

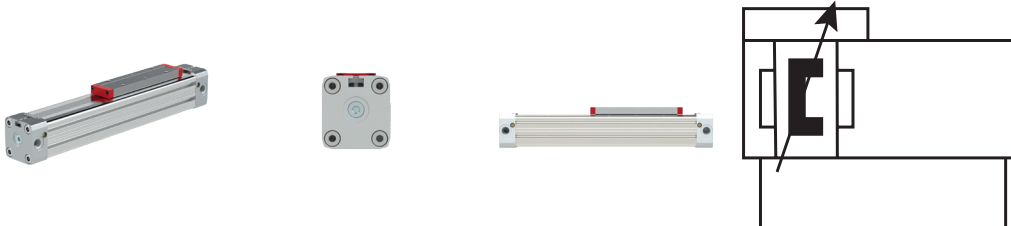
# Piston rod-free cylinder

Serie ZRL1

**PLUS** ||

Art. No. 129684

Type No. ZRL1F.160100



Exemplary illustration

ZRL1F series actuators are characterized by the particularly flat piston design and include piston diameters of 16, 25, 32, 40, 50 and 63 mm with stroke lengths up to 5700 mm. Suitable for filtered (50 µm) and unlubricated or lubricated compressed air. Please ensure continuous oiling when using lubricated compressed air.

Please refer to our type code in the data-sheet for the available variants and their corresponding type designations for your individual inquiry.

Other special designs are also available on request.

After receipt of order, the cylinders will be manufactured individually for you.

Usually, shipment takes place within 5 working days, depending on the number of pieces.

Freight and packaging costs are charged individually and regardless of the value of the goods.

## Technical data

|                           |                                    |
|---------------------------|------------------------------------|
| Piston Ø                  | 16 mm                              |
| Stroke                    | 100 mm                             |
| Magnet                    | with magnet                        |
| Connection                | M5                                 |
| Medium                    | filtered air (max. 50 µm)          |
| Working pressure          | 0.5 - 8 bar                        |
| Temperature range         | -10 to 80 °C                       |
| Function                  | double-acting                      |
| Screws                    | steel 10.9 zinc plated             |
| Cushioning                | cushioned                          |
| Number of pneumatic ports | 3                                  |
| Mounting position         | any                                |
| Forces and moments        | See forces and moments             |
| Support forces            | See deflection diagram             |
| Sealant                   | oil-proof synthetic material (NBR) |
| Air connection            | 3-fold on both sides               |

## Technical data

|                 |       |
|-----------------|-------|
| Load connection | rigid |
|-----------------|-------|

NBR seals recommended for piston speeds  $\leq 1$  m/s. FPM seals recommended for speeds  $> 1$  m/s

## Commercial data

|                         |                     |
|-------------------------|---------------------|
| Customs tariff number   | 84123100            |
| Country of origin       | DE                  |
| eCl@ss 5.1.4            | 27290401            |
| eCl@ss 9.0              | 27290490            |
| UNSPSC_Code_v190501     | 27131701            |
| UNSPSC_CodeDesc_v190501 | Pneumatic cylinders |

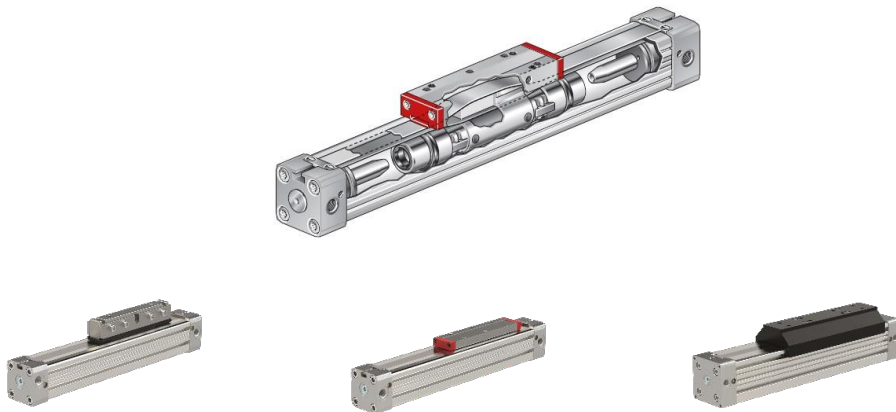
## Material informations

|                            |                            |
|----------------------------|----------------------------|
| REACH SVHC1 substance name | no                         |
| CAS no. SVHC 1             | no CAS No.                 |
| RoHS materials notice      | RoHS compliant             |
| REACH Info                 | no SVHC substance included |

## Materials

| Part          | Material                         |
|---------------|----------------------------------|
| Barrel        | High-strength anodized aluminium |
| End caps      | High-strength anodized aluminium |
| Piston axle   | High-strength anodized aluminium |
| Seals         | Oil-proof synthetic material NBR |
| Sealing bands | Stainless steel                  |
| Piston caps   | Wear-proof synthetic material    |
| Sliding parts | Wear-proof synthetic material    |

NBR seals recommended for piston speeds  $\leq 1$  m/s. FPM seals recommended for speeds  $> 1$  m/s


**ZRL1C series**

Classic design with high carriage

**ZRL1F series**

Compact design with low carriage

**ZRL1S series**

With integrated sliding guide

Other designs with different guides or as duo assembly on request.

**Features:**

- Equal forces in both directions
- Direct force output, protected against rotation
- Particularly space-saving - installation length halved compared to cylinders with piston rod
- Extreme stroke lengths up to 5700 mm
- End caps with three air connections and adjustable cushioning
- High acceleration and velocity
- High degree of design freedom

**Application examples:**

- For linear and direct horizontal, vertical and diagonal load movements
- Can be used as a self-supporting structural or pure load-bearing machine element in single, multiple or parallel axis arrangement
- Suitable for conveyor systems, packaging and filling systems, handling systems, workpiece transport systems, door closing systems, etc.

**Delivery times, freight and packaging costs:**

- After receipt of order, the cylinders will be manufactured individually for you.
- Usually, shipment takes place within 5 working days, depending on the number of pieces.
- Freight and packaging costs are charged individually and regardless of the value of the goods.

**Functional description:**

The entire tube is slotted throughout its full length. The force is transmitted through the load friction, which is attached to the piston axle. The piston axis is designed in such a way that a bridge guided through the tube slot connects the inner part of the piston axis to the outer part.

Therefore the force transmission runs as follows:

Air pressure --> Piston area --> piston axle (inner part) --> piston axle (outer part) --> load friction --> load.

The sealing of the cylinder slot is guaranteed by a precision ground inner steel band. The inner band is kept in position by magnet stripes on both sides of the slot.

In addition, a second steel band on the outside of the slot serves to cover the dust. During piston movement as well as during stillstand of it both steelbands are lifted right after the piston seal and led through the piston axle by means of a separate own guiding channel. Both steel bands are lifted off the slot behind the piston seal during piston travel and at standstill, and each is guided through the piston axis by its own guide channel. In front of and behind the piston, the bands seal the cylinder slot again.

## Structure of the type code:

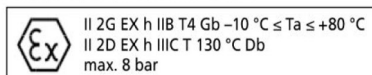
Example:

**ZRL1F.250250.KBWF.LL.N.EX**

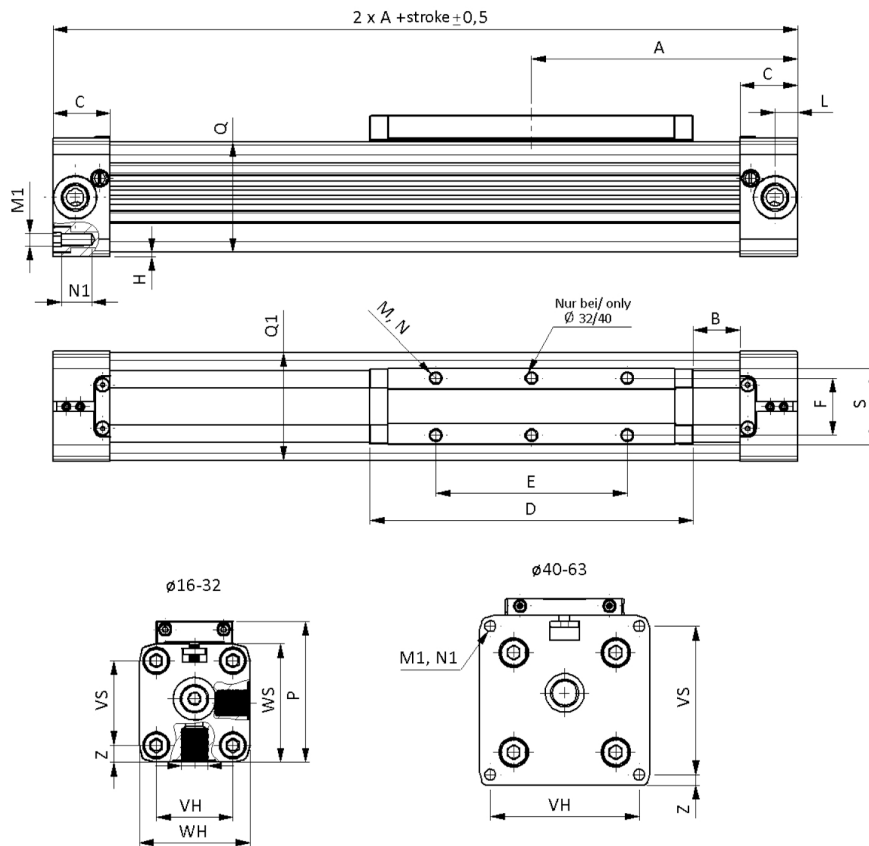
| Piston Ø<br>[mm] | Stroke<br>min.–max.<br>[mm]                | Variant                                                                                                                                                    | Lubrication                                                                                                                  | Magnet                      | ATEX            |
|------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------|
| 16               | 0100 ... 4400<br>(Ø 16)                    | Standard:<br>- Rigid load connection<br>- Screws 10.9 zinc plated<br>- 3 air connections<br>- NBR seals<br><br>For speeds ≤1 m/s.                          | Standard<br>lubrication                                                                                                      | Standard:<br>with<br>magnet | Standard:<br>no |
| 25               | 0100 ... 5700<br>(Ø 25, 32, 40,<br>50, 63) |                                                                                                                                                            | <b>LL</b> Slow speed<br>lubrication<br><br>Recommended<br>for speeds<br>≤ 0,1m/s (NBR<br>seals)/<br>≤ 0,2m/s (FPM<br>seals). | <b>N</b> without<br>magnet  | <b>EX</b> yes   |
| 32               |                                            |                                                                                                                                                            |                                                                                                                              |                             |                 |
| 40               |                                            |                                                                                                                                                            |                                                                                                                              |                             |                 |
| 50               |                                            |                                                                                                                                                            |                                                                                                                              |                             |                 |
| 63               |                                            |                                                                                                                                                            |                                                                                                                              |                             |                 |
|                  |                                            | <b>SX</b> Same as standard, except:<br>⊕ <b>Stainless steel screws</b>                                                                                     |                                                                                                                              |                             |                 |
|                  |                                            | <b>F</b> Same as standard, except:<br>⊕ <b>FPM seals</b><br><br>For speeds >1 m/s, at which the seals are exposed to<br>increased temperature development. |                                                                                                                              |                             |                 |
|                  |                                            | <b>SXF</b> Same as standard, except:<br>⊕ <b>Stainless steel screws</b><br>⊕ <b>FPM seals</b><br><br>For speeds >1 m/s.                                    |                                                                                                                              |                             |                 |
|                  |                                            | <b>LE</b> Same as standard, except:<br>⊕ <b>Air supply from one side</b><br>(only for Ø 32, 40, 50, 63)                                                    |                                                                                                                              |                             |                 |
|                  |                                            | <b>KBW</b> Same as standard, except:<br>⊕ <b>Flexible load connection</b>                                                                                  |                                                                                                                              |                             |                 |
|                  |                                            | <b>KBWF</b> Same as standard, except:<br>⊕ <b>Flexible load connection</b><br>⊕ <b>FPM seals</b><br><br>For speeds >1 m/s.                                 |                                                                                                                              |                             |                 |

- For each position in the type code, only one option can be selected by default.  
Piston Ø and stroke must always be defined as the minimum specification, e. g. ZRL1F.320100.
- Standard options are not explicitly defined, meaning the position in the type code remains empty, e. g. ZRL1F.320100.LL.

Suitable for use in EX areas – ATEX

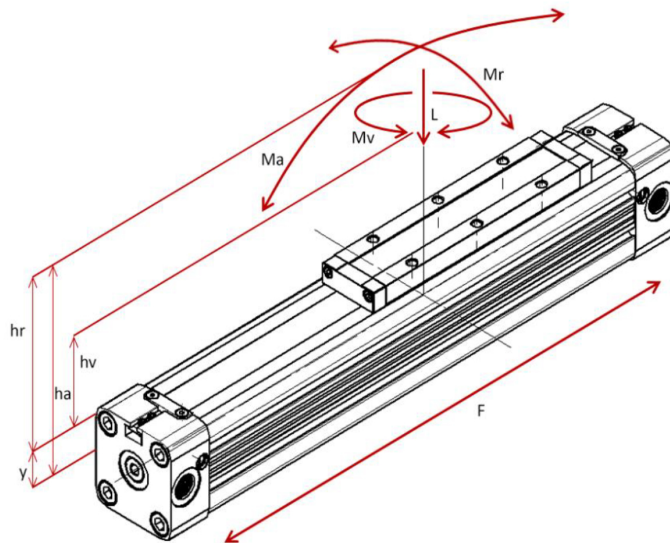


## Dimensions:



| Ø  | A   | B    | C  | D   | E   | F    | G     | H    | L    | M  | M1 | N  | N1 | P     |
|----|-----|------|----|-----|-----|------|-------|------|------|----|----|----|----|-------|
| 16 | 65  | 15.5 | 15 | 69  | 36  | 16.5 | M5    | 1.0  | 5.5  | M4 | M3 | 7  | 7  | 36.5  |
| 25 | 100 | 21.0 | 23 | 111 | 65  | 25.0 | G 1/8 | 2.0  | 8.5  | M5 | M5 | 10 | 12 | 52.5  |
| 32 | 125 | 22.0 | 27 | 152 | 90  | 27.0 | G 1/4 | 2.0  | 10.5 | M6 | M6 | 7  | 14 | 66.5  |
| 40 | 150 | 44.0 | 30 | 152 | 90  | 27.0 | G 1/4 | 6.75 | 15.0 | M6 | M6 | 10 | 17 | 80.0  |
| 50 | 175 | 42.0 | 33 | 200 | 110 | 27.0 | G 1/4 | 0.5  | 11.7 | M6 | M6 | 6  | 18 | 88.0  |
| 63 | 215 | 47.5 | 50 | 235 | 155 | 36.0 | G 3/8 | 1.5  | 25.0 | M8 | M8 | 15 | 18 | 123.0 |

| Ø  | QxQ1    | S    | VS | VH | WS  | WH  | Z    |
|----|---------|------|----|----|-----|-----|------|
| 16 | 24.5x25 | 22.0 | 18 | 18 | 27  | 27  | 4.5  |
| 25 | 36x36   | 33.0 | 27 | 27 | 40  | 40  | 6.5  |
| 32 | 52x51   | 36.0 | 40 | 36 | 56  | 52  | 8.0  |
| 40 | 58.5x59 | 36.4 | 54 | 54 | 69  | 72  | 9.0  |
| 50 | 77x78   | 56.0 | 70 | 70 | 80  | 80  | 4.0  |
| 63 | 102x102 | 50.0 | 78 | 78 | 106 | 106 | 14.5 |


**Formulas**

$$M_a = F \cdot h_a$$

$$M_r = F \cdot h_r$$

$$M_v = F \cdot h_v$$

**Forces and moments:**

|                                       | ZRL1F series |     |     |     |      |      |
|---------------------------------------|--------------|-----|-----|-----|------|------|
| Piston Ø [mm]                         | 16           | 25  | 32  | 40  | 50   | 63   |
| Center distance Y [mm]                | 9            | 14  | 18  | 22  | 28   | 36   |
| Effective force F (6 bar) [N]         | 110          | 250 | 420 | 640 | 1000 | 1550 |
| Cushioning S [mm]                     | 15           | 21  | 26  | 32  | 32   | 40   |
| Max. load L [N]                       | 120          | 300 | 450 | 750 | 1200 | 1650 |
| Max. bending moment axial $M_a$ [Nm]  | 4            | 15  | 30  | 60  | 115  | 200  |
| Max. bending moment radial $M_r$ [Nm] | 0.3          | 1   | 2   | 4   | 7    | 8    |
| Max. torque $M_v$ [Nm]                | 0.5          | 3   | 4.5 | 8   | 15   | 24   |

The figures above are max. values based on light shock free duty and speed of  $v \leq 0.45$  m/sec (ZRL1F series).

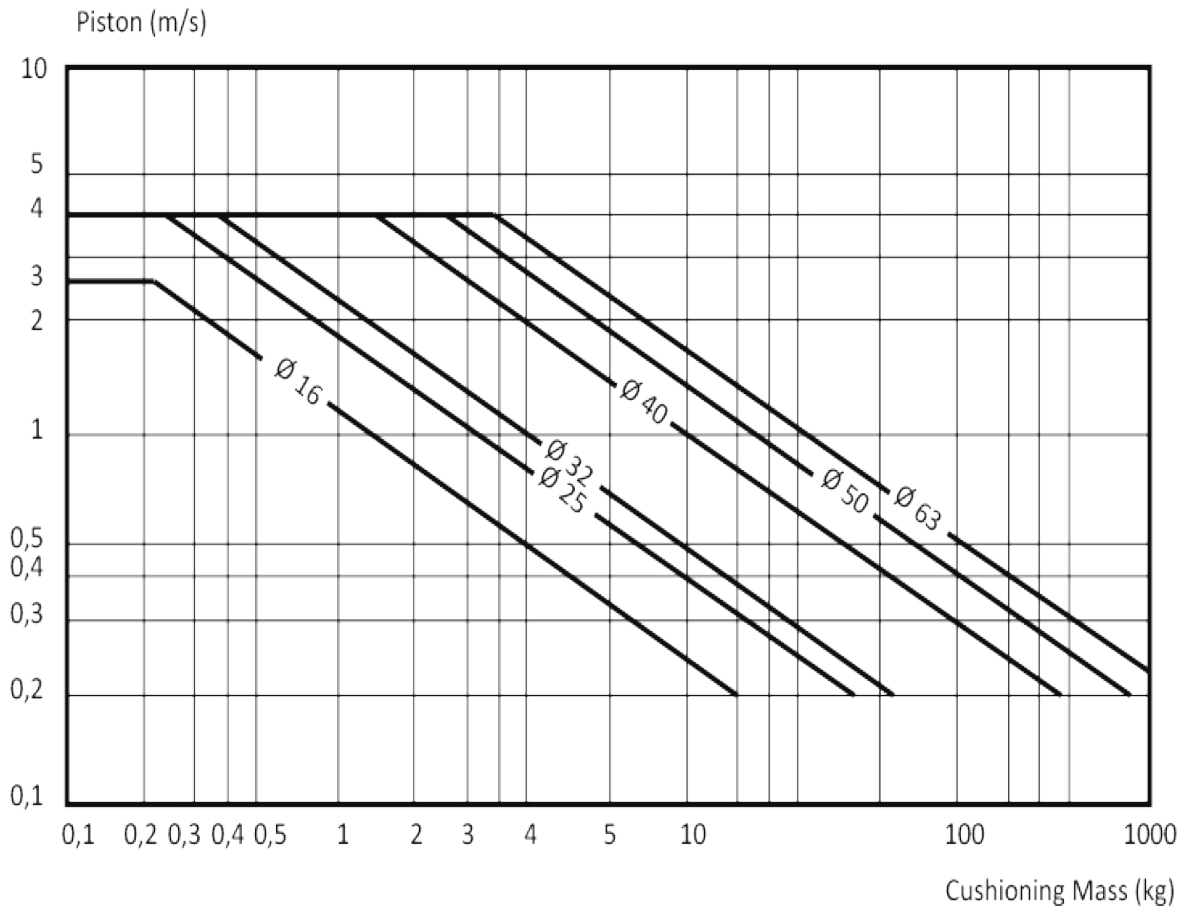
Max. pressure 6 bar.

An exceeding of the values in dynamic operations, even for short moments, has to be avoided.

**Attention:**

Resulting forces could lead to extreme exceedings of the values. In case of undefinable situations, the above max. values have to be reduced by 10 to 20 %.

### Cushioning diagram:

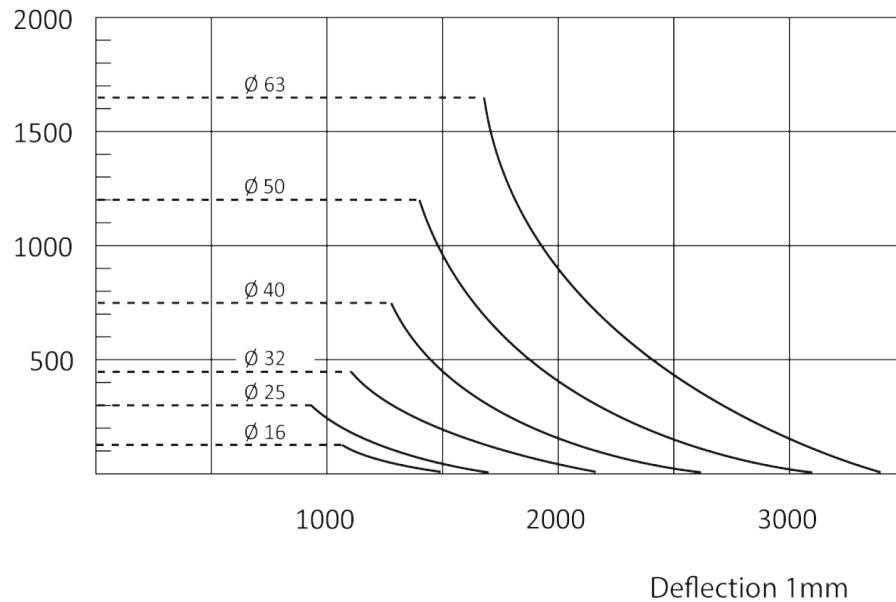


### Pay attention to the following points:

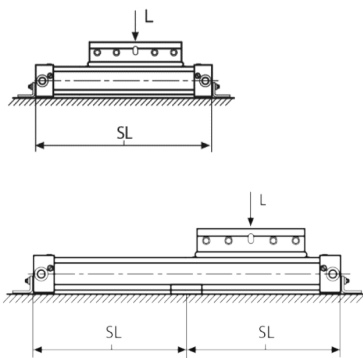
- If the limits above are exceeded additional shock absorbers are necessary.
- For piston speeds of  $> 1$  m/s FPM seals are recommended.
- For piston speeds  $\leq 0.1$  m/s (NBR) /  $\leq 0.2$  m/s (FPM) we recommend slow speed lubrication (variant LL).
- Maximum duration life will be achieved when piston speeds do not exceed 1 m/s.

### Deflection diagram:

Load L (N)



max. distance (SL) in mm - without mid section support / mid section mounting



### Diagram information:

- Calculated deflections without support of 0.5 to 1 mm allow exceeding of supporting distance.
- Calculated deflections without support of 1 to max. 1.5 mm require reduction of the supporting distance.

## Accessories

|                                                                                                                | Art. No. | Type No.       |
|----------------------------------------------------------------------------------------------------------------|----------|----------------|
| Foot mounting for rodless cylinders ZRL1 Ø16, 2 pieces with 4 screws                                           | 129640   | FB.ZRL1.16     |
| Mid section support for rodless cylinders ZRL1 Ø16, 2 pieces                                                   | 129647   | ZS.ZRL1.16     |
| Mobile mid section mounting G for rodless cylinders ZRL1 Ø16, 1 piece with 2 screws                            | 129653   | MMBG.ZRL1.16   |
| Articulated carrier for rodless cylinders ZRL1F, Ø16, 1 piece with 4 screws and 4 washers                      | 129661   | KBW.ZRL1F.16   |
| T-slot sensor adapter for rodless cylinders ZRL1                                                               | 129668   | SA.ZRL1        |
| Sensor cable with M8 connector, straight, 5m, PVC                                                              | 129669   | SK.M8.5        |
| REED sensor, 2-wire, 5 m cable length with open strands, 5-130V AC/DC, 6W, NO, LED, for rodless cylinders ZRL1 | 129638   | RS.ZRL1.K5     |
| HALL sensor, 3-wire, M8 connector, 300 mm cable, 10-30V DC, 4W, NO, PNP, LED, for rodless cylinders ZRL1       | 129639   | HS.ZRL1.PNP.M8 |
| Mobile mid section mounting W for rodless cylinders ZRL1 Ø16, 1 piece with 2 screws                            | 129655   | MMBW.ZRL1.16   |
| REED sensor, 2-wire, M8 connector, 300 mm cable, 5-50V AC/DC, 6W, NO, LED, for rodless cylinders ZRL1          | 129738   | RS.ZRL1.M8     |
| HALL sensor, 3-wire, 5 m cable with open strands, 10-30V DC, 4W, NO, PNP, LED, for rodless cylinders ZRL1      | 129739   | HS.ZRL1.PNP.K5 |