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M6–M36 · English · bolt-torque-chart-en

# Bolt Torque Chart (Metric & Inch)

All sizes in one table: metric M6–M36 by property class and inch 1/4″–2″ by SAE grade, each size linked to its own page with five friction states; Nm ↔ ft-lb toggle, printable.

**M6–M36** · **6 property classes** · **5 friction states** · **N·m (typ / min–max)** · **coarse + fine thread**

## M6

N·m · As 20.1 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **4.8** | 6<br>5–6 | 5<br>4–6 | 6<br>5–7 | 4<br>3–4 | 3<br>2–3 |
| 8.8 | 640 | **9** | 11<br>10–12 | 9<br>8–11 | 12<br>10–14 | 7<br>6–8 | 5<br>4–6 |
| 10.9 | 940 | **13.2** | 16<br>14–17 | 13<br>12–16 | 17<br>14–20 | 10<br>10–12 | 8<br>6–10 |
| 12.9 | 1100 | **15.5** | 19<br>17–20 | 16<br>14–19 | 20<br>17–23 | 12<br>11–14 | 9<br>7–11 |
| A2-70 | 450 | **6.3** | 8<br>7–8 | 6<br>6–8 | 8<br>7–9 | 5<br>5–6 | 4<br>3–5 |
| A4-80 | 600 | **8.4** | 10<br>9–11 | 9<br>8–10 | 11<br>9–13 | 7<br>6–8 | 5<br>4–6 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M6 As = 20.1 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

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.

Cell shows the typical value; the small line below is the range (min–max).

## M8

N·m · As 36.6 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **8.7** | 14<br>13–15 | 12<br>10–14 | 15<br>13–17 | 9<br>8–10 | 7<br>6–8 |
| 8.8 | 640 | **16.4** | 26<br>24–29 | 22<br>20–26 | 29<br>24–33 | 17<br>16–20 | 13<br>10–16 |
| 10.9 | 940 | **24.1** | 39<br>35–42 | 33<br>29–39 | 42<br>35–48 | 25<br>23–29 | 19<br>15–23 |
| 12.9 | 1100 | **28.2** | 45<br>41–50 | 38<br>34–45 | 50<br>41–56 | 29<br>27–34 | 23<br>18–27 |
| A2-70 | 450 | **11.5** | 18<br>17–20 | 16<br>14–18 | 20<br>17–23 | 12<br>11–14 | 9<br>7–11 |
| A4-80 | 600 | **15.4** | 25<br>22–27 | 21<br>18–25 | 27<br>22–31 | 16<br>15–18 | 12<br>10–15 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M8 As = 36.6 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **9.3** | 15<br>13–16 | 13<br>11–15 | 16<br>13–19 | 10<br>9–11 | 7<br>6–9 |
| 8.8 | 640 | **17.6** | 28<br>25–31 | 24<br>21–28 | 31<br>25–35 | 18<br>17–21 | 14<br>11–17 |

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 10.9 | 940 | **25.8** | 41<br>37–45 | 35<br>31–41 | 45<br>37–52 | 27<br>25–31 | 21<br>17–25 |
| 12.9 | 1100 | **30.2** | 48<br>43–53 | 41<br>36–48 | 53<br>43–60 | 31<br>29–36 | 24<br>19–29 |
| A2-70 | 450 | **12.3** | 20<br>18–22 | 17<br>15–20 | 22<br>18–25 | 13<br>12–15 | 10<br>8–12 |
| A4-80 | 600 | **16.5** | 26<br>24–29 | 22<br>20–26 | 29<br>24–33 | 17<br>16–20 | 13<br>11–16 |

Cell shows the typical value; the small line below is the range (min–max).

## M10

N·m · As 58 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **13.8** | 28<br>25–30 | 23<br>21–28 | 30<br>25–35 | 18<br>17–21 | 14<br>11–17 |
| 8.8 | 640 | **26** | 52<br>47–57 | 44<br>39–52 | 57<br>47–65 | 34<br>31–39 | 26<br>21–31 |
| 10.9 | 940 | **38.2** | 76<br>69–84 | 65<br>57–76 | 84<br>69–95 | 50<br>46–57 | 38<br>31–46 |
| 12.9 | 1100 | **44.7** | 89<br>80–98 | 76<br>67–89 | 98<br>80–112 | 58<br>54–67 | 45<br>36–54 |
| A2-70 | 450 | **18.3** | 37<br>33–40 | 31<br>27–37 | 40<br>33–46 | 24<br>22–27 | 18<br>15–22 |
| A4-80 | 600 | **24.4** | 49<br>44–54 | 41<br>37–49 | 54<br>44–61 | 32<br>29–37 | 24<br>19–29 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M10 As = 58 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **15.4** | 31<br>28–34 | 26<br>23–31 | 34<br>28–38 | 20<br>18–23 | 15<br>12–18 |
| 8.8 | 640 | **28.9** | 58<br>52–64 | 49<br>43–58 | 64<br>52–72 | 38<br>35–43 | 29<br>23–35 |
| 10.9 | 940 | **42.4** | 85<br>76–93 | 72<br>64–85 | 93<br>76–106 | 55<br>51–64 | 42<br>34–51 |
| 12.9 | 1100 | **49.7** | 99<br>89–109 | 84<br>74–99 | 109<br>89–124 | 65<br>60–74 | 50<br>40–60 |
| A2-70 | 450 | **20.3** | 41<br>37–45 | 35<br>30–41 | 45<br>37–51 | 26<br>24–30 | 20<br>16–24 |
| A4-80 | 600 | **27.1** | 54<br>49–60 | 46<br>41–54 | 60<br>49–68 | 35<br>33–41 | 27<br>22–33 |

Cell shows the typical value; the small line below is the range (min–max).

## M12

N·m · As 84.3 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **20.1** | 48<br>43–53 | 41<br>36–48 | 53<br>43–60 | 31<br>29–36 | 24<br>19–29 |
| 8.8 | 640 | **37.8** | 91<br>82–100 | 77<br>68–91 | 100<br>82–113 | 59<br>54–68 | 45<br>36–54 |
| 10.9 | 940 | **55.5** | 133<br>120–146 | 113<br>100–133 | 146<br>120–166 | 87<br>80–100 | 67<br>53–80 |


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| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 12.9 | 1100 | **64.9** | 156<br>140–171 | 132<br>117–156 | 171<br>140–195 | 101<br>93–117 | 78<br>62–93 |
| A2-70 | 450 | **26.6** | 64<br>57–70 | 54<br>48–64 | 70<br>57–80 | 41<br>38–48 | 32<br>25–38 |
| A4-80 | 600 | **35.4** | 85<br>76–93 | 72<br>64–85 | 93<br>76–106 | 55<br>51–64 | 42<br>34–51 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M12 As = 84.3 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **21** | 50<br>45–55 | 43<br>38–50 | 55<br>45–63 | 33<br>30–38 | 25<br>20–30 |
| 8.8 | 640 | **39.5** | 95<br>85–104 | 81<br>71–95 | 104<br>85–118 | 62<br>57–71 | 47<br>38–57 |
| 10.9 | 940 | **58** | 139<br>125–153 | 118<br>104–139 | 153<br>125–174 | 90<br>83–104 | 70<br>56–83 |
| 12.9 | 1100 | **67.8** | 163<br>147–179 | 138<br>122–163 | 179<br>147–204 | 106<br>98–122 | 81<br>65–98 |
| A2-70 | 450 | **27.8** | 67<br>60–73 | 57<br>50–67 | 73<br>60–83 | 43<br>40–50 | 33<br>27–40 |
| A4-80 | 600 | **37** | 89<br>80–98 | 75<br>67–89 | 98<br>80–111 | 58<br>53–67 | 44<br>36–53 |

Cell shows the typical value; the small line below is the range (min–max).

## M14

N·m · As 115 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **27.4** | 77<br>69–84 | 65<br>57–77 | 84<br>69–96 | 50<br>46–57 | 38<br>31–46 |
| 8.8 | 640 | **51.5** | 144<br>130–159 | 123<br>108–144 | 159<br>130–180 | 94<br>87–108 | 72<br>58–87 |
| 10.9 | 940 | **75.7** | 212<br>191–233 | 180<br>159–212 | 233<br>191–265 | 138<br>127–159 | 106<br>85–127 |
| 12.9 | 1100 | **88.6** | 248<br>223–273 | 211<br>186–248 | 273<br>223–310 | 161<br>149–186 | 124<br>99–149 |
| A2-70 | 450 | **36.2** | 101<br>91–112 | 86<br>76–101 | 112<br>91–127 | 66<br>61–76 | 51<br>41–61 |
| A4-80 | 600 | **48.3** | 135<br>122–149 | 115<br>101–135 | 149<br>122–169 | 88<br>81–101 | 68<br>54–81 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M14 As = 115 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **29.7** | 83<br>75–92 | 71<br>62–83 | 92<br>75–104 | 54<br>50–62 | 42<br>33–50 |
| 8.8 | 640 | **56** | 157<br>141–172 | 133<br>118–157 | 172<br>141–196 | 102<br>94–118 | 78<br>63–94 |
| 10.9 | 940 | **82.3** | 230<br>207–253 | 196<br>173–230 | 253<br>207–288 | 150<br>138–173 | 115<br>92–138 |


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| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 12.9 | 1100 | **96.3** | 270<br>243–296 | 229<br>202–270 | 296<br>243–337 | 175<br>162–202 | 135<br>108–162 |
| A2-70 | 450 | **39.4** | 110<br>99–121 | 94<br>83–110 | 121<br>99–138 | 72<br>66–83 | 55<br>44–66 |
| A4-80 | 600 | **52.5** | 147<br>132–162 | 125<br>110–147 | 162<br>132–184 | 96<br>88–110 | 74<br>59–88 |

Cell shows the typical value; the small line below is the range (min–max).

## M16

N·m · As 157 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **37.4** | 120<br>108–132 | 102<br>90–120 | 132<br>108–149 | 78<br>72–90 | 60<br>48–72 |
| 8.8 | 640 | **70.3** | 225<br>203–248 | 191<br>169–225 | 248<br>203–281 | 146<br>135–169 | 113<br>90–135 |
| 10.9 | 940 | **103.3** | 331<br>298–364 | 281<br>248–331 | 364<br>298–413 | 215<br>198–248 | 165<br>132–198 |
| 12.9 | 1100 | **120.9** | 387<br>348–426 | 329<br>290–387 | 426<br>348–484 | 251<br>232–290 | 193<br>155–232 |
| A2-70 | 450 | **49.5** | 158<br>142–174 | 135<br>119–158 | 174<br>142–198 | 103<br>95–119 | 79<br>63–95 |
| A4-80 | 600 | **65.9** | 211<br>190–232 | 179<br>158–211 | 232<br>190–264 | 137<br>127–158 | 106<br>84–127 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M16 As = 157 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **39.7** | 127<br>114–140 | 108<br>95–127 | 140<br>114–159 | 83<br>76–95 | 64<br>51–76 |
| 8.8 | 640 | **74.8** | 239<br>215–263 | 203<br>180–239 | 263<br>215–299 | 156<br>144–180 | 120<br>96–144 |
| 10.9 | 940 | **109.9** | 352<br>316–387 | 299<br>264–352 | 387<br>316–440 | 229<br>211–264 | 176<br>141–211 |
| 12.9 | 1100 | **128.6** | 411<br>370–453 | 350<br>309–411 | 453<br>370–514 | 267<br>247–309 | 206<br>165–247 |
| A2-70 | 450 | **52.6** | 168<br>152–185 | 143<br>126–168 | 185<br>152–210 | 109<br>101–126 | 84<br>67–101 |
| A4-80 | 600 | **70.1** | 224<br>202–247 | 191<br>168–224 | 247<br>202–281 | 146<br>135–168 | 112<br>90–135 |

Cell shows the typical value; the small line below is the range (min–max).

## M18

N·m · As 192 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black<br>K 0.18–0.22 · N·m | Electro Zinc<br>K 0.15–0.2 · N·m | Hot-Dip Galv.<br>K 0.18–0.25 · N·m | Oiled<br>K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize<br>K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **45.7** | 165<br>148–181 | 140<br>123–165 | 181<br>148–206 | 107<br>99–123 | 82<br>66–99 |
| 8.8 | 640 | **86** | 310<br>279–341 | 263<br>232–310 | 341<br>279–387 | 201<br>186–232 | 155<br>124–186 |
| 10.9 | 940 | **126.3** | 455<br>409–500 | 387<br>341–455 | 500<br>409–569 | 296<br>273–341 | 227<br>182–273 |
| 12.9 | 1100 | **147.8** | 532<br>479–585 | 452<br>399–532 | 585<br>479–665 | 346<br>319–399 | 266<br>213–319 |


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| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| A2-70 | 450 | **60.5** | 218<br>196–240 | 185<br>163–218 | 240<br>196–272 | 142<br>131–163 | 109<br>87–131 |
| A4-80 | 600 | **80.6** | 290<br>261–319 | 247<br>218–290 | 319<br>261–363 | 189<br>174–218 | 145<br>116–174 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M18 As = 192 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **51.4** | 185<br>167–204 | 157<br>139–185 | 204<br>167–231 | 120<br>111–139 | 93<br>74–111 |
| 8.8 | 640 | **96.8** | 348<br>314–383 | 296<br>261–348 | 383<br>314–435 | 226<br>209–261 | 174<br>139–209 |
| 10.9 | 940 | **142.1** | 512<br>460–563 | 435<br>384–512 | 563<br>460–640 | 333<br>307–384 | 256<br>205–307 |
| 12.9 | 1100 | **166.3** | 599<br>539–659 | 509<br>449–599 | 659<br>539–748 | 389<br>359–449 | 299<br>240–359 |
| A2-70 | 450 | **68** | 245<br>220–269 | 208<br>184–245 | 269<br>220–306 | 159<br>147–184 | 122<br>98–147 |
| A4-80 | 600 | **90.7** | 327<br>294–359 | 278<br>245–327 | 359<br>294–408 | 212<br>196–245 | 163<br>131–196 |

Cell shows the typical value; the small line below is the range (min–max).

## M20

N·m · As 245 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **58.3** | 233<br>210–257 | 198<br>175–233 | 257<br>210–292 | 152<br>140–175 | 117<br>93–140 |
| 8.8 | 640 | **109.8** | 439<br>395–483 | 373<br>329–439 | 483<br>395–549 | 285<br>263–329 | 220<br>176–263 |
| 10.9 | 940 | **161.2** | 645<br>580–709 | 548<br>484–645 | 709<br>580–806 | 419<br>387–484 | 322<br>258–387 |
| 12.9 | 1100 | **188.7** | 755<br>679–830 | 641<br>566–755 | 830<br>679–943 | 490<br>453–566 | 377<br>302–453 |
| A2-70 | 450 | **77.2** | 309<br>278–340 | 262<br>232–309 | 340<br>278–386 | 201<br>185–232 | 154<br>123–185 |
| A4-80 | 600 | **102.9** | 412<br>370–453 | 350<br>309–412 | 453<br>370–515 | 268<br>247–309 | 206<br>165–247 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M20 As = 245 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **64.7** | 259<br>233–285 | 220<br>194–259 | 285<br>233–324 | 168<br>155–194 | 129<br>104–155 |
| 8.8 | 640 | **121.9** | 487<br>439–536 | 414<br>366–487 | 536<br>439–609 | 317<br>292–366 | 244<br>195–292 |
| 10.9 | 940 | **179** | 716<br>644–787 | 609<br>537–716 | 787<br>644–895 | 465<br>430–537 | 358<br>286–430 |
| 12.9 | 1100 | **209.4** | 838<br>754–922 | 712<br>628–838 | 922<br>754–1047 | 545<br>503–628 | 419<br>335–503 |


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| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| A2-70 | 450 | **85.7** | 343<br>308–377 | 291<br>257–343 | 377<br>308–428 | 223<br>206–257 | 171<br>137–206 |
| A4-80 | 600 | **114.2** | 457<br>411–503 | 388<br>343–457 | 503<br>411–571 | 297<br>274–343 | 228<br>183–274 |

Cell shows the typical value; the small line below is the range (min–max).

## M22

N·m · As 303 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **72.1** | 317<br>286–349 | 270<br>238–317 | 349<br>286–397 | 206<br>190–238 | 159<br>127–190 |
| 8.8 | 640 | **135.7** | 597<br>538–657 | 508<br>448–597 | 657<br>538–747 | 388<br>358–448 | 299<br>239–358 |
| 10.9 | 940 | **199.4** | 877<br>790–965 | 746<br>658–877 | 965<br>790–1097 | 570<br>526–658 | 439<br>351–526 |
| 12.9 | 1100 | **233.3** | 1027<br>924–1129 | 873<br>770–1027 | 1129<br>924–1283 | 667<br>616–770 | 513<br>411–616 |
| A2-70 | 450 | **95.4** | 420<br>378–462 | 357<br>315–420 | 462<br>378–525 | 273<br>252–315 | 210<br>168–252 |
| A4-80 | 600 | **127.3** | 560<br>504–616 | 476<br>420–560 | 616<br>504–700 | 364<br>336–420 | 280<br>224–336 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M22 As = 303 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **79.3** | 349<br>314–384 | 296<br>262–349 | 384<br>314–436 | 227<br>209–262 | 174<br>139–209 |
| 8.8 | 640 | **149.2** | 656<br>591–722 | 558<br>492–656 | 722<br>591–821 | 427<br>394–492 | 328<br>263–394 |
| 10.9 | 940 | **219.1** | 964<br>868–1061 | 819<br>723–964 | 1061<br>868–1205 | 627<br>578–723 | 482<br>386–578 |
| 12.9 | 1100 | **256.4** | 1128<br>1015–1241 | 959<br>846–1128 | 1241<br>1015–1410 | 733<br>677–846 | 564<br>451–677 |
| A2-70 | 450 | **104.9** | 462<br>415–508 | 392<br>346–462 | 508<br>415–577 | 300<br>277–346 | 231<br>185–277 |
| A4-80 | 600 | **139.9** | 615<br>554–677 | 523<br>462–615 | 677<br>554–769 | 400<br>369–462 | 308<br>246–369 |

Cell shows the typical value; the small line below is the range (min–max).

## M24

N·m · As 353 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **84** | 403<br>363–444 | 343<br>302–403 | 444<br>363–504 | 262<br>242–302 | 202<br>161–242 |
| 8.8 | 640 | **158.1** | 759<br>683–835 | 645<br>569–759 | 835<br>683–949 | 493<br>455–569 | 380<br>304–455 |
| 10.9 | 940 | **232.3** | 1115<br>1003–1226 | 948<br>836–1115 | 1226<br>1003–1394 | 725<br>669–836 | 557<br>446–669 |
| 12.9 | 1100 | **271.8** | 1305<br>1174–1435 | 1109<br>979–1305 | 1435<br>1174–1631 | 848<br>783–979 | 652<br>522–783 |
| A2-70 | 450 | **111.2** | 534<br>480–587 | 454<br>400–534 | 587<br>480–667 | 347<br>320–400 | 267<br>213–320 |


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| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| A4-80 | 600 | **148.3** | 712<br>640–783 | 605<br>534–712 | 783<br>640–890 | 463<br>427–534 | 356<br>285–427 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M24 As = 353 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **91.4** | 439<br>395–483 | 373<br>329–439 | 483<br>395–548 | 285<br>263–329 | 219<br>175–263 |
| 8.8 | 640 | **172** | 826<br>743–908 | 702<br>619–826 | 908<br>743–1032 | 537<br>495–619 | 413<br>330–495 |
| 10.9 | 940 | **252.7** | 1213<br>1092–1334 | 1031<br>910–1213 | 1334<br>1092–1516 | 788<br>728–910 | 606<br>485–728 |
| 12.9 | 1100 | **295.7** | 1419<br>1277–1561 | 1206<br>1064–1419 | 1561<br>1277–1774 | 923<br>852–1064 | 710<br>568–852 |
| A2-70 | 450 | **121** | 581<br>523–639 | 494<br>435–581 | 639<br>523–726 | 377<br>348–435 | 290<br>232–348 |
| A4-80 | 600 | **161.3** | 774<br>697–852 | 658<br>581–774 | 852<br>697–968 | 503<br>464–581 | 387<br>310–464 |

Cell shows the typical value; the small line below is the range (min–max).

## M27

N·m · As 459 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **109.2** | 590<br>531–649 | 501<br>442–590 | 649<br>531–737 | 383<br>354–442 | 295<br>236–354 |
| 8.8 | 640 | **205.6** | 1110<br>999–1221 | 944<br>833–1110 | 1221<br>999–1388 | 722<br>666–833 | 555<br>444–666 |
| 10.9 | 940 | **302** | 1631<br>1468–1794 | 1386<br>1223–1631 | 1794<br>1468–2039 | 1060<br>979–1223 | 815<br>652–979 |
| 12.9 | 1100 | **353.4** | 1909<br>1718–2099 | 1622<br>1431–1909 | 2099<br>1718–2386 | 1241<br>1145–1431 | 954<br>763–1145 |
| A2-70 | 450 | **144.6** | 781<br>703–859 | 664<br>586–781 | 859<br>703–976 | 507<br>468–586 | 390<br>312–468 |
| A4-80 | 600 | **192.8** | 1041<br>937–1145 | 885<br>781–1041 | 1145<br>937–1301 | 677<br>625–781 | 521<br>416–625 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M27 As = 459 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **118** | 637<br>574–701 | 542<br>478–637 | 701<br>574–797 | 414<br>382–478 | 319<br>255–382 |
| 8.8 | 640 | **222.2** | 1200<br>1080–1320 | 1020<br>900–1200 | 1320<br>1080–1500 | 780<br>720–900 | 600<br>480–720 |
| 10.9 | 940 | **326.4** | 1762<br>1586–1939 | 1498<br>1322–1762 | 1939<br>1586–2203 | 1146<br>1057–1322 | 881<br>705–1057 |
| 12.9 | 1100 | **381.9** | 2062<br>1856–2269 | 1753<br>1547–2062 | 2269<br>1856–2578 | 1341<br>1237–1547 | 1031<br>825–1237 |
| A2-70 | 450 | **156.2** | 844<br>759–928 | 717<br>633–844 | 928<br>759–1055 | 548<br>506–633 | 422<br>337–506 |


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| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| A4-80 | 600 | **208.3** | 1125<br>1012–1237 | 956<br>844–1125 | 1237<br>1012–1406 | 731<br>675–844 | 562<br>450–675 |

Cell shows the typical value; the small line below is the range (min–max).

## M30

N·m · As 561 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **133.5** | 801<br>721–881 | 681<br>601–801 | 881<br>721–1001 | 521<br>481–601 | 401<br>320–481 |
| 8.8 | 640 | **251.3** | 1508<br>1357–1659 | 1282<br>1131–1508 | 1659<br>1357–1885 | 980<br>905–1131 | 754<br>603–905 |
| 10.9 | 940 | **369.1** | 2215<br>1993–2436 | 1883<br>1661–2215 | 2436<br>1993–2769 | 1440<br>1329–1661 | 1107<br>886–1329 |
| 12.9 | 1100 | **432** | 2592<br>2333–2851 | 2203<br>1944–2592 | 2851<br>2333–3240 | 1685<br>1555–1944 | 1296<br>1037–1555 |
| A2-70 | 450 | **176.7** | 1060<br>954–1166 | 901<br>795–1060 | 1166<br>954–1325 | 689<br>636–795 | 530<br>424–636 |
| A4-80 | 600 | **235.6** | 1414<br>1272–1555 | 1202<br>1060–1414 | 1555<br>1272–1767 | 919<br>848–1060 | 707<br>565–848 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M30 As = 561 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **147.8** | 887<br>798–975 | 754<br>665–887 | 975<br>798–1108 | 576<br>532–665 | 443<br>355–532 |
| 8.8 | 640 | **278.2** | 1669<br>1502–1836 | 1419<br>1252–1669 | 1836<br>1502–2087 | 1085<br>1002–1252 | 835<br>668–1002 |
| 10.9 | 940 | **408.6** | 2452<br>2207–2697 | 2084<br>1839–2452 | 2697<br>2207–3065 | 1594<br>1471–1839 | 1226<br>981–1471 |
| 12.9 | 1100 | **478.2** | 2869<br>2582–3156 | 2439<br>2152–2869 | 3156<br>2582–3586 | 1865<br>1721–2152 | 1435<br>1148–1721 |
| A2-70 | 450 | **195.6** | 1174<br>1056–1291 | 998<br>880–1174 | 1291<br>1056–1467 | 763<br>704–880 | 587<br>469–704 |
| A4-80 | 600 | **260.8** | 1565<br>1408–1721 | 1330<br>1174–1565 | 1721<br>1408–1956 | 1017<br>939–1174 | 782<br>626–939 |

Cell shows the typical value; the small line below is the range (min–max).

## M33

N·m · As 694 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **165.2** | 1090<br>981–1199 | 927<br>818–1090 | 1199<br>981–1363 | 709<br>654–818 | 545<br>436–654 |
| 8.8 | 640 | **310.9** | 2052<br>1847–2257 | 1744<br>1539–2052 | 2257<br>1847–2565 | 1334<br>1231–1539 | 1026<br>821–1231 |
| 10.9 | 940 | **456.7** | 3014<br>2713–3315 | 2562<br>2260–3014 | 3315<br>2713–3767 | 1959<br>1808–2260 | 1507<br>1206–1808 |
| 12.9 | 1100 | **534.4** | 3527<br>3174–3880 | 2998<br>2645–3527 | 3880<br>3174–4409 | 2292<br>2116–2645 | 1763<br>1411–2116 |
| A2-70 | 450 | **218.6** | 1443<br>1299–1587 | 1226<br>1082–1443 | 1587<br>1299–1804 | 938<br>866–1082 | 721<br>577–866 |
| A4-80 | 600 | **291.5** | 1924<br>1731–2116 | 1635<br>1443–1924 | 2116<br>1731–2405 | 1250<br>1154–1443 | 962<br>770–1154 |


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Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M33 As = 694 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **181.1** | 1195<br>1076–1315 | 1016<br>897–1195 | 1315<br>1076–1494 | 777<br>717–897 | 598<br>478–717 |
| 8.8 | 640 | **340.9** | 2250<br>2025–2475 | 1913<br>1688–2250 | 2475<br>2025–2813 | 1463<br>1350–1688 | 1125<br>900–1350 |
| 10.9 | 940 | **500.7** | 3305<br>2974–3635 | 2809<br>2479–3305 | 3635<br>2974–4131 | 2148<br>1983–2479 | 1652<br>1322–1983 |
| 12.9 | 1100 | **586** | 3867<br>3481–4254 | 3287<br>2901–3867 | 4254<br>3481–4834 | 2514<br>2320–2901 | 1934<br>1547–2320 |
| A2-70 | 450 | **239.7** | 1582<br>1424–1740 | 1345<br>1187–1582 | 1740<br>1424–1978 | 1028<br>949–1187 | 791<br>633–949 |
| A4-80 | 600 | **319.6** | 2109<br>1899–2320 | 1793<br>1582–2109 | 2320<br>1899–2637 | 1371<br>1266–1582 | 1055<br>844–1266 |

Cell shows the typical value; the small line below is the range (min–max).

## M36

N·m · As 817 mm²

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **194.4** | 1400<br>1260–1540 | 1190<br>1050–1400 | 1540<br>1260–1750 | 910<br>840–1050 | 700<br>560–840 |
| 8.8 | 640 | **366** | 2635<br>2372–2899 | 2240<br>1976–2635 | 2899<br>2372–3294 | 1713<br>1581–1976 | 1318<br>1054–1581 |
| 10.9 | 940 | **537.6** | 3871<br>3484–4258 | 3290<br>2903–3871 | 4258<br>3484–4838 | 2516<br>2322–2903 | 1935<br>1548–2322 |
| 12.9 | 1100 | **629.1** | 4529<br>4077–4982 | 3850<br>3397–4529 | 4982<br>4077–5662 | 2944<br>2718–3397 | 2265<br>1812–2718 |
| A2-70 | 450 | **257.4** | 1853<br>1668–2038 | 1575<br>1390–1853 | 2038<br>1668–2316 | 1204<br>1112–1390 | 926<br>741–1112 |
| A4-80 | 600 | **343.1** | 2471<br>2224–2718 | 2100<br>1853–2471 | 2718<br>2224–3088 | 1606<br>1482–1853 | 1235<br>988–1482 |

Torque follows the K-factor (nut factor) method T = K·D·F: D is the nominal diameter and F the target preload = 70% of Rp0.2 × thread stress area (M36 As = 817 mm²). Yield strengths are published values from ISO 898-1 (carbon/alloy steel) and ISO 3506-1 (stainless A2/A4). K follows published empirical ranges per friction condition (Machinery's Handbook; the wax/PTFE/anti-seize band K≈0.10 follows Machine Design test data). The grease/$MoS_2$ band (K≈0.11) nearly overlaps anti-seize and is available in the calculator instead of a separate column.

### Fine-Thread Torque Matrix

| Class | Rp0.2 (MPa) | Target preload (kN) | Dry / Black K 0.18–0.22 · N·m | Electro Zinc K 0.15–0.2 · N·m | Hot-Dip Galv. K 0.18–0.25 · N·m | Oiled K 0.12–0.15 · N·m | Wax / PTFE / Anti-seize K 0.08–0.12 · N·m |
|---|---|---|---|---|---|---|---|
| 4.8 | 340 | **205.9** | 1482<br>1334–1630 | 1260<br>1112–1482 | 1630<br>1334–1853 | 963<br>889–1112 | 741<br>593–889 |
| 8.8 | 640 | **387.5** | 2790<br>2511–3069 | 2372<br>2093–2790 | 3069<br>2511–3488 | 1814<br>1674–2093 | 1395<br>1116–1674 |
| 10.9 | 940 | **569.2** | 4098<br>3688–4508 | 3483<br>3074–4098 | 4508<br>3688–5123 | 2664<br>2459–3074 | 2049<br>1639–2459 |
| 12.9 | 1100 | **666.1** | 4796<br>4316–5275 | 4076<br>3597–4796 | 5275<br>4316–5994 | 3117<br>2877–3597 | 2398<br>1918–2877 |
| A2-70 | 450 | **272.5** | 1962<br>1766–2158 | 1668<br>1471–1962 | 2158<br>1766–2452 | 1275<br>1177–1471 | 981<br>785–1177 |
| A4-80 | 600 | **363.3** | 2616<br>2354–2877 | 2223<br>1962–2616 | 2877<br>2354–3270 | 1700<br>1569–1962 | 1308<br>1046–1569 |

Cell shows the typical value; the small line below is the range (min–max).

## Basis of Calculation & Sources


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This chart is a simplified K-factor estimate, not a full VDI 2230 analysis (which accounts for joint resilience, embedment and assembly method). Friction is the dominant variable — no single torque value exists without its friction state. Always follow the design specification or manufacturer 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≈0.10)


Disclaimer: This chart is an engineering estimation for selection and budgeting only. It does not constitute assembly instructions or acceptance criteria. Unit weights are theoretical estimates (±5% typical; ±10% for carriage bolts, spring washers, self-drilling screws and anchors).

Bolt Torque Chart (Metric & Inch) — Yaxiio full-range reference PDF, pack v1 · generated 2026-10-19 · data source: yaxiio-customer/utils/fastenerCalc.ts (single source of truth) · methodology matches the online tool pages · https://www.yaxiio.com/en/tools/bolt-torque-chart/m12


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