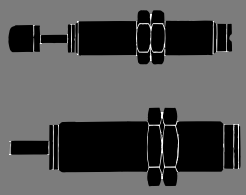
Related Products

Technical Data



Shock Absorber
Series RB

Impact and noise absorption

Dampening to meet the high speed requirements of the modern world.

Shock Absorber: Series RB
Coolant Resistant: Series RBL

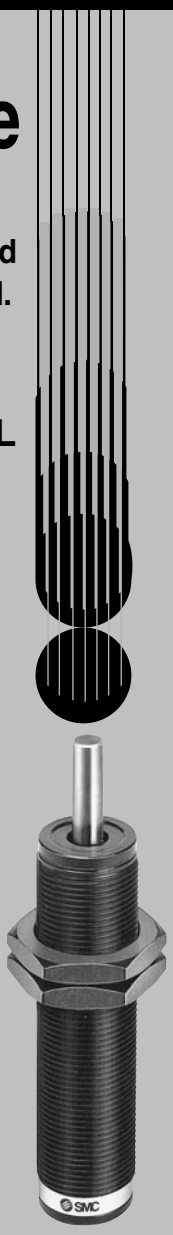
Usable without a stopper nut
The strong body can be positioned directly.

Short Style
Shock Absorber: Series RBQ

A compact style that has been shortened lengthwise

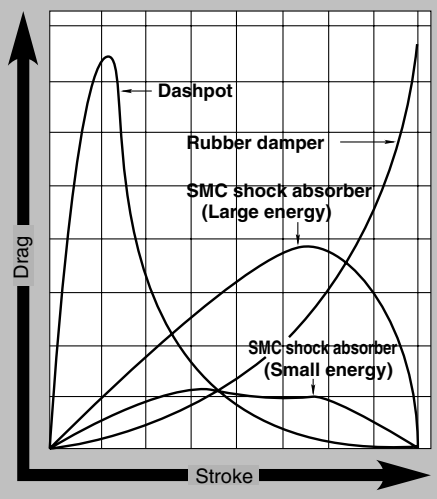
Allowable eccentric angle 5°
Suitable for absorption of rotation energy.

Usable without a stopper nut
The strong body can be positioned directly.



Automatic adjustment to the most appropriate absorption performance

Specially designed orifice can absorb energy comprehensively and most appropriately in many different applications. This ranges from high speed low loads, to low speed high loads; without requiring additional adjustment of the shock absorber.



Variations

Series	Basic	With cap or bumper (Option)	Lock nut*	Stopper nut (Option)	Foot bracket	Page
Series **RB** 	Series RB	●	●	●	●	5.1-2
	Coolant resistant Series RBL (Except 08 type)	●	●	●	●	5.1-7
Series **RBQ** 	Series RBQ	●	●	●	●	5.1-10

∗2 lock nuts are attached for series RB and standard models RBQ.

Shock Absorber
Series RB

Basic **With cap**

Specifications

Model		Basic	RB0805	RB0806	RB1006	RB1007	RB1411	RB1412	RB2015	RB2725
		With cap	RBC0805	RBC0806	RBC1006	RBC1007	RBC1411	RBC1412	RBC2015	RBC2725
Max. energy absorption (J)			0.98	2.94	3.92	5.88	14.7	19.6	58.8	147
Stroke absorption (mm)			5	6	6	7	11	12	15	25
Impact speed (m/s)			0.05 to 5							
Max. operation* (cycle/min)			80	80	70	70	45	45	25	10
Max. allowable thrust energy (N)			245	245	422	422	814	814	1961	2942
Allowable temp. range (°C)			–10 to 80 (No freezing)							
Spring force (N)	Extended		1.96	1.96	4.22	4.22	6.86	6.86	8.34	8.83
	Compressed		3.83	4.22	6.18	6.86	15.30	15.98	20.50	20.01
Weight (g)			15	15	25	25	65	65	150	360
Option	Stopper nut	Basic	RB08S		RB10S		RB14S		RB20S	RB27S
		With cap	RBC08S		RBC10S		RBC14S		RBC20S	RBC27S

∗ At max. energy absorption per cycle. Max. operation cycle/min can increase in proportion to energy absorption.

How to Order

RB | C | 14 | 12 |

Shock absorber

Style

—	Basic
C	With cap

O.D. thread-Stroke

Option

—	None
S	With stopper nut
J	Add'l 1 hex. nut (Total: 3 pcs.*)

∗ 2 mounting hex. nuts are attached as standard

Replacement Part No./Cap (Resin part only)

RBC | 08 | C

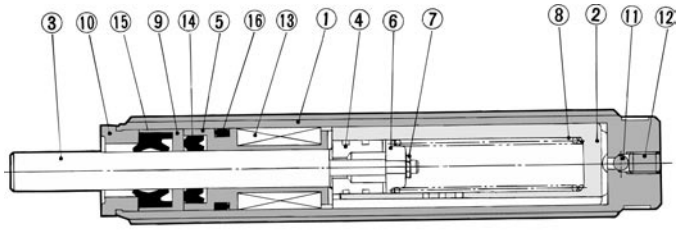
Applicable model

08	RBC0805, 0806	20	RBC2015
10	RBC1006, 1007	27	RBC2725
14	RBC1411, 1412		

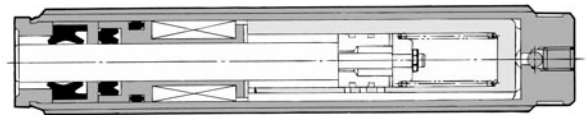
Cap

Construction

Extended



Compressed



Component Parts

No.	Description	Material	Note
①	Outer tube	Rolled steel	Gray coated
②	Inner tube	Special steel	Heat treatment
③	Piston rod	Special steel	Hard chrome plated
④	Piston	Special steel	Heat treatment
⑤	Bearing	Special bearing material	
⑥	Spring guide	Rolled steel	Zinc chromated
⑦	Pushing nut	Steel for spring	
⑧	Return spring	Piano wire	Zinc chromated
⑨	Seal holder	Copper alloy	
⑩	Stopper	Carbon steel	Zinc chromated
⑪	Steal ball	Bearing steel	
⑫	Set screw	Special steel	
⑬	Accumulator	NBR	Foam rubber
⑭	Rod seal	NBR	
⑮	Scraper	NBR	
⑯	Gasket	NBR	

Series RB
How to Select

Selection Procedure

1 Classification of impact

- ☐Cylinder stroke at load (horizontal)
- ☐Cylinder stroke at load (downward)
- ☐Cylinder stroke at load (upward)
- ☐Conveyor stroke at load (horizontal)
- ☐Free horizontal impact
- ☐Free dropping impact
- ☐Rotation impact (with torque)

2 Details of applications

Symbol	Condition of application	Unit
m	Impacting object/weight	kg
υ	Impacting object/speed	m/sec
h	Dropping height	m
ω	Angle/speed	rad/sec
r	Distance between axis of cylinder and impact point	m
d	Bore size	mm
P	Cylinder operating pressure	MPa
F	Thrust energy	N
T	Torque	Nm
n	Operation cycle	cycle/min
t	Ambient temperature	°C
μ	Friction coefficient	–

3 Specifications and Operational instructions

Ensure that the impact speed, thrust energy, operation cycle, ambient temperature and atmosphere fall within the specifications.

∗Be aware of the min. installation radius in the case of oscillating impacts.

4 Calculation of kinetic energy E_1

Using the equation suitable for the classification of impact.

In the case of cylinder stroke at load and free horizontal impact, substitute respective figures for **Data A** in order to calculate E_1.

5 Calculation of thrust energy E_2

Select any shock absorber as a provisional model.

In the case of thrust energy of cylinder, substitute respective figures for **Data B or C**.

6 Calculation of corresponding weight of impacting object Me

Energy absorption $E=E_1+E_2$

Corresponding weight of impacting object $Me=\frac{2}{\upsilon^2}E$

Substitute both energy absorption E and impacting object speed V for **Data A** in order to calculate the corresponding weight of the impacting object.

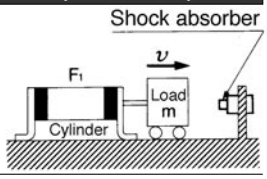
7 Selection of applicable model

Taking into consideration the corresponding weight of the impacting object Me, calculated using **Data D** and impacting object speed V, check provisional model compatibility with the condition of application. If this is satisfactory, then the said provisional model will be the applicable one.

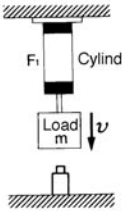
Caution

To enable the shock absorber to operate accurately for long hours, it is necessary to select a model that is well-suited to your operating conditions. If the impact energy is smaller than **5**% of the maximum absorption energy, select a model that is one class lower.

Example of Selection

	Cylinder stroke at load (Horizontal)
1 Classification of impact	
Impact object /speed U (1)	υ
Kinetic energy E_1	$\frac{1}{2}m\upsilon^2$
Thrust energy E_2	F_1S
Energy absorption E	E_1+E_2
Impacting object/ corresponding weight Me (2)	$\frac{2}{\upsilon^2}E$
2 Details of applications	m=50kg υ=0.3m/s d=40mm p=0.5MPa n=20cycle/min t =25°C
3 Specifications Operational instructions	υ ····· 0.3<5 (max.) t ····· –10 (min.)<25<80 (max.) F ····· F1···628<1961 (max.) **YES**
4 Calculation of kinetic energy E_1	Use Formula to calculate E_1. Substitute 50 for m and 0.3 for υ. **$E_1 \cong 2.3$J**
5 Calculation of thrust energy E_2	Use **Data B** to calculate E_2. Substitute 40 for d.44Calculation of corresponding weight of impacting object. **$E_2 \cong 9.4$J**
6 Calculation of corresponding weight of impacting object Me	Use the formula "Energy absorption $E=E_1+E_2=2.3+9.4=11.7$J" to calculate Me. Substitute 11.7J for E and 0.3 for υ. **Me ≅ 260kg**
7 Selection of applicable model	According to **Data D**, the tentatively selected RB2015 satisfies Me= 260kg<400kg at υ=0.3. Ultimately, it will result in an operating frequency of n···20<25, without causing a problem. **YES** **Select RB2015**

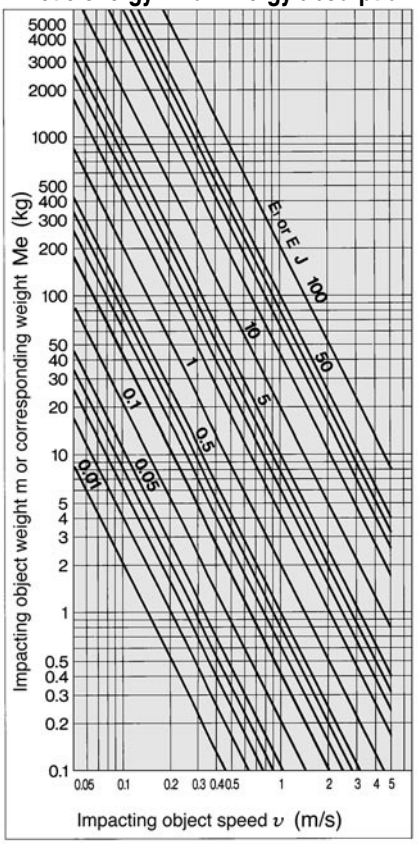
1 Classification of Impact

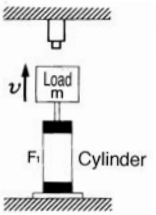
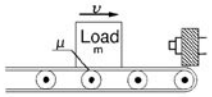
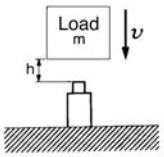
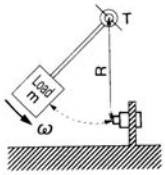
Classification of impact	(Downward) 
Impact object /speed υ (1)	υ
Kinetic energy E_1	$\frac{1}{2}m\upsilon^2$
Thrust energy E_2	F_1S+mgs
Energy absorption E	E_1+E_2
Impacting object/ corresponding weight Me (2)	$\frac{2}{\upsilon^2}E$

Note 1) Impacting object speed is momentary velocity at which object is impacting against shock absorber.

Data A

Kinetic energy E_1 or Energy absorption E



	(Upward)	Conveyor driving at load (Horizontal)	Free dropping impact	Rotation impact (With torque)
				
	υ	υ	$\sqrt{2gh}$	ωR
	$\frac{1}{2}m\upsilon^2$	$\frac{1}{2}m\upsilon^2$	mgh	$\frac{1}{2}I\omega^2$
	$F1S-mgS$	$mg\mu S$	mgS	$T\frac{S}{R}$
	E_1+E_2	E_1+E_2	E_1+E_2	E_1+E_2
	$\frac{2}{\upsilon^2}E$	$\frac{2}{\upsilon^2}E$	$\frac{2}{\upsilon^2}E$	$\frac{2}{\upsilon^2}E$

Note 2) An "Impact body equivalent weight" is the weight of an impact body without involving thrust, into which an object's total energy has been converted.
Note 3) Refer to the catalog of rotary actuator for the formula of moment of inertia (Kgm^2).

«Symbol table»

Symbol	Specifications	Unit
d	Bore size	mm
E	Energy absorption	J
E_1	Kinetic energy	J
E_2	Thrust energy	J
F_1	Cylinder thrust	N
g	Acceleration of gravity	m/s^2
h	Dropping height	m
I(3)	Moment of inertia around the center of gravify	kgm^2
n	Operation cycle	cycle/min
p	Cylinder operation pressure	MPa
R	Distance between axis of cylinder and impact point	m
S	Shock absorber stroke	m
T	Torque	Nm
t	Ambient temperature	°C
υ	Impacting object speed	m/s
m	Impacting object weight	kg
Me	Corresponding weight of impacting object	kg
ω	Angle speed	rad/s
μ	Friction coefficient	—

Data B

Thrust energy of cylinder F_1S (Operating pressure 0.5MPa)

Unit: J

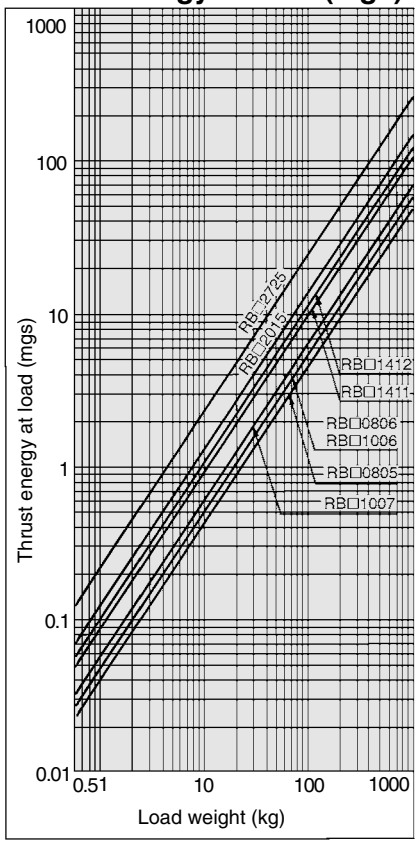
Bore size d (mm) \ Model	RB□ 0805	RB□0806 RB□1006	RB□ 1007	RB□ 1411	RB□ 1412	RB□ 2015	RB□ 2725
Stroke absorption (mm)	5	6	7	11	12	15	25
6	0.071	0.085	0.099	0.156	0.170	0.212	0.353
10	0.196	0.236	0.274	0.432	0.471	0.589	0.982
15	0.442	0.530	0.619	0.972	1.06	1.33	2.21
20	0.785	0.942	1.10	1.73	1.88	2.36	3.93
25	1.23	1.47	1.72	2.70	2.95	3.68	6.14
30	1.77	2.12	2.47	3.89	4.24	5.30	8.84
40	3.14	3.77	4.40	6.91	7.54	9.42	15.7
50	4.91	5.89	6.87	10.8	11.8	14.7	24.5
63	7.79	9.35	10.9	17.1	18.7	23.4	39.0
80	12.6	15.1	17.6	27.6	30.2	37.7	62.8
100	19.6	23.6	27.5	43.2	47.1	58.9	98.2
125	30.7	36.8	43.0	67.5	73.6	92.0	153
140	38.5	46.2	53.9	84.7	92.4	115	192
160	50.3	60.3	70.4	111	121	151	251
180	63.6	76.3	89.1	140	153	191	318
200	78.5	94.2	110	173	188	236	393
250	123	147	172	270	295	368	614
300	177	212	247	389	424	530	884

■**Operating pressure other than 0.5MPa: Multiply by the following coefficient**

Operating press (MPa)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Coefficient	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8

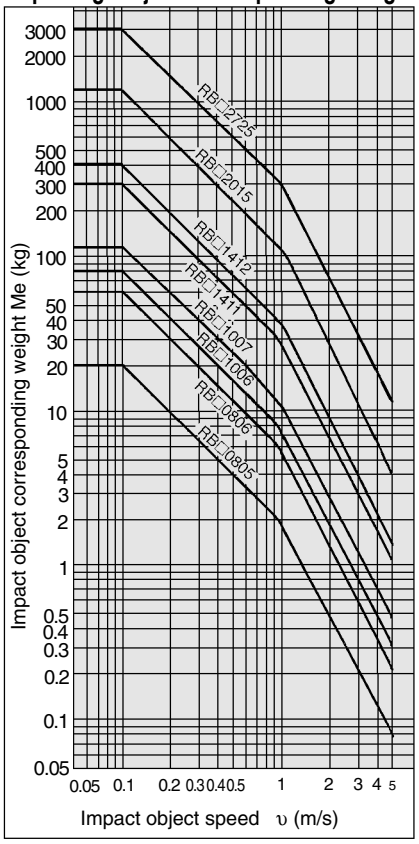
Data C

Thrust energy at load (mgs)



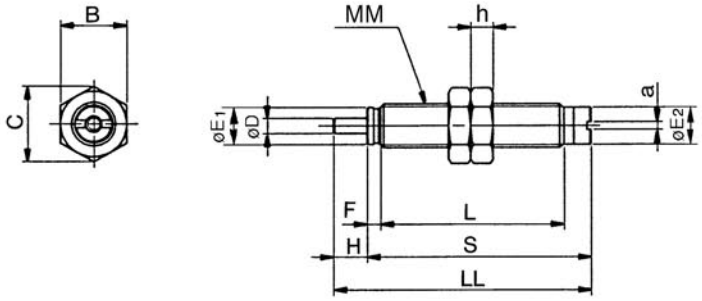
Data D

Impacting object corresponding weight



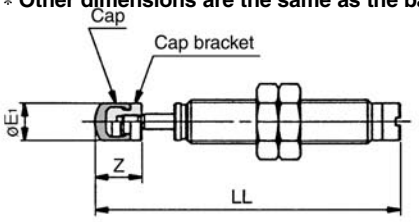
Dimensions

Basic/RB0805, RB0806, RB1006, RB1007



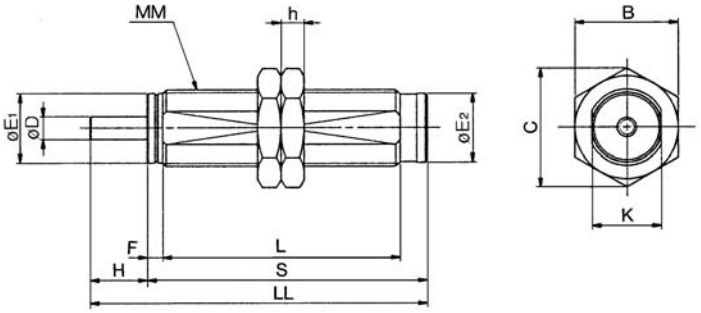
With cap/RBC0805, RBC0806 RBC1006, RBC1007

* Other dimensions are the same as the basic style.



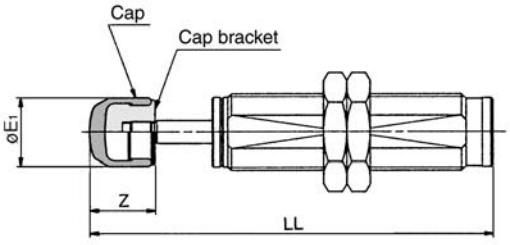
Model		Basic										With cap*			Hexagon nut		
Basic	With cap	D	E1	E2	F	H	a	L	LL	MM	S	E1	LL	Z	B	C	h
RB0805	**RBC0805**	2.8	6.8	6.8	2.4	5	1.4	33.4	45.8	M8 X 1.0	40.8	6.8	54.3	8.5	12	13.9	4
RB0806	**RBC0806**	2.8	6.8	6.8	2.4	6	1.4	33.4	46.8	M8 X 1.0	40.8	6.8	55.3	8.5	12	13.9	4
RB1006	**RBC1006**	3	8.8	8.6	2.7	6	1.4	39	52.7	M10 X 1.0	46.7	8.7	62.7	10	14	16.2	4
RB1007	**RBC1007**	3	8.8	8.6	2.7	7	1.4	39	53.7	M10 X 1.0	46.7	8.7	63.7	10	14	16.2	4

Basic/RB1411, RB1412, RB2015, RB2725



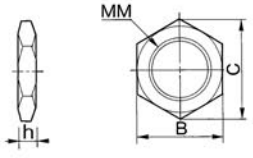
With cap/RBC1411, RBC1412 RBC2015, RBC2725

* Other dimensions are the same as the basic style.



Model		Basic										With cap*			Hexagon nut		
Basic	With cap	D	E1	E2	F	H	K	L	LL	MM	S	E1	LL	Z	B	C	h
RB1411	**RBC1411**	5	12.2	12	3.5	11	12	58.8	78.3	M14 X 1.5	67.3	12	91.8	13.5	19	21.9	6
RB1412	**RBC1412**	5	12.2	12	3.5	12	12	58.8	79.3	M14 X 1.5	67.3	12	92.8	13.5	19	21.9	6
RB2015	**RBC2015**	6	18.2	18	4	15	18	62.2	88.2	M20 X 1.5	73.2	18	105.2	17	27	31.2	6
RB2725	**RBC2725**	8	25.2	25	5	25	25	86	124	M27 X 1.5	99	25	147	23	36	41.6	6

Hexagon Nut (2 pcs. as standard)

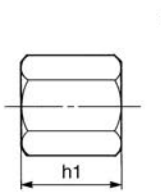


Part No.	Dimensions			
	MM	h	B	C
RB08J	M8 X 1.0	4	12	13.9
RB10J	M10 X 1.0	4	14	16.2
RB14J	M14 X 1.5	6	19	21.9
RB20J	M20 X 1.5	6	27	31.2
RB27J	M27 X 1.5	6	36	41.6

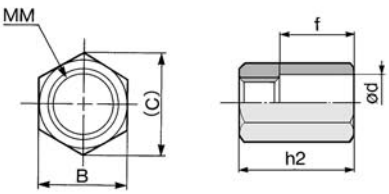
Option

Stopper nut

For basic style



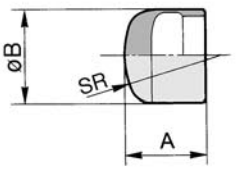
For cap style



Part No.		Dimensions						
Basic	With cap	B	C	h1	h2	MM	d	f
RB08S	**RBC08S**	12	13.9	6.5	23	M8 X 1.0	9	15
RB10S	**RBC10S**	14	16.2	8	23	M10 X 1.0	11	15
RB14S	**RBC14S**	19	21.9	11	31	M14 X 1.5	15	20
RB20S	**RBC20S**	27	31.2	16	40	M20 X 1.5	23	25
RB27S	**RBC27S**	36	41.6	22	51	M27 X 1.5	32	33

Replacement Part

Cap * (These are the replacement parts for the cap style. Not available for the basic style.)



Material: Polyurethane

Part No.	Dimensions		
	A	B	R1
RBC08C	6.5	6.8	6
RBC10C	9	8.7	7.5
RBC14C	12.5	12	10
RBC20C	16	18	20
RBC27C	21	25	25

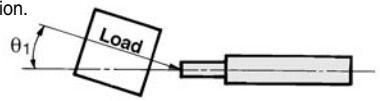
⚠ Precautions

Be sure to read before handling. Refer to Pages p.0-39 to 0-43 for Safety Instructions and common precautions.

Selection

⚠ Warning

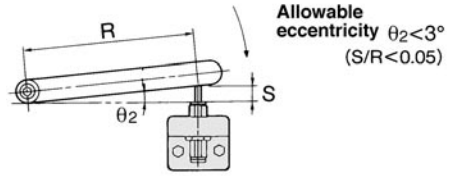
①**The installation must be designed so that the impact body is perpendicular to the shock absorber's axial centre.** An angle of deviation that exceeds 3° will place an excessive load on the bearings, leading to oil leaks within a short period of operation.



Allowable eccentricity $\theta_1 < 3°$

②**If oscillating impacts are involved, the installation must be designed so that the direction in which the load is applied is perpendicular to the shock absorber's axial center.**

The allowable oscillating angle until the stroke end must be $\theta_2 < 3°$. In this case, the minimum installation radius will be as shown in the table below. If the angle exceeds 3°, it could lead to oil leaks.



Installation conditions for rotation impact (mm)

Model	S (Stroke)	θ2 (Allowable rotation angle)	R (Min. installation radius)
RB□□0805	5	3°	96
RB□□0806	6		115
RB□□1006	6		115
RB□□1007	7		134
RB□□1411	11		210
RB□□1412	12		229
RB□□2015	15		287
RB□□2725	25		478

③**A guide is necessary if the impact body involves vibrations.**

If the impact body involves vibrations and if a force that is perpendicular to the axis is applied to the piston rod, a secure guide must be provided for the impact body.

④**The rigidity of the mounting frame must be taken into consideration.**

If the mounting frame lacks rigidity, the shock absorber will vibrate after an impact, causing bearing wear and damage. Apply the following formula to calculate the force that is applied to the mounting frame:

$$\text{Force applied to the mounting frame } N \cong 2\frac{E \text{ (absorption energy J)}}{S \text{ (stroke m)}}$$

⚠ Caution

①**The maximum absorption energy indicated in the specifications for both Series RB and RBL cannot be brought into full play unless the entire stroke is used.**

②**The contact surface of the impact body with which the piston rod comes in contact must be highly rigid.**

In the case without a cap, a high surface compression load is applied to the contact surface of the impact body with which the piston rod comes in contact. Therefore, the contact surface must be highly rigid(hardness of HRC35 or more).

③**Be aware of the return force of the impact body.**

If used in a conveyor drive, after the shock absorber has absorbed energy, it could be pushed back by the spring that is built in. Refer to the column for the spring force in the specifications (P.5.1-2).

Environment

⚠ Warning

①**Do not expose the shock absorber to machining oil, water, or dust.**

Series RB cannot be used under conditions in which fluids such as machining oil or water are present in atomized form or come in direct contact with the piston rod, or in which dust could adhere to the piston rod. Such conditions would cause malfunction.

②**Do not operate the shock absorber in an environment that poses the risk of corrosion.**

Refer to the respective structural drawing for the type of material that is used in the shock absorbar.

③**Do not use the shock absorber in a clean room,** as it could contaminate the clean room.

Mounting

⚠ Warning

①**Before performing installation, removal, or stroke adjustment, make sure to cut the power supply to the equipment and verify that the equipment has stopped.**

⚠ Caution

①**Tightening torque of mounting nut should be as follows.**

Model	RB0805 RB0806	RB□1006 RB□1007	RB□1411 RB□1412	RB□2015	RB□2725
O.D. thread (mm)	M8 X 1.0	M10 X 1.0	M14 X 1.5	M20 X 1.5	M27 X 1.5
Thread prepared bore (mm)	$\phi 7.1^{+0.1}_{0}$	$\phi 9.1^{+0.1}_{0}$	$\phi 12.7^{+0.1}_{0}$	$\phi 18.7^{+0.1}_{0}$	$\phi 25.7^{+0.1}_{0}$
Tightening torque (Nm)	1.67	3.14	10.8	23.5	62.8

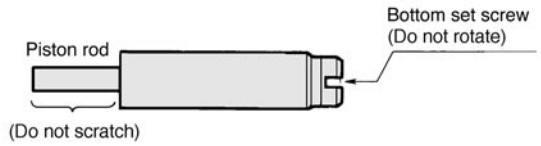
If the tightening torque that is applied to the nut exceeds the value given above, the shock absorber itself could become damaged.

②**Do not scratch the sliding portion of the piston rod or the outside**

Failure to observe this precaution could scratch or gouge the sliding portion of the piston rod, or damage the seals, which could lead to oil leakage and malfunction. Furthermore, damage to outside threaded portion of the outer tube could prevent the shock absorber from being mounted onto the frame, or its internal components could deform, leading to a malfunction.

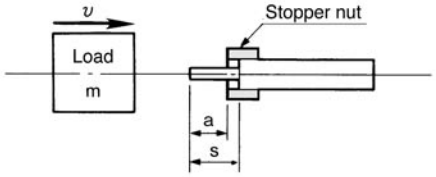
③**Never turn the screw on the bottom of the body**

it is not an adjustment screw, as this will cause oil leakage.



④**Adjust the stopping time through the use of the stopper nut, as follows:**

Control the stopping time of the impact body by turning the stopper nut in or out (thus changing length "a"). After establishing the stopper nut position, use a hexagon nut to secure the stopper nut in place.



Maintenance

Caution

①**Make sure that the retaining nut is not loose.**

The shock absorber could become damaged if it is used in a loose state.

②**Pay attention to any abnormal impact sounds or vibrations.**

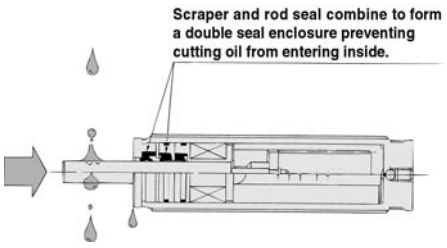
If the impact sounds or vibrations have become abnormally high, the shock absorber may have reached the end of its service life. If this is the case, replace the shock absorber. If use is continued in this state, it could lead to equipment damage.

③**Inspect the cap for any cracks or wear.**

If the shock absorber comes with a cap, the cap could wear first. To prevent damage to the impact body, replace the cap often.

Coolant Resistant Shock Absorber
Series RBL

Can be operated in an environment exposed to non-water soluble cutting oil.



Specifications

Model		Basic	RBL1006	RBL1007	RBL1411	RBL1412	RBL2015	RBL2725
		With cap	RBLC1006	RBLC1007	RBLC1411	RBLC1412	RBLC2015	RBLC2725
Max. energy absorption (J)			3.92	5.88	14.7	19.6	58.8	147
Stroke absorption (mm)			6	7	11	12	15	25
Impact speed (m/s)			0.05 to 5					
Max. operation* (cycle/min)			70	70	45	45	25	10
Max. allowable thrust energy (N)			422	422	814	814	1961	2942
Allowable temperature range (°C)			–10 to 80					
Effective atmosphere			Water-immiscible cutting oil					
Spring force (N)	Extended		4.22	4.22	8.73	8.73	11.57	22.16
	Compressed		6.18	6.86	14.12	14.61	17.65	38.05
Weight (g)			25	25	65	65	150	360
Option	Stopper nut	Basic	RB10S		RB14S		RB20S	RB27S
		With cap	RBC10S		RBC14S		RBC20S	RBC27S

*At max. energy absorption per cycle. Max. operation cycle/min can increase in proportion to energy absorption.

Basic With cap

How to Order

RB L C 14 12 ☐

- **Shock absorber**
- **Coolant resistant**
- **Style**

—	Basic
C	With cap

- **O.D. thread-Stroke**
- **Option**

—	None
S	With stopper nut
J	Add'l 1 hex. nut (Total: 3 pcs.*)

*2 mounting hexagon nuts are attached as standard.

Replacecment Part No./ Cap (Resin part only)

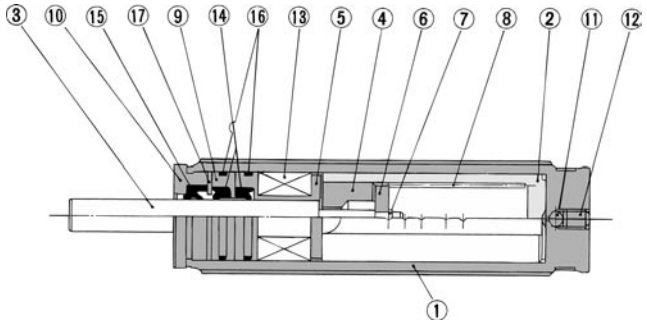
RBC 10 C

- **Applicable model**

10	RBLC1006, 1007	20	RBLC2015
14	RBLC1411, 1412	27	RBLC2725

- **Cap**

Construction

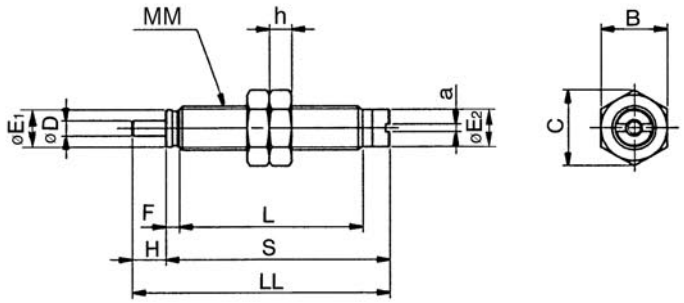


Component Parts

No.	Description	Material	Note
①	Outer tube	Rolled steel	Black coated
②	Inner tube	Special steel	Heat treatment
③	Piston rod	Special steel	Hard chrome plated
④	Piston	Special steel	Heat treatment
⑤	Bearing	Special bearing material	
⑥	Spring guide	Rolled steel	Zinc chromated
⑦	Pushing nut	Steel for spring	
⑧	Return spring	Piano wire	Zinc chromated
⑨	Seal holder	Copper alloy	
⑩	Stopper	Carbon steel	Zinc chromated
⑪	Steal ball	Bearing steel	
⑫	Set screw	Special steel	
⑬	Accumulator	NBR	Foam rubber
⑭	Rod seal	NBR	
⑮	Scraper	NBR	
⑯	Gasket	NBR	
⑰	Spacer	Rolled steel	Zinc chromated

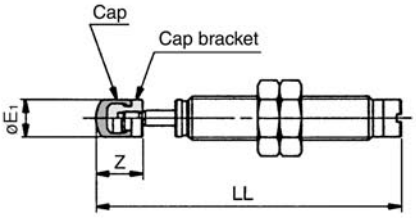
Dimensions

Basic/RBL1006, RBL1007



With Cap/RBLC1006, RBLC1007

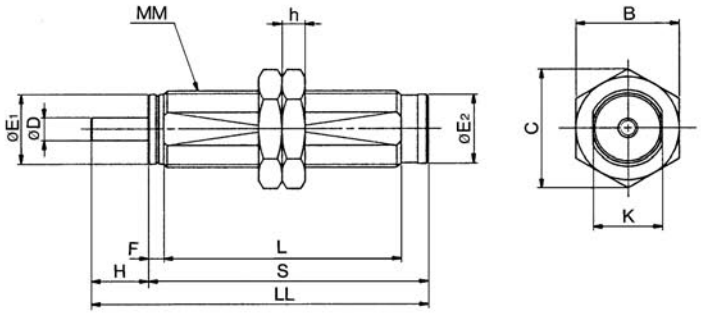
∗ Other dimensions are the same as the basic style.



Model		Basic										With cap*			Hexagon nut		
Basic	With Cap	D	E1	E2	F	H	a	L	LL	MM	S	E1	LL	Z	B	C	h
RBL1006	**RBLC1006**	3	8.8	8.6	2.7	6	1.4	43.8	57.5	M10 X 1.0	51.5	8.7	67.5	10	14	16.2	4
RBL1007	**RBLC1007**	3	8.8	8.6	2.7	7	1.4	43.8	58.5	M10 X 1.0	51.5	8.7	68.5	10	14	16.2	4

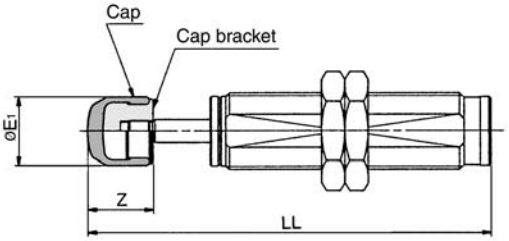
Note) L, LL and S dimensions of RBL(C)1007/1006 are different from those of RB(C)1007/1006.

Basic/RBL1411, RBL1412, RBL2015, RBL2725



With Cap/RBLC1411, RBLC1412 RBLC2015, RBLC2725

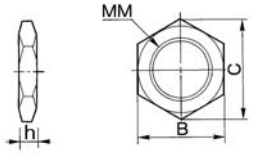
∗ Other dimensions are the same as the basic style.



Model		Basic										With cap*			Hexagon nut		
Basic	With Cap	D	E1	E2	F	H	K	L	LL	MM	S	E1	LL	Z	B	C	h
RBL1411	**RBLC1411**	5	12.2	12	3.5	11	12	63.6	83.1	M14 X 1.5	72.1	12	96.6	13.5	19	21.9	6
RBL1412	**RBLC1412**	5	12.2	12	3.5	12	12	63.6	84.1	M14 X 1.5	72.1	12	97.6	13.5	19	21.9	6
RBL2015	**RBLC2015**	6	18.2	18	4	15	18	62.2	88.2	M20 X 1.5	73.2	18	105.2	17	27	31.2	6
RBL2725	**RBLC2725**	8	25.2	25	5	25	25	91.5	129.5	M27 X 1.5	104.5	25	152.5	23	36	41.6	6

Note) L, LL and S dimensions of RBL(C)1007/1006 are different from those of RB(C)1007/1006.

Hexagon Nut (2 pcs. as standard)



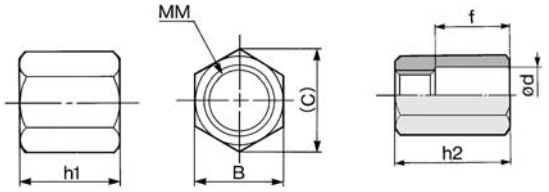
Part No.	Dimensions			
	MM	h	B	C
RB10J	M10 X 1.0	4	14	16.2
RB14J	M14 X 1.5	6	19	21.9
RB20J	M20 X 1.5	6	27	31.2
RB27J	M27 X 1.5	6	36	41.6

Option

Stopper Nut

For basic style

For cap style

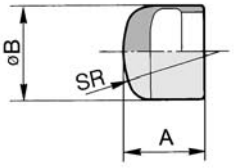


Part No.		Dimensions						
Basic	With Cap	B	C	h1	h2	MM	d	f
RB10S	**RBC10S**	14	16.2	8	23	M10 X 1.0	11	15
RB14S	**RBC14S**	19	21.9	11	31	M14 X 1.5	15	20
RB20S	**RBC20S**	27	31.2	16	40	M20 X 1.5	23	25
RB27S	**RBC27S**	36	41.6	22	51	M27 X 1.5	32	33

Replacement Part

Cap

∗ (These are the replacement part for the cap style. Not available for the basic style.)



Material: Polyurethane

Part No.	Dimensions		
	A	B	SR
RBC10C	9	8.7	7.5
RBC14C	12.5	12	10
RBC20C	16	18	20
RBC27C	21	25	25

Made to Order Specifications

Order Made

Contact SMC for the detailed dimensions, specifications and delivery.

Foot Bracket for Shock Absorber

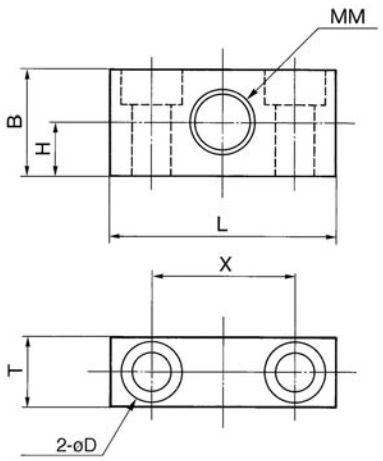
Available for the foot mounting bracket of series RB.

Part No.

Part No.	Applicable absorber
RB08-X331	**RB□805, 0806**
RB10-X331	**RB□1006, 1007**
RB14-X331	**RB□1411, 1412**
RB20-X331	**RB□2015**
RB27-X331	**RB□2725**

∗Order the foot bracket separately.

Dimensions

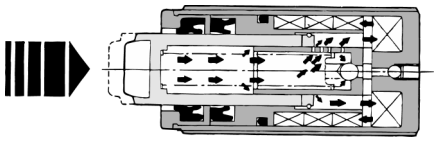


Part No.	B	D	H	L	MM	T	X	Mounting bolt
RB08-X331	15	4.5Drill, 8 Depth of counter bore4.4	7.5	32	M8 X 1.0	10	20	M4
RB10-X331	19	5.5Drill, 9.5 Depth of counter bore5.4	9.5	40	M10 X1.0	12	25	M5
RB14-X331	25	9Drill, 14 Depth of counter bore8.6	12.5	54	M14 X 1.5	16	34	M8
RB20-X331	38	11Drill, 17.5 Depth of counter bore10.8	19	70	M20 X 1.5	22	44	M10
RB27-X331	50	13.5Drill, 20 Depth of counter bore13	25	80	M27 X 1.5	34	52	M12

Shock Absorber
Short Style
Series RBQ

Allowable eccentric angle is 5°

Ideal for absorption of rotation energy



With bumper
Series RBQC

Basic
Series RBQ

Specifications

Model		Basic	RBQ1604	RBQ2007	RBQ2508	RBQ3009	RBQ3213
		With damper	RBQC1604	RBQC2007	RBQC2508	RBQC3009	RBQC3213
Max. energy absorption (J)			1.96	11.8	19.6	33.3	49.0
Stroke absorption (mm)			4	7	8	8.5	13
Impact speed (m/s)			0.05 to 3				
Max. operation* (cycle/min)			60	60	45	45	30
Max. allowable thrust (N)			294	490	686	981	1177
Ambient temperature (°C)			–10 to 80				
Spring force (N)	Extended		6.08	12.75	15.69	21.57	24.52
	Compressed		13.45	27.75	37.85	44.23	54.23
Weight (g)			28	60	110	182	240
Option/Stopper nut			RBQ16S	RB20S	RBQ25S	RBQ30S	RBQ32S

*At max. energy absorption per cycle. Max. operation cycle/min can increase in proportion to energy absorption.

**Mounting nut: 2 pcs. (Standard).

How to Order

RBQ [C] [20] [07] [ ]

- RBQ: Shock absorber, Short Style
- Style: — Basic; C With damper
- 20: O.D. thread-Absorption stroke
- 07: Absorption stroke
- Option: — None; S With stopper nut; J Add'l 1 of hex. nut (Total: 3 pcs.*)

*2 mounting hex. nuts are attached for standard.

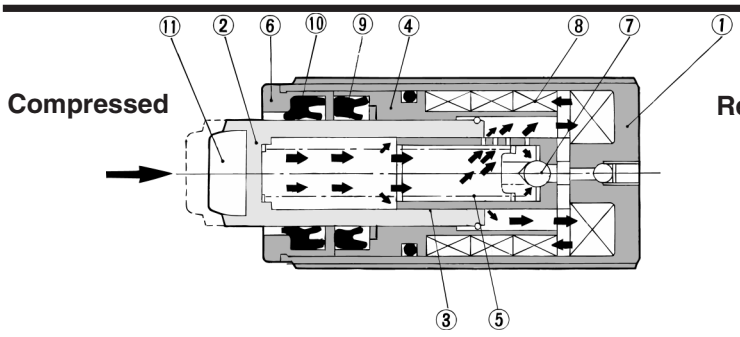
Replacement Part No./Damper

RBQC [16] C

Applicable model: Bumper

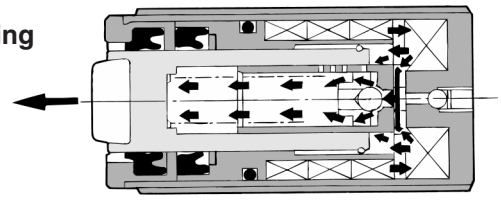
- **16**-RBQC1604
- **20**-RBQC2007
- **25**-RBQC2508
- **30**-RBQC3009
- **32**-RBQC3213

Construction



Compressed

An impacting object that strikes against the piston rod end pressurizes oil inside the piston. Thus, pressurized oil jets out through the orifice inside the piston, thereby generating hydraulic resistance to absorb the energy of the impacting object. The oil jetted out through the orifice is collected inside the outer tube by means of the stretching action of the accumulator.



Returning

When the impacting object is removed, the return spring pushes out the piston rod, and negative pressure, generated at the same time, opens the check ball to permit oil to return to the inside of the piston rod and the piston, thus making the shock absorber ready for the next impact.

Component Parts

No.	Description	Material	Note
①	Outer tube	Rolled steel	Black nickel plated
②	Piston rod	Special steel	Heat treatment Hard chrome plated
③	Piston	Special steel	Heat treatment
④	Bearing	Special bearing material	
⑤	Return spring	Piano wire	Zinc chromated
⑥	Stopper	Carbon steel	Zinc chromated
⑦	Check ball	Bearing steel	
⑧	Accumulator	NBR	Foam rubber
⑨	Rod packed	NBR	
⑩	Scraper	NBR	
⑪	Bumper	Polyurethane	Only with bumper

Series RBQ
How to Select

Selection Procedure

1 Classification of impact

- ☐Cylinder stroke at load (Horizontal)
- ☐Cylinder stroke at load (Downward)
- ☐Cylinder stroke at load (Upward)
- ☐Conveyor stroke at load (Horizontal)
- ☐Free dropping impact
- ☐Rotation impact (With torque)

2 Details of applications

Symbol	Condition of application	Unit
m	Impacting object/weight	kgf
u	Impacting object/speed	m/sec
h	Dropping height	m
w	Angle/speed	rad/sec
r	Distance between axis of cylinder and impact point	m
d	Bore size	mm
P	Cylinder operatina pressure	MPa
F	Thrust	kgf
T	Torque	Nm
n	Operation cycle	cycle/min
t	Ambient temperature	°C
μ	Friction coefficient	—

3 Specifications and Operational instructions

Ensure that the impact speed, thrust, operation cycle, the ambient temperature and atmosphere fall within the specifications.
*Be aware of the min. installation radius in the case of oscillating impacts.

4 Calculation of kinetic energy E_1

Using the equation suitable for the classification of impact.

In the case of cylinder stroke at load and free horizontalimpact, substitute respective figures for Data A in order to calculate E_1.

5 Calculation of thrust energy E_2

Select any shock absorber as a provisional model.

In the case of thrust energy of cylinder, substitute respective figures for Data B or C.

6 Calculation of corresponding weight of impacting object Me

Energy absorption $E=E_1+E2$

Corresponding weight of impacting object $Me-=\frac{2}{\upsilon^2}E$

Substitute both energy absorption E and impacting object speed U for Data A in order to calculate the corresponding weight of the impacting object.

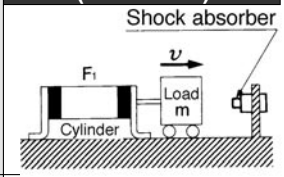
7 Selection of applicable model

Taking into consideration the corresponding weight of the impacting object Me, calculated using Data D and impacting object speed V, check provisional model compatibility with the condition of application. If this is satisfactory, then the said provisional model will be the applicable one.

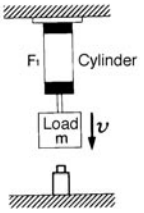
Caution

To enable the shock absorber to operate accurately for long hours, it is necessary to select a model that is well suited to your operating conditions. If the impact energy is smaller than **5**% of the maximum absorption energy, select a model that is one class lower.

Example of Selection

	Cylinder stroke at load (Horizontal)
1 Classification of impact	
Impact object (1) /speed U	υ
Kinetic energy E_1	$\frac{1}{2}m\upsilon^2$
Thrust energy E_2	F_1S
Energy absorption E	E_1+E_2
Impacting object (2) /corresponding weight Me	$\frac{2}{\upsilon^2}E$
2 Details of applications	m=20kg υ=0.7m/s d=40mm p=0.5MPa n=30cycle/min t=25°C
3 Specifications Operational instructions	υ ····· 0.7<3 (max.) t ····· –10 (min.)<25<80 (max.) F ····· F1···628<686 (max.) **YES**
4 Calculation of kinetic energy E_1	Use Formula to calculate E_1. Suitable 20 for m and 0.7 for υ. **$E_1 \cong 4.9J$**
5 Calculation of thrust energy E_2	Select RBQ2508 as provisional model. Use Data B to calculate E2. Substitute d for 40. **$E_2 \cong 5.0J$**
6 Calculation of corresponding weight of impacting object Me	Use the formula "Energy absorption $E=E_1+E_2=4.9+5.0=9.9J$" to calculate Me. Suitable 9.9J for E and 0.7 for υ. **$Me \cong 40kg$**
7 Selection of applicable model	According to Data D, the tentatively selected RBQ2508 satisfies Me=40 kg<60kg at υ=0.7. Ultimately, it will result in an operating frequency of n···30<45, without causing a problem. **YES** **Select RBQ2508**

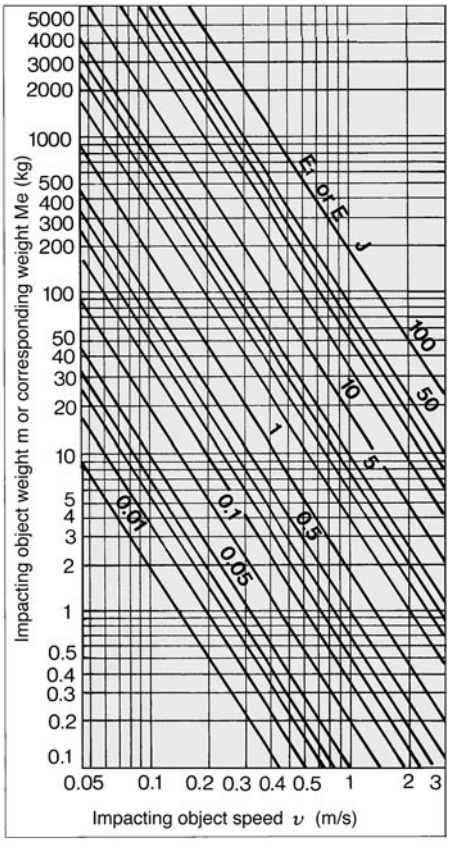
1 Classification of Impact

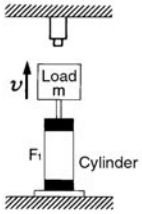
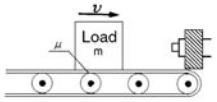
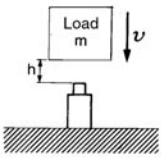
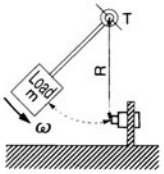
Classification of impact	(Downward) 
Impact object/ speed υ (1)	υ
Kinetic energy E_1	$\frac{1}{2}m\upsilon^2$
Thrust energy E_2	F_1S+mgs
Energy absorption E	E_1+E_2
Impacting object/ corresponding weight Me (2)	$\frac{2}{\upsilon^2}E$

Note 1) Impacting object speed is momentary velocity at which object is impacting against shock absorber.

Data A

Kinetic energy E_1 or Energy absorption E



	(Upward)	Conveyor stroke at load (Horizontal)	Free dropping impact	Rotation impact (Weight torque)
				
	υ	υ	$\sqrt{2gh}$	ωR
	$\frac{1}{2} m\upsilon^2$	$\frac{1}{2} m\upsilon^2$	mgh	$\frac{1}{2} I\omega^2$
	F_1S-mgS	$mg\mu S$	mgS	$T\frac{S}{R}$
	E_1+E_2	E_1+E_2	E_1+E_2	E_1+E_2
	$\frac{2}{\upsilon^2}E$	$\frac{2}{\upsilon^2}E$	$\frac{2}{\upsilon^2}E$	$\frac{2}{\upsilon^2}E$

Note 2) An "Impact body equivalent weight"is the weight of an impact body without involving thrust, into which an object's total energy has been converted. Hence, E = 1/2 Me v^2

Note 3) Refer to the catalogue of rotary actuator for the formula of moment of inertia I (kgm^2)

«Symbol table»

Symbol	Specifications	Unit
d	Bore size	mm
E	Energy absorption	J
E_1	Kinetic energy	J
E_2	Thrust energy	J
F_1	Cylinder thrust	N
g	Acceleration of gravity	m/s^2
h	Dropping height	m
I(3)	Moment of inertia around the centre of gravity	kgm^2
n	Operation cycle	cycle/min
p	Cylinder operation pressure	MPa
R	Distance between axis of cylinder and impact point	m
S	Shock absorber stroke	m
T	Torque	Nm
t	Ambient temperature	°C
υ	Impacting object speed	m/s
m	Impacting object weight	kg
Me	Corresponding weight of impacting object	kg
ω	Angle speed	rad/s
μ	Friction coefficient	—

Data B

Thrust energy of cylinder F_1S (Operating press. 0.5MPa) Unit: J

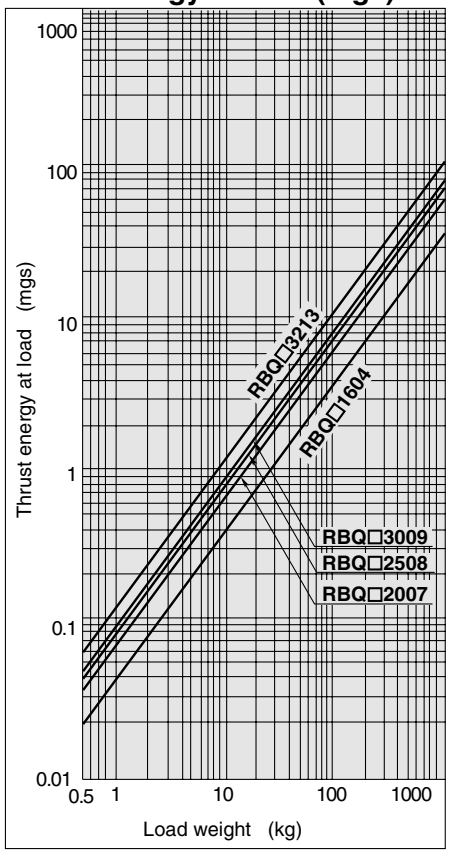
Model		RBQ□ 1604	RBQ□ 2007	RBQ□ 2058	RBQ□ 3009	RBQ□ 3213
Stroke absorption mm		4	7	8	8.5	13
Bore size d (mm)	6	0.057	0.099	0.113	0.120	0.184
	10	0.157	0.274	0.314	0.334	0.511
	15	0.353	0.619	0.707	0.751	1.15
	20	0.628	1.10	1.26	1.34	2.04
	25	0.982	1.72	1.96	2.09	3.19
	30	1.41	2.47	2.83	3.00	4.59
	40	2.51	4.40	5.03	5.34	8.17
	50	3.93	6.87	7.85	8.34	12.8
	63	6.23	10.9	12.5	13.2	20.3
	80	10.1	17.6	20.1	21.4	32.7
	100	15.7	27.5	31.4	33.4	51.1
	125	24.5	43.0	49.1	52.2	79.8
	140	30.8	53.9	61.6	65.4	100
	160	40.2	70.4	80.4	85.5	131
	180	50.9	89.1	102	108	165
	200	62.8	110	126	134	204
	250	98.2	172	196	209	319
	300	141	247	283	300	459

■Operating pressure other than 0.5MPa: Multiply by the following coefficient

Operating pressure (MPa)	1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Coefficient	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8

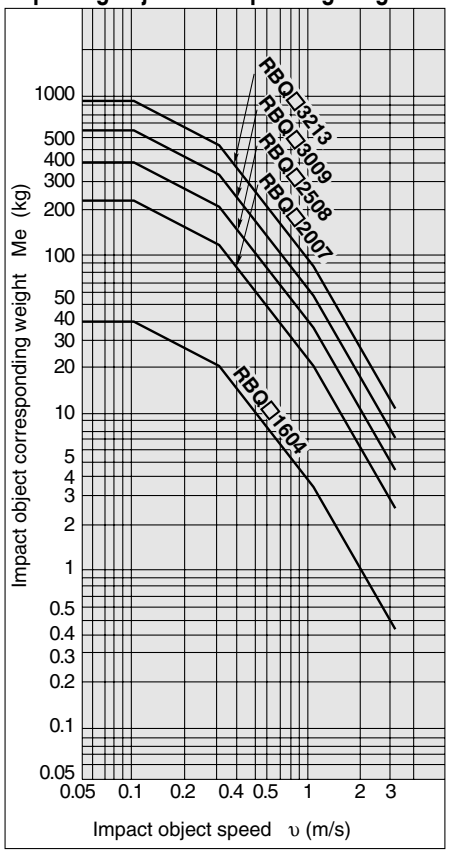
Data C

Thrust energy at load (mgs)

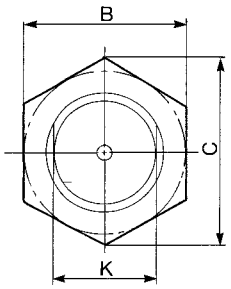


Data D

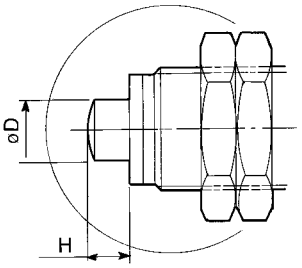
Impacting object corresponding weight Me

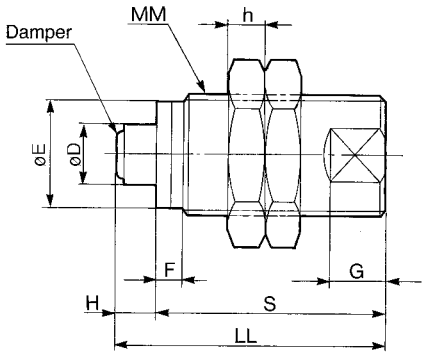


Dimensions



Series RBQ
Basic

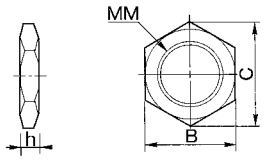




Series RBQC
With damper

Model		Shock absorber									Hexagon nut		
Basic	With damper	D	E	F	H	K	G	LL	MM	S	B	C	h
RBQ1604	**RBQC1604**	6	14.2	3.5	4	14	7	31	M16 X 1.5	27	22	25.4	6
RBQ2007	**RBQC2007**	10	18.2	4	7	18	9	44.5	M20 X 1.5	37.5	27	31.2	6
RBQ2508	**RBQC2508**	12	23.2	4	8	23	10	52	M25 X 1.5	44	32	37	6
RBQ3009	**RBQC3009**	16	28.2	5	8.5	28	12	61.5	M30 X 1.5	53	41	47.3	6
RBQ3213	**RBQC3213**	18	30.2	5	13	30	13	76	M32 X 1.5	63	41	47.3	6

Hexagon nut (2 pcs. as standard)



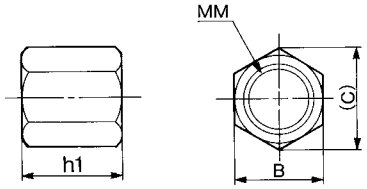
Unit: mm

Part No.	MM	h	B	C
RBQ16J	M16 X 1.5	6	22	25.4
RB20J(1)	M20 X 1.5	6	27	31.2
RBQ25J	M25 X 1.5	6	32	37
RBQ30J	M30 X 1.5	6	41	47.3
RBQ32J	M32 X 1.5	6	41	47.3

Note 1) In case of RB20J, RB and RBQ are common.

Option

Stopper nut



Material: Carbon steel

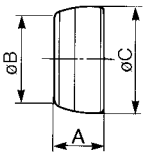
Part No.	B	C	h1	MM
RBQ16S	22	25.4	12	M16 X 1.5
RB20S(2)	27	31.2	16	M20 X 1.5
RBQ25S	32	37	18	M25 X 1.5
RBQ30S	41	47.3	20	M30 X 1.5
RBQ32S	41	47.3	25	M32 X 1.5

Note 2) In case of RB20S, RB and RBQ are common.

Replacement Part

Bumper

* These are the replacement parts for the cap style. Not available for the basic style.



Material: Polyurethane

Part No.	A	B	C
RBQC16C	3.5	4	4.7
RBQC20C	4.5	8	8.3
RBQC25C	5	8.3	9.3
RBQC30C	6	11.3	12.4
RBQC32C	6.6	13.1	14.4

⚠ Precautions

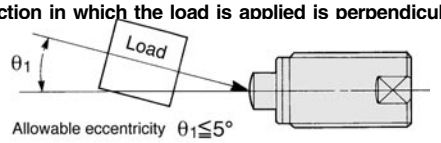
Be sure to read before reading. Refer to p.0-39 to 0-43 for Safety Instructions and common precautions.

Selection

⚠ Warning

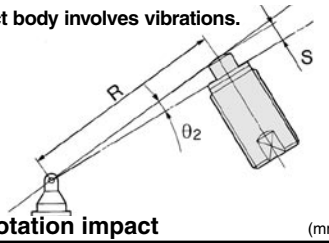
①**Load should always be aligned with the axis of piston rod.**
An angle of deviation that exceeds 5° will place an excessive load on the bearings, leading to oil leaks within a short period of operation.

②**If oscillating impacts are involved, the installation must be designed so that the direction in which the load is applied is perpendicular to the**



shock absorber's axial centre.
The allowable oscillating angle until the stroke end must be θ2 ≤ 5°. In this case, the minimum installation radius will be as shown in the table below.
If the angle exceeds 5°, it could lead to oil leaks.

③**A guide is necessary if the impact body involves vibrations.**



Installation conditions for rotation impact (mm)

Model	S (Stroke)	θ2 (Allowable rotation angle)	R (Min. installation radius)
RBQ□1604	4	5°	46
RBQ□2007	7		80
RBQ□2508	8		92
RBQ□3009	8.5		98
RBQ□3213	13		149

If the impact body involves vibrations and if a force that is perpendicular to the axis is applied to the piston rod, a secure guide must be provided for the impact body.

④**The rigidity of the mounting frame must be taken into consideration.**
If the mounting frame lacks strength, the shock absorber will vibrate after an impact, causing bearing wear and damage.
Load on mounting plate can be calculated as follows.

$$\text{Load on mounting plate } N \cong 2\,\frac{\text{(Energy absorption)}}{\text{(Stroke m)}}$$

⚠ Caution

①**The maximum absorption energy indicated in the specifications cannot be brought into full play unless the entire stroke is used.**

②**The contact surface of the impact body with which the piston rod comes into contact must be highly rigid.**
In the case without a cap, a high surface compression load is applied to the contact surface of the impact body with which the piston rod comes into contact. Therefore, the contact surface must be highly rigid (hardness of HRC35 or more).

③**Be aware of the return force of the impact body.**
If used in a conveyor drive, after the shock absorber has absorbed energy, it could be pushed back by the spring that is built in. For details on this return force, refer to the column for the spring force in the specifications (P.5.1-10).

Environment

⚠ Warning

①**Do not expose the shock absorber to machining oil, water, or dust.**
Series RBQ cannot be used under conditions in which fluids such as machining oil or water are present in atomized form or come in direct contact with the piston rod, or in which dust could adhere to the piston rod. Such conditions would cause malfunction.

②**Do not operate the shock absorber in an environment that poses the risk of corrosion.**
Refer to the respective structural drawing for the type of material that is used in the shock absorber.

③**Do not use the shock absorber in a clean room, as it could contaminate the clean room.**

Mounting

⚠ Warning

①**Before performing installation, removal, or stroke adjustment, make sure to cut off the power supply to the equipment and verify that the equipment has stopped.**

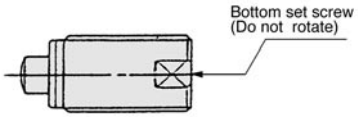
⚠ Caution

Model	RBQ1604	RBQ2007	RBQ2508	RBQ3009	RBQ3213
O.D. thread (mm)	M16	M20	M30	M30	M32
Max. tightening torque (Nm)	14.7	23.5	34.3	78.5	88.3

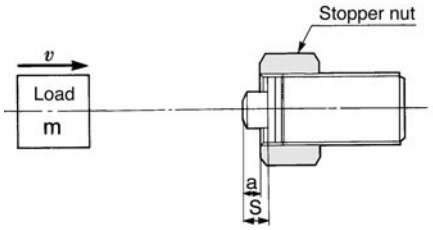
①**Tightening torque of mounting nut should be as follows.**
If the tightening torque that is applied to the nut exceeds the value given above, the shock absorber itself could become damaged.

②**Do not scratch the sliding portion of the piston rod or the outside threads of the outer tube.**
Failure to observe this precaution could scratch or gouge the sliding portion of the piston rod, or damage the seals, which could lead to oil leakage and malfunction. Furthermore, damage to the outside threads of the outer tube could prevent the shock absorber from being mounted onto the frame, or its internal components could deform, leading to a malfunction.

③**Never turn the screw on the bottom of the body (it is not an adjustment screw), as this will cause oil leakage.**



④**Adjust the stopping time through the use of the stopper nut, as follows:**
Control the stopping time of the impact body by turning the stopper nut in or out (thus changing length "a"). After establishing the stopper nut position, use a hexagon nut to secure the stopper nut in place.



Maintenance

⚠ Caution

①**Make sure that the retaining nut is not loose.**
The shock absorber could become damaged if it is used in a loose state.

②**Pay attention to any abnormal impact sounds or vibrations.**
If the impact sounds or vibrations have become abnormally high, the shock absorber may have reached the end of its service life. If this is the case, replace the shock absorber. If use is continued in this state, it could lead to equipment damage.

③**Inspect the bumper for any cracks or wear.**
If the shock absorber comes with a bumper, the damper could wear first. To prevent damage to the impact body, replace the bumper often.
The bumper inserted into the piston rod can be removed easily by a small screwdriver. When reassembling, push the smaller end of the bumper inside the piston.