
Metallic materials — Tube — Ring-expanding test

Matériaux métalliques — Tubes — Essai de dilatation d'anneaux

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The committee responsible for this document is ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 2, *Ductility testing*.

This third edition cancels and replaces the second edition (ISO 8495:1998), of which it constitutes a minor revision.

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Metallic materials — Tube — Ring-expanding test

1 Scope

This International Standard specifies a method for a ring-expanding test on tubes, that is used to reveal defects both on the surfaces and within the tube wall by expanding the test piece using a conical mandrel until fracture occurs. It may be also used to assess the ability of tubes to undergo plastic deformation.

The ring-expanding test is applicable to tubes having an outside diameter from 18 mm up to and including 150 mm and a wall thickness from 2 mm up to and including 16 mm.

2 Symbols, designations and units

Symbols, designations and units for the ring-expanding test are given in [Table 1](#) and are shown in [Figure 1](#).

Table 1

Symbol	Designation	Unit
a^a	Wall thickness of the tube	mm
D	Original outside diameter of the tube	mm
$D_{mmax.}$	Maximum diameter of the conical mandrel	mm
$D_{min.}$	Minimum diameter of the conical mandrel	mm
D_u	Maximum outside diameter of the expanded part of the test piece	mm
k	Length of the taper of the conical mandrel	mm
L	Length of the test piece before the test	mm

^a The symbol T is also used in steel tube standards.

3 Principle

Expanding a ring cut from the end of a tube, over a conical mandrel until fracture, or until the expansion of the test piece reaches a value specified in the relevant product standard (see [Figure 1](#)).

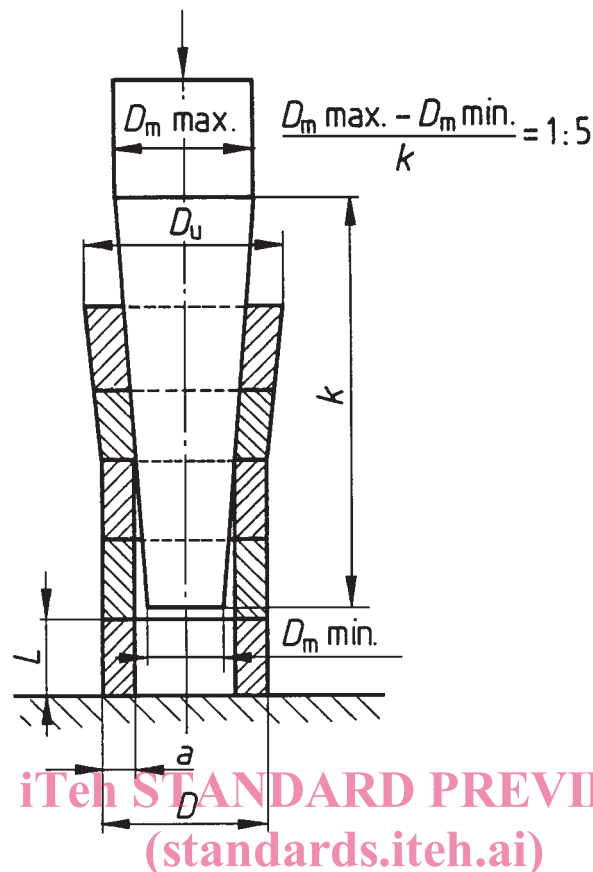


Figure 1

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4 Apparatus

4.1 Variable-speed press or universal testing machine.

4.2 Conical mandrel, having a working length preferably tapered 1:5 as shown in [Figure 1](#), unless otherwise specified in the relevant product standard, and its surface shall be of sufficient hardness, well-polished and free from scores.

5 Test piece

5.1 The length of the test piece shall be between 10 mm and 16 mm. Test pieces shall be taken from the ends of deburred tubes as manufactured before they are cut to length. The rings shall be cut so that the planes of the end faces are parallel with each other and perpendicular to the axis of the tube.

5.2 The edges of the test piece may be rounded by filing or chamfered by other methods.

NOTE Non-rounded or non-chamfered edges are permissible, if the test result meets the test requirements.

5.3 When welded tubes are subjected to the test, the internal weld flash may be removed.

6 Procedure

6.1 In general, the test shall be carried out at ambient temperature within the limits of 10 °C to 35 °C. The test carried out under controlled conditions shall be made at a temperature of 23 °C ± 5 °C.

6.2 Before testing, the rings and the conical mandrel may be lubricated. Rings of the same size and the same type of metal may be placed one on top of each other. The rings and the conical mandrel shall be concentric (see [Figure 1](#)).

6.3 Force the conical mandrel into the rings until the required expansion is reached or the rings fracture.

6.4 The rate of penetration of the conical mandrel shall not exceed 30 mm/s.

6.5 The relative expansion shall be calculated in accordance with the relevant product standard.

6.6 Interpretation of the ring-expanding test shall be carried out in accordance with the requirements of the relevant product standard. When these requirements are not specified, the test piece shall be considered to have passed the test if no cracks are visible without the use of magnifying aids.

7 Test report

A test report shall be provided when so specified in the relevant product standard. In this case, the test report shall include at least the following information:

- a) a reference to this International Standard, i.e. ISO 8495;
- b) identification of the test piece;
- c) dimensions of the test piece;
- d) relative expansion;
- e) taper of the conical mandrel if different from that given in [4.2](#);
- f) result of the test.

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