RE 17341
Edition: 2024-10
Replaces: 2022-07

rexroth
A Bosch Company

Hydraulic cylinder mill type

Series CDM1

CDM1MP5_d

- Nominal pressure 160 bar
- Component series 3X

Features

- Installation dimensions according to ISO 6020-1
- 9 types of mounting
- Piston Ø (ØAL): 25 ... 200 mm
- Piston rod Ø (ØMM): 14 ... 140 mm
- Stroke length up to 3000 mm
- Self-adjusting and adjustable end position damping

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
CD	M1		/		/		/		A	3X	/								

01	Differential cylinder	**CD**
02	Series	**M1**

Types of mounting

03	**Without** mounting	**M00** [1]
	Rectangular flange at head	**MF1** [2]
	Rectangular flange at base	**MF2** [2]
	Round flange at head	**MF3**
	Round flange at base	**MF4**
	Swivel eye at base	**MP3**
	Self-aligning clevis at base	**MP5**
	Trunnion mounting	**MT4** [3]
	Foot mounting	**MS2**
04	Piston Ø (ØAL): 25 ... 200 mm, see page 7	
05	Piston rod Ø (ØMM): 14 ... 140 mm, see page 7	
06	Stroke length in mm	

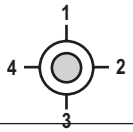
Design principle

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

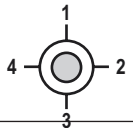
Line connection – version

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 30	**S** [4; 5]
	Rectangular flange connection according to ISO 6162, page 31	**F** [5; 6]
	Square flange connection according to ISO 6164, page 31	**H** [5; 7]
	Switching and proportional directional valves, page 34, 35	
	Subplate NG6	**P** [5; 8; 9; 10]
	Subplate NG10	**T** [5; 9; 10; 11]
	Subplate NG16	**U** [5; 9; 10; 12]
	Check valves type SV and SL, page 32, 33	
	Subplate NG6	**A** [5; 8; 9; 13]
	Subplate NG10	**E** [5; 9; 11; 13]
	Subplate NG20	**L** [5; 9; 12; 13]

Line connection – position at head

10	View to piston rod [14] 	**1**
		2
		3
		4

Line connection – position at base

11	View to piston rod [14] 	**1**
		2
		3
		4

Ordering code

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

Piston rod design

12	Hard chromium-plated	**C**
	Hardened and hard chromium-plated	**H**
	Nickel-plated and hard chromium-plated	**N** [15; 4)]
	Non-corrosive and hard chromium-plated	**L**

Piston rod end (see page 22)

13	Thread (ISO6020-1) for swivel head CGKD / fork clevis CCKB	**G**
	Thread for swivel head CGKD / fork clevis CCKB	**H** [16)]
	Internal thread, see page 30	**E** [17)]
	Piston rod end "H" with mounted swivel head CGKD	**F** [16)]
	Piston rod end "G" with mounted swivel head CGKD	**K**
	Piston rod end "H" with mounted fork clevis CCKB	**P** [16; 18)]
	Piston rod end "G" with mounted fork clevis CCKB	**R** [19)]

End position damping (see page 53 ...55)

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

Seal design (selection criteria for seals, see page 56)

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** [7)]
	Chevron seal kits	**A** [6)]
	For HDFR phosphate ester and HFDU polyol ester	
	Servo quality, reduced friction	**S** [7)]
	Standard seal system FKM	**V**

Additional options (see page 4)

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

Order example:
CDM1MT4/50/28/550A3X/B11CGDMW XV = 175 mm
CDM1MF3/200/140/950A3X/B11CHKAW

1) Only available upon request
2) Piston Ø 25 ... 125 mm
3) Always indicate dimension "XV" in the plain text with orders
4) Piston Ø 63 ... 200 mm
5) Not for "MF2"; "MF4"
6) Piston Ø 50 ... 200 mm
7) Piston Ø 40 ... 200 mm
8) Piston Ø 40 ... 80 mm, only position "1", "1" (head / base)
9) Subplates only with pipe thread (ISO1179-1)
10) Only up to stroke 900 mm
11) Piston Ø 63 ... 200 mm, only position "1", "1" (head / base)
12) Piston Ø 125 ... 200 mm, only position "1", "1" (head / base)
13) Subplates for check valves of type SV and SL
Please note: Seal designs "T" and "S" are not designed for the static holding function.
14) All graphical pictures in the data sheet show position "1"
15) Not possible for piston rod end "E"
16) Per piston Ø only possible with large piston rod Ø
17) Piston rod Ø 22 ... 140 mm
18) Piston Ø 200 mm, on request
19) Piston rod Ø 14 ... 90 mm

Ordering code

		01	02	03	04	05	06	07	08
[	Z								

01	Without	**W**
	Inductive proximity switches without mating connector - separate order, see page 10	**E** [1; 2]
02	Standard with guide rings	**W** [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) Minimum stroke length 20 mm
2) Piston Ø 40 ... 200 mm
3) For Ø 25 and Ø 32 without guide rings
4) On request
5) As of piston Ø 50 ... 200 mm
not for piston rod end "P" and "R"
6) Specify RAL color in plain text

Technical data

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

General	
Installation position	Any
Ambient temperature range	See page 56
Priming	See page 60
Painting	See page 60

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 56
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		Secured against screwing out from piston Ø 40 mm by default

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 (mm)	Line connection	max. stroke velocity in m/s
25	G1/4	0.29
32	G3/8	0.40
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

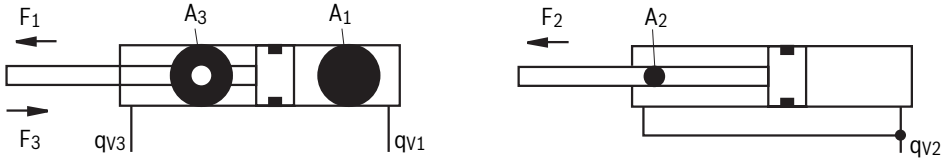
ØAL in mm		**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
Minimum stroke in mm (recommended)	▶ Without damping	–	–	–	–	–	–	–	–	–	–
	▶ With damping	30	38	46	44	54	54	64	66	80	92
Maximum Velocity in m/s (recommended)	▶ Seal design "M"; ▶ 160 bar	0.50				0.40		0.30		0.25	
	▶ Seal 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 in mm
			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	
25	**14**	1.46	4.91	1.54	3.37	7.85	2.44	5.37	2.9	0.9	2.0	600
	18	2.08		2.54	2.36		4.07	3.76		1.5	1.4	
32	**18**	1.46	8.04	2.54	5.50	12.80	4.07	8.76	4.8	1.5	3.3	800
	22	1.90		3.80	4.24		6.08	6.76		2.3	2.5	
40	**22**	1.43	12.56	3.80	8.76	20.00	6.08	14.03	7.5	2.3	5.2	2000
	28	1.96		6.16	6.41		9.82	10.24		3.7	3.8	
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**	**XC** [1]	**XO** [1]	**XS**	**SS**	**XV**	**ZF** [1]	**ZP** [1]	**ZJ**	**XB**	**Y**	**PJ**	**Stroke tolerances** in mm
Stroke length in mm	Tolerances in mm														
≤ 1250	± 2	± 2	± 2	± 1.5	± 1.5	± 2	± 1.5	± 2	± 1.5	± 1.5	± 1.5	max.	± 2	± 1.5	+ 2
> 1250 ... ≤ 3000	± 4	± 4	± 4	± 3	± 3	± 4	± 3	± 4	± 3	± 3	± 3	max.	± 4	± 3	+ 5

[1] Not standardized

Technical data

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

Hydraulic cylinder mass (in kg)

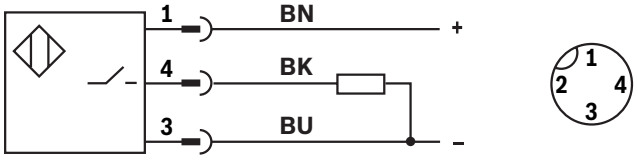
Piston	**Piston rod**	**at 0 mm stroke length**						**per 100 mm stroke length**
ØAL in mm	**ØMM** in mm	**"M00"** in kg	**"MP3", "MP5"** in kg	**"MF1", "MF2"** in kg	**"MF3", "MF4"** in kg	**"MT4"** in kg	**"MS2"** in kg	in kg
25	**14**	2.2	2.3	2.6	2.7	2.6	3.2	0.5
	18	2.2	2.3	2.6	2.7	2.6	3.2	0.6
32	**18**	3.1	3.3	3.8	4.0	3.7	4.7	0.7
	22	3.1	3.3	3.8	4.0	3.7	4.7	0.8
40	**22**	5.5	5.9	6.4	6.7	6.5	7.6	0.9
	28	5.6	6.0	6.5	6.8	6.6	7.7	1.1
50	**28**	8.1	8.9	9.7	10.2	9.8	12.0	1.2
	36	8.3	9.1	9.9	10.4	10.0	12.2	1.5
63	**36**	14.0	15.5	17.0	17.5	17.0	20.0	2.1
	45	14.0	15.5	17.0	17.5	17.0	20.0	2.6
80	**45**	20.0	22.5	24.0	25.0	24.0	29.0	2.9
	56	20.0	22.5	24.0	25.0	24.0	29.0	3.6
100	**56**	36.0	41.0	42.5	44.5	43.5	52.0	5.4
	70	37.0	42.0	43.5	45.5	44.5	53.0	6.5
125	**70**	60.0	66.0	68.0	70.0	73.5	86.0	7.3
	90	61.0	67.0	69.0	71.0	74.5	87.0	9.3
160	**90**	107.0	122.0	–	121.0	136.0	148.0	11.5
	110	108.0	123.0	–	122.0	137.0	149.0	14.0
200	**110**	193.0	222.0	–	217.0	245.0	259.0	15.4
	140	196.0	225.0	–	220.0	248.0	262.0	20.1

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

Inductive proximity switches are used as reliable end position control for hydraulic cylinders. They are an important element for the safe and exact monitoring of safety equipment, lockings and/or other machine functions in their end position by means of the output of signals. The proximity switch which is high-pressure-resistant up to 500 bar works in a contactless manner. Consequently, it is wear-free. The proximity switch has been set at the factory. The switching distance must not be adjusted. The lock nut of the proximity switch is marked at the factory using sealing wax. On versions with proximity switch, the hydraulic cylinders are provided with proximity switches on both sides.

General			
Function type			PNP normally open contact
Admissible pressure		bar	500
Operating voltage		V DC	10 ... 30
	▶ Including residual ripple	%	≤ 15
Voltage drop		V	≤ 1.5
Rated operating voltage		V DC	24
Rated operating current		mA	200
Idle current		mA	≤ 8
Residual current		µA	≤ 10
Repetition accuracy		%	≤ 5
Hysteresis		%	≤ 15
Ambient temperature range		°C	–25 ... +80
Temperature drift		%	≤ 10
Switching frequency		Hz	1000
Protection class	▶ Active area	IP	68 according to DIN 40050
	▶ Proximity switch	IP	67 according to DIN 40050
Housing material			Material no. 1.4104

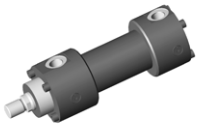
Pin assignment



BN brown
BK black
BU blue

Overview of types of mounting

"M00" (see page 12, 13)



"MF3" (see page 20, 21)

"MP3" (see page 14, 15)

"MF4" (see page 22, 23)

"MP5" (see page 14, 15)

"MT4" (see page 24, 25)

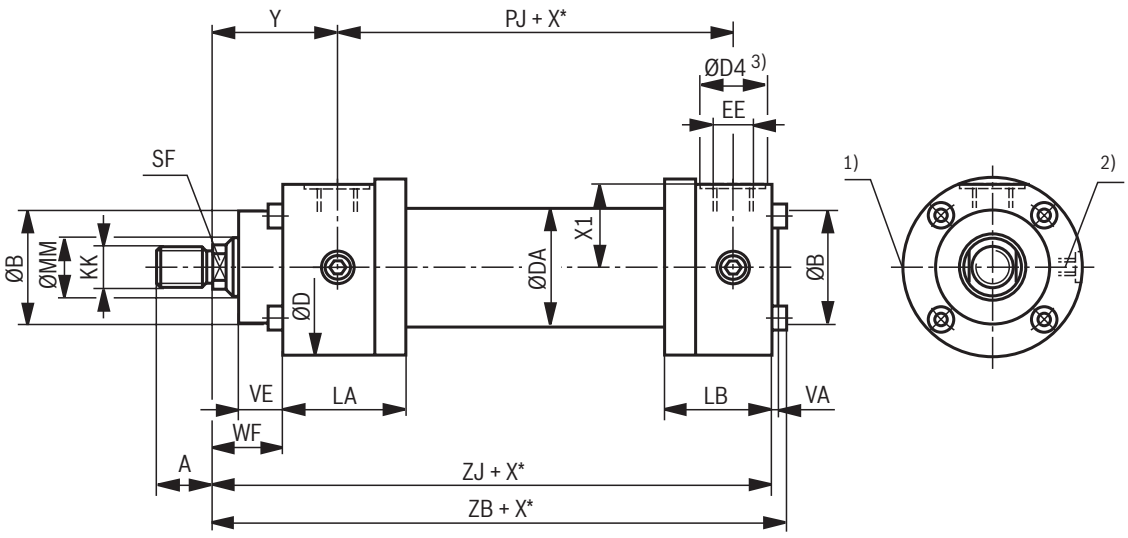
"MF1" (see page 16, 17)

"MS2" (see page 26, 27)

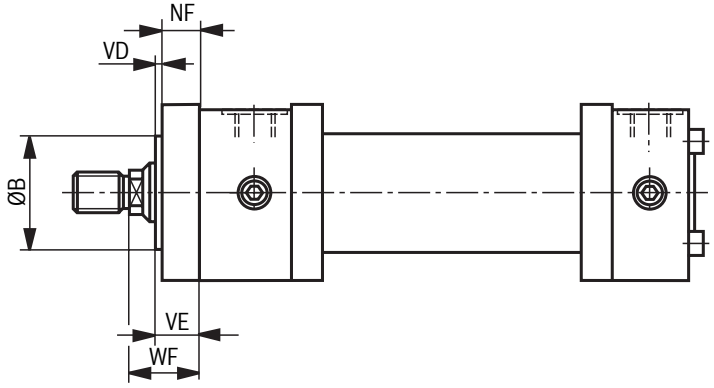
"MF2" (see page 18, 19)

Dimensions: "M00"
(dimensions in mm)

"M00"



M00...2X/...A: as chevron seal version and AL-Ø 50 ... 200 mm



Dimensions: "M00"
(dimensions in mm)

ØAL	ØMM	KK [4] ISO 6020-1	A [4] ISO 6020-1	KK [5]	A [5]	SF	ØB	ØD	ØDA	ØD4 [3; 6]	EE [6]	ØD4 [3; 7]	EE [7]
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	32	56	35	25	G1/4	21	M14 x 1.5
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	40	67	42	28	G3/8	26	M18 x 1.5
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	50	78	50	34	G1/2	29	M22 x 1.5
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
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
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
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
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
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
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

ØAL	ØMM	Y [8]	PJ [8]	X1	VA	VE max.	VD	NF	WF [8]	ZB	ZJ [8]	LA	LB
25	**14** **18**	58	77	26	3	15	–	–	28	156	150	58	43
32	**18** **22**	64	89	30.5	3	19	–	–	32	176	170	62	47
40	**22** **28**	71	97	35.5	3	19	–	–	32	196	190	73	56
50	**28** **36**	72	111	44.5	4	24	4	20	38	213	205	74	62
63	**36** **45**	82	117	54.5	4	29	4	25	45	234	224	84	72
80	**45** **56**	91	134	62.5	4	36	4	32	54	260	250	93	81
100	**56** **70**	108	162	75.5	5	37	5	32	57	310	300	117	96
125	**70** **90**	121	174	92.5	5	37	5	32	60	335	325	143	112
160	**90** **110**	143	191	115.5	8	41	5	36	66	380	370	171	130
200	**110** **140**	190	224	138.5	15	45	5	40	75	466	450	230	151

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

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

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

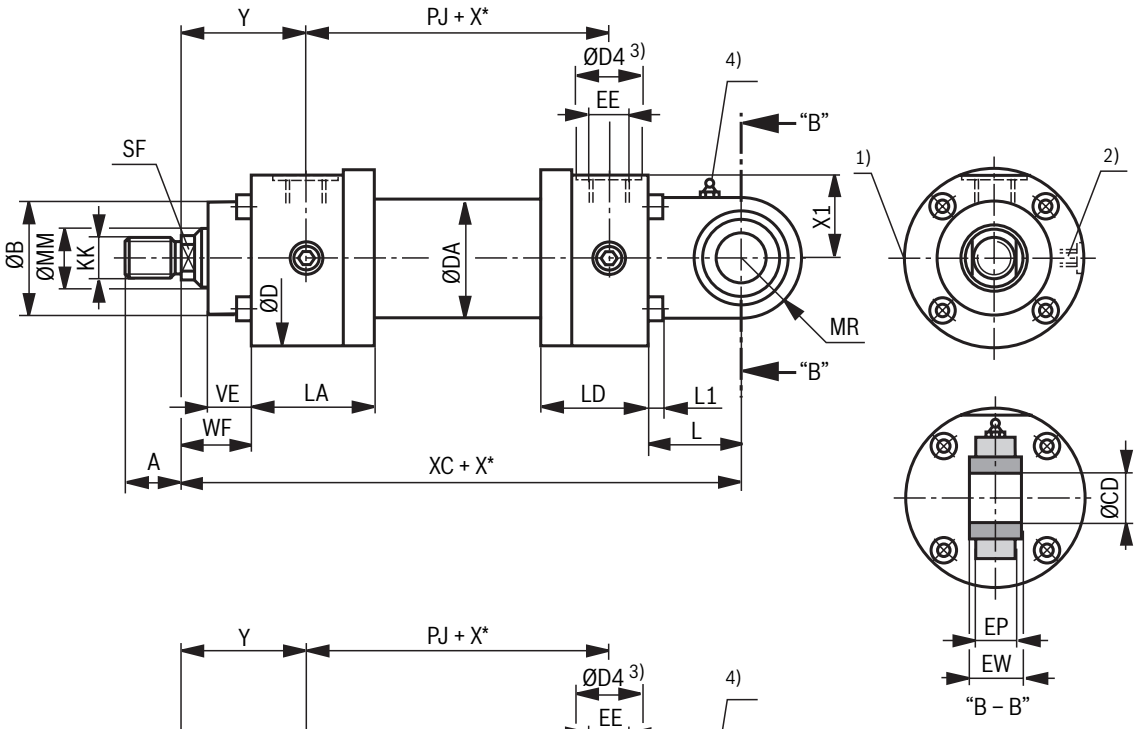
6) Line connection "B"

7) Line connection "R"

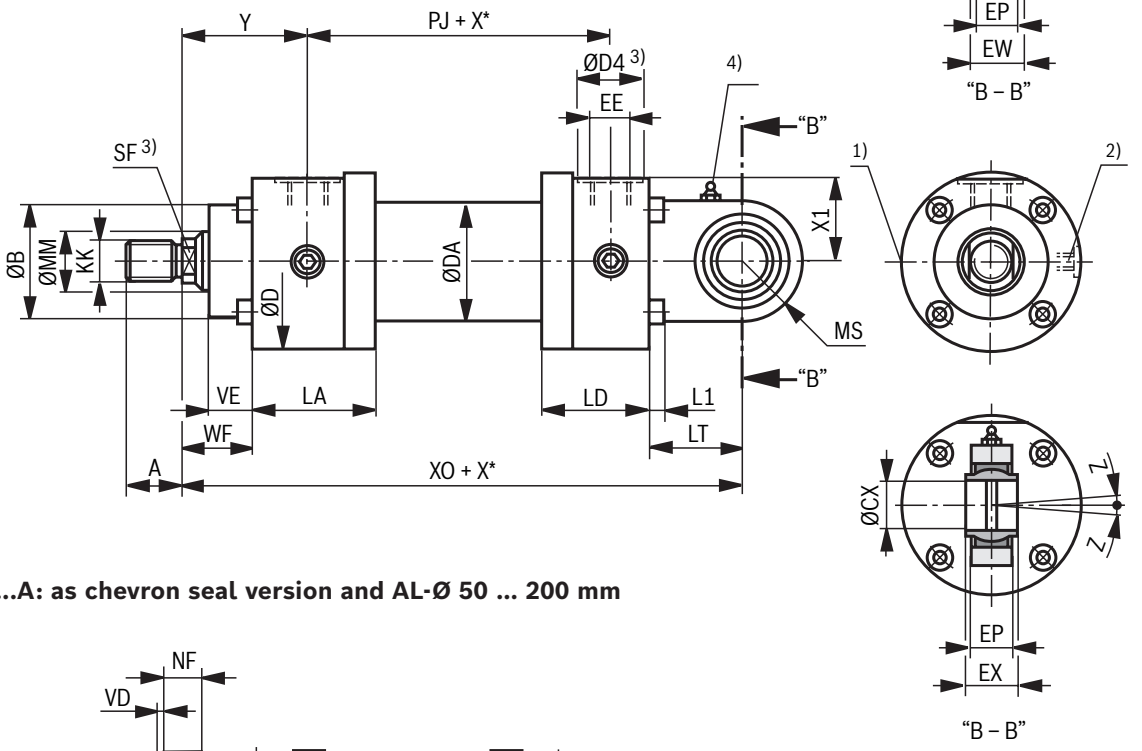
8) Tolerances according to ISO 6020-1, see page 8

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

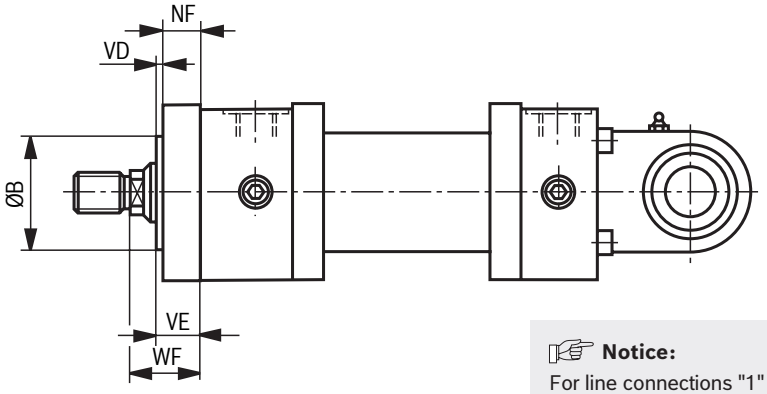
"MP3"



"MP5"



MP3/MP5..2X/...A: as chevron seal version and AL-Ø 50 ... 200 mm



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

Ø AL	Ø MM	KK [5] ISO 6020-1	A [5] ISO 6020-1	KK [6]	A [6]	SF	ØB	ØD	ØDA	ØD4 [3; 7]	EE [7]	ØD4 [3; 8]	EE [8]	Y [9]	PJ [9]
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	32	56	35	25	G1/4	21	M14 x 1.5	58	77
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	40	67	42	28	G3/8	26	M18 x 1.5	64	89
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	50	78	50	34	G1/2	29	M22 x 1.5	71	97
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
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
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
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
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
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
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

ØAL	MM	X1	VE max.	WF [9]	NF	VD min.	XC/XO [9]	CD/CX H9/H7	EP	EW/EX h12	L/LT min.	MR/MS max.	LA	LD	L1	Z
25	**14** **18**	26	15	28	–	–	178	12	11	12	25	16	58	46	6	2°
32	**18** **22**	30.5	19	32	–	–	206	16	13	16	33	20	62	50	6	2°
40	**22** **28**	35.5	19	32	–	–	231	20	17	20	38	25	73	59	6	2°
50	**28** **36**	44.5	24	38	20	4	257	25	22	25	48	32	74	66	8	2°
63	**36** **45**	54.5	29	45	25	4	289	32	27	32	61	40	84	76	10	4°
80	**45** **56**	62.5	36	54	32	4	332	40	32	40	78	50	93	85	10	4°
100	**56** **70**	75.5	37	57	32	5	395	50	40	50	90	63	117	101	10	4°
125	**70** **90**	92.5	37	60	32	5	428	63	52	63	98	71	143	117	12	4°
160	**90** **110**	115.5	41	66	36	5	505	80	66	80	127	90	171	138	12	4°
200	**110** **140**	138.5	45	75	40	5	615	100	84	100	150	112	230	166	16	4°

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

4) Grease nipple, cone head form A according to DIN71412 (lubrication of bearings at piston Ø 25 mm not possible)

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

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

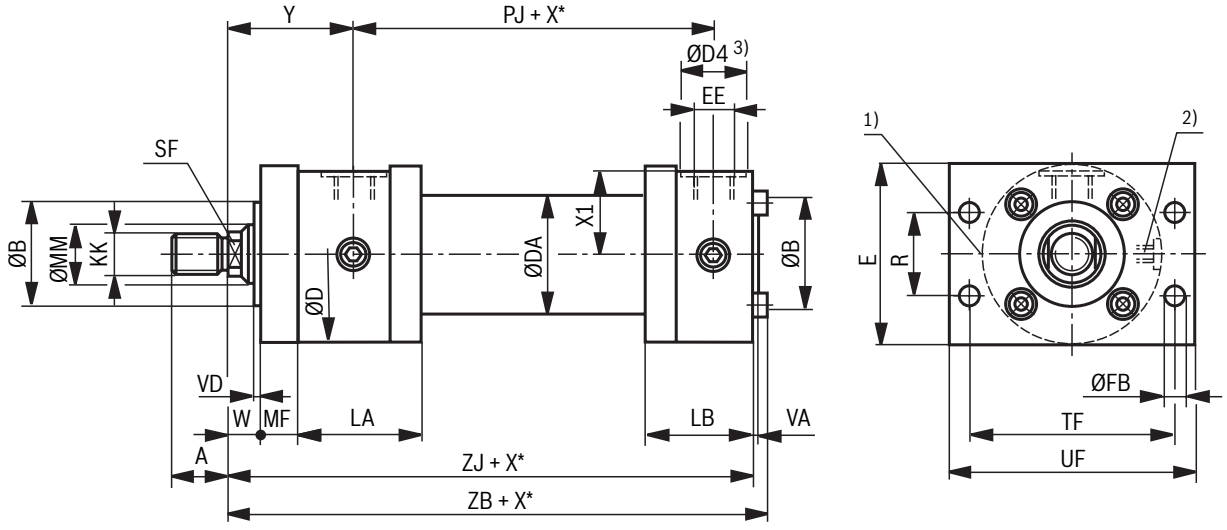
7) Line connection "B"

8) Line connection "R"

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

Dimensions: "MF1"
(dimensions in mm)

"MF1"



Dimensions: "MF1"
(dimensions in mm)

ØAL	ØMM	KK [4] ISO 6020-1	A [4]	KK [5]	A [5]	SF	ØB f8	ØD	ØDA	ØD4 [3; 6]	EE [6]	ØD4 [3; 7]	EE [7]	Y [8]	PJ [8]	X1
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	32	56	35	25	G1/4	21	M14 x 1.5	58	77	26
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	40	67	42	28	G3/8	26	M18 x 1.5	64	89	30.5
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	50	78	50	34	G1/2	29	M22 x 1.5	71	97	35.5
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	44.5
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	54.5
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
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
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

ØAL	ØMM	MF js13	VA	VD min.	W [8]	ZJ [8]	ZB	E max.	R js13	TF js13	UF max.	ØFB H13	LA	LB
25	**14** **18**	12	3	3	16	150	156	60	28.7	69.2	85	6.6	58	43
32	**18** **22**	16	3	3	16	170	176	70	35.2	85	105	9	62	47
40	**22** **28**	16	3	3	16	190	196	80	40.6	98	115	9	73	56
50	**28** **36**	20	4	4	18	205	213	100	48.2	116.4	140	11	74	62
63	**36** **45**	25	4	4	20	224	234	120	55.5	134	160	13.5	84	72
80	**45** **56**	32	4	4	22	250	260	135	63.1	152.5	185	17.5	93	81
100	**56** **70**	32	5	5	25	300	310	160	76.5	184.8	225	22	117	96
125	**70** **90**	32	5	5	28	325	335	195	90.2	217.1	255	22	143	112

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

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

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

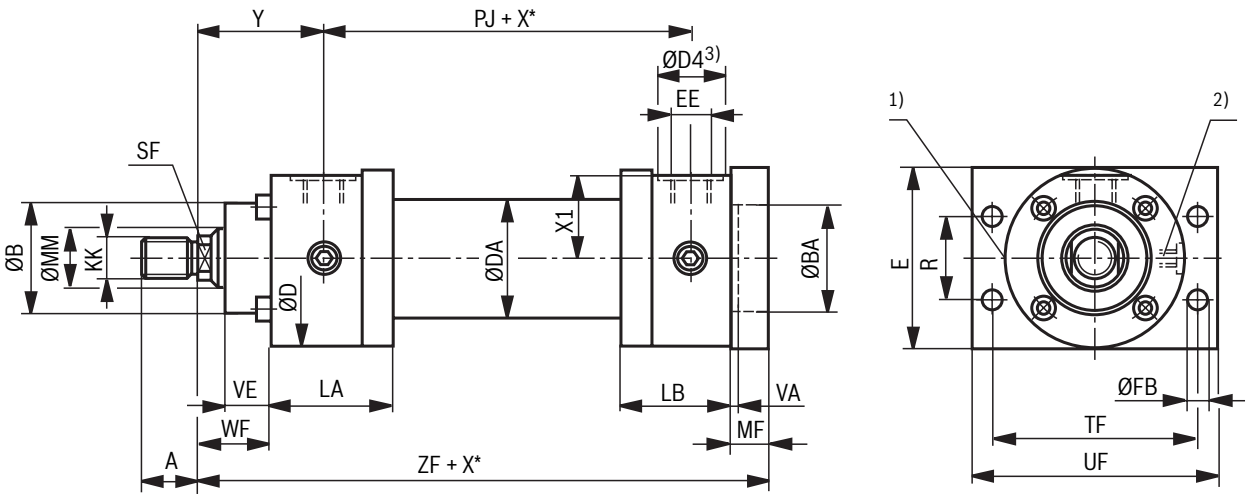
6) Line connection "B"

7) Line connection "R"

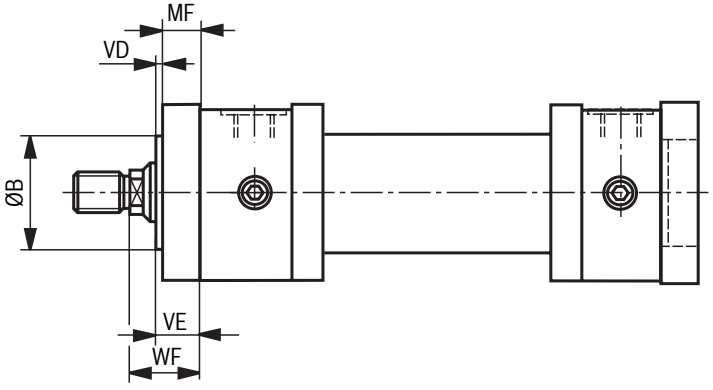
8) Tolerances according to ISO 6020-1, see page 8

Dimensions: "MF2"
(dimensions in mm)

"MF2"



MF2..2X/...A: as chevron seal version and AL-Ø 50 ... 200 mm



Dimensions: "MF2"
(dimensions in mm)

ØAL	ØMM	KK [4] ISO 6020-1	A [4]	KK [5]	A [5]	SF	ØB	ØD	ØDA	ØD4 [3; 6]	EE [6]	ØD4 [3; 7]	EE [7]	Y [8]	PJ [8]
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	32	56	35	25	G1/4	21	M14 x 1.5	58	77
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	40	67	42	28	G3/8	26	M18 x 1.5	64	89
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	50	78	50	34	G1/2	29	M22 x 1.5	71	97
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
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
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
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
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

ØAL	ØMM	X1	WF [8]	MF js13	VA	VE	VD	ØBA H8	ZF [8]	E max.	R js13	TF js13	UF max.	ØFB H13	LA	LB
25	**14** **18**	26	28	12	3	15	–	32	162	60	28.7	69.2	85	6.6	58	43
32	**18** **22**	30.5	32	16	3	19	–	40	186	70	35.2	85	105	9	62	47
40	**22** **28**	35.5	32	16	3	19	–	50	206	80	40.6	98	115	9	73	56
50	**28** **36**	44.5	38	20	4	24	4	60	225	100	48.2	116.4	140	11	74	62
63	**36** **45**	54.5	45	25	4	29	4	70	249	120	55.5	134	160	13.5	84	72
80	**45** **56**	62.5	54	32	4	36	4	85	282	135	63.1	152.5	185	17.5	93	81
100	**56** **70**	75.5	57	32	5	37	5	106	332	160	76.5	184.8	225	22	117	96
125	**70** **90**	92.5	60	32	5	37	5	132	357	195	90.2	217.1	255	22	143	112

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

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

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

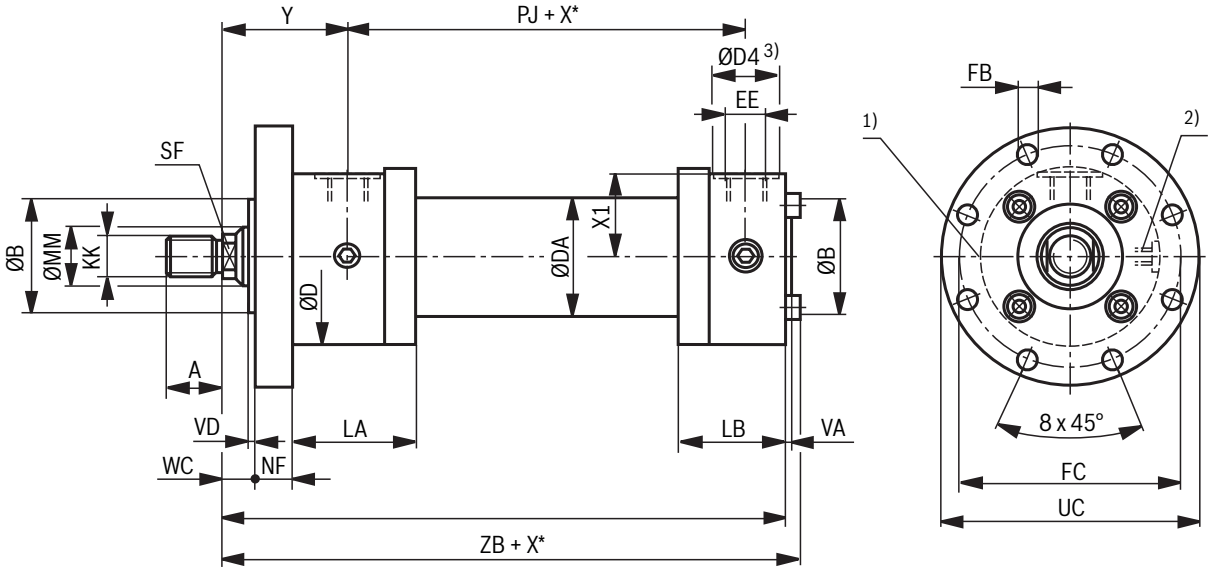
6) Line connection "B"

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] ISO 6020-1	A [4]	KK [5]	A [5]	SF	ØB f8	ØD	ØDA	ØD4 [3; 6]	EE [6]	ØD4 [3; 7]	EE [7]	Y [8]	PJ [8]
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	32	56	35	25	G1/4	21	M14 x 1.5	58	77
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	40	67	42	28	G3/8	26	M18 x 1.5	64	89
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	50	78	50	34	G1/2	29	M22 x 1.5	71	97
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
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
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
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
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
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
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

ØAL	ØMM	X1	NF js13	VA	VD	WC [8]	ZJ [8]	ZB	ØFC js13	ØUC max.	ØFB H13	LA	LB
25	**14** **18**	26	12	3	3	16	150	156	75	90	6.6	58	43
32	**18** **22**	30.5	16	3	3	16	170	176	92	110	9	62	47
40	**22** **28**	35.5	16	3	3	16	190	196	106	125	9	73	56
50	**28** **36**	44.5	20	4	4	18	205	213	126	150	11	74	62
63	**36** **45**	54.5	25	4	4	20	224	234	145	170	13.5	84	72
80	**45** **56**	62.5	32	4	4	22	250	260	165	195	17.5	93	81
100	**56** **70**	75.5	32	5	5	25	300	310	200	240	22	117	96
125	**70** **90**	92.5	32	5	5	28	325	335	235	275	22	143	112
160	**90** **110**	115.5	36	8	5	30	370	380	280	320	22	171	130
200	**110** **140**	138.5	40	15	5	35	450	466	340	385	26	230	151

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

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

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

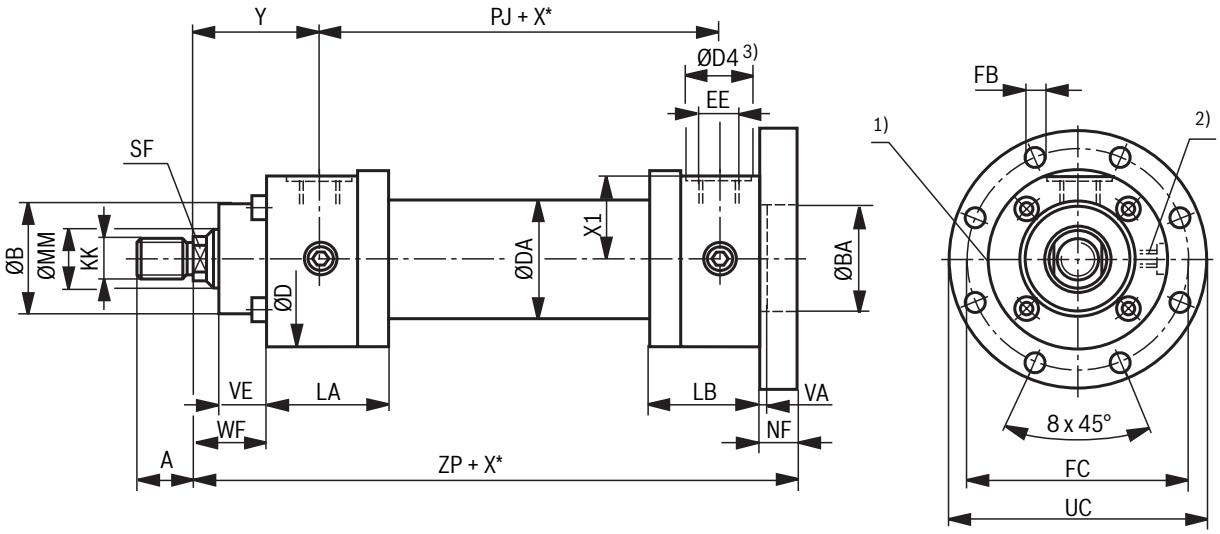
6) Line connection "B"

7) Line connection "R"

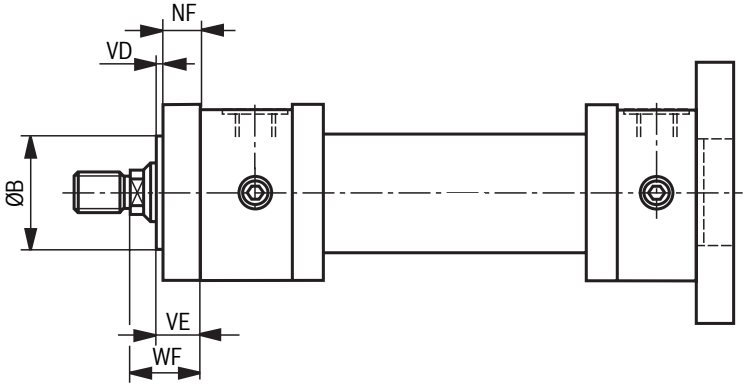
8) Tolerances according to ISO 6020-1, see page 8

Dimensions: "MF4"
(dimensions in mm)

"MF4"



MF4..2X/...A: as chevron seal version and AL-Ø 50 ... 200 mm



Dimensions: "MF4"
(dimensions in mm)

AL Ø	MM Ø	KK [4] ISO 6020-1	A [4]	KK [5]	A [5]	SF	ØD	ØDA	ØD4 3; 6)	EE 6)	ØD4 3; 7)	EE 7)	Y [8]	PJ [8]
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	56	35	25	G1/4	21	M14 x 1.5	58	77
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	67	42	28	G3/8	26	M18 x 1.5	64	89
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	78	50	34	G1/2	29	M22 x 1.5	71	97
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
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
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
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
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
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
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

ØAL	ØMM	X1	WF [8]	NF js13	VA	VE	VD	ØB/BA H8	ZP [8]	ØFC js13	ØUC max.	ØFB H13	LA	LB
25	**14** **18**	26	28	12	3	15	–	32	162	75	90	6.6	58	43
32	**18** **22**	30.5	32	16	3	19	–	40	186	92	110	9	62	47
40	**22** **28**	35.5	32	16	3	19	–	50	206	106	125	9	73	56
50	**28** **36**	44.5	38	20	4	24	4	60	225	126	150	11	74	62
63	**36** **45**	54.5	45	25	4	29	4	70	249	145	170	13.5	84	72
80	**45** **56**	62.5	54	32	4	36	4	85	282	165	195	17.5	93	81
100	**56** **70**	75.5	57	32	5	37	5	106	332	200	240	22	117	96
125	**70** **90**	92.5	60	32	5	37	5	132	357	235	275	22	143	112
160	**90** **110**	115.5	66	36	8	41	5	160	406	280	320	22	171	130
200	**110** **140**	138.5	75	40	15	45	5	200	490	340	385	26	230	151

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

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

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

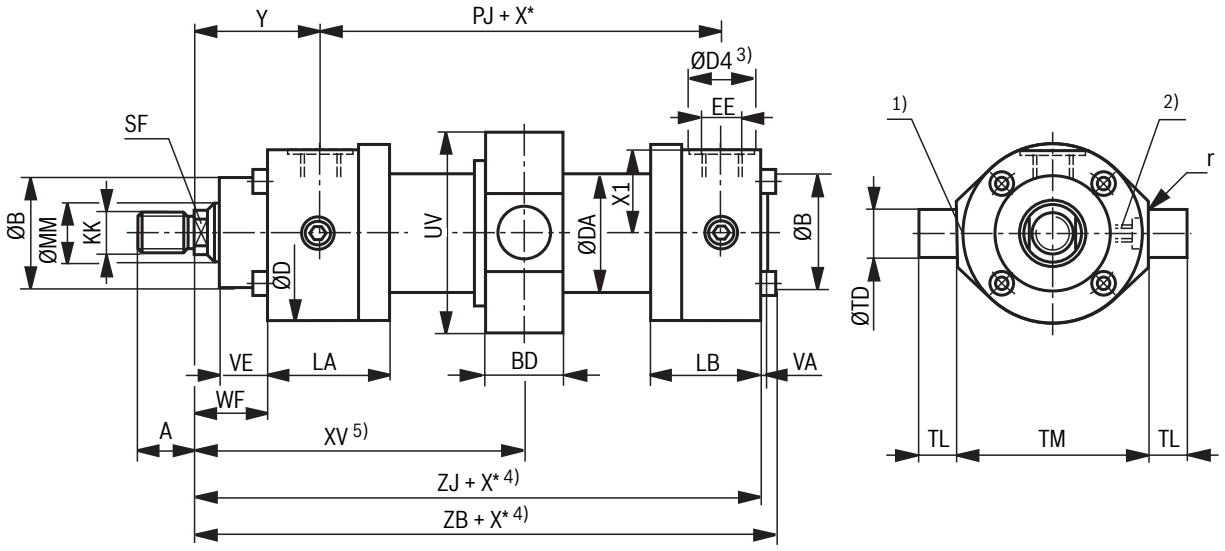
6) Line connection "B"

7) Line connection "R"

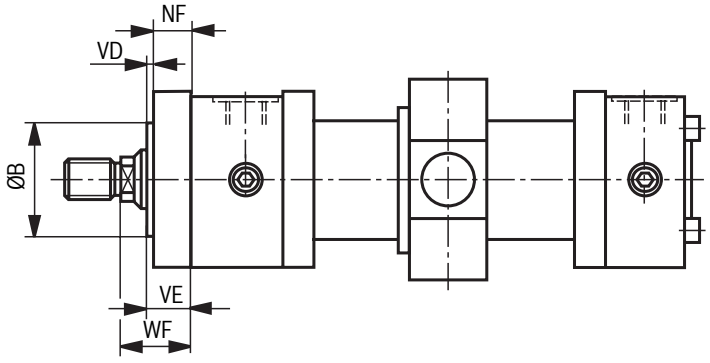
8) Tolerances according to ISO 6020-1, see page 8

Dimensions: "MT4"
(dimensions in mm)

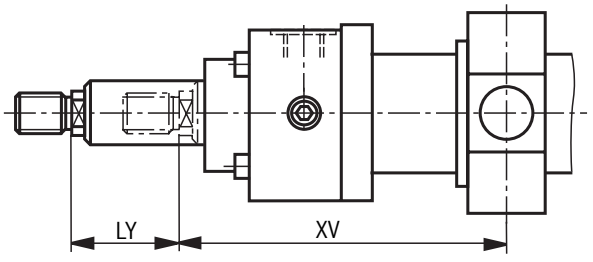
"MT4"



MT4..2X/...A: as chevron seal version and AL-Ø 50 ... 200 mm



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



Dimensions: "MT4"
(dimensions in mm)

AL Ø	MM Ø	KK [6] ISO 6020-1	A [6]	KK [7]	A [7]	SF	ØB	ØD	ØDA	ØD4 [3]; [8]	EE [8]	ØD4 [3]; [9]	EE [9]	Y [11]	PJ [11]	X1	VE
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	32	56	35	25	G1/4	21	M14 x 1.5	58	77	26	15
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	40	67	42	28	G3/8	26	M18 x 1.5	64	89	30.5	19
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	50	78	50	34	G1/2	29	M22 x 1.5	71	97	35.5	19
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	44.5	24
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	54.5	29
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	36
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	37
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	37
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	115.5	41
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	45

AL Ø	MM Ø	WF [11]	NF	VA	VD	ZJ [11]	ZB	BD	UV [10]	r	ØTD f8	TL js13	TM h12	XV [5]; [11] min.	XV [5]; [11] max.	X* [4] min.	LA	LB
25	**14** **18**	28	–	3	–	150	156	19	58	0.8	12	10	63	107.5	93.5+X*	22	58	43
32	**18** **22**	32	–	3	–	170	176	24	67	0.8	16	12	75	118	107+X*	19	62	47
40	**22** **28**	32	–	3	–	190	196	28	78	1	20	16	90	131	116+X*	23	73	56
50	**28** **36**	38	20	4	4	205	213	33	95	1	25	20	105	141.5	122.5+X*	28	74	62
63	**36** **45**	45	25	4	4	224	234	38	116	1.5	32	25	120	164	129+X*	47	84	72
80	**45** **56**	54	32	4	4	250	260	53	130	2	40	32	135	189.5	138.5+X*	63	93	81
100	**56** **70**	57	32	5	5	300	310	68	158	2	50	40	160	224	166+X*	70	117	96
125	**70** **90**	60	32	5	5	325	335	78	210	2.5	63	50	195	261	170+X*	106	143	112
160	**90** **110**	66	36	8	5	370	380	118	250	3	80	63	240	320	157+X*	163	171	130
200	**110** **140**	75	40	15	5	450	466	148	300	3	100	80	295	403	201+X*	202	230	151

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

4) Observe the min. stroke length "$X^*_{min.}$"

5) When ordering, always specify the "XV" dimension in the plain text (observe XV_{min} and XV_{max})

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

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

8) Line connection "B"

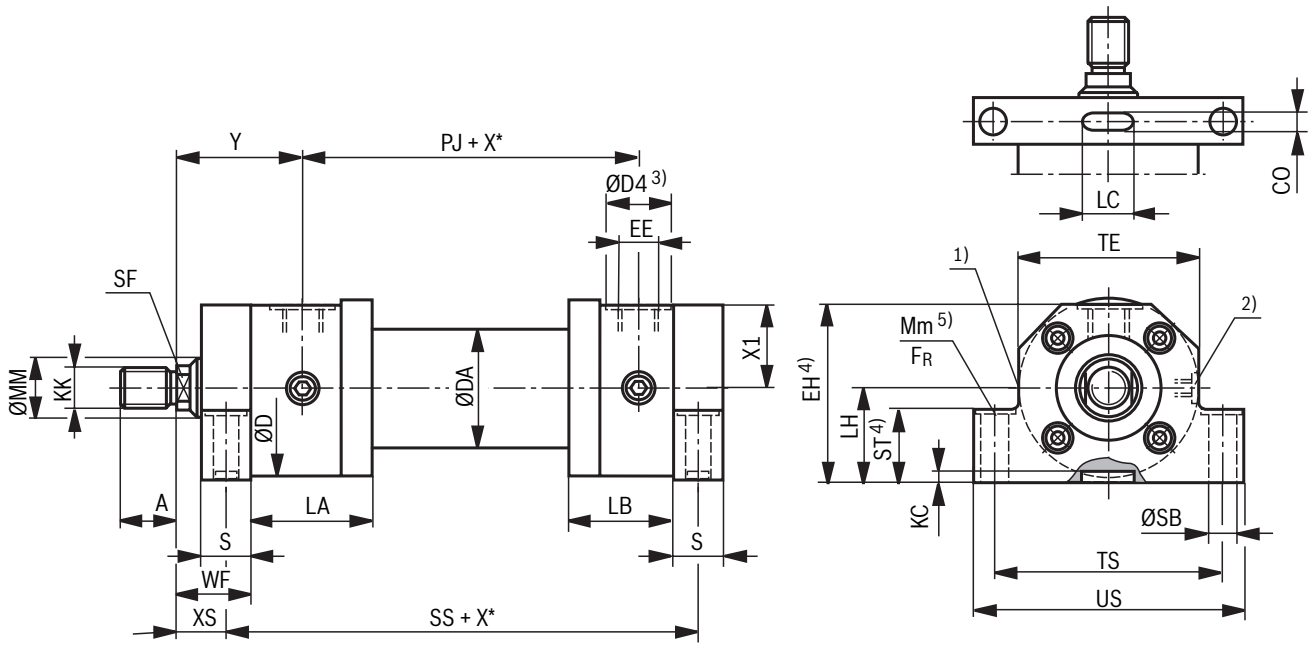
9) Line connection "R"

10) Tolerance according to EN ISO9013: Thermal cutting

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

Dimensions: "MS2"
(dimensions in mm)

"MS2"



ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

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

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

3) ØD4 recess maximum 0.5 mm deep

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

5) Recess maximum 2 mm deep, for hexagon socket head cap screw according to ISO 4762
The mounting screws must not be subjected to shear force.
The mounting screws according to ISO 4762 (property class 10.9) are to be tightened applying the specified tightening torque $\boldsymbol{M}_m$.
If the calculated frictional force $\boldsymbol{F}_R$ is lower than the maximum cylinder force, a fitting key has to be inserted at the head.
Calculation principle:
- The specified frictional forceF_R refers to a friction factor of 0.2 (steel/steel)
- Head-side foot as fixed bearing
- Base side foot as loose bearing

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"

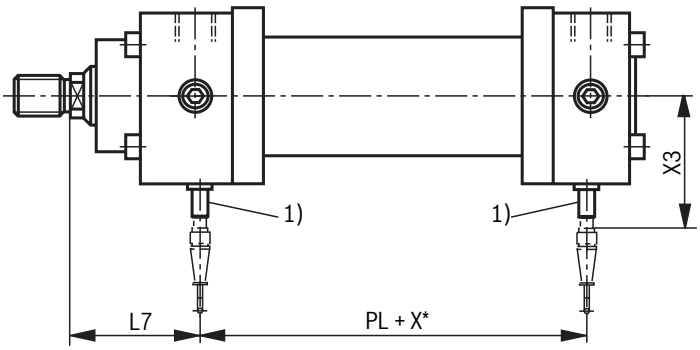
10) Tolerances according to ISO 6020-1, see page 8

Dimensions: "MS2"
(dimensions in mm)

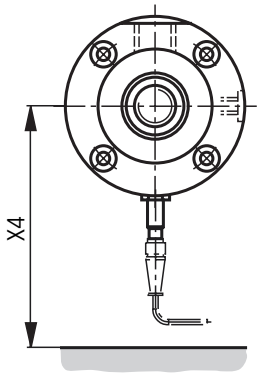
AL Ø	MM Ø	KK [6] ISO 6020-1	A [6]	KK [7]	A [7]	SF	ØD	ØDA	ØD4 [3; 8]	EE [8]	ØD4 [3; 9]	EE [9]	Y [10]	PJ [10]	X1	WF [10]
25	**14** **18**	M12 x 1.25 M14 x 1.5	16 18	– M12 x 1.25	– 16	12 14	56	35	25	G1/4	21	M14 x 1.5	58	77	26	28
32	**18** **22**	M14 x 1.5 M16 x 1.5	18 22	– M14 x 1.5	– 18	14 18	67	42	28	G3/8	26	M18 x 1.5	64	89	30.5	32
40	**22** **28**	M16 x 1.5 M20 x 1.5	22 28	– M16 x 1.5	– 22	18 22	78	50	34	G1/2	29	M22 x 1.5	71	97	35.5	32
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
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
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
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
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
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
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

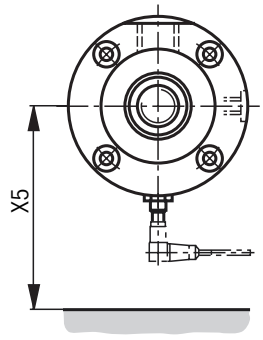
AL Ø	MM Ø	XS [10]	SS [10]	CO N9	LC [4] +0.5	KC min.	EH [4] –1	LH h10	S js13	ØSB H13	ST [4]	TE js13	TS js13	US max.	LA	LB	FR [5] kN	Mm [5] Nm
25	**14** **18**	18	142	6	25	3.5	57	32	20	9	24	56	75	92	58	43	4.90	30
32	**18** **22**	19.5	163	8	36	4	67	38	25	11	32	67	90	110	62	47	7.90	60
40	**22** **28**	19.5	183	8	36	4	77.5	43	25	11	32	78	100	120	73	56	7.90	60
50	**28** **36**	22	199	10	40	4.5	95	52	32	14	42	95	120	145	74	62	11.10	100
63	**36** **45**	29	211	10	40	4.5	113	62	32	18	50	116	150	180	84	72	21.15	250
80	**45** **56**	34	236	14	63	5	129	70	40	22	60	130	170	210	93	81	33.35	490
100	**56** **70**	32	293	16	70	6	153	82	50	26	70	158	205	250	117	96	48.30	850
125	**70** **90**	32	321	18	80	6	190	100	56	33	80	192	245	300	143	112	77.80	1710
160	**90** **110**	36	364	22	125	8	232	119	60	33	90	238	295	350	171	130	77.80	1710
200	**110** **140**	39	447	28	160	9	282	145	72	39	110	285	350	415	230	151	113.25	2970

Dimensions: Proximity switch
(dimensions in mm)



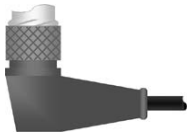
Installation space for mating connector





Mating connector with 5 m cable
Material no. **R913016852**
(separate order)

Mating connector, angled with 5 m cable (position of the cable outlet cannot be defined)
Material no. **R988064311**
(separate order)



Dimensions: Proximity switch (dimensions in mm)

ØAL	ØMM	PL	L7	X3	X4	X5
25 [2]	**14**	–	–	–	–	–
	18	–	–	–	–	–
32 [2]	**18**	–	–	–	–	–
	22	–	–	–	–	–
40	**22**	97	71	94	170	125
	28	97	71	94	170	125
50	**28**	103	76	98	175	130
	36	103	76	98	175	130
63	**36**	113	84	103	180	135
	45	113	84	103	180	135
80	**45**	124	96	109	185	140
	56	124	96	109	185	140
100	**56**	150	114	116	195	150
	70	150	114	116	195	150
125	**70**	158	129	126	205	160
	90	158	129	126	205	160
160	**90**	181	148	136	215	170
	110	181	148	136	215	170
200	**110**	214	195	151	230	185
	140	214	195	151	230	185

ØAL = piston Ø

ØMM = piston rod Ø

X* = stroke length

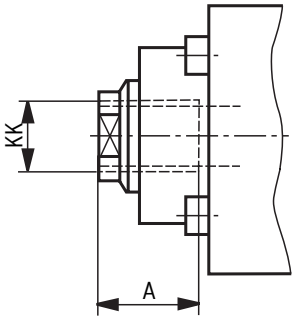
[1] The proximity switch is always located opposite of the line connection

[2] Piston Ø 25 ... 32 mm
Proximity switch not possible

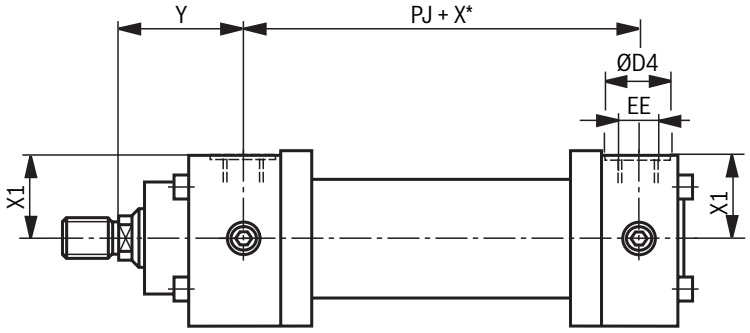
Notice:
For cylinder dimensions, see page 12 ... 27

Piston rod end "E"
(dimensions in mm)

ØAL	ØMM	KK	A
		ISO 6020-1	
32	**22**	M16 x 1.5	22
40	**22**	M16 x 1.5	22
	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)

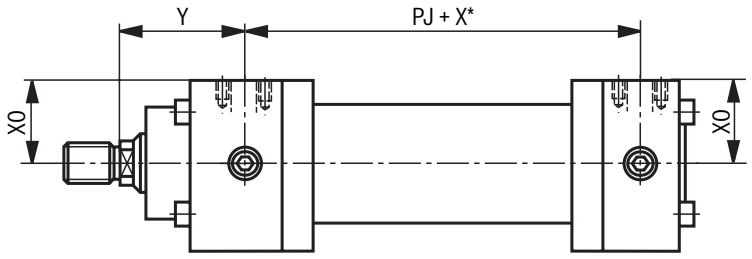


ØAL	Version "S" ISO 1179-1				
	EE	**ØD4** [1]	**Y**	**PJ**	**X1**
25	–	–	–	–	–
32	–	–	–	–	–
40	–	–	–	–	–
50	–	–	–	–	–
63	G1	47	80	121	53.5
80	G1	47	91	134	60.5
100	G1 1/4	58	108	162	74
125	G1 1/4	58	121	174	92
160	G1 1/2	65	143	191	114.5
200	G1 1/2	65	190	224	138.5

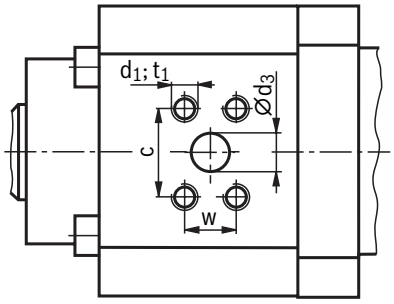
ØAL = piston Ø
ØMM = piston rod Ø
X* = stroke length
[1] ØD4 recess max. 0.5 mm deep

☞ **Notice:**
For cylinder dimensions, see page 12 ... 27

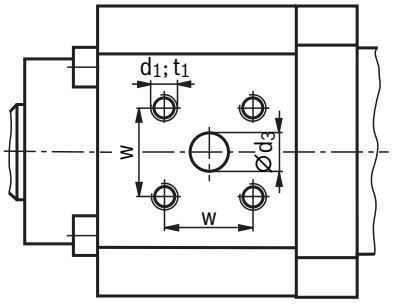
Flange connection
(dimensions in mm)



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]
25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
40	–	–	–	–	–	–	–	–	–	71	97	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

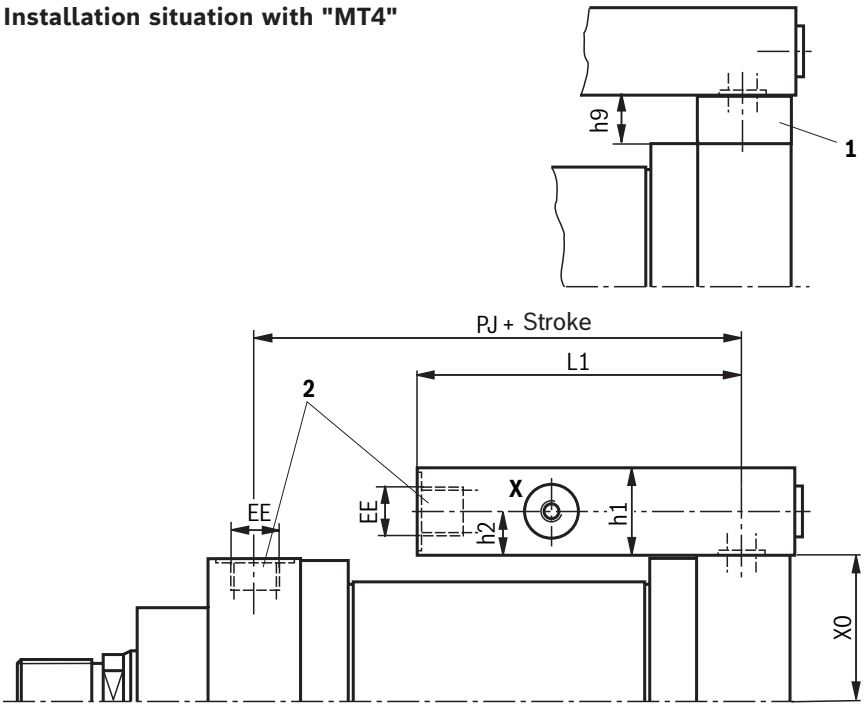
1) Flange connection according to ISO6162-1 corresponds to flange connection according to SAE 3000 PSI

2) Thread depth

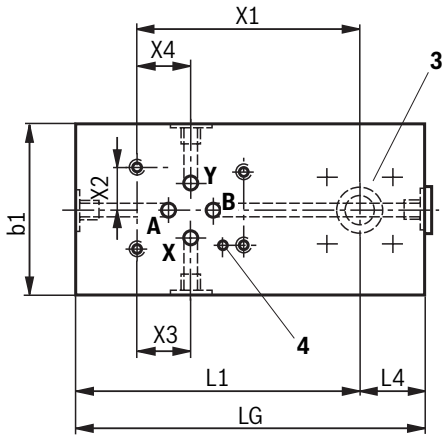
☞ **Notice:**
For cylinder dimensions, see page 12 ... 27

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

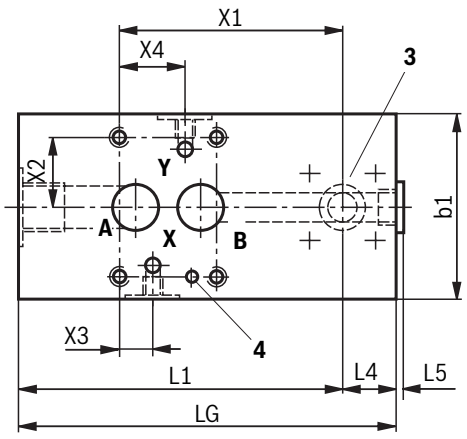
Installation situation with "MT4"



NG6
Porting pattern according to ISO 4401



NG10 and 20
Porting pattern according to 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 12 ... 27

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] [2]	Minimum stroke [1] [3]	X0	Plate dimensions L1	L4	L5	LG	b1	h1	h9
40	6	97	G1/2	100	100	34.5	90	20	4	110	55	40	10
50	6	111	G1/2	100	100	44	90	20	4	110	55	40	10
63	6	117	G3/4	100	100	52	100	25	5	125	55	45	10
	10	117	G3/4	100	100	52	105	25	6	130	85	45	10
80	6	134	G3/4	100	100	60	100	25	5	125	55	45	10
	10	134	G3/4	100	100	60	105	25	5	130	85	45	10
100	10	162	G1	100	100	72	102	28	5	130	85	50	10
125	10	174	G1	100	106	91	102	28	5	130	85	50	20
	20	174	G1	100	106	91	137	28	5	165	100	50	20
160	10	191	G1 1/4	100	163	114	115	35	5	150	85	60	20
	20	191	G1 1/4	100	163	114	140	35	5	175	100	60	20
200	10	224	G1 1/4	100	202	138	115	35	5	150	85	60	20
	20	224	G1 1/4	100	202	138	140	35	5	175	100	60	20

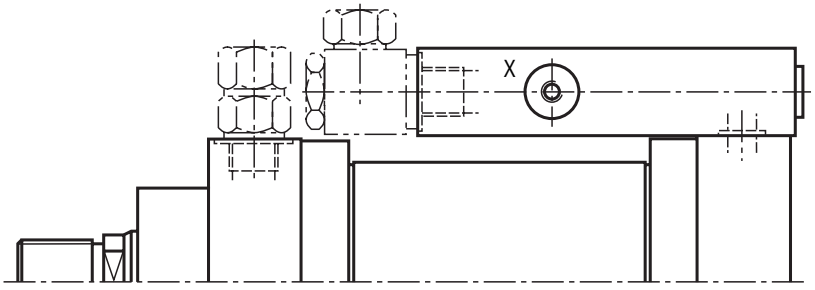
ØAL	Valve size (NG)	Port size, porting pattern h2	A	X	Y	X3	X4	Position point of valve X1	X2
40	6	20	G1/2	G1/4	G1/4	21.5	21.5	65.5	15.5
50	6	20	G1/2	G1/4	G1/4	21.5	21.5	65.5	15.5
63	6	22.5	G3/4	G1/4	G1/4	21.5	21.5	70.5	15.5
	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	73	33.35
80	6	22.5	G3/4	G1/4	G1/4	21.5	21.5	70.5	15.5
	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	73	33.35
100	10	25	G1	G1/4	G1/4	21.5	21.5	70	33.35
125	10	25	G1	G1/4	G1/4	21.5	21.5	70	33.35
	20	25	G1	G1/4	G1/4	20.6	39.5	92	39.7
160	10	30	G1 1/4	G1/4	G1/4	21.5	21.5	80	33.35
	20	30	G1 1/4	G1/4	G1/4	20.6	39.5	95	39.7
200	10	30	G1 1/4	G1/4	G1/4	21.5	21.5	80	33.35
	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.

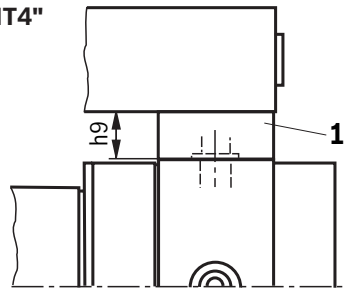
2) Not for "MT4"

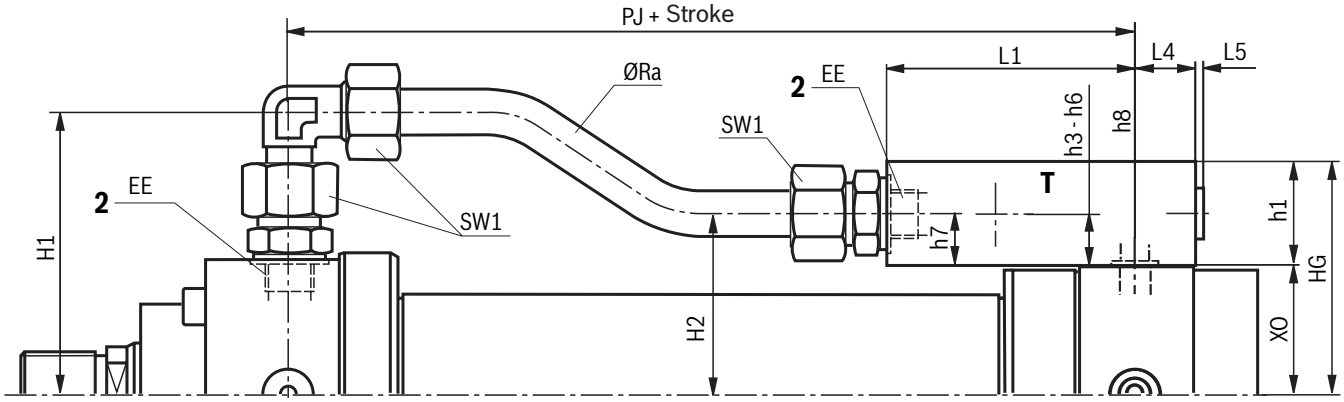
3) Only for "MT4"



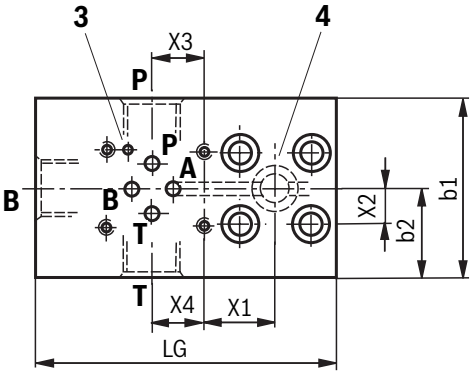
Subplates for valve mounting (switching and proportional directional valves) (dimensions in mm)

Installation situation with "MT4"

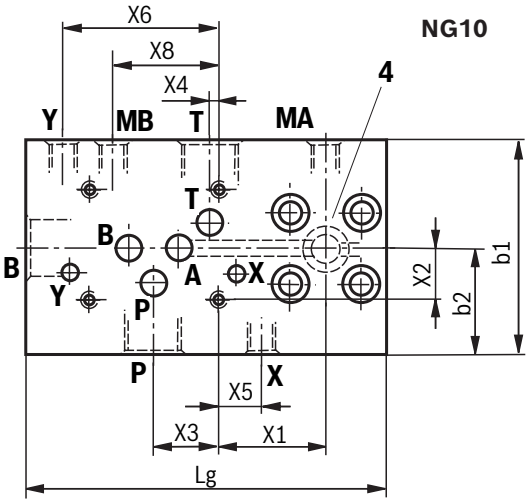




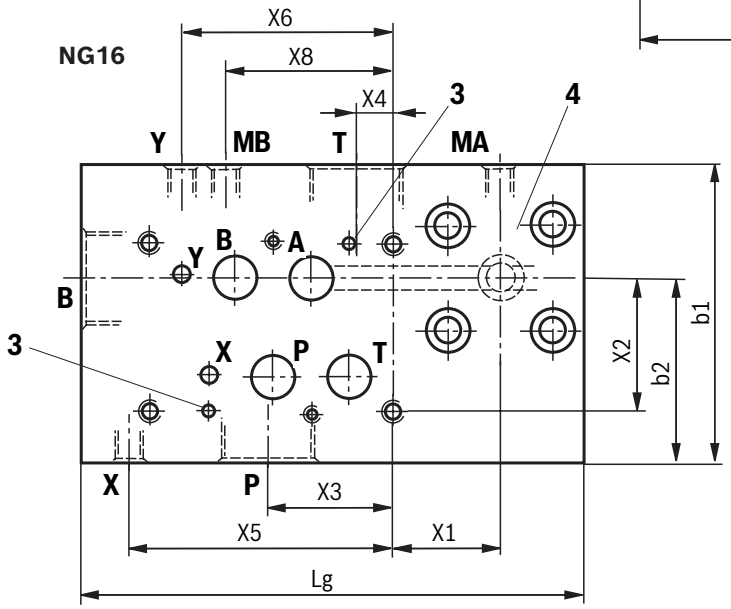
NG6



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 12 ... 27)

3 Bore for locking pin

4 Port "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	97	G1/2	255	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	245	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	290	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	315	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	275	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	300	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	330	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	315	132	28	5	165	121	141	46	25.0 x 4.0	90	80	160	171	191	45	91	30	20
	16	174	G1	340	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	345	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	375	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	310	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	345	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.

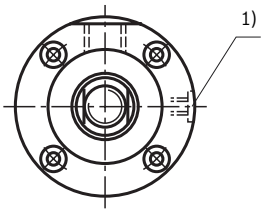
ØAL = piston Ø

[1] Not for "MT4"

[2] Only for "MT4"

Bleeding / measuring coupling
(dimensions in mm)

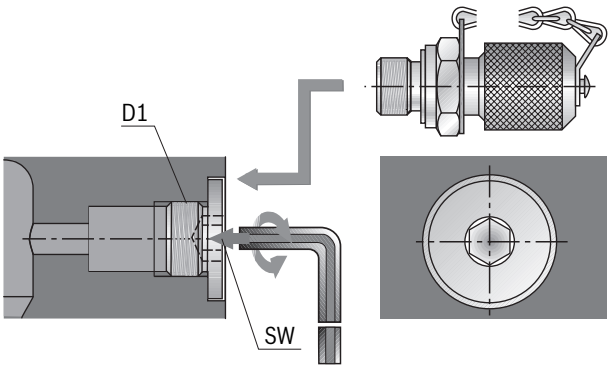
By default, a patented safety vent against unintended screwing out in head and base is delivered for piston Ø ≥ 40 mm.
For piston Ø 25 and 32 mm, a bleed screw G1/8 is installed in head and base which is not secured against screwing out.
The port allows for the installation of a measuring coupling with 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.



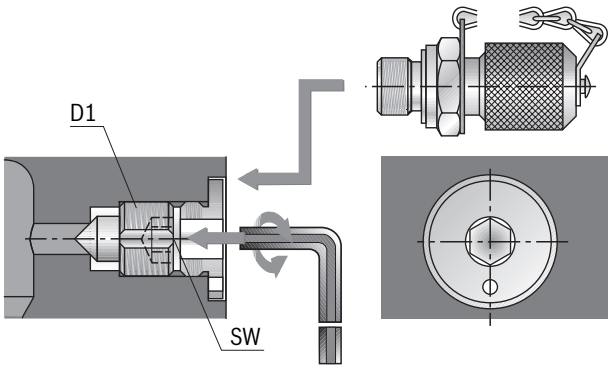
1) Bleeding: With view to the piston rod, the position is always offset by 90° in relation to the line connection (clockwise)

Connection possibility for measuring coupling

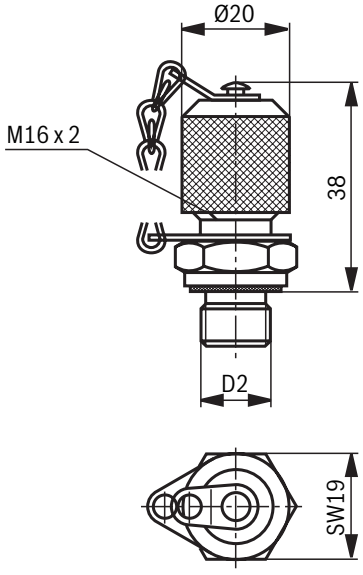
Piston Ø (AL) 25 and 32 mm



Piston Ø (AL) 40 ... 200 mm



	Bleed screw			Measuring coupling
ØAL	**D1**	**Fuse**	**SW**	**D2**
25 and 32	G1/8	not secured	5	G1/8
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**

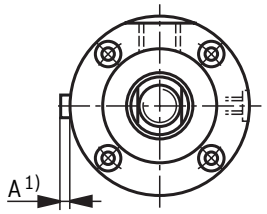
Scope of delivery: measuring coupling **G1/4**
MEASURING COUPLING AB 20-11/K1 G1/4 with seal ring made of NBR
Material no. **R900009090**
MEASURING COUPLING AB 20-11/K1V G1/4 with seal ring made of FKM
Material no. **R900001264**

Throttle valve
(dimensions in mm)

ØAL	25	32	40	50	63	80	100	125	160	200
Protrusion A [1]	6.5	4	5.5	1.5	0	0	0	0	0	0

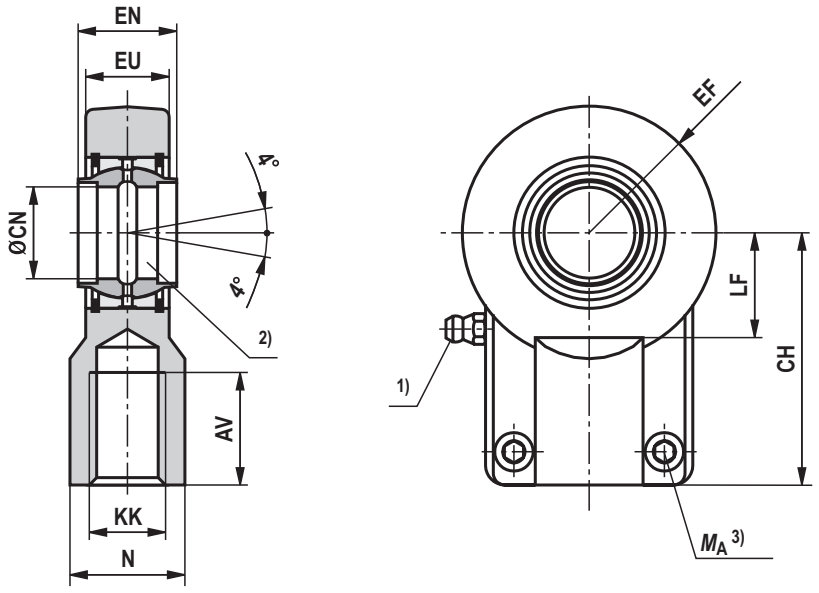
ØAL = piston Ø

[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. Maintenance required [1]	Material no. Flat type grease nipple [4]	Nominal force kN	AV min.	N max.	CH js13	EF max.	ØCN H7 [2]	EN h12	EU max.
25	14	**CGKD 12** [5]	R900540998	–	8	17	19	38	16.5	12	12	11
	18	**CGKD 12** [5]	R900540998	–	8	17	19	38	16.5	12	12	11
	18	**CGKD 16**	R900308559	–	12.5	19	22	44	20.5	16	16	14
32	18	**CGKD 16**	R900308559	–	12.5	19	22	44	20.5	16	16	14
	22	**CGKD 16**	R900308559	–	12.5	19	22	44	20.5	16	16	14
	22	**CGKD 20**	R900308576	–	20	23	28	52	25	20	20	17.5
40	22	**CGKD 20**	R900308576	–	20	23	28	52	25	20	20	17.5
	28	**CGKD 20**	R900308576	–	20	23	28	52	25	20	20	17.5
	28	**CGKD 25**	R900323332	R901085733	32	29	31	65	32	25	25	22
50	28	**CGKD 25**	R900323332	R901085733	32	29	31	65	32	25	25	22
	36	**CGKD 25**	R900323332	R901085733	32	29	31	65	32	25	25	22
	36	**CGKD 32**	R900322049	R900322036	50	37	38	80	40	32	32	28
63	36	**CGKD 32**	R900322049	R900322036	50	37	38	80	40	32	32	28
	45	**CGKD 32**	R900322049	R900322036	50	37	38	80	40	32	32	28
	45	**CGKD 40**	R900322029	R900851873	80	46	47	97	50	40	40	34
80	45	**CGKD 40**	R900322029	R900851873	80	46	47	97	50	40	40	34
	56	**CGKD 40**	R900322029	R900851873	80	46	47	97	50	40	40	34
	56	**CGKD 50**	R900322719	R900322033	125	57	58	120	63	50	50	42
100	56	**CGKD 50**	R900322719	R900322033	125	57	58	120	63	50	50	42
	70	**CGKD 50**	R900322719	R900322033	125	57	58	120	63	50	50	42
	70	**CGKD 63**	R900322028	R900322032	200	64	70	140	72.5	63	63	53.5
125	70	**CGKD 63**	R900322028	R900322032	200	64	70	140	72.5	63	63	53.5
	90	**CGKD 63**	R900322028	R900322032	200	64	70	140	72.5	63	63	53.5
	90	**CGKD 80**	R900322700	R900322031	320	86	91	180	92	80	80	68
160	90	**CGKD 80**	R900322700	R900322031	320	86	91	180	92	80	80	68
	110	**CGKD 80**	R900322700	R900322031	320	86	91	180	92	80	80	68
	110	**CGKD 100**	R900322030	R900322034	500	96	110	210	114	100	100	85.5
200	110	**CGKD 100**	R900322030	R900322034	500	96	110	210	114	100	100	85.5
	140	**CGKD 100**	R900322030	R900322034	500	96	110	210	114	100	100	85.5
	140	**CGKD 125**	R900322026	R900322673	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 [6] kg	C_0 [7] kN	F_{adm} [8] kN
25	14	CGKD 12 [5]	M12 x 1.25	13	M5 x 16	6	0.1	24.5	9.0
	18	CGKD 12 [5]	M12 x 1.25	13	M5 x 16	6	0.1	24.5	9.0
	18	CGKD 16	M14 x 1.5	16.5	M6 x 14	10	0.2	36.5	13.5
32	18	CGKD 16	M14 x 1.5	16.5	M6 x 14	10	0.2	36.5	13.5
	22	CGKD 16	M14 x 1.5	16.5	M6 x 14	10	0.2	36.5	13.5
	22	CGKD 20	M16 x 1.5	20.5	M8 x 20	25	0.35	48	17.7
40	22	CGKD 20	M16 x 1.5	20.5	M8 x 20	25	0.35	48	17.7
	28	CGKD 20	M16 x 1.5	20.5	M8 x 20	25	0.35	48	17.7
	28	CGKD 25	M20 x 1.5	25.5	M8 x 20	30	0.65	78	28.8
50	28	CGKD 25	M20 x 1.5	25.5	M8 x 20	30	0.65	78	28.8
	36	CGKD 25	M20 x 1.5	25.5	M8 x 20	30	0.65	78	28.8
	36	CGKD 32	M27 x 2	30	M10 x 25	59	1.15	114	42.1
63	36	CGKD 32	M27 x 2	30	M10 x 25	59	1.15	114	42.1
	45	CGKD 32	M27 x 2	30	M10 x 25	59	1.15	114	42.1
	45	CGKD 40	M33 x 2	39	M10 x 30	59	2.1	204	75.3
80	45	CGKD 40	M33 x 2	39	M10 x 30	59	2.1	204	75.3
	56	CGKD 40	M33 x 2	39	M10 x 30	59	2.1	204	75.3
	56	CGKD 50	M42 x 2	47	M12 x 35	100	4	310	114.4
100	56	CGKD 50	M42 x 2	47	M12 x 35	100	4	310	114.4
	70	CGKD 50	M42 x 2	47	M12 x 35	100	4	310	114.4
	70	CGKD 63	M48 x 2	58	M16 x 40	250	7.2	430	158.7
125	70	CGKD 63	M48 x 2	58	M16 x 40	250	7.2	430	158.7
	90	CGKD 63	M48 x 2	58	M16 x 40	250	7.2	430	158.7
	90	CGKD 80	M64 x 3	74	M20 x 50	490	15	695	265.5
160	90	CGKD 80	M64 x 3	74	M20 x 50	490	15	695	265.5
	110	CGKD 80	M64 x 3	74	M20 x 50	490	15	695	265.5
	110	CGKD 100	M80 x 3	94	M24 x 60	840	25.5	1060	391.1
200	110	CGKD 100	M80 x 3	94	M24 x 60	840	25.5	1060	391.1
	140	CGKD 100	M80 x 3	94	M24 x 60	840	25.5	1060	391.1
	140	CGKD 125	M100 x 3	116	M24 x 70	840	52.5	1430	527.7

ØAL = piston Ø

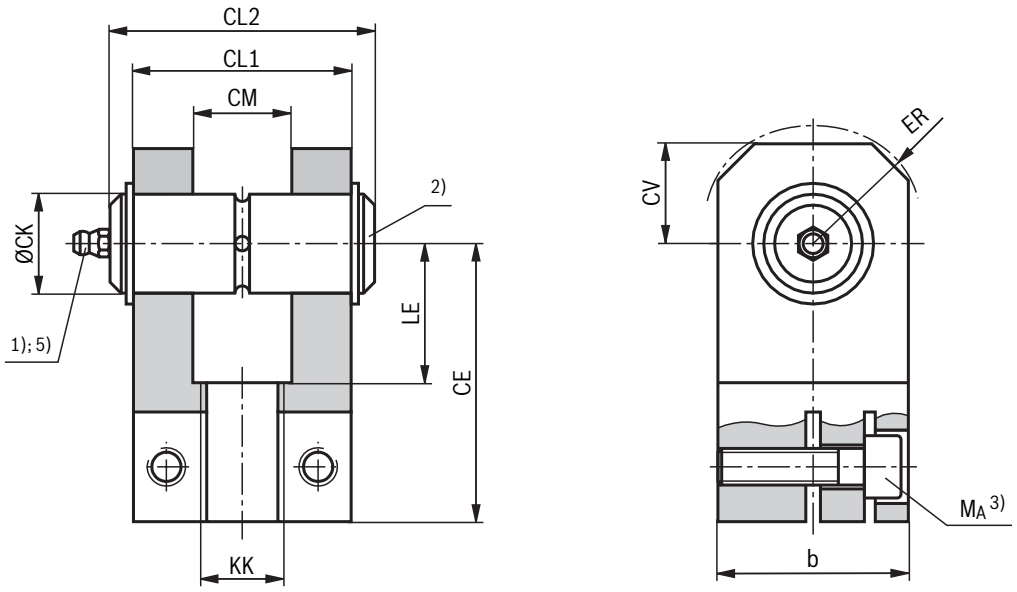
ØMM = piston rod Ø

1) Grease nipple, cone head form A according to DIN 71412
2) Bolt Ø m6 required
3) M_A = tightening torque
4) Form A flat type grease nipple according to DIN 3404
5) Bearing cannot be re-lubricated
6) m = weight of swivel head in kg
7) C_0 = static load rating of the swivel head
8) F_{zul} = 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 clevis brackets are suitable for attachment in case of type of mounting MP5 and at the swivel head.
The swivel head must always be screwed against the piston rod shoulder. Afterwards, the clamping screws must be tightened with the specified tightening torque.

Fork clevis CCKB (clampable)
(dimensions in mm)

ISO 8132



ØAL	ØMM	Type	Material no. Maintenance required 1)	Nominal force kN	b max.	CE js13	ØCK H9 2)	CL1 h16	CL2 max.	CM A13	ER max.
25	14	**CCKB 12** 5)	R900542842	8	25	38	12	28	49	12	16
	18	**CCKB 12** 5)	R900542842	8	25	38	12	28	49	12	16
	18	**CCKB 16**	R900542843	12.5	30	44	16	36	57	16	20
32	18	**CCKB 16**	R900542843	12.5	30	44	16	36	57	16	20
	22	**CCKB 16**	R900542843	12.5	30	44	16	36	57	16	20
	22	**CCKB 20**	R900542844	20	40	52	20	45	72	20	25
40	22	**CCKB 20**	R900542844	20	40	52	20	45	72	20	25
	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
25	14	CCKB 12 [5]	M12 x 1.25	18	16	M4 x 16	2.9	0.2
	18	CCKB 12 [5]	M12 x 1.25	18	16	M4 x 16	2.9	0.2
	18	CCKB 16	M14 x 1.5	22	20	M6 x 20	10	0.35
32	18	CCKB 16	M14 x 1.5	22	20	M6 x 20	10	0.35
	22	CCKB 16	M14 x 1.5	22	20	M6 x 20	10	0.35
	22	CCKB 20	M16 x 1.5	27	25	M8 x 30	25	0.7
40	22	CCKB 20	M16 x 1.5	27	25	M8 x 30	25	0.7
	28	CCKB 20	M16 x 1.5	27	25	M8 x 30	25	0.7
	28	CCKB 25	M20 x 1.5	34	32	M10 x 35	49	1.4
50	28	CCKB 25	M20 x 1.5	34	32	M10 x 35	49	1.4
	36	CCKB 25	M20 x 1.5	34	32	M10 x 35	49	1.4
	36	CCKB 32	M27 x 2	41	40	M12 x 40	85	2.8
63	36	CCKB 32	M27 x 2	41	40	M12 x 40	85	2.8
	45	CCKB 32	M27 x 2	41	40	M12 x 40	85	2.8
	45	CCKB 40	M33 x 2	51	50	M16 x 50	210	5.2
80	45	CCKB 40	M33 x 2	51	50	M16 x 50	210	5.2
	56	CCKB 40	M33 x 2	51	50	M16 x 50	210	5.2
	56	CCKB 50	M42 x 2	63	63	M20 x 60	425	9.5
100	56	CCKB 50	M42 x 2	63	63	M20 x 60	425	9.5
	70	CCKB 50	M42 x 2	63	63	M20 x 60	425	9.5
	70	CCKB 63	M48 x 2	75	71	M24 x 80	730	21.5
125	70	CCKB 63	M48 x 2	75	71	M24 x 80	730	21.5
	90	CCKB 63	M48 x 2	75	71	M24 x 80	730	21.5
	90	CCKB 80	M64 x 3	94	90	M30 x 100	1450	38.2
160	90	CCKB 80	M64 x 3	94	90	M30 x 100	1450	38.2
	110	CCKB 80	M64 x 3	94	90	M30 x 100	1450	38.2
	110	CCKB 100	M80 x 3	114	110	M36 x 130	2480	[6]
200	110	CCKB 100	M80 x 3	114	110	M36 x 130	2480	[6]
	140	CCKB 100	M80 x 3	114	110	M36 x 130	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 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

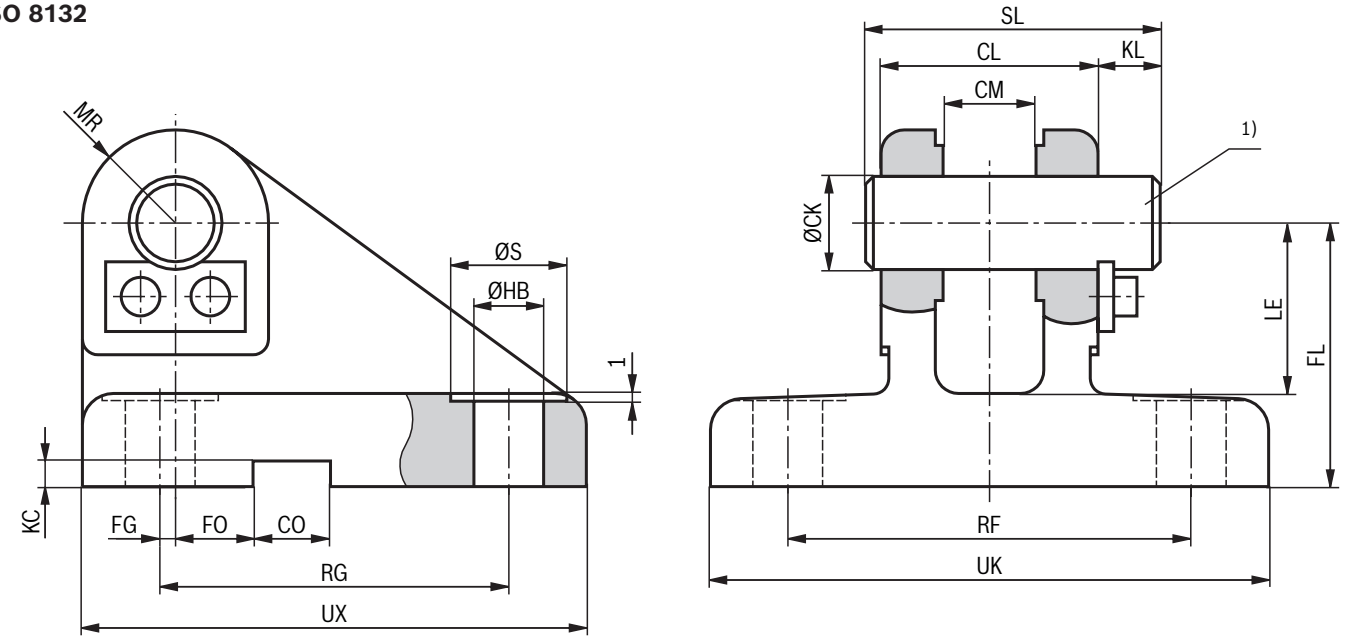
5) Without lubrication bore

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



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 [1]	CL h16	CM A13	CO N9	FG JS14	FL js13	FO JS14
25	14	CLCA 12	R900542861	8	12	28	12	10	2	34	10
	18	CLCA 12	R900542861	8	12	28	12	10	2	34	10
	18	CLCA 16	R900542862	12.5	16	36	16	16	3.5	40	10
32	18	CLCA 16	R900542862	12.5	16	36	16	16	3.5	40	10
	22	CLCA 16	R900542862	12.5	16	36	16	16	3.5	40	10
	22	CLCA 20	R900542863	20	20	45	20	16	7.5	45	10
40	22	CLCA 20	R900542863	20	20	45	20	16	7.5	45	10
	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	R901261098 [3]	500	100	210	100	63	52.5	180	0
200	110	CLCA 100	R901261098 [3]	500	100	210	100	63	52.5	180	0
	140	CLCA 100	R901261098 [3]	500	100	210	100	63	52.5	180	0
	140	CLCA 125	R901373011 [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
25	14	CLCA 12	9	3.3	8	22	12	52	45	15	38	72	65	0.45
	18	CLCA 12	9	3.3	8	22	12	52	45	15	38	72	65	0.45
	18	CLCA 16	11	4.3	8	27	16	65	55	18	46	90	80	1
32	18	CLCA 16	11	4.3	8	27	16	65	55	18	46	90	80	1
	22	CLCA 16	11	4.3	8	27	16	65	55	18	46	90	80	1
	22	CLCA 20	11	4.3	10	30	20	75	70	18	58	100	95	1.5
40	22	CLCA 20	11	4.3	10	30	20	75	70	18	58	100	95	1.5
	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 not mounted upon delivery)

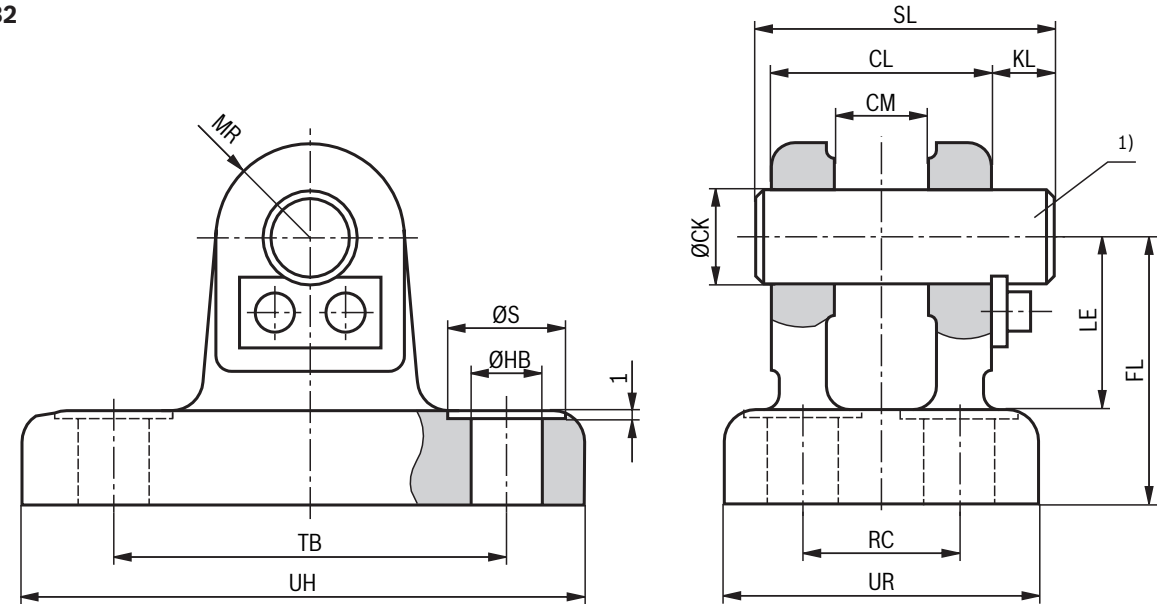
[2] ***m*** = Weight of clevis bracket in kg

[3] On request

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

Clevis bracket CLCD
(dimensions in mm)

ISO 8132



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 1)	CL h16	CM A13	FL js12	ØHB H13	KL
25	14	CLCD 12	R900542879	8	12	28	12	34	9	8
	18	CLCD 12	R900542879	8	12	28	12	34	9	8
	18	CLCD 16	R900542880	12.5	16	36	16	40	11	8
32	18	CLCD 16	R900542880	12.5	16	36	16	40	11	8
	22	CLCD 16	R900542880	12.5	16	36	16	40	11	8
	22	CLCD 20	R900542881	20	20	45	20	45	11	10
40	22	CLCD 20	R900542881	20	20	45	20	45	11	10
	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
25	14	CLCD 12	22	12	20	15	38	50	40	70	0.35
	18	CLCD 12	22	12	20	15	38	50	40	70	0.35
	18	CLCD 16	27	16	26	18	46	65	50	90	0.7
32	18	CLCD 16	27	16	26	18	46	65	50	90	0.7
	22	CLCD 16	27	16	26	18	46	65	50	90	0.7
	22	CLCD 20	30	20	32	18	58	75	58	98	0.95
40	22	CLCD 20	30	20	32	18	58	75	58	98	0.95
	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 not mounted upon delivery)

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

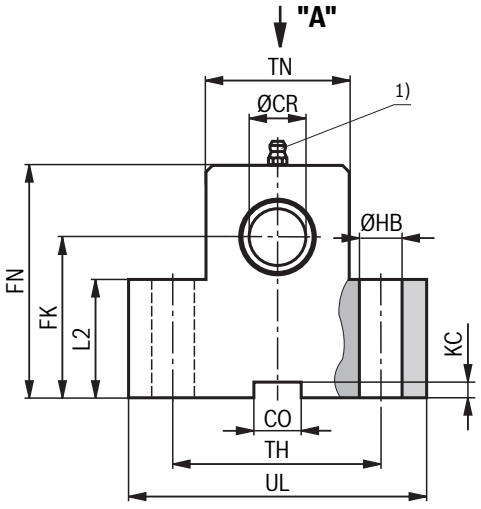
[3] On request

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.

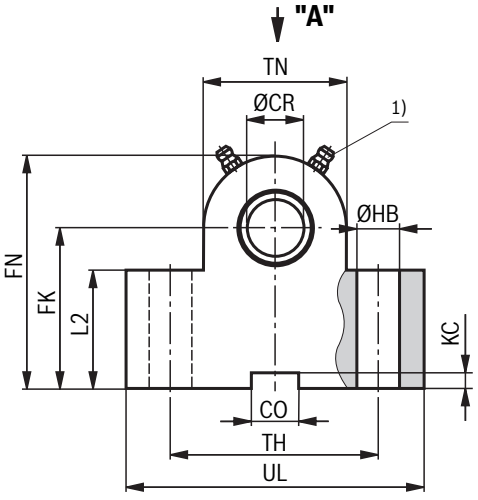
Trunnion mounting bearing block CLTB
(dimensions in mm)

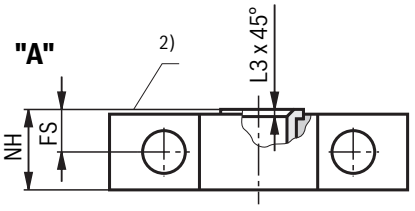
ISO 8132

CLTB 12 ... 20



CLTB 25 ... 110





ØAL	Type [3]	Material no. Maintenance required [1]	Nominal force kN [4]	ØCR H7	CO N9	FK JS12	FN max.	FS js13	ØHB H13	KC +0.3
25	**CLTB 12**	R900772607	8	12	10	34	50	8	9	3.3
32	**CLTB 16**	R900772608	12.5	16	16	40	60	10	11	4.3
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 [5]	500	100	63	180	280	45	52	12.4

Trunnion mounting bearing block CLTB
(dimensions in mm)

ØAL	Type [3]	TN max.	L2	L3	NH max.	TH js13	UL max.	*m* [6] kg
25	**CLTB 12**	24	25	1	17	40	63	0.4
32	**CLTB 16**	31	30	1	21	50	80	0.85
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	[5]

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
6) On request
5) ***m*** = weight of trunnion mounting bearing block in kg (specified per pair)

☞ **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

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

2. Calculation according to Tetmajer

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

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)

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

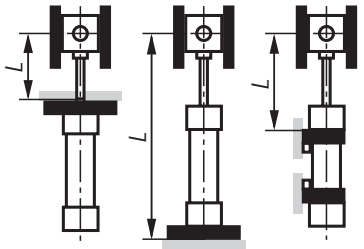
d Piston rod Ø in mm

λ Slenderness ratio

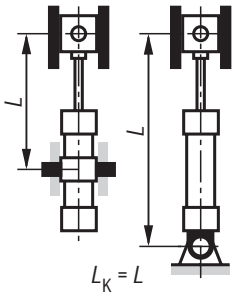
$$= \frac{4 \cdot L_K}{d} \qquad \lambda_g = \pi \cdot \sqrt{\frac{E}{0{,}8 \cdot R_e}}$$

R_e Yield strength of the piston rod material

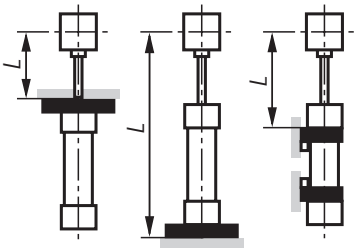
Influence of the type of mounting on the buckling length:



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



$L_K = L$



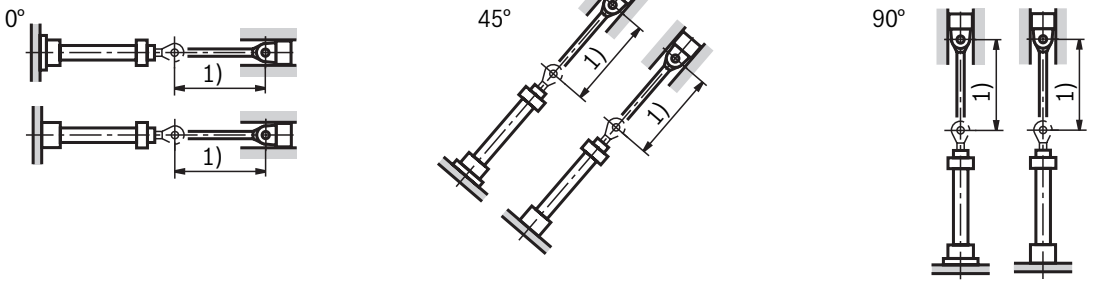
$L_K = 2\,L$

Buckling
(dimensions in mm)

Type of mounting "MF2", "MF4"

ØAL	ØMM	admissible stroke length with								
		70 bar			100 bar			160 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
25	14	260	270	305	215	220	240	160	165	170
	18	435	455	485	385	400	460	310	315	340
32	18	340	355	410	290	295	325	215	220	230
	22	510	535	665	450	465	535	365	370	400
40	22	405	425	495	345	355	395	265	270	285
	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

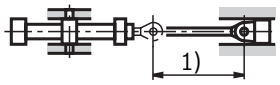
Buckling
(dimensions in mm)

Type of mounting "MT4" trunnion in cylinder center

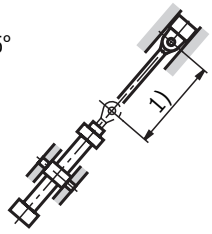
ØAL	ØMM	admissible stroke length with								
		70 bar			100 bar			160 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
25	14	220	235	280	170	180	220	110	120	155
	18	430	455	530	340	365	430	250	265	320
32	18	295	315	375	230	245	295	160	170	210
	22	500	530	620	400	425	500	290	310	370
40	22	360	385	455	280	300	360	195	210	260
	28	665	700	820	535	565	665	395	420	500
50	28	490	520	615	385	410	490	275	295	355
	36	905	955	1110	730	775	905	550	580	685
63	36	665	700	825	525	560	665	380	405	490
	45	1130	1195	1385	920	970	1130	690	730	860
80	45	825	870	1025	655	695	825	475	510	610
	56	1385	1460	1700	1130	1190	1385	850	900	1055
100	56	1025	1085	1275	820	870	1025	595	635	760
	70	1740	1835	2130	1415	1495	1740	1070	1130	1325
125	70	1300	1375	1610	1040	1105	1300	765	815	970
	90	2340	2465	2855	1910	2015	2340	1450	1530	1790
160	90	1710	1805	2110	1375	1455	1710	1015	1080	1280
	110	2725	2870	3000	2225	2345	2725	1685	1780	2080
200	110	2025	2140	2500	1620	1720	2025	1195	1270	1510
	140	3000	3000	3000	2895	3000	3000	2200	2320	2710

Installation position

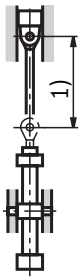
0°



45°



90°



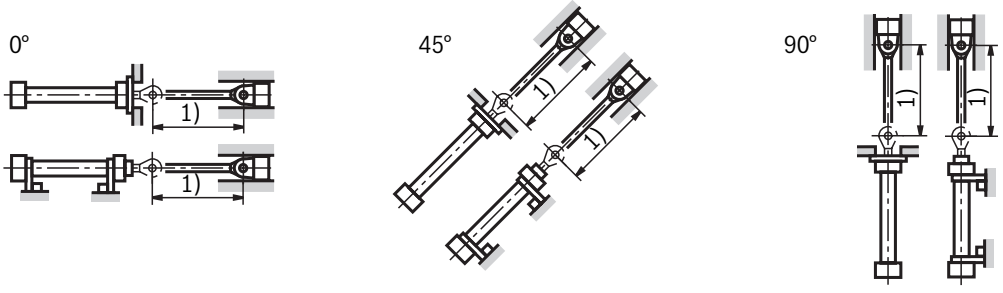
1) Admissible stroke length

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°
25	14	600	600	600	565	575	600	430	440	465
	18	600	600	600	600	600	600	600	600	600
32	18	800	800	800	735	750	790	560	575	605
	22	800	800	800	800	800	800	800	800	800
40	22	1075	1095	1155	880	900	950	675	690	730
	28	1800	1840	1935	1490	1520	1600	1155	1180	1245
50	28	1400	1425	1505	1150	1175	1235	880	900	950
	36	2000	2000	2000	1980	2000	2000	1540	1570	1655
63	36	1845	1880	1980	1520	1550	1635	1170	1190	1260
	45	2000	2000	2000	2000	2000	2000	1910	1950	2000
80	45	2000	2000	2000	1865	1905	2000	1435	1465	1545
	56	2000	2000	2000	2000	2000	2000	2000	2000	2000
100	56	2820	2875	3000	2320	2370	2495	1785	1825	1925
	70	3000	3000	3000	3000	3000	3000	2920	2980	3000
125	70	3000	3000	3000	2910	2970	3000	2245	2290	2420
	90	3000	3000	3000	3000	3000	3000	3000	3000	3000
160	90	3000	3000	3000	3000	3000	3000	2915	2975	3000
	110	3000	3000	3000	3000	3000	3000	3000	3000	3000
200	110	3000	3000	3000	3000	3000	3000	3000	3000	3000
	140	3000	3000	3000	3000	3000	3000	3000	3000	3000

Installation position



1) Admissible stroke length

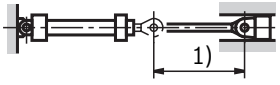
Buckling
(dimensions in mm)

Type of mounting "MP3", "MP5"

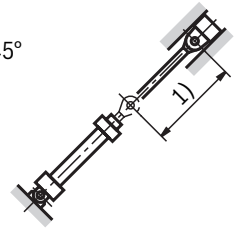
ØAL	ØMM	admissible stroke length with								
		70 bar			100 bar			160 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
25	14	155	160	175	120	125	130	75	80	85
	18	300	310	360	250	260	285	190	195	220
32	18	210	220	240	165	170	180	110	115	120
	22	345	360	420	290	300	330	220	225	235
40	22	255	265	295	205	210	225	140	145	150
	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

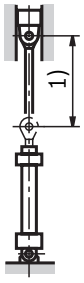
0°



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 checked 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 max. 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 54

Extension:

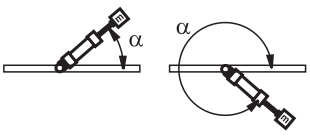
$$D_p = p_S - \frac{m \cdot 9.81 \cdot \sin\alpha}{A_1 \cdot 10}$$

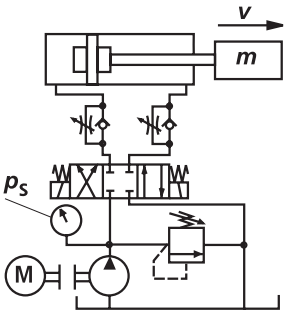
Retraction:

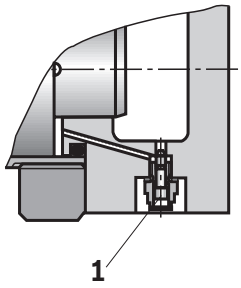
$$D_p = p_S + \frac{m \cdot 9.81 \cdot \sin\alpha}{A_3 \cdot 10}$$

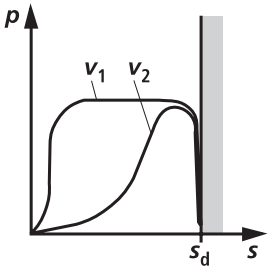
p_S = system pressure in bar
A_1 = piston area in cm² (see page 7)
A_3 = annulus area in cm² (see page 7)
α = angle to the horizontal in degrees

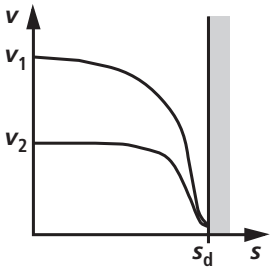
1 Throttle valve











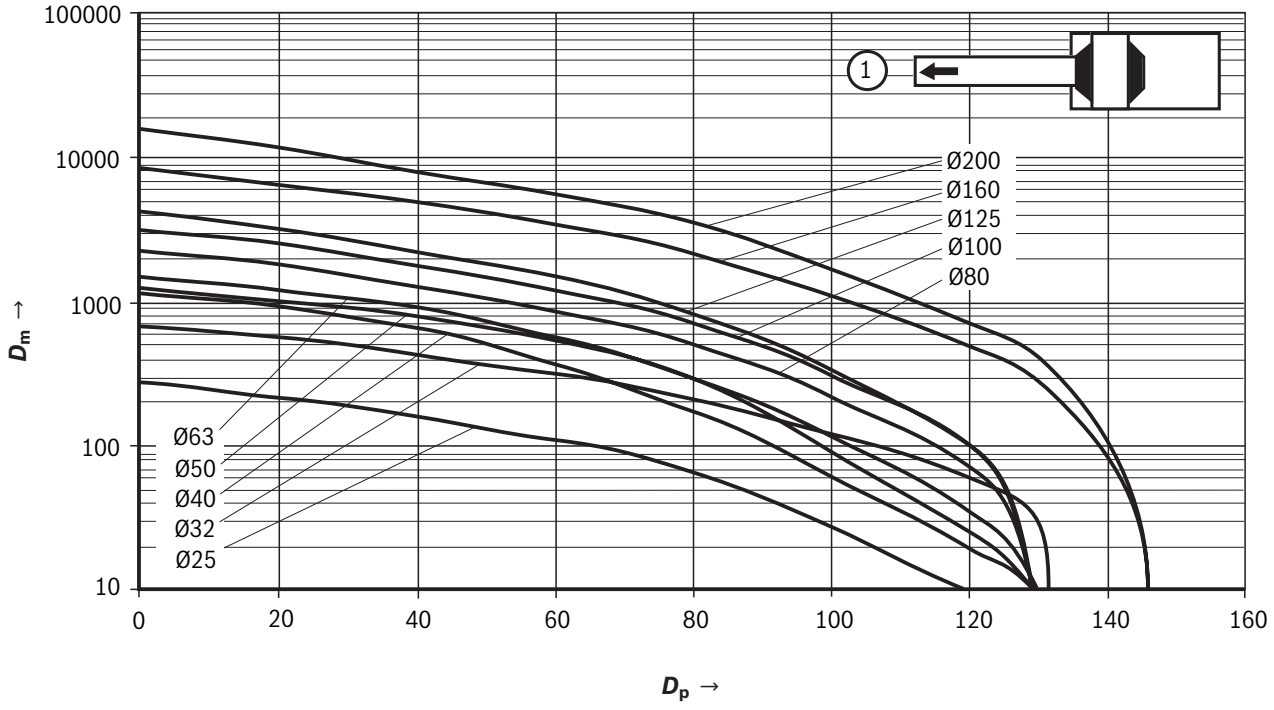
Damping length

ØAL in mm	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
Head side	15	19	23	22	27	27	32	33	40	46
Base side	15	19	23	22	27	27	32	33	40	46

End position damping / damping capacity

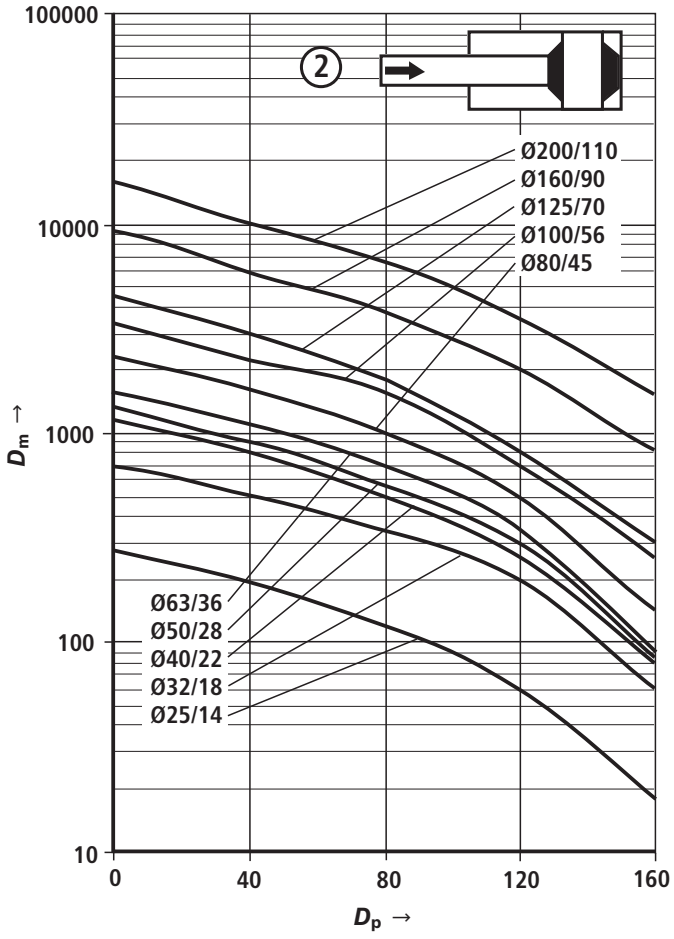
AL Ø mm	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
kv ①	2.97	2.56	2.82	3.51	3.02	2.53	2.65	2.91	2.76	2.95
kv ②	3.15	2.93	2.95	3.45	2.95	2.53	2.93	2.95	2.95	3.1
kv ③	3.1	2.73	3.1	3.51	2.95	2.51	2.91	2.95	2.91	2.93

Damping capacity:
Extension with *kv* ①

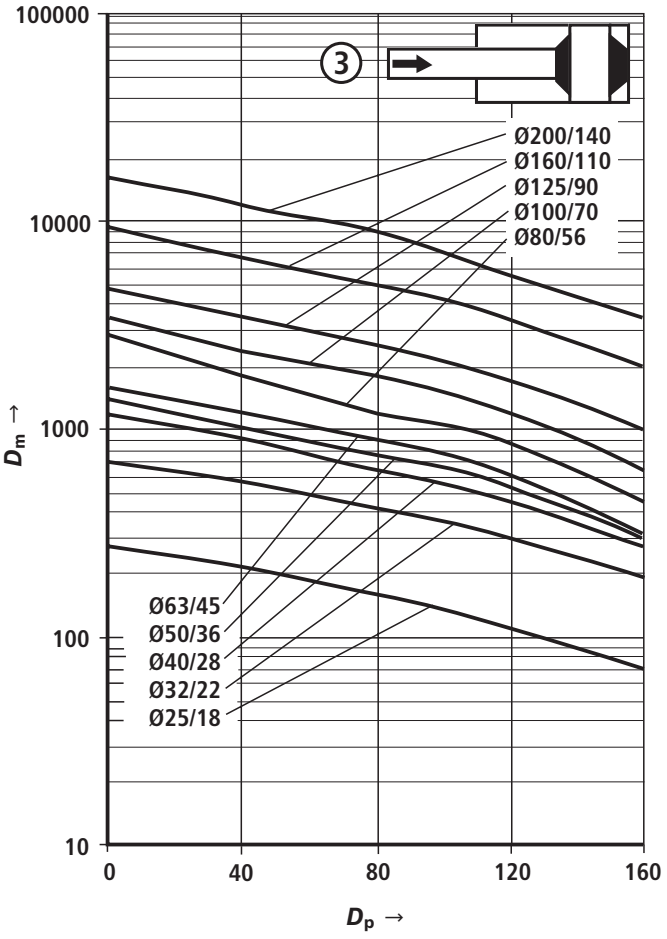


End position damping / damping capacity

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"	"V"	"A"	"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

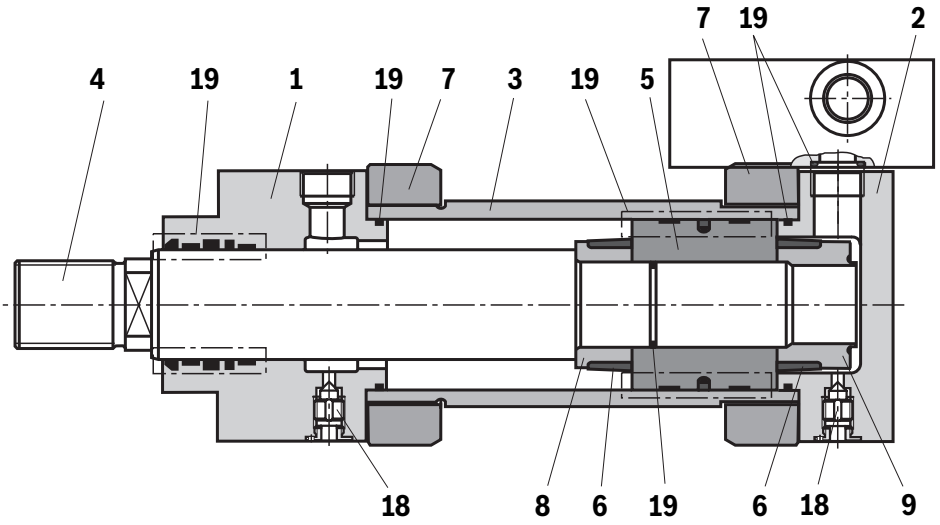
Ambient and rod temperature in the area of the piston rod		Seal versions				
		"M"	"V"	"A"	"T"	"S"
Standard	–20 °C ... +80 °C [1]	++	+ [2]	++	+	++ [2]
Extended	+80 °C ... +120 °C [1]	–	++	–	–	++

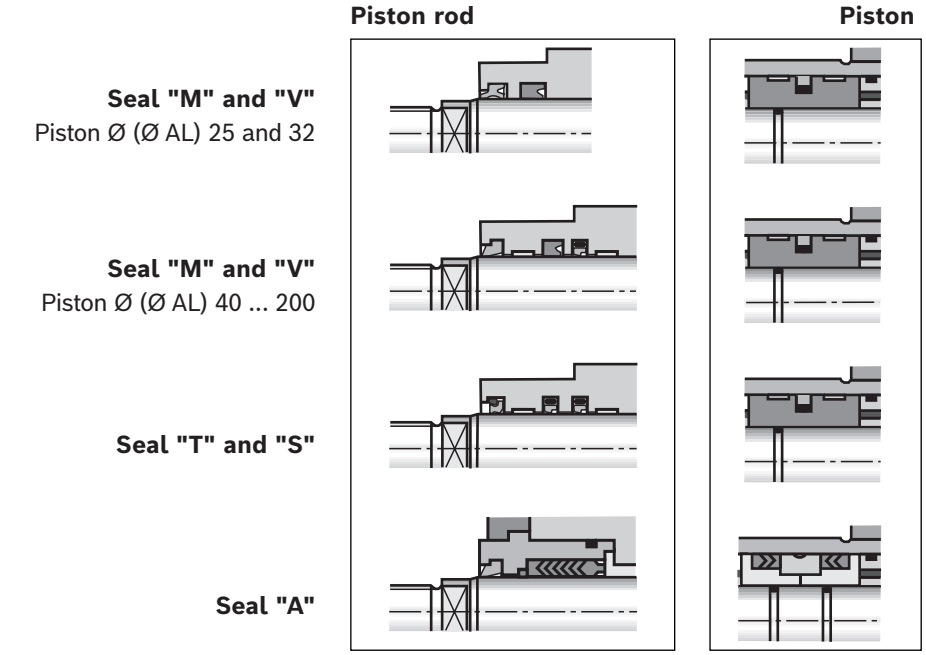
++ = very good
+ = good
+/– = conditional, depending on the application parameters
– = inappropriate

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.

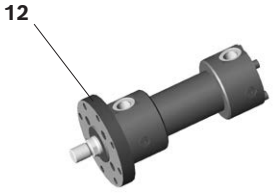
[1] Moreover, observe the corresponding hydraulic fluid temperature range
[2] Lower temperature limit –15 °C

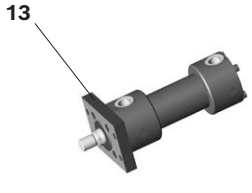
Components

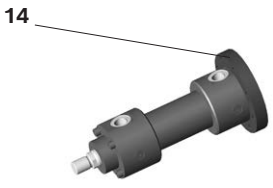


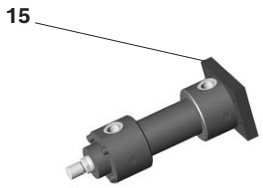


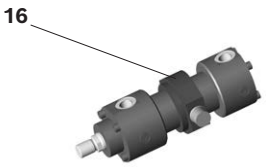
1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket
9 Socket
10 Base "MP3"
11 Base "MP5"
12 Round flange "MF3"
13 Rectangular flange "MF1"
14 Round flange "MF4"
15 Rectangular flange "MF2"
16 Trunnion mounting "MT4"
17 Foot "MS2"
18 Bleeding
19 Seal kit.
Wiper
Rod seal
Piston seal
Seal ring
O-ring
Support ring
Guide ring

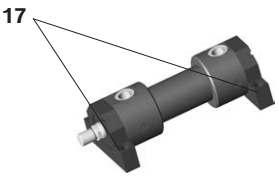












Seal kits [1)]

ØAL	ØMM	Material no. for seal design				
		"M"	"T"	"V"	"S"	"A"
25	14	R407026468	–	R407026567	–	–
	18	R407026529	–	R407026568	–	–
32	18	R407026530	–	R407026569	–	–
	22	R407026531	R407026548	R407026570	R407026587	–
40	22	R407026532	R407026549	R407026571	R407026588	–
	28	R407026533	R407026550	R407026572	R407026589	–
50	28	R407026534	R407026551	R407026573	R407026590	R407026604
	36	R407026535	R407026552	R407026574	R407026591	R407026605
63	36	R407026536	R407026553	R407026575	R407026592	R407026606
	45	R407026537	R407026554	R407026576	R407026593	R407026607
80	45	R407026538	R407026555	R407026577	R407026594	R407026608
	56	R407026539	R407026556	R407026578	R407026595	R407026609
100	56	R407026540	R407026557	R407026579	R407026596	R407026610
	70	R407026541	R407026558	R407026580	R407026597	R407026611
125	70	R407026542	R407026559	R407026581	R407026598	R407026612
	90	R407026543	R407026560	R407026582	R407026599	R407026613
160	90	R407026544	R407026561	R407026583	R407026600	R407026614
	110	R407026545	R407026562	R407026584	R407026601	R407026615
200	110	R407026546	R407026563	R407026585	R407026602	R407026616
	140	R407026547	R407026564	R407026586	R407026603	R407026617

1) Seal kits for proximity switches, separate material no., see below.

Proximity switch

ØAL	Material no. for seal design	
	"M", "T", "A"	"V", "S"
25, 32	–	–
40 ... 200	R900885938	R900885939

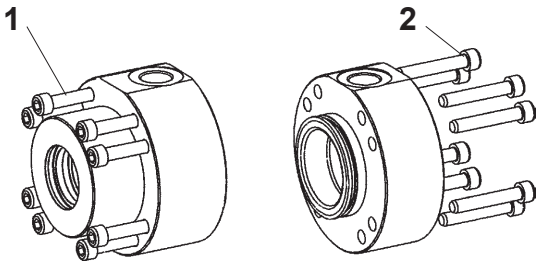
Subplate mounting

ØAL	Material no. for seal design	
	"M", "T", "A"	"V", "S"
40	R961006022	R961006243
50	R691006022	R961006243
63	R961006057	R961006278
80	R961006057	R961006278
100	R961006092	R961006313
125	R961006092	R961006313
160	R961006127	R961006348
200	R961006127	R961006348

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
25	M6	4	10.9	13
32	M6	4	10.9	13
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
- Inductive proximity switches
- 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 weight 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 48).
- 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 56).
- 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 the area ratio of annulus area and piston area and possible throttling points are to be observed.
- Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.

Standards

The installation dimensions and types of mounting of the hydraulic cylinders comply with ISO 6020-1.

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 53.

☞ **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 representations 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

Notes

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Bosch Rexroth AG, RE 17341, edition: 2024-10