

norm

NEN-EN 13445-8

Unfired pressure vessels - Part 8:
Additional requirements for pressure
vessels of aluminium and aluminium
alloys

Publicatie uitsluitend voor commentaar

mei 2013
ICS 23.020.30

Commentaar vóór 2013-08-11

Zal vervangen NEN-EN 13445-8:2012

Als Europees normontwerp is gepubliceerd: prEN 13445-8:2013, IDT

Definitief vastgestelde normen zullen als Nederlandse norm gelden. Daarom wordt dit normontwerp in Nederland voor commentaar gepubliceerd. Op het ontwerp ingebracht commentaar zal aan de bevoegde normcommissie worden voorgelegd die hiermee rekening zal houden bij de bepaling van de Nederlandse stem. Indien er geen bezwaar bij NEN wordt gebracht, kan dat leiden tot ongewijzigde definitieve vaststelling van het ontwerp als norm.

Van Europese normen bestaan drie officiële versies: Engels, Frans en Duits. Voor Nederland zal de Engelse versie gelden. Daarnaast kan er gekozen worden voor een andere geautoriseerde versie in het Nederlands.

Normcommissie 341032 "Drukapparatuur"



THIS PUBLICATION IS COPYRIGHT PROTECTED

DEZE PUBLICATIE IS AUTEURSRECHTELIJK BESCHERMD

Apart from exceptions provided by the law, nothing from this publication may be duplicated and/or published by means of photocopy, microfilm, storage in computer files or otherwise, which also applies to full or partial processing, without the written consent of the Netherlands Standardization Institute.

The Netherlands Standardization Institute shall, with the exclusion of any other beneficiary, collect payments owed by third parties for duplication and/or act in and out of law, where this authority is not transferred or falls by right to the Reproduction Rights Foundation.

Auteursrecht voorbehouden. Behoudens uitzondering door de wet gesteld mag zonder schriftelijke toestemming van het Nederlands Normalisatie-instituut niets uit deze uitgave worden veeleenvoudigd en/of openbaar gemaakt door middel van fotokopie, microfilm, opslag in computerbestanden of anderszins, hetgeen ook van toepassing is op gehele of gedeeltelijke bewerking.

Het Nederlands Normalisatie-instituut is met uitsluiting van ieder ander gerechtigd de door derden verschuldigde vergoedingen voor veeleenvoudiging te innen en/of daartoe in en buiten rechte op te treden, voor zover deze bevoegdheid niet is overgedragen c.q. rechtens toekomt aan de Stichting Reprorecht.

Although the utmost care has been taken with this publication, errors and omissions cannot be entirely excluded. The Netherlands Standardization Institute and/or the members of the committees therefore accept no liability, not even for direct or indirect damage, occurring due to or in relation with the application of publications issued by the Netherlands Standardization Institute.

Hoewel bij deze uitgave de uiterste zorg is nagestreefd, kunnen fouten en onvolledigheden niet geheel worden uitgesloten. Het Nederlands Normalisatie-instituut en/of de leden van de commissies aanvaardden derhalve geen enkele aansprakelijkheid, ook niet voor directe of indirecte schade, ontstaan door of verband houdend met toepassing van door het Nederlands Normalisatie-instituut gepubliceerde uitgaven.

Voorbeeld
Preview

April 2013

ICS 23.020.30

Will supersede EN 13445-8:2009

English Version

Unfired pressure vessels - Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys

Réceptacles sous pression non soumis à la flamme - Partie 8: Exigences complémentaires pour les réceptacles sous pression en aluminium et allages d'aluminium

Unbefeuerte Druckbehälter - Teil 8: Zusätzliche Anforderungen an Druckbehälter aus Aluminium und Aluminiumlegierungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 54.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	4
1 Scope	5
2 Normative references	5
3 Terms, definitions, symbols and units	6
4 General requirements.....	6
5 Materials	7
5.1 General.....	7
5.2 Elongation after fracture	7
5.3 Prevention of brittle fracture	7
5.4 Lamellar tearing	7
5.5 Chemical composition	7
5.6 Material grouping system	8
6 Design	9
6.1 General.....	9
6.2 Design temperature and properties	9
6.3 Time-independent nominal design stress	9
6.4 Thick walled, small bore piping for shells	10
6.5 Fatigue design.....	10
6.6 Lapped joints, joggle joints, permanent backing strips	10
6.6.1 General.....	10
6.6.2 Lapped joints.....	10
6.6.3 Joggle joints.....	11
6.6.4 Joints with permanent backing strips	11
6.7 Flat ends	11
6.8 Design by experiment	12
6.9 Port-hole extruded tubes	12
7 Manufacture.....	12
7.1 General.....	12
7.2 Materials	12
7.3 Tolerances	12
7.4 Welding procedure specification (WPS)	12
7.5 Qualification of welding procedure specifications (WPQR).....	13
7.6 Qualification of welders and welding operators.....	13
7.7 Joint preparation.....	13
7.8 Preheat.....	13
7.9 Production test, reference criteria	13
7.10 Extent of testing.....	14
7.11 Performance of test and acceptance criteria	15
7.12 Forming procedures.....	15
7.13 Heat treatment after forming	15
7.14 Sampling of formed products.....	17
7.15 Tests.....	17
7.15.1 Base material.....	17
7.15.2 Butt welds.....	18
7.16 Post weld heat treatment (PWHT)	18

8	Inspection and testing	18
8.1	General	18
8.2	Non-destructive testing of welded joints	18
8.2.1	General	18
8.2.2	Demonstration of satisfactory experience for testing group 2	19
8.2.3	Symbols	20
8.3	Determination of extent of non-destructive testing	20
8.4	Applicable non-destructive testing techniques	23
8.4.1	NDT methods	23
8.4.2	Acceptance criteria for radiographic testing (RT)	24
8.4.3	Acceptance criteria for visual and surface penetrant testing	24
8.4.4	Acceptance criteria for penetrant testing (PT)	25
8.5	Selection of non-destructive testing methods for internal imperfections	25
8.6	Standard hydrostatic test	26
8.7	Pneumatic testing	26
9	Inspection and testing of serially produced pressure vessels — Model approval	26
9.1	General	26
9.2	Inspection and testing of pressure vessels subject to cyclic loads	26
Annex A (normative)	Allowable design strength values	27
A.1	General	27
A.2	Extruded rod/bar, tube and profile	27
A.3	Cold drawn rod/bar and tube	28
A.4	Forgings	28
A.5	Plate	29
Annex Y (informative)	History of EN 13445-8	32
Y.1	Differences between EN 13445-8:2006 and EN 13445-8:2009	32
Y.2	List of corrected pages of Issue 2 (2010-07)	32
Y.3	List of corrected pages of Issue 3 (2011-07)	32
Y.4	List of corrected pages of Issue 4 (2012-07)	32
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of the EU Pressure Equipment Directive 97/23/EC	33
Bibliography	34

Foreword

This document (prEN 13445-8:2013) has been prepared by Technical Committee CEN/TC 54 "Unfired pressure vessels", the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13445-8:2009.

Changes to EN 13445-8:2009 are as follows:

- the Normative References were updated;
- in 5.6 requirements for inspection documents were added;
- in 6.2 the requirements on design temperature and properties have been revised;
- sub-clause 6.7 on flat ends was added;
- sub-clause 6.8 on design by experiment was added;
- sub-clause 6.9 on port-hole extruded tubes was added;
- sub-clause 7.3 on tolerances was added and the subsequent paragraphs were re-numbered correspondingly;
- in 7.9 the clause on production tests and reference criteria was completely revised;
- in 7.14.1 the requirements on destructive testing of formed and heat treated parts were revised;
- in 8.6 a modification was added to the clause on the standard hydrostatic testing;
- a normative Annex A including allowable design stress values was added.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of this document.

1 Scope

This Part 8 of this EN 13445 specifies requirements for unfired pressure vessels and their parts made of aluminium and aluminium alloys in addition to the general requirements for unfired pressure vessels under EN 13445:2009 Parts 1 to 5. This European Standard specifies unfired pressure vessels for loads up to 500 full cycles.

NOTE Cast materials are not included in this version. Details regarding cast materials will be subject to an amendment to or a revision of this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 485-2, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 2: Mechanical properties*

EN 571-1:1997, *Non-destructive testing — Penetrant testing — Part 1: General principles*

EN 573-3:2009, *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 3: Chemical composition and form of products*

EN 583-4:2002, *Non-destructive testing — Ultrasonic examination — Part 4: Examination for discontinuities perpendicular to the surface*

EN 586-2, *Aluminium and aluminium alloys — Forgings — Part 2: Mechanical properties and additional property requirements*

EN 754-2, *Aluminium and aluminium alloys — Cold drawn rod/bar and tube — Part 2: Mechanical properties*

EN 755-2 (all parts), *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles*

EN 764-5:2002, *Pressure equipment — Part 5: Compliance and inspection documentation of materials*

EN 1435:1997+A1:2002, *Non-destructive examination of welds — Radiographic examination of welded joints*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 12392:2000, *Aluminium and aluminium alloys — Wrought products — Special requirements for products intended for the production of pressure equipment*

EN 13445-1:2009, *Unfired pressure vessels — Part 1: General*

EN 13445-2:2009, *Unfired pressure vessels — Part 2: Materials*

EN 13445-3:2009, *Unfired pressure vessels — Part 3: Design*

EN 13445-4:2009, *Unfired pressure vessels — Part 4: Fabrication*

EN 13445-5:2009, *Unfired pressure vessels — Part 5: Inspection and testing*

EN ISO 3834-2:2005, *Quality requirements for fusion welding of metallic materials — Part 2: Comprehensive quality requirements (ISO 3834-2:2005)*

prEN 13445-8:2013 (E)

EN ISO 3834-3:2005, *Quality requirements for fusion welding of metallic materials — Part 3: Standard quality requirements* (ISO 3834-3:2005)

EN ISO 4063:2010, *Welding and allied processes — Nomenclature of processes and reference numbers* (ISO 4063:2009, Corrected version 2010-03-01)

EN ISO 6520-1:2007, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding* (ISO 6520-1:2007)

EN ISO 9606-2:2004, *Qualification test of welders — Fusion welding — Part 2: Aluminium and aluminium alloys* (ISO 9606-2:2004)

EN ISO 10042:2005, *Welding — Arc-welded joints in aluminium and its alloys — Quality levels for imperfections* (ISO 10042:2005)

EN ISO 11666:2010, *Non-destructive testing of welds — Ultrasonic testing — Acceptance levels* (ISO 11666:2010)

EN ISO 15614-2:2005, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 2: Arc welding of aluminium and its alloys* (ISO 15614-2:2005)

EN ISO 17635:2010, *Non-destructive testing of welds — General rules for metallic materials* (ISO 17635:2010)

EN ISO 17637:2011, *Non-destructive testing of welds — Visual testing of fusion-welded joints* (ISO 17637:2003)

EN ISO 17640:2010, *Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment* (ISO 17640:2010)

EN ISO 23277:2009, *Non-destructive testing of welds — Penetrant testing of welds — Acceptance levels* (ISO 23277:2006)

CR ISO/TR 15608:2005, *Welding — Guidelines for a metallic materials grouping system* (ISO/TR 15608:2005)

ISO 857-1:1998, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes*

3 Terms, definitions, symbols and units

For the purposes of this document, the terms, definitions, symbols and units given in EN 13445:2009 parts 1 to 5 apply.

NOTE Further symbols are listed in 8.2.3.

4 General requirements

The general requirements of EN 13445-1:2009 shall apply.

5 Materials

5.1 General

The requirements of EN 13445-2:2009 shall apply with the following additions/exclusions.

5.2 Elongation after fracture

NOTE Also see 4.1.4 of EN 13445-2:2009.

Aluminium and aluminium alloys used for welded parts of pressure vessels that are subjected to cold forming (e.g. rolled shells and heads) shall have a specified minimum elongation after fracture measured on a gauge length

$$L_o = 5,65\sqrt{S_o} \quad (5.2-1)$$

that is ≥ 14 % in the longitudinal or transverse direction as defined by the material specification.

Aluminium and aluminium alloys used for parts of pressure vessels that are not subjected to cold forming (e.g. straight flanges and nozzles) shall have a specified minimum elongation after fracture measured on a gauge length

$$L_o = 5,65\sqrt{S_o} \quad (5.2-2)$$

that is ≥ 10 % in the longitudinal or transverse direction as defined by the material specification.

5.3 Prevention of brittle fracture

NOTE 1 Also see 4.1.6 of EN 13445-2:2009.

Annex B of EN 13445-2:2009 is not applicable.

NOTE 2 The requirements of 4.3 of EN 1252-1:1998 should be used for determining the minimum design and temperature and the requirements to prevent brittle fracture.

5.4 Lamellar tearing

NOTE Also see 4.2.1.2 of EN 13445-2:2009.

Specific requirements of lamellar tearing for pressure vessels of aluminium and its alloys are not applicable.

5.5 Chemical composition

The chemical composition shall be in accordance with their material specification, except that all materials shall have a maximum lead content of 150 $\mu\text{g/g}$.

It is recommended that the material to be used for welded components be produced from rolling or extrusion ingots with hydrogen level no greater than 0,2 ml per 100 g aluminium, measured on liquid metal during casting.

Bestelformulier

NEN

Stuur naar:

NEN Standards Products & Services
t.a.v. afdeling Klantenservice
Antwoordnummer 10214
2600 WB Delft

NEN Standards Products & Services

Postbus 5059
2600 GB Delft

Vlinderweg 6
2623 AX Delft

T (015) 2 690 390
F (015) 2 690 271

www.nen.nl/normshop

Ja, ik bestel

___ ex. NEN-EN 13445-8:2013 Ontw. en Niet aan vlambelasting blootgestelde drukvaten - Deel 8: Aanvullende eisen voor drukvaten van aluminium of aluminiumlegeringen € 29.64

Wilt u deze norm in PDF-formaat? Deze bestelt u eenvoudig via www.nen.nl/normshop

Gratis e-mailnieuwsbrieven

Wilt u op de hoogte blijven van de laatste ontwikkelingen op het gebied van normen, normalisatie en regelgeving? Neem dan een gratis abonnement op een van onze e-mailnieuwsbrieven. www.nen.nl/nieuwsbrieven

Retourneren

Fax: (015) 2 690 271
E-mail: klantenservice@nen.nl
Post: NEN Standards Products & Services,
t.a.v. afdeling Klantenservice
Antwoordnummer 10214,
2600 WB Delft
(geen postzegel nodig).

Gegevens

Bedrijf / Instelling _____

T.a.v. _____ O M O V

E-mail _____

Klantnummer NEN _____

Uw ordernummer _____ BTW nummer _____

Postbus / Adres _____

Postcode _____ Plaats _____

Telefoon _____ Fax _____

Factuuradres (indien dit afwijkt van bovenstaand adres)

Postbus / Adres _____

Postcode _____ Plaats _____

Datum _____ Handtekening _____

Voorwaarden

- De prijzen zijn geldig tot 31 december 2016, tenzij anders aangegeven.
- Alle prijzen zijn excl. btw, verzend- en handelingskosten en onder voorbehoud bij o.m. ISO- en IEC-normen.
- Bestelt u via de normshop een pdf, dan betaalt u geen handeling en verzendkosten.
- Meer informatie: telefoon (015) 2 690 391, dagelijks van 8.30 tot 17.00 uur.
- Wijzigingen en typfouten in teksten en prijsinformatie voorbehouden.
- U kunt onze algemene voorwaarden terugvinden op: www.nen.nl/leveringsvoorwaarden.