SLOVENSKI STANDARD
SIST EN 15048-2:2016

01-oktober-2016

Nadomešča:
SIST EN 15048-2:2007

Vijačne zveze brez prednapetja - 2. del: Ustreznost namenu

Non-preloaded structural bolting assemblies - Part 2: Fitness for purpose

Garnituren für nicht vorspannbare Schraubverbindungen im Metallbau - Teil 2: Gebrauchstauglichkeit

Boulonnerie de construction métallique non précontrainte - Partie 2: Aptitude à l'emploi

Ta slovenski standard je istoveten z: EN 15048-2:2016

ICS:

21.060.10 Sorniki, vijaki, stebelni vijaki Bolts, screws, studs

SIST EN 15048-2:2016 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15048-2

July 2016

ICS 21.060.01

Supersedes EN 15048-2:2007

English Version

Non-preloaded structural bolting assemblies - Part 2: Fitness for purpose

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This European Standard was approved by CEN on 25 March 2016.

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

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Ref. No. EN 15048-2:2016 E

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European foreword

This document (EN 15048-2:2016) has been prepared by Technical Committee CEN/TC 185 “Fasteners”, 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of an identical text or by endorsement, at the latest by January 2017, and conflicting national standards shall be withdrawn at the latest by January 2017.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 supersedes EN 15048-2:2007.

Compared to the previous version, the modifications are the following:

— technical requirements and delivery conditions for bolting assemblies have been transferred from EN 15048-1;

— relevant product standards are specified by reference to a priority list, see 5.2;

— the use of complementary washers has been added;

— requirements for the test report have been revised.

EN 15048 consists of the following parts, under the general title *Non-preloaded structural bolting assemblies:*

— *Part 1: General requirements*;

— *Part 2: Fitness for purpose*.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard specifies the requirements to ensure that non preloaded structural bolting assemblies (bolts + nuts) are fit for purpose in structural metallic works. Structural bolting assemblies which meet the requirements of this European Standard have been designed to allow tensile loading of at least $f_{ub} \times A_s$.

Since the tensile resistance of bolting assemblies is very sensitive to differences in manufacture, it is important that the bolting assemblies are supplied by one manufacturer who is always responsible for the function of the bolting assembly. For the same reason it is important that the coating of the bolting assemblies is under the control of the manufacturer.

1 Scope

This European Standard specifies the technical requirements for structural bolting assemblies in order to ensure the suitability for non-preloaded bolted connections in steel structures or aluminium structures.

A suitability test is specified to check the behaviour of the structural bolting assemblies.

It applies to bolting assemblies specified in EN 15048-1.

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 1993-1-8:2005, *Eurocode 3: Design of steel structures — Part 1-8: Design of joints*

EN 15048-1:2016, *Non-preloaded structural bolting assemblies — Part 1: General requirements*

EN 28839, *Mechanical properties of fasteners — Bolts, screws, studs and nuts made of non-ferrous metals (ISO 8839:1986)*

EN ISO 898-1, *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)*

EN ISO 898-2, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes — Coarse thread and fine pitch thread (ISO 898-2)*

EN ISO 3506-1, *Mechanical properties of corrosion-resistant stainless steel fasteners — Part 1: Bolts, screws and studs (ISO 3506-1)*

EN ISO 3506-2, *Mechanical properties of corrosion-resistant stainless steel fasteners — Part 2: Nuts (ISO 3506-2)*

EN ISO 4014, *Hexagon head bolts — Product grades A and B (ISO 4014)*

EN ISO 4016, *Hexagon head bolts — Product grade C (ISO 4016)*

EN ISO 4017, *Fasteners — Hexagon head screws — Product grades A and B (ISO 4017)*

EN ISO 4018, *Hexagon head screws — Product grade C (ISO 4018)*

EN ISO 4032, *Hexagon regular nuts (style 1) — Product grades A and B (ISO 4032)*

EN ISO 4033, *Hexagon high nuts (style 2) — Product grades A and B (ISO 4033)*

EN ISO 4034, *Hexagon regular nuts (style 1) — Product grade C (ISO 4034)*

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

EN ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system (ISO 7500-1)*

ISO 273, *Fasteners — Clearance holes for bolts and screws*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15048-1 apply.

4 Symbols

For the purposes of this document, the following symbols apply.

$A_{s,nom}$ nominal stress area of the bolt, in mm^2

d nominal thread diameter, in mm

F_b force in the bolting assembly during the test, in N

$F_{bi,max}$ individual value of the maximum force reached by the assembly during the test, in N

F_{ub} tensile resistance, in N

l bolt length, in mm

$R_{m,min}$ minimum tensile strength, in MPa

NOTE A_s in accordance with EN 1993–1-8 means $A_{s,nom}$ in accordance with this standard.

5 Technical requirements for bolting assemblies

5.1 Composition of structural bolting assemblies

The performance of structural bolting assemblies depends on the properties of their specific components. Therefore, the essential characteristics listed in EN 15048-1 are assessed through the verification of the properties of the involved components and/or bolting assemblies, as applicable. Other aspects dealing with marking and delivery conditions are assessed through inspection of the involved components and/or bolting assemblies, as applicable.

5.2 Product requirements

Dimensions, tolerances on dimensions, form and position shall be in accordance with the relevant product standards. Components of structural bolting assemblies shall be selected by the manufacturer with the following priority order.

a) General reference to published EN standards:

   For hexagon components, the following standards shall apply:

   1) EN ISO 4014, EN ISO 4017, EN ISO 4032 and EN ISO 4033 for hexagon products of product grades A and B;

   2) EN ISO 4016, EN ISO 4018 and EN ISO 4034 for hexagon products of product grade C;

   3) when required, prevailing torque nuts in accordance with EN ISO 2320 and EN ISO 7040, ISO 7041, EN ISO 7042 or EN ISO 7719 may be used.

b) General reference to ETAs,

c) General reference to published ISO standards,

d) When none of these standards/ETAs exist, then reference to national standards is permitted.

Any suitable head shape, shank dimension, thread length, etc. may be used provided that all requirements of EN 15048-1 and EN 15048-2 are met.

NOTE Additional requirements for design and/or execution are defined for instance in EN 1993–1-8, and EN 1090–2 for steel structures or EN 1090–3 for aluminium structures.

If washers are specified for use with non-preloaded structural bolting assemblies, washers of product grade A or C can be combined with any product grade of bolting assemblies. Washers with a minimum hardness of 100 HV[1)] can be combined with any property class of bolting assemblies made of the same type (steel, alloy steel, stainless steel) of material. Washers made of carbon steel or alloy steel, a minimum hardness of 300 HV is required for property classes 8.8 and 10.9 in a single lap joint with only one bolt or single row of bolts, in accordance with EN 1993-1-8:2005, 3.6.1.

5.3 Manufacturing process

5.3.1 Material

Free cutting steel shall not be used for the manufacture of bolts and nuts for structural bolting.

5.3.2 Nuts

Hot dip galvanized nuts shall be galvanized before they are threaded.

Nuts shall not be re-threaded after galvanizing.

5.3.3 Bolts

The manufacturing process for bolts of property class 10.9 shall take due care of the risk of hydrogen embrittlement, especially during the coating process. Appropriate processes shall be considered when the risk of hydrogen embrittlement cannot be avoided.

5.3.4 Finish and coating

Finish and coating, if applied, shall be as specified in the relevant coating standards. Coatings shall not impair the mechanical properties or the functional characteristics of the bolting assembly.

Coating of all components of a bolting assembly shall be compatible and shall have equivalent corrosion resistance.

Coating of each component shall be under the control of the manufacturer of the bolting assemblies.

5.4 Marking

5.4.1 Bolts

Bolts, screws or studs in accordance with this European Standard shall be marked with:

— the property class marking in accordance with EN ISO 898-1 for bolts manufactured from carbon steel and alloy steel or EN ISO 3506-1 for bolts manufactured from stainless steel, and

1) No minimum hardness requirement exists for washers made of aluminium or aluminium alloy.