

# MERCER INVINCIBLE HIGH MOVEMENT EXPANSION JOINTS

Series  
**900 &  
HT900**

## PERFORMANCE FEATURES

- Pressures, vacuum ratings and temperature tolerance as detailed on pages 9-109 - 9-110
- Minimum 3 to 1 safety factor, rated to burst pressure
- High temperature resistant fabric reinforcement for operating temperatures up to 400°F
- Expansion Joints are pressure cured, resulting in a structurally sound product with long service life
- Optional exterior coat of Hypalon® paint provides additional protection against ozone weathering and chemical exposure

## CONSTRUCTION FEATURES

- Extra wide arch for greater movement
- Molded sizes from 11/2" up to 36" diameter
- Choice of eight liner elastomers
- Choice for cover to match liner materials or different materials for superior resistance to external conditions
- Baked Enamel, Galvanized Ductile Iron, Carbon or Stainless Steel Split Backup Rings
- 150 lb ASA drilling is standard. Other drillings or completely customized drillings as required. Opposite flanges can have different drillings to serve as transition pieces
- Reinforcement—Steel Rings and multiple plies of Polyester or Nylon Tire Cord
- Hand-built to your exact specifications
- Can be built with permanent offset to compensate for existing or designed piping misalignment

## SERIES 900

The Invincible 900 Series adopts the best features of our series 450 and 500's. While rated at lower pressures, it has higher movement capabilities and lower spring rates. All joints are hand built by our skilled craftsmen. The 1/4" minimum thickness solid elastomer tube is continuous. Multiple plies of rubber impregnated high strength polyester or nylon tire cord form the first pressure reinforcement over the tube. Arch swell in response to pressure and arch migration are virtually eliminated by crisscrossed layers of reinforcement that pass over the arch and around steel rings embedded on both sides at the base of the arch.

A minimum of two additional plies provide protection to the carcass and the cover. The layered reinforcement and cover materials are carried through the full faced flanges.

### Distributor:

**Interflex Hose & Bellows Ltd.** • [www.interflex.co.uk](http://www.interflex.co.uk)  
Ludlow Eco Park • Ludlow • Shropshire • SY8 1FF • UK  
Tel.: +44 (0)1584 878500 • Email: [enquiries@interflex.co.uk](mailto:enquiries@interflex.co.uk)



For hand-wrapped Joints, flanges are brought to thickness by bolting the steel flange forms. The body is pressure wrapped by layers of nylon tape. For molded joints, both flanges and body are formed in cavities of the molds. The joint is cured in a pressurized thermostatically controlled steam chamber or oven for optimum performance.

After the wraps, forms or molds are removed, the final product is a tough homogeneous expansion joint customized to safely handle the intended service. A variety of tube, cover and carcass elastomers are available and selected to provide superior chemical and aging resistance in temperatures ranging from -30° to 400°F (See Bulletin CRG-MR1 pages 9-59 - 9-68).

## SERIES HT900

The Invincible HT900 has all the construction features of the 900 combined with high temperature capability. DuPont™ Kevlar® or other heat resistant fabrics replace the polyester or nylon. The tube and cover are either EPDM or Viton® for full pressure service up to 350°F and 400°F respectively.

**BACKUP RINGS**

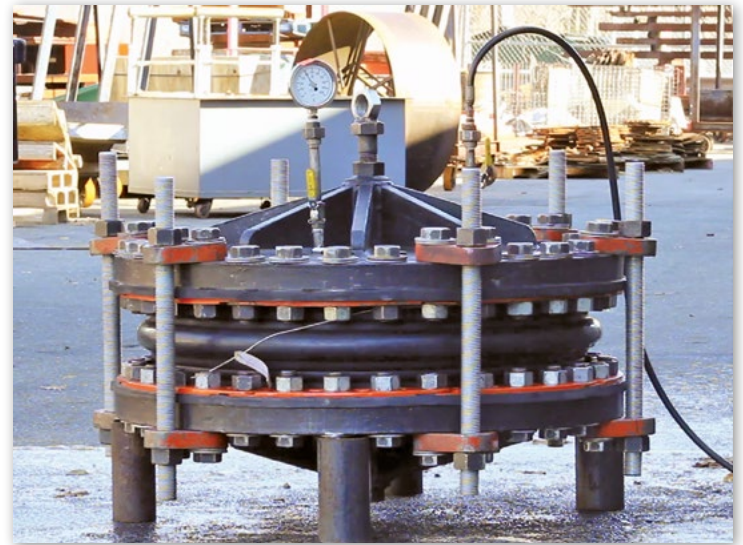
Standard expansion joints are furnished with ASA-150 backup rings. Series ASA-300, DIN, PN, JIS and British Standards are also available, but sometimes at higher cost. Check factory for pricing.

**FILLED ARCHES**

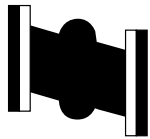
All of the styles are available with filled arch construction for use with heavy slurries. The continuous liner prevents material build-up in the arch. Filled arch joints have 50% of open arch movements.

**CUSTOM DESIGNS**

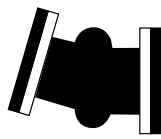
Published dimensional data is for "Standard" joints. However, about 50% of Mercer business consists of building custom joints.



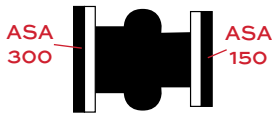
Pressure testing of 901 joint 36" ID x 10" FF



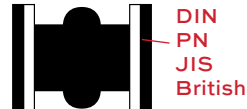
OFFSET JOINTS



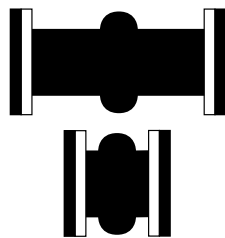
UNPARALLEL FACES



MISMATCHED FLANGES



OVERSEAS FLANGES



LONGER OR SHORTER FACE TO FACE

Mercer can custom design joints for most special requirements.

**SERIES 900**

**MATERIAL AVAILABILITY & OPERATING TEMPERATURES**

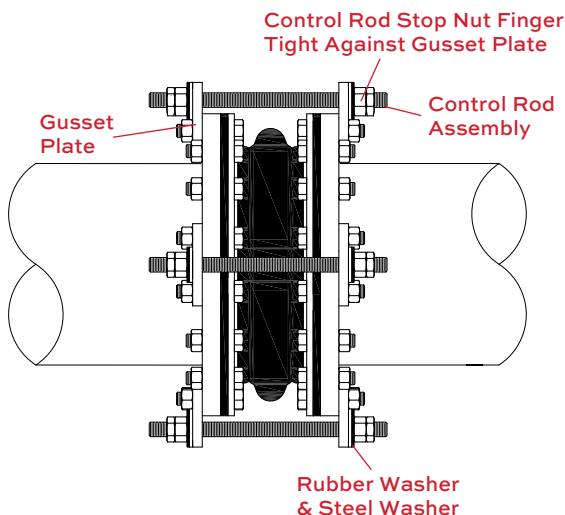
| Series 900 | Standard Materials |          | Max. Oper. Temp. |
|------------|--------------------|----------|------------------|
|            | Tube               | Cover    |                  |
| B          | Butyl              | Butyl    | 250°F            |
| E          | EPDM               | EPDM     | 250°F            |
| H          | Hypalon®           | Hypalon® | 225°F            |
| HN         | Hypalon®           | Neoprene | 225°F            |
| N          | Neoprene           | Neoprene | 225°F            |
| NH         | Neoprene           | Hypalon  | 225°F            |
| Ni         | Nitrile            | Nitrile  | 210°F            |
| NiN        | Nitrile            | Neoprene | 210°F            |
| NR         | Neoprene           | Natural  | 180°F            |
| R          | Natural            | Natural  | 180°F            |
| RN         | Natural            | Neoprene | 180°F            |
| V          | Viton®             | Viton®   | 250°F            |

**SERIES HT900**

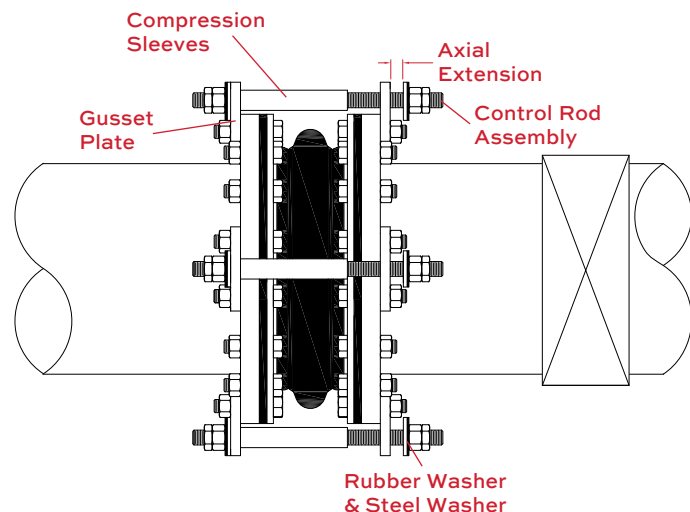
**MATERIAL AVAILABILITY & OPERATING TEMPERATURES**

| Series HT900 | High Temperature Material Cover | Max. Oper. Temp. |
|--------------|---------------------------------|------------------|
| K-E          | EPDM                            | 350°F            |
| K-V          | Viton®                          | 400°F            |

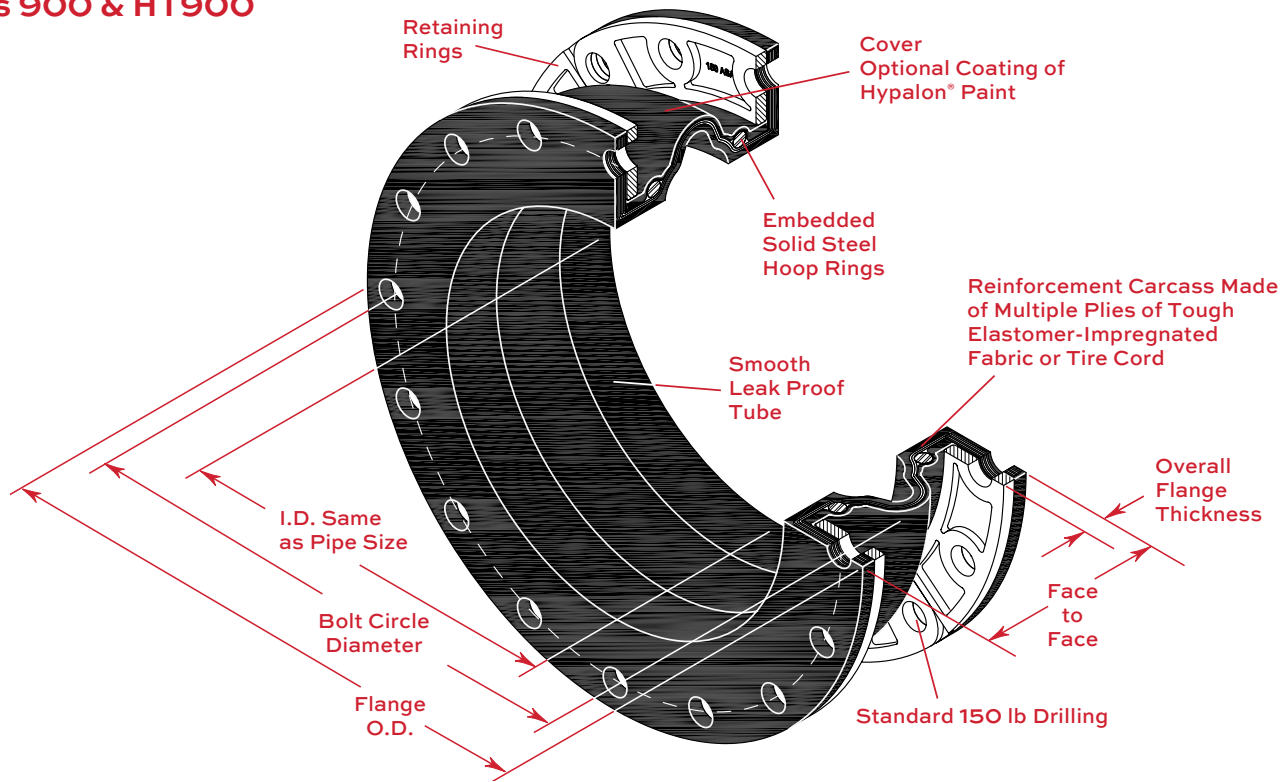
**SPRING MOUNTED EQUIPMENT & OTHER UNANCHORED APPLICATIONS**



**ANCHORED PIPING APPLICATIONS**



Series 900 & HT900

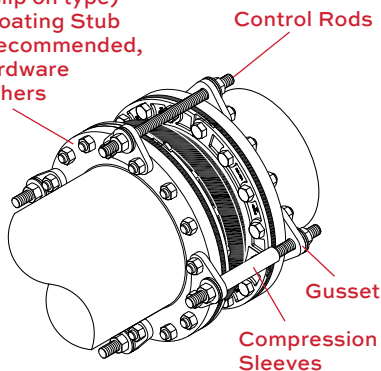


STYLE 901 OPEN ARCH DIMENSIONS, ALLOWABLE MOVEMENTS\* & PRESSURES†

| Pipe Size (in) | Flange Outside Dia. (in) | Face to Face (in) | Overall Flange Thickness (in) | Bolt Circle Dia. (in) | No. of Holes | Bolt Hole Dia. (in) | Allowable Movements    |                      |                         | Pressure Rating (psi) | Vacuum Rating (in Hg) | Pressure Thrust Area (in <sup>2</sup> ) |
|----------------|--------------------------|-------------------|-------------------------------|-----------------------|--------------|---------------------|------------------------|----------------------|-------------------------|-----------------------|-----------------------|---|
|                |                          |                   |                               |                       |              |                     | Axial Compression (in) | Axial Extension (in) | Lateral Deflection (in) |                       |                       |   |
| 1 1/2          | 5                        | 6                 | 3/4                           | 37/8                  | 4            | 5/8                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 5                                       |
| 2              | 6                        | 6                 | 7/8                           | 43/4                  | 4            | 3/4                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 8                                       |
| 2 1/2          | 7                        | 6                 | 7/8                           | 5 1/2                 | 4            | 3/4                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 10                                      |
| 3              | 7 1/2                    | 6                 | 7/8                           | 6                     | 4            | 3/4                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 13                                      |
| 4              | 9                        | 6                 | 7/8                           | 7 1/2                 | 8            | 3/4                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 21                                      |
| 5              | 10                       | 6                 | 7/8                           | 8 1/2                 | 8            | 7/8                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 29                                      |
| 6              | 11                       | 6                 | 7/8                           | 9 1/2                 | 8            | 7/8                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 40                                      |
| 8              | 13 1/2                   | 6                 | 7/8                           | 11 3/4                | 8            | 7/8                 | 2                      | 1 1/8                | 1 1/8                   | 250                   | 30                    | 65                                      |
| 10             | 16                       | 8                 | 7/8                           | 14 1/4                | 12           | 1                   | 2 1/4                  | 1 1/4                | 1 1/4                   | 250                   | 30                    | 97                                      |
| 12             | 19                       | 8                 | 7/8                           | 17                    | 12           | 1                   | 2 1/4                  | 1 1/4                | 1 1/4                   | 250                   | 30                    | 135                                     |
| 14             | 21                       | 8                 | 1 1/4                         | 18 3/4                | 12           | 1 1/8               | 2 1/2                  | 1 3/8                | 1 1/2                   | 250                   | 20                    | 201                                     |
| 16             | 23 1/2                   | 8                 | 1 1/4                         | 21 1/4                | 16           | 1 1/8               | 2 1/2                  | 1 3/8                | 1 1/2                   | 180                   | 20                    | 254                                     |
| 18             | 25                       | 8                 | 1 1/4                         | 22 3/4                | 16           | 1 1/4               | 2 1/2                  | 1 3/8                | 1 1/2                   | 180                   | 20                    | 314                                     |
| 20             | 27 1/2                   | 8                 | 1 1/4                         | 25                    | 20           | 1 1/4               | 2 1/2                  | 1 3/8                | 1 1/2                   | 150                   | 20                    | 380                                     |
| 24             | 32                       | 10                | 1 1/4                         | 29 1/2                | 20           | 1 3/8               | 2 3/4                  | 1 1/2                | 1 5/8                   | 150                   | 20                    | 559                                     |
| 30             | 38 3/4                   | 10                | 1 1/4                         | 36                    | 28           | 1 3/8               | 2 3/4                  | 1 1/2                | 1 5/8                   | 125                   | 20                    | 839                                     |
| 36             | 46                       | 10                | 1 3/8                         | 42 3/4                | 32           | 1 5/8               | 2 3/4                  | 1 1/2                | 1 5/8                   | 125                   | 20                    | 1175                                    |

\*Reduce movements 50% when using filled arches.  
 †Higher pressure joints are special design- Advise factory of requirements.  
 Sizes up to 144 available-consult factory.

Rigid Steel Mating Flange (weld neck or slip on type)  
 Vanstone or Floating Stub Flanges Not Recommended, and Flange Hardware Supplied by Others



If control rods are installed as a safety measure, the locking nuts must be backed off with a clearance equal to the specified axial movement. The expansion joint will exert a thrust force or pressure thrust on the anchors which can be calculated using the following equation:

$$\text{Pressure Thrust} = (\text{Pressure Thrust Area}) \times (\text{Rated Working Pressure})$$

**EXPANSION JOINTS INSTALLED IN UNANCHORED PIPING OR CONNECTED TO ISOLATED EQUIPMENT MUST HAVE CONTROL RODS.**

Control rods are installed with the nuts on the control rods be hand tighten to the gussets, thereby locking them out. The joint will no longer take up axial motion since the pressure will extend the joint into the nuts of the control rods. It will make up for misalignment, transverse and possibly angular motion.

**PIPE ALIGNMENT**

Initial misalignment should be kept to a maximum of 1/8".

**PIPE FLANGE**

Expansion joint flanges must be in contact with a continuous surface, or a maximum of 1/16" standard raised face.

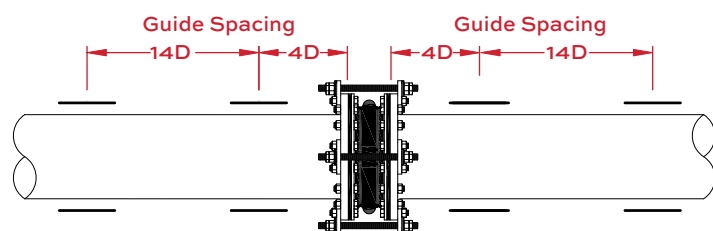
Depressions or protrusions typical of victaulic or similar type flanges must be covered with a steel spacer flange to provide a continuous surface.

**EXPANSION JOINTS INSTALLED IN PIPING SYSTEMS MUST BE ANCHORED ON BOTH SIDES OF THE JOINT.**

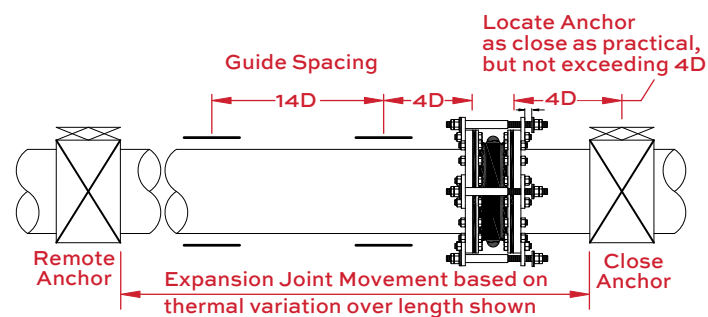
In this case, no control rods are necessary providing piping movements are within the rated movements of expansion joint.



## Guide Spacing – Referencing Pipe Diameter “D”



GUIDES FOR JOINT WITHOUT ANCHORS



GUIDES AND ANCHORS FOR JOINT LOCATED BETWEEN ANCHORS

## Installation Instructions - 900 & HT900

### IMPORTANT

- Do not weld in vicinity of expansion joint.
- Do not lift expansion joint by bolt holes; use padded sling.
- Never operate joint beyond its rated temperature, pressure or movements (see page 9\*110).
- Mating flanges must be flat or raised face. Do not mate with contoured flanges such as victaulic or similar configurations.
- Check for chemical compatibility with the ordered material.

- All pipelines must be properly supported, anchored and guided so joints do not carry pipe or thrust loads.
- If piping is not anchored, control units must be used.
- Use of control units and thrust sleeves will not protect piping in anchored situations. Expansion joints must be selected for adequate movement capability.
- Piping should be aligned. Misalignment or improper face to face openings will reduce the allowable motion by the initial inaccuracy. Joints are often damaged if forced into position.
- Apply a thin film of graphite, dispersed in glycerin or water to the rubber flange face and between the backup ring and the back of the rubber flange to prevent rubber adhering to the mating metal flange for easy removal of the joint without damage. No gaskets or gasket sealants should be used.
- Install bolts from the backup ring side to avoid bolt projections cutting the cover. If this is impossible, bolts should not project more than 1/8" past the nuts. Use washers over split ring gaps.
- Unlike tightening hard flanges, tighten bolts in series making at least three complete circuits of each flange. Flanges will accept full bolt torque.

- After system is in service at operating temperature, check the flange bolts and retighten as necessary. Repeat in a few weeks or if leaks develop. It is normal for rubber flanges to relax after initial installation. Check periodically until bolts remain tight.
- Any gouges or cuts in the cover caused during installation should be inspected and sealed.
- If control rods are used, the clearance between the rubber washer and the gusset plate should be the allowable axial elongation, if the expansion joint is installed at the published face to face. We do not recommend precompression or extension as general practice, but if the joint is compressed, the gap is increased by the decrease in length. If installed elongated, the gap is decreased by the increase in length. Hold one end against the control rod plate and the washers against the nut on the other end when measuring the gap.

### EXAMPLES

14" - 901 - Allowable Extension 13/8"

- 14" - 901 is installed at published 8" face to face dimension.  
Set control rod gap to 13/8".
- 14" - 901 is installed 73/4" long.  
Set control rod gap to 13/8" plus 1/4" = 15/8"
- 14" - 901 is installed 81/4" long.  
Set control rod gap to 13/8" minus 1/4" = 15/8"
- If compression sleeves are used, no setting is required as they are furnished to proper length.
- If these instructions are not strictly adhered to, the Mercer One-Year Guarantee is void. Joints should be checked at a maximum of one year intervals for signs of cracking and hardening. Expansion joints showing these symptoms must be replaced regardless of age.

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