SLOVENSKI STANDARD
SIST EN 13001-3-6:2018/oprA1:2020

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Žerjavi - Konstrukcija, splošno - 3-6. del: Mejna stanja in dokaz varnosti mehanizma - Hidravlični cilindri

Cranes - General design - Part 3-6: Limit states and proof of competence of machinery - Hydraulic cylinders

Krane - Konstruktion allgemein - Teil 3-6: Grenzzustände und Sicherheitsnachweis von Maschinenbauteilen - Hydraulikzylinder

Appareils de levage à charge suspendue - Conception générale - Partie 3-6 : États limites et vérification d'aptitude des éléments de mécanismes - Vérins hydrauliques

Ta slovenski standard je istoveten z: EN 13001-3-6:2018/prA1

ICS:

23.100.20	Hidravlični valji	Cylinders
53.020.20	Dvigala	Cranes

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English Version

Cranes - General design - Part 3-6: Limit states and proof of competence of machinery - Hydraulic cylinders

Appareils de levage à charge suspendue - Conception générale - Partie 3-6 : États limites et vérification d'aptitude des éléments de mécanismes - Vérins hydrauliques

Krane - Konstruktion allgemein - Teil 3-6: Grenzzustände und Sicherheitsnachweis von Maschinenbauteilen - Hydraulikzylinder

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 147.

This draft amendment A1, if approved, will modify the European Standard EN 13001-3-6:2018. If this draft becomes an amendment, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration.

This draft amendment was established by CEN 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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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 13001-3-6:2018/prA1:2020) has been prepared by Technical Committee CEN/TC 147 “Cranes — Safety”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

1 Modifications to Clause 1, Scope

Replace the entire 1st paragraph with the following:

"This document is to be used together with EN 13001-1:2015, EN 13001-2:2014 and EN 13001-3-1:2012+A2:2018 as well as pertinent crane type product EN standards, and as such they specify general conditions, requirements and methods to, by design and theoretical verification, prevent mechanical hazards of hydraulic cylinders that are part of the load carrying structures of cranes. Hydraulic piping, hoses and connectors used with the cylinders, as well as cylinders made from other material than carbon steel, are not within the scope of this document.".

2 Modifications to Clause 2, Normative references

Replace the following normative references:

"EN 13001-1, *Cranes — General design — Part 1: General principles and requirements*

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

EN 13001-3-1, *Cranes — General Design — Part 3-1: Limit States and proof competence of steel structure*"

with:

"EN 13001-1:2015, *Cranes — General design — Part 1: General principles and requirements*

EN 13001-2:2014, *Crane safety — General design — Part 2: Load actions*

EN 13001-3-1:2012+A2:2018, *Cranes — General design — Part 3-1: Limit States and proof competence of steel structure*".

3 Modifications to Clause 3, Terms, definitions and symbols

In Table 1, delete the following line: "

N_{Sd}	Compressive design force

".

4 Modifications to Clause 4, General

In 4.1, replace the fourth dashed item of the list with the following:

"— weld quality levels, in accordance with EN ISO 5817:2014 and EN 13001-3-1:2012+A2:2018;".

In 4.2.1, replace the first dashed item of the list with the following:

"The impact toughness in the transversal direction shall be tested in accordance with EN ISO 148-1 and shall meet the requirements stated in EN 13001-3-1:2012+A2:2018. Samples shall be cut out in the transversal direction and prepared such that the axis of the notch is perpendicular to the surface of the tube.".

In 4.2.1, replace the last sentence with the following:

"Material used in other parts shall meet the requirements stated in EN 13001-3-1:2012+A2:2018.".

In 4.2.2, replace the last sentence with the following:

"Grades and qualities of materials used in other parts of cylinders or mounting interfaces of cylinders shall be selected in accordance with EN 13001-3-1:2012+A2:2018.".

5 Modifications to Clause 5, Proof of static strength

In 5.1, replace the 1st and the 2nd paragraph with the following:

"A proof of static strength by calculation is intended to prevent excessive deformations due to yielding of the material, elastic instability and fracture of structural members or connections. Dynamic factors given in EN 13001-2:2014 or relevant product standards are used to produce equivalent static loads to simulate dynamic effects. Also, load increasing effects due to deformation shall be considered. The use of the theory of plasticity for calculation of ultimate load bearing capacity is not considered acceptable within the terms of this standard. The proof shall be carried out for structural members and connections while taking into account the most unfavourable load effects from the load combinations A, B or C in accordance with EN 13001-2:2014 or relevant product standards.

Cylinder actions are either active or passive. Active cylinders are moving in a direction opposite to the direction of the external force acting on the moving part of the cylinder. Passive cylinders are either not moving or moving in the same direction as the external force acting on the moving part of the cylinder. As the forces applied to the cylinder by the crane structure are computed in accordance with EN 13001-2:2014, they are already increased by the partial safety factors γ_p and relevant dynamic factors. Formulae (1) and (2) give design pressures p_{Sd} caused by forces acting on the cylinder from the crane structure. In addition, additional pressures p_{Sde} caused by internal phenomena in the hydraulic circuit shall be considered and added to the design pressures p_{Sd}. Such internally generated pressures can be caused e.g. by regenerative connections, pressure drop in return lines or cushioning.".

In 5.1, below the key to Formula (2), replace the following sentence:

"Unless justified information for the value of η is used, the value 1,1 shall be assigned to Ψ."

with:

"Unless justified information for the value of η is used, Ψ shall be assigned the value of 1,1 for active cylinders and the value of 1,0 for passive cylinders.".

In 5.2.1, in the key to Formula (3), replace:

"γ_m is the general resistance factor γ_m = 1,1 (see EN 13001-2);"

with:

"γ_m is the general resistance factor γ_m = 1,1 (see EN 13001-2:2014);".

In 5.2.2, below the key to Formula (5), replace the following paragraph:

"For tensile stresses perpendicular to the plane of rolling (see Figure 5), the material shall be suitable for carrying perpendicular loads and be free of lamellar defects. EN 13001-3-1 specifies the values of γ_{sm} for material loaded perpendicular to the rolling plane."

with:

"For tensile stresses perpendicular to the plane of rolling (see Figure 5), the material shall be suitable for carrying perpendicular loads and be free of lamellar defects. EN 13001-3-1:2012+A2:2018 specifies the values of γ_{sm} for material loaded perpendicular to the rolling plane.".

In 5.2.3, replace the 1st paragraph with the following:

"The limit design weld stress $f_{w,Rd}$ used for the design of a welded connection shall be in accordance with EN 13001-3-1:2012+A2:2018.".

In 5.3.4.2, in the key to Formula (13), replace:

"*a* is the effective thickness of the weld;"

with:

"*a* is the effective throat thickness of the weld, see EN 13001-3-1:2012+A2:2018, Annex C;".

In 5.3.5, in the key to Formula (14), replace:

"*a* is the effective thickness of the weld;"

with:

"*a* is the effective throat thickness of the weld, see EN 13001-3-1:2012+A2:2018, Annex C;".

In 5.3.7, in the key to Formulae (16) and (17), replace:

"*L* is the effective thread length, maximum 0,9 · d_2;"

with:

"*L* is the effective threaded length, maximum 0,9 · d_2;".

In 5.3.9, in the key to Formula (21), replace:

"*a* is the effective thickness of the weld;"

with:

"*a* is the effective throat thickness of the weld, see EN 13001-3-1:2012+A2:2018, Annex C;".

In 5.3.10, replace the 1st first paragraph with the following:

"The design stresses in parts connecting the cylinder to the crane structure shall be calculated in accordance with EN 13001-3-1:2012+A2:2018.".

In 5.5.2, replace the 1st paragraph with the following:

"Bolted connections shall be proofed in accordance with EN 13001-3-1:2012+A2:2018.".

In 5.5.3, in the key to Formula (23), replace:

"$f_{w,Rd}$ is the limit design weld stress in accordance with EN 13001-3-1."

with:

"$f_{w,Rd}$ is the limit design weld stress in accordance with EN 13001-3-1:2012+A2:2018.".

6 Modifications to Clause 6, Proof of fatigue strength

Replace the entire sub-Clause 6.1 with the following:

"6.1 General

The proof of fatigue strength is intended to prevent risk of failure due to formation and propagation of critical cracks in load carrying part of a hydraulic cylinder under cyclic loading.

For the execution of the proof of fatigue strength, the cumulative damages caused by variable stress cycles shall be calculated. In this document, Palmgren-Miner's rule of cumulative damage is reflected by use of the stress history parameters (see EN 13001-3-1:2012+A2:2018).

The fatigue strength specific resistance factor γ_{mf} is as defined in EN 13001-3-1:2012+A2:2018.

The limit design stress of a constructional detail is characterized by the value of the characteristic fatigue strength $\Delta\sigma_c$, which represents the fatigue strength at $2 \cdot 10^6$ cycles under constant stress range loading and with a probability of survival equal to P_S 97,7 % (see EN 13001-3-1:2012+A2:2018).

$\Delta\sigma_c$-values depend on the quality level of the weld. Quality levels shall be in accordance with EN ISO 5817:2014, Annex C. Weld quality lower than weld quality class C shall not be used.

Fatigue testing may be used to establish $\Delta\sigma_c$-values for details deviating from those given here below, or to prove higher $\Delta\sigma_c$-values than those given here. Such fatigue testing shall be done in accordance with EN 13001-3-1:2012+A2:2018.".

In 6.4, in the key to Formula (30), replace:

"γ_{mf} is the fatigue strength specific resistance factor (see EN 13001-3-1);"

with:

"γ_{mf} is the fatigue strength specific resistance factor (see EN 13001-3-1:2012+A2:2018);".

In 6.4, replace the last paragraph with the following:

"For the case of $m > 3$, Formula (30) is a conservative simplification. With knowledge of the actual stress spectrum, a more detailed calculation may be done in accordance with EN 13001-3-1:2012+A2:2018.".

In 6.5.3, in the key to Formula (41), replace:

"D is the piston diameter;"

with:

"D is the tube inner diameter;".

In 6.5.4.2, replace the title of Figure 21 as follows:

"**Figure 21 — Tube inner thread**"

In 6.5.4.2, replace the key to Formula (44):

"where

d_S is the stress diameter for inner thread and inner diameter for outer thread;

D_S is the outer diameter for inner thread and stress diameter for outer thread.".

with:

"where

d_S is the thread stress diameter for inner thread and inner tube diameter for outer thread;

D_S is the outer tube diameter for inner thread and thread stress diameter for outer thread.".

In 6.5.5.2, replace the key to Formula (50):

"where

d_S is the stress diameter for inner thread and inner diameter for outer thread;

D_S is the outer diameter for inner thread and stress diameter for outer thread."

with:

"where

d_S is the thread stress diameter for inner thread and inner tube diameter for outer thread;