



Assembly of screwed fastenings

Tightening torque for fasteners made from brass, polyamide and heat-resisting steel (1.7709)

Preloads and tightening torque for fasteners made from brass

For fasteners made from brass, the friction coefficients in the thread and on the contact surfaces are much higher than with quenched and tempered steel screws. In order to determine the correct torque, it is recommended that experiments should be carried out under operating conditions. It is possible to reduce friction coefficients by using lubricating agents.

Table 18 lists non-binding typical values for various friction coefficients, valid for screws and nuts according to DIN 912, 931, 933 and 934/ISO 4762, 4014, 4017, 4032 made from brass with a minimum stress at 0.2% non-proportional elongation of 250 N/mm² (e.g. MS 58 and MS 63) and utilisation of the yield stress of 90%.

The tightening torques listed in the table may **only be used as very rough and non-binding typical values**.

Table 18

Ø	Assembly preloads in kN for $\mu_{total} =$								Tightening torque in Nm for $\mu_{total} =$							
	0.10	0.12	0.14	0.16	0.18	0.20	0.25	0.30	0.10	0.12	0.14	0.16	0.18	0.20	0.25	0.30
M 4	1.75	1.70	1.65	1.60	1.55	1.51	1.65	1.28	1.0	1.1	1.2	1.4	1.5	1.6	1.2	1.9
M 5	2.85	2.78	2.70	2.62	2.54	2.46	2.7	2.09	2.0	2.2	2.5	2.7	2.9	3.1	2.5	3.8
M 6	4.03	3.93	3.82	3.71	3.59	3.48	3.82	2.96	3.4	3.9	4.3	4.7	5.0	5.4	4.3	6.6
M 8	7.39	7.20	7.01	6.84	6.60	6.40	7.01	5.44	8.3	9.4	10.5	11.4	12.3	13.1	10.5	16.2
M 10	11.75	11.46	11.15	10.83	10.51	10.19	11.15	8.66	16.4	18.6	20.7	22.6	24.4	26.0	20.7	32.1
M 12	17.13	16.70	16.25	15.79	15.33	14.86	16.25	12.64	28.3	32.2	35.8	39.1	42.2	45.0	35.8	55.7
M 14	23.50	22.92	22.31	21.68	21.04	20.40	22.31	17.37	45.0	51.2	57.0	62.3	67.2	71.7	57	88.8
M 16	32.19	31.42	30.61	29.77	28.91	28.05	30.61	23.93	69.3	79.2	88.4	96.9	105	112	88.4	139
M 18	39.30	38.33	37.32	36.27	35.21	34.15	37.32	29.08	96.8	110	123	134	145	155	122.7	192
M 20	50.32	49.12	47.86	46.54	45.21	43.86	47.86	37.42	136	155	173	190	205	219	173.3	273
M 22	62.71	61.25	59.70	58.09	56.45	54.79	59.7	46.81	185	212	238	261	282	302	237.6	378
M 24	72.48	70.75	68.93	67.04	65.11	63.17	68.93	53.89	234	268	299	327	354	378	298.5	471
M 27	95.07	92.88	90.54	88.11	85.63	83.12	90.54	71.03	344	395	442	485	526	563	441.9	704
M 30	116	113	110	107	104	101	110.17	86.31	469	537	600	659	713	762	600.1	953
M 33	144	141	137	133	130	126	137.1	108	632	726	813	894	968	1036	812.7	1300
M 36	169	165	161	157	152	148	161.1	126	814	934	1045	1148	1243	1330	1044.6	1664
M 39	203	198	193	188	183	178	193.25	152	1051	1207	1353	1488	1613	1728	1353.1	2169

Tightening torques for polyamide screws and nuts

Table 19 includes non-binding typical values for appropriate tightening torques for screws and nuts made from polyamide 6.6 at 20 °C after storage in a normal climate.

The preload can ease off somewhat as a result of relaxation processes.

Table 19

Ø	Tightening torque in Nm
M 3	0.1
M 4	0.25
M 5	0.5
M 6	0.8
M 8	1.8
M 10	3.5
M 12	6.0
M 16	12

Tightening torques for bolts with waisted shank made from steel 21CrMoV5-7 (1.7709)

Table 20 includes non-binding typical values for appropriate tightening torques for bolts according to DIN 2510 made from steel 21CrMoV5-7 +QT (1.7709) and an yield stress utilisation of 70%.

Table 20

Thread	M 12		M 16		M 20		M 24		M 27	
Shank Ø	8.5		12		15		18		20.5	
μ_{total}	0.10	0.12	0.10	0.12	0.10	0.12	0.10	0.12	0.10	0.12
F_v [kN]	21.6	21.6	43.5	43.5	67.8	67.8	97.8	97.8	126.5	126.5
M_A [Nm]	38	44	98	115	190	220	320	370	465	545

Thread	M 30		M 33		M 36		M 39		M 42	
Shank Ø	23		25.5		27.5		30.5		32.5	
μ_{total}	0.10	0.12	0.10	0.12	0.10	0.12	0.10	0.12	0.10	0.12
F_v [kN]	160	160	196.5	196.5	228.5	228.5	281	281	319	319
M_A [Nm]	650	770	870	1000	1100	1300	1450	1750	1800	2100