

# SLOVENSKI STANDARD

## SIST EN 13480-8:2018

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### Kovinski industrijski cevovodi - 8. del: Dodatne zahteve za cevovode iz aluminija in aluminijevih zlitin

Metallic industrial piping - Part 8: Additional requirements for aluminium and aluminium alloy piping

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Metallische industrielle Rohrleitungen - Teil 8: Zusatzanforderungen an Rohrleitungen aus Aluminium und Aluminiumlegierungen

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Tuyauteries industrielles métalliques - Partie 8: Exigences complémentaires relatives aux tuyauteries en aluminium et alliages d'aluminium

**Ta slovenski standard je istoveten z: EN 13480-8:2017**

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#### **ICS:**

23.040.10	Železne in jeklene cevi	Iron and steel pipes
77.140.75	Jeklene cevi in cevni profili za posebne namene	Steel pipes and tubes for specific use
77.150.10	Aluminijski izdelki	Aluminium products

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EUROPEAN STANDARD

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## Metallic industrial piping - Part 8: Additional requirements for aluminium and aluminium alloy piping

Tuyauteries industrielles métalliques - Partie 8 :  
Exigences complémentaires relatives aux tuyauteries  
en aluminium et alliages d'aluminium

Metallische industrielle Rohrleitungen - Teil 8:  
Zusatzanforderungen an Rohrleitungen aus Aluminium  
und Aluminiumlegierungen

This European Standard was approved by CEN on 21 June 2017.

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.

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

## Contents

	Page
European foreword.....	4
<b>1</b> Scope .....	<b>6</b>
<b>2</b> Normative references .....	<b>6</b>
<b>3</b> Terms, definitions, symbols and units .....	<b>8</b>
<b>4</b> General requirements .....	<b>8</b>
<b>5</b> Materials.....	<b>8</b>
5.1 General.....	8
5.2 Material grouping system .....	8
5.3 Elongation after fracture .....	9
5.4 Chemical composition .....	10
5.5 Lamellar tearing .....	10
5.6 Design temperature and properties.....	10
5.7 Prevention of brittle fracture .....	10
5.8 Specific requirements for fasteners made of aluminium and aluminium alloys.....	11
5.9 Lined piping .....	11
5.10 Clad products.....	11
5.11 Technical delivery conditions for welding consumables .....	11
<b>6</b> Design.....	<b>11</b>
6.1 General.....	11
6.2 Time-independent nominal design stress .....	11
6.3 Straight pipes.....	12
6.4 Pipe bends and elbows.....	12
6.5 Mitre bends.....	12
6.6 Socket welds.....	14
6.7 Designing with transition joints .....	14
6.7.1 Design considerations .....	14
6.7.2 Location of transition joints .....	14
6.7.3 Requirements for transition joints.....	14
6.8 Port-hole extruded tubes .....	14
6.9 Alternative methods .....	14
<b>7</b> Fabrication and installation.....	<b>15</b>
7.1 General.....	15
7.2 Material grouping .....	15
7.3 Tolerances .....	15
7.3.1 Welded pipes and connection dimensions of pipe fittings .....	15
7.3.2 Welded piping construction.....	15
7.4 Cutting and bevelling.....	16
7.5 Bending and other forming .....	16
7.5.1 General.....	16
7.5.2 Definition of cold- and hot forming .....	16
7.5.3 Heat treatment after cold forming.....	16
7.5.4 Heat treatment after hot forming.....	18

7.6	Welding .....	19
7.6.1	Welding personnel .....	19
7.6.2	Welding processes.....	19
7.6.3	Weld joint preparation .....	19
7.6.4	Preheating.....	20
7.6.5	Backing rings and backing strips.....	21
7.6.6	Post-weld heat treatment (PWHT).....	21
8	Inspection and testing.....	21
8.1	General .....	21
8.2	Formed pressure retaining parts.....	22
8.2.1	General .....	22
8.2.2	Testing of formed parts .....	22
8.2.3	Destructive testing of formed and heat treated parts .....	22
8.3	Welding .....	23
8.4	Visual and non-destructive testing of welds.....	23
8.4.1	Application of NDT .....	23
8.4.2	Circumferential, branch, socket and seal welds.....	23
8.4.3	Longitudinal welds and spiral welded tubes/pipes.....	24
8.5	VT and NDT Methods .....	24
8.6	Production test plates for welded pipes.....	25
9	Final assessment and documentation.....	26
9.1	General .....	26
9.2	Pneumatic pressure test .....	27
9.3	Documentation for components .....	27
Annex A (informative)	Dimensional tolerances.....	29
Annex B (normative)	Transition joints.....	31
Annex C (normative)	Nominal design stress values.....	36
Annex Y (informative)	History of EN 13480-8.....	43
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of EU Directive 2014/68/EU aimed to be covered .....	44
Bibliography	.....	45

**EN 13480-8:2017**  
**Issue 1 (2017-06)**

## European foreword

This document (EN 13480-8:2017) has been prepared by Technical Committee CEN/TC 267 “Industrial piping and pipelines”, the secretariat of which is held by AFNOR.

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 2017, and conflicting national standards shall be withdrawn at the latest by December 2017.

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 EN 13480 for metallic industrial piping consists of eight interdependent and not dissociable Parts which are:

- *Part 1: General;*
- *Part 2: Materials;*
- *Part 3: Design and calculation;*
- *Part 4: Fabrication and installation;*
- *Part 5: Inspection and testing;*
- *Part 6: Additional requirements for buried piping;*
- CEN/TR 13480-7, *Guidance on the use of conformity assessment procedures;*
- *Part 8: Additional requirements for aluminium and aluminium alloy piping.*

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

This European Standard will be maintained by a Maintenance MHD working group whose scope of working is limited to corrections and interpretations related to EN 13480.

The contact to submit queries can be found at <http://www.unm.fr> ([en13480@unm.fr](mailto:en13480@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 13480-8:2012. This new edition incorporates the Amendments/the corrigenda which have been approved previously by CEN members, and the corrected pages up to Issue 4 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.

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.

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**EN 13480-8:2017**  
**Issue 1 (2017-06)**

## 1 Scope

This Part of EN 13480 specifies requirements for industrial piping systems made of aluminium and aluminium alloys in addition to the general requirements for industrial piping according to the series of standards EN 13480 and CEN/TR 13480-7.

## 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 485-3, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 3: Tolerances on dimensions and form for hot-rolled products*

EN 485-4, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 4: Tolerances on shape and dimensions for cold-rolled products*

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 (all parts), *Aluminium and aluminium alloys — Cold drawn rod/bar and tube*

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

EN 764-3, *Pressure equipment — Part 3: Definition of parties involved*

EN 1779:1999, *Non-destructive testing — Leak testing — Criteria for method and technique selection*

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 13445-4:2014, *Unfired pressure vessels — Part 4: Fabrication*

EN 13480-1:2017, *Metallic industrial piping — Part 1: General*

EN 13480-2:2017, *Metallic industrial piping — Part 2: Materials*

EN 13480-3:2017, *Metallic industrial piping — Part 3: Design and calculation*

EN 13480-4:2017, *Metallic industrial piping — Part 4: Fabrication and installation*

EN 13480-5:2017, *Metallic industrial piping — Part 5: Inspection and testing*

EN ISO 148-1:2010, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1:2009)*



- 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 4136:2012, *Destructive tests on welds in metallic materials — Transverse tensile test (ISO 4136:2012)*
- EN ISO 5173:2010 + A1:2011, *Destructive tests on welds in metallic materials — Bend tests (ISO 5173:2009 + Amd 1:2011)*
- EN ISO 6892-1:2009, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*
- EN ISO 6892-2:2011, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature (ISO 6892-2:2011)*
- EN ISO 7438:2005, *Metallic materials — Bend test (ISO 7438:2005)*
- 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 10893-8:2011, *Non-destructive testing of steel tubes — Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections (ISO 10893-8:2011)*
- EN ISO 10893-11:2011, *Non-destructive testing of steel tubes — Part 11: Automated ultrasonic testing of the weld seam of welded steel tubes for the detection of longitudinal and/or transverse imperfections (ISO 10893-11:2011)*
- 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 16810:2014, *Non-destructive testing — Ultrasonic testing — General principles (ISO 16810:2012)*
- EN ISO 16811:2014, *Non-destructive testing — Ultrasonic testing — Sensitivity and range setting (ISO 16811:2012)*
- EN ISO 16823:2014, *Non-destructive testing — Ultrasonic testing — Transmission technique (ISO 16823:2012)*
- EN ISO 16826:2014, *Non-destructive testing — Ultrasonic testing — Examination for discontinuities perpendicular to the surface (ISO 16826:2012)*

## EN 13480-8:2017 Issue 1 (2017-06)

EN ISO 16827:2014, *Non-destructive testing — Ultrasonic testing — Characterization and sizing of discontinuities (ISO 16827:2012)*

EN ISO 16828:2014, *Non-destructive testing — Ultrasonic testing — Time-of-flight diffraction technique as a method for detection and sizing of discontinuities (ISO 16828:2012)*

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 17639:2013, *Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds (ISO 17639:2003)*

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)*

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

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

### 3 Terms, definitions, symbols and units

SIST EN 13480-8:2018

For the purposes of this document, the terms, definitions, symbols and units of EN 13480-1:2017, EN 13480-2:2017, EN 13480-3:2017, EN 13480-4:2017 and EN 13480-5:2017 apply.

### 4 General requirements

The general requirements of EN 13480-1 shall apply.

### 5 Materials

#### 5.1 General

Materials for pressure-bearing parts compliant with the requirements of this European Standard shall be accompanied by inspection documents in accordance with EN 10204:2004.

The type of inspection document shall be in accordance with EN 764-5:2002 and include a declaration of compliance to the material specification.

The requirements of EN 13480-2:2017 shall apply with the following additions/exclusions:

#### 5.2 Material grouping system

Annex A of EN 13480-2:2017 is not applicable for aluminium and aluminium alloys. The allowable materials for industrial piping of aluminium and aluminium alloys shall be according to Table 5.2-1.

Any product form available in the EN standards referenced in Annex C for a material and temper listed in Table 5.2-1 is acceptable for construction to this European Standard. Other materials not defined

here may be used by agreement (see EN 13480-2:2017, 4.3) if they meet the requirements of 5.2 and 5.3 of this standard and a Particular Material Appraisal is produced (see EN 764-4:2002).

**Table 5.2-1 — Grouping system based on CEN ISO/TR 15608 and EN AW numbers according to EN 573-3:2013**

Group	Sub group	Type of aluminium and aluminium alloys	Designation		
			EN AW number	Chemical symbol	Temper
21		Pure aluminium with $\leq 1$ % impurities or alloy content	EN AW - 1050A EN AW - 1070A EN AW - 1080A	EN AW-Al 99,5 EN AW-Al 99,7 EN AW-Al 99,8(A)	O, H111, H112 O, H111, H112 O, H111, H112
22	Non heat treatable alloys				
	22.1	Aluminium-manganese alloys	EN AW - 3003 EN AW - 3103 EN AW - 3105	EN AW-Al Mn1Cu EN AW-Al Mn1 EN AW-Al Mn0,5Mg0,5	O, H111, H112 O, H111, H112 O, H111
	22.2	Aluminium-magnesium alloys with Mg $\leq 1,5$ %	EN AW - 5005 EN AW - 5005A EN AW - 5050	EN AW-Al Mg1(B) EN AW-Al Mg1(C) EN AW-Al Mg1,5 (C)	O, H111, H112 O, H111, H112 O, H111
	22.3	Aluminium-magnesium alloys with $1,5$ % < Mg $\leq 3,5$ %	EN AW - 5049 EN AW - 5052 EN AW - 5154A EN AW - 5251 EN AW - 5454 EN AW - 5754	EN AW-Al Mg2Mn0,8 EN AW-Al Mg2,5 EN AW-Al Mg3,5(A) EN AW-Al Mg2 EN AW-Al Mg3Mn(A) EN AW-Al Mg3	O, H111, H112 O, H111, H112 O, H111, H112 O, H111, H112 O, H111, H112 O, H111, H112
	22.4	Aluminium-magnesium alloys with Mg > 3,5 %	EN AW - 5083 EN AW - 5086	EN AW-Al Mg4,5Mn0,7 EN AW-Al Mg4	O, H111, H112 O, H111
23	Heat treatable alloys				
	23.1	Aluminium-magnesium-silicon alloys	EN AW 6060 EN AW 6061	EN AW-Al MgSi EN AW-Al Mg1SiCu	T4 <sup>a</sup> T4 <sup>b</sup> , T6 <sup>c</sup>
<sup>a</sup> for seamless pipes and profiles only <sup>b</sup> for seamless pipes and flanges only <sup>c</sup> for flanges only					

### 5.3 Elongation after fracture

Aluminium and aluminium alloys used for parts of industrial piping that are subjected to cold forming shall have a specified minimum elongation after fracture measured on a gauge length

$$L_o = 5,65\sqrt{S_o} \quad (5.3-1)$$

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

Aluminium and aluminium alloys used for parts of industrial piping that are not subjected to cold forming (e.g. straight flanges and nozzles) shall have a specified minimum elongation after fracture of  $\geq 10$  % in the longitudinal or transverse direction as defined by the material specification measured on a gauge length as defined in equation (5.3-1).

## EN 13480-8:2017 Issue 1 (2017-06)

### 5.4 Chemical composition

The chemical composition shall be in accordance with the material specification.

NOTE EN 12392:2000, 5.1.3 recommends a maximum hydrogen level of 0,2 ml per 100 g aluminium, measured in the liquid metal during casting for parts to be welded. EN 12392:2000, 4.1, recommends a maximum lead content not exceeding 150 µg/g.

### 5.5 Lamellar tearing

Specific requirements to avoid lamellar tearing for industrial piping of aluminium and aluminium alloys are not applicable.

NOTE Specific requirements apply to steel (see EN 1011-2:2001) whereas in EN 1011-4:2000 no requirement is given because lamellar tearing is not a recognized phenomenon.

### 5.6 Design temperature and properties

NOTE 1 See also EN 13480-2:2017, 4.2.2.

EN 13480-2:2017, 4.2.2.1, 2<sup>nd</sup> paragraph is not applicable for aluminium and aluminium alloys.

Nominal design stress values are given in Table C.1, Table C.2, Table C.3 and Table C.4. Design temperatures that exceed the respective temperature limit in Annex C are not permitted.

For materials of group 22.4 temperatures above 80 °C may result in grain boundary precipitation of Al<sub>3</sub>-Mg<sub>2</sub>. These materials may be used at temperatures above 80 °C up to 200 °C only for non-corrosive service.

SIST EN 13480-8:2018

NOTE 2 For further material properties, see EN 12392:2000.  
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For welded parts and heat treated parts after forming only the values equivalent to the O temper shall be used for design when 6 000 series flanges, etc. are welded. Nominal design stresses are given in C.6. The weld area shall be based on the O temper but the flange strength away from the weld (2t) may be based on the actual temper (T4 or T6).

For aluminium and aluminium alloys values of 0,2 % proof strength (or 1 % proof strength for material group 21-1 000 series aluminium) for temperatures above 20 °C shall be established by linear interpolation between two adjacent values according to EN 12392:2000, Clause 8.

For material of group 22.4: For short periods, higher temperatures are permitted (e.g. when defrosting refrigerating plant) up to 150 °C are permissible provided that the pressure is reduced to half the working pressure for a period up to 8 h and to atmospheric pressure for a period up to 24 h.

### 5.7 Prevention of brittle fracture

EN 13480-2:2017, Annex B is not applicable. All materials of Table 5.2-1 are suitable for any minimum metal temperature without impact testing.

NOTE See also EN 1252-1 and EN 12392:2000, 8.4.

## 5.8 Specific requirements for fasteners made of aluminium and aluminium alloys

Threads of bolts and studs shall be rolled. Regarding prevention of brittle fracture for materials of fasteners 5.7 applies.

NOTE 1 Other manufacturing techniques may be agreed by the parties involved. In this case, special considerations regarding the application and testing requirements may be necessary. Such requirements are not addressed by this standard.

NOTE 2 Materials other than aluminium and aluminium alloys may be used for bolting for piping constructions according to this European Standard. The designer should give special consideration to these different bolting materials.

## 5.9 Lined piping

Specific requirements for lined piping are not applicable for aluminium and aluminium alloys.

## 5.10 Clad products

Specific requirements for clad products are not applicable for aluminium and aluminium alloys.

## 5.11 Technical delivery conditions for welding consumables

The requirements of EN 13480-2:2017, 4.3.5 shall apply.

## 6 Design

### 6.1 General

The requirements of EN 13480-3:2017 shall apply with the following additions/exclusions.

### 6.2 Time-independent nominal design stress

The design stresses for aluminium and aluminium alloys materials shall be in accordance with the Table 6.2-1.

**Table 6.2-1 — Design stresses for aluminium and aluminium alloy material**

Group according to Table 5.2-1	Design stresses at design condition	Design stresses at test condition
21	$f = [R_{p1,0,t} / 1.5]$	$f_{\text{test}} = [R_{p1,0,20} / 1.05]$
22	$f = \min ([R_{p0,2,t} / 1.5] \text{ or } [R_{m,20} / 2.4])$	$f_{\text{test}} = [R_{p0,2,20} / 1.05]$
23	$f = \min ([R_{p0,2,t} / 1.5] \text{ or } [R_{m,20} / 3])$	$f_{\text{test}} = [R_{p0,2,20} / 1.05]$