

Technical Sheet

Title	Mechanical properties of fasteners made of carbon steel and alloy steel. Part 1: Bolts, screws and studs.
Norm	UNE-EN ISO 898-1

1.- Scope and field of application.

This part of ISO 898 specifies the mechanical properties of bolts, screws and studs made of carbon steel and alloy steel when tested at room temperature 10-35 °C.

This part of ISO 898 applies to bolts, screws and studs

- With nominal thread diameter M-1,6 a M39 (coarse pitch) and thread diameter M8X1 a M39X3 (fine pitch)
- Con rosca de paso grueso M-1,6 a M39 y con rosca de paso fino M8X1 a M39X3
- With triangular ISO thread, according to ISO 68;
- With diameter/pitch combinations according to ISO 261 and ISO 262;
- With thread tolerance according to ISO 965-1 and ISO 965-2
- Made of carbon steel or alloy steel

It does not apply to set screws and similar threaded fasteners (see ISO 898-5)

It does not specify requirements for such properties as

- Weldability
- Corrosion-resistance
- Ability to withstand temperatures above +300°C(+250°C y 10.9) or below -50°C
- Cutting stress
- Fatigue stress

2- Chemical composition

Property class	Material and treatment	Chemical composition limits (Check analysis) % (m/m)				Tempering temperature °C	
		C		P	S		B
		Min	Max	Max	Max		Max
3.6	Carbon steel – Low tensile strength --	--	0.20	0.05	0.06	0.003	--
4.6		--	0.55				
4.8		--					
5.6		0.13					
5.8		--					
6.8		--					
8.8	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered	0.15	0.40	0.025	0.025	0.003	425
	Carbon steel quenched and tempered	0.25	0.55				
10.9	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered	0.25	0.55	0.025	0.025	0.003	425
	Carbon steel quenched and tempered	0.20					
	Alloy steel quenched and tempered						
12.9	Alloy steel quenched and tempered	0.28	0.50	0.025	0.025	0.003	380

3- Mechanical properties of bolts, screws and studs

Sub- clause nº	Mechanical property	Property class										
		3.6	4.6	4.8	5.6	5.8	6.8	8.8		10.9	12.9	
								d=<16 mm	d>16 mm			
5.1	Tensile strenght, Rm nominal	N/mm2	300	400		500		600	800		1000	1200
5.2	Tensile strenght, Rm min	N/mm2	330	400	420	500	520	600	800	830	1040	1220
5.3	Vickers hardness, HV F>=98N	Mín	95	120	130	155	160	190	250	255	320	385
		Máx	220					250	320	335	380	435
5.4	Brinell hardness, HB	Mín	90	114	124	147	152	238	242	276	304	366
		Máx	209					304	318	342	361	414
5.5	Rockwell hardness, HR	Mín B	52	67	71	79	82	89	--	--	--	--
		Min C	--					--	22	23	32	39
		Máx B	95					99.5				
		Máx C	--						32	34	39	44
5.7	Low yield stress, ReL, N/mm2	Nom	180	240	320	300	400	480	--	--	--	--
		Min	190	240	340	300	420	480	--	--	--	--
5.8	Proof Stress 0.2% Rp0,2 N/mm2	Nom	--	--	--	--	--	--	640	640	900	1080
		Min	--	--	--	--	--	--	640	660	940	1100
5.11	Elongation alter fracture, A	Min	25	22	--	20	--	--	12	12	10	8
5.14	Impact strength , KU	J Min	--	--	--	25	--	--	30	30	20	15

4- Minimum ultimate tensile loads – ISO metric coarse pitch thread –

Thread (d)	Nominal stress area $A_{s,nom}^b$ mm ²	Property class									
		3.6	4.6	4.8	5.6	5.8	6.8	8.8	9.8	10.9	12.9
		Minimum ultimate tensile load ($A_{s,nom} \times R_{m,min}$), N									
M3	5,03	1 660	2 010	2 110	2 510	2 620	3 020	4 020	4 530	5 230	6 140
M3,5	6,78	2 240	2 710	2 850	3 390	3 530	4 070	5 420	6 100	7 050	8 270
M4	8,78	2 900	3 510	3 690	4 390	4 570	5 270	7 020	7 900	9 130	10 700
M5	14,2	4 690	5 680	5 960	7 100	7 380	8 520	11 350	12 800	14 800	17 300
M6	20,1	6 630	8 040	8 440	10 000	10 400	12 100	16 100	18 100	20 900	24 500
M7	28,9	9 540	11 600	12 100	14 400	15 000	17 300	23 100	26 000	30 100	35 300
M8	36,6	12 100	14 600	15 400	18 300	19 000	22 000	29 200	32 900	38 100	44 600
M10	58	19 100	23 200	24 400	29 000	30 200	34 800	46 400	52 200	60 300	70 800
M12	84,3	27 800	33 700	35 400	42 200	43 800	50 600	67 400 ^e	75 900	87 700	103 000
M14	115	38 000	46 000	48 300	57 500	59 800	69 000	92 000 ^e	104 000	120 000	140 000
M16	157	51 800	62 800	65 900	78 500	81 600	94 000	125 000 ^e	141 000	163 000	192 000
M18	192	63 400	76 800	80 600	96 000	99 800	115 000	159 000	--	200 000	234 000
M20	245	80 800	98 000	103 000	122 000	127 000	147 000	203 000	--	255 000	299 000
M22	303	100 000	121 000	127 000	152 000	158 000	182 000	252 000	--	315 000	370 000
M24	353	116 000	141 000	148 000	176 000	184 000	212 000	293 000	--	367 000	431 000
M27	459	152 000	184 000	193 000	230 000	239 000	275 000	381 000	--	477 000	560 000
M30	561	185 000	224 000	236 000	280 000	292 000	337 000	466 000	--	583 000	684 000
M33	694	229 000	278 000	292 000	347 000	361 000	416 000	576 000	--	722 000	847 000
M36	817	270 000	327 000	343 000	408 000	425 000	490 000	678 000	--	850 000	997 000
M39	976	322 000	390 000	410 000	488 000	508 000	586 000	810 000	--	1020 000	1200 000

5- Proofing loads – ISO metric coarse pitch thread –

Thread (d)	Nominal stress area $A_{s,nom}^b$ mm ²	Property class									
		3.6	4.6	4.8	5.6	5.8	6.8	8.8	9.8	10.9	12.9
		Proofing load ($A_{s,nom} \times S_p$), N									
M3	5,03	910	1 130	1 560	1 410	1 910	2 210	2 920	3 270	4 180	4 880
M3,5	6,78	1 220	1 530	2 100	1 900	2 580	2 980	3 940	4 410	5 630	6 580
M4	8,78	1 580	1 980	2 720	2 460	3 340	3 860	5 100	5 710	7 290	8 520
M5	14,2	2 560	3 200	4 400	3 980	5 400	6 250	8 230	9 230	11 800	13 800
M6	20,1	3 620	4 520	6 230	5 630	7 640	8 840	11 600	13 100	16 700	19 500
M7	28,9	5 200	6 500	8 960	8 090	11 000	12 700	16 800	18 800	24 000	28 000
M8	36,6	6 590	8 240	11 400	10 200	13 900	16 100	21 200	23 800	30 400	35 500
M10	58	10 400	13 000	18 000	16 200	22 000	25 500	33 700	37 700	48 100	56 300
M12	84,3	15 200	19 000	26 100	23 600	32 000	37 100	48 900 ^c	54 800	70 000	81 800
M14	115	20 700	25 900	35 600	32 200	43 700	50 600	66 700 ^c	74 800	95 500	112 000
M16	157	28 300	35 300	48 700	44 000	59 700	69 100	91 000 ^c	102 000	130 000	152 000
M18	192	34 600	43 200	59 500	53 800	73 000	84 500	115 000	--	159 000	186 000
M20	245	44 100	55 100	76 000	68 600	93 100	108 000	147 000	--	203 000	238 000
M22	303	54 500	68 200	93 900	84 800	115 000	133 000	182 000	--	252 000	294 000
M24	353	63 500	79 400	109 000	98 800	134 000	155 000	212 000	--	293 000	342 000
M27	459	82 600	103 000	142 000	128 000	174 000	202 000	275 000	--	381 000	445 000
M30	561	101 000	126 000	174 000	157 000	213 000	247 000	337 000	--	466 000	544 000
M33	694	125 000	156 000	215 000	194 000	264 000	305 000	416 000	--	576 000	673 000
M36	817	147 000	184 000	253 000	229 000	310 000	359 000	490 000	--	678 000	792 000
M39	976	176 000	220 000	303 000	273 000	371 000	429 000	586 000	--	810 000	947 000