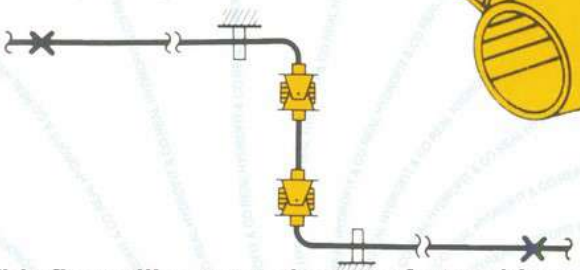
**Because of the tie rods containing the thrust force, this type of Expansion Joint is not capable of absorbing any other movement than its own thermal expansion.**

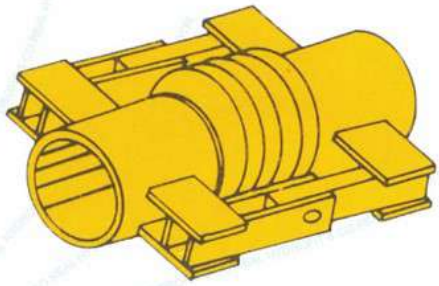
**The longest piping leg will absorb the slight deflection due to the expansion of the shortest piping leg.**

## Hinged Expansion Joint
## (RH112-HEJ)

**A single Expansion Joint provided with two hinges to permit the angular rotation of bellow in one plane only.**

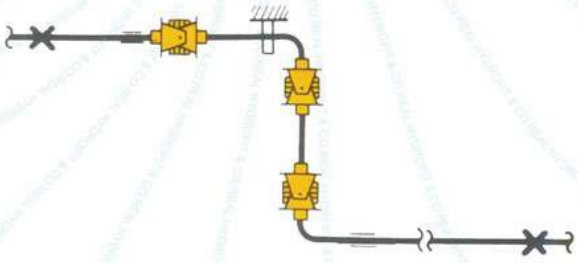
**Angular rotation**
**Hinged Expansion Joint**





**This figure illustrates the use of a two-hinge system to absorb the major thermal expansion in a single-plane 'z' bend. Since the pressure thrust is absorbed by the hinges on the Expansion Joint. Only intermediate anchors are required at each end of the piping system. The amount of bending deflection imposed on each of the two long piping legs may be controlled by proper design of guides and supports.**

**This type of Expansion Joint is used on piping legs requiring a large distance between hinge pins.**

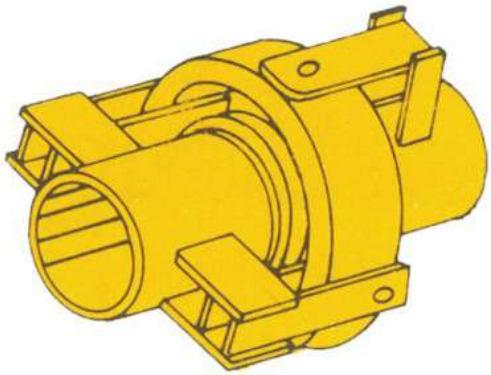


**Where the piping in a single plane system is not sufficiently flexible to absorb the bending deflections involved in a two hinge system. or where the loads resulting fro such bending exceed the allowable limits for connected equipment, a system of three hinged Expansion Joint may be used, as shown in the above figure. The thermal expansion of the offset piping section is absorbed without any bending defection by the action of the three Expansion Joint. Therefore, the middle expansion joint must be capable of absorbing the total of the rotations of the other two units.**

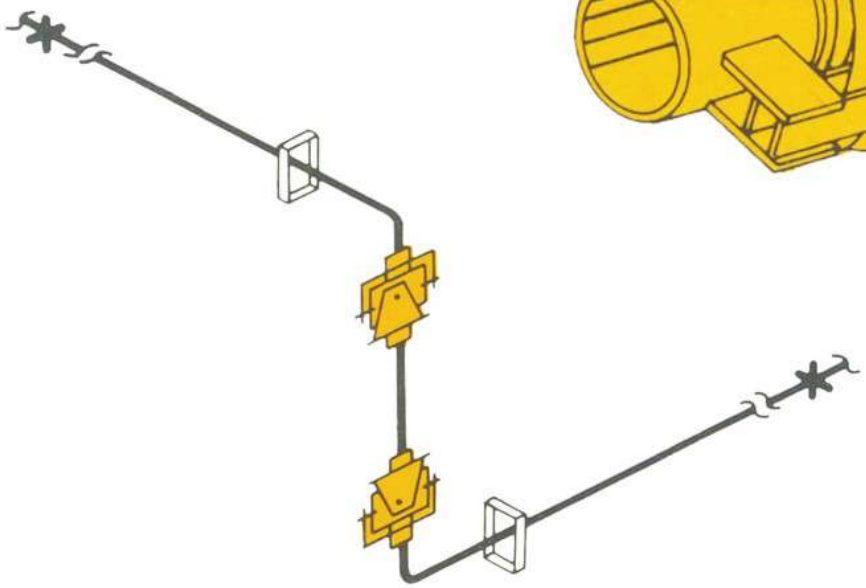
# Gimbal Expansion Joint

## (RH 113-GEJ)

**A single Expansion Joint to permit angular rotation in any plane by the use of two pairs of hinges affixed to a common floating gimbal ring.**



**Gimbal Expansion Joint**



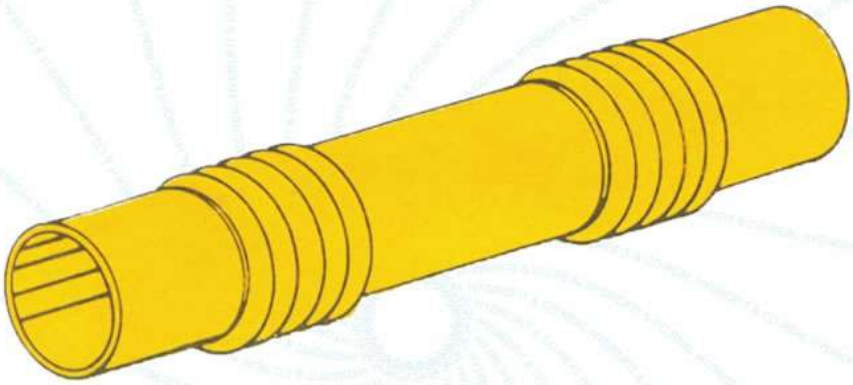
**Gimbal Expansion Joints are designed for applications in multi-plane systems.**

**Guides must be designed to allow for the thermal expansion of the leg containing the Expansion Joints and for the shortening of this leg due to deflection.**

**A system of three gimbal Expansion Joints may be used as in the previously mentioned case for systems containing three hinged Expansion Joints.**

## Universal or double Expansion Joints
## (RH 114-UDEJ)

**A universal Expansion Joints consists of two bellows joined by a common connector for the purpose of absorbing any combination of the three basic movements: axial movement, lateral deflection, angular rotation, or only an axial movement after anchoring the common connector. This assembly is then defined as a 'Double Expansion Joint'**



**Universal pressure balanced Expansion Joints**

**The universal pressure balanced Expansion Joint is used most frequently in application for the absorption of large combined axial movement and lateral deflection and when the thrust force on anchors - one of them located at a change of direction - must be removed. The main guides will be installed on each pipe leg as close as possible to the Expansion Joint.**





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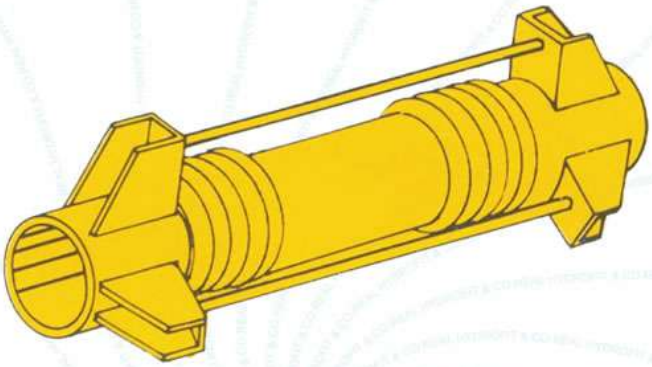
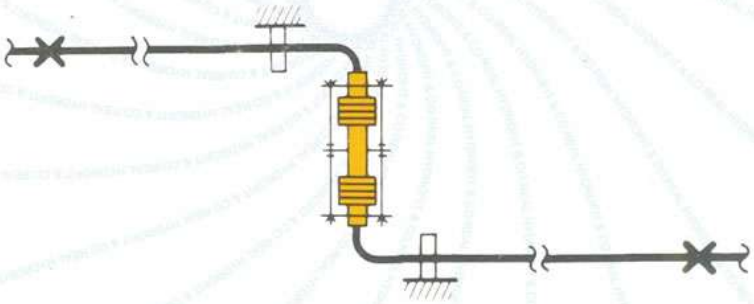
# Double lateral Expansion Joint

## (RH115-DLEJ)

**A double Expansion Joint provided with tie rods to absorb a large lateral movement by the angular rotation in opposite direction of each bellows.**



**Double lateral Expansion Joint.**



**This figure shows a lateral Expansion Joint used to absorb lateral deflection in a single-plane 'z' bend.**

**Only directional guiding is required since the compressive load on the pipe consists only of the force necessary to deflect the Expansion Joint. Any thermal expansion of the offset leg external to the tie rods, such as that of the elbows at either end, must be absorbed by bending of the horizontal pipe legs.**

**Double lateral Expansion Joints are finding increasing use due to their ability to absorb large amounts of movement with minium guiding and anchoring.**





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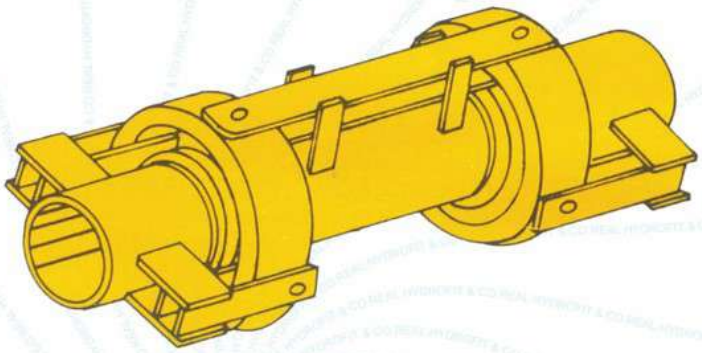
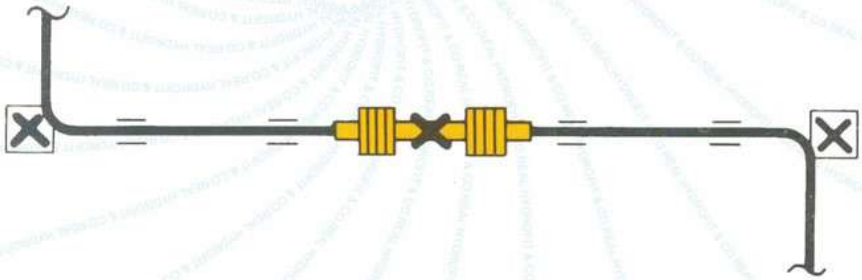
# Double gimbal Expansion Joint
## (RH116-DGEJ)

**A double Expansion Joint to permit a double angular rotation in any plane by the use of two systems of two pairs of hinges and floating gimbal ring.**



**Double Expansion Joint**



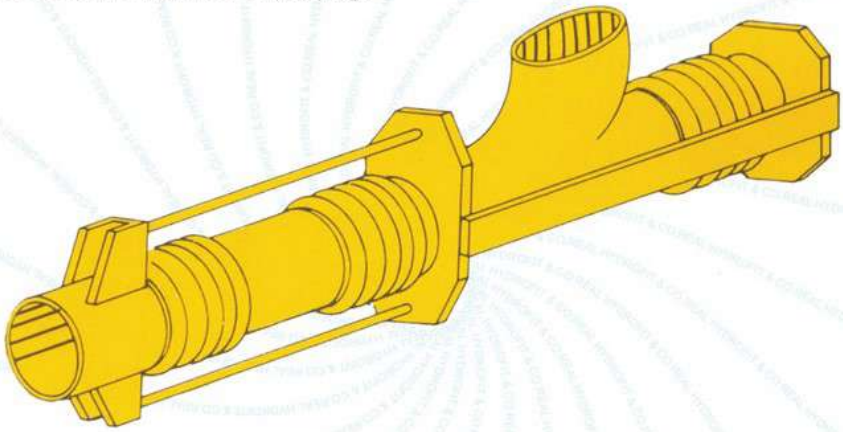
**Double Expansion Joint designed to absorb axial pipe line expansion. Note the addition of the intermediate anchor which, in conjunction with the two main anchors, divides the pipe into individual expanding sections, so that there is only one Expansion Joint between any two anchors.**
**If pipe line offers same characteristics on either side of the intermediate anchor the algebraic sum of stresses transmitted to this anchor is nil.**

**However, it is possible that a pipe line gradually heats up, thus resulting in the expansion of one pipe section before another one. In such a case, the intermediate anchor must be designed to withstand the spring force of one of the two bellows of Expansion Joint, and also the frictional forces due to the displacement of one of the two pipe sections on its guides.**

# Pressure balanced Expansion Joint
## (RH 117-PBEJ)

**A pressure balanced Expansion Joint is designed to absorb axial movement and /or lateral deflection while restraining the pressure thrust by means of tie devices inter-connecting the flow bellows with an opposed bellows also subjected to line pressure.**

**This type of Expansion Joint is normally used where a change of direction occurs in a run of piping.**

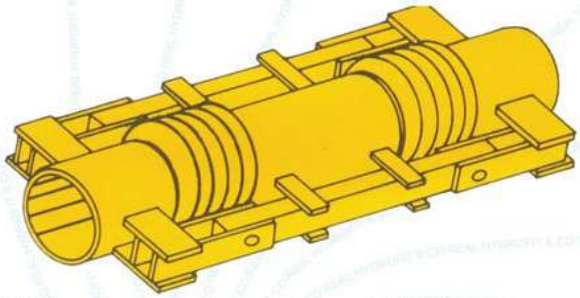


**Pressure balance Expansion Joint**

**This Expansion Joint is located at a change in direction of the piping. Note that the elbow and the end of the pipe line are secured by intermediate anchors. Since the pressure thrust is absorbed by the Expansion Joint itself, and only the spring force and frictional forces are imposed on the piping, a minimum of guiding is required.**

## Swing Expansion Joint
### (RH 118 - SEJ)

**A double Expansion Joint provided with two pairs of hinges connected by a pair of swing bars, designed to absorb lateral deflection and / or angular rotation in one plane.**



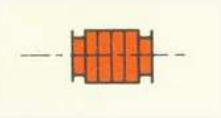
**Swing Expansion Joint**

**Same type as hinged Expansion Joint, but this unit is used on piping legs requiring a short distance between hinge pins.**

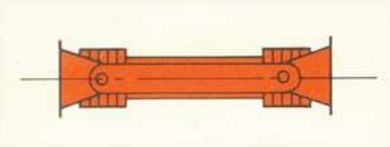
## Externally pressurized Expansion Joint
### (RH119-EPEJ)

**The different types of above Expansion Joints may beve each one of their bellows provided with a jacket in such a way that it may be subjected to the piping internal pressure through its external surface.**
**This system is and advantageous substitute for purge and aeration connections when not allowed by the corrugation geometry.**

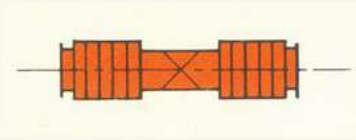
## Different Types Of Expansion Bellows



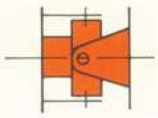
SINGLE
EXPANSION JOINT



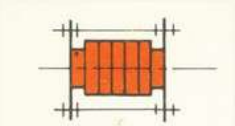
SWING
EXPANSION JOINT



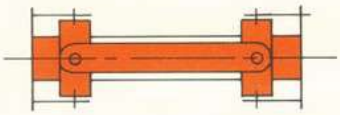
DOUBLE
EXPANSION JOINT WITH
INTERMEDIATE ANCHOR



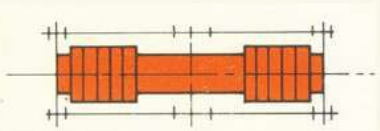
GIMBAL
EXPANSION JOINT



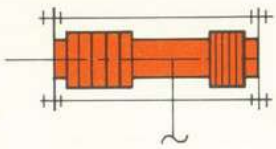
SINGLE LATERAL
EXPANSION JOINT



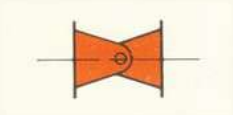
DOUBLE GIMBAL
EXPANSION JOINT



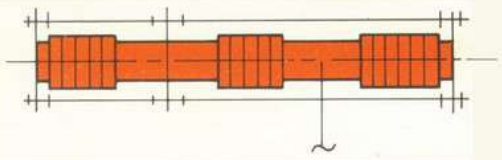
DOUBLE LATERAL
EXPANSION JOINT



PRESSURE BALANCED
EXPANSION JOINT



HINGED
EXPANSION JOINT



UNIVERSAL PRESSURE
BALANCED EXPANSION JOINT





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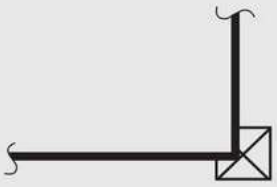
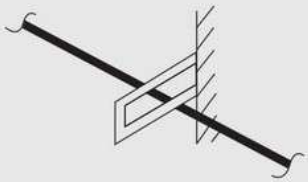
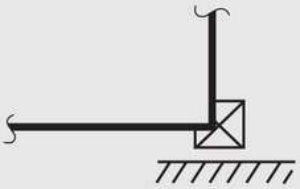
## Symbols used for isometrics



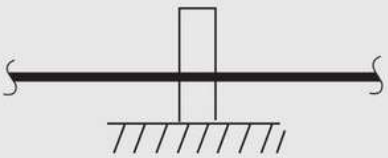
MAIN ANCHOR



HORIZONTAL PLANAR
PIPE ALIGNMENT GUIDE



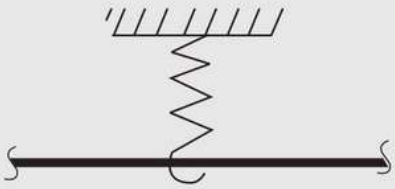
DIRECTIONAL ANCHOR



VERTICAL PLANAR
PIPE ALIGNMENT GUIDE

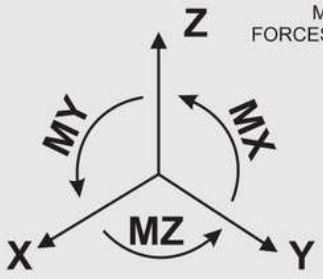
INTERMEDIATE ANCHOR

SPIRING SUPPORT



PIPE GUIDE

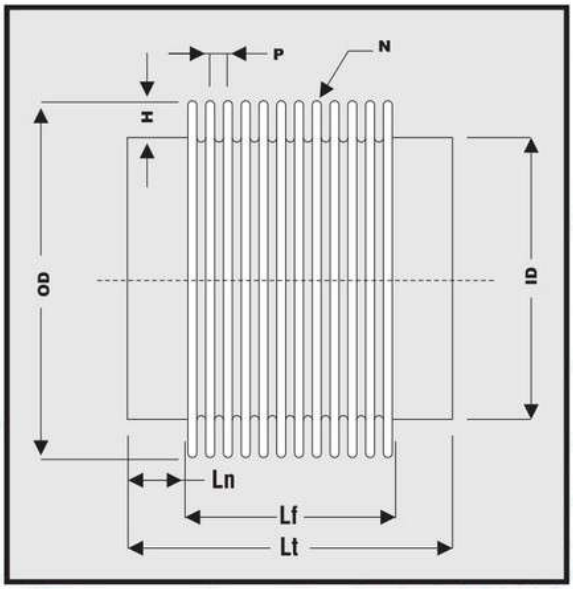
MOVEMENTS,
FORCES, MOMENTS



★★★★★

# REAL HYDROFIT & CO.®

## TECHNICAL DIMENSIONS FOR FEW DIFFERENT SIZES OF BELLOWS




**DN** - Norminal Diameterin inch/mm
**ID** - Inside diameter in mm
**OD** - Outside diameter in mm
**Lt** - No. of Convolution
**N** - No. of Convolution
**m/conv** - **xial Movement Per Convolution in mm**
**PN.XX** - **Working Pressure in kg/sq.cm**
**P** - **Pitch**
**Lf** - **Flexible length**
**Ln** - **Neck length**

Tolerance for inner dia and outer dia ± 0.5mm upto 1.5 inches.

Tolerance for inner dia and outer dia ± 1 mm from 2 inches to 12 inches.

| SIZE | | | | PN.06 | | | PN.10 | | | PN.16 | | | PN.25 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DN | | ID | OD | Lt | N | m/conv | Lt | N | m/conv | Lt | N | m/conv | Lt | N | m/conv |
| 1/2" | 13 | 16.50 | 22.60 | 63 | 14 | 0.55 | 54 | 11 | 0.55 | 62 | 13 | 0.40 | 63 | 13 | 0.30 |
| 5/8" | 16 | 17.50 | 24.50 | 63 | 17 | 0.55 | 63 | 13 | 0.50 | 68 | 14 | 0.40 | 58 | 11 | 0.40 |
| 3/4" | 20 | 22.50 | 31.90 | 64 | 11 | 0.95 | 69 | 12 | 0.70 | 71 | 12 | 0.60 | 82 | 14 | 0.45 |
| 1" | 25 | 28.50 | 40.40 | 88 | 14 | 1.05 | 84 | 12 | 1.30 | 81 | 12 | 1.05 | 75 | 10 | 1.00 |
| 11/4" | 32 | 35.50 | 49.40 | 86 | 11 | 1.45 | 84 | 10 | 1.80 | 87 | 10 | 1.58 | 106 | 12 | 1.05 |
| 11/2" | 40 | 43.00 | 58.00 | 90 | 11 | 1.60 | 88 | 10 | 1.90 | 91 | 10 | 1.55 | 110 | 12 | 1.15 |
| 2" | 50 | 56.00 | 78.00 | 70 | 6 | 3.10 | 83 | 7 | 3.20 | 74 | 6 | 3.00 | 87 | 7 | 2.35 |
| 21/2" | 65 | 72.00 | 96.00 | 74 | 6 | 3.65 | 132 | 10 | 3.00 | 112 | 8 | 2.00 | 91 | 6 | 2.65 |
| 3" | 80 | 89.00 | 118.00 | 111 | 8 | 3.20 | 140 | 10 | 3.30 | 107 | 7 | 2.85 | 96 | 6 | 2.90 |
| 4" | 100 | 114.00 | 140.0 | 115 | 8 | 3.85 | 117 | 8 | 2.95 | 111 | 7 | 3.75 | 115 | 7 | 2.95 |
| 5" | 125 | 141.00 | 168.0 | 141 | 9 | 4.00 | 116 | 7 | 3.55 | 108 | 6 | 4.65 | 111 | 6 | 3.65 |
| 6" | 150 | 168.00 | 200.00 | 140 | 8 | 4.85 | 116 | 6 | 6.20 | 134 | 7 | 4.85 | 137 | 7 | 3.90 |
| 8" | 200 | 219.00 | 256.00 | 158 | 8 | 5.60 | 187 | 9 | 5.90 | 152 | 7 | 5.50 | 155 | 7 | 4.60 |
| 10" | 250 | 273.00 | 324.00 | 193 | 9 | 6.65 | 185 | 8 | 7.90 | 146 | 6 | 7.20 | 172 | 7 | S.50 |
| 12" | 300 | 324.00 | 372.00 | 223 | 10 | 6.10 | 237 | 10 | 7.10 | 195 | 8 | 6.6 | 251 | 10 | 4.75 |

**Our current manufacturing facility enables us to manufacture Bellows up to 120 Inches (3000mm NB) against specific customer requirement.**
**The above information is subject to change without notice due to continuous development and research.**





* Please send your request for detailed technical information on - 66573952 or E-mail: reohydesales@gmail.com
sales@realhydrofit.com

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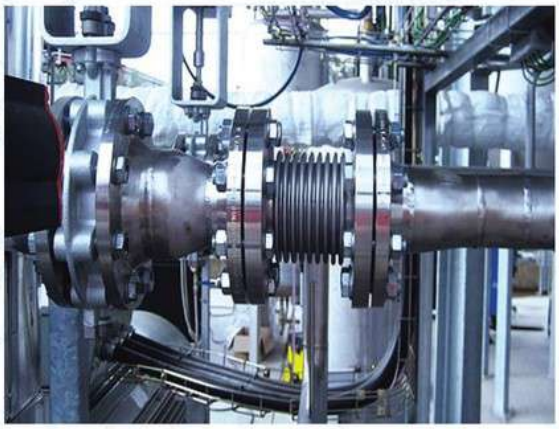
## Application Industry



OUR PRODUCT RANGE



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★★★★★

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DAIRY

PHARMA INDUSTRIES

CONSTRUCTION

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