

## Theoretical pushing and pulling forces for double-acting cylinders [N]

| Ø   | Piston area [mm <sup>2</sup> ] |       | 1 bar    |      | 2 bar    |      | 3 bar    |      | 4 bar    |       | 5 bar    |       |
|-----|--------------------------------|-------|----------|------|----------|------|----------|------|----------|-------|----------|-------|
|     | Pressure                       | Pull  | Pressure | Pull | Pressure | Pull | Pressure | Pull | Pressure | Pull  | Pressure | Pull  |
| 10  | 78                             | 66    | 7,8      | 6,5  | 15,6     | 13,2 | 23       | 19   | 31       | 26    | 39       | 33    |
| 12  | 113                            | 85    | 11       | 8,5  | 23       | 17   | 34       | 25   | 45       | 34    | 56       | 42    |
| 16  | 201                            | 173   | 20       | 17   | 40       | 35   | 60       | 52   | 80       | 69    | 100      | 86    |
| 20  | 314                            | 264   | 31       | 26   | 63       | 53   | 94       | 79   | 126      | 106   | 157      | 132   |
| 25  | 491                            | 412   | 49       | 41   | 98       | 82   | 147      | 124  | 196      | 165   | 245      | 206   |
| 32  | 804                            | 691   | 80       | 69   | 161      | 138  | 241      | 207  | 322      | 276   | 402      | 345   |
| 40  | 1256                           | 1056  | 125      | 105  | 251      | 211  | 376      | 316  | 502      | 422   | 628      | 528   |
| 50  | 1962                           | 1649  | 196      | 165  | 393      | 330  | 588      | 494  | 785      | 660   | 981      | 824   |
| 63  | 3116                           | 2802  | 311      | 280  | 623      | 560  | 934      | 840  | 1246     | 1120  | 1558     | 1401  |
| 80  | 5024                           | 4533  | 502      | 453  | 1005     | 907  | 1507     | 1360 | 2010     | 1814  | 2512     | 2266  |
| 100 | 7850                           | 7143  | 785      | 714  | 1570     | 1429 | 2355     | 2143 | 3140     | 2857  | 3925     | 3571  |
| 125 | 12266                          | 11599 | 1226     | 1160 | 2453     | 2319 | 3679     | 3479 | 4906     | 4639  | 6133     | 5799  |
| 160 | 20096                          | 18840 | 2009     | 1884 | 4019     | 3768 | 6028     | 5652 | 8038     | 7536  | 10048    | 9420  |
| 200 | 31400                          | 30144 | 3140     | 3014 | 6280     | 6028 | 9420     | 9043 | 12560    | 12057 | 15700    | 15072 |

| Ø   | Piston area [mm <sup>2</sup> ] |       | 6 bar    |       | 7 bar    |       | 8 bar    |       | 9 bar    |       | 10 bar   |       |
|-----|--------------------------------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|
|     | Pressure                       | Pull  | Pressure | Pull  | Pressure | Pull  | Pressure | Pull  | Pressure | Pull  | Pressure | Pull  |
| 10  | 78                             | 66    | 47       | 40    | 54       | 48    | 62       | 53    | 70       | 59    | 78       | 66    |
| 12  | 113                            | 85    | 68       | 51    | 79       | 59    | 90       | 68    | 102      | 76    | 113      | 85    |
| 16  | 201                            | 173   | 121      | 104   | 141      | 121   | 161      | 138   | 181      | 156   | 201      | 173   |
| 20  | 314                            | 264   | 188      | 158   | 220      | 185   | 251      | 211   | 283      | 238   | 314      | 264   |
| 25  | 491                            | 412   | 295      | 247   | 344      | 288   | 393      | 330   | 442      | 371   | 491      | 412   |
| 32  | 804                            | 691   | 482      | 414   | 563      | 484   | 643      | 553   | 724      | 622   | 804      | 691   |
| 40  | 1256                           | 1056  | 754      | 633   | 879      | 739   | 1005     | 844   | 1130     | 950   | 1256     | 1055  |
| 50  | 1962                           | 1649  | 1178     | 990   | 1373     | 1154  | 1570     | 1320  | 1765     | 1484  | 1963     | 1650  |
| 63  | 3116                           | 2802  | 1869     | 1680  | 2181     | 1961  | 2493     | 2240  | 2804     | 2521  | 3116     | 2800  |
| 80  | 5024                           | 4533  | 3014     | 2722  | 3516     | 3173  | 4019     | 3629  | 4521     | 4079  | 5024     | 4536  |
| 100 | 7850                           | 7143  | 4710     | 4286  | 5495     | 5000  | 6280     | 5715  | 7065     | 6428  | 7850     | 7143  |
| 125 | 12266                          | 11599 | 7359     | 6959  | 8586     | 8119  | 9812     | 9279  | 11039    | 10439 | 14719    | 11559 |
| 160 | 20096                          | 18840 | 12057    | 11304 | 14067    | 13188 | 16076    | 15072 | 18086    | 16956 | 20096    | 18840 |
| 200 | 31400                          | 30144 | 18840    | 18086 | 21980    | 21100 | 25120    | 24115 | 28260    | 27129 | 31400    | 30144 |

## Compressed air consumption for pneumatic cylinders [Nl/min]

The compressed air consumption  $q$  for pneumatic cylinders is determined using the following formula:

$$q = \frac{d^2 \times \pi}{4} \times H \times p \times a \times b$$

$q$  = Compressed air consumption (1 bar abs and 20° C) [Nl/min]

$d$  = Piston diameter [dm]

$H$  = Stroke [dm]

$p$  = Operating pressure [bar abs]

$a$  = Working cycles per minute [1/min]

$b$  = 1 for single-acting cylinders, 2 for double-acting cylinders

