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Bellows type expansion joints

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by The Society of Piping Engineers of Japan (JSPE)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS B 2352** : 1994 is replaced with this Standard.

This revision has been made based on **ISO 15348**:2002 *Pipework—Metal bellows expansion joints—General* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Contents

Bellows type expansion joints

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 15348** *Pipework—Metal bellows expansion joints—General* published in 2002, with some modification of the technical contents in order to accommodate the domestic needs.

The portions given sidelines or dotted underlines are the matters modified from the original International Standard. A list of modifications with the explanations is given in Annex 5 (informative).

1 Scope This Standard specifies bellows type expansion joints (hereafter referred to as "expansion joints").

It applies to expansion joints equipped with one or more corrugated bellows of circular cross-section.

Remarks : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 15348 : 2002 *Pipework—Metal bellows expansion joints—General* (MOD)

2 Normative references The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0151 *Iron and steel pipe fittings—Vocabulary*

JIS B 0202 *Parallel pipe threads*

Remarks : **ISO 228-1** : 1994 *Pipe thread where pressure-tight joints are not made on the threads—Part 1: Dimensions, tolerances and designation* is equivalent to the said standard.

JIS B 0203 *Taper pipe threads*

Remarks : **ISO 7-1** : 1994 *Pipe thread where pressure-tight joints are made on the threads—Part 1: Dimensions, tolerances and designation* is equivalent to the said standard.

JIS B 2220 *Steel pipe flanges*

JIS B 8265 *Construction of pressure vessel—General principles*

JIS G 4305 *Cold rolled stainless steel plates, sheets and strip*

JIS G 4902 *Corrosion-resisting and heat-resisting superalloy plates and sheets*

ISO 4200 *Plain end steel tube, welded and seamless—General tables of dimensions and masses per unit length*

ISO 7268 *Pipe components—Dimensions of nominal pressure*

3 Terms and definitions For the purposes of this Standard, the following terms and definitions apply.

3.1 expansion joint pipe joint to absorb axial, angular, lateral and/or other movements by means of expansion, construction and/or bend of one or more bellows (see **4201** of **JIS B 0151**)

3.2 corrugation element of the bellows to flexibly expand, contract and bend

3.3 corrugated bellows expansion element made from one or more plies, with one or more corrugations/convolutions and with or without end cuffs

NOTE : It can be reinforced with rings.

3.4 ply constituent element of the wall of the bellows

NOTE : The wall can be made from one or more plies.

3.5 cuff cylindrical section situated at one or both of the ends of the bellows integrated with the corrugations To be used for the portion of welding attachment.

3.6 cuff reinforcement collar ring placed around the cuff to reinforce it against the effect of internal pressure and hence reduce deformation

NOTE : For a structure welding the bellows to internal face of end pipe and the like, it is unnecessary to be provided with cuff reinforcement collar.

3.7 root-reinforcing ring element fitted outside or inside a bellows in a corrugation/convolution root, conforming to the shape of the root, to prevent its deformation under internal or external pressure

NOTES 1 When placed between two corrugation/convolutions, it is called an intermediate reinforcing ring. When placed at the end, it is called an end corrugation/convolution-reinforcing ring.

2 The adjusting ring mentioned in **3.4.4** Remarks 2 of Annex 2 is also included in root-reinforcing rings.

3.8 welding ring ring placed around the cuff to facilitate welding

NOTE : Where the bellows has a thickness sufficient for welding, it is unnecessary to be provided with welding ring.

3.9 internal sleeve element which allows a satisfactory flow of medium and protects the bellows from erosion and flow-induced vibrations

NOTE : It is designed so that it does not restrict the movement of the expansion joint.

3.10 pressure thrust axial force arising from internal pressure which has to be contained to avoid undue axial deformation of the bellows (see clause **2** of Annex 3)

3.11 end fittings fittings (usually weld ends, threaded ends or flanged ends) by means of which expansion joints are connected to the piping system or to equipment

NOTE : Threaded fittings may also be used for those for small size pipes.

3.12 restraining components mechanical components (tie-rods, tie-bars, hinges, gimbal rings, etc.) designed to resist pressure thrust and external loads

NOTE : They are attached to end fittings with brackets, carrier flanges or reinforcing gussets.

3.13 guide elements components used for maintaining coaxiality during movement

3.14 external shroud cover around the bellows, whose dimensions do not impede the movement of the expansion joint but provide limited protection of the bellows against mechanical shock and spatter

NOTE : The external shroud is to be provided on the specific designation by the purchaser.

3.15 stroke indicator device that, in normal service, indicates the movement of the bellows

NOTES 1 If the design movement is exceeded, the device may distort permanently to indicate that an abnormal function of the system has occurred.

2 The stroke indicator is to be provided on the specific designation by the purchaser.

3.16 movement distributor device mounted on an expansion joint containing several bellows that limits each of them to work within their designed movements

3.17 adjusting device device to enable the bellows to be pre-set to given dimensions, or to meet special installation requirements

NOTE : It may combine shipping bars.

3.18 shipping bar device that secures the expansion joint in a position determined by the manufacturer during the period of shipment, handling and installation

3.19 movements

3.19.1 axial movement movement causing axial compression (expressed in negative number) or extension (expressed in positive number) of an expansion joint Its magnitude is regarded as the quantity of axial movement (see **3.2** of Annex 2).

3.19.2 angular movement movement causing bending of axis of an expansion joint in positive (expressed in negative number) or negative (expressed in positive number) side Its magnitude is regarded as the quantity of angular movement (see **3.2** of Annex 2).

3.19.3 lateral movement movement normal to the axis of an expansion joint in positive (expressed in negative number) or negative (expressed in positive number) side Its magnitude is regarded as the quantity of lateral movement (see **3.2** of Annex 2).

3.20 spring rate force, axial, angular or lateral in nature, or moment necessary to produce a unit deflection (1 mm or 1 degree) of the expansion joint

NOTE : For the calculation of reaction force and reaction bending moment of expansion joints, the spring rate per convolution of bellows is to be used (see clause **3** of Annex 3).

3.21 cycle full movement, from an initial position to the given working position and back, under the working conditions specified

NOTE : The number of the full movements cycled under the designated working conditions is regarded as the cycle life.

4 Types of expansion joint

4.1 General There are four principal types of expansion joint, which are designated according to the movements absorbed (see **4.2** to **4.5** and table 1).

NOTE : If information is required on further types, refer to the manufacturer.

4.2 Axial expansion joint Absorbs mainly axial movement. Pressure thrust will act for the loading onto main anchor.

When non-pressure-balanced, it does not restrain pressure thrust. When pressure-balanced, it restrains pressure thrust.

4.3 Angular expansion joint Absorbs angular movement. When fitted with hinges, it allows movement in a single plane and normally be used in a set of two or three joints. When fitted with gimbal rings, it allows movement in any plane.

These restrain static pressure thrust.

NOTE : To normally be used in a set of two gimbal and single hinged expansion joints (see **4207** and **4208** in **JIS B 0151**).

4.4 Lateral expansion joint Absorbs lateral movement. An angular movement is also permissible when the joint is fitted with two tie-bars.

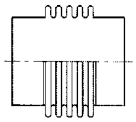
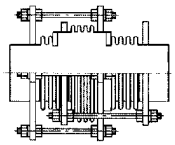
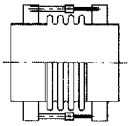
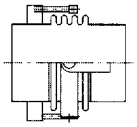
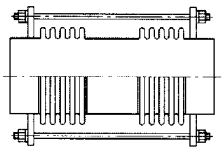
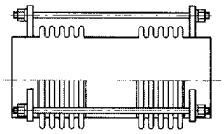
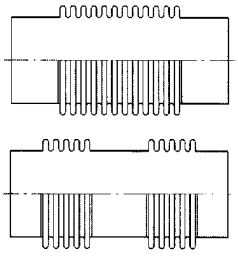
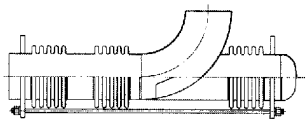
The tie-bar fitted expansion joint restrain static pressure thrust.

NOTE : Those constructed as being fitted with three or more tie-bars are capable of movement of both the end faces of expansion joint shifts parallel to absorb lateral movement.

4.5 Universal expansion joint Absorbs several movements.

Pressure thrust acts on main anchor. In the case of pressure-balanced expansion joint, it does not act on main anchor.

Table 1 Types of expansion joint

Type	Design	Pressure thrust restraint	Movement (1)				
			Axial	Angular		Lateral	
				Single plane	Multi-plane	Single plane	Multi-plane
Axial	Unrestrained 	No	×	(×)	(×)	(×)	(×)
	For straight run pipe Balanced 	Yes	×	–	–	–	–
Angular	Hinged 	Yes	–	×	–	–	–
	Gimbals 	Yes	–	×	×	–	–
Lateral	Two tie-bars 	Yes	–	×	–	×	×
	Three or more tie-bars 	Yes	–	–	–	×	×
Universal	Unrestrained, with one or two bellows 	No	×	×	×	×	×
	For curved pipe Balanced 	Yes	×	×	–	×	×

Note (1) × = Applicable, (×) = Limited use