Shock Absorbers

HOERBIGER
ORIGA

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Shock Absorber

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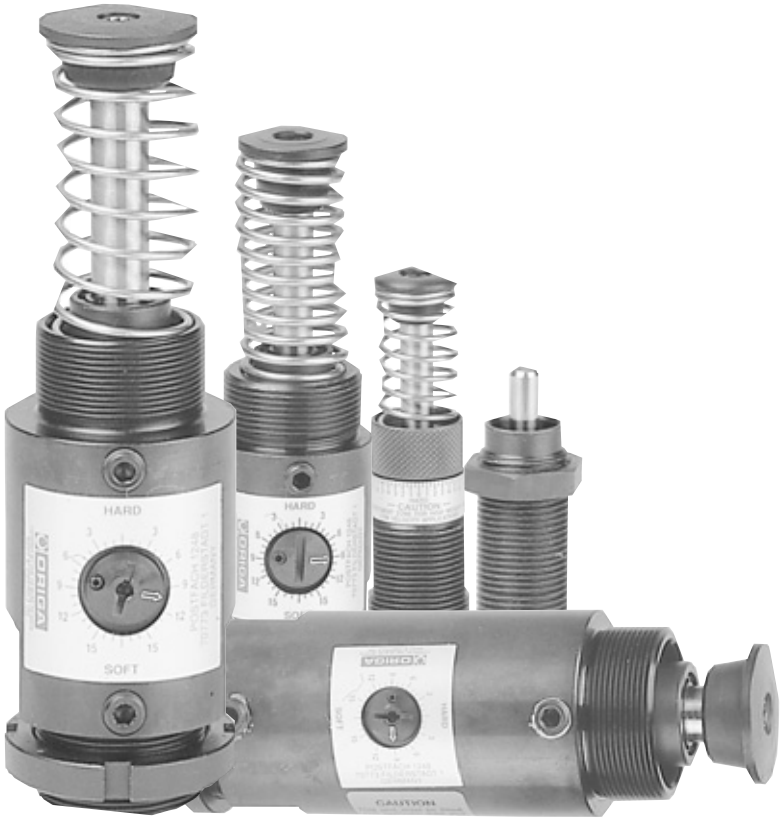
HOERBIGER ORIGA

Industrial Shock Absorbers
Adjustable
Non-adjustable



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The System Concept

SMOOTH, CONTROLLED STOPPING OF MOVING LOADS

HOERBIGER-ORIGA shock absorbers prevent damage to moving parts and to machines and plant:
destructive impact forces are absorbed by controlled linear deceleration.

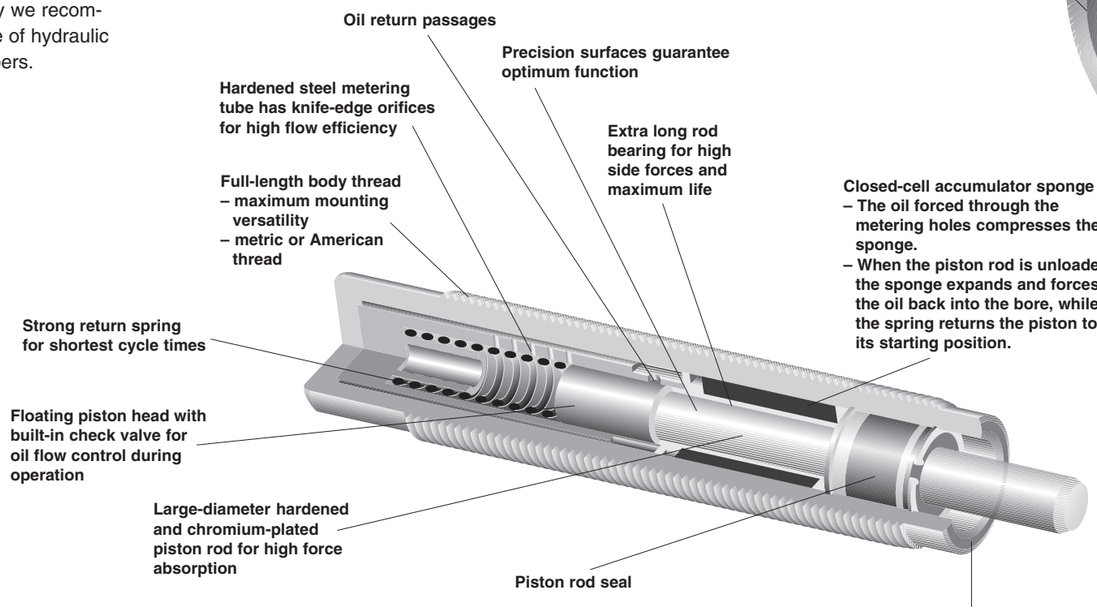
HOERBIGER-ORIGA SHOCK ABSORBERS LET YOU

- increase operating speeds
- increase operating loads
- increase system performance
- increase operating reliability
- reduce stresses on equipment
- reduce production costs
- reduce noise levels

All moving parts in a production process have to be stopped without damage to themselves or to the stopping devices of the machines and plant.
The high impact forces have to be reduced in a controlled manner: to bring a moving load to a standstill, the kinetic energy generated by the movement has to be dissipated.
The heavier the moving load and the faster it moves, the higher the kinetic energy.
In automation especially, shorter and shorter cycle times are demanded, so that stopping times are greatly reduced while kinetic energy levels are dramatically increased. These again have to be dissipated in a controlled manner.

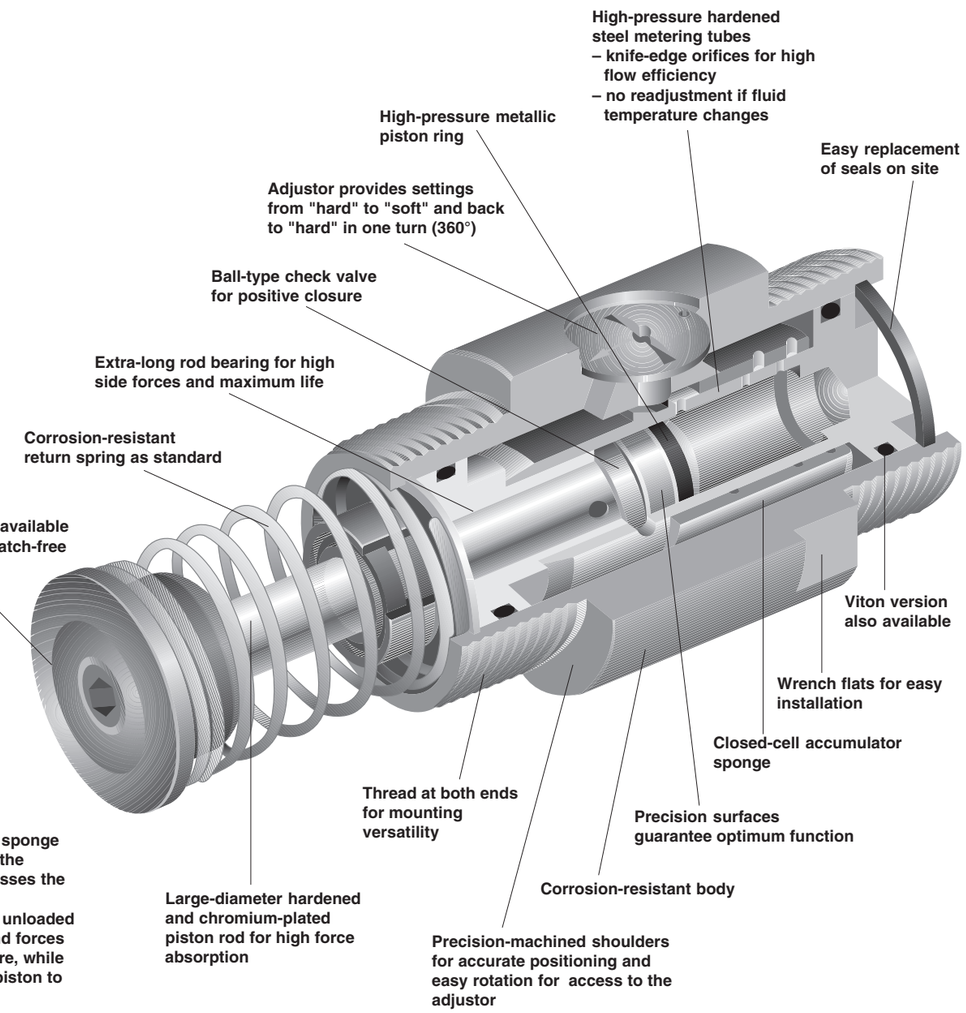
Some commonly used stopping devices such as springs, rubber buffers or dashpots actually increase shock loading instead of reducing it – they do not dissipate energy at a uniform rate.
For smooth dissipation of the kinetic energy we recommend the use of hydraulic shock absorbers.

HOERBIGER-ORIGA shock absorbers convert the kinetic energy generated by the deceleration of the load into thermal energy.
Optimum operating conditions are achieved if the energy is dissipated almost uniformly, i.e. if the moving mass is brought to a halt in the shortest distance, in the shortest time and without sudden peak loads during the stroke.



Operation

A WIDE RANGE OF APPLICATIONS



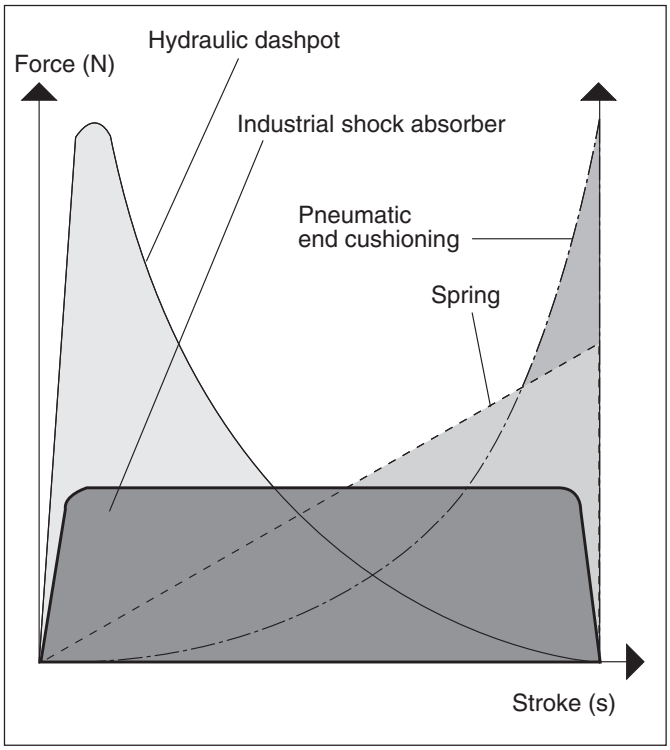
Simplify your design work by installing our shock absorber dimensions on your system. The file is compatible with all popular CAD systems.

ABSORBING SHOCKS

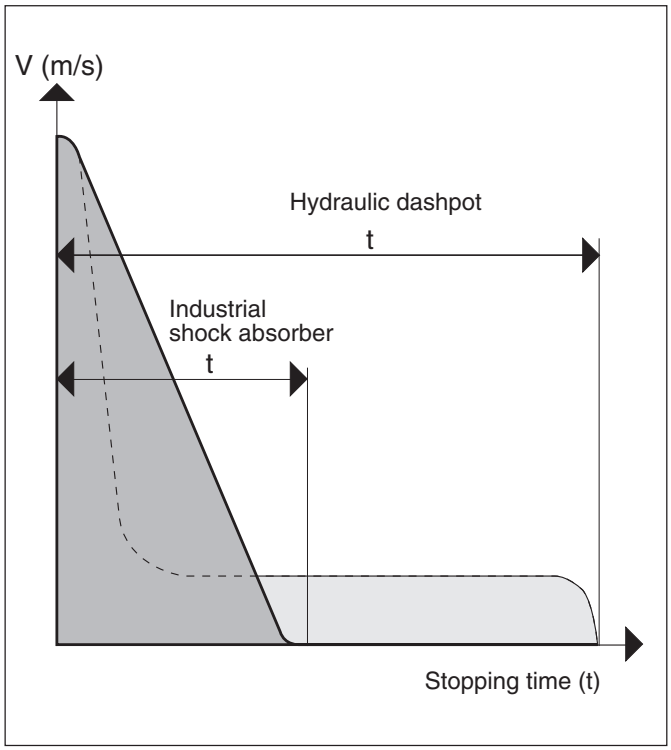
Ordinary shock absorbers, springs, buffers and pneumatic cushioning cannot match the performance of HOERBIGER-ORIGA shock absorbers.
These shock absorbers match the speed and mass of the moving object and bring it smoothly and uniformly to rest.
Springs and buffers, on the other hand, store energy rather than dissipate it.
Although the moving object is stopped, it bounces back and this leads to fatigue in materials and components which can cause premature breakdown of the machine.
Pneumatic cushioning provides a better solution because the energy is actually converted, but because of the compressibility of air the maximum braking force is generated at the end of the stroke, which can lead to excessive loads on components.

Hydraulic dashpots also cause excessive loads because peak resistance comes at the beginning of the stroke and then quickly falls away. This generates unnecessarily high braking forces.

The Force/Stroke Diagram clearly shows these effects. The shock absorber curve is ideal because all the energy is dissipated by linear deceleration without initial impact or final rebound.



Stopping Time
Both damping units stop the same mass from the same speed with the same stroke. Therefore they do the same work but the industrial shock absorber reduces the stopping time by 60 to 70 %.



SELECTION OF SHOCK ABSORBER TYPE

HOERBIGER-ORIGA shock absorbers are available in two main types, to suit different applications and installation requirements. After selection of the appropriate type, sizing is determined by calculation.

COMPACT SERIES WITH FULL-LENGTH BODY THREAD

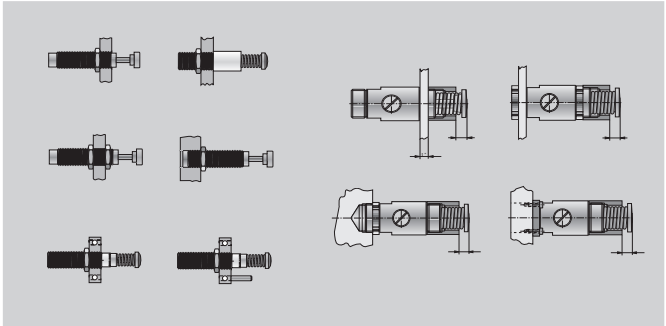
This compact, space-saving series is available in adjustable and non-adjustable versions and can be installed in many different ways, e.g. in a tapped blind hole, in a tapped through-hole, in a clearance hole in a flange or bracket, etc.

UNIVERSAL SERIES

This versatile, adjustable series with various mounting accessories is designed to stop heavier loads. It is especially suited to applications which require several of the same shock absorbers with the same stroke length.

MOUNTING METHODS

HOERBIGER-ORIGA shock absorbers are designed for a variety of mountings, which can be either built into machines or supplied as accessories.



ACCUMULATORS

Normally shock absorbers with internal accumulators are used. This simplifies installation by eliminating external piping and oil storage.
However, in applications with short cycle times and high kinetic energy the oil can become overheated. In this case an external accumulator should be used so that the oil can be cooled in the external circuit.

SHOCK ABSORBER RETURN STROKE

- Piston rod with return spring combined with internal accumulator
- Return stroke actuated by compressed air or mechanically, combined with external accumulator. With this version a delayed return stroke is also possible.

OPTIONS

- Stop collars for front or rear mounting – these provide a positive stop to prevent damage caused by the piston "bottoming out".
  They also allow precise setting of the stroke length.
- Soft pad for the hardened steel button – to avoid surface damage and reduce noise levels.

THE SELECTION OF SHOCK ABSORBERS

CORRECT CHOICE OF SHOCK ABSORBER

The type of shock absorber and its mounting method are mainly determined by the application.
In most applications, shock absorbers with internal accumulators are preferred to those with external accumulators.
Shock absorbers with internal accumulators are supplied prefilled with oil and therefore ready for immediate use, where as shock absorbers with external accumulators require additional equipment, resulting in higher installation costs.

SELECTION CRITERIA

- Type of shock absorber
  - with internal accumulator
  - with external accumulator including air/oil tank
- Type of piston rod return
  - return spring
  - air or mechanical
- Stroke length
  Use the longest stroke possible taking any side loads into account.
  - maximum impact force reduction

ACCUMULATORS

- Internal accumulator
  The fluid displaced by the piston compresses a nitrogen-filled, closed-cell sponge.
  When the piston is unloaded the return spring pushes the piston back to its rest position. At the same time the compressed sponge expands and forces the fluid back into the high pressure chamber.
- External accumulator
  The use of external accumulators is recommended where high energy conversion is needed or excess heat dissipation is required, e.g. in applications with short cycle times or in high temperature areas.

  The external accumulator, consisting of an open or closed tank, is connected to the shock absorber by pipework.
  The oil heated in the shock absorber circulates between the tank and the shock absorber and is therefore continuously cooled during operation.

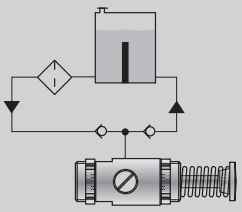
Note:
The tank should always be installed higher than the shock absorber and the connecting pipework should be as short as possible.
If possible there should also be a 10 µm filter between the two units.
If the tank is installed further away from the shock absorber there must be a positive oil circulation system (see diagram) to ensure that the oil actually flows through the tank and is cooled down.

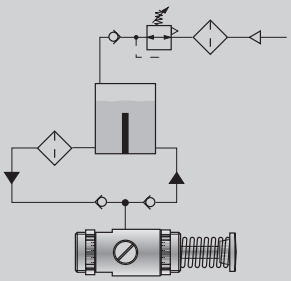
PISTON ROD RETURN

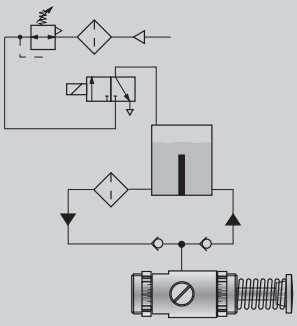
Piston rod return is actuated by

- Return springs
  In the self-contained units, a built-in spring returns the piston rod to its rest position when it is unloaded.
- Air/Oil
  In units with external accumulators an air/oil system or a mechanical device is used for piston rod return.
- Mechanical units
  Mechanical rod return is mostly used in types with a clevis mounting, with actuation by another unit via levers.

HOERBIGER-ORIGA SA-A Series shock absorbers feature steplessly adjustable stroke, time-delay damping and adjustable rod return forces.
The SA Series is fitted with return springs as standard. If these types are used with an external accumulator for better heat dissipation, this does not need to be pressurized because the spring returns the rod.







CALCULATIONS FOR SHOCK ABSORBER SELECTION

SELECTION FACTORS

- How much energy has to be dissipated during each deceleration stroke (cycle)
- How much energy has to be dissipated during one hour of operation
- The Effective Mass

EFFECTIVE MASS

Effective Mass is a very important factor in correctly sizing a shock absorber. It indicates whether the shock absorber can be adjusted to perform properly. It also prevents under- or over-sizing where propelling forces are involved or velocities are very high or very low.

As a general rule, the next larger size of shock absorber is selected if the impact velocity is under 0.3 m/s and/ or the propelling force energy (F x S) exceeds 50 % of the calculated E3 value.

The higher the Effective Mass, the higher the impact force at the end of the shock absorber stroke, whereas low Effective Mass generates very high impact forces at the beginning of the stroke.
These two points have to be considered in the calculation as they can lead to serious damage over a longer period of time..
Minimum/ maximum Effective Mass is laid down for all HOERBIGER-ORIGA shock absorbers (see Table 1.70.001-13).
Effective Mass is calculated using the following formula.

$$\mathbf{M.eff} = \frac{\mathbf{2 \bullet W_3}}{\mathbf{V^2}}$$

SYMBOLS

C	= Cycles per hour
t	= Time in seconds
s	= Shock abs. stroke [m]
V, Vi	= Impact velocity [m/s]
Vt	= Velocity of rotating table [m/s]
g	= Gravitational acceleration [m/s²]
d	= Cylinder diameter [mm]
b	= Radius to centre of gravity [m]
m	= Mass [kg]
ma	= Additional mass [kg]
H	= Height [m]
Fp	= Propelling force [N]
$\mathbf{W_1}$	= Inertial energy [Nm]
$\mathbf{W_2}$	= Propelling force energy [Nm]
$\mathbf{W_3}$	= Total energy per cycle [Nm]
$\mathbf{W_4}$	= Total energy to be dissipated per hour [Nm/h]
P	= Pressure [bar]
M	= Torque [Nm]
$\mathbf{P_m}$	= Motor power [kW]
$\mathbf{R_C}$	= Radius to cylinder [m]
ω	= Angular velocity [rad/s]
M.eff	= Effective Mass
μ	= Coefficient of friction
I	= Moment of inertia [Nm/s]
r	= Radius of table [m]
D	= Distance to shock absorber [m]
2r	= Diameter of table [m]
α	= Slope angle [°]

FORMULAE

$$\mathbf{W_1} = \frac{\mathbf{m \bullet V^2}}{\mathbf{2}} = [\text{Nm}] = \mathbf{m \bullet g \bullet h}\ [\text{Nm}] \quad \textit{inertia and free fall}$$

$$= \frac{1 \bullet \omega^2}{2} = [\text{Nm}] \quad \textit{rotating mass}$$

$$= \frac{m \bullet V_i^2}{4} = [\text{Nm}] \quad \textit{rotating table}$$

$\mathbf{W_2 = Fp \bullet s}$ = [Nm] oder m x g x h *for free-falling mass*

$\mathbf{W_3 = W_1 + W_2}$ [Nm]

$\mathbf{W_4 = W_3 \bullet C}$ [Nm/h]

$\mathbf{Fp} = 0{,}078 \bullet \mathbf{d^2 \bullet P}$ = [N] *determines the cylinder force*

$$\mathbf{Fp} = \frac{2500 \bullet \mathbf{Pm}}{\mathbf{V}} = [\text{N}]$$ *eternines the working force of an electric motor*

$\mathbf{Vt = \omega \bullet a}$ = [m/s] *determines the velocity at distance a from pivot*

$$\mathbf{V} = \sqrt{\mathbf{2 \bullet g \bullet H}} = [\text{m/s}]$$ *determines the impact velocity of a free-falling mass*

$$\mathbf{V_i} = \frac{\mathbf{V \bullet b}}{\mathbf{a}} = [\text{m/s}]$$ *determines the impact velocity of a rotating mass*

$\mathbf{I = m \bullet a^2}$ [Nm/s²]

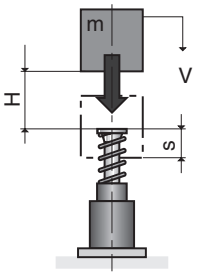
$$\mathbf{t} = \frac{\mathbf{2{,}6 \bullet s}}{\mathbf{V}} = [\text{s}]$$ *determines the stopping time in the course of a stroke*

$$\mathbf{M.eff} = \frac{\mathbf{2 \bullet W_3}}{\mathbf{V^2}} = [\text{kg}]$$ *determines the Effective Mass*

EXAMPLES OF CALCULATIONS FOR SHOCK ABSORBER SELECTION

Example 1 – *Vertical Free-Falling Load*

m = 25 kg
H = 0.4 m
C = 140/h
s = 0.05 m



Calculation

$W_1 = m \cdot g \cdot H$
$= 25 \cdot 9.81 \cdot 0.4$
$= 98$ Nm

$W_2 = m \cdot g \cdot s$
$= 25 \cdot 9.81 \cdot 0.05$
$= 13$ Nm

$W_3 = W_1 + W_2$
$= 98 + 13$
$= 111$ Nm

$W_4 = W_3 \cdot C$
$= 111 \cdot 140$
$= 15540$ Nm/h

$V = \sqrt{2 \cdot g \cdot H}$
$= \sqrt{2 \cdot 9.81 \cdot 0.4}$
$= 2.8$ m/s

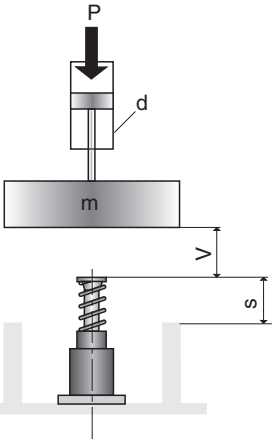
$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 111}{2.8^2}$

$= \frac{222}{7.84} = 28$ kg

Select Type: SA1/2 x 2

Example 2 – *Vertical Load Propelled Downwards*

m = 450 kg
V = 1.2 m/s
d = 50 mm
P = 6 bar
C = 100/h
s = 0.1 m



Calculation

$W_1 = \frac{m \cdot V^2}{2} = \frac{450 \cdot 1.2^2}{2}$

$= 324$ Nm

$F_p = (0{,}078 \cdot d^2 \cdot P) + (g \cdot m)$
$= (0.078 \cdot 50^2 \cdot 6) + (9.81 \cdot 450)$
$= 5585$ N

$W_2 = F_p \cdot s$
$= 5585 \cdot 0.1$
$= 558$ Nm

$W_3 = W_1 + W_2$
$= 324 + 558$
$= 882$ Nm

$W_4 = W_3 \cdot C$
$= 882 \cdot 100$
$= 88200$ Nm/h

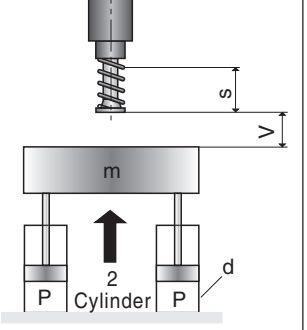
$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 882}{1.2^2}$

$= 1225$ kg

Select Type: SA 1 1/8x4

Example 3 – *Vertical Load Propelled Upwards*

m = 450 kg
V = 1.2 m/s
P = 6 bar
d = 100 mm (2 Cylinders)
s = 0.1 m
C = 200/h



Calculation

$W_1 = \frac{m \cdot V^2}{2} = \frac{450 \cdot 1.2^2}{2}$

$= 324$ Nm

$F_p = 2(0{,}078 \cdot d^2 \cdot P) - (g \cdot m)$
$= 2(0.078 \cdot 100^2 \cdot 6) - (9.81 \cdot 450)$
$= 4950$ N

$W_2 = F_p \cdot s$
$= 4950 \cdot 0.1$
$= 495$ Nm

$W_3 = W_1 + W_2$
$= 324 + 495$
$= 819$ Nm

$W_4 = W_3 \cdot C$
$= 819 \cdot 100$
$= 81900$ Nm/h

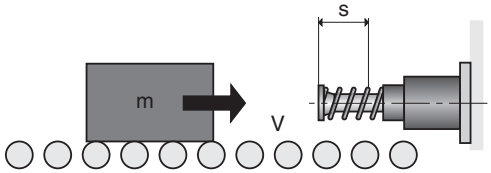
$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 819}{1.2^2}$

$= 1137$ kg

Select Type: SA11/8x4

Example 4 – *Moving Load Without Propelling Force*

m = 900 kg
V = 1.5 m/s
F_p = 0
C = 200/h



Calculation

$W_1 = \frac{m \cdot V^2}{2} = \frac{900 \cdot 1.5^2}{2}$

$= 1012$ Nm

$W_2 = 0$

$W_3 = W_1 + W_2$
$= 1012$

$W_4 = W_3 \cdot C$
$= 1012 \cdot 200$
$= 202400$ Nm/h

$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 1012}{1.5^2}$

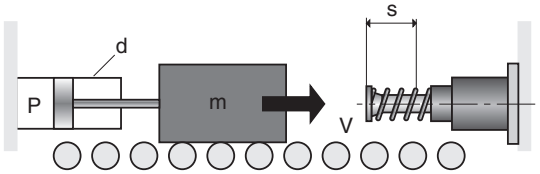
$= 900$ kg

Select Type: SA 1 1/8x4

EXAMPLES OF CALCULATIONS FOR SHOCK ABSORBER SELECTION

Example 5 – *Moving Load With Propelling Force*

m = 900 kg
V = 1.5 m/s
d = 50 mm
P = 6 bar
C = 100/h
s = 0.05 m



Calculation

$W_1 = \frac{m \cdot V^2}{2} = \frac{900 \cdot 1.5^2}{2}$

= 1012 Nm

F_p = **0,078•d²•P**
= 0,078•50²•6
= 1170 N

W_2 = **F_p•s**
= 1170•0,05
= 58.5 Nm

W_3 = **W_1+W_2**
=1012+58.5
=1070.5 Nm

W_4 = **E_3•C**
= 1070.5•100
= 107050 Nm/h

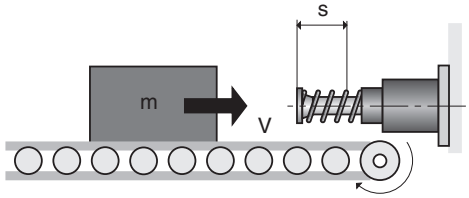
$M.eff = \frac{2 \cdot E_3}{V^2} = \frac{2 \cdot 1070.5}{1.5^2}$

= 951 kg

Select Type: SA 1 1/8x2

Example 7 – *Moving Load Propelled by Rollers (Conveyor with Chain/Belt Drive)*

m = 80 kg
V = 1.0 m/s
μ = 0.3
C = 300/h
s = 0.025 m



Calculation

$W_1 = \frac{m \cdot V^2}{2} = \frac{80 \cdot 1.0^2}{2}$

= 40 Nm

W_2 = **F_p•s**
= 80•0.3•9.81•0.025
= 5.9 Nm

W_3 = **W_1+W_2**
=40+5.9
=45.9 Nm

W_4 = **W_3•C**
= 45.9•300
= 13770 Nm/h

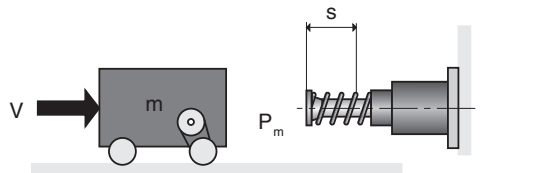
$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 45.9}{1}$

= 91.8 kg

Select Type: SAI 25

Example 6 – *Moving Load Propelled by Motor*

m = 900 kg
V = 1.5 m/s
P_m = 1 kW
C = 100/h
s = 0.05 m



Calculation

$W_1 = \frac{m \cdot V^2}{2} = \frac{900 \cdot 1.5^2}{2}$

= 1012 Nm

$F_p = \frac{2500 \cdot P_m}{V} = \frac{2500 \cdot 1}{1.5}$

= 1666 N

W_2 = **F_p•s**
= 1666•0.05
= 83 Nm

W_3 = **W_1+W_2**
=1012+83
=1095 Nm

W_4 = **W_3•C**
= 1095•100
= 109500 Nm/h

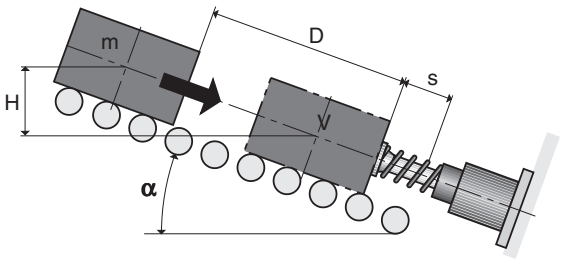
$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 1095}{1.5^2}$

= 973 kg

Select Type: SA1 1/8x2

Example 8 – *Load Moving Down a Slope*

m = 200 kg
α = 15°
H = 0.2 m
C = 100/h
s = 0.05 m



Calculation

W_1 = **m•g•H**
= 200•9.81•0.2
= 392.4 Nm

W_2 = **m•g•sin α•s**
= 200•9.81•0.26•0.05
= 25.51 Nm

W_3 = **W_1+W_2**
= 392,4+25.51
= 417.91 Nm

W_4 = **W_3•C**
= 417.91•100
= 41791 Nm/h

$V = \sqrt{2 \cdot g \cdot H}$

$= \sqrt{2 \cdot 9.81 \cdot 0.2}$

= 1.98 m/s

$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 417.91}{1.98^2}$

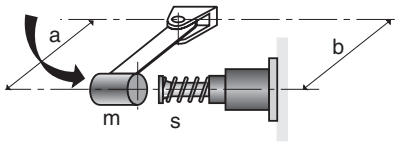
= 213 kg

Select Type: SA 3/4x2

EXAMPLES OF CALCULATIONS FOR SHOCK ABSORBER SELECTION

Example 9 – *Horizontally Moving Load, Rotating*

m = 400 kg
V = 0.4 m/s
a = 0.76 m
b = 0.74 m
F_p = 0
C = 100/h
s = 0.025 m



Calculation

$$W_1 = \frac{m \cdot V^2}{2} = \frac{400 \cdot 0.4^2}{2}$$

= 32 Nm

$$W_2 = F_p \cdot s$$
= 0•0.025
= 0 Nm

$$W_3 = W_1 + W_2$$
= 32 Nm

$$W_4 = W_3 \cdot C$$
= 32•100
= 3200 Nm/h

$$V_i = \frac{V \cdot b}{a} = \frac{0.4 \cdot 0.74}{0.76}$$

= 0.39 m/s

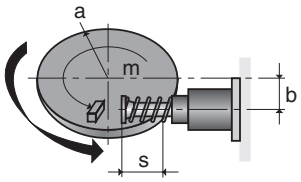
$$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 32}{0.4^2}$$

= 400 kg

Select Type: SA 1/2x1

Example 11 – *Horizontal, Rotary Index Table*

m = 60 kg
V = 0,5 m/s
M = 0
C = 100/h
b = 0.75 m
a = 0.92 m
s = 0.05 m



Calculation

$$W_1 = \frac{m \cdot V^2}{4} = \frac{60 \cdot 0.5^2}{4}$$

= 3.75 Nm

$$W_2 = F_p \cdot s = \frac{M}{b} \cdot s$$
$$= \frac{0}{0.3} \cdot 0.012 = 0$$

$$W_3 = W_1 + W_2$$
= 3.75 Nm

$$W_4 = W_3 \cdot C$$
= 3.75•100
= 375 Nm/h

$$V_i = \frac{V \cdot b}{a} = \frac{0.5 \cdot 0.3}{0.6}$$

= 0.25 m/s

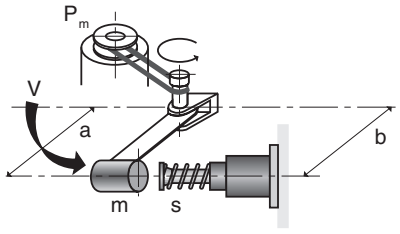
$$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 3.75}{0.5^2}$$

= 30 kg

Select Type: SA 1/4 x 1/2

Example 10 – *Horizontally Propelled Load, Rotating*

m = 400 kg
V = 1.2 m/s
a = 0.76 m
b = 0.74 m
C = 100/h
s = 0.05 m
P_m = **I_{cv}** = 0.735 kW



Calculation

$$W_1 = \frac{m \cdot V^2}{2} = \frac{400 \cdot 1.2^2}{2}$$

= 288 Nm

$$F_p = \frac{2500 \cdot P_m}{V} = \frac{2500 \cdot 0.735}{1.2}$$

= 1531 N

$$W_2 = F_p \cdot s$$
= 1531•0.05 = 77 Nm

$$W_3 = W_1 + W_2$$
= 288+77 = 365 Nm

$$W_4 = W_3 \cdot C$$
= 365•100
= 36500 Nm/h

$$V_i = \frac{V \cdot b}{a} = \frac{1.2 \cdot 0.74}{0,76}$$

= 1.17 m/s

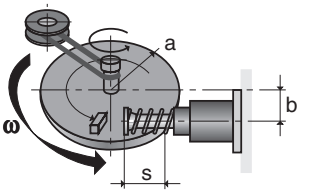
$$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 365}{1.2^2}$$

= 506 kg

Select Type: SA 3/4x2

Example 12 – *Horizontal, Rotary Index Table, Propelled*

m = 400 kg
ω = 2 rad/s
M = 150 Nm
s = 0.05 m
b = 0.75 m
a = 0.92 m
C = 100/h



Calculation

$$V_t = \omega \cdot a$$
= 2•0.92 = 1.84 m/s

$$W_1 = \frac{m \cdot V^2}{4} = \frac{400 \cdot 1.84^2}{4}$$

= 339 Nm

$$W_2 = \frac{M}{b} \cdot s$$
$$= \frac{150}{0.75} \cdot 0.05 = 10 \text{ Nm}$$

$$W_3 = W_1 + W_2$$
=339+10 = 349 Nm

$$W_4 = W_3 \cdot C$$
= 349•100 = 34900 Nm/h

$$V_i = \frac{V \cdot b}{a} = \frac{1.84 \cdot 0.75}{0.92}$$

= 1.5 m/s

$$M.eff = \frac{2 \cdot W_3}{V_i^2} = \frac{2 \cdot 349}{1.5^2}$$

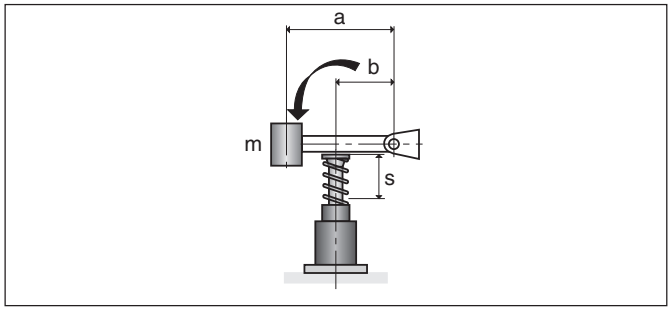
= 310 kg

Select Type: SA 3/4x2

EXAMPLES OF CALCULATIONS FOR SHOCK ABSORBER SELECTION

Example 13 – *Vertical, Rotary*

m = 250 kg
V = 1.2 m/s
a = 0.85 m
b = 0.80 m
C = 100/h
s = 0.05 m



Calculation

$W_1 = \frac{m \cdot V^2}{2} = \frac{250 \cdot 1.2^2}{2}$
= 180 Nm

$F_p = \frac{m \cdot g \cdot a}{b} = \frac{250 \cdot 9.81 \cdot 0.85}{0.80}$
= 2606 N

$W_2 = F_p \cdot s$
= 2606•0.05 = 130 Nm

$W_3 = W_1 + W_2$
=180+130 = 310 Nm

$W_4 = W_3 \cdot C$
= 310•100 = 31000 Nm/h

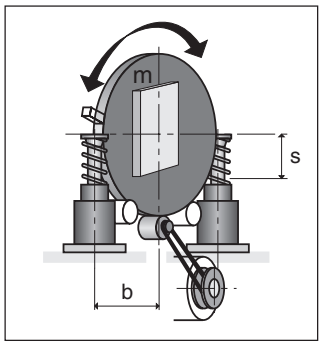
$V_i = \frac{V \cdot b}{a} = \frac{1,2 \cdot 0.8}{0.85}$
= 1.13 m/s

$M.eff = \frac{2 \cdot W_3}{V_i^2} = \frac{2 \cdot 310}{1.13^2}$
= 484 kg

Select Type: SA 3/4x2

Example 14 – *Vertical, Rollover*

m = 340 kg
r = a = 0.8 m
C = 100/h
ω = 1 rad/s
M = 1000 Nm
s = 0.05 m
b = 0.87 m



Calculation

$V = \omega \cdot a$
= 0.8 m/s

$W_1 = \frac{m \cdot V^2}{4} = \frac{340 \cdot 0.8^2}{4}$
= 54.4 Nm

$W_2 = \frac{M \cdot s}{b} = \frac{1000 \cdot 0.05}{0.87}$
= 57.47 Nm

$W_3 = W_1 + W_2$
= 54.4+57.47 = 111.87 Nm

$W_4 = W_3 \cdot C$
= 111.87•100 = 11187 Nm/h

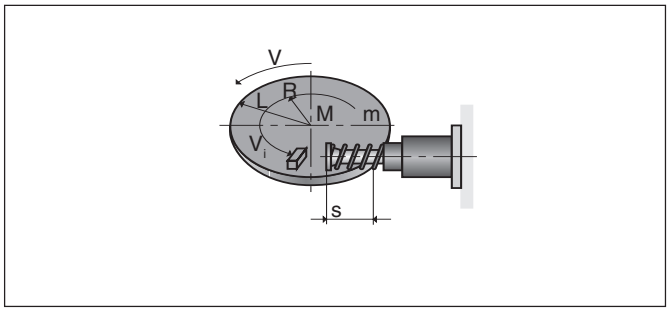
$V_i = \frac{V \cdot b}{a} = \frac{0.8 \cdot 0.87}{0.8}$
= 0.87 m/s

$M.eff = \frac{2 \cdot W_3}{V_i^2} = \frac{2 \cdot 111.87}{0.87^2}$
= 295.6 kg

Select Type: SALD 1/1x2M

Example 15 – *Horizontal, Rotary Movement. Rotary index table, with propelling torque (supplied by pneumatic rotary actuator)*

m = 50 kg
L = 800 mm
V = 0,5 ms $^{-1}$ (average)
R = 500 mm
M = 30 Nm
C = 100/h



Calculation

$W_1 = m \cdot V^2 \cdot 0.25$
= 50•0.5•0.25
= 3.125 Nm

$W_2 = \frac{M \cdot s}{R} = \frac{30 \cdot 0.012}{0.5}$
= 0.72 Nm

$W_3 = W_1 + W_2$
= 3.125+0.72 = 3.845 Nm

$W_4 = W_3 \cdot C$
= 3.845•100 = 384.5 Nm

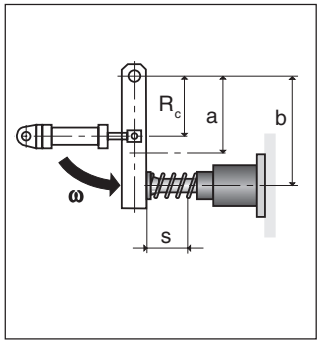
$V_i = \frac{V \cdot R}{L} = \frac{0.5 \cdot 0.225}{0.2}$
= 0,3125 m/s

$M.eff = \frac{2 \cdot W_3}{V_i^2} = \frac{2 \cdot 3.845}{0.3125^2}$
= 78.75 kg

Select Type: SA 20x1

Example 16 – *Vertical, Rotating Beam Propelled by Pneumatic Cylinder*

M = 0.50 kg
d = 0.75 mm
P = 5 bar
ω = 3 rad/s
C = 100/h
a = 0.5 m
b = 0.8 m
s = 0.05 m
R_c = 0.45 m



Calculation

$I = m \cdot a^2$
= 850•0.5^2 = 212 Nm/s^2

$W_1 = \frac{I \cdot \omega^2}{2} = \frac{212 \cdot 3^2}{2}$
= 954 Nm

$F_p = \frac{0.078 \cdot d^2 \cdot P \cdot R_c}{b} = \frac{0.078 \cdot 752 \cdot 5 \cdot 0.45}{0.8}$
= 1234 Nm

$W_2 = F_p \cdot s$
= 1234•0.05 = 62 Nm

$W_3 = W_1 + W_2$
=954+62 =1016 Nm

$W_4 = W_3 \cdot C$
= 1880.46•100 = 188046 Nm/h

$V = \omega \cdot b$
= 3•0.8
= 2.4 Nm/s

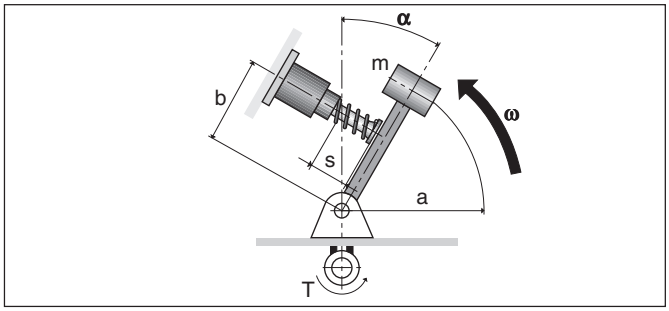
$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 1016}{2.4^2}$
= 353 kg

Select Type: SA 1 1/8x2

EXAMPLES OF CALCULATIONS FOR SHOCK ABSORBER SELECTION

Example 17 – *Vertical, Motor-Driven, Rotating Arm with Load, Against Gravity*

m = 70 kg **ω** = 3 rad/s **C** = 100/h
a = 0.9 m **α** = 30° **s** = 0.05 m
b = 0.7 m **M** = 300 Nm



Calculation

I $= m \cdot a^2$
$= 70 \cdot 0.9 = 57\ Nm/s^2$

$$W_1 = \frac{I \cdot \omega^2}{2} = \frac{57 \cdot 3^2}{2}$$
$= 256$ Nm

$$F_p = \frac{M - (m \cdot g \cdot a \cdot \sin 30°)}{b}$$
$$= \frac{345 - (70 \cdot 9.81 \cdot 0.9 \cdot 0.5)}{0.7} = \frac{36}{0.7}$$
$= 51$ Nm

$W_2 = F_p \cdot s$
$= 51 \cdot 0.05 = 2.5$ Nm

$W_3 = W_1 + W_2$
$= 256 + 2.5 = 258.5$ Nm

$W_4 = W_3 \cdot C$
$= 258.5 \cdot 17 = 45237$ Nm/h

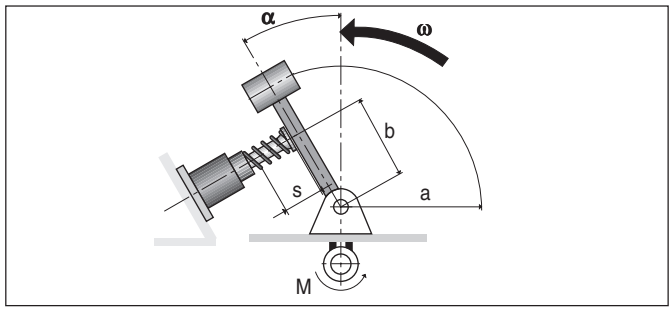
$V = \omega \cdot b$
$= 3 \cdot 0.7$
$= 2.1$ Nm/s

$$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 258.5}{2.1^2}$$
$$= \frac{517}{4.41}$$
$= 117$ kg

Select Type: SA 3/4x2

Example 18 – *Vertical, Motor-Driven Rotating Arm with Load, Aided by Gravity*

m = 160 kg **b** = 0.7 m **α** = 40° **C** = 175/h
a = 0.9 m **ω** = 3 rad/s **M** = 300 Nm **s** = 0.05 m



Calculation

I $= m \cdot a^2$
$= 160 \cdot 0.9 = 130\ Nm/s^2$

$$W_1 = \frac{I \cdot \omega^2}{2} = \frac{130 \cdot 3^2}{2}$$
$= 585$ Nm

$$F_p = \frac{M + (m \cdot g \cdot a \cdot \sin \alpha\ 40°)}{b}$$
$$= \frac{300 + (160 \cdot 9.81 \cdot 0.9 \cdot 0.5)}{0.7} = \frac{1147}{0.7}$$
$= 1638$ Nm

$W_2 = F_p \cdot s$
$= 1638 \cdot 0.05 = 82$ Nm

$W_3 = W_1 + W_2$
$= 585 + 82 = 667$ Nm

$W_4 = W_3 \cdot C$
$= 667 \cdot 175 = 116725$ Nm

$V_i = \omega \cdot b = 3 \cdot 0.7$
$= 2.1$ m/s

$$M.eff = \frac{2 \cdot W_3}{V^2} = \frac{2 \cdot 667}{2.1^2}$$
$$= \frac{1334}{4.41}$$
$= 302$ kg

Select Type: SA 1 1/8x2

OVERVIEW OF ADJUSTABLE AND NON-ADJUSTABLE SHOCK ABSORBERS

Non-Adjustable Shock Absorbers

Type	Stroke (mm)	Effective Mass m_e (kg)		Max. Energy Absorption (Nm)		Thread Size	Data Sheet No.
		Min.	Max.	per stroke W_3	per hour W_4		
SA 10	6.5	1	7	3	22050	M10x1	1.70.002
SA 10S	6.5	3.2	13	3	22050	M10x1	1.70.002
SA 12	10	0.9	16	8.5	28250	M12x1	1.70.003
SA 14	12.5	0.9	10	17	34000	M14x1.5 [1]	1.70.004
SA 14S	12.5	8.6	86	17	34000	M14x1.5 [1]	1.70.004
SA 14S2	12.5	68	205	17	34000	M14x1.5 [1]	1.70.004
SA 20	12.5	2.3	25	25	45000	M20x1.5	1.70.005
SA 20x25	24.6	2.3	16	50.8	68000	M20x1.5	1.70.005
SA 20S	12.5	23	230	25	45000	M20x1.5	1.70.005
SA 20Sx25	24.6	9	59	50.8	68000	M20x1.5	1.70.005
SA 20S2	12.5	182	910	25	45000	M20x1.5	1.70.005
SA 20S2x25	24.6	36	227	50.8	68000	M20x1.5	1.70.005
SAI 25	25.4	9	136	68	68000	M25x1.5	1.70.006
SAI 25S	25.4	113	1130	68	68000	M25x1.5	1.70.006
SAI 25S2	25.4	400	2273	68	68000	M25x1.5	1.70.006
SA 33x25	25.4	9	36	153	84739	M33x1.5	1.70.007
SA 33Sx25	25.4	30	124	153	84739	M33x1.5	1.70.007
SA 33S2x25	25.4	104	418	153	84739	M33x1.5	1.70.007
SA 33S3x25	25.4	354	1418	153	84739	M33x1.5	1.70.007
SA 33x50	50.8	18	73	305	98297	M33x1.5	1.70.007
SA 33Sx50	50.8	61	247	305	98297	M33x1.5	1.70.007
SA 33S2x50	50.8	209	836	305	98297	M33x1.5	1.70.007
SA 33S3x50	50.8	709	2836	305	98297	M33x1.5	1.70.007
SA 45x25	25.4	22	91	339	124284	M45x1.5	1.70.008
SA 45Sx25	25.4	77	309	339	124284	M45x1.5	1.70.008
SA 45S2x25	25.4	261	1045	339	124284	M45x1.5	1.70.008
SA 45S3x25	25.4	886	3545	339	124284	M45x1.5	1.70.008
SA 45x50	50.8	45	182	678	146881	M45x1.5	1.70.008
SA 45Sx50	50.8	154	618	678	146881	M45x1.5	1.70.008
SA 45S2x50	50.8	522	2091	678	146881	M45x1.5	1.70.008
SA 45S3x50	50.8	1772	7091	678	146881	M45x1.5	1.70.008
SA 45x75	76.2	68	273	1017	180776	M45x1.5	1.70.008
SA 45Sx75	76.2	231	927	1017	180776	M45x1.5	1.70.008
SA 45S2x75	76.2	786	3145	1017	180776	M45x1.5	1.70.008
SA 45S3x75	76.2	2659	10636	1017	180776	M45x1.5	1.70.008
SA 64x50	50.8	136	545	1695	169478	M64x2	1.70.009
SA 64Sx50	50.8	463	1855	1695	169478	M64x2	1.70.009
SA 64S2x50	50.8	1572	6291	1695	169478	M64x2	1.70.009
SA 64S3x50	50.8	5318	21273	1695	169478	M64x2	1.70.009
SA 64x100	101.6	272	1091	3390	225970	M64x2	1.70.009
SA 64Sx100	101.6	927	3709	3390	225970	M64x2	1.70.009
SA 64S2x100	101.6	3145	12582	3390	225970	M64x2	1.70.009
SA 64S3x100	101.6	10636	42545	3390	225970	M64x2	1.70.009
SA 64x150	152.4	409	1636	5084	282463	M64x2	1.70.009
SA 64Sx150	152.4	1390	5564	5084	282463	M64x2	1.70.009
SA 64S2x150	152.4	4718	18873	5084	282463	M64x2	1.70.009
SA 64S3x150	152.4	15954	63818	5084	282463	M64x2	1.70.009

[1] Option: Gewinde M14x1

OVERVIEW OF ADJUSTABLE AND NON-ADJUSTABLE SHOCK ABSORBERS

Adjustable Shock Absorbers

Type	Stroke (mm)	Effective Mass m_e (kg)		Max. Energy Absorption (Nm)		Thread Size	Data Sheet No.
		Min.	Max.	per stroke W_3	per hour W_4		
SA 1/4 x 1/2	12.7	2.3	182	17	23000	M20x1.5	1.70.100
SA 3/8 x 1D	25.4	4.5	546	70	46000	M25x1.5 [2]	1.70.101
SALD 1/2 x 1M	25.4	4.5	1134	136	85000	M36x1.5	1.70.102
SALD 1/2 x 2M	50.8	9.5	2268	271	98000	M36x1.5	1.70.102
SA 1/2 x 1	25.4	4.5	545	130	86000	M33x1.5	1.70.103
SA 1/2 x 2	50.8	9.5	950	270	100000	M33x1.5	1.70.103
SA 3/4 x 1	25.4	27	3600	290	126500	M42x1.5	1.70.104
SA 3/4 x 2	50.8	43	6350	600	150000	M42x1.5	1.70.104
SA 3/4 x 3	76	55	9500	890	184000	M42x1.5	1.70.104
SA 1-1/8 x 2	50.8	72	13000	1380	172600	M64x2.0	1.70.105
SA 1-1/8 x 4	102	118	18200	2700	230000	M64x2.0	1.70.105
SA 1-1/8 x 6	152	200	32000	4150	288000	M64x2.0	1.70.105
SA-A 3/4 x 1	25.4	27	3600	290	184000 [3]	M42x1.5	1.70.106
SA-A 3/4 x 2	50.8	43	6350	600	230000 [3]	M42x1.5	1.70.106
SA-A 3/4 x 3	76	55	9500	890	276000 [3]	M42x1.5	1.70.106
SA-A 1-1/8 x 2	50.8	72	13000	1380	345000 [3]	M64x2.0	1.70.107
SA-A 1-1/8 x 4	102	118	18200	2700	460000 [3]	M64x2.0	1.70.107
SA-A 1-1/8 x 6	152	200	32000	4150	575000 [3]	M64x2.0	1.70.107

[1] Option: M14x1 thread [2] Option: M27x3 thread [3] Operation with external air-oil tank

Further shock absorber sizes (1-1/2", 2", 2-1/4", 3", 4") in various stroke lengths are also available on request

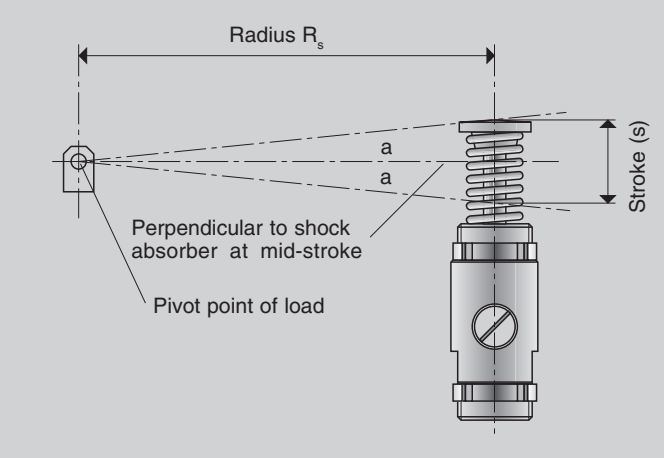
INSTALLATION TIPS

Mounting

HOERBIGER-ORIGA shock absorbers should generally be mounted on a rigid structure with adequate strength. The strength required should be calculated by the following formula:

$$\frac{2{,}5 \bullet W_3 \text{ (max)}}{S}$$

Avoid sideloads of more than 5° and align the centreline of the piston as closely as possible with the centre of gravity of the impacting load (see diagram).



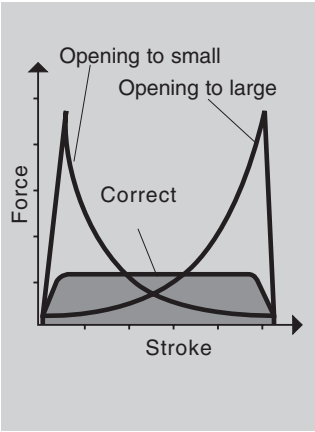
Installation Angle (a)	$\frac{S}{R_S}$	a	$\frac{S}{R_S}$	a
The installation angle (a) is found by dividing the shock absorber stroke (S) by the radius of the shock absorber from the pivot point (R). The installation angle should never exceed 5°. If it does, a shorter stroke or a longer radius must be used.	.0175	1/2°	.1051	3°
	.0349	1°	.1228	31/2°
	.0524	11/2°	.1405	4°
	.0699	2°	.1584	41/2°
	.0875	21/2°	.1763	5°

Positive Stops

External positive stops are always required to produce a firm work-positioning and prevent the shock absorber from "bottoming out". This is achieved either with external dead stops or a stop collar. These are located to stop the piston no more than 1.6 mm short of the end of stroke.

Oil Filling

HOERBIGER-ORIGA shock absorbers with return springs are supplied prefilled with oil and ready for immediate use without any additional pipework etc..
For shock absorbers without return springs an external accumulator or air/oil tank is required.
The air/oil tank is filled with the correct oil up to the "Full" mark (do not overfill), then the shock absorber can be operated at low speed while it is being finally adjusted.



Adjustment

All HOERBIGER-ORIGA shock absorbers are supplied with their adjustment preset at 90°, which is midway between the "hard" and "soft" settings.
To adjust the shock absorber, first loosen the adjustor's lock screw with an Allan key.
Then impact the load slowly on the shock absorber. If the initial impact is too hard, use a screwdriver or coin to rotate the adjustor towards "soft" (18) on the dial. If the initial impact is too soft, rotate the adjustor in the opposite direction towards "hard" (0). When the setting is correct, retighten the adjustor's lock screw with the Allan key.
The shock absorber is properly adjusted when there is no initial impact at the start of the stroke and no hard set-down at the end of the stroke.
If hard set-down persists despite proper adjustment, check whether the positive stop is set correctly to keep the shock absorber piston no more than 1.6 mm off the bottom at end of stroke.

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SA
SA 10
- For smaller effective masses

SA 10 S
- For larger effective masses

Basic Version with:
• Integral stop collar
• 1 mounting nut
• Soft pad

Accessories:
• Universal flange

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 10	6.5	1	7	3	22050
SA 10 S	6.5	3.2	13	3	22050

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.15 - 2.2
Operating temperature range		°C	-10 to +70
Installation			In any position
Force of internal return spring		N	3 - 6
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	0.015
Min. mounting strength required		N	1200 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

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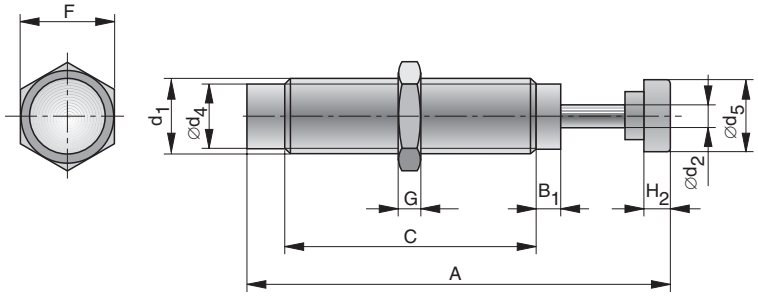
The right to make technical modifications is reserved

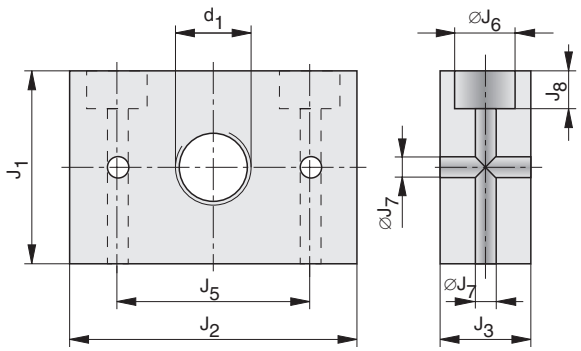
HOERBIGER ORIGA

Dimensions (mm)

Type: SA 10, SA 10 S



Dimensions (mm)
Universal Flange



Dimensions Table (mm)

A	B_1	C	d_1	ød_2	ød_4	ød_5	F	G	H_2	J_1	J_2	J_3	J_5	øJ_6	øJ_7	J_8
50.8	3.3	33.3	M10x1	3	8.6	8.6	12.5	3	3.6	25.4	38	12	25.4	8	4.5	5

Order Instructions

Product	Order Instructions	
	Type	**Order No.**
Shock absorber for smaller effective masses	**SA 10**	**7900**
Shock absorber for larger effective masses	**SA 10 S**	**7907**
Additional mounting nut	**LN 10**	**7909**
Universal flange	**UM 10**	**7902**

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SA
SA 12

Basic Version with :
• Integral stop collar
• 1 mounting nut

Accessories:
• Soft pad
• Universal flange

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 12	10	0.9	16	8.5	28250

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	4.5 - 11
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	0.040
Min. mounting strength required		N	2200 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.003E-1

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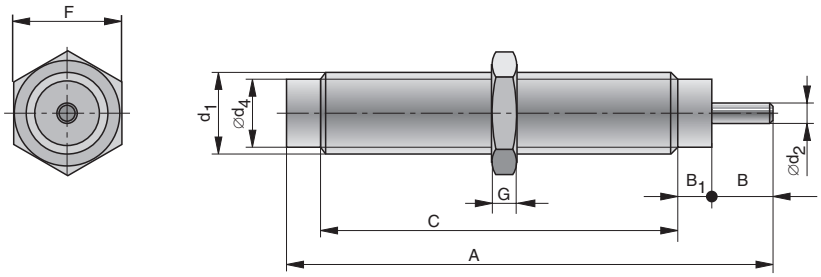
The right to make technical modifications is reserved

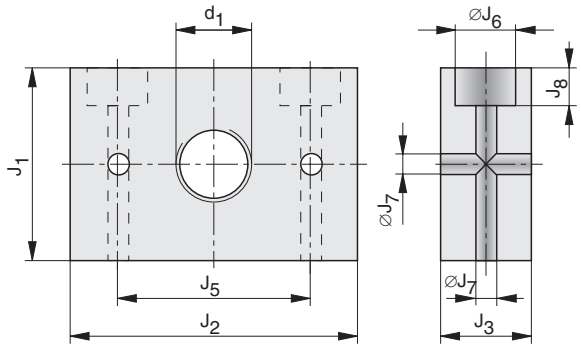
HOERBIGER ORIGA

Dimensions (mm)

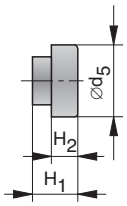
Type: SA 12



Dimensions (mm)
Universal Flange



Dimensions (mm)
Soft Pad



Dimensions Table (mm)

A	B	B_1	C	d_1	ød_2	ød_4	ød_5	F	G	H_1	H_2	J_1	J_2	J_3	J_5	øJ_6	øJ_7	J_8
66.4	9.7	5.1	45	M12x1	3.3	10.4	10.4	16	4	6.1s	3	25.4	38	12	25.4	8	4.5	5

Order Instructions

Product	Order Instructions	
	Type	**Order No.**
Shock absorber	**SA 12**	**7910**
Soft pad	**SP 12**	**7914**
Additional mounting nut	**LN 12**	**7919**
Universal flange	**UM 12**	**7912**

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SA
SA 14
- For smaller effective masses

SA 14 S
- For intermediate effective masses

SA 14 S2
- For larger effective masses

Basic Version with:
• Integral stop collar
• 1 mounting nut

Accessories:
• Soft pad
• Universal Flange

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 14	12.5	0.9	10	17	34000
SA 14 S	12.5	8.6	86	17	34000
SA 14 S2	12.5	68	205	17	34000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	4 - 7
Max. deviation of impacting force from centre axis of shock absorber		±3°	
Weight (mass)		kg	0.125
Min. mounting strength required		N	3400 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.004E-1

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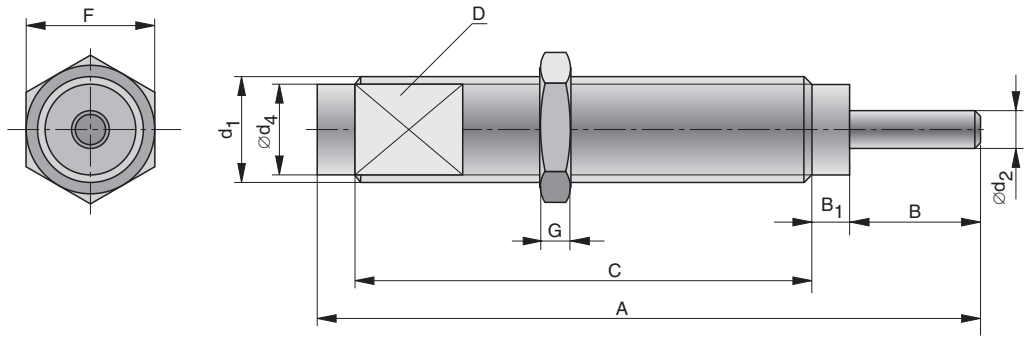
The right to make technical modifications is reserved

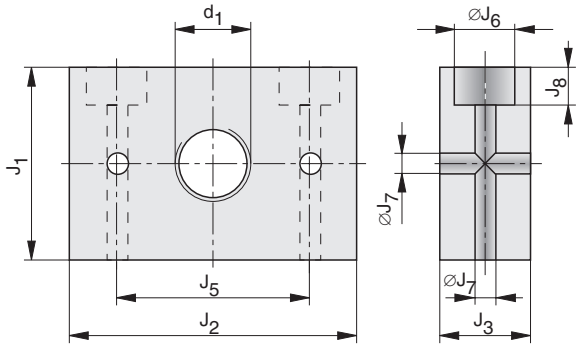
HOERBIGER ORIGA

Dimensions (mm)

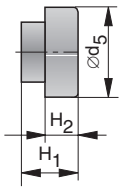
Type: SA 14, SA 14 S, SA 14 S2



Dimensions (mm)
Universal Flange



Dimensions (mm)
Soft Pad



Dimensions table (mm)

A	B	B_1	C	D	d_1	ød_2	ød_4	ød_5	F	G	H_1	H_2	J_1	J_2	J_3	J_5	øJ_6	øJ_7	J_8
87	12	4	61	12	M14x1.5 [1]	4.8	12	11.9	17	5	10.9	6.9	29	45	16	35	8	4.5	5

[1] Option: M14x1 thread (d_1)

Order Instructions

Product	Order Instructions	
	Type	Order No.
Shock absorber for smaller effective masses	**SA 14**	**7920**
Shock absorber for intermediate effective masses	**SA 14 S**	**7927**
Shock absorber for larger effective masses	**SA 14 S2**	**7928**
Soft pad	**SP 14**	**7924**
Additional mounting nut	**LN 14**	**7929**
Universal flange	**UM 14**	**7922**

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 20	12.5	2.3	25	25	45000
SA 20 S	12.5	23	230	25	45000
SA 20 S2	12.5	182	910	25	45000
SA 20x25	24.6	2.3	16	50.8	68000
SA 20 Sx25	24.6	9	59	50.8	68000
SA 20 S2x25	24.6	36	227	50.8	68000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	6 - 10
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	0.176 (Type SA20), 0.207 (Type SA20x25)
Min. mounting strength required		N	5000 [1]
Materials	Body		Steel, black oxid e finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.005E-1

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SA

– For smaller effective masses
SA 20 – Stroke 12,5 mm
SA 20x25 – Stroke 24,6 mm

– For intermediate effective masses
SA 20 S – Stroke 12,5 mm
SA 20 Sx25 – Stroke 24,6 mm

– For larger effective masses
SA 20 S2 – Stroke 12,5 mm
SA 20 S2x25 – Stroke 24,6 mm

Basic Version with:
• Integral stop collar
• 1 mounting nut

Accessories:
• Soft pad
• Universal flange

HOERBIGER ORIGA

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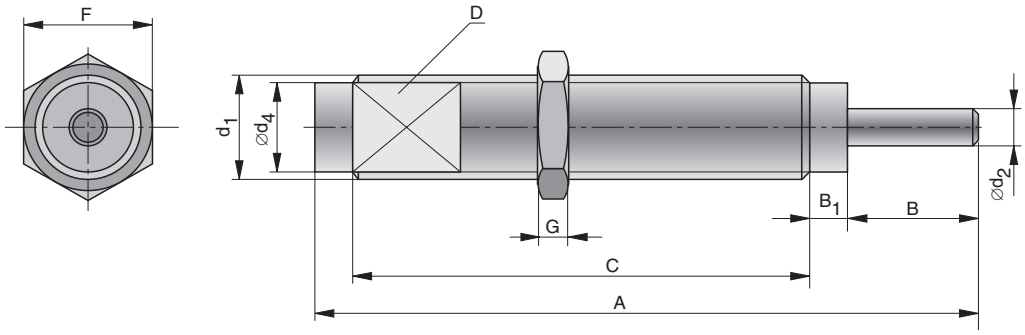
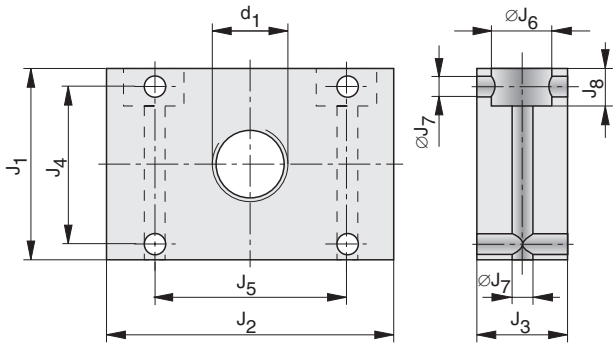
The right to make technical modifications is reserved

Dimensions (mm)

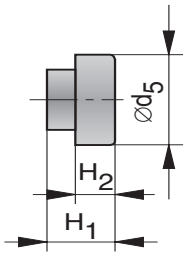
Type: SA 20, SA 20 S, SA 20 S2



Dimensions (mm)
Universal Flange



Dimensions (mm)
Soft Pad



Dimensions Table (mm)

Type	A	B	B_1	C	D	d_1	ød_2	ød_4	ød_5	F
SA 20	89	12	5.6	61.7	17	M20x1.5	6.4	17	17	23.9
SA 20x25	140.5	24.6	5.6	100.3	17	M20x1.5	6.4	17	17	25.4

Type	G	H_1	H_2	J_1	J_2	J_3	J_4	J_5	øJ_6	øJ_7	J_8
SA 20	6	10.7	4.7	35	46	16	25.4	35	10.4	5.5	10.4
SA 20x25	6	10.7	4.7	35	46	16	25.4	35	10.4	5.5	10.4

Order Instructions

Product		Order Instructions Type	Order No.
Shock absorber	– stroke 12.5 mm	**SA 20**	**7930**
– for smaller effective masses	– stroke 24.6 mm	**SA 20x25**	**7700**
Shock absorber	– stroke 12.5 mm	**SA 20 S**	**7937**
– for intermediate effective masses	– stroke 24.6 mm	**SA 20 Sx25**	**7701**
Shock absorber	– stroke 12.5 mm	**SA 20 S2**	**7938**
– for larger effective masses	– strokeb 24.6 mm	**SA 20 S2x25**	**7702**
Soft pad		**SP 20**	**7934**
Additional mounting nut		**LN 20**	**7939**
Universal flange		**UM 20**	**7932**

ORIGA Shock Absorbers

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SAI 25	25.4	9	136	68	68000
SAI 25 S	25.4	113	1130	68	68000
SAI 25 S2	25.4	400	2273	68	68000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	19 - 37
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	0.327
Min. mounting strength required		N	6700 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SAI

SAI 25
- For smaller effective masses

SAI 25 S
- For intermediate effective masses

SAI 25 S2
- For larger effective masses

Basic Version with:
• Integral stop collar
• 1 mounting nut

Accessories:
• Soft pad
• Universal flange

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.006E-1

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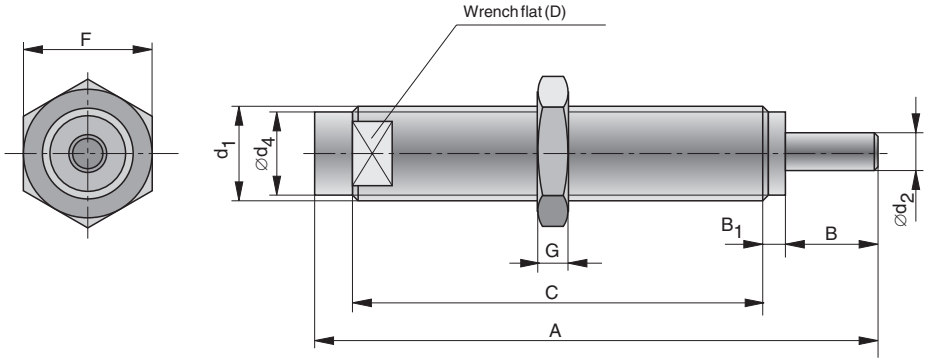
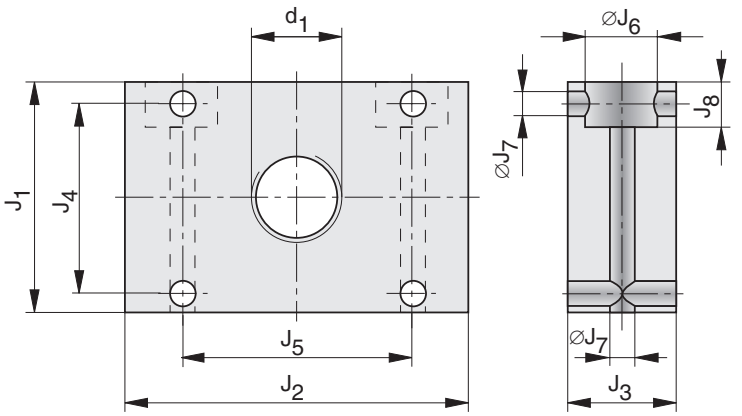
The right to make technical modifications is reserved

Dimensions (mm)

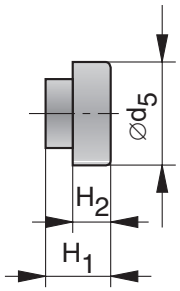
Type: SAI 25, SAI 25 S, SAI 25 S2



Dimensions (mm)
Universal Flange



Dimensions (mm)
Soft Pad



Dimensions Table (mm)

A	B	B_1	C	D	d_1 *	ød_2	ød_4	ød_5	F	G	H_1	H_2	J_1	J_2	J_3	J_4	J_5	øJ_6	øJ_7	J_8
149.1	24.6	4.6	107.2	22	M25x1.5	7.9	22.4	22.3	30	8	11	4.7	35	47	16	25.5	35	10.4	5.5	10.4

* Option M27x3 on request

Order Instructions

Product	Order Instructions	
	Type	**Order No.**
Shock absorber for smaller effective masses	**SAI 25**	**7834**
Shock absorber for intermediate effective masses	**SAI 25 S**	**7835**
Shock absorber for larger effective masses	**SAI 25 S2**	**7836**
Soft pad	**SP-25**	**7837**
Additional mounting nut	**LN-25**	**7959**
Universal flange	**UM-25**	**7952**

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 33x25	25.4	9	36	153	84739
SA 33Sx25	25.4	30	124	153	84739
SA 33S2x25	25.4	104	418	153	84739
SA 33S3x25	25.4	354	1418	153	84739
SA 33x50	50.8	18	73	305	98297
SA 33Sx50	50.8	61	247	305	98297
SA 33S2x50	50.8	209	836	305	98297
SA 33S3x50	50.8	709	2836	305	98297

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 to 4.6
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	on request
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	Type SA33..-25 – on request Type SA33..-50 – on request
Min. mounting strength required		N	on request [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.007E-1

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SA

- For smaller effective masses
  SA 33x25 – Stroke 25.4 mm
  SA 33x50 – Stroke 50.8 mm

- For intermediate effective masses
  SA 33Sx25 – Stroke 25.4 mm
  SA 33Sx50 – Stroke 50.8 mm

- For larger effective masses
  SA 33S2x25 – Stroke 25.4 mm
  SA 33S2x50 – Stroke 50.8 mm

- For high effective masses
  SA 33S3x25 – Stroke 25.4 mm
  SA 33S3x50 – Stroke 50.8 mm

Basic Version with:
• 1 mounting nut

Accessories:
• Soft pad
• Rectangular flange
• Foot mounting
• Stop collar

HOERBIGER ORIGA

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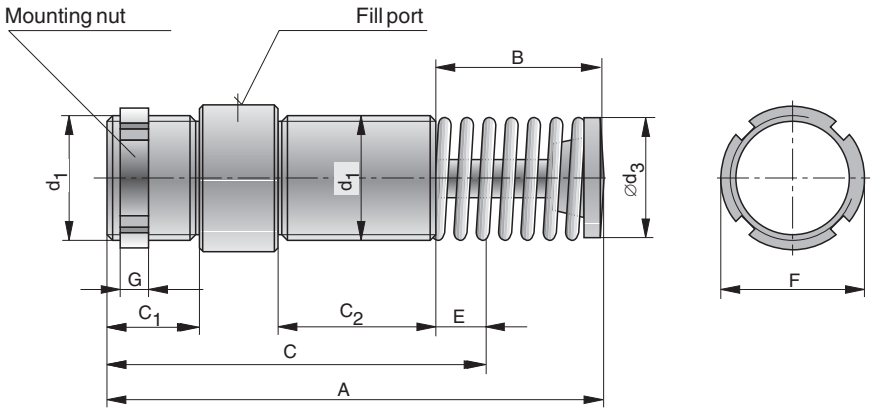
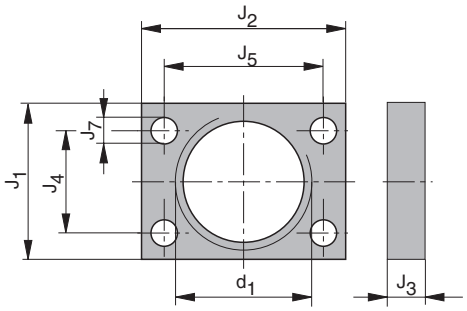
The right to make technical modifications is reserved

Dimensions (mm)

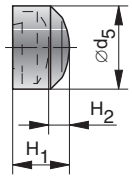
Type: SA 33..x25, SA 33..x50



Dimensions (mm)
Rectangular Flange

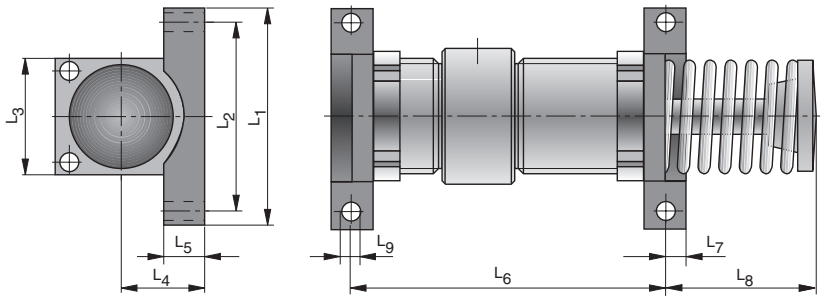


Dimensions (mm)
Soft Pad

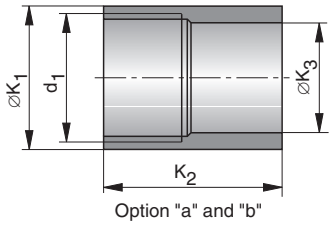


Note:
Cannot be used with stop collar

Dimensions (mm)
Foot Mounting



Dimensions (mm)
Stop collar



Option "a" - for rear mounting
Option "b" - for front mounting

Dimension Table (mm)

Type	A	B	C	C_1	C_2	d_1	$Ød_3$	$Ød_5$	E	ØF	G	H_1	H_2	J_1
SA 33..x25	138.1	55.6	112.7	25.4	38.1	M33x1.5	25.4	31.8	30.2	38	6.4	19.1	11.2	38.1
SA 33..x50	188.9	81	138.1	25.4	53.8	M33x1.5	25.4	31.8	30.2	38	6.4	19.1	11.2	38.1

Type	J_2	J_3	J_4	J_5	$ØK_1$	K_2a	K_2b	$ØK_3$	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA 33..x25	50.8	9.7	28.7	41.4	38.1	47.6	41.3	28.6	69.9	60.3	50.8	22.2	12.7	95.3	6.4	49.2	5.6
SA 33..x50	50.8	9.7	28.7	41.4	38.1	47.6	41.3	28.6	69.9	60.3	50.8	22.2	12.7	121	6.4	74.6	5.6

Order Instructions

Product		Order Instructions Type	Order No.
Shock absorber for smaller effective masses	– stroke 25.4 mm	**SA 33x25**	**8041**
	– stroke 50.8 mm	**SA 33x50**	**8045**
Shock absorber for intermediate masses	– stroke 25.4 mm	**SA 33Sx25**	**8042**
	– stroke 50.8 mm	**SA 33Sx50**	**8046**
Shock absorber for larger masses	– stroke 25.4 mm	**SA 33S2x25**	**8043**
	– stroke 50.8 mm	**SA 33S2x50**	**8047**
Shock absorber for high masses	– stroke 25.4 mm	**SA 33S3x25**	**8044**
	– stroke 50.8 mm	**SA 33S3x50**	**8048**
Stop collar Option "a"	for rear mounting	**SC1/2A**	**7971**
Stop collar Option "b"	for front mounting	**SC1/2B**	**7977**
Soft pad		**SP1/2**	**7974**
Additional mounting nut		**LN1/2**	**7979**
Rectangular flange		**RF1/2**	**7972**
Foot mounting		**FM1/2**	**7973**

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 45x25	25.4	22	91	339	124284
SA 45Sx25	25.4	77	309	339	124284
SA 45S2x25	25.4	261	1045	339	124284
SA 45S3x25	25.4	886	3545	339	124284
SA 45x50	50.8	45	182	678	146881
SA 45Sx50	50.8	154	618	678	146881
SA 45S2x50	50.8	522	2091	678	146881
SA 45S3x50	50.8	1772	7091	678	146881
SA 45x75	76.2	68	273	1017	180776
SA 45Sx75	76.2	231	927	1017	180776
SA 45S2x75	76.2	786	3145	1017	180776
SA 45S3x75	76.2	2659	10636	1017	180776

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 to 4.6
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	on request
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	Type SA45..-25 – on request Type SA45..-50 – on request Type SA45..-75 – on request
Min. mounting strength required		N	on request [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.008E-1

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SA

- For smaller effective masses
  SA 45x25 – Stroke 25.4 mm
  SA 45x50 – Stroke 50.8 mm
  SA 45x75 – Stroke 76.2 mm

- For intermediate effective masses
  SA 45Sx25 – Stroke 25.4 mm
  SA 45Sx50 – Stroke 50.8 mm
  SA 45Sx75 – Stroke 76.2 mm

- For larger effective masses
  SA 45S2x25 – Stroke 25.4 mm
  SA 45S2x50 – Stroke 50.8 mm
  SA 45S2x75 – Stroke 76.2 mm

- For high effective masses
  SA 45S3x25 – Stroke 25.4 mm
  SA 45S3x50 – Stroke 50.8 mm
  SA 45S3x75 – Stroke 76.2 mm

Basic Version with:
• 1 mounting nut

Accessories:
• Soft pad
• Rectangular flange
• Foot mounting
• Stop collar

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ORIGA

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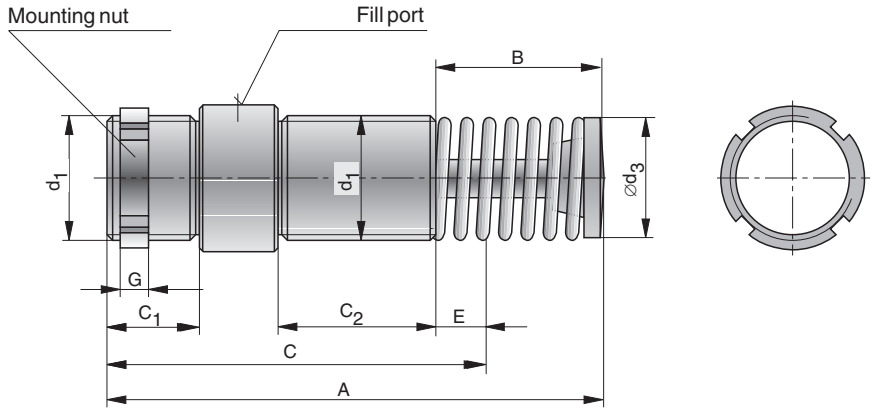
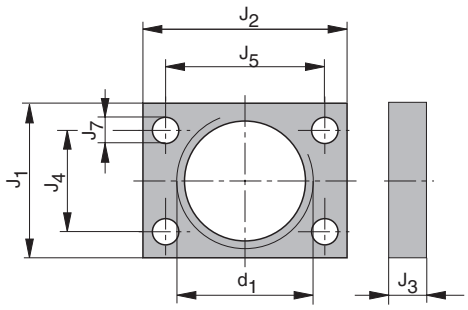
The right to make technical modifications is reserved

Dimensions (mm)

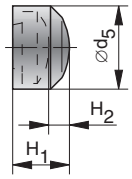
Type: SA 45..x25, SA 45..x50, SA45..x75



Dimensions (mm)
Rectangular Flange

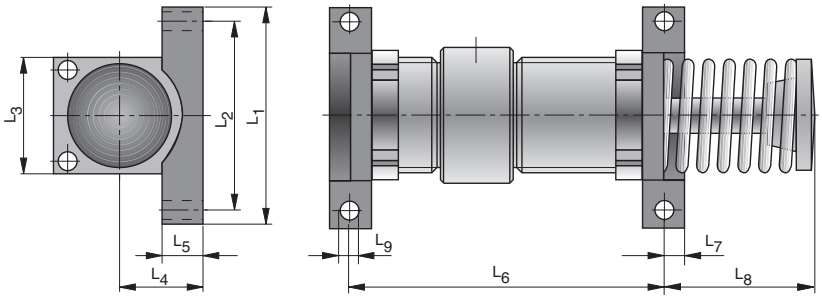


Dimensions (mm)
Soft Pad

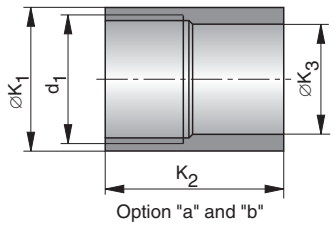


Note:
Cannot be used with stop collar

Dimensions (mm)
Foot Mounting



Dimensions (mm)
Stop collar



Option "a" - for rear mounting
Option "b" - for front mounting

Dimension Table (mm)

Type	A	B	C	C_1	C_2	d_1	Ød_3	Ød_5	E	G	H_1	H_2	J_1
SA 45..x25	144.5	50	119.1	34.8	40.4	M45x1.5	38.1	44.5	24.6	9.7	25.4	17.5	57.2
SA 45..x50	195.3	75.4	144.5	34.8	60.2	M45x1.5	38.1	44.5	24.6	9.7	25.4	17.5	57.2
SA 45..x75	246.1	100.8	169.9	34.8	72.9	M45x1.5	38.1	44.5	24.6	9.7	25.4	17.5	57.2

Type	J_2	J_3	J_4	J_5	ØK_1	K_2a	K_2b	ØK_3	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA 45..x25	76.2	12.7	41.4	60.5	on request				95.3	72.2	57.2	29.4	14.2	85.5	9.5	52.3	8.7
SA 45..x50	76.2	12.7	41.4	60.5	on request				95.3	72.2	57.2	29.4	14.2	111	9.5	77.7	8.7
SA 45..x75	76.2	12.7	41.4	60.5	on request				95.3	72.2	57.2	29.4	14.2	111	9.5	103	8.7

Order Instructions

Product		Order Instructions Type	Order No.
Shock absorber for smaller effective masses	– stroke 25.4 mm	**SA 45x25**	**8049**
	– stroke 50.8 mm	**SA 45x50**	**8053**
	– stroke 76.2 mm	**SA 45x75**	**8057**
Shock absorber for intermediate masses	– stroke 25.4 mm	**SA 45Sx25**	**8050**
	– stroke 50.8 mm	**SA 45Sx50**	**8054**
	– stroke 76.2 mm	**SA 45Sx75**	**8058**
Shock absorber for larger masses	– stroke 25.4 mm	**SA 45S2x25**	**8051**
	– stroke 50.8 mm	**SA 45S2x50**	**8055**
	– stroke 76.2 mm	**SA 45S2x75**	**8059**
Shock absorber for high masses	– stroke 25.4 mm	**SA 45S3x25**	**8052**
	– stroke 50.8 mm	**SA 45S3x50**	**8056**
	– stroke 76.2 mm	**SA 45S3x75**	**8060**
Stop collar Option "a"	for rear mounting	**on request**	**on request**
Stop collar Option "b"	for front mounting	**on request**	**on request**
Soft pad		**on request**	**on request**
Additional mounting nut		**on request**	**on request**
Rectangular flange		**on request**	**on request**
Foot mounting		**on request**	**on request**

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 64x50	50.8	136	545	1695	169478
SA 64Sx50	50.8	463	1855	1695	169478
SA 64S2x50	50.8	1572	6291	1695	169478
SA 64S3x50	50.8	5318	21273	1695	169478
SA 64x100	101.6	272	1091	3390	225970
SA 64Sx100	101.6	927	3709	3390	225970
SA 64S2x100	101.6	3145	12582	3390	225970
SA 64S3x100	101.6	10636	42545	3390	225970
SA 64x150	152.4	409	1636	5084	282463
SA 64Sx150	152.4	1390	5564	5084	282463
SA 64S2x150	152.4	4718	18873	5084	282463
SA 64S3x150	152.4	15954	63818	5084	282463

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0,3 to 4,6
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	on request
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	Type SA64..-50 – on request Type SA64..-100 – on request Type SA64..-150 – on request
Min. mounting strength required		N	on request [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.009E-1

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Non-adjustable

Series SA

- For smaller effective masses
  SA 64x50 – Stroke 50.8 mm
  SA 64x100 – Stroke 101.6 mm
  SA 64x150 – Stroke 152.4 mm

- For intermediate effective masses
  SA 64Sx50 – Stroke 50.8 mm
  SA 64Sx100 – Stroke 101.6 mm
  SA 64Sx150 – Stroke 152.4 mm

- For larger effective masses
  SA 64S2x50 – Stroke 50.8 mm
  SA 64S2x100 – Stroke 101.6 mm
  SA 64S2x150 – Stroke 152.4 mm

- For high effective masses
  SA 64S3x50 – Stroke 50.8 mm
  SA 64S3x100 – Stroke 101.6 mm
  SA 64S3x150 – Stroke 152.4 mm

Basic Version with:
• 1 mounting nut

Accessories:
• Soft pad
• Square flange
• Foot mounting
• Stop collar

HOERBIGER ORIGA

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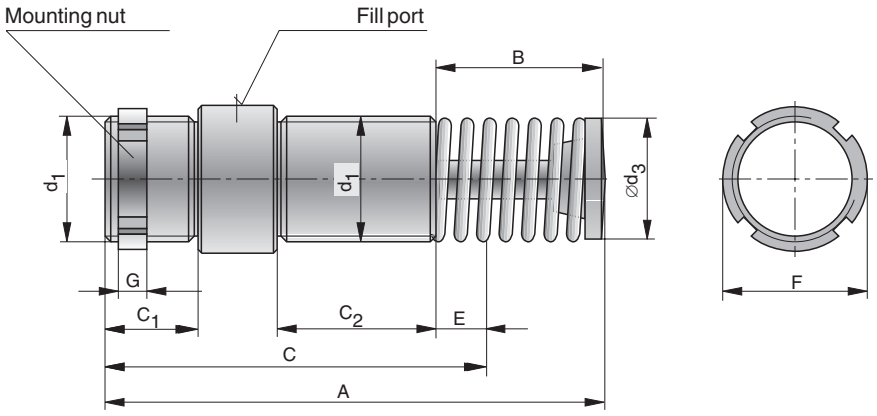
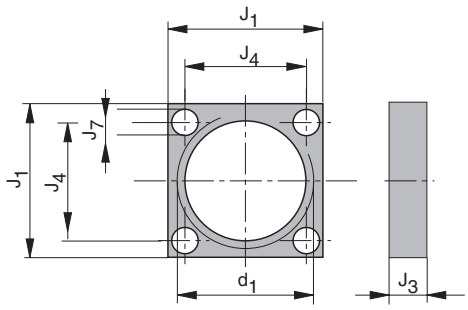
The right to make technical modifications is reserved

Dimensions (mm)

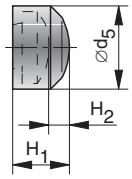
Type: SA 64..x50, SA 64..x100, SA 64..x150



Dimensions (mm)
Square Flange

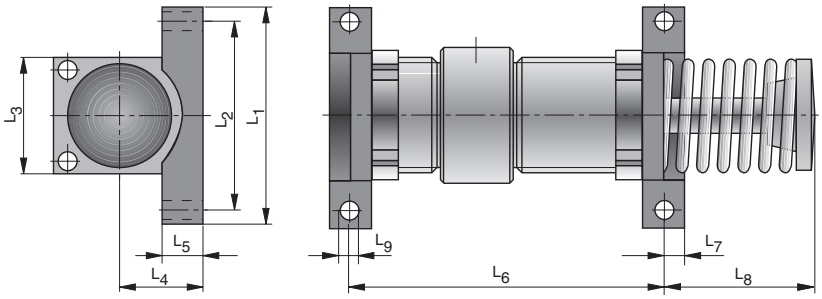


Dimensions (mm)
Soft Pad

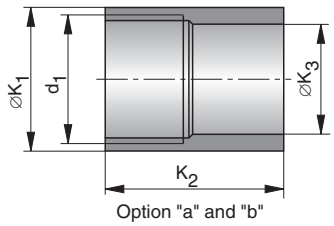


Note:
Cannot be used with stop collar

Dimensions (mm)
Foot Mounting



Dimensions (mm)
Stop collar



Option "a" - for rear mounting
Option "b" - for front mounting

Dimension Table (mm)

Type	A	B	C	C_1	C_2	d_1	Ød_3	Ød_5	E	ØF	G	H_1	H_2	J_1
SA 64..x50	225.4	85.7	174.6	38.1	69.8	M64x2	50.8	57.2	34.9	76.2	9.7	25.4	17.5	88.9
SA 64..x100	327	136.5	225.4	38.1	95.2	M64x2	50.8	57.2	39.4	76.2	9.7	25.4	17.5	88.9
SA 64..x150	509	200.6	298.5	38.1	120.6	M64x2	50.8	57.2	57.2	76.2	9.7	25.4	17.5	88.9

Type	J_3	J_4	ØK_1	K_2a	K_2b	ØK_3	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA 64..x50	16	69.9	76.2	62.7	50	60.3	143	124	88.9	44.5	19.1	127	14.2	90	10.3
SA 64..x100	16	69.9	76.2	62.7	50	60.3	143	124	88.9	44.5	19.1	178	14.2	141	10.3
SA 64..x150	16	69.9	76.2	62.7	50	60.3	143	124	88.9	44.5	19.1	229	14.2	214	10.3

Order Instructions

Product		Order Instructions Type	Order No.
Shock absorber for smaller effective masses	– stroke 50.8 mm	**SA 64x50**	**8061**
	– stroke 101.6 mm	**SA 64x100**	**8065**
	– stroke 152.4 mm	**SA 64x150**	**8069**
Shock absorber for intermediate masses	– stroke 50.8 mm	**SA 64Sx50**	**8062**
	– stroke101.6 mm	**SA 64Sx100**	**8066**
	– stroke 152.4 mm	**SA 64Sx150**	**8070**
Shock absorber for larger masses	– stroke 50.8 mm	**SA 64S2x50**	**8063**
	– stroke 101.6 mm	**SA 64S2x100**	**8067**
	– stroke 152.4 mm	**SA 64S2x150**	**8071**
Shock absorber for high masses	– stroke 50.8 mm	**SA 64S3x50**	**8064**
	– stroke 101.6 mm	**SA 64S3x100**	**8068**
	– stroke 152.4 mm	**SA 64S3x150**	**8072**
Stop collar Option "a" for Type SA 64..x50 and SA 64..x100	for rear mounting	**SC 1-1/8A**	**7991**
Stop collar Option "a" for Type SA 64..x150	for rear mounting	**SC 1-1/8A**	**7891**
Stop collar Option "b" for Type SA 64..x50 and SA 64..x100	for front mounting	**SC 1-1/8B**	**7997**
Stop collar Option "b" for Type SA 64..x150	for front mounting	**SC 1-1/8B**	**7897**
Soft pad		**SP 1-1/8**	**7994**
Additional mounting nut		**LN 1-1/8**	**7999**
Square flange		**SF 1-1/8**	**7998**
Foot mounting		**FM 1-1/8**	**7993**

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 1/4 x 1/2	12.7	2.3	182	17	23000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	6 - 9
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	0.176
Min. mounting strength required		N	3400 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.100E-1

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Adjustable

Series SA
SA 1/4 x 1/2

Basic Version with:
• Integral stop collar
• 1 mounting nut

Accessories:
• Soft pad
• Universal flange

HOERBIGER ORIGA

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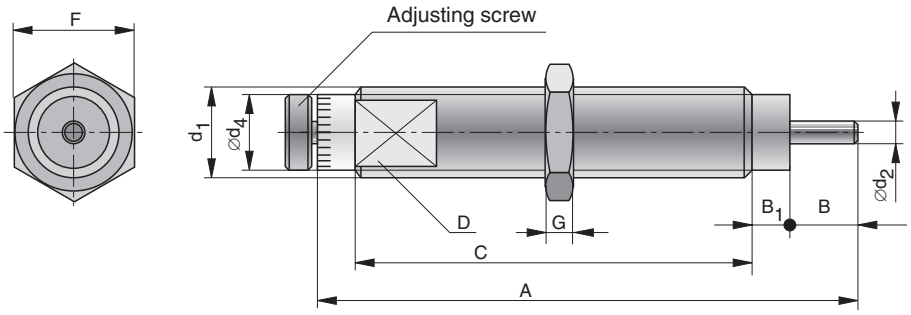
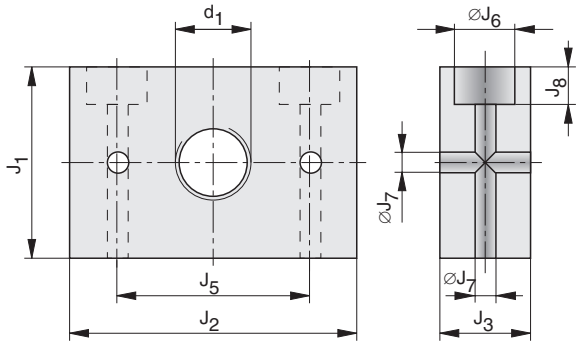
The right to make technical modifications is reserved

Dimensions (mm)

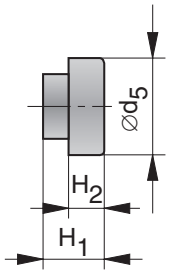
Type: SA 1/4 x 1/2



Dimensions (mm)
Universal Flange



Dimensions (mm)
Soft Pad



Dimensions Table (mm)

A	B	B_1	C	D	d_1	ød_2	ød_4	ød_5	E	F	G	H_1	H_2	J_1	J_2	J_3	J_4	J_5	øJ_6	øJ_7	J_8
98.9	12	5.6	61.7	17	M20x1.5	6.4	16.9	17	6.4	24	6	10.7	4.8	35	47	16	25.5	35	10	5.5	10

Order Instructions

Product	Order Instructions	
	Type	**Order No.**
Shock absorber	**SA 1/4 x 1/2**	**7940**
Soft pad	**SP 20**	**7934**
Additional mounting nut	**LN 20**	**7939**
Universal flange	**UM 20**	**7932**

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
- Adjustable

Series SA
SA 3/8 x 1D

Basic Version with:
- 1 mounting nut
- Front and rear adjustment

Accessories:
- Stop collar
- Soft pad
- Universal flange

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 3/8 x 1D	25.4	4.5	546	70	46000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of internal return spring		N	19 - 37
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass)		kg	0.243
Min. mounting strength required		N	6900 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No.1.70.101E-1

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The right to make technical modifications is reserved

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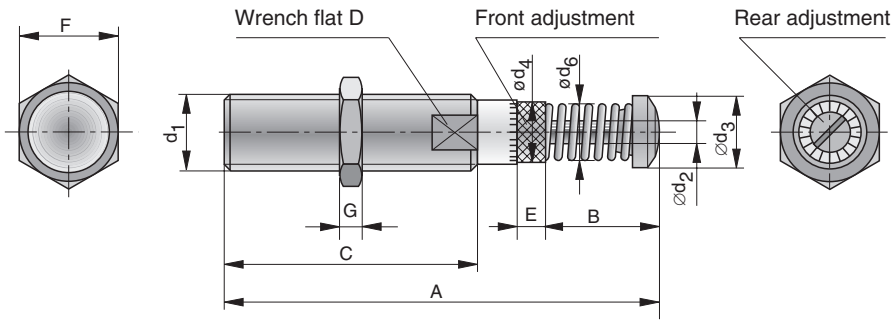
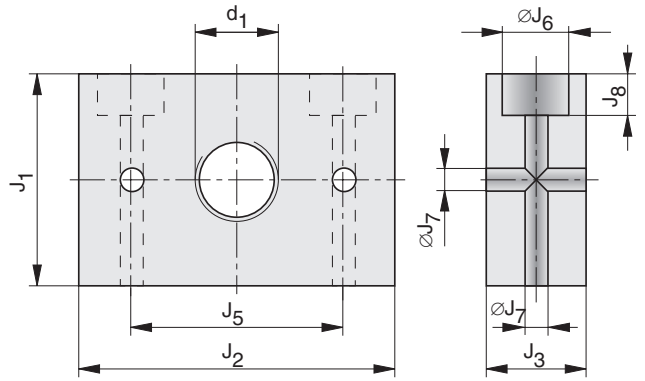
Dimensions (mm)

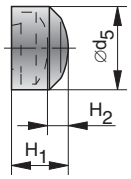
Type: SA 3/8 x 1D



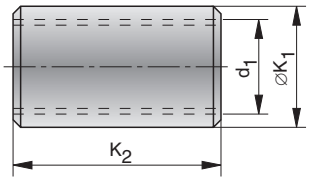
Dimensions (mm) Universal Flange



Dimensions (mm) Soft Pad



Dimensions (mm) Stop Collar



Dimensions Table (mm)

A	B	C	D	d_1	ød_2	ød_3	ød_4	ød_5	ød_6	E	F	G	H_1	H_2	J_1	J_2	J_3	J_4	J_5	øJ_6	øJ_7	J_8	øK_1	K_2
121.2	35.5	61.5	22	M25x1.5 [2]	7.9	19.9	22.7	22.1	18.5	12.7	30	8	12.2	6.4	35	47	16	25.5	35	10	5.5	10	31.8	55.6

[2] Option: M27x3 thread (d_1)

Order Instructions

Product	Order Instructions	
	Type	Order No.
Shock absorber	**SA 3/8 x 1D**	**7840**
Stop collar	**SC 25 B**	**7951**
Soft pad	**SP 25**	**7954**
Additional mounting nut	**LN 25**	**7959**
Universal flange	**UM 25**	**7952**

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Adjustable

Series SALD
SALD 1/2 x 1M
- Stroke: 25.4 mm

SALD 1/2 x 2M
- Stroke 50.8 mm

Basic Version with:
• Integral stop collar
• 1 mounting nut

Accessories:
• Rectangular flange

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SALD 1/2 x 1M	25.4	4.5	1134	136	85000
SALD 1/2 x 2M	50.8	9.5	2268	271	98000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Arbeitstemperatur		°C	-40 bis +82
Installation			In any position
Force of return spring Type: SALD 1/2 x 1M Type: SALD 1/2 x 2M		 N N	 36 - 82 36 - 128
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass) Type: SALD 1/2 x 1M Type: SALD 1/2 x 2M		 kg kg	 0.751 0.922
Min. mounting strength required		N	13400 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.102E-1

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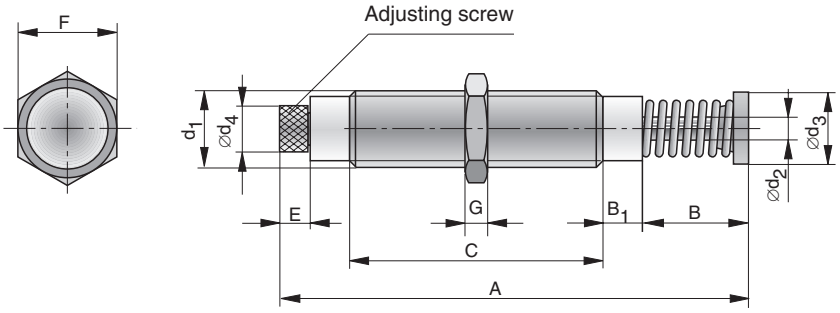
The right to make technical modifications is reserved

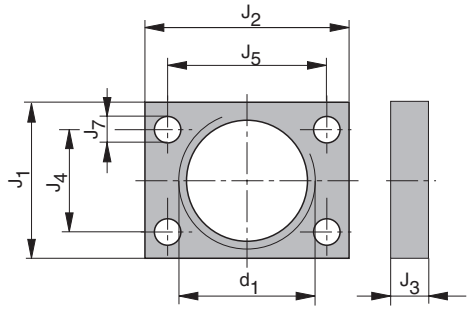
HOERBIGER ORIGA

Dimensions (mm)

Type: SALD 1/2 x 1M, SALD 1/2 x 2M



Dimensions (mm)
Rectangular Flange



Dimensions Table (mm)

Type	A	B	B_1	C	d_1	$ød_2$	$ød_3$	$ød_4$	E	F	G	J_1	J_2	J_3	J_4	J_5	J_7
SALD 1/2 x 1M	165.1	23.8	6	110	M36x1.5	9.5	25.4	22.5	14.7	41.3	6.7	41	54	9.5	28	42	7
SALD 1/2 x 2M	215.9	49.2	6	134	M36x1.5	9.5	25.4	22.5	14.7	41.3	6.7	41	54	9.5	28	42	7

Order Instructions

Product	Order Instructions	
	Type	**Order No.**
Shock absorber, stroke 25.4 mm	**SALD 1/2 x 1M**	**7841**
Shock absorber, stroke 50.8 mm	**SALD 1/2 x 2M**	**7842**
Rectangular flange	**RF 1/2-M**	**7843**
Additional mounting nut	**LN 1/2-M**	**7838**

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Adjustable

Series SA
SA 1/2 x 1
- Stroke: 25.4 mm

SA 1/2 x 2
- Stroke 50.8 mm

Basic Version with:
• 1 mounting nut

Accessories:
• Stop collar
• Rectangular flange
• Soft pad
• Foot mounting

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 1/2 x 1	25.4	4.5	545	130	86000
SA 1/2 x 2	50.8	9.5	950	270	100000

Technical Data

		Unit	Comments
Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of return spring		N N	36 - 82 (Type SA 1/2x1) 36 - 128 (Type SA 1/2x2)
Max. deviation of impacting force from centre axis of shock absorber			±5°
Weight (mass)		kg kg	0.627 (Type SA 1/2x1) 0.8 (Type SA 1/2x2)
Min. mounting strength required		N	13300 [1]
Materials	Body		Steel, black oxide finished
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

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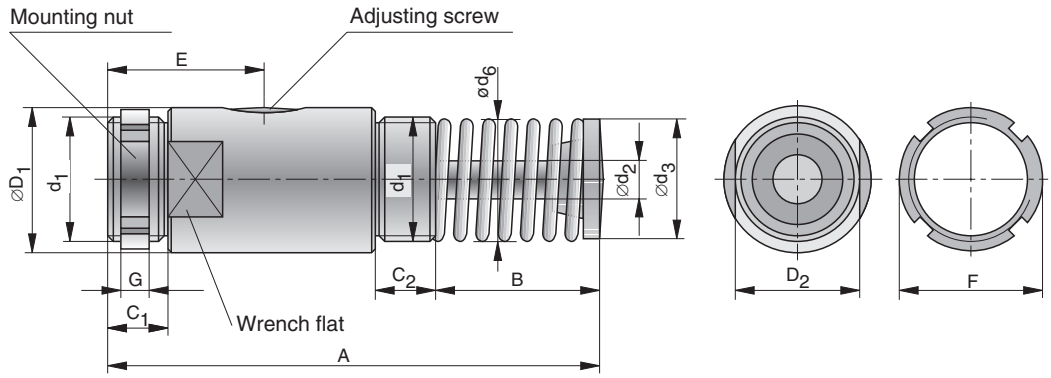
The right to make technical modifications is reserved

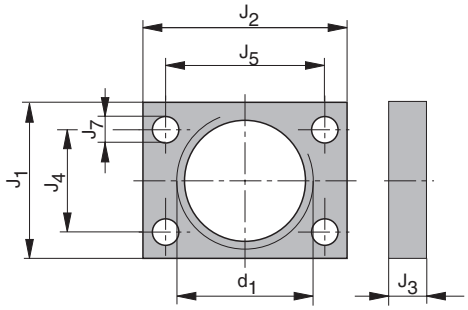
HOERBIGER ORIGA

Dimensions (mm)

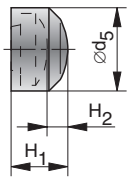
Type: SA 1/2 x 1, SA 1/2 x 2



Dimensions (mm)
Rectangular Flange

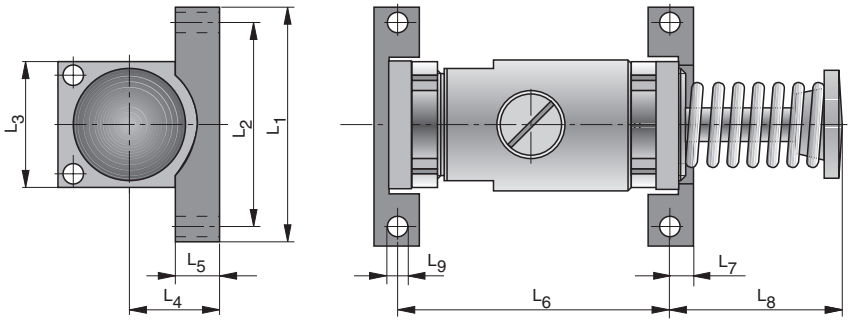


Dimensions (mm)
Soft Pad

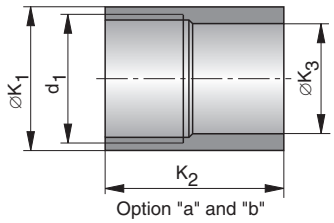


Note:
Cannot be used with stop collar

Dimensions (mm)
Foot mounting



Dimensions (mm)
Stop collar



Option "a" - for rear mounting
Option "b" - for front mounting

Dimensions Table (mm)

Type	A	B	C_1	C_2	øD_1	D_2	d_1	ød_2	ød_3	ød_5	ød_6	E	F	G	H_1	H_2	J_1	J_2
SA 1/2 x 1	138.1	55.5	16	16	38	35	M33x1.5	9.5	25.4	31.8	25.4	41.3	38	6.4	19.1	11.2	41	54
SA 1/2 x 2	189	81	16	16	38	35	M33x1.5	9.5	25.4	31.8	25.4	41.3	38	6.4	19.1	11.2	41	54

Type	J_3	J_4	J_5	J_7	øK_1	K_2a	K_2b	øK_3	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA 1/2 x 1	9.5	28	42	7	38.1	47.6	41.3	28.6	69.9	60.3	54	27	12.7	95.3	6.4	49.2	6
SA 1/2 x 2	9.5	28	42	7	38.1	47.6	41.3	28.6	69.9	60.3	54	27	12.7	120.7	6.4	74.6	6

Order Instructions

Product	Order Instructions	
	Type	Order No.
Shock absorber, stroke 25.4 mm	**SA 1/2 x 1**	**7970**
Shock absorber, stroke 50.8 mm	**SA 1/2 x 2**	**7975**
Soft Pad	**SP 1/2**	**7974**
Stop collar option a – for rear mounting	**SC 1/2A**	**7971**
Stop collar option b – for front mounting	**SC 1/2B**	**7977**
Rectangular flange	**RF 1/2**	**7972**
Foot mounting	**FM 1/2**	**7973**
Additional mounting nut	**LN 1/2**	**7979**

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Adjustable

Series SA
SA 3/4 x 1
- Stroke: 25.4 mm

SA 3/4 x 2
- Stroke: 50.8 mm

SA 3/4 x 3
-Stroke: 76 mm

Basic Version with:
• 1 mounting nut

Accessories:
• Stop collar
• Rectangular flange
• Square flange
• Soft pad
• Foot mounting

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 3/4 x 1	25.4	27	3600	290	126500
SA 3/4 x 2	50.8	43	6350	600	150000
SA 3/4 x 3	76	55	9500	890	184000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of return spring Type: SA 3/4 x 1 Type: SA 3/4 x 2 Type: SA 3/4 x 3		 N N N	 68 - 92 44 - 92 33 - 105
Max. deviation of impacting force from centre axis of shock absorber			±3°
Weight (mass) Type: SA 3/4 x 1 Type: SA 3/4 x 2 Type: SA 3/4 x 3		 kg kg kg	 1.44 1.8 2.24
Min. mounting strength required		N	29600 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2{,}5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.104E-1

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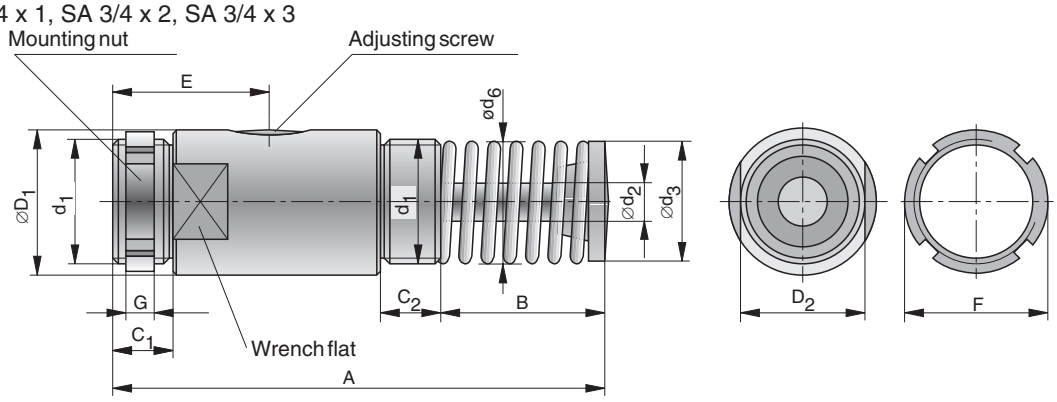
The right to make technical modifications is reserved

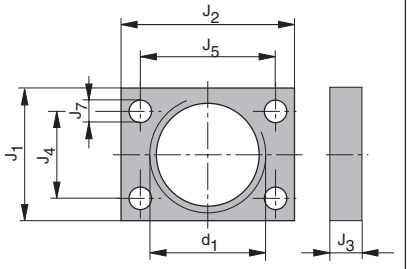
HOERBIGER ORIGA

Dimensions (mm)

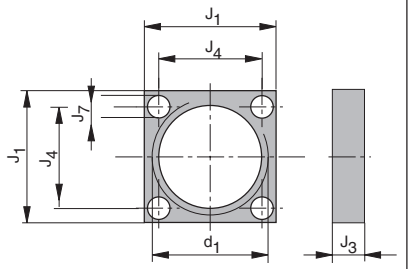
Type: SA 3/4 x 1, SA 3/4 x 2, SA 3/4 x 3



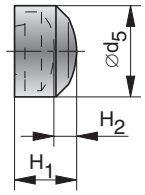
Dimensions (mm) Rectangular flange



Dimensions (mm) Square Flange

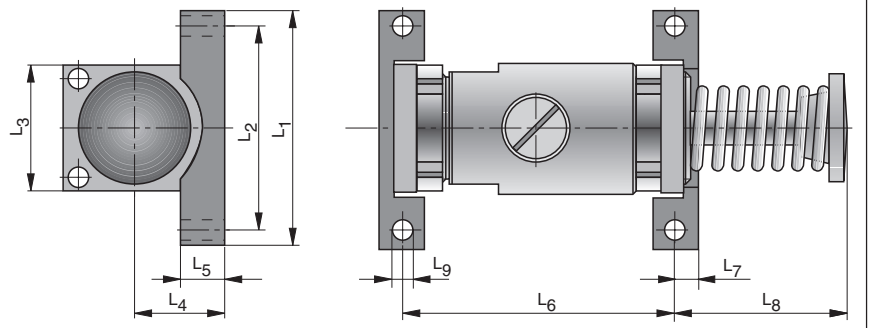


Dimensions (mm) Soft Pad

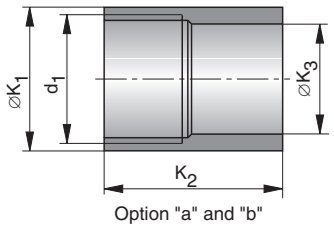


Note:
Cannot be used with stop collar

Dimensions (mm) Foot Mounting



Dimensions (mm) Stop Collar



Option "a" and "b"

Option "a" - for rear mounting
Option "b" - for front mounting

Dimensions Table (mm)

Type	A	B	C_1	C_2	øD_1	D_2	d_1	ød_2	ød_3	ød_5	ød_6	E	F	G	H_1	H_2	J_1	J_2
SA 3/4 x 1	144.4	50	22.9	23	57.2	50	M42x1.5	14.3	38	44.5	34.7	47.2	57.2	9.5	25.4	17.5	57.2	76.2
SA 3/4 x 2	195.2	75.4	22.9	23	57.2	50	M42x1.5	14.3	38	44.5	34.7	59.5	57.2	9.5	25.4	17.5	57.2	76.2
SA 3/4 x 3	246	100.8	22.9	23	57.2	50	M42x1.5	14.3	38	44.5	38.1	72.6	57.2	9.5	25.4	17.5	57.2	76.2

Type	J_3	J_4	J_5	J_7	øK_1	K_2a	K_2b	øK_3	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA 3/4 x 1	12.7	41.3	60.3	8.7	57.2	49.2	39.7	41.2	95.3	76.2	57.2	28.6	14.3	85.7	9.5	52.3	8.7
SA 3/4 x 2	12.7	41.3	60.3	8.7	57.2	49.2	39.7	41.2	95.3	76.2	57.2	28.6	14.3	111.1	9.5	77.6	8.7
SA 3/4 x 3	12.7	41.3	60.3	8.7	57.2	49.2	39.7	41.2	95.3	76.2	57.2	28.6	14.3	136.5	9.5	103.2	8.7

Order Instructions

Product	Order Instructions	
	Type	Order No.
Shock absorber, stroke 25.4 mm	**SA 3/4 x 1**	**7980**
Shock absorber, stroke 50.8 mm	**SA 3/4 x 2**	**7985**
Shock absorber, stroke 76 mm	**SA 3/4 x 3**	**7986**
Soft pad	**SP 3/4**	**7984**
Stop collar option a – for rear mounting	**SC 3/4 A**	**7981**
Stop collar option b – for front mounting	**SA 3/4 B**	**7987**
Rectangular flange	**RF 3/4**	**7982**
Square flange	**SF 3/4**	**7988**
Foot mounting	**FM 3/4**	**7983**
Additional mounting nut	**LN 3/4**	**7989**

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA 1-1/8 x 2	50.8	72	13000	1380	172600
SA 1-1/8 x 4	102	118	18200	2700	230000
SA 1-1/8 x 6	152	200	32000	4150	288000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Force of return spring Type: SA 1-1/8 x 2 Type: SA 1-1/8 x 4 Type: SA 1-1/8 x 6		 N N N	 80 - 151 80 - 200 80 - 187
Max. deviation of impacting force from centre axis of shock absorber		±5°	
Weight (mass) Type: SA 1-1/8 x 2 Type: SA 1-1/8 x 4 Type: SA 1-1/8 x 6		 kg kg kg	 3.719 5.035 6.622
Min.mounting strength required		N	68000 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No.1.70.105E-1

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
• Adjustable

Series SA
SA 1-1/8 x 2
- Stroke: 50.8 mm

SA 1-1/8 x 4
- Stroke: 102 mm

SA 1-1/8 x 6
- Stroke: 152 mm

Basic Version with:
• 1 mounting nut

Accessories:
• Stop collar
• Square flange
• Soft pad
• Foot mounting

HOERBIGER ORIGA

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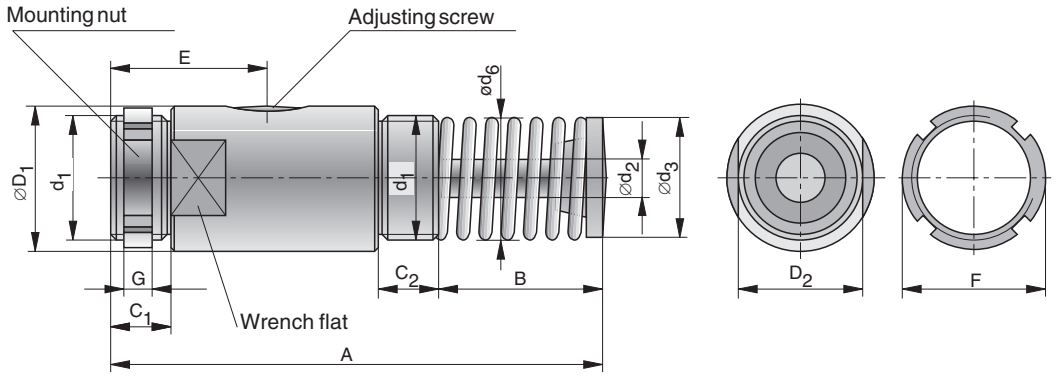
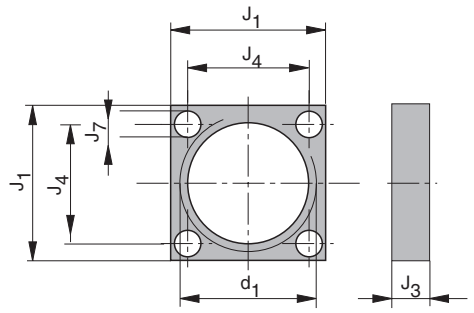
The right to make technical modifications is reserved

Dimensions (mm)

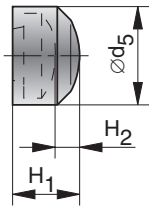
Type: SA 1-1/8 x 2, SA 1-1/8 x 4, SA 1-1/8 x 6



Dimensions (mm)
Square Flange

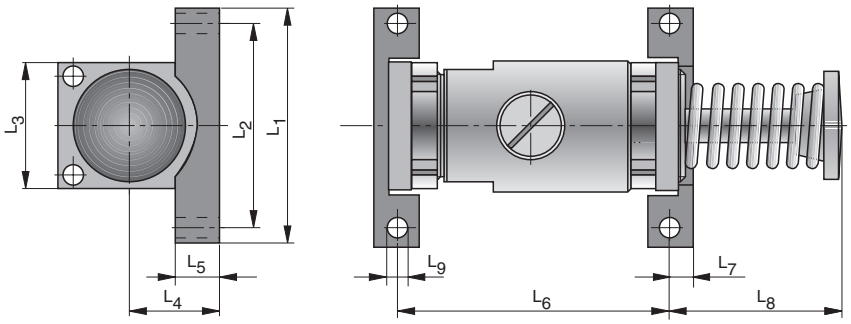


Dimensions (mm)
Soft Pad

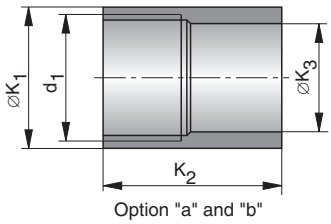


Note:
Cannot be used with stop collar

Dimensions (mm)
Foot Mounting



Dimensions (mm)
Stop Collar



Option "a" - for rear mounting
Option "b" - for front mounting

Dimensions Table (mm)

Type	A	B	C_1	C_2	ØD1	D_2	d_1	ød2	ød3	ød5	ød6	E	F	G	H_1	H_2	J_1
SA 1-1/8 x 2	225.6	85.9	26.2	26.2	76.2	69.9	M64x2	20.6	50.8	57.2	47.9	69.9	76.2	9.5	25.4	17.5	88.9
SA 1-1/8 x 4	327.2	136.7	26.2	26.2	76.2	69.9	M64x2	20.6	50.8	57.2	50.8	95.3	76.2	9.5	25.4	17.5	88.9
SA 1-1/8 x 6	450.9	209.6	26.2	26.2	76.2	69.9	M64x2	20.6	50.8	57.2	48.3	120.7	76.2	9.5	25.4	17.5	88.9

Type	J_3	J_4	J_7	øK1	K2a	K2b	øK3	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA 1-1/8 x 2	15.9	69.9	10.3	76.2	62.7	50	60.3	142.9	123.8	88.9	44.5	19	127	14.3	90.5	10.3
SA 1-1/8 x 4	15.9	69.9	10.3	76.2	62.7	50	60.3	142.9	123.8	88.9	44.5	19	177.8	14.3	141.3	10.3
SA 1-1/8 x 6	15.9	69.9	10.3	76.2	84.9	72.2	60.3	142.9	123.8	88.9	44.5	19	228.5	14.3	214.3	10.3

Order Instructions

Product	Order Instructions	
	Type	**Order No.**
Shock absorber, stroke 50.8 mm	**SA 1-1/8 x 2**	**7990**
Shock absorber, stroke 102 mm	**SA 1-1/8 x 4**	**7995**
Shock absorber, stroke 152 mm	**SA 1-1/8 x 6**	**7996**
Soft pad	**SP 1-1/8**	**7994**
Square flange	**SF 1-1/8**	**7998**
Foot mounting	**FM 1-1/8**	**7993**
Additional mounting nut	**LN 1-1/8**	**7999**
Stop collar option a – for SA 1-1/8 x 2, SA 1-1/8 x 4	**SC 1-1/8 A**	**7991**
Stop collar option b – für SA 1-1/8 x 2, SA 1-1/8 x 4	**SC 1-1/8 B**	**7997**
Stop collar option a – for SA 1-1/8 x 6	**SC 1-1/8 A**	**7891**
Stop collar option b – for SA 1-1/8 x 6	**SC 1-1/8 B**	**7897**

ORIGA Shock Absorbers

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA-A 3/4 x 1	25.4	27	3600	290	184000
SA-A 3/4 x 2	50.8	43	6350	600	230000
SA-A 3/4 x 3	76	55	9500	890	276000

Technical Data

Characteristic		Unit	Comments
Impact velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Max. deviation of impacting force from centre axis of shock absorber			±5°
Weight (mass) Type: SA-A 3/4 x 1 Type: SA-A 3/4 x 2 Type: SA-A 3/4 x 3		 kg kg kg	 1.43 1.79 2.23
Min. mounting strength required		N	29600 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized Air-oil tank: Acrylic, aluminium

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

Hydraulic Industrial Shock Absorbers

Type:
- Adjustable, without return spring, for use with external air-oil tank

Series SA-A
SA-A 3/4 x 1
- Stroke: 25.4 mm

SA-A 3/4 x 2
- Stroke: 50.8 mm

SA-A 3/4 x 3
- Stroke: 76 mm

Basic Version with:
- 1 mounting nut

Accessories:
- Air-oil tank, Type AOT-1
- Stop collar
- Rectangular flange
- Square flange
- Soft pad
- Foot mounting

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

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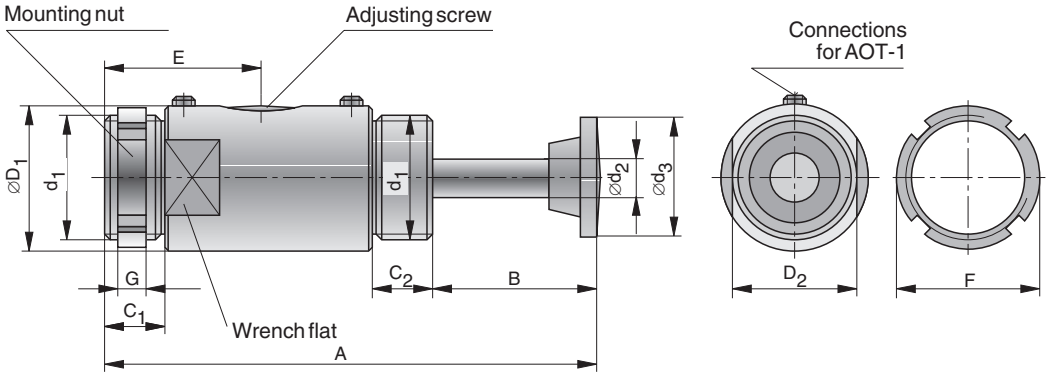
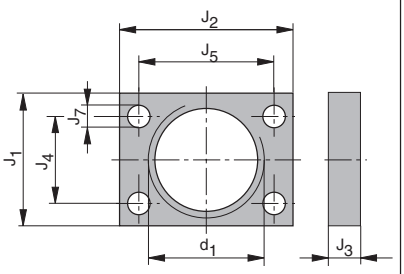
The right to make technical modifications is reserved

Dimensions (mm) – Shock Absorber for Connection to Air-Oil Tank

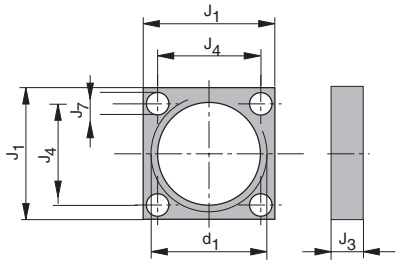
Type: SA-A 3/4 x 1, SA-A 3/4 x 2, SA-A 3/4 x 3



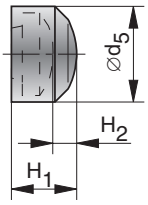
Dimensions (mm) Rectangular flange



Dimensions (mm) Square flange

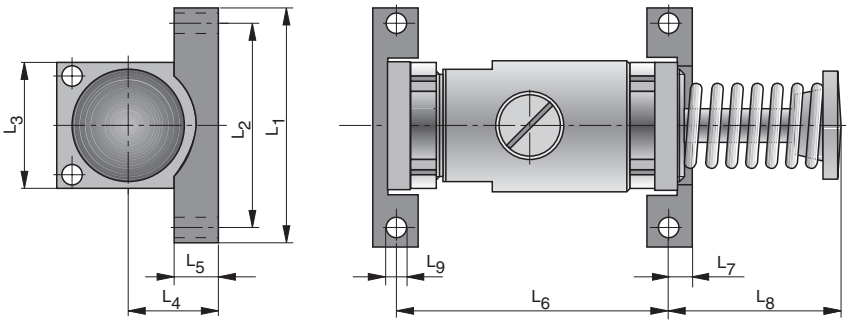


Dimensions (mm) Soft Pad

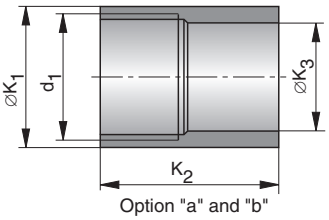


Note:
Cannot be used with stop collar

Dimensions (mm) Foot Mounting



Dimensions (mm) Stop Collar



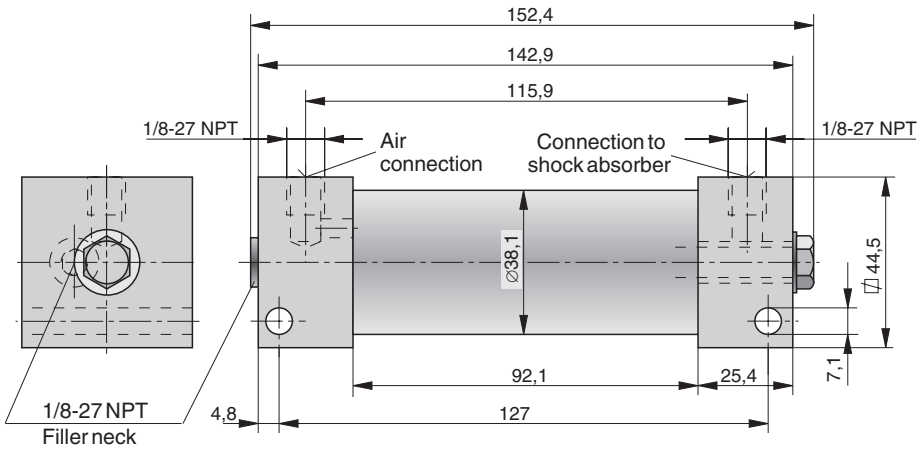
Option "a" - for rear mounting
Option "b" - for front mounting

Dimensions Table (mm)

Type	A	B	C_1	C_2	ØD1	D_2	d_1	Ød2	Ød3	Ød5	E	F	G	H_1	H_2	J_1	J_2
SA-A 3/4 x 1	144.4	50	22.9	23	57.2	50	M42x1.5	14.3	38	44.5	47.2	57.2	9.5	25.4	17.5	57.2	76.2
SA-A 3/4 x 2	195.2	75.4	22.9	23	57.2	50	M42x1.5	14.3	38	44.5	59.5	57.2	9.5	25.4	17.5	57.2	76.2
SA-A 3/4 x 3	246	100.8	22.9	23	57.2	50	M42x1.5	14.3	38	44.5	72.6	57.2	9.5	25.4	17.5	57.2	76.2

Type	J_3	J_4	J_5	J_7	ØK1	K_2a	K_2b	ØK3	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA-A 3/4 x 1	12.7	41.3	60.3	8.7	57.2	49.2	39.7	41.2	95.3	76.2	57.2	28.6	14.3	85.7	9.5	52.3	8.7
SA-A 3/4 x 2	12.7	41.3	60.3	8.7	57.2	49.2	39.7	41.2	95.3	76.2	57.2	28.6	14.3	111.1	9.5	77.6	8.7
SA-A 3/4 x 3	12.7	41.3	60.3	8.7	57.2	49.2	39.7	41.2	95.3	76.2	57.2	28.6	14.3	136.5	9.5	103.2	8.7

Dimensions (mm) – Air-Oil Tank Type AOT-1



Order Instructions

Product	Order Instructions	
	Type	Order No.
Shock absorber, stroke 25.4 mm	**SA-A 3/4 x 1**	**7887**
Shock absorber, stroke 50.8 mm	**SA-A 3/4 x 2**	**7888**
Shock absorber, stroke 76 mm	**SA-A 3/4 x 3**	**7889**
Soft pad	**SP-3/4**	**7984**
Square flange	**SF-3/4**	**7988**
Rectangular flange	**RF-3/4**	**7982**
Foot mounting	**FM-3/4**	**7983**
Additional mounting nut	**LN-3/4**	**7989**
Stop collar option a – for SA-A 3/4 x 1, SA-A 3/4 x 2, SA-A 3/4 x 3	**SC-A 3/4**	**7981**
Stop collar option b – for SA-A 3/4 x 1, SA-A 3/4 x 2, SA-A 3/4 x 3	**SC-B 3/4**	**7987**
Air-oil tank	**AOT-1**	**7898**

ORIGA Shock Absorbers

Hydraulic Industrial Shock Absorbers

Type:
- Adjustable, without return spring, for use with external air-oil tank

Series SA-A
SA-A 1-1/8 x 2
- Stroke: 50.8 mm

SA-A 1-1/8 x 4
- Stroke: 102 mm

SA-A 1-1/8 x 6
- Stroke: 152 mm

Basic Version with:
- 1 mounting nut

Accessories:
- Air-oil tank, Type AOT-3
- Stop collar
- Square flange
- Soft pad
- Foot mounting

Energy Capacity

Type	Stroke (mm)	Effective Mass (kg)		Max. Energy Capacity (Nm)	
		Min.	Max.	per stroke W_3	per hour W_4
SA-A 1-1/8 x 2	50.8	72	13000	1380	345000
SA-A 1-1/8 x 4	102	118	18200	2700	460000
SA-A 1-1/8 x 6	152	200	32000	4150	575000

Technical Data

Characteristic		Unit	Comments
Impact Velocity		m/s	0.3 - 4.5
Operating temperature range		°C	-40 to +82
Installation			In any position
Max. deviation of impacting force from centre axis of shock absorber			±5°
Weight (mass) Type: SA-A 1-1/8 x 2 Type: SA-A 1-1/8 x 4 Type: SA-A 1-1/8 x 6		 kg kg kg	 3.709 5.025 6.612
Min. mounting strength required		N	68000 [1]
Materials	Body		Steel, black oxide finish
	Piston rod		Steel, hardened, ground, hard-chrome plated
	Accessories		Steel, black oxide finish or aluminium, anodized Air-oil tank: high-tensile steel

[1] based on $\frac{2.5 \cdot W_3}{\text{stroke}}$

For product group overview see 1.70.001E
For design and installation notes see 1.70.001E

Data Sheet No. 1.70.107E-1

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The right to make technical modifications is reserved

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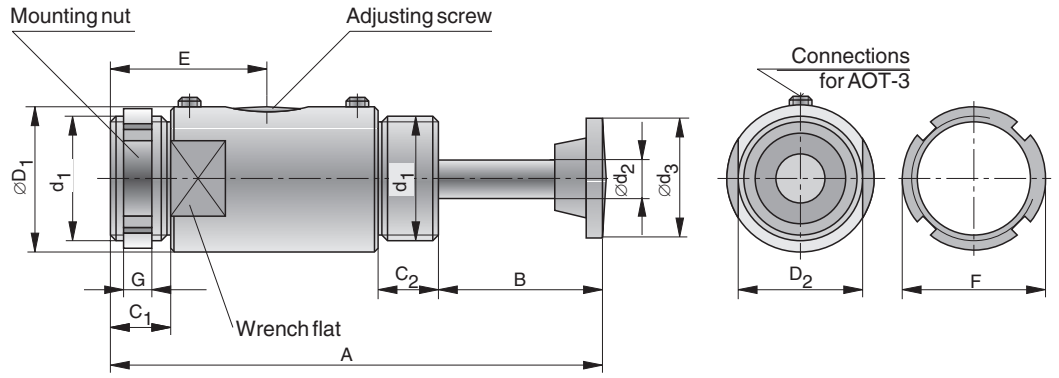
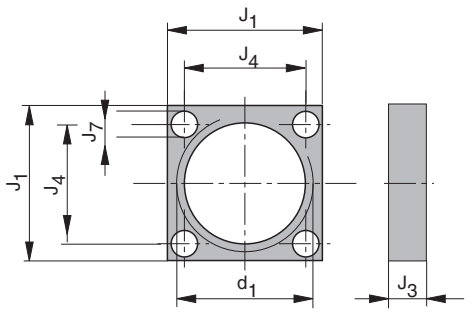
Dimensions (mm) – Shock Absorber

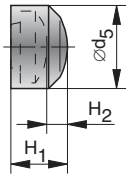
Type: SA-A 1-1/8 x 2, SA-A 1-1/8 x 4, SA-A 1-1/8 x 6



Dimensions (mm) Square Flange

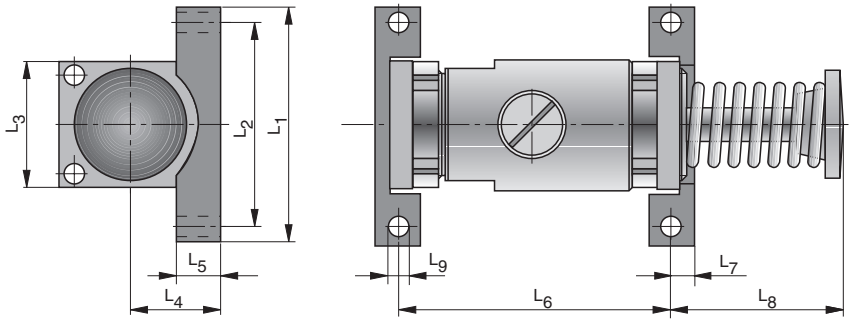


Dimensions (mm) Soft Pad

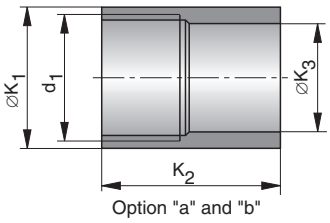


Note:
Cannot be used with stop collar

Dimensions (mm) Foot Mounting



Dimensions (mm) Stop Collar



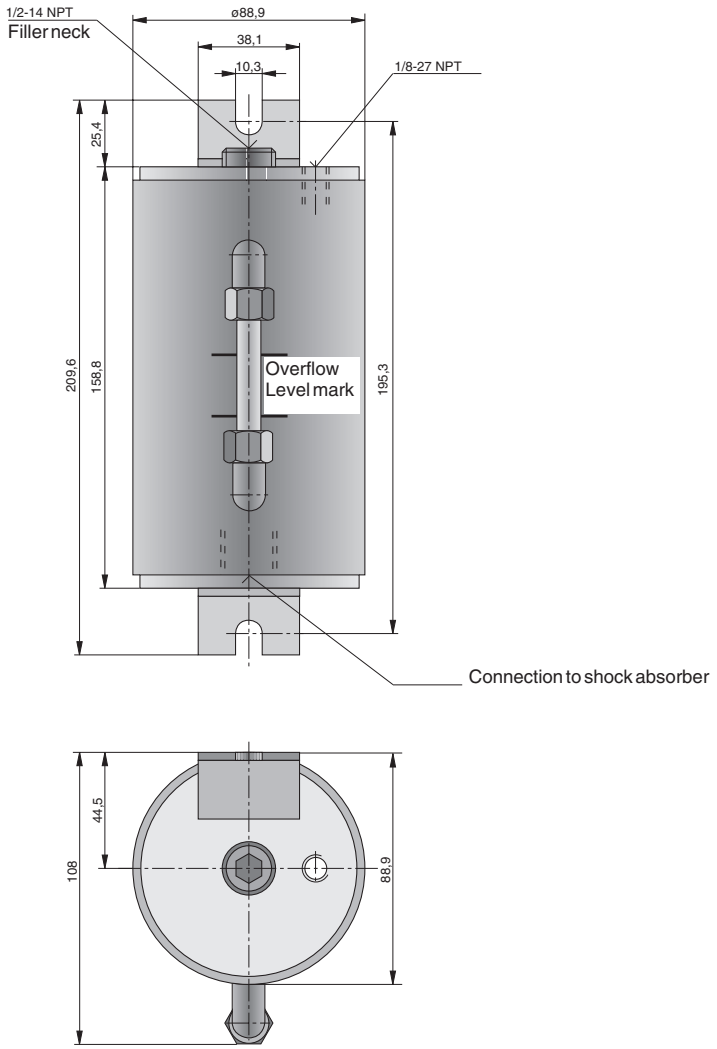
Option "a" - for rear mounting
Option "b" - for front mounting

Dimensions Table (mm)

Type	A	B	C_1	C_2	øD_1	D_2	d_1	ød_2	ød_3	ød_5	E	F	G	H_1	H_2	J_1
SA-A 1-1/8 x 2	225.6	85.9	26.2	26.2	76.2	69.9	M64x2	20.6	50.8	57.2	69.9	76.2	9.5	25.4	17.5	88.9
SA-A 1-1/8 x 4	327.2	136.7	26.2	26.2	76.2	69.9	M64x2	20.6	50.8	57.2	95.3	76.2	9.5	25.4	17.5	88.9
SA-A 1-1/8 x 6	450.9	209.6	26.2	26.2	76.2	69.9	M64x2	20.6	50.8	57.2	120.7	76.2	9.5	25.4	17.5	88.9

Type	J_3	J_4	J_7	øK_1	K_2a	K_2b	øK_3	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
SA-A 1-1/8 x 2	15.9	69.9	10.3	76.2	62.7	50	60.3	142.9	123.8	88.9	44.5	19	127	14.3	90.5	10.3
SA-A 1-1/8 x 4	15.9	69.9	10.3	76.2	62.7	50	60.3	142.9	123.8	88.9	44.5	19	177.8	14.3	141.3	10.3
SA-A 1-1/8 x 6	15.9	69.9	10.3	76.2	84.9	72.2	60.3	142.9	123.8	88.9	44.5	19	228.5	14.3	214.3	10.3

Dimensions (mm) – Air-Oil Tank AOT3



Order Instructions

Product	Order Instructions	
	Type	Order No.
Shock absorber, stroke 50.8 mm	**SA-A 1-1/8 x 2**	**7880**
Shock absorber, stroke 102 mm	**SA-A 1-1/8 x 4**	**7885**
Shock absorber, stroke 152 mm	**SA-A 1-1/8 x 6**	**7886**
Soft pad	**SP 1-1/8**	**7994**
Square flange	**SF 1-1/8**	**7998**
Foot mounting	**FM 1-1/8**	**7993**
Additional mounting nut	**LN 1-1/8**	**7999**
Stop collar option a – SA-A 1-1/8 x 2, SA-A 1-1/8 x 4	**SC 1-1/8 A**	**7991**
Stop collar option b – SA-A 1-1/8 x 2, SA-A 1-1/8 x 4	**SC 1-1/8 B**	**7997**
Stop collar option a – SA-A 1-1/8 x 6	**SC 1-1/8 A**	**7891**
Stop collar option b – SA-A 1-1/8 x 6	**SC 1-1/8 B**	**77897**
Air-oil tank	**AOT-3**	**7899**

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