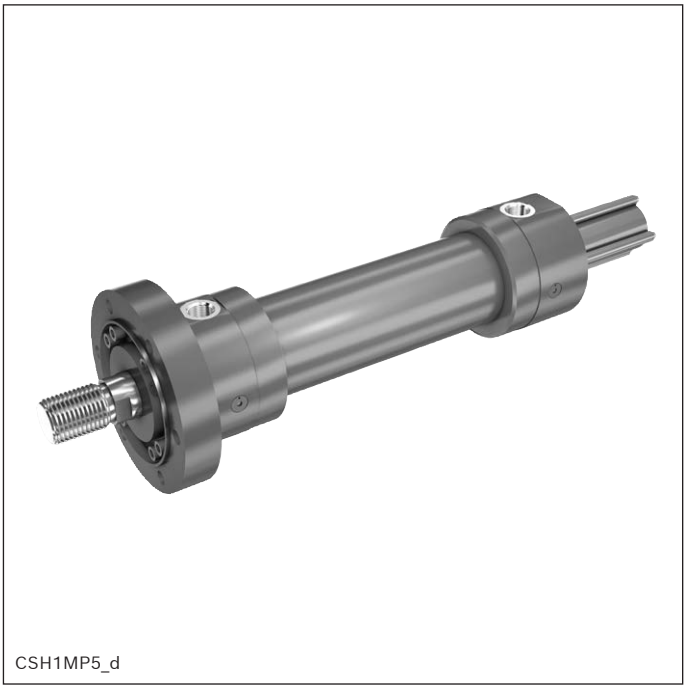
RE 17343
Edition: 2022-07

rexroth
A Bosch Company

Hydraulic cylinders
Mill type

Series CSM1



CSH1MP5_d

- Nominal pressure 160 bar
- Component series 3X

Features

- Rexroth-Standard
- 6 types of mounting
- Piston Ø (ØAL): 40 ... 200 mm
- Piston rod Ø (ØMM): 28 ... 140 mm
- Stroke length up to 3000 mm
- Adjustable end position damping
- IO-Link interface, optional

Project planning software
Interactive Catalog System
www.boschrexroth.com/mill-type-cylinder

Contents

Ordering code

01	02	03		04		05		06	07	08		09	10	11	12	13	14	15	16
CS	**M1**		/		/		/		**A**	**3X**	/								

01	Differential cylinder with position measurement system	**CS** [1]
02	Series	**M1**

Types of mounting

03	Rectangular flange at head	**MF1** [2]
	Round flange at head	**MF3**
	Swivel eye at base	**MP3**
	Self-aligning clevis at base	**MP5**
	Trunnion mounting	**MT4** [3]
	Foot mounting	**MS2**
04	Piston Ø (ØAL): 40 ... 200 mm, see page 7	
05	Piston rod Ø (ØMM): 28 ... 140 mm, see page 7	
06	Stroke length in mm	

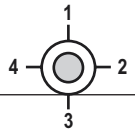
Design principle

07	Head and base flanged	**A**
08	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**

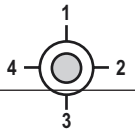
Line connection – version

09	According to ISO 1179-1 (pipe thread ISO 228-1)	**B**
	According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange	**C**
	According to ISO 6149-1 (metric thread ISO 261)	**R**
	Enlarged line connection according to ISO 1179-1 (enlarged pipe thread ISO 228-1), page 24	**S** [4]
	Rectangular flange connection according to ISO 6162, page 25	**F** [5]
	Square flange connection according to ISO 6164, page 25	**H**
	Switching and proportional directional valves, page 28, 29	
	Subplate NG6	**P** [6; 7; 8]
	Subplate NG10	**T** [6; 7; 9]
	Subplate NG16	**U** [6; 7; 10]
	Check valves type SV and SL, page 26, 27	
	Subplate NG6	**A** [6; 8; 11]
	Subplate NG10	**E** [6; 9; 11]
	Subplate NG20	**L** [6; 10; 11]

Line connection – position at head

10	View to piston rod [12]	**1**
		**2**
		3
		4

Line connection – position at base

11	View to piston rod [12]	**1**
		**2**
		3
		4

Piston rod design

Ordering code

01	02	03		04		05		06	07	08		09	10	11	12	13	14	15	16
CS	**M1**		**/**		**/**		**/**		**A**	**3X**	**/**								

12	Hard chromium-plated	**C**
	Hardened and hard chromium-plated	**H** [4]
	Nickel-plated and hard chromium-plated	**N** [13; 14]
	Stainless steel, hard chromium-plated	**L**

Piston rod end

13	Thread (ISO 6020-1) for swivel head CGKD / fork clevis CCKB	**G**
	Thread for swivel head CGKD / fork clevis CCKB	**H** [15]
	Internal thread, see page 24	**E**
	Piston rod end "H" with mounted swivel head CGKD	**F** [15]
	Piston rod end "G" with mounted swivel head CGKD	**K**
	Piston rod end "H" with mounted fork clevis CCKB	**P** [15; 16]
	Piston rod end "G" with mounted fork clevis CCKB	**R** [17]

End position damping (see page 46 ...48)

14	Without	**U**
	Both sides, adjustable	**E** [13]

Seal design (selection criteria for seals, see page 52)

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 HDFR phosphate ester and HFDU polyol ester	
	Servo quality, reduced friction	**S**

Additional options (see page 4)

16	Without	**W**
	With (fill in type key on page 4)	**Z**

Order example:
CSM1MT4/50/28/550A3X/B11CGDMW XV = 175 mm

[1] Not standardized
[2] Piston Ø 40 ... 125 mm
[3] Always indicate dimension "XV" in the plain text with orders
[4] Piston Ø 63 ... 200 mm
[5] Piston Ø 50 ... 200 mm
[6] Subplates only with pipe thread (ISO 1179-1)
[7] Only up to stroke 900 mm
[8] Piston Ø 40 ... 80 mm, only position "1", "1" (head / base)
[9] Piston Ø 63 ... 200 mm, only position "1", "1" (head / base)
[10] Piston Ø 125 ... 200 mm, only position "1", "1" (head / base)
[11] Subplates for check valves of type SV and SL
Please note: Seal designs "T" and "S" are not designed for the static holding function.
[12] All graphical pictures in the data sheet show position "1"
[13] Piston Ø 80 ... 200 mm
[14] Not possible for piston rod end "E"
[15] Per piston Ø only possible with large piston rod Ø
[16] Piston Ø 200 mm, on request
[17] Piston rod Ø 28 ... 90 mm

Ordering code: Additional options

		01	02	03	04	05	06	07	08
[	Z								

01	Position measurement system (magnetostrictive) without mating connector – separate order, see page 10, 11	**T**
02	Analog output 4 ... 20 mA	**C**
	Analog output 0 ... 10 V	**F**
	Digital output SSI (resolution 5 µm, asynchronous forward)	**D**
	Digital output SSI (resolution 1 µm, synchronous forward)	**S**
	IO-Link	**L** [1); 2)]
	Profinet "RT" and "IRT" with encoder profile	**R** [3)]
03	Without measuring coupling	**W**
	Measuring coupling, on both sides	**A**
	Measuring coupling, on both sides, stainless steel version	**E** [4)]
04	Standard conical grease nipples, DIN 71412 form A	**W**
	Flat type grease nipples, DIN 3404 – form A	**B** [5)]
05	Without piston rod extension	**W**
	Specify the piston rod extension dimension "LY" in the plain text in mm	**Y**
06	Priming class CP3	**W**
	Painting class CP4	**B** [6)]
	Painting class CP5	**L** [6)]
	Painting class CP6	**U** [6)]
	Painting class CP7	**E** [6)]
07	Without oil filling	**W**
	With corrosion protection oil VG68	**F**
08	Without test certificate	**W**
	With certificate of compliance 2.1 based on EN 10204	**B**
	With acceptance test certificate 3.1 based on EN 10204	**C**

1) Not possible with "MP3" and "MP5"
2) Minimum stroke length 50 mm / maximum stroke length 2540 mm
3) For "MP3" and "MP5" on request
4) On request
5) From piston Ø 50 ... 200 mm;
not for piston rod end "P" and "R"
6) 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 49
Priming	see page 54
Painting	see page 54

Hydraulic		
Nominal pressure [1]	bar	160
Minimum operating pressure [2] (without load)	bar	10
Static test pressure	bar	240
Hydraulic fluid		see table below
Hydraulic fluid temperature range	°C	see page 49
Viscosity range	mm^2/s	12 ... 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 secured against screwing out

Hydraulic fluid	**Classification**	**Data sheet**
Mineral oils	HL, HLP	90220
Phosphate ester	HFDR	90222
Polyol ester	HFDU	90222
Oil-in-water emulsion	HFA	90223
Water glycol	HFC	90223

[1] Higher operating pressures up to 200 bar on request
With extreme shock loads, mounting elements and threaded piston rod connections must be designed for durability.

[2] Depending on the application, a certain minimum pressure is required in order to guarantee good functioning of the hydraulic cylinder. Without load, a minimum pressure of 10 bar is recommended for differential cylinders; for lower pressures, please contact us.

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

Stroke velocity
Please observe the guideline on maximum stroke velocities (with recommended flow velocity of 5 m/s in the line connection) in the table. 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 hydraulic fluid may result. If necessary, please consult us.

Piston Ø in mm	**Line connection**	**max. stroke velocity** in m/s
40	G1/2	0.61
50	G1/2	0.39
63	G3/4	0.41
80	G3/4	0.25
100	G1	0.20
125	G1	0.13
160	G1 1/4	0.12
200	G1 1/4	0.08

Information on stroke length and stroke velocity

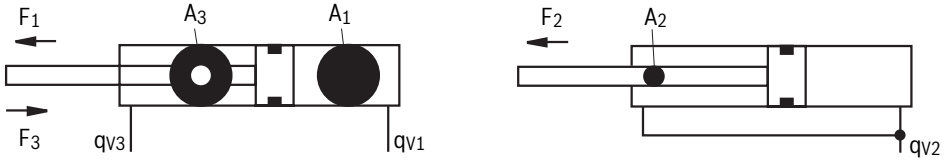
ØAL in mm		**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
Minimum stroke in mm (recommended)	▶ Without damping	–	–	–	–	–	–	–	–
	▶ With damping	46	44	54	54	64	66	80	92
Maximum velocity in m/s (recommended)	▶ Seal design M; ▶ 160 bar	0.50		0.40		0.30		0.25	
	▶ Seal design M; ▶ 100 bar	0.70		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

Piston	Piston rod	Area ratio	Areas			Force at 160 bar [1]			Flow at 0.1 m/s [2]			Max. stroke length
			Piston	Rod	Ring	Pressure	Diff.	Pulling	OFF	Diff.	ON	
ØAL in mm	ØMM in mm	ϕ A1/A3	A_1 in cm²	A_2 in cm²	A_3 in cm²	F_1 kN	F_2 kN	F_3 kN	q_{V1} l/min	q_{V2} l/min	q_{V3} l/min	in mm
40	**28**	1.96	12.56	6.16	6.41	20.00	9.82	10.24	7.5	3.7	3.8	2000
50	**28**	1.46	19.63	6.16	13.47	31.30	9.82	21.55	11.8	3.7	8.1	2000
	36	2.08		10.18	9.46		16.29	15.10		6.1	5.6	
63	**36**	1.48	31.17	10.18	20.99	49.80	16.29	33.56	18.7	6.1	12.6	2000
	45	2.04		15.90	15.27		25.40	24.41		9.5	9.2	
80	**45**	1.46	50.26	15.90	34.36	80.30	25.40	54.96	30.2	9.5	20.7	2000
	56	1.96		24.63	25.63		39.30	40.99		14.8	15.4	
100	**56**	1.46	78.54	24.63	53.91	125.00	39.30	86.22	47.1	14.8	32.3	3000
	70	1.96		38.48	40.06		61.50	64.04		23.1	24.0	
125	**70**	1.46	122.72	38.48	84.24	196.00	61.50	134.7	73.6	23.1	50.5	3000
	90	2.08		63.62	59.10		101.00	94.49		38.2	35.4	
160	**90**	1.46	201.06	63.62	137.44	321.00	101.00	219.8	120.6	38.2	82.4	3000
	110	1.90		95.06	106.00		151.00	169.5		57.0	63.6	
200	**110**	1.43	314.16	95.06	219.09	502.60	152.00	350.6	188.5	57.0	131.5	3000
	140	1.96		153.96	160.20		246.30	256.3		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

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

Tolerances according to ISO 6020-1

Installation dimensions	**WF**	**W**	**WC**	**XS**	**SS**	**XV**	**ZJ**	**Y**	**PJ**	**Stroke tolerances** in mm
Stroke length in mm	Tolerances in mm									
≤ 1250	± 2	± 2	± 2	± 2	± 1.5	± 2	± 1.5	± 2	± 1.5	+ 2
> 1250 ... ≤ 3000	± 4	± 4	± 4	± 4	± 3	± 4	± 3	± 4	± 3	+ 5

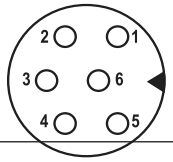
Technical data

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

Hydraulic cylinder mass (in kg)

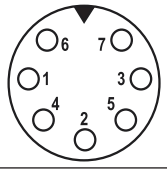
Piston	**Piston rod**						**per 100 mm stroke length**
ØAL in mm	**ØMM** in mm	**"MP3", "MP5"** in kg	**"MF1"** in kg	**"MF3"** in kg	**"MT4"** in kg	**"MS2"** in kg	in kg
40	**28**	6.0	6.5	6.8	6.6	7.7	1.1
50	**28**	8.9	9.7	10.2	9.8	12.0	1.2
	36	9.1	9.9	10.4	10.0	12.2	1.5
63	**36**	15.5	17.0	17.5	17.0	20.0	2.1
	45	15.5	17.0	17.5	17.0	20.0	2.6
80	**45**	22.5	24.0	25.0	24.0	29.0	2.9
	56	22.5	24.0	25.0	24.0	29.0	3.6
100	**56**	41.0	42.5	44.5	43.5	52.0	5.4
	70	42.0	43.5	45.5	44.5	53.0	6.5
125	**70**	66.0	68.0	70.0	73.5	86.0	7.3
	90	67.0	69.0	71.0	74.5	87.0	9.3
160	**90**	122.0	–	121.0	136.0	148.0	11.5
	110	123.0	–	122.0	137.0	149.0	14.0
200	**110**	222.0	–	217.0	245.0	259.0	15.4
	140	225.0	–	220.0	248.0	262.0	20.1

Technical data: Position measurement system
(For applications outside these values, please consult us!)

Analog "C"/"F"			
Operating temperature		°C	–40 ... +85
Electrical connection	▶ Type of connection		1 x M16 connector (6-pole)
	▶ Power consumption	W	<3.25
Operating conditions	▶ Protection class		IP67 (connector professionally mounted) IP68 at cable outlet
	▶ EMC test		Electro-magnetic interference emission according to EN 61000-6-3 Electro-magnetic interference resistance according to EN 61000-6-2 The sensor complies with EC directives and bears the CE marking
Tightening torque M_A	▶ ≦ 1500 mm measurement length	Nm	50 ±4 %
	▶ > 1500 mm measurement length	Nm	65 ±4 %
Wrench size SW		mm	46
Voltage "F"		V	0 ... 10
	▶ Input resistance control system	kΩ	> 5
	▶ Resolution		16 bit (internal resolution 0.1 µm)
Current "C"		mA	4 ... 20
	▶ Load	Ω	min/max: 0/500
	▶ Resolution		16 bit (internal resolution 0.1 µm)
Connector	▶ Pin 1 / cable: gray		Position 1 (solenoid)
(View to pin side)	▶ Pin 2 / cable: pink		DC ground
	▶ Pin 3 / cable: yellow		Not used
	▶ Pin 4 / cable: green		DC ground
	▶ Pin 5 / cable: brown	VDC	+12 ... 30 ±20 % (9.6...36 VDC)
	▶ Pin 6 / cable: white		DC ground (0 V)

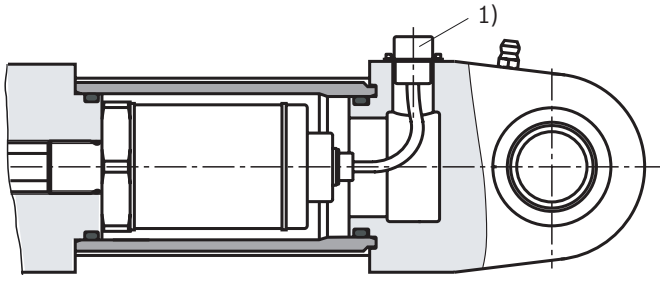
Technical data: Position measurement system
(For applications outside these values, please consult us!)

Digital "D"/"S"			
Operating temperature		°C	–40 ... +85
Electrical connection	▶ Type of connection		1 x M16 connector (7-pole)
	▶ Power consumption	W	1.2 typical
Tightening torque M_A	▶ ≦ 1500 mm measurement length	Nm	50 ±4 %
	▶ > 1500 mm measurement length	Nm	65 ±4 %
Wrench size SW		mm	46
SSI "D"	▶ Interface		SSI 24 Bit (RS-485/RS-422)
	▶ Resolution	µm	5
	▶ Direction of measurement		asynchronous forward
	▶ Data format		Gray
SSI "S"	▶ Interface		SSI 24 Bit (RS-485/RS-422)
	▶ Resolution	µm	1
	▶ Direction of measurement		synchronous forward
	▶ Data format		Gray
Connector	▶ Pin 1 / cable: gray		Data (–)
(View to pin side)	▶ Pin 2 / cable: pink		Data (+)
	▶ Pin 3 / cable: yellow		Clock (+)
	▶ Pin 4 / cable: green		Clock (–)
	▶ Pin 5 / cable: brown	VDC	+12 ... 30 ±20 % (9.6...36 VDC)
	▶ Pin 6 / cable: white		DC ground (0 V)
	▶ Pin 7 / –		Not used

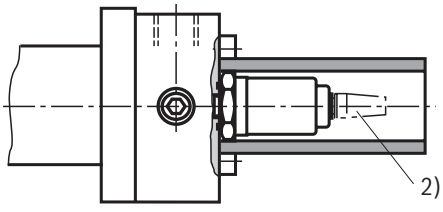


Types of mounting

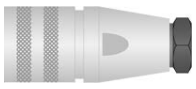
"MP3", "MP5"



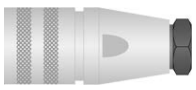
"MF3", "MF4", "MT4", "MS2"



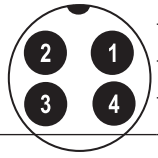
[1] **For analog output**
6-pole Amphenol mating connector, material no. **R900072231**
(Mating connector is **not** included in the scope of delivery and must be ordered separately)



[2] **For digital output**
7-pole Amphenol mating connector, material no. **R900079551**
(Mating connector is **not** included in the scope of delivery and must be ordered separately)



Technical data: IO–Link
(For applications outside these values, please consult us!)

IO–Link "L"			IO–Link V1.1
Operating temperature		°C	–40 ... +75
Electrical connection	▶ Type of connection		1 x M16 connector (4-pole)
	▶ Operating voltage	VDC	+24 (±25 %) / residual ripple ≤ 0.28 Vpp
	▶ Current consumption	mA	< 50
Tightening torque M_A		Nm	50 ±4 %
Wrench size SW		mm	34
Output	▶ Interface		digital
	▶ Transmission record		IO-Link V1.1
	▶ Data format	Bit	32 signed (position in µm)
	▶ Data transmission rate		COM3 (230.4 kBaud)
	▶ Process data Device – Master	Bytes	4
	▶ Process data Master – Device	Bytes	0
	▶ Measured variable	MBit/s	Position
Measured values	▶ Resolution [1]	µm	5, 10, 20, 50 or 100
	▶ Cycle time:	ms	≤ 1 (depending on master)
	▶ Linearity [2]	%	≤ ±0.02 F.S. (≤ ±60 µm)
	▶ Measurement repetition accuracy	%	≤ ±0.005 F.S. (≤ ±20 µm)
Connector (A–coded) (View to sensor) 	▶ Pin 1		+24 VDC (±25 %)
	▶ Pin 2		DI / DQ
	▶ Pin 3		DC ground (0 V)
	▶ Pin 4		C / Q

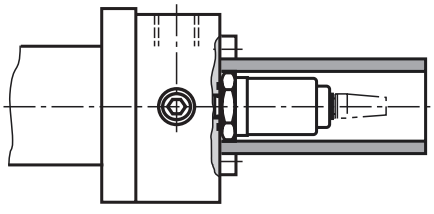
[1] Selectable via IO-Link Master.
[2] Tested with position magnet 251 416-2.

Mating connectors

M12 A-coded (5-pole), straight,
Material number **R913045873**
(Mating connector is **not** included in the scope of delivery and must be ordered separately)

M12 A-coded (5-pole), angled,
Material number **R901500328**
(Mating connector is **not** included in the scope of delivery and must be ordered separately)

"MF3", "MF4", "MT4", "MS2"



Overview of types of mounting

"MP3" (see page 14, 15)

"MP5" (see page 14, 15)

"MF1" (see page 16, 17)

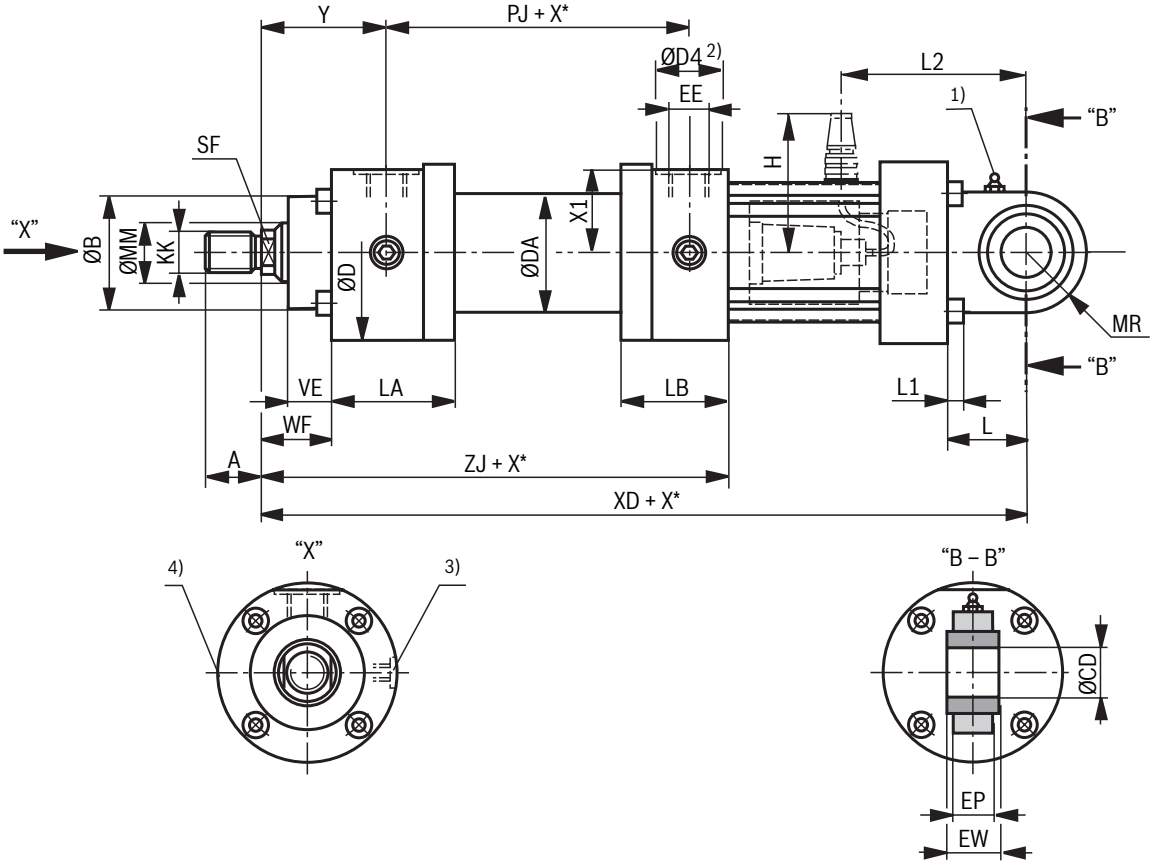
"MF3" (see page 18, 19)

"MT4" (see page 20, 21)

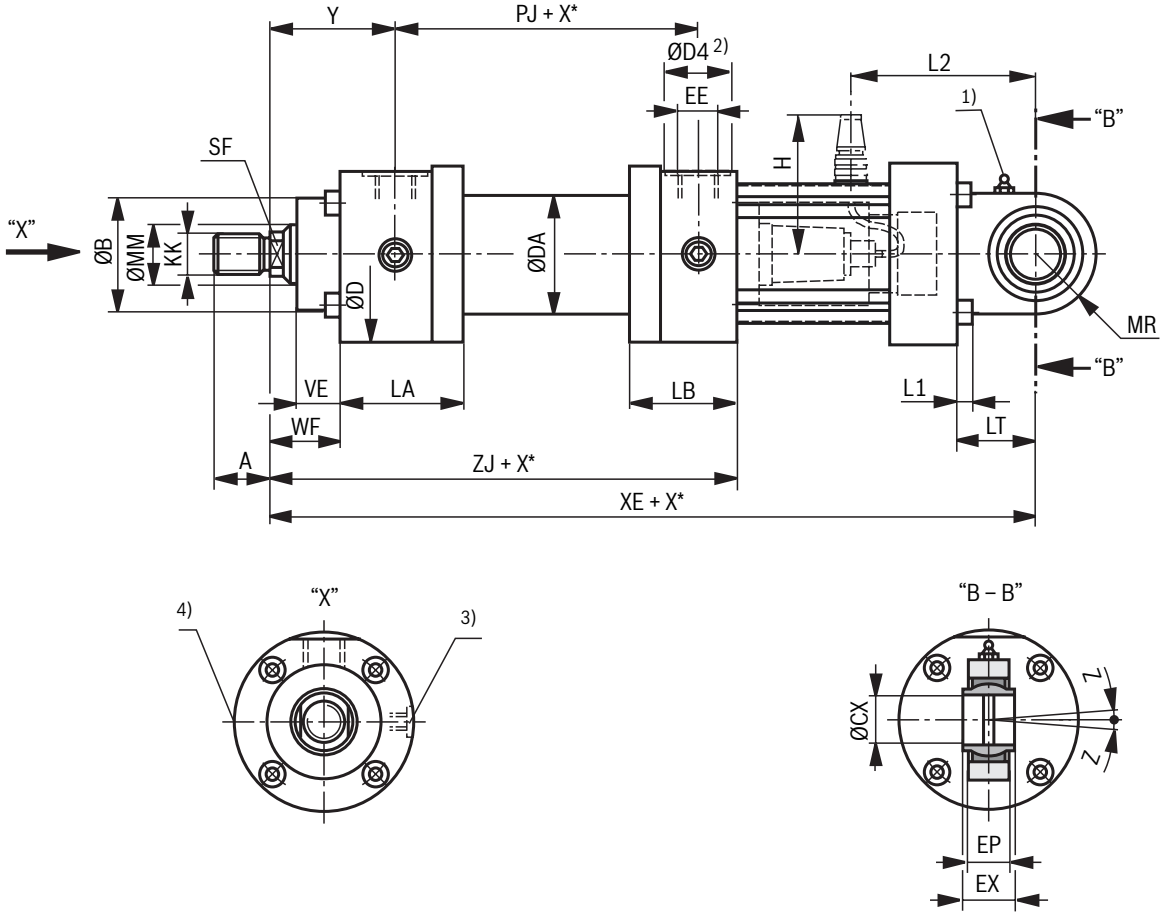
"MS2" (see page 22, 23)

Dimensions: "MP3", "MP5"
(dimensions in mm)

"MP3"



"MP5"



Dimensions: "MP3", "MP5"
(dimensions in mm)

ØAL	ØMM	KK [5]	A [5]	KK [6]	A [6]	SF	ØB	ØD	ØDA	ØD4	EE	ØD4	EE	Y	PJ	X*
		ISO 6020-1					f8			[2; 7]	[7]	[2; 8]	[8]	[9]	[9]	max.
40	**28**	M20 x 1.5	28	M16 x 1.5	22	22	50	78	50	34	G1/2	29	M22 x 1.5	71	97	1000
50	**28** **36**	M20 x 1.5 M27 x 2	28 36	– M20 x 1.5	– 28	22 30	60	95	60	34	G1/2	29	M22 x 1.5	72	111	1000
63	**36** **45**	M27 x 2 M33 x 2	36 45	– M27 x 2	– 36	30 36	70	116	78	42	G3/4	34	M27 x 2	82	117	2000
80	**45** **56**	M33 x 2 M42 x 2	45 56	– M33 x 2	– 45	36 46	85	130	95	42	G3/4	34	M27 x 2	91	134	2000
100	**56** **70**	M42 x 2 M48 x 2	56 63	– M42 x 2	– 56	46 60	106	158	120	47	G1	43	M33 x 2	108	162	3000
125	**70** **90**	M48 x 2 M64 x 3	63 85	– M48 x 2	– 63	60 75	132	192	150	47	G1	43	M33 x 2	121	174	3000
160	**90** **110**	M64 x 3 M80 x 3	85 95	– M64 x 3	– 85	75 95	160	237	190	58	G1 1/4	52	M42 x 2	143	191	3000
200	**110** **140**	M80 x 3 M100 x 3	95 112	– M80 x 3	– 95	95 120	200	285	230	58	G1 1/4	52	M42 x 2	190	224	3000

ØAL	ØMM	X1	VE	WF	ZJ	XD/XE	CD/CX	EP	EW/EX	L/LT	L1	MR/MS	H	L2	LA	LB	Z
			max.	[9]	[9]		H9/H7		h12	min.		max.					
40	**28**	35.5	19	32	190	381	20	17	20	38	6	25	110	102	73	56	2°
50	**28** **36**	44.5	24	38	205	407	25	22	25	48	8	32	120	120	74	62	2°
63	**36** **45**	54.5	29	45	224	439	32	27	32	61	10	40	130	138	84	72	4°
80	**45** **56**	62.5	36	54	250	482	40	32	40	78	10	50	120	165	93	81	4°
100	**56** **70**	75.5	37	57	300	545	50	40	50	90	10	63	135	200	117	96	4°
125	**70** **90**	92.5	37	60	325	578	63	52	63	98	12	71	145	208	143	112	4°
160	**90** **110**	115.5	41	66	370	655	80	66	80	127	12	90	165	245	171	130	4°
200	**110** **140**	138.5	45	75	450	765	100	84	100	150	16	112	185	278	230	151	4°

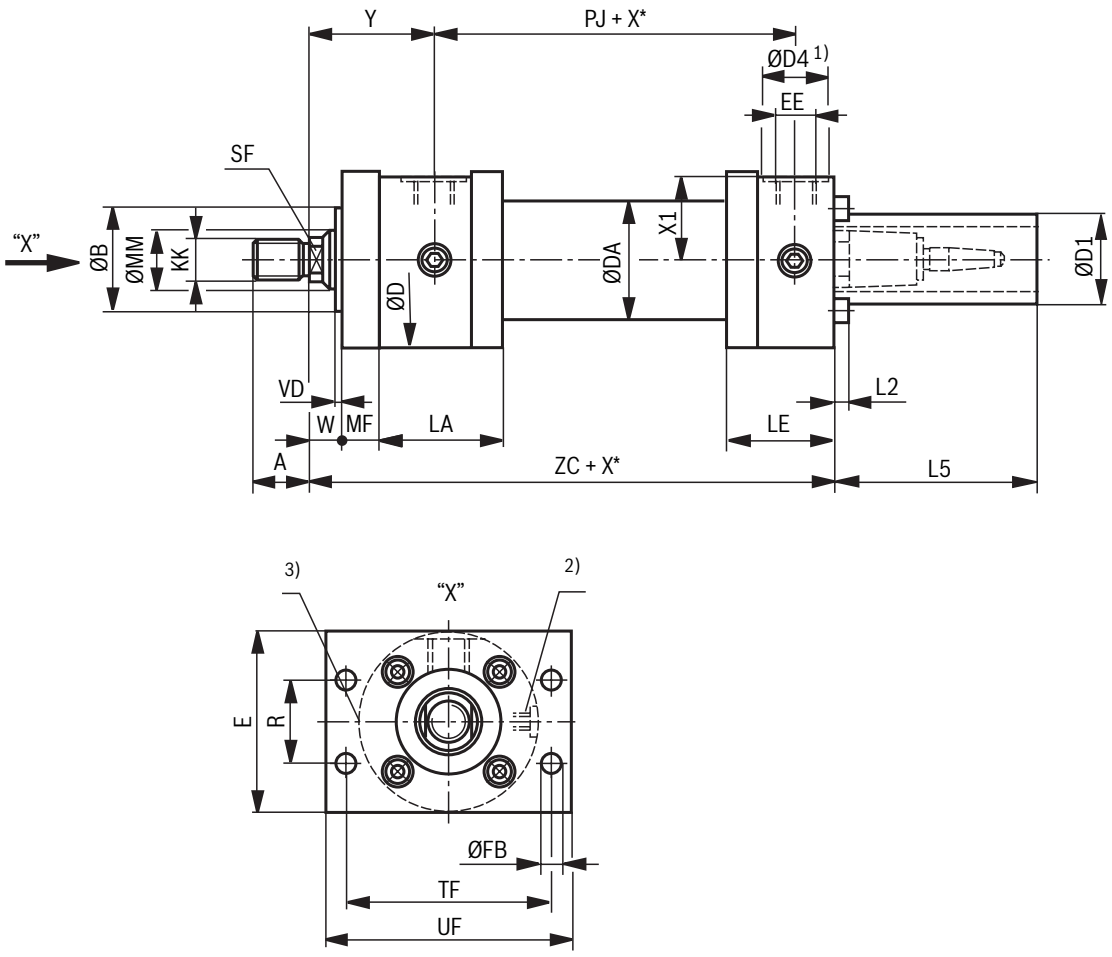
ØAL = piston Ø
ØMM = piston rod Ø
X* = stroke length

1) Grease nipple, cone head form A according to DIN 71412
2) ØD4 recess maximum 0.5 mm deep
3) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
4) Throttle valve only with end position damping "E" (180° for bleeding)
5) Thread for piston rod end "G", "K" and "R"
6) Thread for piston rod end "H", "F" and "P"
7) Line connection "B"
8) Line connection "R"
9) Tolerances according to ISO 6020-1, see page 8

☞ **Notice:**
For line connections "1" and "2", the position of the grease nipple is at "1"
For line connections "3" and "4", the position of the grease nipple is at "3"

Dimensions: "MF1"
(dimensions in mm)

"MF1"



Dimensions: "MF1"
(dimensions in mm)

ØAL	Ø MM	KK [4]	A [4]	KK [5]	A [5]	SF	ØB	ØD	ØDA	ØD4	EE	ØD4	EE	Y	PJ	X*
		ISO 6020-1					f8			[1; 6]	[6]	[1; 7]	[7]	[8]	[8]	max.
40	**28**	M20 x 1.5	28	M16 x 1.5	22	22	50	78	50	34	G1/2	29	M22 x 1.5	71	97	1000
50	**28** **36**	M20 x 1.5 M27 x 2	28 36	– M20 x 1.5	– 28	22 30	60	95	60	34	G1/2	29	M22 x 1.5	72	111	1000
63	**36** **45**	M27 x 2 M33 x 2	36 45	– M27 x 2	– 36	30 36	70	116	78	42	G3/4	34	M27 x 2	82	117	2000
80	**45** **56**	M33 x 2 M42 x 2	45 56	– M33 x 2	– 45	36 46	85	130	95	42	G3/4	34	M27 x 2	91	134	2000
100	**56** **70**	M42 x 2 M48 x 2	56 63	– M42 x 2	– 56	46 60	106	158	120	47	G1	43	M33 x 2	108	162	3000
125	**70** **90**	M48 x 2 M64 x 3	63 85	– M48 x 2	– 63	60 75	132	192	150	47	G1	43	M33 x 2	121	174	3000

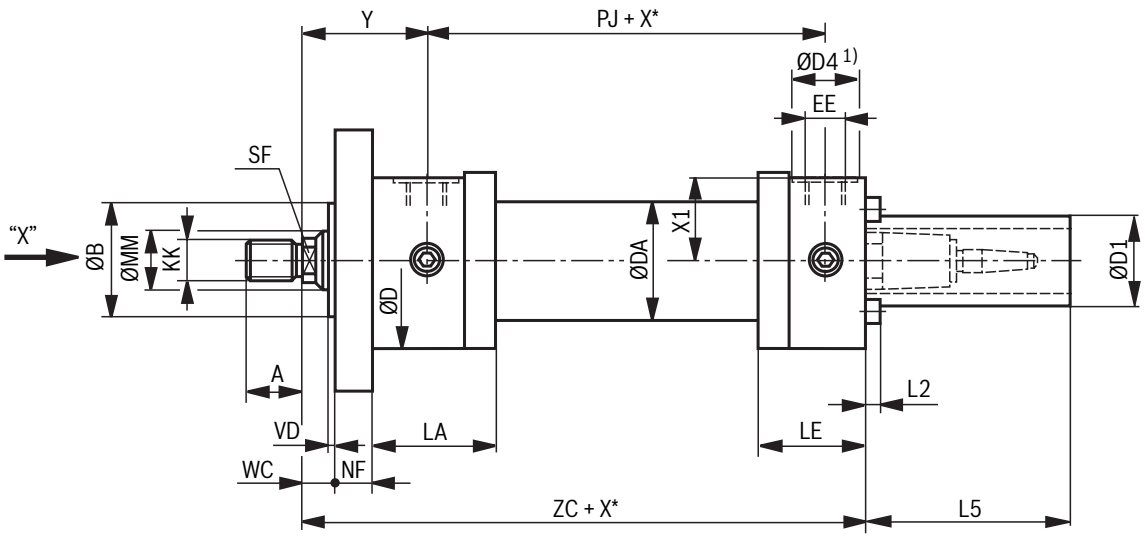
ØAL	ØMM	X1	MF	VD	W	ZC	E	R	TF	UF	ØFB	ØD1	L5	LA	LE	L2
			js13	min.	[8]		max.	js13	js13	max.	H13					
40	**28**	35.5	16	3	16	211	80	40.6	98	115	9	80	166	73	77	0
50	**28** **36**	44.5	20	4	18	224	100	48.2	116.4	140	11	96	166	74	81	0
63	**36** **45**	54.5	25	4	20	237	120	55.5	134	160	13.5	96	166	84	85	0
80	**45** **56**	62.5	32	4	22	281	135	63.1	152.5	185	17.5	96	166	93	112	10
100	**56** **70**	75.5	32	5	25	322	160	76.5	184.8	225	22	96	166	117	118	0
125	**70** **90**	92.5	32	5	28	347	195	90.2	217.1	255	22	96	166	143	134	0

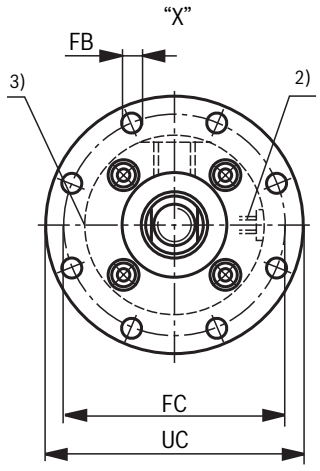
ØAL = piston Ø
ØMM = piston rod Ø
X* = stroke length

[1] ØD4 recess maximum 0.5 mm deep
[2] Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
[3] Throttle valve only with end position damping "E" (180° for bleeding)
[4] Thread for piston rod end "G", "K" and "R"
[5] Thread for piston rod end "H", "F" and "P"
[6] Line connection "B"
[7] Line connection "R"
[8] Tolerances according to ISO 6020-1, see page 8

Dimensions: "MF3"
(dimensions in mm)

"MF3"





Dimensions: "MF3"
(dimensions in mm)

ØAL	ØMM	KK [4]	A [4]	KK [5]	A [5]	SF	ØB	ØD	ØDA	ØD4	EE	ØD4	EE	Y	PJ	X*
		ISO 6020-1					f8			1; 6)	6)	1; 7)	7)	8)	8)	max.
40	**28**	M20 x 1.5	28	M16 x 1.5	22	22	50	78	50	34	G1/2	29	M22 x 1.5	71	97	1000
50	**28** **36**	M20 x 1.5 M27 x 2	28 36	– M20 x 1.5	– 28	22 30	60	95	60	34	G1/2	29	M22 x 1.5	72	111	1000
63	**36** **45**	M27 x 2 M33 x 2	36 45	– M27 x 2	– 36	30 36	70	116	78	42	G3/4	34	M27 x 2	82	117	2000
80	**45** **56**	M33 x 2 M42 x 2	45 56	– M33 x 2	– 45	36 46	85	130	95	42	G3/4	34	M27 x 2	91	134	2000
100	**56** **70**	M42 x 2 M48 x 2	56 63	– M42 x 2	– 56	46 60	106	158	120	47	G1	43	M33 x 2	108	162	3000
125	**70** **90**	M48 x 2 M64 x 3	63 85	– M48 x 2	– 63	60 75	132	192	150	47	G1	43	M33 x 2	121	174	3000
160	**90** **110**	M64 x 3 M80 x 3	85 95	– M64 x 3	– 85	75 95	160	237	190	58	G1 1/4	52	M42 x 2	143	191	3000
200	**110** **140**	M80 x 3 M100 x 3	95 112	– M80 x 3	– 95	95 120	200	285	230	58	G1 1/4	52	M42 x 2	190	224	3000

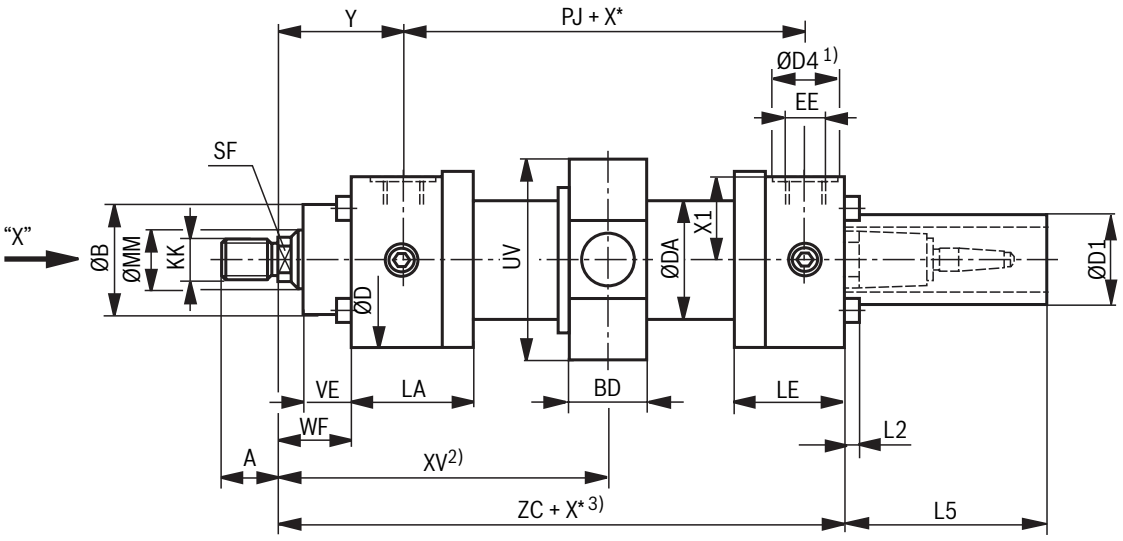
ØAL	ØMM	X1	NF	VD	WC	ZC	ØFC	ØUC	ØFB	ØD1	L5	LA	LE	L2
			js13	min.	8)		js13	max.	H13					
40	**28**	35.5	16	3	16	211	106	125	9	80	166	73	77	0
50	**28** **36**	44.5	20	4	18	224	126	150	11	96	166	74	81	0
63	**36** **45**	54.5	25	4	20	237	145	170	13.5	96	166	84	85	0
80	**45** **56**	62.5	32	4	22	281	165	195	17.5	96	166	93	112	10
100	**56** **70**	75.5	32	5	25	322	200	240	22	96	166	117	118	0
125	**70** **90**	92.5	32	5	28	347	235	275	22	96	166	143	134	0
160	**90** **110**	115.5	36	5	30	390	280	320	22	96	166	171	150	0
200	**110** **140**	138.5	40	5	35	472	340	385	26	96	166	230	173	0

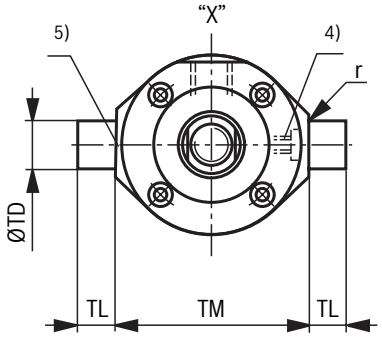
ØAL = piston Ø
ØMM = piston rod Ø
X* = stroke length

1) ØD4 recess maximum 0.5 mm deep
2) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
3) Throttle valve only with end position damping "E" (180° for bleeding)
4) Thread for piston rod end "G", "K" and "R"
5) Thread for piston rod end "H", "F" and "P"
6) Line connection "B"
7) Line connection "R"
8) Tolerances according to ISO 6020-1, see page 8

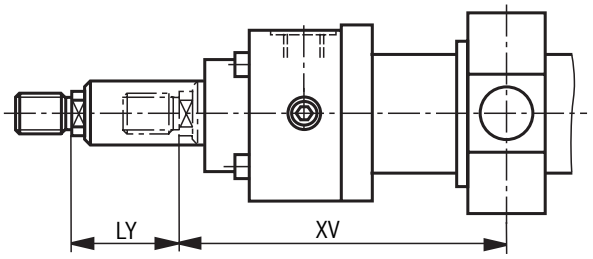
Dimensions: "MT4"
(dimensions in mm)

"MT4"





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



Dimensions: "MT4"
(dimensions in mm)

ØAL	ØMM	KK [6]	A [6]	KK [7]	A [7]	SF	ØB	ØD	ØDA	ØD4	EE	ØD4	EE	Y	PJ	X1	X*
		ISO 6020-1					f8			[1; 8]	[8]	[1; 9]	[9]	[11]	[11]		max.
40	**28**	M20 x 1.5	28	M16 x 1.5	22	22	50	78	50	34	G1/2	29	M22 x 1.5	71	97	35.5	1000
50	**28** **36**	M20 x 1.5 M27 x 2	28 36	– M20 x 1.5	– 28	22 28	60	95	60	34	G1/2	29	M22 x 1.5	72	111	44.5	1000
63	**36** **45**	M27 x 2 M33 x 2	36 45	– M27 x 2	– 36	28 36	70	116	78	42	G3/4	34	M27 x 2	82	117	54.5	2000
80	**45** **56**	M33 x 2 M42 x 2	45 56	– M33 x 2	– 45	36 46	85	130	95	42	G3/4	34	M27 x 2	91	134	62.5	2000
100	**56** **70**	M42 x 2 M48 x 2	56 63	– M42 x 2	– 56	46 60	106	158	120	47	G1	43	M33 x 2	108	162	75.5	3000
125	**70** **90**	M48 x 2 M64 x 3	63 85	– M48 x 2	– 63	60 75	132	192	150	47	G1	43	M33 x 2	121	174	92.5	3000
160	**90** **110**	M64 x 3 M80 x 3	85 95	– M64 x 3	– 85	75 95	160	238	190	58	G1 1/4	52	M42 x 2	143	191	115.5	3000
200	**110** **140**	M80 x 3 M100 x 3	95 112	– M80 x 3	– 95	95 120	200	285	230	58	G1 1/4	52	M42 x 2	190	224	138.5	3000

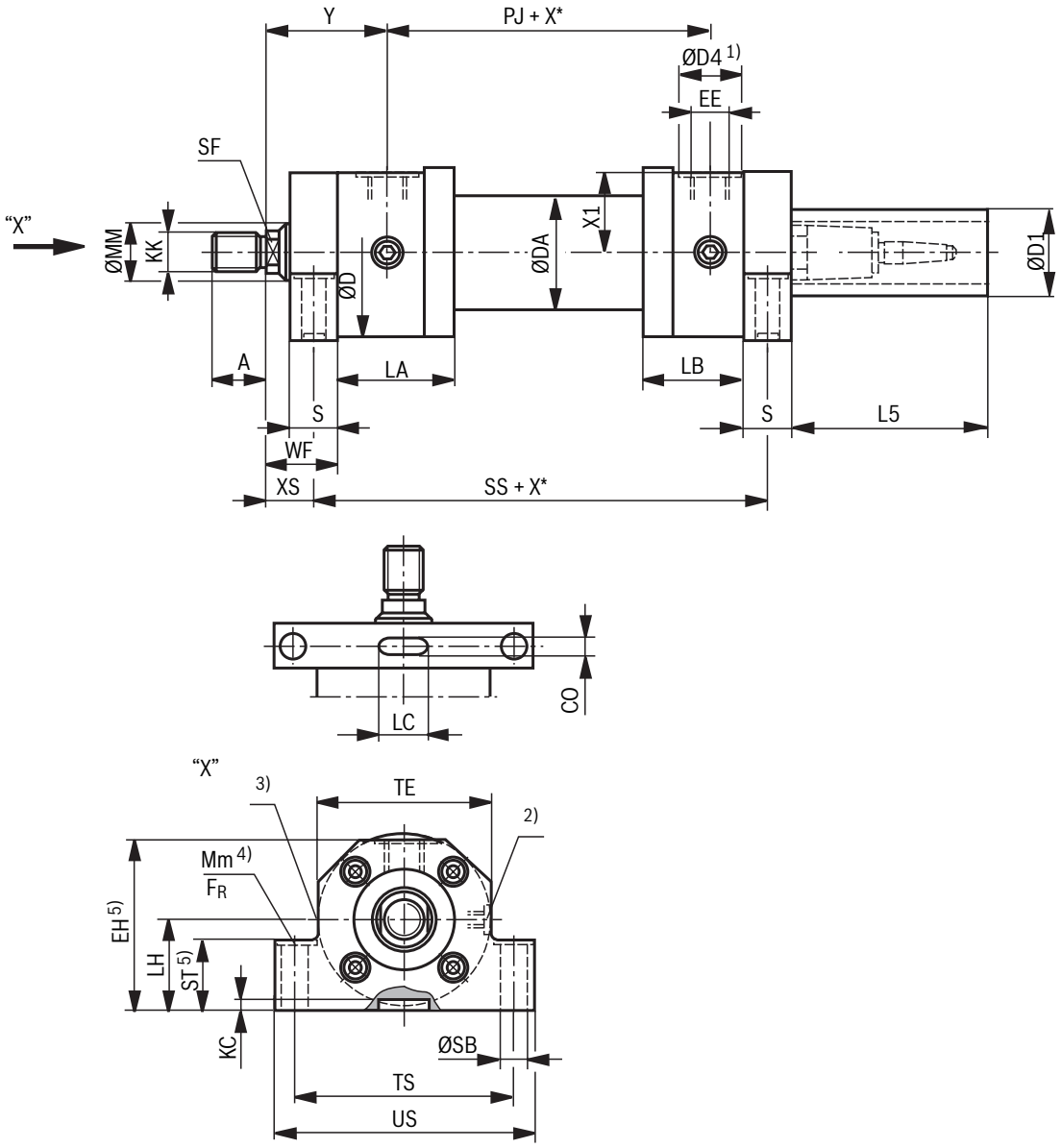
ØAL	ØMM	VE	WF [11]	ZC	BD	UV [10]	r	ØTD	TL	TM	XV [2]	XV [7]	X* [3]	ØD1	L5	LA	LE	L2
								f8	js13	h12	min.	max.	min.					
40	**28**	19	32	211	28	78	1	20	16	90	131	116+X*	23	80	166	73	77	0
50	**28** **36**	24	38	224	33	95	1	25	20	105	141.5	122.5+X*	28	96	166	74	81	0
63	**36** **45**	29	45	237	38	116	1.5	32	25	120	164	129+X*	47	96	166	84	85	0
80	**45** **56**	36	54	281	53	130	2	40	32	135	189.5	138.5+X*	63	96	166	93	112	10
100	**56** **70**	37	57	322	68	158	2	50	40	160	224	166+X*	70	96	166	117	118	0
125	**70** **90**	37	60	347	78	210	2.5	63	50	195	261	170+X*	106	96	166	143	134	0
160	**90** **110**	41	66	390	118	250	3	80	63	240	320	157+X*	163	96	166	171	150	0
200	**110** **140**	45	75	472	148	300	3	100	80	295	403	201+X*	202	96	166	230	173	0

ØAL = piston Ø
ØMM = piston rod Ø
X* = stroke length

1) ØD4 recess maximum 0.5 mm deep
2) When ordering, always specify the "XV" dimension in the plain text (observe XV_{min} and XV_{max})
3) Minimum stroke length "$X^*_{min.}$"
4) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
5) Throttle valve only with end position damping "E" (180° for bleeding)
6) Thread for piston rod end "G", "K" and "R"
7) Thread for piston rod end "H", "F" and "P"
8) Line connection "B"
9) Line connection "R"
10) Tolerance according to EN ISO 9013: Thermal cutting
11) Tolerances according to ISO 6020-1, see page 8

Dimensions: "MS2"
(dimensions in mm)

"MS2"



Dimensions: "MS2"
(dimensions in mm)

ØAL	ØMM	KK [6]	A [6]	KK [7]	A [7]	SF	ØD	ØDA	ØD4	EE	ØD4	EE	Y	PJ	X1	WF	XS	X*
		ISO 6020-1							1; 8)	8)	1; 9)	9)	10)	10)		10)	10)	max.
40	**28**	M20 x 1.5	28	M16 x 1.5	22	22	78	50	34	G1/2	29	M22 x 1.5	71	97	35.5	32	19.5	1000
50	**28** **36**	M20 x 1.5 M27 x 2	28 36	– M20 x 1.5	– 28	22 30	95	60	34	G1/2	29	M22 x 1.5	72	111	44.5	38	22	1000
63	**36** **45**	M27 x 2 M33 x 2	36 45	– M27 x 2	– 36	30 36	116	78	42	G3/4	34	M27 x 2	82	117	54.5	45	29	2000
80	**45** **56**	M33 x 2 M42 x 2	45 56	– M33 x 2	– 45	36 46	130	95	42	G3/4	34	M27 x 2	91	134	62.5	54	34	2000
100	**56** **70**	M42 x 2 M48 x 2	56 63	– M42 x 2	– 56	46 60	158	120	47	G1	43	M33 x 2	108	162	75.5	57	32	3000
125	**70** **90**	M48 x 2 M64 x 3	63 85	– M48 x 2	– 63	60 75	192	150	47	G1	43	M33 x 2	121	174	92.5	60	32	3000
160	**90** **110**	M64 x 3 M80 x 3	85 95	– M64 x 3	– 85	75 95	237	190	58	G1 1/4	52	M42 x 2	143	191	115.5	66	36	3000
200	**110** **140**	M80 x 3 M100 x 3	95 112	– M80 x 3	– 95	95 120	285	230	58	G1 1/4	52	M42 x 2	190	224	138.5	75	39	3000

ØAL	ØMM	SS	CO	LC	KC	EH [5]	LH	S	ØSB	ST [5]	TE	TS	US	ØD1	L5	LA	LB	FR [4]	Mm [4]
		10)	N9	+0.5	min.	–1	h10	js13	H13		js13	js13	max.					kN	Nm
40	**28**	183	8	36	4	77.5	43	25	11	32	78	100	120	80	166	73	56	7.90	60
50	**28** **36**	199	10	40	4.5	95	52	32	14	42	95	120	145	96	166	74	62	11.10	100
63	**36** **45**	211	10	40	4.5	113	62	32	18	50	116	150	180	96	166	84	72	21.15	250
80	**45** **56**	236	14	63	5	129	70	40	22	60	130	170	210	96	166	93	81	33.35	490
100	**56** **70**	293	16	70	6	153	82	50	26	70	158	205	250	96	138	117	96	48.30	850
125	**70** **90**	321	18	80	6	190	100	56	33	80	192	245	300	96	132	143	112	77.80	1710
160	**90** **110**	364	22	125	8	232	119	60	33	90	238	295	350	96	126	171	130	77.80	1710
200	**110** **140**	447	28	160	9	282	145	72	39	110	285	350	415	96	116	230	151	113.25	2970

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

1) ØD4 recess maximum 0.5 mm deep

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

3) Throttle valve only with end position damping "E" (180° for bleeding)

4) Recess maximum 2 mm deep, for hexagon socket head cap screw according to ISO 4762

5) Specified dimensions are smaller than the max. dimensions in ISO 6020-1

6) Thread for piston rod end "G", "K" and "R"

7) Thread for piston rod end "H", "F" and "P"

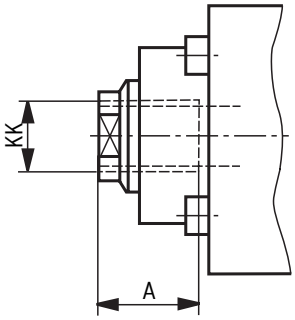
8) Line connection "B"

9) Line connection "R"

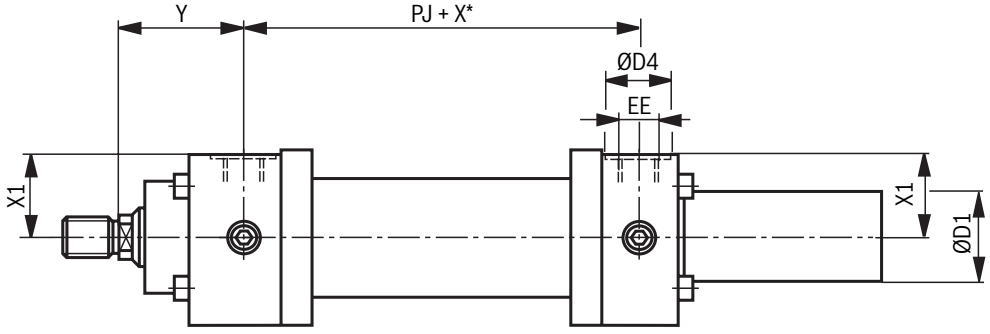
10) Tolerances according to ISO 6020-1, see page 8

Piston rod end "E"
(dimensions in mm)

ØAL	ØMM	KK	A
		ISO 6020-1	
40	**28**	M20 x 1.5	28
50	**28**	M20 x 1.5	28
	36	M27 x 2	36
63	**36**	M27 x 2	36
	45	M33 x 2	45
80	**45**	M33 x 2	45
	56	M42 x 2	56
100	**56**	M42 x 2	56
	70	M48 x 2	63
125	**70**	M48 x 2	63
	90	M64 x 3	85
160	**90**	M64 x 3	85
	110	M80 x 3	95
200	**110**	M80 x 3	95
	140	M100 x 3	112



Enlarged line connection
(dimensions in mm)

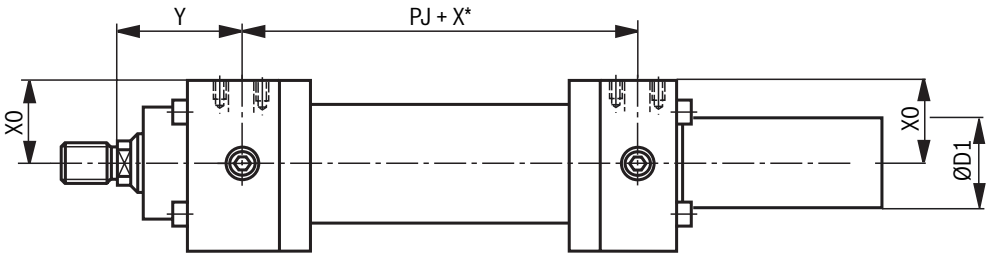


ØAL	Version "S" ISO 1179-1				
	EE	**ØD4** [1]	**Y**	**PJ**	**X1**
40	–	–	–	–	–
50	–	–	–	–	–
63	G1	47	80	121	53.5
80	G1	47	91	134	60.5
100	G1 1/4	58	108	162	74
125	G1 1/4	58	121	174	92
160	G1 1/2	65	143	191	114.5
200	G1 1/2	65	190	224	138.5

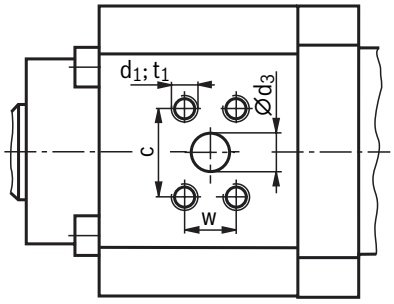
ØAL = piston Ø
ØMM = piston rod Ø
X* = stroke length
[1] ØD4 recess maximum 0.5 mm deep

☞ **Notice:**
For cylinder dimensions, see page 14 ... 23

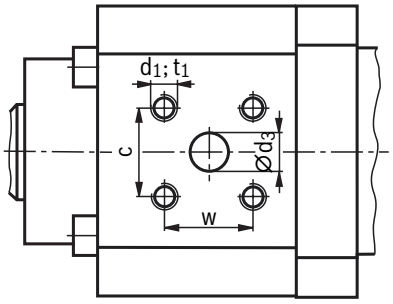
Flange connection
(dimensions in mm)



Dimensions for rectangular flange according to ISO 6162-1 (≙SAE 3000 PSI)



Dimensions for square flange according to ISO 6164



ØAL	Version "F" ISO 6162-1 (SAE 3000 PSI) [1]									Version "H" ISO 6164						
	Y	PJ	X0	Ød3	Ød3 [1]	c ±0.25	w ±0.25	d1	t1 [2]	Y	PJ	X0	Ød3	w ±0.25	d1	t1 [2]
40	–	–	–	–	–	–	–	–	–	69	101	34.5	10	24.7	M6	13
50	72	111	41	13	1/2"	38.1	17.5	M8	14	72	111	44	10	24.7	M6	13
63	82	117	52	13	1/2"	38.1	17.5	M8	16	82	117	52	13	29.7	M8	16
80	91	134	60	13	1/2"	38.1	17.5	M8	16	91	134	60	13	29.7	M8	16
100	108	162	72	19	3/4"	47.6	22.3	M10	20	108	162	72	19	35.4	M8	16
125	121	174	91	19	3/4"	47.6	22.3	M10	20	121	174	91	19	35.4	M8	16
160	143	191	114	25	1"	52.4	26.2	M10	20	143	191	114	25	43.8	M10	20
200	190	224	138	25	1"	52.4	26.2	M10	20	190	224	138	25	43.8	M10	20

ØAL = piston Ø

X* = stroke length

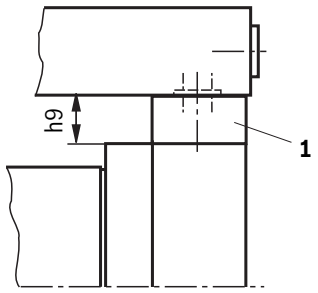
1) Flange connection according to ISO 6162-1 corresponds to flange connection according to SAE 3000 PSI

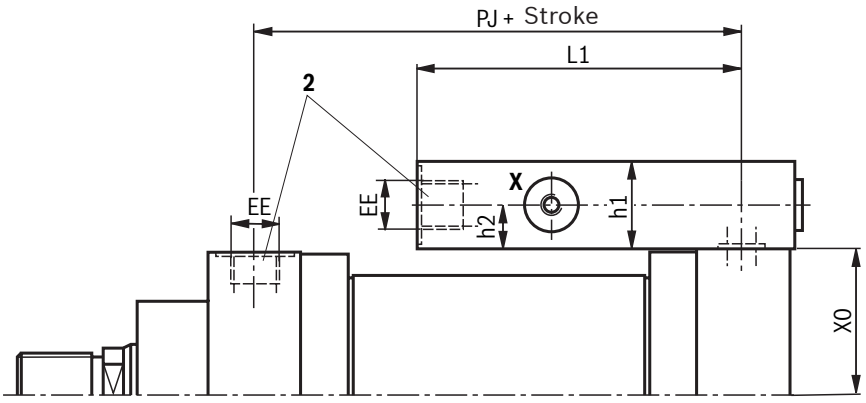
2) Thread depth

☞ **Notice:**
For cylinder dimensions, see page 14 ... 23

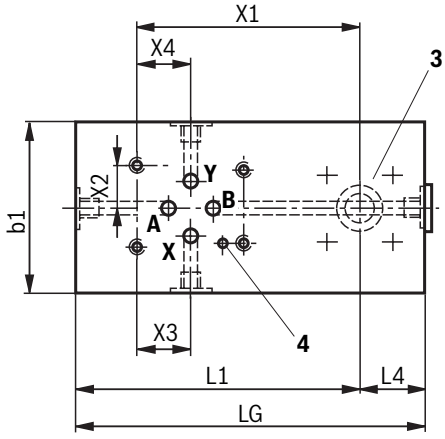
Subplates for valve mounting (check valves type SV and SL) (dimensions in mm)

Installation situation with MT4

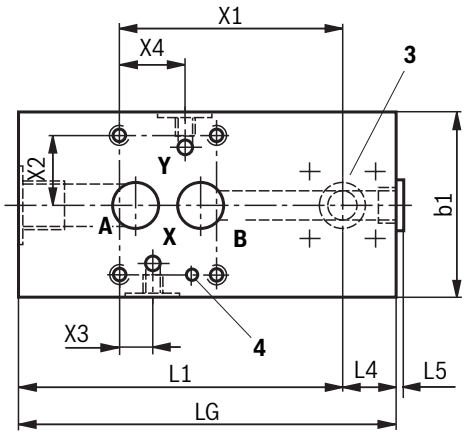




NG6
Dimensions according to DIN 24340 form A and ISO 4401



NG10 and 20
Dimensions according to DIN 24340 form D and ISO 5781



1 Adapter plate for type of mounting MT4 (included in the scope of delivery for MT4)
2 Line connection "B", dimensions see also page 14...23
3 Port "B" to the piston side according to ISO 6164
4 Bore for locking pin

Notice:
- Seal designs "T" and "S" are not designed for the static holding function.
- Valves, fittings and piping are not included in the scope of delivery.

Subplates for valve mounting (check valves type SV and SL)
(dimensions in mm)

ØAL	Valve size (NG)	PJ	EE	Minimum stroke [1]		X0
				[2]	[3]	
40	6	97	G1/2	100	100	34.5
50	6	111	G1/2	100	100	44
63	6	117	G3/4	100	100	52
	10	117	G3/4	100	100	52
80	6	134	G3/4	100	100	60
	10	134	G3/4	100	100	60
100	10	162	G1	100	100	72
125	10	174	G1	100	106	91
	20	174	G1	100	106	91
160	10	191	G1 1/4	100	163	114
	20	191	G1 1/4	100	163	114
200	10	224	G1 1/4	100	202	138
	20	224	G1 1/4	100	202	138

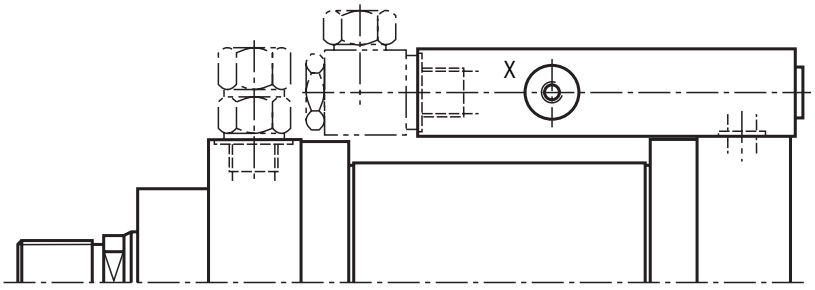
ØAL	Plate dimensions							Port size, porting pattern						Position point of valve	
	L1	L4	L5	LG	b1	h1	h9	h2	A	X	Y	X3	X4	X1	X2
40	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21.5	21.5	65.5	15.5
50	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21.5	21.5	65.5	15.5
63	100	25	5	125	55	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	70.5	15.5
	105	25	6	130	85	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	73	33.35
80	100	25	5	125	55	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	70.5	15.5
	105	25	5	130	85	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	73	33.35
100	102	28	5	130	85	50	10	25	G1	G1/4	G1/4	21.5	21.5	70	33.35
125	102	28	5	130	85	50	20	25	G1	G1/4	G1/4	21.5	21.5	70	33.35
	137	28	5	165	100	50	20	25	G1	G1/4	G1/4	20.6	39.5	92	39.7
160	115	35	5	150	85	60	20	30	G1 1/4	G1/4	G1/4	21.5	21.5	80	33.35
	140	35	5	175	100	60	20	30	G1 1/4	G1/4	G1/4	20.6	39.5	95	39.7
200	115	35	5	150	85	60	20	30	G1 1/4	G1/4	G1/4	21.5	21.5	80	33.35
	140	35	5	175	100	60	20	30	G1 1/4	G1/4	G1/4	20.6	39.5	95	39.7

ØAL = piston Ø

[1] The information only applies to the following connection situation, see representation.

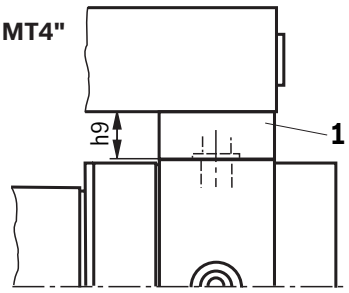
[2] Not for "MT4"

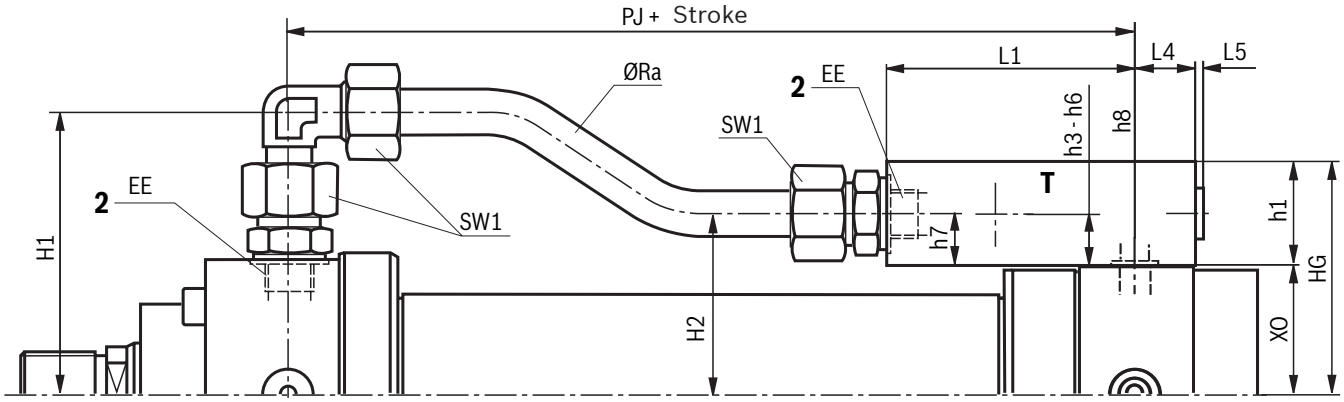
[3] Only for "MT4"



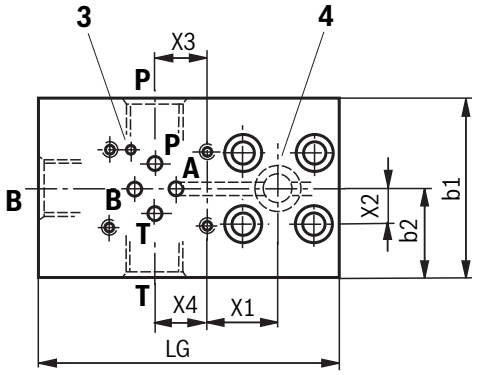
Subplates for valve mounting (switching and proportional directional valves) (dimensions in mm)

Installation situation with "MT4"

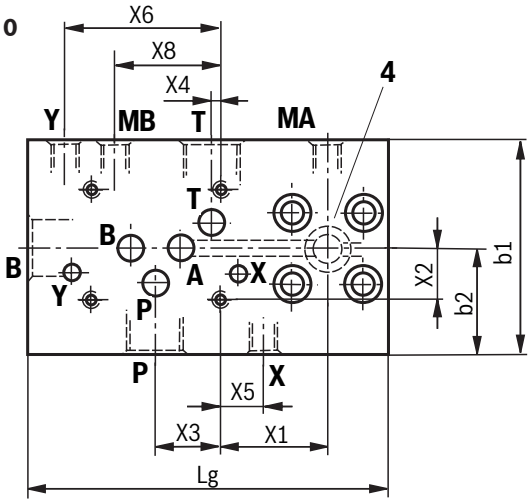




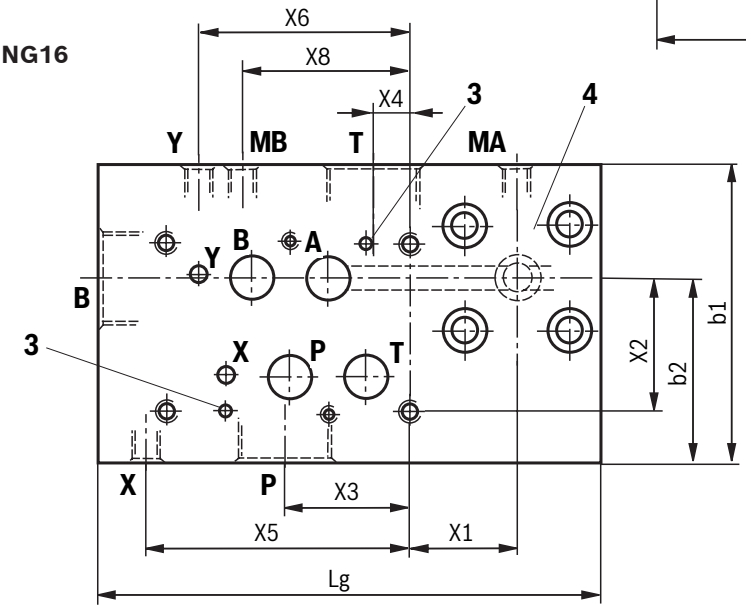
NG6



NG10



NG16



1 Adapter plate for type of mounting "MT4" (included in the scope of delivery for "MT4")

2 Line connection "B" (dimensions see also page 14...23)

3 Bore for locking pin

4 Line connection B to the piston side according to ISO 6164

Notice:
Porting pattern according to ISO 4401

Subplates for valve mounting (switching and proportional directional valves) (dimensions in mm)

ØAL	Valve size (NG)	PJ	EE	Minimum stroke	Plate and piping dimensions																
					L1	L4	$L5_{max.}$	H1	H2 [1]	H2 [2]	SW1	ØRa	b1	h1	lg	HG [1]	HG [2]	b2	X0	h7	h9
40	6	101	G1/2	225	90	20	4	90	54.5	64.5	30	16.0 x 2.5	65	40	110	74.5	84.5	32.5	34.5	20	10
50	6	111	G1/2	215	90	20	4	99	64	74	30	16.0 x 2.5	65	40	110	84	94	32.5	44	20	10
63	6	117	G3/4	250	100	25	5	119	74.5	84.5	36	20.0 x 3.0	75	45	125	97	107	37.5	52	22.5	10
	10	117	G3/4	275	125	25	5	119	75	85	36	20.0 x 3.0	90	70	150	122	132	45	52	23	10
80	6	134	G3/4	235	100	25	5	127	82.5	92.5	36	20.0 x 3.0	75	45	125	105	115	37.5	60	22.5	10
	10	134	G3/4	260	125	25	5	127	83	93	36	20.0 x 3.0	90	70	150	130	140	45	60	23	10
100	10	162	G1	280	132	28	5	148	102	112	46	25.0 x 4.0	90	80	160	152	162	45	72	30	10
125	10	174	G1	270	132	28	5	165	121	141	46	25.0 x 4.0	90	80	160	171	191	45	91	30	20
	16	174	G1	300	162	28	5	165	131	151	46	25.0 x 4.0	120	90	190	181	201	77.5	91	40	20
160	10	191	G1 1/4	295	135	35	5	193.5	149	169	50	30.0 x 5.0	105	95	170	209	229	55	114	35	20
	16	191	G1 1/4	335	175	35	5	193.5	159	179	50	30.0 x 5.0	125	100	210	214	234	77.5	114	45	20
200	10	224	G1 1/4	260	135	35	5	216.5	173	193	50	30.0 x 5.0	105	95	170	233	253	55	138	35	20
	16	224	G1 1/4	300	175	35	5	216.5	183	203	50	30.0 x 5.0	125	100	210	238	258	77.5	138	45	20

ØAL	Valve size (NG)	Port size, porting pattern															
		P	X3	h3	T	X4	h4	X	X5	h5	Y	X6	h6	MA	MB	X8	h8
40	6	G1/2	21.5	20	G1/2	21.5	20	–	–	–	–	–	–	–	–	–	–
50	6	G1/2	21.5	20	G1/2	21.5	20	–	–	–	–	–	–	–	–	–	–
63	6	G3/4	21.5	22.5	G3/4	21.5	22.5	–	–	–	–	–	–	–	–	–	–
	10	G3/4	27	33	G3/4	3.5	33	G1/4	18	47	G1/4	65	47	G1/4	G1/4	60	17
80	6	G3/4	21.5	22.5	G3/4	21.5	22.5	-	-	-	-	-	-	-	-	-	-
	10	G3/4	27	33	G3/4	3.5	33	G1/4	18	47	G1/4	65	47	G1/4	G1/4	60	17
100	10	G1	27	30	G1	3.5	40	G1/4	18	57	G1/4	65	57	G1/4	G1/4	58	20
125	10	G1	27	30	G1	3.5	40	G1/4	18	57	G1/4	65	57	G1/4	G1/4	58	20
	16	G1	50	26	G1	17.0	25	G1/4	105	45	G1/4	88	70	G1/4	G1/4	88	35
160	10	G1 1/4	27	35	G1 1/4	3.5	45	G1/4	20	72	G1/4	65	72	G1/4	G1/4	55	25
	16	G1 1/4	52	32	G1 1/4	15.0	32	G1/4	110	55	G1/4	88	80	G1/4	G1/4	88	40
200	10	G1 1/4	27	35	G1 1/4	3.5	45	G1/4	20	72	G1/4	65	72	G1/4	G1/4	55	25
	16	G1 1/4	52	32	G1 1/4	15.0	32	G1/4	110	55	G1/4	88	80	G1/4	G1/4	88	40

ØAL	Valve size (NG)	Position point of valve	
		X1	X2
40	6	25	15.5
50	6	25	15.5
63	6	30	15.5
	10	45	21.4
80	6	30	15.5
	10	45	21.4
100	10	52	21.4
125	10	52	21.4
	16	37	55.6
160	10	55	21.4
	16	45	55.6
200	10	55	21.4
	16	45	55.6

☞ **Notice:**
The dimensions h3, h4, h5, h6, h8 and X3, X4, X5, X6 determine the position of ports P, T, B, X, Y.

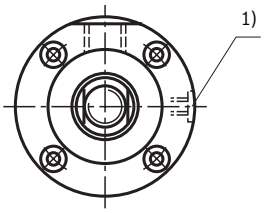
ØAL = piston Ø

[1] Not for "MT4"

[2] Only for "MT4"

Bleeding / measuring coupling
(dimensions in mm)

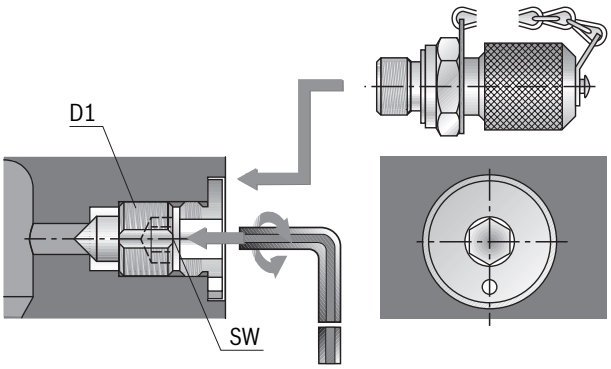
By default, a patented safety vent against unintended screwing out in head and base is delivered for piston Ø ≥ 40 mm.
The port allows for the installation of a measuring coupling with check valve for pressure measurement or contamination-free bleeding. Measuring coupling with check valve function, i.e. it can also be connected when the system is pressurized.



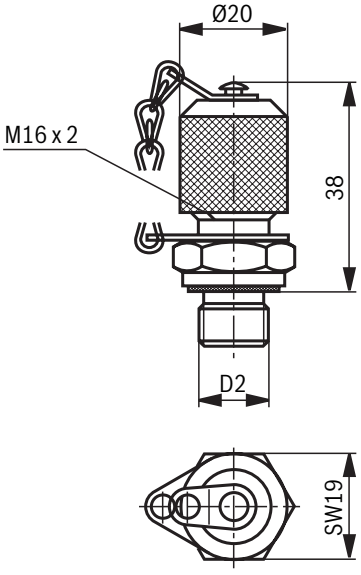
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

Connection possibility for measuring coupling

Piston Ø (AL) 40 ... 200 mm



ØAL	Bleed screw D1	Fuse	SW	Measuring coupling D2
40 and 50	G1/8	secured	5	G1/8
63 ... 200	G1/4	secured	6	G1/4



Scope of delivery: Measuring coupling **G1/8**
MEASURING COUPLING AB 20-11/K3 G1/8 with seal ring made of NBR
Material no. **R900014363**
MEASURING COUPLING AB 20-11/K3V G1/8 with seal ring made of FKM
Material no. **R900024710**

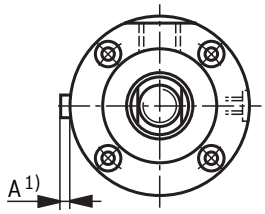
Scope of delivery: Measuring coupling **G1/4**
MEASURING COUPLING AB 20-11/K1 G1/4 with seal ring made of NBR
Material no. **R900009090**
MEASURING COUPLING AB 20-11/K1V G1/4 with seal ring made of FKM
Material no. **R900001264**

Throttle valve
(dimensions in mm)

ØAL	40	50	63	80	100	125	160	200
Protrusion A [1]	5.5	1.5	0	0	0	0	0	0

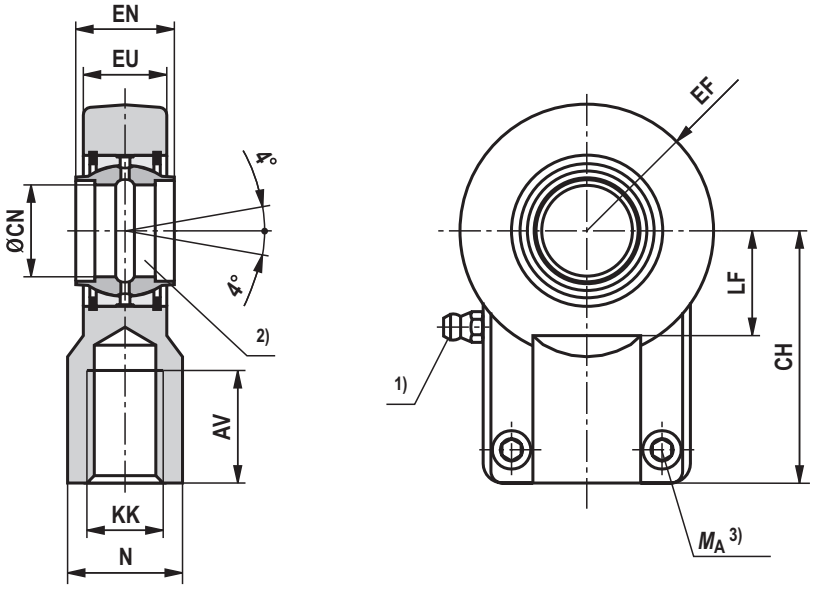
ØAL = piston Ø

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



Swivel head CGKD (clampable)
(dimensions in mm)

ISO 8132



ØAL	ØMM	Type	Material no.	Nominal force kN	AV min.	N max.	CH js13	EF max.	ØCN H7 2)	EN h12	EU max.
40	28	CGKD 20 4)	R900308576	20	23	28	52	25	20	20	17.5
	28	CGKD 25	R900323332	32	29	31	65	32	25	25	22
50	28	CGKD 25	R900323332	32	29	31	65	32	25	25	22
	36	CGKD 25	R900323332	32	29	31	65	32	25	25	22
	36	CGKD 32	R900322049	50	37	38	80	40	32	32	28
63	36	CGKD 32	R900322049	50	37	38	80	40	32	32	28
	45	CGKD 32	R900322049	50	37	38	80	40	32	32	28
	45	CGKD 40	R900322029	80	46	47	97	50	40	40	34
80	45	CGKD 40	R900322029	80	46	47	97	50	40	40	34
	56	CGKD 40	R900322029	80	46	47	97	50	40	40	34
	56	CGKD 50	R900322719	125	57	58	120	63	50	50	42
100	56	CGKD 50	R900322719	125	57	58	120	63	50	50	42
	70	CGKD 50	R900322719	125	57	58	120	63	50	50	42
	70	CGKD 63	R900322028	200	64	70	140	72.5	63	63	53.5
125	70	CGKD 63	R900322028	200	64	70	140	72.5	63	63	53.5
	90	CGKD 63	R900322028	200	64	70	140	72.5	63	63	53.5
	90	CGKD 80	R900322700	320	86	91	180	92	80	80	68
160	90	CGKD 80	R900322700	320	86	91	180	92	80	80	68
	110	CGKD 80	R900322700	320	86	91	180	92	80	80	68
	110	CGKD 100	R900322030	500	96	110	210	114	100	100	85.5
200	110	CGKD 100	R900322030	500	96	110	210	114	100	100	85.5
	140	CGKD 100	R900322030	500	96	110	210	114	100	100	85.5
	140	CGKD 125	R900322026	800	113	135	260	160	125	125	105

Swivel head CGKD (clampable)
(dimensions in mm)

ØAL	ØMM	Type	KK 6H	LF min.	Clamping screw ISO 4762-10.9	M_A [3] Nm	*m* [5] kg	C_0 [6] kN	F_{adm} [7] kN
40	**28**	**CGKD 20** [4]	M16x1.5	20.5	M8x20	25	0.35	48	17.7
	28	**CGKD 25**	M20x1.5	25.5	M8x20	30	0.65	78	28.8
50	**28**	**CGKD 25**	M20x1.5	25.5	M8x20	30	0.65	78	28.8
	36	**CGKD 25**	M20x1.5	25.5	M8x20	30	0.65	78	28.8
	36	**CGKD 32**	M27x2	30	M10x25	59	1.15	114	42.1
63	**36**	**CGKD 32**	M27x2	30	M10x25	59	1.15	114	42.1
	45	**CGKD 32**	M27x2	30	M10x25	59	1.15	114	42.1
	45	**CGKD 40**	M33x2	39	M10x30	59	2.1	204	75.3
80	**45**	**CGKD 40**	M33x2	39	M10x30	59	2.1	204	75.3
	56	**CGKD 40**	M33x2	39	M10x30	59	2.1	204	75.3
	56	**CGKD 50**	M42x2	47	M12x35	100	4	310	114.4
100	**56**	**CGKD 50**	M42x2	47	M12x35	100	4	310	114.4
	70	**CGKD 50**	M42x2	47	M12x35	100	4	310	114.4
	70	**CGKD 63**	M48x2	58	M16x40	250	7.2	430	158.7
125	**70**	**CGKD 63**	M48x2	58	M16x40	250	7.2	430	158.7
	90	**CGKD 63**	M48x2	58	M16x40	250	7.2	430	158.7
	90	**CGKD 80**	M64x3	74	M20x50	490	15	695	265.5
160	**90**	**CGKD 80**	M64x3	74	M20x50	490	15	695	265.5
	110	**CGKD 80**	M64x3	74	M20x50	490	15	695	265.5
	110	**CGKD 100**	M80x3	94	M24x60	840	25.5	1060	391.1
200	**110**	**CGKD 100**	M80x3	94	M24x60	840	25.5	1060	391.1
	140	**CGKD 100**	M80x3	94	M24x60	840	25.5	1060	391.1
	140	**CGKD 125**	M100x3	116	M24x70	840	52.5	1430	527.7

ØAL = piston Ø

ØMM = piston rod Ø

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

2) Related bolt Ø m6

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

4) Flat type grease nipple not possible

5) ***m*** = mass of swivel head in kg

6) C_0 = static load rating of the swivel head

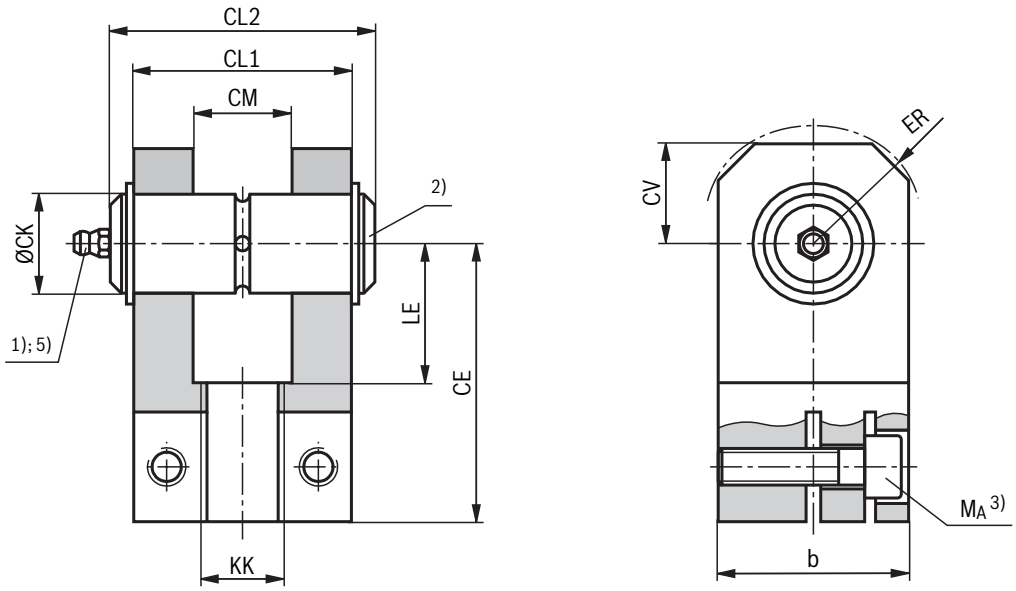
7) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

8) Bearing cannot be re-lubricated

☞ **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.

Fork clevis CCKB (clampable)
(dimensions in mm)

ISO 8132



ØAL	ØMM	Type	Material no.	Nominal force kN	b max.	CE js13	ØCK H9 2)	CL1 h16	CL2 max.	CM A13	ER max.
40	28	CCKB 20	R900542844	20	40	52	20	45	72	20	25
	28	CCKB 25	R900542845	32	50	65	25	56	84	25	32
50	28	CCKB 25	R900542845	32	50	65	25	56	84	25	32
	36	CCKB 25	R900542845	32	50	65	25	56	84	25	32
	36	CCKB 32	R900542846	50	65	80	32	70	105	32	40
63	36	CCKB 32	R900542846	50	65	80	32	70	105	32	40
	45	CCKB 32	R900542846	50	65	80	32	70	105	32	40
	45	CCKB 40	R900542847	80	80	97	40	90	133	40	50
80	45	CCKB 40	R900542847	80	80	97	40	90	133	40	50
	56	CCKB 40	R900542847	80	80	97	40	90	133	40	50
	56	CCKB 50	R900542848	125	100	120	50	110	165	50	63
100	56	CCKB 50	R900542848	125	100	120	50	110	165	50	63
	70	CCKB 50	R900542848	125	100	120	50	110	165	50	63
	70	CCKB 63	R900542849	200	140	140	63	140	185	63	71
125	70	CCKB 63	R900542849	200	140	140	63	140	185	63	71
	90	CCKB 63	R900542849	200	140	140	63	140	185	63	71
	90	CCKB 80	R900542850	320	180	180	80	170	225	80	90
160	90	CCKB 80	R900542850	320	180	180	80	170	225	80	90
	110	CCKB 80	R900542850	320	180	180	80	170	225	80	90
	110	CCKB 100	6)	500	220	210	100	210	6)	100	110
200	110	CCKB 100	6)	500	220	210	100	210	6)	100	110
	140	CCKB 100	6)	500	220	210	100	210	6)	100	110

Fork clevis CCKB (clampable)
(dimensions in mm)

ØAL	ØMM	Type	KK 6H	LE min.	CV max.	Clamping screw ISO 4762-10.9	M_A [3] Nm	*m* [4] kg
40	**28**	**CCKB 20**	M16x1.5	27	25	M8x30	25	0.7
	28	**CCKB 25**	M20x1.5	34	32	M10x35	49	1.4
50	**28**	**CCKB 25**	M20x1.5	34	32	M10x35	49	1.4
	36	**CCKB 25**	M20x1.5	34	32	M10x35	49	1.4
	36	**CCKB 32**	M27x2	41	40	M12x40	85	2.8
63	**36**	**CCKB 32**	M27x2	41	40	M12x40	85	2.8
	45	**CCKB 32**	M27x2	41	40	M12x40	85	2.8
	45	**CCKB 40**	M33x2	51	50	M16x50	210	5.2
80	**45**	**CCKB 40**	M33x2	51	50	M16x50	210	5.2
	56	**CCKB 40**	M33x2	51	50	M16x50	210	5.2
	56	**CCKB 50**	M42x2	63	63	M20x60	425	9.5
100	**56**	**CCKB 50**	M42x2	63	63	M20x60	425	9.5
	70	**CCKB 50**	M42x2	63	63	M20x60	425	9.5
	70	**CCKB 63**	M48x2	75	71	M24x80	730	21.5
125	**70**	**CCKB 63**	M48x2	75	71	M24x80	730	21.5
	90	**CCKB 63**	M48x2	75	71	M24x80	730	21.5
	90	**CCKB 80**	M64x3	94	90	M30x100	1450	38.2
160	**90**	**CCKB 80**	M64x3	94	90	M30x100	1450	38.2
	110	**CCKB 80**	M64x3	94	90	M30x100	1450	38.2
	110	**CCKB 100**	M80x3	114	110	M36x130	2480	[6]
200	**110**	**CCKB 100**	M80x3	114	110	M36x130	2480	[6]
	140	**CCKB 100**	M80x3	114	110	M36x130	2480	[6]

ØAL = piston Ø

ØMM = piston rod Ø

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

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

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

4) ***m*** = mass of the fork clevis in kg

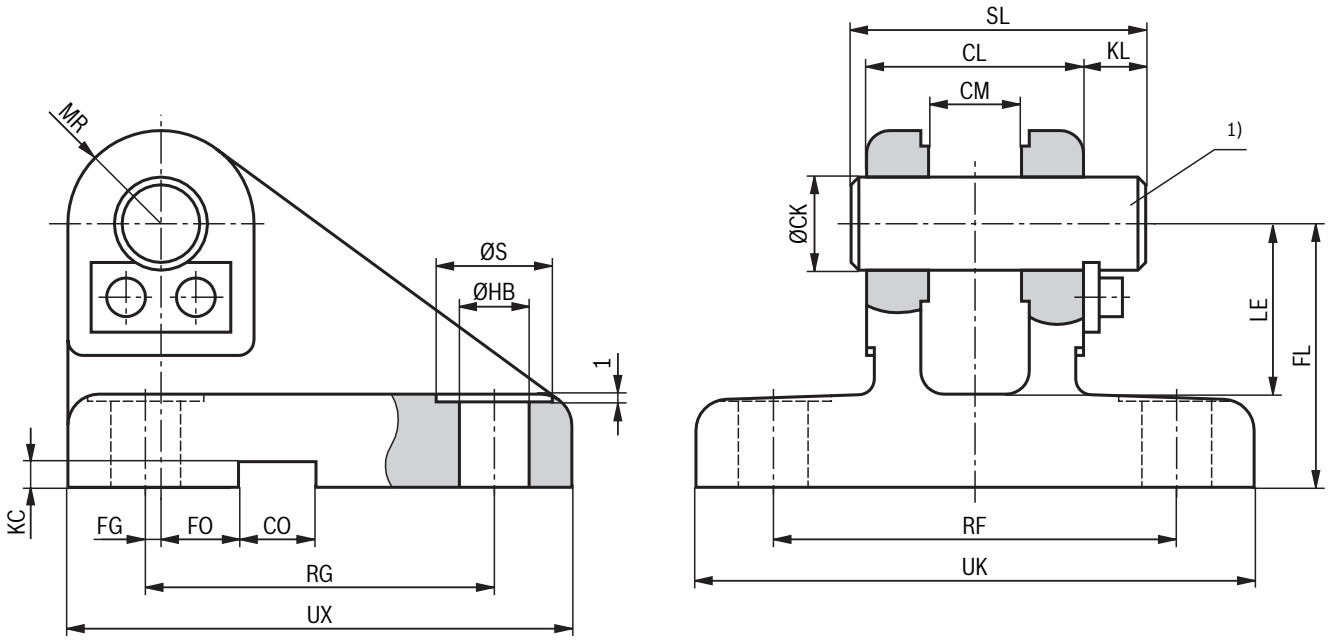
5) Without lubrication bore

6) On request

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

Clevis bracket CLCA
(dimensions in mm)

ISO 8132, form B



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 [1]	CL h16	CM A13	CO N9	FG JS14	FL js13	FO JS14
40	28	CLCA 20	R900542863	20	20	45	20	16	7.5	45	10
	28	CLCA 25	R900542864	32	25	56	25	25	10	55	10
50	28	CLCA 25	R900542864	32	25	56	25	25	10	55	10
	36	CLCA 25	R900542864	32	25	56	25	25	10	55	10
	36	CLCA 32	R900542865	50	32	70	32	25	14.5	65	6
63	36	CLCA 32	R900542865	50	32	70	32	25	14.5	65	6
	45	CLCA 32	R900542865	50	32	70	32	25	14.5	65	6
	45	CLCA 40	R900542866	80	40	90	40	36	17.5	76	6
80	45	CLCA 40	R900542866	80	40	90	40	36	17.5	76	6
	56	CLCA 40	R900542866	80	40	90	40	36	17.5	76	6
	56	CLCA 50	R900542867	125	50	110	50	36	25	95	0
100	56	CLCA 50	R900542867	125	50	110	50	36	25	95	0
	70	CLCA 50	R900542867	125	50	110	50	36	25	95	0
	70	CLCA 63	R900542868	200	63	140	63	50	33	112	0
125	70	CLCA 63	R900542868	200	63	140	63	50	33	112	0
	90	CLCA 63	R900542868	200	63	140	63	50	33	112	0
	90	CLCA 80	R900542869	320	80	170	80	50	45	140	0
160	90	CLCA 80	R900542869	320	80	170	80	50	45	140	0
	110	CLCA 80	R900542869	320	80	170	80	50	45	140	0
	110	CLCA 100	[3]	500	100	210	100	63	52.5	180	0
200	110	CLCA 100	[3]	500	100	210	100	63	52.5	180	0
	140	CLCA 100	[3]	500	100	210	100	63	52.5	180	0
	140	CLCA 125	[3]	800	125	270	125	80	75	230	0

Clevis bracket CLCA
(dimensions in mm)

ØAL	ØMM	Type	ØHB H13	KC +0.3	KL	LE min.	MR max.	RF js13	RG js13	ØS	SL	UK max.	UX max.	*m* [2] kg
40	**28**	**CLCA 20**	11	4.3	10	30	20	75	70	18	58	100	95	1.5
	28	**CLCA 25**	13.5	5.4	10	37	25	90	85	20	69	120	115	3
50	**28**	**CLCA 25**	13.5	5.4	10	37	25	90	85	20	69	120	115	3
	36	**CLCA 25**	13.5	5.4	10	37	25	90	85	20	69	120	115	3
	36	**CLCA 32**	17.5	5.4	13	43	32	110	110	26	87	145	145	5
63	**36**	**CLCA 32**	17.5	5.4	13	43	32	110	110	26	87	145	145	5
	45	**CLCA 32**	17.5	5.4	13	43	32	110	110	26	87	145	145	5
	45	**CLCA 40**	22	8.4	16	52	40	140	125	33	110	185	170	9.6
80	**45**	**CLCA 40**	22	8.4	16	52	40	140	125	33	110	185	170	9.6
	56	**CLCA 40**	22	8.4	16	52	40	140	125	33	110	185	170	9.6
	56	**CLCA 50**	26	8.4	19	65	50	165	150	40	133	215	200	15.5
100	**56**	**CLCA 50**	26	8.4	19	65	50	165	150	40	133	215	200	15.5
	70	**CLCA 50**	26	8.4	19	65	50	165	150	40	133	215	200	15.5
	70	**CLCA 63**	33	11.4	20	75	63	210	170	48	164	270	230	27.5
125	**70**	**CLCA 63**	33	11.4	20	75	63	210	170	48	164	270	230	27.5
	90	**CLCA 63**	33	11.4	20	75	63	210	170	48	164	270	230	27.5
	90	**CLCA 80**	39	11.4	26	95	80	250	210	57	202	320	280	47
160	**90**	**CLCA 80**	39	11.4	26	95	80	250	210	57	202	320	280	47
	110	**CLCA 80**	39	11.4	26	95	80	250	210	57	202	320	280	47
	110	**CLCA 100**	52	12.4	30	120	100	315	250	76	246	405	345	[3]
200	**110**	**CLCA 100**	52	12.4	30	120	100	315	250	76	246	405	345	[3]
	140	**CLCA 100**	52	12.4	30	120	100	315	250	76	246	405	345	[3]
	140	**CLCA 125**	52	15.4	32	170	125	365	350	76	310	455	450	[3]

ØAL = piston Ø

ØMM = piston rod Ø

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

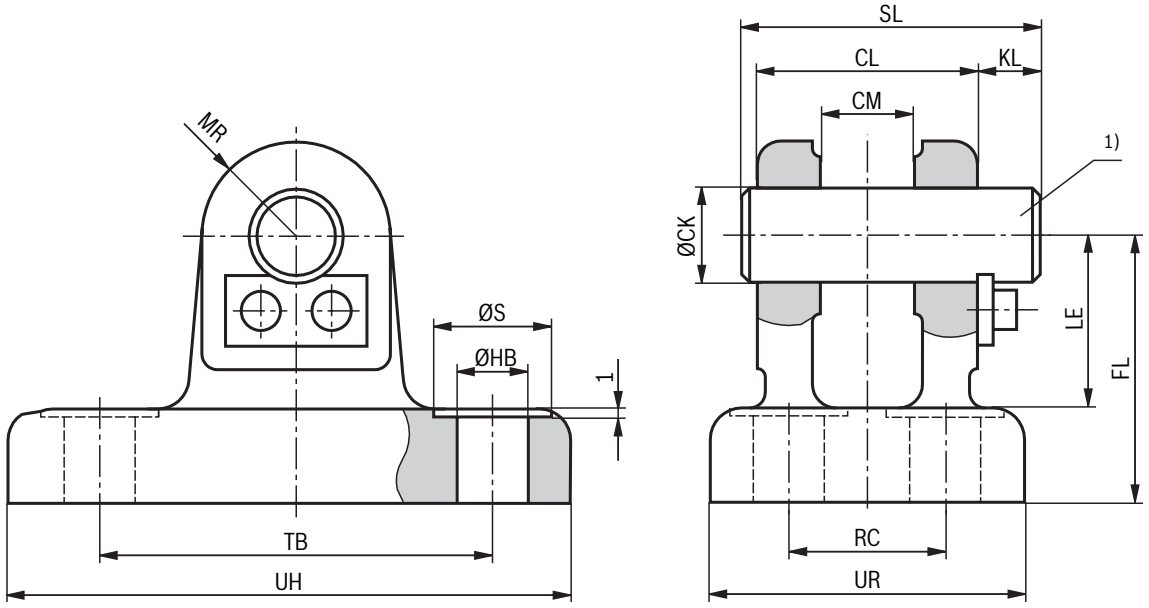
[2] ***m*** = mass of clevis bracket in kg

[3] On request

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

Clevis bracket CLCD
(dimensions in mm)

ISO 8132, form A



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 [1]	CL h16	CM A13	FL js12	ØHB H13	KL
40	28	CLCD 20	R900542881	20	20	45	20	45	11	10
	28	CLCD 25	R900542882	32	25	56	25	55	13.5	10
50	28	CLCD 25	R900542882	32	25	56	25	55	13.5	10
	36	CLCD 25	R900542882	32	25	56	25	55	13.5	10
	36	CLCD 32	R900542883	50	32	70	32	65	17.5	13
63	36	CLCD 32	R900542883	50	32	70	32	65	17.5	13
	45	CLCD 32	R900542883	50	32	70	32	65	17.5	13
	45	CLCD 40	R900542884	80	40	90	40	76	22	16
80	45	CLCD 40	R900542884	80	40	90	40	76	22	16
	56	CLCD 40	R900542884	80	40	90	40	76	22	16
	56	CLCD 50	R900542885	125	50	110	50	95	26	19
100	56	CLCD 50	R900542885	125	50	110	50	95	26	19
	70	CLCD 50	R900542885	125	50	110	50	95	26	19
	70	CLCD 63	R900542886	200	63	140	63	112	33	20
125	70	CLCD 63	R900542886	200	63	140	63	112	33	20
	90	CLCD 63	R900542886	200	63	140	63	112	33	20
	90	CLCD 80	R900542887	320	80	170	80	140	39	26
160	90	CLCD 80	R900542887	320	80	170	80	140	39	26
	110	CLCD 80	R900542887	320	80	170	80	140	39	26
	110	CLCD 100	[3]	500	100	210	100	180	45	30
200	110	CLCD 100	[3]	500	100	210	100	180	45	30
	140	CLCD 100	[3]	500	100	210	100	180	45	30
	140	CLCD 125	[3]	800	125	270	125	230	52	32

Clevis bracket CLCD
(dimensions in mm)

ØAL	ØMM	Type	LE min.	MR max.	RC JS14	ØS	SL	TB JS14	UR max.	UH max.	*m* [2] kg
40	**28**	**CLCD 20**	30	20	32	18	58	75	58	98	0.95
	28	**CLCD 25**	37	25	40	20	69	85	70	113	1.9
50	**28**	**CLCD 25**	37	25	40	20	69	85	70	113	1.9
	36	**CLCD 25**	37	25	40	20	69	85	70	113	1.9
	36	**CLCD 32**	43	32	50	26	87	110	85	143	3
63	**36**	**CLCD 32**	43	32	50	26	87	110	85	143	3
	45	**CLCD 32**	43	32	50	26	87	110	85	143	3
	45	**CLCD 40**	52	40	65	33	110	130	108	170	5.5
80	**45**	**CLCD 40**	52	40	65	33	110	130	108	170	5.5
	56	**CLCD 40**	52	40	65	33	110	130	108	170	5.5
	56	**CLCD 50**	65	50	80	40	133	170	130	220	10.6
100	**56**	**CLCD 50**	65	50	80	40	133	170	130	220	10.6
	70	**CLCD 50**	65	50	80	40	133	170	130	220	10.6
	70	**CLCD 63**	75	63	100	48	164	210	160	270	17
125	**70**	**CLCD 63**	75	63	100	48	164	210	160	270	17
	90	**CLCD 63**	75	63	100	48	164	210	160	270	17
	90	**CLCD 80**	95	80	125	57	202	250	210	320	32
160	**90**	**CLCD 80**	95	80	125	57	202	250	210	320	32
	110	**CLCD 80**	95	80	125	57	202	250	210	320	32
	110	**CLCD 100**	120	100	160	66	246	315	260	400	[3]
200	**110**	**CLCD 100**	120	100	160	66	246	315	260	400	[3]
	140	**CLCD 100**	120	100	160	66	246	315	260	400	[3]
	140	**CLCD 125**	170	125	200	76	310	385	320	470	[3]

ØAL = piston Ø

ØMM = piston rod Ø

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

[2] ***m*** = mass of clevis bracket in kg

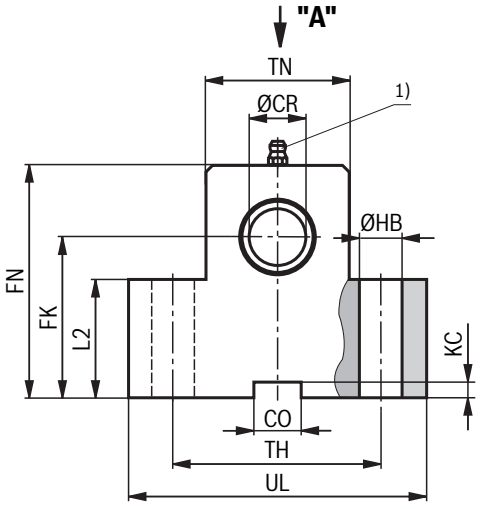
[3] On request

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

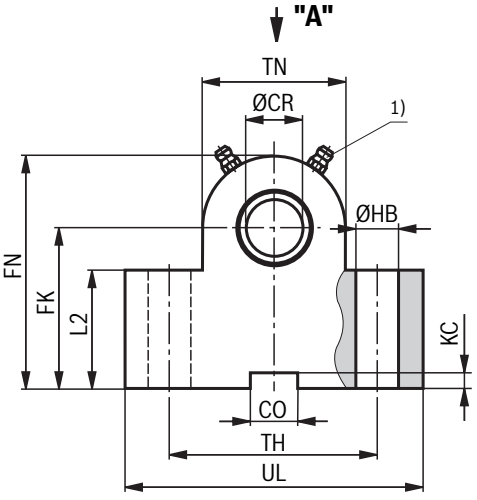
Trunnion mounting bearing bracket CLTB
(dimensions in mm)

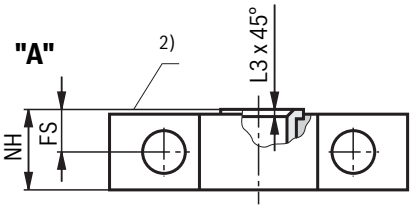
ISO 8132, form A

CLTB 12 ... 20



CLTB 25 ... 110





ØAL	Type [3]	Material no.	Nominal force kN [4]	ØCR H7	CO N9	FK JS12	FN max.	FS js13	ØHB H13	KC +0.3
40	**CLTB 20**	R900772609	20	20	16	45	70	10	11	4.3
50	**CLTB 25**	R900772610	32	25	25	55	80	12	13.5	5.4
63	**CLTB 32**	R900772611	50	32	25	65	100	15	17.5	5.4
80	**CLTB 40**	R900772612	80	40	36	76	120	16	22	8.4
100	**CLTB 50**	R900772613	125	50	36	95	140	20	26	8.4
125	**CLTB 63**	R900772614	200	63	50	112	180	25	33	11.4
160	**CLTB 80**	R900772615	320	80	50	140	220	31	39	11.4
200	**CLTB 100**	R901205929	500	100	63	180	280	45	52	12.4

Trunnion mounting bearing bracket CLTB
(dimensions in mm)

ØAL	Type [3]	TN max.	L2	L3	NH max.	TH js13	UL max.	*m* [5] kg
40	**CLTB 20**	41	38	1.5	21	60	90	1.2
50	**CLTB 25**	56	45	1.5	26	80	110	2.1
63	**CLTB 32**	70	52	2	33	110	150	4.55
80	**CLTB 40**	88	60	2.5	41	125	170	7.3
100	**CLTB 50**	105	75	2.5	51	160	210	14.5
125	**CLTB 63**	130	85	3	61	200	265	23.1
160	**CLTB 80**	170	112	3.5	81	250	325	52.3
200	**CLTB 100**	215	145	4.5	102	295	385	[6]

ØAL = piston Ø

[1] Grease nipple, cone head form A according to DIN 71412

[2] Trunnion mounting contact surface (inside)

[3] Bearing blocks are always supplied in pairs

[4] Nominal force applies to applications in pairs

[5] ***m*** = mass of trunnion mounting bearing block in kg (specified per pair)

[6] On request

☞ **Notice:**
Geometry and dimensions may differ depending on the manufacturer. All graphical representations are examples. In case of combination with other mounting elements, the usability must be checked.
The trunnion mounting bearing blocks are suitable for attachment in case of type of mounting "MT4".

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

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

2. Calculation according to Tetmajer

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

E Module of elasticity in N/mm²
= 2.1 x 10^5 for steel

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

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

v 3.5 (safety factor)

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

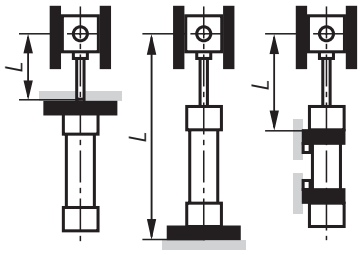
d Piston rod Ø in mm

λ Slenderness ratio

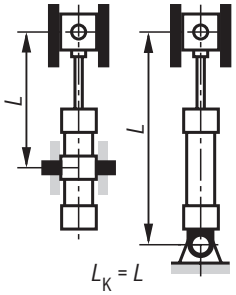
$$= \frac{4 \cdot L_K}{d} \qquad \lambda_g = \pi \cdot \sqrt{\frac{E}{0{,}8 \cdot R_e}}$$

$\boldsymbol{R_e}$ Yield strength of the piston rod material

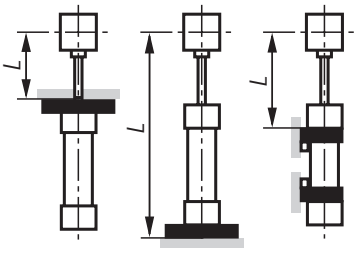
Influence of the type of mounting on the buckling length:



$L_K = 0{,}7\,L$



$L_K = L$



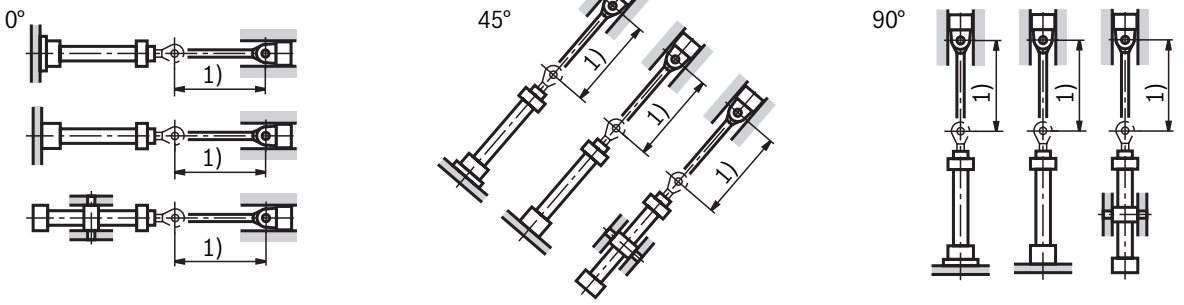
$L_K = 2\,L$

Buckling
(dimensions in mm)

Type of mounting "MT4" trunnion mounting (with $XV_{max.}$)

ØAL	ØMM	admissible stroke length with								
		70 bar			100 bar			160 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	**28**	640	680	875	575	600	710	475	490	535
50	**28**	540	560	665	465	480	535	365	370	390
	36	845	895	1180	765	805	970	645	665	735
63	**36**	705	740	900	620	640	725	500	510	540
	45	1030	1100	1480	945	990	1220	805	830	930
80	**45**	855	900	1120	760	790	905	615	630	680
	56	1230	1310	1700	1130	1190	1490	975	1010	1140
100	**56**	1030	1090	1390	925	965	1130	760	780	850
	70	1500	1590	2000	1380	1460	1880	1200	1250	1440
125	**70**	1280	1360	1770	1160	1210	1450	970	995	1090
	90	1900	2030	2300	1770	1880	2300	1570	1640	1950
160	**90**	1620	1710	2320	1470	1540	1900	1250	1290	1440
	110	2200	2350	2600	2060	2180	2600	1820	1900	2280
200	**110**	1890	2010	2760	1730	1820	2260	1470	1520	1720
	140	2720	2910	3000	2560	2720	3000	2290	2400	2980

Installation position



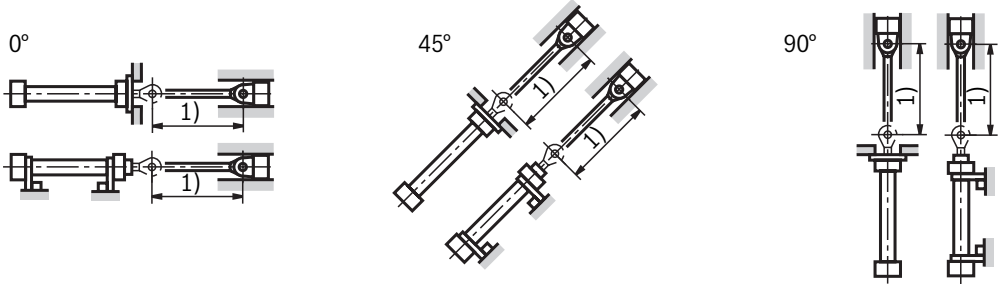
1) Admissible stroke length

Buckling
(dimensions in mm)

Type of mounting "MF1", "MF3", "MS2"

ØAL	ØMM	admissible stroke length with								
		70 bar			100 bar			160 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	**28**	775	810	980	700	725	815	590	600	635
50	**28**	670	690	770	590	600	640	475	485	495
	36	975	1020	1300	890	925	1080	765	785	845
63	**36**	845	880	1000	750	770	830	615	625	645
	45	1170	1230	1400	1070	1120	1330	920	950	1040
80	**45**	1020	1060	1240	910	935	1020	750	765	795
	56	1390	1470	1700	1280	1340	1620	1110	1150	1270
100	**56**	1240	1290	1540	1110	1150	1280	930	940	990
	70	1680	1780	2000	1560	1640	2000	1370	1410	1590
125	**70**	1510	1570	1920	1360	1400	1590	1140	1160	1240
	90	2090	2220	2300	1960	2060	2300	1740	1810	2110
160	**90**	1880	1980	2500	1720	1780	2070	1460	1500	1610
	110	2430	2580	2600	2280	2400	2600	2600	2110	2460
200	**110**	2210	2320	2980	2020	2100	2470	1730	1770	1920
	140	2980	3000	3000	2810	2980	3000	2540	2650	3000

Installation position



1) Admissible stroke length

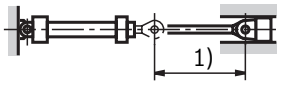
Buckling
(dimensions in mm)

Type of mounting "MP3", "MP5"

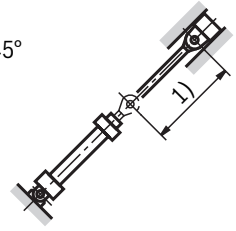
ØAL	ØMM	admissible stroke length with								
		70 bar			100 bar			160 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	**28**	445	465	560	385	395	445	295	305	320
50	**28**	350	360	405	285	290	315	205	210	215
	36	600	630	770	525	540	615	415	425	455
63	**36**	470	490	560	395	405	440	290	292	310
	45	740	780	970	650	680	780	525	535	580
80	**45**	575	600	700	490	505	555	370	375	390
	56	890	935	1190	790	820	960	640	660	715
100	**56**	705	735	880	600	620	695	460	470	495
	70	1085	1150	1500	970	1015	1215	800	825	910
125	**70**	890	935	1135	770	800	905	605	615	655
	90	1400	1490	2030	1270	1340	1660	1070	1110	1250
160	**90**	1130	1190	1490	990	1030	1190	790	810	870
	110	1620	1720	2370	1470	1550	1930	1240	1290	1450
200	**110**	1320	1390	1770	1160	1210	1420	930	955	1040
	140	2010	2140	3000	1850	1950	2520	1580	1650	1910

Installation position

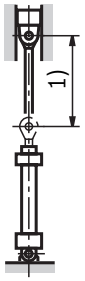
0°



45°



90°



1) Admissible stroke length

End position damping

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 hydraulic cylinder nor the machine into which the hydraulic 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 verified whether end position damping is also required for lower velocities with large masses.

Damping capacity

When decelerating masses via end position damping, the structural-inherent damping capacity must not be exceeded. Hydraulic cylinder with end position damping can achieve their full damping capacity only over the entire stroke 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. The maximum damping capacity can only be achieved when the throttle valve is closed.
The calculation depends on the factors mass, velocity, system pressure and installation position. For this reason, mass and velocity are used to determine the characteristic D_m and system pressure and installation position to determine the characteristic D_p. These two characteristics are used for verifying the admissible damping capacity in the "damping capacity" diagram. The intersection point of the characteristics D_m and D_p must always be below the damping capacity curve of the selected hydraulic cylinder. The values in the diagrams refer to an average oil temperature of +45 ... +65 °C with the throttle valve being closed.
For special applications with very short stroke times, high velocities or large masses, hydraulic cylinder with special end position damping versions can be offered on request. When fixed or adjustable stops are used, special measures must be taken.

Formulas:

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

m = moved mass in kg
v = stroke velocity in m/s
k_v = see table page 47

Extension:

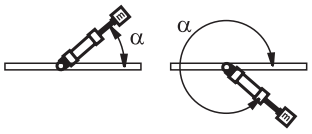
$$D_p = p_S - \frac{m \cdot 9.81 \cdot \sin\alpha}{A_1 \cdot 10}$$

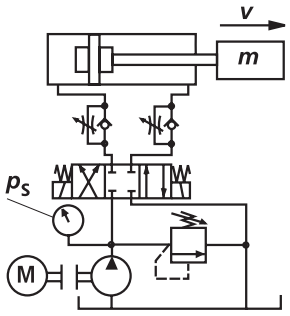
Retraction:

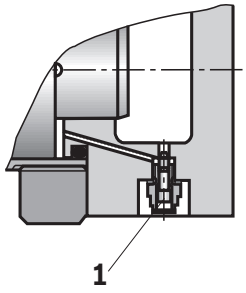
$$D_p = p_S + \frac{m \cdot 9.81 \cdot \sin\alpha}{A_3 \cdot 10}$$

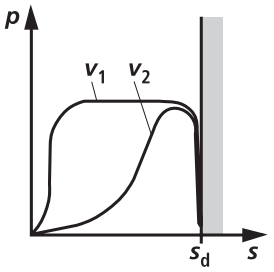
p_S = system pressure in bar
A_1 = piston area in cm² (see page 10)
A_3 = annulus area in cm² (see page 10)
α = angle to the horizontal in degree

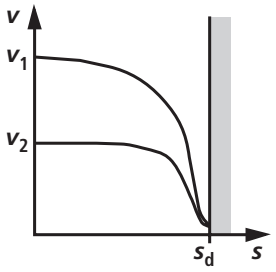
1 throttle valve











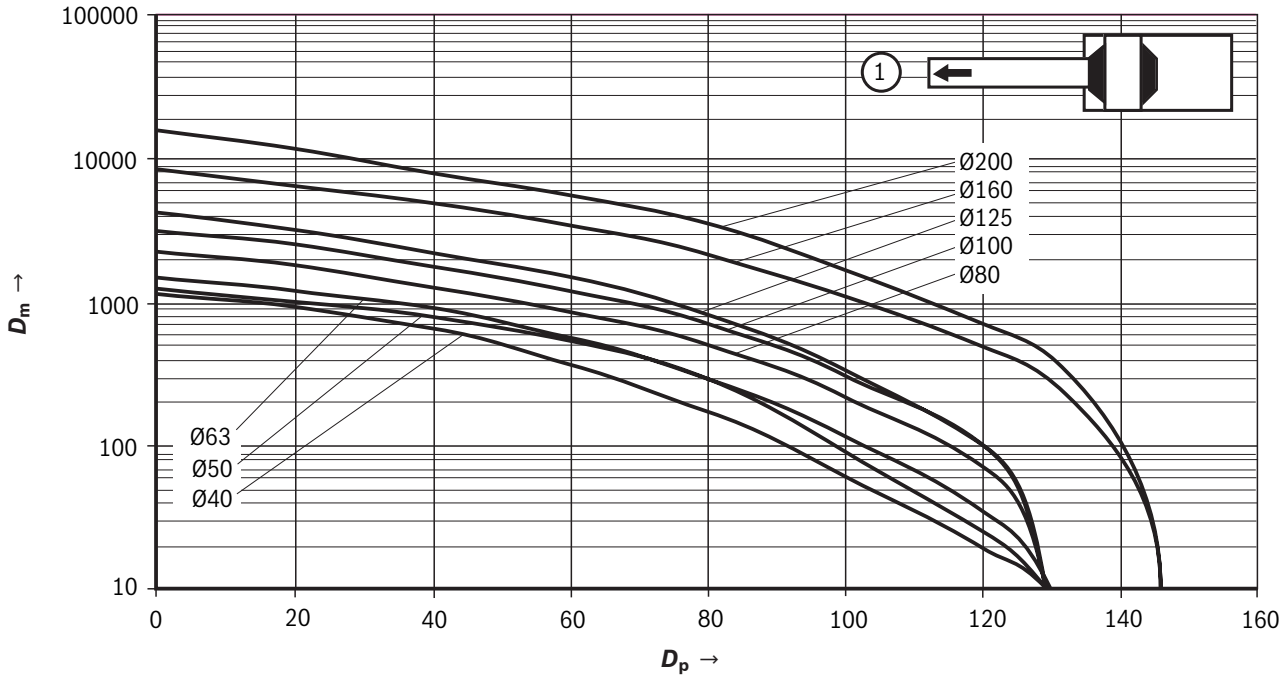
Damping length

ØAL in mm	40	50	63	80	100	125	160	200
Head side	23	22	27	27	32	33	40	46
Base side	23	22	27	27	32	33	40	46

End position damping / damping capacity

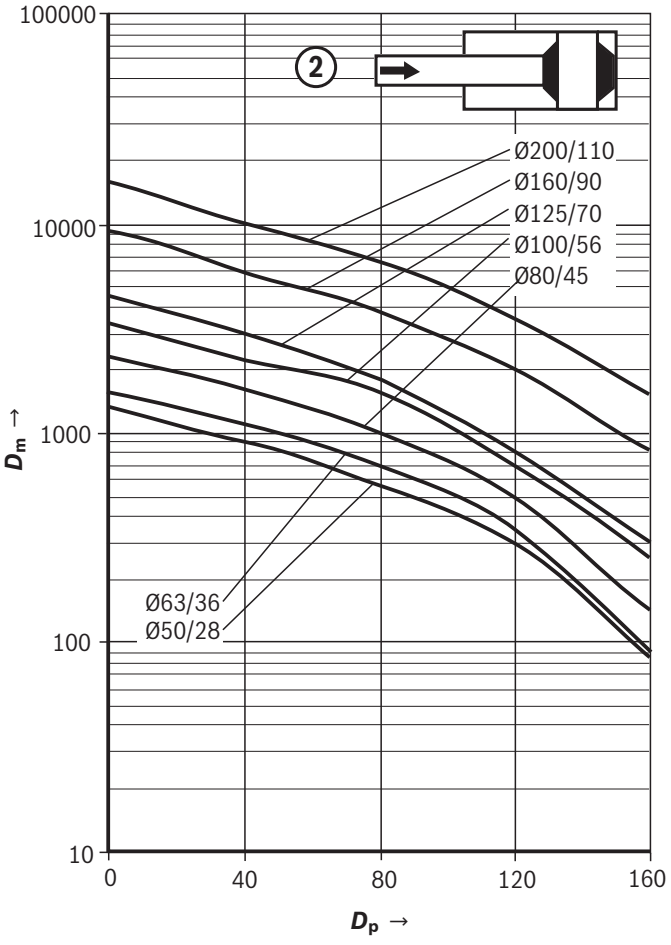
AL Ø mm	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
kv ①	2.82	3.51	3.02	2.53	2.65	2.91	2.76	2.95
kv ②	2.95	3.45	2.95	2.53	2.93	2.95	2.95	3.1
kv ③	3.1	3.51	2.95	2.51	2.91	2.95	2.91	2.93

Damping capacity:
Extension with *kv* ①

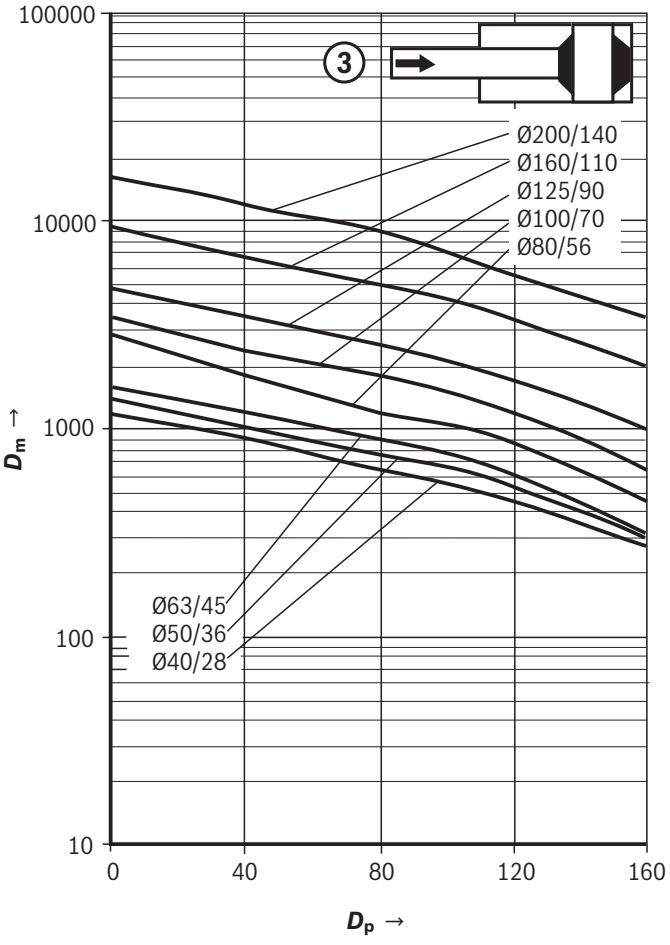


End position damping / damping capacity

Damping capacity:
Retraction with *kv* ②



Damping capacity:
Retraction with *kv* ③



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	–	–	++
HFDU	–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

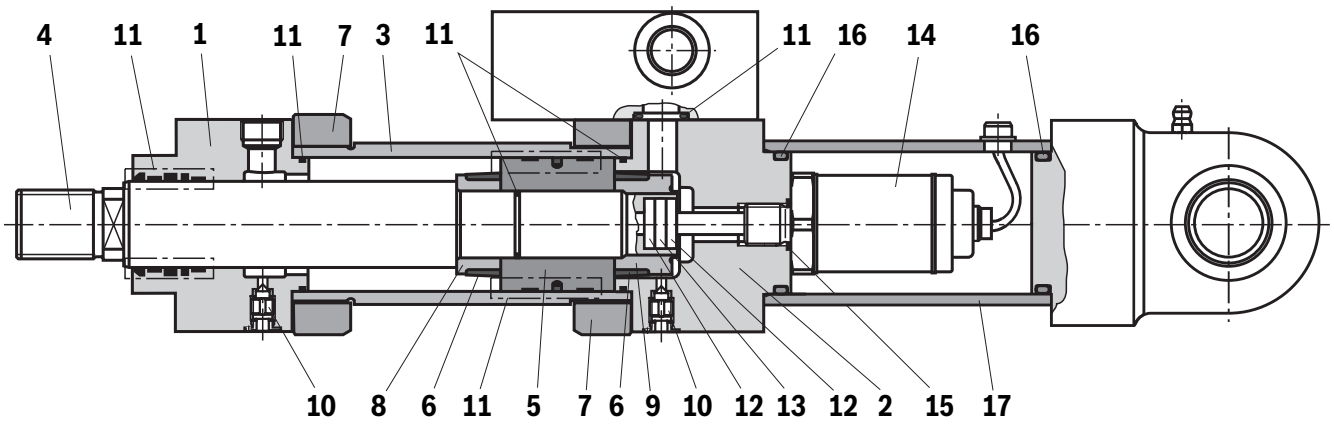
[1] Moreover, observe the corresponding hydraulic fluid temperature range

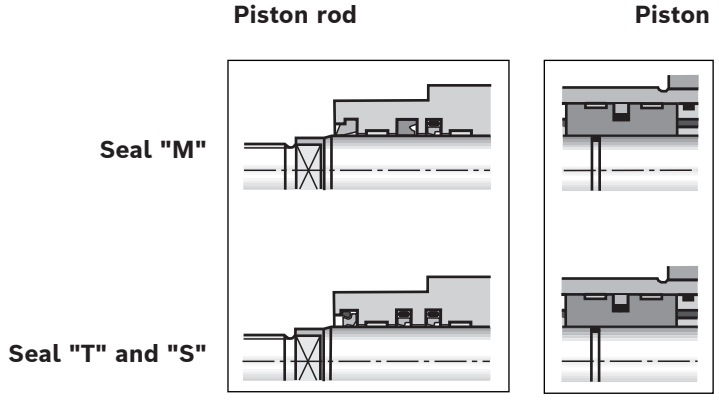
[2] Lower temperature limit –15 °C

Notice:

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

Components: "MP3" and "MP5"



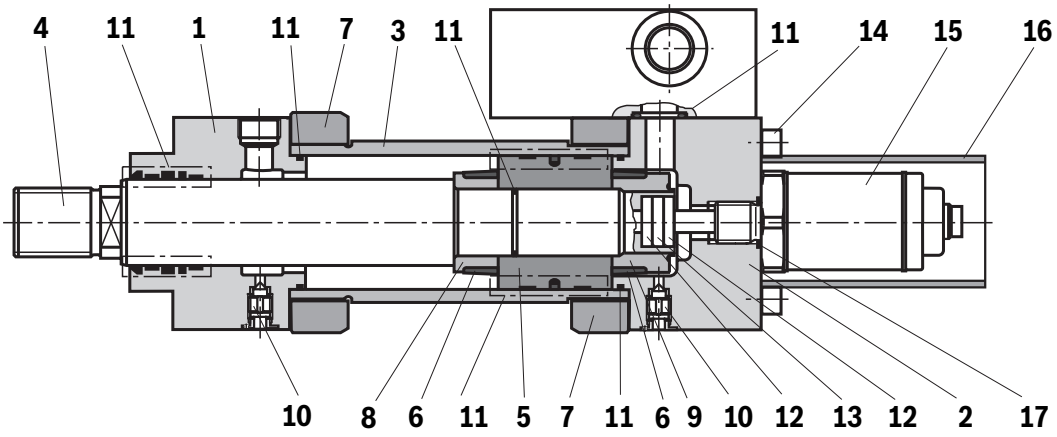


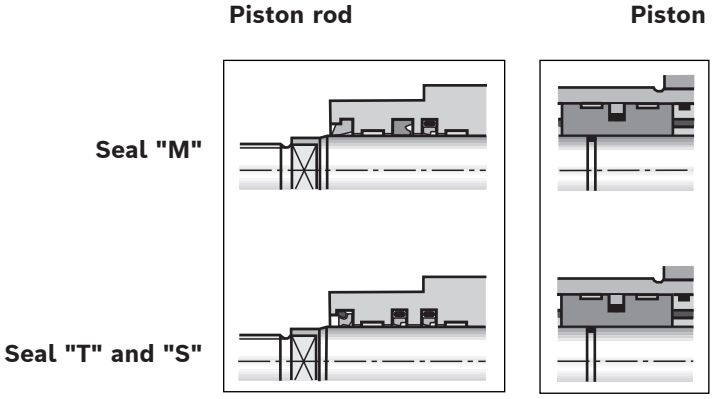
1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket
9 Socket
10 Bleeding
11 Seal kit.
Wiper
Rod seal
Piston seal
Seal ring
Support ring
Guide ring
12 Insulating socket
13 Solenoid
14 Position measurement system
15 Seal
16 Seal
17 Protective pipe

"MP3"
Swivel eye at base

"MP5"
Self-aligning clevis at base

Components: "MF1", "MF3", "MT4" and "MS2"





1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket
9 Socket
10 Bleeding
11 Seal kit.
Wiper
Rod seal
Piston seal
Seal ring
Support ring
Guide ring
12 Insulating socket
13 Solenoid
14 Hexagon socket head cap screws
15 Position measurement system
16 Protective pipe
17 Seal

"MF1"
Rectangular flange at head

"MF3"
Round flange at head

"MT4"
Trunnion mounting

"MS2"
Foot mounting

Seal kits

ØAL	ØMM	Material no. for seal design		
		"M"	"T"	"S"
40	**28**	R407026533	R407026550	R407026589
50	**28**	R407026534	R407026551	R407026590
	36	R407026535	R407026552	R407026591
63	**36**	R407026536	R407026553	R407026592
	45	R407026537	R407026554	R407026593
80	**45**	R407026538	R407026555	R407026594
	56	R407026539	R407026556	R407026595
100	**56**	R407026540	R407026557	R407026596
	70	R407026541	R407026558	R407026597
125	**70**	R407026542	R407026559	R407026598
	90	R407026543	R407026560	R407026599
160	**90**	R407026544	R407026561	R407026600
	110	R407026545	R407026562	R407026601
200	**110**	R407026546	R407026563	R407026602
	140	R407026547	R407026564	R407026603

Proximity switch

ØAL	Material no. for seal design	
	"M", "T"	"S"
40 ... 200	R900885938	R900885939

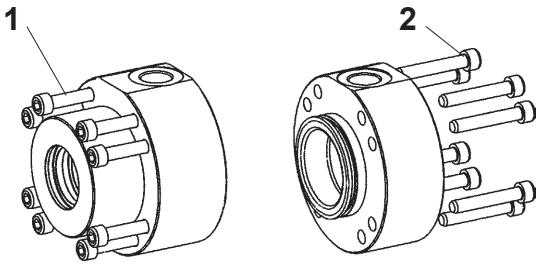
Position measurement system

ØAL	Material no. for seal design	
	"M", "T"	"S"
40	R407026769	R407026777
50	R407026770	R407026778
63	R407026771	R407026779
80	R407026772	R407026780
100	R407026773	R407026781
125	R407026774	R407026782
160	R407026775	R407026783
200	R407026776	R407026784

ØAL = piston Ø
ØMM = piston rod Ø

Tightening torques

Screws: Head and base (item 1 and 2)



ØAL	Screw	Quantity	Quality class	Tightening torque Nm
40	M6	4	10.9	13
50	M8	4	10.9	30
63	M10	4	10.9	60
80	M10	8	10.9	50
100	M10	8	10.9	60
125	M12	12	10.9	100
160	M12	16	10.9	100
200	M16	16	10.9	200

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.
With hydraulic cylinders and attachment parts, the following surfaces 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 to CP7 corrosivity category in the RAL colors.
With hydraulic cylinders and attachment parts, the following surfaces 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
- Inductive proximity switches
- 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

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.
	CP5	720 h salt spray test SST. (DIN EN ISO 9227) 480 h condensation water test KKT (DIN EN ISO 6270-2) Nominal layer thickness: 140 µm	Silo and debris facilities, chemical plants, boathouses above sea water, laundries, breweries with high humidity and medium contamination.	Industrial and coastal areas with medium salt load.
	CP6	1000 h salt spray test SST. (DIN EN ISO 9227) 480 h condensation water test KKT (DIN EN ISO 6270-2) Nominal layer thickness: 220 µm	Buildings or areas with almost permanent condensation and serious contamination.	Industrial areas with large humidity and aggressive atmosphere.
	CP7	1440 h salt spray test SST. (DIN EN ISO 9227) 480 h condensation water test KKT (DIN EN ISO 6270-2) Nominal layer thickness: 320 µm	Buildings or areas with almost permanent condensation and serious contamination.	Coastal and offshore areas with high salt load.

The specified resistances of the individual Rexroth classes only 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 mass of the hydraulic cylinder ("MP3" / "MP5" 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 42).
- 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 49).
- 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 contaminations and deterioration of the hydraulic fluid are to be avoided.

Standards

The installation dimensions and types of mounting of the hydraulic cylinders comply with Rexroth standard.

Acceptance

Every hydraulic cylinder is tested according to Rexroth standards and 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 by Bosch Rexroth AG or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair work not performed by Bosch Rexroth AG.

Check lists for hydraulic cylinders

Hydraulic 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).

Minimum strokes

When using end position damping, the minimum stroke must also be observed, see page 46.

☞ **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 (Interactive Catalog System) 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.

Online: www.boschrexroth.com/mill-type-cylinder

Notes

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