ISDB Series Actuator Operating Manual

Eighth Edition

ISDB, ISDBCR
ISPDB, ISPDBCR
IS Cast SSPDACR

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 CD or DVD that comes with the product contains operation manuals for IAI products.
When using the product, refer to the necessary portions of the applicable operation 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.
- The product cannot be operated in any way unless expressly specified in this Operating Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Operating Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
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- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

CE Marking

If a compliance with the CE Marking is required, please follow Overseas Standards Compliance Manual (ME0287) that is provided separately.

Table of Contents

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 before 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	● 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. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● 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.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● 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. ● 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. ● 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 operation manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● 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. ● 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. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● 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. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● 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. ● 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. ● 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.
		(3) Grounding ● 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. ● 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^2 (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). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● 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. ● 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. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● 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. ● 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. ● 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. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● 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. ● 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.
5	Teaching	● 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. ● 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. ● 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. ● 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. ● Place a sign "Under Operation" at the position easy to see. ● 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. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● 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. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● 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. ● 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. ● 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.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● 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. ● 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.

No.	Operation Description	Description
8	Maintenance and Inspection	● 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. ● 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. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● 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. ● 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. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the Operation Manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● 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. ● 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. ● 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. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● 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. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated operation manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the Operation 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. 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.
   In the case of interpolated operation of combined axes, the speed and acceleration/deceleration settings should correspond to the minimum values among all combined axes.

2. 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. In an extreme case, flaking may occur.

3. Keep the overhang length to within the allowable value.
   If the overhang length is equal to or greater than the allowable value, vibration or abnormal noise may occur.

4. Back and forth operation in a short distance may cause wear of grease.
   If the actuator is moved back and forth continuously over a short distance of 30 mm or less, grease film may run out. As a guide, move the actuator back and forth repeatedly for around 5 cycles over a distance of 50 mm or more after every 5,000 to 10,000 cycles.

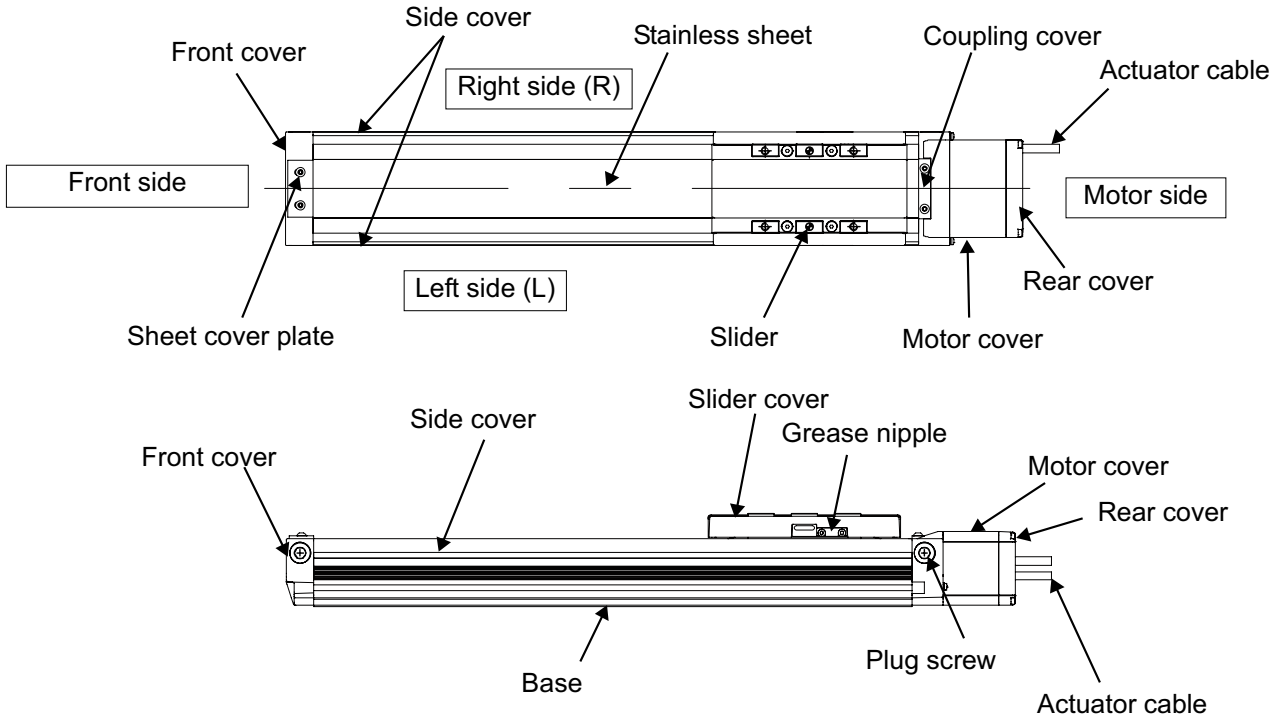
5. A soiled, slacked or deformed stainless sheet can cause problems.
   - If the stainless sheet is soiled by attachment of adhesive, coating material, etc., the stainless sheet may be scratched, which may in turn generate dust to affect the required cleanliness or dirty the work part. In an extreme case, the slider may malfunction.
     Also exercise due caution that the stainless sheet is magnetically attracted to the side covers using magnets, so iron powder and other magnetic matters can attach to the stainless sheet easily.
     If the stainless sheet has become dirty, wipe the dirty areas using alcohol.
   - Do not pinch or otherwise apply force to the stainless sheet. If the stainless sheet is used while being deformed or slacked, the stainless sheet will break.
     If the stainless sheet has deformed, replace the stainless sheet. If the stainless sheet has slacked, remove the stainless sheet and then install it again.
     [Refer to 13, “Replacement/Adjustment Procedure for Stainless Sheet”]

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

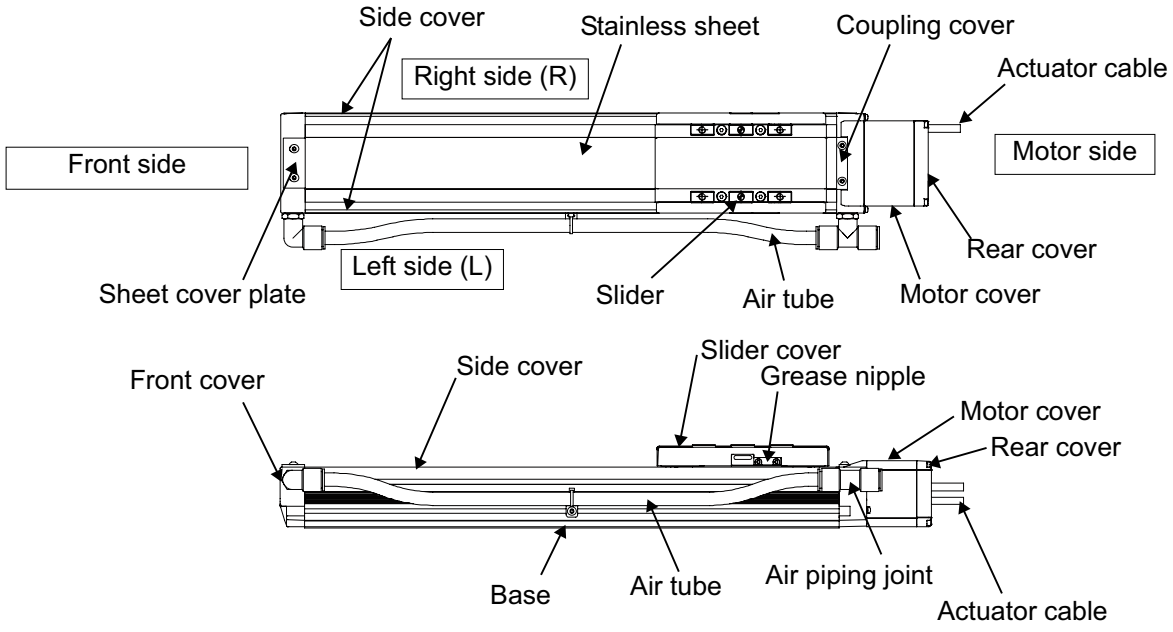
Names of the Parts

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.

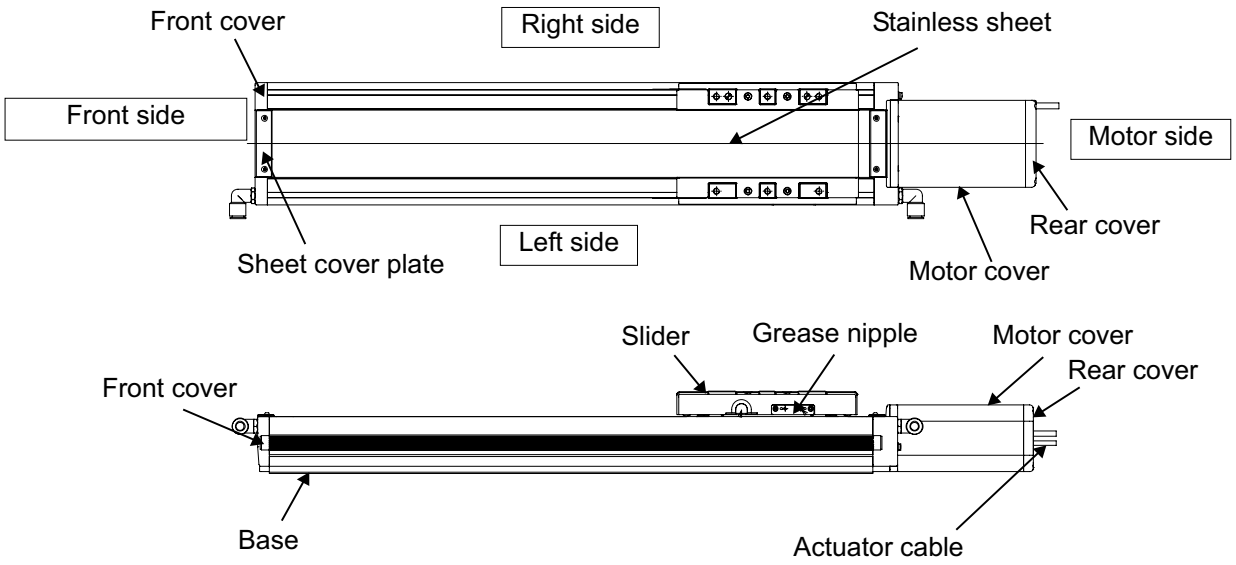
1. ISDB/ISPDB



2. ISDBCR/ISPDBCR



3. SSPDACR


Front cover
Right side
Stainless sheet
Front side
Motor side
Rear cover
Sheet cover plate
Left side
Motor cover
Slider
Grease nipple
Motor cover
Rear cover
Front cover
Base
Actuator cable

1. Checking the Product

If based on a standard configuration, this product consists of the items listed below.

⚠ Caution: Check the packed items against the packing specification. Should you find a wrong model or any missing item, please contact your IAI dealer or IAI.

1.1 Components

No.	Name	Model number	Remarks
1	Actuator	Refer to “How to Read the Model Nameplate” and “How to Read the Model Number.”	
Accessories			
2	Motor/encoder cables*1		
3	Home making seals		
4	Quick Step Guide		
5	Operation Manual (CD/DVD)		
6	Safety Guide		

*1 The motor/encoder cables supplied vary depending on the controller used. [Refer to 11, “Motor/Encoder Cables”.]

1.2 Related Operation Manuals for Each Controller Supported by This Product

The table below lists the related operation manuals for each controller supported by this product, which are included in the Operation Manual CD/DVD.
(1) XSEL-J/K controllers

No.	Name	Control No.
1	Operation Manual for XSEL-J/K Controller	ME0116
2	Operation Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
3	Operation Manual for Teaching Pendant SEL-T/TD/TG	ME0183
4	Operation Manual for Teaching Pendant IA-T-X/XD	ME0160
5	Operation Manual for DeviceNet	ME0124
6	Operation Manual for CC-Link	ME0123
7	Operation Manual for PROFIBUS	ME0153
8	Operation Manual for X-SEL Ethernet	ME0140
9	Operation Manual for Multi-point I/O Board	ME0138
10	Operation Manual for Dedicated Multi-point I/O Board Terminal Block	ME0139

(2) XSEL-P/Q controllers

No.	Name	Control No.
1	Operation Manual for XSEL-P/Q Controller	ME0148
2	Operation Manual for XSEL-P/Q/PX/QX RC Gateway Function	ME0188
3	Operation Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
4	Operation Manual for Teaching Pendant SEL-T/TD/TG	ME0183
5	Operation Manual for Teaching Pendant IA-T-X/XD	ME0160
6	Operation Manual for DeviceNet	ME0124
7	Operation Manual for CC-Link	ME0123
8	Operation Manual for PROFIBUS	ME0153

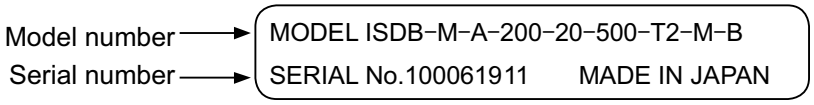
(3) SSEL controllers

No.	Name	Control No.
1	Operation Manual for SSEL Controller	ME0157
2	Operation Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
3	Operation Manual for Teaching Pendant SEL-T/TD/TG	ME0183
4	Operation Manual for Teaching Pendant IA-T-X/XD	ME0160
5	Operation Manual for DeviceNet	ME0124
6	Operation Manual for CC-Link	ME0123
7	Operation Manual for PROFIBUS	ME0153

(4) SCON controllers

No.	Name	Control No.
1	Operation Manual for SCON Controller	ME0161
2	Operation Manual for SCON-CA Controller	ME0155
3	Operation Manual for PC Software RCM-101-MW/RCM-101-USB	ME0243
4	Operation Manual for Teaching Pendant CON-T/TG	ME0178
5	Operation Manual for Touch Panel Teaching Pendant CON-PT/PD/PG	ME0227
6	Operation Manual for Simple Teaching Pendant RCM-E	ME0174
7	Operation Manual for Data Setter RCM-P	ME0175
8	Operation Manual for Touch Panel Display RCM-PM-01	ME0182
9	Operation Manual for DeviceNet	ME0124
10	Operation Manual for CC-Link	ME0123
11	Operation Manual for PROFIBUS	ME0153

1.3 How to Read the Model Nameplate



1.4 How to Read the Model Number

ISDB - M - A - 200 - 20 - 500 – T2 - M - B - **

<Series>
Simple dust-proof type
Aluminum-based
ISDB: Standard specification
ISPDB: High-precision specification
Clean room type
Aluminum-based
ISDBCR: Standard specification
ISPDBCR: High-precision specification
Iron-based
SSPDACR: High-precision specification

<Type>
S: Small type
M: Medium type
MX: Medium type with intermediate support
L: Large type
LX: Large type with intermediate support

<Encoder type>
A: Absolute
I: Incremental

<Motor type>
60: 60 W
100: 100 W
200: 200 W
400: 400 W

<Lead>
4: 4 mm
5: 5 mm
8: 8 mm
10: 10 mm
16: 16 mm
20: 20 mm
30: 30 mm
40: 40 mm

<Stroke>

<Applicable controller>
T1: XSEL-J/K
T2: SCON
SSEL
XSEL-P/Q

<Cable length>
N: No cable
S: 3 m
M: 5 m
X□□: Length specification

<Options>
AQ : AQ seal (Standard equipment)
B : Brake
C : Creep sensor
L : Limit switch
LL : Limit switch, opposite side
LM : Synchronized specification, master axis
LLM: Synchronized specification (sensor on opposite side, master axis)
NM : Reversed-home specification
RT : Guide with ball retention mechanism
S : Synchronized specification, slave axis
A1S: Cable exit from the left
A1E: Cable exit from the back on the left
A3S: Cable exit from the right
A3E: Cable exit from the back on the right
ST : High-precision straightness specification
(Note)Option only for High-Precision Types (ISPDB, ISPDBCR and SSPDACR)
VR : Piping joint for suction
Opposite installation specification

Identification for IAI use only*1

*1 This maybe displayed for the manufacturing reason.
(This is not to indicate the manufacturing model code.)

2. Specification

2.1 Maximum Speed

(1) ISDB, ISPDB, ISDBCR, ISPDBCR

The maximum speed of the actuator is limited to prevent resonance of the ball screw shaft that may occur beyond a certain motor speed.

Be sure to observe the applicable maximum speed shown in the table below.

Strokes and maximum speed limits (Unit: mm/s)

Size	Motor capacity (W))	Lead (mm)	Stroke [mm]																				
			100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100
S	60	4	240									230	200	170	150	135	120	–	–	–	–	–	–
		8	480									460	400	345	305	270	240	–	–	–	–	–	–
		16	960									920	795	690	610	540	480	–	–	–	–	–	–

Size	Motor capacity (W))	Lead (mm)	Stroke [mm]																				
			100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100
M	100	5	300											270	240	215	190	170	155	140	130	120	110
		10	600											545	480	430	380	345	310	285	260	240	220
		20	1200											1085	960	855	765	690	625	570	520	475	440
		30	1800											1630	1440	1280	1150	1035	935	850	780	715	660
	200	5	300											270	240	215	190	170	155	140	130	120	110
		10	600											545	480	430	380	345	310	285	260	240	220
		20	1200											1085	960	855	765	690	625	570	520	475	440
		30	1800											1630	1440	1280	1150	1035	935	850	780	715	660

Size	Motor capacity (W))	Lead (mm)	Stroke [mm]								
			800	900	1000	1100	1200	1300	1400	1500	1600
MX	200	20	1200				1100	1000	950	800	700
		30	1800				1650	1500	1425	1200	1050

Size	Motor capacity (W))	Lead (mm)	Stroke [mm]																			
			100 150	200 250	300 350	400 450	500 550	600 650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	
L	200	10	600						585	520	470	425	385	350	320	295	275	255	235	220	205	
		20	1200						1165	1045	940	850	770	705	645	595	545	505	470	440	410	
		40	1800									1700	1540	1410	1290	1185	1095	1015	940	875	815	
	400	10	600						585	520	470	425	385	350	320	295	275	255	235	220	205	
		20	1200						1165	1045	940	850	770	705	645	595	545	505	470	440	410	
		40	1800									1700	1540	1410	1290	1185	1095	1015	940	875	815	

Size	Motor capacity (W))	Lead (mm)	Stroke [mm]						
			1000	1100	1200	1300	1400	1500	1600
LX	200	20	1200			1150	1000	950	830
		40	1800						1660
	400	20	1200			1150	1000	950	830
		40	1800						1660

(2) SSPDACR

The maximum speed of the actuator is limited to prevent resonance of the ball screw shaft that may occur beyond a certain motor speed.

Be sure to observe the applicable maximum speed shown in the table below.

Stroke and maximum speed (or speed to reach) limits (Unit: mm/s)

Size	Motor capacity [W]	Lead [mm]	Stroke [mm]																													
			100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
S	200	10	600										540	480	430	380	340	310	280	260	240	220	200	-	-	-	-	-	-	-	-
		20	1100										1090	970	880	770	690	630	570	520	480	440	400	-	-	-	-	-	-	-	-
		30	1600											1450	1290	1160	1040	940	860	780	720	660	610	-	-	-	-	-	-	-	-
M	400	10	600											580	520	470	420	380	350	320	290	270	250	230	220	200	190	-	-	-	-
		20	1100												1040	940	850	770	700	640	590	550	500	470	440	410	380	-	-	-	-
		40	1600															1540	1410	1290	1180	1100	1010	940	880	820	760	-	-	-	-
L	750	25	1080				1100														1060		900		770		670		580		520
			620		880		1080		1100												1060		900		770		670		580		520
	750	50	1080		1530		1600																		1550		1340		1170		1040
			620		880		1080		1250		1400		1530		1600										1550		1340		1170		1040

⚠ Caution:

(1) 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.

(2) In the case of interpolated operation of two or more orthogonal axes, make sure the command values (settings) of speed and acceleration/deceleration do not exceed the smallest values of all speeds and accelerations/decelerations of the applicable axes.
Even if any speed or acceleration/deceleration is set that exceeds the smallest speed or acceleration/deceleration among all applicable axes, the actual speed or acceleration/deceleration will be clamped to the smallest speed or acceleration/deceleration.

(3) If any acceleration/deceleration equal to or greater than the rated acceleration/deceleration is set, a creep phenomenon or slipped coupling may occur.

2.2 Acceleration/Deceleration, Payload Capacity and Rated Thrust

If the payload capacity is smaller than as specified, the acceleration/deceleration can be raised beyond the applicable level.

(1) ISDB, ISPDB, ISDBCR, ISPDBCR

Type	Size	Motor capacity [W]	Lead [mm]	Rated acceleration/ deceleration [G]	Maximum acceleration/d eceleration [G]	Horizontal Vertical	Payload capacity by acceleration/deceleration [kg]									Rated thrust [N]
							0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	
Guide with ball retention mechanism (RT) not used	S	60	4	0.2	0.5	Horizontal	55	50	38	30	-	-	-	-	-	212.3
				0.2	0.4	Vertical	14	13	12	-	-	-	-	-	-	
			8	0.4	0.7	Horizontal	27	27	27	20	15	12	-	-	-	106.1
				0.4	0.6	Vertical	6	6	6	5.5	5	-	-	-	-	
			16	0.4	1.0	Horizontal	13	13	13	10.5	8.5	7	6	5.5	4.5	53.1
				0.4	0.8	Vertical	3	3	3	2.8	2.5	2.3	2	-	-	
	M	100	5	0.2	0.5	Horizontal	85	80	60	45	-	-	-	-	-	339.7
				0.2	0.4	Vertical	20	17	15	-	-	-	-	-	-	
			10	0.4	0.7	Horizontal	45	45	45	30	23	20	-	-	-	169.8
				0.4	0.6	Vertical	10	10	10	8	7	-	-	-	-	
			20	0.4	1.0	Horizontal	23	23	23	18	15	13	11	9	8	89.9
				0.4	1.0	Vertical	4	4	4	3.8	3.5	3.3	3	2.8	2.5	
			30	0.4	1.0	Horizontal	15	15	15	11	9	7	6	5	4	56.6
				0.4	1.0	Vertical	2	2	2	1.8	1.6	1.5	1.4	1.3	1.2	
		200	5	0.2	0.5	Horizontal	110	100	90	80	-	-	-	-	-	683.6
				0.2	0.4	Vertical	40	34	30	-	-	-	-	-	-	
			10	0.4	0.7	Horizontal	90	90	90	66	51	40	-	-	-	341.8
				0.4	0.6	Vertical	20	20	20	17	15	-	-	-	-	
			20	0.4	1.0	Horizontal	45	45	45	35	28	23	20	18	16	170.9
				0.4	1.0	Vertical	10	10	10	8.5	7.5	7	6	5.5	5	
			30	0.4	1.0	Horizontal	30	30	30	24	20	17	15	13	12	113.9
				0.4	1.0	Vertical	6	6	6	5.5	5	4.5	4	3.5	3	
	MX	200	20	0.4	0.4	Horizontal	45	45	45	-	-	-	-	-	-	170.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
			30	0.4	0.4	Horizontal	30	30	30	-	-	-	-	-	-	113.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
	L	200	10	0.4	0.7	Horizontal	90	90	90	66	51	40	-	-	-	341.8
				0.4	06	Vertical	20	20	20	16	14	-	-	-	-	
			20	0.4	1.0	Horizontal	45	45	45	35	28	23	20	17	15	170.9
				0.4	1.0	Vertical	9	9	9	8.5	7.5	7	6	5.5	5	
			40	0.4	1.0	Horizontal	15	15	15	12	10.5	9	8	7.5	7	85.5
				0.4	1.0	Vertical	2.5	2.5	2.5	2.4	2.3	2.2	2.1	2	2	
		400	10	0.4	0.7	Horizontal	120	120	120	92	73	60	-	-	-	678.3
				0.4	0.6	Vertical	40	40	40	35	30	-	-	-	-	
			20	0.4	1.0	Horizontal	90	90	90	70	57	47	40	35	30	339.1
				0.4	1.0	Vertical	20	20	20	17	15	14	12	11	10	
			40	0.4	1.0	Horizontal	40	40	40	32	27	23	21	19	17	169.9
				0.4	1.0	Vertical	8	8	8	7.5	7	6.5	6	5.5	5	
	LX	200	20	0.4	0.4	Horizontal	45	45	45	-	-	-	-	-	-	170.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
			40	0.4	0.4	Horizontal	15	15	15	-	-	-	-	-	-	85.5
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
		400	20	0.4	0.4	Horizontal	90	90	90	-	-	-	-	-	-	339.1
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
			40	0.4	0.4	Horizontal	40	40	40	-	-	-	-	-	-	169.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	

⚠ Caution: Even when the acceleration/deceleration is less than the rated acceleration/deceleration, the payload capacity will not exceed the specified payload capacity at the rated acceleration/deceleration.

Type	Size	Motor capacity [W]	Lead [mm]	Rated acceleration/ deceleration [G]	Maximum acceleration/deceleration [G]	Horizontal Vertical	Payload capacity by acceleration/deceleration [kg]									Rated thrust [N]
							0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	
Guide with ball retention mechanism (RT) used	S	60	4	0.2	0.5	Horizontal	55	50	38	30	-	-	-	-	-	212.3
				0.2	0.4	Vertical	13.5	12.5	11.5	-	-	-	-	-	-	
			8	0.4	0.7	Horizontal	27	27	27	20	15	12	-	-	-	106.1
				0.4	0.6	Vertical	5.5	5.5	5.5	5.0	4.5	-	-	-	-	
			16	0.4	1.0	Horizontal	13	13	13	10.5	8.5	7	6	5.5	4.5	53.1
				0.4	0.8	Vertical	2.5	2.5	2.5	2.3	2.0	1.8	1.5	-	-	
	M	100	5	0.2	0.5	Horizontal	85	80	60	45	-	-	-	-	-	339.7
				0.2	0.4	Vertical	19.5	16.5	14.5	-	-	-	-	-	-	
			10	0.4	0.7	Horizontal	45	45	45	30	23	20	-	-	-	169.8
				0.4	0.6	Vertical	9.5	9.5	9.5	7.5	6.5	-	-	-	-	
			20	0.4	1.0	Horizontal	23	23	23	18	15	13	11	9	8	84.9
				0.4	1.0	Vertical	3.5	3.5	3.5	3.3	3.0	2.8	2.5	2.3	2.0	
			30	0.4	1.0	Horizontal	15	15	15	11	9	7	6	5	4	56.6
				0.4	1.0	Vertical	1.5	1.5	1.5	1.3	1.1	1.0	0.9	0.8	0.7	
		200	5	0.2	0.5	Horizontal	110	100	90	80	-	-	-	-	-	683.6
				0.2	0.4	Vertical	40	34	30	-	-	-	-	-	-	
			10	0.4	0.7	Horizontal	90	90	90	66	51	40	-	-	-	341.8
				0.4	0.6	Vertical	20	20	20	17	15	-	-	-	-	
			20	0.4	1.0	Horizontal	45	45	45	35	28	23	20	18	16	170.9
				0.4	1.0	Vertical	10	10	10	8.5	7.5	7	6	5.5	5	
			30	0.4	1.0	Horizontal	30	30	30	24	20	17	15	13	12	113.9
				0.4	1.0	Vertical	6	6	6	5.5	5	4.5	4	3.5	3	
	MX	200	20	0.4	0.4	Horizontal	45	45	45	-	-	-	-	-	-	170.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
			30	0.4	0.4	Horizontal	30	30	30	-	-	-	-	-	-	113.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
	L	200	10	0.4	0.7	Horizontal	90	90	90	66	51	40	-	-	-	341.8
				0.4	06	Vertical	19	19	19	15	13	-	-	-	-	
			20	0.4	1.0	Horizontal	45	45	45	35	28	23	20	17	15	170.9
				0.4	1.0	Vertical	8	8	8	7.5	6.5	6	5	4.5	4	
			40	0.4	1.0	Horizontal	15	15	15	12	10.5	9	8	7.5	7	85.5
				0.4	1.0	Vertical	1.5	1.5	1.5	1.4	1.3	1.2	1.1	1	1	
		400	10	0.4	0.7	Horizontal	120	120	120	92	73	60	-	-	-	678.3
				0.4	0.6	Vertical	40	40	40	35	30	-	-	-	-	
			20	0.4	1.0	Horizontal	90	90	90	70	57	47	40	35	30	339.1
				0.4	1.0	Vertical	20	20	20	17	15	14	12	11	10	
			40	0.4	1.0	Horizontal	40	40	40	32	27	23	21	19	17	169.9
				0.4	1.0	Vertical	8	8	8	7.5	7	6.5	6	5.5	5	
	LX	200	20	0.4	0.4	Horizontal	45	45	45	-	-	-	-	-	-	170.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
			40	0.4	0.4	Horizontal	15	15	15	-	-	-	-	-	-	85.5
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
		400	20	0.4	0.4	Horizontal	90	90	90	-	-	-	-	-	-	339.1
				-	-	Vertical	-	-	-	-	-	-	-	-	-	
			40	0.4	0.4	Horizontal	40	40	40	-	-	-	-	-	-	169.9
				-	-	Vertical	-	-	-	-	-	-	-	-	-	

⚠ Caution: Even when the acceleration/deceleration is less than the rated acceleration/deceleration, the payload capacity will not exceed the specified payload capacity at the rated acceleration/deceleration.

(2) SSPDACR

Size	Type	Motor capacity [W]	Lead [mm]	Maximum acceleration/ deceleration [G]	Horizontal Vertical	Payload capacity by acceleration/deceleration [kg]											Rated thrust [N]
						0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	1.1G	1.2G	
S	-	200	0.4	0.7	Horizontal	90	90	90	72	60	50	-	-	-	-	-	341.8
			0.4	0.6	Vertical	12	12	12	10	8	-	-	-	-	-	-	
			0.4	1.2	Horizontal	45	45	45	36	30	26	22.5	19.5	17	-	-	170.9
			0.4	1.2	Vertical	6	6	6	4.8	4	3.4	3	2.7	2.4	-	-	
			0.4	1.2	Horizontal	30	30	30	24	20	17	15	13	12	11	10	113.9
			0.4	1.2	Vertical	4	4	4	3.2	2.7	2.3	2	1.7	1.4	1.2	1	
M	-	400	0.4	0.7	Horizontal	120	120	120	96	80	70	-	-	-	-	-	678.3
			0.4	0.6	Vertical	25	25	25	20	16.5	-	-	-	-	-	-	
			0.4	1.2	Horizontal	90	90	90	72	60	51	45	39	34	-	-	339.1
			0.4	1.2	Vertical	12	12	12	9.6	8	6.9	6	5.3	4.8	-	-	
			0.4	1.2	Horizontal	45	45	45	36	30	25.5	22.5	19.5	17	15	13.5	169.6
			0.4	1.2	Vertical	6	6	6	4.8	4	3.4	3	2.7	2.4	2.2	2	
L	Guide with ball retention mechanism (RT) not used	750	25	1.2	Horizontal	-	-	120	96	80	69	60	53	48	44	40	510
					Vertical	-	-	25	20	17	14	13	11	10	9	8	
			50	1.2	Horizontal	-	-	60	48	40	34	30	27	24	22	20	255
					Vertical	-	-	12	10	8	7	6	5	5	4	4	
	Guide with ball retention mechanism (RT) used	750	25	1.2	Horizontal	-	-	120	96	80	69	60	53	48	44	40	510
					Vertical	-	-	23	18	15	12	11	9	8	7	6	
			50	1.2	Horizontal	-	-	60	48	40	34	30	27	24	22	20	255
					Vertical	-	-	10	8	6	5	4	3	3	2	2	

⚠ Caution: Even when the acceleration/deceleration is less than the rated acceleration/deceleration, the payload capacity will not exceed the specified payload capacity at the rated acceleration/deceleration.

2.3 Driving System/Position Detector

The actuator is driven by the AC servo control method.

(1) ISDB, ISPDB, ISDBCR, ISPDBCR

Size	Motor capacity [W]	Lead [mm]	Encoder pulses*1	Ball screw specification			
				Type	Diameter	ISD series	ISPD series
S	60	4	16384	Rolled	∅12 mm	C10	C5 or equivalent
		8					
		16					
M	100	5		Rolled	∅16 mm	C10	C5 or equivalent
		10					
		20					
		30					
	200	5		Rolled	∅16 mm	C10	C5 or equivalent
		10					
		20					
		30					
MX	200	20		Rolled	∅16 mm	C10	C5 or equivalent
		30					
L	200	10		Rolled	∅20 mm	C10	C5 or equivalent
		20					
		40					
	400	10		Rolled	∅20 mm	C10	C5 or equivalent
		20					
		40					
LX	200	20		Rolled	∅20 mm	C10	C5 or equivalent
		40					
	400	20		Rolled	∅20 mm	C10	C5 or equivalent
		40					

*1 Number of pulses input to the controller.

(2) SSPDACR

Size	Motor capacity [W]	Lead [mm]	Encoder pulses*1	Ball screw specification		
				Type	Diameter	SSPDACR
S	200	10	16384	Rolled	∅16 mm	C5 or equivalent
		20				
		30				
M	400	10		Rolled	∅20 mm	C5 or equivalent
		20				
		40				
L	750	25		Rolled	∅25 mm	C5 or equivalent
		50				

*1 Number of pulses input to the controller.

2.4 Positioning Preciseness

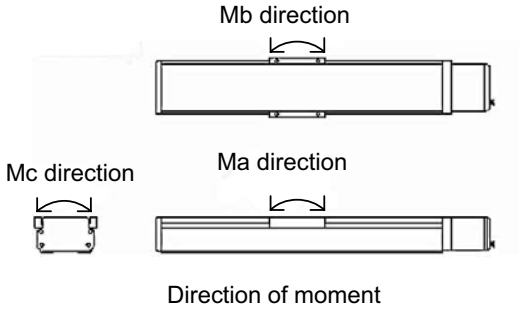
Item	Functions		
	ISD	ISPD	SSPDACR
Positioning repeatability	±0.01 mm	±0.005 mm	±0.005 mm
Backlash*1	0.05 mm or less	0.02 mm or less	0.02 mm or less

*1 Initial value

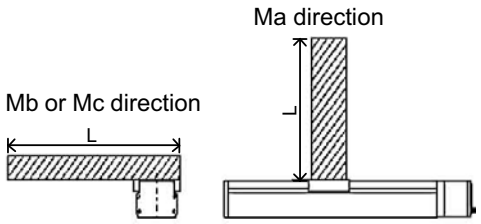
2.5 Allowable Load Moment of the Actuator

(1) ISDB, ISPDB, ISDBCR, ISPDBCR

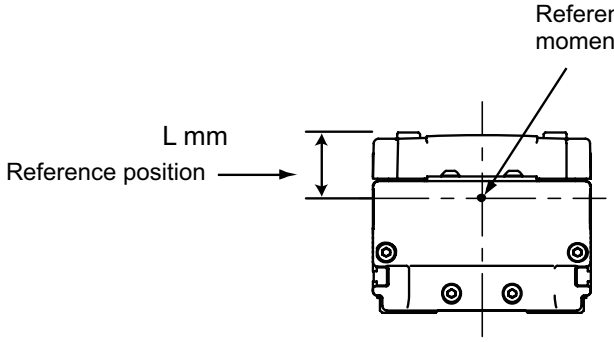
Size	Allowable load moment (N•m)	Allowable load moment (N•m)					Allowable overhang load (L)
	Ma	Ma	Mb	Mc	Mb	Mc	
S	143.8	205.4	336.0	28.4	40.2	65.7	Ma direction: 450 Mb or Mc direction: 450
M	341.5	487.0	796.5	69.6	99.0	161.7	Ma direction: 600 Mb or Mc direction: 600
MX	341.5	487.0	796.5	69.6	99.0	161.7	Ma direction: 600 Mb or Mc direction: 600
L	560.2	800.1	1325.3	104.9	149.9	248.9	Ma direction: 750 Mb or Mc direction: 750
LX	560.2	800.1	1325.3	104.9	149.9	248.9	Ma direction: 750 Mb or Mc direction: 750



Direction of moment



Direction of allowable overhang

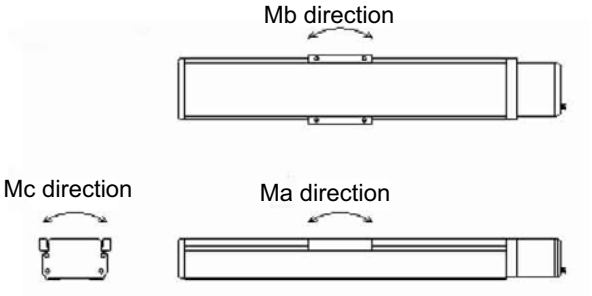


Size	L [mm]
S	42.5
M	51.5
MX	51.5
L	61.5
LX	61.5

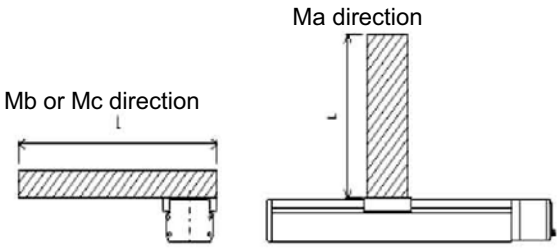
⚠ Caution: Make sure the load installed on the actuator is not longer than the allowable overhang load length (L). If the load is longer than L, vibration may occur or the settling time may increase depending on the position of center of gravity position or weight of the work part.
If a load moment exceeding the allowable load moment is applied, not only the life of the guide will become shorter but vibration or longer settling time may also result.

(2) SSPDACR

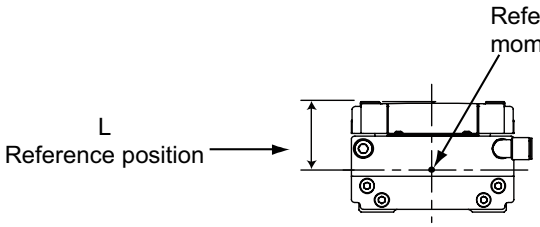
Size	Static allowable load moment [N·m]			Dynamic allowable load moment [N·m]			Allowable overhang load [L]
	Ma	Mb	Mc	Ma	Mb	Mc	
S	190	190	530	36	36	98	Ma direction: 450 Mb or Mc direction: 450
M	470	470	1210	90	90	230	Ma direction: 600 Mb or Mc direction: 600
L	750	750	1850	138.8	138.8	334.5	Ma direction: 750 Mb or Mc direction: 750



Direction of moment



Direction of allowable overhang



	L [mm]
S	50
M	58.5
L	65.5

⚠ Caution: Make sure the load installed on the actuator is not longer than the allowable overhang load length (L). If the load is longer than L, vibration may occur or the settling time may increase depending on the position of center of gravity position or weight of the work part.
If a load moment exceeding the allowable load moment is applied, not only the life of the guide will become shorter but vibration or longer settling time may also result.

3. Life

The mechanical life of an actuator is represented by the life of its guide that receives the largest moment load.
The “rated load” is one factor that relates to the traveling life.
There are two types of “rated load,” namely “static rated load” and “dynamic rated load.”

- “Static rated load”: Load which, when applied to a stationary actuator, leaves a minor pressure mark on the contract surface.
- “Dynamic rated load”: Load which applies after a specified traveling distance under a load based on a specific probability of survival at which the guide does not break

Guide manufacturers indicate the life of a guide using a dynamic rated load when the provability of survival after 50 km of traveling is 90%.
In the case of general industrial machinery, however, you must know the specific life for the purpose of maintenance. Also, the life of a guide has a sufficient allowance relative to a radial load, and receives the greatest impact by a moment load offset from the center of the guide.
The life of the IS series corresponds to a traveling life of 10000 km at a load factor of 1.2 (safety factor) when the allowable load moment is applied. [For the dynamic allowable load moment, refer to 2, “Specification”]
The calculation formula for allowable load moment at a traveling life of 10,000 km is shown below:

$$C_{IA}=\frac{M_{50}}{fw}\times\left(\frac{50km}{10000km}\right)^{\frac{1}{3}}$$

C_{IA}: Allowable load moment
f_W: Load coefficient (= 1.2)
M_{50}: Dynamic rated moment when the probability of survival after 50 km of traveling is 50%

The life at the actual moment is calculated by the formula below:

$$L=\left(\frac{C_{IA}}{P}\right)^{3}\times 10000km$$

L: Traveling live (probability of survival: 90%)
C_{IA}: Allowable dynamic moment
P: Actual moment

4. Installation and Storage/Preservation Environment

4.1 Installation Environment

The actuator should be installed in a location other than those specified below.
In general, the installation environment should be one in which an operator can work without protective gear.
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

4.2 Storage/Preservation Environment

The storage/preservation environment should be similar to the installation environment. In addition, make sure condensation will not occur when the actuator is to be stored or preserved for a long period of time. Unless specified, we do not include drying agents when shipping the actuator. If you are storing the actuator in an environment where condensation might occur, you must treat the entire shipping box, or treat the actuator itself after unpacking, to prevent condensation. The unit can withstand temperatures up to 60ºC during a short storage/preservation period, but only up to 50ºC if the storage/preservation period is longer than one month.

The actuator should be lying flat during storage/preservation.
If the actuator is to be stored in a packed state, follow the specified actuator position if indicated.

5. Transport

5.1 Handling a Single Axis

5.1.1 Handling a Package

Unless otherwise specified, each axis is packed and shipped individually.

- Do not bump or drop the package. The package is not specially designed to withstand the impact of dropping or bumping.
- An operator must not attempt to carry a heavy package alone. Transport the package using an appropriate transport means.
- If the shipping box is to be left standing or transported, it should be in a horizontal position. If the packing specification is instructed, follow the instruction.
- Do not step onto the package.
- Do not put any article on the package which may deform or damage the package.

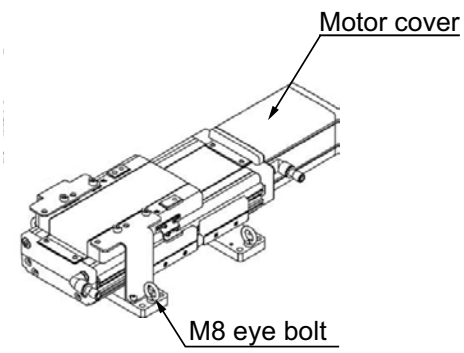
5.1.2 Handling an Actuator after Unpacking

(1) ISDB, ISPDB, ISDBCR, ISPDBCR

- Do not transport the actuator by holding the cable or move it by pulling the cable.
- When transporting the actuator, hold its base.
- When transporting the actuator, be careful not to bump the actuator against anything.
- Do not apply excessive force on any part of the actuator.
- In the case of the high-precision straightness specification type, be careful not to make a damage and the traces of hitting at the base bottom.
  There is a possibility that the running accuracy changes.

(2) SSPDACR

- Four eye bolts are installed, so use these bolts to transport the actuator. The SSPDACR, when unpacked, looks like the condition shown in the figure below.



- Do not hold the motor cover when transporting the SSPDACR. Doing so may damage the cover due to the weight of the actuator or the main unit may fall.
- Do not transport the actuator by holding the cable, or move it by pulling the cable.
- Be careful not to bump the actuator against anything when transporting it.
- Do not apply excessive force on any of the actuator parts.
- In the case of the high-precision straightness specification type, be careful not to make a damage and the traces of hitting at the base bottom.
  There is a possibility that the running accuracy changes.

5.2 Handling an Cartesian Robot (ICS)

Take note of the following points when transporting a set of axes that have been combined.

5.2.1 Handling a Package

Before shipment, combined axes are packed in an outer frame nailed to the base made of square lumbers. Each slider is secured to prevent accidental movement during transport. Each actuator end is also secured to prevent oscillating due to external vibration.

- Do not bump or drop the package. The package is not specially designed to withstand the impact of dropping or bumping.
- An operator must not attempt to carry a heavy package alone. Transport the package using an appropriate transport means.
- When hoisting the package using ropes, etc., support the square lumber base at the reinforcements at the bottom. Similarly when lifting the package with a forklift, insert the forks at the bottom of the square lumber base.
- When setting down the package, be careful not to let the package receive shock or bounce.
- Do not step onto the package.
- Do not put any article on the package which may deform or damage the package.

5.2.2 Handling an Actuator after Unpacking

- Secure the sliders to prevent sudden movement during transport.
- If any end of the actuator is overhanging, secure it properly to avoid significant movement due to external vibration.
- If the actuator assembly is transported without the ends being secured, do not apply an impact of 0.3 G or more.
- When hoisting the actuator using ropes, etc., use appropriate cushioning materials to protect the actuator against strain or distortion. Also keep a stable, horizontal orientation. If necessary, use the tapped mounting holes provided on the bottom face of the base to install hoisting jigs.
- Be careful not to apply a load on any of the actuator brackets or covers or on the connector box. Also, do not allow the cable to be pinched or deformed excessively.

5.3 Handling an Actuator Assembled to a Mechanical System

When transporting an actuator that has been assembled to a mechanical system, as the whole system, take note of the following points:

- Secure the sliders to prevent sudden movement during transport.
- If any end of the actuator is overhanging, secure it properly to avoid significant movement due to external vibration.
- If the actuator assembly is transported without the ends being secured, do not apply an impact of 0.3 G or more.
- When hoisting the mechanical system using ropes, etc., prevent the actuator, connector box, etc., from receiving a load. Also make sure the cables are not pinched or deformed unnaturally.

6. Installation

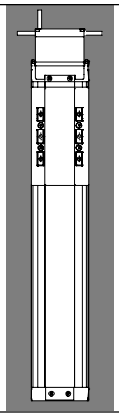
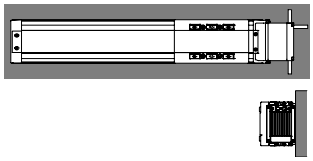
6.1 Installation Orientations

Actuators are subject to certain limitations regarding their installation orientations.
If an actuator is installed in an orientation not allowed for that actuator, the stainless sheet may break or other problems may occur.

○: Installable △: Daily inspection is required x: Not possible

Type		Horizontal installation	Vertical installation	Sideway installation	Ceiling mount installation
S	ISDB ISPDB ISDBCR ISPDBCR	○	○	△	△
	SSPDACR	○	○	X	X
M	ISDB ISPDB ISDBCR ISPDBCR	○	○	△	△
	SSPDACR	○	○	X	X
MX		○	X	X	X
L	ISDB ISPDB ISDBCR ISPDBCR	○	○	△	△
	SSPDACR	○	○	X	X
LX		○	X	X	X

Installation oeientations

Horizontal	Vertical	Vertical	Ceiling mount
			

Caution: (1) When installing the actuator vertically, make sure the motor comes to the top. When the actuator is installed with the motor at the bottom, there shouldn't be any problems during normal operations. If the actuator is not operated for an extended period of time, however, depending on the ambient environment (especially at high temperature) grease may separate and base oil may flow into the motor unit, causing problems on rare occasions.

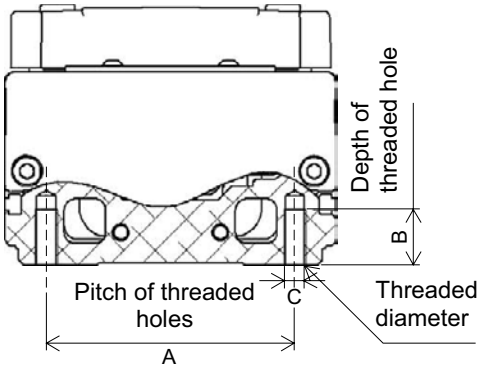
(2) ISDB, ISPDB, ISDBCR and ISPDBCR actuators of S, L and M types can be installed sideways or ceiling mount, but the actuators must be checked daily. If the actuator is installed sideways or ceiling mount, the stainless sheet may be slacked or displaced. If the actuator is used continuously while the stainless sheet is slacked or displaced, the stainless sheet may break or other problems may occur. Check the actuator daily and if the stainless sheet is found slacked or displaced, make installation adjustment of the stainless sheet. [Refer to 13, "Replacement/Adjustment Procedure for Stainless Sheet."]

6.2 Installing the Actuator

6.2.1 Installation Method

- Use the threaded holes on the back of the base to install the actuator.
- ISDB and ISDBCR actuators of intermediate support type (MX/LX) are installed in the same way as the corresponding actuators without intermediate support. However, be careful not to remove or get caught by the wire rope for the intermediate support during installation.
- When positioning pins are used, use pins with an engagement tolerance of h7 or equivalent.
- Positioning can also be performed by pushing the reference surface on the side of the base. [Refer to 6.2.2, “Preciseness of the Installation Surface.”]
- Use high-tension bolts conforming to ISO 10.9 or higher.
- When the threaded holes are used, determine the required thread length as specified below:
  - ISDB, ISPDB, ISDBCR, ISPDBCR
    Depth of threaded hole > Thread engagement length > Nominal thread size x 1.8
  - SSPDACR
    Depth of threaded hole > Thread engagement length > Nominal thread size
- If the through holes are used to install a SSPDACR actuator, provide the following effective engagement length, whichever is applicable, for the female thread:
  - If the female thread is made of steel, same as the nominal diameter
  - If the female thread is made of aluminum, 1.8 times of nominal diameter
- If the bolt seating surface is aluminum, or the through holes are used to install a SSPDACR actuator, also use high-tension bolts with dedicated washers. Failure to do so may cause the seating surface to buckle.

- ISDB, ISPDB, ISDBCR, ISPDBCR
  The installation method is shown by a section view.

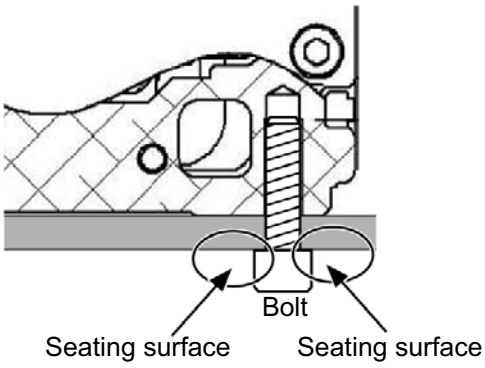


Base: Aluminum alloy (A6063SS-T6 or equivalent) with alumite treatment

Type	Pitch of threaded holes A	Depth of threaded hole B	Thread size C
S	70 mm	17 mm	M6
M, MX	90 mm	20 mm	M8
L, LX	120 mm	20 mm	M8

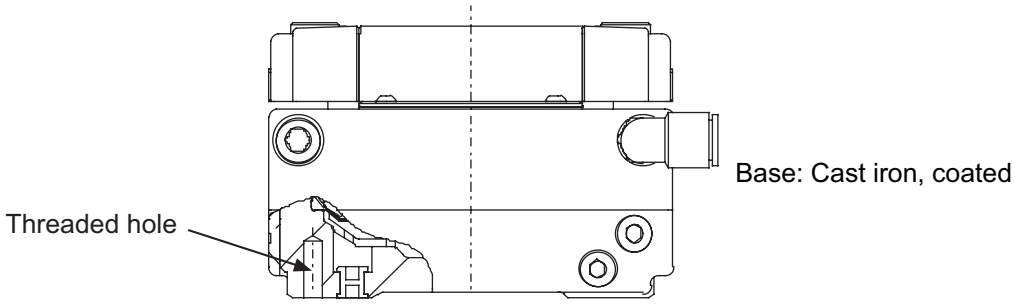
Installation bolt	Tightening torque	
	Bolt seating surface is steel	Bolt seating surface is aluminum
M6	12.3 N·m	5.4 N·m
M8	30.0 N·m	11.5 N·m

Bolt seating surface



⚠ Warning: The threaded holes are not through, so exercise caution when selecting the bolt length. Use of inappropriate bolts may damage the threaded holes or result in insufficient mounting strength of the actuator, leading to a lower precision or unexpected accident.

- SSPDACR
  The installation method is shown by a section view.



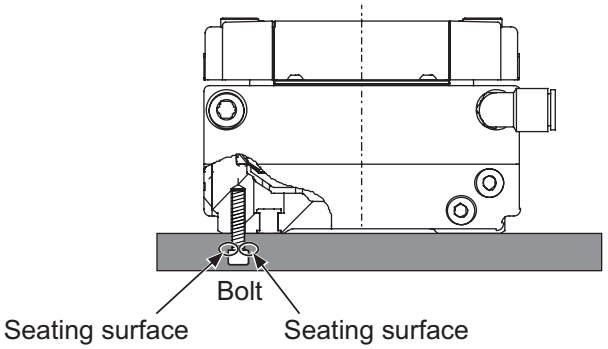
Type	Thread size	Depth of threaded hole
S	M6	9 mm
M	M8	12 mm
L	M8	16 mm

(Note) The through holes are lidded for keep the cleanliness.
It is not possible to attach with the screws applied from the actuator body side.

[Threaded hole]

Installation bolt	Tightening torque	
	Bolt seating surface is steel	Bolt seating surface is aluminum
M6	12.3 N•m	5.4 N•m
M8	30.0 N•m	11.5 N•m

[When threaded holes are used]

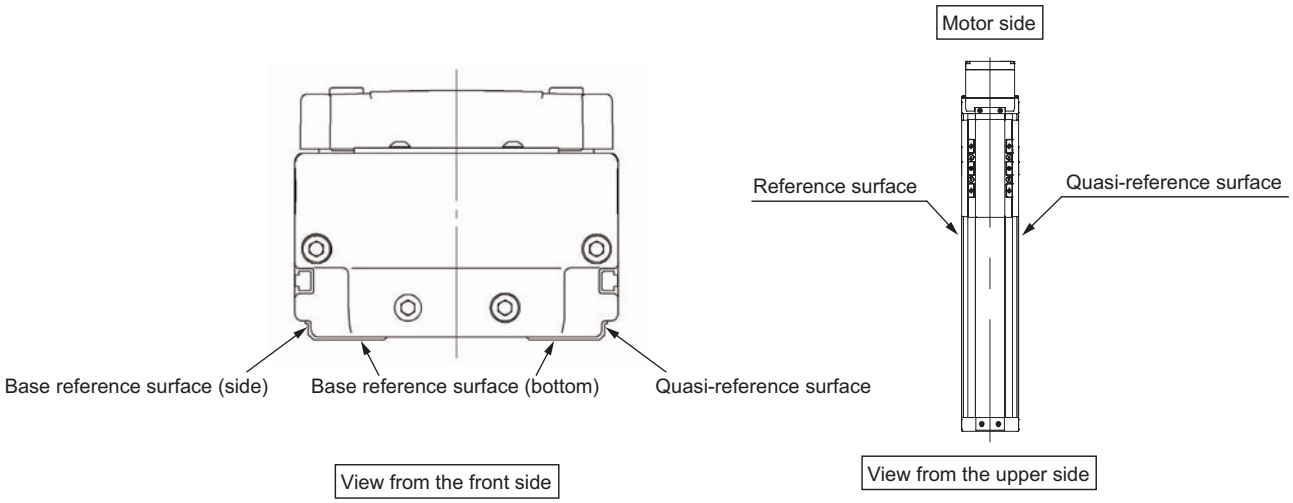


⚠ Warning: The threaded holes are not through, so exercise caution when selecting the bolt length. Use of inappropriate bolts may damage the threaded holes or result in insufficient mounting strength of the actuator, leading to a lower precision or unexpected accident.

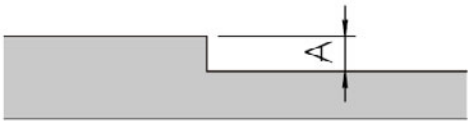
6.2.2 Preciseness of the Installation Surface

- The frame on which the actuator is installed shall have sufficient structural rigidity to remain free from vibration, etc.
- The basis of measurement of the running accuracy of the slider is from the lower side and motor side to right side.
  If accuracy for its run is required, use these surfaces as a datum of the installation.
  In view of the motor side, the parallelism of the quasi-reference surface of left side to the reference surface is 0.1mm or less.
- The actuator installation surface shall be a flat surface that has been machined or has equivalent precision, where the specific flatness of the installation surface shall be within 0.05 mm. If the installation surface is rough, abnormal noise or other problems may occur due to poor contact of the actuator.
- If the actuator is of straightness high-precision specification (indicated by the option model number “ST”), clean the base surface of any soiling and install the actuator on a flat surface with a preciseness of 0.02 mm in flatness.
  [For the straightness high-precision specification (indicated by the option model number “ST”), refer to 10.9, “High-Precision Straightness Specification.”]
- Provide enough space needed to carry out maintenance work.

- ISDB, ISPDB, ISDBCR, ISDBCR



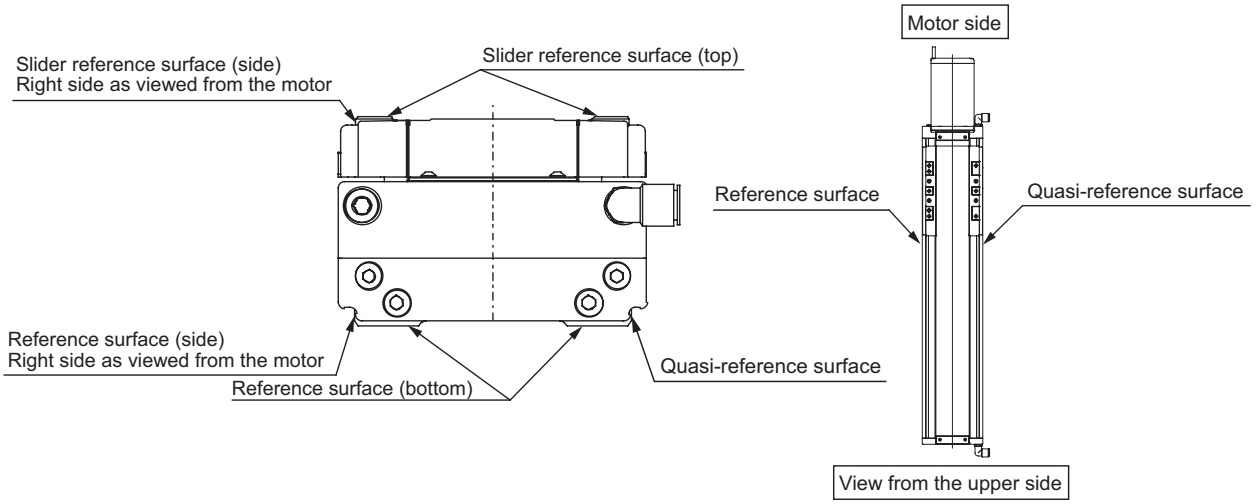
- If the reference surface (side) of the base is used, provide a stopper part of the dimension shown below.



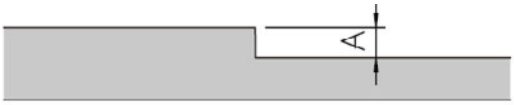
Dimension of stopper part on reference surface

Type	Dimension A
Base reference surface (side)	3 to 5

- SSPDACR



- If the base reference surface (side) is used, provide a stopper part of the dimension shown below.



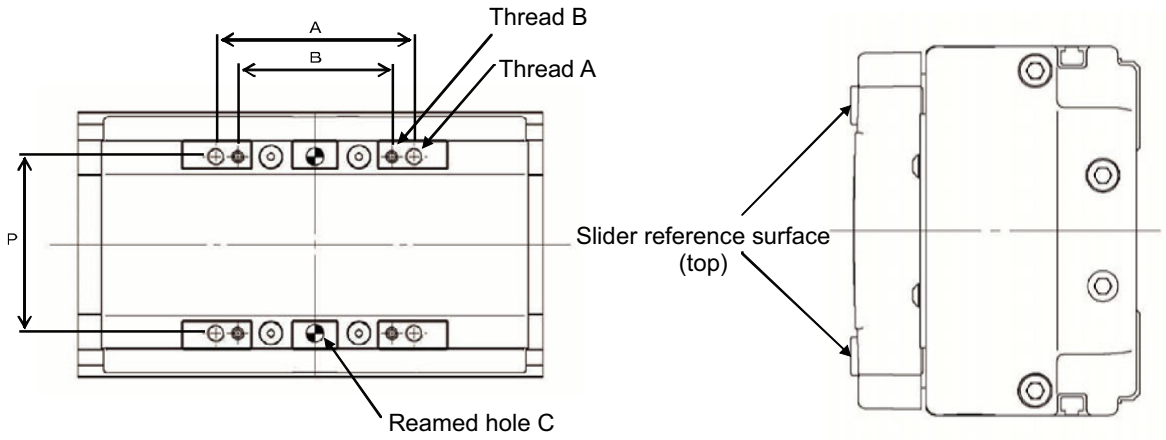
Shoulder dimension on base/slider reference surface (side)

Size	Reference surface	A
S	Slider reference surface (side)	1.5 to 3.5
	Base reference surface (side)	3 to 5
M	Slider reference surface (side)	1.5 to 3.5
	Base reference surface (side)	3 to 7.5
L	Slider reference surface (side)	1.5 to 3.5
	Base reference surface (side)	3 to 8

6.3 Installing the Load on the Slider

- The slider has two types of threaded holes, so affix the load using these holes. The affixing method shall conform to the method for installing the actuator.
- Similarly when the slider is affixed and actuator is moved, install the slider using these threaded holes on the slider.
- The slider has two reamed holes. If repeatability is required after removal/re-installation, use positioning pins. If squareness is required, use one positioning pin and make installation adjustment.
- After removal/re-installation, repeatability can also be ensured by pushing the reference surface on the side of the base.
- Use high-tension bolts conforming to ISO 10.9 or higher.
- When the threaded holes are used, determine the required thread length as specified below:
  - ISDB, ISPDB, ISDBCR, ISPDBCR
    Depth of threaded hole > Thread engagement length > Nominal thread size x 1.8
  - SSPDACR
    Depth of threaded hole > Thread engagement length > Nominal thread size

- ISDB, ISPDB, ISDBCR, ISPDBCR



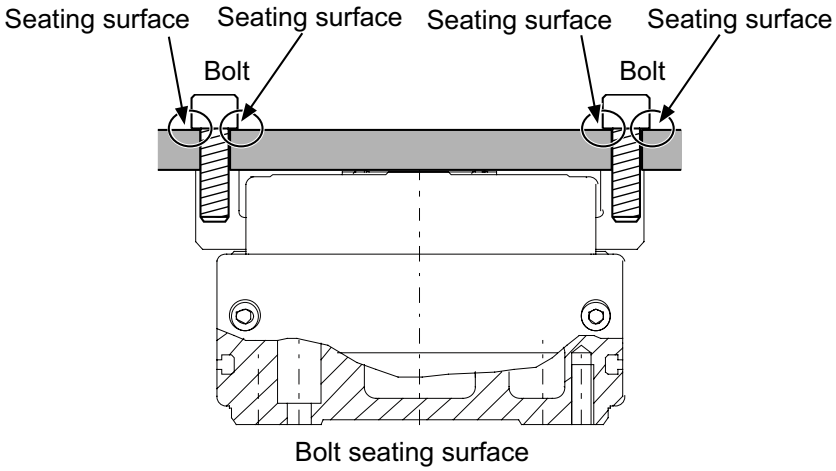
Work Installation Dimensions

Type	Hole dimension P [mm]	Thread A			Thread B			Reamed hole C	
		Thread size	Depth [mm]	Dimension A [mm]	Thread size	Depth [mm]	Dimension B [mm]	Hole diameter	Depth [mm]
ISDB-S, ISPDB-S/ ISDBCR-S, ISPDBCR-S	60	M6	19	70	-	-	-	∅6H7	10
ISDB-M, ISPDB-M/ ISDB-MX, ISPDB-MX, ISDBCR-M, ISPDBCR-M	80	M8	18	90	M6	18	70	∅8H7	10
ISDBCR-MX, ISPDBCR-MX	105								
ISDB-L, ISPDB-L/ ISDB-LX, ISPDB-LX, ISDBCR-L, ISPDBCR-L	105	M8	20	120	M8	20	90	∅8H7	10
ISDBCR-LX, ISPDBCR-LX	130								

Bolt size	Tightening torque	
	Bolt seating surface is steel	Bolt seating surface is aluminum
M6	12.3 N•m	5.4 N•m
M8	30.0 N•m	11.5 N•m

(Note) When positioning holes are used, use pins with an engagement tolerance of h7 or equivalent.

- SSPDACR



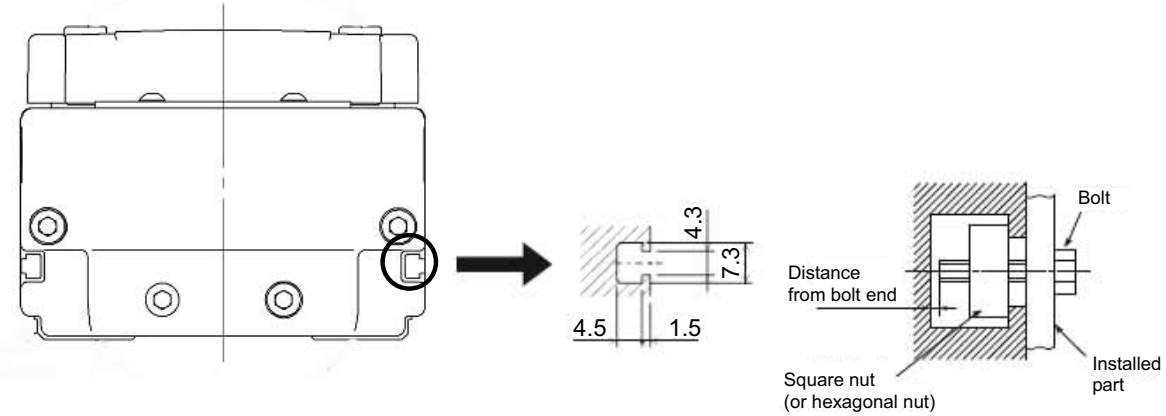
Type	Thread size	Depth of threaded hole
S	M6	9 mm
M	M8	12 mm
L	M8	16 mm

Applicable bolt	Tightening torque	
	Bolt seating surface is steel	Bolt seating surface is aluminum
M6	12.3 N•m	5.4 N•m
M8	30.0 N•m	11.5 N•m

(Note) When two positioning holes are used, use a h7 or equivalent pin for the reference hole and g6 pin for the other hole.

6.4 Using T-slots

M4 T-slots for installing the connector box, etc. are provided on the side face of the base, when configuring the orthogonal axes. (See the figure below.)
You can also use these T-slots freely for installing sensors, securing wires or for other purposes as necessary.



6.5 Suctioning for Clean Room Application

Actuators designed for clean room application can demonstrate performance corresponding to cleanliness class 10 (0.1 μm or more per 1 ft^3) by suctioning air from the suction joint. The suction flow rate at the rated speed of each model is shown in the table below.

Reference Suction Flow Rates

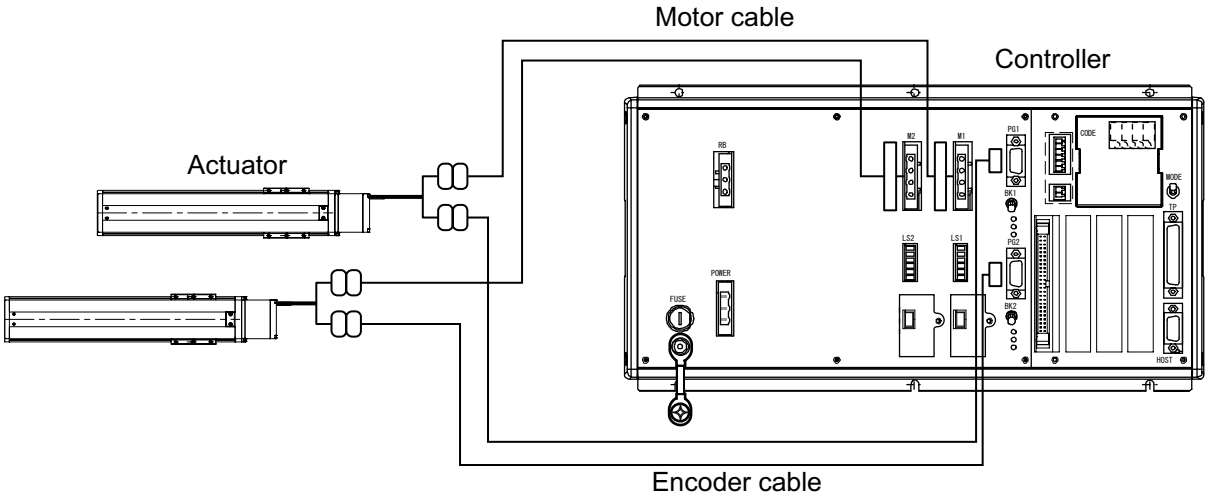
Type	Thread lead	Suction flow rate [NL/min]
ISDBCR-S ISPDBCR-S	4	15
	8	30
	16	60
ISDBCR-M/MX ISPDBCR-M/MX	5	20
	10	50
	20	120
	30	180
ISDBCR-L/LX ISPDBCR-L/LX	10	50
	20	120
	40	180
SSPDACR-S	10	50
	20	100
	30	150
SSPDACR-M	10	60
	20	110
	40	160
SSPDACR-L	25	120
	50	180

- Suction air from the quick joint of ∅12 in outer diameter provided on the side face of the actuator. Connect an air tube to this joint and suction air using a vacuum pump, ejector, etc. Suction equipment must be provided by the customer.

7. Connecting the Controller

7.1 Wiring

The actuator and controller are connected via the motor cable and encoder cable (genuine parts) using connectors.

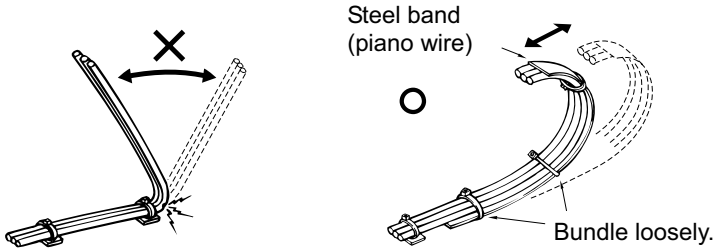


Example of connection with XSEL Controller

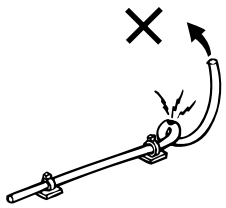
[For details on extension cables, refer to 11, “Motor/Encoder Cables.”]

When designing an application system, incorrect wiring or connection of each cable may cause unexpected problems such as a disconnected cable or poor contact. The following explains examples of prohibited handling of cables.

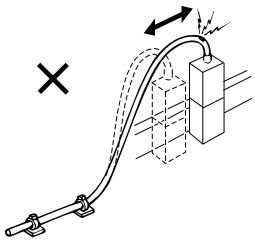
- Do not cut and reconnect the cable for extension or shorten the cable.
- Use a robot cable for any section where the cable will flex. [For the bending radius, refer to 11, “Motor/Encoder Cable.”]
- Provide a sufficient bending radius and prevent the cable from bending at the same point.



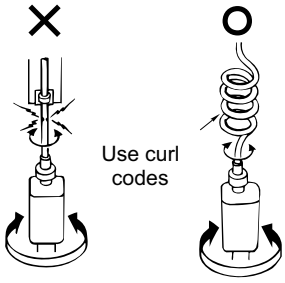
- Do not let the cable bend, kink or twist.



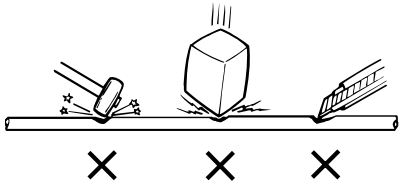
- Do not pull the cable with a strong force



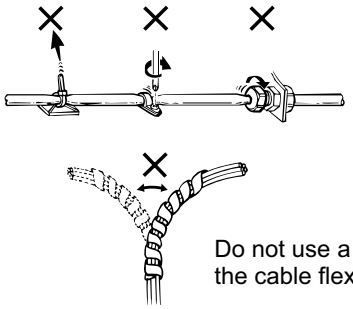
- Do not let the cable receive a turning force at a single point.



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

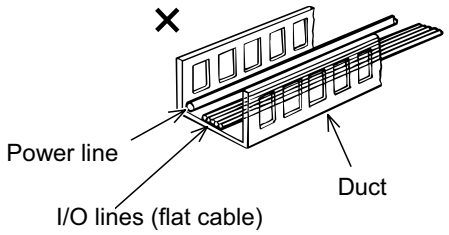


- When fixing the cable, provide a moderate slack and do not tension it too tight.



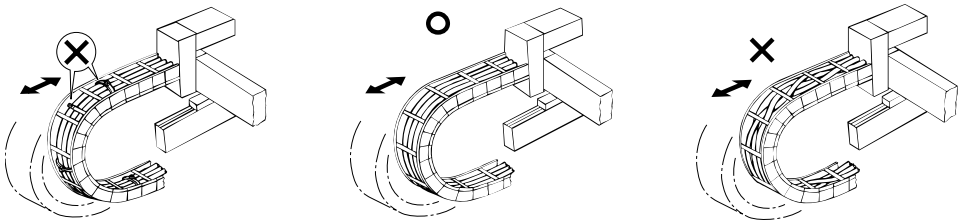
Do not use a spiral tube where the cable flexes frequently.

- Separate the I/O and communication lines from the power and drive lines. Do not wire them together in the same 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.



⚠ Warning:

- Always turn off the controller power before connecting/disconnecting cables. If cables are connected/disconnected while the power is still supplied, the actuator may malfunction and serious injury or equipment damage may occur.
- Loose connectors may cause the actuator to malfunction and create a dangerous situation. Be sure to confirm that all connectors are securely connected.

8. Operating Conditions

8.1 Duty Ratio during Continuous Operation

Operate at duty ratios equal to or greater than the allowable value.
"Duty ratio" refers to a utilization ratio indicating the percentage of the time during which the actuator is operating in one cycle.

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

[How to Calculate Duty]

Calculate the load factor and acceleration/deceleration time ratio and find an applicable duty ratio on a graph of calculated values.
If the load factor is less than 50%, the actuator can be operated at a duty ratio of 100% (continuous operation).

[1] Load factor LF

The maximum payload capacity at rated acceleration, and rated acceleration/deceleration, are specified in 2, "Specifications."

[When commanded acceleration speed is lower than the rated acceleration speed]	
Load factor	: LF = M × α / Mr × αr [%]
Maximum payload capacity at rated acceleration	: Mr [kg]
Rated acceleration/deceleration	: αr [G]
Transfer weight during operation	: M [kg]
Acceleration/deceleration during operation	: α [G]

[When commanded acceleration speed is higher than the rated acceleration speed]	
Load factor	: LF = M × α / M_d × α = M / M_d [%]
Transportable weight in commanded acceleration	: M_d [kg]
Transfer weight during operation	: M [kg]
Acceleration/deceleration during operation	: α [G]

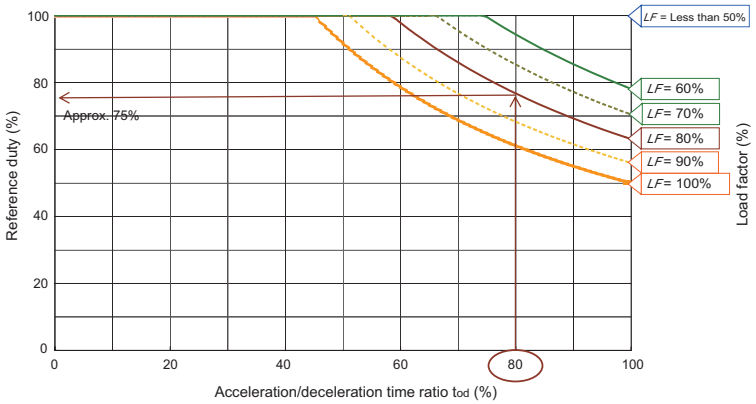
[2] Calculate the acceleration/deceleration time ratio t_{od} using the calculation formula below:

Acceleration/deceleration time ratio t_{od} =
Acceleration time during operation + Deceleration time during operation / Operating time (%)

Acceleration time = Operating speed [mm/s] / Acceleration during operation [mm/s^2] (sec.)
Acceleration (mm/s^2) = Acceleration (G) x 9,800 mm/s^2

Deceleration time = Operating speed [mm/s] / Deceleration during operation [mm/s^2] (sec.)
Deceleration (mm/s^2) = Deceleration (G) x 9,800 mm/s^2

[3] Find the applicable duty ratio on the graph based on each load factor LF for which the duty ratio has been calculated, and the acceleration/deceleration time ratio t_{od}.
Example) If the load factor LF is 80% and acceleration/deceleration time ratio t_{od} is 80%, a reference duty is approx. 75%.



9. Setting the Home Position

9.1 Home Return

Home return involves the operation explained below:
[1] When a home return command is issued, the actuator moves (in the direction set by the applicable parameter).
[2] The software detects the mechanical end in the return operation. If option L (home limit switch) is installed, the mechanical end is detected by a sensor.
[3] The slider reverses its direction when the mechanical end or home limit switch is detected, after which the Z-phase signal is detected and the position where this signal has been detected becomes the reference point.
[4] The slider travels further by the offset amount set by the applicable parameter, and this position becomes home.

9.2 Factory-set Home Position

How much the motor would turn after the mechanical end or home limit switch is detected until the Z-phase signal is generated has been adjusted prior to shipment.
The standard distance travelled by each slider after it reverses its direction upon detection of the mechanical end or home limit switch, until stopping at the home position, is shown in the table below.

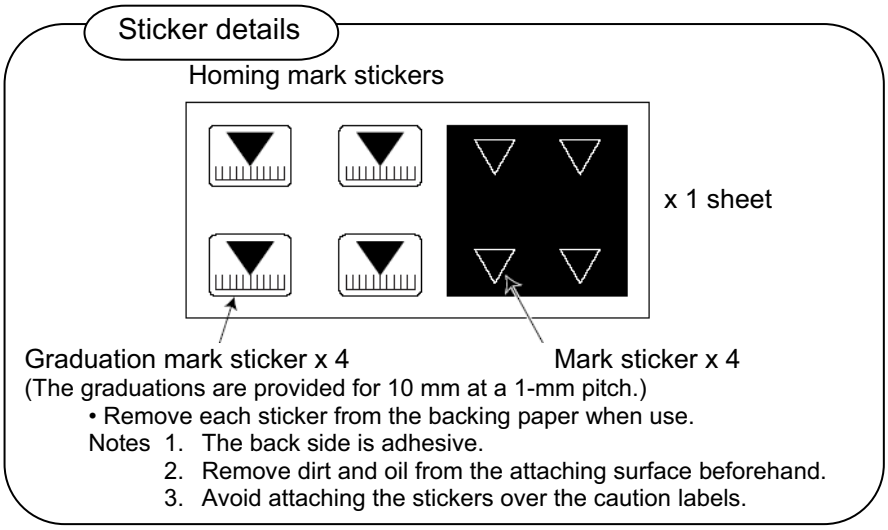
Model name	Home position from mechanical stopper or home sensor (approx. in mm)
ISDB, ISPDB, ISDBCR, ISPDBCR-S/M/MX/L/LX	5 mm
SSPDACR-S SSPDACR-M	5 mm
SSPDACR-L	10 mm

9.3 Changing the Home Direction

If the home direction is changed after the actuator has been delivered, the moving direction parameter must be changed, and the encoder's Z-phase may also need to be adjusted on some models. Contact IAI.

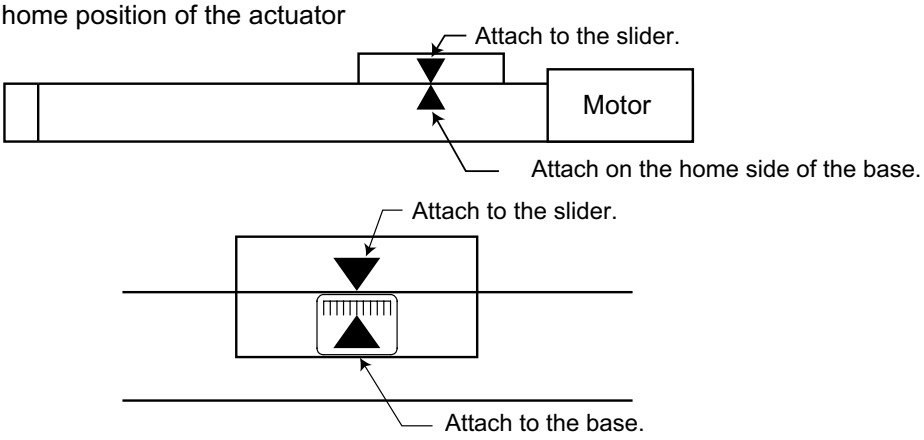
9.4 How to Use the Homing Mark Stickers

The following stickers are supplied with the actuator. Use these stickers, as necessary, to mark the home position of the actuator, etc.



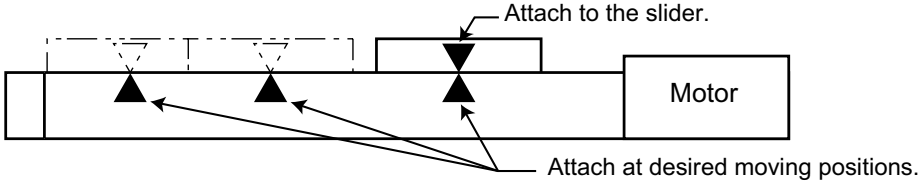
Examples of use

[1] For marking the home position of the actuator



Attach two stickers when the actuator is stopped at its home.

[2] As positioning marks



These marks can be used to check for position deviation, etc.

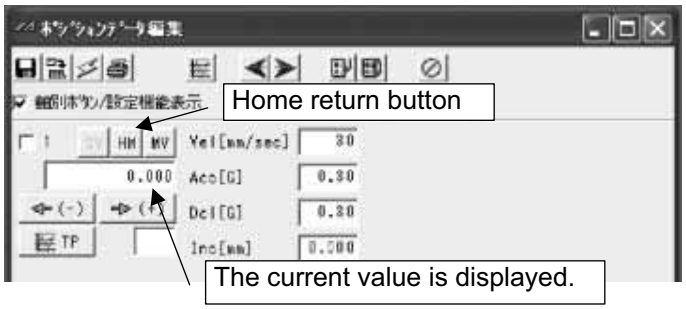
9.5 Fine-tuning the Home Position

Correct the position deviation by changing the parameter for home preset in the case of a X-SEL or SSEL controller, or by changing the parameter for home return offset in the case of a SCON parameter. How to set these parameters is explained below.

9.5.1 X-SEL and SSEL Controllers

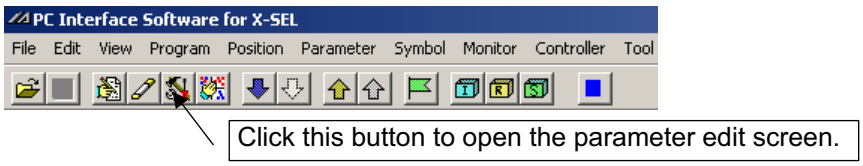
(1) Open the position edit screen.
On the PC software screen, click , select a desired position number, and then click **OK** to display the following screen.

Click the home return button HM to perform home return.

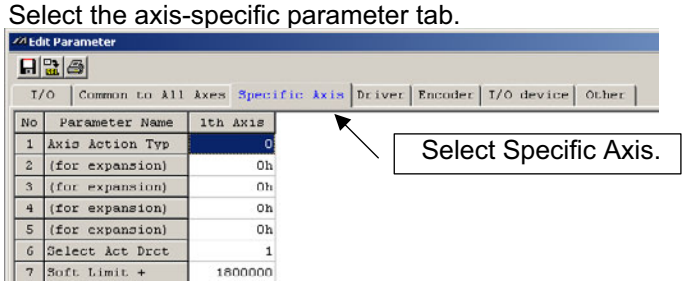


(2) Turn off the servo and move the slider to the home position by hand.
If the slider cannot be moved by hand, move the slider in the jog or inching mode.
Check the current value being displayed, and record the position deviation.

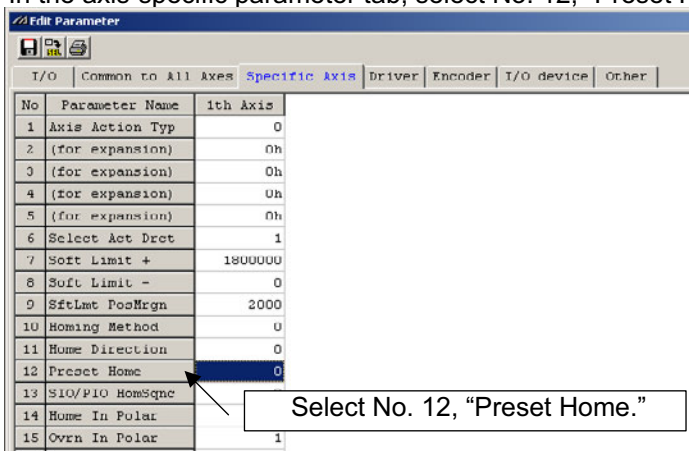
(3) Open the parameter screen.



(4) Select the axis-specific parameter tab.

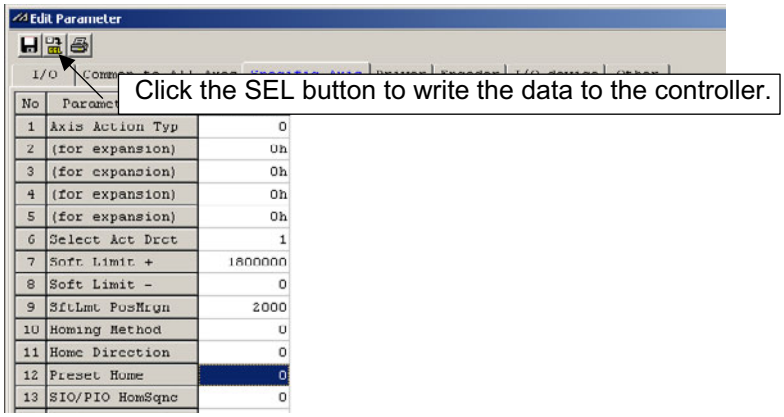


(5) In the axis-specific parameter tab, select No. 12, “Preset Home.”

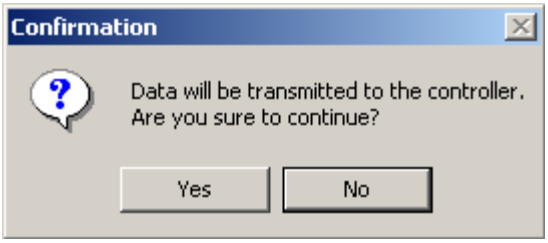


(6) Change the setting of axis-specific parameter No. 12 (Preset Home).
Add or subtract the value measured in (2) to/from the value currently input.
The setting unit is 0.001 mm.
Example: When subtracting 1 mm
Current preset value = Current setting – 1000

(7) Write the new data.

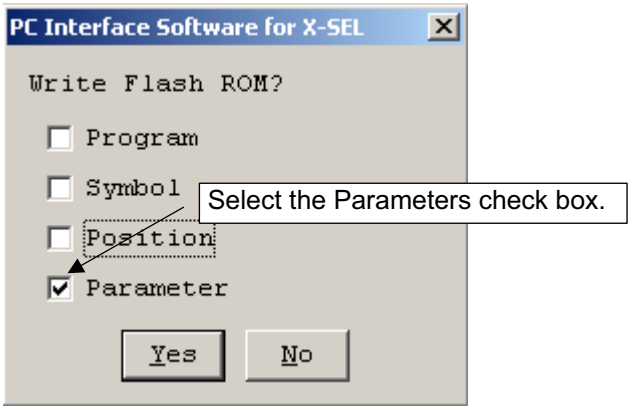


(8) Transfer the data to the controller.

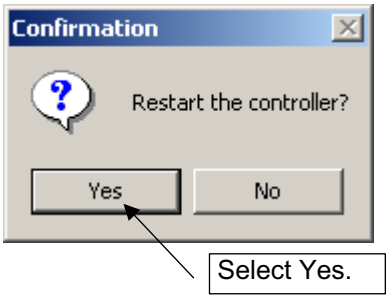


(9) Click **OK**.

(10) Write the data to the flash ROM.

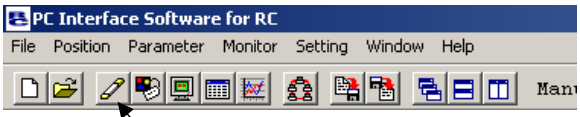


(11) Restart the controller.

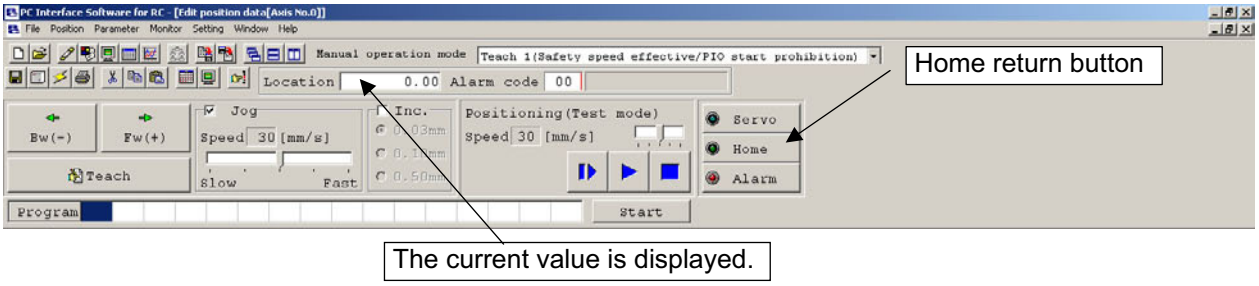


9.5.2 ECON and SCON Controllers

(1) Open the position edit screen.
On the PC software screen, click  , select a desired position number, and then click **OK** to display the following screen.

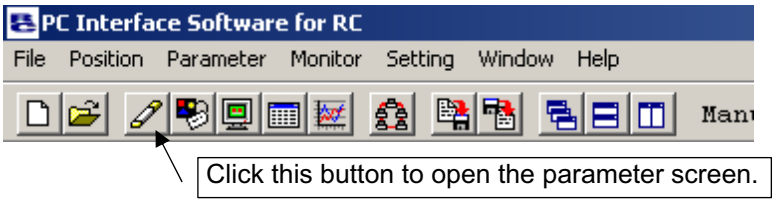


Click the home return button  to perform home return.

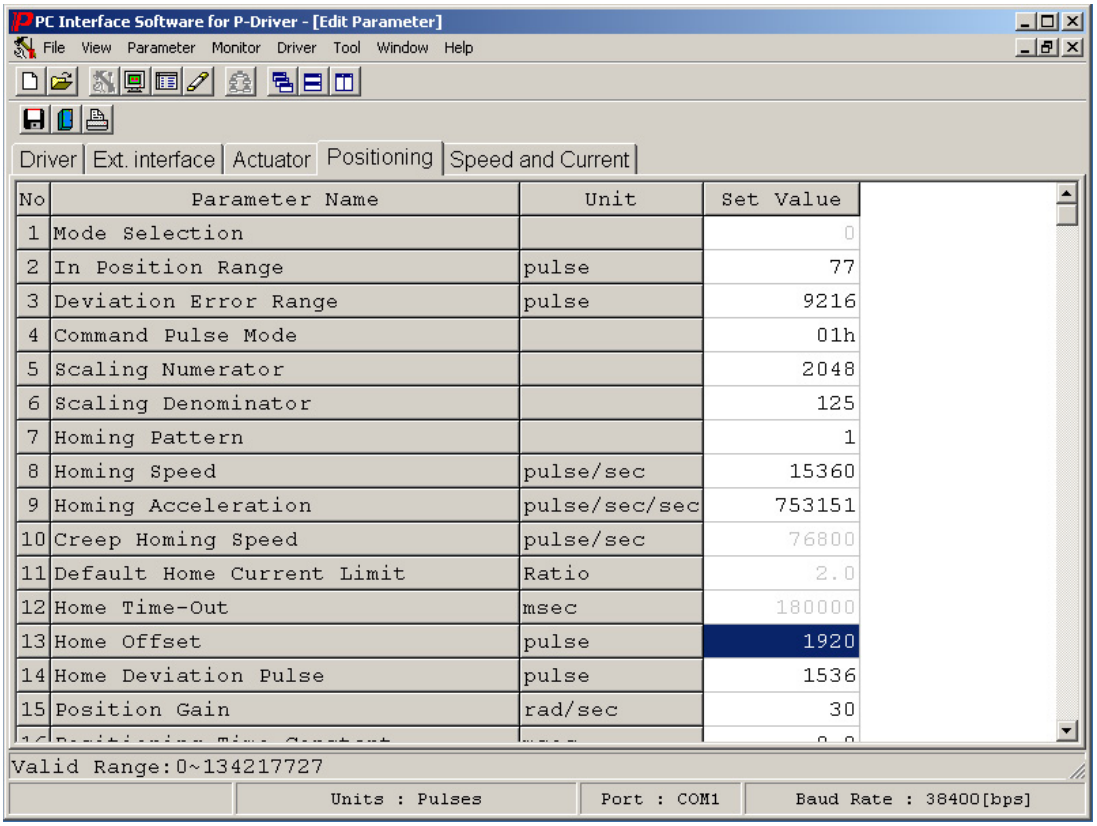


(2) Turn off the servo and move the slider to the home position by hand.
If the slider cannot be moved by hand, move the slider in the jog or inching mode.
Check the current value being displayed, and record the position deviation.

(3) Open the parameter screen.



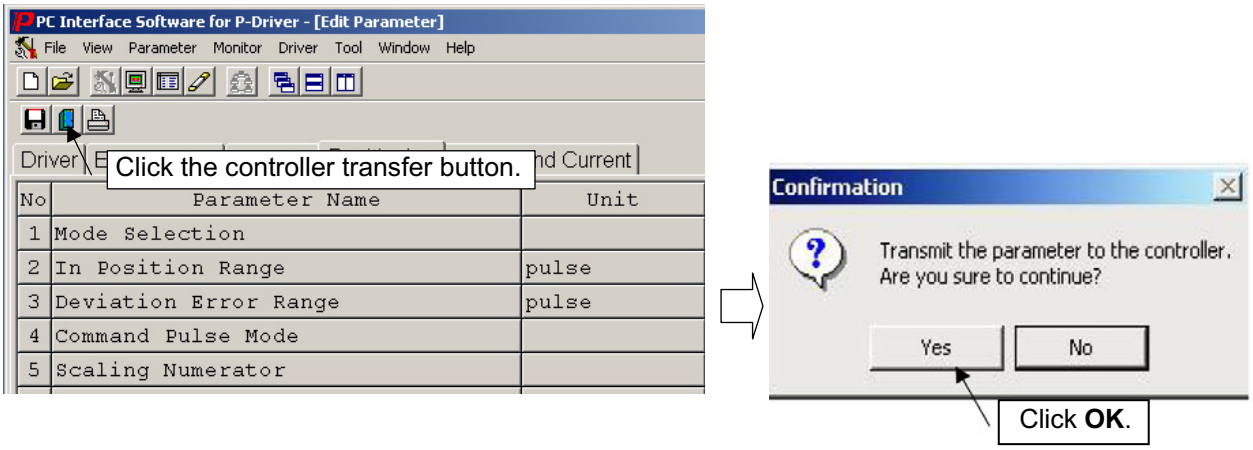
(4) The user parameter screen appears.



No	Parameter Name	Unit	Set Value
1	Mode Selection		0
2	In Position Range	pulse	77
3	Deviation Error Range	pulse	9216
4	Command Pulse Mode		01h
5	Scaling Numerator		2048
6	Scaling Denominator		125
7	Homing Pattern		1
8	Homing Speed	pulse/sec	15360
9	Homing Acceleration	pulse/sec/sec	753151
10	Creep Homing Speed	pulse/sec	76800
11	Default Home Current Limit	Ratio	2.0
12	Home Time-Out	msec	180000
13	Home Offset	pulse	1920
14	Home Deviation Pulse	pulse	1536
15	Position Gain	rad/sec	30

(5) Change user parameter No. 22 (home offset).
* The setting unit is mm.
Add or subtract the value measured in (2) to/from the value currently input.
Example: When subtracting 0.5 mm
Home offset = Current setting – 0.5 mm

(6) Write the new data.
Click the controller transfer button, and then click **OK**.
* After the data has been written, turn off the controller power.



9.6 Absolute Reset Method (Absolute Specification)

If the battery has been replaced or encoder cable unplugged following an absolute encoder battery voltage error, etc., absolute reset must be performed.
For the method to perform absolute reset, check 1.2, “Related Operation Manuals for Each Controller Supported by This Product” in the operation manual of your controller.

10. Options

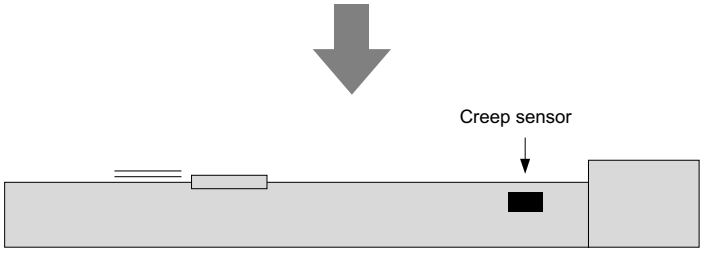
10.1 Brake

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. If any axis is used vertically, an optional brake is required.

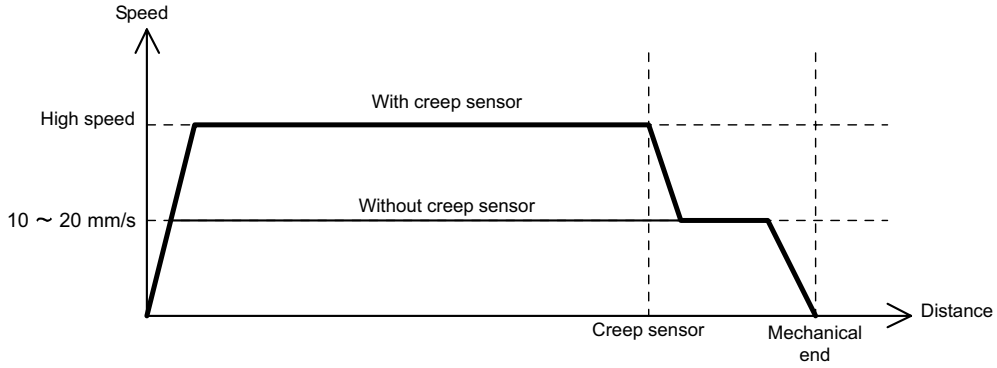
10.2 Creep Sensor

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. To support this “stopper method,” the home return speed is kept to a range of 10 to 20 mm/s. This means that sliders of long strokes require a longer time to complete the home return. The creep sensor is a proximity sensor that allows the slider to move at high speed until halfway and then reduce its speed to the normal home return speed before the home, in order to shorten the time required for home return. The standard installation position of this sensor is on the right side of the actuator as viewed from the motor, represented by the option model number “C.” A cover similar to the one used for limit switches is provided on the outside of the sensor. If both the creep sensor and limit switches are installed, the same cover is used for each. If you want to have the creep sensor on the left side, specify the option model number “CL.” Check the figure of cover installation in 10.3, “Limit Switch.”

Home return of an axis with a long stroke requires a longer time for the axis to move to the mechanical end.

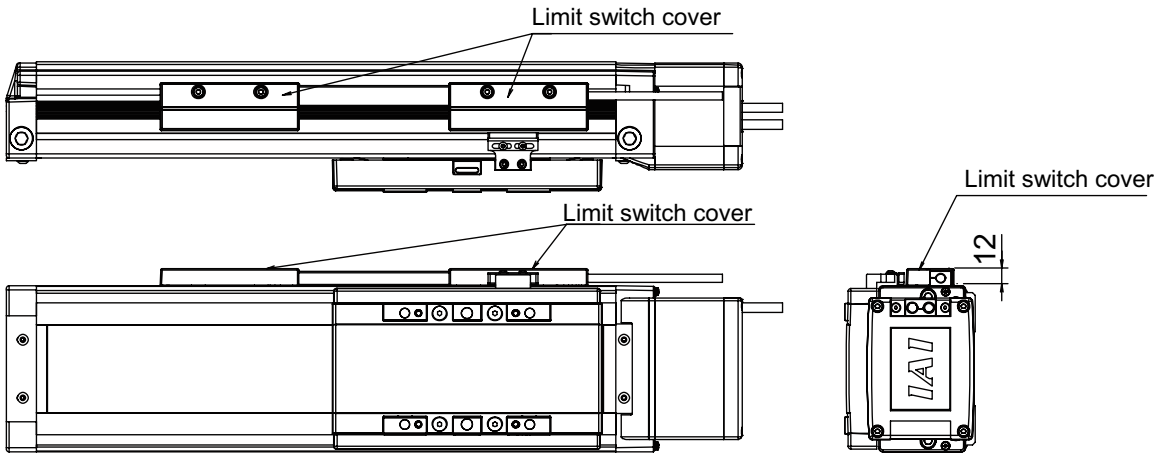


A sensor is provided before the mechanical end and once this sensor actuates, the speed is reduced to perform normal home return operation.



10.3 Limit Switch

Normal home return operation uses the “stopper method” wherein the slider contacts the stopper and reverses, after which the Z-phase is detected and defined as the home. The home limit switch (L) is an option which is designed to perform this reversing operation using a proximity sensor, not a stopper. Use the home limit switch if you want to increase the reliability of home return by, for example, preventing a false detection of mechanical end due to contact with other device, etc.
If this option is selected, three proximity sensors are installed, including the home detection sensor (HOME), overtravel sensor on front side (+OT) and overtravel sensor on motor side (-OT). (HOME and -OT are integrated as twin sensors.) Take note that moving the home sensor significantly may shorten the stroke.
The standard installation position of the home limit switch and cover is on the right side of the actuator as viewed from the motor, represented by the option model number “L.” If you want to have the limit switch on the right side, specify the option model number “LL.”

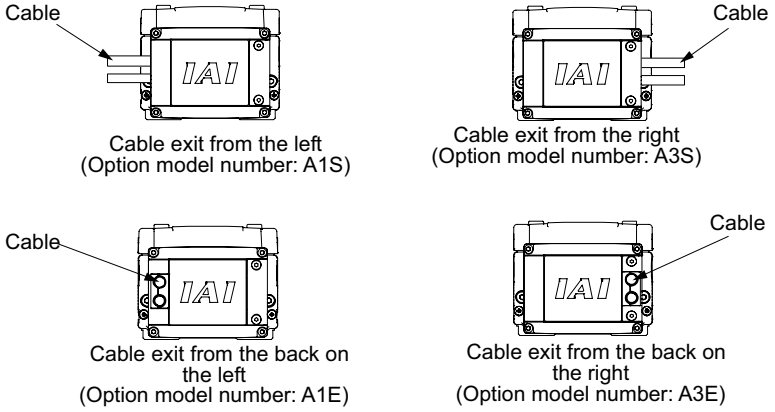


10.4 Reversed-home Specification

In the reversed-home specification, the home is located on the front side. This is indicated by “NM” in the model number. If you wish to change the home direction after the delivery, consult IAI because the moving direction parameter must be adjusted, as well as the encoder’s Z-phase on certain models.

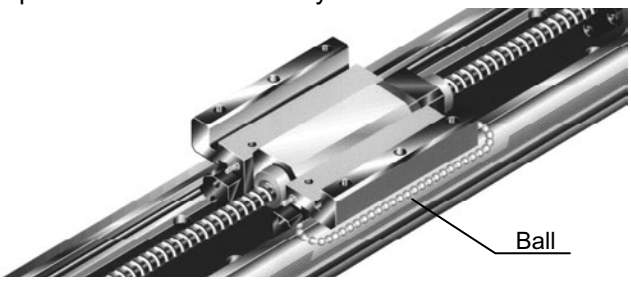
10.5 Cable Exit Direction

The cable should exit in one of the following four

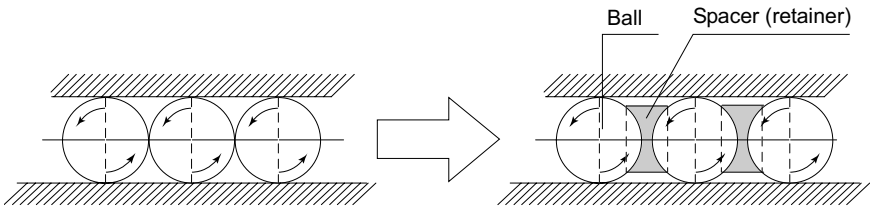


10.6 Guide with Ball Retention Mechanism

A spacer (retainer) is inserted between adjacent balls (steel balls) in the guide to reduce noise and achieve smooth operation. This specification is indicated by “RT” in the model number.



There is no longer metal noise generated by colliding balls and thus noise is reduced. Since balls are aligned by retainers, annoying noise decreases. Wear caused by friction between balls decreases, oil no longer runs out due to contact, and lubricating oil collects at the retainers. Accordingly, operation becomes smooth.

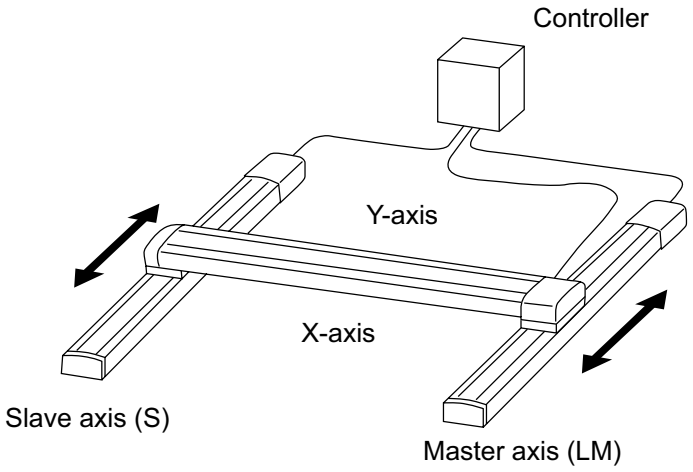


10.7 Suction Joint on Opposite Side

This option is available for the clean room actuators including ISDBCR, ISPDBCR and SSPDACR.
On these clean room actuators, the standard installation position of the suction joint is on the left side of the actuator as viewed from the motor. If you want to have this joint on the right side, specify the option model number “VR.”

10.8 Master Axis/Slave Axis Specification for Synchronized Operation

If the “synchronized operation function” is used, where two actuator axes are operated with the XSEL controller or SSEL controller, one axis is designated as the master axis, while the other axis is designated as the slave axis.
The actuators serving as the master axis and slave axis must be of the same specification.
The master axis comes with the home limit switch, represented by the option model number “LM.”
The standard installation position of the home limit switch and cover is on the right side of the actuator as viewed from the motor. If you want to have the limit switch on the right side, specify the option model number “LLM.”



10.9 High-Precision Straightness Specification

The high-precision straightness specification type is a precision actuator with high-level settings of parallelism and straightness, which is the base and slider travel accuracies. The models are expressed with ST.

・ Aluminum-based ISDB/ISDBCR/ISPDB/ISPDBCR

	Parallelism	Straightness
With no High-precision straightness specification	0.05 mm/m max. (However, the stroke less 500mm is 0.025mm uniformed.)	0.05 mm/m max. (However, the stroke less 500mm is 0.025mm uniformed.)
With High-precision straightness specification	0.03 mm/m max. (However, the stroke less 500mm is 0.015mm uniformed.)	0.02 mm/m max. (However, the stroke less 500mm is 0.015mm uniformed.)

・ Iron-based SSPDACR

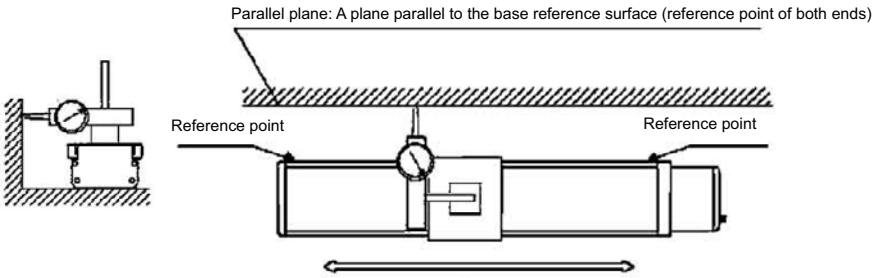
	Parallelism	Straightness
With no High-precision straightness specification	0.05 mm/m max. (However, the stroke less 500mm is 0.025mm uniformed.)	0.05 mm/m max. (However, the stroke less 500mm is 0.025mm uniformed.)
With High-precision straightness specification	0.03 mm/m max. (However, the stroke less 500mm is 0.015mm uniformed.)	0.015 mm/m max. (However, the stroke less 500mm is 0.008mm uniformed.)

- The values for the high-precision straightness specification are based on measurement at a temperature of 20 ± 3°C using a precision stone surface plate of grade 00 and 6.5 μm in flatness.
- The values for the standard specification and high-precision specification are based on measurement at a temperature of 20 ± 3°C using a surface plate of 0.05 mm or less in flatness.
- The parallelism and the straightness of the chart are the standard value of 1m.
  Standard value (mm/m) × stroke (m) will be straightness or flatness of the all stroke.

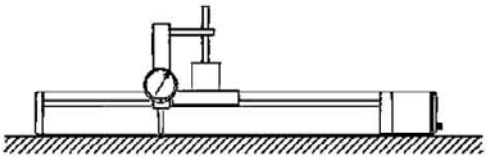
(Reference)

[Measurement Method]

[1] Parallelism (horizontal) between the base reference surface and the slider (reference surface)
Affix the base on the surface plate and, with the indicator on the slider contacting a surface running parallel with the two points at both edges of the base reference surface, move the slider over its entire stroke to perform measurement.

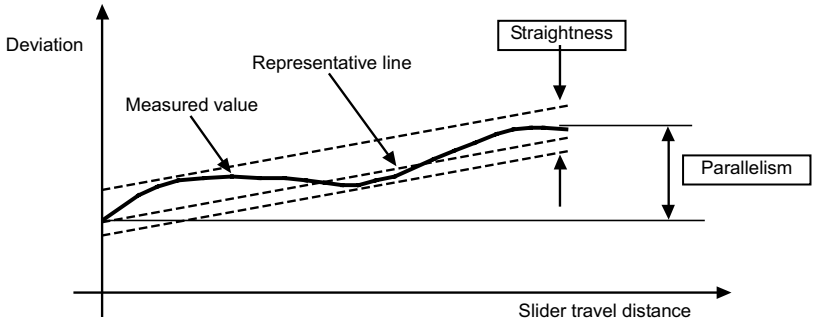


[2] Parallelism (vertical) between the base mounting surface and the slider (work part mounting surface)
With the base affixed on the surface plate and indicator on the slider also contacting the surface plate, move the slider over its entire stroke to perform measurement.



[Parallelism and Straightness]

Parallelism is represented by the maximum value on a graph of indicator changes measured by moving the slider over its entire stroke.
Straightness, or degree of being straight, is represented by the maximum value among all measured results of parallelism expressed by intervals between two straight lines.



11. Motor/Encoder Cables

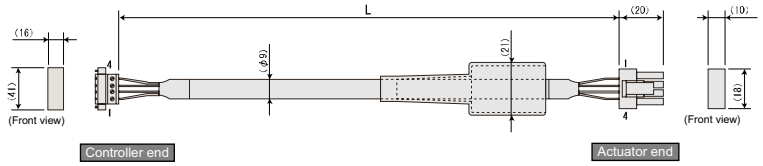
11.1 Standard

The same cables are used regardless of the actuator model. The applicable cables vary depending on the combined controller.

Correspondence table of controllers and motor/encoder cables

Controller	XSEL-J/K		XSEL-P/Q		SSEL		SCON	
LS	Without LS	With LS	Without LS	With LS	Without LS	With LS	Without LS	With LS
Applicable cables	[1], [2]	[1], [2], [3]	[1], [4]	[1], [5]	[1], [4]	[1], [5]	[1], [4]	[1], [5]

[1] Motor cable CB-X-MA***

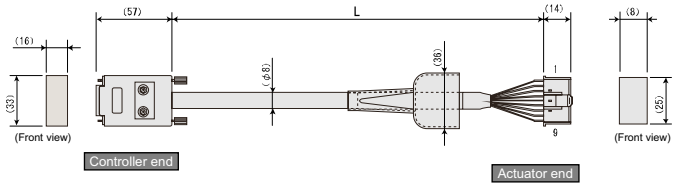


* *** indicates the cable length (L). Up to 30 m can be specified.
Example) 080 = 8 m
[Minimum bending radius]
Movable: 51 mm
Fixed: 34 mm

Wiring	Color	Signal	No.
0.75sq	Green	PE	1
	Red	U	2
	White	V	3
	Black	W	4

No.	Signal	Color	Wiring
1	PE	Green	0.75sq
2	U	Red	
3	V	White	
4	W	Black	

[2] Encoder cable CB-X-PA***



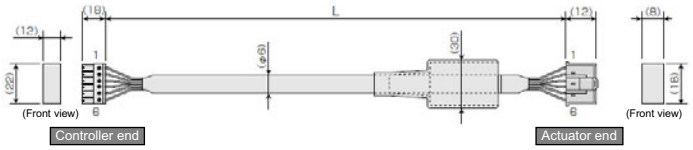
* *** indicates the cable length (L). Up to 30 m can be specified.
Example) 080 = 8 m
[Minimum bending radius]
Movable: 44 mm
Fixed: 29 mm

Wiring	Color	Signal	No.
0.15 sq (crimped)	—	—	1
	—	—	2
	—	—	3
	—	—	4
	—	—	5
	—	—	6
	Blue	SD	7
	Orange	SD	8
	Black	BAT+	9
	Yellow	BAT-	10
	Green	VCC	11
	Brown	GND	12
	Gray	BK-	13
	Red	BK+	14
	—	—	15
The shield is clamped to the hood.			

No.	Signal	Color	Wiring
1	BAT+	Black	0.15 sq (crimped)
2	BAT-	Yellow	
3	SD	Blue	
4	SD	Orange	
5	VCC	Green	
6	GND	Brown	
7	FG	Ground	
8	BK-	Gray	
9	BK+	Red	

Ground wire and braided shield wires

[3] Limit switch cable CB-X-LC***



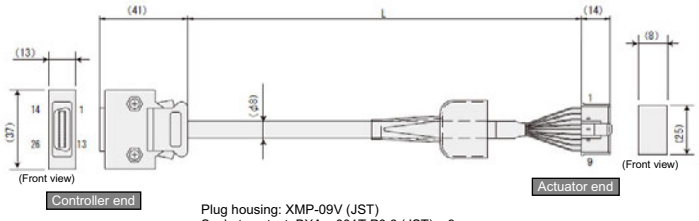
* *** indicates the cable length (L). Up to 30 m can be specified.
Example) 080 = 8 m
[Minimum bending radius]
Movable: 33 mm
Fixed: 22 mm

Wiring	Color	Signal	No.
AWG24	Skyblue	24VOUT	6
	Pink	N	5
	Light green	LS	4
	Orange	CLEEP	3
	Gray	OT	2
	1B/skyblue	RSV	1

No.	Signal	Color	Wiring
1	24VOUT	Skyblue	AWG24
2	N	Pink	
3	LS	Light green	
4	CLEEP	Orange	
5	OT	Gray	
6	RSV	1B/skyblue	

Note) 1B indicates one black dot mark.

[4] Encoder cable CB-X1-PA***



Plug housing: XMP-09V (JST)
Socket contact: BXA—001T-P0.6 (JST) x 9
Retainer: XMS-09V (JST)
Note 6: Use the crimper recommended by the connector manufacturer.

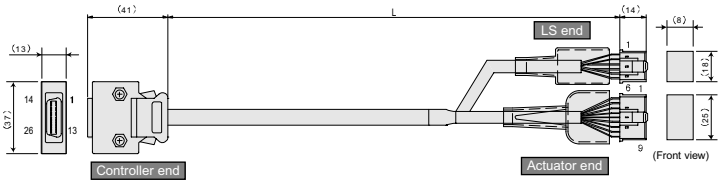
* *** indicates the cable length (L). Up to 30 m can be specified.
Example) 080 = 8 m
[Minimum bending radius]
Movable: 44 mm
Fixed: 29 mm

Wiring	Color	Signal	No.
AWG26 (soldered)	—	—	10
	—	—	11
	—	E24V	12
	—	0V	26
	—	LS	25
	—	CLEEP	24
	—	OT	23
	—	RSV	9
	—	—	18
	—	—	19
	—	A+	1
	—	A−	2
	—	B+	3
	—	B−	4
	—	Z+	5
	—	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

No.	Signal	Color	Wiring
1	BAT+	Black	AWG26 (crimped)
2	BAT-	Yellow	
3	SD	Blue	
4	SD	Orange	
5	VCC	Green	
6	GND	Brown	
7	FG	Ground	
8	BK-	Gray	
9	BK+	Red	

The shield is clamped to the hood.
Ground wire and braided shield wires

[5] Encoder cable with LS CB-X1-PLA***



* *** indicates the cable length (L). Up to 30 m can be specified.
Example) 080 = 8 m
[Minimum bending radius]
Movable: 54 mm
Fixed: 36 mm

Wiring	Color	Signal	No.
AWG26 (soldered)	—	—	10
	—	—	11
	White/blue	E24V	12
	White/yellow	0V	13
	White/red	LS	26
	White/black	CLEEP	25
	White/purple	OT	24
	White/gray	RSV	23
	—	—	9
	—	—	18
	—	—	19
	—	A+	1
	—	A−	2
	—	B+	3
	—	B−	4
	—	Z+	5
	—	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

No.	Signal	Color	Wiring
1	E24V	White/blue	AWG26 (crimped)
2	0V	White/yellow	
3	LS	White/red	
4	CLEEP	White/black	
5	OT	White/purple	
6	RSV	White/gray	

No.	Signal	Color	Wiring
1	BAT+	Purple	AWG26 (crimped)
2	BAT−	Gray	
3	SD	Orange	
4	SD	Green	
5	VCC	Red	
6	GND	Black	
7	FG	Ground	
8	BK−	Blue	
9	BK+	Yellow	

The shield is clamped to the hood.
Ground wire and braided shield wires
(As for wire color, "White/blue" indicates that the band is white and insulator is blue.)

12. Maintenance/Inspection

12.1 Inspection Items and Intervals

Perform maintenance/inspection according to the following timetable.
The operating time is assumed to be 8 hours a day. If the actuator is used continuously for 24 hours or the utilization rate is otherwise high, shorten the inspection intervals accordingly.

	Visual inspection of machine exterior	Interior check	Lubrication
At start of operation	○		
After 1 month of operation	○		
After 6 months of operation	○	○	○ (Note 1)
After 1 year of operation	○	○	○
Every 6 months thereafter	○		
Every year thereafter	○	○	○

(Note 1) If the interior check found deteriorated grease, add grease.

⚠ Caution: When the actuator is moved back and forth continuously over a distance of 30 mm or less, grease film may disappear. As a guide, move the actuator back and forth over a distance of 50 mm or more for five cycles or so after every 5,000 to 10,000 back-and-forth operations over a short distance. This will restore the oil film.

12.2 Visual Inspection of the Machine Exterior

Check the following items visually.

Main body and work part	Loose mounting bolts, etc.
Cables	Damage to cables, connection of connectors
Stainless sheet	Damage to the sheet, slacking
General	Noise, vibration

- Check the stainless sheet for slacking every month and if any slack is found, adjust the stainless sheet until it is not longer slacked.
- As a rough guide, the life of the stainless sheet corresponds to a travelled distance of 5,000 km.
- However, replace the stainless sheet before its life is reached, if deemed necessary depending on the condition of use.
- As a rule, the customer must bring the actuator to IAI, or IAI's service personnel must visit the customer's site, to replace the stainless sheet.
- If the actuator is affixed vertically, grease applied to the guide may drip depending on the environment. In this case, clean the dripped grease and add grease as necessary.

⚠ Caution: If the actuator stroke is 400 mm or more, check the stainless sheet for slacking and position deviation every month. If any slack or other problem is found, adjust the stainless sheet. [For the adjustment procedure of the stainless sheet, refer to 13, “Replacement/Adjustment Procedure for Stainless Sheet.”]

12.3 External Cleaning

- Clean the exterior surfaces from time to time.
- Wipe off dirt with a soft cloth.
- Depending on the situation, base oil of grease may ooze out to the actuator surface. If oil has oozed out, wipe it off using a soft cloth, etc.
- To prevent dust from entering the actuator through gaps and openings, do not clean the actuator by blowing highly compressed air onto it.
- Do not use petroleum-based solvents as they damage plastic parts and painted surfaces.
- If the unit gets badly soiled, moisten a soft cloth with a neutral detergent or alcohol and wipe the soiled area gently.

12.4 Interior Check

Turn off the power, remove the stainless sheet and visually inspect the interior.

For the interior inspection, check the following items.

Actuator	Loosening of actuator mounting bolts, intrusion of dust and other foreign matters
Guide	Lubrication condition, soiling, wear, flaking
Ball screw	Lubrication condition, soiling
Joint	Lubrication condition, soiling

Visually check the condition of the interior. Specifically, see if there is any dust or foreign object inside the actuator and also check the condition of lubrication.
Even if the grease has turned brown, lubrication is fine as long as the traveling surface appears shiny.
If the grease becomes dirty and dull due to dust, or if the grease has worn away due to an extended operating time, lubricate the parts after cleaning them.

[Interior Check Procedure]
[1] Move the slider to the motor side.
[2] Remove the screws retaining the sheet using an Allen wrench of 3.0 mm across flats.
[3] Turn over the sheet and check the interior, and perform cleaning if necessary.
[4] When the check is complete, assemble the components by following the same steps in reverse.

[Cleaning the interior]
- Wipe off dirt with a soft cloth.
- If constituents of grease have separated and base oil has accumulated on both ends of the guide rail, wipe off the oil using a soft cloth, etc. If the accumulated oil is not wiped off, it may seep out to the exterior of the actuator.
- To prevent dust from entering the actuator through gaps and openings, do not clean the actuator by blowing highly compressed air onto it.
- Do not use petroleum-based solvents, neutral detergents or alcohol.

⚠ Caution: If grease contains a large amount of foreign matter, be sure to wipe off the dirty grease before adding new grease.

⚠ Warning:
- Do not disassemble the front cover because the ball screw is supported by the front cover. If a proper adjustment of the front cover is lost, the shaft center may become offset and the traveling resistance may increase or life of each part may become shorter, or abnormal noises may generate.
- An encoder is built into the encoder cover. The encoder not only detects the rotation angle and home signal, but it also performs a critical function in the AC control and the encoder and motor phases have been adjusted precisely. Never touch the encoder.

⚠ Caution: Do not forcibly bend or damage the stainless sheet when checking the interior.
Any changes to the installation condition cause the sheet to be placed disproportionately on one side and affect the life of the product. In such a case, please contact the IAI Sales Engineering Section.
In addition, be sure to wear gloves, etc. when working because the edges of the stainless sheet may cause an injury.

12.5 Adding Grease

(1) Applicable Grease

Our guides use urea grease that offers excellent low-dust-raising property, stable torque characteristics, excellent lubrication performance, and rust-preventive effect similar to lithium grease. The following grease has been applied to the guides of your actuator prior to shipment from IAI.

Parts	ISDB, ISPDB	ISDBCR, ISPDBCR, SSPDACR
	Grease applied prior to shipment	Grease applied prior to shipment
Guide	Daphne Eponex Grease No.2	Kuroda C grease
Ball screw	Daphne Eponex Grease No.2	Kuroda C grease

⚠ Warning:
- If your actuator is of cleanroom type, use low-dust-raising grease. If standard grease is used, dust may be raised.
- Never use fluorine or lithium grease. If fluorine or lithium grease is mixed with urea grease, the lubrication performance normally expected from urea grease may be lost and consequently the mechanical parts may be damaged or cleanliness may drop.

(2) How to add grease

Adding grease to the guides and ball screw

Grease nipples are provided on both sides of the slider. Add grease to the guides and ball screw through these grease nipples.

The grease nipples on the right side as viewed from the motor are used to add grease to the guide on the right side as well as the ball screw.

The grease nipples on the left side as viewed from the motor are used to add grease to the guide on the left side as well as the ball screw.

(Grease can be added to the ball screw from the grease nipple on either side.)

[1] Remove the grease nipple caps on the slider cover.

[2] Supply grease from the left and right grease nipples three to four times using a grease gun.
The table below lists the effective charge volumes of grease.

Parts	Effective charge volumes		
	S	M/MX	L/LX
Guide (Total of left and right guides)	2.5 cm^3	4.0 cm^3	5.0 cm^3
Ball screw	3.5 cm^3	6.5 cm^3	8.5 cm^3

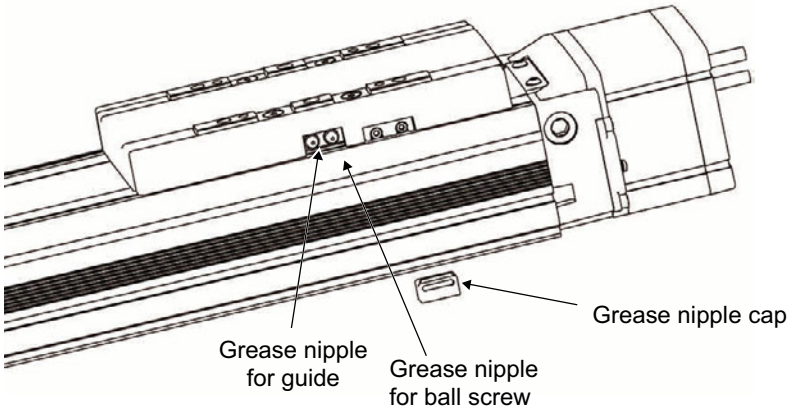
[3] Move the slider several times by hand.

[4] Wipe off any excess grease.

[5] Put the grease nipple caps back on the slider cover.

[Grease Nipple Positions]

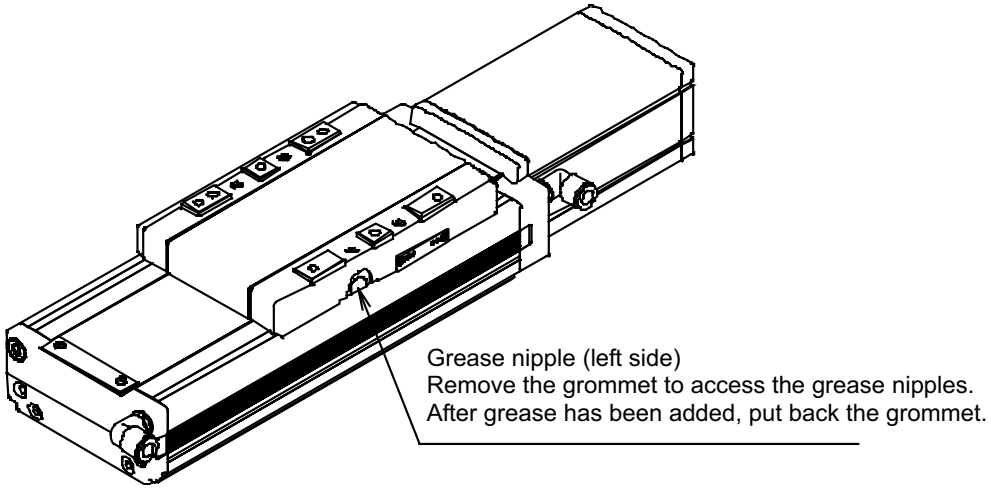
- ISDBCR, ISPDBCR



Model	Nipple diameter [mm]
Common to all models	∅6.0

⚠ Caution:
- Charging too much grease may increase the agitation resistance and cause the ball screw to generate heat easily or allow excess grease on the ball screw to scatter around and dirty the surroundings as the screw turns. Be sure to wipe off excess grease.
- It is difficult to move actuators of short leads by hand. With these actuators, do not try to move the actuator by force, but connect a controller and move the actuator by jog operation.
- 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.

- SSPDACR



Model	Nipple diameter [mm]
SSPDACR-S	∅3.5
SSPDACR-M	∅6.0
SSPDACR-L	∅6.0

⚠ Caution: 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.

13. Replacement/Adjustment Procedure for Stainless Sheet

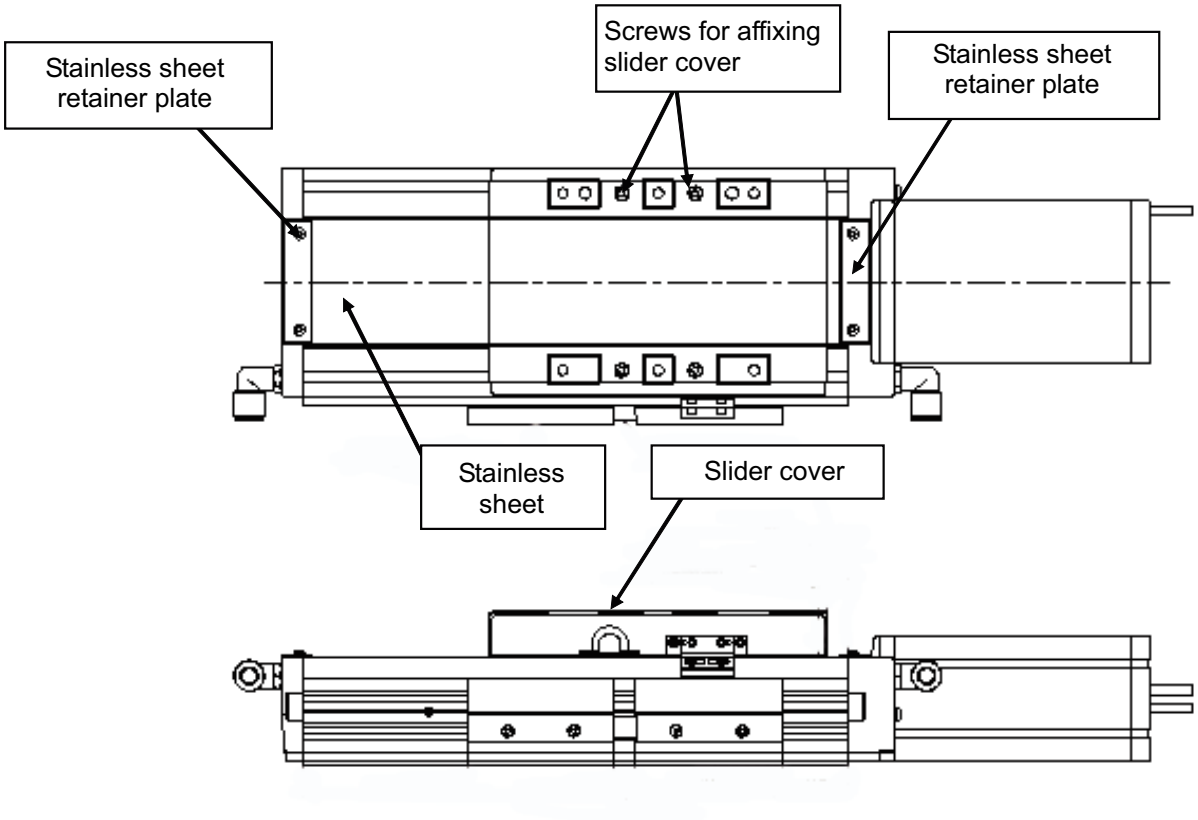
The following explains how to replace and adjust the stainless sheet.
The screws and other parts that are removed to take out the old stainless sheet will be needed when the components are assembled again after to install the new sheet. To prevent missing parts, prepare a storage box, etc., and keep them in the box, etc.

13.1 Preparation

(1) "What you need for replacement"
- New stainless sheet
- Allen wrench set
- Scale

(2) "Notes on tension of the stainless sheet"
Deterioration/wear of the stainless sheet is affected by the tension.
If the stainless sheet is tensioned with a strong force and there is an excessive clearance from the slider cover, the stainless sheet may undergo fatigue fracture.
On the other hand, too small a tension may cause the stainless sheet to slack and contact the back of the slider cover, consequently raising dust.
Accordingly, use a dedicated adjustment jig to adjust the tension of the stainless sheet until the clearance from the back of the slider cover corresponds to the specified dimension.

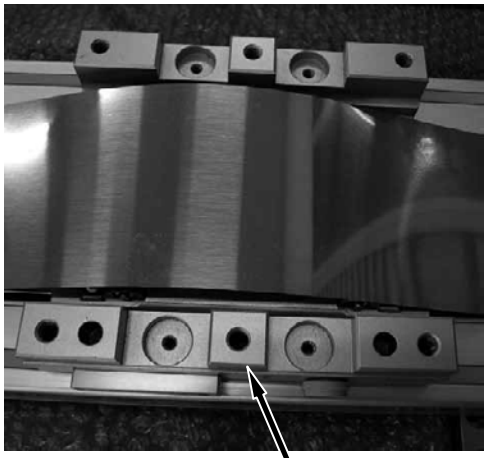
(3) Name of each part



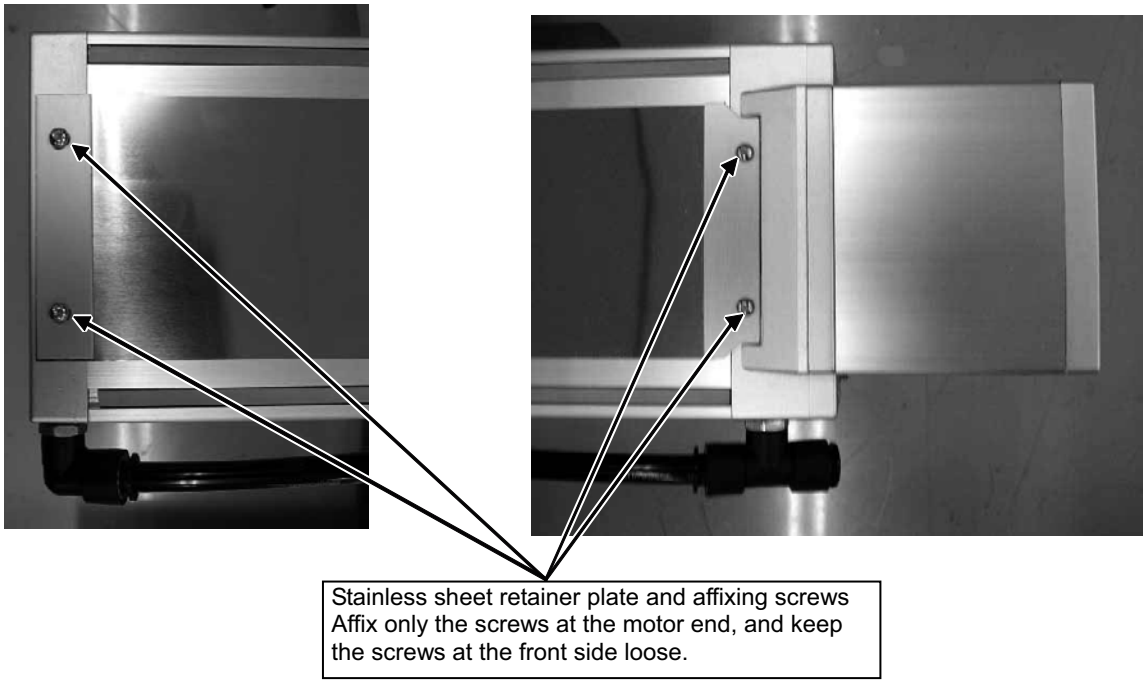
13.2 Replacement/Adjustment Procedure

(1) Move the slider to the center of the actuator.
(2) Turn off the controller power.
(3) Remove the four affixing screws to take out the slider cover.

After removing the slider cover

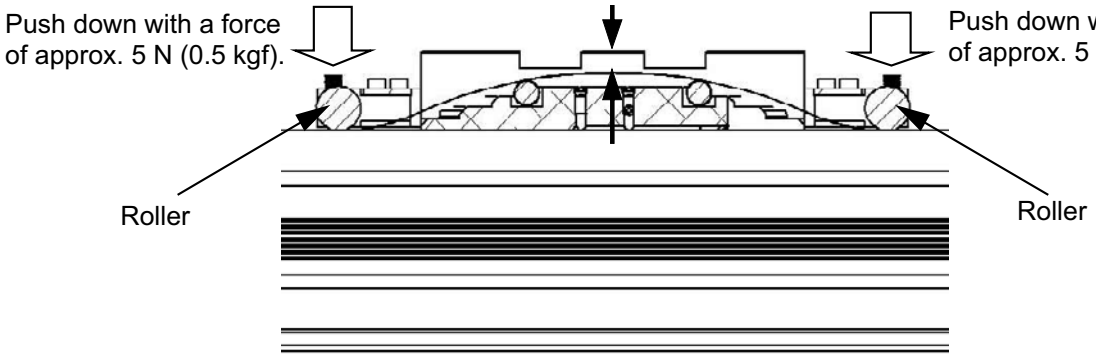


(4) Use an Allen wrench of 3 mm across flats to remove the two retainer screws on the left and right and take out the retainer plate and current stainless sheet.
(5) Affix the new stainless sheet with the retainer plate and screws.
Affix only the screws at the motor end, and keep the screws at the front side loose.



(6) Adjust the tension of the stainless sheet.
[1] Move the stainless sheet back and forth to adjust the sheet tension. If the actuator is of clean room type, push down the rollers until they contact the side cover. This is not necessary with a standard actuator because there are no rollers.
[2] Adjust the sheet tension until the distance between the apex of the sheet and top face of the slider meets the applicable distance shown in the table below, and then loosely tighten the screws on the front side you have loosened earlier, just enough to keep the stainless sheet from moving.

Distance from top face of slider to apex of stainless sheet (H)

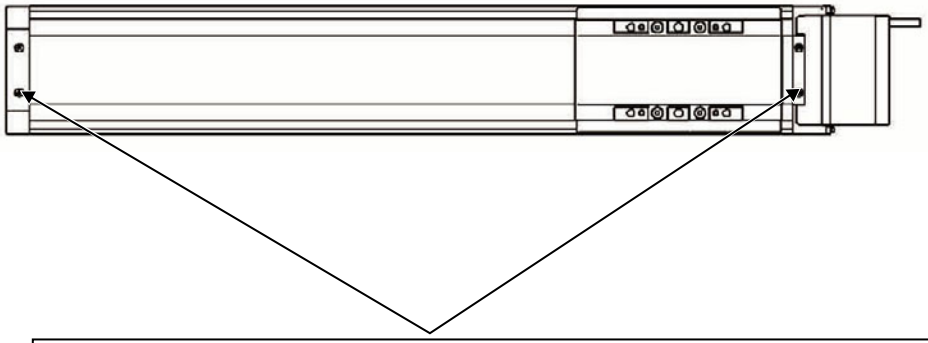


Distance between apex of stainless sheet and top face of slider

Type	H [mm]
ISDB-S, ISPDB-S, ISDBCR-S, ISPDBCR-S	6
ISDB-M, ISPDB-M, ISPDBCR-M, ISDBCR-M	6.5
ISDBCR-MX, ISPDBCR-MX	5.5
ISDB-L/LX, ISPDB-L/LX, ISDBCR-L, ISPDBCR-L	9
ISDBCR-LX, ISPDBCR-LX	8
SSPDACR-S	7
SSPDACR-M	8
SSPDACR-L	9

(7) Move the slider several times over the entire stroke to check the tension by checking if the stainless sheet contacts the slider.
If the lead is small or the actuator is a vertical axis, the slider cannot be moved by hand. In this case, turn on the controller power and move the slider at a speed of approx. 20 mm/s using the teaching pendant or PC software.

(8) After checking the tension of the stainless sheet and confirming absence of slacking, position deviation or other problems, tighten the two screws alternately. At the end, tighten them to a uniform torque to secure the stainless sheet. If the two screws are tightened non-uniformly, the sheet may meander or lift. If the tension still presents a problem, repeat the adjustment from step (5).



Firmly tighten the screws on both sides to prevent the stainless sheet from moving.
Tightening torque: 191 N･cm (19.5 kgf･cm)

(9) Install the slider cover using the four screws.

(10) Once the slider cover has been installed, move the slider to confirm absence of abnormal noise. If rubbing noise, etc., is heard, the stainless sheet may not be adjusted properly. Remove the slider cover and repeat the adjustment from step (5).

14. Motor Replacement Procedures

The following explains the procedure to replace the motor in the event of coil breakage, etc.
Prepare a storage box, etc., and keep in this box, etc., all screws and other parts you have removed to replace the motor, because they will be needed during the reassembly.

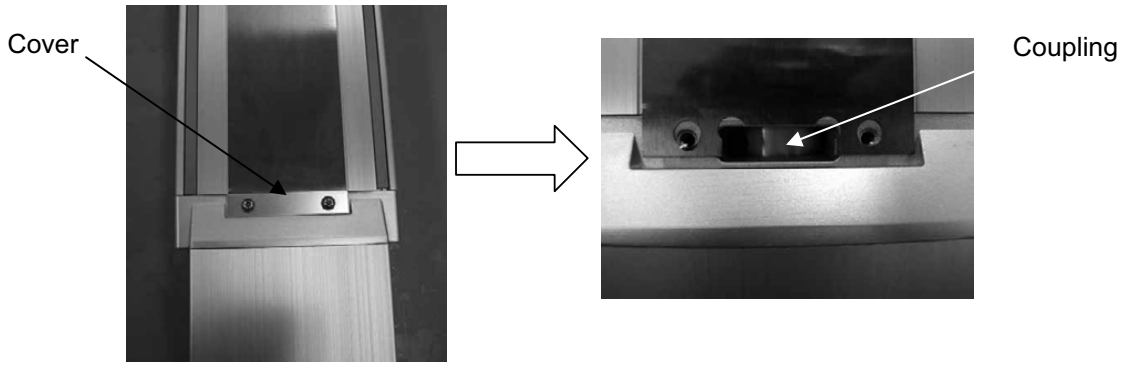
⚠ Caution: When replacing the motor, you must turn on/off the power and servo to perform the following tasks:
[1] Position the coupling on the motor alone
[2] Install the motor
[3] Operate the brake
Exercise due caution when carrying out each task with the power being supplied.

The purpose of [1] and [2] is to correlate the motor/encoder and actuator positions. If these tasks are not performed, home return may not be implemented normally.
[3] is performed because the brake, which is a non-excitation brake, cannot be released (= the slider cannot be moved) without excitation.

14.1 Removing the Motor Unit

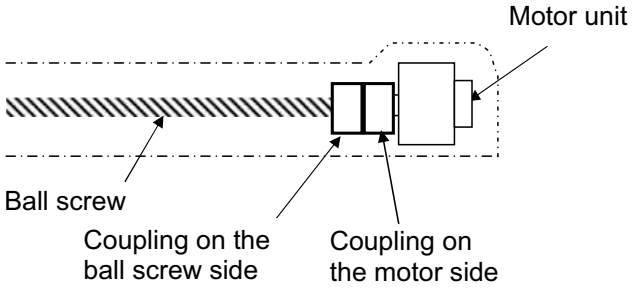
(1) Removing the coupling cover

Turn off the power supply to the controller, and then disconnect the motor cable and encoder cable.
Remove the two screws used to secure the cover on the motor side using an Allen wrench of 2.5 mm across flats for ISDB, ISPDB, ISDBCR and ISPDBCR-S, or 3 mm across flats for all other models.
The coupling will be visible.



Move the slider to a position where the coupling bolt can be loosened.
If the actuator is equipped with a brake, connect the encoder cable and apply power to the controller to release the brake. Then move the slider so that the coupling bolts on the ball screw side can be removed.
After moving the slider, deactivate the brake release, turn off the power to the controller and disconnect the encoder cable.

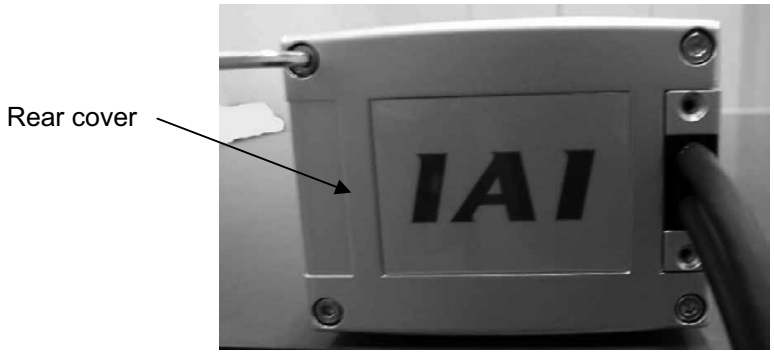
⚠ Caution:
- When the actuator is vertically installed, exercise due caution so that the slider does not fall when the brake is released. Be sure to support the slider externally to prevent it (work part) from falling.
- If you attempt to move the slider with the motor cable connected, the slider movement will become heavy due to regenerative braking. Disconnect the motor cable before moving the slider.



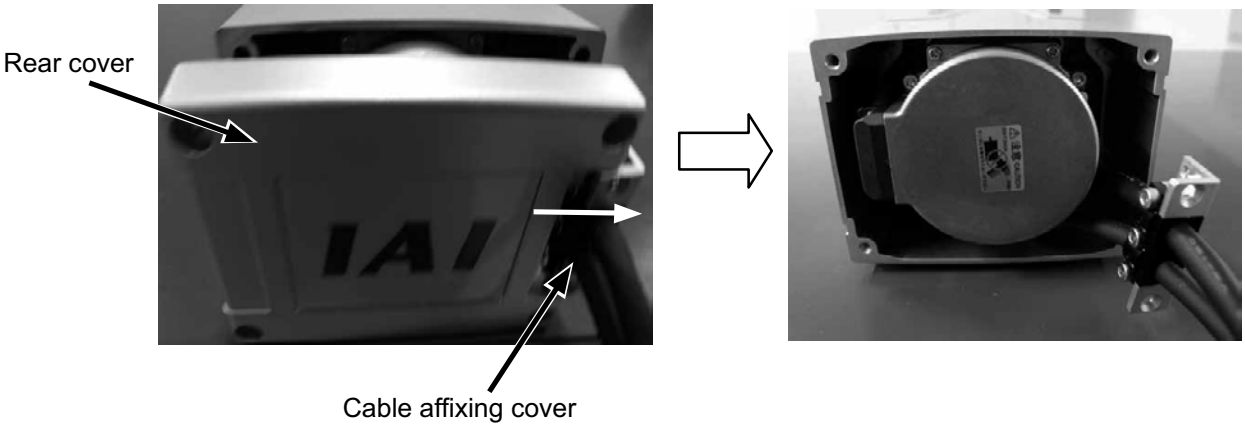
(2) Removing the rear cover

[1] Remove the screws used to secure the cable mounting cover using an Allen wrench of 2 mm across flats.

[2] Remove the four bolts used to secure the rear cover using an Allen wrench of 2.5 mm across flats for ISDB, ISPDB, ISDBCR and ISPDBCR-S, or 3 mm across flats for all other models.



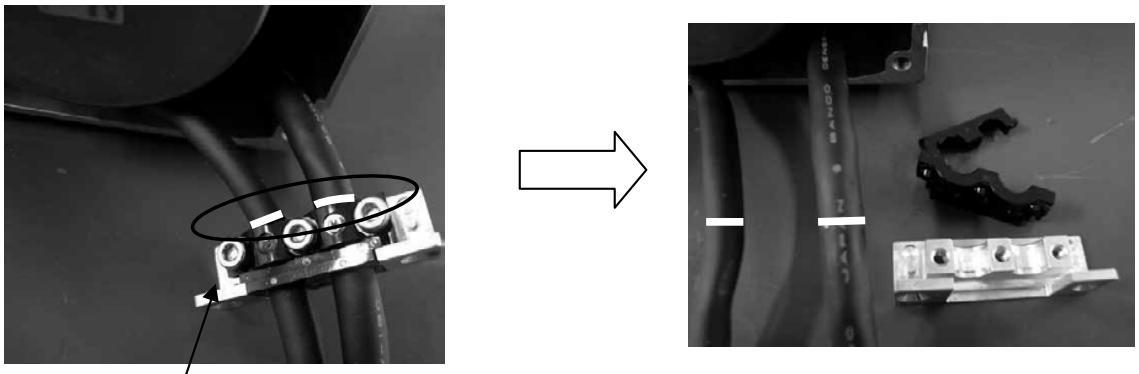
[3] Slide the cable affixing cover to remove it from the rear cover.



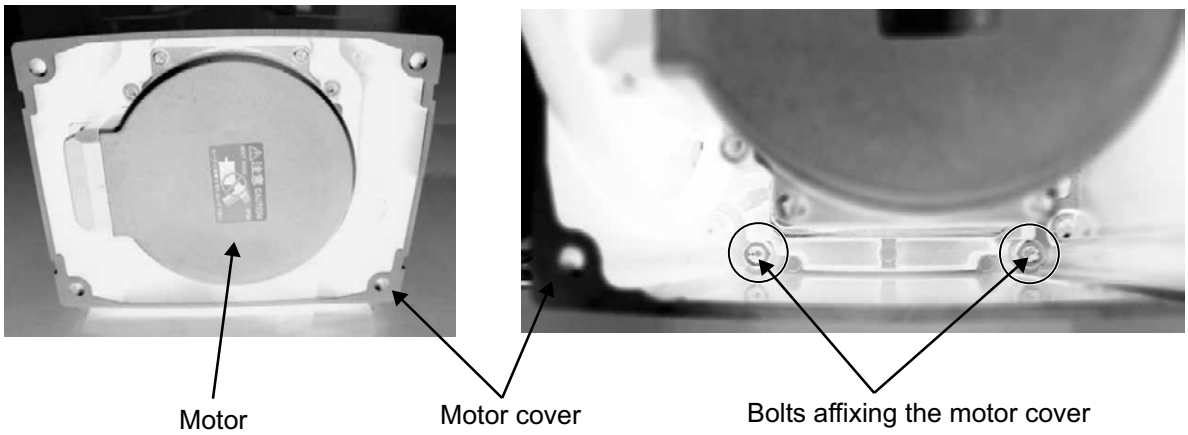
(3) Removing the cable mounting cover

Remove the three bolts used to secure the cable mounting cover to the cable using an Allen wrench of 2.5 mm across flats.

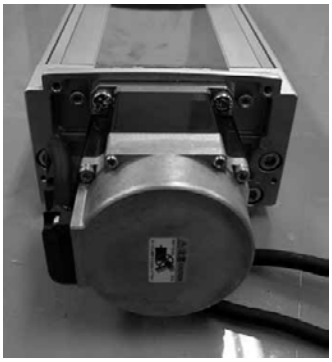
(Note) After the motor is replaced, the motor cables must be installed on the cable affixing cover. Before removing the affixing cover, mark the cables so that their installation positions can be checked later on.



(4) Removing the motor cover
Remove the two bolts used to secure the motor cover using an Allen wrench of 2.5 mm across flats for ISDB, ISDBCR, ISPDB and ISPDBCR-S, or 3 mm across flats for all other models
The two bolts are found below the motor at positions at the back in the motor cover.



The unit will look like below after the motor cover is removed.

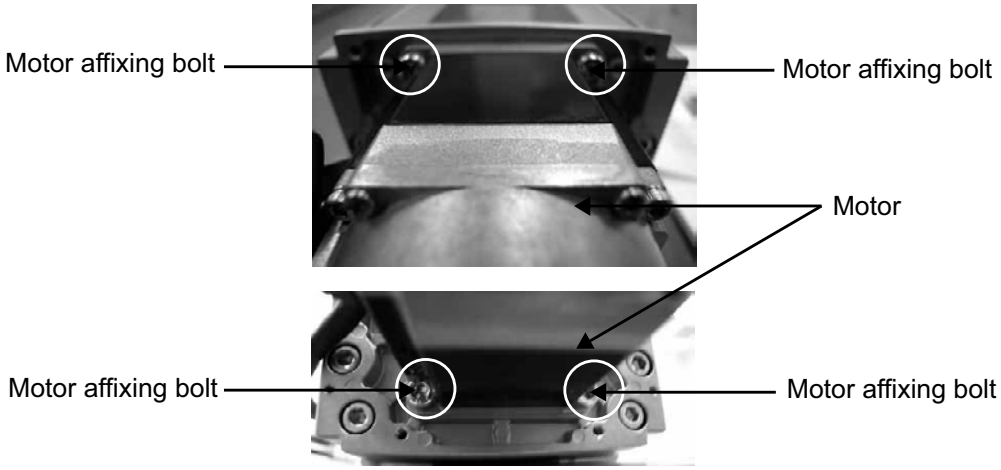


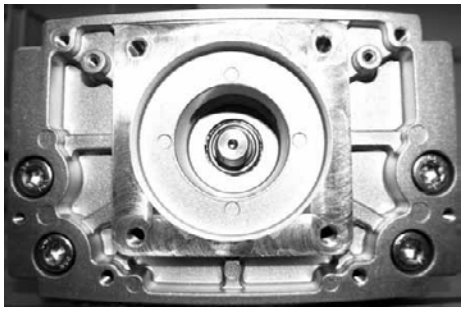
(5) Removing the motor unit

[1] Loosen the coupling tightening bolt.

⚠Caution: If the actuator is installed vertically, exercise due caution not to let the slider drop. Hold the slider (work part) from the outside to prevent it from dropping, and then loosen the coupling bolt.

(2) Remove the bolts used to secure the motor using an Allen wrench of 4 mm across flats, and pull out the motor unit and coupling from the motor housing.



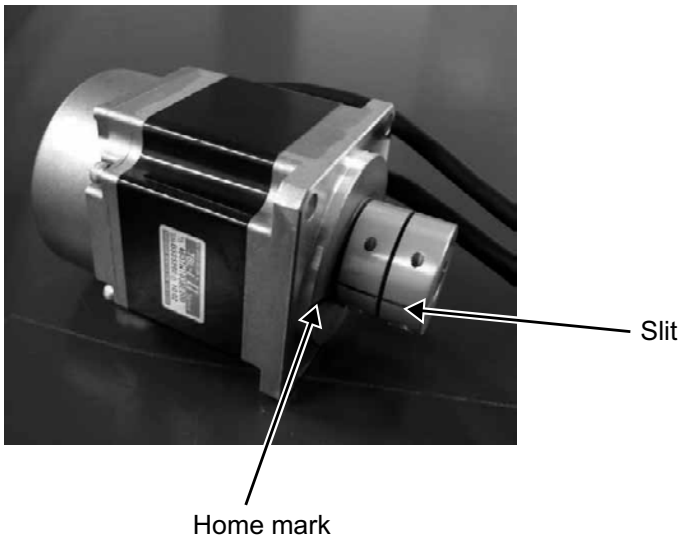


Body

Motor

14.2 Installing a New Motor

(1) New motor unit
The new motor will be supplied together with the coupling installed as shown below.



> ⚠ Caution: The motor actuator cable exit direction varies depending on the actuator cable exit direction. The cable exit direction must be the same for the motor to be removed and new motor to be installed.
> If the cable exit direction is different on the installed motor, deviation of the home position will occur.

> ⚠ Caution: Align the home mark on the motor with the slit position on the coupling, and then install the motor/coupling into the actuator.
> Never loosen the coupling on the motor side.
> The slit in the coupling is provided to help correlate the actuator and encoder positions. If the coupling is loosened, home return may not achieve a normal home position.

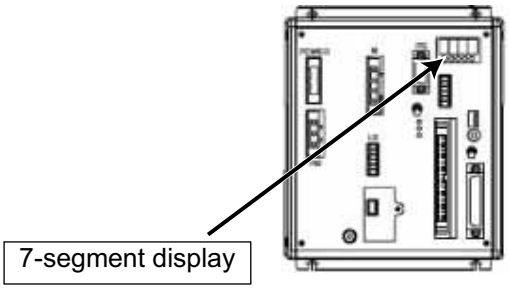
(2) Aligning the slider position

[1] Use extension cables (motor/encoder cables) to connect the motor cable and the encoder cable of the motor unit to the controller.

[2] Action to be taken upon error

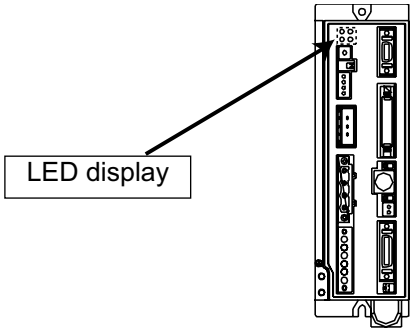
- With XSEL or SSEL controller, if the 7-segment display on the front face of the controller does not show “rdy” or “Ardy” but indicates an alarm after turning on the power, reset the alarm by checking the operation manual. If the problem cannot be resolved, contact IAI.

  The 7-segment display shows “Erg”: Cancel the emergency stop.
  The 7-segment display shows “ECA1”: Perform absolute reset.



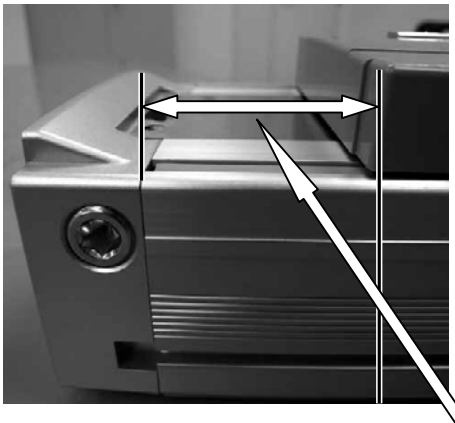
- With the SCON controller, if the PWR LED indicator on the front panel of the controller does not come on, but the ALM indicator comes on instead, after turning on the power, connect the PC or teaching pendant to check the nature of the alarm. Reset the alarm by checking the operation manual. If the problem cannot be resolved, contact IAI.

  Alarm code “0EE”: Perform absolute reset.



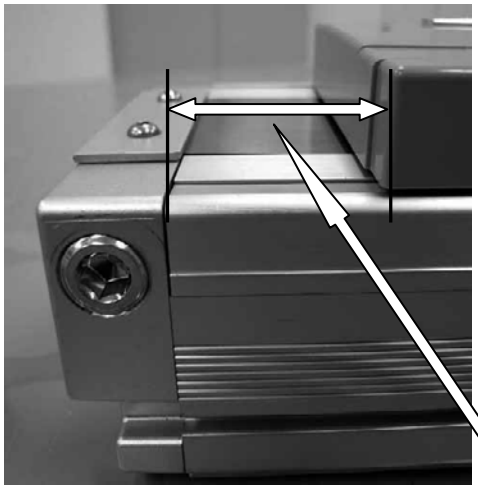
[3] Adjusting the Slider Position
If the actuator has a brake, turn on the controller power, release the brake, and move the slider to align the slider position with respect to the mechanical end.
After moving the slider, deactivate the brake release, turn off the power to the controller and disconnect the brake lead line connector.

■ Standard home specification
[If a slider jig, etc. cannot be removed]



Set this part based on table 1 on next page.
The use of a block gauge is recommended also in this case.

■ Reversed home specification



Set this part based on table 1 on next page.
The use of a block gauge is recommended also in this case.

(Table 1) Spacer Thickness by Model

Standard home specification

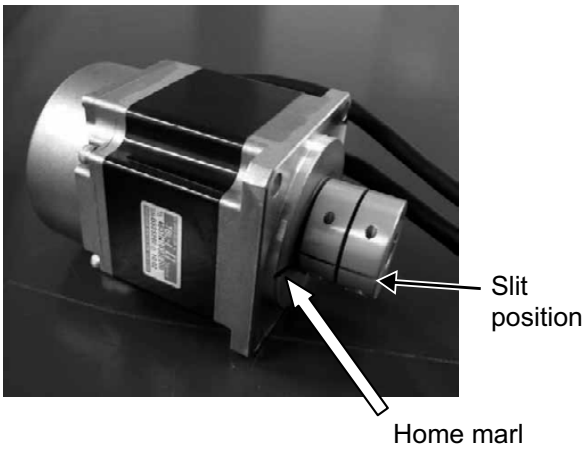
Type	Lead	Adjust dimension to: (mm)	
		Standard	Equipped with a limit switch = Equipped with a home sensor
ISDB, ISPDB ISDBCR, ISPDBCR-S	4	6	8
	8・16	8	8
ISDB, ISPDB ISDBCR, ISPDBCR-M	5	7	9
	10・20・30	9	9
ISDB, ISPDB-MX	20・30	57	57
ISDBCR, ISPDBCR-MX	20・30	58	58
ISDB, ISPDB ISDBCR, ISPDBCR-L	10・20・40	9	9
ISDB, ISPDB-LX	20・40	55	55
ISDBCR, ISPDBCR-LX	20・40	57	57
SSPDACR-S	10・20・30	28.5	28.5
SSPDACR-M	10・20・40	32.5	32.5
SSPDACR-L	25・50	17	17

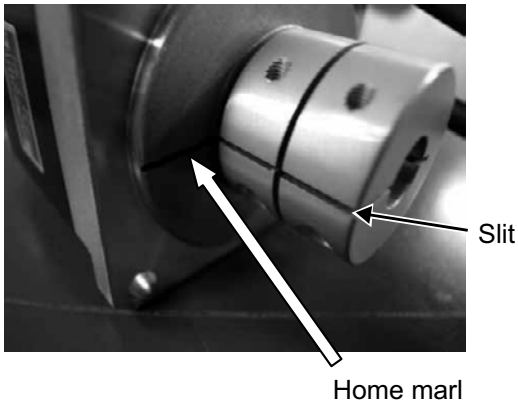
Reversed home specification

Type	Lead	Adjust dimension to: (mm)	
		Standard	Equipped with a limit switch = Equipped with a home sensor
ISDB, ISPDB ISDBCR, ISPDBCR-S	4	12	14
	8・16	14	14
ISDB, ISPDB ISDBCR, ISPDBCR-M	5	10	12
	10・20・30	12	12
ISDB, ISPDB-MX	20・30	60	60
ISDBCR, ISPDBCR-MX	10・20・30	61	61
ISDB, ISPDB ISDBCR, ISPDBCR-L	10・20・40	23	23
ISDB, ISPDB-LX	20・40	69	69
ISDBCR, ISPDBCR-LX	20・40	71	71
SSPDACR-S	10・20・30	8.5	8.5
SSPDACR-M	10・20・40	5.5	5.5
SSPDACR-L	25・50	17	17

(3) Aligning the motor position
Apply power to the controller, and then run the motor with the jog control using the PC software or teaching pendant to align the home position marked on the motor and the slit in the coupling.
(Jog at 1 mm per second (minimum speed).)

* In certain situations such as when the controller is away from the motor, you can turn on the servo after aligning the coupling and slit positions by hand.

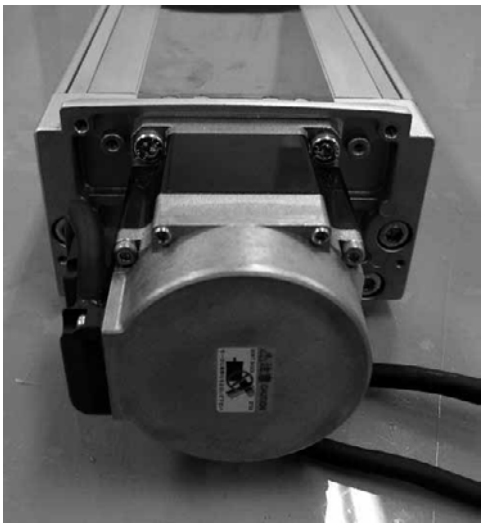




⚠ Caution: Align the home mark on the motor with the slit position on the coupling, and then install the motor/coupling into the actuator.
Never loosen the coupling on the motor side.
The slit in the coupling is provided to help correlate the actuator and encoder positions. If the coupling is loosened, home return may not achieve a normal home position.

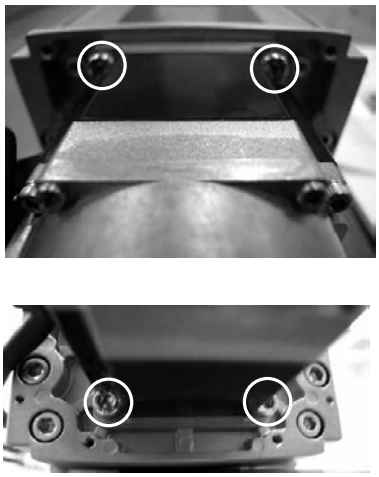
(4) Installing the motor temporarily

[1] With the motor servo turned on, fit the motor unit's coupling in the end of the ball screw shaft and fasten the motor housing and motor unit temporarily. (Tighten manually for this temporary purpose.)
When fastening the motor and motor housing temporarily, be sure to place them next to each other with no gaps or play.
If the cable exits from the right, install the motor as shown in the photograph below so that the motor cable is positioned on the left side. If the cable exits from the left, install the motor in the position opposite of the photograph.



⚠ Caution: The cable exit direction must be the same for the motor to be removed and new motor to be installed.
If the cable exit direction is different on the installed motor, deviation of the home position will occur.

Type	Bolt used
ISDB, ISDBCR, ISPDB, ISPDBCR-S	M4 x 12
ISDB, ISDBCR, ISPDB, ISPDBCR, -M, MX, L, LX	M5 x 15
SSPDACR-S	M5 x 15
SSPDACR-M	M5 x 15
SSPDACR-L	M6 x 20



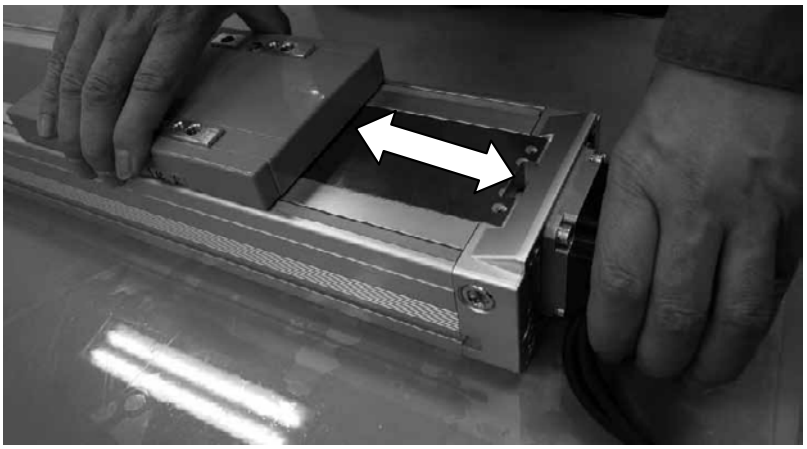
Four bolts used to secure the motor

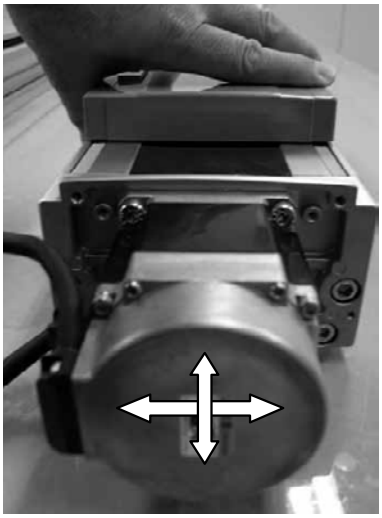
[2] With the motor fastened temporarily, tighten the coupling bolts on the ball screw side.
[3] Turn off the power to the controller, disconnect all connectors (including the motor cable and encoder cable connectors), but this time tighten the bolts in place to the specified torque.

<Tightening torques by coupling bolt type>

Type	Tightening torque
ISDB, ISDBCR, ISPDB, ISPDBCR-S	2.0 N•m
ISDB, ISDBCR, ISPDB, ISPDBCR-M, MX	2.0 N•m
ISDB, ISDBCR, ISPDB, ISPDBCR-L, LX	4.0 N•m
SSPDACR-S	2.0 N•m
SSPDACR-M	4.0 N•m
SSPDACR-L	7.0 N•m

(5) Centering and securing the motor unit
Loosen the motor affixing screws you have tightened only loosely in an earlier step, move the slider back and forth by hand for three to four cycles (over as long an operation stroke as possible) and eventually move the slider to near the mechanical end on the motor side and find a position at which the motor vibration becomes the smallest. Affix the motor unit in the motor housing at this position.



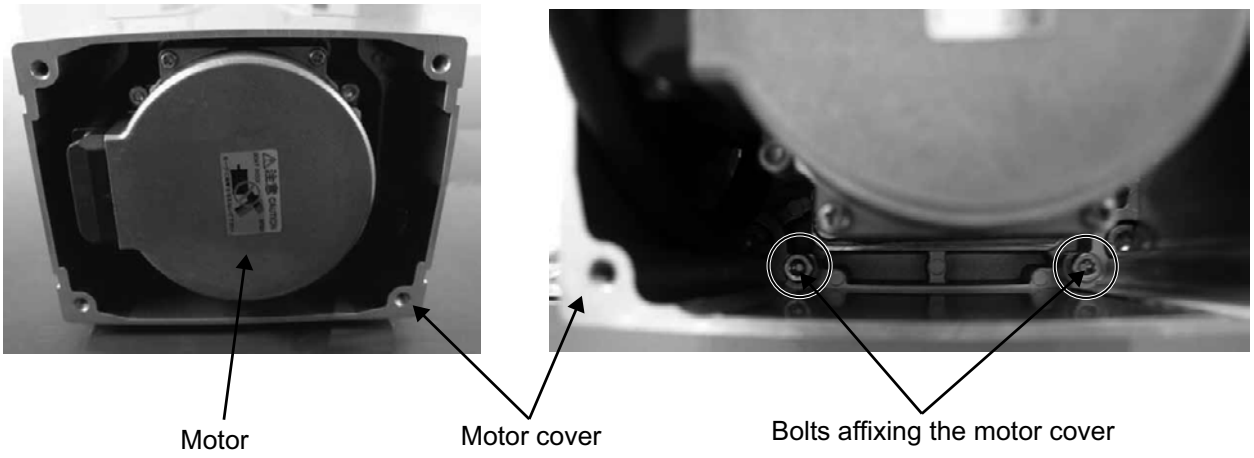


<Tightening torque of the bolt when motor is affixed>

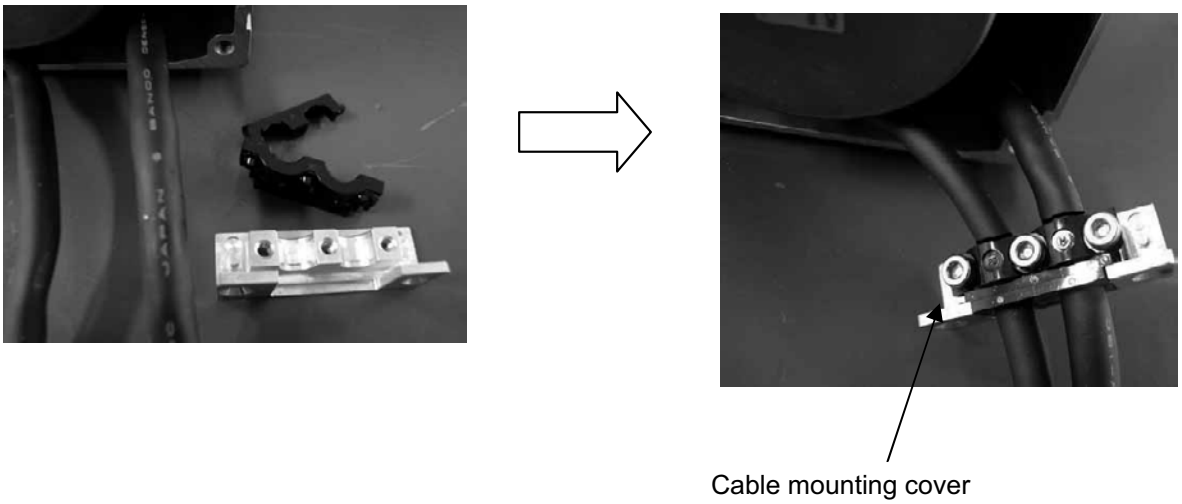
Type	Bolt used	Tightening torque
ISDB, ISDBCR, ISPDB, ISPDBCR-S	M4 x 12	176 N·cm
ISDB, ISDBCR, ISPDB, ISPDBCR, -M, MX, L, LX	M5 x 15	342 N·cm
SSPDACR-S	M5 x 15	342 N·cm
SSPDACR-M	M5 x 15	342 N·cm
SSPDACR-L	M6 x 20	536 N·cm

(Note) If the actuator is equipped with a brake, connect the encoder cable of the motor unit to the controller using the extension cables (motor and encoder cables), and apply power to the controller. Then release the brake and move the slider.
For safety reasons, after securing the motor unit, deactivate the brake release, turn off the power to the controller and disconnect the cable connectors from the motor unit.

(6) Installing the motor cover
Tighten the two bolts to install the motor cover using an Allen wrench of 2.5 mm across flats for ISDB, ISPDB, ISDBCR and ISPDBCR-S, or 3 mm across flats for all other models.
Two of these bolts are found below the motor at locations further back in the motor cover.

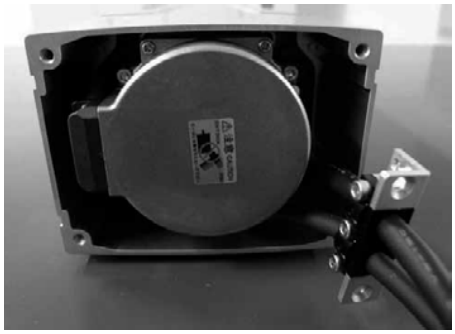


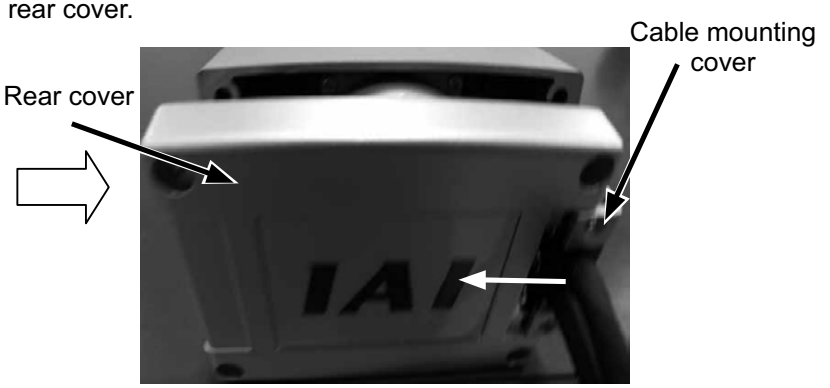
(7) Installing the cable mounting cover
Tighten the three bolts using an Allen wrench of 2.5 mm across flats to install the cable mounting cover to the cable. Install the cable mounting cover in roughly the same position as the area marked on the motor that has been removed.
The cable mounting cover is imprinted with M and PG. Clamp the motor cable to the M side, and the encoder cable to the PG side.
(Note) After the motor is replaced, install the cable mounting cover in roughly the same position as the replaced motor. Mark the cable for the motor to be replaced so that the installation position can be identified.



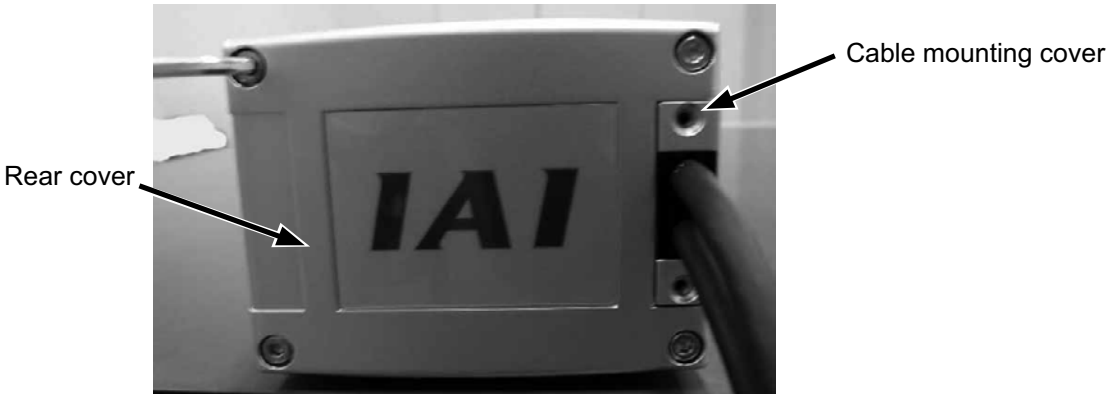
(8) Installing the rear cover

[1] Insert the cable affixing cover into the rear cover.

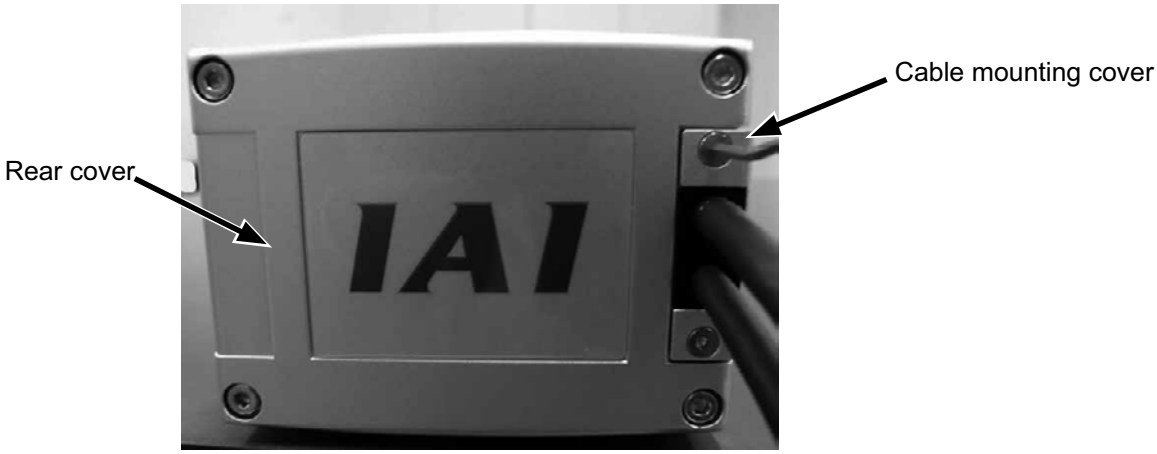




[2] Tighten the four bolts to install the rear cover using an Allen wrench of 2.5 mm across flats for ISDB, ISPDB, ISDBCR and ISPDBCR-S, or 3 mm across flats for all other models.

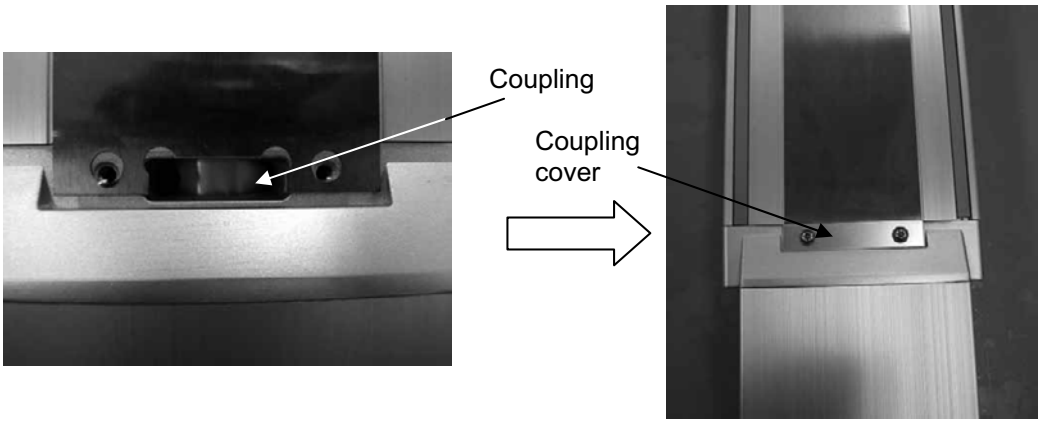


[3] Tighten the screws with an Allen wrench of 2 mm across flats to attach the screws for the cable mounting cover.



(9) Installing the coupling cover

Tighten the two screws to install the cover on the motor side using an Allen wrench of 2.5 mm across flats for ISDB, ISPDB, ISDBCR and ISPDBCR-S, or 3 mm across flats for all other models.



14.3 Correcting for Position Deviation

(1) Connect the motor cable and encoder cable and turn on the controller power.

(2) Use the PC software or teaching pendant to perform homing and check the home position. Repeat homing several times to confirm that the actuator returns to the same position.
(If the actuator is of absolute specification, perform an absolute reset.)

(3) Check the amount of position deviation.
The position may have changed slightly from where it was before the motor was replaced.
Accordingly, select a desired position number that allows you to check the amount of deviation before and after the replacement, and then perform positioning to that position and measure the amount of deviation.

(4) Reflect the deviation in the home preset parameter in the case of an X-SEL/SSEL controller, or in the home return offset parameter in the case of an SCON controller. [For the setting method, refer to 9.5, “Fine-tuning the Home Position.”]

* If the two positions differ significantly (one ball screw revolution or more = lead or more) or if the actuator does not return to the same position when homing is repeated, install the motor unit again by following the procedure described in this manual.
When the motor unit was installed, a wrong spacer size may have been used or the slider may have moved instead of remaining stationary at the mechanical end.

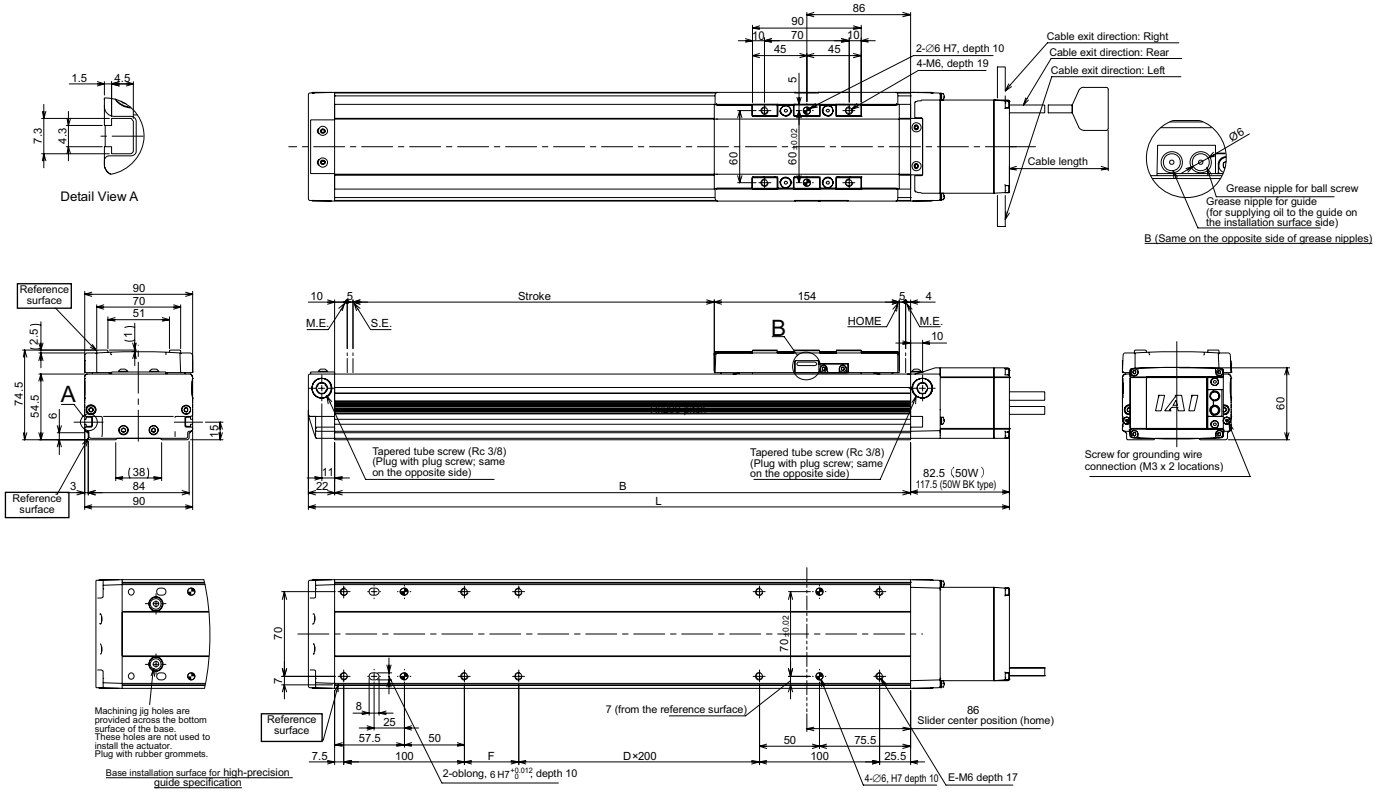
14.4 Operation Check after Replacing the Motor

After replacing the motor, perform continuous operation to confirm absence of vibration or abnormal noise.

15. Appendix

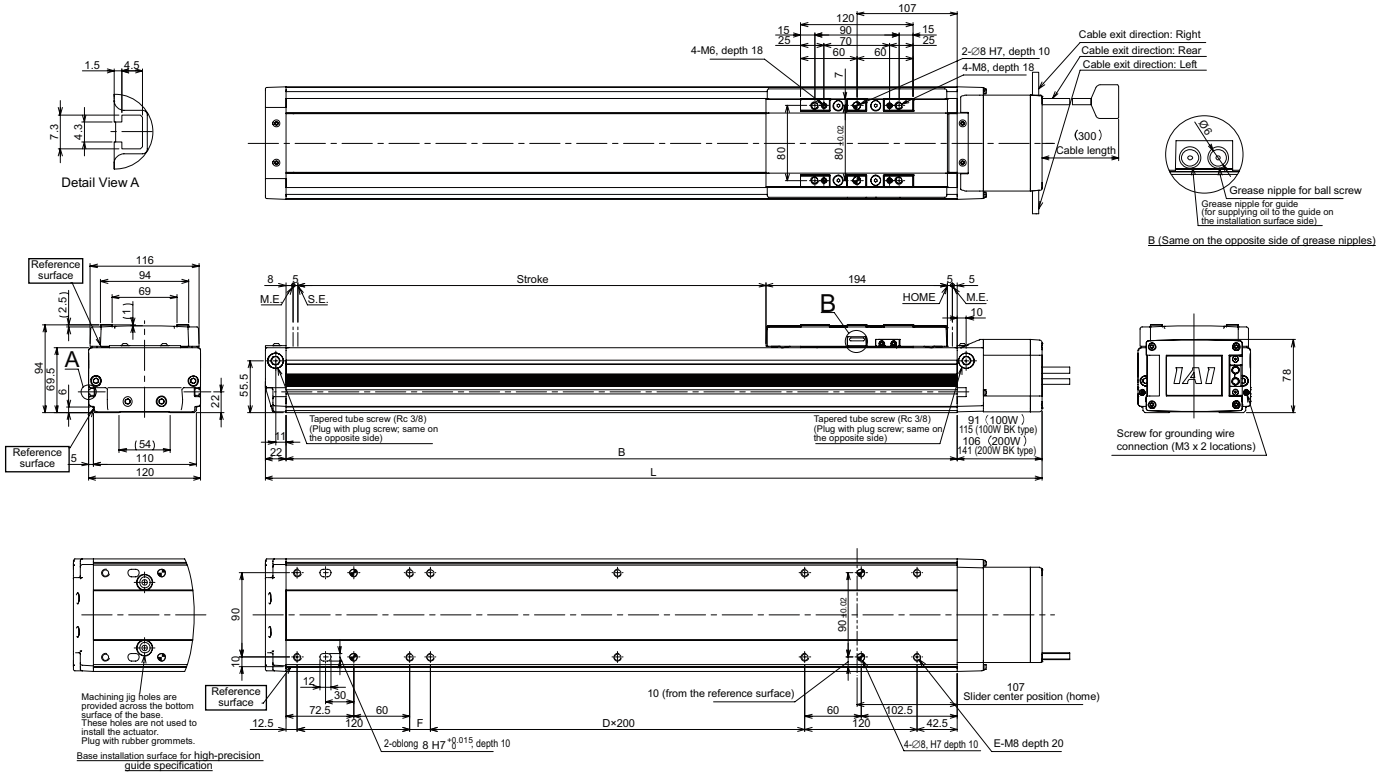
15.1 External Dimensions

15.1.1 ISDB, ISPDB-S



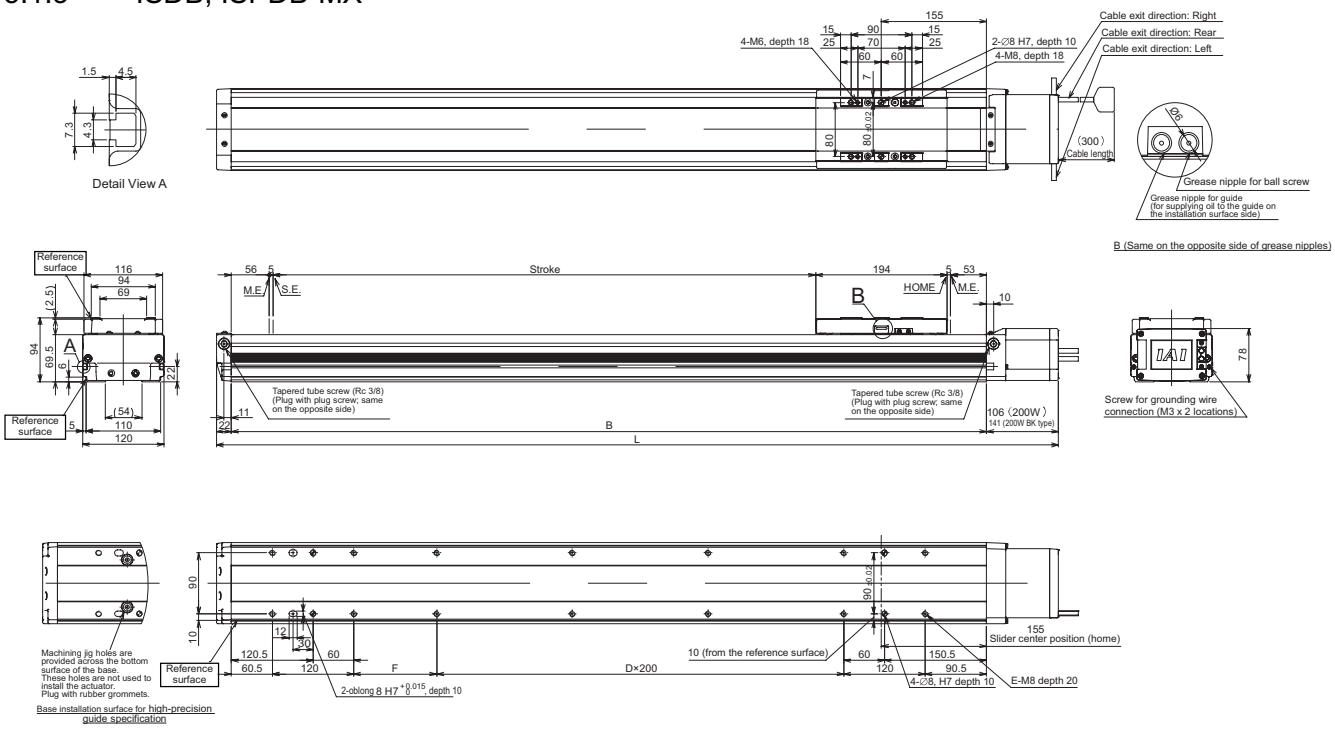
Stroke	L		B	D	E	F	Weight [kg]	
	50 W motor						50 W motor	
	Without brake	With brake					Without brake	With brake
100	382.5	417.5	278	0	8	45	4.1	4.3
150	432.5	467.5	328	0	8	95	4.4	4.6
200	482.5	517.5	378	0	8	145	4.8	5.0
250	532.5	567.5	428	0	8	195	5.1	5.3
300	582.5	617.5	478	1	10	45	5.5	5.7
350	632.5	667.5	528	1	10	95	5.9	6.1
400	682.5	717.5	578	1	10	145	6.2	6.4
450	732.5	787.5	628	1	10	195	6.6	6.8
500	782.5	817.5	678	2	12	45	7.0	7.2
550	832.5	867.5	728	2	12	95	7.3	7.5
600	882.5	917.5	778	2	12	145	7.7	7.9
650	932.5	967.5	828	2	12	195	8.1	8.3
700	982.5	1017.5	878	3	14	45	8.4	8.6
750	1032.5	1067.5	928	3	14	95	8.8	9.0
800	1082.5	1117.5	978	3	14	145	9.1	9.3

15.1.2 ISDB, ISPDB-M



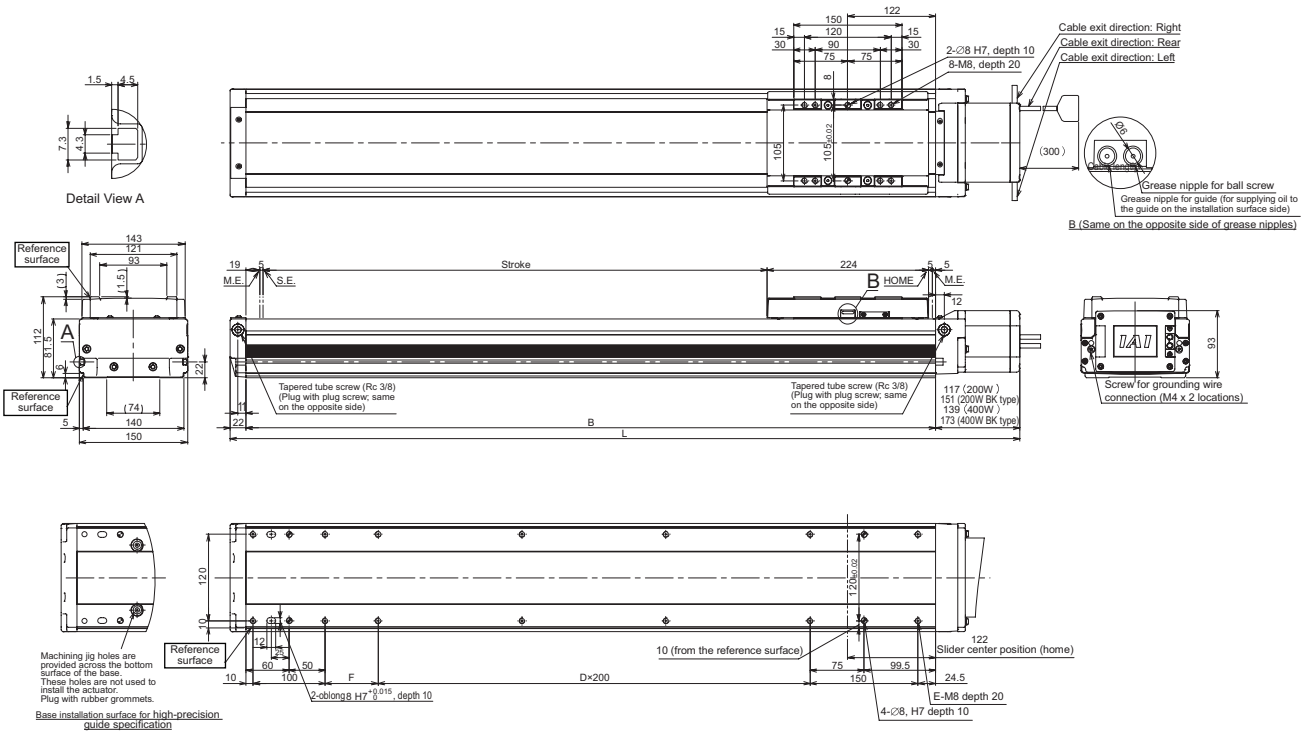
Stroke	L				B	D	E	F	Weight [kg]			
	100 W motor		200 W motor						100 W motor		200 W motor	
	Without brake	With brake	Without brake	With brake					Without brake	With brake	Without brake	With brake
100	430	454	445	480	317	0	8	22	7.5	7.8	7.9	8.3
150	480	504	495	530	367	0	8	72	8.1	8.4	8.5	8.9
200	530	554	545	580	417	0	8	122	8.8	9.1	9.2	9.6
250	580	604	594	630	467	0	8	172	9.4	9.7	9.8	10.2
300	630	654	645	680	517	1	10	22	10.0	10.3	10.4	10.8
350	680	704	695	730	567	1	10	72	10.7	11.0	11.1	11.5
400	730	754	745	780	617	1	10	122	11.3	11.6	11.7	12.1
450	780	804	795	830	667	1	10	172	11.9	12.2	12.3	12.7
500	830	854	845	880	717	2	12	22	12.6	12.9	13.0	13.4
550	880	904	895	930	767	2	12	72	13.2	13.5	13.6	14.0
600	930	954	945	980	817	2	12	122	13.8	14.1	14.2	14.6
650	980	1004	995	1030	867	2	12	172	14.5	14.8	14.9	15.3
700	1030	1054	1045	1080	917	3	14	22	15.1	15.4	15.5	15.9
750	1080	1104	1095	1130	967	3	14	72	15.7	16.0	16.1	16.5
800	1130	1154	1145	1180	1017	3	14	122	16.4	16.7	16.8	17.2
850	1180	1204	1195	1230	1067	3	14	172	17.0	17.3	17.4	17.8
900	1230	1254	1245	1280	1117	4	16	22	17.6	17.9	18.0	18.4
950	1280	1304	1295	1330	1167	4	16	72	18.3	18.6	18.7	19.1
1000	1330	1354	1345	1380	1217	4	16	122	18.9	19.2	19.3	19.7
1050	1380	1404	1395	1430	1267	4	16	172	19.5	19.8	19.9	20.3
1100	1430	1454	1445	1480	1317	5	18	22	20.2	20.5	20.6	21.0

5.1.3 ISDB, ISPDB-MX



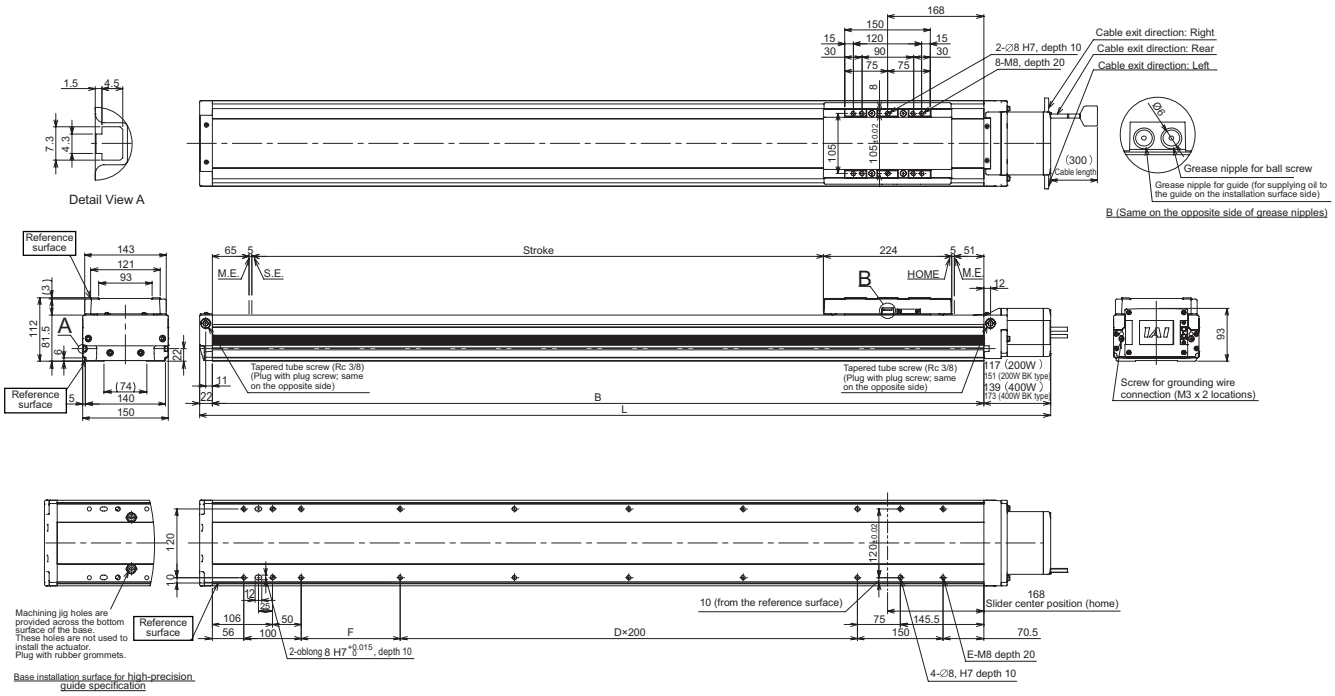
Stroke	L		B	D	E	F	Weight [kg]	
	200 W motor						200 W motor	
	Without brake	With brake					Without brake	With brake
800	1241	1276	1113	3	14	122	18.3	18.8
900	1341	1376	1213	3	14	222	19.6	20.1
1000	1441	1476	1313	4	16	122	20.9	21.4
1100	1541	1576	1413	4	16	222	22.2	22.7
1200	1641	1676	1513	5	18	122	23.4	23.9
1300	1741	1776	1613	5	18	222	24.7	25.2
1400	1841	1876	1713	6	20	122	26.0	26.5
1500	1941	1976	1813	6	20	222	27.3	27.8
1600	2041	2076	1913	7	22	122	28.6	29.1

15.1.4 ISDB, ISPDB-L



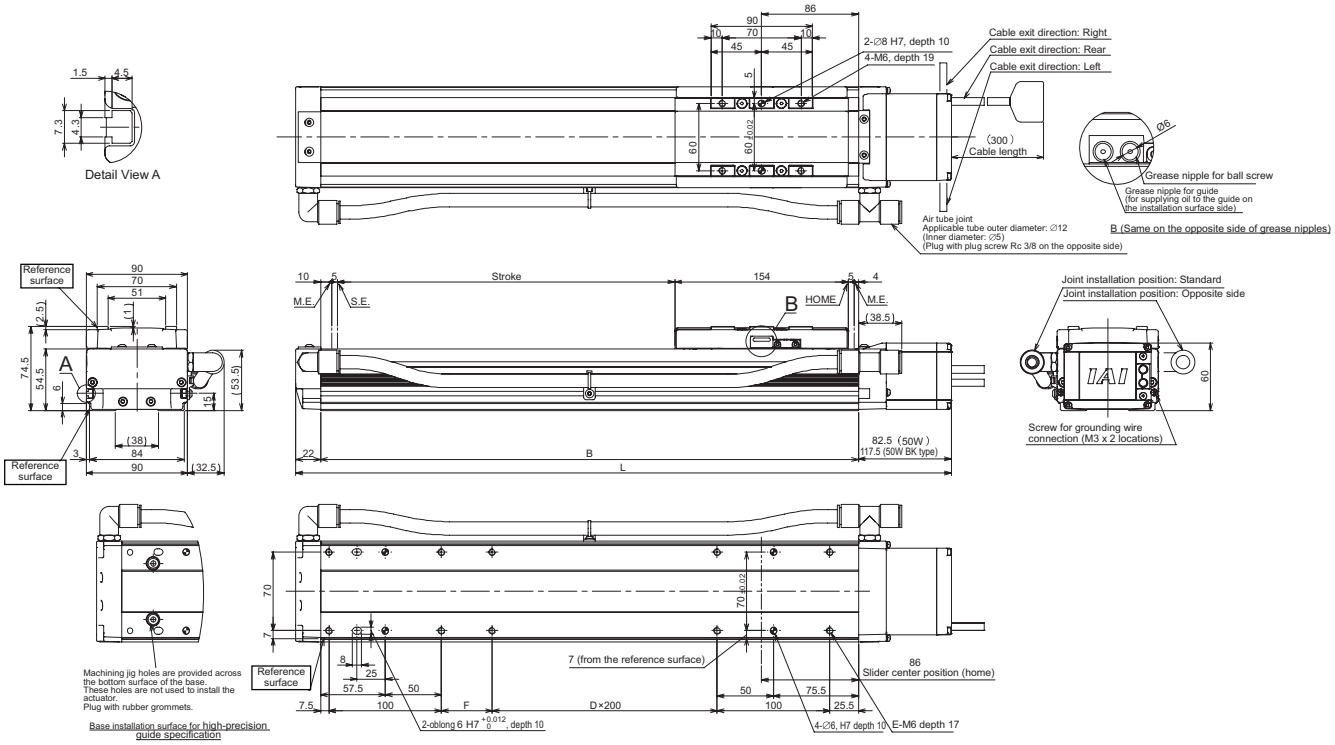
Stroke	L				B	D	E	F	Weight [kg]			
	200 W motor		400 W motor						200 W motor		400 W motor	
	Without brake	With brake	Without brake	With brake					Without brake	With brake	Without brake	With brake
100	497	531	519	553	358	0	8	73.5	11.8	12.3	12.2	12.7
150	547	581	569	603	408	0	8	123.5	12.7	13.2	13.1	13.6
200	597	631	619	653	458	0	8	173.5	13.6	14.1	14.0	14.5
250	647	681	669	703	508	1	10	23.5	14.4	14.9	14.8	15.3
300	697	731	719	753	558	1	10	73.5	15.3	15.8	15.7	16.2
350	747	781	769	803	608	1	10	123.5	16.2	16.7	16.6	17.1
400	797	831	819	853	658	1	10	173.5	17.0	17.5	17.4	17.9
450	847	881	869	903	708	2	12	23.5	17.9	18.4	18.3	18.8
500	897	931	919	953	758	2	12	73.5	18.8	19.3	19.2	19.7
550	947	981	969	1003	808	2	12	123.5	19.6	20.1	20.2	20.7
600	997	1031	1019	1053	858	2	12	173.5	20.5	21.0	20.9	21.4
650	1047	1081	1069	1103	908	3	14	23.5	21.4	21.9	21.8	22.3
700	1097	1131	1119	1153	958	3	14	73.5	22.3	22.8	22.7	23.2
750	1147	1181	1169	1203	1008	3	14	123.5	23.1	23.6	23.5	24.0
800	1197	1231	1219	1253	1058	3	14	173.5	24.0	24.5	24.4	24.9
850	1247	1281	1269	1303	1108	4	16	23.5	24.9	25.4	25.3	25.8
900	1297	1331	1319	1353	1158	4	16	73.5	25.7	26.2	26.1	26.6
950	1347	1381	1369	1403	1208	4	16	123.5	26.6	27.1	27.0	27.5
1000	1397	1431	1419	1453	1258	4	16	173.5	27.5	28.0	27.9	28.4
1050	1447	1481	1469	1503	1308	5	18	23.5	28.3	28.8	28.7	29.2
1100	1497	1531	1519	1553	1358	5	18	73.5	29.2	29.7	29.6	30.1
1150	1547	1581	1569	1603	1408	5	18	123.5	30.1	30.6	30.5	31.0
1200	1597	1631	1619	1653	1458	5	18	173.5	31.0	31.5	31.4	31.9
1250	1647	1681	1669	1703	1508	6	20	23.5	31.8	32.3	32.2	32.7
1300	1697	1731	1719	1753	1558	6	20	73.5	32.7	33.2	33.1	33.6

15.1.5 ISDB, ISPDB-LX



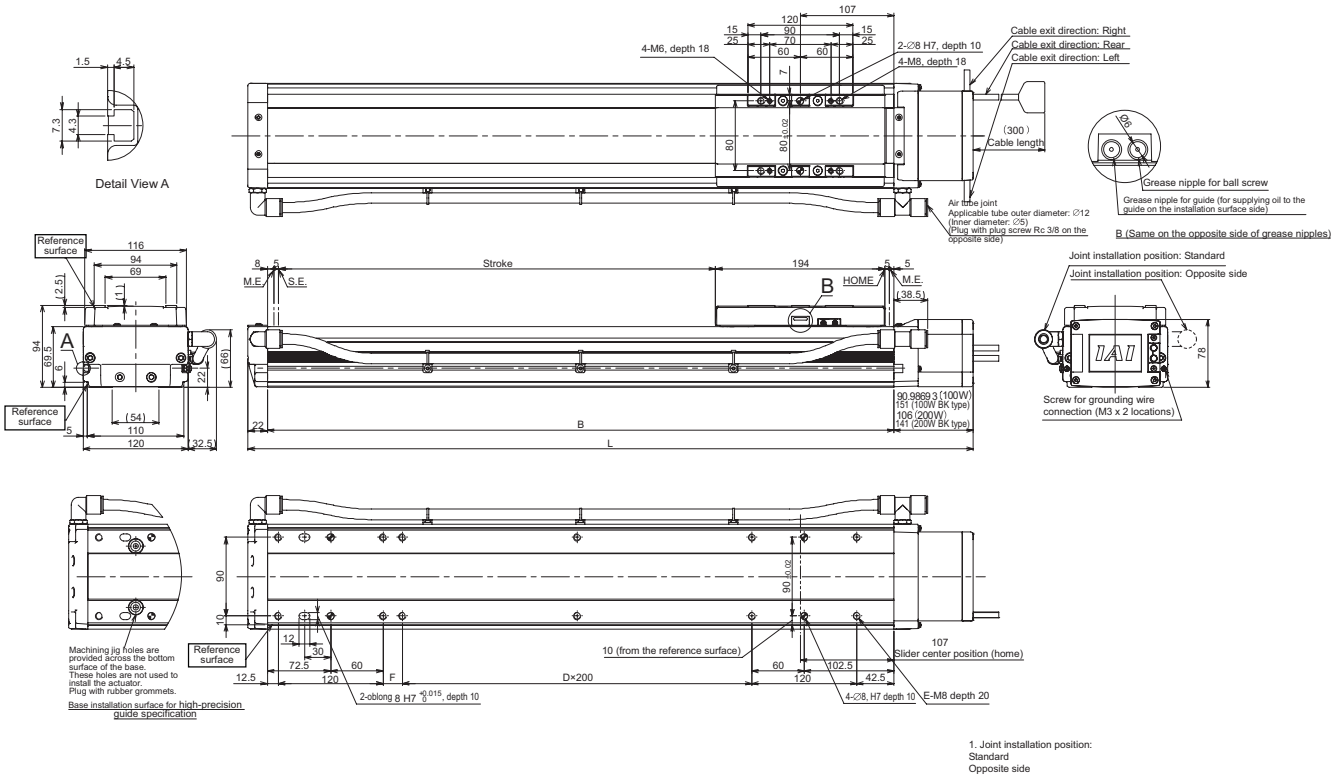
Stroke	L				B	D	E	F	Weight [kg]			
	200 W motor		400 W motor						200 W motor		400 W motor	
	Without brake	With brake	Without brake	With brake					Without brake	With brake	Without brake	With brake
1000	1489	1523	1511	1545	1350	4	16	173.5	29.7	30.2	30.1	30.6
1100	1589	1623	1611	1645	1450	5	18	73.5	31.4	31.9	31.8	32.3
1200	1689	1723	1711	1745	1550	5	18	173.5	33.2	33.7	33.6	34.1
1300	1789	1823	1811	1845	1650	6	20	73.5	35.0	35.5	35.4	35.9
1400	1889	1923	1911	1945	1750	6	20	173.5	36.7	37.2	37.1	37.6
1500	1989	2023	2011	2045	1850	7	22	73.5	38.5	39.0	38.9	39.4
1600	2089	2123	2111	2145	1950	7	22	173.5	40.2	40.7	40.6	41.1

15.1.6 ISDBCR, ISPDBCR-S



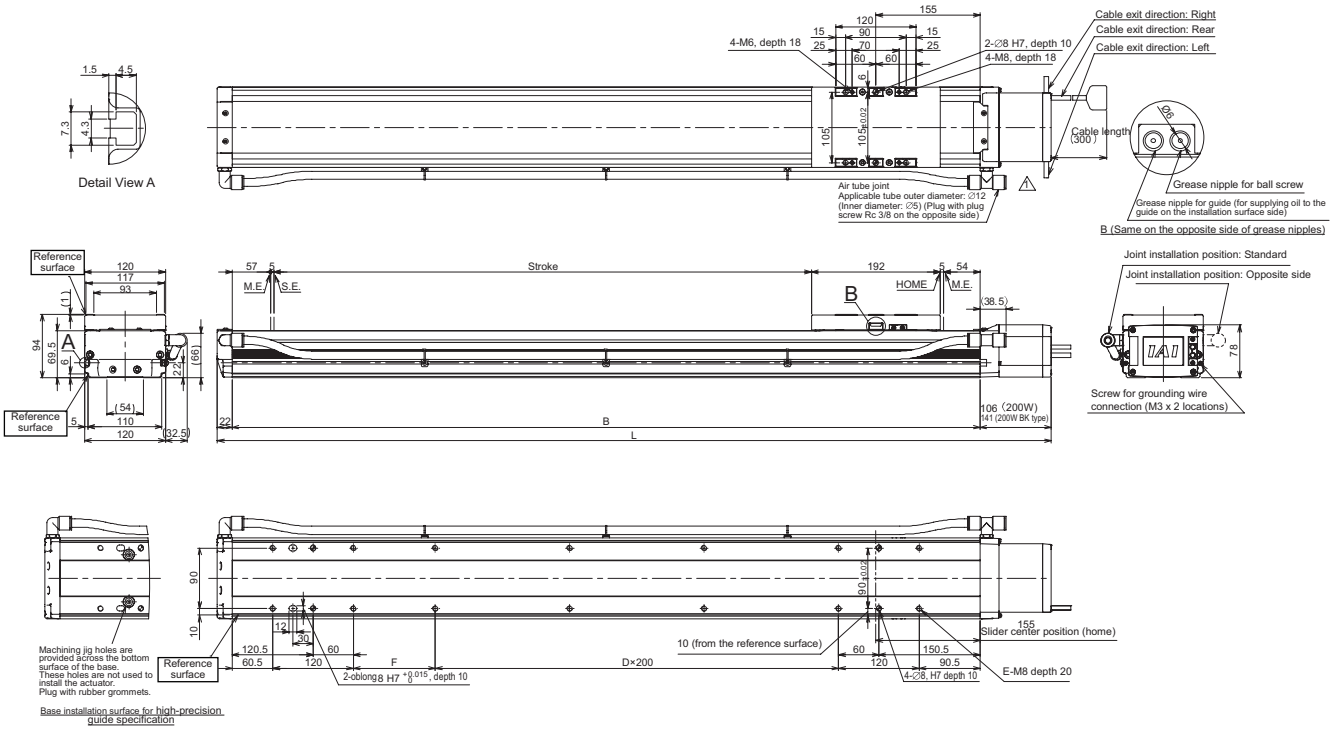
Stroke	L		B	D	E	F	Weight [kg]	
	50 W motor						50 W motor	
	Without brake	With brake					Without brake	With brake
100	382.5	417.5	278	0	8	45	4.2	4.4
150	432.5	167.5	328	0	8	95	4.5	4.7
200	482.5	517.5	378	0	8	145	4.9	5.1
250	532.5	567.5	428	0	8	195	5.2	5.4
300	582.5	617.5	478	1	10	45	5.6	5.8
350	632.5	667.5	528	1	10	95	6.0	6.2
400	682.5	717.5	578	1	10	145	6.3	6.5
450	732.5	767.5	628	1	10	195	6.7	6.9
500	782.5	817.5	678	2	12	45	7.0	7.2
550	832.5	887.5	728	2	12	95	7.4	7.6
600	882.5	917.5	778	2	12	145	7.8	8.0
650	932.5	967.5	828	2	12	195	8.1	8.3
700	982.5	1017.5	878	3	14	45	8.5	8.7
750	1032.5	1067.5	928	3	14	95	8.9	9.1
800	1082.5	1117.5	978	3	14	145	9.2	9.4

15.1.7 ISDBCR, ISPDBCR-M



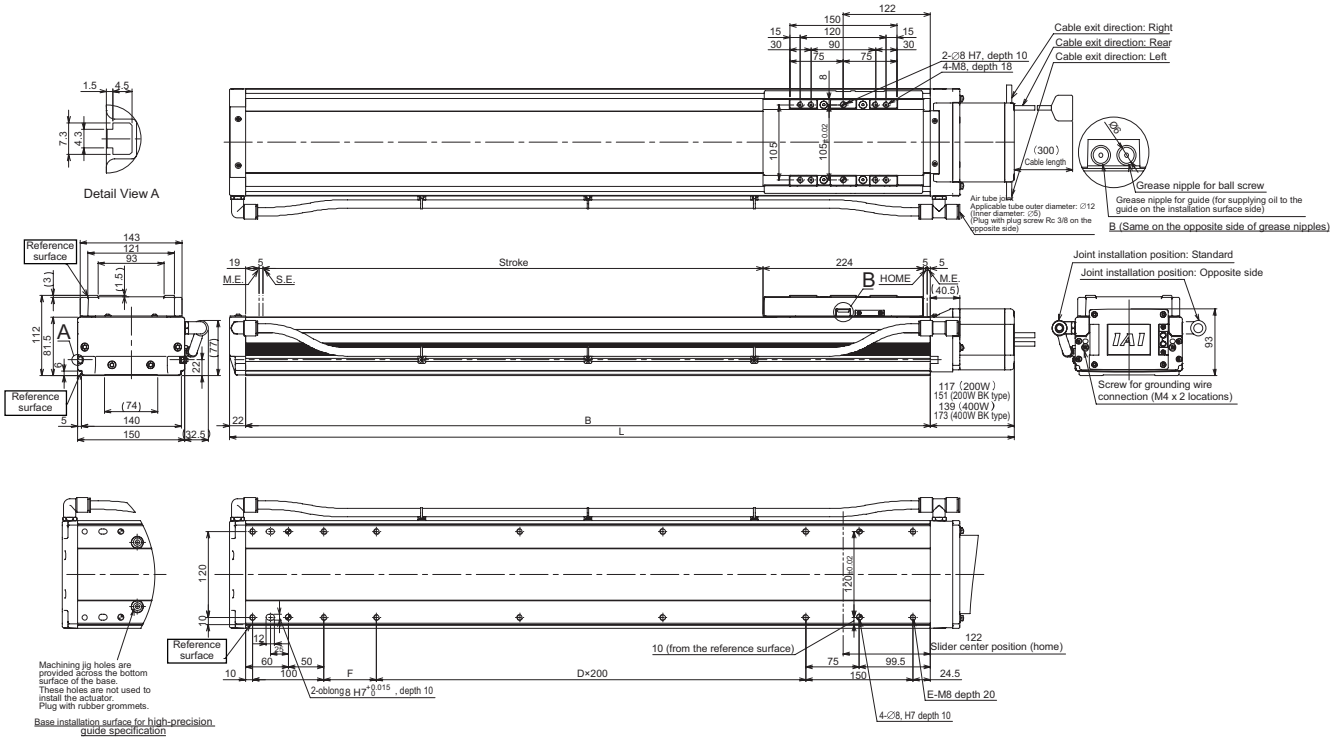
Stroke	L				B	D	E	F	Weight [kg]			
	100 W motor		200 W motor						100 W motor		200 W motor	
	Without brake	With brake	Without brake	With brake					Without brake	With brake	Without brake	With brake
100	430	454	445	480	317	0	8	22	7.6	7.9	8.0	8.4
150	480	504	495	530	367	0	8	72	8.2	8.5	8.6	9.0
200	530	554	545	580	417	0	8	122	8.8	9.1	9.2	9.6
250	580	604	595	630	467	0	8	172	9.5	9.8	9.9	10.3
300	630	654	645	680	517	1	10	22	10.1	10.4	10.5	10.9
350	680	704	695	730	567	1	10	72	10.7	11.0	11.1	11.5
400	730	754	745	780	617	1	10	122	11.3	11.6	11.7	12.1
450	780	804	795	830	667	1	10	172	12.0	12.3	12.4	12.8
500	830	854	845	880	717	2	12	22	12.6	12.9	13.0	13.4
550	880	904	895	930	767	2	12	72	13.2	13.5	13.6	14.0
600	930	954	945	980	817	2	12	122	13.9	14.2	14.3	14.7
650	980	1004	995	1030	867	2	12	172	14.5	14.8	14.9	15.3
700	1030	1054	1045	1080	917	3	14	22	15.1	15.4	15.5	15.9
750	1080	1104	1095	1130	967	3	14	72	15.7	16.0	16.1	16.5
800	1130	1154	1145	1180	1017	3	14	122	16.4	16.7	16.8	17.2
850	1180	1204	1195	1230	1067	3	14	172	17.0	17.3	17.4	17.8
900	1230	1254	1245	1280	1117	4	16	22	17.6	19.9	18.0	18.4
950	1280	1304	1295	1330	1167	4	16	72	18.2	18.5	18.6	19.0
1000	1330	1354	1345	1380	1217	4	16	122	18.9	19.2	19.3	19.7
1050	1380	1404	1395	1430	1267	4	16	172	19.5	19.8	19.9	20.3
1100	1430	1454	1445	1480	1317	5	18	22	20.1	20.4	20.5	20.9

15.1.8 ISDBCR, ISPDBCR-MX



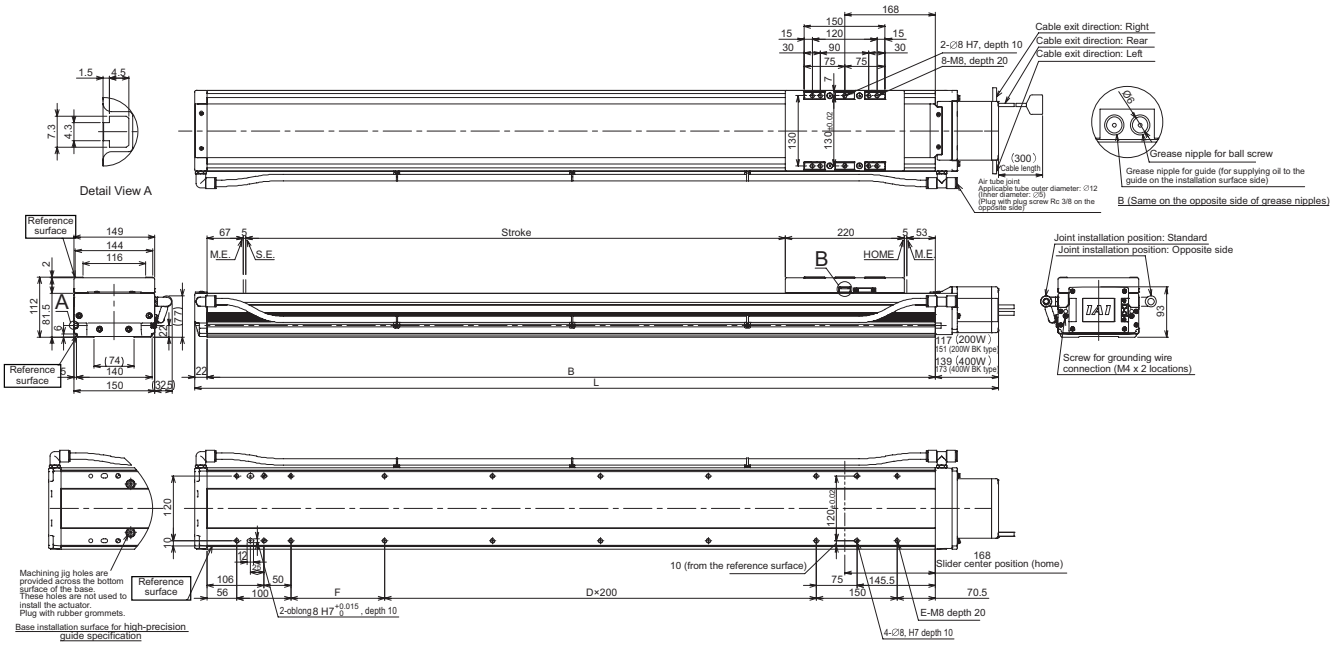
Stroke	L		B	D	E	F	Weight [kg]	
	200 W motor						200 W motor	
	Without brake	With brake					Without brake	With brake
800	1241	1276	1113	3	14	122	18.5	19.0
900	1341	1376	1213	3	14	222	19.8	20.3
1000	1441	1476	1313	4	16	122	21.0	21.5
1100	1541	1576	1413	4	16	222	22.3	22.8
1200	1641	1676	1513	5	18	122	23.6	24.1
1300	1741	1776	1613	5	18	222	24.6	25.1
1400	1841	1876	1713	6	20	122	26.2	26.7
1500	1941	1976	1813	6	20	222	27.4	27.9
1600	2041	2076	1913	7	22	122	28.7	29.2
1700	2141	2176	2013	7	22	222	30.0	30.5
1800	2241	2276	2113	8	24	122	31.3	31.8
1900	2341	2376	2213	8	24	222	32.5	33.0
2000	2441	2476	2313	9	26	122	33.8	34.3

15.1.9 ISDBCR, ISPDBCR-L



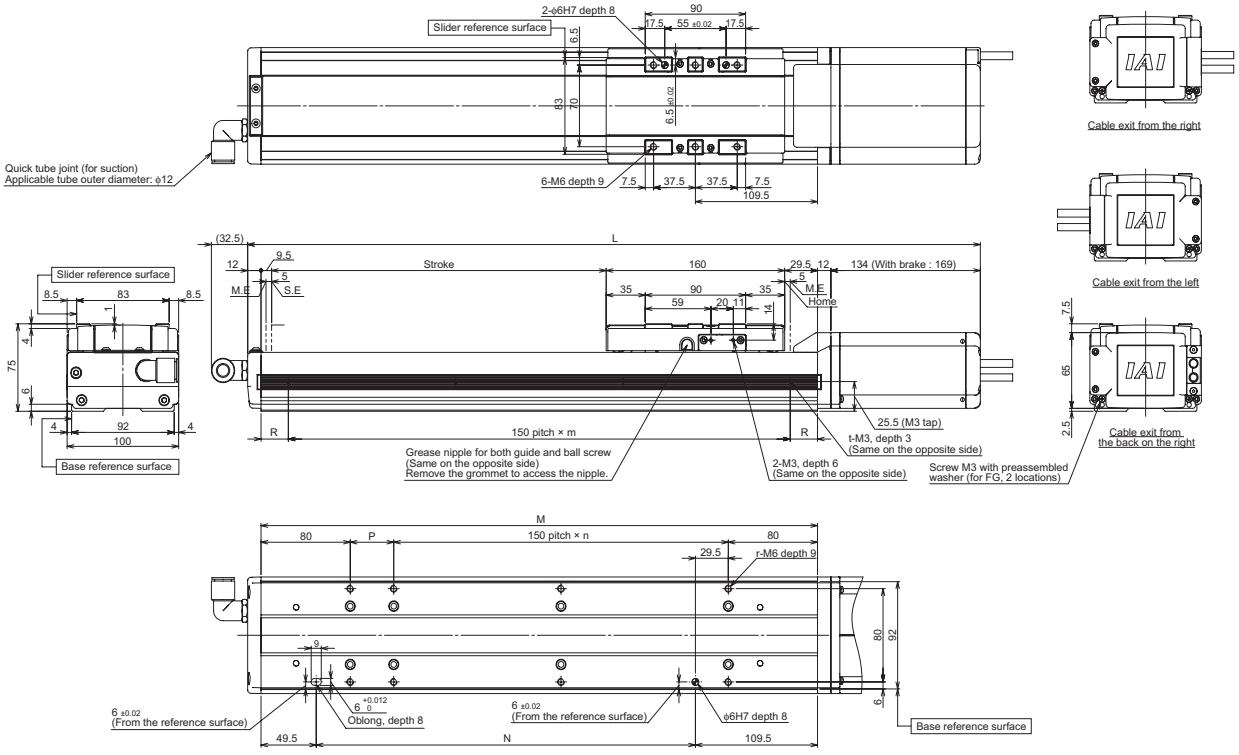
Stroke	L				B	D	E	F	Weight [kg]			
	200 W motor		400 W motor						200 W motor		400 W motor	
	Without brake	With brake	Without brake	With brake					Without brake	With brake	Without brake	With brake
100	497	531	519	553	358	0	8	73.5	11.9	12.4	12.3	12.8
150	547	581	569	603	408	0	8	123.5	12.7	13.2	13.1	13.6
200	597	631	619	653	458	0	8	173.5	13.6	14.1	14.0	14.5
250	647	681	669	703	508	1	10	23.5	14.4	14.9	14.8	15.3
300	697	731	719	753	558	1	10	73.5	15.3	15.8	15.7	16.2
350	747	781	769	803	608	1	10	123.5	16.2	16.7	16.6	17.1
400	797	831	819	853	658	1	10	173.5	17.0	17.5	17.4	17.9
450	847	881	869	903	708	2	12	23.5	17.9	18.4	18.3	18.8
500	897	931	919	953	758	2	12	73.5	18.7	19.2	19.1	19.6
550	947	981	969	1003	808	2	12	123.5	19.6	20.1	20.0	20.5
600	997	1031	1019	1053	858	2	12	173.5	20.4	20.9	20.8	21.3
650	1047	1081	1069	1103	908	3	14	23.5	21.3	21.8	21.7	22.2
700	1097	1131	1119	1153	958	3	14	73.5	22.1	22.6	22.5	23.0
750	1147	1181	1169	1203	1008	3	14	123.5	23.0	23.5	23.4	23.9
800	1197	1231	1219	1253	1058	3	14	173.5	23.9	24.4	24.3	24.8
850	1247	1281	1269	1303	1108	4	16	23.5	24.7	25.2	25.1	25.6
900	1297	1331	1319	1353	1158	4	16	73.5	25.6	26.1	26.0	26.5
950	1347	1381	1369	1403	1208	4	16	123.5	26.4	26.9	26.8	27.3
1000	1397	1431	1419	1453	1258	4	16	173.5	27.3	27.8	27.7	28.2
1050	1447	1481	1469	1503	1308	5	18	23.5	28.1	28.6	28.5	29.0
1100	1497	1531	1519	1553	1358	5	18	73.5	29.0	29.5	29.4	29.9
1150	1547	1581	1569	1603	1408	5	18	123.5	29.8	30.3	30.2	30.7
1200	1597	1631	1619	1653	1458	5	18	173.5	30.7	31.2	31.1	31.6
1250	1647	1681	1669	1703	1508	6	20	23.5	31.5	32.0	31.9	32.4
1300	1697	1731	1719	1753	1558	6	20	73.5	32.4	32.9	32.8	33.3

15.1.10 ISDBCR, ISPDBCR-LX



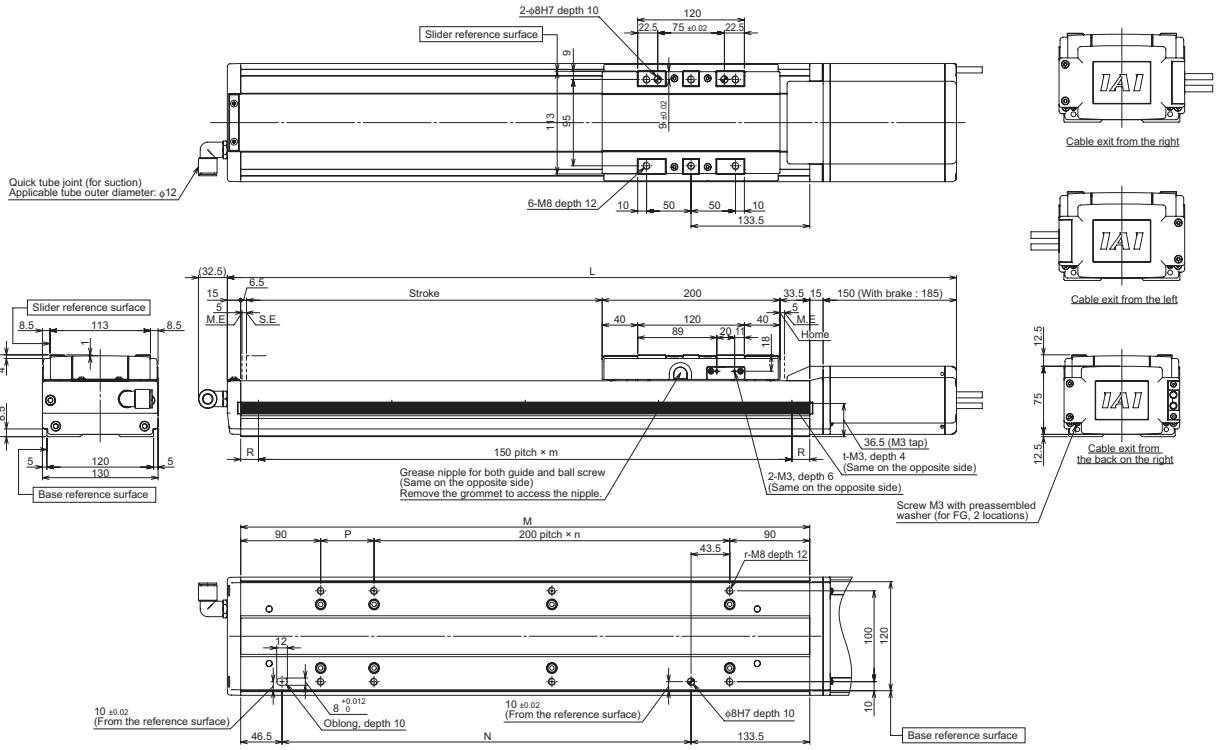
Stroke	L				B	D	E	F	Weight [kg]			
	200 W motor		400 W motor						200 W motor		400 W motor	
	Without brake	With brake	Without brake	With brake					Without brake	With brake	Without brake	With brake
1000	1489	1523	1511	1545	1350	4	16	173.5	29.8	30.3	30.2	30.7
1100	1589	1623	1611	1645	1450	5	18	73.5	31.5	32.0	31.9	32.4
1200	1689	1723	1711	1745	1550	5	18	173.5	33.2	33.7	33.6	34.1
1300	1789	1823	1811	1845	1650	6	20	73.5	35.0	35.5	35.4	35.9
1400	1889	1923	1911	1945	1750	6	20	173.5	36.7	37.2	37.1	37.6
1500	1989	2023	2011	2045	1850	7	22	73.5	38.4	38.9	38.8	39.3
1600	2089	2123	2111	2145	1950	7	22	173.5	40.2	40.7	40.6	41.1
1700	2189	2223	2211	2245	2050	8	24	73.5	41.9	42.4	42.3	42.8
1800	2289	2323	2311	2345	2150	8	24	173.5	43.6	44.1	44.0	44.5
1900	2389	2423	2411	2445	2250	9	26	73.5	45.4	45.9	45.8	46.3
2000	2489	2523	2511	2545	2350	9	26	173.5	47.1	47.6	47.5	48.0
2100	2589	2623	2611	2645	2450	10	28	73.5	48.8	49.3	49.2	49.7
2200	2689	2723	2711	2745	2550	10	28	173.5	50.6	51.1	51.0	51.5
2300	2789	2623	2811	2845	2650	11	30	73.5	52.3	52.8	52.7	53.2
2400	2889	2923	2911	2945	1750	11	30	173.5	54.0	54.5	54.4	54.9
2500	2989	3023	3011	3045	2850	12	32	73.5	55.8	56.3	56.2	56.7

15.1.11 SSPDACR-S



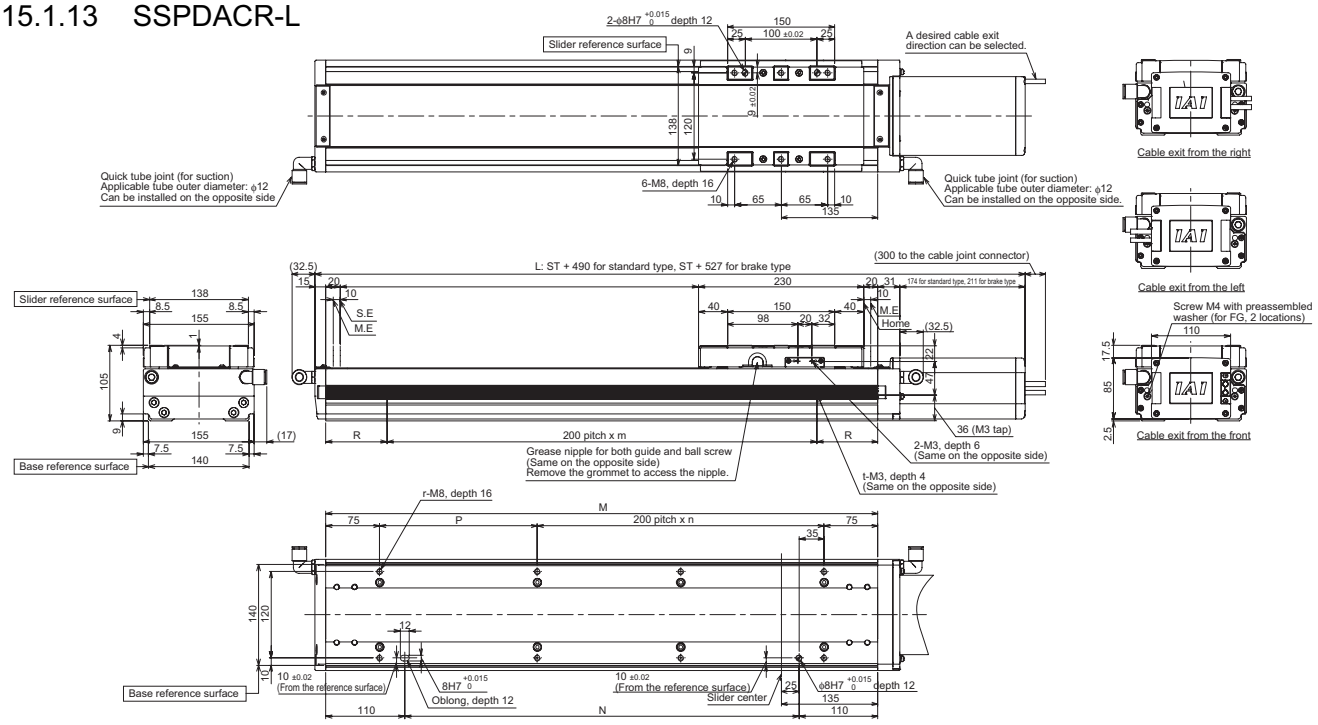
Stroke	L		M	N	P	R	m	n	r	t	Weight [kg]	
	Without brake	With brake									Without brake	With brake
100	457	492	299	140	139	74.5	1	0	4	2	7.5	8.1
150	507	542	349	190	39	24.5	2	1	6	3	8.1	8.7
200	557	592	399	240	89	49.5	2	1	6	3	8.7	9.3
250	607	642	449	290	139	74.5	2	1	6	3	9.3	9.9
300	657	692	499	340	39	24.5	3	2	8	4	10.0	10.6
350	707	742	549	390	89	49.5	3	2	8	4	10.6	11.2
400	757	792	599	440	139	74.5	3	2	8	4	11.2	11.8
450	807	842	649	490	39	24.5	4	3	10	5	11.8	12.4
500	857	892	699	540	89	49.5	4	3	10	5	12.4	13.0
550	907	942	749	590	139	74.5	4	3	10	5	13.0	13.6
600	957	992	799	640	39	24.5	5	4	12	6	13.7	14.3
650	1007	1042	849	690	89	49.5	5	4	12	6	14.3	14.9
700	1057	1092	899	740	139	74.5	5	4	12	6	14.9	15.5
750	1107	1142	949	790	39	24.5	6	5	14	7	15.5	16.1
800	1157	1192	999	840	89	49.5	6	5	14	7	16.1	16.7
850	1207	1242	1049	890	139	74.5	6	5	14	7	16.7	17.3
900	1257	1292	1099	940	39	24.5	7	6	16	8	17.3	17.9
950	1307	1342	1149	990	89	49.5	7	6	16	8	18.0	18.6
1000	1357	1392	1199	1040	139	74.5	7	6	16	8	18.6	19.2
1050	1407	1442	1249	1090	39	24.5	8	7	18	9	19.2	19.8
1100	1457	1492	1299	1140	89	49.5	8	7	18	9	19.8	20.4

15.1.12 SSPDACR-M



Stroke	L		M	N	P	R	m	n	r	t	Weight [kg]	
	Without brake	With brake									Without brake	With brake
100	520	555	340	160	160	20	2	0	4	3	13.9	14.5
150	570	605	390	210	210	45	2	0	4	3	15.0	15.6
200	620	655	440	260	60	70	2	1	6	3	16.0	16.6
250	670	705	490	310	110	20	3	1	6	4	17.1	17.7
300	720	755	540	360	160	45	3	1	6	4	18.1	18.7
350	770	805	590	410	210	70	3	1	6	4	19.2	19.8
400	820	855	640	460	60	20	4	2	8	5	20.2	20.8
450	870	905	690	510	110	45	4	2	8	5	21.3	21.9
500	920	955	740	560	160	70	4	2	8	5	22.3	22.9
550	970	1005	790	610	210	20	5	2	8	6	23.4	24.0
600	1020	1055	840	660	60	45	5	3	10	6	24.4	25.0
650	1070	1105	890	710	110	70	5	3	10	6	25.5	26.1
700	1120	1155	940	760	160	20	6	3	10	7	26.5	27.1
750	1170	1205	990	810	210	45	6	3	10	7	27.6	28.2
800	1220	1255	1040	860	60	70	6	4	12	7	28.7	29.3
850	1270	1305	1090	910	110	20	7	4	12	8	29.7	30.3
900	1320	1355	1140	960	160	45	7	4	12	8	30.8	31.4
950	1370	1405	1190	1010	210	70	7	4	12	8	31.8	32.4
1000	1420	1455	1240	1060	60	20	8	5	14	9	32.9	33.5
1050	1470	1505	1290	1110	110	45	8	5	14	9	33.9	34.5
1100	1520	1555	1340	1160	160	70	8	5	14	9	35.0	35.6
1150	1570	1605	1390	1210	210	20	9	5	14	10	36.0	36.6
1200	1620	1655	1440	1260	60	45	9	6	16	10	37.1	37.7
1250	1670	1705	1490	1310	110	70	9	6	16	10	38.1	38.7
1300	1720	1755	1540	1360	160	20	10	6	16	11	39.2	39.8

15.1.13 SSPDACR-L



Stroke	L		M	N	P	R	m	n	r	t	Weight [kg]	
	Without brake	With brake									Without brake	With brake
100	590	627	370	150	220	85	1	0	4	2	24	25
150	640	677	420	200	70	10	2	1	6	3	26	27
200	690	727	470	250	120	35	2	1	6	3	28	29
250	740	777	520	300	170	60	2	1	6	3	29	30
300	790	827	570	350	220	85	2	1	6	3	31	32
350	840	877	620	400	70	10	3	2	8	4	32	33
400	890	927	670	450	120	35	3	2	8	4	34	35
450	940	977	720	500	170	60	3	2	8	4	36	37
500	990	1027	770	550	220	85	3	2	8	4	37	38
550	1040	1077	820	600	70	10	4	3	10	5	39	40
600	1090	1127	870	650	120	35	4	3	10	5	40	41
650	1140	1177	920	700	170	60	4	3	10	5	42	43
700	1190	1227	970	750	220	85	4	3	10	5	44	45
750	1240	1277	1020	800	70	10	5	4	12	6	45	46
800	1290	1327	1070	850	120	35	5	4	12	6	47	48
850	1340	1377	1120	900	170	60	5	4	12	6	48	49
900	1390	1427	1170	950	220	85	5	4	12	6	50	51
950	1440	1477	1220	1000	70	10	6	5	14	7	52	53
1000	1490	1527	1270	1050	120	35	6	5	14	7	53	54
1050	1540	1577	1320	1100	170	60	6	5	14	7	55	56
1100	1590	1627	1370	1150	220	85	6	5	14	7	56	57
1150	1640	1677	1420	1200	70	10	7	6	16	8	58	59
1200	1690	1727	1470	1250	120	35	7	6	16	8	60	61
1250	1740	1827	1570	1350	220	85	7	6	16	8	61	62
1300	1790	1827	1570	1350	220	85	7	6	16	8	63	64
1350	1840	1877	1620	1400	70	10	8	7	18	9	65	66
1400	1890	1927	1670	1450	120	35	8	7	18	9	66	67
1450	1940	1977	1720	1500	170	60	8	7	18	9	68	69
1500	1990	2027	1770	1550	220	85	8	7	18	9	70	71

16. Warranty

16.1 Warranty Period

One of the following periods, whichever is shorter:
- 18 months after shipment from our company
- 12 months after delivery to the specified location
- 2,500 hours of operation

16.2 Scope of 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 operation manual and catalog.
(4) The breakdown or problem in question was caused by a specification defect or problem, or by the poor quality of 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.

16.3 Honoring the Warranty

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

16.4 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.

16.5 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 operation manual.

16.6 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
July 2011	First edition
October 2011	Second edition A page for CE Marking added
November 2011	Third edition Contents changed in Safety Guide Caution notes added for when working with two or more persons SSPDACR-S and M added Pg. 37 The description “there is no rust-proof treatment conducted” was deleted since SSPDACR is treated with rust-proof process in standard.
March 2012	Fourth edition Pg. 31, 37 ISDB, ISPDB, ISDBCR and ISPDBCR Note changed to 1.8 times more of the nominal diameter for the length of thread engagement Pg. 59 “This is an option limited to the high-precision specifications (ISPDB/ISPDBCR/SSPDACR).” deleted Note added to tell the straightness is 0.025mm for all with stroke 500mm or less unless the model is the high-precision specifications one.
March 2012	Fifth edition Pg. 1 to 7 Contents added and changed in Safety Guide Pg. 8 Note “Make sure to attach the actuator properly by following this operation manual.” added in Caution in Handling Pg. 68 Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care. Pg. 90 to 102 Weight added to external dimensions
May 2012	Sixth edition Pg. 31 to 34 Description regarding through holes for SSPDACR deleted because they are lidded to keep the cleanliness
January 2013	Seventh edition Pg. 44 Correction made to some area in items to be prohibited in handling of cables Pg. 45 Calculation formula added for when commanded acceleration speed is higher than rated acceleration speed

Revision Date	Description of Revision
December 2013	Eighth edition Pg. 85 Note corrected In table N•m → N•cm

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