Flexible Belt Drive Linear Axes System

Freely Configurable Actuator & Guide Modules for Single- or Multi-axis Systems

www.intelligentactuator.de
**Features:**

- A wide variety of configurations are possible by simply combining Actuator, Guide Rail and Profile Modules.
- The slim design enables the FS Linear Axes to provide from 300 up to 3000 mm stroke.
- The FS Large Type focuses on 2 main types: A High-Speed Type (max. speed: 2000 mm/s) and a High-Payload Type (max. payload: 60 kg).
- Timing Belt Drive Method provides a quieter motion.
- Gantry-Type Systems with larger work areas are achievable using guide modules also available in this series.

**Long Slider Option:**

D1 and D2 versions (available as options) have longer slider than the standard FS actuator and come with a dust prevention stainless steel sheet.

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**FS Series Overview**

The FS Series is broadly classified into two product categories:

**FS Modules (single unit) and FS Units (assembled FS modules)**

FS Modules are either a narrow, wide or large frame type and consist of a single guide type actuator module connected to a 60W, 100W, 200W, or 400W AC servo motor and a single extruded guide module.

With the FS Series actuators, generally you would purchase the individual FS Modules to construct one of the three configuration types for the FS Units:

**Single-axis Table, Gantry or Cantilever**

However, depending on your particular application, you may find it easier to purchase the pre-assembled FS Units. Your FS Unit can be customized according to your specifications and drawings (stroke length, available space, payload, speed, etc.).
**Explanation of Model Description**

**FS Series**

<table>
<thead>
<tr>
<th>Type</th>
<th>Encoder Type</th>
<th>Motor Type</th>
<th>Stroke</th>
<th>Applicable Controller</th>
<th>Cable Length</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS Standard Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11WM Narrow Single Slider Type</td>
<td>Absolute I Incremental</td>
<td>60</td>
<td>60W</td>
<td>~</td>
<td>~</td>
<td>3000</td>
</tr>
<tr>
<td>12WM Narrow Double Slider Type</td>
<td></td>
<td>100</td>
<td>100W</td>
<td>~</td>
<td>~</td>
<td></td>
</tr>
<tr>
<td>11LM Narrow Single Slider Type</td>
<td></td>
<td>200</td>
<td>200W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12LM Narrow Double Slider Type</td>
<td></td>
<td>400</td>
<td>400W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11HM Wide Single Slider Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12HM Wide Double Slider Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**System Configuration Examples**

### 1-Axis System (with SCON Controller)

- **FS Actuator**
- Motor cable
- Encoder cable

* Figure above shows non-CE compliant product version with extra motor cover.

### 2-Axis System (with SSEL Controller)

- **FS Gantry System**
- Motor cable
- Encoder cable

* Figure above shows non-CE compliant product version with extra motor cover.

### 3-Axis System (with XSEL Controller)

- **FS Gantry System with Z-Axis**
- Motor cable
- Encoder cable

* Figure above shows non-CE compliant product version with extra motor cover.
FS-NM-60
Single-axis robot / Narrow belt type / Actuator width: 40mm / 60W

Models/Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor output (W)</th>
<th>Slider</th>
<th>Stroke in 1000mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload (Note 1)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11NM</td>
<td>Absolute</td>
<td>60</td>
<td>Single</td>
<td>300–1000</td>
<td>1–1250</td>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>FS-12NM</td>
<td>Incremental</td>
<td>60</td>
<td>Double</td>
<td></td>
<td></td>
<td>9 (Note 2)</td>
<td></td>
</tr>
</tbody>
</table>

Options

- Name
- Code
- Remarks
- Positioning repeatability ±0.08mm
- Drive method Timing belt
- Lost Motion 0.1mm max.
- Allowable static load moment Refer to P. 14 (Technical Reference)
- Allowable dynamic load moment Refer to P. 13 (Technical Reference)
- Overhang load moment Refer to P. 13 (Technical Reference)
- Base Material: Aluminum, with white alumite treatment
- Applicable controller T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12
- Cable length (Note 3) N: None, S: 3m, M: 5m, X: Specified length
- Ambient operating temperature/humidity 0 to 40°C, 85%RH max. (non-condensing)

Dimensions

- Cable length (Note 3) The maximum cable length is 30 m. Specify a desired length in meters. (Example: X08 = 8 m)
- 11NM (Single slider)
- 12NM (Double slider)

Applicable Controller Specifications

- Applicable Controller
- Max. number of controlled axes
- Connectable encoder type
- Operating method
- Power-supply voltage
- Positioner control
- Single/three-phase 230 VAC
- Single-phase 115/230 VAC

Adapt to the applicable controller table below.

- FS-11NM-60
- FS-12NM-60
**FS-NM-100**

**Single-axis robot / Narrow belt type / Actuator width: 40mm / 100W**

### Models/Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor output (W)</th>
<th>Slider</th>
<th>Stroke in 100mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload (Note 1)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11NM-100</td>
<td>Absolute Incremental</td>
<td>100</td>
<td>Single</td>
<td>300-1000</td>
<td>1-1250</td>
<td>5</td>
<td>Designed exclusively for horizontal use</td>
</tr>
<tr>
<td>FS-12NM-100</td>
<td>Absolute Incremental</td>
<td>100</td>
<td>Double</td>
<td>300-1000</td>
<td>1-1250</td>
<td>15 (Note 2)</td>
<td>Designed exclusively for horizontal use</td>
</tr>
</tbody>
</table>

* In the above model numbers, indicates the encoder type, indicates the stroke, indicates the applicable controller, indicates the cable length, and indicates the option(s).

### Options

**Name**
- Slider length equal to 200mm
- Slider length equal to 300mm
- Motor positioned at the opposite side
- Motor positioned at the bottom
- Metal Cable Joint Connector
- Compliance with CE Conformity

**Code**
- D1: Available for 12NM only
- D2: Available for 12NM only
- R: Refer to P. 12 (Installation/Mounting)
- U: Refer to P. 12 (Installation/Mounting)
- EU: Standard option

### Common Specifications

- **Positioning repeatability**: ±0.08mm
- **Drive method**: Timing belt
- **Lost Motion**: 0.1mm max.
- **Allowable static load moment**: Refer to P. 14 (Technical Reference)
- **Allowable dynamic load moment**: Refer to P. 13 (Technical Reference)
- **Overhang load length**: Refer to P. 13 (Technical Reference)
- **Base Material**: Aluminum, with white alumite treatment
- **Applicable controller**: T1, XSEL-KE/KET, T2, SCON, CAL, MSEL
- **Cable length**: (Note 3) None, 3m, 5m, 30m
- **Rated thrust**: Designed exclusively for horizontal use

### Dimensions

**CAD drawings** are available for download from our website.

**2D CAD**

### RoHS

** mandarin language**

### Applicable Controller Specifications

<table>
<thead>
<tr>
<th>Applicable Controller</th>
<th>Max. number of controlled axes</th>
<th>Connectable encoder type</th>
<th>Operating method</th>
<th>Power-supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-SEL-P/Q</td>
<td>6 axes</td>
<td>Absolute/incremental</td>
<td>Program</td>
<td>Single three-phase 230VAC</td>
</tr>
<tr>
<td>X-SEL-XM/NET</td>
<td>4 axes</td>
<td>Absolute/incremental</td>
<td>Program</td>
<td>Single-phase 115/230VAC</td>
</tr>
<tr>
<td>SSEL</td>
<td>2 axes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSEL</td>
<td>6 axes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCON-CAL</td>
<td>1 axis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

- (Note 1) The payload is the value when operated at 0.3 G acceleration.
- (Note 2) The maximum cable length is 30 m. Specify a desired length in meters. (Example: X08 = 8 m)
- (Note 3) The maximum cable length is 30 m. Specify a desired length in meters. (Example: X08 = 8 m)
### Models/Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor type</th>
<th>Stroke in 1000mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11NO-0</td>
<td></td>
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<td>300–1000</td>
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<tr>
<td>FS-12NO-0</td>
<td></td>
<td>0</td>
<td>300–1000</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

* In the above model numbers, indicates the stroke, and indicates the option(s).

### Options

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slider length equal to 200mm</td>
<td>D1</td>
<td>Available for 12NO only</td>
</tr>
<tr>
<td>Slider length equal to 300mm</td>
<td>D2</td>
<td>Available for 12NO only</td>
</tr>
</tbody>
</table>

### Dimensions

**FS-11NO-0**

- Stroke: 300–1000 mm
- Mass (kg): 2.4–5.2
- Payload (kg): 4.1–5.2

**FS-12NO-0**

- Stroke: 300–1000 mm
- Mass (kg): 3.1–5.9
- Payload (kg): 4.3–5.1

* 300–1000mm strokes are available in 100mm increments.

* Dimensions A–D increase by 100mm for every 100mm stroke increment.

### Common Specifications

- Positioning repeatability: —
- Drive method: —
- Lost Motion: —
- Allowable static load moment: Refer to P. 13 (Technical Reference)
- Allowable dynamic load moment: Refer to P. 13 (Technical Reference)
- Overhang load length: Refer to P. 13 (Technical Reference)
- Base: Material: Aluminum, with white alumite treatment
- Cable length: —
- Ambient operating temperature/humidity: 0 to 40°C, 85%RH max. (non-condensing)

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*Refer to P. 12 for the actuator installation method.

*1 The dimensions inside of ( ) indicates 12NO.
**FS-WM-100**  
Single-axis robot / Wide belt type / Actuator width: 52mm / 100W

### Models/Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor type</th>
<th>Stroke in 100mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload (Note 1)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11WM-100</td>
<td>100 100 100</td>
<td>100-100W</td>
<td>300-2500</td>
<td>1-1250</td>
<td>1</td>
<td>49</td>
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<tr>
<td>FS-12WM-100</td>
<td>100 100 100</td>
<td>100-100W</td>
<td>300-2500</td>
<td>1-1250</td>
<td>15 (Note 2)</td>
<td>66</td>
</tr>
</tbody>
</table>

* In the above model numbers, **indicates the encoder type, **indicates the applicable controller, **indicates the cable length, and **indicates the option(s).

### Options

- **Name**: Slider length equal to 200mm  
  **Code**: D1  
  **Remarks**: Available for 12WM only
- **Name**: Slider length equal to 300mm  
  **Code**: D2  
  **Remarks**: Available for 12WM only
- **Name**: Reversed home specification  
  **Code**: NM
- **Name**: Motor positioned on the opposite side  
  **Code**: R  
  **Remarks**: Refer to P. 12 (Installation/Mounting)
- **Name**: Motor positioned at the bottom  
  **Code**: U  
  **Remarks**: Refer to P. 12 (Installation/Mounting)
- **Name**: Motor positioned at bottom on opposite side  
  **Code**: RU  
  **Remarks**: Refer to P. 12 (Installation/Mounting)
- **Name**: Metal Cable Joint Connector  
  **Code**: EU
- **Name**: Compliance with CE Conformity  
  **Code**: LE  
  **Remarks**: Standard option

### Common Specifications

- **Positioning Repeatability**: ±0.08mm
- **Drive method**: Timing belt
- **Lost Motion**: 0.1mm max.
- **Allowable Static Load Moment**: Refer to P. 14 (Technical Reference)
- **Allowable Dynamic Load Moment**: Refer to P. 13 (Technical Reference)
- **Maximum Cable Length**: 30m (Refer to the back page for the cables)
- **Ambient Operating Temperature/Humidity**: 0 to 40°C, 85%RH max. (Non-condensing)
- **Cable Length**: Refer to the back page for the cables

### Dimensions

**CAD Drawings are available for download from our website.**

**2D CAD**

**RoHS**

### Applicable Controller Specifications

<table>
<thead>
<tr>
<th>Applicable Controller</th>
<th>Max. number of connectable axes</th>
<th>Connectable encoder type</th>
<th>Operating method</th>
<th>Power-supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-SEL/P/Q</td>
<td>6 axes</td>
<td>Absolute/Incremental</td>
<td>Single-phase 230 VAC</td>
<td></td>
</tr>
<tr>
<td>X-SEL/NE/P/Q</td>
<td>4 axes</td>
<td>Incremental</td>
<td>Single-phase 230 VAC</td>
<td></td>
</tr>
<tr>
<td>SSEL</td>
<td>2 axes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSCON</td>
<td>6 axes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCON-CVAL</td>
<td>1 axis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Refer to P. 12 for the actuator installation method.

### Applicable Cables

- **Model**: FS-WM-100  
  **Cable Length**: 100m

### Notes

1. The payload is the value when operated at 0.3 G acceleration.
2. Note that when the stroke increases, the payload will drop. (Refer to the tables above for payload by stroke.)
3. The maximum cable length is 30m. Specify a desired length.
**FS-WM-200**

**Single-axis robot / Wide belt type / Actuator width: 52mm / 200W**

### Models/Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor type</th>
<th>Stroke in 100mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload (Note 1)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11WM-200</td>
<td>Absolute Incremental</td>
<td>200</td>
<td>300-2500</td>
<td>1-1250</td>
<td>6</td>
<td>98</td>
</tr>
<tr>
<td>FS-12WM-200</td>
<td>Absolute Incremental</td>
<td>200</td>
<td>300-2500</td>
<td>1-1250</td>
<td>30 (Note 2)</td>
<td>Designed exclusively for horizontal use</td>
</tr>
</tbody>
</table>

### Options

- **Name**: Name Code
- **Remarks**:
  - Slider length equal to 200mm D1
  - Slider length equal to 300mm D2
  - Motor positioned on the opposite side R
  - Motor positioned on the bottom U
  - Metal Cable Joint Connector EU
  - Compliance with CE Conformity CE

### Dimensions

<table>
<thead>
<tr>
<th>11WM (Single slider)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M18 depth 14</td>
</tr>
</tbody>
</table>

### Applicable Controllers & Specifications

<table>
<thead>
<tr>
<th>Applicable Controller</th>
<th>Max. number of controlled axes</th>
<th>Connectable encoder type</th>
<th>Operating method</th>
<th>Power-supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-SEL-P/Q</td>
<td>6 axes</td>
<td>Absolute/Incremental</td>
<td>Program</td>
<td>Single/three-phase 230 VAC</td>
</tr>
<tr>
<td>X-SEL-KE/KEIT</td>
<td>4 axes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSEL</td>
<td>2 axes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSCON</td>
<td>6 axes</td>
<td></td>
<td>Positioner control</td>
<td>Single-phase 115/230 VAC</td>
</tr>
<tr>
<td>SCNON-CA/CAL</td>
<td>1 axis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes

- * In the above model numbers, X indicates the encoder type, X indicates the stroke, and D1 indicates the applicable controller. D indicates the cable length, and D2 indicates the option(s).
- The dimension inside of ( ) indicates 12WM.
- *3 During the return, the slider moves to the ME, so pay attention not to let the slider hit surrounding parts.
- **Cable joint connector *1**
- Connect the motor cable and encoder cable. Refer to the back page for the cables.
- **Cable length (Note 3)**
  - N: None
  - S: 3m
  - M: 5m
  - X: 30m

### Technical Information

- **Positioning repeatability**: ±0.008mm
- **Drive method**: Timing belt
- **Lost Motion**: 0.1mm max.
- **Allowable static load moment**: Refer to P. 14 (Technical Reference)
- **Allowable dynamic load moment**: Refer to P. 13 (Technical Reference)
- **Overhang load length**: Refer to P. 13 (Technical Reference)
- **Base**: Material: Aluminum, with white alumite treatment
- **Applicable controller**: T1: XSEL-KE/KEIT, T2: XSEL-P/Q, SSEL, MSCON, SCNON-CA/CAL, SCNON-CA/CAL
- **Cable length (Note 3)**
  - N: None
  - S: 3m, M: 5m, X: Specified length

### Cable Joint Connector

Refer to the options table below.

### Drive Slider

**Free slider**

**Drive slider ME: Mechanical End**

### Overhang Load Length

Refer to P. 13 (Technical Reference)

### Motor Positioning

- **Motor positioned on the opposite side R**
- **Motor positioned on the bottom U**

### Drive Slider Free Slider

**Model Encoder**

- 11WM: Single slider specification
- 12WM: Double slider specification

### Compliance with CE Conformity

CE Standard option

**B**: Stroke
**C**: Mass (kg)
**D**: (W)
**E**: Rated thrust (N)
**F**: (kg)
**G**: Ambient operating temperature/humidity

**Note 1**: The payload is the value when operated at 0.3 G acceleration.

**Note 2**: Note that when the stroke increases, the payload will drop.

**Note 3**: The maximum cable length is 30 m. Specify a desired length in meters. (Example: X08 = 8 m)
**Models/Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor output (W)</th>
<th>Slider Type</th>
<th>Stroke in 100mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload (kg)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11WO-0</td>
<td>D1</td>
<td>Available for 12WO only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS-12WO-0</td>
<td>D2</td>
<td>Available for 12WO only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* In the above model numbers, D indicates the stroke, and D indicates the option(s).

<table>
<thead>
<tr>
<th>Name Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sliders</td>
<td></td>
</tr>
</tbody>
</table>

**Dimensions**

- Dimensions A~D increase by 100mm for every 100mm stroke increment.

**Common Specifications**

- Positioning repeatability
- Drive method
- Lost Motion

**Options**

- Positioning repeatability
- Drive method
- Lost Motion

**FS-WO**

Single-axis robot / Actuator width: 52mm / Wide guide module

[Image of CAD drawing]

**2D CAD**

- CAD drawings are available for download from our website.

**RoHS**

- Free slider
- Free slider
- M8, depth 14

**Dimensions A~D**

- T-slot dimension

**FS-11WO-0**

<table>
<thead>
<tr>
<th>Stroke (mm)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>551</td>
<td>535</td>
<td>350</td>
<td>370</td>
<td>4.9</td>
</tr>
<tr>
<td>400</td>
<td>651</td>
<td>635</td>
<td>400</td>
<td>470</td>
<td>5.6</td>
</tr>
<tr>
<td>500</td>
<td>851</td>
<td>835</td>
<td>500</td>
<td>700</td>
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<td>600</td>
<td>1051</td>
<td>1235</td>
<td>600</td>
<td>870</td>
<td>8.3</td>
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<td>1235</td>
<td>700</td>
<td>1070</td>
<td>9.6</td>
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</tbody>
</table>

**FS-12WO-0**

<table>
<thead>
<tr>
<th>Stroke (mm)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Mass (kg)</th>
</tr>
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<tbody>
<tr>
<td>300</td>
<td>651</td>
<td>635</td>
<td>350</td>
<td>370</td>
<td>5.6</td>
</tr>
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<td>600</td>
<td>1151</td>
<td>1135</td>
<td>600</td>
<td>870</td>
<td>8.9</td>
</tr>
<tr>
<td>700</td>
<td>1351</td>
<td>1335</td>
<td>700</td>
<td>1070</td>
<td>10.2</td>
</tr>
</tbody>
</table>

*300–2500mm strokes are available in 100mm increments.

Dimensions A–D increase by 100mm for every 100mm stroke increment.

**Note**

- Dimensions inside of ( ) indicates 12WO.

*Refer to P.12 for the actuator installation method.
**FS-LM-400**

**Single-axis robot / Large belt type / Actuator width: 75mm / 400W**

### Models/Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor type</th>
<th>Stroke in 100mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload (Note 1)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11LM-400</td>
<td>Absolute</td>
<td>400</td>
<td>1000 to 2000</td>
<td>1-1250</td>
<td>15</td>
<td>196</td>
</tr>
<tr>
<td>FS-12LM-400</td>
<td>Absolute</td>
<td>400</td>
<td>1000 to 2000</td>
<td>1-1250</td>
<td>60 (Note 2)</td>
<td>Design exclusively for horizontal use</td>
</tr>
</tbody>
</table>

* In the above model numbers, [ ] indicates the encoder type, [ ] indicates the motor type, [ ] indicates the applicable controller, [ ] indicates the cable length, and [ ] indicates the option(s).

### Options

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversing-home specification</td>
<td>NM</td>
<td>Available for 11LM only</td>
</tr>
<tr>
<td>Motor positioned on the opposite side</td>
<td>R</td>
<td>Refer to P. 12 (Installation/Mounting)</td>
</tr>
<tr>
<td>Motor positioned at the bottom</td>
<td>U</td>
<td>Special order; refer to P. 12 (Install./Mount.)</td>
</tr>
<tr>
<td>Motor positioned at bottom on opposite side</td>
<td>RU</td>
<td>Special order; refer to P. 12 (Install./Mount.)</td>
</tr>
<tr>
<td>Metal Cable Joint Connector</td>
<td>EU</td>
<td>Standard option</td>
</tr>
<tr>
<td>Compliance with CE Conformity</td>
<td>CE</td>
<td>Standard option</td>
</tr>
</tbody>
</table>

### Dimensions

- **T-slot dimension**

- **D**
  - Stroke 1000
  - A: 1549
  - B: 1325
  - C: 1000
  - D: 1085
  - Mass (kg): 28
  - Payload (kg): 15
  - Dimensions A-D increase by 100mm for every 100mm stroke increment.

- **D**
  - Stroke 1000
  - A: 1649
  - B: 1425
  - C: 1015
  - D: 1185
  - Mass (kg): 31
  - Payload (kg): 60
  - Dimensions A-D increase by 100mm for every 100mm stroke increment.

* Refer to P. 12 for the actuator installation method.

### Applicable Controller Specifications

<table>
<thead>
<tr>
<th>Applicable Controller</th>
<th>Maximum number of controlled axes</th>
<th>Connectable encoder type</th>
<th>Operating method</th>
<th>Power-supply voltage</th>
<th>Program</th>
<th>Positioner control</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-SEL-P/Q</td>
<td>6 axes</td>
<td>Absolute/incremental</td>
<td>Single/Three phase 230 VAC</td>
<td>Single-phase 115/230 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSEL</td>
<td>2 axes</td>
<td>Absolute/incremental</td>
<td>Single/Three phase 230 VAC</td>
<td>Single-phase 115/230 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCON-CA</td>
<td>1 axis</td>
<td>Absolute/incremental</td>
<td>Single/Three phase 230 VAC</td>
<td>Single-phase 115/230 VAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Note that when the stroke increases, the payload will drop. (Refer to the tables above for payload by stroke.)

**CAUTION**

- (Note 1) The payload is the value when operated at 0.3 G acceleration.
- (Note 2) The maximum cable length is 30 m. Specify a desired length in meters. (Example: 308 = 8 m)
### FS-HM-400 Single-axis robot / Large belt type / Actuator width: 75mm / 400W High-speed specification

#### Models/Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor output (W)</th>
<th>Slider</th>
<th>Stroke in 100mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload (Note 1)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11HM-400</td>
<td>Absolute</td>
<td>400</td>
<td>Single</td>
<td>1000~3000</td>
<td>10</td>
<td>10 (Note 2)</td>
<td>127</td>
</tr>
<tr>
<td>FS-12HM-400</td>
<td>Incremental</td>
<td></td>
<td>Double</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* In the above model numbers, [ ] indicates the encoder type, [ ] indicates the stroke, [ ] indicates the applicable controller, [ ] indicates the cable length, and [ ] indicates the option(s).

#### Options

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversed-home specification</td>
<td>NM</td>
<td>Available for 11HM only</td>
</tr>
<tr>
<td>Motor positioned on the opposite side</td>
<td>R</td>
<td>Refer to P. 12 (Installation/Mounting)</td>
</tr>
<tr>
<td>Motor positioned at the bottom</td>
<td>U</td>
<td>Special order; refer to P. 12 (Install./Mount.)</td>
</tr>
<tr>
<td>Motor positioned at bottom on opposite side</td>
<td>RU</td>
<td>Special order; refer to P. 12 (Install./Mount.)</td>
</tr>
<tr>
<td>Metal Cable Joint Connector</td>
<td>EU</td>
<td></td>
</tr>
<tr>
<td>Compliance with CE Conformity</td>
<td>CE</td>
<td>Standard option</td>
</tr>
</tbody>
</table>

#### Dimensions

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable length</td>
<td></td>
<td>N: None, S: 3m, M: 5m, X: 10m</td>
</tr>
</tbody>
</table>

* The dimension inside of ( ) indicates 12HM.

#### Common Specifications

- Positioning repeatability ±0.08mm
- Drive method Timing belt
- Lost Motion 0.1mm max.
- Allowable static load moment Refer to P. 14 (Technical Reference)
- Allowable dynamic load moment Refer to P. 14 (Technical Reference)
- Overhang load length Refer to P. 13 (Technical Reference)
- Base Material: Aluminum, with white alumite treatment
- Applicable controller T1: XSEL-KE/KET, T2: XSEL-P/Q, SSEL, SCON-CA
- Cable length (Note 3) N: None, S: 3m, M: 5m, X: 10m
- Specified length
- Ambient operating temperature/humidity 0 to 40°C, 85%RH max. (non-condensing)

#### Applicable Controller Specifications

**Applicable Controller**

- Maximum number of controlled axes
- Encoder type
- Operating method
- Power-supply voltage

<table>
<thead>
<tr>
<th>Applicable Controller</th>
<th>Maximum number of controlled axes</th>
<th>Encoder type</th>
<th>Operating method</th>
<th>Power-supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-SEL-P/Q</td>
<td>6 axes</td>
<td>Incremental</td>
<td>Single/three-phase 230VAC</td>
<td></td>
</tr>
<tr>
<td>X-SEL-REXET</td>
<td>4 axes</td>
<td>Incremental</td>
<td>Single/three-phase 230VAC</td>
<td></td>
</tr>
<tr>
<td>SSEL</td>
<td>2 axes</td>
<td>Incremental</td>
<td>Single-phase 115/230VAC</td>
<td></td>
</tr>
<tr>
<td>SCON-CA</td>
<td>1 axis</td>
<td>Incremental</td>
<td>Position control</td>
<td></td>
</tr>
</tbody>
</table>

**Operating Method**

- Program
- Power-supply voltage

- Single/three-phase 230VAC
- Single-phase 115/230VAC

**Power-supply Voltage**

- Single/three-phase 230VAC
- Single-phase 115/230VAC

**Note (1)**

- The payload is the value when operated at 0.3 G acceleration.

**Note (2)**

- Note that when the stroke increases, the payload will drop. (Refer to the tables above for payload by stroke.)

**Note (3)**

- The maximum cable length is 10m. Specify a desired length in meters. (Example: X08 = 8 m)
**FS-LO**

Single-axis robot / Actuator width: 75mm / Large guide module

<table>
<thead>
<tr>
<th>Model</th>
<th>Encoder type</th>
<th>Motor type</th>
<th>Stroke in 1000mm increments (mm)</th>
<th>Speed (mm/s)</th>
<th>Payload Horizontal (kg)</th>
<th>Vertical (kg)</th>
<th>Rated thrust (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11LO-0</td>
<td>Single</td>
<td>1000</td>
<td>1000 to 3000</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>FS-12LO-0</td>
<td>Double</td>
<td>1000</td>
<td>1000 to 3000</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* In the above model numbers, indicates the stroke.

**Common Specifications**

- Positioning repeatability: —
- Drive method: —
- Lost Motion: —
- Allowable static load moment: Refer to P. 14 (Technical Reference)
- Allowable dynamic load moment: Refer to P. 13 (Technical Reference)
- Overhang load length: Refer to P. 13 (Technical Reference)
- Base: Material: Aluminum, with white alumite treatment
- Cable length: —
- Ambient operating temperature/humidity: 0 to 40°C, 85%RH max. (non-condensing)

**Dimensions**

* CAD drawings are available for download from our website.

* Refer to P. 12 for the actuator installation method.

* 1000 to 3000mm strokes are available in 100mm increments. Dimensions A-D increase by 100mm for every 100mm stroke increment.
Installation & Mounting of FS Actuator

**Installation method**

**FS Series**

**NM, NO, WM, WO, LM, LO, HM**

- Using the T-groove on the back of the base, secure the body with the T-nut supplied with the actuator.
  - FS-NM (T-slot 1 line) : T-nut M8
  - FS-NO (T-slot 1 line) : T-nut M8
  - FS-WM (T-slot 1 line) : T-nut M8
  - FS-WO (T-slot 1 line) : T-nut M8
  - FS-LM (T-slot 2 lines) : T-nut M8
  - FS-LO (T-slot 2 lines) : T-nut M8
  - FS-HM (T-slot 2 lines) : T-nut M8

**Quantity of T-nut included**

<table>
<thead>
<tr>
<th>Stroke</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>300~1000</td>
<td>5</td>
</tr>
<tr>
<td>1100~1500</td>
<td>6</td>
</tr>
<tr>
<td>1600~2000</td>
<td>7</td>
</tr>
<tr>
<td>2100~2500</td>
<td>8</td>
</tr>
<tr>
<td>2600~3000</td>
<td>9</td>
</tr>
</tbody>
</table>

*Double the numbers for LM/LO/HM models.

**Actuator installation posture**

- ○: Installable —: Not installable (*) Except for types with D1/D2 option

<table>
<thead>
<tr>
<th>Installation posture</th>
<th>Vertical</th>
<th>Side-mounted</th>
<th>Ceiling mounted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>○</td>
<td>—</td>
<td>○ (*)</td>
</tr>
<tr>
<td>Vertical</td>
<td></td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Motor mounting position options**

The position of the motor can be optional changed to the 3 types as shown in the following figures, depending on the actuator requirements.

With these changes, the motor position can be changed according to the installation environment. Note, that in case of the motor on bottom, the motor position becomes lower than the slider and there is thus no risk of contacting the load.

**Motor on Top (Left/Reversed-mounted)**
- Option code : R

**Motor on Bottom (Right-mounted)**
- Option code : U

**Motor on Bottom (Left/Reversed-mounted)**
- Option code : R-U
Allowable dynamic moment, Overhang load length

With each type of FS Series, a single or double slider can be selected. The allowable dynamic moment and overhang load length vary depending on the length of the slider. Refer to the typical examples shown below.

**Directions of allowable dynamic moments**

- Allowable dynamic moment values are based on a 20000 km service life. Please note that applying a moment exceeding the allowable value will reduce the service life of the guide.

**Directions of load moments**

- When each model is used with an overhang load exceeding the allowable length, vibration may occur. Be sure to keep the overhang load length within the allowable value.

<table>
<thead>
<tr>
<th>Type</th>
<th>Fig.</th>
<th>Overhang load length</th>
<th>Allowable dynamic moment(*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS-11NM</td>
<td>Fig.1</td>
<td>200mm or less</td>
<td>Ma: 2.9 (0.3) Mb: 2.9 (0.3) Mc: 4.5 (0.46)</td>
</tr>
<tr>
<td>FS-11NO</td>
<td>Fig.1</td>
<td>200mm or less</td>
<td>Ma: 2.9 (0.3) Mb: 2.9 (0.3) Mc: 4.5 (0.46)</td>
</tr>
<tr>
<td>FS-12NM</td>
<td>Fig.2</td>
<td>500mm or less</td>
<td>Ma: 20.5 (2.1) Mb: 18.6 (1.9) Mc: 9.1 (0.93)</td>
</tr>
<tr>
<td>FS-12NO</td>
<td>Fig.2</td>
<td>500mm or less</td>
<td>Ma: 20.5 (2.1) Mb: 18.6 (1.9) Mc: 9.1 (0.93)</td>
</tr>
<tr>
<td>FS-11WM</td>
<td>Fig.1</td>
<td>240mm or less</td>
<td>Ma: 4.4 (0.45) Mb: 3.9 (0.4) Mc: 5.8 (0.6)</td>
</tr>
<tr>
<td>FS-11WO</td>
<td>Fig.1</td>
<td>240mm or less</td>
<td>Ma: 4.4 (0.45) Mb: 3.9 (0.4) Mc: 5.8 (0.6)</td>
</tr>
<tr>
<td>FS-12WM</td>
<td>Fig.2</td>
<td>600mm or less</td>
<td>Ma: 27.4 (2.8) Mb: 25.4 (2.6) Mc: 11.7 (1.2)</td>
</tr>
<tr>
<td>FS-12WO</td>
<td>Fig.2</td>
<td>600mm or less</td>
<td>Ma: 27.4 (2.8) Mb: 25.4 (2.6) Mc: 11.7 (1.2)</td>
</tr>
<tr>
<td>FS-11LM</td>
<td>Fig.1</td>
<td>300mm or less</td>
<td>Ma: 8.8 (0.9) Mb: 7.8 (0.8) Mc: 12.7 (1.3)</td>
</tr>
<tr>
<td>FS-11LO</td>
<td>Fig.1</td>
<td>300mm or less</td>
<td>Ma: 8.8 (0.9) Mb: 7.8 (0.8) Mc: 12.7 (1.3)</td>
</tr>
<tr>
<td>FS-11HM</td>
<td>Fig.1</td>
<td>300mm or less</td>
<td>Ma: 8.8 (0.9) Mb: 7.8 (0.8) Mc: 12.7 (1.3)</td>
</tr>
<tr>
<td>FS-12LM</td>
<td>Fig.2</td>
<td>750mm or less</td>
<td>Ma: 51.9 (5.3) Mb: 47.0 (4.8) Mc: 25.4 (2.6)</td>
</tr>
<tr>
<td>FS-12LO</td>
<td>Fig.2</td>
<td>750mm or less</td>
<td>Ma: 51.9 (5.3) Mb: 47.0 (4.8) Mc: 25.4 (2.6)</td>
</tr>
<tr>
<td>FS-12HM</td>
<td>Fig.2</td>
<td>750mm or less</td>
<td>Ma: 51.9 (5.3) Mb: 47.0 (4.8) Mc: 25.4 (2.6)</td>
</tr>
</tbody>
</table>

(*) For case of 20000km service life (fw=1.2)
**Calculation of allowable moments**

There are two types of moment that can be applied to the guide: the allowable dynamic moment and the allowable static moment.

The allowable dynamic moment is calculated from the travel life (when fraking occurs) when moved with the moment load applied. In contrast, the static moment is calculated from the load that causes permanent deformation to the steel ball or its rolling surface (i.e. rated static moment), taking into account the rigidity and deformity of the base.

**[Allowable Dynamic Moment]**

IAI’s catalog contains the allowable dynamic moments based on a load coefficient of 1.2 and 10000km or 5000km. This value is different from the so-called basic rated dynamic moment, which is based on a 50km travel life.

To calculate the basic rated dynamic moment for a 50km travel life, use the following equation.

\[ M_{50} = f_w \times M_s = \left( \frac{50}{1} \right) \]  

**Equation 1**

Mₜₜ : Allowable dynamic moment at an assumed travel distance (catalog value)  
S : IAI catalog assumed travel life (5000km or 10000km)  
fₜ : Load coefficient (=1.2)  
Mₜₜ : Basic rated dynamic moment (50km travel life)

The allowable dynamic moments mentioned in the catalog (10,000km or 5,000km life) are based on a load coefficient fₜ=1.2. To calculate the service life of a guide with a different load coefficient, use Table 1 below to determine the load coefficient that matches your requirements.

**Table 1: Load Coefficients**

<table>
<thead>
<tr>
<th>Operation and Load Requirements</th>
<th>Load Coefficient fₜ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow operation with light vibration/shock (1500mm/s or less, 0.3G or less)</td>
<td>1.0—I.5</td>
</tr>
<tr>
<td>Moderate vibration/shock, abrupt braking and accelerating (2500mm/s or less, 1.0G or less)</td>
<td>1.5—2.0</td>
</tr>
<tr>
<td>Operation with abrupt acceleration/deceleration with heavy vibration/shock (2500mm/s or faster, 1.0G or faster)</td>
<td>2.0—3.5</td>
</tr>
</tbody>
</table>

\[ L_{10} = \frac{C_{IA}}{P} \times \frac{1.2}{f_w} \times S \]  

**Equation (2)**

L₁₀ : Service life (90% Survival Probability)  
Cₜₜ : Allowable dynamic moment in IAI Catalog (5000km or 10000km)  
P : Moment used (≤ CIA)  
S : IAI catalog assumed travel life (5000km or 10000km)  
fₜ : Load coefficient (from Table 1)

**[Allowable Static Moment]**

The maximum moment that can be applied to a slider at rest.

These values are calculated by taking the basic rated static moment of the slider and multiplying with the safety rate that takes into consideration any effects from the rigidity and deformity of the base.

Therefore, if a moment load is applied to the slider at rest, keep the moment within this allowable static moment. However, use caution to avoid adding any unexpected shock load from any inertia that reacts on the load.

**[Basic Rated Static Moment]**

The basic rated static moment is the moment value at which the sum of the permanent deformation at the center of contact between the rolling body (steel ball) and the rolling surface (rail) is 0.0001 times the diameter of the rolling body.

These values are simply calculated strictly from the permanent deformation done to the steel ball and its rolling surface. However, the actual moment value is restricted by the rigidity and deformation of the base. Hence, the allowable static moment the actual moment that can be applied statically, taking into account those factors.
Motor / Encoder / PIO Cables

To connect the actuator cable joint connector and the controller there are a motor cable for the motor power, and an encoder cable for the encoder signals. All the motor/encoder cables are high-flexible robot cables, selectable with plastic connector or metal connector (EU version).

**Motor Cable / EU Motor Cable for XSEL-KE/KET/P/Q, SSEL, MSCON, SCON-CA/CAL**

* □□□□ is the cable length (L); supports up to 30m.

**Model:** CB-X-MA□□□□ / CB-XEU-MA□□□□

![Motor Cable Diagram](image)

Minimum bending R: $r = 51$ mm or more (for movable use)

**Encoder Cable / EU Encoder Cable for XSEL-KE/KET**

* □□□□ is the cable length (L); supports up to 30m.

**Model:** CB-X-PA□□□□ / CB-XEU-PA□□□□

![Encoder Cable Diagram](image)

Minimum bending R: $r = 51$ mm or more (for movable use)

**PIO Flat Cable for XSEL-KE/KET/P/Q**

* □□□□ is the cable length (L); supports up to 10m.

**Model:** CB-X-PIO□□□

![PIO Flat Cable Diagram](image)

No connector

Flat cable (50-core)
**Encoder Cable / EU Encoder Cable for XSEL-P/Q, SSEL, MSCON, SCON-CA/CAL**

Model: **CB-X1-PA[...]** / **CB-XEU1-PA[...]**

- **Actuator side**
  - No connector
- **Controller side**
  - Minimum bend radius $R: r = 44\text{mm}$ or larger (for movable use)

---

**PIO Flat Cable for SSEL**

Model: **CB-DS-PIO[...]**

- No connector
- Flat cable AWG28 (34-core)

---

**PIO Flat Cable for MSCON, SCON-CA/CAL**

Model: **CB-PAC-PIO[...]**

- No connector
- Flat cable (20-core) x 2