

Metallic materials — Tube (in full section) — Bend test

The European Standard EN 10232:1993 has the status of a
British Standard

UDC 669-462:620.174

Cooperating organizations

The European Committee for Standardization (CEN), under whose supervision this European Standard was prepared, comprises the national standards organizations of the following countries:

Austria	Oesterreichisches Normungsinstitut
Belgium	Institut belge de normalisation
Denmark	Dansk Standardiseringsraad
Finland	Suomen Standardisoimisliito, r.y.
France	Association française de normalisation
Germany	Deutsches Institut für Normung e.V.
Greece	Hellenic Organization for Standardization
Iceland	Technological Institute of Iceland
Ireland	National Standards Authority of Ireland
Italy	Ente Nazionale Italiano di Unificazione
Luxembourg	Inspection du Travail et des Mines
Netherlands	Nederlands Normalisatie-instituut
Norway	Norges Standardiseringsforbund
Portugal	Instituto Português da Qualidade
Spain	Asociación Española de Normalización y Certificación
Sweden	Standardiseringskommissionen i Sverige
Switzerland	Association suisse de normalisation
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

© BSI 07-1999

The following BSI references relate to the work on this standard:
Committee reference ISM/NFM/4
Draft announced in *BSI News* April 1991

ISBN 0 580 22877 0

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
Foreword	2
Text of EN 10232	3
National annex NA (informative) Committees responsible	Inside back cover

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 10232:1993 *Metallic materials — Tube (in full section) — Bend test* published by the European Committee for Standardization (CEN). No British Standard is superseded.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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.

UDC 669-462:620.174

Descriptors: Metal tubes, mechanical tests, bend tests

English version

Metallic materials — Tube (in full section) — Bend test

Matériaux métalliques — Tubes —
Essai de cintrage sur tronçons

Metallische Werkstoffe — Rohr
(Rohrabschnitt) — Biegeversuch

This European Standard was approved by CEN on 1993-10-25. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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

Licensed Copy: sheffieldun sheffieldun, na, Thu Oct 26 04:25:22 GMT +00:00 2006, Uncontrolled Copy, (c) BSI

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 the CEN/CENELEC Internal Regulations, 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.

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Principle	3
4 Symbols, descriptions and units	3
5 Testing equipment	3
6 Test piece	3
7 Procedure	3
8 Test report	4
Figure 1 — Symbols for bend test	4
Table 1 — Symbols, descriptions and units	3

Introduction

This standard is based on ISO 8491:1986 *Metallic materials — Tube (in full section) — Bend test* which has been editorially changed in the light of the comments received. A minor technical change has been made in the procedure which, for welded tubes, requires the position of the weld to be at 90° to the plane of bending. 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 full-section metallic tubes of circular cross-section to undergo plastic deformation in bending. It is intended for tubes with an outside diameter not greater than 65 mm, although the range of the outside diameter for which this European Standard is applicable can be more exactly specified in the relevant product standard.

Bend tests of the test pieces taken from tubes in the form of transverse strips should be made in accordance with ISO 7438:1985 so that the original curvature of the test piece is increased.

2 Normative references

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 revisions 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*.

ISO 7438:1985, *Metallic materials — Bend test*.

3 Principle

Bending a straight tube in full section around a grooved former of a specified radius r , until the angle of bend α (see Figure 1) reaches the value specified in the relevant product standard.

4 Symbols, descriptions and units

Symbols, descriptions and units for the bend test of tubes in full section 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	Outside diameter of the tube	mm
T	Wall thickness of the tube	mm
L	Length of the test piece before the test	mm
r	Inside radius at the bottom of the groove	mm
α	Angle of the bend	degree

5 Testing equipment

5.1 The bend test of tubes shall be carried out on tube bending machines designed to restrict the development of ovality of the section of tube.

5.2 The tube bend former of the machine shall have a groove corresponding in profile to the outside diameter of the tube. The radius r at the bottom of the groove shall be specified in the relevant product standard.

NOTE The tolerance of radius r and the depth and ovality of the groove all have an effect on the test result.

6 Test piece

The test piece shall be a portion of a straight tube of any length which will allow the test to be carried out on the tube bending machine.

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 ± 5) °C.

7.2 Bend the unfilled test piece of the tube by means of a tube bending machine, ensuring contact between the test piece and the tube bend former over the length of bend, until the specified angle of bend is reached.

7.3 If welded tubes are subjected to the test, the position of the weld shall be at 90° to the plane of bending, i.e. on the neutral axis, unless otherwise indicated in the relevant product standard.

7.4 Interpretation of the bend test of tubes 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.

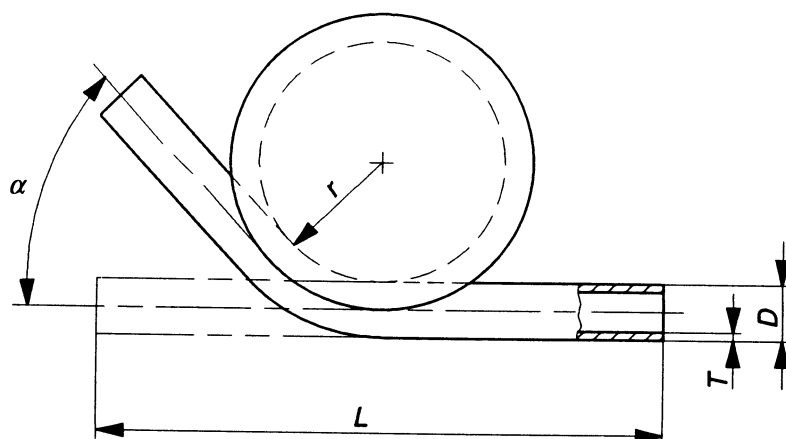


Figure 1 — Symbols for bend test

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:

- reference to this European Standard;
- identification of the test piece;
- dimensions of the test piece;
- angle of the bend α and radius r ;
- position of the weld in relation to the plane of bending;
- 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

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover.
Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre.
Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration.
Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

If permission is granted, the terms may include royalty payments or a licensing agreement. Details and advice can be obtained from the Copyright Manager.
Tel: 020 8996 7070.