SLOVENSKI STANDARD
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Nekurjene tlačne posode - 10. del: Dodatne zahteve za tlačne posode iz niklja in nikljevih zlitin

Unfired pressure vessels - Part 10: Additional requirements for pressure vessels of nickel and nickel alloys

Unbefeuerte Druckbehälter - Teil 10: Zusätzliche Anforderungen an Druckbehälter aus Nickel und Nickellegierungen

Récipients sous pression non soumis à la flamme - Partie 10: Exigences complémentaires pour les récipients sous pression en nickel et alliages de nickel

Ta slovenski standard je istoveten z: **EN 13445-10:2026**

ICS:

23.020.32	Tlačne posode	Pressure vessels
77.150.40	Nikljevi in kromovi izdelki	Nickel and chromium products

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English Version

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This European Standard was approved by CEN on 24 June 2026.

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

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European foreword

This document (EN 13445-10:2026) 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of an identical text or by endorsement, at the latest by December 2026, and conflicting national standards shall be withdrawn at the latest by December 2026.

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 13445-10:2021.

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.

A list of all parts in the EN 13445 series can be found on the CEN website.

Although these Parts may be obtained separately, it should be recognized that the Parts are interdependent. 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 https://unm.fr/en/maintenance-agencies/maintenance-agency-en-13445/. 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.

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, 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, Türkiye and the United Kingdom.

1 Scope

This Part 10 of this document specifies requirements for unfired pressure vessels and their parts made of nickel and nickel alloys (see 3.1) in addition to the general requirements for unfired pressure vessels under EN 13445-1:2026, EN 13445-2:2026, EN 13445-3:2026, EN 13445-4:2026 and EN 13445-5:2026.

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 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 764-5:2014, *Pressure equipment — Part 5: Inspection documentation of metallic materials and compliance with the material specification*

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

EN 13445-1:2026 *Unfired pressure vessels — Part 1: General*

EN 13445-2:2026 *Unfired pressure vessels — Part 2: Materials*

EN 13445-3:2026, *Unfired pressure vessels — Part 3: Design*

EN 13445-4:2026, *Unfired pressure vessels — Part 4: Fabrication*

EN 13445-5:2026, *Unfired pressure vessels — Part 5: Inspection and testing*

EN ISO 9606-4:1999, *Approval testing of welders — Fusion welding — Part 4: Nickel and nickel alloys (ISO 9606-4:1999)*

EN ISO 14732. 2025, *Welding personnel — Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732: 2025)*

EN ISO 15608:2025, *Grouping system for metallic materials (ISO 15608: 2025)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13445-1:2026, EN 13445-2:2026, EN 13445-3:2026, EN 13445-4:2026 and EN 13445-5:2026 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
nickel alloys
those alloys which contain a minimum of 30 % nickel and contain more nickel than iron

4 General information

The general information given in EN 13445-1:2026 on the scope of the standard as well as terms, definitions, quantities, symbols and units shall apply.

5 Materials

5.1 General

The general requirements of EN 13445-2:2026 shall apply with the following additions/exclusions in 5.2 to 5.4.

There are presently no European Standards specifically for nickel or nickel alloys for pressure purposes. However, some materials in Table A.2 can also be classified as stainless steels and are included in some harmonized standards. This part 10 of EN 13445 is therefore limited to European Approval of Materials (EAM) or the use of Particular Materials Appraisal (PMA), except when materials are sourced in accordance with a harmonized standard.

All materials shall meet the requirements in 5.1 to 5.4 of this part 10 of EN 13445.

5.2 Material grouping system

Annex A of EN 13445-2:2026 is not applicable to pressure vessels of nickel and nickel alloys and is replaced by Annex A of this part 10 of EN 13445.

The grouping system for nickel and its alloys is shown in Table A.1 of this part 10 of EN 13445.

Only material having a minimum elongation after fracture greater than 25 % shall be used for construction of pressure vessels.

Materials which have mechanical properties enhanced by precipitation hardening are excluded from this part of EN 13445, unless they are to be used for bolting applications.

5.3 Material documentation

Materials for pressure bearing parts compliant with the requirements of this document shall be accompanied by inspection documentation in accordance with EN 10204:2004.

The type of inspection document shall be in accordance with EN 764-5:2014 and include a declaration of compliance to the material specification.

5.4 Prevention of brittle fracture

There are no general requirements for nickel and nickel alloys at temperatures down to −196 °C. However, the specific requirements of individual EAMs/PMAs shall be taken into account.

6 Design

6.1 General

All the design methods included in EN 13445-3:2026 shall apply, with the following amendments, given in 6.2 to 6.5.

The physical properties of nickel and nickel alloys may be based upon the technical data available for the types/grades of material listed in Annex B and agreed with the material manufacturer based on the properties in the PMA used in the design except where guaranteed properties are available in harmonized standards.

6.2 Time-independent nominal design stress

The design methods included in EN 13445-3:2026, Clauses 5, 7 to 21, Annexes A, E, F, G, J, P and Q shall apply.

The design stress for nickel and nickel alloy materials entering service without any subsequent heat treatment shall be evaluated in accordance with Table 6.2-1.

If any material is subjected to subsequent heat treatment (for example, in the manufacture of dished ends) representative material test coupons shall be heat treated with the components and subjected to the same mechanical tests as used to certify the material at the manufacturer's works. The nominal design stress shall then be calculated in accordance with Table 6.2-1. If this design stress is lower than that used in the original calculations, the design of that component and any other related components shall be repeated using the nominal design stress derived from the properties of the heat treated material.

For designs using nickel and nickel alloys attention is drawn to the effect of heat treatment on the materials, and care should therefore be taken when determining the thickness of the materials that will receive subsequent heat treatments during manufacture.

Table 6.2-1 — Maximum allowed values of the nominal design stress for nickel and nickel alloy materials for pressure parts

Minimum specified elongation after fracture (A) (%)	**Design stress for normal operating load cases (MPa)**	**Design stress for testing and exceptional load cases (MPa)**
$A > 35$	$f_d = \min\left(\frac{R_{p1,0/T}}{1,2}; \frac{R_{m/T}}{3}\right)$	$f_{test} = \left(\frac{R_{p1,0/T_{test}}}{1,05}\right)$
$30 < A \leq 35$	$f_d = \left(\frac{R_{p1,0/T}}{1,5}\right)$	$f_{test} = \left(\frac{R_{p1,0/T_{test}}}{1,05}\right)$
$A \leq 30$	$f_d = \min\left(\frac{R_{p0,2/T}}{1,5}; \frac{R_{m/20}}{2,4}\right)$	$f_{test} = \left(\frac{R_{p0,2/T_{test}}}{1,05}\right)$