

## Torque Recommendations

Unified thread

|                             |                     |  |
|-----------------------------|---------------------|--|
| HEICO-LOCK® material:       | <b>carbon steel</b> | C45E, through-hardened, zinc flake coated (flZnnc) |
| thread type:                | <b>UNC</b>          | unified coarse thread acc. to ASME B1.1            |
| screw product standard:     | ASTM B18.2.1        | hex. cap screw                                     |
| strength class:             | <b>Grade 5</b>      | acc. to SAE J429                                   |
| surface coating (bolt/nut): | <b>phosphated</b>   |  |

| lubrication:       |                           |             | assembly paste                 |                               |                                 |                                  | dry (delivery state)           |                               |                                 |                                  |
|--------------------|---------------------------|-------------|--------------------------------|-------------------------------|---------------------------------|----------------------------------|--------------------------------|-------------------------------|---------------------------------|----------------------------------|
| $\mu_G =$          |                           |             | 0.10                           |                               |                                 |                                  | 0.15                           |                               |                                 |                                  |
| $\mu_K =$          |                           |             | 0.16                           |                               |                                 |                                  | 0.18                           |                               |                                 |                                  |
| $\eta =$           |                           |             | 0.75                           |                               |                                 |                                  | 0.62                           |                               |                                 |                                  |
| Thread designation | nom. diameter d<br>[inch] | HEICO-LOCK® | SI Units                       |                               | Imperial Units                  |                                  | SI Units                       |                               | Imperial Units                  |                                  |
|                    |                           |             | Assembly preload $F_M$<br>[kN] | Assembly torque $M_A$<br>[Nm] | Assembly preload $F_M$<br>[lbf] | Assembly torque $M_A$<br>[lb ft] | Assembly preload $F_M$<br>[kN] | Assembly torque $M_A$<br>[Nm] | Assembly preload $F_M$<br>[lbf] | Assembly torque $M_A$<br>[lb ft] |
| UNC 1/4" - 20      | 1/4"                      | HL-1/4"     | 10.0                           | 12.6                          | 2 255                           | 9.3                              | 8.3                            | 12.6                          | 1 864                           | 9.3                              |
| UNC 5/16" - 18     | 5/16"                     | HL-8        | 16.5                           | 24.5                          | 3 703                           | 18.1                             | 13.6                           | 24.5                          | 3 061                           | 18.1                             |
| UNC 3/8" - 16      | 3/8"                      | HL-3/8"     | 24.3                           | 42.1                          | 5 461                           | 31.0                             | 20.1                           | 42.3                          | 4 515                           | 31.2                             |
| UNC 7/16" - 14     | 7/16"                     | HL-11       | 33.3                           | 65.3                          | 7 491                           | 48.2                             | 27.5                           | 65.8                          | 6 193                           | 48.5                             |
| UNC 1/2" - 13      | 1/2"                      | HL-1/2"     | 44.4                           | 101.2                         | 9 983                           | 74.6                             | 36.7                           | 102.0                         | 8 253                           | 75.2                             |
| UNC 9/16" - 12     | 9/16"                     | HL-14       | 56.9                           | 143.5                         | 12 792                          | 105.8                            | 47.0                           | 144.9                         | 10 575                          | 106.9                            |
| UNC 5/8" - 11      | 5/8"                      | HL-16       | 70.6                           | 200.3                         | 15 867                          | 147.7                            | 58.3                           | 202.1                         | 13 117                          | 149.1                            |
| UNC 3/4" - 10      | 3/4"                      | HL-3/4"     | 104                            | 351                           | 23 460                          | 259                              | 86                             | 355                           | 19 393                          | 262                              |
| UNC 7/8" - 9       | 7/8"                      | HL-22       | 144                            | 562                           | 32 361                          | 414                              | 119                            | 569                           | 26 751                          | 420                              |
| UNC 1" - 8         | 1"                        | HL-1"       | 189                            | 858                           | 42 445                          | 632                              | 156                            | 868                           | 35 088                          | 640                              |
| UNC 1 1/8" - 7     | 1 1/8"                    | HL-30       | 210                            | 1 080                         | 47 099                          | 796                              | 173                            | 1 092                         | 38 936                          | 805                              |
| UNC 1 1/4" - 7     | 1 1/4"                    | HL-33       | 266                            | 1 499                         | 59 696                          | 1 106                            | 220                            | 1 520                         | 49 349                          | 1 121                            |
| UNC 1 3/8" - 6     | 1 3/8"                    | HL-36       | 317                            | 1 968                         | 71 208                          | 1 452                            | 262                            | 1 994                         | 58 865                          | 1 471                            |
| UNC 1 1/2" - 6     | 1 1/2"                    | HL-39       | 385                            | 2 582                         | 86 526                          | 1 904                            | 318                            | 2 622                         | 71 528                          | 1 934                            |

### Symbols:

|           |   |
|-----------|---|
| $\mu_G$ : | Coefficient of friction in the thread                               |
| $\mu_K$ : | Coefficient of friction on the bearing surface (HEICO-LOCK®)        |
| $\eta$ :  | Utilization factor of the yield strength of the bolt by the preload |

### Conversion factors:

|         |                     |         |
|---------|---------------------|---------|
| force:  | factor N → lbf :    | 0.22481 |
| torque: | factor Nm → lb ft : | 0.73756 |

The friction affects the torque/preload ratio to a special degree. In critical cases of application a torque/preload test (e. g. acc. to ISO 16047) is strongly recommended. The calculated torque and preload values are recommendations which are made on the basis of assumed coefficients of friction especially those in the thread which are obtained from standards, specialist literature or internal testings. This does not release the user from the testing that is inevitable, given the diversity of possible influences in the processing and application of our products. Any legal guarantee of specific properties of suitability for any concrete operational purpose may not be assumed from the information provide. Status as of 01/2018

## Torque Recommendations

Unified thread

|                             |                     |  |
|-----------------------------|---------------------|--|
| HEICO-LOCK® material:       | <b>carbon steel</b> | C45E, through-hardened, zinc flake coated (flZnnc) |
| thread type:                | <b>UNC</b>          | unified coarse thread acc. to ASME B1.1            |
| screw product standard:     | ASTM B18.2.1        | hex. cap screw                                     |
| strength class:             | <b>Grade 8</b>      | acc. to SAE J429                                   |
| surface coating (bolt/nut): | <b>phosphated</b>   |  |

| lubrication:       |                           |             | assembly paste                 |                               |                                 |                                  | dry (delivery state)           |                               |                                 |                                  |
|--------------------|---------------------------|-------------|--------------------------------|-------------------------------|---------------------------------|----------------------------------|--------------------------------|-------------------------------|---------------------------------|----------------------------------|
| $\mu_G =$          |                           |             | 0.10                           |                               |                                 |                                  | 0.15                           |                               |                                 |                                  |
| $\mu_K =$          |                           |             | 0.16                           |                               |                                 |                                  | 0.18                           |                               |                                 |                                  |
| $\eta =$           |                           |             | 0.75                           |                               |                                 |                                  | 0.62                           |                               |                                 |                                  |
| Thread designation | nom. diameter d<br>[inch] | HEICO-LOCK® | SI Units                       |                               | Imperial Units                  |                                  | SI Units                       |                               | Imperial Units                  |                                  |
|                    |                           |             | Assembly preload $F_M$<br>[kN] | Assembly torque $M_A$<br>[Nm] | Assembly preload $F_M$<br>[lbf] | Assembly torque $M_A$<br>[lb ft] | Assembly preload $F_M$<br>[kN] | Assembly torque $M_A$<br>[Nm] | Assembly preload $F_M$<br>[lbf] | Assembly torque $M_A$<br>[lb ft] |
| UNC 1/4" - 20      | 1/4"                      | HL-1/4"     | 14.2                           | 17.8                          | 3 187                           | 13.2                             | 11.7                           | 17.7                          | 2 634                           | 13.1                             |
| UNC 5/16" - 18     | 5/16"                     | HL-8        | 23.3                           | 34.6                          | 5 232                           | 25.5                             | 19.2                           | 34.6                          | 4 325                           | 25.6                             |
| UNC 3/8" - 16      | 3/8"                      | HL-3/8"     | 34.3                           | 59.4                          | 7 717                           | 43.8                             | 28.4                           | 59.7                          | 6 379                           | 44.0                             |
| UNC 7/16" - 14     | 7/16"                     | HL-11       | 47.1                           | 92.2                          | 10 586                          | 68.0                             | 38.9                           | 93.0                          | 8 751                           | 68.6                             |
| UNC 1/2" - 13      | 1/2"                      | HL-1/2"     | 62.7                           | 143.0                         | 14 106                          | 105.5                            | 51.9                           | 144.1                         | 11 661                          | 106.3                            |
| UNC 9/16" - 12     | 9/16"                     | HL-14       | 80.4                           | 202.8                         | 18 076                          | 149.6                            | 66.5                           | 204.8                         | 14 943                          | 151.0                            |
| UNC 5/8" - 11      | 5/8"                      | HL-16       | 99.7                           | 283.0                         | 22 421                          | 208.7                            | 82.4                           | 285.6                         | 18 534                          | 210.6                            |
| UNC 3/4" - 10      | 3/4"                      | HL-3/4"     | 147                            | 495                           | 33 150                          | 365                              | 122                            | 501                           | 27 404                          | 370                              |
| UNC 7/8" - 9       | 7/8"                      | HL-22       | 203                            | 794                           | 45 727                          | 586                              | 168                            | 805                           | 37 801                          | 593                              |
| UNC 1" - 8         | 1"                        | HL-1"       | 267                            | 1 212                         | 59 977                          | 894                              | 221                            | 1 226                         | 49 581                          | 905                              |
| UNC 1 1/8" - 7     | 1 1/8"                    | HL-30       | 336                            | 1 733                         | 75 592                          | 1 278                            | 278                            | 1 752                         | 62 489                          | 1 292                            |
| UNC 1 1/4" - 7     | 1 1/4"                    | HL-33       | 426                            | 2 406                         | 95 809                          | 1 775                            | 352                            | 2 440                         | 79 202                          | 1 800                            |
| UNC 1 3/8" - 6     | 1 3/8"                    | HL-36       | 508                            | 3 159                         | 114 285                         | 2 330                            | 420                            | 3 200                         | 94 475                          | 2 360                            |
| UNC 1 1/2" - 6     | 1 1/2"                    | HL-39       | 618                            | 4 144                         | 138 869                         | 3 056                            | 511                            | 4 208                         | 114 798                         | 3 103                            |

### Symbols:

|           |   |
|-----------|---|
| $\mu_G$ : | Coefficient of friction in the thread                               |
| $\mu_K$ : | Coefficient of friction on the bearing surface (HEICO-LOCK®)        |
| $\eta$ :  | Utilization factor of the yield strength of the bolt by the preload |

### Conversion factors:

|         |                     |         |
|---------|---------------------|---------|
| force:  | factor N → lbf :    | 0.22481 |
| torque: | factor Nm → lb ft : | 0.73756 |

The friction affects the torque/preload ratio to a special degree. In critical cases of application a torque/preload test (e. g. acc. to ISO 16047) is strongly recommended. The calculated torque and preload values are recommendations which are made on the basis of assumed coefficients of friction especially those in the thread which are obtained from standards, specialist literature or internal testings. This does not release the user from the testing that is inevitable, given the diversity of possible influences in the processing and application of our products. Any legal guarantee of specific properties of suitability for any concrete operational purpose may not be assumed from the information provide. Status as of 01/2018

## Torque Recommendations

Unified thread

|                             |   |   |
|-----------------------------|---|---|
| HEICO-LOCK® material:       | <b>stainless steel</b>  | 1.4404 (316L), surface hardened         |
| thread type:                | <b>UNC</b>  | unified coarse thread acc. to ASME B1.1 |
| screw product standard:     | ASTM B18.2.1  | hex. cap screw                          |
| strength class:             | <b>Alloy Group 1/2</b><br><b>Condition SH</b><br><b>(materials e.g. 304, 316)</b> | acc. to SAE J429                        |
| surface coating (bolt/nut): | <b>none</b>   |   |

|                    |                           | lubrication: | <b>molybdenum disulfide (MoS2)</b> |                            |                              |                               |
|--------------------|---------------------------|--------------|------------------------------------|----------------------------|------------------------------|-------------------------------|
|                    |                           | $\mu_G =$    | 0.14                               |                            |                              |                               |
|                    |                           | $\mu_K =$    | 0.15                               |                            |                              |                               |
|                    |                           | $\eta =$     | 0.65                               |                            |                              |                               |
| Thread designation | nominal diameter d [inch] | HEICO-LOCK®  | SI Units                           |                            | Imperial Units               |                               |
|                    |                           |              | Assembly preload $F_M$ [kN]        | Assembly torque $M_A$ [Nm] | Assembly preload $F_M$ [lbf] | Assembly torque $M_A$ [lb ft] |
| UNC 1/4" - 20      | 1/4"                      | HL-1/4"S     | 9.0                                | 12.1                       | 2 018                        | 8.9                           |
| UNC 5/16" - 18     | 5/16"                     | HL-8S        | 14.7                               | 23.6                       | 3 314                        | 17.4                          |
| UNC 3/8" - 16      | 3/8"                      | HL-3/8"S     | 21.7                               | 40.7                       | 4 887                        | 30.0                          |
| UNC 7/16" - 14     | 7/16"                     | HL-11S       | 29.8                               | 63.4                       | 6 704                        | 46.7                          |
| UNC 1/2" - 13      | 1/2"                      | HL-1/2"S     | 39.7                               | 98.0                       | 8 934                        | 72.3                          |
| UNC 9/16" - 12     | 9/16"                     | HL-14S       | 50.9                               | 139.3                      | 11 448                       | 102.8                         |
| UNC 5/8" - 11      | 5/8"                      | HL-16S       | 63.2                               | 194.1                      | 14 200                       | 143.2                         |
| UNC 3/4" - 10      | 3/4"                      | HL-3/4"S     | 74                                 | 269                        | 16 575                       | 198                           |
| UNC 7/8" - 9       | 7/8"                      | HL-22S       | 102                                | 431                        | 22 863                       | 318                           |
| UNC 1" - 8         | 1"                        | HL-1"S       | 133                                | 656                        | 29 988                       | 484                           |
| UNC 1 1/8" - 7     | 1 1/8"                    | HL-30S       | 134                                | 750                        | 30 237                       | 553                           |
| UNC 1 1/4" - 7     | 1 1/4"                    | HL-33S       | 170                                | 1 044                      | 38 324                       | 770                           |
| UNC 1 3/8" - 6     | 1 3/8"                    | HL-36S       | 153                                | 1 028                      | 34 285                       | 758                           |
| UNC 1 1/2" - 6     | 1 1/2"                    | HL-39S       | 185                                | 1 350                      | 41 661                       | 996                           |

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