INTERNATIONAL STANDARD

ISO 12474

First edition
2010-10-01

Hexagon socket head cap screws with metric fine pitch thread

Vis à tête cylindrique à six pans creux à pas fin

Reference number
ISO 12474:2010(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12474 was prepared by Technical Committee ISO/TC 2, *Fasteners*, Subcommittee SC 10, *Product standards for fasteners*.

Introduction

This International Standard is based on ISO 21269, which has been withdrawn. The range of approval has been brought into line with the scope of ISO 898-1. ISO 21269 specified also fine pitch thread screws of $d \geqslant \mathrm{M42} \times 3$. Certain dimensions of $d \geqslant \mathrm{M42} \times 3$ were considered as screws with reduced loadability. Therefore, the dimensions $d \geqslant \mathrm{M42} \times 3$ have been omitted from this International Standard because the smallest cross-sectional area for some sizes is not located in the thread, but in the shear area between the head and the shank.

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 36 mm and product grade A.

For approximate masses of screws, see Annex A.

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 descriptions of dimensions*

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

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 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*

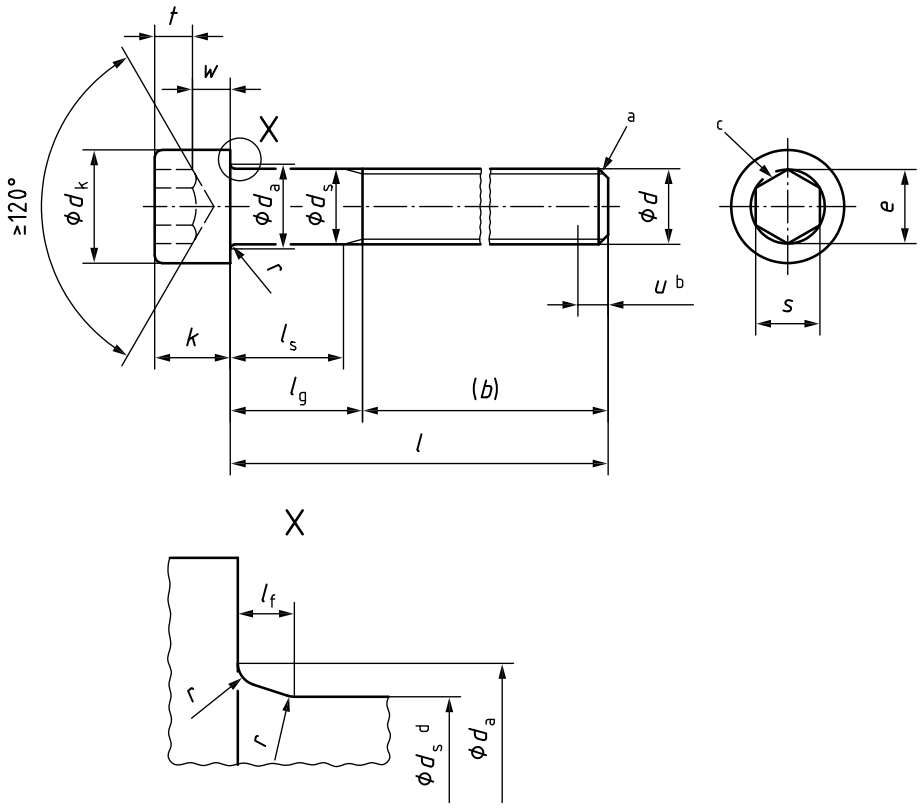
ISO 8992, *Fasteners — General requirements for bolts, screws, studs and nuts*

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

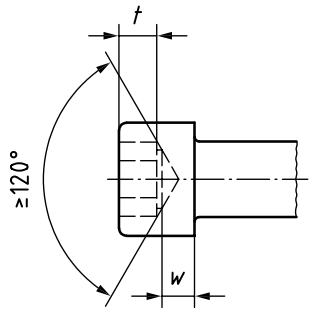
3 Dimensions

See Figure 1 and Table 1.

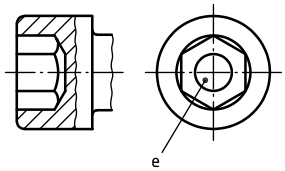
Symbols and descriptions of dimensions are specified in ISO 225.



a) Hexagon socket head cap screw

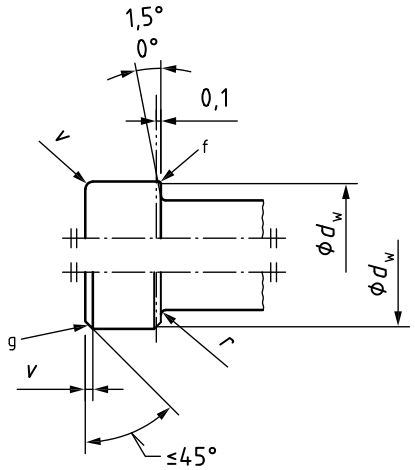


b) Permissible alternative form of socket

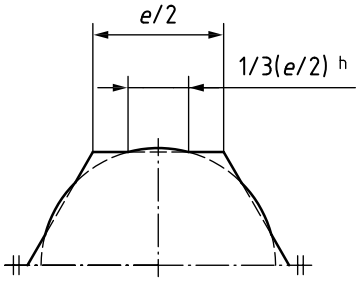


c) Permissible alternative form of socket bottom

Figure 1 (*continued*)



d) Top and bottom edge of the head



e) Broached socket

Key

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

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

$r_{\min}$ see Table 1

a Point chamfered in accordance with ISO 4753.

b Incomplete thread $u \leqslant 2\ P$.

c A slight rounding or countersink at the mouth of the socket is permissible.

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

e Flat area, use for indented marking permitted.

f Bottom edge of head may be rounded or chamfered, but in every case shall be free of burrs.

g Top edge of head may be rounded or chamfered as shown at the manufacturer's discretion.

h For broached sockets which are at the maximum limit of size, the overcut resulting from drilling shall not exceed one third of the length of any flat of the socket which is $e/2$.

Figure 1 — Hexagon socket head cap screw with metric fine pitch thread

Table 1 — Dimensions for hexagon socket head cap screw with metric fine pitch thread

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
		—	(M10 × 1,25)	(M12 × 1,25)	(M14 × 1,5)	—	(M20 × 2)	—	—	—
b[b]	ref.	28	32	36	40	44	52	60	72	84
d_a	max.	9,2	11,2	13,7	15,7	17,7	22,4	26,4	33,4	39,4
d_k	max.[c]	13,00	16,00	18,00	21,00	24,00	30,00	36,00	45,00	54,00
	max.[d]	13,27	16,27	18,27	21,33	24,33	30,33	36,39	45,39	54,46
	min.	12,73	15,73	17,73	20,67	23,67	29,67	35,61	44,61	53,54
d_s	max.	8,00	10,00	12,00	14,00	16,00	20,00	24,00	30,00	36,00
	min.	7,78	9,78	11,73	13,73	15,73	19,67	23,67	29,67	35,61
d_w	min.	12,33	15,33	17,23	20,17	23,17	28,87	34,81	43,61	52,54
e[e,f]	min.	6,863	9,149	11,429	13,716	15,996	19,437	21,734	25,154	30,854
l_f	max.	1,02	1,02	1,45	1,45	1,45	2,04	2,04	2,89	2,89
k	max.	8,00	10,00	12,00	14,00	16,00	20,00	24,00	30,00	36,00
	min.	7,64	9,64	11,57	13,57	15,57	19,48	23,48	29,48	35,38
r	min.	0,4	0,4	0,6	0,6	0,6	0,8	0,8	1	1
s[f]	nom.	6	8	10	12	14	17	19	22	27
	max.	6,14	8,175	10,175	12,212	14,212	17,23	19,275	22,275	27,275
	min.	6,02	8,025	10,025	12,032	14,032	17,05	19,065	22,065	27,065
t	min.	4	5	6	7	8	10	12	15,5	19
v	max.	0,8	1	1,2	1,4	1,6	2	2,4	3	3,6
w	min.	3,3	4	4,8	5,8	6,8	8,6	10,4	13,1	15,3

l[g]			Shank dimensions l_s and 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.
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														
50	49,5	50,5	15,75	22	10,5	18														

Table 1 (*continued*)

Thread, $d \times P$[a]			M8 × 1		M10 × 1		M12 × 1,5		—		M16 × 1,5		M20 × 1,5		M24 × 2		M30 × 2		M36 × 3	
			—		(M10 × 1,25)		(M12 × 1,25)		(M14 × 1,5)		—		(M20 × 2)		—		—		—	
l_g			Shank dimensions l_s and 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.
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	86	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
150	149,2	150,8									96	106	85,5	98	75	90	60,5	78	46	66
160	159,2	160,8									106	116	95,5	108	85	100	70,5	88	56	76
180	179,2	180,8											115,5	128	105	120	90,5	108	76	96
200	199,1	200,9											135,5	148	125	140	110,5	128	96	116

NOTE Sizes in brackets should be avoided if possible.

[a] P is the pitch of the thread.

[b] For lengths below the dashed stepped line.

[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 above the dashed stepped line are threaded to the head within 3 times the respective pitch of the coarse thread. Lengths below the dashed stepped line have values of l_g and l_s in accordance with the following equation:

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

$l_{s\ min} = l_{g\ max}$ – 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

Material		Steel	Stainless steel	Non-ferrous metal
General requirements	International Standard	ISO 8992		
Thread	Tolerance class	5g6g for property class 12.9/12.9; for other property classes: 6g		
	International Standards	ISO 261, ISO 965-2, ISO 965-3		
Mechanical properties	Property class	8 mm $\leqslant d \leqslant$ 36 mm: 8.8, 10.9, 12.9/12.9	$d <$ 24 mm: A2-70[a], A3-70, A4-70, A5-70 24 mm $\leqslant d \leqslant$ 36 mm: A2-50[b], A3-50, A4-50, A5-50	As agreed
	International Standards	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 12.9/12.9 in ISO 6157-3.	—	—
Acceptability		The acceptance procedure is given in ISO 3269.		

[a] For stainless steel screws machined from bar, it is permissible to use steel 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 steel 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 12474 - M12 × 1,5 × 80 - 12.9

6 Other specifications

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

Annex A
(informative)

Masses

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

Table A.1 — Masses

Thread	M8 × 1	M10 × 1	M12 × 1,5	—	M16 × 1,5	M20 × 1,5	M24 × 2	M30 × 2	M36 × 3
	—	M10 × 1,25	M12 × 1,25	M14 × 1,5	—	M20 × 2	—	—	—
Nominal length l mm	Approximate mass, in kilograms per 1 000 pieces ($\rho = 7{,}85$ 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
65	31,0	48,9	67,8	90,0	130	205	345	608	950
70	33,0	52,1	71,3	96,0	138	216	363	635	990
80	37,0	58,5	80,2	108	154	241	399	690	1 070
90		64,9	89,1	120	170	266	435	745	1 150
100		71,2	98,0	132	186	291	471	800	1 230
110			107	144	202	316	507	855	1 310
120			116	156	218	341	543	910	1 390
130				168	234	366	579	965	1 470
140				180	250	391	615	1 020	1 550
150					266	416	651	1 080	1 630
160					282	441	687	1 130	1 710
180						491	759	1 240	1 870
200						541	831	1 350	2 030

Bibliography

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

[2] ISO 21269, *Hexagon socket head cap screws with fine metric fine pitch thread* [1)]

[3] ISO 23429, *Gauging of hexagon sockets*

1) International Standard withdrawn.

ICS 21.060.10

Price based on 8 pages