BS EN 13480-8:2024

BSI Standards Publication

Metallic industrial piping

Part 8: Additional requirements for aluminium and aluminium alloy piping

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National foreword

This British Standard is the UK implementation of EN 13480-8:2024. It supersedes BS EN 13480-8:2017+A1:2019, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PVE/10, Piping systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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

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European foreword

This document (EN 13480-8:2024) 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of an identical text or by endorsement, at the latest by December 2024, and conflicting national standards shall be withdrawn at the latest by December 2024.

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

This document supersedes EN 13480-8:2017.

This new edition incorporates the Amendments/the corrigenda which have been approved previously by CEN members, and the corrected pages up to Issue 2 without any further technical change. Annex Y provides details of significant technical changes between this European Standard and the previous edition.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, 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 recognized 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 https://unm.fr/en/maintenance-agencies/maintenance-agency-en-13480/.
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. Interpretation sheets will be posted on the website of the MHD.

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Amendments to this new edition may be issued from time to time and then used immediately as alternatives to rules contained herein. These amendments will be consolidated within EN 13480:2024 in accordance with the maintenance system of EN 13480 series approved by CEN/BT Decision C172/2021.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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1 Scope

This document 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 13480:2024 and CEN/TR 13480-7:2017. It specifies requirements for wrought products only.

NOTE Castings is not covered in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 485-2:2016+A1:2018, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 2: Mechanical properties*

EN 485-3:2003, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 3: Tolerances on dimensions and form for hot-rolled products*

EN 485-4:1993, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 4: Tolerances on shape and dimensions for cold-rolled products*

EN 573-3:2019+A1:2022, *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 754:2016 (all parts), *Aluminium and aluminium alloys — Cold drawn rod/bar and tube*

EN 755:2016 (all parts), *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles*

EN 764-1:2015+A1:2016, *Pressure equipment — Part 1: Vocabulary*

EN 764-5:2002, *Pressure equipment — Part 5: Inspection documentation of metallic materials and compliance with the material specification*

EN 1779:1999,[1] *Non-destructive testing — Leak testing — Criteria for method and technique selection*

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

EN 12392:2016+A1:2022, *Aluminium and aluminium alloys — Wrought products and cast products — Special requirements for products intended for the production of pressure equipment*

EN 13445-4:2021, *Unfired pressure vessels — Part 4: Fabrication*

EN 13480-1:2024, *Metallic industrial piping — Part 1: General*

EN 13480-2:2024, *Metallic industrial piping — Part 2: Materials*

EN 13480-3:2024, *Metallic industrial piping — Part 3: Design and calculation*

EN 13480-4:2024, *Metallic industrial piping — Part 4: Fabrication and installation*

[1] As impacted by EN 1779:1999/A1:2003.

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EN 13480-5:2024, *Metallic industrial piping — Part 5: Inspection and testing*

EN ISO 148-1:2016, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1:2016)*

EN ISO 3452-1:2021, *Non-destructive testing — Penetrant testing — Part 1: General principles (ISO 3452-1:2021)*

EN ISO 3834-2:2021, *Quality requirements for fusion welding of metallic materials — Part 2: Comprehensive quality requirements (ISO 3834-2:2021)*

EN ISO 3834-3:2021, *Quality requirements for fusion welding of metallic materials — Part 3: Standard quality requirements (ISO 3834-3:2021)*

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

EN ISO 4136:2022, *Destructive tests on welds in metallic materials — Transverse tensile test (ISO 4136:2022)*

EN ISO 5173:2010,[2] *Destructive tests on welds in metallic materials — Bend tests (ISO 5173:2009)*

EN ISO 6892-1:2019, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2019)*

EN ISO 6892-2:2018, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature (ISO 6892-2:2018)*

EN ISO 7438:2020, *Metallic materials — Bend test (ISO 7438:2020)*

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

EN ISO 10042:2018, *Welding — Arc-welded joints in aluminium and its alloys — Quality levels for imperfections (ISO 10042:2018)*

EN ISO 10893-8:2011,[3] *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,[4] *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 11666:2018, *Non-destructive testing of welds — Ultrasonic testing — Acceptance levels (ISO 11666:2018)*

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)*

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[2] As impacted by EN ISO 5173:2010/A1:2011.

[3] As impacted by EN ISO 10893-8:2011/A1:2020.

[4] As impacted by EN ISO 10893-11:2011/A1:2020.

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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 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 17636-1:2022, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film (ISO 17636-1:2022)*

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 17637:2016, *Non-destructive testing of welds — Visual testing of fusion-welded joints (ISO 17637:2016)*

EN ISO 17639:2022, *Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds (ISO 17639:2022)*

EN ISO 17640:2018, *Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment (ISO 17640:2018)*

EN ISO 23277:2015, *Non-destructive testing of welds — Penetrant testing — Acceptance levels (ISO 23277:2015)*

CEN ISO/TR 15608:2017, *Welding — Guidelines for a metallic materials grouping system (ISO/TR 15608:2017)*

ISO/TR 25901-1:2016, *Welding and allied processes — Vocabulary — Part 1: General terms*

ISO/TR 25901-3:2016, *Welding and allied processes — Vocabulary — Part 3: Welding processes*

ISO/TR 25901-4:2016, *Welding and allied processes — Vocabulary — Part 4: Arc welding*

3 Terms, definitions, symbols and units

For the purposes of this document, the terms, definitions, symbols and units of EN 13480-1:2024, EN 13480-2:2024, EN 13480-3:2024, EN 13480-4:2024 and EN 13480-5:2024 apply.

4 General requirements

The general requirements of EN 13480-1:2024 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 13480-2:2024 shall apply with the following additions/exclusions:

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5.2 Material grouping system

Annex A of EN 13480-2:2024 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 specified here can be used by agreement (see EN 13480-2:2024, 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 15608:2017 and EN AW numbers according to EN 573-3:2019+A1:2022

Group	Sub group	Type of aluminium and aluminium alloys	Designation		
			EN AW number	Chemical symbol	Temper
21		Pure aluminium with ≤ 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 ≤ 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 ≤ 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[a] T4[b], T6[c]

[a] for seamless pipes and profiles only

[b] for seamless pipes and flanges only

[c] 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

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

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

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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 ≥ 10 % in the longitudinal or transverse direction as specified by the material specification measured on a gauge length as defined in equation (5.3-1).

5.4 Chemical composition

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

NOTE EN 12392:2016+A1:2022, 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 12392:2016+A1:2022, 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 13480-2:2024, 4.2.2.

EN 13480-2:2024, 4.2.2.1, 2nd 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 can result in grain boundary precipitation of Al_3-Mg_2. These materials can be used at temperatures above 80 °C up to 200 °C only for non-corrosive service.

NOTE 2 For further material properties, see EN 12392:2016+A1:2022.

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) can 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 12392:2016+A1:2022, 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 13480-2:2024, 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 1252-1:1998 and EN 12392:2016+A1:2022, 8.4.

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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 can be agreed by the parties involved. In this case, special considerations regarding the application and testing requirements can be necessary. Such requirements are not addressed by this standard.

NOTE 2 Materials other than aluminium and aluminium alloys can 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 13480-2:2024, 4.3.5 shall apply.

6 Design

6.1 General

The requirements of EN 13480-3:2024 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	$f = [R_{p1,0,t} / 1.5]$	$f_{test} = [R_{p1,0,20} / 1.05]$
22	$f = \min([R_{p0,2,t} / 1.5] \text{ or } [R_{m,20} / 2.4])$	$f_{test} = [R_{p0,2,20} / 1.05]$
23	$f = \min([R_{p0,2,t} / 1.5] \text{ or } [R_{m,20} / 3])$	$f_{test} = [R_{p0,2,20} / 1.05]$

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