Cylinder with Guiding
Ø32-100 mm

- **Guiding- and Stopper Cylinder**
- **Guiding accuracy ± 0,02 mm**
- **Non-rotation accuracy ± 0,02°**
- **Integrated strong guide rods**
- **Variant with 4 ball bearings for precision linear guiding**
- **Variant with 4 plain bearings to absorb high side loads**
- **Easy installation**
- **Magnetic piston as standard**
- **Buffer pad for noise reduction**

Technical Data

Medium:
Compressed air filtered, lubricated or non-lubricated

Operating Pressure:
1 to 10 bar

Operating Temperature:
-10 to +80 °C

Cylinder Diameters:
32, 40, 50, 63, 80 (Cylinder with plain bearings)
32, 40, 50, 63, 80, 100 (Cylinder with ball bearings)

Standard Strokes:
25, 50, 75, 100 mm

* Non standard strokes available (100 mm max.). They have the dimensions of the next longer standard stroke.

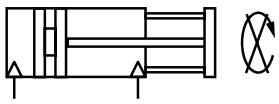
Materials:
Profile barrel: Anodised aluminium
Piston rod: Stainless steel (Martensitic)
Guide rod: Stainless steel (Martensitic)
(Cylinder with plain bearings)
Hardened steel, hard-chrome plated
(Cylinder with ball bearings)
Slide bearings: Solid bronze
(Cylinder with plain bearings)
Steel roller bearings
(Cylinder with ball bearings)
Mounting plate: Stainless steel (Austenitic)
Piston rod seals: Polyurethane
Piston seals: Nitrile rubber
'O'-rings: Nitrile rubber
Buffer: Polyurethane

Ordering Examples

See page N **2.3.**013.02

Switches

See page N **2.3.**013.02



Cylinder Variants

Symbol	Model	Description	Dimensions see page
	**M/61000/M**	Cylinder with plain bearings (Ø 32 to 80 mm)	8
	M/61000/MR	Cylinder with ball bearings (Ø 32 to 100 mm)	8
	M/61000/W2R	Cylinder with ball bearings and special wipers (Ø 32 to 100 mm) for applications in welding areas	on request

Modelcodes

M/61✶✶✶/✶✶/✶✶✶

Cylinder Diameters (mm)	**Substitute**
32	**032**
40	**040**
50	**050**
63	**063**
80	**080**
100	**100**

Strokes (mm)	**Substitute**
25	**25**
50	**50**
75	**75**
100	**100**

Variants (magnetic piston)	**Substitute**
Plain bearings (Ø 32 to 80 mm)	**M**
Ball bearings (Ø 32 to 100 mm)	**MR**
Ball bearings and special wipers (Ø 32 to 100 mm)	**W2R**

Note: If option is not required, disregard option position within part number eg. M/61032/M/25

Switches

Model	Cable	Plug (M8x1)
		
Reed	M/50/LSU/..	M/50/LSU/CP
	M/50/RAC/5V	—
Solid state	M/50/EAP/..	M/50/EAP/CP
	M/50/EAN/..	M/50/EAN/CP

Model		Voltage		Current	Temperature	LED	Features	Cable/Plug	Cable	Plug-in Cable		Catalogue
Reed	Solid State	V a.c.	V d.c.	Max.	°C				Type	Straight	90°	Page
M/50/LSU/*V	—	10 to 240	10 to 170	180 mA	-20° to +80°	●	—	2, 5, 10 m	PVC 2 x 0,25	—	—	N **4.3.**005
M/50/LSU/5U	—	10 to 240	10 to 170	180 mA	-20° to +80°	●	—	5 m	PUR 2 x 0,25	—	—	N **4.3.**005
M/50/RAC/5V	—	10 to 240	10 to 170	180 mA	-20° to +80°	—	Changeover	5 m	PVC 3 x 0,25	—	—	N **4.3.**005
M/50/LSU/CP	—	10 to 60	10 to 75	180 mA	-20° to +80°	●	—	Plug M8x1	—	M/P73001/5	—	N **4.3.**005
—	M/50/EAP/*V	—	10 to 30	150 mA	-20° to +80°	●	PNP	2, 5, 10 m	PVC 3 x 0,25	—	—	N **4.3.**007
—	M/50/EAP/CP	—	10 to 30	150 mA	-20° to +80°	●	PNP	Plug M8x1	—	M/P73001/5	—	N **4.3.**007
—	M/50/EAN/*V	—	10 to 30	150 mA	-20° to +80°	●	NPN	2, 5, 10 m	PVC 3 x 0,25	—	—	N **4.3.**007
—	M/50/EAN/CP	—	10 to 30	150 mA	-20° to +80°	●	NPN	Plug M8x1	—	M/P73001/5	—	N **4.3.**007

* Insert cable length
Full information on switches (technical data, cable materials, dimensions etc.) please refer to relevant catalogue pages

Ordering Examples

Cylinders
To order e.g. a standard 50 mm bore cylinder with a 25 mm stroke with ball bearings quote: **M/61050/MR/25**

Switches
To order e.g. a reed switch with LED and 2 m cable length quote: **M/50/LSU/2V**

Theoretical Forces • Air Consumption

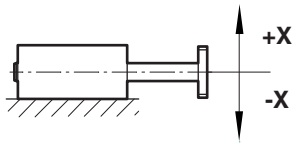
Cylinder ∅ (mm)	Theoretical forces (N) at 6 bar		Air consumption (l/cm stroke) at 6 bar	
	Outstroke	Instroke	Outstroke	Instroke
32	482	414	0,056	0,048
40	754	633	0,088	0,074
50	1178	990	0,137	0,114
63	1870	1680	0,218	0,195
80	3016	2722	0,35	0,32
100	4710	4416	0,55	0,51

Weight (kg)

	Cylinder ∅ (mm)	25 mm stroke	50 mm stroke	75 mm stroke	100 mm stroke
M/61000/M	32	1,50	1,99	2,48	2,97
Cylinder with plain bearings	40	1,70	2,21	2,72	3,23
	50	2,40	3,10	3,80	4,50
	63	3,10	3,91	4,72	5,53
	80	6,45	7,77	9,09	10,40
M/61000/MR	32	1,25	1,65	2,05	2,45
Cylinder with ball bearings	40	1,45	1,87	2,29	2,71
	50	2,10	2,68	3,26	3,84
	63	2,60	3,27	3,94	4,61
	80	5,99	7,14	8,29	9,44
	100	9,16	10,75	12,35	13,95

Guiding Accuracy

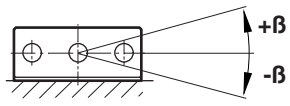
Deflection of the mounting plate X (mm) at instroke and outstroke position without load



Cylinder ∅ mm	32		40		50		63		80		100	
	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke
Position												
Cylinder with plain bearings	± 0,06	± 0,11	± 0,06	± 0,11	± 0,06	± 0,11	± 0,06	± 0,11	± 0,07	± 0.11	–	–
Cylinder with ball bearings	± 0,02	± 0,04	± 0,02	± 0,04	± 0,03	± 0,05	± 0,03	± 0,05	± 0,03	± 0,05	± 0,03	± 0,05

Non-rotation Accuaracy

Deflection of the mounting plate ß (°) at instroke position without load



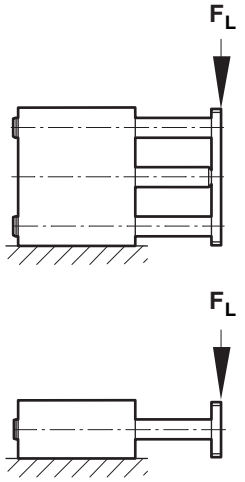
Cylinder ∅ mm	32	40	50	63	80	100
Cylinder with plain bearings	± 0,06	± 0,06	± 0,05	± 0,05	± 0,04	–
Cylinder with ball bearings	± 0,03	± 0,03	± 0,03	± 0,03	± 0,02	± 0,02

Load Data

General:
- The combination of different load cases (e.g. load plus torque or eccentricity in two directions) will reduce the permissible load accordingly.
- Keep the guide rods free from any pollution

Maximum Load F_L (N)

Depending on the stroke



Maximum Load F_L (N) at the front plate

Cylinder ∅ (mm)	Stroke (mm) / Model	25	50	75	100
32	M/61032/M	212	214	215	216
	M/61032/MR	163	179	187	191
40	M/61040/M	227	224	223	222
	M/61040/MR	181	191	195	198
50	M/61050/M	324	331	334	337
	M/61050/MR	223	236	242	246
63	M/61063/M	343	343	343	344
	M/61063/MR	251	254	256	257
80	M/61080/M	470	479	484	487
	M/61080/MR	423	459	477	488
100	M/61100/MR	902	761	799	821

Maximum Load F_L' (N) at the distance Δl

A distance between the force and the front plate (e.g. force in the centre of gravity of a load) will reduce the permissible load as follows:

$$F_L' = F_L \times \left(\frac{b}{b+\Delta l}\right)$$

F_L' – Max. load at the distance Δl (N)

F_L – Max. load at the front plate (N)

Δl – Distance (mm)

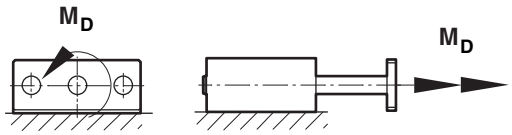
b = a + 2 x stroke (mm)

a – Constant (mm)

Cylinder ∅ (mm)	32	40	50	63	80	100
a	32	39	41	46	54	59

Maximum Torque M_D (Nm)

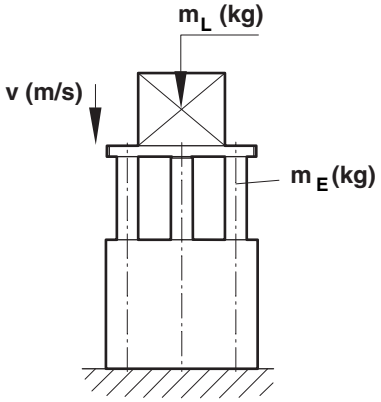
Depending on the stroke



Cylinder ∅ (mm)	Stroke (mm) / Model	25	50	75	100
32	M/61032/M	8,5	8,5	8,6	8,6
	M/61032/MR	6,5	7,1	7,5	7,6
40	M/61040/M	10,2	10,1	10,0	10,0
	M/61040/MR	8,1	8,6	8,7	8,9
50	M/61050/M	16,2	16,5	16,7	16,8
	M/61050/MR	11,1	11,8	12,1	12,3
63	M/61063/M	18,8	18,8	18,8	18,9
	M/61063/MR	13,8	14,0	14,1	14,1
80	M/61080/M	32,9	33,5	33,9	34,1
	M/61080/MR	29,6	32,1	33,4	34,1
100	M/61100/MR	76,7	64,7	67,9	69,8

Calculation of permissible Speed or maximum Load

For a cylinder with guiding used as actuator



E_S – Max. kinetic energy (Nm)
m_E – Moved weight (kg)
m_L – Additional load (kg)
v – Speed (m/s)

$$E_S = \frac{1}{2}(m_E + m_L) \cdot v^2$$

Maximum permissible speed $v_{max.}$

$$v_{max.} = \sqrt{\frac{2\,E_S}{m_E + m_L}} \leq v_{Cyl}$$

v_{Cyl} = 0,6 m/s for Cylinder ∅ 32 to 63 mm

v_{Cyl} = 0,4 m/s for Cylinder ∅ 80 to 100 mm

Maximum additional load $m_{L\,max.}$

$$m_{L\,max.} = \frac{2\,E_S}{v^2} - m_E$$

Maximum Kinetic Energy E_s (Nm)

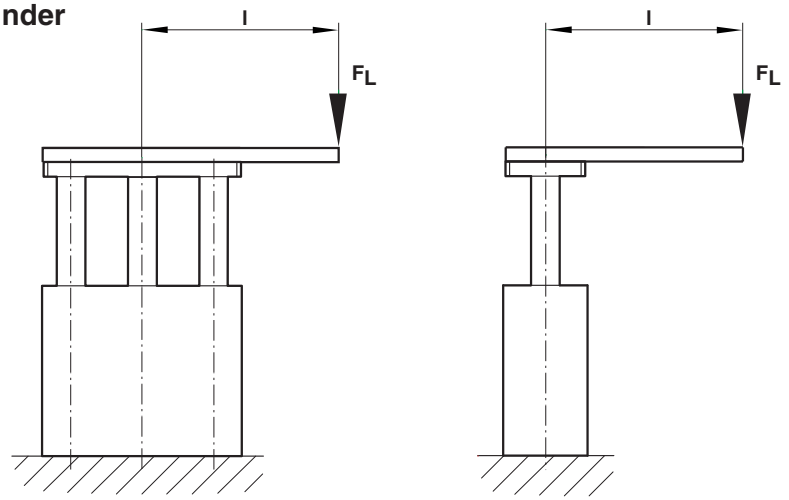
Cylinder ∅ (mm)	32	40	50	63	80	100
E_S	0,40	0,58	0,67	0,67	1,33	1,33

Moved Weight m_E (kg)

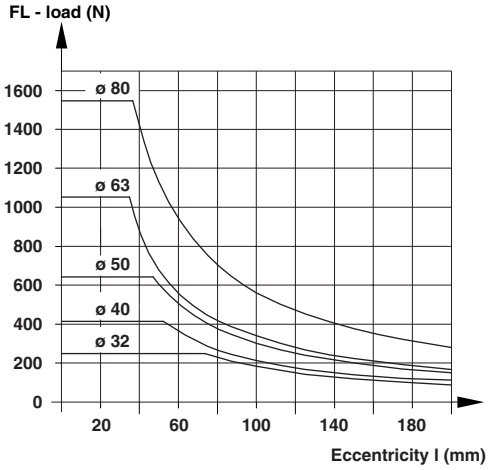
	Cylinder ∅ (mm)	25 mm stroke	50 mm stroke	75 mm stroke	100 mm stroke
M/61000/M Cylinder with plain bearings	32	0,92	1,19	1,46	1,73
	40	1,01	1,30	1,59	1,88
	50	1,49	1,94	2,39	2,84
	63	1,90	2,35	2,80	3,25
	80	3,73	4,38	5,03	5,68
M/61000/MR Cylinder with ball bearings	32	0,74	0,92	1,10	1,28
	40	0,83	1,03	1,23	1,43
	50	1,21	1,52	1,83	2,14
	63	1,61	1,92	2,23	2,54
	80	3,35	3,83	4,32	4,80
	100	4,90	5,55	6,20	6,85

Application: M/61000/M used as Lifting Cylinder

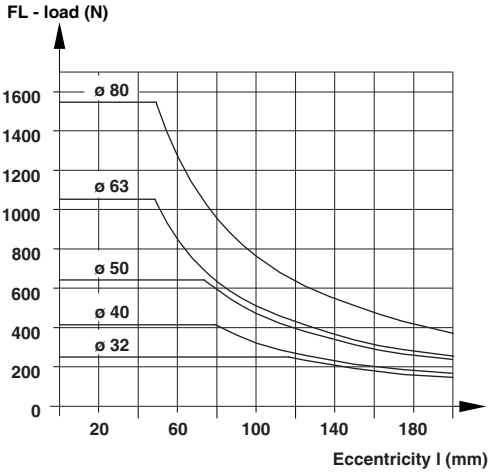
Max. side load (F_L) depending on the eccentricity (l)
(Cylinder with plain bearings)



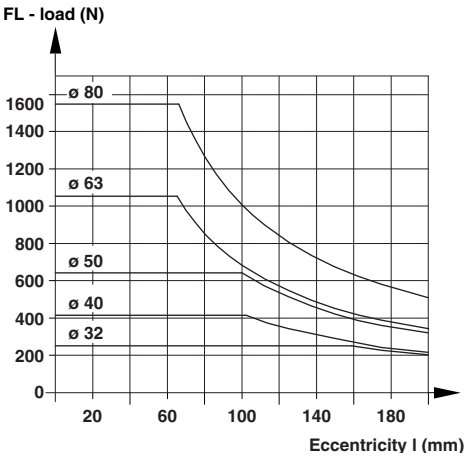
Stroke: 25 mm



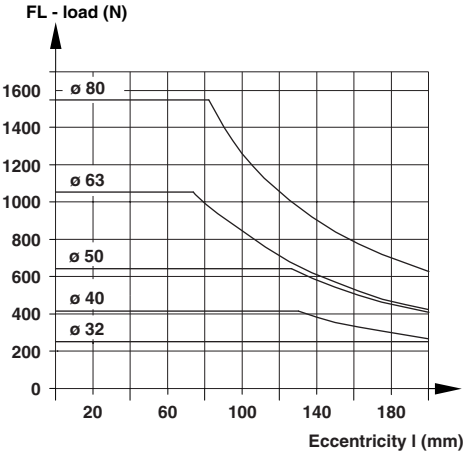
Stroke : 50mm



Stroke: 75 mm

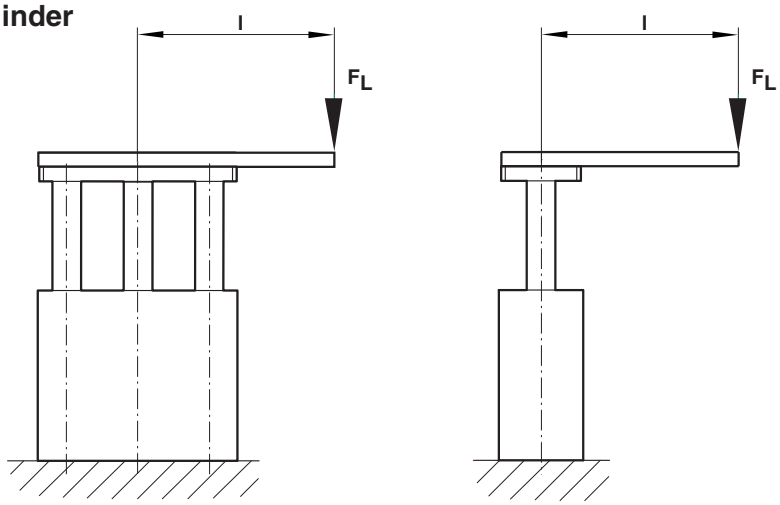


Stroke: 100 mm

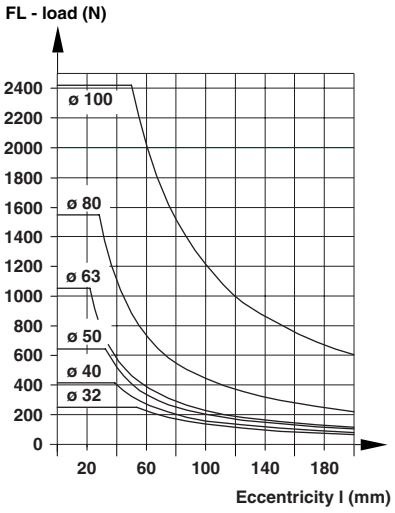


Application: M/61000/MR used as Lifting Cylinder

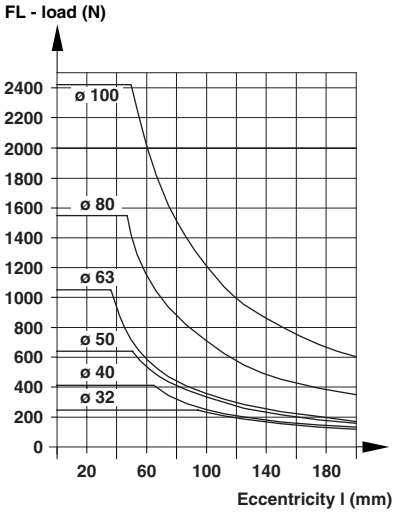
Max. side load (F_L) depending on the eccentricity (l)
(Cylinder with ball bearings)



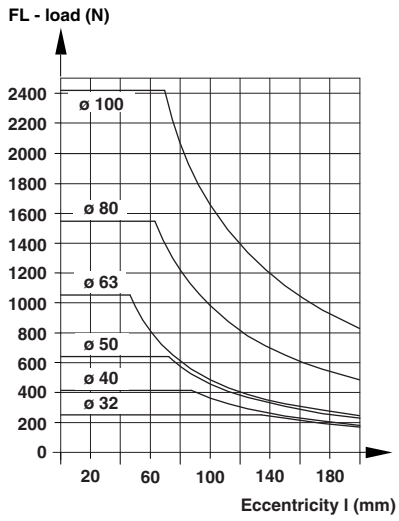
Stroke : 25mm



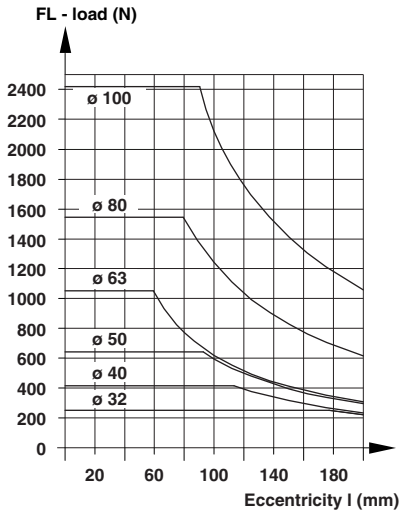
Stroke: 50 mm



Stroke: 75 mm



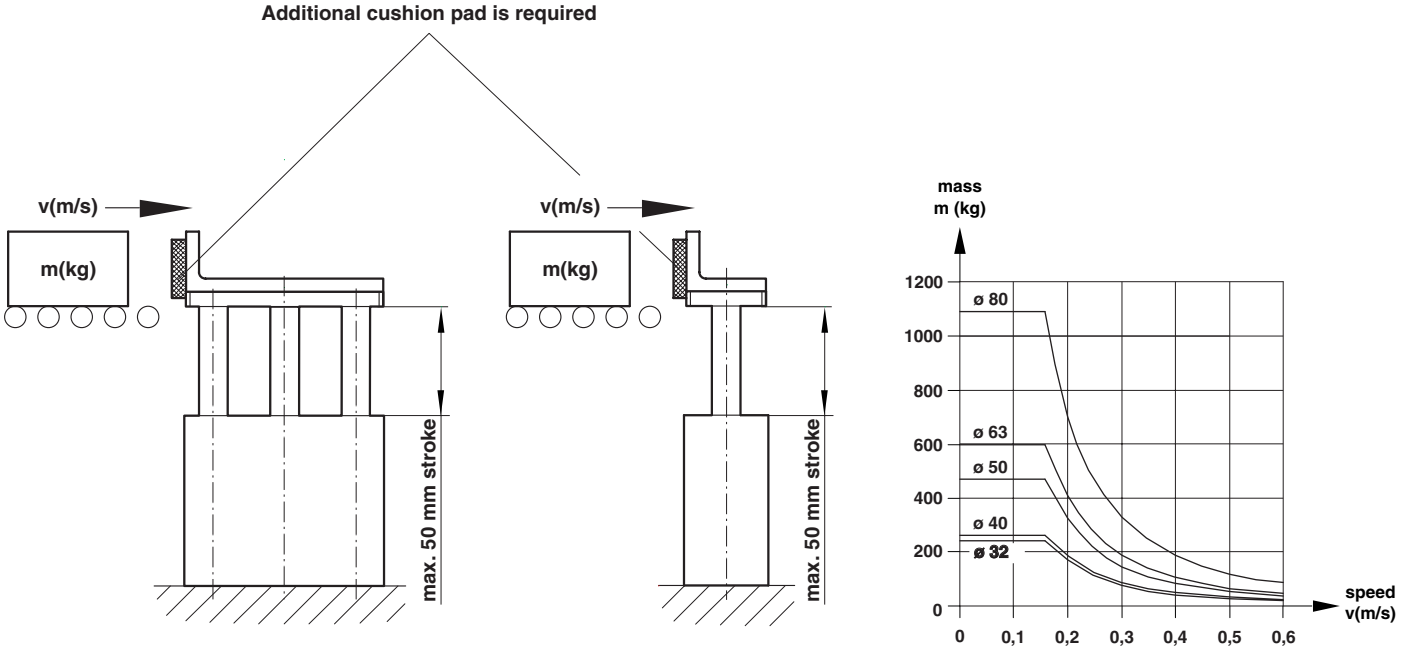
Stroke: 100 mm



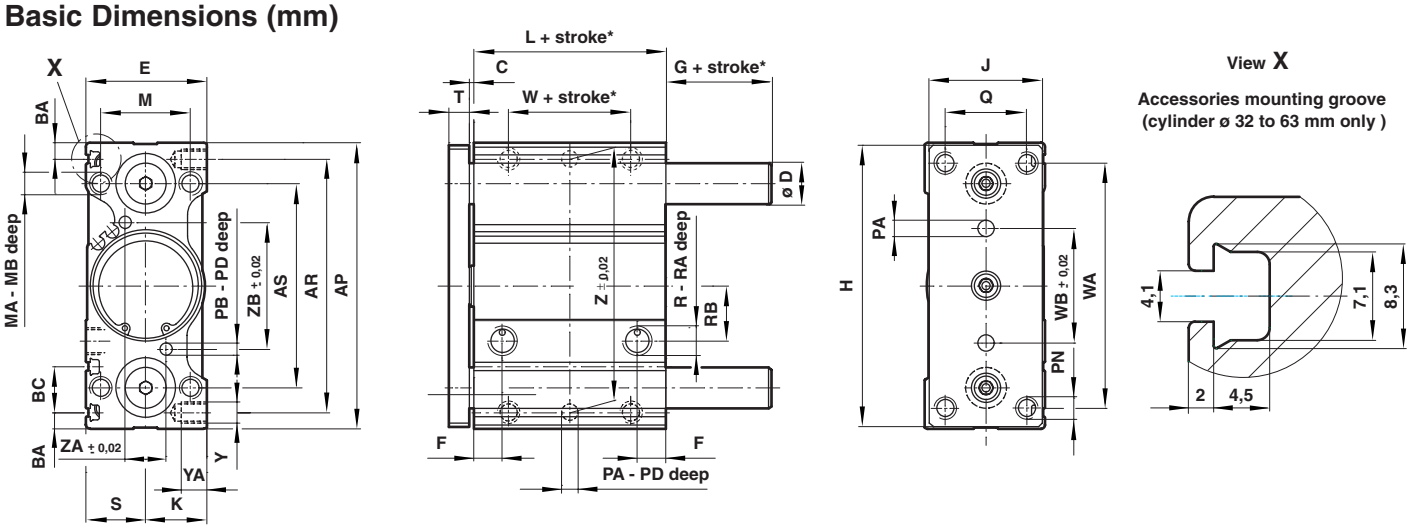
Application: M/61000/M used as Stopper Cylinder

Max. impact energy (Nm)

- **Use only cylinders with plain bearings as stopper**
- **The diagram mass vs. speed is based on a cushion stroke of 2,5 mm at the front plate provided e.g. by an additional cushion pad.**
- **Insert mounting screws at the rear side of the cylinder at least 2 x diameter deep.**



Basic Dimensions (mm)



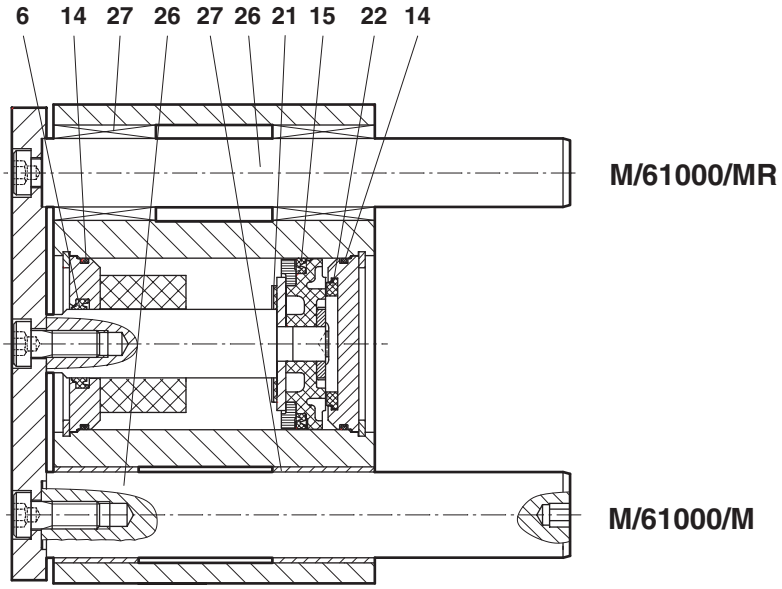
* The dimensions of M/61100 with 25 mm of stroke are identical with 50 mm of stroke!
Cylinders with non-standard strokes have the dimensions of the cylinder with the next longer standard stroke.

Cyl. ∅ (mm)	AP	AR	AS	BA	BC	C	D (1)	D (2)	E	F	G*	H	J	K	L*	M	MA	MB	PA
32	114	100	80	7	22	1,5	16	20	51	11,5	8,5	112	48	26	38	38	M8 x 1,25	20	6^{H7}
40	124	110	90	7	22	2	16	20	51	13,5	2	122	48	26	44	38	M8 x 1,25	20	6^{H7}
50	140	124	100	8	22,5	2	20	25	59	14	7	138	56	30	44	44	M10 x 1,5	25	8^{H7}
63	150	132	110	8	22,5	2	20	25	72	14	2	148	69	36,5	49	44	M10 x 1,5	25	8^{H7}
80	188	166	140	–	–	1,5	25	30	92	17,5	2	185	88	46,5	57	56	M12 x 1,75	30	10^{H7}
100	224	200	170	–	–	2	30	-	112	21	2	221	108	56,5	66	62	M14 x 2	35	10^{H7}

Cyl. ∅ (mm)	PB	PD	PN	Q	R	RA	RB	S	T	W*	WA	WB	Z	Y	YA	ZA	ZB	
32	6^{H7}	8	M8 x 1,25	30	G1/8	7,5	15	25	8	5	96	46	100	M8 x 1,25	11	14	44	
40	6^{H7}	8	M8 x 1,25	30	G1/8	7,5	21	25	8	10	106	50	110	M8 x 1,25	12,5	14	54	
50	6^{H7}	11	M10 x 1,5	40	G1/4	11	27	29	10	10	120	56	124	M10 x 1,5	12,5	20	62	
63	8^{H7}	11	M10 x 1,5	50	G1/4	11	33	35,5	10	10	130	66	132	M10 x 1,5	15	30	74	
80	10^{H7}	13	M12 x 1,75	60	G1/4	11	37	45,5	16	15	160	84	166	M12 x 1,75	18	36	94	
100	10^{H7}	13	M14 x 2	80	G1/4	11	40	55,5	16	15	190	110	200	M14 x 2	21	40	116	

D (1) = M/61000/MR Cylinder with ball bearings
D (2) = M/61000/M Cylinder with plain bearings

Spares



Cylinder ∅ (mm)	Model	Spares kit	Comprising Item	Description	Quantity	Guide rod Item 26	Bearing Item 27
32	M/61032/M	QM/61032/00	21	Cushion Disc	1	M/P72451/*	M/P72433/1
	M/61032/MR	QM/61032/00	6	Piston rod seal	1	M/P72449/*	M/P72431/1
40	M/61040/M	QM/61040/00	14	'O'-ring	2	M/P72451/*	M/P72433/1
	M/61040/MR	QM/61040/00	22	Cushion Disc	1	M/P72449/*	M/P72431/1
50	M/61050/M	QM/61050/00	15	Piston seal	1	M/P72452/*	M/P72433/2
	M/61050/MR	QM/61050/00		Grease	1	M/P72450/*	M/P72431/2
63	M/61063/M	QM/61063/00		Instruction	1	M/P72452/*	M/P72433/2
	M/61063/MR	QM/61063/00				M/P72450/*	M/P72431/2
80	M/61080/M	QM/61080/00				M/P72720/*	M/P72433/3
	M/61080/MR	QM/61080/00				M/P72718/*	M/P72431/3
100	M/61100/MR	QM/61100/00				M/P72719/*	M/P72431/4

Warning

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under **'Technical Data'**.

Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult NORGREN.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes.

The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.
System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.
System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.