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BSI Standards Publication

High-strength structural bolting assemblies for preloading

Part 7: System HR – Countersunk head bolt and nut assemblies

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National foreword

This British Standard is the UK implementation of EN 14399-7:2018. It supersedes BS EN 14399-7:2007, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FME/9/-/2, Fasteners for structural bolting.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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EUROPÄISCHE NORM

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English Version

High-strength structural bolting assemblies for preloading - Part 7: System HR - Countersunk head bolt and nut assemblies

Boulonnerie de construction métallique à haute
résistance apte à la précontrainte - Partie 7 : Système
HR - Boulons à tête fraisée (vis + écrou)

Hochfeste vorspannbare Garnituren für
Schraubverbindungen im Metallbau - Teil 7: System HR
- Garnituren aus Senkschrauben und Muttern

This European Standard was approved by CEN on 15 October 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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
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European foreword

This document (EN 14399-7:2018) 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 2019 and conflicting national standards shall be withdrawn at the latest by January 2019.

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 14399-7:2007.

In comparison with EN 14399-7:2007, the following modifications have been made:

- Table 1 containing the overview of the composition of bolting assemblies and component marking has been revised;
- the coefficient of variation of the k -factor, V_k , was changed from 0,10 to 0,06;
- specifications for the designation of the bolting assemblies have been revised;
- Annex A with detailed specifications on clamp lengths and grip lengths has been added.

EN 14399 consists of the following parts, under the general title *High-strength structural bolting assemblies for preloading*:

- *Part 1: General requirements*
- *Part 2: Suitability for preloading*
- *Part 3: System HR — Hexagon bolt and nut assemblies*
- *Part 4: System HV — Hexagon bolt and nut assemblies*
- *Part 5: Plain washers*
- *Part 6: Plain chamfered washers*
- *Part 7: System HR — Countersunk head bolt and nut assemblies*
- *Part 8: System HV — Hexagon fit bolt and nut assemblies*
- *Part 9: System HR or HV — Direct tension indicators for bolt and nut assemblies*
- *Part 10: System HRC — Bolt and nut assemblies with calibrated preload*

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, Turkey and the United Kingdom.

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Introduction

This document on structural bolting reflects the situation in Europe where two technical solutions exist to achieve the necessary ductility of bolt/nut/washer(s) assemblies. These solutions consist of two different types (HR and HV) of bolt/nut/washer assemblies, see Table 1. Both types are well proven and it is the responsibility of the experts using structural bolting whether they use the one or the other type.

It is, however, important for the performance of the assembly to avoid mixing up the components of both types. Therefore, bolts and nuts for both types are standardized in one single part of this draft European Standard each and the marking of the components of the bolting assemblies is uniform.

Preloaded bolted assemblies are very sensitive to differences in manufacture and lubrication. Therefore, it is important that the bolting assemblies are supplied by one manufacturer, who is always responsible for the functionality of the bolting assemblies as supplied.

For the same reason it is important that the coating of the bolting assemblies is under the control of one manufacturer.

Beside the mechanical properties of the components, the functionality of the bolting assemblies requires that the specified preload can be achieved if the bolting assemblies are tightened with a suitable procedure. For this purpose, a test method for the suitability of the bolting assemblies for preloading was created, which will demonstrate whether the functionality of the bolting assemblies is fulfilled.

Table 1 — Composition of high-strength structural bolting assemblies and component marking

Type of bolting assembly	System HR			System HV		System HRC
General requirements	EN 14399-1					
Suitability for preloading	EN 14399-2 and, if any, additional testing specified in the product standard					
Bolt and nut	EN 14399-3	EN 14399-7	EN 14399-4	EN 14399-8	EN 14399-10	
Marking	HR8.8	HR10.9	HR8.8	HR10.9	HVP10.9	HRC10.9
	HR8 or HR10	HR10	HR8 or HR10	HV10	HV10	HR10
Washer(s)	EN 14399-5 ^a or EN 14399-6			EN 14399-6		EN 14399-5 ^a or EN 14399-6
Marking	H or HR ^b			H or HV ^b		H or HR ^b or HD ^c
Direct tension indicator and nut face washer or bolt face washer, if any	EN 14399-9					
Marking	H8	H10	H8	H10	H10	Not applicable
	HN			HN	HN	
	HB	Not applicable		HB	HB	
^a EN 14399-5 can only be used under the nut.						
^b At the choice of the manufacturer.						
^c Mandatory mark for washers with enlarged outer diameter according to EN 14399-5 only.						

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1 Scope

This European Standard specifies, together with EN 14399-1 and EN 14399-2, the requirements for assemblies of high-strength structural countersunk bolts and nuts of system HR suitable for preloaded joints with thread sizes M12 to M36 and property classes 8.8/8 or 8.8/10 and 10.9/10.

Bolting assemblies in accordance with this document have been designed to allow preloading of at least $0,7 f_{ub} \times A_s$ ¹⁾ according to EN 1993-1-8 (Eurocode 3) and to obtain ductility predominantly by plastic elongation of the bolt. For this purpose the components have the following characteristics:

- regular nut height according to style 1, see EN ISO 4032;
- thread length of the bolt according to ISO 888.

Bolting assemblies in accordance with this document include washers according to EN 14399-6 or to EN 14399-5.

NOTE Attention is drawn to the importance of ensuring that bolting assemblies are correctly used if satisfactory results are to be obtained. For recommendations concerning proper application, reference to EN 1090-2 is made.

General requirements and requirements for suitability for preloading are specified in EN 14399-2.

Clamp lengths and grip lengths for the bolting assemblies are specified in the normative Annex A.

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 14399-1, *High-strength structural bolting assemblies for preloading - Part 1: General requirements*

EN 14399-2, *High-strength structural bolting assemblies for preloading - Part 2: Suitability for preloading*

EN 14399-5, *High-strength structural bolting assemblies for preloading - Part 5: Plain washers*

EN 14399-6, *High-strength structural bolting assemblies for preloading - Part 6: Plain chamfered washers*

EN 14399-9, *High-strength structural bolting assemblies for preloading - Part 9: System HR or HV - Direct tension indicators for bolt and nut assemblies*

EN 26157-1, *Fasteners - Surface discontinuities - Part 1: Bolts, screws and studs for general requirements (ISO 6157-1)*

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 3269, *Fasteners - Acceptance inspection (ISO 3269)*

EN ISO 4759-1, *Tolerances for fasteners - Part 1: Bolts, screws, studs and nuts - Product grades A, B and C (ISO 4759-1)*

1) f_{ub} is the nominal tensile strength (R_m) and A_s is the nominal stress area of the bolt.