

Hydraulic cylinder Tie rod design



Series CDT3...Z



- ▶ Nominal pressure 160 bar
- ▶ Maximum operating pressure up to 210 bar
- ▶ Component series 3X

Features

- ▶ Installation dimensions according to ISO 6020-2 and NF/ISO 6020-2
- ▶ 13 types of mounting
- ▶ Piston \varnothing (\varnothing AL): 25 ... 200 mm
- ▶ Piston rod \varnothing (\varnothing MM): 12 ... 140 mm
- ▶ Stroke length up to 3000 mm
- ▶ Integrated guide socket for fast and easy maintenance
- ▶ Optional self-adjusting or adjustable end position damping
- ▶ Patented safety vent for easy and safe bleeding
- ▶ Easy assembly thanks to freely selectable position of the line connections at head and base

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Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
CD	T3	/	/	/	Z	3X	/													*

01	Differential cylinder	CD
02	Series	T3

Types of mounting

03	according to DIN/ISO/NF	
	Rectangular flange at head	ME5
	Rectangular flange at base	ME6
	Self-aligning clevis at base	MP5
	Foot mounting	MS2
	Trunnion mounting in center	MT4 ¹⁾
	according to ISO/NF	
	Clevis at base	MP1
	Swivel eye at base	MP3
	Trunnion mounting at head	MT1
	Trunnion mounting at base	MT2
	Extended tie rod, on both sides	MX1
	Extended tie rod at base	MX2
	Extended tie rod at head	MX3
	Tapped hole at head	MX5 ²⁾

04	Piston Ø (ØAL) 25 ... 200 mm	
05	Piston rods Ø (ØMM) 12 ... 140 mm ³⁾	
06	Stroke length in mm ⁴⁾	

Design principle

07	Head and base connected to tie rod	Z
08	Component series 30 ... 39 (30 ... 39: Unchanged installation and mounting dimensions)	3X

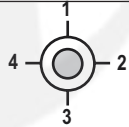
Line connection - version

09	According to ISO 1179-1 (pipe thread)	B
	According to ISO 9974-1 (metric thread ISO 6149-1)	R ⁵⁾
	According to ISO 1179-1 (enlarged pipe thread)	S ⁵⁾

Line connection - position at head (see page 31)

10	View to piston rod		1
			2
			3
			4

Line connection - position at base (see page 31)

11	View to piston rod		1
			2
			3
			4

Piston rod design

12	Hard chromium-plated	C
	Hardened and hard chromium-plated	H

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
CD	T3		/	/	/		Z	3X	/											*

Piston rod end (see page 10 ... 27)

13	Thread (ISO) for swivel head CGKA / CGKD	D ⁶⁾
	Internal thread	E ⁷⁾
	With mounted swivel head CGKA (DIN/ISO)	F ^{8; 9)}
	Thread (DIN/ISO) for swivel head CGKA	H ⁹⁾
	With mounted swivel head CGKA / CGKD	K ^{6); 10); 8)}
	With trunnion	T ¹¹⁾

End position damping (see page 48 ... 52)

14	Without	U
	Both sides, self-adjusting	D
	Both sides, adjustable	E ¹²⁾
	Base side, self-adjusting	K
	Head side, self-adjusting	S

Seal design (selection criteria for seals, see page 53)

15	For mineral oil HL, HLP and HFA	
	Standard seal system	M
	For mineral oil HL, HLP, HFA and water glycol HFC	
	Servo quality / reduced friction	T
	For phosphate ester HFDR	
	Servo quality / reduced friction	S

Option 1

16	Without	W
	Measuring coupling, on both sides	A
	Leakage oil connection	B ^{12); 13); 14)}

Option 2

17	Without	W
	Specify the piston rod extension dimension "LY" in the plain text in mm	Y

Color set-up

18	Priming class CP3	W
	Painting class CP4	B ¹⁵⁾

Hydraulic fluid filling

19	Without	W
	With corrosion protection oil VG 68	F

Test certificate

20	Without	W
	With certificate of compliance 2.1 based on EN 10204	B
	With acceptance test certificate 3.1 based on EN 10204	C

21	Further details in the plain text	
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Ordering code

Order example:

CDT3MP5/50/36/300Z3X/B11HDMWW

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

Comments

- 1) Trunnion mounting position freely selectable; when ordering, always specify the "XV" dimension in the plain text in mm.
- 2) Not according to ISO.
- 3) Observe the admissible piston rod \varnothing and assigned threads at the piston rod end for 210 bar (pages 6 and 10 ... 27).
- 4) Observe the maximum available stroke length page 7 and admissible stroke length (according to buckling calculation) page 41 to 47.
- 5) For type of mounting "ME5" and "ME6", only position 1 and 3 possible.
- 6) For operating pressure up to 210 bar.
- 7) Only with piston rod \varnothing 18 ... 140 mm of the piston rod \varnothing specified in the table on page 33 .
Observe the maximum operating pressure.
- 8) Not possible with type of mounting "MX1" and "MX3".
- 9) For operating pressure up to 160 bar.
- 10) CGKD only with piston \varnothing 160/110 and piston \varnothing 200 mm.
- 11) Only with piston rod \varnothing 22 ... 140 mm of the piston rod \varnothing specified in the table on page 33 . Observe the maximum operating pressure.
- 12) With piston \varnothing 25 ... 100 mm: only line connection "B" possible.
With piston \varnothing 125 ... 200 mm: only types of mounting "ME5", "ME6", "MP5", "MS2", "MT4" and line connection "B" possible.
With type of mounting "MX1" and "MX2", only possible for piston \varnothing 40 ... 200.
- 13) With type of mounting "MS2" and piston \varnothing 25 and end position damping, "E" is not possible.
- 14) Not possible with type of mounting "MT1".
- 15) Specify RAL color in the plain text.

Technical data

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

general		
Installation position		any
Ambient temperature range		See page 53
Priming		see page 57
Painting		see page 57
hydraulic		
Nominal pressure	bar	160
Minimum operating pressure ¹⁾ (without load)	bar	10
Maximum operating pressure ^{2; 3)} (only static load)	bar	210
Static test pressure	bar	240
Hydraulic fluid		see table below
Hydraulic fluid temperature range	°C	see page 53
Viscosity range	mm ² /s	2.8 ... 380
Viscosity at operating temperature (recommended)	mm ² /s	20 ... 100
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)		Class 20/18/15
Bleeding		by default
Hydraulic fluid	Classification	Data sheet
Mineral oils	HL, HLP	90220
Phosphate ester	HFDR	90222
Oil-in-water emulsion	HFA	90223
Water glycol	HFC	90223

¹⁾ 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, please contact us.

²⁾ Static load: less than 10,000 load cycles over the entire life cycle.

³⁾ The admissible dynamic operating pressure amounts to 75% of the maximum operating pressure with maximum amplitude and oscillatory load.

The specified operating pressures apply to applications with shock-free operation with reference 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.

Technical data

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

Stroke velocity

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

If the extension velocity is considerably higher than

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

Piston Ø ØAL in mm	Piston rod Ø ØMM in mm	Line connection "B / R"	Maximum stroke velocity in m/s	Line connection "S"	Maximum stroke velocity in m/s
		EE		EE	
25	12	G1/4	0.60	G3/8	0.90
	18		0.90		1.40
32	14	G1/4	0.40	G3/8	0.50
	22		0.50		0.80
40	18	G3/8	0.40	G1/2	0.80
	22		0.40		0.90
	28		0.50		1.20
50	22	G1/2	0.50	G3/4	0.70
	28		0.60		0.80
	36		0.80		1.10
63	28	G1/2	0.30	G3/4	0.50
	36		0.40		0.50
	45		0.50		0.70
80	36	G3/4	0.30	G1	0.50
	45		0.30		0.50
	56		0.40		0.70
100	45	G3/4	0.20	G1	0.30
	56		0.20		0.40
	70		0.30		0.50
125	56	G1	0.20	G1 1/4	0.30
	70		0.20		0.40
	90		0.30		0.50
160	70	G1	0.20	G1 1/4	0.20
	90		0.20		0.20
	110		0.20		0.30
200	90	G1 1/4	0.20	G1 1/2	0.20
	110		0.20		0.20
	140		0.20		0.20

Information on stroke length and stroke velocity

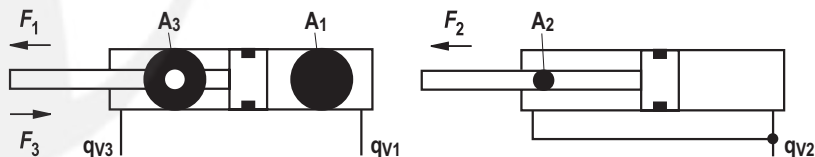
ØAL in mm		25	32	40	50	63	80	100	125	160	200
Minimum stroke in mm (recommended)	without damping	-	-	-	-	-	-	-	-	-	-
	with damping	30	32	46	44	50	54	56	66	72	80
Maximum velocity in m/s (recommended)	Seal design "M"; 160 bar	0.50				0.40		0.30		0.25	
	Seal design "M"; 100 bar	0.70				0.60		0.40		0.35	
	Seal design "T", "S"; 160 bar	1.00				0.80		0.60		0.50	
Minimum velocity in mm/s (recommended)	Seal design "M"	30									
	Seal design "T", "S"	1									

Technical data

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

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

Piston ØAL in mm	Piston rod		Area ratio ϕ A1/A3	Areas			Force ¹⁾						Flow at 0.1 m/s ²⁾			max. available stroke length in mm ⁴⁾	
	ØMM in mm	160 bar		210 bar	Piston A₁ in cm ²	Rod A₂ in cm ²	Ring A₃ in cm ²	Pressure		Diff.		Pulling		OFF q_{v1} l/min	Diff. q_{v2} l/min		ON q_{v3} l/min
								160 bar	210 bar	160 bar	210 bar	160 bar	210 bar				
25	12	-	1.3	4.9	1.1	3.8	7.9	-	1.8	-	6.1	-	2.9	0.7	2.3	600	
	18	18	2.1		2.5	2.4		10.3	4.1	5.3	3.8	5.0		1.5	1.4		
32	14	-	1.3	8.0	1.5	6.5	12.9	-	2.5	-	40.4	-	4.8	0.9	3.9	800	
	22	22	1.9		3.8	4.2		16.9	6.1	8.0	6.8	8.9		2.3	2.5		
40	18	-	1.3	12.6	2.5	10.0	20.1	-	4.1	-	16.0	-	7.5	1.5	6.0	1000	
	22	22	1.4		3.8	8.8		26.4	6.1	8.0	14.0	18.4		2.3	5.3		
	28	28	2.0		6.2	6.4		26.4	9.9	12.9	10.2	13.4		3.7	3.8		
50	22	-	1.3	19.6	3.8	15.8	31.4	-	6.1	-	25.3	-	11.8	2.3	9.5	1200	
	28	28	1.5		6.2	13.5		41.2	9.9	12.9	21.6	28.3		3.7	8.1		
	36	36	2.1		10.2	9.5		41.2	16.3	21.4	15.1	19.9		6.1	5.7		
63	28	-	1.3	31.2	6.2	25.0	49.9	-	9.9	12.9	40.0	-	18.7	3.7	15.0	1400	
	36	36	1.5		10.2	21.0		65.5	16.3	21.4	33.6	44.1		6.1	12.6		
	45	45	2.1		15.9	15.3		65.5	25.4	33.4	24.4	32.1		9.5	9.2		
80	36	-	1.3	50.3	10.2	40.1	80.4	-	16.3	21.4	64.1	-	30.2	6.1	24.0	1700	
	45	45	1.5		15.9	34.4		105.6	25.4	33.4	55.0	72.2		9.5	20.6		
	56	56	2.0		24.6	25.6		105.6	39.4	51.7	41.0	53.8		14.8	15.4		
100	45	-	1.3	78.5	15.9	62.6	125.7	-	25.4	33.4	100.2	-	47.1	9.5	37.6	2000	
	56	56	1.5		24.6	53.9		164.9	39.4	51.7	86.3	113.2		14.8	32.3		
	70	70	2.0		38.5	40.1		164.9	61.6	80.8	64.1	84.1		23.1	24.0		
125	56	-	1.3	122.7	24.6	98.1	196.4	-	39.4	51.7	156.9	-	73.6	14.8	58.9	2300	
	70	70 ³⁾	1.5		38.5	84.2		³⁾	61.6	80.8	134.8	³⁾		23.1	50.5		
	90	90 ³⁾	2.1		63.6	59.1		³⁾	101.8	133.6	94.6	³⁾		38.2	35.5		
160	70	-	1.3	201.1	38.5	162.6	321.7	-	61.6	80.8	260.1	-	120.6	23.1	97.5	2600	
	90	90	1.5		63.6	137.4		422.2	101.8	133.6	219.9	288.6		38.2	82.5		
	110	110 ³⁾	1.9		95.0	106.0		³⁾	152.1	199.6	169.7	³⁾		57.0	63.6		
200	90	-	1.3	314.2	63.6	250.5	502.7	-	101.8	133.6	400.9	-	188.5	38.2	150.3	3000	
	110	110	1.4		95.0	219.1		659.7	152.1	199.6	350.6	460.2		57.0	131.5		
	140	140 ³⁾	2.0		153.9	160.2		³⁾	246.3	323.3	256.4	³⁾		92.4	96.1		



¹⁾ Theoretical static cylinder force
(without consideration of the efficiency and admissible load for attachment parts such as swivel heads, plates, or valves, etc.)

²⁾ Stroke velocity

³⁾ On request

⁴⁾ Larger stroke lengths upon request

Technical data

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

Weight for cylinder (in kg)

ØAL in mm	ØMM in mm	"MX1", "ME5", "S2"	"ME6", "MP3", "MP1"	"MP5"	"MT4"	"MX2", "MX3", "MX5"	"MT1", "MT2"	Stroke 100 mm
25	12	1.1	1.1	1.0	1.3	1.0	1.1	0.4
	18	1.2	1.2	1.1	1.4	1.1	1.2	0.6
32	14	1.5	1.6	1.4	1.8	1.4	1.5	0.5
	22	1.6	1.7	1.5	1.9	1.5	1.6	0.6
40	18	3.4	3.4	3.2	4.1	3.1	3.2	0.8
	22	3.4	3.4	3.2	4.1	3.1	3.2	0.9
	28	3.5	3.5	3.3	4.2	3.2	3.3	1.1
50	22	5.3	5.3	4.9	6.6	4.8	4.9	1.1
	28	5.4	5.4	5	6.7	4.9	5	1.3
	36	5.5	5.5	5.1	6.8	5.0	5.1	1.6
63	28	7.7	7.7	7.3	9.2	7.0	7.3	1.4
	36	7.9	7.8	7.4	9.3	7.1	7.4	1.7
	45	8.2	8.0	7.6	9.5	7.3	7.6	2.2
80	36	14	14	14	18	12	15	2.2
	45	14	14	14	17	13	14	2.6
	56	15	15	15	19	14	15	3.3
100	45	20	20	20	24	19	22	3.3
	56	20	20	19	24	18	22	4.1
	70	21	21	21	25	19	23	5.1
125	56	38	39	38	46	35	43	6.3
	70	38	39	38	46	35	43	7.3
	90	39	40	39	48	37	44	9.3
160	70	62	67	63	78	59	64	8.7
	90	63	68	64	79	60	66	10.7
	110	64	69	65	80	61	67	13.2
200	90	112	120	115	147	107	114	13.4
	110	114	122	116	148	108	116	15.8
	140	115	123	117	149	109	117	20.5

Swivel head, clevis bracket and trunnion mounting
bearing block see pages 34 ... 39.

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

„ME5“ according to DIN/ISO/NF
(see page 10, 11)



„MT1“ according to ISO/NF
(see page 18, 19)



„MX5“ according to NF
(see page 24, 25)



„ME6“ according to DIN/ISO/NF
(see page 10, 11)



„MT2“ according to ISO/NF
(see page 18, 19)



„MP5“ according to DIN/ISO/NF
(see page 12, 13)



„MX1“ according to ISO/NF
(see page 20, 21)



„MS2“ according to DIN/ISO/NF
(see page 14, 15)



„MX2“ according to ISO/NF
(see page 22, 23)



„MT4“ according to DIN/ISO/NF
(see page 16, 17)



„MX3“ according to ISO/NF
(see page 22, 23)



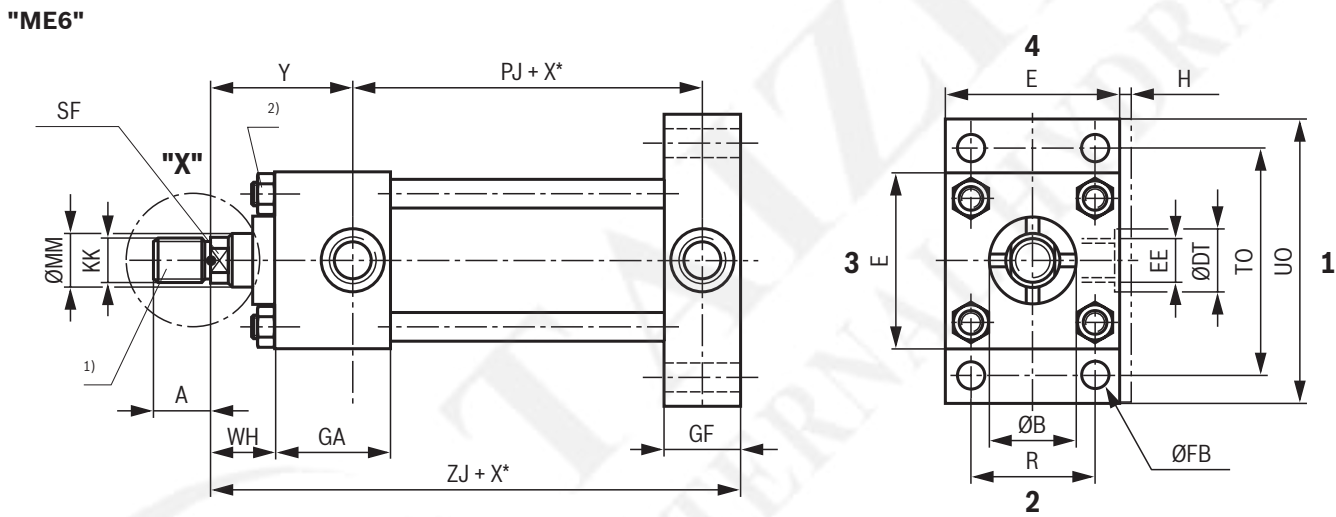
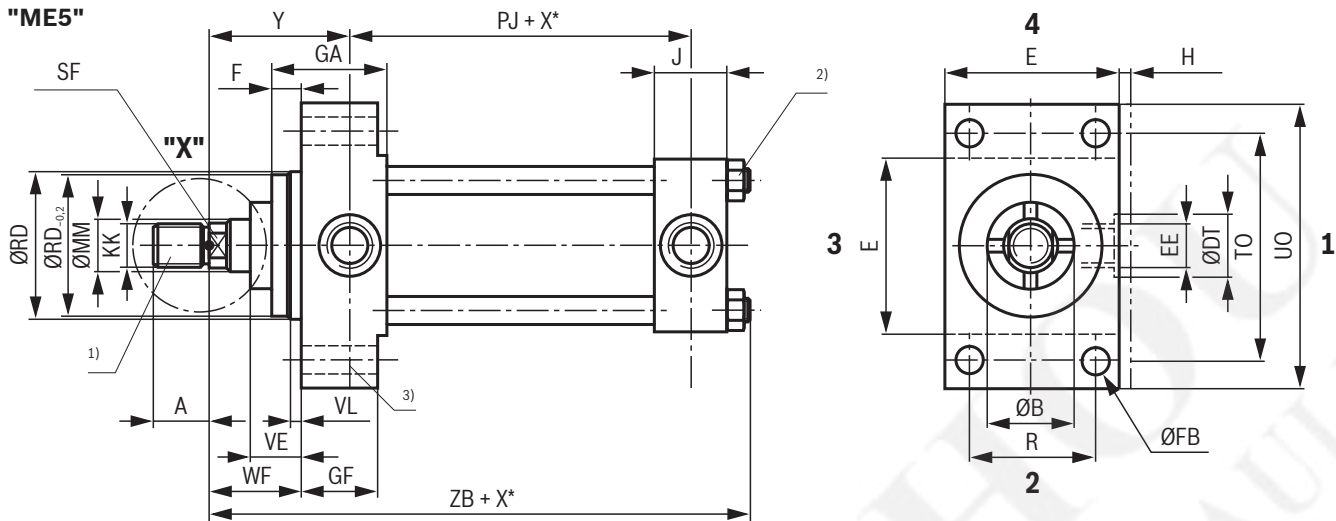
„MP1“ according to ISO/NF
(see page 26, 27)



„MP3“ according to ISO/NF
(see page 26, 27)

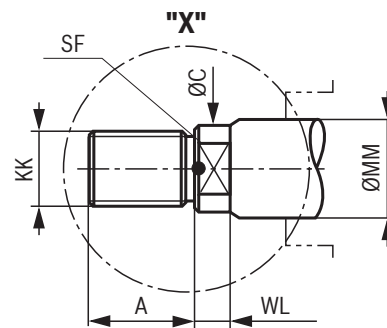


Dimensions: Rectangular flange at head "ME5"
Rectangular flange at base "ME6" (dimensions in mm)



1 ... 4 = Position of the line connections

Position of the line connections	Position dimension "H"	
	"ME5" (head)	"ME6" (base)
1	1	1
2	1	1
3	3	3
4	3	3



ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

- 1) Piston rod ends "E" and "T" see page 33
- 2) Tightening torque see page 55
- 3) Position of the line connections and the bleeding see page 31
- 4) Thread for piston rod ends "F" and "H"

- 5) Thread for piston rod ends "D" and "K"
- 6) On request
- 7) Position dimension "H" see table. "H" dimension always in position of the line connection, except for "ME5" (head) and "ME6" (base).
- 8) "ME5": for line connection position "1" and "3" at head
- 9) "ME5": for line connection position "2" and "4" at head

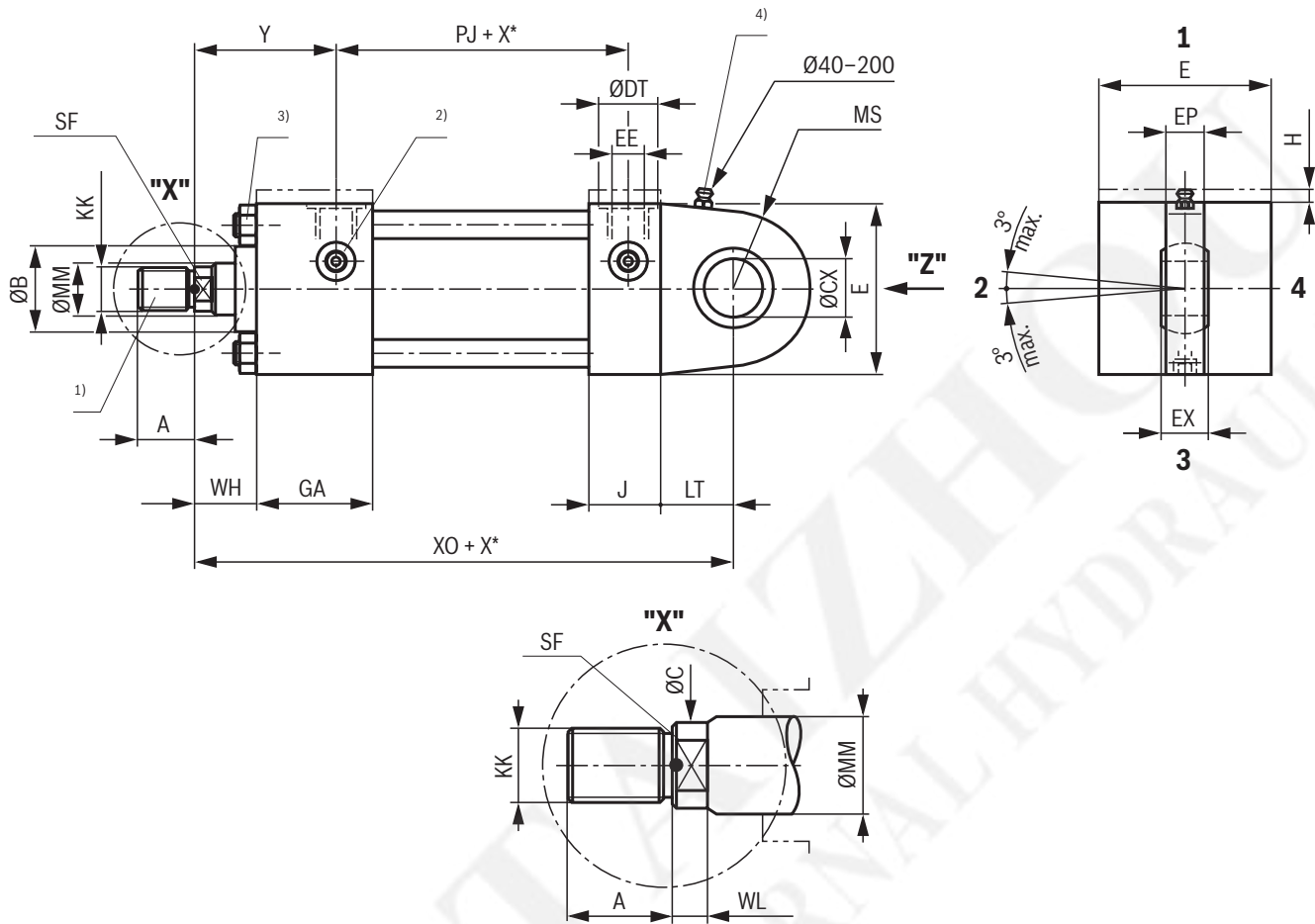
Dimensions: Rectangular flange at head "ME5"
Rectangular flange at base "ME6" (dimensions in mm)

ØAL	F max	ØFB H13	GF ME5/ME6	R JS13	TO JS13	UO max	VE max	VL min	ZB max	ZJ ±1	ZK ±1	ZM ±2
25	10	5.5	25	27	51	65	16	3	121	114	138	154
32	10	6.6	25/26.5	33	58	70	22	3	137	128	151	177
40	10	11	38	41	87	110	22	3	166	153	172	196
50	16	14	38	52	105	130	25	4	176	159	183	207
63	16	14	38	65	117	145	29	4	185	168	190	223
80	20	18	45	83	149	180	29	4	212	190	216	246
100	22	18	45	97	162	200	32	5	225	203	230	265
125	22	22	58	126	208	250	32	5	260	232	254	289
160	25	26	58	155	253	300	32	5	279	245	270	302
200	25	33	76	190	300	360	32	5	336	299	329	361

ØAL	ØMM	DIN / ISO ⁴⁾ (for operating pressure up to 160 bar)					ISO ⁵⁾ (for operating pressure up to 210 bar)						
		KK ⁴⁾	A ⁴⁾ max	ØC	SF	WL	KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	ØB f9	ØRD f8
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24	3
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30	38
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26	42
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34	42
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30	62
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34	62
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42	62
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34	74
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42	74
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50	74
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42	75
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50	88
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60	88
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50	82
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60	105
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72	105
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60	92
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72	125
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88	125
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72	105
	70	M42 x 2	56	68	60	15	M48 x 2 ⁶⁾	63	68	60	15	88	150
	90	M42 x 2	56	88	75	15	M64 x 3 ⁶⁾	85	88	75	15	108	150
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88	125
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108	170
	110	M48 x 2	63	106	95	15	M80 x 3 ⁶⁾	95	106	95	15	133	170
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108	150
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133	210
	140	M64 x 3	85	136	120	15	M100 x 3 ⁶⁾	112	136	120	15	163	210

ØAL	E	Line connection "B"		Line connection "R"		GA "ME5"/"ME6"	H ⁷⁾	J	PJ ⁸⁾ ±1.25	PJ ⁹⁾ ±1.25	WF ±2	WH ±2	Y ⁸⁾ ±2	Y ⁹⁾ ±2
		EE	ØDT _{min}	EE	ØDT _{min}									
25	40 ±1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	64.5	25	15	50	38.5
32	45 ±1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	68.5	35	25	60	47.5
40	63 ±1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	77	35	25	62	58
50	75 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	78	41	25	67	63
63	90 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	81	48	32	71	70
80	115 ±1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	93	51	31	77	77
100	130 ±2	G3/4	36.9	M27 x 2	34	70	-	43	101	101	57	35	82	82
125	165 ±2	G1	46.1	M33 x 2	43	80/76	-	54	117	117	57	35	86	86
160	205 ±2	G1	46.1	M33 x 2	43	83	-	58	130	130	57	32	86	86
200	245 ±2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	165	57	32	98	98

Dimensions: Self-aligning clevis at base "MP5"
(dimensions in mm)



1 ... 4 = Position of the line connections

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

Dimensions: Self-aligning clevis at base "MP5"
(dimensions in mm)

ØAL	ØMM	DIN / ISO ⁵⁾ (for operating pressure up to 160 bar)					ISO ⁶⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	KK ⁶⁾	A ⁶⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁷⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁷⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁷⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁷⁾	112	136	120	15	163

ØAL	E	Line connection "B"		Line connection "R"		GA	H ⁸⁾	J	PJ ±1.25	WH ±2	Y ±2
		EE	ØDT _{min}	EE	ØDT _{min}						
25	40 ±1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50
32	45 ±1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60
40	63 ±1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62
50	75 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	25	67
63	90 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71
80	115 ±1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77
100	130 ±2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82
125	165 ±2	G1	46.1	M33 x 2	43	76	-	54	117	35	86
160	205 ±2	G1	46.1	M33 x 2	43	83	-	58	130	32	86
200	245 ±2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Tightening torque see page 55

4) Grease nipple M6 DIN 71412 from piston Ø 40 mm

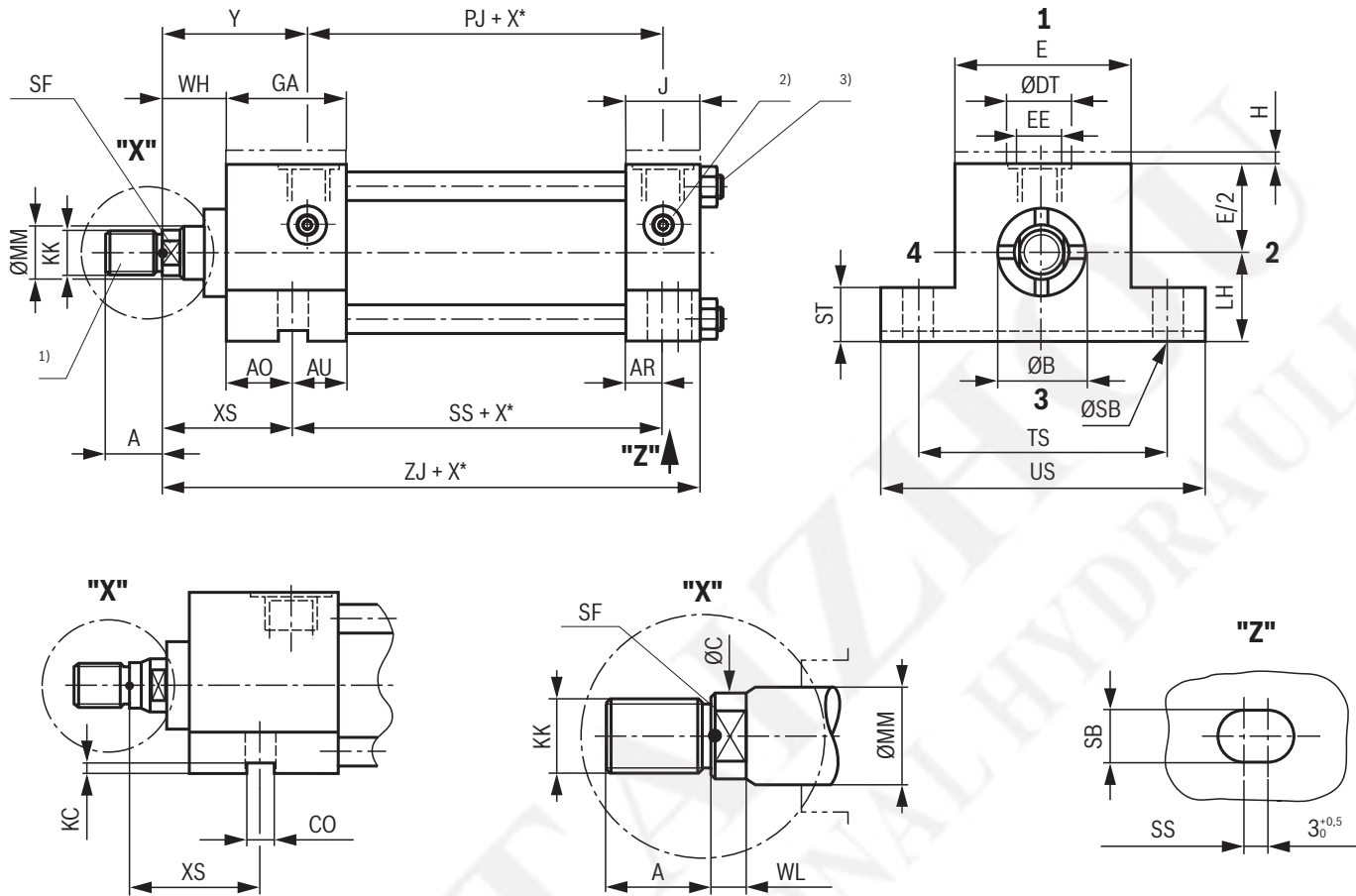
5) Thread for piston rod ends "F" and "H"

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

7) On request

8) "H" dimension always in line connection position

Dimensions: Foot mounting "MS2"
(dimensions in mm)



1 ... 4 = Position of the line connections

ØAL	CO N9	KC +0.2	LH h10	ØSB H13	SS ±1.25	ST	TS JS13	US max	XS ±2	ZJ ±1	ZK ±1	ZM ±2	AO	AU
25	12 ⁴⁾	3 ⁴⁾	19	6.6	72	8.5	54	72	33	114	138	154	18	28.5
32	12 ⁴⁾	4 ⁴⁾	22	9	72	12.5	63	84	45	128	151	177	20	28
40	12	4	31	11	97	12.5	83	103	45	153	172	196	20	32.5
50	12	4.5	37	14	91	19	102	127	54	159	183	207	29.5	28
63	16	4.5	44	18	85	26	124	161	65	168	190	223	33	24.5
80	16	5	57	18	104	26	149	186	68	190	216	246	37.5	29.5
100	16	6	63	26	101	32	172	216	79	203	230	265	44	26
125	20	6	82	26	130	32	210	254	79	232	254	289	44	32
160	30	8	101	33	129	38	260	318	86	245	270	302	54	29
200	40	8	122	39	171	44	311	381	92	299	329	361	60	47.5

Dimensions: Foot mounting "MS2"
(dimensions in mm)

ØAL	ØMM	DIN / ISO ⁵⁾ (for operating pressure up to 160 bar)					ISO ⁶⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	KK ⁶⁾	A ⁶⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁷⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁷⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁷⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁷⁾	112	136	120	15	163

ØAL	E	Line connection "B"		Line connection "R"		GA	H ⁸⁾	J	PJ ±1.25	WH ±2	Y ±2	AR
		EE	ØDT _{min}	EE	ØDT _{min}							
25	40 ±1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50	13.5
32	45 ±1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60	14
40	63 ±1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62	22.5
50	75 ±1.5	G1/2	29.9	M22 x 1.5	29	57.5	-	33.5	74	25	67	20
63	90 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71	17.5
80	115 ±1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77	23
100	130 ±2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82	20
125	165 ±2	G1	46.1	M33 x 2	43	76	-	54	117	35	86	31
160	205 ±2	G1	46.1	M33 x 2	43	83	-	58	130	32	86	28
200	245 ±2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98	41.5

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Tightening torque see page 55

4) Not standardized

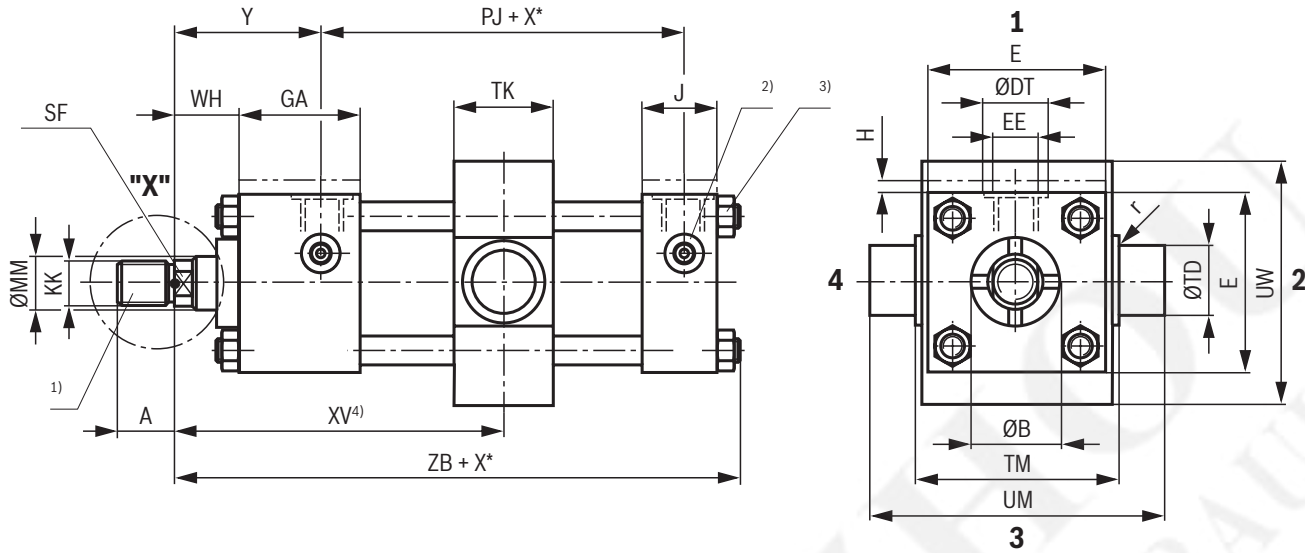
5) Thread for piston rod ends "F" and "H"

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

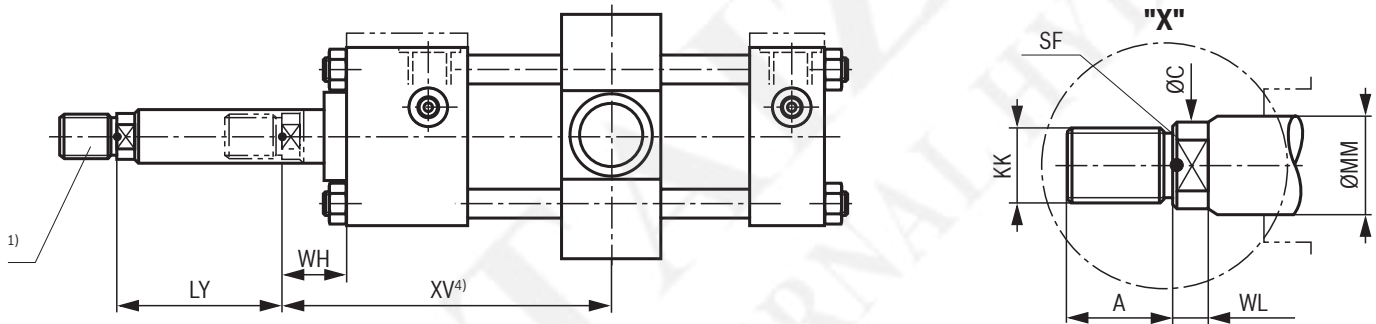
7) On request

8) "H" dimension always in line connection position

Dimensions: Trunnion mounting in center "MT4"
(dimensions in mm)



Dimensions for cylinder with piston rod extension dimension "LY" in retracted condition.



1 ... 4 = Position of the line connections

Notice:

We recommend lubricating the trunnion mounting on a regular basis.

ØAL	r	ØTD f8	TK max	TM h14	UM h15	UW max	X* min	XV min ±2	XV max ±2	ZB max	ZK ±1	ZM ±2
25	1	12	20	48	68	43	1	74	80 + stroke	121	138	154
32	1	16	25	55	79	53	1	88	89 + stroke	137	151	177
40	1.6	20	30	76	108	74	1	95	104 + stroke	166	172	196
50	1.6	25	40	89	129	81	1	105	105 + stroke	176	183	207
63	2	32	50	100	150	97	10	117	107 + stroke	185	190	223
80	2.5	40	60	127	191	124	12	130	118 + stroke	212	216	246
100	2.5	50	70	140	220	137	18	142	124 + stroke	225	230	265
125	3.2	63	90	178	278	175	25	157	132 + stroke	260	254	289
160	3.5	80	110	215	341	212	40	171	131 + stroke	279	270	302
200	4.5	100	130	279	439	276	48	202	154 + stroke	336	329	361

Dimensions: Trunnion mounting in center "MT4"
(dimensions in mm)

ØAL	ØMM	DIN / ISO ⁵⁾ (for operating pressure up to 160 bar)					ISO ⁶⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	KK ⁶⁾	A ⁶⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁷⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁷⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁷⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁷⁾	112	136	120	15	163

ØAL	E	Line connection "B"		Line connection "R"		GA	H ^{8); 9)}	J	PJ ±1.25	WH ±2	Y ±2
		EE	ØDT _{min}	EE	ØDT _{min}						
25	40 ±1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50
32	45 ±1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60
40	63 ±1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62
50	75 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	25	67
63	90 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71
80	115 ±1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77
100	130 ±2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82
125	165 ±2	G1	46.1	M33 x 2	43	76	-	54	117	35	86
160	205 ±2	G1	46.1	M33 x 2	43	83	-	58	130	32	86
200	245 ±2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Tightening torque see page 55

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

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

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

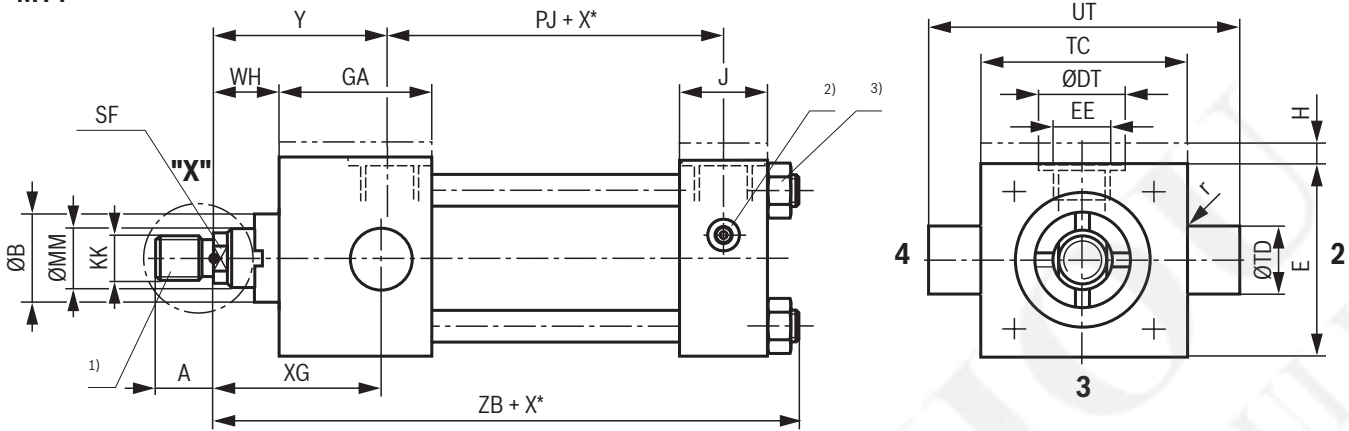
7) On request

8) "H" dimension always in line connection position

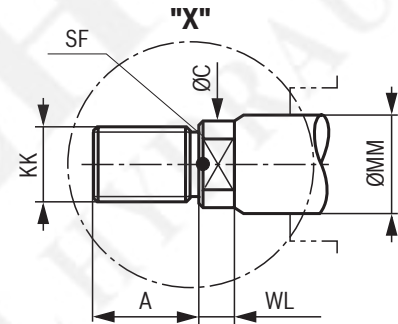
9) Piston Ø 25 and 32 mm: "H" dimension with line connection

Dimensions: Trunnion mounting at head "MT1"
trunnion mounting at base "MT2" (dimensions in mm)

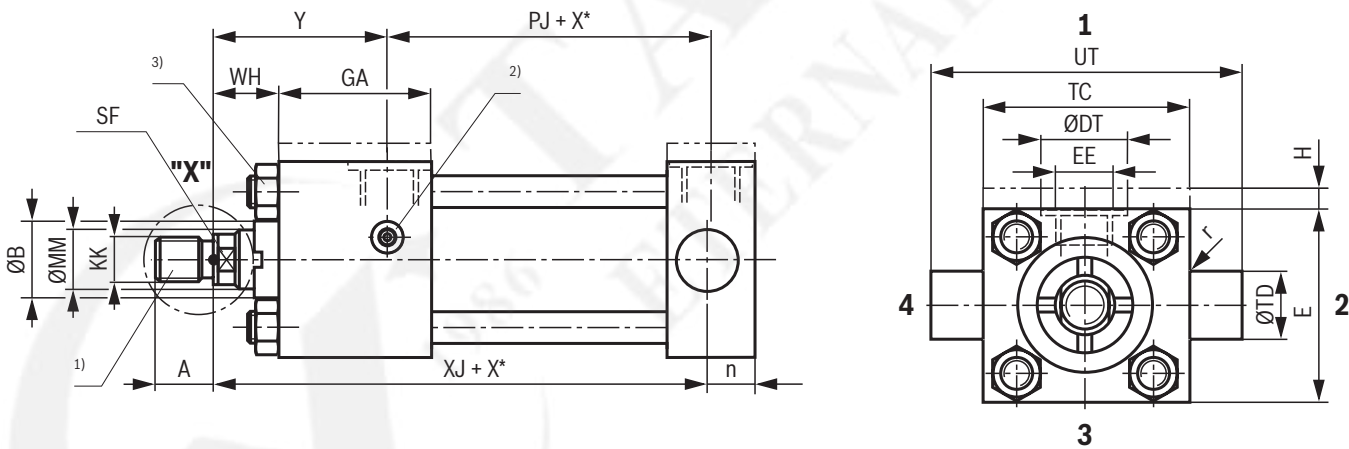
"MT1"



Notice:
We recommend lubricating the trunnion mounting on a regular basis.



"MT2"



1 ... 4 = Position of the line connections

ØAL	n	r	TC h14	ØTD f8	UT h15	XG ±2	XJ ±1.25	ZB max	ZK ±1	ZM ±2
25	13	1	38	12	58	44	101	121	138	154
32	13	1	44	16	68	54	115	137	151	177
40	19	1.6	63	20	95	57	134	166	172	196
50	19	1.6	76	25	116	64	140	176	183	207
63	19	2	89	32	139	70	149	185	190	223
80	23	2.5	114	40	178	76	168	212	216	246
100	28	2.5	127	50	207	71	187	225	230	265
125	35	3.2	165	63	265	75	209	260	254	289
160	43	3.2	203	80	329	75	230	279	270	302
200	54.5	4.5	241	100	401	85	276	336	329	361

Dimensions: Trunnion mounting at head "MT1"
trunnion mounting at base "MT2" (dimensions in mm)

ØAL	ØMM	DIN / ISO ⁴⁾ (for operating pressure up to 160 bar)					ISO ⁵⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁴⁾	A ⁴⁾ max	ØC	SF	WL	KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁶⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁶⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁶⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁶⁾	112	136	120	15	163

ØAL	E	Line connection "B"		Line connection "R"		GA	H ⁷⁾	J	PJ ±1.25	WH ±2	Y ±2
		EE	ØDT _{min}	EE	ØDT _{min}						
25	40 ±1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50
32	45 ±1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60
40	63 ±1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62
50	75 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	25	67
63	90 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71
80	115 ±1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77
100	130 ±2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82
125	165 ±2	G1	46.1	M33 x 2	43	76	-	54	117	35	86
160	205 ±2	G1	46.1	M33 x 2	43	83	-	58	130	32	86
200	245 ±2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Tightening torque see page 55

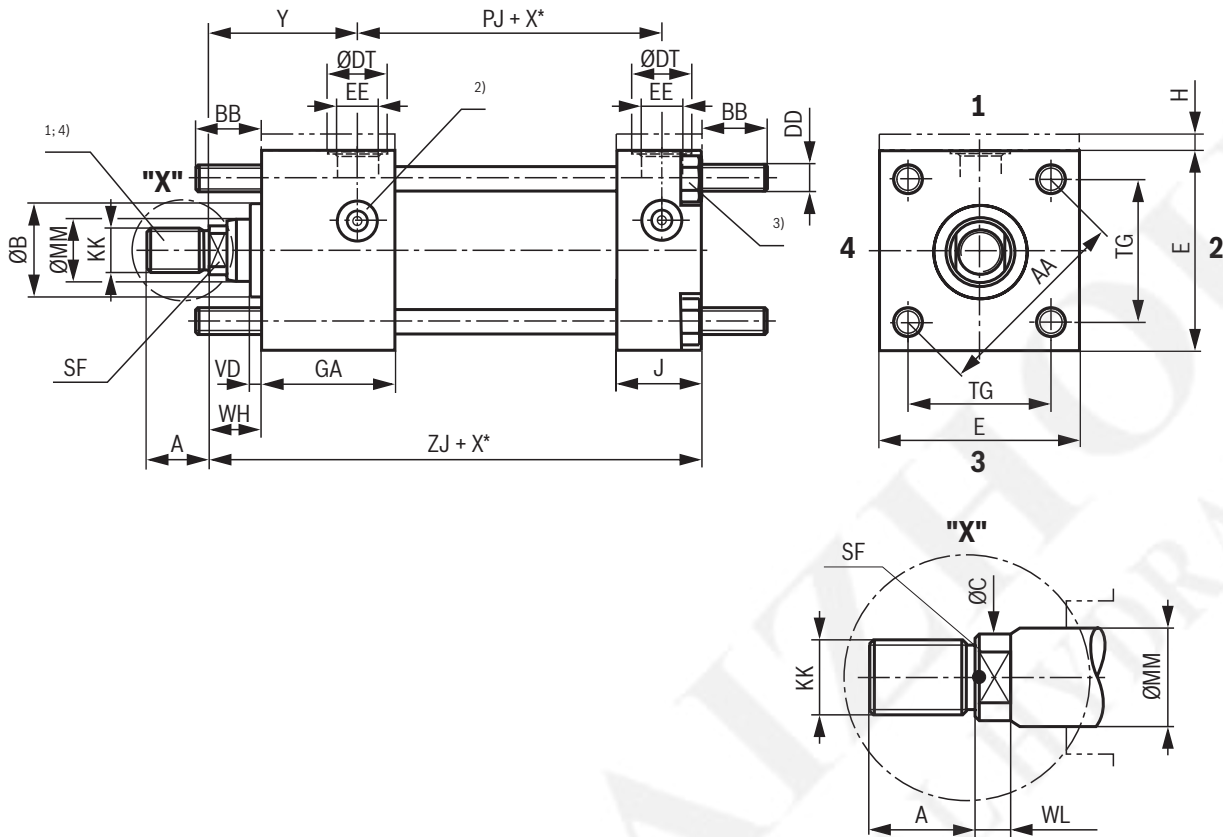
4) Thread for piston rod ends "F" and "H"

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

6) On request

7) "H" dimension always in line connection position

Dimensions: Extended tie rod, on both sides "MX1"
(dimensions in mm)



1 ... 4 = Position of the line connections

ØAL	AA	BB ⁴⁾ +3	TG js13	VD	ZJ ±1.25	ZK ±1	ZM ±2
25	40	19	28.3	6	114	138	154
32	47	24	33.2	12	128	151	177
40	59	35	41.7	12	153	172	196
50	74	46	52.3	9	159	183	207
63	91	46	64.3	13	168	190	223
80	117	59	82.7	9	190	216	246
100	137	59	96.9	10	203	230	265
125	178	81	125.9	10	232	254	289
160	219	92	154.9	7	245	270	302
200	269	115	190.2	7	299	329	361

Dimensions: Extended tie rod, on both sides "MX1"
(dimensions in mm)

ØAL	ØMM	DIN / ISO ⁵⁾ (for operating pressure up to 160 bar)					ISO ⁶⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	KK ⁶⁾	A ⁶⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁷⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁷⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁷⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁷⁾	112	136	120	15	163

ØAL	DD	E	Line connection "B"		Line connection "R"		GA	H ⁸⁾	J	PJ ±1.25	WH ±2	Y ±2
			EE	ØDT _{min}	EE	ØDT _{min}						
25	M5 x 0.8	40 ± 1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50
32	M6 x 1	45 ± 1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60
40	M8 x 1	63 ± 1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62
50	M12 x 1.25	75 ± 1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	25	67
63	M12 x 1.25	90 ± 1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71
80	M16 x 1.5	115 ± 1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77
100	M16 x 1.5	130 ± 2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82
125	M22 x 1.5	165 ± 2	G1	46.1	M33 x 2	43	76	-	54	117	35	86
160	M27 x 2	205 ± 2	G1	46.1	M33 x 2	43	83	-	58	130	32	86
200	M30 x 2	245 ± 2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Tightening torque see page 55

4) Observe the "BB" dimension for the swivel head assembly

5) Thread for piston rod end "H"

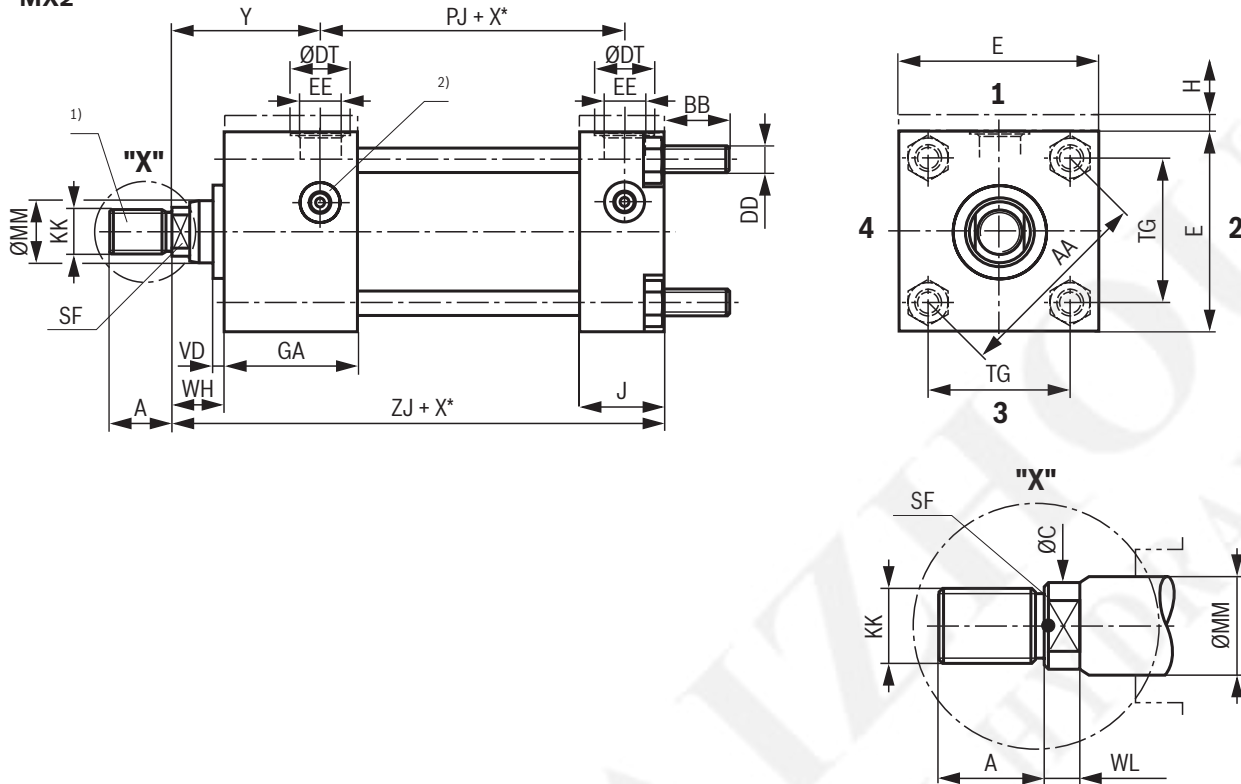
6) Thread for piston rod end "D"

7) On request

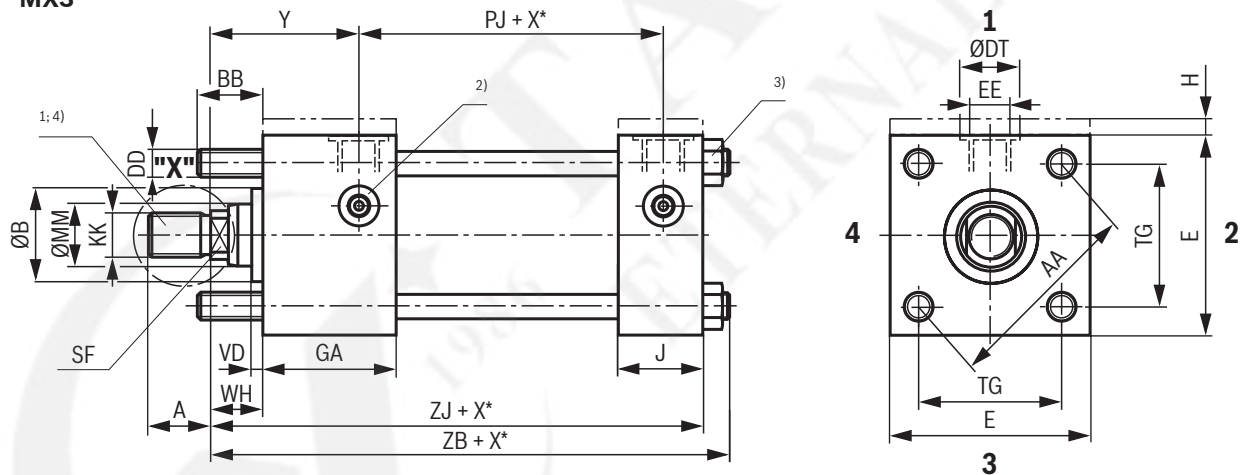
8) "H" dimension always in line connection position

Dimensions: Extended tie rod at base "MX2"
Extended tie rod at head "MX3" (dimensions in mm)

"MX2"



"MX3"



1 ... 4 = Position of the line connections

ØAL	AA	BB ⁴⁾ +3	TG js13	VD	ZB max	ZJ ±1	ZK ±1	ZM ±2
25	40	19	28.3	6	121	114	138	154
32	47	24	33.2	12	137	128	151	177
40	59	35	41.7	12	166	153	172	196
50	74	46	52.3	9	176	159	183	207
63	91	46	64.3	13	185	168	190	223
80	117	59	82.7	9	212	190	216	246
100	137	59	96.9	10	225	203	230	265
125	178	81	125.9	10	260	232	254	289
160	219	92	154.9	7	279	245	270	302
200	269	115	190.2	7	336	299	329	361

Dimensions: Extended tie rod at base "MX2"
Extended tie rod at head "MX3" (dimensions in mm)

ØAL	ØMM	DIN / ISO ⁵⁾ (for operating pressure up to 160 bar)					ISO ⁶⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	KK ⁶⁾	A ⁶⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁷⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁷⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁷⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁷⁾	112	136	120	15	163

ØAL	DD	E	Line connection "B"		Line connection "R"		GA	H ⁸⁾	J	PJ ±1.25	WH ±2	Y ±2
			EE	ØDT _{min}	EE	ØDT _{min}						
25	M5 x 0.8	40 ± 1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50
32	M6 x 1	45 ± 1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60
40	M8 x 1	63 ± 1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62
50	M12 x 1.25	75 ± 1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	25	67
63	M12 x 1.25	90 ± 1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71
80	M16 x 1.5	115 ± 1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77
100	M16 x 1.5	130 ± 2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82
125	M22 x 1.5	165 ± 2	G1	46.1	M33 x 2	43	76	-	54	117	35	86
160	M27 x 2	205 ± 2	G1	46.1	M33 x 2	43	83	-	58	130	32	86
200	M30 x 2	245 ± 2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Tightening torque see page 55

4) Observe the "BB" dimension for the swivel head assembly

5) "MX2": Thread for piston rod ends "F" and "H"

"MX3": Thread for piston rod end "H"

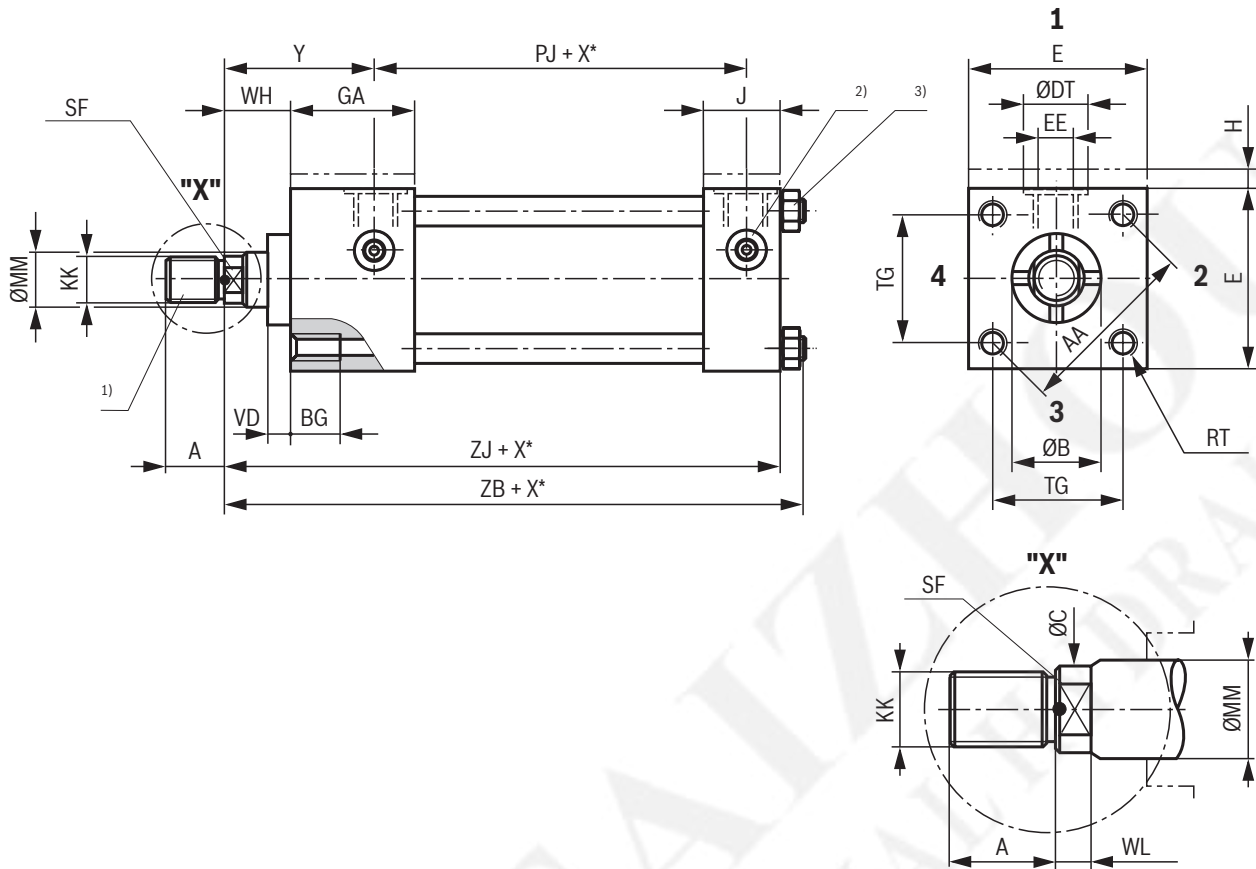
6) "MX2": Thread for piston rod ends "D" and "K"

"MX3": Thread for piston rod end "D"

7) On request

8) "H" dimension always in line connection position

Dimensions: tapped hole at head "MX5"
(dimensions in mm)



1 ... 4 = Position of the line connections

ØAL	AA	BG min	RT 6H	TG js13	VD	ZB max	ZJ ±1.25	ZK ±1	ZM ±2
25	40	8	M5 x 0.8	28.3	6	121	114	138	154
32	47	9	M6 x 1	33.2	12	137	128	151	177
40	59	12	M8 x 1.25	41.7	12	166	153	172	196
50	74	18	M12 x 1.75	52.3	9	176	159	183	207
63	91	18	M12 x 1.75	64.3	13	185	168	190	223
80	117	24	M16 x 2	82.7	9	212	190	216	246
100	137	24	M16 x 2	96.9	10	225	203	230	265
125	178	27	M22 x 2.5	125.9	10	260	232	254	289
160	219	32	M27 x 3	154.9	7	279	245	270	302
200	269	40	M30 x 3.5	190.2	7	336	299	329	361

Dimensions: tapped hole at head "MX5"
(dimensions in mm)

ØAL	ØMM	DIN / ISO ⁴⁾ (for operating pressure up to 160 bar)					ISO ⁵⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁴⁾	A ⁴⁾ max	ØC	SF	WL	KK ⁵⁾	A ⁵⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁶⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁶⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁶⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁶⁾	112	136	120	15	163

ØAL	E	Line connection "B"		Line connection "R"		GA	H ⁷⁾	J	PJ ±1.25	WH ±2	Y ±2
		EE	ØDT _{min}	EE	ØDT _{min}						
25	40 ±1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50
32	45 ±1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60
40	63 ±1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62
50	75 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	25	67
63	90 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71
80	115 ±1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77
100	130 ±2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82
125	165 ±2	G1	46.1	M33 x 2	43	76	-	54	117	35	86
160	205 ±2	G1	46.1	M33 x 2	43	83	-	58	130	32	86
200	245 ±2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Tightening torque see page 55

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

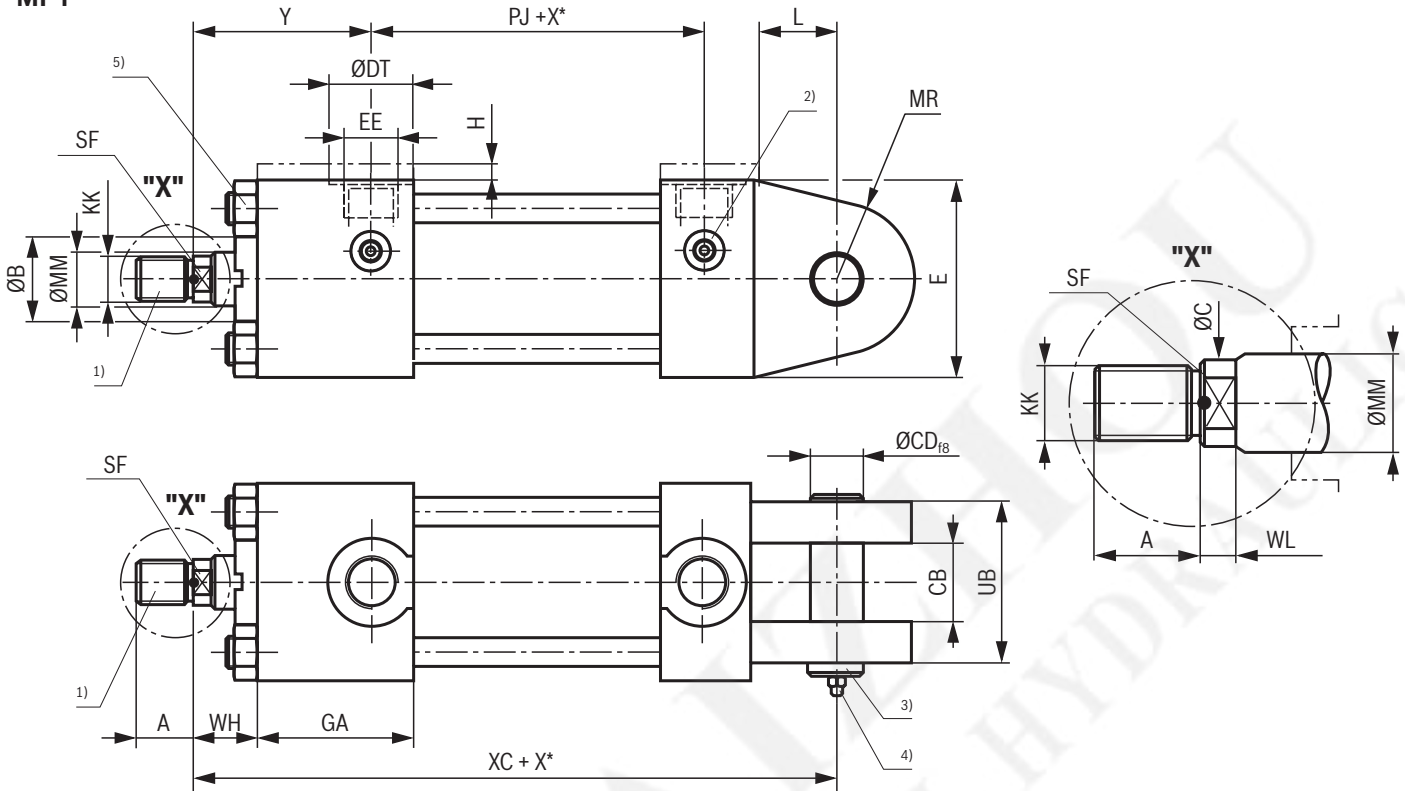
5) Thread for piston rod ends "D" and "K"

6) On request

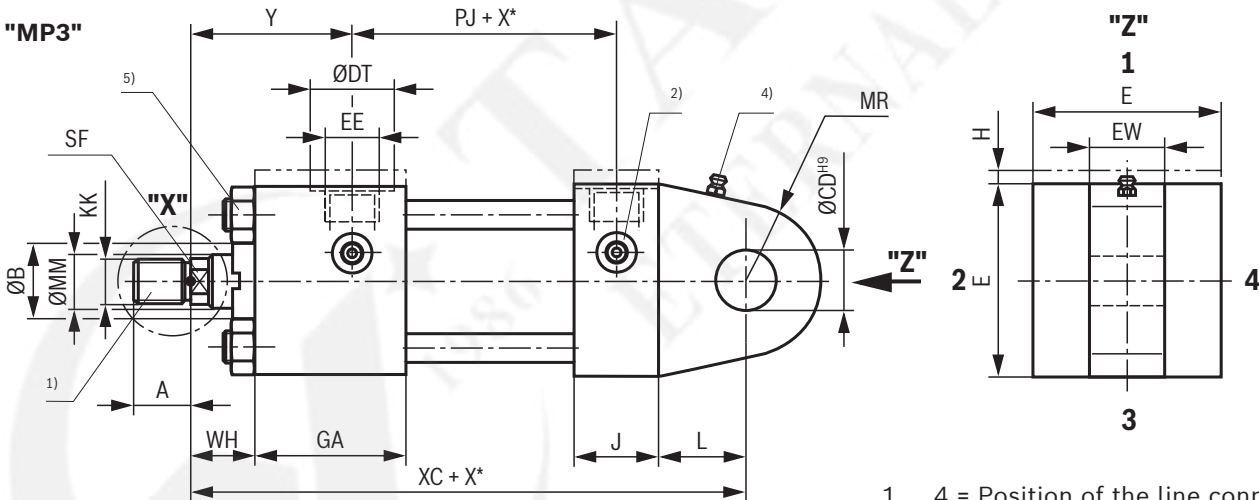
7) "H" dimension always in line connection position

Dimensions: Clevis at base "MP1"
Swivel eye at base "MP3" (dimensions in mm)

"MP1"



"MP3"



1 ... 4 = Position of the line connections

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

Dimensions: Clevis at base "MP1"
Swivel eye at base "MP3" (dimensions in mm)

ØAL	ØMM	DIN / ISO ⁶⁾ (for operating pressure up to 160 bar)					ISO ⁷⁾ (for operating pressure up to 210 bar)					ØB f9
		KK ⁶⁾	A ⁶⁾ max	ØC	SF	WL	KK ⁷⁾	A ⁷⁾ max	ØC	SF	WL	
25	12	M10 x 1.25	14	11	10	5	-	-	-	-	-	24
	18	M10 x 1.25	14	16.5	14	5	M14 x 1.5	18	16.5	14	5	30
32	14	M12 x 1.25	16	13	12	5	-	-	-	-	-	26
	22	M12 x 1.25	16	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
40	18	M14 x 1.5	18	16.5	14	5	-	-	-	-	-	30
	22	M14 x 1.5	18	20.5	18	5	M16 x 1.5	22	20.5	18	5	34
	28	M14 x 1.5	18	26	22	7	M20 x 1.5	28	26	22	7	42
50	22	M16 x 1.5	22	20.5	18	5	-	-	-	-	-	34
	28	M16 x 1.5	22	26	22	7	M20 x 1.5	28	26	22	7	42
	36	M16 x 1.5	22	34	30	8	M27 x 2	36	34	30	8	50
63	28	M20 x 1.5	28	26	22	7	-	-	-	-	-	42
	36	M20 x 1.5	28	34	30	8	M27 x 2	36	34	30	8	50
	45	M20 x 1.5	28	43	36	10	M33 x 2	45	43	36	10	60
80	36	M27 x 2	36	34	30	8	-	-	-	-	-	50
	45	M27 x 2	36	43	36	10	M33 x 2	45	43	36	10	60
	56	M27 x 2	36	54	46	10	M42 x 2	56	54	46	10	72
100	45	M33 x 2	45	43	36	10	-	-	-	-	-	60
	56	M33 x 2	45	54	46	10	M42 x 2	56	54	46	10	72
	70	M33 x 2	45	68	60	15	M48 x 2	63	68	60	15	88
125	56	M42 x 2	56	54	46	10	-	-	-	-	-	72
	70	M42 x 2	56	68	60	15	M48 x 2 ⁸⁾	63	68	60	15	88
	90	M42 x 2	56	88	75	15	M64 x 3 ⁸⁾	85	88	75	15	108
160	70	M48 x 2	63	68	60	15	-	-	-	-	-	88
	90	M48 x 2	63	88	75	15	M64 x 3	85	88	75	15	108
	110	M48 x 2	63	106	95	15	M80 x 3 ⁸⁾	95	106	95	15	133
200	90	M64 x 3	85	88	75	15	-	-	-	-	-	108
	110	M64 x 3	85	106	95	15	M80 x 3	95	106	95	15	133
	140	M64 x 3	85	136	120	15	M100 x 3 ⁸⁾	112	136	120	15	163

ØAL	E	Line connection "B"		Line connection "R"		GA	H ⁹⁾	J	PJ ±1.25	WH ±2	Y ±2
		EE	ØDT _{min}	EE	ØDT _{min}						
25	40 ±1.5	G1/4	20.7	M14 x 1.5	21	46.5	5	22.5	53	15	50
32	45 ±1.5	G1/4	20.7	M14 x 1.5	21	48	5	25	56	25	60
40	63 ±1.5	G3/8	24.5	M18 x 1.5	26	52.5	-	33.5	73	25	62
50	75 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	33.5	74	25	67
63	90 ±1.5	G1/2	29.6	M22 x 1.5	29	57.5	-	35.5	80	32	71
80	115 ±1.5	G3/4	36.9	M27 x 2	34	67	-	41	93	31	77
100	130 ±2	G3/4	36.9	M27 x 2	34	70	-	43	101	35	82
125	165 ±2	G1	46.1	M33 x 2	43	76	-	54	117	35	86
160	205 ±2	G1	46.1	M33 x 2	43	83	-	58	130	32	86
200	245 ±2	G1 1/4	54	M42 x 2	52	107.5	-	77.5	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Piston rod ends "E" and "T" see page 33

2) Position of the line connections and the bleeding see page 31

3) Bolt included in the scope of delivery

4) Grease nipple M6 DIN 71412 from piston Ø 40 mm

5) Tightening torque see page 55

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

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

8) On request

9) "H" dimension always in line connection position

Leakage oil connection (dimensions in mm)

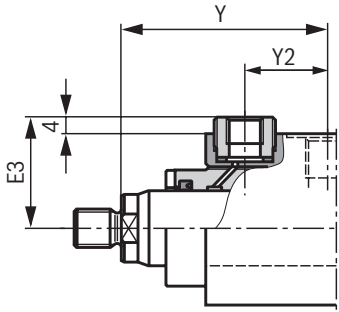
If technical high-quality seals are used, use of a leakage oil connection is generally not necessary. A drag oil collection connection is only recommended in special cases such as extension velocity more than 2 times

retraction velocity with larger strokes, permanent pressurization and the like. In case the extension velocities are more than 5 times the retraction velocity, please contact us.

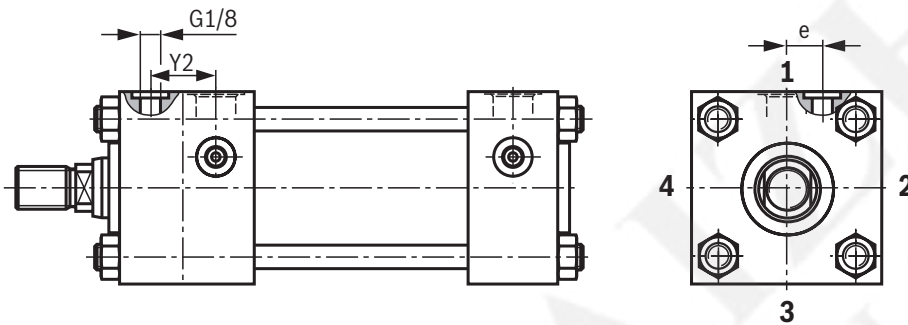
ØAL	ØMM	"ME6", "MP1", "MP3", "MP5", "MT4", "MS2", "MT2", "MX1", "MX2", "MX3", "MX5"			"ME5"	
		e	Y2	E3	e	Y2
25	12	0	24.5	29	17	15
	18	0	24.5	29	17	15
32	14	0	24.5	31.5	18	15
	22	0	24.5	31.5	18	15
40	18	0	26	35.5	22	15
	22	0	26	35.5	22	15
	28	0	26	35.5	22	15
50	22	14.5	28	-	34	15
	28	14.5	28	-	34	15
	36	14.5	28	-	34	15
63	28	16	25.5	-	43	12
	36	16	25.5	-	43	12
	45	16	25.5	-	43	12
80	36	16	29	-	27	15
	45	16	29	-	27	15
	56	16	29	-	27	15
100	45	16	30	-	30	14
	56	16	27	-	30	14
	70	16	27	-	30	14
125	56	18	30.5	-	32	16
	70	18	30.5	-	39	16
	90	18	30.5	-	39	16
160	70	24	31.5	-	30	13
	90	24	31.5	-	40	13
	110	24	31.5	-	40	13
200	90	24	38.5	-	45	26
	110	24	38.5	-	60	26
	140	24	38.5	-	60	26

Leakage oil connection (dimensions in mm)

Ø 25, 32, 40 (except for "ME5")



Ø 50 ... 200, "ME5": Ø 25 ... Ø 200

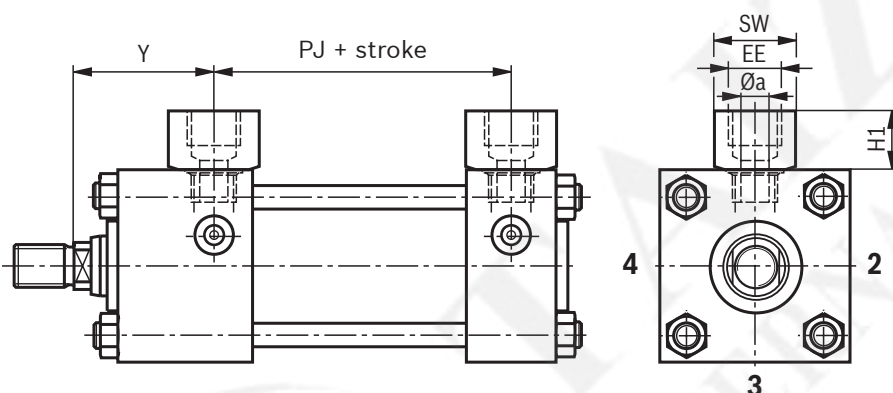


Enlarged line connection (dimensions in mm)

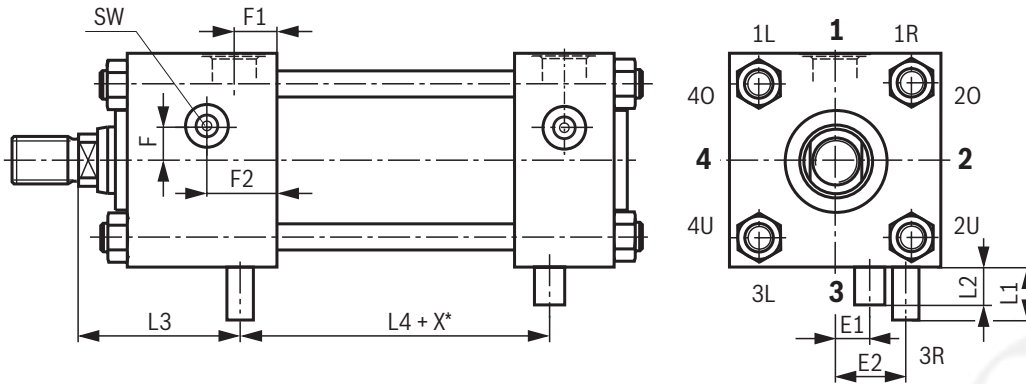
The line connections of this series are generously dimensioned according to the standard; with high velocity, the pressure drop Δp can be reduced by using larger oil ports; sometimes, it is, however, no longer possible to

comply with the standard dimensions, see table. Cannot be realized for the types of mounting "ME5" and "ME6" with connection position 2 or 4.

$\varnothing AL$	EE	H1	Y ± 2	PJ ± 1.25	SW	$\varnothing a$	Tightening torque M_A Nm ($\pm 5\%$)
25	G3/8	20	50	53	27	9	20
32	G3/8	20	60	56	27	9	20
40	G1/2	23	62	73	32	11	26
50	G3/4	29	67	74	41	14	48
63	G3/4	29	71	80	41	14	48
80	G1	33	77	93	46	18	74
100	G1	33	82	101	46	18	74
125	G1 1/4	39	86	117	60	23	127
160	G1 1/4	-	86	130	-	-	-
200	G1 1/2	-	98	165	-	-	-



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



Type of mounting	Line connection	Bleeding		Leakage oil	Throttle valve	
		Head	Base	Head	Head	Base
"MP5", "MT4", "MP1", "MP3", "MX1", "MX2", "MX3", "MX5"	1	2	2	1	3R	3R
	2	3	3	2	4U	4U
	3	4	4	3	1L	1L
	4	1	1	4	2O	2O
"ME5"	1	2	2	1R	3R	3R
	2	3R	3	1R	1L	4U
	3	4	4	3L	1L	1L
	4	1L	1	3L	3R	2O
"MS2"	1	2O	2O	1	4O	4O
"MT1"	1	3L	2	-	3R	3R
	3	1R	4	-	1L	1L
"MT2"	1	2	3L	1	3R	3R
	3	4	1R	3	1L	1L
"ME6"	1	2	2	1	3R	3R
	2	3	3	2	4U	1L
	3	4	4	3	1L	1L
	4	1	1	4	2O	3R

ØAL in mm	F Head/base ¹⁾				F1 Position Line connection		F2 Position Bleeding		SW Allen wrench	Throttle valve adjustable on both sides				Dimension		M _A Nm
	(head) 2/4		(base)		1) 1/3 2/4		1) 1/3 2/4			L1 (head)	L2 (base)	E1 (head)	E2 (base)	L3	L4	
	"ME5"	"MT1"	"MS2"	"ME5"	"ME5"											
25	0	0	6	5	11.5	23	23	11.5	5 ³⁾	12	12	6	6	48	57	5
32	0	0	5	5	13	25.5	25.5	13	5 ³⁾	12	12	9	9	57.5	61	5
40	10	10	10	10	15.5	19.5	15.5	15.5	5	5.5	5.5	8	8	61.5	74	5
50	10	10	10	10	15.5	29.5	15.5	15.5	5	3	3	10	10	67	74	5
63	14	14	14	14	18.5	20	18.5	18.5	5	0	0	15	15	72	78	5
80	10	10	10	10	21	21	21	21	6	0	0	14	14	81	85	15
100	24	24	12	12	23	23	23	23	6	0	0	13	13	86	93	15
125	0	0	12	0	25	25	25	25	6	-	-	22	22	91.5	109	24
160	0	0	0	0	29	29	29	29	6	-	-	30	30	93.5	115	24
200	0	0	0	0	41.5	41.5	31.5	31.5	6	-	-	30	30	114	128	24

X* = stroke length

M_A = tightening torque

1) Position of line connection

2) Types of mounting "ME5" (only base), "ME6", "MP5", "MT4", "MP1", "MP3", "MT2", "MX1", "MX2", "MX3" and "MX5"

3) Protrusion 3 mm

Bleeding / measuring coupling (dimensions in mm)

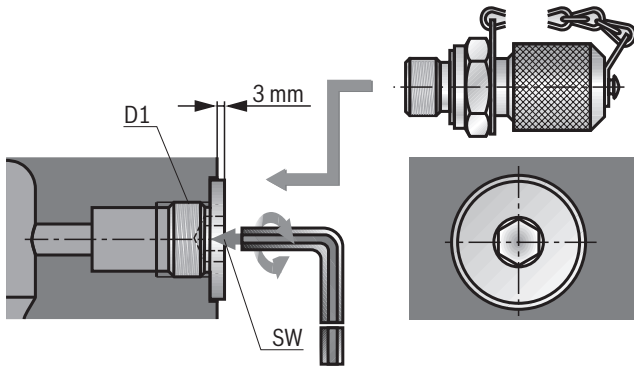
By default, a patented safety vent against unintended screwing out in head and base is delivered for piston $\varnothing \geq 40$ mm.

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

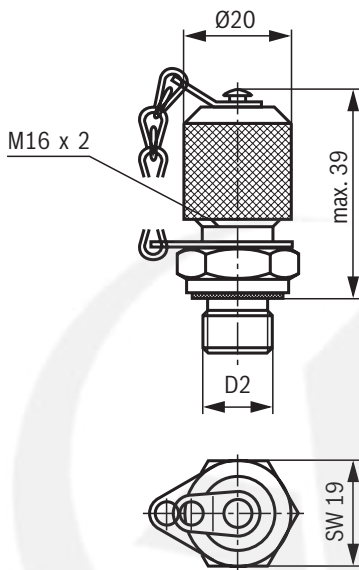
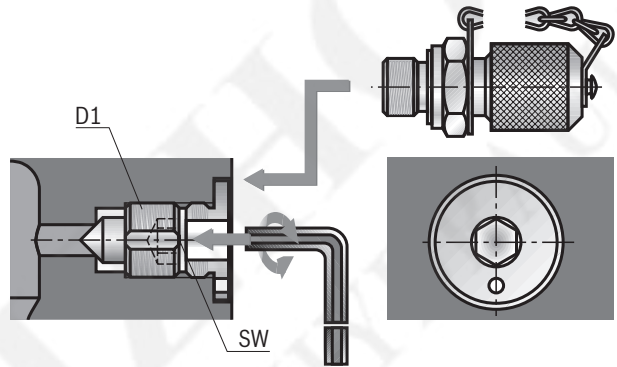
The port allows for the installation of a measuring coupling with check valve for pressure measurement or contamination-free bleeding. Measuring coupling with check valve function, i.e. it can also be connected when the system is pressurized.

Connection possibility for measuring coupling

Piston \varnothing (AL) 25 and 32 mm



Piston \varnothing (AL) 40 ... 200 mm



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

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

Material no. **R900014363**

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

Material no. **R900024710**

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

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

Material no. **R900009090**

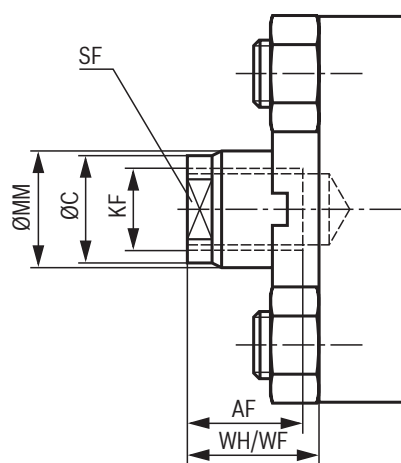
MESSKUPPLUNG AB 20-11/K1V G1/4 with seal ring made of FKM

Material no. **R900001264**

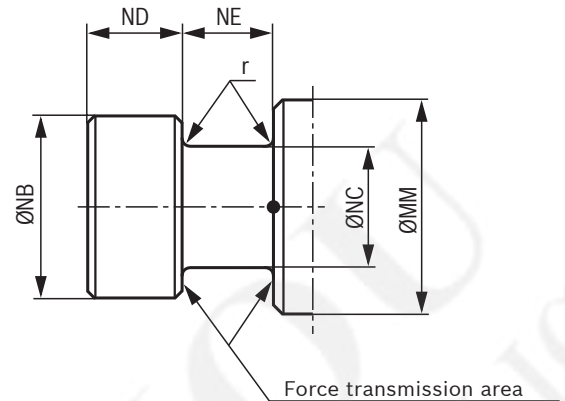
\varnothing AL	Bleed screw			Measuring coupling D2	Tightening torque M_A Nm
	D1	Fuse	SW		
25 and 32	G1/8	not secured	5	G1/8	18
40 ... 63	G1/8	secured	5	G1/8	18
80 ... 200	G1/4	secured	6	G1/4	40

Piston rod ends "E" and "T" (dimensions in mm)

Internal thread "E"



Trunnion "T"

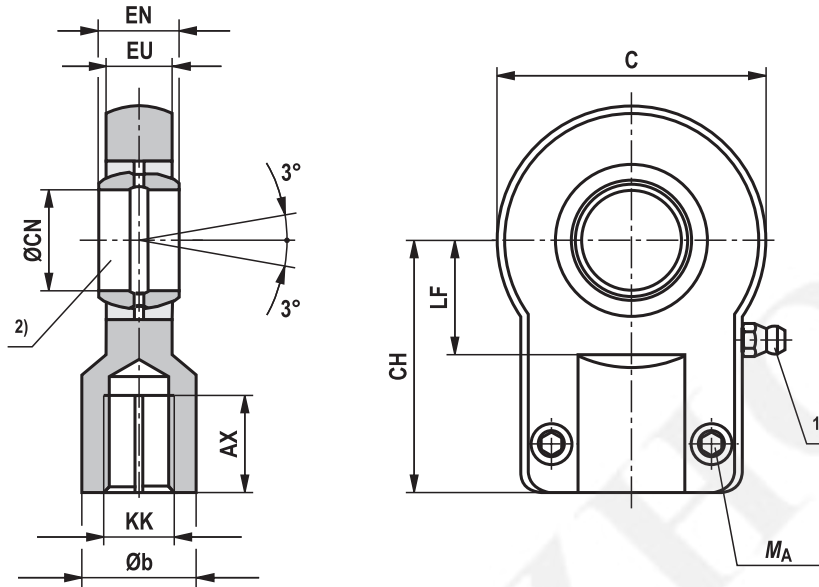


ØAL	ØMM	KF	AF	ØC	SF	ØNB h13	ØNC h13	ND / NE h13 / H11	r	$p_{max.}^{1)}$ bar
25	18	M12 x 1.25	18	17	14	-	-	-	-	-
32	22	M16 x 1.5	22	21	18	18	11.2	8	0.5	160
40	18	M12 x 1.25	18	17	14	-	-	-	-	-
	28	M20 x 1.5	28	25	22	22.4	14	10	0.5	160
50	22	M16 x 1.5	22	21	18	18	11.2	8	0.5	105
	36	M27 x 2	36	34	30	28	18	12.5	0.8	190
63	28	M20 x 1.5	28	25	22	22.4	14	10	0.5	95
	45	M33 x 2	45	43	36	35.5	22.4	16	0.8	160
80	36	M27 x 2	36	34	30	28	18	12.5	0.8	105
	56	M42 x 2	56	53	46	45	28	20	1.2	160
100	45	M33 x 2	45	43	36	35.5	22.4	16	0.8	90
	70	M48 x 2	63	67	60	56	35.5	25	1.2	160
125	56	M42 x 2	56	53	46	45	28	20	1.2	100
	90	M64 x 3	85	86	75	78	45	30	1.5	160
160	70	M48 x 2	63	67	60	56	35.5	25	1.5	90
	110	M80 x 3	95	106	95	106	65	35	1.5	160
200	90	M64 x 3	85	88	75	78	45	30	1.5	90
	140	M100 x 3	112	136	120	136	70	45	1.5	160

¹⁾ with pulling load

Swivel head CGKA - AP 6 (clampable) (dimensions in mm)

ISO 8133 / ISO 8132



Type	Material no.	KK 6H	AX min	Øb	C max	CH js13	ØCN	EN	EU max	LF min	MA ⁷⁾ Nm	m ⁸⁾ kg	C ₀ ⁹⁾ (head) kN	F _{adm} ¹⁰⁾ kN
CGKA 12 ³⁾	R900327186	M10x1.25	15	17	40	42	12 _{-0.008}	10 _{-0.05}	8	16	9.5	0.15	17	6.3
CGKA 16 ⁴⁾	R900327192	M12x1.25	17	21	45	48	16 _{-0.008}	14 _{-0.05}	11	20	9.5	0.25	28.5	10.5
CGKA 20 ⁴⁾	R900306874	M14x1.5	19	25	55	58	20 _{-0.010}	16 _{-0.05}	13	25	23	0.43	42.5	15.7
CGKA 25	R900327191	M16x1.5	23	30	65	68	25 _{-0.010}	20 _{-0.05}	17	30	23	0.73	67	24.7
CGKA 30	R900327187	M20x1.5	29	36	80	85	30 _{-0.010}	22 _{-0.05}	19	35	46	1.3	108	39.9
CGKA 40	R900327188	M27x2	37	45	100	105	40 _{-0.012}	28 _{-0.05}	23	45	46	2.3	156	57.6
CGKA 50	R900327368	M33x2	46	55	125	130	50 _{-0.012}	35 _{-0.05}	30	58	80	4.4	245	90.4
CGKA 60	R900327369	M42x2	57	68	160	150	60 _{-0.015}	44 _{-0.05}	38	68	195	8.4	380	140.2
CGKA 80	R900327370	M48x2	64	90	205	185	80 _{-0.015}	55 _{-0.15}	47	82 ⁶⁾	385	15.6	585	215.9
CGKA 100	R900327371	M64x3	86	110	240	240	100 _{-0.02}	70 _{-0.2}	57	116	660	28	865	319.2
CGKD 100 ⁵⁾	R900322030	M80x3	96	110	210	210	100 H7	100 h12	84	98	385	28	1060	391.1
CGKD 125 ⁵⁾	R900322026	M100x3	113	135	262	260	125 H7	125 h12	102	120	385	43	1430	527.7

- 1) Grease nipple, cone head form A according to DIN 71412
- 2) Related bolt Ø h6
- 3) Cannot be re-lubricated
- 4) Can be re-lubricated via lubricating hole
- 5) Swivel head according to ISO 8132, related bolt Ø m6
- 6) Dimensions may differ from the standard depending on the manufacturer
- 7) M_A = tightening torque
- 8) m = mass of swivel head in kg
- 9) C_0 = static load rating of the swivel head
- 10) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

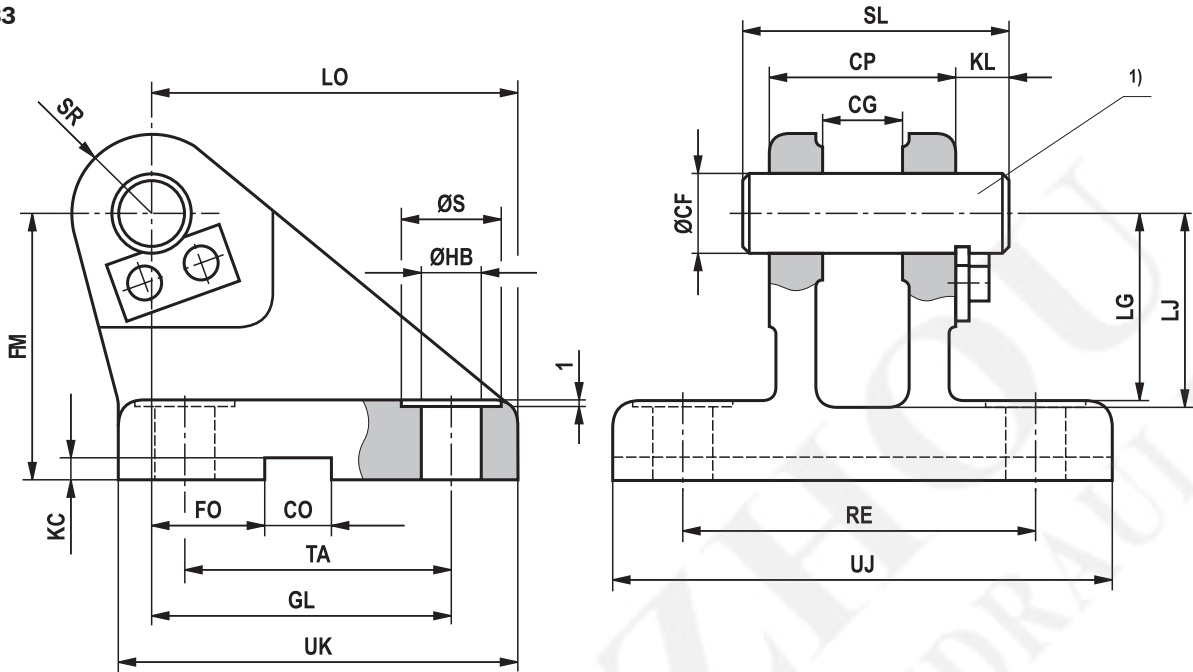
Notice:

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

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

Clevis-bearing block CLCB – AP 5 (clampable) (dimensions in mm)

ISO 8133




Type	Material no.	Nominal force kN	ØCF K7 ¹⁾	CP h14	CG + 0.1 + 0.3	CO N9	FO js14	FM js13	GL JS13	ØHB H13	ØS
CLCB 12	R900326960	8	12	30	10	10	16	40	46	9	15
CLCB 16	R900327372	12.5	16	40	14	16	18	50	61	11	18
CLCB 20	R900327373	20	20	50	16	16	20	55	64	14 ³⁾	20
CLCB 25	R900326961	32	25	60	20	25	22	65	78	16 ³⁾	24
CLCB 30	R900327374	50	30	70	22	25	24	85	97	18 ³⁾	26
CLCB 40	R900327375	80	40	80	28	36	24	100	123	22	33
CLCB 50	R900327376	125	50	100	35	36	35	125	155	30	48
CLCB 60	R900327377	200	60	120	44	50	35	150	187	39	60
CLCB 80	R900327378	320	80	160	55	50	35	190	255	45	80
CLCB 100	R900327379	500	100	200	70	63	35	210	285	48	80

Type	KC +0.3	KL	LG	LJ	LO max	RE js13	SL	SR max	TA js13	UJ max	UK max	m ²⁾ in kg
CLCB 12	3.3	8	28	29	56	55	40	12	40	75	60	0.6
CLCB 16	4.3	8	37	38	74	70	50	16	55	95	80	1.3
CLCB 20	4.3	10	39	40	80	85	62	20	58	120	90	2.1
CLCB 25	5.4	10	48	49	98	100	72	25	70	140	110	3.2
CLCB 30	5.4	13	62	63	120	115	85	30	90	160	135	6.5
CLCB 40	8.4	16	72	73	148	135	100	40	120	190	170	12.0
CLCB 50	8.4	19	90	92	190	170	122	50	145	240	215	23.0
CLCB 60	11.4	20	108	110	225	200	145	60	185	270	260	37.0
CLCB 80	11.4	26	140	142	295	240	190	80	260	320	340	79.0
CLCB 100	12.4	30	150	152	335	300	235	100	300	400	400	140.0

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

2) m = mass of clevis bracket

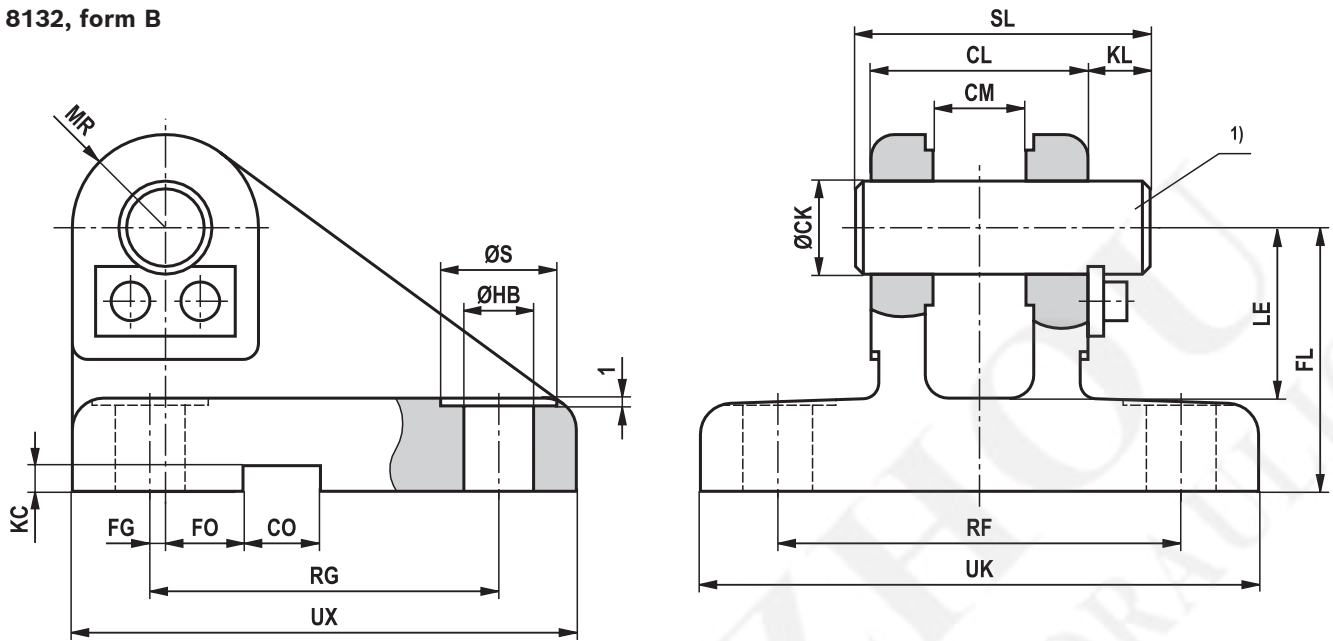
3) Dimensions may differ from the standard depending
on the manufacturer

 **Notice:**

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

Clevis bracket CLCA (clampable) (dimensions in mm)

ISO 8132, form B



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 ¹⁾	CL h16	CM A12	CO N9	FG js14	FL js12	FO js14	ØHB H13
160	110	CLCA 100	2)	500	100	210	100	63	52.5	180	0	52
200	110	CLCA 100	2)	500	100	210	100	63	52.5	180	0	52
200	140	CLCA 125	2)	800	125	270	125	80	75	230	0	52

ØAL	ØMM	Type	KC +0.3	KL	LE min.	MR max.	RF js14	RG js14	ØS	SL	UK max.	UX max.	m ³⁾ in kg
160	110	CLCA 100	12.4	30	120	100	315	250	76	246	405	345	99.2
200	110	CLCA 100	12.4	30	120	100	315	250	76	246	405	345	99.2
200	140	CLCA 125	15.4	32	170	125	365	350	76	310	455	450	174.1

ØAL = piston Ø

ØMM = Piston rod Ø

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

2) On request

3) m = mass of clevis bracket

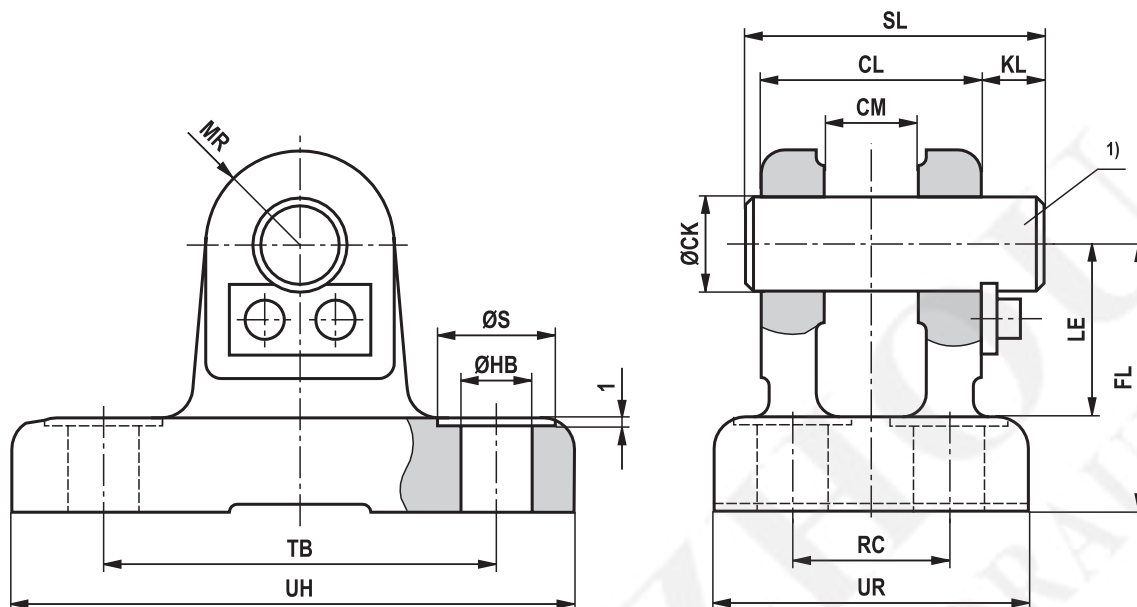
Notice:

Geometry and dimensions may differ depending on the manufacturer.

In case of combination with other mounting elements, the usability must be checked. The clevis brackets are suitable for attachment in case of type of mounting MP5 and at the swivel head.

Clevis bracket CLCD (clampable) (dimensions in mm)

ISO 8132, form A



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 ¹⁾	CL h16	CM A12	FL js12	ØHB H13
160	110	CLCD 100	2)	500	100	210	100	180	45
200	110	CLCD 100	2)	500	100	210	100	180	45
200	140	CLCD 125	2)	800	125	270	125	230	52

ØAL	ØMM	Type	KL	LE min.	MR max.	RC js14	ØS	SL	TB js14	UR max.	UH max.	m ³⁾ in kg
160	110	CLCD 100	30	120	100	160	66	246	315	260	400	74
200	110	CLCD 100	30	120	100	160	66	246	315	260	400	74
200	140	CLCD 125	32	170	125	200	76	310	385	320	470	129

ØAL = Piston Ø

ØMM = Piston rod Ø

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

2) On request

3) m = mass of clevis bracket in kg

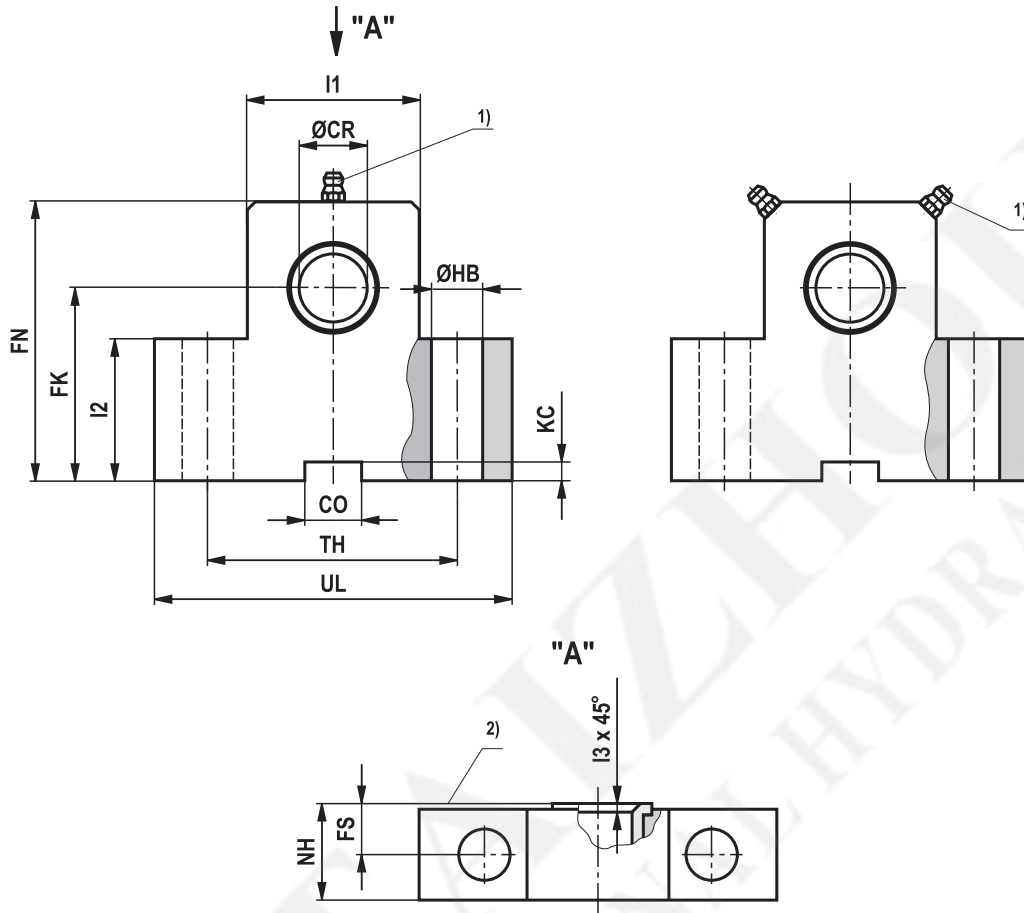
Notice:

Geometry and dimensions may differ depending on the manufacturer.

In case of combination with other mounting elements, the usability must be checked. The clevis brackets are suitable for attachment in case of type of mounting MP5 and at the swivel head.

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


CLTA 12-20



ØAL	Type	Material no.	Nominal force kN ⁴⁾	ØCR H7	CO N9	FK js12	FN max	FS JS14	ØHB H13	KC +0.3	NH max	TH JS14	UL max	l1	l2	l3	m ⁵⁾ in kg
25	CLTA 12	R901071355	8	12	10	38	55	8	9	3.3	17 ³⁾	40	63	25	25	1	0.5
32	CLTA 16	R901071364	12.5	16	16	45	65	10	11	4.3	21	50	80	30	30	1	0.9
40	CLTA 20	R901071365	20	20	16	55	80	10	11	4.3	21	60	90	40	38	1.5	1.35

ØAL = piston Ø

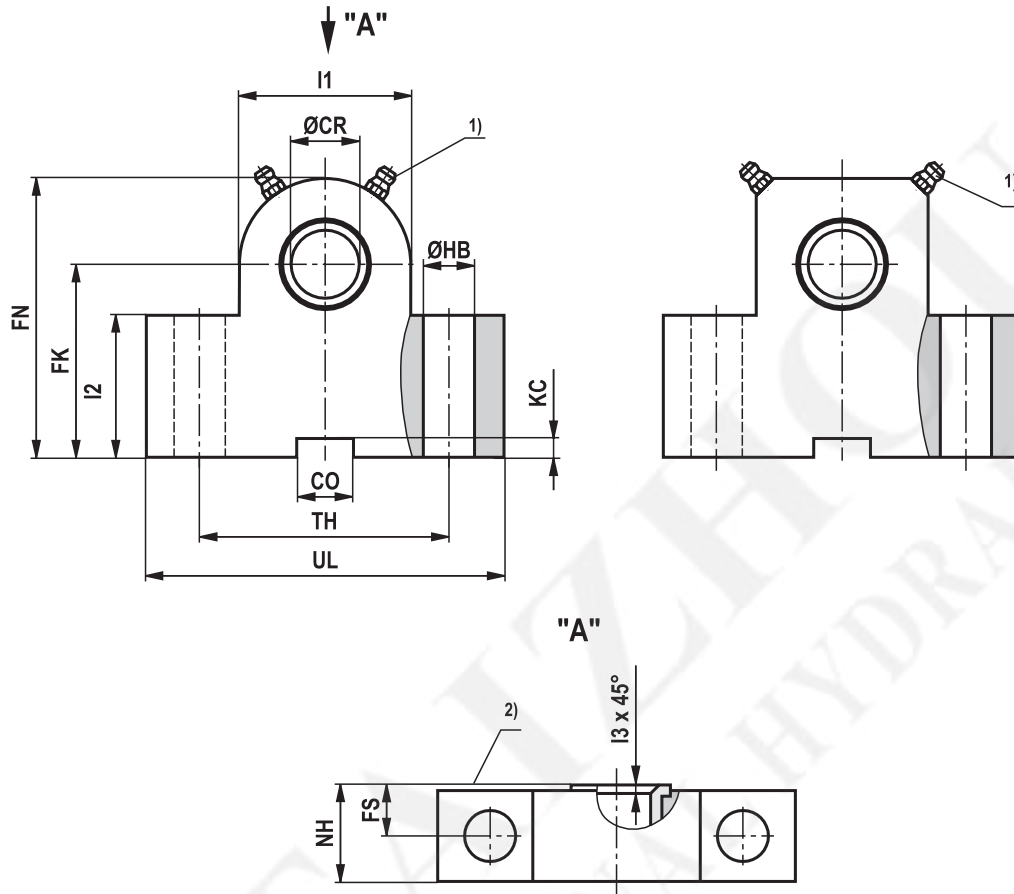
- 1) Grease nipple, cone shape A according to DIN 71412
- 2) Inside
- 3) Dimensions may differ depending on the manufacturer
- 4) Nominal force applies to applications in pairs
- 5) m = mass per pair in kg, brackets are delivered in pairs

 **Notice:**

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

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

CLTA 25-100



ØAL	Type	Material no.	Nominal force kN ⁴⁾	ØCR H7	CO N9	FK js12	FN max	FS JS14	ØHB H13	KC +0.3	NH max	TH JS14	UL max	l1	l2	l3	m ⁵⁾ in kg
50	CLTA 25	R901071368	32	25	25	65	90	12	14 ³⁾	5.4	26	80	110	56	45	1.5	2.4
63	CLTA 32	R901071377	50	32	25	75	110	15	18 ³⁾	5.4	33	110	150	70	52	2	5.0
80	CLTA 40	R901071380	80	40	36	95	140	16	22	8.4	41	125	170	88	60	2.5	8.5
100	CLTA 50	R901071385	125	50	36	105	150	20	26	8.4	51	160	210	90	72	2.5	15
125	CLTA 63	R901071395	200	63	50	125	195	25	33	11.4	61	200	265	136	87	3	30
160	CLTA 80	R901071398	320	80	50	150	230	31	39	11.4	81	250	325	160	112	3.5	59
200	CLTA 100	R901071400	500	100	63	200	300	42	52	12.4	101	320	410	200	150	4.5	131

ØAL = Piston Ø

- 1) Grease nipple, cone shape A according to DIN 71412
- 2) Inside
- 3) Dimensions may differ depending on the manufacturer
- 4) Nominal force applies to applications in pairs
- 5) m = mass per pair, brackets are delivered in pairs

Notice:

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

Buckling

For the admissible stroke length with flexibly guided load and a factor of 3.5 for safety against buckling, 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.

Buckling 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

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

E Module of elasticity in N/mm²

2.1 x 10⁵ for steel

I Geometrical moment of inertia in mm⁴ for circular cross-section

$$= \frac{d^4 \cdot \pi}{64} = 0,0491 \cdot d^4$$

ν 3.5 (safety factor)

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

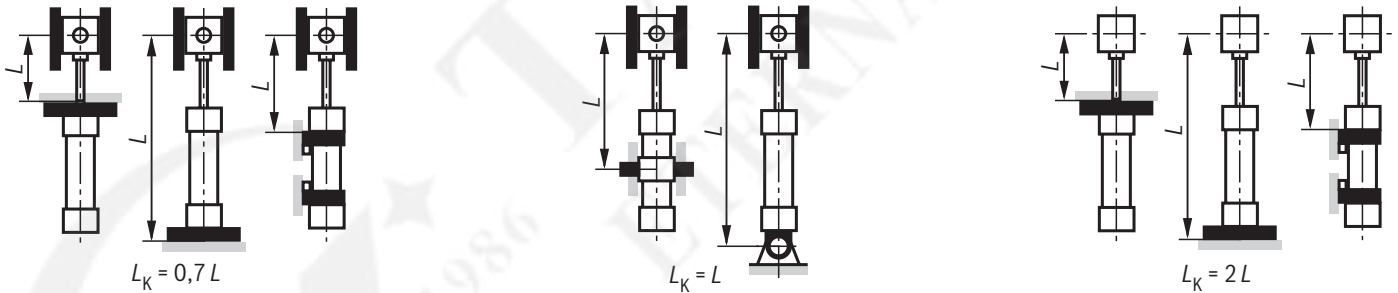
d Piston rod Ø in mm

λ Slenderness ratio

$$= \frac{4 \cdot L_K}{d} \quad \lambda_g = \pi \cdot \sqrt{\frac{E}{0,8 \cdot R_e}}$$

R_e Yield strength of the piston rod material

Influence of the type of mounting on the buckling length:



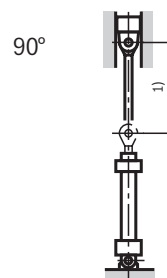
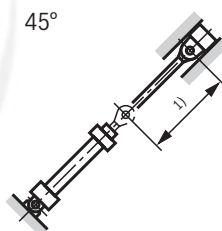
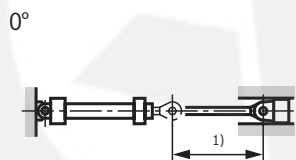
Buckling

(stroke length in mm)

Admissible stroke length for types of mounting "MP1", "MP3", "MP5"

ØAL in mm	ØMM in mm	70 bar			100 bar			160 bar			210 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°
25	12	115	120	125	85	85	90	50	50	55			
	18	315	330	375	270	275	300	205	210	220	180	180	185
32	14	115	120	125	85	85	90	50	50	55			
	22	370	385	440	315	325	350	240	245	255	210	210	215
40	18	160	165	175	120	125	130	75	75	80			
	22	310	320	350	260	265	290	195	200	205	130	130	135
	28	465	485	580	400	415	465	315	320	340	280	285	290
	22	205	210	220	155	160	165	100	100	105			
50	28	420	430	475	355	360	380	270	275	280	190	195	195
	36	620	650	790	545	565	640	435	445	475	395	400	410
63	28	280	285	305	220	225	230	150	150	155			
	36	560	580	645	480	490	520	375	380	390	280	280	285
	45	770	810	995	680	710	805	555	565	605	500	510	530
	36	380	390	415	305	310	320	210	215	220			
80	45	695	715	800	600	610	650	470	475	490	350	355	360
	56	945	995	1225	840	870	995	685	670	745	615	625	655
100	45	480	495	540	390	400	420	280	285	290			
	56	850	880	1000	740	760	820	590	600	625	445	450	460
	70	1150	1210	1550	1030	1075	1260	855	875	955	780	790	830
	56	595	615	685	490	500	535	360	365	375			
125	70	1065	1105	1290	940	965	1060	765	775	810	570	575	595
	90	1445	1535	2110	1315	1380	1690	1115	1150	1285	1035	1055	1130
160	70	730	755	850	610	625	670	455	460	475			
	90	1260	1295	1540	1105	1155	1265	910	930	975	705	780	835
	110	1715	1815	2450	1565	1640	2015	1335	1380	1540	1205	1235	1320
	90	945	985	1140	800	825	900	610	620	645			
200	110	1470	1540	1840	1310	1350	1510	1070	1090	1145	170	800	1000
	140	2120	2255	2700	1955	2060	2625	1690	1755	2010	1540	1580	1725

Installation position



1) Admissible stroke length

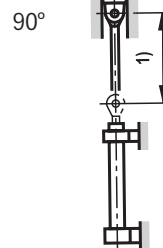
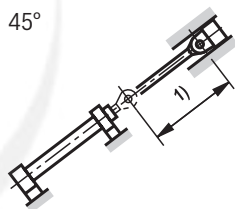
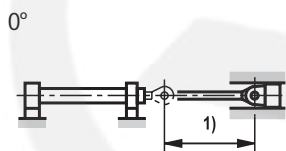
Buckling

(stroke length in mm)

Admissible stroke length for type of mounting "MS2"

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

Installation position



1) Admissible stroke length

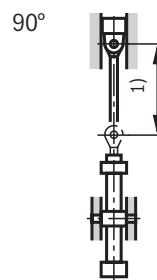
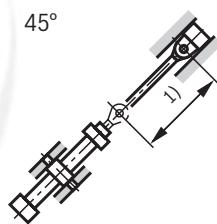
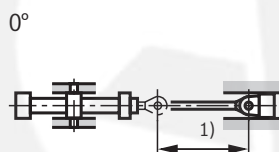
Buckling

(stroke length in mm)

Admissible stroke length for type of mounting "MT4" (trunnion mounting position in cylinder center)

ØAL in mm	ØMM in mm	70 bar			100 bar			160 bar			210 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°
25	12	190	190	200	150	150	155	105	105	105			
	18	455	470	535	395	405	435	310	315	325	275	280	285
32	14	195	200	205	150	155	155	105	105	105			
	22	535	555	625	460	470	510	365	365	380	320	325	330
40	18	265	270	290	215	215	225	150	155	155			
	22	430	445	480	360	370	385	275	280	285	230	230	235
50	28	670	700	825	590	605	670	475	480	505	430	435	445
	22	330	335	355	265	270	280	190	195	195			
50	28	570	590	645	485	495	520	375	380	390	315	315	320
	36	885	925	1115	785	810	910	640	655	690	580	590	610
63	28	435	445	470	355	360	375	265	265	270			
	36	755	780	865	650	660	700	510	575	530	430	430	440
63	45	1095	1145	1390	975	1010	1140	800	815	870	725	735	765
	36	585	595	630	480	485	505	340	360	365			
80	45	890	920	1025	760	775	830	590	595	615	535	540	550
	56	1340	1400	1700	1195	1240	1405	1000	1010	1075	885	900	940
100	45	725	745	805	605	615	645	415	440	475			
	56	1090	1130	1295	940	965	1045	740	750	782	675	680	695
100	70	1615	1700	2000	1460	1515	1770	1225	1255	1355	1115	1130	1185
	56	900	925	1015	760	775	820	485	520	605			
125	70	1340	1395	1640	1170	1205	1330	940	955	1000	855	865	890
	90	2035	2150	2300	1860	1945	2300	1590	1635	1815	1480	1510	1605
160	70	1100	1300	1255	935	955	1015	730	735	760			
	90	1745	1810	2090	1535	1575	1720	1255	1260	1320	1090	1115	1125
160	110	2410	2550	2600	2210	2315	2600	1905	1960	2180	1720	1755	1875
	90	1420	1470	1680	1225	1255	1360	770	830	1020			
200	110	2045	2130	2530	1825	1880	2090	1505	1530	1610	1065	1140	1410
	140	2700	2700	2700	2700	2700	2700	2415	2495	2700	2195	2250	2240

Installation position



1) Admissible stroke length

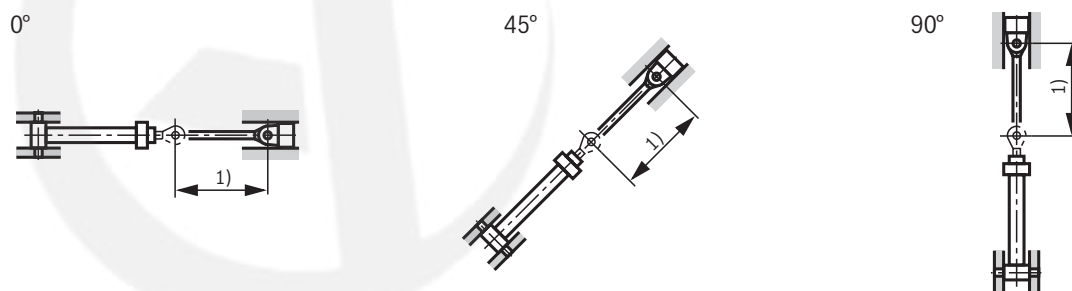
Buckling

(stroke length in mm)

Admissible stroke length for type of mounting "MT2"

ØAL in mm	ØMM in mm	70 bar			100 bar			160 bar			210 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°
25	12	130	130	135	100	100	105	65	65	65			
	18	330	340	390	285	290	315	220	225	230	195	195	200
32	14	135	135	140	100	100	105	65	65	65			
	22	390	405	455	335	340	370	260	260	270	230	230	235
40	18	180	185	200	145	145	150	95	95	100			
	22	305	315	340	250	260	270	185	190	195	155	155	155
50	28	410	425	465	345	350	370	260	265	270	220	220	225
	36	645	675	815	570	590	665	460	470	500	420	425	440
63	28	310	315	335	250	250	260	180	180	180			
	36	550	565	630	465	475	505	360	365	375	305	305	315
80	45	800	840	1025	710	735	835	580	595	630	530	535	555
	36	415	425	450	340	345	355	250	250	255			
100	45	675	700	780	580	590	630	450	455	470	380	385	395
	56	980	1030	1260	875	905	1030	720	735	780	645	655	685
125	45	515	530	575	430	435	455	320	320	330			
	56	825	855	980	710	730	795	565	570	595	480	485	500
160	70	1185	1245	1585	1065	1110	1300	890	915	990	815	830	870
	56	640	660	730	540	550	580	410	410	425			
200	70	1015	1060	1240	890	915	1010	715	725	760	615	625	640
	90	1495	1580	2110	1365	1425	1735	1160	1195	1330	1080	1105	1175
250	70	785	810	905	665	675	720	505	515	530			
	90	1315	1350	1595	1160	1210	1320	965	985	1030	760	835	890
320	110	1770	1870	2505	1620	1695	2070	1390	1430	1595	1260	1290	1375
	90	1015	1055	1210	870	895	970	680	685	715			
400	110	1540	1610	1910	1380	1420	1580	1140	1160	1215	820	870	1070
	140	2190	2325	2700	2025	2125	2695	1760	1825	2080	1610	1650	1790

Installation position



1) Admissible stroke length

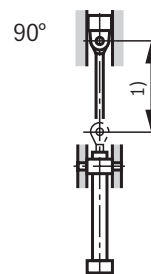
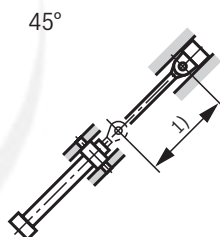
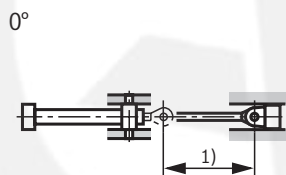
Buckling

(stroke length in mm)

Admissible stroke length for type of mounting "MT1"

ØAL in mm	ØMM in mm	70 bar			100 bar			160 bar			210 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°
25	12	325	325	330	260	260	265	190	190	190			
	18	600	600	600	600	600	600	500	510	520	445	450	455
32	14	335	335	345	265	270	270	190	190	190			
	22	800	800	800	735	750	800	580	590	605	520	520	530
40	18	460	465	475	370	375	375	270	270	275			
	22	690	705	760	585	595	620	455	460	465	385	390	390
50	28	1000	1000	1000	945	970	1000	760	770	800	685	690	705
	22	550	555	570	450	450	455	330	330	335			
50	28	905	930	1015	775	790	830	615	620	630	515	520	525
	36	1200	1200	1200	1200	1200	1200	1010	1025	1075	915	925	955
63	28	715	725	750	590	590	600	440	440	445			
	36	1175	1210	1335	1015	1035	1100	805	810	835	695	695	705
63	45	1400	1400	1400	1400	1400	1400	1245	1270	1345	1135	1150	1190
	36	940	955	995	780	785	805	590	590	600			
80	45	1465	1510	1675	1270	1300	1375	1015	1025	1055	860	865	880
	56	1700	1700	1700	1700	1700	1700	1525	1555	1655	1385	1405	1460
100	45	1190	1210	1270	995	1005	1030	740	760	770			
	56	1790	1850	2000	1570	1600	1730	1270	1285	1330	1085	1095	1115
100	70	2000	2000	2000	2000	2000	2000	1900	1945	2000	1740	1765	1850
	56	1480	1505	1595	1245	1260	1300	965	970	980			
125	70	2190	2270	2300	1935	1990	2175	1585	1605	1675	1375	1385	1420
	90	2300	2300	2300	2300	2300	2300	2300	2300	2300	2290	2300	2300
160	70	1805	1840	1965	1525	1545	1600	1185	1195	1210			
	90	2600	2600	2600	2475	2540	2600	2065	2095	2185	1790	1885	1895
160	110	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600
	90	2340	2400	2610	2000	2035	2135	1575	1585	1620			
200	110	2700	2700	2700	2700	2700	2700	2470	2505	2625	1815	1925	2325
	140	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700

Installation position



1) Admissible stroke length

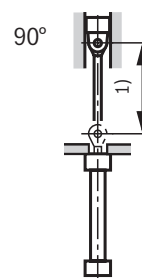
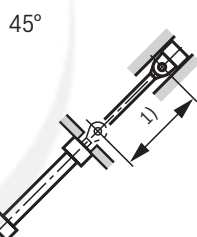
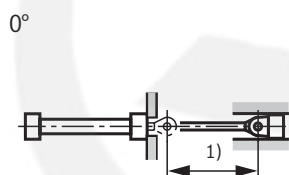
Buckling

(stroke length in mm)

Admissible stroke length for types of mounting "ME5", "MX3", "MX5"

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

Installation position



1) Admissible stroke length

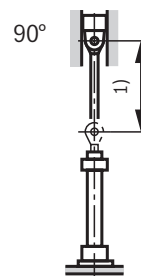
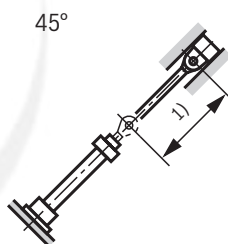
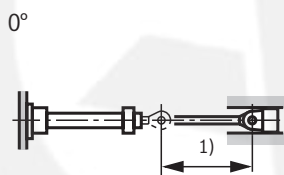
Buckling

(stroke length in mm)

Admissible stroke length for types of mounting "ME6", "MX1", "MX2"

ØAL in mm	ØMM in mm	70 bar			100 bar			160 bar			210 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°
25	12	195	200	220	160	160	170	115	115	120			
	18	445	465	585	395	410	475	325	330	360	295	295	310
32	14	205	210	230	165	170	180	120	120	120			
	22	525	550	685	465	485	560	385	390	420	345	350	365
40	18	270	280	315	225	230	245	165	165	170			
	22	435	455	520	375	385	420	295	300	310	245	250	255
50	28	645	680	895	580	605	730	485	500	555	450	460	480
	22	335	350	390	280	285	305	210	210	220			
63	28	580	600	700	505	515	565	400	405	425	335	340	350
	36	845	895	1200	770	805	990	655	675	755	605	620	655
	28	445	460	520	375	385	415	285	290	300			
80	36	760	795	940	670	690	765	540	550	580	465	470	490
	45	1045	1105	1400	955	1140	1240	815	845	955	765	780	835
	36	590	610	690	505	515	555	390	395	410			
100	45	940	980	1160	830	855	950	675	685	720	580	585	610
	56	1275	1350	1700	1170	1225	1520	1005	1035	1175	930	950	1025
	45	725	755	885	630	645	710	495	505	530			
125	56	1145	1200	1465	1025	1060	1205	850	865	920	730	740	770
	70	1530	1625	2000	1415	1485	1925	1230	1280	1485	1170	1195	1300
	56	885	925	1110	775	800	900	620	635	670			
160	70	1380	1450	1835	1245	1290	1500	1040	1065	1155	915	935	980
	90	1900	2025	2300	1770	1875	2300	1570	1640	1980	1525	1570	1745
	70	1080	1130	1370	950	985	1110	770	785	835			
200	90	1665	1755	2250	1515	1575	1850	1275	1310	1425	1100	1150	1250
	110	2250	2395	2600	2105	2225	2600	1870	1950	2360	1780	1835	2045
200	90	1375	1445	1825	1225	1275	1485	1010	1035	1120			
	110	1940	2050	2670	1770	1845	2200	1500	1550	1690	1250	1350	1500
	140	2700	2700	2700	2605	2700	2700	2340	2450	2700	2245	2325	2660

Installation position



1) Admissible stroke length

End position damping

The objective is to reduce the velocity of a moved mass, the center of gravity of which 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 damping feature, which absorbs energy without requiring the use of additional equipment. It must, however, always be checked whether end position damping is also required for lower velocities with large masses.

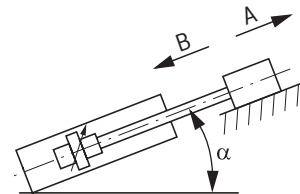
Series CDT3 is equipped with a progressive damping system.

Advantages of this damping system:

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

Cylinders with end position damping can achieve their full damping capacity only over the entire damping length. With the adjustable end position damping version "E", a throttle valve is additionally provided when compared with version "D". End position damping version "E" allows cycle times to be optimized.

Energy determination

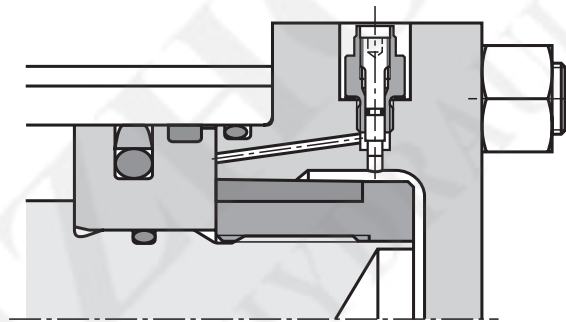


$$E = \frac{1}{2} \cdot m \cdot v^2 \quad \text{Retraction (A): } E = \frac{1}{2} \cdot m \cdot v^2 - mg \cdot l_a$$

$$\text{Retraction (B): } E = \frac{1}{2} \cdot m \cdot v^2 + mg \cdot l_a$$

The maximum damping capacity can only be achieved when the throttle valve is closed.

For special applications with very short stroke times, high velocities or large masses, cylinders with special end position damping versions can be offered on request. When fixed or adjustable stops are used, special measures must be taken.



Damping capacity

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

To this end, the kinetic energy and potential energy of the moved mass are to be calculated and compared to the admissible values from the diagram of page 50.

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

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

E	[Nm] [Joule]	Maximum value see page 50
m	[kg]	Total moved mass including piston and rod

v	[m/s]	Maximum velocity
g	[m/s ²]	9.81
l_a	[m]	Damping length, see page 49

End position damping

Damping lengths and weights

With cylinder strokes within the damping lengths, restrictions with regard to velocity and cycle time are possible.

We recommend minimum stroke greater than the damping length plus 10 mm.

Cylinder Ø	25		32		40			50			63			
	12	18	14	22	18	22	28	22	28	36	28	36	45	
l_a in mm	Head	15	15	16	16	23	23	23	22	22	22	25	25	25
	Base	15	15	16	16	23	23	23	22	22	22	25	25	25
m in kg (kg/100 mm)	Piston	0.15	0.2	0.25	0.4	0.6	0.6	0.7	0.8	1	1.2	1.4	1.7	2.0
	Rod	0.1	0.2	0.12	0.3	0.2	0.3	0.5	0.3	0.5	0.8	0.5	0.8	1.2
$v_{max}^{1)}$ (m/s)		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4

Cylinder Ø	80			100			125			160			200			
	36	45	56	45	56	70	56	70	90	70	90	110	90	110	140	
l_a in mm	Head	27	27	27	28	28	28	33	33	33	36	36	36	40	40	40
	Base	27	27	27	28	28	28	33	33	33	36	36	36	40	40	40
m in kg (kg/100 mm)	Piston	2.6	3	3.6	4.7	5.3	6.3	8.0	9.2	11	16	18	20	30	34	38
	Rod	0.8	1.2	2.0	1.2	2	3.0	2.0	3	5.0	3.0	5	7.5	5.0	7.5	12
$v_{max}^{1)}$ (m/s)		0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.25	0.25	0.25	0.25	0.25	0.25

The diagram on page 50 is based on the preceding table, the maximum velocities specified with closed throttle screw.

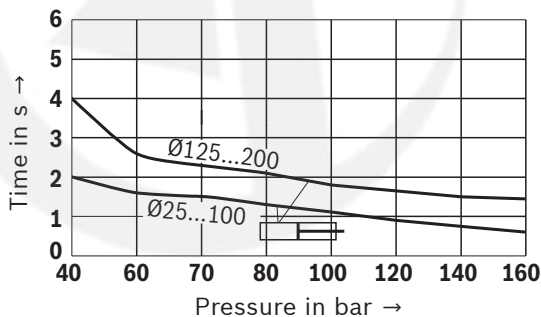
¹⁾ In case v_{max} is exceeded, please contact us.

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

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

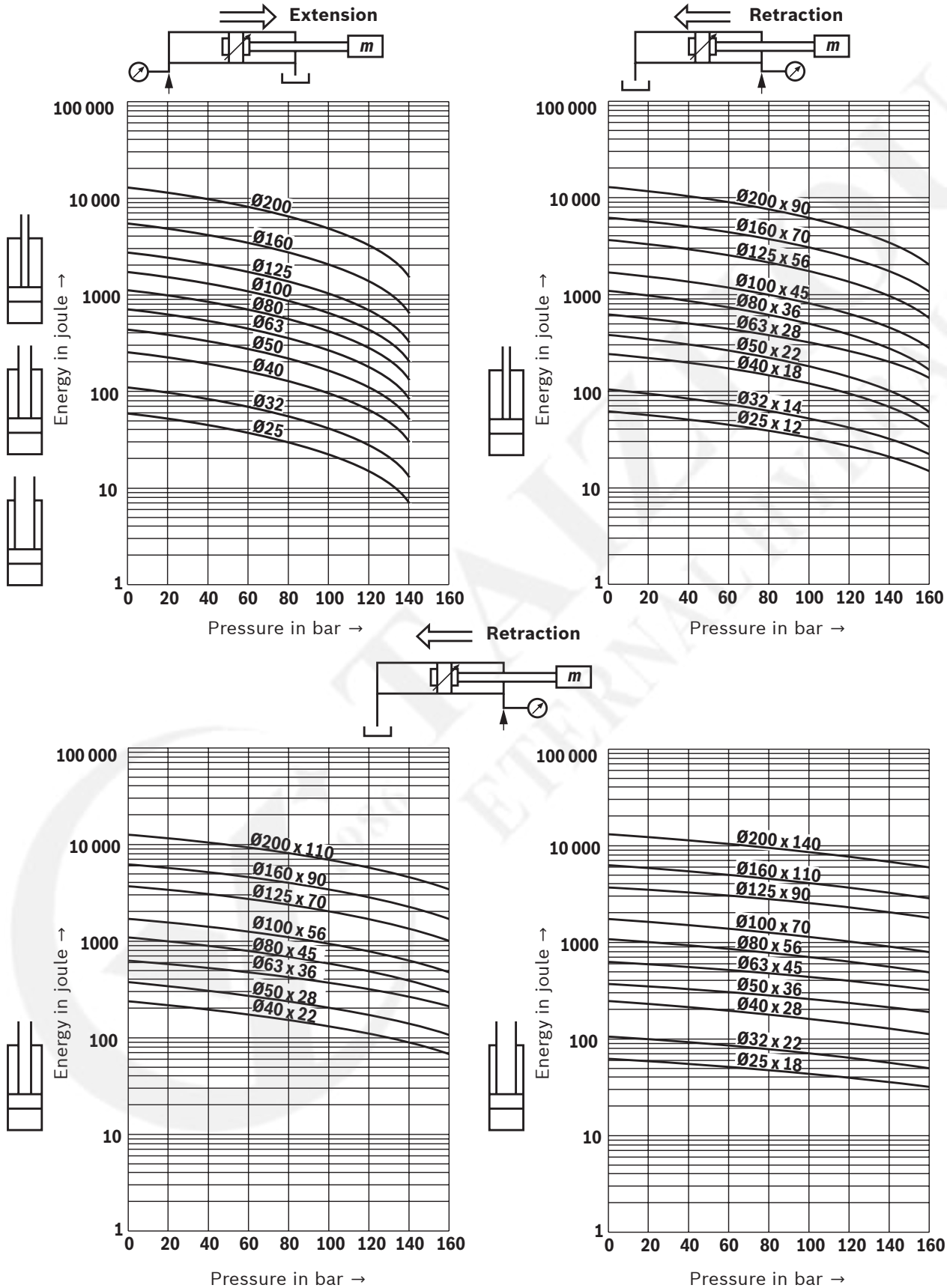
- E_U Energy absorbing
- E_{max} Maximum energy, see characteristic curve
- v_U Stroke velocity
- v_{max} Maximum speed for seal design "M"

Maximum damping time "D"; "E"



End position damping

Damping "D"; "E"

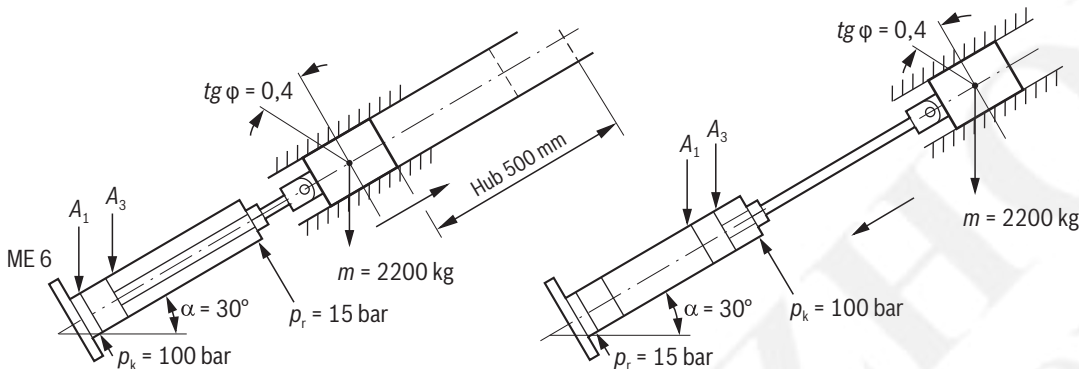


End position damping

Calculation example

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

- ▶ Force
- ▶ Buckling
- ▶ Damping capacity



Example:

Stroke time = 2 seconds

Load friction coefficient = $\text{tg } \phi = 0.4$ (estimated)

Available pressure $p_k = 100$ bar

Return flow pressure $p_r = 15$ bar

- A1** Piston surface
- A3** Annulus of piston surface
- ϕ Surface ratio **A1** / **A3**, see page 7
- m** total moved mass
- v** Velocity
- l_a Damping length, see page 49

To be determined:

Piston and piston rod diameter

Extend piston rod:

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

η_1 = cylinder efficiency = 0.9 (estimated)

η_2 = system efficiency

$$\eta_2 = \frac{p_k \cdot A_1 - p_r \cdot A_3}{p_k \cdot A_1} = 1 - \frac{p_r}{p_k \cdot \phi} = \frac{15}{100 \cdot 1.25} = 0.88$$

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

Force required to move the mass

F = Frictional force plus potential energy

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

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

Retract piston rod

F = Frictional force minus potential energy

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

Test of buckling length

For $p_k = 100$ bar and cylinder 63 / 28, the table on page 47 results in a maximum admissible stroke = 385 mm:

This means that the cylinder buckles.

There are 2 possibilities:

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

1) Assuming the smallest " ϕ "

End position damping

Calculation example: Test of the end position damping

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

Maximum velocity $v_u = 0.275$ m/s

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

Damping capacity required for piston rod extension:

$$= \frac{m \cdot v_u^2}{2} - m \cdot g \cdot l_a \cdot \sin(\alpha)$$
$$= \frac{2200 \cdot 0,275^2}{2} - 2200 \cdot 9,81 \cdot 0,025 \cdot 0,5 = -186 \text{ joules}$$

No damping problem for piston rod extension.

Damping capacity required for piston rod retraction:

$$= \frac{m \cdot v_u^2}{2} + m \cdot g \cdot l_a \cdot \sin(\alpha)$$
$$= \frac{2200 \cdot 0,275^2}{2} + 2200 \cdot 9,81 \cdot 0,025 \cdot 0,5 = 353 \text{ joules}$$

Diagram on page 50 results in 445 joules for $p_k = 100$ bar and $v_{\max} = 0.4$ m/s, i.e. the cylinder can absorb energy for 0.275 m/s (see page 49):

$$E_U = E_{\max} \cdot \frac{v_U}{v_{\max}} = 445 \cdot \frac{0,275}{0,4} = 306 \text{ joules}$$

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

Selection criteria for seals

Working conditions

Hydraulic fluid	Hydraulic fluid temperature range	Seal versions		
		"M"	"T"	"S"
HL, HLP	-20 °C ... +80 °C	++	++	++
HFA	+5 °C ... +55 °C	+/-	++	+/-
HFC	-20 °C ... +60 °C	-	++	-
HFDR	-15 °C ... +80 °C	-	-	++

Environmental conditions

Ambient and rod temperature in the area of the piston rod	Seal versions		
	"M"	"T"	"S"
Standard	-20 °C ... +80 °C ¹⁾	+	++ ²⁾
Extended	+80 °C ... +120 °C ¹⁾	-	++

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

General technical data in corresponding data sheets will remain valid, see page 5.

- 1) Moreover, observe the corresponding hydraulic fluid temperature range
- 2) Lower temperature limit -15 °C

Notice:

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

Seal kits

Seal kit complete

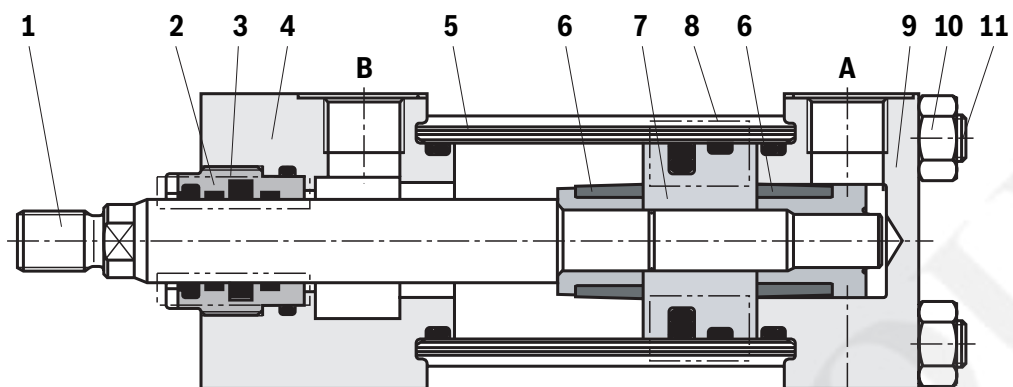
ØAL in mm	ØMM in mm	Material number		
		"M"	"T"	"S"
25	12	R961008000	R961008026	R961008052
	18	R961008001	R961008027	R961008053
32	14	R961008002	R961008028	R961008054
	22	R961008003	R961008029	R961008055
40	18	R961008004	R961008030	R961008056
	22	R961008005	R961008031	R961008057
	28	R961008006	R961008032	R961008058
50	22	R961008007	R961008033	R961008059
	28	R961008008	R961008034	R961008060
	36	R961008009	R961008035	R961008061
63	28	R961008010	R961008036	R961008062
	36	R961008011	R961008037	R961008063
	45	R961008012	R961008038	R961008064
80	36	R961008013	R961008039	R961008065
	45	R961008014	R961008040	R961008066
	56	R961008015	R961008041	R961008067
100	45	R961008016	R961008042	R961008068
	56	R961008017	R961008043	R961008069
	70	R961008018	R961008044	R961008070
125	56	R961011580	R961011587	R961011595
	70	R961011581	R961011588	R961011596
	90	R961011582	R961011589	R961011597
160	70	R961011583	R961011590	R961011598
	90	R961014437	R961014440	R961014443
	110	R961011584	R961011591	R961011599
200	90	R961011585	R961011592	R961011601
	110	R961014438	R961014441	R961014444
	140	R961011586	R961011593	R961011602

Tightening torques

Tie rod nut

ØAL in mm	ØMM in mm	Tightening torques in Nm for types of mounting	
		"ME5", "ME6", "MP1"; "MP3", "MP5", "MS2" "MT1", "MT2", "MT4", "MX3", "MX5"	"MX1", "MX2"
25	12	5.5	4
	18		
32	14	8	6
	22		
40	18	20	15
	22		
	28		
50	22	50	37
	28		
	36		
63	28	60	45
	36		
	45		
80	36	125	90
	45		
	56		
100	45	190	140
	56		
	70		
125	56	400	300
	70		
	90		
160	70	800	600
	90		
	110		
200	90	1250	900
	110		
	140		

Components



Piston rod seals

Ø 25 ... 32 and Ø 40/18



Ø 40/22, Ø 40/28 and Ø 50 ... 200



Piston seals

"M", "T", "S" for piston Ø 25 ... 63



"M", "T", "S" for piston Ø 80 ... 200



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

Priming / painting

Priming | By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010) of min. 40 µm. Other colors on request. The following surfaces of cylinders and attachment parts are not primed:

- ▶ All fit diameters to the customer side
- ▶ Sealing surfaces for line connection
- ▶ Sealing surfaces for flange connection
- ▶ Connection surface for valve mounting
- ▶ Measuring coupling
- ▶ Spherical / plain bearing
- ▶ Grease nipples

Painting | By default, hydraulic cylinders can be ordered in the CP4 corrosivity category in the RAL colors. The following surfaces of cylinders and attachment parts are not painted

- ▶ All fit diameters and connection surfaces to the customer side
- ▶ Sealing surfaces for line connection
- ▶ Sealing surfaces for flange connection
- ▶ Connection surface for valve mounting
- ▶ Measuring coupling
- ▶ Spherical / plain bearing
- ▶ Grease nipples

Notice:

Surfaces not primed or painted are protected with solvent-free corrosion protection agent. Accessories ordered as a separate order item are not primed or painted by default. Corresponding priming and/or painting on request.

Corrosivity categories

Class	Requirements	Applications	
		Inside	Outside
Priming CP3	240 h salt spray test SST (DIN EN ISO 9227) 240 h condensation water test KKT (DIN EN ISO 6270-2) Layer thickness: min. 40 µm	Field of application, e.g. Hall atmosphere, Air humidity ≤ 60%, no thermal load.	Not suitable for outdoor exposure.
Painting CP4	480 h salt spray test SST. (DIN EN ISO 9227) 480 h condensation water test KKT (DIN EN ISO 6270-2) Nominal layer thickness: 120 µm	Unheated buildings in which there may be condensation (production rooms, storage and sport halls).	Urban and industrial atmosphere with little salt or sulfur dioxide load.

In this connection, observe the information on the color set-up on page 5.

Refer to the primed and painted cylinder areas, not, for example, to piston rods, trunnion mounting, etc. In this connection, special measures may be necessary.

Project planning / maintenance instructions

Boundary and application conditions:

- ▶ The mechanical alignment of the movement axis and thus the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. It may be necessary to consider the own weight of the hydraulic cylinder ("MP1", "MP3", "MP5", "MT1", "MT2" or "MT4") or the piston rod.
- ▶ The buckling length / buckling load of the piston rod and / or the hydraulic cylinder must be observed (see page 40).
- ▶ 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 hydraulic fluid (see page 53).
- ▶ The maximum admissible velocities / kinetic energies when moving into the end positions, also considering external loads, must be observed (excess pressure).
- ▶ The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder. Possible pressure intensification resulting from throttling points is to be observed.
- ▶ Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contamination and deterioration of the hydraulic fluid are to be avoided.

Standards

The installation dimensions and types of mounting of the hydraulic cylinders comply with ISO 6020-2.

Acceptance

Every hydraulic cylinder following ISO 10100: 2020 with module L.

Safety instructions

For assembly, commissioning and maintenance of hydraulic cylinders, observe the operating instructions 07100-B. Service and repair work has to be performed or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair work .

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 a 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 (07200).

Stroke tolerances

According to ISO 6020-2, a stroke tolerance of +2 mm is admissible for strokes up to 1250 mm; the stroke tolerance for cylinder strokes over 1250 mm to 3000 mm is +5 mm. A tolerance of ± 0.3 mm is possible as option, smaller tolerances are not reasonable for tie rod cylinders.

Minimum strokes

For type of mounting "MT4", the minimum stroke is to be observed due to the trunnion mounting width, see page 6.

When using end position damping, the minimum stroke must also be observed, see page 48.

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

Line connections

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

Notice:

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

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

Project planning software ICS (Interactive Catalog System)

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

quickly and reliably gets the exact technical data of the selected component as well as 3D CAD data in the correct file format for all common CAD systems. This allows users to reduce costs while increasing their competitiveness.