

## **PŘÍLOHA Č.01 / APPENDIX NO.01**

### **UTAHOVACÍ MOMENTY PRO PŘÍRUBOVÉ SPOJE S HŘEBÍNKOVÝM TĚSNĚNÍM PRO TLAKOVOU TŘÍDU**

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 0.7                                 | 11                                 | 6 ÷ 11                                |                        | 23.4                              | 18.4                              | 26.8                              | 20.4                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 0.7                                 | 14.2                               | 8 ÷ 14                                |                        | 26.3                              | 20.1                              | 34.7                              | 22.6                              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 0.7                                 | 13                                 | 10 ÷ 17                               |                        | 28.5                              | 21.5                              | 39.8                              | 24.3                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 0.8                                 | 15.4                               | 11 ÷ 19                               |                        | 31.4                              | 22.8                              | 44.9                              | 26                                |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 0.9                                 | 18.3                               | 17 ÷ 29                               |                        | 20.2                              | 13.4                              | 28.9                              | 15.5                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 0.9                                 | 23.2                               | 19 ÷ 33                               |                        | 22.8                              | 14.5                              | 32.6                              | 16.9                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 1.1                                 | 27.8                               | 23 ÷ 40                               |                        | 27.3                              | 16.4                              | 39                                | 19.4                              |
| 65                                                                   | 185    | 8        | M16      | 75       | 81                | 100        | 1.1                                 | 24.5                               | 17 ÷ 29                               |                        | 20.7                              | 14.6                              | 28.7                              | 17                                |
| 80                                                                   | 200    | 8        | M16      | 80       | 95                | 115        | 1.2                                 | 22.6                               | 21 ÷ 36                               |                        | 24.6                              | 16.3                              | 35.1                              | 19.2                              |
| 100                                                                  | 220    | 8        | M16      | 80       | 118               | 138        | 1.4                                 | 24.9                               | 25 ÷ 43                               |                        | 29.9                              | 19.1                              | 42.8                              | 22.8                              |
| 125                                                                  | 250    | 8        | M16      | 80       | 142               | 162        | 1.5                                 | 25.9                               | 30 ÷ 52                               |                        | 35.6                              | 22.2                              | 50.8                              | 26.9                              |
| 150                                                                  | 285    | 8        | M20      | 90       | 170               | 190        | 1.8                                 | 30.1                               | 44 ÷ 76                               |                        | 26.8                              | 16.6                              | 38.3                              | 20.3                              |
| 200                                                                  | 340    | 8        | M20      | 100      | 220               | 240        | 2.2                                 | 27.1                               | 57 ÷ 97                               |                        | 35.3                              | 21.5                              | 48.9                              | 26.8                              |
| 250                                                                  | 395    | 12       | M20      | 100      | 270               | 290        | 2.5                                 | 26.8                               | 46 ÷ 79                               |                        | 34.2                              | 20.9                              | 44.1                              | 26                                |
| 300                                                                  | 445    | 12       | M20      | 100      | 320               | 340        | 2.9                                 | 29.7                               | 54 ÷ 93                               |                        | 42.5                              | 25.2                              | 55.4                              | 31.9                              |
| 350                                                                  | 505    | 16       | M20      | 100      | 375               | 395        | 3.4                                 | 33                                 | 47 ÷ 81                               |                        | 42.5                              | 25.3                              | 55.4                              | 31.9                              |
| 400                                                                  | 565    | 16       | M24      | 110      | 426               | 450        | 3.2                                 | 37.7                               | 77 ÷ 132                              |                        | 36.1                              | 21                                | 47.5                              | 26.8                              |
| 450                                                                  | 615    | 20       | M24      | 110      | 480               | 506        | 3.3                                 | 45.1                               | 75 ÷ 129                              |                        | 36.3                              | 21.1                              | 47.8                              | 27                                |
| 500                                                                  | 670    | 20       | M24      | 110      | 530               | 560        | 3.2                                 | 51                                 | 96 ÷ 165                              |                        | 42.5                              | 24.3                              | 56.2                              | 31.3                              |
| 600                                                                  | 780    | 20       | M27      | 120      | 630               | 664        | 3.3                                 | 68.6                               | 144 ÷ 247                             |                        | 41.9                              | 23.5                              | 56                                | 44.8                              |
| 700                                                                  | 895    | 24       | M27      | 120      | 730               | 770        | 3.3                                 | 87.2                               | 163 ÷ 281                             |                        | 46                                | 25.5                              | 61.7                              | 49.2                              |
| 800                                                                  | 1015   | 24       | M30      | 135      | 830               | 876        | 3.3                                 | 85.6                               | 239 ÷ 410                             |                        | 46.6                              | 25.5                              | 62.9                              | 50                                |
| 900                                                                  | 1115   | 28       | M30      | 150      | 930               | 982        | 3.2                                 | 85.2                               | 259 ÷ 446                             |                        | 49.6                              | 27                                | 67.1                              | 53.2                              |
| 1000                                                                 | 1230   | 28       | M33      | 160      | 1040              | 1098       | 3.2                                 | 96.1                               | 350 ÷ 604                             |                        | 47.9                              | 25.7                              | 65.4                              |                                   |
| 1200                                                                 | 1455   | 32       | M36      | 190      | 1250              | 1320       | 3.2                                 | 71.9                               | 488 ÷ 840                             |                        | 50.2                              | 26.6                              | 71.1                              |                                   |
| 1400                                                                 | 1675   | 36       | M39      | 220      | 1440              | 1522       | 3.2                                 | 74.7                               | 629 ÷ 1088                            | 943 ÷ 1632             | 48.1                              | 25.3                              | 70.9                              |                                   |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 3.2                                 | 99.3                               | 838 ÷ 1451                            | 1257 ÷ 2176            |                                   |                                   |                                   |                                   |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 5                                   | 100.8                              | 731 ÷ 1266                            | 1096 ÷ 1898            |                                   |                                   |                                   |                                   |
| 2000                                                                 | 2325   | 48       | M45      | 220      | 2050              | 2120       | 5                                   | 103.3                              | 821 ÷ 1423                            | 1232 ÷ 2134            |                                   |                                   |                                   |                                   |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 0.7                                 | 11                                 | 6 ÷ 11                                |                        | 25.1                              | 18.8                              | 28.9                              | 21.6                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 0.7                                 | 14.2                               | 8 ÷ 14                                |                        | 28.3                              | 20.6                              | 34.7                              | 24                                |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 0.8                                 | 13                                 | 10 ÷ 17                               |                        | 30.9                              | 22                                | 39.8                              | 25.9                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 0.8                                 | 15.4                               | 11 ÷ 19                               |                        | 33.5                              | 23.5                              | 44.9                              | 27.9                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 1                                   | 18.3                               | 17 ÷ 29                               |                        | 20.4                              | 13.9                              | 28.9                              | 16.7                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 1                                   | 23.2                               | 19 ÷ 33                               |                        | 22.8                              | 15                                | 32.6                              | 18.3                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 1.2                                 | 27.8                               | 23 ÷ 40                               |                        | 27.3                              | 17                                | 39                                | 21.1                              |
| 65                                                                   | 185    | 8        | M16      | 75       | 81                | 100        | 1.2                                 | 24.5                               | 17 ÷ 29                               |                        | 22.7                              | 15.1                              | 28.7                              | 18.4                              |
| 80                                                                   | 200    | 8        | M16      | 80       | 95                | 115        | 1.3                                 | 22.6                               | 21 ÷ 36                               |                        | 26.2                              | 16.9                              | 35.1                              | 20.9                              |
| 100                                                                  | 220    | 8        | M16      | 80       | 118               | 138        | 1.5                                 | 24.9                               | 25 ÷ 43                               |                        | 31.9                              | 19.9                              | 42.8                              | 25                                |
| 125                                                                  | 250    | 8        | M16      | 80       | 142               | 162        | 1.7                                 | 25.9                               | 30 ÷ 52                               |                        | 38.3                              | 23.1                              | 50.8                              | 29.6                              |
| 150                                                                  | 285    | 8        | M20      | 90       | 170               | 190        | 1.9                                 | 30.1                               | 44 ÷ 76                               |                        | 29.6                              | 17.3                              | 38.3                              | 22.6                              |
| 200                                                                  | 340    | 8        | M20      | 100      | 220               | 240        | 2.3                                 | 27.1                               | 57 ÷ 97                               |                        | 40.2                              | 22.6                              | 52.3                              | 30                                |
| 250                                                                  | 395    | 12       | M20      | 100      | 270               | 290        | 2.8                                 | 26.8                               | 46 ÷ 79                               |                        | 38.9                              | 21.9                              | 50.5                              | 29.1                              |
| 300                                                                  | 445    | 12       | M20      | 100      | 320               | 340        | 3.2                                 | 29.7                               | 54 ÷ 93                               |                        | 48.6                              | 26.6                              | 63.7                              | 35.9                              |
| 350                                                                  | 505    | 16       | M20      | 100      | 375               | 395        | 3.7                                 | 35.2                               | 47 ÷ 81                               |                        | 48.6                              | 26.6                              | 63.7                              | 35.9                              |
| 400                                                                  | 565    | 16       | M24      | 110      | 426               | 450        | 3.5                                 | 40.3                               | 77 ÷ 132                              |                        | 41.5                              | 22.2                              | 54.8                              | 30.3                              |
| 450                                                                  | 615    | 20       | M24      | 110      | 480               | 506        | 3.6                                 | 48.3                               | 75 ÷ 129                              |                        | 41.7                              | 22.3                              | 55.2                              | 30.5                              |
| 500                                                                  | 670    | 20       | M24      | 110      | 530               | 560        | 3.5                                 | 54.5                               | 96 ÷ 165                              |                        | 49                                | 25.8                              | 65.2                              | 35.5                              |
| 600                                                                  | 780    | 20       | M27      | 120      | 630               | 664        | 3.6                                 | 73.4                               | 144 ÷ 247                             |                        | 48.6                              | 24.9                              | 65.2                              | 50.9                              |
| 700                                                                  | 895    | 24       | M27      | 120      | 730               | 770        | 3.6                                 | 93.4                               | 163 ÷ 281                             |                        | 53.4                              | 27.1                              | 71.9                              | 56                                |
| 800                                                                  | 1015   | 24       | M30      | 135      | 830               | 876        | 3.5                                 | 91.6                               | 239 ÷ 410                             |                        | 54.3                              | 27.1                              | 73.6                              | 57                                |
| 900                                                                  | 1115   | 28       | M30      | 150      | 930               | 982        | 3.5                                 | 91.3                               | 259 ÷ 446                             |                        | 57.8                              | 28.7                              | 78.5                              | 60.7                              |
| 1000                                                                 | 1230   | 28       | M33      | 160      | 1040              | 1098       | 3.5                                 | 103.1                              | 350 ÷ 604                             |                        | 56                                | 27.4                              | 75.6                              |                                   |
| 1200                                                                 | 1455   | 32       | M36      | 190      | 1250              | 1320       | 3.5                                 | 77.2                               | 488 ÷ 840                             |                        | 58.6                              | 28.4                              | 78.7                              |                                   |
| 1400                                                                 | 1675   | 36       | M39      | 220      | 1440              | 1522       | 3.5                                 | 80.1                               | 629 ÷ 1088                            | 943 ÷ 1632             | 55.9                              | 27.1                              | 75.4                              |                                   |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 3.5                                 | 106.6                              | 838 ÷ 1451                            | 1257 ÷ 2176            |                                   |                                   |                                   |                                   |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 5.4                                 | 108.7                              | 792 ÷ 1372                            | 1188 ÷ 2058            |                                   |                                   |                                   |                                   |
| 2000                                                                 | 2325   | 48       | M45      | 220      | 2050              | 2120       | 5.5                                 | 111.4                              | 890 ÷ 1542                            | 1335 ÷ 2313            |                                   |                                   |                                   |                                   |

Obr. / Fig.1 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN10

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | Uťahovací Moment [Nm]                 | [Nm]                   |                                   |                                   |                                   |                                   |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 0.8                                 | 11                                 | 6 ÷ 11                                |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 0.8                                 | 14.2                               | 8 ÷ 14                                |                        | 26.8                              | 19.3                              | 30.5                              | 22                                |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 0.8                                 | 13                                 | 10 ÷ 17                               |                        | 30.5                              | 21.2                              | 35.1                              | 24.5                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 0.9                                 | 15.4                               | 11 ÷ 19                               |                        | 33.4                              | 22.7                              | 39.8                              | 26.5                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 1                                   | 18.3                               | 17 ÷ 29                               |                        | 36.4                              | 24.3                              | 44.9                              | 28.5                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 1.1                                 | 23.2                               | 19 ÷ 33                               |                        | 22.4                              | 14.4                              | 28.9                              | 17.1                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 1.2                                 | 27.8                               | 23 ÷ 40                               |                        | 24.8                              | 15.6                              | 32.6                              | 18.8                              |
| 65                                                                   | 185    | 8        | M16      | 75       | 81                | 100        | 1.3                                 | 24.5                               | 17 ÷ 29                               |                        | 29.2                              | 17.8                              | 39                                | 21.7                              |
| 80                                                                   | 200    | 8        | M16      | 80       | 95                | 115        | 1.3                                 | 22.6                               | 21 ÷ 36                               |                        | 24.9                              | 15.7                              | 29.7                              | 18.9                              |
| 100                                                                  | 220    | 8        | M16      | 80       | 118               | 138        | 1.6                                 | 24.9                               | 25 ÷ 43                               |                        | 29                                | 17.6                              | 35.1                              | 21.5                              |
| 125                                                                  | 250    | 8        | M16      | 80       | 142               | 162        | 1.8                                 | 25.9                               | 30 ÷ 52                               |                        | 35.5                              | 20.8                              | 43.1                              | 25.8                              |
| 150                                                                  | 285    | 8        | M20      | 90       | 170               | 190        | 2                                   | 30.1                               | 44 ÷ 76                               |                        | 42.9                              | 24.3                              | 52.6                              | 30.6                              |
| 200                                                                  | 340    | 8        | M20      | 100      | 220               | 240        | 2.5                                 | 27.1                               | 57 ÷ 97                               |                        | 33.3                              | 18.3                              | 41.3                              | 23.3                              |
| 250                                                                  | 395    | 12       | M20      | 100      | 270               | 290        | 2.9                                 | 26.8                               | 46 ÷ 79                               |                        | 45.6                              | 23.9                              | 57.3                              | 31.1                              |
| 300                                                                  | 445    | 12       | M20      | 100      | 320               | 340        | 3.4                                 | 31                                 | 54 ÷ 93                               |                        | 44.1                              | 23.2                              | 55.3                              | 30.2                              |
| 350                                                                  | 505    | 16       | M20      | 100      | 375               | 395        | 3.9                                 | 43.4                               | 47 ÷ 81                               |                        | 55.4                              | 28.2                              | 70                                | 37.3                              |
| 400                                                                  | 565    | 16       | M24      | 110      | 426               | 450        | 3.7                                 | 49.6                               | 77 ÷ 132                              |                        | 55.4                              | 28.2                              | 70                                | 37.3                              |
| 450                                                                  | 615    | 20       | M24      | 110      | 480               | 506        | 3.8                                 | 59.4                               | 75 ÷ 129                              |                        | 47.5                              | 23.6                              | 60.4                              | 31.5                              |
| 500                                                                  | 670    | 20       | M24      | 110      | 530               | 560        | 3.7                                 | 67.1                               | 96 ÷ 165                              |                        | 47.8                              | 23.7                              | 60.9                              | 31.7                              |
| 600                                                                  | 780    | 20       | M27      | 120      | 630               | 664        | 3.8                                 | 90.3                               | 144 ÷ 247                             |                        | 56.2                              | 27.4                              | 72                                | 37                                |
| 700                                                                  | 895    | 24       | M27      | 120      | 730               | 770        | 3.8                                 | 114.8                              | 163 ÷ 281                             |                        | 56                                | 26.6                              | 72.3                              | 52.8                              |
| 800                                                                  | 1015   | 24       | M30      | 135      | 830               | 876        | 3.7                                 | 112.7                              | 239 ÷ 410                             |                        | 61.7                              | 29                                | 79.7                              | 58                                |
| 900                                                                  | 1115   | 28       | M30      | 150      | 930               | 982        | 3.7                                 | 112.2                              | 259 ÷ 446                             |                        | 62.9                              | 29.1                              | 81.7                              | 59.1                              |
| 1000                                                                 | 1230   | 28       | M33      | 160      | 1040              | 1098       | 3.7                                 | 126.6                              | 350 ÷ 604                             |                        | 67.1                              | 30.8                              | 86.9                              | 63                                |
| 1200                                                                 | 1455   | 32       | M36      | 190      | 1250              | 1320       | 3.7                                 | 93.4                               | 488 ÷ 840                             | 731 ÷ 1261             | 65.1                              | 29.5                              | 83.6                              |                                   |
| 1400                                                                 | 1675   | 36       | M39      | 220      | 1440              | 1522       | 3.7                                 | 97                                 | 629 ÷ 1088                            | 943 ÷ 1632             | 67.6                              | 30.6                              | 87.2                              |                                   |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 3.7                                 | 129                                | 838 ÷ 1451                            | 1257 ÷ 2176            | 64.6                              | 29.2                              | 83.6                              |                                   |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 5.7                                 | 131                                | 838 ÷ 1451                            | 1257 ÷ 2177            |                                   |                                   |                                   |                                   |
| 2000                                                                 | 2325   | 48       | M45      | 220      | 2050              | 2120       | 5.8                                 | 134.2                              | 942 ÷ 1632                            | 1413 ÷ 2447            |                                   |                                   |                                   |                                   |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | Uťahovací Moment [Nm]                 | [Nm]                   |                                   |                                   |                                   |                                   |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 0.9                                 | 11                                 | 6 ÷ 11                                |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 0.9                                 | 14.2                               | 8 ÷ 14                                |                        | 30.1                              | 20                                | 32.4                              | 22.5                              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 1                                   | 13                                 | 10 ÷ 17                               |                        | 34.5                              | 22.1                              | 37.5                              | 25.2                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 1                                   | 15.4                               | 11 ÷ 19                               |                        | 38.1                              | 23.7                              | 41.5                              | 27.2                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 1.2                                 | 18.3                               | 17 ÷ 29                               |                        | 41.7                              | 25.4                              | 45.7                              | 29.4                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 1.2                                 | 23.2                               | 19 ÷ 33                               |                        | 25.9                              | 15.1                              | 28.9                              | 17.7                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 1.4                                 | 27.8                               | 23 ÷ 40                               |                        | 28.9                              | 16.4                              | 32.6                              | 19.4                              |
| 65                                                                   | 185    | 8        | M16      | 75       | 81                | 100        | 1.4                                 | 24.5                               | 17 ÷ 29                               |                        | 34.4                              | 18.8                              | 39                                | 22.5                              |
| 80                                                                   | 200    | 8        | M16      | 80       | 95                | 115        | 1.5                                 | 22.6                               | 21 ÷ 36                               |                        | 29.1                              | 16.5                              | 32.2                              | 19.5                              |
| 100                                                                  | 220    | 8        | M16      | 80       | 118               | 138        | 1.8                                 | 24.9                               | 25 ÷ 43                               |                        | 34.1                              | 18.7                              | 38                                | 22.4                              |
| 125                                                                  | 250    | 8        | M16      | 80       | 142               | 162        | 2                                   | 25.9                               | 30 ÷ 52                               |                        | 42.2                              | 22.1                              | 47.2                              | 26.8                              |
| 150                                                                  | 285    | 8        | M20      | 90       | 170               | 190        | 2.3                                 | 30.1                               | 44 ÷ 76                               |                        | 51.5                              | 25.9                              | 58                                | 31.9                              |
| 200                                                                  | 340    | 8        | M20      | 100      | 220               | 240        | 2.8                                 | 27.4                               | 57 ÷ 97                               |                        | 40.4                              | 19.6                              | 45.7                              | 24.4                              |
| 250                                                                  | 395    | 12       | M20      | 100      | 270               | 290        | 3.4                                 | 30.7                               | 46 ÷ 79                               |                        | 55.9                              | 25.7                              | 63.7                              | 32.7                              |
| 300                                                                  | 445    | 12       | M20      | 100      | 320               | 340        | 3.9                                 | 39.2                               | 54 ÷ 93                               |                        | 54                                | 25                                | 61.5                              | 31.7                              |
| 350                                                                  | 505    | 16       | M20      | 100      | 375               | 395        | 4.4                                 | 54.9                               | 53 ÷ 90                               |                        | 68.3                              | 30.5                              | 78.1                              | 39.2                              |
| 400                                                                  | 565    | 16       | M24      | 110      | 426               | 450        | 4.2                                 | 62.9                               | 82 ÷ 140                              |                        | 68.3                              | 30.5                              | 78.1                              | 39.2                              |
| 450                                                                  | 615    | 20       | M24      | 110      | 480               | 506        | 4.4                                 | 75.3                               | 82 ÷ 141                              |                        | 58.9                              | 25.6                              | 67.6                              | 33.2                              |
| 500                                                                  | 670    | 20       | M24      | 110      | 530               | 560        | 4.2                                 | 85                                 | 101 ÷ 173                             |                        | 59.3                              | 25.8                              | 68.1                              | 33.4                              |
| 600                                                                  | 780    | 20       | M27      | 120      | 630               | 664        | 4.4                                 | 114.4                              | 158 ÷ 275                             |                        | 70.1                              | 29.9                              | 80.7                              | 39                                |
| 700                                                                  | 895    | 24       | M27      | 120      | 730               | 770        | 4.3                                 | 145.6                              | 177 ÷ 302                             |                        | 70.3                              | 29.1                              | 81.3                              | 55.8                              |
| 800                                                                  | 1015   | 24       | M30      | 135      | 830               | 876        | 4.3                                 | 142.9                              | 256 ÷ 440                             |                        | 77.6                              | 31.7                              | 89.7                              | 61.4                              |
| 900                                                                  | 1115   | 28       | M30      | 150      | 930               | 982        | 4.3                                 | 142.4                              | 276 ÷ 474                             |                        | 79.5                              | 31.9                              | 91.5                              | 62.7                              |
| 1000                                                                 | 1230   | 28       | M33      | 160      | 1040              | 1098       | 4.3                                 | 160.6                              | 373 ÷ 645                             |                        | 84.6                              | 33.8                              | 97.3                              | 66.8                              |
| 1200                                                                 | 1455   | 32       | M36      | 190      | 1250              | 1320       | 4.3                                 | 119.3                              | 518 ÷ 893                             | 777 ÷ 1340             | 81.4                              | 32.4                              | 93.9                              |                                   |
| 1400                                                                 | 1675   | 36       | M39      | 220      | 1440              | 1522       | 4.2                                 | 124                                | 659 ÷ 1139                            | 988 ÷ 1709             | 84.9                              | 33.7                              | 98.2                              |                                   |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 4.3                                 | 164.9                              | 894 ÷ 1548                            | 1341 ÷ 2322            | 81.4                              | 32.2                              | 94.2                              |                                   |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 6.5                                 | 167.5                              | 961 ÷ 1664                            | 1441 ÷ 2496            |                                   |                                   |                                   |                                   |
| 2000                                                                 | 2325   | 48       | M45      | 220      | 2050              | 2120       | 6.6                                 | 171.7                              | 1080 ÷ 1870                           | 1620 ÷ 2805            |                                   |                                   |                                   |                                   |

Obr. / Fig.2 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN10

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 0.7                                 | 11                                 | 6 ÷ 11                                |                        | 22.8                              | 21.4                              | 18.8                              | 28.6                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 0.7                                 | 14.2                               | 8 ÷ 14                                |                        | 25.5                              | 23.8                              | 20.6                              | 38.3                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 0.7                                 | 13                                 | 10 ÷ 17                               |                        | 27.6                              | 25.6                              | 22                                | 44                                |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 0.8                                 | 15.4                               | 11 ÷ 19                               |                        | 29.8                              | 27.6                              | 23.5                              | 49.6                              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 0.9                                 | 18.3                               | 17 ÷ 29                               |                        | 18.7                              | 16.5                              | 13.9                              | 31.9                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 0.9                                 | 23.2                               | 19 ÷ 33                               |                        | 21.1                              | 18.1                              | 15                                | 36                                |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81         | 1.1                                 | 27.8                               | 23 ÷ 40                               |                        | 25.2                              | 21                                | 17                                | 43.1                              |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100        | 1.1                                 | 24.5                               | 17 ÷ 29                               |                        | 19.8                              | 18.2                              | 15.1                              | 31.8                              |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115        | 1.2                                 | 22.6                               | 21 ÷ 36                               |                        | 22.7                              | 20.7                              | 16.9                              | 38.8                              |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138        | 1.4                                 | 24.9                               | 25 ÷ 43                               |                        | 27.6                              | 24.7                              | 19.9                              | 47.3                              |
| 125                                                                  | 250    | 8        | M16      | 90       | 142               | 162        | 1.5                                 | 25.9                               | 30 ÷ 52                               |                        | 32.8                              | 29.2                              | 23.1                              | 56.1                              |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190        | 1.8                                 | 30.1                               | 44 ÷ 76                               |                        | 24.9                              | 22.2                              | 17.3                              | 42.3                              |
| 200                                                                  | 340    | 8        | M20      | 110      | 220               | 240        | 2.2                                 | 27.1                               | 57 ÷ 97                               |                        | 33.4                              | 29.5                              | 22.6                              | 54                                |
| 250                                                                  | 395    | 12       | M20      | 110      | 270               | 290        | 2.5                                 | 26.8                               | 46 ÷ 79                               |                        | 32.4                              | 28.6                              | 21.9                              | 47.5                              |
| 300                                                                  | 445    | 12       | M20      | 110      | 320               | 340        | 2.9                                 | 29.7                               | 54 ÷ 93                               |                        | 40.1                              | 35.2                              | 26.6                              | 59.8                              |
| 350                                                                  | 505    | 16       | M20      | 110      | 375               | 395        | 3.4                                 | 33                                 | 47 ÷ 81                               |                        | 40.1                              | 35.2                              | 26.6                              | 59.8                              |
| 400                                                                  | 565    | 16       | M24      | 120      | 426               | 450        | 3.2                                 | 37.7                               | 77 ÷ 132                              |                        | 34                                | 29.7                              | 22.2                              | 51.3                              |
| 450                                                                  | 615    | 20       | M24      | 120      | 480               | 506        | 3.3                                 | 45.1                               | 75 ÷ 129                              |                        | 34.2                              | 29.9                              | 22.3                              | 51.7                              |
| 500                                                                  | 670    | 20       | M24      | 120      | 530               | 560        | 3.2                                 | 51                                 | 96 ÷ 165                              |                        | 40                                | 34.8                              | 25.8                              | 61                                |
| 600                                                                  | 780    | 20       | M27      | 130      | 630               | 664        | 3.3                                 | 68.6                               | 144 ÷ 247                             |                        | 39.3                              | 34.1                              | 24.9                              | 60.9                              |
| 700                                                                  | 895    | 24       | M27      | 140      | 730               | 770        | 3.3                                 | 87.2                               | 163 ÷ 281                             |                        | 43.1                              | 37.3                              | 27.1                              | 67.1                              |
| 800                                                                  | 1015   | 24       | M30      | 150      | 830               | 876        | 3.3                                 | 85.6                               | 239 ÷ 410                             |                        | 43.7                              | 37.6                              | 27.1                              | 68.6                              |
| 900                                                                  | 1115   | 28       | M30      | 160      | 930               | 982        | 3.2                                 | 85.2                               | 259 ÷ 446                             |                        | 46.4                              | 40                                | 28.7                              | 73.1                              |
| 1000                                                                 | 1230   | 28       | M33      | 180      | 1040              | 1098       | 3.2                                 | 96.1                               | 350 ÷ 604                             |                        | 44.8                              | 38.5                              | 27.4                              | 72.3                              |
| 1200                                                                 | 1455   | 32       | M36      | 220      | 1250              | 1320       | 3.2                                 | 71.9                               | 488 ÷ 840                             |                        | 46.8                              | 40.1                              | 28.4                              | 78.6                              |
| 1400                                                                 | 1675   | 36       | M39      | 240      | 1440              | 1522       | 3.2                                 | 74.7                               | 629 ÷ 1088                            | 943 ÷ 1632             | 45.8                              | 38.4                              | 27.1                              | 78.3                              |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 3.2                                 | 99.3                               | 838 ÷ 1451                            | 1257 ÷ 2176            | 39.4                              |                                   | 23.1                              | 67.3                              |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 5                                   | 100.8                              | 731 ÷ 1266                            | 1096 ÷ 1898            | 40.4                              |                                   | 24.4                              | 63.5                              |
| 2000                                                                 | 2325   | 48       | M45      | 240      | 2050              | 2120       | 5                                   | 103.3                              | 821 ÷ 1423                            | 1232 ÷ 2134            | 44.5                              |                                   | 26.9                              | 70.3                              |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 0.7                                 | 11                                 | 6 ÷ 11                                |                        | 23.3                              | 21.9                              | 19                                | 30.5                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 0.7                                 | 14.2                               | 8 ÷ 14                                |                        | 26.1                              | 24.4                              | 20.9                              | 38.3                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 0.8                                 | 13                                 | 10 ÷ 17                               |                        | 28.3                              | 26.3                              | 22.3                              | 44                                |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 0.8                                 | 15.4                               | 11 ÷ 19                               |                        | 30.6                              | 28.3                              | 23.8                              | 49.6                              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 1                                   | 18.3                               | 17 ÷ 29                               |                        | 18.7                              | 17                                | 14.1                              | 31.9                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 1                                   | 23.2                               | 19 ÷ 33                               |                        | 21.1                              | 18.6                              | 15.2                              | 36                                |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81         | 1.2                                 | 27.8                               | 23 ÷ 40                               |                        | 25.2                              | 21.5                              | 17.3                              | 43.1                              |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100        | 1.2                                 | 24.5                               | 17 ÷ 29                               |                        | 20.5                              | 18.7                              | 15.3                              | 31.8                              |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115        | 1.3                                 | 22.6                               | 21 ÷ 36                               |                        | 23.5                              | 21.4                              | 17.2                              | 38.8                              |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138        | 1.5                                 | 24.9                               | 25 ÷ 43                               |                        | 28.3                              | 25.6                              | 20.2                              | 47.3                              |
| 125                                                                  | 250    | 8        | M16      | 90       | 142               | 162        | 1.7                                 | 25.9                               | 30 ÷ 52                               |                        | 33.8                              | 30.3                              | 23.6                              | 56.1                              |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190        | 1.9                                 | 30.1                               | 44 ÷ 76                               |                        | 26                                | 23.1                              | 17.7                              | 42.3                              |
| 200                                                                  | 340    | 8        | M20      | 110      | 220               | 240        | 2.3                                 | 27.1                               | 57 ÷ 97                               |                        | 34.9                              | 30.9                              | 23.1                              | 57.3                              |
| 250                                                                  | 395    | 12       | M20      | 110      | 270               | 290        | 2.8                                 | 26.8                               | 46 ÷ 79                               |                        | 33.8                              | 29.9                              | 22.4                              | 55.3                              |
| 300                                                                  | 445    | 12       | M20      | 110      | 320               | 340        | 3.2                                 | 29.7                               | 54 ÷ 93                               |                        | 42                                | 36.9                              | 27.2                              | 70                                |
| 350                                                                  | 505    | 16       | M20      | 110      | 375               | 395        | 3.7                                 | 35.2                               | 47 ÷ 81                               |                        | 42                                | 36.9                              | 27.2                              | 70                                |
| 400                                                                  | 565    | 16       | M24      | 120      | 426               | 450        | 3.5                                 | 40.3                               | 77 ÷ 132                              |                        | 35.6                              | 31.2                              | 22.7                              | 60.4                              |
| 450                                                                  | 615    | 20       | M24      | 120      | 480               | 506        | 3.6                                 | 48.3                               | 75 ÷ 129                              |                        | 35.9                              | 31.4                              | 22.9                              | 60.9                              |
| 500                                                                  | 670    | 20       | M24      | 120      | 530               | 560        | 3.5                                 | 54.5                               | 96 ÷ 165                              |                        | 42                                | 36.6                              | 26.4                              | 72                                |
| 600                                                                  | 780    | 20       | M27      | 130      | 630               | 664        | 3.6                                 | 73.4                               | 144 ÷ 247                             |                        | 41.4                              | 35.9                              | 25.5                              | 72.3                              |
| 700                                                                  | 895    | 24       | M27      | 140      | 730               | 770        | 3.6                                 | 93.4                               | 163 ÷ 281                             |                        | 45.4                              | 39.3                              | 27.8                              | 79.7                              |
| 800                                                                  | 1015   | 24       | M30      | 150      | 830               | 876        | 3.5                                 | 91.6                               | 239 ÷ 410                             |                        | 46                                | 39.7                              | 27.9                              | 81.7                              |
| 900                                                                  | 1115   | 28       | M30      | 160      | 930               | 982        | 3.5                                 | 91.3                               | 259 ÷ 446                             |                        | 49                                | 42.2                              | 29.5                              | 86.9                              |
| 1000                                                                 | 1230   | 28       | M33      | 180      | 1040              | 1098       | 3.5                                 | 103.1                              | 350 ÷ 604                             |                        | 47.3                              | 40.6                              | 28.2                              | 83.6                              |
| 1200                                                                 | 1455   | 32       | M36      | 220      | 1250              | 1320       | 3.5                                 | 77.2                               | 488 ÷ 840                             |                        | 49.5                              | 42.4                              | 29.2                              | 87.2                              |
| 1400                                                                 | 1675   | 36       | M39      | 240      | 1440              | 1522       | 3.5                                 | 80.1                               | 629 ÷ 1088                            | 943 ÷ 1632             | 47.4                              | 40.7                              | 27.9                              | 83.6                              |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 3.5                                 | 106.6                              | 838 ÷ 1451                            | 1257 ÷ 2176            | 40.3                              |                                   | 23.8                              | 71.6                              |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 5.4                                 | 108.7                              | 792 ÷ 1372                            | 1188 ÷ 2058            | 42.5                              |                                   | 25.1                              | 75.8                              |
| 2000                                                                 | 2325   | 48       | M45      | 240      | 2050              | 2120       | 5.5                                 | 111.4                              | 890 ÷ 1542                            | 1335 ÷ 2313            | 46.9                              |                                   | 27.7                              | 83.9                              |

Obr. / Fig.3 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN10

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment [Nm]                 | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 0.8                                 | 11                                 | 6 ÷ 11                                |                        | 24.2               | 22.8              | 19.3              | 33.4              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 0.8                                 | 14.2                               | 8 ÷ 14                                |                        | 27.2               | 25.5              | 21.2              | 38.7              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 0.8                                 | 13                                 | 10 ÷ 17                               |                        | 29.6               | 27.6              | 22.7              | 44                |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 0.9                                 | 15.4                               | 11 ÷ 19                               |                        | 32.1               | 29.8              | 24.3              | 49.6              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 1                                   | 18.3                               | 17 ÷ 29                               |                        | 19.5               | 18                | 14.4              | 31.9              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 1.1                                 | 23.2                               | 19 ÷ 33                               |                        | 21.5               | 19.7              | 15.6              | 36                |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81         | 1.2                                 | 27.8                               | 23 ÷ 40                               |                        | 25.2               | 22.9              | 17.8              | 43.1              |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100        | 1.3                                 | 24.5                               | 17 ÷ 29                               |                        | 21.6               | 19.8              | 15.7              | 33.4              |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115        | 1.3                                 | 22.6                               | 21 ÷ 36                               |                        | 24.9               | 22.7              | 17.6              | 39.5              |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138        | 1.6                                 | 24.9                               | 25 ÷ 43                               |                        | 30.1               | 27.3              | 20.8              | 49.2              |
| 125                                                                  | 250    | 8        | M16      | 90       | 142               | 162        | 1.8                                 | 25.9                               | 30 ÷ 52                               |                        | 36.1               | 32.5              | 24.3              | 60.5              |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190        | 2                                   | 30.1                               | 44 ÷ 76                               |                        | 27.8               | 24.9              | 18.3              | 47.8              |
| 200                                                                  | 340    | 8        | M20      | 110      | 220               | 240        | 2.5                                 | 27.1                               | 57 ÷ 97                               |                        | 37.6               | 33.4              | 23.9              | 66.8              |
| 250                                                                  | 395    | 12       | M20      | 110      | 270               | 290        | 2.9                                 | 26.8                               | 46 ÷ 79                               |                        | 36.4               | 32.4              | 23.2              | 64.5              |
| 300                                                                  | 445    | 12       | M20      | 110      | 320               | 340        | 3.4                                 | 31                                 | 54 ÷ 93                               |                        | 45.2               | 40.1              | 28.2              | 82                |
| 350                                                                  | 505    | 16       | M20      | 110      | 375               | 395        | 3.9                                 | 43.4                               | 47 ÷ 81                               |                        | 45.3               | 40.1              | 28.2              | 82.1              |
| 400                                                                  | 565    | 16       | M24      | 120      | 426               | 450        | 3.7                                 | 49.6                               | 77 ÷ 132                              |                        | 38.5               | 34                | 23.6              | 71.1              |
| 450                                                                  | 615    | 20       | M24      | 120      | 480               | 506        | 3.8                                 | 59.4                               | 75 ÷ 129                              |                        | 38.8               | 34.2              | 23.7              | 71.6              |
| 500                                                                  | 670    | 20       | M24      | 120      | 530               | 560        | 3.7                                 | 67.1                               | 96 ÷ 165                              |                        | 45.5               | 40                | 27.4              | 85                |
| 600                                                                  | 780    | 20       | M27      | 130      | 630               | 664        | 3.8                                 | 90.3                               | 144 ÷ 247                             |                        | 45                 | 39.3              | 26.6              | 85.7              |
| 700                                                                  | 895    | 24       | M27      | 140      | 730               | 770        | 3.8                                 | 114.8                              | 163 ÷ 281                             |                        | 49.4               | 43.1              | 29                | 94.6              |
| 800                                                                  | 1015   | 24       | M30      | 150      | 830               | 876        | 3.7                                 | 112.7                              | 239 ÷ 410                             |                        | 50.1               | 43.7              | 29.1              | 96.2              |
| 900                                                                  | 1115   | 28       | M30      | 160      | 930               | 982        | 3.7                                 | 112.2                              | 259 ÷ 446                             |                        | 53.4               | 46.4              | 30.8              | 102.4             |
| 1000                                                                 | 1230   | 28       | M33      | 180      | 1040              | 1098       | 3.7                                 | 126.6                              | 350 ÷ 604                             |                        | 51.6               | 44.8              | 29.5              | 98.8              |
| 1200                                                                 | 1455   | 32       | M36      | 220      | 1250              | 1320       | 3.7                                 | 93.4                               | 488 ÷ 840                             | 731 ÷ 1261             | 54.1               | 46.8              | 30.6              | 103.5             |
| 1400                                                                 | 1675   | 36       | M39      | 240      | 1440              | 1522       | 3.7                                 | 97                                 | 629 ÷ 1088                            | 943 ÷ 1632             | 51.6               | 45                | 29.2              | 99.4              |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 3.7                                 | 129                                | 838 ÷ 1451                            | 1257 ÷ 2176            | 43.9               |                   | 24.9              | 85.2              |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 5.7                                 | 131                                | 838 ÷ 1451                            | 1257 ÷ 2177            | 46.4               |                   | 26.3              | 90.3              |
| 2000                                                                 | 2325   | 48       | M45      | 240      | 2050              | 2120       | 5.8                                 | 134.2                              | 942 ÷ 1632                            | 1413 ÷ 2447            | 51.2               |                   | 29.1              | 100.1             |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment [Nm]                 | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 0.9                                 | 11                                 | 6 ÷ 11                                |                        | 26.1               | 24.3              | 20.4              | 35.7              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 0.9                                 | 14.2                               | 8 ÷ 14                                |                        | 29.6               | 27                | 22.6              | 41.6              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 1                                   | 13                                 | 10 ÷ 17                               |                        | 32.4               | 29.8              | 24.3              | 46.3              |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 1                                   | 15.4                               | 11 ÷ 19                               |                        | 35.2               | 32.3              | 26                | 51.2              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 1.2                                 | 18.3                               | 17 ÷ 29                               |                        | 21.6               | 19.7              | 15.5              | 32.3              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 1.2                                 | 23.2                               | 19 ÷ 33                               |                        | 23.9               | 21.7              | 16.9              | 36.3              |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81         | 1.4                                 | 27.8                               | 23 ÷ 40                               |                        | 28.1               | 25.3              | 19.4              | 43.8              |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100        | 1.4                                 | 24.5                               | 17 ÷ 29                               |                        | 24                 | 21.8              | 17                | 36.6              |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115        | 1.5                                 | 22.6                               | 21 ÷ 36                               |                        | 27.8               | 25.1              | 19.2              | 43.3              |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138        | 1.8                                 | 24.9                               | 25 ÷ 43                               |                        | 34                 | 30.4              | 22.8              | 54.4              |
| 125                                                                  | 250    | 8        | M16      | 90       | 142               | 162        | 2                                   | 25.9                               | 30 ÷ 52                               |                        | 41                 | 36.5              | 26.9              | 67.1              |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190        | 2.3                                 | 30.1                               | 44 ÷ 76                               |                        | 31.8               | 28.1              | 20.3              | 53.2              |
| 200                                                                  | 340    | 8        | M20      | 110      | 220               | 240        | 2.8                                 | 27.4                               | 57 ÷ 97                               |                        | 43.4               | 38                | 26.8              | 74.8              |
| 250                                                                  | 395    | 12       | M20      | 110      | 270               | 290        | 3.4                                 | 30.7                               | 46 ÷ 79                               |                        | 42                 | 36.8              | 26                | 72.2              |
| 300                                                                  | 445    | 12       | M20      | 110      | 320               | 340        | 3.9                                 | 39.2                               | 54 ÷ 93                               |                        | 52.5               | 45.9              | 31.9              | 92.1              |
| 350                                                                  | 505    | 16       | M20      | 110      | 375               | 395        | 4.4                                 | 54.9                               | 53 ÷ 90                               |                        | 52.6               | 45.9              | 31.9              | 92.2              |
| 400                                                                  | 565    | 16       | M24      | 120      | 426               | 450        | 4.2                                 | 62.9                               | 82 ÷ 140                              |                        | 45                 | 39.1              | 26.8              | 80.1              |
| 450                                                                  | 615    | 20       | M24      | 120      | 480               | 506        | 4.4                                 | 75.3                               | 82 ÷ 141                              |                        | 45.3               | 39.3              | 27                | 80.7              |
| 500                                                                  | 670    | 20       | M24      | 120      | 530               | 560        | 4.2                                 | 85                                 | 101 ÷ 173                             |                        | 53.2               | 46.1              | 31.3              | 95.9              |
| 600                                                                  | 780    | 20       | M27      | 130      | 630               | 664        | 4.4                                 | 114.4                              | 158 ÷ 272                             |                        | 52.9               | 45.6              | 30.5              | 97                |
| 700                                                                  | 895    | 24       | M27      | 140      | 730               | 770        | 4.3                                 | 145.6                              | 177 ÷ 305                             |                        | 58.2               | 50.1              | 33.4              | 106.7             |
| 800                                                                  | 1015   | 24       | M30      | 150      | 830               | 876        | 4.3                                 | 142.9                              | 256 ÷ 440                             |                        | 59.4               | 50.9              | 33.5              | 108.4             |
| 900                                                                  | 1115   | 28       | M30      | 160      | 930               | 982        | 4.3                                 | 142.4                              | 276 ÷ 474                             |                        | 63.3               | 54.2              | 35.6              | 115.5             |
| 1000                                                                 | 1230   | 28       | M33      | 180      | 1040              | 1098       | 4.3                                 | 160.6                              | 373 ÷ 645                             |                        | 61.3               | 52.4              | 34.2              | 111.7             |
| 1200                                                                 | 1455   | 32       | M36      | 220      | 1250              | 1320       | 4.3                                 | 119.3                              | 518 ÷ 893                             | 777 ÷ 1340             | 63.9               | 55                | 35.6              | 117.2             |
| 1400                                                                 | 1675   | 36       | M39      | 240      | 1440              | 1522       | 4.2                                 | 124                                | 659 ÷ 1139                            | 988 ÷ 1709             | 61                 | 52.4              | 34                | 112.7             |
| 1600                                                                 | 1915   | 40       | M45      | 220      | 1650              | 1742       | 4.3                                 | 164.9                              | 894 ÷ 1548                            | 1341 ÷ 2322            | 52                 |                   | 29.1              | 96.8              |
| 1800                                                                 | 2115   | 44       | M45      | 220      | 1850              | 1914       | 6.5                                 | 167.5                              | 961 ÷ 1664                            | 1441 ÷ 2496            | 55                 |                   | 30.7              | 102.5             |
| 2000                                                                 | 2325   | 48       | M45      | 240      | 2050              | 2120       | 6.6                                 | 171.7                              | 1080 ÷ 1870                           | 1620 ÷ 2805            | 60.7               |                   | 34                | 113.8             |

Obr. / Fig.4 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN10

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |       |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku |                       | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|-------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|-----------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                       |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN10   | Skrutiek | Skrutiek | [mm]  | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment [Nm] | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |       |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60    | 22                | 36         | 0,7                                 | 11                                 | 6 ÷ 11                                |                       |                        | 23.4                              | 18.4                              | 26.8                              | 20.4                              |
| 15                                                                   | 95     | 4        | M12      | 60    | 26                | 42         | 0,7                                 | 14.2                               | 8 ÷ 14                                |                       |                        | 26.3                              | 20.1                              | 34.7                              | 22.6                              |
| 20                                                                   | 105    | 4        | M12      | 65    | 31                | 47         | 0,7                                 | 13                                 | 10 ÷ 17                               |                       |                        | 28.5                              | 21.5                              | 39.8                              | 24.3                              |
| 25                                                                   | 115    | 4        | M12      | 65    | 36                | 52         | 0,8                                 | 15.4                               | 11 ÷ 19                               |                       |                        | 31.4                              | 22.8                              | 44.9                              | 26                                |
| 32                                                                   | 140    | 4        | M16      | 75    | 46                | 62         | 0,9                                 | 18.3                               | 17 ÷ 29                               |                       |                        | 20.2                              | 13.4                              | 28.9                              | 15.5                              |
| 40                                                                   | 150    | 4        | M16      | 75    | 53                | 69         | 0,9                                 | 23.2                               | 19 ÷ 33                               |                       |                        | 22.8                              | 14.5                              | 32.6                              | 16.9                              |
| 50                                                                   | 165    | 4        | M16      | 75    | 65                | 81         | 1,1                                 | 27.8                               | 23 ÷ 40                               |                       |                        | 27.3                              | 16.4                              | 39                                | 19.4                              |
| 65                                                                   | 185    | 8        | M16      | 75    | 81                | 100        | 1,1                                 | 24.5                               | 17 ÷ 29                               |                       |                        | 20.7                              | 14.6                              | 28.7                              | 17                                |
| 80                                                                   | 200    | 8        | M16      | 80    | 95                | 115        | 1,2                                 | 22.6                               | 21 ÷ 36                               |                       |                        | 24.6                              | 16.3                              | 35.1                              | 19.2                              |
| 100                                                                  | 220    | 8        | M16      | 80    | 118               | 138        | 1,4                                 | 24.9                               | 25 ÷ 43                               |                       |                        | 29.9                              | 19.1                              | 42.8                              | 22.8                              |
| 125                                                                  | 250    | 8        | M16      | 80    | 142               | 162        | 1,5                                 | 25.9                               | 30 ÷ 52                               |                       |                        | 35.6                              | 22.2                              | 50.8                              | 26.9                              |
| 150                                                                  | 285    | 8        | M20      | 90    | 170               | 190        | 1,8                                 | 30.1                               | 44 ÷ 76                               |                       |                        | 26.8                              | 16.6                              | 38.3                              | 20.3                              |
| 200                                                                  | 340    | 8        | M20      | 100   | 220               | 240        | 2,2                                 | 27.1                               | 57 ÷ 97                               |                       |                        | 35.3                              | 21.5                              | 48.9                              | 26.8                              |
| 250                                                                  | 395    | 12       | M20      | 100   | 270               | 290        | 2,5                                 | 26.8                               | 46 ÷ 79                               |                       |                        | 34.2                              | 20.9                              | 44.1                              | 26                                |
| 300                                                                  | 445    | 12       | M20      | 100   | 320               | 340        | 2,9                                 | 29.7                               | 54 ÷ 93                               |                       |                        | 42.5                              | 25.2                              | 55.4                              | 31.9                              |
| 350                                                                  | 505    | 16       | M20      | 100   | 375               | 395        | 3,4                                 | 33                                 | 47 ÷ 81                               |                       |                        | 42.5                              | 25.3                              | 55.4                              | 31.9                              |
| 400                                                                  | 565    | 16       | M24      | 110   | 426               | 450        | 3,2                                 | 37.7                               | 77 ÷ 132                              |                       |                        | 36.1                              | 21                                | 47.5                              | 26.8                              |
| 450                                                                  | 615    | 20       | M24      | 110   | 480               | 506        | 3,3                                 | 45.1                               | 75 ÷ 129                              |                       |                        | 36.3                              | 21.1                              | 47.8                              | 27                                |
| 500                                                                  | 670    | 20       | M24      | 110   | 530               | 560        | 3,2                                 | 51                                 | 96 ÷ 165                              |                       |                        | 42.5                              | 24.3                              | 56.2                              | 31.3                              |
| 600                                                                  | 780    | 20       | M27      | 120   | 630               | 664        | 3,3                                 | 68.6                               | 144 ÷ 247                             |                       |                        | 41.9                              | 23.5                              | 56                                | 44.8                              |
| 700                                                                  | 895    | 24       | M27      | 120   | 730               | 770        | 3,3                                 | 87.2                               | 163 ÷ 281                             |                       |                        | 46                                | 25.5                              | 61.7                              | 49.2                              |
| 800                                                                  | 1015   | 24       | M30      | 135   | 830               | 876        | 3,3                                 | 85.6                               | 239 ÷ 410                             |                       |                        | 46.6                              | 25.5                              | 62.9                              | 50                                |
| 900                                                                  | 1115   | 28       | M30      | 150   | 930               | 982        | 3,2                                 | 85.2                               | 259 ÷ 446                             |                       |                        | 49.6                              | 27                                | 67.1                              | 53.2                              |
| 1000                                                                 | 1230   | 28       | M33      | 160   | 1040              | 1098       | 3,2                                 | 96.1                               | 350 ÷ 604                             |                       |                        | 47.9                              | 25.7                              | 65.4                              |                                   |
| 1200                                                                 | 1455   | 32       | M36      | 190   | 1250              | 1320       | 3,2                                 | 71.9                               | 488 ÷ 840                             |                       |                        | 50.2                              | 26.6                              | 71.1                              |                                   |
| 1400                                                                 | 1675   | 36       | M39      | 220   | 1440              | 1522       | 3,2                                 | 74.7                               | 629 ÷ 1088                            | 943 ÷ 1632            |                        | 48.1                              | 25.3                              | 70.9                              |                                   |
| 1600                                                                 | 1915   | 40       | M45      | 220   | 1650              | 1742       | 3,2                                 | 99.3                               | 838 ÷ 1451                            | 1257 ÷ 2176           |                        |                                   |                                   |                                   |                                   |
| 1800                                                                 | 2115   | 44       | M45      | 220   | 1850              | 1914       | 5                                   | 100.8                              | 731 ÷ 1266                            | 1096 ÷ 1898           |                        |                                   |                                   |                                   |                                   |
| 2000                                                                 | 2325   | 48       | M45      | 220   | 2050              | 2120       | 5                                   | 103.3                              | 821 ÷ 1423                            | 1232 ÷ 2134           |                        |                                   |                                   |                                   |                                   |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |       |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku |                       | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|-------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|-----------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                       |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN16   | Skrutiek | Skrutiek | [mm]  | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment [Nm] | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |       |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60    | 22                | 36         | 1,2                                 | 11                                 | 6 ÷ 11                                |                       |                        | 30.4                              | 21.8                              | 35.8                              | 25.6                              |
| 15                                                                   | 95     | 4        | M12      | 60    | 26                | 42         | 1,2                                 | 14.2                               | 8 ÷ 14                                |                       |                        | 34.9                              | 24.3                              | 41.7                              | 28.9                              |
| 20                                                                   | 105    | 4        | M12      | 65    | 31                | 47         | 1,3                                 | 13                                 | 10 ÷ 17                               |                       |                        | 38.5                              | 26.2                              | 46.4                              | 31.6                              |
| 25                                                                   | 115    | 4        | M12      | 65    | 36                | 52         | 1,4                                 | 15.4                               | 11 ÷ 19                               |                       |                        | 42.3                              | 28.2                              | 51.4                              | 34.3                              |
| 32                                                                   | 140    | 4        | M16      | 75    | 46                | 62         | 1,5                                 | 18.3                               | 17 ÷ 29                               |                       |                        | 26.3                              | 17                                | 32.4                              | 21                                |
| 40                                                                   | 150    | 4        | M16      | 75    | 53                | 69         | 1,6                                 | 23.2                               | 19 ÷ 33                               |                       |                        | 29.3                              | 18.6                              | 36.5                              | 23.2                              |
| 50                                                                   | 165    | 4        | M16      | 75    | 65                | 81         | 1,8                                 | 27.8                               | 23 ÷ 40                               |                       |                        | 35                                | 21.4                              | 43.9                              | 27.2                              |
| 65                                                                   | 185    | 8        | M16      | 75    | 81                | 100        | 1,9                                 | 39.7                               | 17 ÷ 29                               |                       |                        | 29.5                              | 18.7                              | 36.7                              | 23.3                              |
| 80                                                                   | 200    | 8        | M16      | 80    | 95                | 115        | 2                                   | 36.2                               | 21 ÷ 36                               |                       |                        | 34.6                              | 21.3                              | 43.5                              | 27                                |
| 100                                                                  | 220    | 8        | M16      | 80    | 118               | 138        | 2,3                                 | 42.1                               | 25 ÷ 43                               |                       |                        | 42.9                              | 25.4                              | 54.6                              | 32.9                              |
| 125                                                                  | 250    | 8        | M16      | 80    | 142               | 162        | 2,7                                 | 40.6                               | 30 ÷ 52                               |                       |                        | 52.3                              | 30.2                              | 67.4                              | 39.6                              |
| 150                                                                  | 285    | 8        | M20      | 90    | 170               | 190        | 3,1                                 | 47.6                               | 44 ÷ 76                               |                       |                        | 41.1                              | 23                                | 53.5                              | 30.6                              |
| 200                                                                  | 340    | 12       | M20      | 95    | 220               | 240        | 3,7                                 | 49.6                               | 38 ÷ 65                               |                       |                        | 42.1                              | 23.5                              | 54.9                              | 31.4                              |
| 250                                                                  | 405    | 12       | M24      | 110   | 270               | 290        | 4,4                                 | 57                                 | 61 ÷ 104                              |                       |                        | 38.4                              | 20.8                              | 50.6                              | 28.2                              |
| 300                                                                  | 460    | 12       | M24      | 110   | 320               | 340        | 5,1                                 | 32                                 | 82 ÷ 141                              |                       |                        | 48.6                              | 25.6                              | 64.7                              | 35.2                              |
| 350                                                                  | 520    | 16       | M24      | 110   | 375               | 395        | 5,9                                 | 36.7                               | 83 ÷ 142                              |                       |                        | 48.6                              | 25.6                              | 64.7                              | 35.3                              |
| 400                                                                  | 580    | 16       | M27      | 120   | 426               | 450        | 5,6                                 | 42.4                               | 120 ÷ 206                             |                       |                        | 45.5                              | 23.4                              | 60.9                              | 47.6                              |
| 450                                                                  | 640    | 20       | M27      | 130   | 480               | 506        | 5,8                                 | 57                                 | 121 ÷ 208                             |                       |                        | 45.8                              | 23.6                              | 61.4                              | 48                                |
| 500                                                                  | 715    | 20       | M30      | 140   | 530               | 560        | 5,6                                 | 65.1                               | 166 ÷ 285                             |                       |                        | 44.4                              | 22.6                              | 59.9                              | 46.6                              |
| 600                                                                  | 840    | 20       | M33      | 150   | 630               | 664        | 5,8                                 | 83.4                               | 252 ÷ 435                             |                       |                        | 47.2                              | 23.4                              | 64                                |                                   |
| 700                                                                  | 910    | 24       | M33      | 150   | 730               | 770        | 5,7                                 | 74.8                               | 282 ÷ 487                             |                       |                        | 52                                | 25.6                              | 70.4                              |                                   |
| 800                                                                  | 1025   | 24       | M36      | 150   | 830               | 876        | 5,7                                 | 90.5                               | 401 ÷ 691                             |                       |                        | 55.6                              | 27                                | 74.7                              |                                   |
| 900                                                                  | 1125   | 28       | M36      | 160   | 930               | 982        | 5,6                                 | 93.5                               | 432 ÷ 745                             |                       |                        | 59.1                              | 28.7                              | 79.5                              |                                   |
| 1000                                                                 | 1255   | 28       | M39      | 200   | 1040              | 1098       | 5,6                                 | 86.9                               | 581 ÷ 1005                            |                       |                        | 59                                | 28.6                              | 79.8                              |                                   |
| 1200                                                                 | 1485   | 32       | M45      | 250   | 1250              | 1320       | 5,6                                 | 64.5                               | 846 ÷ 1466                            | 1270 ÷ 2199           |                        |                                   |                                   |                                   |                                   |
| 1400                                                                 | 1685   | 36       | M45      | 250   | 1440              | 1522       | 5,5                                 | 65.9                               | 1001 ÷ 1734                           | 1502 ÷ 2601           |                        |                                   |                                   |                                   |                                   |
| 1600                                                                 | 1930   | 40       | M52      | 350   | 1650              | 1742       | 5,6                                 | 63.9                               | 1350 ÷ 2342                           | 2026 ÷ 3514           |                        |                                   |                                   |                                   |                                   |
| 1800                                                                 | 2130   | 44       | M52      | 360   | 1850              | 1914       | 8,6                                 | 63.4                               | 1452 ÷ 2518                           | 2177 ÷ 3777           |                        |                                   |                                   |                                   |                                   |
| 2000                                                                 | 2345   | 48       | M56      | 350   | 2050              | 2120       | 8,7                                 | 62.1                               | 1753 ÷ 3037                           | 2630 ÷ 4556           |                        |                                   |                                   |                                   |                                   |

Obr. / Fig.5 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN16

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN16   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 5.6               | 8.8               | A2 50             | A2 70             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 1.2                                 | 11                                 | 6 ÷ 11                                |                        | 32.9              | 22.5              | 38                | 26.1              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 1.2                                 | 14.2                               | 8 ÷ 14                                |                        | 38                | 25.1              | 44.5              | 29.6              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 1.3                                 | 13                                 | 10 ÷ 17                               |                        | 42.1              | 27.2              | 49.7              | 32.4              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 1.4                                 | 15.4                               | 11 ÷ 19                               |                        | 46.4              | 29.3              | 55.1              | 35.2              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 1.6                                 | 18.3                               | 17 ÷ 29                               |                        | 29                | 17.7              | 34.9              | 21.6              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 1.7                                 | 23.2                               | 19 ÷ 33                               |                        | 32.6              | 19.4              | 39.4              | 23.9              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 1.9                                 | 27.8                               | 23 ÷ 40                               |                        | 39                | 22.5              | 47.7              | 28.1              |
| 65                                                                   | 185    | 8        | M16      | 75       | 81                | 100        | 2                                   | 39.7                               | 17 ÷ 29                               |                        | 32.8              | 19.5              | 39.6              | 24                |
| 80                                                                   | 200    | 8        | M16      | 80       | 95                | 115        | 2.1                                 | 36.2                               | 21 ÷ 36                               |                        | 38.6              | 22.3              | 47.2              | 27.8              |
| 100                                                                  | 220    | 8        | M16      | 80       | 118               | 138        | 2.5                                 | 42.1                               | 25 ÷ 43                               |                        | 48.2              | 26.7              | 59.4              | 34                |
| 125                                                                  | 250    | 8        | M16      | 80       | 142               | 162        | 2.8                                 | 40.6                               | 30 ÷ 52                               |                        | 59.1              | 31.8              | 73.7              | 41                |
| 150                                                                  | 285    | 8        | M20      | 90       | 170               | 190        | 3.2                                 | 50.2                               | 44 ÷ 76                               |                        | 46.7              | 24.3              | 58.6              | 31.8              |
| 200                                                                  | 340    | 12       | M20      | 95       | 220               | 240        | 3.9                                 | 61.9                               | 38 ÷ 65                               |                        | 47.9              | 24.9              | 60.2              | 32.6              |
| 250                                                                  | 405    | 12       | M24      | 110      | 270               | 290        | 4.7                                 | 71                                 | 64 ÷ 110                              |                        | 43.9              | 22                | 55.8              | 29.3              |
| 300                                                                  | 460    | 12       | M24      | 110      | 320               | 340        | 5.4                                 | 39.6                               | 87 ÷ 149                              |                        | 55.8              | 27.3              | 71.4              | 36.7              |
| 350                                                                  | 520    | 16       | M24      | 110      | 375               | 395        | 6.2                                 | 45.1                               | 87 ÷ 150                              |                        | 55.8              | 27.3              | 71.5              | 36.7              |
| 400                                                                  | 580    | 16       | M27      | 120      | 426               | 450        | 5.9                                 | 52.2                               | 126 ÷ 218                             |                        | 52.4              | 25                | 67.4              | 49.3              |
| 450                                                                  | 640    | 20       | M27      | 130      | 480               | 506        | 6.1                                 | 70.1                               | 128 ÷ 220                             |                        | 52.8              | 25.2              | 67.9              | 49.7              |
| 500                                                                  | 715    | 20       | M30      | 140      | 530               | 560        | 5.9                                 | 80.2                               | 175 ÷ 301                             |                        | 51.4              | 24.1              | 66.4              | 48.3              |
| 600                                                                  | 840    | 20       | M33      | 150      | 630               | 664        | 6.1                                 | 102.7                              | 266 ÷ 459                             |                        | 54.7              | 25.1              | 70.8              |                   |
| 700                                                                  | 910    | 24       | M33      | 150      | 730               | 770        | 6                                   | 91.9                               | 298 ÷ 515                             |                        | 60.4              | 27.5              | 77.8              |                   |
| 800                                                                  | 1025   | 24       | M36      | 150      | 830               | 876        | 6                                   | 111.3                              | 424 ÷ 730                             |                        | 64.2              | 29                | 82.7              |                   |
| 900                                                                  | 1125   | 28       | M36      | 160      | 930               | 982        | 5.9                                 | 113.2                              | 457 ÷ 787                             |                        | 68.3              | 30.9              | 88.1              |                   |
| 1000                                                                 | 1255   | 28       | M39      | 200      | 1040              | 1098       | 5.9                                 | 105.2                              | 614 ÷ 1061                            | 920 ÷ 1592             | 68.3              | 30.9              | 88.6              |                   |
| 1200                                                                 | 1485   | 32       | M45      | 250      | 1250              | 1320       | 5.9                                 | 79.1                               | 894 ÷ 1549                            | 1341 ÷ 2323            |                   |                   |                   |                   |
| 1400                                                                 | 1685   | 36       | M45      | 250      | 1440              | 1522       | 5.8                                 | 80.9                               | 1058 ÷ 1832                           | 1586 ÷ 2748            |                   |                   |                   |                   |
| 1600                                                                 | 1930   | 40       | M52      | 350      | 1650              | 1742       | 5.9                                 | 78.3                               | 1427 ÷ 2475                           | 2140 ÷ 3712            |                   |                   |                   |                   |
| 1800                                                                 | 2130   | 44       | M52      | 360      | 1850              | 1914       | 9.1                                 | 109.2                              | 1533 ÷ 2660                           | 2300 ÷ 3990            |                   |                   |                   |                   |
| 2000                                                                 | 2345   | 48       | M56      | 350      | 2050              | 2120       | 9.2                                 | 107.9                              | 1852 ÷ 3209                           | 2778 ÷ 4813            |                   |                   |                   |                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN16   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 5.6               | 8.8               | A2 50             | A2 70             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 1.4                                 | 11                                 | 6 ÷ 11                                |                        | 37.4              | 23.4              | 40.8              | 26.9              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 1.4                                 | 14.2                               | 8 ÷ 14                                |                        | 43.7              | 26.3              | 48                | 30.5              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 1.5                                 | 13                                 | 10 ÷ 17                               |                        | 48.8              | 28.5              | 53.7              | 33.4              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 1.6                                 | 15.4                               | 11 ÷ 19                               |                        | 54.1              | 30.8              | 59.8              | 36.4              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 1.8                                 | 18.3                               | 17 ÷ 29                               |                        | 34.2              | 18.7              | 38                | 22.4              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 2                                   | 23.2                               | 19 ÷ 33                               |                        | 38.6              | 20.5              | 43.1              | 24.8              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 2.2                                 | 27.8                               | 23 ÷ 40                               |                        | 46.7              | 23.9              | 52.4              | 29.3              |
| 65                                                                   | 185    | 8        | M16      | 75       | 81                | 100        | 2.3                                 | 39.7                               | 17 ÷ 29                               |                        | 38.8              | 20.7              | 43.4              | 25                |
| 80                                                                   | 200    | 8        | M16      | 80       | 95                | 115        | 2.5                                 | 36.2                               | 21 ÷ 36                               |                        | 46.2              | 23.7              | 51.8              | 29                |
| 100                                                                  | 220    | 8        | M16      | 80       | 118               | 138        | 2.8                                 | 42.1                               | 25 ÷ 43                               |                        | 58.1              | 28.6              | 65.6              | 35.5              |
| 125                                                                  | 250    | 8        | M16      | 80       | 142               | 162        | 3.2                                 | 47.8                               | 30 ÷ 52                               |                        | 72                | 34.2              | 81.7              | 43                |
| 150                                                                  | 285    | 8        | M20      | 90       | 170               | 190        | 3.7                                 | 48.2                               | 44 ÷ 76                               |                        | 57.2              | 26.2              | 65.3              | 33.4              |
| 200                                                                  | 340    | 12       | M20      | 95       | 220               | 240        | 4.5                                 | 78.4                               | 43 ÷ 73                               |                        | 58.8              | 26.8              | 67                | 34.2              |
| 250                                                                  | 405    | 12       | M24      | 110      | 270               | 290        | 5.3                                 | 89.9                               | 73 ÷ 126                              |                        | 54.4              | 23.9              | 62.3              | 30.9              |
| 300                                                                  | 460    | 12       | M24      | 110      | 320               | 340        | 6.2                                 | 50.2                               | 100 ÷ 171                             |                        | 69.6              | 29.7              | 80.1              | 38.8              |
| 350                                                                  | 520    | 16       | M24      | 110      | 375               | 395        | 7.1                                 | 57.2                               | 100 ÷ 172                             |                        | 69.6              | 29.7              | 80.1              | 38.8              |
| 400                                                                  | 580    | 16       | M27      | 120      | 426               | 450        | 6.7                                 | 66.2                               | 145 ÷ 249                             |                        | 65.7              | 27.3              | 75.8              | 52.2              |
| 450                                                                  | 640    | 20       | M27      | 130      | 480               | 506        | 7                                   | 88.8                               | 146 ÷ 252                             |                        | 66.1              | 27.5              | 76.4              | 52.6              |
| 500                                                                  | 715    | 20       | M30      | 140      | 530               | 560        | 6.7                                 | 101.7                              | 201 ÷ 345                             |                        | 64.6              | 26.4              | 74.8              | 51.1              |
| 600                                                                  | 840    | 20       | M33      | 150      | 630               | 664        | 7                                   | 130.3                              | 304 ÷ 526                             |                        | 68.9              | 27.5              | 79.3              |                   |
| 700                                                                  | 910    | 24       | M33      | 150      | 730               | 770        | 6.9                                 | 116.6                              | 341 ÷ 590                             |                        | 75.8              | 30.2              | 87.3              |                   |
| 800                                                                  | 1025   | 24       | M36      | 150      | 830               | 876        | 6.8                                 | 141.2                              | 485 ÷ 836                             | 728 ÷ 1255             | 80.5              | 32                | 93                |                   |
| 900                                                                  | 1125   | 28       | M36      | 160      | 930               | 982        | 6.8                                 | 144.8                              | 523 ÷ 901                             | 785 ÷ 1352             | 85.8              | 34                | 99.2              |                   |
| 1000                                                                 | 1255   | 28       | M39      | 200      | 1040              | 1098       | 6.8                                 | 134.5                              | 703 ÷ 1215                            | 1054 ÷ 1823            | 86.2              | 34.1              | 99.9              |                   |
| 1200                                                                 | 1485   | 32       | M45      | 250      | 1250              | 1320       | 6.8                                 | 102.7                              | 1024 ÷ 1773                           | 1536 ÷ 2660            |                   |                   |                   |                   |
| 1400                                                                 | 1685   | 36       | M45      | 250      | 1440              | 1522       | 6.7                                 | 105.1                              | 1211 ÷ 2097                           | 1816 ÷ 3146            |                   |                   |                   |                   |
| 1600                                                                 | 1930   | 40       | M52      | 350      | 1650              | 1742       | 6.8                                 | 145.9                              | 1634 ÷ 2833                           | 2450 ÷ 4250            |                   |                   |                   |                   |
| 1800                                                                 | 2130   | 44       | M52      | 360      | 1850              | 1914       | 10.4                                | 100.7                              | 1756 ÷ 3046                           | 2634 ÷ 4569            |                   |                   |                   |                   |
| 2000                                                                 | 2345   | 48       | M56      | 350      | 2050              | 2120       | 10.6                                | 98.6                               | 2121 ÷ 3674                           | 3181 ÷ 5511            |                   |                   |                   |                   |

Obr. / Fig.6 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN16

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku |                 | Hydraulickým<br>kľúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|-----------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                 |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN16   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | M <sub>li</sub> | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
|                                                                      |        | [mm]     | [mm]     | [mm]     | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ± 0.2                        |                 | μ = 0.11 ± 0.2         | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 1.1                                 | 11                                 | 6 ÷ 11                                |                 |                        | 27.2                              | 25.3                              | 21.8                              | 34.4                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 1.1                                 | 14.2                               | 8 ÷ 14                                |                 |                        | 31                                | 28.6                              | 24.3                              | 40                                |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 1.2                                 | 13                                 | 10 ÷ 17                               |                 |                        | 33.9                              | 31.2                              | 26.2                              | 44.4                              |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 1.2                                 | 15.4                               | 11 ÷ 19                               |                 |                        | 37                                | 33.9                              | 28.2                              | 49.6                              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 1.4                                 | 18.3                               | 17 ÷ 29                               |                 |                        | 22.8                              | 20.7                              | 17                                | 31.9                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 1.5                                 | 23.2                               | 19 ÷ 33                               |                 |                        | 25.3                              | 22.9                              | 18.6                              | 36                                |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81         | 1.7                                 | 27.8                               | 23 ÷ 40                               |                 |                        | 29.8                              | 26.8                              | 21.4                              | 43.1                              |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100        | 1.8                                 | 39.7                               | 17 ÷ 29                               |                 |                        | 25.4                              | 23                                | 18.7                              | 34.9                              |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115        | 1.9                                 | 36.2                               | 21 ÷ 36                               |                 |                        | 29.5                              | 26.6                              | 21.3                              | 41.2                              |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138        | 2.2                                 | 42.1                               | 25 ÷ 43                               |                 |                        | 36.2                              | 32.4                              | 25.4                              | 51.6                              |
| 125                                                                  | 250    | 8        | M16      | 100      | 142               | 162        | 2.5                                 | 40.6                               | 30 ÷ 52                               |                 |                        | 43.8                              | 38.9                              | 30.2                              | 63.5                              |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190        | 2.8                                 | 47.6                               | 44 ÷ 76                               |                 |                        | 34.1                              | 30.1                              | 23                                | 50.3                              |
| 200                                                                  | 340    | 12       | M20      | 110      | 220               | 240        | 3.5                                 | 47.1                               | 38 ÷ 65                               |                 |                        | 34.9                              | 30.8                              | 23.5                              | 51.6                              |
| 250                                                                  | 405    | 12       | M24      | 120      | 270               | 290        | 4.1                                 | 53.9                               | 56 ÷ 96                               |                 |                        | 31.6                              | 27.7                              | 20.8                              | 47.5                              |
| 300                                                                  | 460    | 12       | M24      | 120      | 320               | 340        | 4.7                                 | 30.1                               | 76 ÷ 131                              |                 |                        | 39.7                              | 34.6                              | 25.6                              | 60.5                              |
| 350                                                                  | 520    | 16       | M24      | 130      | 375               | 395        | 5.4                                 | 34.3                               | 76 ÷ 131                              |                 |                        | 39.7                              | 34.6                              | 25.6                              | 60.5                              |
| 400                                                                  | 580    | 16       | M27      | 150      | 426               | 450        | 5.2                                 | 39.7                               | 110 ÷ 190                             |                 |                        | 36.9                              | 32                                | 23.4                              | 56.9                              |
| 450                                                                  | 640    | 20       | M27      | 150      | 480               | 506        | 5.3                                 | 53.2                               | 111 ÷ 192                             |                 |                        | 37.1                              | 32.2                              | 23.6                              | 57.3                              |
| 500                                                                  | 715    | 20       | M30      | 150      | 530               | 560        | 5.1                                 | 60.9                               | 153 ÷ 263                             |                 |                        | 35.9                              | 31                                | 22.6                              | 55.9                              |
| 600                                                                  | 840    | 20       | M33      | 180      | 630               | 664        | 5.3                                 | 78                                 | 232 ÷ 401                             |                 |                        | 37.8                              | 32.6                              | 23.4                              | 59.6                              |
| 700                                                                  | 910    | 24       | M33      | 180      | 730               | 770        | 5.3                                 | 69.8                               | 261 ÷ 450                             |                 |                        | 41.6                              | 35.8                              | 25.6                              | 65.8                              |
| 800                                                                  | 1025   | 24       | M36      | 180      | 830               | 876        | 5.2                                 | 84.4                               | 370 ÷ 638                             |                 |                        | 44.4                              | 38                                | 27                                | 69.7                              |
| 900                                                                  | 1125   | 28       | M36      | 200      | 930               | 982        | 5.2                                 | 87.1                               | 399 ÷ 688                             |                 |                        | 47.3                              | 40.5                              | 28.7                              | 74.2                              |
| 1000                                                                 | 1255   | 28       | M39      | 220      | 1040              | 1098       | 5.2                                 | 80.9                               | 536 ÷ 928                             |                 | 804 ÷ 1392             | 47.6                              | 40.7                              | 28.6                              | 74.4                              |
| 1200                                                                 | 1485   | 32       | M45      | 280      | 1250              | 1320       | 5.2                                 | 60.1                               | 782 ÷ 1354                            |                 | 1172 ÷ 2030            | 42.9                              |                                   | 26                                | 67.7                              |
| 1400                                                                 | 1685   | 36       | M45      | 300      | 1440              | 1522       | 5.1                                 | 61.4                               | 924 ÷ 1601                            |                 | 1387 ÷ 2402            | 49.4                              |                                   | 30                                | 78.4                              |
| 1600                                                                 | 1930   | 40       | M52      | 350      | 1650              | 1742       | 5.2                                 | 59.5                               | 1247 ÷ 2163                           |                 | 1870 ÷ 3244            | 41.9                              |                                   | 25.5                              | 66.8                              |
| 1800                                                                 | 2130   | 44       | M52      | 360      | 1850              | 1914       | 8                                   | 58.8                               | 1340 ÷ 2325                           |                 | 2010 ÷ 3487            | 44.3                              |                                   | 26.9                              | 70.8                              |
| 2000                                                                 | 2345   | 48       | M56      | 400      | 2050              | 2120       | 8.1                                 | 57.6                               | 1619 ÷ 2805                           |                 | 2428 ÷ 4207            | 42.6                              |                                   | 25.7                              | 68.3                              |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   | TEPLOTA 100°C |                                     | Uťahovací MOMENT<br>pre jednu skrutku |                                     | Hydraulickým<br>kľúčom | SVORNÍKOVÉ SKRUTKY |                                   |                                   |                                   |                                   |         |         |        |  |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|---------------|-------------------------------------|---------------------------------------|-------------------------------------|------------------------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---------|---------|--------|--|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |               | VYUŽITIE                            | VYUŽITIE                              | VDI 2230                            |                        | Skrutka            | Skrutka                           | Skrutka                           | Skrutka                           |                                   |         |         |        |  |
| [mm]                                                                 | PN16   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od    | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%]    | M <sub>li</sub><br>Uťahovací Moment | μ = 0.11 ÷ 0.2         | μ = 0.11 ÷ 0.2     | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |         |         |        |  |
|                                                                      |        |          |          | [mm]     | [mm]              | [mm]          |                                     |                                       |                                     |                        |                    |                                   |                                   |                                   | 12040.6                           | 12050.6 | 15236.6 | 1.4301 |  |
| podľa EN 1514-6                                                      |        |          |          |          |                   |               |                                     |                                       |                                     |                        |                    |                                   |                                   |                                   |                                   |         |         |        |  |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36            | 1.2                                 | 11                                    | 6 ÷ 11                              |                        |                    | 27.9                              | 26                                | 22                                | 38                                |         |         |        |  |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42            | 1.2                                 | 14.2                                  | 8 ÷ 14                              |                        |                    | 31.8                              | 29.4                              | 24.6                              | 44.5                              |         |         |        |  |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47            | 1.3                                 | 13                                    | 10 ÷ 17                             |                        |                    | 35                                | 32.1                              | 26.6                              | 49.7                              |         |         |        |  |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52            | 1.4                                 | 15.4                                  | 11 ÷ 19                             |                        |                    | 38.2                              | 35                                | 28.6                              | 55.1                              |         |         |        |  |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62            | 1.5                                 | 18.3                                  | 17 ÷ 29                             |                        |                    | 23.5                              | 21.4                              | 17.2                              | 34.9                              |         |         |        |  |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69            | 1.6                                 | 23.2                                  | 19 ÷ 33                             |                        |                    | 26.2                              | 23.7                              | 18.9                              | 39.4                              |         |         |        |  |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81            | 1.8                                 | 27.8                                  | 23 ÷ 40                             |                        |                    | 31                                | 27.9                              | 21.8                              | 47.7                              |         |         |        |  |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100           | 1.9                                 | 39.7                                  | 17 ÷ 29                             |                        |                    | 26.3                              | 23.8                              | 19                                | 39.6                              |         |         |        |  |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115           | 2                                   | 36.2                                  | 21 ÷ 36                             |                        |                    | 30.7                              | 27.6                              | 21.6                              | 47.2                              |         |         |        |  |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138           | 2.3                                 | 42.1                                  | 25 ÷ 43                             |                        |                    | 37.7                              | 33.7                              | 25.9                              | 59.4                              |         |         |        |  |
| 125                                                                  | 250    | 8        | M16      | 100      | 142               | 162           | 2.7                                 | 40.6                                  | 30 ÷ 52                             |                        |                    | 45.7                              | 40.6                              | 30.8                              | 73.7                              |         |         |        |  |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190           | 3.1                                 | 47.6                                  | 44 ÷ 76                             |                        |                    | 35.7                              | 31.5                              | 23.5                              | 58.6                              |         |         |        |  |
| 200                                                                  | 340    | 12       | M20      | 110      | 220               | 240           | 3.7                                 | 49.6                                  | 38 ÷ 65                             |                        |                    | 36.5                              | 32.2                              | 24                                | 60.2                              |         |         |        |  |
| 250                                                                  | 405    | 12       | M24      | 120      | 270               | 290           | 4.4                                 | 57                                    | 61 ÷ 104                            |                        |                    | 33.1                              | 29                                | 21.2                              | 55.8                              |         |         |        |  |
| 300                                                                  | 460    | 12       | M24      | 120      | 320               | 340           | 5.1                                 | 32                                    | 82 ÷ 141                            |                        |                    | 41.6                              | 36.3                              | 26.2                              | 71.4                              |         |         |        |  |
| 350                                                                  | 520    | 16       | M24      | 130      | 375               | 395           | 5.9                                 | 36.7                                  | 83 ÷ 142                            |                        |                    | 41.7                              | 36.3                              | 26.2                              | 71.5                              |         |         |        |  |
| 400                                                                  | 580    | 16       | M27      | 150      | 426               | 450           | 5.6                                 | 42.4                                  | 120 ÷ 206                           |                        |                    | 38.8                              | 33.7                              | 24                                | 67.4                              |         |         |        |  |
| 450                                                                  | 640    | 20       | M27      | 150      | 480               | 506           | 5.8                                 | 57                                    | 121 ÷ 208                           |                        |                    | 39                                | 33.9                              | 24.2                              | 67.9                              |         |         |        |  |
| 500                                                                  | 715    | 20       | M30      | 150      | 530               | 560           | 5.6                                 | 65.1                                  | 166 ÷ 285                           |                        |                    | 37.8                              | 32.7                              | 23.2                              | 66.4                              |         |         |        |  |
| 600                                                                  | 840    | 20       | M33      | 180      | 630               | 664           | 5.8                                 | 83.4                                  | 252 ÷ 435                           |                        |                    | 39.9                              | 34.4                              | 24                                | 70.8                              |         |         |        |  |
| 700                                                                  | 910    | 24       | M33      | 180      | 730               | 770           | 5.7                                 | 74.8                                  | 282 ÷ 487                           |                        |                    | 43.9                              | 37.8                              | 26.3                              | 77.8                              |         |         |        |  |
| 800                                                                  | 1025   | 24       | M36      | 180      | 830               | 876           | 5.7                                 | 90.5                                  | 401 ÷ 691                           |                        |                    | 46.9                              | 40.2                              | 27.8                              | 82.7                              |         |         |        |  |
| 900                                                                  | 1125   | 28       | M36      | 200      | 930               | 982           | 5.6                                 | 93.5                                  | 432 ÷ 745                           |                        |                    | 50                                | 42.9                              | 29.5                              | 88.1                              |         |         |        |  |
| 1000                                                                 | 1255   | 28       | M39      | 220      | 1040              | 1098          | 5.6                                 | 86.9                                  | 581 ÷ 1005                          |                        |                    | 50.1                              | 43.1                              | 29.5                              | 88.6                              |         |         |        |  |
| 1200                                                                 | 1485   | 32       | M45      | 280      | 1250              | 1320          | 5.6                                 | 64.5                                  | 846 ÷ 1466                          |                        | 1270 ÷ 2199        | 45.2                              |                                   | 26.7                              | 80.8                              |         |         |        |  |
| 1400                                                                 | 1685   | 36       | M45      | 300      | 1440              | 1522          | 5.5                                 | 65.9                                  | 1001 ÷ 1734                         |                        | 1502 ÷ 2601        | 52.1                              |                                   | 30.9                              | 93.7                              |         |         |        |  |
| 1600                                                                 | 1930   | 40       | M52      | 350      | 1650              | 1742          | 5.6                                 | 63.9                                  | 1350 ÷ 2342                         |                        | 2026 ÷ 3514        | 44.3                              |                                   | 26.2                              | 80.1                              |         |         |        |  |
| 1800                                                                 | 2130   | 44       | M52      | 360      | 1850              | 1914          | 8.6                                 | 63.4                                  | 1452 ÷ 2518                         |                        | 2177 ÷ 3777        | 46.8                              |                                   | 27.7                              | 84.9                              |         |         |        |  |
| 2000                                                                 | 2345   | 48       | M56      | 400      | 2050              | 2120          | 8.7                                 | 62.1                                  | 1753 ÷ 3037                         |                        | 2630 ÷ 4556        | 45                                |                                   | 26.5                              | 82                                |         |         |        |  |

Obr. / Fig.7 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN16

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku |                  | Hydraulickým<br>klúčom            | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |  |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                  | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |  |
| [mm]                                                                 | PN16   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |  |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2   | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |  |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 1.2                                 | 11                                 | 6 ÷ 11                                |                  | 29.2                              | 27.2                              | 22.5                              | 42.1                              |  |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 1.2                                 | 14.2                               | 8 ÷ 14                                |                  | 33.4                              | 31                                | 25.1                              | 49.6                              |  |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 1.3                                 | 13                                 | 10 ÷ 17                               |                  | 36.7                              | 33.9                              | 27.2                              | 55.7                              |  |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 1.4                                 | 15.4                               | 11 ÷ 19                               |                  | 40.2                              | 37                                | 29.3                              | 62                                |  |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 1.6                                 | 18.3                               | 17 ÷ 29                               |                  | 24.9                              | 22.8                              | 17.7                              | 39.6                              |  |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 1.7                                 | 23.2                               | 19 ÷ 33                               |                  | 27.8                              | 25.3                              | 19.4                              | 44.9                              |  |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81         | 1.9                                 | 27.8                               | 23 ÷ 40                               |                  | 33                                | 29.8                              | 22.5                              | 54.6                              |  |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100        | 2                                   | 39.7                               | 17 ÷ 29                               |                  | 27.9                              | 25.4                              | 19.5                              | 45.2                              |  |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115        | 2.1                                 | 36.2                               | 21 ÷ 36                               |                  | 32.7                              | 29.5                              | 22.3                              | 54.1                              |  |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138        | 2.5                                 | 42.1                               | 25 ÷ 43                               |                  | 40.3                              | 36.2                              | 26.7                              | 68.6                              |  |
| 125                                                                  | 250    | 8        | M16      | 100      | 142               | 162        | 2.8                                 | 40.6                               | 30 ÷ 52                               |                  | 49                                | 43.8                              | 31.8                              | 85.5                              |  |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190        | 3.2                                 | 50.2                               | 44 ÷ 76                               |                  | 38.4                              | 34.1                              | 24.3                              | 68.4                              |  |
| 200                                                                  | 340    | 12       | M20      | 110      | 220               | 240        | 3.9                                 | 61.9                               | 38 ÷ 65                               |                  | 39.3                              | 34.9                              | 24.9                              | 70.3                              |  |
| 250                                                                  | 405    | 12       | M24      | 120      | 270               | 290        | 4.7                                 | 71                                 | 64 ÷ 110                              |                  | 35.7                              | 31.6                              | 22                                | 65.5                              |  |
| 300                                                                  | 460    | 12       | M24      | 120      | 320               | 340        | 5.4                                 | 39.6                               | 87 ÷ 149                              |                  | 45.1                              | 39.7                              | 27.3                              | 84.3                              |  |
| 350                                                                  | 520    | 16       | M24      | 130      | 375               | 395        | 6.2                                 | 45.1                               | 87 ÷ 150                              |                  | 45.1                              | 39.7                              | 27.3                              | 84.3                              |  |
| 400                                                                  | 580    | 16       | M27      | 150      | 426               | 450        | 5.9                                 | 52.2                               | 126 ÷ 218                             |                  | 42.1                              | 36.9                              | 25                                | 79.9                              |  |
| 450                                                                  | 640    | 20       | M27      | 150      | 480               | 506        | 6.1                                 | 70.1                               | 128 ÷ 220                             |                  | 42.4                              | 37.1                              | 25.2                              | 80.4                              |  |
| 500                                                                  | 715    | 20       | M30      | 150      | 530               | 560        | 5.9                                 | 80.2                               | 175 ÷ 301                             |                  | 41.1                              | 35.9                              | 24.1                              | 78.8                              |  |
| 600                                                                  | 840    | 20       | M33      | 180      | 630               | 664        | 6.1                                 | 102.7                              | 266 ÷ 459                             |                  | 43.5                              | 37.8                              | 25.1                              | 83.4                              |  |
| 700                                                                  | 910    | 24       | M33      | 180      | 730               | 770        | 6                                   | 91.9                               | 298 ÷ 515                             |                  | 47.9                              | 41.6                              | 27.5                              | 91.9                              |  |
| 800                                                                  | 1025   | 24       | M36      | 180      | 830               | 876        | 6                                   | 111.3                              | 424 ÷ 730                             |                  | 51.2                              | 44.4                              | 29                                | 98                                |  |
| 900                                                                  | 1125   | 28       | M36      | 200      | 930               | 982        | 5.9                                 | 113.2                              | 457 ÷ 787                             |                  | 54.7                              | 47.3                              | 30.9                              | 104.5                             |  |
| 1000                                                                 | 1255   | 28       | M39      | 220      | 1040              | 1098       | 5.9                                 | 105.2                              | 614 ÷ 1061                            | 920 ÷ 1592       | 54.6                              | 47.6                              | 30.9                              | 105.4                             |  |
| 1200                                                                 | 1485   | 32       | M45      | 280      | 1250              | 1320       | 5.9                                 | 79.1                               | 894 ÷ 1549                            | 1341 ÷ 2323      | 49.4                              |                                   | 28                                | 96.4                              |  |
| 1400                                                                 | 1685   | 36       | M45      | 300      | 1440              | 1522       | 5.8                                 | 80.9                               | 1058 ÷ 1832                           | 1586 ÷ 2748      | 56.9                              |                                   | 32.4                              | 111.9                             |  |
| 1600                                                                 | 1930   | 40       | M52      | 350      | 1650              | 1742       | 5.9                                 | 78.3                               | 1427 ÷ 2475                           | 2140 ÷ 3712      | 48.4                              |                                   | 27.4                              | 95.8                              |  |
| 1800                                                                 | 2130   | 44       | M52      | 360      | 1850              | 1914       | 9.1                                 | 109.2                              | 1533 ÷ 2660                           | 2300 ÷ 3990      | 51.2                              |                                   | 28.9                              | 101.6                             |  |
| 2000                                                                 | 2345   | 48       | M56      | 400      | 2050              | 2120       | 9.2                                 | 107.9                              | 1852 ÷ 3209                           | 2778 ÷ 4813      | 49.3                              |                                   | 27.7                              | 98.2                              |  |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku |                  | Hydraulickým<br>klúčom            | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |  |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                  | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |  |
| [mm]                                                                 | PN16   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |  |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2   | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |  |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 1.4                                 | 11                                 | 6 ÷ 11                                |                  | 31.8                              | 29.4                              | 24                                | 45.4                              |  |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 1.4                                 | 14.2                               | 8 ÷ 14                                |                  | 36.7                              | 33.7                              | 27                                | 53.9                              |  |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 1.5                                 | 13                                 | 10 ÷ 17                               |                  | 40.6                              | 37.1                              | 29.3                              | 60.6                              |  |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 1.6                                 | 15.4                               | 11 ÷ 19                               |                  | 44.7                              | 40.6                              | 31.7                              | 67.7                              |  |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 1.8                                 | 18.3                               | 17 ÷ 29                               |                  | 27.9                              | 25.2                              | 19.3                              | 43.4                              |  |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 2                                   | 23.2                               | 19 ÷ 33                               |                  | 31.2                              | 28.1                              | 21.2                              | 49.4                              |  |
| 50                                                                   | 165    | 4        | M16      | 80       | 65                | 81         | 2.2                                 | 27.8                               | 23 ÷ 40                               |                  | 37.3                              | 33.3                              | 24.8                              | 60.5                              |  |
| 65                                                                   | 185    | 8        | M16      | 80       | 81                | 100        | 2.3                                 | 39.7                               | 17 ÷ 29                               |                  | 31.4                              | 28.2                              | 21.3                              | 49.8                              |  |
| 80                                                                   | 200    | 8        | M16      | 90       | 95                | 115        | 2.5                                 | 36.2                               | 21 ÷ 36                               |                  | 37                                | 33                                | 24.6                              | 59.8                              |  |
| 100                                                                  | 220    | 8        | M16      | 90       | 118               | 138        | 2.8                                 | 42.1                               | 25 ÷ 43                               |                  | 46                                | 40.8                              | 29.7                              | 76.3                              |  |
| 125                                                                  | 250    | 8        | M16      | 100      | 142               | 162        | 3.2                                 | 47.8                               | 30 ÷ 52                               |                  | 56.3                              | 49.7                              | 35.6                              | 95.5                              |  |
| 150                                                                  | 285    | 8        | M20      | 100      | 170               | 190        | 3.7                                 | 48.2                               | 44 ÷ 76                               |                  | 44.4                              | 38.9                              | 27.4                              | 76.7                              |  |
| 200                                                                  | 340    | 12       | M20      | 110      | 220               | 240        | 4.5                                 | 78.4                               | 43 ÷ 73                               |                  | 45.5                              | 39.8                              | 28                                | 78.8                              |  |
| 250                                                                  | 405    | 12       | M24      | 120      | 270               | 290        | 5.3                                 | 89.9                               | 73 ÷ 126                              |                  | 41.6                              | 36.2                              | 25                                | 73.7                              |  |
| 300                                                                  | 460    | 12       | M24      | 120      | 320               | 340        | 6.2                                 | 50.2                               | 100 ÷ 171                             |                  | 52.8                              | 45.8                              | 31.1                              | 95.1                              |  |
| 350                                                                  | 520    | 16       | M24      | 130      | 375               | 395        | 7.1                                 | 57.2                               | 100 ÷ 172                             |                  | 52.8                              | 45.8                              | 31.1                              | 95.2                              |  |
| 400                                                                  | 580    | 16       | M27      | 150      | 426               | 450        | 6.7                                 | 66.2                               | 145 ÷ 249                             |                  | 49.5                              | 42.7                              | 28.7                              | 90.3                              |  |
| 450                                                                  | 640    | 20       | M27      | 150      | 480               | 506        | 7                                   | 88.8                               | 146 ÷ 252                             |                  | 49.9                              | 43                                | 28.9                              | 91                                |  |
| 500                                                                  | 715    | 20       | M30      | 150      | 530               | 560        | 6.7                                 | 101.7                              | 201 ÷ 345                             |                  | 48.5                              | 41.7                              | 27.8                              | 88.8                              |  |
| 600                                                                  | 840    | 20       | M33      | 180      | 630               | 664        | 7                                   | 130.3                              | 304 ÷ 526                             |                  | 51.6                              | 44.2                              | 29                                | 94.1                              |  |
| 700                                                                  | 910    | 24       | M33      | 180      | 730               | 770        | 6.9                                 | 116.6                              | 341 ÷ 590                             |                  | 56.9                              | 48.7                              | 31.8                              | 103.7                             |  |
| 800                                                                  | 1025   | 24       | M36      | 180      | 830               | 876        | 6.8                                 | 141.2                              | 485 ÷ 836                             | 728 ÷ 1255       | 60.6                              | 52                                | 33.7                              | 110.9                             |  |
| 900                                                                  | 1125   | 28       | M36      | 200      | 930               | 982        | 6.8                                 | 144.8                              | 523 ÷ 901                             | 785 ÷ 1352       | 64.5                              | 55.5                              | 35.9                              | 118.4                             |  |
| 1000                                                                 | 1255   | 28       | M39      | 220      | 1040              | 1098       | 6.8                                 | 134.5                              | 703 ÷ 1215                            | 1054 ÷ 1823      | 64.5                              | 55.4                              | 36                                | 119.5                             |  |
| 1200                                                                 | 1485   | 32       | M45      | 280      | 1250              | 1320       | 6.8                                 | 102.7                              | 1024 ÷ 1773                           | 1536 ÷ 2660      | 58.5                              |                                   | 32.8                              | 109.5                             |  |
| 1400                                                                 | 1685   | 36       | M45      | 300      | 1440              | 1522       | 6.7                                 | 105.1                              | 1211 ÷ 2097                           | 1816 ÷ 3146      | 67.6                              |                                   | 37.7                              | 127.4                             |  |
| 1600                                                                 | 1930   | 40       | M52      | 350      | 1650              | 1742       | 6.8                                 | 145.9                              | 1634 ÷ 2833                           | 2450 ÷ 4250      | 57.6                              |                                   | 31.9                              | 109.1                             |  |
| 1800                                                                 | 2130   | 44       | M52      | 360      | 1850              | 1914       | 10.4                                | 100.7                              | 1756 ÷ 3046                           | 2634 ÷ 4569      | 61                                |                                   | 33.6                              | 115.8                             |  |
| 2000                                                                 | 2345   | 48       | M56      | 400      | 2050              | 2120       | 10.6                                | 98.6                               | 2121 ÷ 3674                           | 3181 ÷ 5511      | 58.8                              |                                   | 32.3                              | 112.2                             |  |

Obr. / Fig.8 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN16

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 1.7                                 | 11                                 | 6 ÷ 11                                |                        | 34.3                              | 24.8                              | 40.9                              | 28.6                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 1.7                                 | 14.2                               | 8 ÷ 14                                |                        | 39.8                              | 28                                | 48.1                              | 32.7                              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 1.8                                 | 13                                 | 10 ÷ 17                               |                        | 44.2                              | 30.5                              | 53.9                              | 35.9                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 1.9                                 | 15.4                               | 11 ÷ 19                               |                        | 48.7                              | 33.1                              | 59.9                              | 39.3                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 1.8                                 | 18.3                               | 17 ÷ 29                               |                        | 30.6                              | 20.2                              | 38.1                              | 24.3                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 2.4                                 | 23.2                               | 19 ÷ 33                               |                        | 34.4                              | 22.3                              | 43.2                              | 27                                |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 2.7                                 | 21.6                               | 23 ÷ 40                               |                        | 41.3                              | 26.1                              | 52.5                              | 32                                |
| 65                                                                   | 185    | 8        | M16      | 85       | 81                | 100        | 2.7                                 | 24.7                               | 17 ÷ 29                               |                        | 34.6                              | 22.4                              | 43.5                              | 27.2                              |
| 80                                                                   | 200    | 8        | M16      | 85       | 95                | 115        | 2.9                                 | 23.2                               | 21 ÷ 36                               |                        | 40.9                              | 25.9                              | 52                                | 31.8                              |
| 100                                                                  | 235    | 8        | M20      | 90       | 118               | 138        | 3.4                                 | 29.8                               | 32 ÷ 54                               |                        | 32.6                              | 20                                | 41.9                              | 24.9                              |
| 125                                                                  | 270    | 8        | M24      | 105      | 142               | 162        | 3.9                                 | 32.7                               | 45 ÷ 77                               |                        | 28                                | 16.8                              | 36.4                              | 21.1                              |
| 150                                                                  | 300    | 8        | M24      | 110      | 170               | 190        | 4.4                                 | 35.7                               | 58 ÷ 100                              |                        | 34.8                              | 20.4                              | 45.7                              | 25.9                              |
| 200                                                                  | 360    | 12       | M24      | 110      | 220               | 240        | 5.4                                 | 46.3                               | 61 ÷ 104                              |                        | 35.7                              | 20.8                              | 47                                | 26.6                              |
| 250                                                                  | 425    | 12       | M27      | 130      | 270               | 290        | 6.4                                 | 55.5                               | 97 ÷ 167                              |                        | 35.7                              | 20.2                              | 47.4                              | 38.1                              |
| 300                                                                  | 485    | 16       | M27      | 130      | 320               | 340        | 7.4                                 | 33.9                               | 99 ÷ 171                              |                        | 36.1                              | 20.5                              | 48                                | 38.6                              |
| 350                                                                  | 555    | 16       | M30      | 150      | 375               | 395        | 8.4                                 | 37.6                               | 148 ÷ 255                             |                        | 37.3                              | 20.7                              | 50                                | 39.9                              |
| 400                                                                  | 620    | 16       | M33      | 160      | 426               | 450        | 8.1                                 | 39.1                               | 209 ÷ 361                             |                        | 37.1                              | 20.2                              | 50                                |                                   |
| 450                                                                  | 670    | 20       | M33      | 170      | 480               | 506        | 8.3                                 | 46.8                               | 211 ÷ 364                             |                        | 37.3                              | 20.4                              | 50.4                              |                                   |
| 500                                                                  | 730    | 20       | M33      | 180      | 530               | 560        | 8                                   | 43.3                               | 259 ÷ 447                             |                        | 44.3                              | 23.9                              | 60.1                              |                                   |
| 600                                                                  | 845    | 20       | M36      | 200      | 630               | 664        | 8.4                                 | 53.5                               | 399 ÷ 687                             |                        | 50.6                              | 26.8                              | 68.1                              |                                   |
| 700                                                                  | 960    | 24       | M39      | 180      | 730               | 770        | 8.3                                 | 74.1                               | 481 ÷ 831                             | 721 ÷ 1247             | 46.4                              | 24.4                              | 62.3                              |                                   |
| 800                                                                  | 1085   | 24       | M45      | 230      | 830               | 876        | 8.2                                 | 80.5                               | 717 ÷ 1242                            | 1076 ÷ 1863            |                                   |                                   |                                   |                                   |
| 900                                                                  | 1185   | 28       | M45      | 240      | 930               | 982        | 8.1                                 | 82.3                               | 773 ÷ 1338                            | 1159 ÷ 2007            |                                   |                                   |                                   |                                   |
| 1000                                                                 | 1320   | 28       | M52      | 260      | 1040              | 1098       | 8.1                                 | 88.4                               | 1106 ÷ 1919                           | 1660 ÷ 2879            |                                   |                                   |                                   |                                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 1.8                                 | 11                                 | 6 ÷ 11                                |                        | 37.4                              | 25.6                              | 45                                | 30.8                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 1.8                                 | 14.2                               | 8 ÷ 14                                |                        | 43.7                              | 29                                | 53.3                              | 35.4                              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 2                                   | 13                                 | 10 ÷ 17                               |                        | 48.8                              | 31.7                              | 60                                | 39.1                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 2.1                                 | 15.4                               | 11 ÷ 19                               |                        | 54.1                              | 34.4                              | 67                                | 42.9                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 2.4                                 | 18.3                               | 17 ÷ 29                               |                        | 34.2                              | 21                                | 42.9                              | 26.7                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 2.6                                 | 23.2                               | 19 ÷ 33                               |                        | 38.6                              | 23.3                              | 48.8                              | 29.8                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 2.9                                 | 21.6                               | 23 ÷ 40                               |                        | 46.7                              | 27.3                              | 59.7                              | 35.6                              |
| 65                                                                   | 185    | 8        | M16      | 85       | 81                | 100        | 3                                   | 24.7                               | 17 ÷ 29                               |                        | 38.8                              | 23.4                              | 49.2                              | 30                                |
| 80                                                                   | 200    | 8        | M16      | 85       | 95                | 115        | 3.2                                 | 23.2                               | 21 ÷ 36                               |                        | 46.2                              | 27.1                              | 59.1                              | 35.2                              |
| 100                                                                  | 235    | 8        | M20      | 90       | 118               | 138        | 3.7                                 | 31                                 | 32 ÷ 54                               |                        | 37                                | 21                                | 47.9                              | 27.8                              |
| 125                                                                  | 270    | 8        | M24      | 105      | 142               | 162        | 4.2                                 | 34.5                               | 47 ÷ 80                               |                        | 32                                | 17.7                              | 41.8                              | 23.7                              |
| 150                                                                  | 300    | 8        | M24      | 110      | 170               | 190        | 4.8                                 | 37.7                               | 63 ÷ 108                              |                        | 40                                | 21.5                              | 52.8                              | 29.3                              |
| 200                                                                  | 360    | 12       | M24      | 110      | 220               | 240        | 5.8                                 | 48.9                               | 66 ÷ 113                              |                        | 41                                | 22                                | 54.3                              | 30                                |
| 250                                                                  | 425    | 12       | M27      | 130      | 270               | 290        | 6.9                                 | 58.6                               | 105 ÷ 181                             |                        | 41.2                              | 21.4                              | 55                                | 43.1                              |
| 300                                                                  | 485    | 16       | M27      | 130      | 320               | 340        | 8                                   | 36                                 | 107 ÷ 185                             |                        | 41.7                              | 21.7                              | 55.8                              | 43.7                              |
| 350                                                                  | 555    | 16       | M30      | 150      | 375               | 395        | 9.1                                 | 40.1                               | 160 ÷ 276                             |                        | 43.3                              | 22                                | 58.2                              | 45.4                              |
| 400                                                                  | 620    | 16       | M33      | 160      | 426               | 450        | 8.7                                 | 41.7                               | 226 ÷ 390                             |                        | 43.1                              | 21.6                              | 58.4                              |                                   |
| 450                                                                  | 670    | 20       | M33      | 170      | 480               | 506        | 9                                   | 50                                 | 228 ÷ 394                             |                        | 43.4                              | 21.7                              | 58.9                              |                                   |
| 500                                                                  | 730    | 20       | M33      | 180      | 530               | 560        | 8.7                                 | 46.2                               | 280 ÷ 484                             |                        | 51.7                              | 25.5                              | 70                                |                                   |
| 600                                                                  | 845    | 20       | M36      | 200      | 630               | 664        | 9                                   | 57.1                               | 431 ÷ 743                             |                        | 59                                | 28.6                              | 79.4                              |                                   |
| 700                                                                  | 960    | 24       | M39      | 180      | 730               | 770        | 8.9                                 | 79.3                               | 519 ÷ 899                             |                        | 53.9                              | 26.1                              | 72.6                              |                                   |
| 800                                                                  | 1085   | 24       | M45      | 230      | 830               | 876        | 8.8                                 | 86.1                               | 775 ÷ 1343                            | 1163 ÷ 2014            |                                   |                                   |                                   |                                   |
| 900                                                                  | 1185   | 28       | M45      | 240      | 930               | 982        | 8.8                                 | 85.9                               | 835 ÷ 1447                            | 1253 ÷ 2170            |                                   |                                   |                                   |                                   |
| 1000                                                                 | 1320   | 28       | M52      | 260      | 1040              | 1098       | 8.8                                 | 94.7                               | 1196 ÷ 2075                           | 1794 ÷ 3112            |                                   |                                   |                                   |                                   |

Obr. / Fig.9 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN25

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |       |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|-------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | [mm]  | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |       |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60    | 22                | 36         | 1.9                                 | 11                                 | 6 ÷ 11                                |                        | 40.9                              | 26.5                              | 48.1                              | 31.5                              |
| 15                                                                   | 95     | 4        | M12      | 60    | 26                | 42         | 1.9                                 | 14.2                               | 8 ÷ 14                                |                        | 48.1                              | 30.1                              | 57.2                              | 36.3                              |
| 20                                                                   | 105    | 4        | M12      | 65    | 31                | 47         | 2.1                                 | 13                                 | 10 ÷ 17                               |                        | 53.9                              | 33                                | 64.6                              | 40.2                              |
| 25                                                                   | 115    | 4        | M12      | 65    | 36                | 52         | 2.2                                 | 15.4                               | 11 ÷ 19                               |                        | 59.9                              | 35.9                              | 72.3                              | 44.1                              |
| 32                                                                   | 140    | 4        | M16      | 75    | 46                | 62         | 2.5                                 | 18.3                               | 17 ÷ 29                               |                        | 38.1                              | 22                                | 46.5                              | 27.5                              |
| 40                                                                   | 150    | 4        | M16      | 75    | 53                | 69         | 2.7                                 | 23.2                               | 19 ÷ 33                               |                        | 43.2                              | 24.4                              | 53.1                              | 30.8                              |
| 50                                                                   | 165    | 4        | M16      | 75    | 65                | 81         | 3                                   | 22.1                               | 23 ÷ 40                               |                        | 52.5                              | 28.8                              | 65.1                              | 36.8                              |
| 65                                                                   | 185    | 8        | M16      | 85    | 81                | 100        | 3.1                                 | 26.2                               | 17 ÷ 29                               |                        | 43.5                              | 24.6                              | 53.5                              | 31                                |
| 80                                                                   | 200    | 8        | M16      | 85    | 95                | 115        | 3.4                                 | 27.6                               | 21 ÷ 36                               |                        | 52                                | 28.5                              | 64.4                              | 36.4                              |
| 100                                                                  | 235    | 8        | M20      | 90    | 118               | 138        | 3.9                                 | 38.7                               | 32 ÷ 54                               |                        | 41.9                              | 22.2                              | 52.4                              | 28.8                              |
| 125                                                                  | 270    | 8        | M24      | 105   | 142               | 162        | 4.4                                 | 43                                 | 49 ÷ 84                               |                        | 36.4                              | 18.7                              | 46                                | 24.6                              |
| 150                                                                  | 300    | 8        | M24      | 110   | 170               | 190        | 5                                   | 47                                 | 67 ÷ 114                              |                        | 45.7                              | 22.8                              | 58.2                              | 30.5                              |
| 200                                                                  | 360    | 12       | M24      | 110   | 220               | 240        | 6.2                                 | 60.9                               | 69 ÷ 119                              |                        | 47                                | 23.4                              | 59.8                              | 31.2                              |
| 250                                                                  | 425    | 12       | M27      | 130   | 270               | 290        | 7.3                                 | 73.1                               | 111 ÷ 191                             |                        | 47.4                              | 22.9                              | 60.8                              | 44.6                              |
| 300                                                                  | 485    | 16       | M27      | 130   | 320               | 340        | 8.4                                 | 44.6                               | 113 ÷ 195                             |                        | 48                                | 23.1                              | 61.7                              | 45.2                              |
| 350                                                                  | 555    | 16       | M30      | 150   | 375               | 395        | 9.7                                 | 49.5                               | 169 ÷ 291                             |                        | 50                                | 23.5                              | 64.6                              | 47                                |
| 400                                                                  | 620    | 16       | M33      | 160   | 426               | 450        | 9.2                                 | 51.5                               | 239 ÷ 412                             |                        | 50                                | 23.1                              | 64.9                              |                                   |
| 450                                                                  | 670    | 20       | M33      | 170   | 480               | 506        | 9.5                                 | 60.7                               | 241 ÷ 416                             |                        | 50.4                              | 23.2                              | 65.4                              |                                   |
| 500                                                                  | 730    | 20       | M33      | 180   | 530               | 560        | 9.2                                 | 56.2                               | 296 ÷ 511                             |                        | 60.1                              | 27.4                              | 77.4                              |                                   |
| 600                                                                  | 845    | 20       | M36      | 200   | 630               | 664        | 9.6                                 | 69.4                               | 456 ÷ 785                             |                        | 68.1                              | 30.8                              | 88                                |                                   |
| 700                                                                  | 960    | 24       | M39      | 180   | 730               | 770        | 9.4                                 | 96.3                               | 549 ÷ 950                             | 824 ÷ 1425             | 62.3                              | 28.1                              | 80.6                              |                                   |
| 800                                                                  | 1085   | 24       | M45      | 230   | 830               | 876        | 9.3                                 | 104.6                              | 819 ÷ 1419                            | 1229 ÷ 2128            |                                   |                                   |                                   |                                   |
| 900                                                                  | 1185   | 28       | M45      | 240   | 930               | 982        | 9.3                                 | 107                                | 883 ÷ 1529                            | 1324 ÷ 2293            |                                   |                                   |                                   |                                   |
| 1000                                                                 | 1320   | 28       | M52      | 260   | 1040              | 1098       | 9.3                                 | 114.9                              | 1264 ÷ 2192                           | 1896 ÷ 3289            |                                   |                                   |                                   |                                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |       |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|-------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | [mm]  | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |       |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60    | 22                | 36         | 2.2                                 | 8.2                                | 6 ÷ 11                                |                        | 47.2                              | 27.8                              | 52                                | 32.6                              |
| 15                                                                   | 95     | 4        | M12      | 60    | 26                | 42         | 2.2                                 | 10.6                               | 8 ÷ 14                                |                        | 56.2                              | 31.7                              | 62.2                              | 37.6                              |
| 20                                                                   | 105    | 4        | M12      | 65    | 31                | 47         | 2.4                                 | 9.8                                | 10 ÷ 17                               |                        | 63.3                              | 34.8                              | 70.4                              | 41.7                              |
| 25                                                                   | 115    | 4        | M12      | 65    | 36                | 52         | 2.6                                 | 11.6                               | 11 ÷ 19                               |                        | 70.9                              | 38                                | 79                                | 45.9                              |
| 32                                                                   | 140    | 4        | M16      | 75    | 46                | 62         | 2.9                                 | 13.6                               | 17 ÷ 29                               |                        | 45.6                              | 23.5                              | 51.1                              | 28.7                              |
| 40                                                                   | 150    | 4        | M16      | 75    | 53                | 69         | 3.1                                 | 15.6                               | 19 ÷ 33                               |                        | 51.9                              | 26.1                              | 58.4                              | 32.2                              |
| 50                                                                   | 165    | 4        | M16      | 75    | 65                | 81         | 3.5                                 | 17.7                               | 23 ÷ 40                               |                        | 63.7                              | 30.8                              | 72                                | 38.5                              |
| 65                                                                   | 185    | 8        | M16      | 85    | 81                | 100        | 3.6                                 | 22.5                               | 17 ÷ 29                               |                        | 52.3                              | 26.2                              | 58.9                              | 32.4                              |
| 80                                                                   | 200    | 8        | M16      | 85    | 95                | 115        | 3.8                                 | 35                                 | 21 ÷ 36                               |                        | 63                                | 30.5                              | 71.2                              | 38.1                              |
| 100                                                                  | 235    | 8        | M20      | 90    | 118               | 138        | 4.4                                 | 49                                 | 35 ÷ 60                               |                        | 51.2                              | 23.9                              | 58.2                              | 30.2                              |
| 125                                                                  | 270    | 8        | M24      | 105   | 142               | 162        | 5.1                                 | 54.5                               | 56 ÷ 97                               |                        | 44.9                              | 20.2                              | 51.2                              | 25.9                              |
| 150                                                                  | 300    | 8        | M24      | 110   | 170               | 190        | 5.8                                 | 59.6                               | 76 ÷ 131                              |                        | 56.7                              | 24.8                              | 65.1                              | 32.1                              |
| 200                                                                  | 360    | 12       | M24      | 110   | 220               | 240        | 7.1                                 | 77.2                               | 80 ÷ 136                              |                        | 58.3                              | 25.4                              | 66.9                              | 32.9                              |
| 250                                                                  | 425    | 12       | M27      | 130   | 270               | 290        | 8.4                                 | 92.6                               | 127 ÷ 219                             |                        | 59.2                              | 24.9                              | 68.3                              | 47.2                              |
| 300                                                                  | 485    | 16       | M27      | 130   | 320               | 340        | 9.6                                 | 56.5                               | 130 ÷ 224                             |                        | 60.1                              | 25.2                              | 69.2                              | 47.8                              |
| 350                                                                  | 555    | 16       | M30      | 150   | 375               | 395        | 11.1                                | 62.7                               | 194 ÷ 334                             |                        | 62.8                              | 25.7                              | 72.7                              | 49.8                              |
| 400                                                                  | 620    | 16       | M33      | 160   | 426               | 450        | 10.6                                | 65.3                               | 274 ÷ 473                             |                        | 63.1                              | 25.3                              | 72.7                              |                                   |
| 450                                                                  | 670    | 20       | M33      | 170   | 480               | 506        | 10.9                                | 77.5                               | 276 ÷ 477                             |                        | 63.6                              | 25.5                              | 73.2                              |                                   |
| 500                                                                  | 730    | 20       | M33      | 180   | 530               | 560        | 10.5                                | 71.7                               | 339 ÷ 586                             |                        | 75.4                              | 30.1                              | 86.8                              |                                   |
| 600                                                                  | 845    | 20       | M36      | 200   | 630               | 664        | 11                                  | 88.7                               | 522 ÷ 900                             | 784 ÷ 1350             | 85.6                              | 34                                | 99                                |                                   |
| 700                                                                  | 960    | 24       | M39      | 180   | 730               | 770        | 10.8                                | 123.1                              | 630 ÷ 1089                            | 944 ÷ 1634             | 78.4                              | 31                                | 90.7                              |                                   |
| 800                                                                  | 1085   | 24       | M45      | 230   | 830               | 876        | 10.7                                | 133.8                              | 939 ÷ 1627                            | 1409 ÷ 2440            |                                   |                                   |                                   |                                   |
| 900                                                                  | 1185   | 28       | M45      | 240   | 930               | 982        | 10.6                                | 136.7                              | 1012 ÷ 1753                           | 1518 ÷ 2630            |                                   |                                   |                                   |                                   |
| 1000                                                                 | 1320   | 28       | M52      | 260   | 1040              | 1098       | 10.6                                | 147                                | 1449 ÷ 2514                           | 2174 ÷ 3771            |                                   |                                   |                                   |                                   |

Obr. / Fig.10 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN25

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 1.7                                 | 11                                 | 6 ÷ 11                                |                        | 33                                | 30.4                              | 25.6                              | 43.1                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 1.7                                 | 14.2                               | 8 ÷ 14                                |                        | 38.2                              | 34.9                              | 29                                | 50.9                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 1.8                                 | 13                                 | 10 ÷ 17                               |                        | 42.3                              | 38.6                              | 31.7                              | 57.1                              |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 1.9                                 | 15.4                               | 11 ÷ 19                               |                        | 46.6                              | 42.3                              | 34.4                              | 63.7                              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 1.8                                 | 18.3                               | 17 ÷ 29                               |                        | 29.2                              | 26.3                              | 21                                | 40.7                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 2.4                                 | 23.2                               | 19 ÷ 33                               |                        | 32.8                              | 29.4                              | 23.3                              | 46.2                              |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 2.7                                 | 21.6                               | 23 ÷ 40                               |                        | 39.3                              | 35                                | 27.3                              | 56.3                              |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 2.7                                 | 24.7                               | 17 ÷ 29                               |                        | 33                                | 29.6                              | 23.4                              | 46.5                              |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 2.9                                 | 23.2                               | 21 ÷ 36                               |                        | 38.9                              | 34.7                              | 27.1                              | 55.7                              |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 3.4                                 | 29.8                               | 32 ÷ 54                               |                        | 30.8                              | 27.3                              | 21                                | 45.1                              |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 3.9                                 | 32.7                               | 45 ÷ 77                               |                        | 26.5                              | 23.3                              | 17.7                              | 39.3                              |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 4.4                                 | 35.7                               | 58 ÷ 100                              |                        | 32.8                              | 28.7                              | 21.5                              | 49.5                              |
| 200                                                                  | 360    | 12       | M24      | 130      | 220               | 240        | 5.4                                 | 46.3                               | 61 ÷ 104                              |                        | 33.7                              | 29.5                              | 22                                | 50.8                              |
| 250                                                                  | 425    | 12       | M27      | 140      | 270               | 290        | 6.4                                 | 55.5                               | 97 ÷ 167                              |                        | 33.5                              | 29.1                              | 21.4                              | 51.4                              |
| 300                                                                  | 485    | 16       | M27      | 140      | 320               | 340        | 7.4                                 | 33.9                               | 99 ÷ 171                              |                        | 33.9                              | 29.5                              | 21.7                              | 52.1                              |
| 350                                                                  | 555    | 16       | M30      | 160      | 375               | 395        | 8.4                                 | 37.6                               | 148 ÷ 255                             |                        | 35                                | 30.3                              | 22                                | 54.3                              |
| 400                                                                  | 620    | 16       | M33      | 180      | 426               | 450        | 8.1                                 | 39.1                               | 209 ÷ 361                             |                        | 34.7                              | 29.9                              | 21.6                              | 54.4                              |
| 450                                                                  | 670    | 20       | M33      | 180      | 480               | 506        | 8.3                                 | 46.8                               | 211 ÷ 364                             |                        | 34.9                              | 30.1                              | 21.7                              | 54.9                              |
| 500                                                                  | 730    | 20       | M33      | 200      | 530               | 560        | 8                                   | 43.3                               | 259 ÷ 447                             |                        | 41.4                              | 35.6                              | 25.5                              | 65.5                              |
| 600                                                                  | 845    | 20       | M36      | 220      | 630               | 664        | 8.4                                 | 53.5                               | 399 ÷ 687                             |                        | 47.2                              | 40.4                              | 28.6                              | 74.1                              |
| 700                                                                  | 960    | 24       | M39      | 200      | 730               | 770        | 8.3                                 | 74.1                               | 481 ÷ 831                             | 721 ÷ 1247             | 43.3                              | 37                                | 26.1                              | 67.7                              |
| 800                                                                  | 1085   | 24       | M45      | 230      | 830               | 876        | 8.2                                 | 80.5                               | 717 ÷ 1242                            | 1076 ÷ 1863            | 39.9                              |                                   | 24.1                              | 62.8                              |
| 900                                                                  | 1185   | 28       | M45      | 240      | 930               | 982        | 8.1                                 | 82.3                               | 773 ÷ 1338                            | 1159 ÷ 2007            | 42.5                              |                                   | 25.7                              | 67                                |
| 1000                                                                 | 1320   | 28       | M52      | 260      | 1040              | 1098       | 8.1                                 | 88.4                               | 1106 ÷ 1919                           | 1660 ÷ 2879            | 37.9                              |                                   | 23                                | 60.1                              |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 1.8                                 | 11                                 | 6 ÷ 11                                |                        | 34                                | 31.3                              | 26                                | 48.1                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 1.8                                 | 14.2                               | 8 ÷ 14                                |                        | 39.4                              | 36.1                              | 29.4                              | 57.2                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 2                                   | 13                                 | 10 ÷ 17                               |                        | 43.8                              | 39.9                              | 32.2                              | 64.6                              |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 2.1                                 | 15.4                               | 11 ÷ 19                               |                        | 48.3                              | 43.8                              | 35                                | 72.3                              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 2.4                                 | 18.3                               | 17 ÷ 29                               |                        | 30.3                              | 27.3                              | 21.4                              | 46.5                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 2.6                                 | 23.2                               | 19 ÷ 33                               |                        | 34.1                              | 30.5                              | 23.7                              | 53.1                              |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 2.9                                 | 21.6                               | 23 ÷ 40                               |                        | 40.9                              | 36.5                              | 27.9                              | 65.1                              |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 3                                   | 24.7                               | 17 ÷ 29                               |                        | 34.3                              | 30.7                              | 23.9                              | 53.5                              |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 3.2                                 | 23.2                               | 21 ÷ 36                               |                        | 40.5                              | 36.1                              | 27.6                              | 64.4                              |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 3.7                                 | 31                                 | 32 ÷ 54                               |                        | 32.2                              | 28.5                              | 21.4                              | 52.4                              |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 4.2                                 | 34.5                               | 47 ÷ 80                               |                        | 27.7                              | 24.4                              | 18.1                              | 46                                |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 4.8                                 | 37.7                               | 63 ÷ 108                              |                        | 34.4                              | 30.1                              | 22                                | 58.2                              |
| 200                                                                  | 360    | 12       | M24      | 130      | 220               | 240        | 5.8                                 | 48.9                               | 66 ÷ 113                              |                        | 35.3                              | 30.9                              | 22.5                              | 59.8                              |
| 250                                                                  | 425    | 12       | M27      | 140      | 270               | 290        | 6.9                                 | 58.6                               | 105 ÷ 181                             |                        | 35.2                              | 30.6                              | 22                                | 60.8                              |
| 300                                                                  | 485    | 16       | M27      | 140      | 320               | 340        | 8                                   | 36                                 | 107 ÷ 185                             |                        | 35.7                              | 31                                | 22.2                              | 61.7                              |
| 350                                                                  | 555    | 16       | M30      | 160      | 375               | 395        | 9.1                                 | 40.1                               | 160 ÷ 276                             |                        | 36.8                              | 31.9                              | 22.6                              | 64.6                              |
| 400                                                                  | 620    | 16       | M33      | 180      | 426               | 450        | 8.7                                 | 41.7                               | 226 ÷ 390                             |                        | 36.5                              | 31.5                              | 22.1                              | 64.9                              |
| 450                                                                  | 670    | 20       | M33      | 180      | 480               | 506        | 9                                   | 50                                 | 228 ÷ 394                             |                        | 36.8                              | 31.8                              | 22.3                              | 65.4                              |
| 500                                                                  | 730    | 20       | M33      | 200      | 530               | 560        | 8.7                                 | 46.2                               | 280 ÷ 484                             |                        | 43.7                              | 37.6                              | 26.2                              | 77.4                              |
| 600                                                                  | 845    | 20       | M36      | 220      | 630               | 664        | 9                                   | 57.1                               | 431 ÷ 743                             |                        | 49.9                              | 42.8                              | 29.5                              | 88                                |
| 700                                                                  | 960    | 24       | M39      | 200      | 730               | 770        | 8.9                                 | 79.3                               | 519 ÷ 899                             |                        | 45.7                              | 39.2                              | 26.9                              | 80.6                              |
| 800                                                                  | 1085   | 24       | M45      | 230      | 830               | 876        | 8.8                                 | 86.1                               | 775 ÷ 1343                            | 1163 ÷ 2014            | 42.1                              |                                   | 24.8                              | 74.9                              |
| 900                                                                  | 1185   | 28       | M45      | 240      | 930               | 982        | 8.8                                 | 85.9                               | 835 ÷ 1447                            | 1253 ÷ 2170            | 44.8                              |                                   | 26.5                              | 80                                |
| 1000                                                                 | 1320   | 28       | M52      | 260      | 1040              | 1098       | 8.8                                 | 94.7                               | 1196 ÷ 2075                           | 1794 ÷ 3112            | 39.9                              |                                   | 23.7                              | 72                                |

Obr. / Fig.11 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN25

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | Uťahovací Moment                    |                                    | [Nm]                                  |                        | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |
|                                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        |                                   |                                   |                                   |                                   |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 1.9                                 | 11                                 | 6 ÷ 11                                |                        | 35.7                              | 33                                | 26.5                              | 53.8                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 1.9                                 | 14.2                               | 8 ÷ 14                                |                        | 41.6                              | 38.2                              | 30.1                              | 64.5                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 2.1                                 | 13                                 | 10 ÷ 17                               |                        | 46.3                              | 42.3                              | 33                                | 73.2                              |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 2.2                                 | 15.4                               | 11 ÷ 19                               |                        | 51.2                              | 46.6                              | 35.9                              | 82.3                              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 2.5                                 | 18.3                               | 17 ÷ 29                               |                        | 32.3                              | 29.2                              | 22                                | 53.3                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 2.7                                 | 23.2                               | 19 ÷ 33                               |                        | 36.3                              | 32.8                              | 24.4                              | 61                                |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 3                                   | 22.1                               | 23 ÷ 40                               |                        | 43.8                              | 39.3                              | 28.8                              | 75.4                              |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 3.1                                 | 26.2                               | 17 ÷ 29                               |                        | 36.6                              | 33                                | 24.6                              | 61.5                              |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 3.4                                 | 27.6                               | 21 ÷ 36                               |                        | 43.3                              | 38.9                              | 28.5                              | 74.5                              |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 3.9                                 | 38.7                               | 32 ÷ 54                               |                        | 34.6                              | 30.8                              | 22.2                              | 61                                |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 4.4                                 | 43                                 | 49 ÷ 84                               |                        | 29.8                              | 26.5                              | 18.7                              | 53.8                              |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 5                                   | 47                                 | 67 ÷ 114                              |                        | 37.2                              | 32.8                              | 22.8                              | 68.4                              |
| 200                                                                  | 360    | 12       | M24      | 130      | 220               | 240        | 6.2                                 | 60.9                               | 69 ÷ 119                              |                        | 38.2                              | 33.7                              | 23.4                              | 70.3                              |
| 250                                                                  | 425    | 12       | M27      | 140      | 270               | 290        | 7.3                                 | 73.1                               | 111 ÷ 191                             |                        | 38.2                              | 33.5                              | 22.9                              | 71.9                              |
| 300                                                                  | 485    | 16       | M27      | 140      | 320               | 340        | 8.4                                 | 44.6                               | 113 ÷ 195                             |                        | 38.7                              | 33.9                              | 23.1                              | 72.9                              |
| 350                                                                  | 555    | 16       | M30      | 160      | 375               | 395        | 9.7                                 | 49.5                               | 169 ÷ 291                             |                        | 40                                | 35                                | 23.5                              | 76.6                              |
| 400                                                                  | 620    | 16       | M33      | 180      | 426               | 450        | 9.2                                 | 51.5                               | 239 ÷ 412                             |                        | 39.8                              | 34.7                              | 23.1                              | 76.4                              |
| 450                                                                  | 670    | 20       | M33      | 180      | 480               | 506        | 9.5                                 | 60.7                               | 241 ÷ 416                             |                        | 40.1                              | 34.9                              | 23.2                              | 77                                |
| 500                                                                  | 730    | 20       | M33      | 200      | 530               | 560        | 9.2                                 | 56.2                               | 296 ÷ 511                             |                        | 47.7                              | 41.4                              | 27.4                              | 91.4                              |
| 600                                                                  | 845    | 20       | M36      | 220      | 630               | 664        | 9.6                                 | 69.4                               | 456 ÷ 785                             |                        | 54.6                              | 47.2                              | 30.8                              | 104.3                             |
| 700                                                                  | 960    | 24       | M39      | 200      | 730               | 770        | 9.4                                 | 96.3                               | 549 ÷ 950                             | 824 ÷ 1425             | 49.8                              | 43.3                              | 28.1                              | 95.7                              |
| 800                                                                  | 1085   | 24       | M45      | 230      | 830               | 876        | 9.3                                 | 104.6                              | 819 ÷ 1419                            | 1229 ÷ 2128            | 45.9                              |                                   | 26                                | 89.2                              |
| 900                                                                  | 1185   | 28       | M45      | 240      | 930               | 982        | 9.3                                 | 107                                | 883 ÷ 1529                            | 1324 ÷ 2293            | 48.9                              |                                   | 27.7                              | 95.3                              |
| 1000                                                                 | 1320   | 28       | M52      | 260      | 1040              | 1098       | 9.3                                 | 114.9                              | 1264 ÷ 2192                           | 1896 ÷ 3289            | 43.6                              |                                   | 24.8                              | 86                                |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN25   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | Uťahovací Moment                    |                                    | [Nm]                                  |                        | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |
|                                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        |                                   |                                   |                                   |                                   |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 2.2                                 | 8.2                                | 6 ÷ 11                                |                        | 39.5                              | 36                                | 28.6                              | 58.6                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 2.2                                 | 10.6                               | 8 ÷ 14                                |                        | 46.3                              | 42                                | 32.7                              | 70.6                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 2.4                                 | 9.8                                | 10 ÷ 17                               |                        | 51.8                              | 46.8                              | 35.9                              | 80.3                              |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 2.6                                 | 11.6                               | 11 ÷ 19                               |                        | 57.5                              | 51.7                              | 39.3                              | 90.5                              |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 2.9                                 | 13.6                               | 17 ÷ 29                               |                        | 36.5                              | 32.6                              | 24.3                              | 59                                |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 3.1                                 | 15.6                               | 19 ÷ 33                               |                        | 41.3                              | 36.7                              | 27                                | 67.7                              |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 3.5                                 | 17.7                               | 23 ÷ 40                               |                        | 50.1                              | 44.3                              | 32                                | 83.9                              |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 3.6                                 | 22.5                               | 17 ÷ 29                               |                        | 41.6                              | 37                                | 27.2                              | 68.2                              |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 3.8                                 | 35                                 | 21 ÷ 36                               |                        | 49.6                              | 43.9                              | 31.8                              | 83                                |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 4.4                                 | 49                                 | 35 ÷ 60                               |                        | 39.9                              | 35                                | 24.9                              | 68.2                              |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 5.1                                 | 54.5                               | 56 ÷ 97                               |                        | 34.6                              | 30.2                              | 21.1                              | 60.4                              |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 5.8                                 | 59.6                               | 76 ÷ 131                              |                        | 43.4                              | 37.7                              | 25.9                              | 77                                |
| 200                                                                  | 360    | 12       | M24      | 130      | 220               | 240        | 7.1                                 | 77.2                               | 80 ÷ 136                              |                        | 44.5                              | 38.7                              | 26.6                              | 79.2                              |
| 250                                                                  | 425    | 12       | M27      | 140      | 270               | 290        | 8.4                                 | 92.6                               | 127 ÷ 219                             |                        | 44.8                              | 38.7                              | 26.1                              | 81.3                              |
| 300                                                                  | 485    | 16       | M27      | 140      | 320               | 340        | 9.6                                 | 56.5                               | 130 ÷ 224                             |                        | 45.4                              | 39.2                              | 26.5                              | 82.4                              |
| 350                                                                  | 555    | 16       | M30      | 160      | 375               | 395        | 11.1                                | 62.7                               | 194 ÷ 334                             |                        | 47.2                              | 40.6                              | 27.1                              | 86.4                              |
| 400                                                                  | 620    | 16       | M33      | 180      | 426               | 450        | 10.6                                | 65.3                               | 274 ÷ 473                             |                        | 47.1                              | 40.4                              | 26.7                              | 86.1                              |
| 450                                                                  | 670    | 20       | M33      | 180      | 480               | 506        | 10.9                                | 77.5                               | 276 ÷ 477                             |                        | 47.5                              | 40.7                              | 26.8                              | 86.8                              |
| 500                                                                  | 730    | 20       | M33      | 200      | 530               | 560        | 10.5                                | 71.7                               | 339 ÷ 586                             |                        | 56.6                              | 48.4                              | 31.7                              | 103.2                             |
| 600                                                                  | 845    | 20       | M36      | 220      | 630               | 664        | 11                                  | 88.7                               | 522 ÷ 900                             | 784 ÷ 1350             | 64.4                              | 55.4                              | 35.8                              | 118.1                             |
| 700                                                                  | 960    | 24       | M39      | 200      | 730               | 770        | 10.8                                | 123.1                              | 630 ÷ 1089                            | 944 ÷ 1634             | 58.8                              | 50.6                              | 32.8                              | 108.5                             |
| 800                                                                  | 1085   | 24       | M45      | 230      | 830               | 876        | 10.7                                | 133.8                              | 939 ÷ 1627                            | 1409 ÷ 2440            | 54.3                              |                                   | 30.4                              | 101.4                             |
| 900                                                                  | 1185   | 28       | M45      | 240      | 930               | 982        | 10.6                                | 136.7                              | 1012 ÷ 1753                           | 1518 ÷ 2630            | 57.9                              |                                   | 32.4                              | 108.4                             |
| 1000                                                                 | 1320   | 28       | M52      | 260      | 1040              | 1098       | 10.6                                | 147                                | 1449 ÷ 2514                           | 2174 ÷ 3771            | 51.9                              |                                   | 28.9                              | 97.9                              |

Obr. / Fig.12 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN25

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Velkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 2.7                                 | 9.8                                | 6 ÷ 11                                |                        | 43.4                              | 30.1                              | 52.8                              | 35.3                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 2.7                                 | 12.6                               | 8 ÷ 14                                |                        | 51.2                              | 34.5                              | 63.2                              | 41.1                              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 2.9                                 | 11.6                               | 10 ÷ 17                               |                        | 57.6                              | 38.1                              | 71.7                              | 45.7                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 3.1                                 | 13.8                               | 11 ÷ 19                               |                        | 64.2                              | 41.7                              | 80.5                              | 50.5                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 3.5                                 | 16.9                               | 17 ÷ 29                               |                        | 41                                | 25.9                              | 52.1                              | 31.8                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 3.8                                 | 23.6                               | 19 ÷ 33                               |                        | 46.6                              | 28.9                              | 59.6                              | 35.8                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 4.3                                 | 24                                 | 25 ÷ 42                               |                        | 56.9                              | 34.4                              | 73.5                              | 43.1                              |
| 65                                                                   | 185    | 8        | M16      | 85       | 81                | 100        | 4.4                                 | 28.4                               | 19 ÷ 32                               |                        | 46.9                              | 29.1                              | 60.1                              | 36.1                              |
| 80                                                                   | 200    | 8        | M16      | 85       | 95                | 115        | 4.7                                 | 30                                 | 24 ÷ 42                               |                        | 56.3                              | 34.1                              | 72.7                              | 42.7                              |
| 100                                                                  | 235    | 8        | M20      | 90       | 118               | 138        | 5.4                                 | 42                                 | 43 ÷ 73                               |                        | 45.5                              | 26.8                              | 59.5                              | 34.1                              |
| 125                                                                  | 270    | 8        | M24      | 105      | 142               | 162        | 6.2                                 | 46.7                               | 69 ÷ 118                              |                        | 39.7                              | 22.9                              | 52.4                              | 29.4                              |
| 150                                                                  | 300    | 8        | M24      | 110      | 170               | 190        | 7                                   | 56.1                               | 93 ÷ 160                              |                        | 50                                | 28.2                              | 66.6                              | 36.6                              |
| 200                                                                  | 375    | 12       | M27      | 130      | 220               | 240        | 8.6                                 | 56.5                               | 108 ÷ 186                             |                        | 38.9                              | 21.9                              | 51.8                              | 41.6                              |
| 250                                                                  | 450    | 12       | M30      | 140      | 270               | 290        | 10.2                                | 59.3                               | 174 ÷ 299                             |                        | 42.6                              | 23.4                              | 57.4                              | 45.7                              |
| 300                                                                  | 515    | 16       | M30      | 150      | 320               | 340        | 11.8                                | 37                                 | 177 ÷ 305                             |                        | 43.2                              | 23.7                              | 58.2                              | 46.3                              |
| 350                                                                  | 580    | 16       | M33      | 160      | 375               | 395        | 13.5                                | 36                                 | 257 ÷ 443                             |                        | 44                                | 23.7                              | 59.6                              |                                   |
| 400                                                                  | 660    | 16       | M36      | 180      | 426               | 450        | 12.9                                | 38.9                               | 367 ÷ 632                             |                        | 47.2                              | 25.1                              | 63.7                              |                                   |
| 450                                                                  | 685    | 20       | M36      | 190      | 480               | 506        | 13.3                                | 41.8                               | 370 ÷ 638                             |                        | 47.5                              | 25.3                              | 64.1                              |                                   |
| 500                                                                  | 755    | 20       | M39      | 200      | 530               | 560        | 12.8                                | 43.7                               | 488 ÷ 845                             | 732 ÷ 1267             | 47.1                              | 24.8                              | 63.2                              |                                   |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 13.4                                | 48.7                               | 789 ÷ 1366                            | 1183 ÷ 2049            |                                   |                                   | 68.2                              |                                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Velkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 2.9                                 | 9.8                                | 6 ÷ 11                                |                        | 47.9                              | 31.2                              | 58.8                              | 38.4                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 2.9                                 | 12.8                               | 8 ÷ 14                                |                        | 57                                | 35.9                              | 70.8                              | 45                                |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 3.2                                 | 11.9                               | 10 ÷ 17                               |                        | 64.3                              | 39.7                              | 80.6                              | 50.2                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 3.4                                 | 14.2                               | 11 ÷ 19                               |                        | 71.9                              | 43.6                              | 90.9                              | 55.7                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 3.8                                 | 18.9                               | 17 ÷ 29                               |                        | 46.3                              | 27.1                              | 59.2                              | 35.3                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 4.1                                 | 26.5                               | 20 ÷ 34                               |                        | 52.8                              | 30.4                              | 68                                | 39.9                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 4.6                                 | 26.9                               | 27 ÷ 46                               |                        | 64.8                              | 36.2                              | 84.3                              | 48.3                              |
| 65                                                                   | 185    | 8        | M16      | 85       | 81                | 100        | 4.7                                 | 31.8                               | 20 ÷ 35                               |                        | 53.2                              | 30.6                              | 68.5                              | 40.2                              |
| 80                                                                   | 200    | 8        | M16      | 85       | 95                | 115        | 5.1                                 | 33.6                               | 26 ÷ 45                               |                        | 64                                | 35.9                              | 83.3                              | 47.8                              |
| 100                                                                  | 235    | 8        | M20      | 90       | 118               | 138        | 5.9                                 | 47.1                               | 46 ÷ 79                               |                        | 52.1                              | 28.3                              | 68.5                              | 38.3                              |
| 125                                                                  | 270    | 8        | M24      | 105      | 142               | 162        | 6.7                                 | 52.3                               | 75 ÷ 128                              |                        | 45.7                              | 24.2                              | 60.6                              | 33.2                              |
| 150                                                                  | 300    | 8        | M24      | 110      | 170               | 190        | 7.6                                 | 58.4                               | 101 ÷ 173                             |                        | 57.8                              | 29.9                              | 77.4                              | 41.6                              |
| 200                                                                  | 375    | 12       | M27      | 130      | 220               | 240        | 9.3                                 | 59.3                               | 117 ÷ 201                             |                        | 45                                | 23.2                              | 60.3                              | 47.1                              |
| 250                                                                  | 450    | 12       | M30      | 140      | 270               | 290        | 11                                  | 72                                 | 188 ÷ 323                             |                        | 49.6                              | 24.9                              | 67                                | 52                                |
| 300                                                                  | 515    | 16       | M30      | 150      | 320               | 340        | 12.7                                | 81.9                               | 192 ÷ 330                             |                        | 50.3                              | 25.3                              | 68                                | 52.7                              |
| 350                                                                  | 580    | 16       | M33      | 160      | 375               | 395        | 14.6                                | 43.8                               | 278 ÷ 480                             |                        | 51.3                              | 25.3                              | 69.5                              |                                   |
| 400                                                                  | 660    | 16       | M36      | 180      | 426               | 450        | 13.9                                | 47.3                               | 397 ÷ 684                             |                        | 55.2                              | 26.8                              | 74.1                              |                                   |
| 450                                                                  | 685    | 20       | M36      | 190      | 480               | 506        | 14.4                                | 87.1                               | 400 ÷ 690                             |                        | 55.6                              | 27                                | 74.6                              |                                   |
| 500                                                                  | 755    | 20       | M39      | 200      | 530               | 560        | 13.9                                | 53.1                               | 528 ÷ 914                             |                        | 54.7                              | 26.5                              | 73.7                              |                                   |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 14.5                                | 59.2                               | 854 ÷ 1478                            | 1280 ÷ 2218            |                                   |                                   |                                   |                                   |

Obr. / Fig.13 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN40

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 3.1                                 | 10.5                               | 6 ÷ 11                                |                        | 52.8                              | 32.4                              | 63.2                              | 39.5                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 3.1                                 | 14.2                               | 8 ÷ 14                                |                        | 63.2                              | 37.5                              | 76.5                              | 46.3                              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 3.3                                 | 13.2                               | 10 ÷ 17                               |                        | 71.7                              | 41.5                              | 87.4                              | 51.8                              |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 3.6                                 | 15.8                               | 11 ÷ 19                               |                        | 80.5                              | 45.7                              | 98.7                              | 57.5                              |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 4                                   | 21                                 | 17 ÷ 29                               |                        | 52.1                              | 28.6                              | 64.6                              | 36.5                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 4.3                                 | 29.4                               | 21 ÷ 36                               |                        | 59.6                              | 32                                | 74.3                              | 41.3                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 4.9                                 | 29.9                               | 28 ÷ 48                               |                        | 73.5                              | 38.3                              | 92.4                              | 50.1                              |
| 65                                                                   | 185    | 8        | M16      | 85       | 81                | 100        | 5                                   | 35.4                               | 21 ÷ 37                               |                        | 60.1                              | 32.2                              | 74.9                              | 41.6                              |
| 80                                                                   | 200    | 8        | M16      | 85       | 95                | 115        | 5.4                                 | 37.3                               | 28 ÷ 48                               |                        | 72.7                              | 38                                | 91.4                              | 49.6                              |
| 100                                                                  | 235    | 8        | M20      | 90       | 118               | 138        | 6.2                                 | 52.3                               | 49 ÷ 83                               |                        | 59.5                              | 30.1                              | 75.4                              | 39.9                              |
| 125                                                                  | 270    | 8        | M24      | 105      | 142               | 162        | 7.1                                 | 58.1                               | 79 ÷ 135                              |                        | 52.4                              | 25.8                              | 66.9                              | 34.6                              |
| 150                                                                  | 300    | 8        | M24      | 110      | 170               | 190        | 8.1                                 | 63.5                               | 107 ÷ 183                             |                        | 66.6                              | 31.9                              | 85.6                              | 43.4                              |
| 200                                                                  | 375    | 12       | M27      | 130      | 220               | 240        | 9.9                                 | 64.1                               | 123 ÷ 213                             |                        | 51.8                              | 24.8                              | 66.7                              | 48.8                              |
| 250                                                                  | 450    | 12       | M30      | 140      | 270               | 290        | 11.7                                | 77.6                               | 198 ÷ 341                             |                        | 57.4                              | 26.7                              | 74.4                              | 53.9                              |
| 300                                                                  | 515    | 16       | M30      | 150      | 320               | 340        | 13.5                                | 48.4                               | 203 ÷ 348                             |                        | 58.2                              | 27                                | 75.5                              | 54.7                              |
| 350                                                                  | 580    | 16       | M33      | 160      | 375               | 395        | 15.4                                | 47.1                               | 293 ÷ 507                             |                        | 59.6                              | 27.2                              | 76.8                              |                                   |
| 400                                                                  | 660    | 16       | M36      | 180      | 426               | 450        | 14.7                                | 50.9                               | 419 ÷ 722                             |                        | 63.7                              | 28.8                              | 82.1                              |                                   |
| 450                                                                  | 685    | 20       | M36      | 190      | 480               | 506        | 15.2                                | 54.7                               | 423 ÷ 729                             | 635 ÷ 1094             | 64.1                              | 29                                | 82.7                              |                                   |
| 500                                                                  | 755    | 20       | M39      | 200      | 530               | 560        | 14.7                                | 57.2                               | 558 ÷ 966                             | 837 ÷ 1448             | 63.2                              | 28.5                              | 81.8                              |                                   |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 15.3                                | 63.8                               | 902 ÷ 1562                            | 1353 ÷ 2343            |                                   |                                   |                                   |                                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
| 10                                                                   | 90     | 4        | M12      | 60       | 22                | 36         | 3.5                                 | 12.8                               | 6 ÷ 11                                |                        | 62                                | 34.3                              | 68.9                              | 40.9                              |
| 15                                                                   | 95     | 4        | M12      | 60       | 26                | 42         | 3.6                                 | 17.2                               | 8 ÷ 14                                |                        | 75                                | 39.8                              | 83.8                              | 48.2                              |
| 20                                                                   | 105    | 4        | M12      | 65       | 31                | 47         | 3.8                                 | 16                                 | 10 ÷ 17                               |                        | 85.5                              | 44.2                              | 95.9                              | 54                                |
| 25                                                                   | 115    | 4        | M12      | 65       | 36                | 52         | 4.1                                 | 19.2                               | 11 ÷ 19                               |                        | 96.6                              | 48.7                              | 108.7                             | 60                                |
| 32                                                                   | 140    | 4        | M16      | 75       | 46                | 62         | 4.6                                 | 25.6                               | 20 ÷ 34                               |                        | 63.1                              | 30.6                              | 71.4                              | 38.2                              |
| 40                                                                   | 150    | 4        | M16      | 75       | 53                | 69         | 5                                   | 35.8                               | 24 ÷ 41                               |                        | 72.6                              | 34.4                              | 82.4                              | 43.3                              |
| 50                                                                   | 165    | 4        | M16      | 75       | 65                | 81         | 5.6                                 | 36.3                               | 32 ÷ 55                               |                        | 90.2                              | 41.3                              | 102.9                             | 52.7                              |
| 65                                                                   | 185    | 8        | M16      | 85       | 81                | 100        | 5.7                                 | 43                                 | 24 ÷ 42                               |                        | 73.2                              | 34.6                              | 83.1                              | 43.6                              |
| 80                                                                   | 200    | 8        | M16      | 85       | 95                | 115        | 6.1                                 | 45.4                               | 32 ÷ 55                               |                        | 89.2                              | 40.9                              | 101.6                             | 52.1                              |
| 100                                                                  | 235    | 8        | M20      | 90       | 118               | 138        | 7.1                                 | 63.6                               | 56 ÷ 96                               |                        | 73.6                              | 32.6                              | 84.3                              | 42                                |
| 125                                                                  | 270    | 8        | M24      | 105      | 142               | 162        | 8.1                                 | 70.6                               | 90 ÷ 155                              |                        | 65.2                              | 28                                | 75                                | 36.5                              |
| 150                                                                  | 300    | 8        | M24      | 110      | 170               | 190        | 9.2                                 | 77.3                               | 122 ÷ 209                             |                        | 83.4                              | 34.8                              | 96.2                              | 45.9                              |
| 200                                                                  | 375    | 12       | M27      | 130      | 220               | 240        | 11.3                                | 77.9                               | 141 ÷ 244                             |                        | 65                                | 27.1                              | 75                                | 51.6                              |
| 250                                                                  | 450    | 12       | M30      | 140      | 270               | 290        | 13.4                                | 89                                 | 228 ÷ 391                             |                        | 72.4                              | 29.3                              | 83.7                              | 57.2                              |
| 300                                                                  | 515    | 16       | M30      | 150      | 320               | 340        | 15.4                                | 55.6                               | 232 ÷ 399                             |                        | 73.4                              | 29.6                              | 84.8                              | 58                                |
| 350                                                                  | 580    | 16       | M33      | 160      | 375               | 395        | 17.7                                | 54.1                               | 336 ÷ 581                             |                        | 74.8                              | 29.8                              | 86.2                              |                                   |
| 400                                                                  | 660    | 16       | M36      | 180      | 426               | 450        | 16.9                                | 58.4                               | 481 ÷ 828                             | 721 ÷ 1243             | 79.9                              | 31.7                              | 92.3                              |                                   |
| 450                                                                  | 685    | 20       | M36      | 190      | 480               | 506        | 17.5                                | 62.8                               | 485 ÷ 836                             | 728 ÷ 1254             | 80.5                              | 32                                | 93                                |                                   |
| 500                                                                  | 755    | 20       | M39      | 200      | 530               | 560        | 16.8                                | 65.7                               | 640 ÷ 1107                            | 960 ÷ 1661             | 79.6                              | 31.5                              | 92.1                              |                                   |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 17.5                                | 73.2                               | 1034 ÷ 1791                           | 1551 ÷ 2687            |                                   |                                   |                                   |                                   |

Obr. / Fig.14 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN40

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku |                | Hydraulickým<br>kľúčom            | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |  |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |  |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment [Nm]                 | M <sub>u</sub> | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |  |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2 | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |  |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 2.7                                 | 9.8                                | 6 ÷ 11                                |                | 41.6                              | 37.9                              | 31.2                              | 56                                |  |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 2.7                                 | 12.6                               | 8 ÷ 14                                |                | 49                                | 44.3                              | 35.9                              | 67.3                              |  |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 2.9                                 | 11.6                               | 10 ÷ 17                               |                | 54.9                              | 49.5                              | 39.7                              | 76.4                              |  |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 3.1                                 | 13.8                               | 11 ÷ 19                               |                | 61.1                              | 54.9                              | 43.6                              | 86                                |  |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 3.5                                 | 16.9                               | 17 ÷ 29                               |                | 39                                | 34.7                              | 27.1                              | 55.9                              |  |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 3.8                                 | 23.6                               | 19 ÷ 33                               |                | 44.2                              | 39.2                              | 30.4                              | 64                                |  |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 4.3                                 | 24                                 | 25 ÷ 42                               |                | 53.8                              | 47.5                              | 36.2                              | 79.2                              |  |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 4.4                                 | 28.4                               | 19 ÷ 32                               |                | 44.5                              | 39.5                              | 30.6                              | 64.5                              |  |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 4.7                                 | 30                                 | 24 ÷ 42                               |                | 53.2                              | 47                                | 35.9                              | 78.3                              |  |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 5.4                                 | 42                                 | 43 ÷ 73                               |                | 42.9                              | 37.6                              | 28.3                              | 64.3                              |  |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 6.2                                 | 46.7                               | 69 ÷ 118                              |                | 37.4                              | 32.6                              | 24.2                              | 56.8                              |  |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 7                                   | 56.1                               | 93 ÷ 160                              |                | 46.9                              | 40.8                              | 29.9                              | 72.3                              |  |
| 200                                                                  | 375    | 12       | M27      | 140      | 220               | 240        | 8.6                                 | 56.5                               | 108 ÷ 186                             |                | 36.5                              | 31.7                              | 23.2                              | 56.3                              |  |
| 250                                                                  | 450    | 12       | M30      | 160      | 270               | 290        | 10.2                                | 59.3                               | 174 ÷ 299                             |                | 39.9                              | 34.5                              | 24.9                              | 62.5                              |  |
| 300                                                                  | 515    | 16       | M30      | 180      | 320               | 340        | 11.8                                | 37                                 | 177 ÷ 305                             |                | 40.5                              | 34.9                              | 25.3                              | 63.4                              |  |
| 350                                                                  | 580    | 16       | M33      | 180      | 375               | 395        | 13.5                                | 36                                 | 257 ÷ 443                             |                | 41.1                              | 35.4                              | 25.3                              | 65                                |  |
| 400                                                                  | 660    | 16       | M36      | 200      | 426               | 450        | 12.9                                | 38.9                               | 367 ÷ 632                             |                | 44                                | 37.7                              | 26.8                              | 69.2                              |  |
| 450                                                                  | 685    | 20       | M36      | 220      | 480               | 506        | 13.3                                | 41.8                               | 370 ÷ 638                             |                | 44.4                              | 38                                | 27                                | 69.7                              |  |
| 500                                                                  | 755    | 20       | M39      | 220      | 530               | 560        | 12.8                                | 43.7                               | 488 ÷ 845                             | 732 ÷ 1267     | 44                                | 37.6                              | 26.5                              | 68.8                              |  |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 13.4                                | 48.7                               | 789 ÷ 1366                            | 1183 ÷ 2049    | 43.3                              |                                   | 26.2                              | 68.2                              |  |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku |                | Hydraulickým<br>kľúčom            | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |  |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |  |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment [Nm]                 | M <sub>u</sub> | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |  |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2 | 12040.6                           | 12050.6                           | 15236.6                           | 1.4301                            |  |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 2.9                                 | 9.8                                | 6 ÷ 11                                |                | 43                                | 39.2                              | 31.7                              | 63.2                              |  |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 2.9                                 | 12.8                               | 8 ÷ 14                                |                | 50.8                              | 46                                | 36.5                              | 76.5                              |  |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 3.2                                 | 11.9                               | 10 ÷ 17                               |                | 57                                | 51.4                              | 40.4                              | 87.4                              |  |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 3.4                                 | 14.2                               | 11 ÷ 19                               |                | 63.5                              | 57                                | 44.4                              | 98.7                              |  |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 3.8                                 | 18.9                               | 17 ÷ 29                               |                | 40.6                              | 36.2                              | 27.7                              | 64.6                              |  |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 4.1                                 | 26.5                               | 20 ÷ 34                               |                | 46.1                              | 40.9                              | 31                                | 74.3                              |  |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 4.6                                 | 26.9                               | 27 ÷ 46                               |                | 56.2                              | 49.6                              | 37                                | 92.4                              |  |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 4.7                                 | 31.8                               | 20 ÷ 35                               |                | 46.4                              | 41.2                              | 31.2                              | 74.9                              |  |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 5.1                                 | 33.6                               | 26 ÷ 45                               |                | 55.6                              | 49.1                              | 36.7                              | 91.4                              |  |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 5.9                                 | 47.1                               | 46 ÷ 79                               |                | 45                                | 39.5                              | 29                                | 75.4                              |  |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 6.7                                 | 52.3                               | 75 ÷ 128                              |                | 39.2                              | 34.2                              | 24.8                              | 66.9                              |  |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 7.6                                 | 58.4                               | 101 ÷ 173                             |                | 49.3                              | 42.9                              | 30.7                              | 85.6                              |  |
| 200                                                                  | 375    | 12       | M27      | 140      | 220               | 240        | 9.3                                 | 59.3                               | 117 ÷ 201                             |                | 38.4                              | 33.4                              | 23.8                              | 66.7                              |  |
| 250                                                                  | 450    | 12       | M30      | 160      | 270               | 290        | 11                                  | 72                                 | 188 ÷ 323                             |                | 42.1                              | 36.4                              | 25.6                              | 74.4                              |  |
| 300                                                                  | 515    | 16       | M30      | 180      | 320               | 340        | 12.7                                | 81.9                               | 192 ÷ 330                             |                | 42.6                              | 36.9                              | 25.9                              | 75.5                              |  |
| 350                                                                  | 580    | 16       | M33      | 180      | 375               | 395        | 14.6                                | 43.8                               | 278 ÷ 480                             |                | 43.4                              | 37.3                              | 26                                | 76.8                              |  |
| 400                                                                  | 660    | 16       | M36      | 200      | 426               | 450        | 13.9                                | 47.3                               | 397 ÷ 684                             |                | 46.5                              | 39.9                              | 27.6                              | 82.1                              |  |
| 450                                                                  | 685    | 20       | M36      | 220      | 480               | 506        | 14.4                                | 87.1                               | 400 ÷ 690                             |                | 46.8                              | 40.2                              | 27.7                              | 82.7                              |  |
| 500                                                                  | 755    | 20       | M39      | 220      | 530               | 560        | 13.9                                | 53.1                               | 528 ÷ 914                             |                | 46.4                              | 39.8                              | 27.3                              | 81.8                              |  |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 14.5                                | 59.2                               | 854 ÷ 1478                            | 1280 ÷ 2218    | 45.6                              |                                   | 27                                | 81.5                              |  |

Obr. / Fig.15 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN40

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment [Nm]                 | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 3.1                                 | 10.5                               | 6 ÷ 11                                |                        | 45.4                              | 41.6                              | 32.4                              | 71.6                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 3.1                                 | 14.2                               | 8 ÷ 14                                |                        | 53.9                              | 49                                | 37.5                              | 87.3                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 3.3                                 | 13.2                               | 10 ÷ 17                               |                        | 60.6                              | 54.9                              | 41.5                              | 100                               |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 3.6                                 | 15.8                               | 11 ÷ 19                               |                        | 67.7                              | 61.1                              | 45.7                              | 113.5                             |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 4                                   | 21                                 | 17 ÷ 29                               |                        | 43.4                              | 39                                | 28.6                              | 74.7                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 4.3                                 | 29.4                               | 21 ÷ 36                               |                        | 49.4                              | 44.2                              | 32                                | 86.3                              |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 4.9                                 | 29.9                               | 28 ÷ 48                               |                        | 60.5                              | 53.8                              | 38.3                              | 107.9                             |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 5                                   | 35.4                               | 21 ÷ 37                               |                        | 49.8                              | 44.5                              | 32.2                              | 87                                |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 5.4                                 | 37.3                               | 28 ÷ 48                               |                        | 59.8                              | 53.2                              | 38                                | 106.6                             |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 6.2                                 | 52.3                               | 49 ÷ 83                               |                        | 48.5                              | 42.9                              | 30.1                              | 88.5                              |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 7.1                                 | 58.1                               | 79 ÷ 135                              |                        | 42.4                              | 37.4                              | 25.8                              | 78.9                              |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 8.1                                 | 63.5                               | 107 ÷ 183                             |                        | 53.6                              | 46.9                              | 31.9                              | 101.3                             |
| 200                                                                  | 375    | 12       | M27      | 140      | 220               | 240        | 9.9                                 | 64.1                               | 123 ÷ 213                             |                        | 41.7                              | 36.5                              | 24.8                              | 79                                |
| 250                                                                  | 450    | 12       | M30      | 160      | 270               | 290        | 11.7                                | 77.6                               | 198 ÷ 341                             |                        | 45.8                              | 39.9                              | 26.7                              | 88                                |
| 300                                                                  | 515    | 16       | M30      | 180      | 320               | 340        | 13.5                                | 48.4                               | 203 ÷ 348                             |                        | 46.4                              | 40.5                              | 27                                | 89.2                              |
| 350                                                                  | 580    | 16       | M33      | 180      | 375               | 395        | 15.4                                | 47.1                               | 293 ÷ 507                             |                        | 47.3                              | 41.1                              | 27.2                              | 90.7                              |
| 400                                                                  | 660    | 16       | M36      | 200      | 426               | 450        | 14.7                                | 50.9                               | 419 ÷ 722                             |                        | 50.8                              | 44                                | 28.8                              | 97.2                              |
| 450                                                                  | 685    | 20       | M36      | 220      | 480               | 506        | 15.2                                | 54.7                               | 423 ÷ 729                             | 635 ÷ 1094             | 51.2                              | 44.4                              | 29                                | 97.9                              |
| 500                                                                  | 755    | 20       | M39      | 220      | 530               | 560        | 14.7                                | 57.2                               | 558 ÷ 966                             | 837 ÷ 1448             | 50.5                              | 44                                | 28.5                              | 97.2                              |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 15.3                                | 63.8                               | 902 ÷ 1562                            | 1353 ÷ 2343            | 49.7                              |                                   | 28.2                              | 97.2                              |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN40   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment [Nm]                 | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |
| 10                                                                   | 90     | 4        | M12      | 70       | 22                | 36         | 3.5                                 | 12.8                               | 6 ÷ 11                                |                        | 50.8                              | 45.9                              | 35.3                              | 78.5                              |
| 15                                                                   | 95     | 4        | M12      | 70       | 26                | 42         | 3.6                                 | 17.2                               | 8 ÷ 14                                |                        | 60.6                              | 54.4                              | 41.1                              | 96.2                              |
| 20                                                                   | 105    | 4        | M12      | 70       | 31                | 47         | 3.8                                 | 16                                 | 10 ÷ 17                               |                        | 68.6                              | 61.3                              | 45.7                              | 110.6                             |
| 25                                                                   | 115    | 4        | M12      | 70       | 36                | 52         | 4.1                                 | 19.2                               | 11 ÷ 19                               |                        | 77                                | 68.5                              | 50.5                              | 125.8                             |
| 32                                                                   | 140    | 4        | M16      | 80       | 46                | 62         | 4.6                                 | 25.6                               | 20 ÷ 34                               |                        | 49.7                              | 44                                | 31.8                              | 83.2                              |
| 40                                                                   | 150    | 4        | M16      | 80       | 53                | 69         | 5                                   | 35.8                               | 24 ÷ 41                               |                        | 56.8                              | 50                                | 35.8                              | 96.3                              |
| 50                                                                   | 165    | 4        | M16      | 90       | 65                | 81         | 5.6                                 | 36.3                               | 32 ÷ 55                               |                        | 69.9                              | 61.3                              | 43.1                              | 120.9                             |
| 65                                                                   | 185    | 8        | M16      | 90       | 81                | 100        | 5.7                                 | 43                                 | 24 ÷ 42                               |                        | 57.2                              | 50.4                              | 36.1                              | 97.1                              |
| 80                                                                   | 200    | 8        | M16      | 100      | 95                | 115        | 6.1                                 | 45.4                               | 32 ÷ 55                               |                        | 69.1                              | 60.6                              | 42.7                              | 119.4                             |
| 100                                                                  | 235    | 8        | M20      | 110      | 118               | 138        | 7.1                                 | 63.6                               | 56 ÷ 96                               |                        | 56.4                              | 49.2                              | 34.1                              | 99.5                              |
| 125                                                                  | 270    | 8        | M24      | 120      | 142               | 162        | 8.1                                 | 70.6                               | 90 ÷ 155                              |                        | 49.6                              | 43                                | 29.4                              | 89                                |
| 150                                                                  | 300    | 8        | M24      | 120      | 170               | 190        | 9.2                                 | 77.3                               | 122 ÷ 209                             |                        | 62.9                              | 54.4                              | 36.6                              | 114.6                             |
| 200                                                                  | 375    | 12       | M27      | 140      | 220               | 240        | 11.3                                | 77.9                               | 141 ÷ 244                             |                        | 49                                | 42.3                              | 28.4                              | 89.4                              |
| 250                                                                  | 450    | 12       | M30      | 160      | 270               | 290        | 13.4                                | 89                                 | 228 ÷ 391                             |                        | 54.1                              | 46.5                              | 30.8                              | 99                                |
| 300                                                                  | 515    | 16       | M30      | 180      | 320               | 340        | 15.4                                | 55.6                               | 232 ÷ 399                             |                        | 54.9                              | 47.2                              | 31.2                              | 100.4                             |
| 350                                                                  | 580    | 16       | M33      | 180      | 375               | 395        | 17.7                                | 54.1                               | 336 ÷ 581                             |                        | 56.2                              | 48.1                              | 31.4                              | 102.4                             |
| 400                                                                  | 660    | 16       | M36      | 200      | 426               | 450        | 16.9                                | 58.4                               | 481 ÷ 828                             | 721 ÷ 1243             | 60.2                              | 51.6                              | 33.5                              | 110                               |
| 450                                                                  | 685    | 20       | M36      | 220      | 480               | 506        | 17.5                                | 62.8                               | 485 ÷ 836                             | 728 ÷ 1254             | 60.6                              | 52                                | 33.7                              | 110.9                             |
| 500                                                                  | 755    | 20       | M39      | 220      | 530               | 560        | 16.8                                | 65.7                               | 640 ÷ 1107                            | 960 ÷ 1661             | 59.7                              | 51.3                              | 33.3                              | 110.2                             |
| 600                                                                  | 890    | 20       | M45      | 280      | 630               | 664        | 17.5                                | 73.2                               | 1034 ÷ 1791                           | 1551 ÷ 2687            | 59                                |                                   | 33                                | 110.5                             |

Obr. / Fig.16 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN40

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 5.6               | 8.8               | A2 50             | A2 70             |
| 10                                                                   | 100    | 4        | M12      | 70       | 22                | 36         | 4.2                                 | 9.1                                | 7 ÷ 11                                |                        | 55.9              | 37.1              | 69.4              | 44.5              |
| 15                                                                   | 105    | 4        | M12      | 70       | 26                | 42         | 4.3                                 | 12.3                               | 9 ÷ 15                                |                        | 67.2              | 43.4              | 84.5              | 52.7              |
| 20                                                                   | 130    | 4        | M16      | 85       | 31                | 47         | 4.6                                 | 12.1                               | 14 ÷ 24                               |                        | 40                | 25.3              | 50.7              | 31.1              |
| 25                                                                   | 140    | 4        | M16      | 90       | 36                | 52         | 4.9                                 | 11.8                               | 17 ÷ 29                               |                        | 45                | 28.1              | 57.5              | 34.7              |
| 32                                                                   | 155    | 4        | M20      | 100      | 46                | 62         | 5.5                                 | 16.5                               | 29 ÷ 50                               |                        | 35.5              | 21.5              | 45.9              | 27                |
| 40                                                                   | 170    | 4        | M20      | 100      | 53                | 69         | 6.0                                 | 18.5                               | 36 ÷ 61                               |                        | 40.7              | 24.3              | 52.9              | 30.6              |
| 50                                                                   | 180    | 4        | M20      | 100      | 65                | 81         | 6.7                                 | 24                                 | 48 ÷ 83                               |                        | 50.3              | 29.4              | 66.1              | 37.4              |
| 65                                                                   | 205    | 8        | M20      | 100      | 81                | 100        | 6.9                                 | 36.4                               | 37 ÷ 63                               |                        | 41                | 24.5              | 53.3              | 30.9              |
| 80                                                                   | 215    | 8        | M20      | 100      | 95                | 115        | 7.4                                 | 38.8                               | 48 ÷ 82                               |                        | 49.7              | 29.1              | 65.3              | 37                |
| 100                                                                  | 250    | 8        | M24      | 120      | 118               | 138        | 8.5                                 | 46.1                               | 80 ÷ 137                              |                        | 44.8              | 25.5              | 59.5              | 33                |
| 125                                                                  | 295    | 8        | M27      | 130      | 142               | 162        | 9.7                                 | 47.3                               | 120 ÷ 208                             |                        | 42.9              | 23.9              | 57.4              | 45.9              |
| 150                                                                  | 345    | 8        | M30      | 140      | 170               | 190        | 11.1                                | 53.8                               | 182 ÷ 313                             |                        | 44.8              | 24.5              | 60.4              | 48                |
| 200                                                                  | 415    | 12       | M33      | 160      | 220               | 248        | 10.5                                | 64.1                               | 226 ÷ 390                             |                        | 40.2              | 21.8              | 54.3              |                   |
| 250                                                                  | 470    | 12       | M33      | 170      | 270               | 300        | 11.6                                | 75.2                               | 326 ÷ 564                             |                        | 54.7              | 29.1              | 73.9              |                   |
| 300                                                                  | 530    | 16       | M33      | 180      | 320               | 356        | 11.5                                | 45.3                               | 345 ÷ 596                             |                        | 57.4              | 30.5              | 77.4              |                   |
| 350                                                                  | 600    | 16       | M36      | 190      | 375               | 415        | 12                                  | 45.3                               | 513 ÷ 883                             | 769 ÷ 1325             | 63.3              | 33.4              | 85.3              |                   |
| 400                                                                  | 670    | 16       | M39      | 200      | 426               | 474        | 11.5                                | 47.7                               | 672 ÷ 1157                            | 1007 ÷ 1736            | 79.4              | 42                | 107.6             |                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 5.6               | 8.8               | A2 50             | A2 70             |
| 10                                                                   | 100    | 4        | M12      | 70       | 22                | 36         | 4.6                                 | 9.6                                | 7 ÷ 12                                |                        | 62.3              | 38.7              | 78                | 48.8              |
| 15                                                                   | 105    | 4        | M12      | 70       | 26                | 42         | 4.6                                 | 13                                 | 10 ÷ 17                               |                        | 75.4              | 45.3              | 95.5              | 58.2              |
| 20                                                                   | 130    | 4        | M16      | 85       | 31                | 47         | 5                                   | 12.7                               | 15 ÷ 26                               |                        | 45.1              | 26.5              | 57.5              | 34.4              |
| 25                                                                   | 140    | 4        | M16      | 90       | 36                | 52         | 5.3                                 | 12.4                               | 19 ÷ 32                               |                        | 50.9              | 29.4              | 65.4              | 38.6              |
| 32                                                                   | 155    | 4        | M20      | 100      | 46                | 62         | 6                                   | 17.4                               | 32 ÷ 54                               |                        | 40.4              | 22.7              | 52.5              | 30.2              |
| 40                                                                   | 170    | 4        | M20      | 100      | 53                | 69         | 6.4                                 | 19.5                               | 39 ÷ 66                               |                        | 46.5              | 25.6              | 60.8              | 34.4              |
| 50                                                                   | 180    | 4        | M20      | 100      | 65                | 81         | 7.3                                 | 25.4                               | 52 ÷ 89                               |                        | 57.8              | 31                | 76.3              | 42.3              |
| 65                                                                   | 205    | 8        | M20      | 100      | 81                | 100        | 7.5                                 | 38.4                               | 40 ÷ 68                               |                        | 46.8              | 25.8              | 61.3              | 34.7              |
| 80                                                                   | 215    | 8        | M20      | 100      | 95                | 115        | 8                                   | 41                                 | 52 ÷ 88                               |                        | 57.1              | 30.7              | 75.4              | 41.8              |
| 100                                                                  | 250    | 8        | M24      | 120      | 118               | 138        | 9.2                                 | 48.6                               | 87 ÷ 149                              |                        | 51.7              | 27.1              | 69                | 37.4              |
| 125                                                                  | 295    | 8        | M27      | 130      | 142               | 162        | 10.5                                | 49.9                               | 130 ÷ 225                             |                        | 49.7              | 25.4              | 66.8              | 52.1              |
| 150                                                                  | 345    | 8        | M30      | 140      | 170               | 190        | 12                                  | 56.7                               | 197 ÷ 339                             |                        | 52.1              | 26.1              | 70.6              | 54.7              |
| 200                                                                  | 415    | 12       | M33      | 160      | 220               | 248        | 11.3                                | 67.6                               | 244 ÷ 422                             |                        | 46.8              | 23.3              | 63.6              | 70.3              |
| 250                                                                  | 470    | 12       | M33      | 170      | 270               | 300        | 12.5                                | 78.5                               | 353 ÷ 610                             |                        | 64                | 31.1              | 86                | 95.2              |
| 300                                                                  | 530    | 16       | M33      | 180      | 320               | 356        | 12.4                                | 47.6                               | 373 ÷ 645                             |                        | 67.1              | 32.5              | 90.1              | 99.9              |
| 350                                                                  | 600    | 16       | M36      | 190      | 375               | 415        | 13                                  | 47.8                               | 555 ÷ 956                             | 832 ÷ 1434             | 73.6              | 35.7              | 99.6              | 110.6             |
| 400                                                                  | 670    | 16       | M39      | 200      | 426               | 474        | 12.4                                | 49.7                               | 727 ÷ 1253                            | 1090 ÷ 1879            | 92.7              | 45                | 126.1             | 140.3             |

Obr. / Fig.17 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN63

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | 5.6               | 8.8               | A2 50             | A2 70             |
| 10                                                                   | 100    | 4        | M12      | 70       | 22                | 36         | 4.8                                 | 12                                 | 8 ÷ 13                                |                        | 69.4              | 40.4              | 84.5              | 50.3              |
| 15                                                                   | 105    | 4        | M12      | 70       | 26                | 42         | 4.9                                 | 12.8                               | 10 ÷ 18                               |                        | 84.5              | 47.6              | 103.9             | 60.1              |
| 20                                                                   | 130    | 4        | M16      | 85       | 31                | 47         | 5.3                                 | 15.9                               | 16 ÷ 28                               |                        | 50.7              | 27.9              | 62.7              | 35.6              |
| 25                                                                   | 140    | 4        | M16      | 90       | 36                | 52         | 5.6                                 | 15.5                               | 20 ÷ 34                               |                        | 57.5              | 31                | 71.5              | 39.9              |
| 32                                                                   | 155    | 4        | M20      | 100      | 46                | 62         | 6.3                                 | 21.8                               | 34 ÷ 58                               |                        | 45.9              | 24                | 57.6              | 31.3              |
| 40                                                                   | 170    | 4        | M20      | 100      | 53                | 69         | 6.8                                 | 24.3                               | 41 ÷ 70                               |                        | 52.9              | 27.1              | 66.8              | 35.7              |
| 50                                                                   | 180    | 4        | M20      | 100      | 65                | 81         | 7.7                                 | 31.6                               | 55 ÷ 94                               |                        | 66.1              | 33                | 84.1              | 44                |
| 65                                                                   | 205    | 8        | M20      | 100      | 81                | 100        | 7.9                                 | 47.9                               | 42 ÷ 72                               |                        | 53.3              | 27.3              | 67.4              | 36                |
| 80                                                                   | 215    | 8        | M20      | 100      | 95                | 115        | 8.4                                 | 51.1                               | 55 ÷ 93                               |                        | 65.3              | 32.6              | 83                | 43.5              |
| 100                                                                  | 250    | 8        | M24      | 120      | 118               | 138        | 9.7                                 | 60.6                               | 92 ÷ 157                              |                        | 59.5              | 28.8              | 76.2              | 39                |
| 125                                                                  | 295    | 8        | M27      | 130      | 142               | 162        | 11.1                                | 62.2                               | 138 ÷ 237                             |                        | 57.4              | 27.2              | 74                | 54                |
| 150                                                                  | 345    | 8        | M30      | 140      | 170               | 190        | 12.7                                | 70.8                               | 208 ÷ 358                             |                        | 60.4              | 28                | 78.4              | 56.8              |
| 200                                                                  | 415    | 12       | M33      | 160      | 220               | 248        | 12                                  | 84.3                               | 258 ÷ 446                             |                        | 54.3              | 24.9              | 70.3              |                   |
| 250                                                                  | 470    | 12       | M33      | 170      | 270               | 300        | 13.3                                | 97.6                               | 373 ÷ 644                             |                        | 73.9              | 33.4              | 95.2              |                   |
| 300                                                                  | 530    | 16       | M33      | 180      | 320               | 356        | 13.1                                | 58.8                               | 395 ÷ 681                             |                        | 77.4              | 35                | 99.9              |                   |
| 350                                                                  | 600    | 16       | M36      | 190      | 375               | 415        | 13.7                                | 58.8                               | 586 ÷ 1010                            | 879 ÷ 1515             | 85.3              | 38.5              | 110.6             |                   |
| 400                                                                  | 670    | 16       | M39      | 200      | 426               | 474        | 13.1                                | 61.9                               | 768 ÷ 1323                            | 1152 ÷ 1985            | 107.6             | 48.5              | 140.3             |                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | 5.6               | 8.8               | A2 50             | A2 70             |
| 10                                                                   | 100    | 4        | M12      | 70       | 22                | 36         | 5.6                                 | 15.2                               | 9 ÷ 15                                |                        | 82.7              | 43                | 92.7              | 52.4              |
| 15                                                                   | 105    | 4        | M12      | 70       | 26                | 42         | 5.6                                 | 20.5                               | 12 ÷ 20                               |                        | 101.6             | 50.8              | 114.5             | 62.7              |
| 20                                                                   | 130    | 4        | M16      | 85       | 31                | 47         | 6                                   | 20.1                               | 19 ÷ 32                               |                        | 61.3              | 29.9              | 69.3              | 37.2              |
| 25                                                                   | 140    | 4        | M16      | 90       | 36                | 52         | 6.4                                 | 19.6                               | 22 ÷ 38                               |                        | 69.9              | 33.3              | 79.2              | 41.8              |
| 32                                                                   | 155    | 4        | M20      | 100      | 46                | 62         | 7.2                                 | 27.6                               | 39 ÷ 66                               |                        | 56.2              | 25.8              | 64.1              | 32.9              |
| 40                                                                   | 170    | 4        | M20      | 100      | 53                | 69         | 7.8                                 | 30.8                               | 47 ÷ 80                               |                        | 65.2              | 29.3              | 74.5              | 37.6              |
| 50                                                                   | 180    | 4        | M20      | 100      | 65                | 81         | 8.8                                 | 40.1                               | 63 ÷ 108                              |                        | 82                | 35.8              | 94                | 46.3              |
| 65                                                                   | 205    | 8        | M20      | 100      | 81                | 100        | 9.1                                 | 60.7                               | 48 ÷ 82                               |                        | 65.7              | 29.5              | 75.1              | 37.9              |
| 80                                                                   | 215    | 8        | M20      | 100      | 95                | 115        | 9.7                                 | 64.7                               | 63 ÷ 107                              |                        | 81                | 35.4              | 92.9              | 45.8              |
| 100                                                                  | 250    | 8        | M24      | 120      | 118               | 138        | 11.2                                | 76.8                               | 105 ÷ 180                             |                        | 74.2              | 31.4              | 85.5              | 41.2              |
| 125                                                                  | 295    | 8        | M27      | 130      | 142               | 162        | 12.7                                | 78.8                               | 158 ÷ 272                             |                        | 72                | 29.7              | 83.3              | 57.1              |
| 150                                                                  | 345    | 8        | M30      | 140      | 170               | 190        | 14.6                                | 89.6                               | 239 ÷ 411                             |                        | 76.3              | 30.7              | 87.9              | 60.2              |
| 200                                                                  | 415    | 12       | M33      | 160      | 220               | 248        | 13.7                                | 68.5                               | 296 ÷ 511                             |                        | 68.5              | 27.4              | 78.8              |                   |
| 250                                                                  | 470    | 12       | M33      | 170      | 270               | 300        | 15.2                                | 73.4                               | 428 ÷ 740                             |                        | 92.7              | 36.8              | 107.1             |                   |
| 300                                                                  | 530    | 16       | M33      | 180      | 320               | 356        | 15.1                                | 75.2                               | 453 ÷ 782                             |                        | 97.2              | 38.6              | 112.3             |                   |
| 350                                                                  | 600    | 16       | M36      | 190      | 375               | 415        | 15.7                                | 75.1                               | 672 ÷ 1159                            | 1009 ÷ 1738            | 107.6             | 42.5              | 124.8             |                   |
| 400                                                                  | 670    | 16       | M39      | 200      | 426               | 474        | 15                                  | 79.1                               | 881 ÷ 1518                            | 1322 ÷ 2278            | 136.5             | 53.7              | 158.6             |                   |

Obr. / Fig.18 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN63

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 4.2                                 | 9.1                                | 7 ÷ 11                                |                        | 53.3               | 48.1              | 38.7              | 74                |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 4.3                                 | 12.3                               | 9 ÷ 15                                |                        | 63.9               | 57.3              | 45.3              | 90.3              |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 4.6                                 | 12.1                               | 14 ÷ 24                               |                        | 38                 | 33.9              | 26.5              | 54.3              |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 4.9                                 | 11.8                               | 17 ÷ 29                               |                        | 42.7               | 37.9              | 29.4              | 61.7              |
| 32                                                                   | 155    | 4        | M20      | 110      | 46                | 62         | 5.5                                 | 16.5                               | 29 ÷ 50                               |                        | 33.6               | 29.6              | 22.7              | 49.4              |
| 40                                                                   | 170    | 4        | M20      | 110      | 53                | 69         | 6.0                                 | 18.5                               | 36 ÷ 61                               |                        | 38.4               | 33.8              | 25.6              | 57.1              |
| 50                                                                   | 180    | 4        | M20      | 110      | 65                | 81         | 6.7                                 | 24                                 | 48 ÷ 83                               |                        | 47.4               | 41.5              | 31                | 71.5              |
| 65                                                                   | 205    | 8        | M20      | 110      | 81                | 100        | 6.9                                 | 36.4                               | 37 ÷ 63                               |                        | 38.7               | 34                | 25.8              | 57.6              |
| 80                                                                   | 215    | 8        | M20      | 110      | 95                | 115        | 7.4                                 | 38.8                               | 48 ÷ 82                               |                        | 46.9               | 41                | 30.7              | 70.6              |
| 100                                                                  | 250    | 8        | M24      | 130      | 118               | 138        | 8.5                                 | 46.1                               | 80 ÷ 137                              |                        | 42.1               | 36.7              | 27.1              | 64.5              |
| 125                                                                  | 295    | 8        | M27      | 150      | 142               | 162        | 9.7                                 | 47.3                               | 120 ÷ 208                             |                        | 40.2               | 34.9              | 25.4              | 62.3              |
| 150                                                                  | 345    | 8        | M30      | 150      | 170               | 190        | 11.1                                | 53.8                               | 182 ÷ 313                             |                        | 42                 | 36.2              | 26.1              | 65.8              |
| 200                                                                  | 415    | 12       | M33      | 180      | 220               | 248        | 10.5                                | 64.1                               | 226 ÷ 390                             |                        | 37.6               | 32.4              | 23.3              | 59.2              |
| 250                                                                  | 470    | 12       | M33      | 180      | 270               | 300        | 11.6                                | 75.2                               | 326 ÷ 564                             |                        | 51.1               | 43.8              | 31.1              | 80.3              |
| 300                                                                  | 530    | 16       | M33      | 200      | 320               | 356        | 11.5                                | 45.3                               | 345 ÷ 596                             |                        | 53.6               | 45.9              | 32.5              | 84.1              |
| 350                                                                  | 600    | 16       | M36      | 220      | 375               | 415        | 12                                  | 45.3                               | 513 ÷ 883                             | 769 ÷ 1325             | 59.3               | 50.8              | 35.7              | 92.9              |
| 400                                                                  | 670    | 16       | M39      | 220      | 426               | 474        | 11.5                                | 47.7                               | 672 ÷ 1157                            | 1007 ÷ 1736            | 74.2               | 63.8              | 45                | 117.4             |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 4.6                                 | 9.6                                | 7 ÷ 12                                |                        | 55.4               | 49.9              | 39.3              | 84.5              |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 4.6                                 | 13                                 | 10 ÷ 17                               |                        | 66.5               | 59.6              | 46.2              | 103.9             |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 5                                   | 12.7                               | 15 ÷ 26                               |                        | 39.5               | 35.3              | 27.1              | 62.7              |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 5.3                                 | 12.4                               | 19 ÷ 32                               |                        | 44.5               | 39.6              | 30                | 71.5              |
| 32                                                                   | 155    | 4        | M20      | 110      | 46                | 62         | 6                                   | 17.4                               | 32 ÷ 54                               |                        | 35.1               | 31                | 23.2              | 57.6              |
| 40                                                                   | 170    | 4        | M20      | 110      | 53                | 69         | 6.4                                 | 19.5                               | 39 ÷ 66                               |                        | 40.2               | 35.4              | 26.2              | 66.8              |
| 50                                                                   | 180    | 4        | M20      | 110      | 65                | 81         | 7.3                                 | 25.4                               | 52 ÷ 89                               |                        | 49.7               | 43.5              | 31.8              | 84.1              |
| 65                                                                   | 205    | 8        | M20      | 110      | 81                | 100        | 7.5                                 | 38.4                               | 40 ÷ 68                               |                        | 40.5               | 35.7              | 26.4              | 67.4              |
| 80                                                                   | 215    | 8        | M20      | 110      | 95                | 115        | 8                                   | 41                                 | 52 ÷ 88                               |                        | 49.1               | 43                | 31.4              | 83                |
| 100                                                                  | 250    | 8        | M24      | 130      | 118               | 138        | 9.2                                 | 48.6                               | 87 ÷ 149                              |                        | 44.3               | 38.6              | 27.7              | 76.2              |
| 125                                                                  | 295    | 8        | M27      | 150      | 142               | 162        | 10.5                                | 49.9                               | 130 ÷ 225                             |                        | 42.3               | 36.7              | 26.1              | 74                |
| 150                                                                  | 345    | 8        | M30      | 150      | 170               | 190        | 12                                  | 56.7                               | 197 ÷ 339                             |                        | 44.2               | 38.2              | 26.8              | 78.4              |
| 200                                                                  | 415    | 12       | M33      | 180      | 220               | 248        | 11.3                                | 67.6                               | 244 ÷ 422                             |                        | 39.6               | 34.2              | 23.9              | 70.3              |
| 250                                                                  | 470    | 12       | M33      | 180      | 270               | 300        | 12.5                                | 78.5                               | 353 ÷ 610                             |                        | 53.9               | 46.3              | 32                | 95.2              |
| 300                                                                  | 530    | 16       | M33      | 200      | 320               | 356        | 12.4                                | 47.6                               | 373 ÷ 645                             |                        | 56.6               | 48.6              | 33.5              | 99.9              |
| 350                                                                  | 600    | 16       | M36      | 220      | 375               | 415        | 13                                  | 47.8                               | 555 ÷ 956                             | 832 ÷ 1434             | 62.5               | 53.8              | 36.8              | 110.6             |
| 400                                                                  | 670    | 16       | M39      | 220      | 426               | 474        | 12.4                                | 49.7                               | 727 ÷ 1253                            | 1090 ÷ 1879            | 78.3               | 67.4              | 46.3              | 140.3             |

Obr. / Fig.19 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN63

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 4.8                                 | 12                                 | 8 ÷ 13                                |                        | 58.8               | 53.3              | 40.4              | 96.6              |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 4.9                                 | 12.8                               | 10 ÷ 18                               |                        | 70.9               | 63.9              | 47.6              | 119.6             |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 5.3                                 | 15.9                               | 16 ÷ 28                               |                        | 42.3               | 38                | 27.9              | 72.5              |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 5.6                                 | 15.5                               | 20 ÷ 34                               |                        | 47.7               | 42.7              | 31                | 82.9              |
| 32                                                                   | 155    | 4        | M20      | 110      | 46                | 62         | 6.3                                 | 21.8                               | 34 ÷ 58                               |                        | 37.7               | 33.6              | 24                | 67.2              |
| 40                                                                   | 170    | 4        | M20      | 110      | 53                | 69         | 6.8                                 | 24.3                               | 41 ÷ 70                               |                        | 43.3               | 38.4              | 27.1              | 78.2              |
| 50                                                                   | 180    | 4        | M20      | 110      | 65                | 81         | 7.7                                 | 31.6                               | 55 ÷ 94                               |                        | 53.7               | 47.4              | 33                | 98.9              |
| 65                                                                   | 205    | 8        | M20      | 110      | 81                | 100        | 7.9                                 | 47.9                               | 42 ÷ 72                               |                        | 43.7               | 38.7              | 27.3              | 78.9              |
| 80                                                                   | 215    | 8        | M20      | 110      | 95                | 115        | 8.4                                 | 51.1                               | 55 ÷ 93                               |                        | 53.1               | 46.9              | 32.6              | 97.6              |
| 100                                                                  | 250    | 8        | M24      | 130      | 118               | 138        | 9.7                                 | 60.6                               | 92 ÷ 157                              |                        | 48                 | 42.1              | 28.8              | 90                |
| 125                                                                  | 295    | 8        | M27      | 150      | 142               | 162        | 11.1                                | 62.2                               | 138 ÷ 237                             |                        | 46                 | 40.2              | 27.2              | 87.8              |
| 150                                                                  | 345    | 8        | M30      | 150      | 170               | 190        | 12.7                                | 70.8                               | 208 ÷ 358                             |                        | 48.2               | 42                | 28                | 92.4              |
| 200                                                                  | 415    | 12       | M33      | 180      | 220               | 248        | 12                                  | 84.3                               | 258 ÷ 446                             |                        | 43.2               | 37.6              | 24.9              | 82.9              |
| 250                                                                  | 470    | 12       | M33      | 180      | 270               | 300        | 13.3                                | 97.6                               | 373 ÷ 644                             |                        | 59                 | 51.1              | 33.4              | 112.8             |
| 300                                                                  | 530    | 16       | M33      | 200      | 320               | 356        | 13.1                                | 58.8                               | 395 ÷ 681                             |                        | 61.9               | 53.6              | 35                | 118.4             |
| 350                                                                  | 600    | 16       | M36      | 220      | 375               | 415        | 13.7                                | 58.8                               | 586 ÷ 1010                            | 879 ÷ 1515             | 68                 | 59.3              | 38.5              | 131.6             |
| 400                                                                  | 670    | 16       | M39      | 220      | 426               | 474        | 13.1                                | 61.9                               | 768 ÷ 1323                            | 1152 ÷ 1985            | 85.5               | 74.2              | 48.5              | 167.4             |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN63   | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 5.6                                 | 15.2                               | 9 ÷ 15                                |                        | 66.5               | 59.5              | 44.5              | 106.7             |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 5.6                                 | 20.5                               | 12 ÷ 20                               |                        | 80.7               | 71.8              | 52.7              | 132.7             |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 6                                   | 20.1                               | 19 ÷ 32                               |                        | 48.4               | 42.8              | 31.1              | 80.7              |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 6.4                                 | 19.6                               | 22 ÷ 38                               |                        | 54.7               | 48.3              | 34.7              | 92.5              |
| 32                                                                   | 155    | 4        | M20      | 110      | 46                | 62         | 7.2                                 | 27.6                               | 39 ÷ 66                               |                        | 43.6               | 38.2              | 27                | 75.2              |
| 40                                                                   | 170    | 4        | M20      | 110      | 53                | 69         | 7.8                                 | 30.8                               | 47 ÷ 80                               |                        | 50.2               | 43.9              | 30.6              | 87.8              |
| 50                                                                   | 180    | 4        | M20      | 110      | 65                | 81         | 8.8                                 | 40.1                               | 63 ÷ 108                              |                        | 62.6               | 54.5              | 37.4              | 111.3             |
| 65                                                                   | 205    | 8        | M20      | 110      | 81                | 100        | 9.1                                 | 60.7                               | 48 ÷ 82                               |                        | 50.6               | 44.2              | 30.9              | 88.5              |
| 80                                                                   | 215    | 8        | M20      | 110      | 95                | 115        | 9.7                                 | 64.7                               | 63 ÷ 107                              |                        | 61.9               | 53.8              | 37                | 109.9             |
| 100                                                                  | 250    | 8        | M24      | 130      | 118               | 138        | 11.2                                | 76.8                               | 105 ÷ 180                             |                        | 56.2               | 48.7              | 33                | 101.7             |
| 125                                                                  | 295    | 8        | M27      | 150      | 142               | 162        | 12.7                                | 78.8                               | 158 ÷ 272                             |                        | 54.2               | 46.7              | 31.2              | 99.4              |
| 150                                                                  | 345    | 8        | M30      | 150      | 170               | 190        | 14.6                                | 89.6                               | 239 ÷ 411                             |                        | 57                 | 48.9              | 32.3              | 104.1             |
| 200                                                                  | 415    | 12       | M33      | 180      | 220               | 248        | 13.7                                | 68.5                               | 296 ÷ 511                             |                        | 51.2               | 43.9              | 28.8              | 93.5              |
| 250                                                                  | 470    | 12       | M33      | 180      | 270               | 300        | 15.2                                | 73.4                               | 428 ÷ 740                             |                        | 69.9               | 59.9              | 38.8              | 127.7             |
| 300                                                                  | 530    | 16       | M33      | 200      | 320               | 356        | 15.1                                | 75.2                               | 453 ÷ 782                             |                        | 73.1               | 62.9              | 40.7              | 134               |
| 350                                                                  | 600    | 16       | M36      | 220      | 375               | 415        | 15.7                                | 75.1                               | 672 ÷ 1159                            | 1009 ÷ 1738            | 80.5               | 69.1              | 44.9              | 149.4             |
| 400                                                                  | 670    | 16       | M39      | 220      | 426               | 474        | 15                                  | 79.1                               | 881 ÷ 1518                            | 1322 ÷ 2278            | 101.4              | 86.8              | 56.8              | 190.4             |

Obr. / Fig.20 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN63

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEM B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | Uťahovací Moment                    |                                    | [Nm]                                  |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
|                                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        |                                   |                                   |                                   |                                   |
| 10                                                                   | 100    | 4        | M12      | 70       | 22                | 36         | 6.7                                 | 14.4                               | 11 ÷ 18                               |                        | 74.2                              | 47.2                              | 94                                | 57.8                              |
| 15                                                                   | 105    | 4        | M12      | 70       | 26                | 42         | 6.8                                 | 19.5                               | 14 ÷ 25                               |                        | 90.7                              | 56.2                              | 116                               | 69.6                              |
| 20                                                                   | 130    | 4        | M16      | 85       | 31                | 47         | 7.3                                 | 19.2                               | 23 ÷ 39                               |                        | 54.5                              | 33.2                              | 70.4                              | 41.5                              |
| 25                                                                   | 140    | 4        | M16      | 90       | 36                | 52         | 7.8                                 | 18.7                               | 27 ÷ 47                               |                        | 61.9                              | 37.1                              | 80.4                              | 46.7                              |
| 32                                                                   | 155    | 4        | M20      | 100      | 46                | 62         | 8.8                                 | 26.2                               | 47 ÷ 80                               |                        | 49.6                              | 29                                | 65.1                              | 36.9                              |
| 40                                                                   | 170    | 4        | M20      | 100      | 53                | 69         | 9.5                                 | 29.3                               | 57 ÷ 97                               |                        | 57.3                              | 33                                | 75.7                              | 42.4                              |
| 50                                                                   | 195    | 4        | M24      | 110      | 65                | 81         | 10.6                                | 33.7                               | 91 ÷ 156                              |                        | 50.1                              | 28.3                              | 66.8                              | 36.7                              |
| 65                                                                   | 220    | 8        | M24      | 120      | 81                | 100        | 11                                  | 43.2                               | 69 ÷ 119                              |                        | 40.4                              | 23.2                              | 53.3                              | 29.8                              |
| 80                                                                   | 230    | 8        | M24      | 120      | 95                | 115        | 11.7                                | 47.3                               | 90 ÷ 155                              |                        | 49.5                              | 28                                | 66                                | 36.3                              |
| 100                                                                  | 265    | 8        | M27      | 140      | 118               | 138        | 13.5                                | 50.3                               | 141 ÷ 244                             |                        | 49                                | 27.1                              | 65.9                              | 52.5                              |
| 125                                                                  | 315    | 8        | M30      | 150      | 142               | 162        | 15.4                                | 51.6                               | 214 ÷ 368                             |                        | 51.4                              | 27.9                              | 69.5                              | 55.1                              |
| 150                                                                  | 355    | 12       | M30      | 160      | 170               | 190        | 17.6                                | 58                                 | 193 ÷ 332                             |                        | 47                                | 25.6                              | 63.4                              | 50.3                              |
| 200                                                                  | 430    | 12       | M33      | 200      | 220               | 248        | 16.6                                | 38.5                               | 358 ÷ 619                             |                        | 59.5                              | 31.5                              | 80.1                              |                                   |
| 250                                                                  | 505    | 12       | M36      | 200      | 270               | 300        | 18.4                                | 39.6                               | 569 ÷ 980                             |                        | 69.1                              | 36.5                              | 93.3                              |                                   |
| 300                                                                  | 585    | 16       | M39      | 220      | 320               | 356        | 18.2                                | 41.6                               | 646 ÷ 1118                            |                        | 60.1                              | 31.7                              | 81.3                              |                                   |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 19                                  | 38.4                               | 1007 ÷ 1744                           |                        |                                   |                                   | 85.6                              |                                   |

| TESNENIE - Grooved Gasket KEMPCHEM B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | Uťahovací Moment                    |                                    | [Nm]                                  |                        | 5.6                               | 8.8                               | A2 50                             | A2 70                             |
|                                                                      |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        |                                   |                                   |                                   |                                   |
| 10                                                                   | 100    | 4        | M12      | 70       | 22                | 36         | 7.3                                 | 15.2                               | 11 ÷ 20                               |                        | 83.6                              | 49.4                              | 106.6                             | 64                                |
| 15                                                                   | 105    | 4        | M12      | 70       | 26                | 42         | 7.4                                 | 20.6                               | 16 ÷ 27                               |                        | 102.7                             | 58.9                              | 132.5                             | 77.5                              |
| 20                                                                   | 130    | 4        | M16      | 85       | 31                | 47         | 7.9                                 | 20.2                               | 24 ÷ 42                               |                        | 62                                | 34.9                              | 80.5                              | 46.4                              |
| 25                                                                   | 140    | 4        | M16      | 90       | 36                | 52         | 8.4                                 | 19.7                               | 29 ÷ 50                               |                        | 70.7                              | 39.1                              | 92.4                              | 52.4                              |
| 32                                                                   | 155    | 4        | M20      | 100      | 46                | 62         | 9.5                                 | 27.7                               | 51 ÷ 87                               |                        | 56.9                              | 30.6                              | 75.1                              | 41.7                              |
| 40                                                                   | 170    | 4        | M20      | 100      | 53                | 69         | 10.3                                | 30.9                               | 62 ÷ 105                              |                        | 66                                | 34.9                              | 87.6                              | 48                                |
| 50                                                                   | 195    | 4        | M24      | 110      | 65                | 81         | 11.5                                | 35.6                               | 99 ÷ 170                              |                        | 58                                | 30                                | 77.6                              | 41.7                              |
| 65                                                                   | 220    | 8        | M24      | 120      | 81                | 100        | 11.9                                | 45.6                               | 75 ÷ 129                              |                        | 46.5                              | 24.6                              | 61.7                              | 33.8                              |
| 80                                                                   | 230    | 8        | M24      | 120      | 95                | 115        | 12.7                                | 49.9                               | 98 ÷ 168                              |                        | 57.3                              | 29.7                              | 76.6                              | 41.2                              |
| 100                                                                  | 265    | 8        | M27      | 140      | 118               | 138        | 14.7                                | 53                                 | 153 ÷ 264                             |                        | 56.9                              | 28.8                              | 76.8                              | 59.7                              |
| 125                                                                  | 315    | 8        | M30      | 150      | 142               | 162        | 16.7                                | 54.4                               | 232 ÷ 398                             |                        | 59.9                              | 29.7                              | 81.4                              | 62.9                              |
| 150                                                                  | 355    | 12       | M30      | 160      | 170               | 190        | 19.1                                | 60.6                               | 209 ÷ 360                             |                        | 54.7                              | 27.3                              | 74.1                              | 57.4                              |
| 200                                                                  | 430    | 12       | M33      | 200      | 220               | 248        | 18                                  | 40.4                               | 388 ÷ 671                             |                        | 69.4                              | 33.7                              | 93.3                              |                                   |
| 250                                                                  | 505    | 12       | M36      | 200      | 270               | 300        | 19.9                                | 41.7                               | 616 ÷ 1062                            |                        | 80.4                              | 39                                | 109.1                             |                                   |
| 300                                                                  | 585    | 16       | M39      | 220      | 320               | 356        | 19.8                                | 43.7                               | 700 ÷ 1211                            |                        | 70                                | 34                                | 95.1                              |                                   |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 20.6                                | 40.5                               | 1092 ÷ 1891                           |                        |                                   |                                   |                                   |                                   |

Obr. / Fig.21 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN100

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                      |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | 5.6               | 8.8               | A2 50             | A2 70             |
| 10                                                                   | 100    | 4        | M12      | 70       | 22                | 36         | 7.7                                 | 19                                 | 12 ÷ 21                               |                        | 94                | 52                | 116.1             | 66.2              |
| 15                                                                   | 105    | 4        | M12      | 70       | 26                | 42         | 7.8                                 | 25.6                               | 16 ÷ 28                               |                        | 116.1             | 62.2              | 144.9             | 80.3              |
| 20                                                                   | 130    | 4        | M16      | 85       | 31                | 47         | 8.3                                 | 25.2                               | 26 ÷ 44                               |                        | 70.4              | 36.9              | 88.3              | 48.1              |
| 25                                                                   | 140    | 4        | M16      | 90       | 36                | 52         | 8.9                                 | 24.6                               | 31 ÷ 53                               |                        | 80.4              | 41.4              | 101.4             | 54.4              |
| 32                                                                   | 155    | 4        | M20      | 100      | 46                | 62         | 10                                  | 34.5                               | 53 ÷ 91                               |                        | 65.1              | 32.5              | 82.8              | 43.3              |
| 40                                                                   | 170    | 4        | M20      | 100      | 53                | 69         | 10.8                                | 38.6                               | 65 ÷ 111                              |                        | 75.7              | 37.2              | 96.7              | 49.9              |
| 50                                                                   | 195    | 4        | M24      | 110      | 65                | 81         | 12.2                                | 44.4                               | 104 ÷ 179                             |                        | 66.8              | 32                | 85.9              | 43.5              |
| 65                                                                   | 220    | 8        | M24      | 120      | 81                | 100        | 12.5                                | 56.9                               | 79 ÷ 136                              |                        | 53.3              | 26.2              | 68.2              | 35.2              |
| 80                                                                   | 230    | 8        | M24      | 120      | 95                | 115        | 13.4                                | 62.3                               | 103 ÷ 177                             |                        | 66                | 31.7              | 84.8              | 43                |
| 100                                                                  | 265    | 8        | M27      | 140      | 118               | 138        | 15.5                                | 66.2                               | 162 ÷ 278                             |                        | 65.9              | 30.8              | 85.3              | 61.9              |
| 125                                                                  | 315    | 8        | M30      | 150      | 142               | 162        | 17.6                                | 67.9                               | 244 ÷ 420                             |                        | 69.5              | 31.8              | 89.9              | 65.3              |
| 150                                                                  | 355    | 12       | M30      | 160      | 170               | 190        | 20.1                                | 75.3                               | 221 ÷ 379                             |                        | 63.4              | 29.2              | 82.3              | 59.5              |
| 200                                                                  | 430    | 12       | M33      | 200      | 220               | 248        | 19                                  | 50                                 | 410 ÷ 707                             |                        | 80.1              | 36.2              | 103.4             |                   |
| 250                                                                  | 505    | 12       | M36      | 200      | 270               | 300        | 21                                  | 51.5                               | 650 ÷ 1121                            | 975 ÷ 1681             | 93.3              | 42.1              | 121.2             |                   |
| 300                                                                  | 585    | 16       | M39      | 220      | 320               | 356        | 20.8                                | 54                                 | 739 ÷ 1278                            | 1108 ÷ 1917            | 81.3              | 36.7              | 105.7             |                   |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 21.7                                | 49.8                               | 1151 ÷ 1994                           | 1727 ÷ 2991            |                   |                   |                   |                   |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3   qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C       |                     | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY   |                   |                   |                   |       |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|---------------------|---------------------|---------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|-------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE            | VYUŽITIE            | VDI 2230                              |                        | Skrutka           | Skrutka           | Skrutka           | Skrutka           |       |
| [mm]                                                                   | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub> | V <sub>flange</sub> | M <sub>u</sub>                        |                        | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |       |
|                                                                        |        |          |          | [mm]     | [mm]              |            | tesnenie [%]        | príruba [%]         | Uťahovací Moment                      | [Nm]                   | Využitie [%]      | Využitie [%]      | Využitie [%]      | Využitie [%]      |       |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                     |                     |                                       | μ = 0.11 ± 0.2         | μ = 0.11 ± 0.2    | 5.6               | 8.8               | A2 50             | A2 70 |
| 10                                                                     | 100    | 4        | M12      | 70       | 22                | 36         | 8.8                 | 24.1                | 14 ÷ 24                               |                        | NEPOUŽÍVAŤ        | 55.6              | NEPOUŽÍVAŤ        | 69.2              |       |
| 15                                                                     | 105    | 4        | M12      | 70       | 26                | 42         | 8.9                 | 32.5                | 19 ÷ 32                               |                        |                   | 66.8              |                   | 84.2              |       |
| 20                                                                     | 130    | 4        | M16      | 85       | 31                | 47         | 9.6                 | 31.9                | 30 ÷ 51                               |                        |                   | 39.8              |                   | 50.5              |       |
| 25                                                                     | 140    | 4        | M16      | 90       | 36                | 52         | 10.2                | 31.2                | 36 ÷ 61                               |                        |                   | 44.8              |                   | 57.3              |       |
| 32                                                                     | 155    | 4        | M20      | 100      | 46                | 62         | 11.5                | 43.7                | 61 ÷ 105                              |                        |                   | 35.3              |                   | 45.7              |       |
| 40                                                                     | 170    | 4        | M20      | 100      | 53                | 69         | 12.4                | 48.9                | 74 ÷ 128                              |                        |                   | 40.4              |                   | 52.7              |       |
| 50                                                                     | 195    | 4        | M24      | 110      | 65                | 81         | 13.9                | 56.2                | 120 ÷ 205                             |                        |                   | 34.9              |                   | 46                |       |
| 65                                                                     | 220    | 8        | M24      | 120      | 81                | 100        | 14.4                | 72                  | 91 ÷ 156                              |                        |                   | 28.5              |                   | 37.1              |       |
| 80                                                                     | 230    | 8        | M24      | 120      | 95                | 115        | 15.4                | 78.9                | 119 ÷ 203                             |                        |                   | 34.5              |                   | 45.4              |       |
| 100                                                                    | 265    | 8        | M27      | 140      | 118               | 138        | 17.7                | 83.8                | 185 ÷ 319                             |                        |                   | 33.7              |                   | 65.6              |       |
| 125                                                                    | 315    | 8        | M30      | 150      | 142               | 162        | 20.2                | 86                  | 280 ÷ 482                             |                        |                   | 35                |                   | 69.2              |       |
| 150                                                                    | 355    | 12       | M30      | 160      | 170               | 190        | 23.1                | 96                  | 253 ÷ 435                             |                        |                   | 32.1              |                   | 63.1              |       |
| 200                                                                    | 430    | 12       | M33      | 200      | 220               | 248        | 21.8                | 63.8                | 470 ÷ 811                             | 705 ÷ 1217             |                   | 39.9              |                   |                   |       |
| 250                                                                    | 505    | 12       | M36      | 200      | 270               | 300        | 24.1                | 65.7                | 746 ÷ 1285                            | 1118 ÷ 1928            |                   | 46.5              |                   |                   |       |
| 300                                                                    | 585    | 16       | M39      | 220      | 320               | 356        | 23.9                | 69                  | 847 ÷ 1465                            | 1271 ÷ 2198            |                   | 40.5              |                   |                   |       |
| 350                                                                    | 655    | 16       | M45      | 280      | 375               | 415        | 24.9                | 63.7                | 1320 ÷ 2287                           | 1981 ÷ 3430            |                   | 50.2              |                   |                   |       |

Obr. / Fig.22 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN100

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 6.7                                 | 14.4                               | 11 ÷ 18                               |                        | 70.5               | 63                | 49.4              | 100.6             |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 6.8                                 | 19.5                               | 14 ÷ 25                               |                        | 85.9               | 76.2              | 58.9              | 124.8             |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 7.3                                 | 19.2                               | 23 ÷ 39                               |                        | 51.6               | 45.6              | 34.9              | 75.7              |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 7.8                                 | 18.7                               | 27 ÷ 47                               |                        | 58.5               | 51.5              | 39.1              | 86.7              |
| 32                                                                   | 155    | 4        | M20      | 120      | 46                | 62         | 8.8                                 | 26.2                               | 47 ÷ 80                               |                        | 46.7               | 40.9              | 30.6              | 70.4              |
| 40                                                                   | 170    | 4        | M20      | 120      | 53                | 69         | 9.5                                 | 29.3                               | 57 ÷ 97                               |                        | 53.9               | 47.1              | 34.9              | 82                |
| 50                                                                   | 195    | 4        | M24      | 120      | 65                | 81         | 10.6                                | 33.7                               | 91 ÷ 156                              |                        | 47.1               | 40.9              | 30                | 72.5              |
| 65                                                                   | 220    | 8        | M24      | 130      | 81                | 100        | 11                                  | 43.2                               | 69 ÷ 119                              |                        | 38                 | 33.1              | 24.6              | 57.8              |
| 80                                                                   | 230    | 8        | M24      | 130      | 95                | 115        | 11.7                                | 47.3                               | 90 ÷ 155                              |                        | 46.5               | 40.4              | 29.7              | 71.6              |
| 100                                                                  | 265    | 8        | M27      | 150      | 118               | 138        | 13.5                                | 50.3                               | 141 ÷ 244                             |                        | 45.9               | 39.7              | 28.8              | 71.7              |
| 125                                                                  | 315    | 8        | M30      | 160      | 142               | 162        | 15.4                                | 51.6                               | 214 ÷ 368                             |                        | 48.1               | 41.4              | 29.7              | 75.8              |
| 150                                                                  | 355    | 12       | M30      | 180      | 170               | 190        | 17.6                                | 58                                 | 193 ÷ 332                             |                        | 44                 | 37.9              | 27.3              | 69                |
| 200                                                                  | 430    | 12       | M33      | 200      | 220               | 248        | 16.6                                | 38.5                               | 358 ÷ 619                             |                        | 55.5               | 47.5              | 33.7              | 87.1              |
| 250                                                                  | 505    | 12       | M36      | 220      | 270               | 300        | 18.4                                | 39.6                               | 569 ÷ 980                             | 853 ÷ 1470             | 64.6               | 55.7              | 39                | 101.6             |
| 300                                                                  | 585    | 16       | M39      | 240      | 320               | 356        | 18.2                                | 41.6                               | 646 ÷ 1118                            | 969 ÷ 1676             | 56.2               | 48.4              | 34                | 88.6              |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 19                                  | 38.4                               | 1007 ÷ 1744                           | 1511 ÷ 2616            | 53.8               |                   | 32.7              | 85.6              |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                 | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                      |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 7.3                                 | 15.2                               | 11 ÷ 20                               |                        | 73.4               | 65.6              | 50.4              | 116.1             |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 7.4                                 | 20.6                               | 16 ÷ 27                               |                        | 89.6               | 79.6              | 60.2              | 144.9             |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 7.9                                 | 20.2                               | 24 ÷ 42                               |                        | 53.9               | 47.7              | 35.7              | 88.3              |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 8.4                                 | 19.7                               | 29 ÷ 50                               |                        | 61.2               | 53.9              | 40                | 101.4             |
| 32                                                                   | 155    | 4        | M20      | 120      | 46                | 62         | 9.5                                 | 27.7                               | 51 ÷ 87                               |                        | 49                 | 42.9              | 31.3              | 82.8              |
| 40                                                                   | 170    | 4        | M20      | 120      | 53                | 69         | 10.3                                | 30.9                               | 62 ÷ 105                              |                        | 56.6               | 49.4              | 35.8              | 96.7              |
| 50                                                                   | 195    | 4        | M24      | 120      | 65                | 81         | 11.5                                | 35.6                               | 99 ÷ 170                              |                        | 49.5               | 43                | 30.8              | 85.9              |
| 65                                                                   | 220    | 8        | M24      | 130      | 81                | 100        | 11.9                                | 45.6                               | 75 ÷ 129                              |                        | 39.9               | 34.8              | 25.2              | 68.2              |
| 80                                                                   | 230    | 8        | M24      | 130      | 95                | 115        | 12.7                                | 49.9                               | 98 ÷ 168                              |                        | 48.9               | 42.5              | 30.4              | 84.8              |
| 100                                                                  | 265    | 8        | M27      | 150      | 118               | 138        | 14.7                                | 53                                 | 153 ÷ 264                             |                        | 48.4               | 41.9              | 29.6              | 85.3              |
| 125                                                                  | 315    | 8        | M30      | 160      | 142               | 162        | 16.7                                | 54.4                               | 232 ÷ 398                             |                        | 50.7               | 43.7              | 30.5              | 89.9              |
| 150                                                                  | 355    | 12       | M30      | 180      | 170               | 190        | 19.1                                | 60.6                               | 209 ÷ 360                             |                        | 46.3               | 40                | 28                | 82.3              |
| 200                                                                  | 430    | 12       | M33      | 200      | 220               | 248        | 18                                  | 40.4                               | 388 ÷ 671                             |                        | 58.6               | 50.3              | 34.6              | 103.4             |
| 250                                                                  | 505    | 12       | M36      | 220      | 270               | 300        | 19.9                                | 41.7                               | 616 ÷ 1062                            | 925 ÷ 1593             | 68.1               | 58.8              | 40.2              | 121.2             |
| 300                                                                  | 585    | 16       | M39      | 240      | 320               | 356        | 19.8                                | 43.7                               | 700 ÷ 1211                            | 1050 ÷ 1817            | 59.3               | 51.1              | 35                | 105.7             |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 20.6                                | 40.5                               | 1092 ÷ 1891                           | 1637 ÷ 2836            | 56.8               |                   | 33.7              | 102.5             |

Obr. / Fig.23 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN100

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | SVORNÍKOVÉ SKRUTKY |              |              |              |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|---------------------------------------|------------------------|--------------------|--------------|--------------|--------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                              | VDI 2230               | Skrutka            | Skrutka      | Skrutka      | Skrutka      |
| [mm]                                                                 | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%]    | M <sub>u</sub>         | Využitie [%]       | Využitie [%] | Využitie [%] | Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                       | Uťahovací Moment       | [Nm]               | 12040.6      | 12050.6      | 15236.6      |
|                                                                      |        |          |          |          |                   |            |                                     |                                       | μ = 0.11 ÷ 0.2         | μ = 0.11 ÷ 0.2     |              |              |              |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 7.7                                 | 19                                    | 12 ÷ 21                |                    | 78.5         | 70.5         | 52           |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 7.8                                 | 25.6                                  | 16 ÷ 28                |                    | 96.2         | 85.9         | 62.2         |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 8.3                                 | 25.2                                  | 26 ÷ 44                |                    | 57.9         | 51.6         | 36.9         |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 8.9                                 | 24.6                                  | 31 ÷ 53                |                    | 65.9         | 58.5         | 41.4         |
| 32                                                                   | 155    | 4        | M20      | 120      | 46                | 62         | 10                                  | 34.5                                  | 53 ÷ 91                |                    | 52.9         | 46.7         | 32.5         |
| 40                                                                   | 170    | 4        | M20      | 120      | 53                | 69         | 10.8                                | 38.6                                  | 65 ÷ 111               |                    | 61.3         | 53.9         | 37.2         |
| 50                                                                   | 195    | 4        | M24      | 120      | 65                | 81         | 12.2                                | 44.4                                  | 104 ÷ 179              |                    | 53.7         | 47.1         | 32           |
| 65                                                                   | 220    | 8        | M24      | 130      | 81                | 100        | 12.5                                | 56.9                                  | 79 ÷ 136               |                    | 43.2         | 38           | 26.2         |
| 80                                                                   | 230    | 8        | M24      | 130      | 95                | 115        | 13.4                                | 62.3                                  | 103 ÷ 177              |                    | 53.1         | 46.5         | 31.7         |
| 100                                                                  | 265    | 8        | M27      | 150      | 118               | 138        | 15.5                                | 66.2                                  | 162 ÷ 278              |                    | 52.6         | 45.9         | 30.8         |
| 125                                                                  | 315    | 8        | M30      | 160      | 142               | 162        | 17.6                                | 67.9                                  | 244 ÷ 420              |                    | 55.3         | 48.1         | 31.8         |
| 150                                                                  | 355    | 12       | M30      | 180      | 170               | 190        | 20.1                                | 75.3                                  | 221 ÷ 379              |                    | 50.5         | 44           | 29.2         |
| 200                                                                  | 430    | 12       | M33      | 200      | 220               | 248        | 19                                  | 50                                    | 410 ÷ 707              |                    | 64.1         | 55.5         | 36.2         |
| 250                                                                  | 505    | 12       | M36      | 220      | 270               | 300        | 21                                  | 51.5                                  | 650 ÷ 1121             | 975 ÷ 1681         | 74.3         | 64.6         | 42.1         |
| 300                                                                  | 585    | 16       | M39      | 240      | 320               | 356        | 20.8                                | 54                                    | 739 ÷ 1278             | 1108 ÷ 1917        | 64.6         | 56.2         | 36.7         |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 21.7                                | 49.8                                  | 1151 ÷ 1994            | 1727 ÷ 2991        | 62.1         |              | 35.3         |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 21.7                                | 49.8                                  | 1151 ÷ 1994            | 1727 ÷ 2991        | 62.1         |              | 35.3         |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | SVORNÍKOVÉ SKRUTKY |              |              |              |
|----------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|---------------------------------------|------------------------|--------------------|--------------|--------------|--------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                              | VDI 2230               | Skrutka            | Skrutka      | Skrutka      | Skrutka      |
| [mm]                                                                 | PN100  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%]    | M <sub>u</sub>         | Využitie [%]       | Využitie [%] | Využitie [%] | Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                   |            |                                     |                                       | Uťahovací Moment       | [Nm]               | 12040.6      | 12050.6      | 15236.6      |
|                                                                      |        |          |          |          |                   |            |                                     |                                       | μ = 0.11 ÷ 0.2         | μ = 0.11 ÷ 0.2     |              |              |              |
| 10                                                                   | 100    | 4        | M12      | 80       | 22                | 36         | 8.8                                 | 24.1                                  | 14 ÷ 24                |                    | 89.7         | 79.5         | 57.8         |
| 15                                                                   | 105    | 4        | M12      | 80       | 26                | 42         | 8.9                                 | 32.5                                  | 19 ÷ 32                |                    | 110.6        | 97.4         | 69.6         |
| 20                                                                   | 130    | 4        | M16      | 90       | 31                | 47         | 9.6                                 | 31.9                                  | 30 ÷ 51                |                    | 66.9         | 58.7         | 41.5         |
| 25                                                                   | 140    | 4        | M16      | 100      | 36                | 52         | 10.2                                | 31.2                                  | 36 ÷ 61                |                    | 76.4         | 66.8         | 46.7         |
| 32                                                                   | 155    | 4        | M20      | 120      | 46                | 62         | 11.5                                | 43.7                                  | 61 ÷ 105               |                    | 61.7         | 53.7         | 36.9         |
| 40                                                                   | 170    | 4        | M20      | 120      | 53                | 69         | 12.4                                | 48.9                                  | 74 ÷ 128               |                    | 71.7         | 62.2         | 42.4         |
| 50                                                                   | 195    | 4        | M24      | 120      | 65                | 81         | 13.9                                | 56.2                                  | 120 ÷ 205              |                    | 63.1         | 54.5         | 36.7         |
| 65                                                                   | 220    | 8        | M24      | 130      | 81                | 100        | 14.4                                | 72                                    | 91 ÷ 156               |                    | 50.5         | 43.8         | 29.8         |
| 80                                                                   | 230    | 8        | M24      | 130      | 95                | 115        | 15.4                                | 78.9                                  | 119 ÷ 203              |                    | 62.4         | 53.9         | 36.3         |
| 100                                                                  | 265    | 8        | M27      | 150      | 118               | 138        | 17.7                                | 83.8                                  | 185 ÷ 319              |                    | 62.2         | 53.4         | 35.5         |
| 125                                                                  | 315    | 8        | M30      | 160      | 142               | 162        | 20.2                                | 86                                    | 280 ÷ 482              |                    | 65.5         | 56.1         | 36.8         |
| 150                                                                  | 355    | 12       | M30      | 180      | 170               | 190        | 23.1                                | 96                                    | 253 ÷ 435              |                    | 59.8         | 51.3         | 33.8         |
| 200                                                                  | 430    | 12       | M33      | 200      | 220               | 248        | 21.8                                | 63.8                                  | 470 ÷ 811              | 705 ÷ 1217         | 75.7         | 65.2         | 42.1         |
| 250                                                                  | 505    | 12       | M36      | 220      | 270               | 300        | 24.1                                | 65.7                                  | 746 ÷ 1285             | 1118 ÷ 1928        | 88           | 75.4         | 49.2         |
| 300                                                                  | 585    | 16       | M39      | 240      | 320               | 356        | 23.9                                | 69                                    | 847 ÷ 1465             | 1271 ÷ 2198        | 76.6         | 65.6         | 42.9         |
| 350                                                                  | 655    | 16       | M45      | 280      | 375               | 415        | 24.9                                | 63.7                                  | 1320 ÷ 2287            | 1981 ÷ 3430        | 73.8         |              | 40.9         |

Obr. / Fig.24 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN100

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment       | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | NEPOUŽÍVAŤ                        |                                   |                                   |                                   |
|                                                                        |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 16.7                               | 18 ÷ 30                               |                        | 5.6                               | 62                                | A2 50                             | 77.4                              |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 22.5                               | 24 ÷ 41                               |                        |                                   | 75                                |                                   | 94.7                              |
| 25                                                                     | 140    | 4        | M16      | 90       | 36                | 52         | 13.1                                | 24.4                               | 46 ÷ 78                               |                        |                                   | 50.6                              |                                   | 64.9                              |
| 40                                                                     | 170    | 4        | M20      | 110      | 53                | 69         | 15.9                                | 30.5                               | 95 ÷ 163                              |                        |                                   | 46.2                              |                                   | 60.2                              |
| 50                                                                     | 195    | 4        | M24      | 120      | 65                | 81         | 17.9                                | 36.2                               | 153 ÷ 263                             |                        |                                   | 40.1                              |                                   | 52.8                              |
| 65                                                                     | 220    | 8        | M24      | 130      | 81                | 100        | 18.4                                | 42                                 | 116 ÷ 199                             |                        |                                   | 32.5                              |                                   | 42.4                              |
| 80                                                                     | 230    | 8        | M24      | 130      | 95                | 115        | 19.7                                | 34.2                               | 152 ÷ 260                             |                        |                                   | 39.6                              |                                   | 52.1                              |
| 100                                                                    | 265    | 8        | M27      | 150      | 118               | 138        | 22.7                                | 37.2                               | 237 ÷ 409                             |                        |                                   | 38.9                              |                                   | 77.8                              |
| 125                                                                    | 315    | 8        | M30      | 160      | 142               | 162        | 25.9                                | 39.3                               | 359 ÷ 617                             |                        |                                   | 40.5                              |                                   | 82.3                              |
| 150                                                                    | 355    | 12       | M30      | 180      | 170               | 190        | 29.6                                | 41.4                               | 324 ÷ 557                             |                        |                                   | 37.1                              |                                   | 75                                |
| 200                                                                    | 430    | 12       | M33      | 200      | 220               | 248        | 27.9                                | 42.8                               | 601 ÷ 1038                            | 902 ÷ 1558             |                                   | 46.5                              |                                   |                                   |
| 250                                                                    | 515    | 12       | M39      | 220      | 270               | 300        | 30.9                                | 44.6                               | 1026 ÷ 1774                           | 1538 ÷ 2661            |                                   | 45.2                              |                                   |                                   |
| 300                                                                    | 585    | 16       | M39      | 250      | 320               | 356        | 30.6                                | 47.4                               | 1084 ÷ 1876                           | 1626 ÷ 2813            |                                   | 47.4                              |                                   |                                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment       | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | NEPOUŽÍVAŤ                        |                                   |                                   |                                   |
|                                                                        |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 18.7                               | 18 ÷ 30                               |                        | 5.6                               | 65.2                              | A2 50                             | 86.5                              |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 25.2                               | 24 ÷ 41                               |                        |                                   | 79.1                              |                                   | 106.5                             |
| 25                                                                     | 140    | 4        | M16      | 90       | 36                | 52         | 13.1                                | 24.9                               | 46 ÷ 78                               |                        |                                   | 53.5                              |                                   | 73.4                              |
| 40                                                                     | 170    | 4        | M20      | 110      | 53                | 69         | 15.9                                | 31.1                               | 95 ÷ 163                              |                        |                                   | 49.1                              |                                   | 68.7                              |
| 50                                                                     | 195    | 4        | M24      | 120      | 65                | 81         | 17.9                                | 36.9                               | 153 ÷ 263                             |                        |                                   | 42.7                              |                                   | 60.4                              |
| 65                                                                     | 220    | 8        | M24      | 130      | 81                | 100        | 18.4                                | 51                                 | 116 ÷ 199                             |                        |                                   | 34.5                              |                                   | 48.4                              |
| 80                                                                     | 230    | 8        | M24      | 130      | 95                | 115        | 19.7                                | 41.5                               | 152 ÷ 260                             |                        |                                   | 42.2                              |                                   | 59.7                              |
| 100                                                                    | 265    | 8        | M27      | 150      | 118               | 138        | 22.7                                | 44.9                               | 237 ÷ 409                             |                        |                                   | 41.5                              |                                   | 89                                |
| 125                                                                    | 315    | 8        | M30      | 160      | 142               | 162        | 25.9                                | 47.1                               | 359 ÷ 617                             |                        |                                   | 43.3                              |                                   | 93.6                              |
| 150                                                                    | 355    | 12       | M30      | 180      | 170               | 190        | 29.6                                | 49.5                               | 324 ÷ 557                             |                        |                                   | 39.6                              |                                   | 85.7                              |
| 200                                                                    | 430    | 12       | M33      | 200      | 220               | 248        | 27.9                                | 51.2                               | 601 ÷ 1038                            | 902 ÷ 1558             |                                   | 49.8                              |                                   |                                   |
| 250                                                                    | 515    | 12       | M39      | 220      | 270               | 300        | 30.9                                | 53.1                               | 1026 ÷ 1774                           | 1538 ÷ 2661            |                                   | 48.4                              |                                   |                                   |
| 300                                                                    | 585    | 16       | M39      | 250      | 320               | 356        | 30.6                                | 56.5                               | 1084 ÷ 1876                           | 1626 ÷ 2813            |                                   | 50.7                              |                                   |                                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment       | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | NEPOUŽÍVAŤ                        |                                   |                                   |                                   |
|                                                                        |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 20.8                               | 18 ÷ 30                               |                        | 5.6                               | 68.9                              | A2 50                             | 89.7                              |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 28                                 | 24 ÷ 41                               |                        |                                   | 83.8                              |                                   | 110.6                             |
| 25                                                                     | 140    | 4        | M16      | 90       | 36                | 52         | 13.1                                | 27.7                               | 46 ÷ 78                               |                        |                                   | 57                                |                                   | 76.4                              |
| 40                                                                     | 170    | 4        | M20      | 110      | 53                | 69         | 15.9                                | 34.5                               | 95 ÷ 163                              |                        |                                   | 52.4                              |                                   | 71.7                              |
| 50                                                                     | 195    | 4        | M24      | 120      | 65                | 81         | 17.9                                | 41                                 | 153 ÷ 263                             |                        |                                   | 45.7                              |                                   | 63.1                              |
| 65                                                                     | 220    | 8        | M24      | 130      | 81                | 100        | 18.4                                | 54.9                               | 116 ÷ 199                             |                        |                                   | 36.9                              |                                   | 50.5                              |
| 80                                                                     | 230    | 8        | M24      | 130      | 95                | 115        | 19.7                                | 44.7                               | 152 ÷ 260                             |                        |                                   | 45.2                              |                                   | 62.4                              |
| 100                                                                    | 265    | 8        | M27      | 150      | 118               | 138        | 22.7                                | 48.3                               | 237 ÷ 409                             |                        |                                   | 44.6                              |                                   | 92.4                              |
| 125                                                                    | 315    | 8        | M30      | 160      | 142               | 162        | 25.9                                | 50.8                               | 359 ÷ 617                             |                        |                                   | 46.6                              |                                   | 97                                |
| 150                                                                    | 355    | 12       | M30      | 180      | 170               | 190        | 29.6                                | 53.3                               | 324 ÷ 557                             |                        |                                   | 42.6                              |                                   | 88.7                              |
| 200                                                                    | 430    | 12       | M33      | 200      | 220               | 248        | 27.9                                | 55.1                               | 601 ÷ 1038                            | 902 ÷ 1558             |                                   | 53.8                              |                                   |                                   |
| 250                                                                    | 515    | 12       | M39      | 220      | 270               | 300        | 30.9                                | 57.2                               | 1026 ÷ 1774                           | 1538 ÷ 2661            |                                   | 52                                |                                   |                                   |
| 300                                                                    | 585    | 16       | M39      | 250      | 320               | 356        | 30.6                                | 60.9                               | 1084 ÷ 1876                           | 1626 ÷ 2813            |                                   | 54.5                              |                                   |                                   |

  

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | Uťahovací Moment       | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | NEPOUŽÍVAŤ                        |                                   |                                   |                                   |
|                                                                        |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 25.3                               | 18 ÷ 30                               |                        | 5.6                               | 74.2                              | A2 50                             | 94.1                              |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 34                                 | 24 ÷ 41                               |                        |                                   | 90.7                              |                                   | 116.4                             |
| 25                                                                     | 140    | 4        | M16      | 90       | 36                | 52         | 13.1                                | 33.7                               | 46 ÷ 78                               |                        |                                   | 61.9                              |                                   | 80.6                              |
| 40                                                                     | 170    | 4        | M20      | 110      | 53                | 69         | 15.9                                | 42                                 | 95 ÷ 163                              |                        |                                   | 57.3                              |                                   | 75.9                              |
| 50                                                                     | 195    | 4        | M24      | 120      | 65                | 81         | 17.9                                | 49.8                               | 153 ÷ 263                             |                        |                                   | 50.1                              |                                   | 67                                |
| 65                                                                     | 220    | 8        | M24      | 130      | 81                | 100        | 18.4                                | 63                                 | 116 ÷ 199                             |                        |                                   | 40.4                              |                                   | 53.5                              |
| 80                                                                     | 230    | 8        | M24      | 130      | 95                | 115        | 19.7                                | 51.3                               | 152 ÷ 260                             |                        |                                   | 49.5                              |                                   | 66.1                              |
| 100                                                                    | 265    | 8        | M27      | 150      | 118               | 138        | 22.7                                | 55.4                               | 237 ÷ 409                             |                        |                                   | 49                                |                                   | 98                                |
| 125                                                                    | 315    | 8        | M30      | 160      | 142               | 162        | 25.9                                | 58.3                               | 359 ÷ 617                             |                        |                                   | 51.4                              |                                   | 102.7                             |
| 150                                                                    | 355    | 12       | M30      | 180      | 170               | 190        | 29.6                                | 61.2                               | 324 ÷ 557                             |                        |                                   | 47                                |                                   | 93.9                              |
| 200                                                                    | 430    | 12       | M33      | 200      | 220               | 248        | 27.9                                | 63.3                               | 601 ÷ 1038                            | 902 ÷ 1558             |                                   | 59.5                              |                                   |                                   |
| 250                                                                    | 515    | 12       | M39      | 220      | 270               | 300        | 30.9                                | 65.7                               | 1026 ÷ 1774                           | 1538 ÷ 2661            |                                   | 57.3                              |                                   |                                   |
| 300                                                                    | 585    | 16       | M39      | 250      | 320               | 356        | 30.6                                | 69.9                               | 1084 ÷ 1876                           | 1626 ÷ 2813            |                                   | 60.1                              |                                   |                                   |

Obr. / Fig.25 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN160

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                        |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                        |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 16.7                               | 18 ÷ 30                               |                        | 96.1               | 85                | 65.2              | 140.9             |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 22.5                               | 24 ÷ 41                               |                        | 118.9              | 104.5             | 79.1              | 177.2             |
| 25                                                                     | 140    | 4        | M16      | 100      | 36                | 52         | 13.1                                | 24.4                               | 46 ÷ 78                               |                        | 82.5               | 72                | 53.5              | 125.2             |
| 40                                                                     | 170    | 4        | M20      | 120      | 53                | 69         | 15.9                                | 30.5                               | 95 ÷ 163                              |                        | 77.7               | 67.3              | 49.1              | 120.6             |
| 50                                                                     | 195    | 4        | M24      | 140      | 65                | 81         | 17.9                                | 36.2                               | 153 ÷ 263                             |                        | 68.6               | 59.2              | 42.7              | 107.7             |
| 65                                                                     | 220    | 8        | M24      | 140      | 81                | 100        | 18.4                                | 42                                 | 116 ÷ 199                             |                        | 54.8               | 47.4              | 34.5              | 85                |
| 80                                                                     | 230    | 8        | M24      | 140      | 95                | 115        | 19.7                                | 34.2                               | 152 ÷ 260                             |                        | 67.8               | 58.5              | 42.2              | 106.2             |
| 100                                                                    | 265    | 8        | M27      | 160      | 118               | 138        | 22.7                                | 37.2                               | 237 ÷ 409                             |                        | 67.7               | 58.2              | 41.5              | 106.8             |
| 125                                                                    | 315    | 8        | M30      | 180      | 142               | 162        | 25.9                                | 39.3                               | 359 ÷ 617                             |                        | 71.5               | 61.2              | 43.3              | 112.1             |
| 150                                                                    | 355    | 12       | M30      | 200      | 170               | 190        | 29.6                                | 41.4                               | 324 ÷ 557                             |                        | 65.2               | 55.9              | 39.6              | 102.4             |
| 200                                                                    | 430    | 12       | M33      | 220      | 220               | 248        | 27.9                                | 42.8                               | 601 ÷ 1038                            | 902 ÷ 1558             | 82.3               | 70.8              | 49.8              | 130               |
| 250                                                                    | 515    | 12       | M39      | 240      | 270               | 300        | 30.9                                | 44.6                               | 1026 ÷ 1774                           | 1538 ÷ 2661            | 79.7               | 68.2              | 48.4              | 127.7             |
| 300                                                                    | 585    | 16       | M39      | 260      | 320               | 356        | 30.6                                | 47.4                               | 1084 ÷ 1876                           | 1626 ÷ 2813            | 83.6               | 71.6              | 50.7              | 135.1             |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                        |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                        |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 18.7                               | 18 ÷ 30                               |                        | 100.4              | 88.8              | 66.6              | 164.1             |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 25.2                               | 24 ÷ 41                               |                        | 124.5              | 109.5             | 80.9              | 207.5             |
| 25                                                                     | 140    | 4        | M16      | 100      | 36                | 52         | 13.1                                | 24.9                               | 46 ÷ 78                               |                        | 86.5               | 75.6              | 54.8              | 147.5             |
| 40                                                                     | 170    | 4        | M20      | 120      | 53                | 69         | 15.9                                | 31.1                               | 95 ÷ 163                              |                        | 81.8               | 70.9              | 50.3              | 143.2             |
| 50                                                                     | 195    | 4        | M24      | 140      | 65                | 81         | 17.9                                | 36.9                               | 153 ÷ 263                             |                        | 72.3               | 62.4              | 43.8              | 128.3             |
| 65                                                                     | 220    | 8        | M24      | 140      | 81                | 100        | 18.4                                | 51                                 | 116 ÷ 199                             |                        | 57.6               | 49.9              | 35.4              | 100.9             |
| 80                                                                     | 230    | 8        | M24      | 140      | 95                | 115        | 19.7                                | 41.5                               | 152 ÷ 260                             |                        | 71.4               | 61.7              | 43.3              | 126.6             |
| 100                                                                    | 265    | 8        | M27      | 160      | 118               | 138        | 22.7                                | 44.9                               | 237 ÷ 409                             |                        | 71.5               | 61.4              | 42.7              | 126.4             |
| 125                                                                    | 315    | 8        | M30      | 180      | 142               | 162        | 25.9                                | 47.1                               | 359 ÷ 617                             |                        | 75.6               | 64.8              | 44.6              | 133.2             |
| 150                                                                    | 355    | 12       | M30      | 200      | 170               | 190        | 29.6                                | 49.5                               | 324 ÷ 557                             |                        | 68.8               | 59.1              | 40.8              | 121.5             |
| 200                                                                    | 430    | 12       | M33      | 220      | 220               | 248        | 27.9                                | 51.2                               | 601 ÷ 1038                            | 902 ÷ 1558             | 86.8               | 74.8              | 51.3              | 155.2             |
| 250                                                                    | 515    | 12       | M39      | 240      | 270               | 300        | 30.9                                | 53.1                               | 1026 ÷ 1774                           | 1538 ÷ 2661            | 84.2               | 72.2              | 49.8              | 152.6             |
| 300                                                                    | 585    | 16       | M39      | 260      | 320               | 356        | 30.6                                | 56.5                               | 1084 ÷ 1876                           | 1626 ÷ 2813            | 88.3               | 75.7              | 52.1              | 160.4             |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                        |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                        |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 20.8                               | 18 ÷ 30                               |                        | 107.9              | 96.1              | 68.9              | 191.2             |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 28                                 | 24 ÷ 41                               |                        | 134.2              | 118.9             | 83.8              | 243.1             |
| 25                                                                     | 140    | 4        | M16      | 100      | 36                | 52         | 13.1                                | 27.7                               | 46 ÷ 78                               |                        | 93.6               | 82.5              | 57                | 173.8             |
| 40                                                                     | 170    | 4        | M20      | 120      | 53                | 69         | 15.9                                | 34.5                               | 95 ÷ 163                              |                        | 88.9               | 77.7              | 52.4              | 169.9             |
| 50                                                                     | 195    | 4        | M24      | 140      | 65                | 81         | 17.9                                | 41                                 | 153 ÷ 263                             |                        | 78.8               | 68.6              | 45.7              | 151.2             |
| 65                                                                     | 220    | 8        | M24      | 140      | 81                | 100        | 18.4                                | 54.9                               | 116 ÷ 199                             |                        | 62.6               | 54.8              | 36.9              | 119.8             |
| 80                                                                     | 230    | 8        | M24      | 140      | 95                | 115        | 19.7                                | 44.7                               | 152 ÷ 260                             |                        | 77.8               | 67.8              | 45.2              | 149.3             |
| 100                                                                    | 265    | 8        | M27      | 160      | 118               | 138        | 22.7                                | 48.3                               | 237 ÷ 409                             |                        | 78                 | 67.7              | 44.6              | 149.4             |
| 125                                                                    | 315    | 8        | M30      | 180      | 142               | 162        | 25.9                                | 50.8                               | 359 ÷ 617                             |                        | 82.6               | 71.5              | 46.6              | 158.1             |
| 150                                                                    | 355    | 12       | M30      | 200      | 170               | 190        | 29.6                                | 53.3                               | 324 ÷ 557                             |                        | 75.3               | 65.2              | 42.6              | 144               |
| 200                                                                    | 430    | 12       | M33      | 220      | 220               | 248        | 27.9                                | 55.1                               | 601 ÷ 1038                            | 902 ÷ 1558             | 94.7               | 82.3              | 53.8              | 185.1             |
| 250                                                                    | 515    | 12       | M39      | 240      | 270               | 300        | 30.9                                | 57.2                               | 1026 ÷ 1774                           | 1538 ÷ 2661            | 92                 | 79.7              | 52                | 182.6             |
| 300                                                                    | 585    | 16       | M39      | 260      | 320               | 356        | 30.6                                | 60.9                               | 1084 ÷ 1876                           | 1626 ÷ 2813            | 96.6               | 83.6              | 54.5              | 192.1             |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                   | PN160  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                        |        |          |          |          | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
|                                                                        |        |          |          |          | podľa EN 1514-6   |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                     | 100    | 4        | M12      | 80       | 22                | 36         | 11.3                                | 25.3                               | 18 ÷ 30                               |                        | 124.5              | 109.3             | 77.4              | 214               |
| 15                                                                     | 105    | 4        | M12      | 80       | 26                | 42         | 11.4                                | 34                                 | 24 ÷ 41                               |                        | 155.8              | 136               | 94.7              | 273               |
| 25                                                                     | 140    | 4        | M16      | 100      | 36                | 52         | 13.1                                | 33.7                               | 46 ÷ 78                               |                        | 109.5              | 95                | 64.9              | 196               |
| 40                                                                     | 170    | 4        | M20      | 120      | 53                | 69         | 15.9                                | 42                                 | 95 ÷ 163                              |                        | 104.8              | 90.2              | 60.2              | 192.1             |
| 50                                                                     | 195    | 4        | M24      | 140      | 65                | 81         | 17.9                                | 49.8                               | 153 ÷ 263                             |                        | 93.2               | 80                | 52.8              | 170.4             |
| 65                                                                     | 220    | 8        | M24      | 140      | 81                | 100        | 18.4                                | 63                                 | 116 ÷ 199                             |                        | 73.8               | 63.6              | 42.4              | 135.3             |
| 80                                                                     | 230    | 8        | M24      | 140      | 95                | 115        | 19.7                                | 51.3                               | 152 ÷ 260                             |                        | 92                 | 79                | 52.1              | 168.2             |
| 100                                                                    | 265    | 8        | M27      | 160      | 118               | 138        | 22.7                                | 55.4                               | 237 ÷ 409                             |                        | 92.7               | 79.3              | 51.7              | 168.9             |
| 125                                                                    | 315    | 8        | M30      | 180      | 142               | 162        | 25.9                                | 58.3                               | 359 ÷ 617                             |                        | 97.4               | 83.8              | 54.2              | 179.1             |
| 150                                                                    | 355    | 12       | M30      | 200      | 170               | 190        | 29.6                                | 61.2                               | 324 ÷ 557                             |                        | 89.1               | 76.5              | 49.5              | 163               |
| 200                                                                    | 430    | 12       | M33      | 220      | 220               | 248        | 27.9                                | 63.3                               | 601 ÷ 1038                            | 902 ÷ 1558             | 112.3              | 96.2              | 62.9              | 210.4             |
| 250                                                                    | 515    | 12       | M39      | 240      | 270               | 300        | 30.9                                | 65.7                               | 1026 ÷ 1774                           | 1538 ÷ 2661            | 109.6              | 93.5              | 60.5              | 208               |
| 300                                                                    | 585    | 16       | M39      | 260      | 320               | 356        | 30.6                                | 69.9                               | 1084 ÷ 1876                           | 1626 ÷ 2813            | 115.2              | 98.2              | 63.4              | 218.9             |

Obr. / Fig.26 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN160

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            |                                     | TEPLOTA 20°C                       | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                                     | μ = 0.11 ± 0.2                     |                                       | μ = 0.11 ± 0.2         |                                   |                                   |                                   |                                   |
| 10                                                                     | 125    | 4        | M16      | 90       | 22                | 36         | 17.6                                | 20.3                               | 35 ÷ 61                               |                        | NEPOUŽÍVAŤ                        | 43.1                              | NEPOUŽÍVAŤ                        | 54.8                              |
| 15                                                                     | 130    | 4        | M16      | 100      | 26                | 42         | 17.8                                | 23                                 | 48 ÷ 82                               |                        |                                   |                                   |                                   | 68                                |
| 25                                                                     | 150    | 4        | M20      | 110      | 36                | 52         | 20.4                                | 29.6                               | 88 ÷ 152                              |                        |                                   |                                   |                                   | 57.5                              |
| 40                                                                     | 185    | 4        | M24      | 130      | 53                | 73         | 22.1                                | 39.4                               | 204 ÷ 350                             |                        |                                   |                                   |                                   | 67.4                              |
| 50                                                                     | 200    | 8        | M24      | 130      | 65                | 87         | 23.3                                | 43.2                               | 143 ÷ 246                             |                        |                                   |                                   |                                   | 50.5                              |
| 65                                                                     | 230    | 8        | M24      | 140      | 81                | 103        | 26.3                                | 32.8                               | 196 ÷ 336                             |                        |                                   |                                   |                                   | 64.5                              |
| 80                                                                     | 255    | 8        | M27      | 160      | 95                | 121        | 26.2                                | 41.9                               | 300 ÷ 517                             |                        |                                   |                                   |                                   | 96.7                              |
| 100                                                                    | 300    | 8        | M30      | 180      | 118               | 146        | 28.5                                | 41.6                               | 481 ÷ 827                             | 721 ÷ 1240             |                                   |                                   |                                   | 106.4                             |
| 125                                                                    | 340    | 12       | M30      | 190      | 142               | 178        | 27.4                                | 47                                 | 480 ÷ 826                             | 720 ÷ 1238             |                                   |                                   |                                   | 106.5                             |
| 150                                                                    | 390    | 12       | M33      | 210      | 170               | 212        | 27.8                                | 48.6                               | 735 ÷ 1270                            | 1103 ÷ 1904            |                                   |                                   |                                   |                                   |
| 200                                                                    | 485    | 12       | M39      | 250      | 220               | 280        | 26.3                                | 60                                 | 1530 ÷ 2646                           | 2295 ÷ 3970            |                                   | 64.6                              |                                   |                                   |
| 250                                                                    | 585    | 16       | M45      | 300      | 270               | 340        | 27                                  | 54.8                               | 1938 ÷ 3356                           | 2907 ÷ 5034            |                                   |                                   |                                   |                                   |
| 300                                                                    | 690    | 16       | M48      |          | 320               | 400        |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            |                                     | TEPLOTA 100°C                      | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                                     | μ = 0.11 ± 0.2                     |                                       | μ = 0.11 ± 0.2         |                                   |                                   |                                   |                                   |
| 10                                                                     | 125    | 4        | M16      | 90       | 22                | 36         | 17.6                                | 21.7                               | 35 ÷ 61                               |                        | NEPOUŽÍVAŤ                        | 45.5                              | NEPOUŽÍVAŤ                        | 61.7                              |
| 15                                                                     | 130    | 4        | M16      | 100      | 26                | 42         | 17.8                                | 24.3                               | 48 ÷ 82                               |                        |                                   |                                   |                                   | 77                                |
| 25                                                                     | 150    | 4        | M20      | 110      | 36                | 52         | 20.4                                | 31.2                               | 88 ÷ 152                              |                        |                                   |                                   |                                   | 65.5                              |
| 40                                                                     | 185    | 4        | M24      | 130      | 53                | 73         | 22.1                                | 41.6                               | 204 ÷ 350                             |                        |                                   |                                   |                                   | 77.5                              |
| 50                                                                     | 200    | 8        | M24      | 130      | 65                | 87         | 23.3                                | 45.6                               | 143 ÷ 246                             |                        |                                   |                                   |                                   | 57.8                              |
| 65                                                                     | 230    | 8        | M24      | 140      | 81                | 103        | 26.3                                | 34.3                               | 196 ÷ 336                             |                        |                                   |                                   |                                   | 74                                |
| 80                                                                     | 255    | 8        | M27      | 160      | 95                | 121        | 26.2                                | 43.7                               | 300 ÷ 517                             |                        |                                   |                                   |                                   | 110.1                             |
| 100                                                                    | 300    | 8        | M30      | 180      | 118               | 146        | 28.5                                | 43.4                               | 481 ÷ 827                             |                        |                                   |                                   |                                   | 121.3                             |
| 125                                                                    | 340    | 12       | M30      | 190      | 142               | 178        | 27.4                                | 49                                 | 480 ÷ 826                             |                        |                                   |                                   |                                   | 121.4                             |
| 150                                                                    | 390    | 12       | M33      | 210      | 170               | 212        | 27.8                                | 50.7                               | 735 ÷ 1270                            | 1103 ÷ 1904            |                                   | 60.4                              |                                   |                                   |
| 200                                                                    | 485    | 12       | M39      | 250      | 220               | 280        | 26.3                                | 62.8                               | 1530 ÷ 2646                           | 2295 ÷ 3970            |                                   |                                   |                                   |                                   |
| 250                                                                    | 585    | 16       | M45      | 300      | 270               | 340        | 27                                  | 57.3                               | 1938 ÷ 3356                           | 2907 ÷ 5034            |                                   |                                   |                                   |                                   |
| 300                                                                    | 690    | 16       | M48      |          | 320               | 400        |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            |                                     | TEPLOTA 200°C                      | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                                     | μ = 0.11 ± 0.2                     |                                       | μ = 0.11 ± 0.2         |                                   |                                   |                                   |                                   |
| 10                                                                     | 125    | 4        | M16      | 90       | 22                | 36         | 17.6                                | 26.7                               | 35 ÷ 61                               |                        | NEPOUŽÍVAŤ                        | 48.3                              | NEPOUŽÍVAŤ                        | 64.1                              |
| 15                                                                     | 130    | 4        | M16      | 100      | 26                | 42         | 17.8                                | 30.3                               | 48 ÷ 82                               |                        |                                   |                                   |                                   | 80.2                              |
| 25                                                                     | 150    | 4        | M20      | 110      | 36                | 52         | 20.4                                | 38.9                               | 88 ÷ 152                              |                        |                                   |                                   |                                   | 68.4                              |
| 40                                                                     | 185    | 4        | M24      | 130      | 53                | 73         | 22.1                                | 51.9                               | 204 ÷ 350                             |                        |                                   |                                   |                                   | 81.1                              |
| 50                                                                     | 200    | 8        | M24      | 130      | 65                | 87         | 23.3                                | 56.9                               | 143 ÷ 246                             |                        |                                   |                                   |                                   | 60.4                              |
| 65                                                                     | 230    | 8        | M24      | 140      | 81                | 103        | 26.3                                | 42.6                               | 196 ÷ 336                             |                        |                                   |                                   |                                   | 77.4                              |
| 80                                                                     | 255    | 8        | M27      | 160      | 95                | 121        | 26.2                                | 54                                 | 300 ÷ 517                             |                        |                                   |                                   |                                   | 114.1                             |
| 100                                                                    | 300    | 8        | M30      | 180      | 118               | 146        | 28.5                                | 54                                 | 481 ÷ 827                             | 721 ÷ 1240             |                                   |                                   |                                   | 125.9                             |
| 125                                                                    | 340    | 12       | M30      | 190      | 142               | 178        | 27.4                                | 61                                 | 480 ÷ 826                             | 720 ÷ 1238             |                                   |                                   |                                   | 126                               |
| 150                                                                    | 390    | 12       | M33      | 210      | 170               | 212        | 27.8                                | 63.1                               | 735 ÷ 1270                            | 1103 ÷ 1904            |                                   | 65.2                              |                                   |                                   |
| 200                                                                    | 485    | 12       | M39      | 250      | 220               | 280        | 26.3                                | 79                                 | 1530 ÷ 2646                           | 2295 ÷ 3970            |                                   |                                   |                                   |                                   |
| 250                                                                    | 585    | 16       | M45      | 300      | 270               | 340        | 27                                  | 72.1                               | 1938 ÷ 3356                           | 2907 ÷ 5034            |                                   |                                   |                                   |                                   |
| 300                                                                    | 690    | 16       | M48      |          | 320               | 400        |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            |                                     | TEPLOTA 300°C                      | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |                                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                   | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                                     | μ = 0.11 ± 0.2                     |                                       | μ = 0.11 ± 0.2         |                                   |                                   |                                   |                                   |
| 10                                                                     | 125    | 4        | M16      | 90       | 22                | 36         | 17.6                                | 33.8                               | 35 ÷ 61                               |                        | NEPOUŽÍVAŤ                        | 52.4                              | NEPOUŽÍVAŤ                        | 67.6                              |
| 15                                                                     | 130    | 4        | M16      | 100      | 26                | 42         | 17.8                                | 38.4                               | 48 ÷ 82                               |                        |                                   |                                   |                                   | 84.7                              |
| 25                                                                     | 150    | 4        | M20      | 110      | 36                | 52         | 20.4                                | 49.3                               | 88 ÷ 152                              |                        |                                   |                                   |                                   | 72.3                              |
| 40                                                                     | 185    | 4        | M24      | 130      | 53                | 73         | 22.1                                | 65.7                               | 204 ÷ 350                             |                        |                                   |                                   |                                   | 86.1                              |
| 50                                                                     | 200    | 8        | M24      | 130      | 65                | 87         | 23.3                                | 72                                 | 143 ÷ 246                             |                        |                                   |                                   |                                   | 64                                |
| 65                                                                     | 230    | 8        | M24      | 140      | 81                | 103        | 26.3                                | 54.4                               | 196 ÷ 336                             |                        |                                   |                                   |                                   | 82.2                              |
| 80                                                                     | 255    | 8        | M27      | 160      | 95                | 121        | 26.2                                | 69.4                               | 300 ÷ 517                             |                        |                                   |                                   |                                   | 120.7                             |
| 100                                                                    | 300    | 8        | M30      | 180      | 118               | 146        | 28.5                                | 69                                 | 481 ÷ 827                             | 721 ÷ 1240             |                                   |                                   |                                   | 133.4                             |
| 125                                                                    | 340    | 12       | M30      | 190      | 142               | 178        | 27.4                                | 78                                 | 480 ÷ 826                             | 720 ÷ 1238             |                                   |                                   |                                   | 133.5                             |
| 150                                                                    | 390    | 12       | M33      | 210      | 170               | 212        | 27.8                                | 80.6                               | 735 ÷ 1270                            | 1103 ÷ 1904            |                                   | 71.8                              |                                   |                                   |
| 200                                                                    | 485    | 12       | M39      | 250      | 220               | 280        | 26.3                                | 102.7                              | 1530 ÷ 2646                           | 2295 ÷ 3970            |                                   |                                   |                                   |                                   |
| 250                                                                    | 585    | 16       | M45      | 300      | 270               | 340        | 27                                  | 93.7                               | 1938 ÷ 3356                           | 2907 ÷ 5034            |                                   |                                   |                                   |                                   |
| 300                                                                    | 690    | 16       | M48      |          | 320               | 400        |                                     |                                    |                                       |                        |                                   |                                   |                                   |                                   |

Obr. / Fig.27 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN250

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3    qt = 69°MPa |        |          |          |          |                   |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|---------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                        | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                      | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                           |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      |                        | [Nm]               | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                           |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                    |                   |                   |                   |
| μ = 0.11 ± 0.2                                                            |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                    |                   |                   |                   |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69°MPa |        |          |          |          |                   |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                   | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | M <sub>u</sub>         | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                        |        |          |          |          | [mm]              | [mm]       |                                     |                                    | [Nm]                                  |                        | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                    |                   |                   |                   |
|                                                                        |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                     | 125    | 4        | M16      | 100      | 22                | 36         | 17.6                                | 21.7                               | 35 ÷ 61                               |                        | 72.4               | 63.5              | 46.6              | 121.7             |
| 15                                                                     | 130    | 4        | M16      | 100      | 26                | 42         | 17.8                                | 24.3                               | 48 ÷ 82                               |                        | 90.9               | 79.4              | 57.4              | 155.6             |
| 25                                                                     | 150    | 4        | M20      | 120      | 36                | 52         | 20.4                                | 31.2                               | 88 ÷ 152                              |                        | 77.9               | 67.6              | 48.1              | 136               |
| 40                                                                     | 185    | 4        | M24      | 140      | 53                | 73         | 22.1                                | 41.6                               | 204 ÷ 350                             |                        | 93.2               | 80.2              | 55.7              | 164.9             |
| 50                                                                     | 200    | 8        | M24      | 150      | 65                | 87         | 23.3                                | 45.6                               | 143 ÷ 246                             |                        | 69.1               | 59.7              | 42                | 122.3             |
| 65                                                                     | 230    | 8        | M24      | 160      | 81                | 103        | 26.3                                | 34.3                               | 196 ÷ 336                             |                        | 89                 | 76.6              | 53.3              | 157.5             |
| 80                                                                     | 255    | 8        | M27      | 180      | 95                | 121        | 26.2                                | 43.7                               | 300 ÷ 517                             |                        | 88.7               | 76.1              | 52.4              | 156.4             |
| 100                                                                    | 300    | 8        | M30      | 200      | 118               | 146        | 28.5                                | 43.4                               | 481 ÷ 827                             |                        | 97.9               | 84.5              | 57.7              | 174.1             |
| 125                                                                    | 340    | 12       | M30      | 220      | 142               | 178        | 27.4                                | 49                                 | 480 ÷ 826                             |                        | 98                 | 84.5              | 57.8              | 174.2             |
| 150                                                                    | 390    | 12       | M33      | 240      | 170               | 212        | 27.8                                | 50.7                               | 735 ÷ 1270                            | 1103 ÷ 1904            | 104.9              | 90.1              | 62.2              | 189.1             |
| 200                                                                    | 485    | 12       | M39      | 280      | 220               | 280        | 26.3                                | 62.8                               | 1530 ÷ 2646                           | 2295 ÷ 3970            | 122.4              | 104.6             | 71.2              | 225.2             |
| 250                                                                    | 585    | 16       | M45      | 325      | 270               | 340        | 27                                  | 57.3                               | 1938 ÷ 3356                           | 2907 ÷ 5034            | 98.9               |                   | 57.3              | 183.2             |
| 300                                                                    | 690    | 16       | M48      |          | 320               | 400        |                                     |                                    |                                       |                        |                    |                   |                   |                   |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69°MPa |        |          |          |          |                   |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Skrutka  | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
|                                                                        | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
| [mm]                                                                   |        |          |          | [mm]     | [mm]              | [mm]       |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                    |                   |                   |                   |
| μ = 0.11 ± 0.2                                                         |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                    |                   |                   |                   |

| TESNENIE - Grooved Gasket KEMPCHEN B25A,B27A,B29A<br>m = 3 qt = 69*MPa |        |          |          |          |                   |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY |                   |                   |                   |
|------------------------------------------------------------------------|--------|----------|----------|----------|-------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|
| DN                                                                     | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka            | Skrutka           | Skrutka           | Skrutka           |
| [mm]                                                                   | PN250  | Skrutiek | Skrutiek | Skrutiek | GROOVED id        | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub>  | V <sub>bolt</sub> | V <sub>bolt</sub> | V <sub>bolt</sub> |
|                                                                        |        |          |          |          |                   |            |                                     |                                    | Uťahovací Moment                      | [Nm]                   | Využitie [%]       | Využitie [%]      | Využitie [%]      | Využitie [%]      |
| podľa EN 1514-6                                                        |        |          |          |          |                   |            |                                     |                                    |                                       |                        |                    |                   |                   |                   |
|                                                                        |        |          |          |          |                   |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | 12040.6            | 12050.6           | 15236.6           | 1.4301            |
| 10                                                                     | 125    | 4        | M16      | 100      | 22                | 36         | 17.6                                | 33.8                               | 35 ÷ 61                               |                        | 91                 | 79.2              | 54.8              | 160.7             |
| 15                                                                     | 130    | 4        | M16      | 100      | 26                | 42         | 17.8                                | 38.4                               | 48 ÷ 82                               |                        | 115.2              | 99.9              | 68                | 207.1             |
| 25                                                                     | 150    | 4        | M20      | 120      | 36                | 52         | 20.4                                | 49.3                               | 88 ÷ 152                              |                        | 99.7               | 85.9              | 57.5              | 182.6             |
| 40                                                                     | 185    | 4        | M24      | 140      | 53                | 73         | 22.1                                | 65.7                               | 204 ÷ 350                             |                        | 120.9              | 103.4             | 67.4              | 220.2             |
| 50                                                                     | 200    | 8        | M24      | 150      | 65                | 87         | 23.3                                | 72                                 | 143 ÷ 246                             |                        | 89                 | 76.4              | 50.5              | 162.7             |
| 65                                                                     | 230    | 8        | M24      | 160      | 81                | 103        | 26.3                                | 54.4                               | 196 ÷ 336                             |                        | 115.3              | 98.6              | 64.5              | 210.1             |
| 80                                                                     | 255    | 8        | M27      | 180      | 95                | 121        | 26.2                                | 69.4                               | 300 ÷ 517                             |                        | 114.5              | 98.6              | 63.7              | 210.1             |
| 100                                                                    | 300    | 8        | M30      | 200      | 118               | 146        | 28.5                                | 69                                 | 481 ÷ 827                             | 721 ÷ 1240             | 126.3              | 108.4             | 70.6              | 235.5             |
| 125                                                                    | 340    | 12       | M30      | 220      | 142               | 178        | 27.4                                | 78                                 | 480 ÷ 826                             | 720 ÷ 1238             | 126.4              | 108.4             | 70.7              | 235.6             |
| 150                                                                    | 390    | 12       | M33      | 240      | 170               | 212        | 27.8                                | 80.6                               | 735 ÷ 1270                            | 1103 ÷ 1904            | 136.2              | 116.4             | 75.7              | 257.3             |
| 200                                                                    | 485    | 12       | M39      | 280      | 220               | 280        | 26.3                                | 102.7                              | 1530 ÷ 2646                           | 2295 ÷ 3970            | 160.6              | 136.4             | 87.2              | 315.1             |
| 250                                                                    | 585    | 16       | M45      | 325      | 270               | 340        | 27                                  | 93.7                               | 1938 ÷ 3356                           | 2907 ÷ 5034            | 129.8              |                   | 70.2              | 256.7             |
| 300                                                                    | 690    | 16       | M48      |          | 320               | 400        |                                     |                                    |                                       |                        |                    |                   |                   |                   |

Obr. / Fig.28 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu PN250

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment<br>μ = 0.11 ÷ 0.2    | [Nm]<br>μ = 0.11 ÷ 0.2 | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 50       | 20                     | 30         | 1.9                                 | 26.9                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 55       | 25                     | 35         | 2                                   | 22.9                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 60       | 32                     | 42         | 2.3                                 | 18.5                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 60       | 40                     | 56         | 2                                   | 28                                 | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 65       | 45                     | 61         | 2.2                                 | 26.9                               | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 75       | 60                     | 80         | 2.2                                 | 36.1                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 80       | 70                     | 90         | 2.4                                 | 28                                 | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 62                                |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 85       | 85                     | 105        | 2.7                                 | 26.3                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 73.6                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 85       | 110                    | 130        | 3.2                                 | 31.4                               | 25 ÷ 42                               |                        | 13                                | 12.5                              | 46.5                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 90       | 135                    | 155        | 3.7                                 | 33.4                               | 35 ÷ 60                               |                        | 10.5                              | 10.1                              | 37.7                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 95       | 160                    | 180        | 4.2                                 | 32.7                               | 44 ÷ 75                               |                        | 13                                | 12.5                              | 46.5                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 100      | 210                    | 230        | 5.2                                 | 35.5                               | 70 ÷ 119                              |                        | 20.8                              | 19.9                              | 74.3                              |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120      | 265                    | 285        | 6.3                                 | 40.1                               | 81 ÷ 138                              |                        | 15.1                              | 14.5                              | 53.9                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120      | 315                    | 335        | 7.3                                 | 41.9                               | 110 ÷ 189                             |                        | 20.6                              | 19.8                              | 73.7                              |
| 14"                                                                  | 533.4  | 12       | 1"       | 130      | 350                    | 370        | 8                                   | 43.9                               | 152 ÷ 260                             |                        | 19.1                              | 18.3                              | 68                                |
| 16"                                                                  | 596.9  | 16       | 1"       | 140      | 400                    | 425        | 7.4                                 | 48                                 | 151 ÷ 259                             |                        | 18.9                              | 18.2                              | 67.7                              |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150      | 450                    | 480        | 7                                   | 66.9                               | 217 ÷ 371                             |                        | 19.3                              | 18.5                              | 68.8                              |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160      | 500                    | 535        | 6.7                                 | 54.8                               | 216 ÷ 370                             |                        | 19.2                              | 18.4                              | 68.6                              |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 170      | 600                    | 640        | 7                                   | 65.7                               | 337 ÷ 580                             | 505 ÷ 870              | 21.4                              | 20.5                              | 76.5                              |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 170      | 650                    | 685        | 8.4                                 | 72.9                               | 318 ÷ 547                             | 476 ÷ 820              | 20.2                              | 19.4                              | 72.2                              |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 170      | 700                    | 745        | 7.2                                 | 81.9                               | 325 ÷ 560                             | 488 ÷ 840              | 20.7                              | 19.8                              | 73.9                              |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 170      | 750                    | 790        | 7.6                                 | 91.9                               | 369 ÷ 635                             | 553 ÷ 953              | 23.5                              | 22.5                              | 83.8                              |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment<br>μ = 0.11 ÷ 0.2    | [Nm]<br>μ = 0.11 ÷ 0.2 | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 50       | 20                     | 30         | 2.1                                 | 11.6                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 55       | 25                     | 35         | 2.3                                 | 28.1                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 60       | 32                     | 42         | 2.6                                 | 25.8                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 60       | 40                     | 56         | 2.3                                 | 39.2                               | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 65       | 45                     | 61         | 2.4                                 | 36                                 | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 75       | 60                     | 80         | 2.5                                 | 16.2                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 80       | 70                     | 90         | 2.7                                 | 36.3                               | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 62                                |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 85       | 85                     | 105        | 3.1                                 | 35.8                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 73.6                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 85       | 110                    | 130        | 3.6                                 | 46.6                               | 25 ÷ 42                               |                        | 13                                | 12.5                              | 46.5                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 90       | 135                    | 155        | 4.2                                 | 57.8                               | 37 ÷ 63                               |                        | 11                                | 10.2                              | 40.8                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 95       | 160                    | 180        | 4.7                                 | 57.4                               | 49 ÷ 83                               |                        | 14.6                              | 13.5                              | 53.8                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 100      | 210                    | 230        | 5.8                                 | 53.7                               | 78 ÷ 133                              |                        | 23.2                              | 21.6                              | 85.3                              |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120      | 265                    | 285        | 7                                   | 73.3                               | 90 ÷ 155                              |                        | 16.9                              | 15.7                              | 61.6                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120      | 315                    | 335        | 8.1                                 | 87                                 | 123 ÷ 211                             |                        | 23.1                              | 21.4                              | 83.9                              |
| 14"                                                                  | 533.4  | 12       | 1"       | 130      | 350                    | 370        | 8.9                                 | 85.4                               | 169 ÷ 291                             |                        | 21.3                              | 19.7                              | 77.3                              |
| 16"                                                                  | 596.9  | 16       | 1"       | 140      | 400                    | 425        | 8.2                                 | 53.6                               | 168 ÷ 289                             |                        | 21.2                              | 19.6                              | 77                                |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150      | 450                    | 480        | 7.8                                 | 74.8                               | 242 ÷ 415                             |                        | 21.5                              | 20                                | 78.4                              |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160      | 500                    | 535        | 7.5                                 | 61.2                               | 241 ÷ 413                             |                        | 21.5                              | 19.9                              | 78.2                              |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 170      | 600                    | 640        | 7.8                                 | 73.4                               | 376 ÷ 648                             | 564 ÷ 972              | 23.9                              | 22.2                              | 87.1                              |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 170      | 650                    | 685        | 9.4                                 | 57.5                               | 355 ÷ 611                             | 532 ÷ 917              | 22.6                              | 20.9                              | 81.9                              |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 170      | 700                    | 745        | 8                                   | 66                                 | 363 ÷ 626                             | 545 ÷ 938              | 23.1                              | 21.4                              | 84.1                              |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 170      | 750                    | 790        | 8.5                                 | 102.7                              | 412 ÷ 710                             | 618 ÷ 1065             | 26.2                              | 24.3                              | 93.6                              |

Obr. / Fig.29 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 150#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            | Uťahovací Moment                    |                                    | μ = 0.11 ÷ 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 50       | 20                     | 30         | 2.1                                 | 26.9                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 55       | 25                     | 35         | 2.3                                 | 22.9                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 60       | 32                     | 42         | 2.7                                 | 18.5                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 60       | 40                     | 56         | 2.3                                 | 28                                 | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 65       | 45                     | 61         | 2.5                                 | 26.9                               | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 75       | 60                     | 80         | 2.6                                 | 36.1                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 80       | 70                     | 90         | 2.8                                 | 28                                 | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 62                                |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 85       | 85                     | 105        | 3.1                                 | 26.3                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 73.6                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 85       | 110                    | 130        | 3.7                                 | 31.4                               | 25 ÷ 42                               |                        | 13                                | 12.5                              | 53.6                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 90       | 135                    | 155        | 4.3                                 | 35.5                               | 38 ÷ 64                               |                        | 11.2                              | 10.7                              | 49.8                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 95       | 160                    | 180        | 4.8                                 | 37.4                               | 50 ÷ 85                               |                        | 14.9                              | 14.3                              | 65.7                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 100      | 210                    | 230        | 5.9                                 | 40.5                               | 80 ÷ 136                              |                        | 23.8                              | 22.8                              | 104.1                             |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120      | 265                    | 285        | 7.2                                 | 45.8                               | 92 ÷ 158                              |                        | 17.3                              | 16.5                              | 75.2                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120      | 315                    | 335        | 8.3                                 | 47.9                               | 126 ÷ 216                             |                        | 23.6                              | 22.6                              | 102.4                             |
| 14"                                                                  | 533.4  | 12       | 1"       | 130      | 350                    | 370        | 9.1                                 | 50.1                               | 173 ÷ 297                             |                        | 21.8                              | 20.9                              | 94.3                              |
| 16"                                                                  | 596.9  | 16       | 1"       | 140      | 400                    | 425        | 8.4                                 | 54.8                               | 172 ÷ 295                             |                        | 21.6                              | 20.8                              | 93.9                              |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150      | 450                    | 480        | 8                                   | 76.5                               | 247 ÷ 424                             |                        | 22                                | 21.1                              | 95.7                              |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160      | 500                    | 535        | 7.6                                 | 62.6                               | 247 ÷ 423                             |                        | 21.9                              | 21                                | 95.5                              |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 170      | 600                    | 640        | 8                                   | 75                                 | 385 ÷ 662                             | 577 ÷ 994              | 24.5                              | 23.5                              | 106.4                             |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 170      | 650                    | 685        | 9.6                                 | 83.3                               | 363 ÷ 625                             | 544 ÷ 937              | 23.1                              | 22.1                              | 99.9                              |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 170      | 700                    | 745        | 8.2                                 | 93.6                               | 371 ÷ 640                             | 557 ÷ 960              | 23.6                              | 22.7                              | 102.7                             |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 170      | 750                    | 790        | 8.7                                 | 105                                | 421 ÷ 726                             | 632 ÷ 1088             | 26.8                              | 25.7                              | 116.3                             |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            | Uťahovací Moment                    |                                    | μ = 0.11 ÷ 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 50       | 20                     | 30         | 2.4                                 | 31.6                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 55       | 25                     | 35         | 2.7                                 | 22.9                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 60       | 32                     | 42         | 3                                   | 18.5                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 60       | 40                     | 56         | 2.7                                 | 28                                 | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 65       | 45                     | 61         | 2.8                                 | 26.9                               | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 75       | 60                     | 80         | 2.9                                 | 36.1                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 80       | 70                     | 90         | 3.2                                 | 28                                 | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 63.5                              |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 85       | 85                     | 105        | 3.6                                 | 26.3                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 83.9                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 85       | 110                    | 130        | 4.2                                 | 33.3                               | 26 ÷ 45                               |                        | 13.8                              | 13.2                              | 61.9                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 90       | 135                    | 155        | 4.9                                 | 40.7                               | 43 ÷ 74                               |                        | 12.9                              | 12.3                              | 57.4                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 95       | 160                    | 180        | 5.5                                 | 42.9                               | 57 ÷ 98                               |                        | 17.1                              | 16.4                              | 75.9                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 100      | 210                    | 230        | 6.8                                 | 46.5                               | 91 ÷ 156                              |                        | 27.2                              | 26.1                              | 120.2                             |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120      | 265                    | 285        | 8.2                                 | 52.5                               | 106 ÷ 181                             |                        | 19.8                              | 19                                | 86.8                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120      | 315                    | 335        | 9.5                                 | 54.9                               | 144 ÷ 248                             |                        | 27                                | 25.9                              | 118.2                             |
| 14"                                                                  | 533.4  | 12       | 1"       | 130      | 350                    | 370        | 10.4                                | 57.5                               | 199 ÷ 341                             |                        | 25                                | 23.9                              | 108.9                             |
| 16"                                                                  | 596.9  | 16       | 1"       | 140      | 400                    | 425        | 9.6                                 | 62.9                               | 198 ÷ 339                             |                        | 24.8                              | 23.8                              | 108.5                             |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150      | 450                    | 480        | 9.1                                 | 87.7                               | 284 ÷ 486                             |                        | 25.2                              | 24.2                              | 110.5                             |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160      | 500                    | 535        | 8.8                                 | 71.8                               | 283 ÷ 485                             |                        | 25.2                              | 24.1                              | 110.2                             |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 170      | 600                    | 640        | 9.1                                 | 86                                 | 441 ÷ 760                             | 661 ÷ 1139             | 28.1                              | 26.9                              | 122.8                             |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 170      | 650                    | 685        | 11                                  | 95.5                               | 416 ÷ 717                             | 624 ÷ 1075             | 26.5                              | 25.4                              | 115.4                             |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 170      | 700                    | 745        | 9.4                                 | 107.3                              | 426 ÷ 734                             | 639 ÷ 1100             | 27.1                              | 26                                | 118.5                             |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 170      | 750                    | 790        | 10                                  | 120.5                              | 483 ÷ 832                             | 725 ÷ 1248             | 30.7                              | 29.5                              | 134.2                             |

Obr. / Fig.30 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 150#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 60       | 20                     | 30         | 1.9                                 | 26.9                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 60       | 25                     | 35         | 2                                   | 22.9                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 70       | 32                     | 42         | 2.3                                 | 18.5                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 70       | 40                     | 56         | 2                                   | 28                                 | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 70       | 45                     | 61         | 2.2                                 | 26.9                               | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 80       | 60                     | 80         | 2.2                                 | 36.1                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 90       | 70                     | 90         | 2.4                                 | 28                                 | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 62                                |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 90       | 85                     | 105        | 2.7                                 | 26.3                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 73.6                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 90       | 110                    | 130        | 3.2                                 | 31.4                               | 25 ÷ 42                               |                        | 13                                | 12.5                              | 46.5                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 100      | 135                    | 155        | 3.7                                 | 33.4                               | 35 ÷ 60                               |                        | 10.5                              | 10.1                              | 37.7                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 100      | 160                    | 180        | 4.2                                 | 32.7                               | 44 ÷ 75                               |                        | 13                                | 12.5                              | 46.5                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 120      | 210                    | 230        | 5.2                                 | 35.5                               | 70 ÷ 119                              |                        | 20.8                              | 19.9                              | 74.3                              |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120      | 265                    | 285        | 6.3                                 | 40.1                               | 81 ÷ 138                              |                        | 15.1                              | 14.5                              | 53.9                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120      | 315                    | 335        | 7.3                                 | 41.9                               | 110 ÷ 189                             |                        | 20.6                              | 19.8                              | 73.7                              |
| 14"                                                                  | 533.4  | 12       | 1"       | 140      | 350                    | 370        | 8                                   | 43.9                               | 152 ÷ 260                             |                        | 19.1                              | 18.3                              | 68                                |
| 16"                                                                  | 596.9  | 16       | 1"       | 140      | 400                    | 425        | 7.4                                 | 48                                 | 151 ÷ 259                             |                        | 18.9                              | 18.2                              | 67.7                              |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150      | 450                    | 480        | 7                                   | 66.9                               | 217 ÷ 371                             |                        | 19.3                              | 18.5                              | 68.8                              |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160      | 500                    | 535        | 6.7                                 | 54.8                               | 216 ÷ 370                             |                        | 19.2                              | 18.4                              | 68.6                              |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 180      | 600                    | 640        | 7                                   | 65.7                               | 337 ÷ 580                             | 505 ÷ 870              | 21.4                              | 20.5                              | 76.5                              |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 200      | 650                    | 685        | 8.4                                 | 72.9                               | 318 ÷ 547                             | 476 ÷ 820              | 20.2                              | 19.4                              | 72.2                              |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 200      | 700                    | 745        | 7.2                                 | 81.9                               | 325 ÷ 560                             | 488 ÷ 840              | 20.7                              | 19.8                              | 73.9                              |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 200      | 750                    | 790        | 7.6                                 | 91.9                               | 369 ÷ 635                             | 553 ÷ 953              | 23.5                              | 22.5                              | 83.8                              |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 60       | 20                     | 30         | 2.1                                 | 11.6                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 60       | 25                     | 35         | 2.3                                 | 28.1                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 70       | 32                     | 42         | 2.6                                 | 25.8                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 70       | 40                     | 56         | 2.3                                 | 39.2                               | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 70       | 45                     | 61         | 2.4                                 | 36                                 | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 80       | 60                     | 80         | 2.5                                 | 16.2                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 90       | 70                     | 90         | 2.7                                 | 36.3                               | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 62                                |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 90       | 85                     | 105        | 3.1                                 | 35.8                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 73.6                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 90       | 110                    | 130        | 3.6                                 | 46.6                               | 25 ÷ 42                               |                        | 13                                | 12.5                              | 46.5                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 100      | 135                    | 155        | 4.2                                 | 57.8                               | 37 ÷ 63                               |                        | 10.6                              | 10.2                              | 40.8                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 100      | 160                    | 180        | 4.7                                 | 57.4                               | 49 ÷ 83                               |                        | 14.1                              | 13.5                              | 53.8                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 120      | 210                    | 230        | 5.8                                 | 53.7                               | 78 ÷ 133                              |                        | 22.5                              | 21.6                              | 85.3                              |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120      | 265                    | 285        | 7                                   | 73.3                               | 90 ÷ 155                              |                        | 16.3                              | 15.7                              | 61.6                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120      | 315                    | 335        | 8.1                                 | 87                                 | 123 ÷ 211                             |                        | 22.3                              | 21.4                              | 83.9                              |
| 14"                                                                  | 533.4  | 12       | 1"       | 140      | 350                    | 370        | 8.9                                 | 85.4                               | 169 ÷ 291                             |                        | 20.6                              | 19.7                              | 77.3                              |
| 16"                                                                  | 596.9  | 16       | 1"       | 140      | 400                    | 425        | 8.2                                 | 53.6                               | 168 ÷ 289                             |                        | 20.5                              | 19.6                              | 77                                |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150      | 450                    | 480        | 7.8                                 | 74.8                               | 242 ÷ 415                             |                        | 20.8                              | 20                                | 78.4                              |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160      | 500                    | 535        | 7.5                                 | 61.2                               | 241 ÷ 413                             |                        | 20.8                              | 19.9                              | 78.2                              |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 180      | 600                    | 640        | 7.8                                 | 73.4                               | 376 ÷ 648                             | 564 ÷ 972              | 23.2                              | 22.2                              | 87.1                              |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 200      | 650                    | 685        | 9.4                                 | 57.5                               | 355 ÷ 611                             | 532 ÷ 917              | 21.8                              | 20.9                              | 81.9                              |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 200      | 700                    | 745        | 8                                   | 66                                 | 363 ÷ 626                             | 545 ÷ 938              | 22.4                              | 21.4                              | 84.1                              |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 200      | 750                    | 790        | 8.5                                 | 102.7                              | 412 ÷ 710                             | 618 ÷ 1065             | 25.4                              | 24.3                              | 93.6                              |

Obr. / Fig.31 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 150#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |       |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |       |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 60    | 20                     | 30         | 2.1                                 | 26.9                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 60    | 25                     | 35         | 2.3                                 | 22.9                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 70    | 32                     | 42         | 2.7                                 | 18.5                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 70    | 40                     | 56         | 2.3                                 | 28                                 | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 70    | 45                     | 61         | 2.5                                 | 26.9                               | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 80    | 60                     | 80         | 2.6                                 | 36.1                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 90    | 70                     | 90         | 2.8                                 | 28                                 | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 62                                |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 90    | 85                     | 105        | 3.1                                 | 26.3                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 73.6                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 90    | 110                    | 130        | 3.7                                 | 31.4                               | 25 ÷ 42                               |                        | 13                                | 12.5                              | 53.6                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 100   | 135                    | 155        | 4.3                                 | 35.5                               | 38 ÷ 64                               |                        | 11.2                              | 10.7                              | 49.8                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 100   | 160                    | 180        | 4.8                                 | 37.4                               | 50 ÷ 85                               |                        | 14.9                              | 14.3                              | 65.7                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 120   | 210                    | 230        | 5.9                                 | 40.5                               | 80 ÷ 136                              |                        | 23.8                              | 22.8                              | 104.1                             |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120   | 265                    | 285        | 7.2                                 | 45.8                               | 92 ÷ 158                              |                        | 17.3                              | 16.5                              | 75.2                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120   | 315                    | 335        | 8.3                                 | 47.9                               | 126 ÷ 216                             |                        | 23.6                              | 22.6                              | 102.4                             |
| 14"                                                                  | 533.4  | 12       | 1"       | 140   | 350                    | 370        | 9.1                                 | 50.1                               | 173 ÷ 297                             |                        | 21.8                              | 20.9                              | 94.3                              |
| 16"                                                                  | 596.9  | 16       | 1"       | 140   | 400                    | 425        | 8.4                                 | 54.8                               | 172 ÷ 295                             |                        | 21.6                              | 20.8                              | 93.9                              |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150   | 450                    | 480        | 8                                   | 76.5                               | 247 ÷ 424                             |                        | 22                                | 21.1                              | 95.7                              |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160   | 500                    | 535        | 7.6                                 | 62.6                               | 247 ÷ 423                             |                        | 21.9                              | 21                                | 95.5                              |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 180   | 600                    | 640        | 8                                   | 75                                 | 385 ÷ 662                             | 577 ÷ 994              | 24.5                              | 23.5                              | 106.4                             |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 200   | 650                    | 685        | 9.6                                 | 83.3                               | 363 ÷ 625                             | 544 ÷ 937              | 23.1                              | 22.1                              | 99.9                              |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 200   | 700                    | 745        | 8.2                                 | 93.6                               | 371 ÷ 640                             | 557 ÷ 960              | 23.6                              | 22.7                              | 102.7                             |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 200   | 750                    | 790        | 8.7                                 | 105                                | 421 ÷ 726                             | 632 ÷ 1088             | 26.8                              | 25.7                              | 116.3                             |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |       |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 150#   | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |       |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 88.9   | 4        | 1/2"     | 60    | 20                     | 30         | 2.4                                 | 31.6                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 98.42  | 4        | 1/2"     | 60    | 25                     | 35         | 2.7                                 | 22.9                               | 5 ÷ 9                                 |                        | 5.1                               | 4.9                               | 18.3                              |
| 1"                                                                   | 107.95 | 4        | 1/2"     | 70    | 32                     | 42         | 3                                   | 18.5                               | 6 ÷ 11                                |                        | 6.3                               | 6.1                               | 22.6                              |
| 1 1/4"                                                               | 117.47 | 4        | 1/2"     | 70    | 40                     | 56         | 2.7                                 | 28                                 | 13 ÷ 22                               |                        | 13.1                              | 12.6                              | 46.8                              |
| 1 1/2"                                                               | 127    | 4        | 1/2"     | 70    | 45                     | 61         | 2.8                                 | 26.9                               | 14 ÷ 25                               |                        | 14.5                              | 13.9                              | 51.7                              |
| 2"                                                                   | 152.4  | 4        | 5/8"     | 80    | 60                     | 80         | 2.9                                 | 36.1                               | 29 ÷ 50                               |                        | 15.2                              | 14.6                              | 54.2                              |
| 2 1/2"                                                               | 177.8  | 4        | 5/8"     | 90    | 70                     | 90         | 3.2                                 | 28                                 | 33 ÷ 57                               |                        | 17.4                              | 16.6                              | 63.5                              |
| 3"                                                                   | 190.5  | 4        | 5/8"     | 90    | 85                     | 105        | 3.6                                 | 26.3                               | 39 ÷ 67                               |                        | 20.6                              | 19.8                              | 83.9                              |
| 4"                                                                   | 228.6  | 8        | 5/8"     | 90    | 110                    | 130        | 4.2                                 | 33.3                               | 26 ÷ 45                               |                        | 13.8                              | 13.2                              | 61.9                              |
| 5"                                                                   | 254    | 8        | 3/4"     | 100   | 135                    | 155        | 4.9                                 | 40.7                               | 43 ÷ 74                               |                        | 12.9                              | 12.3                              | 57.4                              |
| 6"                                                                   | 279.4  | 8        | 3/4"     | 100   | 160                    | 180        | 5.5                                 | 42.9                               | 57 ÷ 98                               |                        | 17.1                              | 16.4                              | 75.9                              |
| 8"                                                                   | 342.9  | 8        | 3/4"     | 120   | 210                    | 230        | 6.8                                 | 46.5                               | 91 ÷ 156                              |                        | 27.2                              | 26.1                              | 120.2                             |
| 10"                                                                  | 406.4  | 12       | 7/8"     | 120   | 265                    | 285        | 8.2                                 | 52.5                               | 106 ÷ 181                             |                        | 19.8                              | 19                                | 86.8                              |
| 12"                                                                  | 482.6  | 12       | 7/8"     | 120   | 315                    | 335        | 9.5                                 | 54.9                               | 144 ÷ 248                             |                        | 27                                | 25.9                              | 118.2                             |
| 14"                                                                  | 533.4  | 12       | 1"       | 140   | 350                    | 370        | 10.4                                | 57.5                               | 199 ÷ 341                             |                        | 25                                | 23.9                              | 108.9                             |
| 16"                                                                  | 596.9  | 16       | 1"       | 140   | 400                    | 425        | 9.6                                 | 62.9                               | 198 ÷ 339                             |                        | 24.8                              | 23.8                              | 108.5                             |
| 18"                                                                  | 635    | 16       | 1 1/8"   | 150   | 450                    | 480        | 9.1                                 | 87.7                               | 284 ÷ 486                             |                        | 25.2                              | 24.2                              | 110.5                             |
| 20"                                                                  | 698.5  | 20       | 1 1/8"   | 160   | 500                    | 535        | 8.8                                 | 71.8                               | 283 ÷ 485                             |                        | 25.2                              | 24.1                              | 110.2                             |
| 24"                                                                  | 812.8  | 20       | 1 1/4"   | 180   | 600                    | 640        | 9.1                                 | 86                                 | 441 ÷ 760                             | 661 ÷ 1139             | 28.1                              | 26.9                              | 122.8                             |
| 26"                                                                  | 869.95 | 24       | 1 1/4"   | 200   | 650                    | 685        | 11                                  | 95.5                               | 416 ÷ 717                             | 624 ÷ 1075             | 26.5                              | 25.4                              | 115.4                             |
| 28"                                                                  | 927.1  | 28       | 1 1/4"   | 200   | 700                    | 745        | 9.4                                 | 107.3                              | 426 ÷ 734                             | 639 ÷ 1100             | 27.1                              | 26                                | 118.5                             |
| 30"                                                                  | 948.25 | 28       | 1 1/4"   | 200   | 750                    | 790        | 10                                  | 120.5                              | 483 ÷ 832                             | 725 ÷ 1248             | 30.7                              | 29.5                              | 134.2                             |

Obr. / Fig.32 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 150#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | Uťahovací Moment                    |                                    | [Nm]                                  |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
|                                                                      |         |          |          |          |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 50       | 20                     | 30         | 3                                   | 14.1                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 55       | 25                     | 35         | 3.3                                 | 13                                 | 6 ÷ 11                                |                        | 3.3                               | 3.1                               | 11.6                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 60       | 32                     | 42         | 3.7                                 | 6                                  | 8 ÷ 13                                |                        | 4                                 | 3.8                               | 14.3                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 60       | 40                     | 56         | 3.3                                 | 20.3                               | 16 ÷ 27                               |                        | 8.3                               | 8                                 | 29.7                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 65       | 45                     | 61         | 3.5                                 | 21                                 | 21 ÷ 35                               |                        | 6.2                               | 5.9                               | 22                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 75       | 60                     | 80         | 3.6                                 | 22.9                               | 15 ÷ 25                               |                        | 7.6                               | 7.3                               | 27.1                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 80       | 70                     | 90         | 3.9                                 | 20.5                               | 19 ÷ 33                               |                        | 5.8                               | 5.6                               | 20.8                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 85       | 85                     | 105        | 4.4                                 | 20.9                               | 25 ÷ 43                               |                        | 7.6                               | 7.2                               | 27                                |
| 4"                                                                   | 254     | 8        | 3/4"     | 85       | 110                    | 130        | 5.2                                 | 22                                 | 38 ÷ 65                               |                        | 11.3                              | 10.8                              | 40.2                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 90       | 135                    | 155        | 5.9                                 | 25.4                               | 53 ÷ 90                               |                        | 15.7                              | 15                                | 56                                |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 95       | 160                    | 180        | 6.7                                 | 29.7                               | 46 ÷ 79                               |                        | 13.9                              | 13.3                              | 49.5                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 100      | 210                    | 230        | 8.3                                 | 35.4                               | 85 ÷ 146                              |                        | 16                                | 15.3                              | 57                                |
| 10"                                                                  | 444.5   | 16       | 1"       | 120      | 265                    | 285        | 10                                  | 35.6                               | 110 ÷ 188                             |                        | 13.8                              | 13.2                              | 49.2                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120      | 315                    | 335        | 11.6                                | 41.4                               | 252 ÷ 432                             |                        | 15                                | 14.3                              | 53.4                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 130      | 350                    | 370        | 12.7                                | 38.8                               | 163 ÷ 279                             |                        | 14.5                              | 13.9                              | 51.8                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140      | 400                    | 425        | 11.8                                | 42.1                               | 236 ÷ 407                             |                        | 15                                | 14.4                              | 53.7                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150      | 450                    | 480        | 11.1                                | 48.3                               | 252 ÷ 434                             |                        | 16                                | 15.4                              | 57.3                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160      | 500                    | 535        | 10.7                                | 52.2                               | 314 ÷ 541                             |                        | 20                                | 19.2                              | 71.4                              |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 170      | 600                    | 640        | 11.1                                | 58.2                               | 533 ÷ 919                             | 800 ÷ 1379             | 19.6                              | 18.8                              | 70.1                              |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 170      | 650                    | 685        | 13.4                                | 90.9                               | 532 ÷ 930                             | 797 ÷ 1395             | 14.7                              | 14.1                              | 52.5                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 170      | 700                    | 745        | 11.5                                | 93.7                               | 635 ÷ 1111                            | 952 ÷ 1666             | 17.6                              | 16.8                              | 62.7                              |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 170      | 750                    | 795        | 12.2                                | 95.4                               | 817 ÷ 1406                            | 1225 ÷ 2109            | 19.1                              | 18.3                              | 68.3                              |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | Uťahovací Moment                    |                                    | [Nm]                                  |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
|                                                                      |         |          |          |          |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 50       | 20                     | 30         | 3.2                                 | 18.3                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 55       | 25                     | 35         | 3.5                                 | 17.8                               | 6 ÷ 11                                |                        | 3.3                               | 3.1                               | 11.6                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 60       | 32                     | 42         | 4                                   | 6.5                                | 8 ÷ 13                                |                        | 4                                 | 3.9                               | 15.9                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 60       | 40                     | 56         | 3.5                                 | 27.6                               | 16 ÷ 27                               |                        | 8.3                               | 8                                 | 29.7                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 65       | 45                     | 61         | 3.8                                 | 27.1                               | 21 ÷ 35                               |                        | 6.2                               | 5.9                               | 23                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 75       | 60                     | 80         | 3.9                                 | 31.8                               | 15 ÷ 25                               |                        | 7.6                               | 7.3                               | 29.1                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 80       | 70                     | 90         | 4.2                                 | 29.4                               | 21 ÷ 35                               |                        | 6.1                               | 5.9                               | 24.2                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 85       | 85                     | 105        | 4.7                                 | 27                                 | 27 ÷ 47                               |                        | 8.2                               | 7.8                               | 31.9                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 85       | 110                    | 130        | 5.6                                 | 24.2                               | 41 ÷ 70                               |                        | 12.2                              | 11.7                              | 47.2                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 90       | 135                    | 155        | 6.4                                 | 28.4                               | 57 ÷ 97                               |                        | 17                                | 16.3                              | 65.2                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 95       | 160                    | 180        | 7.3                                 | 33.2                               | 50 ÷ 86                               |                        | 15                                | 14.4                              | 57.4                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 100      | 210                    | 230        | 9                                   | 40.3                               | 92 ÷ 158                              |                        | 17.3                              | 16.6                              | 65.6                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 120      | 265                    | 285        | 10.9                                | 42.5                               | 119 ÷ 203                             |                        | 14.9                              | 14.3                              | 56.2                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120      | 315                    | 335        | 12.6                                | 48.4                               | 182 ÷ 312                             |                        | 16.2                              | 15.5                              | 60.9                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 130      | 350                    | 370        | 13.8                                | 54.2                               | 176 ÷ 302                             |                        | 15.7                              | 15.1                              | 58.9                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140      | 400                    | 425        | 12.7                                | 45.6                               | 256 ÷ 440                             |                        | 16.3                              | 15.6                              | 61.2                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150      | 450                    | 480        | 12.1                                | 52.2                               | 273 ÷ 470                             |                        | 17.4                              | 16.6                              | 65.4                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160      | 500                    | 535        | 11.6                                | 56.5                               | 340 ÷ 586                             |                        | 21.6                              | 20.7                              | 81.5                              |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 170      | 600                    | 640        | 12.1                                | 70.9                               | 577 ÷ 995                             | 865 ÷ 1492             | 21.2                              | 20.4                              | 80                                |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 170      | 650                    | 685        | 15.9                                | 98.3                               | 575 ÷ 1007                            | 863 ÷ 1510             | 15.9                              | 15.3                              | 59.7                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 170      | 700                    | 745        | 12.4                                | 101.4                              | 687 ÷ 1202                            | 1031 ÷ 1803            | 19                                | 18.2                              | 71.5                              |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 170      | 750                    | 795        | 13.2                                | 103.2                              | 884 ÷ 1522                            | 1326 ÷ 2282            | 20.7                              | 19.8                              | 77.7                              |

Obr. / Fig.33 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 300#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 50    | 20                     | 30         | 3.4                                 | 14.1                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 16.7                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 55    | 25                     | 35         | 3.7                                 | 13                                 | 6 ÷ 11                                |                        | 3.3                               | 3.1                               | 14                                |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 60    | 32                     | 42         | 4.2                                 | 6.3                                | 8 ÷ 14                                |                        | 4.3                               | 4.1                               | 19.4                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 60    | 40                     | 56         | 3.7                                 | 20.3                               | 16 ÷ 27                               |                        | 8.3                               | 8                                 | 35.9                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 65    | 45                     | 61         | 4                                   | 21                                 | 21 ÷ 35                               |                        | 6.2                               | 5.9                               | 28                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 75    | 60                     | 80         | 4.1                                 | 23.5                               | 15 ÷ 25                               |                        | 7.8                               | 7.5                               | 35.6                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 80    | 70                     | 90         | 4.5                                 | 22.8                               | 22 ÷ 37                               |                        | 6.5                               | 6.2                               | 29.5                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 85    | 85                     | 105        | 5                                   | 23.9                               | 29 ÷ 49                               |                        | 8.6                               | 8.3                               | 39                                |
| 4"                                                                   | 254     | 8        | 3/4"     | 85    | 110                    | 130        | 5.9                                 | 25.2                               | 43 ÷ 74                               |                        | 12.9                              | 12.3                              | 57.6                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 90    | 135                    | 155        | 6.8                                 | 29.1                               | 60 ÷ 103                              |                        | 17.9                              | 17.2                              | 79.6                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 95    | 160                    | 180        | 7.7                                 | 34                                 | 53 ÷ 91                               |                        | 15.9                              | 15.2                              | 70.1                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 100   | 210                    | 230        | 9.5                                 | 40.5                               | 98 ÷ 167                              |                        | 18.3                              | 17.5                              | 80.1                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 120   | 265                    | 285        | 11.5                                | 40.7                               | 125 ÷ 215                             |                        | 15.7                              | 15.1                              | 68.7                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120   | 315                    | 335        | 13.3                                | 47.3                               | 192 ÷ 329                             |                        | 17.1                              | 16.4                              | 74.3                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 130   | 350                    | 370        | 14.5                                | 44.4                               | 186 ÷ 319                             |                        | 16.6                              | 15.9                              | 71.9                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140   | 400                    | 425        | 13.5                                | 48.2                               | 270 ÷ 465                             |                        | 17.2                              | 16.5                              | 74.7                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150   | 450                    | 480        | 12.7                                | 55.2                               | 288 ÷ 496                             |                        | 18.3                              | 17.6                              | 79.8                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160   | 500                    | 535        | 12.2                                | 59.7                               | 359 ÷ 619                             |                        | 22.9                              | 21.9                              | 99.5                              |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 170   | 600                    | 640        | 12.7                                | 74.9                               | 609 ÷ 1051                            | 914 ÷ 1576             | 22.4                              | 21.5                              | 97.6                              |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 170   | 650                    | 685        | 15.3                                | 103.9                              | 608 ÷ 1064                            | 912 ÷ 1595             | 16.8                              | 16.1                              | 72.8                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 170   | 700                    | 745        | 13.1                                | 107.1                              | 726 ÷ 1270                            | 1089 ÷ 1905            | 20.1                              | 19.3                              | 87.3                              |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 170   | 750                    | 795        | 13.9                                | 103.9                              | 934 ÷ 1608                            | 1401 ÷ 2412            | 21.9                              | 21                                | 94.9                              |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 50    | 20                     | 30         | 3.9                                 | 14.1                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 19.3                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 55    | 25                     | 35         | 4.3                                 | 13.9                               | 7 ÷ 11                                |                        | 3.5                               | 3.3                               | 16.2                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 60    | 32                     | 42         | 4.9                                 | 7.2                                | 9 ÷ 16                                |                        | 4.9                               | 4.7                               | 22.4                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 60    | 40                     | 56         | 4.3                                 | 13.8                               | 17 ÷ 29                               |                        | 8.9                               | 8.6                               | 41.4                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 65    | 45                     | 61         | 4.5                                 | 23.8                               | 23 ÷ 40                               |                        | 7                                 | 6.7                               | 32.4                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 75    | 60                     | 80         | 4.7                                 | 26.9                               | 17 ÷ 29                               |                        | 8.9                               | 8.6                               | 41.1                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 80    | 70                     | 90         | 5.1                                 | 26.2                               | 25 ÷ 43                               |                        | 7.4                               | 7.1                               | 34                                |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 85    | 85                     | 105        | 5.7                                 | 27.4                               | 33 ÷ 57                               |                        | 9.9                               | 9.5                               | 45                                |
| 4"                                                                   | 254     | 8        | 3/4"     | 85    | 110                    | 130        | 6.8                                 | 28.9                               | 49 ÷ 85                               |                        | 14.8                              | 14.2                              | 66.4                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 90    | 135                    | 155        | 7.8                                 | 33.3                               | 69 ÷ 118                              |                        | 20.6                              | 19.7                              | 91.9                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 95    | 160                    | 180        | 8.8                                 | 39                                 | 61 ÷ 104                              |                        | 18.2                              | 17.4                              | 80.9                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 100   | 210                    | 230        | 10.9                                | 46.4                               | 112 ÷ 192                             |                        | 20.9                              | 20.1                              | 92.5                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 120   | 265                    | 285        | 13.2                                | 46.7                               | 144 ÷ 246                             |                        | 18.1                              | 17.3                              | 79.3                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120   | 315                    | 335        | 15.2                                | 54.3                               | 220 ÷ 378                             |                        | 19.6                              | 18.8                              | 85.8                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 130   | 350                    | 370        | 16.7                                | 50.9                               | 214 ÷ 366                             |                        | 19                                | 18.2                              | 83.1                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140   | 400                    | 425        | 15.4                                | 55.2                               | 310 ÷ 534                             |                        | 19.7                              | 18.9                              | 86.2                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150   | 450                    | 480        | 14.6                                | 63.3                               | 331 ÷ 569                             |                        | 21                                | 20.2                              | 92.1                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160   | 500                    | 535        | 14                                  | 68.4                               | 412 ÷ 709                             |                        | 26.2                              | 25.1                              | 114.9                             |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 170   | 600                    | 640        | 14.6                                | 76.4                               | 699 ÷ 1205                            | 1048 ÷ 1808            | 25.7                              | 24.7                              | 112.7                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 170   | 650                    | 685        | 17.5                                | 119.1                              | 697 ÷ 1220                            | 1046 ÷ 1829            | 19.3                              | 18.5                              | 84.1                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 170   | 700                    | 745        | 15.1                                | 122.9                              | 833 ÷ 1457                            | 1249 ÷ 2185            | 23                                | 22.1                              | 100.8                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 170   | 750                    | 795        | 16                                  | 125.1                              | 1071 ÷ 1844                           | 1607 ÷ 2766            | 25.1                              | 24                                | 109.5                             |

Obr. / Fig.34 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 300#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | M <sub>u</sub><br>[Nm] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 60    | 20                     | 30         | 3                                   | 14.1                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 60    | 25                     | 35         | 3.3                                 | 13                                 | 6 ÷ 11                                |                        | 3.3                               | 3.1                               | 11.6                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 70    | 32                     | 42         | 3.7                                 | 6                                  | 8 ÷ 13                                |                        | 4                                 | 3.8                               | 14.3                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 70    | 40                     | 56         | 3.3                                 | 20.3                               | 16 ÷ 27                               |                        | 8.3                               | 8                                 | 29.7                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 70    | 45                     | 61         | 3.5                                 | 21                                 | 21 ÷ 35                               |                        | 6.2                               | 5.9                               | 22                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 80    | 60                     | 80         | 3.6                                 | 22.9                               | 15 ÷ 25                               |                        | 7.6                               | 7.3                               | 27.1                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 90    | 70                     | 90         | 3.9                                 | 20.5                               | 19 ÷ 33                               |                        | 5.8                               | 5.6                               | 20.8                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 90    | 85                     | 105        | 4.4                                 | 20.9                               | 25 ÷ 43                               |                        | 7.6                               | 7.2                               | 27                                |
| 4"                                                                   | 254     | 8        | 3/4"     | 90    | 110                    | 130        | 5.2                                 | 22                                 | 38 ÷ 65                               |                        | 11.3                              | 10.8                              | 40.2                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 100   | 135                    | 155        | 5.9                                 | 25.4                               | 53 ÷ 90                               |                        | 15.7                              | 15                                | 56                                |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 100   | 160                    | 180        | 6.7                                 | 29.7                               | 46 ÷ 79                               |                        | 13.9                              | 13.3                              | 49.5                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 120   | 210                    | 230        | 8.3                                 | 35.4                               | 85 ÷ 146                              |                        | 16                                | 15.3                              | 57                                |
| 10"                                                                  | 444.5   | 16       | 1"       | 120   | 265                    | 285        | 10                                  | 35.6                               | 110 ÷ 188                             |                        | 13.8                              | 13.2                              | 49.2                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120   | 315                    | 335        | 11.6                                | 41.4                               | 252 ÷ 432                             |                        | 15                                | 14.3                              | 53.4                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 140   | 350                    | 370        | 12.7                                | 38.8                               | 163 ÷ 279                             |                        | 14.5                              | 13.9                              | 51.8                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140   | 400                    | 425        | 11.8                                | 42.1                               | 236 ÷ 407                             |                        | 15                                | 14.4                              | 53.7                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150   | 450                    | 480        | 11.1                                | 48.3                               | 252 ÷ 434                             |                        | 16                                | 15.4                              | 57.3                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160   | 500                    | 535        | 10.7                                | 52.2                               | 314 ÷ 541                             |                        | 20                                | 19.2                              | 71.4                              |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 180   | 600                    | 640        | 11.1                                | 58.2                               | 533 ÷ 919                             | 800 ÷ 1379             | 19.6                              | 18.8                              | 70.1                              |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 200   | 650                    | 685        | 13.4                                | 90.9                               | 532 ÷ 930                             | 797 ÷ 1395             | 14.7                              | 14.1                              | 52.5                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 200   | 700                    | 745        | 11.5                                | 93.7                               | 635 ÷ 1111                            | 952 ÷ 1666             | 17.6                              | 16.8                              | 62.7                              |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 200   | 750                    | 795        | 12.2                                | 95.4                               | 817 ÷ 1406                            | 1225 ÷ 2109            | 19.1                              | 18.3                              | 68.3                              |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | M <sub>u</sub><br>[Nm] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 60    | 20                     | 30         | 3.2                                 | 18.3                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 15.2                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 60    | 25                     | 35         | 3.5                                 | 17.8                               | 6 ÷ 11                                |                        | 3.3                               | 3.1                               | 11.6                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 70    | 32                     | 42         | 4                                   | 6.5                                | 8 ÷ 13                                |                        | 4                                 | 3.9                               | 15.9                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 70    | 40                     | 56         | 3.5                                 | 27.6                               | 16 ÷ 27                               |                        | 8.3                               | 8                                 | 29.7                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 70    | 45                     | 61         | 3.8                                 | 27.1                               | 21 ÷ 35                               |                        | 6.2                               | 5.9                               | 23                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 80    | 60                     | 80         | 3.9                                 | 31.8                               | 15 ÷ 25                               |                        | 7.6                               | 7.3                               | 29.1                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 90    | 70                     | 90         | 4.2                                 | 29.4                               | 21 ÷ 35                               |                        | 6.1                               | 5.9                               | 24.2                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 90    | 85                     | 105        | 4.7                                 | 27                                 | 27 ÷ 47                               |                        | 8.2                               | 7.8                               | 31.9                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 90    | 110                    | 130        | 5.6                                 | 24.2                               | 41 ÷ 70                               |                        | 12.2                              | 11.7                              | 47.2                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 100   | 135                    | 155        | 6.4                                 | 28.4                               | 57 ÷ 97                               |                        | 17                                | 16.3                              | 65.2                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 100   | 160                    | 180        | 7.3                                 | 33.2                               | 50 ÷ 86                               |                        | 15                                | 14.4                              | 57.4                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 120   | 210                    | 230        | 9                                   | 40.3                               | 92 ÷ 158                              |                        | 17.3                              | 16.6                              | 65.6                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 120   | 265                    | 285        | 10.9                                | 42.5                               | 119 ÷ 203                             |                        | 14.9                              | 14.3                              | 56.2                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120   | 315                    | 335        | 12.6                                | 48.4                               | 182 ÷ 312                             |                        | 16.2                              | 15.5                              | 60.9                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 140   | 350                    | 370        | 13.8                                | 54.2                               | 176 ÷ 302                             |                        | 15.7                              | 15.1                              | 58.9                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140   | 400                    | 425        | 12.7                                | 45.6                               | 256 ÷ 440                             |                        | 16.3                              | 15.6                              | 61.2                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150   | 450                    | 480        | 12.1                                | 52.2                               | 273 ÷ 470                             |                        | 17.4                              | 16.6                              | 65.4                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160   | 500                    | 535        | 11.6                                | 56.5                               | 340 ÷ 586                             |                        | 21.6                              | 20.7                              | 81.5                              |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 180   | 600                    | 640        | 12.1                                | 70.9                               | 577 ÷ 995                             | 865 ÷ 1492             | 21.2                              | 20.4                              | 80                                |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 200   | 650                    | 685        | 15.9                                | 98.3                               | 575 ÷ 1007                            | 863 ÷ 1510             | 15.9                              | 15.3                              | 59.7                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 200   | 700                    | 745        | 12.4                                | 101.4                              | 687 ÷ 1202                            | 1031 ÷ 1803            | 19                                | 18.2                              | 71.5                              |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 200   | 750                    | 795        | 13.2                                | 103.2                              | 884 ÷ 1522                            | 1326 ÷ 2282            | 20.7                              | 19.8                              | 77.7                              |

Obr. / Fig.35 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 300#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69°MPa |         |          |          |       |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 60    | 20                     | 30         | 3.4                                 | 14.1                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 16.7                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 60    | 25                     | 35         | 3.7                                 | 13                                 | 6 ÷ 11                                |                        | 3.3                               | 3.1                               | 14                                |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 70    | 32                     | 42         | 4.2                                 | 6.3                                | 8 ÷ 14                                |                        | 4.3                               | 4.1                               | 19.4                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 70    | 40                     | 56         | 3.7                                 | 20.3                               | 16 ÷ 27                               |                        | 8.3                               | 8                                 | 35.9                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 70    | 45                     | 61         | 4                                   | 21                                 | 21 ÷ 35                               |                        | 6.2                               | 5.9                               | 28                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 80    | 60                     | 80         | 4.1                                 | 23.5                               | 15 ÷ 25                               |                        | 7.8                               | 7.5                               | 35.6                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 90    | 70                     | 90         | 4.5                                 | 22.8                               | 22 ÷ 37                               |                        | 6.5                               | 6.2                               | 29.5                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 90    | 85                     | 105        | 5                                   | 23.9                               | 29 ÷ 49                               |                        | 8.6                               | 8.3                               | 39                                |
| 4"                                                                   | 254     | 8        | 3/4"     | 90    | 110                    | 130        | 5.9                                 | 25.2                               | 43 ÷ 74                               |                        | 12.9                              | 12.3                              | 57.6                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 100   | 135                    | 155        | 6.8                                 | 29.1                               | 60 ÷ 103                              |                        | 17.9                              | 17.2                              | 79.6                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 100   | 160                    | 180        | 7.7                                 | 34                                 | 53 ÷ 91                               |                        | 15.9                              | 15.2                              | 70.1                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 120   | 210                    | 230        | 9.5                                 | 40.5                               | 98 ÷ 167                              |                        | 18.3                              | 17.5                              | 80.1                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 120   | 265                    | 285        | 11.5                                | 40.7                               | 125 ÷ 215                             |                        | 15.7                              | 15.1                              | 68.7                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120   | 315                    | 335        | 13.3                                | 47.3                               | 192 ÷ 329                             |                        | 17.1                              | 16.4                              | 74.3                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 140   | 350                    | 370        | 14.5                                | 44.4                               | 186 ÷ 319                             |                        | 16.6                              | 15.9                              | 71.9                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140   | 400                    | 425        | 13.5                                | 48.2                               | 270 ÷ 465                             |                        | 17.2                              | 16.5                              | 74.7                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150   | 450                    | 480        | 12.7                                | 55.2                               | 288 ÷ 496                             |                        | 18.3                              | 17.6                              | 79.8                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160   | 500                    | 535        | 12.2                                | 59.7                               | 359 ÷ 619                             |                        | 22.9                              | 21.9                              | 99.5                              |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 180   | 600                    | 640        | 12.7                                | 74.9                               | 609 ÷ 1051                            | 914 ÷ 1576             | 22.4                              | 21.5                              | 97.6                              |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 200   | 650                    | 685        | 15.3                                | 103.9                              | 608 ÷ 1064                            | 912 ÷ 1595             | 16.8                              | 16.1                              | 72.8                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 200   | 700                    | 745        | 13.1                                | 107.1                              | 726 ÷ 1270                            | 1089 ÷ 1905            | 20.1                              | 19.3                              | 87.3                              |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 200   | 750                    | 795        | 13.9                                | 103.9                              | 934 ÷ 1608                            | 1401 ÷ 2412            | 21.9                              | 21                                | 94.9                              |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69°MPa |         |          |          |       |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 300#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 60    | 20                     | 30         | 3.9                                 | 14.1                               | 4 ÷ 7                                 |                        | 4.3                               | 4.1                               | 19.3                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 60    | 25                     | 35         | 4.3                                 | 13.9                               | 7 ÷ 11                                |                        | 3.5                               | 3.3                               | 16.2                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 70    | 32                     | 42         | 4.9                                 | 7.2                                | 9 ÷ 16                                |                        | 4.9                               | 4.7                               | 22.4                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 70    | 40                     | 56         | 4.3                                 | 13.8                               | 17 ÷ 29                               |                        | 8.9                               | 8.6                               | 41.4                              |
| 1 1/2"                                                               | 153.99  | 4        | 3/4"     | 70    | 45                     | 61         | 4.5                                 | 23.8                               | 23 ÷ 40                               |                        | 7                                 | 6.7                               | 32.4                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 80    | 60                     | 80         | 4.7                                 | 26.9                               | 17 ÷ 29                               |                        | 8.9                               | 8.6                               | 41.1                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 90    | 70                     | 90         | 5.1                                 | 26.2                               | 25 ÷ 43                               |                        | 7.4                               | 7.1                               | 34                                |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 90    | 85                     | 105        | 5.7                                 | 27.4                               | 33 ÷ 57                               |                        | 9.9                               | 9.5                               | 45                                |
| 4"                                                                   | 254     | 8        | 3/4"     | 90    | 110                    | 130        | 6.8                                 | 28.9                               | 49 ÷ 85                               |                        | 14.8                              | 14.2                              | 66.4                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 100   | 135                    | 155        | 7.8                                 | 33.3                               | 69 ÷ 118                              |                        | 20.6                              | 19.7                              | 91.9                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 100   | 160                    | 180        | 8.8                                 | 39                                 | 61 ÷ 104                              |                        | 18.2                              | 17.4                              | 80.9                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 120   | 210                    | 230        | 10.9                                | 46.4                               | 112 ÷ 192                             |                        | 20.9                              | 20.1                              | 92.5                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 120   | 265                    | 285        | 13.2                                | 46.7                               | 144 ÷ 246                             |                        | 18.1                              | 17.3                              | 79.3                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 120   | 315                    | 335        | 15.2                                | 54.3                               | 220 ÷ 378                             |                        | 19.6                              | 18.8                              | 85.8                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 140   | 350                    | 370        | 16.7                                | 50.9                               | 214 ÷ 366                             |                        | 19                                | 18.2                              | 83.1                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 140   | 400                    | 425        | 15.4                                | 55.2                               | 310 ÷ 534                             |                        | 19.7                              | 18.9                              | 86.2                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 150   | 450                    | 480        | 14.6                                | 63.3                               | 331 ÷ 569                             |                        | 21                                | 20.2                              | 92.1                              |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 160   | 500                    | 535        | 14                                  | 68.4                               | 412 ÷ 709                             |                        | 26.2                              | 25.1                              | 114.9                             |
| 24"                                                                  | 914.2   | 24       | 1 1/2"   | 180   | 600                    | 640        | 14.6                                | 76.4                               | 699 ÷ 1205                            | 1048 ÷ 1808            | 25.7                              | 24.7                              | 112.7                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 200   | 650                    | 685        | 17.5                                | 119.1                              | 697 ÷ 1220                            | 1046 ÷ 1829            | 19.3                              | 18.5                              | 84.1                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 200   | 700                    | 745        | 15.1                                | 122.9                              | 833 ÷ 1457                            | 1249 ÷ 2185            | 23                                | 22.1                              | 100.8                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 200   | 750                    | 795        | 16                                  | 125.1                              | 1071 ÷ 1844                           | 1607 ÷ 2766            | 25.1                              | 24                                | 109.5                             |

Obr. / Fig.36 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 300#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |      | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |      | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    | Skrutiek | Skrutiek | [mm]  | [mm]                   | [mm] | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |      | Uťahovací Moment                    |                                    | [Nm]                                  |                        | SA193B16 SA193B7 SA193B8M         |                                   |                                   |
|                                                                      |         |          |          |       |                        |      | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65    | 20                     | 30   | 4.7                                 | 13.7                               | 5 ÷ 8                                 |                        | 5                                 | 4.8                               | 17.7                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 70    | 25                     | 35   | 5.2                                 | 14.4                               | 8 ÷ 14                                |                        | 4.2                               | 4                                 | 15                                |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 70    | 32                     | 42   | 5.8                                 | 16.2                               | 11 ÷ 19                               |                        | 5.9                               | 5.6                               | 20.9                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 80    | 40                     | 56   | 5.2                                 | 19.5                               | 21 ÷ 35                               |                        | 10.7                              | 10.3                              | 38.3                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 90    | 45                     | 61   | 5.5                                 | 21.3                               | 28 ÷ 48                               |                        | 8.4                               | 8.1                               | 30.1                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 90    | 60                     | 80   | 5.6                                 | 17.4                               | 21 ÷ 35                               |                        | 10.7                              | 10.3                              | 38.3                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110   | 70                     | 90   | 6.1                                 | 24.6                               | 30 ÷ 51                               |                        | 8.9                               | 8.6                               | 31.9                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120   | 85                     | 105  | 6.9                                 | 26.4                               | 40 ÷ 68                               |                        | 11.9                              | 11.4                              | 42.5                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 120   | 110                    | 130  | 8.1                                 | 28.5                               | 59 ÷ 102                              |                        | 17.7                              | 17                                | 63.6                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 130   | 135                    | 155  | 9.4                                 | 34                                 | 83 ÷ 141                              |                        | 24.7                              | 23.7                              | 88.2                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 130   | 160                    | 180  | 10.6                                | 38.3                               | 73 ÷ 125                              |                        | 21.9                              | 21                                | 78                                |
| 8"                                                                   | 381     | 12       | 7/8"     | 150   | 210                    | 230  | 13.1                                | 45.1                               | 134 ÷ 230                             |                        | 25.2                              | 24.1                              | 89.9                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 180   | 265                    | 295  | 11.4                                | 49.8                               | 191 ÷ 327                             |                        | 24                                | 23                                | 85.5                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 180   | 315                    | 350  | 11.6                                | 59.3                               | 301 ÷ 515                             |                        | 26.7                              | 25.6                              | 95.5                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 190   | 350                    | 390  | 11.3                                | 58.5                               | 299 ÷ 513                             |                        | 26.6                              | 25.5                              | 95.1                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 200   | 400                    | 445  | 11.5                                | 63.2                               | 425 ÷ 732                             | 638 ÷ 1099             | 27.1                              | 25.9                              | 96.6                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 210   | 450                    | 500  | 11.6                                | 71.6                               | 447 ÷ 770                             | 670 ÷ 1155             | 28.4                              | 27.3                              | 101.6                             |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 220   | 500                    | 555  | 11.7                                | 77                                 | 550 ÷ 948                             | 825 ÷ 1421             | 35                                | 33.6                              | 125                               |
| 24"                                                                  | 914.4   | 24       | 1 1/2"   | 240   | 600                    | 665  | 11.8                                | 87.3                               | 938 ÷ 1618                            | 1407 ÷ 2426            | 34.5                              | 33.1                              | 123.3                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 280   | 650                    | 705  | 14.4                                | 119.2                              | 912 ÷ 1595                            | 1367 ÷ 2392            | 25.2                              | 24.2                              | 90.1                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 280   | 700                    | 765  | 13.3                                | 122.3                              | 1081 ÷ 1891                           | 1621 ÷ 2836            | 29.9                              | 28.7                              | 106.8                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 300   | 750                    | 820  | 13.3                                | 121.3                              | 1409 ÷ 2425                           | 2113 ÷ 3638            | 33                                | 31.6                              | 117.7                             |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |      | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |      | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    | Skrutiek | Skrutiek | [mm]  | [mm]                   | [mm] | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | M <sub>u</sub>                        |                        | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |      | Uťahovací Moment                    |                                    | [Nm]                                  |                        | SA193B16 SA193B7 SA193B8M         |                                   |                                   |
|                                                                      |         |          |          |       |                        |      | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65    | 20                     | 30   | 5                                   | 14.4                               | 5 ÷ 9                                 |                        | 5.4                               | 5.2                               | 21.6                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 70    | 25                     | 35   | 5.6                                 | 14.4                               | 9 ÷ 15                                |                        | 4.5                               | 4.3                               | 18.1                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 70    | 32                     | 42   | 6.3                                 | 14.9                               | 12 ÷ 21                               |                        | 6.3                               | 6.1                               | 25.1                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 80    | 40                     | 56   | 5.6                                 | 19.1                               | 22 ÷ 38                               |                        | 11.6                              | 11.1                              | 46.3                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 90    | 45                     | 61   | 5.9                                 | 19.3                               | 31 ÷ 52                               |                        | 9.1                               | 8.7                               | 36.2                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 90    | 60                     | 80   | 6.1                                 | 23.5                               | 22 ÷ 38                               |                        | 11.6                              | 11.1                              | 45.9                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110   | 70                     | 90   | 6.6                                 | 23.9                               | 32 ÷ 55                               |                        | 9.7                               | 9.3                               | 38.1                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120   | 85                     | 105  | 7.5                                 | 25.1                               | 43 ÷ 74                               |                        | 12.9                              | 12.3                              | 50.3                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 120   | 110                    | 130  | 8.8                                 | 27                                 | 64 ÷ 110                              |                        | 19.2                              | 18.4                              | 74.3                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 130   | 135                    | 155  | 10.1                                | 33.6                               | 89 ÷ 153                              |                        | 26.7                              | 25.6                              | 102.7                             |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 130   | 160                    | 180  | 11.5                                | 36.6                               | 79 ÷ 136                              |                        | 23.6                              | 22.7                              | 90.4                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 150   | 210                    | 230  | 14.2                                | 43                                 | 145 ÷ 249                             |                        | 27.2                              | 26.1                              | 103.4                             |
| 10"                                                                  | 444.5   | 16       | 1"       | 180   | 265                    | 295  | 12.4                                | 52.5                               | 206 ÷ 354                             |                        | 25.9                              | 24.9                              | 98.8                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 180   | 315                    | 350  | 12.5                                | 62.7                               | 325 ÷ 557                             |                        | 28.9                              | 27.8                              | 110.3                             |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 190   | 350                    | 390  | 12.3                                | 73.7                               | 324 ÷ 555                             |                        | 28.8                              | 27.6                              | 109.9                             |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 200   | 400                    | 445  | 12.4                                | 83.4                               | 460 ÷ 793                             | 690 ÷ 1189             | 29.3                              | 28.1                              | 111.6                             |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 210   | 450                    | 500  | 12.5                                | 90.9                               | 484 ÷ 833                             | 725 ÷ 1249             | 30.8                              | 29.5                              | 117.3                             |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 220   | 500                    | 555  | 12.6                                | 97.6                               | 595 ÷ 1025                            | 893 ÷ 1538             | 37.9                              | 36.3                              | 144.4                             |
| 24"                                                                  | 914.4   | 24       | 1 1/2"   | 240   | 600                    | 665  | 12.8                                | 116.7                              | 1015 ÷ 1750                           | 1523 ÷ 2626            | 37.4                              | 35.8                              | 142.4                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 280   | 650                    | 705  | 15.6                                | 129                                | 986 ÷ 1726                            | 1480 ÷ 2589            | 27.3                              | 26.2                              | 103.3                             |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 280   | 700                    | 765  | 14.4                                | 132.4                              | 1169 ÷ 2046                           | 1754 ÷ 3069            | 32.4                              | 31                                | 122.7                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 300   | 750                    | 820  | 14.4                                | 131.3                              | 1524 ÷ 2624                           | 2287 ÷ 3936            | 35.7                              | 34.2                              | 135.4                             |

Obr. / Fig.37 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 400#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |                   |                     |                   |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|-------------------|---------------------|-------------------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet<br>Skrutiek | Veľkosť<br>Skrutiek | Dĺžka<br>Skrutiek | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    |                   |                     |                   | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | M <sub>u</sub>         | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |                   |                     |                   |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 95.25   | 4                 | 1/2"                | 65                | 20                     | 30         | 5.3                                 | 15.7                               | 6 ÷ 10                                |                        | 5.7                               | 5.4                               | 26.4                              |
| 3/4"                                                                 | 117.47  | 4                 | 5/8"                | 70                | 25                     | 35         | 5.9                                 | 16.4                               | 9 ÷ 16                                |                        | 4.8                               | 4.6                               | 22.1                              |
| 1"                                                                   | 123.82  | 4                 | 5/8"                | 70                | 32                     | 42         | 6.7                                 | 18.6                               | 13 ÷ 22                               |                        | 6.7                               | 6.4                               | 30.6                              |
| 1 1/4"                                                               | 133.35  | 4                 | 5/8"                | 80                | 40                     | 56         | 5.9                                 | 22.3                               | 23 ÷ 40                               |                        | 12.3                              | 11.8                              | 56.5                              |
| 1 1/2"                                                               | 155.57  | 4                 | 3/4"                | 90                | 45                     | 61         | 6.2                                 | 24.4                               | 32 ÷ 55                               |                        | 9.6                               | 9.2                               | 44.1                              |
| 2"                                                                   | 165.1   | 8                 | 5/8"                | 90                | 60                     | 80         | 6.5                                 | 19.9                               | 23 ÷ 40                               |                        | 12.3                              | 11.8                              | 56                                |
| 2 1/2"                                                               | 190.5   | 8                 | 3/4"                | 110               | 70                     | 90         | 7                                   | 28.1                               | 34 ÷ 59                               |                        | 10.2                              | 9.8                               | 46.4                              |
| 3"                                                                   | 209.55  | 8                 | 3/4"                | 120               | 85                     | 105        | 7.9                                 | 30.2                               | 46 ÷ 78                               |                        | 13.6                              | 13                                | 61.4                              |
| 4"                                                                   | 254     | 8                 | 3/4"                | 120               | 110                    | 130        | 9.3                                 | 32.6                               | 68 ÷ 116                              |                        | 20.3                              | 19.4                              | 90.6                              |
| 5"                                                                   | 279.4   | 8                 | 3/4"                | 130               | 135                    | 155        | 10.7                                | 38.9                               | 95 ÷ 162                              |                        | 28.2                              | 27.1                              | 125.4                             |
| 6"                                                                   | 317.5   | 12                | 3/4"                | 130               | 160                    | 180        | 12.1                                | 43.8                               | 84 ÷ 143                              |                        | 25                                | 24                                | 110.4                             |
| 8"                                                                   | 381     | 12                | 7/8"                | 150               | 210                    | 230        | 15                                  | 51.6                               | 154 ÷ 263                             |                        | 28.8                              | 27.6                              | 126.1                             |
| 10"                                                                  | 444.5   | 16                | 1"                  | 180               | 265                    | 295        | 13.1                                | 57                                 | 218 ÷ 374                             |                        | 27.4                              | 26.3                              | 120.6                             |
| 12"                                                                  | 520.7   | 16                | 1 1/8"              | 180               | 315                    | 350        | 13.3                                | 67.8                               | 344 ÷ 589                             |                        | 30.6                              | 29.3                              | 134.6                             |
| 14"                                                                  | 584.2   | 20                | 1 1/8"              | 190               | 350                    | 390        | 13                                  | 66.9                               | 342 ÷ 586                             |                        | 30.4                              | 29.2                              | 134.2                             |
| 16"                                                                  | 647.7   | 20                | 1 1/4"              | 200               | 400                    | 445        | 13.1                                | 72.3                               | 486 ÷ 837                             | 729 ÷ 1256             | 30.9                              | 29.7                              | 136.3                             |
| 18"                                                                  | 711.2   | 24                | 1 1/4"              | 210               | 450                    | 500        | 13.3                                | 81.8                               | 511 ÷ 880                             | 766 ÷ 1320             | 32.5                              | 31.2                              | 143.2                             |
| 20"                                                                  | 774.7   | 24                | 1 1/4"              | 220               | 500                    | 555        | 13.4                                | 88.1                               | 629 ÷ 1083                            | 943 ÷ 1625             | 40                                | 38.4                              | 176.2                             |
| 24"                                                                  | 914.4   | 24                | 1 1/2"              | 240               | 600                    | 665        | 13.5                                | 99.8                               | 1073 ÷ 1849                           | 1609 ÷ 2774            | 39.5                              | 37.9                              | 173.8                             |
| 26"                                                                  | 971.55  | 28                | 1 5/8"              | 280               | 650                    | 705        | 16.4                                | 136.3                              | 1042 ÷ 1823                           | 1563 ÷ 2735            | 28.8                              | 27.6                              | 126.1                             |
| 28"                                                                  | 1035.05 | 28                | 1 5/8"              | 280               | 700                    | 765        | 15.3                                | 139.8                              | 1235 ÷ 2161                           | 1853 ÷ 3242            | 34.2                              | 32.8                              | 149.8                             |
| 30"                                                                  | 1092.2  | 28                | 1 3/4"              | 300               | 750                    | 820        | 15.2                                | 138.7                              | 1610 ÷ 2772                           | 2416 ÷ 4158            | 37.7                              | 36.1                              | 165.2                             |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |                   |                     |                   |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|-------------------|---------------------|-------------------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet<br>Skrutiek | Veľkosť<br>Skrutiek | Dĺžka<br>Skrutiek | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    |                   |                     |                   | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | M <sub>u</sub>         | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |                   |                     |                   |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 95.25   | 4                 | 1/2"                | 65                | 20                     | 30         | 6.1                                 | 18                                 | 6 ÷ 11                                |                        | 6.5                               | 6.3                               | 30.4                              |
| 3/4"                                                                 | 117.47  | 4                 | 5/8"                | 70                | 25                     | 35         | 6.8                                 | 18.9                               | 11 ÷ 18                               |                        | 5.5                               | 5.3                               | 25.5                              |
| 1"                                                                   | 123.82  | 4                 | 5/8"                | 70                | 32                     | 42         | 7.7                                 | 21.3                               | 15 ÷ 25                               |                        | 7.7                               | 7.4                               | 35.3                              |
| 1 1/4"                                                               | 133.35  | 4                 | 5/8"                | 80                | 40                     | 56         | 6.8                                 | 25.5                               | 27 ÷ 46                               |                        | 14.1                              | 13.5                              | 65.2                              |
| 1 1/2"                                                               | 155.57  | 4                 | 3/4"                | 90                | 45                     | 61         | 7.2                                 | 27.9                               | 37 ÷ 63                               |                        | 11.1                              | 10.6                              | 51                                |
| 2"                                                                   | 165.1   | 8                 | 5/8"                | 90                | 60                     | 80         | 7.4                                 | 22.9                               | 27 ÷ 46                               |                        | 14.1                              | 13.5                              | 64.7                              |
| 2 1/2"                                                               | 190.5   | 8                 | 3/4"                | 110               | 70                     | 90         | 8.1                                 | 32.2                               | 39 ÷ 67                               |                        | 11.7                              | 11.2                              | 53.6                              |
| 3"                                                                   | 209.55  | 8                 | 3/4"                | 120               | 85                     | 105        | 9                                   | 34.6                               | 52 ÷ 89                               |                        | 15.6                              | 15                                | 70.9                              |
| 4"                                                                   | 254     | 8                 | 3/4"                | 120               | 110                    | 130        | 10.7                                | 37.4                               | 78 ÷ 133                              |                        | 23.3                              | 22.3                              | 104.7                             |
| 5"                                                                   | 279.4   | 8                 | 3/4"                | 130               | 135                    | 155        | 12.3                                | 44.7                               | 108 ÷ 186                             |                        | 32.4                              | 31.1                              | 144.8                             |
| 6"                                                                   | 317.5   | 12                | 3/4"                | 130               | 160                    | 180        | 13.9                                | 50.3                               | 96 ÷ 164                              |                        | 28.7                              | 27.5                              | 127.4                             |
| 8"                                                                   | 381     | 12                | 7/8"                | 150               | 210                    | 230        | 17.2                                | 59.2                               | 176 ÷ 302                             |                        | 33                                | 31.7                              | 145.6                             |
| 10"                                                                  | 444.5   | 16                | 1"                  | 180               | 265                    | 295        | 15                                  | 65.4                               | 250 ÷ 429                             |                        | 31.4                              | 30.1                              | 139.3                             |
| 12"                                                                  | 520.7   | 16                | 1 1/8"              | 180               | 315                    | 350        | 15.2                                | 77.8                               | 394 ÷ 676                             |                        | 35.1                              | 33.6                              | 155.4                             |
| 14"                                                                  | 584.2   | 20                | 1 1/8"              | 190               | 350                    | 390        | 14.9                                | 76.8                               | 393 ÷ 673                             |                        | 34.9                              | 33.5                              | 154.9                             |
| 16"                                                                  | 647.7   | 20                | 1 1/4"              | 200               | 400                    | 445        | 15.1                                | 82.9                               | 558 ÷ 961                             | 837 ÷ 1441             | 35.5                              | 34                                | 157.3                             |
| 18"                                                                  | 711.2   | 24                | 1 1/4"              | 210               | 450                    | 500        | 15.2                                | 93.9                               | 586 ÷ 1010                            | 879 ÷ 1515             | 37.3                              | 35.8                              | 165.3                             |
| 20"                                                                  | 774.7   | 24                | 1 1/4"              | 220               | 500                    | 555        | 15.3                                | 101                                | 722 ÷ 1243                            | 1083 ÷ 1865            | 45.9                              | 44                                | 203.4                             |
| 24"                                                                  | 914.4   | 24                | 1 1/2"              | 240               | 600                    | 665        | 15.5                                | 114.6                              | 1231 ÷ 2122                           | 1846 ÷ 3183            | 45.3                              | 43.5                              | 200.6                             |
| 26"                                                                  | 971.55  | 28                | 1 5/8"              | 280               | 650                    | 705        | 18.9                                | 156.4                              | 1196 ÷ 2096                           | 1794 ÷ 3139            | 33.1                              | 31.7                              | 145.5                             |
| 28"                                                                  | 1035.05 | 28                | 1 5/8"              | 280               | 700                    | 765        | 17.5                                | 160.5                              | 1418 ÷ 2480                           | 2127 ÷ 3721            | 39.2                              | 37.6                              | 172.9                             |
| 30"                                                                  | 1092.2  | 28                | 1 3/4"              | 300               | 750                    | 820        | 17.4                                | 159.2                              | 1848 ÷ 3181                           | 2772 ÷ 4772            | 43.3                              | 41.5                              | 190.7                             |

Obr. / Fig.38 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 400#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65    | 20                     | 30         | 4.7                                 | 13.7                               | 5 ÷ 8                                 |                        | 5                                 | 4.8                               | 17.7                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80    | 25                     | 35         | 5.2                                 | 14.4                               | 8 ÷ 14                                |                        | 4.2                               | 4                                 | 15                                |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 80    | 32                     | 42         | 5.8                                 | 16.2                               | 11 ÷ 19                               |                        | 5.9                               | 5.6                               | 20.9                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 100   | 40                     | 56         | 5.2                                 | 19.5                               | 21 ÷ 35                               |                        | 10.7                              | 10.3                              | 38.3                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100   | 45                     | 61         | 5.5                                 | 21.3                               | 28 ÷ 48                               |                        | 8.4                               | 8.1                               | 30.1                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100   | 60                     | 80         | 5.6                                 | 17.4                               | 21 ÷ 35                               |                        | 10.7                              | 10.3                              | 38.3                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110   | 70                     | 90         | 6.1                                 | 24.6                               | 30 ÷ 51                               |                        | 8.9                               | 8.6                               | 31.9                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120   | 85                     | 105        | 6.9                                 | 26.4                               | 40 ÷ 68                               |                        | 11.9                              | 11.4                              | 42.5                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 130   | 110                    | 130        | 8.1                                 | 28.5                               | 59 ÷ 102                              |                        | 17.7                              | 17                                | 63.6                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 130   | 135                    | 155        | 9.4                                 | 34                                 | 83 ÷ 141                              |                        | 24.7                              | 23.7                              | 88.2                              |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 140   | 160                    | 180        | 10.6                                | 38.3                               | 73 ÷ 125                              |                        | 21.9                              | 21                                | 78                                |
| 8"                                                                   | 381     | 12       | 7/8"     | 160   | 210                    | 230        | 13.1                                | 45.1                               | 134 ÷ 230                             |                        | 25.2                              | 24.1                              | 89.9                              |
| 10"                                                                  | 444.5   | 16       | 1"       | 180   | 265                    | 295        | 11.4                                | 49.8                               | 191 ÷ 327                             |                        | 24                                | 23                                | 85.5                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 200   | 315                    | 350        | 11.6                                | 59.3                               | 301 ÷ 515                             |                        | 26.7                              | 25.6                              | 95.5                              |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 200   | 350                    | 390        | 11.3                                | 58.5                               | 299 ÷ 513                             |                        | 26.6                              | 25.5                              | 95.1                              |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 220   | 400                    | 445        | 11.5                                | 63.2                               | 425 ÷ 732                             | 638 ÷ 1099             | 27.1                              | 25.9                              | 96.6                              |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 220   | 450                    | 500        | 11.6                                | 71.6                               | 447 ÷ 770                             | 670 ÷ 1155             | 28.4                              | 27.3                              | 101.6                             |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 230   | 500                    | 555        | 11.7                                | 77                                 | 550 ÷ 948                             | 825 ÷ 1421             | 35                                | 33.6                              | 125                               |
| 24"                                                                  | 914.4   | 24       | 1 1/2"   | 260   | 600                    | 665        | 11.8                                | 87.3                               | 938 ÷ 1618                            | 1407 ÷ 2426            | 34.5                              | 33.1                              | 123.3                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 300   | 650                    | 705        | 14.4                                | 119.2                              | 912 ÷ 1595                            | 1367 ÷ 2392            | 25.2                              | 24.2                              | 90.1                              |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 300   | 700                    | 765        | 13.3                                | 122.3                              | 1081 ÷ 1891                           | 1621 ÷ 2836            | 29.9                              | 28.7                              | 106.8                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 325   | 750                    | 820        | 13.3                                | 121.3                              | 1409 ÷ 2425                           | 2113 ÷ 3638            | 33                                | 31.6                              | 117.7                             |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |       |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|-------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    | Skrutiek | Skrutiek | [mm]  | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |       |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65    | 20                     | 30         | 5                                   | 14.4                               | 5 ÷ 9                                 |                        | 5.4                               | 5.2                               | 21.6                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80    | 25                     | 35         | 5.6                                 | 14.4                               | 9 ÷ 15                                |                        | 4.5                               | 4.3                               | 18.1                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 80    | 32                     | 42         | 6.3                                 | 14.9                               | 12 ÷ 21                               |                        | 6.3                               | 6.1                               | 25.1                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 100   | 40                     | 56         | 5.6                                 | 19.1                               | 22 ÷ 38                               |                        | 11.6                              | 11.1                              | 46.3                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100   | 45                     | 61         | 5.9                                 | 19.3                               | 31 ÷ 52                               |                        | 9.1                               | 8.7                               | 36.2                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100   | 60                     | 80         | 6.1                                 | 23.5                               | 22 ÷ 38                               |                        | 11.6                              | 11.1                              | 45.9                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110   | 70                     | 90         | 6.6                                 | 23.9                               | 32 ÷ 55                               |                        | 9.7                               | 9.3                               | 38.1                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120   | 85                     | 105        | 7.5                                 | 25.1                               | 43 ÷ 74                               |                        | 12.9                              | 12.3                              | 50.3                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 130   | 110                    | 130        | 8.8                                 | 27                                 | 64 ÷ 110                              |                        | 19.2                              | 18.4                              | 74.3                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 130   | 135                    | 155        | 10.1                                | 33.6                               | 89 ÷ 153                              |                        | 26.7                              | 25.6                              | 102.7                             |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 140   | 160                    | 180        | 11.5                                | 36.6                               | 79 ÷ 136                              |                        | 23.6                              | 22.7                              | 90.4                              |
| 8"                                                                   | 381     | 12       | 7/8"     | 160   | 210                    | 230        | 14.2                                | 43                                 | 145 ÷ 249                             |                        | 27.2                              | 26.1                              | 103.4                             |
| 10"                                                                  | 444.5   | 16       | 1"       | 180   | 265                    | 295        | 12.4                                | 52.5                               | 206 ÷ 354                             |                        | 25.9                              | 24.9                              | 98.8                              |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 200   | 315                    | 350        | 12.5                                | 62.7                               | 325 ÷ 557                             |                        | 28.9                              | 27.8                              | 110.3                             |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 200   | 350                    | 390        | 12.3                                | 73.7                               | 324 ÷ 555                             |                        | 28.8                              | 27.6                              | 109.9                             |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 220   | 400                    | 445        | 12.4                                | 83.4                               | 460 ÷ 793                             | 690 ÷ 1189             | 29.3                              | 28.1                              | 111.6                             |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 220   | 450                    | 500        | 12.5                                | 90.9                               | 484 ÷ 833                             | 725 ÷ 1249             | 30.8                              | 29.5                              | 117.3                             |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 230   | 500                    | 555        | 12.6                                | 97.6                               | 595 ÷ 1025                            | 893 ÷ 1538             | 37.9                              | 36.3                              | 144.4                             |
| 24"                                                                  | 914.4   | 24       | 1 1/2"   | 260   | 600                    | 665        | 12.8                                | 116.7                              | 1015 ÷ 1750                           | 1523 ÷ 2626            | 37.4                              | 35.8                              | 142.4                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 300   | 650                    | 705        | 15.6                                | 129                                | 986 ÷ 1726                            | 1480 ÷ 2589            | 27.3                              | 26.2                              | 103.3                             |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 300   | 700                    | 765        | 14.4                                | 132.4                              | 1169 ÷ 2046                           | 1754 ÷ 3069            | 32.4                              | 31                                | 122.7                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 325   | 750                    | 820        | 14.4                                | 131.3                              | 1524 ÷ 2624                           | 2287 ÷ 3936            | 35.7                              | 34.2                              | 135.4                             |

Obr. / Fig.39 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 400#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment<br>μ = 0.11 ÷ 0.2    | [Nm]<br>μ = 0.11 ÷ 0.2 | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 5.3                                 | 15.7                               | 6 ÷ 10                                |                        | 5.7                               | 5.4                               | 26.4                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 5.9                                 | 16.4                               | 9 ÷ 16                                |                        | 4.8                               | 4.6                               | 22.1                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 80       | 32                     | 42         | 6.7                                 | 18.6                               | 13 ÷ 22                               |                        | 6.7                               | 6.4                               | 30.6                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 100      | 40                     | 56         | 5.9                                 | 22.3                               | 23 ÷ 40                               |                        | 12.3                              | 11.8                              | 56.5                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 6.2                                 | 24.4                               | 32 ÷ 55                               |                        | 9.6                               | 9.2                               | 44.1                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 6.5                                 | 19.9                               | 23 ÷ 40                               |                        | 12.3                              | 11.8                              | 56                                |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 7                                   | 28.1                               | 34 ÷ 59                               |                        | 10.2                              | 9.8                               | 46.4                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 7.9                                 | 30.2                               | 46 ÷ 78                               |                        | 13.6                              | 13                                | 61.4                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 130      | 110                    | 130        | 9.3                                 | 32.6                               | 68 ÷ 116                              |                        | 20.3                              | 19.4                              | 90.6                              |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 130      | 135                    | 155        | 10.7                                | 38.9                               | 95 ÷ 162                              |                        | 28.2                              | 27.1                              | 125.4                             |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 140      | 160                    | 180        | 12.1                                | 43.8                               | 84 ÷ 143                              |                        | 25                                | 24                                | 110.4                             |
| 8"                                                                   | 381     | 12       | 7/8"     | 160      | 210                    | 230        | 15                                  | 51.6                               | 154 ÷ 263                             |                        | 28.8                              | 27.6                              | 126.1                             |
| 10"                                                                  | 444.5   | 16       | 1"       | 180      | 265                    | 295        | 13.1                                | 57                                 | 218 ÷ 374                             |                        | 27.4                              | 26.3                              | 120.6                             |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 200      | 315                    | 350        | 13.3                                | 67.8                               | 344 ÷ 589                             |                        | 30.6                              | 29.3                              | 134.6                             |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 200      | 350                    | 390        | 13                                  | 66.9                               | 342 ÷ 586                             |                        | 30.4                              | 29.2                              | 134.2                             |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 220      | 400                    | 445        | 13.1                                | 72.3                               | 486 ÷ 837                             | 729 ÷ 1256             | 30.9                              | 29.7                              | 136.3                             |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 220      | 450                    | 500        | 13.3                                | 81.8                               | 511 ÷ 880                             | 766 ÷ 1320             | 32.5                              | 31.2                              | 143.2                             |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 230      | 500                    | 555        | 13.4                                | 88.1                               | 629 ÷ 1083                            | 943 ÷ 1625             | 40                                | 38.4                              | 176.2                             |
| 24"                                                                  | 914.4   | 24       | 1 1/2"   | 260      | 600                    | 665        | 13.5                                | 99.8                               | 1073 ÷ 1849                           | 1609 ÷ 2774            | 39.5                              | 37.9                              | 173.8                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 300      | 650                    | 705        | 16.4                                | 136.3                              | 1042 ÷ 1823                           | 1563 ÷ 2735            | 28.8                              | 27.6                              | 126.1                             |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 300      | 700                    | 765        | 15.3                                | 139.8                              | 1235 ÷ 2161                           | 1853 ÷ 3242            | 34.2                              | 32.8                              | 149.8                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 325      | 750                    | 820        | 15.2                                | 138.7                              | 1610 ÷ 2772                           | 2416 ÷ 4158            | 37.7                              | 36.1                              | 165.2                             |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 400#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment<br>μ = 0.11 ÷ 0.2    | [Nm]<br>μ = 0.11 ÷ 0.2 | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            |                                     |                                    |                                       |                        |                                   |                                   |                                   |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 6.1                                 | 18                                 | 6 ÷ 11                                |                        | 6.5                               | 6.3                               | 30.4                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 6.8                                 | 18.9                               | 11 ÷ 18                               |                        | 5.5                               | 5.3                               | 25.5                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 80       | 32                     | 42         | 7.7                                 | 21.3                               | 15 ÷ 25                               |                        | 7.7                               | 7.4                               | 35.3                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 100      | 40                     | 56         | 6.8                                 | 25.5                               | 27 ÷ 46                               |                        | 14.1                              | 13.5                              | 65.2                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 7.2                                 | 27.9                               | 37 ÷ 63                               |                        | 11.1                              | 10.6                              | 51                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 7.4                                 | 22.9                               | 27 ÷ 46                               |                        | 14.1                              | 13.5                              | 64.7                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 8.1                                 | 32.2                               | 39 ÷ 67                               |                        | 11.7                              | 11.2                              | 53.6                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 9                                   | 34.6                               | 52 ÷ 89                               |                        | 15.6                              | 15                                | 70.9                              |
| 4"                                                                   | 254     | 8        | 3/4"     | 130      | 110                    | 130        | 10.7                                | 37.4                               | 78 ÷ 133                              |                        | 23.3                              | 22.3                              | 104.7                             |
| 5"                                                                   | 279.4   | 8        | 3/4"     | 130      | 135                    | 155        | 12.3                                | 44.7                               | 108 ÷ 186                             |                        | 32.4                              | 31.1                              | 144.8                             |
| 6"                                                                   | 317.5   | 12       | 3/4"     | 140      | 160                    | 180        | 13.9                                | 50.3                               | 96 ÷ 164                              |                        | 28.7                              | 27.5                              | 127.4                             |
| 8"                                                                   | 381     | 12       | 7/8"     | 160      | 210                    | 230        | 17.2                                | 59.2                               | 176 ÷ 302                             |                        | 33                                | 31.7                              | 145.6                             |
| 10"                                                                  | 444.5   | 16       | 1"       | 180      | 265                    | 295        | 15                                  | 65.4                               | 250 ÷ 429                             |                        | 31.4                              | 30.1                              | 139.3                             |
| 12"                                                                  | 520.7   | 16       | 1 1/8"   | 200      | 315                    | 350        | 15.2                                | 77.8                               | 394 ÷ 676                             |                        | 35.1                              | 33.6                              | 155.4                             |
| 14"                                                                  | 584.2   | 20       | 1 1/8"   | 200      | 350                    | 390        | 14.9                                | 76.8                               | 393 ÷ 673                             |                        | 34.9                              | 33.5                              | 154.9                             |
| 16"                                                                  | 647.7   | 20       | 1 1/4"   | 220      | 400                    | 445        | 15.1                                | 82.9                               | 558 ÷ 961                             | 837 ÷ 1441             | 35.5                              | 34                                | 157.3                             |
| 18"                                                                  | 711.2   | 24       | 1 1/4"   | 220      | 450                    | 500        | 15.2                                | 93.9                               | 586 ÷ 1010                            | 879 ÷ 1515             | 37.3                              | 35.8                              | 165.3                             |
| 20"                                                                  | 774.7   | 24       | 1 1/4"   | 230      | 500                    | 555        | 15.3                                | 101                                | 722 ÷ 1243                            | 1083 ÷ 1865            | 45.9                              | 44                                | 203.4                             |
| 24"                                                                  | 914.4   | 24       | 1 1/2"   | 260      | 600                    | 665        | 15.5                                | 114.6                              | 1231 ÷ 2122                           | 1846 ÷ 3183            | 45.3                              | 43.5                              | 200.6                             |
| 26"                                                                  | 971.55  | 28       | 1 5/8"   | 300      | 650                    | 705        | 18.9                                | 156.4                              | 1196 ÷ 2096                           | 1794 ÷ 3139            | 33.1                              | 31.7                              | 145.5                             |
| 28"                                                                  | 1035.05 | 28       | 1 5/8"   | 300      | 700                    | 765        | 17.5                                | 160.5                              | 1418 ÷ 2480                           | 2127 ÷ 3721            | 39.2                              | 37.6                              | 172.9                             |
| 30"                                                                  | 1092.2  | 28       | 1 3/4"   | 325      | 750                    | 820        | 17.4                                | 159.2                              | 1848 ÷ 3181                           | 2772 ÷ 4772            | 43.3                              | 41.5                              | 190.7                             |

Obr. / Fig.40 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 400#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |                   |                     |                   |                                                 |      | TEPLOTA 20°C                                    |                                                | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                              |                                              |                                              |
|----------------------------------------------------------------------|---------|-------------------|---------------------|-------------------|-------------------------------------------------|------|-------------------------------------------------|------------------------------------------------|---------------------------------------|------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|
| DN                                                                   | Trieda  | Počet<br>Skrutiek | Veľkosť<br>Skrutiek | Dĺžka<br>Skrutiek | TESNENIE - rozmer ANSI<br>GROOVED id GROOVED od |      | VYUŽITIE<br>V <sub>gasket</sub><br>tesnenie [%] | VYUŽITIE<br>V <sub>flange</sub><br>príruba [%] | VDI 2230<br>M <sub>u</sub>            |                        | Skrutka<br>V <sub>bolt</sub><br>Využitie [%] | Skrutka<br>V <sub>bolt</sub><br>Využitie [%] | Skrutka<br>V <sub>bolt</sub><br>Využitie [%] |
| [mm]                                                                 | 600#    |                   |                     | [mm]              | [mm]                                            | [mm] |                                                 |                                                | Uťahovací Moment<br>μ = 0.11 ÷ 0.2    | [Nm]<br>μ = 0.11 ÷ 0.2 | SA193B16                                     | SA193B7                                      | SA193B8M                                     |
| podľa EN 1514-6                                                      |         |                   |                     |                   |                                                 |      |                                                 |                                                |                                       |                        |                                              |                                              |                                              |
| 1/2"                                                                 | 95.25   | 4                 | 1/2"                | 65                | 20                                              | 30   | 7.4                                             | 21.8                                           | 8 ÷ 13                                |                        | 7.9                                          | 7.6                                          | 28.2                                         |
| 3/4"                                                                 | 117.47  | 4                 | 5/8"                | 80                | 25                                              | 35   | 8.2                                             | 22.8                                           | 13 ÷ 22                               |                        | 6.7                                          | 6.4                                          | 23.8                                         |
| 1"                                                                   | 123.82  | 4                 | 5/8"                | 90                | 32                                              | 42   | 9.3                                             | 25.8                                           | 18 ÷ 30                               |                        | 9.3                                          | 8.9                                          | 33.2                                         |
| 1 1/4"                                                               | 133.35  | 4                 | 5/8"                | 90                | 40                                              | 56   | 8.2                                             | 30.9                                           | 33 ÷ 56                               |                        | 17                                           | 16.3                                         | 60.8                                         |
| 1 1/2"                                                               | 155.57  | 4                 | 3/4"                | 100               | 45                                              | 61   | 8.7                                             | 33.8                                           | 45 ÷ 77                               |                        | 13.4                                         | 12.8                                         | 47.7                                         |
| 2"                                                                   | 165.1   | 8                 | 5/8"                | 100               | 60                                              | 80   | 9                                               | 38.3                                           | 33 ÷ 55                               |                        | 17                                           | 16.3                                         | 60.8                                         |
| 2 1/2"                                                               | 190.5   | 8                 | 3/4"                | 110               | 70                                              | 90   | 9.8                                             | 39                                             | 48 ÷ 81                               |                        | 14.2                                         | 13.6                                         | 50.7                                         |
| 3"                                                                   | 209.55  | 8                 | 3/4"                | 120               | 85                                              | 105  | 10.9                                            | 41.9                                           | 63 ÷ 108                              |                        | 18.9                                         | 18.1                                         | 67.4                                         |
| 4"                                                                   | 273.05  | 8                 | 7/8"                | 150               | 110                                             | 130  | 12.9                                            | 40.7                                           | 108 ÷ 186                             |                        | 20.3                                         | 19.5                                         | 72.5                                         |
| 5"                                                                   | 330.2   | 8                 | 1"                  | 160               | 135                                             | 155  | 14.9                                            | 42.2                                           | 171 ÷ 294                             |                        | 21.5                                         | 20.6                                         | 76.8                                         |
| 6"                                                                   | 355.6   | 12                | 1"                  | 180               | 160                                             | 180  | 16.8                                            | 44.4                                           | 151 ÷ 260                             |                        | 19                                           | 18.3                                         | 68                                           |
| 8"                                                                   | 419.1   | 12                | 1 1/8"              | 200               | 210                                             | 230  | 20.8                                            | 53                                             | 271 ÷ 465                             |                        | 24.1                                         | 23.2                                         | 86.2                                         |
| 10"                                                                  | 508     | 16                | 1 1/4"              | 220               | 265                                             | 295  | 18.1                                            | 60                                             | 371 ÷ 639                             |                        | 23.6                                         | 22.6                                         | 84.3                                         |
| 12"                                                                  | 558.8   | 20                | 1 1/4"              | 220               | 315                                             | 350  | 18.4                                            | 70.9                                           | 417 ÷ 718                             |                        | 26.5                                         | 25.5                                         | 94.8                                         |
| 14"                                                                  | 603.25  | 20                | 1 3/8"              | 240               | 350                                             | 390  | 18                                              | 85                                             | 573 ÷ 984                             | 860 ÷ 1477             | 27.8                                         | 26.7                                         | 99.4                                         |
| 16"                                                                  | 685.8   | 20                | 1 1/2"              | 260               | 400                                             | 445  | 18.2                                            | 92.3                                           | 803 ÷ 1384                            | 1204 ÷ 2076            | 29.6                                         | 28.3                                         | 105.5                                        |
| 18"                                                                  | 742.95  | 20                | 1 1/2"              | 280               | 450                                             | 500  | 18.4                                            | 83.4                                           | 1012 ÷ 1745                           | 1518 ÷ 2618            | 37.3                                         | 35.7                                         | 133.1                                        |
| 20"                                                                  | 812.8   | 24                | 1 5/8"              | 300               | 500                                             | 555  | 18.5                                            | 91.1                                           | 1067 ÷ 1868                           | 1601 ÷ 2801            | 29.5                                         | 28.3                                         | 105.4                                        |
| 24"                                                                  | 939.8   | 24                | 1 7/8"              | 340               | 600                                             | 665  | 18.8                                            | 95.2                                           | 1743 ÷ 3064                           | 2615 ÷ 4596            | 31.1                                         | 29.9                                         | 111.2                                        |
| 26"                                                                  | 1016    | 28                | 1 7/8"              | 350               | 650                                             | 705  | 22.8                                            | 132.4                                          | 1648 ÷ 2897                           | 2472 ÷ 4345            | 29.4                                         | 28.2                                         | 105.1                                        |
| 28"                                                                  | 1073.15 | 28                | 2"                  | 360               | 700                                             | 765  | 21.2                                            | 134.2                                          | 2209 ÷ 3807                           | 3313 ÷ 5711            | 34.6                                         | 33.1                                         | 123.4                                        |
| 30"                                                                  | 1130.3  | 28                | 2"                  | 380               | 750                                             | 820  | 21.1                                            | 138.7                                          | 2539 ÷ 4376                           | 3808 ÷ 6564            | 39.7                                         | 38.1                                         | 141.8                                        |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |                   |                     |                   |                                                 |      | TEPLOTA 100°C                                   |                                                | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                              |                                              |                                              |
|----------------------------------------------------------------------|---------|-------------------|---------------------|-------------------|-------------------------------------------------|------|-------------------------------------------------|------------------------------------------------|---------------------------------------|------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|
| DN                                                                   | Trieda  | Počet<br>Skrutiek | Veľkosť<br>Skrutiek | Dĺžka<br>Skrutiek | TESNENIE - rozmer ANSI<br>GROOVED id GROOVED od |      | VYUŽITIE<br>V <sub>gasket</sub><br>tesnenie [%] | VYUŽITIE<br>V <sub>flange</sub><br>príruba [%] | VDI 2230<br>M <sub>u</sub>            |                        | Skrutka<br>V <sub>bolt</sub><br>Využitie [%] | Skrutka<br>V <sub>bolt</sub><br>Využitie [%] | Skrutka<br>V <sub>bolt</sub><br>Využitie [%] |
| [mm]                                                                 | 600#    |                   |                     | [mm]              | [mm]                                            | [mm] |                                                 |                                                | Uťahovací Moment<br>μ = 0.11 ÷ 0.2    | [Nm]<br>μ = 0.11 ÷ 0.2 | SA193B16                                     | SA193B7                                      | SA193B8M                                     |
| podľa EN 1514-6                                                      |         |                   |                     |                   |                                                 |      |                                                 |                                                |                                       |                        |                                              |                                              |                                              |
| 1/2"                                                                 | 95.25   | 4                 | 1/2"                | 65                | 20                                              | 30   | 8                                               | 19.5                                           | 9 ÷ 14                                |                        | 8.6                                          | 8.2                                          | 34.3                                         |
| 3/4"                                                                 | 117.47  | 4                 | 5/8"                | 80                | 25                                              | 35   | 8.9                                             | 21                                             | 14 ÷ 24                               |                        | 7.2                                          | 6.9                                          | 28.7                                         |
| 1"                                                                   | 123.82  | 4                 | 5/8"                | 90                | 32                                              | 42   | 10.1                                            | 23.7                                           | 19 ÷ 33                               |                        | 10.1                                         | 9.7                                          | 39.8                                         |
| 1 1/4"                                                               | 133.35  | 4                 | 5/8"                | 90                | 40                                              | 56   | 8.9                                             | 30.3                                           | 35 ÷ 60                               |                        | 18.5                                         | 17.7                                         | 73.4                                         |
| 1 1/2"                                                               | 155.57  | 4                 | 3/4"                | 100               | 45                                              | 61   | 9.4                                             | 30.7                                           | 49 ÷ 83                               |                        | 14.5                                         | 13.9                                         | 57.4                                         |
| 2"                                                                   | 165.1   | 8                 | 5/8"                | 100               | 60                                              | 80   | 9.7                                             | 37.4                                           | 35 ÷ 60                               |                        | 18.4                                         | 17.7                                         | 72.9                                         |
| 2 1/2"                                                               | 190.5   | 8                 | 3/4"                | 110               | 70                                              | 90   | 10.6                                            | 38                                             | 51 ÷ 88                               |                        | 15.4                                         | 14.7                                         | 60.4                                         |
| 3"                                                                   | 209.55  | 8                 | 3/4"                | 120               | 85                                              | 105  | 11.8                                            | 39.9                                           | 69 ÷ 117                              |                        | 20.5                                         | 19.6                                         | 79.8                                         |
| 4"                                                                   | 273.05  | 8                 | 7/8"                | 150               | 110                                             | 130  | 14                                              | 38.3                                           | 118 ÷ 202                             |                        | 22                                           | 21.1                                         | 85                                           |
| 5"                                                                   | 330.2   | 8                 | 1"                  | 160               | 135                                             | 155  | 16.1                                            | 39.5                                           | 186 ÷ 318                             |                        | 23.3                                         | 22.4                                         | 89.5                                         |
| 6"                                                                   | 355.6   | 12                | 1"                  | 180               | 160                                             | 180  | 18.2                                            | 44.1                                           | 164 ÷ 282                             |                        | 20.6                                         | 19.8                                         | 78.8                                         |
| 8"                                                                   | 419.1   | 12                | 1 1/8"              | 200               | 210                                             | 230  | 22.5                                            | 49.5                                           | 294 ÷ 504                             |                        | 26.2                                         | 25.1                                         | 99.2                                         |
| 10"                                                                  | 508     | 16                | 1 1/4"              | 220               | 265                                             | 295  | 19.7                                            | 63.3                                           | 402 ÷ 693                             |                        | 25.6                                         | 24.5                                         | 97.4                                         |
| 12"                                                                  | 558.8   | 20                | 1 1/4"              | 220               | 315                                             | 350  | 19.9                                            | 80.3                                           | 452 ÷ 779                             |                        | 28.8                                         | 27.6                                         | 109.5                                        |
| 14"                                                                  | 603.25  | 20                | 1 3/8"              | 240               | 350                                             | 390  | 19.5                                            | 88.7                                           | 621 ÷ 1067                            | 932 ÷ 1600             | 30.2                                         | 28.9                                         | 114.9                                        |
| 16"                                                                  | 685.8   | 20                | 1 1/2"              | 260               | 400                                             | 445  | 19.8                                            | 96.3                                           | 870 ÷ 1500                            | 1305 ÷ 2250            | 32                                           | 30.7                                         | 121.9                                        |
| 18"                                                                  | 742.95  | 20                | 1 1/2"              | 280               | 450                                             | 500  | 19.9                                            | 90.4                                           | 1097 ÷ 1892                           | 1646 ÷ 2838            | 40.4                                         | 38.7                                         | 153.7                                        |
| 20"                                                                  | 812.8   | 24                | 1 5/8"              | 300               | 500                                             | 555  | 20.1                                            | 98.8                                           | 1157 ÷ 2024                           | 1735 ÷ 3036            | 32                                           | 30.7                                         | 121.8                                        |
| 24"                                                                  | 939.8   | 24                | 1 7/8"              | 340               | 600                                             | 665  | 20.3                                            | 103.2                                          | 1889 ÷ 3321                           | 2834 ÷ 4982            | 33.8                                         | 32.4                                         | 128.4                                        |
| 26"                                                                  | 1016    | 28                | 1 7/8"              | 350               | 650                                             | 705  | 24.8                                            | 143.5                                          | 1789 ÷ 3140                           | 2679 ÷ 4710            | 31.9                                         | 30.6                                         | 120.6                                        |
| 28"                                                                  | 1073.15 | 28                | 2"                  | 360               | 700                                             | 765  | 23                                              | 145.5                                          | 2394 ÷ 4127                           | 3591 ÷ 6190            | 37.5                                         | 35.9                                         | 141.9                                        |
| 30"                                                                  | 1130.3  | 28                | 2"                  | 380               | 750                                             | 820  | 22.9                                            | 150.3                                          | 2752 ÷ 4743                           | 4128 ÷ 7115            | 43.1                                         | 41.3                                         | 163.1                                        |

Obr. / Fig.41 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 600#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 600#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 8.5                                 | 24.9                               | 9 ÷ 15                                |                        | 9                                 | 8.6                               | 41.9                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 9.4                                 | 26.1                               | 15 ÷ 25                               |                        | 7.6                               | 7.3                               | 35                                |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 90       | 32                     | 42         | 10.6                                | 29.5                               | 20 ÷ 35                               |                        | 10.6                              | 10.2                              | 48.5                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 90       | 40                     | 56         | 9.4                                 | 35.3                               | 37 ÷ 64                               |                        | 19.5                              | 18.7                              | 89.6                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 9.9                                 | 38.7                               | 51 ÷ 88                               |                        | 15.3                              | 14.7                              | 70                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 10.3                                | 43.7                               | 37 ÷ 63                               |                        | 19.5                              | 18.7                              | 88.9                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 11.2                                | 44.6                               | 54 ÷ 93                               |                        | 16.2                              | 15.6                              | 73.7                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 12.5                                | 47.9                               | 72 ÷ 124                              |                        | 21.6                              | 20.7                              | 97.4                              |
| 4"                                                                   | 273.05  | 8        | 7/8"     | 150      | 110                    | 130        | 14.7                                | 46.5                               | 124 ÷ 213                             |                        | 23.2                              | 22.3                              | 103.8                             |
| 5"                                                                   | 330.2   | 8        | 1"       | 160      | 135                    | 155        | 17                                  | 48.2                               | 196 ÷ 336                             |                        | 24.6                              | 23.6                              | 109.2                             |
| 6"                                                                   | 355.6   | 12       | 1"       | 180      | 160                    | 180        | 19.2                                | 50.8                               | 173 ÷ 297                             |                        | 21.8                              | 20.9                              | 96.2                              |
| 8"                                                                   | 419.1   | 12       | 1 1/8"   | 200      | 210                    | 230        | 23.7                                | 60.6                               | 310 ÷ 532                             |                        | 27.6                              | 26.5                              | 121                               |
| 10"                                                                  | 508     | 16       | 1 1/4"   | 220      | 265                    | 295        | 20.7                                | 68.6                               | 424 ÷ 731                             |                        | 27                                | 25.9                              | 118.9                             |
| 12"                                                                  | 558.8   | 20       | 1 1/4"   | 220      | 315                    | 350        | 21                                  | 81                                 | 477 ÷ 821                             | 715 ÷ 1232             | 30.3                              | 29.1                              | 133.6                             |
| 14"                                                                  | 603.25  | 20       | 1 3/8"   | 240      | 350                    | 390        | 20.6                                | 93.6                               | 655 ÷ 1125                            | 983 ÷ 1688             | 31.8                              | 30.5                              | 140.2                             |
| 16"                                                                  | 685.8   | 20       | 1 1/2"   | 260      | 400                    | 445        | 20.8                                | 101.6                              | 918 ÷ 1582                            | 1377 ÷ 2373            | 33.8                              | 32.4                              | 148.8                             |
| 18"                                                                  | 742.95  | 20       | 1 1/2"   | 280      | 450                    | 500        | 21                                  | 95.4                               | 1157 ÷ 1996                           | 1736 ÷ 2993            | 42.6                              | 40.9                              | 187.6                             |
| 20"                                                                  | 812.8   | 24       | 1 5/8"   | 300      | 500                    | 555        | 21.2                                | 104.2                              | 1220 ÷ 2135                           | 1831 ÷ 3203            | 33.8                              | 32.4                              | 148.6                             |
| 24"                                                                  | 939.8   | 24       | 1 7/8"   | 340      | 600                    | 665        | 21.5                                | 108.8                              | 1993 ÷ 3503                           | 2989 ÷ 5255            | 35.6                              | 34.1                              | 156.7                             |
| 26"                                                                  | 1016    | 28       | 1 7/8"   | 350      | 650                    | 705        | 26.1                                | 151.4                              | 1884 ÷ 3312                           | 2826 ÷ 4968            | 33.7                              | 32.3                              | 147.2                             |
| 28"                                                                  | 1073.15 | 28       | 2"       | 360      | 700                    | 765        | 24.2                                | 153.5                              | 2526 ÷ 4353                           | 3788 ÷ 6529            | 39.5                              | 37.9                              | 173.1                             |
| 30"                                                                  | 1130.3  | 28       | 2"       | 380      | 750                    | 820        | 24.1                                | 158.6                              | 2903 ÷ 5003                           | 4354 ÷ 7505            | 45.4                              | 43.5                              | 199                               |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 600#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 9.7                                 | 28.6                               | 10 ÷ 18                               |                        | 10.3                              | 9.9                               | 48.3                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 10.7                                | 29.9                               | 17 ÷ 28                               |                        | 8.7                               | 8.4                               | 40.4                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 90       | 32                     | 42         | 12.2                                | 33.8                               | 23 ÷ 40                               |                        | 12.2                              | 11.7                              | 56                                |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 90       | 40                     | 56         | 10.7                                | 40.5                               | 43 ÷ 73                               |                        | 22.3                              | 21.4                              | 103.5                             |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 11.4                                | 44.3                               | 59 ÷ 100                              |                        | 17.5                              | 16.8                              | 80.9                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 11.8                                | 50.2                               | 43 ÷ 73                               |                        | 22.3                              | 21.4                              | 102.7                             |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 12.8                                | 51.1                               | 62 ÷ 107                              |                        | 18.6                              | 17.8                              | 85.1                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 14.3                                | 54.9                               | 83 ÷ 142                              |                        | 24.8                              | 23.7                              | 112.5                             |
| 4"                                                                   | 273.05  | 8        | 7/8"     | 150      | 110                    | 130        | 16.9                                | 53.3                               | 142 ÷ 244                             |                        | 26.6                              | 25.5                              | 119.8                             |
| 5"                                                                   | 330.2   | 8        | 1"       | 160      | 135                    | 155        | 19.5                                | 55.3                               | 224 ÷ 385                             |                        | 28.2                              | 27                                | 126.1                             |
| 6"                                                                   | 355.6   | 12       | 1"       | 180      | 160                    | 180        | 22.1                                | 58.3                               | 199 ÷ 341                             |                        | 25                                | 23.9                              | 111                               |
| 8"                                                                   | 419.1   | 12       | 1 1/8"   | 200      | 210                    | 230        | 27.2                                | 69.5                               | 356 ÷ 610                             |                        | 31.7                              | 30.4                              | 139.8                             |
| 10"                                                                  | 508     | 16       | 1 1/4"   | 220      | 265                    | 295        | 23.8                                | 78.7                               | 486 ÷ 838                             | 730 ÷ 1257             | 31                                | 29.7                              | 137.3                             |
| 12"                                                                  | 558.8   | 20       | 1 1/4"   | 220      | 315                    | 350        | 24.1                                | 92.9                               | 547 ÷ 942                             | 820 ÷ 1413             | 34.8                              | 33.4                              | 154.3                             |
| 14"                                                                  | 603.25  | 20       | 1 3/8"   | 240      | 350                    | 390        | 23.6                                | 103.2                              | 752 ÷ 1291                            | 1128 ÷ 1936            | 36.5                              | 35                                | 161.9                             |
| 16"                                                                  | 685.8   | 20       | 1 1/2"   | 260      | 400                    | 445        | 23.9                                | 116.5                              | 1052 ÷ 1815                           | 1579 ÷ 2722            | 38.7                              | 37.2                              | 171.8                             |
| 18"                                                                  | 742.95  | 20       | 1 1/2"   | 280      | 450                    | 500        | 24.1                                | 109.4                              | 1327 ÷ 2288                           | 1991 ÷ 3433            | 48.9                              | 46.9                              | 216.6                             |
| 20"                                                                  | 812.8   | 24       | 1 5/8"   | 300      | 500                    | 555        | 24.3                                | 119.5                              | 1400 ÷ 2449                           | 2099 ÷ 3673            | 38.7                              | 37.1                              | 171.6                             |
| 24"                                                                  | 939.8   | 24       | 1 7/8"   | 340      | 600                    | 665        | 24.6                                | 124.8                              | 2285 ÷ 4018                           | 3428 ÷ 6027            | 40.8                              | 39.2                              | 180.9                             |
| 26"                                                                  | 1016    | 28       | 1 7/8"   | 350      | 650                    | 705        | 29.9                                | 173.6                              | 2161 ÷ 3798                           | 3241 ÷ 5697            | 38.6                              | 37                                | 169.9                             |
| 28"                                                                  | 1073.15 | 28       | 2"       | 360      | 700                    | 765        | 27.8                                | 176                                | 2896 ÷ 4992                           | 4344 ÷ 7488            | 45.3                              | 43.4                              | 199.9                             |
| 30"                                                                  | 1130.3  | 28       | 2"       | 380      | 750                    | 820        | 27.7                                | 181.9                              | 3329 ÷ 5738                           | 4994 ÷ 8606            | 52.1                              | 49.9                              | 229.8                             |

Obr. / Fig.42 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 600#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>ključom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|-------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                         | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 600#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                    | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 7.4                                 | 21.8                               | 8 ÷ 13                                |                         | 7.9                               | 7.6                               | 28.2                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 8.2                                 | 22.8                               | 13 ÷ 22                               |                         | 6.7                               | 6.4                               | 23.8                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 90       | 32                     | 42         | 9.3                                 | 25.8                               | 18 ÷ 30                               |                         | 9.3                               | 8.9                               | 33.2                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 90       | 40                     | 56         | 8.2                                 | 30.9                               | 33 ÷ 56                               |                         | 17                                | 16.3                              | 60.8                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 8.7                                 | 33.8                               | 45 ÷ 77                               |                         | 13.4                              | 12.8                              | 47.7                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 9                                   | 38.3                               | 33 ÷ 55                               |                         | 17                                | 16.3                              | 60.8                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 9.8                                 | 39                                 | 48 ÷ 81                               |                         | 14.2                              | 13.6                              | 50.7                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 10.9                                | 41.9                               | 63 ÷ 108                              |                         | 18.9                              | 18.1                              | 67.4                              |
| 4"                                                                   | 273.05  | 8        | 7/8"     | 150      | 110                    | 130        | 12.9                                | 40.7                               | 108 ÷ 186                             |                         | 20.3                              | 19.5                              | 72.5                              |
| 5"                                                                   | 330.2   | 8        | 1"       | 160      | 135                    | 155        | 14.9                                | 42.2                               | 171 ÷ 294                             |                         | 21.5                              | 20.6                              | 76.8                              |
| 6"                                                                   | 355.6   | 12       | 1"       | 180      | 160                    | 180        | 16.8                                | 44.4                               | 151 ÷ 260                             |                         | 19                                | 18.3                              | 68                                |
| 8"                                                                   | 419.1   | 12       | 1 1/8"   | 200      | 210                    | 230        | 20.8                                | 53                                 | 271 ÷ 465                             |                         | 24.1                              | 23.2                              | 86.2                              |
| 10"                                                                  | 508     | 16       | 1 1/4"   | 220      | 265                    | 295        | 18.1                                | 60                                 | 371 ÷ 639                             |                         | 23.6                              | 22.6                              | 84.3                              |
| 12"                                                                  | 558.8   | 20       | 1 1/4"   | 220      | 315                    | 350        | 18.4                                | 70.9                               | 417 ÷ 718                             |                         | 26.5                              | 25.5                              | 94.8                              |
| 14"                                                                  | 603.25  | 20       | 1 3/8"   | 240      | 350                    | 390        | 18                                  | 85                                 | 573 ÷ 984                             | 860 ÷ 1477              | 27.8                              | 26.7                              | 99.4                              |
| 16"                                                                  | 685.8   | 20       | 1 1/2"   | 260      | 400                    | 445        | 18.2                                | 92.3                               | 803 ÷ 1384                            | 1204 ÷ 2076             | 29.6                              | 28.3                              | 105.5                             |
| 18"                                                                  | 742.95  | 20       | 1 1/2"   | 280      | 450                    | 500        | 18.4                                | 83.4                               | 1012 ÷ 1745                           | 1518 ÷ 2618             | 37.3                              | 35.7                              | 133.1                             |
| 20"                                                                  | 812.8   | 24       | 1 5/8"   | 300      | 500                    | 555        | 18.5                                | 91.1                               | 1067 ÷ 1868                           | 1601 ÷ 2801             | 29.5                              | 28.3                              | 105.4                             |
| 24"                                                                  | 939.8   | 24       | 1 7/8"   | 340      | 600                    | 665        | 18.8                                | 95.2                               | 1743 ÷ 3064                           | 2615 ÷ 4596             | 31.1                              | 29.9                              | 111.2                             |
| 26"                                                                  | 1016    | 28       | 1 7/8"   | 350      | 650                    | 705        | 22.8                                | 132.4                              | 1648 ÷ 2897                           | 2472 ÷ 4345             | 29.4                              | 28.2                              | 105.1                             |
| 28"                                                                  | 1073.15 | 28       | 2"       | 360      | 700                    | 765        | 21.2                                | 134.2                              | 2209 ÷ 3807                           | 3313 ÷ 5711             | 34.6                              | 33.1                              | 123.4                             |
| 30"                                                                  | 1130.3  | 28       | 2"       | 380      | 750                    | 820        | 21.1                                | 138.7                              | 2539 ÷ 4376                           | 3808 ÷ 6564             | 39.7                              | 38.1                              | 141.8                             |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>ključom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|-------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                         | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 600#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                    | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 8                                   | 19.5                               | 9 ÷ 14                                |                         | 8.6                               | 8.2                               | 34.3                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 8.9                                 | 21                                 | 14 ÷ 24                               |                         | 7.2                               | 6.9                               | 28.7                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 90       | 32                     | 42         | 10.1                                | 23.7                               | 19 ÷ 33                               |                         | 10.1                              | 9.7                               | 39.8                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 90       | 40                     | 56         | 8.9                                 | 30.3                               | 35 ÷ 60                               |                         | 18.5                              | 17.7                              | 73.4                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 9.4                                 | 30.7                               | 49 ÷ 83                               |                         | 14.5                              | 13.9                              | 57.4                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 9.7                                 | 37.4                               | 35 ÷ 60                               |                         | 18.4                              | 17.7                              | 72.9                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 10.6                                | 38                                 | 51 ÷ 88                               |                         | 15.4                              | 14.7                              | 60.4                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 11.8                                | 39.9                               | 69 ÷ 117                              |                         | 20.5                              | 19.6                              | 79.8                              |
| 4"                                                                   | 273.05  | 8        | 7/8"     | 150      | 110                    | 130        | 14                                  | 38.3                               | 118 ÷ 202                             |                         | 22                                | 21.1                              | 85                                |
| 5"                                                                   | 330.2   | 8        | 1"       | 160      | 135                    | 155        | 16.1                                | 39.5                               | 186 ÷ 318                             |                         | 23.3                              | 22.4                              | 89.5                              |
| 6"                                                                   | 355.6   | 12       | 1"       | 180      | 160                    | 180        | 18.2                                | 44.1                               | 164 ÷ 282                             |                         | 20.6                              | 19.8                              | 78.8                              |
| 8"                                                                   | 419.1   | 12       | 1 1/8"   | 200      | 210                    | 230        | 22.5                                | 49.5                               | 294 ÷ 504                             |                         | 26.2                              | 25.1                              | 99.2                              |
| 10"                                                                  | 508     | 16       | 1 1/4"   | 220      | 265                    | 295        | 19.7                                | 63.3                               | 402 ÷ 693                             |                         | 25.6                              | 24.5                              | 97.4                              |
| 12"                                                                  | 558.8   | 20       | 1 1/4"   | 220      | 315                    | 350        | 19.9                                | 80.3                               | 452 ÷ 779                             |                         | 28.8                              | 27.6                              | 109.5                             |
| 14"                                                                  | 603.25  | 20       | 1 3/8"   | 240      | 350                    | 390        | 19.5                                | 88.7                               | 621 ÷ 1067                            | 932 ÷ 1600              | 30.2                              | 28.9                              | 114.9                             |
| 16"                                                                  | 685.8   | 20       | 1 1/2"   | 260      | 400                    | 445        | 19.8                                | 96.3                               | 870 ÷ 1500                            | 1305 ÷ 2250             | 32                                | 30.7                              | 121.9                             |
| 18"                                                                  | 742.95  | 20       | 1 1/2"   | 280      | 450                    | 500        | 19.9                                | 90.4                               | 1097 ÷ 1892                           | 1646 ÷ 2838             | 40.4                              | 38.7                              | 153.7                             |
| 20"                                                                  | 812.8   | 24       | 1 5/8"   | 300      | 500                    | 555        | 20.1                                | 98.8                               | 1157 ÷ 2024                           | 1735 ÷ 3036             | 32                                | 30.7                              | 121.8                             |
| 24"                                                                  | 939.8   | 24       | 1 7/8"   | 340      | 600                    | 665        | 20.3                                | 103.2                              | 1889 ÷ 3321                           | 2834 ÷ 4982             | 33.8                              | 32.4                              | 128.4                             |
| 26"                                                                  | 1016    | 28       | 1 7/8"   | 350      | 650                    | 705        | 24.8                                | 143.5                              | 1789 ÷ 3140                           | 2679 ÷ 4710             | 31.9                              | 30.6                              | 120.6                             |
| 28"                                                                  | 1073.15 | 28       | 2"       | 360      | 700                    | 765        | 23                                  | 145.5                              | 2394 ÷ 4127                           | 3591 ÷ 6190             | 37.5                              | 35.9                              | 141.9                             |
| 30"                                                                  | 1130.3  | 28       | 2"       | 380      | 750                    | 820        | 22.9                                | 150.3                              | 2752 ÷ 4743                           | 4128 ÷ 7115             | 43.1                              | 41.3                              | 163.1                             |

Obr. / Fig.43 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 600#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 600#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 8.5                                 | 24.9                               | 9 ÷ 15                                |                        | 9                                 | 8.6                               | 41.9                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 9.4                                 | 26.1                               | 15 ÷ 25                               |                        | 7.6                               | 7.3                               | 35                                |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 90       | 32                     | 42         | 10.6                                | 29.5                               | 20 ÷ 35                               |                        | 10.6                              | 10.2                              | 48.5                              |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 90       | 40                     | 56         | 9.4                                 | 35.3                               | 37 ÷ 64                               |                        | 19.5                              | 18.7                              | 89.6                              |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 9.9                                 | 38.7                               | 51 ÷ 88                               |                        | 15.3                              | 14.7                              | 70                                |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 10.3                                | 43.7                               | 37 ÷ 63                               |                        | 19.5                              | 18.7                              | 88.9                              |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 11.2                                | 44.6                               | 54 ÷ 93                               |                        | 16.2                              | 15.6                              | 73.7                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 12.5                                | 47.9                               | 72 ÷ 124                              |                        | 21.6                              | 20.7                              | 97.4                              |
| 4"                                                                   | 273.05  | 8        | 7/8"     | 150      | 110                    | 130        | 14.7                                | 46.5                               | 124 ÷ 213                             |                        | 23.2                              | 22.3                              | 103.8                             |
| 5"                                                                   | 330.2   | 8        | 1"       | 160      | 135                    | 155        | 17                                  | 48.2                               | 196 ÷ 336                             |                        | 24.6                              | 23.6                              | 109.2                             |
| 6"                                                                   | 355.6   | 12       | 1"       | 180      | 160                    | 180        | 19.2                                | 50.8                               | 173 ÷ 297                             |                        | 21.8                              | 20.9                              | 96.2                              |
| 8"                                                                   | 419.1   | 12       | 1 1/8"   | 200      | 210                    | 230        | 23.7                                | 60.6                               | 310 ÷ 532                             |                        | 27.6                              | 26.5                              | 121                               |
| 10"                                                                  | 508     | 16       | 1 1/4"   | 220      | 265                    | 295        | 20.7                                | 68.6                               | 424 ÷ 731                             |                        | 27                                | 25.9                              | 118.9                             |
| 12"                                                                  | 558.8   | 20       | 1 1/4"   | 220      | 315                    | 350        | 21                                  | 81                                 | 477 ÷ 821                             | 715 ÷ 1232             | 30.3                              | 29.1                              | 133.6                             |
| 14"                                                                  | 603.25  | 20       | 1 3/8"   | 240      | 350                    | 390        | 20.6                                | 93.6                               | 655 ÷ 1125                            | 983 ÷ 1688             | 31.8                              | 30.5                              | 140.2                             |
| 16"                                                                  | 685.8   | 20       | 1 1/2"   | 260      | 400                    | 445        | 20.8                                | 101.6                              | 918 ÷ 1582                            | 1377 ÷ 2373            | 33.8                              | 32.4                              | 148.8                             |
| 18"                                                                  | 742.95  | 20       | 1 1/2"   | 280      | 450                    | 500        | 21                                  | 95.4                               | 1157 ÷ 1996                           | 1736 ÷ 2993            | 42.6                              | 40.9                              | 187.6                             |
| 20"                                                                  | 812.8   | 24       | 1 5/8"   | 300      | 500                    | 555        | 21.2                                | 104.2                              | 1220 ÷ 2135                           | 1831 ÷ 3203            | 33.8                              | 32.4                              | 148.6                             |
| 24"                                                                  | 939.8   | 24       | 1 7/8"   | 340      | 600                    | 665        | 21.5                                | 108.8                              | 1993 ÷ 3503                           | 2989 ÷ 5255            | 35.6                              | 34.1                              | 156.7                             |
| 26"                                                                  | 1016    | 28       | 1 7/8"   | 350      | 650                    | 705        | 26.1                                | 151.4                              | 1884 ÷ 3312                           | 2826 ÷ 4968            | 33.7                              | 32.3                              | 147.2                             |
| 28"                                                                  | 1073.15 | 28       | 2"       | 360      | 700                    | 765        | 24.2                                | 153.5                              | 2526 ÷ 4353                           | 3788 ÷ 6529            | 39.5                              | 37.9                              | 173.1                             |
| 30"                                                                  | 1130.3  | 28       | 2"       | 380      | 750                    | 820        | 24.1                                | 158.6                              | 2903 ÷ 5003                           | 4354 ÷ 7505            | 45.4                              | 43.5                              | 199                               |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |         |          |          |          |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|---------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda  | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 600#    | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |         |          |          |          |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 95.25   | 4        | 1/2"     | 65       | 20                     | 30         | 9.7                                 | 28.6                               | 10 ÷ 18                               |                        | 10.3                              | 9.9                               | 48.3                              |
| 3/4"                                                                 | 117.47  | 4        | 5/8"     | 80       | 25                     | 35         | 10.7                                | 29.9                               | 17 ÷ 28                               |                        | 8.7                               | 8.4                               | 40.4                              |
| 1"                                                                   | 123.82  | 4        | 5/8"     | 90       | 32                     | 42         | 12.2                                | 33.8                               | 23 ÷ 40                               |                        | 12.2                              | 11.7                              | 56                                |
| 1 1/4"                                                               | 133.35  | 4        | 5/8"     | 90       | 40                     | 56         | 10.7                                | 40.5                               | 43 ÷ 73                               |                        | 22.3                              | 21.4                              | 103.5                             |
| 1 1/2"                                                               | 155.57  | 4        | 3/4"     | 100      | 45                     | 61         | 11.4                                | 44.3                               | 59 ÷ 100                              |                        | 17.5                              | 16.8                              | 80.9                              |
| 2"                                                                   | 165.1   | 8        | 5/8"     | 100      | 60                     | 80         | 11.8                                | 50.2                               | 43 ÷ 73                               |                        | 22.3                              | 21.4                              | 102.7                             |
| 2 1/2"                                                               | 190.5   | 8        | 3/4"     | 110      | 70                     | 90         | 12.8                                | 51.1                               | 62 ÷ 107                              |                        | 18.6                              | 17.8                              | 85.1                              |
| 3"                                                                   | 209.55  | 8        | 3/4"     | 120      | 85                     | 105        | 14.3                                | 54.9                               | 83 ÷ 142                              |                        | 24.8                              | 23.7                              | 112.5                             |
| 4"                                                                   | 273.05  | 8        | 7/8"     | 150      | 110                    | 130        | 16.9                                | 53.3                               | 142 ÷ 244                             |                        | 26.6                              | 25.5                              | 119.8                             |
| 5"                                                                   | 330.2   | 8        | 1"       | 160      | 135                    | 155        | 19.5                                | 55.3                               | 224 ÷ 385                             |                        | 28.2                              | 27                                | 126.1                             |
| 6"                                                                   | 355.6   | 12       | 1"       | 180      | 160                    | 180        | 22.1                                | 58.3                               | 199 ÷ 341                             |                        | 25                                | 23.9                              | 111                               |
| 8"                                                                   | 419.1   | 12       | 1 1/8"   | 200      | 210                    | 230        | 27.2                                | 69.5                               | 356 ÷ 610                             |                        | 31.7                              | 30.4                              | 139.8                             |
| 10"                                                                  | 508     | 16       | 1 1/4"   | 220      | 265                    | 295        | 23.8                                | 78.7                               | 486 ÷ 838                             | 730 ÷ 1257             | 31                                | 29.7                              | 137.3                             |
| 12"                                                                  | 558.8   | 20       | 1 1/4"   | 220      | 315                    | 350        | 24.1                                | 92.9                               | 547 ÷ 942                             | 820 ÷ 1413             | 34.8                              | 33.4                              | 154.3                             |
| 14"                                                                  | 603.25  | 20       | 1 3/8"   | 240      | 350                    | 390        | 23.6                                | 103.2                              | 752 ÷ 1291                            | 1128 ÷ 1936            | 36.5                              | 35                                | 161.9                             |
| 16"                                                                  | 685.8   | 20       | 1 1/2"   | 260      | 400                    | 445        | 23.9                                | 116.5                              | 1052 ÷ 1815                           | 1579 ÷ 2722            | 38.7                              | 37.2                              | 171.8                             |
| 18"                                                                  | 742.95  | 20       | 1 1/2"   | 280      | 450                    | 500        | 24.1                                | 109.4                              | 1327 ÷ 2288                           | 1991 ÷ 3433            | 48.9                              | 46.9                              | 216.6                             |
| 20"                                                                  | 812.8   | 24       | 1 5/8"   | 300      | 500                    | 555        | 24.3                                | 119.5                              | 1400 ÷ 2449                           | 2099 ÷ 3673            | 38.7                              | 37.1                              | 171.6                             |
| 24"                                                                  | 939.8   | 24       | 1 7/8"   | 340      | 600                    | 665        | 24.6                                | 124.8                              | 2285 ÷ 4018                           | 3428 ÷ 6027            | 40.8                              | 39.2                              | 180.9                             |
| 26"                                                                  | 1016    | 28       | 1 7/8"   | 350      | 650                    | 705        | 29.9                                | 173.6                              | 2161 ÷ 3798                           | 3241 ÷ 5697            | 38.6                              | 37                                | 169.9                             |
| 28"                                                                  | 1073.15 | 28       | 2"       | 360      | 700                    | 765        | 27.8                                | 176                                | 2896 ÷ 4992                           | 4344 ÷ 7488            | 45.3                              | 43.4                              | 199.9                             |
| 30"                                                                  | 1130.3  | 28       | 2"       | 380      | 750                    | 820        | 27.7                                | 181.9                              | 3329 ÷ 5738                           | 4994 ÷ 8606            | 52.1                              | 49.9                              | 229.8                             |

Obr. / Fig.44 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 600#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 5.6                               | 5.4                               | 20.1                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 7.5                               | 7.2                               | 26.7                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 7.6                               | 7.2                               | 27                                |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 13.8                              | 13.3                              | 49.4                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 12.3                              | 11.8                              | 44                                |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 13.8                              | 13.2                              | 49.3                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.1                              | 12.5                              | 46.7                              |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 25.7                              | 24.7                              | 91.9                              |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 22.8                              | 21.8                              | 81.3                              |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 70.6                               | 416 ÷ 717                             |                        | 26.5                              | 25.4                              | 94.6                              |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             | 531 ÷ 910              | 31.5                              | 30.2                              | 112.5                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 33.6                              | 32.2                              | 120                               |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 40                                | 38.3                              | 142.7                             |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 45.4                              | 43.5                              | 161.9                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 42.4                              | 40.6                              | 151.3                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 42                                | 40.3                              | 150                               |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 40.7                              | 39                                | 145.2                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 47.8                              | 45.8                              | 170.7                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 51.5                              | 49.4                              | 184                               |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>kľúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            | μ = 0.11 ± 0.2                      |                                    | μ = 0.11 ± 0.2                        |                        | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 5.6                               | 5.4                               | 23.4                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 7.5                               | 7.2                               | 30.8                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 7.6                               | 7.2                               | 30.8                              |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 13.8                              | 13.3                              | 56.8                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 12.3                              | 11.8                              | 50.4                              |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 13.8                              | 13.2                              | 56.4                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.1                              | 12.5                              | 53                                |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 25.7                              | 24.7                              | 104.6                             |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 22.8                              | 21.8                              | 91.6                              |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 58.6                               | 416 ÷ 717                             |                        | 26.5                              | 25.4                              | 106.6                             |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             | 531 ÷ 910              | 31.5                              | 30.2                              | 126.7                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 33.6                              | 32.2                              | 134.4                             |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 40                                | 38.3                              | 159.8                             |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 45.4                              | 43.5                              | 181.4                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 42.4                              | 40.6                              | 168.3                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 42                                | 40.3                              | 166.7                             |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 40.7                              | 39                                | 161.9                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 47.8                              | 45.8                              | 189.7                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 51.5                              | 49.4                              | 204.1                             |

Obr. / Fig.45 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 900#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 5.6                               | 5.7                               | 28.5                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 7.6                               | 7.5                               | 37.6                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 7.6                               | 7.5                               | 37.6                              |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 14                                | 13.8                              | 69.4                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 12.4                              | 12.2                              | 61.5                              |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 13.9                              | 13.7                              | 68.8                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.1                              | 12.8                              | 64.7                              |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 25.7                              | 25.3                              | 127.6                             |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 22.8                              | 22.2                              | 111.8                             |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 70.6                               | 416 ÷ 717                             |                        | 26.5                              | 25.8                              | 130.1                             |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             | 531 ÷ 910              | 31.5                              | 30.7                              | 154.6                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 33.6                              | 32.5                              | 164                               |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 40                                | 38.7                              | 195                               |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 45.4                              | 43.9                              | 221.4                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 42.4                              | 40.8                              | 205.4                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 42                                | 40.4                              | 203.4                             |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 40.7                              | 39.2                              | 197.6                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 47.8                              | 45.9                              | 231.5                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 51.5                              | 49.4                              | 249.1                             |

  

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | HLAVOVÉ SKRUTKY                   |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    | μ = 0.11 ± 0.2                        | μ = 0.11 ± 0.2         | SA193B16                          | SA193B7                           | SA193B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 6.1                               | 6.4                               | 32.9                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 8                                 | 8.5                               | 43.4                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 8                                 | 8.5                               | 43.4                              |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 14.9                              | 15.7                              | 80.1                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 13.2                              | 13.9                              | 71                                |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 14.7                              | 15.6                              | 79.5                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.9                              | 14.6                              | 74.7                              |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 27.3                              | 28.8                              | 147.4                             |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 23.9                              | 25.3                              | 129.1                             |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 70.6                               | 416 ÷ 717                             |                        | 27.9                              | 29.4                              | 150.2                             |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             |                        | 33.1                              | 34.9                              | 178.5                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 35.1                              | 37.1                              | 189.3                             |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 41.8                              | 44.1                              | 225.1                             |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 47.4                              | 50                                | 255.6                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 44                                | 46.4                              | 237.2                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 43.6                              | 46                                | 234.9                             |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 42.3                              | 44.7                              | 228.2                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 49.6                              | 52.3                              | 267.3                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 53.3                              | 56.3                              | 287.6                             |

Obr. / Fig.46 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 900#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 20°C                        |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 5.6                               | 5.4                               | 20.1                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 7.5                               | 7.2                               | 26.7                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 7.6                               | 7.2                               | 27                                |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 13.8                              | 13.3                              | 49.4                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 12.3                              | 11.8                              | 44                                |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 13.8                              | 13.2                              | 49.3                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.1                              | 12.5                              | 46.7                              |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 25.7                              | 24.7                              | 91.9                              |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 22.8                              | 21.8                              | 81.3                              |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 70.6                               | 416 ÷ 717                             |                        | 26.5                              | 25.4                              | 94.6                              |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             | 531 ÷ 910              | 31.5                              | 30.2                              | 112.5                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 33.6                              | 32.2                              | 120                               |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 40                                | 38.3                              | 142.7                             |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 45.4                              | 43.5                              | 161.9                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 42.4                              | 40.6                              | 151.3                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 42                                | 40.3                              | 150                               |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 40.7                              | 39                                | 145.2                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 47.8                              | 45.8                              | 170.7                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 51.5                              | 49.4                              | 184                               |

| TESNENIE - Grooved Gasket KEMPCHEN B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 100°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            | μ = 0.11 ÷ 0.2                      |                                    | μ = 0.11 ÷ 0.2                        |                        | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 5.6                               | 5.4                               | 23.4                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 7.5                               | 7.2                               | 30.8                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 7.6                               | 7.2                               | 30.8                              |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 13.8                              | 13.3                              | 56.8                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 12.3                              | 11.8                              | 50.4                              |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 13.8                              | 13.2                              | 56.4                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.1                              | 12.5                              | 53                                |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 25.7                              | 24.7                              | 104.6                             |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 22.8                              | 21.8                              | 91.6                              |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 58.6                               | 416 ÷ 717                             |                        | 26.5                              | 25.4                              | 106.6                             |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             | 531 ÷ 910              | 31.5                              | 30.2                              | 126.7                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 33.6                              | 32.2                              | 134.4                             |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 40                                | 38.3                              | 159.8                             |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 45.4                              | 43.5                              | 181.4                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 42.4                              | 40.6                              | 168.3                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 42                                | 40.3                              | 166.7                             |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 40.7                              | 39                                | 161.9                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 47.8                              | 45.8                              | 189.7                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 51.5                              | 49.4                              | 204.1                             |

Obr. / Fig.47 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 900#

# VÝPOČET UTAHOVACÍCH MOMENTŮ

| TESNENIE - Grooved Gasket KEMPCHEM B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 200°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 5.6                               | 5.7                               | 28.5                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 7.6                               | 7.5                               | 37.6                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 7.6                               | 7.5                               | 37.6                              |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 14                                | 13.8                              | 69.4                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 12.4                              | 12.2                              | 61.5                              |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 13.9                              | 13.7                              | 68.8                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.1                              | 12.8                              | 64.7                              |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 25.7                              | 25.3                              | 127.6                             |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 22.8                              | 22.2                              | 111.8                             |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 70.6                               | 416 ÷ 717                             |                        | 26.5                              | 25.8                              | 130.1                             |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             | 531 ÷ 910              | 31.5                              | 30.7                              | 154.6                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 33.6                              | 32.5                              | 164                               |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 40                                | 38.7                              | 195                               |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 45.4                              | 43.9                              | 221.4                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 42.4                              | 40.8                              | 205.4                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 42                                | 40.4                              | 203.4                             |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 40.7                              | 39.2                              | 197.6                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 47.8                              | 45.9                              | 231.5                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 51.5                              | 49.4                              | 249.1                             |

| TESNENIE - Grooved Gasket KEMPCHEM B7A,B9A,B11A<br>m = 3 qt = 69*MPa |        |          |          |          |                        |            | TEPLOTA 300°C                       |                                    | Uťahovací MOMENT<br>pre jednu skrutku | Hydraulickým<br>klúčom | SVORNÍKOVÉ SKRUTKY                |                                   |                                   |
|----------------------------------------------------------------------|--------|----------|----------|----------|------------------------|------------|-------------------------------------|------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| DN                                                                   | Trieda | Počet    | Veľkosť  | Dĺžka    | TESNENIE - rozmer ANSI |            | VYUŽITIE                            | VYUŽITIE                           | VDI 2230                              |                        | Skrutka                           | Skrutka                           | Skrutka                           |
| [mm]                                                                 | 900#   | Skrutiek | Skrutiek | Skrutiek | GROOVED id             | GROOVED od | V <sub>gasket</sub><br>tesnenie [%] | V <sub>flange</sub><br>príruba [%] | Uťahovací Moment                      | [Nm]                   | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] | V <sub>bolt</sub><br>Využitie [%] |
| podľa EN 1514-6                                                      |        |          |          |          |                        |            |                                     |                                    | μ = 0.11 ÷ 0.2                        | μ = 0.11 ÷ 0.2         | SA320B16                          | SA320B7                           | SA320B8M                          |
| 1/2"                                                                 | 120.65 | 4        | 3/4"     | 100      | 20                     | 30         | 12.4                                | 18.6                               | 19 ÷ 32                               |                        | 6.1                               | 6.4                               | 32.9                              |
| 3/4"                                                                 | 130.17 | 4        | 3/4"     | 110      | 25                     | 35         | 13.7                                | 18.1                               | 25 ÷ 43                               |                        | 8                                 | 8.5                               | 43.4                              |
| 1"                                                                   | 149.22 | 4        | 7/8"     | 120      | 32                     | 42         | 15.6                                | 19.8                               | 40 ÷ 69                               |                        | 8                                 | 8.5                               | 43.4                              |
| 1 1/4"                                                               | 158.75 | 4        | 7/8"     | 120      | 40                     | 56         | 13.7                                | 33.1                               | 74 ÷ 127                              |                        | 14.9                              | 15.7                              | 80.1                              |
| 1 1/2"                                                               | 177.8  | 4        | 1"       | 140      | 45                     | 61         | 14.6                                | 32.8                               | 98 ÷ 168                              |                        | 13.2                              | 13.9                              | 71                                |
| 2"                                                                   | 215.9  | 8        | 7/8"     | 140      | 60                     | 80         | 15                                  | 32.4                               | 74 ÷ 127                              |                        | 14.7                              | 15.6                              | 79.5                              |
| 2 1/2"                                                               | 244.47 | 8        | 1"       | 160      | 70                     | 90         | 16.4                                | 33.9                               | 104 ÷ 178                             |                        | 13.9                              | 14.6                              | 74.7                              |
| 3"                                                                   | 241.3  | 8        | 7/8"     | 150      | 85                     | 110        | 16.1                                | 56.6                               | 137 ÷ 236                             |                        | 27.3                              | 28.8                              | 147.4                             |
| 4"                                                                   | 292.1  | 8        | 1 1/8"   | 180      | 110                    | 135        | 18.7                                | 63.8                               | 256 ÷ 438                             |                        | 23.9                              | 25.3                              | 129.1                             |
| 5"                                                                   | 349.25 | 8        | 1 1/4"   | 200      | 135                    | 165        | 19                                  | 70.6                               | 416 ÷ 717                             |                        | 27.9                              | 29.4                              | 150.2                             |
| 6"                                                                   | 381    | 12       | 1 1/8"   | 200      | 160                    | 195        | 19.2                                | 70.9                               | 354 ÷ 607                             |                        | 33.1                              | 34.9                              | 178.5                             |
| 8"                                                                   | 469.9  | 12       | 1 3/8"   | 220      | 210                    | 250        | 21                                  | 81.3                               | 692 ÷ 1188                            | 1038 ÷ 1783            | 35.1                              | 37.1                              | 189.3                             |
| 10"                                                                  | 546.1  | 16       | 1 3/8"   | 240      | 265                    | 315        | 21.1                                | 92.6                               | 823 ÷ 1414                            | 1235 ÷ 2120            | 41.8                              | 44.1                              | 225.1                             |
| 12"                                                                  | 609.6  | 20       | 1 3/8"   | 260      | 315                    | 375        | 21                                  | 105.6                              | 934 ÷ 1604                            | 1402 ÷ 2407            | 47.4                              | 50                                | 255.6                             |
| 14"                                                                  | 641.35 | 20       | 1 1/2"   | 280      | 350                    | 405        | 23.9                                | 101.5                              | 1151 ÷ 1984                           | 1726 ÷ 2976            | 44                                | 46.4                              | 237.2                             |
| 16"                                                                  | 704.85 | 20       | 1 5/8"   | 300      | 400                    | 460        | 24.7                                | 109.7                              | 1519 ÷ 2657                           | 2278 ÷ 3985            | 43.6                              | 46                                | 234.9                             |
| 18"                                                                  | 787.4  | 20       | 1 7/8"   | 340      | 450                    | 525        | 23                                  | 111.3                              | 2277 ÷ 4002                           | 3415 ÷ 6003            | 42.3                              | 44.7                              | 228.2                             |
| 20"                                                                  | 857.25 | 20       | 2"       | 360      | 500                    | 575        | 24.7                                | 115.5                              | 3056 ÷ 5267                           | 4584 ÷ 7900            | 49.6                              | 52.3                              | 267.3                             |
| 24"                                                                  | 1041.4 | 20       | 2 1/4"   | 440      | 600                    | 685        | 25.8                                | 102.2                              | 4778 ÷ 8280                           | 7168 ÷ 12419           | 53.3                              | 56.3                              | 287.6                             |

Obr. / Fig.48 Uťahovací momenty pro přírubové spoje s hřebínkovým těsněním pro tlakovou třídu 900#