IKO Selection of Precision Positioning Table

IKO Precision Positioning Table should be selected taking the points related to the required conditions into careful consideration. Typical selection procedure is shown below.

**1. Check for operational condition**
- Stroke length to be used
- Mounting space (height, width, length)
- Mounting direction
- Applied load size and direction
- Operation pattern
- Operating environment

**2. Check for the required accuracy**
- Positioning accuracy
- Positioning repeatability
- Parallelism in table motion A, B
- Straightness
- Squareness

**3. Temporary selection of table model**
- Feeding mechanism of slide table
- Size
- Stroke length
- Number of axes

**4. Temporary selection of motor**
- Type and size of motor
- Ball screw lead
- Maximum number of revolutions of the motor
- Encoder specification

**5. Final checking**
- Re-check for operational condition
- Cost and delivery
- Additional machining
- Special table

**6. Consideration of system**
- Selection of controller
- With or without sensor
- Connection cord
- Interface with external devices

**7. Consideration of operation patterns**
- Marginal acceleration time
- Effective torque
- Inertia
- Positioning time

**8. Consideration of system**
- Selection of controller
- With or without sensor
- Connection cord
- Interface with external devices

---

**IKO Characteristics of Precision Positioning Table**

<table>
<thead>
<tr>
<th>Series</th>
<th>Model</th>
<th>Stroke length mm</th>
<th>Positioning repeatability</th>
<th>Positioning accuracy</th>
<th>High speed</th>
<th>Rigidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision Positioning Table TE</td>
<td>TE-B</td>
<td>50 ~ 800</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Precision Positioning Table TU</td>
<td>TU</td>
<td>30 ~ 1400</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Precision Positioning Table L</td>
<td>TSL-M</td>
<td>50 ~ 1000</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Precision Positioning Table LH</td>
<td>TSLH-M</td>
<td>100 ~ 800</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Super Precision Positioning Table TX</td>
<td>TX-M</td>
<td>100 ~ 800</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Cleanroom Precision Positioning Table TC</td>
<td>TC-EB</td>
<td>50 ~ 800</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Micro Precision Positioning Table TM</td>
<td>TM</td>
<td>10 ~ 60</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Precision Positioning Table TS/CT</td>
<td>TS</td>
<td>25 ~ 250</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>CT</td>
<td>15 ~ 250</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Precision Positioning Table LB</td>
<td>TSLB</td>
<td>300 ~ 1200</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Nano Linear NT</td>
<td>NT-V, XZ, XZH</td>
<td>10 ~ 120</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>NT-H</td>
<td>25 ~ 65</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Alignment Stage SA</td>
<td>SA-DE/X</td>
<td>10 ~ 20</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Linear Motor Table LT</td>
<td>LT-CE</td>
<td>200 ~ 1200</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>LT-LD</td>
<td>240 ~ 2780</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>LT-H</td>
<td>410 ~ 2670</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Alignment Module AM</td>
<td>AM</td>
<td>30 ~ 120</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**Feeding mechanism**
- C-Lube ball screw
- Ball screw

**Applied motor**
- AC servomotor
- Stepper motor

**With or without sensor**
- Provided as standard
- Selection

**Linear motion rolling guide**
- U-shaped Track Rail Linear Way
- Parallel arrangement of 2 ways
- Anti-Creep Cage Crossed Roller Way
- Linear Way

**Applications**
- Semiconductor related device, Medical equipment
- Assembly, Measuring equipment
- Machine tool, Assembler
- Positioning equipment, Prober
- Positioning equipment, Prober
- Positioning equipment, Prober
- Positioning equipment, Prober
- Positioning equipment, Prober
- Positioning equipment, Prober
- Positioning equipment, Prober
- Positioning equipment, Prober
Selection of Precision Positioning Table

**Size of Precision Positioning Table**

How to see the above graph

- The values shown in the graph are for reference. For details, see the explanation of each model.

**Stroke Length of Precision Positioning Table**

How to see the above graph

- The values shown in the graph are for reference. For details, see the explanation of each model.
- Length of a bar represents a standardized range of stroke length.
Positioning Repeatability of Precision Positioning Table

How to see the above graph

- The values shown in the graph are for reference. For details, see the explanation of each model.
- For models of ball screw drive, the value of the case selected ground ball screw is indicated.
- When two or more values are indicated for a model, this means that the applicable value depends on the stroke length.
- For TU, the value of the standard table is indicated.
- CTLH…M, CTX…M and CT are tables of two-axis specification.
- SA···DE represents value in X-axis.

Positioning Accuracy of Precision Positioning Table

How to see the above graph

- The values shown in the graph are for reference. For details, see the explanation of each model.
- For models of ball screw drive, the value of the case selected ground ball screw is indicated.
- When two or more values are indicated for a model, this means that the applicable value depends on the stroke length.
- For TU, the value of the standard table is indicated.
- CTLH…M, CTX…M and CT are tables of two-axis specification.
Maximum Speed of Precision Positioning Table

How to see the above graph
- The values shown in the graph are for reference. For details, see the explanation of each model.
- For models of ball screw drive, the value with the longest ball screw lead allowable is indicated.
- The upper sections indicate values of AC servomotor, whereas the lower sections indicate values of stepper motor specification.
- The ball screw drive type may sometimes be restricted by the allowable number of revolution of ball screw depending on the stroke length.

Carrying Mass of Precision Positioning Table

How to see the above graph
- The values shown in the graph are for reference. For details, see the explanation of each model.
- Values of LT, NT—V, NT—H, NT—X2, NT—XZH, and SA—DE indicate the maximum load masses.
Accuracy

Accuracy standard of precision positioning table varies depending on models and measurement methods are described below. In addition, model testing according to the use conditions such as dynamics testing may be conducted on request. Please contact 1KB for details.

Precision positioning table is supplied with an inspection sheet or certificate of passing inspection regarding accuracy for details.

UK Distributor: Motion Control Products Ltd., 11-15 Francis Avenue, Bournemouth, Dorset, UK, BH11 8NX               TEL.: +44 (0)1202 599922                        www.motioncontrolproducts.com

### Positioning repeatability

Repeat positioning to any one point from one direction 7 times to measure the stop position and obtain 1/2 of the maximum reading difference.

In principle, perform this measurement at the center and each end of the stroke length and take the maximum obtained value as the measurement value. Indicate the 1/2 of the maximum difference with ±.

### Positioning accuracy

Perform positioning successively in the certain direction from the reference position, measure the difference between actual travel distance at each position and the theoretical travel distance, and indicate the maximum difference within the stroke length as an absolute value.

### Parallelism in table motion A

Refers to parallelism (indicator fix) of the slide table motion and flat surface (precision positioning table mounting surface).

- When the stroke is shorter than the slide table length
  Fix the test indicator on the stool on which the precision positioning table is mounted, place the straight-edge on the slide table, and apply the test indicator at the center of the slide table. Make a measurement across almost whole area of the stroke length in X and Y directions, and take the maximum reading difference as a measurement value.

- When the stroke is longer than the slide table length
  Fix the test indicator on the stool on which the precision positioning table is mounted, place the straight-edge on the slide table, and apply the test indicator at the center of the slide table. Make a measurement across almost whole area of the stroke length while moving the table by the length of the table during strokes in X and Y directions, and take the maximum reading difference as a measurement value.

### Parallelism in table motion B

Refers to parallelism (indicator travel) of the slide table motion and flat surface (table mounting surface).

Fix the indicator at the center of the slide table, apply the test indicator on the stool on which the precision positioning table is mounted, make a measurement across almost whole area of the stroke length in X and Y directions, and take the maximum reading difference as a measurement value.

### Straightness

Refers to an extent of deviation from the ideal straight line of the slide table motion, which should be linear.

- Straightness in horizontal: Motion of the slide table travel axis in left and right (horizontal) direction.
- Straightness in vertical: Motion of the slide table travel axis in up and down (vertical) direction.

These are measured by a test bar and indicator or laser running straightness measurement system. The measurement value is represented by the interval between two straight lines in parallel with each other, when placed so that the interval becomes minimal.

### Squareness of XY motion

Refers to squareness of X- and Y-axis motions.
Fix a square scale on the slide table taking either travel axis direction as a reference, apply the test indicator perpendicular to the reference travel axis and take the maximum reading difference within the stroke length of the axis as a measurement value.

### Backlash

Feed to the slide table and take reading of the test indicator when it is moved slightly as a reference. Then, move the slide table in the same direction with the given load from such condition without the feed gear and release the load. Obtain the difference from the reference value at this point.
Perform this measurement at the center and each end of the stroke length and take the maximum obtained value as the measurement value.

### Lost motion

Perform positioning in the forward direction for one position and measure the position (L in the figure). Then give a command to move it in the same direction and give the same command in the backward direction from the position to perform positioning in the backward direction. Measure the position (L’ in the figure). Further, give a command to move it in the backward direction and give the same command in the forward direction from the position to perform positioning in the forward direction. Measure the position (L in the figure). Subsequently, repeat these motions and measurements and obtain the difference between average values of stop position of the 7 positionings in forward and backward directions.
Perform this measurement at the center and each end of the motion and take the maximum obtained value as the measurement value.
### Carrying Mass, Load Mass, Allowable Load

#### Maximum carrying mass

The maximum carrying mass is the mass that satisfies the following ①, ②, and ③. It is set for TE・B, TU, TSL・M, TSLH・M, TX・M, TC・EB, TM, TSL/CT, TSLB, AT, AM, TZ, and TZ・X. The value changes by the position of the mass loaded (length L, height H). It is calculated by the formula (L, H) = (0, 0).

① The mass when the total rating life of the linear motion rolling guide, ball screws or bearings is 18,000 hours with continuous operation at the maximum speed for each model and size, and with an acceleration/deceleration time of 0.2s.

② The mass for which the acceleration 0.3G can be acquired in general.

③ The mass calculated based upon the basic static load rating of the linear motion rolling guide you are using. Note that the value calculated varies depending on various conditions, such as the size, ball screw specifications, slide table length, or stroke length. The value shown at the specifications of each model was calculated based on the most severe conditions that are typical for each size. For detailed values, please contact 1KB.

#### Maximum load mass

The maximum load mass refers to the maximum mass of a steel cube that ensures necessary acceleration: acceleration 0.5G for linear motion and acceleration 0.5G in outer circumferential for rotational motion. It is restricted by thrust (torque) characteristics of the motor used, and the larger the carrying mass is, the longer the marginal acceleration time becomes. For linear motor drive models (LT, NT・V, NT・H, NT・XZ and NT・XZH) and direct drive models (SA・DE), the dynamic load mass representing the relation between acceleration and load mass in standard traveling models is set.

![Fig. 1 Carrying mass position](image_url)
Maximum Speed and Resolution

- **Maximum speed**
  The maximum speed of precision positioning table is defined by the following equation.
  The ball screw drive type is restricted by the allowable number of ball screw revolutions which vary by the stroke length. For the timing belt drive, it is calculated with the maximum number of motor revolutions of 900 (min⁻¹). See the specifications of each model for details.
  Each linear motor drive model has fixed maximum speed. See the specifications of each model.

Ball screw drive

\[
\text{Maximum speed (mm/s)} = \frac{\text{Ball screw lead (mm)} \times \text{Allowable number of revolutions of ball screw (min⁻¹)}}{60}
\]

Timing belt drive

\[
\text{Maximum speed (mm/s)} = \frac{\text{Pulley pitch diameter} \times \pi \times \text{Maximum number of revolutions of the motor (min⁻¹)}}{60}
\]

(Pulley pitch diameter × ð = 100mm)

To obtain the actual positioning time, the operation pattern must be considered according to conditions such as acceleration / deceleration time and stroke length. See the section of consideration of operation patterns.

- **Resolution**
  Resolution refers to the minimum feed rate allowed for precision positioning table and can be obtained by the following equation.
  Each linear motor drive model has fixed resolution. See the specifications of each model.

Ball screw drive

\[
\text{Resolution (mm/pulse)} = \frac{\text{Ball screw lead (mm)}}{\text{Number of fraction sizes per motor rotation (pulse)}}
\]

Timing belt drive

\[
\text{Resolution (mm/pulse)} = \frac{\text{Pulley pitch diameter} \times \pi \times \text{Number of fraction sizes per motor rotation (pulse)}}{60}
\]

(Pulley pitch diameter × ð = 100mm)

Consideration of Operation Patterns

- **Calculation of positioning time**
  The positioning time taken when the precision positioning table actually moves can be obtained by the following equation.
  For applications requiring high precision positioning, the settling time from completion of command pulse input to full stop of the table at the positioning point and vibration damping time of the machine device must be considered in addition to the constant speed traveling time and acceleration / deceleration time.

Long-distance positioning

Long distance in this context refers to distance for which there is enough constant speed traveling time even taking into account the acceleration / deceleration time.

\[
T = \frac{L}{V_2} + \frac{L}{V_1} + \frac{L}{V_1} + \frac{L}{V_1}
\]

where:
- : Positioning time (s)
- : Acceleration/deceleration time (s)
- : Constant speed traveling time (s)
- : Setting time (s)
- : Traveling distance (mm)
- : Traveling speed (set speed) (mm/s)

Short-distance positioning

Short distance in this context refers to distance for which there is no constant speed traveling time because deceleration occurs before reaching to constant speed traveling.

\[
T = \frac{L}{V_1} + \frac{L}{V_1} + \frac{L}{V_1}
\]

where:
- : Positioning time (s)
- : Acceleration/deceleration time (s)
- : Setting time (s)
- : Traveling distance (mm)
- : Set speed (mm/s)
- : Traveling speed (mm/s)
Consideration of Operation Patterns

Calculation of marginal acceleration time

Torque (thrust force) required for driving of precision positioning table comes to the highest during acceleration. Torque (thrust force) required for this acceleration is limited by motor output torque (linear motor thrust force). Therefore, the marginal acceleration time with table used horizontally is calculated by the following equation.

For ball screw drive and timing belt drive

- **Applied torque** $T_t$:
  
  $T_t = T_r + \mu W_g \cdot \frac{a}{\theta} \cdot V \cdot T_m$ [N-m]  
  
  Ball screw drive

  $T_t = T_r + \omega (W_g + \mu \cdot V \cdot T_m)$ [N-m]  
  
  Applicable to TZ

  $T_t = T_r + \mu W_g \cdot \frac{a}{\theta} \cdot V \cdot T_m$ [N-m]  
  
  Timing belt drive

- **Acceleration torque** $T_a$:
  
  $T_a = \frac{W}{\theta} \cdot \frac{a}{\theta}$ [N-m]

- **Marginal acceleration time** $\omega$:
  
  $\omega = (J + J_a + J_{L} + J_T) \cdot \frac{2 \pi N}{30} \cdot \frac{1}{5}$ [s]

**In case of AT**

- **Applied torque** $T_t$:
  
  $T_t = T_r + \mu W_g \cdot \frac{a}{\theta} \cdot V \cdot T_m$ [N-m]

- **Carrying mass inertia** $\lambda$:
  
  $\lambda = \frac{W}{\theta} \cdot \frac{a}{\theta}$

- **Distance to center of table** $L$:
  
  - **Model**
  
    | Model | $L$ [m] |
    |-------|---------|
    | AT120A | 0.001   |
    | AT200A | 0.002   |
    | AT300A | 0.003   |

In case of linear motor drive

- **Force from acceleration** $F_a$:
  
  $F_a = \frac{(W_g + V \cdot T_m)}{T_m}$ [N]

  Thrust force required for acceleration $F_r$

  $F_r = \frac{F_a}{F_r}$ [N]

- **Marginal acceleration time** $\omega$:
  
  $\omega = (W_g + V \cdot T_m) \cdot \frac{1}{T_m}$ [s]

  Efficiency $\eta$ = 0.9

- **Table inertia** $J_t$ [kg-m²]

  - Motor inertia $J_m$ [kg-m²]
  
    - Coupling inertia $J_c$ [kg-m²]
  
    - Coupling mass inertia $J_m$ [kg-m²]

- **Number of revolutions of motor** $N [\text{rev}^{-1}]$

- **Acceleration time** $t_a$ [s]

- **Gravity acceleration** $9.8 m/s^2$

- **Motor output torque** $N [\text{Nm}]$

  - For the stepper motor, it is the output torque at the number of motor revolutions $N$
  
  - For the AC servomotor, it is the maximum (momentary) torque at the number of revolutions $N$

  - Factor of safety $k$ = 1.3

  - (stepper motor : 1.5--2)

  **Wedge reduction ratio**: 0.5 in case of 1 : 2

  - 0.25 in case of 1 : 4

  - 0.05 in case of 1 : 1

- **Distance from the center of the table to the center of gravity of the load** $m$

- **Distance from the center of the table to the rotator** $m$

In case of LT - CE, LT - LD

- Friction resistance of rolling guide $F_r$

  - $F_r = \mu (W_g + V \cdot T_m)$ [N]

  However, minimum value of $F_r$ shall be as follows.

  - For LT100CE: 2.5N
  
  - For LT100CE: 5.0N
  
  - For LT130LD: 6.0N

  - Force from running resistance $F_r$
  
  $F_r = F_r + F_r$ [N]

In case of LT - H

- **Running resistance** $F_r$

  LT170H: 4.0N

- **Speed coefficient** $f$

  - **Traveling speed** $V$ [mm/s]

  - above 1.0 and below 1.5
  
    1.5

  - above 1.5 and below 1.8
  
    2.25

  - Force from running resistance $F_r$
  
  $F_r = f \cdot F_r [N]$

In case of NT38V

- **Force from running resistance** $F_r$

  $F_r = 0.25N$

In case of NT50V/NT80V

- **Force from running resistance** $F_r$

  $F_r = 1.5N$

In case of NT80XZ

- **Force from running resistance** $F_r$

  Horizontal axis: $F_r = 1.5N$

  Vertical axis: $F_r = 0.5N$

Note $^{(1)}$: It is the resistance value for the stroke of ±5mm from the equilibrium point in the center area of the stroke range, assuming the spring system balance mechanism of the vertical axis.

The value changes depending on the spring mounting position or the stroke width in the actual calculation. Please verify using the actual machine.
### Calculation of effective torque and effective thrust force

As a large torque (thrust force) is required for acceleration/deceleration when the precision positioning table is driven, the effective torque (effective thrust force) may become larger than the motor’s rated torque (rated thrust) depending on the operation rate of each pattern. In case the AC servomotor or linear motor drive is used. Continuing the operation in this condition may cause overheating and seizure of the motor. So ensure that the effective torque (effective thrust force) is smaller than motor’s rated torque (rated thrust). The effective torque (effective thrust force) by the operation pattern of table is calculated by the following equation.

If the rated torque (rated thrust) of the motor is larger than the effective torque (effective thrust force), continuous operation according to the operation pattern is possible.

#### If AC servomotor is used

**Effective torque** \( T_{\text{AC}} \)

\[
T_{\text{AC}} = \sqrt{F_{\text{L}}^2 + F_{\text{M}}^2 + F_{\text{H}}^2 + F_{\text{P}}^2} \quad \text{[N-m]}
\]

#### In case of linear motor drive

**Effective thrust force** \( F_{\text{LM}} \)

\[
F_{\text{LM}} = \sqrt{F_{\text{L}}^2 + F_{\text{M}}^2 + F_{\text{H}}^2} \quad \text{[N]}
\]

#### In case of direct drive (SA-DE/DE)

**Effective thrust force (applicable to SA-DE/DE)** \( F_{\text{SDE}} \)

\[
F_{\text{SDE}} = \sqrt{F_{\text{L}}^2 + F_{\text{M}}^2 + F_{\text{H}}^2 + F_{\text{P}}^2} \quad \text{[N]}
\]

**Effective thrust force (applicable to SA-DE/DE)** \( M_{\text{SDE}} \)

\[
M_{\text{SDE}} = \sqrt{\frac{F_{\text{L}}^2 F_{\text{M}}^2}{F_{\text{P}}^2} + (F_{\text{H}} - 3F_{\text{M}} + F_{\text{P}})^2} \quad \text{[N-m]}
\]

---

**Calculation of inertia moment**

- \( \rho \): density, \( m \): mass

<table>
<thead>
<tr>
<th>Cylinder</th>
<th>Quadrangular prism</th>
<th>Offset rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ J = \frac{1}{2} \pi r^4 ]</td>
<td>[ J = \frac{1}{12} (a^4 + b^4) ]</td>
<td>[ J = J_{\text{c}} + m r^2 ]</td>
</tr>
<tr>
<td>[ J_{\text{c}} = \frac{1}{2} \pi r^4 ]</td>
<td>[ J_{\text{c}} = \frac{1}{12} (a^4 + b^4) ]</td>
<td>[ J_{\text{c}} = J + m r^2 ]</td>
</tr>
</tbody>
</table>

\( J \): Inertia moment from rotation center

\( J_{\text{c}} \): Inertia moment when rotating around the center of gravity

---

**Note**

1. Cord pull-resistance varies depending on cord mass and how to pull it. Use the an expected resistance value for calculation.
2. As there is no cord for \( \theta \)-axis moving table, set the cord pull-resistance to 0 if the load does not pull cord. Calculate the inertia moment of load by referencing calculation formulas below.

---

**In case of direct drive (SA-DE/DE)**

- Friction resistance of rolling guide \( F_r \)
- Value shall be as follows.
  - In case of SA65DE/X, 0.5N
  - In case of SA120DE/X, 3.0N
- Force from running resistance \( F_I \)
- \( F_I = F_r + F_C \) [N]
- Force from acceleration \( F_a \)
  \[
  F_a = \frac{(W_{\text{m}} + W_{\text{M}}) V^2}{2M} \quad \text{[N]}
  \]
- Thrust force required for acceleration \( F_T \)
  \[
  F_T = F_a + F_C \quad \text{[N]}
  \]
- Marginal acceleration time \( t_a \)
  \[
  t_a = \frac{(W_{\text{m}} + W_{\text{M}}) V^2}{2M} \quad \text{[s]}
  \]

\( W_{\text{m}} \): Mass of moving table kg
\( W_M \): Carrying mass kg
\( F_C \): Cord pull-resistance(\( \rho \)) N
\( F_T \): Linear motor thrust force N
  (maximum thrust at traveling speed \( V \))
\( t_a \): Acceleration time s
\( V \): Traveling speed m/s
\( k \): Factor of safety (1.3)

---

**Note**

- In case of SA-DE/DE(XY)
- Friction resistance of rolling guide \( M_r \)
  \[
  M_r = 0.03N \cdot m \quad \text{[N-m]}
  \]
- Friction resistance of moving table \( M_r \)
  \[
  M_r = 0.15N \cdot m \quad \text{[N-m]}
  \]
- Force from acceleration \( M_r \)
  \[
  M_r = M_{\text{c}} + M_r \quad \text{[N-m]}
  \]
- Thrust force required for acceleration \( M_r \)
  \[
  M_r = M_{\text{c}} + M_r \quad \text{[N-m]}
  \]
- Marginal acceleration time \( t_a \)
  \[
  t_a = \frac{(J_{\text{c}} + a^2 + b^2) V^2}{2M} \quad \text{[s]}
  \]
### Consideration of Operation Patterns

#### Consideration example of operation pattern

**If AC servomotor is used**

| Usage conditions | 
| --- | --- |
| Mounting direction | Horizontal usage |
| Carrying mass | W | 30kg |
| Smoke length | L | 300mm |
| Traveling speed (set speed) | V | 300mm/s |
| Acceleration/deceleration time | t | 0.2s |
| Constant speed traveling time | t_a | 0.8s |
| 1 cycle time | t | 2.0s |

- **Calculation of torque required for acceleration**
  
  \[ T_a = (J_0 + J_c + J_e) \frac{v^2}{2} \]

  \[ = (0.93 \times 0.380 + 0.290 + 7.60) \times 10^{-5} \times 2 \times \pi \times 1800 \]

  \[ J_0 = 0.2 \times 0.09 \times 0.2 \]

  \[ = 0.09 \cdot N \cdot m \]

- **Acceleration torque**

  \[ T_a = (J_0 + J_c + J_e) \frac{v^2}{2} \]

  \[ = (0.93 \times 0.380 + 0.290 + 7.60) \times 10^{-5} \times 2 \times \pi \times 1800 \]

  \[ J_0 = 0.2 \times 0.09 \times 0.2 \]

  \[ = 0.09 \cdot N \cdot m \]

- **Torque required for acceleration**

  \[ T_r = T_a + T_c = 0.99 + 0.09 = 1.08 \cdot N \cdot m \]

At this point, check that the \( T \cdot x \cdot L \) (factor of safety) is smaller than motor's output torque \( T_o \) as indicated below.

\[ T_0 = 0.318 \times 3 \times 0.95 \cdot N \cdot m \]

\[ T_0 \cdot x \cdot L = 0.18 \times 1.3 = 0.23 \cdot N \cdot m < T_0 \]

- **Consideration of effective torque**

  - **Effective torque** \( T_{eff} \)

  \[ T_{eff} = \sqrt{\int \frac{F}{2} \cdot x \cdot (v - 2 \cdot x \cdot V) \cdot x \cdot P} \]

  \[ = \sqrt{0.39 \times 0.9 \times (0.23 - 2 \cdot 0.09 \times 0.8) \times 0.09 \times 0.8} \]

  \[ = 0.09 \cdot N \cdot m \]

As motor’s rated torque is larger than the effective torque \( T_{eff} \), it can be judged that continuous operation in the operation pattern under consideration is possible.

### In case of linear motor drive

The effective thrust force may exceed the rated thrust depending on the operation rate of Linear Motor Table, leading to motor overheating and seizure that may cause breakage and human injury. Before operations, ensure that the effective thrust force is below the rated thrust. Below described is an example of consideration of operation pattern with LT170HS. Temporarily select the operation pattern as indicated below considering the carrying mass and acceleration from the dynamic load mass chart in page II-294.

**STEP1** Calculation of thrust force required for acceleration

1. Force from running resistance \( F_r \)

\[ F_r = \frac{P}{2} \times \frac{C}{V} \]

\[ = (30 + 4.0) \times \frac{1.3}{2} \]

\[ = 170 \cdot N \]

2. Force from acceleration \( F_a \)

\[ F_a = \frac{P}{2} \times \frac{C}{V} \]

\[ = (30 + 4.0) \times \frac{1.3}{2} \]

\[ = 170 \cdot N \]

At this point, check that the \( F \times L \times C \) (factor of safety) is below the thrust characteristics curve. When this value is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time. You can see in the example pattern that it is below the thrust characteristics curve.

Maximum thrust \( F_{max} \) at 1.5m/s

\[ F_{max} = 261 \cdot 1.3 = 339 \cdot N \]

**STEP2** Consideration of effective thrust force

- **Effective thrust force** \( F_{eff} \) can be obtained as follows.

\[ F_{eff} = \sqrt{\frac{F_r + F_a}{2}} \]

\[ = \sqrt{261 + 0.3 + (261 - 91)} \cdot 0.3 + 91 \cdot 0.5 \]

\[ = 103 \cdot N \]

At this point, check that \( F_{eff} \) is below the rated thrust. If the rated thrust is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time. (For \( H \), thrust characteristics vary depending on ambient temperature. See the rated thrust characteristics diagram.)

For the example pattern, the rated thrust is about 117N at the ambient temperature of 30°C, so the value is 103N< 117N (rated thrust) and it can be judged that continuous operation is possible.
Consideration of Operation Patterns

In case of Alignment Stage SA

The effective thrust force may exceed the rated thrust (or the effective torque exceeds the rated torque) depending on the operation rate of Alignment Stage SA, leading to motor overheating and seizure that may cause breakage and human injury. Before operations, ensure that the effective thrust force is below the rated thrust (or the effective torque is below the rated torque).

Described below is an example of consideration of operation pattern with Alignment Stage SA120DE/XYS.

Temporarily set an operation pattern as indicated below considering the marginal acceleration time.

Setting items

<table>
<thead>
<tr>
<th>Table model</th>
<th>SA120DE/XYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load mass</td>
<td>5.8kg</td>
</tr>
<tr>
<td>Inertia moment of load</td>
<td>1.0×10⁻⁵kgm²</td>
</tr>
<tr>
<td>Mass of moving table</td>
<td>3.46kg</td>
</tr>
<tr>
<td>Set stroke</td>
<td>0.07m</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>0.1m/s</td>
</tr>
<tr>
<td>Acceleration/deceleration time</td>
<td>0.05s</td>
</tr>
<tr>
<td>Constant speed traveling time</td>
<td>0.05s</td>
</tr>
<tr>
<td>Cycle time</td>
<td>0.4s</td>
</tr>
<tr>
<td>Cord pull-resistance</td>
<td>1.0N</td>
</tr>
</tbody>
</table>

| Mass of moving table | 3.46kg |
| Set stroke  | 0.07m       |
| Maximum speed | 0.1m/s     |
| Acceleration/deceleration time | 0.05s |
| Constant speed traveling time | 0.05s |
| Cycle time  | 0.4s        |
| Cord pull-resistance | 1.0N |

| Inertia moment of moving table | 2.0×10⁻⁰kgm² |
| Set operating angle | 0.1rad/° |
| Maximum speed | 180°/s |
| Acceleration/deceleration time | 0.05s |
| Constant speed traveling time | 0.05s |
| Cycle time  | 0.4s        |
| Cord pull-resistance | 0.6N-m |
| Factor of safety | 1.3 |

STEP1 Calculation of thrust force required for X-axis acceleration

1. Force from running resistance \( F_r \)
\[ F_r = \frac{W \cdot v^2}{2} \]
2. Force from acceleration \( F_a \)
\[ F_a = \frac{W \cdot a}{2} \]
3. Thrust force required for acceleration \( F_t \)
\[ F_t = F_r + F_a \]

At this point, check that the \( F_t \times L \) (factor of safety) is below the maximum thrust in page 1-270. If this value is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time.

You can see in the example pattern that it is below the maximum thrust.

The maximum thrust \( F_{ax} \) of SA120DE/X=70N
\[ F_{ax} = 25.8 \times 1.3 = 33.54\text{N}<F_t \]

STEP2 Consideration of effective thrust force

- Effective thrust force \( F_{ax} \) can be obtained as follows.
\[ F_{ax} = \sqrt{\frac{F_r \cdot F_a + (F_r - 2F_a)^2}{F_r + F_a}} \]
\[ = \sqrt{25.8 \times 0.05 + (25.8 - 2 	imes 0.05) \times 0.05 + 4.0 \times 0.05} \]
\[ = 11.17\text{N} \]

At this point, check that \( F_{ax} \) is below the rated thrust. If the rated thrust is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time.

In the example pattern, it can be judged that continuous operation is possible.

STEP3 Consideration of thrust force and effective thrust force required for Y-axis acceleration

Perform the same calculation as X-axis. If the operation pattern is the same, the condition is lighter for Y-axis as its mass of moving table is smaller. So that is omitted in this example.

STEP4 Consideration of torque required for \( \theta \)-axis acceleration

1. Torque from rotation resistance \( M_r \)
\[ M_r = M_l + M_a \]
\[ = 0.1 + 0.0 = 0.1\text{N-m} \]
2. Torque from acceleration \( M_a \)
\[ M_a = \frac{W_\theta \cdot a}{2} \]
\[ = (0.01 + 0.002) \times 2 \times 0.1 = 0.754\text{N-m} \]

At this point, check that \( M_a \) is below the rated torque. If the rated torque is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time.

In the example pattern, it can be judged that continuous operation is possible.

STEP5 Consideration of effective torque

- Effective torque \( M_{ax} \) can be obtained as follows.
\[ M_{ax} = \sqrt{M_a^2 + \left( (M_a - M_r) \frac{L}{W_{ax}} \right)^2} \]
\[ = \sqrt{(0.754 + 0.1)^2 + 0.854^2} \]
\[ = 0.38\text{N-m} \]

At this point, check that \( M_{ax} \) is below the rated torque. If the rated torque is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time.

In the example pattern, it can be judged that continuous operation is possible.

Caution: If the load is offset from the rotation center, X- and Y-axis acceleration / deceleration generates torque load on the \( \theta \)-axis. So extra care must be exercised.
Sensor Specification

Precision positioning table is equipped with CW and CCW limit sensors for overrun prevention and pre-origin and origin sensors for machine origin detection. For some table models, these sensors are provided as standard equipment, and for the other models, mounting is specified by identification numbers.

Types of sensors used for Precision positioning table are listed in Table 1 and specifications of each sensor in Table 2 to 4. For connector specifications for NT, see Table 5.1 to 5.2. For other tables, wires are unbound, so that the sensor output connector and mating side must be prepared separately by customer. For sensor timing chart, please see section of sensor specifications of each model. In addition, unless otherwise stated, sensor positions can be fine-adjusted. Please make adjustment on your own.

Table 1 Sensor types

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>CW limit</th>
<th>CCW limit</th>
<th>Pre-origin (PORG)</th>
<th>Origin (ORG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE B</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>TU M</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>TSL M</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>TL 755/55 M</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
</tr>
<tr>
<td>TL 7575</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
</tr>
<tr>
<td>TS75/75</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
</tr>
<tr>
<td>TS755/75</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
</tr>
<tr>
<td>TS800/800</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
<td>Photo sensor 3</td>
</tr>
<tr>
<td>LT CE</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>LT LD</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>LT H</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>NT V</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>AT</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>SA DE</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
<td>Proximity sensor</td>
</tr>
<tr>
<td>Other than listed above</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes

- Mounting a sensor is specified using the corresponding identification number. For the other models, sensors are supplied as standard equipment.
- No origin sensor is provided if an attachment for AC servomotor or linear encoder is selected. Use C phase or Z phase signal of AC servomotor or linear encoder to be installed on your own. For AT, only AC servomotor is selected.
- Each signal is output from applicable dedicated programmable control unit or dedicated driver.
- Sensors are built in the table and each signal is output from a dedicated sensor amplifier. When the AC servomotor is used, use encoder’s C phase for origin signals.
- Sensor (encoder) positions cannot be fine-adjusted.
- This is built in the substrate.

Table 2 Photo sensor specifications

<table>
<thead>
<tr>
<th>Sensor Specification</th>
<th>Limit, pre-origin and origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Panasonic Industrial Devices BUNX Co., Ltd.</td>
</tr>
<tr>
<td>Shape (mm)</td>
<td>CN-14A-C1 (lead length: 1 m) or CN-14A-C3 (lead length: 3 m)</td>
</tr>
<tr>
<td>Output connector models (1)</td>
<td>DCS—24V ±10%</td>
</tr>
<tr>
<td>Output voltage</td>
<td>15mA or less</td>
</tr>
<tr>
<td>Output</td>
<td>NPN transistor open collector</td>
</tr>
<tr>
<td>- Maximum input current</td>
<td>50mA</td>
</tr>
<tr>
<td>- Residual voltage</td>
<td>2V or less at input current of 50mA</td>
</tr>
<tr>
<td>1V or less at 16mA</td>
<td></td>
</tr>
<tr>
<td>Operation indication</td>
<td>ON/OFF upon light entrance, selectable (2)</td>
</tr>
<tr>
<td>Circuit diagram</td>
<td>Orange LED (ON upon light entrance)</td>
</tr>
</tbody>
</table>

Notes:

1. Selected according to the applicable models.
2. For CT75/75, use OUT1 (black) for CW limit and CCW limit and OUT2 (white) for pre-origin and origin. For the other models, use OUT1 (black) for all.
3. Wire the sensor cords on your own.
4. Lead runs off by at least 200mm from the table end. Actual length varies depending on stroke length.
Table 3 Specifications of proximity sensor

<table>
<thead>
<tr>
<th>Item</th>
<th>SA200DE/S</th>
<th>Other models</th>
<th>TZ120X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>ABB Corporation</td>
<td>OMRON Corporation</td>
<td></td>
</tr>
<tr>
<td>Model(1)</td>
<td>APM-D3A1F-S</td>
<td>APM-D3B1F-S</td>
<td>APM-D3B1F-S</td>
</tr>
<tr>
<td>Pre-origin</td>
<td>APM-D3A1F-S</td>
<td>APM-D3B1F-S</td>
<td>APM-D3B1F-S</td>
</tr>
<tr>
<td>C/W limit</td>
<td>APM-D3A1F-S</td>
<td>APM-D3B1F-S</td>
<td>APM-D3B1F-S</td>
</tr>
<tr>
<td>Origin</td>
<td>APM-D3B1F-S</td>
<td>APM-D3A1F-S</td>
<td>APM-D3A1F-S</td>
</tr>
<tr>
<td>CODA limit</td>
<td>E2S-W14 1M</td>
<td>E2S-W14 1M</td>
<td>E2S-W14 1M</td>
</tr>
</tbody>
</table>

Remarks: 1. Wire the sensor cords on your own
2. Lead runs off by at least 200mm from the table end. Actual length varies depending on stroke length.
3. For information about PNP sensor options, please contact the manufacturer.

Table 4 Specifications of magnetic sensor

<table>
<thead>
<tr>
<th>Item</th>
<th>TM</th>
<th>SA65DE, SA120DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>DC12 to 24V ±10%</td>
<td>DC5 to 24V ±10%</td>
</tr>
<tr>
<td>Current consumption</td>
<td>85mA or less (1)</td>
<td>10mA or less (1)</td>
</tr>
</tbody>
</table>

Output(1)

- Pre-origin: OFF in proximity
- Origin: ON in proximity
- C/W limit
- Operation indication
- Pre-origin: Red LED (ON upon detection)
- C/W limit: Yellow LED (ON upon detection)
- Operation indication
- Pre-origin: Red LED (ON upon detection)
- C/W limit: Yellow LED (ON upon detection)

Notes: 1. Current consumption of the whole system including sensor amplifier.
2. Output per circuit.

Table 5.1 Connector specifications (NT55V/SC, NT80V/SC, SA200DE/S and LT)

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal name</th>
<th>Connector used (Product of Molex Japan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-origin(1)</td>
<td>Housing 1625-12R1</td>
</tr>
<tr>
<td>2</td>
<td>Pre-origin</td>
<td>Housing 1625-12P1</td>
</tr>
<tr>
<td>3</td>
<td>C/W limit</td>
<td>Terminal 1855LT</td>
</tr>
<tr>
<td>4</td>
<td>C/W limit</td>
<td>Terminal 1854TL</td>
</tr>
<tr>
<td>5</td>
<td>Power input</td>
<td>43020-0600</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>43031-0010</td>
</tr>
</tbody>
</table>

Notes: 1. For the table of LT/T2.

Table 5.2 Connector specifications for TM

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal name</th>
<th>Connector used (Product of Molex Japan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Origin</td>
<td>Housing 43020-0600</td>
</tr>
<tr>
<td>2</td>
<td>Pre-origin</td>
<td>Housing 43025-0600</td>
</tr>
<tr>
<td>3</td>
<td>C/W limit</td>
<td>Terminal 43091-0600</td>
</tr>
<tr>
<td>4</td>
<td>C/W limit</td>
<td>Terminal 43091-0600</td>
</tr>
<tr>
<td>5</td>
<td>Power input</td>
<td>43030-0600</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td></td>
</tr>
</tbody>
</table>

Remark: When the AC Servomotor is used, use encoder’s C phase for origin signals.
### Mounting

**Processing accuracy of mounting surface**

Accuracy and performance of Precision positioning table are affected by accuracy of mating mounting surface. Therefore, processing accuracy of the mounting surface must be considered according to usage conditions such as required motion performance and positioning accuracy. Reference flatness of the mating mounting surface under general usage conditions is indicated in Table 6. In addition, the base on which a table is mounted receives a large reactive force, so take enough care about the rigidity of the base.

**Table 6 Accuracy of mounting surface**

<table>
<thead>
<tr>
<th>Model</th>
<th>Flatness of the mounting surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT-H</td>
<td>5</td>
</tr>
<tr>
<td>TX</td>
<td>8</td>
</tr>
<tr>
<td>TSL/CT</td>
<td>10</td>
</tr>
<tr>
<td>NT-V</td>
<td></td>
</tr>
<tr>
<td>NT-XZ</td>
<td></td>
</tr>
<tr>
<td>NT-XZH</td>
<td></td>
</tr>
<tr>
<td>SA-DE</td>
<td></td>
</tr>
<tr>
<td>TSLH-M</td>
<td>15</td>
</tr>
<tr>
<td>TE-B</td>
<td>30</td>
</tr>
<tr>
<td>TU</td>
<td></td>
</tr>
<tr>
<td>TSL-M</td>
<td></td>
</tr>
<tr>
<td>TC-EB</td>
<td></td>
</tr>
<tr>
<td>LT</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td></td>
</tr>
<tr>
<td>TSLB</td>
<td>50</td>
</tr>
</tbody>
</table>

**Tightening torque for fixing screw**

Typical tightening torque to fix the Precision positioning table is indicated in Table 7. If sudden acceleration / deceleration occurs frequently or moment is applied, it is recommended to tighten them to 1.3 times higher torque than that indicated in the table. In addition, when high accuracy is required with no vibration and shock, it is recommended to tighten the screws to torque smaller than that indicated in the table and use adhesive agent to prevent looseness of screws.

**Table 7 Screw tightening torque**

<table>
<thead>
<tr>
<th>Bolt size</th>
<th>Female thread component</th>
<th>Steel</th>
<th>Aluminum alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2 × 0.4</td>
<td></td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>M3 × 0.5</td>
<td></td>
<td>1.71</td>
<td></td>
</tr>
<tr>
<td>M4 × 0.7</td>
<td></td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>M5 × 0.8</td>
<td></td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>M6 × 1</td>
<td></td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>M8 × 1.25</td>
<td></td>
<td>32.0</td>
<td></td>
</tr>
<tr>
<td>M10×1.25</td>
<td></td>
<td>62.7</td>
<td></td>
</tr>
</tbody>
</table>

Note (*) As tightening torque for NT-V, 1.1Nm is recommended. (When using a steel base)

### Precaution for Use

**Safety precautions**

- Be sure to earth the ground terminal (The grounding resistance is 100Ω or less.). It may lead to electric shock and fire.
- Use only the power voltage indicated on the device. Otherwise, it may lead to fire and malfunction.
- Do not touch any electrical component with wet hand. It may lead to electric shock.
- Do not bend forcibly, twist, pull, heat or apply heavy load on the cord. It may lead to electric shock and fire.
- Do not put your finger into any opening during table operations. It may lead to injury.
- Do not touch any moving part during table operations. It may lead to injury.
- When removing the electrical component cover, be sure to turn the power off and disconnect the power plug. It may lead to electric shock.
- Do not touch the terminal for 5 minutes after shutting down the power. Otherwise, electric shock due to residual voltage may occur.
- When installing / removing the connection terminal, be sure to turn the power off and disconnect the power plug in advance. Otherwise, it may lead to electric shock and fire.

**Precaution for Use**

- As precision positioning table is a precision machine, excessive load or shock may impair accuracy and damage the parts. Take extra care when handling it.
- Check that the table mounting surface is free from dust and harmful projection.
- Use it in a clean environment where it is not exposed to water, oil and dust particles.
- As grease is applied to the linear motion rolling guide integrated with precision positioning table and ball screws, take dust protection measures to prevent dust and other foreign matters from entering into the unit. If foreign matters get mixed, thoroughly eliminate the contaminated grease and apply clean grease again.
- Though lubrication frequency for precision positioning table varies depending on usage conditions, wipe off old grease and apply clean grease again biannually for normal cases or every three months for applications with constant reciprocating motions in long distance. In addition, the Precision Positioning Table in which C-Lube is built delivers long-term maintenance free performance. This reduces the need for the lubrication mechanism and workload which used to be necessary for linear motion rolling guides and ball screws, allowing large-scale reduction of maintenance cost.
- As precision positioning table is assembled through precise processing and adjustments, do not disassemble or alter it.
- Linear motor drive products have strong magnets inside. Note that any magnetic object around such product may be attracted. For use around any device vulnerable to magnetism, please contact us.
- Linear motor drive products require parameter settings of programmable control unit or driver for driving. Securely configure parameter settings suitable for the drive motor.
- For Linear Motor Table LT series, motor cord, etc. is connected to moving table, so a space for wiring of cord must be ensured in addition to the installation space for the main body. In addition, arrange cord wiring with sufficient curvature so that the running resistance does not increase or no excessive force is applied.

The external appearance / specifications of this product can be modified for improvements without notices.