# SensoControl®
# Test Points
# Diagnostic-
# Test equipment
# Industrial Products

Parker流体连接件授权分销商联系方式：

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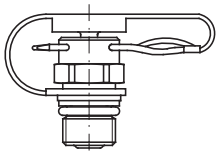
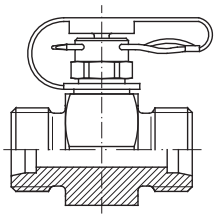
# Visual index

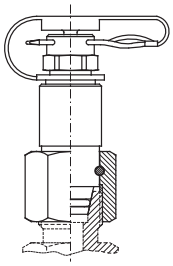
**Series 1**
Test point fitting with pin-lock



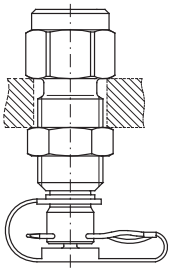
**EMA1**
p. Q4



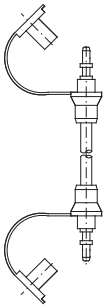
**GMA1**
p. Q5



**VKA1**
p. Q6

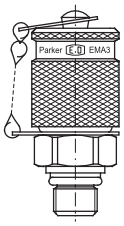


**MAV … MA1**
p. Q7

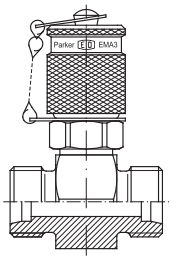


**SMA1**
p. Q7

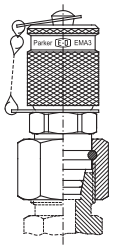
**Series 3**
Test point with threaded connection
M 16×2



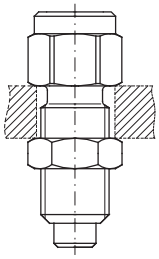

**EMA3**
p. Q8



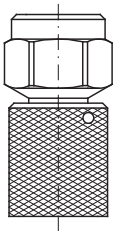

**GMA3**
p. Q9



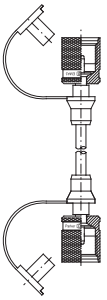

**VKA3**
p. Q10



**MAV … MA3**
p. Q11



**MAVMD … MA3**
p. Q11

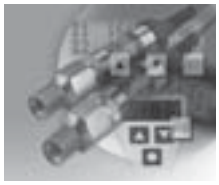


**SMA3**
p. Q11

**SensoControl®**

**Product range**

**Diagnostic/Industrial**



p. Q12

# EMA1/EMA3-Test Point fitting

- For pressure monitoring and checking on high, low and negative pressure systems.
- For bleeding cylinders and hydraulic systems.
- For taking samples on high, low and negative pressure systems.

**Advantages:**

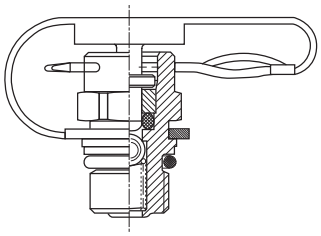
- Leakfree connection before valve is open
- Sturdy, safe constructions for small dimensions
- Easy handling
- Simple connection of measuring, control and switching devices
- Coupling under pressure up to 400 bar is possible with screw couplings
- Nominal pressures up to 630 bar
- Self locking metal guard cap, vibration resistant

**Sealing system of the primary seal:**

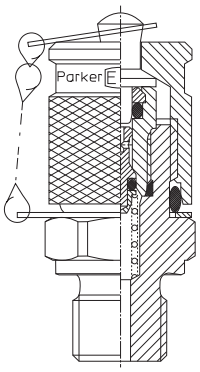
EMA1 by ball non-return valve.
EMA3 by cone seal with O-ring.
The new EMA3 sealing system guarantees minimum leakage rates.

The screw-on Cap (EMA3), and pin lock (EMA1) types both employ an O-ring seal as secondary sealing with the hose attached.

EMA1



EMA3




**Differences between EMA1 and EMA3 types**

a) sealing system (see previous section)
b) Test hose connection by plug-in coupling in EMA1
Test hose connection by threaded connection in EMA3
c) Working pressures (see section advantages)

**Working pressure**

- EMA3 types up to 630 bar
- EMA1 types up to 400 bar
- Max. working pressure 630 bar for GMA, VKA and EMA … the recommended working pressure of fitting manufacturer has to be applied
- Joining under pressure up to 400 bar max.
- The allowable nominal pressures of each Test-Point are shown on the product pages.

**Materials and Temperatures:**

- Steel, zinc plated, Cr(VI)-free
- Stainless Steel, material 1.4571
- Seals:
- FKM (Temperature range –20 to +200°C)
- EPDM Ethylene Propylene (for Break Fluid) (Temperature range –40 to +150°C)
- Hose:
  Polyamide (Temperature range: –35°C … 100°C max.)
- Stainless Steel FKM only

**Media:**

- Suitable for hydraulic oils and other mineral oil based fluids (Please pay attention to the sealing materials used!)
- For use in conjunction with other liquid media please consult Parker

**Approvals**

DVGW for EMA3/8X1OR, EMA3/10X1OR, EMA31/8NPT, EMA31/4NPT

Perbunan = registered trademark of Bayer

Q

## EMA1 Test point fitting with pin-lock — Series 1

Male stud thread: BSP, metric

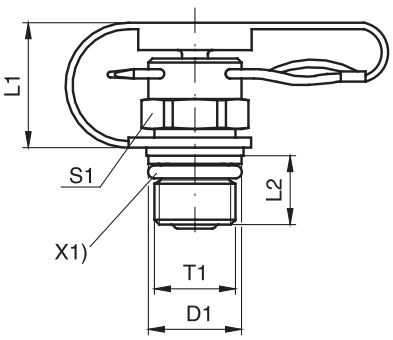



Fig. A

X1) O-ring
X2) Cutting face

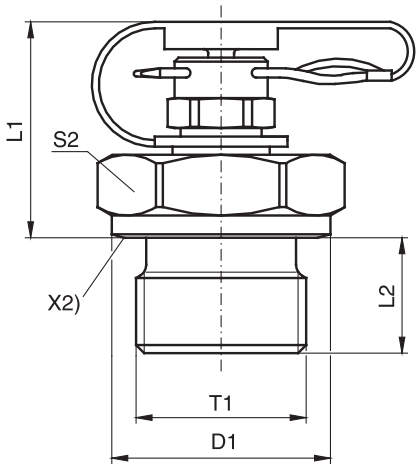



Fig. B

| T1 | D1 | L1 | L2 | S1 | S2 | Fig. | Weight g/1 piece | Order code* | PN (bar)[1) CF | DF** |
|---|---|---|---|---|---|---|---|---|---|---|
| M 12×1.5 | 17.0 | 32.0 | 12.0 | | 19 | B | 53 | **EMA1/12X1.5** | 400 | 4 |
| M 14×1.5 | 19.0 | 32.0 | 12.0 | | 19 | B | 56 | **EMA1/14X1.5** | 400 | 4 |
| M 16×1.5 | 21.0 | 25.0 | 12.0 | | 22 | B | 47 | **EMA1/16X1.5** | 400 | 4 |
| G 1/8 | 14.0 | 32.5 | 8.0 | | 17 | B | 41 | **EMA1/1/8** | 400 | 4 |
| G 1/4 | 18.0 | 32.0 | 12.0 | | 19 | B | 54 | **EMA1/1/4** | 400 | 4 |
| G 3/8 | 22.0 | 27.5 | 12.0 | | 22 | B | 55 | **EMA1/3/8** | 400 | 4 |
| G 1/2 | 26.0 | 27.5 | 14.0 | | 27 | B | 78 | **EMA1/1/2** | 400 | 4 |
| M 08×1.0 | 9.5 | 17.5 | 8.4 | 12 | | A | 16 | **EMA1/8X1OR** | 400 | 4 |
| M 10×1.0 | 11.5 | 18.0 | 8.0 | 12 | | A | 18 | **EMA1/10X1OR** | 400 | 4 |
| M 10×1.0 | 14.0 | 32.5 | 8.0 | | 17 | B | 42 | **EMA1/10X1** | 400 | 4 |

**DF = Design Factor

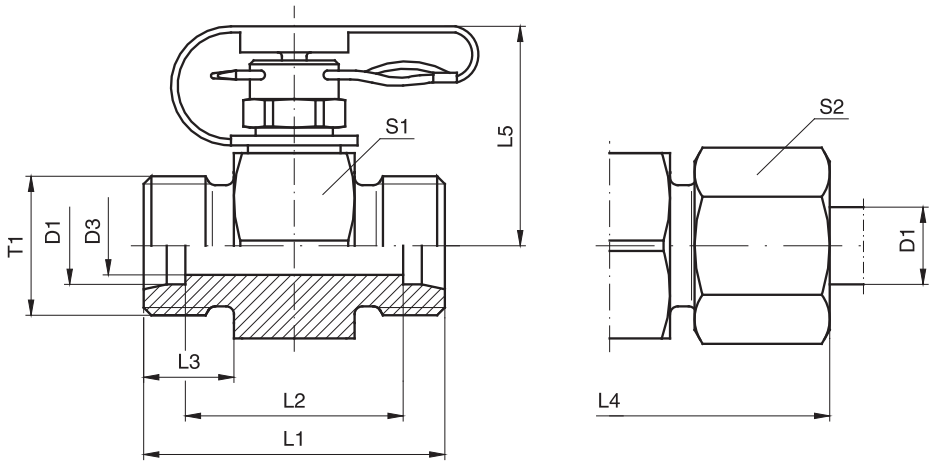
[1) Pressure shown = item deliverable

$\frac{\text{PN (bar)}}{10}$ = PN (MPa)

*Please add the **suffixes** below according to the material/ surface required.

| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | EMA1/12X1.5CF | NBR |

## GMA1 Straight test point fitting with pin-lock Series 1




| Series | D1 | T1 | D3 | L1 | L2 | L3 | L4 | L5 | S1 | S2 | Weight g/1 piece | Order code* | PN (bar)[1] CF | DF** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L[3]) | 06 | M 12×1.5 | 4 | 35 | 21 | 10 | 51 | 29.0 | 24 | 14 | 73 | **GMA1/06LOMD** | 315 | 4 |
| | 08 | M 14×1.5 | 6 | 35 | 21 | 10 | 51 | 29.0 | 24 | 17 | 75 | **GMA1/08LOMD** | 315 | 4 |
| | 10 | M 16×1.5 | 7 | 37 | 23 | 11 | 53 | 29.0 | 24 | 19 | 80 | **GMA1/10LOMD** | 315 | 4 |
| | 12 | M 18×1.5 | 8 | 37 | 23 | 11 | 53 | 30.5 | 24 | 22 | 96 | **GMA1/12LOMD** | 315 | 4 |
| | 15 | M 22×1.5 | 11 | 39 | 25 | 12 | 55 | 32.0 | 30 | 27 | 121 | **GMA1/15LOMD** | 315 | 4 |
| | 18 | M 26×1.5 | 14 | 39 | 24 | 12 | 57 | 33.0 | 32 | 32 | 139 | **GMA1/18LOMD** | 315 | 4 |
| | 22 | M 30×2.0 | 18 | 43 | 28 | 14 | 61 | 35.0 | 36 | 36 | 171 | **GMA1/22LOMD** | 160 | 4 |
| S[4]) | 06 | M 14×1.5 | 4 | 39 | 25 | 12 | 55 | 29.0 | 24 | 17 | 82 | **GMA1/06SOMD** | 400 | 4 |
| | 08 | M 16×1.5 | 5 | 39 | 25 | 12 | 55 | 29.0 | 24 | 19 | 88 | **GMA1/08SOMD** | 400 | 4 |
| | 10 | M 18×1.5 | 7 | 39 | 24 | 12 | 57 | 29.0 | 24 | 22 | 90 | **GMA1/10SOMD** | 400 | 4 |
| | 12 | M 20×1.5 | 7 | 39 | 24 | 12 | 57 | 29.0 | 24 | 24 | 96 | **GMA1/12SOMD** | 400 | 4 |
| | 14 | M 22×1.5 | 10 | 43 | 27 | 14 | 63 | 30.5 | 27 | 27 | 121 | **GMA1/14SOMD** | 400 | 4 |
| | 16 | M 24×1.5 | 11 | 43 | 26 | 14 | 63 | 32.0 | 30 | 30 | 138 | **GMA1/16SOMD** | 400 | 4 |
| | 20 | M 30×2.0 | 15 | 47 | 26 | 16 | 69 | 35.0 | 36 | 36 | 222 | **GMA1/20SOMD** | 400 | 4 |

**DF = Design Factor

[1]) Pressure shown = item deliverable

[3]) L = light series; [4]) S = heavy series

$\frac{\text{PN (bar)}}{10}$ = PN (MPa)

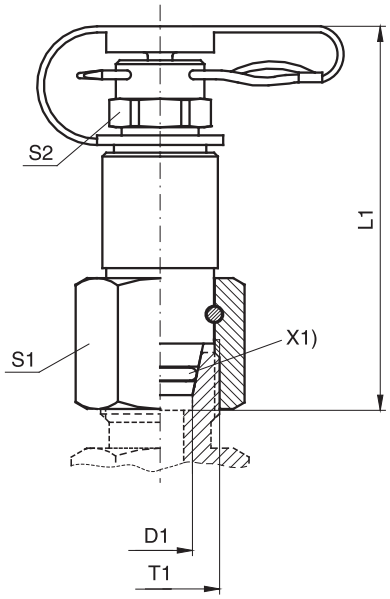
**Delivery without nut and ring. Information on ordering complete fittings or alternative sealing materials see page I7.**

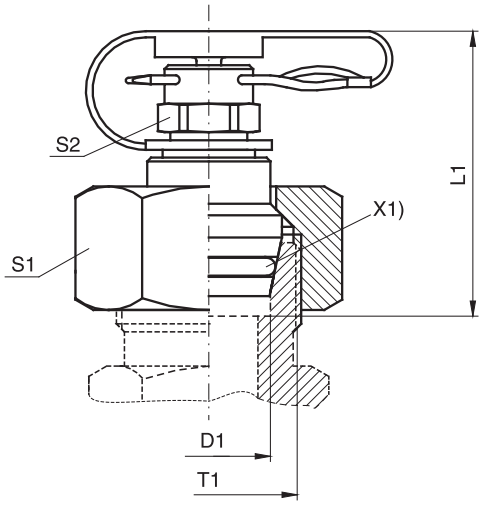
*Please add the **suffixes** below according to the material/ surface required.

| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | GMA1/06LOMDCF | NBR |

## VKA1 Test point fitting with pin lock for cones Series 1

With 24° cone swivel nut connection




X1) O-ring

| Series | D1 | T1 | L1 | S1 | S2 | Fig. | Weight g/1 piece | Order code* | PN (bar)1) CF | DF** |
|---|---|---|---|---|---|---|---|---|---|---|
| L[3]) | 06 | M 12×1.5 | 48 | 14 | 12 | A | 44 | **VKA1/06L** | 315 | 4 |
| | 08 | M 14×1.5 | 49 | 17 | 12 | A | 54 | **VKA1/08L** | 315 | 4 |
| | 10 | M 16×1.5 | 50 | 19 | 12 | A | 68 | **VKA1/10L** | 315 | 4 |
| | 12 | M 18×1.5 | 51 | 22 | 12 | A | 81 | **VKA1/12L** | 315 | 4 |
| | 15 | M 22×1.5 | 39 | 27 | 12 | B | 82 | **VKA1/15L** | 315 | 4 |
| | 18 | M 26×1.5 | 38 | 32 | 12 | B | 112 | **VKA1/18L** | 315 | 4 |
| S[4]) | 06 | M 14×1.5 | 48 | 17 | 12 | A | 51 | **VKA1/06S** | 400 | 4 |
| | 08 | M 16×1.5 | 50 | 19 | 12 | A | 62 | **VKA1/08S** | 400 | 4 |
| | 10 | M 18×1.5 | 50 | 22 | 12 | A | 78 | **VKA1/10S** | 400 | 4 |
| | 12 | M 20×1.5 | 51 | 24 | 12 | A | 100 | **VKA1/12S** | 400 | 4 |
| | 14 | M 22×1.5 | 39 | 27 | 12 | B | 88 | **VKA1/14S** | 400 | 4 |
| | 16 | M 24×1.5 | 37 | 30 | 12 | B | 105 | **VKA1/16S** | 400 | 4 |
| | 20 | M 30×2.0 | 44 | 36 | 12 | B | 174 | **VKA1/20S** | 400 | 4 |

**DF = Design Factor

[1]) Pressure shown = item deliverable

[3]) L = light series; [4]) S = heavy series

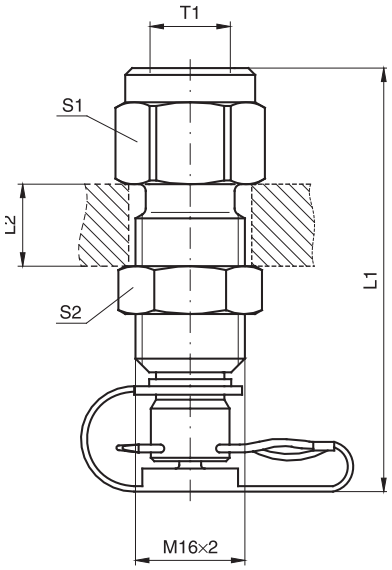
$\frac{\text{PN (bar)}}{10}$ = PN (MPa)

*Please add the **suffixes** below according to the material/ surface required.

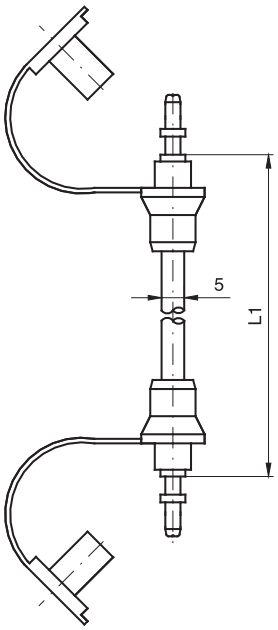
| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | VKA1/06LCF | NBR |

# MAV-MA1 Test Point pressure gauge connector with pin-lock
# SMA1 Test Point high pressure hose with pin-lock Series 1

Female thread: BSP
Sealing: sealing ring DIN 16258




Pressure gauge connector: MAV-MA1




Test hose: SMA1

| T1 | L1 | L2 max. | S1 | S2 | Weight g/1 piece | Order code* | PN (bar)1) CF | DF** |
|---|---|---|---|---|---|---|---|---|
| G 1/4 | 61.5 | 12 | 19 | 19 | 78 | **MAV1/4MA1** | 400 | 4.0 |
| G 1/2 | 72.0 | 12 | 27 | 19 | 135 | **MAV1/2MA1** | 400 | 4.0 |
| | 400.0 | | | | 21 | **SMA1-400** | 400 | 2.5 |
| | 630.0 | | | | 26 | **SMA1-630** | 400 | 2.5 |
| | 800.0 | | | | 26 | **SMA1-800** | 400 | 2.5 |
| | 1000.0 | | | | 31 | **SMA1-1000** | 400 | 2.5 |
| | 1500.0 | | | | 40 | **SMA1-1500** | 400 | 2.5 |
| | 2000.0 | | | | 49 | **SMA1-2000** | 400 | 2.5 |
| | 2500.0 | | | | 58 | **SMA1-2500** | 400 | 2.5 |
| | 3200.0 | | | | 70 | **SMA1-3200** | 400 | 2.5 |
| | 4000.0 | | | | 84 | **SMA1-4000** | 400 | 2.5 |

**DF = Design Factor

1) Pressure shown = item deliverable

$\frac{\text{PN (bar)}}{10}$ = PN (MPa)

*Please add the **suffixes** below according to the material/ surface required.

| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | MAV1/4MA1CF | NBR |

**Note hoses with small diameter:**
- Min. bending radius r = 20 mm
- Working temperature –20 °C up to 100 °C (short time to +120 °C)
- Hoses are to be protected from fire, from sharp-corners and hot objects.

Temperature factor of pressure rating:

| | | |
|---|---|---|
| up to | 0 °C | 122 % |
| for | 30 ° C | 110 % |
| for | 50 °C | 100 % |
| for | 80 °C | 86 % |
| for | 100 °C | 77 % |

For measuring with liquid pressure media please note:
Bleed before connecting tube! By capillary action discharge of the pressure medium is prevented widely.

Q

## EMA3 Test Point with threaded connection M 16×2 — Series 3

Male thread: BSP, metric

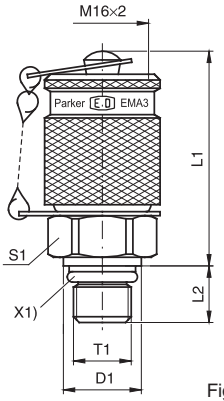


Fig. A

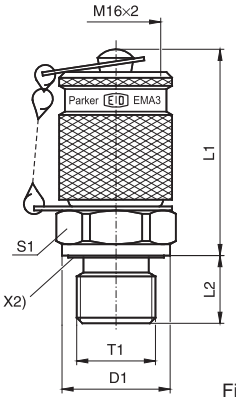


Fig. B

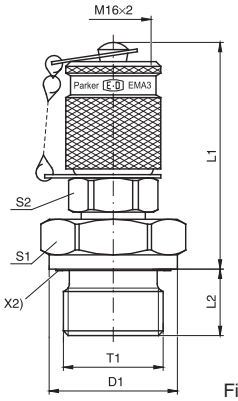
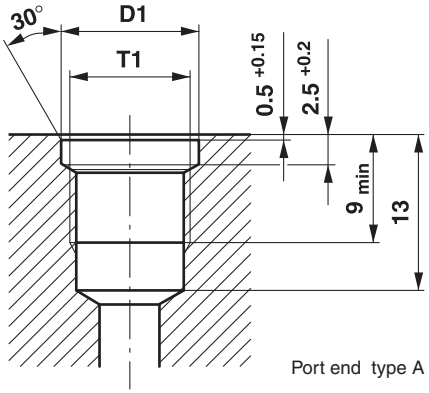
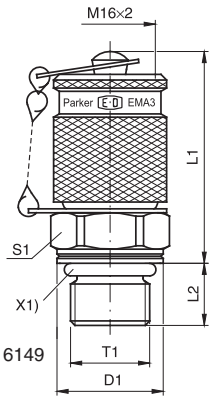


Fig. C



Port end type A



ISO 6149

Fig. F

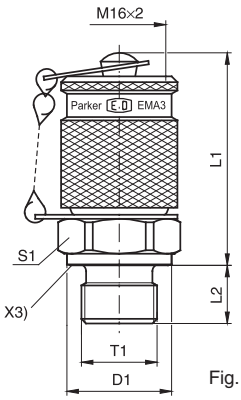


Fig. D

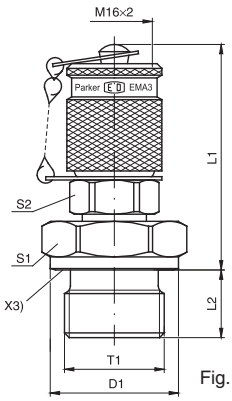


Fig. E

X1) O-ring
X2) Eolastic sealing
X3) Cutting face

| T1 | D1 | L1 | L2 | S1 | S2 | Fig. | Weight g/1 piece | Order code* | PN (bar)[1] CF | PN (bar)[1] 71 | DF** CF | DF** 71 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M 08×1.0 | 9.5 | 38.5 | 7.5 | 17 | | A | 66 | **EMA3/8X1OR** | 250 | | 4.0 | |
| M 10×1.0 | 11.5 | 37.0 | 7.5 | 17 | | A | 70 | **EMA3/10X1OR** | 630 | 630 | 4.0 | 4 |
| M 14×1.5 | 18.8 | 39.5 | 11.0 | 19 | | F | 79 | **EMA3/14X1.5ISO** | 630 | 630 | 4.0 | 4 |
| M 10×1.0 | 14.0 | 40.0 | 8.0 | 17 | | D | 67 | **EMA3/10X1** | 400 | | 4.0 | |
| M 12×1.5 | 17.0 | 38.0 | 12.0 | 17 | | D | 74 | **EMA3/12X1.5** | 400 | | 4.0 | |
| M 14×1.5 | 19.0 | 39.0 | 12.0 | 19 | | D | 78 | **EMA3/14X1.5** | 400 | | 4.0 | |
| M 16×1.5 | 21.0 | 40.0 | 12.0 | 22 | | D | 90 | **EMA3/16X1.5** | 400 | | 4.0 | |
| G 1/8 | 14.0 | 37.5 | 8.0 | 17 | | D | 70 | **EMA3/1/8** | 400 | | 4.0 | |
| G 1/4 | 18.0 | 39.0 | 12.0 | 19 | | D | 77 | **EMA3/1/4** | 400 | | 4.0 | |
| G 3/8 | 22.0 | 40.5 | 12.0 | 22 | | D | 91 | **EMA3/3/8** | 400 | | 4.0 | |
| G 1/2 | 26.0 | 46.0 | 14.0 | 27 | 17 | E | 137 | **EMA3/1/2** | 400 | | 3.4 | |
| G 1/8 | 14.0 | 37.5 | 8.0 | 17 | | B | 72 | **EMA3/1/8ED** | 400 | 400 | 4.0 | 4 |
| G 1/4 | 19.0 | 39.0 | 12.0 | 19 | | B | 76 | **EMA3/1/4ED** | 630 | 630 | 4.0 | 4 |
| G 3/8 | 22.0 | 40.5 | 12.0 | 22 | | B | 93 | **EMA3/3/8ED** | 630 | 630 | 4.0 | 4 |
| M 10×1.0 | 14.0 | 40.0 | 8.0 | 17 | | B | 71 | **EMA3/10X1ED** | 400 | 400 | 4.0 | 4 |
| M 12×1.5 | 17.0 | 38.0 | 12.0 | 17 | | B | 72 | **EMA3/12X1.5ED** | 630 | 630 | 4.0 | 4 |
| M 14×1.5 | 19.0 | 39.0 | 12.0 | 19 | | B | 77 | **EMA3/14X1.5ED** | 400 | 400 | 4.0 | 4 |
| G 1/2 | 27.0 | 46.0 | 14.0 | 27 | 17 | C | 135 | **EMA3/1/2ED** | 400 | 400 | 4.0 | 4 |

**DF = Design Factor

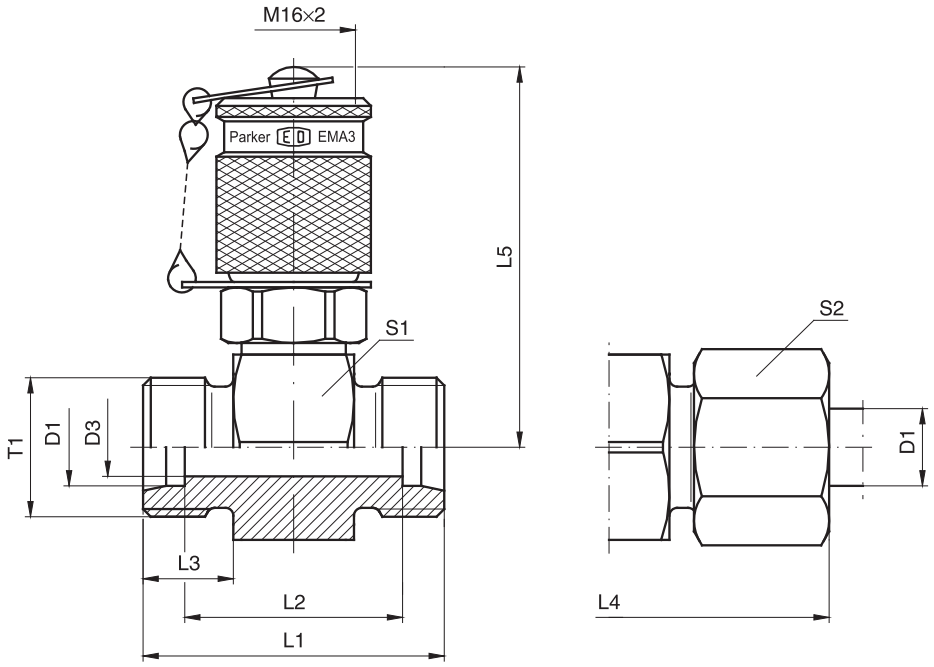
[1]) Pressure shown = item deliverable

$\frac{\text{PN (bar)}}{10}$ = PN (MPa)

*Please add the **suffixes** below according to the material/ surface required.

| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | EMA3/10X10ORCF | NBR |
| Stainless Steel | 71 | EMA3/10X10OR71 | VIT |

## GMA3 Straight Test Point with threaded connection M 16×2 Series 3




| Series | D1 | T1 | D3 | L1 | L2 | L3 | L4 | L5 | S1 | S2 | Weight g/1 piece | Order code* | PN (bar)[1] CF | PN (bar)[1] 71 | DF** CF | DF** 71 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L[3] | 06 | M 12×1.5 | 4 | 35 | 21 | 10 | 51 | 49.0 | 24 | 14 | 126 | **GMA3/06LOMD** | 315 | 315 | 4 | 4 |
| | 08 | M 14×1.5 | 6 | 35 | 21 | 10 | 51 | 49.0 | 24 | 17 | 128 | **GMA3/08LOMD** | 315 | 315 | 4 | 4 |
| | 10 | M 16×1.5 | 7 | 37 | 23 | 11 | 53 | 49.0 | 24 | 19 | 132 | **GMA3/10LOMD** | 315 | 315 | 4 | 4 |
| | 12 | M 18×1.5 | 8 | 37 | 23 | 11 | 53 | 50.5 | 27 | 22 | 145 | **GMA3/12LOMD** | 315 | 315 | 4 | 4 |
| | 15 | M 22×1.5 | 11 | 39 | 25 | 12 | 55 | 52.0 | 30 | 27 | 174 | **GMA3/15LOMD** | 315 | 315 | 4 | 4 |
| | 18 | M 26×1.5 | 14 | 39 | 24 | 12 | 57 | 53.0 | 32 | 32 | 192 | **GMA3/18LOMD** | 315 | 315 | 4 | 4 |
| | 22 | M 30×2.0 | 18 | 43 | 28 | 14 | 61 | 55.0 | 36 | 36 | 220 | **GMA3/22LOMD** | 160 | 160 | 4 | 4 |
| | 28 | M 36×2.0 | 23 | 43 | 28 | 14 | 61 | 57.5 | 41 | 41 | 259 | **GMA3/28LOMD** | 160 | 160 | 4 | 4 |
| | 35 | M 45×2.0 | 30 | 47 | 26 | 16 | 69 | 60.0 | 46 | 50 | 363 | **GMA3/35LOMD** | 160 | 160 | 4 | 4 |
| | 42 | M 52×2.0 | 36 | 47 | 25 | 16 | 71 | 64.5 | 55 | 60 | 419 | **GMA3/42LOMD** | 160 | 160 | 4 | 4 |
| S[4] | 06 | M 14×1.5 | 4 | 39 | 25 | 12 | 55 | 49.0 | 24 | 17 | 137 | **GMA3/06SOMD** | 630 | 630 | 4 | 4 |
| | 08 | M 16×1.5 | 5 | 39 | 25 | 12 | 55 | 49.0 | 24 | 19 | 141 | **GMA3/08SOMD** | 630 | 630 | 4 | 4 |
| | 10 | M 18×1.5 | 7 | 39 | 24 | 12 | 57 | 49.0 | 24 | 22 | 141 | **GMA3/10SOMD** | 630 | 630 | 4 | 4 |
| | 12 | M 20×1.5 | 7 | 39 | 24 | 12 | 57 | 49.0 | 24 | 24 | 150 | **GMA3/12SOMD** | 630 | 630 | 4 | 4 |
| | 14 | M 22×1.5 | 10 | 43 | 27 | 14 | 63 | 50.5 | 27 | 27 | 172 | **GMA3/14SOMD** | 630 | 630 | 4 | 4 |
| | 16 | M 24×1.5 | 11 | 43 | 26 | 14 | 63 | 52.0 | 30 | 30 | 195 | **GMA3/16SOMD** | 400 | 400 | 4 | 4 |
| | 20 | M 30×2.0 | 15 | 47 | 26 | 16 | 69 | 55.0 | 36 | 36 | 254 | **GMA3/20SOMD** | 400 | 400 | 4 | 4 |
| | 25 | M 36×2.0 | 20 | 51 | 27 | 18 | 75 | 57.5 | 41 | 46 | 329 | **GMA3/25SOMD** | 400 | 400 | 4 | 4 |
| | 30 | M 42×2.0 | 25 | 55 | 28 | 20 | 81 | 60.0 | 46 | 50 | 412 | **GMA3/30SOMD** | 400 | 400 | 4 | 4 |
| | 38 | M 52×2.0 | 32 | 61 | 29 | 22 | 91 | 64.5 | 55 | 60 | 616 | **GMA3/38SOMD** | 315 | 315 | 4 | 4 |

**DF = Design Factor

[1]) Pressure shown = item deliverable

[3]) L = light series; [4]) S = heavy series

$\frac{\text{PN (bar)}}{10}$ = PN (MPa)

**Delivery without nut and ring.**
**Information on ordering complete fittings or alternative sealing materials see page I7.**

*Please add the **suffixes** below according to the material/ surface required.

| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | GMA3/06LOMDCF | NBR |
| Stainless Steel | 71 | GMA3/06LOMD71 | VIT |

Q

## VKA3 Test Point for cones with threaded connection M 16×2 Series 3

With 24° cone swivel nut connection

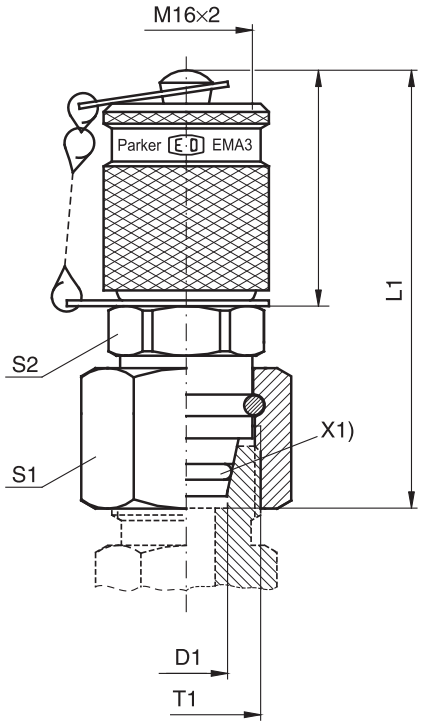



Fig. A

X1) O-ring

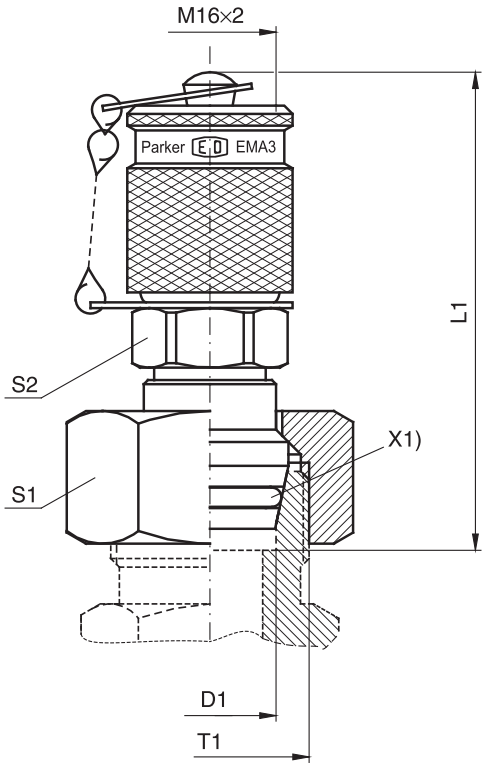



Fig. B

| Series | D1 | T1 | L1 | S1 | S2 | Fig. | Weight g/1 piece | Order code* | PN (bar)[1] CF | PN (bar)[1] 71 | DF** CF | DF** 71 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L[3] | 06 | M 12×1.5 | 55 | 14 | 17 | A | 82 | **VKA3/06L** | 315 | 315 | 4 | 4 |
| | 08 | M 14×1.5 | 51 | 17 | 17 | A | 82 | **VKA3/08L** | 315 | 315 | 4 | 4 |
| | 10 | M 16×1.5 | 53 | 19 | 17 | A | 93 | **VKA3/10L** | 315 | 315 | 4 | 4 |
| | 12 | M 18×1.5 | 53 | 22 | 17 | A | 107 | **VKA3/12L** | 315 | 315 | 4 | 4 |
| | 15 | M 22×1.5 | 59 | 27 | 17 | B | 133 | **VKA3/15L** | 315 | 315 | 4 | 4 |
| | 18 | M 26×1.5 | 59 | 32 | 17 | B | 163 | **VKA3/18L** | 315 | 315 | 4 | 4 |
| | 22 | M 30×2.0 | 60 | 36 | 17 | B | 205 | **VKA3/22L** | 160 | 160 | 4 | 4 |
| | 28 | M 36×2.0 | 64 | 41 | 17 | B | 269 | **VKA3/28L** | 160 | 160 | 4 | 4 |
| | 35 | M 45×2.0 | 71 | 50 | 17 | B | 411 | **VKA3/35L** | 160 | 160 | 4 | 4 |
| | 42 | M 52×2.0 | 72 | 60 | 17 | B | 592 | **VKA3/42L** | 160 | 160 | 4 | 4 |
| S[4] | 06 | M 14×1.5 | 50 | 17 | 17 | A | 81 | **VKA3/06S** | 630 | 630 | 4 | 4 |
| | 08 | M 16×1.5 | 52 | 19 | 17 | A | 88 | **VKA3/08S** | 630 | 630 | 4 | 4 |
| | 10 | M 18×1.5 | 53 | 22 | 17 | A | 99 | **VKA3/10S** | 630 | 630 | 4 | 4 |
| | 12 | M 20×1.5 | 54 | 24 | 19 | A | 121 | **VKA3/12S** | 630 | 630 | 4 | 4 |
| | 14 | M 22×1.5 | 59 | 27 | 17 | B | 136 | **VKA3/14S** | 630 | 630 | 4 | 4 |
| | 16 | M 24×1.5 | 58 | 30 | 17 | B | 156 | **VKA3/16S** | 400 | 400 | 4 | 4 |
| | 20 | M 30×2.0 | 65 | 36 | 17 | B | 223 | **VKA3/20S** | 400 | 400 | 4 | 4 |
| | 25 | M 36×2.0 | 68 | 46 | 17 | B | 367 | **VKA3/25S** | 400 | 400 | 4 | 4 |
| | 30 | M 42×2.0 | 74 | 50 | 17 | B | 444 | **VKA3/30S** | 400 | 400 | 4 | 4 |
| | 38 | M 52×2.0 | 81 | 60 | 17 | B | 655 | **VKA3/38S** | 315 | 315 | 4 | 4 |

**DF = Design Factor

[1]) Pressure shown = item deliverable

[3]) L = light series; [4]) S = heavy series

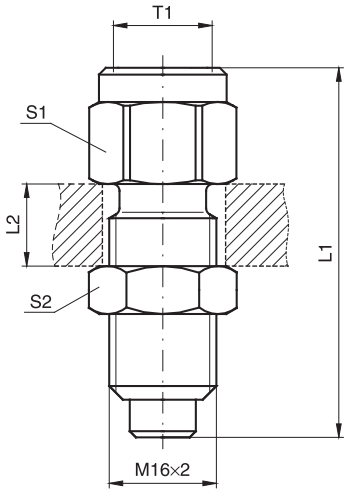
$\frac{PN\ (bar)}{10}$ = PN (MPa)

*Please add the **suffixes** below according to the material/ surface required.

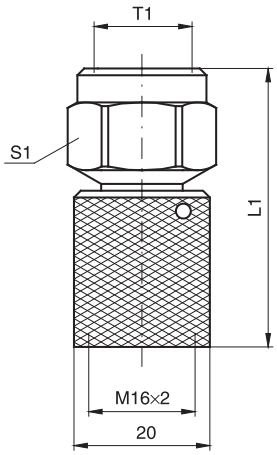
| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | VKA3/06LCF | NBR |
| Stainless Steel | 71 | VKA3/06L71 | VIT |

## MAV…MA3 Test point pressure gauge connector with threaded connection M 16×2
## MAVMD…MA3 Test point with threaded connection M 16×2
## SMA3 Test point high pressure hose with threaded connection M 16×2 Series 3

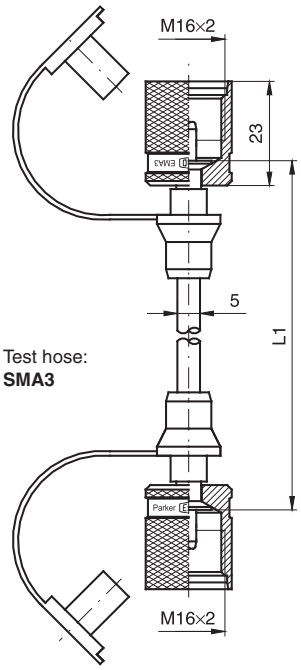
Female thread: BSP
Sealing: sealing ring DIN 16258*




Pressure gauge connector:
**MAV…MA3**




Gauge-Direct-Connector:
**MAVMD…MA3**




Test hose:
**SMA3**

| T1 | L1 | L2 max. | S1 | S2 | Weight g/1 piece | Order code* | PN (bar)1) CF | DF** |
|---|---|---|---|---|---|---|---|---|
| G 1/4 | 54.0 | 12 | 19 | 19 | 74 | **MAV1/4MA3** | 630 | 4.0 |
| G 1/2 | 64.0 | 12 | 27 | 19 | 129 | **MAV1/2MA3** | 630 | 4.0 |
| G 1/4 | 41.0 | | 19 | | 61 | **MAVMD1/4MA3** | 630 | 4.0 |
| G 1/2 | 51.5 | | 27 | | 103 | **MAVMD1/2MA3** | 630 | 4.0 |
| | 200.0 | | | | 73 | **SMA3-200** | 630 | 2.5 |
| | 300.0 | | | | 74 | **SMA3-300** | 630 | 2.5 |
| | 400.0 | | | | 74 | **SMA3-400** | 630 | 2.5 |
| | 630.0 | | | | 79 | **SMA3-630** | 630 | 2.5 |
| | 800.0 | | | | 83 | **SMA3-800** | 630 | 2.5 |
| | 1000.0 | | | | 87 | **SMA3-1000** | 630 | 2.5 |
| | 1500.0 | | | | 95 | **SMA3-1500** | 630 | 2.5 |
| | 2000.0 | | | | 105 | **SMA3-2000** | 630 | 2.5 |
| | 2500.0 | | | | 110 | **SMA3-2500** | 630 | 2.5 |
| | 3200.0 | | | | 125 | **SMA3-3200** | 630 | 2.5 |
| | 4000.0 | | | | 137 | **SMA3-4000** | 630 | 2.5 |

**DF = Design Factor

1) Pressure shown = item deliverable

$\frac{PN\ (bar)}{10}$ = PN (MPa)

*Please add the **suffixes** below according to the material/ surface required.

| Order code suffixes | | | |
|---|---|---|---|
| Material | Suffix surface and material | Example | Standard sealing material (no additonal. suffix needed) |
| Steel, zinc plated, Cr(VI)-free | CF | MAV1/4MA3CF | NBR |

* Sealing rings according to DIN 16258 for steel design of copper, for stainless steel design of stainless steel.

**Note hoses with small diameter:**
- Min. bending radius r = 20 mm
- Working temperature –20 °C up to 100 °C (short time to +120 °C)
- Hoses are to be protected from fire, from sharp-corners and hot objects.

For measuring with liquid pressure media please note:
Bleed before connecting tube! By capillary action discharge of the pressure medium is prevented widely.

Temperature factor of pressure rating:

| | | |
|---|---|---|
| up to | 0 °C | 122 % |
| for | 30 °C | 110 % |
| for | 50 °C | 100 % |
| for | 80 °C | 86 % |
| for | 100 °C | 77 % |

Q

## SensoControl®

### ServiceJunior

The ServiceJunior makes possible the measurement and display of pressures with one instrument. Measured values are shown with high precision on a 4-digit display. Pressure peaks are securely captured at a scanning rate of 10 ms.

- Digital pressure measurement and display
- Back-lit measured value display
- Accuracy ± 0,5% FS
- Pressure peaks captured by displaying MIN/MAX reading
- Graphic display with bar graph (trailing indicator), peak & hold function

### ServiceJunior Kit

- Delivery in storage-case
- Incl. test point-adapters and test hoses

**Catalogue 4054/UK**

## SensoControl®

### ServiceJunior wireless

Utilising the ServiceJunior wireless from Parker's SensoControl family of products allows you to comfortably record the pressure values taken from one or several measurement points on your machine or installation. Stored measurement data is transmitted to a PC across distances of up to 150 meters.

- Measured data memory for storing pressure sequences
- Network operations: monitor several measurement points
- Read-out data from measured data memory to the PC via a radio interface
- Set and evaluate measurement data using PC software "JuniorWin"

**Catalogue 4054/UK**

## SensoControl®

### Serviceman

The Serviceman has 2 inputs for sensors.
This enables a differential pressure measurement by pressing only one key. Fast comparisons of actual and set values are done very easily.

- Easily operation
- Prevention of measuring errors due to automatic sensor recognition
- Two-line display
- Pressure peak measuring in 2 msec.

### Serviceman Kit

- Delivery in storage-case
- Incl. test point-adapters and test hoses
- Attachments and sensors to measure pressure/ temperature, flow

**Catalogue 4054/UK**

## SensoControl®

### The Parker Service Master *"Easy"*

Measurement and display of up to four measured values simultaneously. Proportional technology differential values, addition, performance and signals are very easily analysed.

- Rapid fault diagnosis = high quality maintenance
- Pressure spike measurement 1 msec
- Measured value storage to record pressure sequences with various storage functions (auto trigger, start-stop, etc)
- USB PC interface
- Setting and evaluation of measurement data with "SensoWin" software.

**Catalogue 4054/UK**

## SensoControl®

### The Parker Service Master Plus

This high-end instrument with innovative and unique features is aimed at the future and is available worldwide.

- Analogue, CAN, LAN and USB interfaces
- Measured value display: numerical, bar graph, pointer, curve graph
- Measurement and display of more than 50 channels
- Measurement data are automatically displayed, stored and directly analysed with the proven “SensoWin” PC software
- Remote monitoring via LAN, regardless of location
- Everything is measured, stored, monitored and analysed: pressure, temperature, flow and speed
- Up to 4 million measured values per measurement. Total measured value storage for more than 1 billion measured values
- Extensive choice of trigger methods

### The Parker Service Master Plus Kit:

- Delivery in storage-case
- Incl. attachments
- test point-adapters and test hoses

**Catalogue 4054/UK**

## Pressure/Temperature sensor SCPT

- Measurement range up to 1,000 bar
- Accuracy ±0,25% FS typical
- Rugged stainless steel design
- Response time of 1 msec
- Flexible operation

**Catalogue 4054/UK**

## Pressure/Temperature Sensor SCPT-CAN

All advantages of the analogue SCPT sensors combined with innovative CAN-bus technology. Up to eight sensors can be wired easily to a bus cable and quick-plug SPEEDCON®*) screw connection. Plug & Play functionality and no complex configuration required.

- Robust stainless steel design
- Response times of 1 msec
- Capturing of pressure peaks
- Future-proof CAN-bus technology
- Easy wiring with SPEEDCON®
- High cable lengths up to 100 m
- Sensor identification LED (SIL)

**Catalogue 4054/UK**

## Temperature sensor SCT

In hydraulics, temperature measurements serve to locate faults and avoid the kind of damage caused by excessive oil temperatures in critical parts such as pumps and proportional valves.

- High pressure-proof temperature sensor
- Measuring of oil temperatures up to 125 °C
- Flexible operation
- Screw-in or manual sensor

**Catalogue 4054/UK**

*) SPEEDCON®: Trademark of PHOENIX CONTACT GmbH & Co. KG

## Hydraulic tester SCLV

These hydraulic testers can be used for precisely measuring flow, pressure and temperature. The testers can also be helpful when performing hydraulic system maintenance, locating error sources on directional control valves and making valve adjustments. The pressure-load valve, with its integrated bypass blow-out discs, makes it possible to build up pressure progressively in order to check the flow in an entire working area.

- Rapid fault diagnosis = high quality maintenance
- Three measurement ranges up to 750 l/min
- Pressure resistant up to 480 bar
- Integrated overload protection
- Reverse operation (Flow direction A-B)
- Also with CAN-Bus connection

**Catalogue 4054/UK**

## Turbine flow meter type SCFT

A turbine wheel is driven by the oil flow. The frequencies thus produced are processed by digital electronics. The influence of turbulent flow effects is compensated for. Because of low flow resistance QR the hydraulic circuit operates with very low losses.

- Measurement range up to 750 l/min.
- Accuracy: 1% of measured value
- Pressure resistant up to 480 bar
- Small flow resistance
- Built-in pressure and temperature measurement ports
- Suitable for reverse operation

**Catalogue 4054/UK**

## Turbine Flow Meter SCFT-CAN

- Flow turbine with CAN-Bus technology
- Six measurement ranges up to 750 l/min
- Easy assembly
- Pressure resistant up to 480 bar
- Small flow resistance
- Built-in pressure and temperature measurement ports
- Suitable for reverse operation
- Easy wiring with SPEEDCON®*)
- High conductor lengths up to 100 m

**Catalogue 4054/UK**

## Tachometer SCRPM

Contactless measurement (opto-electronic principal) can be done quickly and easily. Rotational speed is detected, for example, at a main drive shaft (e.g. power take-off shaft of a tractor), and displayed on the hand-held device. Installation or adjustment is not necessary.

- Measurement range up to 10,000 RPM
- Accuracy ± 0.5% FS typically
- Easy and fast measuring

**Catalogue 4054/UK**

*) SPEEDCON®: Trademark of PHOENIX CONTACT GmbH & Co. KG

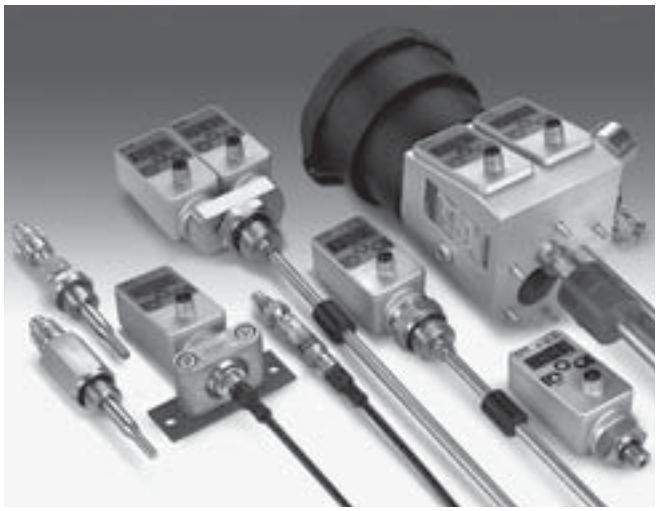
## Flow Transducer SCQ

In the field of high pressure hydraulics, the rapid capture of the amount of flow is of great significance. The reaction times of the SCQ's enable the dynamic behaviour of hydraulic systems to be measured. The indication of direction is helpful when searching for faults in hydraulic systems.

- Measurement principle: spring/piston
- Response time: ≤ 2 ms
- Compact construction
- Pressure resistant up to 420 bar
- Wide viscosity range
- Mounting with the connection block permits a combined measurement of p, T and Q.

**Catalogue 4054/UK**

## SensoControl® Controller Family



The Controllers are used in control, regulating and monitoring systems when switching or analogue signals, or a display, are required.
The Controllers can replace

- mechanical switches
- mechanical displays (manometers, thermometers, sight glasses)
- sensors

and combine all the functions of the above-mentioned components in one instrument.

- large display
- freely settable
- rugged metal design
- compact
- long-term stability
- reliable
- interference-free

**Catalogue 4083**

## SensoControl®

### Pressure Controller SCPSD

DESINA

c UL us LISTED

DNV


**Simple operation, comprehensive functionality and long working life are the major features of the electronic SCPSD Pressure Controller.**

Features:
- Bar/PSI/MPa
- compact design
- rotatable
- rugged housing (IP 67)
- simple operation
- 2 switching outputs
- 4 switching points
- settable analogue output
- time delay (damping)
- hysteresis/window function
- password

If pressure is to be displayed, or the requirement is for rapid switching or analogue signals, which can be set simply and without additional adjustments, then the SCPSD is the ideal solution.

**Catalogue 4083**

## SensoControl®

### Temperature Controller SCTSD

**Simple operation and comprehensive functionality are the major features of the electronic SCTSD Temperature Controller.**

Features:
- °C and °F
- compact design
- rotatable
- rugged housing (IP 67)
- simple operation
- 2 switching outputs
- 4 switching points
- settable analogue output
- delay times (damping)
- hysteresis/window function
- password

If temperature is to be displayed, or the requirement is for temperature-dependent switching or analogue signals, which can be set simply and without additional adjustments, then the SCTSD is the ideal solution.

**Catalogue 4083**

## SensoControl®

### LevelController SCLSD

**Simple operation and comprehensive functionality are the major features of the electronic SCLSD LevelController.**

- level display in mm/inch/%
- compact design
- rotatable
- rugged housing (IP 67)
- settable via menu
- high & low display
- switching output
- analogue output
- proven float measuring system
- simple operation
- flexible installation
- hysteresis/window function

The LevelController is very suitable for monitoring tank levels. With its menu-controlled setting of level switching points, a very wide range of applications can be conveniently carried out. If the percentage display is selected, the fullness level is shown to the operator in a consistent manner, independently of the tank shape.

**Catalogue 4083**

## SensoControl®

### LevelTempController SCLTSD

**Simple operation and comprehensive functionality are the major features of the electronic SCLTSD LevelTempController.**

Features:
- temperature and level
- compact design
- rotatable
- rugged housing (IP67)
- simple operation
- menu-controlled setting
- probe
- locating bore
- switching output
- analogue output
- hysteresis/window function
- password

With the LevelTempController it is possible to set and display temperature and level separately on a common platform. It is precisely in the field of tank monitoring that the integration of level and temperature shows its unique potential.

**Catalogue 4083**

## SensoControl®

### OilTankController SCOTC

The **OilTankController** offers standardised connection points for an air filter and a filler coupling, which are additional to the **LevelTempController.**
It is precisely in the field of tank monitoring for series production that the integration of level and temperature, in combination with the air filter and filler coupling, shows its unique potential. Only one location bore is required for all 4 functions.

- proven measuring system
- level and temperature display
- mm/inch/% displays
- high and low display
- only one bore
- continuous level measurement
- connections:
  - filler coupling
  - air filter
  - under-pressure
- no surge tube needed

**Catalogue 4083**

## SensoControl®

### Pressure sensor SCP Mini

The SCP Mini pressure sensor was designed for industrial application needs and is used in control, regulating and monitoring systems, when the requirement is for rapid pressure-dependent analogue signals.
The SCP Mini sensor is noted for its compact design, high linearity and excellent interference resistance.

- stainless steel cell
- small size
- high burst pressure
- resistant to pressure peaks
- shock and vibration resistant
- wide media compatibility
- high linearity
- long-term stability

**Catalogue 4083**

## SensoControl®

### Pressure sensor SCP-EX

The SCP-EX pressure sensor was designed for the requirements of applications where there is a risk of explosion (II 2G EEx ia IIC T4) and is used in control, regulating and monitoring systems when there is a requirement for pressure-dependent analogue signals.

- rugged
- long-term stability
- reliable
- stainless steel
- EEx ia

**Catalogue 4083**

## SensoControl®

### Pressur sensor SCP-Mobil

The SCP-Mobil was specially developed for mobile hydraulic applications and may be modified to suit special customer requirements. With its rugged and compact construction the hermatically-welded stainless steel membrane guarantees high long-term stability and freedom from leaks. The pressure cell is completely vacuum-tight, extremely resistant to bursting and accommodates all the standard media used in motor vehicles, mobile hydraulics and testing technologies. Thanks to its mechanical construction, a high degree of accuracy and long-term stability are guaranteed.

- Compact construction
- Stainless steel cell
- Load Dump Protection
- High burst pressure
- Pressure peak damping
- Shock and vibration-proof
- Vibration 50 g
- IP 65 high protection class
- High over-voltage protection
- High reverse polarity protection
- EMC up to 300 V/m

**Catalogue 4083**

## CanBus SCP

### Pressure/Temperature Sensor with CANopen technology

**Technical data:**

- Pressure range (measuring range) –1…16 / 0…60/150/400/600/1000 bar
- Temperature range (measuring range) –25°C … +105°C (± 2,0% FS max.)
- Accuracy ± 0,25% FS (typ.)
- Response time 1 ms
- Housing stainless steel 1.4404
  Sealing FKM
- Connections electrical M12 5-pin
  hydraulic ½˝ BSP
- CANopen DS 301 v 4.1
  Type 2.0 A
  Profile DS 404 v 1.2
  Functions LSS (DSS 305 v 2.0)

**Flexible, innovative and reliable**

The new pressure/temperature sensor in the SCPT series offers flexible application possibilities in automation technology. Besides the pressure and temperature measurement combination, CANopen technology offers the designer cost-effective and reliable measuring technology.

**Advantages**

- Combined pressure and temperature measurement
- Digital measured value capture and transmission
- Error monitoring/self-diagnosis
- Heartbeat function/SYNC

**Applications**

- Hydraulics/pneumatics
- Automation technology
- Paper machinery/automotive/mobile hydraulics

**Leaflet 4059/UK**

## SensoControl®

### Temperature sensor SCT

Compact construction and high pressure resistance are the main features of the SCT temperature sensor. The SCT is ideal for use when temperatures at higher pressures are to be measured and a compact construction is required. With its pressure resistance up to 630 bar, the SCT temperature sensor is very suitable for hydraulic application requirements. It has the ability to make precise, rapid temperature measurements. SCT series temperature sensors are compatible with the SCE built-in measuring instruments. With the latter, besides the hydraulic pressure, the temperature of the medium too can be measured, controlled and evaluated.

- Pressure-proof up to 630 bar
- Compact construction
- Rugged steel housing
- Simple installation
- –50 °C to +125 °C
- 0/4…20 mA

**Catalogue 4083**

## SensoControl®

### SCE-020 digital display instrument


Plenty of connections, flexible display and copious outputs are the main features of the SCE digital display instrument. The SCE-020 converts standard analogue signals (in the ranges 0…10 V up to 0/4…20 mA) into clearly understandable measurement values/units. Consequently with the SCE-020, any sensor required (pressure, temperature, torque, length, etc) can be easily displayed.

- Easily readable digital display
- Programmable
- Easily selectable units
- Display range can be set
- Input:
  - Current: 0/4…20 mA
  - Voltage: 0…10 V
  - Frequency: 0…8 kHz
- Switching output
- Loop-through function: analogue output, serial interface
- Standard housing 96×48 mm

**Catalogue 4083**

# Ermeto Original
# *Tubes*

# General recommendations for tubes

## 1. Steel types, mechanical properties, conditions

**Steel types, mechanical properties and conditions of EO steel tubes**

| Steel type | Tensile strength Rm | Yield point ReH | Ductile yield A5 (longit.) | Condition |
|---|---|---|---|---|
| Fine grain E235N acc. to EN 10305-4 (St. 37.4 acc. to DIN 1630/DIN 2391 old designation) | 340 N/mm² min. 49,000 lb/in² | 235 N/mm² min. 34,000 lb/in² | 25% min. | Seamless, cold drawn, normal annealed, DIN EN 10305-1 and -4 |

**Steel types, mechanical properties and conditions of EO stainless steel tubes**

| Steel type | Tensile strength Rm | Yield point (1% proof stress) | Ductile yield A5 (longit.) | Condition |
|---|---|---|---|---|
| 1.4571 X6CrNiMoTi17122 | 500 N/mm² min. 72,500 lb/in² | 245 N/mm² min. 35,500 lb/in² | 35% min. | Seamless, cold drawn free of scale, heat treated in accordance with DIN EN 10216-5 tab. 6 |

## 2. Tests and certifications

All tubes are subjected to a non-destructive leak test and marked accordingly as proof. This marking replaces a works certificate DIN EN 10204-2.2. Test class 1 DIN EN 10216-5 Table 7 applies for tubes made of 1.4571.

## 3. Recommended bend radius

A bend radius of 3x the external tube diameter is recommended for cold bending of tubes with tube benders or by hand.

## 4. Welding suitability and weldability

Tubes of E235N are weldable according to usual techniques. Types made of 1.4571 (stainless) are suitable for arc welding. The welding filler should be selected in accordance with DIN EN 1600 and DIN EN 12072 part 1 taking into account the type of application and the welding technique.

## 5. Approximate calculation of the flow resistance in straight tubelines

The flow resistance and thus the tubeline efficiency is influenced by the tube inside diameter, the volume flow (measured or calculated) and the properties of the medium. Laminar flow should be considered in order to keep losses in the system down to a minimum. The transition from laminar to turbulent flow, which brings an increase in the flow resistance is generally defined by the Reynolds number Re 2320. Since the transition cannot be pinpointed exactly, the transition range can only be determined by measuring. If, for simplified calculation, transition at Re 2320 and a “technically smooth” tube inner surface are assumed, the limit speeds w crit. and the laminar to turbulent flow volume flow v crit. when transition takes place, can be estimated according to the following formulas:

$$w_{crit.} = \frac{2.32 \cdot \nu}{d_i} \text{ [m / s]}$$

$$\dot{v}_{crit.} = 0.109 \cdot d_i \cdot \nu \text{ [l / min]}$$

$d_i$ = tube bore ∅ in mm

$\nu$ = kinematic viscosity in mm² / s.

For approximate calculation of the pressure drop in bar/1 m tube length, the following formulas can be used:

1. Laminar range:

$$\rho_v = \frac{0.32 \cdot w \cdot \nu \cdot \rho}{d_i^2 \cdot 10^3} = \frac{6.79 \cdot \dot{v} \cdot \nu \cdot \rho}{d_i^4 \cdot 10^3} \text{ [bar / 1 m]}$$

2. Turbulent range:

$$\rho_v = \frac{0.281 \cdot w^{1.75} \cdot \nu^{0.25} \cdot \rho}{d_i^{1.25} \cdot 10^3}$$

$$= \frac{59 \cdot \dot{v}^{1.75} \cdot \nu^{0.25} \cdot \rho}{d_i^{4.75} \cdot 10^3} \text{ [bar / 1 m]}$$

$w$ = flow speed in m/s; $\nu$ = kinetic viscosity in mm²/s; $\dot{v}$ = volume flow in l/min.; $\rho$ = density of the medium in kg/m³; $d_i$ = pipe internal diameter in mm.

Detailed calculations of the flow resistance require an exact knowledge of the tubeline system and the operating conditions. Refer to the relevant literature for other methods of calculations.

R

## 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 |
| | **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 |

**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.

**Calculation pressures:**

Calculation pressures given are according to DIN 2413 part I for **static stress**

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

Material characteristic value K = 235N/mm² 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 N/mm² (permanent fatigue strength)

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

## Seamless EO steel tubes (Continued) 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 | | |
| | **R20X1.5CF** | 20 | | 1.50 | 17.0 | 212 | 190 | 675 | 0.684 |
| **R20X2** | **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** | **R20X3CF** | 20 | | 3.00 | 14.0 | 423 | 357 | 1400 | 1.258 |
| | **R20X3.5CF** | 20 | | 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 | | 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 | | 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 | | 4.50 | 16.0 | 508 | 418 | 1625 | 2.275 |
| **R28X1.5** | **R28X1.5CF** | 28 | | 1.50 | 25.0 | 151 | 138 | 425 | 0.980 |
| **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 |
| | **R30X2CF** | 30 | | 2.00 | 26.0 | 188 | 170 | 575 | 1.381 |
| **R30X2.5** | **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 | | 5.00 | 20.0 | 470 | 391 | 1600 | 3.083 |
| **R35X2** | **R35X2CF** | 35 | | 2.00 | 31.0 | 161 | 147 | 450 | 1.628 |
| **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 |
| | **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 |
| | **R38X7CF** | 38 | | 7.00 | 24.0 | 519 | 427 | 1700 | 5.352 |
| **R42X2** | **R42X2CF** | 42 | | 2.00 | 38.0 | 134 | 123 | 375 | 1.973 |
| **R42X3** | **R42X3CF** | 42 | ±0.2 | 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 | | 11.246 |

**Remarks:**

Corrosion – additional allowances are not considered for the calculation of pressures. Tube with a diameter ratio of

$\frac{da}{di_{max.}} > 2$ are calculated for static stress in accordance with DIN 2413 coverage III, but with $K = 235\ N/mm^2$.

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

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

**For increased temperatures:**

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

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

Material strength K for increased temperatures:

| Temperature in °C | K (Nmm²) |
|---|---|
| up to 200 | 185 |
| up to 250 | 165 |

R

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

Tolerances 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 stainless steel tubes (continued) Material-No.: 1.4571

**Calculation pressure:**
Calculation pressures given are according to DIN 2413 part I for **static stress**

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

Material characteristic value K = 245 N/mm² (1.4571) (1% proof stress)
Safety factor S = 1.5
Factor c for consideration of wall thickness divergence: 0.9

For range of application for which a certain safety value compared to burst pressure is demanded for tubes of 1.4571 grade stainless steel, the measured burst pressures are contained in tube-tables.
Calculation pressures according to DIN EN 2413 part III for **dynamic stress** are not listed, because in DIN 17458 the permanent fatigue stress is not listed. Until standards will be available for gauge localization of permanent fatigue strength we recommend for calculations to use DIN EN 2413 part III with the following characteristic values:
permanent fatigue strength K=190 N/mm² for tubes of 1.4571; S = 1.5; C = 0.9.

**Remarks:**
Corrosion: additional allowances are not considered for the calculation of pressures.
Tubes with a diameter proportion da/di ≥ 1.35 are calculated according to DIN 2413 III with above characteristic values.

**Permissible temperature range and required pressure reductions.** This is based on calculated pressures at the elevated temperatures shown, taking into consideration the recommended reduction in proof stress (DIN EN 10216-5).

| Temperature | | –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 |

Interpolation is acceptable for intermediate temperature levels.

## Seamless EO steel tubes Material C-Steel

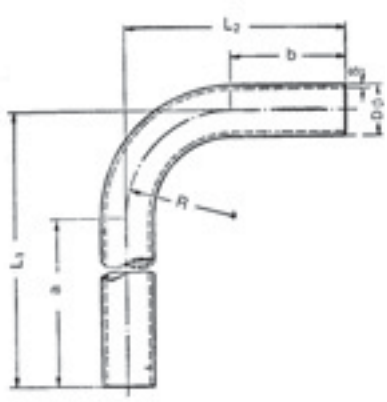
for hydraulic and pneumatic pressure lines.
SAE J 524. C-Steel.
Test according ASTM A 179-90 A/ASME SA 179.
Quality and leak tested.

| Order code (With Tube O.D. and wall thickness Inch) | Tube O.D. (mm) | Tolerance | Wall thickness (mm) | Design pressure bar DIN 2413 I Static | Design pressure bar DIN 2413 III Dynamic | burst pressure bar | Weight kg/m |
|---|---|---|---|---|---|---|---|
| **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 |

R

## Seamless EO tube bends 90° Material E235N (St. 37.4) and 1.4571

For minimum pressure loss




| Order code | | Tube | | Wall- | Tube | Bending | Leg length | | Length | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cr(VI)-free | 1.4571 | O.D. D | Tolerance ± | thickness S | I.D. mm | radius R | a | b | L1 | L2 | kg/piece |
| **RB16X2CF** | **RB16X271** | 16 | 0.08 | 2.0 | 12 | 30 | 200 | 40 | 230 | 70 | 0.198 |
| **RB18X1.5CF** | **RB18X1.571** | 18 | 0.08 | 1.5 | 15 | 36 | 200 | 35 | 236 | 71 | 0.178 |
| **RB20X2CF** | | 20 | 0.08 | 2.0 | 16 | 36 | 200 | 45 | 236 | 81 | 0.268 |
| **RB20X2.5CF** | **RB20X2.571** | 20 | 0.08 | 2.5 | 15 | 36 | 200 | 45 | 236 | 81 | 0.326 |
| **RB22X1.5CF** | | 22 | 0.08 | 1.5 | 19 | 38 | 200 | 40 | 238 | 78 | 0.227 |
| **RB22X2CF** | **RB22X271** | 22 | 0.08 | 2.0 | 18 | 38 | 200 | 40 | 238 | 78 | 0.296 |
| **RB25X2CF** | | 25 | 0.08 | 2.0 | 21 | 44 | 200 | 50 | 244 | 94 | 0.362 |
| **RB25X2.5CF** | **RB25X2.571** | 25 | 0.08 | 2.5 | 20 | 44 | 200 | 50 | 244 | 94 | 0.442 |
| **RB25X3CF** | | 25 | 0.08 | 3.0 | 19 | 44 | 200 | 50 | 244 | 94 | 0.519 |
| **RB28X1.5CF** | | 28 | 0.08 | 1.5 | 25 | 48 | 200 | 50 | 248 | 98 | 0.319 |
| **RB28X2CF** | **RB28X271** | 28 | 0.08 | 2.0 | 24 | 48 | 200 | 50 | 248 | 98 | 0.417 |
| **RB28X3CF** | | 28 | 0.08 | 3.0 | 22 | 48 | 200 | 50 | 248 | 98 | 0.601 |
| **RB30X2.5CF** | | 30 | 0.08 | 2.5 | 25 | 50 | 200 | 60 | 250 | 110 | 0.575 |
| **RB30X3CF** | **RB30X371** | 30 | 0.08 | 3.0 | 24 | 50 | 200 | 60 | 250 | 110 | 0.677 |
| **RB30X4CF** | | 30 | 0.08 | 4.0 | 22 | 50 | 200 | 60 | 250 | 110 | 0.869 |
| **RB35X2CF** | **RB35X271** | 35 | 0.15 | 2.0 | 31 | 60 | 200 | 65 | 260 | 125 | 0.586 |
| **RB35X3CF** | | 35 | 0.15 | 3.0 | 29 | 60 | 200 | 65 | 260 | 125 | 0.852 |
| **RB38X2.5CF** | | 38 | 0.15 | 2.5 | 33 | 65 | 200 | 75 | 265 | 140 | 0.827 |
| **RB38X3CF** | | 38 | 0.15 | 3.0 | 32 | 65 | 200 | 75 | 265 | 140 | 0.979 |
| **RB38X4CF** | **RB38X471** | 38 | 0.15 | 4.0 | 30 | 65 | 200 | 75 | 265 | 140 | 1.268 |
| **RB38X5CF** | | 38 | 0.15 | 5.0 | 28 | 65 | 200 | 75 | 265 | 140 | 1.538 |
| **RB42X2CF** | **RB42X271** | 42 | 0.20 | 2.0 | 38 | 80 | 200 | 85 | 280 | 165 | 0.809 |
| **RB42X3CF** | | 42 | 0.20 | 3.0 | 36 | 80 | 200 | 85 | 280 | 165 | 1.183 |
| **RB50X6*** | | 50 | 0.20 | 6.0 | 38 | 180 | 150 | 150 | 330 | 330 | 3.496 |
| **RB65X8*** | | 65 | 0.30 | 8.0 | 49 | 180 | 160 | 160 | 330 | 330 | 6.294 |

Tolerances for leg length a, b = ±2.5 mm

For tube bends, contrary to straight tubes of the same wall thickness there is a higher stress at the inside of the bend and a reduction of the fatigue strength, because of the out-of-round of tube. Details see DIN 2413 III section 4.7.

If the elbow end is cut off to a different length, a recalibration of the tube end may be necessary.

Tube bends material E235N (St. 37.4) are phosphated and oiled. (Yellow chromated on request.)

*phosphated and oiled