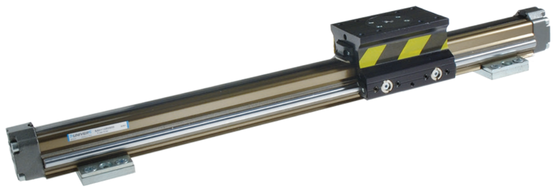
# S1-S5-LV1 - RODLESS CYLINDERS

SERIES
S1

**Standard version rodless cylinders**

SERIES
S5

**Rodless cylinders with integrated guides**



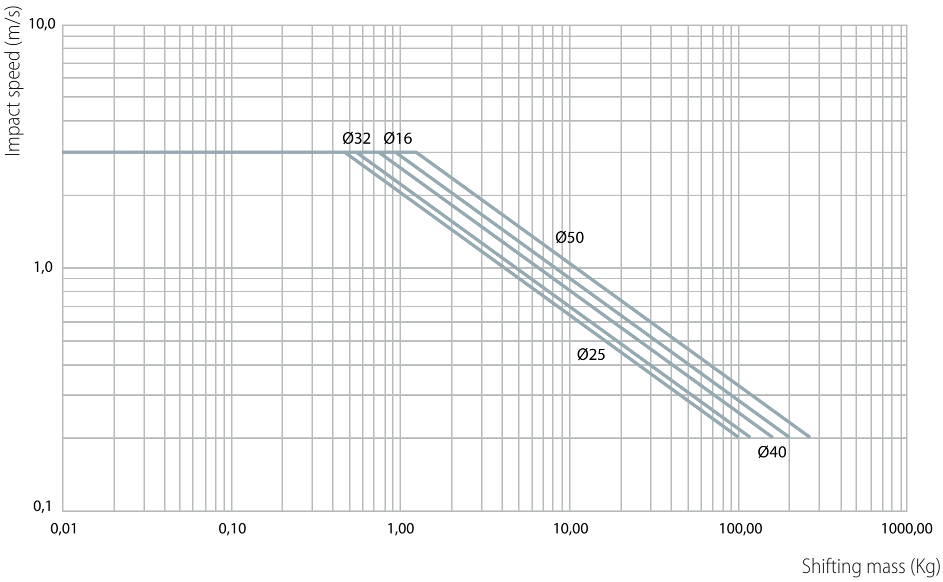
SERIES
VL1

**Rodless cylinders with 90° integrated guides**

## EXAMINATION AND VERIFICATION OF THE CUSHIONING

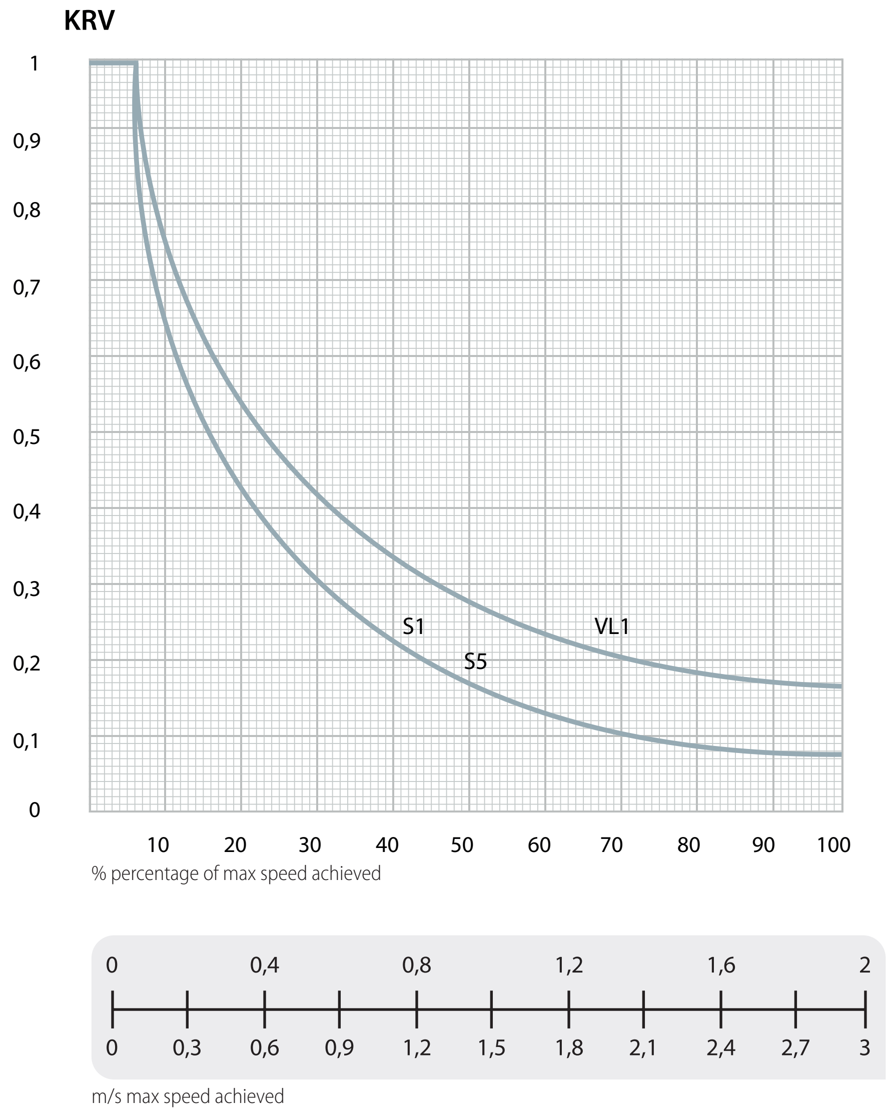
In a system with moving masses, as in the case of rodless cylinders, it is essential to control the dissipation of the system's kinetc energy as it is brought to a stop. First of all, it is necessary to establish and verify the most suitable method for cushioning the system, in order to avoid the moving mass (carriage with load) striking against the end-caps and compromising the life of the cylinder.
If the point corresponding to a given load and speed lies beneath the appropriate curve, the cushioning is able to absorb the kinetic energy of the system.
Vice versa if the point lies above the curve, the cushioning is not able to absorbe the kinetic energy. In that case you must:
a) decrease the load and mantain the translation speed
b) decrease the speed and mantain the load
c) select a cylinder with a bigger bore or with twin chambers

**The cushioning capacity is shown in the diagram below, referenced to the final speed as the carriage approaches the end-caps for S1- S5 - VL1 series.**




As a result, if cushionings can not absorb the kinetic energy and changing the working parameters is not possible, it is necessary to provide an additional hydraulic shock absorber (YDA / YDR series) to reduce the load speed before the cushionings operate.

## DYNAMIC LOAD CAPACITY




1. Calculation of the operational speed percentage in relation to the max allowable speed:

$$\% = \frac{\textbf{Operational speed (m/s)}}{\textbf{Max. allowable speed (m/s)}} \cdot 100$$

2. Apply the following formula for the calculation of the max. dynamic load:

**CD = CM · KRV**

**CD =** Max. dynamic load (N)
**CM =** Max. static load (N). See relevant load tables for the various series
**KRV =** System coeff icient (which acts to reduce the max. load based on the system speed)

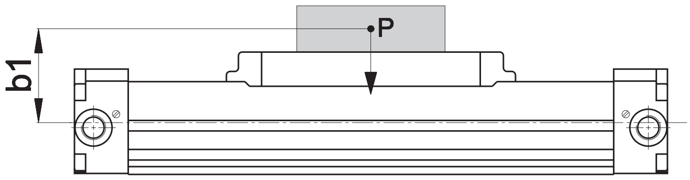
### CYLINDER SELECTION

As previously discussed, it is necessary to produce (for a correct use of the cylinder) a gradual deceleration of the moving mass.

### CYLINDER WITH LOAD MOUNTED DIRECTLY ON THE CARRIAGE (EXAMPLE A)

Let us consider the case of a S1 series cylinder with a load of 50 N placed on the carriage, at the max. translation speed of 1,2 m/s., as shown in the picture. Verify the cushioning capacity and calculate the capacity of the dinamic load and of the torque and bending moments..

P 50 N
V 1,2 m/s
b1 110 mm




### VERIFICATION OF THE CUSHIONING CAPACITY

According to the graph 50 bore size cylinder is able to absorb the developed kinetic energy developed by the application in the picture above, since the intersection point corresponding to the speed and load lies beneath the cushioning curve.

### VERIFICATION AND CALCULATION OF THE DYNAMIC LOAD CAPACITY

Using the equation 1, we can calculate the percentage between the operation speed and allowable speed.

$$\% = \frac{\text{Operational speed (m/s)}}{\text{Max. allowable speed (m/s)}} \cdot 100 = \frac{1{,}2\ \text{m/s}}{3\ \text{m/s}} \cdot 100 = 40\%$$

From the graph we can determine the KRV (coefficient of speed reduction)

**KRV = 0,24**

Applying the equation 2 we can determine the max. permitted dynamic load.

**CD = CM · KRV**

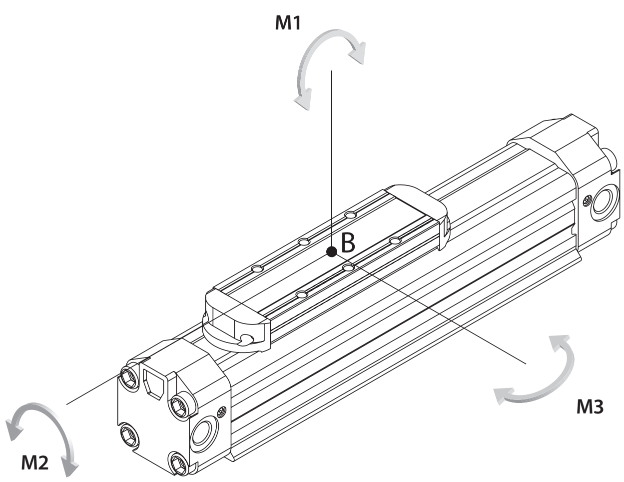
**CD =** Dynamic load
**CM =** Static load 500 N (see table for S1 50mm cylinder series - P1)

**CD = 500 · 0,24 = 120 N**

**As P (50 N) < CD (120 N)** the S1 series 50 bore cylinder is suitable for the application

### CARRIAGE STRESSES

Different load applications have different moments M1 - M2 - M3, which directly infl uence the life of the cylinder.
By selecting a cylinder that can support off-set loads, we can avoid compomising the cylinder life.
Load must be applied, if possible, so that it acts through the centre point B (see picture).



## CALCULATION OF THE TORQUE M1 - M2 - M3

In order to calculate the various moments, which act on the carriage, we must calculate the force, generated by the load, when it is subjected to accelerations and decelerations.

$$a = \frac{V2}{2L \cdot 10^{-3}} = (m/sec.^2)$$

$$a = \frac{1{,}22}{2 \cdot 52 \cdot 10^{-3}} = 13{,}8\ (m/sec.^2)$$

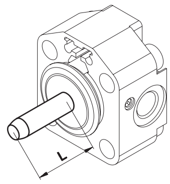
$$F = m \cdot a$$

F = Force   m = Mass (P/9,81)

$$F = \frac{50}{9{,}81} \cdot 13{,}8 = 70\ N$$

$$M1 = F \cdot b1$$

### CUSHION LENGTH




| Ø | L mm |
|---|---|
| **16** | 16,5 |
| **25** | 25 |
| **32** | 32,5 |
| **40** | 41,5 |
| **50** | 52 |

a = Acceleration/deceleration
V = Speed in m/s.
L = Cushion length in mm
M1 = Torque
b1 = Distance between the centre of gravity of load P and the centre of gravity through the cylinder centre line.

The **example A** is subjected to the moment M1 as the load decelerates through the cushion.

$$M1 = 70 \cdot 110 = 7700\ N\ mm = 7{,}7\ Nm$$

The equation gives the following result:

**M1 = 7,7 Nm < 19 Nm (see table for S1 50mm cylinder series - M1)**

Thus S1 series, bore size 50, with standard carriage is suitable for the movement of the load in the given conditions. If the calculated value is equal to or higher than the value given in the table, it is necessary to select a different size of carriage, or a different type of rodless cylinder (e.g with integrated slide)

### ATTENTION!

If the translation speed of **example A** is 2 m/s instead of 1,2 m/s, the cushioning capacity of the cylinder, given in the example, will not be enough to absorb the kinetic energy generated by the moving load.
Therefore it is necessary to reduce the translation speed before reaching the cushion, by means of shock absorbers until the value is 1,2 m/s (for example).

## SIZING OF A POSSIBLE HYDRAULIC SHOCK ABSORBER

The hydraulic shock absorber must be mounted, so as to strike the centre of gravity of the load.

$$Ec = \frac{1}{2} \cdot m \cdot V^2$$

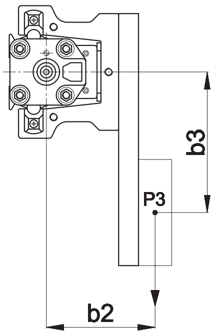
Ec = Kinetic energy
m = Mass (P/9,81)
V = Translation speed (2 m/s)
P = Weight 50 N
9,81 = Acceleration of the centre of gravity

$$Ec = \frac{1}{2} \cdot \frac{50}{9{,}81} \cdot 2^2 = \frac{200}{19{,}62} = 10\ Nm$$

In this case the hydraulic shock absorber must have a capacity greater than or equal to 10 Nm.

### CYLINDER WITH MISALIGNED LOAD (PICTURE B)

Let use suppose that we want to move a load of 50 N displaced at a distance B3 from the central axis, at a maximum translation speed of 1,2 m/s. Due to the misaligned load a cylinder with an external carriage is required and we must verify if a S5 cylinder with integrated slide is suitable for this application.




**P3 =** 50 N

**V =** 1,2 m/s

**b2 =** 150 mm

**b3 =** 200 mm

### VERIFICATION OF THE CUSHIONING CAPACITY

The S5 series cylinder (graph on page 22), 40 mm bore, can absorb the kinetic energy developed by the 50 N load at a speed of 1,2 m/s.

### VERIFICATION AND CALCULATION OF THE CARRIAGE MOMENTS

Using the equation we can calculate the percentage of the max. speed as follows.

$$\% = \frac{\text{Operational speed (m/s)}}{\text{Max. allowable speed (m/s)}} \cdot 100 = \frac{1{,}2\ \text{m/s}}{3\ \text{m/s}} \cdot 100 = 40\%$$

From the graph given on page 23 we can determine the KRV coefficient.

**KRV = 0,24**

Applying the equation 2 on page 23 we can determine the max. allowable dynamic load.

**CD = CM · KRV**

**CD =** Dynamic load
**CM =** Static load 600 N (see table for S5 50mm cylinder series)

**CD = 600 · 0,24 = 144 N**

**As P3 (50 N) < CD (144 N)** the S5 series 40 bore cylinder is suitable for the application.

### CALCULATION AND VERIFICATION OF THE CARRIAGE MOMENTS

As load P is misaligned (B3) from the central axis of the cylinder, the carriage is acted on by a signifi cant moment M3, so that it is necessary to use a cylinder with an external carrriage.

### CALCULATION OF THE MOMENTS M1 - M2 - M3 AND CARRIAGE SELECTION

$$a = \frac{V2}{2\,L \cdot 0\,\text{-}3} = (\text{m/sec.}^2)$$

$$a = \frac{1{,}2^2}{2 \cdot 41{,}5 \cdot 10^{-3}} = 17{,}3\ (\text{m/sec.}^2)$$

$$F = m \cdot a = \frac{P}{9{,}81} \cdot 17{,}3 = \frac{50}{9{,}81} \cdot 17{,}3 = 88\ \text{N}$$

a = Acceleration/deceleration
m = Mass (P/9,81)
F = Force
P = Weight in N
9,81 = Centre of gravity acceleration
L = Length in mm of the internal cushion (see on page 25)
V = Speed in m/s

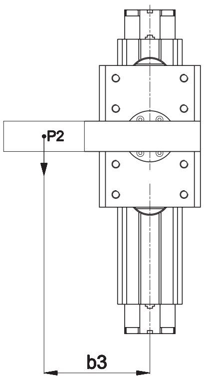
**THE EXAMPLE IS SUBJECTED TO MOMENTS M1 - M2 - M3**

| torque | Torque calculation | Maximum allowable torque |
|---|---|---|
| M1 = F × b2 | 88 × 150 = 13200 N·mm = 13,2 N·m | 60 Nm |
| M2 = P × b2 | 50 × 150 = 7500 N·mm = 7,5 N·m | 30 Nm |
| M3 = F × b3 | 88 × 200 = 17600 N·mm = 17,6 N·m | 80 Nm |

By comparing the calculated values to the max values on page 12, it can be deducted that the medium carriage is suitable for this application.

## CYLINDER WITH MISALIGNED LOAD IN VERTICAL POSITION

In this istance let use suppose to verify if a 40 mm bore VL1 series cylinder, in the vertical plane, is sufficient to move a 50 N load misaligned at a distance b3, at a speed of 1,2 m/s.




**P3** = 50 N

**V** = 1,2 m/s

**b2** = 150 mm

**b3** = 200 mm

**ATTENTION!**

By checking the data given in the example, we note that the cylinder, in the vertical position, is not able to cushion the load and it is therefore necessary to use a 50 mm bore cylinder or an external shock absorber (see on page 26). Now we must calculate the dynamic load capacity and the developed moments. To obtain the value of the KRV coeeficient follow the procedure as given in the examples, which will result in a coefficient of KRV 0,24 (**SEE PICTURES A AND B**).

$$CD = CM \cdot KRV = 1100 \cdot 0{,}24 = 264\ N$$

$$P < CD$$

The cylinder is therefore able to move the applied load.
In this application the moment M2 is not generated, as no force is acting transversally to the moving axis; therefore we must calculate only the moments M1 and M3.

$$F = m \cdot a$$

$$a = \frac{V^2}{2L \cdot 10^{-3}} = 17{,}3\ (m/sec.^2)$$ (**esempio B**)

$$F = m \cdot a = 88\ N$$ (**esempio B**)

| THE EXAMPLE IS SUBJECTED TO MOMENTS M1 - M2 - M3 | | |
|---|---|---|
| **torque** | **Torque calculation** | **Maximum allowable torque** |
| M1 = F × b1 | 88 × 110 = 9680 Nmm = 9,68 Nm | 120 Nm |
| M3 = F × b3 | 88 × 200 = 17600 Nmm = 17,6 Nm | 120 Nm |

By comparing the obtained values with the maximum values in table at page 18, we can verify that the cylinder is proper, but in order to cushion the vertical load, we must either use an external cushion, increase the cylinder bore size or use another cylinder series.

### FOR A CORRECT USE SEE THE FOLLOWING INSTRUCTIONS:

1. For a longer life of the cylinder it is suggested to use the cyliner at a speed of 1 m/s
2. f the cushioning value is in proximity to the max. value, please apply an additional shock absorber
3. If the cylinder is used vertically, the cushioning capacity is reduced by 40%.
4. Mantain a correct and constant lubrication.

# SERIES S5 - RODLESS CYLINDERS WITH INTEGRATED SLIDE

## TECNICHAL CHARACTERISTICS

**Pressure**
3 bar ÷ 10 bar

**Temperature**
- 20 °C ÷ + 80 °C

**Fluid**
filtered air, with or without lubrication

**Bore**
25 - 32 - 40 - 50 mm

**Standard strokes**
Strokes up to 6000 mm

**Operation**
Flexible guide system with a sliding carriage running on plastic guide shoes and steel rods.
Speed: 0.2 to 1.5 m/s.
Parking lock available.

**Materials and Components**
- Die-cast aluminum end caps
- Anodized aluminum barrel
- Aluminum piston
- Acetal resin guide shoe
- NBR double-lip piston seal
- NBR cushioning pads on both ends
- Aluminum profile

| Series | Type | Left-hand side power supply | Right-hand side power supply | Bore (mm) | Stroke (mm) |
|---|---|---|---|---|---|
| S 5 | 0 | 1 | 1 | 2 5 | 1 0 0 0 |
| **S5** Rodless Cylinders with integrated guides - Technopolymer sliding guide | **0** Standard carriage (except for Ø 40-50)<br>**2** Medium carriage<br>**3** Long carriage | **0** No supply port (both chambers are supplied from the right end-cap)<br>**1** Side supply port<br>**2** Bottom supply port<br>**3** Rear supply port | **1** Side supply port<br>**2** Bottom supply port<br>**3** Rear supply port<br>**4** Rear supply ports for both chambers on the right end-cap | **25** = Ø25<br>**32** = Ø32<br>**40** = Ø40<br>**50** = Ø50 | Fino a **6000** |

STROKE TOLERANCES

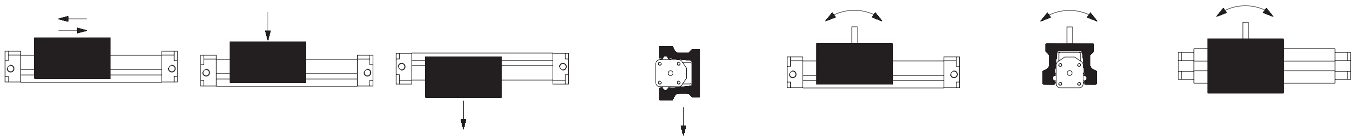
| Ø | mm |
|---|---|
| **25** | +2,5 -0 |
| **32** | +3,2 -0 |
| **40** | +3,2 -0 |
| **50** | +3,2 -0 |

| Ø | CYLINDER MASS STANDARD CARRIAGE<br>Cylinder - stroke 0<br>g | CYLINDER MASS MEDIUM CARRIAGE<br>Cylinder - stroke 0<br>g | CYLINDER MASS LONG CARRIAGE<br>Cylinder - stroke 0<br>g | Increase for 100 mm stroke<br>g |
|---|---|---|---|---|
| **25** | 1625 | 1930 | 264 | 365 |
| **32** | 2775 | 3265 | 465 | 495 |
| **40** | - | 6095 | 860 | 920 |
| **50** | - | 10030 | 14040 | 1280 |

**Theoretical forces (N) at different working pressure (bar) Static load value (N) and torque (Nm)**

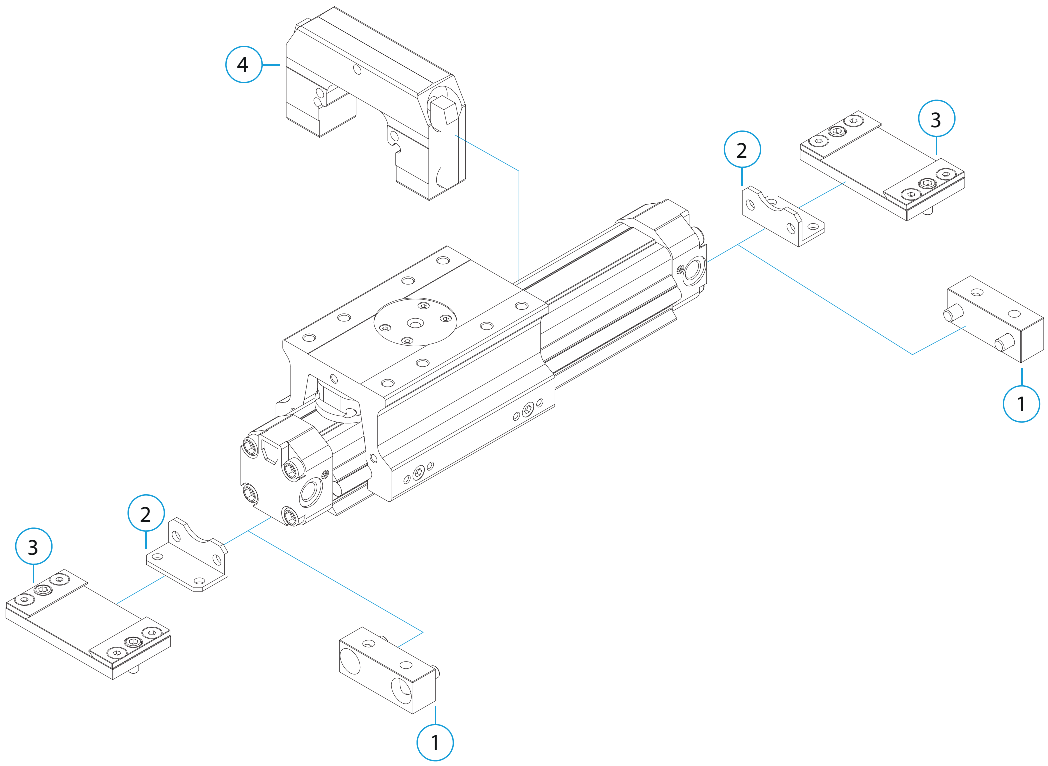
Please note that in dynamic conditions, the load must be reduced due to effects associated with the speed.. A moment is the product of the load (Newton) and the arm (meters), i.e the distance between the centre of gravity of the load and the longitudinal axis of the piston.

| Force<br>6 bar | P1 | Load<br>P2 | P3 | Bending moment<br>M1 | Torque<br>M2 | Bending moment<br>M3 |
|---|---|---|---|---|---|---|



| Ø | Forc e<br>F<br>(N) | Load<br>P1<br>(N) | P2<br>(N) | P3<br>(N) | Standard carriage<br>M1<br>(Nm) | M2<br>(Nm) | M3<br>(Nm) | Medium carriage<br>M1<br>(Nm) | M2<br>(Nm) | M3<br>(Nm) | Long carriage<br>M1<br>(Nm) | M2<br>(Nm) | M3<br>(Nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **25** | 250 | | 400 | | 13 | 8 | 16 | 20 | 10 | 25 | 40 | 15 | 50 |
| **32** | 420 | | 400 | | 20 | 9 | 27 | 30 | 12 | 40 | 55 | 18 | 75 |
| **40** | 640 | | 600 | | - | - | - | 60 | 30 | 80 | 110 | 45 | 150 |
| **50** | 1050 | | 800 | | - | - | - | 85 | 50 | 110 | 150 | 75 | 210 |

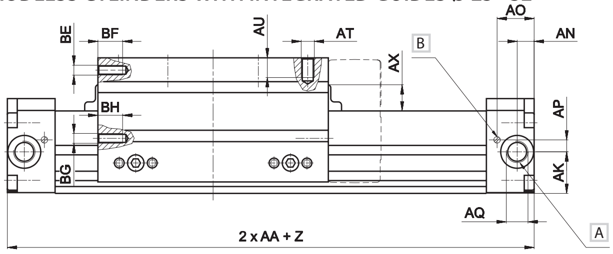
## FIXING ELEMENTS AND ACCESSORIES

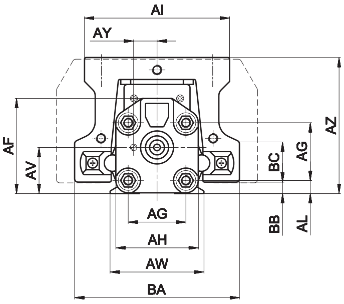


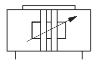

| | |
|---|---|
| **1** | Angle bracket Ø25-32 **SF-13** |
| **2** | Bracket Ø40-50 **SF-13** |
| **3** | Fixing plate **SF-12** |
| **4** | L6 locking unit **L6-S5** |

# S5

## RODLESS CYLINDERS WITH INTEGRATED GUIDES Ø 25 - 32



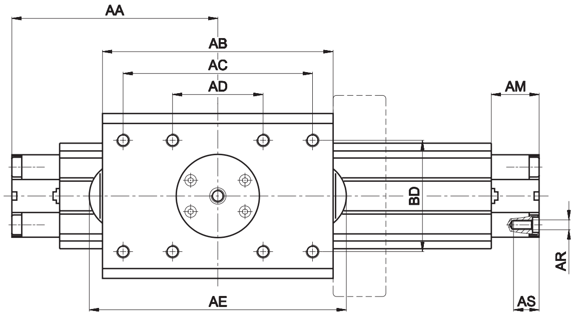



A Pneumatic cushioning adjusting screw

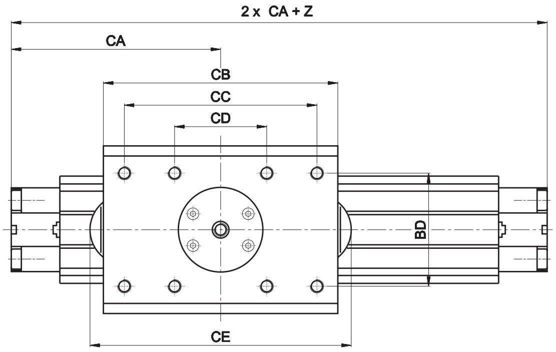
B Side supply port

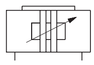
### STANDARD CARRIAGE




Z = Stroke
For Ø 40 - 50 the standard carriage is not available

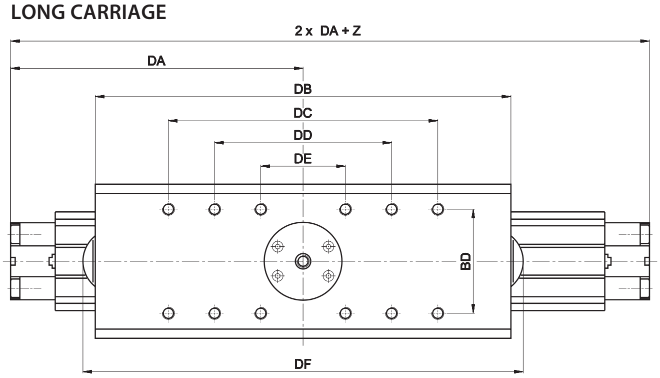
### MEDIUM CARRIAGE

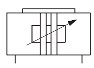


Z = Stroke

### LONG CARRIAGE



Z = Stroke

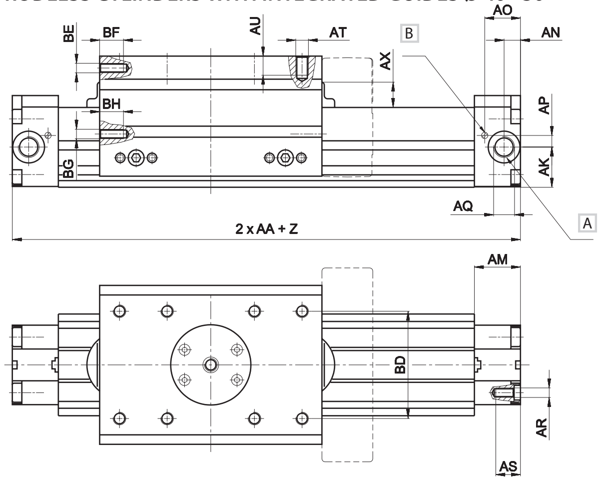
| Ø | AA | AB | AC | AD | AE | AF | AG | AH | AI | AK | AL | AM | AN | AO | AP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 100 | 106 | 90 | 50 | 130 | 48,3 | 28 | 40,5 | 70 | 20,2 | 7 | 24 | 7,4 | 18,2 | 5,7 |
| 32 | 125 | 140 | 115 | 55 | 156 | 57 | 35 | 50 | 88 | 25,3 | 8 | 29 | 10,3 | 22,5 | 7,3 |

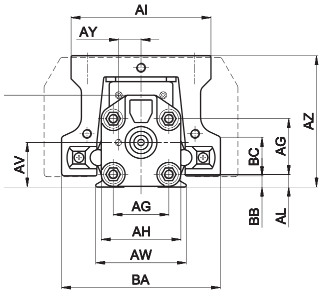
| Ø | AQ | AR | AS | AT | AU | AV | AW | AX | AY | AZ | BA | BB | BC | BD | BE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | G1/8 | M5 | 12 | M6 | 10 | 22,8 | 42,8 | 16 | 12,2 | 71,8 | 85 | 5,7 | 24 | 50 | 15 |
| 32 | G1/4 | M6 | 15,5 | M6 | 12 | 28 | 57 | 16 | 14,2 | 82,5 | 100 | 7 | 24,5 | 67,5 | 15 |

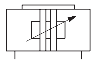
| Ø | BF | BG | BH | CA | CB | CC | CD | CE | DA | DB | DC | DD | DE | DF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | M6 | M6 | 15 | 114,5 | 136 | 90 | 50 | 160 | 147,5 | 201 | 130 | 90 | 50 | 225 |
| 32 | M6 | M6 | 15 | 142,5 | 175 | 115 | 55 | 191 | 190 | 270 | 175 | 115 | 55 | 286 |

# S5

## RODLESS CYLINDERS WITH INTEGRATED GUIDES Ø 40 - 50



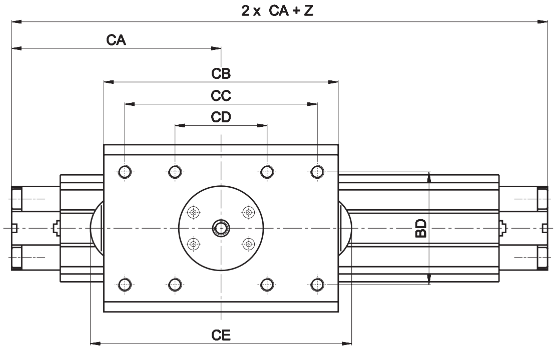



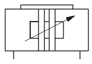
A Pneumatic cushioning adjusting screw

B Side supply port

Z = Stroke

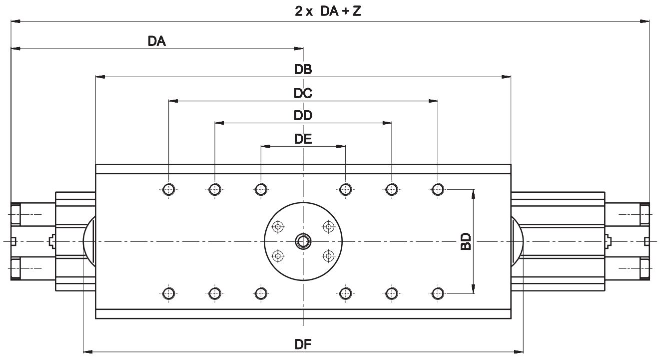
## MEDIUM CARRIAGE

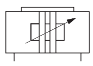


Z = Stroke

## LONG CARRIAGE



Z = Stroke

| Ø | AG | AH | AI | AK | AL | AM | AN | AO | AP | AQ | AR | AS | AT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 44 | 64 | 90 | 33,8 | 11,8 | 33 | 12,5 | 26,5 | 8,7 | G3/8 | M8 | 20 | M8 |
| 50 | 55 | 80 | 100 | 41,4 | 14,7 | 33 | 14,2 | 25,7 | 11,8 | G3/8 | M10 | 20 | M8 |

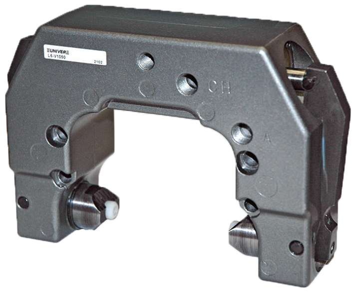
| Ø | AU | AV | AW | AX | AY | AZ | BA | BB | BC | BD | BE | BF | BG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 14 | 37 | 67 | 19,5 | 16,5 | 106,6 | 135 | 7 | 39 | 65 | 15 | M6 | M6 |
| 50 | 16 | 47,7 | 86 | 20,5 | 19,1 | 123,7 | 149 | 7,2 | 41 | 76,5 | 16 | M8 | M6 |

| Ø | BH | BD | CA | CB | CC | CD | CE | DA | DB | DC | DD | DE | DF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 15 | 65 | 169 | 205 | 180 | 75 | 215 | 225 | 317 | 280 | 185 | 75 | 327 |
| 50 | 15 | 76,5 | 205 | 258 | 190 | 80 | 271 | 277 | 398 | 320 | 200 | 80 | 411 |

# LOCKING UNITS FOR RODLESS CYLINDERS

## TECNICHAL CHARACTERISTICS

UNIVER Locking Units for rodless cylinders perform the function of keeping the carriage in any intended point of its stroke and allow high locking accuracy.
They can be mounted on both sides of the carriage and the mechanical braking force can be further increased by means of an additional pneumatic override.



**Pressure**
4,5 bar ÷ 10 bar

**Temperature**
- 20 °C ÷ + 80 °C

**Fluid**
filtered air, with or without lubrication

**Bore**
25 - 32 - 40 - 50 mm

**Materials and Components**
- Body in die-cast aluminium
- Seals in NBR
- Internal parts in brass/aluminium

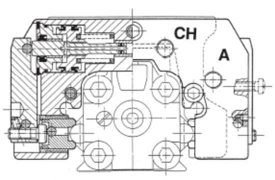
| Series | Bore(mm) |
|---|---|
| L 6 - S 5 | 0 2 5 |
| **L6-S5** Locking Units for S5 series rodless cylinder | **25** = Ø25<br>**32** = Ø32<br>**40** = Ø40<br>**50** = Ø50 |

## Characteristics

- Min release pressure 4,5 bar
- Able to keep the carriage in position in both directions
- Easy installation, possible by both the carriage sides indifferently.
- Permanent manual release by tightening two M5 screws.
- Locking by means of mechanic springs acting over the carriage in event of lack of air pressure (A).
- To increase the locking force, this unit is ready for an additional pneumatic override (CH).

## S5 SERIES WITH L6 LOCKING UNIT

MANUAL RELEASE M5X12




## STATIC LOCKING FORCE

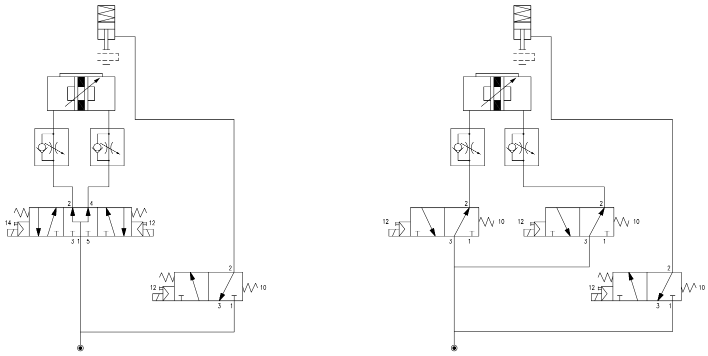
| Ø | Force N | A = CH |
|---|---|---|
| 25 | 810 | M5 |
| 32 | 1185 | G1/8 |
| 40 | 825 | G1/8 |
| 50 | 1235 | G1/8 |

A =Pneumatic release
CH = Additional pneumatic override

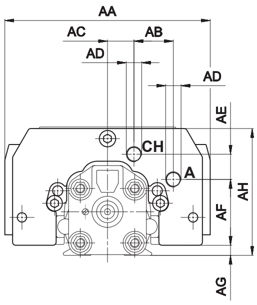
## MASS

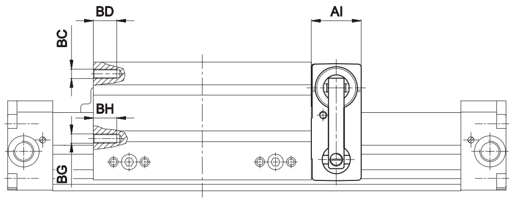
| Code | Ø | Locking unit g |
|---|---|---|
| L6-S5025 | 25 | 350 |
| L6-S5032 | 32 | 460 |
| L6-S5040 | 40 | 820 |
| L6-S5050 | 50 | 1450 |

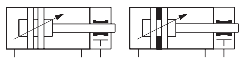
## SCHEME OF WORKING PRINCIPLE



# S5

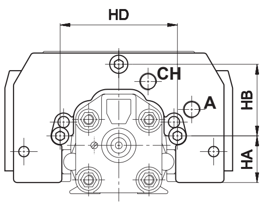


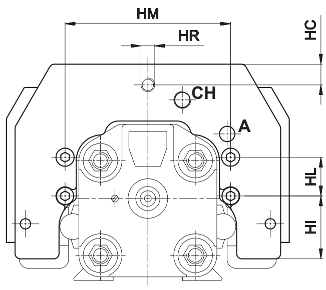
A = Pneumatic release
CH = Additional pneumatic override

**FIXING Ø 25 - 32 - 40**




A = Pneumatic release
CH = Additional pneumatic override

**FIXING Ø 50**



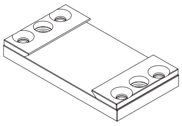

A = Pneumatic release
CH = Additional pneumatic override

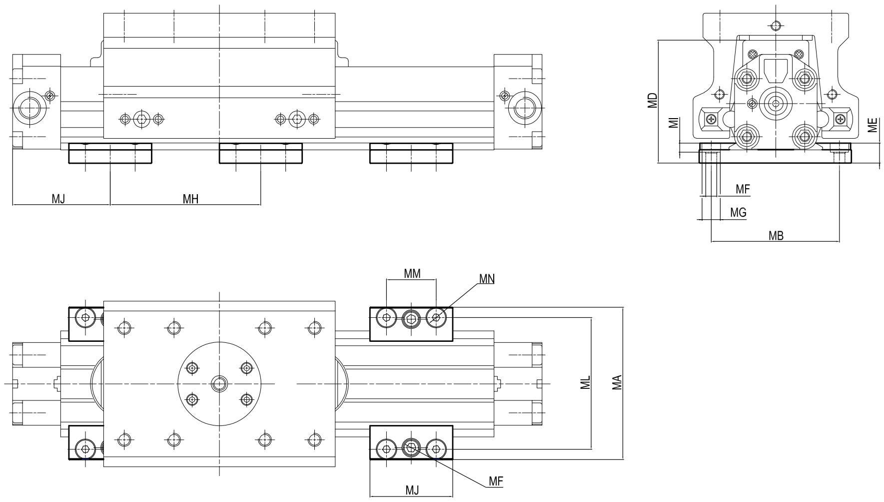
| Ø | AA | AB | AC | AD | AE | AF | AG | AH | AI | BC | BD | BG | BH | HA | HB | HC | HD | HI | HL | HM | HR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 120 | 24,5 | 12,5 | M5 | 16,5 | 34,5 | 5 | 71,5 | 32 | M6 | 15 | M6 | 15 | 24,7 | 34,8 | - | 59,5 | - | - | - | - |
| 32 | 132 | 25,3 | 17 | G1/8 | 16,2 | 42,3 | 6,5 | 81,5 | 32 | M6 | 15 | M6 | 15 | 27 | 41,5 | - | 68 | - | - | - | - |
| 40 | 150 | 26 | 17 | G1/8 | 18,2 | 58,3 | 10 | 106 | 40 | M6 | 15 | M6 | 15 | 45,3 | 43,8 | - | 81,5 | - | - | - | - |
| 50 | 164 | 26 | 20 | G1/8 | 19,8 | 72,5 | 12,7 | 125,7 | 51 | M8 | 16 | M6 | 15 | - | - | 12 | - | 36,5 | 22,5 | 96 | M8x14 |

## FIXING ELEMENTS AND ACCESSORIES

# SF-12

**FIXING PLATE**





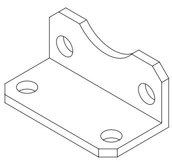

| | Ø | MA | MB | MC | MD | ME | MF | MG | MH (a) | MI | MJ | ML | MM | MN | Mass g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SF-12025 | 25 | 78,5 | 63,5 | 50 | 79,8 | 12 | M8 | 11 | 500 | 6,5 | 55 | 65,5 | 30 | M6 | 310 |
| SF-12032 | 32 | 92 | 77,5 | 50 | 90,5 | 12 | M8 | 11 | 600 | 8,5 | 60 | 79,5 | 30 | M6 | 340 |
| SF-12040 | 40 | 117 | 96 | 60 | 116,6 | 15 | M10 | 14 | 700 | 8 | 70 | 96 | 37,5 | M8 | 660 |
| SF-12050 | 50 | 136 | 115 | 60 | 133,7 | 15 | M10 | 14 | 800 | 8 | 70 | 115 | 37,5 | M8 | 700 |

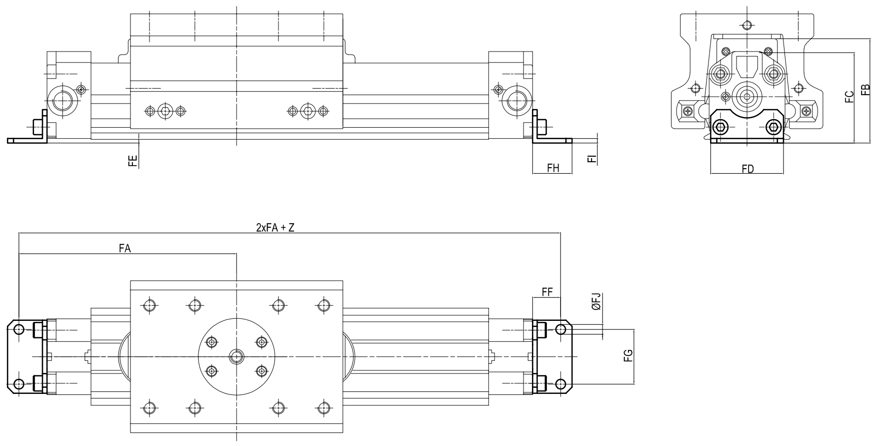
(a) = Max allowable dimension to limit the bending of cylinder according to the stroke and to provide a correct fixing

Material: Zinc-plated steel

# SF-13

**ANGLE BRACKET**



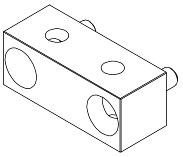


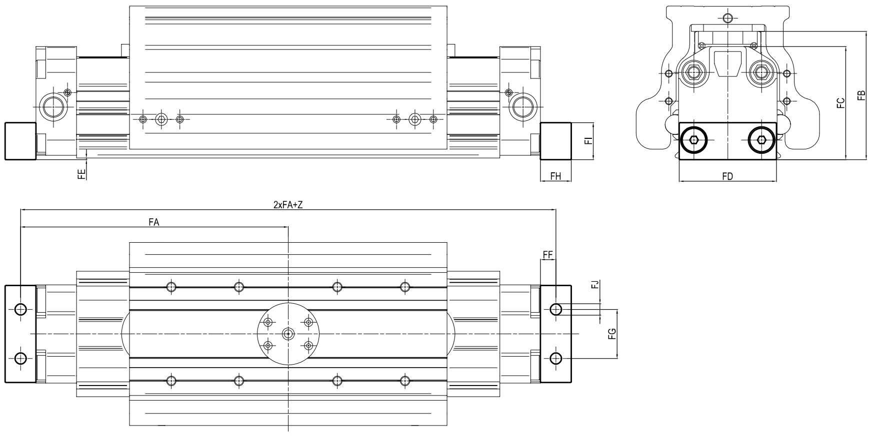

| | Ø | FA | FB | FC | FD | FE | FF | FG | FH | FI | FJ Ø | Mass g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SF-13025 | 25 | 116 | 58,1 | 48,8 | 40 | 0,5 | 16 | 27 | 22 | 2,5 | 5,5 | 34 |
| SF-13032 | 32 | 143,5 | 68,7 | 59,2 | 48 | 2,5 | 18,5 | 36 | 26 | 3 | 6,5 | 53 |

Material: Zinc-plated steel

# SF-13

**BRACKET**






| | Ø | FA | FB | FC | FD | FE | FF | FG | FH | FI | FJ Ø | Mass g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SF-13040** | **40** | 162,5 | 86,5 | 74,9 | 63 | 0,7 | 12,5 | 30 | 25 | 25 | 9 | 116 |
| **SF-13050** | **50** | 187,5 | 104,3 | 92,4 | 79 | 1,3 | 12,5 | 40 | 25 | 30 | 9,3 | 170 |

Material: Anodized aluminium