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I.S. EN 14399-10:2009 (APR '09)

# High-strength structural bolting assemblies for preloading - Part 10: System HRC - Bolt and nut assemblies with calibrated preload

## I.S. EN 14399-10:2009 (Apr '09)

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English Version

## High-strength structural bolting assemblies for preloading - Part 10: System HRC - Bolt and nut assemblies with calibrated preload

Boulonnerie de construction métallique à haute résistance  
apte à la précontrainte - Partie 10: Système HRC - Boulons  
(vis + écrou + rondelle) à précontrainte calibrée

Hochfeste planmäßig vorspannbare  
Schraubenverbindungen für den Metallbau - Teil 10:  
System HRC - Garnituren aus Schrauben und Muttern mit  
kalibrierter Vorspannung

This European Standard was approved by CEN on 24 January 2009.

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## Foreword

This document (EN 14399-10:2009) has been prepared by Technical Committee CEN/TC 185 "Fasteners", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by September 2011.

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.

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 test 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

This part of this European Standard completes the series of European standards EN 14399 parts 1 to 10 which specify high-strength structural bolting for preloading; it belongs to the system HR. The specificity of bolt and nut assemblies with a calibrated preload, compared with the system HR as defined in EN 14399-3, is the preload in the bolt which is controlled during tightening by the fracture of the spline-end of the bolt under torsional stress, this fracture occurring for a precise predetermined stress.

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

For the same reason it is important that the coating of the assembly is under the control of the manufacturer.

Besides the mechanical properties of the components, the functionality of the assembly requires that the specified preload can be achieved when the fracture of the break neck at the spline-end of the bolt occurs under the predetermined torsional stress when the assembly is tightened with the appropriate procedure. For this purpose a test method for the suitability of the components for preloading was created which will demonstrate whether the function of the assembly is fulfilled.

It should be pointed out that, compared to ISO 272, the widths across flats (large series) for M12 and M20 have been changed to 22 mm and 32 mm respectively. These changes are justified by the following reasons:

- under the specific conditions of structural bolting the compressive stresses under the bolt head or nut for the sizes M12 may become too large with the width across flats of 21 mm, especially if the washer is fitted eccentrically to the bolt axis;
- for the size M20 the width across flats of 34 mm is very difficult to be produced; the change to 32 mm is primarily motivated by economics but it should also be pointed out that the width across flats of 32 mm is already common practice in Europe.

## 1 Scope

This part of this European Standard specifies, together with EN 14399-1, the requirements for assemblies of high-strength structural bolts and nuts of system HRC suitable for preloaded joints, with hexagon head (large widths across flats) or cup head, thread sizes M12 to M30 and property class 10.9/10.

Bolt and nut assemblies conforming to this part of this European Standard have been designed to allow preloading of at least  $0,7 f_{ub} \times A_s^{1)}$  according to EN 1993-1-8:2005 (*Eurocode 3*) and to obtain ductility predominantly by plastic elongation of the bolt. For this purpose the components have the following characteristics:

- nut according to EN 14399-3, or
- nut with height  $m = 1 d$ ,
- thread length of the bolt according to ISO 888.

Bolt and nut assemblies conforming to this part of this European Standard include washer(s) according to EN 14399-6 or to EN 14399-5 (under the nut only).

NOTE Attention is drawn to the importance of ensuring that the bolts are correctly used if a satisfactory result is to be obtained.

The test method for suitability for preloading is specified in EN 14399-2 and in Clause 8.

## 2 Normative references

The following referenced documents are indispensable for the application 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 10045-1, *Metallic materials – Charpy impact test – Part 1: Test method*

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

EN 14399-2:2005, *High-strength structural bolting assemblies for preloading – Part 2: Suitability test for preloading*

EN 14399-3:2005, *High-strength structural bolting assemblies for preloading – Part 3: System HR – Hexagon bolt and nut assemblies*

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 20898-2, *Mechanical properties of fasteners – Part 2: Nuts with specified proof load values – Coarse thread (ISO 898-2:1992)*

EN 26157-1, *Fasteners – Surface discontinuities – Part 1: Bolts, screws and studs for general requirements (ISO 6157-1:1988)*

EN ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs (ISO 898-1:1999)*

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



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