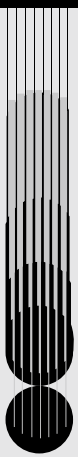
# Shock Absorber

## *RB* Series

## Absorbing impact and noise

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



### Shock absorber: RB series
### Coolant resistant type: RBL series

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

### Short type: RBQ series

**A compact type that has been shortened lengthwise**

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

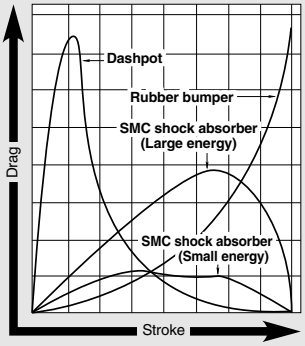
**Usable without a stopper nut**
The strong body can be positioned directly.

## Shock absorber

**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 load speed high loads; without requiring additional adjustment of the shock absorber.

**Example of comparison for drag characteristics**




∗ 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 |
|---|---|---|---|---|---|---|---|
| *RB Series*  | RB series | M6, M8, M10, M14, M20, M27 (Optional specifications are not available for M6.) | ● | ● | ● | ● | 899 |
| | Coolant resistant RBL series | M10, M14, M20, M27 | ● | ● | ● | ● | 906 |
| *RBQ Series*  | RBQ series | M16, M20, M25, M30, M32 | ● | ● | ● | ● | 910 |

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

# 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 |
|---|---|---|
| **m** | Impacting object mass | kg |
| υ | Collision 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 | N |
| **T** | Torque | N · m |
| **n** | Operation cycle | cycle / min |
| **t** | Ambient temperature | °C |
| μ | 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 $E_1$**

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 **$E_1$**, substitute respective figures for **Data B** or **Data C**.

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

Absorbed energy $\mathbf{E} = \mathbf{E_1} + \mathbf{E_2}$

Corresponding mass of impacting object $\mathbf{Me} = \frac{2}{\upsilon^2} \cdot \mathbf{E}$

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

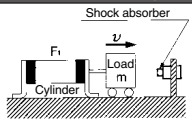
**7. Selection of applicable model**

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

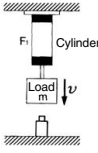
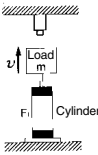
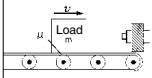
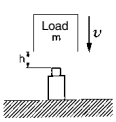
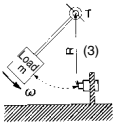
### Caution on Selection

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 (1) υ | υ | | |
| Kinetic energy $E_1$ | $\frac{1}{2}\cdot m\cdot \upsilon^2$ | | |
| Thrust energy $E_2$ | $F_1 \cdot S$ | | |
| Absorbed energy E | $E_1 + E_2$ | | |
| Corresponding (2) mass of impacting object Me | $\frac{2}{\upsilon^2}\cdot E$ | | |
| **2. Operating conditions** | **m** = 1 kg<br>υ = 0.5 m/s<br>**d** = 10 mm<br>**p** = 0.5 MPa<br>**n** = 30 cycle/min<br>**t** = 25 °C | **2. Operating conditions** | **m** = 50 kg<br>υ = 0.3 m/s<br>**d** = 40 mm<br>**p** = 0.5 MPa<br>**n** = 20 cycle/min<br>**t** = 25 °C |
| **3. Specifications and operational instructions** | ● Confirmation of specifications<br>υ ··· 0.5 < 1.0 (max.)<br>**t** ··· −10 (min.) < 25 < 80 (max.)<br>**F** ··· **$F_1$** ··· 39.3 <<br>**YES** | **3. Specifications and operational instructions** | ● Confirmation of specifications<br>υ ··· 0.3 < 5 (max.)<br>**t** ··· −10 (min.) < 25 < 80 (max.)<br>**F** ··· **$F_1$** ···628 < 1961 (max.)<br>**YES** |
| **4. Calculation of kinetic energy $E_1$** | ● Kinetic energy $E_1$<br>Use Formula to calculate **$E_1$**. Substitute 1.0 for **m** and 0.5 for υ.<br>**$E_1 \cong 0.125$** | **4. Calculation of kinetic energy $E_1$** | ● Kinetic energy $E_1$<br>Use Formula to calculate **$E_1$**. Substitute 50 for **m** and 0.3 for υ.<br>**$E_1 \cong 2.3$ J** |
| **5. Calculation of thrust energy $E_2$** | ● Thrust energy $E_2$<br>Provisionally select a model RB0604 and make the use of Data B at left. According to **d** = 10, **$E_2$** is obtained.<br>**$E_2 \cong 0.157$** | **5. Calculation of thrust energy $E_2$** | ● Thrust energy $E_2$<br>Provisionally select a model RB2015 and make the use of Data B. According to **d** = 40, **$E_2$** is obtained.<br>**$E_2 \cong 9.4$ J** |
| **6. Calculation of corresponding mass of impacting object Me** | ● Corresponding mass of impacting object Me<br>Use the Formula "Absorbed energy **E** = **$E_1$** + **$E_2$** = 0.282" to calculate **Me**. Substitute 0.282 for **E** and 0.5 for υ.<br>**Me ≅ 2.3** | **6. Calculation of corresponding mass of impacting object Me** | ● Corresponding mass of impacting object Me<br>Use the formula "Absorbed energy **E** = **$E_1$** + **$E_2$** = 2.3 + 9.4 = 11.7 J" to calculate **Me**. Substitute 11.7 J for **E** and 0.3 for υ.<br>**Me ≅ 260 kg** |
| **7. Selection of RB0604** | ● Selection of RB0604<br>RB0604 satisfies **Me** = 2.3 < 3 kg (Max. corresponding mass of impacting object). Ultimately, it will result in an operating frequency of 30 < 80, without causing a problem.<br>**YES** | **7. Selection of applicable model** | ● Selection of applicable model<br>According to Data D, the tentatively selected RB2015 satisfies **Me** = 260 kg < 400 kg at υ = 0.3. Ultimately, it will result in an operating frequency of **n**···20 < 25, without causing a problem.<br>**YES**<br>**Select RB2015** |

## 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** (1) **υ** | **υ** | **υ** | **υ** | $\sqrt{2gh}$ | **ω · R** |
| **Kinetic energy E1** | $\frac{1}{2}\cdot m\cdot \upsilon^2$ | $\frac{1}{2}\cdot m\cdot \upsilon^2$ | $\frac{1}{2}\cdot m\cdot \upsilon^2$ | **m · g · h** | $\frac{1}{2}\cdot m\cdot \omega^2$ |
| **Thrust energy E2** | **F1 · S + m · g · S** | **F1 · S + m · g · S** | **m · g · μ · S** | **m · g · S** | $T\cdot\frac{S}{R}$ |
| **Absorbed energy E** | **E1 + E2** | **E1 + E2** | **E1 + E2** | **E1 + E2** | **E1 + E2** |
| **Corresponding** (2) **mass of impacting object Me** | $\frac{2}{\upsilon^2}\cdot E$ | $\frac{2}{\upsilon^2}\cdot E$ | $\frac{2}{\upsilon^2}\cdot E$ | $\frac{2}{\upsilon^2}\cdot E$ | $\frac{2}{\upsilon^2}\cdot E$ |

Note 1) Collision speed is momentary velocity at which object is impacting against shock absorber. The collision speed is $\upsilon = 2\overline{\upsilon}$ when the speed (average speed $\overline{\upsilon}$) 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, $E = \frac{1}{2}\cdot Me\cdot\upsilon^2$

Note 3) R: The distance between rotational center and impact point. Set R at the minimum installation radius (page 904) or higher.

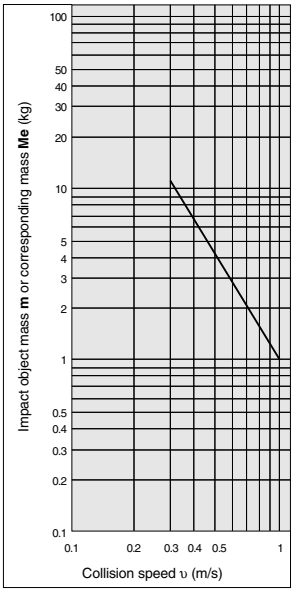
**RJ**

**RB**

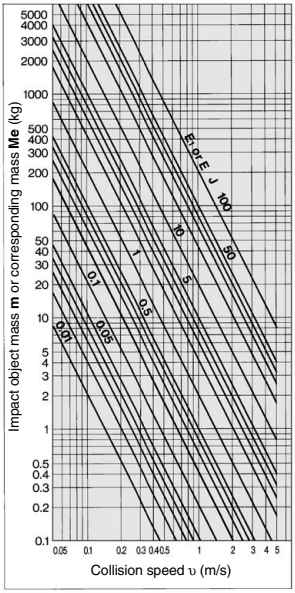
## Data A

### Kinetic Energy E1 or Energy Absorption E

**RB0604**




**RB□0805 to 2725**




### Symbol

| Symbol | Specifications | Unit |
|---|---|---|
| **d** | Bore size | mm |
| **E** | Absorbed energy | J |
| **E1** | Kinetic energy | J |
| **E2** | Thrust energy | J |
| **F1** | Cylinder thrust | N |
| **g** | Acceleration of gravity (9.8) | m / s² |
| **h** | Dropping height | m |
| **I** (4) | Moment of inertia around the center of gravity | kg · m² |
| **n** | Operating frequency | cycle / min |
| **p** | Cylinder operating pressure | MPa |
| **R** | Distance between axis of cylinder and impact point | m |
| **S** | Shock absorber stroke | m |
| **T** | Torque | N · m |
| **t** | Ambient temperature | °C |
| **υ** | Collision speed | m / s |
| **m** | Impact object mass | kg |
| **Me** | Corresponding mass of impact object | kg |
| **ω** | Angle speed | rad / s |
| **μ** | Friction coefficient | — |

Note 4) For the formula of moment of inertia I (kg·m²), refer to the catalog of rotary actuator.

**D-□**

**-X□**

## Data B

### Thrust Energy of Cylinder $F_1 \cdot S$

(Operating pressure 0.5 MPa) (J)

| Model | | RB0604 | RB□0805 | RB□0806<br>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 |

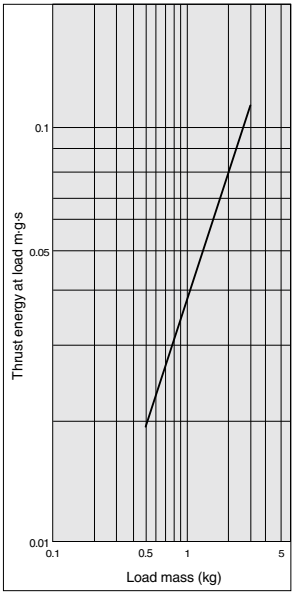
■ **Operating pressure other than 0.5 MPa:**
**Multiply by the following coefficient.**

| 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 |

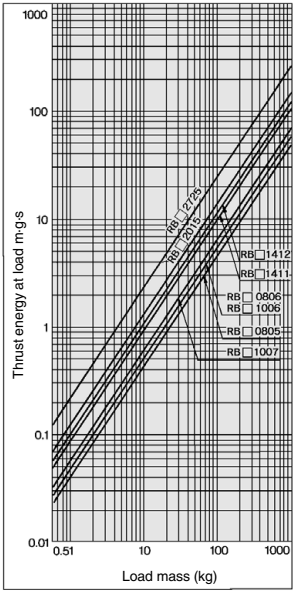
## Data C

### Thrust Energy at Load m·g·s

**RB0604**

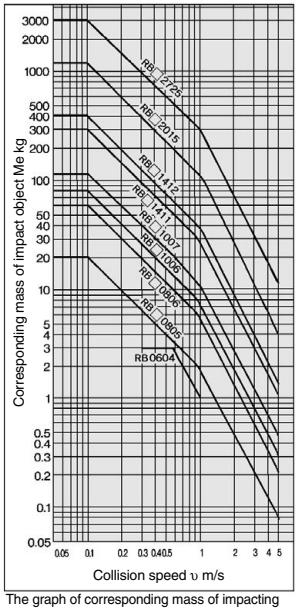



**RB□0805 to 2725**



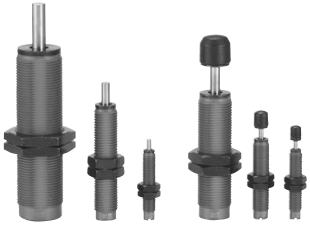

## Data D

### Corresponding Mass of Impacting Object Me




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

# Shock Absorber
# *RB* Series



Basic type　　With cap

## Specifications

| Model / Specifications | | RB0604 | RB0805 | RB0806 | RB1006 | RB1007 | RB1411 | RB1412 | RB2015 | RB2725 |
|---|---|---|---|---|---|---|---|---|---|---|
| | With cap | — | RBC0805 | RBC0806 | RBC1006 | RBC1007 | RBC1411 | RBC1412 | RBC2015 | RBC2725 |
| Max. energy absorption (J) Note) | | 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

**RB C 14 12 ☐**

- **Shock absorber**
- **Type**

| | |
|---|---|
| **Nil** | Basic type |
| **C** | With cap |

- **O.D. thread size/Stroke**

| Symbol | O.D. thread size | Stroke | Symbol | O.D. thread size | Stroke |
|---|---|---|---|---|---|
| **0604** | 6 mm | 4 mm | **1411** | 14 mm | 11 mm |
| **0805** | 8 mm | 5 mm | **1412** | 14 mm | 12 mm |
| **0806** | 8 mm | 6 mm | **2015** | 20 mm | 15 mm |
| **1006** | 10 mm | 6 mm | **2725** | 27 mm | 25 mm |
| **1007** | 10 mm | 7 mm | | | |

Note) RB0604: With cap type is not available.

- **Option**

| Symbol | Hex. nut | Stopper nut |
|---|---|---|
| **Nil** | 2 pcs. | — |
| **J** | 3 pcs. | — |
| **N** | — | — |
| **S** | 2 pcs. | 1 pc. |
| **SJ** | 3 pcs. | 1 pc. |
| **SN** | — | 1 pc. |

Note) RB0604: "Nil" or "N" only

### 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 | | |

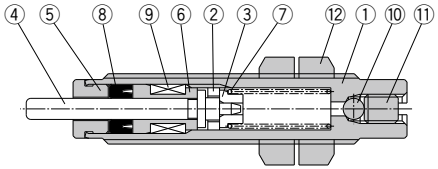
- **Cap**

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

## Construction

### RB0604

**Extended**

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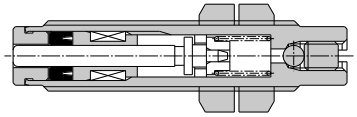
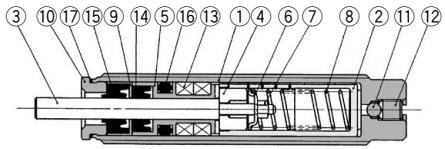


**Component Parts**

| 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**

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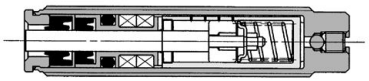
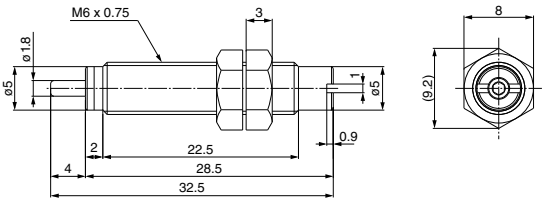


**Component Parts**

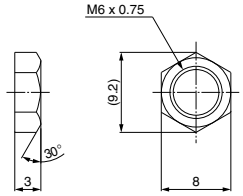
| No. | Description | Material | Treatment |
|---|---|---|---|
| 1 | **Outer tube** | Rolled steel | Gray coated |
| 2 | **Inner tube** | Special steel | Heat treated |
| 3 | **Piston rod** | Special steel | Electroless nickel plated |
| 4 | **Piston** | Special steel | Heat treated |
| 5 | **Bearing** | 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 | |
| 17 | **Gasket** | NBR | Only RB(C)2015, 2725 |

## Dimensions

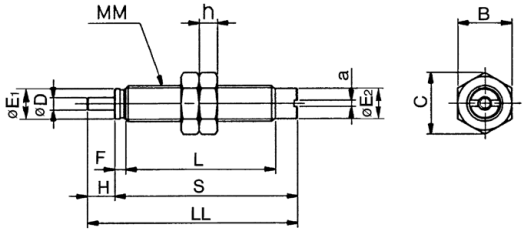
### RB0604




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

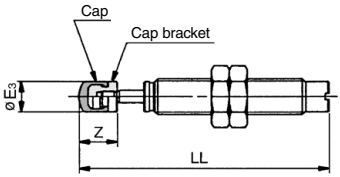



### Basic type: RB0805, RB0806, RB1006, RB1007



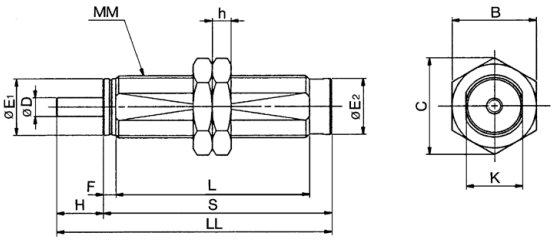

### With cap: RBC0805, RBC0806 RBC1006, RBC1007

∗ Other dimensions are the same as the basic type.



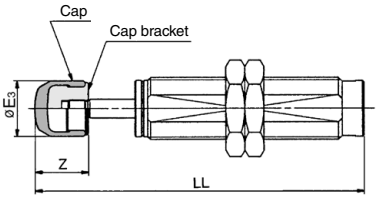

| Model | | Basic type dimensions | | | | | | | | | | With cap ∗ | | | Hexagon nut | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic type | With cap | D | $E_1$ | $E_2$ | F | H | a | L | LL | MM | S | $E_3$ | LL | Z | B | C | h |
| **RB0805** | **RBC0805** | 2.8 | 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

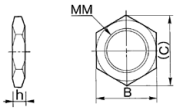
∗ Other dimensions are the same as the basic type.




| Model | | Basic type dimensions | | | | | | | | | | With cap ∗ | | | Hexagon nut | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic type | With cap | D | $E_1$ | $E_2$ | F | H | K | L | LL | MM | S | $E_3$ | 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)



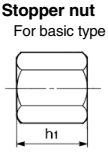

Material: Special steel
Treatment: Zinc trivalent chromated

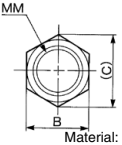
| Part no. | Dimensions | | | |
|---|---|---|---|---|
| | MM | h | B | C |
| RB06J | M6 x 0.75 | 3 | 8 | 9.2 |
| RB08J | M8 x 1.0 | 4 | 12 | 13.9 |
| RB10J | M10 x 1.0 | 4 | 14 | 16.2 |
| RB14J | M14 x 1.5 | 6 | 19 | 21.9 |
| RB20J | M20 x 1.5 | 6 | 27 | 31.2 |
| RB27J | M27 x 1.5 | 6 | 36 | 41.6 |

## Option

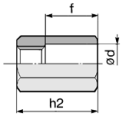
**Stopper nut**

For basic type




For cap type

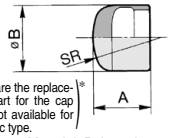



Material: Carbon steel
Treatment: Zinc trivalent chromated

| Part no. | | Dimensions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Basic type | With cap | B | C | h1 | h2 | MM | d | f |
| 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 Parts

**Cap**




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

Material: Polyurethane

| Part no. | Dimensions | | |
|---|---|---|---|
| | A | B | SR |
| 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 |

## Foot Bracket for Shock Absorber

Available for the foot mounting bracket of the RB series.

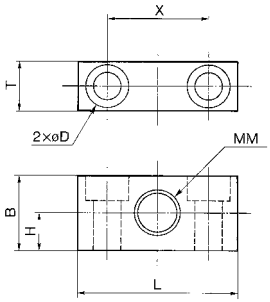
**Part no.**

Material: Aluminum alloy
Treatment: Black hard anodized

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

∗ Order foot brackets separately.

## Dimensions




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

# Specific Product Precautions 1

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions.**

## Selection

### ⚠ Danger

**1. Energy absorption**

Select a model so that the aggregated energy of impact object should not exceed the maximum absorption energy. Otherwise, it could cause changes in properties or result in damaging the shock absorber.

**2. Corresponding mass of impacting object**

Make a model selection, so that the corresponding mass of impacting object does not exceed the allowable range. Pulsation will occur in buffer and deceleration force, thus making it difficult to absorb shock smoothly.

**3. Collision speed**

Use it in the conditions that collision speed is within the specified range. It could cause the changes in buffer characteristics or lead to damage a shock absorber.

### ⚠ Warning

**1. Static load**

Design the system, so that any other forces than the buffer capacity or impacts should not be applied to the piston rod which is stopped at the retracted state.

### ⚠ Caution

**1. Maximum operating frequency**

Design the system in the conditions under which it is not used at the frequency exceeding the specified maximum operating frequency.

**2. Stroke**

The maximum absorption energy in the specifications cannot be exerted unless the full stroke is used for both RB and RBL Series.

**3. Work surface of an impact object**

The contact surface of the impact object 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).

**4. Be aware of the return force of the impact object.**

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 the spring force in the specifications, refer to the column (page 899).

**5. Selection of size**

As the number of operation proceeds, the maximum absorption energy of shock absorbers will be decreased by the following reasons such as abrasion, or deterioration, etc. of the internal working fluid. Taking this into consideration, selecting a size which is 20 to 40% affordable against the amount of absorption energy is recommended.

**6. Drag characteristics**

In general, the values of drag (reactive force generated during operation) generated by the operating speed will vary in hydraulic shock absorber. And then, by adopting “Porous orifice construction”, the RB series can adapt to such this fast/slow speed and can absorb shock smoothly in a wide range of speed.

But, the speed reduction (speed reduction G) would be larger around the stroke terminal, depending upon the operating conditions. Please note that it might be encountered that stroke time is long, motion is not smooth, etc. If this would be a problem, we recommend that stroke amount should be restricted by using our optional component like “Stopper nut”, etc.

### ⚠ Caution

**7. Parallel usage**

When using multiple shock absorbers in parallel, energy will not be divided evenly because of differences in product dimensions and devices. For this reason, select the following options.

E = Ea/N/0.6

E : Energy used per shock absorber

Ea: All energies

N : The number of shock absorbers used in parallel

## Operating Environment

### ⚠ Danger

**1. Operation in an environment which requires explosion-proof**

- When mounting in places where static electricity is accumulated, implement a distribution of electrical energy by grounding.
- Do not use the materials for buffer face which might cause to spark by collision.

### ⚠ Warning

**1. Pressure**

Do not use it in the vacuum state, which is substantially different from the atmospheric pressure (above sea level) and in the atmosphere under being pressurized.

**2. Using inside a clean room**

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

### ⚠ Caution

**1. Temperature range**

Do not use it, exceeding the specified allowable temperature range. Seal could be softened or hardened or worn out, or leading to leak a working fluid, deterioration, or impact characteristic changes.

**2. Deterioration by atmosphere**

Do not use the product in an environment where the product may be damaged by salt or air which contains organic solvent, phosphoester operating oil, sulfurous acid gas, chlorine gas or other acids. It may deteriorate seals or corrode metals.

**3. Deterioration by ozone**

Do not use it under the direct sunlight on the beach, or by the mercury lamp, or the ozone generator, because the rubber material will be deteriorated by ozone.

**4. Cutting oil, water, blown dust**

Do not use the product under the condition, where the liquid such as cutting oil, water, solvent, etc. is exposed either directly or in atomized form to the piston rod, or where blown dust could be adhered around the piston rod. This could cause malfunction.

# Specific Product Precautions 2

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions.**

## Operating Environment

### ⚠Caution

**5. Vibration**

When vibrations are applied on impact objects, implement a secure guide on impact objects.

## 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.**

**2. Installation of protective cover**

We recommend the protective cover should be installed in the case workers might be getting close during the operation.

**3. The rigidity of the mounting frame**

The mounting frame must have sufficient rigidity.

Load on mounting plate can be calculated as follows.

$$\text{Load on mounting plate} \quad N \cong 2\,\frac{\text{E (Absorbed energy : J)}}{\text{S (Stroke : m)}}$$

Depending on the impact conditions, a load applied to the mounting frame may exceed the calculated value.

When setting the rigidity of the mounting frame, the sufficient safety ration must be taken into account in the calculated value.

### ⚠Caution

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

When threading on a mounting frame in order to mount a shock absorber directly, prepared hole dimensions are referred to the table below.

For tightening torque of a nut for shock absorber, kindly abide by the table below.

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

| Model | RB0604 | RB(C)0805<br>RB(C)0806 | RB(C)1006<br>RB(C)1007 | RB(C)1411<br>RB(C)1412 |
|---|---|---|---|---|
| O.D. thread (mm) | M6 x 0.75 | M8 x 1.0 | M10 x 1.0 | M14 x 1.5 |
| Thread prepared bore (mm) | ø5.3 $^{+0.1}_{0}$ | ø7.1 $^{+0.1}_{0}$ | ø9.1 $^{+0.1}_{0}$ | ø12.7 $^{+0.1}_{0}$ |
| Tightening torque (N · m) | 0.85 | 1.67 | 3.14 | 10.8 |

| Model | RB(C)2015 | RB(C)2725 |
|---|---|---|
| O.D. thread (mm) | M20 x 1.5 | M27 x 1.5 |
| Thread prepared bore (mm) | ø18.7 $^{+0.1}_{0}$ | ø25.7 $^{+0.1}_{0}$ |
| Tightening torque (N · m) | 23.5 | 62.8 |

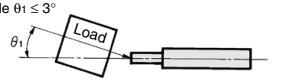
## Mounting

### ⚠Caution

**2. Deviation of impact**

The installation must be designed so that the impact body is perpendicular to the shock absorber's axial center. 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.

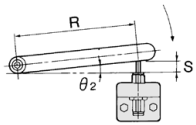
Allowable eccentric angle $\theta_1 \leq 3°$




With cap $\theta_1 \leq 1°$

**3. Rotating angle**

If rotating 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 rotating angle until the stroke end must be $\theta_2 < 3°$.




Allowable rotating eccentric angle $\theta_2 \leq 3°$

**Installation Conditions for Rotating Impact** (mm)

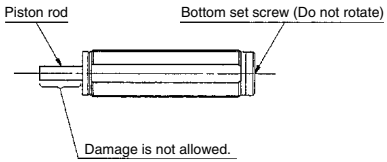
| Model | S (Stroke) | $\theta_2$ (Allowable rotating angle) | R (Min. installation radius) | |
|---|---|---|---|---|
| | | | Basic type | With cap |
| RB0604 | 4 | 3° | 76 | — |
| RB□□0805 | 5 | | 96 | 258 |
| RB□□0806 | 6 | | 115 | 277 |
| RB□□1006 | 6 | | 115 | 306 |
| RB□□1007 | 7 | | 134 | 325 |
| RB□□1411 | 11 | | 210 | 468 |
| RB□□1412 | 12 | | 229 | 487 |
| RB□□2015 | 15 | | 287 | 611 |
| RB□□2725 | 25 | | 478 | 916 |

**4. 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 potion 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.

**5. Never turn the screw on the bottom of the body.**

This is not an adjusting screw. Turning it could result in oil leakage.



# Specific Product Precautions 3

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions.**

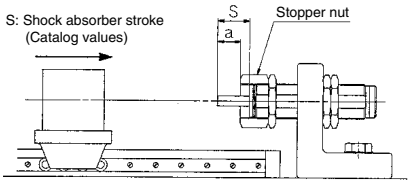
## Mounting

### ⚠Caution

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

Control the stopping time of the impact object 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.

Capacity of shock absorbers deteriorate in accordance with usage. When crashing sounds or vibrations are generated during the operation, adjust the stopper nut and make the effective stroke (a) longer, or give the stroke enough leeway beforehand.




## Maintenance

### ⚠Caution

**1. Check the mounting nut is not loosen.**

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. Confirm that abnormality, oil leakage, etc. in the outward surface.**

When a large amount of oil is leaking, replace the product, because it is believed to be happening something wrong with it. If it keeps on using, it may cause to break the equipment which is mounted by this product.

**4. 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 object, replace the cap often.

## Storage

### ⚠Caution

**1. Piston rod position while stored**

If a piston rod is stored as pushed in for a long period of time (over 30 days), absorption capacity may decrease.

Avoid storing like this for a long time.

## Service Life and Replacement Period of Shock Absorber

### ⚠Caution

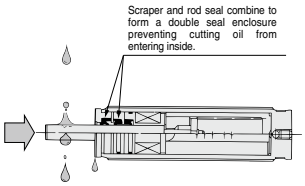
**1. Allowable operating cycle under the specifications set in this catalog is shown below.**

| | |
|---|---|
| 1.2 million cycles | RB0604, RB08□□ |
| 2 million cycles | RB10□□ to RB2725 |
| 1 million cycles | RBA□□□□, RBL□□□□ |

Note) Specified service life (suitable replacement period) is the value at room temperature (20 to 25°C). The period may vary depending on the temperature and other conditions. In some cases the absorber may need to be replaced before the allowable operating cycle above.

# Shock Absorber: Coolant Resistant Type
# *RBL Series*

**Can be operated in an environments exposed to non-water soluble cutting oil. (Mainly JIS Class 1 equivalent)**




Basic type　　With cap

## Specifications

| Model / Specifications | | RBL1006 | RBL1007 | RBL1411 | RBL1412 | RBL2015 | RBL2725 |
|---|---|---|---|---|---|---|---|
| | Basic type | RBLC1006 | RBLC1007 | RBLC1411 | RBLC1412 | RBLC2015 | RBLC2725 |
| | With cap | | | | | | |
| Max. energy absorption (J) Note) | | 3.92 | 5.88 | 14.7 | 19.6 | 58.8 | 147 |
| Thread O.D. size | | M10 x 1.0 | | M14 x 1.5 | | M20 x 1.5 | M27 x 1.5 |
| Stroke absorption (mm) | | 6 | 7 | 11 | 12 | 15 | 25 |
| Collision speed (m/s) | | 0.05 to 5 | | | | | |
| Max. operating frequency (cycle/min) | | 70 | 70 | 45 | 45 | 25 | 10 |
| Max. allowable thrust (N) | | 422 | 422 | 814 | 814 | 1961 | 2942 |
| Ambient temperature range (°C) | | –10 to 80 | | | | | |
| Effective atmosphere | | Non-water soluble cutting oil | | | | | |
| Spring force (N) | Extended | 4.22 | 4.22 | 8.73 | 8.73 | 11.57 | 22.16 |
| | Retracted | 6.18 | 6.86 | 14.12 | 14.61 | 17.65 | 38.05 |
| Weight (g) | Basic type | 26 | 26 | 70 | 70 | 150 | 365 |
| | With cap | 28 | 28 | 75 | 75 | 165 | 410 |

Note) The maximum energy absorption and maximum operating frequency are measured at room temperature (20 to 25°C).

## How to Order

**RB L C 14 12 ☐**

- RB: Shock absorber
- L: Coolant resistant type
- C: Type

| Nil | Basic type |
|---|---|
| C | With cap |

- 14 / 12: O.D. thread size/Stroke

| Symbol | O.D. thread size | Stroke | Symbol | O.D. thread size | Stroke |
|---|---|---|---|---|---|
| 1006 | 10 mm | 6 mm | 1412 | 14 mm | 12 mm |
| 1007 | 10 mm | 7 mm | 2015 | 20 mm | 15 mm |
| 1411 | 14 mm | 11 mm | 2725 | 27 mm | 25 mm |

- ☐: Option

| Symbol | Hex. nut | Stopper nut |
|---|---|---|
| Nil | 2 pcs. | — |
| J | 3 pcs. | — |
| N | — | — |
| S | 2 pcs. | 1 pc. |
| SJ | 3 pcs. | 1 pc. |
| SN | — | 1 pc. |

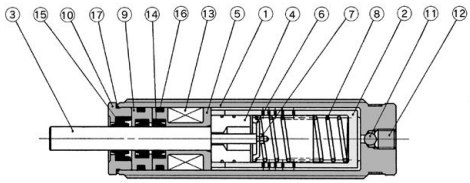
**Replacement part no./ Cap (Resin part only)　RBC 10 C**

- 10: Applicable model
- C: Cap

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

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

## Construction

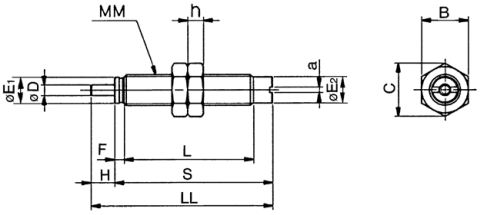



### Component Parts

| 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 | |
| 17 | Gasket | NBR | Only RBL(C)2015, 2725 |

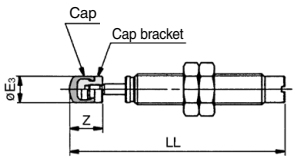
## Dimensions

### Basic type: RBL1006, RBL1007




### With cap: RBLC1006, RBLC1007

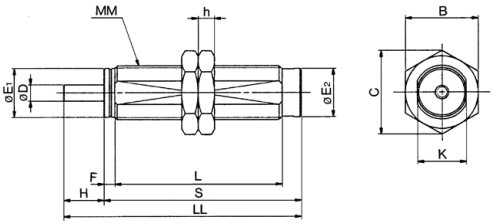
∗ Other dimensions are the same as the basic type.




| Model | | Basic type dimensions | | | | | | | | | | With cap ∗ | | | Hexagon nut | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic type | With cap | D | $E_1$ | $E_2$ | F | H | a | L | LL | MM | S | $E_3$ | 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 |

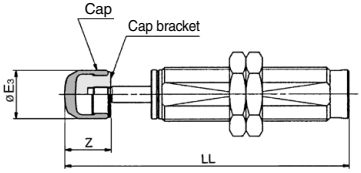
Note) L, LL and S dimensions of RBL(C)1007/1006 are different from those of RB(C)1007/1006.

### Basic type: RBL1411·RBL1412·RBL2015·RBL2725




### With cap: RBLC1411·RBLC1412 RBLC2015·RBLC2725

∗ Other dimensions are the same as the basic type.

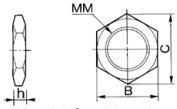



| Model | | Basic type dimensions | | | | | | | | | | With cap∗ | | | Hexagon nut | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic type | With cap | D | $E_1$ | $E_2$ | F | H | K | L | LL | MM | S | $E_3$ | LL | Z | B | C | h |
| **RBL1411** | **RBLC1411** | 5 | 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 are different from those of RB(C) (except RBL(C)2015).

## Hexagon Nut

(2 pcs. standard equipment)



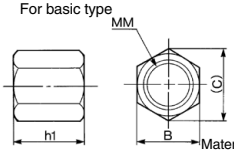

Material: Special steel
Treatment: Zinc trivalent chromated

| 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 |

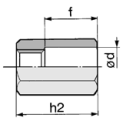
## Option

**Stopper nut**

For basic type




For cap type

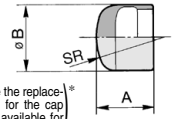



Material: Carbon steel
Treatment: Zinc trivalent chromated

| Part no. | | Dimensions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Basic type | With cap | **B** | **C** | **h1** | **h2** | **MM** | **d** | **f** |
| **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 Parts

**Cap**




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

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 |

## Foot Bracket for Shock Absorber

Available for the foot mounting bracket of the RBL series.

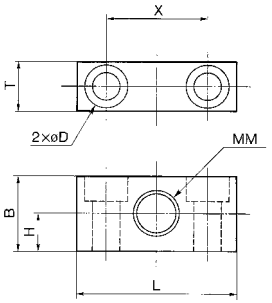
**Part no.**

Material: Aluminum alloy
Treatment: Black hard anodized

| Part no. | Applicable absorber |
|---|---|
| **RB10-X331** | **RB□1006, 1007** |
| **RB14-X331** | **RB□1411, 1412** |
| **RB20-X331** | **RB□2015** |
| **RB27-X331** | **RB□2725** |

∗ Order foot brackets separately.

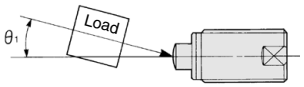
## Dimensions




| Part no. | B | D | H | L | MM | T | X | Mounting bolt |
|---|---|---|---|---|---|---|---|---|
| **RB10-X331** | 19 | 5.5 drill, 9.5 counterbore depth 5.4 | 9.5 | 40 | M10 x 1.0 | 12 | 25 | M5 |
| **RB14-X331** | 25 | 9 drill, 14 counterbore depth 8.6 | 12.5 | 54 | M14 x 1.5 | 16 | 34 | M8 |
| **RB20-X331** | 38 | 11 drill, 17.5 counterbore depth 10.8 | 19 | 70 | M20 x 1.5 | 22 | 44 | M10 |
| **RB27-X331** | 50 | 13.5 drill, 20 counterbore depth 13 | 25 | 80 | M27 x 1.5 | 34 | 52 | M12 |

# Shock Absorber: Short Type
# *RBQ* Series

### Allowable eccentric angle is 5°




Allowable eccentic angle $\theta_1 \leq 5°$

Ideal for absorption of rotating energy

**With bumper RBQC series** **Basic type RBQ series**

### Specifications

| Model / Specifications | | RBQ1604 / RBQC1604 | RBQ2007 / RBQC2007 | RBQ2508 / RBQC2508 | RBQ3009 / RBQC3009 | RBQ3213 / RBQC3213 |
|---|---|---|---|---|---|---|
| Max. energy absorption (J) Note) | | 1.96 | 11.8 | 19.6 | 33.3 | 49.0 |
| Thread O.D. size | | M16 x 1.5 | M20 x 1.5 | M25 x 1.5 | M30 x 1.5 | M32 x 1.5 |
| Stroke absorption (mm) | | 4 | 7 | 8 | 8.5 | 13 |
| Collision speed (m/s) | | 0.05 to 3 | | | | |
| Max. operating frequency (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 |
| | Retracted | 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 |

Note) The maximum energy absorption and maximum operating frequency are measured at room temperature (20 to 25°C).

## How to Order

**Replacement part no./Bumper**

**RBQC 16 C**

Applicable model

Bumper

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

**RB Q C 20 07** Option

Shock absorber

Short type

Type

| | |
|---|---|
| Nil | Basic type |
| C | With bumper |

O.D. thread size/Stroke

| Symbol | Hex. nut | Stopper nut |
|---|---|---|
| Nil | 2 pcs. | — |
| J | 3 pcs. | — |
| N | — | — |
| S | 2 pcs. | 1 pc. |
| SJ | 3 pcs. | 1 pc. |
| SN | — | 1 pc. |

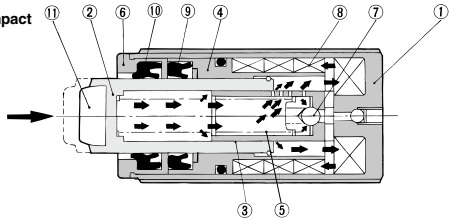
∗ 2 mounting hexagon nuts are attached as standard.

| Symbol | O.D. thread size | Stroke | Symbol | O.D. thread size | Stroke |
|---|---|---|---|---|---|
| 1604 | 16 mm | 4 mm | 3009 | 30 mm | 9 mm |
| 2007 | 20 mm | 7 mm | 3213 | 32 mm | 13 mm |
| 2508 | 25 mm | 8 mm | | | |

Bumper cannot be mounted for basic type. Please place an order with bumper type from the beginning.

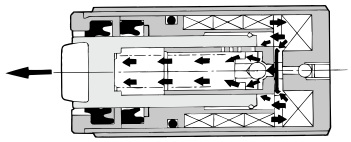
## Construction

**At impact**




An impact 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.

**At returning**



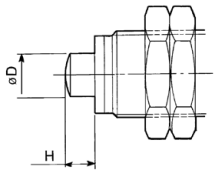
When the impact object is removed, the return spring pushes out the piston rod, and negative pressure, generated at the same time, opens the check ball to permit oil to return to the inside of the piston rod and the piston, making the shock absorber ready for the next impact.

### Component Parts

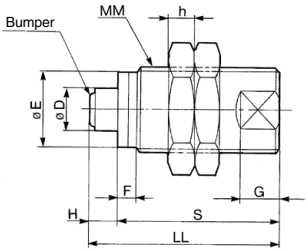
| No. | Description | Material | Treatment |
|---|---|---|---|
| 1 | **Outer tube** | Rolled steel | Black electroless nickel plated |
| 2 | **Piston rod** | Special steel | Heat treated, Hard chrome plated |
| 3 | **Piston** | Special steel | Heat treated |
| 4 | **Bearing** | Special bearing material | |
| 5 | **Return spring** | Piano wire | Zinc chromated |
| 6 | **Stopper** | Carbon steel | Zinc chromated |

| No. | Description | Material | Treatment |
|---|---|---|---|
| 7 | **Check ball** | Bearing steel | |
| 8 | **Accumulator** | Fluororubber | Foam rubber |
| 9 | **Rod seal** | NBR | |
| 10 | **Scraper** | NBR | |
| 11 | **Bumper** | Polyurethane | Only with bumper |

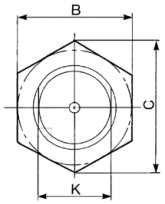
## Dimensions




**RBQ series**
**Basic type**



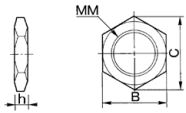

**RBQC series**
**With bumper**




| Model | | Shock absorber | | | | | | | | | Hexagon nut | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic type | With bumper | **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. standard equipment)



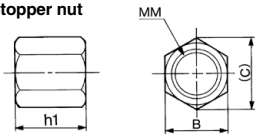

Material: Special steel
Treatment: Zinc trivalent chromated

| Part no. | MM | h | B | C |
|---|---|---|---|---|
| **RBQ16J** | M16 x 1.5 | 6 | 22 | 25.4 |
| **RBQ20J** (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 the case of RB20J, RB and RBQ are common.

## Option

**Stopper nut**



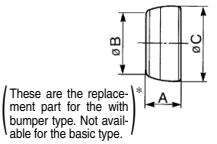

Material: Carbon steel
Treatment: Zinc trivalent chromated

| Part no. | B | C | h1 | MM |
|---|---|---|---|---|
| **RBQ16S** | 22 | 25.4 | 12 | M16 x 1.5 |
| **RBQ20S**(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 the case of RB20S, RB and RBQ are common.

## Replacement Parts

**Bumper**




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 |

# 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 dropping impact
- ☐ Rotating impact (With torque)

**2. Enumeration of operating conditions**

| Symbol | Operating conditions | Unit |
|---|---|---|
| **m** | Impacting object mass | kg |
| υ | Collision 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 | N |
| **T** | Torque | N · m |
| **n** | Operation cycle | cycle/min |
| **t** | Ambient temperature | °C |
| μ | 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 $E_1$**

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 $E_2$, substitute respective figures for **Data B** or **Data C**.

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

Absorbed energy $\mathbf{E = E_1 + E_2}$

Corresponding mass of impacting object $\mathbf{Me} = \frac{2}{\upsilon^2} \cdot \mathbf{E}$

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

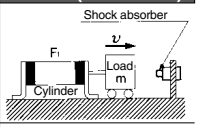
**7. Selection of applicable model**

Taking into consideration the corresponding mass of the impacting object **Me**, calculated using **Data D** and collision speed υ, 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

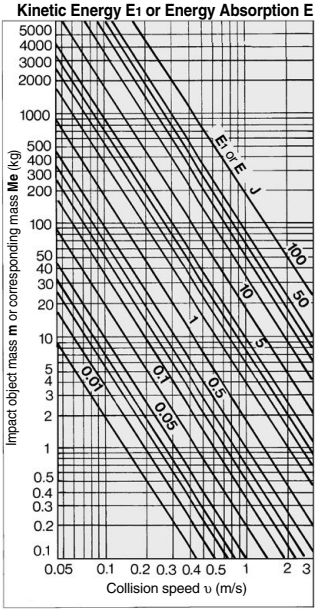
In order for the shock absorbers to operate accurately for long hours, it is necessary to select a model that is well-suited to your operating conditions. If the impact energy is smaller than 5% of the maximum energy absorption, select a model that is one class smaller.

### Selection Example

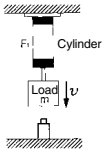
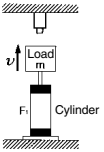
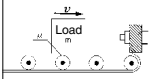
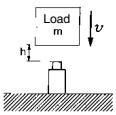
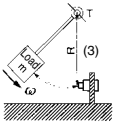
| | Cylinder stroke at load (Horizontal) |
|---|---|
| **1. Type of impact** |   |
| Collision speed (1) υ | υ |
| Kinetic energy $E_1$ | $\frac{1}{2} \cdot m \cdot \upsilon^2$ |
| Thrust energy $E_2$ | $F_1 \cdot S$ |
| Absorbed energy E | $E_1 + E_2$ |
| Corresponding (2) mass of impacting object Me | $\frac{2}{\upsilon^2} \cdot E$ |
| **2. Operating conditions** | m = 20 kg<br>υ = 0.7 m/s<br>d = 40 mm<br>p = 0.5 MPa<br>n = 30 cycle/min<br>t = 25 °C |
| **3. Specifications and operational instructions** | ● Confirmation of specifications<br>υ ··· 0.7 < 3 (max.)<br>t ··· –10 (min.) < 25 < 80 (max.)<br>F ··· $F_1$ ··628 < 686 (max.)<br>**YES** |
| **4. Calculation of kinetic energy $E_1$** | ● Kinetic energy $E_1$<br>Use Formula to calculate $E_1$. Suitable 20 for **m** and 0.7 for υ.<br>**$E_1 \cong 4.9$ J** |
| **5. Calculation of thrust energy $E_2$** | ● Thrust energy $E_2$<br>Provisionally select a model RBQ2508 and make the use of **Data B**. According to **d = 40**, $E_2$ is obtained.<br>**$E_2 \cong 5.0$ J** |
| **6. Calculation of corresponding mass of impacting object Me** | ● Corresponding mass of impacting object Me<br>Use the formula "Absorbed energy **E = E1 + E2 = 4.9 + 5.0 = 9.9 J**" to calculate **Me**. Substitute 9.9 J for **E** and **0.7** for υ.<br>**Me ≅ 40 kg** |
| **7. Selection of applicable model** | ● Selection of applicable model<br>According to **Data D**, the tentatively selected RBQ2508 satisfies **Me** = 40 kg < 60 kg at υ = 0.7. Ultimately, it will result in an operating frequency of **n**···30 < 45, without causing a problem.<br>**YES**<br>**Select RBQ2508** |

**Data A**

**Kinetic Energy $E_1$ or Energy Absorption E**



## 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** (1) **υ** | $\upsilon$ | $\upsilon$ | $\upsilon$ | $\sqrt{2gh}$ | $\omega \cdot R$ |
| **Kinetic energy E1** | $\frac{1}{2} \cdot m \cdot \upsilon^2$ | $\frac{1}{2} \cdot m \cdot \upsilon^2$ | $\frac{1}{2} \cdot m \cdot \upsilon^2$ | $m \cdot g \cdot h$ | $\frac{1}{2} \cdot I \cdot \omega^2$ |
| **Thrust energy E2** | $F_1 \cdot S + m \cdot g \cdot S$ | $F_1 \cdot S - m \cdot g \cdot S$ | $m \cdot g \cdot \mu \cdot S$ | $m \cdot g \cdot S$ | $T \cdot \frac{S}{R}$ |
| **Absorbed energy E** | $E_1 + E_2$ | $E_1 + E_2$ | $E_1 + E_2$ | $E_1 + E_2$ | $E_1 + E_2$ |
| **Corresponding** (2) **mass of impacting object Me** | $\frac{2}{\upsilon^2} \cdot E$ | $\frac{2}{\upsilon^2} \cdot E$ | $\frac{2}{\upsilon^2} \cdot E$ | $\frac{2}{\upsilon^2} \cdot E$ | $\frac{2}{\upsilon^2} \cdot E$ |

Note 1) Collision speed is momentary velocity at which object is impacting against shock absorber.
The collision speed is $\upsilon = 2\overline{\upsilon}$ when the speed (average speed $\overline{\upsilon}$) 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, $E = \frac{1}{2} \cdot Me \cdot \upsilon^2$
Note 3) R: The distance between rotational center and impact point. Set R at the minimum installation radius (page 916) or higher.

RJ

RB

**Data B**

### Thrust Energy of Cylinder $F_1 \cdot S$ (Operating pressure 0.5 MPa) (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 |
| | 32 | 1.61 | 2.81 | 3.22 | 3.42 | 5.23 |
| | 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 0.5 MPa:**
**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 |

**Symbol**

| Symbol | Specifications | Unit |
|---|---|---|
| **d** | Bore size | mm |
| **E** | Absorbed energy | J |
| **E1** | Kinetic energy | J |
| **E2** | Thrust energy | J |
| **F1** | Cylinder thrust | N |
| **g** | Acceleration of gravity (9.8) | m/s² |
| **h** | Dropping height | m |
| **I** (4) | Moment of inertia around the center of gravity | kg·m² |
| **n** | Operating frequency | cycle/min |
| **p** | Cylinder operation pressure | MPa |
| **R** | Distance between axis of cylinder and impact point | m |
| **S** | Shock absorber stroke | m |
| **T** | Torque | N·m |
| **t** | Ambient temperature | °C |
| **υ** | Collision speed | m/s |
| **m** | Impact object mass | kg |
| **Me** | Corresponding mass of impact object | kg |
| **ω** | Angle speed | rad/s |
| **μ** | Friction coefficient | — |

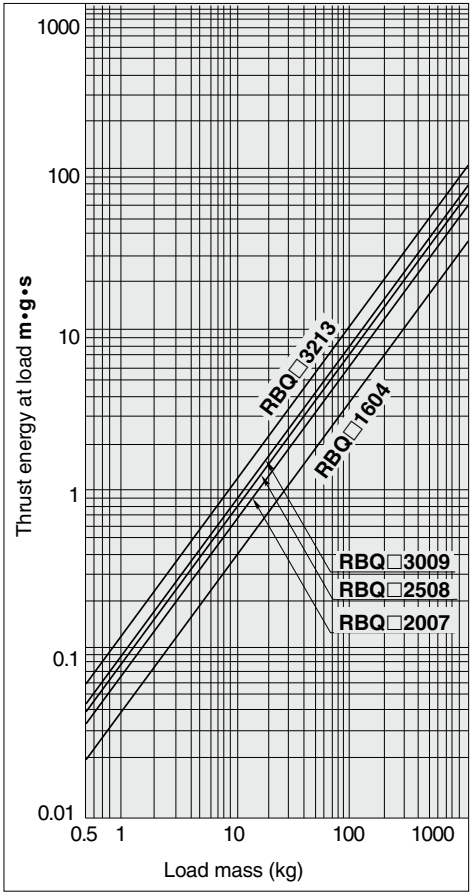
Note 4) For the formula of moment of inertia I (kg·m²), refer to the catalog of rotary actuator.

D-□

-X□

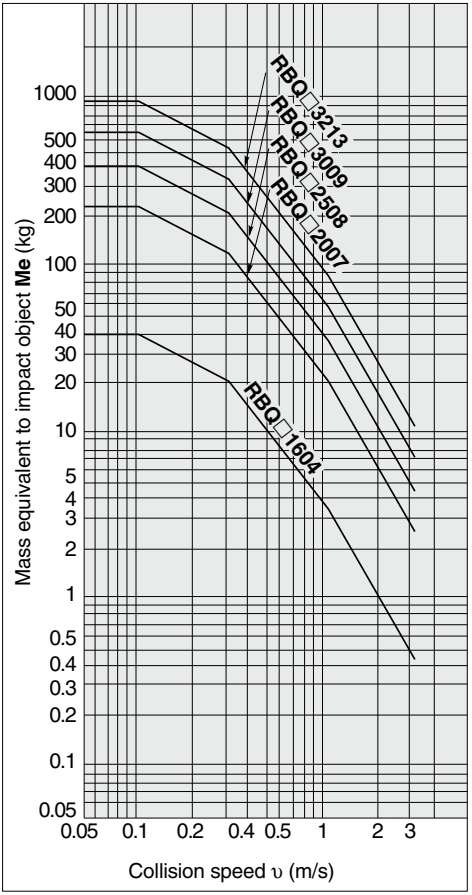
**Data C**

**Thrust Energy at Load m · g · s**




**Data D**

**Corresponding Mass of Impacting Object Me**




The corresponding mass graph shows the values at room temperature (20 to 25 °C).

# Specific Product Precautions 1

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions.**

## Selection

### ⚠ Danger

**1. Energy absorption**

Select a model so that the aggregated energy of impact object should not exceed the maximum absorption energy. Otherwise, it could cause changes in properties or result in damaging the shock absorber.

**2. Corresponding mass of impacting object**

Make a model selection, so that the corresponding mass of impacting object does not exceed the allowable range. Pulsation will occur in buffer and deceleration force, thus making it difficult to absorb shock smoothly.

**3. Collision speed**

Use it in the conditions that collision speed is within the specified range. It could cause the changes in buffer characteristics or lead to damage a shock absorber.

### ⚠ Warning

**1. Static load**

Design the system, so that any other forces than the buffer capacity or impacts should not be applied to the piston rod which is stopped at the retracted state.

### ⚠ Caution

**1. Maximum operating frequency**

Design the system in the conditions under which it is not used at the frequency exceeding the specified maximum operating frequency.

**2. Stroke**

The maximum absorption energy in the specifications cannot be exerted unless the full stroke is used.

**3. Work surface of an impact object**

The contact surface of the impact object 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).

**4. Be aware of the return force of the impact object.**

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 the spring force in the specifications, refer to the column (page 910).

**5. Selection of size**

As the number of operation proceeds, the maximum absorption energy of shock absorbers will be decreased by the following reasons such as abrasion, or deterioration, etc. of the internal working fluid. Taking this into consideration, selecting a size which is 20 to 40% affordable against the amount of absorption energy is recommended.

### ⚠ Caution

**6. Drag characteristics**

In general, the values of drag (reactive force generated during operation) generated by the operating speed will vary in hydraulic shock absorber. And then, by adopting “Porous orifice construction”, the RB series can adapt to such this fast/slow speed and can absorb shock smoothly in a wide range of speed.

But, the speed reduction (speed reduction G) would be larger around the stroke terminal, depending upon the operating conditions. Please note that it might be encountered that stroke time is long, motion is not smooth, etc. If this would be a problem, we recommend that stroke amount should be restricted by using our optional component like “Stopper nut”, etc.

**7. Parallel usage**

When using multiple shock absorbers in parallel, energy will not be divided evenly because of differences in product dimensions and devices. For this reason, select the following options.

E = Ea/N/0.6

E : Energy used per shock absorber

Ea: All energies

N : The number of shock absorbers used in parallel

## Operating Environment

### ⚠ Danger

**1. Operation in an environment which requires explosion-proof**

- When mounting in places where static electricity is accumulated, implement a distribution of electrical energy by grounding.
- Do not use the materials for buffer face which might cause to spark by collision.

### ⚠ Warning

**1. Pressure**

Do not use it in the vacuum state, which is substantially different from the atmospheric pressure (above sea level) and in the atmosphere under being pressurized.

**2. Using inside a clean room**

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

### ⚠ Caution

**1. Temperature range**

Do not use it, exceeding the specified allowable temperature range. Seal could be softened or hardened or worn out, or leading to leak a working fluid, deterioration, or impact characteristic changes.

**2. Deterioration by atmosphere**

Do not use the product in an environment where the product may be damaged by salt or air which contains organic solvent, phosphoester operating oil, sulfurous acid gas, chlorine gas or other acids. It may deteriorate seals or corrode metals.

# *RBQ Series*
# Specific Product Precautions 2

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions.**

## Operating Environment

### ⚠Caution

**3. Deterioration by ozone**

Do not use it under the direct sunlight on the beach, or by the mercury lamp, or the ozone generator, because the rubber material will be deteriorated by ozone.

**4. Cutting oil, water, blown dust**

Do not use the product under the condition, where the liquid such as cutting oil, water, solvent, etc. is exposed either directly or in atomized form to the piston rod, or where blown dust could be adhered around the piston rod. This could cause malfunction.

**5. Vibration**

When vibrations are applied on impact objects, implement a secure guide on impact objects.

## 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.**

**2. Installation of protective cover**

We recommend the protective cover should be installed in the case workers might be getting close during the operation.

**3. The rigidity of the mounting frame**

The mounting frame must have sufficient rigidity.

Load on mounting plate can be calculated as follows.

$$\text{Load on mounting plate} \quad N \cong 2\,\frac{\text{E (Absorbed energy : J)}}{\text{S (Stroke : m)}}$$

Depending on the impact conditions, a load applied to the mounting frame may exceed the calculated value.

When setting the rigidity of the mounting frame, the sufficient safety ration must be taken into account in the calculated value.

### ⚠Caution

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

When threading on a mounting frame in order to mount a shock absorber directly, prepared hole dimensions are referred to the table below.

For tightening torque of a nut for shock absorber, kindly abide by the table below.

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

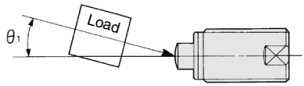
| Model | RBQ(C)1604 | RBQ(C)2007 | RBQ(C)2508 | RBQ(C)3009 | RBQ(C)3213 |
|---|---|---|---|---|---|
| O.D. thread (mm) | M16 x 1.5 | M20 x 1.5 | M25 x 1.5 | M30 x 1.5 | M32 x 1.5 |
| Thread prepared bore (mm) | ø14.7 $^{+0.1}_{0}$ | ø18.7 $^{+0.1}_{0}$ | ø23.7 $^{+0.1}_{0}$ | ø28.7 $^{+0.1}_{0}$ | ø30.7 $^{+0.1}_{0}$ |
| Tightening torque (N · m) | 14.7 | 23.5 | 34.3 | 78.5 | 88.3 |

## Mounting

### ⚠Caution

**2. Deviation of impact.**

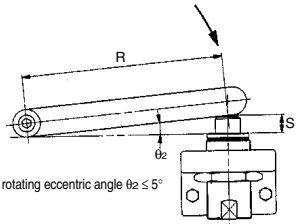
The installation must be designed so that the impact body is perpendicular to the shock absorber's axial center. An angle of deviation that exceeds 5° will place an excessive load on the bearings, leading to oil leaks within a short period of operation.




Allowable eccentric angle $\theta_1 \leq 5°$

**3. Rotating angle**

If rotating 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 rotating eccentric angle until the stroke end must be $\theta_2 \leq 5°$.




Allowable rotating eccentric angle $\theta_2 \leq 5°$

**Installation Conditions for Rotating Impact** (mm)

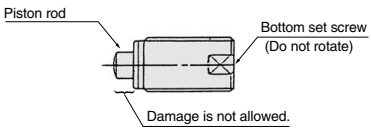
| Model | S (Stroke) | θ2 (Allowable rotating angle) | R (Min. installation radius) |
|---|---|---|---|
| RBQ□1604 | 4 | 5° | 46 |
| RBQ□2007 | 7 | | 80 |
| RBQ□2508 | 8 | | 92 |
| RBQ□3009 | 8.5 | | 98 |
| RBQ□3213 | 13 | | 149 |

**4. 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 potion 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.

**5. Never turn the screw on the bottom of the body.**

This is not an adjusting screw. Turning it could result in oil leakage.



# Specific Product Precautions 3

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions.**

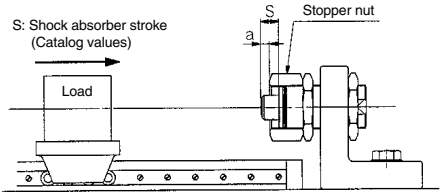
## Mounting

### ⚠ Caution

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

Control the stopping time of the impact object 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.

Capacity of shock absorbers deteriorate in accordance with usage. When crashing sounds or vibrations are generated during the operation, adjust the stopper nut and make the effective stroke (a) longer, or give the stroke enough leeway beforehand.




## Maintenance

### ⚠ Caution

**1. Check the mounting nut is not loosen.**

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. Confirm that abnormality, oil leakage, etc. in the outward surface.**

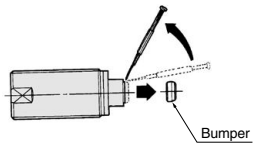
When a large amount of oil is leaking, replace the product, because it is believed to be happening something wrong with it. If it keeps on using, it may cause to break the equipment which is mounted by this product.

**4. Inspect the bumper for any cracks or wear.**

If the shock absorber comes with a bumper, the damper could wear first. To prevent bumper to the impact object, replace the bumper often.

**5. How to replace bumper**

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.




## Storage

### ⚠ Caution

**1. Piston rod position while stored**

If a piston rod is stored as pushed in for a long period of time (over 30 days), absorption capacity may decrease.

Avoid storing like this for a long time.

## Service Life and Replacement Period of Shock Absorber

### ⚠ Caution

**1. Allowable operating cycle under the specifications set in this catalog is shown below.**

2 million cycles

Note) Specified service life (suitable replacement period) is the value at room temperature (20 to 25°C). The period may vary depending on the temperature and other conditions. In some cases the absorber may need to be replaced before the allowable operating cycle above.