



TSUBAKI

# POWER CYLINDER

< Eco Series Servo Type >

70 / 105 FLAME

LPES150

LPES300

LPES1500

## Instruction manual

### Attention

Make sure that this instruction manual is delivered  
to the final user who uses this product.

### NOTICE

In the case of special specification, it might be partially different from this instruction manual.

Refer to the attached final drawing for “★” sections.

※The final drawing of standard specification is not attached, so please check the catalog or website as necessary.

**TSUBAKIMOTO CHAIN CO.**

# TSUBAKI POWER CYLINDER Eco series Servo Type

## Safety Precaution

- You must read this instruction manual and other attached documents prior to use (installation, operation, maintenance, inspection, etc). Understand the equipment and read all instructions thoroughly before installing or operating.
- Keep this manual visible to all users
- Safety precautions in this manual are classified into two categories, “WARNING” and “CAUTION”. These are defined as follows:

	<b>WARNING</b>	Death or serious injury may result from misusing the product without following the instructions.
	<b>CAUTION</b>	Minor or moderate injury, as well as damage to the product may result from misusing the product without following the instructions.

Notice that under “CAUTION” lead to serious results depending on the surrounding situation. Therefore, this section is just as significant as the other, and requires much attention.

 <b>WARNING</b>
<p><b>&lt; General &gt;</b></p> <ul style="list-style-type: none"> <li>• Do not handle POWER CYLINDER under live-wire condition. Before starting work, switch off the power supply, otherwise electrical shock may occur.</li> <li>• Transporting, installing, wiring, operating, maintaining and inspecting must be carried out by skilled and professional engineers, to avoid mis-handling, resulting in hazardous situations.</li> <li>• When using with an equipment for transporting human, install a suitable protection device on that equipment for safety purposes. Otherwise an accident resulting in death, injury or damage to the equipment may occur due to accidental falling.</li> <li>• Keep the brake free from water or oil. Weak brake torque may cause accidents such as falling and disfunctioning of the product.</li> <li>• Do not use the standard POWER CYLINDER in an explosive atmosphere. Use explosion-proof type POWER CYLINDER in such environments, otherwise explosion, ignition, fire, electrical shock, or damage to the equipment may occur.</li> <li>• Make sure to use a torque wrench to tighten the clamp bolt. Ensure it is tightened with specified torque. Insufficient bolt tightening may lead to dangerous situation such as breakage, lack of power transmission, etc. As well as poor servo motor performance.</li> </ul> <p><b>&lt; Transportation &gt;</b></p> <ul style="list-style-type: none"> <li>• Do not stand under the product when it is lifted for transportation, otherwise the product may fall and result in death or serious injury.</li> </ul> <p><b>&lt; Wiring &gt;</b></p> <ul style="list-style-type: none"> <li>• If you do not connect the power cable according to the wiring diagram shown in the terminal or this instruction manual, electrical shock or fire may occur. ( In case of no terminal box, insulate terminals completely. )</li> <li>• Do not bend, pull or pinch the power cable or motor lead wires, otherwise electrical shock may occur.</li> <li>• Make sure you ground the earth terminal to avoid electrical shocks.</li> </ul>

**< Operation >**

- Always supply power as specified on the nameplate, otherwise burnout or fire may occur.
- Do not stand by or touch any rotating portion (manual shaft, etc. ) and rod during operation, otherwise injury may occur.
- In case of power failure, make sure the power is off. Otherwise power may come back suddenly and injure a person or damage the equipment.

**< Maintenance and safety check >**

- When inspecting the product during operation, do not approach or touch any rotating portion( manual shaft, etc.) and rod, otherwise accidents resulting in death or injury may occur.
- Do not remove the cover for internal inspection during operation. This may cause burns due to the splashing of high temperature oil.
- In case of inspecting the tooth on gears and screw while the motor is not running, double check that all the gears and screw are also completely stopped.
- When performing an internal inspection, make sure that the motor and all the gears are stopped, and that the inside of the machine is cool enough and well ventilated.
- Set personnel outside of the product to supervise and support the person inspecting inside.
- Internal parts are well lubricated. You must take safety measures to prevent accidents such as slipping.
- Do not operate without placing the safety cover back on. This can cause potentially hazardous situations.



**CAUTION**

**< General >**

- Do not use the POWER CYLINDER beyond the capacity of those specified on its name plate or manufacturing specifications. Otherwise electrical shock, injury, damage to the equipment, etc. may occur.
- Do not insert your fingers or other objects in the opening of the POWER CYLINDER, otherwise electrical shock, injury, fire or damage to the equipment may occur.
- Do not use a damaged Power Cylinder continuously, otherwise injury, fire, etc. may occur.
- Do not remove the name plate.
- Any remodeling carried out by the customer is not covered by our guarantee and therefore we cannot be held responsible.
- Use within the travel stroke specified. If not, the product can potentially breakdown.

**< Upon receipt of the POWER CYLINDER you purchased >**

- Make sure the package is in upright position prior to opening.
- Check the Power Cylinder you received is exactly what you ordered. If an incorrect product is installed to your equipment, injury, damage to the equipment, etc. may occur.

**< Transportation >**

- Pay full attention not to drop or overturn the product during transportation. In such cases where the Power Cylinder is fitted with lifting rings, check that these rings are fastened securely before use. However, after installing the Power Cylinder to another equipment, do not lift the entire equipment by using these lifting rings. Confirm the weight of the Power Cylinder with an outline diagram or catalog before lifting. You must not lift the Power Cylinder if its weight exceeds the maximum rated weight assigned to the lifting device . This can cause accidents or damage to the equipment or Power Cylinder.

**< Installation >**

- Do not place any flammable objects around the POWER CYLINDER. Otherwise fire may occur.
- Do not place any obstacles which may block the ventilation around the POWER CYLINDER. Otherwise cooling of the POWER CYLINDER becomes less effective and burns or fire may

occur due to abnormal overheating.

- Do not climb or hang on to the POWER CYLINDER, otherwise injury may occur.

**< Lubricant >**

- When the Power Cylinder is used for food processing machinery, etc. avoid contact with the lubricant oil by installing devices such as oil pans. Otherwise oil leaks from the Power Cylinder may damage the food products.

**< Wiring >**

- Wire according to the general technical standards of electrical installations or those set forth by your company. Otherwise burnout, electrical shock, fire or injury may occur.
- Protection devices are not equipped with the POWER CYLINDER. Installation of the overload protection device is mandatory under the technical standards of Electrical Installations. Installation of other protection devices ( such as ground-fault circuit breakers, etc. ) in addition to the overload protection device is recommended. Without these devices, damage, electrical shock, fire or injury may occur.
- Before installing the Power Cylinder to another machine, check the traveling direction of rod. Incorrect traveling direction may cause injury or damage to the equipment.
- When changing rotation direction, stop the motor completely and then reverse. Otherwise forwarding and reversing rotation by plugging may cause damage to the equipment.

**< Operation >**

- During operation, the surface temperature of the Power Cylinder becomes considerably high. Be careful not to touch the Power Cylinder, otherwise burn injury may occur.
- Stop the operation immediately when you suspect any problems, otherwise electrical shock, injury or fire may occur.
- Do not exceed the rated maximum load of the material loaded. Otherwise, injury, damage to your equipment or damage to the POWER CYLINDER may occur.

**< Maintenance and Safety check >**

- In case of changing lubricant, follow the instruction manual. Be sure to use the recommended lubricants, otherwise damage to POWER CYLINDER may occur.
- The surface temperature of the POWER CYLINDER becomes high. Do not touch with bare hands, otherwise burn injury may occur.
- For abnormal situations, carry out diagnosis according to the instruction manual. Never resume operation until you investigate the cause of the problem.

**< Disassembly & assembly >**

- Repair, disassembly and assembly of the POWER CYLINDER must be handled by specialists, otherwise electrical shock, injury or fire, ect. may occur.

**< Scrapping >**

- When scrapping the Power Cylinder or disposing the lubricant, dispose as general industrial waste.

Thank you for purchasing Tsubaki Power Cylinder Eco Series Servo Type.

This cylinder uses high performance ball screw, and is optimum for the servo motor which meets the needs of high speed and large thrust.

Power Cylinder Eco Series Servo Type has superior features compared to pneumatic and hydraulic cylinder or other linear actuators commonly used. This product is both mechanically and electrically sophisticated. Therefore, careful attention to this manual is essential in order to obtain optimum performance. This operation manual covers everything from how to install to methods of maintenance. Please read carefully and pay special attention to details on inspection, handling, and maintenance. If you have any question in this manual, contact the distributor or our sales office with the information of the name plate.

As well, read carefully and understand about the content of the catalog as well as the servo motor manual.

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## Caution for handling the products

### 1. Operation manual

- Deliver this instruction manual to the final customer who uses the Power Cylinder. Read the instruction manual carefully, and use the product properly.
- In case the instruction manual is not at hand, request the distributor where you purchased the product, or our sales office with the information of product name and model number.

### 2. For safety

- If you suspect danger during operation, take safety precautions immediately, to avoid serious accidents.
- Consider and plan ahead, so that danger will not be a factor, in case the operation becomes abnormal.

### 3. When performing maintenance or inspection

- Wear proper working clothes and protective equipments (safety device, gloves, shoes, etc.). Make sure the environment is appropriate, before performing maintenance and inspection to avoid secondary disaster.
- Make sure the power is switched off, and the machine has stopped completely before carrying out maintenance and inspection.
- Be careful so that nobody turns the power back on.
- Comply with Ordinance on Labor Safety Law by government.

### 4. Storage

- Though Power Cylinder is an entirely enclosed structure, store in a dry & well conditioned room indoors to avoid rust.
- If it is stored in a place prone to sudden temperature change, dew condensation may cause damage or rust.
- It is dangerous to pour liquid such as water, or place metal pieces inside the product. Do not put any foreign particles inside the Power Cylinder and your equipment.
- Do not store or use in corrosive or flammable atmosphere.
- Do not store or use as disassembled parts, because this can damage the product, and /or cause electrical shock.
- Do not use in a sealed container where heat radiation cannot be expected.
- The Power Cylinder can produce large power. Do not bring hands, feet and body to the moving parts of the entire equipment including Power Cylinder. Otherwise they can get caught in the machine, and cause hazardous situations.
- Shut down the power source immediately, perform safety procedure, and contact the distributor from whom you purchased the product or our sales office, in case of malfunction (abnormal odor, heat generation, noise and vibration).

## 1. Upon receiving the Power Cylinder, check the following.

1. Confirm that the thrust, speed, stroke, voltage, etc. printed on the nameplate and the accessories (Trunnion column and bellows are attached with the unit) correspond to your requirements.
  2. Check whether any part of the product has been damaged during delivery.
  3. Check whether the bolts and nuts are fastened securely.
- Immediately report on any damage that was found on to the POWER CYLINDER during shipment to your distributor, or Tsubaki with the information on the nameplate.

## 2. Installation

Correct installation is essential for an effective long service life of the POWER CYLINDER.

### ★ 2-1. Installation site

This Power Cylinder is only for indoor use. Do not use in a hostile environment such as in rain or wind, and wet or vaporous conditions. Ambient temperature is usually 0°C to +40°C.

Do not operate the Power Cylinder in an explosive atmosphere. Failure to do so may result in explosion, fire, electrical shock, injury and product damage. In addition, do not use the Power Cylinder where the vibration or impact is larger than 1G.

※ In case of special specification, please confirm the final drawing because use conditions such as a use environment or ambient temperature might be different.

### ★ 2-2. Installation direction

In case of Trunnion Mounting, install the Power Cylinder onto your equipment in any direction you wish, unless otherwise specified in the outline drawing. While in case of Flange Mounting (only LPES150), install the Power Cylinder vertically.

※ If the direction is specified on the final drawing, follow the instructions.

### 2-3. Method of Installation

#### 1) Trunnion Mounting

Do not tighten the frame of Power Cylinder from the outside.

Put grease to the trunnion pins and holes of the trunnion, and also to the fitting of I and U type end fixture. Use the bolts of strength class 10.9 or 12.9 to install the trunnion columns.

If the main body swing largely when the cylinder operates, consider to use plain bearings or ball-and-roller bearings in the joints. Secure 3 times or more of the rated thrust of Power Cylinder for the strength of customer's equipment and mounting base. In case of long stroke and also horizontal installation, support the bottom of frame tip. In this regard, do not fix the frame and support base.



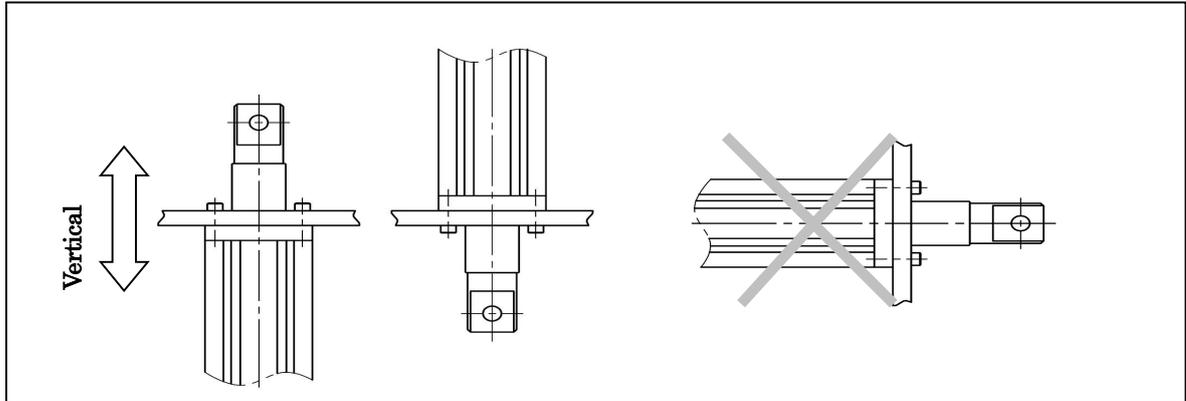
Trunnion mount

support at tip of frame  
(Do not fix the frame and support base.)

## 2) Flange mounting (only LPES150)

Flange mounting can be used only on LPES150.

Install the cylinder vertically in case of flange mounting at the tip of the cylinder. In this case, do not swing the cylinder. In addition, do not apply side force to the cylinder unit. For flange installation, screw M6 bolts 12mm and more. Bolt tightening torque for these bolts should be  $12\text{N} \cdot \text{m}$ . Do not install the cylinder horizontally in flange mounting.

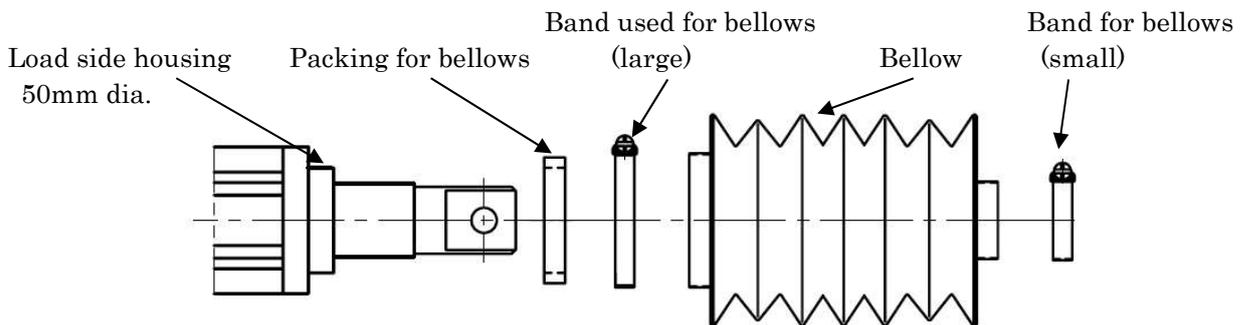


Flange mounting

## 3) Assembly of bellows

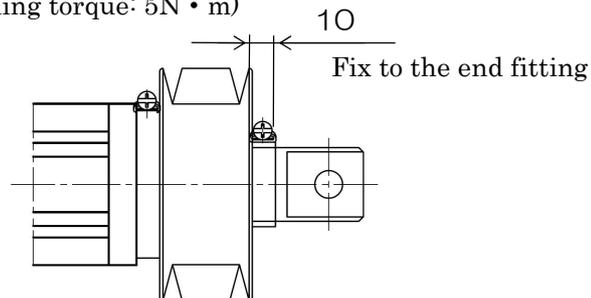
Bellows for LPES150 are included with main unit. Make sure the following parts are bundled. While, bellows for LPES300 – LPES1500 are installed to the main unit.

### 3-1) Accessories for bellows



### 3-2) Assembly procedures

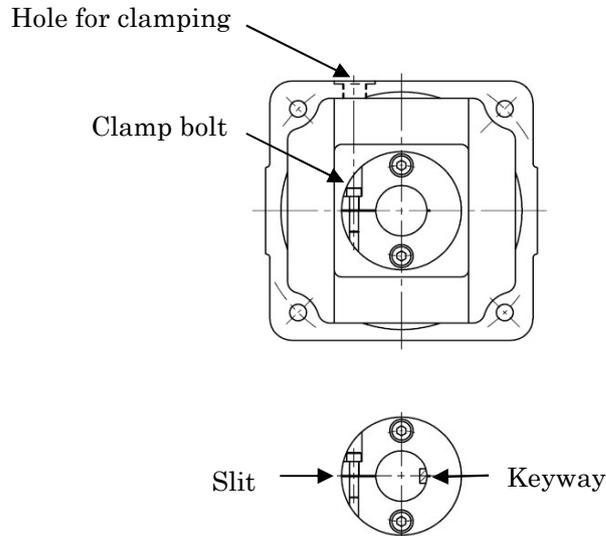
- ① Insert packing to the load side housing 50mm dia. portion.
- ② Insert bellows and band (large) to the end face of the load side housing along the circumference of packing for bellows.
- ③ Tighten the set screw of bellows band securely by screwdriver. (tightening torque:  $5\text{N} \cdot \text{m}$ )
- ④ Retract the bellows, and attach the opposite side opening section of the bellows to the 10 mm at root of end fixture, then tighten the set screw with the bellows band (small) securely. (tightening torque:  $5\text{N} \cdot \text{m}$ )



#### 4) Installation of servo motor

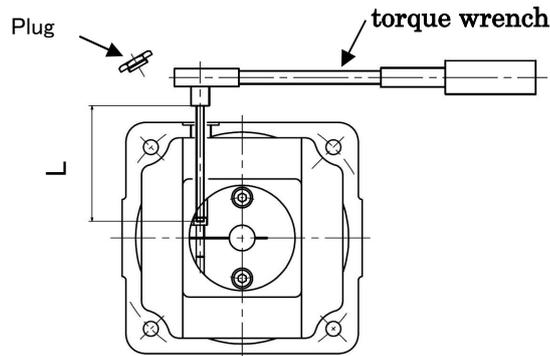
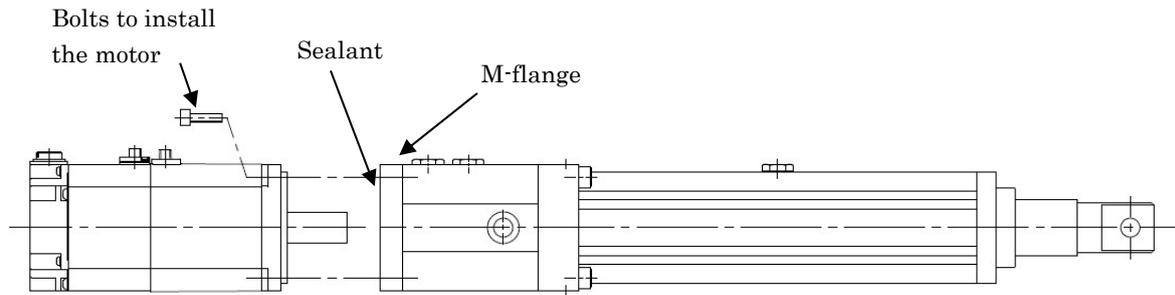
Refer to the following when the customer installs servo motor.

- 4-1) When the motor is connected directly (without gearbox).  
<LPES150F, LPES300F, LPES1500F>



Positional relationship in case of with keyway

- ① Wipe off the rust, dust or rust prevention oil of servo motor shaft.  
Detach the key in case servo motor output shaft has a key. Set the servo motor keyway position at 180°opposite to the slit of coupling.
- ② Loosen and remove the plug at coupling housing, rotate the coupling so that the clamp bolt and the hole for clamping are aligned.
- ③ Loosen clamp bolt of coupling.
- ④ Apply the Sealant between M-flange and servo motor.  
Then insert the motor into the coupling.  
On this occasion, pay attention not to insert the motor shaft misaligned.  
After inserting the motor into the spigot facing completely, install the servo motor with bolts to install the motor.
- ⑤ Tighten the clamp bolt for coupling by torque wrench with the specified torque.  
Refer to the table next page on tightening torque.
- ⑥ Attach the plug, which was removed in ②, to the coupling housing.



 **Danger**

**Make sure to use a torque wrench to tighten the clamp bolt. Ensure it is tightened with specified torque.**  
**Insufficient bolt tightening may lead to dangerous situation such as breakage, lack of power transmission, etc. As well as poor servo motor performance.**

Model No.	Clamp bolt size	Tightening torque N • m	Wrench length L mm
LPES150F	M4	3.8	60
LPES300F			70
LPES1500F	M6	12	90

4-2) With high precision planetary gearbox  
 <LPES150R, LPES300R, LPES1500R>

4-2-1) For smooth motor shafts

- ① Set the gearbox so that the mounting surface is on top.
- ② Thoroughly remove rust, dust, rust-preventive oil, or any other protective agents on the motor shaft.
- ③ Remove the plug from the adapter and turn the input shaft so that the bolt head aligns with the plug hole.
- ④ Use an Allen key wrench to check that the clamping bolt is loose.
- ⑤ Insert the motor shaft into the input shaft bore. Make sure the motor shaft is not inclined. Otherwise, the shaft will bind in the bore and will not mount properly.
- ⑥ After inserting the spigot facing completely, fasten the motor to the adapter using the appropriate tightening torque.
- ⑦ Tighten the clamping bolt on the input shaft using a torque wrench or similar tool to the tightening torque listed in the table. Failure to apply the proper amount of torque may cause the clamping bolt to loosen. If this occurs, the motor shaft may slip and cause operating failures.  
 Do not apply Loctite or any other locking adhesive to the clamping bolt. Doing so will prevent the bolt from being tightened to its appropriate torque and result in an insufficient clamp.
- ⑧ Attach the plug. This completes the motor set up procedure.

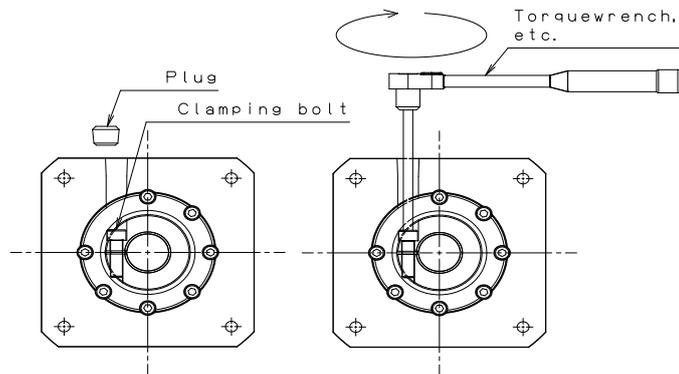
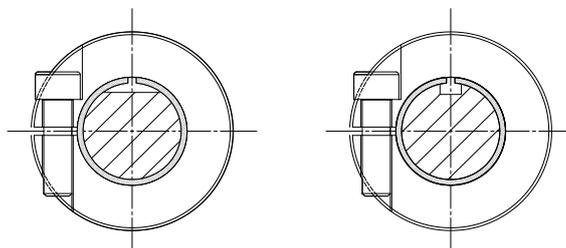


Table Clamping bolt tightening torque

Bolt size	Tightening torque
M3	1.9 N·m
M4	4.3 N·m
M5	8.7 N·m
M6	15 N·m
M8	36 N·m
M10	71 N·m

4-2-2) Mounting a keyed / flatted motor

- ① Keyed / flatted motor shafts can be used with clamp type just like smooth shafts by removing the key.
- ② Set the keyway / flat, each slit, and set bolt on the motor shaft as shown in the figure.
- ③ Otherwise, assemble using the same procedures for smooth shafts.



## ★2-4. Prevention of Rod rotation

The rod builds up the rotational force along with the thrust.

Make sure to prevent this rotation from your equipment/ machine side.

The rotational torque generated by rod is shown in Table.

※In case of the special specification, such as anti-rod rotation might be different from following table, so please confirm the final drawing.

Model No.	LPES150	LPES300	LPES1500
Rod rotation	1.60	3.19	26.6
N·m {kgf·m}	{0.16}	{0.33}	{2.72}

## 2-5. Installation precaution

- Make sure there is not too much force with your equipment/machine at the full stroke.
- After installation, make sure there is no interference between trunnion column and the Power Cylinder, and the Power Cylinder can swing smoothly.
- If side load or bending moment to the Power Cylinder can not be avoided, use guide to prevent the side load directly to the cylinder.

## 3. Wiring

### 3-1. Wiring

Use the lead wires with the diameter which your servo motor manufacturer recommends.

### 3-2. Earth ground

After installation of the Power Cylinder, make sure to ground the servo motor through the servo amplifier.

### 3-3. Wire connection

Refer to the manual for servo motor and connect servo motor and amplifier

## ★3-4. Wiring of magnetic sensor

Wire the magnetic sensor with a special attention to the following, otherwise the magnetic sensor may be damaged.

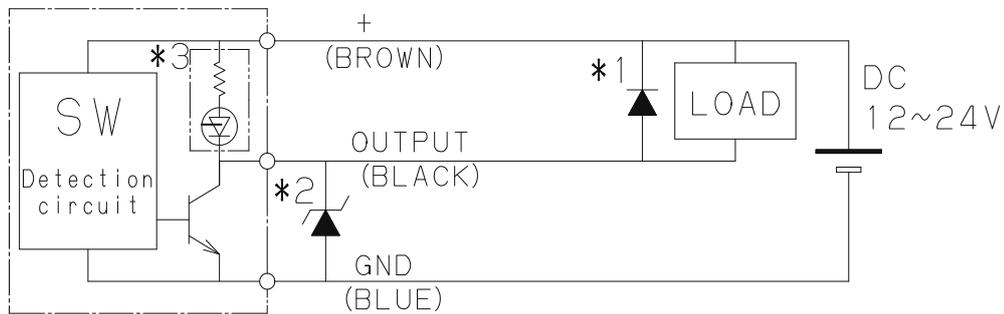
- (1) Do not wire the “+” and “GND” of power source in reverse. (Protection circuit for reverse connection is not included.)
- (2) Do not apply over voltage and over current.
  - Standard magnetic sensor (No LED)  
MAX. under DC24V, MAX. under 15mA
  - Magnetic sensor with LED (Publication product of catalog)  
MAX. under DC24V, MAX. under 12mA
- (3) Do not wire the power line and sensor wiring all together.
- (4) In case of load which generates surge such as relay, set diode (\*1) near by the load.  
Use a diode with a peak reverse voltage over 400V, average rectified current over 1A.
- (5) In case of longer wiring than the cable length of magnetic sensor is required, set zener diode (\*2) near by the magnetic sensor.

Use a zener diode with a zener voltage over 33V, allowable power dissipation over 500mW.

※ \* 3 is added to the diagram for the magnetic sensor with LED

※ In case of special specification, please confirm the final drawing because the type of magnetic sensor might be different.

## Diagram for standard magnetic sensor



### 4. Precaution before operation

#### 4-1. Verification of wiring and power source

Verify there is no miswiring, specifically whether motor wiring (rotational direction) is correct. In addition, each parameter of servo amplifier as well. After that locate the rod at the middle of stroke, then verify the actuation direction at slow speed.

#### 4-2. Connection with machine/equipment

Make sure there is no side force applied to the cylinder rod (force to the axial direction of linkage pin), specifically when it swings at all strokes, check the interference at the end fixture and the other portion. Do not apply the force to bend the rod (lateral load), otherwise it may cause breakage, reduced life or noise

### 5. Frequency in use and percentage duty cycle

Number of start up	15 times/min
ED%	50%ED

Allowable number of start on Eco-series Servo type depends on the heat generation of motor, ball screw and bearings. Above is rough guide because it varies depending on the stroke and thrust used. In addition, life of cylinder is not considered. The above ED% is the ratio of operation per every 30 minutes.

### 6. Basic specification

Model No.	Max. thrust	Max. speed Max. input rpm	Aluminum frame size	Ball screw
LPES150	1.50kN {153kgf}	300mm/s 3000r/min	□70	OD $\phi$ 20 Lead 6mm
LPES300	3.00kN {8306kgf}	300mm/s 3000r/min	□70	OD $\phi$ 20 Lead 6mm
LPES1500	15.0kN {1530kgf}	333mm/s 2000r/min	□105	OD $\phi$ 30 Lead 10mm

## **7. General precaution**

### **7-1. Load**

Avoid the following load because these may affect the efficiency of the POWER CYLINDER, have a bad influence on the life of motor or ball screw, and can cause damage to inner tube (rod) or frame.

- ① Side load  
Do not apply the force which bends the rod (side force).
- ② Impact load
- ③ Overload
- ④ Large inertia load

### **7-2. Speed**

Do not operate the Power Cylinder with the speed or motor rotational speed in excess of that on the table item 6 - the basic specification. Vibration and noise occur due to resonance of the ball screw, and it may lead to shorten the product life.

### **7-3. Operation upon occurrence of abnormality**

If any abnormality is found during operation, immediately stop the operation, and check the cylinder after taking the appropriate measures to prevent lifted objects from falling and other accidents.

Make sure to set up an external sequential circuit to activate the brake for holding the load in case that the servo amplifier alarm is activated. It may lead to fall accident because Power Cylinder can not support the load due to the loss of motor output.

### **7-4. Overload protection**

Overload protection device is not built-in Power Cylinder unit. Take measures for overload protection with servo motor torque limiting function.

### **7-5. Brake for servo motor**

In case dangerous situation is predicted when stopping or product malfunction (when an alarm is activated, etc.), use servo motor with electromagnetic brake for holding. Electromagnetic brake is used just for holding purpose, do not use it for braking.

### **7-6. Manual operation**

Manual shaft is not equipped with this Power Cylinder. Operate the cylinder with servo amplifier operation (slow speed) to adjust the cylinder positioning.

## 8. Maintenance and inspection

Make sure the power is switched off, and the machine has stopped completely before carrying out maintenance and inspection. Make sure that nobody turns the power back on.

Disassembly of Power Cylinder unit may lead to falling accident because it becomes unable to hold the load. Remove the load before disassembly.

### ★8-1. Lubrication to ball screw

Screw shaft and rod are already filled with grease before shipment, and is usable as is.

Refer to the following table for the periodic cycle of greasing.

After extending the rod to the forward stroke end, inject grease to screw shaft circumference by grease gun through grease port.

Amount of grease for a 100mm stroke is approx. 10 to 15g.

Refer to the following table for recommended grease.

Frequency of use	Periodic cycle for greasing
500 to 1000 reciprocates/ day	Every 3 to 6 months
100 to 500 reciprocates/ day	Every 6 to 12 months
10 to 100 reciprocates/ day and less	Every 12 to 18 months

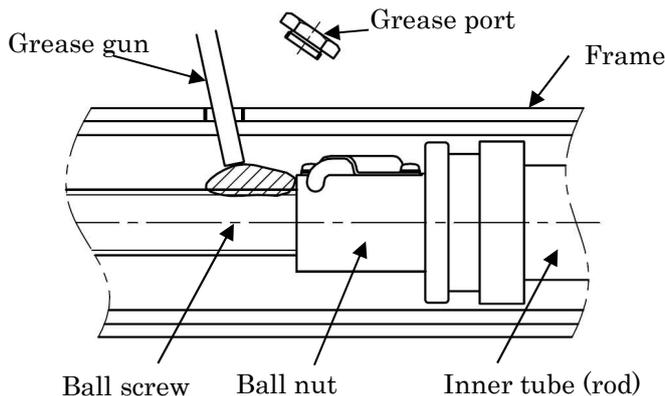
The above is only a rough indication for longer usage, it does not guarantee longer product life.

\*Recommended grease

Category	Company	Name
Screw	Idemitsu	Daphne Eponex SR No. 2

Put the same grease as for screw to the surface of the rod to maintain the oil film.

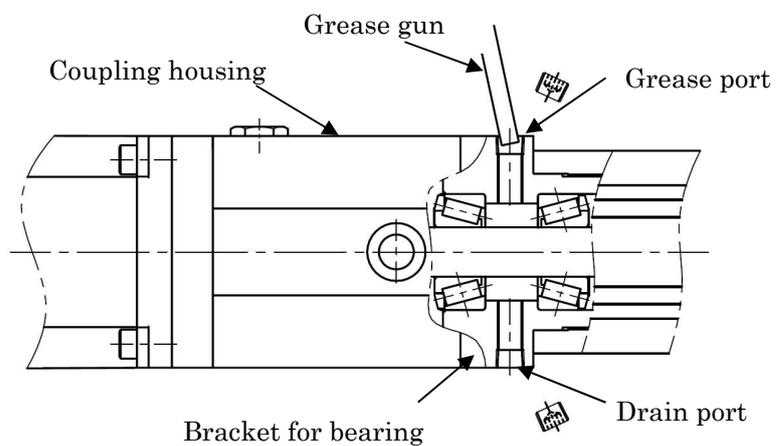
※For made-to-order products, confirm the lubricant with final drawing, the filled grease might not be the same as above standard.



## ★8-2. Lubrication to taper bearing

Taper bearings are already filled with grease before shipment, and is usable as is. Periodic cycle of greasing is once a year. Remove the grease port and drain port, then inject grease to the taper bearings by grease gun through grease port until new grease comes out from drain port.

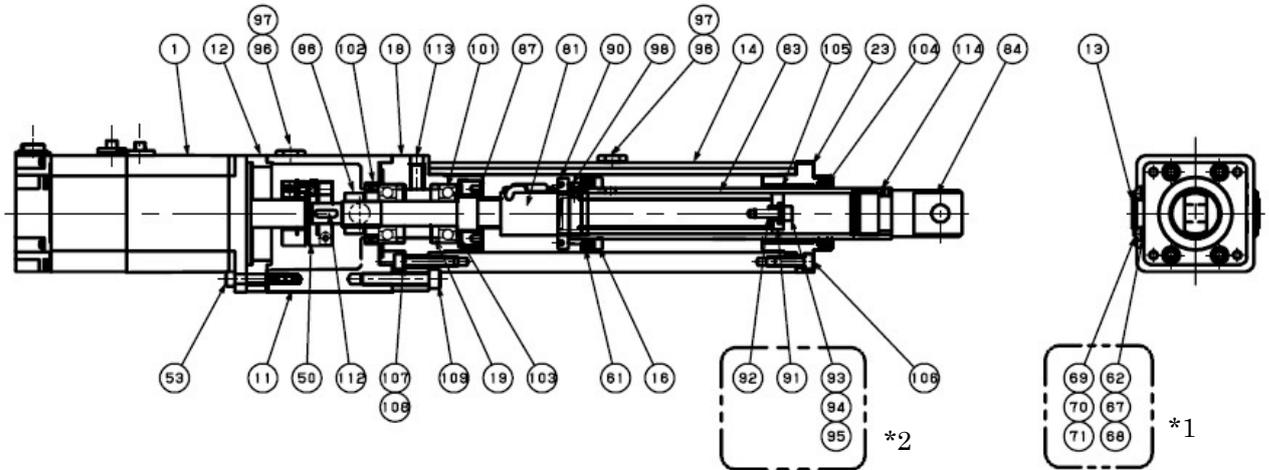
※For made-to-order products, confirm the lubricant with final drawing, the filled grease might not be the same as above standard.



### 8-3. Structure drawing

The structures differ slightly depending on thrust.

<LPES150 Structure drawing>



\*1 With magnetic sensor

\*2 In case of stroke 300 – 600mm (Ball screw measures for self-excited vibration)

Item No.	Part name	Q'ty	Item No.	Part name	Q'ty
1	Servo motor	1	87	Stopper plate	1
11	Coupling housing	1	90	Sliding nut	1
12	M flange	1	91	Screw shaft end guide	1
13	Oiles flange bushing	2	92	End guide spacer	1
14	Frame	1	93	H. S. H. C. Screw	1
16	Inner tube collar	1	94	Spring washer	1
18	Bearing housing	1	95	Flat washer	1
19	Bearing collar	2	96	Grease port bolt	3
23	Load side housing	1	97	Seal washer	3
50	NES Coupling	1	98	Set screw	1
53	H. S. H. C. Screw	4	101	Angular ball bearing	2
61	Magnet	2	102	Oilseal	1
62	Sensor bracket	3	103	Nilos ring	1
67	Magnetic switch	3	104	Scraper	1
68	Squire nut	3	105	Oiles drymet	1
69	+ Pan head screw	3	106	H. S. H. C. Screw	4
70	Flat washer	3	107	H. S. H. C. Screw	4
71	Spring washer	3	108	Spring washer	4
81	Ball screw/nut	1	109	H. S. H. C. Screw	4
83	Inner tube	1	112	Both ends round key	1
84	I-end fitting	1	113	H. S. H. Plug	2
86	Stopper nut	1	114	Hexagon Socket Set Screw	1

Note

\*Items 91, 92, 93 and 94 are used for stroke 300 to 600.

\*Items 62, 67, 68, 69, 70 and 71 are used for with magnetic sensor (option).

## 9. Trouble shooting

Refer to the following table when trouble happens.

In case the servo amplifier alarm is activated, refer to the manual of servo motor/ amplifier and implement appropriate measures.

Condition	Possible cause	Measure
Does not operate even when pushing the start button.	<ol style="list-style-type: none"> <li>1. Incorrect wiring of servo motor, amplifier</li> <li>2. Servo amplifier alarm</li> <li>3. Servo motor/amplifier malfunction</li> <li>4. Overload, inertia is too large</li> <li>5. Input signal for servo amplifier</li> </ol> Parameter setting	Inspection of wiring * Verification of the detail of alarm, measures * Repair and replace Review on equipment design Verification of input signal * Verification of setting values *
Does not actuate even though motor sounds.	<ol style="list-style-type: none"> <li>1. Breakage of electro-magnetic brake</li> <li>2. Defective power source for electro-magnetic brake</li> <li>3. Slippage of coupling</li> <li>4. Servo amplifier input signal</li> </ol> Parameter setting	Replacement Verification of brake power source  Verification of clamp bolt tightening Verification of input signal * Verification of parameter setting values *
Run away	<ol style="list-style-type: none"> <li>1. Incorrect wiring of servo motor, amplifier</li> <li>2. Disconnection of encoder cable, Incorrect wiring</li> </ol>	Inspection of wiring * Inspection of wiring *
Hunting	<ol style="list-style-type: none"> <li>1. Incorrect wiring of servo motor, amplifier</li> <li>2. Parameter gain setting</li> </ol>	Inspection of wiring Verification of parameter setting values *
Do not produce rated thrust	<ol style="list-style-type: none"> <li>1. Slippage of coupling</li> <li>2. Bad connection with machine/equipment</li> <li>3. Breakage of electro-magnetic brake</li> <li>4. Bad power source for <math>\phi</math> electro-magnetic brake</li> </ol>	Tightening of clamp bolt Repair Replacement Verification of brake power source
Motor overheated	<ol style="list-style-type: none"> <li>1. Too much load</li> <li>2. Too high frequency of use</li> <li>3. Breakage of electro-magnetic brake</li> <li>4. Bad power source for electro-magnetic brake</li> </ol>	Reduction of load, or Acquire model with more capacity Acquire model with more capacity Replacement  Verification of brake power source
Damage of the unit	<ol style="list-style-type: none"> <li>1. Impact load</li> <li>2. Side load</li> </ol>	Repair Repair
Magnetic sensor does not output signal	<ol style="list-style-type: none"> <li>1. Wrong wiring</li> <li>2. Over voltage</li> </ol>	Re-wiring, replacement of sensor Reset to correct voltage, replacement of sensor

\* Refer to the detail of servo motor/amplifier manual.

## **10. Warranty**

Tsubaki : hereinafter referred to as “Seller”

Customer: hereinafter referred to as “Buyer”

Goods sold or supplied by Seller to Buyer: hereinafter referred to as “Goods”

### **10-1. Warranty period without charge**

18 months effective the date of shipment or 12 months effective the first use of Goods, including installation of Goods to Buyer’s equipment or machines - whichever comes first.

### **10-2. Warranty coverage**

Should any damage or problem with the Goods arise within the warranty period, given that the Goods were operated and maintained under instructions provided in the manual, Seller would repair and replace at no charge once the Goods are returned to Seller. The following are excluded from the warranty.

- 1) Any cost related to removal or re-installation of Goods from the Buyer’s equipment or machines to repair or replace parts.
- 2) Cost to transport Buyer’s equipment or machines to the Buyer’s repair shop.
- 3) Costs to reimburse any profit loss due to any repair or damage and consequential losses caused by the Buyer.

### **10-3. Warranty with charge**

Seller will charge any investigation and repair of Goods caused by:

- 1) Improper installation by failing to follow the instruction manual.
- 2) Insufficient maintenance or improper operation by the Buyer.
- 3) Incorrect installation of Goods into other equipment or machines.
- 4) Structure change of the Goods by any modifications or alterations by the Buyer.
- 5) Any repair by engineers other than the Seller or those designated by the Seller.
- 6) Operation in inappropriate environment not specified in the manual.
- 7) Force Majeure or forces beyond the Seller’s control such as natural disaster and injustice done by third party.
- 8) Secondary damage or problem incurred by the Buyer’s equipment or machines.
- 9) Defected parts supplied, or specified by the Buyer.
- 10) Incorrect wiring or parameter setting by the Buyer.
- 11) The end of life cycle of the Goods under normal use condition.
- 12) Losses or damages not liable to the Seller

### **10-4. Dispatch the Seller’s engineer**

Service to dispatch Seller’s engineer for investigation, adjustment or trial testing, etc. of Seller’s Goods are at Buyer’s expense.

### **10-5. Others**

- In accordance with the policy of Tsubaki, the contents of this instruction manual are subject to change without notice.
- We take all possible measures to ensure that there is no error in writing or defect with the contents of this instruction manual.
- We highly appreciate it, if you would let us know any error or defects found in this instruction manual.



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