
**Pipework — Metal bellows expansion
joints — General**

Tuyauteries — Compensateurs métalliques à soufflet — Généralités

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15348 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 11, *Flexible metallic hoses and expansion joints*.

Annexes A to G form a normative part of this International Standard.

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Introduction

This document is a base standard for metal bellows expansion joints.

Users of this International Standard are advised to consider the desirability of third-party certification of product conformity with this International Standard, based on testing and continuous product surveillance, which may be coupled with the assessment of suppliers' quality systems against ISO 9001.

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Pipework — Metal bellows expansion joints — General

1 Scope

This International Standard specifies the terminology and the general rules for the design, manufacture, control and type testing of metal expansion joints incorporating corrugated bellows.

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

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

[ISO 15348:2002](#)

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

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

ISO 7005-1, *Metallic flanges — Part 1: Steel flanges*

ISO 7268, *Pipe components — Definition of nominal pressure*

ISO 9328-5, *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 5: Austenitic steels*

EN 1092-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 1333, *Pipework components — Definition and selection of PN*

EN 10088-2, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip for general purposes*

ENV 10220, *Seamless and welded steel tubes — Dimensions and masses per unit length*

EN 10226-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Designation, dimensions and tolerances*

3 Terms and definitions

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

3.1

expansion joint

leakproof metal device consisting of one or more bellows used to absorb movements such as caused by thermal or mechanical effects in piping or components of equipment

3.2

corrugation GB

convolution US

single flexible element of the bellows

3.3

corrugated bellows GB

convoluted bellows US

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 to allow its attachment

3.6

cuff reinforcement collar

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

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

NOTE 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.

3.8

welding ring

ring placed around the cuff to facilitate welding

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

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

3.12**restraining components**

mechanical components (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

3.15**stroke indicator**

device that, in normal service, indicates the movement of the bellows

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

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3.16**movement distributor**

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

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3.17**adjusting device**

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

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**

movements of an axial, angular or lateral nature

3.19.1**axial movement**

movement causing axial compression or extension of an expansion joint

3.19.2**angular movement**

movement causing bending of an expansion joint

3.19.3**lateral movement**

transverse movement of the ends of an expansion joint such that their axes remain parallel

3.20

spring rate

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

3.21

cycle

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

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. 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. When fitted with gimbal rings, it allows movement in any plane. It restrains pressure thrust. Normally used in a set of two or three joints.

4.4 Lateral expansion joint

Absorbs lateral movement. An angular movement is also permissible when the joint is fitted with two tie-bars, the movement being perpendicular to the plane containing the tie rods. It restrains pressure thrust.

4.5 Universal expansion joint

Absorbs several movements. It does not restrain pressure thrust unless it is pressure-balanced.

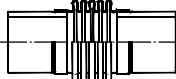
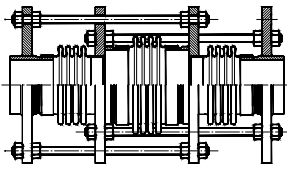
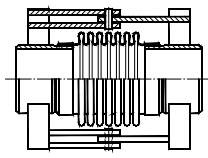
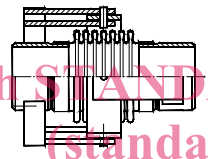
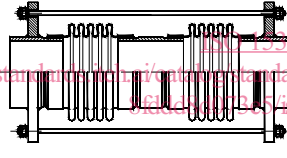
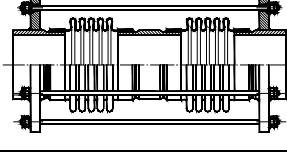
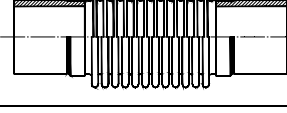
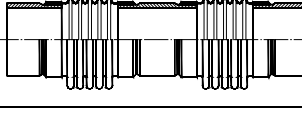
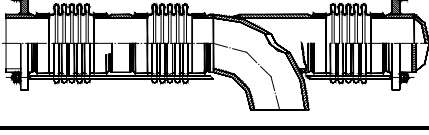
5 Information to be supplied by the purchaser

The purchaser shall state, as a minimum, the following in all enquiries and orders:

- a) the expansion joint type (see Table 1);
- b) the nominal size (DN);
- c) the design pressure;
- d) the design temperature;
- e) the movements;
- f) the materials;
- g) the fittings.

Dependent on the application, the relevant details listed in annex A shall also be given.

Table 1 — Types of expansion joint

Type	Design	Pressure thrust restraint	Movement				
			Axial	Angular		Lateral	
				Single plane	Multi-plane	Single plane	Multi-plane
Axial	Unrestrained 	No	X	(X)	(X)	(X)	(X)
	Balanced 	Yes	X				
Angular	Hinged 	Yes		X			
	Gimbals 	Yes		X	X		
Lateral	Two tie-bars 	Yes				X	X
	Three or more tie-bars 	Yes				X	X
Universal	Unrestrained, with one or two bellows 	No	X	X	X	X	X
							
	Balanced 	Yes	X	X		X	X

X = Applicable, (X) = Limited use