INTERNATIONAL STANDARD

ISO 5252

Second edition
1991-02-15

Steel tubes — Tolerance systems

Tubes en acier — Systèmes de tolérances

Reference number
ISO 5252:1991(E)

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.

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.

International Standard ISO 5252 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*.

This second edition cancels and replaces the first edition (ISO 5252:1977), the standardized tolerances on thickness of which have been technically revised.

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Introduction

This International Standard groups together the majority of the tolerances on dimensions used by ISO/TC 5/SC 1 in the drawing up of its International Standards concerning steel tubes.

It is intended for use as a basic document by all ISO technical committees concerned with the standardization of steel tubes.

It cannot, therefore, be used as a standard for the definition of a product.

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Steel tubes — Tolerance systems

1 Scope

This International Standard establishes the tolerance systems to be used for the standardization of steel tubes (product standards).

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 286-1:1988, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits.*

3 Definitions

For the purposes of this International Standard, the definitions of the terms "size tolerance", "deviation" and "nominal size" given in ISO 286-1 and the following definitions apply.

3.1 proportional tolerance: Tolerance where the deviations with respect to the nominal size are specified as a percentage of the size.

EXAMPLE

Proportional tolerance applied to a thickness

6,3 mm ± 12,5 %

3.2 absolute tolerance: Tolerance where the deviations with respect to the nominal size are specified in the form of a value expressed in the units of the size.

EXAMPLE

Absolute tolerance applied to a diameter

30 mm ± 0,5 mm

3.3 joint tolerance: Tolerance where one of the deviations is given in the proportional system and the other in the absolute system.

EXAMPLE

Joint tolerance applied to a thickness

$2{,}9\ \text{mm}\ ^{+0{,}5\ \text{mm}}_{-15\ \%}$

3.4 unilateral tolerance: Tolerance where the deviation is wholly positive or wholly negative.

EXAMPLE

Unilateral tolerance applied to a length

$6\,000\ \text{mm}\ ^{+10\ \text{mm}}_{0}$

3.5 bilateral tolerance: Tolerance where the deviations are of opposite signs.

3.6 symmetrical tolerance: Bilateral tolerance where the deviations, expressed in the same unit, are equal.

EXAMPLE

Symmetrical tolerance applied to a diameter

168,3 mm ± 1 %

3.7 asymmetrical tolerance: Bilateral tolerance where the deviations, expressed in the same unit, are unequal.

EXAMPLE

Asymmetrical tolerance applied to a thickness

$12{,}5\ \text{mm}\ ^{+15{,}0\ \%}_{-12{,}5\ \%}$

4 Use of tolerances

4.1 The tolerances used in product standards should be selected from this International Standard although the use of a tolerance specific to a particular product is not excluded.

4.2 The choice and the combination of the different proposed tolerances should be the subject of a careful examination. Among other factors, consideration should be given to the tube manufacturing process, the intended use and dimensions of the tubes and the methods and instruments employed for the checking of product conformity with specifications.

4.3 Unilateral or bilateral tolerances may be used, but the use of symmetrical tolerances is recommended.

For most product standards for steel tubes, the proportional tolerance is the most suitable.

The use of a joint tolerance is allowed.

5 Outside diameter

5.1 The five classes of proportional tolerances shown in table 1 are standardized.

Table 1

Tolerance class	Tolerance on outside diameter
D0	± 2 % with ± 1 mm min.
D1	± 1,5 % with ± 0,75 mm min.
D2	± 1 % with ± 0,5 mm min.
D3	± 0,75 % with ± 0,3 mm min.
D4	± 0,5 % with ± 0,1 mm min.

5.2 If not otherwise stated in the product standard, the tolerance on ovality is included in the tolerance on outside diameter.

5.3 For particular applications, for example for the diameter of precision tubes, the use of an absolute tolerance is necessary. In such cases, this tolerance shall be stated clearly and precisely for each diameter covered by the product standard. In case of doubt about the tolerance on an intermediate diameter, the tolerance on the next larger size applies.

EXAMPLE

If in a product standard a table similar to table 2 appears, the tolerance for a diameter of 32 mm, between diameters 30 mm and 35 mm, is ± 0,25 mm.

Table 2

Outside diameter mm	Tolerance mm
30	± 0,2
35	± 0,25

6 Thickness

6.1 The ten classes of proportional tolerances shown in table 3 are standardized.

6.2 If not otherwise stated in the product standard, the tolerance on eccentricity is included in the thickness tolerance.

6.3 For particular applications, for example for heat-exchanger tubes, the unilateral tolerance system is usually adopted.

7 Length

7.1 General

Four types of length, defined in 7.2.1 to 7.2.4, are standardized. The product standard shall specify the type or types applicable and shall define the tolerances to be applied.

7.2 Types of standardized length

7.2.1 Random length

The random length is defined of necessity by a minimum and a maximum length. By definition the difference between these lengths may not be less than 2 m.

EXAMPLES

10 m to 15 m
4 m to 7 m

This range of lengths may be supplemented by the indication of a percentage of shorter tubes, whose length shall be not less than a third limiting value.

Table 3

Tolerance class	Tolerance on thickness as a function of ratio T/D			
	$0{,}1 < T/D$	$0{,}05 < T/D \leqslant 0{,}1$	$0{,}025 < T/D \leqslant 0{,}05$	$T/D \leqslant 0{,}025$
T0	± 20 % with ± 1 mm min.			
T1	± 15 % with ± 0,6 mm min.			
T2	± 12,5 % with ± 0,4 mm min.			
T2.1	+ (Percentage not specified)[1] − 12,5 %			
T2.2	± 10 %	± 12,5 %	± 15 %	± 20 % with ± 0,4 mm min.
T3	± 10 % with ± 0,2 mm min.			
T3.1	+ (Percentage not specified)[1] − 10 %			
T3.2	± 7,5 %	± 10 %	± 12,5 %	± 15 % with ± 0,2 mm min.
T4	± 7,5 % with ± 0,15 mm min.			
T5	± 5 % with ± 0,1 mm min.			

1) The plus tolerance is dependent on the plus tolerance on mass.

EXAMPLE

10 m to 15 m with 10 % not less than 7 m

Finally, the product standard may specify an average length to be guaranteed.

EXAMPLE

10 m to 15 m with a guaranteed average length of 13 m

7.2.2 Approximate length

For differences in length of random lengths less than 2 m, the concept of approximate length, with which a symmetrical absolute tolerance is associated, is specified.

EXAMPLES

1 800 mm ± 500 mm
900 mm ± 100 mm

7.2.3 Exact length

For an even more restricted range of lengths, the exact length, with which a unilateral absolute tolerance is always associated, is specified.

EXAMPLES

2 000 mm $^{+5}_{0}$ mm

6 000 mm $^{+15}_{0}$ mm

7.2.4 Multiple length

The multiple length comprises a whole number multiplied by the useful length, plus the saw cuts. The parameters (multiples and saw cuts) shall be defined in the order.

8 Straightness

8.1 Types of deflection

For particular cases for which it is necessary to specify a special straightness by measuring the deflection, the distinction between the total deflection and a local deflection must be made.

8.2 Deflections

8.2.1 Total deflection

The three classes of deflection, measured over the total length of the tube, shown in table 4 are standardized.

Table 4

Deflection class	Total deflection % of total tube length
S1	0,2
S2	0,15
S3	0,1

8.2.2 Local deflection

The four classes of local deflection, measured over a length of 1 m, shown in table 5 are standardized.

Table 5

Deflection class	Local deflection (over a length of 1 m) mm
F1	3
F2	2
F3	1
F4	0,5

9 Mass

9.1 Types of mass

It is necessary to distinguish between two types of mass, i.e. the mass per tube and the mass per batch or consignment.

9.2 Tolerances

9.2.1 Mass per tube

The two classes of mass tolerance per tube shown in table 6 are standardized.

Table 6

Tolerance class	Mass tolerance per tube %
M1	± 10
M2	± 7,5

9.2.2 Mass per batch or consignment

The two classes of mass tolerance per batch or consignment shown in table 7 are standardized.

Table 7

Tolerance class	Mass tolerance per batch or consignment %
C1	± 7,5
C2	± 5

The mass tolerance per batch or consignment is of course more stringent than the mass tolerance per tube. Therefore it is not applicable to batches or consignments below 10 t.

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Descriptors: pipes (tubes), metal tubes, steel tubes, dimensions, dimensional tolerances, form tolerances.

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