INTERNATIONAL STANDARD

ISO 21269

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Hexagon socket head cap screws with metric fine pitch thread

Vis à tête cylindrique à six pans creux à pas fin

Reference number
ISO 21269:2004(E)

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 21269 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

Hexagon socket head cap screws with metric fine pitch thread

1 Scope

This International Standard specifies the characteristics of hexagon socket head cap screws with metric fine pitch thread with nominal thread diameters, d, from 8 mm up to 64 mm and product grade A.

For approximate masses of screws see Annex A.

If, in special cases, specifications other than those listed in this International Standard are required, they should be selected from existing International Standards, e.g. ISO 261, ISO 888, ISO 898-1, ISO 965-2, ISO 3506-1, ISO 8839 and ISO 4759-1.

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.

ISO 225, *Fasteners — Bolts, screws, studs and nuts — Symbols and designations of dimensions*

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

ISO 888, *Bolts, screws and studs — Nominal lengths, and thread lengths for general purpose bolts*

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs*

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 965-3, *ISO general purpose metric screw threads — Tolerances — Part 3: Deviations for constructional screw threads*

ISO 3269, *Fasteners — Acceptance inspection*

ISO 3506-1, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 1: Bolts, screws and studs*

ISO 4042, *Fasteners — Electroplated coatings*

ISO 4753, *Fasteners — Ends of parts with external ISO metric thread*

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

ISO 6157-1, *Fasteners — Surface discontinuities — Part 1: Bolts, screws and studs for general requirements*

ISO 6157-3, *Fasteners — Surface discontinuities — Part 3: Bolts, screws and studs for special requirements*

ISO 8839, *Mechanical properties of fasteners — Bolts, screws, studs and nuts made of non-ferrous metals*

ISO 8992, *Fasteners — General requirements for bolts, screws, studs and nuts*

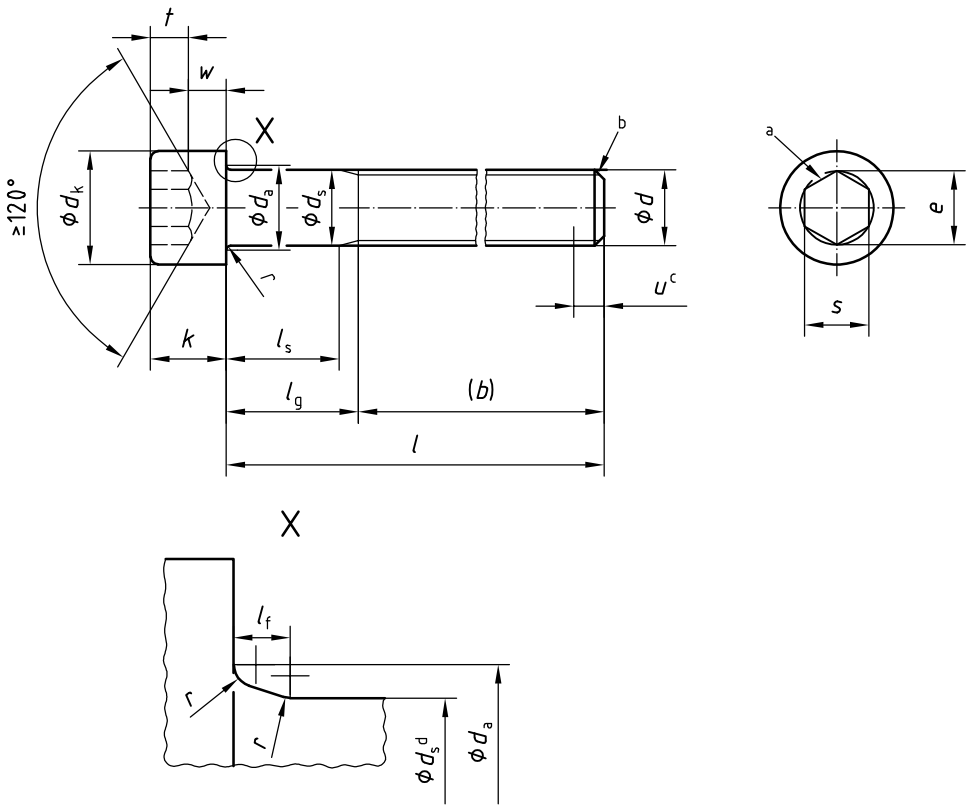
ISO 10683, *Fasteners — Non-electrolytically applied zinc flake coatings*

ISO 23429, *Gauging of hexagon sockets*

3 Dimensions

See Figure 1 and Table 1.

Symbols and designations of dimensions are defined in ISO 225.



Permissible underhead fillet

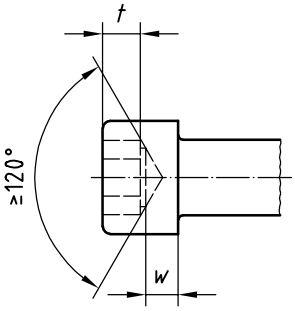
$$l_{\text{f, max}} = 1{,}7\, r_{\text{max}}$$

$$r_{\text{max}} = \frac{d_{\text{a, max}} - d_{\text{s, max}}}{2}$$

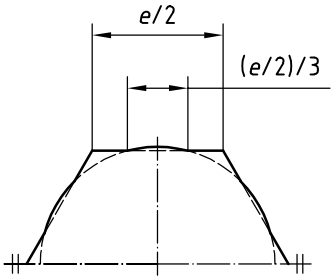
r_{min}, see Table 1

Figure 1

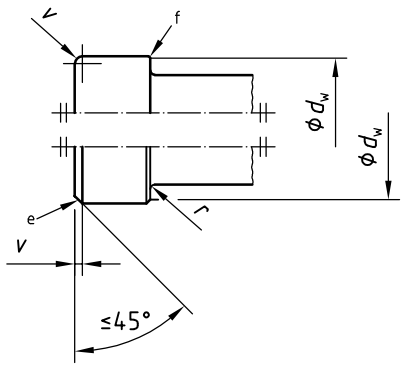
Permissible alternative form of socket



For broached sockets which are at the maximum limit of size the overcut resulting from drilling shall not exceed 1/3 of the length of any flat of the socket which is e/2.



Top and bottom edge of the head



[a] A slight rounding or countersink at the mouth of the socket is permissible.

[b] Point chamfered according to ISO 4753.

[c] Incomplete thread $u \leqslant 2\ P$.

[d] d_s applies if values of $l_{s,\,min}$ are specified.

[e] Top edge of head may be rounded or chamfered as shown at the option of the manufacturer.

[f] Bottom edge of head may be rounded or chamfered to d_w but in every case shall be free from burrs.

Figure 1(*continued*)

Table 1 — Dimensions

Dimensions in millimetres

Thread ($d \times P$ [a])		M8×1	M10×1	M12×1,5	—	M16×1,5	M20×1,5	M24×2	M30×2	M36×3	M42×3	M46×3	M56×4	M64×4
		—	(M10×1,25)	(M12×1,25)	(M14×1,5)	—	(M20×2)	—	—	—	—	—	—	—
b[b]	ref.	28	32	36	40	44	52	60	72	84	96	108	124	140
d_k	max.[c]	13,00	16,00	18,00	21,00	24,00	30,00	36,00	45,00	54,00	63,00	72,00	84,00	96,00
	max.[d]	13,27	16,27	18,27	21,33	24,33	30,33	36,39	45,39	54,46	63,46	72,46	84,54	96,54
	min.	12,73	15,73	17,73	20,67	23,67	29,67	35,61	44,61	53,54	62,54	71,54	83,46	95,46
d_a	max.	9,2	11,2	13,7	15,7	17,7	22,4	26,4	33,4	39,4	45,6	52,6	63	71
d_s	max.	8,00	10,00	12,00	14,00	16,00	20,00	24,00	30,00	36,00	42,00	48,00	56,00	64,00
	min.	7,78	9,78	11,73	13,73	15,73	19,67	23,67	29,67	35,61	41,61	47,61	55,54	63,54
e[e, f]	min.	6,863	9,149	11,429	13,716	15,996	19,437	21,734	25,154	30,854	36,571	41,131	46,831	52,531
l_f	max	1,02	1,02	1,45	1,45	1,45	2,04	2,04	2,89	2,89	3,06	3,91	5,95	5,95
k	max.	8,00	10,00	12,00	14,00	16,00	20,00	24,00	30,00	36,00	42,00	48,00	56,00	64,00
	min.	7,64	9,64	11,57	13,57	15,57	19,48	23,48	29,48	35,38	41,38	47,38	55,26	63,26
r	min.	0,4	0,4	0,6	0,6	0,6	0,8	0,8	1	1	1,2	1,6	2	2
s[f]	nom.	6	8	10	12	14	17	19	22	27	32	36	41	46
	max.	6,14	8,175	10,175	12,212	14,212	17,23	19,275	22,275	27,275	32,33	36,33	41,33	46,33
	min.	6,02	8,025	10,025	12,032	14,032	17,05	19,065	22,065	27,065	32,08	36,08	41,08	46,08
t	min.	4	5	6	7	8	10	12	15,5	19	24	28	34	38
v	max.	0,8	1	1,2	1,4	1,6	2	2,4	3	3,6	4,2	4,8	5,6	6,4
d_w	min	12,33	15,33	17,23	20,17	23,17	28,87	34,81	43,61	52,54	61,34	70,34	82,26	94,26
w	min.	3,3	4	4,8	5,8	6,8	8,6	10,4	13,1	15,3	16,3	17,5	19	22

l^g			Shank length l_s and grip length 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	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.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
12	11,65	12,35																										
16	15,65	16,35																										
20	19,58	20,42																										
25	24,58	25,42																										
30	29,58	30,42																										
35	34,5	35,5																										
40	39,5	40,5	5,75	12																								
45	44,5	45,5	10,75	17	5,5	13																						

Table 1 — Dimensions (*continued*)

50	49,5	50,5	15,75	22	10,5	18																						
55	54,4	55,6	20,75	27	15,5	23	10,25	19																				
60	59,4	60,6	25,75	32	20,5	28	15,25	24	10	20																		
65	64,4	65,6	30,75	37	25,5	33	20,25	29	15	25	11	21																
70	69,4	70,6	35,75	42	30,5	38	25,25	34	20	30	16	26																
80	79,4	80,6	45,75	52	40,5	48	35,25	44	30	40	26	36	15,5	28														
90	89,3	90,7			50,5	58	45,25	54	40	50	36	46	25,5	38	15	30												
100	99,3	100,7			60,5	68	55,25	64	50	60	46	56	35,5	48	25	40												
110	109,3	110,7					65,25	74	60	70	56	66	45,5	58	35	50	20,5	38										
120	119,3	120,7					75,25	84	70	80	66	76	55,5	68	45	60	30,5	48	16	36								
130	129,2	130,8							80	90	76	66	65,5	78	55	70	40,5	58	26	46								
140	139,2	140,8							90	100	86	96	75,5	88	65	80	50,5	68	36	56	21,5	44						
150	149,2	150,8									96	106	85,5	98	75	90	60,5	78	46	66	31,5	54						
160	159,2	160,8									106	116	95,5	108	85	100	70,5	88	56	76	41,5	64	27	52				
180	179,2	180,8											115,5	128	105	120	90,5	108	76	96	61,5	84	47	72	28,5	56		
200	199,075	200,925											135,5	148	125	140	110,5	128	96	116	81,5	104	67	92	48,5	76	30	60
220	219,075	220,925																			101,5	124	87	112	68,5	96	50	80
240	239,075	240,925																			121,5	155	107	132	88,5	116	70	100
260	258,95	261,05																			141,5	164	127	152	108,5	136	90	120
280	278,95	281,05																			161,5	184	147	172	128,5	156	110	140
300	298,95	301,05																			181,5	204	167	192	148,5	176	130	160

NOTE Sizes in brackets should be avoided if possible.

[a] P is the pitch of the thread.

[b] For lengths between the bold stepped lines in the unshaded area.

[c] For plain heads.

[d] For knurled heads.

[e] $e_{min} = 1{,}14\ s_{min}$

[f] Combined gauging of socket dimensions e and s, see ISO 23429.

[g] The range of commercial lengths is between the bold stepped lines. Lengths in the shaded area are threaded to the head within 3 times the respective pitch of the coarse thread. Lengths below the shaded area have values of l_g and l_s in accordance with the following formulae:

$l_{g,\,max} = l_{nom} - b$

$l_{s,\,min} = l_{g,\,max}$ − 5 times the respective pitch of the coarse thread.

4 Requirements and reference International Standards

See Table 2.

Table 2 — Requirements and reference International Standards

Materials		Steel	Stainless steel	Non-ferrous metal
General requirements	International Standard	ISO 8992		
Thread	Tolerance	5g6g for property class 12.9; for other property classes: 6g		
	International Standard	ISO 261, ISO 965-2, ISO 965-3		
Mechanical properties	Property class	$d \leqslant$ 39 mm: 8.8, 10.9, 12.9 $d >$ 39 mm: as agreed	$d <$ 24 mm: A2-70[a], A3-70, A4-70, A5-70 24 mm $\leqslant d \leqslant$ 39 mm: A2-50[b], A3-50, A4-50, A5-50 $d >$ 39 mm: as agreed	As agreed
	International Standard	ISO 898-1	ISO 3506-1	ISO 8839
Tolerances	Product grade	A		
	International Standard	ISO 4759-1		
Finish		As processed Requirements for electroplating are covered in ISO 4042. Requirements for non-electrolytically applied zinc flake coatings are covered in ISO 10683.	Plain —	Plain Requirements for electroplating are covered in ISO 4042.
Surface discontinuities		Limits for surface discontinuities are covered in ISO 6157-1 and for property class 12.9 in ISO 6157-3.	—	—
Acceptability		Acceptance procedure is covered in ISO 3269.		

[a] For stainless steel screws machined from bar it is permissible to use grade A1-70 for sizes $d \leqslant$ 12 mm and the product shall be marked accordingly.

[b] For stainless steel screws machined from bar it is permissible to use grade A1-50 and the product shall be marked accordingly.

5 Designation

EXAMPLE A hexagon socket head cap screw with thread M12×1,5, nominal length $l =$ 80 mm and property class 12.9 is designated as follows:

Hexagon socket head cap screw ISO 21269-M12×1,5×80-12.9

Annex A
(informative)

Masses

In Table A.1 approximate masses of screws with commercial lengths are given for information only.

Table A.1 — Masses

	M8×1	**M10×1**	**M12× 1,5**	**—**	**M16× 1,5**	**M20× 1,5**	**M24×2**	**M30×2**	**M36×2**	**M42×3**	**M48×3**	**M56×4**	**M64×4**
	—	**M10× 1,25**	**M12× 1,25**	**M14× 1,5**	**—**	**M20×2**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Nominal length l mm	**Approximate mass, in kilograms per 1 000 pieces (ρ = 7,85 kg/dm^3)** (for information only)												
12	10,9												
16	12,1	20,9											
20	13,4	22,9	32,1										
25	15,0	25,4	35,7	48,0	71,3								
30	16,9	27,9	39,3	53,0	77,8	128							
35	18,9	30,4	42,9	58,0	84,4	139							
40	20,9	32,9	46,5	63,0	91,0	150	270						
45	22,9	36,1	50,1	68,0	97,6	161	285	500					
50	24,9	39,3	54,5	73,0	106	172	300	527					
55	26,9	42,5	58,9	78,0	114	183	316	554	870				
60	28,9	45,7	63,4	84,0	122	194	330	581	910	1 370			
65	31,0	48,9	67,8	90,0	130	205	345	608	950	1 420			
70	33,0	52,1	71,3	96,0	138	216	363	635	990	1 470	2 040		
80	37,0	58,5	80,2	108	154	241	399	690	1 070	1 580	2 180	3 340	
90		64,9	89,1	120	170	266	435	745	1 150	1 680	2 320	3 530	5 220
100		71,2	98,0	132	186	291	471	800	1 230	1 790	2 460	3 720	5 470
110			107	144	202	316	507	855	1 310	1 890	2 600	3 920	5 730
120			116	156	218	341	543	910	1 390	2 000	2 740	4 110	5 980
130				168	234	366	579	965	1 470	2 100	2 880	4 300	6 230
140				180	250	391	615	1 020	1 550	2 210	3 020	4 490	6 490
150					266	416	651	1 080	1 630	2 320	3 160	4 680	6 740
160					282	441	687	1 130	1 710	2 420	3 300	4 880	6 900
180						491	759	1 240	1 870	2 640	3 590	5 270	7 250
200						541	831	1 350	2 030	2 860	3 870	5 650	7 750
220							903	1 460	2 190	3 080	4 150	6 040	8 250
240							975	1 570	2 250	3 300	4 430	6 420	8 750
260								1 680	2 410	3 520	4 710	6 810	9 260
280								1 790	2 570	3 740	4 990	7 200	9 760
300								1 900	2 730	3 960	5 270	7 580	10 300

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