



Hydraulic cylinders for explosive areas

**Series CDH2...XC / CGH2...
XC / CSH2...XE**

- ▶ Series H2
- ▶ Component series 3X
- ▶ Nominal pressure 250 bar [25 MPa]

Features

- ▶ Standards: DIN 24333, ISO 6022
- ▶ 6 types of mounting
- ▶ Piston Ø (**Ø AL**): 40 ... 320 mm
- ▶ Piston rod Ø (**Ø MM**): 25 ... 220 mm
- ▶ Stroke lengths up to 6 m

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
CD	H2		/		/		/		XC	3X	/				

01	Differential cylinders	CD
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02	Series	H2
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03	Swivel eye at base	MP3
	Self-aligning clevis at base	MP5
	Round flange at head	MF3
	Round flange at base	MF4
	Trunnion	MT4 ²⁾
	Foot mounting	MS2 ¹⁸⁾

04	Piston Ø (Ø AL) 40 ... 320 mm	...
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05	Piston rod Ø (Ø MM) 25 ... 8,66 in	...
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06	Stroke length in mm ³⁾	...
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07	Design safety	XC
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08	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	3X
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09	According to ISO 1179-1 (pipe thread ISO 228-1)	B
	According to ISO 9974-1 (metric thread ISO 261)	M ³³⁾
	Flange connection according to ISO 6162-1 tab. 2 type 1 (≙ SAE 3000 PSI)	F ^{4; 21)}
	Flange connection according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI)	D ^{4; 9)}
	Flange connection according to ISO 6164 tab. 1	K ^{1; 4)}
	Flange connection according to ISO 6164 tab. 2	H ⁴⁾

10	View of piston rod ³⁰⁾		1 2 3 4
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11	View of piston rod ³⁰⁾		1 2 3 4
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12	Hard chromium-plated	C
	Hardened and hard chromium-plated	H ²³⁾
	Nickel-plated and hard chromium-plated	N ²⁴⁾

13	Thread for swivel head CGKD	H
	With mounted swivel head CGKD	F

Ordering code: Series CDH2...XC

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
CD	H2		/		/		/		XC	3X	/				

End position cushioning

14	Without end position cushioning	U
	Both sides, self-adjusting	D ¹⁾
	Both sides, adjustable	E

Seal design

15	For mineral oils HL, HLP and oil-in-water emulsion HFA	Standard seal system	M
	For mineral oils HL, HLP, oil-in-water emulsion HFA and water glycol HFC	Servo quality / reduced friction	T
		Chevron seal kits	A
	For phosphoric acid ester HFDR	Servo quality / reduced friction	S
		Chevron seal kits	B

Option

16	Additional options, fill fields for additional options	Z
	Without additional options, do not fill fields for additional options	W

Additional options

Fields for additional options

17	18	19	20	21
Z	W			

17	Without option	W
18	Additional guide rings	F ¹⁰⁾
	Without additional guide rings	W
19	Measuring coupling, on both sides	A
	Without measuring coupling	W
20	Flanged grease nipple	B
	Standard conical grease nipple	W
21	Specify the piston rod extension LY in the plain text in mm	Y
	Without piston rod extension	W

Order examples:

Without additional options:

CDH2MT4/63/45/350XC3X/B11CHDMWW, XV=300 mm

With additional options:

CDH2MF3/80/56/500XC3X/B11CHDMZ WWAWW

- ¹⁾ Only piston Ø 40 to 200 mm
- ²⁾ Trunnion position freely selectable.
When ordering, always specify the "XV" dimensions in clear text in mm
- ³⁾ Observe the max. stroke length available, page 11, and the admissible stroke length
(according to kinking calculation) on pages 52 to 54
- ⁴⁾ Not possible with MF4
- ⁹⁾ Only piston Ø 80 to 320 mm
- ¹⁰⁾ Seal design A, B not possible;

- piston Ø 220 to 320 mm standard
- ¹⁸⁾ Not standardized
- ²¹⁾ Only piston Ø 63 to 200 mm
- ²³⁾ Only piston rod Ø 25 to 140 mm
- ²⁴⁾ Only piston rod Ø 28 to 160 mm
- ³⁰⁾ All graphical presentations in the data sheet show position 1
- ³³⁾ Version does not comply with ISO 6022

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
CG	H2		/		/		/	XC	3X	/					

14	Without end position cushioning	U
	Both sides, self-adjusting	D ¹⁾
	Both sides, adjustable	E

Ordering code: Series CGH2...XC

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
CG	H2		/		/		/		XC	3X	/				

Seal design

15	For mineral oils HL, HLP and oil-in-water emulsion HFA	Standard seal system	M
	For mineral oils HL, HLP, oil-in-water emulsion HFA and water glycol HFC	Servo quality / reduced friction	T
		Chevron seal kits	A
	For phosphoric acid ester HFDR	Servo quality / reduced friction	S
		Chevron seal kits	B

Option

16	Additional options, fill fields for additional options	Z
	Without additional options, do not fill fields for additional options	W

Additional options

Fields for additional options

17	18	19	20	21
Z	W			

17	Without option	W
18	Additional guide rings	F ¹⁰⁾
	Without additional guide rings	W
19	Measuring coupling, on both sides	A
	Without measuring coupling	W
20	Flanged grease nipple	B
	Standard conical grease nipple	W
21	Specify the piston rod extension LY in the plain text in mm	Y ¹⁶⁾
	Without piston rod extension	W

Order examples:

Without additional options:

CGH2MF3/100/70/500XC3X/B11CHUMWW

With additional options:

CGH2MF3/100/70/500XC3X/B11CHUMZ WWAWW

- ¹⁾ Only piston Ø 40 to 200 mm
- ²⁾ Trunnion position freely selectable.
When ordering, always specify the "XV" dimensions in clear text in mm
- ³⁾ Observe the max. stroke length available, page 11, and the admissible stroke length (according to kinking calculation) on pages 52 to 54
- ⁹⁾ Only piston Ø 80 to 320 mm
- ¹⁰⁾ Seal design A, B not possible; piston Ø 220 to 320 mm standard
- ¹⁶⁾ Only at left piston rod side (orientation: catalog figures)
- ¹⁷⁾ Only one plain clevis / swivel head mounted, left piston rod

- side (orientation: catalog figures)
- ¹⁸⁾ Not standardized
- ²¹⁾ Only piston Ø 63 to 200 mm
- ²³⁾ Only piston rod Ø 25 to 140 mm
- ³⁰⁾ All graphical presentations in the data sheet show position 1
- ³³⁾ Version does not comply with ISO 6022

Ordering code: Series CSH2...XE

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
CS	H2		/		/		/	XE	3X	/					Z

01	Differential cylinder with position measurement system	CS ¹⁸⁾
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02	Series	H2
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Types of mounting

03	Swivel eye at base	MP3 ³⁴⁾
	Self-aligning clevis at base	MP5 ³⁴⁾
	Round flange at head	MF3
	Round flange at base	MF4
	Trunnion	MT4 ²⁾
	Foot mounting	MS2

04	Piston Ø (Ø AL) 40 ... 320 mm	...
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05	Piston rod Ø (Ø MM) 28 ... 220 mm	...
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06	Stroke length in mm ³⁾	...
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Protection class for ATEX version

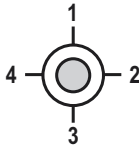
07	Increased safety	XE
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08	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	3X
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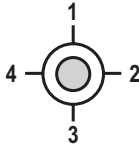
Line connection / version

09	According to ISO 1179-1 (pipe thread ISO 228-1)	B
	According to ISO 9974-1 (metric thread ISO 261)	M ³³⁾
	Flange connection according to ISO 6162-1 tab. 2 type 1 (≙ SAE 3000 PSI)	F ^{4; 21)}
	Flange connection according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI)	D ^{4; 9)}
	Flange connection according to ISO 6164 tab. 1	K ^{1; 4)}
	Flange connection according to ISO 6164 tab. 2	H ⁴⁾

Line connection/position at head

10	View of piston rod ³⁰⁾	1
		2
		3
		4

Line connection/position at base

11	View of piston rod ³⁰⁾	1
		2
		3
		4

Piston rod design

12	Hard chromium-plated	C
	Nickel-plated and hard chromium-plated	N ¹⁹⁾

Piston rod end

13	Thread for swivel head CGKD	H
	With mounted swivel head CGKD	F

Ordering code: Series CSH2...XE

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
CS	H2		/		/		/		XE	3X	/				Z

End position cushioning

14	Without end position cushioning	U
	Both sides, adjustable	E ²⁰⁾

Seal design

15	For mineral oils HL, HLP and oil-in-water emulsion HFA	Standard seal system	M ²⁹⁾
	For mineral oils HL, HLP, oil-in-water emulsion HFA and water glycol HFC	Servo quality / reduced friction	T ²⁹⁾
	For phosphoric acid ester HFDR	Servo quality / reduced friction	S ²⁹⁾

Option

16	Additional options, fill fields for additional options	Z
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Additional options

Fields for additional options

17	18	19	20	21
Z	T			

17	Position measurement system (magnetostrictive) without mating connector, mating connector – separate order, see page 37	T
18	Analog output 4 ... 20 mA	C
	Analog output 0 ... 10 V	F
	Digital output SSI	D
19	Measuring coupling, on both sides	A
	Without measuring coupling	W
20	Flanged grease nipple	B
	Standard conical grease nipple	W
21	Specify the piston rod extension LY in the plain text in mm	Y
	Without piston rod extension	W

Order example:

CSH2MF3/100/70/500XE3X/B11CHUTZ TFABW

- | | |
|---|--|
| <p>1) Only piston Ø 40 to 200 mm</p> <p>2) Trunnion position freely selectable.
When ordering, always specify the “XV” dimensions in clear text in mm</p> <p>3) Observe the max. stroke length available, page 11, and the admissible stroke length (according to kinking calculation) on pages 52 to 54</p> <p>4) Not possible with MF4</p> <p>9) Only piston Ø 80 to 320 mm</p> | <p>18) Not standardized</p> <p>19) Only piston rod Ø 28 mm to 160 mm</p> <p>20) Possible from piston rod Ø 45 mm</p> <p>21) Only piston Ø 63 to 200 mm</p> <p>29) With CSH2...XE, by default with guide belts</p> <p>30) All graphical presentations in the data sheet show position 1</p> <p>33) Version does not comply with ISO 6022</p> <p>34) On request only</p> |
|---|--|

Technical data

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

ATEX units for explosive areas

What you need to know about the documentation for ATEX units.

The documentation for ATEX units applies to the explosion-proof version of hydraulic cylinders and consists of the following two part:

- ▶ Operating instructions for hydraulic cylinders tie rod design / mill type, mill type for explosive areas
- ▶ Technical data sheet You can find further information on the correct handling of hydraulic products in our publication "General product information on hydraulic products".

- ▶ Cylinders without position measurement system
 - Marking according to directive 94/9/EC II 2G c T4
 - Marking according to directive 94/9/EC II 2D c T135 °C
 - Ambient temperature $-20\text{ °C} \leq T_a \leq +80\text{ °C}$
- ▶ Cylinders with position measurement system
 - Marking according to directive 94/9/EC II 3G Ex e T4X
 - Marking according to directive 94/9/EC II 3D Ex tc T135 °C
 - Ambient temperature $-20\text{ °C} \leq T_a \leq +59\text{ °C}$

Information on the explosion protection:

General		
Weight	kg	see page 67
Installation position		any
Ambient temperature range	°C	see page 58
Primer coat ¹⁾	µm	min. 40

Hydraulic		
Nominal pressure ²⁾	bar [MPa]	250 [25]
Minimum operating pressure ³⁾	(without load) bar [MPa]	10 [1]
Static test pressure	bar [MPa]	375 [37.5]
Reduced test pressure	bar [MPa]	315 [31.5]
Hydraulic fluid		see table below
Hydraulic fluid temperature range	°C	see page 58
Viscosity range	mm ² /s	12 ... 380
Maximum permissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)		Class 20/18/15 ⁴⁾
Stroke speed ⁵⁾ (depending on line connection)	m/s	see table on page 9
Bleeding		by default secured against screwing out

Hydraulic fluid ⁶⁾	Classification	Suitable sealing materials	Standards
Mineral oils	HL, HLP	NBR, FKM	DIN 51524
Oil-in-water emulsion	HFA	NBR, FKM	ISO 12922
Phosphoric acid esters	HFDR	FKM	ISO 12922
Water glycol	HFC	on request	

Technical data

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

Stroke velocity

Piston Ø in mm	Mating connector	max. stroke velocity in m/s
40	G1/2	0.31
50	G1/2	0.20
63	G3/4	0.28
80	G3/4	0.18
100	G1	0.20
125	G1	0.13
140	G1 1/4	0.16

Piston Ø in mm	Mating connector	max. stroke velocity in m/s
160	G1 1/4	0.12
180	G1 1/4	0.10
200	G1 1/4	0.08
220	G1 1/2	0.09
250	G1 1/2	0.07
280	G1 1/2	0.06
320	G1 1/2	0.04

- 1) By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010). 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
- ▶ Position measurement system

The areas that are not painted are protected by means of a solvent-free corrosion protection agent.

- 2) Higher operating pressures upon request
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 sequence cycle, mounting elements and threaded piston rod connections must be designed for durability.
- 3) 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 10 bar is recommended for

differential cylinders; for lower pressures as well as double-acting cylinders, please contact us.

- 4) The cleanliness classes stated for the components has to be maintained in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.
- 5) Please observe the guideline on max. stroke velocities (with recommended flow velocity of 5 m/s in the line connection) in the table. Higher stroke velocities 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.
- 6) For more information about fluids see data sheet

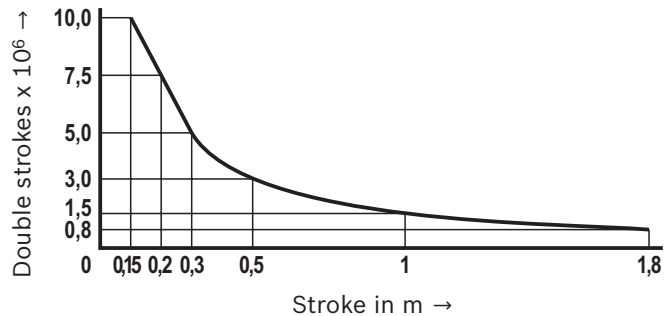
Technical data

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

Life cycle:

cylinders correspond to the reliability recommendations for industrial applications.

≥ 10,000,000 double strokes in idle continuous operation or 3,000 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 %.



Notice!

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 dead weight of the hydraulic cylinder (MP3/MP5 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 area 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.

Standards:

The installation dimensions and types of mounting of the cylinder comply with the standards DIN 24333 and ISO 6022.

Acceptance:

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

Safety instructions:

For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions have to be observed!

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

Check lists for hydraulic cylinders:

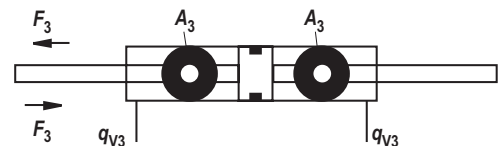
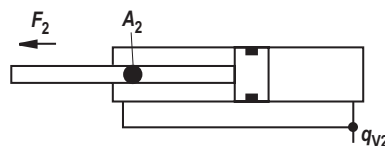
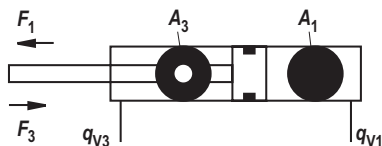
Cylinders the characteristics and/or application parameters of which deviate from the values specified in the data sheet can only be offered as special version upon request. For offers, the deviations of the characteristics and/or application parameters must be described in the check lists for hydraulic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

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

All graphical presentations in the data sheet are examples. The product supplied may therefore differ from the photo shown.

Diameters, areas, forces, flow

Piston	Piston rod	Area ratio	Piston	Areas	Ring	Force at 250 bar ¹⁾			Flow at 0.1 m/s ²⁾			max. available stroke length
$\varnothing$ AL mm	$\varnothing$ MM mm	ϕ A_1/A_3	A_1 cm ²	A_2 cm ²	A_3 cm ²	F_1 kN	F_2 kN	F_3 kN	q_{v1} l/min	q_{v2} l/min	q_{v3} l/min	mm
40	25 28	1.64 1.96	12.56	4.90 6.16	7.65 6.40	31.40	12.25 15.40	19.12 16.00	7.5	2.9 3.7	4.6 3.8	2000
50	32 36	1.69 2.08	19.63	8.04 10.18	11.59 9.45	49.10	20.12 25.45	28.98 23.65	11.8	4.8 6.1	7.0 5.7	2000
63	40 45	1.67 2.04	31.17	12.56 15.90	18.61 15.27	77.90	31.38 39.75	46.52 38.15	18.7	7.5 9.5	11.2 9.2	2000
80	50 56	1.66 1.96	50.26	19.63 24.63	30.63 25.63	125.65	49.07 61.55	76.58 64.10	30.2	11.8 14.8	18.4 15.4	2000
100	63 70	1.66 1.96	78.54	31.16 38.48	47.38 40.06	196.35	77.93 96.20	118.42 100.15	47.1	18.7 23.1	28.4 24.0	3000
125	80 90	1.69 2.08	122.72	50.24 63.62	72.48 59.10	306.75	125.62 159.05	181.13 147.70	73.6	30.1 38.2	43.5 35.4	3000
140	90 100	1.70 2.04	153.94	63.62 78.54	90.32 75.40	384.75	159.05 196.35	225.70 188.40	92.4	38.2 47.1	54.2 45.3	3000
160	100 110	1.64 1.90	201.06	78.54 95.06	122.50 106.00	502.50	196.35 237.65	306.15 264.85	120.6	47.1 57.0	73.5 63.6	3000
180	110 125	1.60 1.93	254.47	95.06 122.72	159.43 131.75	636.17	237.65 306.80	398.52 329.37	152.7	57.0 73.6	95.7 79.1	3000
200	125 140	1.64 1.96	314.16	122.72 153.96	191.44 160.20	785.25	306.80 384.90	478.45 400.35	188.5	73.6 92.4	114.9 96.1	3000
220	140 160	1.68 2.12	380.1	153.96 201.0	226.2 179.1	950.3	384.9 502.6	565.5 447.7	228.1	92.4 120.7	135.7 107.4	6000
250	160 180	1.69 2.08	490.8	201.0 254.4	289.8 236.4	1227.2	502.6 636.2	724.5 590.0	294.5	120.7 152.7	173.8 141.8	6000
280	180 200	1.70 2.04	615.7	254.4 314.1	361.3 301.6	1539.4	636.2 785.4	903.2 753.9	369.4	152.7 188.5	216.7 180.9	6000
320	200 220	1.64 1.90	804.2	314.1 380.1	490.1 424.2	2010.6	785.4 950.3	1225.2 1060.3	482.5	188.5 228.1	294.0 254.4	6000



- 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

Tolerances according to ISO 6020-1

Installation dimensions	WC	XC ²⁾	XO ²⁾	XS ^{1), 2)}	XV ²⁾	ZP ²⁾	Stroke tolerances
Type of mounting	MF3	MP3	MP5	MS2	MT4	MF4	
Stroke length	Tolerances						
≤ 1250	±2	±1.5	±1.5	±2	±2	±1.5	+2
> 1250 – ≤ 3150	±4	±3	±3	±4	±4	±3	+5
> 3150 – ≤ 6000	±8	±5	±5	±8	±8	±5	+8

¹⁾ Not standardized

²⁾ Including stroke length

Overview types of mounting: Series CDH2...XC

CDH2...XC: MP3

see page 14, 15

CDH2...XC: MF4

see page 20, 21

CDH2...XC: MP5

see page 16, 17

CDH2...XC: MT4

see page 22, 23

CDH2...XC: MF3

see page 18, 19

CDH2...XC: MS2

see page 24, 25

Overview types of mounting: Series CGH2...XC

CGH2...XC: MF3

see page 18, 19

CGH2...XC: MS2

see page 24, 25

CGH2...XC: MT4

see page 22, 23

Overview types of mounting: Series CSH2...XE

CSH2...XE: MF3

see page 26, 27

CSH2...XE: MT4

see page 30, 31

CSH2...XE: MF4

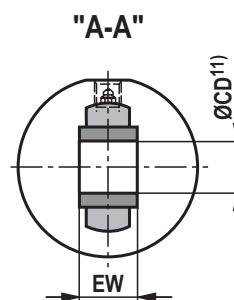
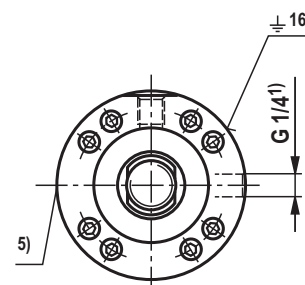
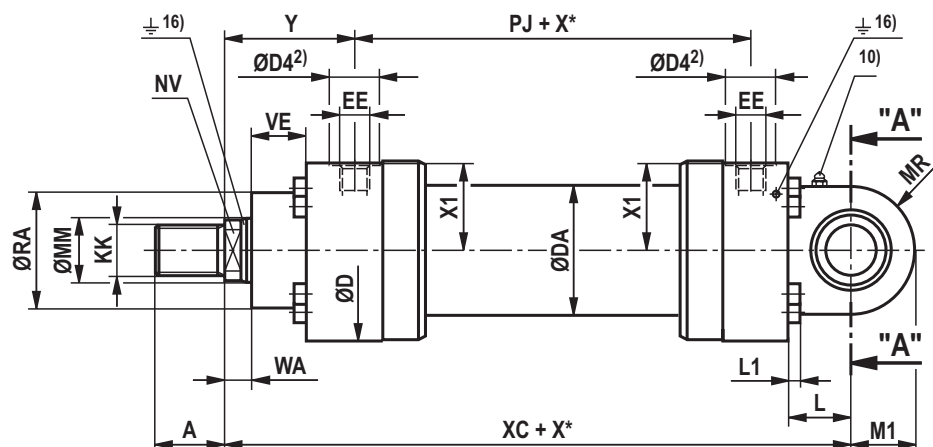
see page 28, 29

CSH2...XE: MS2

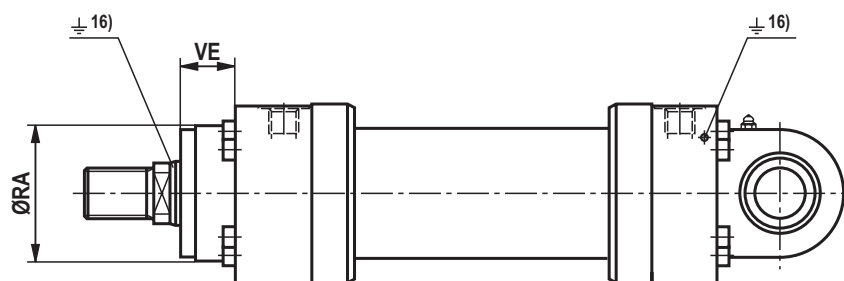
see page 32, 33

Dimensions: Swivel eye at base CDH2...XC: MP3
(dimensions in mm)

CDH2...XC: MP3



CDH2...XC: MP3: with seal design "A", "B" and AL Ø 160 ... 320 mm



Dimensions: Swivel eye at base CDH2...XC: MP3

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 ²⁾	EE ⁴⁾	EE ⁴⁾	Y	PJ	X1	WA	XC
40⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18	282
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18	305
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21	348
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24	395
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27	442
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31	520
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31	580
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35	617
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40	690
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40	756
220⁶⁾	140/160	M125 x 4	125	120/140	355	270	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42	890
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48 x 2 ³⁾	257	326	194	42	903
280⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48	1072
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48	1080

Ø AL	Ø MM	L	L1	MR	M1	ØCD ^{H9}	EW ^{h12}	ØRA ⁷⁾	VE ⁷⁾	ØRA ⁸⁾	VE ⁸⁾
40⁶⁾	25/28	53	8	32	32	25	25	52	29	88	–
50	32/36	61	8	40	40	32	32	63	29	102	–
63	40/45	74	8	50	50	40	40	75	32	120	–
80	50/56	90	10	63	63	50	50	90	36	145	–
100	63/70	102	12	71	71	63	63	110	41	170	–
125	80/90	124	16	90	90	80	80	132	45	206	–
140	90/100	149	16	100	100	90	90	145	45	226	–
160	100/110	150	16	112	112	100	100	160	50	200	50
180	110/125	180	20	129	129	110	110	185	55	220	55
200	125/140	206	20	145	145	125	125	200	61	235	61
220⁶⁾	140/160	253	20	179 ¹²⁾	187 ¹²⁾	160	160	235	71	270	71
250	160/180	253	24	179 ¹²⁾	187 ¹²⁾	160	160	250	71	300	71
280⁶⁾	180/200	320	30	230 ¹²⁾	240 ¹²⁾	200	200	295	88	325	88
320	200/220	320	30	231 ¹²⁾	241 ¹²⁾	200	200	320	88	365	88

Ø AL =Piston Ø

Ø MM =Piston rod Ø

X* =Stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E" (180° for bleeding)

6) Piston Ø not standardized

7) Dimensions for cylinders with seal design M, T, and S

8) Dimensions for cylinders with seal design A and B

10) Standard version "W"
Lubricating nipple, cone head form A according to DIN 71412 related bolt Ø f8

12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

16) Equipotential bonding see pages 40 and 41

Dimensions: Self-aligning clevis at base CDH2...XC: MP5

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 ²⁾	EE ⁴⁾	EE ⁴⁾	Y	PJ	X1	WA	XO
40⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18	282
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18	305
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21	348
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24	395
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27	442
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31	520
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31	580
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35	617
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40	690
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40	756
220⁶⁾	140/160	M125 x 4	125	120/140	355	270	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42	890
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48 x 2 ³⁾	257	326	194	42	903
280⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48	1072
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48	1080

Ø AL	Ø MM	LT	L1	MS	M1	ØCX ¹¹⁾ H7	EP	EX h12	ØRA ⁷⁾	VE ⁷⁾	ØRA ⁸⁾	VE ⁸⁾	Z
40⁶⁾	25/28	53	8	32	32	25	22	25	52	29	88	–	2°
50	32/36	61	8	40	40	32	27	32	63	29	102	–	4°
63	40/45	74	8	50	50	40	32	40	75	32	120	–	4°
80	50/56	90	10	63	63	50	40	50	90	36	145	–	4°
100	63/70	102	12	71	71	63	52	63	110	41	170	–	4°
125	80/90	124	16	90	90	80	66	80	132	45	206	–	4°
140	90/100	149	16	100	100	90	72	90	145	45	226	–	4°
160	100/110	150	16	112	112	100	84	100	160	50	200	50	4°
180	110/125	180	20	129	129	110	88	110	185	55	220	55	4°
200	125/140	206	20	145	145	125	102	125	200	61	235	61	4°
220⁶⁾	140/160	253	20	179 ¹²⁾	187 ¹²⁾	160	130	160	235	71	270	71	4°
250	160/180	253	24	179 ¹²⁾	187 ¹²⁾	160	130	160	250	71	300	71	4°
280⁶⁾	180/200	320	30	230 ¹²⁾	240 ¹²⁾	200	138	200	295	88	325	88	4°
320	200/220	320	30	231 ¹²⁾	241 ¹²⁾	200	162	200	320	88	365	88	4°

Ø AL =Piston Ø

Ø MM =Piston rod Ø

X* =Stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E" (180° for bleeding)

6) Piston Ø not standardized

7) Dimensions for cylinders with seal design M, T, and S

8) Dimensions for cylinders with seal design A and B

10) Standard version "W"

Lubricating nipple, cone head form A according to DIN 71412

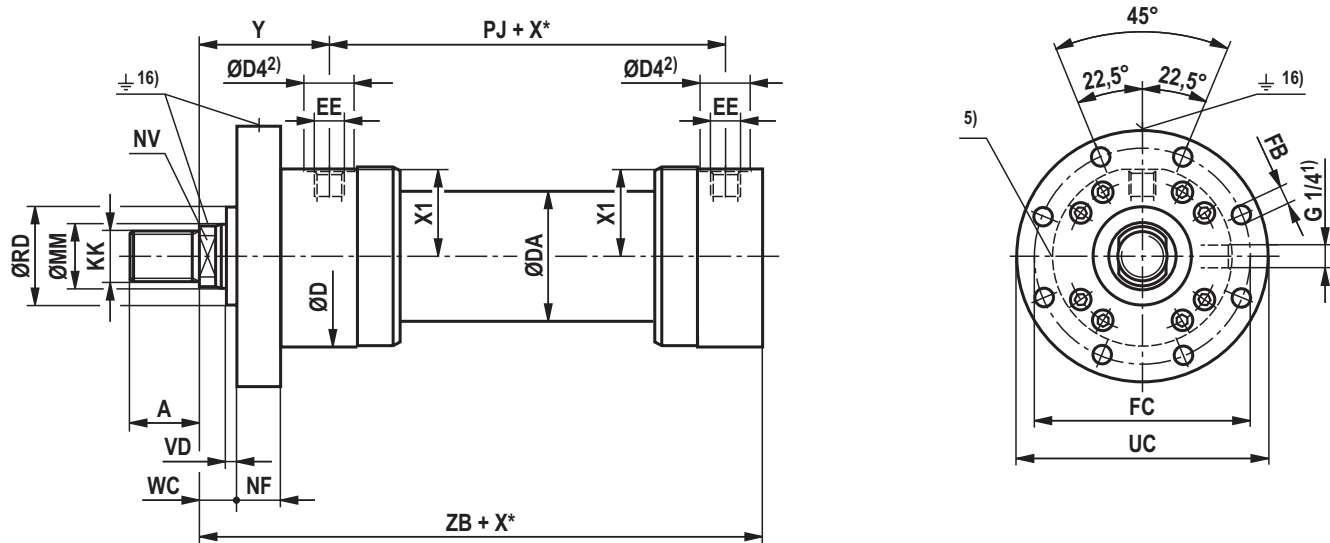
11) related bolt Ø f8

12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

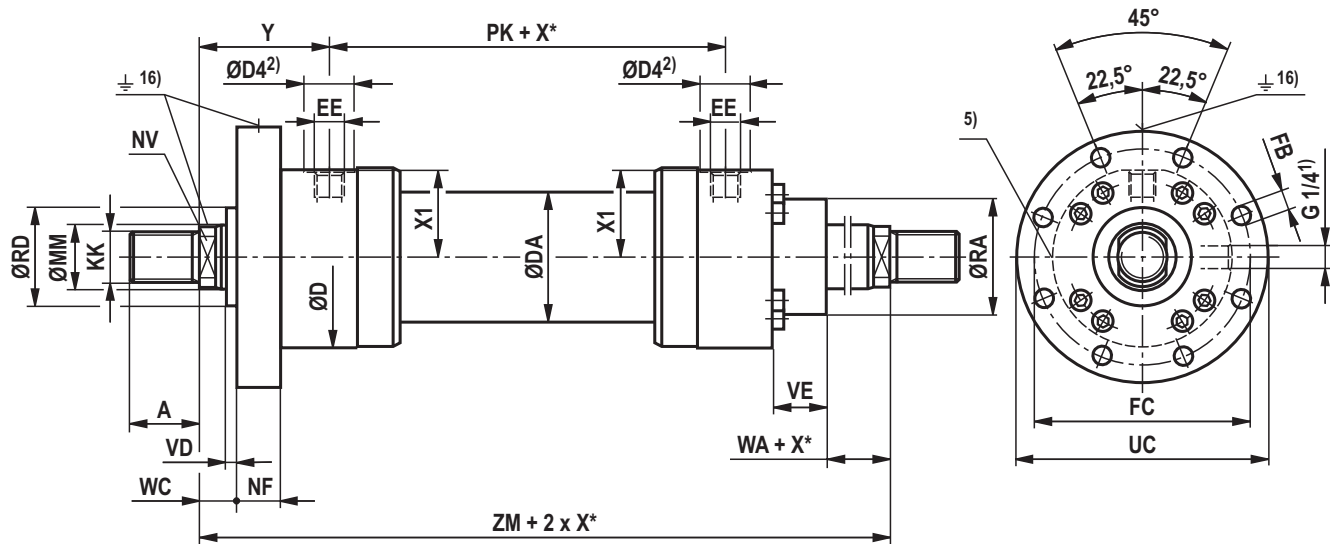
16) Equipotential bonding see pages 40 and 41

Dimensions: Round flange at head CDH2...XC / CGH2...XC: MF3 (dimensions in mm)

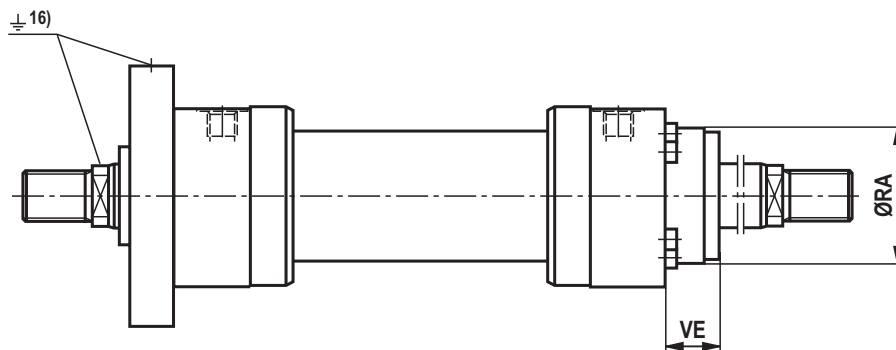
CDH2...XC: MF3



CGH2...XC: MF3 ¹⁰⁾



CGH2...XC: MF3 ¹⁰⁾: With seal design "A", "B" and AL Ø 160 ... 320 mm



Dimensions: Round flange at head CDH2...XC / CGH2...XC: MF3

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40 ⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40
220 ⁶⁾	140/160	M125 x 4	125	120/140	355	270	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48x 2 ³⁾	257	326	194	42
280 ⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48x2 ³⁾	282	391	243	48

Ø AL	Ø MM	ØRD f8	WC	VD	NF js13	PK	ZB max.	ZM	ØFB H13	ØFC js13	ØUC -1	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40 ⁶⁾	25/28	52	22	4	25	120	230	286	11	115	138	52	29	88	–
50	32/36	63	22	4	25	120	244	316	13.5	132	155	63	29	102	–
63	40/45	75	25	4	28	133	274	357	13.5	150	175	75	32	120	–
80	50/56	90	28	4	32	155	305	395	17.5	180	210	90	36	145	–
100	63/70	110	32	5	36	171	340	439	22	212	250	110	41	170	–
125	80/90	132	36	5	40	205	396	511	22	250	290	132	45	206	–
140	90/100	145	36	5	40	219	430	551	26	285	330	145	45	226	–
160	100/110	160	40	5	45	235	467	605	26	315	360	160	50	200	50
180	110/125	185	45	5	50	264	510	652	33	355	410	185	55	220	55
200	125/140	200	45	5	56	278	550	718	33	385	440	200	61	235	61
220 ⁶⁾	140/160	235	50	8	63	326	637	814	39	435	500	235	71	270	71
250	160/180	250	50	8	63	326	650	840	39	475	540	250	71	300	71
280 ⁶⁾	180/200	295	56	8	80	375	752	955	45	555	630	295	88	325	88
320	200/220	320	56	8	80	391	760	955	45	600	675	320	88	365	88

Ø AL = Piston Ø

Ø MM = Piston rod Ø

X* = Stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022;
M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E"
(180° for bleeding)

6) Piston Ø not standardized

7) Dimensions for cylinders with seal design M, T, and S

8) Dimensions for cylinders with seal design A and B

10) Double-acting cylinder not standardized

16) Equipotential bonding see pages 40 and 41

Dimensions: Round flange at base CDH2...XC: MF4

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40 ⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40
220 ⁶⁾	140/160	M125 x 4	125	120/140	355	270	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48 x 2 ³⁾	257	326	194	42
280 ⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48

Ø AL	Ø MM	ZP	NF js13	PI	ØBA H8	ØFB H13	ØFC js13	ØUC -1	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40 ⁶⁾	25/28	250	25	5	52	11	115	138	52	29	88	–
50	32/36	265	25	4	63	13.5	132	155	63	29	102	–
63	40/45	298	28	4	75	13.5	150	175	75	32	120	–
80	50/56	332	32	5	90	17.5	180	210	90	36	145	–
100	63/70	371	36	5	110	22	212	250	110	41	170	–
125	80/90	430	40	6	132	22	250	290	132	45	206	–
140	90/100	465	40	5	145	26	285	330	145	45	226	–
160	100/110	505	45	7	160	26	315	360	160	50	200	50
180	110/125	550	50	10	185	33	355	410	185	55	220	55
200	125/140	596	56	10	200	33	385	440	200	61	235	61
220 ⁶⁾	140/160	690	63	10	235	39	435	500	235	71	270	71
250	160/180	703	63	10	250	39	475	540	250	71	300	71
280 ⁶⁾	180/200	822	80	10	295	45	555	630	295	88	325	88
320	200/220	830	80	10	320	45	600	675	320	88	365	88

Ø AL =Piston Ø

Ø MM=Piston rod Ø

X* =Stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022;
M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E"
(180° for bleeding)

6) Piston Ø not standardized

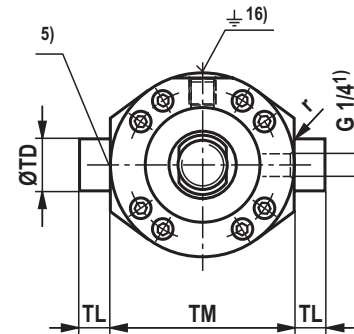
7) Dimensions for cylinders with seal design M, T, and S

8) Dimensions for cylinders with seal design A and B

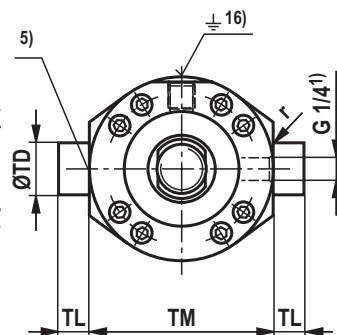
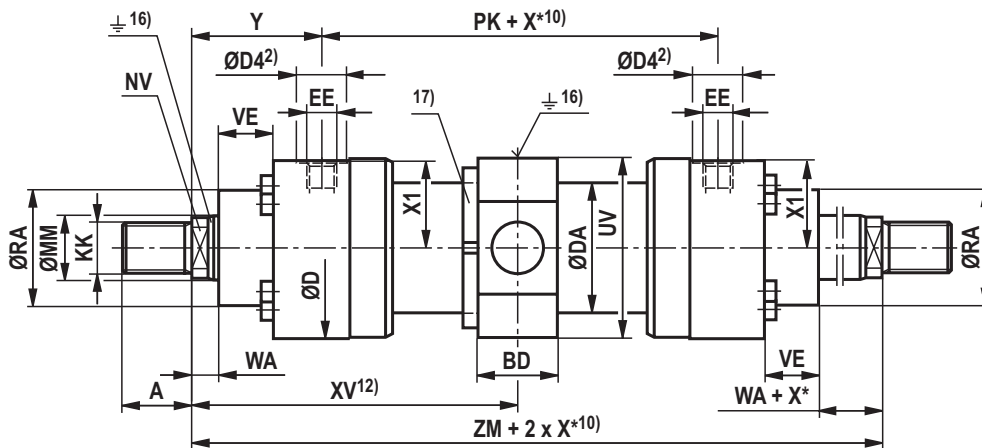
16) Equipotential bonding see pages 40 and 41

Technical drawing of a shaft assembly with dimensions and labels. The drawing shows a shaft with various components and dimensions. Key dimensions include:

- $\varnothing RA$: Outer diameter of the shaft at the left end.
- $\varnothing MM$: Inner diameter of the shaft at the left end.
- KK : Width of the shaft at the left end.
- 16 : Dimension line for the shaft diameter at the left end.
- NV : Label for the shaft at the left end.
- Y : Dimension line for the shaft diameter at the left end.
- $\varnothing D4^{(2)}$: Dimension line for the shaft diameter at the left end.
- VE : Label for the shaft at the left end.
- EE : Label for the shaft at the left end.
- 17 : Label for the shaft at the left end.
- 16 : Dimension line for the shaft diameter at the left end.
- $\varnothing D$: Dimension line for the shaft diameter at the left end.
- WA : Label for the shaft at the left end.
- A : Dimension line for the shaft diameter at the left end.
- $XV^{(12)}$: Dimension line for the shaft diameter at the left end.
- $ZB + X^{*10}$: Dimension line for the shaft diameter at the left end.
- $PJ + X^{*10}$: Dimension line for the shaft diameter at the left end.
- $\varnothing DA$: Dimension line for the shaft diameter at the left end.
- UV : Label for the shaft at the left end.
- BD : Label for the shaft at the left end.
- $X1$: Label for the shaft at the left end.
- EE : Label for the shaft at the left end.
- $\varnothing D4^{(2)}$: Dimension line for the shaft diameter at the left end.



Technical drawing of a shaft-hub assembly. The drawing shows a shaft with a keyway and a hub with a keyway. The dimension LY indicates the length of the shaft section, and XV 12) indicates the length of the hub section.



Technical drawing of a shaft assembly. The drawing shows a central shaft with a diameter of $\varnothing 16$ and a length of 17. The shaft is supported by two bearings, each with a width of VE. The shaft is also equipped with two couplings, each with a diameter of $\varnothing 16$. The total length of the assembly is 17.

Dimensions: Trunnion CDH2...XC / CGH2...XC: MT4

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 ²⁾	EE ⁴⁾	EE ⁴⁾	Y	PJ	X1	WA
40 ⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40
220 ⁶⁾	140/160	M125 x 4	125	120/140	355	273	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48 x 2 ³⁾	257	326	194	42
280 ⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48

Ø AL	Ø MM	PK	ZB max.	ZM	X* min.	XV ¹⁴⁾ cent.	XV ¹²⁾ min.	XV ¹²⁾ max.	BD	UV ¹⁵⁾	ØTD f8	TL js16	TM h12	r	ØRA ⁷⁾	VE ⁷⁾	ØRA ⁸⁾	VE ⁸⁾
40 ⁶⁾	25/28	120	230	286	22	143 + X*/2	154	140 + X*	38	97	25	20	95	0.8	52	29	88	–
50	32/36	120	244	316	32	158 + X*/2	174	151 + X*	38	111	32	25	112	0.8	63	29	102	–
63	40/45	133	274	357	47	178.5 + X*/2	202	167 + X*	48	129	40	32	125	1	75	32	120	–
80	50/56	155	305	395	58	197.5 + X*/2	226.5	180.5 + X*	58	163	50	40	150	1	90	36	145	–
100	63/70	171	340	439	79	219.5 + X*/2	259	195 + X*	78	188	63	50	180	1.2	110	41	170	–
125	80/90	205	396	511	91	255.5 + X*/2	301	210 + X*	98	234	80	63	224	1.2	132	45	206	–
140	90/100	219	430	551	121	275.5 + X*/2	336	215 + X*	118	257	90	70	265	1.5	145	45	226	–
160	100/110	235	467	605	142	302.5 + X*/2	373.5	231.5 + X*	128	287	100	80	280	1.5	160	50	200	50
180	110/125	264	510	652	158	326 + X*/2	405	247 + X*	138	328	110	90	320	1.5	185	55	220	55
200	125/140	278	550	718	204	359 + X*/2	461	257 + X*	178	343	125	100	335	1.5	200	61	235	61
220 ⁶⁾	140/160	326	637	814	200	407 + X*/2	507	307 + X*	180	393	160	125	385	1.5	235	71	270	71
250	160/180	326	650	840	210	420 + X*/2	525	315 + X*	180	433	160	125	425	1.5	250	71	300	71
280 ⁶⁾	180/200	375	752	955	241	477.5 + X*/2	598	357 + X*	220	486	200	160	480	2	295	88	325	88
320	200/220	391	760	955	245	477.5 + X*/2	600	355 + X*	220	536	200	160	530	2	320	88	365	88

Ø AL = Piston Ø

Ø MM = Piston rod Ø

X* = Stroke length

X*_{min.} = min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E" (180° for bleeding)

6) Piston Ø not standardized

7) Dimensions for cylinders with seal design M, T, and S

8) Dimensions for cylinders with seal design A and B

10) Observe the min. stroke length "X*_{min.}"

11) Double-acting cylinder not standardized

12) When ordering, always specify the "XV" dimension in the plain text. Preferred XV dimension: Observe trunnion position in cylinder center XV_{min.} and XV_{max.}

14) XV_{cent.} Recommendation: Trunnion position in cylinder center

15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

16) Equipotential bonding see pages 40 and 41

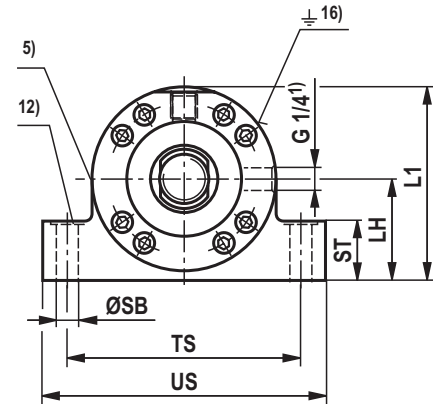
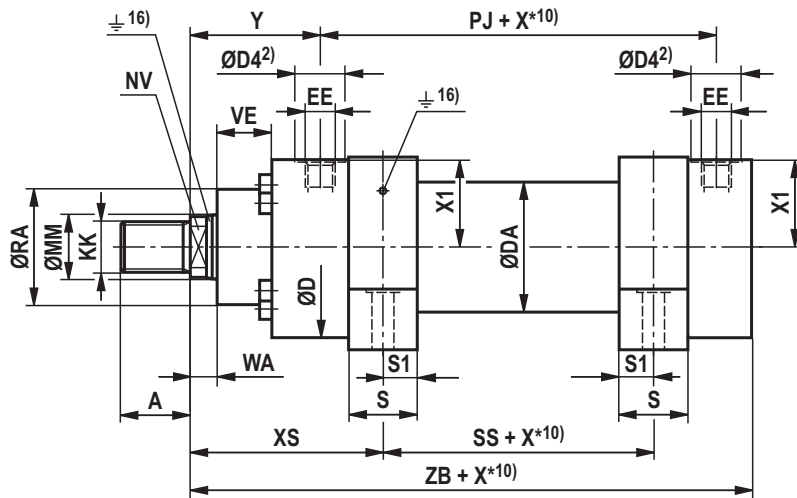
17) Trunnion nut at AL-Ø ≥ 125 mm depending on the location of the trunnion (XV) either head or base side.

Important installation information!

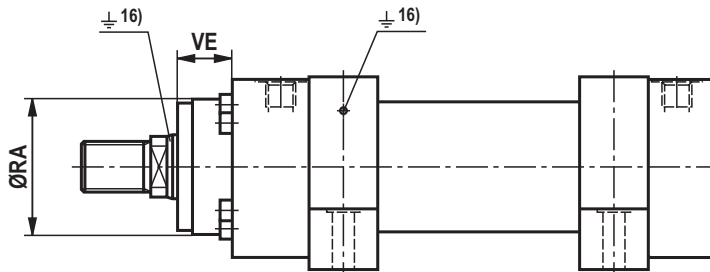
During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product's service life.

Dimensions: Foot mounting CDH2...XC / CGH2...XC: MS2 (dimensions in mm)

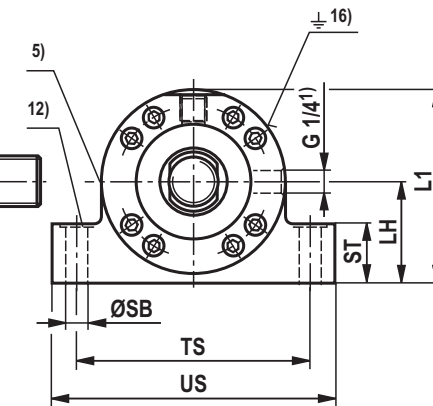
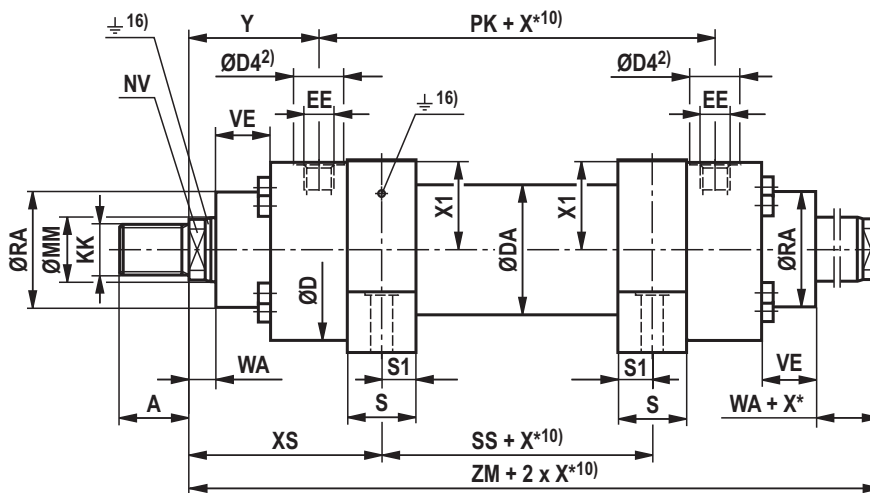
CDH2...XC: MS2 2; 11)



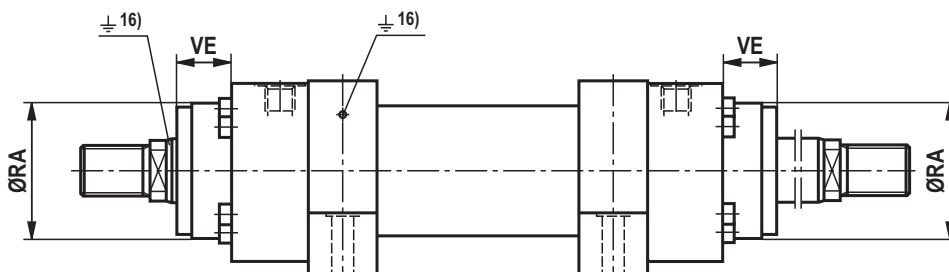
CDH2...XC: MS2 11): with seal design "A", "B" and AL Ø 160 ... 320 mm



CGH2...XC: MS2 11)



CGH2...XC: MS2 11): with seal design "A", "B" and AL Ø 160 ... 320 mm



Dimensions: Foot mounting CDH2...XC / CGH2...XC: MS2

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40 ⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40
220 ⁶⁾	140/160	M125 x 4	125	120/140	355	270	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48 x 2 ³⁾	257	326	194	42
280 ⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48

Ø AL	Ø MM	PK	XS	ZB max.	ZM	SS	X* min.	S	S1	ØSB H13	ST	TS js13	US 15)	LH	L1	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40 ⁶⁾	25/28	120	118	230	286	50	1	30	15	11	32	110	140	45	93	52	29	88	–
50	32/36	120	135.5	244	316	45	1	35	17.5	11	37	130	161	55	110	63	29	102	–
63	40/45	133	154	274	357	49	1	40	20	13.5	42	150	183	65	129	75	32	120	–
80	50/56	155	171.5	305	395	52	2	50	25	17.5	47	180	220	75	149	90	36	145	–
100	63/70	171	189	340	439	61	3	60	30	22	57	210	260	90	181	110	41	170	–
125	80/90	205	218	396	511	75	1	70	35	26	67	255	313	105	215	132	45	206	–
140	90/100	219	240.5	430	551	70	19	85	42.5	30	72	290	359	115	235	145	45	226	–
160	100/110	235	270	467	605	65	44	105	52.5	33	77	330	402	135	277	160	50	200	50
180	110/125	264	291.5	510	652	69	50	115	57.5	40	92	360	445	150	305	185	55	220	55
200	125/140	278	322.5	550	718	73	56	125	62.5	40	97	385	471	160	322	200	61	235	61
220 ⁶⁾	140/160	326	369.5	637	814	75	100	155	77.5	45	102	445	541	185	373	235	71	270	71
250	160/180	326	382.5	650	840	75	100	155	77.5	52	112	500	610	205	414	250	71	300	71
280 ⁶⁾	180/200	375	415.5	752	955	124	51	155	77.5	52	142	550	661	235	469	295	88	325	88
320	200/220	391	435	760	955	85	125	190	95	62	142	610	732	255	512	320	88	365	88

Ø AL = Piston Ø

Ø MM = Piston rod Ø

X* = Stroke length

X*_{min.} = min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E" (180° for bleeding)

6) Piston Ø not standardized

7) Dimensions for cylinders with seal design M, T, and S

8) Dimensions for cylinders with seal design A and B

10) Observe the min. stroke length "X*_{min.}"

11) Not standardized

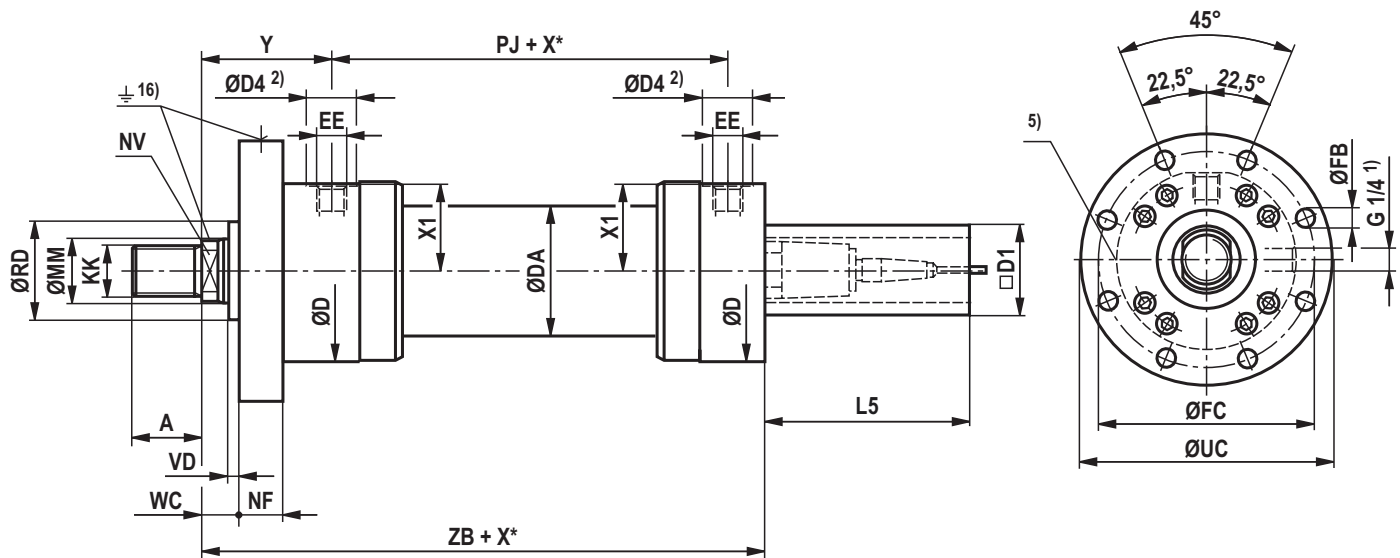
12) Recess 2 mm deep, for hexagon socket head cap screws; ISO 4762 – The screws must not be subjected to shear force. Force application via additional external fitting strip

15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

16) Equipotential bonding see pages 40 and 41

Dimensions: Round flange at head CSH2...XE: MF3
 (dimensions in mm)

CSH2...XE: MF3



Dimensions: Round flange at head CSH2...XE: MF3

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 ²⁾	EE ⁴⁾	EE ⁴⁾	Y	PJ	X1	X* max.	L5	D1 max.
40 ⁶⁾	25/28	M20x1.5	28	19/22	88	52	34	G1/2	M22x1.5	83	120	41	1000	166	80
50	32/36	M27x2	36	27/30	102	62	34	G1/2	M22x1.5	98	120	48,5	1000	166	96
63	40/45	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56.5	2000	166	96
80	50/56	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69.5	2000	166	96
100	63/70	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	3000	166	96
125	80/90	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100.5	3000	166	96
140	90/100	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109.5	3000	166	96
160	100/110	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129.5	3000	166	96
180	110/125	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143.5	3000	166	96
200	125/140	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150.5	3000	166	96
220 ⁶⁾	140/160	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 ³⁾	244	326	174	3000	166	96
250	160/180	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 ³⁾	257	326	194	3000	166	96
280 ⁶⁾	180/200	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 ³⁾	290	375	220.5	3000	166	96
320	200/220	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 ³⁾	282	391	243	3000	166	96

Ø AL	Ø MM	ØRD f8	WC	VD	NF js13	ZB max.	ØFB H13	ØFC js13	ØUC -1
40 ⁶⁾	25/28	52	22	4	25	239	11	115	138
50	32/36	63	22	4	25	254	13.5	132	155
63	40/45	75	25	4	28	299	13.5	150	175
80	50/56	90	28	4	32	332.5	17.5	180	210
100	63/70	110	32	5	36	362	22	212	250
125	80/90	132	36	5	40	410	22	250	290
140	90/100	145	36	5	40	440	26	285	330
160	100/110	160	40	5	45	472.5	26	315	360
180	110/125	185	45	5	50	510	33	355	410
200	125/140	200	45	5	56	550	33	385	440
220 ⁶⁾	140/160	235	50	8	63	637	39	435	500
250	160/180	250	50	8	63	650	39	475	540
280 ⁶⁾	180/200	295	56	8	80	752	45	555	630
320	200/220	320	56	8	80	760	45	600	675

Ø AL =Piston Ø

Ø MM=Piston rod Ø

X* = Stroke length

X*_{max.} = max. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

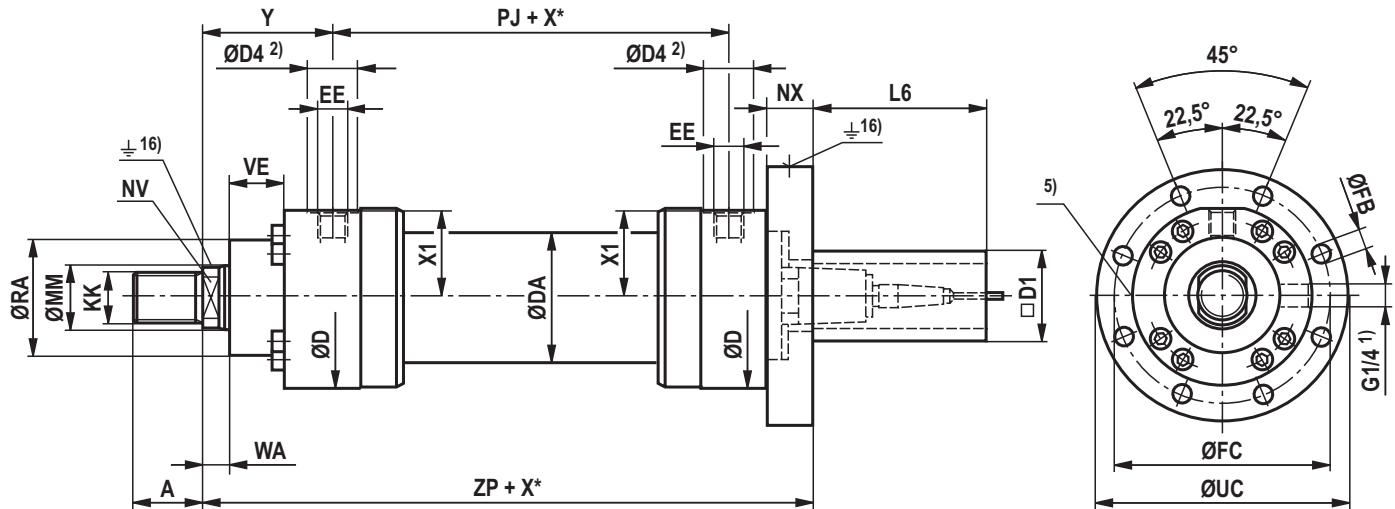
5) Throttle valve only with end position cushioning "E" (180° for bleeding)

6) Piston Ø not standardized

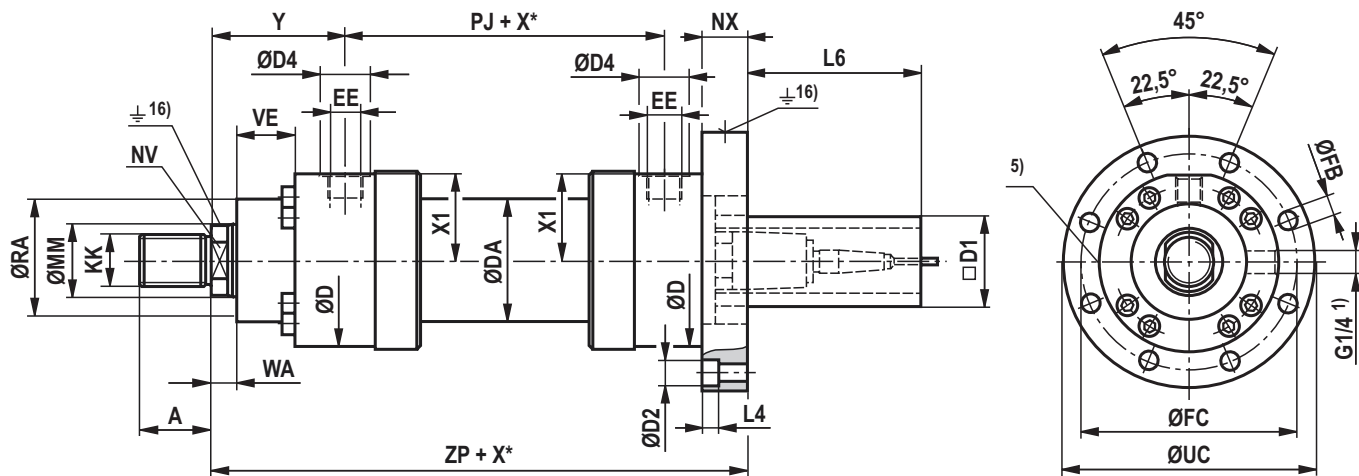
16) Equipotential bonding see pages 40 and 41

Dimensions: Round flange at base CSH2...XE: MF4
 (dimensions in mm)

CSH2...XE: MF4: Ø AL 40 ... 100 mm



CSH2...XE: MF4: Ø AL 125 ... 320 mm



Dimensions: Round flange at base CSH2...XE: MF4

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 ²⁾	EE ⁴⁾	EE ⁴⁾	Y	PJ	X1	WA	X* max.	L4
40 ⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18	1000	3
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48.5	18	1000	3
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21	2000	0
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24	2000	0
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27	3000	0
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31	3000	21.5
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31	3000	25.5
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35	3000	25.5
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40	3000	32
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40	3000	32
220 ⁶⁾	140/160	M125 x 4	125	120/140	355	270	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42	3000	38
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48 x 2 ³⁾	257	326	194	42	3000	38
280 ⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48	3000	44
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48	3000	44

Ø AL	Ø MM	L6	ØD2	D1 max.	ZP	NX js13	ØFB H13	ØFC js13	ØUC -1	ØRA	VE
40 ⁶⁾	25/28	166	18	80	262	28	11	115	138	52	29
50	32/36	166	20	96	278	28	13.5	132	155	63	29
63	40/45	166	0	96	313	28	13.5	150	175	75	32
80	50/56	166	0	96	350	32	17.5	180	210	90	36
100	63/70	138	0	96	390	36	22	212	250	110	41
125	80/90	131	33	96	445	55	22	250	290	132	45
140	90/100	121	40	96	485	60	26	285	330	145	45
160	100/110	113.5	40	96	525	65	26	315	360	160	50
180	110/125	106	48	96	570	70	33	355	410	185	55
200	125/140	100	48	96	616	76	33	385	440	200	61
220 ⁶⁾	140/160	88	57	96	715	88	39	435	500	235	71
250	160/180	86	57	96	730	90	39	475	540	250	71
280 ⁶⁾	180/200	61	66	96	857	115	45	555	630	295	88
320	200/220	61	66	96	865	115	45	600	675	320	88

Ø AL = Piston Ø

Ø MM = Piston rod Ø

X* = Stroke length

X*_{max.} = max. stroke length

¹⁾ Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

²⁾ Ø D4 max. 0.5 mm deep

³⁾ Thread size does not correspond to ISO 6022; M50 x 2 available upon request

⁴⁾ Flange connections see separate table pages 34 and 35

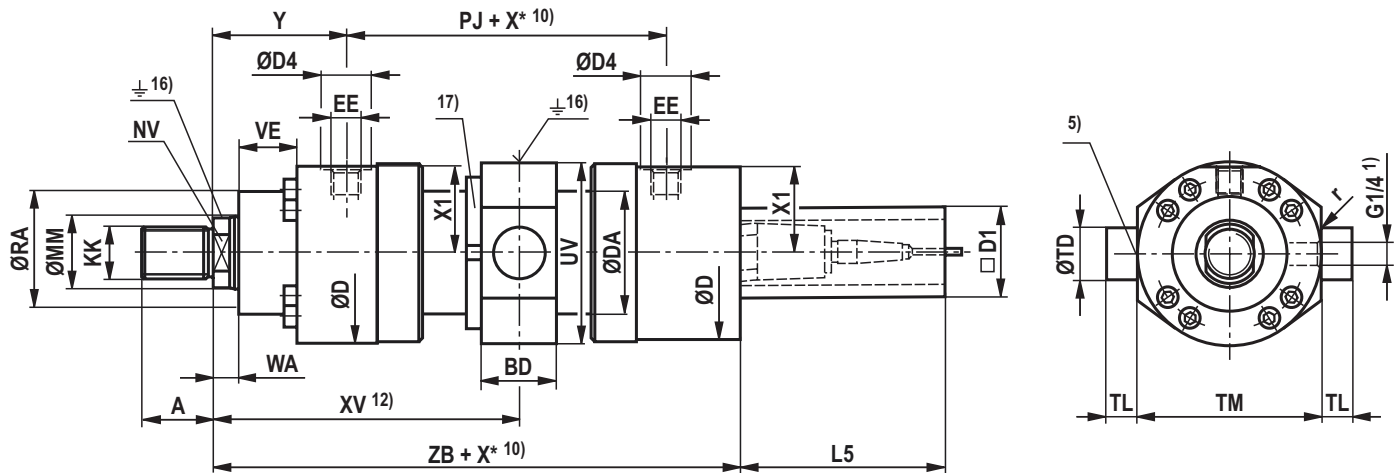
⁵⁾ Throttle valve only with end position cushioning "E" (180° for bleeding)

⁶⁾ Piston Ø not standardized

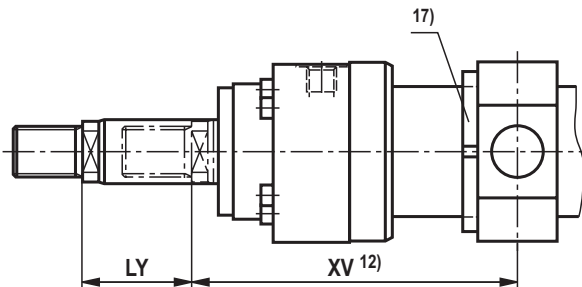
¹⁶⁾ Equipotential bonding see pages 40 and 41

(dimensions in mm)

CSH2...XE: MT4



Dimensions for cylinder with piston rod extension “LY” in retracted condition



Dimensions: Trunnion CSH2...XE: MT4

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 ²⁾	EE ⁴⁾	EE ⁴⁾	Y	PJ	X1	WA	X* max.	L5	D1 max.
40 ⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18	1000	166	80
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18	1000	166	96
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56,5	21	2000	166	96
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69,5	24	2000	166	96
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27	3000	166	96
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100,5	31	3000	166	96
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109,5	31	3000	166	96
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129,5	35	3000	166	96
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143,5	40	3000	166	96
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150,5	40	3000	166	96
220 ⁶⁾	140/160	M125 x 4	125	120/140	355	273	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42	3000	166	96
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48x2 ³⁾	257	326	194	42	3000	166	96
280 ⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220,5	48	3000	166	96
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48	3000	166	96

Ø AL	Ø MM	ZB max.	X* min.	XV ¹⁴⁾ cent.	XV ¹²⁾ min.	XV ¹²⁾ max.	BD	UV ¹⁵⁾	ØTD f8	TL js16	TM h12	r	ØRA	VE
40 ⁶⁾	25/28	239	22	143 + X*/2	154	140 + X*	38	97	25	20	95	0.8	52	29
50	32/36	254	32	158 + X*/2	174	151 + X*	38	111	32	25	112	0.8	63	29
63	40/45	299	47	178.5 + X*/2	202	167 + X*	48	129	40	32	125	1	75	32
80	50/56	332.5	58	197.5 + X*/2	226.5	180.5 + X*	58	163	50	40	150	1	90	36
100	63/70	362	79	219.5 + X*/2	259	195 + X*	78	188	63	50	180	1.2	110	41
125	80/90	410	91	255.5 + X*/2	301	210 + X*	98	234	80	63	224	1.2	132	45
140	90/100	440	121	275.5 + X*/2	336	215 + X*	118	257	90	70	265	1.5	145	45
160	100/110	472.5	142	302.5 + X*/2	373.5	231.5 + X*	128	287	100	80	280	1.5	160	50
180	110/125	510	158	326 + X*/2	405	247 + X*	138	328	110	90	320	1.5	185	55
200	125/140	550	204	359 + X*/2	461	257 + X*	178	343	125	100	335	1.5	200	61
220 ⁶⁾	140/160	637	200	407 + X*/2	507	307 + X*	180	393	160	125	385	1.5	235	71
250	160/180	650	210	420 + X*/2	525	315 + X*	180	433	160	125	425	1.5	250	71
280 ⁶⁾	180/200	752	241	477.5 + X*/2	598	357 + X*	220	486	200	160	480	2	295	88
320	200/220	760	245	477.5 + X*/2	600	355 + X*	220	536	200	160	530	2	320	88

Ø AL = Piston Ø

Ø MM = Piston rod Ø

X* = Stroke length

X*_{max.} = max. stroke length

X*_{min.} = min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E" (180° for bleeding)

6) Piston Ø not standardized

10) Observe the min. stroke length "X*_{min.}"

11) Double-acting cylinder not standardized

12) When ordering, always specify the "XV" dimension in the plain text. Preferred XV dimension: Observe trunnion position in cylinder center XV_{min.} and XV_{max.}

14) XV_{cent.} Recommendation: Trunnion position in cylinder center

15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

16) Equipotential bonding see pages 40 and 41

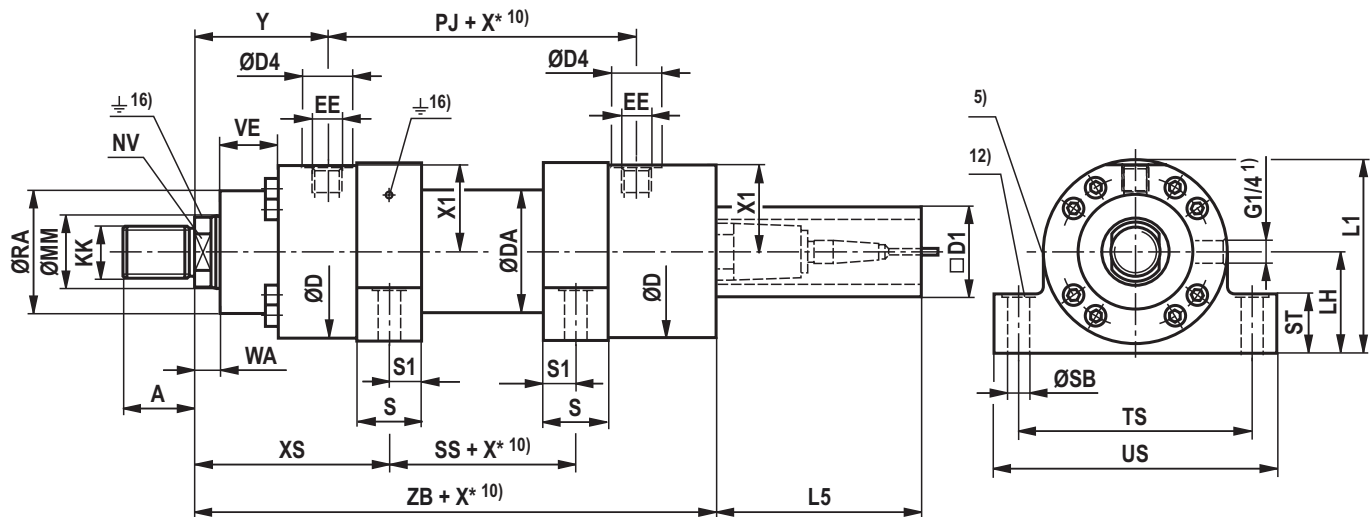
17) Trunnion nut at AL-Ø ≥ 125 mm depending on the location of the trunnion (XV) either head or base side.



Important installation information!

During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product's service life.

CSH2...XE MS2



Dimensions: Foot mounting CSH2...XE: MS2

(dimensions in mm)

Ø AL	Ø MM	KK	A	NV	ØD	ØDA	ØD4 ²⁾	EE ⁴⁾	EE ⁴⁾	Y	PJ	X1	WA	X* max.
40⁶⁾	25/28	M20 x 1.5	28	19/22	88	52	34	G1/2	M22 x 1.5	83	120	41	18	1000
50	32/36	M27 x 2	36	27/30	102	62	34	G1/2	M22 x 1.5	98	120	48,5	18	1000
63	40/45	M33 x 2	45	32/36	120	78	42	G3/4	M27 x 2	112	133	56.5	21	2000
80	50/56	M42 x 2	56	41/46	145	95	42	G3/4	M27 x 2	120	155	69.5	24	2000
100	63/70	M48 x 2	63	50/60	170	125	47	G1	M33 x 2	134	171	82	27	3000
125	80/90	M64 x 3	85	65/75	206	150	47	G1	M33 x 2	153	205	100.5	31	3000
140	90/100	M72 x 3	90	75/85	226	170	58	G1 1/4	M42 x 2	166	219	109.5	31	3000
160	100/110	M80 x 3	95	85/95	265	190	58	G1 1/4	M42 x 2	185	235	129.5	35	3000
180	110/125	M90 x 3	105	95/110	292	210	58	G1 1/4	M42 x 2	194	264	143.5	40	3000
200	125/140	M100 x 3	112	110/120	306	235	58	G1 1/4	M42 x 2	220	278	150.5	40	3000
220⁶⁾	140/160	M125 x 4	125	120/140	355	270	65	G1 1/2	M48 x 2 ³⁾	244	326	174	42	3000
250	160/180	M125 x 4	125	140/160	395	305	65	G1 1/2	M48 x 2 ³⁾	257	326	194	42	3000
280⁶⁾	180/200	M160 x 4	160	160/180	445	343	65	G1 1/2	M48 x 2 ³⁾	290	375	220.5	48	3000
320	200/220	M160 x 4	160	180/200	490	394	65	G1 1/2	M48 x 2 ³⁾	282	391	243	48	3000

Ø AL	Ø MM	L5	D1 max.	XS	ZB max.	SS	X* min.	S	S1	ØSB H13	ST	TS js13	US ¹⁵⁾	LH	L1 15)	ØRA	VE
40⁶⁾	25/28	166	80	118	239	50	1	30	15	11	32	110	140	45	93	52	29
50	32/36	166	96	135.5	254	45	1	35	17.5	11	37	130	161	55	110	63	29
63	40/45	166	96	154	299	49	1	40	20	13.5	42	150	183	65	129	75	32
80	50/56	166	96	171.5	332.5	52	2	50	25	17.5	47	180	220	75	149	90	36
100	63/70	166	96	189	362	61	3	60	30	22	57	210	260	90	181	110	41
125	80/90	166	96	218	410	75	1	70	35	26	67	255	313	105	215	132	45
140	90/100	166	96	240.5	440	70	19	85	42.5	30	72	290	359	115	235	145	45
160	100/110	166	96	270	472.5	65	44	105	52.5	33	77	330	402	135	277	160	50
180	110/125	166	96	291.5	510	69	50	115	57.5	40	92	360	445	150	305	185	55
200	125/140	166	96	322.5	550	73	56	125	62.5	40	97	385	471	160	322	200	61
220⁶⁾	140/160	166	96	369.5	637	75	100	155	77.5	45	102	445	541	185	373	235	71
250	160/180	166	96	382.5	650	75	100	155	77.5	52	112	500	610	205	414	250	71
280⁶⁾	180/200	166	96	415.5	752	124	51	155	77.5	52	142	550	661	235	469	295	88
320	200/220	166	96	435	760	85	125	190	95	62	142	610	732	255	512	320	88

Ø AL = Piston Ø

Ø MM = Piston rod Ø

X* = Stroke length

X*_{max.} = max. stroke length

X*_{min.} = min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

2) Ø D4 max. 0.5 mm deep

3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request

4) Flange connections see separate table pages 34 and 35

5) Throttle valve only with end position cushioning "E" (180° for bleeding)

6) Piston Ø not standardized

10) Observe the min. stroke length "X*_{min.}"

12) Recess 2 mm deep, for hexagon socket head cap screws; ISO 4762 – The screws must not be subjected to shear force. Force application via additional external fitting strip

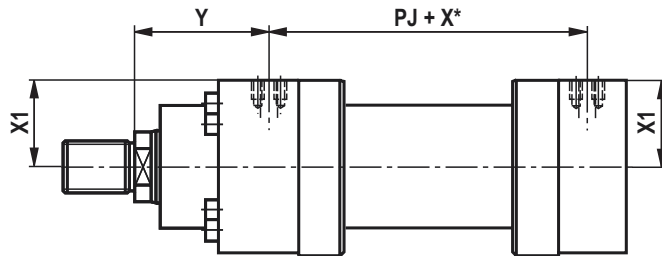
15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

16) Equipotential bonding see pages 40 and 41

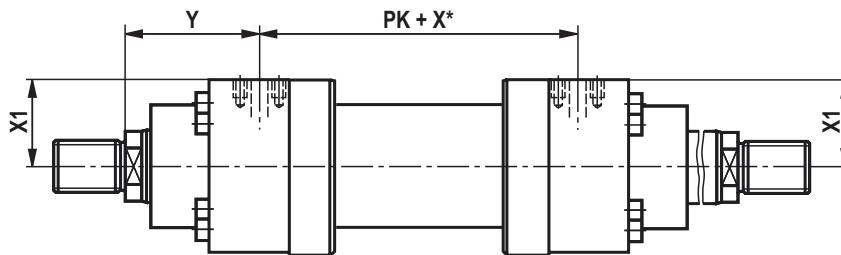
Dimensions: Flange ports

(dimensions in mm)

CDH2...XC / CSH2...XE

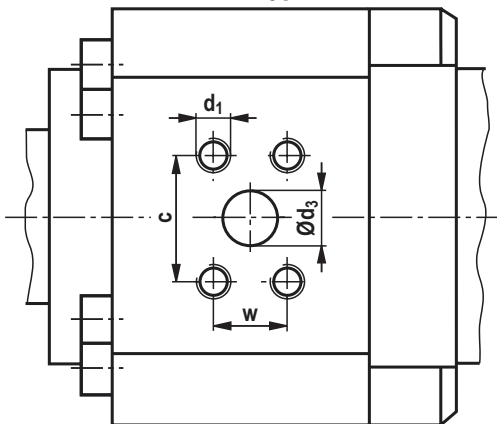


CGH2...XC

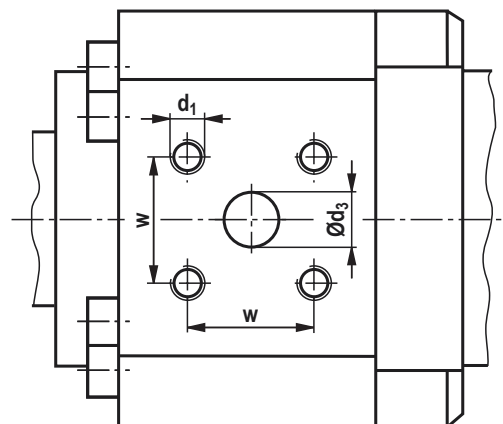


Dimensions for rectangular flange according to
ISO 6162-1 tab. 2

Type 1 and ISO 6162-2 tab. 2 type 1



Dimensions for square flange according to ISO 6164
table 1 and ISO 6164 table 2



Dimensions: Flange ports

(dimensions in mm)

Ø AL	Version "F" ⁶⁾ ISO 6162-1 tab. 2 type 1 (200 ... 350 bar) (= ^ SAE 3000 PSI)											Version "K" ⁷⁾ ISO 6164 tab.1 (250 bar)								
	Y	PJ PK	X1	Ød ₃	Ød ₃ ⁴⁾	c ±0.25	w ±0.25	d ₁	t ₁ ¹⁾	t ₁ ²⁾	p ³⁾	Y	PJ PK	X1	Ød ₃	w ±0.25	d ₁	t ₁ ¹⁾	t ₁ ²⁾	p ³⁾
40	—	—	—	—	—	—	—	—	—	—	—	82	122	40.5	10	24.7	M6	12.5	10	250
50	—	—	—	—	—	—	—	—	—	—	—	97	122	48	10	24.7	M6	12.5	12.5	250
63	111	135	55	13	1/2"	38,1	17.5	M8	16	16	350	111	135	57	13	29.7	M8	16	16	250
80	123.5	148	68	13	1/2"	38,1	17.5	M8	16	16	350	123.5	148	69.5	13	29.7	M8	16	16	250
100	133	173	79	19	3/4"	47.6	22.3	M10	20	20	350	133	173	81.5	19	35.4	M8	16	16	250
125	153	205	98	25	1"	52.4	26.2	M10	20	20	350	157	197	100	19	35.4	M8	16	16	250
140	162	227	107	32	1 1/4"	58,7	30.2	M10	20	20	250	162	227	109	25	43.8	M10	20	20	250
160	181.5	242	127	32	1 1/4"	58,7	30.2	M10	20	20	250	181.5	242	128,5	25	43.8	M10	20	20	250
180	193	266	139	38	1 1/2"	69.9	35.7	M12	24	24	200	194	264	142	32	51.6	M12	24	24	250
200	219	280	146.5	38	1 1/2"	69.9	35.7	M12	24	24	200	220	278	148,5	32	51.6	M12	24	24	250

Ø AL	Version "D" ⁸⁾ ISO 6162-2 tab.2 type1 (400 bar) (= ^ SAE 6000 PSI)											Version "H" ⁸⁾ ISO 6164 tab.2 (400 bar)								
	Y	PJ PK	X1	Ød ₃	Ød ₃ ⁵⁾	c ±0.25	w ±0.25	d ₁	t ₁ ¹⁾	t ₁ ²⁾	p ³⁾	Y	PJ PK	X1	Ød ₃	w ±0.25	d ₁	t ₁ ¹⁾	t ₁ ²⁾	p ³⁾
40	—	—	—	—	—	—	—	—	—	—	—	82	122	40.5	10	24.7	M6	12.5	10	400
50	—	—	—	—	—	—	—	—	—	—	—	97	122	48	10	24.7	M6	12.5	12.5	400
63	—	—	—	—	—	—	—	—	—	—	—	111	135	57	13	29.7	M8	16	16	400
80	120	155	67	13	1/2"	40.5	18,2	M8	16	14	400	123.5	148	69.5	13	29.7	M8	16	16	400
100	134	171	80.5	13	1/2"	40.5	18,2	M8	16	16	400	133	173	81.5	19	35.4	M8	16	16	400
125	153	205	97	19	3/4"	50.8	23.8	M10	20	20	400	157	197	100	19	35.4	M8	16	16	400
140	162	227	107	25	1"	57.2	27.8	M12	24	24	400	162	227	109	25	43.8	M10	20	20	400
160	181.5	242	127	25	1"	57.2	27.8	M12	24	24	400	181.5	242	128,5	25	43.8	M10	20	20	400
180	194	264	139.5	32	1 1/4"	66.6	31.8	M14	26	26	400	194	264	142	32	51.6	M12	24	24	400
200	220	278	147	32	1 1/4"	66.6	31.8	M14	26	26	400	220	278	148,5	32	51.6	M12	24	24	400
220	244	326	168	38	1 1/2"	79.3	36.5	M16	30	30	400	244	326	171	38	60.1	M16	30	30	400
250	257	326	189	38	1 1/2"	79.3	36.5	M16	30	30	400	257	326	192	38	60.1	M16	30	30	400
280	290	375	215	38	1 1/2"	79.3	36.5	M16	30	30	400	290	375	218	38	60.1	M16	30	30	400
320	282	391	236	51	2"	96.8	44.5	M20	36	36	400	282	391	240	51	69.3	M16	30	30	400

Main dimensions see pages 14 to 33

Ø AL = Piston Ø

X* = Stroke length

1) Thread depth for seal design M, T, and S

2) Thread depth for seal design A and B

3) Max. operating pressure for related flanges in bar

4) Flange connection according to ISO 6162-1 tab.2 type 1 corre-

sponds to flange connection according to SAE 3000 PSI

5) Flange connection according to ISO 6162-2 tab.2 type 1 corresponds to flange connection according to SAE 6000 PSI

6) Version "F" with piston Ø 125 ... 200 mm not standardized

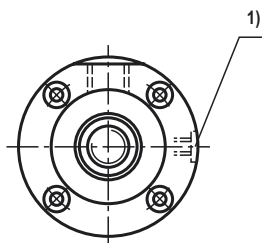
7) Version "K" with piston Ø 40 ... 50 mm and piston Ø 180 ... 200 mm not standardized

8) Versions "D" and "H" not standardized

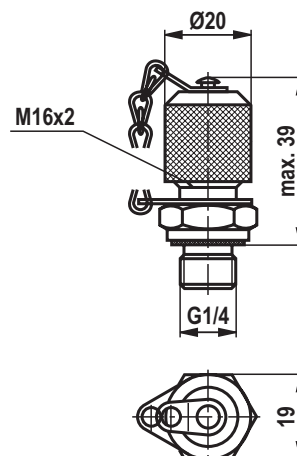
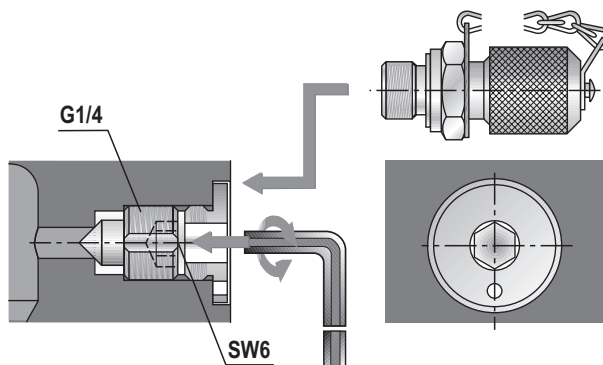
Dimensions: Bleeding / measuring coupling (dimensions in mm)

By default, a patented safety bleeding device against unintended screwing out in head and base is delivered for all cylinders.

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



- 1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)



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

MEASURING COUPLING AB 20-11/K1 G1/4 with sealing ring made of NBR

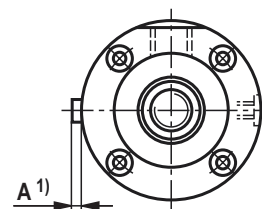
MEASURING COUPLING AB 20-11/K1V G1/4 with sealing ring made of FKM

Dimensions: Throttle valve (dimensions in mm)

Ø AL	40	50	63	80	100	125	140	160	180	200	220	250	280	320
Protrusion A ¹⁾	1	0	0	0	0	0	0	0	0	0	9.5	0	0	0
Nominal width	4	4	4	5	5	8	8	8	8	8	20	20	20	20

Ø AL = Piston Ø

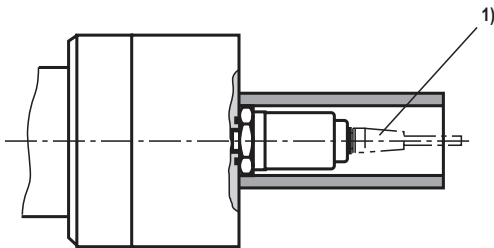
- 1) Throttle valve only with end position cushioning "E"
(180° for bleeding)
Protrusion A in closed condition



Position measurement system

Types of mounting

MF3, MF4, MT4, MS2



- 1) for Analog output:
6-pin Amphenol

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



- 1) For digital output:
7-pin Amphenol

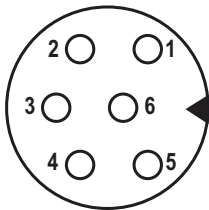
(Mating connector is **not** included in the scope of delivery, must be ordered separately)



Pin assignment

Position measurement system (analog output)

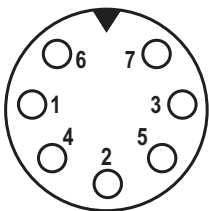
Connector (view to pin side)



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

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 torsional impulse.

This impulse runs on the wave guide inside the scale from the measuring point to the sensor head. The running time is constant and almost independent of temperature. It is proportional to the solenoid position and thus a measure for the actual position value and is converted within the sensor into a direct analog or digital output.

Technical data

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

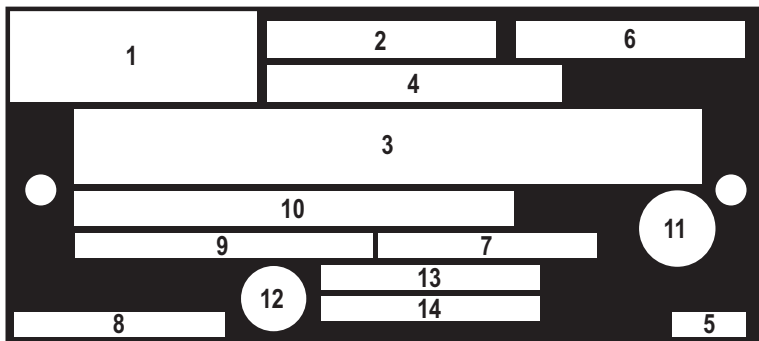
Operating pressure		bar	250
Analog output		V	0 ... 10
	Load resistance	k Ω	≥ 5
	Resolution		unlimited
Analog output		mA	4 ... 20
	Load resistance	Ω	0 ... 500
	Resolution		unlimited
Digital output			SSI 24 bit gray-coded
	Resolution	μm	5
	Direction of measurement		asynchronously forward
Linearity (absolute accuracy)	Analog	% mm	$\leq \pm 0.02$ % (referred to measurement length) min. ± 0.05
	Digital	% mm	$\leq \pm 0.01$ % (referred to measurement length) min. ± 0.04
Reproducibility		% mm	± 0.001 (referred to measurement length) min. ± 0.0025
Hysteresis		mm	≤ 0.004
Supply voltage		V DC	24 (± 10 % with analog output)
	Current consumption	mA	100
	Residual ripple	% s-s	≤ 1
		V DC	24 (+20 %/-15 % with digital output)
	Current consumption	mA	70
	Residual ripple	% s-s	≤ 1
Protection class	Pipe and flange		IP 67
	Sensor electronics		IP 65
Ambient temperature	Sensor electronics	$^{\circ}\text{C}$	-20 ... +59

Name plate

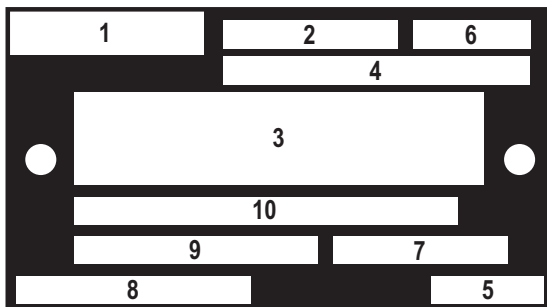
- | | |
|--------------------------------|--|
| 1 Word mark | 9 Customer or production order |
| 2 Material no. | 10 Customer's material number or additional information |
| 3 Material short text | 11 CE mark |
| 4 Serial number | 12 Explosion protection |
| 5 Area / works number | 13 EX mark 1 |
| 6 Date of production | 14 EX mark 2 |
| 7 Catalog no. | 15 Test stamp ¹⁾ |
| 8 Designation of origin | 16 Assembly stamp ¹⁾ |

¹⁾ Items 15 and 16 must be attached at the device.

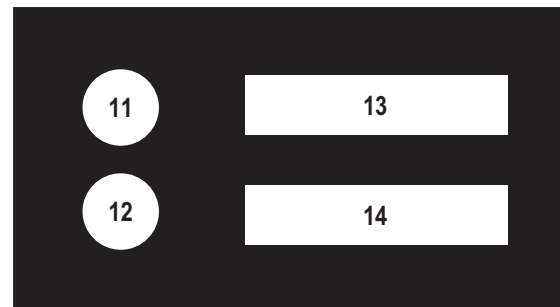
Name plate for piston Ø 63 mm to 320 mm



Name plate for piston Ø 40 mm to 50 mm

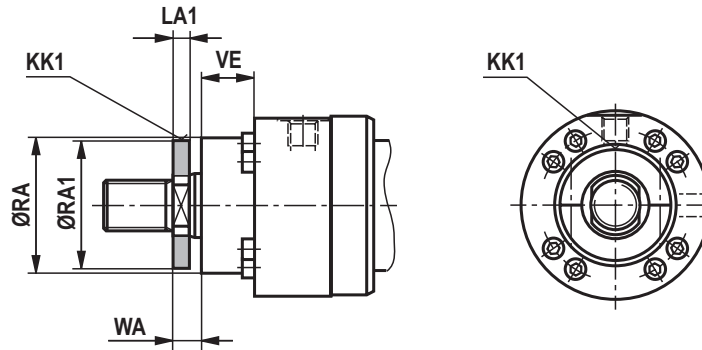


Separate adhesive label for ATEX units
piston Ø 40 mm and 50 mm

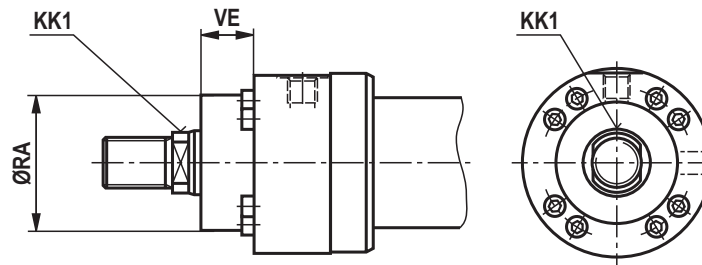


Dimensions: Potential equalizer (dimensions in mm)

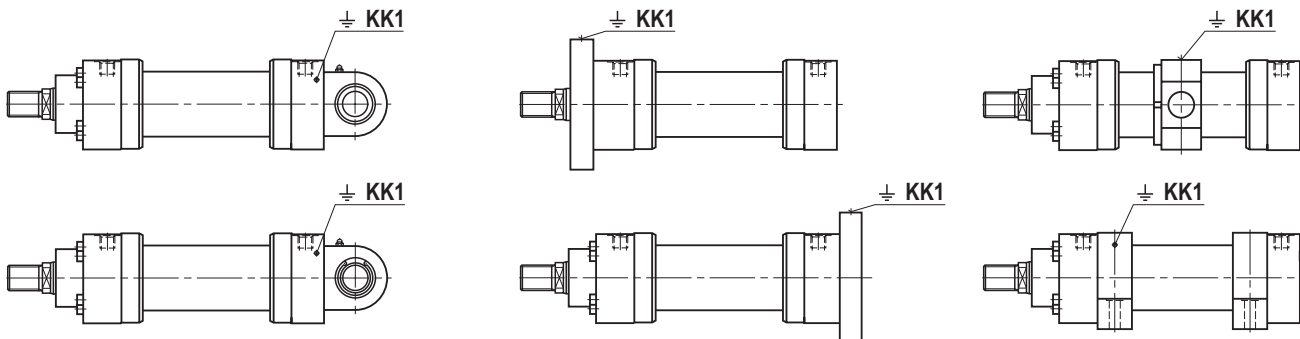
Mounting ring for equipotential bonding at the piston rod piston Ø 40 ... 125 mm



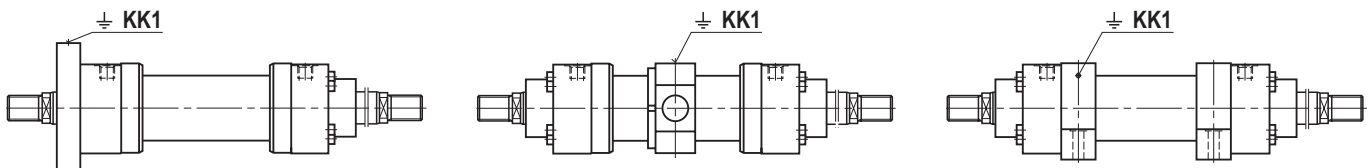
Equipotential bonding at the piston rod piston Ø 140 ... 320 mm



Equipotential bonding at the cylinder piston Ø 40 ... 320 mm CDH2...XC



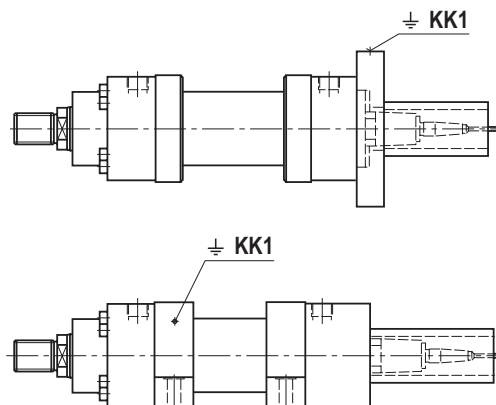
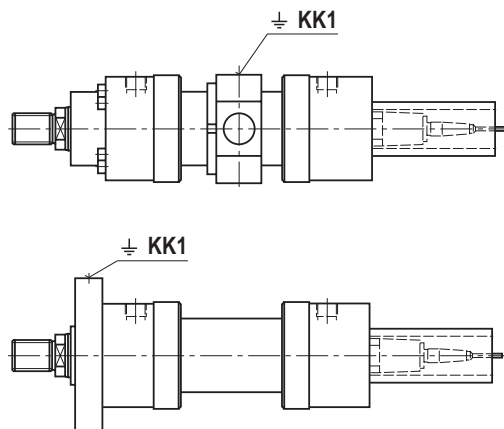
CGH2...XC



Dimensions: Potential equalizer

(dimensions in mm)

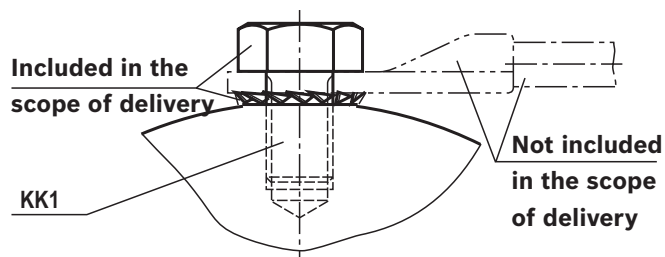
CSH2...XE



Ø AL	Ø MM	RA1	LA1	KK1
40	25	48	12	M6
	28	50		
50	32	56	12	M6
	36	60		
63	40	68	12	M6
	45	72		
80	50	80	13	M6
	56	85		
100	63	95	18	M6
	70	100		
125	80	110	18	M6
	90	120		
140 ... 320	-	-	-	M8

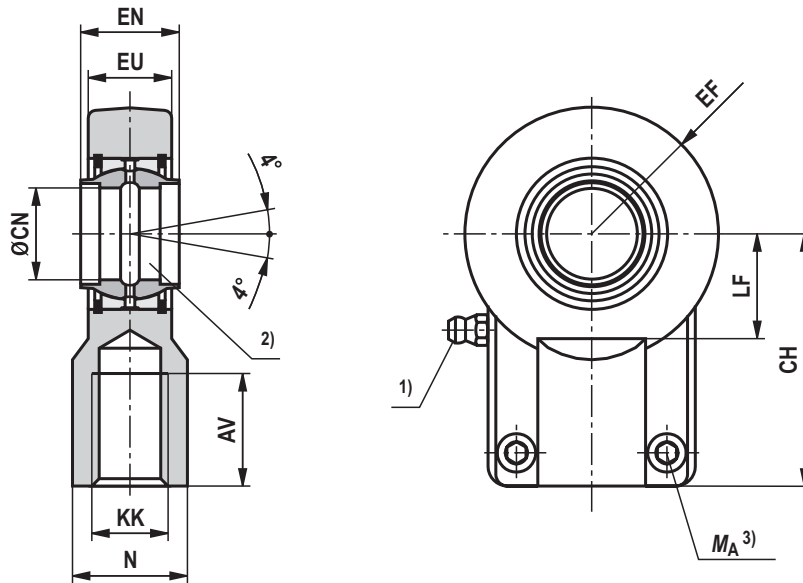
Ø AL = Piston Ø

Ø MM = Piston rod Ø



Dimensions: Swivel head CGKD(clampable)
 (dimensions in mm)

ISO 8132



Ø AL	Type	Nominal force kN	AV min.	N max.	CH js13	EF max.	ØCN ²⁾ H7	EN h12	EU max.
40	CGKD 25	32	29	31	65	32	25	25	22
50	CGKD 32	50	37	38	80	40	32	32	28
63	CGKD 40	80	46	47	97	50	40	40	34
80	CGKD 50	125	57	58	120	63	50	50	42
100	CGKD 63	200	64	70	140	72.5	63	63	53.5
125	CGKD 80	320	86	91	180	92	80	80	68
140	CGKD 90 ⁷⁾	400	91	100	195	101	90	90	72
160	CGKD 100	500	96	110	210	114	100	100	85.5
180	CGKD 110 ⁷⁾	635	106	125	235	129	110	110	88
200	CGKD 125	800	113	135	260	160	125	125	105
220	CGKD 160	1.520	126	165	310	200	160	160	133
250	CGKD 160	1.520	126	165	310	200	160	160	133
280	CGKD 200	2.000	161	215	390	250	200	200	165
320	CGKD 200	2.000	161	215	390	250	200	200	165

Dimensions: Swivel head CGKD(clampable)
(dimensions in mm)

Ø AL	Type	KK	LF min.	Clamping screw ISO 4762-10.9	M_A ³⁾ Nm	m ⁴⁾ kg	C_0 ⁵⁾ kN	F_{adm} ⁶⁾ kN
40	CGKD 25	M20 x 1.5	25.5	M8 x 20	30	0.65	78	28,8
50	CGKD 32	M27 x 2	30	M10 x 25	59	1.15	114	42.1
63	CGKD 40	M33 x 2	39	M10 x 30	59	2.1	204	75.3
80	CGKD 50	M42 x 2	47	M12 x 35	100	4	310	114.4
100	CGKD 63	M48 x 2	58	M16 x 40	250	7.2	430	158,7
125	CGKD 80	M64 x 3	74	M20 x 50	490	15	695	256.5
140	CGKD 90 ⁷⁾	M72 x 3	85	M20 x 60	490	19	750	276.8
160	CGKD 100	M80 x 3	94	M24 x 60	840	25.5	1060	391.1
180	CGKD 110 ⁷⁾	M90 x 3	105	M24 x 60	840	36.5	1200	442.8
200	CGKD 125	M100 x 3	116	M24 x 70	840	52.5	1430	527.7
220	CGKD 160	M125 x 4	145	M24 x 80	840	82.5	2200	811.8
250	CGKD 160	M125 x 4	145	M24 x 80	840	82.5	2200	811.8
280	CGKD 200	M160 x 4	190	M30 x 100	1700	168	3650	1346.9
320	CGKD 200	M160 x 4	190	M30 x 100	1700	168	3650	1346.9

Note:

Geometry and dimensions may differ depending on the manufacturer. All graphical presentations are examples.
In case of combination with other mounting elements, the usability must be checked.

Ø AL = Piston Ø

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

²⁾ Related bolt Ø m6

³⁾ M_A =Tightening torque

The swivel head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

⁴⁾ m =Swivel head weight in kg

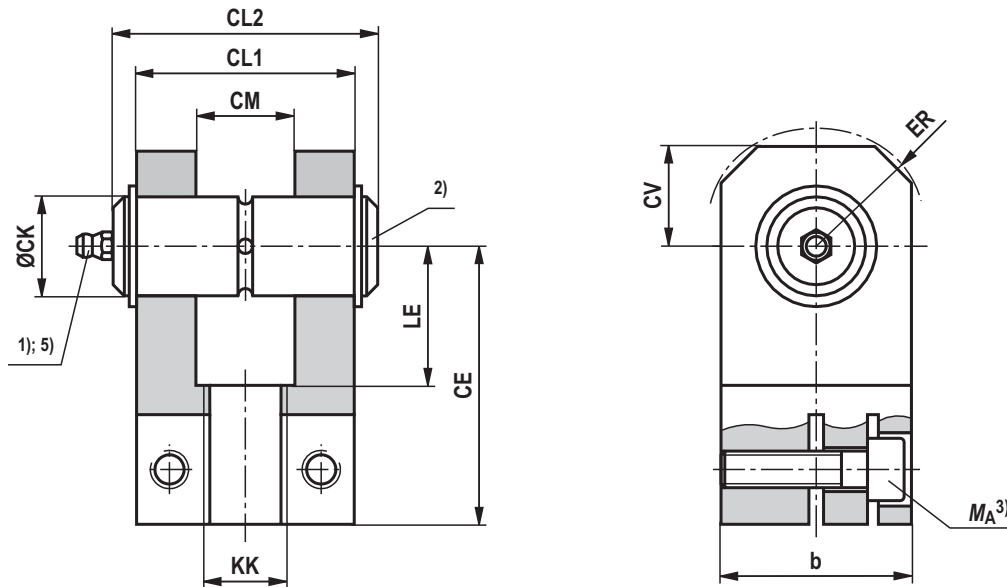
⁵⁾ C_0 =static load rating of the tilt head

⁶⁾ F_{adm} =max. admissible load of the swivel head with oscillatory or alternating loads

⁷⁾ Not contained in the standard

Dimensions: Fork clevis CCKB (clampable)
 (dimensions in mm)

ISO 8132



Ø AL	Type	Nominal force kN	b max.	CE js13	ØCK ²⁾ H9	CL1 h16	CL2 max.	CM A13	ER max.
40	CCKB 25	32	50	65	25	56	84	25	32
50	CCKB 32	50	65	80	32	70	105	32	40
63	CCKB 40	80	80	97	40	90	133	40	50
80	CCKB 50	125	100	120	50	110	165	50	63
100	CCKB 63	200	140	140	63	140	185	63	71
125	CCKB 80	320	180	180	80	170	225	80	90
140	CCKB 90	400	200	195	90	190	⁶⁾	90	100
160	CCKB 100	500	220	210	100	210	⁶⁾	100	110

Dimensions: Fork clevis CCKB (clampable)

(dimensions in mm)

Ø AL	Type	KK	LE min.	CV max.	Clamping screw ISO 4762-10.9	M_A ³⁾ Nm	m ⁴⁾ kg
40	CCKB 25	M20 x 1.5	34	32	M10 x 35	49	1.4
50	CCKB 32	M27 x 2	41	40	M12 x 40	85	2.8
63	CCKB 40	M33 x 2	51	50	M16 x 50	210	5.2
80	CCKB 50	M42 x 2	63	63	M20 x 60	425	9.5
100	CCKB 63	M48 x 2	75	71	M24 x 80	730	21.5
125	CCKB 80	M64 x 3	94	90	M30 x 100	1450	38.2
140	CCKB 90	M72 x 3	108	100	M36 x 120	2480	⁶⁾
160	CCKB 100	M80 x 3	114	110	M36 x 130	2480	⁶⁾

Note:

Geometry and dimensions may differ depending on the manufacturer. All graphical presentations are examples. In case of combination with other mounting elements, the usability must be checked.

Ø AL = Piston Ø

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

²⁾ Bolt Ø m6 required (bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)

³⁾ M_A = Tightening torque

The fork clevis must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

⁴⁾ m = Fork clevis weight in kg

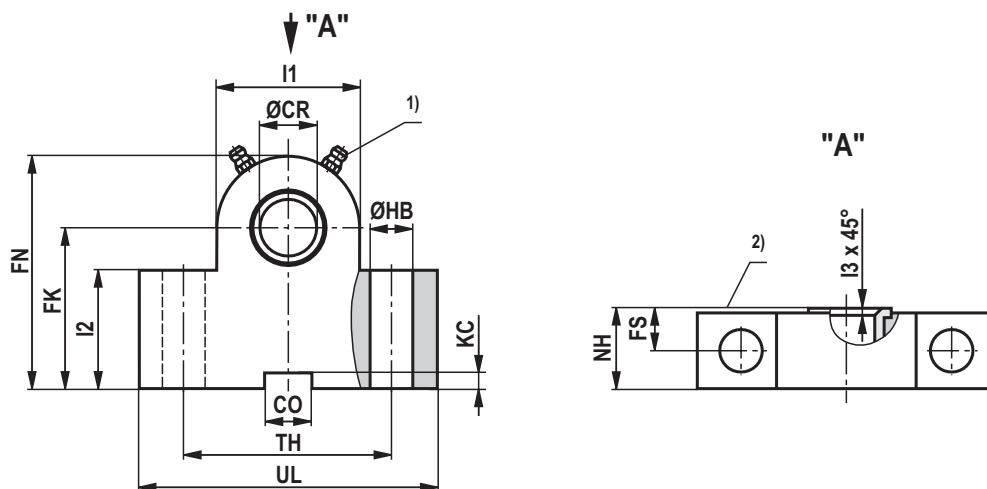
⁵⁾ Without lubrication bore

⁶⁾ On request

Dimensions: Trunnion bearing block CLTB

(dimensions in mm)

ISO 8132



Ø AL	Type ³⁾	Nominal force ⁴⁾ kN	ØCR H7	CO N9	FK js12	FN max.	FS js14	ØHB H13	KC +0.3
40	CLTB 25	32	25	25	55	80	12	13.5	5.4
50	CLTB 32	50	32	25	65	100	15	17.5	5.4
63	CLTB 40	80	40	36	76	120	16	22	8,4
80	CLTB 50	125	50	36	95	140	20	26	8,4
100	CLTB 63	200	63	50	112	180	25	33	11.4
125	CLTB 80	320	80	50	140	220	31	39	11.4
140	CLTB 90	385	90	63	160	250	40	45	12.4
160	CLTB 100	500	100	63	180	280	45	52	12.4
180	CLTB 110	630	110	80	200	310	50	52	15.4

Dimensions: Trunnion bearing block CLTB

(dimensions in mm)

Ø AL	Type ³⁾	l1	l2	l3	NH max.	TH js14	UL max.	m ⁵⁾ kg
40	CLTB 25	56	45	1.5	26	80	110	2.1
50	CLTB 32	70	52	2	33	110	150	4.55
63	CLTB 40	88	60	2.5	41	125	170	7.3
80	CLTB 50	100	75	2.5	51	160	210	14.5
100	CLTB 63	130	85	3	61	200	265	23.1
125	CLTB 80	160	112	3.5	81	250	325	52.3
140	CLTB 90	180	130	4	91	265	345	⁶⁾
160	CLTB 100	200	145	4.5	102	295	385	100
180	CLTB 110	220	160	5	112	320	410	⁶⁾

Note:

Geometry and dimensions may differ depending on the manufacturer. All graphical presentations are examples. In case of combination with other mounting elements, the usability must be checked.

The trunnion bearing blocks are suitable for attachment in case of type of mounting MT4.

Ø AL = Piston Ø

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

²⁾ Contact surface trunnion (inside)

³⁾ Bearing blocks are always supplied in pairs

⁴⁾ Nominal force applies to applications in pairs

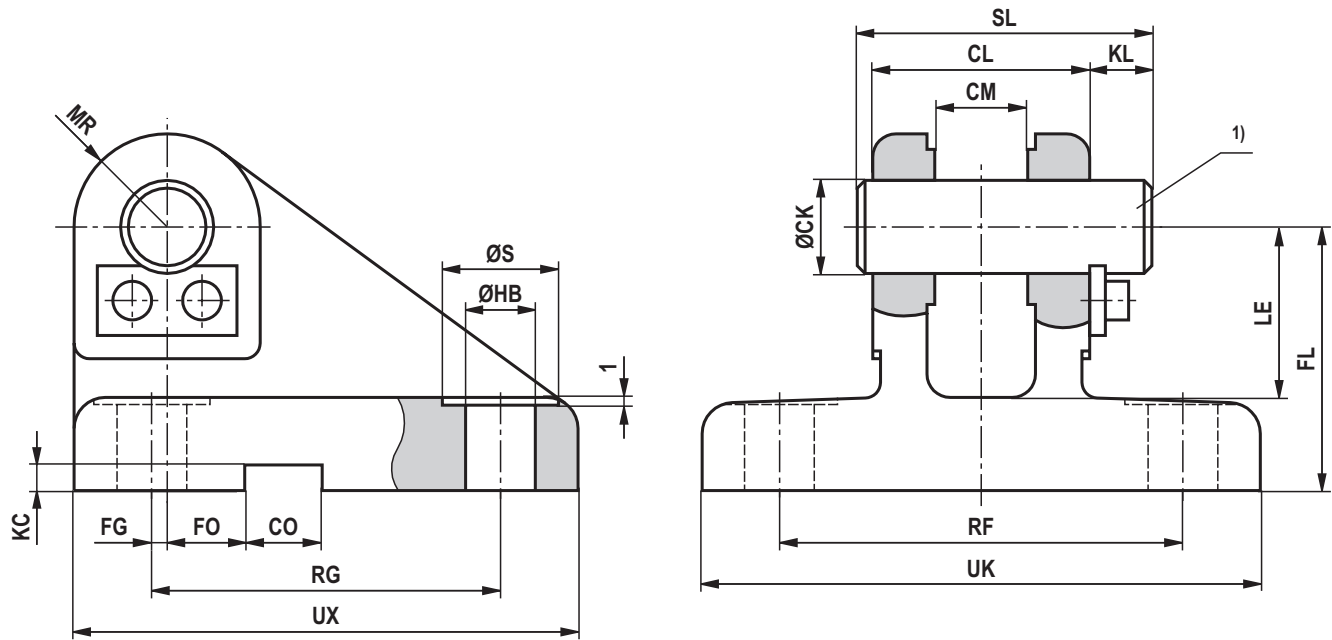
⁵⁾ **m** = Weight of trunnion bearing block in kg
(specified per pair)

⁶⁾ On request

Dimensions: Clevis bracket CLCA

(dimensions in mm)

ISO 8132, form B



Ø AL	Type	Nominal force kN	ØCK ¹⁾ H9	CL h16	CM A12	CO N9	FG js14	FL js12	FO js14
40	CLCA 25	32	25	56	25	25	10	55	10
50	CLCA 32	50	32	70	32	25	14.5	65	6
63	CLCA 40	80	40	90	40	36	17.5	76	6
80	CLCA 50	125	50	110	50	36	25	95	0
100	CLCA 63	200	63	140	63	50	33	112	0
125	CLCA 80	320	80	170	80	50	45	140	0
140	CLCA 90	400	90	190	90	63	47.5	160	0
160	CLCA 100	500	100	210	100	63	52.5	180	0
180	CLCA 110	635	110	240	110	80	62.5	200	0
200	CLCA 125	800	125	270	125	80	75	230	0

Dimensions: Clevis bracket CLCA

(dimensions in mm)

Ø AL	Type	ØHB H13	KC +0.3	KL	LE min.	MR max.	RF js14	RG js14	ØS	SL	UK max.	UX max.	m ²⁾ kg
40	CLCA 25	13.5	5.4	10	37	25	90	85	20	69	120	115	3
50	CLCA 32	17.5	5.4	13	43	32	110	110	26	87	145	145	5
63	CLCA 40	22	8,4	16	52	40	140	125	33	110	185	170	9.6
80	CLCA 50	26	8,4	19	65	50	165	150	40	133	215	200	15.5
100	CLCA 63	33	11.4	20	75	63	210	170	48	164	270	230	27.5
125	CLCA 80	39	11.4	26	95	80	250	210	57	202	320	280	47
140	CLCA 90	45	12.4	28	108	90	280	235	66	224	360	320	3)
160	CLCA 100	52	12.4	30	120	100	315	250	76	246	405	345	3)
180	CLCA 110	52	15.4	31	138	110	335	305	76	277	425	400	3)
200	CLCA 125	52	15.4	32	170	125	365	350	76	310	455	450	3)

Note:

Geometry and dimensions may differ depending on the manufacturer. All graphical presentations are examples.
In case of combination with other mounting elements, the usability must be checked.

Ø AL = Piston Ø

¹⁾ Bolt Ø m6 required (bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)

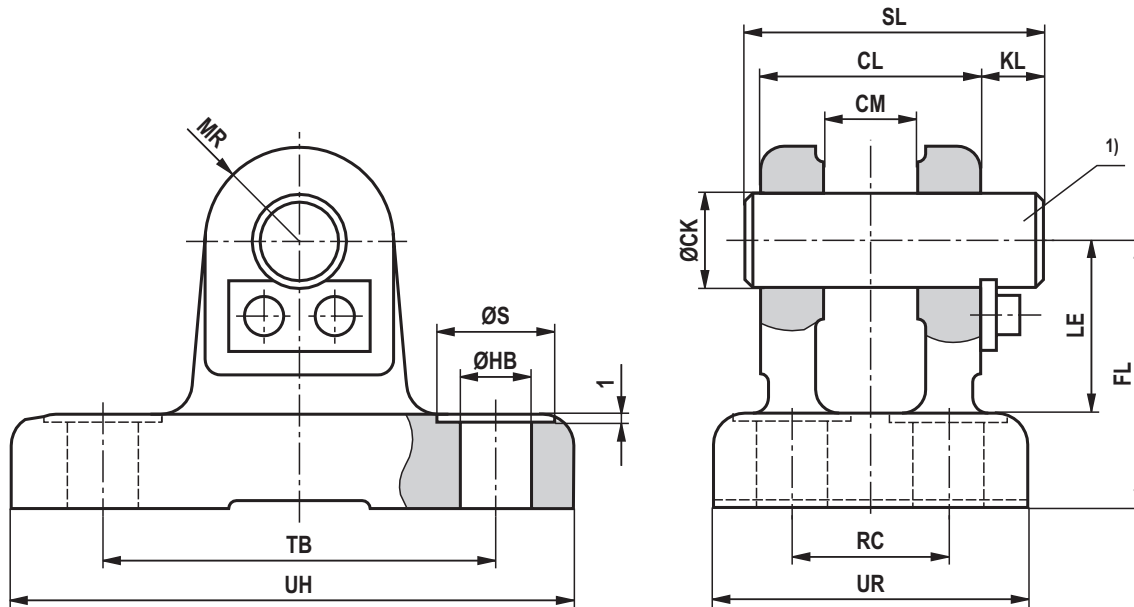
²⁾ **m** = weight of clevis bracket in kg

³⁾ On request

Dimensions: Clevis bracket CLCD

(dimensions in mm)

ISO 8132, form A



Ø AL	Type	Nominal force kN	ØCK ¹⁾ H9	CL h16	CM A13	FL js12	ØHB H13	KL
40	CLCD 25	32	25	56	25	55	13.5	10
50	CLCD 32	50	32	70	32	65	17.5	13
63	CLCD 40	80	40	90	40	76	22	16
80	CLCD 50	125	50	110	50	95	26	19
100	CLCD 63	200	63	140	63	112	33	20
125	CLCD 80	320	80	170	80	140	39	26
140	CLCD 90	400	90	190	90	160	45	28
160	CLCD 100	500	100	210	100	180	45	30
180	CLCD 110	635	110	240	110	200	52	31
200	CLCD 125	800	125	270	125	230	52	32

Dimensions: Clevis bracket CLCD

(dimensions in mm)

Ø AL	Type	LE min.	MR max.	RC js14	ØS	SL	TB js14	UR max.	UH max.	m ²⁾ kg
40	CLCD 25	37	25	40	20	69	85	70	113	1.9
50	CLCD 32	43	32	50	26	87	110	85	143	3
63	CLCD 40	52	40	65	33	110	130	108	170	5.5
80	CLCD 50	65	50	80	40	133	170	130	220	10.6
100	CLCD 63	75	63	100	48	164	210	160	270	17
125	CLCD 80	95	80	125	57	202	250	210	320	32
140	CLCD 90	108	90	140	66	224	290	230	370	³⁾
160	CLCD 100	120	100	160	66	246	315	260	400	³⁾
180	CLCD 110	138	110	180	76	277	350	290	445	³⁾
200	CLCD 125	170	125	200	76	310	385	320	470	³⁾

Note:

Geometry and dimensions may differ depending on the manufacturer. All graphical presentations are examples.
In case of combination with other mounting elements, the usability must be checked.

Ø AL = Piston Ø

¹⁾ Bolt Ø m6 required (bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)

²⁾ **m** = weight of clevis bracket in kg

³⁾ On request

Kinking

For the admissible stroke length with flexibly guided load and a factor of 3.5 for safety against kinking, please refer to 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

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

2. Calculation according to Tetmajer

$$F = \frac{d^2 \cdot \pi \cdot (335 - 0.62 \cdot \lambda)}{4 \cdot \nu} \quad \text{if } \lambda \leq \lambda_g$$

Explanation:

E = Module of elasticity in N/mm²

= 2.1×10^5 for steel

I = Geometrical moment of inertia in mm⁴

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

ν = 3.5 (safety factor)

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

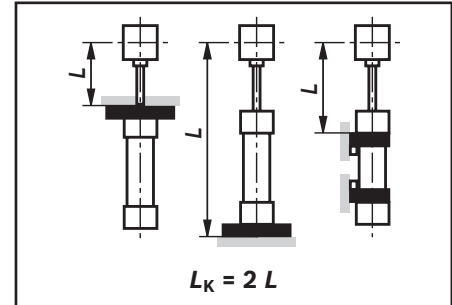
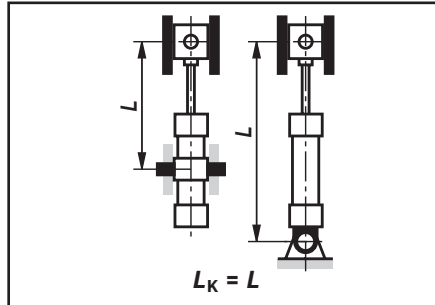
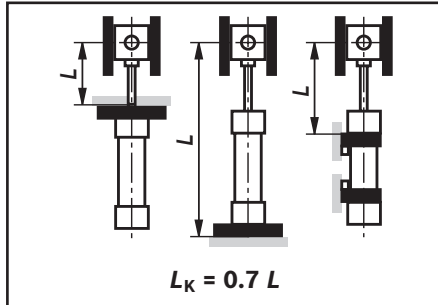
d = Piston rod Ø in mm

λ = Slenderness ratio

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

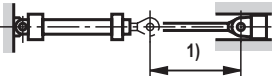
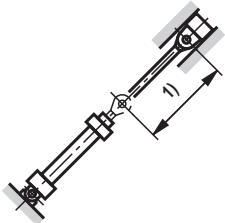
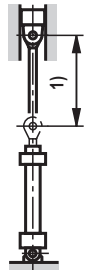
R_e = Yield strength of the piston rod material

Influence of the type of mounting on the kinking length:



Admissible stroke length (dimensions in mm)

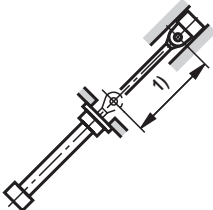
Type of mounting CDH2...XC: MP3, MP5

Ø AL	Ø MM	admissible stroke length with									Installation position	
		100 bar			160 bar			250 bar				
		0°	45°	90°	0°	45°	90°	0°	45°	90°		
40	25	195	200	215	130	135	140	40	45	55	0°	
	28	385	400	445	295	300	320	215	220	225		
50	32	380	390	430	280	285	300	195	200	205		
	36	505	525	595	395	405	430	290	295	305		
63	40	480	500	550	365	370	385	255	260	265	45°	
	45	640	660	750	505	515	550	380	385	395		
80	50	590	615	690	455	465	495	330	335	345	90°	
	56	765	800	930	615	630	685	470	475	495		
100	63	750	780	910	595	610	660	445	455	470		
	70	940	985	1195	775	800	885	605	615	650		
125	80	970	1015	1200	780	805	880	595	605	635		
	90	1235	1300	1610	1030	1070	1200	825	840	895		
140	90	1075	1130	1360	875	905	1000	675	685	725		
	100	1335	1405	1770	1120	1165	1325	900	920	985		
160	100	1175	1230	1480	955	985	1085	735	750	785		
	110	1430	1500	1875	1195	1240	1400	955	975	1040		
180	110	1250	1310	1570	1010	1045	1150	775	790	830		
	125	1620	1710	2160	1365	1420	1620	1100	1125	1205		
200	125	1435	1510	1860	1180	1220	1365	915	935	990		
	140	1795	1900	2450	1525	1590	1840	1240	1270	1370		
220	140	1620	1710	2180	1360	1415	1630	1090	1120	1200		
	160	2075	2200	3000	1810	1890	2280	1510	1560	1730		
250	160	1805	1910	2490	1520	1590	1850	1220	1250	1360		
	180	2250	2395	3300	1960	2060	2500	1630	1690	1880		
280	180	2075	2200	2900	1775	1880	2170	1450	1490	1620		
	200	2510	2670	3700	2200	2310	2820	1850	1920	2140		
320	200	2135	2270	3030	1820	1900	2260	1470	1510	1660		1) Adm. stroke length
	220	2550	2720	3820	2230	2340	2880	1860	1930	2170		

¹⁾ Adm. stroke length

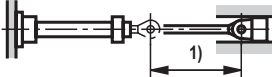
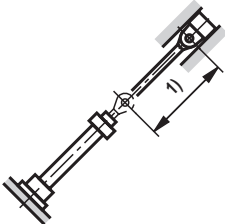
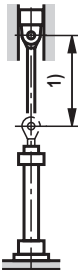
Admissible stroke length (dimensions in mm)

Type of mounting CDH2...XC / CGH2...XC / CSH2...XE 2): MF3

Ø AL	Ø MM	admissible stroke length with									Installation position	
		100 bar			160 bar			250 bar				
		0°	45°	90°	0°	45°	90°	0°	45°	90°		
40	25	895	915	980	730	735	760	440	450	510	0° 	
	28	1400	1415	1630	1180	1205	1275	970	980	1010		
50	32	1440	1490	1670	1210	1230	1300	985	995	1025	45° 	
	36	1760	1830	2000	1510	1545	1675	1255	1270	1320		
63	40	1735	1800	2000	1475	1510	1620	1215	1230	1270		90° 
	45	2000	2000	2000	1830	1880	2080	1540	1560	1640		
80	50	2000	2000	2000	1810	1850	1995	1495	1515	1570		1) Adm. stroke length
	56	2000	2000	2000	2000	2000	2000	1870	1900	2000		
100	63	2580	2690	3000	2235	2300	2550	1875	1910	2010		
	70	3000	3000	3000	2690	2780	3000	2300	2350	2520		
125	80	3000	3000	3000	2840	2930	3000	2400	2450	2590		
	90	3000	3000	3000	3000	3000	3000	3000	3000	3000		
140	90	3000	3000	3000	3000	3000	3000	2700	2760	2950		
	100	3000	3000	3000	3000	3000	3000	3000	3000	3000		
160	100	3000	3000	3000	3000	3000	3000	2920	2980	3000		
	110	3000	3000	3000	3000	3000	3000	3000	3000	3000		
180	110	3000	3000	3000	3000	3000	3000	3000	3000	3000		
	125	3000	3000	3000	3000	3000	3000	3000	3000	3000		
200	125	3000	3000	3000	3000	3000	3000	3000	3000	3000		
	140	3000	3000	3000	3000	3000	3000	3000	3000	3000		
220	140	5400	5680	6000	4800	4980	5780	4120	4220	4560		
	160	6000	6000	6000	5820	6000	6000	5150	5330	6000		
250	160	5850	6000	6000	5270	5500	6000	4600	4740	5250		
	180	6000	6000	6000	6000	6000	6000	5650	5850	6000		
280	180	6000	6000	6000	6000	6000	6000	5270	5420	5970		
	200	6000	6000	6000	6000	6000	6000	6000	6000	6000		
320	200	6000	6000	6000	6000	6000	6000	5950	6000	6000		
	220	6000	6000	6000	6000	6000	6000	6000	6000	6000		

1) Adm. stroke length

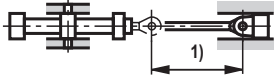
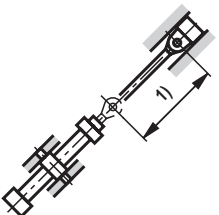
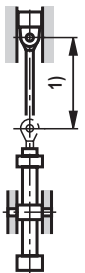
Type of mounting CDH2...XC / CSH2...XE 2): MF4

Ø AL	Ø MM	admissible stroke length with									Installation position
		100 bar			160 bar			250 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	25	325	340	370	245	250	260	105	110	140	0°
	28	565	590	695	465	475	520	365	370	385	
50	32	600	625	715	485	495	530	370	375	390	
	36	755	790	950	630	650	715	505	515	540	
63	40	730	765	905	600	615	675	470	480	500	
	45	920	965	1190	780	805	905	630	645	685	
80	50	910	950	1130	750	775	845	595	605	630	
	56	1125	1185	1470	960	990	1120	785	800	850	
100	63	1120	1175	1460	945	980	1105	770	785	835	45°
	70	1350	1430	1860	1175	1220	1420	980	1000	1090	
125	80	1430	1510	1910	1225	1270	1450	1000	1025	1100	
	90	1750	1855	2490	1540	1610	1910	1300	1340	1470	
140	90	1585	1675	2170	1370	1425	1650	1135	1165	1260	
	100	1895	2010	2750	1675	1755	2110	1425	1470	1630	
160	100	1725	1820	2340	1490	1545	1780	1230	1260	1360	
	110	2030	2150	2900	1785	1870	2230	1510	1560	1720	
180	110	1855	1960	2510	1595	1660	1910	1315	1350	1450	
	125	2300	2440	3350	2040	2130	2580	1735	1790	1990	
200	125	2105	2230	2950	1830	1910	2250	1530	1570	1715	
	140	2535	2700	3000	2260	2370	2920	1940	2010	2255	
220	140	2250	2400	3350	1990	2090	2550	1685	1740	1950	90°
	160	2800	2990	4500	2530	2680	3480	2220	2310	2700	
250	160	2600	2770	3900	2310	2430	3000	1975	2040	2300	
	180	3130	3350	5050	2840	3000	3910	2500	2600	3040	
280	180	2850	3050	4400	2550	2680	3370	2190	2270	2600	
	200	3370	3610	5550	3070	3250	4300	2700	2820	3330	
320	200	3070	3270	4750	2750	2890	3650	2150	2460	2810	1) Adm. stroke length
	220	3560	3820	5850	3250	3430	4550	2860	2980	3530	

1) Adm. stroke length

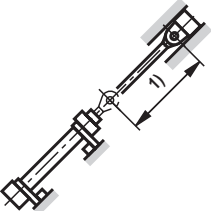
Admissible stroke length (dimensions in mm)

Type of mounting CDH2...XC / CGH2...XC / CSH2...XE ²⁾: MT4 trunnion in cylinder center

Ø AL	Ø MM	admissible stroke length with									Installation position
		100 bar			160 bar			250 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	25	340	345	365	250	255	260	130	135	145	0° 
	28	590	605	665	470	480	500	365	370	375	
50	32	600	615	670	470	480	495	355	360	365	45° 
	36	770	795	890	625	635	670	485	490	505	
63	40	740	765	845	590	600	630	450	455	465	90° 
	45	940	975	1115	770	790	845	610	620	640	
80	50	920	950	1055	735	750	790	570	575	590	1) Adm. stroke length
	56	1155	1195	1375	950	975	1045	755	765	790	
100	63	1145	1190	1365	940	960	1030	740	750	775	
	70	1400	1460	1740	1180	1210	1330	955	970	1015	
125	80	1470	1530	1780	1220	1250	1350	970	985	1020	
	90	1820	1910	2320	1550	1600	1780	1275	1300	1370	
140	90	1640	1710	2020	1370	1410	1540	1100	1120	1170	
	100	1980	2080	2570	1700	1755	1970	1400	1430	1515	
160	100	1780	1850	2180	1485	1520	1660	1190	1210	1260	
	110	2110	2210	2710	1800	1860	2080	1480	1510	1595	
180	110	1910	1990	2340	1590	1635	1780	1275	1295	1350	
	125	2405	2530	3000	2065	2130	2400	1710	1740	1850	
200	125	2180	2280	2740	1840	1890	2090	1490	1510	1590	
	140	2660	2800	3000	2300	2380	2720	1915	1960	2100	
220	140	2490	2510	3150	2050	2120	2400	1685	1720	1835	
	160	3000	3170	4230	2640	2750	3260	2240	2310	2530	
250	160	2730	2870	3640	2350	2440	2790	1950	1990	2140	
	180	3320	3520	4720	2940	3060	3650	2500	2570	2830	
280	180	3040	3210	4140	2640	2750	3170	2210	2260	2440	
	200	3620	3840	5210	3210	3360	4040	2750	2830	3140	
320	200	3250	3430	4455	2820	2930	3410	2360	2420	2620	
	220	3800	4030	5500	3370	3530	4250	2880	2970	3290	

¹⁾ Adm. stroke length

Type of mounting CDH2...XC / CGH2...XC / CSH2...XE ²⁾: MS2

Ø AL	Ø MM	admissible stroke length with									Installation position
		100 bar			160 bar			250 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	25	825	840	885	645	650	665	370	375	410	0° 
	28	1305	1350	1535	1085	1110	1180	875	885	910	
50	32	1330	1375	1560	1095	1120	1190	875	885	910	 
	36	1645	1715	2030	1395	1430	1560	1140	1160	1210	
63	40	1610	1670	1950	1345	1380	1490	1085	1100	1145	
	45	1980	2000	2000	1700	1750	1950	1410	1435	1510	
80	50	1980	2000	2000	1665	1710	1850	1350	1370	1425	
	56	2000	2000	2000	2000	2000	2000	1730	1760	1860	
100	63	2420	2535	3000	2080	2140	2390	1720	1750	1850	
	70	2880	3000	3000	2530	2630	3000	2140	2190	2360	
125	80	3000	3000	3000	2660	2750	3000	2220	2270	2410	
	90	3000	3000	3000	3000	3000	3000	2810	2890	3000	
140	90	3000	3000	3000	2970	3000	3000	2490	2550	2740	
	100	3000	3000	3000	3000	3000	3000	3000	3000	3000	
160	100	3000	3000	3000	3000	3000	3000	2690	2750	2950	
	110	3000	3000	3000	3000	3000	3000	3000	3000	3000	
180	110	3000	3000	3000	3000	3000	3000	2890	2960	3000	
	125	3000	3000	3000	3000	3000	3000	3000	3000	3000	
200	125	3000	3000	3000	3000	3000	3000	3000	3000	3000	
	140	3000	3000	3000	3000	3000	3000	3000	3000	3000	
220	140	5090	5370	6000	4490	4670	5470	3820	3910	4260	
	160	6000	6000	6000	5510	5800	6000	4850	5020	5750	
250	160	5520	5860	6000	4940	5170	6000	4270	4410	4920	
	180	6000	6000	6000	6000	6000	6000	5320	5520	6000	
280	180	6000	6000	6000	5700	5960	6000	4930	5070	5630	
	200	6000	6000	6000	6000	6000	6000	6000	6000	6000	
320	200	6000	6000	6000	5890	6000	6000	4750	5310	6000	
	220	6000	6000	6000	6000	6000	6000	6000	6000	6000	

1) Adm. stroke length

¹⁾ Adm. stroke length

With longer strokes, an extended guide and/or the use of guide rings may be reasonable for increasing the service life, depending on the respective application and installation position. Recommendation on request.

²⁾ With CSH2...XE, observe the maximum stroke length "X*_{max.}", pages 26 to 33

End position cushioning

End position cushioning:

The objective is to reduce the velocity of a moved 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. It must, however, always be verified whether end position cushioning is also required for lower velocities with large masses.

Damping capacity:

When decelerating masses via end position cushioning, the structural-inherent cushioning capacity must not be exceeded. Cylinders with end position cushioning can achieve their full damping capacity only over the entire stroke length.

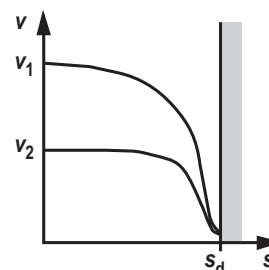
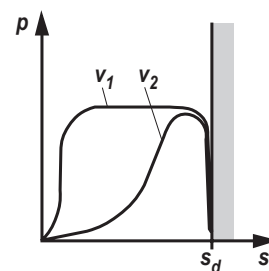
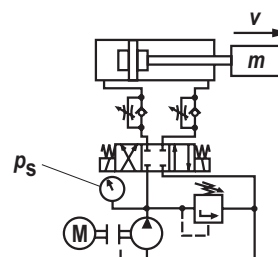
With the adjustable end position cushioning version "E", a throttle valve is additionally provided when compared with version "D". End position cushioning version "E" allows cycle times to be optimized. The max. damping capacity can only be achieved when the throttle valve is closed. The calculation depends on the factors weight, velocity,

system pressure and installation position. For this reason, mass and velocity are used to determine the characteristic D_m and system pressure and installation position to determine the characteristic D_p .

These two characteristics are used for verifying the admissible damping capacity in the "damping capacity" diagram. The intersection point of the characteristics D_m and D_p must always be below the damping capacity curve of the selected cylinder. The values in the diagrams refer to an average oil temperature of + 45 to +65 °C with the throttle valve being 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!



Formulas:

$$D_m = \frac{m}{10K}; K = kv(0.5-v)$$

m = moved weight in kg

v = stroke velocity in m/s

kv = see table page 56

Extension for CDH2...XC and CSH2...XE

$$D_p = p_s - \frac{m \cdot 9.81 \cdot \sin \alpha}{A_1 \cdot 10}$$

Retraction for CDH2...XC, CGH2...XC and CSH2...XE;

Extension for CGH2...XC

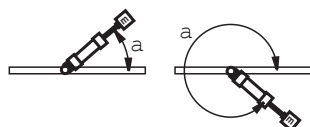
$$D_p = p_s + \frac{m \cdot 9.81 \cdot \sin \alpha}{A_3 \cdot 10}$$

p_s = system pressure in bar

A_1 = piston area in cm² (see page 11)

A_3 = annulus area in cm² (see page 11)

α = angle to the horizontal in degree



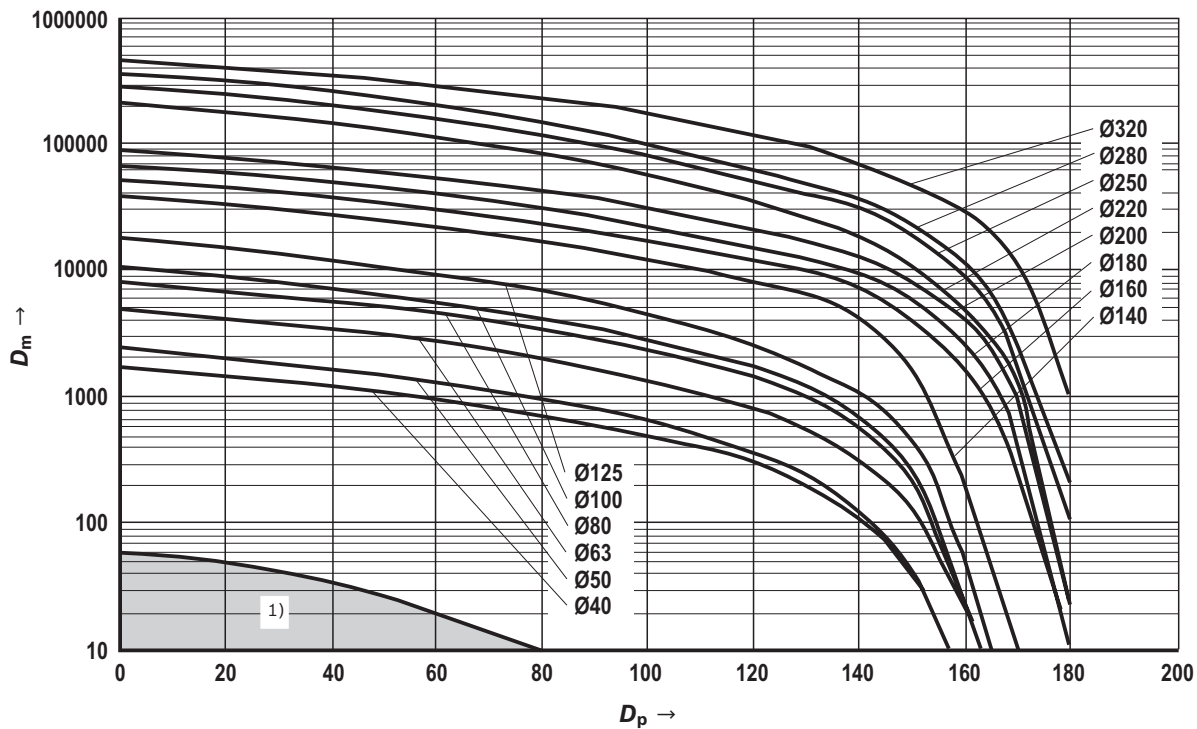
Damping length

Ø ALmm	40	50	63	80	100	125	140	160	180	200	220	250	280	320
Head side	21	20	23	25	25	25	33	33	37	37	76	81	86	90
Base side	21	20	23	25	25	25	33	33	37	37	76	81	86	90

End position cushioning

Ø ALmm	40	50	63	80	100	125	140	160	180	200	220	250	280	320
kv ①	2.85	2.97	2.56	2.82	3.51	3.02	2.53	2.65	2.91	2.76	2.85	2.95	3.11	3.13
kv ②	3.1	3.25	2.85	2.85	3.52	2.91	2.53	2.93	2.95	2.95	2.93	3.1	3.12	3.07
kv ③	2.95	3.1	2.73	3.1	3.51	2.95	2.51	2.91	2.95	2.91	2.93	2.93	3.15	3.25

Damping capacity: Extension for CDH2...XC and CSH2...XE, with kv ①

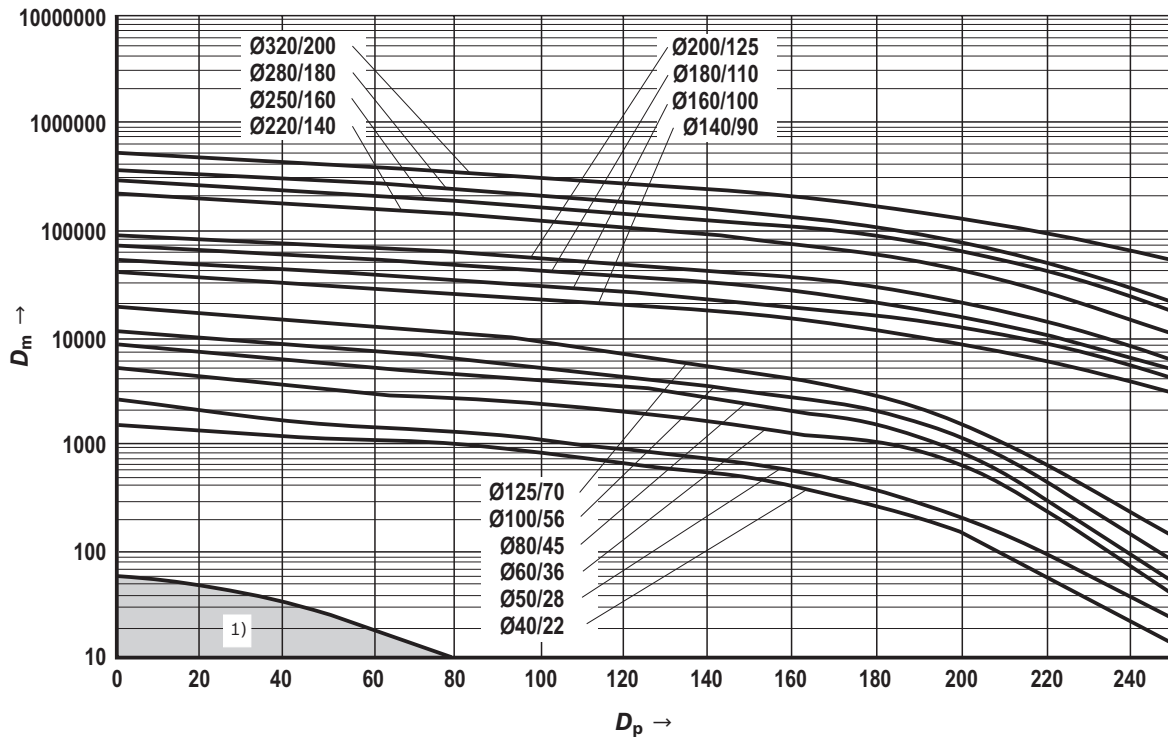


Ø AL = Piston Ø

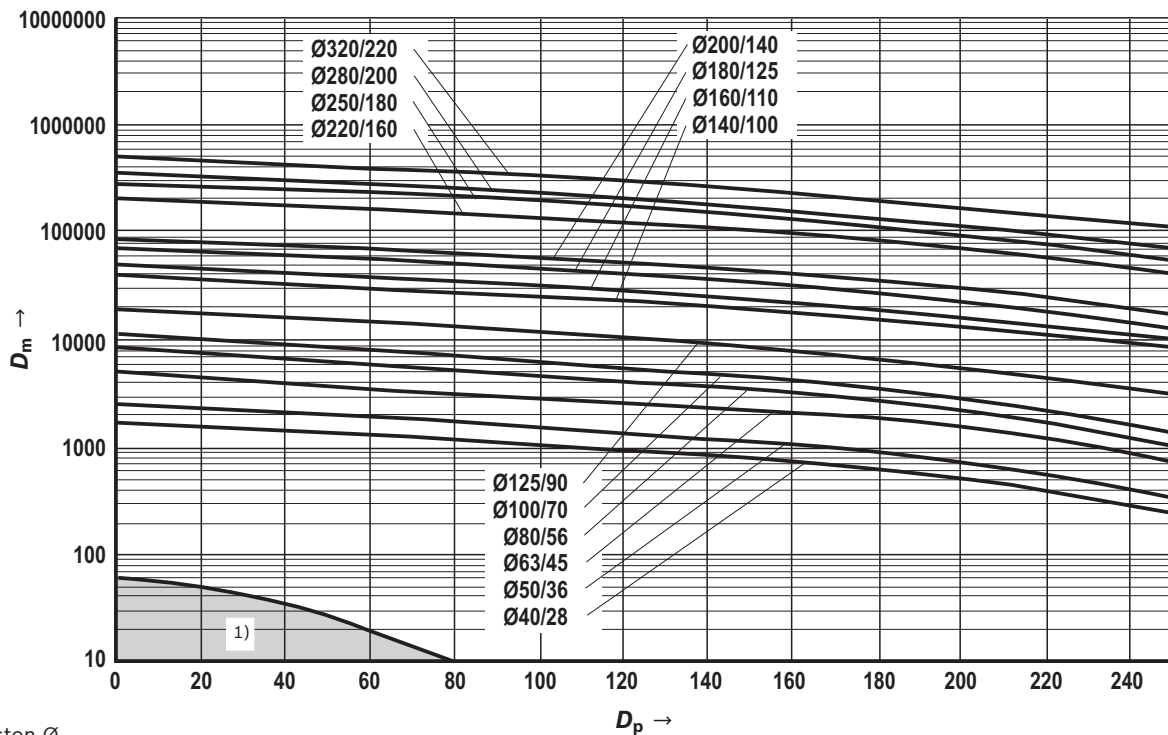
- 1) If with standard applications the calculated intersection point of D_m and D_p is within the marked area, we recommend designing the cylinder without end position cushioning.

End position cushioning

Damping capacity: Retraction for CDH2...XC, CGH2...XC and CSH2...XE; extension for CGH2...XC with k_v ②



Damping capacity: Retraction for CDH2...XC, CGH2...XC and CSH2...XE; extension for CGH2...XC with k_v ③



$\varnothing AL$ = Piston $\varnothing$

1) If with standard applications the calculated intersection point of D_m and D_p is within the marked area, we recommend designing the cylinder without end position cushioning.

Selection criteria for seals

Work and environmental conditions		Seal versions				
		M	A	B	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 HFDR / 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)	+	++ 2)
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!

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.

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

Seal kits

CDH2...XC – standard

Ø AL	Ø MM	Material no. for seal design				
		M	A	B	T	S
40	25					
	28					
50	32					
	36					
63	40					
	45					
80	50					
	56					
100	63					
	70					
125	80					
	90					
140	90					
	100					
160	100					
	110					
180	110					
	125					
200	125					
	140					
220	140					
	160					
250	160					
	180					
280	180					
	200					
320	200					
	220					

Ø AL = Piston Ø

Ø MM = Piston rod Ø

Seal kits

CGH2...XC – standard

Ø AL	Ø MM	Material no. for seal design				
		M	A	B	T	S
40	25					
	28					
50	32					
	36					
63	40					
	45					
80	50					
	56					
100	63					
	70					
125	80					
	90					
140	90					
	100					
160	100					
	110					
180	110					
	125					
200	125					
	140					
220	140					
	160					
250	160					
	180					
280	180					
	200					
320	200					
	220					

Ø AL =Piston Ø

Ø MM =Piston rod Ø

Seal kits

CDH2...XC – standard + additional option F

Ø AL	Ø MM	Material no. for seal design		
		M+F	T+F	S+F
40	25			
	28			
50	32			
	36			
63	40			
	45			
80	50			
	56			
100	63			
	70			
125	80			
	90			
140	90			
	100			
160	100			
	110			
180	110			
	125			
200	125			
	140			

CGH2...XC – standard + additional option F

Ø AL	Ø MM	Material no. for seal design		
		M+F	T+F	S+F
40	25			
	28			
50	32			
	36			
63	40			
	45			
80	50			
	56			
100	63			
	70			
125	80			
	90			
140	90			
	100			
160	100			
	110			
180	110			
	125			
200	125			
	140			

Ø AL = Piston Ø

Ø MM = Piston rod Ø

Seal kits²⁾

CSH2...XE

Ø AL	Ø MM	Material no. for seal design		
		M	T	S
40	28			
50	32			
	36			
63	40			
	45			
80	50			
	56			
100	63			
	70			
125	80			
	90			
140	90			
	100			
160	100			
	110			
180	110			
	125			
200	125			
	140			
220	140			
	160			
250	160			
	180			
280	180			
	200			
320	200			
	220			

Only for position measurement system

Ø AL	Material no. for seal design	
	M, T	S
40		
50		
63		
80		
100		
125		
140		
160		
180		
200		
220		
250		
280		
320		

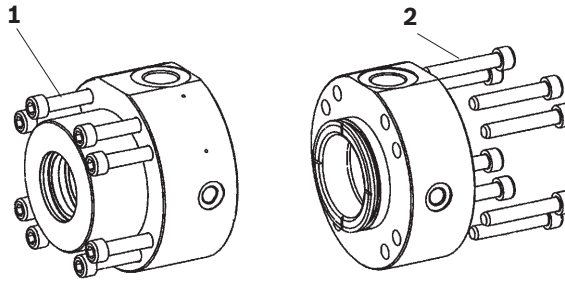
Ø AL = Piston Ø

Ø MM = Piston rod Ø

²⁾ Seal kits for position measurement system separate material no.

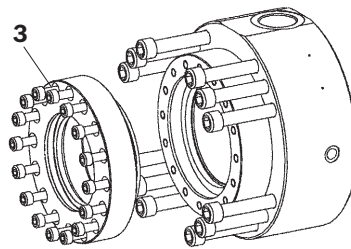
Tightening torques

Screws: Head and base (item 1 and 2)



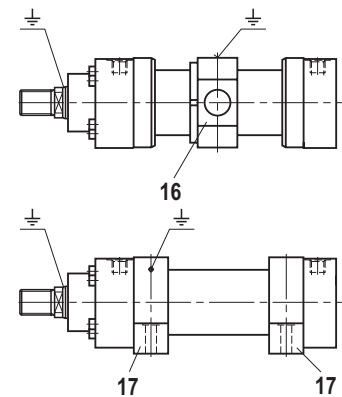
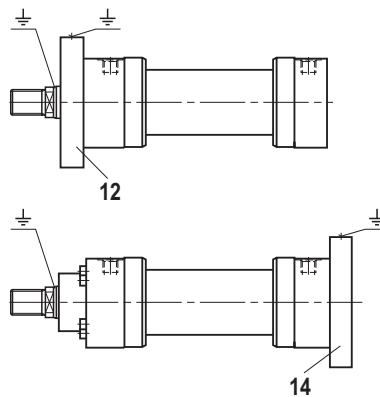
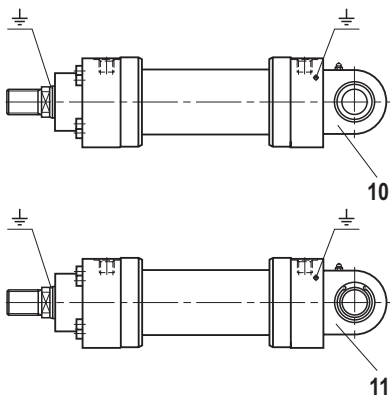
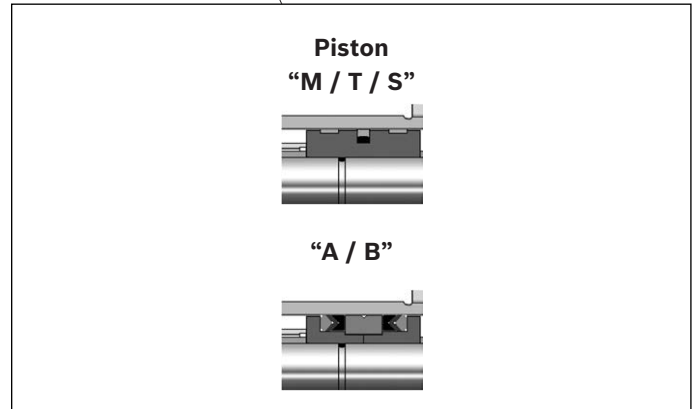
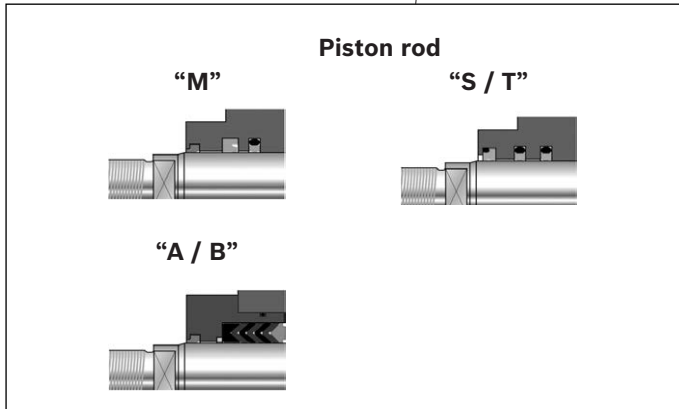
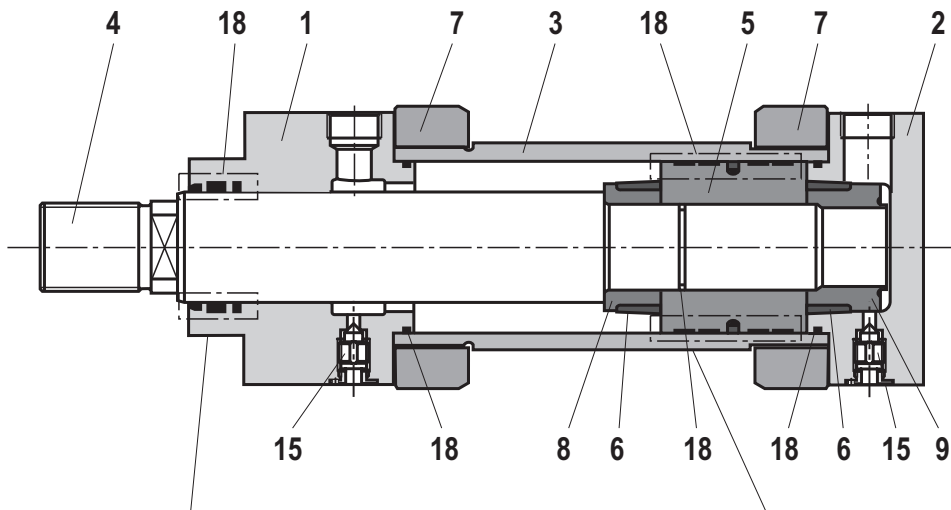
Series	Piston Ø	Screw	Quantity	Quality class	Tightening torque
CDH2...XC / CGH2...XC / CSH2...XE	40	M8	4	10.9	23 Nm
CDH2...XC / CGH2...XC / CSH2...XE	50	M8	8	10.9	20 Nm
CDH2...XC / CGH2...XC / CSH2...XE	63	M8	8	10.9	30 Nm
CDH2...XC / CGH2...XC / CSH2...XE	80	M10	8	10.9	55 Nm
CDH2...XC / CGH2...XC / CSH2...XE	100	M12	8	10.9	100 Nm
CDH2...XC / CGH2...XC / CSH2...XE	125	M16	8	10.9	200 Nm
CDH2...XC / CGH2...XC / CSH2...XE	140	M16	12	10.9	170 Nm
CDH2...XC / CGH2...XC / CSH2...XE	160	M16	12	10.9	220 Nm
CDH2...XC / CGH2...XC / CSH2...XE	180	M20	12	10.9	350 Nm
CDH2...XC / CGH2...XC / CSH2...XE	200	M20	12	10.9	410 Nm
CDH2...XC / CGH2...XC / CSH2...XE	220	M20	16	10.9	460 Nm
CDH2...XC / CGH2...XC / CSH2...XE	250	M24	16	10.9	700 Nm
CDH2...XC / CGH2...XC / CSH2...XE	280	M30	12	10.9	1 700 Nm
CDH2...XC / CGH2...XC / CSH2...XE	320	M30	16	10.9	1 500 Nm

Screws: Seal cover (item 3)

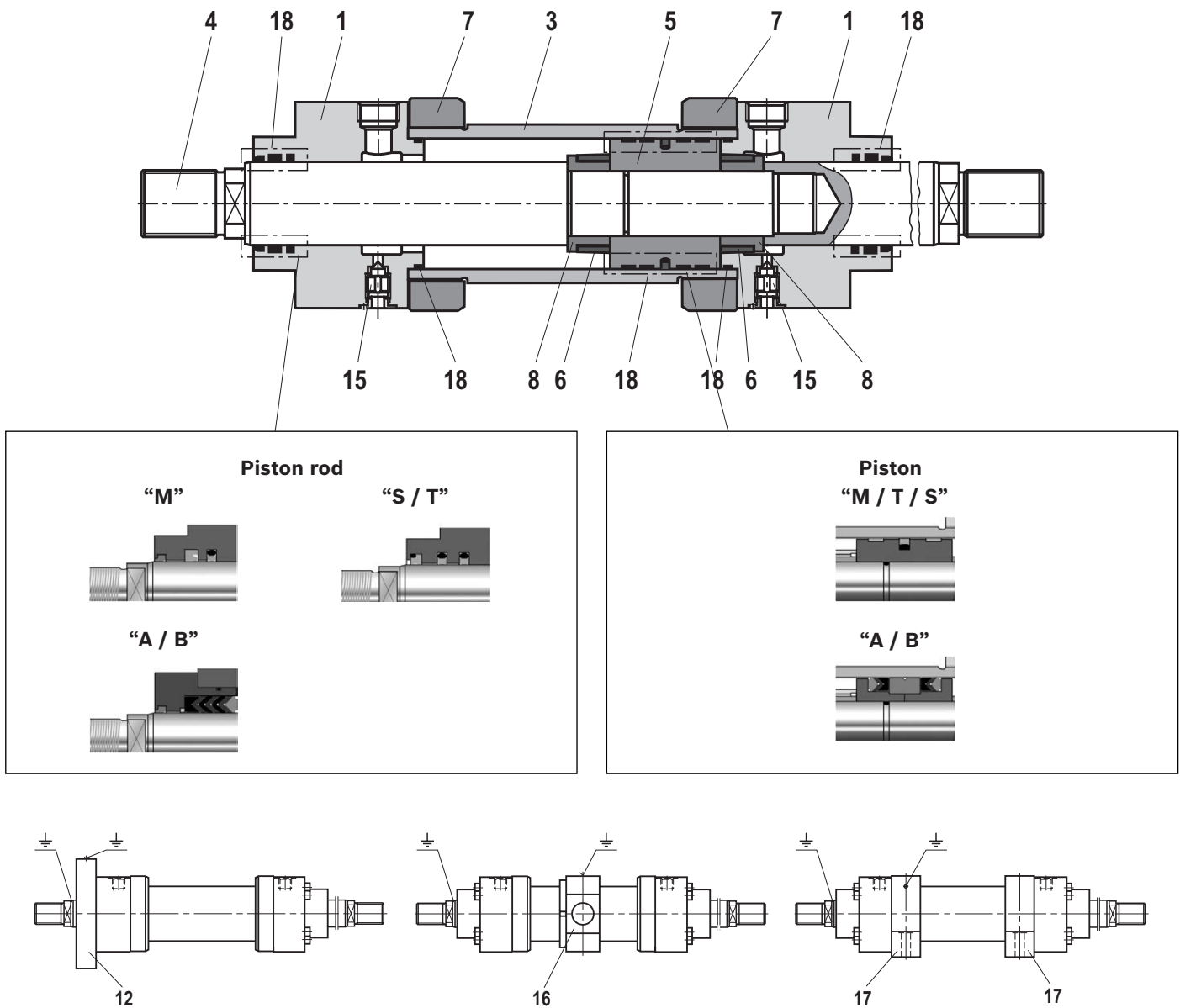


Only with seal design “A” and “B”

Series	Piston Ø	Piston rod Ø	Screw	Quantity	Quality class	Tightening torque
CDH2...XC / CGH2...XC	160	100	M10	16	10.9	60 Nm
		110				
CDH2...XC / CGH2...XC	180	110	M12	16	10.9	80 Nm
		125				
CDH2...XC / CGH2...XC	200	125	M12	16	10.9	90 Nm
		140				
CDH2...XC / CGH2...XC	220	140	M12	16	10.9	90 Nm
		160		24		
CDH2...XC / CGH2...XC	250	160	M12	24	10.9	90 Nm
		180				
CDH2...XC / CGH2...XC	280	180	M12	24	10.9	90 Nm
		200				
CDH2...XC / CGH2...XC	320	200	M12	24	10.9	90 Nm
		220	M16	16		230 Nm

Spare parts drawing: Series CDH2...XC:


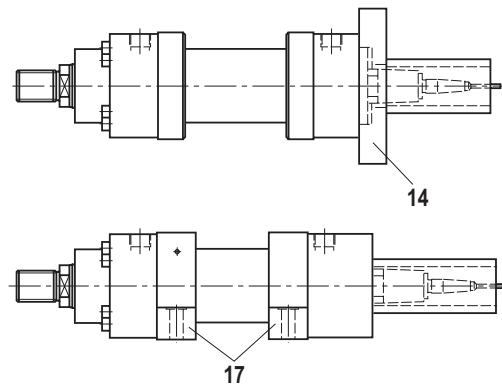
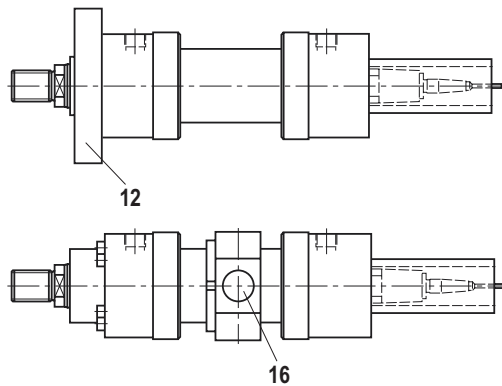
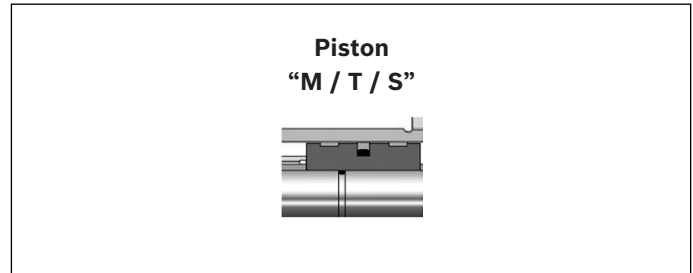
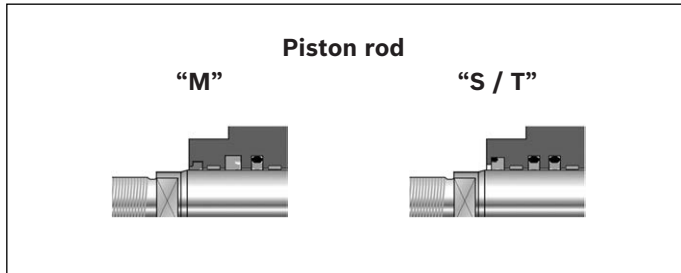
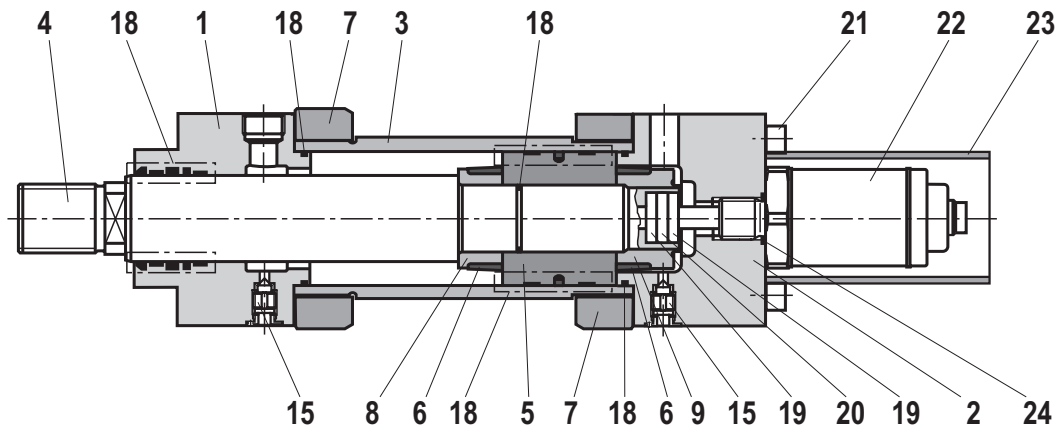
- | | | | |
|---------------------|-----------------------|----------------------------|---------------------|
| 1 Head | 6 Damping bush | 11 Base MP5 | 17 Foot MS2 |
| 2 Base | 7 Flange | 12 Round flange MF3 | 18 Seal kit: |
| 3 Pipe | 8 Bushing | 14 Round flange MF4 | ▶ Wiper |
| 4 Piston rod | 9 Bushing | 15 Bleeding | ▶ Rod seal |
| 5 Piston | 10 Base MP3 | 16 Trunnion MT4 | ▶ Piston seal |
| | | | ▶ Seal ring |
| | | | ▶ Guide ring |

Spare parts drawing: Series CGH2...XC:


- 1 Head
- 3 Pipe
- 4 Piston rod
- 5 Piston
- 6 Damping bush

- 7 Flange
- 8 Bushing
- 12 Round flange MF3
- 15 Bleeding
- 16 Trunnion MT4

- 17 Foot MS2
- 18 Seal kit:
 - ▶ Wiper
 - ▶ Rod seal
 - ▶ Piston seal
 - ▶ Seal ring
 - ▶ Guide ring

Spare parts drawing: Series CSH2...XE: MF3, MF4, MT4 and MS2


- 1 Head
- 2 Base
- 3 Pipe
- 4 Piston rod
- 5 Piston
- 6 Damping bush

- 7 Flange
- 8 Bushing
- 9 Bushing
- 12 Round flange MF3
- 14 Round flange MF4
- 15 Bleeding

- 16 Trunnion MT4
- 17 Foot MS2
- 18 Seal kit:
 - Wiper
 - Rod seal
 - Piston seal
 - Seal ring
 - Guide ring

- 19 Insulating socket
- 20 Solenoid
- 21 Hex socket head cap screws
- 22 Position transducer
- 23 Protective pipe
- 24 Seal

Cylinder weight

Piston	Piston rod	CD/CS cylinder with 0 mm stroke length				per 100 mm stroke length	CG cylinder with 0 mm stroke length			per 100 mm stroke length
Ø AL	Ø MM	MP3 ¹⁾ MP5 ¹⁾	MF3 MF4	MT4	MS2		MF3	MT4	MS2	
mm	mm	kg	kg	kg	kg	kg	kg	kg	kg	kg
40	25	7	9	9	9	0.9	10	10	10	1.3
	28	7	9	9	9	1.0	10	10	10	1.5
50	32	12	14	13	13	1.3	16	16	16	1.9
	36	12	14	13	14	1.5	16	16	16	2.3
63	40	20	21	21	21	2.3	25	25	25	3.3
	45	20	21	21	21	2.6	25	25	25	3.8
80	50	32	35	34	35	3.2	41	40	41	4.7
	56	32	35	34	36	3.6	41	40	42	5.5
100	63	51	54	54	55	5.2	63	63	64	7.6
	70	51	55	54	56	5.7	64	64	65	8.8
125	80	95	96	99	98	8.2	113	115	114	12.1
	90	96	97	100	99	9.2	115	117	116	14.2
140	90	131	132	136	137	10.7	155	158	159	15.7
	100	132	133	137	138	11.9	156	160	161	18.1
160	100	185	184	197	206	12.6	217	231	239	18.8
	110	186	186	199	207	13.9	220	233	242	21.4
180	110	255	253	264	274	14.7	294	305	314	22.1
	125	258	256	267	277	16.8	300	311	320	26.5
200	125	349	332	350	363	19.0	359	377	389	28.6
	140	352	335	353	366	21.5	365	383	396	33.5
220	140	527	512	546	518	27.1	604	638	610	39.1
	160					30.9				46.7
250	160	673	640	677	650	32.7	761	798	772	48.5
	180					36.9				56.9
280	180	976	966	1020	918	44.2	1130	1183	1081	64.2
	200					48.8				73.4
320	200	1251	1172	1223	1174	55.2	1354	1405	1356	79.8
	220					60.4				90.2

Ø AL =Piston Ø

Ø MM=Piston rod Ø

¹⁾ Weight without position measurement system