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**High-strength structural bolting assemblies for preloading –
Part 6: Plain chamfered washers
(includes Corrigendum AC:2006)
English version of DIN EN 14399-6:2006-06**

Hochfeste planmäßig vorspannbare Schraubenverbindungen für den Metallbau –
Teil 6: Flache Scheiben mit Fase
(enthält Berichtigung AC:2006)
Englische Fassung DIN EN 14399-6:2006-06

Document comprises 10 pages

Start of validity

This standard is valid from 1 June 2006.

DIN 6916:1989-10 shall remain valid until 30 September 2007.

National foreword

This standard has been prepared by CEN/TC 185 'Threaded and non-threaded mechanical fasteners and accessories' (Secretariat: Germany).

The responsible German body involved in its preparation was the *Normenausschuss Mechanische Verbindungselemente* (Fasteners Standards Committee), Technical Committee NA 067-03-04 AA *Stahlbauverschraubungen*.

Details regarding the allocation of washers conforming to this standard to system HR or system HV bolt/nut/washer assemblies are given in the Introduction to the European Standard.

The European Standards referred to in clause 2 of the EN have been published as the corresponding DIN EN or DIN EN ISO Standards with the same number.

Corrigendum EN 14399-6:2005/AC:2006 and CMC Resolution 4 of 2005-08-05 (amendment of date of withdrawal (DOW) of conflicting national standards) have been integrated in this standard and are indicated by a vertical line in the margin.

Amendments

This standard differs from DIN 6916:1989-10 as follows:

- a) The title has been amended.
- b) The scope has been amended.
- c) References have been updated.
- d) The nominal thread diameter of the associated bolt has been specified as nominal dimension.
- e) Dimension e for nominal size 36 has been amended.
- f) For dimension e , limiting values have been specified.
- g) The designation has been amended.

Compared with DIN EN 14399-6:2005-06, the following amendments have been made:

- a) The date of withdrawal (DOW) of conflicting national standards has been changed from September 2005 to September 2007.
- b) In clause 6, the term "manufacturer's identification mark" has been replaced by "identification mark of the manufacturer of the assembly".

Previous editions

DIN EN 14399-6: 2005-06

DIN 6916: 1962-08, 1970-12, 1979-03, 1989-10

ICS 21.060.30

English version

**High-strength structural bolting assemblies for preloading –
Part 6: Plain chamfered washers
(includes Corrigendum AC:2006)**

Boulonnerie de construction métallique à haute résistance
apte à la précontrainte – Partie 6: Rondelles plates
chanfreinées (corrigendum AC:2006 inclus)

Hochfeste planmäßig vorspannbare Schrauben-
verbindungen für den Metallbau – Teil 6: Flache Scheiben
mit Fase (enthält Berichtigung AC:2006)

EN 14399-6:2005 was approved by CEN on 2004-04-30 and Corrigendum AC on 2006-01-25.

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 Management Centre or to any CEN member.

The European Standards exist 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 Management Centre has the same status as the official versions.

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Foreword

This document (EN 14399-6:2005) has been prepared by Technical Committee CEN /TC 185 "Threaded and non-threaded mechanical fasteners and accessories", 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 2005, and conflicting national standards shall be withdrawn at the latest by September 2007.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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 assemblies. These solutions utilize different systems (HR and HV) of bolt/nut/washer assemblies, see Table 1. Both systems are well proved and it is up to the experts responsible for structural bolting whether they use the one or the other system.

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

Table 1 — Systems of bolt/nut/washer assemblies

	Bolt/nut/washer assembly System HR		Bolt/nut/washer assembly System HV
General requirements	EN 14399-1		
Bolt/nut assembly	EN 14399-3		EN 14399-4
Marking	HR		HV
Property classes	8.8/8	10.9/10	10.9/10
Washer(s)	EN 14399-5 or EN 14399-6		EN 14399-5 or EN 14399-6
Marking	H		H
Suitability test for preloading	EN 14399-2		EN 14399-2

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 coating of the assembly is under the control of one manufacturer.

Beside the mechanical properties of the components the functionality of the assembly requires that the specified preload can be achieved if the assembly is tightened with a suitable 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 excentrically 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.

For the time being, the product standards EN 14399-3 to EN 14399-6 are the only European Standards which have regard to the general requirements of EN 14399-1. However, further product standards on

- fit bolts,
- countersunk head bolts, and
- load indicating washers

for the use in high strength structural bolting for preloading are under preparation.

1 Scope

This document specifies, together with EN 14399-1, hardened and tempered plain washers with chamfer intended for assembly with large series hexagon high-strength structural bolts and nuts with thread sizes from M12 to M36 inclusive.

NOTE Attention is drawn to the importance of ensuring that the washers are correctly used if satisfactory results are to be obtained. For recommendations concerning proper application, reference to ENV 1090-1 is made.

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

EN ISO 3269, *Fasteners — Acceptance inspection (ISO 3269:2000)*.

EN ISO 4759-3, *Tolerances for fasteners — Part 3: Plain washers for bolts, screws and nuts — Products grades A and C (ISO 4759-3:2000)*.

EN ISO 10684, *Fasteners — Hot dip galvanized coatings (ISO 10684:2004)*.

3 Dimensions

See Figure 1 and Table 2.

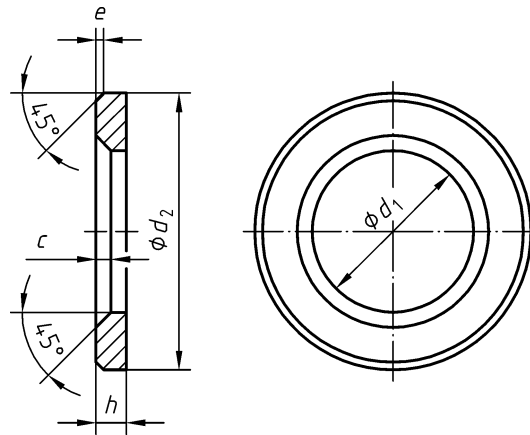


Figure 1 — Dimensions

Table 2 — Dimensions

Dimensions in millimetres

Nominal size <i>d</i> (nominal thread diameter of associated bolts)		12	(14) ^a	16	(18) ^a	20	22	24	27	30	36
<i>d</i> ₁	min.	13	15	17	19	21	23	25	28	31	37
	max.	13,27	15,27	17,27	19,33	21,33	23,33	25,33	28,52	31,62	37,62
<i>d</i> ₂	min.	23,48	27,48	29,48	33,38	36,38	38,38	43,38	49	54,80	64,80
	max.	24	28	30	34	37	39	44	50	56	66
<i>h</i>	nom.	3	3	4	4	4	4	4	5	5	6
	min.	2,7	2,7	3,7	3,7	3,7	3,7	3,7	4,4	4,4	5,4
	max.	3,3	3,3	4,3	4,3	4,3	4,3	4,3	5,6	5,6	6,6
<i>e</i>	nom. = min.	0,5	0,5	0,75	0,75	0,75	0,75	0,75	1	1	1,25
	max.	1,0	1,0	1,50	1,50	1,50	1,50	1,50	2	2	2,50
<i>c</i>	min.	1,6	1,6	1,6	2	2,0	2,0	2,0	2,5	2,5	2,5
	max.	1,9	1,9	1,9	2,5	2,5	2,5	2,5	3,0	3,0	3,0

NOTE For hot dip galvanized washers the above dimensions apply prior to galvanizing.

^a Sizes in brackets are non-preferred sizes.

4 Specification and reference standards

Table 3 — Specifications and reference standards

Material		Steel
General requirements		EN 14399-1
Mechanical properties	Hardness range	300 HV to 370 HV
Tolerances	Product grade	A
	International Standard	EN ISO 4759-3
Surface finish^a	normal	as processed ^b
	hot dip galvanized	EN ISO 10684
	others	to be agreed ^c
Workmanship	Parts shall be uniform and free of irregularities or detrimental defects. No protruding burrs shall appear on the washer.	
Acceptability	For acceptance procedure, see EN ISO 3269.	
<p>^a Attention is drawn to the need to consider the risk of hydrogen embrittlement when selecting an appropriate surface treatment process (e.g. cleaning and coating), see the relevant coating standards.</p> <p>^b "As processed" means the normal finish resulting from heat treatment with a light coating of oil.</p> <p>^c Other coatings may be negotiated between the purchaser and the manufacturer provided they do not impair the mechanical properties or the functional characteristics. Coatings of cadmium or cadmium alloys are not permitted.</p>		

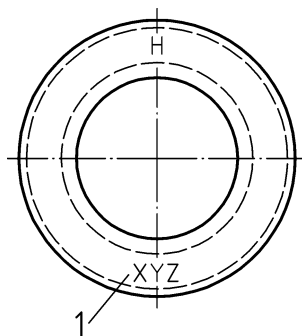
5 Designation

EXAMPLE A hardened and tempered chamfered plain washer, nominal size $d = 16$ mm, for high-strength structural bolting for preloading is designated as follows:

Washer EN 14399-6 — 16

6 Marking

Hardened and tempered chamfered washers shall be marked with the identification mark of the manufacturer of the assembly and the letter H. The marking shall be indented on the non-chamfered side.



Key

1 Identification mark of the manufacturer of the assembly

Figure 2 — Marking

Bibliography

- [1] ENV 1090-1, *Execution of steel structures — Part 1: General rules and rules for buildings.*
- [2] ISO 272, *Fasteners — Hexagon products - Widths across flats.*