aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

# EO-Tubes and Pipes for fittings and flanges

Industrial and Mobile Applications
Marine and Offshore Applications

**Parker**

ENGINEERING **YOUR** SUCCESS.

**For your safety!**

Under certain circumstances, tubes, fittings and flanges can be subjected to extreme loadings such as vibration and uncontrolled pressure peaks.

Only by using genuine Parker components and following Parker assembly instructions you can be assured of the reliability and safety of the products and their conformity to the applicable standards.

Failure to follow this rule can adversely affect the functional safety and reliability of products, cause personal injury, property damage, and result in loss of your guarantee rights.

Subject to alteration

ENGINEERING **YOUR** SUCCESS.

Tubes for fluid, hydraulic and pneumatic Applications

# The world of tubes

**Your choice for high pressure.**

The tube programme from Parker Hannifin gives all possibilities for usage in hydraulic applications. Tubes for fitting- and flange-systems, tubes for mobile and stationary systems. Different dimensions, carbon- and stainless-steel tubes as well as different surfaces are available.

**Approved quality.**

Parker tubes are designed for the special requirements in several markets. Continuous tests in laboratories and on test benches ensure the high quality level of the material. Certifications from independent institutes such as ABS, LR or DNV confirm the adherence to high standards. This opens into reliability and longevity of the hydraulic application.

**Worldwide connections.**

The Parker Hannifin tube-warehouse with its worldwide network provides a close and prompt supply of high precision tubes; thus, international customers can also rely on us. Efficient, reliable, environmentally friendly and on-time deliveries are available in almost every country in the world.

**All around tubes.**

This brochure provides all relevant information regarding hydraulic lines in a structured and clear way. Which parameters are important, what kind of tubes and dimensions fit the construction and specifications, and which materials are in use in special applications. With Parker order codes you can start right away...

**Certificates**

On request our tubes & pipes have the relevant certificates for your markets. The suppliers are approved e.g. by ISO 9001, ISO/TS 16949, ISO 14001. Please ask for details.

Complete Piping Solutions and System Supplier
# Added Value maximizes your performance

**CPS - Complete Piping Solutions.**

Just tubes! But it gets even better. Many customers like to have the complete Parker programme, and that's what we deliver worldwide based on our „Complete Piping Solutions"-concept. Technical support, reengineering, pre-fabrication, delivery and installation. These five steps give an effective and environmentally friendly solution from one source.

Our integrated knowledge, quality products, contemporary production methods and installation-experience guarantee perfect complete solutions for hydraulic systems. Integration in existing systems is also available. We help our customers right from their project start to highest productivity and timeliness.

**Advantages as a system supplier.**

Parker Hannifin is the world's leading diversified manufacturer of motion and control technology. The company offers a product portfolio that is exemplary in the breadth and depth, and in constantly keeping quality. Through an international distribution network, the components are delivered quickly.

System solutions are tailored to the customer's situation. Whether DIN or SAE and available anywhere in the world. It will match everything together with a system, and the global design production is nothing in the way to the last detail. Efficient, sustainable and progressive.





ENGINEERING **YOUR** SUCCESS.

## Tube and pipe specification

**Recommended carbon steel tubes and pipes**

Parker recommends the use of cold drawn seamless hydraulic tubes and pipes acc. to DIN EN 10305-4.
E 355N (St. 52.4 NBK) or E 235N (St. 37.4 NBK).

+ precision dimension/shape    + clean inside (no scale)
+ high pressure capability      + excellent scaling surface
                                  after roll flaring

**Recommended stainless steel tubes and pipes**

Parker recommends the use of seamless cold drawn stainless steel tubes and pipes acc. to
DIN EN 10216-5
ASTM A269/A213
ASTM A312

+ precision dimension/shape    + excellent scaling surface
+ high pressure capability       after roll flaring

**Welded tubes and pipes**

Tubes and pipes acc. to above specification but welded and cold redrawn instead of seamless drawn are usually suitable. Pressure capability might be reduced due to the welding seam zone.
Welding seam quality might effect roll flaring surface results.

**Hot rolled pipes**

Hot rolled pipes are not recommended for the following reasons:
Hot rolled pipes do not have precision dimensions and may slip in machine dies.
They have scales inside and outside. The inside scales effect the cleanliness level of the fluid and reduces fatigue levels.
Used in roll flaring process the scales will contaminate the flaring tools (high cleaning effort) and cause poor flare surface quality.

**The required maximum working pressure is calculated either acc. to DNV, DIN or ANSI.**

## Material Specifications & Values

**1.0308 (E235/St.35.4) acc. to DIN EN 10305-4**

| | |
|---|---|
| Tensile strength | min 340 N/mm$^2$ |
| Yield strength | min 235 N/mm$^2$ |
| Fatigue strength | 225 N/mm$^2$  [1] |
| Elongation at break | min. 25% |

**1.0508 (E355/St.52.4) acc. to DIN EN 10305-4**

| | |
|---|---|
| Tensile strength | min 490 N/mm$^2$ |
| Yield strength | min 355 N/mm$^2$ |
| Fatigue strength | 265 N/mm$^2$ |
| Elongation at break | min. 22 % |

**1.4571 (316 Ti) cold drawn (CFA)[3] acc. to DIN EN 10216-5**

| | |
|---|---|
| Tensile strength | min 500 N/mm$^2$ |
| 0.2 % proof stress | min 210 N/mm$^2$ |
| 1 % proof stress | min 245 N/mm$^2$ |
| Fatigue strength | 220 N/mm$^2$ |
| Elongation at break | min. 35 % |

**1.4404 (316L) cold drawn (CFA)[3] acc. to DIN EN 10216-5**

| | |
|---|---|
| Tensile strength | min 500 N/mm$^2$ |
| 0.2 % proof stress | min 210 N/mm$^2$ |
| 1 % proof stress | min 245 N/mm$^2$ |
| Elongation at break | min. 35 % |

**1.4401 (316) acc. to DIN EN 10216-5**

| | |
|---|---|
| Tensile strength | min 510 N/mm$^2$ |
| 0.2 % proof stress | min 205 N/mm$^2$ |
| 1 % proof stress | min 240 N/mm$^2$ |
| Elongation at break | min. 40 % |

**1.4301 (304) acc. to DIN EN 10216-5**

| | |
|---|---|
| Tensile strength | min 500 N/mm$^2$ |
| 0.2 % proof stress | min 195 N/mm$^2$ |
| 1 % proof stress | min 230 N/mm$^2$ |
| Fatigue strength | 195 N/mm$^2$  [2] |
| Elongation at break | min. 40 % |

**1.4404 (316L) ASTM A269 / A213**

| | |
|---|---|
| Tensile strength | min 530 N/mm$^2$ |
| Yield strength | min 276 N/mm$^2$ |
| 0.2 % proof stress / 1.6   [4] | 172.5 N/mm$^2$ |

**1.4404 (316L) ASTM A312 / A530**

| | |
|---|---|
| Tensile strength | min 515 N/mm$^2$ |
| Yield strength | min 234 N/mm$^2$ |
| 0.2 % proof stress / 1.6   [4] | 146 N/mm$^2$ |

[1] DIN 2413 Template, Tab. 4
[2] Rollof/Matek ME Ausg. 14, (no standard value)
[3] Strength increase due to cold forming following 1.4571
[4] Pressure rating calculation based on this mechanical properties require certification according to 3.1 - EN 10204 that confirmes the mechanical properties.

## Tube calculation for marine and offshore acc. to DNV rules

Calculation of working pressure of steel and stainless steel tubes for ship building acc. to DNV Part 4, Chapter 6, Section 6.

$$P = \frac{20 \cdot \sigma_t \cdot e \cdot t_0}{D - t_0}$$

P = permissible working pressure [bar]
$\sigma_t$ = permissible stress [N/mm²]
    calculated from the lower value off:

stainless steel:

$$\sigma_t = \frac{R_m}{2.7} \text{ or } \frac{K}{1.6}$$

carbon steel:

$$\sigma_t = \frac{R_m}{2.7} \text{ or } \frac{K}{1.8}$$

$t_0$ = tube wall thickness without allowences [mm]

$$t_0 = t_n \cdot a - c - b$$

$t_n$ = tube wall thickness nominal [mm]
a = factor for wall thickness allowence [mm]
   = 0.8 for Tube-OD 4-5, 0.85 for Tube-OD 6-8, 0.9 for Tube OD >=10
   = 0.9 for all stainless steel tubes
b = bending allowence

$b = 0.1333 \cdot t_0$ (at R/D=3) $\rightarrow$ $t_0 = \dfrac{t_n \cdot a - c}{1.1333}$

c = corrosion tolerance, c = 0.3 mm for hydraulic steel tube, c = 0 mm for SS tubes
e = strength ratio: for seamless tubes e = 1
D = tube outside diameter [mm]
$R_m$ = min. tensile strength [N/mm²]
K = min. yield strength or min 0.2% proof stress [N/mm²]

## Tube calculation for landbased and industrial applications acc. to DIN rules

**DIN 2413 I, only for static load**

Calculation of working pressure of steel tubes for static stress up to 120°C. Corrosion – additional allowences are not considered for the calculation of pressures. Tubes with a diameter of OD/ID > 2 are calculated for static stress in accordance with DIN 2413 III, but with K = yield strength.

$$P = \frac{20 \cdot K \cdot s \cdot c}{S \cdot D}$$

P = permissible working pressure [bar]
K = yield strength [N/mm²]
s = tube wall thickness [mm]
c = factor for wall thickness allowance
  = 0.8 for Tube-OD 4-5, 0.85 for Tube-OD 6-8,
    0.9 for Tube-OD 10
  = 0.9 for all stainless steel tubes
S = Safety factor = 1.5
D = tube outside diameter [mm]

**DIN 2413 III, for dynamic load**

Calculation of working pressure of steel tubes for dynamic stress up to 120°C.
Corrosion – additional allowences are not considered for the calculation of pressures.

$$P = \frac{20 \cdot K \cdot s \cdot c}{S \cdot (D + s \cdot c)}$$

P = permissible working pressure [bar]
K = fatigue strength [N/mm²]
s = tube wall thickness [mm]
c = factor for wall thickness allowance
  = 0.8 for Tube-OD 4-5, 0.85 for Tube-OD 6-8,
    0.9 for Tube-OD 10-80
  = 0.9 for all stainless steel tubes
S = Safety factor = 1.5
D = tube outside diameter [mm]

**Burst Pressure calculation**

Calculation acc. to Formula of DIN 2413 but without safety
    BP = Burst Pressure
    Rm = min tensile strength
    s = tube wall thickness
    c = factor for wall thickness allowance
      = 0.8 for Tube-OD 4-5,
        0.85 for Tube-OD 6-8,
        0.9 for Tube-OD 10
        0.9 for all stainless steel tubes
    D = tube outside diameter [mm]

$$BP = \frac{20 \cdot Rm \cdot s \cdot c}{D}$$

ENGINEERING **YOUR** SUCCESS.

## Pressure reductions and temperatures

Required pressure reductions (depending on the material) with reference to the catalogue pressures for higher temperatures. Both metal fitting material and elastomeric sealing compound have to be selected according to the temperature range of the system.

DNV may require different pressure reduction based on application

| Material | Pressure reduction of permissable operating temperatures TB in °C | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -60 | -54 | -40 | -35 | -25 | +20 | +50 | +100 | +120 | +150 | +175 | +200 | +250 | +300 | +400 |
| Steel components | | | 10% | | | 0% | | | | 11% | 19% | | | | |
| Steel, tubes | | | 10% | | | 0% | | | | 19% | | | 27% | | |
| Stainless steel components | 0% | | | | | 5% | 15% | | 23% | | 29% | | 33% | 37% | 42% |
| Stainless steel, tubes | 0% | | | | | 5.5% | 11.5% | | 21.5% | | | | 29% | | 34% |
| Sealing material NBR (e.g. Perbunan) | | | | | | | | | | | | | | | |
| Sealing material FKM | | | | | | | | | | | | | | | |
| Sealing material Polyurethan (P5008) | | | | | | | | | | | | | | | |

☐ Permissible operating temperature
☐ Ambient temperature of hydraulic and pneumatic applications
☐ Temperature not permissible

Calculation example:
Temperature = 200°C
Material = Stainless steel
Pressure reduction = 29%
Pressure reduction tubes = 21.5%
PN tube 16x2.5/71. DIN2413 III = 362 bar

Formula:

$$PN_{200°C} = \frac{400 \text{ bar}}{100\%} \times (100\% - 29\%) = 284 \text{ bar}$$

$$PN_{\text{tube } 200°C} = \frac{362 \text{ bar}}{100\%} \times (100\% - 21.5\%) = 284 \text{ bar}$$

## Flow diameter of tube lines

**Determining tube sizes for hydraulic systems**

Proper tube material, type and size for a given application and type of fitting are critical for efficient and trouble-free operation of the fluid system. Selection of proper tubing involves choosing the right tube material, and determining the optimum tube size (O.D. and wall thickness).
Proper sizing of the tube for various parts of a hydraulic system results in an optimum combination of efficient and cost effective performance.
A tube that is too small causes high fluid velocity, which has many detrimental effects. In pressure lines, it causes high friction losses and turbulence, both resulting in high pressure drops and heat generation. High heat accelerates wear in moving parts and rapid aging of seals and hoses, all resulting in reduced component life. High heat generation also means wasted energy, and hence, low efficiency.
Too large tubes increase system cost. Thus, optimum tube sizing is very critical. The following is a simple procedure for sizing tubes.

**Determine required flow diameter**
Use table to determine recommended flow diameter for the required flow rate and type of line.

The table is based on the following recommended flow rates that are common in the shipbuilding and offshore engineering:

$$\text{Pressure lines} - 3 \rightarrow 7.2 \left[\frac{m}{s}\right]$$

$$\text{Return lines} - 2 \rightarrow 4.5 \left[\frac{m}{s}\right]$$

$$\text{Suction lines} - 1 \rightarrow 1.8 \left[\frac{m}{s}\right]$$

Avoid flow rates > 8 m/s!
The resulting forces are high and can destroy the tube lines.

If you desire to use different velocities than the above, use the following formula to determine the required flow diameter.

$$\text{Tube} - \text{I.D. [mm]} = 4{,}61 \times \sqrt{\frac{\text{Flow} \left[\frac{\text{ltr.}}{\text{min}}\right]}{\text{Velocity} \left[\frac{m}{s}\right]}}$$

**Determine required wall thickness**
Use tube/pressure calculation tables shown in the tube chapter to determine recommended wall thickness for the required working pressure and flow diameter of the line. Therefore choose a working pressure which is equal or higher than the required working pressure.

## Flow characteristics

Hydraulic systems are in most cases only rated with a flow velocity defined on the basis of experience. The pressure losses in lines are not taken into account, or measured later on when testing the system. As the pressure losses increase porportionally greater than the flow resistance, it is important to achieve the best rating of the system, so that they are already taken into account when planning the tube connections. Calculation is not as difficult as it is often thought, and this chapter is intended to provide a guideline. Besides, it provides information on how excessive pressure losses can be avoided, because pressure losses result in losses in performance and excessive heat. Noise occurs and possibly cavitation in suction lines.

**Medium**

All indication given with regard to flow restrictions and to flow properties refer exclusively to liquids. For gaseous media, the variable density of the gas must additionally be taken into account.

**Units**

$c$ = Flow velocity $\left[\dfrac{m}{s}\right]$

$d$ = Pipe inside diameter [m]

$L$ = Pipe length [m]

$p$ = Pressure [Pa], 1 bar = 100000 Pa

$\dot{V}$ = Flow rate $\left[\dfrac{m^3}{s}\right]$, $1\ \dfrac{m^3}{s} = 6000\ \dfrac{l}{min}$

$\lambda$ = Pipe friction factor

$\upsilon(T)$ = Kinematic viscosity of the medium depending on temperature $\left[\dfrac{m^2}{s}\right]$

$\rho(T)$ = Density of the medium depending on temperature $\left[\dfrac{kg}{m^3}\right]$

$\zeta$ = Individual pressure loss coefficient

Only base units have been used. This has the advantage that the formula do not contain correction factors and there is no danger of confusion, e.g. that values are used with the wrong unit. In case values are given in other units – the flow rate is e.g. often given in l/min – it is advisable to convert them into the base units before starting calculation.

**Pressure losses in pipe lines**

To calculate pressure losses in pipe lines, it must first be determined whether there is a laminar or a turbulent flow. Laminar flow is homogenous and without turbulence. In case of turbulent flow, the losses increase much more quickly.
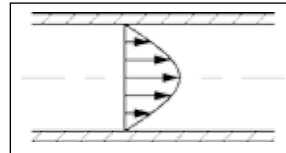


Flow profile
with laminar flow
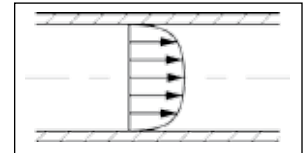
Flow profile
with turbulent flow

The kind of flow is defined by the Reynolds' number. With a Reynolds' number of more than 2320, the flow changes to turbulent. The Reynolds' number is calculated according to the formula:

$$Re = \frac{c \cdot d}{\upsilon(T)}$$

The Reynolds' number is a non-dimensional number. The critical fluid velocity at which the flow regime can change, is thus calculated from:

$$c_{cr} = 2320 \cdot \frac{\upsilon(T)}{d} \left[\frac{m}{s}\right]$$

With a given flow rate, the fluid velocity can be calculated according to the formula:

$$c = \frac{\dot{V} \cdot 4}{d^2 \cdot \pi} \left[\frac{m}{s}\right]$$

Subsequently, the pipe friction factor $\lambda$ can be calculated. The pipe friction factor $\lambda$ is a function of the Reynolds' number and also depends on the roughness of the pipe. As hydraulically smooth pipes can generally be assumed in hydraulic applications, the pipe friction factor $\lambda$ is calculated according to the following formula:

$$\text{laminar flow, (Re} < 2320\text{): } \lambda = \frac{64}{Re}$$

$$\textit{turbulent flow, (Re} > 2320\textit{): } \lambda = \frac{0.3164}{\sqrt[4]{Re}}$$

Finally, if all factors are known, the pressure loss in a certain pipe line can be calculated according to the formula:

$$\Delta p = \lambda \cdot \frac{L}{d} \cdot \frac{\rho(T) \cdot c^2}{2} \text{ [Pa]}$$

**Calculation of individual losses**

A hydraulic system does not only incorporate pipes, but also valves, fittings, pipe bends etc. that cause flow losses. These individual losses are often much higher than the pipe losses and are calculated according to the following formula:

$$\Delta p = \zeta \cdot \rho(T) \cdot \frac{c^2}{2} \text{ [Pa]}$$

ENGINEERING **YOUR** SUCCESS.

## Oil flow and pressure loss

All calculations based on Tube acc. to EN 10305-4, viscosity 37sct. specific gravity 0.860.
Following formula used and to determine other required tube or pipe sizes:

$$\text{Tube/Pipe I.D.} = 4.61 \times \sqrt{\frac{\text{flow/min}}{\text{velocity m/s}}}$$

| Tube | Oil flow capacity l/min | | | Pressure loss in tube bar/m | | | Tube | Oil flow capacity l/min | | | Pressure loss in tube bar/m | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.8 m/s | 4.5 m/s | 7.2 m/s | 1.8 m/s | 4.5 m/s | 7.2 m/s | | 1.8 m/s | 4.5 m/s | 7.2 m/s | 1.8 m/s | 4.5 m/s | 7.2 m/s |
| 6x1.0 | | 3.4 | 5.4 | | 1.90 | 4.10 | 30x2.0 | | 143.1 | 229.0 | | 0.10 | 0.30 |
| 6x1.5 | | 1.9 | 3.1 | | 2.80 | 5.90 | 30x3.0 | | 122.0 | 195.1 | | 0.10 | 0.40 |
| 8x1.0 | | 7.6 | 12.2 | | 1.10 | 2.30 | 30x4.0 | | 102.5 | 164.0 | | 0.10 | 0.40 |
| 8x1.5 | | 5.3 | 8.5 | | 1.40 | 3.00 | 35x2.0 | 81.4 | 203.5 | 325.6 | 0.024 | 0.10 | 0.30 |
| 8x2.0 | | 3.4 | 5.4 | | 1.90 | 4.10 | 35x3.0 | | 178.1 | 284.9 | | 0.10 | 0.30 |
| 8x2.5 | | 1.9 | 3.1 | | 2.80 | 5.90 | 38x2.5 | | 230.6 | 368.9 | | 0.10 | 0.20 |
| 10x1.0 | | 13.6 | 21.7 | | 0.70 | 1.60 | 38x3.0 | | 216.8 | 346.9 | | 0.10 | 0.30 |
| 10x1.5 | | 10.4 | 16.6 | | 0.90 | 1.90 | 38x4.0 | | 190.6 | 304.9 | | 0.10 | 0.30 |
| 10x2.0 | | 7.6 | 12.2 | | 1.10 | 2.30 | 38x5.0 | | 166.0 | 265.6 | | 0.10 | 0.30 |
| 10x2.5 | | 5.3 | 8.5 | | 1.40 | 3.00 | 42x2.0 | 122.3 | 305.8 | 489.2 | 0.018 | 0.09 | 0.20 |
| 12x1.0 | | 21.2 | 33.9 | | 0.50 | 1.20 | 42x3.0 | | 274.4 | 439.1 | | 0.10 | 0.20 |
| 12x1.5 | | 17.2 | 27.4 | | 0.60 | 1.30 | 42x4.0 | | 244.8 | 391.6 | | 0.10 | 0.20 |
| 12x2.0 | | 13.6 | 21.7 | | 0.70 | 1.60 | 46x8.5 | | 178.1 | 284.9 | | 0.06 | 0.14 |
| 12x2.5 | | 10.4 | 16.6 | | 0.90 | 1.90 | 50x3.0 | 164.0 | 410.0 | 656.0 | 0.012 | 0.07 | 0.17 |
| 14x1.5 | | 25.6 | 41.0 | | 0.50 | 1.00 | 50x5.0 | | 338.8 | 542.1 | | 0.08 | 0.19 |
| 14x2.0 | | 21.2 | 33.9 | | 0.50 | 1.20 | 50x6.0 | | 305.8 | 489.2 | | 0.09 | 0.19 |
| 15x1.5 | | 30.5 | 48.8 | | 0.40 | 0.90 | 56x8.5 | | 322.1 | 515.3 | | 0.09 | 0.19 |
| 15x2.0 | | 25.6 | 41.0 | | 0.50 | 1.00 | 60x3.0 | | 617.4 | 987.9 | 0.012 | 0.06 | 0.13 |
| 16x1.5 | | 35.8 | 57.3 | | 0.40 | 0.80 | 60x5.0 | | 529.4 | 847.0 | | 0.06 | 0.14 |
| 16x2.0 | | 30.5 | 48.8 | | 0.40 | 0.09 | 65x8.0 | | 508.4 | 813.4 | | 0.06 | 0.14 |
| 16x2.5 | | 25.6 | 41.0 | | 0.50 | 1.00 | 66x8.5 | | 508.4 | 813.4 | | 0.06 | 0.14 |
| 16x3.0 | | 21.2 | 33.9 | | 0.50 | 1.20 | 73x7.0 | | 737.1 | 1179.3 | | 0.05 | 0.11 |
| 18x1.5 | | 47.6 | 76.2 | | 0.30 | 0.70 | 75x3.0 | | 1008.1 | 1613.0 | 0.008 | 0.04 | 0.09 |
| 18x2.0 | | 41.5 | 66.4 | | 0.30 | 0.70 | 75x5.0 | | 894.6 | 1431.4 | | 0.03 | 0.10 |
| 20x2.0 | | 54.2 | 86.7 | | 0.30 | 0.70 | 80x10.0 | | 762.3 | 1219.6 | | 0.05 | 0.11 |
| 20x2.5 | | 47.6 | 76.2 | | 0.30 | 0.70 | 90x3.5 | | 1458.7 | 2333.9 | 0.006 | 0.03 | 0.07 |
| 20x3.0 | | 41.5 | 66.4 | | 0.30 | 0.70 | 90x5.0 | | 1355.2 | 2168.3 | | 0.03 | 0.08 |
| 20x4.0 | | 30.5 | 48.8 | | 0.40 | 0.90 | 90x9.0 | | 1097.7 | 1756.3 | | 0.04 | 0.09 |
| 22x1.5 | | 76.4 | 122.3 | | 0.20 | 0.50 | 97x12.0 | | 1128.4 | 1805.4 | | 0.04 | 0.09 |
| 22x2.0 | | 68.6 | 109.8 | | 0.20 | 0.05 | 115x4.0 | | 2424.3 | 3878.8 | 0.004 | 0.03 | 0.05 |
| 22x2.5 | | 61.2 | 97.9 | | 0.30 | 0.60 | 115x15.0 | | 1529.8 | 2447.8 | | 0.03 | 0.07 |
| 25x2.0 | | 93.4 | 149.4 | | 0.20 | 0.40 | 125x4.0 | | 2898.6 | 4637.7 | | 0.03 | 0.05 |
| 25x2.5 | | 84.7 | 135.5 | | 0.20 | 0.50 | 130x15.0 | | 2117.4 | 3387.9 | | 0.03 | 0.06 |
| 25x3.0 | | 76.4 | 122.3 | | 0.20 | 0.50 | 140x4.5 | 1453.5 | 3633.7 | 5814.0 | 0.004 | 0.02 | 0.04 |
| 25x4.0 | | 61.2 | 97.9 | | 3.00 | 0.06 | 165x5.0 | 1931.3 | 5087.0 | 7725.0 | | | |
| 28x2.0 | | 122.0 | 195.1 | | 0.20 | 0.40 | 220x6.0 | 3664.5 | 9160.5 | 14658.0 | | | |
| 28x2.5 | | 112.0 | 179.2 | | 0.20 | 0.40 | 273x6.0 | 5769.5 | 14424.0 | 23079.0 | | | |
| 28x3.0 | | 102.5 | 164.0 | | 0.20 | 0.40 | | | | | | | |

# EO-Tubes for fittings
Industrial and Mobile Applications

ENGINEERING **YOUR** SUCCESS.

## Seamless EO steel tubes | Material E235N (St. 37.4)

Tolerance DIN EN 10305-4

| Order code | | Tube O.D. (mm) | Tolerance | Wall thickness (mm) | Tube I.D. (mm) | Design pressure bar | | Burst pressure bar | Weight kg/m |
|---|---|---|---|---|---|---|---|---|---|
| Phosphated and oiled | Cr(VI)-free | | | | | DIN 2413 I Static | DIN 2413 III Dynamic | | |
| R04X0.5 | R04X0.5CF | 4 | | 0.50 | 3.0 | 313 | 273 | 1160 | 0.047 |
| | R04X0.75CF | 4 | ±0.08 | 0.75 | 2.5 | 470 | 391 | 1820 | 0.063 |
| R04X1 | R04X1CF | 4 | | 1.00 | 2.0 | 627 | 500 | 2700 | 0.074 |
| | R05X1CF | 5 | ±0.08 | 1.00 | 3.0 | 501 | 416 | 2120 | 0.099 |
| | R06X0.75CF | 6 | | 0.75 | 4.5 | 333 | 288 | 1150 | 0.103 |
| R06X1 | R06X1CF | 6 | | 1.00 | 4.0 | 444 | 372 | 1650 | 0.123 |
| R06X1.5 | R06X1.5CF | 6 | ±0.08 | 1.50 | 3.0 | 666 | 526 | 2550 | 0.166 |
| | R06X2CF | 6 | | 2.00 | 2.0 | 692 | 662 | >3500 | 0.197 |
| | R06X2.25CF | 6 | | 2.25 | 1.5 | 757 | 725 | >3500 | 0.208 |
| R08X1 | R08X1CF | 8 | | 1.00 | 6.0 | 333 | 288 | 1175 | 0.173 |
| R08X1.5 | R08X1.5CF | 8 | ±0.08 | 1.50 | 5.0 | 499 | 412 | 1925 | 0.240 |
| R08X2 | R08X2CF | 8 | | 2.00 | 4.0 | 666 | 526 | 2500 | 0.296 |
| | R08X2.5CF | 8 | | 2.50 | 3.0 | 658 | 630 | 2650 | 0.339 |
| R10X1 | R10X1CF | 10 | | 1.00 | 8.0 | 282 | 248 | 900 | 0.222 |
| R10X1.5 | R10X1.5CF | 10 | | 1.50 | 7.0 | 423 | 357 | 1450 | 0.314 |
| R10X2 | R10X2CF | 10 | ±0.08 | 2.00 | 6.0 | 564 | 458 | 2025 | 0.395 |
| | R10X2.5CF | 10 | | 2.50 | 5.0 | 705 | 551 | 2675 | 0.462 |
| | R10X3CF | 10 | | 3.00 | 4.0 | 666 | 638 | >3500 | 0.518 |
| R12X1 | R12X1CF | 12 | | 1.00 | 10.0 | 235 | 209 | 750 | 0.271 |
| R12X1.5 | R12X1.5CF | 12 | | 1.50 | 9.0 | 353 | 303 | 1150 | 0.388 |
| R12X2 | R12X2CF | 12 | ±0.08 | 2.00 | 8.0 | 470 | 391 | 1600 | 0.493 |
| | R12X2.5CF | 12 | | 2.50 | 7.0 | 588 | 474 | 2025 | 0.586 |
| | R12X3CF | 12 | | 3.00 | 6.0 | 705 | 551 | 2600 | 0.666 |
| | R12X3.5CF | 12 | | 3.50 | 5.0 | 651 | 624 | | 0.734 |
| | R14X1.5CF | 14 | | 1.50 | 11.0 | 302 | 264 | 975 | 0.462 |
| R14X2 | R14X2CF | 14 | | 2.00 | 10.0 | 403 | 342 | 1325 | 0.592 |
| | R14X2.5CF | 14 | ±0.08 | 2.50 | 9.0 | 504 | 415 | 1650 | 0.709 |
| R14X3 | R14X3CF | 14 | | 3.00 | 8.0 | 604 | 485 | 2200 | 0.814 |
| | | 14 | | 3.50 | 7.0 | 705 | 551 | 2625 | 0.906 |
| R15X1 | R15X1CF | 15 | | 1.00 | 13.0 | 188 | 170 | 575 | 0.345 |
| R15X1.5 | R15X1.5CF | 15 | | 1.50 | 12.0 | 282 | 248 | 950 | 0.499 |
| R15X2 | R15X2CF | 15 | ±0.08 | 2.00 | 11.0 | 376 | 321 | 1275 | 0.641 |
| | | 15 | | 3.00 | 9.0 | 564 | 458 | 2000 | 0.888 |
| R16X1.5 | R16X1.5CF | 16 | | 1.50 | 13.0 | 264 | 233 | 850 | 0.536 |
| R16X2 | R16X2CF | 16 | ±0.08 | 2.00 | 12.0 | 353 | 303 | 1175 | 0.691 |
| R16X2.5 | R16X2.5CF | 16 | | 2.50 | 11.0 | 441 | 370 | 1500 | 0.832 |
| R16X3 | R16X3CF | 16 | | 3.00 | 10.0 | 529 | 433 | 1850 | 0.962 |
| R18X1 | R18X1CF | 18 | | 1.00 | 16.0 | 157 | 143 | 450 | 0.419 |
| R18X1.5 | R18X1.5CF | 18 | | 1.50 | 15.0 | 235 | 209 | 700 | 0.610 |
| R18X2 | R18X2CF | 18 | ±0.08 | 2.00 | 14.0 | 313 | 273 | 975 | 0.789 |
| R18X2.5 | R18X2.5CF | 18 | | 2.50 | 13.0 | 392 | 333 | 1300 | 0.956 |
| | R18X3CF | 18 | | 3.00 | 12.0 | 470 | 391 | 1575 | 1.111 |

**ℙarker**

## Seamless EO steel tubes (continued) | Material E235N (St. 37.4)

Tolerance DIN EN 10305-4

| Order code | | Tube O.D. (mm) | Tolerance | Wall thickness (mm) | Tube I.D. (mm) | Design pressure bar | | Burst pressure bar | Weight kg/m |
|---|---|---|---|---|---|---|---|---|---|
| Phosphated and oiled | Cr(VI)-free | | | | | DIN 2413 I Static | DIN 2413 III Dynamic | | |
| **R20X2** **R20X2.5** **R20X3** | **R20X1.5CF** **R20X2CF** **R20X2.5CF** **R20X3CF** **R20X3.5CF** **R20X4CF** | 20 20 20 20 20 20 | ±0.08 | 1.50 2.00 2.50 3.00 3.50 4.00 | 17.0 16.0 15.0 14.0 13.0 12.0 | 212 282 353 423 494 564 | 190 248 303 357 408 458 | 675 900 1100 1400 1650 2000 | 0.684 0.888 1.079 1.258 1.424 1.578 |
| **R22X1.5** **R22X2** **R22X2.5** | **R22X1.5CF** **R22X2CF** **R22X2.5CF** **R22X3CF** | 22 22 22 22 | ±0.08 | 1.50 2.00 2.50 3.00 | 19.0 18.0 17.0 16.0 | 192 256 320 385 | 173 227 278 328 | 550 775 1025 1175 | 0.758 0.986 1.202 1.406 |
| **R25X2** **R25X2.5** **R25X3** **R25X4** **R25X4.5** | **R25X2CF** **R25X2.5CF** **R25X3CF** **R25X4CF** **R25X4.5CF** | 25 25 25 25 25 | ±0.08 | 2.00 2.50 3.00 4.00 4.50 | 21.0 20.0 19.0 17.0 16.0 | 226 282 338 451 508 | 201 248 292 378 418 | 725 850 1025 1500 1625 | 1.134 1.387 1.628 2.072 2.275 |
| **R28X1.5** **R28X2** **R28X2.5** **R28X3** | **R28X1.5CF** **R28X2CF** **R28X2.5CF** **R28X3CF** | 28 28 28 28 | ±0.08 | 1.50 2.00 2.50 3.00 | 25.0 24.0 23.0 22.0 | 151 201 252 302 | 138 181 223 264 | 425 600 750 900 | 0.980 1.282 1.572 1.850 |
| **R30X2.5** **R30X3** **R30X4** **R30X5** | **R30X2CF** **R30X2.5CF** **R30X3CF** **R30X4CF** **R30X5CF** | 30 30 30 30 30 | ±0.08 | 2.00 2.50 3.00 4.00 5.00 | 26.0 25.0 24.0 22.0 20.0 | 188 235 282 376 470 | 170 209 248 321 391 | 575 725 850 1175 1600 | 1.381 1.695 1.998 2.565 3.083 |
| **R35X2** **R35X2.5** **R35X3** | **R35X2CF** **R35X2.5CF** **R35X3CF** **R35X4CF** | 35 35 35 35 | ±0.15 | 2.00 2.50 3.00 4.00 | 31.0 30.0 29.0 27.0 | 161 201 242 322 | 147 181 215 280 | 450 600 700 960 | 1.628 2.004 2.367 3.058 |
| **R38X3** **R38X4** **R38X5** | **R38X2.5CF** **R38X3CF** **R38X4CF** **R38X5CF** **R38X6CF** **R38X7CF** | 38 38 38 38 38 38 | ±0.15 | 2.50 3.00 4.00 5.00 6.00 7.00 | 33.0 32.0 30.0 28.0 26.0 24.0 | 186 223 297 371 445 519 | 168 199 260 318 373 427 | 550 675 900 1150 1425 1700 | 2.189 2.589 3.354 4.069 4.735 5.352 |
| **R42X2** **R42X3** **R42X4** | **R42X2CF** **R42X3CF** **R42X4CF** | 42 42 42 | ±0.2 | 2.00 3.00 4.00 | 38.0 36.0 34.0 | 134 201 269 | 123 181 237 | 375 575 850 | 1.973 2.885 3.749 |
| **R50X6** | | 50 | ±0.2 | 6.00 | 38.0 | 338 | 292 | | 6.511 |
| **R65X8** | | 65 | ±0.3 | 8.00 | 49.0 | 347 | 299 | | 11.246 |

Surface finish:
- Phosphated and oiled:
- Tubes with I.D. 1.5–5 mm: outside and inside oiled.
- Tubes from 6 mm I.D.: outside and inside phosphated and oiled.

- Cr(VI)-free:
These dimensions are externally thick coat passivated (thickness of coat 8–12 μm), inside oiled.

ENGINEERING **YOUR** SUCCESS.

## Seamless EO stainless steel tubes | Material-No.: 1.4571

Tolerance DIN EN 10305-1

| Order code 1.4571 | Tube O.D. (mm) | Tolerance | Wall thickness (mm) | Tube I.D. (mm) | 1.4571 Design pressure bar DIN 2413 I Static | 1.4571 burst pressure bar | Weight kg/m |
|---|---|---|---|---|---|---|---|
| R04X171 | 4 | ±0.08 | 1.0 | 2 | 735 | | 0.075 |
| R06X171 | 6 | ±0.08 | 1.0 | 4 | 490 | 1850 | 0.125 |
| R06X1.571 | 6 | ±0.08 | 1.5 | 3 | 735 | 2900 | 0.169 |
| R08X171 | 8 | ±0.08 | 1.0 | 6 | 368 | 1300 | 0.175 |
| R08X1.571 | 8 | | 1.5 | 5 | 551 | 2050 | 0.244 |
| R10X171 | 10 | | 1.0 | 8 | 294 | 950 | 0.225 |
| R10X1.571 | 10 | ±0.08 | 1.5 | 7 | 441 | 1750 | 0.319 |
| R10X271 | 10 | | 2.0 | 6 | 588 | 2400 | 0.401 |
| R12X171 | 12 | | 1.0 | 10 | 245 | 850 | 0.275 |
| R12X1.571 | 12 | ±0.08 | 1.5 | 9 | 368 | 1400 | 0.394 |
| R12X271 | 12 | | 2.0 | 8 | 490 | 1900 | 0.501 |
| R14X1.571 | 14 | | 1.5 | 11 | 315 | 1200 | 0.469 |
| R14X271 | 14 | ±0.08 | 2.0 | 10 | 420 | 1550 | 0.601 |
| R14X2.571 | 14 | | 2.5 | 9 | 525 | 2100 | 0.720 |
| R15X171 | 15 | | 1.0 | 13 | 196 | 675 | 0.351 |
| R15X1.571 | 15 | ±0.08 | 1.5 | 12 | 294 | 1100 | 0.507 |
| R15X271 | 15 | | 2.0 | 11 | 392 | 1400 | 0.651 |
| R16X1.571 | 16 | ±0.08 | 1.5 | 13 | 276 | 950 | 0.545 |
| R16X271 | 16 | | 2.0 | 12 | 368 | 1300 | 0.701 |
| R16X2.571 | 16 | ±0.08 | 2.5 | 11 | 459 | 1850 | 0.845 |
| R16X371 | 16 | | 3.0 | 10 | 551 | 2400 | 0.977 |
| R18X1.571 | 18 | ±0.08 | 1.5 | 15 | 245 | 800 | 0.620 |
| R18X271 | 18 | | 2.0 | 14 | 327 | 1150 | 0.801 |
| R20X271 | 20 | | 2.0 | 16 | 294 | 1050 | 0.901 |
| R20X2.571 | 20 | ±0.08 | 2.5 | 15 | 368 | 1400 | 1.095 |
| R20X371 | 20 | | 3.0 | 14 | 441 | 1800 | 1.277 |
| R22X1.571 | 22 | ±0.08 | 1.5 | 19 | 200 | 650 | 0.770 |
| R22X271 | 22 | | 2.0 | 18 | 267 | 900 | 1.002 |
| R25X2.571 | 25 | ±0.08 | 2.5 | 20 | 294 | 1050 | 1.408 |
| R25X371 | 25 | | 3.0 | 19 | 353 | 1275 | 1.653 |
| R28X1.571 | 28 | ±0.08 | 1.5 | 25 | 158 | 550 | 0.995 |
| R28X271 | 28 | | 2.0 | 24 | 210 | 700 | 1.302 |
| R30X2.571 | 30 | ±0.08 | 2.5 | 25 | 245 | 850 | 1.722 |
| R30X371 | 30 | ±0.08 | 3.0 | 24 | 294 | 1150 | 2.028 |
| R30X471 | 30 | | 4.0 | 22 | 392 | 1500 | 2.605 |
| R35X271 | 35 | ±0.15 | 2.0 | 31 | 168 | 550 | 1.653 |
| R38X471 | 38 | ±0.15 | 4.0 | 30 | 309 | 1150 | 3.405 |
| R42X271 | 42 | ±0.2 | 2.0 | 38 | 140 | 475 | 2.003 |
| R42X371 | 42 | | 3.0 | 36 | 210 | 750 | 2.930 |

## Seamless EO steel tubes | Material Carbon-Steel

for hydraulic and pneumatic pressure lines.
SAE J 524. C-Steel, surface phosphated and oiled.
Test according ASTM A 179-90 A/ASME SA 179.
Quality and leak tested.

| Order code (With Tube O.D. and wall thickness Inch) | Tube O.D. (mm) | Tolerance | Wall thickness (mm) | Design pressure bar | | burst pressure bar | Weight kg/m |
|---|---|---|---|---|---|---|---|
| | | | | DIN 2413 I Static | DIN 2413 III Dynamic | | |
| R1/4X0.049 | 6.35 | ±0.08 | 1.24 | 553 | 450 | – | 0.157 |
| R3/8X0.049PHR | 9.53 | ±0.08 | 1.24 | 368 | 316 | – | 0.254 |
| R3/8X0.065PHR | 9.53 | ±0.08 | 1.65 | 489 | 405 | – | 0.321 |
| R1/2X0.049PHR | 12.70 | ±0.08 | 1.24 | 276 | 243 | – | 0.352 |
| R1/2X0.065PHR | 12.70 | ±0.08 | 1.65 | 367 | 314 | – | 0.450 |
| R5/8X0.083PHR | 16.00 | ±0.08 | 2.11 | 374 | 320 | – | 0.716 |
| R3/4X0.095PHR | 19.05 | ±0.08 | 2.41 | 357 | 307 | – | 0.990 |
| R3/4X0.109PHR | 19.05 | ±0.08 | 2.67 | 410 | 347 | – | 1.112 |
| R1X0.095PHR | 25.40 | ±0.08 | 2.41 | 268 | 236 | – | 1.368 |
| R1X0.120PHR | 25.40 | ±0.08 | 3.05 | 338 | 292 | – | 1.680 |
| R11/4X0.120PHR | 31.75 | ±0.08 | 3.05 | 271 | 239 | – | 2.157 |
| R11/2X0.156PHR | 38.10 | ±0.15 | 3.96 | 293 | 257 | – | 3.336 |

ENGINEERING **YOUR** SUCCESS.

# Notes

# Tubes and pipes
# for piping business

## Tubes – Marine and offshore applications (DNV Rules)

1 DNV Bended pipe including manufacturing and corrosion tolerances
2 DNV Straight pipe including manufacturing and corrosion tolerances
3 Burst pressure (B.P.) calculation including manufacturing tolerance

**Tube E 235N /St. 37.4 NBK - Cr(VI)-free plated or phosphated and oiled**

| Tube O.D. x W.T. | 1 DNV W.P. bar | 2 DNV W.P. bar | 3 B.P. bar | Weight kg/mtr. | Phosphated and oiled Order code | Cr(VI)-free Order code |
|---|---|---|---|---|---|---|
| 06x1.0 | 230 | 373 | 1105 | 0.07 | R06x1 | R06x1CF |
| 06X1.5 | 437 | 506 | 1658 | 0.17 | R06X1.5 | R06X1.5CF |
| 08X1.0 | 169 | 193 | 829 | 0.17 | R08X1 | R08X1CF |
| 08X1.5 | 315 | 362 | 1243 | 0.24 | R08X1.5 | R08X1.5CF |
| 10X1.0 | 146 | 167 | 702 | 0.22 | R10X1 | R10X1CF |
| 10X1.5 | 267 | 306 | 1053 | 0.31 | R10X1.5 | R10X1.5CF |
| 12X1.5 | 218 | 250 | 878 | 0.39 | R12X1.5 | R12X1.5CF |
| 12X2.0 | 324 | 373 | 1170 | 0.49 | R12X2 | R12X2CF |
| 14X2.0 | 273 | 313 | 1003 | 0.59 | R14X2 | R14X2CF |
| 15X1.5 | 172 | 196 | 702 | 0.50 | R15X1.5 | R15X1.5CF |
| 15X2.0 | 253 | 290 | 936 | 0.64 | R15X2 | R15X2CF |
| 16X1.5 | 160 | 183 | 658 | 0.54 | R16X1.5 | R16X1.5CF |
| 16X2.0 | 235 | 270 | 878 | 0.69 | R16X2 | R16X2CF |
| 16X2.5 | 315 | 362 | 1097 | 0.83 | R16X2.5 | R16X2.5CF |
| 18X1.5 | 142 | 162 | 585 | 0.61 | R18X1.5 | R18X1.5CF |
| 18X2.0 | 207 | 237 | 780 | 0.79 | R18X2 | R18X2CF |
| 20X2.0 | 185 | 212 | 702 | 0.89 | R20X2 | R20X2CF |
| 20X2.5 | 246 | 282 | 878 | 1.08 | R20X2.5 | R20X2.5CF |
| 20X3.0 | 309 | 356 | 1053 | 1.26 | R20X3 | R20X3CF |
| 20X4.0 | 445 | 516 | 1404 | 1.58 | | R20X4CF |
| 22X1.5 | 115 | 131 | 479 | 0.76 | R22X1.5 | R22X1.5CF |
| 22X2.0 | 167 | 191 | 638 | 0.99 | R22X2 | R22X2CF |
| 22X2.5 | 221 | 254 | 798 | 1.20 | R22x2.5 | R22X2.5CF |
| 25X2.0 | 146 | 167 | 562 | 1.13 | R25X2 | R25X2CF |
| 25X2.5 | 193 | 221 | 702 | 1.39 | R25X2.5 | R25X2.5CF |
| 25X3.0 | 242 | 277 | 842 | 1.63 | R25X3 | R25X3CF |
| 25X4.0 | 344 | 397 | 1123 | 2.07 | R25X4 | R25X4CF |
| 28X2.0 | 129 | 148 | 501 | 1.28 | R28X2 | R28X2CF |
| 28X3.0 | 214 | 245 | 752 | 1.85 | R28X3 | R28X3CF |
| 30X2.0 | 120 | 137 | 468 | 1.38 | | R30X2CF |
| 30X3.0 | 198 | 227 | 702 | 2.00 | R30X3 | R30X3CF |
| 30X4.0 | 281 | 323 | 936 | 2.56 | R30X4 | R30X4CF |
| 30X5.0 | 368 | 425 | 1170 | 3.08 | R30X5 | R30X5CF |
| 35X2.0 | 103 | 117 | 401 | 1.63 | R35X2 | R35X2CF |
| 35X3.0 | 168 | 192 | 602 | 2.37 | R35X3 | R35X3CF |
| 38X2.5 | 124 | 141 | 462 | 2.19 | | R38X2.5CF |
| 38X3.0 | 154 | 176 | 554 | 2.59 | R38X3 | R38X3CF |
| 38X4.0 | 217 | 248 | 739 | 3.35 | R38X4 | R38X4CF |
| 38X5.0 | 282 | 324 | 924 | 4.07 | R38X5 | R38X5CF |
| 42X2.0 | 85 | 97 | 334 | 1.97 | R42X2 | R42X2CF |
| 42X3.0 | 139 | 158 | 501 | 2.89 | R42X3 | R42X3CF |
| 42X4.0 | 194 | 223 | 669 | 3.75 | R42X4 | R42X4CF |
| 50X3.0 | 115 | 132 | 421 | 3.48 | R50X3 | R50X3CF |
| 60X3.0 | 95 | 109 | 351 | 4.22 | R60X3 | R60X3CF |
| 75X3.0 | 76 | 86 | 281 | 5.32 | R75X3 | R75X3CF |
| 90X3.5 | 75 | 85 | 273 | 7.47 | R90X3.5 | R90X3.5CF |
| 100X4.0 | 78 | 89 | 281 | 9.47 | R100X4 | |
| 115X4.0 | 68 | 77 | 244 | 10.98 | R115X4 | |
| 140X4.5 | 63 | 72 | 226 | 15.04 | R140X4.5 | |
| 165X5.0 | 60 | 68 | 213 | 19.73 | R165X5 | |
| 220X6.0 | 55 | 62 | 191 | 31.66 | R220X6 | |
| 273X6.0 | 44 | 50 | 154 | 39.51 | R273X6 | |

Other sizes on request

## Tubes – Landbased and industrial applications (DIN Rules)

1 DIN 2413 I static pressure (W.P.) capability for straight pipe including manufacturing tolerance
2 DIN 2413 III dynamic pressure (W.P.) capability for straight pipe including manufacturing tolerance
3 Burst pressure (B.P.) calculation including manufacturing tolerance

**Tube E 235N /St. 37.4 NBK - Cr(VI)-free plated or phosphated and oiled**

| Tube<br>O.D. x W.T. | 1<br>DIN 2413 I<br>W.P. bar | 2<br>DIN 2413 III<br>W.P. bar | 3<br>B.P. bar | Weight<br>kg/mtr. | Phosphated<br>and oiled<br>Order code | Cr(VI)-free<br>Order code |
|---|---|---|---|---|---|---|
| 06x1.0 | 444 | 372 | 1105 | 0.07 | **R06x1** | **R06x1CF** |
| 06X1.5 | 666 | 526 | 1658 | 0.17 | **R06X1.5** | **R06X1.5CF** |
| 08X1.0 | 333 | 288 | 829 | 0.17 | **R08X1** | **R08X1CF** |
| 08X1.5 | 499 | 412 | 1243 | 0.24 | **R08X1.5** | **R08X1.5CF** |
| 10X1.0 | 282 | 248 | 702 | 0.22 | **R10X1** | **R10X1CF** |
| 10X1.5 | 423 | 357 | 1053 | 0.31 | **R10X1.5** | **R10X1.5CF** |
| 12X1.5 | 353 | 303 | 878 | 0.39 | **R12X1.5** | **R12X1.5CF** |
| 12X2.0 | 470 | 391 | 1170 | 0.49 | **R12X2** | **R12X2CF** |
| 14X2.0 | 403 | 342 | 1003 | 0.59 | **R14X2** | **R14X2CF** |
| 15X1.5 | 282 | 248 | 702 | 0.50 | **R15X1.5** | **R15X1.5CF** |
| 15X2.0 | 376 | 321 | 936 | 0.64 | **R15X2** | **R15X2CF** |
| 16X1.5 | 264 | 233 | 658 | 0.54 | **R16X1.5** | **R16X1.5CF** |
| 16X2.0 | 353 | 303 | 878 | 0.69 | **R16X2** | **R16X2CF** |
| 16X2.5 | 441 | 370 | 1097 | 0.83 | **R16X2.5** | **R16X2.5CF** |
| 18X1.5 | 235 | 209 | 585 | 0.61 | **R18X1.5** | **R18X1.5CF** |
| 18X2.0 | 313 | 273 | 780 | 0.79 | **R18X2** | **R18X2CF** |
| 20X2.0 | 282 | 248 | 702 | 0.89 | **R20X2** | **R20X2CF** |
| 20X2.5 | 353 | 303 | 878 | 1.08 | **R20X2.5** | **R20X2.5CF** |
| 20X3.0 | 423 | 357 | 1053 | 1.26 | **R20X3** | **R20X3CF** |
| 20X4.0 | 564 | 458 | 1404 | 1.58 | | **R20X4CF** |
| 22X1.5 | 192 | 173 | 479 | 0.76 | **R22X1.5** | **R22X1.5CF** |
| 22X2.0 | 256 | 227 | 638 | 0.99 | **R22X2** | **R22X2CF** |
| 22X2.5 | 320 | 278 | 798 | 1.20 | **R22x2.5** | **R22X2.5CF** |
| 25X2.0 | 226 | 201 | 562 | 1.13 | **R25X2** | **R25X2CF** |
| 25X2.5 | 282 | 248 | 702 | 1.39 | **R25X2.5** | **R25X2.5CF** |
| 25X3.0 | 338 | 292 | 842 | 1.63 | **R25X3** | **R25X3CF** |
| 25X4.0 | 451 | 378 | 1123 | 2.07 | **R25X4** | **R25X4CF** |
| 28X2.0 | 201 | 181 | 501 | 1.28 | **R28X2** | **R28X2CF** |
| 28X3.0 | 302 | 264 | 752 | 1.85 | **R28X3** | **R28X3CF** |
| 30X2.0 | 188 | 170 | 468 | 1.38 | | **R30X2CF** |
| 30X3.0 | 282 | 248 | 702 | 2.00 | **R30X3** | **R30X3CF** |
| 30X4.0 | 376 | 321 | 936 | 2.56 | **R30X4** | **R30X4CF** |
| 30X5.0 | 470 | 391 | 1170 | 3.08 | **R30X5** | **R30X5CF** |
| 35X2.0 | 161 | 147 | 401 | 1.63 | **R35X2** | **R35X2CF** |
| 35X3.0 | 242 | 215 | 602 | 2.37 | **R35X3** | **R35X3CF** |
| 38X2.5 | 186 | 168 | 462 | 2.19 | | **R38X2.5CF** |
| 38X3.0 | 223 | 199 | 554 | 2.59 | **R38X3** | **R38X3CF** |
| 38X4.0 | 297 | 260 | 739 | 3.35 | **R38X4** | **R38X4CF** |
| 38X5.0 | 371 | 318 | 924 | 4.07 | **R38X5** | **R38X5CF** |
| 42X2.0 | 134 | 123 | 334 | 1.97 | **R42X2** | **R42X2CF** |
| 42X3.0 | 201 | 181 | 501 | 2.89 | **R42X3** | **R42X3CF** |
| 42X4.0 | 269 | 237 | 669 | 3.75 | **R42X4** | **R42X4CF** |
| 50X3.0 | 169 | 154 | 421 | 3.48 | **R50X3** | **R50X3CF** |
| 60X3.0 | 141 | 129 | 351 | 4.22 | **R60X3** | **R60X3CF** |
| 75X3.0 | 113 | 104 | 281 | 5.32 | **R75X3** | **R75X3CF** |
| 90X3.5 | 110 | 101 | 273 | 7.47 | **R90X3.5** | **R90X3.5CF** |
| 100X4.0 | 113 | 104 | 281 | 9.47 | **R100X4** | |
| 115X4.0 | 98 | 91 | 244 | 10.98 | **R115X4** | |
| 140X4.5 | 91 | 84 | 226 | 15.04 | **R140X4.5** | |
| 165X5.0 | 85 | 80 | 213 | 19.73 | **R165X5** | |
| 220X6.0 | 77 | 72 | 191 | 31.66 | **R220X6** | |
| 273X6.0 | 62 | 58 | 154 | 39.51 | **R273X6** | |

Other sizes on request

ENGINEERING **YOUR** SUCCESS.

## Tubes – Marine and Offshore applications (DNV Rules)

1 DNV Bended pipe including manufacturing and corrosion tolerances
2 DNV Straight pipe including manufacturing and corrosion tolerances
3 Burst pressure (B.P.) calculation including manufacturing tolerance

**Tube E 355N /St.52.4 NBK - Cr(VI)-free plated or phosphated and oiled**

| Tube O.D. x W.T. | 1 DNV W.P. bar | 2 DNV W.P. bar | 3 B.P. bar | Weight kg/mtr. | Phosphated and oiled Order code | Cr(VI)-free Order code |
|---|---|---|---|---|---|---|
| 15X1.5 | 259 | 297 | 959 | 0.50 | | **R15X1.5ST52CF** |
| 15X2.0 | 381 | 438 | 1279 | 0.61 | | **R15X2ST52CF** |
| 16X2.0 | 355 | 408 | 1199 | 0.69 | | **R16X2ST52CF** |
| 16X2.5 | 475 | 547 | 1499 | 0.83 | | **R16X2.5ST52CF** |
| 18X1.5 | 214 | 244 | 800 | 0.61 | | **R18X1.5ST52CF** |
| 18X2.0 | 313 | 358 | 1066 | 0.79 | | **R18X2ST52CF** |
| 20X2.0 | 279 | 319 | 959 | 0.89 | | **R20X2ST52CF** |
| 20X2.5 | 371 | 426 | 1199 | 1.08 | | **R20X2.5ST52CF** |
| 20X3.0 | 467 | 537 | 1439 | 1.25 | | **R20X3ST52CF** |
| 22X1.5 | 173 | 197 | 654 | 0.76 | | **R22X1.5ST52CF** |
| 22X2.0 | 252 | 288 | 872 | 0.99 | | **R22X2ST52CF** |
| 25X2.5 | 291 | 333 | 959 | 1.39 | | **R25X2.5ST52CF** |
| 25X3.0 | 365 | 418 | 1151 | 1.63 | | **R25X3ST52CF** |
| 25X4.0 | 519 | 599 | 1535 | 2.07 | | **R25X4ST52CF** |
| 28X2.0 | 195 | 223 | 685 | 1.28 | | **R28X2ST52CF** |
| 30X3.0 | 299 | 343 | 959 | 2.00 | | **R30X3ST52CF** |
| 30X4.0 | 424 | 487 | 1279 | 2.56 | | **R30X4ST52CF** |
| 30X5.0 | 555 | 641 | 1599 | 3.08 | | **R30X5ST52CF** |
| 35X3.0 | 254 | 290 | 822 | 2.37 | | **R35X3ST52CF** |
| 38X3.0 | 233 | 266 | 757 | 2.37 | | **R38X3ST52CF** |
| 38X4.0 | 327 | 375 | 1010 | 3.35 | | **R38X4ST52CF** |
| 38X5.0 | 426 | 490 | 1262 | 4.07 | | **R38X5ST52CF** |
| 39X7.5 | 673 | 781 | 1845 | 8.53 | | **R39X7.5ST52CF** |
| 42X3.0 | 209 | 239 | 685 | 2.89 | | **R42X3ST52CF** |
| 42X4.0 | 294 | 336 | 914 | 3.75 | | **R42X4ST52CF** |
| 46X8.0 | 601 | 695 | 1669 | 7.50 | | **R46X8ST52CF** |
| 50X5.0 | 315 | 361 | 959 | 5.55 | **R50X5ST52** | **R50X5ST52CF** |
| 50X6.0 | 390 | 448 | 1151 | 6.50 | **R50X6ST52** | **R50X6ST52CF** |
| 56X8.5 | 516 | 595 | 1456 | 9.96 | **R56X8.5ST52** | |
| 60X5.0 | 259 | 297 | 800 | 6.78 | | **R60X5ST52CF** |
| 60X6.0 | 319 | 366 | 959 | 7.97 | **R60X6ST52** | **R60X6ST52CF** |
| 65X8.0 | 407 | 468 | 1121 | 11.25 | | **R65X8ST52CF** |
| 66X8.5 | 429 | 494 | 1236 | 12.05 | **R66X8.5ST52** | |
| 73X7.0 | 309 | 353 | 920 | 11.22 | **R73X7ST52** | **R73X7ST52CF** |
| 75X5.0 | 205 | 234 | 640 | 8.63 | **R75X5ST52** | **R75X5ST52CF** |
| 80X10 | 418 | 481 | 1199 | 17.21 | **R80X10ST52** | |
| 90X5.0 | 169 | 193 | 533 | 10.48 | **R90X5ST52** | **R90X5ST52CF** |
| 90X9.0 | 326 | 374 | 959 | 17.98 | **R90X9ST52** | **R90X9ST52CF** |
| 97X12 | 416 | 478 | 1187 | 25.15 | **R97X12ST52** | |
| 115X15 | 444 | 511 | 1251 | 36.95 | **R115X15ST52** | |
| 130X15 | 388 | 445 | 1107 | 42.54 | **R130X15ST52** | |
| 150X15 | 332 | 380 | 959 | 49.94 | **R150X15ST52** | |
| 190X20 | 353 | 405 | 1010 | 83.84 | **R190X20ST52** | |
| 250X25 | 335 | 384 | 959 | 138.72 | **R250X25ST52** | |

Other sizes on request

## Tubes – Landbased and industrial applications (DIN Rules)

1 DIN 2413 I static pressure (W.P.) capability for straight pipe including manufacturing tolerance
2 DIN 2413 III dynamic pressure (W.P.) capability for straight pipe including manufacturing tolerance
3 Burst pressure (B.P.) calculation including manufacturing tolerance

**Tube E 355N /St.52.4 NBK - Cr(VI)-free plated or phosphated and oiled**

| Tube O.D. x W.T. | 1 DIN 2413 I W.P. bar | 2 DIN 2413 III W.P. bar | 3 B.P. bar | Weight kg/mtr. | Phosphated and oiled Order code | Cr(VI)-free Order code |
|---|---|---|---|---|---|---|
| 15X1.5 | 426 | 292 | 959 | 0.50 | | **R15X1.5ST52CF** |
| 15X2.0 | 568 | 379 | 1279 | 0.61 | | **R15X2ST52CF** |
| 16X2.0 | 533 | 357 | 1199 | 0.69 | | **R16X2ST52CF** |
| 16X2.5 | 666 | 436 | 1499 | 0.83 | | **R16X2.5ST52CF** |
| 18X1.5 | 355 | 247 | 800 | 0.61 | | **R18X1.5ST52CF** |
| 18X2.0 | 473 | 321 | 1066 | 0.79 | | **R18X2ST52CF** |
| 20X2.0 | 426 | 292 | 959 | 0.89 | | **R20X2ST52CF** |
| 20X2.5 | 533 | 357 | 1199 | 1.08 | | **R20X2.5ST52CF** |
| 20X3.0 | 639 | 420 | 1439 | 1.25 | | **R20X3ST52CF** |
| 22X1.5 | 290 | 204 | 654 | 0.76 | | **R22X1.5ST52CF** |
| 22X2.0 | 387 | 267 | 872 | 0.99 | | **R22X2ST52CF** |
| 25X2.5 | 426 | 292 | 959 | 1.39 | | **R25X2.5ST52CF** |
| 25X3.0 | 511 | 344 | 1151 | 1.63 | | **R25X3ST52CF** |
| 25X4.0 | 682 | 445 | 1535 | 2.07 | | **R25X4ST52CF** |
| 28X2.0 | 304 | 213 | 685 | 1.28 | | **R28X2ST52CF** |
| 30X3.0 | 426 | 292 | 959 | 2.00 | | **R30X3ST52CF** |
| 30X4.0 | 568 | 379 | 1279 | 2.56 | | **R30X4ST52CF** |
| 30X5.0 | 710 | 461 | 1599 | 3.08 | | **R30X5ST52CF** |
| 35X3.0 | 365 | 253 | 822 | 2.37 | | **R35X3ST52CF** |
| 38X3.0 | 336 | 234 | 757 | 2.37 | | **R38X3ST52CF** |
| 38X4.0 | 448 | 306 | 1010 | 3.35 | | **R38X4ST52CF** |
| 38X5.0 | 561 | 374 | 1262 | 4.07 | | **R38X5ST52CF** |
| 39X7.5 | 819 | 521 | 1845 | 8.53 | | **R39X7.5ST52CF** |
| 42X3.0 | 304 | 213 | 685 | 2.89 | | **R42X3ST52CF** |
| 42X4.0 | 406 | 279 | 914 | 3.75 | | **R42X4ST52CF** |
| 46X8.0 | 741 | 478 | 1669 | 7.50 | | **R46X8ST52CF** |
| 50X5.0 | 426 | 292 | 959 | 5.55 | **R50X5ST52** | **R50X5ST52CF** |
| 50X6.0 | 511 | 344 | 1151 | 6.50 | **R50X6ST52** | **R50X6ST52CF** |
| 56X8.5 | 647 | 425 | 1456 | 9.96 | **R56X8.5ST52** | |
| 60X5.0 | 355 | 247 | 800 | 6.78 | | **R60X5ST52CF** |
| 60X6.0 | 426 | 292 | 959 | 7.97 | **R60X6ST52** | **R60X6ST52CF** |
| 65X8.0 | 524 | 352 | 1121 | 11.25 | | **R65X8ST52CF** |
| 66X8.5 | 549 | 367 | 1236 | 12.05 | **R66X8.5ST52** | |
| 73X7.0 | 408 | 281 | 920 | 11.22 | **R73X7ST52** | **R73X7ST52CF** |
| 75X5.0 | 284 | 200 | 640 | 8.63 | **R75X5ST52** | **R75X5ST52CF** |
| 80X10 | 533 | 357 | 1199 | 17.21 | **R80X10ST52** | |
| 90X5.0 | 237 | 168 | 533 | 10.48 | **R90X5ST52** | **R90X5ST52CF** |
| 90x9.0 | 426 | 292 | 959 | 17.98 | **R90X9ST52** | **R90X9ST52CF** |
| 97X12 | 527 | 354 | 1187 | 25.15 | **R97X12ST52** | |
| 115X15 | 556 | 371 | 1251 | 36.95 | **R115X15ST52** | |
| 130X15 | 492 | 332 | 1107 | 42.54 | **R130X15ST52** | |
| 150X15 | 426 | 292 | 959 | 49.94 | **R150X15ST52** | |
| 190X20 | 448 | 306 | 1010 | 83.84 | **R190X20ST52** | |
| 250X25 | 426 | 292 | 959 | 138.72 | **R250X25ST52** | |

Other sizes on request

ENGINEERING **YOUR** SUCCESS.

## Tubes – Marine and Offshore applications (DNV Rules)

1 DNV: Bended pipe including manufacturing and corrosion tolerances
2 Burst pressure (B.P.) calculation including manufacturing tolerance

**Seamless cold drawn Stainless Steel Tube ASTM A269/A213 - AISI 316L**

| Tube O.D. x W.T. | 1 DNV W.P. bar | 2 B.P. bar | Weight kg/mtr. | AISI 316L Order code |
|---|---|---|---|---|
| 06X1 | 493 | 1590 | 0.13 | R06X1-316 |
| 08X1 | 357 | 1193 | 0.18 | R08X1-316 |
| 10X1 | 298 | 954 | 0.23 | R10X1-316 |
| 10X1.5 | 467 | 1431 | 0.32 | R10X1.5-316 |
| 12X1 | 244 | 795 | 0.28 | R12X1-316 |
| 12X1.5 | 380 | 1193 | 0.39 | R12X1.5-316 |
| 12X2 | 526 | 1590 | 0.50 | R12X2-316 |
| 15X1.5 | 298 | 954 | 0.51 | R15X1.5-316 |
| 16X2 | 380 | 1193 | 0.70 | R16X2-316 |
| 16X2.5 | 489 | 1491 | 0.85 | R16X2.5-316 |
| 18X1.5 | 244 | 795 | 0.62 | R18X1.5-316 |
| 18X2 | 334 | 1060 | 0.80 | R18X2-316 |
| 20X2 | 298 | 954 | 0.90 | R20X2-316 |
| 20X2.5 | 380 | 1193 | 1.10 | R20X2.5-316 |
| 20X3 | 467 | 1431 | 1.28 | R20X3-316 |
| 22X2 | 268 | 867 | 1.00 | R22X2-316 |
| 25X2 | 234 | 763 | 1.13 | R25X2-316 |
| 25X2.5 | 298 | 954 | 1.41 | R25X2.5-316 |
| 25X3 | 363 | 1145 | 1.65 | R25X3-316 |
| 28X2 | 207 | 681 | 1.30 | R28X2-316 |
| 30X2.5 | 244 | 795 | 1.70 | R30X2.5-316 |
| 30X3 | 298 | 954 | 2.03 | R30X3-316 |
| 30X4 | 409 | 1272 | 2.60 | R30X4-316 |
| 35X2 | 164 | 545 | 1.65 | R35X2-316 |
| 35X3 | 252 | 818 | 2.40 | R35X3-316 |
| 38X3 | 231 | 753 | 2.63 | R38X3-316 |
| 38X4 | 315 | 1004 | 3.41 | R38X4-316 |
| 38X5 | 403 | 1255 | 4.12 | R38X5-316 |
| 38X6 | 495 | 1506 | 4.81 | R38X6-316 |
| 42X2 | 136 | 454 | 1.97 | R42X2-316 |
| 42X3 | 207 | 681 | 2.93 | R42X3-316 |
| 50X3 | 173 | 572 | 3.53 | R50X3-316 |
| 50X5 | 298 | 954 | 5.63 | R50X5-316 |
| 50X6 | 363 | 1145 | 6.61 | R50X6-316 |
| 60X3 | 143 | 477 | 4.28 | R60X3-316 |
| 60X5 | 244 | 795 | 6.89 | R60X5-316 |
| 66X8.5 | 393 | 1229 | 12.24 | R66X8.5-316 |
| 73X7 | 284 | 915 | 11.57 | R73X7-316 |
| 75X3 | 113 | 382 | 5.41 | R75X3-316 |
| 75X5 | 193 | 636 | 8.76 | R75X5-316 |
| 80X10 | 380 | 1193 | 17.53 | R80X10-316 |
| 97X12 | 376 | 1180 | 25.54 | R97X12X5000-316 |

Other sizes on request

# Tubes – Landbased and industrial applications (DIN Rules)

1 DIN 2413 I static pressure (W.P.) capability for straight pipe including manufacturing tolerance
2 Burst pressure (B.P.) calculation including manufacturing tolerance

**Seamless cold drawn Stainless Steel Tube ASTM A269/A213 - AISI 316L**

| Tube<br>O.D. x W.T. | 1<br>DIN 2413 I<br>W.P. bar | 2<br><br>B.P. bar | Weight<br>kg/mtr. | AISI 316L<br>Order code |
|---|---|---|---|---|
| 06X1 | 490 | 1590 | 0.13 | R06X1-316 |
| 08X1 | 368 | 1193 | 0.18 | R08X1-316 |
| 10X1 | 294 | 954 | 0.23 | R10X1-316 |
| 10X1.5 | 441 | 1431 | 0.32 | R10X1.5-316 |
| 12X1 | 245 | 795 | 0.28 | R12X1-316 |
| 12X1.5 | 368 | 1193 | 0.39 | R12X1.5-316 |
| 12X2 | 490 | 1590 | 0.50 | R12X2-316 |
| 15X1.5 | 294 | 954 | 0.51 | R15X1.5-316 |
| 16X2 | 368 | 1193 | 0.70 | R16X2-316 |
| 16X2.5 | 459 | 1491 | 0.85 | R16X2.5-316 |
| 18X1.5 | 245 | 795 | 0.62 | R18X1.5-316 |
| 18X2 | 327 | 1060 | 0.80 | R18X2-316 |
| 20X2 | 294 | 954 | 0.90 | R20X2-316 |
| 20X2.5 | 368 | 1193 | 1.10 | R20X2.5-316 |
| 20X3 | 441 | 1431 | 1.28 | R20X3-316 |
| 22X2 | 267 | 867 | 1.00 | R22X2-316 |
| 25X2 | 235 | 763 | 1.13 | R25X2-316 |
| 25X2.5 | 294 | 954 | 1.41 | R25X2.5-316 |
| 25X3 | 353 | 1145 | 1.65 | R25X3-316 |
| 28X2 | 210 | 681 | 1.30 | R28X2-316 |
| 30X2.5 | 245 | 795 | 1.70 | R30X2.5-316 |
| 30X3 | 294 | 954 | 2.03 | R30X3-316 |
| 30X4 | 392 | 1272 | 2.60 | R30X4-316 |
| 35X2 | 168 | 545 | 1.65 | R35X2-316 |
| 35X3 | 252 | 818 | 2.40 | R35X3-316 |
| 38X3 | 232 | 753 | 2.63 | R38X3-316 |
| 38X4 | 309 | 1004 | 3.41 | R38X4-316 |
| 38X5 | 387 | 1255 | 4.12 | R38X5-316 |
| 38X6 | 464 | 1506 | 4.81 | R38X6-316 |
| 42X2 | 140 | 454 | 1.97 | R42X2-316 |
| 42X3 | 210 | 681 | 2.93 | R42X3-316 |
| 50X3 | 176 | 572 | 3.53 | R50X3-316 |
| 50X5 | 294 | 954 | 5.63 | R50X5-316 |
| 50X6 | 353 | 1145 | 6.61 | R50X6-316 |
| 60X3 | 147 | 477 | 4.28 | R60X3-316 |
| 60X5 | 245 | 795 | 6.89 | R60X5-316 |
| 66X8.5 | 379 | 1229 | 12.24 | R66X8.5-316 |
| 73X7 | 282 | 915 | 11.57 | R73X7-316 |
| 75X3 | 118 | 382 | 5.41 | R75X3-316 |
| 75X5 | 196 | 636 | 8.76 | R75X5-316 |
| 80X10 | 368 | 1193 | 17.53 | R80X10-316 |
| 97X12 | 364 | 1180 | 25.54 | R97X12X5000-316 |

Other sizes on request

ENGINEERING **YOUR** SUCCESS.

## Pipe according to ANSI B36.19 ASTM - A - 312 - TP - 316L

Pressure table acc. to DNV Rules for Classification of Ships Newbuilding and Mobile
Offshore Units Drilling Plants.

1 ANSI B313 pipe including manufacturing tolerance, bending and corrosion considered
2 Burst pressure (B.P.) including manufacturing tolerance

| Nom. Pipe Size SCH size | Tube/Pipe O.D-x W.T. | 1 W.P. bar | 2 B.P. bar | Weight kg/mtr. | Order code |
|---|---|---|---|---|---|
| 1/2" SCH 10 | 21.34x2.11 | 249 | 917 | 1.02 | **on request** |
| 1/2" SCH 40 | 21.34x2.77 | 336 | 1203 | 1.29 | **on request** |
| 1/2" SCH 80 | 21.34x3.73 | 471 | 1620 | 1.65 | **on request** |
| 1/2" SCH 160 | 21.34x4.78 | 632 | 2076 | 1.98 | **on request** |
| 1/2" SCH xxs | 21.34x7.47 | 1124 | 3245 | 2.55 | **on request** |
| 3/4" SCH 10 | 26.67x2.11 | 196 | 733 | 1.30 | **on request** |
| 3/4" SCH 40 | 26.67x2.81 | 267 | 977 | 1.71 | **on request** |
| 3/4" SCH 80 | 26.67x3.91 | 385 | 1359 | 2.33 | **on request** |
| 3/4" SCH 160 | 26.67x5.56 | 579 | 1933 | 2.94 | **on request** |
| 3/4" SCH xxs | 26.67x7.82 | 886 | 2718 | 3.64 | **on request** |
| 1" SCH 10 | 33.40x2.77 | 206 | 769 | 2.13 | **on request** |
| 1" SCH 40 | 33.40x3.38 | 255 | 938 | 2.54 | **on request** |
| 1" SCH 80 | 33.40x4.55 | 354 | 1263 | 3.29 | **on request** |
| 1" SCH 160 | 33.40x6.35 | 805 | 1762 | 4.30 | **on request** |
| 1" SCH xxs | 33.40x9.09 | 805 | 2523 | 5.45 | **on request** |
| 1 1/4" SCH 10 | 42.16x2.77 | 161 | 609 | 2.73 | **on request** |
| 1 1/4" SCH 40 | 42.16x3.56 | 210 | 783 | 3.44 | **on request** |
| 1 1/4" SCH 80 | 42.16x4.85 | 294 | 1066 | 4.53 | **on request** |
| 1 1/4" SCH 160 | 42.16x6.35 | 397 | 1396 | 5.69 | **on request** |
| 1 1/4" SCH xxs | 42.16x9.70 | 653 | 2133 | 7.76 | **on request** |
| 1 1/2" SCH 10 | 48.26x2.77 | 139 | 532 | 3.16 | **on request** |
| 1 1/2" SCH 40 | 48.26x3.68 | 188 | 707 | 4.11 | **on request** |
| 1 1/2" SCH 80 | 48.26x5.08 | 266 | 976 | 5.49 | **on request** |
| 1 1/2" SCH 160 | 48.26x7.14 | 389 | 1371 | 7.35 | **on request** |
| 1 1/2" SCH xxs | 48.26x10.16 | 586 | 1952 | 9.55 | **on request** |
| 2" SCH 10 | 60.30x2.77 | 111 | 426 | 3.99 | **on request** |
| 2" SCH 40 | 60.30x3.91 | 159 | 601 | 5.52 | **on request** |
| 2" SCH 80 | 60.30x5.54 | 230 | 852 | 7.60 | **on request** |
| 2" SCH 160 | 60.30x8.74 | 380 | 1344 | 11.28 | **on request** |
| 2" SCH xxs | 60.30x11.07 | 498 | 1702 | 13.44 | **on request** |
| 2 1/2" SCH 5 | 73.00x2.11 | 69 | 268 | 3.76 | **on request** |
| 2 1/2" SCH 10 | 73.00x3.05 | 100 | 387 | 5.37 | **on request** |
| 2 1/2" SCH 40 | 73.00x5.16 | 174 | 655 | 8.80 | **on request** |
| 2 1/2" SCH 80 | 73.00x7.01 | 241 | 890 | 11.64 | **on request** |
| 2 1/2" SCH 160 | 73.00x9.53 | 338 | 1210 | 15.15 | **on request** |
| 2 1/2" SCH xxs | 73.00x14.02 | 526 | 1780 | 20.50 | **on request** |
| 3" SCH 5 | 88.90x2.11 | 56 | 220 | 4.59 | **on request** |
| 3" SCH 10 | 88.90x3.05 | 82 | 318 | 6.45 | **on request** |
| 3" SCH 40 | 88.90x5.49 | 151 | 572 | 11.64 | **on request** |
| 3" SCH 80 | 88.90x7.67 | 215 | 800 | 15.51 | **on request** |
| 3" SCH 160 | 88.90x11.13 | 322 | 1161 | 21.67 | **on request** |
| 3" SCH xxs | 88.90x15.24 | 460 | 1589 | 27.68 | **on request** |
| 4" SCH 5 | 114.30x2.11 | 43 | 171 | 5.93 | **on request** |
| 4" SCH 10 | 114.30x3.05 | 63 | 247 | 8.50 | **on request** |
| 4" SCH 40 | 114.30x6.07 | 129 | 492 | 16.32 | **on request** |
| 4" SCH 80 | 114.30x8.56 | 185 | 694 | 22.67 | **on request** |
| 4" SCH 160 | 114.30x13.49 | 302 | 1094 | 34.05 | **on request** |
| 4" SCH xxs | 114.30x17.12 | 394 | 1388 | 41.03 | **on request** |
| 5" SCH 10 | 141.30x3.40 | 57 | 233 | 41.03 | **on request** |
| 5" SCH 40 | 141.30x6.55 | 112 | 430 | 41.03 | **on request** |
| 5" SCH 80 | 141.30x9.53 | 165 | 625 | 41.03 | **on request** |
| 5" SCH 160 | 141.30x15.88 | 286 | 1042 | 41.03 | **on request** |
| 5" SCH xxs | 141.30x19.05 | 350 | 1250 | 41.03 | **on request** |
| 6" SCH 40 | 168.30x7.11 | 101 | 392 | 28.69 | **on request** |
| 6" SCH 160 | 168.30x18.26 | 275 | 1006 | 67.56 | **on request** |
| 6" SCH xxs | 168.30x21.95 | 337 | 1209 | 79.21 | **on request** |
| 8" SCH 40 | 219.10x8.18 | 89 | 346 | 43.20 | **on request** |
| 8" SCH 160 | 219.10x23.01 | 266 | 974 | 111.30 | **on request** |
| 8" SCH xxs | 219.10x22.00 | 253 | 931 | 106.88 | **on request** |
| 10" SCH xxs | 273.00x25.40 | 233 | 862 | 101.90 | **on request** |

Other sizes on request

## Temperature conversion table

### Celsius to Fahrenheit

| °C | °F |
|---|---|
| 150 | 302 |
| 145 | 293 |
| 140 | 284 |
| 135 | 275 |
| 130 | 266 |
| 125 | 257 |
| 120 | 248 |
| 115 | 239 |
| 110 | 230 |
| 105 | 221 |
| 100 | 212 |
| 95 | 203 |
| 90 | 194 |
| 85 | 185 |
| 80 | 176 |
| 75 | 167 |
| 70 | 158 |
| 65 | 149 |
| 60 | 140 |
| 55 | 131 |
| 50 | 122 |
| 45 | 113 |
| 40 | 104 |
| 35 | 95 |
| 30 | 86 |
| 25 | 77 |
| 20 | 68 |
| 15 | 59 |
| 10 | 50 |
| 5 | 41 |
| 0 | 32 |
| -5 | 23 |
| -10 | 14 |
| -15 | 5 |
| -20 | -4 |
| -25 | -13 |
| -30 | -22 |
| -35 | -31 |
| -40 | -40 |
| -45 | -49 |
| -50 | -58 |

### Fahrenheit to Celsius

| °F | °C |
|---|---|
| 340 | 171 |
| 330 | 166 |
| 320 | 160 |
| 310 | 154 |
| 300 | 149 |
| 290 | 143 |
| 280 | 138 |
| 270 | 132 |
| 260 | 127 |
| 250 | 121 |
| 240 | 116 |
| 230 | 110 |
| 220 | 104 |
| 210 | 99 |
| 200 | 93 |
| 190 | 88 |
| 180 | 82 |
| 170 | 77 |
| 160 | 71 |
| 150 | 66 |
| 140 | 60 |
| 130 | 54 |
| 120 | 49 |
| 110 | 43 |
| 100 | 38 |
| 90 | 32 |
| 80 | 27 |
| 70 | 21 |
| 60 | 16 |
| 50 | 10 |
| 40 | 4 |
| 30 | -1 |
| 20 | -7 |
| 10 | -12 |
| 0 | -18 |
| -10 | -23 |
| -20 | -29 |
| -30 | -34 |
| -40 | -40 |
| -50 | -46 |
| -60 | -51 |

## Pressure conversion table

### bar to psi

| bar | psi |
|---|---|
| 1000 | 14505 |
| 800 | 11604 |
| 600 | 8703 |
| 500 | 7253 |
| 400 | 5802 |
| 250 | 3626 |
| 160 | 2321 |
| 100 | 1451 |
| 60 | 870 |
| 40 | 580 |
| 35 | 508 |
| 25 | 363 |
| 16 | 232 |
| 10 | 145 |
| 6 | 87 |
| 4 | 58 |
| 2.5 | 36 |
| 1.6 | 23 |
| 1 | 15 |

### psi to bar

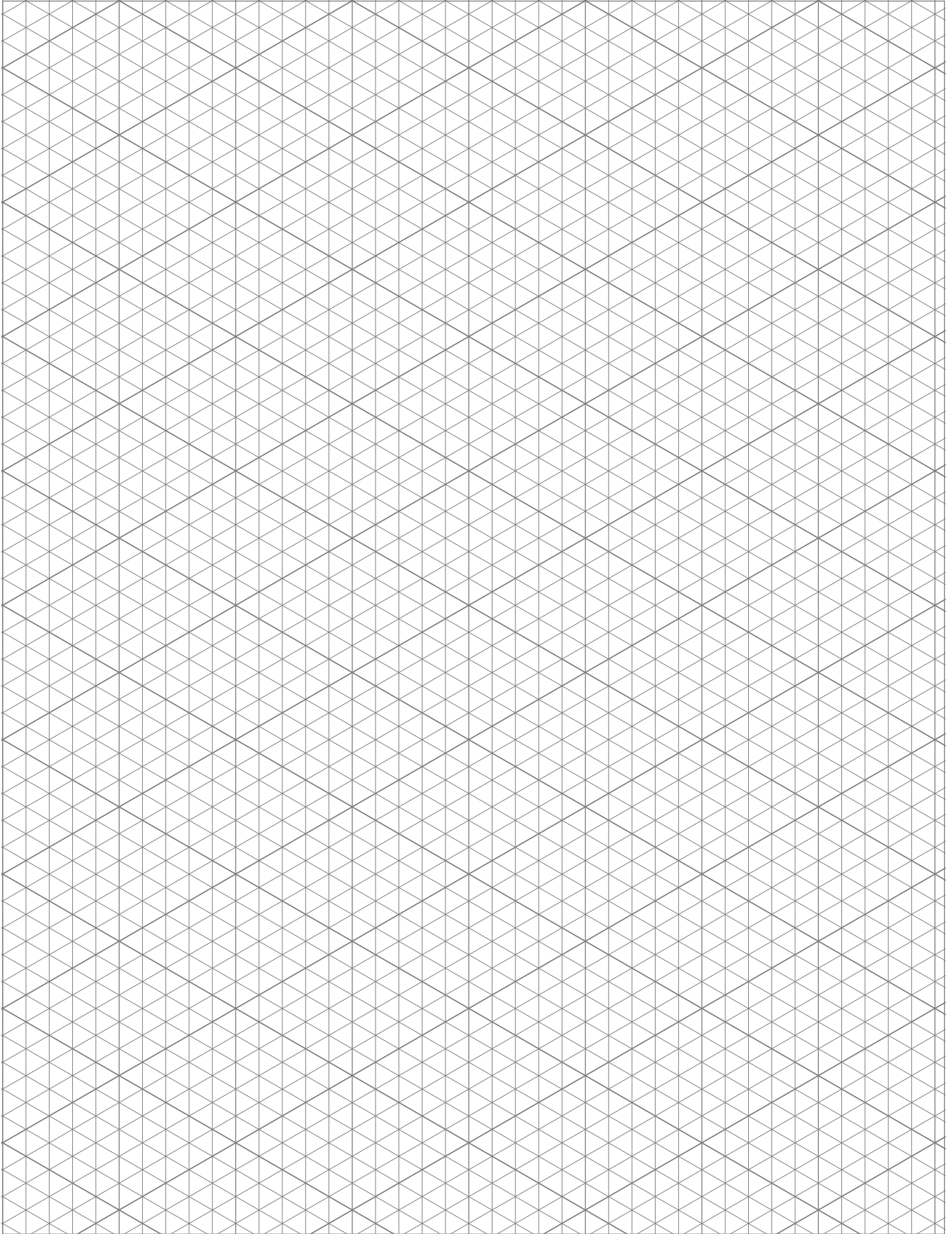| psi | bar |
|---|---|
| 10000 | 689 |
| 9000 | 620 |
| 7000 | 483 |
| 6000 | 414 |
| 4000 | 276 |
| 3000 | 207 |
| 2500 | 172 |
| 1000 | 69 |
| 900 | 62 |
| 600 | 41 |
| 500 | 34 |
| 400 | 28 |
| 250 | 17 |
| 150 | 10.3 |
| 100 | 6.9 |
| 90 | 6.2 |
| 60 | 4.1 |
| 40 | 2.8 |
| 25 | 1.7 |
| 10 | 0.7 |

### Examples

**Temperature conversion**

Initial value:  100
°C in °F:       212 °F
°F in °C:       37.78 °C

**Pressure conversion**

Initial value:  35
bar in psi:     507.675 psi
psi in bar:     2.41296 bar

ENGINEERING **YOUR** SUCCESS.

**Notes**

# Parker's Motion & Control Technologies

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 00800 27 27 5374

## Aerospace
### Key Markets
Aftermarket services
Commercial transports
Engines
General & business aviation
Helicopters
Launch vehicles
Military aircraft
Missiles
Power generation
Regional transports
Unmanned aerial vehicles

### Key Products
Control systems & actuation products
Engine systems & components
Fluid conveyance systems & components
Fluid metering, delivery & atomization devices
Fuel systems & components
Fuel tank inerting systems
Hydraulic systems & components
Thermal management
Wheels & brakes

## Climate Control
### Key Markets
Agriculture
Air conditioning
Construction Machinery
Food & beverage
Industrial machinery
Life sciences
Oil & gas
Precision cooling
Process
Refrigeration
Transportation

### Key Products
Accumulators
Advanced actuators
$CO_2$ controls
Electronic controllers
Filter driers
Hand shut-off valves
Heat exchangers
Hose & fittings
Pressure regulating valves
Refrigerant distributors
Safety relief valves
Smart pumps
Solenoid valves
Thermostatic expansion valves

## Electromechanical
### Key Markets
Aerospace
Factory automation
Life science & medical
Machine tools
Packaging machinery
Paper machinery
Plastics machinery & converting
Primary metals
Semiconductor & electronics
Textile
Wire & cable

### Key Products
AC/DC drives & systems
Electric actuators, gantry robots & slides
Electrohydrostatic actuation systems
Electromechanical actuation systems
Human machine interface
Linear motors
Stepper motors, servo motors, drives & controls
Structural extrusions

## Filtration
### Key Markets
Aerospace
Food & beverage
Industrial plant & equipment
Life sciences
Marine
Mobile equipment
Oil & gas
Power generation & renewable energy
Process
Transportation
Water Purification

### Key Products
Analytical gas generators
Compressed air filters & dryers
Engine air, coolant, fuel & oil filtration systems
Fluid condition monitoring systems
Hydraulic & lubrication filters
Hydrogen, nitrogen & zero air generators
Instrumentation filters
Membrane & fiber filters
Microfiltration
Sterile air filtration
Water desalination & purification filters & systems

## Fluid & Gas Handling
### Key Markets
Aerial lift
Agriculture
Bulk chemical handling
Construction machinery
Food & beverage
Fuel & gas delivery
Industrial machinery
Life sciences
Marine
Mining
Mobile
Oil & gas
Renewable energy
Transportation

### Key Products
Check valves
Connectors for low pressure fluid conveyance
Deep sea umbilicals
Diagnostic equipment
Hose couplings
Industrial hose
Mooring systems & power cables
PTFE hose & tubing
Quick couplings
Rubber & thermoplastic hose
Tube fittings & adapters
Tubing & plastic fittings

## Hydraulics
### Key Markets
Aerial lift
Agriculture
Alternative energy
Construction machinery
Forestry
Industrial machinery
Machine tools
Marine
Material handling
Mining
Oil & gas
Power generation
Refuse vehicles
Renewable energy
Truck hydraulics
Turf equipment

### Key Products
Accumulators
Cartridge valves
Electrohydraulic actuators
Human machine interfaces
Hybrid drives
Hydraulic cylinders
Hydraulic motors & pumps
Hydraulic systems
Hydraulic valves & controls
Hydrostatic steering
Integrated hydraulic circuits
Power take-offs
Power units
Rotary actuators
Sensors

## Pneumatics
### Key Markets
Aerospace
Conveyor & material handling
Factory automation
Life science & medical
Machine tools
Packaging machinery
Transportation & automotive

### Key Products
Air preparation
Brass fittings & valves
Manifolds
Pneumatic accessories
Pneumatic actuators & grippers
Pneumatic valves & controls
Quick disconnects
Rotary actuators
Rubber & thermoplastic hose & couplings
Structural extrusions
Thermoplastic tubing & fittings
Vacuum generators, cups & sensors

## Process Control
### Key Markets
Alternative fuels
Biopharmaceuticals
Chemical & refining
Food & beverage
Marine & shipbuilding
Medical & dental
Microelectronics
Nuclear Power
Offshore oil exploration
Oil & gas
Pharmaceuticals
Power generation
Pulp & paper
Steel
Water/wastewater

### Key Products
Analytical Instruments
Analytical sample conditioning products & systems
Chemical injection fittings & valves
Fluoropolymer chemical delivery fittings, valves & pumps
High purity gas delivery fittings, valves, regulators & digital flow controllers
Industrial mass flow meters/controllers
Permanent no-weld tube fittings
Precision industrial regulators & flow controllers
Process control double block & bleeds
Process control fittings, valves, regulators & manifold valves

## Sealing & Shielding
### Key Markets
Aerospace
Chemical processing
Consumer
Fluid power
General industrial
Information technology
Life sciences
Microelectronics
Military
Oil & gas
Power generation
Renewable energy
Telecommunications
Transportation

### Key Products
Dynamic seals
Elastomeric o-rings
Electro-medical instrument design & assembly
EMI shielding
Extruded & precision-cut, fabricated elastomeric seals
High temperature metal seals
Homogeneous & inserted elastomeric shapes
Medical device fabrication & assembly
Metal & plastic retained composite seals
Shielded optical windows
Silicone tubing & extrusions
Thermal management
Vibration dampening

ENGINEERING **YOUR** SUCCESS.

# Parker Worldwide

## Europe, Middle East, Africa

**AE – United Arab Emirates,** Dubai
Tel: +971 4 8127100
parker.me@parker.com

**AT – Austria,** Wiener Neustadt
Tel: +43 (0)2622 23501-0
parker.austria@parker.com

**AT – Eastern Europe,** Wiener Neustadt
Tel: +43 (0)2622 23501 900
parker.easteurope@parker.com

**AZ – Azerbaijan,** Baku
Tel: +994 50 2233 458
parker.azerbaijan@parker.com

**BE/LU – Belgium,** Nivelles
Tel: +32 (0)67 280 900
parker.belgium@parker.com

**BY – Belarus,** Minsk
Tel: +375 17 209 9399
parker.belarus@parker.com

**CH – Switzerland,** Etoy
Tel: +41 (0)21 821 87 00
parker.switzerland@parker.com

**CZ – Czech Republic,** Klecany
Tel: +420 284 083 111
parker.czechrepublic@parker.com

**DE – Germany,** Kaarst
Tel: +49 (0)2131 4016 0
parker.germany@parker.com

**DK – Denmark,** Ballerup
Tel: +45 43 56 04 00
parker.denmark@parker.com

**ES – Spain,** Madrid
Tel: +34 902 330 001
parker.spain@parker.com

**FI – Finland,** Vantaa
Tel: +358 (0)20 753 2500
parker.finland@parker.com

**FR – France,** Contamine s/Arve
Tel: +33 (0)4 50 25 80 25
parker.france@parker.com

**GR – Greece,** Athens
Tel: +30 210 933 6450
parker.greece@parker.com

**HU – Hungary,** Budapest
Tel: +36 1 220 4155
parker.hungary@parker.com

**IE – Ireland,** Dublin
Tel: +353 (0)1 466 6370
parker.ireland@parker.com

**IT – Italy,** Corsico (MI)
Tel: +39 02 45 19 21
parker.italy@parker.com

**KZ – Kazakhstan,** Almaty
Tel: +7 7272 505 800
parker.easteurope@parker.com

**NL – The Netherlands,** Oldenzaal
Tel: +31 (0)541 585 000
parker.nl@parker.com

**NO – Norway,** Asker
Tel: +47 66 75 34 00
parker.norway@parker.com

**PL – Poland,** Warsaw
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

**PT – Portugal,** Leca da Palmeira
Tel: +351 22 999 7360
parker.portugal@parker.com

**RO – Romania,** Bucharest
Tel: +40 21 252 1382
parker.romania@parker.com

**RU – Russia,** Moscow
Tel: +7 495 645-2156
parker.russia@parker.com

**SE – Sweden,** Spånga
Tel: +46 (0)8 59 79 50 00
parker.sweden@parker.com

**SK – Slovakia,** Banská Bystrica
Tel: +421 484 162 252
parker.slovakia@parker.com

**SL – Slovenia,** Novo Mesto
Tel: +386 7 337 6650
parker.slovenia@parker.com

**TR – Turkey,** Istanbul
Tel: +90 216 4997081
parker.turkey@parker.com

**UA – Ukraine,** Kiev
Tel +380 44 494 2731
parker.ukraine@parker.com

**UK – United Kingdom,** Warwick
Tel: +44 (0)1926 317 878
parker.uk@parker.com

**ZA – South Africa,** Kempton Park
Tel: +27 (0)11 961 0700
parker.southafrica@parker.com

## North America

**CA – Canada,** Milton, Ontario
Tel: +1 905 693 3000

**US – USA,** Cleveland
Tel: +1 216 896 3000

## Asia Pacific

**AU – Australia,** Castle Hill
Tel: +61 (0)2-9634 7777

**CN – China,** Shanghai
Tel: +86 21 2899 5000

**HK – Hong Kong**
Tel: +852 2428 8008

**IN – India,** Mumbai
Tel: +91 22 6513 7081-85

**JP – Japan,** Tokyo
Tel: +81 (0)3 6408 3901

**KR – South Korea,** Seoul
Tel: +82 2 559 0400

**MY – Malaysia,** Shah Alam
Tel: +60 3 7849 0800

**NZ – New Zealand,** Mt Wellington
Tel: +64 9 574 1744

**SG – Singapore**
Tel: +65 6887 6300

**TH – Thailand,** Bangkok
Tel: +662 186 7000-99

**TW – Taiwan,** Taipei
Tel: +886 2 2298 8987

## South America

**AR – Argentina,** Buenos Aires
Tel: +54 3327 44 4129

**BR – Brazil,** Sao Jose dos Campos
Tel: +55 800 727 5374

**CL – Chile,** Santiago
Tel: +56 2 623 1216

**MX – Mexico,** Apodaca
Tel: +52 81 8156 6000

---

**EMEA Product Information Centre**
**Free phone: 00 800 27 27 5374**
(from AT, BE, CH, CZ, DE, DK, EE, ES, FI, FR, IE, IL, IS, IT, LU, MT, NL, NO, PL, PT, RU, SE, SK, UK, ZA)

**US Product Information Centre**
**Toll-free number: 1-800-27 27 537**
www.parker.com

Your local authorized Parker distributor