

- Magnet piston as standard – provides a wide range of control options
- Attractive clean-line design – enhances installation appearance
- Threaded rear end covers on Ø 32 mm to Ø 63 mm simplify mounting
- Threaded fixing holes in both end covers – increased mounting versatility



### Technical Data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting with magnetic piston and buffer cushioning

Operating Pressure:

1 to 10 bar

Operating Temperature:

-20°C\* to +80°C max.

\*Consult our Technical Service for use below +2°C

Cylinder Diameters:

32, 40, 50, 63, 80, 100 mm

Standard Strokes:

25, 50, 80, 100, 125, 160, 200, 250, 300 mm

Materials:

Stainless steel (Martensitic) piston rod, anodised aluminium end covers and barrel, nitrile rubber seals and 'O'-rings

### Alternative Cylinders:

See page N 1.5.062.02

### Ordering Information

To order a basic 80 mm bore cylinder with a 50 mm stroke quote: RM/55480/M/50

To order a basic 100 mm bore cylinder with a 100 mm stroke quote: RM/55410/M/100

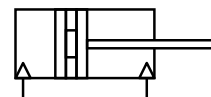
To order mounting brackets refer to appropriate cylinder mounting table.

Order magnetically operated switches separately.

### Accessories

Switches QM/33, QM/34                      See page N 4.3.051.01

Switches QM/134, QM/134/N                N 4.3.055.01





### Alternative Cylinders

| Symbol | Model (magnetic piston)  | Description   |
|--------|--|---|
|        | CM/55400/M   | Hard chromium plated piston rod   |
|        | SM/55400/M   | Stainless steel piston rod (Austenitic)   |
|        | . M/55400/W2 (RM/.., CM/.., SM/..)   | Special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice.   |
|        | RM/55400/MU  | Extended piston rod   |
|        | RM/55400/W6  | Extended piston rod and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice.   |
|        | RM/55433/M, RM/55441/M, RM/55451/M   | With adjustable cushioning  |
|        | RM/55464/M, RM/55481/M, RM/55411/M   |   |
|        | RM/55433/W2, RM/55441/W2, RM/55451/W2<br>RM/55464/W2, RM/55481/W2, RM/55411/W2 | With adjustable cushioning and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice.  |
|        | RM/55433/MU, RM/55441/MU, RM/55451/MU  | Extended piston rod and adjustable cushioning   |
|        | RM/55464/MU, RM/55481/MU, RM/55411/MU  |   |
|        | RM/55433/W6, RM/55441/W6, RM/55451/W6<br>RM/55464/W6, RM/55481/W6, RM/55411/W6 | Extended piston rod with adjustable cushioning and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice.                                |
|        | KM/55433/M, KM/55441/M, KM/55451/M   | Stainless steel cylinders with adjustable cushioning (Ø 32 to 63 mm)  |
|        | KM/55464/M   | Materials: Stainless steel (Austenitic) piston rod, end covers and barrel, nitrile rubber seals   |
|        | KM/55433/W2, KM/55441/W2, KM/55451/W2<br>KM/55464/W2                           | Stainless steel cylinders with adjustable cushioning (Ø 32 to 63 mm) and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice.          |
|        | KM/55433/MU, KM/55441/MU, KM/55451/MU  | Stainless steel cylinders with adjustable cushioning and extended piston rod  |
|        | KM/55464/MU  |   |
|        | KM/55433/W6, KM/55441/W6, KM/55451/W6  | Stainless steel cylinders with adjustable cushioning extended piston rod and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice.      |
|        | KM/55464/W6  |   |
|        |  |   |
|        | RM/55433/JM, RM/55441/JM, RM/55451/JM  | Double ended piston rod with adjustable cushioning  |
|        | RM/55464/JM, RM/55481/JM, RM/55411/JM  |   |
|        | RM/55433/W4, RM/55441/W4, RM/55451/W4<br>RM/55464/W4, RM/55481/W4, RM/55411/W4 | Double ended piston rod with adjustable cushioning and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice.                            |
|        | KM/55433/JM, KM/55441/JM, KM/55451/JM  | Stainless steel cylinders, double ended piston rod with adjustable cushioning   |
|        | KM/55464/JM, KM/55481/JM, KM/55411/JM  |   |
|        | KM/55433/W4, KM/55441/W4, KM/55451/W4<br>KM/55464/W4, KM/55481/W4, KM/55411/W4 | Stainless steel cylinders, double ended piston rod with adjustable cushioning and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice. |

For combinations of alternative cylinders consult our Technical Service.

### Theoretical Forces • Air Consumption • Cushioning

| Model | Theoretical forces (N) at 6 bar |          | Air consumption (l/cm stroke) at 6 bar |          | Model | Cushion length (mm) | Initial cushion volume (cm <sup>3</sup> ) |
|-------|---------------------------------|----------|--|----------|-------|---------------------|---|
|       | Outstroke                       | Instroke | Outstroke                              | Instroke |       |                     |   |
| 55432 | 482                             | 414      | 0,056                                  | 0,048    | 55433 | 19                  | 12,3                                      |
| 55440 | 754                             | 633      | 0,088                                  | 0,074    | 55441 | 22                  | 20,7                                      |
| 55450 | 1178                            | 990      | 0,137                                  | 0,114    | 55451 | 24                  | 36  |
| 55463 | 1870                            | 1680     | 0,218                                  | 0,195    | 55464 | 24                  | 64  |
| 55480 | 3016                            | 2722     | 0,35                                   | 0,320    | 55481 | 27                  | 116                                       |
| 55410 | 4710                            | 4416     | 0,55                                   | 0,510    | 55411 | 34                  | 242                                       |

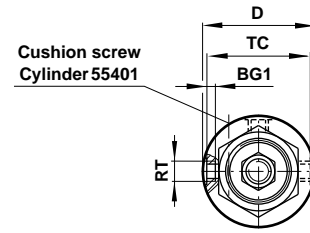
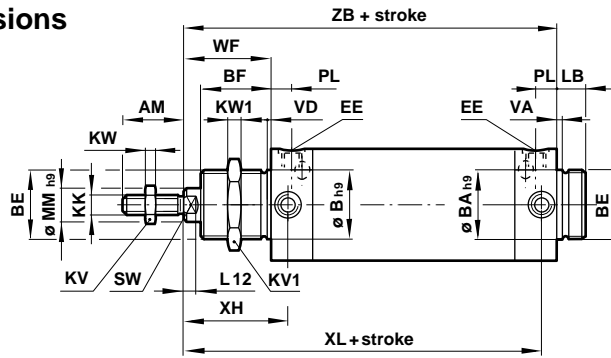
### Weights of Cylinders and Mountings (kg)

| Model | RM/55400/M<br>Weight at 0 mm | KM/55400/M<br>Weight at 0 mm | Weight per 100 mm |            |                |                |           |
|-------|------------------------------|------------------------------|-------------------|------------|----------------|----------------|-----------|
|       |                              |                              |                   | Style 'AK' | Style 'B', 'G' | Style 'C'      | Style 'F' |
| 32    | 0,400                        | 0,720                        | 0,140             | 0,200      | 0,110          | 0,240          | 0,090     |
| 40    | 0,720                        | 1,350                        | 0,270             | 0,200      | 0,190          | 0,430          | 0,130     |
| 50    | 1,170                        | 2,130                        | 0,320             | 0,650      | 0,250          | 0,570          | 0,330     |
| 63    | 1,620                        | 3,080                        | 0,380             | 0,650      | 0,330          | 0,730          | 0,330     |
| 80    | 3,270                        | -                            | 0,590             | 0,720      | 0,810          | 0,670          | 0,670     |
| 100   | 4,780                        | -                            | 0,680             | 0,720      | 1,100          | 1,000          | 0,670     |
|       |                              |                              |                   |            |                |                |           |
| 32    | Style 'H'                    | Style 'L'                    | Style 'M'         | Style 'N'  | Style 'UF'     | Switch bracket |           |
| 32    | 0,020                        | 0,160                        | 0,260             | 0,007      | 0,090          | 0,007          |           |
| 40    | 0,030                        | 0,230                        | 0,380             | 0,010      | 0,120          | 0,008          |           |
| 50    | 0,050                        | 0,330                        | 0,670             | 0,010      | 0,150          | 0,010          |           |
| 63    | 0,070                        | 0,480                        | 0,800             | 0,021      | 0,150          | 0,012          |           |
| 80    | -                            | 0,870                        | 1,780             | 0,250      | 0,330          | 0,015          |           |
| 100   | -                            | 1,200                        | 2,200             | 0,250      | 0,330          | 0,020          |           |

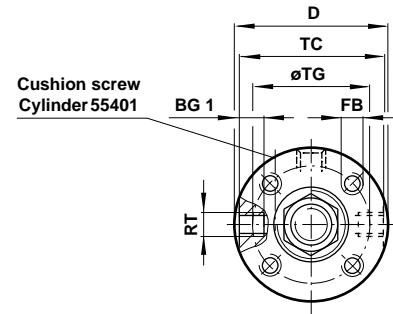
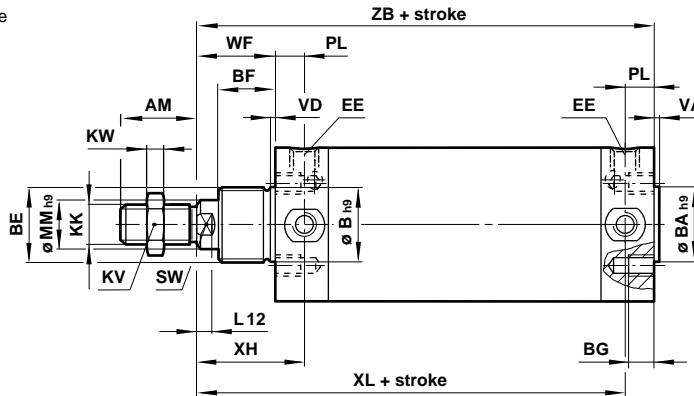


### Basic Dimensions

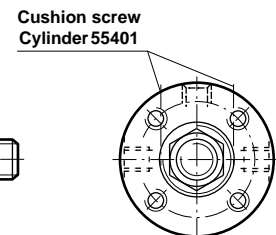
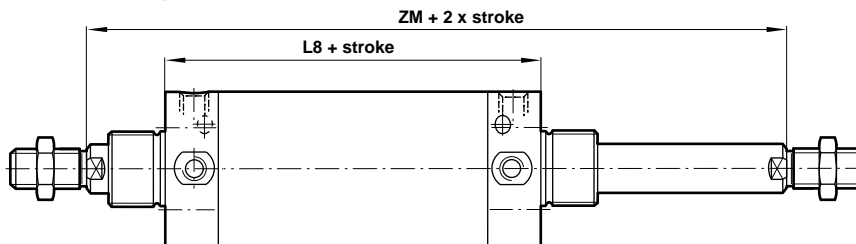
∅ 32 to 63 mm bore



∅ 80 and 100 mm bore



### Cylinder double ended piston rod

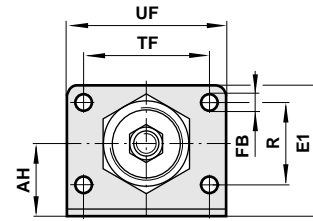
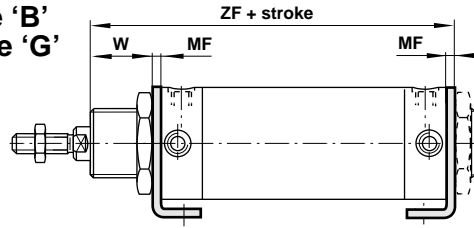


| Model     | 55432, 55433 | 55440, 55441 | 55450, 55451 | 55463, 55464 | 55480, 55481 | 55410, 55411 |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| ∅         | 32           | 40           | 50           | 63           | 80           | 100          |
| AM        | 22           | 24           | 32           | 32           | 40           | 40           |
| ∅ B/BA h9 | 30           | 38           | 45           | 45           | 55           | 55           |
| BE        | M 30 x 1,5   | M 38 x 1,5   | M 45 x 1,5   | M 45 x 1,5   | M 55 x 1,5   | M 55 x 1,5   |
| BF        | 30           | 35           | 38           | 38           | 45           | 45           |
| BG        | -            | -            | -            | -            | 14           | 14           |
| BG1       | 6            | 8            | 9,5          | 10           | 17,5         | 21,5         |
| ∅ D       | 36,5         | 45,5         | 55,5         | 69,5         | 87,5         | 107,5        |
| EE        | G 1/8        | G 1/4        | G 1/4        | G 3/8        | G 3/8        | G 1/2        |
| FB        | -            | -            | -            | -            | M8           | M10          |
| KK        | M 10 x 1,25  | M 12 x 1,25  | M 16 x 1,5   | M 16 x 1,5   | M 20 x 1,5   | M 20 x 1,5   |
| KV (A/F)  | 17           | 19           | 24           | 24           | 30           | 30           |
| KV1 (A/F) | 36           | 46           | 55           | 55           | -            | -            |
| KW        | 5            | 6            | 8            | 8            | 10           | 10           |
| KW1       | 8            | 10           | 10           | 10           | -            | -            |
| LB        | 14           | 16           | 18           | 18           | -            | -            |
| L8        | 94           | 109          | 114          | 121          | 150          | 158          |
| L12       | 5,5          | 7,5          | 8,5          | 8,5          | 11,5         | 11,5         |
| ∅ MM h9   | 12           | 16           | 20           | 20           | 25           | 25           |
| PL        | 9            | 12           | 12           | 13           | 15           | 18,5         |
| RT        | M 8 x 1      | M 10 x 1     | M 12 x 1,5   | M 14 x 1,5   | M 16 x 1,5   | M 20 x 1,5   |
| SW (A/F)  | 10           | 13           | 17           | 17           | 22           | 22           |
| TC        | 35           | 44           | 54           | 67           | 85,5         | 105,5        |
| ∅ TG      | -            | -            | -            | -            | 70           | 80           |
| VA/VD     | 3            | 3            | 3            | 3            | 5            | 5            |
| WF        | 38           | 45           | 50           | 51           | 61           | 61           |
| XH        | 47           | 57           | 62           | 64           | 76           | 79,5         |
| XL        | 123          | 142          | 152          | 159          | 196          | 200,5        |
| ZB        | 132          | 154          | 164          | 172          | 211          | 219          |
| ZM        | 170          | 199          | 214          | 223          | 272          | 280          |

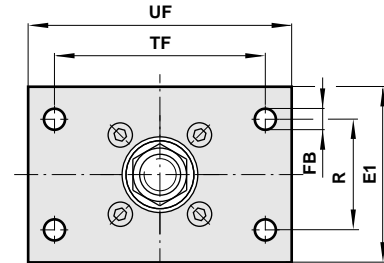
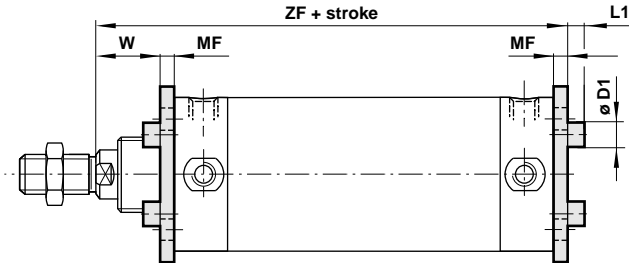


**Rear Flange Mounting Style 'B'**  
**Front Flange Mounting Style 'G'**

∅ 32 to 63 mm bore

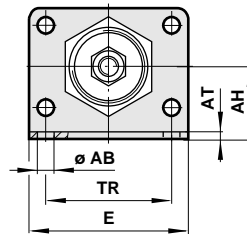
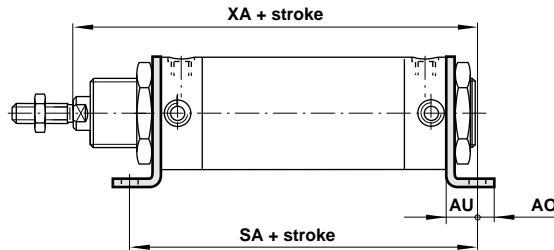


∅ 80 and 100 mm bore

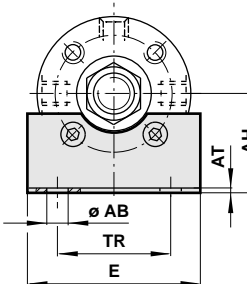
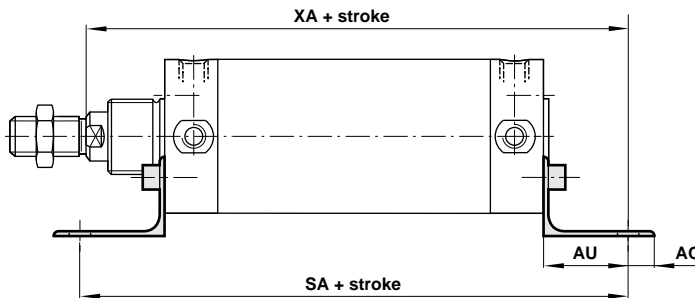


**Foot Mounting Style 'C'**

∅ 32 to 63 mm bore



∅ 80 and 100 mm bore

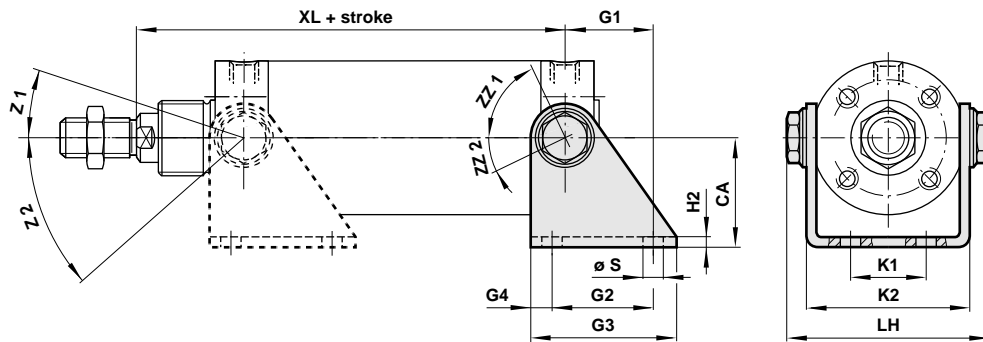


|                |                |                |                |                |             |             |
|----------------|----------------|----------------|----------------|----------------|-------------|-------------|
| Model 'B', 'G' | QM/55232/22    | QM/55240/22    | QM/55250/22    | QM/55263/22    | QM/55480/22 | QM/55410/22 |
|                | KQM/55433/22 * | KQM/55441/22 * | KQM/55451/22 * | KQM/55464/22 * | -           | -           |
| Model 'C'      | QM/55232/21    | QM/55240/21    | QM/55250/21    | QM/55263/21    | QM/55480/21 | QM/55410/21 |
|                | KQM/55433/21 * | KQM/55441/21 * | KQM/55451/21 * | KQM/55464/21 * | -           | -           |
| ∅              | 32             | 40             | 50             | 63             | 80          | 100         |
| ∅ AB           | 7              | 9              | 9              | 9              | 12          | 14          |
| AH             | 28             | 33             | 40             | 45             | 56          | 66          |
| AO             | 7              | 10             | 10             | 10             | 15          | 20          |
| AT             | 4              | 5              | 5              | 5              | 5           | 5           |
| AU             | 14             | 20             | 20             | 20             | 45          | 45          |
| ∅ D1           | -              | -              | -              | -              | 13,5        | 16          |
| E              | 66             | 80             | 90             | 96             | 90          | 113         |
| E1             | 49             | 58             | 70             | 80             | 100         | 120         |
| ∅ FB           | 7              | 9              | 9              | 9              | 12          | 14          |
| L1             | -              | -              | -              | -              | 7           | 10          |
| MF             | 4              | 5              | 5              | 5              | 8           | 8           |
| R              | 28             | 30             | 40             | 50             | 63          | 80          |
| SA             | 122            | 149            | 154            | 161            | 240         | 248         |
| TF             | 52             | 60             | 70             | 76             | 120         | 130         |
| TR             | 52             | 60             | 70             | 76             | 63          | 75          |
| UF             | 66             | 80             | 90             | 96             | 150         | 170         |
| W              | 34             | 40             | 45             | 46             | 53          | 53          |
| XA             | 146            | 174            | 184            | 192            | 256         | 264         |
| ZF             | 136            | 159            | 169            | 177            | 219         | 227         |

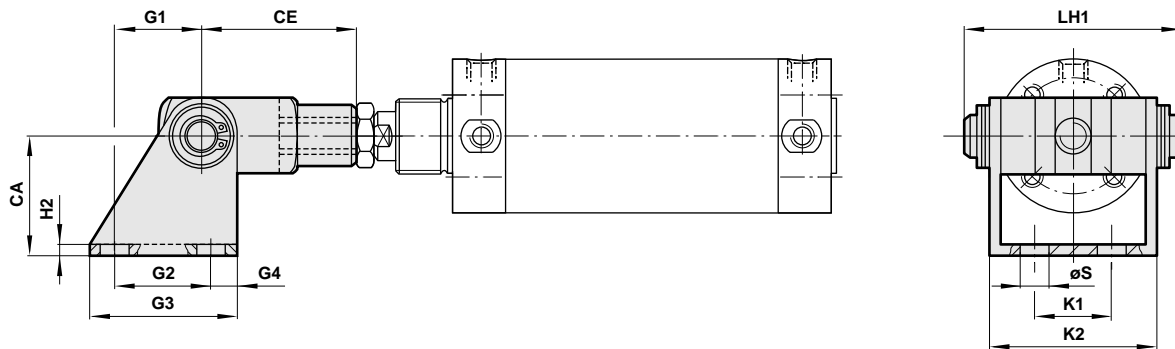
\* Mounting brackets KQM/55400/21 and KQM/55400/22 are for use with KM/55400/M cylinders



### Rear Hinge Mounting Style 'L'



### Front Hinge Mounting Style 'M'

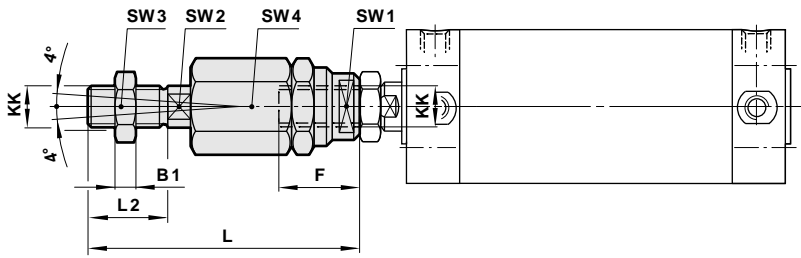


| Model 'L' | QM/55232/24<br>KQM/55433/24 * | QM/55240/24<br>KQM/55441/24 * | QM/55250/24<br>KQM/55451/24 * | QM/55263/24<br>KQM/55464/24 * | QM/55480/24 | QM/55410/24 |
|-----------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------|-------------|
| Model 'M' | QM/55432/26<br>KQM/55433/26 * | QM/55440/26<br>KQM/55441/26 * | QM/55450/26<br>KQM/55451/26 * | QM/55463/26<br>KQM/55464/26 * | QM/55480/26 | QM/55410/26 |
| ∅         | 32                            | 40                            | 50                            | 63                            | 80          | 100         |
| CA        | 35                            | 40                            | 45                            | 50                            | 65          | 77          |
| G1        | 20                            | 27                            | 30                            | 34                            | 47,5        | 63          |
| G2        | 24                            | 30                            | 34                            | 35                            | 55          | 70          |
| G3        | 40                            | 50                            | 54                            | 65                            | 80          | 100         |
| G4        | 8                             | 10                            | 10                            | 15                            | 12,5        | 15          |
| ∅ S       | 7                             | 9                             | 9                             | 9                             | 11          | 11          |
| H2        | 4                             | 5                             | 5                             | 5                             | 6           | 6           |
| CE        | 40                            | 48                            | 64                            | 64                            | 80          | 80          |
| K1        | 20                            | 28                            | 36                            | 42                            | 55          | 70          |
| K2        | 46,5                          | 56,5                          | 68,5                          | 82,5                          | 100         | 120         |
| LH        | 58                            | 70                            | 86                            | 102                           | 124,5       | 144,5       |
| LH1       | 60                            | 70                            | 86                            | 100                           | 120,5       | 140,5       |
| XL        | 123                           | 142                           | 152                           | 159                           | 196         | 200,5       |
| Z 1       | 18°                           | 12°                           | 12°                           | 9°                            | 13°         | 63°         |
| Z 2       | 42°                           | 39°                           | 38°                           | 41°                           | 45°         | 11°         |
| ZZ 1      | 65°                           | 55°                           | 60°                           | 189°                          | 193°        | 191°        |
| ZZ 2      | 36°                           | 32°                           | 30°                           | 25°                           | 27°         | 25°         |

\* Mounting brackets KQM/55400/24 and KQM/55400/26 are for use with KM/55400/M cylinders

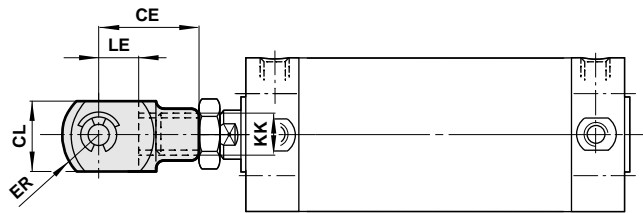


### Piston Rod Swivel Mounting Style 'AK'



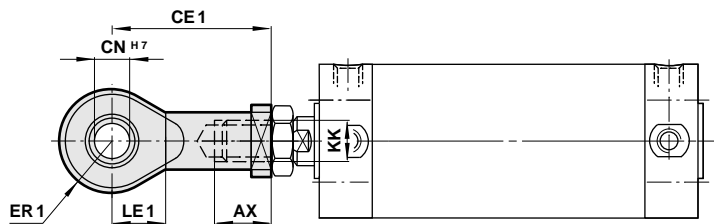
### Piston Rod Clevis Mounting Style 'F'

(Corresponds to DIN ISO 8140)



### Universal Piston Rod Eye Mounting Style 'UF'

(Corresponds to DIN ISO 8139)

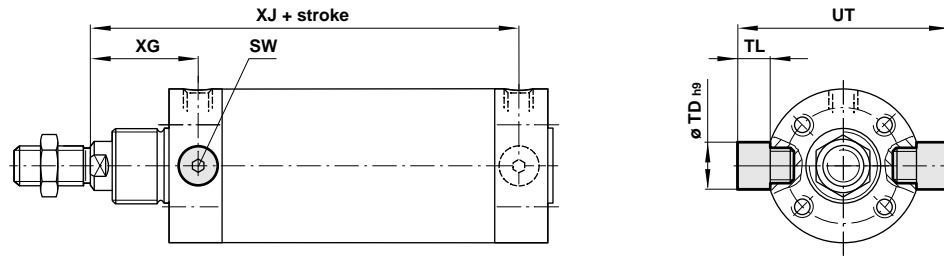


|            |                |                |                |                |            |            |
|------------|----------------|----------------|----------------|----------------|------------|------------|
| Model 'AK' | QM/8025/38     | QM/8040/38     | QM/8050/38     | QM/8050/38     | QM/8080/38 | QM/8080/38 |
| Model 'F'  | QM/8025/25     | QM/8040/25     | QM/8050/25     | QM/8050/25     | QM/8080/25 | QM/8080/25 |
|            | KQM/55433/25 * | KQM/55441/25 * | KQM/55451/25 * | KQM/55464/25 * | -          | -          |
| Model 'UF' | QM/8025/32     | QM/8040/32     | QM/8050/32     | QM/8050/32     | QM/8080/32 | QM/8080/32 |
| ∅          | 32             | 40             | 50             | 63             | 80         | 100        |
| AX         | 20             | 22             | 28             | 28             | 33         | 33         |
| B 1        | 5              | 6              | 8              | 8              | 10         | 10         |
| CE         | 40             | 48             | 64             | 64             | 80         | 80         |
| CE 1       | 43             | 50             | 64             | 64             | 77         | 77         |
| ∅ CK h11   | 10             | 12             | 16             | 16             | 20         | 20         |
| CL         | 20             | 24             | 32             | 32             | 40         | 40         |
| CM         | 10             | 12             | 16             | 16             | 20         | 20         |
| ∅ CN H7    | 10             | 12             | 16             | 16             | 20         | 20         |
| EN -0,1    | 14             | 16             | 21             | 21             | 25         | 25         |
| ER         | 16             | 19             | 25             | 25             | 32         | 32         |
| ER 1       | 14             | 16             | 21             | 21             | 25         | 25         |
| F          | 26             | 26             | 34             | 34             | 42         | 42         |
| KK         | M 10 x 1,25    | M 12 x 1,25    | M 16 x 1,5     | M 16 x 1,5     | M 20 x 1,5 | M 20 x 1,5 |
| L          | 73             | 77             | 106            | 106            | 122        | 122        |
| L 2        | 20             | 24             | 32             | 32             | 40         | 40         |
| LE         | 20             | 24             | 32             | 32             | 40         | 40         |
| LE 1       | 15             | 17             | 22             | 22             | 26         | 26         |
| RK         | 28             | 32             | 41,5           | 41,5           | 50         | 50         |
| SW 1 (A/F) | 19             | 19             | 30             | 30             | 30         | 30         |
| SW 2 (A/F) | 12             | 12             | 19             | 19             | 19         | 19         |
| SW 3 (A/F) | 17             | 19             | 24             | 24             | 30         | 30         |
| SW 4 (A/F) | 30             | 30             | 42             | 42             | 42         | 42         |
| Z          | 13°            | 13°            | 15°            | 15°            | 15°        | 15°        |

\* Mounting brackets KQM/55400/25 are for use with KM/55400/M cylinders

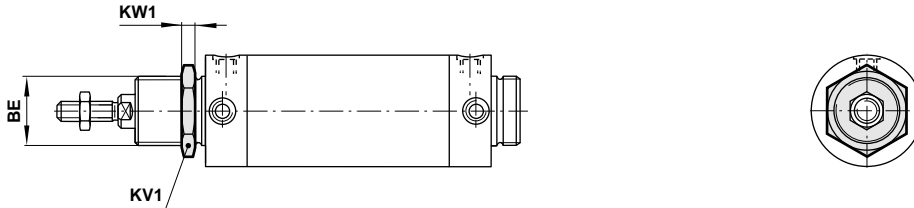


### End Cover Trunnion Mounting Style 'H'

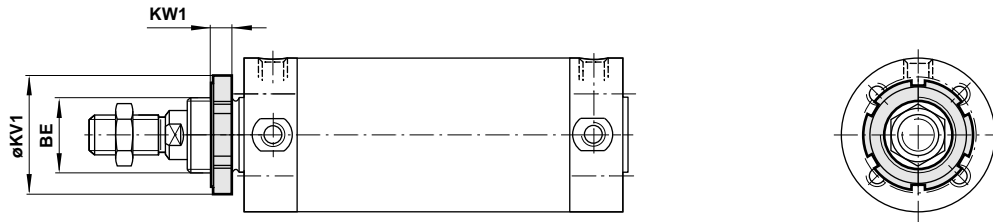


### Locknut Style 'N'

Ø 32 to 63 mm bore



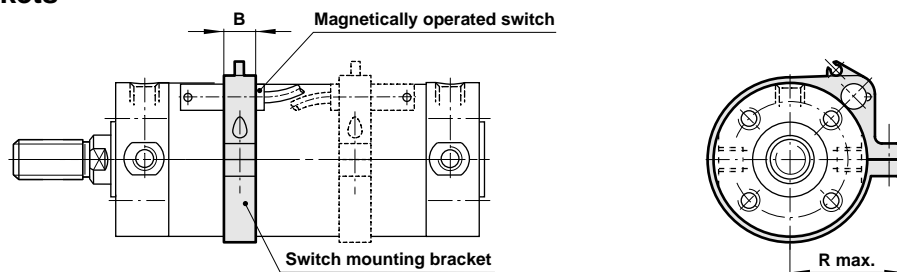
Ø 80 and 100 mm bore



| Model 'H' | QM/55232/28 | QM/55240/28 | QM/55250/28 | QM/55263/28 | QM/55480/28 | QM/55410/28 |
|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| Model 'N' | M/P29254    | M/P29255    | M/P29256    | M/P29256    | M/P34806    | M/P34806    |
|           | M/P34276 *  | M/P34277 *  | M/P34278 *  | M/P34278 *  | -           | -           |
| Ø         | 32          | 40          | 50          | 63          | 80          | 100         |
| BE        | M 30 x 1,5  | M 38 x 1,5  | M 45 x 1,5  | M 45 x 1,5  | M 55 x 1,5  | M 55 x 1,5  |
| KV1 (A/F) | 36          | 46          | 55          | 55          | Ø 80        | Ø 80        |
| KW1       | 8           | 10          | 10          | 10          | 13          | 13          |
| SW (A/F)  | 5           | 6           | 6           | 8           | 8           | 10          |
| Ø TD h9   | 10          | 12          | 14          | 16          | 18          | 20          |
| TL        | 8           | 9,5         | 11          | 13          | 13          | 13          |
| UT        | 51          | 63          | 76          | 93          | 111,5       | 131,5       |
| XG        | 47          | 57          | 62          | 64          | 76          | 79,5        |
| XJ        | 123         | 142         | 152         | 159         | 196         | 200,5       |

\* Locknut is for use with KM/55400/M cylinders

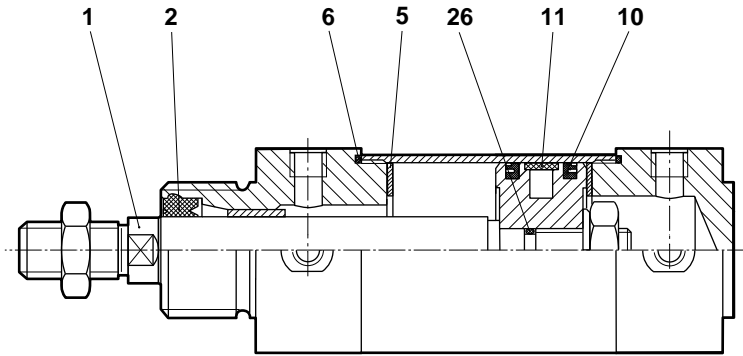
### Switch Mounting Brackets



| Model  | QM/33/432/22 | QM/33/440/22 | QM/33/450/22 | QM/33/463/22 | QM/33/480/22 | QM/33/410/22 |
|--------|--------------|--------------|--------------|--------------|--------------|--------------|
| Ø      | 32           | 40           | 50           | 63           | 80           | 100          |
| B      | 10           | 10           | 10           | 10           | 12           | 12           |
| R max. | 29           | 32           | 38           | 46           | 54           | 64           |



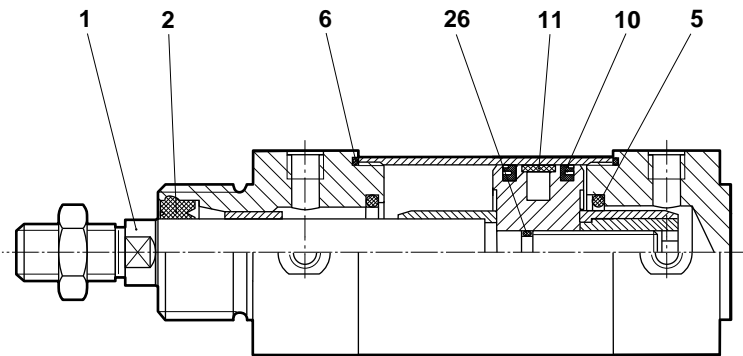
Spares



| Model      | Spares kit  | Comprising |                 |          | Piston rod Item 1 |
|------------|-------------|------------|-----------------|----------|-------------------|
|            |             | Item       | Description     | Quantity |                   |
| RM/55432/M | QM/55432/00 | 2          | Piston rod seal | 1        | SM/P30207/*       |
| RM/55440/M | QM/55440/00 | 5          | Cushion buffer  | 2        | RM/P30208/*       |
| RM/55450/M | QM/55450/00 | 6          | 'O'-ring        | 2        | RM/P30209/*       |
| RM/55463/M | QM/55463/00 | 10         | Piston seal     | 2        | RM/P30210/*       |
| RM/55480/M | QM/55480/00 | 11         | Wear ring       | 1        | RM/P34626/*       |
| RM/55410/M | QM/55410/00 | 26         | 'O'-ring        | 1        | RM/P34663/*       |

\* Insert stroke length

Note: Please quote the cylinder type number when ordering spare parts



| Model                  | Spares kit  | Comprising |                 |          | Piston rod Item 1 |             |
|------------------------|-------------|------------|-----------------|----------|-------------------|-------------|
|                        |             | Item       | Description     | Quantity | RM/55400/M        | KM/55400/M  |
| RM/55433/M, KM/55433/M | QM/55433/00 | 2          | Piston rod seal | 1        | SM/P30207/*       | SM/P30207/* |
| RM/55441/M, KM/55441/M | QM/55441/00 | 5          | Cushion seal    | 2        | RM/P30208/*       | SM/P30208/* |
| RM/55451/M, KM/55451/M | QM/55451/00 | 6          | 'O'-ring        | 2        | RM/P30209/*       | SM/P30209/* |
| RM/55464/M, KM/55464/M | QM/55464/00 | 10         | Piston seal     | 2        | RM/P30210/*       | SM/P30210/* |
| RM/55481/M, KM/55481/M | QM/55481/00 | 11         | Wear ring       | 1        | RM/P34626/*       | -           |
| RM/55411/M, KM/55411/M | QM/55411/00 | 26         | 'O'-ring        | 1        | RM/P34663/*       | -           |

\* Insert stroke length

Note: Please quote the cylinder type number when ordering spare parts

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.