# New model of Power Cylinder for high speed and large thrust

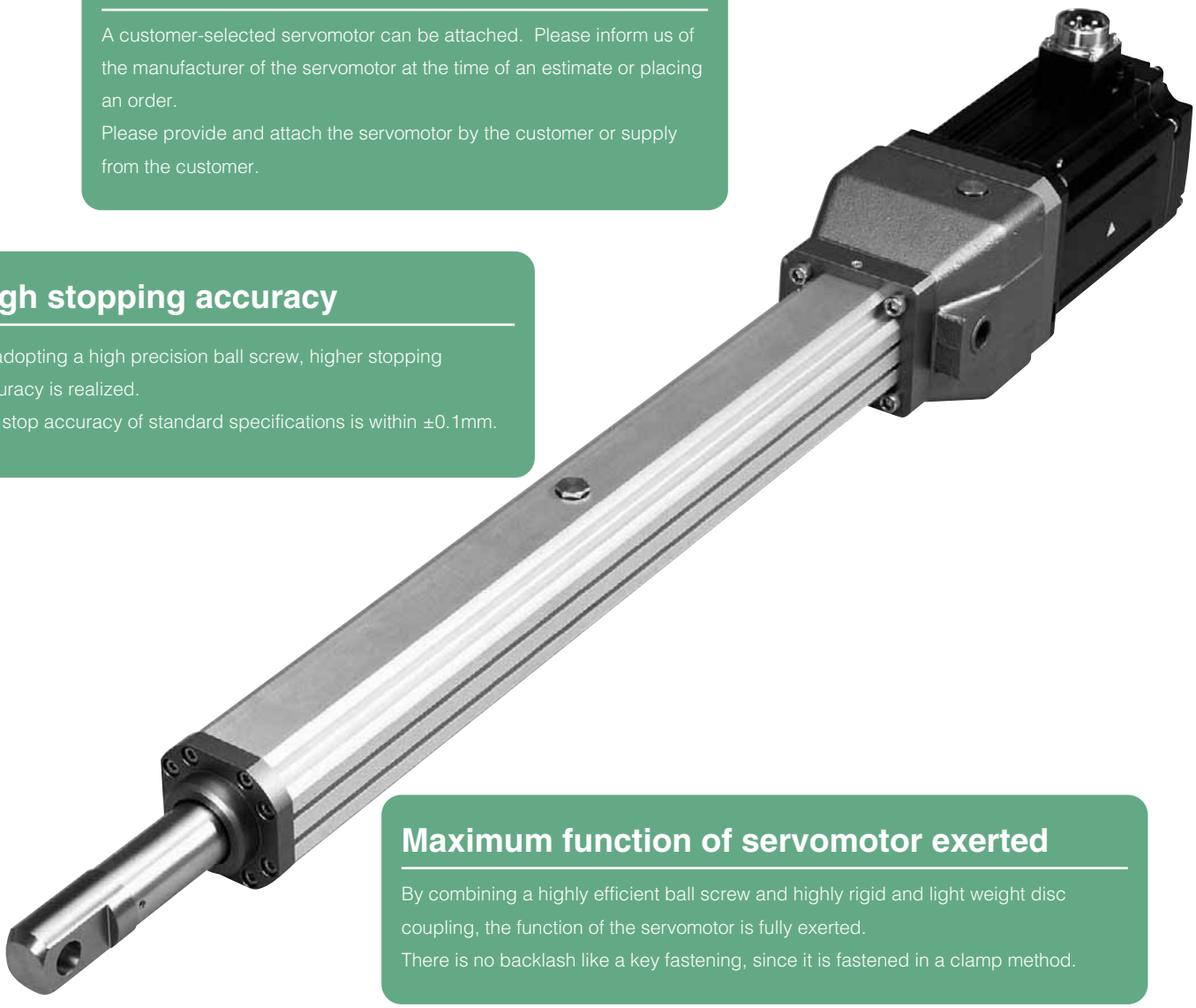
- High speed & Large thrust
- High stopping accuracy
- High frequent drive

## Servomotor can be selected

A customer-selected servomotor can be attached. Please inform us of the manufacturer of the servomotor at the time of an estimate or placing an order.
Please provide and attach the servomotor by the customer or supply from the customer.

## High stopping accuracy

By adopting a high precision ball screw, higher stopping accuracy is realized.
The stop accuracy of standard specifications is within ±0.1mm.



## Maximum function of servomotor exerted

By combining a highly efficient ball screw and highly rigid and light weight disc coupling, the function of the servomotor is fully exerted.
There is no backlash like a key fastening, since it is fastened in a clamp method.

## High speed and large thrust

It can be used at high speeds in a large thrust area.
Large thrust is maintained even at high speeds.
* 333mm/s at a maximum 15.0kN {1530kgf}

## Model No. designation

**LPES 300 F T 3 S3IJ A**

Power Cylinder
Eco series servo type

**Maximum thrust**

| | | |
|---|---|---|
| 040: | 400N | {40.8kgf} |
| 150: | 1.50kN | {153kgf} |
| 300: | 3.00kN | {306kgf} |
| 400: | 4.00kN | {408kgf} |
| 800: | 8.00kN | {816kgf} |
| 1200: | 12.0kN | {1220kgf} |
| 1500: | 15.0kN | {1530kgf} |

**Mounting method**
F : Motor direct mounting

**Main body shape**
T : straight

**Stroke**

| | |
|---|---|
| 1: | 100mm |
| 3: | 300mm |
| 6: | 600mm |
| 10: | 1000mm |

* The above numerical values are examples.
Refer to the standard model list below for the actual stroke.

**Options**
S3: with 3 magnetic sensors
I : I-type end fitting
U: U-type end fitting
J : bellows
(* Make sure to select I or U for the end fitting.)

**Motor handling**
A : Installed by customer
B : Supplied by customer

## Standard model list

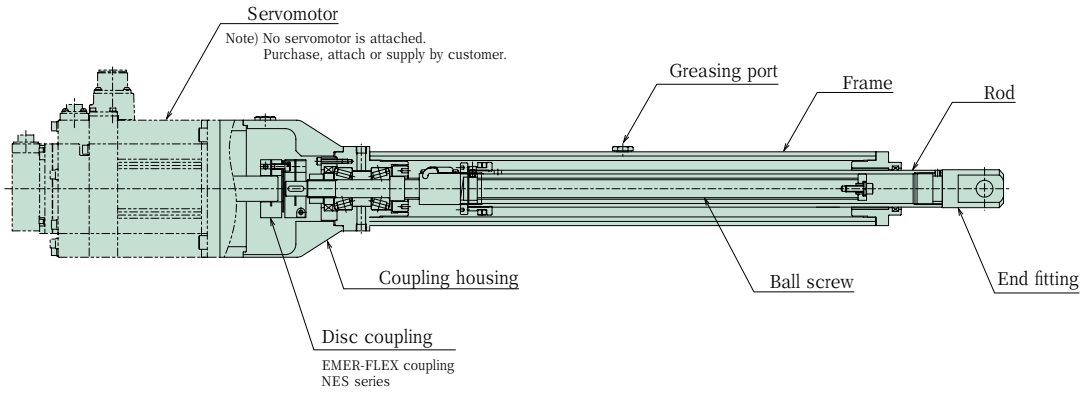
| Model number | Maximum thrust N{kgf} | Maximum speed mm/s | Stroke mm | Screw lead mm | Frame size |
|---|---|---|---|---|---|
| LPES040 | 400 {40.8} | 300 | 100<br>200<br>300<br>400<br>500<br>600 | 6 | 70 |
| LPES150 | 1.50k {153} | | | | |
| LPES300 | 3.00k {306} | | | | |
| LPES400 | 4.00k {408} | 333 | 200<br>300<br>400<br>500<br>600<br>800<br>1000 | 10 | 105 |
| LPES800 | 8.00k {816} | | | | |
| LPES1200 | 12.0k {1220} | | | | |
| LPES1500 | 15.0k {1530} | | | | |

## Standard use environment

| Environment \ Model | Indoor type |
|---|---|
| Ambient temperature | 0～40℃ |
| Relative humidity | 45～85% |
| Impact resistance value | 1G or less |
| Installation altitude | 1000m or lower above sea level |
| Atomsphere | Normally indoors* |

* Normally indoors means no exposure to wind, rain and water, and dusts at a level inside an ordinary factory.

## Structure




### Driving part

**Motor**
A servomotor of almost any manufacturer can be selected. Please attach or supply a servomotor.

### Coupling part

**Coupling**
EMER-FLEX coupling NES series is adopted. The industry leader in light weight and high rigidity, servomotor functions are fully exerted.

### Actuating part

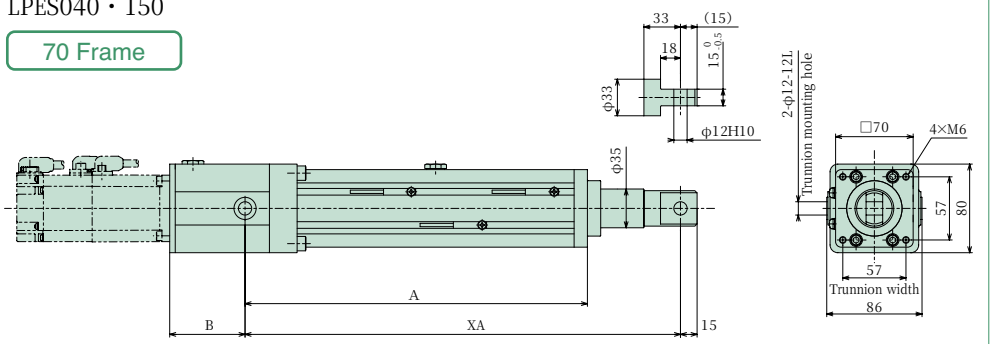
**Ball screw**
Highly efficient ball screw is adopted. It can withstand remarkably frequent operations and a long life can be expected.

**Frame**
To realize lighter weight, an aluminum frame has been adopted. And the external dimensions of the cylinder are not changed even after mounting a magnetic sensor.

## Dimensions Table

LPES040・150

70 Frame



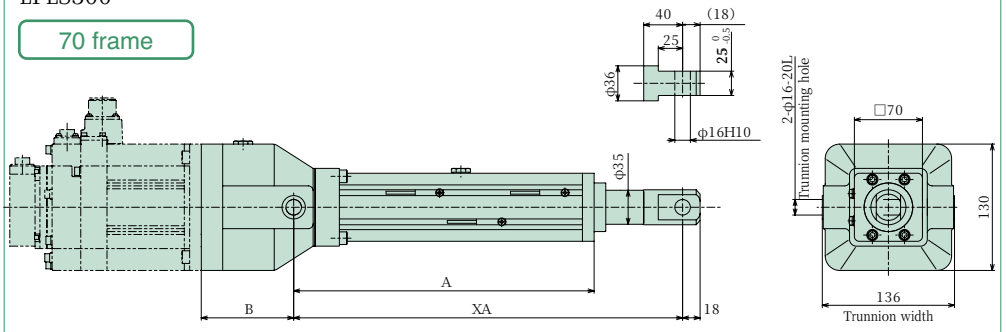

Unit: mm

| Model number | B | Stroke | A | XA | |
|---|---|---|---|---|---|
| | | | | MIN | MAX |
| LPES040 | 68 | 100 | 309 | 395 | 495 |
| | | 200 | 409 | 495 | 695 |
| | | 300 | 509 | 595 | 895 |
| LPES150 | 77 | 400 | 609 | 695 | 1095 |
| | | 500 | 709 | 795 | 1295 |
| | | 600 | 809 | 895 | 1495 |

* B dimension in the above table shows a value when a servomotor J3 series of Mitsubishi Electric is mounted.
* A flange can be attached. Refer to page 23 for the installation method.

LPES300

70 frame



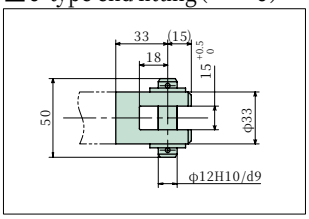

Unit: mm

| Model number | B | Stroke | A | XA | |
|---|---|---|---|---|---|
| | | | | MIN | MAX |
| LPES300 | 95 | 100 | 309 | 400 | 500 |
| | | 200 | 409 | 500 | 700 |
| | | 300 | 509 | 600 | 900 |
| | | 400 | 609 | 700 | 1100 |
| | | 500 | 709 | 800 | 1300 |
| | | 600 | 809 | 900 | 1500 |

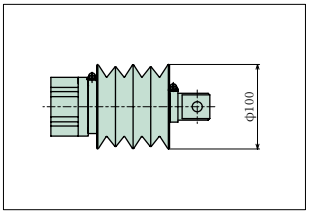
* B dimension in the above table shows a value when a servomotor J3 series of Mitsubishi Electric is mounted.
* No flange can be attached. Refer to page 23 for the installation method.

## Options

■U-type end fitting( — U)

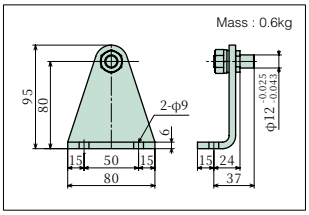



■Bellows( — J)



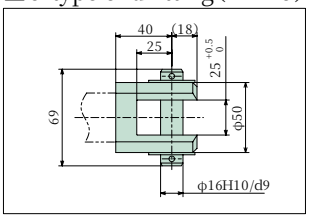

When bellows are equipped, flange mount is not available.

■Trunnion column(LPE025-T)

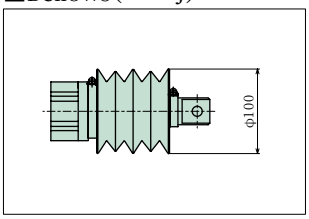



Place an order for a trunnion column separately from the main body model number, and do not provide the code at the end of the model number.

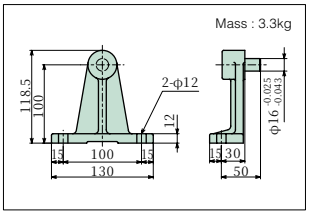
■U-type end fitting( — U)




■Bellows( — J)




■Trunnion column(LPE300-T)

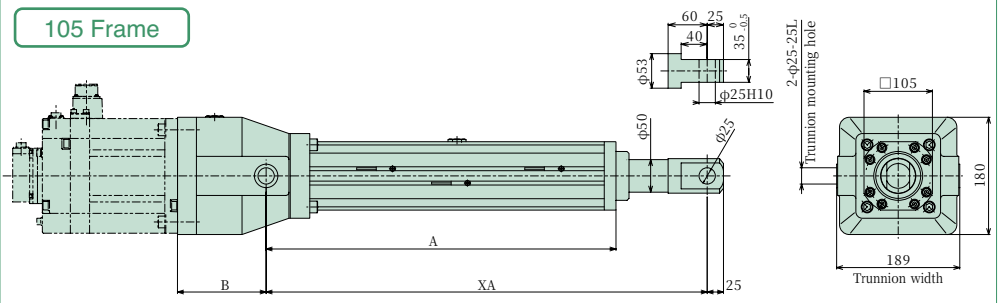



Place an order for a trunnion column separately from the main body model number, and do not provide the code at the end of the model number.

## Dimensions Table

LPES400～1500

105 Frame



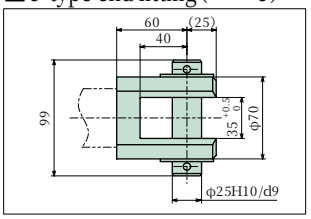

Unit: mm

| Model number | B | Stroke | A | XA | |
|---|---|---|---|---|---|
| | | | | MIN | MAX |
| LPES400 | 136 | — | — | — | — |
| | | 200 | 537 | 680 | 880 |
| LPES800 | | 300 | 637 | 790 | 1090 |
| | | 400 | 737 | 900 | 1300 |
| LPES1200 | | 500 | 837 | 1010 | 1510 |
| | | 600 | 937 | 1115 | 1715 |
| LPES1500 | | 800 | 1137 | 1335 | 2135 |
| | | 1000 | 1337 | 1555 | 2555 |

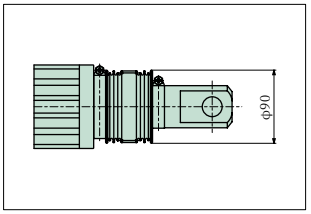
* B dimension in the above table shows a value when a servomotor J3 series of Mitsubishi Electric is mounted.
* No flange can be attached. Refer to page 23 for the installation method.

## Options

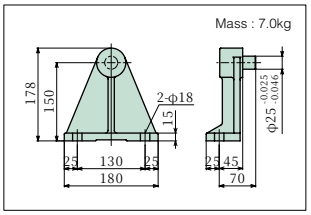
■U-type end fitting ( — U)




■Bellows ( — J)



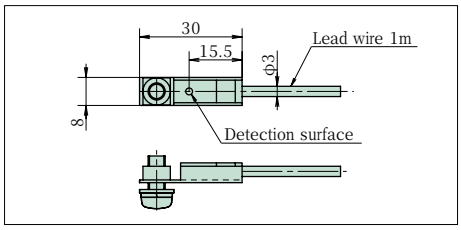

■Trunnion column (LPE400-T)

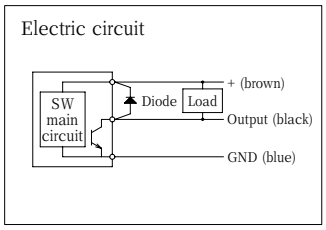



Place an order for a trunnion column separately from the main body model number, and do not provide the code at the end of the model number.

# Sensor related option

## Standard magnetic sensor (S3)



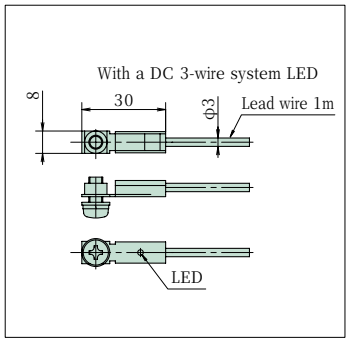

Magnetic sensor specifications

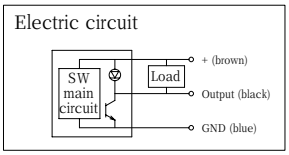
| Non-contact switch (DC 3-wire system) (lead wire 1m) | |
|---|---|
| Power voltage | DC5～26V |
| Consumption current | 8mA MAX(DC24V) |
| Output specifications | 15mA MAX(DC24V)<br>Open collector output |

## Special type

①With (LED) lamp

When the sensor detects, a red lamp lights to indicate detection.
It is useful when setting the position of the magnetic sensor.



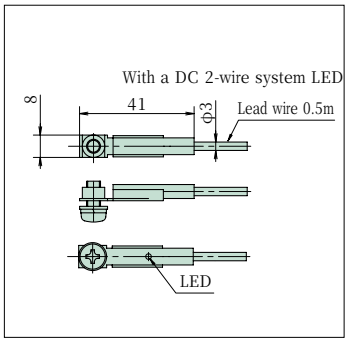



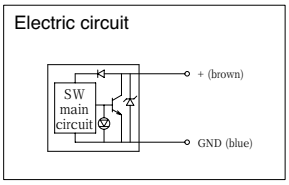

Magnetic sensor specifications

| For position detection | |
|---|---|
| Power voltage | 5～24V DC |
| Consumption current | 8mA MAX(DC24V) |
| Output specifications | 15mA MAX(DC24V)<br>Open collector output |

②2-wire system

* 2-wire system is only with lamp.




Magnetic sensor specifications

| For position detection | |
|---|---|
| Power voltage | 10～28V DC |
| Load current | 5～40mA |
| Internal drop voltage | 4V or less |

# Power transmission capacity

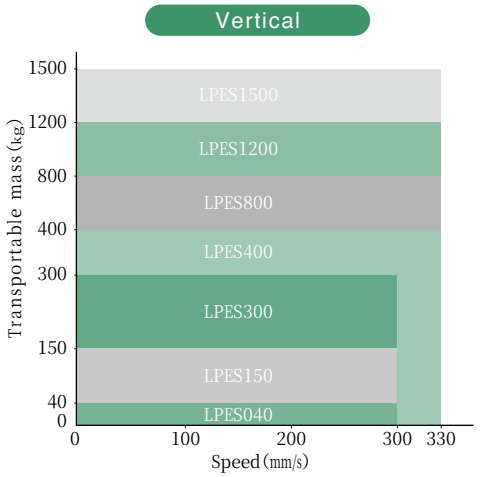
| Basic model number | Maximum thrust N{kgf} | Maximum transportable mass note 1) note 2) | | Maximum speed Maximum input rotation speed | Servomotor J3 series by Mitsubishi Electric | Screw lead mm |
|---|---|---|---|---|---|---|
| | | Vertical kg | Horizontal kg | | | |
| LPES040 | 400 {40.8} | 40.8 | 100 | 300mm/s (3000r/min) | HF-KP43B (400W) | 6 |
| LPES150 | 1.50k {153} | 153 | 300 | 300mm/s (3000r/min) | HF-KP73B (750W) | 6 |
| LPES300 | 3.00k {306} | 306 | 600 | 300mm/s (3000r/min) | HF-SP152B note 3) (1.5kW) | 6 |
| LPES400 | 4.00k {408} | 408 | 800 | 333mm/s (2000r/min) | HF-SP202B (2.0kW) | 10 |
| LPES800 | 8.00k {816} | 816 | 1600 | 333mm/s (2000r/min) | HF-SP352B (3.5kW) | 10 |
| LPES1200 | 12.0k {1220} | 1220 | 2400 | 333mm/s (2000r/min) | HF-SP502B (5.0kW) | 10 |
| LPES1500 | 15.0k {1530} | 1530 | 3000 | 333mm/s (2000r/min) | HF-SP702B (7.0kW) | 10 |

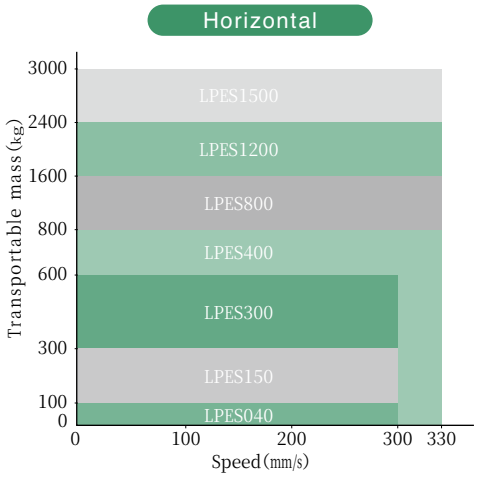
Note 1) The transportable mass shows a value when it is operated at an acceleration of 0.3G.

Note 2) In a case of horizontal transportation, use a linear guide.

Note 3) The rated rotation speed of HF-SP152B is 2000r/min. When use at the maximum rotation speed, set the input rotation speed to 3000r/min.

# Simple selection graph



## Operating frequency and duty factor

| | |
|---|---|
| Number of cycles | 15 times/min. |
| Working time rate | 50%ED |

The working time rate shows a rate of operating time per 30 minutes on a 30-minute basis.
The working time rate is calculated with the right formula.

$$\text{Working time rate (\%ED)} = \frac{\text{operating time of a cycle}}{\text{operating time of a cycle + dwell time}} \times 100$$

The allowable cycle number of the Eco series servo type is determined depending on heating of the motor and heating of the ball screw and bearing part. It varies depending on the stroke and thrust in use, use the values specified above as a guide. Additionally, the life of the cylinder is not considered for the values.

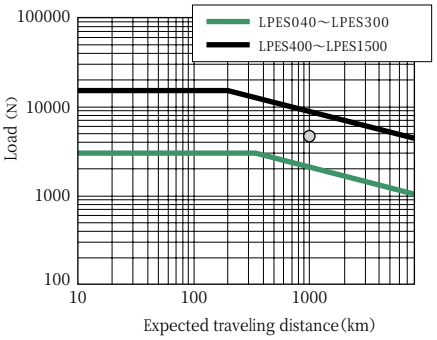
## Life

The life of the ball screw varies depending on peeling due to fatigue of the rolling surface. Check the approximate life with this expected traveling distance graph. However, when shocks are frequently applied, and when appropriate lubrication or maintenance are not provided, the expected traveling distance becomes considerably shorter.

Expected traveling distance (km) =
actual load stroke (m) × operation frequency (times/day) × operating number of days/year × $10^{-3}$ × expected number of years

The graph at the right is on an L10 life basis.
The L10 life means the life that can be reached by 90% or more of all is shown as traveling distance.
When selecting a Power Cylinder based on the life, select the model number in the following procedures from this graph. In this graph, the required expected traveling distance is set to 1000km and PM equivalent load is set to 5000N {510kgf}.
Each intersection point is the required size of a Power Cylinder to be LPES400 – 1500. However from the rated thrust, it will be LPES800 or larger. When the load changes greatly, calculate the equivalent load with the right formula.

Expected traveling distance




$P_M$ : equivalent load N
$P_{MIN}$ : minimum load N
$P_{MAX}$ : maximum load N

$$P_M = \frac{P_{MIN} + 2 \times P_{MAX}}{3}$$

## Input shaft conversion inertia moment, cylinder mass

Upper line: moment of inertia $\times 10^{-3}$ kg・m$^2$
Lower line: cylinder mass kg

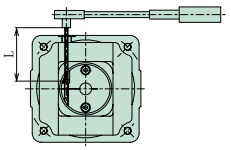
| Basic model number | Stroke mm | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 100 | 200 | 300 | 400 | 500 | 600 | 800 | 1000 |
| LPES040 | 0.103 | 0.115 | 0.128 | 0.14 | 0.153 | 0.165 | — | — |
| | 8.5 | 9.4 | 10.4 | 11.3 | 12.2 | 13.2 | — | — |
| LPES150 | 0.103 | 0.115 | 0.128 | 0.14 | 0.153 | 0.165 | — | — |
| | 8.6 | 9.5 | 10.5 | 11.4 | 12.3 | 13.3 | — | — |
| LPES300 | 0.171 | 0.184 | 0.196 | 0.208 | 0.221 | 0.233 | — | — |
| | 14.3 | 15.2 | 16.1 | 17.1 | 18 | 19 | — | — |
| LPES400 | — | 1.24 | 1.31 | 1.37 | 1.43 | 1.49 | 1.62 | 1.74 |
| | — | 39 | 42 | 43.5 | 45.8 | 48 | 53 | 57 |
| LPES800 | — | 1.24 | 1.31 | 1.37 | 1.43 | 1.49 | 1.62 | 1.74 |
| | — | 39 | 42 | 43.5 | 45.8 | 48 | 53 | 57 |
| LPES1200 | — | 1.24 | 1.31 | 1.37 | 1.43 | 1.49 | 1.62 | 1.74 |
| | — | 39 | 42 | 43.5 | 45.8 | 48 | 53 | 57 |
| LPES1500 | — | 1.24 | 1.31 | 1.37 | 1.43 | 1.49 | 1.62 | 1.74 |
| | — | 39 | 42 | 43.5 | 45.8 | 48 | 53 | 57 |

Note 1) The moment of inertia does not include the moment of inertia of the servomotor.
Note 2) The cylinder mass does not include the mass of the servomotor.

## Servomotor mounting procedures (when installed by customer)

1. Prepare a servomotor. (An output shaft with/without keyway can be used.)
2. Set the servo motor with the coupling mounting hole of the motor flange facing upward.
3. Cleanly wipe away rust, dust, antirust oil, etc., of the motor shaft.
4. Loosen the clamp bolt of the coupling.
5. Remove the plug of the coupling case, turn the input shaft and set the clamp bolt head of the coupling to the position of the plug hole.
6. Smoothly insert the motor shaft to the coupling.
7. Pay sufficient attention not to insert the motor shaft in a tilted manner.
8. After inserting the spigot facing part completely, attach it with the motor
9. attaching bolt.
   Using a torque wrench, tighten the clamp bolt of the coupling at the
10. specified tightening torque.
    Attach the removed plug to the coupling case.

* Refer to the instruction manual for details.




| Model number | Coupling bolt size | Tightening torque N・m{kgf・m} | Wrench length L mm |
|---|---|---|---|
| LPES040 | M4 | 3.8{0.39} | 60 |
| LPES150 | | | |
| LPES300 | | | 70 |
| LPES400 | M6 | 12{1.22} | 90 |
| LPES800 | | | |
| LPES1200 | | | |
| LPES1500 | | | |

# ⚠ WARNING

## ■ Cautions for selecting

● Anti-rod rotation mechanism is not provided with this cylinder. Turning force is generated to the rod owing to the thrust, make sure to perform prevention of rotation on the equipment side.
The turning force placed on the rod at the time of the maximum thrust is as shown in the following table.

| Model number | LPES040 | LPES150 | LPES300 | LPES400 | LPES800 | LPES1200 | LPES1500 |
|---|---|---|---|---|---|---|---|
| Rod turning force N•m | 0.43 | 1.60 | 3.19 | 7.08 | 14.2 | 21.3 | 26.6 |
| {kgf•m} | {0.04} | {0.16} | {0.33} | {0.73} | {1.49} | {2.18} | {2.72} |

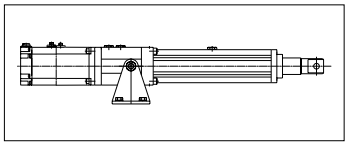
● Load holding mechanism is not provided with this cylinder in the cylinder main body. If a dangerous situation is anticipated during stoppage and when the product is broken, use a servomotor with a magnetic brake to hold the load, or provide a brake mechanism outside. It is same to use for elevating device or horizontal use and displacement is problem.

## ■ Cautions for installation

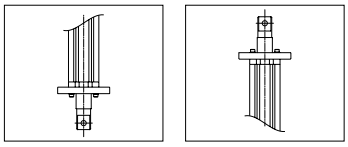
● Use a trunnion mount or a flange mount (possible only for LPES150 or smaller) to install the main body. When used with oscillation, select an I-type or a U-type end fitting. If a lateral load is applied, provide a guide so as not to receive the direct lateral load or the bending moment.

● When it is installed with a flange mount, install it in the vertical direction. (Refer to the figure at the right.)
* When considering use of a flange mount for a type of LPES300 or larger, please contact TEM beforehand.

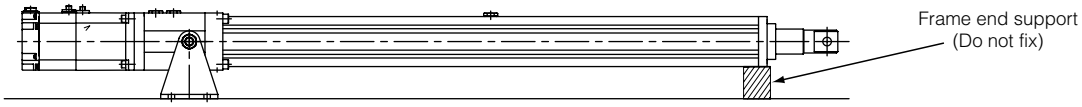
● When it is used horizontally for a long stroke, support the bottom part of the frame end as shown in the figure below. At this point, do not fix the frame and the supporting base.



Trunnion mount



Flange mount




## ■ Cautions for use

● Overload protection mechanism is not provided with this cylinder in the cylinder main body, so provide protection against overvoltage, overcurrent, overload of the servo driver (servo amplifier). Additionally, manufacture the opposite side equipment of the power cylinder with a strength sufficient to withstand the maximum torque of the servomotor.

● Manual operation shaft is not provided with this cylinder for a structural reason, so adjust the cylinder position by operating the servo driver (servo amplifier) at very low speed.

● Daphne Eponex SR No.2 is applied to the screw shaft of this cylinder at the time of shipment, however, periodic lubrication is required. Refer to the table at the right for the lubrication amount of grease and the lubrication cycle.
The application amount of the grease is 10 – 15g per stroke of 100mm.
And as grease for maintenance, JWGS100G is available (sold separately) from our company.

| Frequency of operation | Lubrication cycle |
|---|---|
| 500 – 100 reciprocations/day | Every 3 months – 6 months |
| 100 – 500 reciprocations/day | Every 6 months – 1 year |
| 10 – 100 reciprocations/day or less | Every 1 year – 1.5 years |

On the rod periphery, apply grease according to the lubrication cycle so that an oily film does not run out. Use the same grease as the one used for the screw.