Selection guide

Setting working conditions

Make the following conditions clear for shock absorber selection.

(1) Load weight (kg)
(2) Instantaneous colliding speed of impact with shock absorber(m/s)
(3) Thrust (kgf) if there is external pressure with load

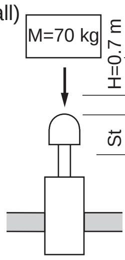
Code

D = Cylinder diameter (mm)
E = Kinetic energy (J)
P = Operation pressure (MPa)
K = Radius of rotation (m) (distance of load center to center of rotation)
ω = Colliding angular speed (rad/s)
I = Moment of inertia (kg/m^2)
F = Thrust (N)
T = Torque (N·m)
V = Colliding speed (m/s)
H = Height (m)
St = Shock absorber stroke (m)
M = Weight of workpiece (kg)
g = Gravity acceleration 9.8 m/s^2

Example of calculation

(1) Vertical falling motion (free fall)

$$E = \frac{1}{2} \cdot M \cdot V^2 + Mg \cdot St$$



Where weight (M) of workpiece is 70 kg and vertical fall is from 0.7 m (H), check if SCK-00-60 can be used.

Find the max. colliding speed under these conditions.

$V = \sqrt{2 \cdot g \cdot H} = \sqrt{19.6 \times H}$

$V = \sqrt{19.6 \times 0.7} = 3.7 \text{ m/s} < 4 \text{ m/s}$

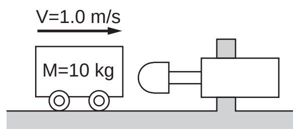
(SCK-00-60)

$E = \frac{1}{2} x70x3.7^2 + 70x9.8x0.07 = 527.2$

Absorbed energy of SCK-00-60 is larger according to colliding speed characteristics graph of absorbed energy on Graph 1. Therefore, energy can be absorbed by SCK-00-60.

(2) Horizontal motion (inertia motion)

$$E = \frac{1}{2} \cdot M \cdot V^2$$



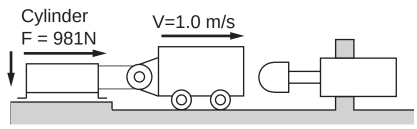
With workpiece weight (M) of 10 kg for colliding speed (V)
At 1.0m/s,

$E = \frac{1}{2} \times 10 \times (1.0)^2 = 5.0J$

SCK-00-1.2 can be used.

(3) Horizontal motion (for thrust)

$$E = \frac{1}{2} \cdot M \cdot V^2 + F \cdot St$$



If the workpiece calculated in (2) is moved by a ø50 mm pneumatic cylinder (D)with pneumatic pressure (P) of 0.5 MPa, pneumatic cylinder thrust is:

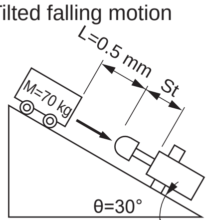
$F = \frac{\pi}{4} \times D^2 \times P = \frac{\pi}{4} \times 50^2 \times 0.5 = 981N$

Check if SCK-00-6.5 can be used.$E = \frac{1}{2} x10x(1.0)^2 + 981x0.025$

≈ 29.5

Therefore, energy can be absorbed by SCK-00-6.5.

(4) Tilted falling motion



$E = (\frac{1}{2} MV^2) +$
$(Mg \cdot St \cdot \sin\theta)$

When a 70 kgf workpiece comes down a 30° slope, consider if the SCK-00-40 can be used. Find the max. colliding speed under the same conditions.

$V = \sqrt{19.6xH} (H=0.5x\sin 30°)$

$= \sqrt{19.6x0.5x\sin 30°}$

$= 2.2 \text{ m/s} < 3 \text{ m/s}$

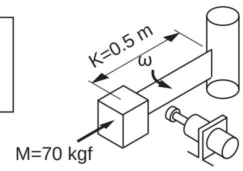
$E = (\frac{1}{2} x70x2.2^2) + (70x9.8x0.07x\sin 30°)$

≈ 193.4 J

Therefore, energy can be absorbed by SCK-00-20.

(5) Horizontal rotary motion (inertia motion)

$I = WK^2$
$E = \frac{1 \cdot \omega^2}{2}$



When a 70 kgf workpiece with a radius of rotation (K) 0.5 m and colliding angular speed of 1 rad/s is being operated, consider if the SCK-00-1.2 can be used. I =

$70 \times (0.5)^2 = 17.5 \text{ kg} \cdot \text{m}^2$

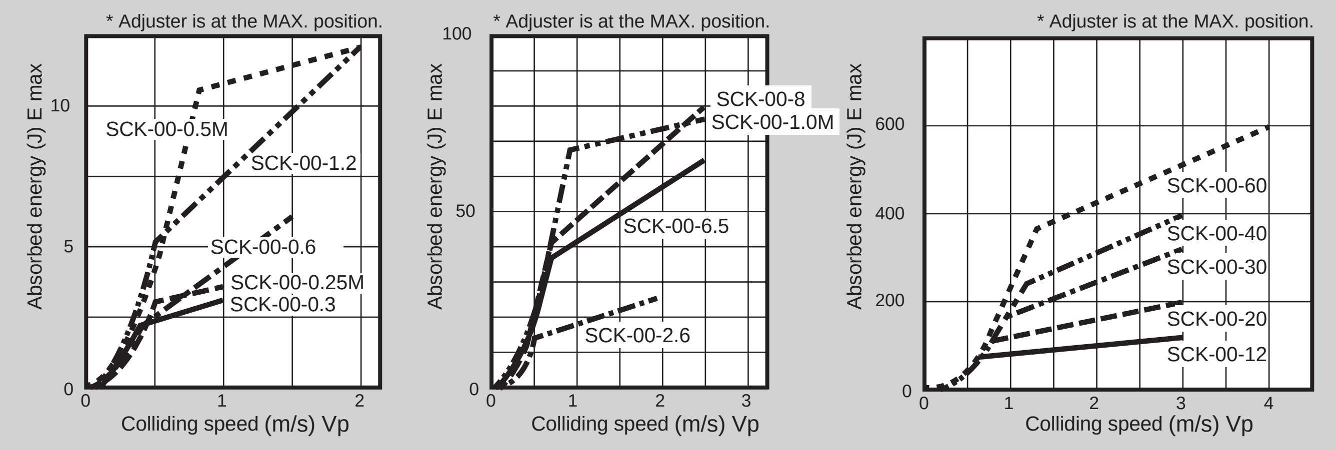
$E = \frac{(1)^2}{2} = \frac{17.5x(1)^2}{2}$

$= 8.8$ J

Therefore, energy can be absorbed by SCK-00-1.2.

(Graph 1)

Vp·E max. characteristics (colliding speed/absorbed energy)



* Absorption energy drops at low speed.