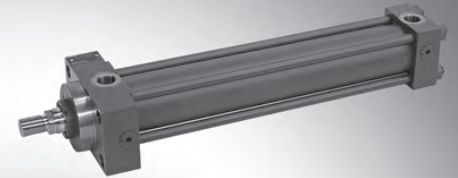


Section 3

Hydraulic cylinder Tie rod design

RE 17049/10.12
Replaces: 09.12

1/66

Series CDT3...Z; CGT3...Z; CST3...ZComponent series 2X
Nominal pressure 160 bar (16 MPa)

S1_d

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Project planning software **Interactive Catalog System****Online**www.boschrexroth.com/ics

Features

- Installation dimensions according to ISO 6020-2, DIN 24554 and NF/ISO 6020-2
- 13 types of mounting
- Piston Ø 25 to 200 mm
- Piston rod Ø 12 to 140 mm
- Stroke lengths up to 2700 mm
- Integrated guide socket for fast and easy maintenance
- Self-adjusting or adjustable end position cushioning as option
- Patented safety bleeding device for easy and safe bleeding
- Easy assembly thanks to freely selectable position of the line connections at head and base

Technical data (For applications outside these parameters, please consult us!)

Nominal pressure: 160 bar (16 MPa)

Maximum operating pressure
(only static load): 210 bar (21 MPa)

Static test pressure: 240 bar (24 MPa)

Cylinders of this series are designed for a nominal pressure of 160 bar and in version CD for a maximum operating pressure of 210 bar with static load.

(Static load: Less than 10,000 load cycles over the entire life cycle)

The admissible dynamic operating pressure amounts to 75 % of the maximum operating pressure with maximum amplitude and oscillatory load.

The specified operating pressures apply to applications with shock-free operation with regard to excess pressure and/or external loads. With extreme loads like e.g. high cycle sequence, mounting elements and threaded piston rod connections must be designed for durability.

Minimum pressure:

Depending on the application, a certain minimum pressure is required in order to guarantee good functioning of the cylinder. Without load, a minimum pressure of 20 bar is recommended for differential cylinders; for lower pressures as well as double-acting cylinders, please contact us.

Installation position: Any

Hydraulic fluid:

Mineral oils DIN 51524 HL, HLP

Oil-in-water emulsion HFA

Water glycol HFCP

Phosphate ester HFD-R

Hydraulic fluid temperature range: See page 59

Ambient temperature range: See page 59

Optimum viscosity range: 20 to 100 mm²/s

Minimum admissible viscosity: 2.8 mm²/s

Maximum admissible viscosity: 380 mm²/s

Cleanliness class according to ISO

Maximum admissible degree of contamination of the hydraulic fluid according to ISO 4406 (c) class 20/18/15.

The cleanliness classes specified for the components need to be met in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

For the selection of the filters see www.boschrexroth.com/filter

Bleeding: By default

Primer coat: By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010) of min. 40 µm. Other colors upon request.

With cylinders and attachment parts, the following surfaces are not primed or painted:

- All fit diameters to the customer side
- Sealing surfaces for line connection
- Sealing surfaces for flange connection
- Connection surface for valve mounting position measurement system

Accessories that are ordered as separate order item are not primed or painted by default. Corresponding priming and/or painting on request.

Technical data (For applications outside these parameters, please consult us!)

Boundary and application conditions:

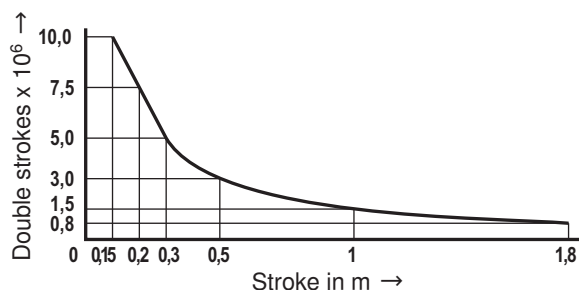
- The mechanical alignment of the movement axis and thus the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. It may be necessary to consider the own weight of the hydraulic cylinder (MP1, MP3, MP5, MT1, MT2 or MT4) or the piston rod.
- The kinking length/kinking load of the piston rod and/or the hydraulic cylinder must be observed (see page topic kinking).
- The maximum admissible stroke velocities with regard to the suitability/load of seals must be observed as must their compatibility with the properties of the fluid type (see page topic seals).
- The maximum admissible velocities/kinetic energies when moving into the end positions, also considering external loads, must be observed.
Danger: Excess pressure
- The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder. Possible pressure intensification resulting from the area ratio of annulus to piston area and possible throttling points are to be observed.
- Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.

Notice: This list does not claim to be complete. In case of questions regarding the compatibility with the medium or exceedance of the boundary or application conditions, please contact us.

Life cycle:

Rexroth cylinders correspond to the reliability recommendations for industrial applications.

≥ 10000000 double strokes in idle continuous operation or 3000 km piston travel at 70 % of the maximum operating pressure, without load on the piston rod, with a maximum velocity of 0.5 m/s, with a failure rate of less than 5 %.



Acceptance:

Each cylinder is tested according to Bosch Rexroth standard and in compliance with ISO 10100: 2001.

Safety instructions:

For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions data sheet 07100-B have to be observed!

Service and repair works have to be performed by Bosch Rexroth or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair works not performed by Bosch Rexroth.

Check lists for hydraulic cylinders:

Cylinders the characteristics and/or application parameters of which deviate from the values specified in the data sheet can only be offered as special version upon request. For offers, the deviations of the characteristics and/or application parameters must be described in the check lists for hydraulic cylinders (data sheet 07200).

Double-acting cylinders with continuous piston rod:

With this design type, the friction is considerably higher than with the "CD version" with simple piston rod.

Stroke tolerances:

According to ISO 6020-2, a stroke tolerance of 0/+2 mm is admissible for strokes up to 1250 mm; for larger strokes please contact us.

A tolerance of ±0.3 mm is possible as option, smaller tolerances are not reasonable for tie rod cylinders.

Minimum strokes:

For the "MT4" mounting, the minimum stroke is to be observed due to the trunnion width, see pages 16 and 36.

When using end position cushioning, the minimum stroke must also be observed. With stroke lengths smaller than the cushioning length, we recommend selecting the cylinder without end position cushioning.

Support width extension and tie rod support are possible upon request.

Line connections:

The cylinders of series CDT3/CGT3 are supplied with pipe thread or enlarged pipe thread according to ISO 1179-1 or metric ISO thread according to ISO 6149-1.

The cylinders of series CST3 are supplied with pipe thread according to ISO 1179-1 or with subplate.

Stroke velocity:

See information on stroke length and stroke velocity, higher stroke velocity on request.

If the extension velocity is considerably higher than the retraction velocity of the piston rod, drag-out losses of the medium may result. If necessary, please consult us.

Information on stroke length and stroke velocity

| Piston Ø (mm) | | 25 | 32 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 |
|--|------------------------------|------|----|----|------|----|------|-----|------|-----|-----|
| Min recommended stroke in mm | without cushioning | – | – | – | – | – | – | – | – | – | – |
| | with cushioning | 30 | 32 | 46 | 44 | 50 | 54 | 56 | 68 | 73 | 106 |
| Maximum velocity (m/s) | Seal design M; 160 bar | 0.50 | | | 0.40 | | 0.30 | | 0.25 | | |
| | Seal design M; 100 bar | 0.70 | | | 0.60 | | 0.40 | | 0.35 | | |
| | Seal design T, S; 160 bar | 1.00 | | | 0.80 | | 0.60 | | 0.50 | | |
| Recommended minimum velocity (mm/s) | Seal design M | 30 | | | | | | | | | |
| | Seal design T, S | 1 | | | | | | | | | |

Project planning software ICS (Interactive Catalog System)

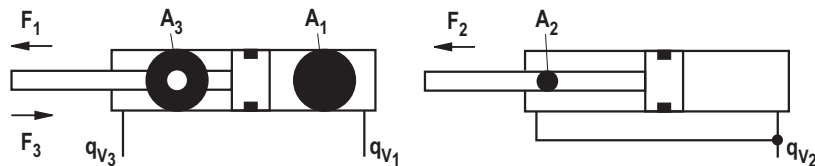
The ICS (Interactive Catalog System) is a selection and project planning help for hydraulic cylinders. The ICS allows designers for machines and systems to quickly and reliably find the perfect hydraulic cylinder solution through logic-guided type key enquiries. This software helps to solve design and project planning tasks more quickly and efficiently. After having been guided through the product selection, the user quick-

ly and reliably gets the exact technical data of the selected component as well as 2D and 3D CAD data in the correct file format for all common CAD systems.

This allows users to reduce costs while increasing their competitiveness.

Areas, forces, flow: Series CDT3 (for operating pressure up to 210 bar)

| Piston AL Ø mm | Piston rod | | Area ratio ϕ A_1/A_3 | Areas | | | Force ¹⁾ | | | | | | Flow at 0.1 m/s ²⁾ | | | Max. avail- able stroke length (mm) |
|-----------------------------|-------------------|---------------------|-----------------------------------|---|--|---|--|------------|-------------------------------------|------------|---------------------------------------|------------|---------------------------------------|---|--------------------------------------|---|
| | MM Ø mm | | | Piston A₁ cm ² | Rod A₂ cm ² | Ring A₃ cm ² | Pressure F₁ kN | | Diff. F₂ kN | | Pulling F₃ kN | | Off q_{v1} l/min | Diff. q_{v2} l/min | On q_{v3} l/min | |
| | 160 bar | 210 bar | | | | | 160 bar | 210 bar | 160 bar | 210 bar | 160 bar | 210 bar | | | | |
| 25 | 12 | - | 1.3 | 4.91 | 1.13 | 3.78 | 7.86 | - | 1.81 | - | 6.05 | - | 2.9 | 0.70 | 2.30 | 600 |
| | 18 | 18 | 2.07 | | 2.54 | 2.37 | | 10.31 | 4.06 | 5.33 | 3.79 | 4.98 | | 1.50 | 1.40 | |
| 32 | 14 | - | 1.25 | 8.04 | 1.54 | 6.5 | 12.86 | - | 2.46 | - | 10.40 | - | 4.8 | 0.90 | 3.90 | 800 |
| | 22 | 22 | 1.90 | | 3.80 | 4.24 | | 16.88 | 6.08 | 7.98 | 6.78 | 8.90 | | 2.30 | 2.50 | |
| 40 | 18 | - | 1.25 | 12.56 | 2.54 | 10.02 | 20.10 | - | 4.06 | - | 16.03 | - | 7.5 | 1.50 | 6.00 | 1000 |
| | 22 ³⁾ | 22 ³⁾ | 1.43 | | 3.80 | 8.76 | | 26.38 | 6.08 | 7.98 | 14.02 | 18.40 | | 2.30 | 5.30 | |
| | 28 | 28 | 1.96 | | 6.16 | 6.4 | | 9.86 | 12.94 | 10.24 | 13.44 | 3.70 | | 3.80 | | |
| 50 | 22 | - | 1.25 | 19.63 | 3.8 | 15.83 | 31.41 | - | 6.08 | - | 25.33 | - | 11.8 | 2.30 | 9.50 | 1200 |
| | 28 ³⁾ | 28 ³⁾ | 1.46 | | 6.16 | 13.47 | | 41.22 | 9.86 | 12.94 | 21.55 | 28.29 | | 3.70 | 8.10 | |
| | 36 | 36 | 2.08 | | 10.18 | 9.45 | | 16.29 | 21.38 | 15.12 | 19.85 | 6.10 | | 5.70 | | |
| 63 | 28 | - | 1.25 | 31.17 | 6.16 | 25.01 | 49.87 | - | 9.86 | 12.94 | 40.02 | - | 18.7 | 3.70 | 15.00 | 1400 |
| | 36 ³⁾ | 36 ³⁾ | 1.48 | | 10.18 | 20.99 | | 65.46 | 16.29 | 21.38 | 33.58 | 44.08 | | 6.10 | 12.60 | |
| | 45 | 45 | 2.04 | | 15.90 | 15.27 | | 25.44 | 33.39 | 24.43 | 32.07 | 9.50 | | 9.20 | | |
| 80 | 36 | - | 1.25 | 50.26 | 10.18 | 40.08 | 80.42 | - | 16.29 | 21.38 | 64.13 | - | 30.2 | 6.10 | 24.00 | 1700 |
| | 45 ³⁾ | 45 ³⁾ | 1.46 | | 15.90 | 34.36 | | 105.55 | 25.44 | 33.39 | 54.98 | 72.16 | | 9.50 | 20.60 | |
| | 56 | 56 | 1.96 | | 24.63 | 25.63 | | 39.41 | 51.72 | 41.01 | 53.82 | 14.80 | | 15.40 | | |
| 100 | 45 | - | 1.25 | 78.54 | 15.90 | 62.64 | 125.66 | - | 25.44 | 33.39 | 100.22 | - | 47.1 | 9.50 | 37.60 | 2000 |
| | 56 ³⁾ | 56 ³⁾ | 1.46 | | 24.63 | 53.91 | | 164.93 | 39.41 | 51.72 | 86.26 | 113.21 | | 14.80 | 32.30 | |
| | 70 | 70 | 1.96 | | 38.48 | 40.06 | | 61.57 | 80.81 | 64.10 | 84.13 | 23.10 | | 24.00 | | |
| 125 | 56 | - | 1.25 | 122.72 | 24.63 | 98.09 | 196.35 | - | 39.41 | 51.72 | 156.94 | - | 73.6 | 14.80 | 58.90 | 2300 |
| | 70 ³⁾ | 70 ^{3);4)} | 1.46 | | 38.48 | 84.24 | | 4) | 61.57 | 80.81 | 134.78 | 4) | | 23.10 | 50.50 | |
| | 90 | 90 ⁴⁾ | 2.08 | | 63.62 | 59.1 | | 101.79 | 133.60 | 94.56 | 4) | 38.20 | | 35.50 | | |
| 160 | 70 | - | 1.25 | 201.06 | 38.48 | 162.58 | 321.70 | - | 61.57 | 80.81 | 260.13 | - | 120.6 | 23.10 | 97.50 | 2600 |
| | 110 | 110 ⁴⁾ | 1.90 | | 95.03 | 106.03 | | 4) | 152.05 | 199.56 | 169.65 | 4) | | 57.00 | 63.60 | |
| 200 | 90 | - | 1.25 | 314.16 | 63.62 | 250.54 | 502.66 | - | 101.79 | 133.60 | 400.86 | - | 188.5 | 38.20 | 150.30 | 2700 |
| | 140 | 140 ⁴⁾ | 1.96 | | 153.94 | 160.22 | | 4) | 246.30 | 323.27 | 256.35 | 4) | | 92.40 | 96.10 | |



- 1) Theoretical static cylinder force
(without consideration of the efficiency and admissible load for attachment parts like e.g. tilt heads, plates or valves, etc.)
- 2) Stroke velocity
- 3) Piston rod Ø not standardized
- 4) With operating pressures up to 210 bar only on request

Overview types of mounting: Series CDT3 (for operating pressure up to 210 bar)

CDT3 ME5 (ISO/DIN/NF)

see page 10, 11



CDT3 ME6 (ISO/DIN/NF)

see page 10, 11



CDT3 MP5 (ISO/DIN/NF)

see page 12, 13



CDT3 MS2 (ISO/DIN/NF)

see page 14, 15



CDT3 MT4 (ISO/DIN/NF)

see page 16, 17



CDT3 MT1 (ISO/DIN/NF)

see page 18, 19



CDT3 MT2 (ISO/DIN/NF)

see page 18, 19



CDT3 MX1 (ISO/DIN/NF)

see page 20, 21



CDT3 MX2 (ISO/DIN/NF)

see page 22, 23



CDT3 MX3 (ISO/DIN/NF)

see page 22, 23



CDT3 MX5 (NF)

see page 24, 25



CDT3 MP1 (ISO/DIN/NF)

see page 26, 27



CDT3 MP3 (ISO/DIN/NF)

see page 26, 27



Ordering code: Series CDT3 (for operating pressure up to 210 bar)

The preferred cylinder designs are marked in gray.

| | | | | | | | | | | | | | | | | | | | |
|-----------|-----------|---|---|---|----------|-----------|--|--|--|--|--|--|--|--|--|--|--|--|---|
| CD | T3 | / | / | / | Z | 2X | | | | | | | | | | | | | * |
|-----------|-----------|---|---|---|----------|-----------|--|--|--|--|--|--|--|--|--|--|--|--|---|

Differential cylinder = **CD**

Series = **T3**

Types of mounting DIN/ISO

Rectangular flange at head = **ME5**

Rectangular flange at base = **ME6**

Self-aligning clevis at base = **MP5**

Foot mounting = **MS2**

Trunnion in center ¹⁾ = **MT4**

Types of mounting ISO

Fork at base = **MP1**

Swivel eye at base = **MP3**

Trunnion at head = **MT1**

Trunnion at base = **MT2**

Extended tie rod, on both sides = **MX1**

Extended tie rod, at base = **MX2**

Extended tie rod, at head = **MX3**

Tapped hole at head ²⁾ = **MX5**

Piston Ø (AL) 25 to 200 mm

Piston rod Ø (MM) 12 to 140 mm ¹³⁾

Stroke length in mm ¹¹⁾

Design principle

Head and base connected to tie rod = **Z**

Component series = **2X**

20 to 29 unchanged installation and connection dimensions

Line connection/design

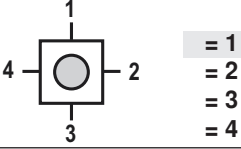
Pipe thread (ISO 1179-1) = **B**

Metric ISO thread (ISO 6149-1) = **R**

Enlarged pipe thread (ISO 1179-1) = **S**

Line connection/position at head

see page 41



View to piston rod

Further details in the plain text

Option 2

W = Without option

Y = Specify the piston rod extension LY in the clear text in mm

Option 1

W = Without option

B = ^{3; 4; 16)} Leakage oil connection

A = Threaded coupling, on both sides

Seal design

M = Standard seal system

T = Reduced friction

S = High temperature with reduced friction

End position cushioning

See pages 54 to 58

U = Without

D = On both sides, self-adjusting

S = Head side, self-adjusting

K = Base side, self-adjusting

E = ⁴⁾ On both sides, adjustable

Piston rod end

See pages 10 to 27

H = ¹⁴⁾ Thread (DIN/ISO) for tilt head CGKA

D = ¹⁵⁾ Thread (ISO) for tilt head CGKA

E = ¹²⁾ Internal thread

F = ^{5; 14)} With mounted tilt head CGKA (DIN/ISO)

K = ^{5; 15)} With mounted tilt head CGKA (ISO)

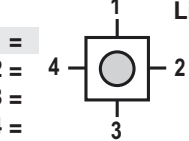
T = ⁶⁾ With trunnion

Piston rod design

H = Hardened and hard chromium-plated

Line connection/position at base

see page 41



View to piston rod

Comments:

- 1) Trunnion position freely selectable; when ordering, always specify the "XV" dimension in the clear text in mm
- 2) Not ISO standardized
- 3) With type of mounting MS2 and piston Ø 25 and end position cushioning, "E" is not possible
- 4) With piston Ø 25 to 100 mm: Only line connection "B" possible
With piston Ø 125 to 200 mm: Only DIN types of mounting and line connection "B" possible
- 5) Not possible with type of mounting MX1 and MX3
- 6) See page 44 (Only with standardized piston rod Ø 22 to 140 mm possible), observe the max. operating pressure
- 11) Observe the max. stroke length available, page 5, and the admissible stroke length (according to kinking calculation) on pages 50 to 53
- 12) See page 44 (Only with standardized piston rod Ø 18 to 140 mm possible), observe the max. operating pressure
- 13) Observe the admissible piston rod Ø and assigned threads at the piston rod end for 210 bar (pages 5 and 10 to 27)

Order example:

CDT3MP5/50/36/300Z2X/B11HHDMMWW

When selecting, please observe the limitations on the corresponding catalog pages!

- 14) For operating pressure up to 160 bar
- 15) For operating pressure up to 210 bar
- 16) Not possible with MT1

Courtesy of CMA/Flodyne/Hydradyne • Motion Control • Hydraulic • Pneumatic • Electrical • Mechanical • (800) 426-5480 • www.cmafh.com

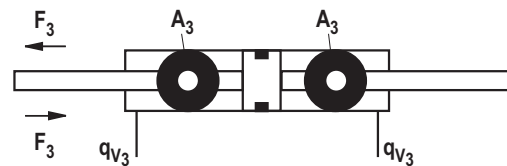
Areas, forces, flow: Series CGT3 (for operating pressure up to 160 bar)

| Piston AL Ø mm | Piston rod MM Ø mm | Areas A₃ cm ² | Force at 160 bar ¹⁾ F₃ kN | Flow at 0.1 m/s ²⁾ q_{V3} l/min | Max. avail- able stroke length (mm) |
|-----------------------------|------------------------------------|--|---|--|---|
| 25 | 12 | 3.78 | 6.04 | 2.3 | 600 |
| | 18 | 2.37 | 3.78 | 1.4 | |
| 32 | 14 | 6.50 | 10.40 | 3.9 | 800 |
| | 22 | 4.24 | 6.79 | 2.5 | |
| 40 | 18 | 10.02 | 16.03 | 6.0 | 1000 |
| | 22 ³⁾ | 8.77 | 14.02 | 5.3 | |
| | 28 | 6.40 | 10.25 | 3.8 | |
| 50 | 22 | 15.83 | 25.33 | 9.5 | 1200 |
| | 28 ³⁾ | 13.48 | 21.56 | 8.1 | |
| | 36 | 9.45 | 15.13 | 5.7 | |
| 63 | 28 | 25.01 | 40.02 | 15.0 | 1400 |
| | 36 ³⁾ | 20.99 | 33.59 | 12.6 | |
| | 45 | 15.27 | 24.43 | 9.2 | |
| 80 | 36 | 40.08 | 64.14 | 24.0 | 1700 |
| | 45 ³⁾ | 34.36 | 54.98 | 20.6 | |
| | 56 | 25.63 | 41.02 | 15.4 | |
| 100 | 45 | 62.64 | 100.21 | 37.6 | 2000 |
| | 56 ³⁾ | 53.91 | 86.26 | 32.3 | |
| | 70 | 40.06 | 64.09 | 24.0 | |
| 125 | 56 | 98.09 | 156.94 | 58.9 | 2300 |
| | 70 ³⁾ | 84.23 | 134.77 | 50.5 | |
| | 90 | 59.10 | 94.56 | 35.5 | |
| 160 | 70 | 162.58 | 260.12 | 97.5 | 2600 |
| | 110 | 106.03 | 169.64 | 63.6 | |
| 200 | 90 | 250.54 | 400.86 | 150.3 | 2700 |
| | 140 | 160.22 | 256.35 | 96.1 | |

1) Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. tilt heads, plates or valves, etc.)

2) Stroke velocity

3) Piston rod Ø not standardized



Overview types of mounting: Series CGT3 (for operating pressure up to 160 bar)

CGT3 ME5

see page 10, 11



CGT3 MS2

see page 14, 15



CGT3 MT4

see page 16, 17



CGT3 MT1

see page 18, 19



CGT3 MX1

see page 20, 21



CGT3 MX3

see page 22, 23



CGT3 MX5

see page 24, 25



Ordering code: Series CGT3 (for operating pressure up to 160 bar)

| | | | | | | | | | | | | | | | |
|----|----|---|---|---|---|----|--|--|--|--|--|--|--|--|---|
| CG | T3 | / | / | / | Z | 2X | | | | | | | | | * |
|----|----|---|---|---|---|----|--|--|--|--|--|--|--|--|---|

Double-acting cylinder ¹⁰⁾ = CG

Series = T3

Types of mounting

- Rectangular flange at head = ME5
- Foot mounting = MS2
- Trunnion in center ¹⁾ = MT4
- Trunnion at head = MT1
- Extended tie rods, on both sides = MX1
- Extended tie rods, at head = MX3
- Tapped hole at head = MX5

Piston Ø (AL) 25 to 200 mm

Piston rod Ø (MM) 12 to 140 mm

Stroke length in mm ¹⁴⁾

Design principle

Head and base connected to tie rod = Z

Component series = 2X

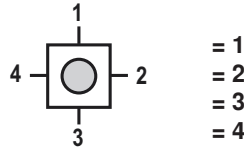
20 to 29 unchanged installation and connection dimensions

Line connection/design

- Pipe thread (ISO 1179-1) = B
- Metric ISO thread (ISO 6149-1) = R
- Enlarged pipe thread (ISO 1179-1) = S

Line connection/position at head

see page 41



View to piston rod

Comments:

- 1) Trunnion position freely selectable; when ordering, always specify the "XV" dimension in the clear text in mm
- 3) With type of mounting MS2 and piston Ø 25 and end position cushioning, "E" is not possible
- 4) With piston Ø 25 to 100 mm: Only line connection "B" possible
With piston Ø 125 to 200 mm: Only DIN types of mounting and line connection "B" possible
- 5) Not possible with type of mounting MX1 and MX3
- 10) Not standardized
- 12) See page 44 (only with standardized piston rod Ø 18 to 140 mm possible), observe the max. operating pressure
- 14) Observe the max. stroke length available, page 8, and the admissible stroke length (according to kinking calculation) on pages 50 to 53
- 16) Not possible with MT1

Further details in the plain text

Option 2

- W = Without option
- Y = Specify the piston rod extension LY in the clear text in mm

Option 1

- W = Without option
- B = ^{3; 4; 16)} Leakage oil connection
- A = Threaded coupling, on both sides

Seal design

- M = Standard seal system
- T = Servo quality/reduced friction
- S = High temperature with reduced friction

End position cushioning

see pages 54 to 58

- U = Without
- D = On both sides, self-adjusting
- S = Head side, self-adjusting
- K = Base side, self-adjusting
- E = ⁴⁾ On both sides, adjustable

Piston rod end

see pages 10 to 27

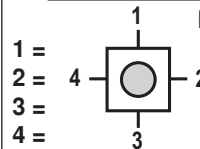
- H = Thread (DIN/ISO) for tilt head CGKA
- D = Thread (ISO) for tilt head CGKA
- E = ¹²⁾ Internal thread
- F = ⁵⁾ With mounted tilt head CGKA (DIN/ISO)
- K = ⁵⁾ With mounted tilt head CGKA (ISO)

Piston rod design

H = Hardened and hard chromium-plated

Line connection/position at base

see page 41



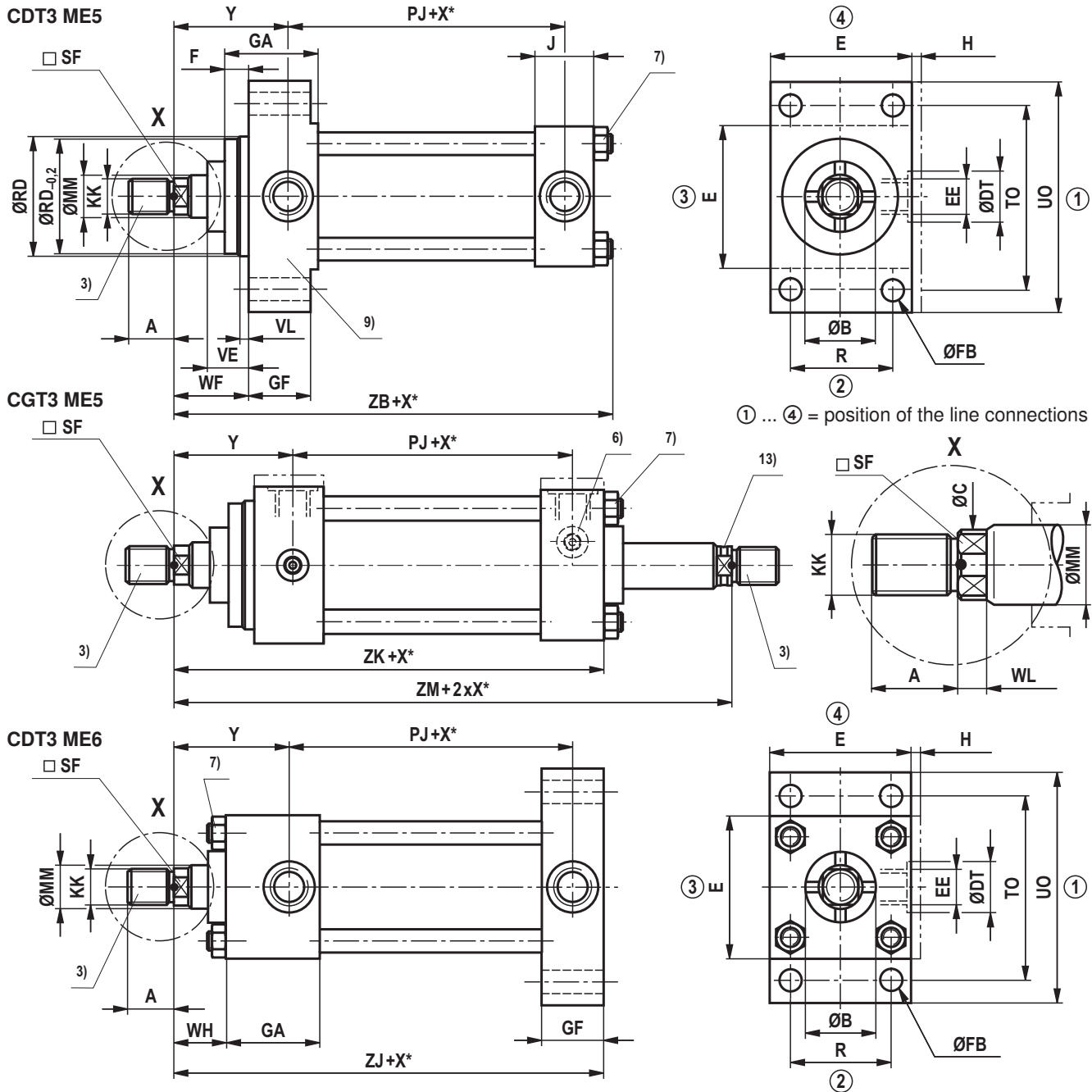
View to piston rod

Order example:

CGT3ME5/80/56/400Z2X/B11HDMWW

When selecting, please observe the limitations on the corresponding catalog pages!

Device dimensions: Type of mounting ME5, ME6 (dimensions in mm)



| AL Ø | F max | FB Ø; H13 | GF ⁹⁾ | R JS13 | TO JS13 | UO max | VE max | VL min | ZB max | ZJ ± 1 | ZK ± 1 | ZM ± 2 |
|---------|----------|--------------|------------------|-----------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 25 | 10 | 5,5 | 25 | 27 | 51 | 65 | 16 | 3 | 121 | 114 | 138 | 154 |
| 32 | 10 | 6,6 | 26,5 | 33 | 58 | 70 | 22 | 3 | 137 | 128 | 151 | 177 |
| 40 | 10 | 11 | 38 | 41 | 87 | 110 | 22 | 3 | 166 | 153 | 172 | 196 |
| 50 | 16 | 14 | 38 | 52 | 105 | 130 | 25 | 4 | 176 | 159 | 183 | 207 |
| 63 | 16 | 14 | 38 | 65 | 117 | 145 | 29 | 4 | 185 | 168 | 190 | 223 |
| 80 | 20 | 18 | 45 | 83 | 149 | 180 | 29 | 4 | 212 | 190 | 216 | 246 |
| 100 | 22 | 18 | 45 | 97 | 162 | 200 | 32 | 5 | 225 | 203 | 230 | 265 |
| 125 | 22 | 22 | 58 | 126 | 208 | 250 | 32 | 5 | 260 | 232 | 254 | 289 |
| 160 | 25 | 26 | 58 | 155 | 253 | 300 | 32 | 5 | 279 | 245 | 270 | 302 |
| 200 | 25 | 33 | 76 | 190 | 300 | 360 | 32 | 5 | 336 | 299 | 324 | 356 |

Device dimensions: ME5, ME6 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f9 | RD Ø; f8 |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|------|-----|----|------------|-------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | CØ | SF | WL | | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 | 38 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 | 38 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 | 42 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 | 42 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 | 62 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 | 62 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 | 62 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 | 74 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 | 74 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 | 74 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 | 75 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 | 88 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 | 88 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 | 82 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 | 105 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 | 105 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 | 92 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 | 125 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 | 125 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 | 105 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 | 150 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 | 150 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 | 125 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 | 170 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 | 150 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 | 210 |

| AL Ø | E | EE | DT Ø | EE | DT Ø | GA | H ⁵⁾ | J | PJ ¹⁰⁾ ± 1.25 | PJ ¹¹⁾ ± 1.25 | WF ± 2 | WH ± 2 | Y ¹⁰⁾ ± 2 | Y ¹¹⁾ ± 2 |
|---------|-----------|---------|---------|---------|---------|------|-----------------|------|-----------------------------|-----------------------------|-----------|-----------|-------------------------|-------------------------|
| 25 | 40 ± 1,5 | G 1/4 | 25 | M14x1,5 | 21 | 46,5 | 5 | 22,5 | 53 | 64,5 | 25 | 15 | 50 | 38,5 |
| 32 | 45 ± 1,5 | G 1/4 | 25 | M14x1,5 | 21 | 48 | 5 | 25 | 56 | 68,5 | 35 | 25 | 60 | 47,5 |
| 40 | 63 ± 1,5 | G 3/8 | 28 | M18x1,5 | 26 | 52,5 | – | 33,5 | 73 | 77 | 35 | 25 | 62 | 58 |
| 50 | 75 ± 1,5 | G 1/2 | 34 | M22x1,5 | 29 | 57,5 | – | 33,5 | 74 | 78 | 41 | 25 | 67 | 63 |
| 63 | 90 ± 1,5 | G 1/2 | 34 | M22x1,5 | 29 | 57,5 | – | 35,5 | 80 | 81 | 48 | 32 | 71 | 70 |
| 80 | 115 ± 1,5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 93 | 93 | 51 | 31 | 77 | 77 |
| 100 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 101 | 101 | 57 | 35 | 82 | 82 |
| 125 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73,5 | – | 51,5 | 117 | 117 | 57 | 35 | 86 | 86 |
| 160 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80,5 | – | 55,5 | 130 | 130 | 57 | 32 | 86 | 86 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 165 | 165 | 57 | 32 | 98 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position
Exception ME5 head and ME6 base6) For the position of the line connections and the bleeding
see page 41

7) Tightening torque see page 61

9) Flange thickness according to DIN 24554

10) ME5: For line connection position "1" and "3" at head

11) ME5: For line connection position "2" and "4" at head

12) Piston rod Ø not standardized

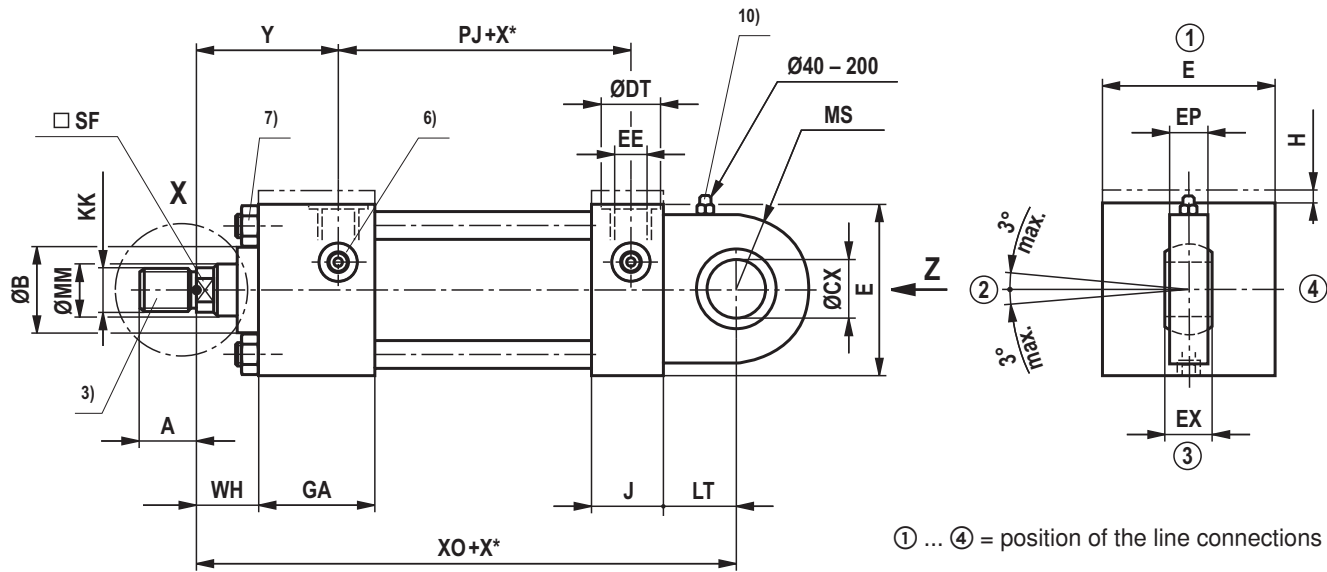
13) CG design: Piston rod marked with groove, only admis-
sible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

| Line connection/ position | Position H | |
|------------------------------|------------|----------|
| | ME5 head | ME6 base |
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 3 | 3 |
| 4 | 3 | 3 |

Device dimensions: Type of mounting MP5 (dimensions in mm)

CDT3 MP5



| AL Ø | CX Ø | EP h13 | EX | LT min | XO ± 1.5 | MS max |
|---------|-------------|-----------|-----------|-----------|-------------|-----------|
| 25 | 12 - 0.008 | 8 | 10 - 0.12 | 16 | 130 | 20 |
| 32 | 16 - 0.008 | 11 | 14 - 0.12 | 20 | 148 | 22.5 |
| 40 | 20 - 0.012 | 13 | 16 - 0.12 | 25 | 178 | 29 |
| 50 | 25 - 0.012 | 17 | 20 - 0.12 | 31 | 190 | 33 |
| 63 | 30 - 0.012 | 19 | 22 - 0.12 | 38 | 206 | 40 |
| 80 | 40 - 0.012 | 23 | 28 - 0.12 | 48 | 238 | 50 |
| 100 | 50 - 0.012 | 30 | 35 - 0.12 | 58 | 261 | 62 |
| 125 | 60 - 0.015 | 38 | 44 - 0.15 | 72 | 304 | 80 |
| 160 | 80 - 0.015 | 47 | 55 - 0.15 | 92 | 337 | 100 |
| 200 | 100 - 0.020 | 57 | 70 - 0.20 | 116 | 415 | 120 |

Device dimensions: MP5 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f9 |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|--------|-----|----|------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | E | EE | DT Ø | EE | DT Ø | GA | H ⁵⁾ | J | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|-----------|---------|---------|---------|---------|------|-----------------|------|--------------|-----------|----------|
| 25 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | 5 | 22.5 | 53 | 15 | 50 |
| 32 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | 5 | 25 | 56 | 25 | 60 |
| 40 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | – | 33.5 | 73 | 25 | 62 |
| 50 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 33.5 | 74 | 25 | 67 |
| 63 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 35.5 | 80 | 32 | 71 |
| 80 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 93 | 31 | 77 |
| 100 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 101 | 35 | 82 |
| 125 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73.5 | – | 51.5 | 117 | 35 | 86 |
| 160 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80.5 | – | 55.5 | 130 | 32 | 86 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

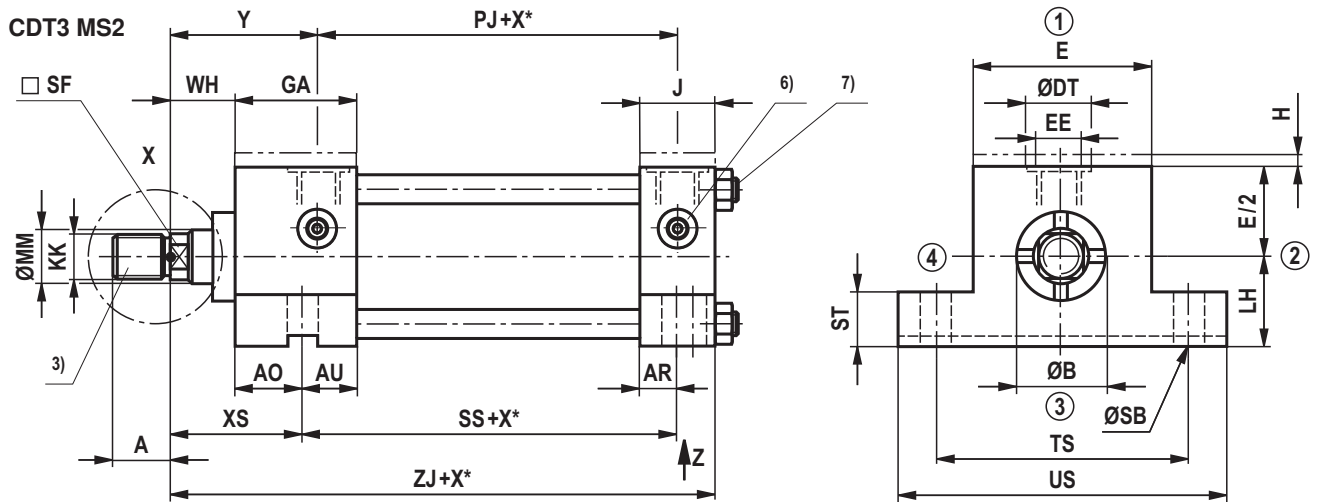
7) Tightening torque see page 61

10) Lubricating nipple M6 DIN 71412 from piston Ø 40 mm

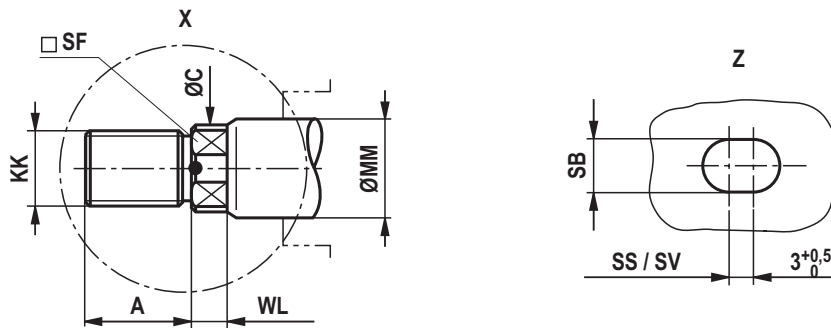
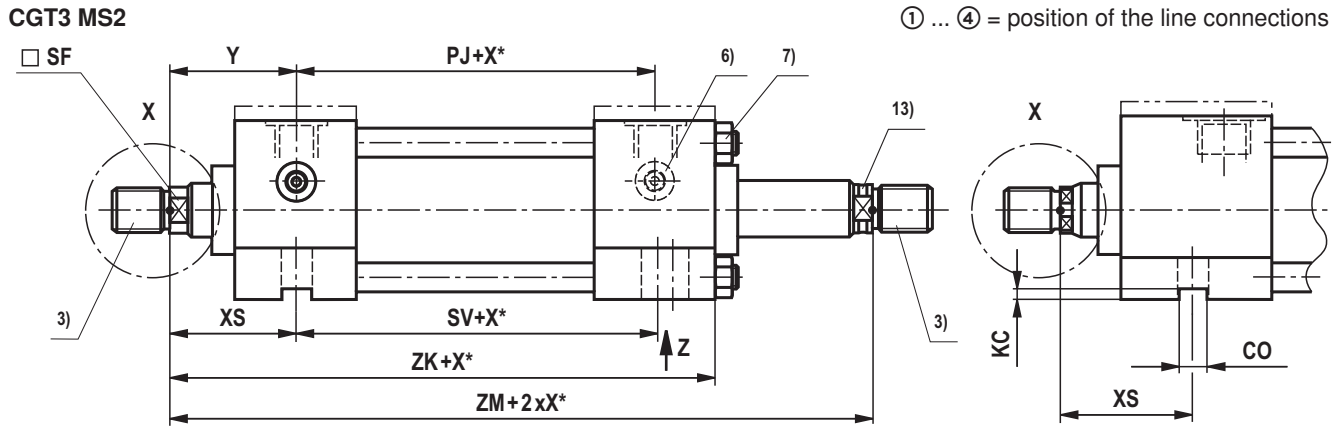
12) Piston rod Ø not standardized

14) With operating pressures up to 210 bar only on request

Device dimensions: Type of mounting MS2 (dimensions in mm)



① ... ④ = position of the line connections



| AL Ø | CO N9 | KC +0.2 0 | LH h10 | SB (Ø); H13 | SS ± 1.25 | ST | SV ± 1 | TS JS13 | US max | XS ± 2 | ZJ ± 1 | ZK ± 1 | ZM ± 2 | AO | AU |
|---------|----------|-----------------|-----------|----------------|--------------|------|-----------|------------|-----------|-----------|-----------|-----------|-----------|------|------|
| 25 | 12 | 4 | 19 | 6.6 | 72 | 8.5 | 87 | 54 | 72 | 33 | 114 | 138 | 154 | 18 | 28.5 |
| 32 | 12 | 4 | 22 | 9 | 72 | 12.5 | 87 | 63 | 84 | 45 | 128 | 151 | 177 | 20 | 28 |
| 40 | 12 | 4 | 31 | 11 | 97 | 12.5 | 105 | 83 | 103 | 45 | 153 | 172 | 196 | 20 | 32.5 |
| 50 | 12 | 4.5 | 37 | 14 | 91 | 19 | 99 | 102 | 127 | 54 | 159 | 183 | 207 | 29.5 | 28 |
| 63 | 16 | 4.5 | 44 | 18 | 85 | 26 | 92 | 124 | 161 | 65 | 168 | 190 | 223 | 33 | 24.5 |
| 80 | 16 | 5 | 57 | 18 | 104 | 26 | 110 | 149 | 186 | 68 | 190 | 216 | 246 | 39 | 28 |
| 100 | 16 | 6 | 63 | 26 | 101 | 32 | 107 | 172 | 216 | 79 | 203 | 230 | 265 | 44 | 26 |
| 125 | 20 | 5 | 82 | 26 | 131 | 32 | 131 | 210 | 254 | 79 | 232 | 254 | 289 | 44 | 29.5 |
| 160 | - | - | 101 | 33 | 130 | 38 | 130 | 260 | 318 | 86 | 245 | 270 | 302 | 54 | 26.5 |
| 200 | - | - | 122 | 39 | 172 | 44 | 172 | 311 | 381 | 92 | 299 | 324 | 356 | 60 | 41 |

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Device dimensions: MS2 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f9 |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|------|-----|----|------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | CØ | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | E | EE | DT Ø | EE | DT Ø | GA | H ⁵⁾ | J | PJ ± 1.25 | WH ± 2 | Y ± 2 | AR |
|---------|-----------|---------|---------|---------|---------|------|-----------------|------|--------------|-----------|----------|------|
| 25 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | 5 | 22.5 | 53 | 15 | 50 | 13.5 |
| 32 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | 5 | 25 | 56 | 25 | 60 | 14 |
| 40 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | – | 33.5 | 73 | 25 | 62 | 22.5 |
| 50 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 33.5 | 74 | 25 | 67 | 19.5 |
| 63 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 35.5 | 80 | 32 | 71 | 17.5 |
| 80 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 93 | 31 | 77 | 23 |
| 100 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 101 | 35 | 82 | 20 |
| 125 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73.5 | – | 51.5 | 117 | 35 | 86 | 29.5 |
| 160 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80.5 | – | 55.5 | 130 | 32 | 86 | 26.5 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 165 | 32 | 98 | 41 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

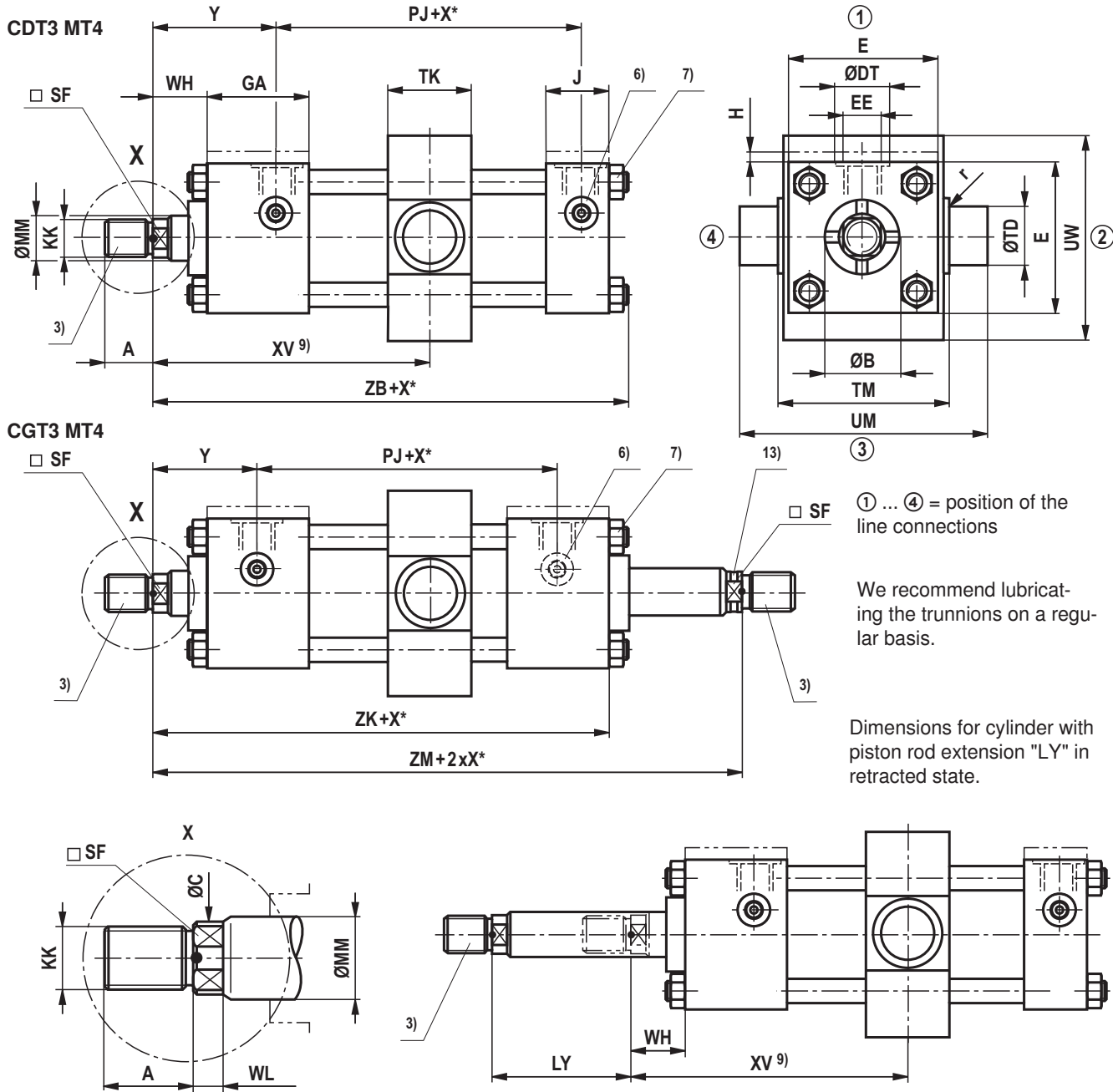
7) Tightening torque see page 61

12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

Device dimensions: Type of mounting MT4 (dimensions in mm)



| AL Ø | r | TD Ø; f8 | TK max | TM h14 | UM h15 | UW max | X* min | XV min | XV max | ZB max | ZK ± 1 | ZM ± 2 |
|---------|-----|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 25 | 1 | 12 | 20 | 48 | 68 | 43 | 0 | 74 | 80 + Hub | 121 | 138 | 154 |
| 32 | 1 | 16 | 25 | 55 | 79 | 53 | 0 | 88 | 89 + Hub | 137 | 151 | 177 |
| 40 | 1.6 | 20 | 30 | 76 | 108 | 74 | 0 | 95 | 104 + Hub | 166 | 172 | 196 |
| 50 | 1.6 | 25 | 40 | 89 | 129 | 81 | 0 | 105 | 105 + Hub | 176 | 183 | 207 |
| 63 | 2 | 32 | 50 | 100 | 150 | 97 | 10 | 117 | 107 + Hub | 185 | 190 | 223 |
| 80 | 2.5 | 40 | 60 | 127 | 191 | 124 | 12 | 130 | 118 + Hub | 212 | 216 | 246 |
| 100 | 2.5 | 50 | 70 | 140 | 220 | 137 | 18 | 142 | 124 + Hub | 225 | 230 | 265 |
| 125 | 3.2 | 63 | 90 | 178 | 278 | 175 | 25 | 157 | 132 + Hub | 260 | 254 | 289 |
| 160 | 3.2 | 80 | 110 | 215 | 341 | 221 | 40 | 171 | 131 + Hub | 279 | 270 | 302 |
| 200 | 3.2 | 100 | 130 | 279 | 439 | 281 | 48 | 202 | 154 + Hub | 336 | 324 | 356 |

Device dimensions: MT4 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f9 |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|------|-----|----|------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | CØ | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | E | EE | DT Ø | EE | DT Ø | GA | H ^{5; 11)} | J | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|-----------|---------|---------|---------|---------|------|---------------------|------|--------------|-----------|----------|
| 25 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | 5 | 22.5 | 53 | 15 | 50 |
| 32 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | 5 | 25 | 56 | 25 | 60 |
| 40 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | – | 33.5 | 73 | 25 | 62 |
| 50 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 33.5 | 74 | 25 | 67 |
| 63 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 35.5 | 80 | 32 | 71 |
| 80 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 93 | 31 | 77 |
| 100 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 101 | 35 | 82 |
| 125 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73.5 | – | 51.5 | 117 | 35 | 86 |
| 160 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80.5 | – | 55.5 | 130 | 32 | 86 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 61

9) "XV" dimension in mm, always specify in the plain text

11) Piston Ø 25 and 32 mm: "H" dimension with line connection

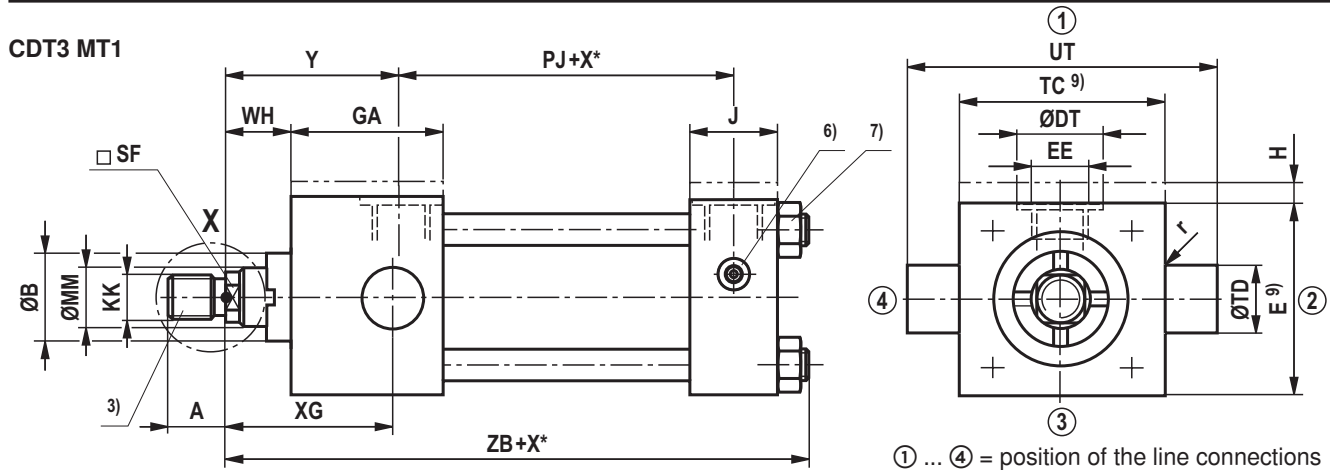
12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

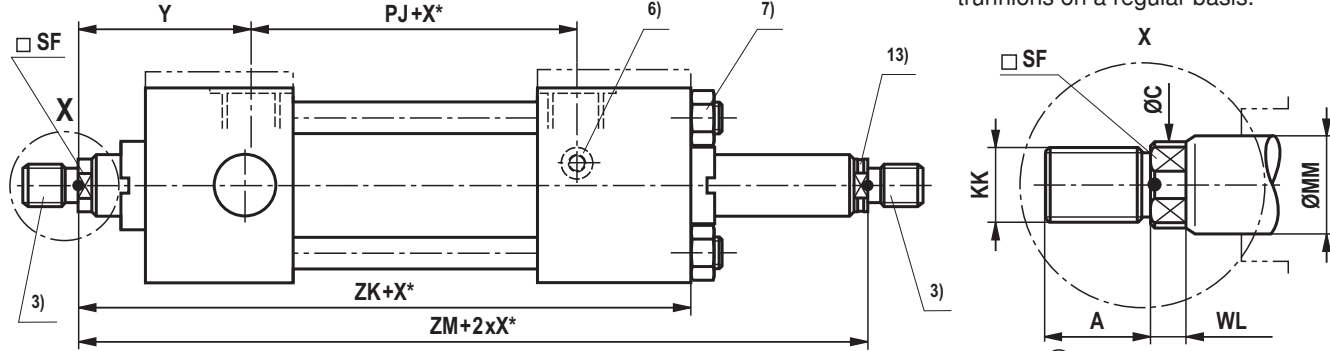
Device dimensions: Type of mounting MT1, MT2 (dimensions in mm)

CDT3 MT1

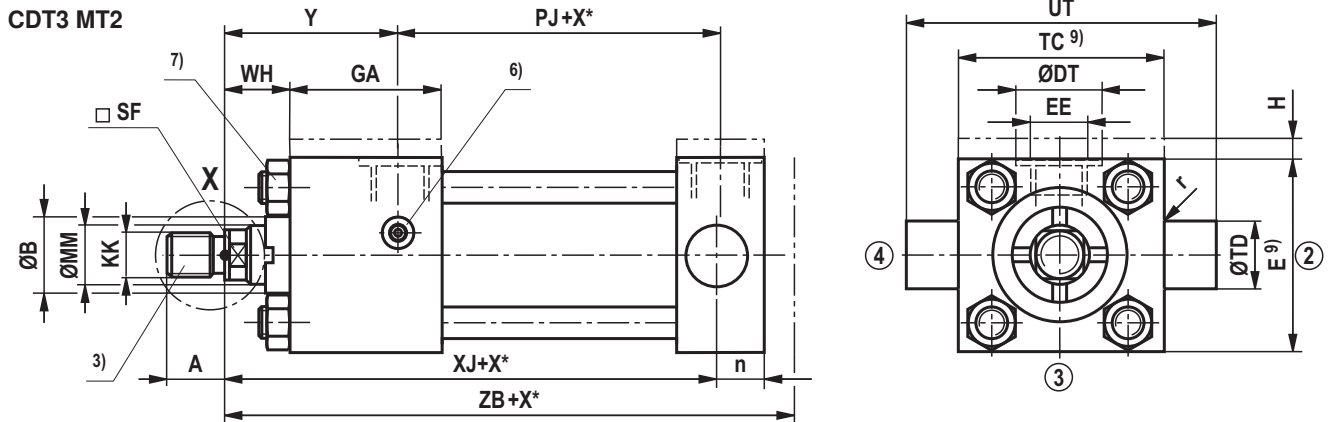


We recommend lubricating the trunnions on a regular basis.

CGT3 MT1



CDT3 MT2



| AL Ø | n | r | TC h14 | TD Ø; f8 | UT h15 | XG ± 2 | XJ ± 1.25 | ZB max | ZK ± 1 | ZM ± 2 |
|---------|----|-----|-----------|-------------|-----------|-----------|--------------|-----------|-----------|-----------|
| 25 | 13 | 1 | 38 | 12 | 58 | 44 | 101 | 121 | 138 | 154 |
| 32 | 13 | 1 | 44 | 16 | 68 | 54 | 115 | 137 | 151 | 177 |
| 40 | 19 | 1.6 | 63 | 20 | 95 | 57 | 134 | 166 | 172 | 196 |
| 50 | 19 | 1.6 | 76 | 25 | 116 | 64 | 140 | 176 | 183 | 207 |
| 63 | 19 | 2 | 89 | 32 | 139 | 70 | 149 | 185 | 190 | 223 |
| 80 | 23 | 2.5 | 114 | 40 | 178 | 76 | 168 | 212 | 216 | 246 |
| 100 | 28 | 2.5 | 127 | 50 | 207 | 71 | 187 | 225 | 230 | 265 |
| 125 | 51 | 3.2 | 165 | 63 | 265 | 75 | 209 | 260 | 254 | 289 |
| 160 | 40 | 3.2 | 203 | 80 | 329 | 75 | 230 | 279 | 270 | 302 |
| 200 | 53 | 4.5 | 241 | 100 | 401 | 85 | 276 | 336 | 324 | 356 |

Device dimensions: MT1, MT2 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f ₉ |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|------|-----|----|------------------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | CØ | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | E | EE | DT Ø | EE | DT Ø | GA | | H ⁵⁾ | J | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|-----------|---------|---------|---------|---------|-------|------|-----------------|------|--------------|-----------|----------|
| | | | | | | MT1 | MT2 | | | | | |
| 25 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | | 5 | 22.5 | 53 | 15 | 50 |
| 32 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | | 5 | 25 | 56 | 25 | 60 |
| 40 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | | – | 33.5 | 73 | 25 | 62 |
| 50 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | | – | 33.5 | 74 | 25 | 67 |
| 63 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | | – | 35.5 | 80 | 32 | 71 |
| 80 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | | – | 41 | 93 | 31 | 77 |
| 100 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | | – | 43 | 101 | 35 | 82 |
| 125 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 74.9 | 73.5 | – | 51.5 | 117 | 35 | 86 |
| 160 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 86.4 | 80.5 | – | 55.5 | 130 | 32 | 86 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 106.4 | 101 | – | 76 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 61

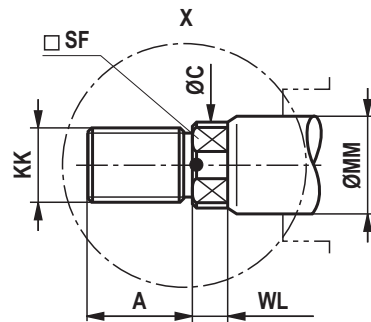
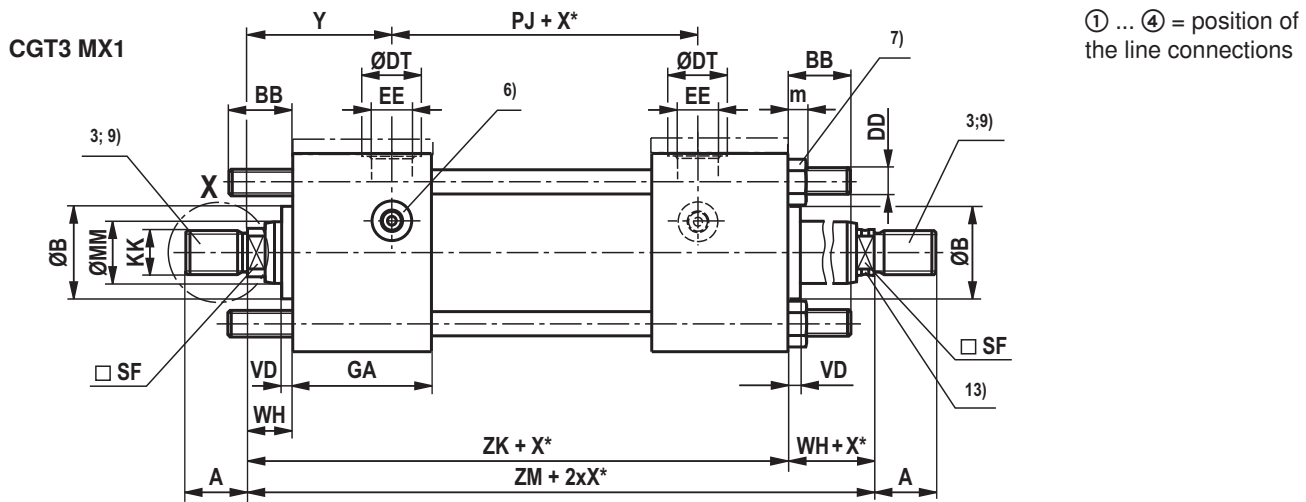
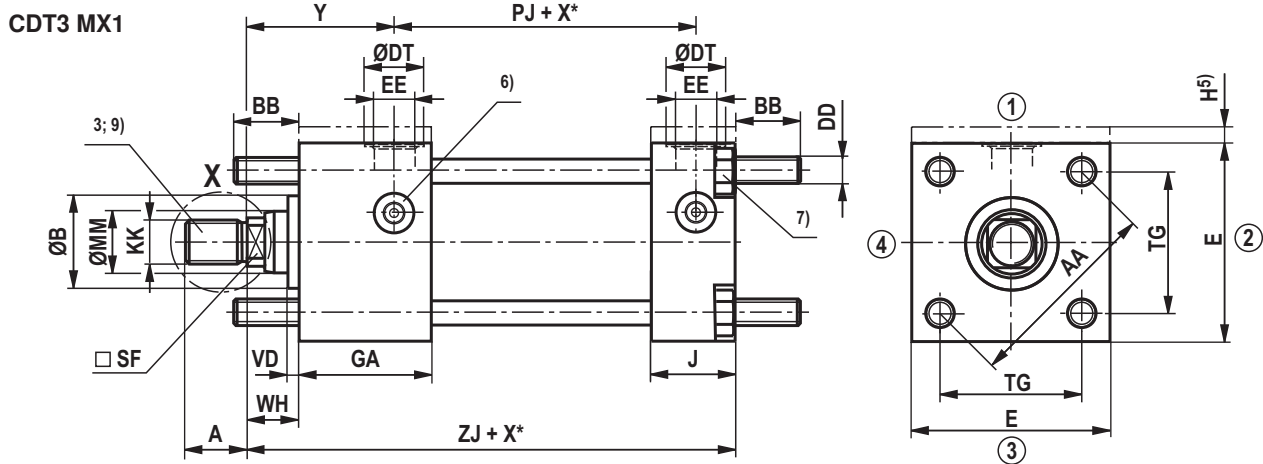
9) With short strokes, observe "TC" and "E"

12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

Device dimensions: Type of mounting MX1 (dimensions in mm)



| AL Ø | AA | BB ⁹⁾ + 3 | TG js13 | VD | ZJ ± 1.25 | ZK ± 1 | ZM ± 2 |
|---------|-----|-------------------------|------------|----|--------------|-----------|-----------|
| 25 | 40 | 19 | 28.3 | 6 | 114 | 138 | 154 |
| 32 | 47 | 24 | 33.2 | 12 | 128 | 151 | 177 |
| 40 | 59 | 35 | 41.7 | 12 | 153 | 172 | 196 |
| 50 | 74 | 46 | 52.3 | 9 | 159 | 183 | 207 |
| 63 | 91 | 46 | 64.3 | 13 | 168 | 190 | 223 |
| 80 | 117 | 59 | 82.7 | 9 | 190 | 216 | 246 |
| 100 | 137 | 59 | 96.9 | 10 | 203 | 230 | 265 |
| 125 | 178 | 81 | 125.9 | 9 | 232 | 254 | 289 |
| 160 | 219 | 92 | 154.9 | 7 | 245 | 270 | 302 |
| 200 | 269 | 115 | 190.2 | 7 | 299 | 324 | 356 |

Device dimensions: MX1 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f ₉ |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|--------|-----|----|------------------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | DD | E | EE | DT Ø | EE | DT Ø | GA | H ⁵⁾ | J | m | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|----------|-----------|---------|---------|---------|---------|------|-----------------|------|-----|--------------|-----------|----------|
| 25 | M5x0.8 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | 5 | 22.5 | 4 | 53 | 15 | 50 |
| 32 | M6x1 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | 5 | 25 | 5 | 56 | 25 | 60 |
| 40 | M8x1 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | – | 33.5 | 6.5 | 73 | 25 | 62 |
| 50 | M12x1.25 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 33.5 | 10 | 74 | 25 | 67 |
| 63 | M12x1.25 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 35.5 | 10 | 80 | 32 | 71 |
| 80 | M16x1.5 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 13 | 93 | 31 | 77 |
| 100 | M16x1.5 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 13 | 101 | 35 | 82 |
| 125 | M22x1.5 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73.5 | – | 51.5 | 18 | 117 | 35 | 86 |
| 160 | M27x2 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80.5 | – | 55.5 | 22 | 130 | 32 | 86 |
| 200 | M30x2 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 24 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 61

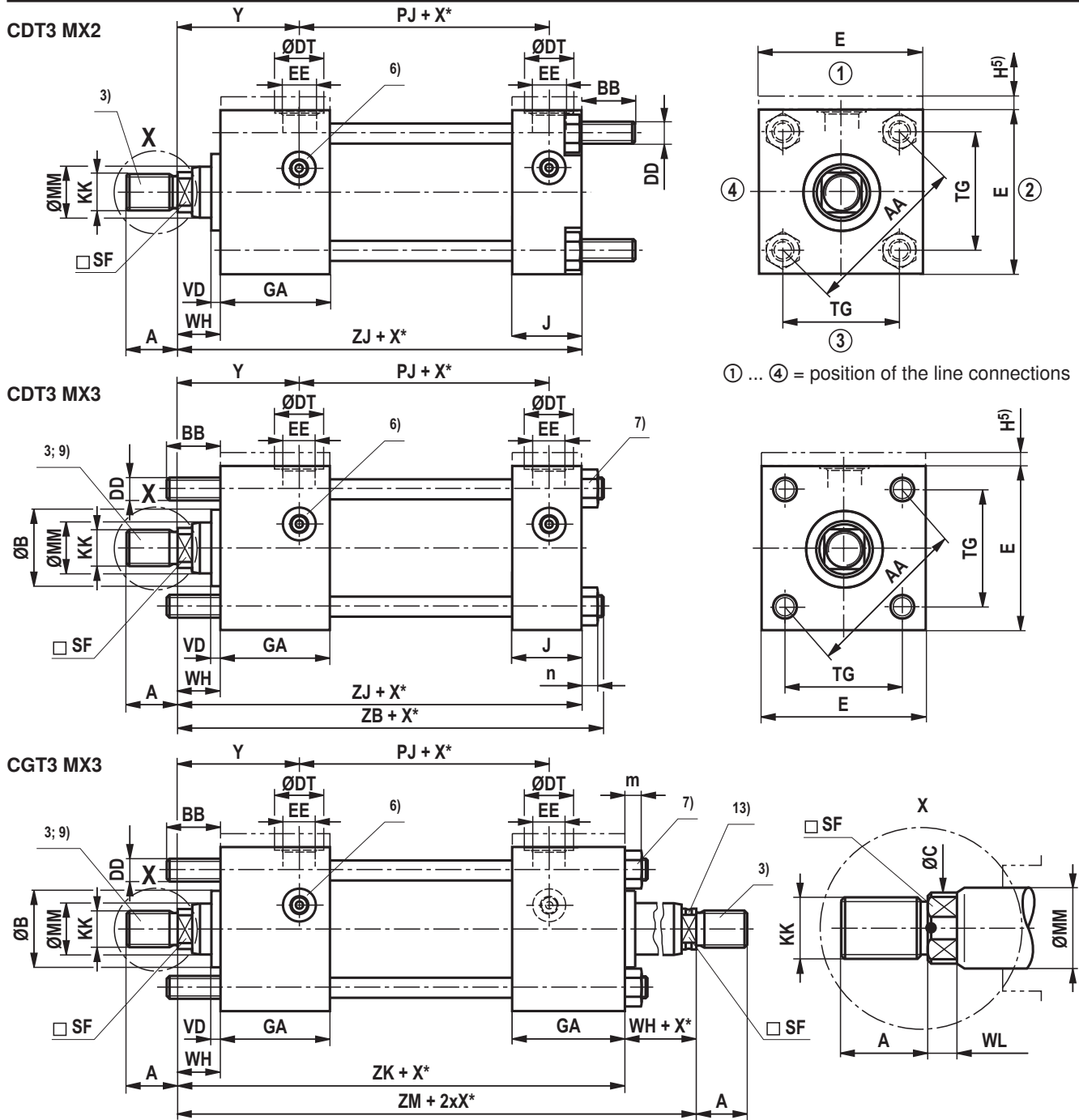
9) Observe the "BB" dimension for the tilt head assembly

12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

Device dimensions: Type of mounting MX2, MX3 (dimensions in mm)



| AL Ø | AA | BB ⁹⁾ + 3 | TG js13 | VD | ZB max | ZJ ± 1 | ZK ± 1 | ZM ± 2 |
|---------|-----|-------------------------|------------|----|-----------|-----------|-----------|-----------|
| 25 | 40 | 19 | 28.3 | 6 | 121 | 114 | 138 | 154 |
| 32 | 47 | 24 | 33.2 | 12 | 137 | 128 | 151 | 177 |
| 40 | 59 | 35 | 41.7 | 12 | 166 | 153 | 172 | 196 |
| 50 | 74 | 46 | 52.3 | 9 | 176 | 159 | 183 | 207 |
| 63 | 91 | 46 | 64.3 | 13 | 185 | 168 | 190 | 223 |
| 80 | 117 | 59 | 82.7 | 9 | 212 | 190 | 216 | 246 |
| 100 | 137 | 59 | 96.9 | 10 | 225 | 203 | 230 | 265 |
| 125 | 178 | 81 | 125.9 | 9 | 260 | 232 | 254 | 289 |
| 160 | 219 | 92 | 154.9 | 7 | 279 | 245 | 270 | 302 |
| 200 | 269 | 115 | 190.2 | 7 | 336 | 299 | 324 | 356 |

Device dimensions: MX2, MX3 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f ₉ |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|--------|-----|----|------------------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | DD | E | EE | DT Ø | EE | DT Ø | GA | H ⁵⁾ | J | m | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|----------|-----------|---------|---------|---------|---------|------|-----------------|------|-----|--------------|-----------|----------|
| 25 | M5x0.8 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | 5 | 22.5 | 4 | 53 | 15 | 50 |
| 32 | M6x1 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | 5 | 25 | 5 | 56 | 25 | 60 |
| 40 | M8x1 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | – | 33.5 | 6.5 | 73 | 25 | 62 |
| 50 | M12x1.25 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 33.5 | 10 | 74 | 25 | 67 |
| 63 | M12x1.25 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 35.5 | 10 | 80 | 32 | 71 |
| 80 | M16x1.5 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 13 | 93 | 31 | 77 |
| 100 | M16x1.5 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 13 | 101 | 35 | 82 |
| 125 | M22x1.5 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73.5 | – | 51.5 | 18 | 117 | 35 | 86 |
| 160 | M27x2 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80.5 | – | 55.5 | 22 | 130 | 32 | 86 |
| 200 | M30x2 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 24 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 61

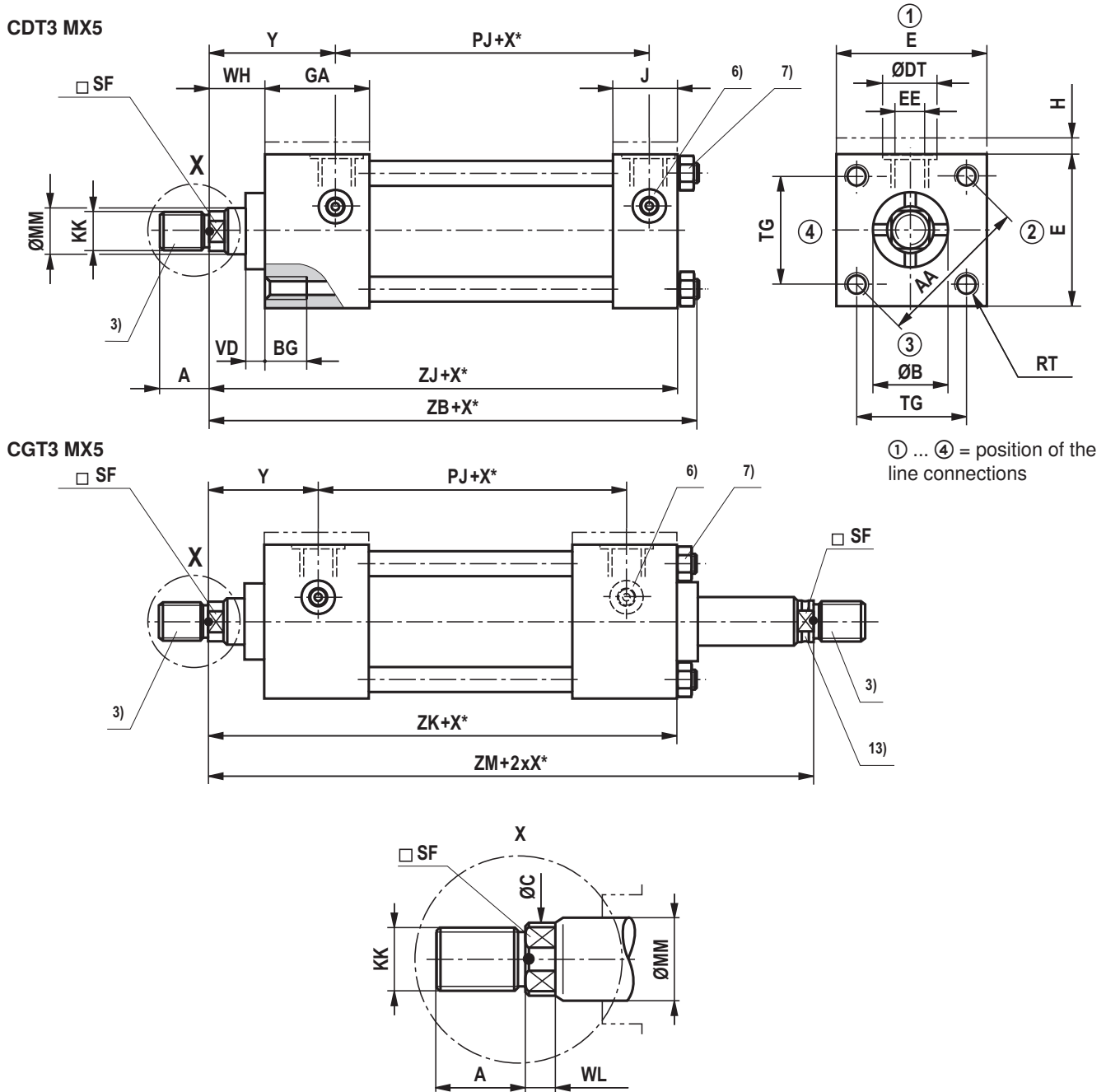
9) Observe the "BB" dimension for the tilt head assembly

12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

Device dimensions: Type of mounting MX5 (dimensions in mm)



| AL Ø | AA | BG min | RT 6H | TG js13 | VD | ZB max | ZJ ± 1.25 | ZK ± 1 | ZM ± 2 |
|---------|-----|-----------|----------|------------|----|-----------|--------------|-----------|-----------|
| 25 | 40 | 8 | M5x0.8 | 28.3 | 6 | 121 | 114 | 138 | 154 |
| 32 | 47 | 9 | M6x1 | 33.2 | 12 | 137 | 128 | 151 | 177 |
| 40 | 59 | 12 | M8x1.25 | 41.7 | 12 | 166 | 153 | 172 | 196 |
| 50 | 74 | 18 | M12x1.75 | 52.3 | 9 | 176 | 159 | 183 | 207 |
| 63 | 91 | 18 | M12x1.75 | 64.3 | 13 | 185 | 168 | 190 | 223 |
| 80 | 117 | 24 | M16x2 | 82.7 | 9 | 212 | 190 | 216 | 246 |
| 100 | 137 | 24 | M16x2 | 96.9 | 10 | 225 | 203 | 230 | 265 |
| 125 | 178 | 27 | M22x2.5 | 125.9 | 9 | 260 | 232 | 254 | 289 |
| 160 | 219 | 32 | M27x3 | 154.9 | 7 | 279 | 245 | 270 | 302 |
| 200 | 269 | 40 | M30x3.5 | 190.2 | 7 | 336 | 299 | 324 | 356 |

Device dimensions: MX5 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f ₉ |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|--------|-----|----|------------------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | E | EE | DT Ø | EE | DT Ø | GA | H ⁵⁾ | J | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|-----------|---------|---------|---------|---------|------|-----------------|------|--------------|-----------|----------|
| 25 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | 5 | 22.5 | 53 | 15 | 50 |
| 32 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | 5 | 25 | 56 | 25 | 60 |
| 40 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | – | 33.5 | 73 | 25 | 62 |
| 50 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 33.5 | 74 | 25 | 67 |
| 63 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 35.5 | 80 | 32 | 71 |
| 80 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 93 | 31 | 77 |
| 100 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 101 | 35 | 82 |
| 125 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73.5 | – | 51.5 | 117 | 35 | 86 |
| 160 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80.5 | – | 55.5 | 130 | 32 | 86 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

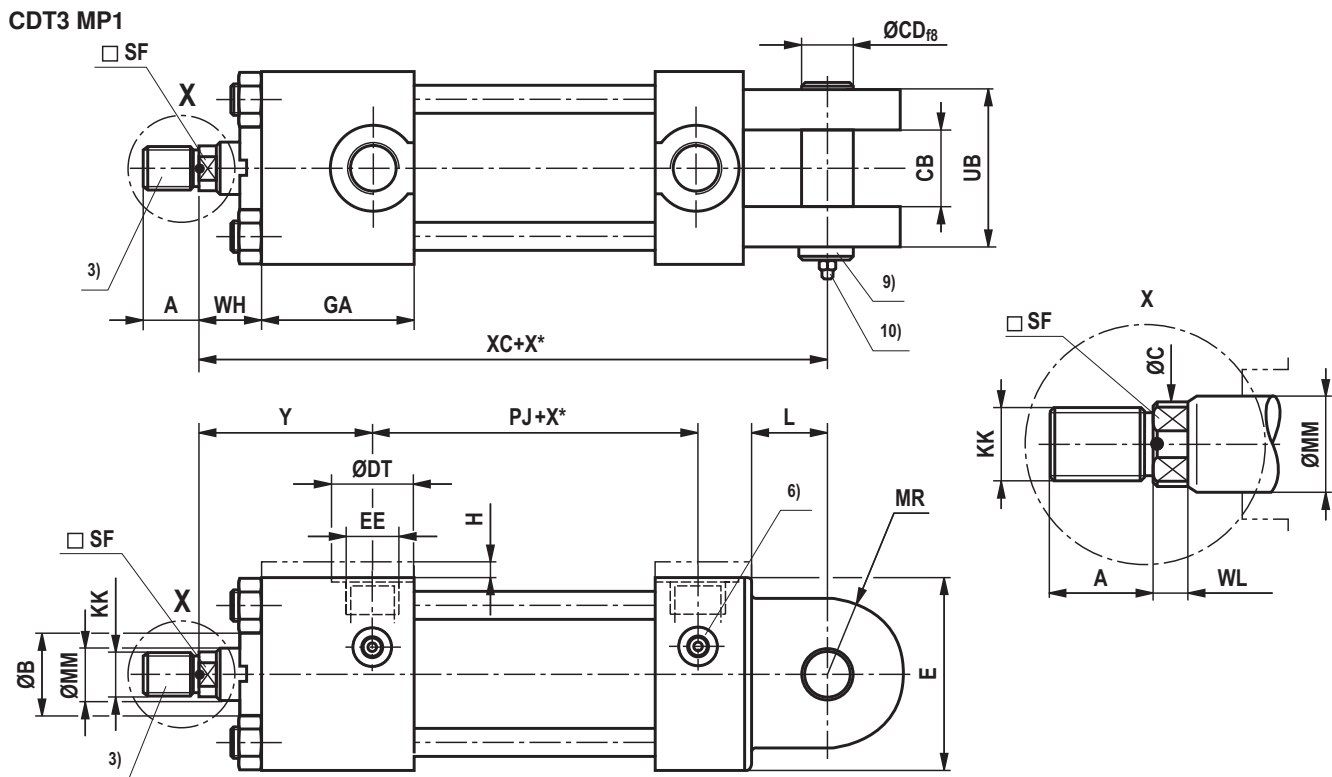
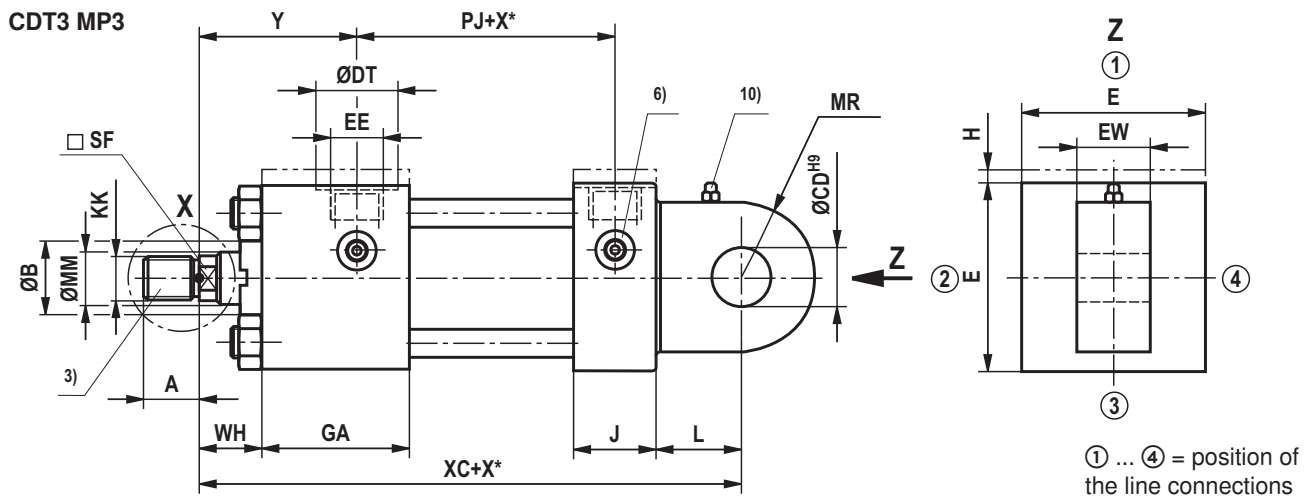
7) Tightening torque see page 61

12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

Device dimensions: Type of mounting MP1, MP3 (dimensions in mm)



| AL Ø | CB A16 | CD Ø; H9; f8 | EW h14 | L min | MR max | UB max | XC ± 1.25 |
|---------|-----------|-----------------|-----------|----------|-----------|-----------|--------------|
| 25 | 12 | 10 | 12 | 13 | 12 | 25 | 127 |
| 32 | 16 | 12 | 16 | 19 | 17 | 34 | 147 |
| 40 | 20 | 14 | 20 | 19 | 17 | 42 | 172 |
| 50 | 30 | 20 | 30 | 32 | 29 | 62 | 191 |
| 63 | 30 | 20 | 30 | 32 | 29 | 62 | 200 |
| 80 | 40 | 28 | 40 | 39 | 34 | 83 | 229 |
| 100 | 50 | 36 | 50 | 54 | 50 | 103 | 257 |
| 125 | 60 | 45 | 60 | 57 | 53 | 120 | 289 |
| 160 | 70 | 56 | 70 | 63 | 59 | 140 | 308 |
| 200 | 80 | 70 | 80 | 82 | 78 | 160 | 381 |

Device dimensions: MP1, MP3 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ (for operating pressure up to 160 bar) | | | | | ISO ²⁾ (for operating pressure up to 210 bar) | | | | | B Ø; f ₉ |
|---------|-------------------|--|------------------------|--------|-----|----|--|------------------------|--------|-----|----|------------------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 25 | 12 | M10x1.25 | 14 | 11 | 10 | 5 | – | – | – | – | – | 24 |
| | 18 | M10x1.25 | 14 | 16.5 | 14 | 5 | M14x1.5 | 18 | 16.5 | 14 | 5 | 30 |
| 32 | 14 | M12x1.25 | 16 | 13 | 12 | 5 | – | – | – | – | – | 26 |
| | 22 | M12x1.25 | 16 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| 40 | 18 | M14x1.5 | 18 | 16.5 | 14 | 5 | – | – | – | – | – | 30 |
| | 22 ¹²⁾ | M14x1.5 | 18 | 20.5 | 18 | 5 | M16x1.5 | 22 | 20.5 | 18 | 5 | 34 |
| | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 22 | M16x1.5 | 22 | 20.5 | 18 | 5 | – | – | – | – | – | 34 |
| | 28 ¹²⁾ | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 28 | M20x1.5 | 28 | 26 | 22 | 7 | – | – | – | – | – | 42 |
| | 36 ¹²⁾ | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 36 | M27x2 | 36 | 34 | 30 | 8 | – | – | – | – | – | 50 |
| | 45 ¹²⁾ | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 45 | M33x2 | 45 | 43 | 36 | 10 | – | – | – | – | – | 60 |
| | 56 ¹²⁾ | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 56 | M42x2 | 56 | 53 | 46 | 10 | – | – | – | – | – | 72 |
| | 70 ¹²⁾ | – | – | – | – | – | M48x2 ¹⁴⁾ | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 ¹⁴⁾ | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 ¹⁴⁾ | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 ¹⁴⁾ | 112 | 136 | 125 | 18 | 163 |

| AL Ø | E | EE | DT Ø | EE | DT Ø | GA | H ⁵⁾ | J | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|-----------|---------|---------|---------|---------|------|-----------------|------|--------------|-----------|----------|
| 25 | 40 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 46.5 | 5 | 22.5 | 53 | 15 | 50 |
| 32 | 45 ± 1.5 | G 1/4 | 25 | M14x1.5 | 21 | 48 | 5 | 25 | 56 | 25 | 60 |
| 40 | 63 ± 1.5 | G 3/8 | 28 | M18x1.5 | 26 | 52.5 | – | 33.5 | 73 | 25 | 62 |
| 50 | 75 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 33.5 | 74 | 25 | 67 |
| 63 | 90 ± 1.5 | G 1/2 | 34 | M22x1.5 | 29 | 57.5 | – | 35.5 | 80 | 32 | 71 |
| 80 | 115 ± 1.5 | G 3/4 | 42 | M27x2 | 34 | 67 | – | 41 | 93 | 31 | 77 |
| 100 | 130 ± 2 | G 3/4 | 42 | M27x2 | 34 | 70 | – | 43 | 101 | 35 | 82 |
| 125 | 165 ± 2 | G 1 | 47 | M33x2 | 43 | 73.5 | – | 51.5 | 117 | 35 | 86 |
| 160 | 205 ± 2 | G 1 | 47 | M33x2 | 43 | 80.5 | – | 55.5 | 130 | 32 | 86 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | M42x2 | 52 | 101 | – | 76 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 61

9) Bolt included in the scope of delivery

10) Lubricating nipple M6 DIN 71412

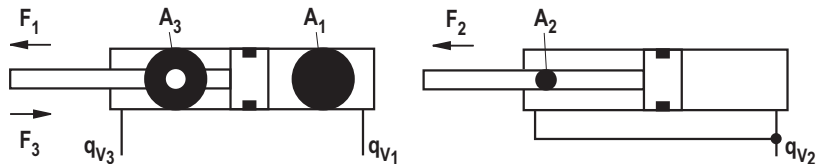
12) Piston rod Ø not standardized

14) With operating pressures up to 210 bar only on request

Areas, forces, flow: Series CST3 (for operating pressure up to 160 bar)

| Piston AL Ø mm | Piston rod MM Ø mm | Area ratio φ A_1/A_3 | Areas | | | Force at 160 bar ¹⁾ | | | Flow at 0.1 m/s ²⁾ | | |
|-----------------------------|---------------------------------|--------------------------------------|------------------------------------|---------------------------------|----------------------------------|--------------------------------|----------------------|------------------------|-------------------------------|----------------------------|-------------------------|
| | | | Piston A_1 cm ² | Rod A_2 cm ² | Ring A_3 cm ² | Pressure F_1 kN | Diff. F_2 kN | Pulling F_3 kN | Off q_{V1} l/min | Diff. q_{V2} l/min | On q_{V3} l/min |
| 40 | 28 | 1.96 | 12.56 | 6.16 | 6.40 | 20.11 | 9.85 | 10.25 | 7.5 | 3.7 | 3.8 |
| 50 | 28 ³⁾ | 1.46 | 19.63 | 6.16 | 13.48 | 31.42 | 9.85 | 21.56 | 11.8 | 3.7 | 8.1 |
| | 36 | 2.08 | | | | | | | | | |
| 63 | 36 ³⁾ | 1.48 | 31.17 | 10.18 | 20.99 | 49.88 | 16.29 | 33.59 | 18.7 | 6.1 | 12.6 |
| | 45 | 2.04 | | | | | | | | | |
| 80 | 45 ³⁾ | 1.46 | 50.26 | 15.90 | 34.36 | 80.42 | 25.45 | 54.98 | 30.2 | 9.5 | 20.6 |
| | 56 | 1.96 | | | | | | | | | |
| 100 | 56 ³⁾ | 1.46 | 78.54 | 24.63 | 53.91 | 125.66 | 39.41 | 86.26 | 47.1 | 14.8 | 32.3 |
| | 70 | 1.96 | | | | | | | | | |
| 125 | 70 ³⁾ | 1.46 | 122.72 | 38.48 | 84.23 | 196.35 | 61.58 | 134.77 | 73.6 | 23.1 | 50.5 |
| | 90 | 2.08 | | | | | | | | | |
| 160 | 70 | 1.25 | 201.06 | 38.48 | 162.58 | 321.70 | 61.58 | 260.12 | 120.6 | 23.1 | 97.5 |
| | 110 | 1.90 | | | | | | | | | |
| 200 | 90 | 1.25 | 314.16 | 63.62 | 250.54 | 502.65 | 101.79 | 400.86 | 188.5 | 38.2 | 150.3 |
| | 140 | 1.96 | | | | | | | | | |

- 1) Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. tilt heads, plates or valves, etc.)
- 2) Stroke velocity
- 3) Piston rod Ø not standardized



Overview types of mounting: Series CST3 (only for operating pressure up to 160 bar)

CST3 ME5

see page 30, 31



CST3 MP5

see page 32, 33



CST3 MS2

see page 34, 35



CST3 MT4

see page 36, 37



CST3 MX5

see page 38, 39



Ordering code: Series CST3 (for operating pressure up to 160 bar)

| | | | | | | | | | | | | | | | | |
|----|----|---|---|---|---|----|--|--|--|--|--|--|--|--|--|---|
| CS | T3 | / | / | / | Z | 2X | | | | | | | | | | * |
|----|----|---|---|---|---|----|--|--|--|--|--|--|--|--|--|---|

Differential cylinder with position measurement system ¹⁰⁾ = CS

Series = T3

Types of mounting DIN/ISO

- Rectangular flange at head = ME5
- Self-aligning clevis at base = MP5
- Foot mounting ⁸⁾ = MS2
- Trunnion in center ¹⁾ = MT4
- Tapped hole at head = MX5

Piston Ø (AL) 40 to 200 mm

Piston rod Ø (MM) 28 to 140 mm

Stroke length in mm ¹¹⁾

Design principle

Head and base connected to tie rod = Z

Component series = 2X

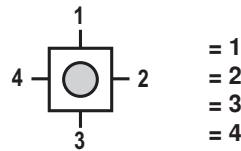
20 to 29 unchanged installation and connection dimensions

Line connection/design

- Pipe thread (ISO 1179-1) = B
- Subplate size 6 ^{8; 9)} = P
- Subplate size 10 ⁸⁾ = T
- Subplate size 16 ^{8; 15)} = U

Line connection/position at head

see page 41



View to piston rod

Order example:

CST3ME5/50/36/300Z2X/P11HDUTTD

When selecting, please observe the limitations on the corresponding catalog pages!

Further details in the plain text

Option 2

- V = Prepared for position measurement system
- C = Analog output 4-20 mA
- F = Analog output 0-10 V
- D = Digital output SSI

Option 1

- T = Position measurement system (magnetostrictive) without mating connector
- Mating connector – separate order see page 46

Seal design

- M = Standard seal system
- T = Servo quality/reduced friction
- S = High temperature with reduced friction

End position cushioning

U = Without

Piston rod end

see pages 30 to 39

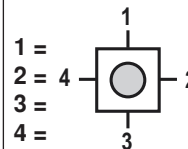
- H = Thread (DIN/ISO) for tilt head CGKA/CGKD
- D = Thread (ISO) for tilt head CGKA/CGKD
- F = With mounted tilt head CGKA/CGKD (DIN/ISO)
- K = With mounted tilt head CGKA/CGKD (DIN/ISO)

Piston rod design

H = Hardened and hard chromium-plated

Line connection/position at base

See page 41



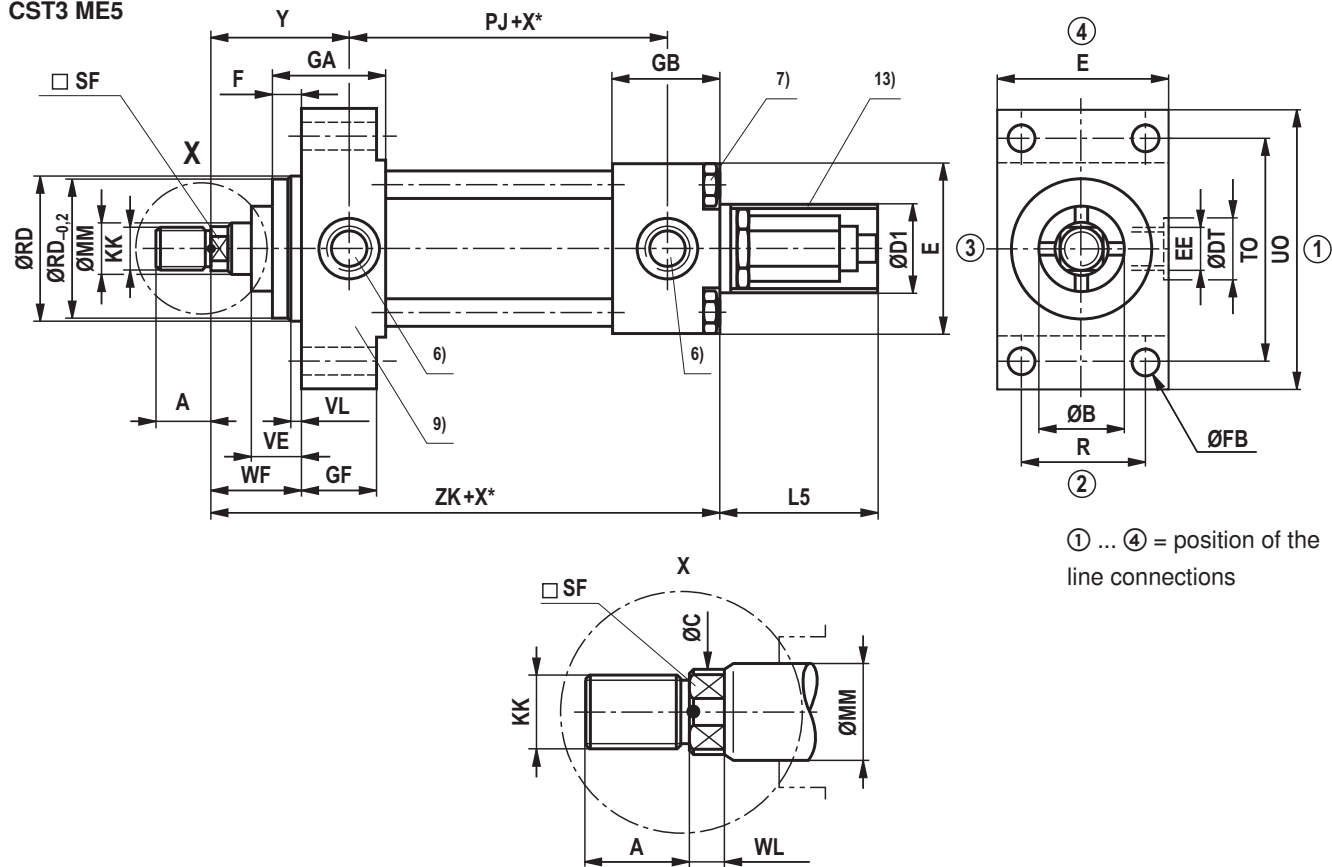
View to piston rod

Comments:

- 1) Trunnion position freely selectable; when ordering, always specify the "XV" dimension in the clear text in mm
- 8) Only position 11 possible
- 9) Only up to piston Ø 80 mm
- 10) Not standardized
- 11) Observe the max. and min. stroke length on pages 30 to 39 and the admissible stroke length (according to kinking calculation) on pages 50 to 53
- 15) Only piston Ø 100 – 200 mm

Device dimensions: Type of mounting ME5 (dimensions in mm)

CST3 ME5



① ... ④ = position of the line connections

| AL Ø | MM Ø | PJ ¹⁰⁾ ± 1.25 | PJ ¹¹⁾ ± 1.25 | R JS13 | TO JS13 | UO max | VE max | VL min | ZK ± 1 | L5 | D1 Ø max | X* max | X* min without subplate | X* min with subplate |
|---------|-----------|-----------------------------|-----------------------------|-----------|------------|-----------|-----------|-----------|-----------|----|----------------|--------------|----------------------------------|-------------------------------|
| 40 | 28 | 73 | 77 | 41 | 87 | 110 | 22 | 3 | 195 | - | - | 600 | - | 50 |
| 50 | 28 36 | 74 | 78 | 52 | 105 | 130 | 25 | 4 | 194 | - | - | 500 800 | - | 50 |
| 63 | 36 45 | 80 | 81 | 65 | 117 | 145 | 29 | 4 | 205 | 82 | 96 | 650 1000 | - | 45 |
| 80 | 45 56 | 93 | 93 | 83 | 149 | 180 | 29 | 4 | 234 | 82 | 96 | 800 1200 | - | 32 |
| 100 | 56 70 | 101 | 101 | 97 | 162 | 200 | 32 | 5 | 248 | 82 | 96 | 1000 1370 | - | 57 |
| 125 | 70 90 | 117 | 117 | 126 | 208 | 250 | 32 | 5 | 260.5 | 82 | 96 | 1200 1420 | - | 35 |
| 160 | 70 110 | 130 | 130 | 155 | 253 | 300 | 32 | 5 | 272.5 | 82 | 96 | 1000 1410 | 20 | 20 |
| 200 | 90 140 | 160 | 160 | 190 | 300 | 360 | 32 | 5 | 329 | 82 | 96 | 1300 1350 | 20 | 20 |

Device dimensions: ME5 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ | | | | | ISO ²⁾ | | | | | B Ø; f9 | RD Ø; f8 |
|---------|---------|-------------------------|------------------------|--------|-----|----|-------------------|------------------------|--------|-----|----|------------|-------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | | |
| 40 | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 | 62 |
| 50 | 28 | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 | 74 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 | 74 |
| 63 | 36 | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 | 88 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 | 88 |
| 80 | 45 | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 | 105 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 | 105 |
| 100 | 56 | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 | 125 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 | 125 |
| 125 | 70 | – | – | – | – | – | M48x2 | 63 | 67 | 60 | 15 | 88 | 150 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 | 85 | 86 | 75 | 15 | 108 | 150 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 | 125 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 | 95 | 106 | 92 | 18 | 133 | 170 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 | 150 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 | 112 | 136 | 125 | 18 | 163 | 210 |

| AL Ø | F max | FB Ø; H13 | GF ⁹⁾ | E | EE | DT Ø | GA | GB | WF ± 2 | Y ¹⁰⁾ ± 2 | Y ¹¹⁾ ± 2 |
|---------|----------|--------------|------------------|-----------|---------|---------|------|------|-----------|-------------------------|-------------------------|
| 40 | 10 | 11 | 38 | 63 ± 1.5 | G 3/8 | 28 | 52.5 | 75.5 | 35 | 62 | 58 |
| 50 | 16 | 14 | 38 | 75 ± 1.5 | G 1/2 | 34 | 57.5 | 68.5 | 41 | 67 | 63 |
| 63 | 16 | 14 | 38 | 90 ± 1.5 | G 1/2 | 34 | 57.5 | 72.5 | 48 | 71 | 70 |
| 80 | 20 | 18 | 45 | 115 ± 1.5 | G 3/4 | 42 | 67 | 85 | 51 | 77 | 77 |
| 100 | 22 | 18 | 45 | 130 ± 2 | G 3/4 | 42 | 70 | 88 | 57 | 82 | 82 |
| 125 | 22 | 22 | 58 | 165 ± 2 | G 1 | 47 | 80 | 73.5 | 57 | 86 | 86 |
| 160 | 25 | 26 | 58 | 205 ± 2 | G 1 | 47 | 83 | 80.5 | 57 | 86 | 86 |
| 200 | 25 | 33 | 76 | 245 ± 2 | G 1 1/4 | 58 | 101 | 101 | 57 | 98 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

X*min Min. stroke length

X*max Max. stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 61

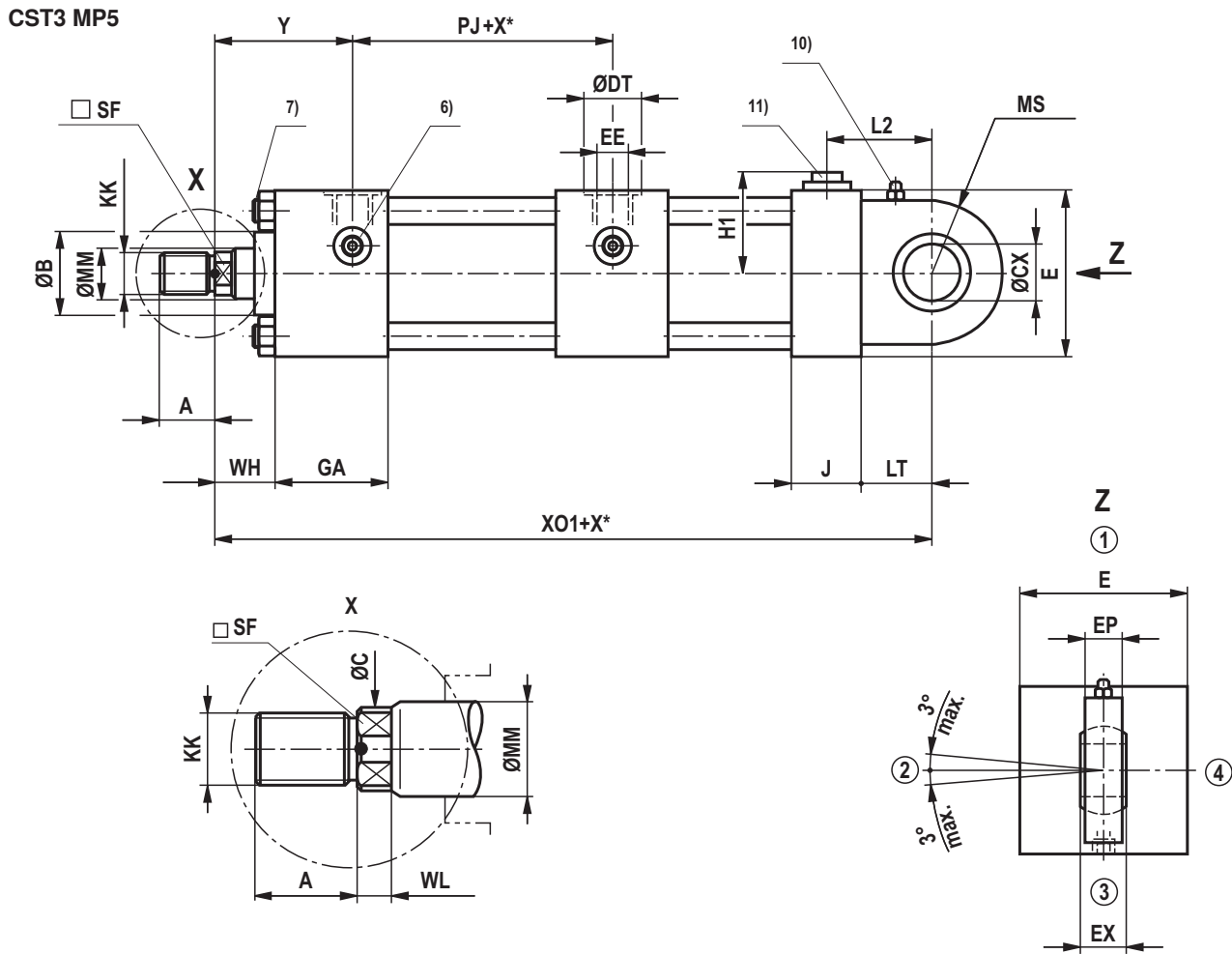
9) Flange thickness according to DIN 24554

10) ME5: For line connection position "1" and "3" at head

11) ME5: For line connection position "2" and "4" at head

13) With piston Ø 40 – 50 mm without protective pipe

Device dimensions: Type of mounting MP5 (dimensions in mm)



① ... ④ = position of the line connections

| AL Ø | MM Ø | CX Ø | EP h13 | EX | LT min | X01 ± 1.5 | MS max | X* max | X* min without subplate | X* min with subplate |
|---------|-----------|-------------|-----------|-----------|-----------|--------------|-----------|-------------|----------------------------------|-------------------------------|
| 40 | 28 | 20 - 0.012 | 13 | 16 - 0.12 | 25 | 348 | 29 | 390 | - | 50 |
| 50 | 28 36 | 25 - 0.012 | 17 | 20 - 0.12 | 31 | 365 | 33 | 325 520 | - | 50 |
| 63 | 36 45 | 30 - 0.012 | 19 | 22 - 0.12 | 38 | 383 | 40 | 420 650 | - | 45 |
| 80 | 45 56 | 40 - 0.012 | 23 | 28 - 0.12 | 48 | 410 | 50 | 520 780 | - | 32 |
| 100 | 56 70 | 50 - 0.012 | 30 | 35 - 0.12 | 58 | 436 | 62 | 650 940 | - | 57 |
| 125 | 70 90 | 60 - 0.015 | 38 | 44 - 0.15 | 72 | 487 | 80 | 780 1240 | - | 35 |
| 160 | 70 110 | 80 - 0.015 | 47 | 55 - 0.15 | 92 | 528 | 100 | 650 1410 | 20 | 20 |
| 200 | 90 140 | 100 - 0.020 | 57 | 70 - 0.20 | 116 | 632 | 120 | 850 1350 | 20 | 20 |

Device dimensions: MP5 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ | | | | | ISO ²⁾ | | | | | B Ø; f9 |
|---------|---------|-------------------------|------------------------|--------|-----|----|-------------------|------------------------|--------|-----|----|------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 40 | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 28 | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 36 | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 45 | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 56 | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 70 | – | – | – | – | – | M48x2 | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 | 112 | 136 | 125 | 18 | 163 |

| AL Ø | H1 | L2 | E | EE | DT Ø | GA | J | PJ ± 1.25 | WH ± 2 | Y ± 2 |
|---------|-------|-------|-----------|---------|---------|------|------|--------------|-----------|----------|
| 40 | 40 | 43.5 | 63 ± 1.5 | G 3/8 | 28 | 52.5 | 33.5 | 73 | 25 | 62 |
| 50 | 45.5 | 49 | 75 ± 1.5 | G 1/2 | 34 | 57.5 | 33.5 | 74 | 25 | 67 |
| 63 | 53 | 55 | 90 ± 1.5 | G 1/2 | 34 | 57.5 | 35.5 | 80 | 32 | 71 |
| 80 | 65.5 | 68 | 115 ± 1.5 | G 3/4 | 42 | 67 | 41 | 93 | 31 | 77 |
| 100 | 73 | 78 | 130 ± 2 | G 3/4 | 42 | 70 | 43 | 101 | 35 | 82 |
| 125 | 90.5 | 101 | 165 ± 2 | G 1 | 47 | 73.5 | 51.5 | 117 | 35 | 86 |
| 160 | 110.5 | 120.5 | 205 ± 2 | G 1 | 47 | 80.5 | 55.5 | 130 | 32 | 86 |
| 200 | 130.5 | 157 | 245 ± 2 | G 1 1/4 | 58 | 101 | 76 | 165 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

X*min Min. stroke length

X*max Max. stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

6) For the position of the line connections and the bleeding see page 41

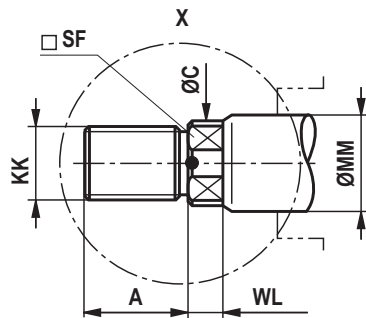
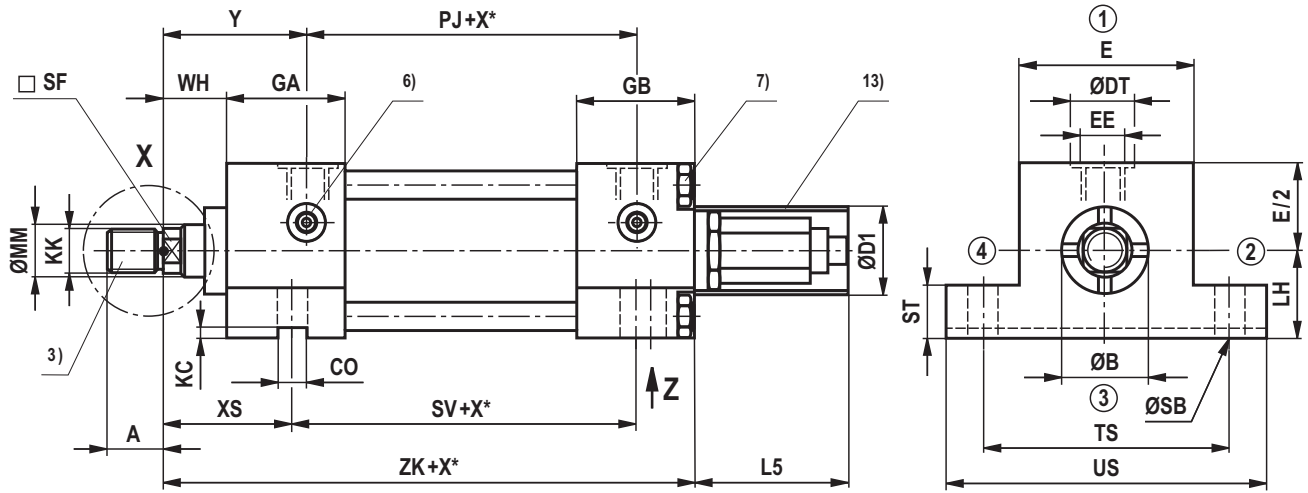
7) Tightening torque see page 61

10) Lubricating nipple M6 DIN 71412

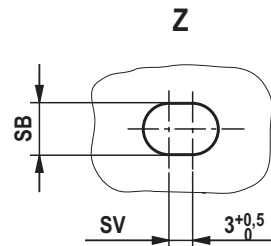
11) Only in line connection position 1 at base

Device dimensions: Type of mounting MS2 (dimensions in mm)

CST3 MS2



① ... ④ = position of the line connections



| AL Ø | CO N9 | KC $+0.2$ 0 | LH h10 | PJ ± 1.25 | SB (Ø); H13 | ST | SV ± 1 | TS JS13 | US max |
|---------|----------|-------------------|-----------|------------------|----------------|------|---------------|------------|-----------|
| 40 | 12 | 4 | 31 | 73 | 11 | 12.5 | 106.5 | 83 | 103 |
| 50 | 12 | 4.5 | 37 | 74 | 14 | 19 | 99.5 | 102 | 127 |
| 63 | 16 | 4.5 | 44 | 80 | 18 | 26 | 91.5 | 124 | 161 |
| 80 | 16 | 5 | 57 | 93 | 18 | 26 | 110.5 | 149 | 186 |
| 100 | 16 | 6 | 63 | 101 | 26 | 32 | 106.5 | 172 | 216 |
| 125 | 20 | 6 | 82 | 117 | 26 | 32 | 131 | 210 | 254 |
| 160 | 30 | 8 | 101 | 130 | 33 | 38 | 130 | 260 | 318 |
| 200 | 40 | 8 | 122 | 160 | 39 | 44 | 172 | 311 | 381 |

Device dimensions: MS2 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ | | | | | ISO ²⁾ | | | | | B Ø; f9 |
|---------|---------|-------------------------|------------------------|--------|-----|----|-------------------|------------------------|--------|-----|----|------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 40 | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 28 | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 36 | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 45 | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 56 | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 70 | – | – | – | – | – | M48x2 | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 | 112 | 136 | 125 | 18 | 163 |

| AL Ø | E | EE | DT Ø | GA | GB | WH ± 2 | Y ± 2 |
|---------|-----------|---------|---------|------|------|-----------|----------|
| 40 | 63 ± 1.5 | G 3/8 | 28 | 52.5 | 75.5 | 25 | 62 |
| 50 | 75 ± 1.5 | G 1/2 | 34 | 57.5 | 68.5 | 25 | 67 |
| 63 | 90 ± 1.5 | G 1/2 | 34 | 57.5 | 72.5 | 32 | 71 |
| 80 | 115 ± 1.5 | G 3/4 | 42 | 67 | 85 | 31 | 77 |
| 100 | 130 ± 2 | G 3/4 | 42 | 70 | 88 | 35 | 82 |
| 125 | 165 ± 2 | G 1 | 47 | 73.5 | 73.5 | 35 | 86 |
| 160 | 205 ± 2 | G 1 | 47 | 80.5 | 80.5 | 32 | 86 |
| 200 | 245 ± 2 | G 1 1/4 | 58 | 101 | 101 | 32 | 98 |

| AL Ø | MM Ø | XS ± 2 | ZK ± 1 | L5 | D1 Ø max | X* max | X* min without subplate | X* min with subplate |
|---------|---------|-----------|-----------|----|----------------|-----------|----------------------------------|-------------------------------|
| 40 | 28 | 45 | 195 | – | – | 600 | – | 50 |
| 50 | 28 | 54 | 194 | – | – | 500 | – | 50 |
| | 800 | | | | | | | |
| 63 | 36 | 65 | 205 | 82 | 96 | 650 | – | 45 |
| | 45 | | | | | 1000 | | |
| 80 | 45 | 68 | 234 | 82 | 96 | 800 | – | 32 |
| | 56 | | | | | 1200 | | |
| 100 | 56 | 79 | 248 | 82 | 96 | 1000 | – | 57 |
| | 70 | | | | | 1370 | | |
| 125 | 70 | 79 | 254 | 82 | 96 | 1200 | – | 35 |
| | 90 | | | | | 1420 | | |
| 160 | 70 | 86 | 270 | 82 | 96 | 1000 | 20 | 20 |
| | 110 | | | | | 1410 | | |
| 200 | 90 | 92 | 324 | 82 | 96 | 1300 | 20 | 20 |
| | 140 | | | | | 1350 | | |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

X*min Min. stroke length

X*max Max. stroke length

²⁾ Thread for piston rod ends "D" and "K"⁶⁾ For the position of the line connections and the bleeding see page 41⁷⁾ Tightening torque see page 61¹³⁾ With piston Ø 40 – 50 mm without protective pipe¹⁾ Thread for piston rod ends "F" and "H"

Device dimensions: MT4 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ | | | | | ISO ²⁾ | | | | | B Ø; f9 |
|---------|---------|-------------------------|------------------------|--------|-----|----|-------------------|------------------------|--------|-----|----|------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 40 | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 28 | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 36 | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 45 | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 56 | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 70 | – | – | – | – | – | M48x2 | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 | 112 | 136 | 125 | 18 | 163 |

| AL Ø | PJ ± 1.25 | TK max | TM h14 | UM h15 | UW max | r | TD Ø; f8 | E | EE | DT Ø | GA | GB | WH ± 2 | Y ± 2 |
|---------|--------------|-----------|-----------|-----------|-----------|-----|-------------|-----------|---------|---------|------|------|-----------|----------|
| 40 | 73 | 30 | 76 | 108 | 74 | 1.2 | 20 | 63 ± 1.5 | G 3/8 | 28 | 52.5 | 75.5 | 25 | 62 |
| 50 | 74 | 40 | 89 | 129 | 81 | 1.6 | 25 | 75 ± 1.5 | G 1/2 | 34 | 57.5 | 68.5 | 25 | 67 |
| 63 | 80 | 50 | 100 | 150 | 97 | 1.6 | 32 | 90 ± 1.5 | G 1/2 | 34 | 57.5 | 72.5 | 32 | 71 |
| 80 | 93 | 60 | 127 | 191 | 124 | 2.4 | 40 | 115 ± 1.5 | G 3/4 | 42 | 67 | 85 | 31 | 77 |
| 100 | 101 | 70 | 140 | 220 | 137 | 2.4 | 50 | 130 ± 2 | G 3/4 | 42 | 70 | 88 | 35 | 82 |
| 125 | 117 | 90 | 178 | 278 | 175 | 3.2 | 63 | 165 ± 2 | G 1 | 47 | 73.5 | 73.5 | 35 | 86 |
| 160 | 130 | 110 | 215 | 341 | 221 | 3.2 | 80 | 205 ± 2 | G 1 | 47 | 80.5 | 80.5 | 32 | 86 |
| 200 | 160 | 130 | 279 | 439 | 281 | 3.2 | 100 | 245 ± 2 | G 1 1/4 | 58 | 101 | 101 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

X*min Min. stroke length

X*max Max. stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

6) For the position of the line connections and the bleeding see page 41

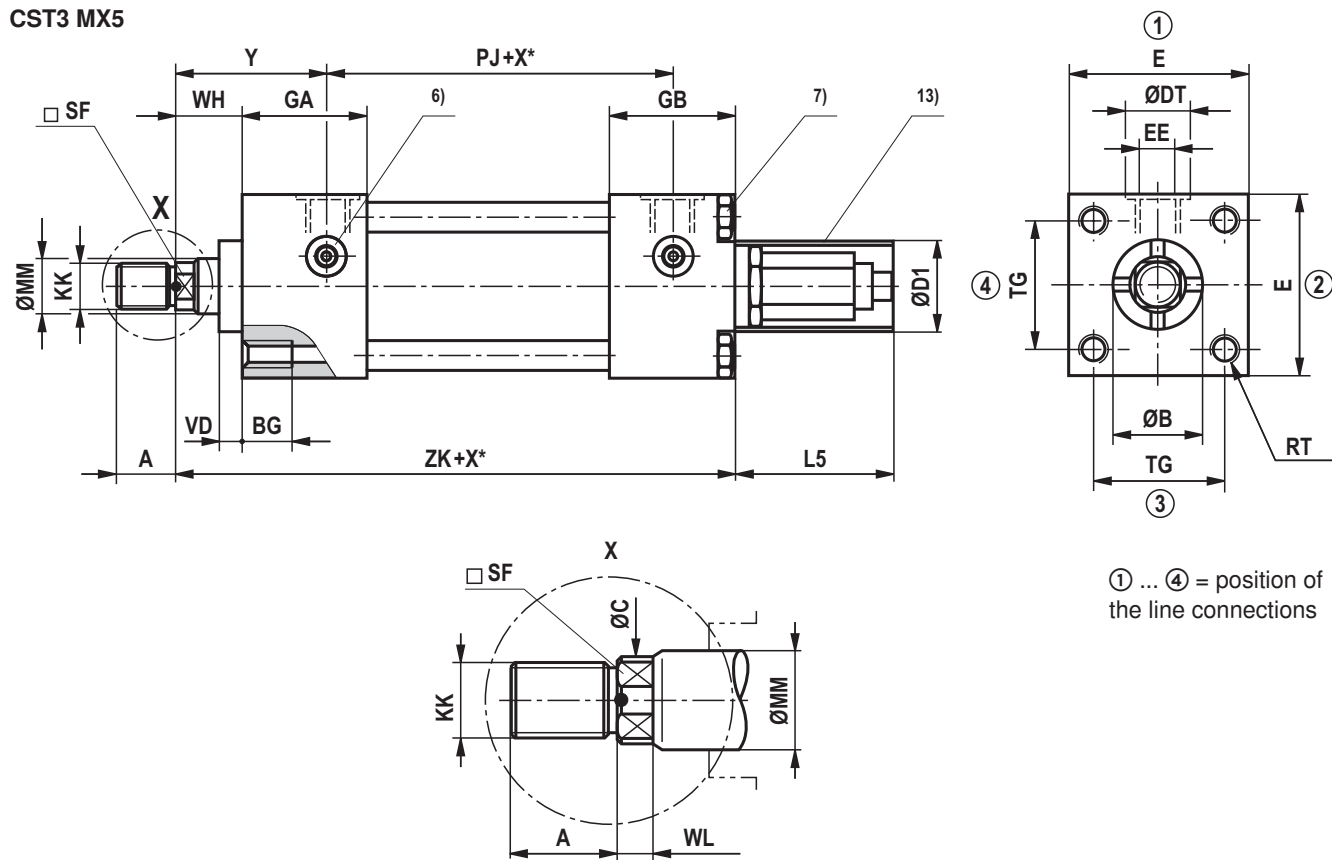
7) Tightening torque see page 61

9) "XV" dimension in mm, always specify in the plain text

13) With piston Ø 40 – 50 mm without protective pipe

Device dimensions: Type of mounting MX5 (dimensions in mm)

CST3 MX5



① ... ④ = position of the line connections

| AL Ø | MM Ø | BG min | PJ ± 1.25 | RT 6H | TG js13 | VD | ZK ± 1 | X* max | X* min without subplate | X* min with subplate |
|---------|-----------|-----------|--------------|----------|------------|----|-----------|--------------|----------------------------------|-------------------------------|
| 40 | 28 | 12 | 73 | M8x1.25 | 41.7 | 12 | 195 | 600 | - | 50 |
| 50 | 28 36 | 18 | 74 | M12x1.75 | 52.3 | 9 | 194 | 500 800 | - | 50 |
| 63 | 36 45 | 18 | 80 | M12x1.75 | 64.3 | 13 | 205 | 650 1000 | - | 45 |
| 80 | 45 56 | 24 | 93 | M16x2 | 82.7 | 9 | 234 | 800 1200 | - | 32 |
| 100 | 56 70 | 24 | 101 | M16x2 | 96.9 | 10 | 248 | 1000 1370 | - | 57 |
| 125 | 70 90 | 27 | 117 | M22x2.5 | 125.9 | 9 | 254 | 1200 1420 | - | 35 |
| 160 | 70 110 | 32 | 130 | M27x3 | 154.9 | 7 | 270 | 1000 1410 | 20 | 20 |
| 200 | 90 140 | 40 | 160 | M30x3.5 | 190.2 | 7 | 324 | 1300 1350 | 20 | 20 |

Device dimensions: MX5 (dimensions in mm)

| AL Ø | MM Ø | DIN / ISO ¹⁾ | | | | | ISO ²⁾ | | | | | B Ø; f9 |
|---------|---------|-------------------------|------------------------|--------|-----|----|-------------------|------------------------|--------|-----|----|------------|
| | | KK ¹⁾ | A ¹⁾ max | C Ø | SF | WL | KK ²⁾ | A ²⁾ max | C Ø | SF | WL | |
| 40 | 28 | M14x1.5 | 18 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| 50 | 28 | M16x1.5 | 22 | 26 | 22 | 7 | M20x1.5 | 28 | 26 | 22 | 7 | 42 |
| | 36 | M16x1.5 | 22 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| 63 | 36 | M20x1.5 | 28 | 34 | 30 | 8 | M27x2 | 36 | 34 | 30 | 8 | 50 |
| | 45 | M20x1.5 | 28 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| 80 | 45 | M27x2 | 36 | 43 | 36 | 10 | M33x2 | 45 | 43 | 36 | 10 | 60 |
| | 56 | M27x2 | 36 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| 100 | 56 | M33x2 | 45 | 54 | 46 | 10 | M42x2 | 56 | 54 | 46 | 10 | 72 |
| | 70 | M33x2 | 45 | 68 | 60 | 15 | M48x2 | 63 | 68 | 60 | 15 | 88 |
| 125 | 70 | – | – | – | – | – | M48x2 | 63 | 67 | 60 | 15 | 88 |
| | 90 | M42x2 | 56 | 86 | 75 | 15 | M64x3 | 85 | 86 | 75 | 15 | 108 |
| 160 | 70 | M48x2 | 63 | 67 | 60 | 15 | – | – | – | – | – | 88 |
| | 110 | M48x2 | 63 | 106 | 92 | 18 | M80x3 | 95 | 106 | 92 | 18 | 133 |
| 200 | 90 | M64x3 | 85 | 86 | 75 | 15 | – | – | – | – | – | 108 |
| | 140 | M64x3 | 85 | 136 | 125 | 18 | M100x3 | 112 | 136 | 125 | 18 | 163 |

| AL Ø | L5 | D1 Ø max | E | EE | DT | GA | GB | WH ± 2 | Y ± 2 |
|---------|----|----------------|-----------|---------|----|------|------|-----------|----------|
| 40 | – | – | 63 ± 1.5 | G 3/8 | 28 | 52.5 | 75.5 | 25 | 62 |
| 50 | – | – | 75 ± 1.5 | G 1/2 | 34 | 57.5 | 68.5 | 25 | 67 |
| 63 | 82 | 96 | 90 ± 1.5 | G 1/2 | 34 | 57.5 | 72.5 | 32 | 71 |
| 80 | 82 | 96 | 115 ± 1.5 | G 3/4 | 42 | 67 | 85 | 31 | 77 |
| 100 | 82 | 96 | 130 ± 2 | G 3/4 | 42 | 70 | 88 | 35 | 82 |
| 125 | 82 | 96 | 165 ± 2 | G 1 | 47 | 73.5 | 73.5 | 35 | 86 |
| 160 | 82 | 96 | 205 ± 2 | G 1 | 47 | 80.5 | 80.5 | 32 | 86 |
| 200 | 82 | 96 | 245 ± 2 | G 1 1/4 | 58 | 101 | 101 | 32 | 98 |

AL Piston Ø

MM Piston rod Ø

X* Stroke length

X*min Min. stroke length

X*max Max. stroke length

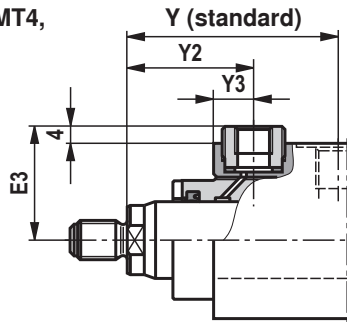
¹⁾ Thread for piston rod ends "F" and "H"²⁾ Thread for piston rod ends "D" and "K"⁶⁾ For the position of the line connections and the bleeding see page 41⁷⁾ Tightening torque see page 61¹³⁾ With piston Ø 40 – 50 mm without protective pipe

Leakage oil connection/enlarged line connection (dimensions in mm)

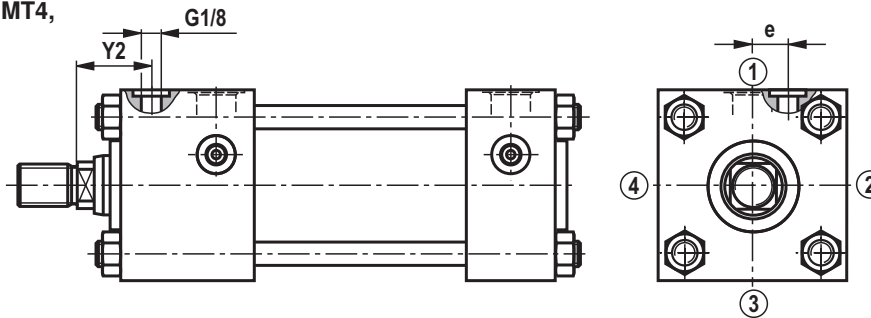
Leakage oil connection

If technical high-quality seals are used, use of a leakage oil connection is generally not necessary. A drag oil collection connection is only recommended in special cases such as extension velocity more than 2 times retraction velocity with larger strokes, permanent pressurization and the like. In case the extension velocities are more than 5 times the retraction velocity, please contact us.

ME6, MP5, MS2, MT4,
Ø 25, 32, 40



ME5, ME6, MP5, MS2, MT4,
Ø 50 to Ø 200



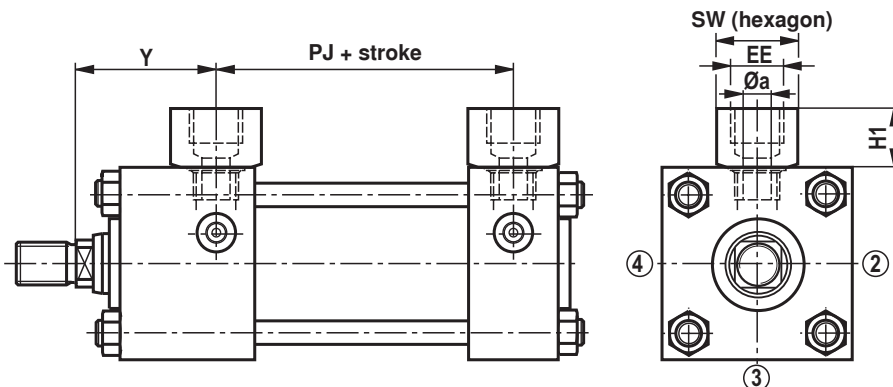
| AL Ø | MM Ø | MS2, MT4 ME6, MP5 | | | | ME5 | |
|---------|---------|----------------------|------|------|------|-----|----|
| | | e | Y2 | Y3 | E3 | e | Y2 |
| 25 | | 0 | 25.5 | 10.5 | 29.5 | 17 | 35 |
| 32 | | 0 | 35.5 | 10.5 | 32 | 18 | 45 |
| 40 | | 0 | 36 | 11 | 36 | 22 | 47 |
| 50 | | 14.5 | 39 | - | - | 34 | 52 |
| 63 | | 16 | 45.5 | - | - | 43 | 59 |
| 80 | | 16 | 48 | - | - | 27 | 62 |
| 100 | 45 | 16 | 52 | - | - | 30 | 68 |
| 100 | 70 | 16 | 55 | - | - | 30 | 68 |
| 125 | 56 | 16 | 54 | - | - | 45 | 68 |
| 125 | 90 | 18 | 57 | - | - | 45 | 68 |
| 160 | 70 | 16 | 54 | - | - | 45 | 68 |
| 160 | 110 | 16 | 54 | - | - | 47 | 68 |
| 200 | 90 | 16 | 55 | - | - | 45 | 68 |
| 200 | 140 | 24 | 61 | - | - | 45 | 72 |

Enlarged line connection

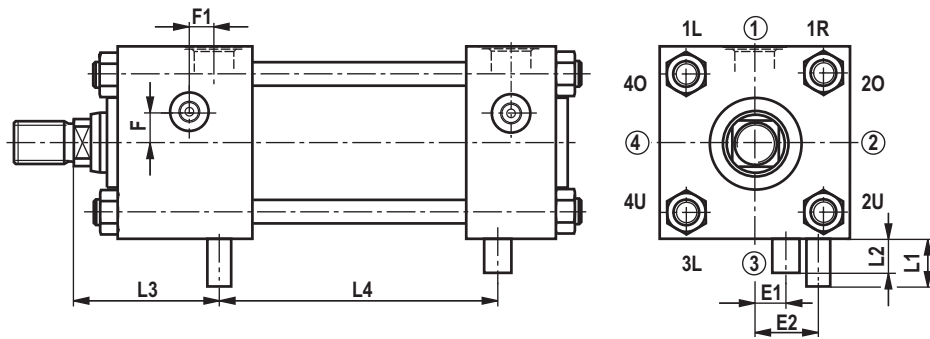
The oil ports of this series are generously dimensioned according to the standard; with high velocities, the pressure drop Δp can be reduced by using larger oil ports; sometimes, it is, however, no longer possible to comply with the standard dimensions, see table.

Cannot be realized for the types of mounting ME 5 / 6 with connection position 2 or 4.

| AL Ø | EE | H1 | Y ±2 | PJ ±1.25 | SW | a Ø |
|---------|-------|----|---------|-------------|----|--------|
| 25 | G3/8 | 20 | 50 | 53 | 27 | 9 |
| 32 | G3/8 | 20 | 60 | 56 | 27 | 9 |
| 40 | G1/2 | 23 | 62 | 73 | 32 | 11 |
| 50 | G3/4 | 29 | 67 | 74 | 41 | 14 |
| 63 | G3/4 | 29 | 71 | 80 | 41 | 14 |
| 80 | G1 | 33 | 77 | 93 | 46 | 18 |
| 100 | G1 | 33 | 82 | 101 | 46 | 18 |
| 125 | G11/4 | 39 | 86 | 117 | 60 | 23 |
| 160 | G11/4 | - | 86 | 130 | - | - |
| 200 | G11/2 | - | 98 | 165 | - | - |



Position of line connections/bleeding/leakage oil/throttle valve



| Mounting | Line connection | CDT3 / CST3 | | | | | CGT3 | | | | | | |
|---|-----------------|---------------|------|---------------------|------------------------|---------|---------------------|--------|--------------------|--------|-----------------------|--------|----|
| | | Bleeding Head | Base | Leakage oil Head 1) | Throttle valve Head 1) | Base 1) | Bleeding Head 1 | Head 2 | Leakage oil Head 1 | Head 2 | Throttle valve Head 1 | Head 2 | |
| MP5. MT4. MP1. MP3. MX1. MX2. MX3. MX5 | 1 | 2 | 2 | 1 | 3R | 3R | MT4. MX1. MX3 | 2 | 4 | 1 | 1 | 3R | 3L |
| | 2 | 3 | 3 | 2 | 4U | 4U | | 3 | 1 | 2 | 2 | 4U | 4O |
| | 3 | 4 | 4 | 3 | 1L | 1L | | 4 | 2 | 3 | 3 | 1L | 1R |
| | 4 | 1 | 1 | 4 | 2O | 2O | | 1 | 3 | 4 | 4 | 2O | 2U |
| ME5 | 1 | 2 | 2 | 1R | 3R | 3R | ME5 | 2 | 4 | 1R | 1 | 3R | 3L |
| | 2 | 3R | 3 | 1R | 1L | 4U | | 3R | 1 | 1R | 2 | 1L | 4O |
| | 3 | 4 | 4 | 3L | 1L | 1L | | 4 | 2 | 3L | 3 | 1L | 1R |
| | 4 | 1L | 1 | 3L | 3R | 2O | | 1L | 3 | 3L | 4 | 3R | 2U |
| MS2 | 1 | 2O | 2O | 1 | 4O | 4O | MS2 | 2O | 4O | 1 | 1 | 4O | 2O |
| MT1 | 1 | 3L | 2 | - | 3R | 3R | MT1 | 3L | 4 | - | - | 3R | 3L |
| | 3 | 1R | 4 | - | 1L | 1L | | 1R | 2 | - | - | 1L | 1R |
| MT2 | 1 | 2 | 3L | 1 | 3R | 3R | | | | | | | |
| | 3 | 4 | 1R | 3 | 1L | 1L | | | | | | | |
| ME6 | 1 | 2 | 2 | 1 | 3R | 3R | | | | | | | |
| | 2 | 3 | 3 | 2 | 4U | 1L | | | | | | | |
| | 3 | 4 | 4 | 3 | 1L | 1L | | | | | | | |
| | 4 | 1 | 1 | 4 | 2O | 3R | | | | | | | |

1) Not possible with CST3
 2) Protrusion 3 mm
 3) Types of mounting ME5, ME6, MP5, MT4, MP1, MP3, MT2, MX1, MX2, MX3 and MX5

| AL Ø | Bleeding | | | | | | Throttle valve adjustable on both sides | | | | | |
|---------|--------------------------|-----|-------------------------|-------------------------|-----------------------|-----------------|---|---------------|----|-----------|------|-----------|
| | F Head/base offset | | F1 Connection 1/3 | F1 Connection 2/4 | SW Allen wrench | L1 (Head) | L2 (Base) | Center offset | | Dimension | | |
| | 3) | MT1 | MS2 | ME5 | E1 (Head) | | | E2 (Base) | L3 | L4 | | |
| 25 | 0 | 6 | 5 | 11.5 | 0 | 5 ²⁾ | 12 | 12 | 6 | 6 | 48 | 57 + Hub |
| 32 | 0 | 5 | 5 | 12.5 | 0 | 5 ²⁾ | 12 | 12 | 9 | 9 | 57.5 | 61 + Hub |
| 40 | 10 | 10 | 10 | 0 | 10 | 5 | 5.5 | 5.5 | 8 | 8 | 61.5 | 74 + Hub |
| 50 | 10 | 10 | 10 | 0 | 10 | 5 | 3 | 3 | 10 | 10 | 67 | 74 + Hub |
| 63 | 14 | 14 | 14 | 0 | 14 | 5 | 0 | 0 | 15 | 15 | 72 | 78 + Hub |
| 80 | 10 | 10 | 10 | 0 | 10 | 6 | 0 | 0 | 14 | 14 | 81 | 85 + Hub |
| 100 | 12 | 12 | 12 | 0 | 12 | 6 | 0 | 0 | 13 | 13 | 86 | 93 + Hub |
| 125 | 0 | 0 | 0 | 0 | - | 6 | - | - | 22 | 22 | 91.5 | 109 + Hub |
| 160 | 0 | 0 | 0 | 0 | - | 6 | 4 | - | 30 | 30 | 93.5 | 115 + Hub |
| 200 | 0 | 0 | 0 | 0 | - | 6 | 4 | - | 30 | 30 | 114 | 128 + Hub |

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Bleeding/threaded coupling (dimensions in mm)

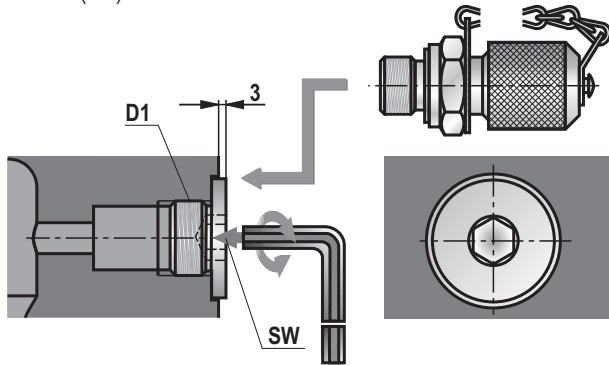
By default, a patented safety bleeding device against unintended screwing out in head and base is delivered for piston $\varnothing \geq 40$ mm.

For piston \varnothing 25 and 32 mm, a bleed screw G1/8 is installed in head and base which is **not** secured against screwing out.

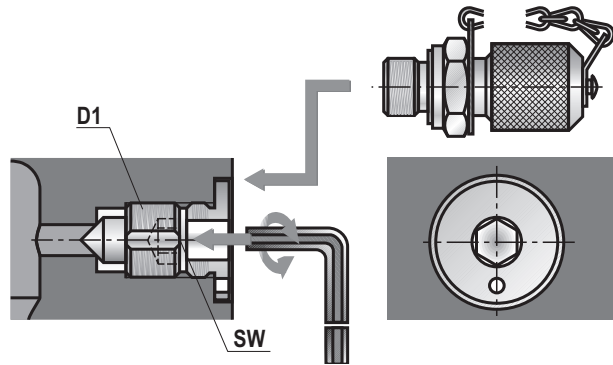
The port allows for the installation of a threaded coupling with check valve for pressure measurement or contamination-free bleeding. Threaded coupling with check valve function, i.e. it can also be connected when the system is pressurized.

Connection possibility for threaded coupling

Piston \varnothing (AL) 25 and 32 mm



Piston \varnothing (AL) 40 to 200 mm



| AL \varnothing | D1 | Bleed screw | | Threaded coupling | |
|------------------|------|-------------|----|-------------------|--|
| | | Fuse | SW | D2 | |
| 25 and 32 | G1/8 | not secured | 5 | G1/8 | |
| 40 and 63 | G1/8 | secured | 5 | G1/8 | |
| 80 to 200 | G1/4 | secured | 6 | G1/4 | |

Scope of delivery: Threaded coupling **G1/8**

SCHRAUBKUPPLUNG AB 20-11/K3 G1/8 with seal ring of NBR

Material no. **R900014363**

SCHRAUBKUPPLUNG AB 20-11/K3V G1/8 with seal ring of FKM

Material no. **R900024710**

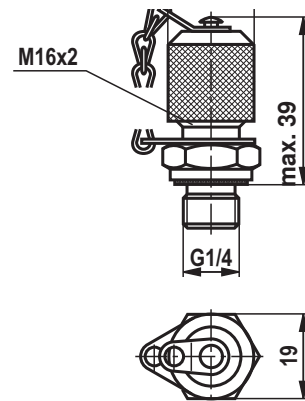
Scope of delivery: Threaded coupling **G1/4**

SCHRAUBKUPPLUNG AB 20-11/K1 G1/4 with seal ring of NBR

Material no. **R900009090**

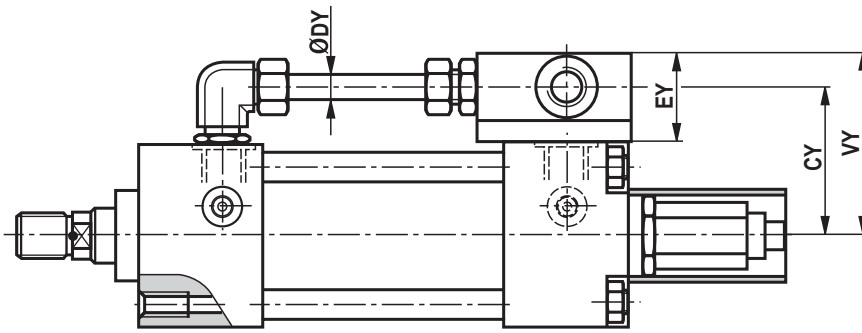
SCHRAUBKUPPLUNG AB 20-11/K1V G1/4 with seal ring of FKM

Material no. **R900001264**

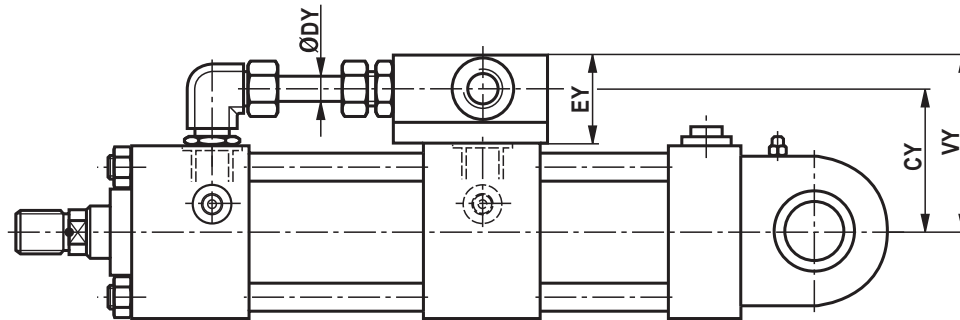


Subplates for valve mounting – dimensions and porting pattern (dimensions in mm)

MX5
ME5, MS2, MT4



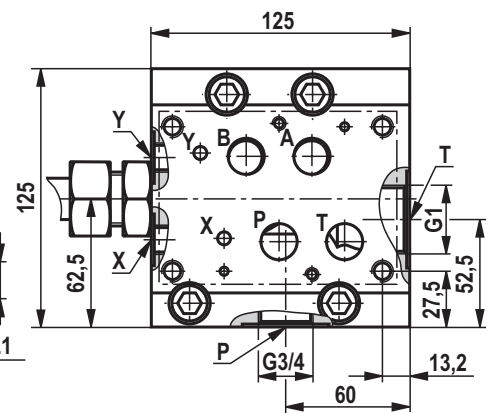
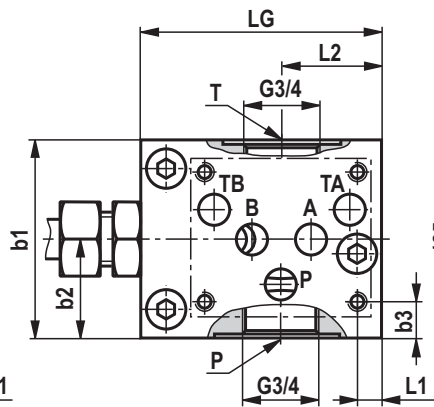
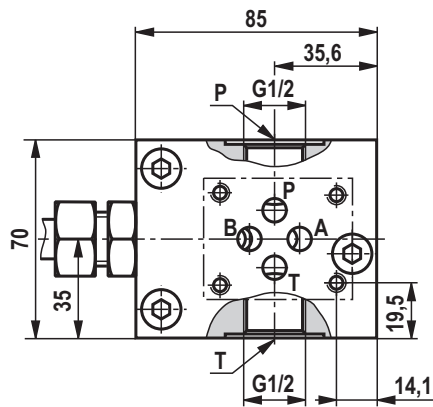
MP5



Size 6
Porting pattern according to ISO 4401

Size 10
Porting pattern according to ISO 4401

Size 16
Porting pattern according to ISO 4401



| AL Ø | Size 6 | | | | Size 10 | | | | | | | | Size 16 | | | | | |
|---------|--------|------|-------|---------|---------|------|-------|---------|-----|-----|------|-----|---------|------|-------|------|-------|---------|
| | CY | EY | VY | DY Ø | CY | EY | VY | DY Ø | LG | L1 | L2 | b1 | b2 | b3 | CY | EY | VY | DY Ø |
| 40 | 63.2 | 49.7 | 81.2 | 15 | 63.2 | 49.7 | 81.2 | 15 | 85 | 8.5 | 35.5 | 70 | 35 | 13 | - | - | - | - |
| 50 | 69.2 | 49.7 | 87.2 | 15 | 69.2 | 49.7 | 87.2 | 15 | 85 | 8.5 | 35.5 | 70 | 35 | 13 | - | - | - | - |
| 63 | 76.7 | 49.7 | 94.7 | 15 | 76.7 | 49.7 | 94.7 | 15 | 85 | 8.5 | 35.5 | 70 | 35 | 13 | - | - | - | - |
| 80 | 89.2 | 49.7 | 107.2 | 15 | 89.2 | 49.7 | 107.2 | 15 | 85 | 8.5 | 35.5 | 70 | 35 | 13 | - | - | - | - |
| 100 | - | - | - | - | 106.4 | 64.7 | 129.7 | 20 | 110 | 27 | 52 | 125 | 62.5 | 39.5 | 104 | 79.7 | 144.7 | 20 |
| 125 | - | - | - | - | 123.9 | 64.7 | 147.2 | 20 | 110 | 27 | 52 | 125 | 62.5 | 39.5 | 121.5 | 79.7 | 162.2 | 20 |
| 160 | - | - | - | - | 143.9 | 64.7 | 167.2 | 20 | 110 | 27 | 52 | 125 | 62.5 | 39.5 | 141.5 | 79.7 | 182.2 | 20 |
| 200 | - | - | - | - | 163.9 | 64.7 | 187.2 | 20 | 110 | 27 | 52 | 125 | 62.5 | 39.5 | 161.5 | 79.7 | 202.2 | 20 |

For the weight of the subplates refer to page 44.

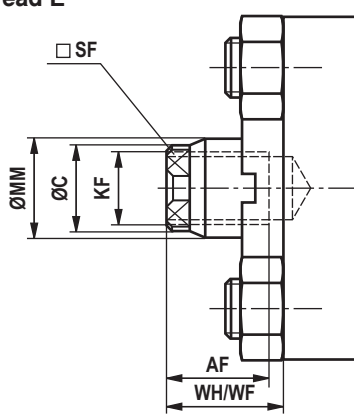
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Weight: Subplates

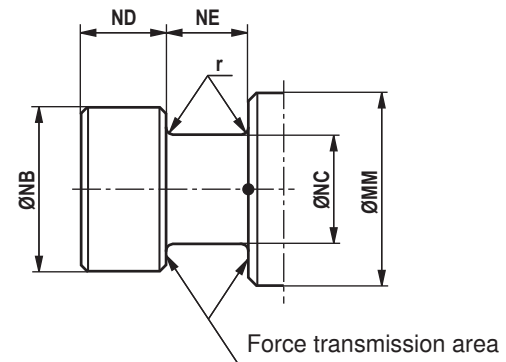
| AL Ø | Size 6 in kg | Size 10 in kg | Size 16 in kg |
|---------|-----------------|------------------|------------------|
| 40 | 2.3 | 2.3 | - |
| 50 | 2.3 | 2.3 | - |
| 63 | 2.3 | 2.3 | - |
| 80 | 2.3 | 2.3 | - |
| 100 | - | 7.0 | 9.8 |
| 125 | - | 7.0 | 9.8 |
| 160 | - | 7.0 | 9.8 |
| 200 | - | 7.0 | 9.8 |

Piston rod ends E and T (dimensions in mm)

Internal thread E



Trunnion T



| AL Ø | MM Ø | Stroke ²⁾ min | KF | DR | C Ø | SF | NB Ø; h13 | NC Ø; h13 | ND / NE h13 / H11 | r | p max. ¹⁾ bar |
|---------|---------|-----------------------------|----------|-----|--------|-----|--------------|--------------|----------------------|-----|-----------------------------|
| 25 | 18 | 14 | M12x1.25 | 18 | 17 | 15 | - | - | - | - | - |
| 32 | 22 | 17 | M16x1.5 | 22 | 21 | 18 | 18 | 11.2 | 8 | 0.5 | 160 |
| 40 | 18 | 20 | M12x1.25 | 18 | 17 | 15 | - | - | - | - | - |
| | 28 | 36 | M20x1.5 | 28 | 25 | 22 | 22.4 | 14 | 10 | 0.5 | 160 |
| 50 | 22 | 27 | M16x1.5 | 22 | 21 | 18 | 18 | 11.2 | 8 | 0.5 | 105 |
| | 36 | 56 | M27x2 | 36 | 33 | 30 | 28 | 18 | 12.5 | 0.8 | 190 |
| 63 | 28 | 33 | M20x1.5 | 28 | 25 | 22 | 22.4 | 14 | 10 | 0.5 | 95 |
| | 45 | 61 | M33x2 | 45 | 42 | 36 | 35.5 | 22.4 | 16 | 0.8 | 160 |
| 80 | 36 | 47 | M27x2 | 36 | 33 | 30 | 28 | 18 | 12.5 | 0.8 | 105 |
| | 56 | 64 | M42x2 | 56 | 53 | 46 | 45 | 28 | 20 | 1.2 | 160 |
| 100 | 45 | 0 | M33x2 | 45 | 42 | 36 | 35.5 | 22.4 | 16 | 0.8 | 90 |
| | 70 | 0 | M48x2 | 63 | 67 | 60 | 56 | 35.5 | 25 | 1.2 | 160 |
| 125 | 56 | 0 | M42x2 | 56 | 53 | 46 | 45 | 28 | 20 | 1.2 | 100 |
| | 90 | 30 | M64x3 | 85 | 86 | 75 | 78 | 45 | 30 | 1.5 | 160 |
| 160 | 70 | 5 | M48x2 | 63 | 67 | 60 | 56 | 35.5 | 25 | 1.5 | 90 |
| | 110 | 45 | M80x3 | 95 | 106 | 92 | 106 | 65 | 35 | 1.5 | 160 |
| 200 | 90 | 35 | M64x3 | 85 | 86 | 75 | 78 | 45 | 30 | 1.5 | 90 |
| | 140 | 67 | M100x3 | 112 | 136 | 125 | 136 | 70 | 45 | 1.5 | 160 |

1) with pulling load

2) = minimum stroke length with piston rod end "E"
and only with CGT3

Position measurement system

The position measurement system that is pressure-resistant up to 500 bar works in a contactless and absolute manner.

The basis of this position measurement system is the magnetostrictive effect. Here, the coincidence of two magnetic fields triggers a torsion pulse. This pulse runs on the waveguide inside the gauge from the measuring point to the sensor head. The running time is constant and almost temperature-independent. It is proportional to the position of the solenoid and thus a measure for the actual position value and is converted in the sensor into a direct analog or digital output.

Technical data: Position measurement system

(For applications outside these parameters, please consult us!)

| | | |
|----------------------------------|--------------------------|--|
| Operating pressure | bar | 160 |
| Analog output | V | 0 to 10 |
| | Load resistance | k Ω \geq 5 |
| | Resolution | unlimited |
| Analog output | mA | 4 to 20 |
| | Load resistance | Ω 0 to 500 |
| | Resolution | unlimited |
| Digital output | | SSI 24 bit gray-coded |
| | Resolution | μ m 5 |
| | Direction of measurement | asynchronously forward |
| Linearity (absolute accuracy) | Analog | % \leq \pm 0.02 % (referred to measurement length) mm min. \pm 0.05 |
| | Digital | % \leq \pm 0.01 % (referred to measurement length) mm min. \pm 0.04 |
| Reproducibility | % | \pm 0.001 (referred to measurement length) |
| | mm | min. \pm 0.0025 |
| Hysteresis | mm | \leq 0.004 |
| | | |
| Supply voltage | V DC | 24 (\pm 10 % with analog output) |
| | mA | 100 |
| | Current consumption | |
| | Residual ripple | % s-s \leq 1 |
| | V DC | 24 (+20 %/-15 % with digital output) |
| | mA | 70 |
| Protection class | Pipe and flange | IP 67 |
| | Sensor electronics | IP 65 |
| Operating temperature | Sensor electronics | $^{\circ}$ C -40 to +75 |
| Temperature coefficient | Voltage | ppm/ $^{\circ}$ C 70 |
| | Current | ppm/ $^{\circ}$ C 90 |

Position measurement system

1) For analog output:

6-pole amphenol mating connector, material no. **R900072231**

(Mating connector is **not** included in the scope of delivery, must be ordered separately)



1) For digital output:

7-pole amphenol mating connector, material no. **R900079551**

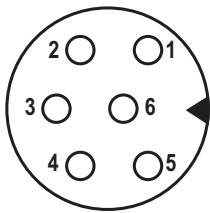
(Mating connector is **not** included in the scope of delivery, must be ordered separately)



Pin assignment

Position measurement system (analog output)

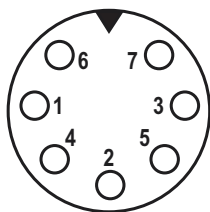
Connector (view to pin side)



| Pin | Cable | Signal / current | Signal / voltage |
|-----|--------|-----------------------------|-----------------------------|
| 1 | gray | 4 ... 20 mA | 0 ... 10 V |
| 2 | pink | DC ground | DC ground |
| 3 | yellow | not used | not used |
| 4 | green | DC ground | DC ground |
| 5 | brown | +24 V DC (+20 % / -15 %) | +24 V DC (+20 % / -15 %) |
| 6 | white | DC ground (0 V) | DC ground (0 V) |

Position measurement system (digital output)

Connector (view to pin side)

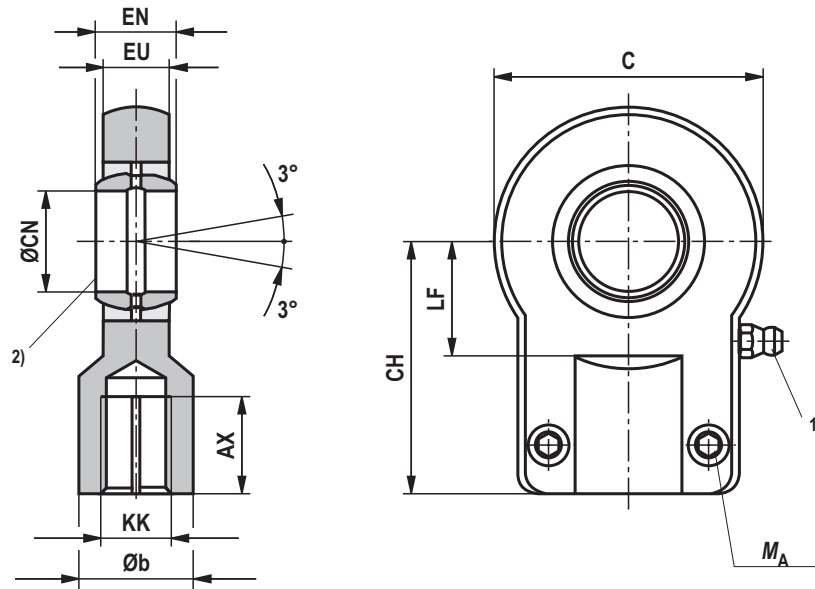


| Pin | Cable | Signal / SSI |
|-----|--------|-------------------------|
| 1 | gray | Data (-) |
| 2 | pink | Data (+) |
| 3 | yellow | Clock (+) |
| 4 | green | Clock (-) |
| 5 | brown | +24 V DC(+20 % / -15 %) |
| 6 | white | DC ground (0 V) |
| 7 | - | not used |

Tilt head (clampable): CGKA - AP 6 (dimensions in mm)

ISO 8133

DIN 24555



| KK | Type | Material no. | AX min. | b Ø | C max. | CH js13 | CN Ø | EN | EU max | LF min. | M_A ⁸⁾ Nm | m ⁷⁾ kg | C_0 ¹⁰⁾ (head) kN | F_{adm} ¹¹⁾ kN |
|-----------|-------------------------------|--------------|------------|--------|-----------|------------|-----------|----------|-----------|------------------|---------------------------|-------------------------|--------------------------------------|--------------------------------|
| M10 x1.25 | CGKA 12 ³⁾ | R900327186 | 15 | 17 | 40 | 42 | 12 -0.008 | 10 -0.12 | 8 | 16 | 9.5 | 0.15 | 17 | 6.3 |
| M12x1.25 | CGKA 16 ⁴⁾ | R900327192 | 17 | 21 | 45 | 48 | 16 -0.008 | 14 -0.12 | 11 | 20 | 9.5 | 0.25 | 28.5 | 10.5 |
| M14x1.5 | CGKA 20 ⁴⁾ | R900306874 | 19 | 25 | 55 | 58 | 20 -0.012 | 16 -0.12 | 13 | 25 | 23 | 0.43 | 42.5 | 15.7 |
| M16x1.5 | CGKA 25 | R900327191 | 23 | 30 | 65 | 68 | 25 -0.012 | 20 -0.12 | 17 | 30 | 23 | 0.73 | 67 | 24.7 |
| M20x1.5 | CGKA 30 | R900327187 | 29 | 36 | 80 | 85 | 30 -0.012 | 22 -0.12 | 19 | 35 | 46 | 1.3 | 108 | 39.9 |
| M27x2 | CGKA 40 | R900327188 | 37 | 45 | 100 | 105 | 40 -0.012 | 28 -0.12 | 23 | 45 | 46 | 2.3 | 156 | 57.6 |
| M33x2 | CGKA 50 | R900327368 | 46 | 55 | 125 | 130 | 50 -0.012 | 35 -0.12 | 30 | 58 | 80 | 4.4 | 245 | 90.4 |
| M42x2 | CGKA 60 | R900327369 | 57 | 68 | 160 | 150 | 60 -0.012 | 44 -0.12 | 38 | 68 | 195 | 8.4 | 380 | 140.2 |
| M48x2 | CGKA 80 | R900327370 | 64 | 90 | 205 | 185 | 80 -0.015 | 55 -0.15 | 47 | 82 ⁹⁾ | 385 | 15.6 | 585 | 215.9 |
| M64x3 | CGKA 100 | R900327371 | 86 | 110 | 240 | 240 | 100 -0.02 | 70 -0.2 | 57 | 116 | 660 | 28 | 865 | 319.2 |
| M80x3 | CGKD 100 ⁵⁾ | R900322030 | 96 | 110 | 210 | 210 | 100 H7 | 100 h12 | 84 | 98 | 385 | 28 | 1060 | 391.1 |
| M100x3 | CGKD 125 ⁵⁾ | R900322026 | 113 | 135 | 262 | 260 | 125 H7 | 125 h12 | 102 | 120 | 385 | 43 | 1200 | 442.8 |

1) Lubricating nipple, cone head form A according to DIN 71412

2) Related bolt Ø h6

3) Cannot be re-lubricated

4) Can be re-lubricated via lubricating hole

5) Tilt head according to ISO 8132, related bolt Ø m6

7) Tilt head weight

8) M_A = tightening torque

The tilt head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws have to be tightened applying the specified tightening torque.

9) Dimensions may differ from the standard depending on the manufacturer

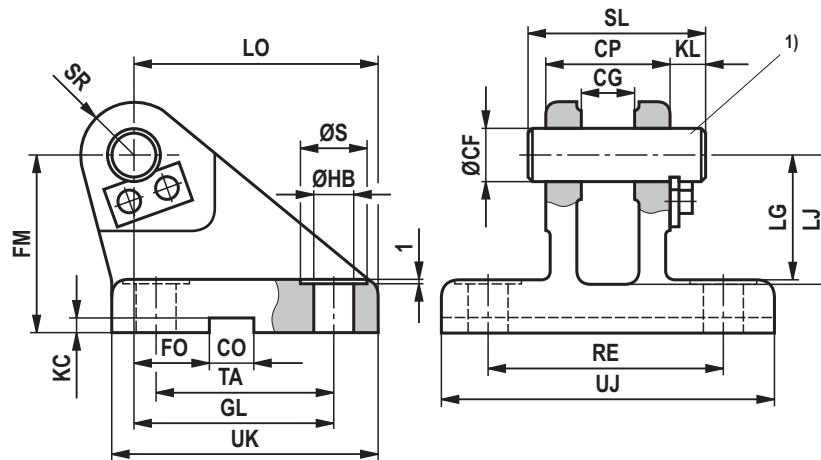
10) C_0 = static load rating of the tilt head

11) F_{adm} = maximum admissible load of the tilt head with oscillatory or alternating loads

Clevis bracket (clampable): CLCB - AB 5 (dimensions in mm)

ISO 8133

DIN 24 556



| Type | Material no. | m^2 kg | CF Ø K7 | CP h14 | CG + 0.1 + 0.3 | CO N9 | FO js14 | FM js11 | GL js13 | HB Ø | KC + 0.3 0 | KL | LG | LJ | LO | RE js13 | SL | SR max. | TA js13 | UJ | UK | S Ø |
|-----------------|--------------|-------------|---------------|-----------|----------------------|----------|------------|------------|------------|------------------|------------------|----|-----|-----|-----|------------|-----|------------|------------|-----|-----|--------|
| CLCB 12 | R900326960 | 0.6 | 12 | 30 | 10 | 10 | 16 | 40 | 46 | 9 | 3.3 | 8 | 28 | 29 | 56 | 55 | 40 | 12 | 40 | 75 | 60 | 15 |
| CLCB 16 | R900327372 | 1.3 | 16 | 40 | 14 | 16 | 18 | 50 | 61 | 11 | 4.3 | 8 | 37 | 38 | 74 | 70 | 50 | 16 | 55 | 95 | 80 | 18 |
| CLCB 20 | R900327373 | 2.1 | 20 | 50 | 16 | 16 | 20 | 55 | 64 | 14 ³⁾ | 4.3 | 10 | 39 | 40 | 80 | 85 | 62 | 20 | 58 | 120 | 90 | 20 |
| CLCB 25 | R900326961 | 3.2 | 25 | 60 | 20 | 25 | 22 | 65 | 78 | 16 ³⁾ | 5.4 | 10 | 48 | 49 | 98 | 100 | 72 | 25 | 70 | 140 | 110 | 24 |
| CLCB 30 | R900327374 | 6.5 | 30 | 70 | 22 | 25 | 24 | 85 | 97 | 18 ³⁾ | 5.4 | 13 | 62 | 63 | 120 | 115 | 85 | 30 | 90 | 160 | 135 | 26 |
| CLCB 40 | R900327375 | 12.0 | 40 | 80 | 28 | 36 | 24 | 100 | 123 | 22 | 8.4 | 16 | 72 | 73 | 148 | 135 | 100 | 40 | 120 | 190 | 170 | 33 |
| CLCB 50 | R900327376 | 23.0 | 50 | 100 | 35 | 36 | 35 | 125 | 155 | 30 | 8.4 | 19 | 90 | 92 | 190 | 170 | 122 | 50 | 145 | 240 | 215 | 48 |
| CLCB 60 | R900327377 | 37.0 | 60 | 120 | 44 | 50 | 35 | 150 | 187 | 39 | 11.4 | 20 | 108 | 110 | 225 | 200 | 145 | 60 | 185 | 270 | 260 | 60 |
| CLCB 80 | R900327378 | 79.0 | 80 | 160 | 55 | 50 | 35 | 190 | 255 | 45 | 11.4 | 26 | 140 | 142 | 295 | 240 | 190 | 80 | 260 | 320 | 340 | 80 |
| CLCB 100 | R900327379 | 140.0 | 100 | 200 | 70 | 63 | 35 | 210 | 285 | 48 | 12.4 | 30 | 150 | 152 | 335 | 300 | 235 | 100 | 300 | 400 | 400 | 80 |

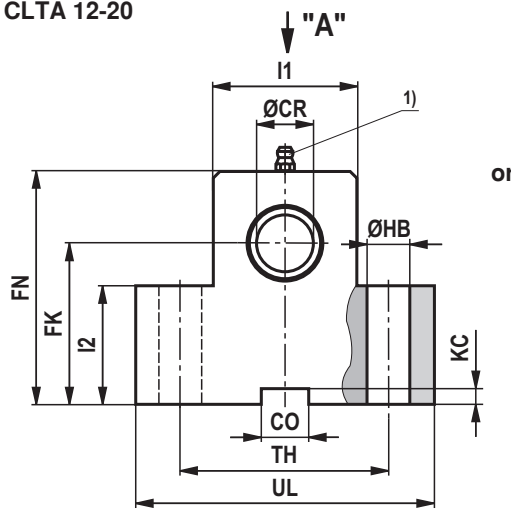
¹⁾ Related bolt Ø h6, suitable for tilt head CGKA...
(bolt and bolt lock are included in the scope of delivery)

²⁾ Weight clevis bracket

³⁾ Dimensions may differ from the standard depending on the manufacturer

Trunnion bearing block CLTA - AT 4 (dimensions in mm)

CLTA 12-20

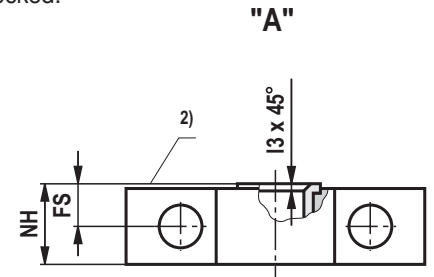
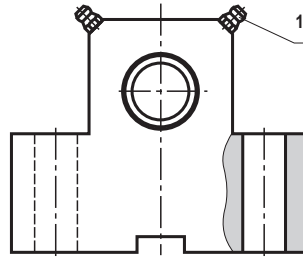


Note:

Geometry and dimensions may differ depending on the manufacturer.

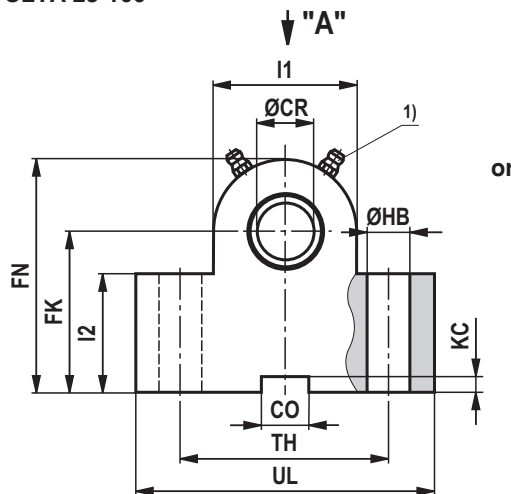
In case of combination with other mounting elements, the usability must be checked.

or



| Series CDT3 Piston Ø | Type | Material no. | CR Ø H7 | CO N9 | FK js12 | FN max. | FS js14 | HB Ø H13 | KC +0.3 0 | NH max. | TH js14 | UL max. | I1 | I2 | I3 | m ³⁾ kg |
|----------------------|---------|--------------|---------|-------|---------|---------|---------|----------|-----------|------------------|---------|---------|----|----|-----|--------------------|
| 25 | CLTA 12 | R901071355 | 12 | 10 | 38 | 55 | 8 | 9 | 3.3 | 17 ⁴⁾ | 40 | 63 | 25 | 25 | 1 | 0.5 |
| 32 | CLTA 16 | R901071364 | 16 | 16 | 45 | 65 | 10 | 11 | 4.3 | 21 | 50 | 80 | 30 | 30 | 1 | 0.9 |
| 40 | CLTA 20 | R901071365 | 20 | 16 | 55 | 80 | 10 | 11 | 4.3 | 21 | 60 | 90 | 40 | 38 | 1.5 | 1.35 |

CLTA 25-100

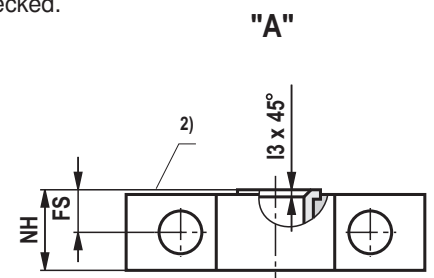
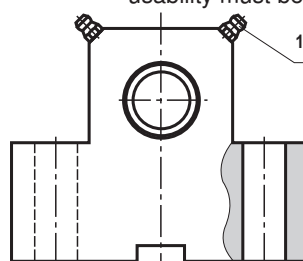


Note:

Geometry and dimensions may differ depending on the manufacturer.

In case of combination with other mounting elements, the usability must be checked.

or



| Series CDT3 Piston Ø | Type | Material no. | CR Ø H7 | CO N9 | FK js12 | FN max. | FS js14 | HB Ø H13 | KC +0.3 0 | NH max. | TH js14 | UL max. | I1 | I2 | I3 | m ³⁾ kg |
|----------------------|----------|--------------|---------|-------|---------|---------|---------|------------------|-----------|---------|---------|---------|-----|-----|-----|--------------------|
| 50 | CLTA 25 | R901071368 | 25 | 25 | 65 | 90 | 12 | 14 ⁴⁾ | 5.4 | 26 | 80 | 110 | 56 | 45 | 1.5 | 2.4 |
| 63 | CLTA 32 | R901071377 | 32 | 25 | 75 | 110 | 15 | 18 ⁴⁾ | 5.4 | 33 | 110 | 150 | 70 | 52 | 2 | 5.0 |
| 80 | CLTA 40 | R901071380 | 40 | 36 | 95 | 140 | 16 | 22 | 8.4 | 41 | 125 | 170 | 88 | 60 | 2.5 | 8.5 |
| 100 | CLTA 50 | R901071385 | 50 | 36 | 105 | 150 | 20 | 26 | 8.4 | 51 | 160 | 210 | 90 | 72 | 2.5 | 15 |
| 125 | CLTA 63 | R901071395 | 63 | 50 | 125 | 195 | 25 | 33 | 11.4 | 61 | 200 | 265 | 136 | 87 | 3 | 30 |
| 160 | CLTA 80 | R901071398 | 80 | 50 | 150 | 230 | 31 | 39 | 11.4 | 81 | 250 | 325 | 160 | 112 | 3.5 | 59 |
| 200 | CLTA 100 | R901071400 | 100 | 63 | 200 | 300 | 42 | 52 | 12.4 | 101 | 320 | 410 | 200 | 150 | 4.5 | 131 |

Comments

1) Lubricating nipple, cone form A according to DIN 71412

2) Inside

3) m = weight per pair, bearing blocks are delivered in pairs

4) Dimensions may differ depending on the manufacturer

Kinking

The admissible stroke length with flexibly guided load and a factor of 3.5 for safety against kinking can be seen from the relevant table. For other installation positions of the cylinder, the admissible stroke length must be interpolated. Admissible stroke length for non-guided load on request.

Kinking calculations are carried out according to the following formulas:

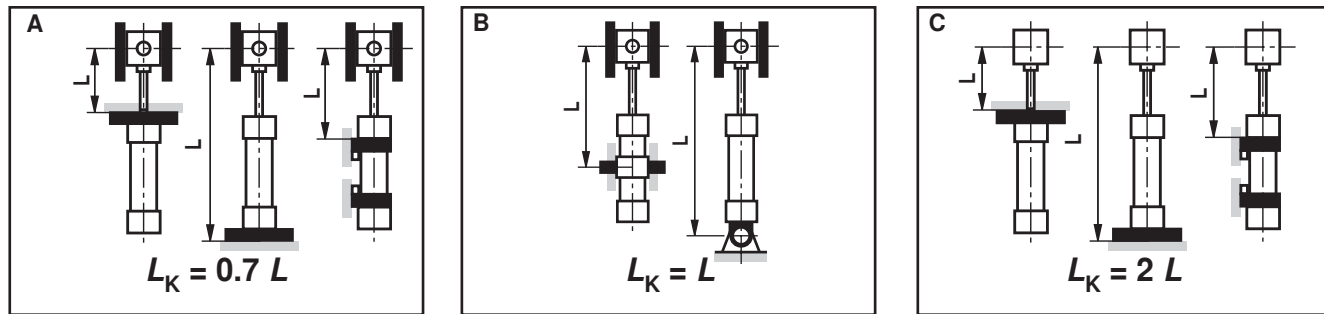
1. Calculation according to Euler

$$F = \frac{\pi^2 \cdot E \cdot I}{v \cdot L_K^2} \text{ if } \lambda > \lambda_g$$

2. Calculation according to Tetmajer

$$F = \frac{d^2 \cdot \pi (335 - 0,62 \cdot \lambda)}{4 \cdot v} \text{ if } \lambda \leq \lambda_g$$

Influence of the type of mounting on the kinking length:



Explanation:

E = modulus of elasticity in N/mm²
 = 2.1 x 10⁵ for steel

I = geometrical moment of inertia in mm⁴

for circular cross-section = $\frac{d^4 \cdot \pi}{64} = 0.0491 \cdot d^4$

v = 3.5 (safety factor)

L_K = free kinking length in mm (depending on the type of mounting see sketches A, B, C)

d = piston rod Ø in mm

λ = slenderness ratio

$$= \frac{4 \cdot L_K}{d} \quad \lambda_g = \pi \sqrt{\frac{E}{0.8 \cdot R_e}}$$

R_e = yield strength of the piston rod material

Admissible stroke length (dimensions in mm)

Type of mounting MP1, MP3, MP5

| AL Ø | MM Ø | 70 bar | | | 100 bar | | | 160 bar | | | 210 bar | | | Installation position |
|---------|---------|--------|------|------|---------|------|------|---------|------|------|---------|------|------|-----------------------|
| | | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | |
| 25 | 12 | 115 | 120 | 125 | 85 | 85 | 90 | 50 | 50 | 55 | 180 | 180 | 185 | |
| | 18 | 315 | 330 | 375 | 270 | 275 | 300 | 205 | 210 | 220 | | | | |
| 32 | 14 | 115 | 120 | 125 | 85 | 85 | 90 | 50 | 50 | 55 | 210 | 210 | 215 | |
| | 22 | 370 | 385 | 440 | 315 | 325 | 350 | 240 | 245 | 255 | | | | |
| 40 | 18 | 160 | 165 | 175 | 120 | 125 | 130 | 75 | 75 | 80 | 130 | 130 | 135 | |
| | 22 | 310 | 320 | 350 | 260 | 265 | 290 | 195 | 200 | 205 | | | | |
| 50 | 28 | 465 | 485 | 580 | 400 | 415 | 465 | 315 | 320 | 340 | 280 | 285 | 290 | |
| | 36 | 620 | 650 | 790 | 545 | 565 | 640 | 435 | 445 | 475 | | | | |
| 63 | 28 | 280 | 285 | 305 | 220 | 225 | 230 | 150 | 150 | 155 | 280 | 280 | 285 | |
| | 36 | 560 | 580 | 645 | 480 | 490 | 520 | 375 | 380 | 390 | | | | |
| 80 | 45 | 770 | 810 | 995 | 680 | 710 | 805 | 555 | 565 | 605 | 500 | 510 | 530 | |
| | 56 | 945 | 995 | 1225 | 840 | 870 | 995 | 685 | 670 | 745 | | | | |
| 100 | 45 | 480 | 495 | 540 | 390 | 400 | 420 | 280 | 285 | 290 | 445 | 450 | 460 | |
| | 56 | 850 | 880 | 1000 | 740 | 760 | 820 | 590 | 600 | 625 | | | | |
| 125 | 70 | 1150 | 1210 | 1550 | 1030 | 1075 | 1260 | 855 | 875 | 955 | 780 | 790 | 830 | |
| | 90 | 1445 | 1535 | 2110 | 1315 | 1380 | 1690 | 1115 | 1150 | 1285 | | | | |
| 160 | 70 | 595 | 615 | 685 | 490 | 500 | 535 | 360 | 365 | 375 | 570 | 575 | 595 | |
| | 110 | 1065 | 1105 | 1290 | 940 | 965 | 1060 | 765 | 775 | 810 | | | | |
| 200 | 90 | 1445 | 1535 | 2110 | 1315 | 1380 | 1690 | 1115 | 1150 | 1285 | 1035 | 1055 | 1130 | |
| | 140 | 2120 | 2255 | 2700 | 1955 | 2060 | 2625 | 1690 | 1755 | 2010 | | | | |

Admissible stroke length (dimensions in mm)

Type of mounting MS2

| AL ∅ | MM ∅ | Admissible stroke length with | | | | | | | | | | | | Installation position |
|---------|---------|-------------------------------|------|------|---------|------|------|---------|------|------|---------|------|------|-----------------------|
| | | 70 bar | | | 100 bar | | | 160 bar | | | 210 bar | | | |
| | | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | |
| 25 | 12 | 500 | 510 | 530 | 420 | 425 | 435 | 325 | 325 | 330 | 600 | 600 | 600 | |
| | 18 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | | | | |
| 32 | 14 | 525 | 535 | 555 | 435 | 440 | 450 | 335 | 335 | 340 | 780 | 790 | 800 | |
| | 22 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | | | | |
| 40 | 18 | 700 | 715 | 750 | 590 | 595 | 610 | 455 | 460 | 465 | 610 | 610 | 620 | |
| | 22 | 975 | 1000 | 1000 | 855 | 875 | 940 | 690 | 700 | 720 | | | | |
| 50 | 22 | 835 | 850 | 895 | 705 | 710 | 730 | 545 | 550 | 555 | 795 | 800 | 815 | |
| | 28 | 855 | 1200 | 1200 | 1100 | 1130 | 1200 | 895 | 910 | 945 | | | | |
| 63 | 28 | 1060 | 1086 | 1160 | 900 | 915 | 950 | 705 | 710 | 720 | 1045 | 1055 | 1080 | |
| | 36 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1185 | 1200 | 1255 | | | | |
| 80 | 36 | 1370 | 1405 | 1525 | 1175 | 1195 | 1250 | 930 | 935 | 955 | 1295 | 1305 | 1340 | |
| | 45 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1460 | 1480 | 1555 | | | | 1700 |
| 100 | 45 | 1685 | 1735 | 1910 | 1460 | 1485 | 1570 | 1165 | 1175 | 1205 | 1595 | 1615 | 1670 | |
| | 56 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 1800 | 1835 | 1950 | | | | 2000 |
| 125 | 56 | 2075 | 2140 | 2300 | 1810 | 1845 | 1970 | 1455 | 1470 | 1515 | 2010 | 2035 | 2120 | |
| | 70 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2240 | 2290 | 2300 | | | | 2300 |
| 160 | 70 | 2515 | 2595 | 2600 | 2200 | 2245 | 2415 | 1780 | 1800 | 1855 | 2600 | 2600 | 2600 | |
| | 110 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | | | | 2600 |
| 200 | 90 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | |
| | 140 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | | | | 2700 |

Type of mounting MT4 (trunnion position in cylinder center)

| AL ∅ | MM ∅ | Admissible stroke length with | | | | | | | | | | | | Installation position |
|---------|---------|-------------------------------|------|------|---------|------|------|---------|------|------|---------|------|------|-----------------------|
| | | 70 bar | | | 100 bar | | | 160 bar | | | 210 bar | | | |
| | | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | |
| 25 | 12 | 190 | 190 | 200 | 150 | 150 | 155 | 105 | 105 | 105 | 275 | 280 | 285 | |
| | 18 | 455 | 470 | 535 | 395 | 405 | 435 | 310 | 315 | 325 | | | | |
| 32 | 14 | 195 | 200 | 205 | 150 | 155 | 155 | 105 | 105 | 105 | 320 | 325 | 330 | |
| | 22 | 535 | 555 | 625 | 460 | 470 | 510 | 365 | 365 | 380 | | | | |
| 40 | 18 | 265 | 270 | 290 | 215 | 215 | 225 | 150 | 155 | 155 | 230 | 230 | 235 | |
| | 22 | 430 | 445 | 480 | 360 | 370 | 385 | 275 | 280 | 285 | | | | |
| 50 | 22 | 330 | 335 | 355 | 265 | 270 | 280 | 190 | 195 | 195 | 315 | 315 | 320 | |
| | 28 | 570 | 590 | 645 | 485 | 495 | 520 | 375 | 380 | 390 | | | | |
| 63 | 28 | 435 | 445 | 470 | 355 | 360 | 375 | 265 | 265 | 270 | 430 | 430 | 440 | |
| | 36 | 755 | 780 | 865 | 650 | 660 | 700 | 510 | 575 | 530 | | | | |
| 80 | 36 | 585 | 595 | 630 | 480 | 485 | 505 | 340 | 360 | 365 | 535 | 540 | 550 | |
| | 45 | 890 | 920 | 1025 | 760 | 775 | 830 | 590 | 595 | 615 | | | | 885 |
| 100 | 45 | 725 | 745 | 805 | 605 | 615 | 645 | 415 | 440 | 475 | 675 | 680 | 695 | |
| | 56 | 1090 | 1130 | 1295 | 940 | 965 | 1045 | 740 | 750 | 782 | | | | 1115 |
| 125 | 56 | 900 | 925 | 1015 | 760 | 775 | 820 | 485 | 520 | 605 | 855 | 865 | 890 | |
| | 70 | 1340 | 1395 | 1640 | 1170 | 1205 | 1330 | 940 | 955 | 1000 | | | | 1480 |
| 160 | 70 | 1100 | 1300 | 1255 | 935 | 955 | 1015 | 730 | 735 | 760 | 1720 | 1755 | 1875 | |
| | 110 | 2410 | 2550 | 2600 | 2210 | 2315 | 2600 | 1905 | 1960 | 2180 | | | | 2195 |
| 200 | 90 | 1420 | 1470 | 1680 | 1225 | 1255 | 1360 | 770 | 830 | 1020 | 2195 | 2250 | 2240 | |
| | 140 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2415 | 2495 | 2700 | | | | 2700 |

Admissible stroke length (dimensions in mm)

Type of mounting MT2

| AL ∅ | MM ∅ | 70 bar | | | Admissible stroke length with | | | | | | 210 bar | | | Installation position |
|---------|---------|--------|------|------|-------------------------------|------|---------|------|---------|------|---------|------|------|-----------------------|
| | | 0° | 45° | 90° | 100 bar | | 160 bar | | 210 bar | | | | | |
| | | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | |
| 25 | 12 | 130 | 130 | 135 | 100 | 100 | 105 | 65 | 65 | 65 | 195 | 195 | 200 | |
| | 18 | 330 | 340 | 390 | 285 | 290 | 315 | 220 | 225 | 230 | 195 | 195 | 200 | |
| 32 | 14 | 135 | 135 | 140 | 100 | 100 | 105 | 65 | 65 | 65 | 230 | 230 | 235 | |
| | 22 | 390 | 405 | 455 | 335 | 340 | 370 | 260 | 260 | 270 | 230 | 230 | 235 | |
| 40 | 18 | 180 | 185 | 200 | 145 | 145 | 150 | 95 | 95 | 100 | 155 | 155 | 155 | |
| | 22 | 305 | 315 | 340 | 250 | 260 | 270 | 185 | 190 | 195 | 305 | 305 | 315 | |
| 50 | 22 | 230 | 235 | 245 | 180 | 185 | 190 | 125 | 125 | 125 | 220 | 220 | 225 | |
| | 28 | 410 | 425 | 465 | 345 | 350 | 370 | 260 | 265 | 270 | 420 | 425 | 440 | |
| 63 | 28 | 310 | 315 | 335 | 250 | 250 | 260 | 180 | 180 | 180 | 305 | 305 | 315 | |
| | 36 | 550 | 565 | 630 | 465 | 475 | 505 | 360 | 365 | 375 | 305 | 305 | 315 | |
| 80 | 45 | 800 | 840 | 1025 | 710 | 735 | 835 | 580 | 595 | 630 | 530 | 535 | 555 | |
| | 36 | 415 | 425 | 450 | 340 | 345 | 355 | 250 | 250 | 255 | 380 | 385 | 395 | |
| 100 | 45 | 515 | 530 | 575 | 430 | 435 | 455 | 320 | 320 | 330 | 480 | 485 | 500 | |
| | 56 | 825 | 855 | 980 | 710 | 730 | 795 | 565 | 570 | 595 | 815 | 830 | 870 | |
| 125 | 56 | 640 | 660 | 730 | 540 | 550 | 580 | 410 | 410 | 425 | 615 | 625 | 640 | |
| | 70 | 1015 | 1060 | 1240 | 890 | 915 | 1010 | 715 | 725 | 760 | 1080 | 1105 | 1175 | |
| 160 | 90 | 1495 | 1580 | 2110 | 1365 | 1425 | 1735 | 1160 | 1195 | 1330 | 1080 | 1105 | 1175 | |
| | 70 | 785 | 810 | 905 | 665 | 675 | 720 | 505 | 515 | 530 | 1260 | 1290 | 1375 | |
| 200 | 110 | 1770 | 1870 | 2505 | 1620 | 1695 | 2070 | 1390 | 1430 | 1595 | 1260 | 1290 | 1375 | |
| | 90 | 1015 | 1055 | 1210 | 870 | 895 | 970 | 680 | 685 | 715 | 1610 | 1650 | 1790 | |
| 200 | 140 | 2190 | 2325 | 2700 | 2025 | 2125 | 2695 | 1760 | 1825 | 2080 | 1610 | 1650 | 1790 | |

Type of mounting MT1

| AL ∅ | MM ∅ | 70 bar | | | Admissible stroke length with | | | | | | 210 bar | | | Installation position |
|---------|---------|--------|------|------|-------------------------------|------|---------|------|---------|------|---------|------|------|-----------------------|
| | | 0° | 45° | 90° | 100 bar | | 160 bar | | 210 bar | | | | | |
| | | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | |
| 25 | 12 | 325 | 325 | 330 | 260 | 260 | 265 | 190 | 190 | 190 | 445 | 450 | 455 | |
| | 18 | 600 | 600 | 600 | 600 | 600 | 600 | 500 | 510 | 520 | 445 | 450 | 455 | |
| 32 | 14 | 335 | 335 | 345 | 265 | 270 | 270 | 190 | 190 | 190 | 520 | 520 | 530 | |
| | 22 | 800 | 800 | 800 | 735 | 750 | 800 | 580 | 590 | 605 | 520 | 520 | 530 | |
| 40 | 18 | 460 | 465 | 475 | 370 | 375 | 375 | 270 | 270 | 275 | 385 | 390 | 390 | |
| | 22 | 690 | 705 | 760 | 585 | 595 | 620 | 455 | 460 | 465 | 685 | 690 | 705 | |
| 50 | 22 | 550 | 555 | 570 | 450 | 450 | 455 | 330 | 330 | 335 | 515 | 520 | 525 | |
| | 28 | 905 | 930 | 1015 | 775 | 790 | 830 | 615 | 620 | 630 | 915 | 925 | 955 | |
| 63 | 28 | 715 | 725 | 750 | 590 | 590 | 600 | 440 | 440 | 445 | 695 | 695 | 705 | |
| | 36 | 1175 | 1210 | 1335 | 1015 | 1035 | 1100 | 805 | 810 | 835 | 695 | 695 | 705 | |
| 80 | 45 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1245 | 1270 | 1345 | 1135 | 1150 | 1190 | |
| | 36 | 940 | 955 | 995 | 780 | 785 | 805 | 590 | 590 | 600 | 860 | 865 | 880 | |
| 100 | 45 | 1190 | 1210 | 1270 | 995 | 1005 | 1030 | 740 | 760 | 770 | 1385 | 1405 | 1460 | |
| | 56 | 1790 | 1850 | 2000 | 1570 | 1600 | 1730 | 1270 | 1285 | 1330 | 1385 | 1405 | 1460 | |
| 125 | 70 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 1900 | 1945 | 2000 | 1740 | 1765 | 1850 | |
| | 56 | 1480 | 1505 | 1595 | 1245 | 1260 | 1300 | 965 | 970 | 980 | 1085 | 1095 | 1115 | |
| 160 | 70 | 2190 | 2270 | 2300 | 1935 | 1990 | 2175 | 1585 | 1605 | 1675 | 1375 | 1385 | 1420 | |
| | 90 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2290 | 2300 | 2300 | |
| 200 | 70 | 1805 | 1840 | 1965 | 1525 | 1545 | 1600 | 1185 | 1195 | 1210 | 2600 | 2600 | 2600 | |
| | 110 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | |
| 200 | 90 | 2340 | 2400 | 2610 | 2000 | 2035 | 2135 | 1575 | 1585 | 1620 | 2700 | 2700 | 2700 | |
| | 140 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | |

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Admissible stroke length (dimensions in mm)

Type of mounting ME5, MX3, MX5

| AL ∅ | MM ∅ | Admissible stroke length with | | | | | | | | | | | | Installation position |
|---------|---------|-------------------------------|------|------|---------|------|------|---------|------|------|---------|------|------|-----------------------|
| | | 70 bar | | | 100 bar | | | 160 bar | | | 210 bar | | | |
| | | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | |
| 25 | 12 | 510 | 520 | 540 | 430 | 435 | 445 | 335 | 335 | 340 | | | | |
| | 18 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | |
| 32 | 14 | 535 | 545 | 565 | 445 | 450 | 460 | 345 | 345 | 350 | | | | |
| | 22 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 790 | 800 | 800 | |
| 40 | 18 | 710 | 725 | 755 | 600 | 605 | 620 | 465 | 470 | 475 | | | | |
| | 22 | 990 | 1000 | 1000 | 870 | 890 | 955 | 705 | 715 | 735 | 620 | 625 | 635 | |
| 50 | 28 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | |
| | 22 | 850 | 865 | 910 | 720 | 725 | 750 | 560 | 565 | 570 | | | | |
| 63 | 28 | 1200 | 1200 | 1200 | 1125 | 1150 | 1200 | 920 | 930 | 965 | 810 | 815 | 830 | |
| | 36 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | |
| 80 | 28 | 1080 | 1100 | 1170 | 920 | 930 | 965 | 720 | 725 | 740 | | | | |
| | 36 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1205 | 1225 | 1280 | 1065 | 1075 | 1100 | |
| 100 | 45 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | |
| | 36 | 1390 | 1425 | 1545 | 1195 | 1215 | 1270 | 950 | 955 | 975 | | | | |
| 125 | 45 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1485 | 1510 | 1580 | 1310 | 1325 | 1360 | |
| | 56 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | |
| 160 | 45 | 1710 | 1760 | 1935 | 1480 | 1510 | 1590 | 1185 | 1195 | 1225 | | | | |
| | 56 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 1815 | 1850 | 1965 | 1620 | 1635 | 1690 | |
| 200 | 70 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | |
| | 56 | 2100 | 2165 | 2300 | 1830 | 1865 | 1990 | 1200 | 1280 | 1540 | | | | |
| 125 | 70 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2255 | 2300 | 2300 | 2030 | 2060 | 2140 | |
| | 90 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | 2300 | |
| 160 | 70 | 2540 | 2600 | 2600 | 2225 | 2275 | 2440 | 1805 | 1825 | 1885 | | | | |
| | 110 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | 2600 | |
| 200 | 90 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2360 | 2395 | 2510 | | | | |
| | 140 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | 2700 | |

Type of mounting ME6, MX1, MX2

| AL ∅ | MM ∅ | Admissible stroke length with | | | | | | | | | | | | Installation position |
|---------|---------|-------------------------------|------|------|---------|------|------|---------|------|------|---------|------|------|-----------------------|
| | | 70 bar | | | 100 bar | | | 160 bar | | | 210 bar | | | |
| | | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | 0° | 45° | 90° | |
| 25 | 12 | 195 | 200 | 220 | 160 | 160 | 170 | 115 | 115 | 120 | | | | |
| | 18 | 445 | 465 | 585 | 395 | 410 | 475 | 325 | 330 | 360 | 295 | 295 | 310 | |
| 32 | 14 | 205 | 210 | 230 | 165 | 170 | 180 | 120 | 120 | 120 | | | | |
| | 22 | 525 | 550 | 685 | 465 | 485 | 560 | 385 | 390 | 420 | 345 | 350 | 365 | |
| 40 | 18 | 270 | 280 | 315 | 225 | 230 | 245 | 165 | 165 | 170 | | | | |
| | 22 | 435 | 455 | 520 | 375 | 385 | 420 | 295 | 300 | 310 | 245 | 250 | 255 | |
| 50 | 28 | 645 | 680 | 895 | 580 | 605 | 730 | 485 | 500 | 555 | 450 | 460 | 480 | |
| | 22 | 335 | 350 | 390 | 280 | 285 | 305 | 210 | 210 | 220 | | | | |
| 63 | 28 | 580 | 600 | 700 | 505 | 515 | 565 | 400 | 405 | 425 | 335 | 340 | 350 | |
| | 36 | 845 | 895 | 1200 | 770 | 805 | 990 | 655 | 675 | 755 | 605 | 620 | 655 | |
| 80 | 28 | 445 | 460 | 520 | 375 | 385 | 415 | 285 | 290 | 300 | | | | |
| | 36 | 760 | 795 | 940 | 670 | 690 | 765 | 540 | 550 | 580 | 465 | 470 | 490 | |
| 100 | 45 | 1045 | 1105 | 1400 | 955 | 1140 | 1240 | 815 | 845 | 955 | 765 | 780 | 835 | |
| | 36 | 590 | 610 | 690 | 505 | 515 | 555 | 390 | 395 | 410 | | | | |
| 125 | 45 | 940 | 980 | 1160 | 830 | 855 | 950 | 675 | 685 | 720 | 580 | 585 | 610 | |
| | 56 | 1275 | 1350 | 1700 | 1170 | 1225 | 1520 | 1005 | 1035 | 1175 | 930 | 950 | 1025 | |
| 160 | 45 | 725 | 755 | 885 | 630 | 645 | 710 | 495 | 505 | 530 | | | | |
| | 56 | 1145 | 1200 | 1465 | 1025 | 1060 | 1205 | 850 | 865 | 920 | 730 | 740 | 770 | |
| 200 | 70 | 1530 | 1625 | 2000 | 1415 | 1485 | 1925 | 1230 | 1280 | 1485 | 1170 | 1195 | 1300 | |
| | 56 | 885 | 925 | 1110 | 775 | 800 | 900 | 620 | 635 | 670 | | | | |
| 125 | 70 | 1380 | 1450 | 1835 | 1245 | 1290 | 1500 | 1040 | 1065 | 1155 | 915 | 935 | 980 | |
| | 90 | 1900 | 2025 | 2300 | 1770 | 1875 | 2300 | 1570 | 1640 | 1980 | 1525 | 1570 | 1745 | |
| 160 | 70 | 1080 | 1130 | 1370 | 950 | 985 | 1110 | 770 | 785 | 835 | | | | |
| | 110 | 2250 | 2395 | 2600 | 2105 | 2225 | 2600 | 1870 | 1950 | 2360 | 1780 | 1835 | 2045 | |
| 200 | 90 | 1375 | 1445 | 1825 | 1225 | 1275 | 1485 | 1010 | 1035 | 1120 | | | | |
| | 140 | 2700 | 2700 | 2700 | 2605 | 2700 | 2700 | 2340 | 2450 | 2700 | 2245 | 2325 | 2660 | |

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End position cushioning

End position cushioning:

The objective is to reduce the velocity of a moved reduced mass, whose center of gravity lies on the cylinder axis to a level, at which neither the cylinder nor the machine into which the cylinder is installed is damaged.

For velocities above 20 mm/s, we recommend the use of an end position cushioning feature, which absorbs energy without requiring the use of additional equipment.

Series CDT3/CGT3 is equipped with a progressive cushioning system.

Advantages of this cushioning system:

- Progressive delay.
- Short cushioning time.
- Cushioning length depending on the velocity.
- Due to low cushioning pressures and no pressure peaks, safety and the life cycle of the cylinder and the machine are increased.
- Insensitive to changes in pressure, temperature and the moved masses.
- Controlled end stop velocity of the piston – more safety and reliability.
- Quick start-up due to special check valve and floating bushing.

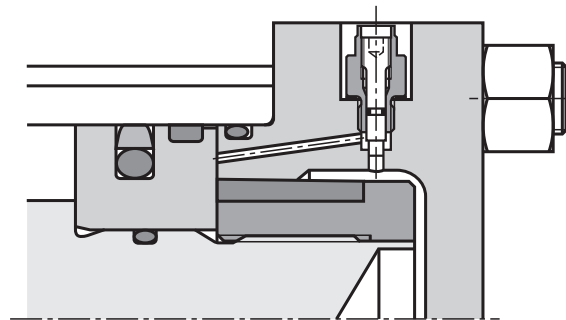
Cylinders with end position cushioning can achieve their full cushioning capacity only over the entire stroke length.

With the adjustable end position cushioning version "E", a throttle valve is additionally provided when compared with version "D". End position cushioning "E" allows for optimization of the cycle times.

The max. cushioning capacity can only be achieved when the throttle valve is closed.

For special applications with very short stroke times, high velocities or large masses, cylinders with special end position cushioning versions can be offered on request.

When fixed or adjustable stops are used, special measures must be taken!

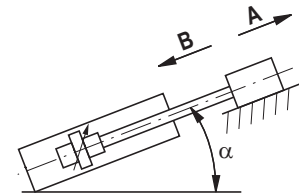
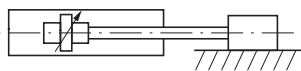


Cushioning capacity:

When decelerating masses via the end position cushioning, the structural-inherent cushioning capacity must not be exceeded.

To this end, the kinetic energy and potential energy of the moved mass are to be calculated and compared to the admissible values from the diagram on pages 56 to 57.

Energy determination



$$E = \frac{1}{2} m \cdot v^2$$

$$1 \text{ Retract (A): } E = \frac{1}{2} mv^2 - mg \cdot l_a$$

$$1 \text{ Extend (A): } E = \frac{1}{2} mv^2 - mg \cdot l_a \cdot \sin \alpha$$

$$1 \text{ Extend (B): } E = \frac{1}{2} mv^2 + mg \cdot l_a$$

$$1 \text{ Retract (B): } E = \frac{1}{2} mv^2 + mg \cdot l_a \cdot \sin \alpha$$

| | | |
|----------------------|---------------------|---------------------------------------|
| E | [Nm] [joule] | Maximum value see pages 54 to 57 |
| m | [kg] | Total moved mass incl. piston and rod |
| v | [m/s] | Max. velocity |
| g | [m/s ²] | 9.81 |
| l_a | [m] | Cushioning length, see page 55 |

End position cushioning

Cushioning lengths and masses

| Cylinder Ø | | | | | | | | | | | | | | |
|--------------------------|--------|------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| l_a in mm | Head | 15 | 15 | 16 | 16 | 23 | 23 | 23 | 22 | 22 | 22 | 25 | 25 | 25 |
| | Base | 15 | 15 | 16 | 16 | 23 | 23 | 23 | 22 | 22 | 22 | 25 | 25 | 25 |
| m in kg (kg/100 mm) | Piston | 0.15 | 0.2 | 0.25 | 0.4 | 0.6 | 0.6 | 0.7 | 0.8 | 1 | 1.2 | 1.4 | 1.7 | 2.0 |
| | Rod | 0.1 | 0.2 | 0.12 | 0.3 | 0.2 | 0.3 | 0.5 | 0.3 | 0.5 | 0.8 | 0.5 | 0.8 | 1.2 |
| $v_{max}^{1)}$ | (m/s) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 |

| Cylinder Ø | | | | | | | | | | | | | | |
|--------------------------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| l_a in mm | Head | 27 | 27 | 27 | 28 | 28 | 28 | 33 | 33 | 33 | 38 | 38 | 57 | 57 |
| | Base | 27 | 27 | 27 | 28 | 28 | 28 | 46 | 46 | 46 | 46 | 46 | 64 | 64 |
| m in kg (kg/100 mm) | Piston | 2.6 | 3 | 3.6 | 4.7 | 5.3 | 6.3 | 8.0 | 9.2 | 11 | 16 | 20 | 30 | 38 |
| | Rod | 0.8 | 1.2 | 2.0 | 1.2 | 2 | 3.0 | 2.0 | 3 | 5.0 | 3.0 | 7.5 | 5.0 | 12 |
| $v_{max}^{1)}$ | (m/s) | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.25 | 0.25 | 0.25 | 0.25 |

¹⁾ In case v_{max} is exceeded, please contact us.

²⁾ Piston rod Ø not standardized

The diagrams on pages 56-57 are based on the preceding table, the maximum velocities specified referring to "M" seals with closed throttle screw.

With slower velocities, the absorbing energy decreases according to the formula.

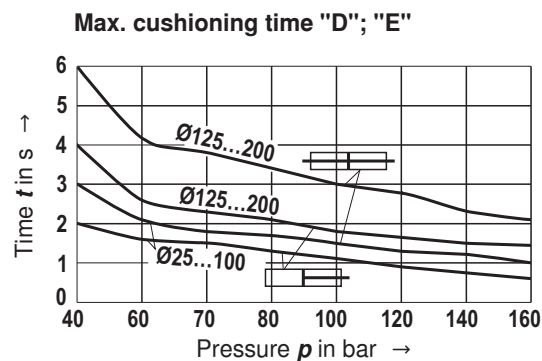
$$E_U = E_{max} \cdot \frac{v_U}{v_{max}}$$

E_U = energy absorbing

E_{max} = energy max. see characteristic curve

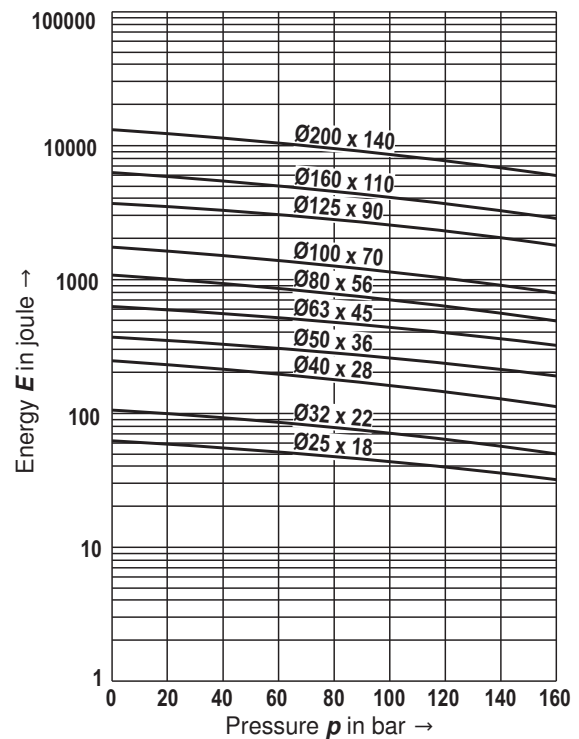
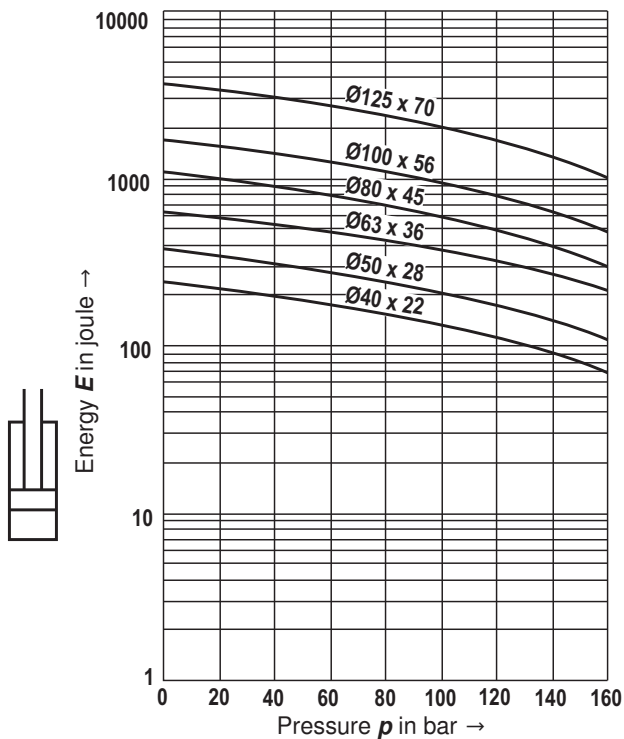
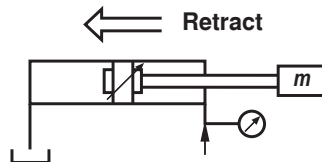
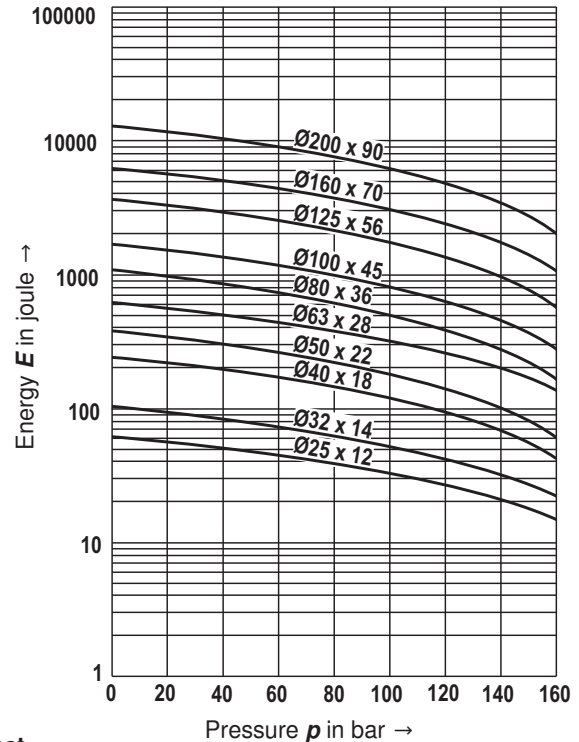
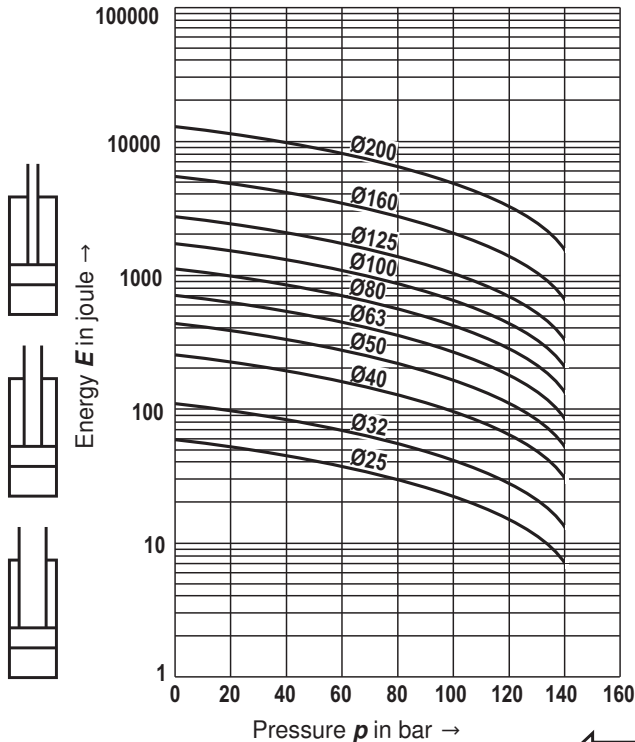
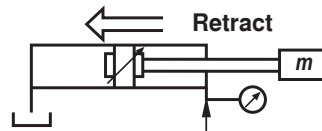
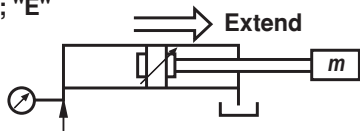
v_U = stroke velocity

v_{max} = velocity max. for seal version "M"



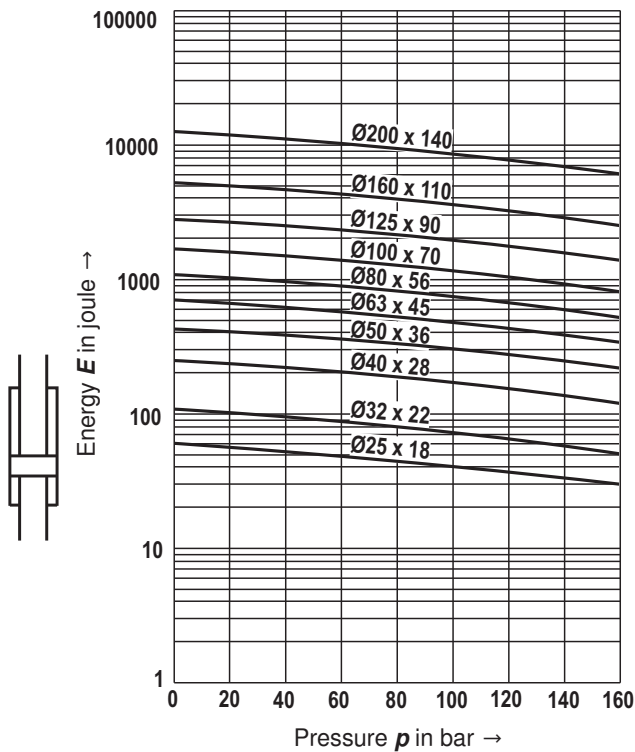
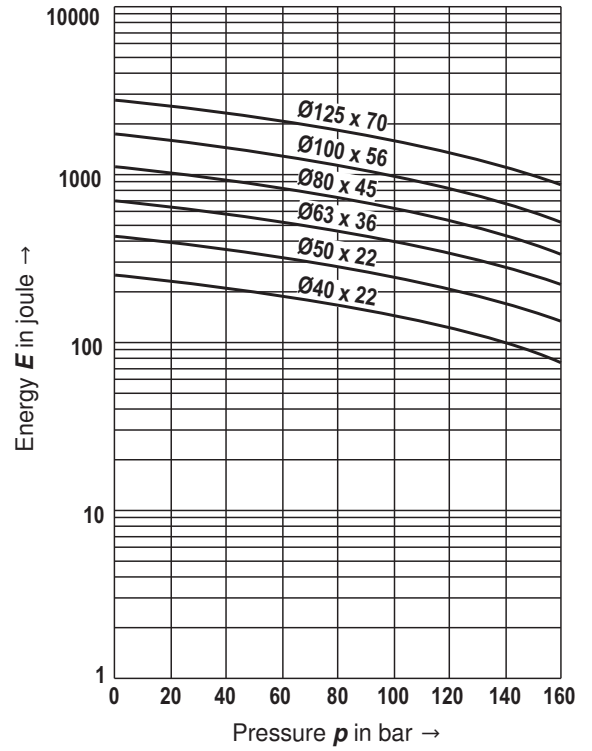
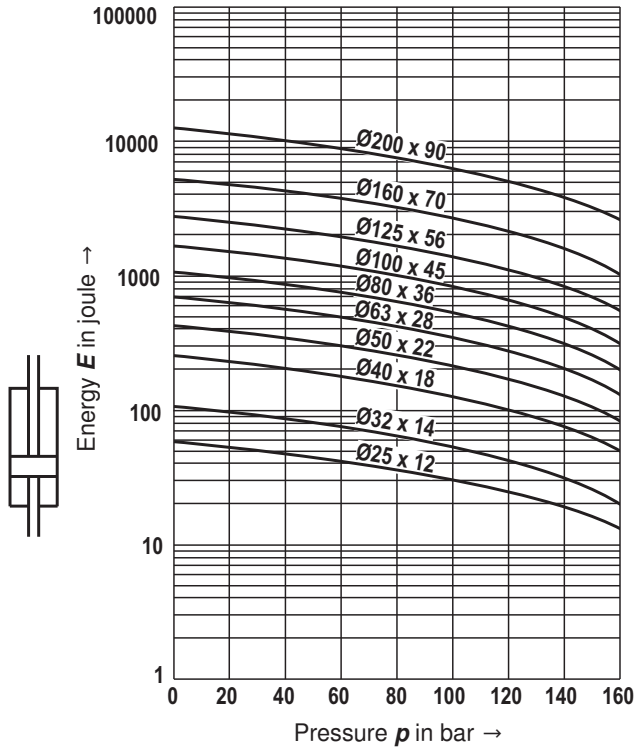
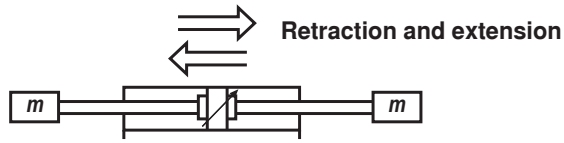
End position cushioning

Cushioning "D"; "E"



End position cushioning

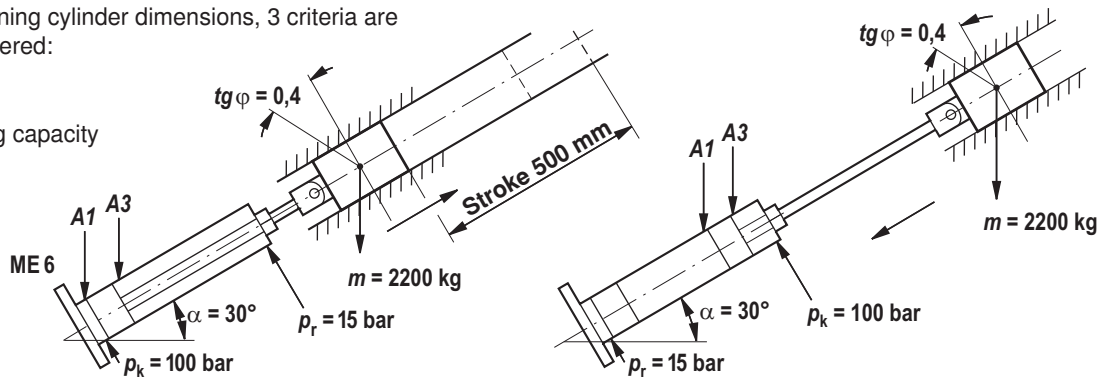
Cushioning "D"; "E"



Calculation example

When designing cylinder dimensions, 3 criteria are to be considered:

- Force
- Kinking
- Cushioning capacity



Example:

Stroke time = 2 seconds

Load friction coefficient = $tg \varphi = 0.4$ (estimated)

Available pressure $p_k = 100$ bar

Return flow pressure $p_r = 15$ bar

$A1$ = piston surface, $A3$ = piston ring surface

φ = surface ratio $A1 / A3$, see page 5

m = total moved mass, v = velocity

La = cushioning length, see page 54

To be determined:

Piston and piston rod diameter

Extend piston rod:

Total efficiency $\eta = \eta_1 \cdot \eta_2$

η_1 = cylinder efficiency = 0.9 (estimated)

η_2 = system efficiency

$$\eta_2 = \frac{p_k \cdot A1 - p_r \cdot A3}{p_k \cdot A1} = 1 - \frac{p_r}{p_k \cdot \varphi} = \frac{15}{100 \cdot 1.25} = 0,88$$

$$\eta = 0.9 \cdot 0.88 = 0.79$$

¹⁾ Assuming the smallest " φ "

Test of the end position cushioning

Average velocity $0.5 / 2 = 0.25$ m/s

Max. velocity $v_u = 0.275$ m/s

(estimated correction coefficient = 1.1 due to start-up and braking)

Cushioning capacity required for piston rod extension =

$$\frac{m \cdot v_u^2}{2} - m \cdot g \cdot La \cdot \sin \alpha = \frac{2200 \cdot 0.275^2}{2} - 2200 \cdot 9.81 \cdot 0.025 \cdot 0.5 = -186 \text{ joules}$$

No cushioning problem for piston rod extension

Cushioning capacity required for piston rod retraction =

$$\frac{m \cdot v_u^2}{2} + m \cdot g \cdot La \cdot \sin \alpha = \frac{2200 \cdot 0.275^2}{2} + 2200 \cdot 9.81 \cdot 0.025 \cdot 0.5 = 353 \text{ joules}$$

Diagram on page 55 results in 445 joules for $p_k = 100$ bar and $v_{max} = 0.4$ m/s, i.e. the cylinder can absorb energy for 0.275 m/s (see page 54):

$$E_u = E_{max} \cdot \frac{v_u}{v_{max}} = 445 \cdot \frac{0.275}{0.4} = 306 \text{ joules}$$

So the cylinder cannot absorb the necessary cushioning capacity: you have to select the next larger diameter 80/56.

Force required to move the mass:

F = frictional force plus potential energy

$$\begin{aligned} &= tg \varphi \cdot m \cdot g \cdot \cos \alpha + m \cdot g \cdot \sin \alpha \\ &= 0.4 \cdot 2200 \cdot 9.81 \cdot 0.866 + 2200 \cdot 9.81 \cdot 0.5 = 18270 \text{ N} \\ &= 18.27 \text{ kN} \end{aligned}$$

This theoretical force 18.27 kN with $\eta = 0.79$ results in a required force = 23.13 kN and thus, a cylinder piston diameter = 63 mm is necessary for $p_k = 100$ bar, see page 5

Retract piston rod:

F = frictional force minus potential energy

$$\begin{aligned} &= tg \varphi \cdot m \cdot g \cdot \cos \alpha - m \cdot g \cdot \sin \alpha \\ &= 0.4 \cdot 2200 \cdot 9.81 \cdot 0.866 - 2200 \cdot 9.81 \cdot 0.5 \\ &= -3315 \text{ N} = -3.3 \text{ kN} \quad \text{no force problem during retraction} \end{aligned}$$

Test of kinking length:

For $p_k = 100$ bar and cylinder 63 / 28, the table on page 52 results in a maximum admissible stroke = 385 mm:

So the cylinder kinks

There are 2 possibilities:

- Select piston rod diameter 45, max. admissible stroke = 1140 mm, i.e. kinking-proof
- Change the type of mounting, e.g. MS2 with a maximum admissible stroke = 915 mm

Selection criteria for seals

| Work and environmental conditions | | Seal versions | | |
|--|---|---------------|----|------------------|
| | | M | T | S |
| Medium/temperature | Medium HL, HLP/operating temperature medium -20 °C to +80 °C | ++ | ++ | ++ |
| | Medium HFA/operating temperature medium +5 °C to +55 °C | +/- | ++ | +/- |
| | Medium HFC/operating temperature medium -20 °C to +60 °C | - | ++ | - |
| | Medium HFD-R/operating temperature medium -15 °C to +80 °C | - | - | ++ |
| | Medium HFD-U/operating temperature medium -15 °C to +80 °C | - | - | ++ |
| | Ambient and rod temperature in the area of the piston rod from -20 °C to +80 °C ¹⁾ | ++ | + | ++ ²⁾ |
| | Extended ambient and rod temperature in the area of the piston rod from +80 °C to +120 °C | - | - | ++ |
| Function/velocity... | Static holding function more than 10 minutes: Attention! Application- and temperature-dependent | ++ | + | + |
| | Static holding function short-term < 1 minute | ++ | ++ | ++ |
| | Robust application conditions: Steel works, mining, thin ice | ++ | - | - |
| | Zero point control, hardly any amplitude, frequency max. 5 Hz, not longer than 5 minutes | - | ++ | ++ |
| | Cylinder velocity min. 0.001 m/sec stick-slip behavior | ++ | ++ | ++ |
| | Cylinder velocity from 0.01 m/sec to 0.5 m/sec ³⁾ | ++ | ++ | ++ |
| | Cylinder velocity > 0.5 m/sec to max. 0.8 m/sec ³⁾ | - | ++ | ++ |
| | Stroke > 1.0 m | +/- | ++ | ++ |
| | Standstill period (wear) | ++ | ++ | ++ |
| Undissolved air in the oil ⁴⁾ | - | + | + | |

++ = very good + = good +/- = conditional, depending on the application parameters - = unsuitable

General technical data in corresponding data sheets will remain valid!

- 1) Moreover, observe the corresponding medium temperature range
- 2) Lower temperature limit -15 °C
- 3) Standard line connections not designed for that velocity
- 4) - seal is destroyed / + seal is not directly destroyed, leaks may occur

Generally, a medium temperature of approx. 40 °C is recommended. The specified values are to be regarded as guidelines; depending on the application, it may be necessary to check the suitability of the seal system.

Seal kits

Seal kit complete

| AL Ø | MM Ø | Material no. for seal design CDT3 | | | Material no. for seal design CGT3 | | |
|---------|---------|-----------------------------------|------------|------------|-----------------------------------|------------|------------|
| | | M | T | S | M | T | S |
| 25 | 12 | R961008000 | R961008026 | R961008052 | R961008078 | R961008104 | R961008130 |
| | 18 | R961008001 | R961008027 | R961008053 | R961008079 | R961008105 | R961008131 |
| 32 | 14 | R961008002 | R961008028 | R961008054 | R961008080 | R961008106 | R961008132 |
| | 22 | R961008003 | R961008029 | R961008055 | R961008081 | R961008107 | R961008133 |
| 40 | 18 | R961008004 | R961008030 | R961008056 | R961008082 | R961008108 | R961008134 |
| | 22 | R961008005 | R961008031 | R961008057 | R961008083 | R961008109 | R961008135 |
| | 28 | R961008006 | R961008032 | R961008058 | R961008084 | R961008110 | R961008136 |
| 50 | 22 | R961008007 | R961008033 | R961008059 | R961008085 | R961008111 | R961008137 |
| | 28 | R961008008 | R961008034 | R961008060 | R961008086 | R961008112 | R961008138 |
| | 36 | R961008009 | R961008035 | R961008061 | R961008087 | R961008113 | R961008139 |
| 63 | 28 | R961008010 | R961008036 | R961008062 | R961008088 | R961008114 | R961008140 |
| | 36 | R961008011 | R961008037 | R961008063 | R961008089 | R961008115 | R961008141 |
| | 45 | R961008012 | R961008038 | R961008064 | R961008090 | R961008116 | R961008142 |
| 80 | 36 | R961008013 | R961008039 | R961008065 | R961008091 | R961008117 | R961008143 |
| | 45 | R961008014 | R961008040 | R961008066 | R961008092 | R961008118 | R961008144 |
| | 56 | R961008015 | R961008041 | R961008067 | R961008093 | R961008119 | R961008145 |
| 100 | 45 | R961008016 | R961008042 | R961008068 | R961008094 | R961008120 | R961008146 |
| | 56 | R961008017 | R961008043 | R961008069 | R961008095 | R961008121 | R961008147 |
| | 70 | R961008018 | R961008044 | R961008070 | R961008096 | R961008122 | R961008148 |
| 125 | 56 | R961008019 | R961008045 | R961008071 | R961008097 | R961008123 | R961008149 |
| | 70 | R961008020 | R961008046 | R961008072 | R961008098 | R961008124 | R961008150 |
| | 90 | R961008021 | R961008047 | R961008073 | R961008099 | R961008125 | R961008151 |
| 160 | 70 | R961008022 | R961008048 | R961008074 | R961008100 | R961008126 | R961008152 |
| | 110 | R961008023 | R961008049 | R961008075 | R961008101 | R961008127 | R961008153 |
| 200 | 90 | R961008024 | R961008050 | R961008076 | R961008102 | R961008128 | R961008154 |
| | 140 | R961008025 | R961008051 | R961008077 | R961008103 | R961008129 | R961008155 |

Seal kit CST3 only for cylinder ¹⁾

| AL Ø | MM Ø | Material no. for seal design CST3 | | |
|---------|---------|-----------------------------------|------------|------------|
| | | M | T | S |
| 40 | 28 | R961008006 | R961008032 | R961008058 |
| 50 | 28 | R961008008 | R961008034 | R961008060 |
| | 36 | R961008009 | R961008035 | R961008061 |
| 63 | 36 | R961008011 | R961008037 | R961008063 |
| | 45 | R961008012 | R961008038 | R961008064 |
| 80 | 45 | R961008014 | R961008040 | R961008066 |
| | 56 | R961008015 | R961008041 | R961008067 |
| 100 | 56 | R961008017 | R961008043 | R961008069 |
| | 70 | R961008018 | R961008044 | R961008070 |
| 125 | 70 | R961008020 | R961008046 | R961008072 |
| | 90 | R961008021 | R961008047 | R961008073 |
| 160 | 70 | R961008022 | R961008048 | R961008074 |
| | 110 | R961008023 | R961008049 | R961008075 |
| 200 | 90 | R961008024 | R961008050 | R961008076 |
| | 140 | R961008025 | R961008051 | R961008077 |

AL = piston Ø in mm

MM = piston rod Ø in mm

¹⁾ Seal kits for position measurement system and subplate mounting separate material no.

Seal kits

Only for subplate mounting

| Subplates Size | Material number for seal design | |
|-------------------|---------------------------------|------------|
| | M, T | S |
| 6 | R961008236 | R961008239 |
| 10 | R961008237 | R961008240 |
| 16 | R961008238 | R961008241 |

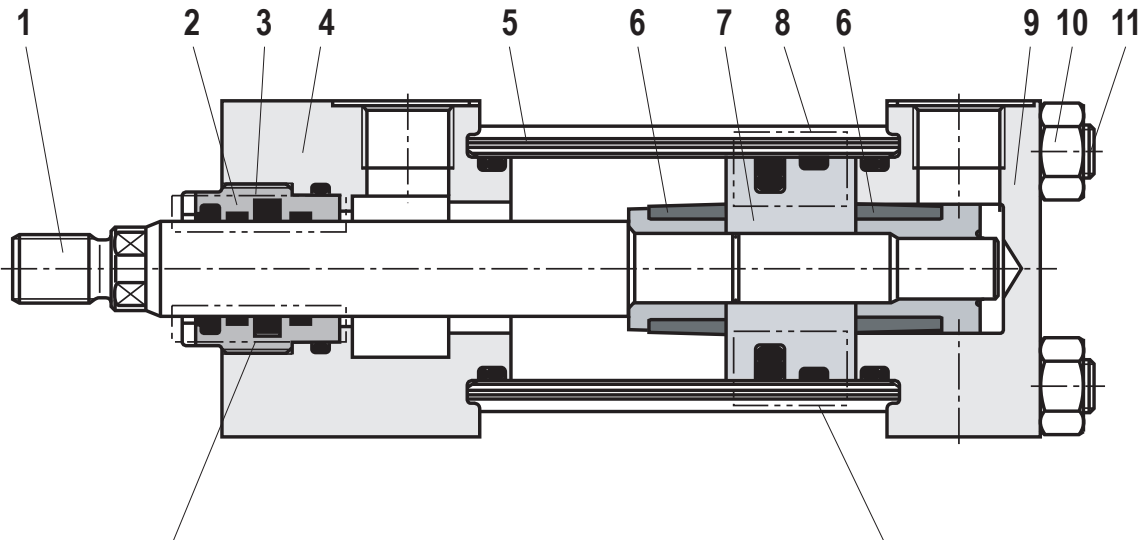
Only for position measurement system

| AL Ø | Material number for seal design | |
|---------|---------------------------------|------------|
| | M, T | S |
| 40 | R961008156 | R961008161 |
| 50 | R961008157 | R961008162 |
| 63 | R961008158 | R961008163 |
| 80 | R961008159 | R961008164 |
| 100 | R961008160 | R961008165 |
| 125 | R961008222 | R961008221 |
| 160 | R961008223 | R961008225 |
| 200 | R961008224 | R961008226 |

Tightening torques

| AL Ø | MM Ø | Tightening torques in Nm for types of mounting | |
|---------|---------|--|-------|
| | | ME5/6, MP1/3/5, MS2, MT1/2/4, MX3/5 | MX1/2 |
| 25 | 12 | 5,5 | 3 |
| | 18 | | |
| 32 | 14 | 8 | 6,5 |
| | 22 | | |
| 40 | 18 | 20 | 12 |
| | 22 | | |
| | 28 | | |
| 50 | 22 | 50 | 37 |
| | 28 | | |
| | 36 | | |
| 63 | 28 | 60 | 40 |
| | 36 | | |
| | 45 | | |
| 80 | 36 | 125 | 90 |
| | 45 | | |
| | 56 | | |
| 100 | 45 | 190 | 100 |
| | 56 | | |
| | 70 | | |
| 125 | 56 | 400 | 240 |
| | 70 | | |
| | 90 | | |
| 160 | 70 | 800 | 450 |
| | 110 | | |
| 200 | 90 | 1250 | 600 |
| | 140 | | |

Spare parts: Series CDT3



Piston rod seals

Ø25 – 32 and Ø40/18



Ø40/22, Ø40/28 and Ø50 – 100



Ø125 – 200

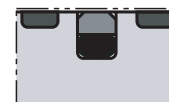


Piston seals

M, T, S for piston Ø25 – 63

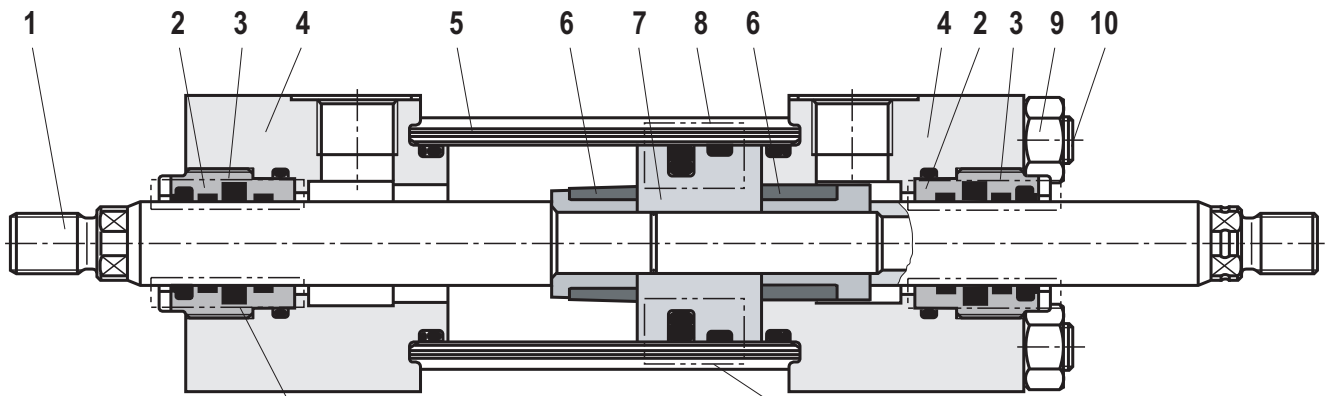


M, T, S for piston Ø80 – 200



- 1 Piston rod
- 2 Guide socket
- 3 Piston rod seal
- 4 Cylinder head
- 5 Cylinder pipe
- 6 Damping bush
- 7 Piston
- 8 Piston seal
- 9 Cylinder base
- 10 Nut
- 11 Tie rod

Spare parts: Series CGT3



Piston rod seals

Ø25 – 32 and Ø40/18

M

T, S

Ø40/22, Ø40/28 and Ø50 – 100

M

T, S

Ø125 – 200

M

T, S

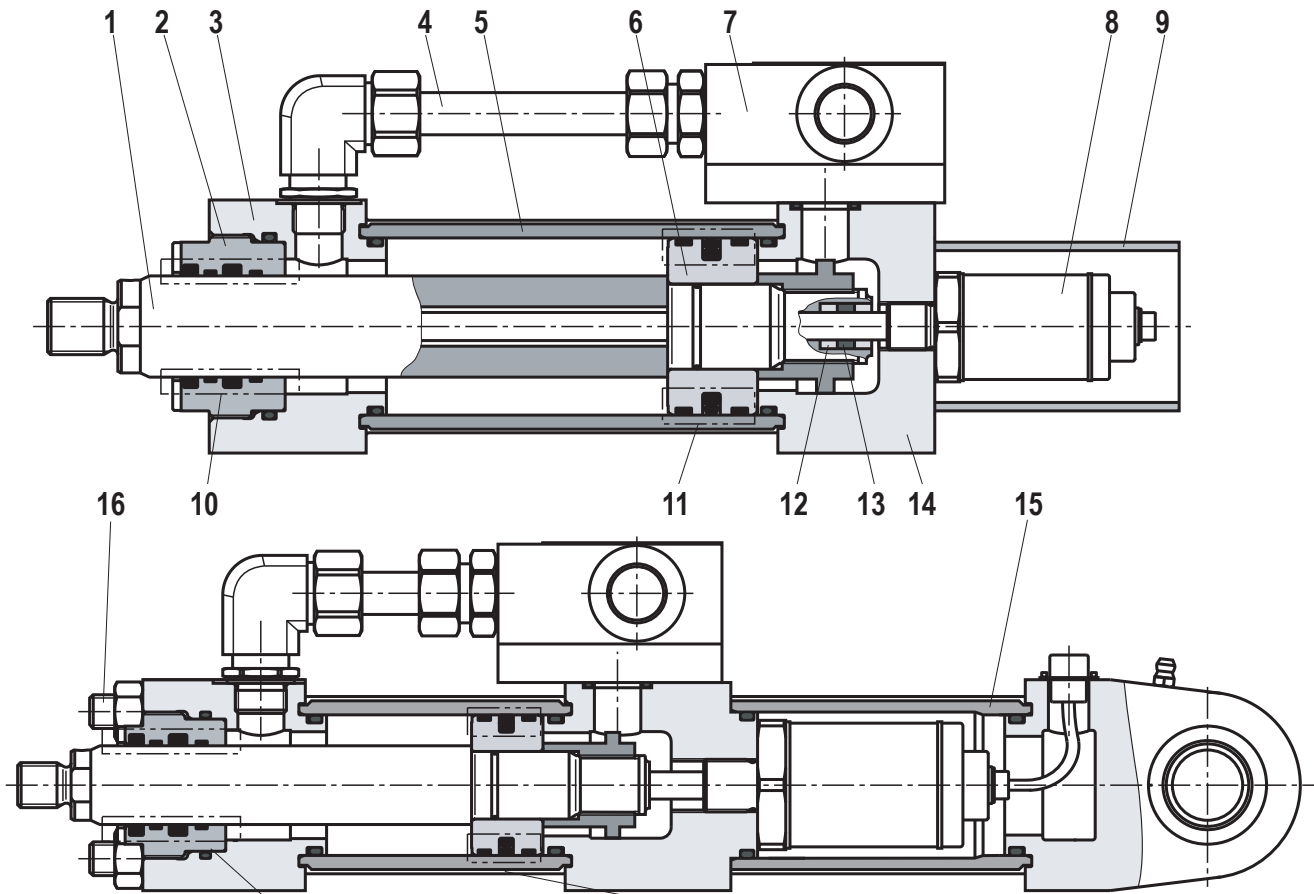
Piston seals

M, T, S for piston Ø25 – 63

M, T, S for piston Ø80 – 200

- 1 Piston rod
- 2 Guide socket
- 3 Piston rod seal
- 4 Cylinder head
- 5 Cylinder pipe
- 6 Damping bush
- 7 Piston
- 8 Piston seal
- 9 Nut
- 10 Tie rod

Spare parts: Series CST3



Piston rod seals

Ø40 – 100

M

T, S

Ø125 – 200

M

T, S

Piston seals

M, T, S for piston Ø40 – 63

M, T, S for piston Ø80 – 200

- | | | |
|-----------------|-----------------------|--------------------|
| 1 Piston rod | 7 Subplate | 13 Solenoid |
| 2 Guide socket | 8 Position transducer | 14 Cylinder base |
| 3 Cylinder head | 9 Protective pipe | 15 Connection pipe |
| 4 Piping | 10 Piston rod seal | 16 Tie rod |
| 5 Cylinder pipe | 11 Piston seal | |
| 6 Piston | 12 Insulating socket | |

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Weight for cylinder (in kg)

CDT3 / CGT3

| AL Ø | MM Ø | MX1, ME5, MS2 | | ME6, MP3, MP1 | | MP5 | | MT4 | | MX2, MX3, MX5 (in case of CGT3 with- out MX2) | | MT1, MT2 (in case of CGT3 with- out MT2) | | Stroke 100 mm | |
|---------|-------------------|------------------|------|------------------|------|------|------|------|------|---|------|---|------|------------------|------|
| | | CDT3 | CGT3 | CDT3 | CGT3 | CDT3 | CGT3 | CDT3 | CGT3 | CDT3 | CGT3 | CDT3 | CGT3 | CDT3 | CGT3 |
| 25 | 12 | 1.1 | 1.2 | 1.1 | - | 1.0 | - | 1.3 | 1.4 | 1.0 | 1.1 | 1.1 | 1.2 | 0.4 | 0.5 |
| | 18 | 1.2 | 1.4 | 1.2 | - | 1.1 | - | 1.4 | 1.6 | 1.1 | 1.3 | 1.2 | 1.4 | 0.6 | 0.8 |
| 32 | 14 | 1.5 | 1.6 | 1.6 | - | 1.4 | - | 1.8 | 1.9 | 1.4 | 1.5 | 1.5 | 1.6 | 0.5 | 0.6 |
| | 22 | 1.6 | 1.9 | 1.7 | - | 1.5 | - | 1.9 | 2.2 | 1.5 | 1.8 | 1.6 | 1.9 | 0.6 | 0.9 |
| 40 | 18 | 3.4 | 3.6 | 3.4 | - | 3.2 | - | 4.1 | 4.3 | 3.1 | 3.3 | 3.2 | 3.4 | 0.8 | 1.0 |
| | 22 ¹²⁾ | 3.4 | 3.8 | 3.4 | - | 3.2 | - | 4.1 | 4.5 | 3.1 | 3.5 | 3.2 | 3.6 | 0.9 | 1.2 |
| | 28 | 3.5 | 4.0 | 3.5 | - | 3.3 | - | 4.2 | 4.7 | 3.2 | 3.7 | 3.3 | 3.8 | 1.1 | 1.6 |
| 50 | 22 | 5.3 | 5.7 | 5.3 | - | 4.9 | - | 6.6 | 7.0 | 4.8 | 5.2 | 4.9 | 5.3 | 1.1 | 1.4 |
| | 28 ¹²⁾ | 5.4 | 6.0 | 5.4 | - | 5 | - | 6.7 | 7.3 | 4.9 | 5.5 | 5 | 5.6 | 1.3 | 1.8 |
| | 36 | 5.5 | 6.4 | 5.5 | - | 5.1 | - | 6.8 | 7.7 | 5.0 | 5.9 | 5.1 | 6.0 | 1.6 | 2.4 |
| 63 | 28 | 7.7 | 8.3 | 7.7 | - | 7.3 | - | 9.2 | 9.8 | 7.0 | 7.6 | 7.3 | 7.9 | 1.4 | 1.9 |
| | 36 ¹²⁾ | 7.9 | 8.8 | 7.8 | - | 7.4 | - | 9.3 | 10.3 | 7.1 | 8.1 | 7.4 | 8.4 | 1.7 | 2.5 |
| | 45 | 8.2 | 9.7 | 8.0 | - | 7.6 | - | 9.5 | 11 | 7.3 | 8.8 | 7.6 | 9.1 | 2.2 | 3.4 |
| 80 | 36 | 14 | 15 | 14 | - | 14 | - | 18 | 19 | 12 | 13 | 15 | 15 | 2.2 | 3.0 |
| | 45 ¹²⁾ | 14 | 16 | 14 | - | 14 | - | 17 | 20 | 13 | 14 | 14 | 16 | 2.6 | 3.8 |
| | 56 | 15 | 17 | 15 | - | 15 | - | 19 | 21 | 14 | 16 | 15 | 17 | 3.3 | 5.2 |
| 100 | 45 | 20 | 22 | 20 | - | 20 | - | 24 | 26 | 19 | 20 | 22 | 24 | 3.3 | 4.5 |
| | 56 ¹²⁾ | 20 | 23 | 20 | - | 19 | - | 24 | 27 | 18 | 21 | 22 | 25 | 4.1 | 6.1 |
| | 70 | 21 | 25 | 21 | - | 21 | - | 25 | 29 | 19 | 23 | 23 | 27 | 5.1 | 8.1 |
| 125 | 56 | 38 | 41 | 39 | - | 38 | - | 46 | 49 | 35 | 39 | 43 | 46 | 6.3 | 8.2 |
| | 70 ¹²⁾ | 38 | 43 | 39 | - | 38 | - | 46 | 51 | 35 | 41 | 43 | 48 | 7.3 | 10.3 |
| | 90 | 39 | 46 | 40 | - | 39 | - | 48 | 55 | 37 | 44 | 44 | 51 | 9.3 | 14 |
| 160 | 70 | 62 | 68 | 67 | - | 63 | - | 78 | 83 | 59 | 65 | 64 | 69 | 8.7 | 12 |
| | 110 | 64 | 75 | 69 | - | 65 | - | 80 | 91 | 61 | 72 | 67 | 79 | 13.2 | 21 |
| 200 | 90 | 112 | 124 | 120 | - | 115 | - | 147 | 158 | 107 | 118 | 114 | 126 | 13.4 | 18 |
| | 140 | 115 | 137 | 123 | - | 117 | - | 149 | 171 | 109 | 131 | 117 | 138 | 20.5 | 33 |

Tilt head, clevis bracket and trunnion bearing block
see pages 47 to 49

Subplates see page 44

¹²⁾ Piston rod Ø not standardized

Weight for cylinder (in kg)

CST3

| AL Ø | MM Ø | ME5, MS2 | MP5 | MT4 | MX5 | Stroke 100 mm |
|---------|-------------------|----------|-------|-----|-----|---------------|
| 40 | 28 | 3.5 | 3.8 | 4.2 | 3.2 | 1.1 |
| 50 | 28 ¹²⁾ | 5.4 | 5.8 | 6.7 | 4.9 | 1.3 |
| | 36 | 5.5 | 5.9 | 6.8 | 5.0 | 1.6 |
| 63 | 36 ¹²⁾ | 7.9 | 8.5 | 9.3 | 7.1 | 1.7 |
| | 45 | 8.2 | 8.7 | 9.5 | 7.3 | 2.2 |
| 80 | 45 ¹²⁾ | 14 | 16.1 | 17 | 13 | 2.6 |
| | 56 | 15 | 17.3 | 19 | 14 | 3.3 |
| 100 | 56 ¹²⁾ | 20 | 21.8 | 24 | 18 | 4.1 |
| | 70 | 21 | 24.1 | 25 | 19 | 5.1 |
| 125 | 70 ¹²⁾ | 38 | 43.7 | 46 | 35 | 7.3 |
| | 90 | 39 | 44.8 | 48 | 37 | 9.3 |
| 160 | 70 | 62 | 72.5 | 78 | 59 | 8.7 |
| | 110 | 64 | 74.8 | 80 | 61 | 13.2 |
| 200 | 90 | 112 | 132 | 147 | 107 | 13.4 |
| | 140 | 115 | 134.5 | 149 | 109 | 20.5 |

Tilt head, clevis bracket and trunnion bearing block
see pages 47 to 49

Subplates see page 44

¹²⁾ Piston rod Ø not standardized

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