KARAKURI products

Zenmai Motor
- ZS/ZW series
- ZM80 series
- ZM60 series

Square Balancer
- BS series
- SBS series
- RS series

Optional parts for Zenmai Motor
- Bearing unit
- Speed reduction unit
- Wheel set
- Shaft set
- Pre-assembly insertion nut
Why would people choose ENDO products for Kaizen or Karakuri?

ENDO spring balancers have Zenmai (Mainspring) as power sources. The telescopic motion of Zenmai can give force to various things and it does not need other power resources such as electric or compressed air. It is very ecological power resource and very useful for Kaizen or Karakuri activities.

Coil springs or weights (Counter weight) are also ecological power resources which are similar to Zenmai.

However the capacity of those devices is fixed and it spends a time to change units when the machine which has those devices needs adjustments.

ENDO Spring balancer and Zenmai motor have the capability to adjust their spring tension accurately by easy process. That’s why many customers choose our ENDO products for their Kaizen or Karakuri activities.
Zenmai motor allows the dynamic power of springs to be used more directly for a wider range of applications.

1 Construction

Zenmai Motor is composed primarily of the following five (5) parts:

1. **Casing**
   - Casing stores Zenmai (spring).

2. **Mechanism to prevent reverse winding**
   - Prevents reverse winding after the spring has completely unwound and the number of windings has reached zero.

3. **Axis shaft**
   - Transfers the rotation to the attached component. (option)

4. **Mechanism to prevent excess winding**
   - Prevents damage that could be caused by winding the spring beyond its maximum number of turns.

5. **Zenmai (spring)**
   - Provides the driving force for the motor.

**Mechanism to prevent reverse winding**

Prevents reverse winding after the spring has completely unwound and the number of windings has reached zero.

- **One-way clutch**
  - Shafts rotate freely in the direction opposite to spring winding direction.
  - Shafts keep rotating by inertia after the spring has completely unwound. This inertial force can become the additional power source for Karakuri.

**Mechanism to prevent excess winding**

Prevents damage that could be caused by winding the spring beyond its maximum number of permitted rotations.

- The end of spring changes its position inside the casing by the telescopic motion of the excess wound spring.

*Please avoid rapid release of the spring in an unloaded state. Rapid release of the spring cause damage or spring corruption.

*ZM series does not have One-way clutch.

*Please do not regularly use the Mechanism to prevent excess winding. If the windings of spring is beyond or greater than its maximum number of rotations, the mechanism to prevent excess winding will produce a ricking/clicking sound.
**Application**

**Cart**

Zenmai motor can be installed into a cart as a unit with a shaft and wheels. Zenmai motor makes the cart move automatically by its winding or releasing motion through wheels or a shaft.

*Application*
- Winding Zenmai motor according to the motion of a conveyor or an operator
- Winding Zenmai motor by the weight

**Swing gate**

Zenmai motor makes a swing gate go back slowly and safely when Zenmai motor is assembled with Speed reduction unit (see pp.5) into a shaft for a gate.

**Turntable**

Zenmai motor supports rotation of a workpiece when Zenmai motor is assembled with a shaft and a table.
Speed reduction unit

Oil dumpers control return speed of the shaft by its resistance.

Bearing unit

Bearing unit makes shafts' radial load higher when Zenmai motor is combined with a wheel and a shaft.

Wheel set

Wheel set can be attached directly with Bearing unit.

- Size
  - φ150mm
  - φ200mm
  - φ250mm

Assembling optional parts

Shaft set

Single axis shaft set
Includes axis shaft, shaft collars and keys.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBP001953</td>
<td>Single axis shaft set</td>
<td>Type ZS</td>
</tr>
<tr>
<td>LBP001954</td>
<td>Dual axes shaft set</td>
<td></td>
</tr>
<tr>
<td>LBP001955</td>
<td>Single axis shaft set</td>
<td>Type ZW</td>
</tr>
<tr>
<td>LBP001956</td>
<td>Dual axes shaft set</td>
<td></td>
</tr>
</tbody>
</table>

Dual axes shaft set
Includes axis shaft, shaft collars and keys.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBP001975</td>
<td>Shaft collars (2 pcs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4 screws attached)</td>
<td></td>
</tr>
</tbody>
</table>

Shaft collars only

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBP001975</td>
<td>Shaft collars (2 pcs)</td>
</tr>
</tbody>
</table>
### 4 Installation Guidance (ZS/ZW Series)

To install the main body, use grooves on body*1 or M5 bolt hole on the body flange side*2. We recommend commercial pre-assembly insertion 8mm nut for aluminum frame to groove.

![Pre-assembly insertion nut](image)

![Bolt](image)

<table>
<thead>
<tr>
<th>Name</th>
<th>Bolt size</th>
<th>Part No.</th>
<th>Qty/unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-assembly insertion nut</td>
<td>M5</td>
<td>LBP001973</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>M6</td>
<td>LBP001974</td>
<td>10</td>
</tr>
</tbody>
</table>

*1 Pre-assembly insertion nut is optional.

### 5 Specification

#### ZS/ZW Series

![ZS Series](image)

![ZW Series](image)

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. torque</th>
<th>Max. number of turns</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-02</td>
<td>0.2N·m</td>
<td>27</td>
<td>1.2kg</td>
</tr>
<tr>
<td>ZS-05</td>
<td>0.5N·m</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>ZS-08</td>
<td>0.8N·m</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>ZS-16</td>
<td>1.6N·m</td>
<td>12</td>
<td>1.3kg</td>
</tr>
<tr>
<td>ZS-24</td>
<td>2.4N·m</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>ZW-16</td>
<td>1.6N·m</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>ZW-32</td>
<td>3.2N·m</td>
<td>12</td>
<td>2.3kg</td>
</tr>
<tr>
<td>ZW-48</td>
<td>4.8N·m</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

#### ZM Series (Assembled Dual axes shaft type)

![ZM60 Series](image)

![ZM80 Series](image)

*Optional parts on pp.5 cannot apply to ZM series.

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. torque</th>
<th>Max. number of turns</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZM60-02</td>
<td>0.2N·m</td>
<td>10</td>
<td>0.5kg</td>
</tr>
<tr>
<td>ZM60-05</td>
<td>0.5N·m</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>ZM60-08</td>
<td>0.8N·m</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>ZM80-02</td>
<td>0.2N·m</td>
<td>22</td>
<td>0.8kg</td>
</tr>
<tr>
<td>ZM80-05</td>
<td>0.5N·m</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>ZM80-08</td>
<td>0.8N·m</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>ZM80-16</td>
<td>1.6N·m</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
**ZS/ZW Series**

ZS Series

ZW Series

**ZM Series**

ZM60 Series

ZM80 Series

*Axis shaft*: Please follow specifications below if produce or use different axis shaft from ENDO optional parts.

- Diameter: φ12 h6
- Surface hardness: HRC58～64
- Surface roughness: Ra0.4
Perform the initial turn and other settings as indicated in the graphs below.

*Due to the characteristics of the product, the spring may not fully return, even without any torque. This makes the product inoperable within the ranges that are indicated by the broken lines in the graphs.*

*Operate the product with leeway from the maximum number of rotation. The less leeway makes the lifetime of the spring shorter.*
Square shape of the spring balancer enables more flexible installation and reliable attachment. Balancer type BS and SBS series provide fixed tension during cable extension while the retractor type RS series supports variable tension, enabling a longer stroke length.

- Flexible mounting holes
  Unit can easily be fixed in place using only two M5 metric thread screws.
  BS and RS series have total 17 mounting holes on the all face.
  SBS series has total 10 mounting holes on 5 faces.

- Wire rope and Nylon rope
  Please choose strong wire rope or flexible nylon rope.

- Tension increasing from both sides
  2 tension increasing holes make it easy to adjust the spring tension of square balancer after installation.

- Lever for decreasing tension
  Adoption of a flexible lever type mechanism enables extremely safe and easy tension adjustment.
1 Specification

Square balancer

Square reel

2 Application

Supporting heavy lifting work

Square balancer/Square reel makes a slope get back automatically when Square balancer/Square reel is installed into the mechanism of the seesaw.

Flow rack

Square balancer or Square reel can make lifting functions inside a flow rack. Square balancer/reel and weight of a carton move a lift between upper shelves and lower shelves.
We have agents all over the world and we are providing sales and maintenance services. For details, please check on our website.