SLOVENSKI STANDARD
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Visokotrdnostne strukturne vijačne zveze za prednapetje - 8. del: Sistem HV - Zveze prilagodnega vijaka s šestrobo glavo in matice

High-strength structural bolting assemblies for preloading - Part 8: System HV - Hexagon fit bolt and nut assemblies

Hochfeste vorspannbare Garnituren für Schraubverbindungen im Metallbau - Teil 8: System HV - Garnituren aus Sechskant-Passschrauben und Muttern

Boulonnerie de construction métallique à haute résistance apte à la précontrainte - Partie 8 : Système HV - Boulons ajustés à tête hexagonale (vis + écrou)

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21.060.20	Matice	Nuts

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EUROPEAN STANDARD

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High-strength structural bolting assemblies for preloading - Part 8: System HV - Hexagon fit bolt and nut assemblies

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Hochfeste vorspannbare Garnituren für Schraubverbindungen im Metallbau - Teil 8: System HV - Garnituren aus Sechskant-Passschrauben und Muttern

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

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 14399-8:2018) 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of an identical text or by endorsement, at the latest by January 2019 and conflicting national standards shall be withdrawn at the latest by January 2019.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 14399-8:2007.

In comparison with EN 14399-8:2007, the following modifications have been made:

— Table 1 containing the overview of the composition of bolting assemblies and component marking has been added;

— 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.

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 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 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 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 width 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 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	
Marking	Nut	HR8 or HR10	HR10	HR8 or HR10	HR10	HV10	HV10	HR10	HRD10
Washer(s)		EN 14399-5[a] or EN 14399-6				EN 14399-6			EN 14399-5[a] or EN 14399-6
Marking		H or H[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						Not applicable	
Marking	Direct tension indicator	H8	H10	H8	H10	H10			
Marking	Nut face washer	HN				HN			
Marking	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.

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 width across flats, thread sizes M12 to M36 and property classes 10.9/10.

Bolting assemblies (including fit bolts with nominal shank diameter d + 1 mm) 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

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 14399-6, *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 26157-1)*

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.

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

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

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

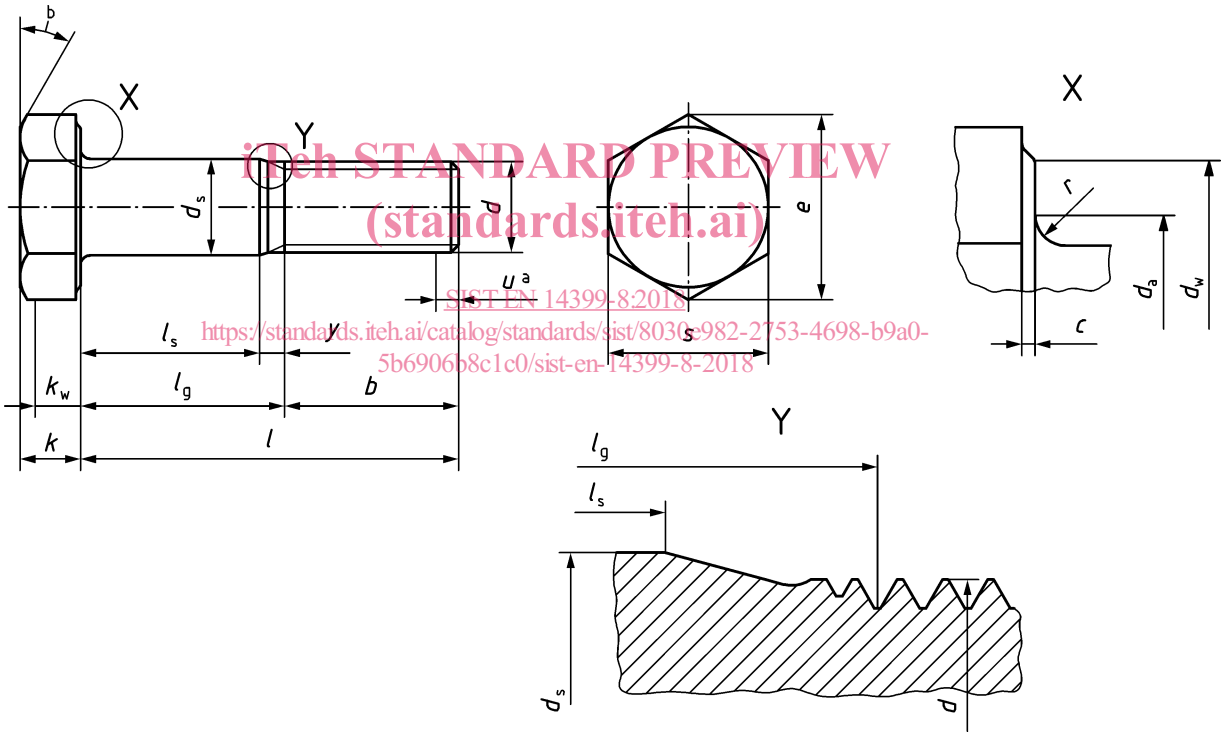
ISO 965-2, *ISO general purpose metric screw threads - Tolerances - Part 2: Limits of sizes for general purpose external and internal screw threads - Medium quality*

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 Fit bolts

3.1 Dimensions of fit bolts

See Figure 1 and Table 2.



Key

a incomplete thread $u \leq 2P$

b 15° to 30°

Figure 1 — Dimensions of fit 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 fit bolts

Dimensions in millimetres

Thread d		M12	M16	M20	M22	M24	M27	M30	M36
P[a]		1,75	2	2,5	2,5	3	3	3,5	4
b (ref)		23	28	33	34	39	41	44	52
c	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
d_a	max.	15,2	19,2	24,0	26,0	28,0	32,0	35,0	41,0
d_s	nom.	13	17	21	23	25	28	31	37
	min.[b]	12,74	16,74	20,71	22,71	24,71	27,71	30,67	36,67
	max.[b]	12,85	16,85	20,84	22,84	24,84	27,84	30,83	36,83
d_w	min.	20,1	24,9	29,5	33,3	38,0	42,8	46,6	55,9
	max.	[c]							
e	min.	23,91	29,56	35,03	39,55	45,20	50,85	55,37	66,44
k	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
k_w	min.	5,28	6,47	8,47	9,17	9,87	11,27	12,56	15,36
r	min.	1,2	1,2	1,5	1,5	1,5	2,0	2,0	2,0
s	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
y	max.	6,5	7,5	8,5	8,5	10,0	10,0	11,5	13,0

l			l_s and l_g [d]															
			l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g
nom.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
50	48,75	51,25	20,5	27														
55	53,50	56,50	25,5	32														
60	58,50	61,50	30,5	37														
65	63,50	66,50	35,5	42	29,5	37												
70	68,50	71,50	40,5	47	34,5	42												
75	73,50	76,50	45,5	52	39,5	47	33,5	42										
80	78,50	81,50	50,5	57	44,5	52	38,5	47	37,5	46								
85	83,25	86,75	55,5	62	49,5	57	43,5	52	42,5	51								
90	88,25	91,75	60,5	67	54,5	62	48,5	57	47,5	56	41	51						
95	93,25	96,75	65,5	72	59,5	67	53,5	62	52,5	61	46	56	44	54				
100	98,25	101,75			64,5	72	58,5	67	57,5	66	51	61	49	59				
105	103,25	106,75			69,5	77	63,5	72	62,5	71	56	66	54	64	49,5	61		

Thread d			M12		M16		M20		M22		M24		M27		M30		M36	
l			l_s and l_g[d]															
			l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g
nom.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
110	108,25	111,75			74,5	82	68,5	77	67,5	76	61	71	59	69	54,5	66		
115	113,25	116,75			79,5	87	73,5	82	72,5	81	66	76	64	74	59,5	71		
120	118,25	121,75			84,5	92	78,5	87	77,5	86	71	81	69	79	64,5	76		
125	123,0	127,0			89,5	97	83,5	92	82,5	91	76	86	74	84	69,5	81	60	73
130	128,0	132,0					88,5	97	87,5	96	81	91	79	89	74,5	86	65	78
135	133,0	137,0					93,5	102	92,5	101	86	96	84	94	79,5	91	70	83
140	138,0	142,0					98,5	107	97,5	106	91	101	89	99	84,5	96	75	88
145	143,0	147,0					103,5	112	102,5	111	96	106	94	104	89,5	101	80	93
150	148,0	152,0					108,5	117	107,5	116	101	111	99	109	94,5	106	85	98
155	153,0	159,0					113,5	122	112,5	121	106	116	104	114	99,5	111	90	103
160	158,0	164,0							117,5	126	111	121	109	119	104,5	116	95	108
165	163,0	169,0							122,5	131	116	126	114	124	109,5	121	100	113
170	168,0	174,0									121	131	119	129	114,5	126	105	118
175	173,0	179,0									126	136	124	134	119,5	131	110	123
180	178,0	184,0									131	141	129	139	124,5	136	115	128
185	182,7	189,6									136	146	134	144	129,5	141	120	133
190	187,7	194,6											139	149	134,5	146	125	138
195	192,7	199,6											144	154	139,5	151	130	143
200	197,7	204,6											149	159	144,5	156	135	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] Corresponding to tolerance class b11.

[c] $d_{w\,max} = s_{actual}$

[d] $l_{g\,max} = l_{nom} - b$; $l_{s\,min} = l_{g\,max} - y_{max}$