

Description

- Standard cylinder according to ISO 6020/2, DIN 24554
- Strokes up to 2000 mm
- Piston diameter: 25 - 200 mm
- With/without end position cushioning (with identical installation dimensions)
- Two area ratios $\phi = 1.4$ and $\phi = 2.0$
- 16 different mounting types, as well as the choice between two piston area ratios and different seals ensure the perfect adjustment to each specific application
- More mounting types and special design concepts are available
- The installation dimensions are according to ISO 6020/2 and DIN 24554, the installation spaces for the seals are designed to DIN ISO 5597 and DIN ISO 6547
- End position cushioning is precisely adjustable
- Generously dimensioned start-up check valves allow high speed extension with full pressure loading of the effective piston area
- The mounting types, the tie rod design, generously dimensioned guide lengths at the piston rod and piston and high-quality materials allow its application under most severe conditions
- The guide bush can be dismantled together with the piston rod sealing without disassembling of the cylinder head. This allows quick and simple maintenance.

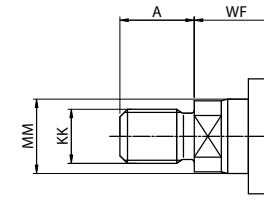
Technical data

- Operating pressure: 160 bar (16 MPa)
- Test pressure: 240 bar (24 MPa)
- Temperature range of hydraulic fluid: - 20 ... + 80 °C
- Viscosity range: (20 ... 80) 10^{-6} m²/s
- Piston speed: ≤ 0.5 m/s
(higher speeds on request)

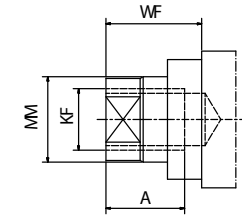
Hydraulic fluids:

- Mineral oils, HFC, HFD liquids in combination with seals made of PTFE and fluoric elastomers
- HFA and HFB liquids on request

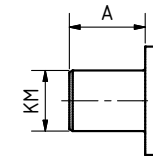
Piston rod end



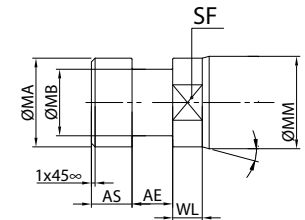
External thread, ref. no. 0
External thread, ref. no. 4



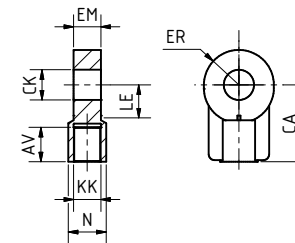
Inside thread, ref. no. 1



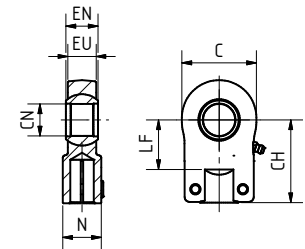
Cylindrical, ref. no. 2



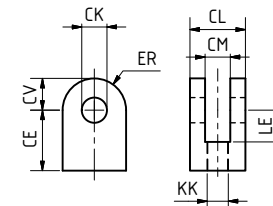
Clutch element, ref. no. 3



Plain rod eye, ref. no. 5

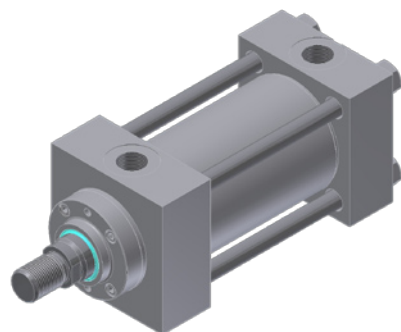


Swivel head, ref. no. 8

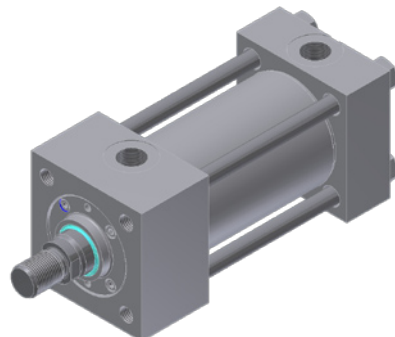


Clevis, ref. no. 9

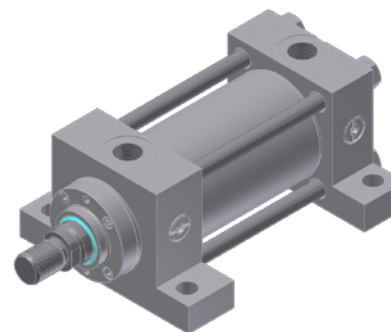
Special design on request!



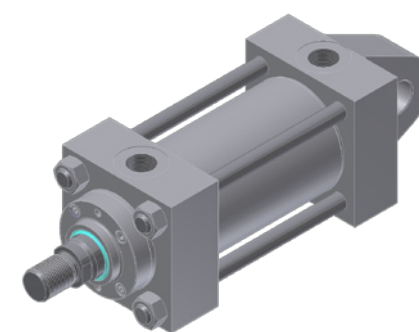
Mounting type: 00
Description: Basic form
ISO-des.: --



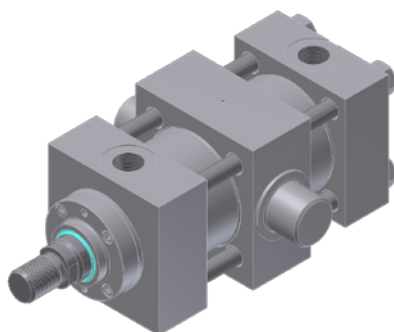
Mounting type: 01
Description: Threaded holes head end
ISO-des.: MX 5



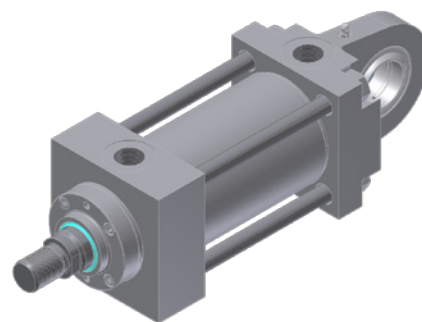
Mounting type: 02
Description: Foot mounting
ISO-des.: MS 2



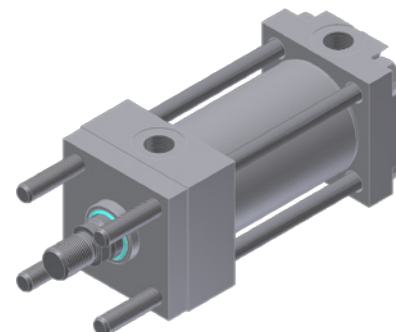
Mounting type: 05
Description: Rod eye
ISO-des.: MP 3



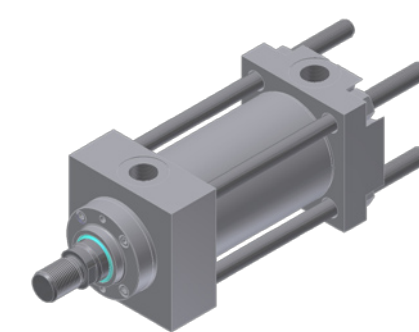
Mounting type: 06
Description: Trunnion
ISO-des.: MT 4



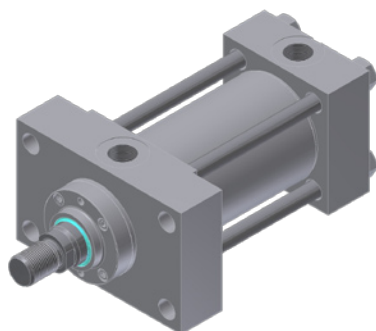
Mounting type: 08
Description: Rod end bearing
ISO-des.: MP 5



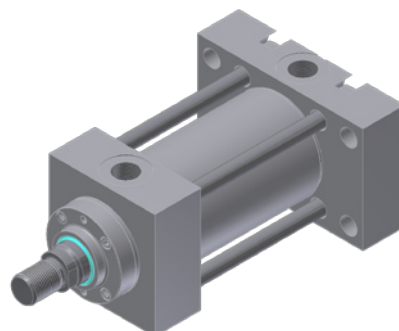
Mounting type: 11
Description: Tie rods elongated head end
ISO-des.: MX 3



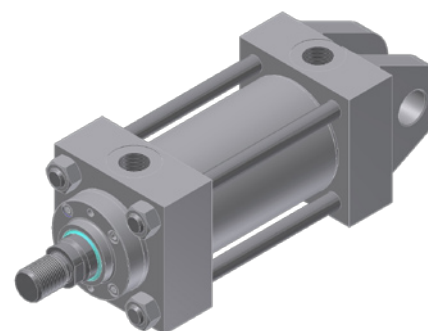
Mounting type: 12
Description: Tie rods elongated cap end
ISO-des.: MX 2



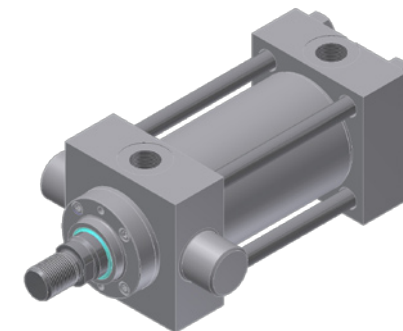
Mounting type: 13
Description: Rectangular flange head end
ISO-des.: ME 5



Mounting type: 14
Description: Rectangular flange cap end
ISO-des.: ME 6

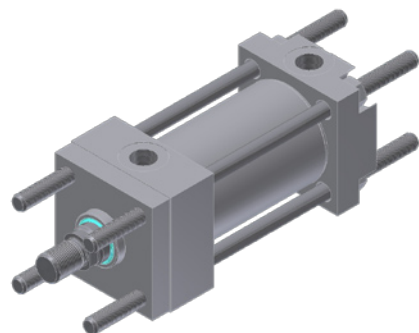


Mounting type: 15
Description: Clevis mounting
ISO-des.: MP 1



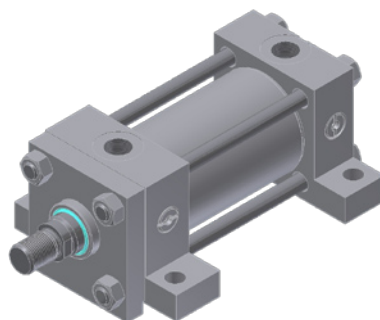
Mounting type: 16
Description: Trunnion on the head
ISO-des.: MT 1

Mounting types



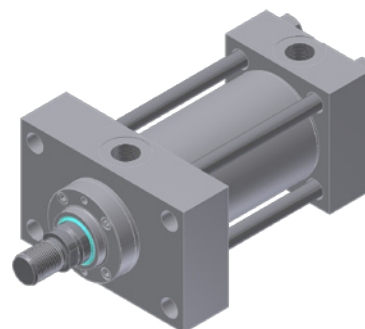
Mounting type: 19

Description: Tie rods elongated both ends
ISO-des.: MX 1



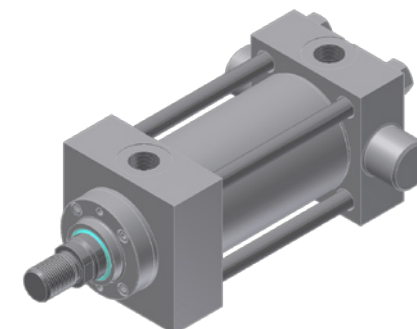
Mounting type: 22

Description: Foot mounting with fit-in key
ISO-des.: MS 2



Mounting type: 23

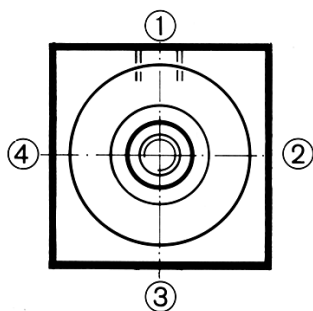
Description: Rectangular flange head end
ISO-des.: --



Mounting type: 26

Description: Trunnion on the bottom
ISO-des.: MF 4

Position of connections



Piston rod view

Connections: Standard position of connections is side 1 for all mounting types.
Connections in different positions are available on request.

Cushioning: Standard position of the adjustment screw for cushioning is side 3, except for:

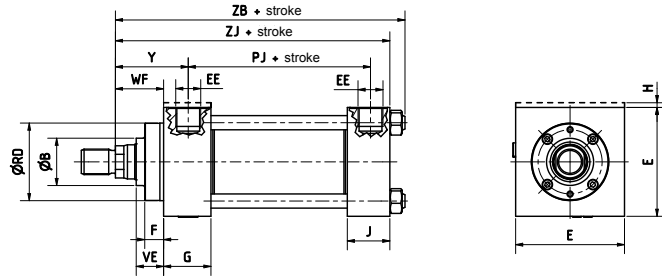
- Mounting type 02, ISO MS 02: side 2
- Mounting type 22, ISO MS 02: side 2

Different positions are available on request.

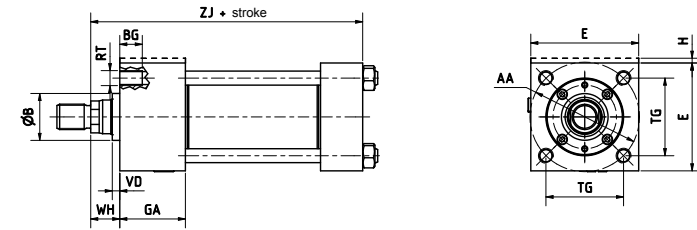
Air bleed: Standard position of the air bleed screw is side 4 for all mounting types.
Air bleed screws in different positions are available on request.

If the connections are ordered on a position deviating from side 1, then the position of the adjustment screw for cushioning and the position of the air bleed screw change accordingly.
If you wish differing positions, please specify when ordering.

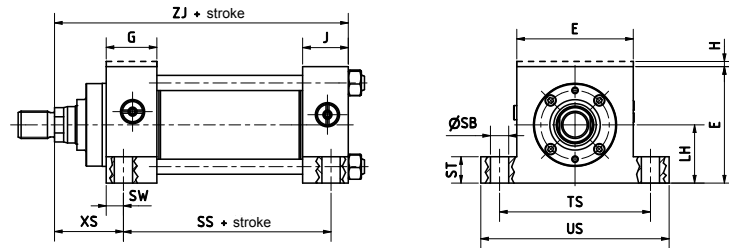
Mounting types



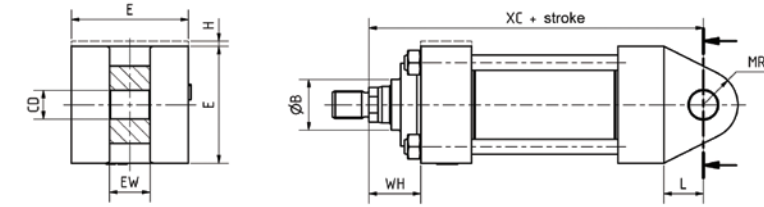
Mounting type 00: Basic form; ISO-des.: --



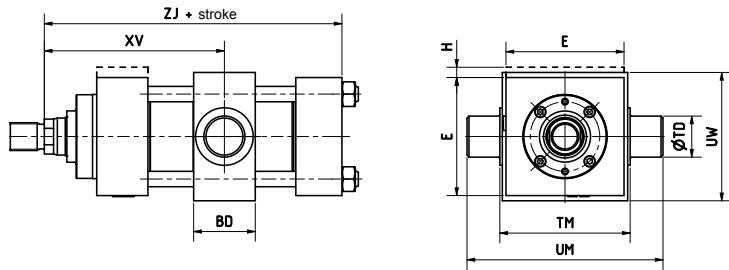
Mounting type 01: Threaded holes head end; ISO-des.: MX 5



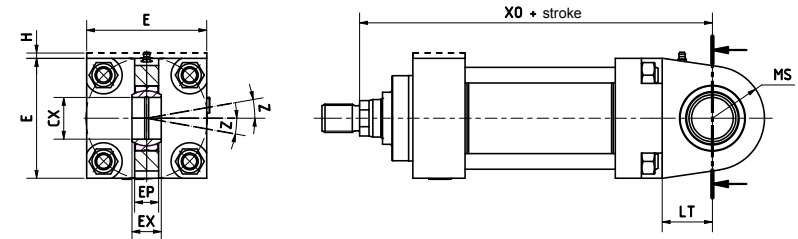
Mounting type 02: Foot mounting; ISO-des.: MS 2



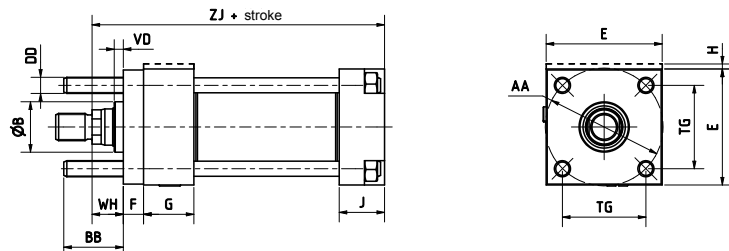
Mounting type 05: Rod eye; ISO-des.: MP 3



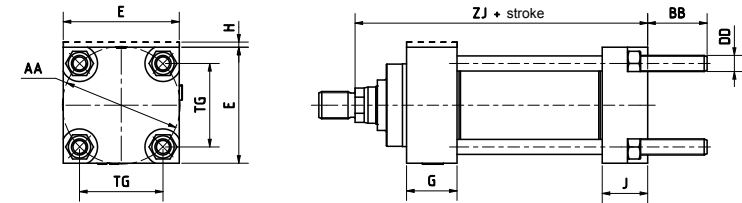
Mounting type 06: Trunnion; ISO-des.: MT 4



Mounting type 08: Rod end bearing; ISO-des.: MP 5

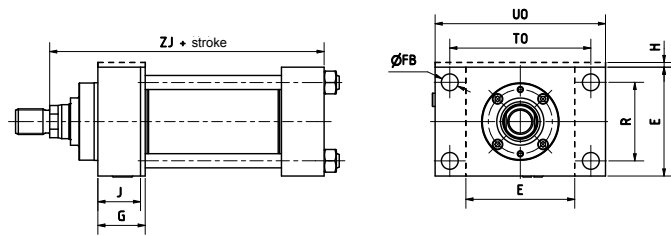


Mounting type 11: Tie rods elongated head end; ISO-des.: MX 3

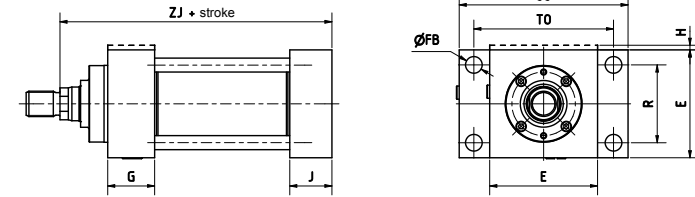


Mounting type 12: Tie rods elongated cap end; ISO-des.: MX 2

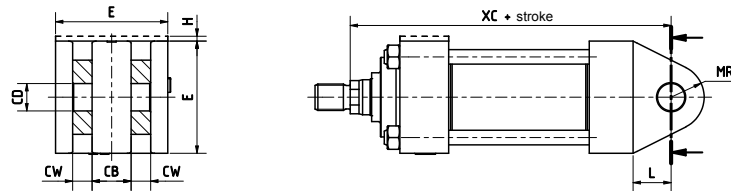
Mounting types



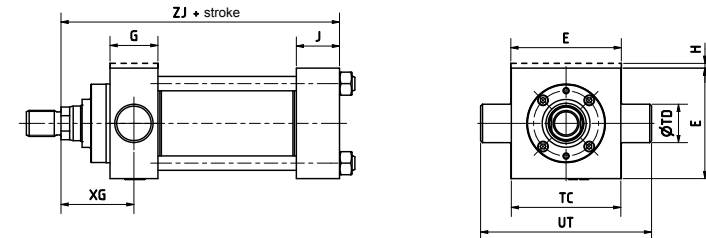
Mounting type 13: Rectangular flange head end; ISO-des.: ME 5



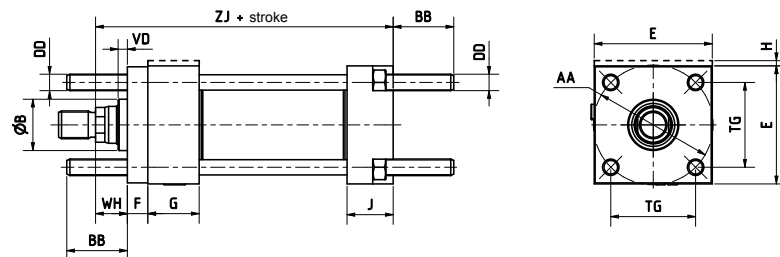
Mounting type 14: Rectangular flange cap end; ISO-des.: ME 6



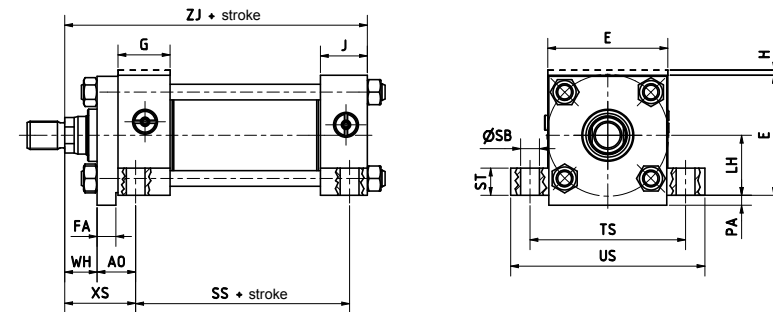
Mounting type 15: Clevis mounting; ISO-des.: MP 1



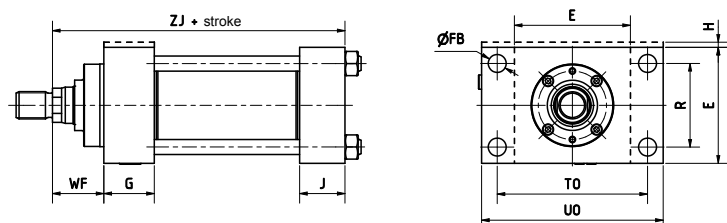
Mounting type 16: Trunnion on the head; ISO-des.: MT 1



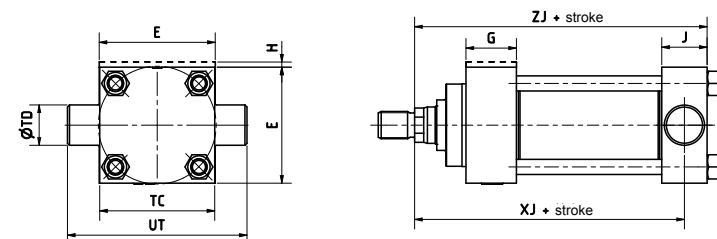
Mounting type 19: Tie rods elongated both ends; ISO-des.: MX 1



Mounting type 22: Foot mounting with fit-in key; ISO-des.: MS 2



Mounting type 23: Rectangular flange head end; ISO-des.: --



Mounting type 26: Trunnion on the bottom; ISO-des.: MF 4

Datasheet Type 51 · Single rod cylinder according to ISO 6020/2, DIN 24554



Piston rod dimensions

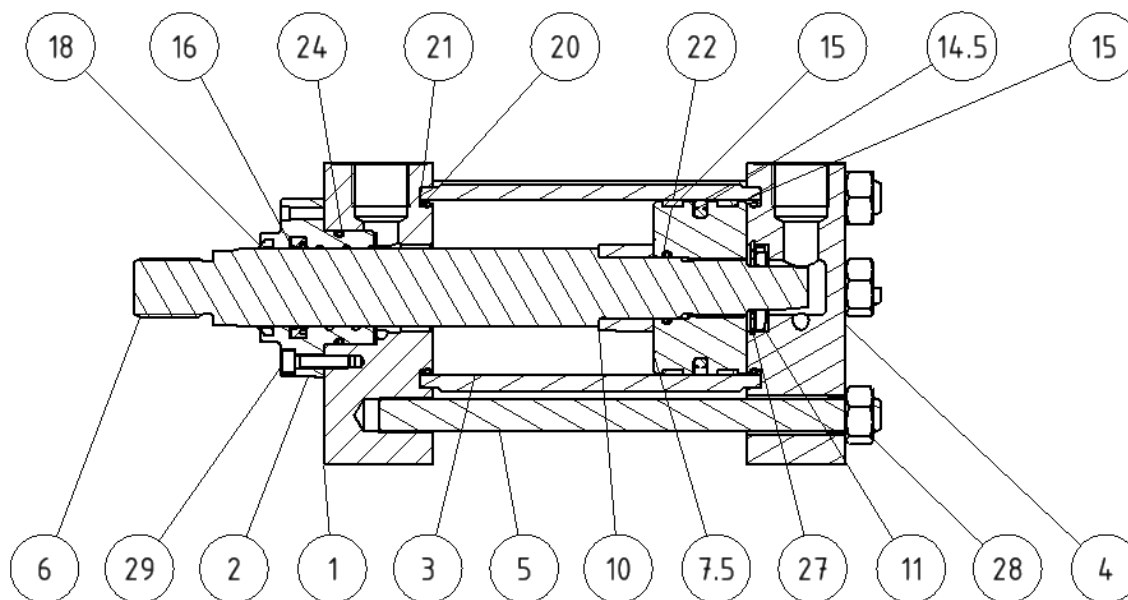
| Piston Ø | Rod end | Tol. | 25 | | 32 | | 40 | | 50 | | | 63 | | | 80 | | | 100 | | | 125 | | | 140 | | | 160 | | | 180 | | | 200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---------|------|-----------|----------|-----------|---------|-----------|---------|-----------|---------|-------|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|------------|-------|-------|------------|-------|--------|-------|-------|--------|-------|-------|--------|----|----|--|----|--|----|--|----|--|----|--|----|--|----|--|----|--|----|--|-----|--|----|--|----|--|-----|--|
| | | | 12 | 18 | 14 | 22 | 18 | 28 | 22 | 28 | 36 | 28 | 36 | 45 | 36 | 45 | 56 | 45 | 56 | 70 | 56 | 70 | 90 | 63 | 80 | 100 | 70 | 90 | 110 | 80 | 100 | 125 | 90 | 110 | 140 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 0 | h15 | 14 | | 16 | | 18 | | 22 | | | 28 | | | 36 | | | 45 | | | 56 | | | 63 | | | 63 | | | 63 | | | 85 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 4 | | 18 | | 22 | | 28 | | 36 | | | 45 | | | 56 | | | 63 | | | 85 | | | 95 | | | 95 | | | 95 | | | 112 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 1 | | 14 | 18 | 16 | 22 | 18 | 28 | 22 | 28 | 36 | 28 | 36 | 45 | 36 | 45 | 56 | 45 | 56 | 63 | 56 | 63 | 85 | 63 | 85 | 95 | 63 | 85 | 95 | 63 | 85 | 95 | 85 | 95 | 112 | 85 | 95 | 112 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AE | 3 | +0.1 | 7.5 | | 9 | | 11 | | 17.5 | | | 20 | | | 25 | | | 27.5 | | | 40 | | | 40 | | | 40 | | | 50 | | | 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AS | 3 | -0.1 | 7.5 | | 9 | | 11 | | 17.5 | | | 20 | | | 25 | | | 27.5 | | | 40 | | | 40 | | | 40 | | | 50 | | | 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | 8 | | 40 | | 45 | | 55 | | 65 | | | 80 | | | 100 | | | 125 | | | 160 | | | 205 | | | 205 | | | 240 | | | 240 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CH | 8 | js13 | 42 | | 48 | | 58 | | 68 | | | 85 | | | 105 | | | 130 | | | 150 | | | 185 | | | 185 | | | 240 | | | 240 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CK | 5, 9 | | 12 -0.008 | | 16 -0.008 | | 20 -0.012 | | 25 -0.012 | | | 30 -0.012 | | | 40 -0.012 | | | 50 -0.012 | | | 60 -0.015 | | | 80 -0.015 | | | 80 -0.015 | | | 100 -0.020 | | | 100 -0.020 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CN | 8 | | 12 -0.008 | | 16 -0.008 | | 20 -0.012 | | 25 -0.012 | | | 30 -0.012 | | | 40 -0.012 | | | 50 -0.012 | | | 60 -0.015 | | | 80 -0.015 | | | 80 -0.015 | | | 100 -0.020 | | | 100 -0.020 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SF | 0 | | 10 | | 15 | | 12 | | 17 | | 15 | | 24 | | 19 | | 24 | | 30 | | 24 | | 30 | | 36 | | 30 | | 36 | | 46 | | 36 | | 46 | | 60 | | 46 | | 60 | | 75 | | 50 | | 70 | | 85 | | 60 | | 75 | | 95 | | 70 | | 85 | | 100 | | 75 | | 95 | | 120 | |
| EN | 8 | | 10 -0.12 | | 14 -0.12 | | 16 -0.12 | | 20 -0.12 | | | 22 -0.12 | | | 28 -0.12 | | | 35 -0.12 | | | 44 -0.15 | | | 55 -0.15 | | | 55 -0.15 | | | 70 -0.20 | | | 70 -0.20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EU | 8 | h13 | 8 | | 11 | | 13 | | 17 | | | 19 | | | 23 | | | 30 | | | 38 | | | 47 | | | 47 | | | 57 | | | 57 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KF | 1 | | M8x1 | M12x1.25 | M10x1.25 | M16x1.5 | M12x1.25 | M20x1.5 | M16x1.5 | M20x1.5 | M27x2 | M20x1.5 | M27x2 | M33x2 | M27x2 | M33x2 | M42x2 | M33x2 | M42x2 | M48x2 | M42x2 | M48x2 | M64x3 | M48x2 | M64x3 | M80x3 | M48x2 | M64x3 | M80x3 | M48x2 | M64x3 | M80x3 | M64x3 | M80x3 | M100x3 | M64x3 | M80x3 | M100x3 | M64x3 | M80x3 | M100x3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KK | 0 | | M10x1.25 | | M12x1.25 | | M14x1.5 | | M16x1.5 | | | M20x1.5 | | | M27x2 | | | M33x2 | | | M42x2 | | | M48x2 | | | M64x3 | | | M80x3 | | | M100x3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KK | 4 | | M14x1.5 | | M16x1.5 | | M20x1.5 | | M27x2 | | | M33x2 | | | M42x2 | | | M48x2 | | | M64x3 | | | M80x3 | | | M100x3 | | | M100x3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LF | 8 | min | 16 | | 20 | | 25 | | 30 | | | 35 | | | 45 | | | 58 | | | 68 | | | 92 | | | 92 | | | 116 | | | 116 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MA | 3 | | 11.2 | 17 | 13 | 20 | 17 | 26 | 21 | 26 | 34 | 26 | 34 | 42 | 34 | 42 | 53 | 42 | 53 | 67 | 53 | 67 | 87 | 60 | 77 | 97 | 67 | 87 | 107 | 77 | 97 | 122 | 87 | 107 | 137 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB | 3 | -0.1 | 7.8 | 11.8 | 8.8 | 15.8 | 11.8 | 19.8 | 15.8 | 19.8 | 23.8 | 19.8 | 23.8 | 31.8 | 23.8 | 31.8 | 40.8 | 31.8 | 40.8 | 45.8 | 40.8 | 45.8 | 59.8 | 44.8 | 55.8 | 69.8 | 45.8 | 59.8 | 79.8 | 55.8 | 69.8 | 89.8 | 59.8 | 79.8 | 99.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| N | 8 | max | 17 | | 21 | | 25 | | 30 | | | 36 | | | 45 | | | 55 | | | 68 | | | 90 | | | 90 | | | 110 | | | 110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RK | 3 | | 0.4 | | 0.6 | | 0.6 | | 1 | | | 1.6 | | | 1.6 | | | 2 | | | 2.5 | | | 3 | | | 3 | | | 3.5 | | | 3.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W | 3 | | 15 | | 15 | | 15 | | 15 | | | 15 | | | 30 | | | 30 | | | 30 | | | 30 | | | 30 | | | 30 | | | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WL | 3 | | 5 | 6 | 6 | 8 | 6 | 9 | 8 | 9 | 9 | 9 | 9 | 12 | 9 | 12 | 16 | 12 | 16 | 17 | 16 | 17 | 17 | 17 | 17 | 18 | 17 | 17 | 18 | 17 | 17 | 18 | 17 | 18 | 17 | 18 | 17 | 18 | 17 | 18 | 17 | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | |

Rod end = piston rod ends which correspond to dimensions

Cylinder dimensions

| Piston Ø | Mt. | Tol. | 25 | | 32 | | 40 | | 50 | | | 63 | | | 80 | | | 100 | | | 125 | | | 140 | | | 160 | | | 180 | | | 200 | | | | | | | | | | | | | | |
|------------------------------------------------|----------|--------|-----------|-----|-----------|-----|-----------|-----|-----------|------|-----|-----------|----|------|-----------|------|------|-----------|------|------|-----------|------|------|-----------|-------|------|-----------|-------|-----|------------|-------|-------|------------|-------|-----|-----|--|--|-----|--|--|-----|--|--|-----|--|--|
| | | | 12 | 18 | 14 | 22 | 18 | 28 | 22 | 28 | 36 | 28 | 36 | 45 | 36 | 45 | 56 | 45 | 56 | 70 | 56 | 70 | 90 | 63 | 80 | 100 | 70 | 90 | 110 | 80 | 100 | 125 | 90 | 110 | 140 | | | | | | | | | | | | |
| Piston rod Ø MM | | | 12 | | 14 | | 18 | | 22 | | | 28 | | | 36 | | | 45 | | | 56 | | | 63 | | | 70 | | | 80 | | | 90 | | | 100 | | | 110 | | | 125 | | | 140 | | |
| Piston area A ₁ (cm ²) | | | 4.9 | | 8 | | 12.6 | | 19.6 | | | 31.2 | | | 50.3 | | | 78.5 | | | 122.7 | | | 153.9 | | | 201.1 | | | 254.5 | | | 314.2 | | | | | | | | | | | | | | |
| Annulus area A ₂ (cm ²) | | | 3.8 | 2.4 | 6.5 | 4.2 | 10 | 6.4 | 15.8 | 13.5 | 9.4 | 25 | 21 | 15.3 | 40.1 | 34.4 | 25.6 | 62.6 | 53.9 | 40.1 | 98.1 | 84.2 | 59.1 | 122.7 | 103.7 | 75.4 | 162.6 | 137.4 | 106 | 204.2 | 175.9 | 131.8 | 250.5 | 219.1 | 160 | | | | | | | | | | | | |
| AA | 11,12,19 | | 40 | | 47 | | 59 | | 74 | | | 91 | | | 117 | | | 137 | | | 178 | | | 200 | | | 219 | | | 246 | | | 269 | | | | | | | | | | | | | | |
| AO | 22 | | 10 | | 10 | | 10 | | 16 | | | 16 | | | 20 | | | 22 | | | 22 | | | 25 | | | 25 | | | 25 | | | 25 | | | | | | | | | | | | | | |
| Ø B | 00 | | 24 | 30 | 26 | 34 | 30 | 42 | 34 | 42 | 50 | 42 | 50 | 60 | 50 | 60 | 72 | 60 | 72 | 88 | 72 | 88 | 108 | 80 | 108 | 122 | 88 | 108 | 133 | 98 | 133 | 154 | 108 | 133 | 163 | | | | | | | | | | | | |
| BB | 11,12,19 | | 19 | | 24 | | 35 | | 46 | | | 46 | | | 59 | | | 59 | | | 81 | | | 92 | | | 92 | | | 115 | | | 115 | | | | | | | | | | | | | | |
| BD | 06 | | 20 | | 25 | | 30 | | 40 | | | 40 | | | 60 | | | 70 | | | 90 | | | 100 | | | 110 | | | 120 | | | 130 | | | | | | | | | | | | | | |
| BG | 01 | | 8 | | 9 | | 12 | | 18 | | | 18 | | | 24 | | | 24 | | | 27 | | | 32 | | | 32 | | | 40 | | | 40 | | | | | | | | | | | | | | |
| CB | 15 | A16 | 12 | | 16 | | 20 | | 30 | | | 30 | | | 40 | | | 50 | | | 60 | | | 70 | | | 70 | | | 80 | | | 80 | | | | | | | | | | | | | | |
| CD | 05,15 | H9 | 10 | | 12 | | 14 | | 20 | | | 20 | | | 28 | | | 36 | | | 45 | | | 56 | | | 56 | | | 70 | | | 70 | | | | | | | | | | | | | | |
| CW | 15 | | 6 | | 8 | | 10 | | 15 | | | 15 | | | 20 | | | 25 | | | 30 | | | 35 | | | 35 | | | 40 | | | 40 | | | | | | | | | | | | | | |
| CX | 08 | | 12 -0.008 | | 16 -0.008 | | 20 -0.012 | | 25 -0.012 | | | 30 -0.012 | | | 40 -0.012 | | | 50 -0.012 | | | 60 -0.015 | | | 80 -0.015 | | | 80 -0.015 | | | 100 -0.020 | | | 100 -0.020 | | | | | | | | | | | | | | |
| DD | 11,12,19 | | M5x0.8 | | M6x1 | | M8x1 | | M12x1.25 | | | M12x1.25 | | | M16x1.5 | | | M16x1.5 | | | M22x1.5 | | | M27x2 | | | M27x2 | | | M30x2 | | | M30x2 | | | | | | | | | | | | | | |
| E | 00 | ±1.5 | 40 | | 45 | | 63 | | 75 | | | 90 | | | 115 | | | 130 | | | 165 | | | 190 | | | 205 | | | 230 | | | 245 | | | | | | | | | | | | | | |
| EE (Whitworth pipe thread) | 00 | | G 1/4" | | G 1/4" | | G 3/8" | | G 1/2" | | | G 1/2" | | | G 3/4" | | | G 3/4" | | | G 1" | | | G 1" | | | G 1" | | | G 1 1/4" | | | G 1 1/4" | | | | | | | | | | | | | | |
| EP | 08 | h15 | 8 | | 11 | | 13 | | 17 | | | 19 | | | 23 | | | 30 | | | 38 | | | 47 | | | 47 | | | 57 | | | 57 | | | | | | | | | | | | | | |
| EW | 05 | h14 | 12 | | 16 | | 20 | | 30 | | | 30 | | | 40 | | | 50 | | | 60 | | | 70 | | | 70 | | | 80 | | | 80 | | | | | | | | | | | | | | |
| EX | 08 | | 10 -0.12 | | 14 -0.12 | | 16 -0.12 | | 20 -0.12 | | | 22 -0.12 | | | 28 -0.12 | | | 35 -0.12 | | | 44 -0.15 | | | 55 -0.15 | | | 55 -0.15 | | | 70 -0.2 | | | 70 -0.2 | | | | | | | | | | | | | | |
| F | 00 | | 10 | | 10 | | 10 | | 16 | | | 16 | | | 20 | | | 22 | | | 22 | | | 25 | | | 25 | | | 25 | | | 25 | | | | | | | | | | | | | | |
| FA | 22 | -0.075 | 8 | | 8 | | 8 | | 14 | | | 14 | | | 18 | | | 22 | | | 22 | | | 25 | | | 25 | | | 25 | | | 25 | | | | | | | | | | | | | | |
| Ø FB | 13,14 | H13 | 5.5 | | 6.6 | | 11 | | 14 | | | 14 | | | 18 | | | 18 | | | 22 | | | 26 | | | 26 | | | 33 | | | 33 | | | | | | | | | | | | | | |
| G | 00 | | 48 | | 48 | | 53 | | 45 | | | 45 | | | 50 | | | 50 | | | 58 | | | 58 | | | 58 | | | 76 | | | 76 | | | | | | | | | | | | | | |
| GA | 01 | | 58 | | 58 | | 53 | | 61 | | | 61 | | | 70 | | | 72 | | | 80 | | | 83 | | | 83 | | | 101 | | | 101 | | | | | | | | | | | | | | |
| H | 00 | | 5 | | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Mt. = mounting types which correspond to dimensions



| Spare parts | | | | | | | | |
|-----------------------------------------------------------------|-------|-------------------|---------------------------------------------------|-------|--------------|--------------------------------|-------|-------------------|
| Piston rod and piston complete with seals consisting of: | | | Bushing complete with seals consisting of: | | | Seal kit consisting of: | | |
| Pos. | Units | Description | Pos. | Units | Description | Pos. | Units | Description |
| 6 | 1 | Piston rod | 2 | 1 | Bushing | 14.5 | * | Piston seal |
| 7.5 | 1 | Piston | 16 | * | Rod seal | 15 | * | Piston guide ring |
| 14.5 | * | Piston seal | 18 | 1 | Scraper ring | 16 | * | Rod seal |
| 15 | * | Piston guide ring | 24 | 1 | O-ring | 18 | 1 | Scraper ring |
| 22 | 1 | O-ring | | | | 20 | 1 | O-ring |
| | | | | | | 21 | 1 | Thrust ring |
| | | | | | | 22 | 1 | O-ring |
| | | | | | | 24 | 1 | O-ring |

| Other components (also available on request) | | | | | | | | |
|----------------------------------------------|-------|----------------|------|-------|---------------|------|-------|----------------|
| Pos. | Units | Description | Pos. | Units | Description | Pos. | Units | Description |
| 1 | 1 | Cylinder head | 5 | 1 | Tie rod | 27 | * | Locking ring |
| 3 | 1 | Cylinder tube | 10 | * | Damper piston | 28 | 4 | Nut |
| 4 | 1 | Cylinder cover | 11 | * | Damping ring | 29 | * | Mounting screw |

*Number of units depends on design

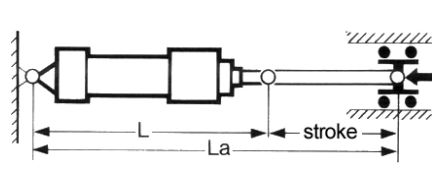
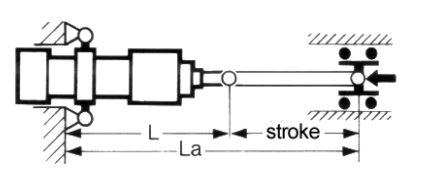
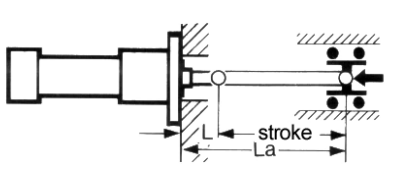
Calculation of buckling strength

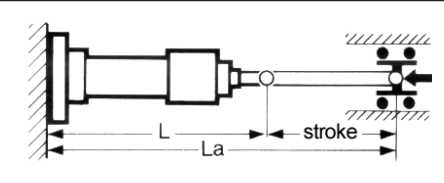
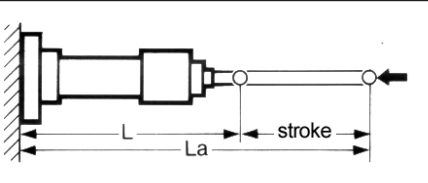
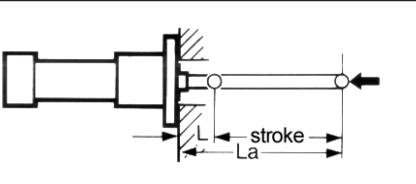
Proceeding:

1. Determine the necessary length L_a of the piston rod (including stroke).
2. Define the effective buckling length S_{kv} with the help of the table.
3. Identify the allowable buckling length $S_{k,zul.}$ using the diagram.
4. The effective buckling length must be less than or equal to the allowable buckling length.

$$S_{kv} \leq S_{k,zul.}$$

Effective buckling length S_{kv}

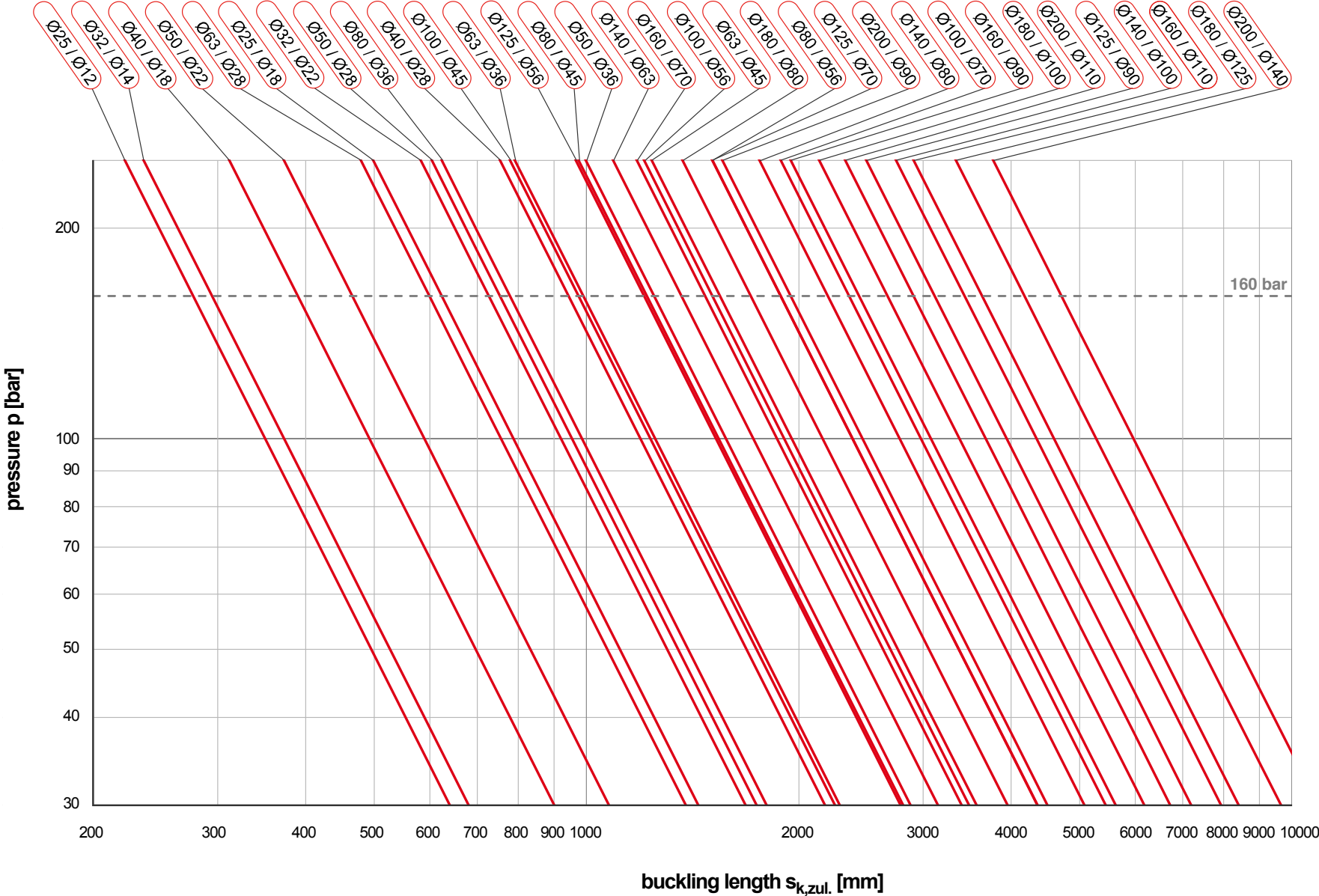
| | | | |
|---------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Type of fixing |  |  |  |
| Mounting type | 05, 08, 15 | 06, 16, 26 | 01, 02, 11, 13, 19*, 22, 23 |
| Effective buckling length | $S_{kv}=L_a$ | $S_{kv}=L_a$ | $S_{kv}=0.7 L_a$ |

| | | | |
|---------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Type of fixing |  |  |  |
| Mounting type | 12, 14, 19* | 12, 14, 19* | 01, 02, 11, 13, 19*, 22, 23 |
| Effective buckling length | $S_{kv}=0.7 L_a$ | $S_{kv}=2 L_a$ | $S_{kv}=2 L_a$ |

*depends on the mounting of the cylinder

Buckling

Allowable buckling length $s_{k,zul.}$



(safety factor $S = 3.5$)

Datasheet Type 51 · Single rod cylinder according to ISO 6020/2, DIN 24554



Ordering Code Standard Cylinders / Standard Cylinders DIN/ISO

Classification / order number

| | | | | | | | | | | | | | | | | | | | | | | | |
|---------|-----|------|------|-----|-----|-----|-------|-----|-----|------|------|----|-------|------|------|-------|-----|------|---|-----|------|-----|---|
| TYP | KST | KSTH | KSTV | BEA | BAA | DAE | -DKO- | MM | HUB | KDI | KSDI | EE | -EEV- | EEH- | DAEV | DAEH- | ELV | ELH- | S | SZA | -SVO | SHI | |
| Example | 51 | 0 | 0 | 8 | 02 | 2 | 1 | 050 | 022 | 0350 | 5 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | N | 0 | 3 | 3 |

| Abbr. | Characteristics | Types of cylinders | | | | | | | | | |
|-------|------------------|--------------------|----|----|----|----|----|----|----|----|--|
| TYP | Type of cylinder | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 | |

| KST | Piston rod | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-----|-------------------------------------|----|----|----|----|----|----|----|----|----|
| 0 | single | X | X | X | X | X | X | X | X | X |
| 1 | on both sides (double rod cylinder) | X | | | | | X | | X | |
| 2 | on both sides, small rear rod | | | | | | X | | X | |
| 3 | on both sides, large rear rod | | | | | | X | | X | |
| 4 | on both sides, medium rear rod | | | | | | X | | X | |

| KSTH | Piston rod end, rear | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|------|--------------------------------------|----|----|----|----|----|----|----|----|----|
| 0 | external thread | X | X | X | X | X | X | | X | |
| 1 | internal thread | X | | | | | X | | X | |
| 2 | cylindrical | X | | | | | | | | |
| 4 | external thread ISO 4395 | | | | | | X | | X | |
| 5 | plain rod eye | X | | | | | | | | |
| 8 | swivel head (Type 51, 55: DIN 24555) | X | | | | | X | | X | |

| KSTV | Piston rod end, front | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|------|--------------------------------------|----|----|----|----|----|----|----|----|----|
| 0 | external thread | X | X | X | X | X | X | X | X | X |
| 1 | internal thread | X | X | X | X | X | X | X | X | X |
| 2 | cylindrical | X | X | X | X | X | X | X | X | X |
| 3 | coupling | X | X | X | X | X | X | X | X | X |
| 4 | external thread ISO 4395 | X | X | X | X | X | X | X | X | X |
| 5 | plain rod eye | X | X | X | X | X | X | X | X | X |
| 8 | swivel head (Type 51, 55: DIN 24555) | X | X | X | X | X | X | X | X | X |
| 9 | clevis | X | X | X | X | X | X | X | X | X |

| BEA | Mounting type | ISO-des. | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-----|----------------------------------------------|----------|----|----|----|----|----|----|----|----|----|
| 00 | basic form | | X | | X | X | X | X | X | X | |
| 01 | threaded flange head end | | X | | | | | | | | |
| | threaded holes head end | MX5 | | | | | | X | X | X | |
| 02 | foot mounting | MS2 | X | X | X | X | X | X | X | X | X |
| 03 | flange head end | MF3 | X | X | X | X | X | | | | |
| 04 | flange cap end | MF4 | X | X | X | X | X | | | | |
| 05 | rod eye | MP3 | X | X | X | X | X | X | X | X | |
| 06 | trunnion | MT4 | X | | X | X | X | X | X | X | |
| 08 | rod end bearing | MP5 | X | | X | X | X | X | X | X | |
| 11 | threaded holes head end | MX5 | | | | | | | | | X |
| | tie rods elongated head end | MX3 | | | | | | X | X | X | |
| 12 | threaded holes cap end | | | | | | | | | | X |
| | tie rods elongated cap end | MX2 | | | | | | X | X | X | |
| 13 | rectangular flange head end ^{1),3)} | MF1/ME5 | | | X | X | X | X | X | X | X |
| 14 | rectangular flange cap end ^{2),3)} | MF2/ME6 | | | X | X | X | X | X | X | X |
| 15 | clevis mounting | MP1 | | | | | | X | X | X | |
| 16 | trunnion on the head | MT1 | | | | | | X | X | X | |
| 19 | tie rods elongated both ends | MX1 | | | | | | X | X | X | |
| 22 | foot mounting with fit-in key | MS2 | | | | | | X | X | X | X |
| 23 | rectangular flange head end (wide) | | | | | | | X | X | X | |
| 26 | trunnion on the bottom | MT2 | | | | | | X | X | X | |
| 33 | flange on cylinder | | X | | X | X | X | | | | |
| 43 | longitudinal bores, sinks on both sides | | | | | | | | | | X |

| BAA | Type of construction | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-----|--------------------------------------------------|----|----|----|----|----|----|----|----|----|
| 2 | double-acting | X | X | X | X | X | X | X | X | X |
| 3+4 | single-acting (3=pushing; 4=pulling) | X | X | X | X | X | X | X | X | X |
| 5+6 | single-acting with spring (5=pushing; 6=pulling) | X | | X | X | X | X | X | X | X |

| Abbr. | Characteristics | Types of cylinders | | | | | | | | | |
|-------|--------------------------|--------------------|----|----|----|----|----|----|----|----|--|
| DAE | Cushioning | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 | |
| 0 | without cushioning | X | X | X | X | X | X | X | X | X | |
| 1 | cushioning in the front | X | X | X | X | X | X | X | X | | |
| 2 | cushioning in the head | X | X | X | X | X | X | X | X | | |
| 3 | cushioning on both sides | X | X | X | X | X | X | X | X | | |

| DKO | Piston diameter | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-----|---------------------|----|----|----|----|----|----|----|----|----|
| | see measuring index | | | | | | | | | |

| MM | Piston rod diameter | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|----|---------------------|----|----|----|----|----|----|----|----|----|
| | see measuring index | | | | | | | | | |

| HUB | Stroke | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-----|-------------------|----|----|----|----|----|----|----|----|----|
| | consider buckling | | | | | | | | | |

| KDI | Piston seal | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-----|---------------------------------|------------------|----|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 0 | NBR lip seals / PUR lip seals | X _s | X | X | X | X | X | X | X | X |
| 2 | PUR lip seal / Viton® | X | X | | | | | | | |
| 3 | piston ring / casting | X _s | | | | | | | | |
| 5* | sleeve ring/o-ring; tefl./NBR | X _(S) | X | X _s | X _s | X _s | X _s | X | X _s | X _s |
| 6 | sleeve ring/o-ring;tefl./Viton® | X | X | X | X | X | X | X | X | X |
| 7 | compact seal / NBR | X | | X | X | X | X | X _s | X | |

| KSDI | Piston rod seal | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|------|-------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 0 | NBR lip seals / PUR lip seals | X _s | | X | X _s | X _s | X _s | X _s | X _s | X _s |
| 1 | PUR lip seal, u-seal | | | | X | X | X | X | X | X _s |
| 2 | lip seal / Viton® | X | | | X | X | X | X | X | X |
| 3 | chevron ring NBR | | X _s | X _s | | | | | | |
| 4 | chevron ring Viton® | | X | X | | | | | | |
| 5 | stepseal/o-ring; tefl./NBR | | | | X | X | X | X | X | |
| 6 | stepseal/o-ring;tefl./Viton® | | | | X | X | X | X | X | |
| 9 | PUR lip seal, u-seal+scraper Viton® | | | | X | X | X | X | X | X |

| EE | Hydraulic connections | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|----|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 0 | pipe thread (DIN/ISO 228) | X _s | X _s | X _s | X _s | X _s | X _s | X _s | X _s | X _s |
| 1 | metrical ISO thread | X | | X | X | X | X | X | X | |
| 2 | UNF thread | X | | X | X | X | X | X | X | |
| 3 | flange connection | | | X | X | X | X | X | X | |

| EEV | Hydr. connection, front position | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-------|----------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----|
| 1 | 0 degrees (at top) | X _s | X _s | X _s | X _s | X _s | X _s | X _s | X _s | X |
| 2 | 45 / 60 degrees (clockwise) | | | X | X | X | | | | |
| 2 / 3 | 90 degrees (clockwise) | | | 3 | 3 | 3 | 2 | 2 | 2 | X |
| 4 | 135 degrees (clockwise) | | | X | X | X | | | | |
| 3 / 5 | 180 degrees (clockwise) | | | 5 | 5 | 5 | 3 | 3 | 3 | |
| 6 | 225 degrees (clockwise) | | | X | X | X | | | | |
| 4 / 7 | 270 degrees (clockwise) | | | 7 | 7 | 7 | 4 | 4 | 4 | |
| 8 | 315 degrees (clockwise) | | | X | X | X | | | | |

¹⁾ MF 1 for 44, 46, 47, 48; ME 5 for 51, 53, 55

²⁾ MF 2 for 44, 46, 47, 48; ME 6 for 51, 53, 55

³⁾ mounting type 13 (14) for type 57: longitudinal bores, sinks on rear (front)

* type 41: standard for piston diameter = 12, 15, 20

s = standard design

(S) = standard design, not for all forms of construction

RC = rear center

| Abbr. | Characteristics | Types of cylinders | | | | | | | | | |
|-------|---------------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----|--|
| EEH | Hydr. Connection, rear position | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 | |
| RC | 0 degrees (at top) | RC | X _s | X _s | X _s | X _s | X _s | X _s | X _s | X | |
| | 2 45 / 60 degrees (clockwise) | | X | X | X | | | | | | |
| 2 / 3 | 90 degrees (clockwise) | | 3 | 3 | 3 | 2 | 2 | 2 | 2 | X | |
| 4 | 135 degrees (clockwise) | | X | X | X | | | | | | |
| 3 / 5 | 180 degrees (clockwise) | | 5 | 5 | 5 | 3 | 3 | 3 | | | |
| 6 | 225 degrees (clockwise) | | X | X | X | | | | | | |
| 4 / 7 | 270 degrees (clockwise) | | 7 | 7 | 7 | 4 | 4 | 4 | | | |
| 8 | 315 degrees (clockwise) | | X | X | X | | | | | | |

| DAEV | Cushioning, front position | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-------|-----------------------------|----------------|----|----------------|----------------|----------------|----------------|----------------|----------------|----|
| 0 | without cushioning | X | | X | X | X | X | X | X | |
| 1 | 0 degrees (at top) | | X | X | X | X | X | X | X | |
| 2 | 45 / 60 degrees (clockwise) | X | | X | X | X | | | | |
| 2 / 3 | 90 degrees (clockwise) | X _s | | 3 _s | 3 _s | 3 _s | 2 _s | 2 _s | 2 _s | |
| 4 | 135 degrees (clockwise) | | X | X | X | | | | | |
| 3 / 5 | 180 degrees (clockwise) | X | | 5 | 5 | 5 | 3 | 3 _s | 3 | |
| 6 | 225 degrees (clockwise) | | X | X | X | | | | | |
| 4 / 7 | 270 degrees (clockwise) | X | | 7 | 7 | 7 | 4 | 4 | 4 | |
| 8 | 315 degrees (clockwise) | | X | X | X | | | | | |

| DAEH | Cushioning, rear position | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-------|-----------------------------------|----------------|----|----------------|----------------|----------------|------------------|------------------|------------------|----|
| 0 | without cushioning | X | | X | X | X | X | X | X | |
| 1 | 0 degrees (at top) | | X | X | X | X | X | X | X | |
| 2 | 45 / 60 degrees (clockwise) | X | | X | X | X | | | | |
| 2 / 3 | 90 degrees (CW: 51/55; Br. 02->S) | X _s | | 3 _s | 3 _s | 3 _s | 2 _(S) | 2 _(S) | 2 _(S) | |
| 4 | 135 degrees (clockwise) | | X | X | X | | | | | |
| 3 / 5 | 180 degrees (clockwise) | X | | 5 | 5 | 5 | 3 _s | 3 _s | 3 _s | |
| 6 | 225 degrees (clockwise) | | X | X | X | | | | | |
| 4 / 7 | 270 degrees (clockwise) | X | | 7 | 7 | 7 | 4 | 4 | 4 | |
| 8 | 315 degrees (clockwise) | | X | X | X | | | | | |

| ELV | Air bleed, front position | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-------|---------------------------|----|----|----|----|----|----|----|----|----|
| 0 | without air bleed | X | X | | | | | | | X |
| 1 - 8 | see cushioning position | X | X | X | X | X | X | X | X | X |

| ELH | Air bleed, rear position | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-------|--------------------------|----|----|----|----|----|----|----|----|----|
| 0 | without air bleed | X | X | | | | | | | X |
| 1 - 8 | see cushioning position | X | X | X | X | X | X | X | X | X |

| S | Position detection | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|---|-----------------------------|----|----|----|----|----|----|----|----|----|
| Z | attached proximity switches | | | | | | | | X | |
| N | built-in proximity switches | X | X | X | X | X | X | X | X | X |

| SZA | Number of switches | 41 | 44 | 46 | 47 | 48 | 51 | 53 | 55 | 57 |
|-------|--------------------|----|----|----|----|----|----|----|----|----|
| 1 - 9 | for S = Z | | | | | | | | X | |
| 1 - 2 | for S = | | | | | | | | | |