SKL

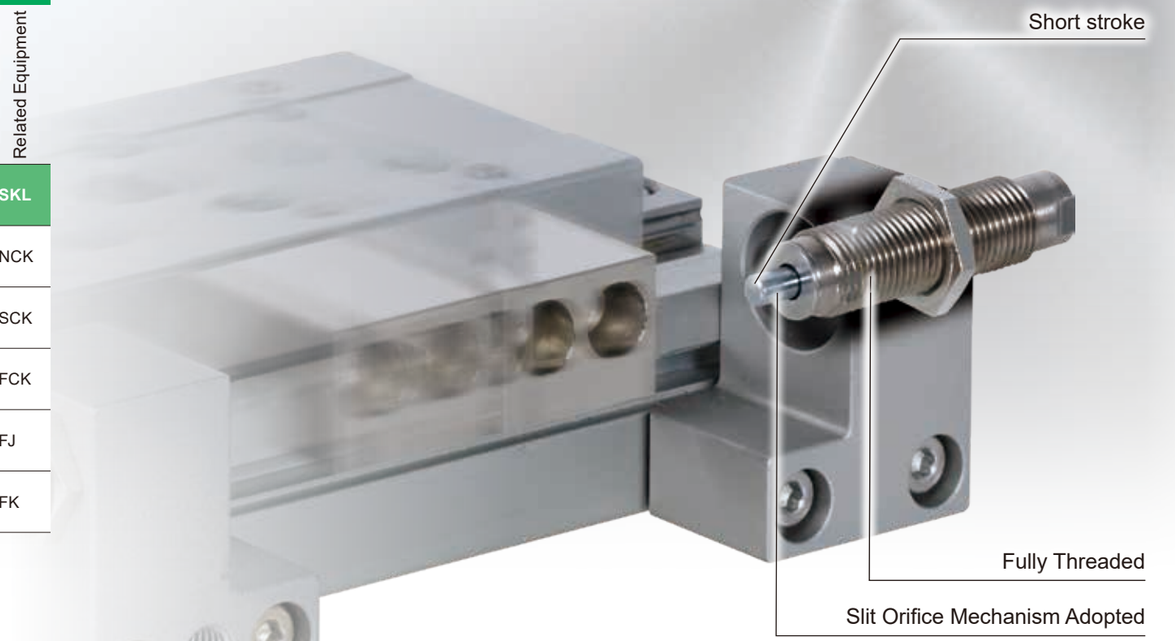
Shock Absorber, Fixed Type

CONTENTS

SKL Series

Achieves equipment cycle time reduction and contributes to productivity improvement!

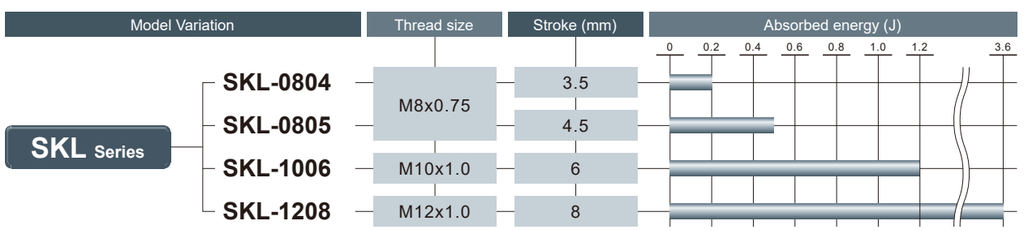
Mounted on LCR, LCG Optimized



Fast, Soft, Durable

Model Variations

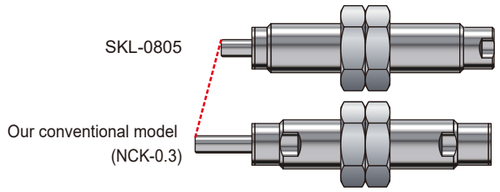
4 types available to match the Max absorption energy suitable for linear slide cylinders.

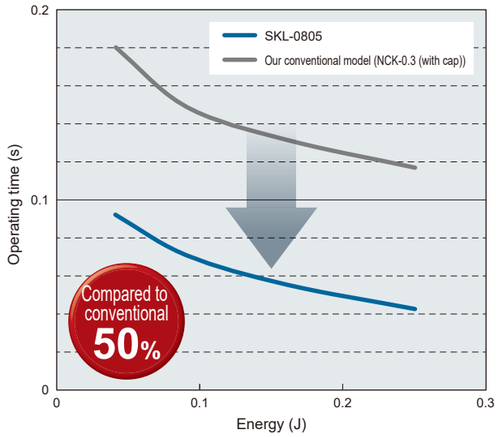


High cycle

Significant reduction in operating time due to short stroke

Compatible with high cycle time and high precision of linear slide cylinders. Achieves reduction in equipment operating time and contributes to productivity improvement.



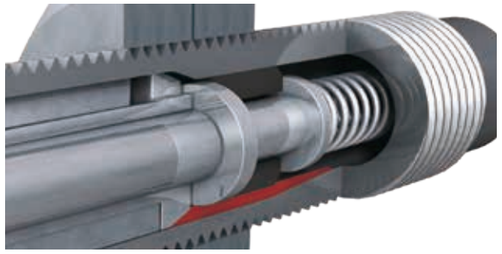


* The data are reference values at a cylinder thrust of 160 N and room temperature. Operating time varies depending on impact conditions.

Achieves long life with soft stopping

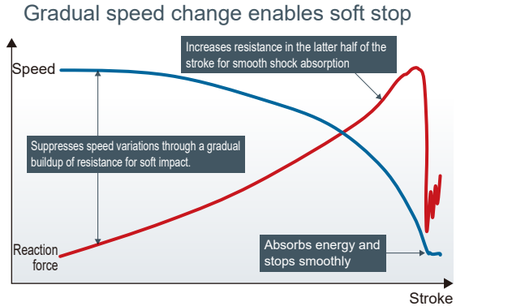
Smooth shock absorption characteristics due to adoption of slit orifice mechanism

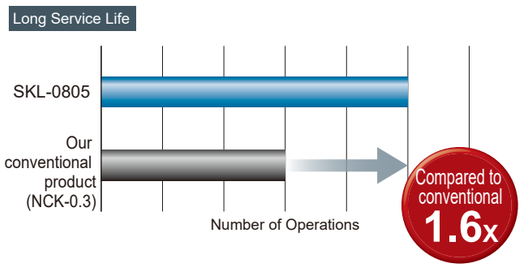
Adopts a slit orifice mechanism where the orifice area smoothly decreases with piston movement. Achieves an ideal triangular waveform and mitigates impact with soft absorption characteristics.



Slit orifice mechanism achieving long life

While inheriting the conventionally well-regarded slit orifice mechanism, it has been specialized and optimized for linear slide cylinders.

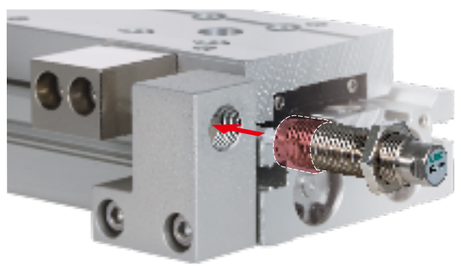


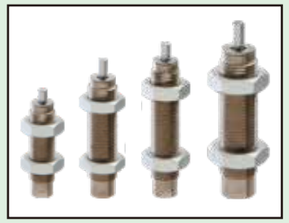


High maintainability

Easy mounting without tip cap

Adopts a structure where the slider is directly received by the main body. Since there is no tip cap and it can be mounted from the rod side, the shock absorber can be replaced while the linear slide cylinder is installed.





Shock Absorber

SKL Series

● Max absorbed energy: 0.2 to 3.6 J

RoHS

Model Number Notation

SKL - 08 05

Model No. / ② Stroke / ① Thread Size

① Thread Size

Code	Content
08	M8×0.75
10	M10×1.0
12	M12×1.0

②Stroke (mm)

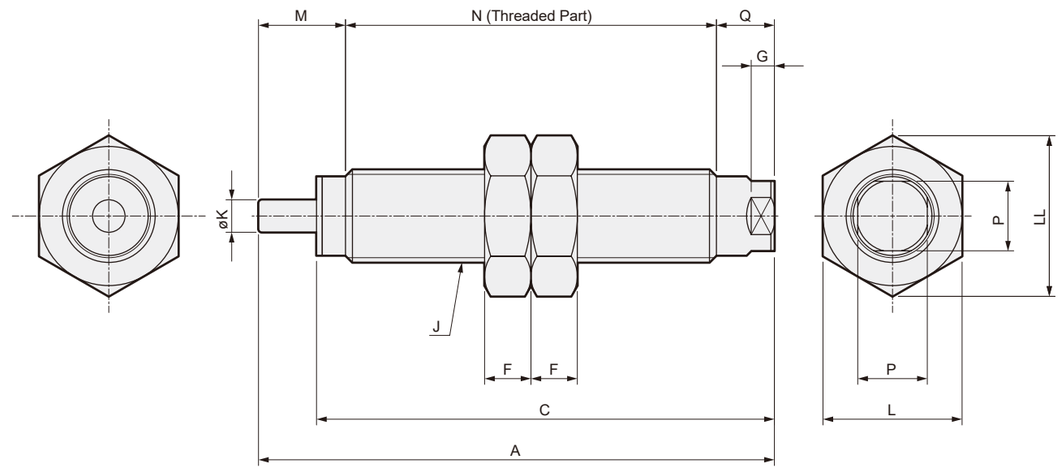
Code	Content	Thread Size		
		08	10	12
04	3.5 mm	●		
05	4.5 mm	●		
06	6 mm		●	
08	8 mm			●

Specifications

Item		SKL			
Model No.		SKL-0804	SKL-0805	SKL-1006	SKL-1208
Maximum absorption energy	J	0.2	0.5	1.2	3.6
Outer diameter thread size	mm	M8×0.75		M10×1.0	M12×1.0
Stroke	mm	3.5	4.5	-	8
Max Absorption Energy per Hour	kJ/hour	0.9	2.4	4.3	12.9
Max Impact Speed	m/s	1.0			
Max Repetition Frequency	cycles/min	80		60	
Ambient Temperature	°C	-10 to 60 (however, no freezing)			
Max Allowable Thrust	N	40	158	281	687
Max Load (Rated Resistance Force)	N	152	277	484	1064
Required mounting strength	N	456	831	1452	3192
Return Time	s	0.3 or less			
Weight	g	9	12	20	40
Return	At Extension N	3.3	3.3	2.3	3.4
Spring Force	At Compression N	4.6	4.6	4.2	5.9

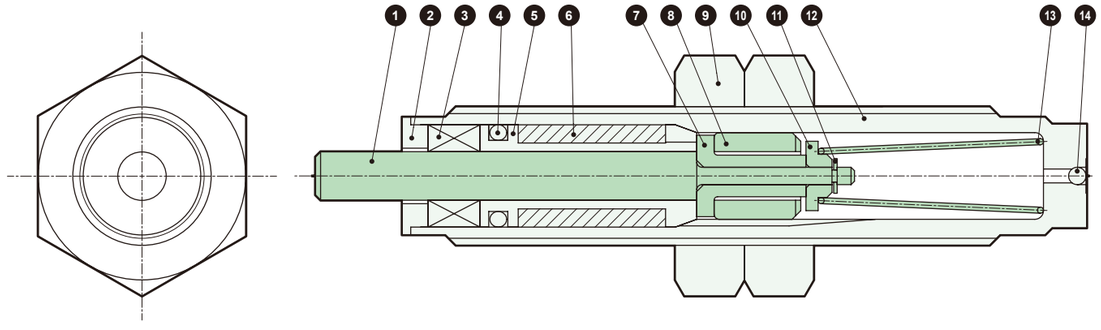
Note: The absorption capacity of the shock absorber changes depending on the speed and Ambient Temperature. The above specification values are at normal temperature.

Dimensional Drawings



Model No.	A	C	F	G	J	K	L	LL	M	N	P	Q
SKL-0804	34.5	30.5	4	2	M8×0.75	2.8	12	13.9	6.5	23	6	5
SKL-0805	44.5	39.5	4	2	M8×0.75	2.8	12	13.9	7.5	32	6	5
SKL-1006	49	42.5	4	2	M10×1.0	3	14	16.2	9	34	8	6
SKL-1208	56	47.5	5	2	M12×1.0	3.5	17	19.6	12	37	10	7

Internal Structure Diagram/Material



Do not disassemble

Part No.	Part Name	Material	Remarks	Part No.	Part Name	Material	Remarks
1	Piston Rod	Steel	Industrial Hard Chrome Plating	8	Piston	Cast Iron	
2	Cover	Stainless Steel		9	Hexagon Nut	Steel	Zinc Plating
3	Oil Seal	Special Nitrile Rubber		10	Valve Stopper	Steel	
4	O-ring	Nitrile Rubber		11	E-type Retaining Ring	Stainless Steel	
5	Rod Guide	Aluminum Alloy		12	Damper Case	Steel	Nickel Plating
6	Air Chamber	Nitrile Rubber		13	Spring	Piano Wire	
7	Valve	Steel		14	Steel ball	Steel	

Shock Absorber Model Selection Guide

1 Clarify the equipment impact pattern

- Horizontal Motion
  - a. Simple Horizontal Impact
  - b. Impact with Cylinder Thrust
  - c. Impact with Motor Driving Force
- Vertical Motion
  - d. Impact due to Free Fall
  - e. Impact with Cylinder Thrust (Lowering)
  - f. Impact with Cylinder Thrust (Ascending)
- Inclined Motion
  - g. Impact due to Free Sliding
  - h. Impact with Cylinder Thrust (Lowering)
  - i. Impact with Cylinder Thrust (Ascending)
- Oscillating Motion Rotation
  - j. Impact due to Free Oscillation Fall
  - k. Impact with Torque from Motor, etc. (Oscillation)
  - l. Impact with Torque from Motor, etc. (Rotation)

Note: Refer to "Collision Pattern Diagram Examples".

2 Clarify conditions/items necessary for energy calculation

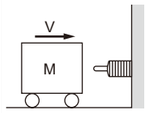
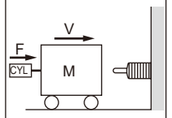
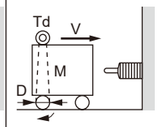
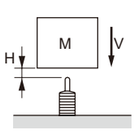
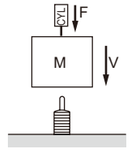
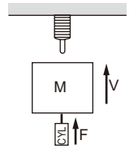
E = Total Absorption Energy (J)
E_1 = Kinetic Energy (J)
E_2 = Thrust / Self-weight Energy (J)

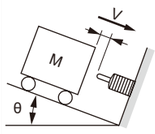
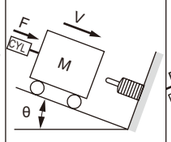
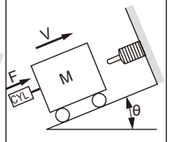
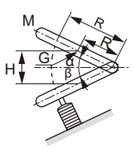
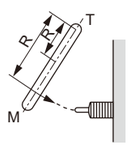
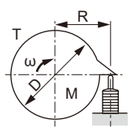
L = Impact Object Travel Distance (m)
(Inclined Free Fall)
R = Distance from Center of Rotation to Impact Point (m)
r = Distance from Center of Rotation to Center of Gravity (m)
G = Center of Gravity Position

M = Impact Weight (kg)
V = Impact Speed (m/s)
S = SKL Stroke (m)
F = Pushing Force (N)
g = Acceleration of Gravity 9.8 m/s^2
ω = Angular Velocity (rad/s)
J = Moment of Inertia ($kg \cdot m^2$)
D = Diameter (m)
N = Rotational Speed (rpm)
Me = Equivalent Weight (kg)

H = Fall Height (m)
T = Torque (N·m)
Td = Motor Starting Torque (N·m)
K = Reduction Ratio
θ, α, β = Inclination Angle (deg)

3 Actually calculate energy according to impact pattern diagram examples

	Horizontal Impact			Vertical Impact		
	a. Simple Horizontal Impact	b. When there is cylinder pushing force	c. When there is motor pushing force	d. Free Fall	e. Cylinder Lower Limit Stopper	f. Cylinder Upper Limit Stopper
Usage Example						
Kinetic Energy E_1 (J)	$\frac{1}{2}\cdot M\cdot V^2$	$\frac{1}{2}\cdot M\cdot V^2$	$\frac{1}{2}\cdot M\cdot V^2$	$\frac{1}{2}\cdot M\cdot V^2$	$\frac{1}{2}\cdot M\cdot V^2$	$\frac{1}{2}\cdot M\cdot V^2$
Thrust/Self-weight Energy E_2 (J)	——	F·S	$2\cdot\frac{K}{D}\cdot Td\cdot S$	M·g·S	(M·g+F)·S	(F−M·g)·S
Total Absorption Energy E (J)	$E = E_1$	$E=E_1+E_2$	$E=E_1+E_2$	$E=E_1+E_2$	$E=E_1+E_2$	$E=E_1+E_2$
Equivalent Weight Me (kg)	$Me = M$	$Me=\frac{2\cdot E}{V^2}$	$Me=\frac{2\cdot E}{V^2}$	$Me=\frac{2\cdot E}{V^2}$ $(V=\sqrt{2\cdot g\cdot H})$	$Me=\frac{2\cdot E}{V^2}$	$Me=\frac{2\cdot E}{V^2}$

	Inclined Impact			Oscillating Impact		Rotational Impact
	g. Free Fall	h. When there is cylinder pushing force	i. When there is cylinder pushing force	j. Free Fall	k. When there is torque from motor, etc.	L. When there is torque from motor, etc.
Usage Example						
Kinetic Energy E_1 (J)	$\frac{1}{2}\cdot M\cdot V^2$	$\frac{1}{2}\cdot M\cdot V^2$	$\frac{1}{2}\cdot M\cdot V^2$	M·g·H	$\frac{J\cdot\omega^2}{2}$ or $\frac{1}{2}\cdot M\cdot V^2$	$\frac{J\cdot\omega^2}{2}=\frac{M\cdot D^2\cdot\omega^2}{16}$
Thrust/Self-weight Energy E_2 (J)	M·g·S·sinθ	(M·g·sinθ+F)·S	(F−M·g·sinθ)·S	$\frac{r}{R}\cdot M\cdot g\cdot S$	$\frac{T}{R}\cdot S$	$\frac{T}{R}\cdot S$
Total Absorption Energy E (J)	$E=E_1+E_2$	$E=E_1+E_2$	$E=E_1+E_2$	$E=E_1+E_2$	$E=E_1+E_2$	$E = E_1+E_2$
Equivalent Weight Me (kg)	$Me=\frac{2\cdot E}{V^2}$ $(V=\sqrt{2\cdot g\cdot L\cdot\sin\theta})$	$Me=\frac{2\cdot E}{V^2}$	$Me=\frac{2\cdot E}{V^2}$	$Me=\frac{2\cdot E}{V^2}$ $(V=\frac{R}{r}\sqrt{\frac{3\cdot g\cdot H}{2}})$	$Me=\frac{2\cdot E}{V^2}$ $(V=\omega\cdot R)$	$Me=\frac{2\cdot E}{V^2}$ $(V=\omega\cdot R,\ \omega=\frac{2\pi\cdot N}{60})$

● Explanation of code
E = Total Absorption Energy J
E_1 = Kinetic Energy J
E_2 = Thrust / Self-weight Energy J

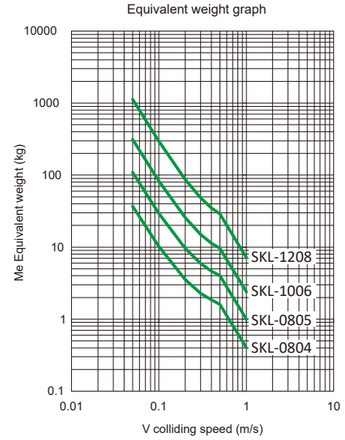
a. Kinetic Energy …… Calculate the value of E_1 according to the "Impact Pattern Diagram Examples."
b. Thrust/Self-weight Energy … Calculate the value of E_2 according to the "Impact Pattern Diagram Examples."For S (SKL stroke) in the calculation formula, select a model whose Max absorption energy exceeds E_1, and substitute S for that model number.
c. Total Absorption Energy … Then, if the calculation result exceeds Emax (Max absorption energy), select an SKL one size larger than the previously selected model number and recalculate. It is OK if the calculated value of E is less than the Emax of the model number selected here.

4 Confirmation of Equivalent Weight

a. Calculate the value of Me according to the impact pattern diagram examples.
b. From the Me (catalog value) for the model number selected in 3 and the calculation result of a, it can be used if Me under the current conditions is within the Me range of the selected model (calculated value of Me < specified value of Me).
c. If it exceeds the range of Me of the model selected in b, select an SKL one size larger and check in the same way.

Note) Equivalent weight corresponds to the weight of the workpiece when considering that even for an object moving with thrust, etc., it is all only kinetic energy. This performs load limitation under very low speed conditions.

Equivalent weight graph



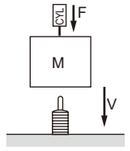
5 Confirmation of Shock Absorber Specification Range

a. Max Repetition Frequency [times/min]
b. Maximum collision speed [m/s]
c. Ambient Temperature [°C]
d. Return time [s]

Note: The value of energy that can be absorbed may change depending on the impact speed.

Selection Example

1 Clarify the equipment impact pattern

	Vertical Impact
	e. Cylinder Lower Limit Stopper
Usage Example	
Kinetic Energy E_1 (J)	$E_1=\frac{1}{2}\cdot M\cdot V^2$
Thrust/Self-weight Energy E_2 (J)	$E_2=(Mg+F)\cdot S$
Total Absorption Energy E (J)	$E=E_1+E_2$
Equivalent Weight Me (kg)	$Me=\frac{2\cdot E}{V^2}$

2 Clarify conditions/items necessary for energy calculation

(Example)
Impact Material Weight: M=1.0 kg
Impact Speed: V=0.5 m/s
Pushing Force: F=70 N
aAmbient Temperature: 23°C
Return Time: 2 seconds (Time until re-impact)

3 Actually calculate energy according to impact pattern diagram examples

Calculate E_1

$E_1=\frac{1}{2}\cdot MV^2=\frac{1}{2}\times1\times0.5^2=0.13$ (J)

Temporarily select SKL-0804 from E_1 and calculate E_2

$E_2=(Mg+F)\cdot S=(1\times9.8+70)\times0.0035=0.28$ (J)

Since the allowable absorption energy of SKL-0804 is exceeded, recalculate with SKL-0805, one size larger

$E_2=(Mg+F)\cdot S=(1\times9.8+70)\times0.0045=0.36$ (J)

$E=E_1+E_2=0.13+0.36=0.49$ (J)

OK because it is below the SKL-0805 allowable absorption energy

4 Confirmation of Equivalent Weight

$Me=\frac{2E}{V^2}=\frac{2\times0.49}{0.5^2}=3.92$ (kg)

OK because it is below the allowable value of SKL-0805
Select SKL-0805