

Stud Bolt Torque Chart

Tightening torque for stud bolts at three nut factors ($K\ 0.12/0.15/0.20$) × six property classes, target preload included, Nm ↔ ft-lb toggle.

M6–M36 · 6 property classes · K 0.12 / 0.15 / 0.20 · N·m · target preload kN · coarse + fine thread

M6

As 20.1 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	4.8	3	4	6
8.8	640	9	6	8	11
10.9	940	13.2	10	12	16
12.9	1100	15.5	11	14	19
A2-70	450	6.3	5	6	8
A4-80	600	8.4	6	8	10

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M6 × 1 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M6 As = 20.1 mm²).

M6 is not covered by the fine-thread stress area table of ISO 898-1:2013 (Table 6 starts at M8×1); the fine-thread values shown on this page equal the coarse chart.

M8

As 36.6 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	8.7	8	10	14
8.8	640	16.4	16	20	26
10.9	940	24.1	23	29	39
12.9	1100	28.2	27	34	45
A2-70	450	11.5	11	14	18
A4-80	600	15.4	15	18	25

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M8 × 1 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M8 As = 39.2 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	9.3	9	11	15
8.8	640	17.6	17	21	28
10.9	940	25.8	25	31	41
12.9	1100	30.2	29	36	48
A2-70	450	12.3	12	15	20
A4-80	600	16.5	16	20	26

M10

As 58 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	13.8	17	21	28
8.8	640	26	31	39	52
10.9	940	38.2	46	57	76
12.9	1100	44.7	54	67	89
A2-70	450	18.3	22	27	37
A4-80	600	24.4	29	37	49

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M10 × 1 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M10 As = 64.5 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	15.4	18	23	31
8.8	640	28.9	35	43	58
10.9	940	42.4	51	64	85
12.9	1100	49.7	60	74	99
A2-70	450	20.3	24	30	41
A4-80	600	27.1	33	41	54

M12

As 84.3 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	20.1	29	36	48
8.8	640	37.8	54	68	91
10.9	940	55.5	80	100	133
12.9	1100	64.9	93	117	156
A2-70	450	26.6	38	48	64
A4-80	600	35.4	51	64	85

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M12 × 1.5 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M12 As = 88.1 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	21	30	38	50
8.8	640	39.5	57	71	95
10.9	940	58	83	104	139
12.9	1100	67.8	98	122	163
A2-70	450	27.8	40	50	67
A4-80	600	37	53	67	89

M14

As 115 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	27.4	46	57	77

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
8.8	640	51.5	87	108	144
10.9	940	75.7	127	159	212
12.9	1100	88.6	149	186	248
A2-70	450	36.2	61	76	101
A4-80	600	48.3	81	101	135

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M14 × 1.5 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M14 As = 125 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	29.7	50	62	83
8.8	640	56	94	118	157
10.9	940	82.3	138	173	230
12.9	1100	96.3	162	202	270
A2-70	450	39.4	66	83	110
A4-80	600	52.5	88	110	147

M16

As 157 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	37.4	72	90	120
8.8	640	70.3	135	169	225
10.9	940	103.3	198	248	331
12.9	1100	120.9	232	290	387
A2-70	450	49.5	95	119	158
A4-80	600	65.9	127	158	211

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M16 × 1.5 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M16 As = 167 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	39.7	76	95	127
8.8	640	74.8	144	180	239
10.9	940	109.9	211	264	352
12.9	1100	128.6	247	309	411
A2-70	450	52.6	101	126	168
A4-80	600	70.1	135	168	224

M18

As 192 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	45.7	99	123	165
8.8	640	86	186	232	310

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
10.9	940	126.3	273	341	455
12.9	1100	147.8	319	399	532
A2-70	450	60.5	131	163	218
A4-80	600	80.6	174	218	290

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M18 × 1.5 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M18 As = 216 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	51.4	111	139	185
8.8	640	96.8	209	261	348
10.9	940	142.1	307	384	512
12.9	1100	166.3	359	449	599
A2-70	450	68	147	184	245
A4-80	600	90.7	196	245	327

M20

As 245 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	58.3	140	175	233
8.8	640	109.8	263	329	439
10.9	940	161.2	387	484	645
12.9	1100	188.7	453	566	755
A2-70	450	77.2	185	232	309
A4-80	600	102.9	247	309	412

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M20 × 1.5 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M20 As = 272 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	64.7	155	194	259
8.8	640	121.9	292	366	487
10.9	940	179	430	537	716
12.9	1100	209.4	503	628	838
A2-70	450	85.7	206	257	343
A4-80	600	114.2	274	343	457

M22

As 303 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	72.1	190	238	317
8.8	640	135.7	358	448	597
10.9	940	199.4	526	658	877

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
12.9	1100	233.3	616	770	1027
A2-70	450	95.4	252	315	420
A4-80	600	127.3	336	420	560

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M22 × 1.5 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M22 As = 333 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	79.3	209	262	349
8.8	640	149.2	394	492	656
10.9	940	219.1	578	723	964
12.9	1100	256.4	677	846	1128
A2-70	450	104.9	277	346	462
A4-80	600	139.9	369	462	615

M24

As 353 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	84	242	302	403
8.8	640	158.1	455	569	759
10.9	940	232.3	669	836	1115
12.9	1100	271.8	783	979	1305
A2-70	450	111.2	320	400	534
A4-80	600	148.3	427	534	712

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M24 × 2 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M24 As = 384 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	91.4	263	329	439
8.8	640	172	495	619	826
10.9	940	252.7	728	910	1213
12.9	1100	295.7	852	1064	1419
A2-70	450	121	348	435	581
A4-80	600	161.3	464	581	774

M27

As 459 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	109.2	354	442	590
8.8	640	205.6	666	833	1110
10.9	940	302	979	1223	1631
12.9	1100	353.4	1145	1431	1909

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
A2-70	450	144.6	468	586	781
A4-80	600	192.8	625	781	1041

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M27 × 2 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M27 As = 496 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	118	382	478	637
8.8	640	222.2	720	900	1200
10.9	940	326.4	1057	1322	1762
12.9	1100	381.9	1237	1547	2062
A2-70	450	156.2	506	633	844
A4-80	600	208.3	675	844	1125

M30

As 561 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	133.5	481	601	801
8.8	640	251.3	905	1131	1508
10.9	940	369.1	1329	1661	2215
12.9	1100	432	1555	1944	2592
A2-70	450	176.7	636	795	1060
A4-80	600	235.6	848	1060	1414

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M30 × 2 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M30 As = 621 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	147.8	532	665	887
8.8	640	278.2	1002	1252	1669
10.9	940	408.6	1471	1839	2452
12.9	1100	478.2	1721	2152	2869
A2-70	450	195.6	704	880	1174
A4-80	600	260.8	939	1174	1565

M33

As 694 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	165.2	654	818	1090
8.8	640	310.9	1231	1539	2052
10.9	940	456.7	1808	2260	3014
12.9	1100	534.4	2116	2645	3527
A2-70	450	218.6	866	1082	1443

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
A4-80	600	291.5	1154	1443	1924

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M33 × 2 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M33 As = 761 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	181.1	717	897	1195
8.8	640	340.9	1350	1688	2250
10.9	940	500.7	1983	2479	3305
12.9	1100	586	2320	2901	3867
A2-70	450	239.7	949	1187	1582
A4-80	600	319.6	1266	1582	2109

M36

As 817 mm² · N·m

Torque by Property Class and Nut Factor K

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	194.4	840	1050	1400
8.8	640	366	1581	1976	2635
10.9	940	537.6	2322	2903	3871
12.9	1100	629.1	2718	3397	4529
A2-70	450	257.4	1112	1390	1853
A4-80	600	343.1	1482	1853	2471

Each K column shows the tightening torque at that nut factor (N·m). K combines thread and bearing-surface friction: 0.12 ≈ well lubricated (MoS₂ / assembly paste), 0.15 ≈ normal assembly oil (typical default), 0.20 ≈ unlubricated or plated surfaces. Select by your actual lubrication condition; verify on site for critical joints.

Fine-Thread Torque Matrix

Fine-thread series (M36 × 3 mm) target preload and tightening torque, same basis as the coarse chart; the fine-thread stress area As follows ISO 898-1:2013 Table 6 (this page takes M36 As = 865 mm²).

Class	Rp0.2 (MPa)	Target preload (kN)	K 0.12 N·m	K 0.15 N·m	K 0.20 N·m
4.8	340	205.9	889	1112	1482
8.8	640	387.5	1674	2093	2790
10.9	940	569.2	2459	3074	4098
12.9	1100	666.1	2877	3597	4796
A2-70	450	272.5	1177	1471	1962
A4-80	600	363.3	1569	1962	2616

Basis of Calculation & Sources

Torque follows the K-factor (nut factor) method $T = K \cdot D \cdot F$: D is the nominal diameter and F the target preload = 70% of $Rp0.2 \times$ thread stress area (size As = {as} mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). The three K columns follow the standard stud-bolt torque table format (K = 0.12 / 0.15 / 0.20), the same three-column output as the online torque calculator's stud bolt mode.

Boundary: this chart is a simplified K-factor estimate, not a full VDI 2230 analysis (which also accounts for joint resilience, embedment and assembly method). Friction and lubrication are the dominant variables — the spread between K 0.12 and K 0.20 can reach ~65% of the torque value. Always follow the design specification or the manufacturer's torque table.

References

- ISO 898-1:2013 — Mechanical properties of fasteners made of carbon and alloy steel — <https://www.iso.org/standard/60610.html>
- ISO 3506-1:2020 — Mechanical properties of corrosion-resistant stainless steel fasteners (A2/A4) — <https://www.iso.org/standard/70045.html>
- GB/T 3098.1-2010 — Mechanical properties of bolts, screws and studs (CN national standard, official full text) — https://openstd.samr.gov.cn/bzgk/gb/std?std_no=GB%2FT%203098.1-2010

- GB/T 3098.6-2014 — Mechanical properties of stainless steel bolts, screws and studs (CN, official full text) — https://openstd.samr.gov.cn/bzgk/gb/std?std_no=GB%2FT%203098.6-2014
- ISO 16047:2005 — Fasteners: torque/clamp force testing (K-factor measurement method)
- Machinery's Handbook (30th ed.) — empirical K-factor ranges
- Machine Design — anti-seize compound friction test ($K \approx 0.10$)

Disclaimer: This chart is an engineering estimation for selection and budgeting only. It does not constitute assembly instructions or acceptance criteria.

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