

**LEEKKUUMUTUSETA SURVEANUMAD. OSA 8:
TÄIENDAVAD NÕUDED ALUMIINIUMIST VÕI
ALUMIINIUMSULAMIST SURVEANUMATELE**

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

EESTI STANDARDI EESSÕNA**NATIONAL FOREWORD**

See Eesti standard EVS-EN 13445-8:2014+A1:2014 sisaldab Euroopa standardi EN 13445-8:2014 (V05, avaldatud 07.2018) ja selle muudatuse A1:2014 ingliskeelset teksti.	This Estonian standard EVS-EN 13445-8:2014+A1:2014 consists of the English text of the European standard EN 13445-8:2014 (Issue V05, 07.2018) and its amendment A1:2014.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 10.09.2014, muudatuse A1 10.12.2014.	Date of Availability of the European standard is 10.09.2014, for A1 10.12.2014
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 23.020.30

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

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

Réceptifs sous pression non soumis à la flamme - Partie 8:
Exigences complémentaires pour les réceptifs sous
pression en aluminium et alliages d'aluminium

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

This European Standard was approved by CEN on 19 August 2014.

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 CEN-CENELEC Management Centre 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 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.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	4
1 Scope	6
2 Normative references	6
3 Terms, definitions, symbols and units	7
4 General requirements.....	7
5 Materials	7
5.1 General.....	7
5.2 Elongation after fracture	7
5.3 Prevention of brittle fracture	7
5.4 Lamellar tearing	8
5.5 Chemical composition	8
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	9
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.....	10
6.6.4 Joints with permanent backing strips	11
6.7 Flat ends	11
6.8 Design by experiment	11
6.9 Port-hole-extruded tubes	11
7 Manufacture.....	a
7.1 General.....	a
7.2 Materials	a
7.3 Tolerances	a
7.4 Welding procedure specification (WPS)	a
7.5 Qualification of welding procedure specifications (WPQR).....	a
7.6 Qualification of welders and welding operators.....	12
7.7 Joint preparation.....	12
7.8 Preheat.....	12
7.9 Production test, reference criteria	12
7.10 Extent of testing.....	13
7.11 Performance of test and acceptance criteria	13
7.12 Forming procedures	13
7.13 Heat treatment after forming	13
7.14 Sampling of formed products.....	15
7.15 Tests.....	15
7.15.1 Base material.....	15
7.15.2 Butt welds	16
7.16 Post weld heat treatment (PWHT)	16
8 Inspection and testing.....	16
8.1 General.....	16
8.2 Non-destructive testing of welded joints	16
8.2.1 General.....	16
8.2.2 Demonstration of satisfactory experience for testing group 2.....	17
8.2.3 Symbols	18

8.3	Determination of extent of non destructive testing	18
8.4	Applicable non-destructive testing techniques	21
8.4.1	NDT methods	21
8.4.2	Acceptance criteria for radiographic testing (RT).....	22
8.4.3	Acceptance criteria for visual and surface penetrant testing.....	22
8.4.4	Acceptance criteria for penetrant testing (PT)	23
8.5	Selection of non-destructive testing methods for internal imperfections.....	23
8.6	Standard hydrostatic test	24
8.7	Pneumatic testing.....	24
9	Inspection and testing of serially produced pressure vessels — Model approval.....	24
9.1	General.....	24
9.2	Inspection and testing of pressure vessels subject to cyclic loads	24
Annex A (normative) Allowable design strength values.....		24a
Annex Y (informative) History of EN 13445-8		25
Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2014/68/EU aimed to be covered		26
Bibliography		27

Foreword

This document (EN 13445-8:2014) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

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 December 2014, and conflicting national standards shall be withdrawn at the latest by December 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

This European Standard consists of the following Parts:

- Part 1: *General.*
- Part 2: *Materials.*
- Part 3: *Design.*
- Part 4: *Fabrication.*
- Part 5: *Inspection and testing.*
- Part 6: *Requirements for the design and fabrication of pressure vessels and pressure parts constructed from spheroidal graphite cast iron.*
- CR 13445-7, *Unfired pressure vessels* — Part 7: *Guidance on the use of conformity assessment procedures.*
- Part 8: *Additional requirements for pressure vessels of aluminium and aluminium alloys.*
- CEN/TR 13445-9, *Unfired pressure vessels* — Part 9: *Conformance of EN 13445 series to ISO 16528*
- Part 10: *Additional requirements for pressure vessels of nickel and nickel alloys*

Although these Parts may be obtained separately, it should be recognised that the Parts are inter-dependant. As such the manufacture of unfired pressure vessels requires the application of all the relevant Parts in order for the requirements of the Standard to be satisfactorily fulfilled.

Corrections to the standard interpretations where several options seem possible are conducted through the Migration Help Desk (MHD). Information related to the Help Desk can be found at <http://www.unm.fr/en13445@unm.fr>. A form for submitting questions can be downloaded from the link to the MHD website. After subject experts have agreed an answer, the answer will be communicated to the questioner. Corrected pages will be given specific issue number and issued by CEN according to CEN Rules. Interpretation sheets will be posted on the website of the MHD.

This document supersedes EN 13445-8:2009. This new edition incorporates the Amendments which have been approved previously by CEN members, and the corrected pages up to Issue 5 without any further technical change. Annex Y provides details of significant technical changes between this European Standard and the previous edition.

Amendments to this new edition may be issued from time to time and then used immediately as alternatives to rules contained herein. It is intended to deliver a new Issue of EN 13445:2014 each year, consolidating these Amendments and including other identified corrections. Issue 5 (2018-07) includes the corrected pages listed in Annex Y.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Document is a preview generated by EVS

1 Scope

This European Standard 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 13445:2014 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 485-2:2013, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 2: Mechanical properties*
- EN 573-3:2013, *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 3: Chemical composition and form of products*
- EN 586-2:1994, *Aluminium and aluminium alloys — Forgings — Part 2: Mechanical properties and additional property requirements*
- EN 754-2:2013, *Aluminium and aluminium alloys — Cold drawn rod/bar and tube — Part 2: Mechanical properties*
- EN 755 (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 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 3452-1:2013, *Non-destructive testing — Penetrant testing — Part 1: General principles (ISO 3452-1:2013)*
- EN ISO 3834-2:2005, *Quality requirements for fusion welding of metallic materials — Part 2: Comprehensive quality requirements (ISO 3834-2:2005)*
- 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 16826:2014, *Non-destructive testing — Ultrasonic testing — Examination for discontinuities perpendicular to the surface (ISO 16826:2012)*
- EN ISO 17635:2016, *Non-destructive testing of welds — General rules for metallic materials (ISO 17635:2016)*
- EN ISO 17636-1:2013, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film (ISO 17636-1:2013)*
- EN ISO 17636-2:2013, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors (ISO 17636-2:2013)*
- 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 15608:2013, *Welding — Guidelines for a metallic materials grouping system (ISO/TR 15608:2013)*
- ISO 857-1:1998, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes*