These linear actuators only need a drive unit. They are suited for applications such as lifting, inclining, turning, and positioning.

### Standard models (Ball screw, Machine screw)

<table>
<thead>
<tr>
<th>Basic capacity</th>
<th>Speed</th>
<th>Stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4900 N</td>
<td>0.5</td>
<td>Up to 1000</td>
</tr>
<tr>
<td>9600 N</td>
<td>1</td>
<td>Up to 1500</td>
</tr>
<tr>
<td>24500</td>
<td>2.5</td>
<td>Up to 2000</td>
</tr>
<tr>
<td>45000</td>
<td>5</td>
<td>Up to 2000</td>
</tr>
<tr>
<td>94000</td>
<td>10</td>
<td>Up to 2000</td>
</tr>
<tr>
<td>150000</td>
<td>20</td>
<td>Up to 2000</td>
</tr>
<tr>
<td>204000</td>
<td>30</td>
<td>Up to 2000</td>
</tr>
<tr>
<td>460000</td>
<td>50</td>
<td>Up to 2000</td>
</tr>
<tr>
<td>730000</td>
<td>100</td>
<td>Up to 2000</td>
</tr>
</tbody>
</table>

*Note: In accordance with the policy of TSUBAKIMOTO CHAIN CO. to constantly improve its products, the specifications in this catalog are subject to change without notice.*

---

**Related Product**

**Lini-Power Jack**

- **TSUBAKI POWER CYLINDER**

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**TSUBAKIMOTO CHAIN CO.**

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  - Facsimile: 847-459-9515
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  - Facsimile: 65167005
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  - No. 7 Peng Sun Keng
  - Kuei Shih-Hoan, Taoyuan-Hsien
  - Takahe P.R.C.
  - Phone: 033-203927/7/9
  - Facsimile: 033-2030005
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  - Belder 1, 4704 RK Rosendaal
  - The Netherlands
  - Phone: 0163-854860
  - Facsimile: 0163-854980
- TSUBAKI EUROPE B.V.
  - Ukraine Drive, Sherwood Park
  - Amersley, Nottingham, NG15 6EX
  - United Kingdom
  - Phone: 01623-588700
  - Facsimile: 01623-588780

Distributed by:
High performance linear actuators offering efficient, clean and quiet drive—environmental consciousness

Ready for outdoor use
T series, G series, Ultra heavy duty series, F series, Battery series

With Electromagnetic brake motor
T series, G series, Ultra heavy duty series

Battery powered actuator
DC motor type
Battery series, F series

Easy and economical to combine with your equipment
The mechanical type motor driven actuator reduces the need for compressors, piping valves or hydraulic units, making the equipment simpler and more economical. The device can be treated as a motor and allows for simple remote control. Furthermore, the simple construction and long life grease provide for more economical maintenance.

Three phase motor with brake
for precise positioning, and rigid load holding
T series, G series, Ultra heavy duty series

Internal position sensor; Limit switch type
available at your choice for signaling the position of the stroke
T series, G series, F series

Potentiometer or Rotary encoder
available at your choice for remote control operation
T series, G series, Ultra heavy duty series

Press loaded stopping device
for safety and thrust sensing
A combination of dish springs and limit switches is used to provide thrust sensing and press loaded stopping.
Available for T series, G series, LPTC type and, G series, LPGC type, Battery series

Rod anti-rotation device
available as made-to-order
If the actuator rod end is free or connected to wire rope, anti-rotation device for a rod is needed.
T series, G series, Ultra heavy duty series

Mounting type and an end fitting
Clevis or trunnion mount and I type end fitting are available for T series, G series, Ultra heavy duty series F series—clevis mount only

Bellows
To be used in dusty area at your choice
T series, G series, Ultra heavy duty series, F series

External limit switches
available at your choice for adjusting stroke of the actuator
T series, G series, Ultra heavy duty series, F series

Multi type actuator
available for synchronized operation with one motor
Multi series

Jack type
(Ball screw or trapezoidal screw)
Lini-power jack available by a separate catalog
1.96-980KN (0.2-100tf)

Mounting type
and an end fitting
Clevis or trunnion mount and I type end fitting are available for T series, G series, Ultra heavy duty series
F series—clevis mount only

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Multi series

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1.96-980KN (0.2-100tf)
## Brake Environment

<table>
<thead>
<tr>
<th>Environment</th>
<th>Outdoor</th>
<th>Outdoor</th>
<th>Outdoor</th>
<th>Outdoor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brake</strong></td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
<td><img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>Shaft for manual operation</td>
<td><img src="image5" alt="Image" /></td>
<td><img src="image6" alt="Image" /></td>
<td><img src="image7" alt="Image" /></td>
<td><img src="image8" alt="Image" /></td>
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<tr>
<td>Anti-rod rotation</td>
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<td><img src="image10" alt="Image" /></td>
<td><img src="image11" alt="Image" /></td>
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<tr>
<td>Limit switch for stroke adjusting</td>
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<td><img src="image14" alt="Image" /></td>
<td><img src="image15" alt="Image" /></td>
<td><img src="image16" alt="Image" /></td>
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<tr>
<td>Built-in L.S. for positioning</td>
<td><img src="image17" alt="Image" /></td>
<td><img src="image18" alt="Image" /></td>
<td><img src="image19" alt="Image" /></td>
<td><img src="image20" alt="Image" /></td>
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<td>Potentiometer*</td>
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<td><img src="image22" alt="Image" /></td>
<td><img src="image23" alt="Image" /></td>
<td><img src="image24" alt="Image" /></td>
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<tr>
<td>Rotary encoder</td>
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<td><img src="image28" alt="Image" /></td>
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<tr>
<td>End fitting (type U)</td>
<td><img src="image29" alt="Image" /></td>
<td><img src="image30" alt="Image" /></td>
<td><img src="image31" alt="Image" /></td>
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<tr>
<td>End fitting (type I)</td>
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<td><img src="image34" alt="Image" /></td>
<td><img src="image35" alt="Image" /></td>
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<td>Bellows</td>
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<td><img src="image39" alt="Image" /></td>
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<td>Clevis*</td>
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<td><img src="image42" alt="Image" /></td>
<td><img src="image43" alt="Image" /></td>
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<tr>
<td>Trunnion mounting adapter</td>
<td><img src="image45" alt="Image" /></td>
<td><img src="image46" alt="Image" /></td>
<td><img src="image47" alt="Image" /></td>
<td><img src="image48" alt="Image" /></td>
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<tr>
<td>Press contact stopping</td>
<td><img src="image49" alt="Image" /></td>
<td><img src="image50" alt="Image" /></td>
<td><img src="image51" alt="Image" /></td>
<td><img src="image52" alt="Image" /></td>
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</tbody>
</table>

## Brake Performance

<table>
<thead>
<tr>
<th>Speed (mm/sec.)</th>
<th>50/60Hz</th>
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</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td>25/30</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td>35/40</td>
</tr>
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</table>

### Thrust (kgf)

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<th>92.0</th>
<th>96.0</th>
<th>100.0</th>
<th>114.0</th>
<th>120.0</th>
<th>125.0</th>
<th>130.0</th>
<th>130.0</th>
<th>130.0</th>
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<td>10000</td>
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</tbody>
</table>

### Stroke

<table>
<thead>
<tr>
<th>Stroke</th>
<th>300mm</th>
<th>200mm</th>
<th>150mm</th>
<th>120mm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td><img src="image53" alt="Image" /></td>
<td><img src="image54" alt="Image" /></td>
<td><img src="image55" alt="Image" /></td>
<td><img src="image56" alt="Image" /></td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td><img src="image57" alt="Image" /></td>
<td><img src="image58" alt="Image" /></td>
<td><img src="image59" alt="Image" /></td>
<td><img src="image60" alt="Image" /></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td><img src="image61" alt="Image" /></td>
<td><img src="image62" alt="Image" /></td>
<td><img src="image63" alt="Image" /></td>
<td><img src="image64" alt="Image" /></td>
</tr>
</tbody>
</table>

### Duty Series

<table>
<thead>
<tr>
<th>Duty Series</th>
<th>TB type</th>
<th>TC type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For general industrial use, hopper gate &amp; dumper</strong></td>
<td><img src="image65" alt="Image" /></td>
<td><img src="image66" alt="Image" /></td>
</tr>
<tr>
<td><strong>High grade series with various optional parts</strong></td>
<td><img src="image67" alt="Image" /></td>
<td><img src="image68" alt="Image" /></td>
</tr>
</tbody>
</table>

### Multi Series

<table>
<thead>
<tr>
<th>Multi Series</th>
<th>TB type</th>
<th>TC type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For general industrial use, hopper gate &amp; dumper</strong></td>
<td><img src="image69" alt="Image" /></td>
<td><img src="image70" alt="Image" /></td>
</tr>
<tr>
<td><strong>High grade series with various optional parts</strong></td>
<td><img src="image71" alt="Image" /></td>
<td><img src="image72" alt="Image" /></td>
</tr>
</tbody>
</table>

### Notes

- Fitted on the standard units
- Multi series available as optional parts
- Available on made-to-order basis
- *: Potentiometer cannot be used with Clevis mounting type
- **: Multi series available as optional parts
- ○: Available on made-to-order basis
- ●: Fitted on the standard units
Battery Cylinder

D.C. MOTOR SERIES

FEATURES
1. Compact and clean electro-mechanical drive for linear movement.
2. No piping for hydraulic fluid or compressed air.
3. Maintenance-free.
4. Ball type overload clutch is equipped for overload protection.
5. Weatherproof for indoor and outdoor operation.
6. Pressure contact stopping is available for LPA010M & LPA040L.

TYPICAL APPLICATIONS
1. Agricultural Equipment
   Silage chutes, conveyors, cutter bar control transmission shifters, tractor accessory lifts.
2. Industrial Equipment
   Belt speed and tension controls, flue and draft controls, table lifts, hatch covers, ventilator controls.
3. Medical Equipment
   Dental chairs, hospital beds, examination tables, X-ray equipment, invalid lifts, patient handlers.
4. Material Handling Equipment
   Container tippers, dump chute doors, elevators, container positioners, conveyor switching, and trip devices.
5. Recreational Equipment
   Satellite systems, trailer actuators.

SPECIFICATIONS

1. Use the battery cylinder below the rated load and speed in the table.
2. Speed and motor current vary depending upon the load applied.
3. The battery cylinder should be used for intermittent operation only. For applications where frequent and continuous operation is required, please consult Tsubaki.

TYPICAL APPLICATIONS

1. Agricultural Equipment
   Silage chutes, conveyors, cutter bar control transmission shifters, tractor accessory lifts.
2. Industrial Equipment
   Belt speed and tension controls, flue and draft controls, table lifts, hatch covers, ventilator controls.
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   Dental chairs, hospital beds, examination tables, X-ray equipment, invalid lifts, patient handlers.
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   Container tippers, dump chute doors, elevators, container positioners, conveyor switching, and trip devices.
5. Recreational Equipment
   Satellite systems, trailer actuators.

DIMENSIONS/ENGINEERING INFORMATION

ENGINEERING INFORMATION

1. Wiring
   For normal inching operation, please refer to the circuit below;
2. Installation
   When installing, don't apply radial force to the Power Cylinder rod or external forces other than thrust force.

<table>
<thead>
<tr>
<th>Model/No.</th>
<th>Stroke (mm)</th>
<th>Voltage</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPA010X0.5(V)</td>
<td>100</td>
<td>DC12V/24V</td>
<td>50</td>
</tr>
<tr>
<td>LPA010X1.0(V)</td>
<td>50</td>
<td>DC12V/24V</td>
<td>100</td>
</tr>
<tr>
<td>LPA010X1.5(V)</td>
<td>25</td>
<td>DC12V/24V</td>
<td>150</td>
</tr>
<tr>
<td>LPA010X2.0(V)</td>
<td>12.5</td>
<td>DC12V/24V</td>
<td>200</td>
</tr>
<tr>
<td>LPA100X0.5(V)</td>
<td>150</td>
<td>DC12V/24V</td>
<td>50</td>
</tr>
<tr>
<td>LPA100X1.0(V)</td>
<td>75</td>
<td>DC12V/24V</td>
<td>100</td>
</tr>
<tr>
<td>LPA100X1.5(V)</td>
<td>37.5</td>
<td>DC12V/24V</td>
<td>150</td>
</tr>
<tr>
<td>LPA100X2.0(V)</td>
<td>20</td>
<td>DC12V/24V</td>
<td>200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model/No.</th>
<th>Stroke (mm)</th>
<th>Voltage</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPA010X0.5(V)</td>
<td>100</td>
<td>DC12V/24V</td>
<td>50</td>
</tr>
<tr>
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<td>LPA010X1.5(V)</td>
<td>25</td>
<td>DC12V/24V</td>
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<td>100</td>
</tr>
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<td>LPA100X1.5(V)</td>
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<td>150</td>
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<tr>
<td>LPA100X2.0(V)</td>
<td>20</td>
<td>DC12V/24V</td>
<td>200</td>
</tr>
</tbody>
</table>
FEATURES
1. Compact design with right angled connection between motor and actuator.
2. Right angled two-way clevis holes make four position of mounting.
3. Press stopping is available with overload detecting unit. Ac adapter, overload detecting unit and so on.

STANDARD SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Rated Thrust (N)</th>
<th>Stroke (mm)</th>
<th>Speed (mm/s)</th>
<th>Voltage (V)</th>
<th>Rated load current (A)</th>
<th>Locked current (A)</th>
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<td>150</td>
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<td>(1.6)</td>
<td>(7.5)</td>
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</tr>
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<td>LPF010L1.5</td>
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<td>200</td>
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<td>450</td>
<td></td>
<td>(1.8)</td>
<td>(7.5)</td>
<td></td>
</tr>
<tr>
<td>LPF040L1.5</td>
<td>150</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPF040L2.0</td>
<td>200</td>
<td>550</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPF040L3.0</td>
<td>300</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Model No. should be selected in consideration of locked current.
2. Figures in (     ) are shown as current for DC 24V models.

AMBIENT CONDITIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Outdoor temp.</th>
<th>Humidity</th>
<th>Shock</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>-15°C ~ 40°C</td>
<td>Less than 85%</td>
<td>Less than 1G</td>
<td>Less than 1000m</td>
</tr>
<tr>
<td>DC</td>
<td>-15°C ~ 40°C</td>
<td>Less than 85%</td>
<td>Less than 1G</td>
<td>Less than 1000m</td>
</tr>
</tbody>
</table>

WIRING DIAGRAMS

REFERENCE CIRCUIT: DYNAMIC BRAKE CIRCUIT

OVERLOAD DETECTION UNIT

AC ADAPTER
**SELECTION AND INSTRUCTION FOR OPERATION**

**SELECTION**
The following information is necessary for the selection of F series.

1. Application
2. Required Thrust or Load (N or kgf)
3. Stroke (mm)
4. Speed (mm/sec)
5. Frequency of operation (cycle/min)
6. Voltage of power source

**SELECTION PROCEDURE**

1. **Selection of Model No.**
   Select the suitable model number from the chart of standard specification (page 8) based on Thrust (N or kgf), Stroke (mm), Speed (mm/sec), and so on.

2. **Confirmation of special features**
   Frequency of operation must be kept at the following:
   - Allowable number of motor starts: 2 times/min. or less
   - Allowable working time rate: 25% ED or less

**INSTRUCTION FOR OPERATION**

1. **Performance**
   Operative speed and motor current varies depending on actual load applied to the rod. Refer to the characteristics graph at page 10 for the detail.
   F series Power Cylinders cannot be operate in synchronicity due to change of speed by applied load as a characteristic of DC motor. Life is approximately 15,000 times rod’s reciprocating motion.

2. **Power source**
   When using AC power source by transformer in stead of DC battery power source, capacity of transformer should be large enough to avoid dropping of voltage. (AC adapter for output voltage DC 24V is available as optional parts.)

3. **Voltage**
   DC 12V type (10 ~ 14V) and DC 24V (20 ~ 28V) are available. Operative speed may change depending on actual voltage.

4. **Maintenance**
   Actuator portion and reducer portion are pre-greased. Greasing is not required.

5. **Press stopping operation**
   Press stopping is available with overload detecting unit. (overload detection unit must be used with Power Cylinder in this case)
   CAUTION: Press stopping is not available for the standard model because it doesn’t have any overload detecting units.

6. **Rod rotating prevention**
   It is necessary to prevent rod rotating because rotating torque as shown below applies to the rod when operating.
   LPF010H: Max 0.14 Nm
   LPF020M: Max 0.28 Nm
   LPF040L: Max 0.55 Nm

7. **Frequency of operation**
   F series Power Cylinder is designed for low frequency of operation, however it can be also used for inching operation if frequency of operation is less than 10 times/min.

8. **Outdoor use**
   F Series Power Cylinder itself is for outdoor use. Waterproof connector must be prepared and connected to the end of the motor cable.

9. **Installation**
   When installing, do not apply radial force to the rod or external forces other than thrust force.
   Power Cylinder should be connected with connecting pins to the equipment. Both clevis pin and end fitting pin should be also adjusted in phase.

Note: Data in the graphs is based on DC 12V/24V, ambient temp 20°C. Speed and motor current depend on conditions of power source and ambient temp.
The following two built-in units are available for position detection.

1. INTERNAL LIMIT SWITCH FOR POSITION DETECTION

   - For space saving or hard environments such as dust, corrosion etc.

   Limit Switch Set-Up
   1. Operate Power Cylinder to confirm direction of LS cam before installing the Power Cylinder.
   2. Install the Power Cylinder, then adjust where the position of stroke is to be stopped or detected.
   3. Rotate LS cam, then fix it at the position where the micro switch works by tightening set screws taking into consideration the coasting distance of the stroke.

2. POTENTIOMETER

   Potentiometer is a variable resistor to output electrical signals by stroke. Printed circuit board and stroke indication meter may be used together with the potentiometer. Resistor is preset by model of Power Cylinder before delivery. If the actuator rod is rotated before installation, the stroke position will be out of phase with potentiometer. After installation adjust the phase correctly.

**SPECIFICATIONS OF POSITION DETECTING UNIT**

1. INTERNAL LIMIT SWITCH FOR POSITION DETECTION

   For space saving or hard environments such as dust, corrosion etc.

   Limit Switch Set-Up
   1. Operate Power Cylinder to confirm direction of LS cam before installing the Power Cylinder.
   2. Install the Power Cylinder, then adjust where the position of stroke is to be stopped or detected.
   3. Rotate LS cam, then fix it at the position where the micro switch works by tightening set screws taking into consideration the coasting distance of the stroke.

**WITH LIMIT SWITCH FOR STROKE ADJUSTMENT**

Note: Limit switch for stroke adjustment cannot be installed onto the model with 50 mm stroke.

**WITH BELLOWS**

**INTERNAL STRUCTURE**

The following two built-in units are available for position detection.

1. INTERNAL LIMIT SWITCH FOR POSITION DETECTION

   - For space saving or hard environments such as dust, corrosion etc.

   Limit Switch Set-Up
   1. Operate Power Cylinder to confirm direction of LS cam before installing the Power Cylinder.
   2. Install the Power Cylinder, then adjust where the position of stroke is to be stopped or detected.
   3. Rotate LS cam, then fix it at the position where the micro switch works by tightening set screws taking into consideration the coasting distance of the stroke.

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**SPECIFICATIONS OF POSITION DETECTING UNIT**

1. INTERNAL LIMIT SWITCH FOR POSITION DETECTION

   For space saving or hard environments such as dust, corrosion etc.

   Limit Switch Set-Up
   1. Operate Power Cylinder to confirm direction of LS cam before installing the Power Cylinder.
   2. Install the Power Cylinder, then adjust where the position of stroke is to be stopped or detected.
   3. Rotate LS cam, then fix it at the position where the micro switch works by tightening set screws taking into consideration the coasting distance of the stroke.
TYPE (OVER LOAD PROTECTION DEVICE) SELECTION

There are 3 types of G series Power Cylinder. Select the type based on your application. Basic performances (Thrust, Speed and Stroke) are the same.

Basic type (LPGA)
This type has no Over Load Protection Device. It only has a brake for the brake motor. Please note that it can be used within their stroke. If you use it over the stroke, it may cause damage. Use LS for stroke control on your equipment or stroke adjusting. The LS unit is optional when you choose an LPGA type. We recommend using a Shock Relay or Shock Monitor for Overload Protection Device.

Slip Clutch type (LPGB). Only Parallel type is available
The internal slip clutch is activated as Overload Protection Device when the thrust load exceeds pre-set thrust. However the slip clutch will wear quickly through continuous slipping and smooth operation may not be possible. Therefore we recommend using it with a Shock Relay.

Thrust Detection Spring Unit type (LPGC)
The LPGC type features an internal thrust detection system that combines pressurizing disk springs with a micro switch. This system will operate effectively in cases shown below.
1. Press stopping and stopping by own motor power at min/max stroke end.
2. To require electrical signal when overload working.
3. Working of overload from load side during stopping. When shock load working, the spring unit can absorb it.

INSTRUCTIONS
1. When using a rotary encoder or potentiometer, LPGC type Power Cylinder uses a spring unit. Therefore, electrical signal of rotary encoder or potentiometer will have some lag due to bending of spring unit when the spring unit is operating. LPGB type Power Cylinder can use rotary encoder or potentiometer without any lag when the slip clutch is operating. LPGC type Power Cylinder can use them when the spring unit does not operate.
2. Overload working during Power Cylinder stopping, LPGC type Power Cylinder cannot be used if the rod has to stop without any bending.
3. When you use LPGC type Power Cylinder for press/pull stopping, the equipment strength required must be more than 250% against the rated thrust of the Power Cylinder.
**STANDARD SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Speed N (kgf)</th>
<th>Thrust mm/sec.</th>
<th>Motor</th>
<th>RockTone per minute operation max/min</th>
<th>Stroke</th>
<th>Thrust</th>
<th>Type</th>
<th>Overload protection device</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPGA070</td>
<td>100</td>
<td>100/120</td>
<td>U</td>
<td>300</td>
<td>600</td>
<td>500</td>
<td>U</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>LPGA070</td>
<td>150</td>
<td>150/180</td>
<td>U</td>
<td>600</td>
<td>800</td>
<td>1000</td>
<td>U</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>LPGA150</td>
<td>250</td>
<td>250/300</td>
<td>U</td>
<td>100</td>
<td>1200</td>
<td></td>
<td>U</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>LPGA200</td>
<td>500</td>
<td>500/600</td>
<td>U</td>
<td>250</td>
<td></td>
<td></td>
<td>U</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

**SELECTION**

1. Application
2. Thrust N (kgf)
3. Stroke mm
4. Speed mm/s
5. Frequency of operation Cycle/min
6. Power source Voltage & Hz
7. Ambient condition
8. Operation hours/day, Operating days/year

**REQUIRED INFORMATION FOR SELECTION**

1. Select the type of Power Cylinder to be used based on the operating environment, load conditions (N (kgf)) and speed (mm/s).
2. Based on an application, select straight or parallel type. Also select the Overload protection device and options.
3. Confirm that the frequency of operation and working time rate ED is allowable.

Allowable Frequency of Operation & Working time rate ED

<table>
<thead>
<tr>
<th>Number of Motor Starts</th>
<th>Below 10 time/min</th>
</tr>
</thead>
</table>
| Workiing Time Rate ED (%) | 25%

Working time rate ED is a rate of working time per 10 minute and to be calculated as below.

Working time rate ED (%) = Working Time per cycle × Working Time per cycle = stopping time per cycle × 100 (%)

**ESTIMATE LIFE TIME**

Estimated life time of G series Power Cylinder is shown below.

- Based on brake operations: 2 million times (Need brake gap adjusting)
- Based on running distance of cylinder: 25 km

**INERTIA LOAD FOR HORIZONTAL APPLICATIONS**

Setting load of the overload protection device is from 140% to 200% against raised thrust of cylinder.

When starting with large inertia loads, there is possibility of not smooth operation because over protection device is activated. Refer to the following table for limits. If inertia load is larger than the following table, please use the inverter to start slowly.

Allowable car weight, considering inertia

<table>
<thead>
<tr>
<th>Speed</th>
<th>LPGA070</th>
<th>LPGA070</th>
<th>LPGA100</th>
<th>LPGA100</th>
<th>LPGA150</th>
<th>LPGA150</th>
<th>LPGA300</th>
<th>LPGA300</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>1150</td>
<td>1150</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td>M</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>H</td>
<td>710</td>
<td>710</td>
<td>710</td>
<td>710</td>
<td>710</td>
<td>710</td>
<td>710</td>
<td>710</td>
</tr>
</tbody>
</table>

**BRAKE HOLDING POWER**

The load holding strength of the brake exceeds the rated thrust of the Power Cylinder so loads can be safely and securely held by the brake. This holding power is generated by the motor brake. While in operation the brake uses spring power and generates holding power that exceeds 150% of the rated torque of the motor.
### INSTALLATION & MAINTENANCE

#### INSTALLATION POSITION

Power Cylinders may be installed in any position.

#### INSTALLATION METHOD

Use a trunnion or clevis mount when installing. Install with either a male (I) or female (U) style end fitting. Apply grease to the Trunnion Pin and Bracket hole.

#### MANUAL CONTROL

To manually adjust the stroke, remove the load from the actuator, release the brake of the brake motor then turn the manually operated shaft of the motor with a handle.

**WARNING:** Remove any load from the actuator rod before releasing the brake.

Regarding rod travel per manual operated shaft revolution, please refer to the table on page 17.

#### ANTI ROD ROTATION

- **For the thrust of the actuator rod there is a reaction torque.**
  - Generally, connection to the driven load prevents rotation.
- **If the actuator rod end piece is required to rotate freely or if the actuator rod is used to drive a rolling car or to pull a load with a wire rope or chain, please use option M.**

#### SIDE LOADS ON THE ROD

Install the device so that bending moments are not applied to the actuator rod. Permanent damage to Power Cylinder may result.

#### SETTING THE EXTERNAL STROKE ADJUST LIMIT SWITCHES

1. Set the limit switches taking into consideration expected coasting. (refer to page 19)
2. Set the limit switches so that the rod stops within XA dimension.
3. When using the Power Cylinder for multiple driving, use the limit switches attached on min/max stroke end of each Power Cylinder.

#### MAINTENANCE

Lubrication

The Power Cylinder is delivered with grease applied to the screw and can be used without greasing. For maintenance, recommended grease and lubrication cycle is as below.

<table>
<thead>
<tr>
<th>Table 2 Recommended Grease</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBIL</td>
</tr>
<tr>
<td>SHELL</td>
</tr>
</tbody>
</table>

### SELECTION 2

Select the type of Power Cylinder to be used based on the following selection criteria.

1. **Setting Load of Overload protection device**
   - Slip Clutch (GB Type) : 150% ~ 200% against rated thrust
   - Thrust detection spring unit (SC Type) : 140% ~ 200% against rated thrust

2. **Brake Holding Power**

   The load holding strength of the brake exceeds the rated thrust of the Power Cylinder so loads can be safely and securely held by the brake. This holding power is generated by the motor brake. While in operation the brake uses spring power and generates holding power that exceeds 150% of the rated torque of the motor.

3. **Coasting and Stopping Accuracy**

   The position accuracy of the Power Cylinder varies depending upon speed and load inertia. Accuracy will improve as speed is lowered. Refer to the table shown below, and then set the limit switches taking into consideration expected coasting.

Coasting and Stopping Accuracy Table (Reference value when time lag of relay is 0.03S)

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation</th>
<th>Lifting (in case of 1 and 3)</th>
<th>Lowering (in case of 2 and 4)</th>
<th>50Hz</th>
<th>60Hz</th>
<th>50Hz</th>
<th>60Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coasting (in m)</td>
<td>Coasting (in m)</td>
<td>Coating (in m)</td>
<td>Coating (in m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPQA70</td>
<td>L</td>
<td>6.9 ±0.4</td>
<td>10.0 ±0.5</td>
<td>10.6 ±0.4</td>
<td>14.9 ±0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>15.0 ±1.1</td>
<td>21.5 ±1.3</td>
<td>21.8 ±1.2</td>
<td>30.1 ±1.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>15.4 ±1.4</td>
<td>21.7 ±1.7</td>
<td>23.7 ±1.5</td>
<td>32.7 ±1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>34.2 ±2.8</td>
<td>47.9 ±3.4</td>
<td>60.6 ±5.1</td>
<td>81.2 ±3.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPQB70</td>
<td>L</td>
<td>6.1 ±0.4</td>
<td>9.0 ±0.5</td>
<td>10.6 ±0.4</td>
<td>14.9 ±0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>13.6 ±1.1</td>
<td>19.8 ±1.3</td>
<td>22.1 ±1.2</td>
<td>30.5 ±1.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>14.1 ±1.4</td>
<td>19.8 ±1.7</td>
<td>23.8 ±1.5</td>
<td>32.7 ±1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>32.0 ±2.8</td>
<td>45.0 ±3.4</td>
<td>66.9 ±5.1</td>
<td>88.2 ±3.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPQC70</td>
<td>L</td>
<td>4.6 ±0.4</td>
<td>8.6 ±0.5</td>
<td>7.1 ±0.4</td>
<td>9.8 ±0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>10.6 ±1.1</td>
<td>14.7 ±1.3</td>
<td>15.6 ±1.2</td>
<td>21.3 ±1.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>13.7 ±1.4</td>
<td>19.0 ±1.7</td>
<td>21.8 ±1.6</td>
<td>30.0 ±1.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPQA300</td>
<td>L</td>
<td>3.3 ±0.4</td>
<td>4.6 ±0.5</td>
<td>5.1 ±0.4</td>
<td>6.9 ±0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>8.6 ±0.8</td>
<td>12.4 ±0.9</td>
<td>13.2 ±0.8</td>
<td>29.4 ±1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>9.4 ±1.0</td>
<td>13.1 ±1.2</td>
<td>19.0 ±1.1</td>
<td>25.0 ±1.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Values of the above table show parallel type Power Cylinder and the Power Cylinder with slip clutch when their thrust is more than 100 N. Coasting of another type of Power Cylinder will be smaller than the above.

Coasting Distance:
The amount of stroke traveled from power shut-off and until the unit completely stops.

Stopping Accuracy:
The position deviation for repeated stops. The above values include ±25% time lag of relay and brake.

**BALL SCREW LUBRICANT REPLACEMENT**

Grease must be applied to the ball screw. Grease can be injected through the grease port of the cylinder after extending the actuator rod to the forward stroke end.
If position sensing is required, any or all of the following three built-in units may be used only with trunnion mount:

1. Internal position sensor limit switch (2 or 4 circuit)
2. Potentiometer
3. Rotary encoder

Note: Clevis adapter cannot be attached when a Position Sensor Unit is used.

INTERNAL CONSTRUCTION OF POSITION SENSOR UNIT

Use the internal terminal strip for the position sensor limit switch, potentiometer and rotary encoder wiring.

Use shielded wire for the rotary encoder signals.

LIMIT SWITCHES SPECIFICATIONS

<table>
<thead>
<tr>
<th>Stroke adjustment Limit Switch (External)</th>
<th>Thrust detection Limit Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit Switch</td>
<td>Position Limit Switch (Internal) (K2, K4)</td>
</tr>
<tr>
<td>Current</td>
<td>LS1</td>
</tr>
<tr>
<td>AC 250V 3A (cos $\phi = 0.4$)</td>
<td>AC 250V 2A (cos $\phi = 0.4$)</td>
</tr>
<tr>
<td></td>
<td>NC</td>
</tr>
<tr>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Contact configuration</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>M3 Screw x 3 (ø5.8 – ø7.6)</td>
</tr>
</tbody>
</table>

LIMITING SWITCHES

Position Switch

Micro Switch LS4

Micro Switch LS3

Micro Switch LS2

Micro Switch LS1

For Power Cylinder

For Customer’s wiring

INTERNAL WIRING OF THE POSITION LIMIT SWITCH UNIT

Use the internal terminal strip for the position sensor limit switch, potentiometer and rotary encoder wiring. Use shielded wire for the rotary encoder signals.
POSITION DETECTION INTERNAL LS

Use a Position detection internal LS when there is no space to install external stroke adjustment LS unit, or you want to use it combined with a Potentiometer and/or a Rotary encoder.

- When the two are attached (K2): The arrangement is as for micro switches LS1 and LS2 in the drawing on the previous page.
- When four are attached (K4): The arrangement is as for micro switches LS1, LS2, LS3 and LS4 in the drawing on the previous page.

LS settings
To adjust the operating position, first operate the G series Power Cylinder, then adjust the LS cam and make the setting taking into account the amount of coating. Use a hexagonal wrench (1.5) to loosen the LS cam’s two hexagonal socket set screws and to make the adjustment. (See the illustration on the right.)

* The limit switches are not set before shipping. Upon delivery, please set them into suit your equipment.

ENCODER SPECIFICATIONS

Output voltage: 5V Power Source (10% to 90% max.)
Output resistance: Load resistance 2.0kΩ
Signal accuracy: Cycle error: less than 0.1 cycles
Light source: LED, Infrared
Light receiver: Photodetector
Operating temperature: 0°C to +50°C
Storage temperature: -20°C to +80°C
Humidity: Less than 85% relative humidity (RH), (With no condensation)
Vibration: 30g in x, y, z direction (3 times)
Shock: 50G in x, y, z direction (3 times)

1. Please use the limit switches to make the origin setting.
2. External loads should not exceed allowable loss P.

POTENTIO-CONTROL OPTION

STROKE DISPLAY METER

Type: RM-608 (DC100µA)
Class: JIS C 1102 2.5 class
Appearance: Framed back
Scale specifications: Full stroke 100% display

PRINTED CIRCUIT BOARD

Please adjust the meter using the ADJUST controls located on the PCB. Do not get + and – confused on the stroke meter. To have the meter display 100% when at its minimum value, switch terminals 1 and 2 on the PCB.

R CONTROLLER

The signal from the potentiometer located inside the G series Power Cylinder position detection mechanism is digitized for display and stroke control. An internally mounted scaling mechanism can display the actual stroke and the degree of extension (%). Direct connection of the R controller to the potentiometer is possible.

METER RELAY

Stroke adjustment can be easily performed from the control panel. (The steel panel attachment is standard. Please indicate if an aluminum panel is desired.)

Note: When using a TC unit, etc. (4 to 20 mA output), please indicate, “For 4 to 20 mA output.”
The G series Power Cylinder comes equipped with a potentiometer. Use caution when installing; if the screw is turned, stroke and phase settings will be thrown off. Using the limit switches, adjust the minimum and maximum application stroke setting before using the meter relay.

PRINTED CIRCUIT BOARD
Same as the stroke meter PCB.

RELAY OPERATION
(NORMALLY CLOSED CONTACT)
The meter relay's wiring is the same as that of the stroke meter except that a separate power supply is necessary. Please use one of the other power sources. Direct connection of the output contact (normally closed) with the LS stroke adjustment normally closed, contact is simple.

SHOCK RELAY
We recommend a Shock Relay as the electric safety device for GB type Power Cylinder.

ROTARY ENCODER OPTIONS
PULSE COUNTER
This counter is capable of displaying the pulse count from the rotary encoder in addition to sending relay output. With its prescale function, the actual amount of movement can also be displayed. For stroke control and other uses, please use it in conjunction with a self-protecting circuit.

* If there is a power failure, counting is not possible, so do not attempt to move the jack. We recommend that external stroke adjusting limit switches also be used.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>OMRON H7CS-CW (± area type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Preset counter</td>
</tr>
<tr>
<td>Protective construction</td>
<td>IP54F (panel display section)</td>
</tr>
<tr>
<td>Prescale function</td>
<td>Yes (0.001 to 99.999)</td>
</tr>
<tr>
<td>Display type</td>
<td>Backlit, 7-segment LCD</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>AC100 to 240V (50/60Hz)</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Approx. 6.0VA (at AC 250V, 50Hz)</td>
</tr>
<tr>
<td>Control output</td>
<td>Contact: AC 250V 3A (cos ϕ = 0.8 to 1)</td>
</tr>
<tr>
<td>External power supply</td>
<td>DC 12V ±10%, 100mA (less than 5% ripple)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10 to + 55 °C (Not to be frozen)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25 to + 65 °C (Not to be frozen)</td>
</tr>
<tr>
<td>Humidity</td>
<td>35 to 80% RH</td>
</tr>
</tbody>
</table>

REFERENCE CIRCUITS
### DIMENSIONS STRAIGHT TYPE

**LPGA070~300**

**(BASIC MODEL)**

- **Cable dia.:** ø11~ø13 PF12
- **Dimensions in mm**

**LPGC070~300**

**(WITH THRUST DETECTION UNIT)**

- **Cable dia.:** ø11~ø13 PF12
- **Cable length:** ø10~ø13 PF12

### DIMENSIONS PARALLEL TYPE

**LPGA070~300**

**(BASIC MODEL)**

**LPGB070~300**

**(WITH SLIP CLUTCH)**

- **Cable dia.:** ø11~ø13 PF12
- **Dimensions in mm**

### OPTION

#### STROKE ADJUSTING LS

- **Trunnion Mounting Adaptor (LPGA300-T)**
- **I Type End Fitting (LPGA300-I)**

#### BELLOWS (-J)

- **Trunnion Mounting Adaptor (LPGA300-T)**
- **I Type End Fitting (LPGA300-I)**

#### CLEVIS MOUNTING ADAPTOR (LPTB500-C)

---

Note: Mechanical Stroke has a room for 3 ~ 8mm at each stroke end against XA dimensions.

---

Note: Mechanical Stroke has a room for 3 ~ 8mm at each stroke end against XA dimensions.
**VARIATION OF DIRECTION AND POSITION OF MOTOR TERMINAL BOX**

**DIRECTION OF MOTOR TERMINAL BOX**
Direction of the motor terminal box can be installed as one of the four (4) directions shown below. It can be easily changed by the user.

1. Remove the lid of the terminal box.
2. Remove the 2 screws tightening the terminal.
3. Lift the terminal without detaching the wiring to the motor and brake. Then take off the 4 screws fixing the terminal box.
4. Rotate the terminal box for the required direction and fix.
5. Install terminal.
6. Wire the cable from the power source and replace the lid on the terminal box.

When you fix the terminal box, please check that the rubber packing is inserted correctly and firmly tighten the screw.

**POSITION OF MOTOR TERMINAL BOX**
Position of the motor terminal box can be rotated at 90 degrees intervals as shown below. However, please do not perform this yourself. Please inform Tsubaki of the desired position when ordering.

---

**ADJUSTMENT FOR EXTERNAL LS AND VARIATIONS OF INSTALLATION**

**1. STANDARD INSTALLATION**

- Straight
- Parallel

**2. ADJUSTMENT METHOD**

G series Power Cylinder has a room from 3 to 8 mm at both stroke end as mechanical stroke. However it should be used within XA dimensions. Please adjust the limit switches to operate within XA dimensions. If you operate over XA dimensions, The LS striker will come off from LS guide rail. When you adjust limit switches, please adjust and fix each limit switch to avoid lag of relative position between Power Cylinder body and LS guide rail.

1. Loosen set screw for LS flange (A) and LS guide rail (B).
2. Slide a flange to its required position.
3. Tighten the set screw for LS guide rail (B) first.
4. Tighten the set screw for LS flange (A) without twist between LS guide rail and LS rod.

**3. VARIATION OF INSTALLATION**

LS setting for standard and emergency use.

Install 3LS

Different position and direction

**4. INSTALLATION OF EXTERNAL LS**

- Tsubaki has an installation manual for changing direction and quantity of LS. Please consult Tsubaki.
- The direction of LS installation is free. Do not allow dust or mud on the LS guide rail for smooth operation of LS strikers.
**T Series TB type, TC type**

**TB type (Built-in Slip Clutch)**

- Slip clutch type (economical)
- An internal slip clutch is built-in as an overload protection device. The slip clutch is activated when the thrust load exceeds the preset level. The special friction facing provides smooth operation when overloading or overrunning at the stroke end.

*Tsutaki Shock Relay is recommended when the electrical signal for overloading is required for TB type.*

**TC type (Built-in Thrust Detection System)**

- Thrust detection unit type
- An internal thrust detection system consisting of two types of disk spring with different spring rate and cam operated limit switches provides the electrical signal to stop the motor when thrust load exceeds the preset level. (For thrust rating 6 tons and over, only one type of spring is used)

This unique system is suitable for the following even for high-speed operation.
1) Press (or pull) stopping
2) Internal stopping at the mechanical stroke end
3) Electrical signal is required when overloading
4) In case overload acts to the POWER CYLINDER when stopping (Internal springs absorb the shock load)

**SPECIFICATIONS**

TB and TC type have the same basic function (Thrust, Speed and Stroke) and have the following features for thrust limiting mechanism.

- **TB type:** Slip clutch type (economical)
  - An internal slip clutch is built-in as an overload protection device. The slip clutch is activated when the thrust load exceeds the preset level.
  - The special friction facing provides smooth operation when overloading or overrunning at the stroke end.
  - *Tsutaki Shock Relay is recommended when the electrical signal for overloading is required for TB type.*

- **TC type:** Thrust detection unit type
  - An internal thrust detection system consisting of two types of disk spring with different spring rate and cam operated limit switches provides the electrical signal to stop the motor when thrust load exceeds the preset level. (For thrust rating 6 tons and over, only one type of spring is used)

This unique system is suitable for the following even for high-speed operation.
1) Press (or pull) stopping
2) Internal stopping at the mechanical stroke end
3) Electrical signal is required when overloading
4) In case overload acts to the POWER CYLINDER when stopping (Internal springs absorb the shock load)

**TC TYPE THRUST DETECTION SYSTEM**

- **Tension Load (Retraction)**
  - Overload during retracting
  - Internal stopping at the backward stroke end
  - Tension is required after stopping

- **Compression Load (Extension)**
  - Overload during extension
  - Internal stopping at the forward stroke end
  - Compression is required after stopping

**INSTRUCTIONS**

1. When using a rotary encoder or potentiometer, LPTC type Power Cylinder uses a spring unit. Therefore, electrical signal of rotary encoder or potentiometer will have some lag due to bending of spring unit when the spring unit is operating. LPTB type Power Cylinder can use rotary encoder or potentiometer without any lag when the slip clutch is operating. LPTC type Power Cylinder can use them when the spring unit does not operate.

2. Overload working during Power Cylinder stopping. LPTC type Power Cylinder cannot be used if the rod has to keep the same position when stopping.

3. When you use LPTC type Power Cylinder for press/pull stopping, the equipment strength required must be more than 250% against the rated thrust of the Power Cylinder.
### SPECIFICATIONS

#### STANDARD SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>Motor</th>
<th>Speed 50/60Hz (mm/sec.)</th>
<th>Motor (kW)</th>
<th>Stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPTB 250</td>
<td>S</td>
<td>12.5/15</td>
<td>0.1</td>
<td>200~600</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>25/30</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>50/60</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>LPTB 500</td>
<td>S</td>
<td>12.5/15</td>
<td>0.1</td>
<td>200~600</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>25/30</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>50/60</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>LPTB 1000</td>
<td>S</td>
<td>12.5/15</td>
<td>0.2</td>
<td>200~600</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>25/30</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>50/60</td>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

#### Brake
- 0.1 - 0.4 kW Motor
- DC Brake
- Separate power supply is available.
- AC 200V is needed for DC Module input

- 0.75 - 11 kW motor
- Separate power supply is available.
- Same voltage as motor for AC Brake input

#### Application data:
1. Power Cylinder type being considered and method of operation
2. Thrust and inertia load
3. Stroke
4. Speed
5. Frequency of use (times/minute)

#### TYPE SELECTION
- Select the type of cylinder to be used based on the operating environment, load condition and the following selection criteria.

#### SELECTION CRITERIA: TB and TC Power Cylinders have the same basic features; thrust, speed, stroke, load, and integral motor.
- The TB type is an economical, light weight, positive displacement linear actuator with slip clutch safety protection. This actuator should be considered when optional position feedback if position accuracy is critical.

- The TC type provides thrust detection in tension and compression of the Power Cylinder at 150 – 200% of rated load without damage to the Power Cylinder (providing that power source is coupled to thrust detection circuit). The unique thrust detection mechanism employed also provides for moderate shock loading of the unit without damage. This actuator should be considered for applications that may see shock loads, require electronic overload signal, or when press/pull stopping is required. (See Table 1).

#### MODEL SELECTION
1. Calculate annual running distance.
   \[ \text{Annual Running Distance (km)} = \text{Strokes/minute} \times \text{Operating Days/Year} \]

2. Choose a service factor based on the Power Cylinder, load characteristics and the annual running distance of the Power Cylinder.

3. Multiply the thrust and the load service factors.

4. Using the compensated thrust, stroke, speed and number of cycles, select the appropriate model for your application from the standard models.

#### Table 1 (For high frequency use of thrust detection unit)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>LPTC250-LPTC4000</th>
<th>LPTC4000-LPTC32000</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED</td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>RESISTANCE</td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

#### Table 2 Service Factor

<table>
<thead>
<tr>
<th>Characteristics of the load</th>
<th>Application</th>
<th>Thrust (kg)</th>
<th>Annual running distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniform load</td>
<td>Opening/closing for damper, valve, etc.</td>
<td>1.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Low inertia load</td>
<td>Opening/closing for hopper gate</td>
<td>1.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Medium shock</td>
<td>Looping/loading application, filler, etc.</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Medium inertia load</td>
<td>Buffer for belt conveyors</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Heavy shock/dirt vibration</td>
<td>Heavy loaded cars, etc.</td>
<td>1.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>

#### Ambient Conditions

- Ambient temp: -15°C – 40°C
- Humidity: Below 85%
- Shock: Below 1G
- Altitude: Less than 1000 m
- Outdoor use

#### MOTOR SPECIFICATIONS
- Brake Motor, Enclosed type, Self-cooling type
- 4P 500V/500V/500V 50/60/60Hz
- Insulation class E, 30 min. rating for use (IP54)
- Paint: Munsell 5GY6/0.5

#### MODEL No.

<table>
<thead>
<tr>
<th>T Series Power Cylinder</th>
<th>TB type</th>
<th>TC type</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPTB 1000</td>
<td>L  4 V</td>
<td>L  4 V</td>
</tr>
<tr>
<td>LPTC 1000</td>
<td>L  4 V</td>
<td>L  4 V</td>
</tr>
<tr>
<td>LPTC 1600</td>
<td>L  4 V</td>
<td>L  4 V</td>
</tr>
</tbody>
</table>

#### Operating Environment

- Humidity: Below 85%
- Shock: Below 1G
- Altitude: Less than 1000 m
- Outdoor use

### T Series TB type, TC type

#### Trunnion Mounting Adaptor: Order separately from Power Cylinder

#### Different position of Motor terminal box/L. S.

- Bellowes
  - No mark: STD. End Fitting
  - L: type End Fitting

- C: Weis Adaptor
  - P: Potentiometer
  - R: Rotary Encoder

- L: LS. for stroke adjusting (2pcs.)
- K: Ls. for positioning

Note: If the running distance exceeds that listed above. Please consult Tsubaki.

Note: Separate power supply for brake is recommended for press (pull) stopping. When using the brake the cable may exceed 250% of the maximum thrust produced.
CONFIRMATION OF THE SPECIAL FEATURES

1. Ensure that the frequency of use is kept below the allowable value listed in Table 3. The allowed operating frequency depends on the starting frequency and the work rate and must be within the range specified in the table below. The duty cycle is calculated with the following formula:

\[
\text{Working time rate ED} = \frac{\text{Working Time per cycle}}{\text{Working Time per cycle + stopping time per cycle}} \times 100\%
\]

2. The accuracy of positioning depends upon the stopping method employed.

3. If multiple driving is required, refer to page 30.

4. If TC Type is specified be sure total press stops do not exceed values shown in Table 1 page 26.

Table 3 Allowable Frequency of Operation

<table>
<thead>
<tr>
<th>Model</th>
<th>LPTB</th>
<th>250L</th>
<th>500L</th>
<th>1000L</th>
<th>2000L</th>
<th>4000L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LPTC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of motor starts (cycles/min.)</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Working time rate ED (%)</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: The operating frequency is set by the motor temperature limit not the Power Cylinder. Consult factory if number of starts is greater than listed above.

INERTIA LOAD FOR HORIZONTAL APPLICATIONS

Setting load of the overload protection device is from 150% to 200% against rated thrust of cylinder. When starting with large inertia loads, there is possibility of not smooth operation because over protection device is activated. Refer to Table 4 for the limits. Slow Speed Ranges Power Cylinders are not limited by inertia.

* The internal thrust detection mechanisms are not user adjustable and may vary ±15%.

Car weight : \( w \)

Coefficient of friction : \( \mu \)

Car running resistance : \( F = \mu w \) Rated Thrust

Table 4 Allowable car weight, considering inertia

<table>
<thead>
<tr>
<th>Model</th>
<th>LPTB</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LPTC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowable loading kg</td>
<td>400</td>
<td>500</td>
<td>700</td>
<td>1000</td>
<td>2000</td>
<td>3000</td>
</tr>
</tbody>
</table>

Note: In case of speed "S": it is no problem practically because of slow speed.

SELECTION EXAMPLE

The following is an example of the procedure to be followed when selecting a Power Cylinder. Application Data is required before selecting an individual Power Cylinder. Begin the Selection Process by obtaining the information required on page 32. When data is available follow the selection procedure shown on pages 34 and 35.

APPLICATION DATA

1. Type of application: Damper opening/closing (2 mid-point stops, tension and compression press stopping).

2. Required Thrust: 1,300 kgf.

3. Stroke: 600 mm (0.6m)

4. Speed: 600 mm in about 20 secs (30 mm/sec).

5. Frequency of use: 1 cycle/10 mins. (6 cycles/hr.)

6. Operating time: 10 hrs/day, 250 days/year, 5 years

7. Design life: 5 years

8. Load characteristics: Forward and reverse loading, uniform load

9. Operating conditions: Outdoors, dusty, temp. range 0°C - 35°C

10. Power: 220V, 60Hz-3PH

SELECTION OF POWER CYLINDER

1. Type Selection: Press stopping with internal Limit switch.

The TC type Power Cylinder meets these requirements.

2. Select the Size of Power Cylinder:

   a) Determine Service Factor: Calculate annual running distance.

   \[ 2 \text{ Strokes} \times \frac{0.6 \text{ Meters}}{8 \text{ Cycles}} \times \frac{10 \text{ Hours}}{1 \text{ Cycle}} \times \frac{250 \text{ Days}}{1 \text{ Year}} = 18 \text{ km} \]

   b) Minimum thrust rating = service factor \times \text{required thrust of Power Cylinder}

3. Confirmation of Choice: Based on allowed operating frequency and total press stops.

   Operating Frequency

   \[ \text{Starting Frequency} = \frac{2 \text{ Times}}{10 \text{ Min.}} = \frac{4 \text{ Times}}{4 \text{ Min.}} \]

   Working time rate = \( \frac{600 \text{ mm} \times 2 \times \frac{30 \text{ mm/sec}}{60 \text{ Sec/Min}}}{10 \text{ Min.}} \times \frac{100\%}{6.7\%} \times 25\% \)

   Total Press Stops = \( \frac{2 \text{ Stops}}{6 \text{ Cycles}} \times \frac{10 \text{ Hours}}{1 \text{ Cycle}} \times \frac{250 \text{ Days}}{1 \text{ Year}} \times 5 \text{ Years} = 15 \times 10^3 \times 30 = 10^7 \)
**BRAKE HOLDING POWER**
The load holding strength of the brake exceeds the rated thrust of the Power Cylinder so loads can be safely and securely held by the brake. This holding power is generated by the motor brake. While in operation the brake uses spring power and generates holding power that exceeds 150% of the rated torque of the motor.
Caution: Overload of TB Power Cylinder will result in loss of brake – unit may free-fall.

**BRAKE STOPPING**
Using either limit switches or push button control, multiple positioning including mid-point, upper and lower point stopping are possible. Stopping accuracy and coasting distance depend upon the load size and drive speed. When using multi-positioning, it is recommended that either low operating speed be used or that the brake be wired separately from the motor. When setting the limit switches, please consider the over travel of the rod. (see Table 5)

**COASTING AND STOPPING ACCURACY**
The following chart provides coasting and stopping data for the T-Series at full load.

<table>
<thead>
<tr>
<th>Table 5 Coasting and Stopping Accuracy Table</th>
<th>Lifting</th>
<th>Lowering</th>
<th>Lifting</th>
<th>Lowering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>LPTB 250</td>
<td>2.2</td>
<td>±0.4</td>
<td>3.0</td>
<td>±0.6</td>
</tr>
<tr>
<td>LPTC 100</td>
<td>4.0</td>
<td>±0.8</td>
<td>8.5</td>
<td>±2.1</td>
</tr>
<tr>
<td>LPTC 320</td>
<td>6.0</td>
<td>±1.4</td>
<td>12.4</td>
<td>±3.2</td>
</tr>
<tr>
<td>LPTC 160</td>
<td>13.7</td>
<td>±2.7</td>
<td>27.3</td>
<td>±5.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5</th>
<th>Coasting and StoppingAccuracy</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPTB 500</td>
<td>2.1</td>
<td>±0.4</td>
<td>3.1</td>
<td>±0.9</td>
<td>1.9</td>
<td>±0.5</td>
<td>2.7</td>
<td>±0.5</td>
<td></td>
</tr>
<tr>
<td>LPTC 700</td>
<td>3.6</td>
<td>±0.7</td>
<td>6.1</td>
<td>±1.6</td>
<td>3.1</td>
<td>±0.6</td>
<td>5.6</td>
<td>±1.4</td>
<td></td>
</tr>
<tr>
<td>LPTC 1600</td>
<td>8.1</td>
<td>±1.3</td>
<td>14.4</td>
<td>±3.0</td>
<td>5.9</td>
<td>±1.2</td>
<td>10.9</td>
<td>±2.7</td>
<td></td>
</tr>
<tr>
<td>LPTC 2000</td>
<td>12.1</td>
<td>±2.1</td>
<td>22.3</td>
<td>±5.9</td>
<td>10.2</td>
<td>±2.0</td>
<td>19.8</td>
<td>±5.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 6</th>
<th>Coasting and Stopping Accuracy</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPTB 250</td>
<td>1.7</td>
<td>±0.4</td>
<td>2.8</td>
<td>±0.7</td>
<td>1.5</td>
<td>±0.5</td>
<td>2.5</td>
<td>±0.6</td>
<td></td>
</tr>
<tr>
<td>LPTC 500</td>
<td>3.2</td>
<td>±0.7</td>
<td>5.4</td>
<td>±1.4</td>
<td>2.9</td>
<td>±0.8</td>
<td>5.1</td>
<td>±1.2</td>
<td></td>
</tr>
<tr>
<td>LPTC 1000</td>
<td>6.3</td>
<td>±1.4</td>
<td>10.2</td>
<td>±2.6</td>
<td>5.0</td>
<td>±1.0</td>
<td>8.8</td>
<td>±2.2</td>
<td></td>
</tr>
<tr>
<td>LPTC 2000</td>
<td>10.5</td>
<td>±2.1</td>
<td>18.4</td>
<td>±4.2</td>
<td>10.4</td>
<td>±2.0</td>
<td>22.1</td>
<td>±5.3</td>
<td></td>
</tr>
</tbody>
</table>

**ACCURACY IN MULTIPLE DRIVING**
Speed change due to load variation is up to 5% for each Power Cylinder. The possible stopping inaccuracies are listed in Table 6, page 29.

**CONTROL**
When starting, connect power to all motors at the same time. When stopping, use the limit switches attached to each device. Avoid using one limit switch to control all of the devices as error will accumulate. (see Dia. 1)

**SIDE AND ECCENTRIC LOADING**
Do not apply eccentric or side loading to the cylinder. When eccentric or side loading is present, install the device to insure that no direct moment is applied to the cylinder rod.

**INSTALLATION POSITION**
Power Cylinders may be installed in any position

**MANUAL CONTROL**
To manually adjust the stroke, remove the load from the actuator, release the brake of the brake motor then turn the shaft of the motor pinion on the gear box with a wrench or a socket wrench.

**ROD ANTI ROTATION**
Accompanying the thrust of the actuator rod there is a reaction torque. Generally, connection to the driven load prevents rotation.

**SIDE LOADS ON THE ROD**
Install the device so that bending moments are not applied to the actuator rod. Permanent damage to the Power Cylinder may result.

**SETTING THE EXTERNAL STROKE ADJUSTMENT LIMIT SWITCHES**
- Refer to Table 5 page 37, then set the limit switches based on the expected coasting.
- When the full nominal stroke is to be used, set the limit switches so that stopping occurs within theXA dimension limit taking in to consideration coasting (XA dimension see pages 47-50).
- When multiple cylinders are to be used for driving, use limit switches on each cylinder to control the upper and lower stroke limits.

**INSTALLATION**
As illustrated in Diagram 1, multiple driving is possible to distribute load in lifting and lowering operations. This arrangement results in low speed variation. When making your selection, please use the formulas to the below.

**Diagram 1**

**Diagram 2**

Refer to the available options listed on pages 51.
**MAINTENANCE**

**BALL SCREW LUBRICANT REPLACEMENT**

Grease must be applied to ball screw. Grease can be injected through the grease port of the cylinder after extending the actuator rod to the forward stroke end.

**RECOMMENDED GREASE**

<table>
<thead>
<tr>
<th>Controller</th>
<th>Shell</th>
<th>Mobil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear Box</td>
<td>Shell Alvania EP No. 1</td>
<td>Mobil EP No. 1</td>
</tr>
</tbody>
</table>

**Lubrication Cycle for Ball Screw**

<table>
<thead>
<tr>
<th>Frequency of start/day</th>
<th>500~1000</th>
<th>100~500</th>
<th>10~100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lubrication cycle</td>
<td>3 to 6 months</td>
<td>6 to 12 months</td>
<td>12 to 18 months</td>
</tr>
</tbody>
</table>

**GEAR BOX LUBRICATION**

The gears and bearing of the speed reducer are lubricated with grease inside the casing. It is unnecessary to apply lubricant more than once a year. If the power cylinder is operated constantly or left unused for long periods of time, the grease condition should be checked.

**WIRING**

**BRAKE MOTOR WIRING (Pre-wiring)**

*SBH type Brake motor 0.1 kW, 0.2 kW, 0.4 kW*

**200V Class**

- Red 3 Green 4
- Yellow 5
- Brown 6

**400V Class**

- Red 3 Green 4
- Yellow 5
- Brown 6

---

**LIMIT SWITCHES SPECIFICATIONS**

**Stroke adjustment Limit Switch (External)**

<table>
<thead>
<tr>
<th>Power Cylinder</th>
<th>Stroke adjustment Limit Switch (External)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sizes</td>
<td>LPTC 250 ~ LPTC 3000D</td>
</tr>
<tr>
<td>Limit Switch</td>
<td>WJCU-2 (OMRON)</td>
</tr>
<tr>
<td>Current</td>
<td>AC 250V 10A (cos ø = 0.4)</td>
</tr>
<tr>
<td>Contact config</td>
<td>NC 1 - 4 NO</td>
</tr>
<tr>
<td>Connection</td>
<td>SCL-10B (φ10.5 - φ12.5) PF12</td>
</tr>
</tbody>
</table>

**Thrust detection Limit Switch**

<table>
<thead>
<tr>
<th>Power Cylinder</th>
<th>Thrust detection Limit Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sizes</td>
<td>LPTC 250 ~ LPTC 3000D</td>
</tr>
<tr>
<td>Limit Switch</td>
<td>WJCU-2 (OMRON)</td>
</tr>
<tr>
<td>Current</td>
<td>AC 250V 10A (cos ø = 0.4)</td>
</tr>
<tr>
<td>Contact config</td>
<td>NC 2 - 3 NO</td>
</tr>
<tr>
<td>Connection</td>
<td>SCL-14A (φ10.5 - φ12.5) PF12</td>
</tr>
</tbody>
</table>

**REFERENCE CIRCUITS (For the motor 0.75kw and bigger)**

**SINGLE ACTION CIRCUITS**

(Separate brake power supply)

**TWO MACHINE MULTIPLE DRIVE CIRCUIT**

(Separate brake power supply)

---

**NOTE:** Please refer to the page 26 for the motor 0.4kw and smaller.
LIMIT SWITCHES

Operating examples of Limit Switch application

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity</th>
<th>Contact configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2</td>
<td>AC 250V 4A (cos φ = 0.4)</td>
<td>1C</td>
</tr>
<tr>
<td>K4</td>
<td>AC 1000V (1 min.)</td>
<td>2C</td>
</tr>
</tbody>
</table>

CAUTION: Overtravel limit switches required.

POTENTIOMETER SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>SF-NKL23A-M (OMRON) or equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maker</td>
<td>Sakae</td>
</tr>
<tr>
<td>Total resistance</td>
<td>1 K Ohm</td>
</tr>
<tr>
<td>Power rating</td>
<td>0.75 W</td>
</tr>
<tr>
<td>Insulation rating</td>
<td>AC 1000V (1 min.)</td>
</tr>
<tr>
<td>Effective electrical angle</td>
<td>355°</td>
</tr>
<tr>
<td>Effective angle of rotation</td>
<td>360° (Infinitely)</td>
</tr>
</tbody>
</table>

The numbers in brackets indicate the terminals.
CONTROL OPTIONS

• Stroke indication meter

To adjust the meter, use the potentiometers on the printed circuit board. If you require the meter to read 100% at minimum stroke, reverse wires 1 and 2.

CIRCUIT BOARD

ROTARY ENCODER

The rotary encoder provides an interface to programmable controllers. It may be used in combination with an AC motor speed controller such as an inverter or servo controller to provide accurate positioning. All Power Cylinders move 1mm/pulse.

ENCODER SPECIFICATIONS

Output method: Incremental
Output pulse number: 60 Pulse/Rev
Output wave form: 90° phase difference
Output voltage: 12V
Power Source: Above 10V
5V Power Source: Above 4V
Output resistance: Above 10KΩ
Signal accuracy: ±1/15P ±1/4P
Power source: DC 4.75V ~ 13.2V 70mA
Frequency response: 20 kHz
Light source: L.E.D.
Light receiver: Phototransistor
Type: SP-405Z or equivalent
Maker: Ono

ENVIRONMENTAL CONDITIONS

Operating temperature: 0°C ~ 50°C
Storage temperature: −20°C ~ +60°C
Humidity: 85% (40°C 8hrs.)
Vibration: 5G (X, Y, Z direction 2 hrs.)
Shock: 50G (X, Y, Z direction 3 times, 10G on the shaft)

INTERNAL WIRING OF THE POSITION LIMIT SWITCH UNIT

Use the internal terminal strip for the position sense limit switch, potentiometer and rotary encoder wiring. Use shielded wire for the rotary encoder signals.

OUTPUT WAVE FORMS

Position Limit Switch (Internal)

Potentiometer

Rotary Encoder
POWER CYLINDER STROKE CONTROL

There are a variety of methods by which stroke control may be achieved. The position accuracy of the Power Cylinder varies depending upon stroke, speed, load size, load inertia, direction (vertical, inclined, etc.) and brake wiring. Further, some limitations may result due to the operating conditions. The following is a general guide to the types of control available.

LIMIT SWITCHES

Two types of limit switches are available:
- External - stroke adjustment for upper and lower position setting.
- Internal - Built-in switches control mid-point position setting.
Combination of both external and internal may be selected by using K4 switch shown on page 42. Accuracy will improve as speed is lowered.

PRESS STOPPING

(TC type using thrust sensing limit switches)
When using press or pull stopping, mechanical stopping is employed at both ends with a thrust sensing limit switch to control the drive. This mechanical stopping allows good positioning accuracy.

CAUTION: Overtravel limit switches required.

POTENTIOMETER CONTROL

Potentiometer control is used when free adjustment of the stroke is required. In general, as the speed is reduced, accuracy of operation will improve. To protect against stroke overrun, it is recommended that stroke adjustment limit switches be used.

CAUTION: Overtravel limit switches required.

ROTARY ENCODER CONTROL (ABSOLUTE CONTROL) ONE DIRECTION

Use the rotary encoder with a programmable controller, with an attached counter. A limit switch is used to initiate counting. An externally installed adjustable limit switch is recommended.

Direct control method

To provide absolute position control, external limit switches may be used to trigger the counter/control circuitry in the programmable controller.

B: Separately wired brake
M: Motor
RE: Rotary Encoder
LS: External Stroke Adjustment Limit Switch

This system switches the motor off when the signal is received from the limit switch. The rod speed then decreases as it coasts towards the final stop position. When the stop position is reached the brake is applied as the rod speed decreases providing accurate positioning.

CAUTION: Overtravel limit switches required.

MOTOR SPEED CONTROL

Absolute position control with acceleration and deceleration can be provided by using an A.C. inverter coupled to the programmable controller to control motor speed.

B: Separately wired brake
M: Motor
RE: Rotary Encoder
LS: External Stroke Adjustment Limit Switch

CAUTION: Overtravel limit switches required.

No matter what control method is used, where high inertia loads are to be driven horizontally or lifted or lowered vertically it is required that provision be made for control of the acceleration and deceleration rates. Failure to provide system control may result in damage to equipment or personal safety.
**Ultra Heavy Duty Series**

**OPTIONS**

**CLEVIS MOUNTING ADAPTOR**

<table>
<thead>
<tr>
<th>Power Cylinder Size</th>
<th>Size No. of Clevis</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K (max)</th>
<th>L</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPT500S LPT1000C</td>
<td>120</td>
<td>12.5</td>
<td>25</td>
<td>20</td>
<td>40</td>
<td>10</td>
<td>130</td>
<td>150</td>
<td>25</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>LPT500S LPT1000C</td>
<td>140</td>
<td>15</td>
<td>30</td>
<td>25</td>
<td>40</td>
<td>12</td>
<td>140</td>
<td>150</td>
<td>25</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>LPTB500-C</td>
<td>170</td>
<td>17.5</td>
<td>30</td>
<td>25</td>
<td>40</td>
<td>15</td>
<td>170</td>
<td>200</td>
<td>25</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>LPTB500-C</td>
<td>200</td>
<td>20</td>
<td>40</td>
<td>20</td>
<td>50</td>
<td>20</td>
<td>200</td>
<td>230</td>
<td>40</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>LPT250S LPT500S</td>
<td>240</td>
<td>24</td>
<td>40</td>
<td>25</td>
<td>50</td>
<td>25</td>
<td>240</td>
<td>270</td>
<td>40</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>LPT250S LPT500S</td>
<td>260</td>
<td>26</td>
<td>40</td>
<td>25</td>
<td>50</td>
<td>25</td>
<td>260</td>
<td>290</td>
<td>40</td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>LPT250S LPT500S</td>
<td>300</td>
<td>30</td>
<td>50</td>
<td>30</td>
<td>60</td>
<td>30</td>
<td>300</td>
<td>330</td>
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<td>25</td>
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<td>LPT250S LPT500S</td>
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<td>32</td>
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<td>60</td>
<td>30</td>
<td>320</td>
<td>360</td>
<td>50</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>LPT250S LPT500S</td>
<td>350</td>
<td>35</td>
<td>50</td>
<td>35</td>
<td>65</td>
<td>35</td>
<td>350</td>
<td>380</td>
<td>50</td>
<td>35</td>
<td>32</td>
</tr>
<tr>
<td>LPT250S LPT500S</td>
<td>380</td>
<td>38</td>
<td>50</td>
<td>38</td>
<td>65</td>
<td>38</td>
<td>380</td>
<td>420</td>
<td>50</td>
<td>38</td>
<td>36</td>
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</table>

**TRUNNION MOUNTING ADAPTOR**

<table>
<thead>
<tr>
<th>Power Cylinder Size</th>
<th>Size No. of Trunnion</th>
<th>AY</th>
<th>BY</th>
<th>FY</th>
<th>FT</th>
<th>HY</th>
<th>K</th>
<th>M</th>
<th>N</th>
<th>R</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPT500S LPT1000T</td>
<td>130</td>
<td>180</td>
<td>15</td>
<td>16</td>
<td>150</td>
<td>50</td>
<td>40</td>
<td>25</td>
<td>25</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>LPT500S LPT1000T</td>
<td>130</td>
<td>180</td>
<td>15</td>
<td>15</td>
<td>150</td>
<td>50</td>
<td>40</td>
<td>25</td>
<td>25</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>LPT500S LPT1000T</td>
<td>150</td>
<td>200</td>
<td>15</td>
<td>26</td>
<td>170</td>
<td>40</td>
<td>40</td>
<td>25</td>
<td>25</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>LPT4000S LPT8000C</td>
<td>240</td>
<td>240</td>
<td>30</td>
<td>30</td>
<td>240</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>LPT4000S LPT8000C</td>
<td>240</td>
<td>240</td>
<td>30</td>
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<td>240</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>LPT4000S LPT8000C</td>
<td>240</td>
<td>240</td>
<td>30</td>
<td>30</td>
<td>240</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>LPT4000S LPT8000C</td>
<td>240</td>
<td>240</td>
<td>30</td>
<td>30</td>
<td>240</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

**BELLOWS**

<table>
<thead>
<tr>
<th>Model No</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPT450C</td>
<td>90</td>
</tr>
<tr>
<td>LPT650C</td>
<td>120</td>
</tr>
<tr>
<td>LPT850C</td>
<td>135</td>
</tr>
<tr>
<td>LPT1000C</td>
<td>150</td>
</tr>
<tr>
<td>LPT1200C</td>
<td>160</td>
</tr>
<tr>
<td>LPT1500C</td>
<td>180</td>
</tr>
<tr>
<td>LPT2000C</td>
<td>210</td>
</tr>
<tr>
<td>LPT3000C</td>
<td>250</td>
</tr>
</tbody>
</table>

**END FITTING**

<table>
<thead>
<tr>
<th>Power Cylinder Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPT250C LPT500C</td>
<td>35</td>
<td>25</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>LPT650C LPT1000C</td>
<td>46</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>LPT1200C LPT1500C</td>
<td>60</td>
<td>30</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>LPT2000C LPT3000C</td>
<td>75</td>
<td>50</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

**AVAILABLE DESIGN RANGE**

<table>
<thead>
<tr>
<th>Model</th>
<th>Thrust (kgf)</th>
<th>Speed mm/sec</th>
<th>Stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPT6000L</td>
<td>600</td>
<td>10/12</td>
<td>1000 ~ 3000</td>
</tr>
<tr>
<td>LPT6000M</td>
<td>600</td>
<td>1000 ~ 3000</td>
<td></td>
</tr>
</tbody>
</table>

Please supply us your requirement including application, duty cycle, actual thrust force, speed, stroke and atmosphere. We will design the best matched Power Cylinder for you.

---

**Example of dimension:**

Size: LPT6000L10

---

**Example of dimension:**

Size: LPT90000M20

---

**Example of dimension:**

Size: LPT4000S LPT8000C
**Cylinder**
- Ball screws convert rotary motion into linear motion. Cylinder stroke can be adjusted by an externally mounted limit switch.
- Limit switches for outdoor use are available.
- Bellows are available for additional protection for outdoor use.
- Integral dust seal for cylinder rod is rated for outdoor use.

**Gear Box**
- Heat treated spiral bevel gears for tough dependable performance.
- Cradle movement is also possible with multiple cylinder operation.
- Low Maintenance.
- Leak Proof

**LPTB and LPTC Features**

**TB Type Features**
- Economical ball screw drive.
- Light weight and compact.
- During stopping, rod position is kept stationary by driver source brake.

**TC Type Features**
- Press-loaded stopping, stroke and self-stopping (Consult Tsubaki).
- Electrical overload indication (optional).
- When Power Cylinder is stopped, this mechanism allows absorption of shock or overload from driven side.

**Thrust Limiting Mechanism Available – TC Type**
The TC Power Cylinder utilizes an internal thrust detection system. This unique system is employed to detect thrust loading providing electrical feedback that allows press/pull stopping. Two types of disk springs with different spring rates are coupled with cam operated limit switches, which result in a system that will allow press stopping during high speed operation in both tension and compression of the Power Cylinder. (For thrust ratings in excess of 6 tons only one type of spring is used.)

---

*The internal thrust detection mechanisms are not user adjustable and may vary ±15%.

---

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---

---
55. The brake must be connected to the power source cylinder.

1. If motor is larger than required, it will cause damage to the

\[ \eta = \frac{P_{\text{Max}}}{P_{\text{Min}}} \times 10^2 \]

kw = Motor capacity (kw)
V = Velocity (m/s)

Efficiency of other elements, such as gear reducers, must also be taken into consideration.

Note:
1. If motor is larger than required, it will cause damage to the cylinder.
2. The brake must be connected to the power source separately from the motor.
MAINTENANCE
BALL SCREW LUBRICANT REPLACEMENT
Greas must be applied to ball screw. Grease can be injected
through the grease port of the cylinder after extending the actuator
rod to the forward stroke end.

Recommended Grease

<table>
<thead>
<tr>
<th>Ball screw</th>
<th>SHELL</th>
<th>SHELL ALVANIA EP No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOBIL</td>
<td>MOBILUX EP No. 2</td>
</tr>
</tbody>
</table>

Lubrication Cycle for Ball Screw

<table>
<thead>
<tr>
<th>Frequency (starts/day)</th>
<th>500–1000</th>
<th>100–500</th>
<th>10–100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lubrication Cycle</td>
<td>3 to 6 months</td>
<td>6 to 12 months</td>
<td>12 to 18 months</td>
</tr>
</tbody>
</table>

WIRING

An example wiring diagram is shown here. For reference only, All Limit Switches in series.

LIMIT SWITCHES SPECIFICATIONS

<table>
<thead>
<tr>
<th>Power Cylinder</th>
<th>Stroke adjustment Limit Switch (External)</th>
<th>Thrust detection Limit Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPTB, LPTC</td>
<td>LPTC 250 ~ LPTC 32000</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>AC 250V 10A (cos φ = 0.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 250V 10A (cos φ = 0.4)</td>
<td></td>
</tr>
<tr>
<td>Contact configuration</td>
<td>NC 1  →  4 NO</td>
<td>NC 1  →  4 NO</td>
</tr>
<tr>
<td></td>
<td>NC 2  →  3 NO</td>
<td>NC 2  →  3 NO</td>
</tr>
<tr>
<td>Connection</td>
<td>SCS-10B (φ 10.5 ~ φ 10.5) FR1/2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SCS-14A (φ 12.5 ~ φ 12.5) FR1/2</td>
<td></td>
</tr>
</tbody>
</table>

APPLICATION INFORMATION

1. SYNCHRONOUS OPERATION
The Multi-cylinder allows synchronous operation of several units. The above diagrams illustrate some possible installation options.

2. OVERLOAD PROTECTION
When a LPTB type is used, a torque limiter coupling is recommended on the motor output shaft to protect against overload. A torque limiter coupling is not necessary for the LPTC type, however, thrust detectors for each Power Cylinder must be individually wired to the power source, separate from the motor.

3. STROKE ADJUSTMENT
Stroke is limited by external limit switches at both ends. Limit switches are available for mounting to Power Cylinder body. Rod "coasting" distance must be considered when determining proper positioning of limit switches. All upper and lower limit switches must be wired in series.

4. ROD ROTATION REACTION TORQUE
The thrust of the actuator rod creates a reaction torque. Generally, connection to the driven load prevents rotation. If the actuator rod end piece is required to rotate freely or if the actuator rod is used to drive a rolling car or to pull a load with a wire rope or chain, please contact Tsubaki.

5. THRUST DETECTOR
Proset thrust detector setting of LPTC Series Power Cylinder is 150% of rated thrust and the safety device does not operate during normal turning, inclining and lifting motion starts. However, in applications with a heavy load or vehicle, the safety device may be triggered during starting or cutting off operation. Please consult Tsubaki.

6. ALIGNMENT
Proper alignment of trunnion and rod end centers is very important, and care must be taken to ensure it is done correctly. A side load must not be applied to the cylinder during operation.

Table 1 Allowable overhung load

<table>
<thead>
<tr>
<th>Size - LPTB, LPTC</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
<th>6000</th>
<th>7000</th>
<th>8000</th>
<th>9000</th>
<th>10000</th>
<th>11000</th>
<th>12000</th>
<th>13000</th>
<th>14000</th>
<th>15000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowable O.H.L (kgf)</td>
<td>56</td>
<td>108</td>
<td>199</td>
<td>356</td>
<td>463</td>
<td>619</td>
<td>693</td>
<td>903</td>
<td>1140</td>
<td>1340</td>
<td>1780</td>
<td>2080</td>
<td>2500</td>
<td>2800</td>
<td>3200</td>
<td>3600</td>
</tr>
<tr>
<td>Load position factor: Lf</td>
<td>0.5</td>
<td>0.6</td>
<td>0.75</td>
<td>1.0</td>
<td>1.35</td>
<td>1.65</td>
<td>2.00</td>
<td>2.50</td>
<td>3.00</td>
<td>3.50</td>
<td>4.00</td>
<td>4.50</td>
<td>5.00</td>
<td>5.50</td>
<td>6.00</td>
<td>6.50</td>
</tr>
</tbody>
</table>

7. FLOATING SHAFT
Long floating shafts may induce vibration. Shaft rigidity and backlash of coupling must be carefully checked.

8. COUPLING
Chain, gear, and flange type couplings are recommended for connecting input shaft.

9. OVERHUNG LOAD (O.H.L)
Be sure that overhung load is below the limit (Table 1) before installing gears, sprockets and pulleys on a shaft.

An example wiring diagram is shown here. For reference only, All Limit Switches in series.
### DIMENSIONS

<table>
<thead>
<tr>
<th>Size</th>
<th>Stroke</th>
<th>Length</th>
<th>Input shaft</th>
<th>Input bracket</th>
<th>Gear housing</th>
<th>Bracket</th>
<th>End fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPTB 500</td>
<td>300</td>
<td>570</td>
<td>675</td>
<td>780</td>
<td>885</td>
<td>990</td>
<td>1100</td>
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<tr>
<td>300</td>
<td>570</td>
<td>675</td>
<td>780</td>
<td>885</td>
<td>990</td>
<td>1100</td>
<td>2200</td>
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<tr>
<td>400</td>
<td>670</td>
<td>785</td>
<td>890</td>
<td>1000</td>
<td>1105</td>
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<td>2350</td>
</tr>
<tr>
<td>500</td>
<td>770</td>
<td>885</td>
<td>990</td>
<td>1100</td>
<td>1225</td>
<td>1350</td>
<td>2500</td>
</tr>
<tr>
<td>1000</td>
<td>1220</td>
<td>1350</td>
<td>1485</td>
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<td>2615</td>
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<tr>
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<td>3690</td>
<td>3990</td>
<td>4300</td>
<td>4600</td>
<td>7160</td>
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</tbody>
</table>

### OPTION

**Bel lows**
- **LPTB 500** — 4 J
- **LPTB 500 B** — T

**Trunnion**
- **LPTB Series**
- **LPTB Multi Series**

### TRUNNION ADAPTER DIMENSIONS

<table>
<thead>
<tr>
<th>Size</th>
<th>Stroke</th>
<th>Length</th>
<th>Input shaft</th>
<th>Input bracket</th>
<th>Gear housing</th>
<th>Bracket</th>
<th>End fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPTB 500</td>
<td>790</td>
<td>895</td>
<td>1000</td>
<td>1105</td>
<td>1220</td>
<td>1350</td>
<td>2350</td>
</tr>
<tr>
<td>300</td>
<td>790</td>
<td>895</td>
<td>1000</td>
<td>1105</td>
<td>1220</td>
<td>1350</td>
<td>2350</td>
</tr>
<tr>
<td>400</td>
<td>895</td>
<td>1000</td>
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<td>1220</td>
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<td>2350</td>
<td>2550</td>
</tr>
<tr>
<td>500</td>
<td>1000</td>
<td>1105</td>
<td>1220</td>
<td>1350</td>
<td>2350</td>
<td>2550</td>
<td>3150</td>
</tr>
<tr>
<td>1000</td>
<td>1650</td>
<td>1855</td>
<td>2060</td>
<td>2265</td>
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<td>2675</td>
<td>5270</td>
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<tr>
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<td>2800</td>
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<td>3380</td>
<td>3680</td>
<td>4020</td>
<td>4400</td>
<td>5560</td>
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<tr>
<td>4000</td>
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<td>5430</td>
<td>5780</td>
<td>6320</td>
<td>6900</td>
<td>7850</td>
</tr>
</tbody>
</table>

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**Notes:**
- Sizes may vary depending on specific application requirements.
- Always consult the manufacturer for the most accurate and up-to-date information.
- Diagrams and technical specifications provided for illustrative purposes only.
product please thoroughly read the “handling manual” and correctly operate the product. The product information contained in this catalog is mainly to assist in selection of machinery. Before using this •

• To be designed as per request

• Available upon request (M.T.O).

• Available


Caution
• To avoid danger please comply with the below points

  • Do not release the brake when the Power Cylinder is supporting a load. If the brake is released when under loaded conditions, suspended objects may fall or movable parts may suddenly move.
  • When manually operating the Power Cylinder by the manual shaft, make sure that the Power Cylinder is not supporting a load. Operate the Power Cylinder according to the handling manual.
  • When using for suspended operations, provide safety shelving to prevent falling and never stand under the cylinder when in operation.
  • Observe the Labor Safety & Hygiene Regulations, General Criteria, Paragraph 1, Chapter 1, Edition 2, or your local regulations of such.
  • Installation, removal, maintenance and inspection:
    - Carry out operation according to the handling manual.
    - When performing electrical wiring, observe Laws and Regulations such as Electricity Equipment Criteria and Extension Rules, as well as following cautions (Ex. direction, space, operating conditions, etc) indicated in the handling manual.
    - Especially, follow the instructions with regard to grounding so as to prevent electric shocks.
    - Shut down the power source and make sure that power will not be turned on accidentally (Ex. Power lock etc.).
    - Wear the proper work clothes and protective accessories (safety glasses, gloves, safety shoes, etc.).

Warning
To avoid accidents please comply with the below points

• Always operate within the allowable stroke range. Operating the Power Cylinder outside the allowable stroke range may result an accident.
  • Before switching on the power, make sure that the limit switches have been wired correctly and the stroke has been adjusted correctly.
  • Operate the Power Cylinder within correct electrical voltage range. Operating the Power Cylinder outside this range may result in motor burnout or fire.
  • Efficiency and functioning of parts may lessen with wear and age. Carry out periodic inspection as set out in the handling manual. When functioning or efficiency is defective please contact a Tsubaki distributor for repairing.

Warning
To avoid accidents please comply with the below points

• Always operate within the allowable stroke range. (Ex. Power lock etc.).
• Wear the proper work clothes and protective accessories (safety glasses, gloves, safety shoes, etc.).

Caution
The product information contained in this catalog is mainly to assist in selection of machinery. Before using this product please thoroughly read the “handling manual” and correctly operate the product.