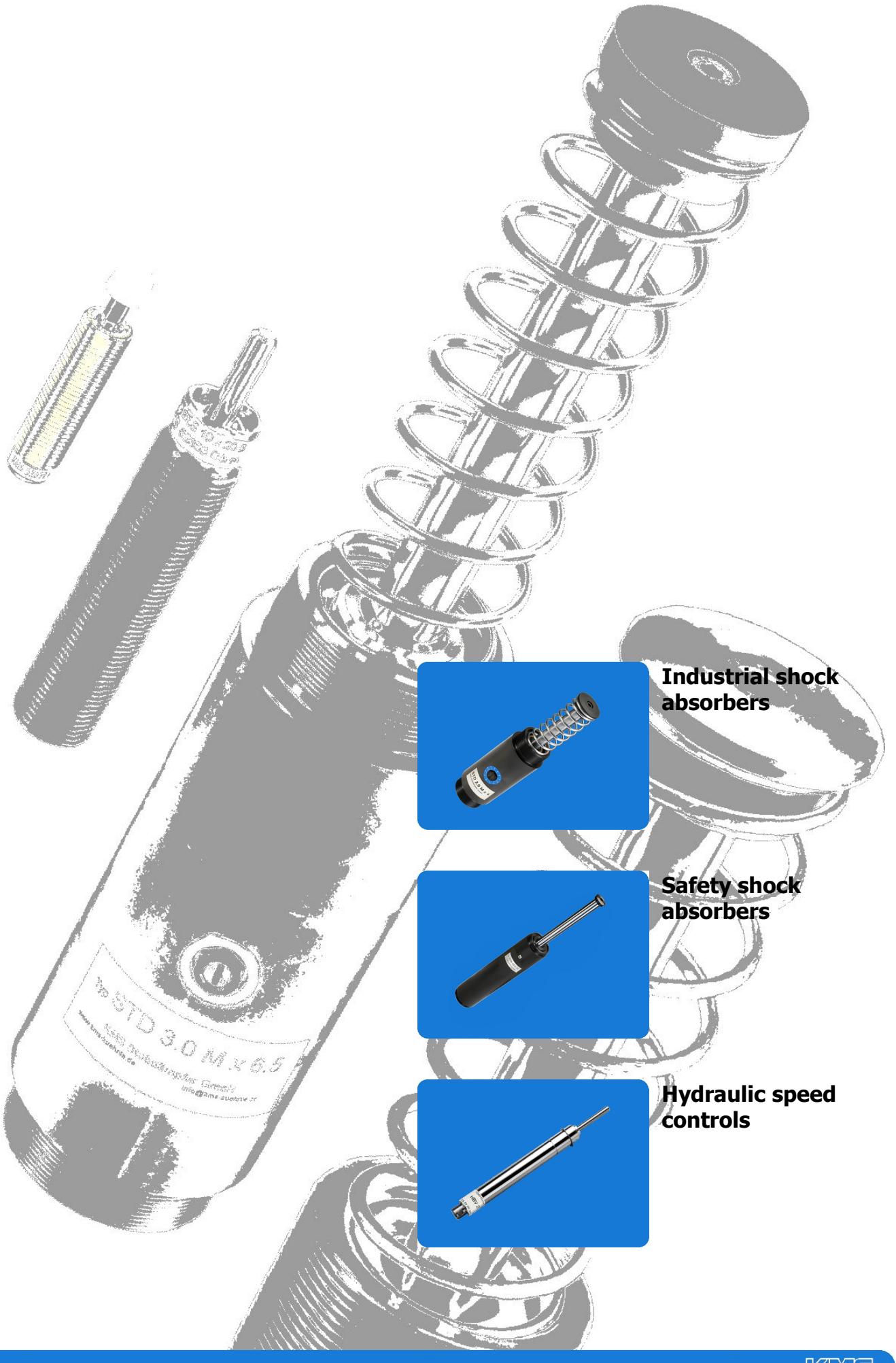


Industrial shock absorbers

Safety shock absorbers

Hydraulic speed controls

General information

Industrial shock absorbers, safety shock absorbers and hydraulic speed controls are used wherever masses have to be decelerated smoothly. The easiest way to increase productivity is to raise operation speed. It often accompanies with excessive vibration and noise, damage to products and machines.
Our damping systems work basically with hydraulic damping. These reliable and mature technology enables high energy absorption at compact external dimensions. Combined with high operational reliability and low maintenance design - you can benefit from our over 35-years experience in manufacturing hydraulic damping systems!

We are manufacturer for the following products:

- Adjustable hydraulic shock absorbers
- Self compensating hydraulic shock absorbers
- Safety shock absorbers
- Hydraulic speed controls

All products use the principle of hydraulic damping. Different applications require precisely tailored products in terms of cushioning properties, robustness and durability. To select the right shock absorber for your application, we give you below an survey of the specific characteristics of our products.

Adjustable hydraulic shock absorbers STD

KMS shock absorbers are widely used in industrial fields. Impact forces, speeds and weights usually vary from application to application.
Adjustable hydraulic shock absorbers are used to absorb kinetic energy of any moving device. Especially at changing impact conditions such as impact weights, forces and speeds.

Self compensating hydraulic shock absorbers SES

Self compensating industrial shock absorbers are designed for a predetermined area. Therefore, self compensating industrial shock absorbers are offered in several degrees of hardness, so that for each application area suitable dampers simply can be determined. In the specified area of the application the self compensating shock absorber will compensate the influences of changing parameters (impact speed, impact mass, driving force).
Self compensating industrial shock absorbers are mainly used if the conditions vary only in the known limits or remain constant.

Safety shock absorbers SDN

Safety dampers are hydraulic shock absorbers designed for the precise use for a particular application. During normal operation the shock absorbers require to provide only minimal resistance. They are designed to protect the installation in emergency case by controlled deceleration. Security absorbers are designed for occasional use and therefore primarily for the emergency-stop use.
Typical applications are cranes, lifts, automated storage systems ... .

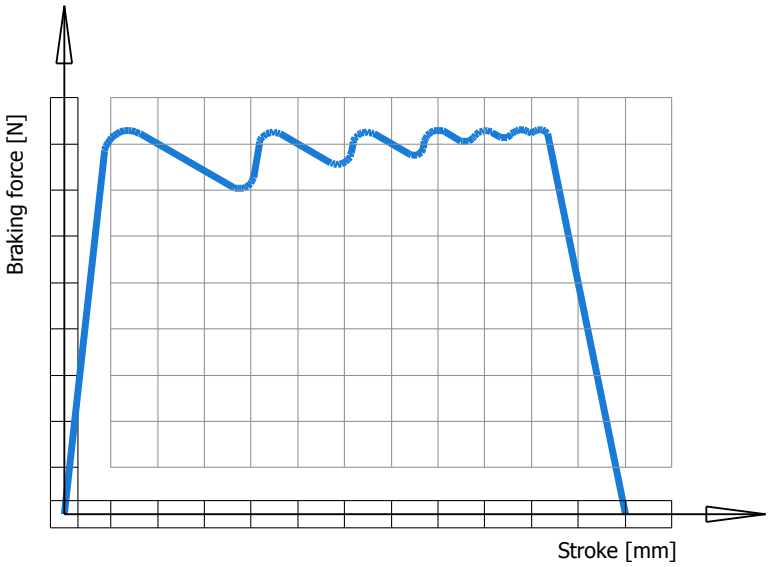
Hydraulic speed controls HBV

Hydraulic speed controls are designed to achieve a constant velocity, such as pneumatic cylinders, automatic machine slides. Hydraulic speed controls are used in production and manufacturing equipment in which constant feed rates are essential, such as drills, grinders and cutting tools.
In order to be prepared for continuous use, highest standards in the production process are kept and partially hardened materials are in use. Silicone fluid is more constant in viscosity than ordinary hydraulic oil so speed variations due to temperature changes are almost imperceptible. All these features ensure proper function, a smooth dependable, constant speed control.

Functioning of an industrial shock absorber

During operation the piston rod moves inside and the piston pushes the hydraulic fluid through the orifice holes, producing a resistant force. The more the piston rod enters, the more orifice holes are closed. This will reduce speed, pressure and braking remain nearly constant. This prevents the occurrence of peak power which can cause damage to products and machines.
The return spring pushes the piston rod back to the start position. A check valve supports the rapid extension so the shock absorber is ready for the next working cycle in the shortest possible time.

Force-stroke diagram



The force-stroke diagram of a properly adjusted industrial shock absorber.

Reaction force is as low as possible so KMS shock absorbers provide linear decelaration, no destructive shock forces and reduced machine load.

<u>You benefit from these advantages:</u>

- Increase the operating speed → higher productivity
- Increase the lifetime and efficiency of the machine → lower costs
- Reduced noise pollution and energy costs

Summary SES

Product	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Effective mass [kg]	Page
SES 7 x 6 A	6	M10x1,0	3	4 - 12	7
SES 7 x 6 B	6	M10x1,0	3	1 - 6	7
SES 7 x 6 AA	6	M10x1,0	3	9 - 23	7
SES 7 x 10 A	10	M12x1,0	7	6 - 45	7
SES 7 x 10 B	10	M12x1,0	7	1 - 14	7
SES 7 x 10 AA	10	M12x1,0	7	25 - 70	7
SES 14 S	16	M14x1,0	30	5 - 192	8
SES 14 H	16	M14x1,0	30	140 - 720	8
SES 7 x 15 A	15	M14x1,0 or M14x1,5	19	8 - 80	9
SES 7 x 15 B	15	M14x1,0 or M14x1,5	19	1 - 10	9
SES 7 x 15 AA	15	M14x1,0 or M14x1,5	19	65 - 200	9
SES 10 x 12 A	12	M16x1,5	18	12 - 140	9
SES 10 x 12 B	12	M16x1,5	18	2,5 - 20	9
SES 10 x 12 AA	12	M16x1,5	18	100 - 480	9
SES 10 x 20 A	20	M20x1,5	30	24 - 240	10
SES 10 x 20 B	20	M20x1,5	30	3 - 28	10
SES 10 x 20 AA	20	M20x1,5	30	170 - 900	10
SES 10 x 40 A	40	M20x1,5	60	40 - 500	10
SES 10 x 40 B	40	M20x1,5	60	6 - 60	10
SES 10 x 40 AA	40	M20x1,5	60	300 - 1600	10
SES 11 x 25 A	25	M25x1,5 or M25x2,0	81	110 - 900	11
SES 11 x 25 B	25	M25x1,5 or M25x2,0	81	8 - 138	11
SES 11 x 25 AA	25	M25x1,5 or M25x2,0	81	390 - 2300	11
SES 1.0 M x 40 A	40	M25x1,5	116	175 - 1140	11
SES 1.0 M x 40 B	40	M25x1,5	116	13 - 220	11
SES 1.0 M x 40 AA	40	M25x1,5	116	624 - 2600	11

Please note that this review is only for pre-selection. In any case, please use our example calculations (page 32 and 33) to check whether the selected damper is suitable.

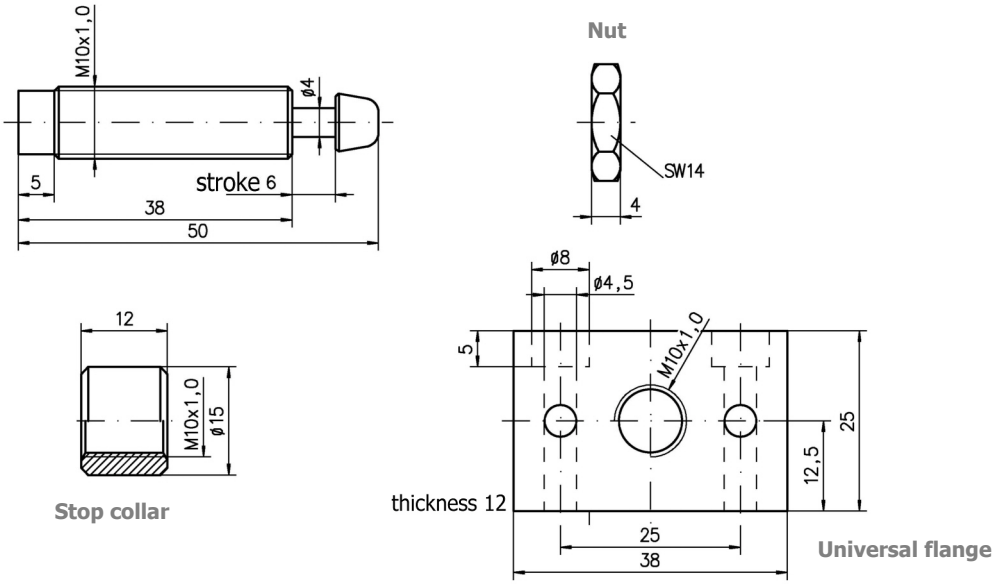
Summary SES

Product	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Effective mass [kg]	Page
SES 1.15 M x 1 A	25	M33x1,5 or 1 ¼" – 12UNF	100	25 - 110	12
SES 1.15 M x 1 B	25	M33x1,5 or 1 ¼" – 12UNF	100	8 - 33	12
SES 1.15 M x 1 AA	25	M33x1,5 or 1 ¼" – 12UNF	100	95 - 440	12
SES 1.15 M x 2 A	50	M33x1,5 or 1 ¼" – 12UNF	200	45 - 220	12
SES 1.15 M x 2 B	50	M33x1,5 or 1 ¼" – 12UNF	200	15 - 65	12
SES 1.15 M x 2 AA	50	M33x1,5 or 1 ¼" – 12UNF	200	190 - 890	12
SES 1.1 M x 1 A	25	M36x1,5	195	170 - 870	13
SES 1.1 M x 1 B	25	M36x1,5	195	45 - 250	13
SES 1.1 M x 1 AA	25	M36x1,5	195	540 - 2700	13
SES 1.1 M x 2 A	50	M36x1,5	390	340 - 1740	13
SES 1.1 M x 2 B	50	M36x1,5	390	90 - 500	13
SES 1.1 M x 2 AA	50	M36x1,5	390	1080 - 5400	13
SES 1.5 M x 1 A	25	M45x1,5	250	110 - 700	14
SES 1.5 M x 1 B	25	M45x1,5	250	27 - 130	14
SES 1.5 M x 1 AA	25	M45x1,5	250	600 - 3000	14
SES 1.5 M x 2 A	50	M45x1,5	500	220 - 1400	14
SES 1.5 M x 2 B	50	M45x1,5	500	55 - 260	14
SES 1.5 M x 2 AA	50	M45x1,5	500	1200 - 6000	14
SES 1.5 M x 3 A	75	M45x1,5	750	330 - 2100	14
SES 1.5 M x 3 B	75	M45x1,5	750	82 - 390	14
SES 1.5 M x 3 AA	75	M45x1,5	750	1800 - 9000	14
SES 2.0 M x 2 A	50	M64x2,0	1140	430 - 2250	15
SES 2.0 M x 2 B	50	M64x2,0	1140	130 - 675	15
SES 2.0 M x 2 AA	50	M64x2,0	1140	1600 - 9000	15
SES 2.0 M x 2 BB	50	M64x2,0	1140	35 - 165	15
SES 2.0 M x 4 A	100	M64x2,0	2280	900 - 4900	15
SES 2.0 M x 4 B	100	M64x2,0	2280	250 - 1300	15
SES 2.0 M x 4 AA	100	M64x2,0	2280	3500 - 18000	15
SES 2.0 M x 4 BB	100	M64x2,0	2280	70 - 350	15
SES 2.0 M x 6 A	150	M64x2,0	3420	1300 - 6500	15
SES 2.0 M x 6 B	150	M64x2,0	3420	400 - 2000	15
SES 2.0 M x 6 AA	150	M64x2,0	3420	5300 - 27000	15
SES 2.0 M x 6 BB	150	M64x2,0	3420	100 - 500	15

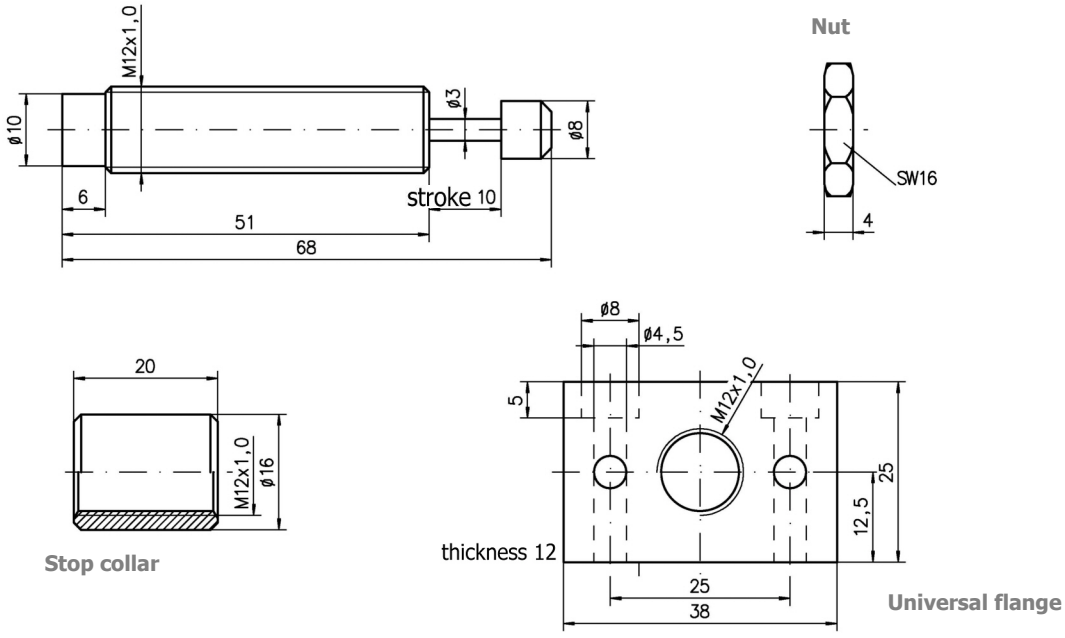
Please note that this review is only for pre-selection. In any case, please use our example calculations (page 32 and 33) to check whether the selected damper is suitable.

- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Nylon cap standard.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

SES 7 x 6



SES 7 x 10

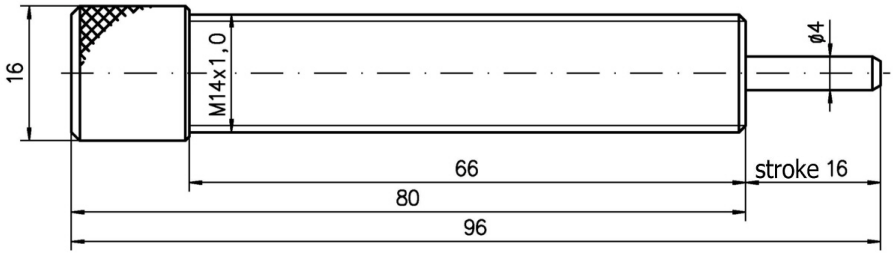


	Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
	**SES 7 x 6 A**	6	M10x1,0	3	10,8	4 - 12	1,5 - 4	19
	SES 7 x 6 B	6	M10x1,0	3	10,8	1 - 6	1,5 - 4	19
	SES 7 x 6 AA	6	M10x1,0	3	10,8	9 - 23	1,5 - 4	19
	**SES 7 x 10 A**	10	M12x1,0	7	12	6 - 45	6 - 11	50
	SES 7 x 10 B	10	M12x1,0	7	12	1 - 14	6 - 11	50
	SES 7 x 10 AA	10	M12x1,0	7	12	25 - 70	6 - 11	50

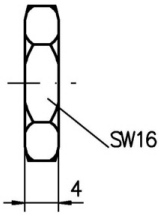
SES 14

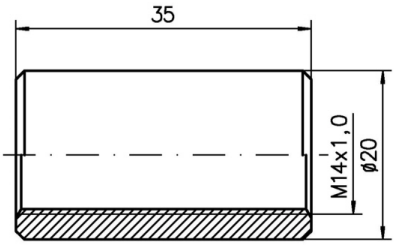
This shock absorber is designed for automatic machines, handling systems with high frequency applications. Superfine surface treatment, special seals and special oil provide a guaranteed lifetime of at least 10,000,000 strokes! The progressive characteristic ensures a smooth deceleration, even at very high driving forces.

- Temperature range from – 10 °C to + 80 °C.
- Fitting according to your requirements.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

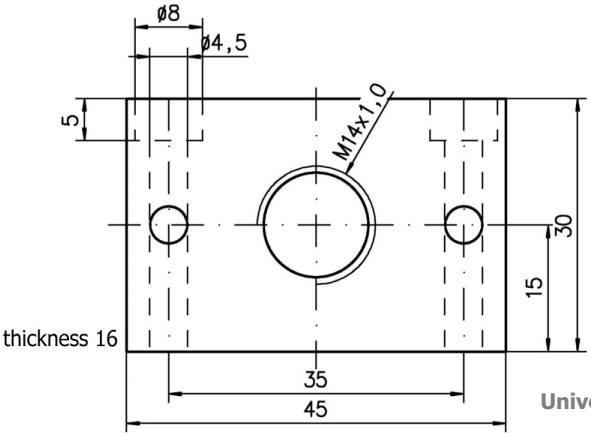


Nut





Stop collar

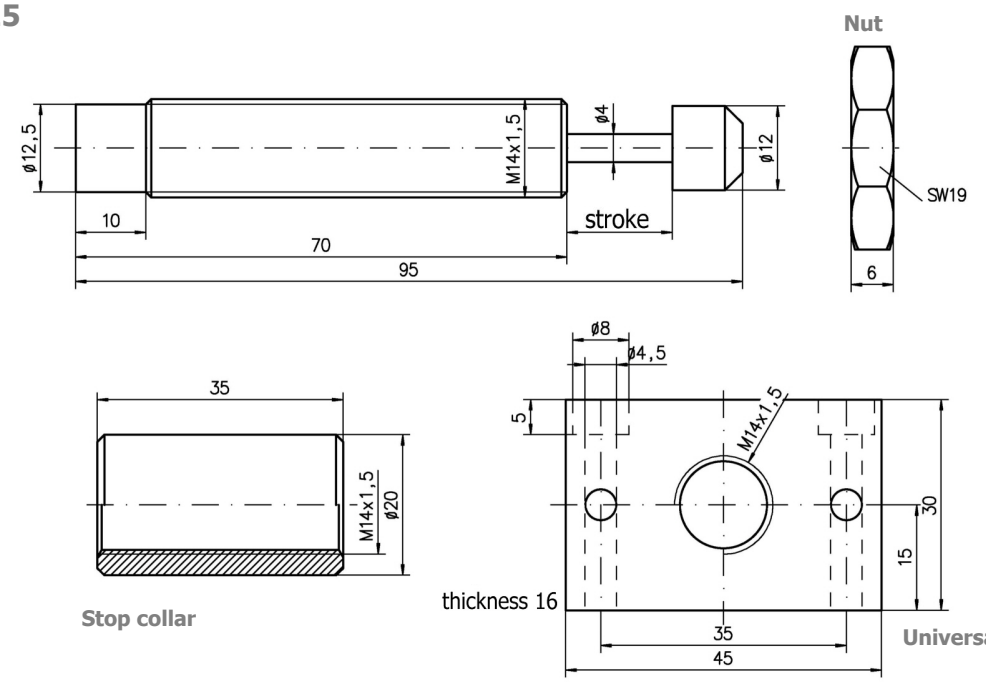


Universal flange

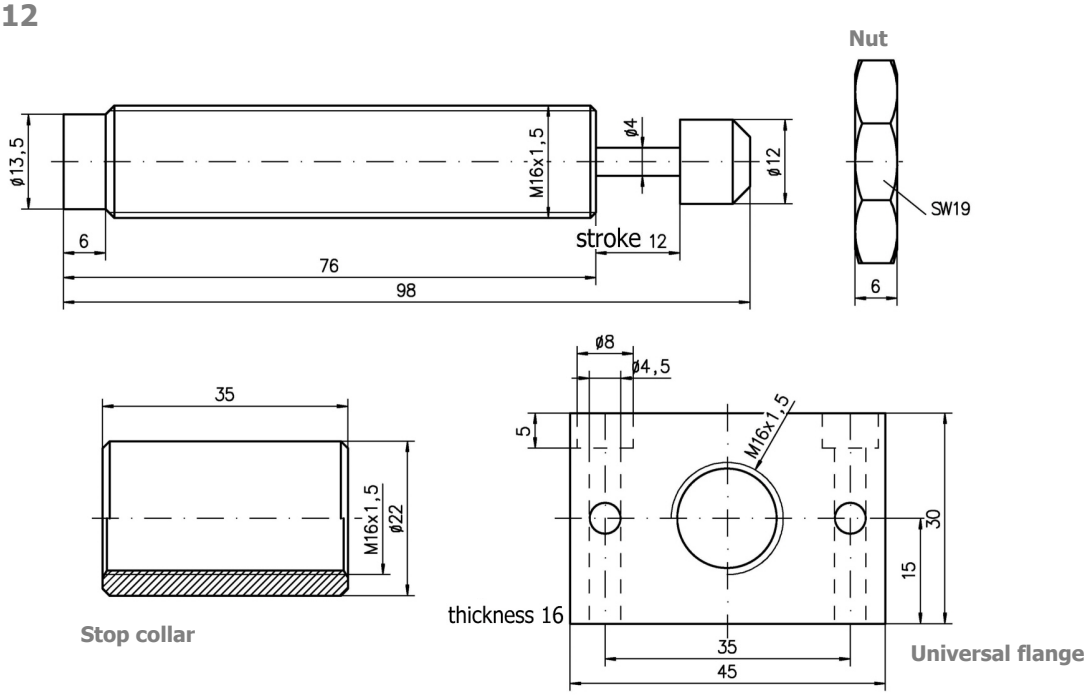
Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	[kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
SES 14 S	16	M14x1,0	30	45	5 - 192	8 - 19	78
SES 14 H	16	M14x1,0	30	45	140 - 720	8 - 19	78

- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Nylon cap standard.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

SES 7 x 15



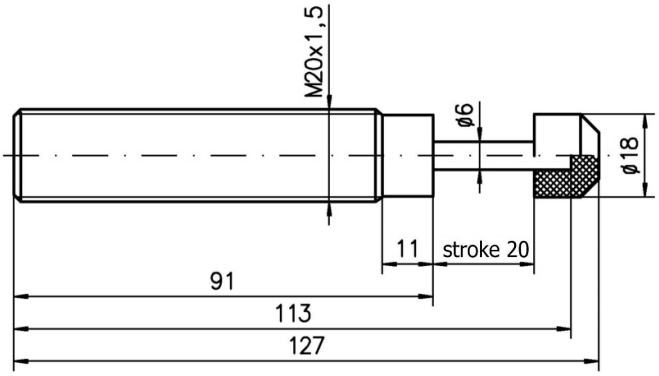
SES 10 x 12



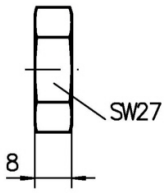
	Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	[kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
	**SES 7 x 15 A**	15	M14x1,0	19	36	8 - 80	1,5 - 4	65
	SES 7 x 15 B	15	or	19	36	1 - 10	1,5 - 4	65
	SES 7 x 15 AA	15	M14x1,5	19	36	65 - 198	1,5 - 4	65
	SES 10 x 12 A	12	M16x1,5	18	40	12 - 140	4 - 11	90
	SES 10 x 12 B	12	M16x1,5	18	40	2,5 - 20	4 - 11	90
	SES 10 x 12 AA	12	M16x1,5	18	40	100 - 480	4 - 11	90

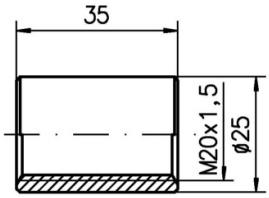
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Nylon cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

SES 10 x 20

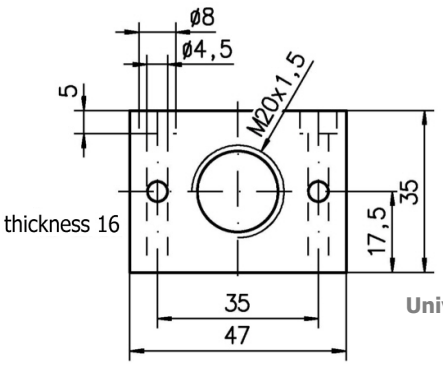


Nut



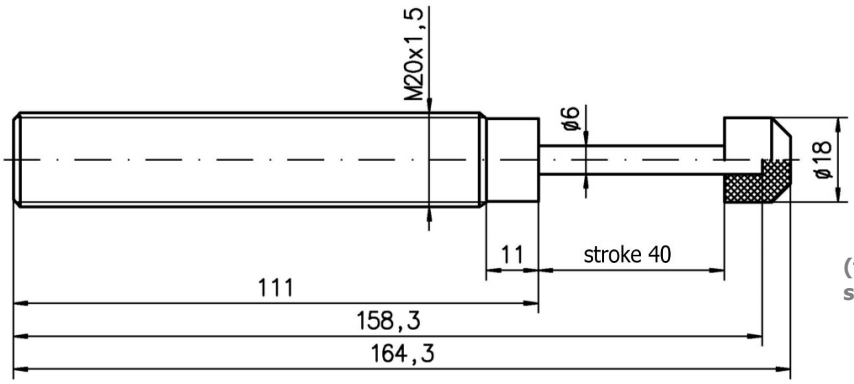


Stop collar



Universal flange

SES 10 x 40

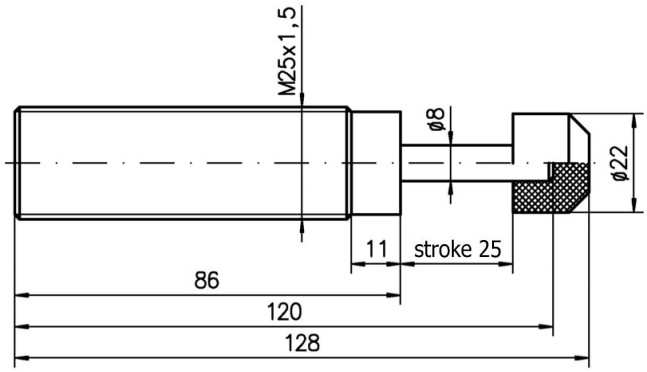


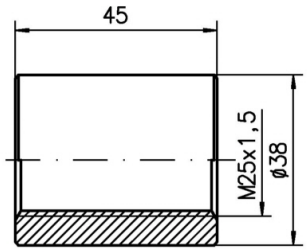
(for accessories see SES 10 x 20)

	Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
	**SES 10 x 20 A**	20	M20x1,5	30	46	24 - 240	7 - 20	170
	SES 10 x 20 B	20	M20x1,5	30	46	3 - 28	7 - 20	170
	SES 10 x 20 AA	20	M20x1,5	30	46	176 - 960	7 - 20	170
	SES 10 x 40 A	40	M20x1,5	60	56	40 - 500	10 - 25	210
	SES 10 x 40 B	40	M20x1,5	60	56	6 - 60	10 - 25	210
	SES 10 x 40 AA	40	M20x1,5	60	56	300 - 1600	10 - 25	210

- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Nylon cap available for SES 11 x 25.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

SES 11 x 25

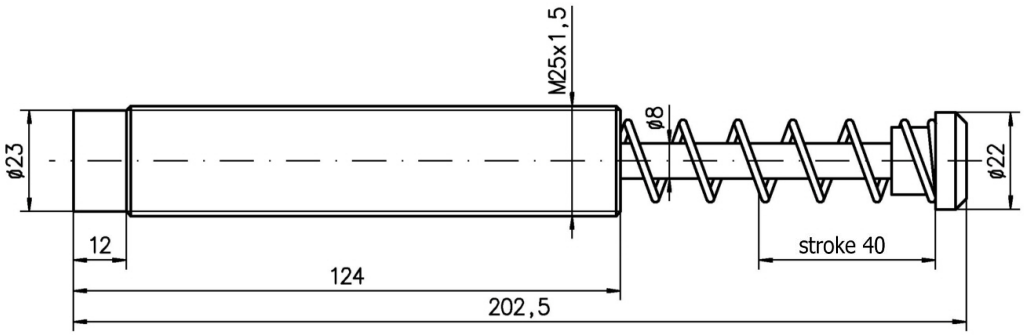




Stop collar

(for accessories see SES 1.0 M x 40)

SES 1.0 M x 40



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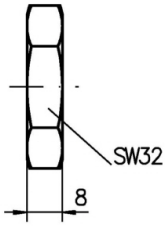
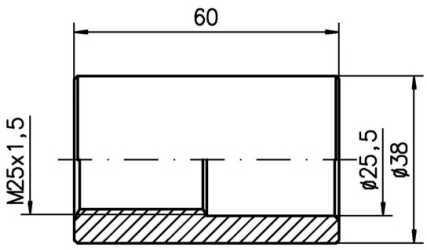
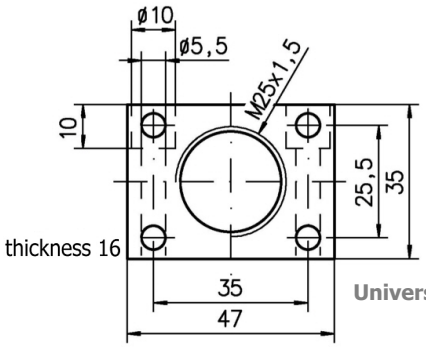




Stop collar

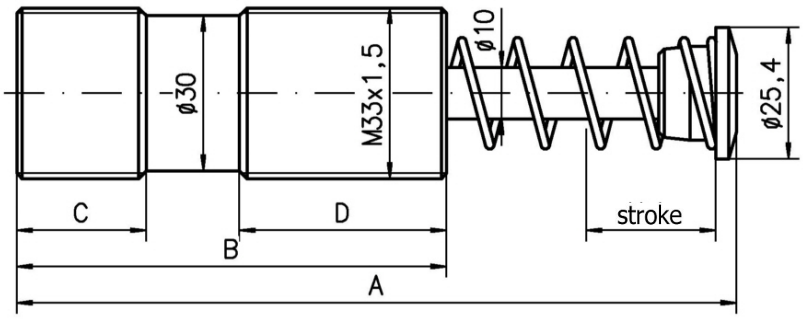


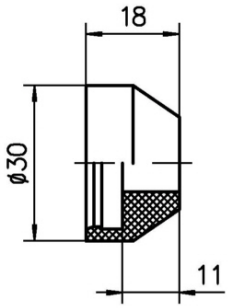
Universal flange

Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
SES 11 x 25 A	25	M25x1,5	81	72	110 - 900	13 - 26	240
SES 11 x 25 B	25	or	81	72	8 - 138	13 - 26	240
SES 11 x 25 AA	25	M25x2,0	81	72	390 - 2300	13 - 26	240
SES 1.0 M x 40 A	40	M25x1,5	116	106	176 - 1140	20 - 70	360
SES 1.0 M x 40 B	40	M25x1,5	116	106	13 - 220	20 - 70	360
SES 1.0 M x 40 AA	40	M25x1,5	116	106	624 - 2600	20 - 70	360

- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Poyurethane cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

SES 1.15 M



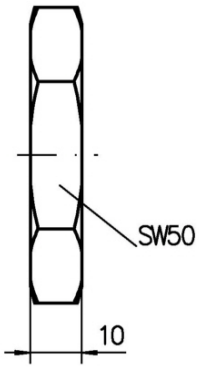


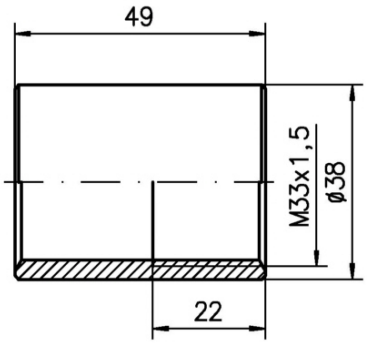
Polyurethane cap

Dimensions:

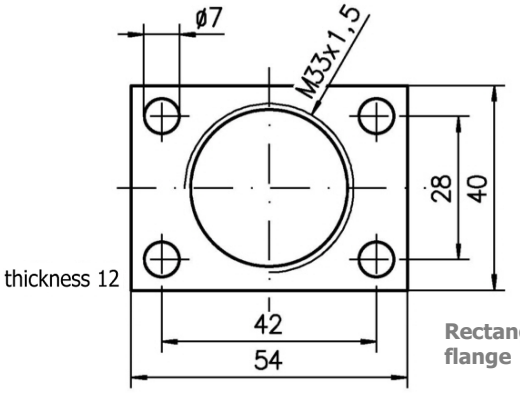
Type	Stroke	A	B [mm]	C	D
SES 1.15 M x 1	25	139	83	25	40
SES 1.15 M x 2	50	189	108	30	60

Nut





Stop collar



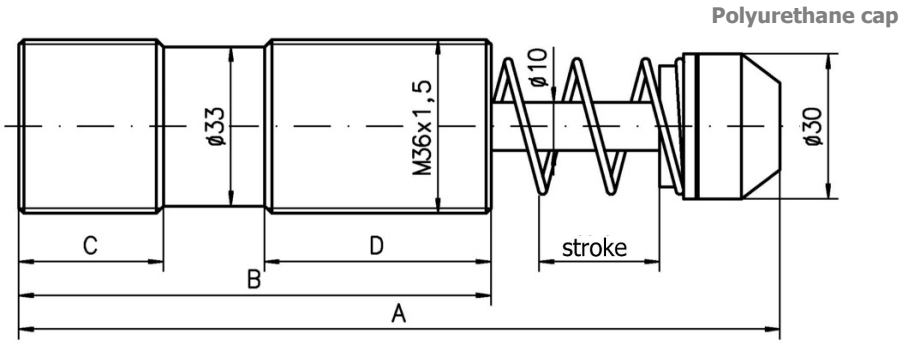
Rectangular flange

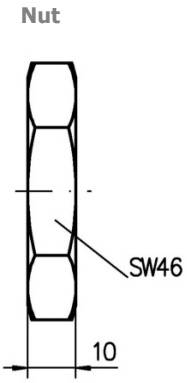
Technical data:

Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
SES 1.15 M x 1 A	25	M33x1,5	100	76	25 - 110	40 - 70	410
SES 1.15 M x 1 B	25	or	100	76	3 - 28	40 - 70	410
SES 1.15 M x 1 AA	25	1 ¼" – 12 UNF	100	76	176 - 960	40 - 70	410
SES 1.15 M x 2 A	50	M33x1,5	200	86	45 - 220	45 - 80	520
SES 1.15 M x 2 B	50	or	200	86	15 - 65	45 - 80	520
SES 1.15 M x 2 AA	50	1 ¼" – 12 UNF	200	86	190 - 890	45 - 80	520

- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Poyurethane cap standard.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

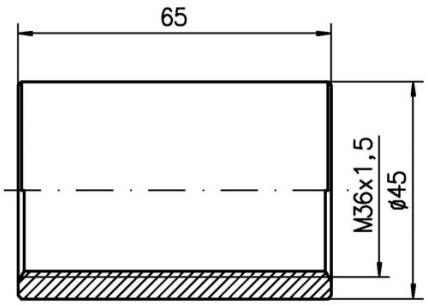
SES 1.1 M



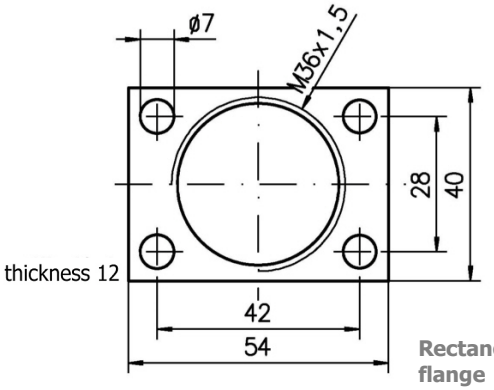


Dimensions:

Type	Stroke	A	B [mm]	C	D
SES 1.1 M x 1	25	158	98	30	47
SES 1.1 M x 2	50	195	106	30	55



Stop collar



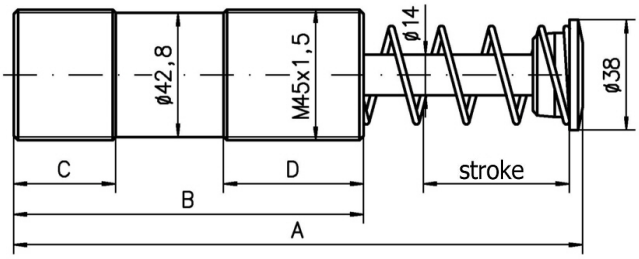
Rectangular flange

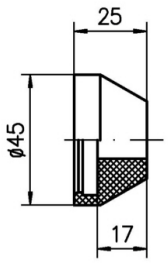
Technical data:

Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
SES 1.1 M x 1 A	25	M36x1,5	195	94	170 - 870	35 - 80	500
SES 1.1 M x 1 B	25	M36x1,5	195	94	45 - 250	35 - 80	500
SES 1.1 M x 1 AA	25	M36x1,5	195	94	540 - 2700	35 - 80	500
SES 1.1 M x 2 A	50	M36x1,5	390	188	340 - 1740	35 – 85	650
SES 1.1 M x 2 B	50	M36x1,5	390	188	90 - 500	35 – 85	650
SES 1.1 M x 2 AA	50	M36x1,5	390	188	1080 - 5400	35 - 85	650

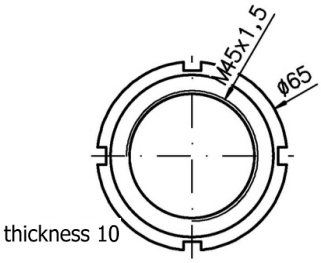
- Temperature range from - 10 °C to + 80 °C (for higher temperature up to max. 120° C on request).
- Fitting position according to your requirements.
- Polyurethane-cap optional.
- The shock absorbers in this series are equipped with an integrated stop, so that an external mechanical stop is not necessary.

SES 1.5 M





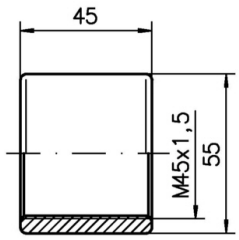
Polyurethane cap



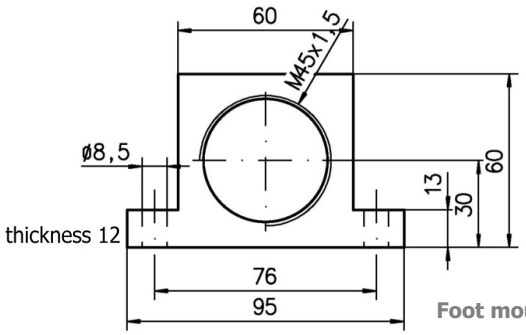
Nut

Dimensions:

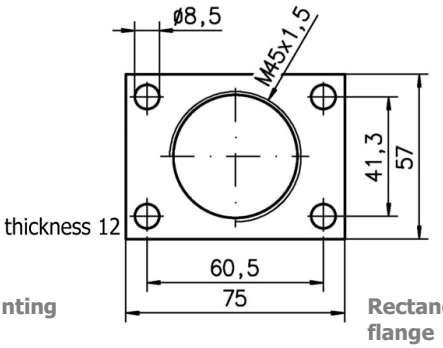
Type	Stroke	A	B [mm]	C	D
SES 1.5 M x 1	25	145	95	25	43
SES 1.5 M x 2	50	195	120	35	48
SES 1.5 M x 3	75	245	145	35	73



Stop collar



Foot mounting



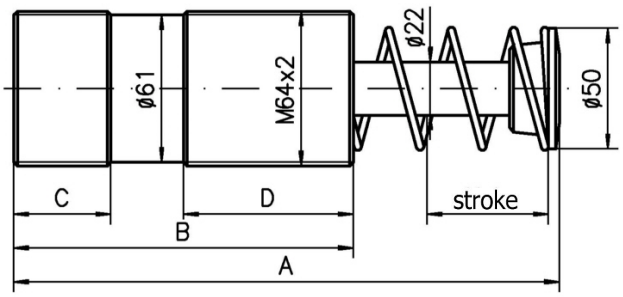
Rectangular flange

Technical data:

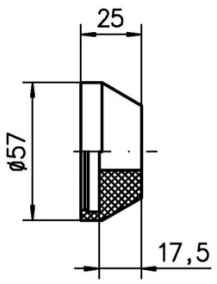
Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [kg]
SES 1.5 M x 1 A	25	M45x1,5	250	137	110 - 700	60 - 90	1,2
SES 1.5 M x 1 B	25	M45x1,5	250	137	27 - 130	60 - 90	1,2
SES 1.5 M x 1 AA	25	M45x1,5	250	137	600 - 3000	60 - 90	1,2
SES 1.5 M x 2 A	50	M45x1,5	500	149	220 - 1400	70 – 150	1,4
SES 1.5 M x 2 B	50	M45x1,5	500	149	55 - 260	70 – 150	1,4
SES 1.5 M x 2 AA	50	M45x1,5	500	149	1200 - 6000	70 – 150	1,4
SES 1.5 M x 3 A	75	M45x1,5	750	168	330 - 2100	40 - 150	1,6
SES 1.5 M x 3 B	75	M45x1,5	750	168	82 - 390	40 - 150	1,6
SES 1.5 M x 3 AA	75	M45x1,5	750	168	1800 - 9000	40 - 150	1,6

- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Poyurethane-cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

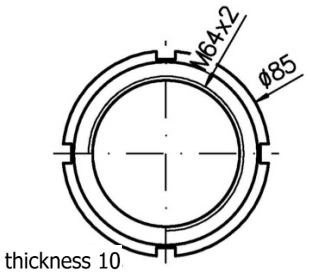
SES 2.0 M



Polyurethane cap



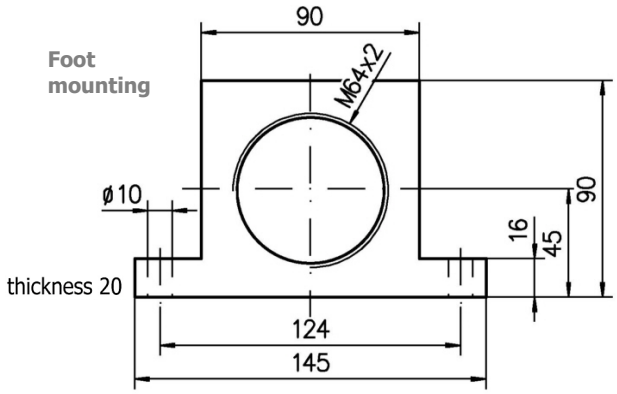
Nut

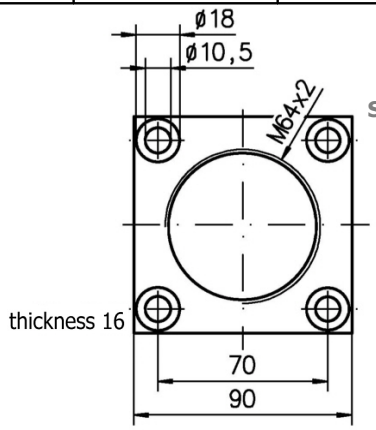


Dimensions:

Type	Stroke	A	B [mm]	C	D
SES 2.0 M x 2	50	225	140	40	70
SES 2.0 M x 4	100	327	190	50	100
SES 2.0 M x 6	150	455	240	50	120

Foot mounting





Square flange

Technical data:

Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [kg]
SES 2.0 M x 2 A	50	M64x2,0	1140	165	430 - 2250	60 - 130	2,9
SES 2.0 M x 2 B	50	M64x2,0	1140	165	130 - 675	60 - 130	2,9
SES 2.0 M x 2 AA	50	M64x2,0	1140	165	1600 - 9000	60 - 130	2,9
SES 2.0 M x 2 BB	50	M64x2,0	1140	165	35 - 165	60 - 130	2,9
SES 2.0 M x 4 A	100	M64x2,0	2280	228	900 - 4900	60 - 180	3,8
SES 2.0 M x 4 B	100	M64x2,0	2280	228	250 - 1300	60 - 180	3,8
SES 2.0 M x 4 AA	100	M64x2,0	2280	228	3500 - 18000	60 - 180	3,8
SES 2.0 M x 4 BB	100	M64x2,0	2280	228	70 - 350	60 - 180	3,8
SES 2.0 M x 6 A	150	M64x2,0	3420	255	1300 - 6500	60 - 270	5,1
SES 2.0 M x 6 B	150	M64x2,0	3420	255	400 - 2000	60 - 270	5,1
SES 2.0 M x 6 AA	150	M64x2,0	3420	255	5300 - 27000	60 - 270	5,1
SES 2.0 M x 6 BB	150	M64x2,0	3420	255	100 - 500	60 - 270	5,1

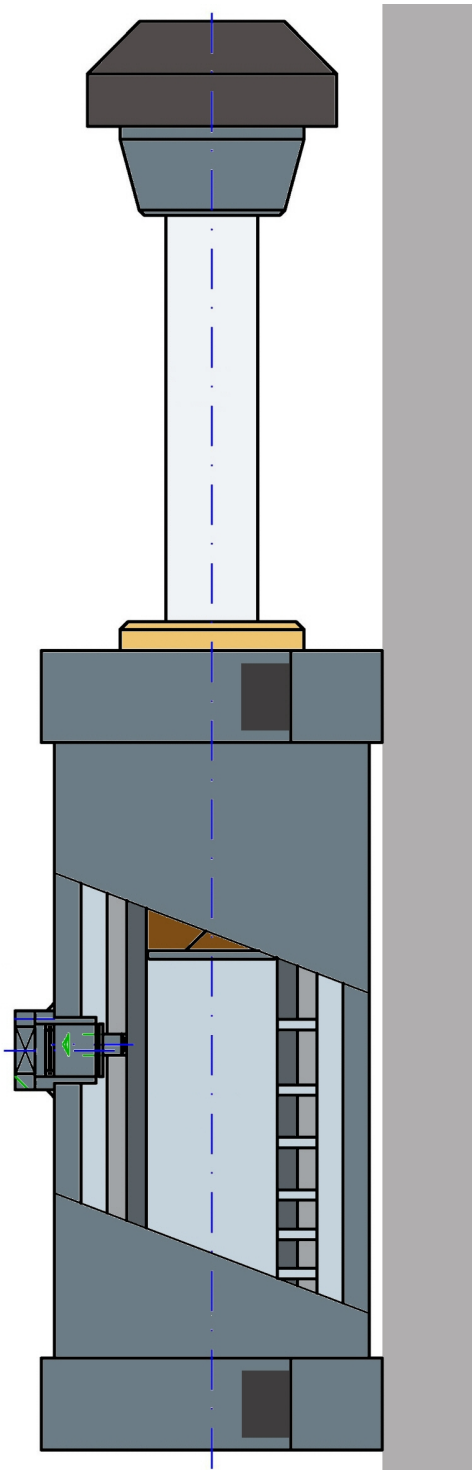
Working principle of adjustable shock absorbers STD

During operation the piston rod travels through the stroke, the piston forces the hydraulic oil through the orifice holes. The total orifice area decreases at a rate consistent with the stroke. Speed is reduced, pressure and braking force remain nearly constant. This eliminates destructive shock forces which can cause damage to products and machines.

In order to adapt the shock absorber to different operating situations, the total orifice area can be adjusted. A rotation of the adjusting screw causes a shift betweeen damping and cylinder tube. The adjustable shock absorber offers more flexibility in application design and selection procedure. When an effective weight change is required, you can simply adjust the setting.

The basic characteristics will be preserved, since the total orifice area changes, providing true linear deceleration. Adjustable models offer a wide range of effective weight. One model is capable of handling numerous applications.

The return spring (not shown) pushes the piston rod to the start position for the next cycle. A check valve supports the rapid extension so the shock absorber is ready for a working stroke in the shortest possible time.



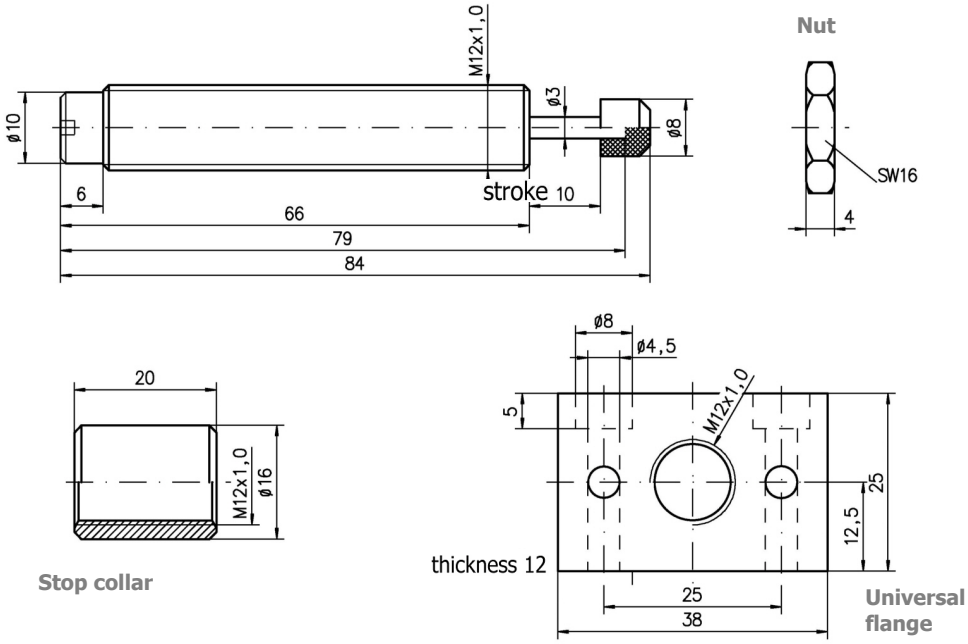
Summary STD

Product	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Effective mass [kg]	Page
STD 7 x 10	10	M12x1,0	4	5 - 60	18
STD 7 x 12	12	M14x1,5	16	1 - 100	18
STD 10 x 12	12	M16x1,5	18	1,5 - 160	19
STD 10 x 20	20	M20x1,5	30	2,5 - 240	19
STD 1.0 M	25	M25x1,5 or M27x3,0	78	8 - 1360	20
STD 1.0 M x 40	40	M25x1,5	116	13 - 1980	20
STD 1.25 M x 1	25	M33x1,5 or 1 ¼" – 12UNF	112	10 - 1800	21
STD 1.25 M x 1 NG	25	M33x1,5 or 1 ¼" – 12UNF	112	330 - 48000	21
STD 1.25 M x 2	50	M33x1,5 or 1 ¼" – 12UNF	224	15 - 2400	21
STD 1.25 M x 2 NG	50	M33x1,5 or 1 ¼" – 12UNF	224	470 - 77000	21
STD 1.2 M x 1	25	M36x1,5	195	10 - 1250	22
STD 1.2 M x 1 NG	25	M36x1,5	195	350 - 51000	22
STD 1.2 M x 2	50	M36x1,5	390	15 - 1850	22
STD 1.2 M x 2 NG	50	M36x1,5	390	450 - 81000	22
STD 1.5 M x 1	25	M42x1,5	250	27 - 3600	23
STD 1.5 M x 1 NG	25	M42x1,5	250	3000 - 110000	23
STD 1.5 M x 2	50	M42x1,5	500	43 - 6350	23
STD 1.5 M x 2 NG	50	M42x1,5	500	5000 - 175000	23
STD 1.5 M x 3	75	M42x1,5	750	55 - 9500	23
STD 2.0 M x 1	25	M64x2,0	570	40 - 7500	24
STD 2.0 M x 1 NG	25	M64x2,0	570	10000 - 250000	24
STD 2.0 M x 2	50	M64x2,0	1140	70 - 12000	24
STD 2.0 M x 2 NG	50	M64x2,0	1140	11000 - 460000	24
STD 2.0 M x 4	100	M64x2,0	2280	115 - 12000	24
STD 2.0 M x 4 NG	100	M64x2,0	2280	12000 - 460000	24
STD 2.0 M x 6	150	M64x2,0	3420	130 - 23000	24
STD 3.0 M x 2	50	M85x2,0	2100	190 - 31000	25
STD 3.0 M x 3,5	90	M85x2,0	3600	220 - 35000	25
STD 3.0 M x 5	125	M85x2,0	5100	230 - 40000	25
STD 3.0 M x 6,5	165	M85x2,0	6500	310 - 43000	25
STD 3.0 M x 8	200	M85x2,0	10000	330 - 48000	25
STD 4.0 M x 2	50	M115x2,0	4500	200 - 70000	26
STD 4.0 M x 4	100	M115x2,0	9000	220 - 75000	26
STD 4.0 M x 6	150	M115x2,0	13500	240 - 84000	26
STD 4.0 M x 8	200	M115x2,0	19000	270 - 90000	26
STD 4.0 M x 10	250	M115x2,0	23500	300 - 110000	26

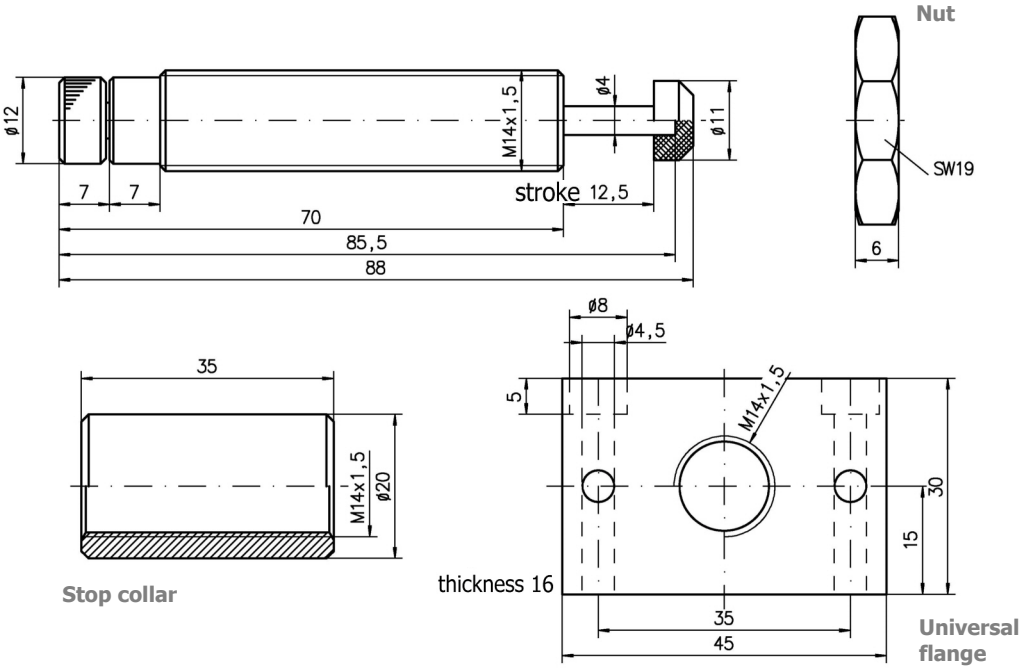
Please note that this review is only for pre-selection. In any case, please use our example calculations (page 32 and 33) to check whether the selected damper is suitable.

- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Nylon cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

STD 7 x 10



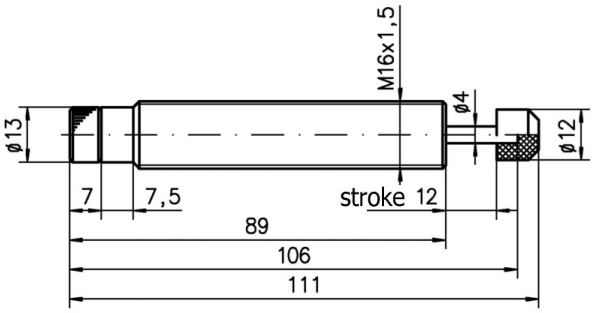
STD 7 x 12



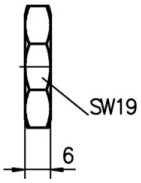
Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	[kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
STD 7 x 10	10	M12x1,0	4	6	5 - 60	6 - 11	50
STD 7 x 12	12,5	M14x1,5	16	25	1 - 100	5 - 15	70

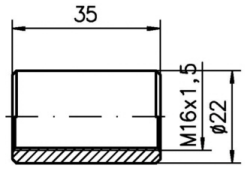
- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Nylon cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

STD 10 x 12

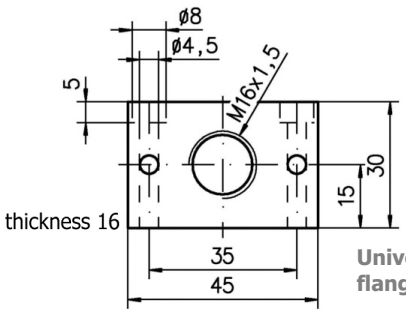


Nut



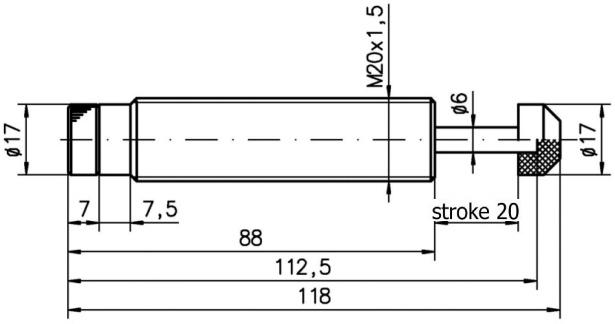


Stop collar



Universal flange

STD 10 x 20



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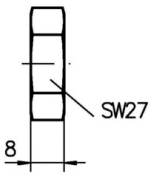
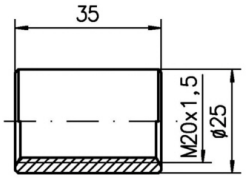
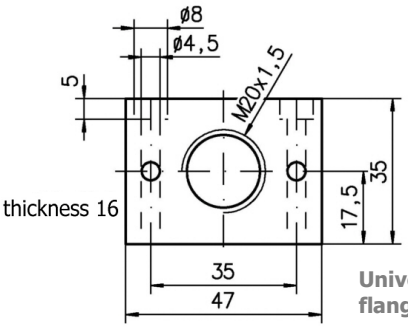




Stop collar

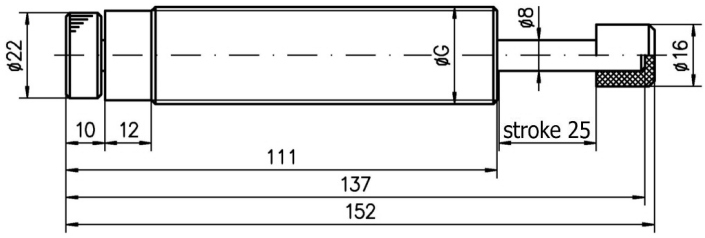


Universal flange

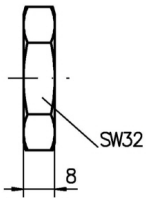
Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	[kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
STD 10 x 12	12	M16x1,5	18	26	1,5 - 160	4 - 11	90
STD 10 x 20	20	M20x1,5	30	46	2,5 - 240	7 - 20	130

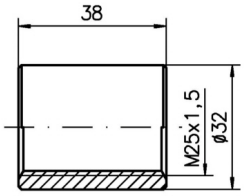
- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Nylon cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

STD 1.0 M

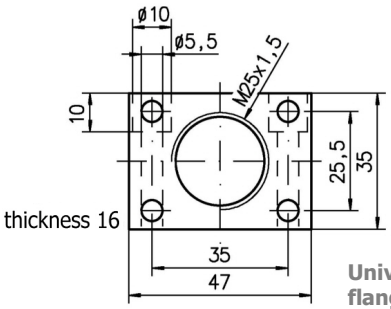


Nut



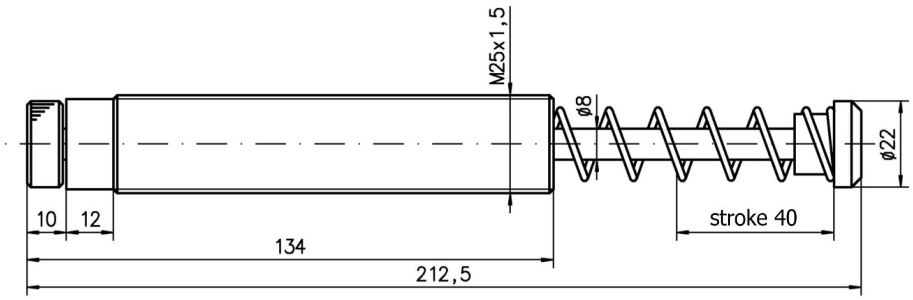


Stop collar

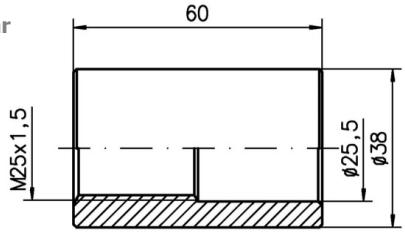


Universal flange

STD 1.0 x 40



Stop collar

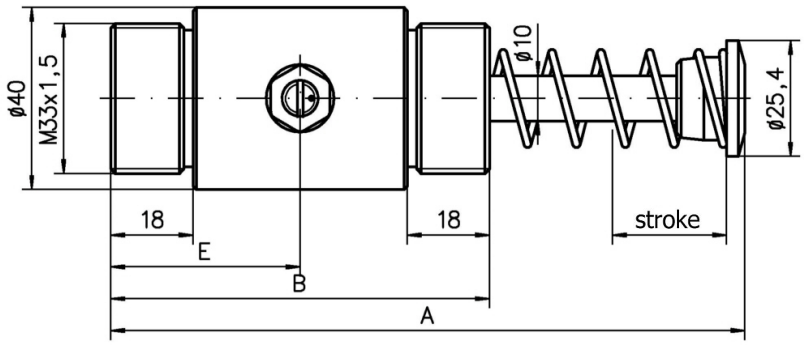


(for accessories see STD 1.0 M)

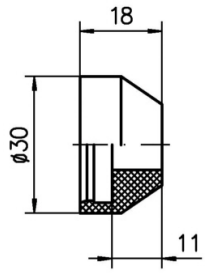
Type	Stroke [mm]	Options	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
STD 1.0 M	25	---	M27x3,0	78	66	8 - 1360	25 - 50	390
STD 1.0 MB	25	Nylon cap	M27x3,0	78	66	8 - 1360	25 - 50	310
STD 1.0 M-S	25	---	M25x1,5	78	66	8 - 1360	25 - 50	400
STD 1.0 MB-S	25	Nylon cap	M25x1,5	78	66	8 - 1360	25 - 50	320
STD 1.0 M x 40	40	---	M25x1,5	116	106	13 - 1980	20 - 70	390

- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Polyurethane cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

STD 1.25 M



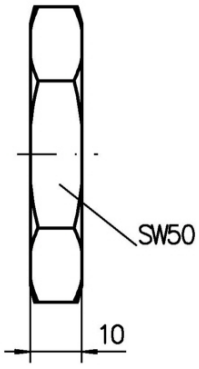
Polyurethane cap



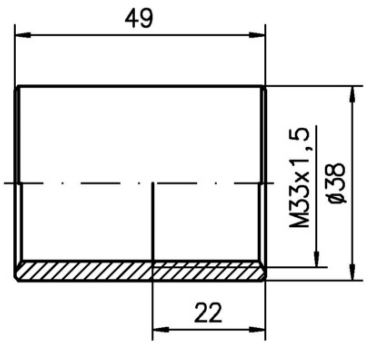
Dimensions:

Type	Stroke	A	B	E
		[mm]		
STD 1.25 M x 1	25	139	83	41,5
STD 1.25 M x 2	50	189	108	66,5

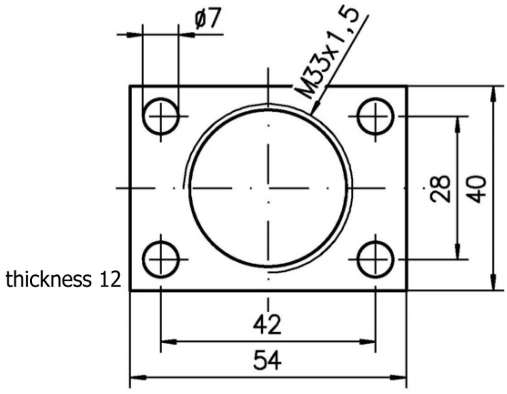
Nut



Stop collar



Rectangular flange

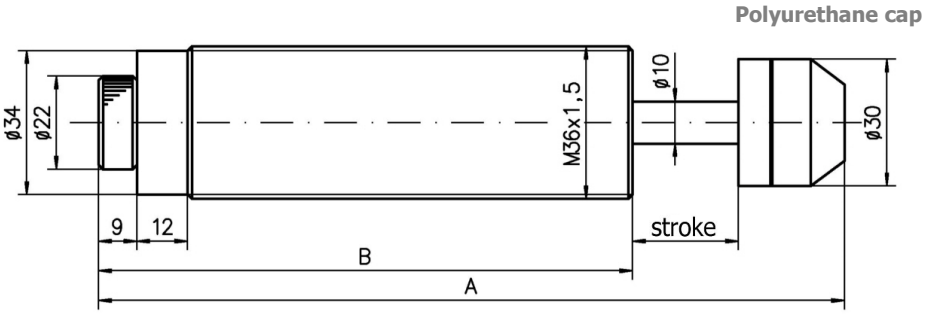


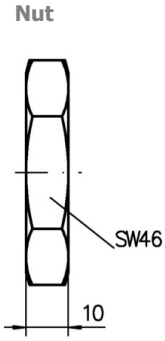
Technical data:

Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
STD 1.25 M x 1	25	M33x1,5 or	112	76	10 - 1800	40 - 70	640
STD 1.25 M x 1 NG	25	1 ¼" – 12 UNF	112	76	330 - 48000	40 - 70	640
STD 1.25 M x 2	50	M33x1,5 or	224	86	15 - 2400	45 - 80	730
STD 1.25 M x 2 NG	50	1 ¼" – 12 UNF	224	86	470 - 77000	45 - 80	730

- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Polyurethane cap standard.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

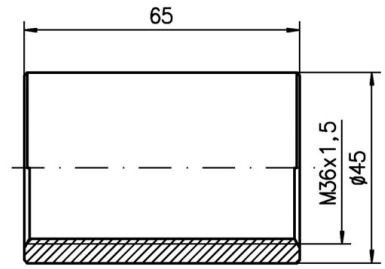
STD 1.2 M



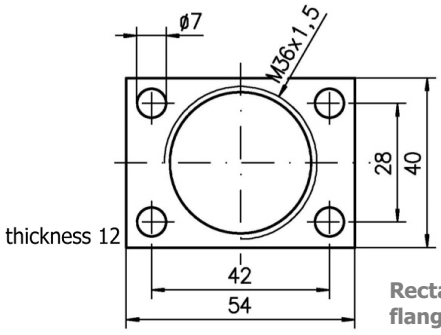


Dimensions:

Type	Stroke	A [mm]	B
STD 1.2 M x 1	25	176	126
STD 1.2 M x 2	50	248	172



Stop collar



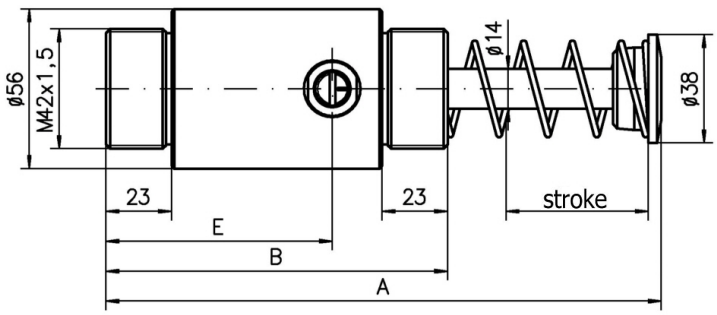
Rectangular flange

Technical data:

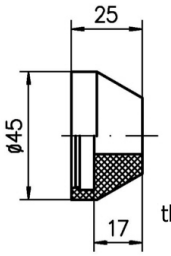
Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [g]
STD 1.2 M x 1	25	M36x1,5	195	94	10 - 1250	35 - 80	650
STD 1.2 M x 1 NG	25	M36x1,5	195	94	350 - 51000	35 - 80	650
STD 1.2 M x 2	50	M36x1,5	390	188	15 - 1850	35 - 85	820
STD 1.2 M x 2 NG	50	M36x1,5	390	188	450 - 81000	35 - 85	820

- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Polyurethane cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

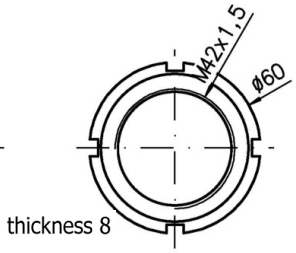
STD 1.5 M



Polyurethane cap

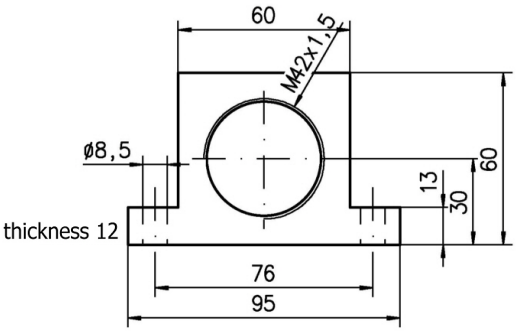


Nut

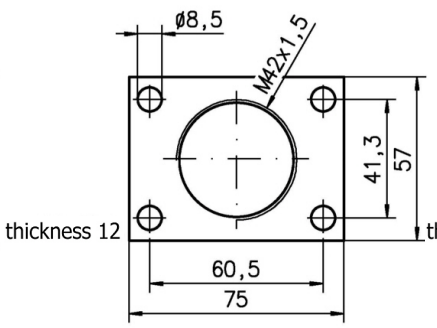


Dimensions:

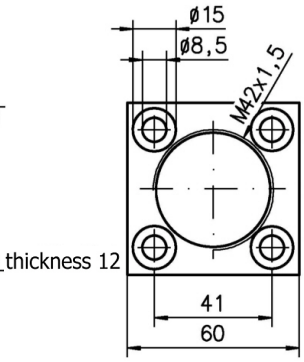
Type	Stroke	A	B	E
		[mm]		
STD 1.5 M x 1	25	144	94	53
STD 1.5 M x 2	50	195	120	79,5
STD 1.5 M x 3	75	246	145	104,5



Foot mounting



Rectangular flange



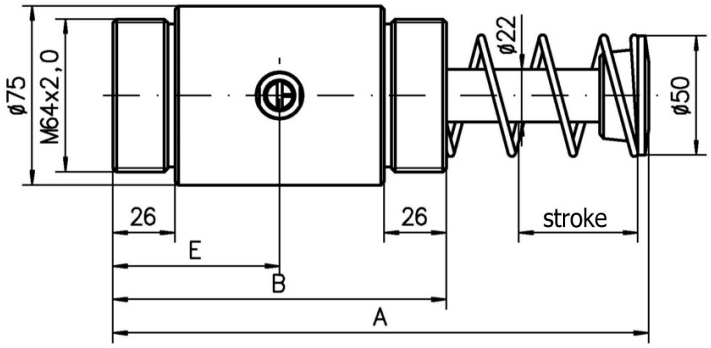
Square flange

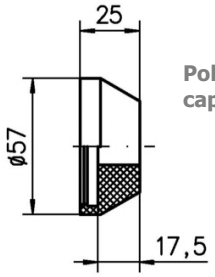
Technical data:

Type	Stroke	Thread	Energy capacity		Effective mass	Spring force	Weight
	[mm]		[Nm/stroke]	[kNm/h]	[kg]	[N]	[kg]
STD 1.5 M x 1	25	M42x1,5	250	125	27 - 3600	60 - 90	1,4
STD 1.5 M x 1 NG	25	M42x1,5	250	125	3000 - 110000	60 - 90	1,4
STD 1.5 M x 2	50	M42x1,5	500	148	43 - 6350	70 - 150	1,7
STD 1.5 M x 2 NG	50	M42x1,5	500	148	5000 - 175000	70 - 150	1,7
STD 1.5 M x 3	75	M42x1,5	750	182	55 - 9500	60 - 130	2,1

- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Polyurethane cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

STD 2.0 M

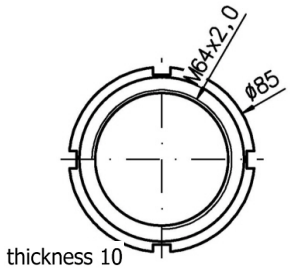




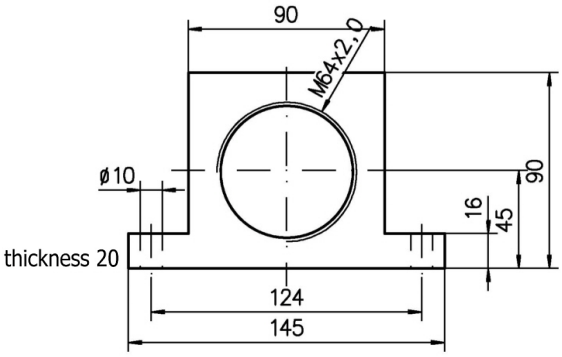
Polyurethane cap

Dimensions:

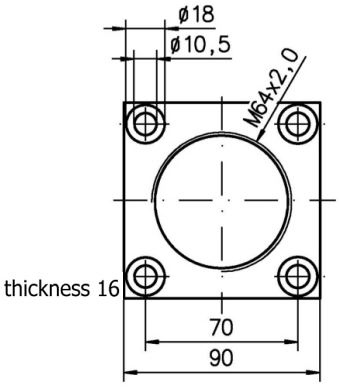
Type	Stroke	A	B	E
		[mm]		
STD 2.0 M x 1	25	175	115	57,5
STD 2.0 M x 2	50	225	140	70
STD 2.0 M x 4	100	327	190	95
STD 2.0 M x 6	150	455	240	120



Nut



Foot mounting



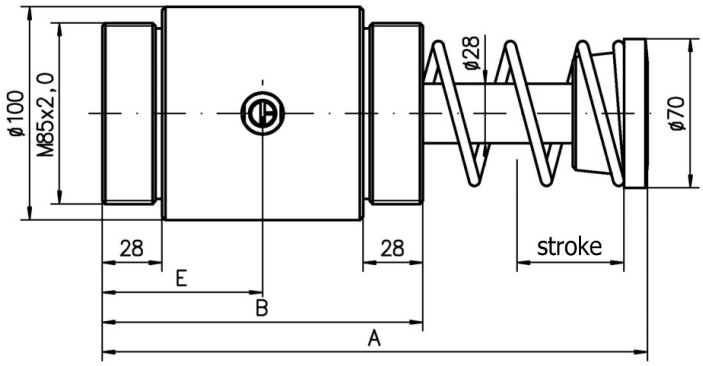
Square flange

Technical data:

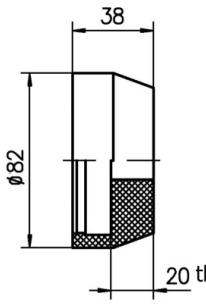
Type	Stroke	Thread	Energy capacity		Effective mass	Spring force	Weight
	[mm]		[Nm/stroke]	[kNm/h]	[kg]	[N]	[kg]
STD 2.0 M x 1	25	M64x2,0	570	150	55 - 8000	60 - 90	3,2
STD 2.0 M x 1 NG	25	M64x2,0	570	150	10000 - 250000	60 - 90	3,2
STD 2.0 M x 2	50	M64x2,0	1140	171	70 - 12000	60 - 130	3,6
STD 2.0 M x 2 NG	50	M64x2,0	1140	171	11000 - 460000	60 - 130	3,6
STD 2.0 M x 4	100	M64x2,0	2280	228	115 - 17000	60 - 180	4,8
STD 2.0 M x 4 NG	100	M64x2,0	2280	228	12000 - 460000	60 - 180	4,8
STD 2.0 M x 6	150	M64x2,0	3420	287	130 - 23000	55 - 270	6,0

- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Polyurethane cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

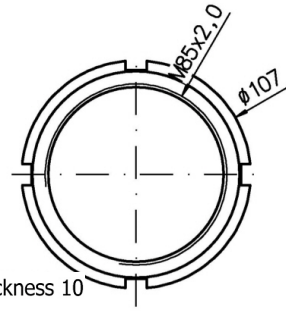
STD 3.0 M



Polyurethane cap



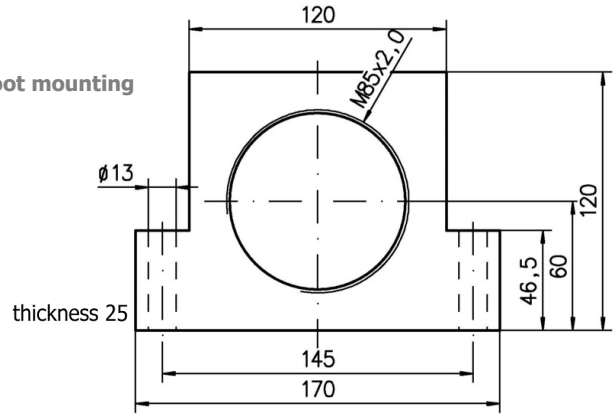
Nut



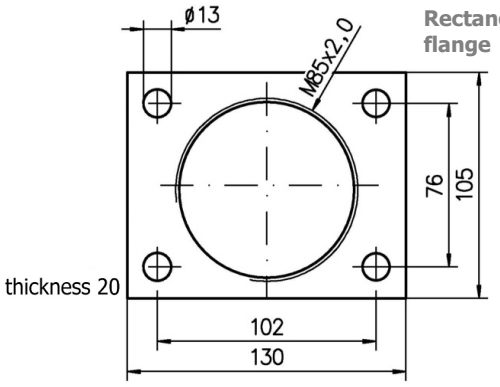
Dimensions:

Type	Stroke	A [mm]	B	E
STD 3.0 M x 2	50	255	150	75
STD 3.0 M x 3.5	90	335	190	95
STD 3.0 M x 5	125	410	225	112
STD 3.0 M x 6.5	165	505	265	132
STD 3.0 M x 8	200	600	300	150

Foot mounting



Rectangular flange

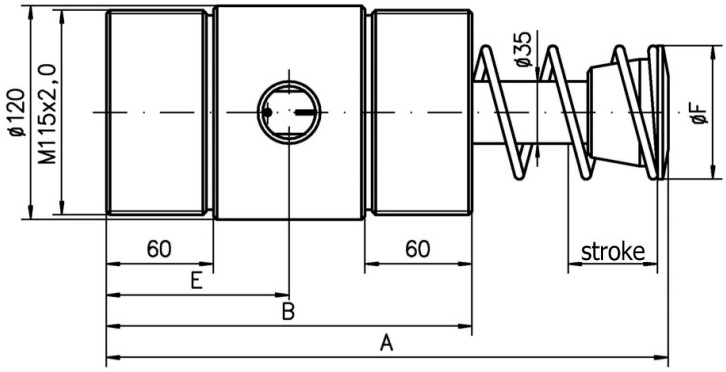


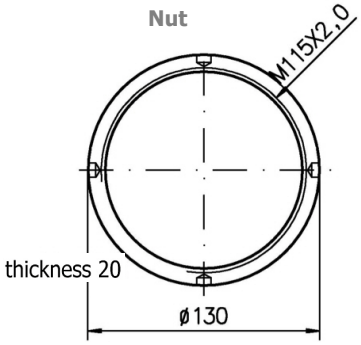
Technical data:

Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	[kNm/h]	Effective mass [kg]	Spring force [N]	Weight [kg]
STD 3.0 M x 2	50	M85x2,0	2100	720	190 - 31000	140 - 265	7,5
STD 3.0 M x 3.5	90	M85x2,0	3600	1030	220 - 35000	110 - 200	9,0
STD 3.0 M x 5	125	M85x2,0	5100	1250	228 - 40000	105 - 290	11,0
STD 3.0 M x 6.5	165	M85x2,0	6500	1550	310 - 43000	120 - 350	13,2
STD 3.0 M x 8	200	M85x2,0	10000	2100	330 - 48000	170 - 580	16,0

- Fully adjustable.
- Temperature range from – 10 °C to + 80 °C (higher temperature up to + 120 °C on request).
- Fitting according to your requirements.
- Polyurethane cap optional.
- Install a mechanical stop 1 mm before end of the stroke, do not bottoming under load to prevent damage.

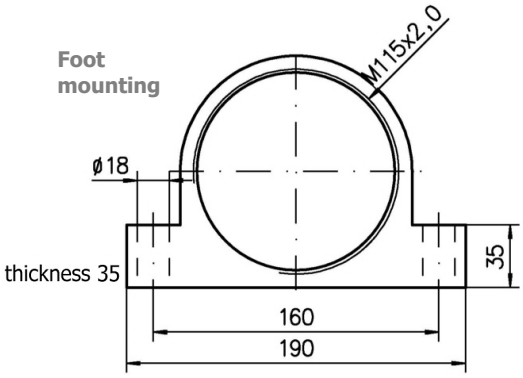
STD 4.0 M

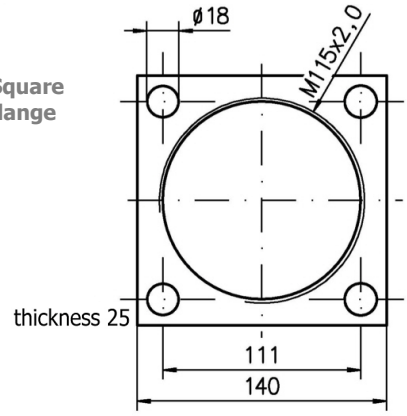




Dimensions:

Type	Stroke	A	B [mm]	E	ØF
STD 4.0 M x 2	50	315	205	102	75
STD 4.0 M x 4	100	415	255	127	75
STD 4.0 M x 6	150	516	305	152	90
STD 4.0 M x 8	200	642	355	177	90
STD 4.0 M x 10	250	745	405	202	110





Technical data:

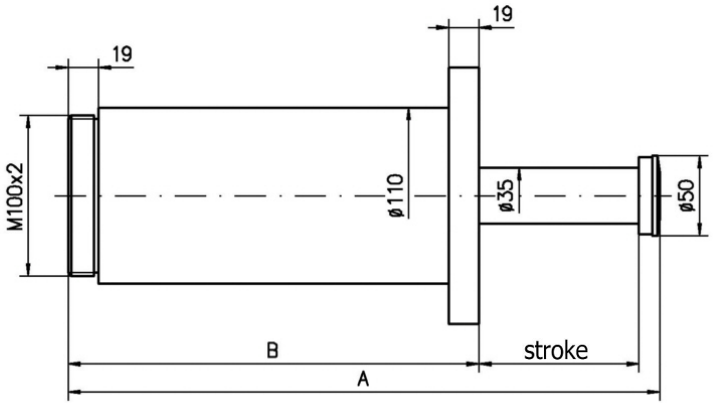
Type	Stroke [mm]	Thread	Energy capacity [Nm/stroke]	Energy capacity [kNm/h]	Effective mass [kg]	Spring force [N]	Weight [kg]
STD 4.0 M x 2	50	M115x2,0	4500	1000	200 - 70000	200 - 290	14
STD 4.0 M x 4	100	M115x2,0	9000	1250	220 - 75000	170 - 290	16
STD 4.0 M x 6	150	M115x2,0	13500	1450	240 - 84000	170 - 390	18
STD 4.0 M x 8	200	M115x2,0	19000	1700	270 - 90000	240 - 600	21
STD 4.0 M x 10	250	M115x2,0	23500	2000	300 - 110000	170 - 460	25

SDN 45

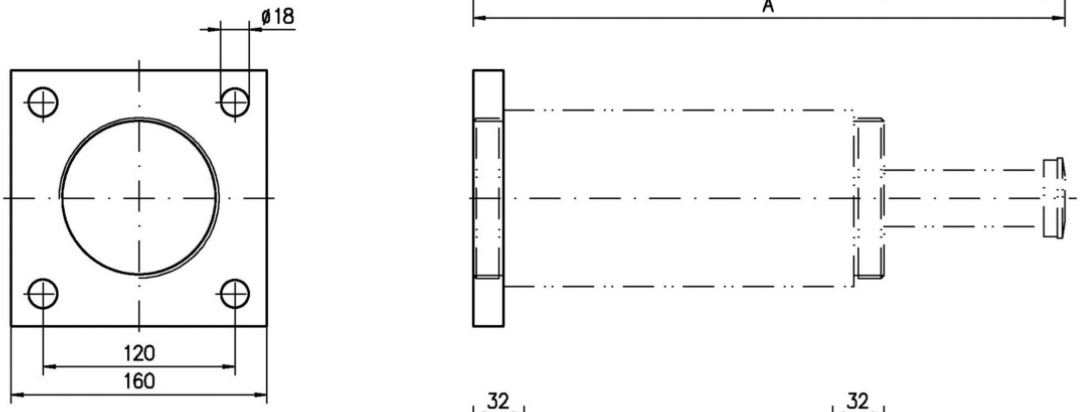
Safety shock absorbers SDN are a low cost alternative to industrial shock absorbers appropriate to customers requirements.
Typical applications: cranes, storage and retrieval unit for highbay warehouse, heavy machinery, etc.

- Impact velocity 0,9 – 4,5 m/s.
- Brake force max.: 80 kN (max. energy capacity).
- Spring force: 400 – 500 N.
- Temperature range: - 10° C to + 80° C.

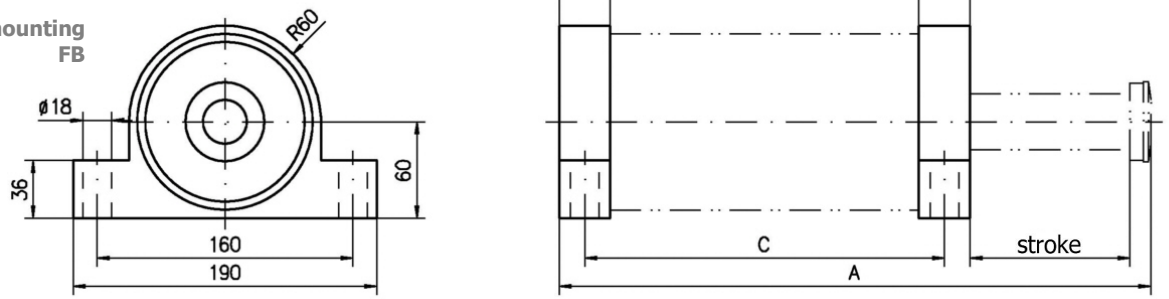
Front flange FLV



Rear flange FLH



Foot mounting FB



Dimensions: / Technical data:

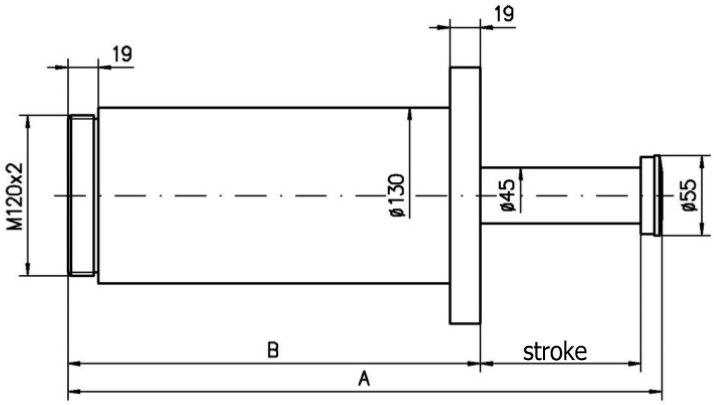
Type	Stroke	A	B	C	Energy capacity	Allowed angular deviation		Weight
		[mm]			Max. [kNm/stroke]	FLV + FB [°]	FLH [°]	[kg]
SDN 45-50	50	270	207	175	3,6	5	4	13
SDN 45-100	100	370	257	225	7,2	5	4	15
SDN 45-150	150	470	307	275	10,8	5	4	17
SDN 45-200	200	570	357	325	14,4	5	4	19
SDN 45-250	250	670	407	375	18,0	4,5	3,5	21
SDN 45-300	300	785	472	440	21,6	4	3	23
SDN 45-350	350	885	522	490	25,2	3,5	2,5	25
SDN 45-400	400	1000	587	555	28,8	3	2	27
SDN 45-500	500	1215	702	670	36,0	2,5	1,5	31
SDN 45-600	600	1430	817	785	43,2	2	1	35
SDN 45-700	700	1645	932	900	50,4	1,5	0,5	39

SDN 60

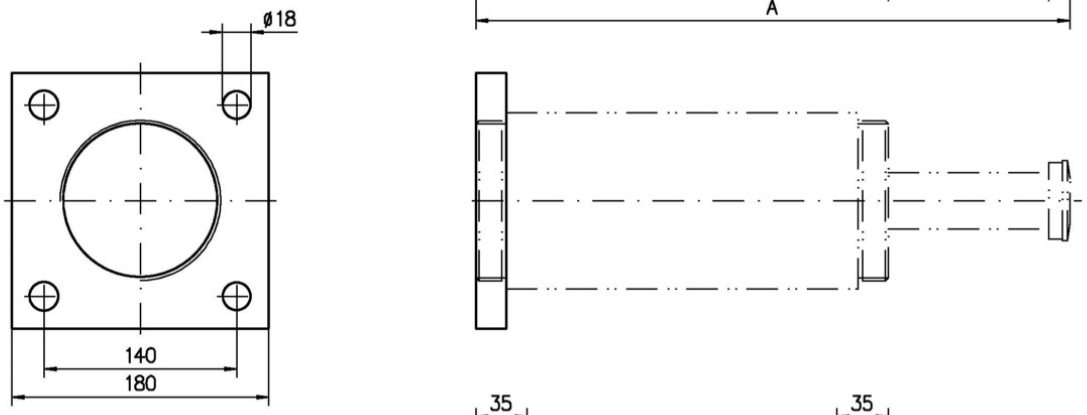
Safety shock absorbers SDN are a low cost alternative to industrial shock absorbers appropriate to customers requirements.
Typical applications: cranes, storage and retrieval unit for highbay warehouse, heavy machinery, etc.

- Impact velocity 0,5 – 4,5 m/s.
- Brake force max.: 160 kN (max. energy capacity).
- Spring force: 600 – 800 N.
- Temperature range: - 10° C to + 80° C.

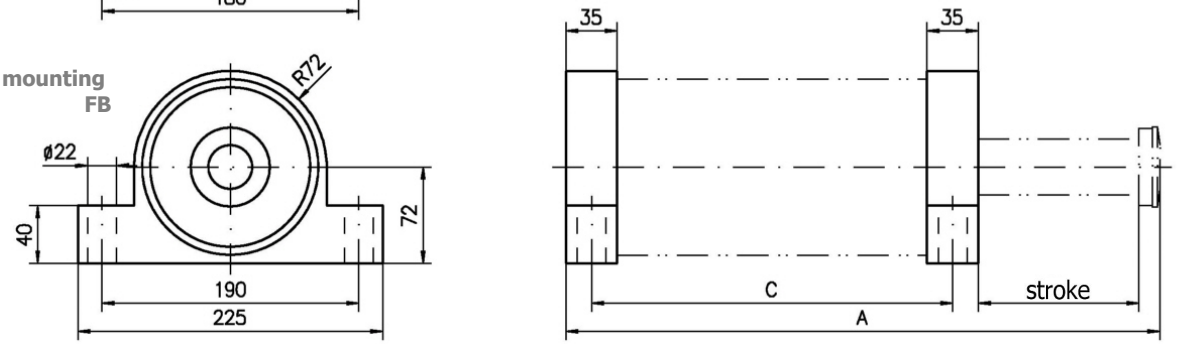
Front flange FLV



Rear flange FLH



Foot mounting FB



Dimensions: / Technical data:

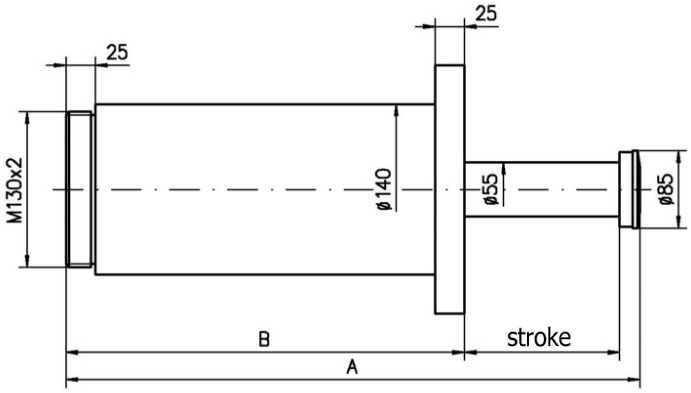
Type	Stroke	A	B	C	Energy capacity	Allowed angular deviation		Weight
		[mm]			Max. [kNm/stroke]	FLV + FB [°]	FLH [°]	[kg]
SDN 60-100	100	390	270	235	14	5	4	23
SDN 60-150	150	490	320	285	21	5	4	26
SDN 60-200	200	590	370	335	28	5	4	28
SDN 60-250	250	690	420	385	35	4,5	3,5	31
SDN 60-300	300	805	485	450	42	4	3	34
SDN 60-350	350	905	535	500	49	3,5	2,5	37
SDN 60-400	400	1020	600	565	56	3	2	40
SDN 60-500	500	1235	715	680	70	2,5	1,5	45
SDN 60-600	600	1450	830	795	84	2	1	51
SDN 60-700	700	1665	945	910	98	1,5	0,5	57
SDN 60-800	800	1880	1060	1025	112	1	0	63

SDN 75

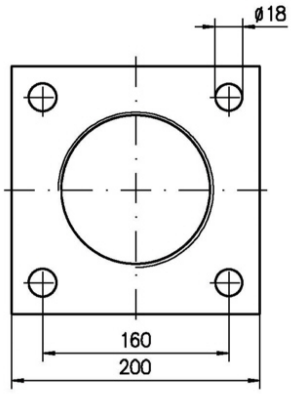
Safety shock absorbers SDN are a low cost alternative to industrial shock absorbers appropriate to customers requirements.
Typical applications: cranes, storage and retrieval unit for highbay warehouse, heavy machinery, etc.

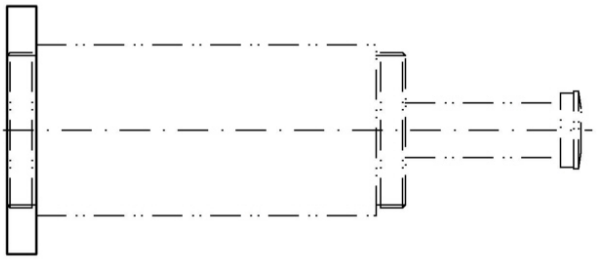
- Impact velocity 0,5 – 4,5 m/s.
- Brake force max.: 210 kN (max. energy capacity).
- Spring force: 1000 – 1300 N.
- Temperature range: - 10° C to + 80° C.

Front flange FLV

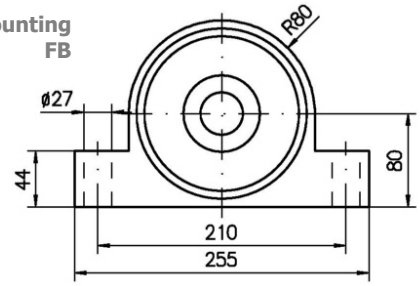


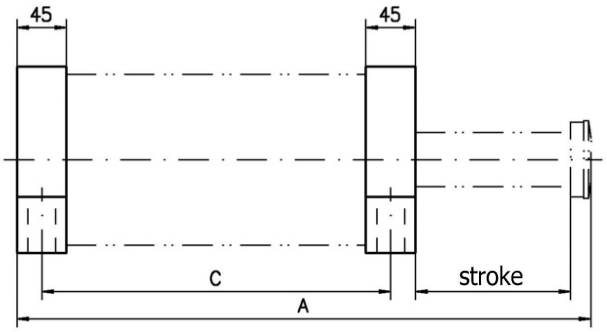
Rear flange FLH





Foot mounting FB

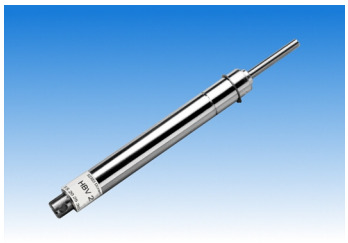




Dimensions: Technical data:

Type	Stroke	A	B	C	Energy capacity Max.	Allowed angular deviation FLV + FB	Allowed angular deviation FLH	Weight
		[mm]			[kNm/stroke]	[°]	[°]	[kg]
SDN 75-100	100	405	285	240	18	5	4	30
SDN 75-150	150	505	335	290	27	5	4	33
SDN 75-200	200	605	385	340	36	5	4	36
SDN 75-250	250	705	435	390	45	4,5	3,5	39
SDN 75-300	300	805	485	440	54	4	3	42
SDN 75-350	350	925	555	510	63	3,5	2,5	45
SDN 75-400	400	1025	605	560	72	3	2	48
SDN 75-500	500	1245	725	680	90	2,5	1,5	56
SDN 75-600	600	1445	825	780	108	2	1	63
SDN 75-700	700	1665	945	900	126	1,5	0,5	70
SDN 75-800	800	1865	1045	1000	144	1	0	76
SDN 75-1000	1000	2285	1265	1220	180	1,5	0,5	90
SDN 75-1200	1200	2705	1485	1440	216	1	0	104

Characteristics



Versatile HBV hydraulic speed control cylinders may be used to precisely regulate the speed or feed rate of any moving device. Use it to control the speed or air cylinders, automatic machines, slides and carriages. To regulate the feed of drills, grinders and cutting tools.

Leakproof HBV hydraulic speed control cyclinders are hermetically sealed and may operate in any position. These units are excellent for use on food processing equipment, business machines, medical and optical equipment and automatic production machinery.

Precision design A patented rolling diaphragm seal provides leakproof, frictionless sealing of the piston rod and makes a HBV unsurpassed for smooth, dependable, constant speed control. They are more precise in movement than conventional speed controls because the super-clean Silicone fluid they contain is sealed in for life and filtered every stroke.

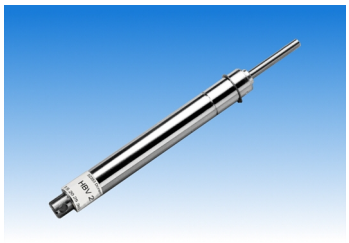
Long life HBV speed controls are guaranteed to provide millions of trouble-free cycles without noticeable wear. All cylinders contain a tool steel cylinder that is hardened to 60 Rockwell, honed to a mirror finish, and precisely mated to a special alloy all metal piston. This combination is virtually impossible to wearout.

Maintenance free The rolling diaphragm succesfully withstand endurance tests of 10 million cycles without leaking. An internal rod wiper protects the seal and other internal parts from contamination by cutting oils, moisture and dust. All moving parts are permanently lubricated and contribute to an extremely long life without maintenance.

Reliability Each HBV speed control has to pass a 48-hour endurance test under different load conditions. This guarantees excellent function of each HBV speed control cylinder.

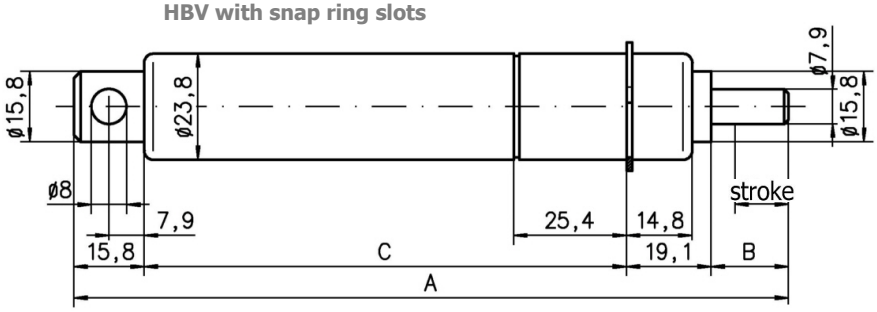
Stroke [mm]	Load that will push plunger 25 mm/s at fastest adjustment [N]	Load that will push plunger 100 mm/s at fastest adjustment [N]	Time for full stroke of plunger at slowest adjustment and 500 kg load. [s]	Time for full stroke of plunger at slowest adjustment and 50 kg load. [s]	Return spring force [N]	Time for return [s]
12	50	150	8	150	18	0,03
25	50	150	15	300	18	0,06
50	50	150	30	600	18	0,10
75	50	150	45	900	18	0,23

Technical Data

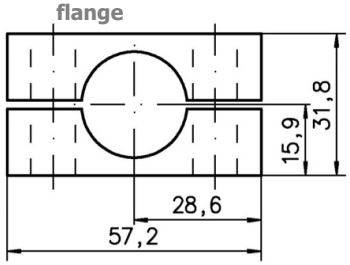


- Temperature range from + 5 °C to + 60 °C.
- Fitting position according to your requirements.
- Install a mechanical stop 1 mm before end of the stroke.
- Do not distort piston rod – this causes damage of the rolling diaphragm.
- Snap ring slots standard, external thread optional.
- Use of the clamping flange always with snap ring to transfer the braking force.

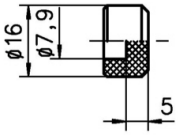
HBV with snap ring slots

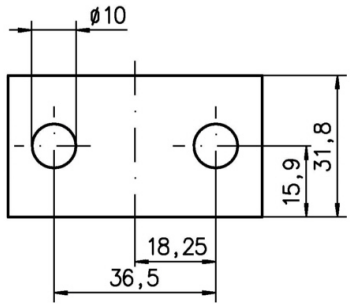


Clamping flange

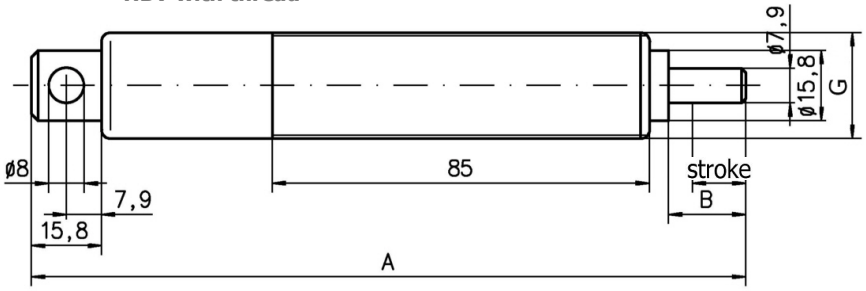


Polyurethane cap

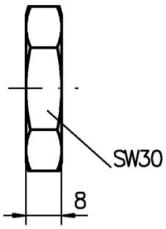




HBV with thread



Nut



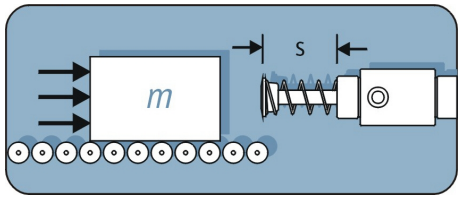
Type	Stroke [mm]	Brake force [N] min.	Brake force [N] max.	G (screw thread optional)	A [mm]	B [mm]	C [mm]	Weight [g]
HBV 0.5	12	25	5400	M24x1,0 or M24x1,5	161	17,4	109	330
HBV 1	25	25	5400	M24x1,0 or M24x1,5	199	30,1	134	350
HBV 2	50	25	5400	M24x1,0 or M24x1,5	276	55,5	186	470
HBV 3	75	25	5400	M24x1,0 or M24x1,5	352	81,0	236	540

Capacity charts:

The following parameters will be needed in the energy absorption calculation:		
1. Mass	**m**	[kg]
2. Impact velocity	**v**	[m/s]
3. Propelling force	**F**	[N]
4. Cycles per hour	**C**	[1/h]

The load range is calculated with those parameters. Pre-determine a stroke length and verify the calculation.		
1. Total energy/stroke	E_T	[Nm]
2. Total energy/hour	E_{TC}	[Nm/h]
3. Effective mass	m_e	[kg]

Case 1: Mass without propelling force

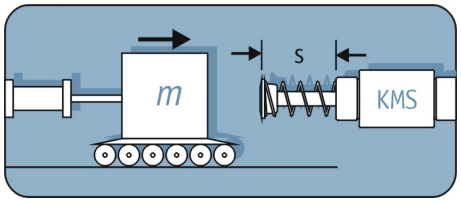


m	= 50 kg	*Mass*
v	= 1,5 m/s	*Impact velocity*
C	= 100 1/h	*Cycles per hour*

E_K/E_T	$= ½ \cdot m \cdot v^2$	$= ½ \cdot 50\ kg \cdot (1,5\ m/s)^2$	= **56 Nm**
E_{TC}	$= E_T \cdot C$	$= 56\ Nm \cdot 100\ 1/h$	= **5600 Nm/h**
m_e	$= 2 \cdot E_T / v^2$	$= 2 \cdot 56\ Nm / (1,5\ m/s)^2$	= **50 kg**

→ **SES 11 x 25 B selected**

Case 2: Mass with propelling force

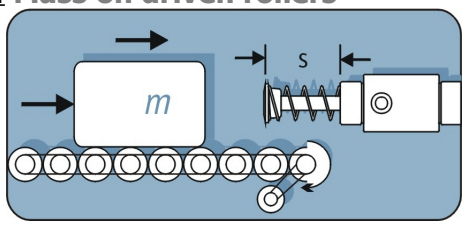


m	= 100 kg	*Mass*
v	= 1,5 m/s	*Impact velocity*
F_D	= 1000 N	*Propelling force*
C	= 200 1/h	*Cycles per hour*
s	= 0,025 m	*Stroke*

E_K	$= ½ \cdot m \cdot v^2$	$= ½ \cdot 100\ kg \cdot (1,5\ m/s)^2$	= **112,5 Nm**
E_W	$= F_D \cdot s$	$= 1000\ N \cdot 0,025\ m$	= **25 Nm**
E_T	$= E_K + E_W$	$= 112,5\ Nm + 25\ Nm$	= **137,5 Nm**
E_{TC}	$= E_T \cdot C$	$= 137,5\ Nm \cdot 200\ 1/h$	= **27500 Nm/h**
m_e	$= 2 \cdot E_T / v^2$	$= 2 \cdot 137,5\ Nm / (1,5\ m/s)^2$	= **122 kg**

→ **SES 1.1 M x 1 B selected**

Case 3: Mass on driven rollers

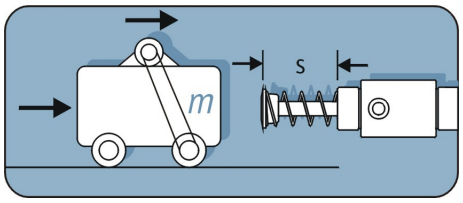


m	= 900 kg	*Mass*
v	= 1,0 m/s	*Impact velocity*
C	= 200 1/h	*Cycles per hour*
s	= 0,05 m	*Stroke*
μ	= 0,3	*Coefficient of friction steel/steel*

E_K	$= ½ \cdot m \cdot v^2$	$= ½ \cdot 900\ kg \cdot (1,0\ m/s)^2$	= **450 Nm**
E_W	$= m \cdot \mu \cdot g \cdot s$	$= 900\ kg \cdot 0,3 \cdot 9,81\ m/s^2 \cdot 0,05\ m$	= **132 Nm**
E_T	$= E_K + E_W$	$= 450\ Nm + 137,5\ Nm$	= **582 Nm**
E_{TC}	$= E_T \cdot C$	$= 582\ Nm \cdot 200\ 1/h$	= **116400 Nm/h**
m_e	$= 2 \cdot E_T / v^2$	$= 2 \cdot 582\ Nm / (1,0\ m/s)^2$	= **1164 kg**

→ **STD 2.0 M x 2 selected**

Case 4: Mass with motor drive

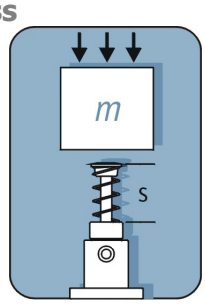


m	= 3000 kg	*Mass*
v	= 1,4 m/s	*Impact velocity*
HM	= 2,5	*Arresting torque factor for motors*
P	= 3 kW	*Drive power*
C	= 1/h	*Cycles per hour*
s	= 0,125 m	*Stroke*

E_K	$= ½ \cdot m \cdot v^2$	$= ½ \cdot 3000\ kg \cdot (1,4\ m/s)^2$	**= 2940 Nm**
E_W	$= 1000 \cdot P \cdot s \cdot HM / v$	$= 1000 \cdot 3\ kW \cdot 0,125\ m \cdot 2,5 / 1,4\ m/s$	**= 670 Nm**
E_T	$= E_K + E_W$	$= 2940\ Nm + 670\ Nm$	**= 3610 Nm**
E_{TC}	$= E_T \cdot C$	$= 3610\ Nm \cdot 1\ 1/h$	**= 3610 Nm/h**
m_e	$= 2 \cdot E_T / v^2$	$= 2 \cdot 3610\ Nm / (1,4\ m/s)^2$	**= 3684 kg**

→ **STD 3.0 M x 5 selected**

Case 5: Free falling mass

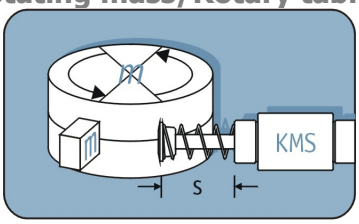


m	= 50 kg	*Mass*
h	= 0,5 m	*Height of fall*
C	= 300 1/h	*Cycles per hour*
s	= 0,05 m	*Stroke*

v	$= \sqrt{2 \cdot g \cdot h}$	$= \sqrt{2 \cdot 9,81\ m/s^2 \cdot 0,5\ m}$	**= 3,1 m/s**
E_K	$= m \cdot g \cdot h$	$= 50\ kg \cdot 9,81\ m/s^2 \cdot 0,5\ m$	**= 245 Nm**
E_W	$= m \cdot g \cdot s$	$= 50\ kg \cdot 9,81\ m/s^2 \cdot 0,05\ m$	**= 24,5 Nm**
E_T	$= E_K + E_W$	$= 245\ Nm + 24,5\ Nm$	**= 269,5 Nm**
E_{TC}	$= E_T \cdot C$	$= 269,5\ Nm \cdot 300\ 1/h$	**= 80850 Nm/h**
m_e	$= 2 \cdot E_T / v^2$	$= 2 \cdot 269,5\ Nm / (3,1\ m/s)^2$	**= 55 kg**

→ **STD 1.5 M x 2 selected**

Case 6: Rotating mass/Rotary table with driving torque

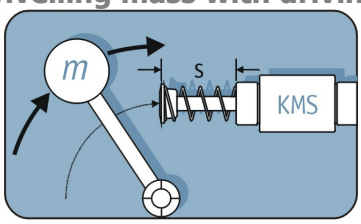


J	= 60 kgm²	*Moment of inertia*
ω	= 1,2 1/s	*Angular velocity*
r	= 0,5 m	*Radius (shock absorber)*
M	= 200 Nm	*Driving torque*
C	= 1000 1/h	*Cycles per hour*
s	= 0,025 m	*Stroke*

v	$= \omega \cdot r$	$= 1,2\ 1/s \cdot 0,5\ m$	**= 0,6 m/s**
E_K	$= ½ \cdot J \cdot \omega^2$	$= ½ \cdot 60\ kgm^2 \cdot (1,2\ 1/s)^2$	**= 43,2 Nm**
E_W	$= M \cdot s / r$	$= 200\ Nm \cdot 0,025\ m / 0,5\ m$	**= 10 Nm**
E_T	$= E_K + E_W$	$= 43,2\ Nm + 10\ Nm$	**= 53,2 Nm**
E_{TC}	$= E_T \cdot C$	$= 53,2\ Nm \cdot 1000\ 1/h$	**= 53200 Nm/h**
m_e	$= 2 \cdot E_T / v^2$	$= 2 \cdot 53,2\ Nm / (0,6\ m/s)^2$	**= 296 kg**

→ **STD 1.0 M selected**

Case 7: Swivelling mass with driving torque

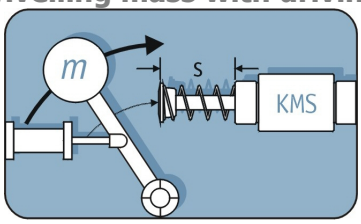


m	= 30 kg	*Mass*
v_m	= 1,0 m/s	*Impact velocity*
r	= 0,4 m	*Radius (shock absorber)*
R_m	= 0,6 m	*Radius (mass)*
M	= 40 Nm	*Driving torque*
C	= 1500/h	*Cycles per hour*
s	= 0,02 m	*Stroke*

E_K	= ½ · m · v^2	= ½ · 30 kg · (1,0 m/s)^2	= **15 Nm**
E_W	= M · s / r	= 40 Nm · 0,02 m / 0,4 m/s	= **2 Nm**
E_T	= E_K + E_W	= 15 Nm + 2 Nm	= **17 Nm**
E_{TC}	= E_T · C	= 17 Nm · 1500 1/h	= **25500 Nm/h**
v	= v_m · r / R_m	= 1,0 m/s · 0,4 m / 0,6 m	= **0,67 m/s**
m_e	= 2 · E_T / v^2	= 2 · 17 Nm / (0,67 m/s)^2	= **76 kg**

→ **SES 10 x 20 A selected**

Case 8: Swivelling mass with driving force

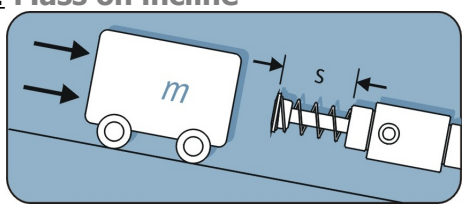


m	= 3000 kg	*Mass*
v_m	= 1,5 m/s	*Impact velocity*
r	= 1,0 m	*Radius (shock absorber)*
R_m	= 1,3 m	*Radius (mass)*
R_F	= 0,5 m	*Radius (force)*
F_D	= 4000 N	*Driving force*
C	= 150/h	*Cycles per hour*
S	= 0,1 m	*Stroke*

E_K	= ½ · m · v^2	= ½ · 3000 kg · (1,5 m/s)^2	= **3375 Nm**
E_W	= F_D · s · R_F / r	= 4000 N · 0,1 m · 0,5 m/1,0 m	= **200 Nm**
E_T	= E_K + E_W	= 3375 Nm + 200 Nm	= **3575 Nm**
E_{TC}	= E_T · C	= 3575 Nm · 150 1/h	= **536,25 kNm/h**
v	= v_m · r / R_m	= 1,5 m/s · 1,0 m/1,3 m	= **1,15 m/s**
m_e	= 2 · E_T / v^2	= 2 · 3575 Nm / (1,15 m/s)^2	= **1352 kg**

→ **STD 4.0 M x 4 selected**

Case 9: Mass on incline



m	= 10 kg	*Mass*
h	= 0,2 m	*Height*
α	= 20°	*Angle of inclination*
C	= 500 1/h	*Cycles per hour*
s	= 0,016 m	*Stroke*

E_K	= m · g · h	= 10 kg · 9,81 m/s^2 · 0,2 m	= **19,62 Nm**
E_W	= m · g · s · sin α	= 10 kg · 9,81 m/s^2 · 0,016 m · sin 20°	= **0,54 Nm**
E_T	= E_K + E_W	= 19,62 Nm + 0,54 Nm	= **20,16 Nm**
E_{TC}	= E_T · C	= 20,16 Nm · 500 1/h	= **53200 Nm/h**
v	= $\sqrt{2 \cdot g \cdot h}$	= $\sqrt{2 \cdot 9{,}81\ m/s^2 \cdot 0{,}2\ m}$	= **1,98 m/s**
m_e	= 2 · E_T / v^2	= 2 · 20,16 Nm / (1,98 m/s)^2	= **10,3 kg**

→ **SES 14 S selected**

Additional sizing formulas and calculations:

Effective mass m_e [kg] $m_e = 2 \cdot E_T / v^2$	Brake force F_B [N] $F_B = 1{,}2 \cdot E_T / s$
Deceleration a [m/s^2] $a = 0{,}6 \cdot v^2 / s$	Deceleration time t_B [s] $t_B = 2{,}5 \cdot s / v$

The above formulas apply to correctly selected and adjusted shock absorbers. Please take more precautions than may be necessary to be on the safe side.

Special versions are available on request:	
Description	**Application**
Shock absorber with swivelling fixing	• Clevis mounting
Shock absorber with special characteristic line	• Very high impact velocity • Very low impact velocity
Shock absorber in stainless steel	• Hostile environment • Outdoor application
Shock absorber with alternative seals	• Hostile environment • Deviating ambient temperatures
Shock absorber with special stroke length	
Shock absorber with nickel plated outside parts	• Hostile environment • Outdoor application
Shock absorber with air/oil-tank	• High frequencies requiring an increased energy capacity/h • Controlled return stroke of piston rod
Shock absorber with special fastening thread	• Pre-determined fastening elements