

ANTI-VIBRATION & SPRINGS

Linear Decelerators

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Deceleration Principles

Controlled linear deceleration provides:

- Increased operating speeds
- Higher equipment productivity
- Reduced maintenance
- Reduced noise pollution

Any moving object possesses kinetic energy as a result of its motion and if the object changes direction or is brought to rest, the dissipation of this kinetic energy can result in destructive shock forces within the structural and operating members of the machine.

Formulae & Calculations

Key to symbols used:

W_1	Kinetic energy per cycle	(Nm)	*v	Velocity of moving mass	(m/s)
W_2	Propelling force energy per cycle	(Nm)	*v _D	Impact velocity at shock absorber	(m/s)
W_3	Total energy per cycle ($W_1 + W_2$)	(Nm)	F	Propelling force	(N)
W_4	Total energy per hour ($W_3 \cdot C$)	(Nm/hr)	c	Cycles per hour	(/hr)
me	Effective weight	(kg)	s	Shock absorber stroke	(m)
m	Mass to be decelerated	(kg)			

Mass without propelling force

Formulae	Example 1
$W_1 = m \cdot v^2 \cdot 0.5$	m = 100kg
$W_2 = 0$	v = 1.5m/s
$W_3 = W_1 + W_2$	c = 500/h
$W_4 = W_3 \cdot c$	s = 0.05 m (chosen)
v _D = v	
me = m	

$$\begin{aligned}W_1 &= 100 \cdot 1.5^2 \cdot 0.5 = \underline{113Nm} \\W_2 &= \text{zero} \\W_3 &= 113 + 0 = \underline{113Nm} \\W_4 &= 113 \cdot 500 = \underline{56500Nm/hr} \\me &= m = \underline{100kg}\end{aligned}$$

Choose from capacity chart:

Model MC 1202 M-2 self-compensating
alternative: Model A1/2 X 2 adjustable
(Available on request)

Mass with propelling force

Formulae	Example 1
$W_1 = m \cdot v^2 \cdot 0.5$	m = 36kg
$W_2 = F \cdot s$	*v = 1.5m/s
$W_3 = W_1 + W_2$	F = 400N
$W_4 = W_3 \cdot c$	c = 1000/h
v _D = v	s = 0.025 m (chosen)
$me = \frac{2 \cdot W_3}{vD^2}$	
$W_2 = (F - m \cdot g) \cdot s$	
$W_2 = (F + m \cdot g) \cdot s$	

$$\begin{aligned}W_1 &= 36 \cdot 1.5^2 \cdot 0.5 = \underline{41Nm} \\W_2 &= 400 \cdot 0.025 = \underline{10Nm} \\W_3 &= 41 + 10 = \underline{51Nm} \\W_4 &= 51 \cdot 1000 = \underline{51000Nm/hr} \\me &= \frac{2 \cdot 51}{1.5^2} = \underline{45kg}\end{aligned}$$

Choose from capacity chart:

Model MC 600 M self-compensating

*v is the final impact velocity of the mass: with pneumatically propelled systems this can be 1.5 to 2 times the average velocity. Please take this into account when calculating energy.

SMALLER SHOCK ABSORBERS HAVE HIGH ENERGY CAPACITY



Ondrives' range of innovative shock absorbers, branded Magnum, that are said to have a higher energy capacity in a smaller body size than competing units. This has been achieved by increasing the size of the inner and metering-tube diameters which also increases the operating range of effective weights. The units have a threaded outer body for easy mounting and are available in both adjustable and self-compensating versions. An integral stop collar mechanically seals around the wiper-seal and rod, and they are said to have a superior length-to-diameter ratio for the rod bearing.

Adjustment of the shock absorber has been made easier by offering two methods of adjustment. The stop collar doubles as an adjuster with a second adjuster at the back of the unit for increased access. A new rod-and-seal design with unsymmetrical U-cups protects the shock absorbers in dirty environments, and the latest seal technology is said to extend operating life. Design Engineers can now select smaller shock absorbers for the same energy capacity with reductions in required space and cost.