

Metallic materials — Tube — Flanging test

The European Standard EN 10235:1993 has the status of a
British Standard

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United Kingdom	British Standards Institution

This British Standard, having been prepared under the direction of the Iron and Steel and the Non-ferrous Metals Standards Policy Committees, was published under the authority of the Standards Board and comes into effect on 15 May 1994

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The following BSI references relate to the work on this standard:
Committee reference
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National foreword

This British Standard has been prepared under the direction of the Iron and Steel and the Non-ferrous Metals Standards Policy Committees and is the English language version of EN 10235:1993 *Metallic materials — Tube — Flanging test*, published by the European Committee for Standardization (CEN). No British Standard is superseded.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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Descriptors: Metal tubes, mechanical tests, flanging tests

English version

Metallic materials — Tube — Flanging test

Matériaux métalliques — Tubes — Essai de
rabattement de collerette

Metallische Werkstoffe — Rohr —
Bördelversuch

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by sub-committee ECISS/TC 29, the Secretariat of which has been allocated to the United Kingdom (BSI).

No meeting of the sub-committee has been held but the following countries voted positively by the PQ procedure on the acceptability of the reference document as a European Standard: Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom. No country voted negatively.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1994, and conflicting national standards shall be withdrawn at the latest by April 1994.

In accordance with CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

This standard is based on ISO 8494:1986 *Metallic materials — Tube — Flanging test* which has been editorially changed in the light of the comments received. Several minor changes have been made in clauses 5 to 8. The usage of symbols has been aligned with the requirements of ISO 3545-1:1989.

1 Scope

This European Standard specifies a method for determining the ability of metallic tubes of circular cross section to undergo plastic deformation during flange formation.

It is intended that the standard should be applicable to tubes having an outside diameter not greater than 150 mm and a wall thickness not greater than 10 mm. The range of diameters or wall thicknesses for which this European Standard is applicable could be more exactly specified in the relevant product standard.

2 Normative reference

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revision of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 3545-1:1989, *Steel tubes and fittings — Symbols for use in specifications — Part 1: Tubes and tubular accessories with circular cross-section.*

3 Principle

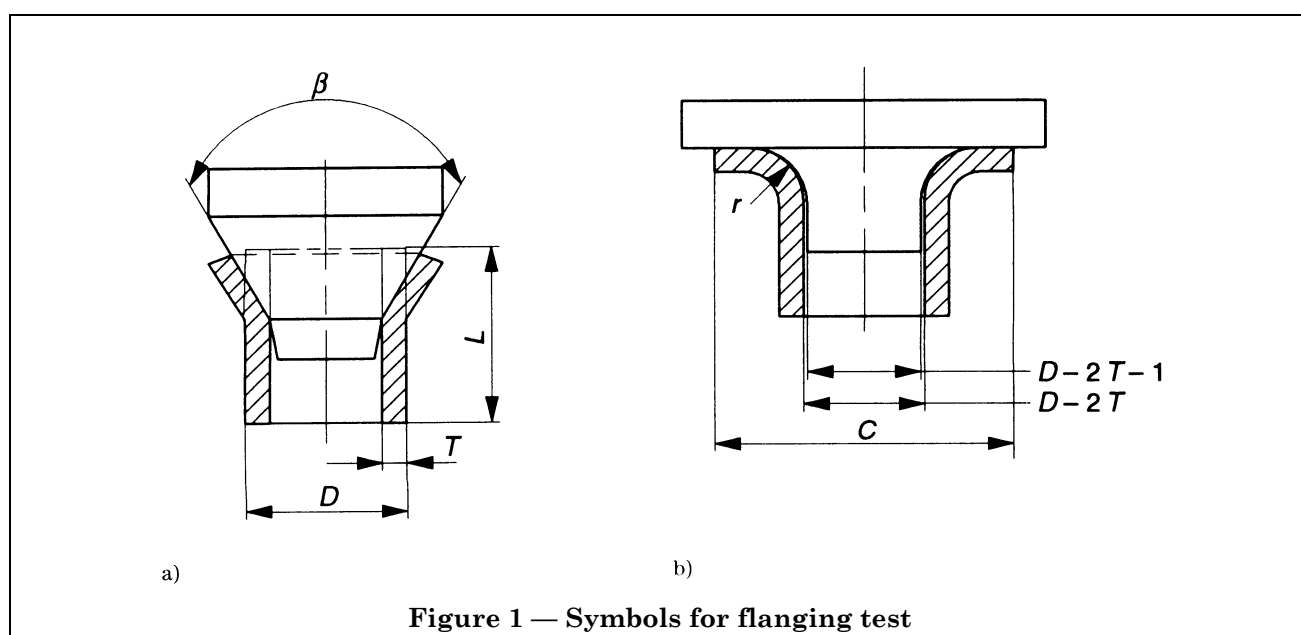
Forming on the end of a test piece cut from a tube, a flange in a plane perpendicular to the axis of the tube, until the external diameter of the flange reaches the value specified in the relevant product standard.

4 Symbols, descriptions and units

Symbols, descriptions and units for the flanging test of tubes are in accordance with ISO 3545-1:1989 and are given in Figure 1 and Table 1.

Table 1 — Symbols, descriptions and units

Symbol	Description	Unit
D	Original outside diameter of the tube	mm
T	Wall thickness of the tube	mm
L	Length of the test piece before the test	mm
r	Corner radius of the flanging tool	mm
C	Maximum outside diameter of the flange	mm
β	Angle of the conical mandrel	degree



5 Testing equipment

5.1 The test shall be carried out in a variable-speed press or a universal testing machine.

5.2 The forming equipment shall consist of

- a) a conical mandrel having a suitable angle (generally 90°);
- b) where r is specified in the relevant product standard a flanging tool having
 - a cylindrical end of a diameter about 1 mm less than the inside diameter of the tube,
 - a flat concentric portion, perpendicular to the axis of the forming tool, and having a diameter not less than the required diameter of the flange.

NOTE When necessary a supporting die may be used to support the tube during the formation of the flange.

5.3 The forming tools shall be made of polished material of sufficient hardness.

6 Test piece

6.1 The length L of the test piece shall be approximately $1,5D$. The test piece may be shorter provided that the cylindrical part remaining after flanging is at least $0,5D$.

6.2 Both ends of the test piece shall be in a plane perpendicular to the axis of the tube. The edges of the end to be tested 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.

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

7 Procedure

7.1 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 $(23 \pm 5)^\circ\text{C}$.

7.2 Preform the test piece by forcing the conical mandrel into one end of the test piece until the diameter of the drifted test pieces is such that a flange having the specified diameter can be formed [see Figure 1 a)]. The axis of the mandrel shall be aligned with the axis of the tube.

7.3 Remove the conical mandrel and, if necessary, replace with the flanging tool [see Figure 1 b)].

7.4 Form the flange by applying axial force to the test piece until the drifted portion has formed a flange of the required diameter perpendicular to the axis of the test piece.

7.5 The forming tools may be lubricated. The tools shall not rotate relative to the test piece during the test.

7.6 In case of dispute, the rate of movement of the forming tools shall not exceed 50 mm/min.

7.7 The diameter of the flange and the radius r shall be as specified in the relevant product standard.

7.8 Interpretation of the flanging test shall be carried out according to the requirements of the relevant product standard. When these requirements are not specified, absence of cracks visible without the use of magnifying aids shall be considered as evidence that the test piece passed the test. Slight premature failure at the edges shall not be considered cause for rejection.

8 Test report

8.1 A test report shall be provided when so specified in the relevant product standard.

8.2 The test report shall include at least the following information:

- a) reference to this European Standard;
- b) identification of the test piece;
- c) dimensions of the test piece;
- d) maximum outside diameter of the expanded part of the test piece C or relative expansion as a percentage of the original diameter D ;
- e) corner radius r of the flanging tool, when relevant;
- f) result of the test.

National annex NA (informative)

Committees responsible

The United Kingdom participation in the preparation of this European Standard was entrusted by the Iron and Steel Standards Policy Committee (ISM/-) and the Non-ferrous Metals Standards Policy Committee (NFM/-) to Technical Committee ISM/NFM/4, upon which the following bodies were represented:

AEA Technology
Aluminium Federation
British Non-ferrous Metals Federation
British Railways Board
British Steel Industry
Copper Development Association
Department of Trade and Industry (National Measurement Accreditation Service)
Department of Trade and Industry (National Physical Laboratory)
ERA Technology Ltd.
GAMBICA (BEAMA Ltd.)
Institute of Materials
Light Metal Founders' Association
Ministry of Defence
Society of British Aerospace Companies Limited
University College London
Welding Institute

The following body was also represented in the drafting of the standard, through subcommittees and panels:

British Welded Steel Tube Association

BSI — British Standards Institution

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