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TSUBAKI

POWER CYLINDER

< Eco Series Servo Type >

LPES15

LPES30

Instruction manual

Attention

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

TSUBAKIMOTO CHAIN CO.

TSUBAKI POWER CYLINDER Eco series Servo Type 45 Frame

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:

| | | |
|---|----------------|---|
|  | WARNING | Death or serious injury may result from misusing the product without following the instructions. |
|  | CAUTION | 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.

| |
|---|
|  WARNING |
| <p>< General ></p> <ul style="list-style-type: none"> • Do not handle POWER CYLINDER under live-wire condition. To handle the POWER CYLINDER, switch off the power supply and confirm that the charge lamp of the servo amplifire is off. Then wait for more than 15 minites and check the voltage by a tester to avoid electric shock. • Transporting, installing, wiring, operating, maintaining and inspecting must be carried out by skilled and professional engineers, to avoid mis-handling, resulting in hazardous situations. • 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. • Keep the brake free from water or oil. Weak brake torque may cause accidents such as falling and disfunctioning of the product. • 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. • 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. <p>< Transportation ></p> <ul style="list-style-type: none"> • Do not stand under the product when it is lifted for transportation, otherwise the product may fall and result in death or serius injury. <p>< Wiring ></p> <ul style="list-style-type: none"> • Refer to the instruction manual of servo motor manufacturer and confirm that wiring is correct. Otherwise, electrical shock or fire may occur. • Do not bend, pull or pinch the power cable or motor lead wires, otherwise electrical shock may occur. • Make sure you ground the earth terminal to avoid electrical shocks. |

< Operation >

- Never connect the servomotor to the commercial power supply. It may result in break down of the product.
- 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.
- 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.
- Understand that the inside of the equipment is slippery due to lubricating oil. You must take safety measures to prevent slipping accidents.
- 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 step on or hang on to the POWER CYLINDER, otherwise injury may occur.
- In case Power Cylinder is equipped with magnetic sensors, avoid using it in a place where a magnetic field is generated because it may cause malfunctioning.

< 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 >

- Make sure that wiring is correct before turning on the power. Failure to do so may result in injury or breakdown of the equipment.
- 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.
- Never perform a megger test on this cylinder. It may damage electronic parts built in the servomotor.
- 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 >

- 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 >

- Return the Power Cylinder to Tsubaki in case of product failure. Do not disassemble or assemble the product because it may cause electric shock, injury or fire.

< Scrapping >

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

Parts used for the POWER CYLINDER are RoHS compliant. Dispose the POWER CYLINDER as general industrial waste.

Thank you for purchasing Tsubaki Power Cylinder Eco Series Servo Type 45 Frame. This cylinder is a linear actuator to which a servomotor can be attached. Equipped with a high performance ball screw, it has realized high speed, light weight, and compactness.

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. Please read this manual carefully and pay special attention to details on inspection, handling, and maintenance. If you have any question, contact the distributor or our sales office with the information of the name plate.

Please read the manual and the catalog of the servomotor before operation.

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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 optional accessories correspond to your requirements. (Trunnion column, foot mounting adaptor, and mounting bolts are included with shipment.)
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.

Secure 3 times or more of the rated thrust of Power Cylinder for the strength of customer's equipment and mounting base. In case Power Cylinder is equipped with magnetic sensors, avoid using it in a place where a magnetic field is generated.

2-2. Installation direction

Power Cylinder can be installed onto your equipment in any direction you wish, unless otherwise specified in the outline drawing.

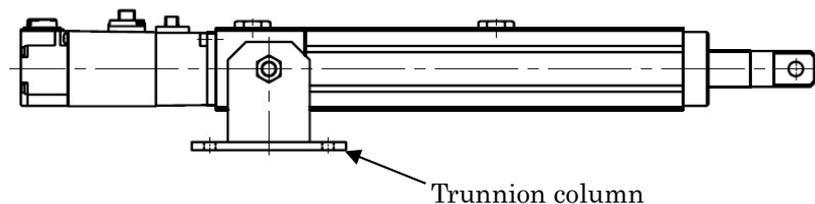
2-3. Method of Installation

1) Trunnion Mounting

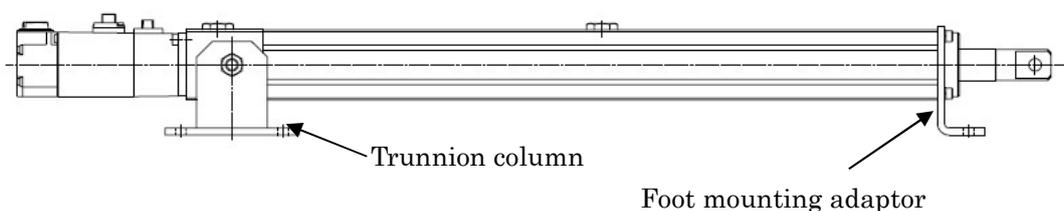
Do not tighten the frame of Power Cylinder from the outside.

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.

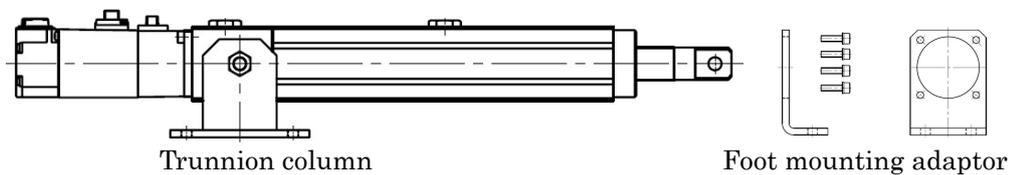


In case of long stroke and horizontal installation, install the foot mounting adaptor in combination with the trunnion column.



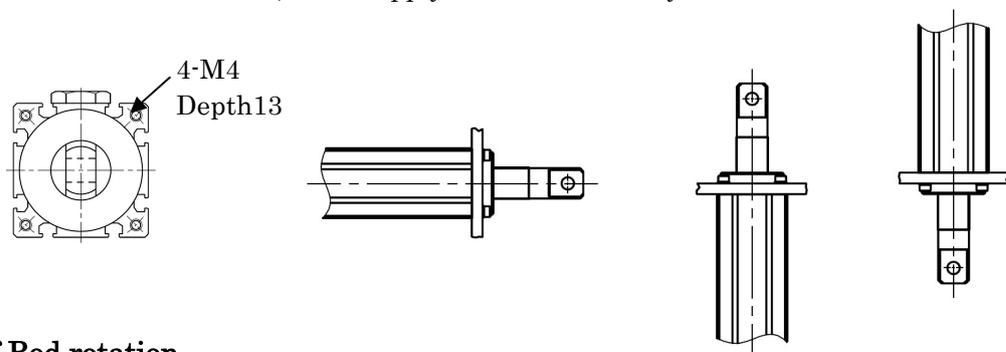
2) Foot mounting

Attach the foot mounting adaptor to the main body of Power Cylinder with bolts (included with shipment). Use the trunnion columns and the foot mounting adaptor at the same time. Use the bolts of strength class 10.9 or 12.9 to install the trunnion columns and foot mounting adaptor.



3) Flange Mounting

Screw in the bolts into the four holes of M4 (Depth 13mm) to attach the flange. In case of horizontal installation, do not apply side force to the cylinder unit.



2-4. Prevention of Rod rotation

The rod generates a 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.

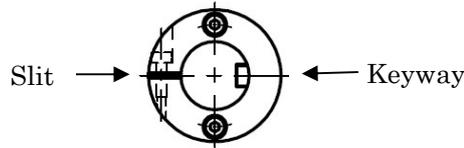
| Model No. | LPES15 | LPES30 |
|-----------------------------|----------------|----------------|
| Rod rotation N·m {kgf·m} | 0.16 {1.57} | 0.32 {3.14} |

2-5. Installation precaution

- Make sure that no excessive force acts on 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.
- When side loads are applied to the cylinder, use a guide or other means to prevent the side load from applying directly to the Power Cylinder.

3. Installation of servo motor

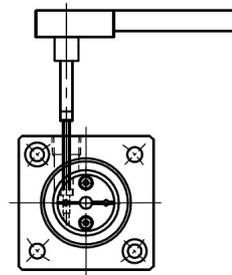
Refer to the following when the customer installs the servo motor.



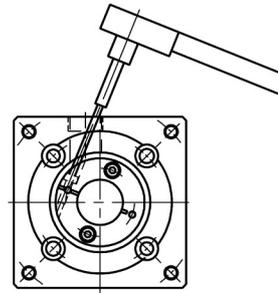
Position of slit and keyway (in case of keyed motor output shaft)

3-1. In case of motor direct mounting (without reducer): LPES15F, LPES30F

- ① Wipe off the rust, dust or rust prevention oil of servo motor shaft.
Detach the key in case the 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 M-bracket, rotate the coupling so that the clamp bolt and the hole for clamping are aligned.
※ For LPES30F, the torque wrench needs to be inserted at an angle as shown below.

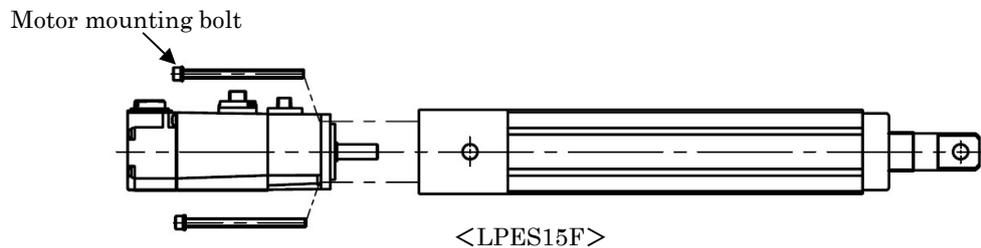


<LPES15F>

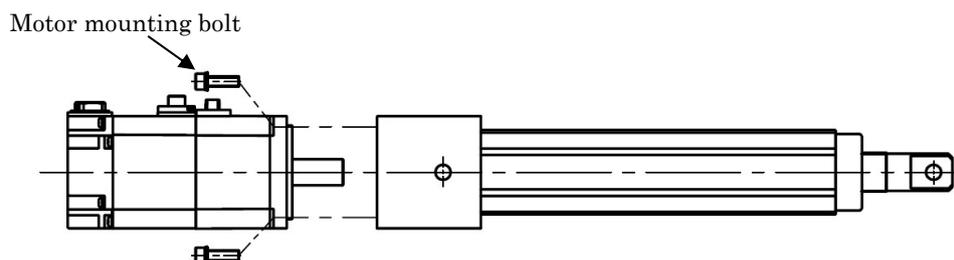


<LPES30F>

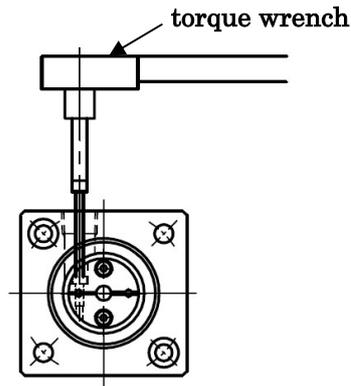
- ③ Loosen clamp bolt of coupling.
 - ④ Then insert the motor shaft into the coupling.
Be careful not to apply excessive force to the coupling during this procedure.
- Note)** Rotating the motor in the rotational direction during installation can cause misalignment between the motor and the clamp bolt.
- ⑤ After inserting the spigot facing part completely, attach it with the motor attaching bolts.
 - ⑥ Using a torque wrench, tighten the clamp bolt of the coupling at the specified tightening torque. Refer to the table on the next page for tightening torque.
 - ⑦ Attach the removed plug in the procedure ② to the coupling housing.



<LPES15F>



<LPES30F>



 Danger

Make sure to use a torque wrench to tighten the clamp bolt. Ensure it is tightened with specified torque.
Insufficient bolt tightening may result in poor performance of the servo motor or can cause dangerous situations such as breakage and lack of power transmission.

Table 1. Tightening torque of clamp bolt

| Model No. | Clamp bolt size | Tightening torque N · m { kgf · m } |
|-----------|-----------------|--|
| LPES15F | M2 | 0.5 {0.04} |
| LPES30F | M2.5 | 1.0 {0.10} |

3-2) With high precision planetary gearbox
<LPES30R>

3-2-1) 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.

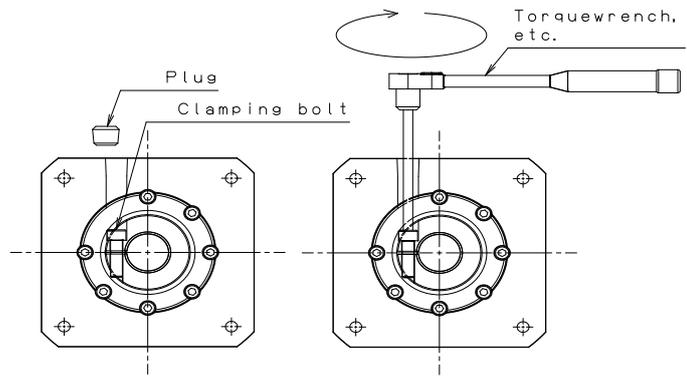
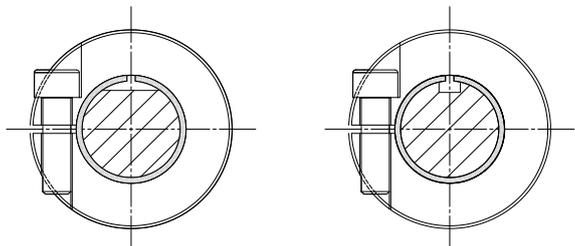


Table Clamping bolt tightening torque

| 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 |

3-2-2) 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.



4. Wiring

4-1. Wiring

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

4-2. Earth ground

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

4-3. Wire connection

Refer to the manual of the servo motor manufacturer and connect servo motor and amplifier.

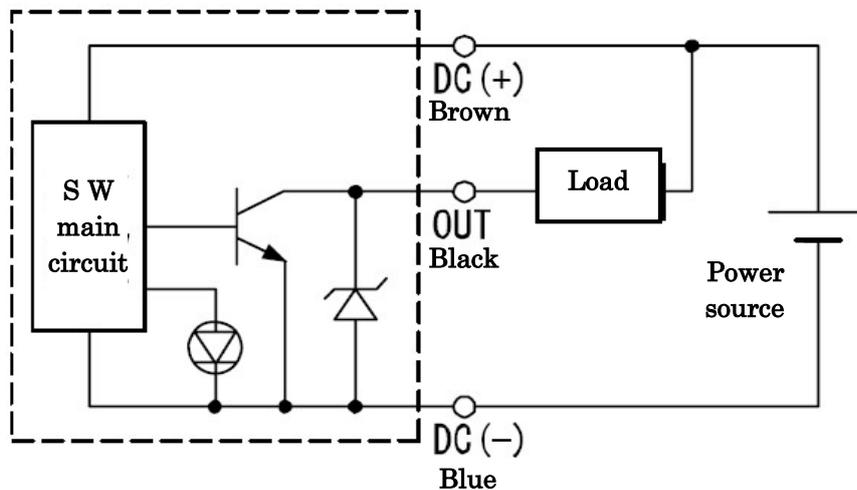
4-4. Wiring of magnetic sensor

Wire the magnetic sensors according to the following instructions, otherwise the magnetic sensors 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 excessive voltage and current.
(Voltage: Max. DC28V, Current: Max. 40mA)
- (3) Do not wire the power line and sensor wiring all together.
- (4) When directly driving a surge generating load such as relay and solenoid valve, use a product having a built-in surge absorbing element or provide a countermeasure against a surge in the circuit.

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

Diagram for standard magnetic sensor



5. Precaution before operation

5-1. Verification of wiring and power source

Confirm that wiring, especially motor wiring (rotational direction) is correct. Check each parameter of servo amplifier as well. Then locate the rod at the middle of stroke and verify the actuation direction at slow speed.

5-2. Connection to mating machine/equipment

Make sure that no side load is applied to the cylinder rod (force applied to the axial direction of linkage pin), specifically when the cylinder swings at all strokes, check the interference at the end fixture and the other portion. Side loads to the rod may cause breakage, reduced life or noise.

6. Basic specification

| Model No. | Max. thrust | Max. speed Max. input rpm | Aluminum frame size | Ball screw |
|-----------|-------------------|------------------------------|------------------------|--------------------|
| LPES15 | 150N {15.3kgf} | 300mm/s 3000r/min | □45 | OD φ12 Lead 6mm |
| LPES30 | 300N {30.6kgf} | 300mm/s 3000r/min | □45 | OD φ12 Lead 6mm |

7. General precaution

7-1. Load

Avoid the loads described below because they may have adverse effect on the efficiency of Power Cylinder and the life of the motor and ball screw. They can also cause damages to the inner tube (rod) or frame.

① Side load

Do not apply the force which bends the rod (side load).

② Impact load

③ Overload

④ Large inertia load

Allowable inertia load to convey is the following mass or less.

7-2. Speed

Do not operate the Power Cylinder with the speed exceeding the value indicated on the table of “6. Basic Specifications” or motor rotational speed. Vibration and noise caused by the resonance of the ball screw may shorten the product service life.

7-3. Operation upon occurrence of abnormality

If any abnormality is found, immediately stop the operation. Before inspection, take measures to prevent falling of the product or other predictable 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 a load due to the loss of motor output.

7-4. Overload protection

This Power Cylinder does not have a built-in overload protection device. Take measures for overload protection with servo motor torque limiting function if allowable thrust for each frame is exceeded.

7-5. Brake for servo motor

If a dangerous situation is anticipated during stoppage and when the product is broken (when the alarm is activated etc.), use a servo motor with a magnetic brake to hold the load. Electromagnetic brake can be used for the purpose of holding, not braking.

7-6. Manual operation

Manual operation is impossible because a manual shaft is not provided with this cylinder for a structural reason, so adjust the cylinder position by operating the servo amplifier at very low speed.

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 the screw shaft circumference by grease gun through grease port.

Amount of grease for a 100mm stroke is approx 5g.

Refer to the following table for recommended grease.

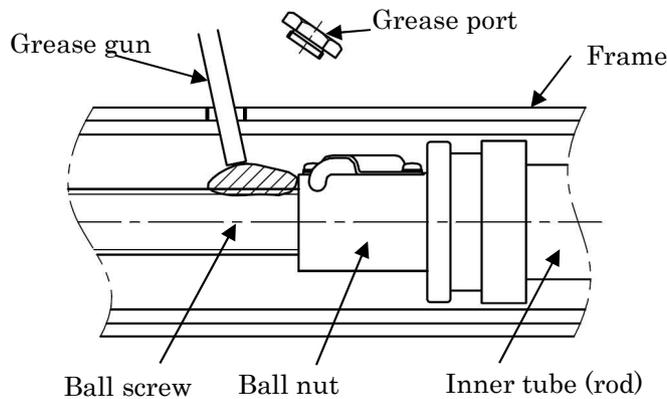
| Frequency of use | Periodic cycle for greasing |
|--|-----------------------------|
| 500 to 1000 reciprocations/ day | Every 3 to 6 months |
| 100 to 500 reciprocations/ day | Every 6 to 12 months |
| 10 to 100 reciprocations/ day and less | Every 12 to 18 months |

The above is a reference for the long term use. It does not guarantee the product life.

*Recommended grease

| Manufacturer | Name of the grease |
|----------------|------------------------|
| Idemitsu Kosan | Daphne Eponex SR No. 2 |

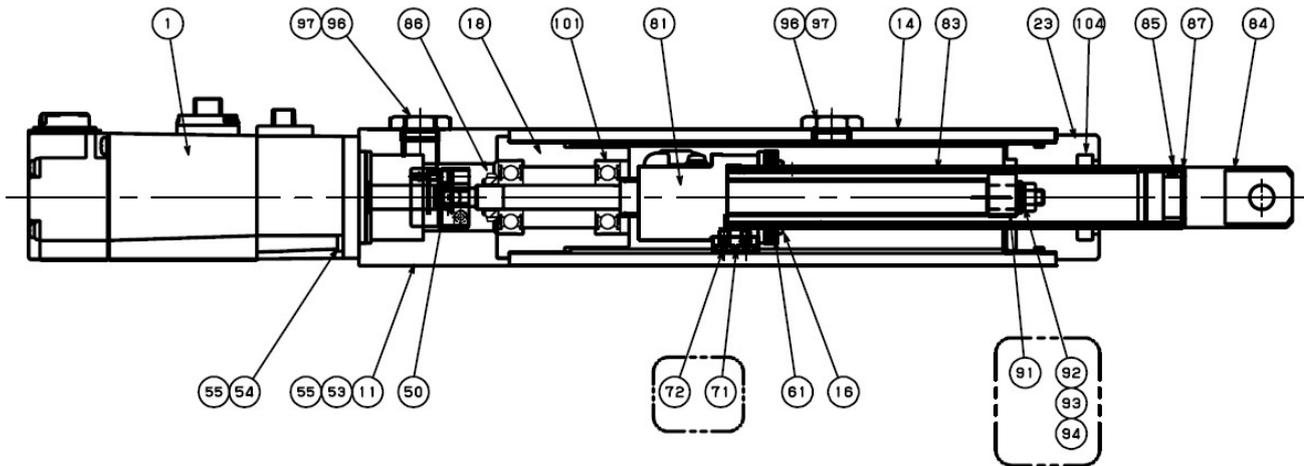
Use the same grease as the screw. Apply grease to the surface of the rod to maintain the oil film.



8-2. Structure drawing

The structures differ slightly depending on thrust.

<LPES15 Structure drawing>



| Part No. | Name | Q'ty | Part No. | Name | Q'ty |
|----------|----------------------------|------|----------|---------------------------|------|
| 1 | Servo motor | 1 | 81 | Ball screw/nut | 1 |
| 11 | M bracket | 1 | 83 | Inner tube | 1 |
| 14 | Frame | 1 | 84 | I-end fitting | 1 |
| 16 | Inner tube collar | 1 | 85 | Hex Socket Set Screw M3×3 | 1 |
| 18 | Bearing housing | 1 | 86 | fine U nut | 1 |
| 23 | Load side housing | 1 | 87 | Spacer | 1 |
| 50 | NES Coupling | 1 | 91 | End guide spacer | 1 |
| 53 | H.S.H.C.Screw M4×55 | 2 | 92 | Hexagon nut M5 | 1 |
| 54 | H.S.H.C.Screw M4×65 | 2 | 93 | Spring washer M5 | 1 |
| 55 | Spring washer M4 | 2 | 94 | Flat washer M5 | 1 |
| 61 | Magnet | 1 | 96 | Grease port bolt | 2 |
| 67 | Magnetic switch | 3 | 97 | Seal washer | 2 |
| 71 | Guide key | 1 | 101 | Miniature bearing | 2 |
| 72 | H.S.H.C. Button Screw M3×5 | 2 | 104 | Scraper | 1 |

Note

*Items 91, 92, 93 and 94 are used for the stroke of 300 or more.

*Items 71 and 72 are used for rod anti-rotation type (option).

9. Trouble shooting

Refer to the following table when troubles happen.

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

| Condition | Possible cause | Measure |
|---|--|---|
| Does not operate even if the start button is pushing. | <ol style="list-style-type: none"> 1. Incorrect wiring of servo motor / amplifier 2. Servo amplifier alarm 3. Servo motor/amplifier malfunction 4. Overload, inertia is too large 5. Input signal for servo amplifier 6. Parameter setting | Check wiring * Check the detail of alarm and take measures * Repair and replace Review on equipment design Check the input signal * Check the parameter setting values * |
| Does not actuate even though motor makes sound. | <ol style="list-style-type: none"> 1. Breakdown of electro-magnetic brake 2. Defective power source for electro-magnetic brake 3. Slippage of coupling 4. Servo amplifier input signal 5. Parameter setting | Replace Check the brake power source Check clamp bolt tightening Check the input signal * Check the parameter setting values * |
| Run away | <ol style="list-style-type: none"> 1. Incorrect wiring of servo motor/amplifier 2. Disconnection of encoder cable, incorrect wiring | Check wiring * Check wiring * |
| Hunting | <ol style="list-style-type: none"> 1. Incorrect wiring of servo motor, amplifier 2. Parameter gain setting | Check wiring Check the parameter setting values * |
| Do not produce rated thrust | <ol style="list-style-type: none"> 1. Slippage of coupling 2. Bad connection with mating machine 3. Breakdown of electro-magnetic brake 4. Bad power source for electro-magnetic brake | Tightening of clamp bolt Repair Replace Check the brake power source |
| Motor overheat | <ol style="list-style-type: none"> 1. Excessive load 2. Excessive frequency of use 3. Breakdown of electro-magnetic brake 4. Bad power source for electro-magnetic brake | Reduce load or re-consideration of model with more capacity Acquire model with more capacity Replace Check the brake power source |
| Damage of the unit | <ol style="list-style-type: none"> 1. Impact load 2. Side load | Repair Repair |
| Magnetic sensors do not output signal | <ol style="list-style-type: none"> 1. Wrong wiring 2. Over voltage | Re-wiring, replace the sensor Reset to correct voltage, Replace the 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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