UDC 621.882.215.61.091.1 May 1985

Hexagon socket thin head cap screws
with pilot recess for wrench key

DIN 6912

Zylinderschrauben mit Innensechskant; niedriger Kopf, mit Schlüsselführung

Supersedes
December 1967 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

Dimensions in mm

1 Field of application

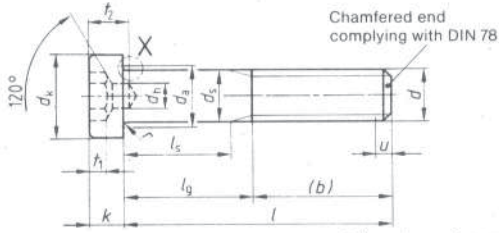
This standard specifies product grade A hexagon socket thin head cap screws with pilot recess for wrench key with ISO metric screw thread from M4 up to and including M36.

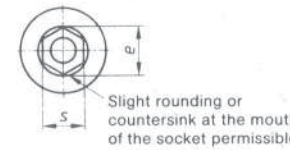
If, in special cases, the screws are to meet requirements other than those given in this standard, e.g. with regard to property class or material, these shall be selected in accordance with the appropriate standard. This also applies to the fine pitch thread conforming to DIN 13 Part 13 required in exceptional cases.

The critical cross section of screws covered by this standard can, as a consequence of the head geometry and the form of the wrench engagement, be located below the hexagon socket and not in the thread. This particularly applies for fine pitch thread screws and/or where tolerance positions are unfavourable (see also Explanatory notes). It is thus recommended that the screws should not be used for the transmission of high axial loads involving prestressing.

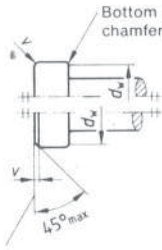
These screws can not be used in the form of screw assemblies with captive washers as specified in DIN 6900, as they are always required to have a short unthreaded portion of shank to compensate for the pilot recess, taking into account strength criteria.

2 Dimensions

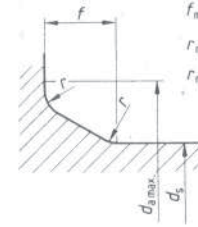




$u = 2P$ maximum, incomplete thread



Detail X
Maximum underhead fillet



$f_{max} = 1{,}7\, r_{max}$

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

r_{min} See table.

Continued on pages 2 to 7

Thread size d		M 4	M 5	M 6	M 8	M 10	M 12	(M 14)	M 16
P [1]		0,7	0,8	1	1,25	1,5	1,75	2	2
b Reference dimension	[2]	14	16	18	22	26	30	34	38
	[3]	–	–	–	–	32	36	40	44
	[4]	–	–	–	–	–	–	–	57
d_k	max. = nominal dimension	7	8,5	10	13	16	18	21	24
	min.	6,78	8,28	9,78	12,73	15,73	17,73	20,67	23,67
d_a	max.	4,7	5,7	6,8	9,2	11,2	13,7	15,7	17,7
d_h	min. = nominal dimension	2	2,5	3	4	5	6	7	8
	max.	2,06	2,56	3,06	4,075	5,075	6,075	7,09	8,09
d_s	max. = nominal dimension	4	5	6	8	10	12	14	16
	min.	3,82	4,82	5,82	7,78	9,78	11,73	13,73	15,73
d_w	min.	6,2	7,7	9,2	12,03	15,03	17,03	19,83	22,83
e [5]	min.	3,44	4,58	5,72	6,86	9,15	11,43	13,72	16
f	max.	0,6	0,6	0,68	1,02	1,02	1,45	1,45	1,45
k	max. = nominal dimension	2,8	3,5	4	5	6,5	7,5	8,5	10
	min.	2,66	3,32	3,82	4,82	6,28	7,28	8,28	9,78
r	min.	0,2	0,2	0,25	0,4	0,4	0,6	0,6	0,6
s	Nominal dimension	3	4	5	6	8	10	12	14
	min.	3,02	4,02	5,02	6,02	8,025	10,025	12,032	14,032
	max.	3,10	4,12	5,14	6,14	8,175	10,175	12,212	14,212
t_1	Nominal dimension	1,6	2	2,5	3	3,5	4	4,5	5,5
	min.	1,48	1,88	2,38	2,88	3,35	3,85	4,35	5,35
	max.	1,72	2,12	2,62	3,12	3,65	4,15	4,65	5,65
t_2	min.	3,3	4	5	6,5	7,5	9	10	11,5
	max.	3,6	4,3	5,3	6,86	7,86	9,36	10,36	11,93
v	max.	0,4	0,5	0,6	0,8	1	1,2	1,4	1,6

l			Shank lengths l_s and l_g															
Nominal length	min.	max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.
10	9,71	10,29	1,4	3,5	1,8	4,2	2,5	5,5										
12	11,65	12,35	1,4	3,5	1,8	4,2	2,5	5,5	3,2	7								
16	15,65	16,35	1,4	3,5	1,8	4,2	2,5	5,5	3,2	7	3,5	8	4,2	9,5				
20	19,58	20,42	2,5	6	1,8	4,2	2,5	5,5	3,2	7	3,5	8	4,2	9,5	4,5	10,5	5	11
25	24,58	25,42	7,5	11	5	9	2,5	5,5	3,2	7	3,5	8	4,2	9,5	4,5	10,5	5	11
30	29,58	30,42	12,5	16	10	14	7	12	3,2	7	3,5	8	4,2	9,5	4,5	10,5	5	11
35	34,5	35,5	17,5	21	15	19	12	17	6,75	13	3,5	8	4,2	9,5	4,5	10,5	5	11
40	39,5	40,5	22,5	26	20	24	17	22	11,75	18	6,5	14	4,2	9,5	4,5	10,5	5	11
50	49,5	50,5	27,5	31	30	34	27	32	21,75	28	16,5	24	11,5	20	4,5	10,5	5	11
60	59,4	60,6			40	44	37	42	31,75	38	26,5	34	21,5	30	16	26	12	22
70	69,4	70,6					47	52	41,75	48	36,5	44	31,5	40	26	36	22	32
80	79,4	80,6							51,75	58	46,5	54	41,5	50	36	46	32	42
90	89,3	90,7									56,5	64	51,5	60	46	56	42	52
100	99,3	100,7											61,5	70	56	66	52	62
(110)	109,3	110,7													66	76	62	72
120	119,3	120,7													76	86	72	82
(130)	129,2	130,8															76	86
140	139,2	140,8															86	96

[1] P = pitch of thread (coarse pitch thread).
[2] For lengths $l \leq 125$ mm.
[3] For lengths $l > 125$ mm ≤ 200 mm.
[4] For lengths $l > 200$ mm.
[5] e min. = 1,14 × s min.

Thread size d		(M 18)	M 20	(M 22)	M 24	(M 27)	M 30	(M 33)	M 36
P [1]		2,5	2,5	2,5	3	3	3,5	3,5	4
b Reference dimension	[2]	42	46	50	54	60	66	72	78
	[3]	48	52	56	60	66	72	78	84
	[4]	61	65	69	73	79	85	91	97
d_k	max.=nominal dimension	27	30	33	36	40	45	50	54
	min.	26,67	29,67	32,61	35,61	39,61	44,61	49,61	53,54
d_a	max.	20,2	22,4	24,4	26,4	30,4	33,4	36,4	39,4
d_h	min.=nominal dimension	8	10	10	12	12	15	16,5	18
	max.	8,09	10,09	10,09	12,11	12,11	15,11	16,61	18,11
d_s	max.=nominal dimension	18	20	22	24	27	30	33	36
	min.	17,73	19,67	21,67	23,67	26,67	29,67	32,61	35,61
d_w	min.	25,83	28,83	31,61	34,61	38,61	43,61	48,61	52,34
e [5]	min.	16	19,44	19,44	21,73	21,73	25,15	27,43	30,85
f	max.	1,87	2,04	2,04	2,04	2,89	2,89	2,89	2,89
k	max.=nominal dimension	11	12	13	14	16	17,5	19,5	21,5
	min.	10,73	11,73	12,73	13,73	15,73	17,23	19,17	21,17
r	min.	0,6	0,8	0,8	0,8	1	1	1	1
s	Nominal dimension	14	17	17	19	19	22	24	27
	min.	14,032	17,05	17,05	19,065	19,065	22,065	24,065	27,065
	max.	14,212	17,23	17,23	19,275	19,275	22,275	24,275	27,275
t_1	Nominal dimension	6	6,5	7	7	8,5	9	10	11,5
	min.	5,85	6,32	6,82	6,82	8,32	8,82	9,82	11,28
	max.	6,15	6,68	7,18	7,18	8,68	9,18	10,18	11,72
t_2	min.	12,5	14	15	16	17	19	20	24
	max.	12,93	14,43	15,43	16,43	17,43	19,52	20,52	24,52
v	max.	1,8	2	2,2	2,4	2,7	3	3,3	3,6

l			Shank lengths l_s and l_g															
Nominal length	min.	max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.
20	19,58	20,42																
25	24,58	25,42	5,5	13														
30	29,58	30,42	5,5	13	6,5	14												
35	34,5	35,5	5,5	13	6,5	14												
40	39,5	40,5	5,5	13	6,5	14	6,5	14										
50	49,5	50,5	5,5	13	6,5	14	6,5	14										
60	59,4	60,6	5,5	13	6,5	14	6,5	14	7	16								
70	69,4	70,6	15,5	28	11,5	24	6,5	14	7	16	8	17	8,5	19				
80	79,4	80,6	25,5	38	21,5	34	17,5	30	7	16	8	17	8,5	19	9,5	20		
90	89,3	90,7	35,5	48	31,5	44	27,5	40	21	36	8	17	8,5	19	9,5	20	10,5	22,5
100	99,3	100,7	45,5	58	41,5	54	37,5	50	31	46	25	40	8,5	19	9,5	20	10,5	22,5
(110)	109,3	110,7	55,5	68	51,5	64	47,5	60	41	56	35	50	26,5	44	9,5	20	10,5	22,5
120	119,3	120,7	65,5	78	61,5	74	57,5	70	51	66	45	60	36,5	54	30,5	48	10,5	22,5
(130)	129,2	130,8	69,5	82	65,5	78	61,5	74	55	70	49	64	40,5	58	34,5	52	26	46
140	139,2	140,8	79,5	92	75,5	88	71,5	84	65	80	59	74	50,5	68	44,5	62	36	56
(150)	149,2	150,8	89,5	102	85,5	98	81,5	94	75	90	69	84	60,5	78	54,5	72	46	66
160	159,2	160,8			95,5	108	91,5	104	85	100	79	94	70,5	88	64,5	82	56	76
(170)	169,2	170,8			105,5	118	101,5	114	95	110	89	104	80,5	98	74,5	92	66	86
180	179,8	180,8			115,5	128	111,5	124	105	120	99	114	90,5	108	84,8	102	76	96
(190)	189,1	190,9					121,5	134	115	130	109	124	100,5	118	94,5	112	86	106
200	199,1	200,9					131,5	144	125	140	119	134	110,5	128	104,5	122	96	116

See page 2 for [1]) to [5]).

The commercial nominal lengths are designated by giving the shank lengths.

The thread sizes and intermediate lengths given in brackets shall be avoided where possible.

Nominal lengths above 200 mm shall be graded by steps of 20 mm.

The distance from the last full form thread to the head bearing surface shall be l_g max. $\approx 5P$ for bolts with nominal lengths above the dashed stepped line. The l_g and l_s values for bolts with nominal lengths below the dashed stepped line shall be determined in accordance with the following equations:

l_g max. $= l$ (nominal length) $- b$ (nominal length); $\quad l_s$ min. $= l_g$ max. $- 5P$.

3 Technical delivery conditions

Material		Steel	Stainless steel	Nonferrous metal
General requirements		As specified in DIN 267 Part 1.		
Thread	Tolerance class	6g		
	Standard	DIN 13 Part 12 and Part 15		
Mechanical properties	Property class (material)	8.8	≤ M 20: A2-70; > M 20: A2-50.	CuZn = copper-zinc alloy [2]
		Other property classes or materials subject to agreement.		
	Standard	ISO 898 Part 1 [1]	DIN 267 Part 11	DIN 267 Part 18
Permissible dimensional deviations and deviations of form	Product grade	A		
	Standard	ISO 4759 Part 1		
Surface finish		(Thermally or chemically) blackened.	Bright.	Bright.
		DIN 267 Part 2 shall apply with regard to the surface roughness.		
		DIN 267 Part 19 shall apply with regard to the permissible surface discontinuities.		
		DIN 267 Part 9 shall apply with regard to electroplating.		
		If a different kind of electroplating or a different kind of surface protection is desired, this shall be agreed upon at the time of ordering.		
Acceptance inspection		DIN 267 Part 5 shall apply with regard to acceptance inspection.		

[1] The acceptance inspection shall include hardness testing of property class 8.8 screws, with hardness values of HV 250 to 320 for sizes up to and including M 16, and HV 255 to 335 for sizes greater than M 16 (see Explanatory notes).

[2] Preferably CU2 or CU3, at the manufacturer's discretion.

4 Designation

Designation of an M 12 hexagon socket head cap screw of nominal length $l = 60$ mm and assigned to property class 8.8:

Hexagon socket head cap screw DIN 6912 – M 12 × 60 – 8.8

DIN 962 shall apply with regard to the designation of types and designs with additional information to be given on ordering.

The DIN 4000-2-1 tabular layout of article characteristics shall apply for screws covered by this standard.

5 Masses

Thread size d	M 4	M 5	M 6	M 8	M 10	M 12	(M 14)	M 16
Nominal length l	Mass (7,85 kg/dm^3), in kg per 1000 units ≈							
10	1,3	2,2	3,6					
12	1,5	2,5	3,9	7,7				
16	1,9	3,1	4,5	8,8	15,5	22,3		
20	2,3	3,7	5,2	10,2	17,9	25,5	37,9	52,5
25	2,7	4,4	6,2	12,5	20,2	29,5	42,5	56,5
30	3,2	5,1	7,3	14	22	32,5	48	63
35	3,4	5,8	8,3	15,7	25,5	36,5	53	69,7
40	4,2	6,6	9,5	17,5	28,5	40	58	78,7
50	5,2	7,3	11,5	21,5	34,8	48	69,5	91,5
60		9	13,6	25,3	40,3	57	82	107
70			15,7	29,1	46	65	92,5	122
80				32,8	52,5	72	104	140
90					57,8	80	116	154
100						88	127	169
110							139	183
120							151	198
130								212
140								226

Thread size d	(M 18)	M 20	(M 22)	M 24	(M 27)	M 30	(M 33)	M 36
Nominal length l	Mass (7,85 kg/dm^3), in kg per 1000 units ≈							
20								
25	77							
30	84,6	108						
35	93,3	118						
40	102	128	185					
50	119	150	215					
60	138	172	245	263				
70	157	196	275	298	445	498		
80	178	222	305	333	490	552	793	
90	196	245	335	369	535	607	860	1000
100	215	269	365	407	580	662	927	1080
110	235	292	395	439	625	717	994	1160
120	255	316	425	474	670	772	1060	1240
130	275	342	455	510	715	827	1130	1320
140	295	368	485	545	760	880	1190	1400
150	315	394	515	580	805	940	1250	1470
160		422	545	616	850	990	1320	1550
170		448	575	651	895	1050	1380	1630
180		474	605	687	940	1100	1450	1710
190			635	722	995	1160	1510	1790
200			665	758	1030	1210	1580	1870

The values of mass specified for the commercial sizes are for guidance only.

Standards referred to

DIN 13 Part 12	ISO metric screw threads; coarse and fine pitch threads from 1 to 300 mm diameter; selection of diameters and pitches
DIN 13 Part 13	ISO metric screw threads; selected sizes for screws, bolts and nuts from 1 to 52 mm screw thread diameter and limits of size
DIN 13 Part 15	ISO metric screw threads; fundamental deviations and tolerances for screw threads of 1 mm diameter and larger
DIN 78	Thread ends and lengths of projection of bolt ends for ISO metric threads in accordance with DIN 13
DIN 267 Part 1	Fasteners; technical delivery conditions; general requirements
DIN 267 Part 2	Fasteners; technical delivery conditions; types of finish and dimensional accuracy
DIN 267 Part 5	Fasteners; technical delivery conditions; acceptance inspection
DIN 267 Part 9	Fasteners; technical delivery conditions; electroplated components
DIN 267 Part 11	Fasteners; technical delivery conditions with addenda to ISO 3506; stainless and acid resistant steel components
DIN 267 Part 18	Fasteners; technical delivery conditions; nonferrous metal components
DIN 267 Part 19	Fasteners; technical delivery conditions; surface discontinuities on bolts
DIN 962	Bolts, screws, studs and nuts; designations, types and finishes
DIN 4000 Part 2	Tabular layout of article characteristics for bolts, screws and nuts
DIN 6900	Screw assemblies
ISO 898 Part 1	Mechanical properties of fasteners; bolts, screws and studs
ISO 4759 Part 1	Tolerances for fasteners; bolts, screws and nuts with thread diameters $\geq$ 1,6 and $\leq$ 150 mm and product grades A, B and C

Previous editions

DIN 6912: 03.54x, 12.67

Amendments

The following amendments have been made in comparison with the December 1967 edition:

a) The content of the standard has been editorially revised and harmonized with DIN 912.

b) Screws with fine pitch thread have been deleted.

c) Shank lengths have been specified (see Explanatory notes).

d) The head bearing surface has been dimensioned in detail (see Explanatory notes).

e) The technical delivery conditions have been supplemented and harmonized with the corresponding basic standards.

f) Design m has been replaced by product grade A.

g) Maximum and minimum values have been adopted for the individual dimensions.

h) The hardness test has been specified as the determining test for the acceptance inspection.

Explanatory notes

Re amendment a)

In respect of its dimensional specifications and its layout, Standard DIN 912, December 1983 edition, corresponds to International Standard ISO 4762–1977. The national amendments and/or supplements required have been identified. The same layout has been selected for this standard, DIN 6912, and the other standards covering hexagon socket screws, DIN 7984 and DIN 7991, although, at present, no international standards comparable to these standards have yet been published.

Re amendment b)

Cap screws conforming to DIN 6912 are only seldom required with fine pitch thread. This thread has been deleted from the standard for this reason. However, according to the field of application, screws with fine pitch thread may continue to be ordered in accordance with this standard, if required.

Re amendment c)

As an addition to the previous specifications, dimensions have been specified for the shank lengths (l_s and l_g). l_g can be considered to represent the minimum grip length. Thread length b, which has remained unamended at $2 \times d + 6$ mm or $2 \times d + 12$ or 25 mm, is now only applicable as reference dimension for calculating l_g and l_s. This dimension also covers the tolerance on the nominal length l and the previous tolerance on thread length b, i.e. the difference between l_g and l_s ($= 5\,P$) covers both tolerances and the thread runout. A value corresponding to $\approx 5\,P$ has been inserted for the dimension l_g of screws with a nominal length above the dashed stepped line, so that the thread does not extend too far into the area of the pilot recess (which would result in a weakening of the cross section). This corresponds approximately to the previous specifications given in DIN 6912 (dimension l_1 min.). There is no risk to interchangeability as a consequence of the amended dimensioning.

Re amendment d)

The head bearing surface and the underhead fillet of the screw have been dimensioned in detail by analogy with DIN 912. As a deviation from DIN 912, a minimum bearing surface diameter corresponding to d_w min. = d_k min. − IT 15 has been specified for sizes up to M 24, following proper cold forming practice (see also Explanatory notes to DIN 912 in this respect).

Re amendment h)

As it is possible for the critical cross section in these screws to lie between the hexagon socket and the shank, they are excluded from the wedge loading test (see ISO 898 Part 1, April 1979 edition, table 5). Furthermore, according to a revision agreed in October 1984 by Subcommittee SC1 of Technical Committee ISO/TC 2, the hardness test has been made mandatory for acceptance inspection as specified in ISO 898 Part 1, table 3. In addition to revised hardness values, this specifies that screws having a head style which is (or could be) weaker than the threaded portion, shall be inspected by means of hardness testing.

International Patent Classification

F16B 23/00