

STN	Žeriavy Všeobecný návrh Časť 3-1: Medzné stavy a overovanie spôsobilosti ocel'ových konštrukcií	STN EN 13001-3-1 27 0043
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Cranes - General design - Part 3-1: Limit states and proof competence of steel structure

Táto norma obsahuje anglickú verziu európskej normy.

This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 04/25

Obsahuje: EN 13001-3-1:2025

Oznámením tejto normy sa ruší

STN EN 13001-3-1+A2 (27 0043) z mája 2018

140414

Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2025

Slovenská technická norma a technická normalizačná informácia je chránená zákonom č. 60/2018 Z. z. o technickej normalizácii v znení neskorších predpisov.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13001-3-1

March 2025

ICS 53.020.20

Supersedes EN 13001-3-1:2012+A2:2018

English Version

**Cranes - General design - Part 3-1: Limit states and proof
competence of steel structure**

Appareils de levage à charge suspendue - Conception
générale - Partie 3-1 : Etats limites et vérification
d'aptitude des charpentes en acier

Krane - Konstruktion allgemein - Teil 3-1:
Grenzzustände und Sicherheitsnachweis von
Stahltragwerken

This European Standard was approved by CEN on 22 December 2024.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 13001-3-1:2025) has been prepared by Technical Committee CEN/TC 147 “Cranes - Safety”, the secretariat of which is held by SFS.

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of an identical text or by endorsement, at the latest by September 2025, and conflicting national standards shall be withdrawn at the latest by September 2025.

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 13001-3-1:2012+A2:2018.

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.

CEN/TC 147 WG 2 has reviewed EN 13001-3-1:2012+A2:2018 to adapt the document to technical progress. The main changes are:

- design values for standardized steels (4.2.1) were moved to a new Annex M (normative);
- design values for bolt materials were changed (Table 4);
- limit design values for welded connection were changed (5.2.5);
- static proof of welded connections was changed (5.3.4 and Annex C (normative));
- proof of fatigue strength was revised to include additional modern methods (6.1);
- fatigue strength specific resistance factors were modified (Table 8);
- the geometric stress (Hot Spot) method was added (6.2.4 and Annex I (normative));
- the effective notch method was added (6.2.5 and Annex I (normative));
- lateral-torsional stability of beams was added (8.4 and 8.5.3 and Annex J (informative));
- recommended tightening torques for preloaded bolts were modified (Annex B (informative));
- characteristic fatigue strengths for plates in shear were modified (Table D.1);
- Annex L (informative) with a list of hazards was inserted;
- Annex ZA (informative) was significantly revised.

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This document is one part of the EN 13001 series of standards. The other parts are:

- *Part 1: General principles and requirements;*
- *Part 2: Load actions;*
- *Part 3-2: Limit states and proof of competence of wire ropes in reeving systems;*
- *Part 3-3: Limit states and proof of competence of wheel/rail contacts;*
- *Part 3-4: Limit states and proof of competence of machinery;*
- *Part 3-5: Limit states and proof of competence of forged hooks and cast hooks;*
- *Part 3-6: Limit states and proof of competence of hydraulic cylinders.*

An overview of European Standards for cranes is provided in Annex K (informative).

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 organisations 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.

Introduction

This document has been prepared to be a harmonized standard to provide one means for the mechanical design and theoretical verification of cranes to conform to the essential health and safety requirements of the Machinery Directive, as amended.

This document is a type-C standard as stated in EN ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate in the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the scope of this document.

When provisions of this type-C standard are different from those which are stated in type-A or B standards, the provisions of this type-C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type-C standard.

EN 13001-3-1:2025 (E)**1 Scope**

This document specifies limit states, requirements and methods to prevent mechanical hazards in steel structures of cranes by design and theoretical proof of competence.

The significant hazardous situations and hazardous events that could result in risks to persons during intended use are identified in an informative Annex L (informative). Clauses 4 to 8 of this document provide requirements and methods to reduce or eliminate these risks:

- a) exceeding the limits of strength (yield, ultimate, fatigue);
- b) exceeding temperature limits of material or components;
- c) elastic instability of the crane or its parts (buckling, bulging).

This document does not apply to cranes which are designed before the date of its publication as EN.

NOTE This document deals only with the limit state method in accordance with reference [44].

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 1993-1-8:2024, *Eurocode 3 — Design of steel structures — Part 1-8: Joints*

EN 10025-2:2019, *Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10025-3:2019, *Hot rolled products of structural steels — Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels*

EN 10025-4:2019+A1:2022, *Hot rolled products of structural steels — Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels*

EN 10025-6:2019+A1:2022, *Hot rolled products of structural steels — Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition*

EN 10029:2010, *Hot-rolled steel plates 3 mm thick or above — Tolerances on dimensions and shape*

EN 10088-2:2024, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resistant steels for general purposes*

EN 10088-3:2023, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resistant steels for general purposes*

EN 10149-2:2013, *Hot rolled flat products made of high yield strength steels for cold forming — Part 2: Technical delivery conditions for thermomechanically rolled steels*

EN 10149-3:2013, *Hot rolled flat products made of high yield strength steels for cold forming — Part 3: Technical delivery conditions for normalized or normalized rolled steels*

EN 10160:1999, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

EN 10163-1:2004, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 1: General requirements*

EN 10163-2:2004, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 2: Plate and wide flats*

EN 10163-3:2004, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 3: Sections*

EN 10164:2018, *Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions*

EN 13001-2:2021, *Crane safety — General design — Part 2: Load actions*

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

EN ISO 286-2:2010, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts (ISO 286-2:2010)*

EN ISO 898-1:2013, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread (ISO 898-1:2013)*

EN ISO 5817:2023, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2023)*

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

EN ISO 9013:2017, *Thermal cutting — Classification of thermal cuts — Geometrical product specification and quality tolerances (ISO 9013:2017)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 17635:2016, *Non-destructive testing of welds — General rules for metallic materials (ISO 17635:2016)*

EN ISO 17659:2004, *Welding — Multilingual terms for welded joints with illustrations (ISO 17659:2002)*

ISO 4306-1:2007, *Cranes — Vocabulary — Part 1: General*

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