

# Nut Rotary Actuator NS Series

## Operating Manual

===== **Ninth Edition** =====

Small type: SXMS, SXMM, SZMS, SZMM

Medium type: MXMS, MXMM, MXMXS, MZMS, MZMM

Large type: LXMS, LXMM, LXXMS, LZMS, LZMM

***IAI America, Inc.***



## Please Read Before Use

Thank you for purchasing our product.

This Operating Manual explains the handling methods, structure and maintenance of this product, among others, providing the information you need to know to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

The DVD that comes with the product contains Operating manuals for IAI products.

When using the product, refer to the necessary portions of the applicable instruction manual by printing them out or displaying them on a PC.

After reading the Operating Manual, keep it in a convenient place so that whoever is handling this product can reference it quickly when necessary.

### [Important]

- This Operating Manual is original.
- This product is not to be used for any other purpose from what is noted in this Operating Manual. IAI shall not be liable whatsoever for any loss or damage arising from the result of using the product for any other purpose from what is noted in the manual.
- The information contained in this Operating Manual is subject to change without notice for the purpose of production improvement.
- If you have any question or finding regarding the information contained in this Operating Manual, contact our customer center or our sales office near you.
- Using or copying all or a part of this Operating Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.



INTELLIGENT ACTUATOR

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## Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it 1before the operation of this product.

### Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	<ul style="list-style-type: none"> <li>● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications.               <ol style="list-style-type: none"> <li>1) Medical equipment used to maintain, control or otherwise affect human life or physical health.</li> <li>2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility)</li> <li>3) Important safety parts of machinery (Safety device, etc.)</li> </ol> </li> <li>● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product.</li> <li>● Do not use it in any of the following environments.               <ol style="list-style-type: none"> <li>1) Location where there is any inflammable gas, inflammable object or explosive</li> <li>2) Place with potential exposure to radiation</li> <li>3) Location with the ambient temperature or relative humidity exceeding the specification range</li> <li>4) Location where radiant heat is added from direct sunlight or other large heat source</li> <li>5) Location where condensation occurs due to abrupt temperature changes</li> <li>6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)</li> <li>7) Location exposed to significant amount of dust, salt or iron powder</li> <li>8) Location subject to direct vibration or impact</li> </ol> </li> <li>● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.</li> </ul>

No.	Operation Description	Description
2	Transportation	<ul style="list-style-type: none"> <li>● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane.</li> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped.</li> <li>● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the Operating manual for each model.</li> <li>● Do not step or sit on the package.</li> <li>● Do not put any heavy thing that can deform the package, on it.</li> <li>● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work.</li> <li>● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit.</li> <li>● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength.</li> <li>● Do not get on the load that is hung on a crane.</li> <li>● Do not leave a load hung up with a crane.</li> <li>● Do not stand under the load that is hung up with a crane.</li> </ul>
3	Storage and Preservation	<ul style="list-style-type: none"> <li>● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation.</li> <li>● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.</li> </ul>
4	Installation and Start	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> <li>● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake.</li> <li>● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life.</li> <li>● When using the product in any of the places specified below, provide a sufficient shield.             <ol style="list-style-type: none"> <li>1) Location where electric noise is generated</li> <li>2) Location where high electrical or magnetic field is present</li> <li>3) Location with the mains or power lines passing nearby</li> <li>4) Location where the product may come in contact with water, oil or chemical droplets</li> </ol> </li> </ul>



No.	Operation Description	Description
4	Installation and Start	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> <li>● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool.</li> <li>● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error.</li> <li>● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error.</li> <li>● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction.</li> <li>● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product.</li> <li>● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.</li> </ul> <p>(3) Grounding</p> <ul style="list-style-type: none"> <li>● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation.</li> <li>● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm<sup>2</sup> (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards).</li> <li>● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).</li> </ul>





No.	Operation Description	Description
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury.</li> <li>● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation.</li> <li>● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product.</li> <li>● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input.</li> <li>● When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury.</li> <li>● Take the measure so that the work part is not dropped in power failure or emergency stop.</li> <li>● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety.</li> <li>● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> </ul>
5	Teaching	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the "Stipulations for the Operation" and make sure that all the workers acknowledge and understand them well.</li> <li>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.</li> <li>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.</li> <li>● Place a sign "Under Operation" at the position easy to see.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> </ul> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>

No.	Operation Description	Description
6	Trial Operation	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation.</li> <li>● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation.</li> <li>● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc.</li> <li>● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.</li> </ul>
7	Automatic Operation	<ul style="list-style-type: none"> <li>● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence.</li> <li>● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication.</li> <li>● Make sure to operate automatic operation start from outside of the safety protection fence.</li> <li>● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product.</li> <li>● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.</li> </ul>

No.	Operation Description	Description
8	Maintenance and Inspection	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well.</li> <li>● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch.</li> <li>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.</li> <li>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.</li> <li>● Place a sign “Under Operation” at the position easy to see.</li> <li>● For the grease for the guide or ball screw, use appropriate grease according to the Operating Manual for each model.</li> <li>● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> <li>● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation.</li> <li>● Pay attention not to lose the cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury.</li> </ul> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> <li>● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.</li> </ul>
10	Disposal	<ul style="list-style-type: none"> <li>● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste.</li> <li>● When removing the actuator for disposal, pay attention to drop of components when detaching screws.</li> <li>● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.</li> </ul>
11	Other	<ul style="list-style-type: none"> <li>● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device.</li> <li>● See Overseas Specifications Compliance Manual to check whether complies if necessary.</li> <li>● For the handling of actuators and controllers, follow the dedicated Operating manual of each unit to ensure the safety.</li> </ul>

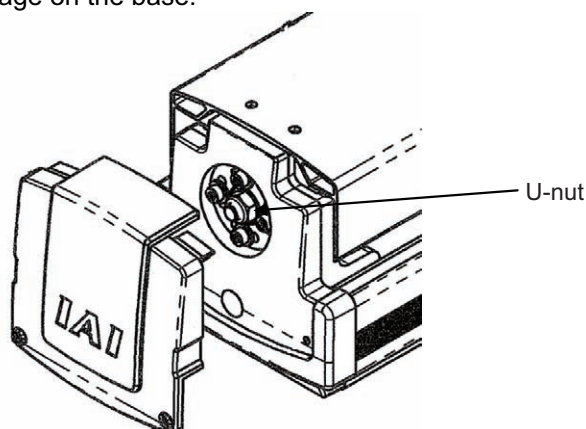
## Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the Operating Manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

## Caution in Handling

1. Make sure to follow the usage condition, environment and specification range of the product.  
Operation out of the guarantee could cause a drop in performance or malfunction of the product.
2. Do not attempt to handle or operate the product in a way that is not described in the operating manual.
3. Use the products of IAI for the wiring between an actuator and a controller.
4. Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings.  
If the actuator is operated at a speed or acceleration/deceleration exceeding the allowable value, abnormal noise or vibration, failure, or shorter life may result.
5. Keep the load moment within the allowable value.  
If the actuator is operated under a load equal to or greater than the allowable load moment, abnormal noise or vibration, failure, or shorter life may result.
6. Do not apply any liquid with temperature lower than the ambient temperature of the installed actuator.  
It may cause condensation inside the product, which may lead to malfunction.
7. Back and forth operation in a short distance may cause wear of grease.  
If the actuators are moved back and forth continuously over a short distance of 30 mm or less, grease film may run out. As a guide, move the actuators back and forth repeatedly for around 5 cycles over a distance of 50 mm or more after every 5,000 to 10,000 cycles. Keep using the actuators with the grease worn out may cause malfunction.
8. Do not attempt to lock in the U-nut.  
Doing so may cause warpage on the base.



9. Make sure to attach the actuator properly by following this operating manual.  
Using the product with the actuator not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.

## International Standards Compliances

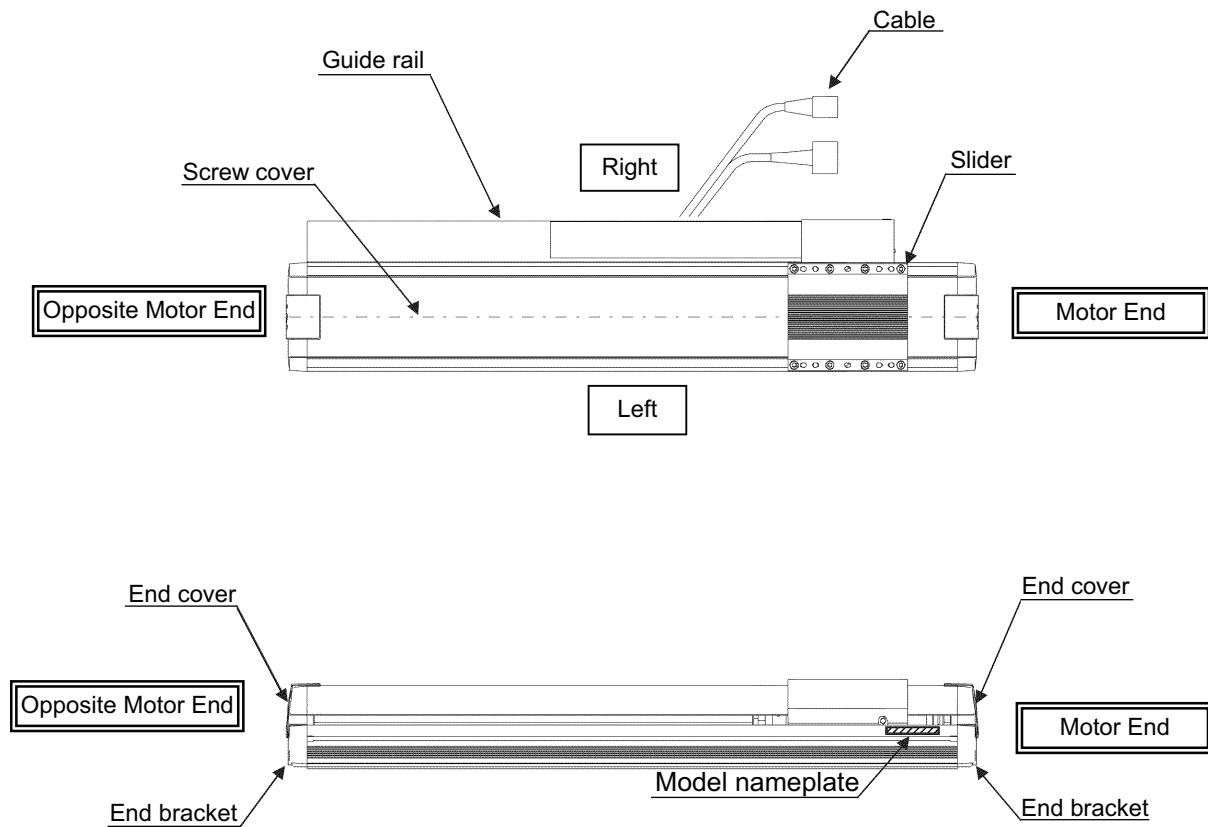
This actuator complies with the following overseas standard.  
Refer to Overseas Standard Compliance Manual (ME0287) for more detailed information.

○ : Applicable   × : Not applicable

RoHS Directive	CE Marking	UL
○	○	×

## Names of the Parts

In this Operating Manual, the left and right sides are indicated by looking at the actuator from the motor end, with the actuator placed horizontally, as shown in the figure below.



\* The installation direction of the cable track varies depending on the specification of the delivered product.



# 1. Specifications Check

## 1.1 Checking the Product

The standard configuration of this product is comprised of the following parts. See the component list for the details of the enclosed components. If you find any fault or missing parts, contact your local IAI distributor.

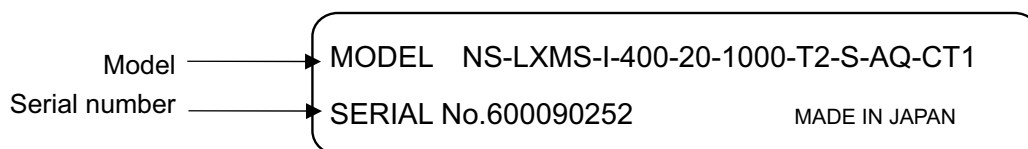
### 1.1.1 Parts

No.	Name	Model number	Quantity	Remarks
1	Actuator	Refer to "How to Read the Model Nameplate" and "How to Read the Model Number."	1	
Accessories				
2	Motor Cables	CB-X-MA□□□	1	
3	Encoder Cables	Standard specification	CB-X3-PA□□□	1
		With limit switch	CB-X2-PLA□□□	1
4	First Step Guide		1	
5	Operating Manual (DVD)		1	
6	Safety Guide		1	

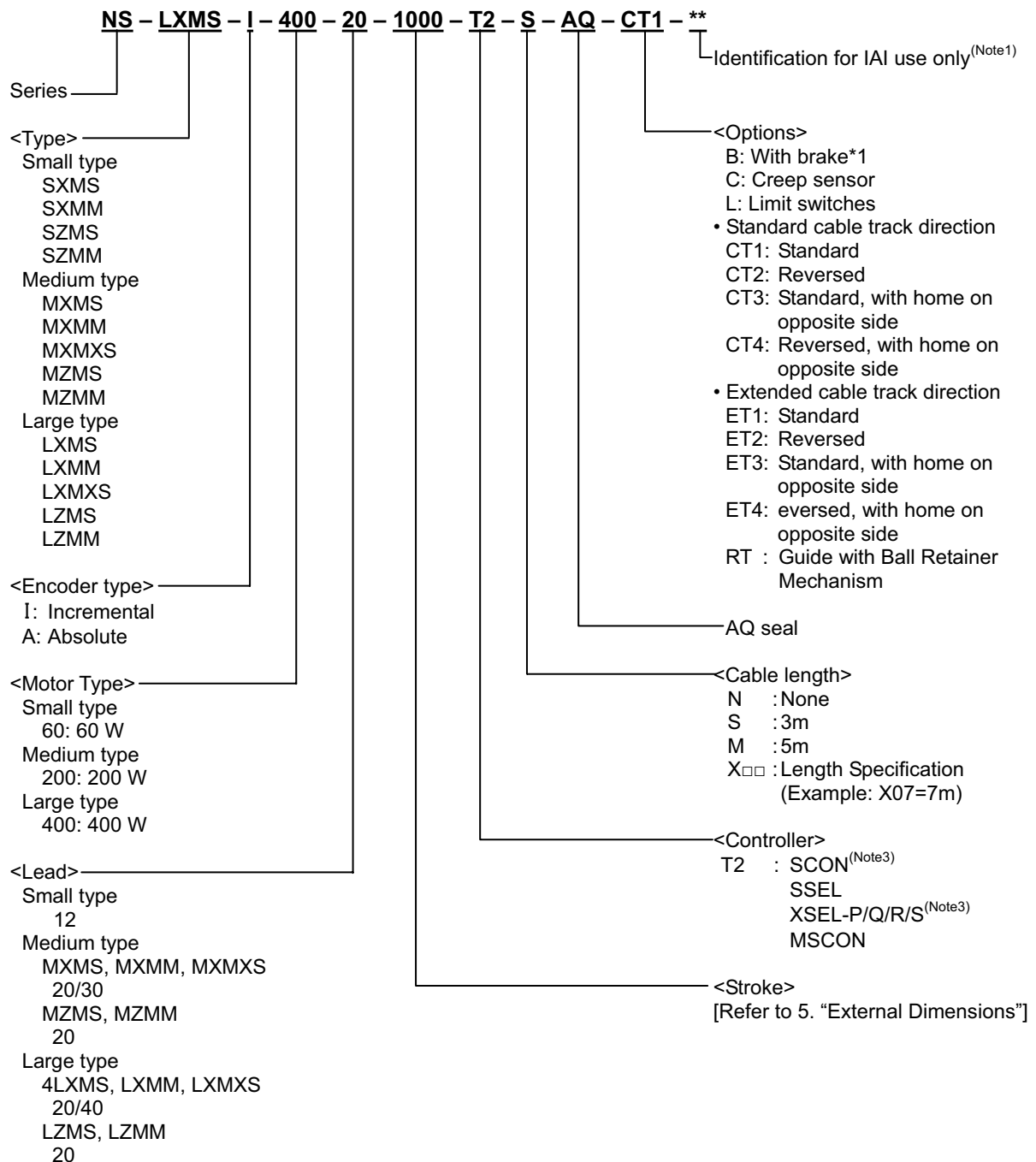
### 1.1.2 Operating Manuals for the Controllers Related to this Product

No.	Name	Control No.
1	Operating Manual for XSEL-P/Q/PCT/QCT Controller	ME0148
2	Operating Manual for XSEL-R/S/RX/SX/RXD/SXD Controller	ME0313
3	Operating Manual for SSEL Controller	ME0157
4	Operating Manual for SCON Controller	ME0161
5	Operating Manual for SCON-CA Controller	ME0243
6	Operating Manual for MSCON Controller	ME0306
7	Operating Manual for XSEL-P/Q/PX/QX RC Gateway Function	ME0188
8	Operating Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
9	Operation Manual for Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Program Controller	ME0325
10	Operating Manual for Teaching Pendant SEL-T/TD/TG	ME0183
11	Operating Manual for Teaching Pendant IA-T-X/XD	ME0160
12	Operating Manual for Software RCM-101MW/RCM-101-USB	ME0155
13	Operating Manual for Teaching Pendant CON-T/TG	ME0178
14	Operation Manual for Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Position Controller	ME0324
15	Operating Manual for Touch Panel Teaching Pendant CON-PT/PD/PG	ME0227
16	Operating Manual for Touch Panel Teaching CON-PTA/PDA/PGA	ME0295
17	Operating Manual for Simple Teaching Pendant RCM-E	ME0174
18	Operating Manual for Data Setter RCM-P	ME0175
19	Operating Manual for Touch Panel Display RCM-PM-01	ME0182
20	Operating Manual for DeviceNet	ME0124
21	Operating Manual for CC-Link	ME0123
22	Operating Manual for PROFIBUS-DP	ME0153
23	Operating Manual for PROFIBUS-DP (SCON-CA)	ME0258
24	Operating Manual for Ethernet	ME0140
25	Operating Manual for Ethernet (XSEL-R/S/RX/SX/RSD/SXD)	ME0309
26	Operating Manual for Ethernet/IP (XSEL-R/S/RX/SX/RSD/SXD)	ME0308
27	Operating Manual for Ethernet/IP (SCON-CA)	ME0278
28	Operating Manual for EtherCAT (SCON-CA)	ME0273
29	Operating Manual for CompoNet	ME0220
30	Operating Manual for MECHATROLINK	ME0221

### 1.1.3 How to Read the Model Nameplate



### 1.1.4 How to Read the Model Number



Note 1 Identification for IAI use only : It may be displayed for IAI use. It is not a code to show the model type.

Note 2 A brake is a standard feature on vertical specification models such as the SZMS, SZMM, MZMS, MZMM, LZMS and LZMM.

Note 3 Incremental type in NS-S Type cannot be connected to XSEL-R/S and SCON-CAL controllers.

## 1.2 Specification

### 1.2.1 Speed

Type	Installation	Lead [mm]	Maximum speed [mm/s]
SXMS	Horizontal	12	720
SXMM	Horizontal	12	720
SZMS	Vertical	12	600
SZMM	Vertical	12	600
MXMS	Horizontal	20	1,200
		30	1,800
MXMM	Horizontal	20	1,200
		30	1,800
MXMXS	Horizontal	20	1,200
		30	1,800
MZMS	Vertical	20	1,000
MZMM	Vertical	20	1,000
LXMS	Horizontal	20	1,300
		40	2,400
LXMM	Horizontal	20	1,300
		40	2,400
LXMXS	Horizontal	20	1,300
		40	2,400
LZMS	Vertical	20	1,000
LZMM	Vertical	20	1,000

## 1.2.2 Maximum Acceleration Speed and Load Capacity

Unit: [kg]

Type	Installation	Lead [mm]	Payload capacity by acceleration/deceleration								Rated thrust [N]
			0.3G <sup>(Note 1)</sup>	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	
SXMS	Horizontal	12	15	7	5	3	1	0.5	-	-	70.8
SXMM	Horizontal	12	15	7	5	3	1	0.5	-	-	70.8
SZMS	Vertical	12	3	2	1.5	1	0.5	-	-	-	70.8
SZMM	Vertical	12	3	2	1.5	1	0.5	-	-	-	70.8
MXMS	Horizontal	20	40	28	18	10	5	2.5	-	-	170.9
		30	25	16	10	6	3.5	2	1	0.5	113.9
MXMM	Horizontal	20	40	28	18	10	5	2.5	-	-	170.9
		30	25	16	10	6	3.5	2	1	0.5	113.9
MXMXS	Horizontal	20	40	-	-	-	-	-	-	-	170.9
		30	25	-	-	-	-	-	-	-	113.9
MZMS	Vertical	20	6	4	3	-	-	-	-	-	170.9
MZMM	Vertical	20	6	4	3	-	-	-	-	-	170.9
LXMS	Horizontal	20	80	60	48	40	34	30	27	24	340.1
		40	40	30	25	20	17	15	13	10	170.0
LXMM	Horizontal	20	80	60	48	40	34	30	27	24	340.1
		40	40	30	25	20	17	15	13	10	170.0
LXMXS	Horizontal	20	80	-	-	-	-	-	-	-	340.1
		40	40	-	-	-	-	-	-	-	170.0
LZMS	Vertical	20	16	12.3	11.1	10.1	9.2	6	-	-	340.1
LZMM	Vertical	20	16	12.3	11.1	10.1	9.2	6	-	-	340.1

### Note 1 Rated acceleration

Even when the acceleration is equal to or below the rated acceleration, the loading capacity remains the same as the value at the rated acceleration.



**Caution:** Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings. Doing so may result in vibration, failure or shorter life.

### 1.2.3 Driving System and Position Detector

Type	Motor type	Lead [mm]	No. of Encoder Pulses	Ball Screw Type		
				Type	Diameter	Accuracy
SXMS	60W	12	Absolute type: 16,384	Rolled	φ10	C10 or equiv.
			Incremental type: 2,400			
SXMM	60W	12	Absolute type: 16,384		φ10	C10 or equiv.
			Incremental type: 2,400			
SZMS	60W	12	Absolute type: 16,384		φ10	C10 or equiv.
			Incremental type: 2,400			
SZMM	60W	12	Absolute type: 16,384		φ10	C10 or equiv.
			Incremental type: 2,400			
MXMS	200W	20	16,384		φ16	C5 or equiv.
		30				
MXMM	200W	20			φ16	C5 or equiv.
		30				
MXMXS	200W	20			φ16	C5 or equiv.
		30				
MZMS	200W	20			φ16	C5 or equiv.
MZMM	200W	20			φ16	C5 or equiv.
LXMS	400W	20		φ20	C5 or equiv.	
		40				
LXMM	400W	20		φ20	C5 or equiv.	
		40				
LXMXS	400W	20		φ20	C5 or equiv.	
		40				
LZMS	400W	20		φ20	C5 or equiv.	
LZMM	400W	20		φ20	C5 or equiv.	

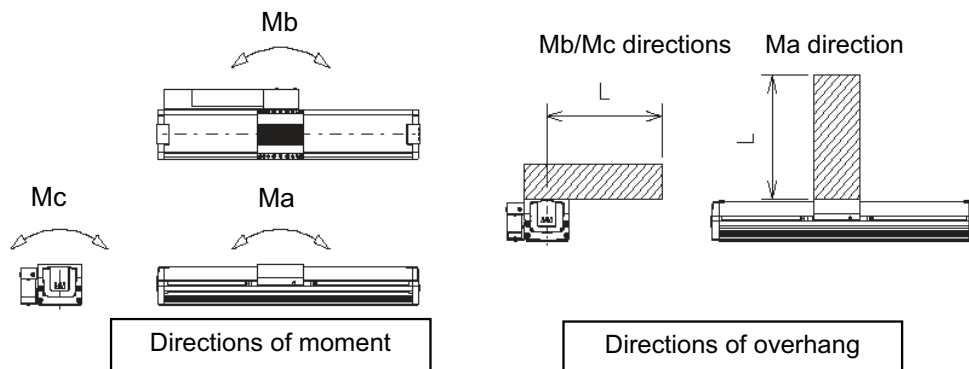
### 1.2.4 Positioning Repeatability and Lost Motion

Type	Installation	Lead [mm]	Positioning repeatability [mm]	Lost motion [mm]
SXMS	Horizontal	12	±0.02	0.05 or less
SXMM	Horizontal	12		
SZMS	Vertical	12		
SZMM	Vertical	12		
MXMS	Horizontal	20	±0.01	0.02 or less
		30		
MXMM	Horizontal	20		
		30		
MXMXS	Horizontal	20		
		30		
MZMS	Vertical	20		
MZMM	Vertical	20		
LXMS	Horizontal	20		
		40		
LXMM	Horizontal	20		
		40		
LXMXS	Horizontal	20		
		40		
LZMS	Vertical	20		
LZMM	Vertical	20		

The values shown above are the accuracy at the delivery from the factory.  
It does not include the consideration of time-dependent change as it is used.

## 1.2.5 Allowable Moment and Overhang Load Length for Actuator

Type	Dynamic allowable moment [N·m (Kgf·m)]			Overhang load length (L)
	Ma	Mb	Mc	
SXMS	32.9 (3.36)	47.0 (4.8)	76.8 (7.84)	Ma direction: 450mm or less Mb, Mc direction: 450mm or less
SXMM	32.9 (3.36)	47.0 (4.8)	76.8 (7.84)	Ma direction: 450mm or less Mb, Mc direction: 450mm or less
SZMS	32.9 (3.36)	47.0 (4.8)	76.8 (7.84)	Ma direction: 450mm or less Mb, Mc direction: 450mm or less
SZMM	32.9 (3.36)	47.0 (4.8)	76.8 (7.84)	Ma direction: 450mm or less Mb, Mc direction: 450mm or less
MXMS	81.0 (8.27)	116.0 (11.84)	189.0 (9.29)	Ma direction: 600mm or less Mb, Mc direction: 600mm or less
MXMM	81.0 (8.27)	116.0 (11.84)	189.0 (9.29)	Ma direction: 600mm or less Mb, Mc direction: 600mm or less
MXMXS	81.0 (8.27)	116.0 (11.84)	189.0 (9.29)	Ma direction: 600mm or less Mb, Mc direction: 600mm or less
MZMS	81.0 (8.27)	116.0 (11.84)	189.0 (9.29)	Ma direction: 600mm or less Mb, Mc direction: 600mm or less
MZMM	81.0 (8.27)	116.0 (11.84)	189.0 (9.29)	Ma direction: 600mm or less Mb, Mc direction: 600mm or less
LXMS	123.0 (12.55)	176.0 (17.96)	291.0 (29.69)	Ma direction: 750mm or less Mb, Mc direction: 750mm or less
LXMM	123.0 (12.55)	176.0 (17.96)	291.0 (29.69)	Ma direction: 750mm or less Mb, Mc direction: 750mm or less
LXMXS	123.0 (12.55)	176.0 (17.96)	291.0 (29.69)	Ma direction: 750mm or less Mb, Mc direction: 750mm or less
LZMS	123.0 (12.55)	176.0 (17.96)	291.0 (29.69)	Ma direction: 750mm or less Mb, Mc direction: 750mm or less
LZMM	123.0 (12.55)	176.0 (17.96)	291.0 (29.69)	Ma direction: 750mm or less Mb, Mc direction: 750mm or less



**Caution:** If the robot is operated under a load equal to or greater than the allowable moment, abnormal noise or vibration, failure, or shorter life may result. If it is extreme, flaking may occur on the guide. Set the overhang length within the allowable range. The overhang length above the allowable range may cause vibration or abnormal noise.



## 1.2.6 Duty of Continuous Operation

“Duty” indicates the utilization rate of an actuator (time during which the actuator operates in a cycle). Use your actuator at duties not exceeding the reference duty calculated as follows. If the actuator is used at duties exceeding the reference duty, the actuator may receive an overload or its motor may generate heat. In extreme cases, motor damage or other undesired result may follow.

$$\text{Duty} = \text{Operating time} / (\text{Operating time} + \text{Standstill time}) [\%]$$



**Caution:** If an overload error occurs, increase the standstill time to lower the duty or decrease the acceleration/deceleration.

[How to Calculate Duty]

1) Calculate the load factor LF using the calculation formula below:

[When commanded the acceleration/deceleration is lower than the rated acceleration/deceleration]

Load factor :  $LF = M \times \alpha / M_r \times \alpha_r [\%]$   
 Maximum payload capacity at rated acceleration:  $M_r [\text{kg}]$   
 Rated acceleration/deceleration :  $\alpha_r [\text{G}]$   
 Transfer weight during operation :  $M [\text{kg}]$   
 Acceleration/deceleration during operation :  $\alpha [\text{G}]$

[When commanded the acceleration/deceleration is higher than the rated acceleration/deceleration]

Load factor :  $LF = M \times \alpha / M_d \times \alpha = M / M_d [\%]$   
 Transportable weight in commanded acceleration:  $M_d [\text{kg}]$   
 Transfer weight during operation :  $M [\text{kg}]$   
 Acceleration/deceleration during operation :  $\alpha [\text{G}]$

(Note) For the maximum payload capacity at rated acceleration, and rated acceleration/deceleration, refer to 1.2, “Specifications.”

2) Calculate the acceleration/deceleration time ratio  $t_{od}$  using the calculation formula below:

$$\text{Acceleration/deceleration time ratio } t_{od} = (\text{Acceleration time} + \text{Deceleration time}) / \text{Operating time} [\%]$$

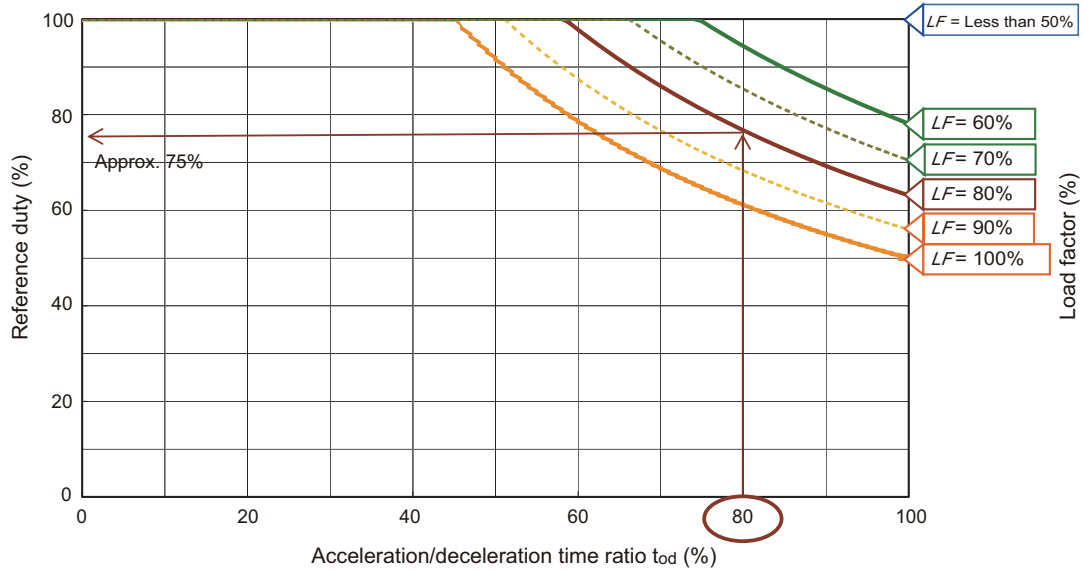
$$\text{Acceleration time} = \text{Speed} [\text{mm/s}] / \text{Acceleration} [\text{mm/s}^2] [\text{sec.}]$$

$$\text{Acceleration} [\text{mm/s}^2] = \text{Acceleration} [\text{G}] \times 9,800 \text{ mm/s}^2$$

$$\text{Deceleration time} = \text{Speed} [\text{mm/s}] / \text{Deceleration} [\text{mm/s}^2] [\text{sec.}]$$

$$\text{Deceleration} [\text{mm/s}^2] = \text{Deceleration} [\text{G}] \times 9,800 \text{ mm/s}^2$$

- 3) Find the reference duty on a graph of calculated load factor LF and acceleration/deceleration time ratio  $t_{od}$ .  
 Example) If the load factor LF is 80% and acceleration/deceleration time ratio  $t_{od}$  is 80%, the reference duty is approx. 75%.



## 1.2.7 About Home Return

### (1) Operating Principles of Home Return

This actuator implements a home return in the following steps:

- 1) Upon receiving a home return command, the actuator determines the moving direction based on the specified parameter.
- 2) The actuator detects a home sensor signal during the return operation.
- 3) After detecting the home sensor signal, the actuator reverses its direction and operates until a Z-phase signal is detected, upon which the actuator defines the applicable position as the reference point.
- 4) The actuator travels further by the offset specified by a parameter, and defines the achieved position as the home.

### (2) Fine-tuning the Home Position

The motor revolution after a home sensor signal is detected until a Z-phase signal generates has been adjusted prior to shipment.

The table below shows the standard distances from the stopper, reached by the slider when it reverses its direction upon detecting a home sensor signal and eventually stops at the home position.

Lead	Distance from mechanical stopper [mm]
20mm or less	5±1
Over 20mm	5±2

If the direction of home return remains the same, the home position for each actuator can be fine-tuned using the applicable distance shown above by changing the parameter.

Shown below is how to perform the fine-tuning.

- 1) Perform a home return operation to check the home.
- 2) Calculate the difference between the current home position and the desired home position and change the parameter. Parameter can be set in positive side of the moving direction. (The position cannot be corrected in the negative direction.)
- 3) Increasing the offset will narrow the moving range of the actuator. In case of having an offset more than 1mm, reestablish the setting also for the stroke soft limit.



**Warning:** The encoder not only detects angles of rotation and home signals, but it also serves an important role in the switching of phases in the AC-servo power line. For this reason, the encoder phases have been adjusted precisely. Never touch the encoder to change the home.

## 1.3 Option

### 1.3.1 AQ Seal (Model: AQ)

The AQ seal is a lubrication unit that uses a lubricating member made of resin-solidified lubricating oil. The AQ seal is a porous member containing a lot of lubricating oil, so lubricating oil oozes out to the surface by means of capillary phenomenon.

When the AQ seal is pressed against the guide and ball screw surface (steel-ball rolling surface), lubricating oil is supplied and this, combined with use of grease, keeps the actuator maintenance-free for a long time.

### 1.3.2 Brake (Model: B)

The brake is a mechanism to retain the slider of a vertically installed actuator so that the slider will not drop when the power is cut off or servo turns off.

SZMS, SZMM, MZMS, MZMM, LZMS and LZMM types are equipped with a brake in standard as they are initially established for vertical use.

It is necessary to have a brake box on the way of the encoder cable for the actuator and the controller.

### 1.3.3 Creep Sensor (Model: C)

This sensor is used to perform home return at high speed.

Normally home return is implemented with the slider contacting the stopper at the stroke end on the motor side and then reversing its direction, and therefore the home return speed is kept to a range of 10 to 20mm/s. Therefore it takes time to finish the home-return operation for the types with a long stroke, and this is the proximity sensor to shorten the required time by getting the slider back at high speed until a certain point of the stroke and by reducing to the ordinary home-return speed in front of the home position.

The position to attach the sensor is on the right side of the actuator body in the view from the motor end.

A cover similar to the one used for limit switches is provided on the outside of the sensor

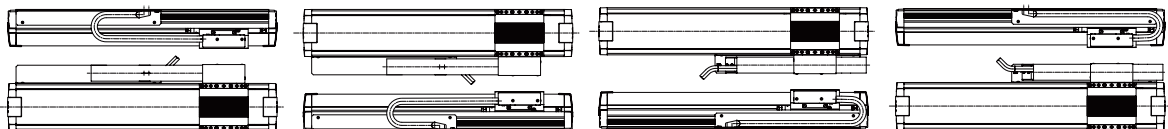
### 1.3.4 Standard Cable Track Attachment Orientations (Model: CT1 to CT4)

The direction to attach the cable track can be selected from following 4 patterns (including the standard direction). (The reamed hole is on the right side and the slotted hole on left side of the base of the main body.)

### 1.3.5 Extended Cable Track Attachment Orientations (Model: ET1 to ET4)

Expanded cable track is available to choose if the standard cable track is not capable enough. (For large type only)

[Attachment Orientations]



Attachment Orientations 1  
(Standard)

Standard Cable Track: Symbol CT1  
Extended Cable Track: Symbol ET1

Attachment Orientations 2  
(Standard, with reversed)

Standard Cable Track: Symbol CT2  
Extended Cable Track: Symbol ET2

Attachment Orientations 3  
(Standard, with home on opposite side)

Standard Cable Track: Symbol CT3  
Extended Cable Track: Symbol ET3

Attachment Orientations 4  
(Home on opposite side)

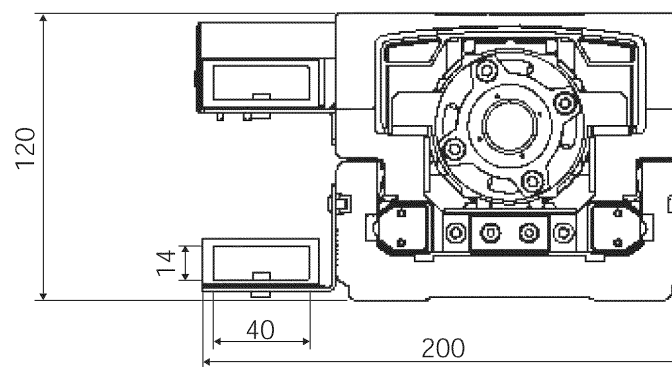
Standard Cable Track: Symbol CT4  
Extended Cable Track: Symbol ET4

The standard cable track that comes pre-assembled on large nut rotary actuators is used exclusively for the wirings of the nut rotary actuator and has no space for accommodating any additional wirings the user may require.

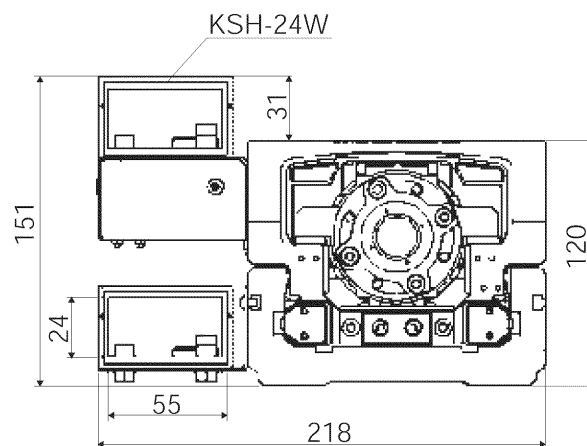
Accordingly, extended cable tracks are provided as options to accommodate user wirings.

The standard cable tracks that come with small and medium types have a space to accommodate user cables. Refer to the following page.

Model of extended cable track option	Cable track installation direction
ET1	Standard
ET2	Reversed
ET3	Standard, with home on opposite side
ET4	Reversed, with home on opposite side



Standard cable track specification



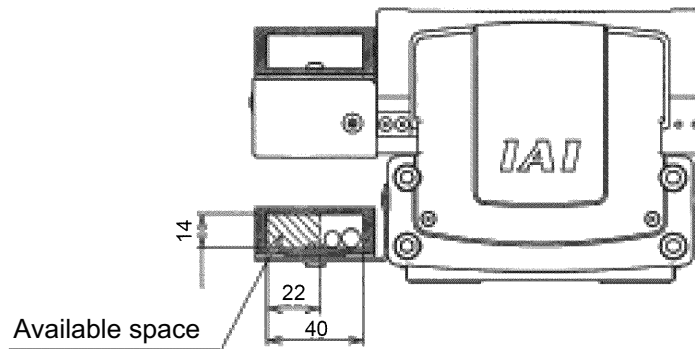
Extended cable track specification (optional)

The points to note when storing cables/hoses in an extended cable track (optional) are specified below:

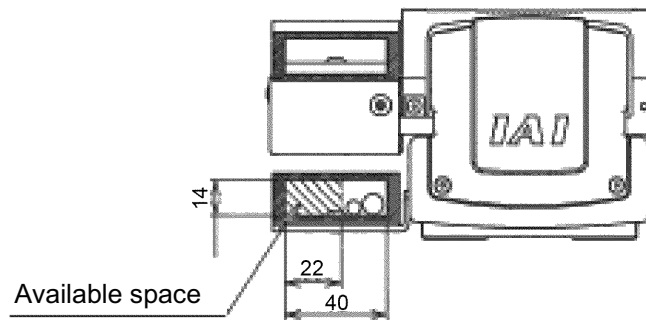
- 1) Provide a minimum clearance of 2mm between the outer diameter of the cable/hose bundle and the interior wall of the cable track, and also between the individual cables and hoses.
- 2) Use cables/hoses with an outer diameter of  $\phi 16.8$  or less, and arrange the cables/hoses horizontally by making sure they don't cross with one another.

Take note that if the cables/hoses are stored without observing the above precautions, the cables/hoses will receive an excessive force and their life will become significantly shorter.

The available spaces in the standard cable tracks for small and medium types are shown below.



Medium types: MXMS, MXMM, MXMXS, MZMS, MZMM



Small types: SXMS, SXMM, SZMS, SZMM

The points to note when storing cables/hoses in an extended cable track (optional) are specified below:

- 1) Provide a minimum clearance of 2mm between the outer diameter of the cable/hose bundle and the interior wall of the cable track, and also between the individual cables and hoses.
  - 2) Use cables/hoses with an outer diameter of  $\phi 16.8$  or less, and arrange the cables/hoses horizontally by making sure they don't cross with one another.
- Take note that if the cables/hoses are stored without observing the above precautions, the cables/hoses will receive an excessive force and their life will become significantly shorter.

### 1.3.6 Home Limit Switch (Model: L)

In ordinary home-return operation, “pressing method” which the actuator is pressed against the stopper and detects the Z-phase after reversed is adopted.

It is an option to have a reverse in the home-return operation not by the pressing method, but by sensing with the proximity sensors. Three proximity sensors, HOME (for home detection), +OT (excess travelling on opposite side of the motor) and –OT (excess travelling on the motor side), are equipped. HOME and –OT are integrated in a twin sensor. Utilize them for fine-tuning or for improvement of certainty. (Note that, in case that the home sensor is moved in a large amount, the stroke may get shortened.)

The home limit switch is equipped on the right of the actuator body in the view from the motor end. Since the limit switch is equipped inside the body, there is no cover to be attached on the side of the body.

### 1.3.7 Guide with Ball Retainer Mechanism (Model: RT)

This is a mechanism to put a spacer (retainer) between balls (steel balls) on the guide.

It reduces the remarkable metal noise caused by balls hitting with each other.

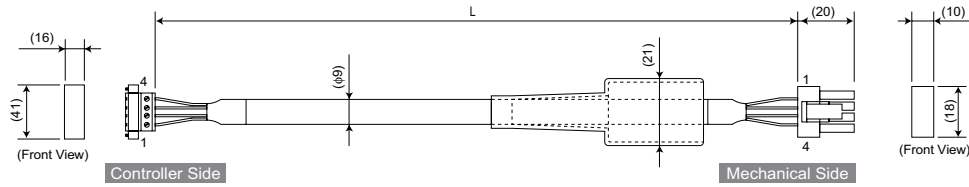
It makes the life of the guide last longer because the abrasion caused by the friction between balls gets reduced.

The movement becomes smooth as the interference of balls to each other can be avoided, thus the operation of the slider can be improved.

## 1.4 Motor • Encoder Cables

### 1.4.1 Motor Cable

CB-X-MA□□□

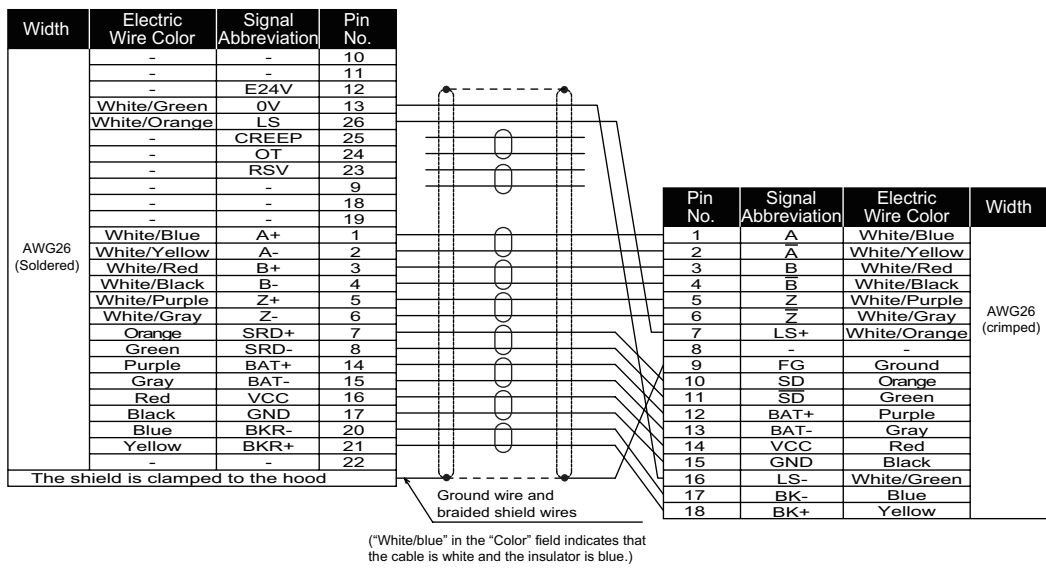
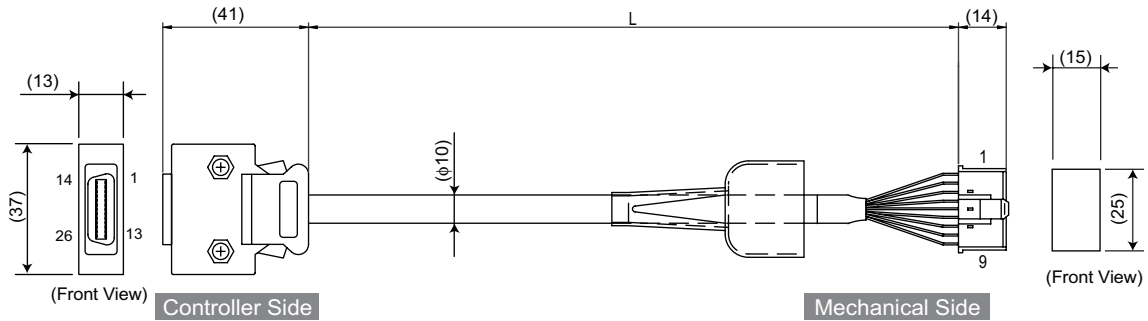


Width	Electric Wire Color	Signal Abbreviation	Pin No.	Pin No.	Signal Abbreviation	Electric Wire Color	Width
0.75sq	Green	PE	1	1	U	Red	0.75sq (crimped)
	Red	U	2	2	V	White	
	White	V	3	3	W	Black	
	Black	W	4	4	PE	Green	



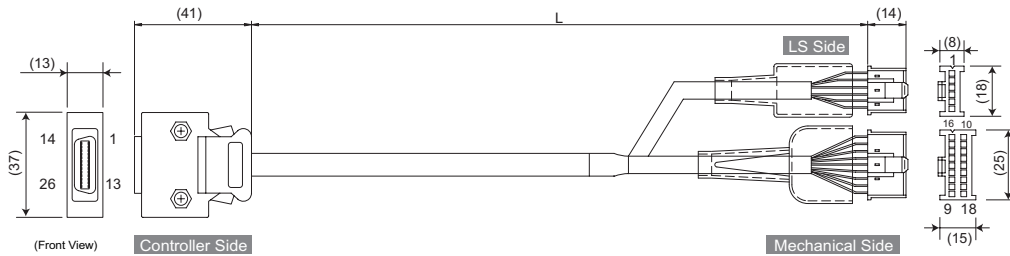
## 1.4.2 Encoder Cable

CB-X3-PA□□□



### 1.4.3 Encoder Cable with LS

CB-X2-PLA□□□



Width	Electric Wire Color	Signal Abbreviation	Pin No.
	—	—	10
	—	—	11
	White/Orange	E24V	12
	White/Green	OV	13
	Red/Blue	LS	26
	Brown/Yellow	CREEP	25
	Brown/Red	OT	24
	Brown/Black	RSV	23
	—	—	9
	—	—	18
	—	—	19
AWG26 (soldered)	White/Blue	A+	1
	White/Yellow	A-	2
	White/Red	B+	3
	White/Black	B-	4
	White/Purple	Z+	5
	White/Gray	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Gray	BAT-	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	—	—	22

Pin No.	Signal Abbreviation	Electric Wire Color	Width
1	E24V	White/Blue	AWG26 (crimped)
2	OV	White/Yellow	
3	LS	White/Red	
4	CREEP	White/Black	
5	OT	White/Purple	
6	RSV	White/Gray	

Pin No.	Signal Abbreviation	Electric Wire Color	Width
1	A	White/Blue	AWG26 (crimped)
2	A	White/Yellow	
3	B	White/Red	
4	B	White/Black	
5	Z	White/Purple	
6	Z	White/Gray	
7	—	—	
8	—	—	
9	FG	Ground	
10	SD	Orange	
11	SD	Green	
12	BAT+	Purple	
13	BAT-	Gray	
14	VCC	Red	
15	GND	Black	
16	—	—	
17	BK-	Blue	
18	BK+	Yellow	

Clamp the shield to the hood.

Ground wire or braided shield wire

("White/blue" in the "Color" field indicates that the cable is white and the insulator is blue.)

## 2. Installation

### 2.1 Transportation

#### [1] Handling of the Actuator

Unless otherwise specified, the actuator is shipped with 1 axis unit packaged separately.

##### (1) Handling the Packed Unit

- Do not damage or drop. The package is not applied with any special treatment that enables it to resist an impact caused by a drop or crash.
- Transport a heavy package with at least more than two operators. Consider an appropriate method for transportation.
- Keep the unit in a horizontal orientation when placing it on the ground or transporting. Follow the instruction if there is any for the packaging condition.
- Do not step or sit on the package.
- Do not put any load that may cause a deformation or breakage of the package.

##### (2) Handling the Actuator after Unpacking

- Do not carry the actuator by its motor unit or its cable or attempt to move it by pulling the cable.
- Hold the base part or bracket part of the body when transporting the actuator main body.
- Do not hit or drop the actuator during transportation.
- Do not attempt to force any part of the actuator.

## [2] Handling in the Assembled Condition

This is the case when the product is delivered from our factory under a condition that it is assembled with other actuators. The combined axes are delivered in a package that the frame is nailed on the lumber base. The sliders are fixed so they would not accidentally move. The actuators are also fixed so the end of it would not shake due to the external vibration.

### (1) How to Handle the Package

- Do not hit or drop the package. No special treatment is conducted on this package to endure a drop or impact on it.
- Do not attempt to carry a heavy package with only one worker. Also, have an appropriate method for transportation.
- When hanging up with ropes, support on the reinforcement frame on the bottom of the lumber base. When bringing up the package with a forklift, also support on the bottom of the lumber base.
- Handle with care when putting the package down to avoid impact or bounce.
- Do not step on the package.
- Do not put anything on the package that could deform or damage it.

### (2) How to Handle after Unpackaged

- Fix the slider so they would not accidentally move during transportation.
- If the end of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the end being fixed, do not apply any impact with 0.3G or more.
- When hanging up with ropes, have appropriate cushioning to avoid any deformation of the actuator body. Also keep it in stable horizontal orientation. Make a fixture utilizing the attachment holes and the tapped holes on the actuator body if necessary.
- Do not attempt to apply load on the actuators or the connector box. Also pay attention not to pinch cables and bend or deform them forcefully.

## [3] Handling in Condition of being assembled in Machinery Equipment (System)

These are some caution notes for when transporting the actuator being assembled in the machinery equipment (system):

- Fix the sliders so it would not move during transportation.
- If the end of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the end being fixed, do not apply any impact with 0.3G or more.
- When hanging up the machinery equipment (system) with ropes, do not attempt to apply load on the actuators or the connector box. Also pay attention not to pinch cables and bend or deform them forcefully.

## 2.2 Installation and Storage • Preservation Environment

### [1] Installation Environment

The actuator should be installed in a location other than those specified below. Also provide sufficient work space required for maintenance inspection.

- Where the actuator receives radiant heat from strong heat sources such as heat treatment furnaces
- Where the ambient temperature exceeds the range of 0 to 40°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the actuator receives direct sunlight
- Where the actuator is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of powder dust, salt or iron (at level exceeding what is normally expected in an assembly plant)
- Where the actuator is subject to splashed water, oil (including oil mist or cutting fluid) or chemical solutions
- Where the actuator receives impact or vibration

If the actuator is used in any of the following locations, provide sufficient shielding measures:

- Where noise generates due to static electricity, etc.
- Where the actuator is subject to a strong electric or magnetic field
- Where the actuator is subject to ultraviolet ray or radiation

### [2] Storage • Preservation Environment

- The storage and preservation environment should comply with the same standards as those for the installation environment. In particular, when the machine is to be stored for a long time, pay close attention to environmental conditions so that no dew condensation forms.
- Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.
- For storage and preservation temperature, the machine withstands temperatures up to 60°C for a short time, but in the case of the storage and preservation period of 1 month or more, control the temperature to 50°C or less.
- Storage and preservation should be performed in the horizontal condition. In the case it is stored in the packaged condition, follow the posture instruction if any displayed on the package.

## 2.3 How to Install


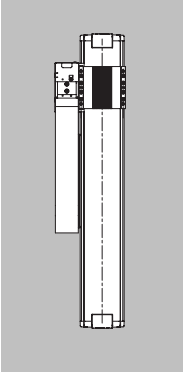
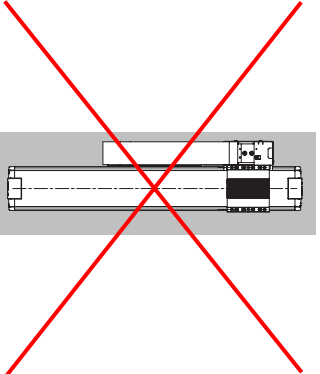
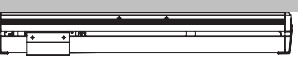
This chapter explains how to install the actuator on your mechanical system.

### 2.3.1 Installation

○ : Possible    △ : Installation possible under conditions    × : Not possible

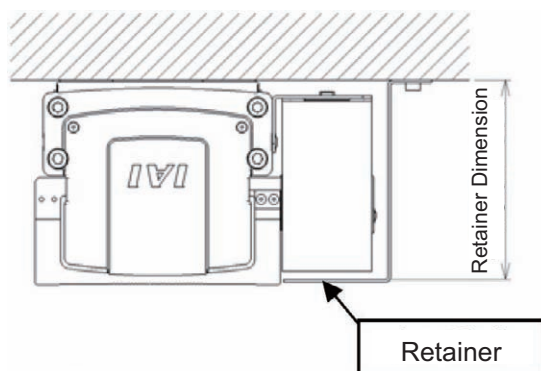
Horizontal installation	Vertical installation	Horizontally Oriented Wall Mount installation	Ceiling Mount installation
○ (Horizontal use only)	○ (Vertical use only)	×	△ (Note 1)

#### Installation Orientation

Horizontal	Vertical	Horizontally Oriented Wall Mount	Ceiling Mount
			

Note 1 Applicable models: SXMS, SXMM, MXMS, MXMM, LXMS, LXMM

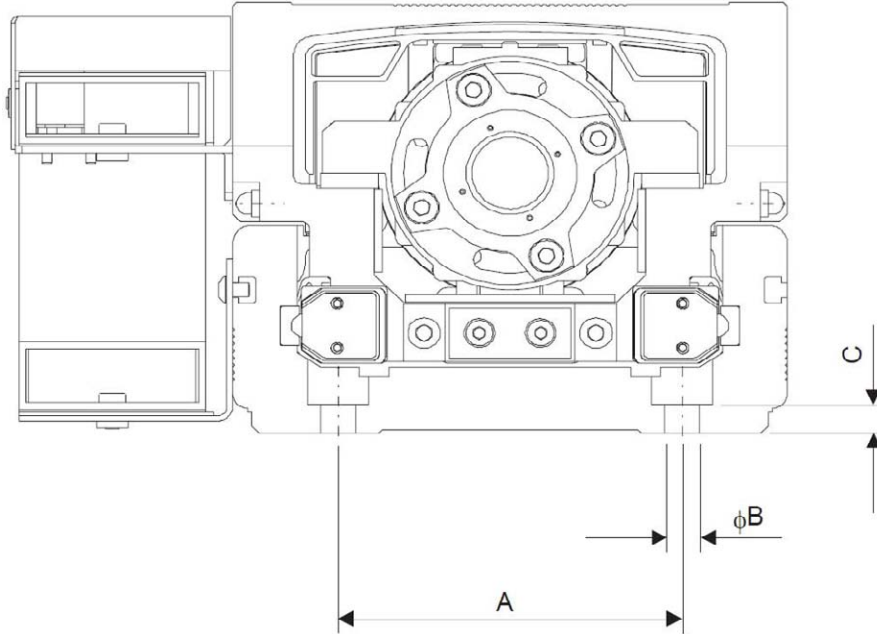
Ceiling mount is available under the condition to have a retainer made of steel or stainless steel at the position of the dimension shown below. However, stroke of 1600mm or less is available to mount for LXMS and LXMM.



Type	Retainer Dimension [mm]
SXMS, SXMM	89
MXMS, MXMM	109
LXMS, LXMM (Expanded track OP)	155

### 2.3.2 Installation of Main Unit

- For the platform to install the actuator, ensure the structure that possesses enough stiffness to avoid vibration being generated.
- The surface where the actuator will be mounted should be a machined surface or that with an accuracy equivalent to it, and the flatness should be 0.05mm or below.
- Have enough space for the maintenance work.



	Applicable bolt	Tightening torque		Dimension A	Dimension B	Dimension C
		Bolt bearing surface is steel	Bolt bearing surface is aluminum			
Small type SXMS, SXMM, SZMS, SZMM	M6	12.3N•m (1.26kgf•m)	5.4N•m (0.55kgf•m)	50	7	5
Medium type MXMS, MXMM, MXMXS, MZMS, MZMM	M8	31.3N•m (3.19kgf•m)	14N•m (1.43kgf•m)	70	9	5
Large type LXMS, LXMM, LXXMS, LZMS, LZMM	M8			90	9	8

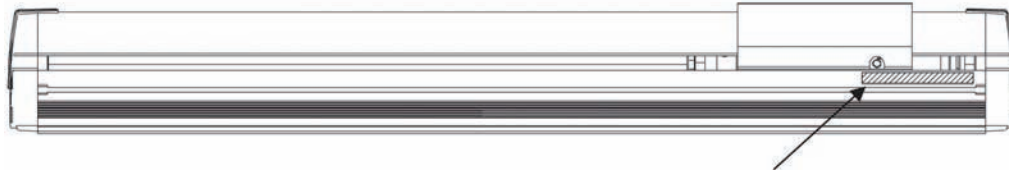
#### About tightening bolts

- Use hexagonal socket head bolts as the male threads with which to install the actuator base.
- Use of high-strength bolts conforming to ISO 10.9 or above is recommended.
- The effective engagement length between the bolt and female thread shall be at least the value specified below:  
When the male thread is made of steel → Same as the nominal diameter  
When the male thread is made of aluminum → 1.8 times of nominal diameter
- If the bolt bearing surface is made of aluminum, also use a dedicated washer for high-strength bolt. (If the bolt is applied without an appropriate washer, the bearing surface may buckle.)



**Caution:** Select a bolts length that suits to the effective thread depth. In case that an insufficient bolt is used, it may cause damage on the tapped holes or insufficiency in the strength.

- On an actuator of single-slider specification, the home is located on the end where the IAI logo is attached on the side face of the screw cover. Be careful of the direction.



**Counter-home side**

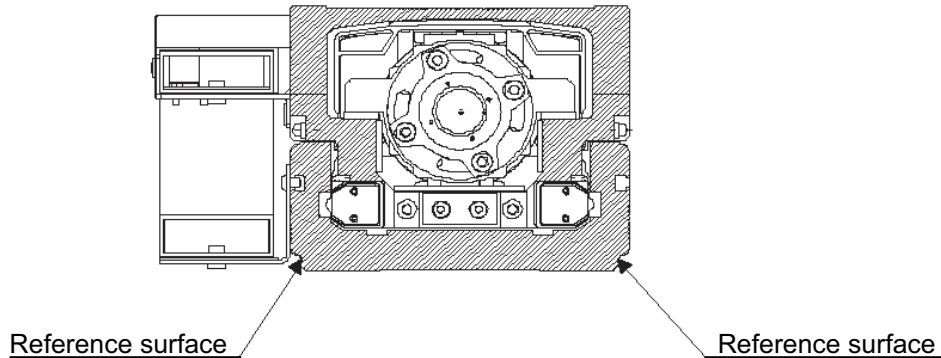
**Model nameplate**

**Home side**



### 2.3.3 Installation Surface

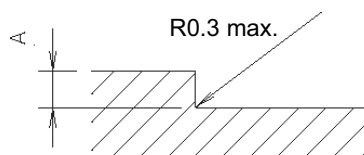
- The frame shall have sufficient structural rigidity to prevent vibration.
- The surface on which to install the actuator shall be a machined surface or a flat surface having equivalent accuracy, where the surface flatness shall be within 0.05mm.
- Provide the space needed to carry out maintenance work.
- The side and bottom faces of the actuator base are used as reference surfaces for slider travel alignment.
- If high traveling accuracy is required, install the actuator using these surfaces as a reference.



The side faces of the base are used as reference surfaces for slider travel alignment. If high traveling accuracy is required, install the actuator using these surfaces as a reference.

When installing the actuator on a frame using the reference surfaces of the base, provide the required machining by following the figure below.

When machining the surface, provide a margin corresponding to the thickness of the cover to prevent the ends of the actuator from contacting the front cover and rear cover.

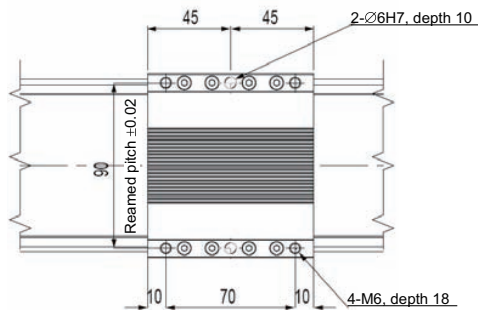


Dimension A (mm)
3 to 5

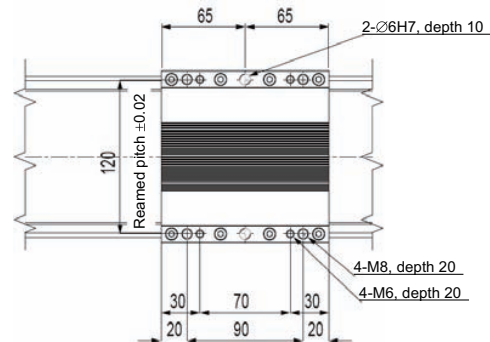
### 2.3.4 Attachment of Transported Object

- Tapped holes are provided in the slider, so use these holes to securely affix a load. The affixing method varies depending on how the actuator is installed.
- If the slider is affixed to move the actuator body, also use the slider's tapped holes for installation. (When installing a heavy object, also use pins.)
- Two reamed holes are provided in the slider, so use these holes if position accuracy must be maintained after removal/reinstallation. If the application requires fine-tuning of the squareness, etc., use one of the slider's reamed holes for adjustment.
- Keep the screw-in depth to 20mm or less. If the bolt is screwed in beyond the above dimension, the tip of the bolt may damage the side cover and consequently the actuator.

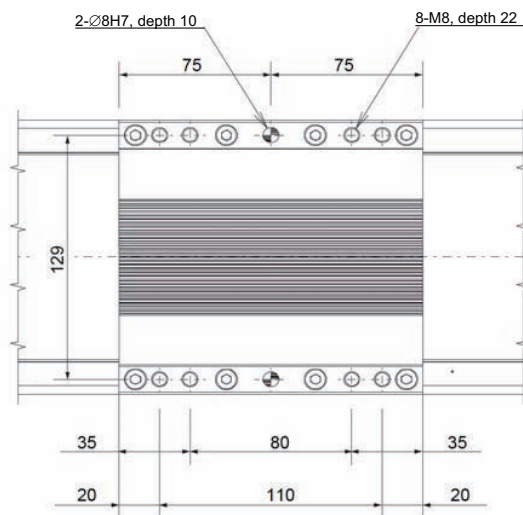
- Small type  
SXMS, SXMM, SZMS, SZMM



- Medium type  
MXMS, MXMM, MXMXS, MZMS, MZMM



- Large type  
LXMS, LXMM, LXMXS, LZMS, LZMM

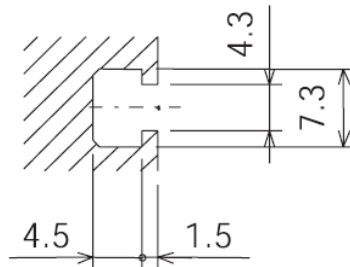


### 2.3.5 Installing the Connector Box, and T-groove

On the nut rotary actuators of medium and large types, M4 T-grooves are provided on the side face of the base for installing the connector box, cable track receiver and other items required by the combination specification. (See the figure below.)

If the combined specification requires a wiring kit, use this T-groove to install the kit.

The T-groove can also be used to install sensors or secure wires or for various other purposes as deemed necessary.



**Caution:** Although square nuts are recommended, general hexagonal nuts can also be used with the T-groove.  
When installing a bolt in the T-groove, pay attention to the bolt length to make sure the tip of the bolt will not contact the bottom of the T-groove.

### 3. Connecting with the Controller

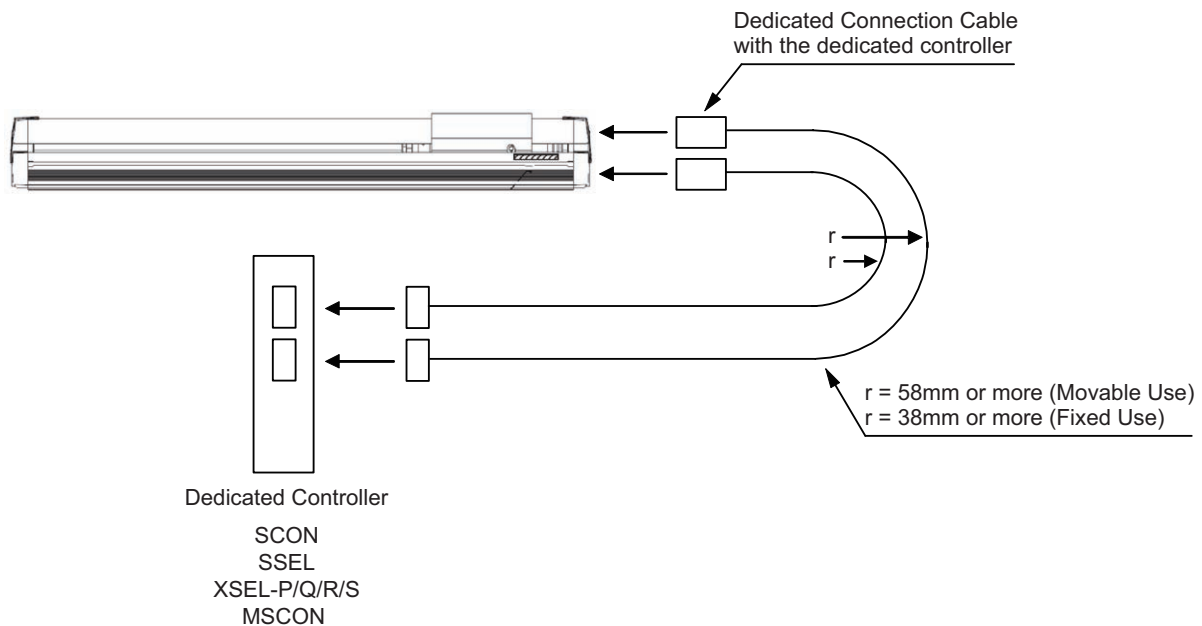
For the connection of an actuator to the controller, apply an IAI dedicated controller and dedicated connection cable.

How to wire the actuator with the controller is explained based on a single-axis configuration.

- If the dedicated connection cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Do not cut and reconnect the dedicated connection cable for extension or shorten the cable.
- Do not pull on the dedicated connection cable or bend it forcibly.
- The actuator cable coming out of the motor unit is not meant to be bent. Fix the cable so it would not be bent repeatedly.

Please consult with IAI if you require a different kind of cable than the one supplied.

[SCON, SSEL, XSEL-P/Q/R/S, MSCON Connecting to the controller]



(Note) Incremental type in NS-S Type cannot be connected to XSEL-R/S and SCON-CAL Controllers.

#### Dedicated cables

- Motor cable (Robot cable) CB-X-MA□□□
- Encoder cable CB-X3-PA□□□  
(With LS/creep sensors) CB-X2-PLA□□□

□□□ indicates the cable length.

A desired length up to 30m can be specified.

Example) 080 = 8m

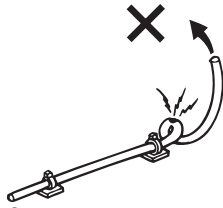


**Warning:** For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, or an operation error, but also electric shock or electric leakage, or may even cause a fire.

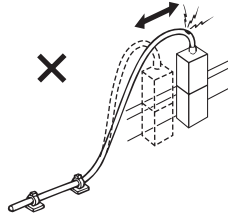
- Use dedicated cables of IAI indicated in this operating manual. Contact us if you wish to have a change to the specifications of the dedicated cables.
- Make sure to turn the power off in the process of power line or cable connection or disconnection.
- Do not attempt to cut a dedicated cable with connectors on both ends to extend, shorten or re-joint it.
- Hold the dedicated cable to avoid mechanical force being applied to the terminals and connectors.
- Use a cable pipe or duct to have an appropriate protection when there is a possibility of mechanical damage on a dedicated cable.
- In case a dedicated cable is to be used at a moving part, make sure to lay out the cable without applying any force to pull the connector or extreme bend on the cable. Do not attempt to use the cable with a bending radius below the allowable value.
- Make certain that the connectors are plugged properly. Insufficient connection may cause an operation error, thus it is extremely risky.
- Do not lay out the cables to where the machine runs over them.
- Pay attention to the cable layout so it would not hit peripherals during an operation. In case it does, have an appropriate protection such as a cable track.
- When a cable is used hanging on the ceiling, prevent an environment that the cable swings with acceleration or wind velocity.
- Make sure there is not too much friction inside the cable storage equipment.
- Do not apply radiated heat to power line or cables.
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.



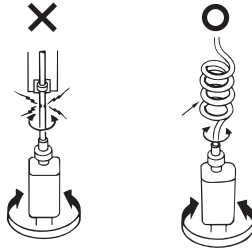
- Do not let the cable bend, kink or twist.



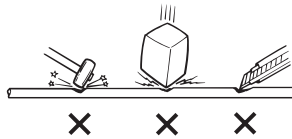
- Do not pull the cable with a strong force.



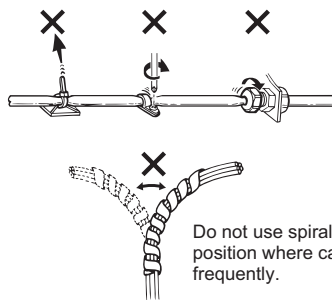
- Pay attention not to concentrate the twisting force to one point on a cable.



- Do not pinch, drop a heavy object onto or cut the cable.

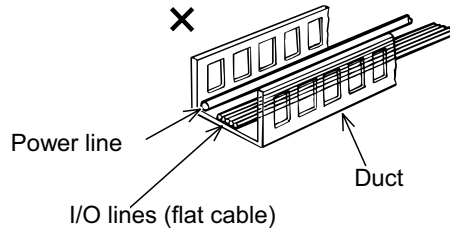


- When a cable is fastened to affix, make sure to have an appropriate force and do not tighten too much.



Do not use spiral tube in any position where cables are bent frequently.

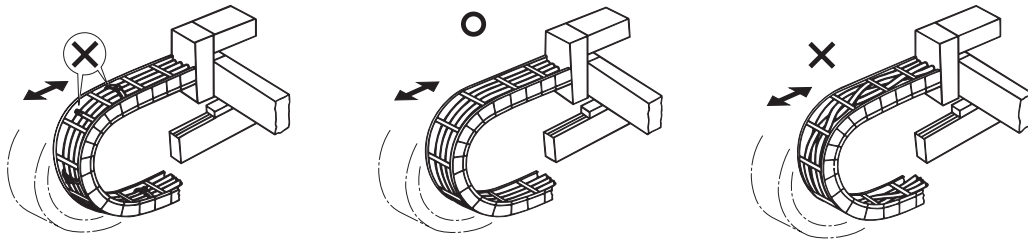
- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



Follow the instructions below when using a cable track.

- If there is an indication to the cable for the space factor in a cable track, refer to the wiring instruction given by the supplier when storing the cable in the cable track.
- Avoid the cables to get twined or twisted in the cable track, and also to have the cables move freely and do not tie them up. (Avoid tension being applied when the cables are bent.)

Do not pile up cables. It may cause faster abrasion of the sheaths or cable breakage.



## 4. Maintenance and Inspection

### 4.1 Inspection Items and Schedule

Perform maintenance and inspection at the intervals specified below.

This schedule assumes that the actuator is operated eight hours a day.

If the actuator is operated at a higher utilization, such as when the machine is used continuously day and night, reduce the inspection intervals accordingly.

Schedule	External visual inspection	Internal inspection	Greasing <sup>(Note 1)</sup>	Mid-support wire
Start of work inspection	○			
1 month inspection	○			
3 months inspection			○	
3 months after starting operation			Depends on grease supply timing (reference)	
6 months inspection	○	○ <sup>(Note 2)</sup>		
Every 6 months thereafter	○	○ <sup>(Note 2)</sup>		
After 1 year start of operation				○ <sup>(Note 3)</sup>
Every 1 year thereafter				○ <sup>(Note 3)</sup>

**Note 1** Grease film may run out if the actuator is moved back and forth continuously over a distance of 30 mm or less. As a guide, perform a back-and-forth operation five times or so over a distance of 50 mm or more after a back-and-forth operation over such short distance has been repeated 5,000 to 10,000 times. This will restore oil film.

**Note 2** Check the condition of grease, and wipe off the grease before supplying new in case it is extremely dirty.

**Note 3** Please perform tension adjustment.

[Grease Supply Timing (Reference)]

Perform grease supply when it has reached to either the operation distance or spent months described in the table below.

Maximum Speed of Use [mm/s]	Grease Supply Timing (Reference)	
	Operated distance	Months
0 to 750 or less	1,250 km	12-month
Above 750 to 1,440	2,500 km	
Above 1,500 to 2,400	5,000 km	

**⚠ Caution:**

- An actuator after 6 months of storage may have caused a degradation of the grease. Supply grease before start using. [Refer to 4.5 "Grease Supply"]
- Degradation speed of grease may differ depending on the environment of use (temperature, humidity and ambient conditions). It is recommended to shorten the grease supply period if the actuator is used under a bad condition such as in high temperature, high humidity or in dusty ambience. Also, it is recommended to improve the environment conditions in case the grease changes its color due to the bad condition of use.

### 4.2 Visually Inspecting the Exterior

Visually check the exterior of the following items.

Actuator	Loosening of actuator mounting bolts, etc.
Cables	Scratches, connector engagement
Overall	Noise, vibration



### 4.3 Internal inspection

Turn off the power and remove the screw cover to visually inspect the interior. Check the following items in the internal inspection.

Main body	Loose mounting bolts
Guide	Lubrication condition okay, Soiling
Ball screw	Lubrication condition okay, Soiling

Visually check the condition inside the actuator. Specifically, check for entry of dust and other foreign debris and the lubrication condition.

Even if the grease on the guide and ball screw has turned brown, a good lubrication condition is maintained if the traveling surface is wet and glossy.

If the grease has become dirty and is no longer glossy, or when you notice a shortage of grease after a long period of use, clean each area and add grease.

The internal inspection procedure is specified below.

An example of how to check the interior of large types is given below. Follow the same procedure to check the interior of small and medium types.

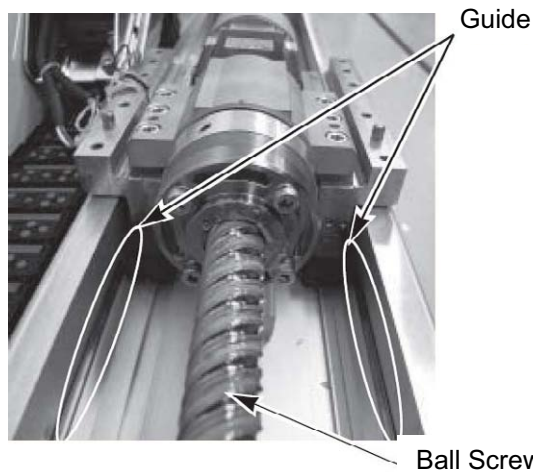
- 1) Use an Allen wrench of .1.5mm in width across flats to take out the end cover.



- 2) Remove the screw cover using an Allen wrench of 2.5mm across flats. (For small types, use an Allen wrench of 1.5mm in width across flats.)



- 3) Check the interior.




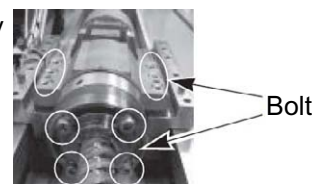
- 4) After the check, assemble the parts by following the same steps in reverse. When installing the screw cover, make sure the side face bearing the IAI logo is on the same side as the serial number label on the base.

Screw-cover affixing bolt [M4 × 5] Tightening torque = 0.6N•m

[M3 × 5] Tightening torque = 0.7N•m

End-cover affixing bolt [M3 × 6] Tightening torque = 0.4N•m

 **Caution:** The hollow-shaft motor has been adjusted at the factory prior to installation. Never loosen the mounting bolts of the hollow-shaft motor.



## 4.4 Cleaning

Clean the exterior as needed.

- Wipe off dirt with a soft cloth.
- Do not use strong compressed air on the actuator, as it may force dust into the crevices.
- Do not use petroleum-based solvents, as they may damage resin or coated surfaces.
- If the unit is badly soiled, apply a neutral detergent or alcohol to a soft cloth and wipe lightly.

## 4.5 Grease Supply to the Guides

On the guide of the moving part, a product of maintenance free (long term supply of lubricating oil) is applied. Even though the life and degradation will differ depending on the condition of use, make sure to have a grease supply when inside inspection is implemented.

### 4.5.1 Applied Grease on Guides

The following grease is applied when the product is shipped out from IAI factory.

Idemitsu Kosan	Daphne Eponex Grease No.2
----------------	---------------------------

Other manufacturers offer different greases equivalent to the above product. Contact each manufacturer and ask them to suggest equivalent greases corresponding to the product specified above. There are products shown below as an equivalent.

Showa Shell Sekiyu	Albania Grease S2
Mobil Sekiyu	Unirex N2



**Warning:** Never use any fluorine-based grease. Mixing with lithium-based grease with other grease not only reduces the performance of the grease, it may even cause damage to the actuator.

#### 4.5.2 Greasing the Guide

- (1) Small type: SXMS, SXMM, SZMS, SZMM  
 Medium type: MXMS, MXMM, MXMXS, MZMS, MZMM

A grease nipple is provided inside the home-side stopper of the slider, so add grease from this grease nipple.

- 1) Use an Allen wrench of 1.5mm in width across flats to remove the two screws and take out the end cover on the home side.



- 2) Move the slider all the way to the home side.  
 3) Insert a grease gun into the hole provided at the end bracket, secure the slider so that it won't move, and then add grease. (For the specific positions, see the figures on the next page.)



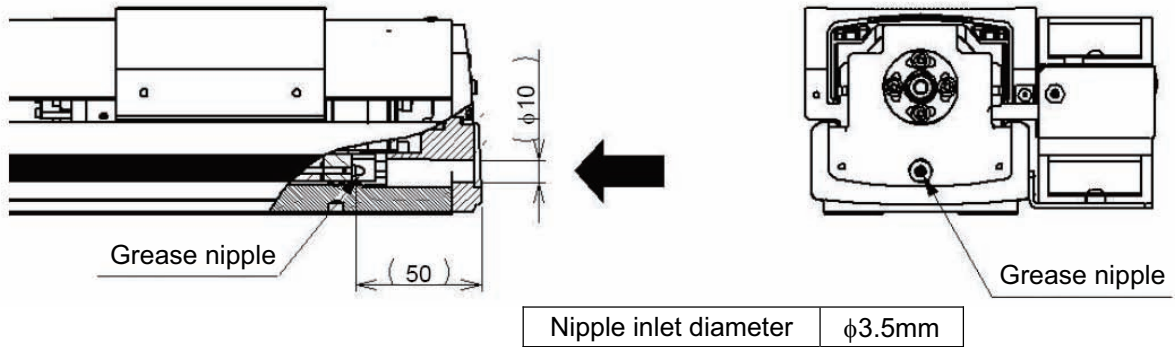
Model	Grease supply volume (reference)	
SXSM, SXMM, SZMS, SZMM	1 to 1.5cc	
MXMS, MXMM, MXMXS, MZMS, MZMM	2.5 to 3cc	
Recommended grease gun	Nozzle	Supplier
MG70	N type	THK

**Caution:**

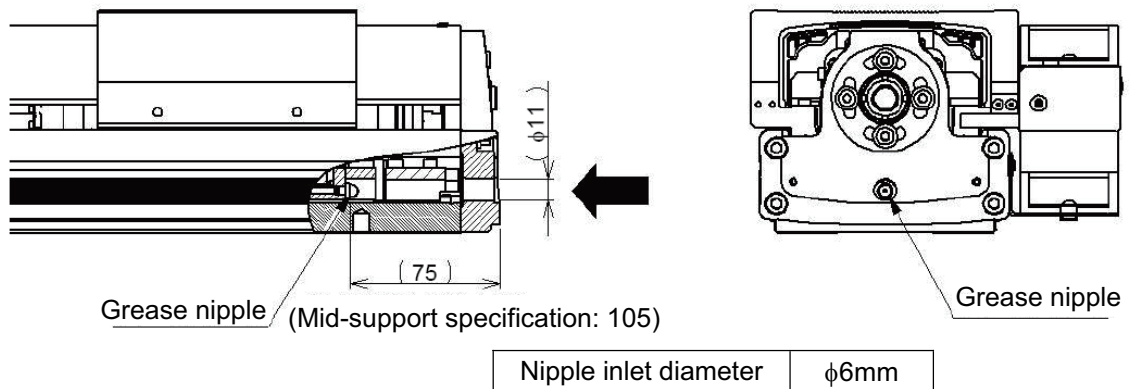
- Supplying grease too much may increase the sliding resistance and load to the motor, which could drop the performance. Also, excess grease on the ball screw may be splashed around in the ambience.
- In case the grease got into your eye, immediately go to see the doctor to get an appropriate care.

After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease off.

- Small type: SXMS, SXMM, SZMS, SZMM



- Medium type: MXMS, MXMM, MXMXS, MZMS, MZMM

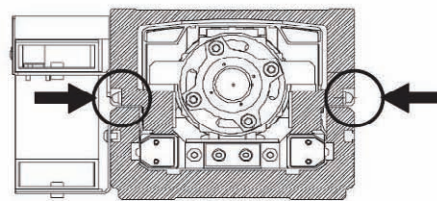
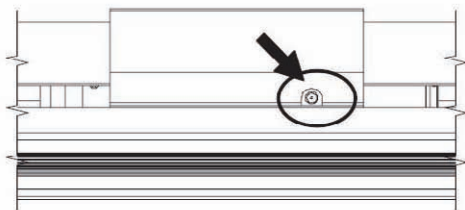
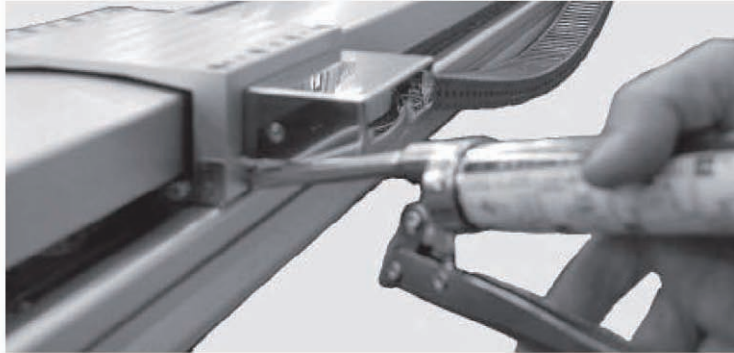


- 4) Move the slider back and forth several times by hand.
- 5) Repeat the above steps to add grease.
- 6) Use a waste cloth, etc., to wipe off grease that has overflowed from the slider.

(2) Large type: LXMS, LXMM, LXMXS, LZMS, LZMM

Two grease nipples are found, one each on the right and left sides of the slider. Apply grease from these nipples.

- 1) Using a grease gun, apply grease from the grease nipples located on the end faces of the slider. (Refer to the figure below for the positions of grease nipples.)



Grease nipple positions on the slider

Nipple inlet diameter

φ6mm

- 2) Move the slider back and forth several times by hand.
- 3) Repeat the above steps to add grease.
- 4) Use a waste cloth, etc., to wipe off grease that has overflowed from the slider.

Grease supply volume (reference)	3 to 3.5cc	
Recommended grease gun	Nozzle	Supplier
MG70	N type	THK

**⚠ Caution:**


- Supplying grease too much may increase the sliding resistance and load to the motor, which could drop the performance. Also, excess grease on the ball screw may be splashed around in the ambience.
- In case the grease got into your eye, immediately go to see the doctor to get an appropriate care. After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease off.

## 4.6 How to Add Grease to the Ball Screw

### 4.6.1 Grease applied on Ball Screw

The following lithium grease has been applied prior to shipment.

Kyodo Yushi	Multemp LRL 3
-------------	---------------

 **Warning:** Never use any fluorine-based grease. Mixing with lithium-based grease with other grease not only reduces the performance of the grease, it may even cause damage to the actuator.

### 4.6.2 How to Apply Grease to Ball Screw


Clean the ball screw before applying grease. Apply grease by hand, and then move the slider back and forth to let grease spread evenly. Finally, wipe off excess grease that has overflowed from the nut.



Apply grease on the ball screw.



Move the slider. If the actuator is equipped with a brake, release the brake.

 **Caution:**

- Supplying grease too much may increase the sliding resistance and load to the motor, which could drop the performance. Also, excess grease on the ball screw may be splashed around in the ambience.
- In case the grease got into your eye, immediately go to see the doctor to get an appropriate care. After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease off.



## 4.7 Adjusting the Mid-support Wire Tension

[Items required for adjustment]

- Allen wrenches
- Tension gauge (capable of exerting a push force of at least 1 kg (9.8 N))

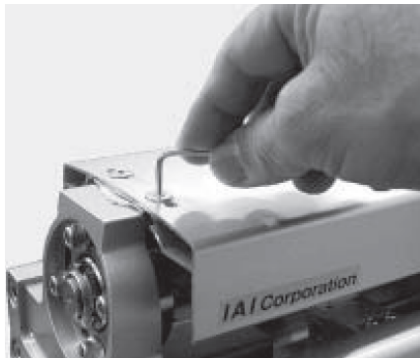


[Procedure]

- 1) Remove the end cover using an Allen wrench of 1.5mm across flats.



- 2) Remove the screw cover using an Allen wrench of 2.0mm across flats.



- 3) Loosen the two screws (M3 × 5) affixing one wire hook (base side) of the mid-support wire located at the center of the base, so that the wire hook can be moved.  
Loosen the screws for only one wire hook on either the home side or counter-home side.

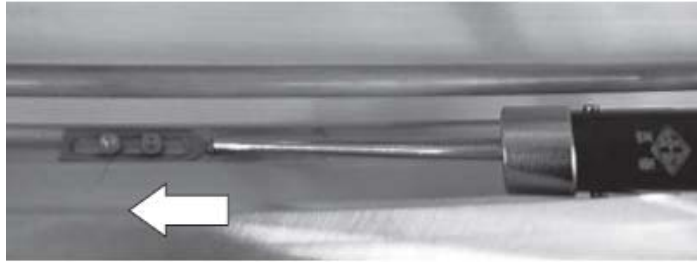


Wire hook  
(base side)

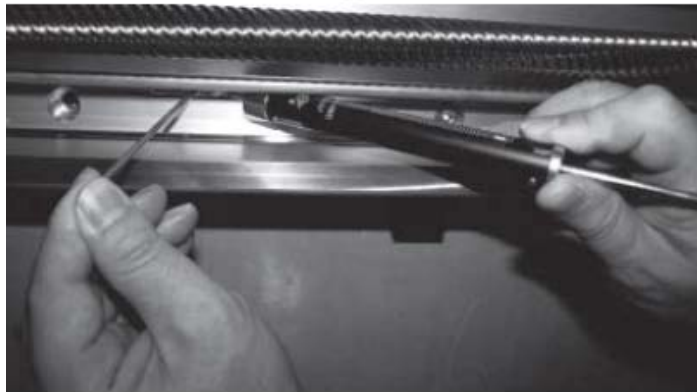
Loosen the wire hook  
on one side.



- 4) Use a tension gauge to push the loosened wire hook with the specified push force, and tighten the two wire hook screws (M3 × 5).



Specified push force: 9.31 to 9.8 N




Tighten the screws while pushing the wire hook with the specified push force.

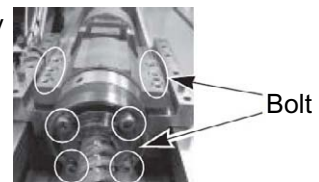
Tightening torque: 1.5 (N•m)

- 5) After the check, assemble the parts by following the same steps in reverse. When installing the screw cover, make sure the side face of the actuator bearing the IAI logo is on the same side as the serial number label on the base.

Screw-cover affixing bolt [M4 × 5] Tightening torque = 0.6N•m

End-cover affixing bolt [M3 × 6] Tightening torque = 0.4N•m

 **Caution:** The hollow-shaft motor has been adjusted at the factory prior to installation. Never loosen the mounting bolts of the hollow-shaft motor.



## 4.8 Replace the Mid-support Wire

[Items required for replacement]

- Mid-support wire           MXMXS : Model WR-NMX-(stroke)  
                                          LXMXS : Model WR-NLX-(stroke)
- Wire hook (base side): As a replacement when the wire catch of the original hook is deformed.
- Wire hook (motor side): As a replacement when the wire catch of the original hook is deformed.
- Allen wrenches
- Tension gauge (capable of exerting a push force of at least 1 kg (9.8 N))

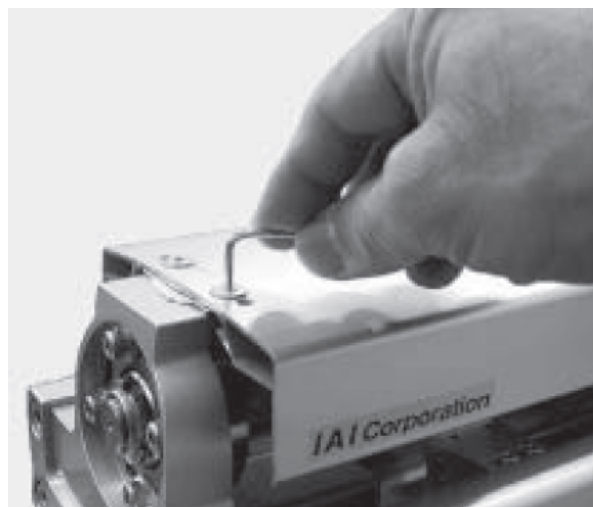


[Procedure]

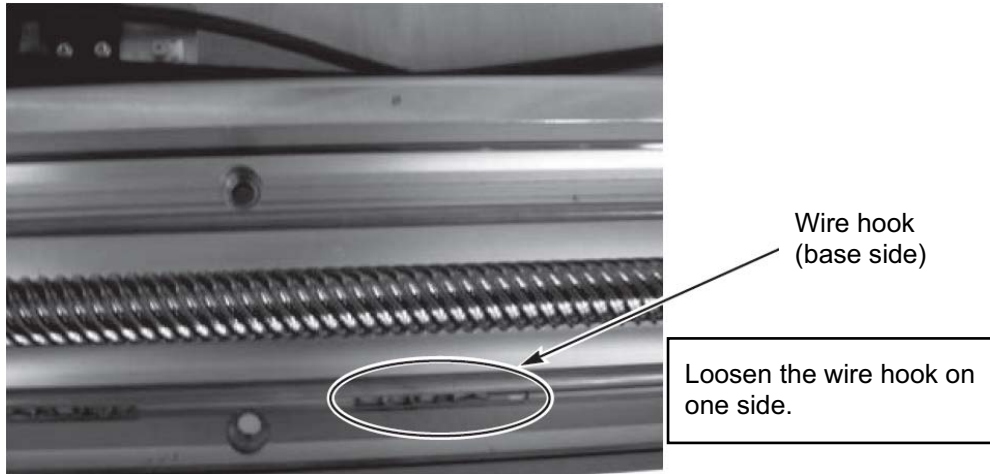
- 1) Remove the end cover using an Allen wrench of 1.5mm across flats.



- 2) Remove the screw cover using an Allen wrench of 2.0mm across flats.

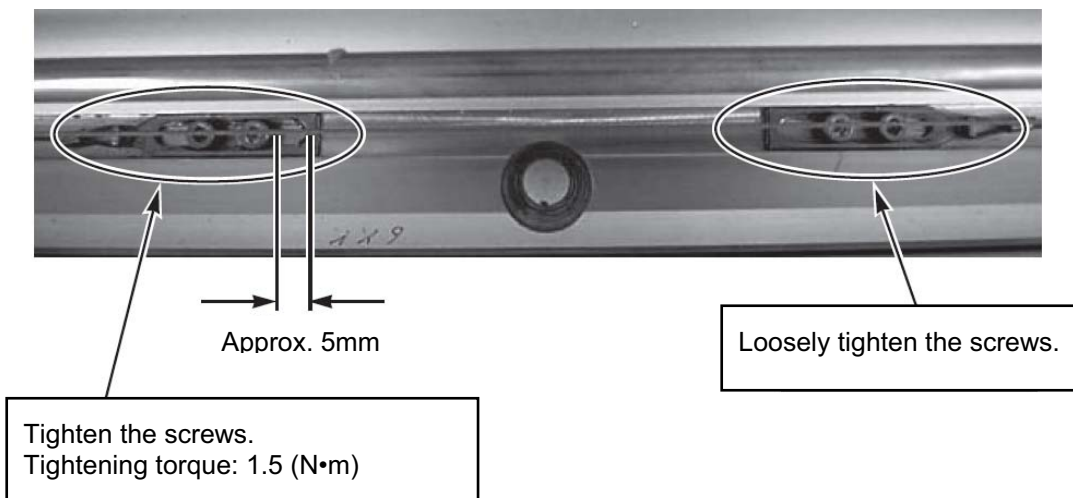


- 3) Loosen the two screws (M3 × 5) affixing one wire hook (base side) of the mid-support wire located at the center of the base, so that the wire hook can be moved.  
Loosen the screws for only one wire hook on either the home side or counter-home side.

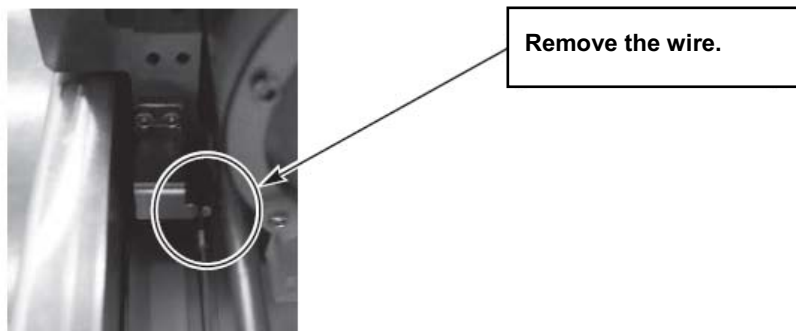
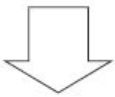
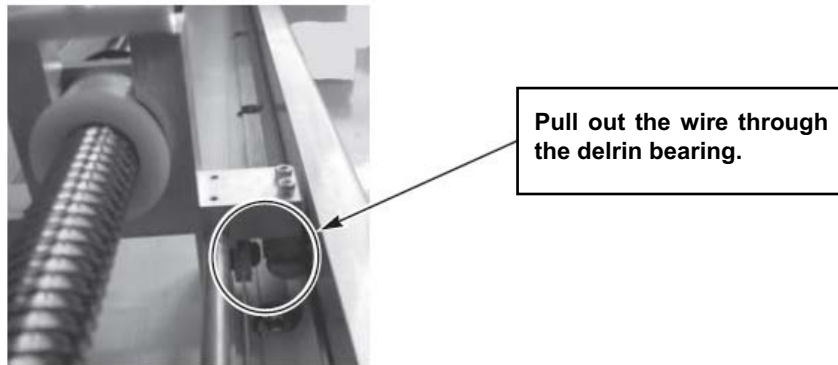
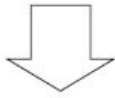
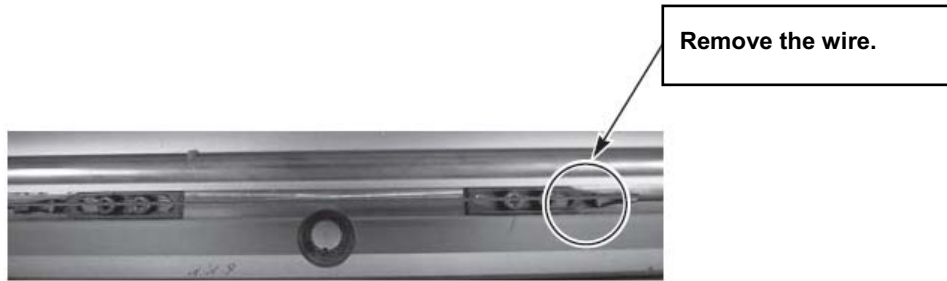


If the wire catch of the hook (base side) is deformed, replace the wire hook as follows:

- ⊙ Replace the wire hook on one side (base side) with a replacement hook, and tighten the two screws (M3 × 5) by keeping approx. 5mm between the slot end and each screw as shown below. Also replace the wire hook on the other side (base side) with a replacement hook, and loosely tighten the two screws (M3 × 5) so that the wire hook can be moved.

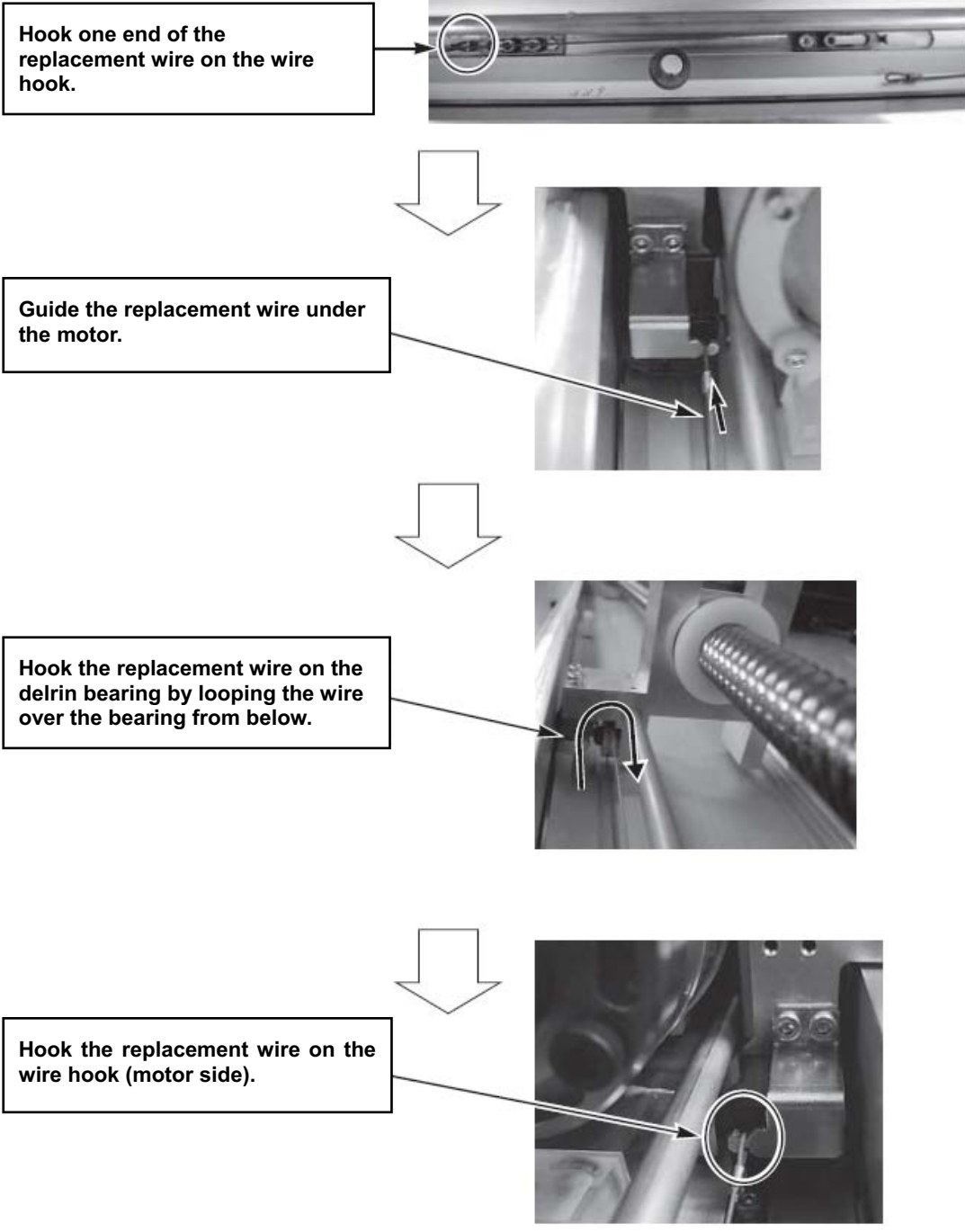


- 4) Remove the wire from the wire hook whose screws have been loosened.  
Remove the wire from the wire hook (base side). Next, pull out the wire through the delrin bearing at the mid-support and remove it from the wire hook (motor side).



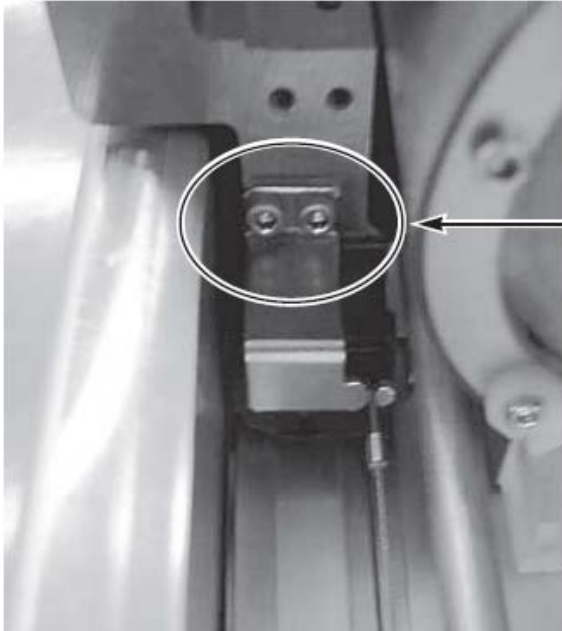
- 5) Follow the same steps to also remove the wire from the wire hook (base side) whose screws have not been loosened.

- 6) Hook one end of the replacement wire on the wire hook (base side) whose screws have not been loosened. Guide the other end of the wire under the motor and bring it to the mid-support, and hook the wire on the delrin bearing at the mid-support. Next, pull the wire further to the motor and hook it on the wire hook at the motor.



When hanging on the wire in the step in the previous page, in case it is necessary to have the part on the wire hook (on motor end) to hang on the wire replaced for deformation, have a replacement following the step below.

- ⊙ Replace the wire hook with a replacement wire hook (motor side), and tighten the two screws (M3 × 6).

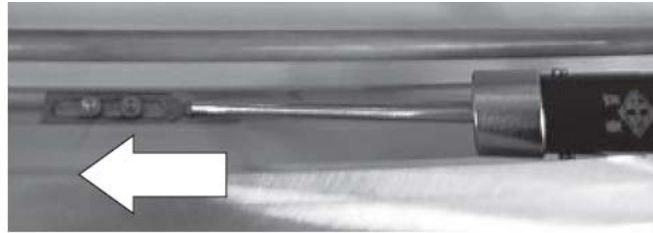


**Tighten the screws.  
Tightening torque: 1.5 (N•m)**

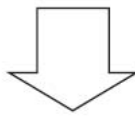
- 7) Follow the same steps to also attach the wire to the wire hook (base side) whose screws have been loosened. Specifically, guide the wire from the wire hook (base side) to the delrin bearing at the midsupport, and attach it to the wire hook (motor side).

When hanging on the wire in the step above, in case it is necessary to have the part on the wire hook (on motor end) to hang on the wire replaced for deformation, have a replacement following the same step.

- 8) Use a tension gauge to push the wire hook (base side) whose screws have been loosened with the specified push force, and tighten the two wire hook screws (M3 × 5).



**Specified push force: 9.31 to 9.8 N**



**Tighten the screws while pushing the wire hook with the specified push force.**

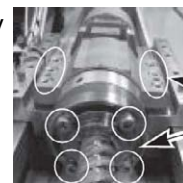
**Tightening torque: 1.5 (N·m)**

- 9) After the check, assemble the parts by following the same steps in reverse. When installing the screw cover, make sure the side face of the actuator bearing the IAI logo is on the same side as the serial number label on the base.

Screw-cover affixing bolt [M4 × 5] Tightening torque = 0.6N·m  
 End-cover affixing bolt [M3 × 6] Tightening torque = 0.4N·m



**Caution:** The hollow-shaft motor has been adjusted at the factory prior to installation. Never loosen the mounting bolts of the hollow-shaft motor.

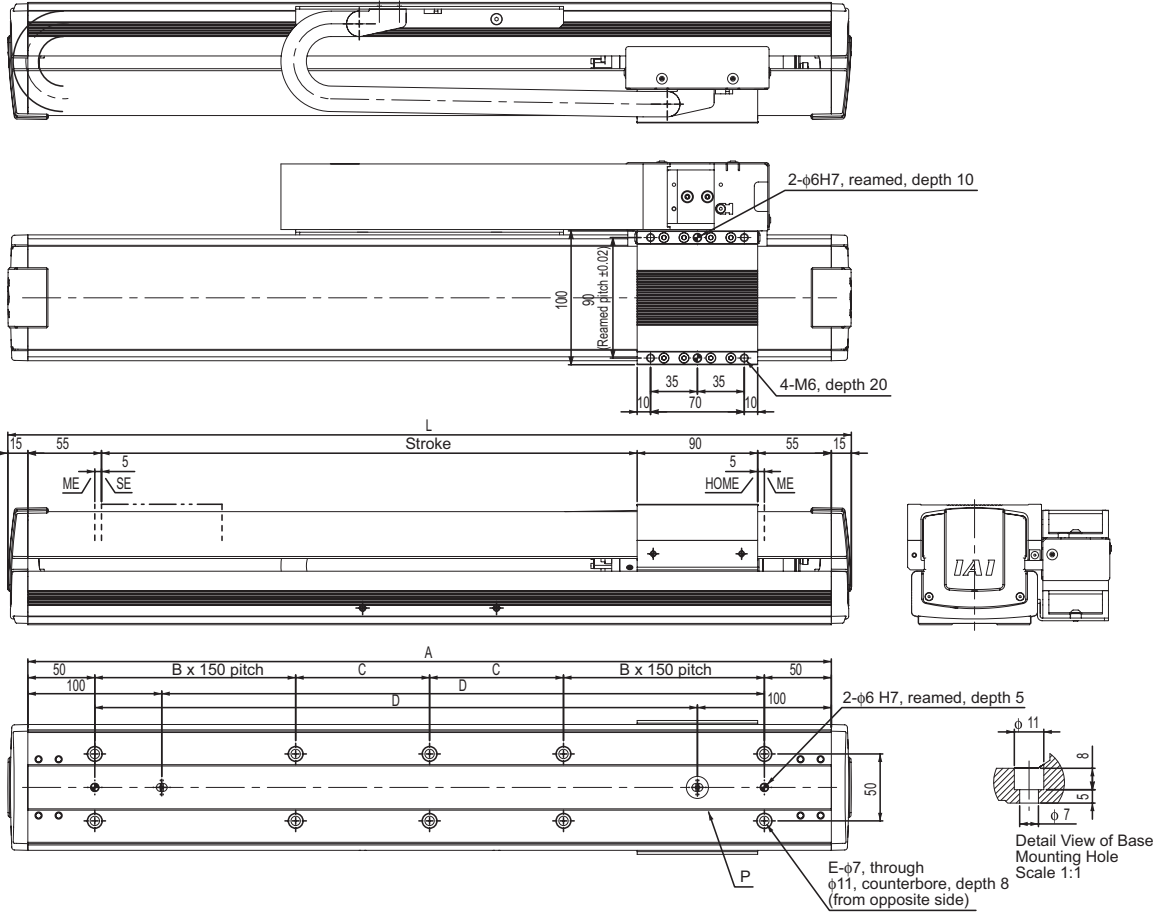


Bolt

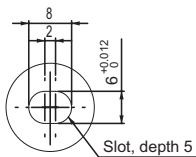
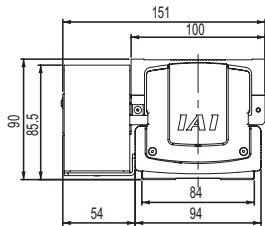
## 5. External Dimensions

### 5.1!! Small Types

#### 5.1.1 SXMS



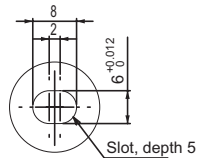
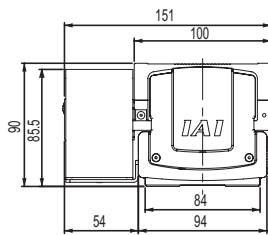
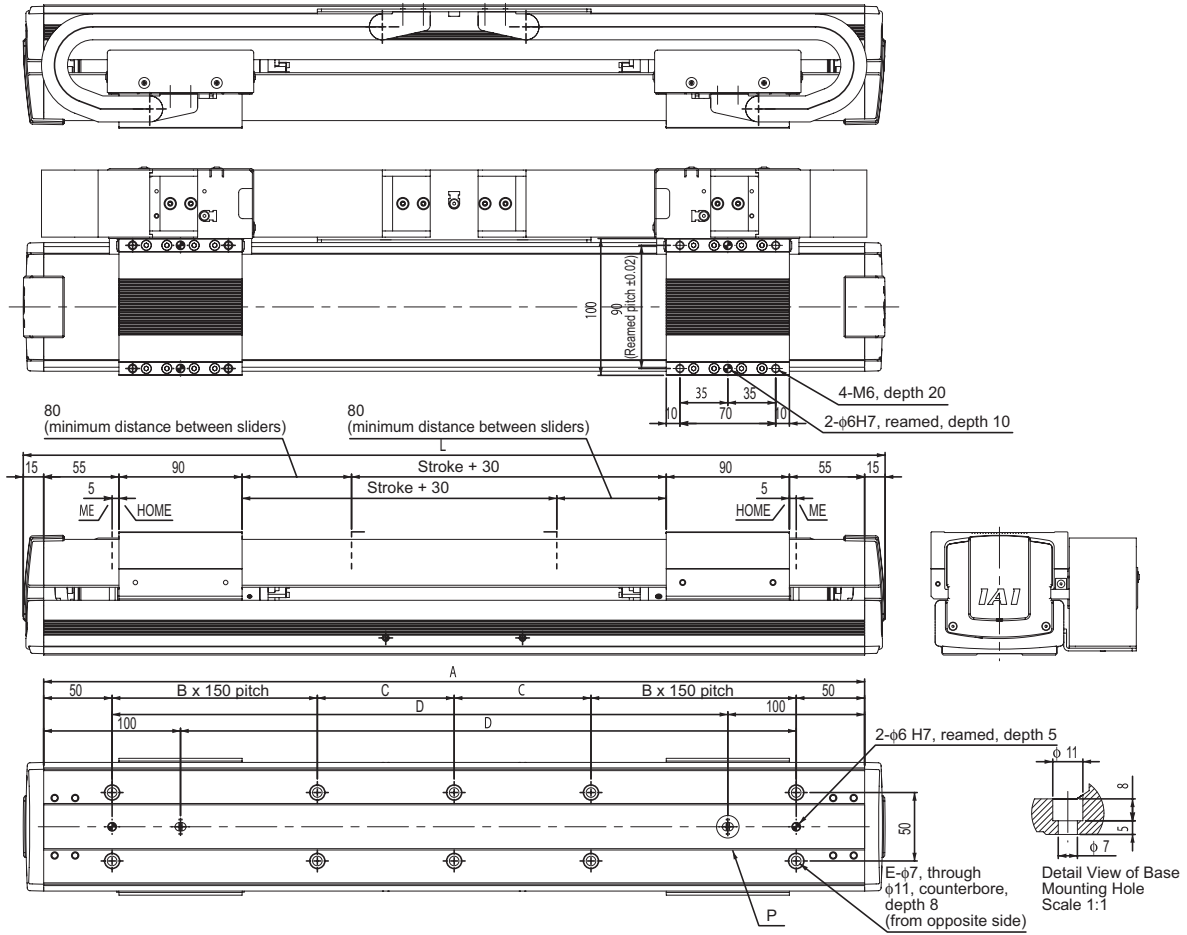
Stroke	400	500	600	700	800
L	630	730	830	930	1030
A	1	1	1	2	2
B	100	150	200	100	150
C	450	550	650	750	850
D	10	10	10	14	14
Mass [kg]	5.8	6.5	7.1	7.8	8.4



Detail View of P  
(2 locations)  
Scale 2:1



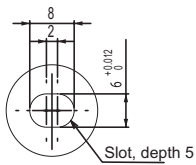
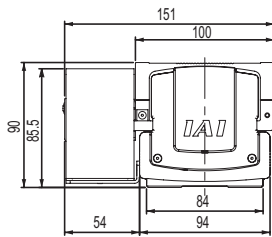
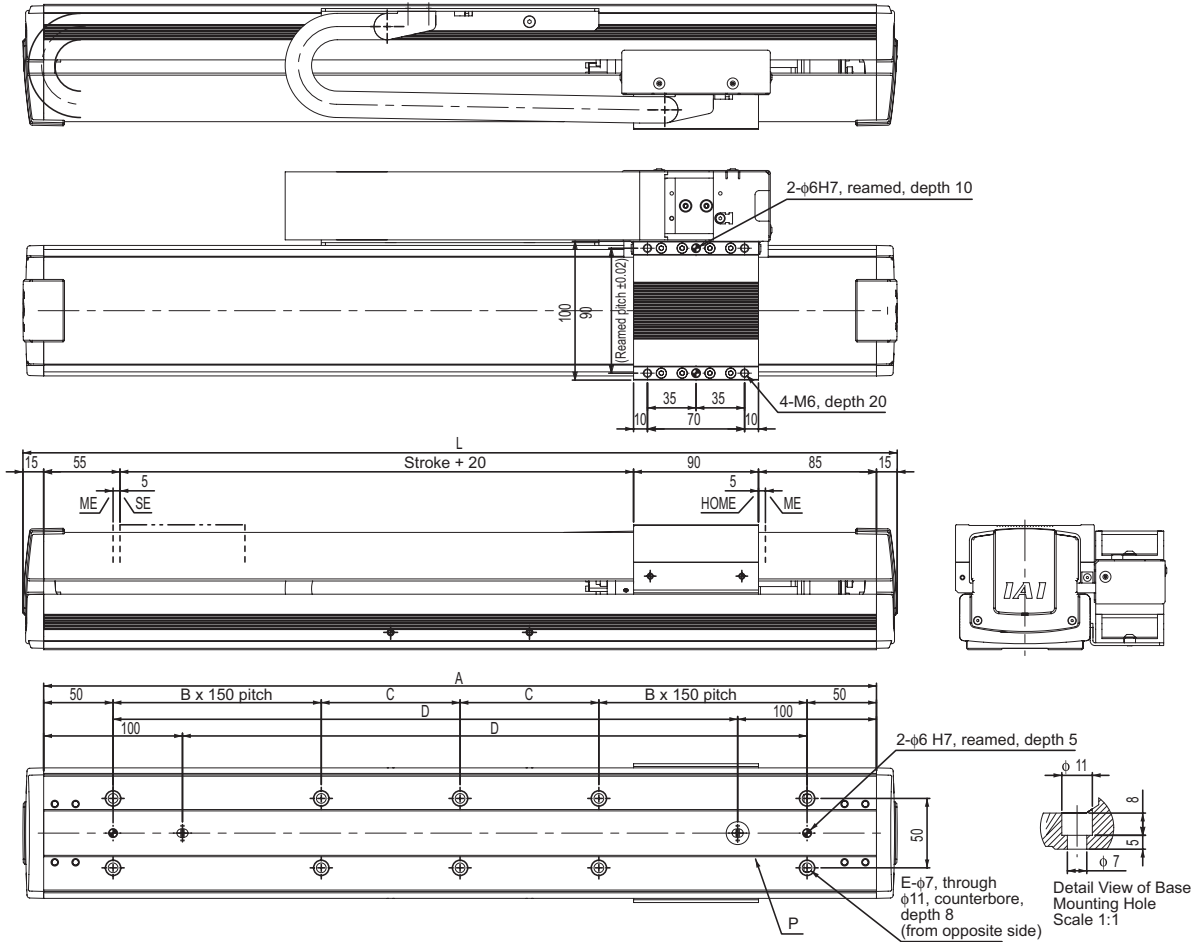
### 5.1.2 SXMM



Detail View of P  
(2 locations)  
Scale 2:1

Stroke	200	300	400	500	600	700	800
L	630	730	830	930	1030	1130	1230
A	1	1	1	2	2	2	2
B	100	150	200	100	150	200	100
C	450	550	650	750	850	950	1050
D	10	10	10	14	14	14	18
Mass [kg]	7.5	8.1	8.7	9.4	10.0	10.7	11.3

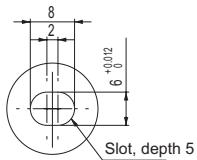
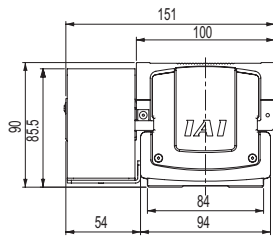
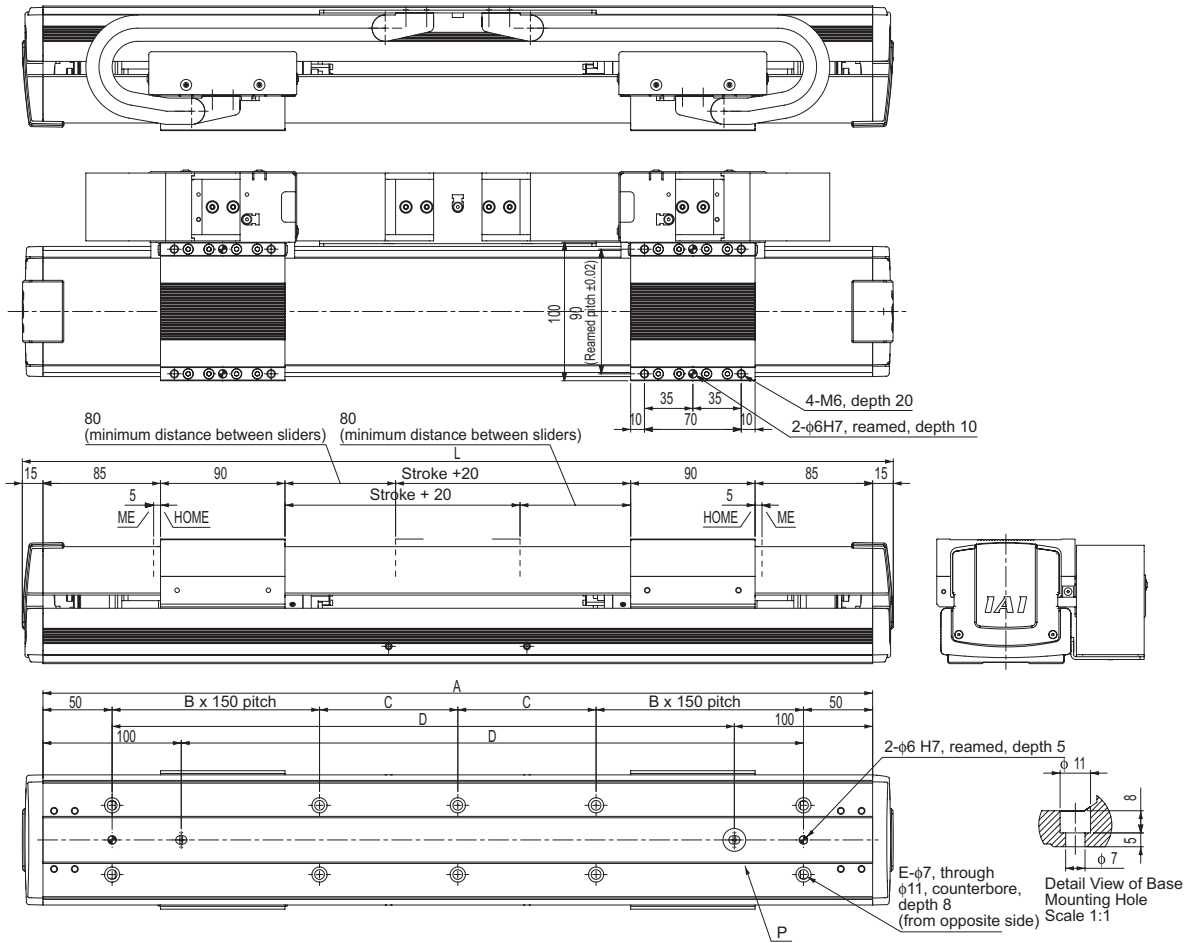
### 5.1.3 SZMS



Detail View of P (2 locations) Scale 2:1

Stroke	400	500	600	700	800
L	680	780	880	980	1080
A	1	1	1	2	2
B	125	175	225	125	175
C	500	600	700	800	900
D	10	10	10	14	14
Mass [kg]	6.2	6.8	7.4	8.1	8.7

### 5.1.4 SZMM

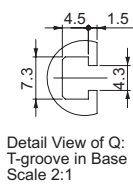
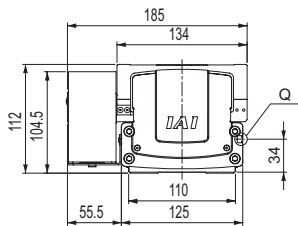
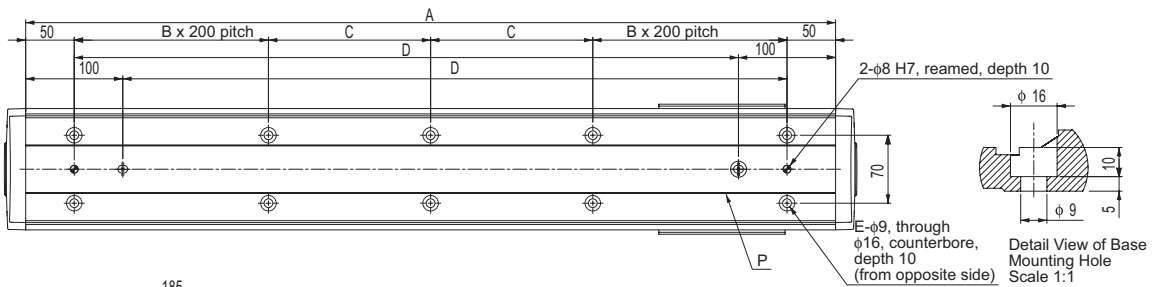
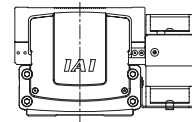
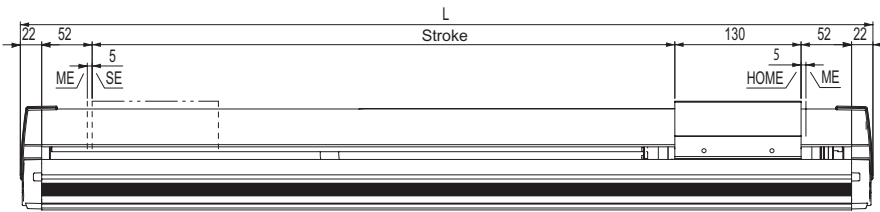
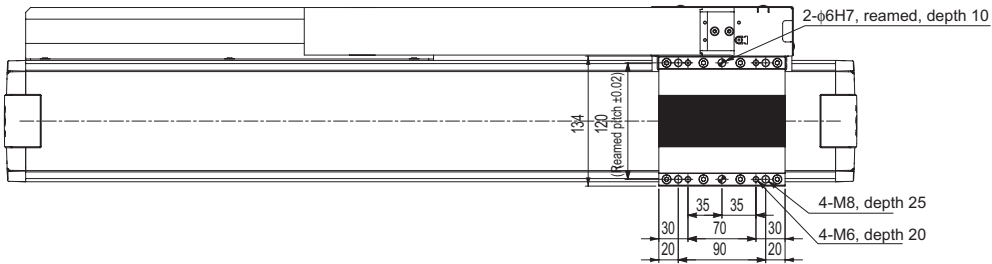
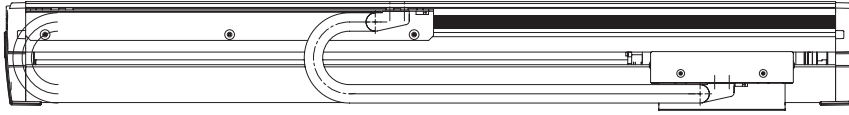


Detail View of P  
(2 locations)  
Scale 2:1

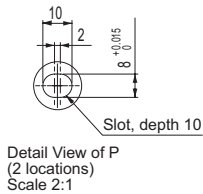
Stroke	200	300	400	500	600	700	800
L	680	780	880	980	1080	1180	1280
A	1	1	1	2	2	2	3
B	125	175	225	125	175	225	125
C	500	600	700	800	900	1000	1100
D	10	10	10	14	14	14	18
Mass [kg]	7.7	8.4	9.0	9.7	10.3	10.9	11.6

## 5.2 Medium Types

### 5.2.1 MXMS

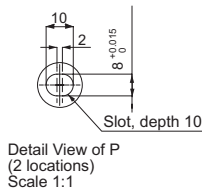
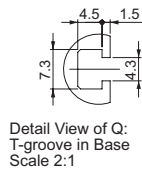
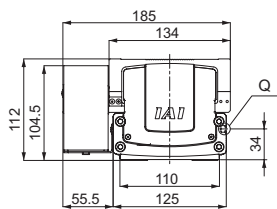
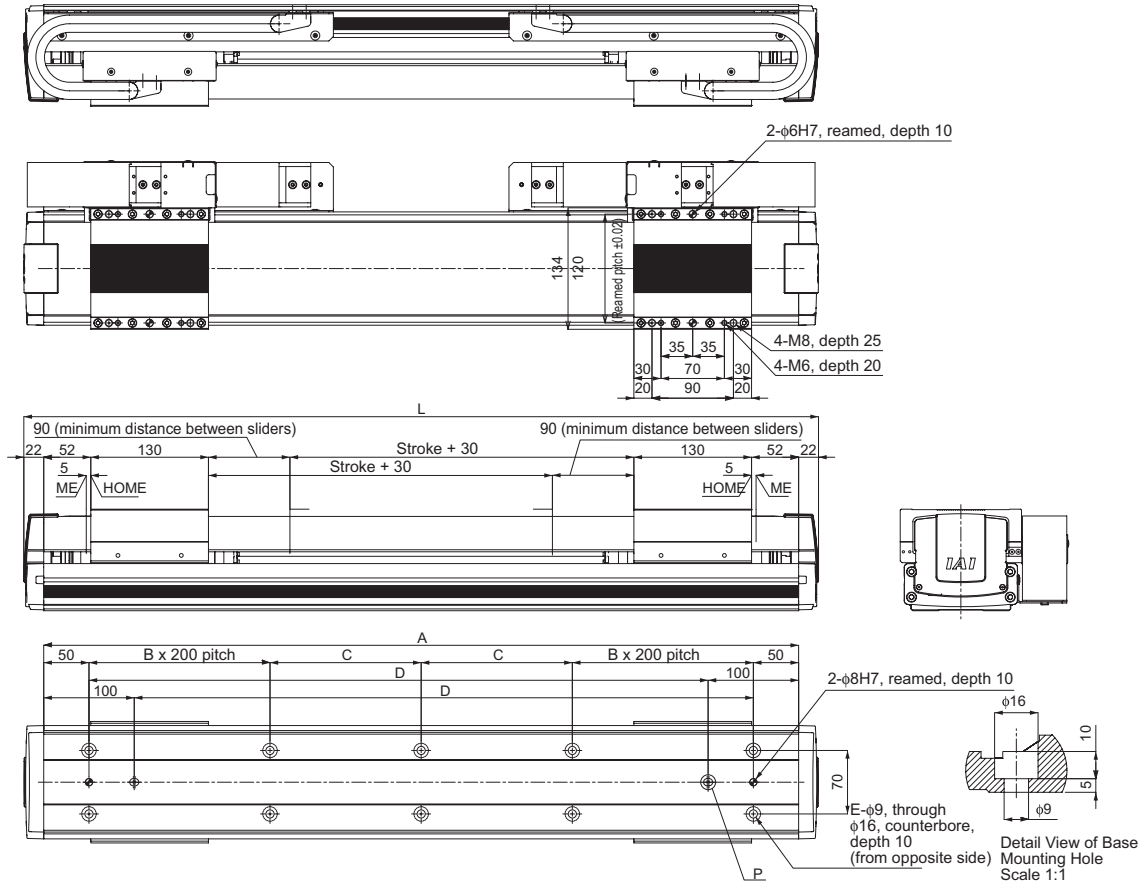


Stroke	500	600	700	800	900
L	778	878	978	1078	1178
A	0	1	1	1	1
B	317	167	217	267	317
C	584	684	784	884	984
D	6	10	10	10	10
Mass [kg]	11.9	13.1	14.4	15.6	16.8



Stroke	1000	1100	1200	1300	1400	1500
L	1278	1378	1478	1578	1678	1778
A	2	2	2	2	3	3
B	167	217	267	317	167	217
C	1084	1184	1284	1384	1484	1584
D	14	14	14	14	18	18
Mass [kg]	18.0	19.3	20.5	21.7	23.0	24.2

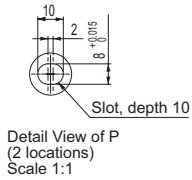
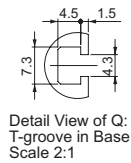
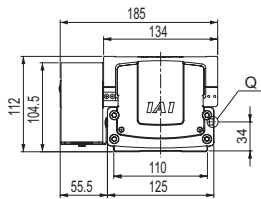
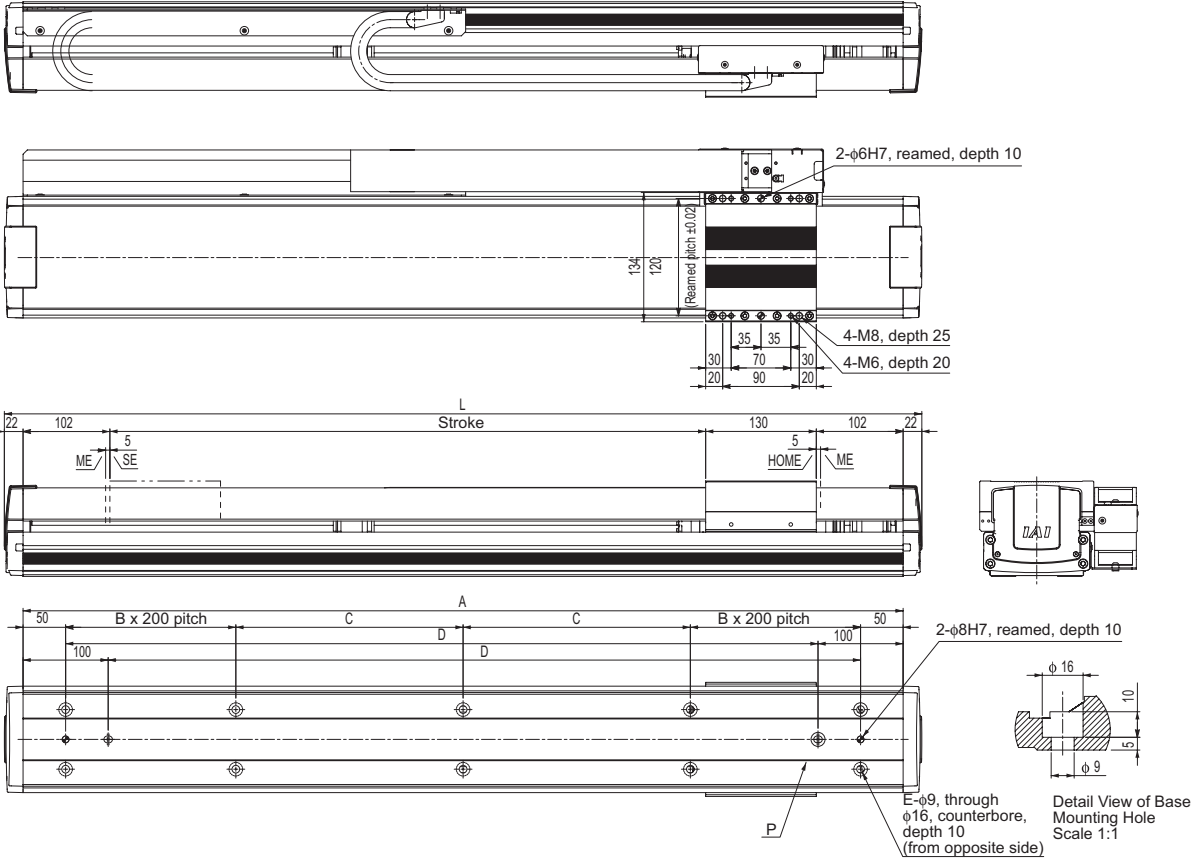
## 5.2.2 MXMM



Stroke	300	400	500	600	700	800
L	828	928	1028	1128	1228	1328
A	1	1	1	1	2	2
B	142	192	242	292	142	192
C	634	734	834	934	1034	1134
D	10	10	10	10	14	14
Mass [kg]	15.6	16.8	18	19.2	20.5	21.7

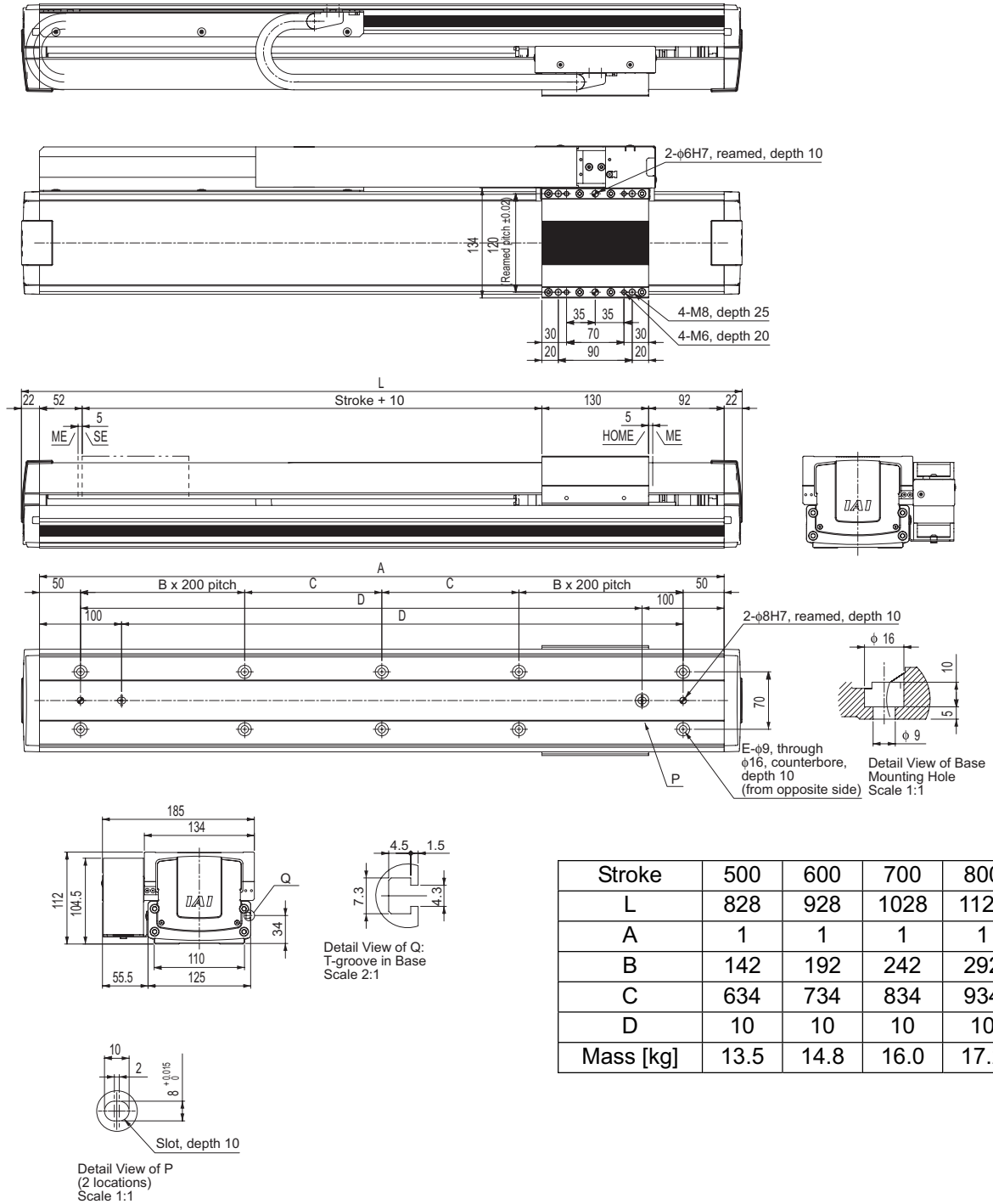
Stroke	900	1000	1100	1200	1300	1400	1500
L	1428	1528	1628	1728	1828	1928	2028
A	2	2	3	3	3	3	4
B	242	292	142	192	242	292	142
C	1234	1334	1434	1534	1634	1734	1834
D	14	14	18	18	18	18	22
Mass [kg]	22.9	24.2	25.4	26.6	27.9	29.1	30.3

### 5.2.3 MXMXS

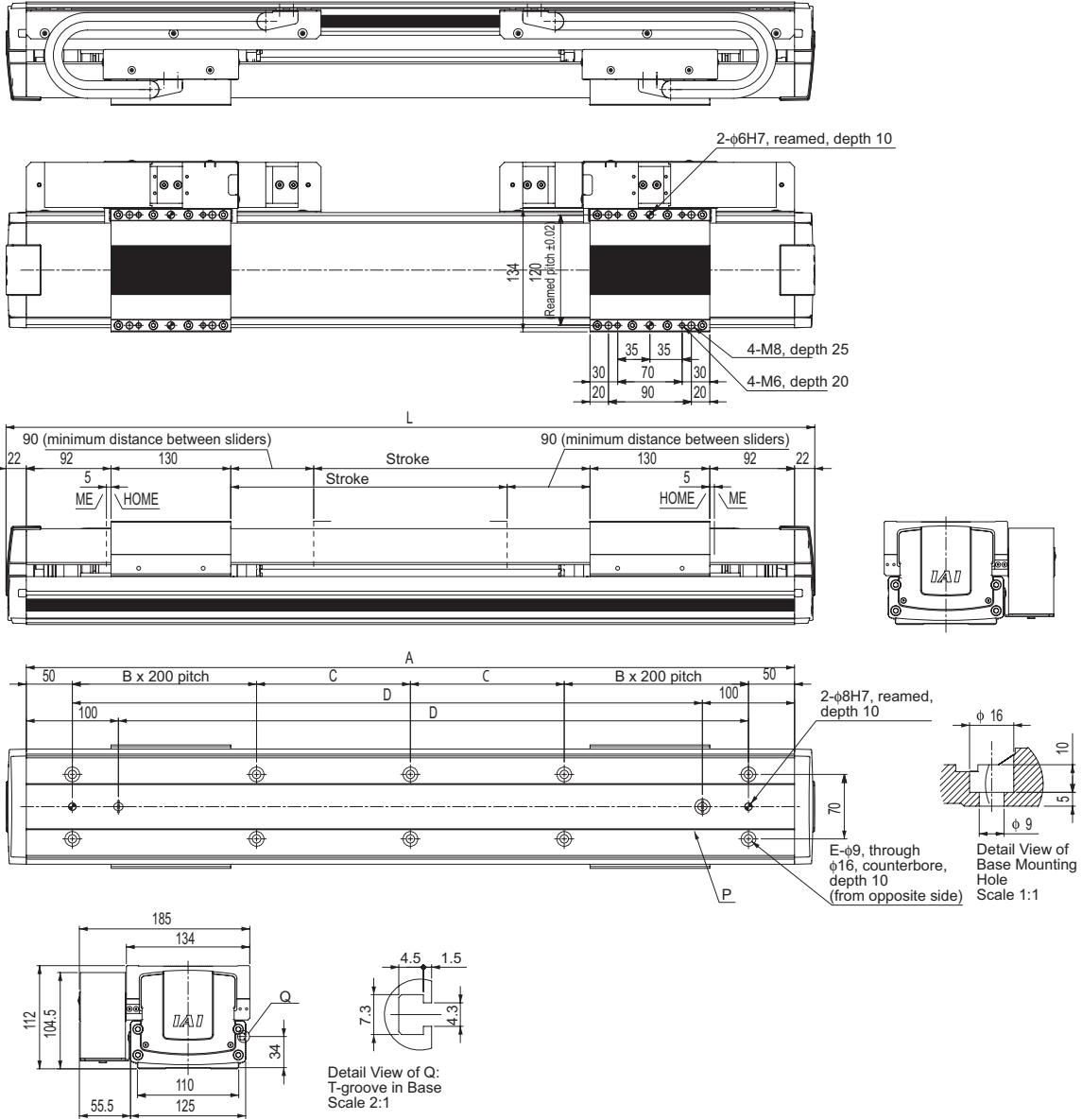


Stroke	1600	1700	1800	1900	2000	2100	2200
L	1978	2078	2178	2278	2378	2478	2578
A	3	4	4	4	4	5	5
B	317	167	217	267	317	167	217
C	1784	1884	1984	2084	2184	2284	2384
D	18	22	22	22	22	26	26
Mass [kg]	26.2	27.5	28.7	29.9	31.2	32.4	33.6

## 5.2.4 MZMS



### 5.2.5 MZMM

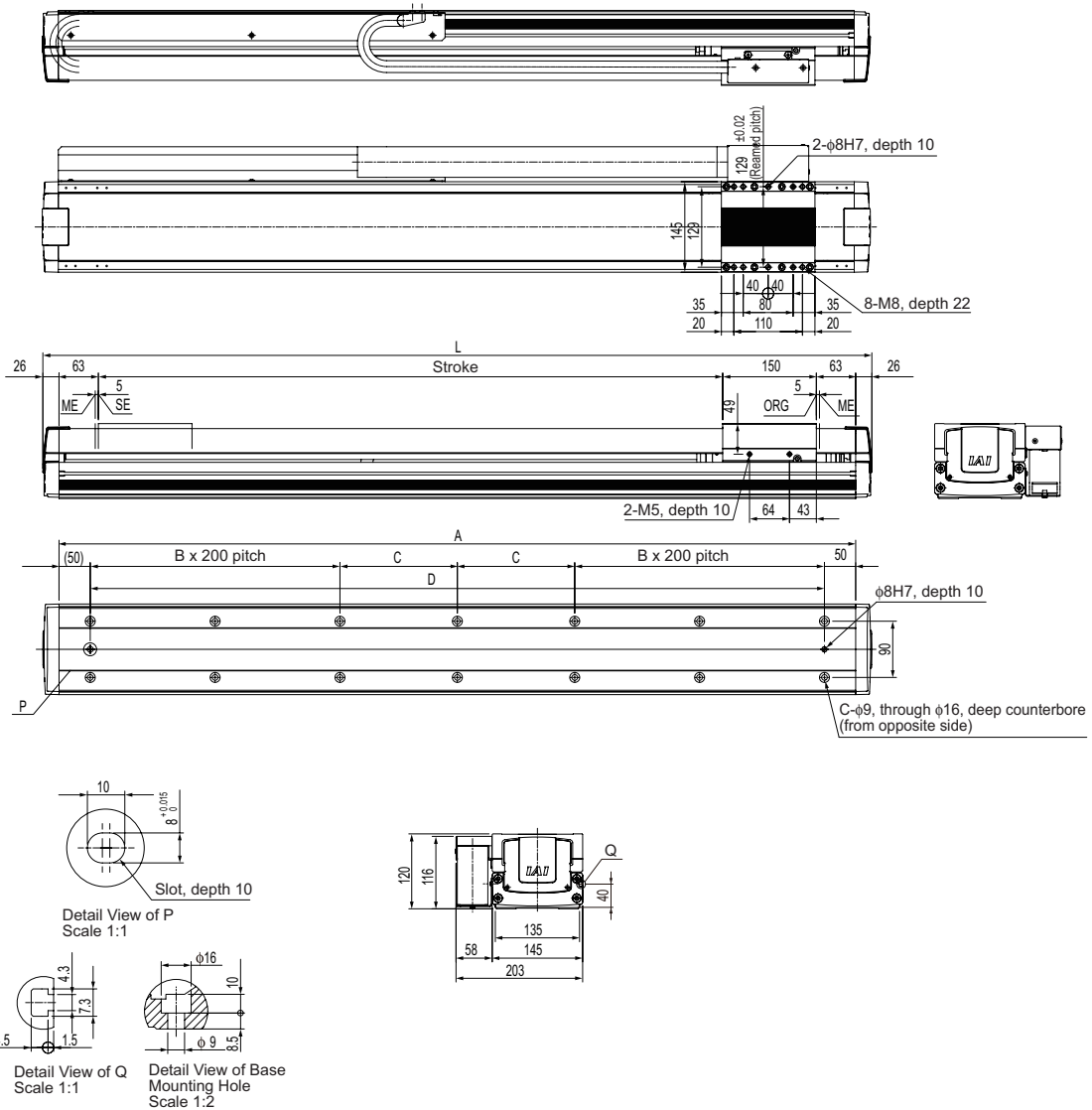


Stroke	300	400	500	600	700	800
L	878	978	1078	1178	1278	1378
A	1	1	1	1	2	2
B	167	217	267	317	167	217
C	684	784	884	984	1084	1184
D	10	10	10	10	14	14
Mass	17.2	18.4	19.7	20.9	22.1	23.4



## 5.3 Large Types

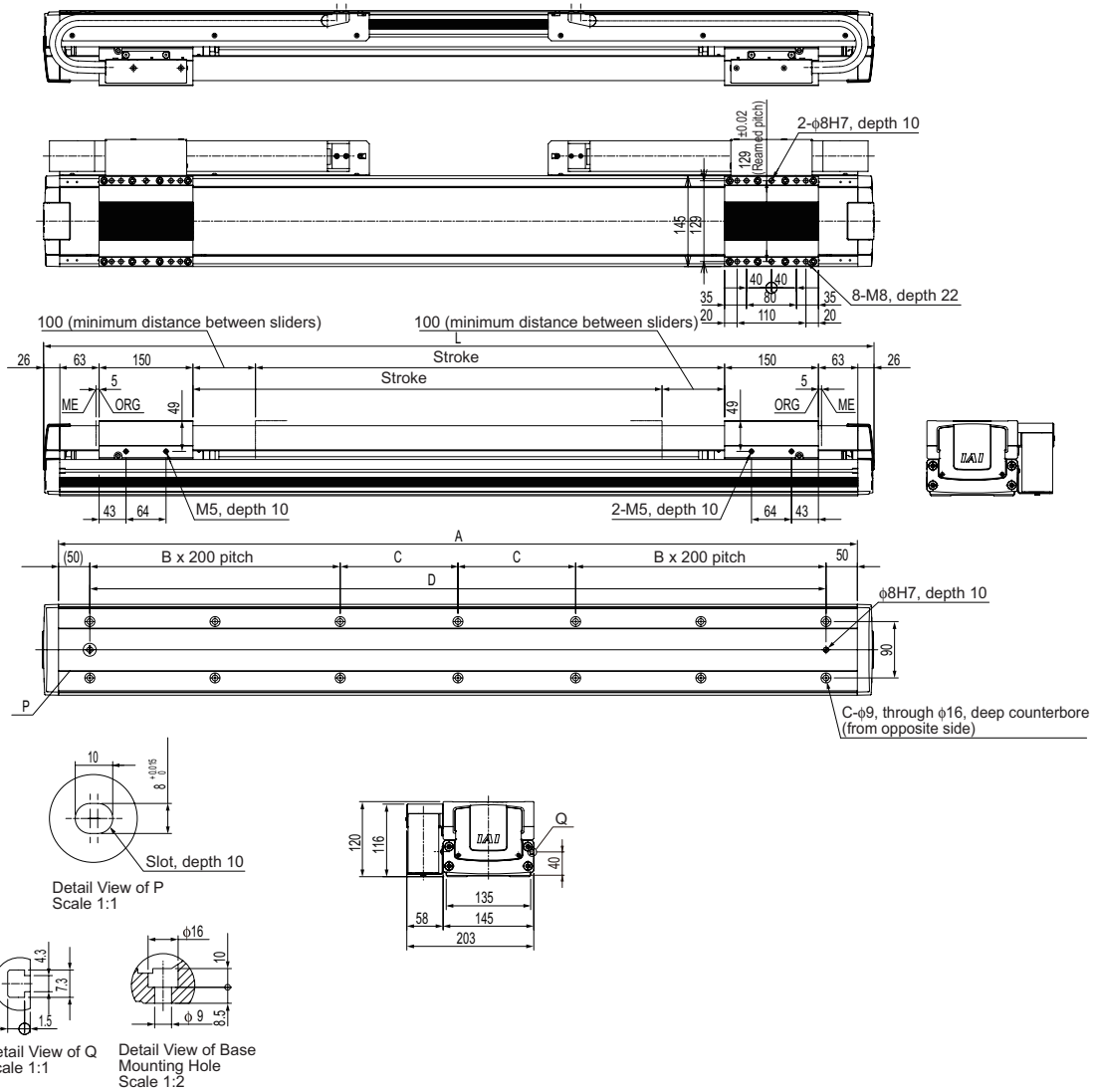
### 5.3.1 LXMS



Stroke	500	600	700	800	900	1000	1100	1200	1300
L	828	928	1028	1128	1228	1328	1428	1528	1628
A	1	1	1	1	2	2	2	2	3
B	138	188	238	288	138	188	238	288	138
C	10	10	10	10	14	14	14	14	18
Mass [kg]	18.6	20.1	21.6	23.1	24.5	26.0	27.5	29.0	30.5

Stroke	1400	1500	1600	1700	1800	1900	2000	2100	2200
L	1728	1828	1928	2028	2128	2228	2328	2428	2528
A	3	3	3	4	4	4	4	5	5
B	188	238	288	138	188	238	288	138	188
C	18	18	18	22	22	22	22	26	26
Mass [kg]	32.0	33.5	35.0	36.5	38.0	39.5	41.0	42.5	43.9

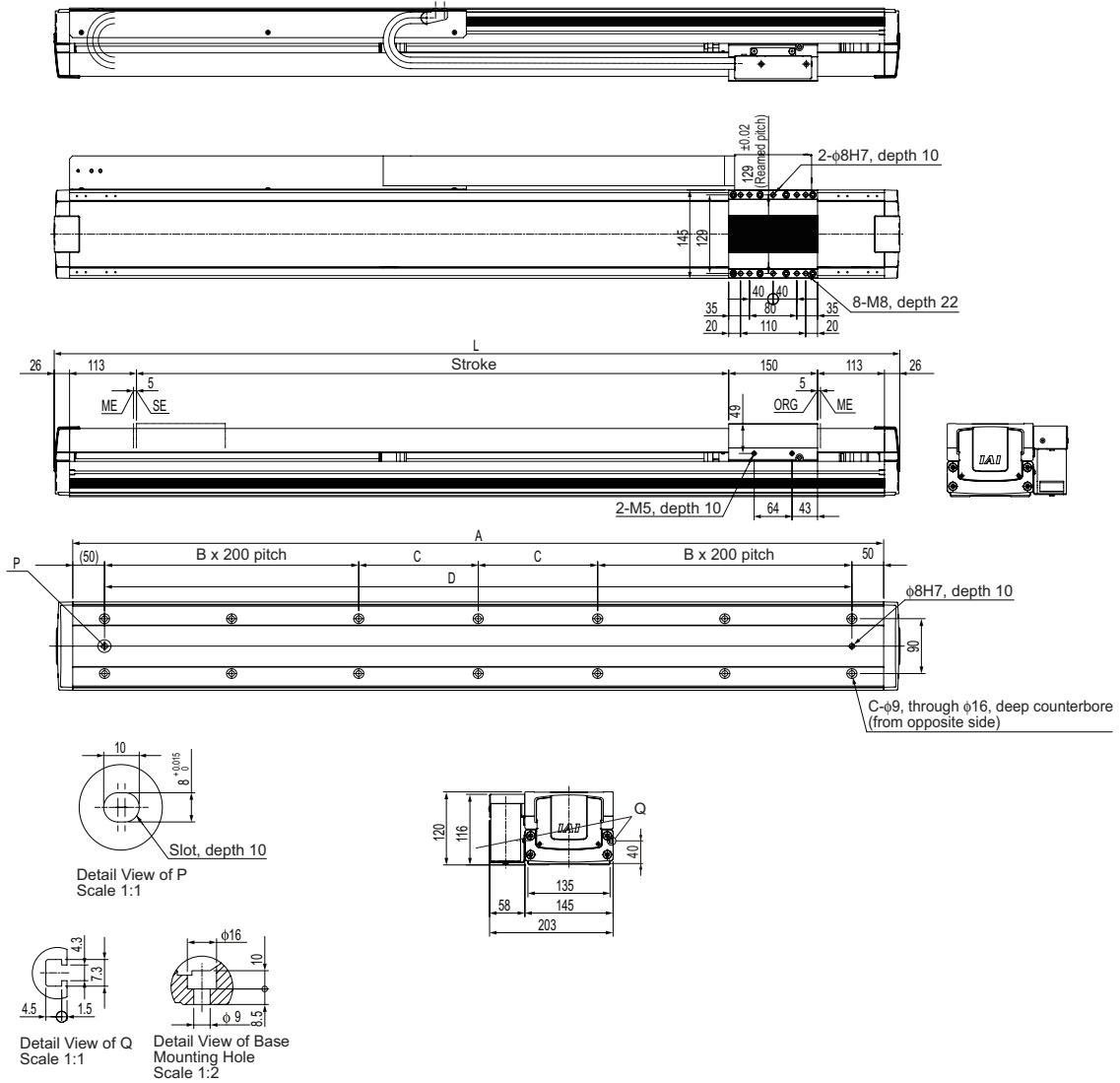
### 5.3.2 LXMM



Stroke	250	350	450	550	650	750	850	950	1050	1150
L	828	928	1028	1128	1228	1328	1428	1528	1628	1728
A	1	1	1	1	2	2	2	2	3	3
B	138	188	238	288	138	188	238	288	138	188
C	10	10	10	10	14	14	14	14	18	18
Mass [kg]	24.7	26.4	28.2	29.9	31.6	33.4	35.1	36.8	38.6	40.3

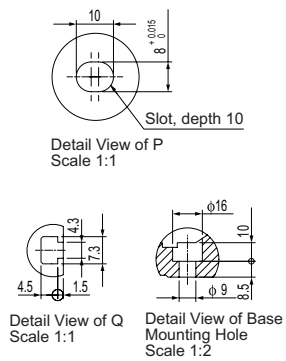
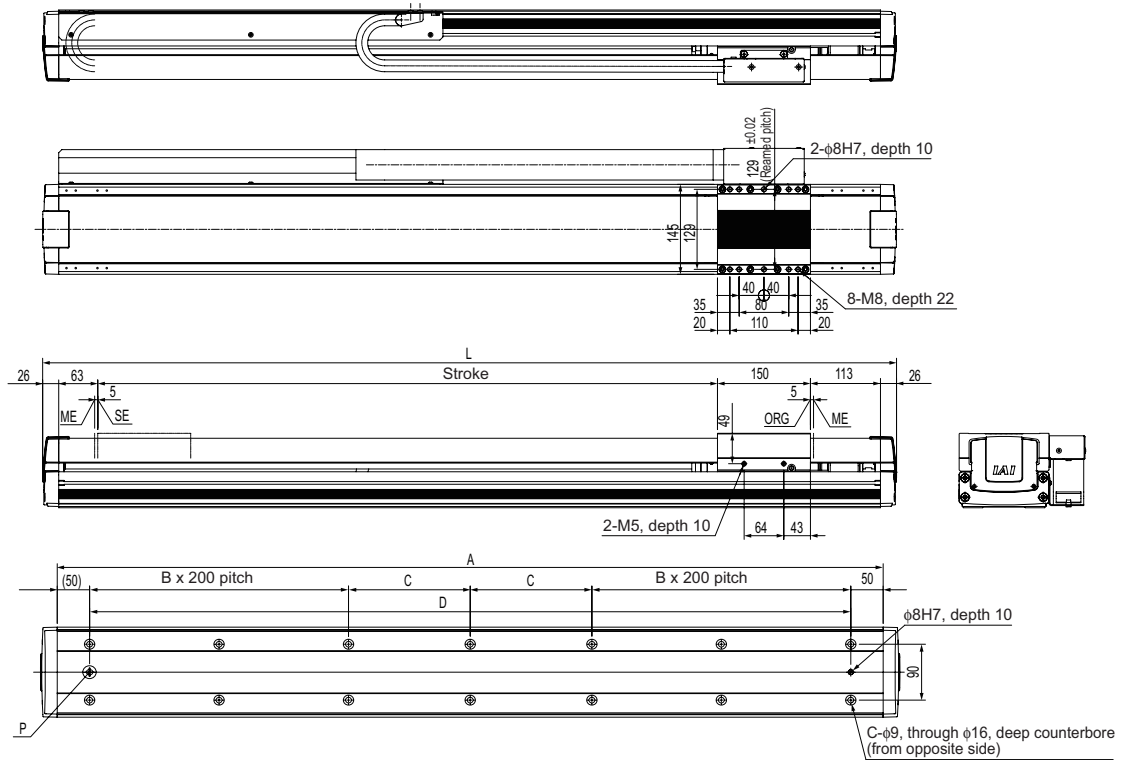
Stroke	1250	1350	1450	1550	1650	1750	1850	1950	2050	2150	2250
L	1828	1928	2028	2128	2228	2328	2428	2528	2628	2728	2828
A	3	3	4	4	4	4	5	5	5	5	6
B	238	288	138	188	238	288	138	188	238	288	138
C	18	18	22	22	22	22	26	26	26	26	30
Mass [kg]	42.0	43.8	45.5	47.2	48.9	50.7	52.4	54.1	55.9	57.6	59.3

### 5.3.3 LXXMXS



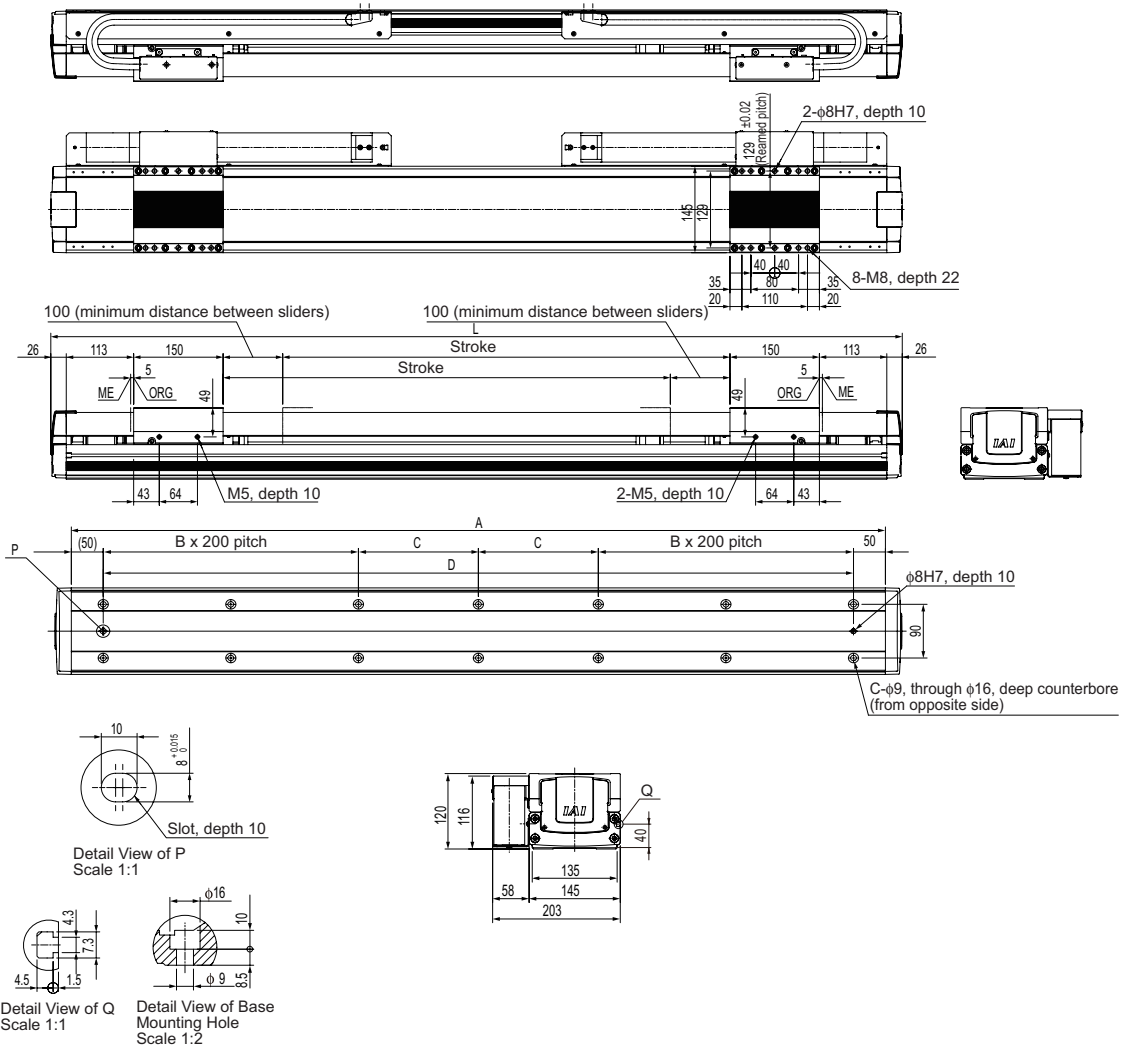
Stroke	2300	2400	2500	2600	2700	2800	2900	3000
L	2728	2828	2928	3028	3128	3228	3328	3428
A	5	6	6	6	6	7	7	7
B	288	138	188	238	288	138	188	238
C	26	30	30	30	30	34	34	34
Mass [kg]	46.4	47.9	49.4	50.9	52.3	53.8	55.3	56.8

### 5.3.4 LZMS



Stroke	500	600	700	800	900	1000
L	878	978	1078	1178	1278	1378
A	1	1	1	2	2	2
B	163	213	263	113	163	213
C	10	10	10	14	14	14
Mass [kg]	19.9	21.4	22.9	24.4	25.9	27.4

### 5.3.5 LZMM



Stroke	250	350	450	550	650	750	850	950
L	928	1028	1128	1228	1328	1428	1528	1628
A	1	1	1	2	2	2	2	3
B	188	238	288	138	188	238	288	138
C	10	10	10	14	14	14	14	18
Mass [kg]	27.1	28.8	30.5	32.2	34	35.7	37.4	39.2

## 6. Life

The product life is assumed to be 10,000km (reference) under the condition that it runs with maximum transportable weight and maximum acceleration/deceleration.

## 7. Warranty

### 7.1 Warranty Period

One of the following periods, whichever is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to the specified location
- 2,500 hours of operation

### 7.2 Scope of the Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:

- (1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.
- (2) The breakdown or problem in question occurred during the warranty period.
- (3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the instruction manual and catalog.
- (4) The breakdown of problem in question was caused by a specification defect or problem, or by a quality issue with our product.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

- [1] Anything other than our product
- [2] Modification or repair performed by a party other than us (unless we have approved such modification or repair)
- [3] Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
- [4] A natural disaster, man-made disaster, incident or accident for which we are not liable
- [5] Natural fading of paint or other symptoms of aging
- [6] Wear, depletion or other expected result of use
- [7] Operation noise, vibration or other subjective sensation not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

### 7.3 Honoring the Warranty

As a rule, the product must be brought to us for repair under warranty.

### 7.4 Limited Liability

- (1) We shall assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
- (2) We shall not be liable for any program or control method created by the customer to operate our product or for the result of such program or control method.

## 7.5 Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications

- (1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.
- (2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:
  - [1] Medical equipment pertaining to maintenance or management of human life or health
  - [2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
  - [3] Important safety parts of mechanical equipment (such as safety devices)
  - [4] Equipment used to handle cultural assets, art or other irreplaceable items
- (3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or instruction manual.

## 7.6 Other Items Excluded from Warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- [1] Guidance for installation/adjustment and witnessing of test operation
- [2] Maintenance and inspection
- [3] Technical guidance and education on operating/wiring methods, etc.
- [4] Technical guidance and education on programming and other items related to programs



## Change History

Revision Date	Description of Revision
Feb. 2009	Version 1
Aug. 2011	Version 2 Small types: SXMS, SXMM, SZMS, SZMM Medium types: MXMS, MXMM, MXMXS, MZMS, MZMM
Mar. 2012	Version 3 <ul style="list-style-type: none"> <li>• “Please Read Before Use” is changed</li> <li>• “Safety Precautions” is changed to “Safety Guide”</li> <li>• P.49 9,800 N → 9.8 N</li> <li>• P.50 9,310 to 9,800 N → 9.31 N to 9.8 N</li> <li>• P.51 9,800 N → 9.8 N</li> <li>• P.56 9,310 to 9,800 N → 9.31 N to 9.8 N</li> <li>• P.60, 61 Contents changed in 13. Warranty</li> </ul>
Jan. 2013	Version 4 <ul style="list-style-type: none"> <li>• P.26 Graph added for MXMXS transportable weight</li> <li>• P.27 Graph of transportable weight for each speed Lead 20mm 2400mm/sec → 1300/sec Lead 40mm 1200mm/sec → 2400/sec</li> <li>• P.28 Graph added for LXXMS transportable weight</li> <li>• P.30 Note changed to 1.8 times more of the nominal diameter for the length of thread engagement on aluminum</li> </ul>
Mar. 2013	Version 5 <ul style="list-style-type: none"> <li>• P.37 Correction made to some area in items to be prohibited in handling of cables</li> <li>• P.39 Contents changed in duty</li> </ul>
Jul. 2013	Version 6 <ul style="list-style-type: none"> <li>• P.39 Contents changed in duty</li> </ul>
Feb. 2014	Version 7 Revised overall
Mar. 2015	Version 8 <ul style="list-style-type: none"> <li>• P.51 Model code changed for wire for intermediate support</li> </ul>
April. 2015	Version 8C <ul style="list-style-type: none"> <li>• P.32 However, stroke of 1600mm or less is available to mount for LXMS and LXMM.</li> </ul>
	Version 9 <ul style="list-style-type: none"> <li>• P.12 Touch panel teaching TB-01 added</li> <li>• P.18 Dynamic allowable moment value changed</li> <li>• P.13, 38 Dedicated controller added</li> <li>• P.42 Change made to inspection schedule</li> <li>• P.46, 47, 48 Grease supply volume, Recommended grease gun, Nipple inlet diameter added</li> </ul>



Revision Date	Description of Revision
June 2015	Version 9B • P.45 Grease change due to production stop Albania Grease No.2 → Albania Grease S2 Mobilux 2 → Unirex N2
July 2015	Version 9C • P.12, 13 Guide with Ball Retainer Mechanism (RT) changed to option RT removed from model code • P.38 Correction made from 10m to 30 for max length





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