



Metric Tube

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ENGINEERING YOUR SUCCESS.

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	R15X1.5CF	14		3.50	7.0	705	551	2625	0.906
	R15X1CF	15		1.00	13.0	188	170	575	0.345
	R15X1.5CF	15	±0.08	1.50	12.0	282	248	950	0.499
R15X2	R15X2CF	15		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

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
	R20X4CF	20		4.00	12.0	564	458	2000	1.578
R22X1.5	R22X1.5CF	22	±0.08	1.50	19.0	192	173	550	0.758
R22X2	R22X2CF	22		2.00	18.0	256	227	775	0.986
R22X2.5	R22X2.5CF	22	±0.08	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	R25X3CF	25	±0.08	3.00	19.0	338	292	1025	1.628
R25X4	R25X4CF	25		4.00	17.0	451	378	1500	2.072
R25X4.5	R25X4.5CF	25	±0.08	4.50	16.0	508	418	1625	2.275
R28X1.5	R28X1.5CF	28		±0.08	1.50	25.0	151	138	425
R28X2	R28X2CF	28	2.00		24.0	201	181	600	1.282
R28X2.5	R28X2.5CF	28	±0.08	2.50	23.0	252	223	750	1.572
R28X3	R28X3CF	28		3.00	22.0	302	264	900	1.850
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	±0.08	3.00	24.0	282	248	850	1.998
R30X4	R30X4CF	30		4.00	22.0	376	321	1175	2.565
R30X5	R30X5CF	30	±0.15	5.00	20.0	470	391	1600	3.083
R35X2	R35X2CF	35		±0.15	2.00	31.0	161	147	450
R35X2.5	R35X2.5CF	35	2.50		30.0	201	181	600	2.004
R35X3	R35X3CF	35	±0.15	3.00	29.0	242	215	700	2.367
	R35X4CF	35		4.00	27.0	322	280	960	3.058
R38X3	R38X2.5CF	38	±0.15	2.50	33.0	186	168	550	2.189
	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	±0.2	6.00	26.0	445	373	1425	4.735
R42X2	R42X2CF	42		±0.2	2.00	38.0	134	123	375
R42X3	R42X3CF	42	3.00		36.0	201	181	575	2.885
R42X4	R42X4CF	42	±0.3	4.00	34.0	269	237	850	3.749
R50X6		50		6.00	38.0	338	292		6.511
R65X8		65	8.00	49.0	347	299		11.246	

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.

