

Appendix 34_INT

Screw Joints

Permitted tightening torques

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Headless screws with standard metric thread

Valid for headless screws with standard metric thread according to DIN 13 / ISO 965.
Bearing faces according to DIN 912, DIN 931 and DIN 933

Headless screws with standard metric thread ISO 965							
Property class	3.6	4.6	5.6 (4.8)	6.8	8.8	10.9	12.9
	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]
M 2	0.10	0.12	0.15	0.25	0.35	0.45	0.55
M 2.5	0.20	0.25	0.30	0.55	0.70	0.90	1.0
M3	0.35	0.45	0.55	0.85	1.2	1.6	1.9
M 4	0.80	1.0	1.2	2.0	2.7	4.2	4.6
M 5	1.4	2.0	2.4	4.0	5.5	7.5	9.0
M 6	2.4	3.3	4.2	7.0	9.0	14	16
M 8	6.0	8.0	10	16	22	33	38
M 10	12	16	20	33	44	65	75
M 12	20	28	35	52	75	112	131
M 16	52	65	89	131	187	275	322
M 20	105	131	167	275	377	538	629
M 24	167	238	275	447	649	925	1088

Table 1 – Standard assembly tightening torques for screws with standard metric thread

The standard assembly tightening torques are calculated based on the maximum tightening torques:
The maximum tightening torques for 8.8, 10.9 and 12.9 were taken from VDI 2230, and the torques for M2 – M3 and for the property classes 3.6, 4.6, 5.6 and 6.8 are provided in the technical information on the website of the Bossard Group [www.bossard.com]. **The specified values are based on a 90%-utilization of the 2%-offset yield stress / the yield strength and the friction coefficient μ_{TOTAL} 0.12.** In the case of critical screw joints, we recommend performing tests to determine the tightening torque. The total friction coefficient $\mu_{TOTAL} = 0.12$ was selected because it represents the state of the art in the manufacture of screws and the screw joints at Heidelberg.

Heidelberg has provided specifications for the design of screw joints in the SN 768-1 standard. The standard assembly tightening torques listed below are merely based on the properties of the screw. The assembly tightening torque of a screw joint depends on additional conditions that are taken into account by the design of the joint.

The thread tolerance for all screw types listed below is 6g. According to the standard, the tolerance 6h may be used as well. This tolerance must be specified if it is used!

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For rust-resistant screws, the total friction coefficient $\mu_{\text{TOTAL}} = 0.14$ is used.

Headless screws with standard metric thread* ISO 965 (rust-resistant screws) Material A2-70, A4-70									
Size	M4	M5	M6	M8	M10	M12	M16	M20	M24
M _{AS} [Nm]	2	3.7	6.5	16	31	56	131	257	238

Table 2 – Standard assembly tightening torques for rust-resistant screws with standard thread

*(Source: Values for max. tightening torques and total friction coefficient by Berrang, Mannheim)

Headless screws with metric fine pitch thread

Valid for headless screws with metric fine pitch thread according to DIN 13 / ISO 965
Bearing faces according to DIN 912, DIN 931 and DIN 933

Headless screws with metric fine pitch thread ISO 965					
Property class	4.8*	5.8*	8.8	10.9	12.9
	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]	M _{AS} [Nm]
M 8x1	8	15	24	35	41
M 10x1.25			47	70	75
M 12x1.25			83	121	142
M 12x1.5	26	47	75	112	142
M 16x1.5	65	121	208	302	322
M 20x1.5	131	257	412	587	687
M 24x2			687	1033	1177

Table 3 – Standard assembly tightening torques for screws with metric fine pitch thread

*(Source: Values for max. tightening torques of property classes 4.8 and 5.8 by Berrang, Mannheim [determined empirically])

Friction coefficients μ_{total} with different surface treatments of commercial screws:

μ_{total}	Surface treatment of the screws	Fault for M _A ¹⁾
0.14	Without aftertreatment or phosphatized, dry or lightly oiled, microencapsulated glue	1.00
0.125	Electrogalvanized (8 μm)	0.92
0.1	Lubricated with Molykote (MoS ₂)	0.80

¹⁾ The tightening torques M_A must be multiplied with this factor if $\mu_{\text{total}} = 0.14$.