

# 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**

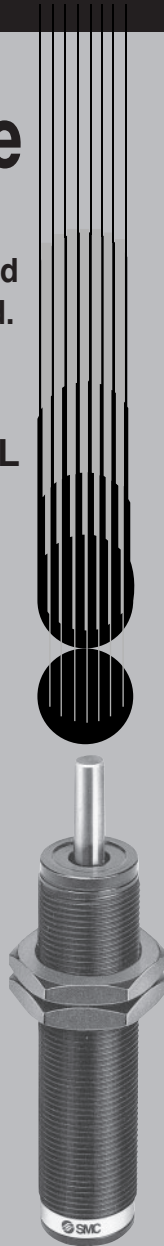
**Usable without a stopper nut**  
The strong body can be positioned directly.

**Short Style**  
**Shock Absorber: Series RBQ**

A compact style that has been shortened lengthwise

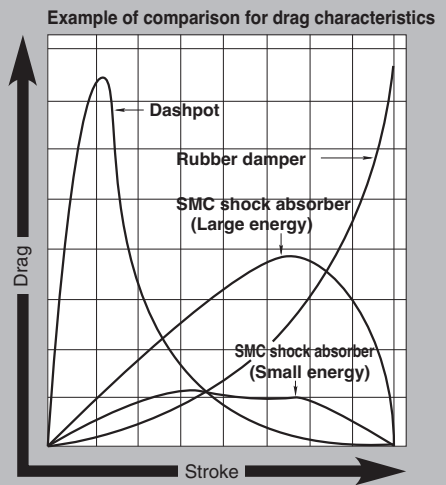
Allowable eccentric angle 5°  
Suitable for absorption of rotation energy.

**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.



\* Drag waveform will vary depending on the operating conditions.

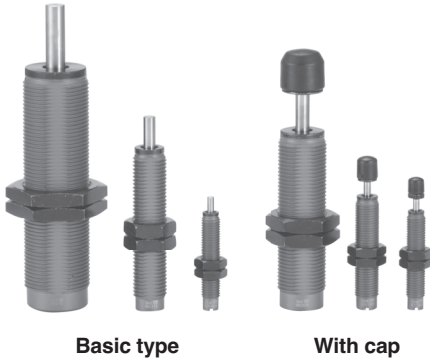
### Series Variations

Series	Basic type	Thread O.D. size	With cap or bumper (Option)	Hexagon nut *	Stopper nut (Option)	Foot bracket	Page
<b>RB Series</b> 	RB series	M6, M8, M10, M14, M20, M27	●	●	●	●	5.1-2
	Coolant resistant RBL series	M10, M14, M20, M27	●	●	●	●	5.1-7
<b>RBQ Series</b> 	RBQ series	M16, M20, M25, M30, M32	●	●	●		5.1-10

Optional specifications are not available for M6.

\* 2 Hexagon nuts are attached for the RB series and standard models RBQ.

# Shock Absorber *RB Series*

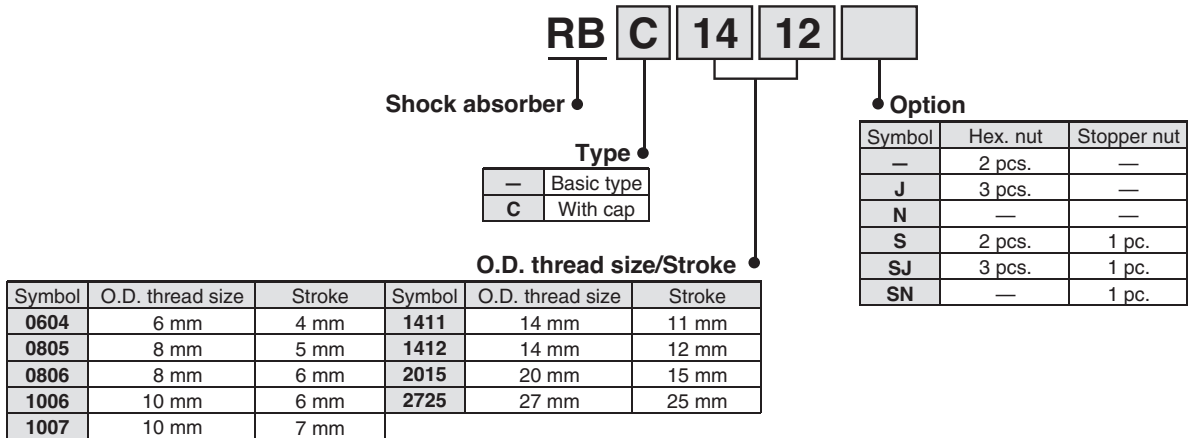


## Specifications

Model	Basic type	RB0604	RB0805	RB0806	RB1006	RB1007	RB1411	RB1412	RB2015	RB2725
	With cap	—	RBC0805	RBC0806	RBC1006	RBC1007	RBC1411	RBC1412	RBC2015	RBC2725
Max. energy absorption (J) <sup>Note)</sup>		0.5	0.98	2.94	3.92	5.88	14.7	19.6	58.8	147
Thread O.D. size		M6 x 0.75	M8 x 1.0		M10 x 1.0		M14 x 1.5		M20 x 1.5	M27 x 1.5
Stroke (mm)		4	5	6	6	7	11	12	15	25
Collision speed (m/s)		0.3 to 1.0		0.05 to 5.0						
Max. operating frequency (cycle/min)		80	80	80	70	70	45	45	25	10
Max. allowable thrust (N)		150	245	245	422	422	814	814	1961	2942
Ambient temperature range (°C)		-10 to 80 (No freezing)								
Spring force (N)	Extended	3.05	1.96	1.96	4.22	4.22	6.86	6.86	8.34	8.83
	Retracted	5.59	3.83	4.22	6.18	6.86	15.30	15.98	20.50	20.01
Weight (g)	Basic type	5.5	15	15	23	23	65	65	150	350
	With cap	—	16	16	25	25	70	70	165	400

Note) The maximum energy absorption, the maximum corresponding mass of impacting object and maximum operating frequency are measured at room temperature (20 to 25 °C).

## How to Order



Note) RB0604: With cap type is not available.

### Replacement part no./Cap (Resin part only)

**RBC** **08** **C**

Applicable model •

<b>08</b>	RBC0805, 0806	<b>20</b>	RBC2015
<b>10</b>	RBC1006, 1007	<b>27</b>	RBC2725
<b>14</b>	RBC1411, 1412		

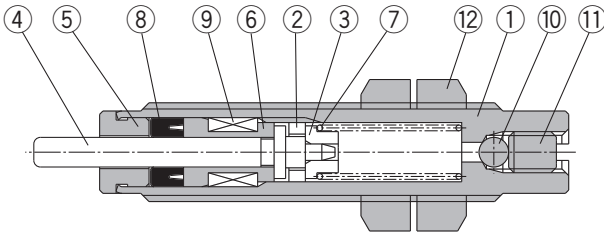
Cap

Cap cannot be mounted for basic type. Please place an order with cap type from the beginning.

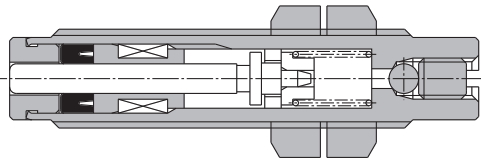
## Construction

### RB0604

Extended



Compressed

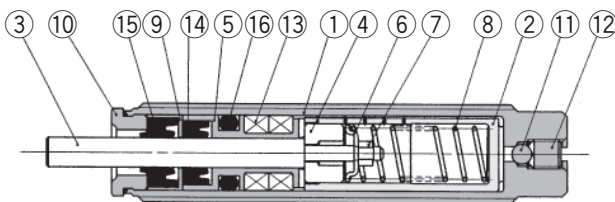


#### Component Parts

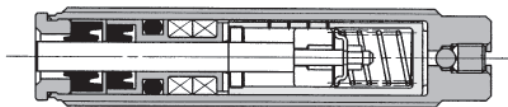
No.	Description	Material	Treatment
1	Outer tube	Free-cutting steel	Nitriding
2	Piston	Copper alloy	—
3	Spring guide	Stainless steel	—
4	Piston rod	Carbon steel	Nitriding
5	Stopper	Stainless steel	—
6	Bearing	Copper alloy	—
7	Return spring	Piano wire	Zinc trivalent chromated
8	Rod seal	NBR	—
9	Accumulator	NBR	Foam rubber
10	Steel ball	Bearing steel	—
11	Hexagon socket head cap screw	Special steel	Nickel plated
12	Hexagon nut	Carbon steel	Nickel plated

### RB□0805 to 2725

Extended



Compressed



#### Component Parts

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

# Shock Absorber RB Series Technical Data:

## Model Selection

### Model Selection Step

#### 1. Type 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
- Rotating impact (With torque)

#### 2. Enumeration of operating conditions

Symbol	Operating condition	Unit
<b>m</b>	Impacting object mass	kg
<b>v</b>	Collision speed	m / sec
<b>h</b>	Dropping height	m
<b>ω</b>	Angle speed	rad/sec
<b>R</b>	Distance between axis of cylinder and impact point	m
<b>d</b>	Bore size	mm
<b>p</b>	Cylinder operating pressure	MPa
<b>F</b>	Thrust	N
<b>T</b>	Torque	N · m
<b>n</b>	Operation cycle	cycle / min
<b>t</b>	Ambient temperature	°C
<b>μ</b>	Friction coefficient	—

#### 3. Specifications and operational instructions

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

#### 4. Calculation of kinetic energy E<sub>1</sub>

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<sub>1</sub>.

#### 5. Calculation of thrust energy E<sub>2</sub>

Select any shock absorber as a provisional model.

In the case of thrust energy of cylinder E<sub>1</sub>, substitute respective figures for **Data B** or **Data C**.

#### 6. Calculation of corresponding mass of impacting object Me

Absorbed energy  $E = E_1 + E_2$   
Corresponding mass of impacting object  $Me = \frac{2}{v^2} \cdot E$

Substitute both absorbed energy **E** and collision speed **v** for **Data A** in order to calculate the corresponding mass of the impacting object **Me**.

#### 7. Selection of applicable model

Taking into consideration the corresponding mass of the impacting object **Me**, calculated using **Data B** and collision 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 on Selection

In order for the shock absorbers 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 energy absorption, select a model that is one class smaller.

### Selection Example

Cylinder stroke at load (Horizontal)			
1. Type of impact			
Collision speed <sup>(1)</sup> v	v		
Kinetic energy E <sub>1</sub>	$\frac{1}{2} \cdot m \cdot v^2$		
Thrust energy E <sub>2</sub>	F <sub>1</sub> · S		
Absorbed energy E	E <sub>1</sub> + E <sub>2</sub>		
Corresponding <sup>(2)</sup> mass of impacting object Me	$\frac{2}{v^2} \cdot E$		
2. Operating conditions	<p>m = 1 kg v = 0.5 m/s d = 10 mm p = 0.5 MPa n = 30 cycle/min t = 25 °C</p>	2. Operating conditions	<p>m = 50 kg v = 0.3 m/s d = 40 mm p = 0.5 MPa n = 20 cycle/min t = 25 °C</p>
3. Specifications and operational instructions	<p>● Confirmation of specifications v ... 0.5 &lt; 1.0 (max.) t ... -10 (min.) &lt; 25 &lt; 80 (max.) F ... F<sub>1</sub> ... 39.3 &lt;</p> <p><b>YES</b></p>	3. Specifications and operational instructions	<p>● Confirmation of specifications v ... 0.3 &lt; 5 (max.) t ... -10 (min.) &lt; 25 &lt; 80 (max.) F ... F<sub>1</sub> ... 628 &lt; 1961 (max.)</p> <p><b>YES</b></p>
4. Calculation of kinetic energy E <sub>1</sub>	<p>● Kinetic energy E<sub>1</sub> Use <b>[Formula]</b> to calculate E<sub>1</sub>. Substitute 1.0 for m and 0.5 for v.</p> <p><b>E<sub>1</sub> ≈ 0.125</b></p>	4. Calculation of kinetic energy E <sub>1</sub>	<p>● Kinetic energy E<sub>1</sub> Use <b>[Formula]</b> to calculate E<sub>1</sub>. Substitute 50 for m and 0.3 for v.</p> <p><b>E<sub>1</sub> ≈ 2.3 J</b></p>
5. Calculation of thrust energy E <sub>2</sub>	<p>● Thrust energy E<sub>2</sub> Provisionally select a model RB0604 and make the use of <b>Data B</b> at left. According to d = 10, E<sub>2</sub> is obtained.</p> <p><b>E<sub>2</sub> ≈ 0.157</b></p>	5. Calculation of thrust energy E <sub>2</sub>	<p>● Thrust energy E<sub>2</sub> Provisionally select a model RB2015 and make the use of <b>Data B</b>. According to d = 40, E<sub>2</sub> is obtained.</p> <p><b>E<sub>2</sub> ≈ 9.4 J</b></p>
6. Calculation of corresponding mass of impacting object Me	<p>● Corresponding mass of impacting object Me Use the <b>[Formula]</b> "Absorbed energy E = E<sub>1</sub> + E<sub>2</sub> = 0.282" to calculate Me. Substitute 0.282 for E and 0.5 for v.</p> <p><b>Me ≈ 2.3</b></p>	6. Calculation of corresponding mass of impacting object Me	<p>● Corresponding mass of impacting object Me Use the formula "Absorbed energy E = E<sub>1</sub> + E<sub>2</sub> = 2.3 + 9.4 = 11.7 J" to calculate Me. Substitute 11.7 J for E and 0.3 for v.</p> <p><b>Me ≈ 260 kg</b></p>
7. Selection of applicable model	<p>● Selection of RB0604 RB0604 satisfies Me = 2.3 &lt; 3 kg (Max. corresponding mass of impacting object). Ultimately, it will result in an operating frequency of 30 &lt; 80, without causing a problem.</p> <p><b>YES</b></p>	7. Selection of applicable model	<p>● Selection of applicable model According to <b>Data D</b>, the tentatively selected RB2015 satisfies Me = 260 kg &lt; 400 kg at v = 0.3. Ultimately, it will result in an operating frequency of n ... 20 &lt; 25, without causing a problem.</p> <p><b>YES</b></p> <p><b>Select RB2015</b></p>

## 1. Type of Impact

Type of impact	Cylinder stroke at load (Downward)	Cylinder stroke at load (Upward)	Conveyor stroke at load (Horizontal)	Free dropping impact	Rotating impact (With torque)
Collision speed $v$ <sup>(1)</sup>	$v$	$v$	$v$	$\sqrt{2gh}$	$\omega \cdot R$
Kinetic energy $E_1$	$\frac{1}{2} \cdot m \cdot v^2$	$\frac{1}{2} \cdot m \cdot v^2$	$\frac{1}{2} \cdot m \cdot v^2$	$m \cdot g \cdot h$	$\frac{1}{2} \cdot I \cdot \omega^2$
Thrust energy $E_2$	$F_1 \cdot S + m \cdot g \cdot S$	$F_1 \cdot S - m \cdot g \cdot S$	$m \cdot g \cdot \mu \cdot S$	$m \cdot g \cdot S$	$T \cdot \frac{S}{R}$
Absorbed energy $E$	$E_1 + E_2$	$E_1 + E_2$	$E_1 + E_2$	$E_1 + E_2$	$E_1 + E_2$
Corresponding <sup>(2)</sup> mass of impacting object $M_e$	$\frac{2}{v^2} \cdot E$	$\frac{2}{v^2} \cdot E$	$\frac{2}{v^2} \cdot E$	$\frac{2}{v^2} \cdot E$	$\frac{2}{v^2} \cdot E$

Note 1) Collision speed is momentary velocity at which object is impacting against shock absorber. The collision speed is  $v = 2\bar{v}$  when the speed (average speed  $\bar{v}$ ) is calculated from the air cylinder's stroke time.

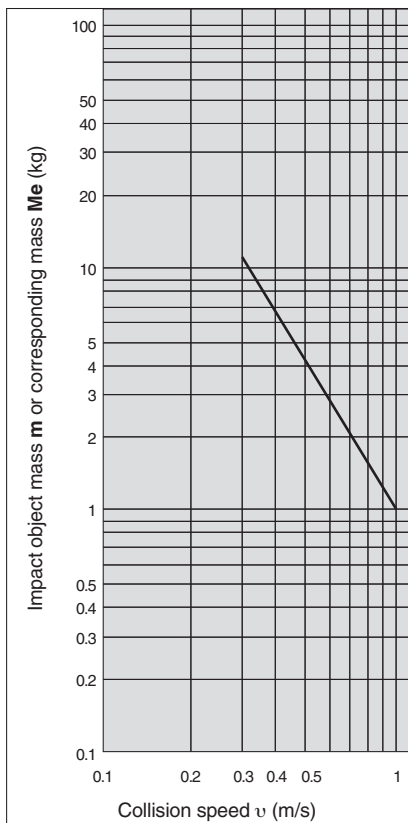
Note 2) An "Impact body equivalent mass" is the mass of an impact object without involving thrust, into which an object's total energy has been converted. Hence,  $E = \frac{1}{2} \cdot M_e \cdot v^2$

Note 3) R: The distance between rotational centre and impact point. Set R at the minimum installation radius or higher.

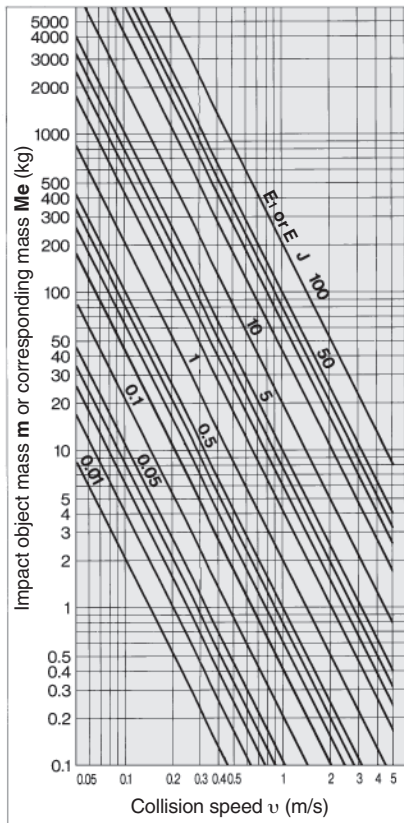
### Data A

#### Kinetic Energy $E_1$ or Energy Absorption $E$

RB0604



RB□0805 to 2725



### Symbol

Symbol	Specifications	Unit
<b>d</b>	Bore size	mm
<b>E</b>	Absorbed energy	J
<b>E<sub>1</sub></b>	Kinetic energy	J
<b>E<sub>2</sub></b>	Thrust energy	J
<b>F<sub>1</sub></b>	Cylinder thrust	N
<b>g</b>	Acceleration of gravity (9.8)	m / s <sup>2</sup>
<b>h</b>	Dropping height	m
<b>I<sup>(4)</sup></b>	Moment of inertia around the center of gravity	kg · m <sup>2</sup>
<b>n</b>	Operating frequency	cycle / min
<b>p</b>	Cylinder operating pressure	MPa
<b>R</b>	Distance between axis of cylinder and impact point	m
<b>S</b>	Shock absorber stroke	m
<b>T</b>	Torque	N · m
<b>t</b>	Ambient temperature	°C
<b>v</b>	Collision speed	m / s
<b>m</b>	Impact object mass	kg
<b>M<sub>e</sub></b>	Corresponding mass of impact object	kg
<b>ω</b>	Angle speed	rad / s
<b>μ</b>	Friction coefficient	—

Note 4) For the formula of moment of inertia I (kg·m<sup>2</sup>), refer to the catalog of rotary actuator.

# RB Series

## Data B

### Thrust Energy of Cylinder F1·S

(Operating pressure 0.5 MPa) (J)

Model	RB0604	RB□0805	RB□0806 RB□1006	RB□1007	RB□1411	RB□1412	RB□2015	RB□2725	
Stroke absorption (mm)	4	5	6	7	11	12	15	25	
Bore size d (mm)	6	0.057	0.071	0.085	0.099	0.156	0.170	0.212	0.353
	10	0.157	0.196	0.236	0.274	0.432	0.471	0.589	0.982
	15	0.353	0.442	0.530	0.619	0.972	1.06	1.33	2.21
	20	0.628	0.785	0.942	1.10	1.73	1.88	2.36	3.93
	25	0.981	1.23	1.47	1.72	2.70	2.95	3.68	6.14
	32	—	2.01	2.41	2.81	4.42	4.83	6.03	10.1
	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	

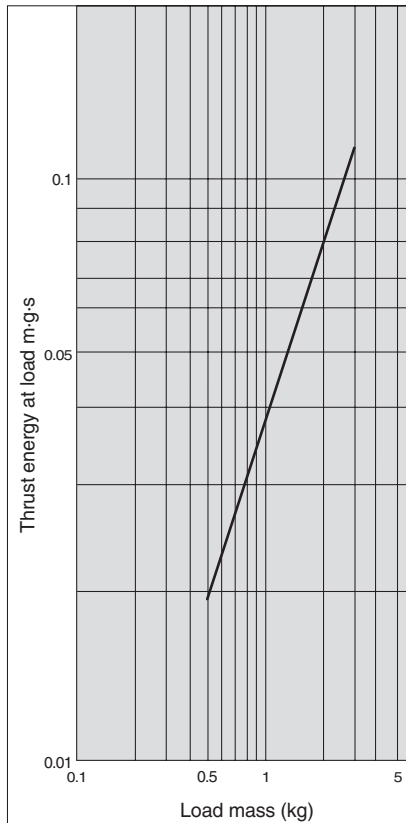
■ Operating pressure other than 0.5 MPa:  
Multiply by the following coefficient.

Operating pressure (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

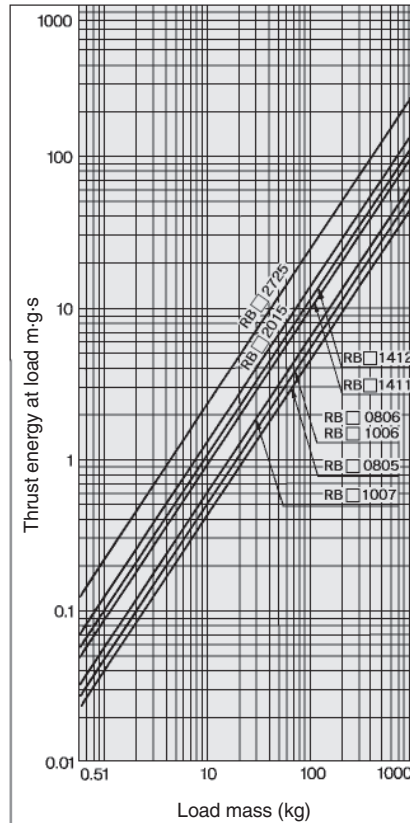
## Data C

### Thrust Energy at Load m·g·s

#### RB0604

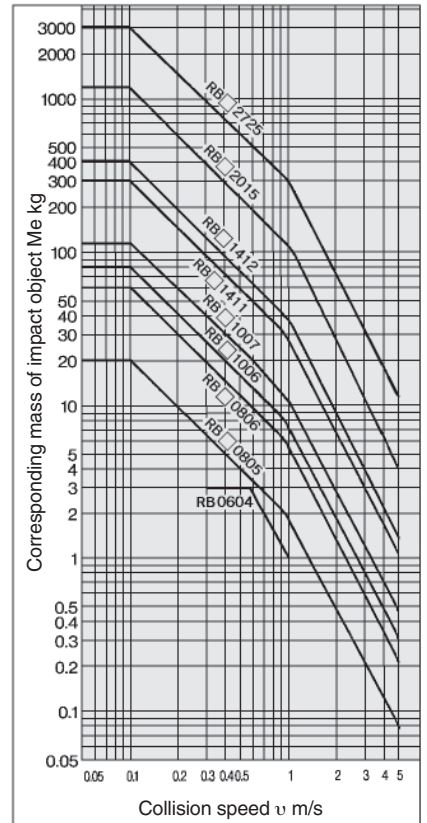


#### RB□0805 to 2725



## Data D

### Corresponding Mass of Impacting Object Me



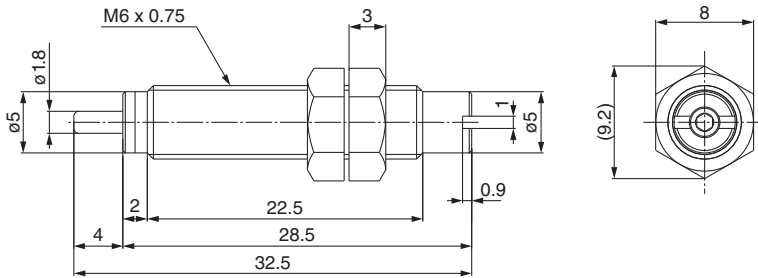
The graph of corresponding mass of impacting object: At room temperature (20 to 25 °C)



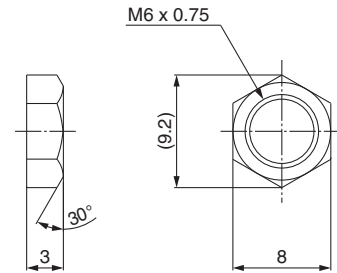
# Series RB

## Dimensions

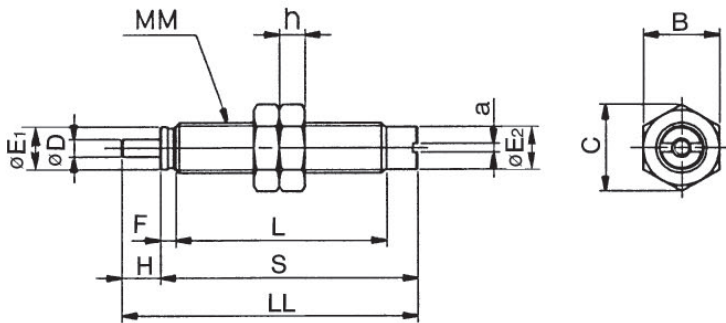
### RB0604



### Hexagon Nut (2 pcs. standard equipment)

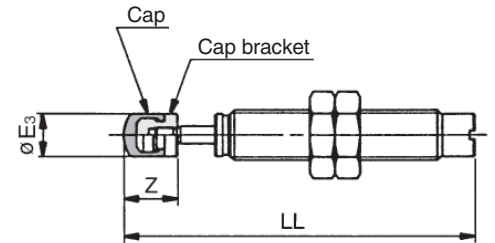


### Basic type: RB0805, RB0806, RB1006, RB1007



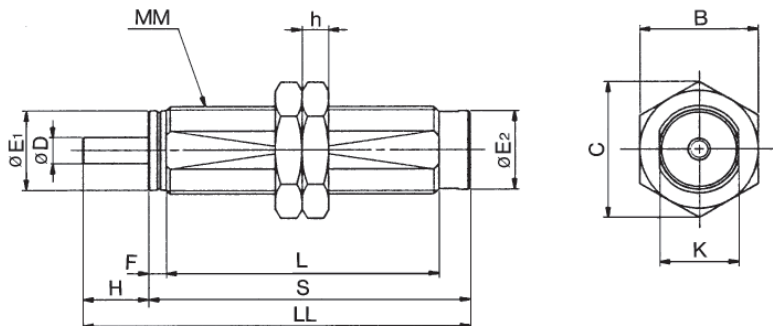
### With cap: RBC0805, RBC0806 RBC1006, RBC1007

\* Other dimensions are the same as the basic type.



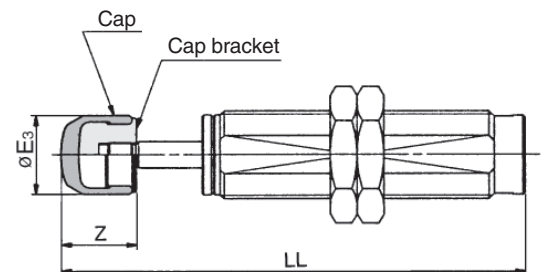
Model		Basic type dimensions									With cap *				Hexagon nut		
Basic type	With cap	D	E <sub>1</sub>	E <sub>2</sub>	F	H	a	L	LL	MM	S	E <sub>3</sub>	LL	Z	B	C	h
RB0805	RBC0805	2.8	6.8	6.6	2.4	5	1.4	33.4	45.8	M8 x 1.0	40.8	6.8	54.3	8.5	12	13.9	4
RB0806	RBC0806	2.8	6.8	6.6	2.4	6	1.4	33.4	46.8	M8 x 1.0	40.8	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 type: RB1411, RB1412, RB2015, RB2725



### With cap: RBC1411, RBC1412 RBC2015, RBC2725

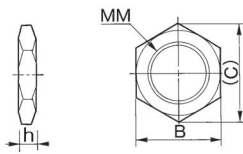
\* Other dimensions are the same as the basic type.



Model		Basic type dimensions									With cap *				Hexagon nut		
Basic type	With cap	D	E <sub>1</sub>	E <sub>2</sub>	F	H	K	L	LL	MM	S	E <sub>3</sub>	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. standard equipment)



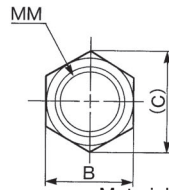
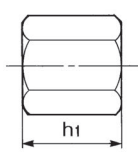
Material: Special steel  
Treatment: Zinc trivalent chromated

Part no.	Dimensions			
	MM	h	B	C
<b>RB06J</b>	M6 x 0.75	3	8	9.2
<b>RB08J</b>	M8 x 1.0	4	12	13.9
<b>RB10J</b>	M10 x 1.0	4	14	16.2
<b>RB14J</b>	M14 x 1.5	6	19	21.9
<b>RB20J</b>	M20 x 1.5	6	27	31.2
<b>RB27J</b>	M27 x 1.5	6	36	41.6

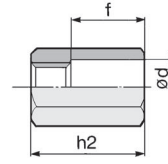
## Option

### Stopper nut

For basic type



For cap type

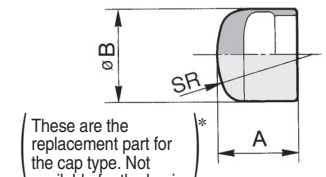


Material: Carbon steel  
Treatment: Zinc trivalent chromated

Part no.		Dimensions						
Basic type	With cap	B	C	h1	h2	MM	d	f
<b>RB06S</b>	—	8	9.3	5	—	M6 x 0.75	—	—
<b>RB08S</b>	<b>RBC08S</b>	12	13.9	6.5	23	M8 x 1.0	9	15
<b>RB10S</b>	<b>RBC10S</b>	14	16.2	8	23	M10 x 1.0	11	15
<b>RB14S</b>	<b>RBC14S</b>	19	21.9	11	31	M14 x 1.5	15	20
<b>RB20S</b>	<b>RBC20S</b>	27	31.2	16	40	M20 x 1.5	23	25
<b>RB27S</b>	<b>RBC27S</b>	36	41.6	22	51	M27 x 1.5	32	33

## Replacement Parts

### Cap



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

Material: Polyurethane

Part no.	Dimensions		
	A	B	SR
<b>RBC08C</b>	6.5	6.8	6
<b>RBC10C</b>	9	8.7	7.5
<b>RBC14C</b>	12.5	12	10
<b>RBC20C</b>	16	18	20
<b>RBC27C</b>	21	25	25

## Foot Bracket for Shock Absorber

Available for the foot mounting bracket of the RB series.

Material: Aluminum alloy

Treatment: Black hard anodized

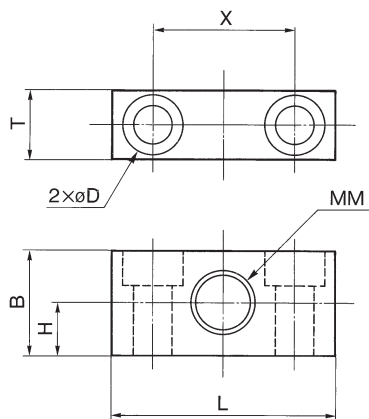


### Part no.

Part no.	Applicable absorber
<b>RB08-X331</b>	<b>RB□0805, 0806</b>
<b>RB10-X331</b>	<b>RB□1006, 1007</b>
<b>RB14-X331</b>	<b>RB□1411, 1412</b>
<b>RB20-X331</b>	<b>RB□2015</b>
<b>RB27-X331</b>	<b>RB□2725</b>

\* Order foot brackets separately.

## Dimensions



Part no.	B	D	H	L	MM	T	X	Mounting bolt
<b>RB08-X331</b>	15	4.5 drill, 8 counterbore depth 4.4	7.5	32	M8 x 1.0	10	20	M4
<b>RB10-X331</b>	19	5.5 drill, 9.5 counterbore depth 5.4	9.5	40	M10 x 1.0	12	25	M5
<b>RB14-X331</b>	25	9 drill, 14 counterbore depth 8.6	12.5	54	M14 x 1.5	16	34	M8
<b>RB20-X331</b>	38	11 drill, 17.5 counterbore depth 10.8	19	70	M20 x 1.5	22	44	M10
<b>RB27-X331</b>	50	13.5 drill, 20 counterbore depth 13	25	80	M27 x 1.5	34	52	M12

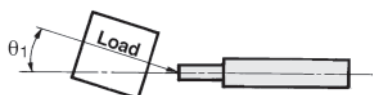
## ⚠ Precautions

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

### Selection

#### ⚠ Warning

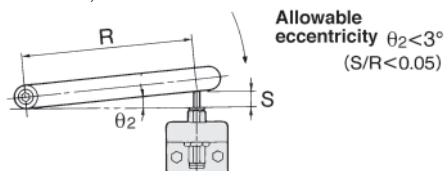
- The installation must be designed so that the impact body is perpendicular to the shock absorber's axial centre. An angle of deviation that exceeds 3° will place an excessive load on the bearings, leading to oil leaks within a short period of operation.



Allowable eccentricity  $\theta_1 < 3^\circ$

- 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  $\theta_2 < 3^\circ$ . 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.



Allowable eccentricity  $\theta_2 < 3^\circ$   
( $S/R < 0.05$ )

#### Installation conditions for rotation impact (mm)

Model	S (Stroke)	$\theta_2$ (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

- 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.

- 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:

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

#### ⚠ Caution

- 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.
- 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).
- 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

- 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.

- 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.

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

### Mounting

#### ⚠ Warning

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

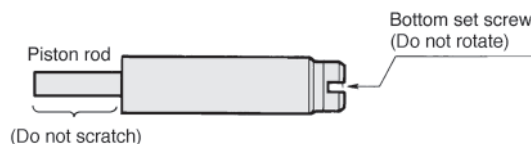
#### ⚠ Caution

- 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)	$\phi 7.1 \begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	$\phi 9.1 \begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	$\phi 12.7 \begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	$\phi 18.7 \begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	$\phi 25.7 \begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$
Tightening torque (Nm)	1.67	3.14	10.8	23.5	62.8

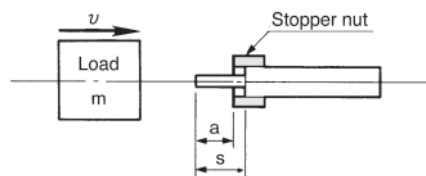
If the tightening torque that is applied to the nut exceeds the value given above, the shock absorber itself could become damaged.

- 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.
- Never turn the screw on the bottom of the body. It is not an adjustment screw, as this will cause oil leakage.



- 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.



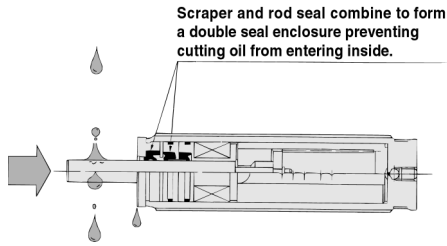
### Maintenance

#### Caution

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

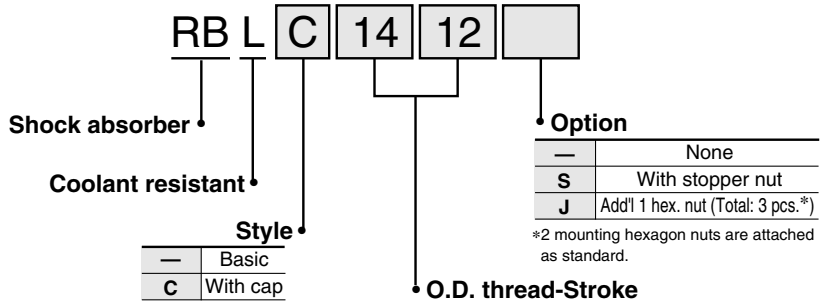


## Specifications

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.

## How to Order

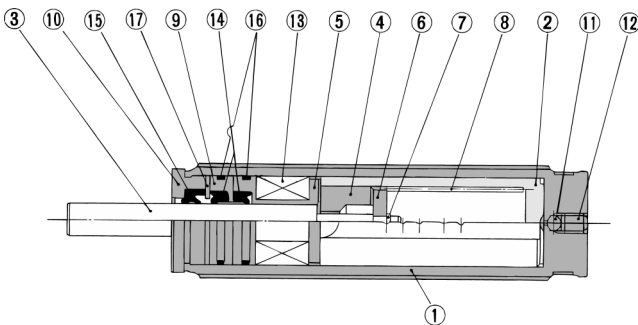


## Replacement Part No./ Cap (Resin part only)

Replacement code: **RBC 10 C**

Applicable model	Replacement Part No./ Cap
10 RBL1006, 1007	20 RBLC2015
14 RBL1411, 1412	27 RBLC2725

## Construction



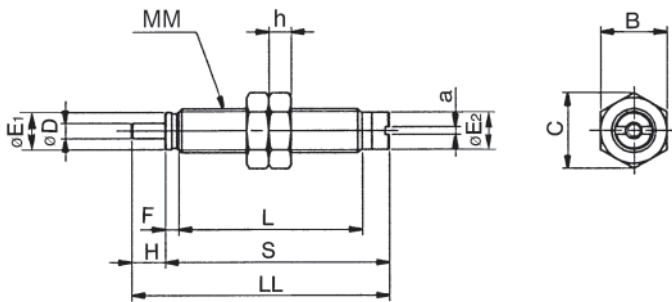
## Component Parts

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

# Series RBL

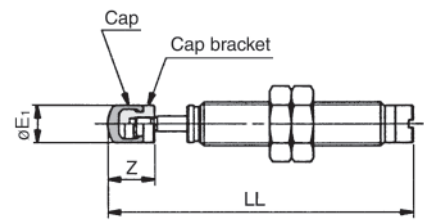
## Dimensions

### Basic/RBL1006, RBL1007



### With Cap/RBLC1006, RBLC1007

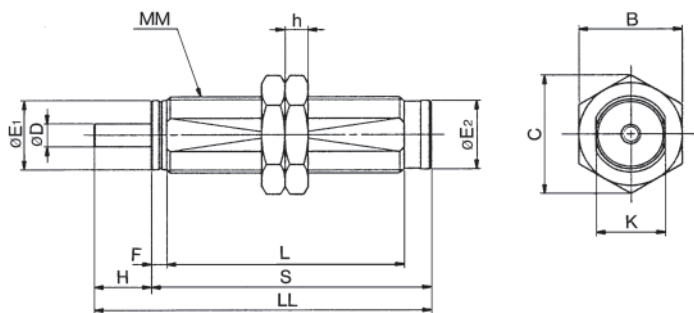
\* Other dimensions are the same as the basic style.



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

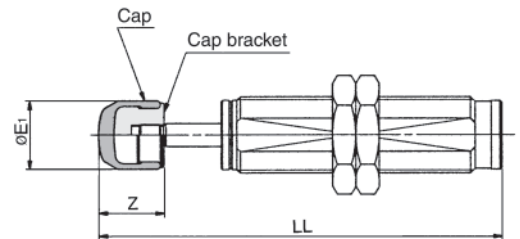
Note) L, LL and S dimensions of RBL(C)1007/1006 are different from those of RB(C)1007/1006.

### Basic/RBL1411, RBL1412, RBL2015, RBL2725



### With Cap/RBLC1411, RBLC1412, RBLC2015, RBLC2725

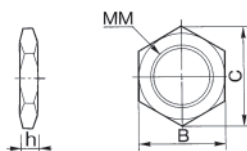
\* Other dimensions are the same as the basic style.



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)

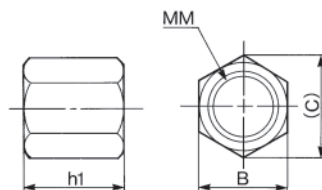


Part No.	Dimensions			
	MM	h	B	C
RB10J	M10 X 1.0	4	14	16.2
RB14J	M14 X 1.5	6	19	21.9
RB20J	M20 X 1.5	6	27	31.2
RB27J	M27 X 1.5	6	36	41.6

### Option

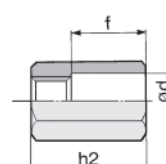
#### Stopper Nut

For basic style



Part No.	With Cap	Dimensions						
		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

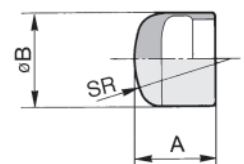
For cap style



### Replacement Part

#### Cap

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



Material: Polyurethane

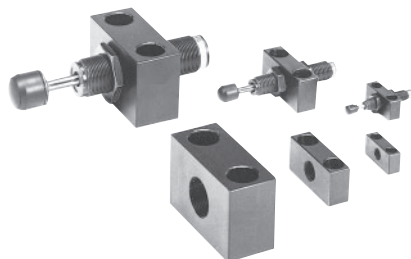
Part No.	Dimensions		
	A	B	SR
RB10C	9	8.7	7.5
RB14C	12.5	12	10
RB20C	16	18	20
RB27C	21	25	25



Contact SMC for the detailed dimensions, specifications and delivery.

## Foot Bracket for Shock Absorber

Available for the foot mounting bracket of series RB.

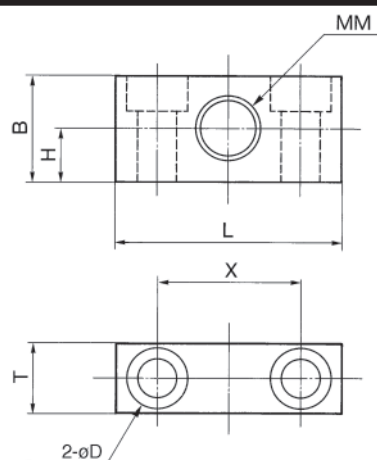


### Part No.

Part No.	Applicable absorber
<b>RB10-X331</b>	<b>RB□1006, 1007</b>
<b>RB14-X331</b>	<b>RB□1411, 1412</b>
<b>RB20-X331</b>	<b>RB□2015</b>
<b>RB27-X331</b>	<b>RB□2725</b>

\*Order the foot bracket separately.

## Dimensions



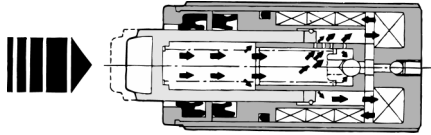
Part No.	B	D	H	L	MM	T	X	Mounting bolt
<b>RB10-X331</b>	19	5.5Drill, 9.5 Depth of counter bore5.4	9.5	40	M10 X1.0	12	25	M5
<b>RB14-X331</b>	25	9Drill, 14 Depth of counter bore8.6	12.5	54	M14 X 1.5	16	34	M8
<b>RB20-X331</b>	38	11Drill, 17.5 Depth of counter bore10.8	19	70	M20 X 1.5	22	44	M10
<b>RB27-X331</b>	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

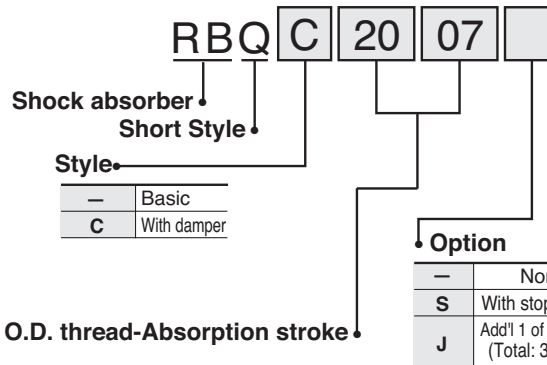
## Specifications

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



### Replacement Part No./Damper

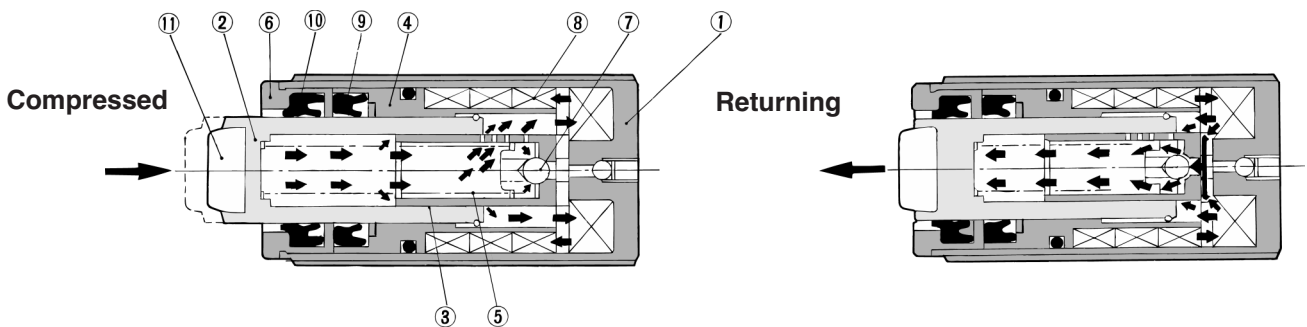
RBQC 16 C

Applicable model  
 16-RBQC1604  
 20-RBQC2007  
 25-RBQC2508  
 30-RBQC3009  
 32-RBQC3213

Bumper

\*2 mounting hex. nuts are attached for standard.

## Construction



An impacting object that strikes 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.

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

No.	Description	Material	Note
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 operating pressure	MPa
F	Thrust	kgf
T	Torque	Nm
n	Operation cycle	cycle/min
t	Ambient temperature	C
	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 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  $Me = \frac{2}{v^2} E$

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

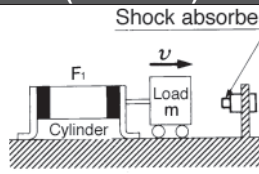
### 7 Selection of applicable model

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

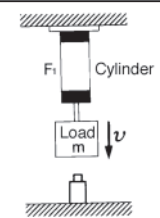
## Caution

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)	
<b>1</b> Classification of impact	
Impact object /speed $U$	$v$
Kinetic energy $E_1$	$\frac{1}{2} m v^2$
Thrust energy $E_2$	$F_1 S$
Energy absorption $E$	$E_1 + E_2$
Impacting object /corresponding weight $Me$	$\frac{2}{v^2} E$
<b>2</b> Details of applications	$m=20\text{kg}$ $v=0.7\text{m/s}$ $d=40\text{mm}$ $p=0.5\text{MPa}$ $n=30\text{cycle/min}$ $t=25\text{C}$
<b>3</b> Specifications Operational instructions	$v \dots 0.7 < 3$ (max.) $t \dots -10$ (min.) $< 25 < 80$ (max.) $F \dots F_1 \dots 628 < 686$ (max.) <b>YES</b>
<b>4</b> Calculation of kinetic energy $E_1$	Use Formula to calculate $E_1$ . Suitable 20 for $m$ and 0.7 for $v$ . <b><math>E_1 \approx 4.9\text{J}</math></b>
<b>5</b> Calculation of thrust energy $E_2$	Select RBQ2508 as provisional model. Use <b>Data B</b> to calculate $E_2$ . Substitute $d$ for 40. <b><math>E_2 \approx 5.0\text{J}</math></b>
<b>6</b> Calculation of corresponding weight of impacting object $Me$	Use the formula "Energy absorption $E = E_1 + E_2 = 4.9 + 5.0 = 9.9\text{J}$ " to calculate $Me$ . Suitable 9.9J for $E$ and 0.7 for $v$ . <b><math>Me \approx 40\text{kg}</math></b>
<b>7</b> Selection of applicable model	According to <b>Data D</b> , the tentatively selected RBQ2508 satisfies $Me = 40\text{kg} < 60\text{kg}$ at $v = 0.7$ . Ultimately, it will result in an operating frequency of $n \dots 30 < 45$ , without causing a problem. <b>YES</b> <b>Select RBQ2508</b>

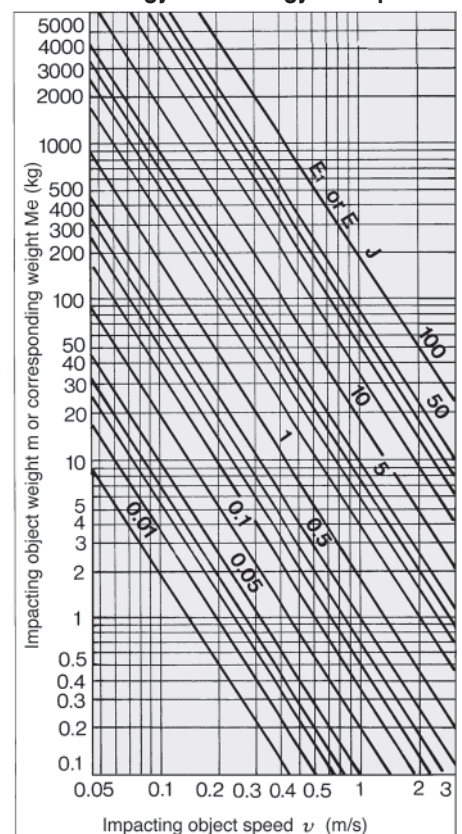
## 1 Classification of Impact

Classification of impact	(Downward)	
		$v$
Impact object/speed $v^{(1)}$	$v$	
Kinetic energy $E_1$	$\frac{1}{2} m v^2$	
Thrust energy $E_2$	$F_1 S + mgs$	
Energy absorption $E$	$E_1 + E_2$	
Impacting object /corresponding weight $Me$	$\frac{2}{v^2} E$	

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)
v	v	$\sqrt{2gh}$	$\omega R$
$\frac{1}{2} m v^2$	$\frac{1}{2} m v^2$	mgh	$\frac{1}{2} I \omega^2$
$F_1 S - mg S$	$mg \mu S$	mgS	$T \frac{S}{R}$
$E_1 + E_2$	$E_1 + E_2$	$E_1 + E_2$	$E_1 + E_2$
$\frac{2}{v^2} E$	$\frac{2}{v^2} E$	$\frac{2}{v^2} E$	$\frac{2}{v^2} E$

### «Symbol table»

Symbol	Specifications	Unit
d	Bore size	mm
E	Energy absorption	J
E1	Kinetic energy	J
E2	Thrust energy	J
F1	Cylinder thrust	N
g	Acceleration of gravity	m/s <sup>2</sup>
h	Dropping height	m
I(3)	Moment of inertia around the centre of gravity	kgm <sup>2</sup>
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
v	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	—

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<sup>2</sup>)

### Data B

Thrust energy of cylinder  $F_1 S$  (Operating press. 0.5MPa) Unit: J

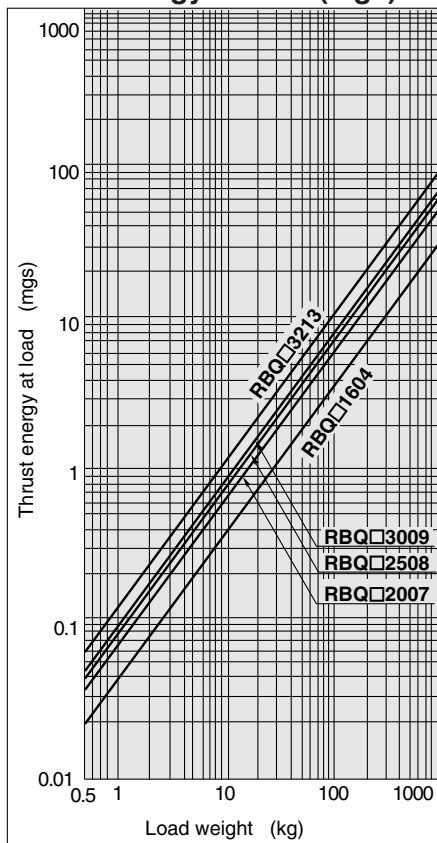
Model	RBQ□1604	RBQ□2007	RBQ□2058	RBQ□3009	RBQ□3213	
Stroke absorption mm	4	7	8	8.5	13	
Bore size d (mm)	6	0.057	0.099	0.113	0.120	0.184
	10	0.157	0.274	0.314	0.334	0.511
	15	0.353	0.619	0.707	0.751	1.15
	20	0.628	1.10	1.26	1.34	2.04
	25	0.982	1.72	1.96	2.09	3.19
	30	1.41	2.47	2.83	3.00	4.59
	40	2.51	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

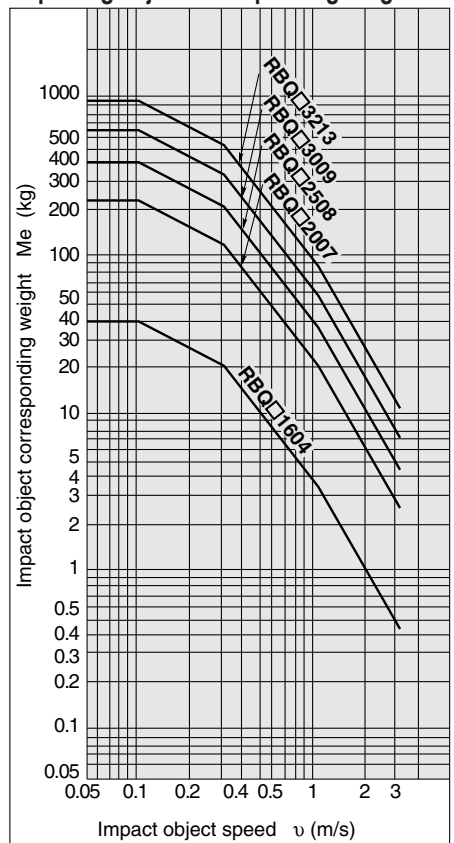
### Data C

Thrust energy at load (mgs)



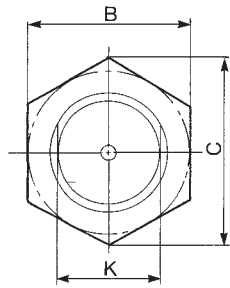
### Data D

Impacting object corresponding weight  $Me$

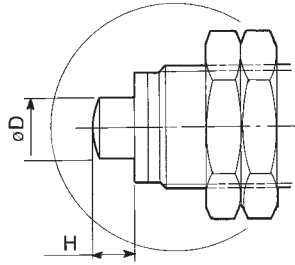


# Series RBQ

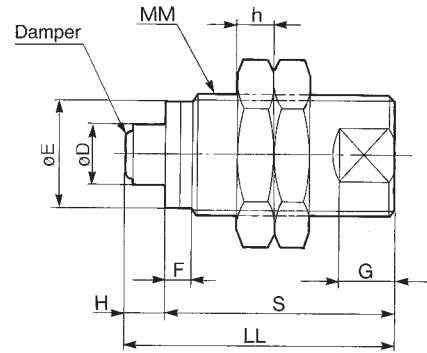
## Dimensions



Series RBQ  
Basic

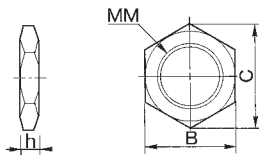


Series RBQC  
With damper



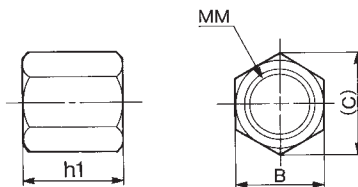
Model		Shock absorber									Hexagon nut		
Basic	With damper	D	E	F	H	K	G	LL	MM	S	B	C	h
RBQ1604	RBQC1604	6	14.2	3.5	4	14	7	31	M16 X 1.5	27	22	25.4	6
RBQ2007	RBQC2007	10	18.2	4	7	18	9	44.5	M20 X 1.5	37.5	27	31.2	6
RBQ2508	RBQC2508	12	23.2	4	8	23	10	52	M25 X 1.5	44	32	37	6
RBQ3009	RBQC3009	16	28.2	5	8.5	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)



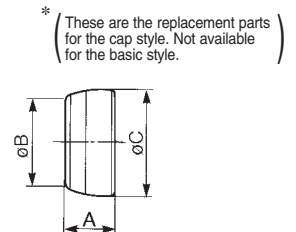
### Option

#### Stopper nut



### Replacement Part

#### Bumper



Unit: mm

Part No.	MM	h	B	C
RBQ16J	M16 X 1.5	6	22	25.4
RB20J <sup>(1)</sup>	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.

Material: Carbon steel

Part No.	B	C	h1	MM
RBQ16S	22	25.4	12	M16 X 1.5
RB20S <sup>(2)</sup>	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.

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

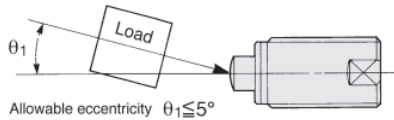
## ⚠ Precautions

Be sure to read before reading. Refer to Safety Instructions and common precautions.

### Selection

#### ⚠ Warning

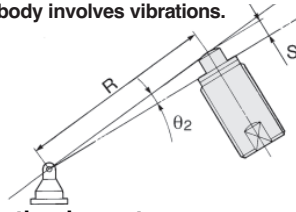
- Load should always be aligned with the axis of piston rod.  
An angle of deviation that exceeds 5° will place an excessive load on the bearings, leading to oil leaks within a short period of operation.
- If oscillating impacts are involved, the installation must be designed so that the direction in which the load is applied is perpendicular to the



shock absorber's axial centre.

The allowable oscillating angle until the stroke end must be  $\theta_2 \leq 5^\circ$ . 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.

- A guide is necessary if the impact body involves vibrations.



#### Installation conditions for rotation impact (mm)

Model	S (Stroke)	$\theta_2$ (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.

- 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.

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

#### ⚠ Caution

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

- 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.
- 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.
- Do not use the shock absorber in a clean room, as it could contaminate the clean room.
- Before performing installation, removal, or stroke adjustment, make

### Mounting

#### ⚠ Warning

sure to cut off the power supply to the equipment and verify that the equipment has stopped.

#### ⚠ Caution

- Tightening torque of mounting nut should be as follows.

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

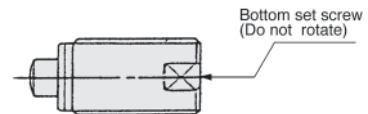
If the tightening torque that is applied to the nut exceeds the value given above, the shock absorber itself could become damaged.

- 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.

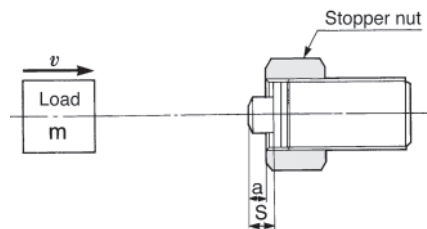
- Never turn the screw on the bottom of the body (it is not an adjustment screw), as this will cause oil leakage.

- 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.

- Make sure that the retaining nut is not loose.



### Maintenance

#### ⚠ Caution

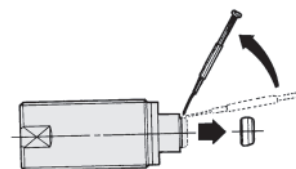
The shock absorber could become damaged if it is used in a loose state.

- 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.

- 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.



## Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) <sup>1)</sup>, and other safety regulations.

-  **Danger:** **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
-  **Warning:** **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
-  **Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

- 1) ISO 4414: Pneumatic fluid power – General rules and safety requirements for systems and their components.  
ISO 4413: Hydraulic fluid power – General rules and safety requirements for systems and their components.  
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)  
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.  
etc.

### Warning

#### 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

#### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

#### 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

#### 4. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments.

##### Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogues and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

### Caution

**SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries. Use in non-manufacturing industries is not allowed.**

Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

## Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. <sup>2)</sup> Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.
  - 2) **Suction cups (Vacuum pads) are excluded from this 1 year warranty.**  
A suction cup (vacuum pad) is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the suction cup (vacuum pad) or failure due to the deterioration of rubber material are not allowed by the limited warranty.

### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

## Safety Instructions

Be sure to read the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.

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<b>South Africa</b>	+27 10 900 1233	www.smcza.co.za	Sales.za@smc.com