Metric thread stud bolts

DIN 976-1

ICS 21.040.10; 21.060.10

Supersedes February 1995 edition.

Gewindebolzen – Teil 1: Metrisches Gewinde

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.

Foreword

This standard has been prepared by Technical Committee *Verbindungselemente mit Sonderformen* of the *Normenausschuss Mechanische Verbindungselemente* (Fasteners Standards Committee).

Amendments

This standard differs from the February 1995 edition as follows:

a) All stud bolts (irrespective of their nominal length) may be provided with either type A or type B ends.
b) Property classes have been changed.
c) The specifications relating to surface finish have been amended.
d) Alternative marking by colour coding has been specified.
e) References have been updated.

Previous editions

DIN 976: 1970-01, 1986-09; DIN 976-1: 1995-02.

All dimensions are in millimetres.

Introduction

Stud bolts with metric thread are designed to perform functions similar to those of double end studs (clamping type or interference-fit type). This standard covers stud bolts with threads produced to tolerance 6g which is customary for bolt/nut assemblies of thread engagement group N as specified in DIN ISO 965-1. Attention is drawn to the fact that stud bolts with lengths exceeding those specified for thread engagement group N might not be true to gauge.

Continued on pages 2 to 7.

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original should be consulted as the authoritative text.

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1 Scope

This standard specifies dimensions and technical delivery conditions for stud bolts with metric thread made of steel, stainless steel or nonferrous metal.

2 Normative references

This standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the titles of the publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

DIN 267-2	Fasteners – Technical delivery conditions – Product grades and tolerances
DIN 267-10	Fasteners – Technical delivery conditions – Hot-dip galvanized components
DIN 4000-2	Tabular layouts of article characteristics for bolts, screws and fit bolts
DIN EN 26157-3	Fasteners – Surface discontinuities – Part 3: Bolts, screws and studs for special requirements (ISO 6157-3 : 1988)
DIN EN 28839	Mechanical properties of fasteners – Bolts, screws, studs and nuts made of non-ferrous metals (ISO 8839 : 1986)
DIN EN ISO 898-1	Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs (ISO 898-1 : 1999)
DIN EN ISO 3269	Fasteners – Acceptance inspection (ISO 3269 : 2000)
DIN EN ISO 3506-1	Mechanical properties of corrosion-resistant stainless steel fasteners – Part 1: Bolts, screws and studs (ISO 3506-1 : 1997)
DIN EN ISO 4042	Fasteners – Electroplated coatings (ISO 4042 : 1999)
DIN EN ISO 4753	Fasteners – Ends of parts with external ISO metric screw thread (ISO 4753 : 1999)
DIN EN ISO 4759-1	Tolerances for fasteners – Part 1: Bolts, screws, studs and nuts – Product grades A, B and C (ISO 4759-1 : 2000)
DIN EN ISO 10683	Fasteners – Non-electrolytically applied zinc flake coatings (ISO 10683 : 2000)
DIN ISO 965-1	ISO general purpose metric screw threads — Tolerances – Part 1: Principles and basic dates (ISO 965-1 : 1998)
DIN 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 965-2 : 1998)
ISO 8992:1986	Fasteners – General requirements for bolts, screws, studs and nuts

3 Dimensions

Stud bolt dimensions shall be as given in figures 1 and 2 and table 1.

Type A, with RL type thread end as in DIN EN ISO 4753

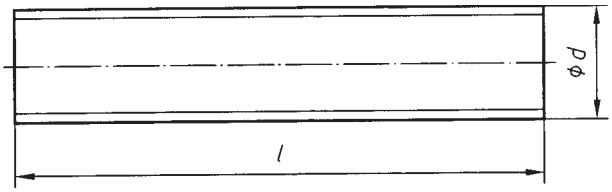

Figure 1: Type A stud bolt dimensions (notation)

Type B, with CH type thread end as in DIN EN ISO 4753

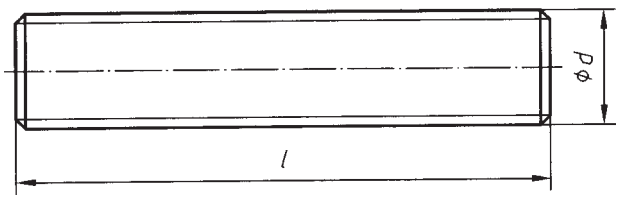

Figure 2: Type B stud bolt dimensions (notation)

Table 1: Stud bolt dimensions

Thread size (d)			M2	M2,5	M3	(M3,5)	M4	M5	M6	M8	M10	M12
			—	—	—	—	—	—	—	M8×1	M10×1,25	M12×1,25
			—	—	—	—	—	—	—	—	M10×1	M12×1,5
Nominal size	l Min.	Max.	Approx. mass, in kg, per 1 000 units									
5	4,76	5,24	0,09	0,15								
6	5,76	6,24	0,11	0,18	0,27							
8	7,71	8,29	0,15	0,24	0,35	0,48	0,62					
10	9,71	10,29	0,19	0,30	0,44	0,60	0,78	1,24				
12	11,65	12,35	0,22	0,36	0,53	0,72	0,93	1,49	2,12			
(14)	13,65	14,35	0,26	0,42	0,62	0,84	1,09	1,73	2,47			
16	15,65	16,35	0,30	0,48	0,71	0,95	1,24	1,98	2,82	5,10		
(18)	17,65	18,35	0,34	0,54	0,79	1,07	1,40	2,23	3,18	5,73		
20	19,58	20,42	0,37	0,60	0,88	1,19	1,55	2,48	3,53	6,37	10,0	
(22)	21,58	22,42	0,41	0,66	0,97	1,31	1,71	2,72	3,88	7,01	11,0	
25	24,58	25,42	0,47	0,75	1,10	1,49	1,94	3,09	4,41	7,96	12,6	18,2
(28)	27,58	28,42	0,52	0,84	1,24	1,67	2,17	3,47	4,94	8,92	14,1	20,3
30	29,58	30,42	0,56	0,90	1,32	1,79	2,32	3,71	5,29	9,56	15,1	21,8
35	34,5	35,5	0,66	1,05	1,53	2,09	2,71	4,33	6,18	11,1	17,5	25,5
40	39,5	40,5	0,75	1,20	1,74	2,39	3,10	4,95	7,06	12,7	20,1	29,1
45	44,5	45,5		1,35	1,94	2,69	3,49	5,57	7,94	14,3	22,5	32,7
50	49,5	50,5		1,50	2,15	2,99	3,88	6,19	8,82	15,9	25,1	36,4
55	54,4	55,6			2,36	3,29	4,27	6,81	9,71	17,5	27,5	40,0
60	59,4	60,6			2,58	3,59	4,66	7,43	10,6	19,1	30,1	43,7
65	64,4	65,6				3,89	5,05	8,05	11,5	20,7	32,5	47,3
70	69,4	70,6				4,20	5,44	8,67	12,4	22,3	35,2	50,9
75	74,4	75,6					5,83	9,29	13,3	23,9	37,7	54,7
80	79,4	80,6					6,22	9,91	14,2	25,5	40,2	58,2
(85)	84,3	85,7						10,5	15,1	27,1	42,7	61,8
90	89,3	90,7						11,2	15,9	28,7	45,2	65,5
(95)	94,3	95,7						11,8	16,8	30,3	47,7	69,1
100	99,3	100,7						12,4	17,7	31,9	50,2	72,8
110	109,3	110,7							19,5	35,1	55,2	80,0
120	119,3	120,7							21,3	38,3	60,2	87,3
130	129,2	130,8								41,5	65,1	94,6
140	139,2	140,8								44,7	70,1	102
150	149,2	150,8								47,9	75,1	109
160	159,2	160,8								51,1	80,1	117
170	169,2	170,8									85,0	124
180	179,2	180,8									90,0	131
190	189,075	190,925									95,0	138
200	199,075	200,925									99,9	146
220	219,075	220,925										160
240	239,075	240,925										175
1 000	995,5	1 004,5	19,0	30,0	43,0	59,8	77,6	124	177	319	502	728
2 000	1 992,5	2 007,5	38,0	60,0	86,0	120	155	248	354	638	1 004	1 456
3 000	2 989,5	3 010,5	57,0	90,0	129	179	233	372	531	957	1 506	2 184

(continued)

Table 1 (continued)

Thread size (d)			(M14)	M16	(M18)	M20	(M22)	M24	(M27)	M30	(M33)	M36
			(M14×1,5)	M16×1,5	(M18×1,5)	M20×1,5	(M22×1,5)	M24×2	(M27×2)	M30×2	(M33×2)	M36×3
l			Approx. mass, in kg, per 1 000 units									
Nominal size	Min.	Max.										
30	29,58	30,42	29,8	40,0								
35	34,5	35,5	34,8	46,6	57,9							
40	39,5	40,5	39,8	53,3	66,1	83,3						
45	44,5	45,5	44,8	60,0	74,4	93,7	115					
50	49,5	50,5	49,7	66,6	82,7	104	128	150				
55	54,4	55,6	54,7	73,3	90,9	115	141	165	213			
60	59,4	60,6	59,7	80,0	99,2	125	154	180	232	284		
65	64,4	65,6	64,6	86,6	107	135	166	195	251	308	378	
70	69,4	70,6	69,6	93,3	116	146	179	210	271	332	407	482
75	74,4	75,6	74,6	100	124	156	192	225	290	355	437	516
80	79,4	80,6	79,6	107	132	167	205	240	310	379	466	550
(85)	84,3	85,7	84,5	113	141	177	218	255	329	403	495	585
90	89,3	90,7	89,5	120	149	187	230	270	348	427	524	619
(95)	94,3	95,7	94,5	127	157	198	243	285	368	450	553	653
100	99,3	100,7	99,5	133	165	208	256	300	387	474	582	688
110	109,3	110,7	109	147	182	229	282	330	426	521	640	757
120	119,3	120,7	119	160	198	250	307	360	464	569	698	825
130	129,2	130,8	129	173	215	271	333	390	503	616	757	894
140	139,2	140,8	139	187	231	291	358	420	542	664	815	963
150	149,2	150,8	149	200	248	312	383	450	580	711	873	1 032
160	159,2	160,8	159	213	265	333	410	480	619	758	931	1 101
170	169,2	170,8	169	226	281	354	435	510	658	806	990	1 169
180	179,2	180,8	180	239	298	375	461	540	696	853	1 048	1 238
190	189,075	190,925	190	252	315	396	486	570	735	901	1 106	1 307
200	199,075	200,925	199	265	332	416	512	600	774	948	1 164	1 376
220	219,075	220,925	218	291	366	456	563	660	851	1 043	1 281	1 513
240	239,075	240,925	237	317	400	496	614	720	929	1 138	1 397	1 651
260	258,95	261,05	256	343	434	535	665	780	1 006	1 232	1 513	1 788
280	278,95	281,05	275	369	468	575	716	840	1 083	1 327	1 630	1 926
300	298,95	301,05		395	502	615	767	900	1 161	1 422	1 746	2 064
320	318,85	321,15		421	536	655	818	960	1 239	1 517	1 862	2 202
340	338,85	341,15			570	694	869	1 020	1 317	1 612	1 978	2 340
360	358,85	361,15			604	734	920	1 080	1 395	1 707	2 094	2 478
380	378,85	381,15				774	971	1 140	1 473	1 802	2 210	2 616
400	398,85	401,15				815	1 022	1 200	1 551	1 897	2 326	2 754
420	418,75	421,25					1 073	1 260	1 629	1 992	2 442	2 892
440	438,75	441,25					1 124	1 320	1 707	2 087	2 548	3 030
460	458,75	461,25						1 380	1 785	2 182	2 674	3 168
480	478,75	481,25						1 440	1 863	2 277	2 790	3 306
500	498,75	501,25							1 941	2 372	2 906	3 444
1 000	995,5	1 004,5	995	1 330	1 650	2 080	2 560	3 000	3 882	4 744	5 812	6 888
2 000	1 992,5	2 007,5	1 990	2 660	3 300	4 160	5 120	6 000	7 764	9 488	11 624	13 776
3 000	2 989,5	3 010,5	2 985	3 990	4 950	6 240	7 680	9 000	11 646	14 232	17 436	20 664

(continued)

Table 1 (concluded)

Thread size (d)			(M39)	M42	(M45)	M48	(M52)	M56	(M60)	M64	(M68)	—
			(M39×3)	M42×3	(M45×3)	M48×3	(M52×3)	M56×4	(M60×4)	M64×4	(M68×4)	M72×6
l			Approx. mass, in kg, per 1 000 units									
Nominal size	Min.	Max.										
80	79,4	80,6	654									
(85)	84,3	85,7	694									
90	89,3	90,7	735	847								
(95)	94,3	95,7	776	894								
100	99,3	100,7	817	941	1 091	1 235						
110	109,3	110,7	899	1 036	1 201	1 358						
120	119,3	120,7	980	1 131	1 310	1 482	1 758	2 034				
130	129,2	130,8	1 062	1 224	1 419	1 605	1 905	2 203	2 552	2 895		
140	139,2	140,8	1 143	1 318	1 528	1 729	2 052	2 372	2 748	3 118	3 547	
150	149,2	150,8	1 225	1 412	1 637	1 852	2 198	2 542	2 945	3 341	3 800	4 289
160	159,2	160,8	1 307	1 506	1 747	1 976	2 345	2 711	3 141	3 563	4 054	4 575
170	169,2	170,8	1 389	1 600	1 856	2 099	2 491	2 881	3 337	3 786	4 307	4 861
180	179,2	180,8	1 471	1 695	1 965	2 223	2 637	3 050	3 533	4 009	4 560	5 147
190	189,075	190,925	1 552	1 789	2 074	2 346	2 784	3 219	3 729	4 232	4 814	5 433
200	199,075	200,925	1 634	1 883	2 183	2 470	2 931	3 389	3 926	4 455	5 067	5 719
220	219,075	220,925	1 797	2 071	2 401	2 716	3 224	3 728	4 319	4 901	5 574	6 291
240	239,075	240,925	1 961	2 260	2 620	2 963	3 517	4 067	4 712	5 347	6 080	6 863
260	258,95	261,05	2 124	2 448	2 838	3 210	3 810	4 406	5 104	5 793	6 587	7 435
280	278,95	281,05	2 288	2 636	3 056	3 457	4 103	4 745	5 497	6 239	7 094	8 007
300	298,95	301,05	2 451	2 824	3 275	3 704	4 396	5 084	5 889	6 682	7 600	8 579
320	318,85	321,15	2 614	3 013	3 493	3 951	4 689	5 423	6 282	7 127	8 107	9 150
340	338,85	341,15	2 778	3 201	3 711	4 198	4 982	5 762	6 675	7 572	8 614	9 722
360	358,85	361,15	2 941	3 389	3 930	4 445	5 275	6 101	7 067	8 017	9 121	10 294
380	378,85	381,15	3 104	3 578	4 148	4 692	5 568	6 440	7 460	8 462	9 627	10 866
400	398,85	401,15	3 267	3 766	4 366	4 939	5 861	6 779	7 853	8 908	10 134	11 438
420	418,75	421,25	3 430	3 954	4 585	5 186	6 155	7 118	8 245	9 354	10 641	12 009
440	438,75	441,25	3 593	4 142	4 803	5 433	6 448	7 457	8 638	9 799	11 147	12 582
460	458,75	461,25	3 756	4 330	5 021	5 680	6 741	7 796	9 030	10 245	11 654	13 154
480	478,75	481,25	3 919	4 518	5 239	5 927	7 034	8 134	9 423	10 690	12 161	13 726
500	498,75	501,25	4 082	4 706	5 457	6 174	7 327	8 473	9 816	11 136	12 667	14 298
1 000	995,5	1 004,5	8 164	9 412	10 914	12 348	14 654	16 946	19 632	22 272	25 334	28 596
2 000	1 992,5	2 007,5	16 328	18 824	21 828	24 696	29 308	33 892	39 264	44 544	50 668	57 192
3 000	2 989,5	3 010,5	24 492	28 236	32 742	37 044	43 962	50 838	58 896	66 816	76 002	85 788

Stud bolts are generally manufactured in the sizes for which a value of mass has been specified.

Lengths between 500 mm and 1 000 mm shall be graded in 20 mm steps.

Bracketed sizes should not be used.

4 Technical delivery conditions

Table 2: Technical delivery conditions

Material		Steel	Stainless steel	Nonferrous metal
General requirements		As specified in ISO 8992.		
Thread	Tolerance	6g		
	As specified in	DIN ISO 965-2.		
Mechanical properties	Property class (material)	For sizes up to M2,5: subject to agreement. For sizes M3 up to M39: 4.8, 5.6, 5.8, 8.8, 10.9 or 12.9. For sizes above M39: subject to agreement.	For sizes up to M2,5: subject to agreement. For sizes M3 up to M24: A2-70 or A4-70. For sizes above M24: subject to agreement.	CuZn [1]) Al [2])
	As specified in	DIN EN ISO 898-1 (test programme B).	DIN EN ISO 3506-1.	DIN EN 28839.
Limit deviations and geometrical tolerances [3])	Product grade	A		
	As specified in	DIN EN ISO 4759-1.		
Surface finish		As processed. DIN 267-2 applies with regard to surface roughness. DIN EN ISO 4042 applies with regard to electroplating. DIN EN ISO 10683 applies with regard to zinc flake coatings. DIN 267-10 applies with regard to hot-dip galvanizing.	Plain –	Plain –
Surface discontinuities		DIN EN 26157-3 applies with regard to limits for surface discontinuities for property classes 5.6, 8.8, 10.9, and 12.9.	–	–
Acceptance inspection		As specified in DIN EN ISO 3269.		

[1]) CU2 or CU3 grade copper-zinc alloy, at the manufacturer's discretion.

[2]) AL1 or AL2 grade aluminium alloy, at the manufacturer's discretion.

[3]) For stud bolts with nominal lengths of 1 000 mm or more, the tolerance on length shall be js17 (product grade B as in DIN EN ISO 4759-1).

5 Designation

Designation of an M10 stud bolt (M10) of type B (B), with a nominal length, l, of 80 mm (80), of property class 8.8:

Stud bolt DIN 976-1 – M10 × 80 – B – 8.8

The DIN 4000-2-3 tabular layout of article characteristics shall apply to studs covered in this standard.

6 Marking

6.1 Property class or steel grade

Steel stud bolts of size M5 or greater shall be marked at one end with the symbol denoting the property class, except for bolts of property class 4.8 (cf. DIN EN ISO 898-1). Marking with the manufacturer's symbol is not required.

Stainless steel stud bolts of size M5 or greater assigned to property class A2-70 or A4-70 shall be marked at one end with the symbol denoting the material grade (A2 or A4).

Marking of nonferrous metal stud bolts is not required.

6.2 Colour coding

As an alternative to marking as in subclause 6.1, stud bolts may be marked at one end with a colour code as in table 3. The marking shall not impair proper use of the bolt.

Table 3: Colour codes for stud bolts

Steel		
Property class 4.8	Marking not required.	
Property class 5.6	Brown	RAL 8015 [1])
Property class 5.8	Blue	RAL 5010 [1])
Property class 8.8	Yellow	RAL 1023 [1])
Property class 10.9	White	RAL 1013 [1])
Property class 12.9	Black	RAL 9017 [1])
Stainless steel		
A2-70	Green	RAL 6024 [1])
A4-70	Red	RAL 3000 [1])
Nonferrous metal		
CuZN, Al	Marking not required.	

[1]) As in RAL 840-HR, obtainable from *RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V.*, Siegburgerstraße 39, 53757 Sankt Augustin, Germany.