



Metric Tube

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Introduction

Parker offers three types of seamless metric tubes for hydraulic, pneumatic and instrumentation applications:

- Steel seamless cold drawn tube, phosphate and oil dipped for corrosion resistance
- Steel seamless cold drawn tube, zinc Chromium-6 free plating for corrosion resistance
- Stainless steel cold drawn tube

Conformance and Material Specifications

Tests and Certificates

All tubes are subjected to a non-destructive leak test and marked accordingly. This marking is used in lieu of a works certificate DIN EN 10204-2.2. Test Class 1 DIN EN 10216-5 Table 7 applies for tubes made of 1.4571 material.

Materials and Mechanical Properties

Steel Types, mechanical properties and conditions are listed in Table Q1.

Welding Suitability and Weldability:

- Steel tubes of St. 37.4, R Series, are weldable according to usual techniques.
- Not recommended to weld St. 37.4, R-VZ series, Zinc Chromium-6 Free plated tubes.

Stainless steel tubes of 1.4571 are suitable for arc welding. The welding filler should be selected in accordance with DIN EN1600 and DIN EN12072 Part 1 taking into account the type of application and the welding technique.

Assembly and Installation

Please refer to Section S for the assembly and installation instructions for Metric Tube fittings.

Applications

Recommended Bend Radius

A bend radius of 3 times the tube O.D. or greater is recommended for cold bending of Parker tubes with hand, mechanical and power bending equipment.

*Use of Tube Supports

The use of VH tube supports for EO and EO-2 fittings is required in certain thinner wall tubes to ensure proper assembly. Consult Fig. S45 & Fig. S46 on page S30.

Temperature Range

- Parker steel (St. 37.4) metric seamless tube can be used at the full rated working pressures without pressure rating reductions within the following temperature range: -40°C to +120°C. Maximum allowable operating temperature of +250°C.
- Parker stainless steel (1.4571) metric seamless tube can be used at full rated working pressures with-out pressure reductions within the following temperature ranges: -60°C to +20°C. Maximum allowable operating temperature of +400°C. Elevated temperature pressure reductions are as listed in Table Q2.

As Delivered Conditions:

Standard Tube Lengths: 6 meters (approx. 20 ft)

Surface Finish:

- Steel (St. 37.4): Phosphated and oiled
 - I.D. dimensions 1.5 – 5 mm, outside and inside oiled
 - I.D. dimensions 6 mm and higher, outside and inside phosphated and oiled
- Steel (St. 37.4) R-VZ Series: Zinc Chromium-6 Free

| Parker Series | Material | Tensile Strength | Yield Strength | % Elongation | Condition |
|---------------|---|--|--|--------------|---|
| R Series | Steel, fine grain E235N acc. to EN10305-4 (St. 37.4 acc. to DIN1630 | 340 N/mm ² min. 49,000 PSI | 235 N/mm ² min. 34,000 PSI | 25% min. | Seamless, cold drawn normal annealed, DIN EN 10305-1 and -4 |
| R-71 Series | Stainless steel, 1.4571 X6CrNiMoTi17122 | 500 N/mm ² min. 72,500 PSI | 245 N/mm ² min. 35,500 PSI | 35% min. | Seamless, cold drawn free of scale, heat treated in accordance with DIN EN 10216-5 tab. 6 |

Table Q1 — Parker Steel tubes mechanical properties and conditions

| Temperature | Material | -60° up to +20° C | 50° C | 100° C | 200° C | 300° C | 400° C |
|--------------------------|----------|-------------------|-------|--------|--------|--------|--------|
| Pressure reductions in % | 1.4571 | — | 5.5 | 11.5 | 21.5 | 29 | 34 |

Note: Interpolation is acceptable for intermediate temperature levels.

Table Q2 — Parker stainless tube elevated temperature derating factors

Seamless EO Steel Tubes Material E235N (St. 37.4)

Tolerances 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 |
| R04X1 | R04X0.75CF | 4 | ±0.08 | 0.75 | 2.5 | 470 | 391 | 1820 | 0.063 |
| | R04X1CF | 4 | | 1.00 | 2.0 | 627 | 500 | 2700 | 0.074 |
| R06X1 | 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 |
| | 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 |
| R14X2 | R12X3.5CF | 12 | | 3.50 | 5.0 | 651 | 624 | 2600 | 0.734 |
| | R14X1.5CF | 14 | | 1.50 | 11.0 | 302 | 264 | 975 | 0.462 |
| | R14X2CF | 14 | ±0.08 | 2.00 | 10.0 | 403 | 342 | 1325 | 0.592 |
| R14X3 | R14X2.5CF | 14 | | 2.50 | 9.0 | 504 | 415 | 1650 | 0.709 |
| | R14X3CF | 14 | | 3.00 | 8.0 | 604 | 485 | 2200 | 0.814 |
| R15X1 | R15X1CF | 15 | | 1.00 | 13.0 | 188 | 170 | 575 | 0.345 |
| | R15X1.5CF | 15 | | 1.50 | 12.0 | 282 | 248 | 950 | 0.499 |
| | R15X2 | R15X2CF | 15 | ±0.08 | 2.00 | 11.0 | 376 | 321 | 1275 |
| R16X1.5 | R15X2.5CF | 15 | | 3.00 | 9.0 | 564 | 458 | 2000 | 0.888 |
| | R16X1.5CF | 16 | | 1.50 | 13.0 | 264 | 233 | 850 | 0.536 |
| | 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 |

Table Q3 — Seamless EO steel tubes

Pressure Calculations:

Calculation pressures given are according to DIN 2413 Part 1 for **static stress**

$$P = \frac{20 \cdot K \cdot s \cdot c}{S \cdot da} \text{ (bar)}$$

Material characteristic value $K=235 \text{ N/mm}^2$

and

DIN 2413 part III for **dynamic stress**

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

Material characteristic value $K=226 \text{ N/mm}^2$ (permanent fatigue strength)

Safety correction value $S=1.5$ for static and dynamic stress.

Factor "c" for consideration of wall thickness **divergence for static and dynamic stress** =0.8 for tube o.d. 4 and 5; 0.85 for tube o.d. 6 and 8; 0.9 for larger tube o.d.

da = Tube O.D. in mm

s = Wall thickness in mm

Standard Tube Length:

- 6 m (19.7 ft.)

Conversion Factors:

- Bar x 14.5 = psig
- kg/m x 0.672 = lbs/ft
- $\text{N/mm}^2 \times 145 = \text{lb/in}^2$

See Remarks on page Q5.

Dimensions and pressures for reference only, subject to change.

Seamless EO Steel Tubes Material E235N (St. 37.4) (continued)

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

Table Q3 — Seamless EO steel tubes (cont'd.)

Remarks:

Corrosion — Additional allowances are not considered for the calculation of pressures

$$\frac{da \text{ (bar)}}{\text{dimax.}} > 2$$

are calculated for static stress in accordance with DIN 2413 Part III, but with $K = 235 \text{ N/mm}^2$

When a specific factor of safety is required, calculations should be based upon the burst pressures shown in the above tables.

Temperature range: -40°C up to 120°C without pressure reductions.

Surface finish:

Tubes with I.D. 1.5 to 5 mm: outside and inside oiled.

Tubes from 6 mm I.D. and above: outside and inside phosphated and oiled.

For increased temperatures:

control calculation according to DIN 2413 required (static application above 120°C).

$$P = \frac{20 \cdot K \cdot a \cdot c}{S \cdot (da + a \cdot c)} \text{ (bar)}$$

Material strength K for increased temperatures:

| Temperature in °C | K (Nmm ²) |
|-------------------|-----------------------|
| up to 200 | 185 |
| up to 250 | 165 |

Dimensions and pressures for reference only, subject to change.



Seamless EO Stainless Steel Tubes Material-No.: 1.4571

Tolerances DIN EN 10305-1

| Order code | | | | | 1.4571 Design pressure bar DIN 2413 I Static | 1.4571 burst pressure bar | Weight kg/m |
|------------|----------------|-----------|---------------------|----------------|--|---------------------------|-------------|
| 1.4571 | Tube O.D. (mm) | Tolerance | Wall thickness (mm) | Tube I.D. (mm) | | | |
| 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 |

Table Q4 — Seamless EO stainless steel tubes

Pressure Calculation:

Pressure calculation given are according to DIN 2413 part I for **static stress**

$$P = \frac{20 \cdot K \cdot s \cdot c}{S \cdot da} \text{ (bar)}$$

Material characteristic value $K=245 \text{ N/mm}^2$ (1.4571), $K=245 \text{ N/mm}^2$ (1.4571) (1% proof stress)

Safety factor $S = 1.5$

Factor "c" for consideration of wall thickness divergence: 0.9

da = Tube O.D. in mm

s = Wall thickness in mm

Remarks:

Corrosion — Additional allowances are not considered for the calculation of pressures.

Tubes with a diameter ratio $da/di \geq 1.35$ are calculated according to DIN 2413 part III (formula see page Q5) with above characteristic K value.

Conversion Factors:

- Bar x 14.5 = psig
- kg/m x 0.672 = lbs/ft
- $\text{N/mm}^2 \times 145 = \text{lb/in}^2$

Dimensions and pressures for reference only, subject to change.

