

S1

Rodless Cylinders standard version - Ø 16÷50 mm

- Extruded aluminium profile Ø 16÷50 mm
- Stroke length up to 6 m
- Different possibilities of end-cap supply
- Different carriage types: standard, medium, long
- High translation speed until 3 m/s
- Magnetic version standard supplied for Ø 16
- Assembly with integrated slide unit - series J30-31- available upon request

Available ATEX version upon request

CE Ex II 2Gc IIC T5 II 2Dc T100°C



TECNICAL CHARACTERISTICS

Ambient temperature	-20÷80 °C
Fluid	filtered air, with or without lubrication
Working pressure	3÷10 bar
Bores	Ø 16 - 25 - 32 - 40 - 50 mm
Cushionings	adjustable on both sides

CONSTRUCTIVE CHARACTERISTICS

End-caps	zamak (Ø16), die-cast aluminium (Ø25÷50)
Barrel	anodized aluminium
Piston	aluminium
Guide slide	acetalic resin
Piston seal	double lip nitrile rubber (NBR)
Shock absorber seals	nitrile rubber (NBR) on both sides
Magnet	neodimio

CODIFICATION KEY

S	1	0	1	1	2	5	0	8	5	0		
1	2	3	4	5	6	7	8					

1 Series

S1 = Ø 16÷50 mm - Rodless cylinders standard version

2 Carriage type

- 0 = Standard carriage
- 2 = Medium carriage (except for Ø16)
- 3 = Long carriage (except for Ø16)

3 Left end-cap supply port

- 0 = No supply port (both chambers are supplied from the right end-cap)
- 1 = Side supply port (except for Ø16)
- 2 = Bottom supply port (except for Ø16)
- 3 = Rear supply port (except for Ø16)

4 Right end-cap supply port

- 1 = Side supply port (except for Ø16)
- 2 = Bottom supply port (except for Ø16)
- 3 = Rear supply port (except for Ø16)
- 4 = Rear supply ports for both chambers on the right end-cap
- 5 = Side supply ports for both chambers on the right end-cap (only for Ø16)

5 Bore (mm)

- 16 = Ø16
- 25 = Ø25
- 32 = Ø32
- 40 = Ø40
- 50 = Ø50

6 Stroke (mm)

- Up to 5000 (Ø 16)
- Up to 6000 (Ø 25÷50)

7 Magnetic

M = Magnetic version standard supplied (Ø 16) upon request (Ø 25÷50)

8 Atex option

X = Atex (upon request)

For types and versions, see ATEX catalogue

Standard version Ø 16÷50 mm



CONSTRUCTIVE CHARACTERISTICS

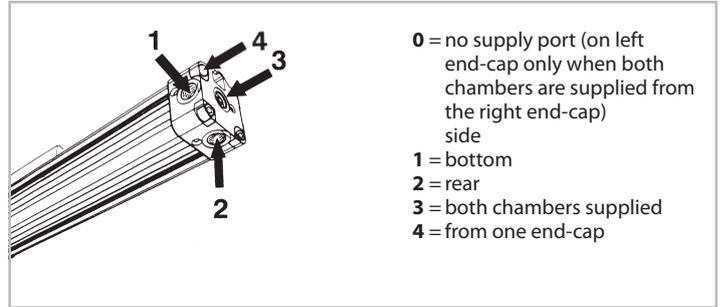
END-CAPS

End-caps in die-cast light alloy with various supply port options. The unique method of stripseal attachment permits easy assembly and disassembly, without the need for tools or the necessity for continuous adjustment.

Ø 16 mm



Ø 25÷50 mm

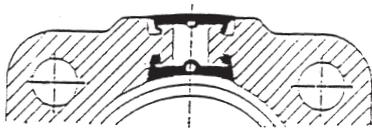


SLIDEWAY SEALING

The pneumatic sealing is achieved through an axial elastomer stripseal reinforced with Kevlar. This system guarantees dimensional stability even with high speeds.

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The external protection seal consists of a thermoplastic stripseal reinforced with Kevlar.



PISTON-CARRIAGE ASSEMBLY

In extruded aluminium alloy with thermoplastic plane guide bearings. The piston is fitted with double lip seals which automatically self-compensate against wear. Pistons with permanent magnets are available upon request (S1 series only).

BARREL

In extruded aluminium alloy with internal and external anodisation.

CUSHIONINGS

Pneumatic adjustable cushionings with two regulation screws in each end-cap allow an improved regulation of piston deceleration.

MECHANICAL SHOCK ABSORBERS

Mechanical rubber shock absorbers avoid mechanical stress and reduce machinery noise (below 50 dB).

Stroke tolerances

Ø	mm
16	+2,5 - 0
25	+2,5 - 0
32	+3,2 - 0
40	+3,2 - 0
50	+3,2 - 0

Cylinder mass
Standard carriage

Cylinder mass
Medium carriage

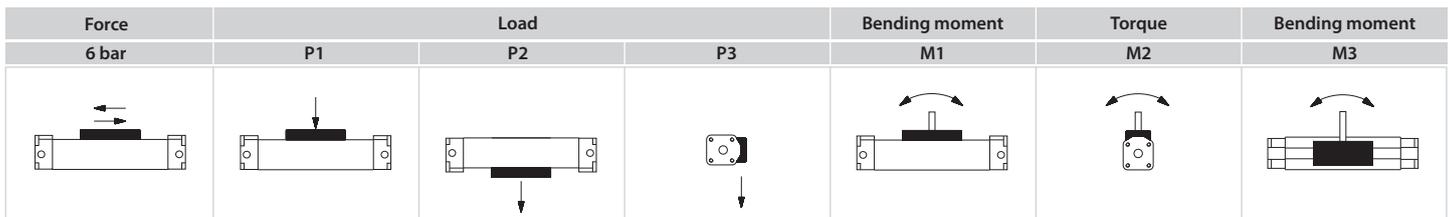
Cylinder mass
Long carriage

Ø	Cylinder - stroke 0		Cylinder - stroke 0	
	g	Increase for 100 mm stroke	g	Increase for 100 mm stroke
16	310	104	-	-
25	750	210	840	1050
32	1310	325	1480	1930
40	2600	555	2910	3800
50	4785	955	5550	7330

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.

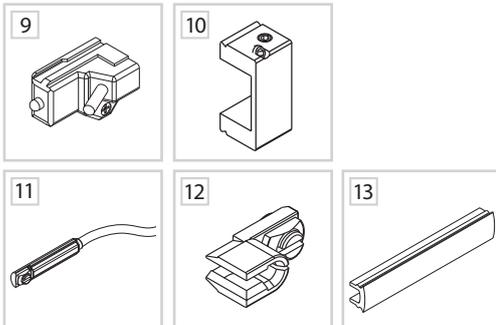
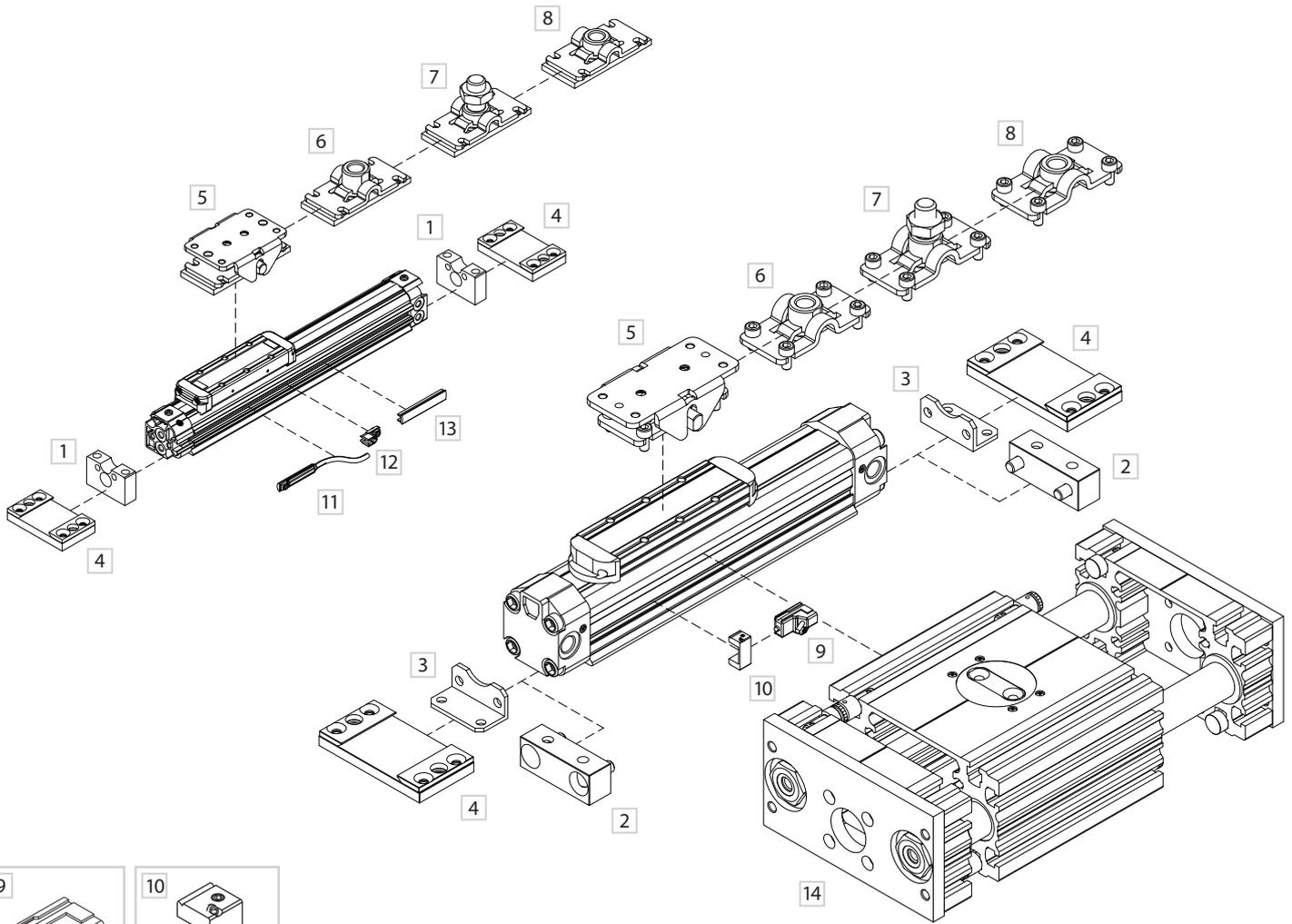
A moment is the product of the load (Newton) and the arm (meters), i.e the distance between the centre of gravity of the load and the longitudinal axis of the piston.



Ø	Force F (N)	Load			Standard carriage			Medium carriage			Long carriage		
		P1 (N)	P2 (N)	P3 (N)	M1 (Nm)	M2 ^(a) (Nm)	M3 (Nm)	M1 (Nm)	M2 ^(a) (Nm)	M3 (Nm)	M1 (Nm)	M2 (Nm)	M3 (Nm)
16	125	100	100	25	5	0,2	0,8	-	-	-	-	-	-
25	250	200	200	50	8	2	3	14	3	5	15	6	9
32	420	250	250	65	9	3	4	15	4	7	28	8	12
40	640	350	350	90	11	9	14	16	14	20	31	27	39
50	1050	500	500	125	19	13	19	29	20	30	52	36	53

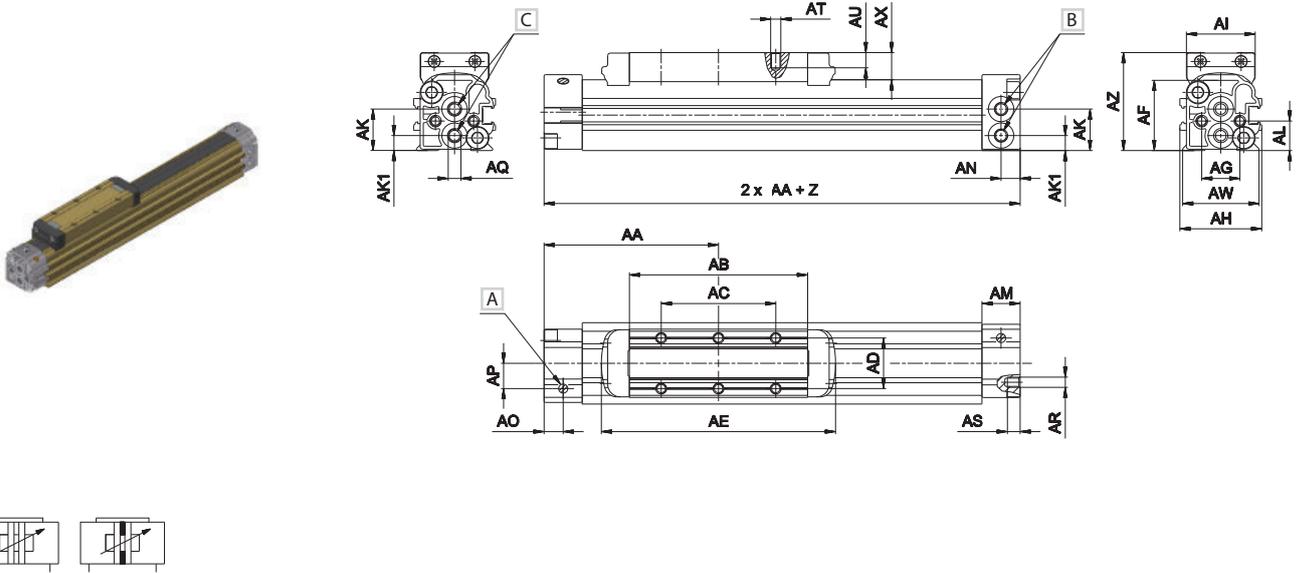
(a) = Using the cylinder with heavy stress is not recommended

Fixing elements and accessories

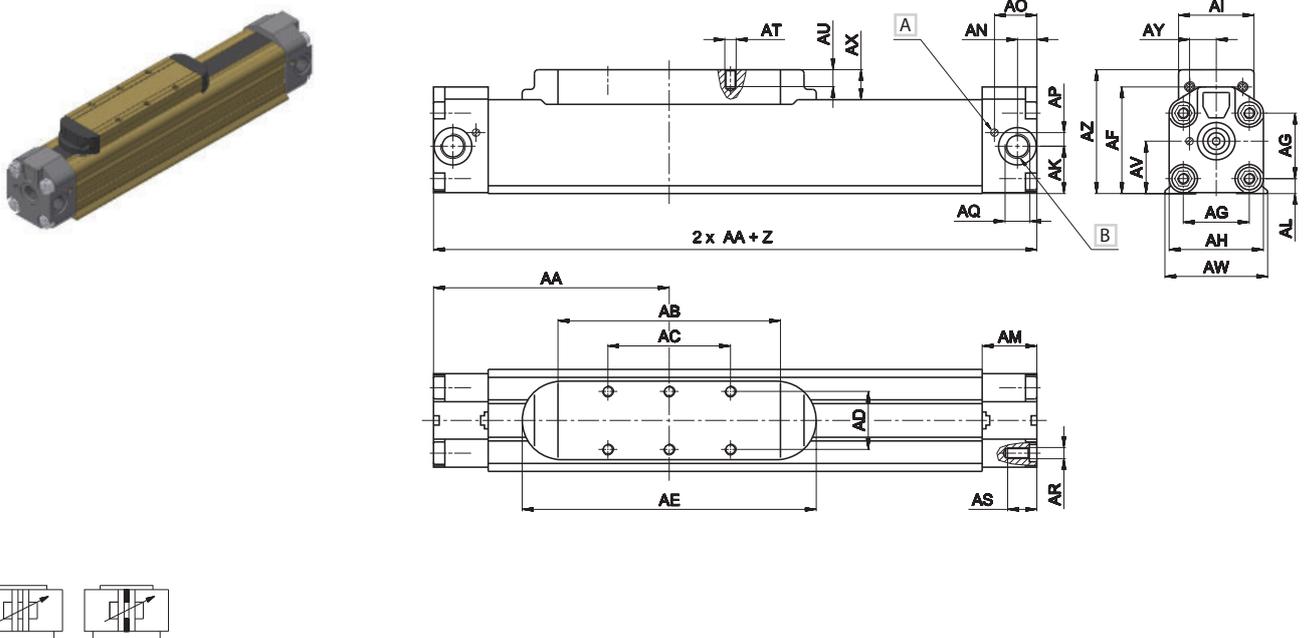


DESCRIPTION	NOTE	PART NO.
1 Bracket Ø16	Anodized aluminium	SF-13_ _ _
2 Bracket Ø40-50	Anodized aluminium	SF-13_ _ _
3 Angle bracket Ø25-32	Zinc-plated steel	SF-13_ _ _
4 Fixing plate	Zinc-plated steel	SF-12_ _ _
5 Oscillating bracket	Zinc-plated steel	SF-24_ _ _
6 Female threaded connection	Zinc-plated steel	SF-26_ _ _
7 Male threaded pin	Zinc-plated steel	SF-27_ _ _
8 Female connection without thread	Zinc-plated steel	SF-28_ _ _
9 DH sensor	-	DH- _ _ _
10 DH sensor fixing plate	-	DH-S_ _ _
11 DF sensor (Ø16 only)	-	DF- _ _ _
12 Cable clamping for DF sensor (Ø16 only)	-	DF-001
13 DHF covering strip (Ø16 only)	Nitrile rubber (NBR)	DHF-0020100
14 Slide unit J30_31	-	J30A530050A

Rodless cylinder with standard carriage - 6 fixing holes Ø 16 mm



Rodless cylinder with standard carriage - 6 fixing holes Ø 25÷50 mm



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CYLINDERS

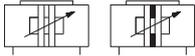
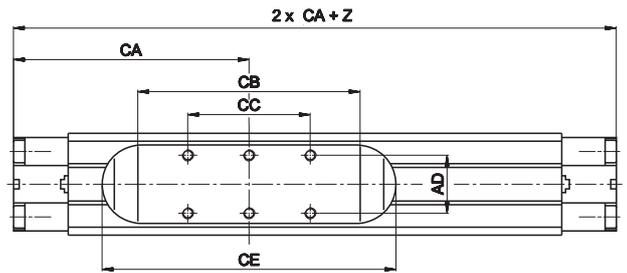
Z = Stroke

Ø	AA	AB	AC	AD	AE	AF	AG	AH	AI	AK	AK1	AL	AM
16	68,5	70	45	20	92	30	18	32	27	16,5	6	11,5	15
25	100	95	50	24	130	48,3	28	40,5	33	20,2	-	7	24
32	125	118	65	31	156	57	35	50	40	25,3	-	8	29
40	150	134	65	31	177	74	44	64	44	33,8	-	11,8	33
50	175	164	105	39	211	90,7	55	80	54	41,4	-	14,7	33

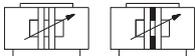
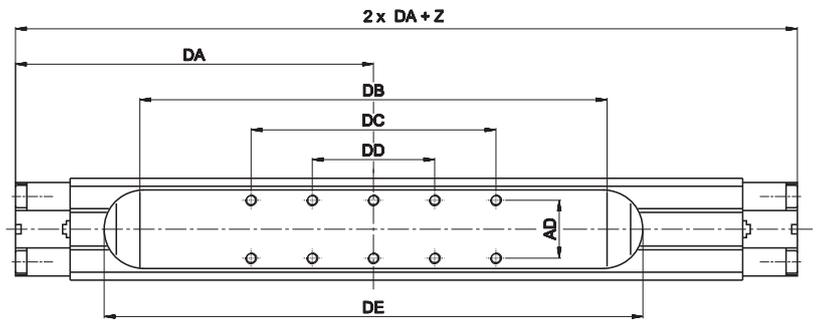
Ø	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ
16	7,5	7,5	10	M5	M4	5	M4	6	-	30	11	-	39
25	7,4	18,2	5,7	G1/8	M5	12	M5	9	22,8	42,8	16	12,2	57,6
32	10,3	22,5	7,3	G1/4	M6	15,5	M6	9	28	54,5	16	14,2	66,2
40	12,5	26,5	8,7	G3/8	M8	20	M6	11	37	67	19,5	16,5	85,8
50	14,2	25,7	11,8	G3/8	M10	20	M8	12	47,7	86	20,5	19,1	103

- A Pneumatic cushioning adjusting screw
- B Side supply port
- C Rear supply port

Rodless cylinder with medium carriage - 6 fixing holes Ø 25 ÷ 50 mm



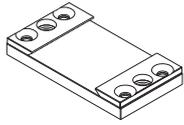
Rodless cylinder with long carriage - 10 fixing holes Ø 25 ÷ 50 mm



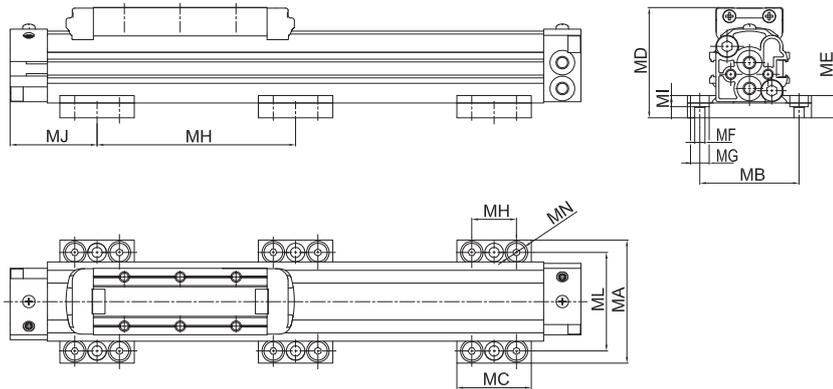
Z = Stroke

Ø	AD	CA	CB	CC	CE	DA	DB	DC	DD	DE
25	24	114,5	125	50	160	147,5	190	100	50	225
32	31	142,5	153	65	191	190	248	130	65	286
40	31	169	172	65	215	225	284	130	65	327
50	39	205	224	105	271	277	364	315	105	411

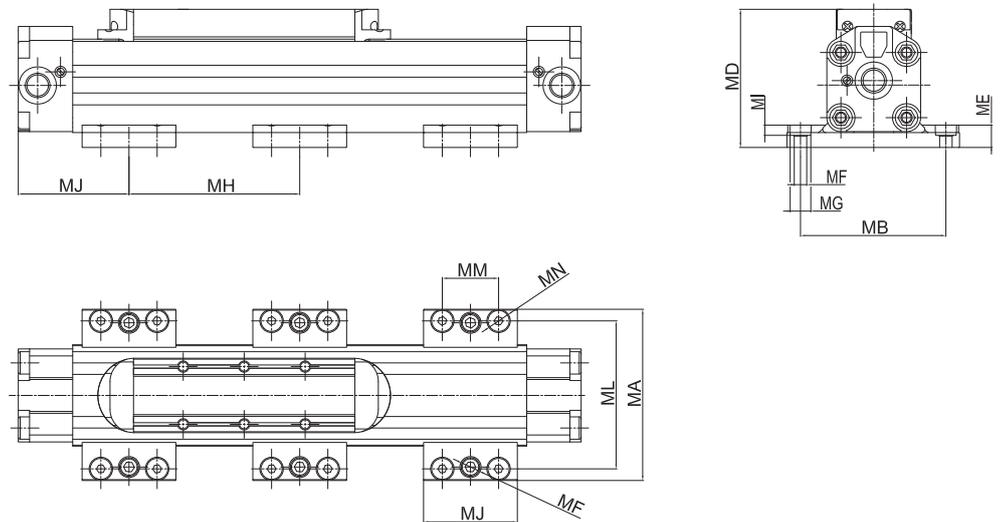
Fixing plate



Ø 16 mm



Ø 25÷50 mm



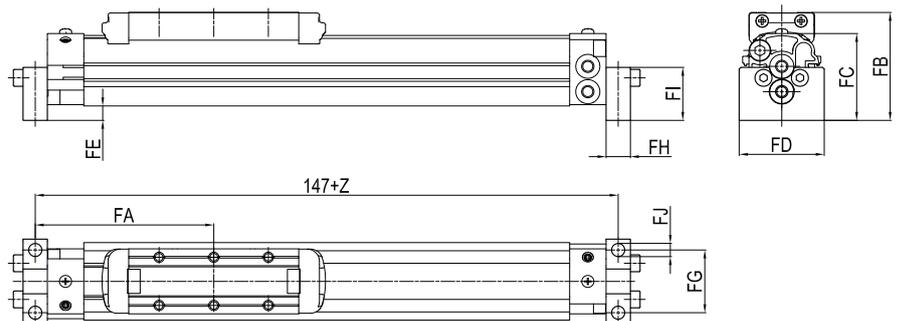
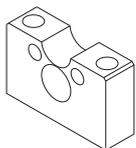
Material: zinc-plated steel

Cylinder Ø	MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	ML ^(b)	MM	MN	Mass g	Part no.
16	50	40	30	44,8	9	M5	8	400 (a)	4,5	35	40	-	M6	83	SF-12016
25	78,5	63,5	50	65,6	12	M8	11	500 (a)	6,5	55	65,5	30	M6	310	SF-12025
32	92	77,5	50	74,2	12	M8	11	600 (a)	8,5	60	79,5	30	M6	340	SF-12032
40	117	96	60	95,8	15	M10	14	700 (a)	8	70	96	37,5	M8	660	SF-12040
50	136	115	60	113	15	M10	14	800 (a)	8	70	115	37,5	M8	700	SF-12050

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

(b) = For Ø 16 - 40 - 50 mm, MB and ML dimensions are the same

Bracket

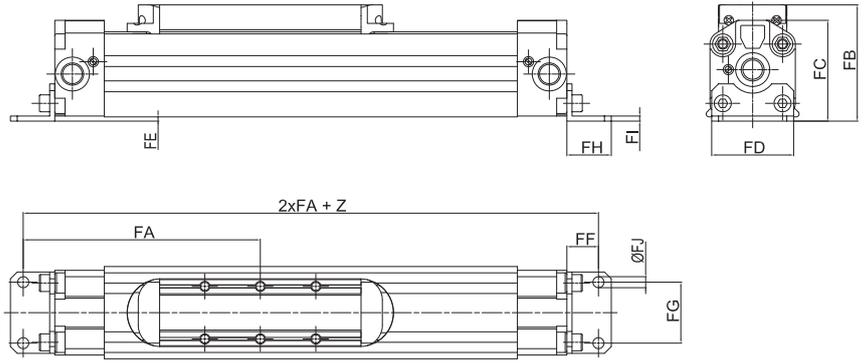
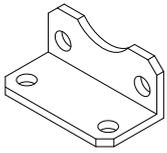


Material: Anodized aluminium

Cylinder Ø	FA	FB	FC	FD	FE	FG	FH	FI	FJ	Mass g	Part no.
16	73,5	45	36	35	6	26	10	22	5,5	15	SF-13016

Subject to change

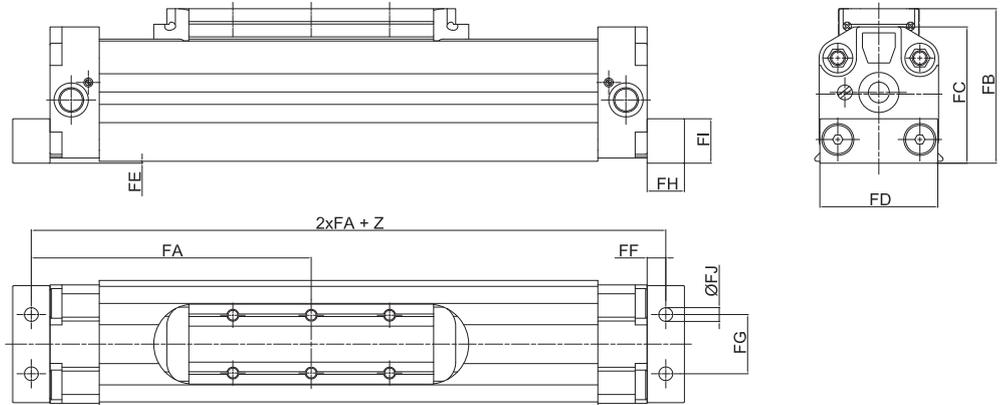
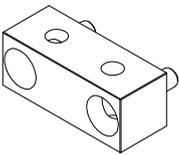
Angle bracket



Material: Zinc-plated steel

Cylinder Ø	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	Mass g	Part no.
25	116	58,1	48,8	40	0,5	16	27	22	2,5	5,5	34	SF-13025
32	143,5	68,7	59,2	48	2,5	18,5	36	26	3	6,5	53	SF-13032

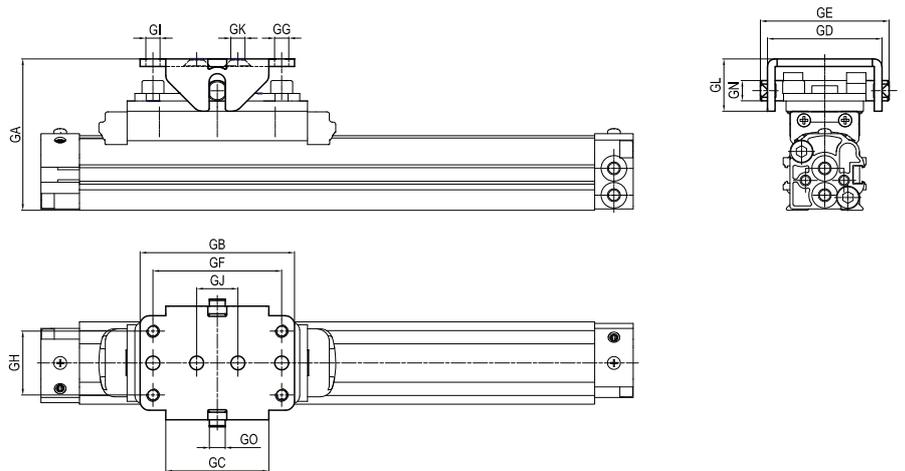
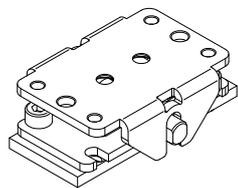
Bracket



Material: Anodized aluminium

Cylinder Ø	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	Mass g	Part no.
40	162,5	86,5	74,9	63	0,7	12,5	30	25	25	9	116	SF-13040
50	187,5	104,3	92,4	79	1,3	12,5	40	25	30	9,3	170	SF-13050

Oscillating bracket

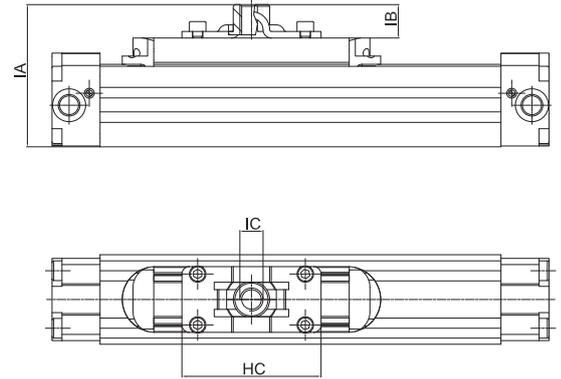
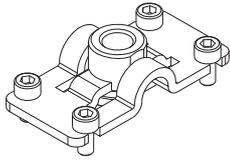


Material: Zinc-plated steel

Cylinder Ø	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	Mass g	Part no.
16	58	60	40	44,5 ± 0,25	50	50	5,5	25	M5	16	5,5	20,5	3	8	6	195	SF-24016
25	73,5 ± 2,5	60	40	44,5 ± 2,5	50	50	5,5	25	M5	16	5,5	20,5	3	8	6,15	142	SF-24025
32	89 ± 4	100	60	56 ± 4	64	80	5,5	30	M6	40	6,5	30	4	12	8,2	362	SF-24032
40	108,5 ± 4	100	60	56 ± 4	64	80	5,5	30	M6	40	6,5	30	4	12	8,2	362	SF-24032
50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Use in case of external guide

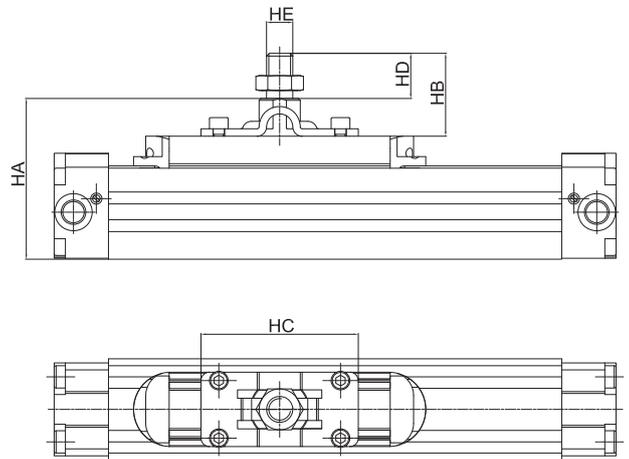
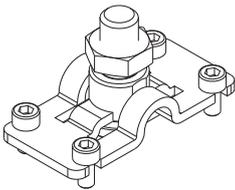
Female threaded connection



Material: Zinc-plated steel

Cylinder Ø	IA	IB	IC	HC	Mass g	Part no.
16	61	22	M12	64	132	SF-26016
25	75,6	18	M12	64	76	SF-26025
32	87,2	21	M14	84	157	SF-26032
40	106,8	21	M14	84	157	SF-26032
50	-	-	-	-	-	-

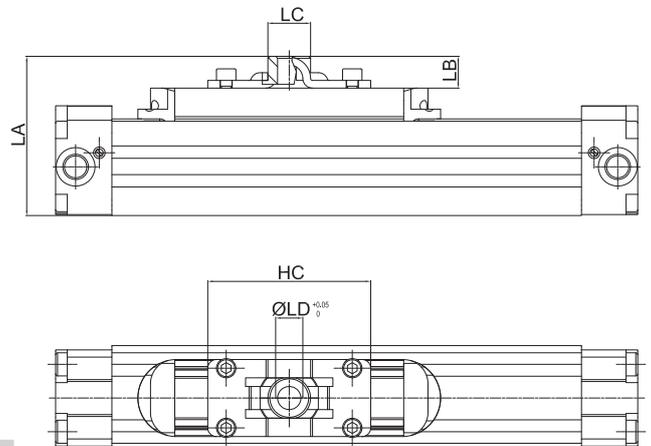
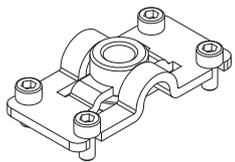
Male threaded pin



Material: Zinc-plated steel

Cylinder Ø	HA	HB	HC	HD Ø	HE	Mass g	Part no.
16	76,5	37,5	64	22	M12	160	SF-27016
25	91,1	33,5	64	22	M12	105	SF-27025
32	107,7	41,5	84	24,3	M14	260	SF-27032
40	127,3	41,5	84	24,3	M14	260	SF-27032
50	-	-	-	-	-	-	-

Female connection without thread



Material: Zinc-plated steel

Cylinder Ø	LA	LB	LC	LD Ø	LH	Mass g	Part no.
16	56	17	18	10	64	129	SF-28016
25	70,6	13	18	10	64	73	SF-28025
32	83,4	17,2	22	12	84	152	SF-28032
40	103	17,2	22	12	84	152	SF-28032
50	-	-	-	-	-	-	-

EXAMINATION AND VERIFICATION OF THE CUSHIONING

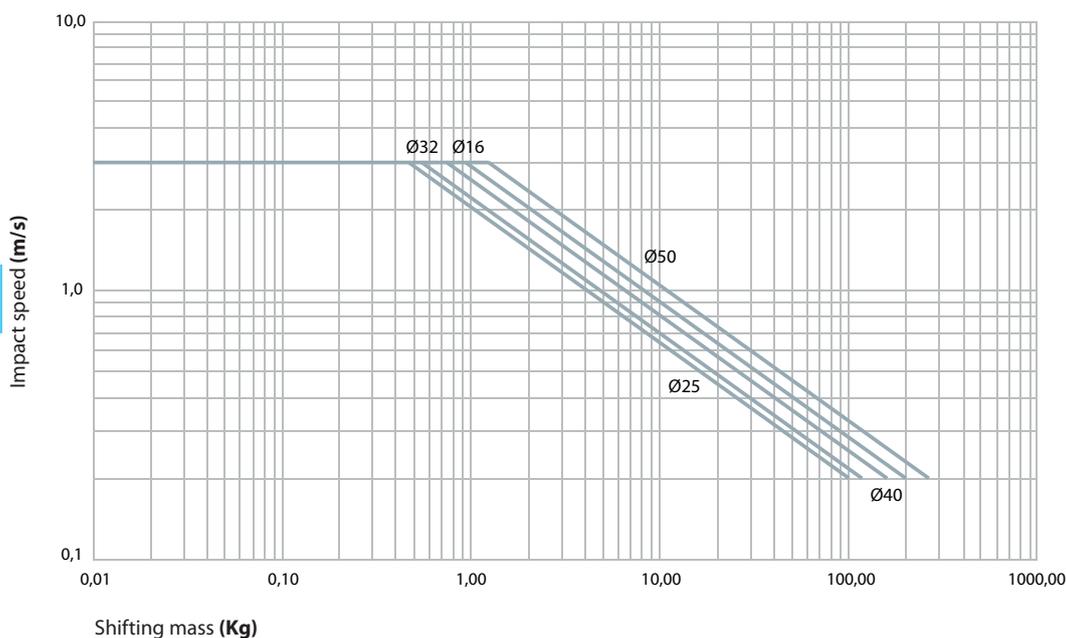
In a system with moving masses, as in the case of rodless cylinders, it is essential to control the dissipation of the system's kinetic energy as it is brought to a stop. First of all, it is necessary to establish and verify the most suitable method for cushioning the system, in order to avoid the moving 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 absorb the kinetic energy. In that case you must:

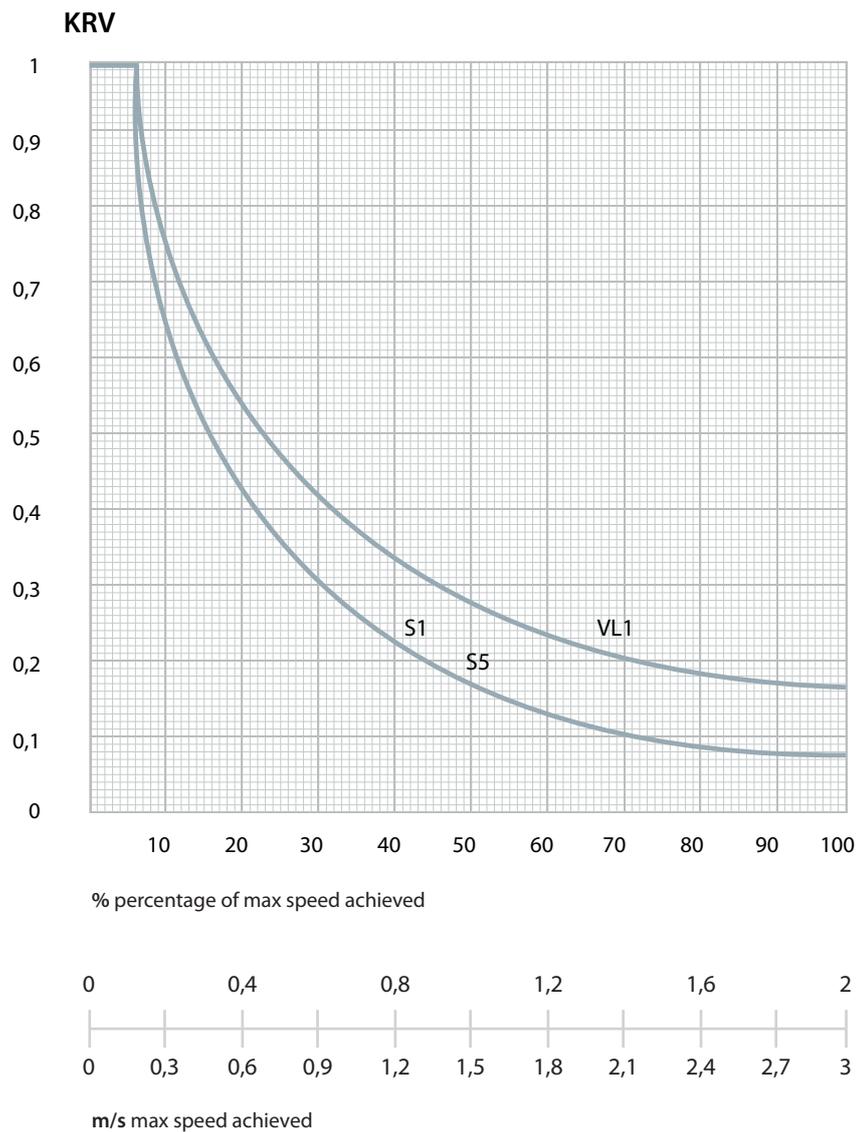
- decrease the load and maintain the translation speed
- decrease the speed and maintain the load
- select a cylinder with a bigger bore or with twin chambers

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:

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

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

$$CD = CM \cdot KRV$$

CD = Max. dynamic load (N)

CM = Max. static load (N). See relevant load tables for the various series

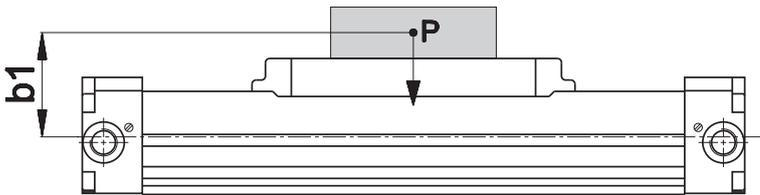
KRV = System coefficient (which acts to reduce the max. load based on the system speed)

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 (picture 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 dynamic load and of the torque and bending moments.



$$\begin{aligned} P &= 50 \text{ N} \\ V &= 1,2 \text{ m/s.} \\ b1 &= 110 \text{ mm} \end{aligned}$$

VERIFICATION OF THE CUSHIONING CAPACITY

According to the graph shown on page 22 a 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.

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VERIFICATION AND CALCULATION OF THE DYNAMIC LOAD CAPACITY

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

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

From the graph given on page 23 we can determine the KRV (coefficient of speed reduction)

$$\text{KRV} = 0,24$$

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

$$\text{CD} = \text{CM} \cdot \text{KRV}$$

CD = Dynamic load

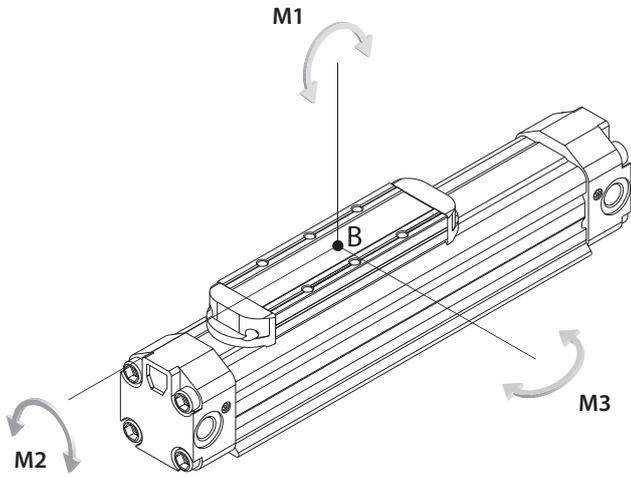
CM = Static load 500 N (see table for S1 50mm cylinder series - P1 page 3)

$$\text{CD} = 500 \cdot 0,24 = 120 \text{ N}$$

As $P (50 \text{ N}) < CD (120 \text{ N})$ the S1 series 50 bore cylinder is suitable for the application

CARRIAGE STRESSES

Different load applications have different moments M1 - M2 - M3, which directly influence the life of the cylinder. By selecting a cylinder that can support off-set loads, we can avoid compromising 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

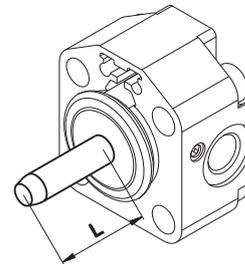
In order to calculate the various moments, which act on the carriage, we must calculate the force, generated by the load, when it is subjected to accelerations and decelerations.

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

a = Acceleration/deceleration
 V = Speed in m/s.
 L = Cushion length in mm

CUSHION LENGTH

∅	L
	mm
16	16,5
25	25
32	32,5
40	41,5
50	52



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

$$F = m \cdot a$$

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

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

$$M1 = F \cdot b1$$

The example A on page 24 is subjected to the moment M1 as the load decelerates through the cushion.

M1 = Torque

b1 = Distance between the centre of gravity of load P and the centre of gravity through the cylinder centre line (see picture A on page 24)

$$M1 = 70 \cdot 110 = 7700 \text{ Nmm} = 7,7 \text{ Nm}$$

The equation gives the following result:

$$M1 = 7,7 \text{ Nm} < 19 \text{ Nm} \text{ (see table for S1 50mm cylinder series - M1 page 3)}$$

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)

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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.

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

E_c = 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

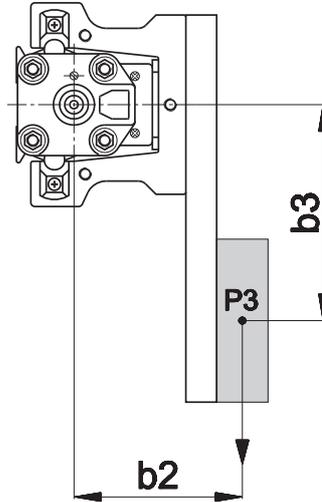
$$E_c = \frac{1}{2} \cdot \frac{50}{9,81} \cdot 2^2 = \frac{200}{19,62} = 10 \text{ Nm}$$

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 us 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.

$P3 = 50 \text{ N}$
 $V = 1,2 \text{ m/s}$
 $b2 = 150 \text{ mm}$
 $b3 = 200 \text{ mm}$



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.

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

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

$$\text{KRV} = 0,24$$

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

$$\text{CD} = \text{CM} \cdot \text{KRV}$$

$\text{CD} =$ Dynamic load
 $\text{CM} =$ Static load 600 N (see table for S5 50mm cylinder series - P3 page 12)

$$\text{CD} = 600 \cdot 0,24 = 144 \text{ N}$$

As $P3 (50 \text{ N}) < \text{CD} (144 \text{ N})$ 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 significant moment M3, so that it is necessary to use a cylinder with an external carriage.

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

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

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

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

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

1

The example is subjected to moments M1 - M2 - M3

$$M1 = F \cdot b2 = 88 \cdot 150 = 13200 \text{ Nmm} = 13,2 \text{ Nm} \quad (M1 \text{ max } 60 \text{ Nm})$$

$$M2 = P \cdot b2 = 50 \cdot 150 = 7500 \text{ Nmm} = 7,5 \text{ Nm} \quad (M2 \text{ max } 30 \text{ Nm})$$

$$M3 = F \cdot b3 = 88 \cdot 200 = 17600 \text{ Nmm} = 17,6 \text{ Nm} \quad (M3 \text{ max } 80 \text{ Nm})$$

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

CYLINDER WITH MISALIGNED LOAD IN VERTICAL POSITION

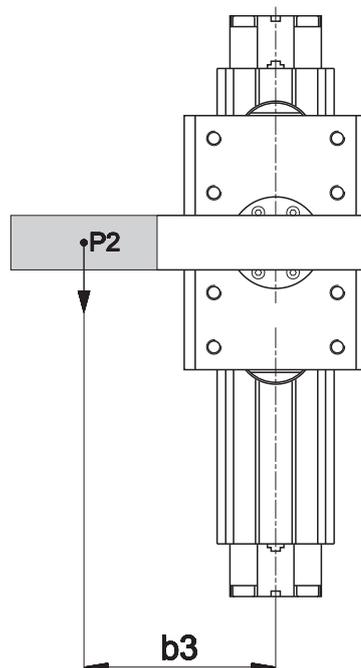
In this instance let us suppose to verify if a 40 mm bore VL1 series cylinder, in the vertical plane, is sufficient to move a 50 N load misaligned at a distance b3, at a speed of 1,2 m/s.

P = 50 N

V = 1,2 m/s

b1 = 110 mm (see picture A)

b3 = 200 mm



ATTENTION!

If the cylinder is vertically mounted, the cushioning capacity is reduced by 40%.

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 coefficient follow the procedure as given in the examples, which will result in a coefficient of KRV 0,24 (see pictures A and B).

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

$$P < CD$$

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.

$$F = m \cdot a$$

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

$$F = m \cdot a = 88 \text{ N} \quad \text{(picture B)}$$

$$M1 = F \cdot b1 = 88 \cdot 110 = 9680 \text{ Nmm} = 9,68 \text{ Nm} \quad \text{(M1 max 120 Nm)}$$

$$M3 = F \cdot b3 = 88 \cdot 200 = 17600 \text{ Nmm} = 17,6 \text{ Nm} \quad \text{(M3 max 120 Nm)}$$

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 cylinder at a speed of 1 m/s
2. If 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. Maintain a correct and constant lubrication.