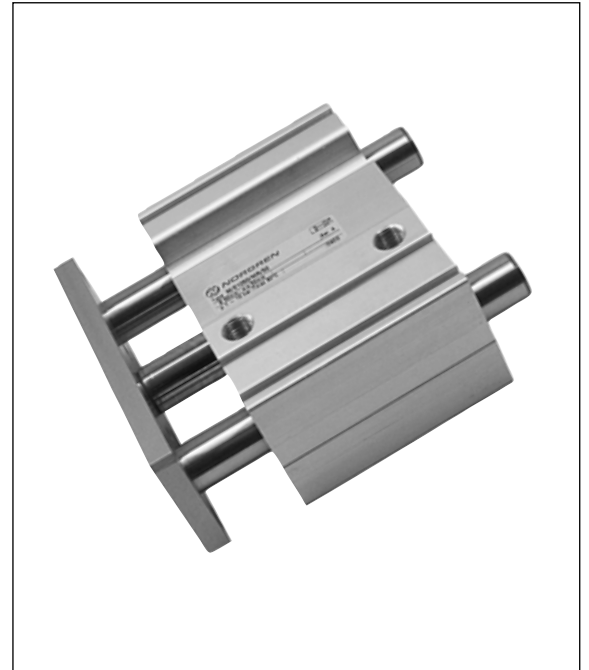


- **Guiding- and Stopper Cylinder**
- **Guiding accuracy  $\pm 0,02$  mm**
- **Non-rotation accuracy  $\pm 0,02^\circ$**
- **Integrated strong guide rods**
- **Variant with 4 ball bearings for precision linear guiding**
- **Variant with 4 plain bearings to absorb high side loads**
- **Easy installation**
- **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

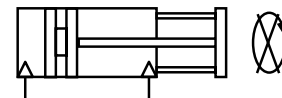
Buffer: Polyurethane

### Ordering Examples

See page N 2.3.013.02

### Switches

See page N 2.3.013.02





## Cylinder Variants

| Symbol | Model              | Description   | Dimensions<br>see page |
|--------|--------------------|---|------------------------|
|        | <b>M/61000/M</b>   | Cylinder with plain bearings (Ø 32 to 80 mm)  | 8                      |
|        | <b>M/61000/MR</b>  | Cylinder with ball bearings (Ø 32 to 100 mm)  | 8                      |
|        | <b>M/61000/W2R</b> | 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                      | <b>032</b> |
| 40                      | <b>040</b> |
| 50                      | <b>050</b> |
| 63                      | <b>063</b> |
| 80                      | <b>080</b> |
| 100                     | <b>100</b> |

| Strokes (mm) | Substitute |
|--------------|------------|
| 25           | <b>25</b>  |
| 50           | <b>50</b>  |
| 75           | <b>75</b>  |
| 100          | <b>100</b> |

| Variants (magnetic piston)                        | Substitute |
|---|------------|
| Plain bearings (Ø 32 to 80 mm)                    | <b>M</b>   |
| Ball bearings (Ø 32 to 100 mm)                    | <b>MR</b>  |
| Ball bearings and special wipers (Ø 32 to 100 mm) | <b>W2R</b> |

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 |

| Reed        | Model       |   | Voltage   |           | Current Max. | Temperature °C | LED | Features   | Cable/Plug | Cable Type   | Plug-in Cable |     | Catalogue Page |
|-------------|-------------|---|-----------|-----------|--------------|----------------|-----|------------|------------|--------------|---------------|-----|----------------|
|             | Solid State |   | V a.c.    | V d.c.    |              |                |     |            |            |              | Straight      | 90° |                |
| 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

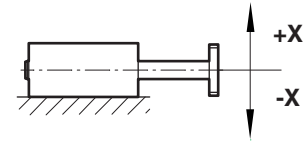
| Cylinder<br>Ø (mm) | Theoretical forces (N) at 6 bar |          | Air consumption (l/cm stroke) at 6 bar |          |
|--------------------|---------------------------------|----------|--|----------|
|                    | Outstroke                       | Instroke | Outstroke                              | 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<br>Ø (mm) | 25 mm stroke | 50 mm stroke | 75 mm stroke | 100 mm stroke |
|---|--------------------|--------------|--------------|--------------|---------------|
| M/61000/M<br>Cylinder with plain bearings | 32                 | 1,50         | 1,99         | 2,48         | 2,97          |
|   | 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<br>Cylinder with ball bearings | 32                 | 1,25         | 1,65         | 2,05         | 2,45          |
|   | 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

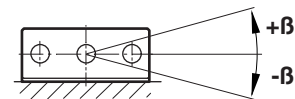
Deflection of the mounting plate X (mm) at instroke and outstroke position without load



| Cylinder Ø 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 Accuracy

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



| Cylinder Ø 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 |

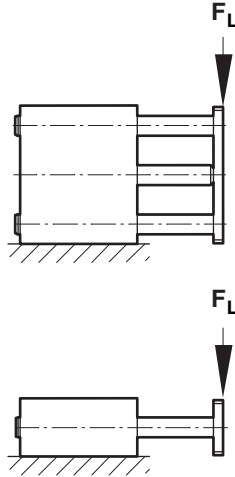


### Load Data

- 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<br>∅ (mm) | Model      | Stroke (mm) |     |     |     |
|--------------------|------------|-------------|-----|-----|-----|
|                    |            | 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 $\Delta l$

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  $\Delta l$  (N)

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

$\Delta l$  – Distance (mm)

$b = a + 2 \times \text{stroke (mm)}$

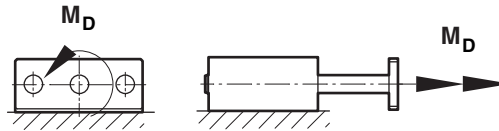
$a$  – Constant (mm)

| Cylinder<br>∅ (mm) | 32 | 40 | 50 | 63 | 80 | 100 |
|--------------------|----|----|----|----|----|-----|
| a                  | 32 | 39 | 41 | 46 | 54 | 59  |



## Maximum Torque $M_D$ (Nm)

Depending on the stroke



| Cylinder<br>Ø (mm) | Model      | Stroke (mm) |      |      |      |
|--------------------|------------|-------------|------|------|------|
|                    |            | 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  $v_{max}$ .

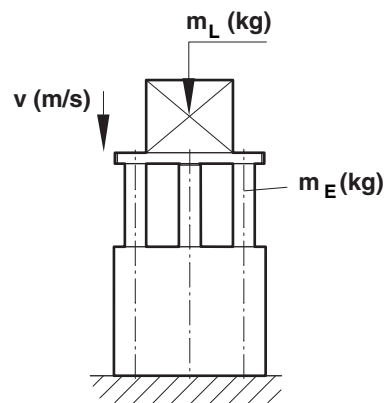
$$v_{max} = \sqrt{\frac{2 E_S}{m_E + m_L}} \leq v_{Cyl}$$

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

$v_{Cyl} = 0,4$  m/s for Cylinder Ø 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<br>Ø (mm) | 32   | 40   | 50   | 63   | 80   | 100  |
|--------------------|------|------|------|------|------|------|
| $E_s$              | 0,40 | 0,58 | 0,67 | 0,67 | 1,33 | 1,33 |

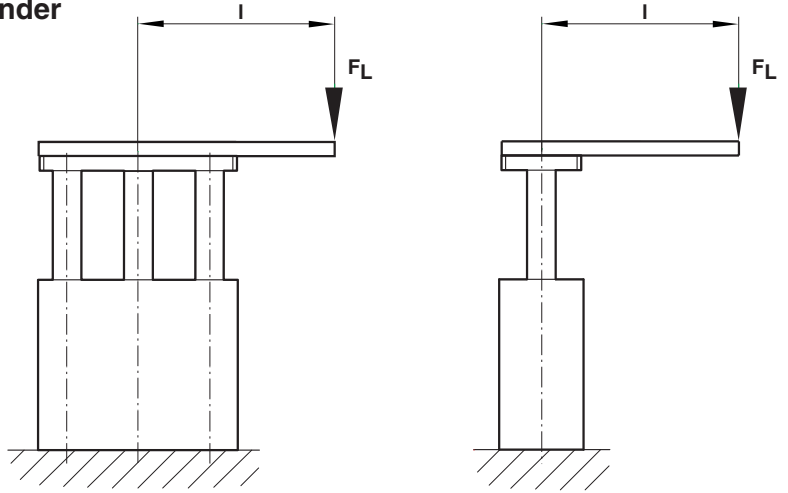
## Moved Weight $m_E$ (kg)

|   | Cylinder<br>Ø (mm) | 25 mm stroke | 50 mm stroke | 75 mm stroke | 100 mm stroke |
|---|--------------------|--------------|--------------|--------------|---------------|
| M/61000/M<br>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<br>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          |

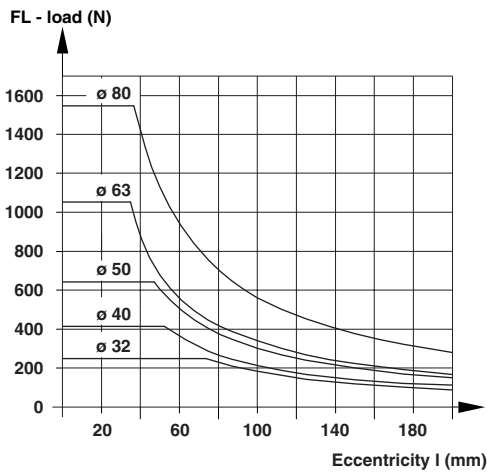


### Application: M/61000/M used as Lifting Cylinder

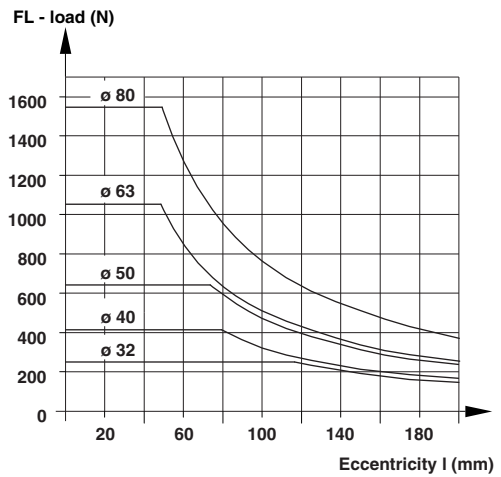
Max. side load ( $F_L$ ) depending on the eccentricity ( $l$ )  
(Cylinder with plain bearings)



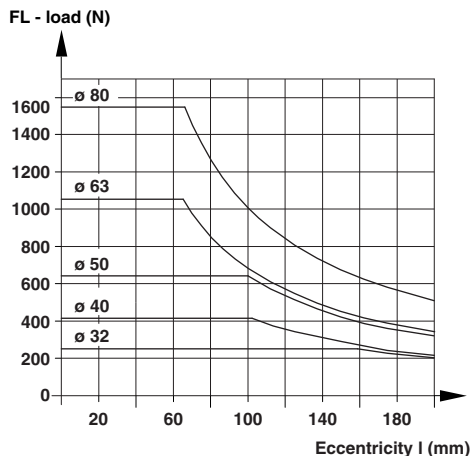
Stroke: 25 mm



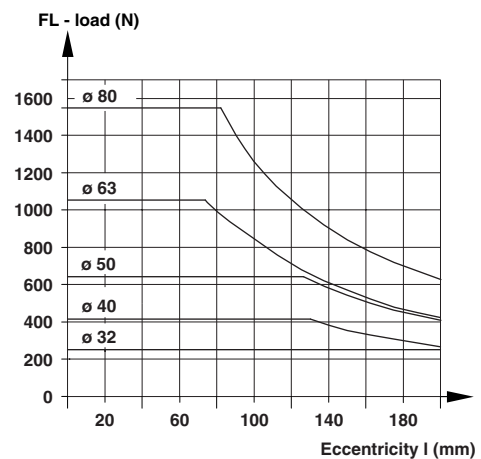
Stroke : 50mm



Stroke: 75 mm



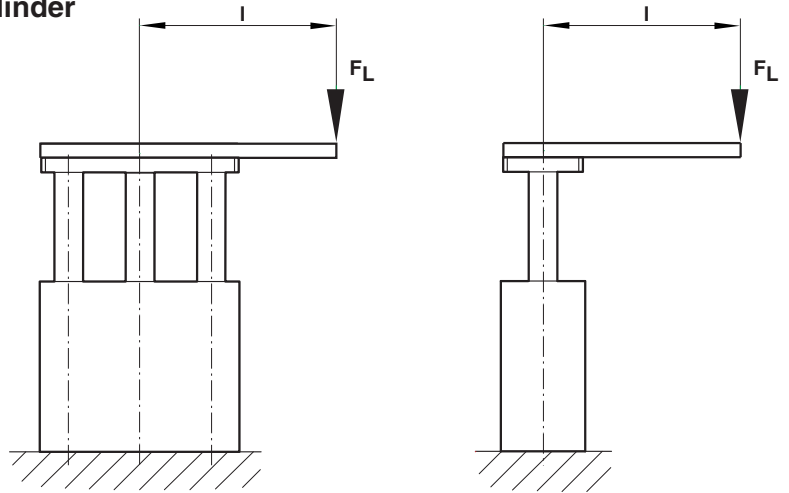
Stroke: 100 mm



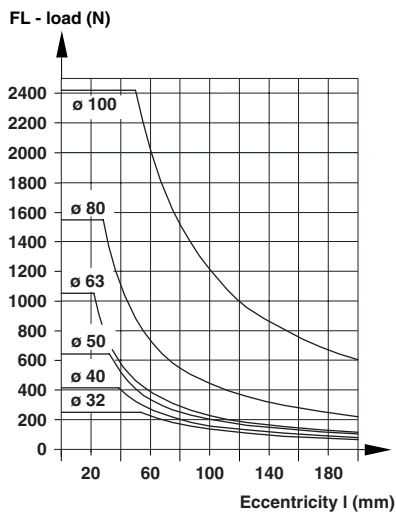


### Application: M/61000/MR used as Lifting Cylinder

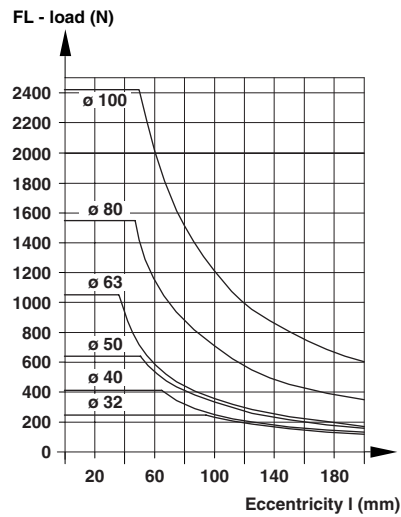
Max. side load ( $F_L$ ) depending on the eccentricity ( $l$ )  
(Cylinder with ball bearings)



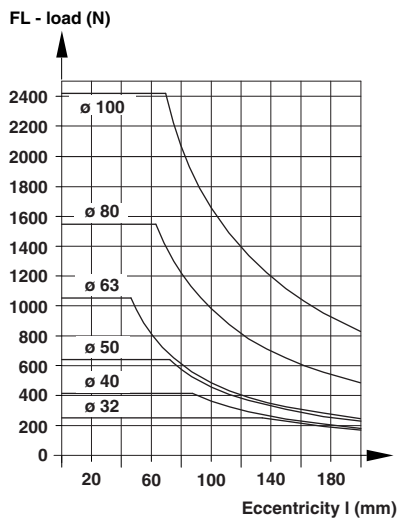
Stroke : 25mm



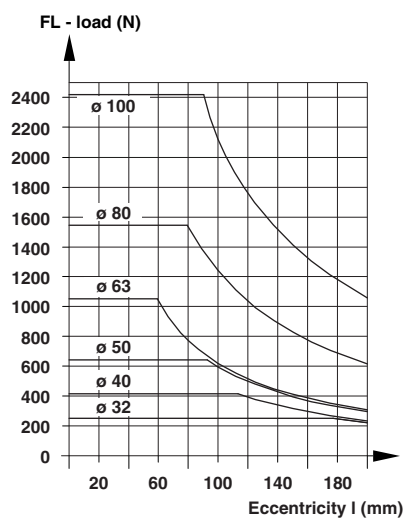
Stroke: 50 mm



Stroke: 75 mm



Stroke: 100 mm

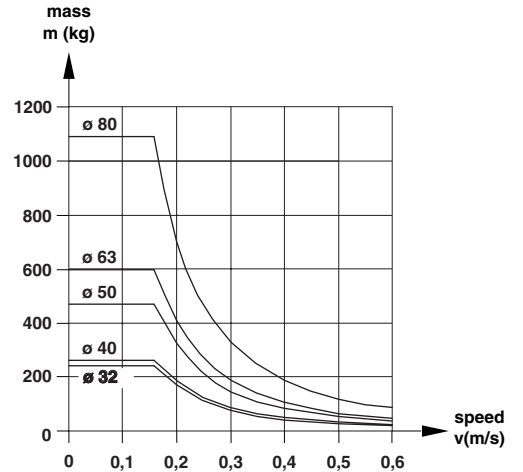
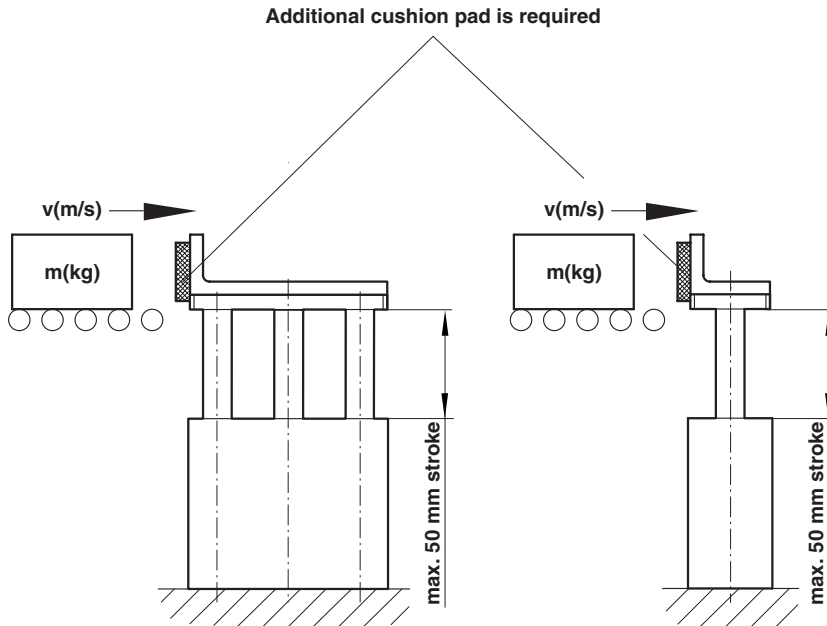




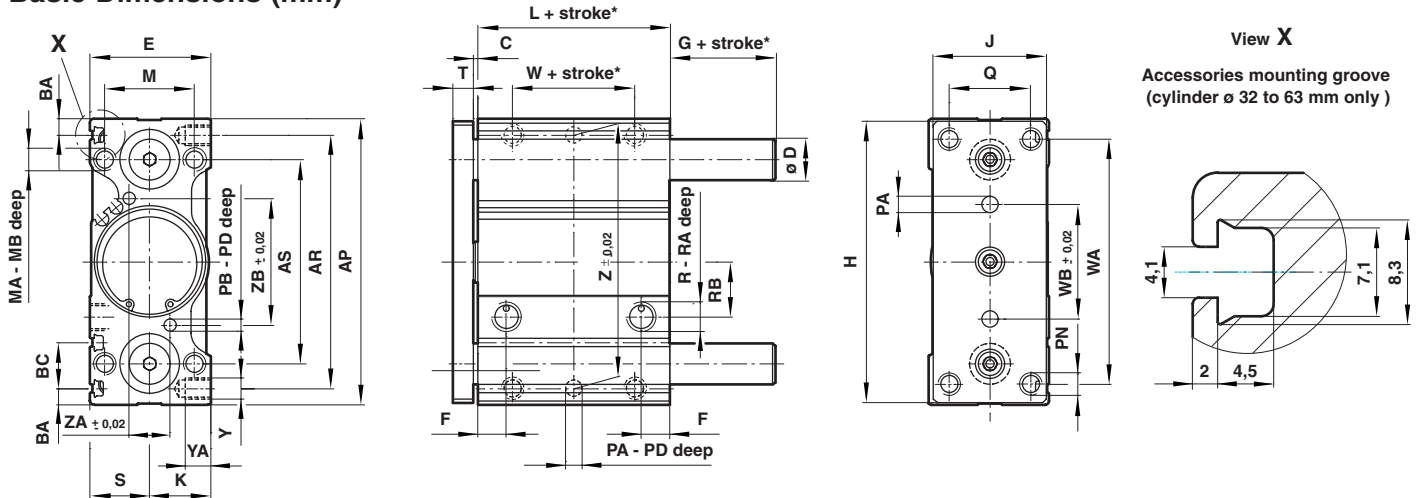
### Application: M/61000/M used as Stopper Cylinder

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. Ø (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 <sup>H7</sup>  |
| 40          | 124 | 110 | 90  | 7  | 22   | 2   | 16    | 20    | 51  | 13,5 | 2   | 122 | 48  | 26   | 44 | 38 | M8 x 1,25  | 20 | 6 <sup>H7</sup>  |
| 50          | 140 | 124 | 100 | 8  | 22,5 | 2   | 20    | 25    | 59  | 14   | 7   | 138 | 56  | 30   | 44 | 44 | M10 x 1,5  | 25 | 8 <sup>H7</sup>  |
| 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 <sup>H7</sup>  |
| 80          | 188 | 166 | 140 | -  | -    | 1,5 | 25    | 30    | 92  | 17,5 | 2   | 185 | 88  | 46,5 | 57 | 56 | M12 x 1,75 | 30 | 10 <sup>H7</sup> |
| 100         | 224 | 200 | 170 | -  | -    | 2   | 30    | -     | 112 | 21   | 2   | 221 | 108 | 56,5 | 66 | 62 | M14 x 2    | 35 | 10 <sup>H7</sup> |

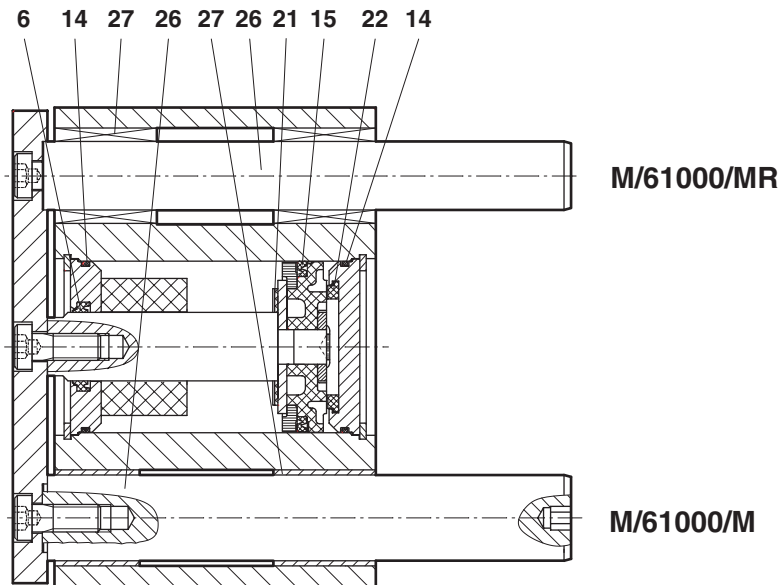
| Cyl. Ø (mm) | PB               | PD | PN         | Q  | R    | RA  | RB | S    | T  | W* | WA  | WB  | Z   | Y          | YA   | ZA | ZB  |
|-------------|------------------|----|------------|----|------|-----|----|------|----|----|-----|-----|-----|------------|------|----|-----|
| 32          | 6 <sup>H7</sup>  | 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 <sup>H7</sup>  | 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 <sup>H7</sup>  | 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 <sup>H7</sup>  | 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 <sup>H7</sup> | 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 <sup>H7</sup> | 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 Ø (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.