

KARAKURI SERIES

ZENDO



ENDO KARAKURI products



Zenmai Motor
ZS/ZW series



Zenmai Motor
ZM80 series



Zenmai Motor
ZM60 series



Square Balancer
BS series



Square Balancer
SBS series



Square Reel
RS series

Optional parts for Zenmai Motor



Bearing unit



Speed reduction unit



Wheel set



Shaft set



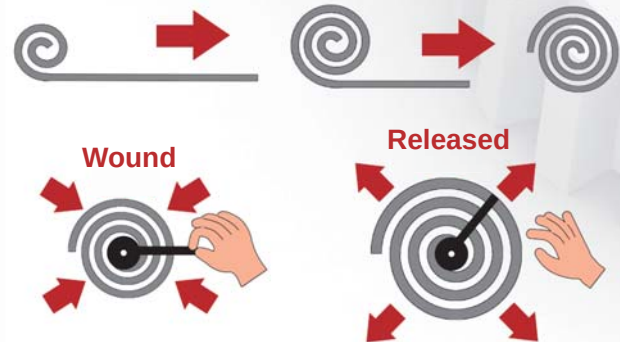
Pre-assembly insertion nut

Why would people choose ENDO products for Kaizen or Karakuri?

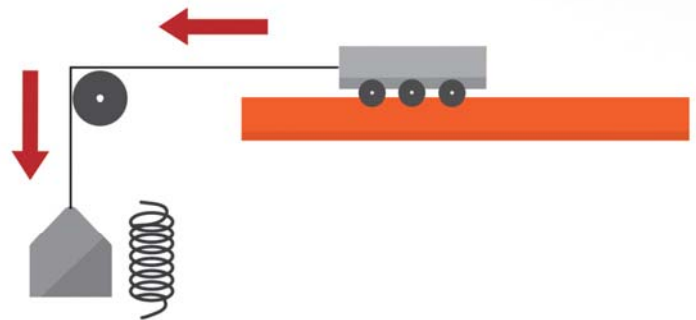


ENDO spring balancers have Zenmai (Mainspring) as power sources.

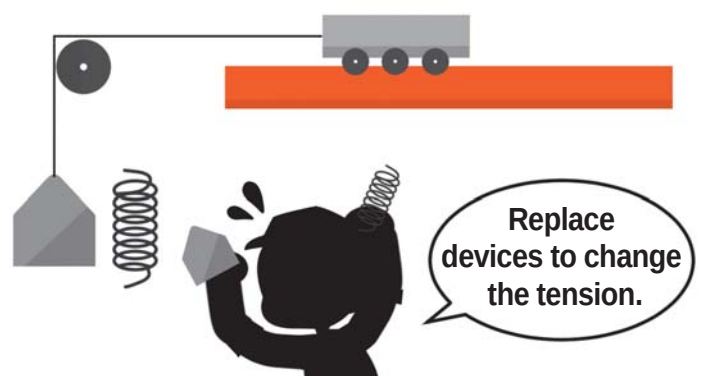
The telescopic motion of Zenmai can give force to various things and it does not need other power resources such as electric or compressed air. It is very ecological power resource and very useful for Kaizen or Karakuri activities.



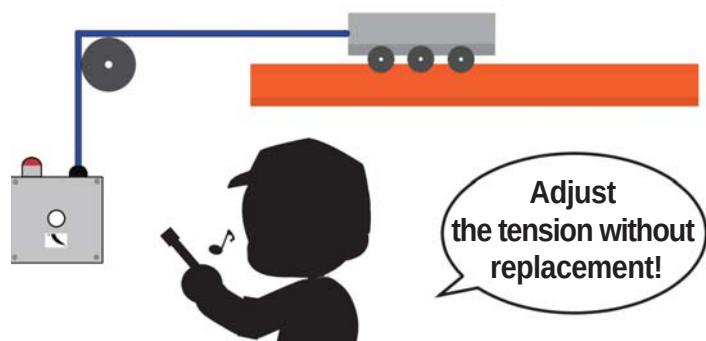
Coil springs or weights (Counter weight) are also ecological power resources which are similar to Zenmai.



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

Patent Pending

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 winding has reached zero.

3 Axis shaft

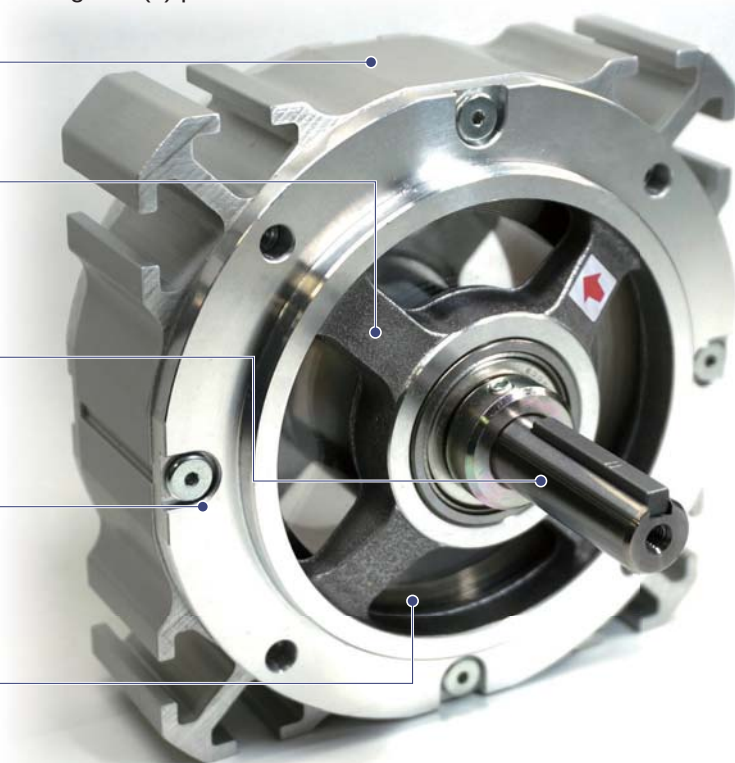
Transfers the rotation to the attached component. (option)

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.



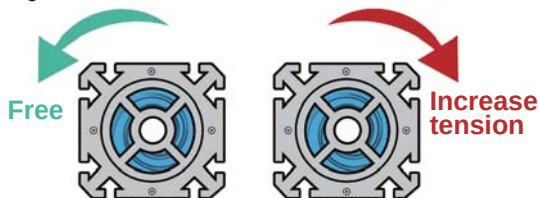
Mechanism to prevent reverse winding

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.

2 Application

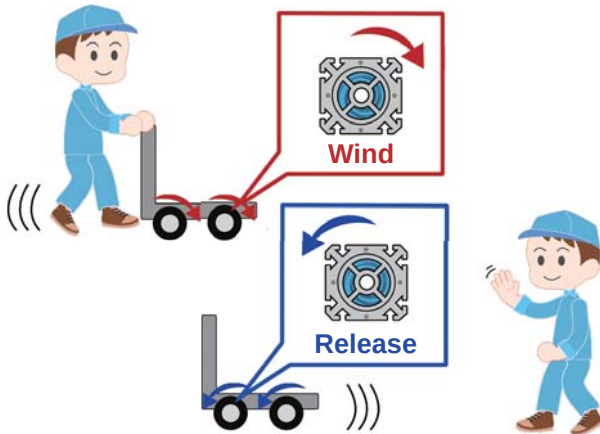


Cart

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】

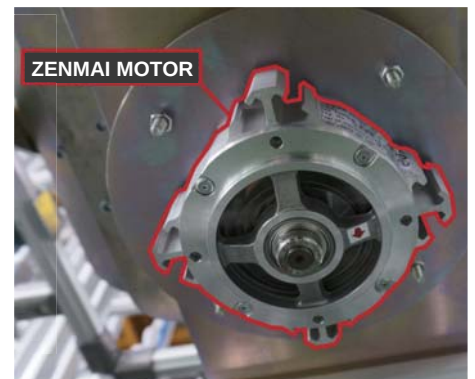
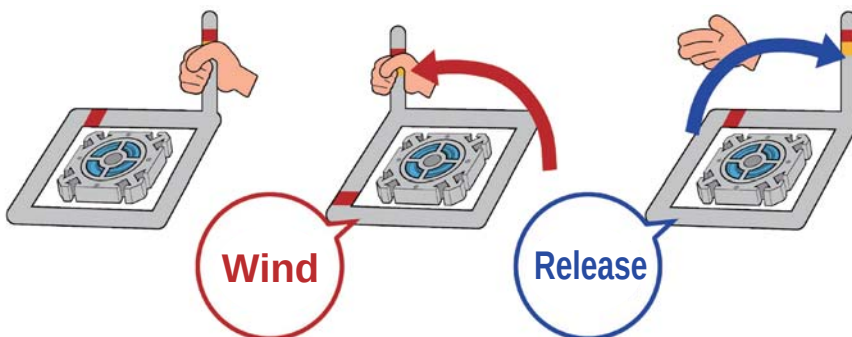
- Winding Zenmai motor according to the motion of a conveyor or an operator
- Winding Zenmai motor by the weight



The cart has the mechanism which Zenmai motor is wound by adding the weight. The cart gets back automatically after remove the weight.

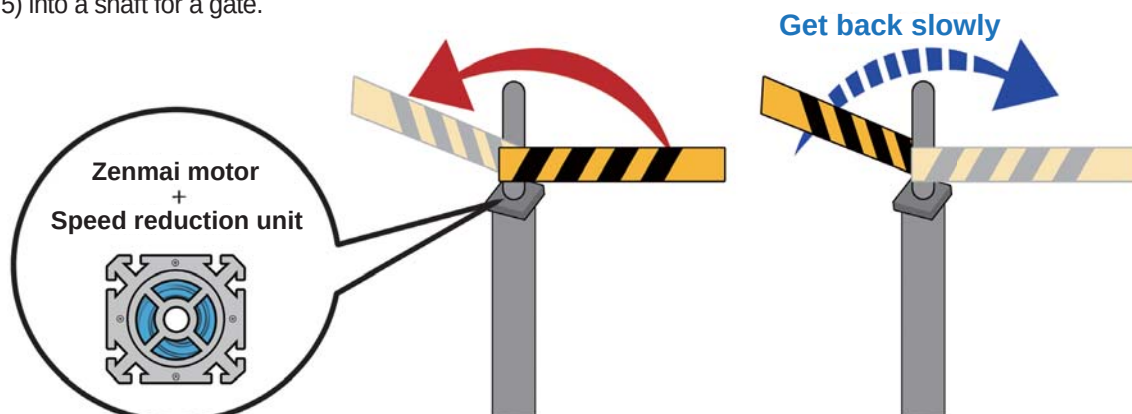
Turntable

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



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.





3 Optional parts (ZS/ZW Series)

Speed reduction unit

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



It controls return speed of the cart and keep it safe.

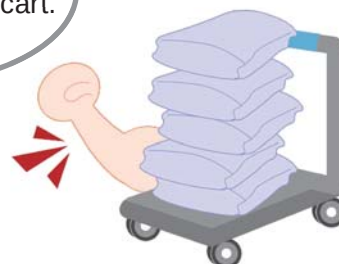


Bearing unit

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



It enhances the strength of the cart.

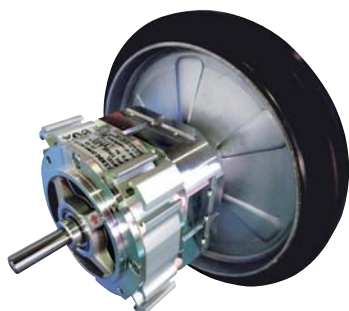


Wheel set

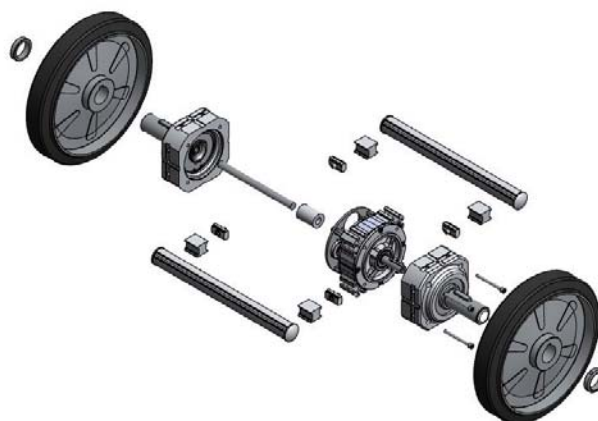
Wheel set can be attached directly with Bearing unit.

[Size]

- $\phi 150\text{mm}$
- $\phi 200\text{mm}$
- $\phi 250\text{mm}$



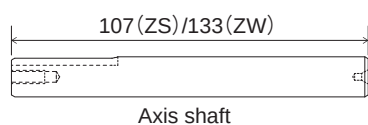
Assembling optional parts



Shaft set

Single axis shaft set

Includes axis shaft, shaft collars and keys.



Axis shaft

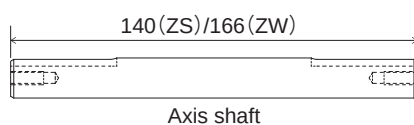


Shaft collars

Key

Dual axes shaft set

Includes axis shaft, shaft collars and keys.



Axis shaft



Shaft collars

Key

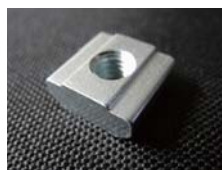
Part No.	Name	Model
LBP001953	Single axis shaft set	Type ZS
LBP001954	Dual axes shaft set	
LBP001955	Single axis shaft set	Type ZW
LBP001956	Dual axes shaft set	

Shaft collars only

Part No.	Name
LBP001975	Shaft collars (2 pcs) (4 screws attached)

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.



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^{*1}

Pre-assembly insertion nut

Bolt

Name	Bolt size	Part No.	Qty/unit
Pre-assembly insertion nut	M5	LBP001973	10
	M6	LBP001974	10

^{*}Pre-assembly insertion nut is optional.



^{*2}

5 Specification

ZS/ZW Series



ZS Series



ZW Series

Model	Max. torque	Max. number of turns	Mass
ZS-02	0.2N•m	27	1.2kg
ZS-05	0.5N•m	20	
ZS-08	0.8N•m	15	1.3kg
ZS-16	1.6N•m	12	
ZS-24	2.4N•m	10	
ZW-16	1.6N•m	15	2.3kg
ZW-32	3.2N•m	12	
ZW-48	4.8N•m	10	

ZM Series (Assembled Dual axes shaft type)

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



ZM60 Series

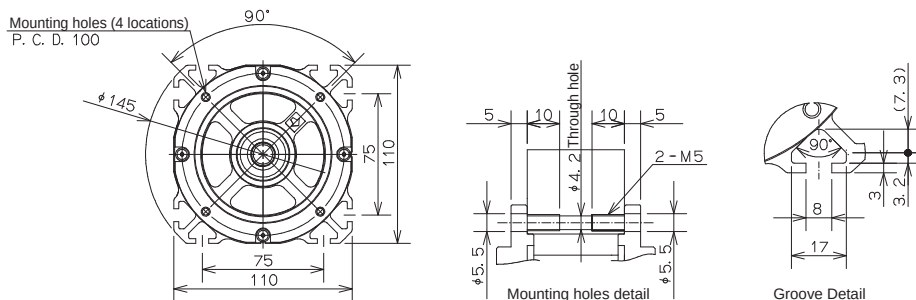


ZM80 Series

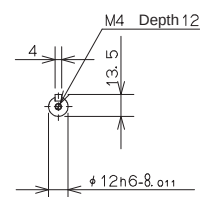
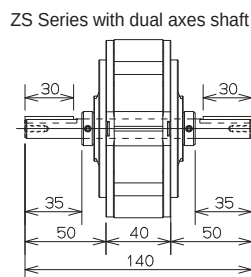
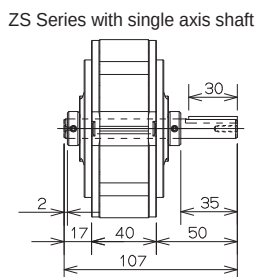
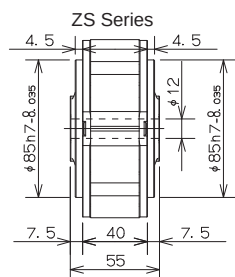
Model	Max. torque	Max. number of turns	Mass
ZM60-02	0.2N•m	10	0.5kg
ZM60-05	0.5N•m	7	
ZM60-08	0.8N•m	4.5	
ZM80-02	0.2N•m	22	0.8kg
ZM80-05	0.5N•m	17	
ZM80-08	0.8N•m	12	
ZM80-16	1.6N•m	9	

6 Outline drawings

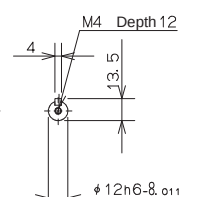
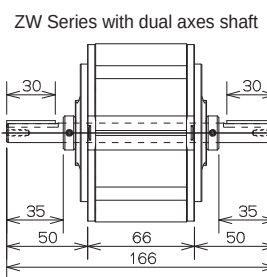
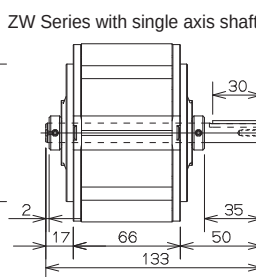
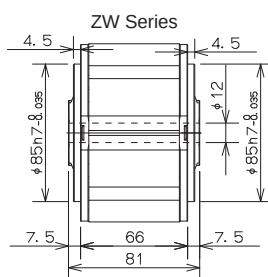
ZS/ZW Series



ZS Series



ZW Series

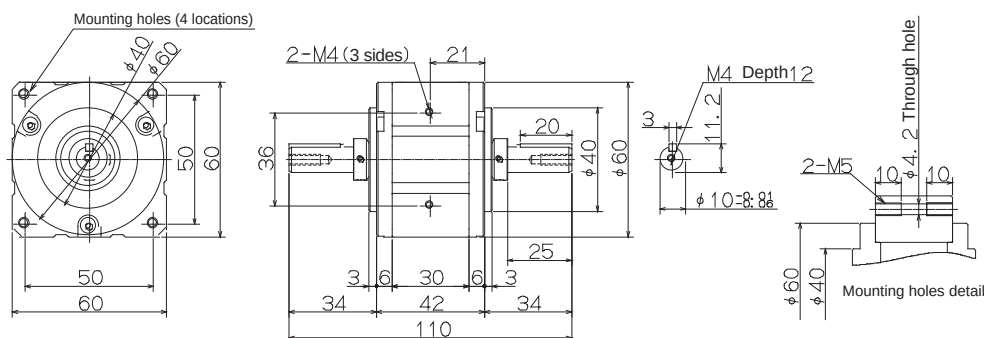


*Axis shaft : Please follow specifications below if produce or use different axis shaft from ENDO optional parts.
Diameter : φ12 h6 -0.011 / Surface hardness : HRC58~64 / Surface roughness : Ra0.4

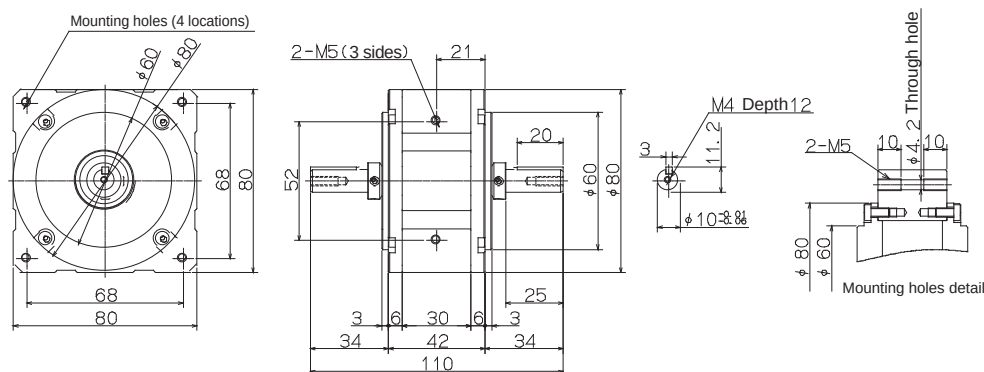
ZM Series



ZM60 Series



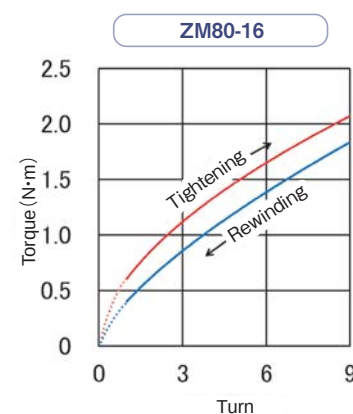
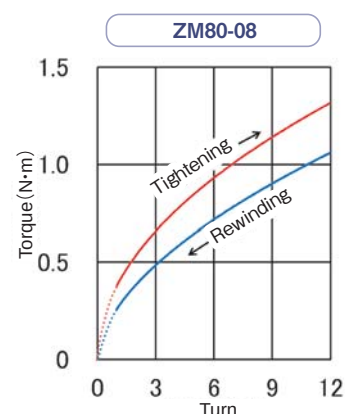
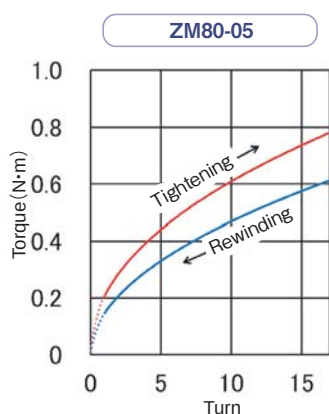
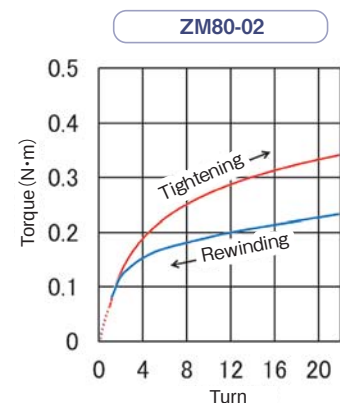
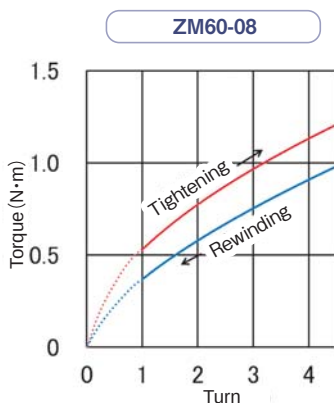
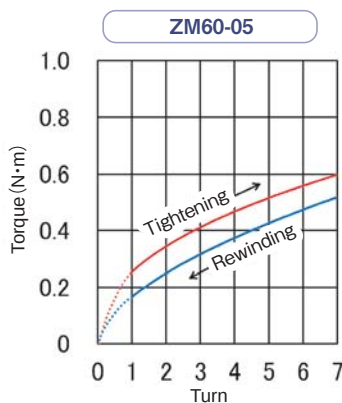
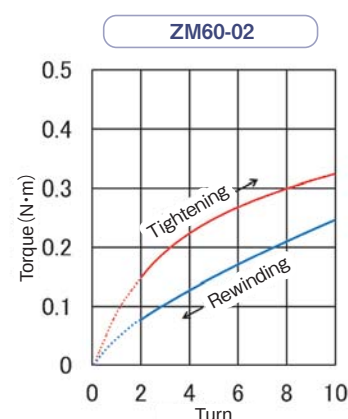
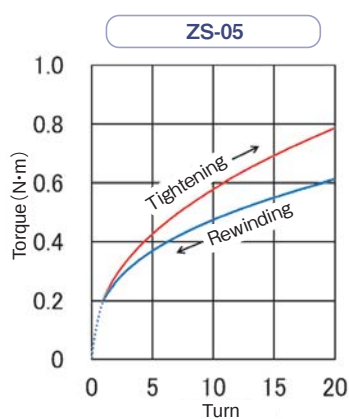
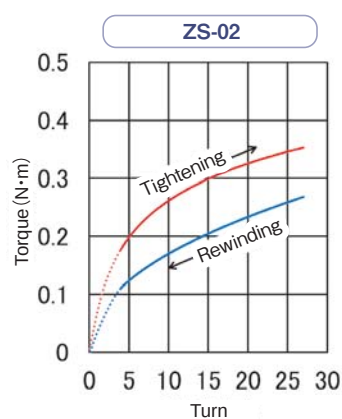
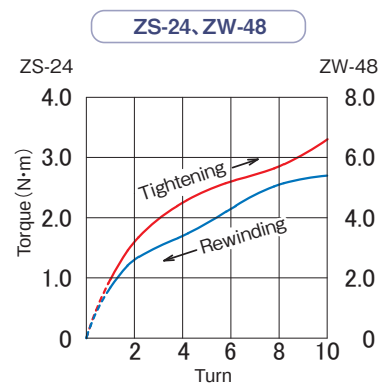
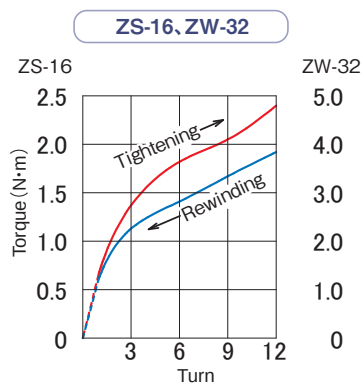
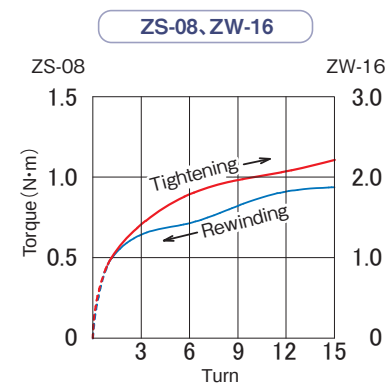
ZM80 Series



7 Torque curves



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 BALANCER / SQUARE REEL

Square shape of the spring balancer enables more flexible installation and reliable attachment.

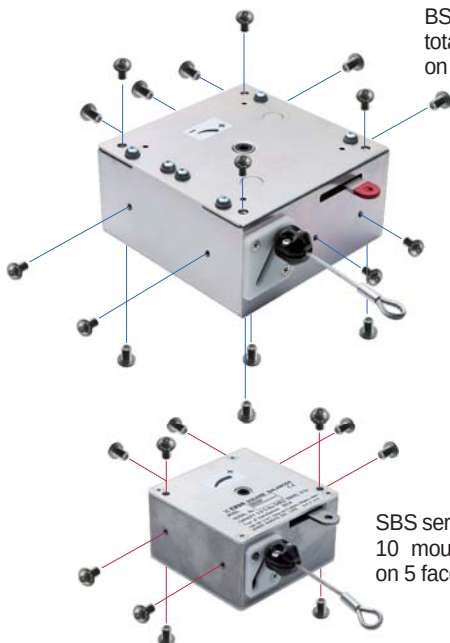
Balancer type BS and SBS series provide fixed tension during cable extension while the retractor type RS series supports variable tension, enabling a longer stroke length.



Flexible installation

■ 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.

■ 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.

■ Wire rope and Nylon rope

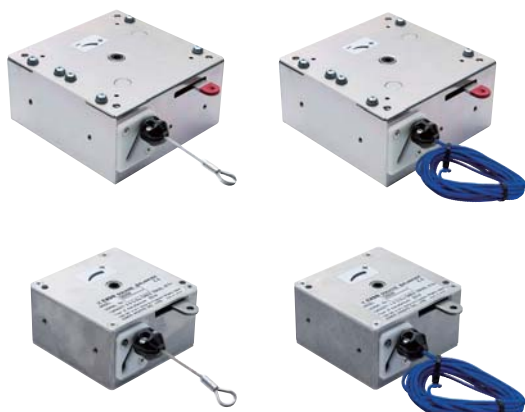
Please choose strong wire rope or flexible nylon rope.



1 Specification



Square balancer



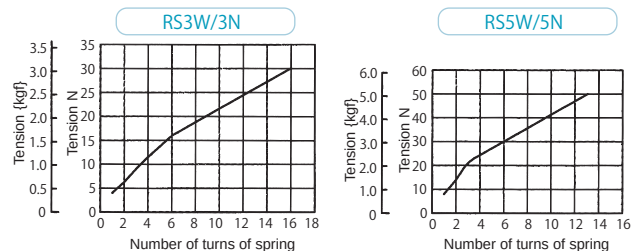
W model is Wire rope type (ex. BS3W). N model is Nylon rope type (ex. BS3N)

Model	Capacity (kg)	Stroke (m)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
BS3W	1.5-3.0	1.3	144	144	73	120	80
BS3N							
BS5W	3.0-5.0	1.3					
BS5N							
BS7W	5.0-7.0	1.3	98	98	57	86	60
BS7N							
SBS3W	1.5-3.0	0.5					
SBS3N							
SBS5W	3.0-5.0	0.5					
SBS5N							

Square reel

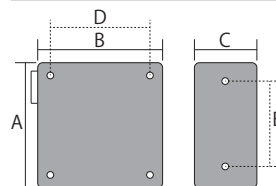


【Torque curves】 Square reel changes its tension according to the number of turns of spring.



W model is Wire rope type (ex. RS3W). N model is Nylon rope type (ex. RS3N)

Model	Max. tension (N(kgf))	Stroke (m)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
RS3W	29N{3.0kgf}	3.0	144	144	73	120	80
RS3N							
RS5W	49N{5.0kgf}	3.0					
RS5N							

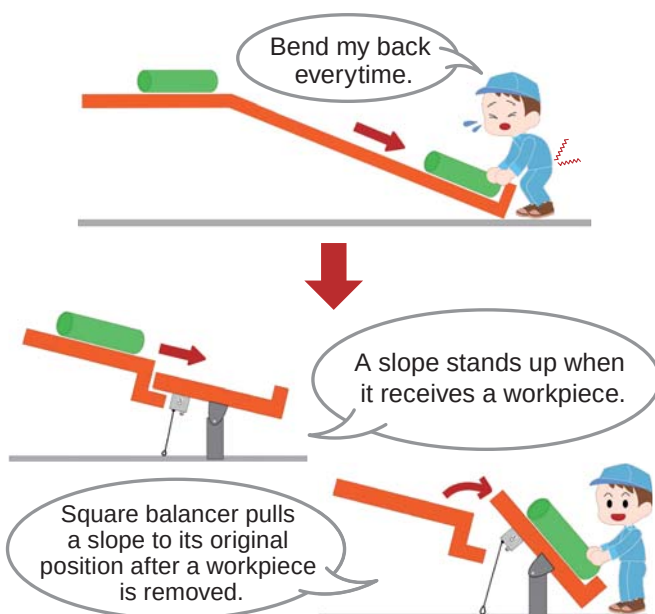


2 Application



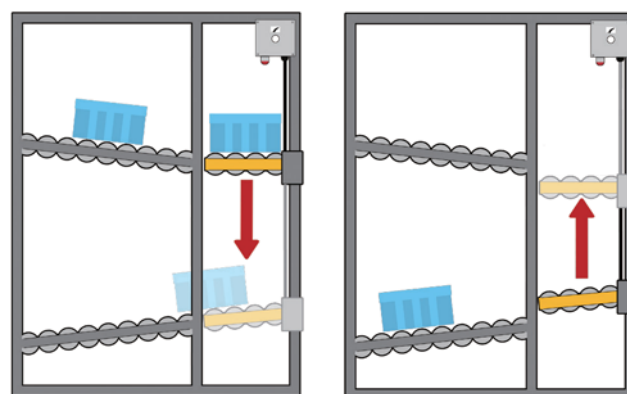
Supporting heavy lifting work

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



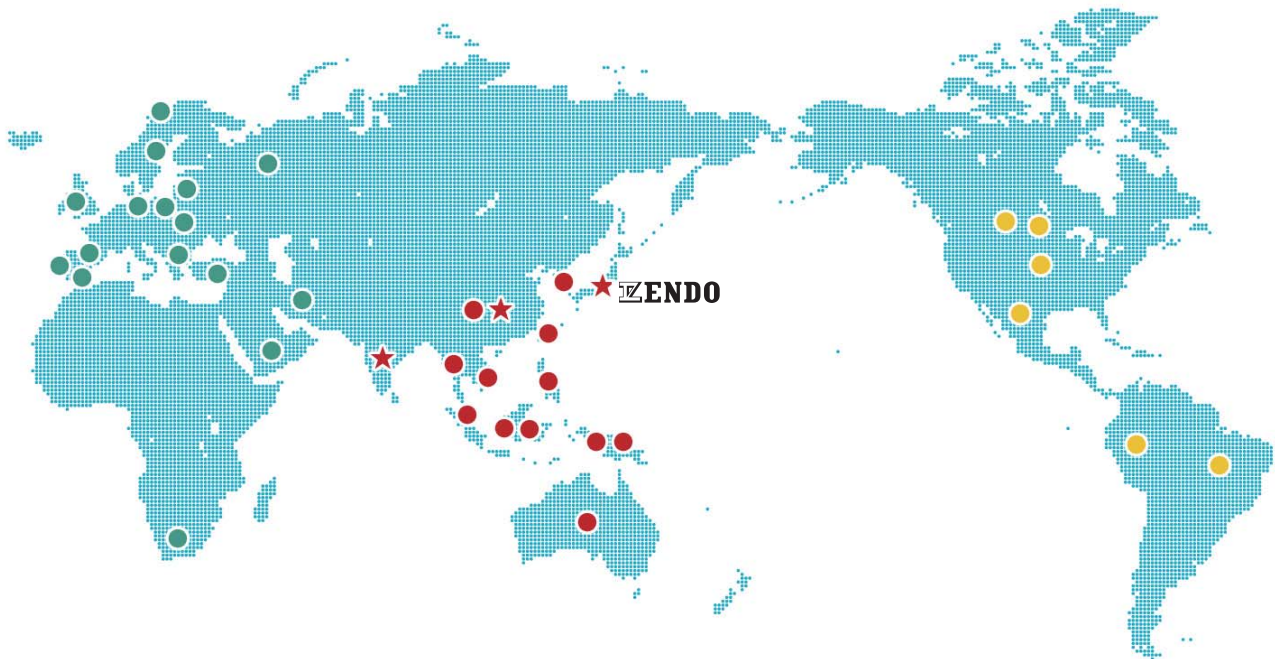
Flow rack

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.



ENDO Network

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