

WŁAŚCIWOŚCI MECHANICZNE

| Nazwa gatunku        | Norma      | Numer materiału | Granica plastyczności (R <sub>p</sub> H)<br>- minimum dla grubości ścianki w mm MPa (N/mm²) |                  |                  |                  |          | Wytrzymałość na rozciąganie (R <sub>m</sub> )<br>- minimum dla grubości ścianki w mm MPa (N/mm²) |                      |                  |          | Minimalne wydłużenie (A) w % <sup>b</sup> |         |                  | Badanie udarności     |                  |
|----------------------|------------|-----------------|---------------------------------------------------------------------------------------------|------------------|------------------|------------------|----------|--------------------------------------------------------------------------------------------------|----------------------|------------------|----------|-------------------------------------------|---------|------------------|-----------------------|------------------|
|                      |            |                 | T≤16                                                                                        | 16<T≤40          | 40<T≤65          | 65<T≤80          | 80<T≤100 | T≤16                                                                                             | 16<T≤40              | 40<T≤65          | 65<T≤100 | T≤40                                      | 40<T≤63 | 63<T≤100         | Minimalna śr. wartość | Temp.            |
| P235TR1 <sup>e</sup> | EN 10216-1 | 1.0254          | 235                                                                                         | 225              | 215 <sup>c</sup> | -                | a        | -                                                                                                | 360-500              | -                | -        | 25                                        | 23      | -                | -                     | -                |
| St 37.0              | DIN 1629   | 1.0254          | 235                                                                                         | 225              | 215              | -                | -        | -                                                                                                | 350-480              | -                | -        | 25                                        | 23      | -                | -                     | -                |
| P235TR2              | EN 10216-1 | 1.0255          | 235                                                                                         | 225              | 215 <sup>c</sup> | -                | a        | -                                                                                                | 360-500              | -                | -        | 25                                        | 23      | 40 <sup>d</sup>  | 27                    | 0                |
| P265TR1 <sup>e</sup> | EN 10216-1 | 1.0258          | 265                                                                                         | 255              | 245 <sup>c</sup> | -                | a        | -                                                                                                | 410-570              | -                | -        | 21                                        | 19      | -                | -                     | -                |
| St 44.0              | DIN 1629   | 1.0256          | 275                                                                                         | 265              | 255              | -                | -        | -                                                                                                | 420-550              | -                | -        | 21                                        | 19      | -                | -                     | -                |
| P265TR2              | EN 10216-1 | 1.0259          | 265                                                                                         | 255              | 245 <sup>c</sup> | -                | a        | -                                                                                                | 410-570              | -                | -        | 21                                        | 19      | 40 <sup>d</sup>  | 27                    | 0                |
| P355N                | EN 10216-3 | 1.0545          | 355 <sup>p</sup>                                                                            | 345 <sup>q</sup> | 335 <sup>r</sup> | 315              | 305      | 490-650 <sup>s</sup>                                                                             | 490-630 <sup>t</sup> | 450-590          | -        | 22                                        | 20      | 40               | 40                    | -20              |
| P355NH               | EN 10216-3 | 1.0539          | 355 <sup>p</sup>                                                                            | 345 <sup>q</sup> | 335 <sup>r</sup> | 315              | 305      | 490-650 <sup>s</sup>                                                                             | 490-630 <sup>t</sup> | 450-590          | -        | 22                                        | 20      | 40               | 40                    | -20              |
| E235                 | EN 10297-1 | 1.0308          | 235                                                                                         | 225              | 215              | 205              | 195      | 360                                                                                              | 360                  | 340              | -        | 25                                        | 23      | -                | -                     | -                |
| E275                 | EN 10297-1 | 1.0205          | 275                                                                                         | 265              | 255              | 245              | 235      | 410                                                                                              | 410                  | 380              | -        | 22                                        | 20      | -                | -                     | -                |
| E355                 | EN 10297-1 | 1.0580          | 355                                                                                         | 345              | 335              | 315              | 295      | 490                                                                                              | 490                  | 470              | -        | 20                                        | 18      | -                | -                     | -                |
| E355                 | EN 10294-1 | 1.0580          | 355                                                                                         | 345 <sup>u</sup> | 335 <sup>v</sup> | -                | -        | 490                                                                                              | 490 <sup>u</sup>     | 470 <sup>f</sup> | -        | 18                                        | 16      | -                | -                     | -                |
| St 52.0              | DIN 1629   | 1.0421          | 355                                                                                         | 345              | 335              | -                | -        | -                                                                                                | 500-650              | -                | -        | 21                                        | 19      | -                | -                     | -                |
| E470                 | EN 10297-1 | 1.0536          | 470                                                                                         | 430              | -                | -                | -        | 650                                                                                              | 600                  | -                | -        | 17                                        | 15      | -                | -                     | -                |
| E470                 | EN 10294-1 | 1.0536          | 470                                                                                         | 460 <sup>u</sup> | 430 <sup>v</sup> | -                | -        | 650                                                                                              | 620 <sup>u</sup>     | 600 <sup>g</sup> | -        | 17                                        | 15      | -                | -                     | -                |
| E275K2               | EN 10297-1 | 1.0456          | 275                                                                                         | 265              | 255              | 245              | 235      | 410                                                                                              | 410                  | 380              | -        | 22                                        | 20      | 40               | 27                    | -20              |
| E355K2               | EN 10297-1 | 1.0920          | 355                                                                                         | 345              | 335              | 315              | 295      | 490                                                                                              | 490                  | 470              | -        | 20                                        | 18      | 40               | 27                    | -20              |
| E420J2               | EN 10297-1 | 1.0599          | 420                                                                                         | 400              | 390              | 370              | 360      | 600                                                                                              | 560                  | 530              | -        | 19                                        | 17      | 27               | 20                    | -20              |
| E460K2               | EN 10297-1 | 1.8891          | 460                                                                                         | 440              | 430              | 410              | 390      | 550                                                                                              | 550                  | 520              | -        | 19                                        | 17      | 40               | 27                    | -20              |
| E590K2               | EN 10297-1 | 1.0644          | 590                                                                                         | 540              | 480              | 455              | 420      | 700                                                                                              | 650                  | 570              | -        | 16                                        | 14      | 40               | 27                    | -20              |
| S235JRH <sup>f</sup> | EN 10210-1 | 1.0039          | 235                                                                                         | 225              | 215 <sup>l</sup> | 215 <sup>m</sup> | 215      | 360-510 <sup>n</sup>                                                                             | 360-510 <sup>o</sup> | -                | -        | 26                                        | 25      | 24               | h                     | 27 <sup>k</sup>  |
| S275JOH <sup>f</sup> | EN 10210-1 | 1.0149          | 275                                                                                         | 265              | 255 <sup>l</sup> | 245 <sup>m</sup> | 235      | 430-580 <sup>n</sup>                                                                             | 410-560 <sup>o</sup> | -                | -        | 23                                        | 22      | 21               | h                     | 27 <sup>k</sup>  |
| S275J2H              | EN 10210-1 | 1.0138          | 275                                                                                         | 265              | 255 <sup>l</sup> | 245 <sup>m</sup> | 235      | 430-580 <sup>n</sup>                                                                             | 410-560 <sup>o</sup> | -                | -        | 23                                        | 22      | 21               | h                     | 27 <sup>k</sup>  |
| S355J2H              | EN 10210-1 | 1.0576          | 355                                                                                         | 345              | 335 <sup>l</sup> | 325 <sup>m</sup> | 315      | 510-680 <sup>n</sup>                                                                             | 470-630 <sup>o</sup> | -                | -        | 22                                        | 21      | 20               | h                     | 27 <sup>k</sup>  |
| S355K2H              | EN 10210-1 | 1.0512          | 355                                                                                         | 345              | 335 <sup>l</sup> | 325 <sup>m</sup> | 315      | 510-680 <sup>n</sup>                                                                             | 470-630 <sup>o</sup> | -                | -        | 22                                        | 21      | 20               | h                     | 40 <sup>jk</sup> |
| S275NH               | EN 10210-1 | 1.0493          | 275                                                                                         | 265              | 255              | -                | -        | 370-510                                                                                          | -                    | -                | -        | 24                                        | 22      | 40 <sup>jk</sup> | -                     | -20              |
| S355NH               | EN 10210-1 | 1.0539          | 355                                                                                         | 345              | 335              | -                | -        | 470-630                                                                                          | -                    | -                | -        | 22                                        | 20      | 40 <sup>jk</sup> | -                     | -20              |
| S420NH               | EN 10210-1 | 1.8750          | 420                                                                                         | 400              | 390              | -                | -        | 520-680                                                                                          | -                    | -                | -        | 19                                        | 17      | 40 <sup>jk</sup> | -                     | -20              |
| S460NH               | EN 10210-1 | 1.8953          | 460                                                                                         | 440              | 430              | -                | -        | 540-720                                                                                          | -                    | -                | -        | 17                                        | 15      | 40 <sup>jk</sup> | -                     | -20              |

a - dla ścianek >60 mm właściwości mechaniczne do uzgodnienia  
b - l- wzdłużnie, t- poprzecznie  
c - wartości dla ścianki 40 < T ≤ 60 mm  
d - opcja 4: badanie udarności w temperaturze -10°C, minimalna wartość 28 J  
e - rury z tych materiałów nie spełniają podstawowych wymagań dyrektywy 97/23/EG Unii Europejskiej, o ile inne kryteria nie są brane pod uwagę.  
f - wartość dla 25 < T ≤ 50 mm  
g - wartość dla 25 < T ≤ 40 mm, dla 40 < T ≤ 50 mm wartość wynosi 550  
h - wartości wydłużenia wzdłużnego l pomniejszone o 2 %  
i - badanie udarności tylko w przypadku opcji 1.3  
j - wartość odpowiada 27 J w temperaturze -30°C  
k - wzdłużnie lub poprzecznie - do wyboru dostawcy  
l - wartości dla ścianki 40 < T ≤ 63 mm  
m - wartości dla ścianki 63 < T ≤ 100 mm  
n - wartości dla T ≤ 3 mm  
o - wartości dla 3 < T ≤ 100 mm  
p - wartość dla T ≤ 20 mm  
q - wartość dla 20 < T ≤ 40 mm  
r - wartość dla 40 < T ≤ 50 mm, wartość dla 50 < T ≤ 65 mm wynosi 325  
s - wartość dla T ≤ 20 mm  
t - wartość dla 20 < T ≤ 65 mm  
u - wartość dla 16 < T ≤ 25 mm

SKŁAD CHEMICZNY ( analiza wytopowa )<sup>a</sup>

| Nazwa<br>gatunku | Norma      | C    |                   | Si   |      | Mn   |      | P     | S                 | Al<br>razem       | Cr   |                   | Cu                 | Mo   | Nb                | Ni                 | Ti                | V                 | Cr + Cu<br>+ Mo + Ni | N                   | CEV max. w % dla ścianki |                   |                   |      |      |            |
|------------------|------------|------|-------------------|------|------|------|------|-------|-------------------|-------------------|------|-------------------|--------------------|------|-------------------|--------------------|-------------------|-------------------|----------------------|---------------------|--------------------------|-------------------|-------------------|------|------|------------|
|                  |            | min. | max.              | min. | max. | min. | max. | max.  | max.              |                   | min. | max.              | max. <sup>b</sup>  | min. | max.              | max. <sup>b</sup>  | max. <sup>b</sup> | max. <sup>b</sup> | min.                 |                     | max.                     | max. <sup>b</sup> | max. <sup>b</sup> | max. | ≤ 16 | >16<br>>40 |
| P235TR1          | EN 10216-1 | -    | 0,16              | -    | 0,35 | -    | 1,20 | 0,025 | 0,02              | -                 | -    | 0,30 <sup>b</sup> | 0,30 <sup>bc</sup> | -    | 0,08 <sup>b</sup> | 0,010 <sup>b</sup> | 0,30 <sup>b</sup> | 0,04              | -                    | 0,02 <sup>b</sup>   | 0,70 <sup>b</sup>        | -                 | -                 | -    | -    | -          |
| St 37.0          | DIN 1629   | -    | 0,17              | -    | -    | -    | -    | 0,04  | 0,04              | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | 0,009 <sup>k</sup>  | -                        | -                 | -                 | -    | -    |            |
| P235TR2          | EN 10216-1 | -    | 0,16              | -    | 0,35 | -    | 1,20 | 0,025 | 0,02              | 0,02 <sup>d</sup> | -    | 0,30 <sup>b</sup> | 0,30 <sup>bc</sup> | -    | 0,08 <sup>b</sup> | 0,010 <sup>b</sup> | 0,30 <sup>b</sup> | 0,04              | -                    | 0,02 <sup>b</sup>   | 0,70 <sup>b</sup>        | -                 | -                 | -    | -    | -          |
| P265TR1          | EN 10216-1 | -    | 0,20              | -    | 0,40 | -    | 1,40 | 0,025 | 0,02              | -                 | -    | 0,30 <sup>b</sup> | 0,30 <sup>bc</sup> | -    | 0,08 <sup>b</sup> | 0,010 <sup>b</sup> | 0,30 <sup>b</sup> | 0,04              | -                    | 0,02 <sup>b</sup>   | 0,70 <sup>b</sup>        | -                 | -                 | -    | -    | -          |
| St 44.0          | DIN 1629   | -    | 0,21              | -    | -    | -    | -    | 0,04  | 0,04              | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | 0,009 <sup>k</sup>  | -                        | -                 | -                 | -    | -    | -          |
| P265TR2          | EN 10216-1 | -    | 0,20              | -    | 0,40 | -    | 1,40 | 0,025 | 0,02              | 0,02 <sup>d</sup> | -    | 0,30 <sup>b</sup> | 0,30 <sup>bc</sup> | -    | 0,08 <sup>b</sup> | 0,010 <sup>b</sup> | 0,30 <sup>b</sup> | 0,04              | -                    | 0,02 <sup>b</sup>   | 0,70 <sup>b</sup>        | -                 | -                 | -    | -    | -          |
| P355N            | EN 10216-3 | -    | 0,20              | -    | 0,50 | 0,90 | 1,70 | 0,025 | 0,02              | 0,02              | -    | 0,30 <sup>m</sup> | 0,30 <sup>cm</sup> | -    | 0,08 <sup>m</sup> | 0,05 <sup>n</sup>  | 0,50              | 0,04 <sup>n</sup> | -                    | 0,10 <sup>n</sup>   | -                        | 0,02              | -                 | -    | -    | -          |
| P355NH           | EN 10216-3 | -    | 0,20              | -    | 0,50 | 0,90 | 1,70 | 0,025 | 0,02              | 0,02              | -    | 0,30 <sup>m</sup> | 0,30 <sup>cm</sup> | -    | 0,08 <sup>m</sup> | 0,05 <sup>n</sup>  | 0,50              | 0,04 <sup>n</sup> | -                    | 0,10 <sup>n</sup>   | -                        | 0,02              | -                 | -    | -    | -          |
| E235             | EN 10297-1 | -    | 0,17              | -    | 0,35 | -    | 1,20 | 0,03  | 0,035             | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | -                 | -                 | -    | -    | -          |
| E275             | EN 10297-1 | -    | 0,21              | -    | 0,35 | -    | 1,40 | 0,03  | 0,035             | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | -                 | -                 | -    | -    | -          |
| E355             | EN 10297-1 | -    | 0,22              | -    | 0,55 | -    | 1,60 | 0,03  | 0,035             | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | -                 | -                 | -    | -    | -          |
| E355             | EN 10294-1 | -    | 0,22              | -    | 0,55 | -    | 1,60 | 0,03  | 0,05 <sup>o</sup> | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | -                 | -                 | -    | -    | -          |
| St 52.0          | DIN 1629   | -    | 0,22              | -    | 0,55 | -    | 1,60 | 0,04  | 0,04              | 0,02              | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | -                 | -                 | -    | -    | -          |
| E470             | EN 10297-1 | 0,16 | 0,22              | 0,10 | 0,50 | 1,30 | 1,70 | 0,03  | 0,035             | 0,01              | -    | -                 | -                  | -    | 0,02              | -                  | 0,08              | 0,15              | -                    | 0,02                | -                        | -                 | -                 | -    | -    | -          |
| E470             | EN 10294-1 | 0,16 | 0,22              | 0,10 | 0,50 | 1,30 | 1,70 | 0,03  | 0,05 <sup>o</sup> | 0,01              | -    | -                 | -                  | -    | 0,07 <sup>b</sup> | -                  | 0,08 <sup>f</sup> | 0,15 <sup>e</sup> | -                    | 0,02                | -                        | -                 | -                 | -    | -    | -          |
| E275K2           | EN 10297-1 | -    | 0,20              | -    | 0,40 | 0,50 | 1,40 | 0,03  | 0,03              | 0,02 <sup>d</sup> | -    | 0,30              | 0,35               | -    | 0,10              | 0,05               | 0,30              | 0,03              | -                    | 0,05                | -                        | 0,015             | -                 | -    | -    | -          |
| E355K2           | EN 10297-1 | -    | 0,20              | -    | 0,50 | 0,90 | 1,65 | 0,03  | 0,03              | 0,02 <sup>d</sup> | -    | 0,30              | 0,35               | -    | 0,10              | 0,05               | 0,50              | 0,05              | -                    | 0,12                | -                        | 0,015             | -                 | -    | -    | -          |
| E420J2           | EN 10297-1 | 0,16 | 0,22              | 0,10 | 0,50 | 1,30 | 1,70 | 0,03  | 0,035             | 0,01 <sup>d</sup> | -    | 0,30              | 0,30               | -    | 0,08              | 0,079              | 0,40              | 0,05              | 0,08                 | 0,15 <sup>g</sup>   | -                        | 0,02              | -                 | -    | -    | -          |
| E460K2           | EN 10297-1 | -    | 0,20              | -    | 0,60 | 1,00 | 1,70 | 0,03  | 0,03              | 0,02 <sup>d</sup> | -    | 0,30              | 0,70               | -    | 0,10              | 0,059              | 0,80              | 0,05              | -                    | 0,20 <sup>g</sup>   | -                        | 0,025             | -                 | -    | -    | -          |
| E590K2           | EN 10297-1 | 0,16 | 0,22              | 0,10 | 0,50 | 1,30 | 1,70 | 0,03  | 0,035             | 0,01 <sup>d</sup> | -    | 0,30              | 0,30               | -    | 0,08              | 0,079              | 0,40              | 0,05              | 0,08                 | 0,15 <sup>g</sup>   | -                        | 0,02              | -                 | -    | -    | -          |
| S235JRH          | EN 10210-1 | -    | 0,17 <sup>i</sup> | -    | -    | -    | 1,40 | 0,04  | 0,04              | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | 0,009 <sup>kl</sup> | 0,37                     | 0,39              | 0,41              | 0,44 | -    | -          |
| S275JOH          | EN 10210-1 | -    | 0,20 <sup>i</sup> | -    | -    | -    | 1,50 | 0,035 | 0,035             | -                 | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | 0,009 <sup>kl</sup> | 0,41                     | 0,43              | 0,45              | 0,48 | -    | -          |
| S275J2H          | EN 10210-1 | -    | 0,20 <sup>i</sup> | -    | -    | -    | 1,50 | 0,03  | 0,03              | 0,02 <sup>h</sup> | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | 0,41              | 0,43              | 0,45 | 0,48 | -          |
| S355J2H          | EN 10210-1 | -    | 0,22              | -    | 0,55 | -    | 1,60 | 0,03  | 0,03              | 0,02 <sup>h</sup> | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | 0,45              | 0,47              | 0,5  | 0,53 | -          |
| S355K2H          | EN 10210-1 | -    | 0,22              | -    | 0,55 | -    | 1,60 | 0,03  | 0,03              | 0,02 <sup>h</sup> | -    | -                 | -                  | -    | -                 | -                  | -                 | -                 | -                    | -                   | -                        | 0,45              | 0,47              | 0,5  | 0,53 | -          |
| S275NH           | EN 10210-1 | -    | 0,20              | -    | 0,40 | 0,50 | 1,40 | 0,035 | 0,03              | 0,02 <sup>d</sup> | -    | 0,30              | 0,35 <sup>j</sup>  | -    | 0,10              | 0,05               | 0,30              | 0,03              | -                    | 0,08                | -                        | 0,015             | 0,40              | 0,40 | -    | -          |
| S355NH           | EN 10210-1 | -    | 0,20              | -    | 0,50 | 0,90 | 1,65 | 0,035 | 0,03              | 0,02 <sup>d</sup> | -    | 0,30              | 0,35 <sup>j</sup>  | -    | 0,10              | 0,05               | 0,50              | 0,03              | -                    | 0,12                | -                        | 0,02              | 0,43              | 0,45 | -    | -          |
| S420NH           | EN 10210-1 | -    | 0,22              | -    | 0,60 | 1,00 | 1,70 | 0,035 | 0,03              | 0,02 <sup>d</sup> | -    | 0,30              | 0,70 <sup>j</sup>  | -    | 0,10              | 0,05               | 0,80              | 0,03              | -                    | 0,20                | -                        | 0,025             | 0,50              | 0,52 | -    | -          |
| S460NH           | EN 10210-1 | -    | 0,22              | -    | 0,60 | 1,00 | 1,70 | 0,035 | 0,03              | 0,02 <sup>d</sup> | -    | 0,30              | 0,70 <sup>j</sup>  | -    | 0,10              | 0,05               | 0,80              | 0,03              | -                    | 0,20                | -                        | 0,025             | 0,53              | 0,55 | -    | -          |

a - oprócz obróbki końcowej wytopu, pierwiastki nie podane w tej tabeli nie powinny być dodawane do stali bez zgody zamawiającego.  
b - nie potrzeba podawać zawartości tych pierwiastków, jeżeli nie zostały celowo dodane do wytopu.  
c - opcja 2: aby ułatwić późniejsze przekształcenia obowiązuje uzgodniona maksymalna zawartość miedzi Cu, niższa niż podana oraz uzgodniona maksymalna zawartość cynku Zn.  
d - to wymaganie nie obowiązuje, jeśli zawartość innych pierwiastków wiążących azot (które należy podać) jest wystarczająca. Przy użyciu tytanu producent powinien udowodnić że:  
e - V może zostać zastąpiony przez te same zawartości procentowe Nb lub Ti, pod warunkiem, że zawartość V wynosi co najmniej 0,05 % suma Nb+V+Ti ≤ 0,21 %.  
f - dodanie Nb, V i Ti jest dozwolone. Zawartość tych pierwiastków musi być podana.  
g - Nb+V: maksymalnie 0,20 %  
h - lub 0,015 rozpuszczonego aluminium  
i - maksymalna zawartość węgla C dla ścianki 40 < T ≤ 120 mm wynosi 0,20 % dla gatunku S235JRH i 0,22 % dla gatunków S275JOH i S235J2H  
j - jeśli zawartość miedzi jest większa niż 0,3



# BEZSZWOWE RURY GRUBOŚCIENNE

| D [mm] | 2.0  | 2.3  | 2.6  | 2.9  | 3.2  | 3.6  | 4.0  | 4.5  | 5.0  | 5.6  | 6.3  | 7.1  | 8.0  | 8.8  | 10.0 | 11.0 | 12.5 | 14.2 | 16.0 | 17.5   |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------|
| 10.2   | 0.40 | 0.44 | 0.48 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |        |
| 13.5   | 0.56 | 0.63 | 0.69 | 0.75 | 0.81 | 0.87 |      |      |      |      |      |      |      |      |      |      |      |      |      |        |
| 16.0   | 0.69 | 0.77 | 0.85 | 0.93 | 1.01 | 1.10 | 1.18 |      |      |      |      |      |      |      |      |      |      |      |      |        |
| 17.2   | 0.75 | 0.84 | 0.93 | 1.02 | 1.10 | 1.21 | 1.30 | 1.41 |      |      |      |      |      |      |      |      |      |      |      |        |
| 19.0   | 0.84 | 0.94 | 1.05 | 1.15 | 1.25 | 1.37 | 1.48 | 1.61 | 1.73 |      |      |      |      |      |      |      |      |      |      |        |
| 20.0   | 0.88 | 1.00 | 1.12 | 1.22 | 1.33 | 1.46 | 1.58 | 1.72 | 1.85 |      |      |      |      |      |      |      |      |      |      |        |
| 21.3   | 0.95 | 1.08 | 1.20 | 1.32 | 1.43 | 1.57 | 1.71 | 1.86 | 2.01 | 2.17 |      |      |      |      |      |      |      |      |      |        |
| 25.0   | 1.13 | 1.29 | 1.44 | 1.58 | 1.72 | 1.90 | 2.07 | 2.28 | 2.47 | 2.68 | 2.91 |      |      |      |      |      |      |      |      |        |
| 26.9   |      | 1.40 | 1.56 | 1.72 | 1.87 | 2.07 | 2.26 | 2.49 | 2.70 | 2.94 | 3.20 | 3.47 |      |      |      |      |      |      |      |        |
| 30.0   |      |      | 1.76 | 1.94 | 2.10 | 2.34 | 2.56 | 2.83 | 3.08 | 3.37 | 3.68 | 4.01 | 4.34 | 4.60 |      |      |      |      |      |        |
| 31.8   |      |      | 1.87 | 2.07 | 2.26 | 2.50 | 2.74 | 3.03 | 3.30 | 3.62 | 3.96 | 4.32 | 4.70 | 4.99 |      |      |      |      |      |        |
| 33.7   |      |      | 1.99 | 2.20 | 2.41 | 2.67 | 2.93 | 3.24 | 3.54 | 3.88 | 4.30 | 4.70 | 5.10 | 5.40 | 5.84 |      |      |      |      |        |
| 35.0   |      |      | 2.08 | 2.30 | 2.51 | 2.79 | 3.06 | 3.38 | 3.70 | 4.06 | 4.46 | 4.89 | 5.33 | 5.69 | 6.17 |      |      |      |      |        |
| 38.0   |      |      | 2.27 | 2.51 | 2.75 | 3.05 | 3.35 | 3.72 | 4.07 | 4.47 | 4.93 | 5.41 | 5.92 | 6.34 | 6.91 | 7.32 |      |      |      |        |
| 42.4   |      |      | 2.55 | 2.82 | 3.09 | 3.44 | 3.79 | 4.21 | 4.61 | 5.08 | 5.61 | 6.20 | 6.80 | 7.29 | 8.00 | 8.52 | 9.20 |      |      |        |
| 44.5   |      |      | 2.69 | 2.98 | 3.26 | 3.63 | 4.00 | 4.44 | 4.87 | 5.37 | 5.94 | 6.55 | 7.20 | 7.75 | 8.51 | 9.09 | 9.90 |      |      |        |
| 48.3   |      |      | 2.93 | 3.25 | 3.56 | 3.97 | 4.37 | 4.86 | 5.34 | 5.90 | 6.53 | 7.21 | 7.95 | 8.60 | 9.45 | 10.1 | 11.0 |      |      |        |
| 51.0   |      |      | 3.10 | 3.44 | 3.77 | 4.21 | 4.64 | 5.16 | 5.67 | 6.27 | 6.94 | 7.70 | 8.48 | 9.16 | 10.1 | 10.9 | 11.9 | 12.9 |      |        |
| 54.0   |      |      | 3.30 | 3.65 | 4.01 | 4.47 | 4.93 | 5.49 | 6.04 | 6.68 | 7.41 | 8.21 | 9.08 | 9.81 | 10.9 | 11.7 | 12.9 | 13.9 |      |        |
| 57.0   |      |      |      | 3.87 | 4.25 | 4.74 | 5.23 | 5.83 | 6.41 | 7.10 | 7.90 | 8.80 | 9.67 | 10.5 | 11.6 | 12.5 | 13.8 | 15.0 | 16.2 |        |
| 60.3   |      |      |      | 4.11 | 4.51 | 5.03 | 5.55 | 6.19 | 6.82 | 7.55 | 8.40 | 9.32 | 10.3 | 11.2 | 12.4 | 13.4 | 14.8 | 16.2 | 17.5 | 18.5   |
| 63.5   |      |      |      | 4.33 | 4.76 | 5.32 | 5.87 | 6.55 | 7.21 | 8.00 | 8.90 | 9.90 | 10.9 | 11.9 | 13.2 | 14.3 | 15.8 | 17.3 | 18.7 | 19.9   |
| 67.0   |      |      |      | 4.58 | 5.03 | 5.63 | 6.21 | 6.94 | 7.64 | 8.48 | 9.40 | 10.5 | 11.6 | 12.6 | 14.1 | 15.2 | 16.8 | 18.5 | 20.1 | 21.4   |
| 70.0   |      |      |      | 4.80 | 5.27 | 5.90 | 6.51 | 7.27 | 8.01 | 8.89 | 9.90 | 11.0 | 12.2 | 13.3 | 14.8 | 16.0 | 17.8 | 19.6 | 21.3 | 22.7   |
| 73.0   |      |      |      | 5.01 | 5.51 | 6.16 | 6.81 | 7.60 | 8.38 | 9.31 | 10.4 | 11.5 | 12.8 | 13.9 | 15.5 | 16.9 | 18.8 | 20.6 | 22.4 | 23.9   |
| 76.1   |      |      |      | 5.24 | 5.75 | 6.44 | 7.11 | 7.95 | 8.77 | 9.74 | 10.9 | 12.1 | 13.4 | 14.6 | 16.3 | 17.7 | 19.7 | 21.7 | 23.7 | 25.3   |
| 82.5   |      |      |      |      | 6.26 | 7.00 | 7.74 | 8.66 | 9.56 | 10.6 | 11.9 | 13.2 | 14.7 | 16.0 | 17.9 | 19.5 | 21.6 | 24.0 | 26.2 | 28.1   |
| 88.9   |      |      |      |      | 6.76 | 7.57 | 8.38 | 9.37 | 10.3 | 11.5 | 12.9 | 14.4 | 16.0 | 17.4 | 19.5 | 21.2 | 23.7 | 26.2 | 28.8 | 30.8   |
| 95.0   |      |      |      |      |      | 8.11 | 8.98 | 10.0 | 11.1 | 12.3 | 13.8 | 15.4 | 17.2 | 18.9 | 21.0 | 23.1 | 25.4 | 28.3 | 31.2 | 33.4   |
| 101.6  |      |      |      |      |      | 8.70 | 9.63 | 10.8 | 11.9 | 13.3 | 14.9 | 16.6 | 18.5 | 20.1 | 22.6 | 24.7 | 27.6 | 30.7 | 33.8 | 36.3   |
| 108.0  |      |      |      |      |      | 9.27 | 10.3 | 11.5 | 12.7 | 14.1 | 15.8 | 17.7 | 19.7 | 21.5 | 24.2 | 26.4 | 29.6 | 32.9 | 36.3 | 39.1   |
| 114.3  |      |      |      |      |      | 9.83 | 10.9 | 12.2 | 13.5 | 15.0 | 16.8 | 18.8 | 21.0 | 22.9 | 25.7 | 28.1 | 31.6 | 35.1 | 38.8 | 41.8   |
| 121.0  |      |      |      |      |      |      | 11.5 | 12.9 | 14.3 | 15.9 | 17.8 | 19.9 | 22.3 | 24.7 | 27.4 | 30.2 | 33.4 | 37.4 | 41.4 | 44.7   |
| 127.0  |      |      |      |      |      |      | 12.1 | 13.6 | 15.0 | 16.8 | 18.8 | 21.0 | 23.5 | 25.7 | 28.9 | 31.6 | 35.5 | 39.6 | 43.8 | 47.3   |
| 133.0  |      |      |      |      |      |      | 12.7 | 14.3 | 15.8 | 17.6 | 19.8 | 22.1 | 24.7 | 27.0 | 30.3 | 33.3 | 37.4 | 41.8 | 46.2 | 49.9   |
| 139.7  |      |      |      |      |      |      | 13.4 | 15.0 | 16.6 | 18.5 | 20.8 | 23.3 | 26.0 | 28.4 | 32.0 | 35.1 | 39.5 | 44.0 | 48.8 | 52.7   |
| 146.0  |      |      |      |      |      |      |      | 15.7 | 17.4 | 19.4 | 21.7 | 24.3 | 27.2 | 29.8 | 33.5 | 36.6 | 41.2 | 46.2 | 51.3 | 55.5   |
| 152.4  |      |      |      |      |      |      |      | 16.4 | 18.2 | 20.3 | 22.8 | 25.5 | 28.5 | 31.2 | 35.1 | 38.5 | 43.4 | 48.5 | 53.8 | 58.2   |
| 159.0  |      |      |      |      |      |      |      | 17.1 | 19.0 | 21.2 | 23.8 | 26.6 | 29.8 | 32.6 | 36.7 | 40.3 | 45.4 | 50.8 | 56.4 | 61.1   |
| 165.1  |      |      |      |      |      |      |      | 17.8 | 19.7 | 22.0 | 24.7 | 27.7 | 31.0 | 33.9 | 38.2 | 41.8 | 47.0 | 52.0 | 58.8 | 63.7   |
| 168.3  |      |      |      |      |      |      |      | 18.2 | 20.1 | 22.5 | 25.3 | 28.3 | 31.6 | 34.6 | 39.0 | 42.9 | 48.4 | 54.1 | 60.1 | 65.1   |
| 171.0  |      |      |      |      |      |      |      |      | 20.5 | 22.8 | 25.6 | 28.7 | 32.2 | 35.2 | 39.7 | 43.4 | 48.9 | 54.9 | 61.2 | 66.2   |
| 177.8  |      |      |      |      |      |      |      |      | 21.3 | 23.8 | 26.7 | 30.0 | 36.5 | 36.7 | 41.4 | 45.4 | 51.3 | 57.4 | 63.8 | 69.2   |
| 191.0  |      |      |      |      |      |      |      |      |      | 25.6 | 28.7 | 32.2 | 36.1 | 39.5 | 44.6 | 48.8 | 55.0 | 61.9 | 69.1 | 74.9   |
| 193.7  |      |      |      |      |      |      |      |      |      | 26.0 | 29.2 | 32.8 | 36.6 | 40.1 | 45.3 | 49.8 | 56.2 | 63.0 | 70.1 | 76.0   |
| 203.0  |      |      |      |      |      |      |      |      |      |      | 30.6 | 34.3 | 38.5 | 42.7 | 47.6 | 52.8 | 58.7 | 66.1 | 73.8 | 80.1   |
| 216.0  |      |      |      |      |      |      |      |      |      |      |      | 32.6 | 36.6 | 41.0 | 45.0 | 50.8 | 55.6 | 62.7 | 70.7 | 85.7   |
| 219.1  |      |      |      |      |      |      |      |      |      |      |      | 33.2 | 37.2 | 41.6 | 45.6 | 51.6 | 56.7 | 64.1 | 71.9 | 87.0   |
| 229.0  |      |      |      |      |      |      |      |      |      |      |      | 34.5 | 38.8 | 43.6 | 47.7 | 54.0 | 59.1 | 66.7 | 75.2 | 84.0   |
| 241.0  |      |      |      |      |      |      |      |      |      |      |      | 36.5 | 41.0 | 46.0 | 50.4 | 57.0 | 62.4 | 70.4 | 79.4 | 96.5   |
| 244.5  |      |      |      |      |      |      |      |      |      |      |      | 37.1 | 41.7 | 46.7 | 51.2 | 57.8 | 63.6 | 72.0 | 80.8 | 90.2   |
| 254.0  |      |      |      |      |      |      |      |      |      |      |      | 38.5 | 43.2 | 48.5 | 53.9 | 60.2 | 66.8 | 74.4 | 84.0 | 93.9   |
| 267.0  |      |      |      |      |      |      |      |      |      |      |      | 40.6 | 45.6 | 50.9 | 55.8 | 63.4 | 69.7 | 79.0 | 88.7 | 98.6   |
| 273.0  |      |      |      |      |      |      |      |      |      |      |      | 41.6 | 46.7 | 52.3 | 57.3 | 64.9 | 71.4 | 80.9 | 90.9 | 101    |
| 279.0  |      |      |      |      |      |      |      |      |      |      |      |      | 47.6 | 53.5 | 58.6 | 66.0 | 72.7 | 82.2 | 92.7 | 104    |
| 292.0  |      |      |      |      |      |      |      |      |      |      |      |      | 49.9 | 56.0 | 61.5 | 69.5 | 76.2 | 86.2 | 97.3 | 109    |
| 298.5  |      |      |      |      |      |      |      |      |      |      |      |      | 51.1 | 57.1 | 62.6 | 71.1 | 78.3 | 88.8 | 99.8 | 111    |
| 305.0  |      |      |      |      |      |      |      |      |      |      |      |      | 52.1 | 58.5 | 64.2 | 72.7 | 79.7 | 90.1 | 101  | 113    |
| 318.0  |      |      |      |      |      |      |      |      |      |      |      |      | 54.4 | 61.2 | 67.1 | 76.0 | 83.3 | 94.2 | 106  | 119    |
| 323.9  |      |      |      |      |      |      |      |      |      |      |      |      | 55.6 | 62.3 | 68.4 | 77.4 | 85.3 | 96.7 | 109  | 121    |
| 330.0  |      |      |      |      |      |      |      |      |      |      |      |      |      | 63.5 | 69.6 | 78.8 | 86.5 | 97.8 | 110  | 123    |
| 343.0  |      |      |      |      |      |      |      |      |      |      |      |      |      | 66.1 | 72.5 | 82.0 | 90.0 | 102  | 115  | 128    |
| 355.6  |      |      |      |      |      |      |      |      |      |      |      |      |      | 68.6 | 75.3 | 85.2 | 93.9 | 107  | 120  | 134    |
| 368.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 78.0 | 88.3 | 96.8 | 109  | 123  | 138    |
| 381.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 80.7 | 91.5 | 101  | 114  | 129  | 144    |
| 394.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 83.5 | 96.8 | 103  | 117  | 132  | 149    |
| 406.4  |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 86.3 | 97.8 | 108  | 122  | 138  | 154    |
| 419.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 88.7 | 101  | 111  | 126  | 142  | 158    |
| 431.8  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 104  | 114  | 129  | 146  | 164    |
| 445.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 107  | 117  | 133  | 150  | 169    |
| 457.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 110  | 121  | 137  | 155  | 174    |
| 470.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 124  | 141  | 159  | 179    |
| 482.6  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 130  | 145  | 164  | 184    |
| 495.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 131  | 149  | 168  | 189    |
| 508.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 135  | 154  | 173  | 194    |
| 521.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 156  | 177  | 199    |
| 530.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 159  | 181  | 203    |
| 546.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 164  | 186  | 209    |
| 559.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 168  | 190  | 214    |
| 572.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 172  | 195  | 219    |
| 584.2  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 176  | 199  | 224    |
| 610.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 184  | 209  | 234    |
| 622.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 188  | 213  | 239    |
| 635.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 192  | 217  | 244    |
| 660.4  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 199  | 226  | 254    |
| D [mm] | 2.0  | 2.3  | 2.6  | 2.9  | 3.2  | 3.6  | 4.0  | 4.5  | 5.0  | 5.6  | 6.3  | 7.1  | 8.0  | 8.8  | 10.0 | 11.0 | 12.5 | 14.2 | 16.0 | 17.5</ |

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| [g/m] |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | D      |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|--------|
| 20.0  | 22.2 | 25.0 | 28.0 | 30.0 | 32.0 | 35.0 | 36.0 | 40.0 | 45.0 | 50.0 | 55.0 | 60.0 | 65.0 | 70.0 | 75.0 | 80.0 | 85.0 | 90.0 | 100.0 | [mm]   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 10.2   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 13.5   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 16.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 17.2   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 19.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 20.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 21.3   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 25.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 26.9   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 30.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 31.8   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 33.7   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 35.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 38.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 42.4   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 44.5   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 48.3   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 51.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 54.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 57.0   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 60.3   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 63.5   |
|       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 67.0   |
| 24.7  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 70.0   |
| 26.1  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 73.0   |
| 27.7  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 76.1   |
| 30.8  | 33.0 | 35.4 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 82.5   |
| 34.0  | 36.5 | 39.4 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 88.9   |
| 37.0  | 39.9 | 43.0 | 46.3 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 95.0   |
| 40.2  | 43.5 | 47.5 | 50.8 | 53.0 | 54.9 |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 101.6  |
| 43.4  | 47.0 | 51.4 | 55.2 | 57.7 | 60.0 |      |      |      |      |      |      |      |      |      |      |      |      |      |       | 108.0  |
| 46.5  | 50.4 | 55.3 | 69.6 | 62.4 | 64.9 | 68.5 | 69.5 | 73.3 |      |      |      |      |      |      |      |      |      |      |       | 114.3  |
| 49.8  | 54.1 | 59.2 | 64.2 | 67.3 | 70.2 | 74.2 | 75.5 | 79.9 |      |      |      |      |      |      |      |      |      |      |       | 121.0  |
| 52.8  | 57.4 | 63.2 | 68.4 | 71.8 | 75.0 | 79.3 | 80.8 | 85.8 |      |      |      |      |      |      |      |      |      |      |       | 127.0  |
| 55.7  | 60.8 | 67.1 | 72.5 | 76.3 | 79.7 | 84.5 | 86.1 | 91.7 | 97.7 |      |      |      |      |      |      |      |      |      |       | 133.0  |
| 59.0  | 64.3 | 71.1 | 77.1 | 81.2 | 85.0 | 90.3 | 92.1 | 98.4 | 105  | 110  |      |      |      |      |      |      |      |      |       | 139.7  |
| 62.1  | 67.8 | 74.6 | 81.5 | 85.8 | 90.0 | 95.7 | 97.7 | 104  | 112  | 118  |      |      |      |      |      |      |      |      |       | 146.0  |
| 65.3  | 71.3 | 79.0 | 85.9 | 90.6 | 95.0 | 101  | 103  | 112  | 119  | 126  |      |      |      |      |      |      |      |      |       | 152.4  |
| 68.6  | 74.9 | 83.0 | 90.5 | 95.4 | 100  | 106  | 109  | 119  | 127  | 134  | 141  | 146  |      |      |      |      |      |      |       | 159.0  |
| 71.6  | 78.2 | 86.4 | 94.7 | 100  | 105  | 112  | 115  | 123  | 133  | 142  | 149  | 156  |      |      |      |      |      |      |       | 165.1  |
| 73.1  | 80.0 | 88.9 | 96.9 | 102  | 108  | 115  | 117  | 127  | 137  | 146  | 153  | 160  |      |      |      |      |      |      |       | 168.3  |
| 74.5  | 81.5 | 90.0 | 98.7 | 104  | 110  | 117  | 120  | 129  | 140  | 149  | 157  | 164  |      |      |      |      |      |      |       | 171.0  |
| 77.8  | 85.2 | 94.8 | 103  | 109  | 115  | 123  | 126  | 136  | 147  | 158  | 166  | 174  |      |      |      |      |      |      |       | 177.8  |
| 84.3  | 92.4 | 102  | 113  | 119  | 125  | 135  | 138  | 149  | 162  | 174  | 184  | 194  |      |      |      |      |      |      |       | 191.0  |
| 85.7  | 93.9 | 105  | 114  | 121  | 128  | 136  | 140  | 152  | 167  | 179  | 188  | 197  |      |      |      |      |      |      |       | 193.7  |
| 90.3  | 99.0 | 110  | 121  | 128  | 135  | 144  | 148  | 161  | 178  | 191  | 200  | 211  |      |      |      |      |      |      |       | 203.0  |
| 96.7  | 106  | 118  | 130  | 138  | 145  | 156  | 160  | 174  | 190  | 205  | 218  | 231  |      |      |      |      |      |      |       | 216.0  |
| 98.2  | 108  | 120  | 132  | 140  | 148  | 158  | 163  | 176  | 196  | 211  | 222  | 235  | 247  | 257  |      |      |      |      |       | 219.1  |
| 103   | 113  | 125  | 138  | 147  | 155  | 167  | 171  | 186  | 204  | 220  | 236  | 250  | 262  | 274  |      |      |      |      |       | 229.0  |
| 109   | 120  | 133  | 147  | 156  | 165  | 178  | 182  | 198  | 218  | 236  | 252  | 268  | 282  | 295  |      |      |      |      |       | 241.0  |
| 111   | 122  | 136  | 149  | 159  | 168  | 180  | 185  | 202  | 224  | 243  | 257  | 273  | 287  | 301  |      |      |      |      |       | 244.5  |
| 115   | 127  | 141  | 156  | 166  | 175  | 188  | 194  | 211  | 232  | 251  | 270  | 287  | 303  | 317  |      |      |      |      |       | 254.0  |
| 122   | 134  | 150  | 165  | 175  | 185  | 200  | 205  | 223  | 250  | 271  | 287  | 306  | 323  | 340  | 355  | 369  |      |      |       | 267.0  |
| 125   | 137  | 154  | 169  | 180  | 190  | 205  | 210  | 229  | 256  | 275  | 296  | 315  | 333  | 350  | 366  | 381  | 394  |      |       | 273.0  |
| 128   | 141  | 157  | 173  | 184  | 195  | 211  | 216  | 236  | 260  | 282  | 304  | 324  | 343  | 361  | 377  | 393  | 407  |      |       | 279.0  |
| 134   | 148  | 165  | 182  | 194  | 205  | 222  | 227  | 249  | 274  | 298  | 321  | 343  | 364  | 383  | 401  | 418  | 434  | 448  |       | 292.0  |
| 137   | 151  | 170  | 187  | 198  | 210  | 227  | 233  | 255  | 285  | 306  | 330  | 353  | 374  | 394  | 413  | 431  | 448  | 463  |       | 298.5  |
| 140   | 154  | 173  | 191  | 203  | 215  | 232  | 239  | 261  | 288  | 314  | 338  | 362  | 384  | 405  | 425  | 444  | 461  | 477  |       | 305.0  |
| 147   | 162  | 181  | 200  | 213  | 226  | 244  | 250  | 274  | 303  | 330  | 357  | 382  | 406  | 428  | 449  | 470  | 488  | 506  |       | 318.0  |
| 150   | 165  | 186  | 204  | 217  | 230  | 249  | 256  | 280  | 313  | 338  | 370  | 390  | 415  | 438  | 460  | 481  | 501  | 519  |       | 323.9  |
| 152   | 168  | 187  | 208  | 221  | 235  | 254  | 261  | 285  | 316  | 345  | 372  | 399  | 425  | 449  | 471  | 493  | 514  | 533  |       | 330.0  |
| 159   | 175  | 195  | 217  | 231  | 245  | 265  | 273  | 298  | 330  | 361  | 390  | 418  | 446  | 471  | 496  | 518  | 541  | 562  |       | 343.0  |
| 166   | 183  | 205  | 226  | 241  | 255  | 276  | 284  | 311  | 349  | 377  | 413  | 437  | 466  | 493  | 519  | 543  | 567  | 590  | 630   | 355.6  |
| 171   | 189  | 211  | 234  | 250  | 265  | 287  | 295  | 323  | 358  | 392  | 424  | 455  | 485  | 514  | 541  | 568  | 593  | 617  | 661   | 368.0  |
| 178   | 197  | 220  | 243  | 259  | 275  | 298  | 306  | 336  | 372  | 408  | 442  | 475  | 506  | 537  | 566  | 593  | 620  | 646  | 693   | 381.0  |
| 184   | 203  | 227  | 252  | 269  | 286  | 309  | 318  | 349  | 387  | 423  | 459  | 493  | 527  | 559  | 590  | 619  | 648  | 675  | 725   | 394.0  |
| 191   | 210  | 237  | 261  | 278  | 295  | 320  | 329  | 361  | 406  | 439  | 483  | 515  | 547  | 581  | 613  | 644  | 673  | 702  | 756   | 406.4  |
| 197   | 217  | 245  | 270  | 288  | 305  | 331  | 340  | 373  | 421  | 455  | 500  | 531  | 567  | 603  | 636  | 669  | 700  | 730  | 786   | 419.0  |
| 203   | 224  | 251  | 279  | 298  | 315  | 343  | 351  | 387  | 430  | 471  | 512  | 551  | 588  | 625  | 660  | 698  | 727  | 758  | 818   | 431.8  |
| 209   | 231  | 258  | 287  | 306  | 326  | 353  | 363  | 399  | 443  | 486  | 528  | 569  | 609  | 647  | 684  | 720  | 754  | 787  | 850   | 445.0  |
| 216   | 238  | 266  | 296  | 316  | 335  | 364  | 374  | 411  | 457  | 502  | 545  | 587  | 628  | 668  | 707  | 744  | 780  | 815  | 880   | 457.0  |
| 222   | 245  | 274  | 305  | 325  | 346  | 375  | 385  | 424  | 471  | 517  | 562  | 606  | 649  | 690  | 730  | 769  | 807  | 843  | 912   | 470.0  |
| 228   | 252  | 282  | 314  | 335  | 356  | 386  | 396  | 437  | 486  | 533  | 580  | 625  | 669  | 712  | 754  | 794  | 833  | 871  | 943   | 482.6  |
| 234   | 259  | 290  | 322  | 344  | 365  | 397  | 408  | 449  | 499  | 549  | 597  | 644  | 689  | 734  | 777  | 819  | 859  | 899  | 974   | 495.0  |
| 241   | 266  | 300  | 331  | 354  | 376  | 408  | 419  | 462  | 521  | 565  | 614  | 663  | 710  | 756  | 801  | 844  | 886  | 927  | 1006  | 508.0  |
| 246   | 272  | 305  | 340  | 363  | 386  | 419  | 431  | 474  | 527  | 580  | 631  | 681  | 731  | 778  | 825  | 870  | 914  | 956  | 1038  | 521.0  |
| 252   | 278  | 311  | 347  | 370  | 393  | 427  | 439  | 483  | 538  | 592  | 644  | 695  | 745  | 794  | 842  | 887  | 932  | 976  | 1060  | 530.0  |
| 259   | 287  | 321  | 358  | 382  | 406  | 441  | 453  | 499  | 556  | 612  | 666  | 719  | 771  | 822  | 871  | 919  | 966  | 1012 | 1100  | 546.0  |
| 265   | 293  | 329  | 366  | 391  | 416  | 452  | 464  | 511  | 570  | 627  | 693  | 738  | 791  | 843  | 894  | 944  | 993  | 1040 | 1131  | 559.0  |
| 272   | 301  | 337  | 376  | 401  | 426  | 463  | 476  | 525  | 585  | 644  | 701  | 758  | 813  | 867  | 919  | 971  | 1021 | 1070 | 1164  | 572.0  |
| 278   | 307  | 344  | 384  | 410  | 436  | 474  | 487  | 536  | 598  | 658  | 717  | 775  | 832  | 887  | 941  | 994  | 1046 | 1096 | 1194  | 584.2  |
| 291   | 322  | 361  | 402  | 429  | 456  | 496  | 510  | 562  | 627  | 691  | 753  | 814  | 874  | 932  | 990  | 1046 | 1101 | 1154 | 1258  | 610.0  |
| 297   | 328  | 368  | 410  | 438  | 466  | 506  | 520  | 574  | 640  | 705  | 769  | 832  | 893  | 953  | 1012 | 1069 | 1126 | 1181 | 1287  | 622.0  |
| 303   | 335  | 376  | 419  | 447  | 476  | 518  | 532  | 587  | 654  | 721  | 786  | 850  | 913  | 975  | 1035 | 1095 | 1152 | 1209 | 1319  | 635.0  |
| 315   | 349  | 391  | 436  | 466  | 496  | 539  | 554  | 612  | 683  | 752  | 821  | 888  | 954  | 1019 | 1082 | 1145 | 1206 | 1266 | 1382  | 660.4  |
| 20.0  | 22.2 | 25.0 | 28.0 | 30.0 | 32.0 | 35.0 | 36.0 | 40.0 | 45.0 | 50.0 | 55.0 | 60.0 | 65.0 | 70.0 | 75.0 | 80.0 | 85.0 | 90.0 | 100.0 | D [mm] |

Oferujemy wszystkie wymiary i gatunki rur grubościennych według istniejących

norm. Na bardziej szczegółowe pytania odpowiedzą Państwu nasi specjaliści.