

IS Series Actuator

ISWA, ISPWA

Instruction Manual Eighth Edition ME3688-8M



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Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

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

Please download the user' s manual from our website.

You can download it free of charge. User registration is required for the first time downloading.

URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.



International Standards Compliances

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

CE Marking	RoHS3 Directive
<input type="checkbox"/>	<input type="checkbox"/>

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Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it 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	<ul style="list-style-type: none"> ● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. <ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> 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	<ul style="list-style-type: none"> ● 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 instruction 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	<ul style="list-style-type: none"> ● 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	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> ● 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. <ol style="list-style-type: none"> 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	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> ● 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. <p>(3) Grounding</p> <ul style="list-style-type: none"> ● 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 (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure 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 standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).





No.	Operation Description	Description
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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. <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>

No.	Operation Description	Description
6	Trial Operation	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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 instruction 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 removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. <p>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.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> ● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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 instruction 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 instruction 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

Precautions in Handling

1. Do not establish the speed or acceleration/deceleration settings beyond the rated values.

Please do not establish the speed or acceleration/deceleration settings beyond the rated values. It may cause an occurrence of vibration, malfunction, or shorten the product life.

When having the actuator run to synchronize the multi axes, adjust the speed setting to the axis with the maximum speed and the acceleration/deceleration to the axis with the minimum acceleration/deceleration.

Setting especially the acceleration/deceleration beyond the rated values may cause a creep or a slip of the coupling.

2. Set the allowable load moment within the allowable range.

Make sure to set the allowable load moment within the allowable range. If a load beyond the range is applied, it may shorten the product life. An extremely high load may cause breakdown.

3. Set the overhang load length within the allowable range.


It is a reference for offset that enables an actuator to operate smoothly when a workpiece or bracket is offset from the actuator slider.

Overhang load length above the allowable range may cause vibration or abnormal noise.

4. Use the product with the duty below 50%.

Please use the product with the duty below 50%. A use with duty that exceeds 50% may cause overload or generate heat on motor. If the duty is extremely high, it may cause the motor to be damaged.

$$\text{Duty (\%)} = (\text{Continuous Operation} / (\text{Continuous Operation} + \text{Stop Duration})) / 100$$

 CAUTION: If an overload error occurs even with the duty less than 50%, try to either extend the stop duration to lower the duty or lower the acceleration/deceleration speed.

5. Moving the actuator back and forth in a short distance may cause wear of grease.

Continuous back and forth operation within a distance less than 30mm may cause wear of grease. It is recommended to have 5 rounds of back and forth operation in a distance more than 50mm after every 5,000 to 10,000 rounds of the short distance operation. A layer of the grease will recover.

6. Make sure to attach the actuator properly by following this instruction manual.

Using the product with the actuator not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.

7. Transportation

7.1 Handling of Single Axis Type

Exercise precaution to the following when transporting an actuator by itself.

7.1.1 Handling the Packed Unit

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

- Do not damage or drop. The package is not supplied with any special treatment that enables it to resist an impact caused by a drop or crash.
- The operator should not carry heavy shipping boxes by themselves. Consider an appropriate method for transportation.
- If the package is to be left standing, it should be in a horizontal position. Follow the instruction if there is any for the packaging condition.
- Do not climb on top of the package.
- Do not put any load that may cause a deformation or breakage of the package.

7.1.2 Handling of Unpackaged Product

- Do not carry the actuator by holding the cable, or do not move it by pulling the cable.
- Hold the body base when transporting the actuator.
- When carrying the actuator, exercise caution not to bump it against nearby objects or structures.
- Do not exert an excessive force on any part of the actuator.

7.2 Handling of Multi-Axes Type

Exercise precaution to the following when transporting the multi-axes.

7.2.1 Handling the Packed Unit

Multi-axes type will be delivered in a package with an outer case fixed to a wooden base. Sliders are fixed so they would not accidentally move while in transportation. The tip of the actuator is also fixed to avoid it swinging by external vibration.

- Do not damage or drop. The package is not supplied with any special treatment that enables it to resist an impact caused by a drop or crash.
- The operator should not carry heavy shipping boxes by themselves. Consider an appropriate method for transportation.
- When suspending the package using ropes, pass the ropes from underneath the reinforcement frames at the bottom of the base. When lifting with a forklift, also place the forks underneath the base.
- Do not apply an impact on the package or let it bounce when putting it down.
- Do not climb on top of the shipping box.
- Do not put any load that may cause a deformation or breakage of the package.

7.2.2 Handling of Unpackaged Product

- Secure the sliders to prevent sudden movement during transport.
- If any tip of the actuator is overhanging, secure it properly to avoid significant movement due to external vibration.
- If the actuator assembly is transported without the tips being secured, do not apply impact of 0.3G or more.
- In the case that the product needs to be carried up with ropes or another method, be sure to use an appropriate cushioning to avoid the actuator being deformed or putting on an excessive pressure. And also, be sure to keep the product in a stable and horizontal posture. Utilize the tapped holes on the bottom of the base to attach a tool to suspend the product if necessary.
- 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.

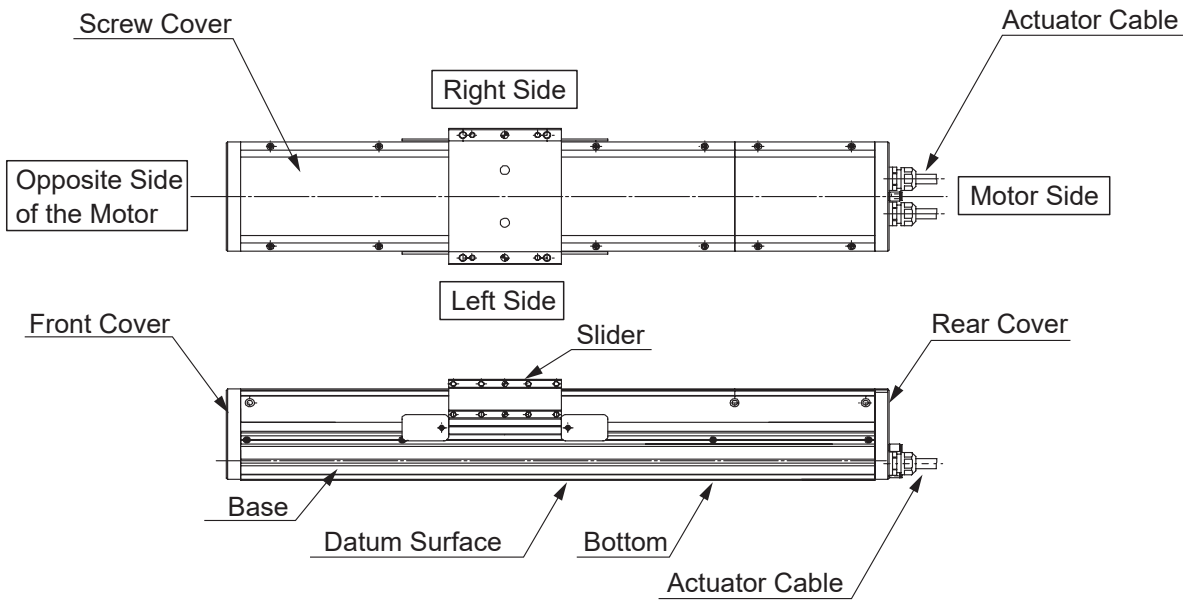
7.3 Handling of Product Mounted to Mechanical Equipment (System)

Exercise precaution to the following when the whole mechanical equipment (system) that the actuator is mounted on needs to be transported.

- Secure the sliders to prevent sudden movement during transport.
- If any tip of the actuator is overhanging, secure it properly to avoid significant movement due to external vibration.
- If the actuator assembly is transported without the tips being secured, do not apply impact of 0.3G or more.
- When suspending the mechanical equipment (system) with ropes, avoid applying force to the actuator, connector box, etc. Also, do not allow the cable to be pinched or deformed excessively.

Names of the Parts


In this manual, the right and left of the actuator is indicated with the view from the motor side when the actuator is placed horizontally as shown below.



*Refer to [11.1 External Dimensions] for the detail of the datum surface.

1. Product Check

This product is comprised of the following parts if it is of standard configuration.

 **CAUTION:** Check the packing list to confirm what is in the package. If you find any fault in the contained model or any missing parts, contact us or our distributor.

1.1 Parts

No.	Part Name	Model Number	Remarks
1	Main Body	"How to read the model plate", "How to read the model No."	
Accessories			
2	Home Position Marking Sticker		
3	Safety Guide	M0194	

1.2 Instruction Manuals for Controllers Relevant to This Product

(1) XSEL-P/Q, XSEL-RA/SA Controller

No.	Name	Manual No
1	XSEL-P/Q Controller Instruction Manual	ME0148
2	XSEL-RA/SA Controller Instruction Manual	ME0359
3	XSEL-P/Q/PX/QX RC-Gateway Function Instruction Manual	ME0188
4	PC Software IA-101-X-MW/IA-101-X-USBMW Instruction Manual	ME0154
5	Touch Panel Teaching TB-03 Applicable for Program Controller Instruction Manual	ME0377
6	Touch Panel Teaching TB-02, TB-02D Applicable for Program Controller Instruction Manual	ME0356
7	Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Program Controller Instruction Manual	ME0325
8	Teaching Pendant SEL-T/TD/TG Instruction Manual	ME0183
9	DeviceNet Instruction Manual	ME0124
10	CC-Link Instruction Manual	ME0123
11	PROFIBUS-DP Instruction Manual	ME0153

(2) SSEL Controller

No.	Name	Manual No
1	SSEL Controller Instruction Manual	ME0157
2	PC Software IA-101-X-MW/IA-101-X-USBMW Instruction Manual	ME0154
3	Touch Panel Teaching TB-03 Applicable for Program Controller Instruction Manual	ME0377
4	Touch Panel Teaching TB-02, TB-02D Applicable for Program Controller Instruction Manual	ME0356
5	Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Program Controller Instruction Manual	ME0325
6	Teaching Pendant SEL-T/TD/TG Instruction Manual	ME0183
7	DeviceNet Instruction Manual	ME0124
8	CC-Link Instruction Manual	ME0123
9	PROFIBUS-DP Instruction Manual	ME0153

(3) RSEL System

No.	Name	Manual No
1	RSEL System Instruction Manual	ME0392
2	PC Software IA-101-X-MW/IA-101-X-USBMW (RSEL Edition) Instruction Manual	ME0398
3	Touch Panel Teaching TB-03 Applicable for Program Controller Instruction Manual	ME0377
4	Touch Panel Teaching TB-02, TB-02D Applicable for Program Controller Instruction Manual	ME0356

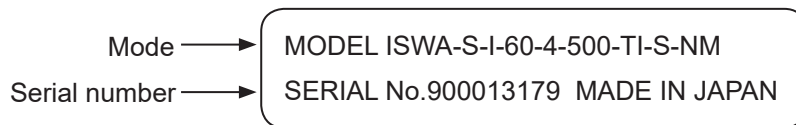
(4) SCON Controller Related

No.	Name	Manual No
1	SCON Controller Instruction Manual	ME0161
2	SCON-CA Controller Instruction Manual	ME0243
3	SCON-CB/CGB Instruction Manual	ME0340
4	PC Software RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
5	Touch Panel Teaching TB-03 Applicable for Position Controller Instruction Manual	ME0376
6	Touch Panel Teaching TB-02, TB-02D Applicable for Position Controller Instruction Manual	ME0355
7	Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Position Controller Instruction Manual	ME0324
8	Teaching Pendant CON-T/TG Instruction Manual	ME0178
9	Touch Panel Teaching CON-PT/PD/PG Instruction Manual	ME0227
10	DeviceNet Instruction Manual (SCON-C)	ME0124
11	CC-Link Instruction Manual (SCON-C)	ME0123
12	PROFIBUS-DP Instruction Manual (SCON-C)	ME0153
13	DeviceNet Instruction Manual (SCON-CA/CB)	ME0256
14	CC-Link Instruction Manual (SCON-CA/CB)	ME0254
15	PROFIBUS-DP Instruction Manual (SCON-CA/CB)	ME0258

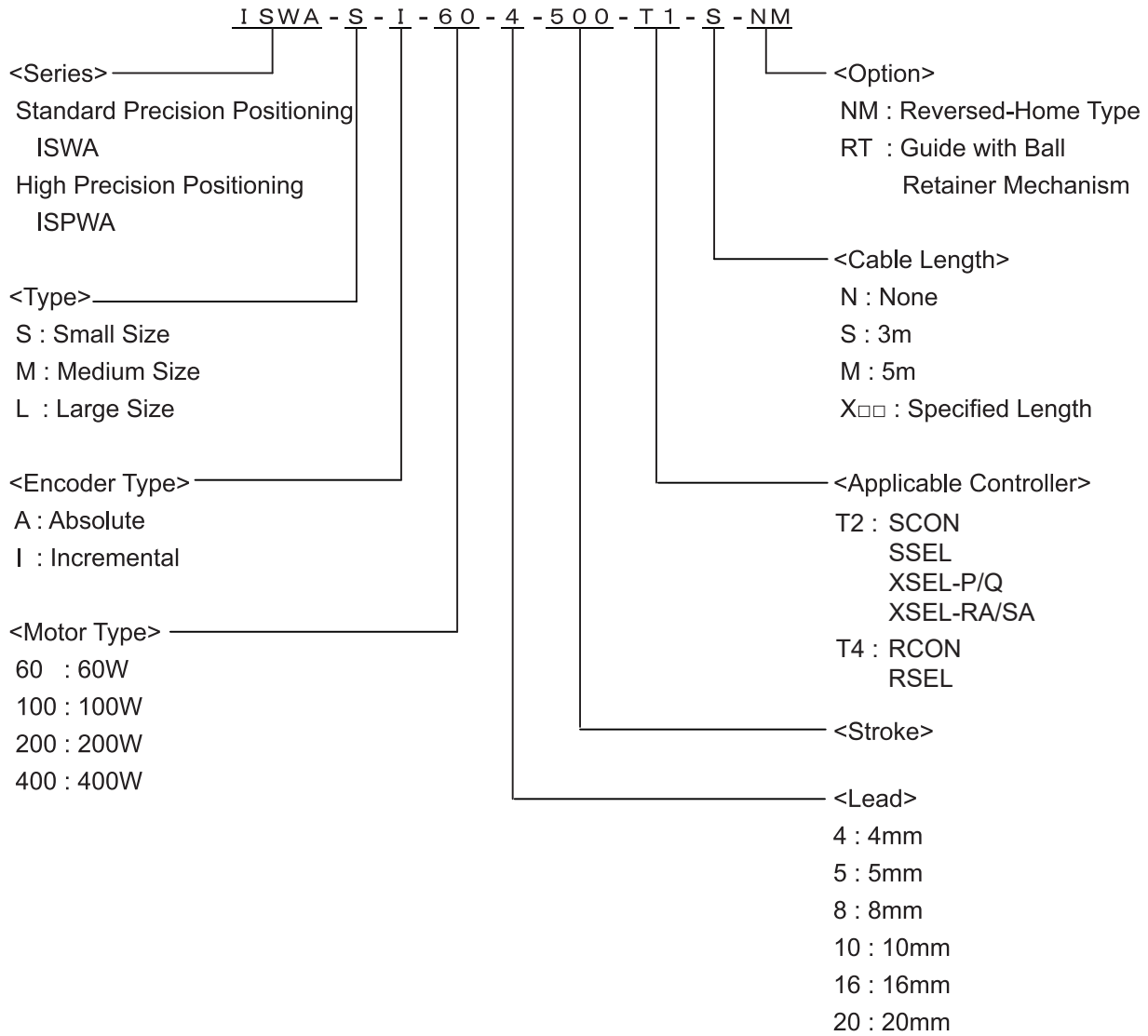
(5) RCON System

No.	Name	Manual No
1	RCON System Instruction Manual	ME0384
2	PC Software RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
3	Touch Panel Teaching TB-03 Applicable for Position Controller Instruction Manual	ME0376
4	Touch Panel Teaching TB-02, TB-02D Applicable for Position Controller Instruction Manual	ME0355

1.3 How to read the model plate



1.4 How to read the model No.



2. Specifications

(1) Maximum Speed

The maximum speed for the actuator is limited due to the resonance of the ball screw axis and the limitation of the number of motor rotation.

Make sure that the maximum speed of your actuator does not exceed the applicable limit specified in the table below.

Restriction in Stroke and Maximum Speed (unit: mm/s)

Type	Motor Capacity (W)	Lead (mm)	Stroke (mm)							
			<500	600	700	800	900	1000	1100	1200
S	60	4	200	190	-	-	-	-	-	-
		8	400	380	-	-	-	-	-	-
		16	800	760	-	-	-	-	-	-
M	100	5	250	225	180	150	125	-	-	
		10	500	455	365	300	250	-	-	
	200	10	500	455	365	300	250	-	-	
		20	1000	915	735	600	500	-	-	
L	200	10	500	465	380	320	270	230		
		20	1000	930	765	640	545	465		
	400	20	1000	930	765	640	545	465		



CAUTION: Please do not establish the speed settings beyond the rated values. It may cause an occurrence of vibration, malfunction, or shorten the product life. When having the actuator run to synchronize the multi axes, adjust the speed setting to the axis with the maximum speed and the acceleration/deceleration to the axis with the minimum acceleration/deceleration.

(2) Max. Acceleration Speed and Max. Transportable Weight

Type	Motor Output (W)	Lead (mm)	Maximum Acceleration(G)	Max. Transportable Weight (kg)
S	60	16	0.3	7
		8		20
		4		45
M	100	10	0.3	30
		5		70
	200	20	0.3	30
		10		70
L	200	20	0.3	30
		10		70
	400	20	0.3	70



CAUTION: 1. Even if the acceleration setting is less than the rated acceleration, transportable weight cannot be more than that guaranteed for the rated acceleration.
2. When having the actuator run to synchronize the multi axes, adjust the speed setting to the axis with the maximum speed and the acceleration/deceleration to the axis with the minimum acceleration/deceleration.

(3) Rated Thrust

Type	Motor Output (W)	Lead (mm)	Rated Thrust (N)
S	60	16	63.7
		8	127.4
		4	254.8
M	100	10	169.5
		5	340.1
	200	20	169.5
		10	340.1
L	200	20	169.5
		10	340.1
	400	20	340.1

(4) Driving Type

Type	Motor Output (W)	Lead (mm)	Driving Type		
				ISWA Series	ISPWA Series
S	60	16	Ball screw ϕ 12mm	Rolled C10	Rolled C5 or equiv
		8			
		4			
M	100	10	Ball screw ϕ 16mm	Rolled C10	Rolled C5 or equiv
		5			
	200	20			
		10			
L	200	20	Ball screw ϕ 20mm	Rolled C10	Rolled C5 or equiv
		10			
	400	20			

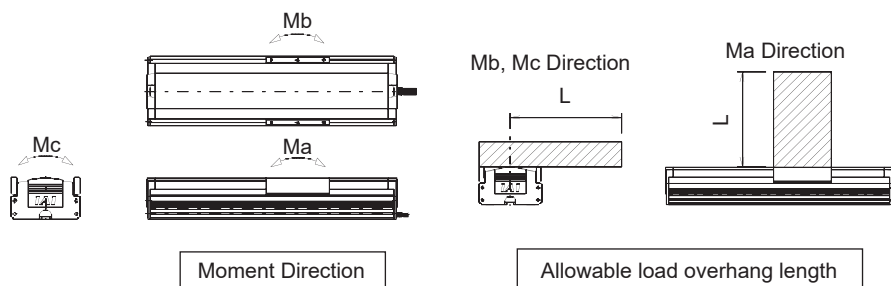
(5) Common Specifications

Item	ISWA Series	ISPWA Series
Positioning Accuracy Repeatability	$\pm 0.02\text{mm}$	$\pm 0.01\text{mm}$
Lost Motion	0.05mm or less	0.02mm or less
Base	Material: Aluminum, white anodizing	

(6) Load on the Actuator

Table below shows the dynamic allowable moment and allowable load overhang length for each actuator. Use the actuators within the allowable range.

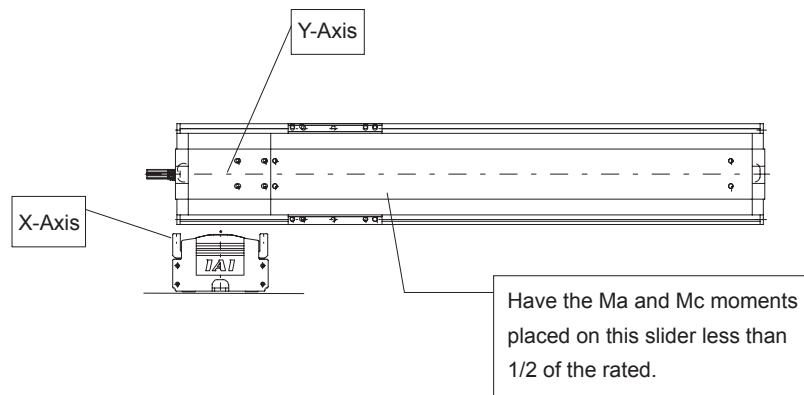
Actuator		Dynamic Allowable Moment (N•m)			Allowable Load Overhang Length (L)
		Ma(N•m)	Mb(N•m)	Mc(N•m)	
ISWA ISPWA	S	32.9	47.0	76.8	450
	M	81.0	116	189	600
	L	123	176	291	750



⚠ Caution : Do not have the load mounted on the actuator exceed the allowable load overhang length (L). If it is exceeded, it may cause an occurrence of vibration or longer operation time.

Using the actuator with the moment greater than the allowable moment applied may not only shorten the guide life, but also cause an occurrence of vibration or longer operation time.

: When using the axes cantilevered and X-Y combined, base body of the Y-axis has a risk to get deformed. Use under the condition of M_a and M_c moments less than 1/2 of the rated values.



The picture above shows IS(P)A-W as an example, however, also handle in the same manner for other actuators.

(7) Anti-Rust Electrolytically Black Colored Coating on Ball Screw and Stainless Steel Type Attachment Bolt

ISWA and ISPWA are applicable for anti-rust electrolytically black colored coating on ball screw and stainless steel type attachment bolt in standard.

It is unnecessary to select ball screw with anti-rust electrolytically black colored coating (Option No. M1) or stainless steel type attachment bolt (Option No. M1) from the option items.

3. Life

The mechanical life of the actuator is represented by that of the guide receiving the greatest moment load. Operation life of the linear guide is to be determined by the total driving distance which can reach without having 90% flaking (peeling on rail surface). Operation life can be figured out with the calculation method shown below.

3.1 How to Calculate Operation Life

For the operation life of the linear guide, use the dynamic allowable moment stated in 2. Specifications, and figure out with the formula below.

$$L = \left(\frac{C_M}{M} \right)^3 \cdot 10000\text{km}$$

L : Operation life (km) C_M : Dynamic allowable moment (N·m)
 M : Moment to work (N·m) 10000km : Standard rated life of single axis robot

In addition, have a calculation for the drop of life with the formula below if there is a concern that the life could drop due to the condition of vibration or way to be attached.

$$L = \left(\frac{C_M}{M} \cdot \frac{f_{ws}}{f_w} \cdot \frac{1}{f_\alpha} \right)^3 \cdot 10000\text{km}$$

L : Operation life (km) C_M : Dynamic allowable moment (N·m)
 M : Moment to work (N·m) f_{ws} : Standard operational coefficient
 f_w : Load coefficient f_α : Attachment coefficient
 10000km : Standard rated life of single axis robot

Explained below is regarding the standard operational coefficient f_{ws} , load coefficient f_w and attachment coefficient f_α .

Refer to the contents below to set them up.

[Standard operational coefficient f_{ws}]

For ROBO Cylinders described in this manual, $f_{ws} = 1.2$. It is a coefficient defined for each model, some models such as RCS3 high-speed type is 1.35.


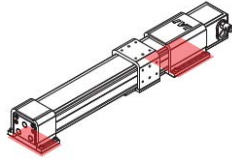
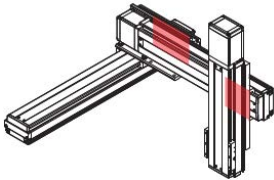
[Load coefficient f_w]

It is a coefficient to consider the life drop due to operational conditions.

Load coefficient f_w	Operation Condition	Reference for acceleration/deceleration
1.0 to 1.5	Small vibration or impact in slow operation	0.3G or less

[Attachment coefficient f_α]

Attachment coefficient f_α is a coefficient to consider the life drop due to the condition of actuator attachment.

Attachment coefficient f_α	1.0	1.2	1.5
	Attachment in whole area	Attachment on both ends	Attachment on spots
Attached condition			

* As the figures are those in common for each manual, they are not for IS (P) WA Type.

Replace to figures for IS (P) WA Type and select the attachment coefficient.

* Even when in attachment in whole area, and the actuator is seated in the whole length of the product, select 1.2 or 1.5 for the attachment coefficient depending on the position of screw fixing.

* For attachment in whole area, use all of the tapped holes (counterbored holes) on the seat surface to fix.

3.2 Operation Life

The operation life depends on the moment to work. With light load, it will be longer than 10,000km, the standard rated life. With no consideration of vibration and attachment condition, the operation life is 80,000km according to the calculation with formula in the previous page under assumption that $0.5C_M$ (half of dynamic allowable moment) of moment is applied on. It shows that it can be 8 times longer than the standard rated life, which is 10,000km.

4. Installation and Environment for Storage and Preservation

4.1 Installation Environment

An environment that satisfies the following conditions is required during installation.

- There should be no direct sunlight.
- Any radiant heat from a large heat source such as a heat treatment furnace should not be directed at the machine main body.
- The ambient temperature should be 0 to 40°C.
- There should be no condensation in 85% or less relative humidity except for the case when air purge is performed. If air purge is performed, the actuator will have water resistance of the protective structure shown in the table below.
- Do not use the product in an atmosphere of corrosive gasses, inflammable gasses, inflammable dusts or ignitable liquids.
- An impact or vibration should not be transmitted to it.
- There should be no strong electromagnetic waves, ultraviolet rays or radiation.
- The actuator should not be installed where it gets dipped in liquid.
- Do not expose the product to cutting dust that may damage the wiper seal.
- Do not expose the product to oil mist or cutting fluid.
- The working space required for maintenance or inspection should be secured.

*Please contact us for the details of splash-proof performance for other fluids than water.

4.2 Storage and Preservation Environment

The storage and preservation environment should comply with the same standards as those for the installation environment. In particular, when the machine is to be stored for a long time, pay close attention to environmental conditions so that no dew condensation forms.

Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.

For storage temperature, the machine withstands temperatures up to 60°C for a short time, but in the case of the storage period of 1 month or more, control the temperature to 50°C or less.

Storage and preservation should be performed in the horizontal condition.

5. Installation

Stated below tells how to install the actuator to a mechanical equipment.

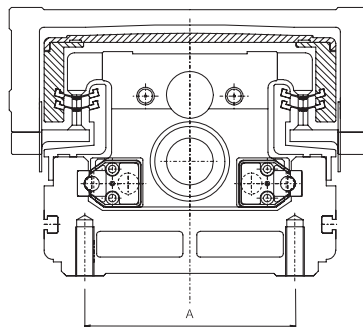
5.1 Attachment

This actuator is recommended for a standard horizontal mount for the posture of installation to fully perform its dust proof and splash proof specifications. Other postures of installation (horizontal wall mount, up-side-down or vertical mount) may allow water to get inside.

5.2 Installing the Main Body

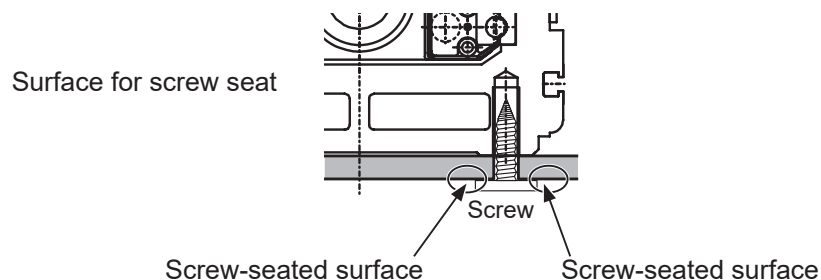
There are tapped holes on the back of the actuator base for installation. Please utilize these holes to install the unit.

Shown below is the mounting dimension explained in a section.



Machine Type	Tap diameter	Tap Effective length	A
Small Size	M6	17mm	70mm
Medium Size	M8	20mm	90mm
Large Size	M8	20mm	120mm

Bolt to be used	Tightening Torque	
	In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:
M6	12.3N•m(1.26kg•m)	5.4N•m(0.55kg•m)
M8	30.0N•m(3.06kg•m)	11.5N•m(1.17kg•m)





⚠ CAUTION: Since the tap is a blind hole, please be careful when setting the bolt length. Inadequate bolt usage may cause tap hole breakdown as well as lead to lack of intensity in actuator mounting, thus lowering precision and may cause an accident.

Description of the Set Screws

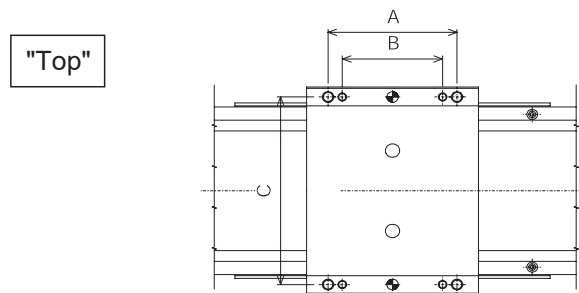
- For the base male set screw, use a hexagon socket head cap screw.
- For the bolts to be used, a high-tensile bolt complying with ISO- 10.9 or more is recommended.
- If using the tapped holes, use screws with the thread length dimension being less than the effective depth of the holes.
- In case the tapped hole is a through hole, be careful so the screw tip does not exceed the surface of the tapped hole.
- The length of thread engagement should be 1.8 times more than the nominal diameter.
- Apply a washer dedicated for high-tensile screw when the screw-seated surface on the base is aluminum (otherwise the seated surface may sink).

5.3 Mounting Load on Slider

- There are tapped holes in the slider where you can affix the load.
To do this, follow the mounting procedure used for the main body.
- The slider has two reamed holes that are used to reproduce the correct position when the slider is removed and reinstalled. Use only one of these holes when fine-tuning of perpendicularity, etc., is required.

Slider Tap Hole Diameter and Reamer Diameter (Top)

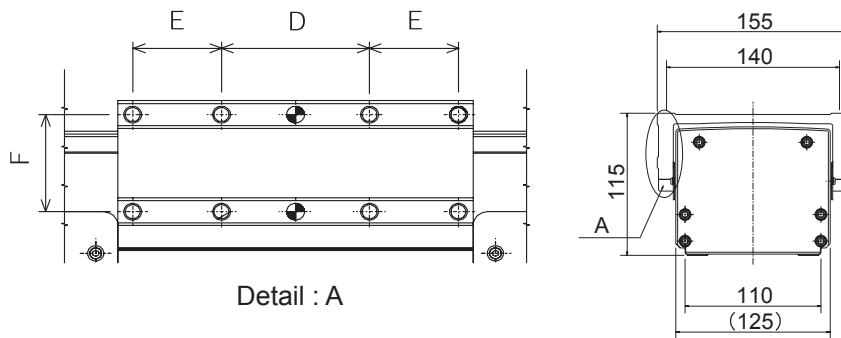
Machine Type	Tap diameter	Tap depth	A	B	C	Reamer Hole	Reamer Depth
Small Size	M6	13mm	70mm	-	110mm	$\phi 6H10$	10mm
Medium Size	M6	18mm	-	70mm	140mm	$\phi 8H10$	10mm
	M8	18mm	90mm	-			
Large Size	M8	20mm	120mm	90mm	170mm	$\phi 8H10$	10mm



Bolt to be used	Tightening Torque	
	In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:
M6	12.3N•m(1.26kg•m)	5.4N•m(0.55kg•m)
M8	30.0N•m(3.06kg•m)	11.5N•m(1.17kg•m)

Slider Tap Hole Diameter and Reamer Diameter (on sides)

Machine Type	Tap diameter	Tap depth	D	E	F	Reamer Hole	Reamer Depth
Small Size	M6	12mm	40mm	-	-	φ6H10	8mm
Medium Size	M6	13mm	50mm	30mm	35mm	φ6H10	8mm
Large Size	M6	13mm	40mm	50mm	50mm	φ6H10	8mm

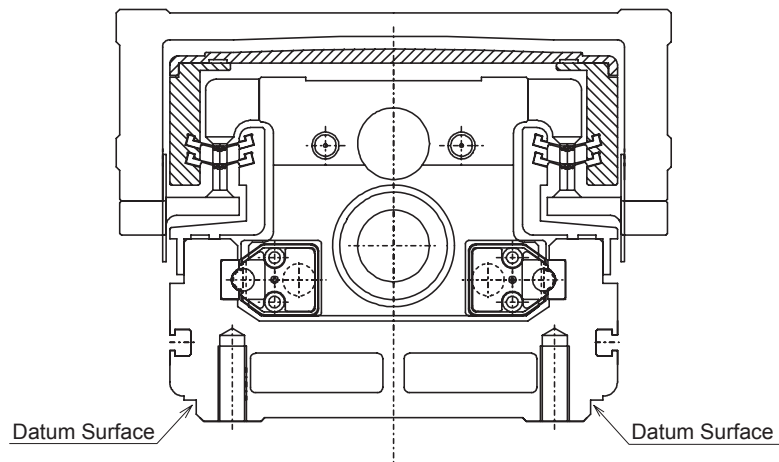


Bolt to be used	Tightening Torque	
	In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:
M6	12.3N•m(1.26kg•m)	5.4N•m(0.55kg•m)

- For the bolts to be used, a high-tensile bolt complying with ISO- 10.9 or more is recommended.
- If using the tapped holes, use screws with the thread length dimension being less than the effective depth of the holes.
- The length of thread engagement should be 1.8 times more than the nominal diameter.

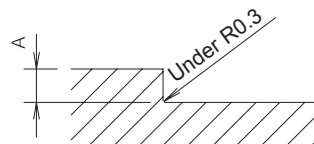
5.4 Datum Surface and Mounting Surface

- The mounting frame should have sufficient rigidity to avoid generation of vibration.
- The surface where the actuator will be mounted should be machined or be equally level, and the flatness between the actuator and the frame should be within 0.05 mm/m.
- Provide enough space around the actuator so that maintenance work can be carried out.
- The side and bottom of the actuator base provide reference planes for slider travel.
- When traveling precision is required, use these surfaces as the reference for mounting.



As shown in the picture above, the base side surfaces work as the datum for the slider's run. If accuracy is required, use these surfaces as a datum for the installation.

When installing the unit on the platform using the datum surface, follow the figure shown below for the platform profile.



A dimensions (mm)

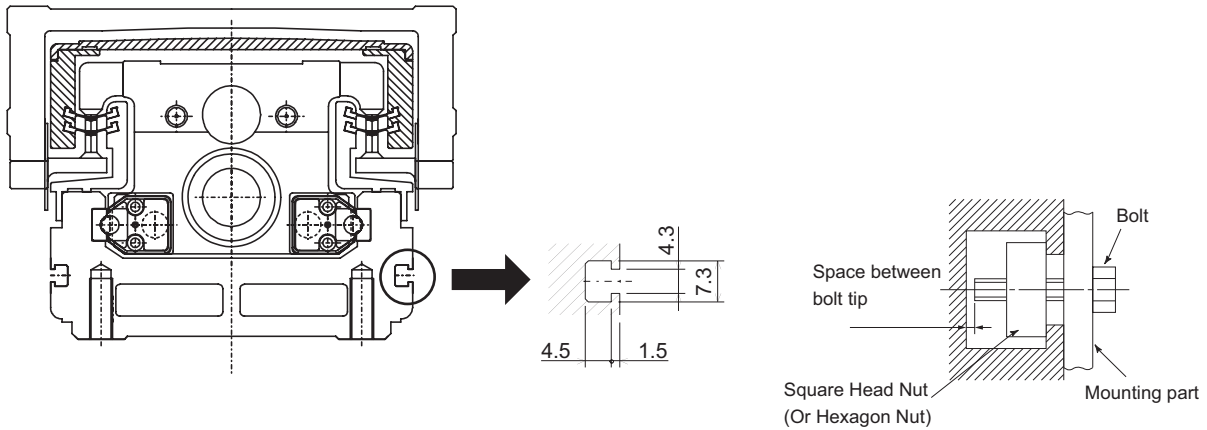
3 to 5

5.5 Utilization of T-slot

There are T-slots (width of slot 4mm) in the base for mounting external devices such as a connector box.

When using the wiring kit, mount the connector box using these T-slots.

Use the slots as necessary to mount sensors or to anchor cables.



⚠ **CAUTION** : We recommend a square nut for the T-slot but you can also use a hexagonal nut.
 When mounting, check the bolt length to make sure the end does not touch the bottom of the T-slot. Be especially careful during tightening.

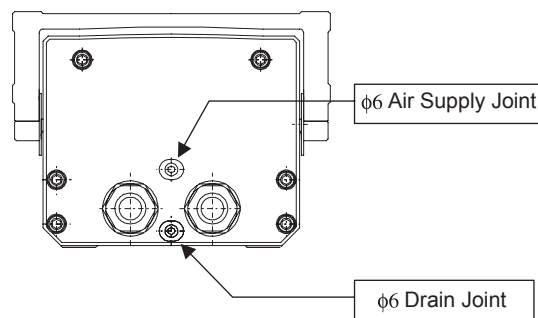
5.6 Air Purge for Splash-Proof Type

By supplying dry air into the actuator, it performs dust proof and splash proof (water and dust) complied with IP65*1.

Instruction below shows how to perform air purge.

Air purge is performed with using the quick joint (O.D. $\phi 6$) on the rear cover. Supply air from the upper joint.

The lower quick joint is used as a drain (to withdraw water) in the case that water gets inside the actuator. Connect a $\phi 6$ air tube and take it to a place where no water dust gets in to withdraw water.

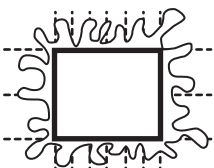


1. Actuator Air Pressure ... 0.1MPa to 0.2MPa(approx. 1kgf/cm² to 2kgf/cm²)
2. Air Flow ... Approx.20 to 40NI/min
3. Applied Air ... Do not supply air directly from a compressor. Make sure to supply dry compressed air via an air drier.

Air to supply should not contain compressor oil or other contamination and should be clean dry air that has passed the air filter with the filtration of 10 μ m or less and that is dried in atmospheric dew point from -15°C to -20°C.

*1<Explanation of IP 65 (JIS C 0920)>

Primary Characteristic No.1	Protection Level to Outer Solid Body	
6		No dust gets inside

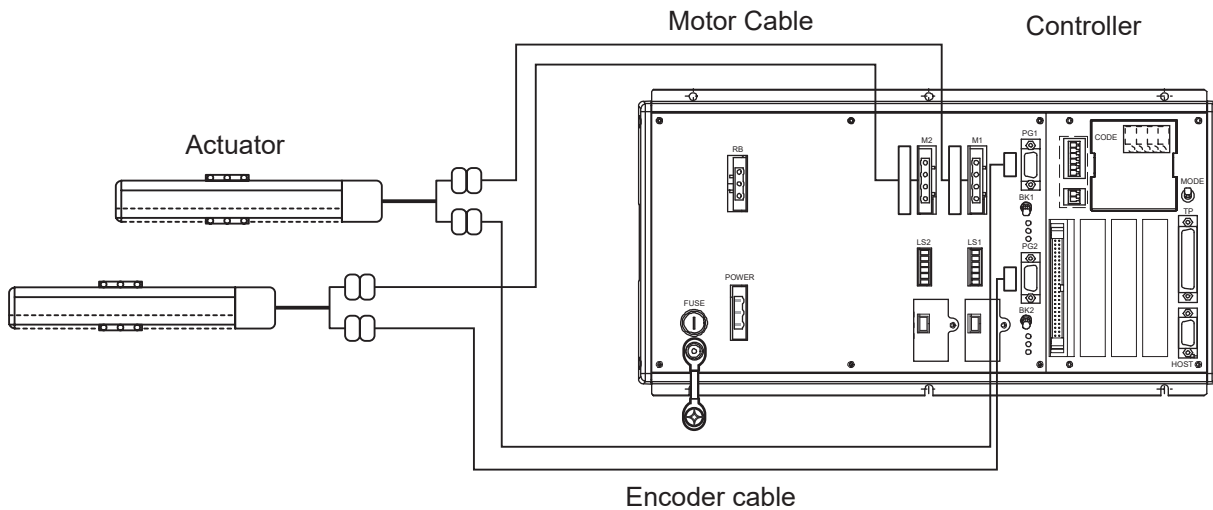
Primary Characteristic No.2	Protection Level to Water Penetration	
5		No harmful influence is occurred by water splashed from any angle. In the standard, it is specified the pressure of splash water is 30KPa (30KN/m ² , 0.3kgf/cm ²), splash speed is 12.2L/min and duration is for 3min.

6. Connecting the Controller

We will explain the controller wiring for a single axis actuator.

6.1 Wiring

The actuator and the controller are joined with connectors of motor cable and encoder cable (IAI supplied part).



Example of connection to XSEL controller

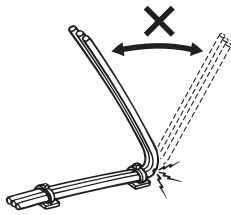
[Refer to "9. Supplied Cables" for the details of the relay cable.]

CAUTION : In a use of the actuator with the cables not fixed, consider to ease the load to the cables by using the actuator in the range of the cable bends only with its weight or by using a stand-alone cable hose to gain a large radius bending.

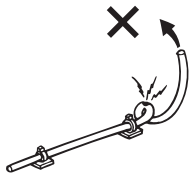
- Do not cut and extend, short or rejoin the cables.
- Do not pull the cables or bend them forcefully. The cables may break.

When designing an application system using IA actuators and controllers, incorrect wiring or connection of each cable may cause unexpected problems such as a cable breakage or a poor contact. Stated below explains the prohibited handling of cables. Read the information carefully to connect the cables properly.

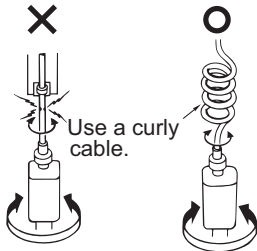
- Do not let the cable flex at a single point.



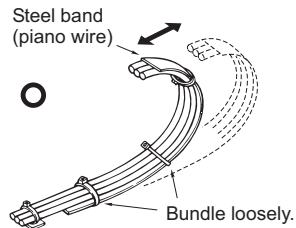
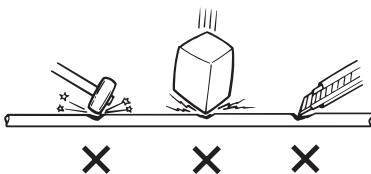
- Do not let the cable bend, kink or twist.



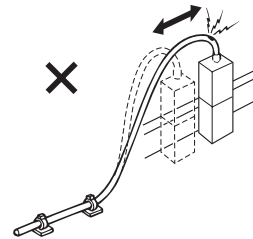
- Do not let the cable receive a turning force at a single point.



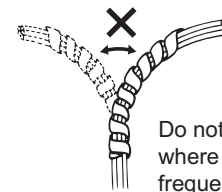
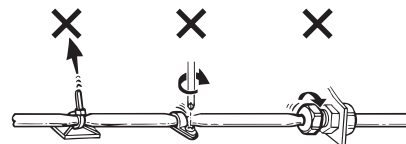
- Do not pinch, drop a heavy object onto or cut the cable.



- Do not pull the cable with a strong force.



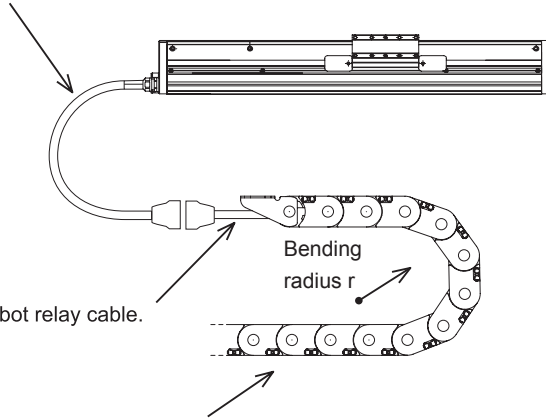
- When fixing the cable, provide a moderate slack and do not tension it too tight.



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

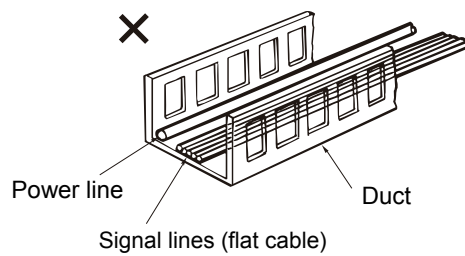
• Cautions for use of a cable track

- The supplied cable is not a robot cable, so never store it in a cable track.



- Always use a robot relay cable.

- Make sure to have a radius more than the minimum bending radius when using a cable track. [Refer to "9. Motor and Encoder Cables".]
- Do not lay signal lines together with circuit lines that create a strong electric field.

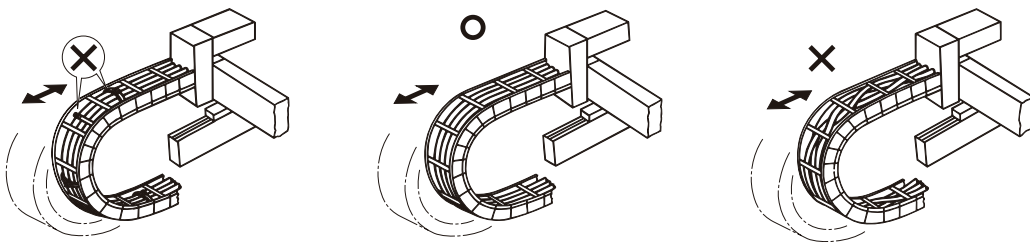


- Follow the instructions below when using a cable track.

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.



7. Setting the Home Position

7.1 Home-Return Operation

The actuator operates as shown below in the home-return operation:

- (1) The moving direction is determined by the parameters set by the homing command. The software senses the mechanical end in the homing operation.
- (2) The slider reverses direction when this end is reached and the place where the Z-phase signal is detected it becomes the reference point.
- (3) After reversing at the end, it determines the point where the Z-phase signal is detected as the datum point.
- (4) The actuator moves the set offset amount in addition, and determines this point as the home position.

7.2 Fine Control of Home Position

Number of motor rotation after the actuator hitting the stopper till Z-phase signal is generated is already adjusted before shipping out.

The standard value of the backing distance when the slider hits the stopper, reverses and then stops at the home position is:

Model Name	Home Position Distance from Mechanical Stopper (Approx. mm)
ISWA/ISWPA	5

As long as the homing direction is the same, you can make fine adjustments to the home position for each actuator by changing the parameters based on this value.

- (1) Adjustments are made as follows: Initiate the homing operation and confirm home.
- (2) After that, move the actuator to the preferable home position, and confirm the position difference, and correct the parameter of the home preset value for XSEL and SSEL and the home-return offset amount for SCON and MCON.

Make the value either positive or negative to the value currently set.

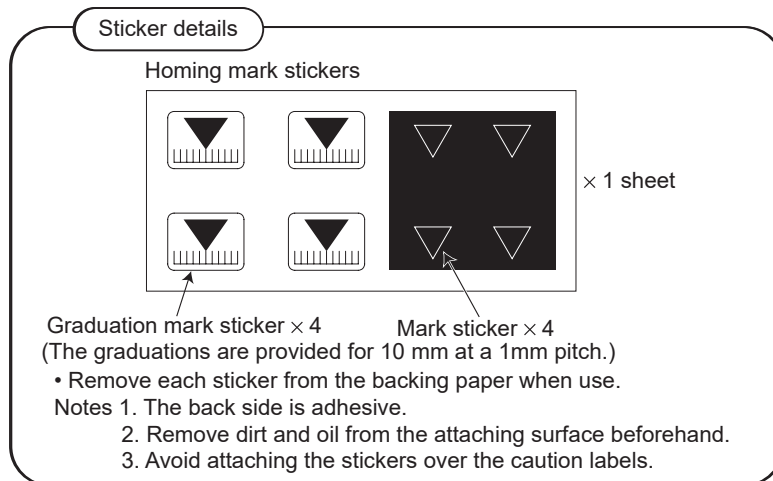
- (3) If you allow for ample offset amount the movement range is that much more limited. If the offset is greater than 1mm, you will have to reset the stroke soft limit.

7.3 Changing Home Direction

Please contact us if a change in the home direction after delivery is required since it requires adjustment of the movement direction parameter and also the encoder Z-phase adjustment for some models.

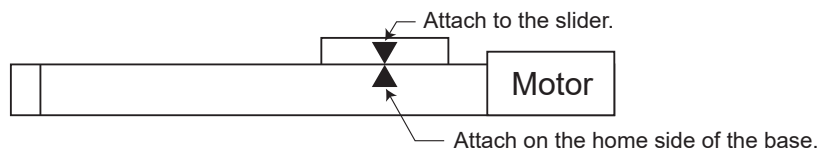
7.4 How to Use the Homing Mark Stickers

- ◆ Attach these stickers to the product, as necessary, to indicate the home direction of the actuator, etc.

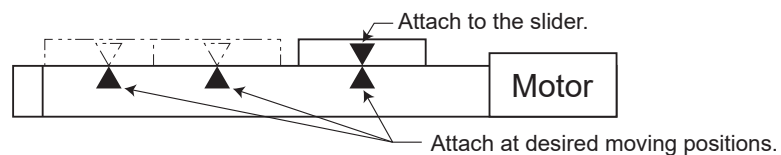


Examples of use

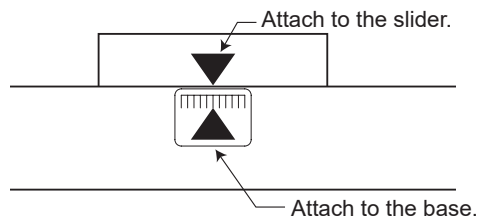
- [1] For marking the home direction of the actuator



- [2] As positioning marks



- [3] For displacement check



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

8. Option

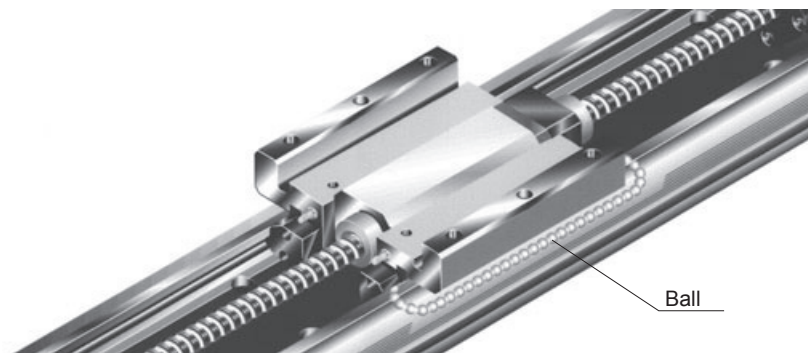
8.1 Reversed-home Specification (Model : NM)

For the reversed-home type actuator, the opposite side of the motor is the home position. The model code is indicated with NM. Please contact us if a change in the home direction after delivery is required since it requires adjustment of the movement direction parameter and also the encoder Z-phase adjustment for some models.

8.2 Guide with Ball Retainer Mechanism (Model : RT)

(Structure)

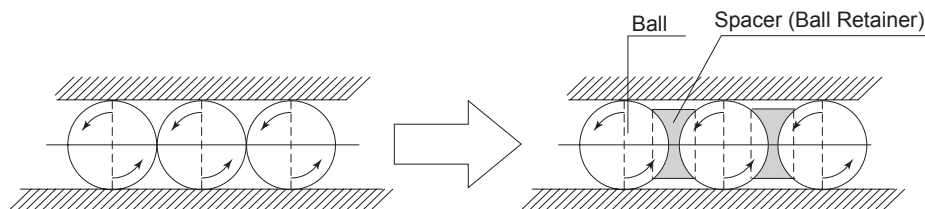
Putting spacers (ball retainers) between the balls will enable a lower operation noise and smoother movement.



(Characteristics)

(1) Low noise generation

Putting ball retainers removes the noise of metal balls crashing each other, and aligns the balls, thus the harsh noise gets decreased.



(2) Smooth movement

A wear-off occurred by the friction of balls will be reduced, and run-out of the lubricant is avoided, and also the lubricant stays on the retainer and supplies a smoother move.

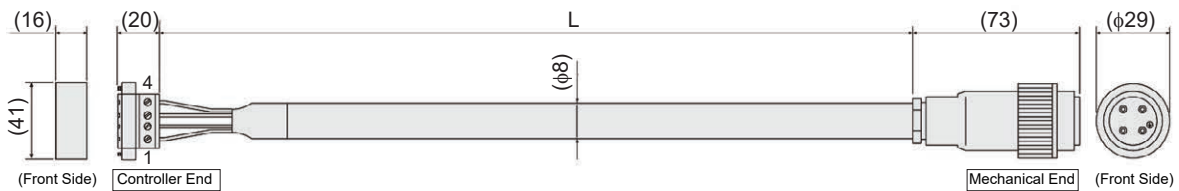
9. Motor and Encoder Cables

Applicable cable differs depending on the corresponding controller.

Chart of Controllers and Motor and Encoder Cables

Controller	XSEL-J/K	XSEL-P/Q/R/S/RA/SA	SSEL	SCON, MSCON	RCON-SC
Relative Supplied Cable	(1), (3)	(1), (4)	(1), (4)	(1), (4)	(2), (4)

(1) Motor Cable CB-XEU-MA□□□



□□ indicate the cable length (L), Available up to 30m

Example) 080 = 8m

[Minimum Bending Radius]

Movable Use : 48mm

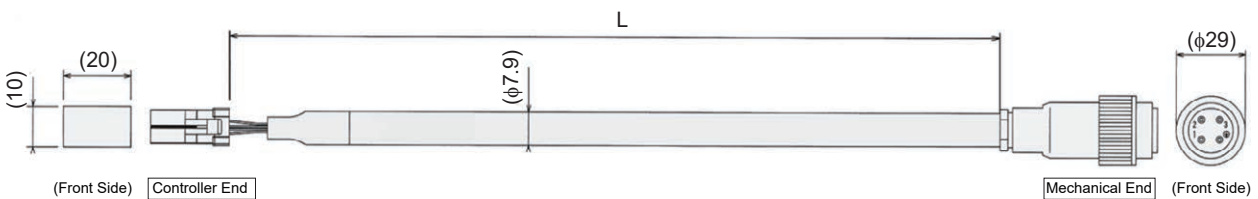
GIC2.5/4-STF-7.62(PHOENIX)

Cable	Color	Signal	No.
0.75sq	Green / Yellow	PE	1
	Black with 1 in White Letter	U	2
	Black with 2 in White Letter	V	3
	Black with 3 in White Letter	W	4

99-4222-00-04(BINDER)

No.	Signal	Color	Cable
⊕	PE	Green / Yellow	0.75sq (solderless)
1	U	Black with 1 in White Letter	
2	V	Black with 2 in White Letter	
3	W	Black with 3 in White Letter	

(2) Motor Cable CB-XEU1-MA□□□



□□ indicate the cable length (L), Available up to 30m

Example) 080 = 8m

[Minimum Bending Radius]

Movable Use : 48mm

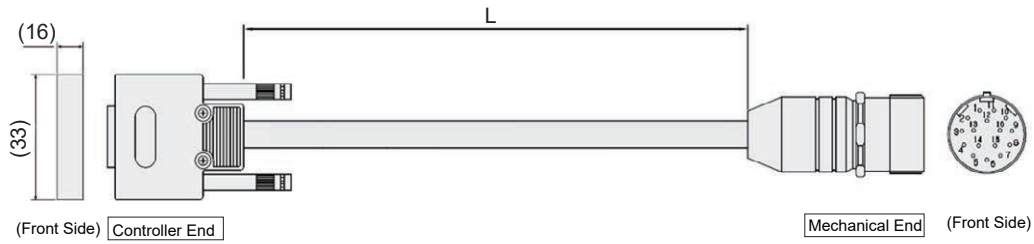
F35FDC-04V-K(J.S.T. Mfg.)

Cable	Color	Signal	No.
0.75sq (solderless)	Black with 1 in White Letter	U	B1
	Black with 2 in White Letter	V	B2
	Black with 3 in White Letter	W	A1
	Green / Yellow	PE	A2

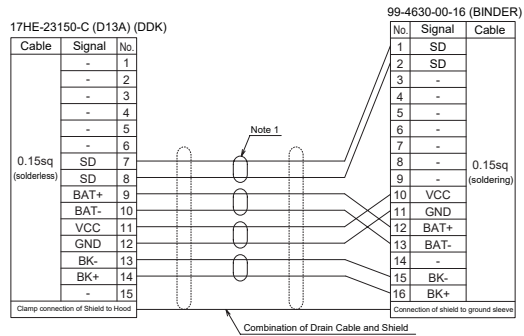
99-4222-00-04(BINDER)

No.	Signal	Color	Cable
1	U	Black with 1 in White Letter	0.75sq (solderless)
2	V	Black with 2 in White Letter	
3	W	Black with 3 in White Letter	
⊕	PE	Green / Yellow	

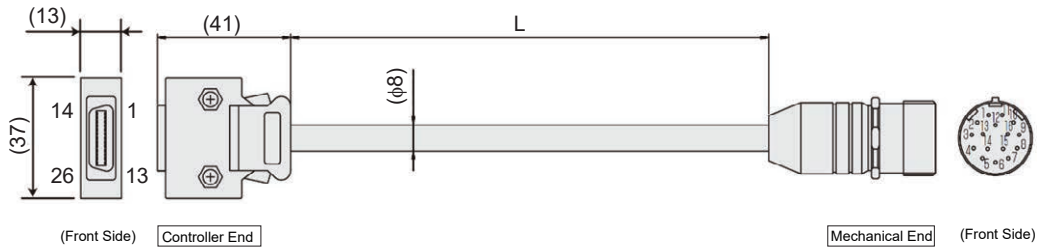
(3) Encoder Cable CB-X-PA□□□-WC



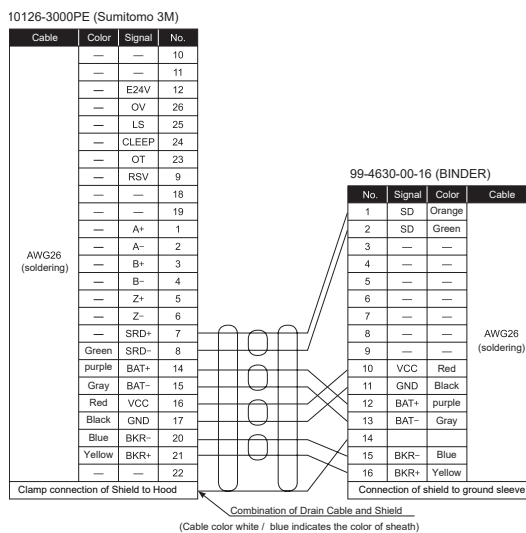
□□□ indicate the cable length (L), Available up to 30m
 Example) 080 = 8m
 [Minimum Bending Radius]
 Movable Use : 38mm



(4) Encoder Cable CB-X1-PA□□□-WC



□□□ indicate the cable length (L), Available up to 30m
 Example) 080 = 8m
 [Minimum Bending Radius]
 Movable Use : 38mm



10. Maintenance/Inspection

10.1 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.

Period	Visual inspection of machine exterior	Interior check	Grease Supply ^(Note 1)
At start of operation	○		
After 1 month of operation	○		
After 3 month of operation			○
After 3 month of operation thereafter			Period of Grease Supply (reference)
After 6 month of operation	○	○ ^(Note 2)	
Every 6 months thereafter	○	○ ^(Note 2)	

(Note 1) 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.

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

[Period of Grease Supply (reference)]

Supply grease in the earlier timing of either the operation distance or months described in the table below.

Max. Velocity of Use [mm/s]	Period of Grease Supply (reference)	
	Operation Distance	Months
0 to 750 or less	625 km	6 months
750 to 1500 or less	1,250 km	
1500 to 2000 or less	2,500 km	

For the actuators with the guide equipped with the ball retainer (option code RT), implement grease supply in the frequency of the period of grease supply (reference) described in the table below.

Max. Velocity of Use [mm/s]	Period of Grease Supply (reference)	
	Operation Distance	Months
0 to 750 or less	625 km	6 months
750 to 1500 or less	1,250 km	
1500 to 2000 or less	2,500 km	



Caution:

- The grease may be degraded if the actuator has got stored for 6 months or more. Supply grease before starting to use. [Reference to 10.6 Grease Supply]
- The speed of grease degradation differs depending on the environment of use (temperature, humidity and ambient environment). It is recommended to shorten the period of grease supply in case of use in bad environment with high temperature, high humidity, high rate of dust and so on. Also, it is recommended to improve the environment in case the color of the grease changes remarkably due to bad environmental condition.

10.2 Visual Inspection of the Machine Exterior

Please check the following items in the visual inspection.

Main body	Loose mounting bolts
Cables	Damage to cables, connection of connectors
General	Noise, vibration

10.3 External Cleaning

- Clean the exterior surfaces from time to time.
- Wipe off dirt with a soft cloth.
- There may be a case that the base oil of the grease is come out of the actuator housing.
Wipe it off with a soft cloth.
- Do not spray compressed air on the actuator that might force dust into the crevices.
- 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.

10.4 Internal Inspection

Turn off the power supply, remove the screw cover and have a visual inspection.

Please check the following items in the internal inspection.

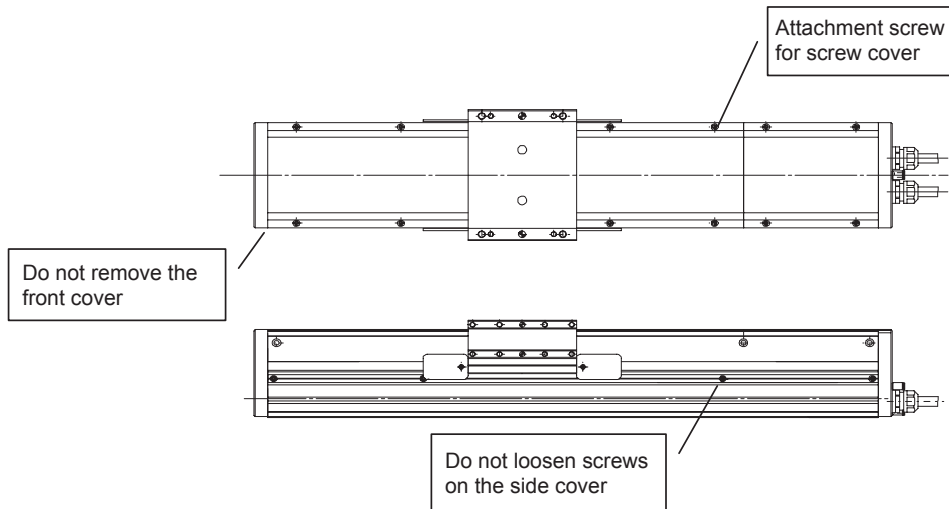
Main body	Loose mounting bolts
Guide Area	Lubricant condition and dirtiness
Ball Screw Area	Lubricant condition and dirtiness

Check the internal condition by visual. Check inside for foreign substance such as dust and the condition of lubricant.

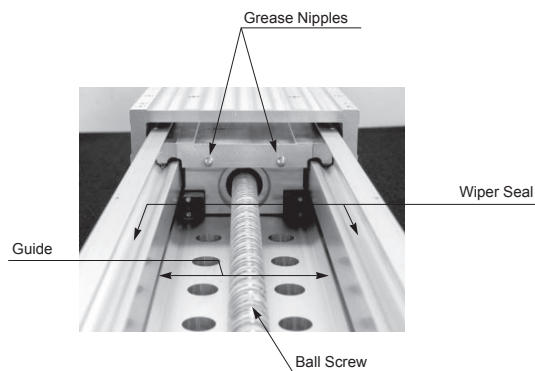
Even if the grease has turned brown, the lubricant condition is good as long as the track surface is glossy and looks wet. In the case the grease is dirty with dust and gloss is lost, or it is worn out after a long term of use, supply the grease after conducting cleaning to each part.

Shown below is the process of internal inspection.

- (1) Use a 2.5mm hex wrench to remove the screw cover on the top.
- (2) Conduct the internal inspection.
- (3) Re-assemble in reverse order after inspection is finished.




- CAUTION :**
- Do not remove the front cover since it has a function to support the ball screw. The front cover being off the adjusted position may make the shaft position misaligned, which may cause resistance in operation, shorten the life of each part, or cause an occurrence of abnormal noise.
 - Side cover retains a sealing. Do not loosen the screws. Once the screws are loosened, it affects the function of the sealing and may allow water to get in.
 - If an abnormality such as crack or peel-off is found on the sealing on the back side of the screw cover, replace it accordingly.



10.5 Cleaning the interior

- Wipe off dirt with a soft cloth.
- Wipe off the base oil when it is separated from the grease and appeared on the sides of the guide rail. It may come out to the external if it is left without being wiped off.
- Do not spray compressed air on the actuator that might force dust into the crevices.
- Do not use petroleum-based solvents, neutral detergents or alcohol.

 **CAUTION** : Wipe off the old grease then supply new grease when much dirt is contained in the old grease.

10.6 Grease Supply

10.6.1 Applicable Grease

Complex aluminum grease shown below is applied at our factory before delivery.

Applied Area	Grease at Delivery	
	Grease Name	Supplier
Guide	Medallion FM Grease, consistency class 2	Taiyo Petroleum Gas
Ball Screw		
Wiper Seal		

10.6.2 Grease Supply

(1) Lubricating the Guide

Remove the screw cover and find the 2 grease nipples located on the right and left of the slider.
Supply grease here.

(1) Use a 2.5mm hex wrench to remove the screws retaining the screw cover.

(2) Inject grease into the grease nipples on the slider with a grease gun.

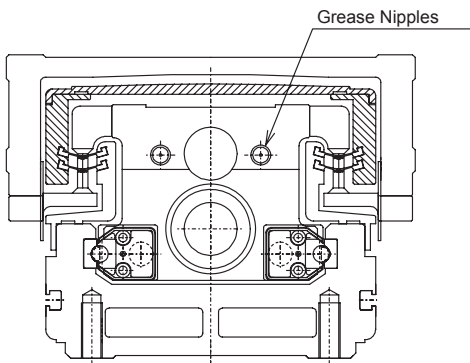
(Refer to the picture below for the positions)

Model	Grease Supply (reference)
S	1 cc to 1.5 cc
M	2 cc to 2.5 cc
L	3 cc to 3.5 cc

(3) Rotate the slider several times manually to spread out the grease evenly.

Confirm that the ball tracks on the ball screw and guide look glossy with oil of grease. Supply grease again if it is not spread enough.

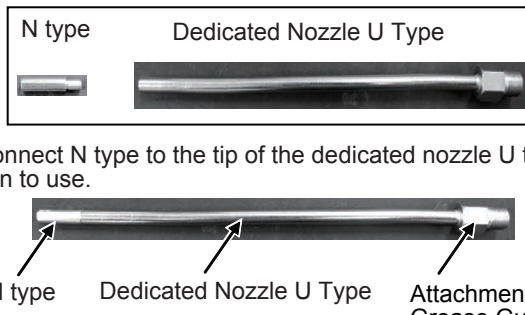
(4) Wipe off any excess grease.



(Note) Follow the grease nipple diameter shown in the list below when preparing a grease gun.

Machine Type	Nipple Diameter(mm)
IS(P)WA-S	φ3.5
IS(P)WA-M	φ6.0
IS(P)WA-L	φ6.0

Grease Gun Attachment Screw R1/8	Maker
(Example) GC-57K	Yamada Corporation

Nozzle	Maker
<p>N type + Dedicated Nozzle U Type</p>  <p>• Connect N type to the tip of the dedicated nozzle U type and attach a grease gun to use.</p>	THK

- ⚠ 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.

(2) Grease Supply to Ball Screw

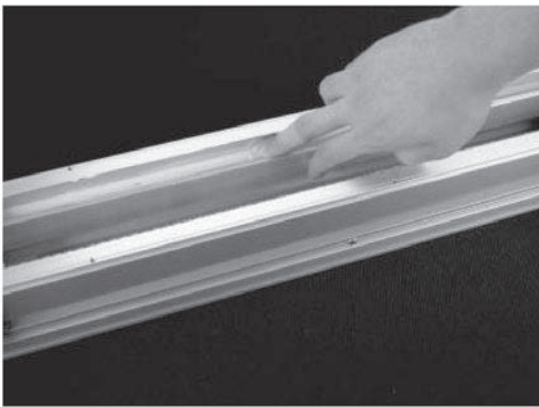
Perform a grease supply using a hand to apply grease after cleaning the screw then move the slider back and forth to spread the grease evenly on the shaft. Make sure to wipe off the excess grease out of the nut to finish the process.

- ⚠ CAUTION :** It is difficult to move the slider manually for the low lead actuator. Do not forcefully move the actuator, and connect the controller to utilize the JOG operation.

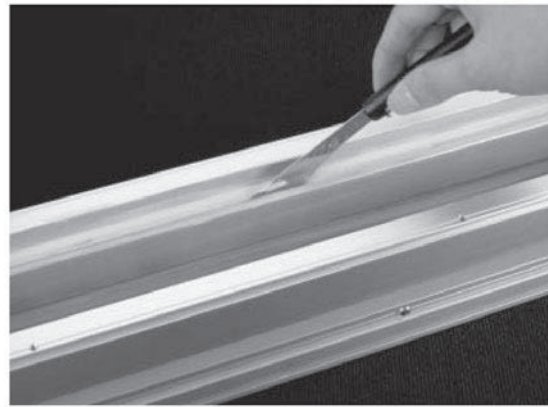
⚠ CAUTION : Excessive supply of grease may increase the stirring resistance and generate heat on the ball screw, or excess grease on the ball screw may splash on the surroundings. Make sure to wipe off the excess grease.

⚠ 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.

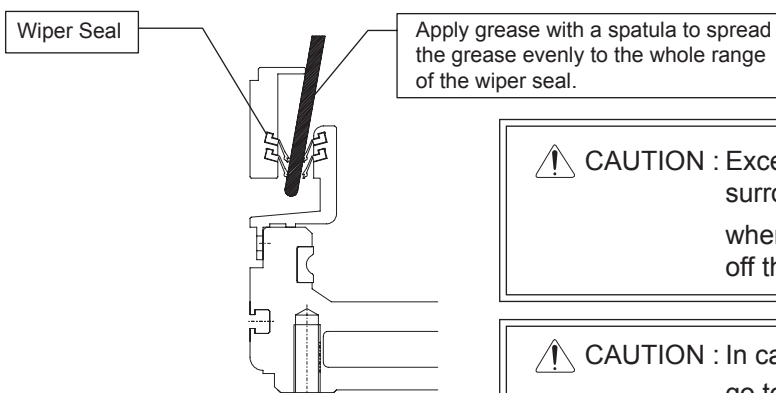
(3) Grease Supply on Wiper Seal



Perform a grease supply using fingers to apply on the upper surface of the wiper seal as shown on the left after cleaning the wiper seal.



Using a tool such as a spatula, apply small amount of grease on the inner side of the wiper seal. Move the slider back and forth to spread the grease evenly to the whole range of the wiper seal. To finish, wipe off the excess grease out of the applied area.



⚠ CAUTION : Excessive supply of grease may dirty the surroundings with excess grease dropped when slider is operated. Make sure to wipe off the excess grease.

⚠ 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.

10.7 Motor Replacement

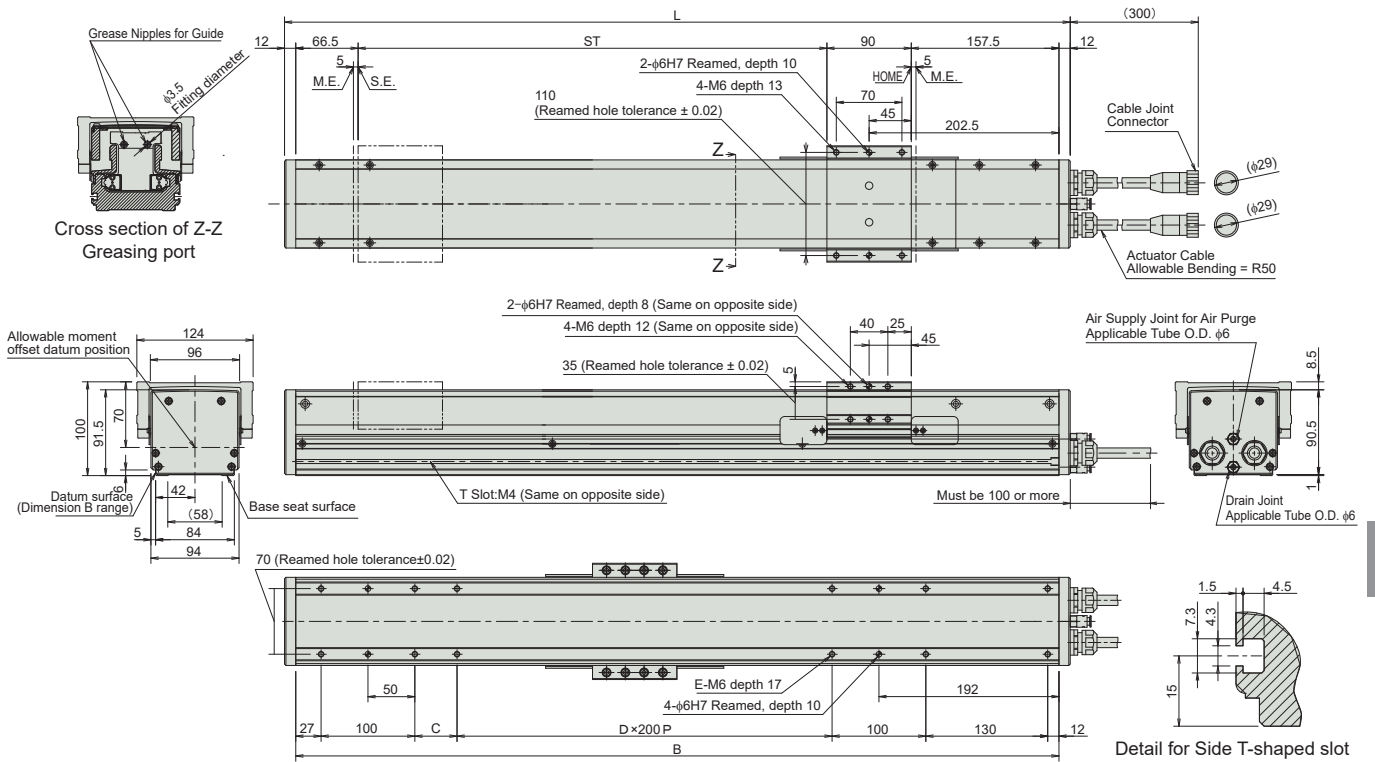
In order to secure performance of IP65, the motor cannot be replaced by a customer.

Apply for a repair work from IAI homepage.

11. Appendix

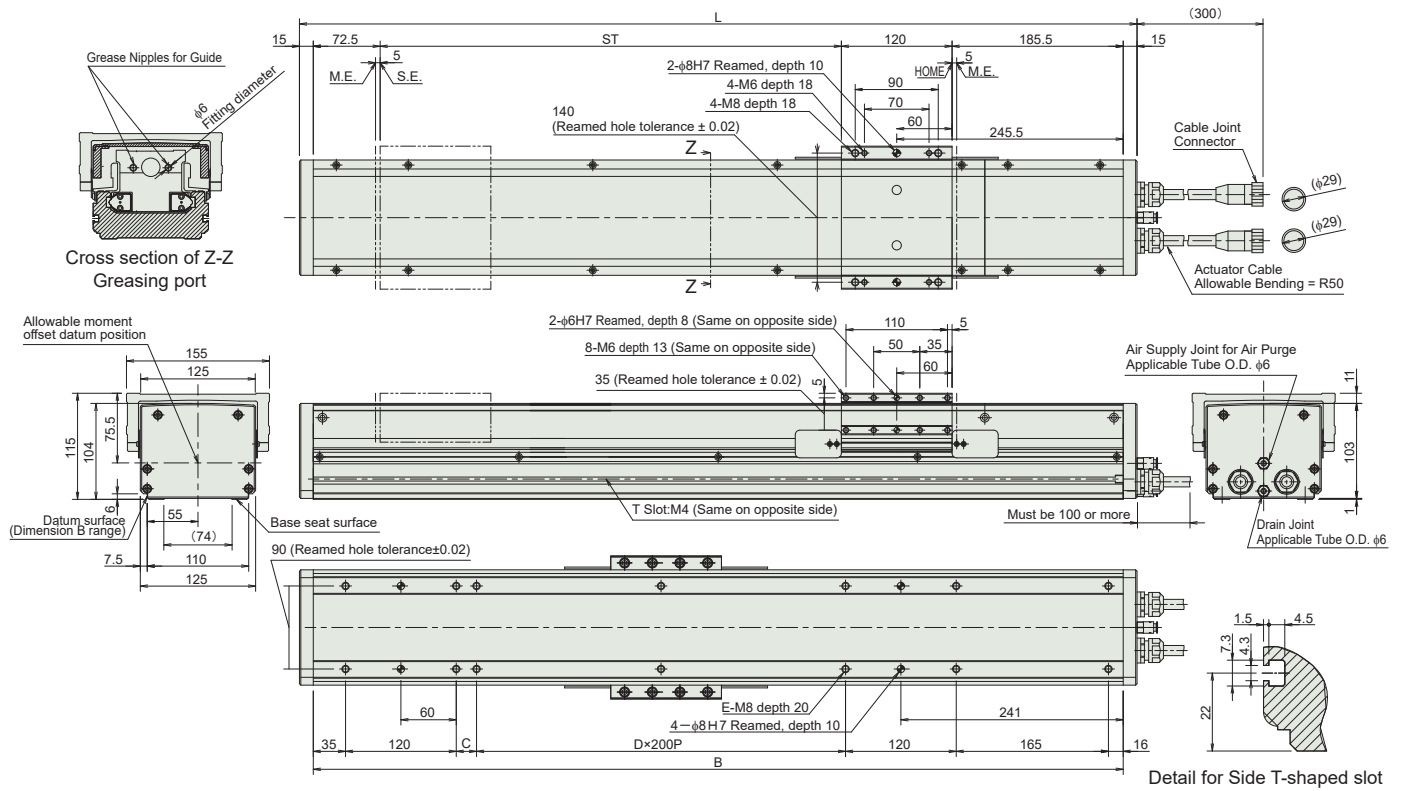
11.1 External Dimensions

11.1.1 ISWA-S, ISPWA-S



Stroke	100	150	200	250	300	350	400	450	500	550	600
L	438	488	538	588	638	688	738	788	838	888	938
B	414	464	514	564	614	664	714	764	814	864	914
C	45	95	145	195	45	95	145	195	45	95	145
D	0	0	0	0	1	1	1	1	2	2	2
E	10	10	10	10	12	12	12	12	14	14	14
Mass [kg]	6.9	7.4	7.8	8.3	8.7	9.2	9.6	10.1	10.5	11	11.4

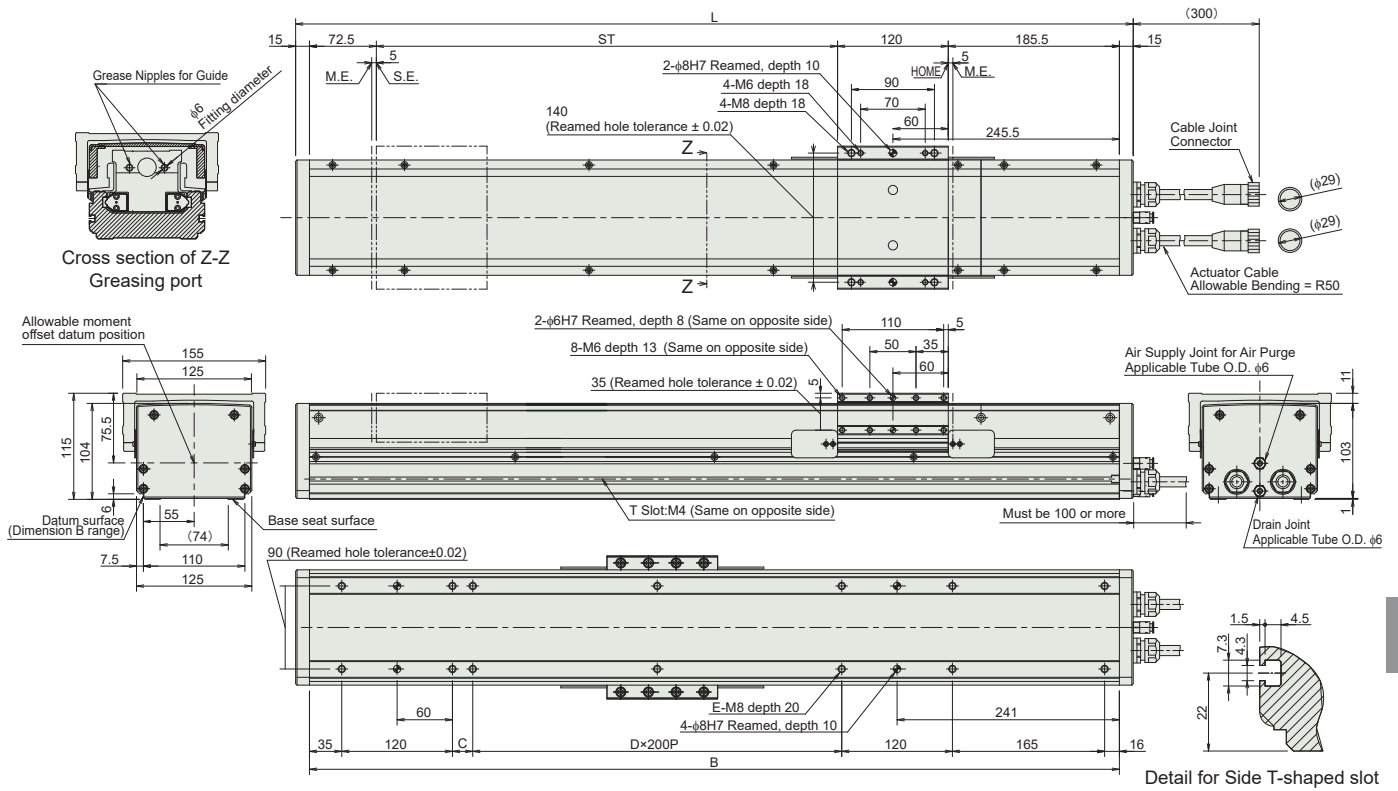
11.1.2 ISWA-M-100, ISPWA-M-100



Stroke	100	150	200	250	300	350	400	450	500	550	600
L	508	558	608	658	708	758	808	858	908	958	1008
B	478	528	578	628	678	728	778	828	878	928	978
C	22	72	122	172	22	72	122	172	22	72	122
D	0	0	0	0	1	1	1	1	2	2	2
E	10	10	10	10	12	12	12	12	14	14	14
Mass [kg]	11.7	12.6	13.4	14.3	15.1	16.0	16.8	17.7	18.5	19.4	20.2

Stroke	650	700	750	800	850	900	950	1000
L	1058	1108	1158	1208	1258	1308	1358	1408
B	1028	1078	1128	1178	1228	1278	1328	1378
C	172	22	72	122	172	22	72	122
D	2	3	3	3	3	4	4	4
E	14	16	16	16	16	18	18	18
Mass [kg]	21.1	21.9	22.8	23.6	24.5	25.3	26.2	27

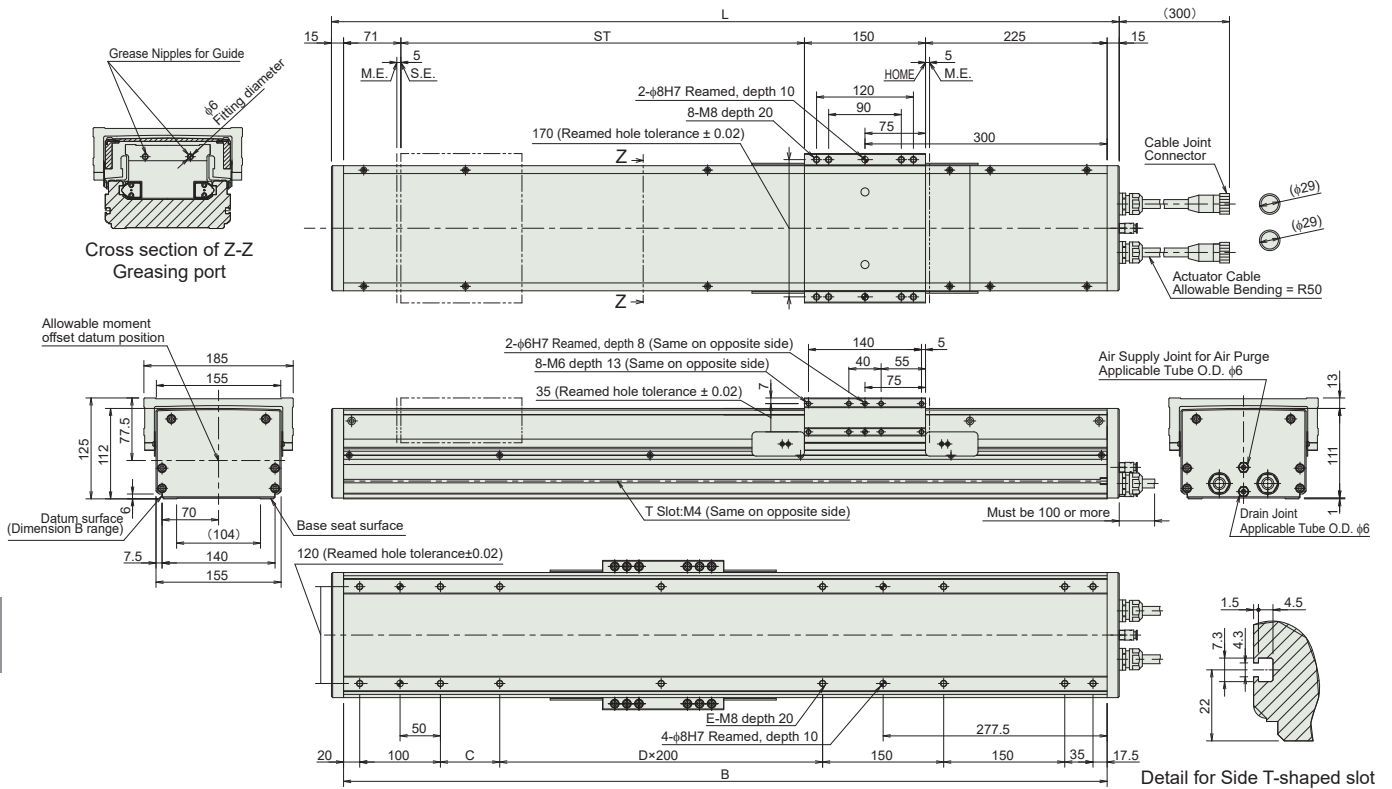
11.1.3 ISWA-M-200, ISPWA-M-200



Stroke	100	150	200	250	300	350	400	450	500	550	600
L	508	558	608	658	708	758	808	858	908	958	1008
B	478	528	578	628	678	728	778	828	878	928	978
C	22	72	122	172	22	72	122	172	22	72	122
D	0	0	0	0	1	1	1	1	2	2	2
E	10	10	10	10	12	12	12	12	14	14	14
Mass [kg]	11.9	12.8	13.6	14.5	15.3	16.2	17	17.9	18.7	19.6	20.4

Stroke	650	700	750	800	850	900	950	1000
L	1058	1108	1158	1208	1258	1308	1358	1408
B	1028	1078	1128	1178	1228	1278	1328	1378
C	172	22	72	122	172	22	72	122
D	2	3	3	3	3	4	4	4
E	14	16	16	16	16	18	18	18
Mass [kg]	21.3	22.1	23	23.8	24.7	25.5	26.4	27.2

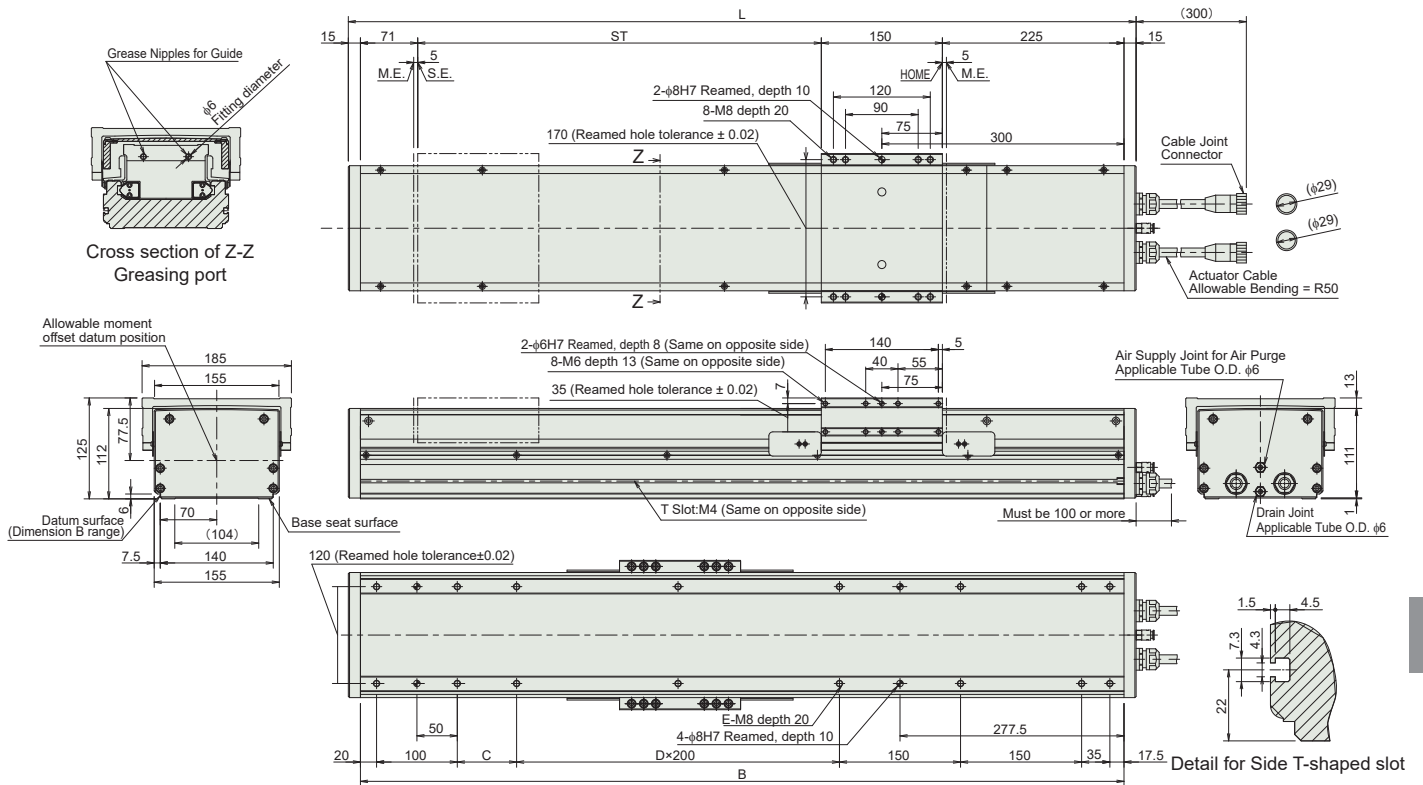
11.1.4 ISWA-L-200, ISPWA-L-200



Stroke	100	150	200	250	300	350	400	450	500	550	600	650	700
L	576	626	676	726	776	826	876	926	976	1026	1076	1126	1176
B	546	596	646	696	746	796	846	896	946	996	1046	1096	1146
C	73.5	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5
D	0	0	0	1	1	1	1	2	2	2	2	3	3
E	12	12	12	14	14	14	14	16	16	16	16	18	18
Mass [kg]	19.9	20.9	21.8	22.8	23.7	24.7	25.6	26.6	27.5	28.5	29.4	30.4	31.3

Stroke	750	800	850	900	950	1000	1050	1100	1150	1200
L	1226	1276	1326	1376	1426	1476	1526	1576	1626	1676
B	1196	1246	1296	1346	1396	1446	1496	1546	1596	1646
C	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5	123.5	173.5
D	3	3	4	4	4	4	5	5	5	5
E	18	18	20	20	20	20	22	22	22	22
Mass [kg]	32.3	33.2	34.2	35.1	36.1	37	38	38.9	39.9	40.8

11.1.5 ISWA-L-400, ISPWA-L-400



Stroke	100	150	200	250	300	350	400	450	500	550	600	650	700
L	576	626	676	726	776	826	876	926	976	1026	1076	1126	1176
B	546	596	646	696	746	796	846	896	946	996	1046	1096	1146
C	73.5	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5
D	0	0	0	1	1	1	1	2	2	2	2	3	3
E	12	12	12	14	14	14	14	16	16	16	16	18	18
Mass [kg]	20.1	20.6	22	22.5	23.9	24.4	25.8	26.3	27.7	28.2	29.6	30.1	31.5

Stroke	750	800	850	900	950	1000	1050	1100	1150	1200
L	1226	1276	1326	1376	1426	1476	1526	1576	1626	1676
B	1196	1246	1296	1346	1396	1446	1496	1546	1596	1646
C	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5	123.5	173.5
D	3	3	4	4	4	4	5	5	5	5
E	18	18	20	20	20	20	22	22	22	22
Mass [kg]	32	33.4	33.9	35.3	35.8	37.2	37.7	39.1	39.6	41

11.2 Method to Absolute Reset (for absolute type)

11.2.1 For X-SEL Controller

The encoder battery error occurs when there is an abnormality on the absolute encoder battery voltage on X-SEL controller and the encoder cable is off the battery, and it is necessary to conduct an absolute reset.

[1] Preparation

(1) Computer

A computer that the PC software dedicated for our X-SEL (X_SEL.exe) is already installed.

(2) Connection Cable (Cable packaged in the PC software)

RS232C Cross Cable (PC side / Female, 9-pin, Controller side / Male, 25-pin)

(3) It is assumed that all necessary adjustments other than the absolute reset are already completed.

[2] Procedure

(1) Turn off the power supply to X-SEL controller. Turn on the power to PC and finish the boot of OS.

(2) Connect the 9-pin D sub-connector of the connection cable to the communication port on the PC, and 25-pin D sub-connector to the 25-pin communication port on the controller.

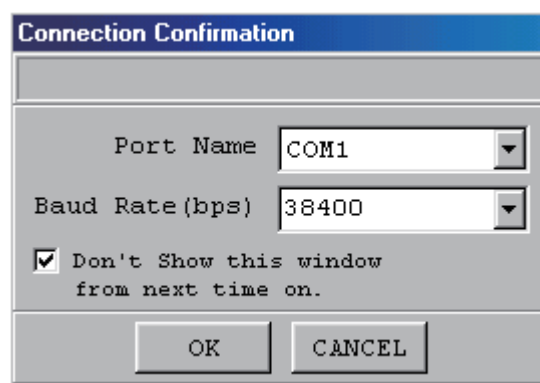
(3) Turn on the power supply to the controller. Unless there is no other error being occurred, 7-seg LED should show "E914" or "ECA2" and controller shows that it detected an encoder battery error.

(4) Boot the X-SEL PC software (X_SEL.exe) on the computer.

Shown below is the explanation for the operation on X-SEL software.

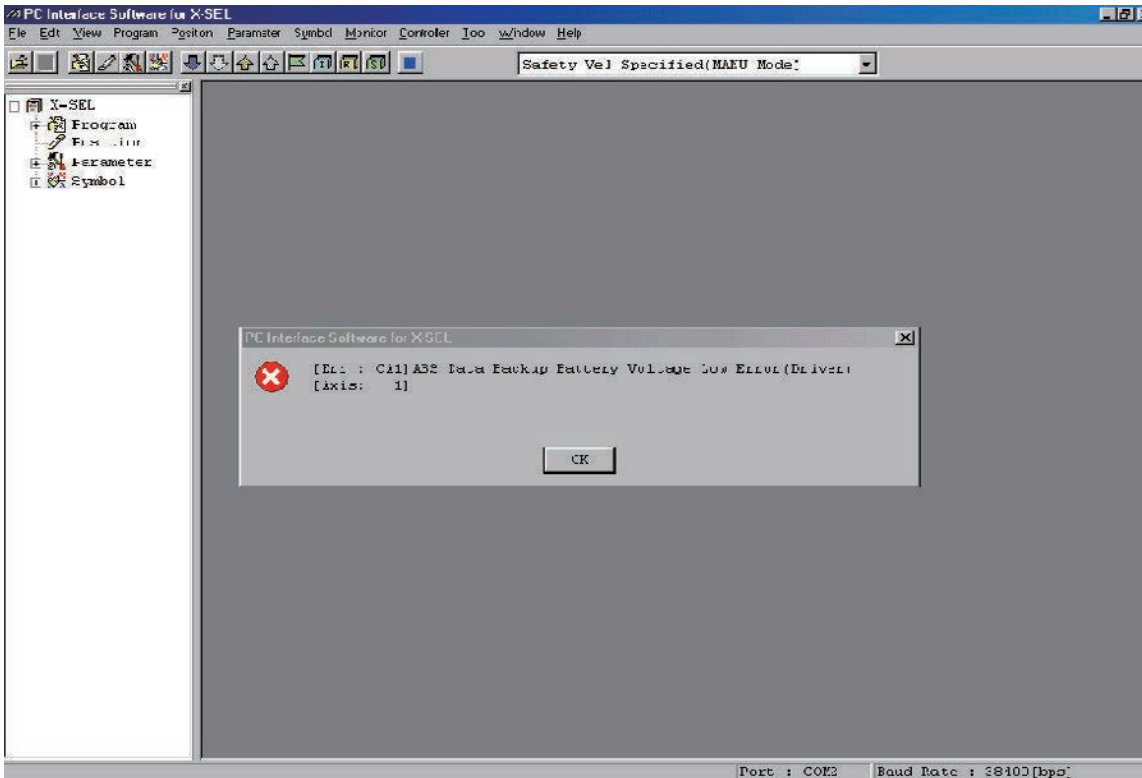
(5) [Connection Check] dialog box appears. Adjust the communication port setting to the computer that you are using. Then, click .

(The baud rate will be automatically detected without any manual setting.)



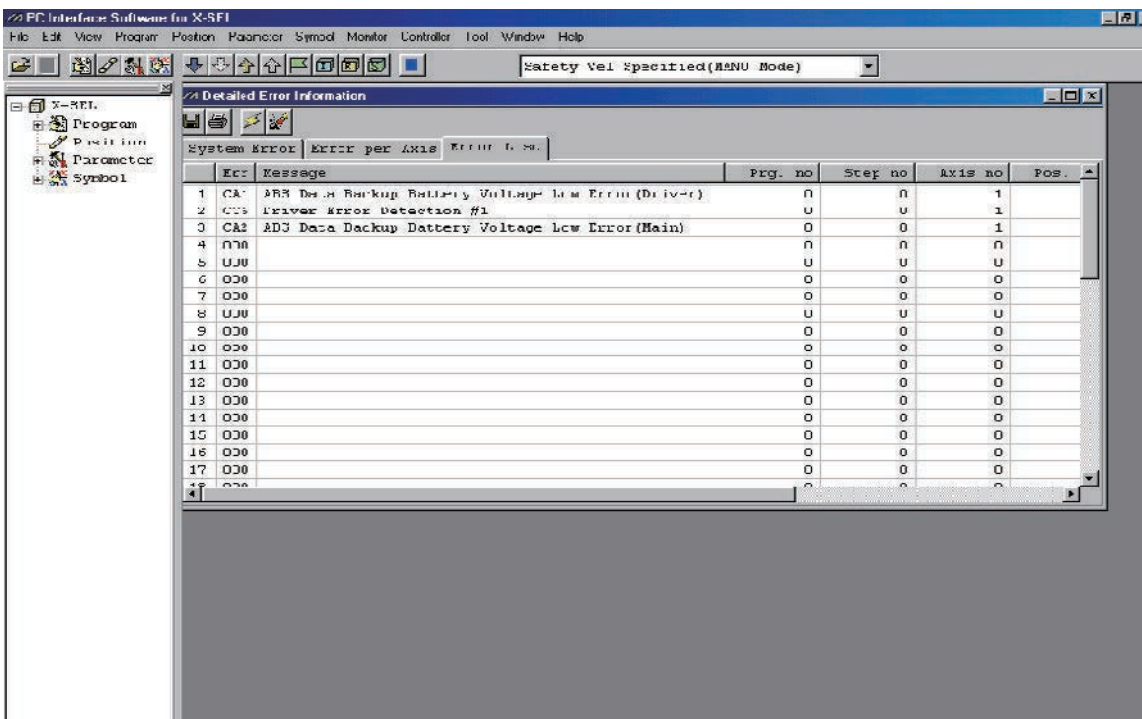
(6) A window for X-SEL PC software is displayed.

Click **OK** and the error message will be closed.

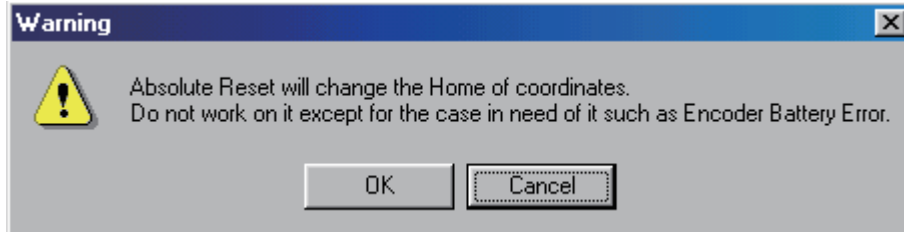


(7) Confirm the current error condition by selecting [Monitor (M)] → [Error Details (E)] menu.

The window shows as shown below if it is the encoder battery error. (An example of using an absolute encoder on the 4th axis) After confirmation, close the [Error Details] window.

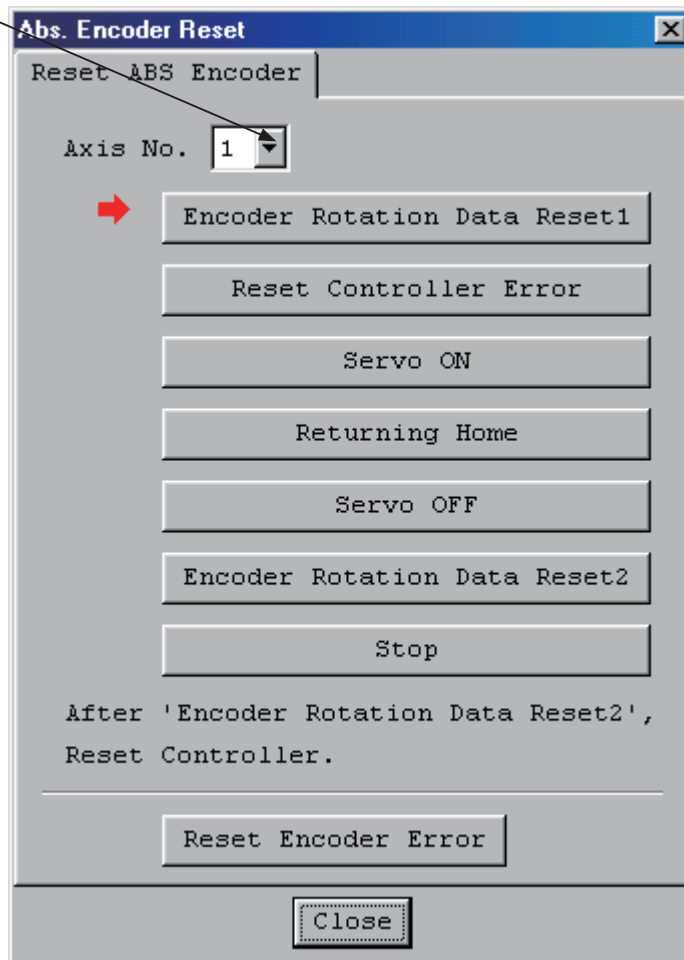


- (8) Select the [Controller (C)] → [Absolute Reset (A)] menu.
- (9) Click **OK** in [Warning] dialog box.

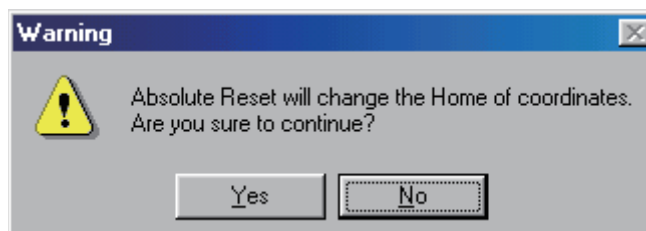


- (10) [Absolute Reset] window opens.

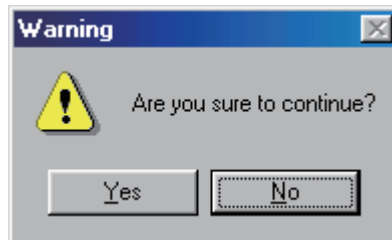
Click [here](#) to select the axis that the absolute reset is going to be performed.



- (11) Click **Encoder Turns Data Reset 1**, and [Warning] dialog box opens. Click **Yes**.



(12) "Warning" dialog box opens again. Click [Yes].



(13) When the Encoder Rotation Data Reset 1 process completes, the red arrow moves to the next step. Press the buttons in the following order. (The red arrow shifts to another when one process is complete.)

1. Controller Error Reset
2. Servo ON
3. Home Return
4. Servo OFF

(Note) For the PC software Ver. 1.1.0.0 or later, Encoder Turns Data Reset 2 is processed while the servo is on. Thus, the servo OFF process is skipped.

5. Encoder Rotation Data Reset 2

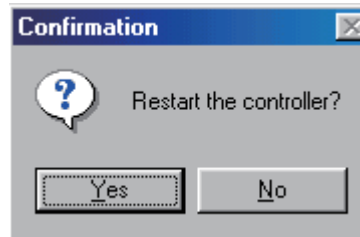
After Encoder Rotation Data Reset 2 is completed, the red arrow goes back to the top as shown in (10). When performing an absolute encoder reset on the multi axes type, select another axis here, and repeat the process after (10).

If desired to finish, click **Close** button to close the [Absolute Rest] dialog box.

(Note) When it is necessary to perform an absolute encoder reset on multiple axes, make sure to perform steps (10) to (13) before proceeding to step (14) Software Reset.

(14) Select [Controller (C)] → [Software Reset (R)] menu.

(15) "Confirmation" dialog box opens. Click [Yes] and reboot the controller.



(Note) If start operation without the software reset or reboot, it may cause:

Error No. C70 ABS Coordinates Undetermined Error, or

Error No. C6F Home Return Incompletion Error

(16) Unless there is another error, the controller shows "rdy" on the 7-seg LED.

(17) This is all for the absolute reset process.

If you desire to redo the absolute reset, shutdown the X-SEL PC software and repeat the whole process from the start again.

(Note) There are some models that the present value does not show 0mm after the absolute reset is complete, however, it is not an error.

Refer to the table below for the coordinate values after the absolute reset is complete.

Machine Type	Lead	Present Value after Absolute Reset Completion
RCS2-SA7C(R)	4	0
	8	1
	16	3
RCS2-SS7C(R)	6	-0.5
	12	1
RCS2-SS8C(R)	10	0
	20	2.5
	30	5
RCS2-RA5C(R)	4	0
	8	0
	16	2

*Models not listed in the table above should show 0 for the present value after absolute reset.

11.2.2 For SCON Controller

- (1) Connect the motor cable and encoder cable.
- (2) Connect to the host PLC on PIO connector using the flat cable packaged in the product.
- (3) Select the axis address with the axis number setting switch for the link connection of more than 2 axes.
- (4) Attach the battery connection.
- (5) Supply 24V for PIO through the flat cable.
- (6) Turn on the 24V power supply to the brake if the actuator is equipped with a brake.
- (7) Supply the control power and motor power at the same time. (Supply by using the same power supply.)

* The alarm output signal (* ALM) turns off, alarm code shows "OEE" or "OEF", alarm output of PIO (PM9 to PM1) displays "1101", and ALM LED turns on.

Also, a message "Absolute Encoder Error (2)" will be displayed on the computer or the teaching pendant.

- (8) Connect the computer or teaching pendant to perform the minimum initial settings of the parameter.
 - Select Parameter No. 25 PIO Pattern
 - Select Parameter No. 27 Move Command Classification for the air cylinder type
- (9) Perform the alarm reset.
 - Operation on Teaching Pendant
 - Press [ERROR RESET] key for CON-T
 - Press BEGIN/END key for RCM-T/RCM-E
 - Operation on PC software

Select the position data from the main window and press [Alarm].

* Message "Absolute Encoder Error (2)" will disappear.

Also, the alarm output signal (* ALM) turns on and the alarm code output signal (PM8 to PM1) turns off.

(Note) "OEE" and "OEF" alarm cannot be reset from PIO.

- (10) Turn the servo on.

Use "Servo ON Function" on the PC or teaching pendant to make the servo on.

It is working properly if the actuator becomes the servo lock condition and the SV LED on the front turns to green.

* If ALM LED is on, it means there is an error still In this case, please refer to the Alarm List.

- (11) Perform a home-return operation.
 - Operation on Teaching Pendant
 - For CON-T, Select "1. JOG Window" in "4. Teach/Play Window" of "** EDIT".
Press HOME key.
 - For RCM-T, Select "Edit/Teach" window and put the cursor onto "** Home" in the sub-display area then press the return key.
 - For RCM-E, Select "Teach/Play" window and scroll till "Home Return" then press the return key.

12. Warranty

12.1 Warranty Period

One of the following periods, whichever is shorter:

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

12.2 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.

12.3 Honoring the Warranty

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

12.4 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.

12.5 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.

12.6 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

13. Change History

Revision Date	Revision Description	
2010.04	First Edition	
2010.07	Second Edition	<p>Page 9 Precautions in Handling</p> <ul style="list-style-type: none"> • duty more than 50% → duty that exceeds 50% <p>Page 31 Section "6.2 Wiring with Dedicated Stand-Alone Cable (CS Series)" deleted</p> <p>Page 32 Statement changed to "Make sure to have a radius more than the minimum bending radius when using a cable track."</p> <p>Page 38 "O" added to "After 6 months of operation" in "Grease Supply"</p> <p>Page 40 Statement telling to wipe off the base oil when it is appeared on the sides of the guide rail is added</p> <p>Page 41 Statement telling to utilize the JOG operation for the low lead actuator is added</p>
2011.04	Third Edition	A page for CE Marking added
2012.03	Fourth Edition	<p>Contents changed in Safety Guide</p> <p>Caution notes added for when working with two or more persons</p> <p>Pages 22, 24 Note changed to 1.8 times more of the nominal diameter for the length of thread engagement on aluminum</p>
2012.03	Fifth Edition	<p>Page 1 to 7 Contents added and changed in Safety Guide</p> <p>Page 9 Note "Make sure to attach the actuator properly by following this instruction manual." added in Caution in Handling</p> <p>Page 41 Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care.</p>
2013.12	Sixth Edition	Page 49 to 52 Picture changed for new motor unit.

Revision Date	Revision Description		
2015.01	Seventh Edition	Page 19	Note added to state anti-rust electrolytically black colored coating on ball screw and stainless steel type attachment bolt are in standard
		Page 37	Change made to grease supply period
		Page 40	Recommended grease gun at grease supply added
2015.04	Eighth Edition	Page 13, 14, 15	Touch Panel Teaching Pendant TB-01 added
		Page 14, 15, 16, 33, 36, 57, 60, 63	Dedicated controller added
		Page 18	Dynamic allowable moment value changed
		Page 20, 21	Changed the description about the life
		Page 35	Model added
2015.10	Edition 8B	Page 38	Period of grease supply (reference) added for actuators with guide equipped with ball retainer
2016.05	Edition 8C	Page 42	Grease gun and nozzle changed
2016.11	Edition 8D	Page 17	“Acceleration/deceleration” and “creep phenomenon or slipped coupling” deleted Caution note added for synchronized operation of combined axes
2017.08	Edition 8F	Page 36	Change a diagram of CB-X-PA□□□-WC
2018.12	Edition 8G	Page 16	XSEL-RA/SA added to applicable controllers
		Page 29	Atmospheric dew point changed from "-20°C max." to "from -15°C to -20°C"
2019.02	Edition 8H	Page 27	Correction made 0.05mm → 0.05mm/m
2019.08	Edition 8J	Page 68 to 72	External Dimensions changed
2021.10	Edition 8K	Page 36 to 37	Cable added
		Page 44	Motor Replacement added
		Page 44 to 67	Procedure for Motor Replacement deleted
2021.12	Edition 8L	Page 13	Change in components
		Page 44	Correction made to motor replacement
2026.02	Edition 8M		Change made in accordance with discontinuation of including First Step Guide



IAI Corporation

Head Office: 1210 Iharacho Shimizu-KU Shizuoka City Shizuoka 424-0114, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL +1-310-891-6015 FAX +1-310-891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL +1-847-908-1400 FAX +1-847-908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL +1-678-354-9470 FAX +1-678-354-9471
website: www.intelligentactuator.com

Technical Support available in Europe

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL +49(0)6196-88950 FAX +49(0)6196-889524
website: www.iai-automation.com

Technical Support available in Great Britain



Duttons Way, Shadsworth Business Park, Blackburn, Lancashire, BB1 2QR, United Kingdom
TEL +44(0)1254-685900
website: www.lcautomation.com

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL +86-21-6448-4753 FAX +86-21-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825 PhairojKijja Tower 7th Floor, Debaratana RD., Bangna-Nuea, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456
website: www.iai-robot.co.th