

# JS Type Sleeve Expansion Joint

for (Building • Air Conditioning Equipments), (Factory Equipments), etc.

Flanged

Sleeve expansion joint absorbing expansion/contraction of pipe in axial direction due to change of temperature.

Suitable for main pipeline in high buildings, area conditioning, plants, factories and hospitals. Also serve as countermeasure for ground sinkage and earthquake.

Solutions for Pipe Expansion/Contraction, Ground Sinkage

## ■ FEATURES

- Supper packing for high sealing performance.
- Safe structure.
- Large expansion/contraction.
- No need for lubrication.
- All stainless steel products are also suitable for water supply.

## ■ SPECIFICATIONS

|                     |                                                                                    |         |                      |         |
|---------------------|------------------------------------------------------------------------------------|---------|----------------------|---------|
| Model name          | JS-5HF                                                                             | JS-6HF  | JS-7HF               | JS-8HF  |
| Code name           | JS5HF-N                                                                            | JS6HF-N | JS7HF-N              | JS8HF-N |
| Applicable fluid    | Steam, air, gases, cold or hot water & oils                                        |         |                      |         |
| Fluid temperature   | Max. 220℃                                                                          |         |                      |         |
| Applicable pressure | Max. 1.0MPa                                                                        |         | Max. 2.0MPa          |         |
| End connection      | Flanged JIS 10KFF                                                                  |         | Flanged JIS 20KRF    |         |
| Materials           | Sleeve(Stainless steel), External sleeve(Carbon steel), Packing(Graphite compound) |         |                      |         |
|                     | Flange(Mild steel)                                                                 |         | Flange(Carbon steel) |         |
| Pressure test       | Hydraulic 1.5MPa                                                                   |         | Hydraulic 3.0MPa     |         |
| Expansion amount    | 100mm                                                                              | 200mm   | 100mm                | 200mm   |
| Expansion           | 20mm                                                                               | 40mm    | 20mm                 | 40mm    |
| Contraction         | 80mm                                                                               | 160mm   | 80mm                 | 160mm   |

\* All stainless steel material is also available upon request.

## ■ DIMENSIONS

| DIMENSIONS |      | L(mm)                           |                                 | D(mm) | Pressure receiving area of sleeve Ae(mm <sup>2</sup> ) | Friction resistance of sleeve μ(N) | Load on main fixing point (N) |                           |
|------------|------|---------------------------------|---------------------------------|-------|--------------------------------------------------------|------------------------------------|-------------------------------|---------------------------|
| Model Name | Size | JS-5HF,7HF<br>(Max. exp. 100mm) | JS-6HF,8HF<br>(Max. exp. 200mm) |       |                                                        |                                    | JS-5HF,6HF<br>(at 1.0MPa)     | JS-7HF,8HF<br>(at 2.0MPa) |
| 20(¾")     |      | 380                             | 560                             | 83    | 530                                                    | 1300                               | 1900                          | 2400                      |
| 25(1")     |      | 380                             | 560                             | 90    | 860                                                    | 1600                               | 2500                          | 3400                      |
| 32(1¼")    |      | 380                             | 560                             | 100   | 1320                                                   | 2000                               | 3400                          | 4700                      |
| 40(1½")    |      | 380                             | 560                             | 105   | 1730                                                   | 2300                               | 4100                          | 5800                      |
| 50(2")     |      | 380                             | 560                             | 120   | 2460                                                   | 2700                               | 5200                          | 7700                      |
| 65(2½")    |      | 430                             | 600                             | 135   | 4300                                                   | 3600                               | 8000                          | 13000                     |
| 80(3")     |      | 430                             | 600                             | 145   | 5810                                                   | 4200                               | 11000                         | 16000                     |
| 100(4")    |      | 430                             | 640                             | 185   | 9850                                                   | 5400                               | 16000                         | 26000                     |
| 125(5")    |      | 500                             | 640                             | 210   | 14700                                                  | 6600                               | 22000                         | 37000                     |
| 150(6")    |      | 500                             | 690                             | 235   | 20600                                                  | 7800                               | 29000                         | 49000                     |
| 200(8")    |      | 500                             | 690                             | 300   | 35600                                                  | 10300                              | 46000                         | 82000                     |
| 250(10")   |      | 580                             | 740                             | 350   | 54700                                                  | 12700                              | 68000                         | 123000                    |
| 300(12")   |      | 580                             | 740                             | 415   | 77900                                                  | 15200                              | 94000                         | 172000                    |

Flange code JIS 10KFF, JIS 20KRF

## ■ MASS

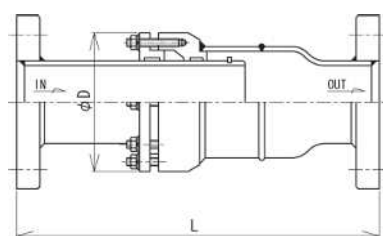
(kg)

| Model Name | JS-5HF | JS-6HF | JS-7HF | JS-8HF |
|------------|--------|--------|--------|--------|
| Size       | JS-5HF | JS-6HF | JS-7HF | JS-8HF |
| 20(¾")     | 4.5    | 5.5    | 5      | 6      |
| 25(1")     | 6.5    | 7      | 7      | 7.5    |
| 32(1¼")    | 7.5    | 9.5    | 8      | 10     |
| 40(1½")    | 8.5    | 10     | 9      | 10.5   |
| 50(2")     | 10.5   | 12.5   | 11     | 13     |
| 65(2½")    | 14.5   | 18.5   | 15     | 19     |
| 80(3")     | 15.5   | 25.5   | 16.5   | 26.5   |
| 100(4")    | 20     | 29.5   | 21     | 30.5   |
| 125(5")    | 30     | 34     | 32     | 36     |
| 150(6")    | 40     | 47     | 42     | 49     |
| 200(8")    | 60     | 71     | 64     | 75     |
| 250(10")   | 88     | 107    | 93     | 112    |
| 300(12")   | 122    | 141    | 132    | 151    |

Flange code JIS 10KFF, JIS 20KRF



## ■ CONSTRUCTION



Depending on size, the structure may vary.

# DATA/JB Type Bellows Expansion Joint

## ■ ABOUT BELLOWS MATERIAL SUS316L (Stainless steel)

The JIS B 2352 Bellows Type Expansion Joint recommends SUS304, SUS304L, SUS316, SUS316L, and others for making bellows. To ensure durability and corrosion resistance, which are

extremely important parameters for high grade bellows, we selected SUS316L for making bellows and all parts that contact with fluid. With higher performance than SUS304, SUS316L is consi-

dered having the same or even higher characteristics than SUS304L. See the following table for characteristics of SUS316L and SUS304L.

## ■ COMPARISON BETWEEN SUS316L AND SUS304L

TABLE1. CHEMICAL COMPOSITION (%)

| Type    | Carbon C      | Silicon Si   | Manganese Mn | Phosphor P    | Sulfur S      | Nickel Ni   | Chrome Cr   | Molybdenum Mo |
|---------|---------------|--------------|--------------|---------------|---------------|-------------|-------------|---------------|
| SUS316L | 0.030 or less | 1.00 or less | 2.00 or less | 0.045 or less | 0.030 or less | 12.00~15.00 | 16.00~18.00 | 2.00~3.00     |
| SUS304L | 0.030 or less | 1.00 or less | 2.00 or less | 0.045 or less | 0.030 or less | 9.00~13.00  | 18.00~20.00 | —             |

TABLE2. MECHANICAL PROPERTY

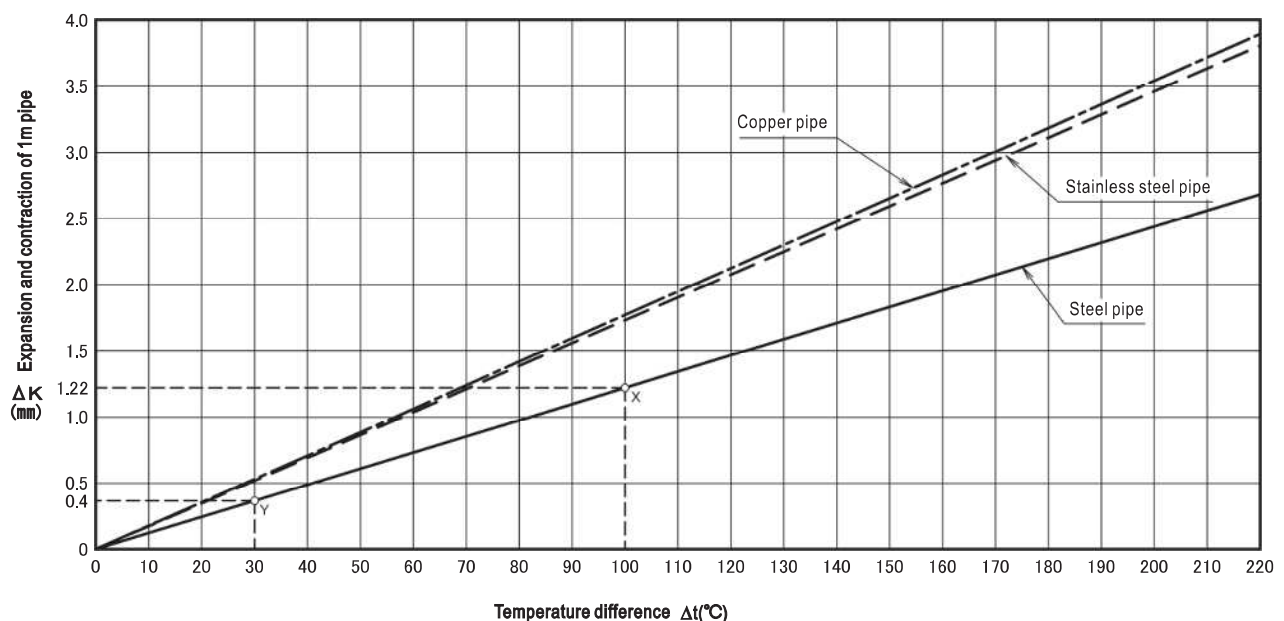
| Type    | Tensile test                     |                           |              | Hardness test |            |             |
|---------|----------------------------------|---------------------------|--------------|---------------|------------|-------------|
|         | Yield Strength N/mm <sup>2</sup> | Tensile N/mm <sup>2</sup> | Elongation % | HB            | HRB        | HV          |
| SUS316L | 175 or more                      | 480 or more               | 40 or more   | 187 or less   | 90 or less | 200 or less |
| SUS304L | 175 or more                      | 480 or more               | 40 or more   | 187 or less   | 90 or less | 200 or less |

TABLE3. ANTICORROSION

| Type    | All surface corrosion | Intercrystalline corrosion | Stress corrosion crack | Porous corrosion | Gap corrosion |
|---------|-----------------------|----------------------------|------------------------|------------------|---------------|
| SUS316L | ○                     | ○                          | ◎                      | ◎                | ◎             |
| SUS304L | ○                     | ○                          | ○                      | ○                | ○             |

\* ○:Superior ◎:Much superior

## ■ FIG.1 EXPANSION AND CONTRACTION OF 1m PIPE



## ■ SELECTING EXPANSION JOINT

Determine the type and number of expansion joints based on the material of pipe and change of temperature, which are factors affecting expansion/contraction of pipe.

● Calculation  $n = \frac{\Delta l}{\delta}$

$\Delta l = \beta \times \Delta t \times \ell$

n : number of joints

δ : max. expansion/contraction of joint (mm)

Δl : expansion/contraction of pipe (mm)

β : linear expansion coefficient of pipe (mm/m/°C)

Steel pipe (12.2×10<sup>-3</sup>)

Copper pipe (17.7×10<sup>-3</sup>)

Stainless steel pipe (17.3×10<sup>-3</sup>)

Δt : temperature difference (°C)  
ℓ : length of pipe (m)

### ● Example

Under the following conditions:

Length of pipe (ℓ): 35m

Max. working temperature (t<sub>1</sub>): 120°C

Min. ambient temperature (t<sub>2</sub>): -10°C

Ambient temperature at the time of installation (t<sub>3</sub>): 20°C

Determine the type and number of expansion joints.

The pipe is steel pipe and the joint is to be determined based on standard face-to-face dimensions.

# DATA/JS Type Sleeve Expansion Joint

## ■ ABOUT SUPER PACKING

Super packing is packing material made of flexible graphite and a certain type of inorganic substance in specific proportion. It has a high sealing performance and reliable service life.

In addition, it can resist -200~450°C temperature and shows great corrosion resistance against acid, alkaline and organic solvents.

## ■ EXAMPLE OF APPLICATION

Fig.1 Absorption of thermal expansion

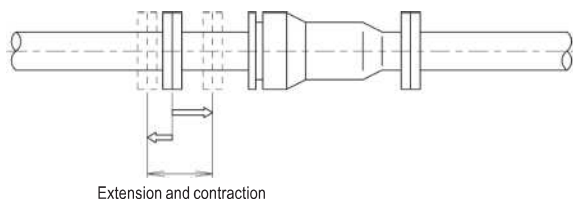


Fig.2 Ground sinkage prevention

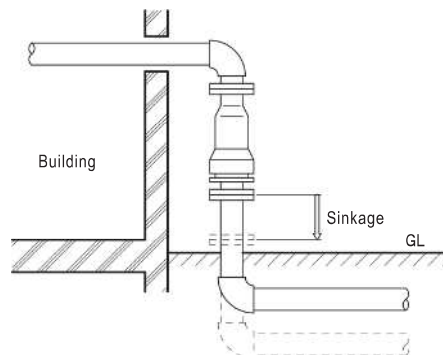
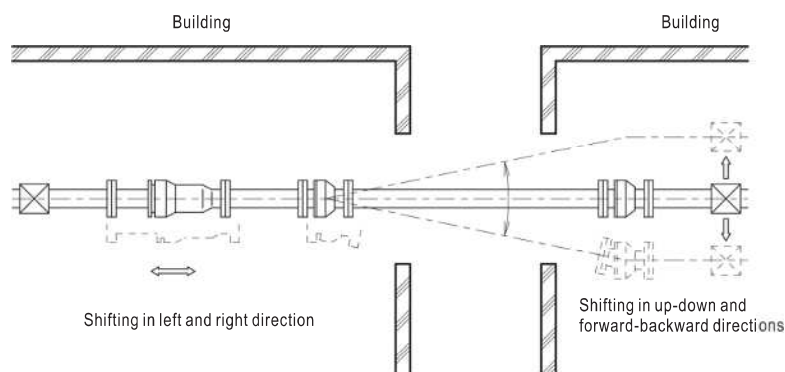


Fig.3 Earthquake-proof building and ground sinkage prevention



## ■ CALCULATING EXPANSION/CONTRACTION OF PIPE

$$\Delta l = \beta \times \Delta t \times l$$

$\Delta l$ : Expansion/contraction of pipe (mm)

$\beta$ : Linear expansion coefficient of pipe  
 $12.2 \times 10^{-3} \text{ mm/m/}^\circ\text{C}$  (steel pipe)

$\Delta t$ : Temperature difference ( $^\circ\text{C}$ )

$l$ : Length of pipe (m)

Note: The extension/compression of 1m pipe can also be calculated using Fig.1 in Page 179.

## ■ FIXING POINT INSTALLATION

Fixing point with sufficient strength are necessary for installing expansion joint. The position of fixing point is the following.

### ① Main fixing point

- The end of straight pipe closed by a flange or valve.
- Bending pipe where the direction of flow changes;
- Between two expansion joints, where reducer is used to change the diameter of pipe;
- Pipe between two expansion joints, where valve is installed;
- The inlet of main pipe of branch pipe with free expansion joint.

### ② Intermediate fixing point

In the middle of two expansion joints between main fixing point.

## ■ LOAD ON FIXING POINT

Load on main fixing point of straight pipe  $F_m$  (N)

$$F_m = A_e \times P + \mu$$

Load on intermediate fixing point  $F_i$  (N)

$$F_i = \mu$$

$A_e$ : Pressure receiving area of sleeve ( $\text{mm}^2$ )

$P$ : Pressure of fluid (MPa)

$\mu$ : Friction resistance of sleeve (N)

## ■ GUIDE AND PIPE SUPPORT

### ① Guide

To ensure correct expansion and contraction of expansion joint, the axes of expansion joint and pipe must match with each other. In addition, it is necessary to use guides to transmit the force for the movement in axial direction to fixing point. The guides need to be installed according to the following intervals.

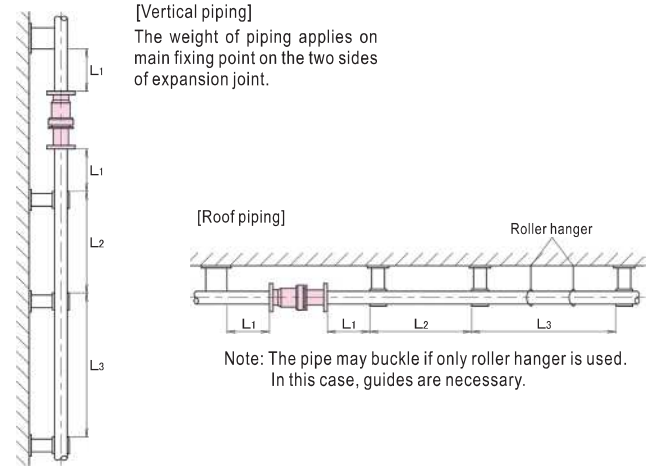
The deviation of pipe axes is  $\pm 2\text{mm}$  for size 125mm or smaller pipes, and  $\pm 3\text{mm}$  for size 150mm or larger pipes. The deviation of degree of parallelization of pipe should be  $\pm 0.5^\circ$ .

$L_1$ : The interval between expansion joint and No.1 guide.

$L_2$ : The interval between No.1 guide and No.2 guide.

$L_3$ : The interval between No.2 guide and middle guide.

Fig. 4-2 Vertical piping and roof piping



The max. interval of guides can be calculated using the following formula.  
The max. interval of intermediate guide ( $L_3$ ) can be determined using Fig.5.  
(For STPG Sch40 carbon steel)

$$L_1 \leq 4D$$

$$L_2 \leq 14D$$

$$L_3 \leq \sqrt{\frac{\pi^2 EI}{f F_m}} \quad I = \frac{\pi}{64} (D^4 - d^4)$$

$L_1, L_2, L_3$ : Interval between guides (max.)

$D$ : External diameter of pipe

$d$ : Internal diameter of pipe

$E$ : Young's modulus at the designed

temperature of pipe material

Steel pipe 200°C:

Stainless steel pipe 200°C:

$I$ : Secondary moment of the cross section of pipe

$f$ : Safety factor

$F_m$ : Load on main fixing point

(mm)

(mm)

(mm)

(N/mm<sup>2</sup>)

191 × 10<sup>9</sup> N/mm<sup>2</sup>

183 × 10<sup>9</sup> N/mm<sup>2</sup>

(mm<sup>4</sup>)

(3 or larger)

(N)

### ② Pipe supporting

Install roller support or roller hanger guide to prevent pipe from bending due the weight of pipe or fluid.

Fig.5 Max. interval between intermediate guides

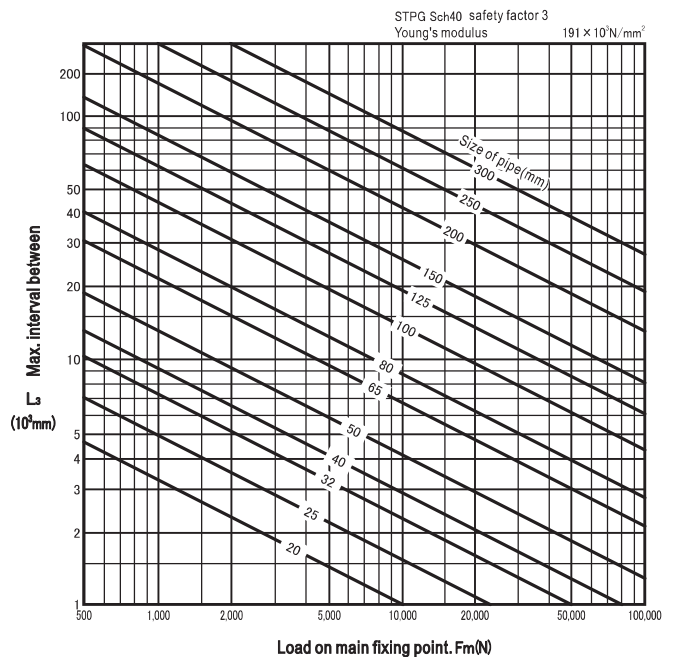


Fig.4-1 Interval between guides

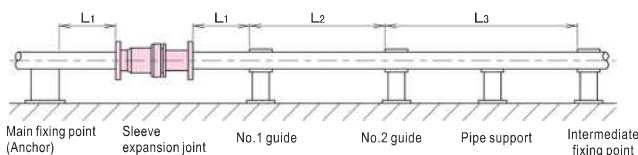


Fig.6 Fixing point and guide (example)

Other guide (example)

