



SLOVENSKI STANDARD

SIST EN 14399-4:2015

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Nadomešča:
SIST EN 14399-4:2005

Visokotrdnostne strukturne vijačne zveze za prednapetje - 4. del: Sistem HV - Zveze vijakov s šestrobo glavo in šestrobo matico

High-strength structural bolting assemblies for preloading - Part 4: System HV - Hexagon bolt and nut assemblies

Hochfeste vorspannbare Garnituren für Schraubverbindungen im Metallbau - Teil 4: System HV - Garnituren aus Sechskantschrauben und muttern

Ensembles de boulonnerie de construction métallique à haute résistance apte à la précontrainte - Partie 4: Système HV - Boulons à tête hexagonale (vis + écrou)

Ta slovenski standard je istoveten z: EN 14399-4:2015

ICS:

21.060.10	Sorniki, vijaki, stebelni vijaki	Bolts, screws, studs
21.060.20	Matice	Nuts

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EUROPEAN STANDARD

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English Version

High-strength structural bolting assemblies for preloading - Part 4: System HV - Hexagon bolt and nut assemblies

Boulonnerie de construction métallique à haute résistance
apte à la précontrainte - Partie 4: Système HV - Boulons à
tête hexagonale (vis + écrou)

Hochfeste vorspannbare Garnituren für
Schraubverbindungen im Metallbau - Teil 4: System HV -
Garnituren aus Sechskantschrauben und -muttern

This European Standard was approved by CEN on 18 October 2014.

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.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 14399-4:2015) 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of an identical text or by endorsement, at the latest by August 2015 and conflicting national standards shall be withdrawn at the latest by November 2016.

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 14399-4:2005.

In comparison with EN 14399-4:2005, the following modifications have been made:

- Table 1 containing the overview of the composition of bolting assemblies and component marking has been added;
- the use of washers in accordance with EN 14399-5 was deleted;
- the coefficient of variation of the k -factor, V_k , has changed from 0,10 to 0,06;
- specifications for the designation of the bolting assemblies have been revised;
- in Annex A detailed specifications on 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 14399-4:2015 (E)**Introduction**

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

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.

For the same reason it is important that 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.

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.

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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 was already common practice in Europe.

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	Bolt	HR8.8	HR10.9	HR8.8	HR10.9	HV10.9	HVP10.9	HRC10.9	
	Nut	HR8 or HR10	HR10	HR8 or HR10	HR10	HV10	HV10	HR10	HRD10
Washers		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	H or HR ^b or HD ^c
Direct tension indicator and nut face washer or bolt face washer, if any		EN 14399-9 https://standards.iteh.ai/catalog/standards/sist/130b997f-07bb-48c0-ada5-0cad44832a55/sist-en-14399-4-2015						Not applicable	
Marking	Direct tension indicator	H8	H10	H8	H10	H10			
	Nut face washer	HN				HN			
	Bolt face washer	HB		Not applicable		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.									

EN 14399-4:2015 (E)**1 Scope**

This European Standard specifies together with EN 14399-1 and EN 14399-2, the requirements for assemblies of high-strength structural bolts and nuts of system HV suitable for preloaded joints with large widths across flats, thread sizes M12 to M36 and property classes 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 deformation of the engaged threads. For this purpose the components have the following characteristics:

- nut height approximately $0,8 d$;
- bolt with short thread length.

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

NOTE Attention is drawn to the importance of ensuring that the 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

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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.

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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 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)*

EN ISO 6157-2, *Fasteners - Surface discontinuities - Part 2: Nuts (ISO 6157-2)*

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

EN ISO 10684, Fasteners - Hot dip galvanized coatings (ISO 10684)

ISO 261, ISO general purpose metric screw threads - General plan

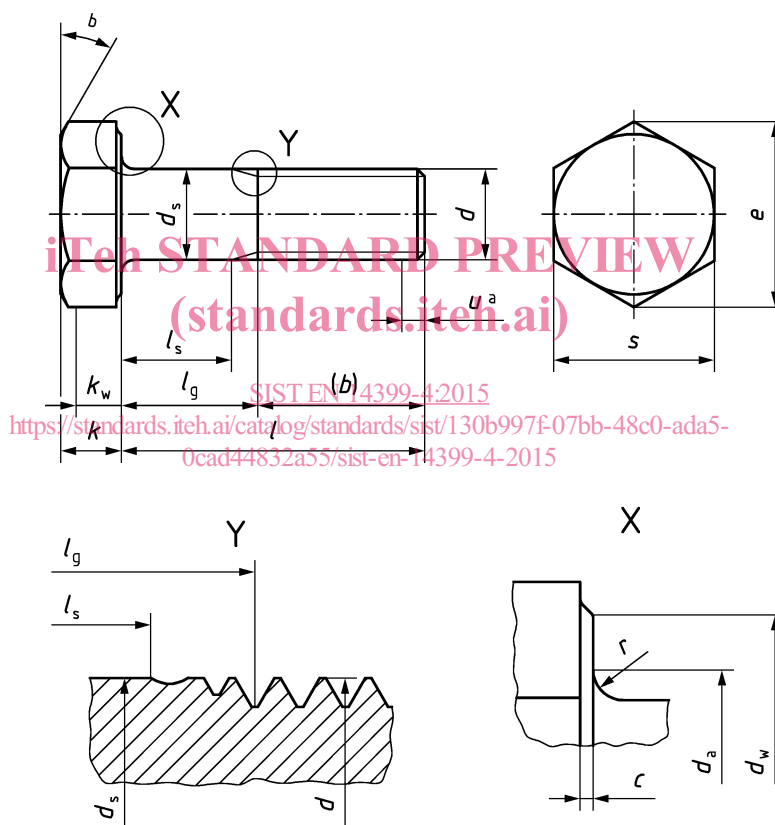
ISO 965-2, ISO general purpose metric screw threads - Tolerances - Part 2: Limits of sizes for general purpose external and internal screw threads - Medium quality

ISO 965-5, ISO general purpose metric screw threads - Tolerances - Part 5: Limits of sizes for internal screw threads to mate with hot-dip galvanized external screw threads with maximum size of tolerance position h before galvanizing

3 Bolts

3.1 Dimensions of bolts

See Figure 1 and Table 2.



Key

- a incomplete thread $u \leq 2P$
- b 15° to 30°

Figure 1 — Dimensions of bolts

The difference between l_g and l_s should not be less than $1,5 P$.

For coated bolts, the dimensions apply prior to coating.

Table 2 — Dimensions of bolts

Dimensions in millimetres

Thread (<i>d</i>)			M12	M16	M20	M22	M24	M27	M30	M36								
<i>p</i> ^a			1,75	2	2,5	2,5	3	3	3,5	4								
<i>b</i> (ref.)			23	28	33	34	39	41	44	52								
<i>c</i>	min.		0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4								
	max.		0,6	0,6	0,8	0,8	0,8	0,8	0,8	0,8								
<i>d</i> _a		max.	15,2	19,2	24,0	26,0	28,0	32,0	35,0	41,0								
<i>d</i> _s	nom.		12	16	20	22	24	27	30	36								
	min.		11,30	15,30	19,16	21,16	23,16	26,16	29,16	35,00								
	max.		12,70	16,70	20,84	22,84	24,84	27,84	30,84	37,00								
<i>d</i> _w	min.		20,1	24,9	29,5	33,3	38,0	42,8	46,6	55,9								
	max.		^b	^b	^b	^b	^b	^b	^b	^b								
<i>e</i>		min.	23,91	29,56	35,03	39,55	45,20	50,85	55,37	66,44								
<i>k</i>	nom.		8	10	13	14	15	17	19	23								
	min.		7,55	9,25	12,10	13,10	14,10	16,10	17,95	21,95								
	max.		8,45	10,75	13,90	14,90	15,90	17,90	20,05	24,05								
<i>k</i> _w	min.		5,28	6,47	8,47	9,17	9,87	11,27	12,56	15,36								
<i>r</i>		min.	1,2	1,2	1,5	1,5	1,5	2,0	2,0	2,0								
<i>s</i>	max.		22	27	32	36	41	46	50	60								
	min.		21,16	26,16	31,00	35,00	40,00	45,00	49,00	58,80								
<i>l</i>			<i>l</i> _s and <i>l</i> _g ^c															
			<i>l</i> _s	<i>l</i> _g	<i>l</i> _s	<i>l</i> _g	<i>l</i> _s	<i>l</i> _g	<i>l</i> _s	<i>l</i> _g	<i>l</i> _s	<i>l</i> _g	<i>l</i> _s	<i>l</i> _g	<i>l</i> _s	<i>l</i> _g	<i>l</i> _s	<i>l</i> _g
nom.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
35	33,75	36,25	6,75	12														
40	38,75	41,25	11,75	17	6	12												
45	43,75	46,25	16,75	22	11	17	4,5	12										
50	48,75	51,25	21,75	27	16	22	9,5	17	8,5	16								
55	53,5	56,5	26,75	32	21	27	14,5	22	13,5	21								
60	58,5	61,5	31,75	37	26	32	19,5	27	18,5	26	12	21						
65	63,5	66,5	36,75	42	31	37	24,5	32	23,5	31	17	26						
70	68,5	71,5	41,75	47	36	42	29,5	37	28,5	36	22	31	20	29				
75	73,5	76,5	46,75	52	41	47	34,5	42	33,5	41	27	36	25	34	20,5	31		
80	78,5	81,5	51,75	57	46	52	39,5	47	38,5	46	32	41	30	39	25,5	36		
85	83,25	86,75	56,75	62	51	57	44,5	52	43,5	51	37	46	35	44	30,5	41	21	33
90	88,25	91,75	61,75	67	56	62	49,5	57	48,5	56	42	51	40	49	35,5	46	26	38
95	93,25	96,75	66,75	72	61	67	54,5	62	53,5	61	47	56	45	54	40,5	51	31	43
100	98,25	101,75			66	72	59,5	67	58,5	66	52	61	50	59	45,5	56	36	48
105	103,25	106,75			71	77	64,5	72	63,5	71	57	66	55	64	50,5	61	41	53

110	108,25	111,75			76	82	69,5	77	68,5	76	62	71	60	69	55,5	66	46	58
115	113,25	116,75			81	87	74,5	82	73,5	81	67	76	65	74	60,5	71	51	63
120	118,25	121,75			86	92	79,5	87	78,5	86	72	81	70	79	65,5	76	56	68
125	123	127			91	97	84,5	92	83,5	91	77	86	75	84	70,5	81	61	73
130	128	132			96	102	89,5	97	88,5	96	82	91	80	89	75,5	86	66	78
135	133	137					94,5	102	93,5	101	87	96	85	94	80,5	91	71	83
140	138	142					99,5	107	98,5	106	92	101	90	99	85,5	96	76	88
145	143	147					104,5	112	103,5	111	97	106	95	104	90,5	101	81	93
150	148	152					109,5	117	108,5	116	102	111	100	109	95,5	106	86	98
155	153	159					114,5	122	113,5	121	107	116	105	114	100,5	111	91	103
160	158	164							118,5	126	112	121	110	119	105,5	116	96	108
165	163	169							123,5	131	117	126	115	124	110,5	121	101	113
170	168	174									122	131	120	129	115,5	126	106	118
175	173	179									127	136	125	134	120,5	131	111	123
180	178	184									132	141	130	139	125,5	136	116	128
185	182,7	189,6									137	146	135	144	130,5	141	121	133
190	187,7	194,6									142	151	140	149	135,5	146	126	138
195	192,7	199,6									147	156	145	154	140,5	151	131	143
200	197,7	204,6											150	159	147,5	156	136	148

NOTE Preferred lengths are defined in terms of lengths $l_{s,min}$ and $l_{g,max}$.

^a P is the pitch of thread

^b $d_{w,max} = s_{actual}$

^c $l_{g,max} = l_{nom} - b$

$l_{s,min} = l_{g,max} - 3P$

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