IS Series Actuator
Instruction Manual

Splash-Proof Type
ISWA・ISPWA

Eighth Edition

IAI America Inc.

Please Read Before Use

Thank you for purchasing our product.

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

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.
The DVD that comes with the product contains operation manuals for IAI products.
When using the product, refer to the necessary portions of the applicable Instruction Manual by printing them out or displaying them on a PC.

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

[Important]

- This Instruction Manual is original.
- The product cannot be operated in any way unless expressly specified in this Instruction Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Instruction Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
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CE Marking

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

Table of Contents

Safety Guide

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

Safety Precautions for Our Products

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

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the 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	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the "Stipulations for the Operation" and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign "Under Operation" at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the 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 cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated 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 length within the allowable range.

Make sure to set the overhang length within the allowable range. The overhang length beyond 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.

Duty (%) = (Continuous Operation / (Continuous Operation + 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 accidently 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.

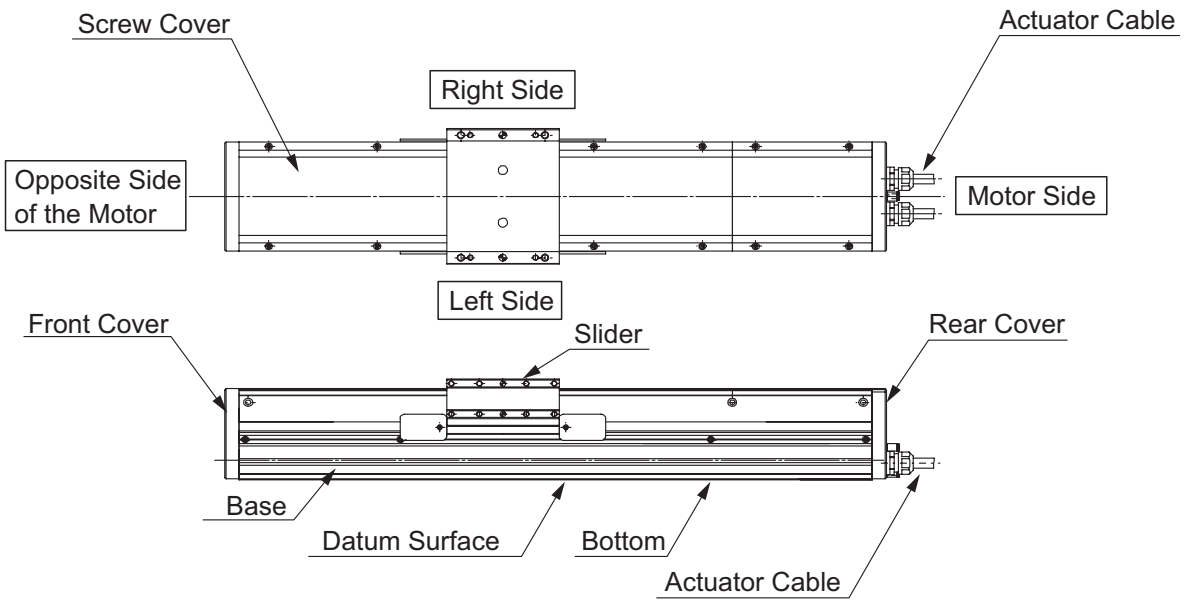
7.3 Handling of Product Mounted to Mechanical Equipment (System)

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 [12.1 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	Remarks
1	Main Body	"How to read the model plate", "How to read the model No."
Accessories		
2	Home Position Marking Sticker	
3	First Step Guide	
4	Instruction Manual (DVD)	
5	Safety Guide	

1.2 Instruction Manuals for Controllers Relevant to This Product

(1) XSEL-J/K Controller

No.	Name	Manual No
1	XSEL-J/K Controller Instruction Manual	ME0116
2	PC Software IA-101-X-MW/IA-101-X-USBMW Instruction Manual	ME0154
3	Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Program Controller Instruction Manual	ME0325
4	Teaching Pendant SEL-T/TD/TG Instruction Manual	ME0183
5	Teaching Pendant IA-T-X/XD Instruction Manual	ME0160
6	DeviceNet Instruction Manual	ME0124
7	CC-Link Instruction Manual	ME0123
8	PROFIBUS-DP Instruction Manual	ME0153
9	X-SEL Ethernet Instruction Manual	ME0140
10	Instruction Manual for Multi point I/O Board	ME0138
11	Instruction Manual for Multi point I/O Terminal Block	ME0139

(2) XSEL-P/Q, XSEL-R/S Controller

No.	Name	Manual No
1	XSEL-P/Q Controller Instruction Manual	ME0148
2	XSEL-R/S Controller Instruction Manual	ME0313
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-01, TB-01D, TB-01DR Applicable for Program Controller Instruction Manual	ME0325
6	Teaching Pendant SEL-T/TD/TG Instruction Manual	ME0183
7	Teaching Pendant IA-T-X/XD Instruction Manual	ME0160
8	DeviceNet Instruction Manual	ME0124
9	CC-Link Instruction Manual	ME0123
10	PROFIBUS-DP Instruction Manual	ME0153

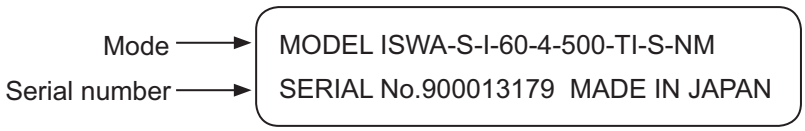
(3) SSEL Controller

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-01, TB-01D, TB-01DR Applicable for Program Controller Instruction Manual	ME0325
4	Teaching Pendant SEL-T/TD/TG Instruction Manual	ME0183
5	Teaching Pendant IA-T-X/XD Instruction Manual	ME0160
6	DeviceNet Instruction Manual	ME0124
7	CC-Link Instruction Manual	ME0123
8	PROFIBUS-DP Instruction Manual	ME0153

(4) SCON, MSCON Controller Related

No.	Name	Manual No
1	SCON Controller Instruction Manual	ME0161
2	SCON-CA Controller Instruction Manual	ME0243
3	MSCON-CA Controller Instruction Manual	ME0306
4	PC Software RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
5	Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Position Controller Instruction Manual	ME0324
6	Teaching Pendant CON-T/TG Instruction Manual	ME0178
7	Teaching Pendant RCM-T/TD Instruction Manual	ME0173
8	Simplified Teaching Pendant RCM-E Instruction Manual	ME0174
9	Data Setter RCM-P Instruction Manual	ME0175
10	Touch Panel Indicator RCM-PM-01 Instruction Manual	ME0182
11	DeviceNet Instruction Manual	ME0124
12	CC-Link Instruction Manual	ME0123
13	PROFIBUS-DP Instruction Manual	ME0153

1.3 How to read the model plate



1.4 How to read the model No.

ISWA - S - I - 60 - 4 - 500 - T1 - S - NM

<Series>
Standard Precision Positioning
ISWA
High Precision Positioning
ISPWA

<Type>
S : Small Size
M : Medium Size
L : Large Size

<Encoder Type>
A : Absolute
I : Incremental

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

<Option>
NM : Reversed-Home Type
RT : Guide with Ball
Retainer Mechanism

<Cable Length>
N : None
S : 3m
M : 5m
X□□ : Specified Length

<Applicable Controller>
T1 : XSEL-J/K
T2 : SCON
SSEL
XSEL-P/Q/R/S
MSCON

<Stroke>

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

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 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) 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: Even if the acceleration setting is less than the rated acceleration, transportable weight cannot be more than that guaranteed for the rated acceleration.

(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 ϕ12mm	Rolled C10	Rolled C5 or equiv
		8			
		4			
M	100	10	Ball screw ϕ16mm	Rolled C10	Rolled C5 or equiv
		5			
	200	20			
		10			
L	200	20	Ball screw ϕ20mm	Rolled C10	Rolled C5 or equiv
		10			
	400	20			

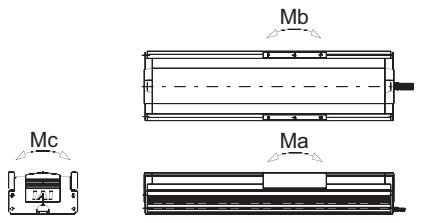
(5) Common Specifications

Item	ISWA Series	ISPWA Series
Positioning Accuracy Repeatability	±0.02mm	±0.01mm
Lost Motion	0.05mm or less	0.02mm or less
Base	Material: Aluminum, white anodizing	

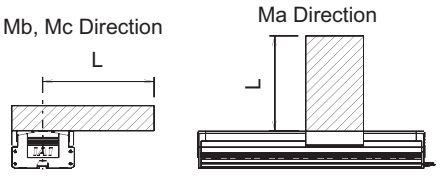
(6) Load on the Actuator

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



Moment Direction

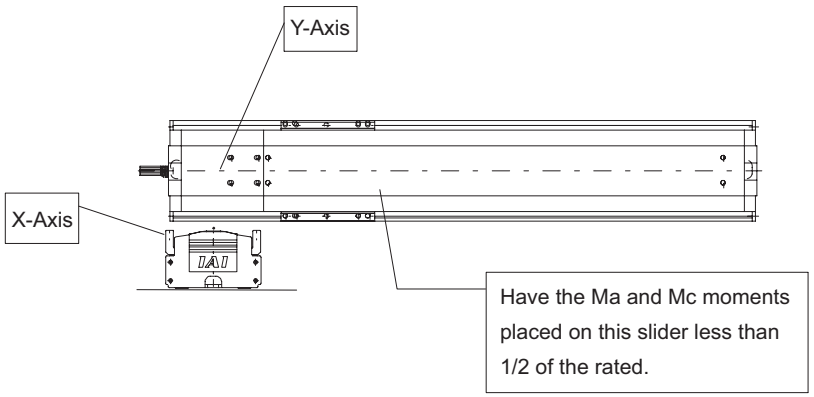


Allowable overhang length

⚠ 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 Ma and Mc moments less that 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 Operaition 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 : Operaition 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 : Operaition life (km)　C_M : Dynamic allowable moment (N·m)
M : Moment to work (N·m)　f_{ws} : Standard operational coefficient
f_w : Load coefficient　$f\alpha$: Attachment coefficient
10000km : Standard rated life of single axis robot

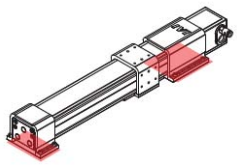
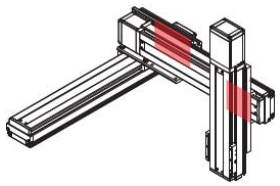
Explained below is regarding the standard operational coefficient f_{ws}, load coefficient f_w and attachment coefficient $f\alpha$.
Refer to the contents below to set them up.

[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
Attached condition	Attachment in whole area	Attachment on both ends	Attachment on spots
			

* 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 underassumption 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 strage 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

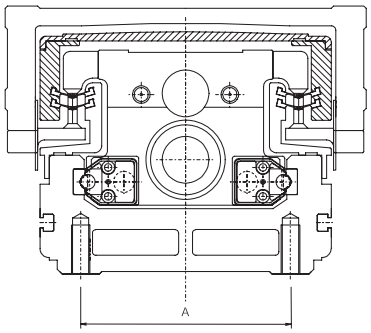
Stated below tells how to install the actuator to a mechanical equipment.

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.

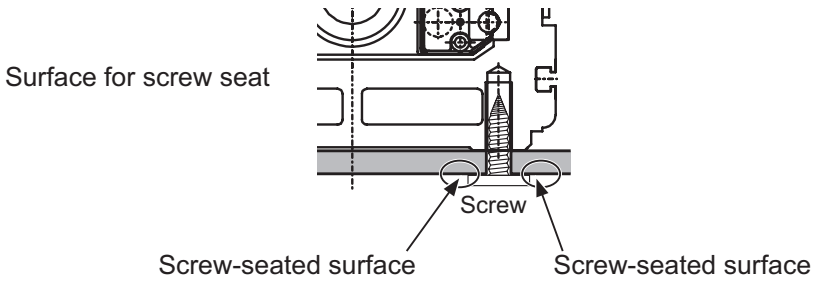
5.2 Installing the Main Body

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).

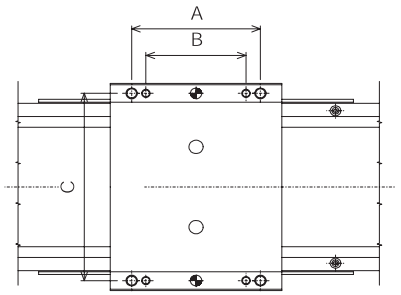
5.3 Mounting Load on Slider

- 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	ϕ6H10	10mm
Medium Size	M6	18mm	-	70mm	140mm	ϕ8H10	10mm
	M8	18mm	90mm	-			
Large Size	M8	20mm	120mm	90mm	170mm	ϕ8H10	10mm

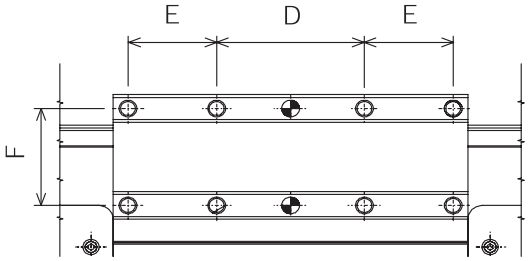
"Top"



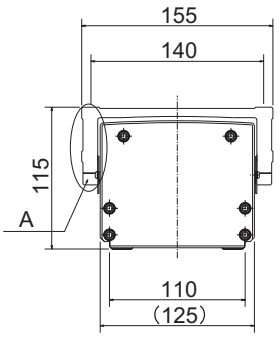
Bolt to be used	Tightening Torque	
	In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:
M6	12.3N•m(1.26kg•m)	5.4N•m(0.55kg•m)
M8	30.0N•m(3.06kg•m)	11.5N•m(1.17kg•m)

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



Detail : A

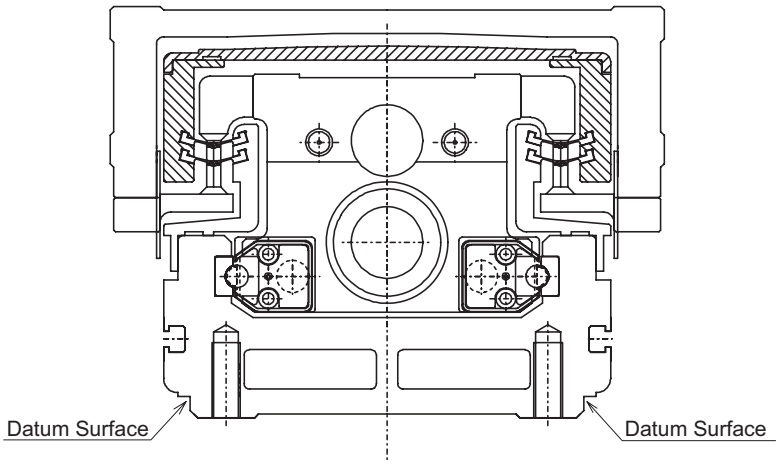


Bolt to be used	Tightening Torque	
	In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:
M6	12.3N•m(1.26kg•m)	5.4N•m(0.55kg•m)

- 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.

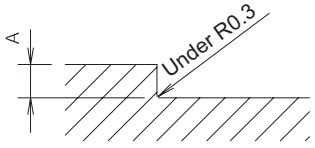
5.4 Datum Surface and Mounting Surface

- 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 0.05mm.
- 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.

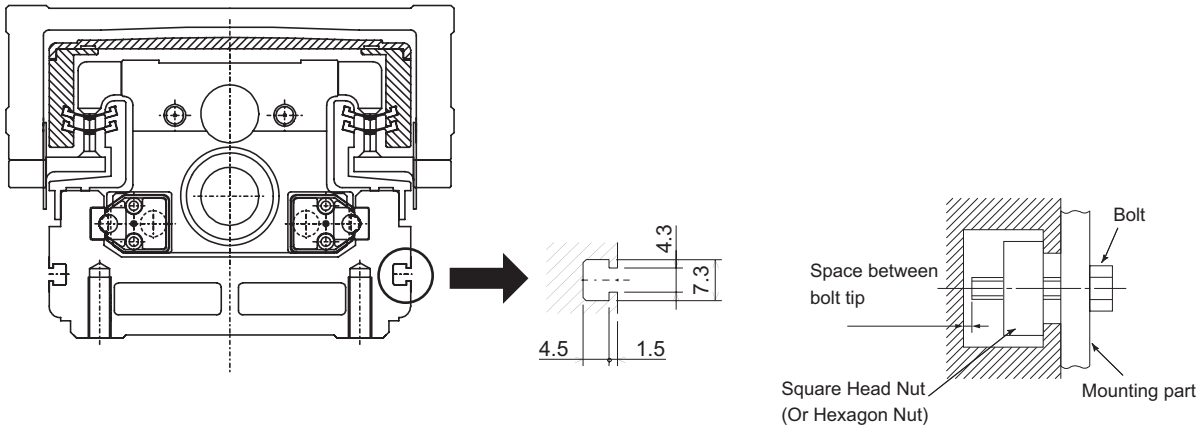
When installing the unit on the platform using the datum surface, follow the figure shown below for the platform profile.



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.

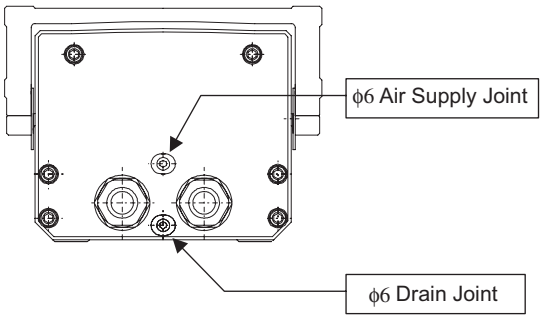


⚠ CAUTION : We recommend a square nut for the T-slot but you can also use a hexagonal nut.
When mounting, check the bolt length to make sure the end does not touch the bottom of the T-slot. Be especially careful during tightening.

5.6 Air Purge for Splash-Proof Type

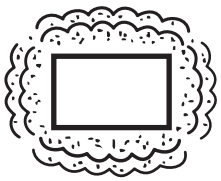
By supplying dry, compressed air into the actuator, it performs dust proof and splash proof (water and dust) of IP65 *1.

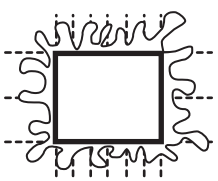
Instruction below shows how to perform air purge.
Air purge is performed with using the quick joint (O.D. ϕ6) on the rear cover. Supply air from the upper joint.
The lower quick joint is used as a drain joint (a hole to withdraw water) in the case that water gets inside the actuator. Connect a ϕ6 air tube and take it to a place where no water or dust gets in to withdraw water.



1. Actuator Air Pressure … 0.1MPa to 0.2MPa(approx. 1kgf/cm^2 to 2kgf/cm^2)
2. Air Flow … Approx.20 to 40Nl/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 and should be clean dry air that has passed the air filter with the filtration of 10μm max. and that is dried in atmospheric dew point of -20°C max.

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

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

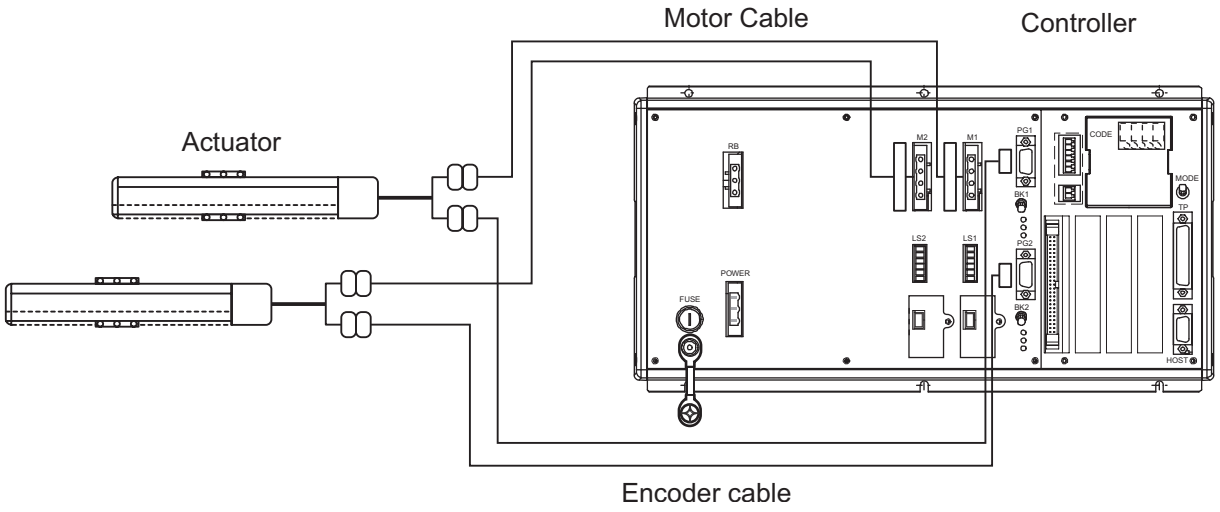
Primary Characteristic No.2	Protection Level to Water Penetration	
5		No harmful influence is occurred by water splashed from any angle. In the standard, it is specified the pressure of splash water is 30KPa (30KN/m^2, 0.3kgf/cm^2), splash speed is 12.2L/min and duration is for 3min.

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

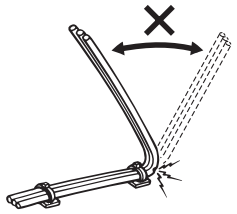
[Refer to "9. Supplied Cables" for the details of the relay cable.]

⚠ 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.

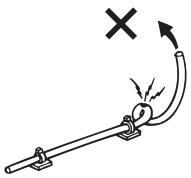
- Do not cut and extend, short or rejoin the cables.
- Do not pull the cables or bend them forcefully. The cables may break.

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.

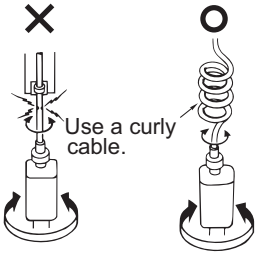
- Do not let the cable flex at a single point.



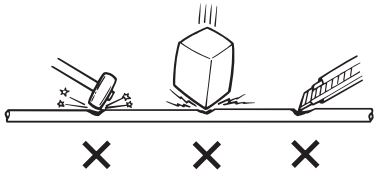
- Do not let the cable bend, kink or twist.

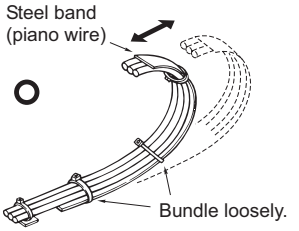


- Do not let the cable receive a turning force at a single point.

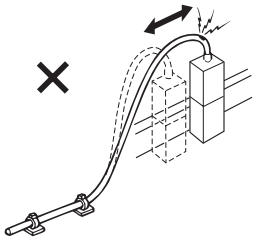


- Do not pinch, drop a heavy object onto or cut the cable.

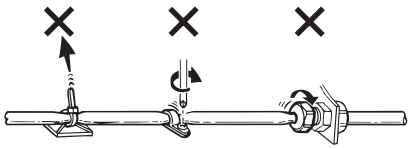


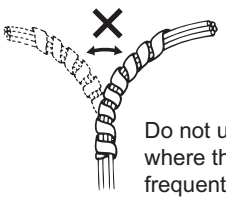


- Do not pull the cable with a strong force.



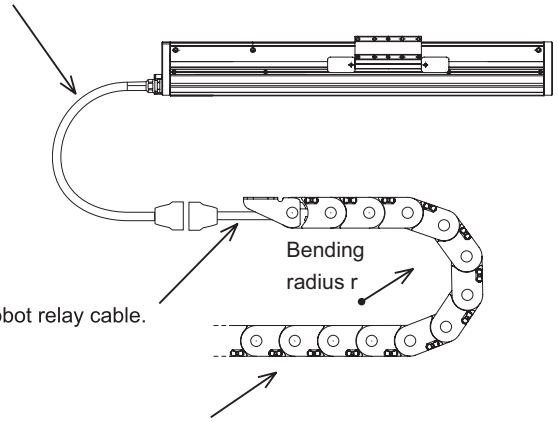
- When fixing the cable, provide a moderate slack and do not tension it too tight.





- Cautions for use of a cable track

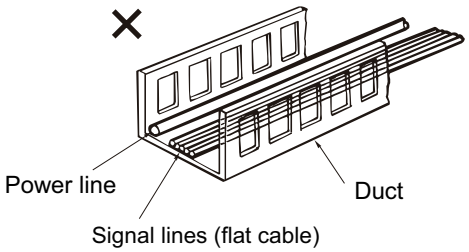
  - The supplied cable is not a robot cable, so never store it in a cable track.



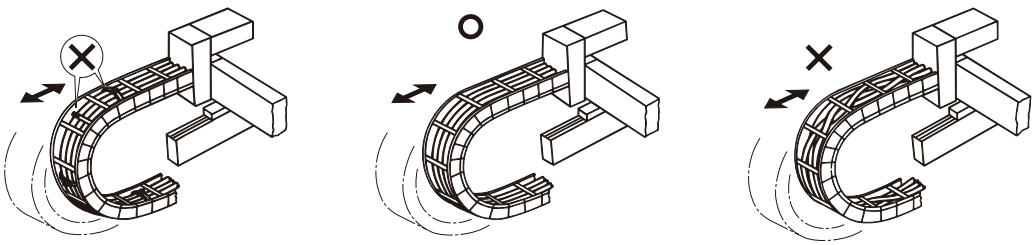
  - Always use a robot relay cable.

  - 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 linest hat 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 an SSEL and the home-return offset amount for SCON and MSCON.
Make the value either positive or negative to the value currently set.

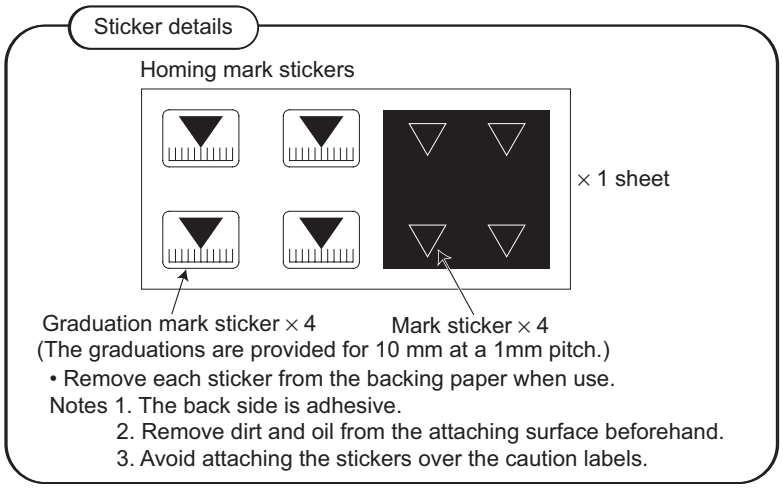
(3) If you allow for ample offset amount the movement range is that much more limited. If the offset is greater than 1mm, you will have to reset the stroke soft limit.

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.

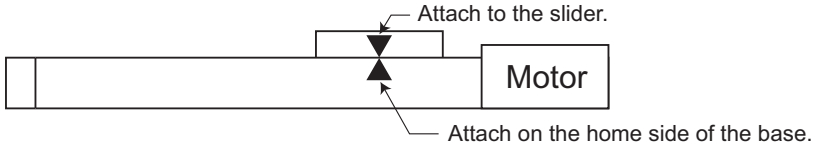
7.4 How to Use the Homing Mark Stickers

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

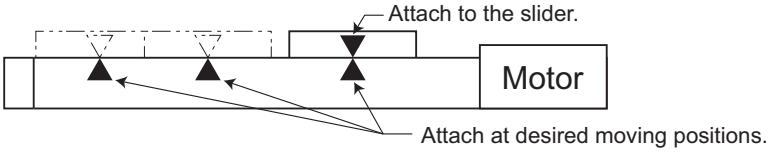


Examples of use

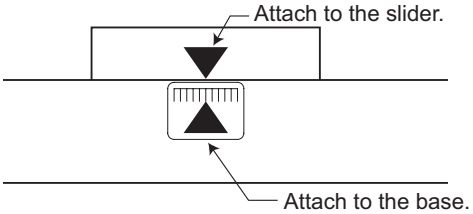
[1] For marking the home direction of the actuator



[2] As positioning marks



[3] For displacement check



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

8. Option

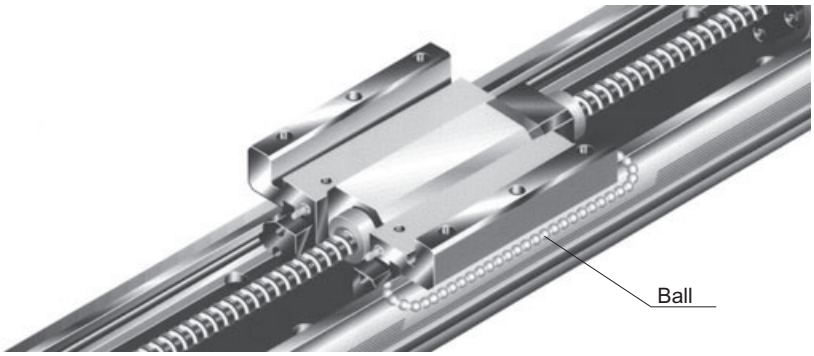
8.1 Reversed-home Specification (Model : NM)

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)

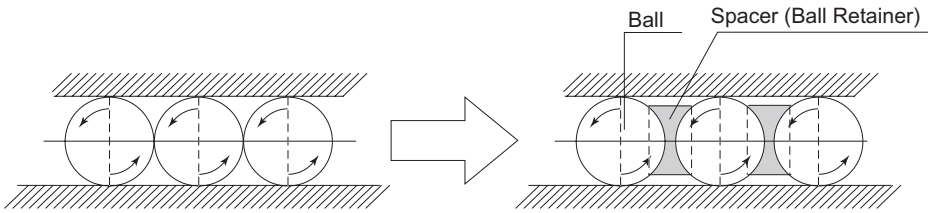
Putting spacers (ball retainers) between the balls will enable a lower operation noise and smoother movement.



(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.

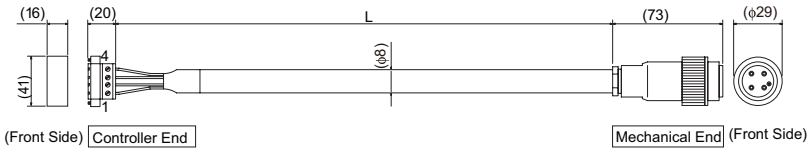
9. Motor and Encoder Cables

The supplied cables are in common for all models no matter what the actuator model type is. Applicable cable differs depending on the corresponding controller.

Chart of Controllers and Relative Supplied Cables

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

(1) Motor Cable CB-XEU-MA□□□



□□□ indicate the cable length (L), Available up to 30m
Example) 080 = 8m
(Minimum Bending Radius)
Movable Use : 48mm
Fixed Use : 48mm

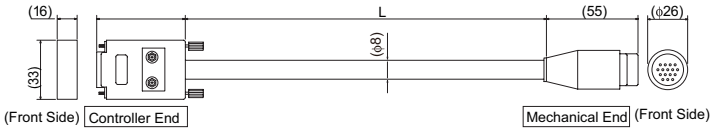
Plug
GIC2.5/4-STF-7.62(PHOENIX)

Cable	Signal	No.
0.75sq	PE	1
	U	2
	V	3
	W	4

Plug Connector
99-4222-00-04(BINDER)

No.	Signal	Cable
⊕	PE	0.75sq (solderless)
1	U	
2	V	
3	W	

(2) Encoder Cable CB-X-PA□□□-WC



□□□ indicate the cable length (L), Available up to 30m
Example) 080 = 8m
(Minimum Bending Radius)
Movable Use : 37.5mm
Fixed Use : 37.5mm

Plug Connector : 17HE-23150-C (D13A) (DDK)

Cable	Signal	No.
0.15sq (solderless)	-	1
	-	2
	-	3
	-	4
	-	5
	-	6
	SD	7
	SD	8
	BAT+	9
	BAT-	10
	VCC	11
	GND	12
	BK-	13
	BK+	14
	-	15
Clamp connection of Shield to Hood		

Note 3

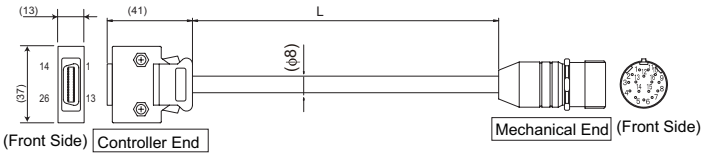
Note 1

Colored Connector : 99-4630-00-16 (BINDER)

No.	Signal	Cable
1	SD	0.15sq (soldering)
2	SD	
3	-	
4	-	
5	-	
6	-	
7	-	
8	-	
9	-	
10	VCC	
11	GND	
12	BAT+	
13	BAT-	
14	-	
15	BK-	
16	BK+	
Connection of shield to ground sleeve		

Combination of Drain Cable and Shield

(3) Encoder Cable CB-X1-PA□□□-WC



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

Example) 080 = 8m

(Minimum Bending Radius)

Movable Use : 37.5mm
Fixed Use : 37.5mm

Encoder Cable CB-XEU1-PA***

Cable	Color	Signal	No.
AWG26 (soldering)	—	—	10
	—	—	11
	—	E24V	12
	—	OV	26
	—	LS	25
	—	CLEEP	24
	—	OT	23
	—	RSV	9
	—	—	18
	—	—	19
	—	A+	1
	—	A−	2
	—	B+	3
	—	B−	4
	—	Z+	5
	—	Z−	6
	—	SRD+	7
	Green	SRD−	8
	purple	BAT+	14
	Gray	BAT−	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR−	20
	Yellow	BKR+	21
	—	—	22
Clamp connection of Shield to Hood			

No.	Color	Signal	Cable
1	SD	Orange	AWG26 (soldering)
2	SD	Green	
3	—	—	
4	—	—	
5	—	—	
6	—	—	
7	—	—	
8	—	—	
9	—	—	
10	VCC	Red	
11	GND	Black	
12	BAT+	purple	
13	BAT−	Gray	
14			
15	BKR−	Blue	
16	BKR+	Yellow	
Connection of shield to ground sleeve			

Combination of Drain Cable and Shield
(Cable color white / blue indicates the color of sheath)

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	

⚠ 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.

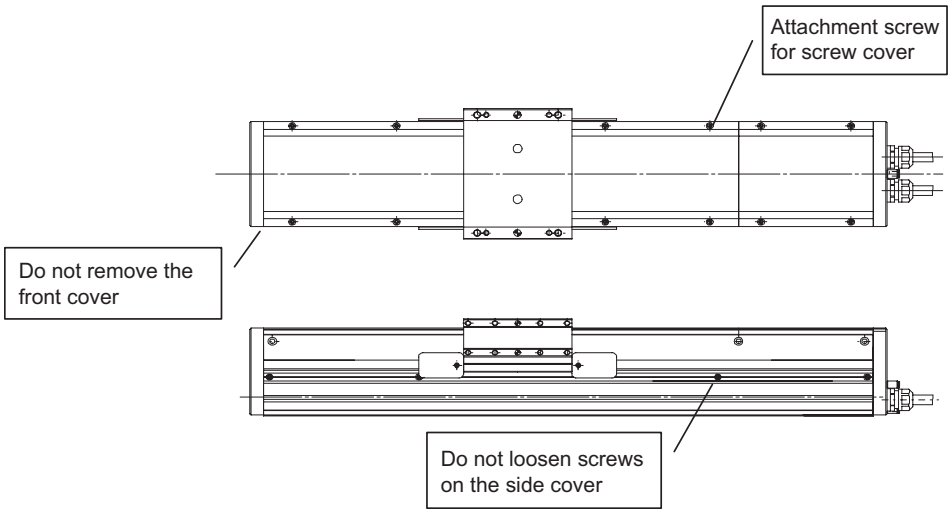
10.4 Internal Inspection

Turn off the power supply, remove the screw cover and have a visual inspection.
Please check the following items in the internal inspection.

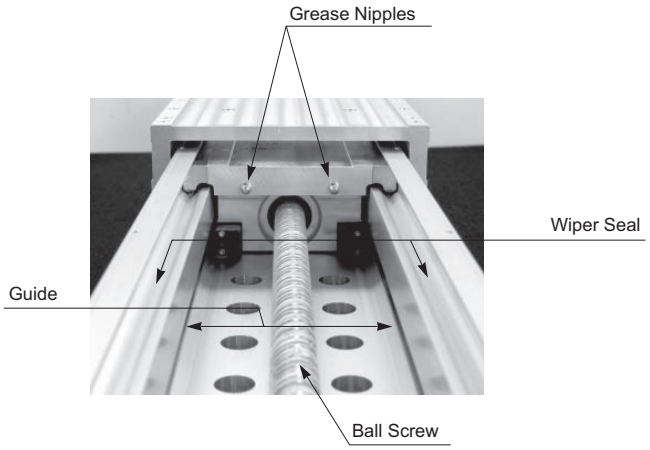
Main body	Loose mounting bolts
Guide Area	Lubricant condition and dirtiness
Ball Screw Area	Lubricant condition and dirtiness

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.

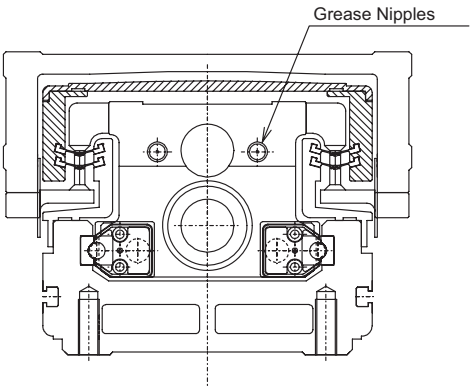
(2) Inject grease into the grease nipples on the slider with a grease gun.

(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

Recommend grease gun	Nozzle	Maker
MG70	N type	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

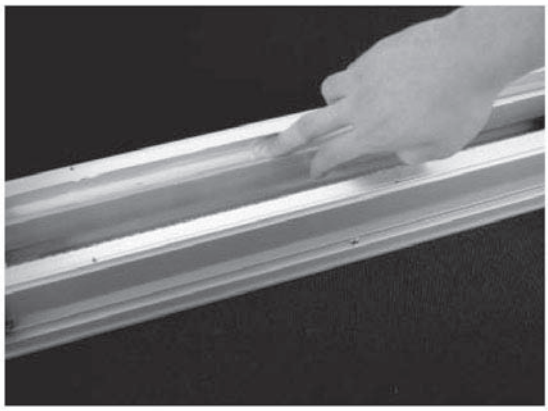
Perform a grease supply using a hand to apply grease after cleaning the screw then move the slider back and forth to spread the grease evenly on the shaft. Make sure to wipe off the excess grease out of the nut to finish the process.

⚠ 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.

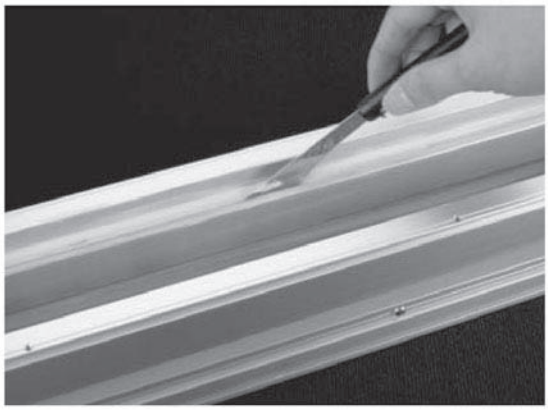
⚠ CAUTION : Excessive supply of grease may increase the stirring resistance and generate heat on the ball screw, or excess grease on the ball screw may splash on the surroundings. Make sure to wipe off the excess grease.

⚠ 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.

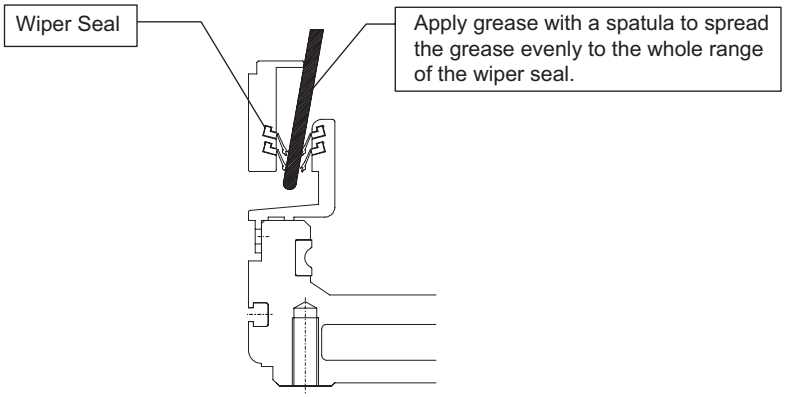
(3) Grease Supply on Wiper Seal



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.

11. Procedure for Motor Replacement

11.1 Motor Replacement

This manual details the procedure for replacement of an ISWA/ISPWA Series motor.
When you need to replace your motor, please follow the steps described below.
Because the screws and other components removed during replacement of the motor will be needed for reassembly, prepare a storage box in advance to keep those components so that you don't lose or misplace them.

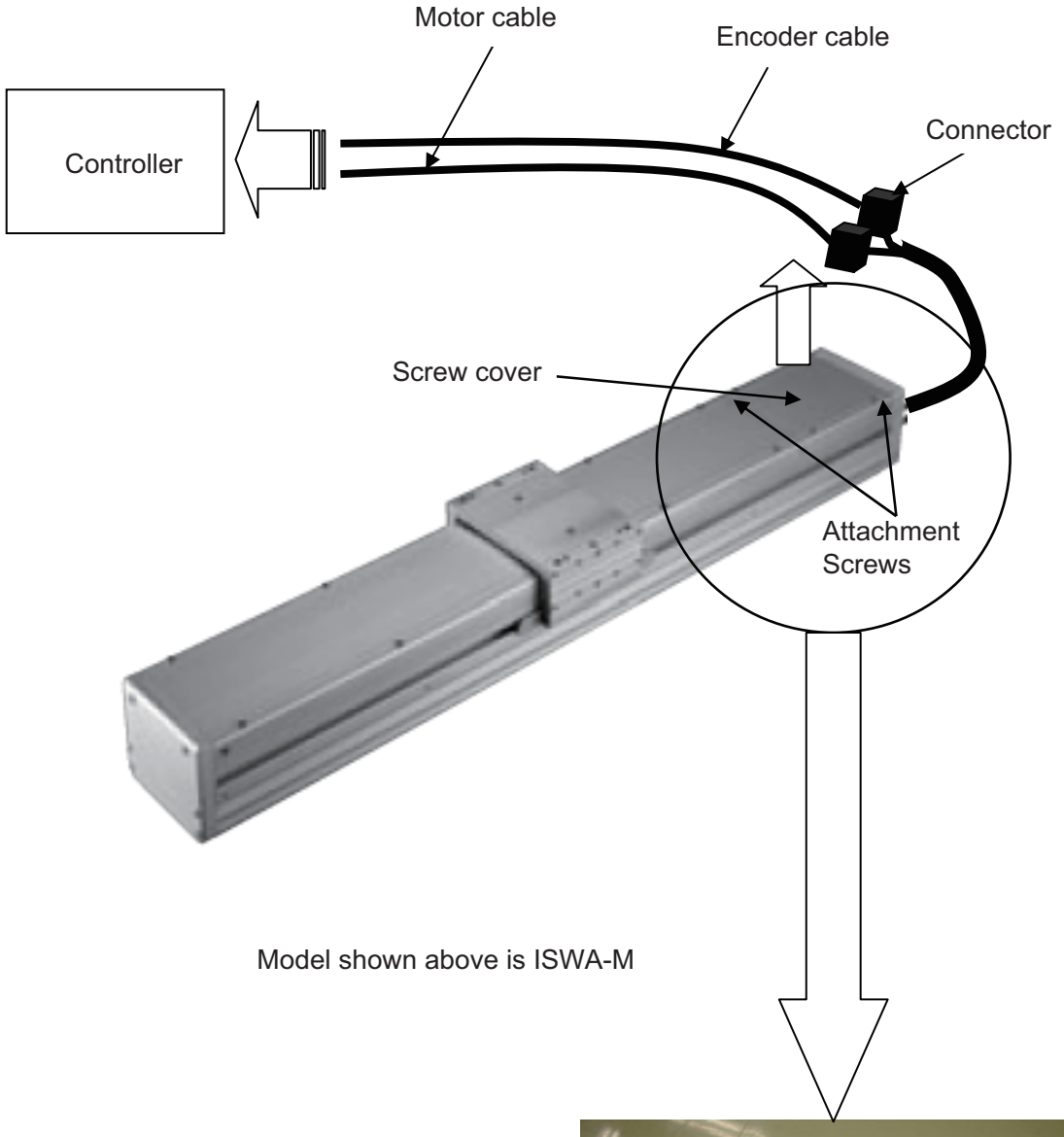
⚠ CAUTION : When replacing the motor, ON/OFF operation of power supply and the servo is required to perform the following processes;
(1) Aligning of the coupling on the motor
(2) Attaching the motor
(3) Brake Operation
Pay special attention on your work while the power is turned on.

Processes (1) and (2) are necessary to align the relative positions of the motor/encoder unit and the actuator.
Without this positioning process, there may be a case that the home-returning function does not correctly operate.
Process (3) is required because the brake is an electromagnetic brake, and it will not be released without exciting it.

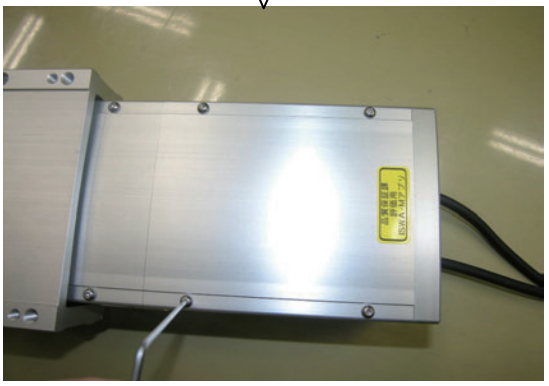
11.1.1 Removing the Motor Unit

11.1.1.1 Removing the Screw Cover

Turn off the power supply to the controller, and then disconnect the motor cable and encoder cable.
Remove the four thin-head screws used for mounting the screw cover, and take out the cover.

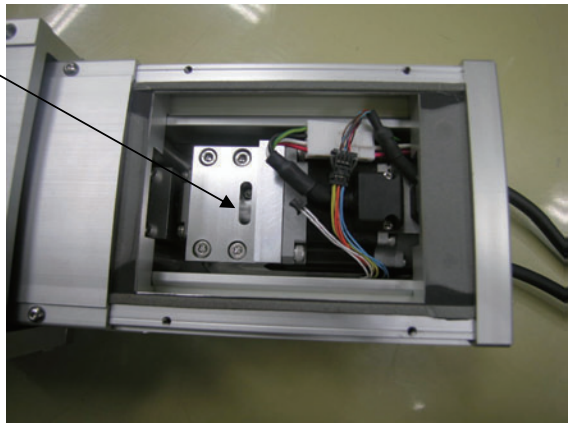


Model shown above is ISWA-M

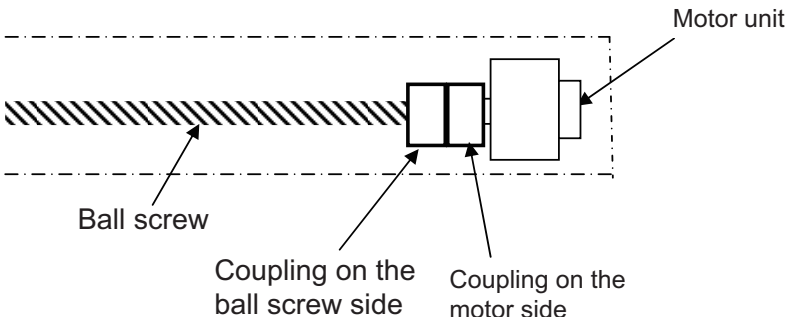


You can now see the ball screw side of the coupling.
For an actuator equipped with a brake, connect the encoder cable to the controller and turn on the power supply to the controller.
As a next step, release the brake and move the slider to the position far enough to remove the coupling screws on the ball screw side.
After moving the slider, deactivate the brake release, turn off the power to the controller and disconnect the encoder cable.

The ball screw side of the coupling is visible.

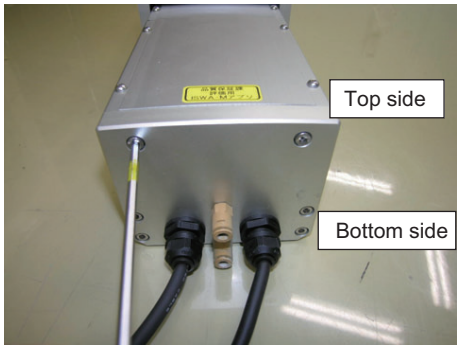


⚠ CAUTION : • If the actuator is vertically mounted (Z axis), exercise due caution so that the slider doesn't fall when the brake is released.
• If you attempt to move the slider with the motor cable connected, the slider movement will become heavy due to regenerative braking. Disconnect the motor cable before moving the slider.



11.1.1.2 Removing the Motor Cover

Remove the six bolts that secure the motor cover.



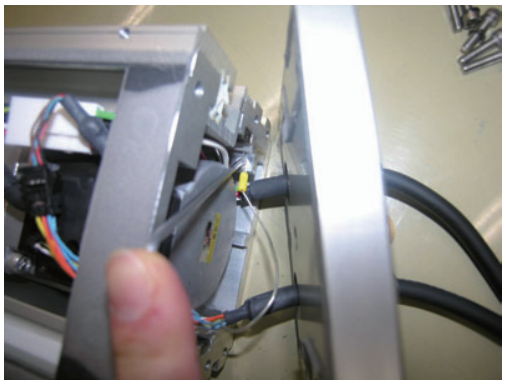
<List of Cover Mounting Bolts>

Type	Motor output (W)	Location	Bolt used		
			Nominal Diameter	Length	Quantity
S	60	Top side	M4	18	2
		Bottom side		18	4
M	100	Top side	M5	20	2
		Bottom side		20	4
	200	Top side	M5	20	2
		Bottom side		20	4
L	200	Top side	M6	20	2
		Bottom side		20	4
	400	Top side	M6	20	2
		Bottom side		20	4

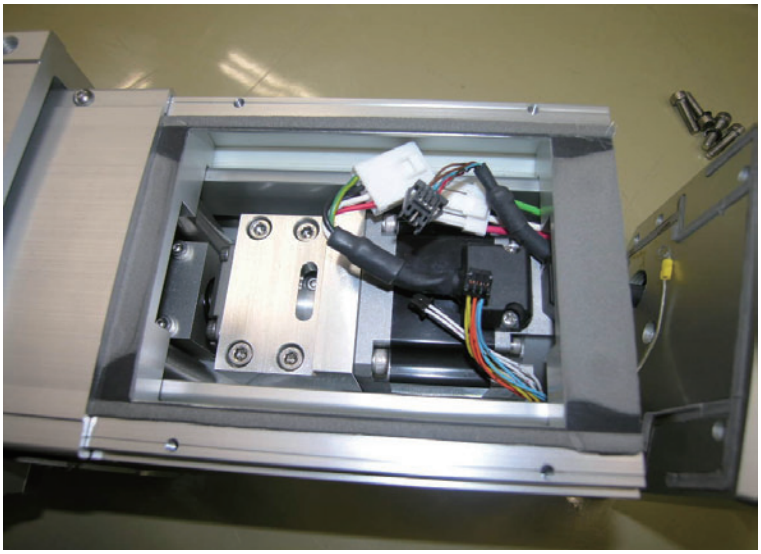
* There is a sealing washer applied with the top two screws.

11.1.1.3 Removing Wire/Cable Lines for the Motor Unit

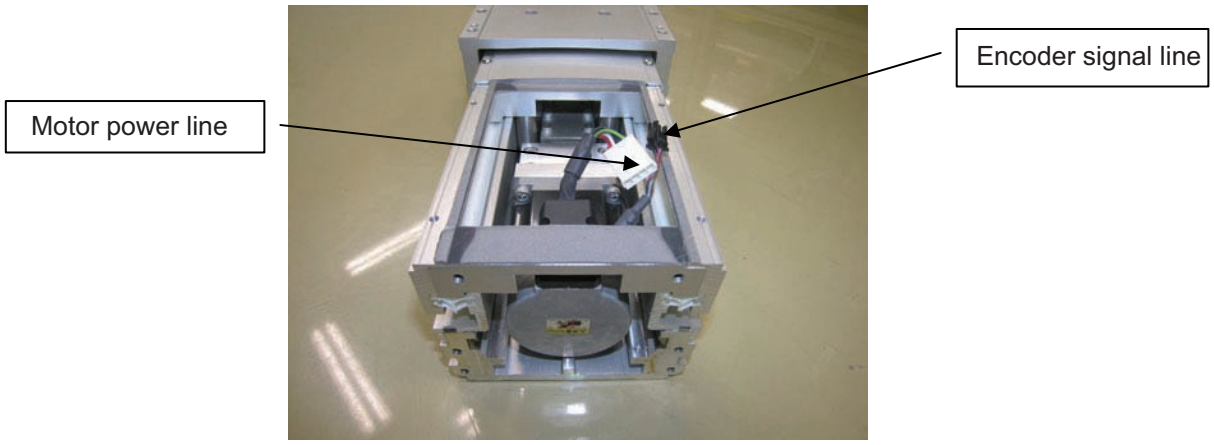
(1) Remove the ground line, which is bolted to the motor bracket.



(2) Disconnect the encoder signal line connector and the motor power line connector.
If a brake is provided, the brake lead connector should also be disconnected.



The photo below shows how the motor looks when the motor cover and all connectors are removed.

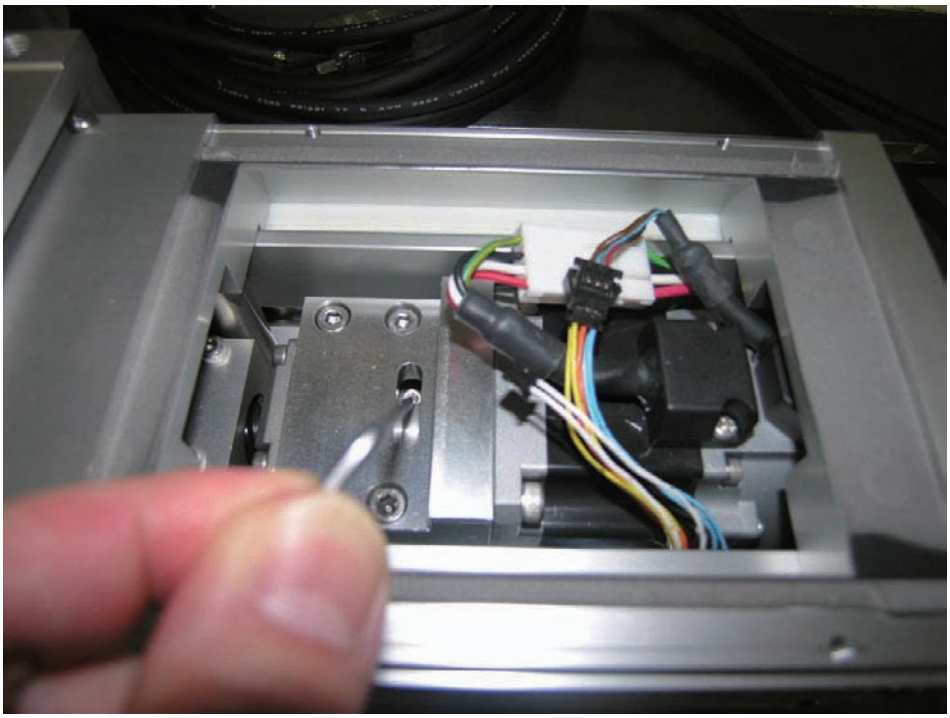


⚠ CAUTION : • Exercise caution so as not to pull out the brake lead line.
It is connected inside the actuator. If it is forcefully pulled out, the connecter inside may get disconnected.

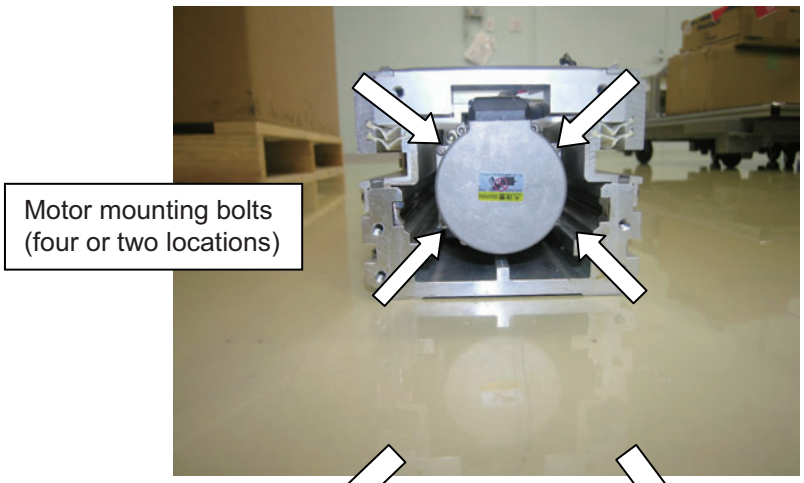
11.1.1.4 Removing the Motor Unit

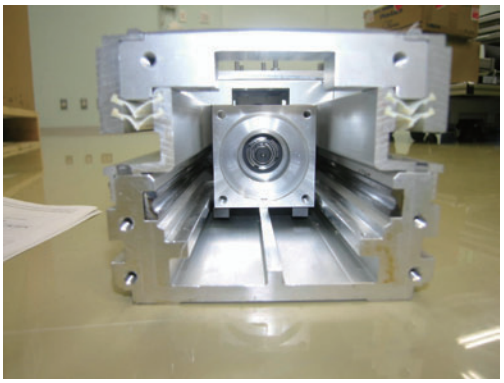
(1) Move the slider to a position in which the coupling bolts on the ball screw side can be loosened. If a brake is provided, this procedure should be completed before the seat cover is removed as described in Section 11.1.1.1.

(2) Loosen the coupling bolts on the ball screw side.

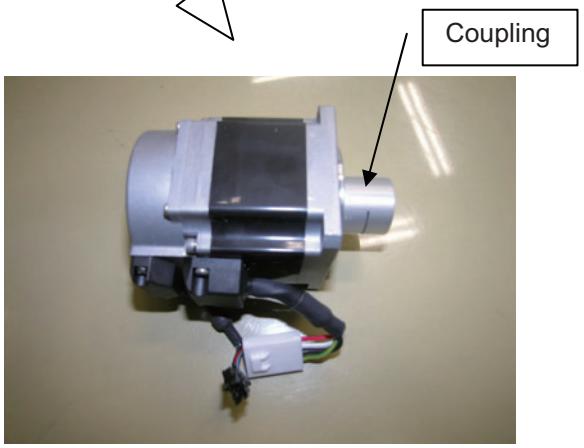


(3) Remove the motor mounting bolts, and then pull the motor unit and coupling out of the motor housing.





[Motor housing]

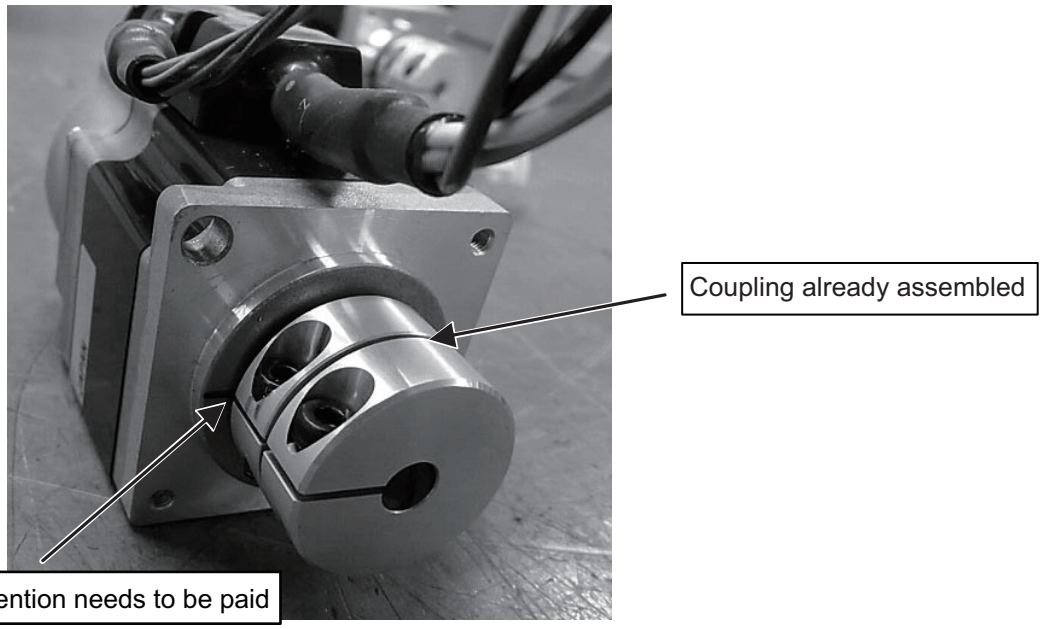


[Motor unit]

11.1.2 Installing a New Motor Unit

11.1.2.1 New Motor Unit

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

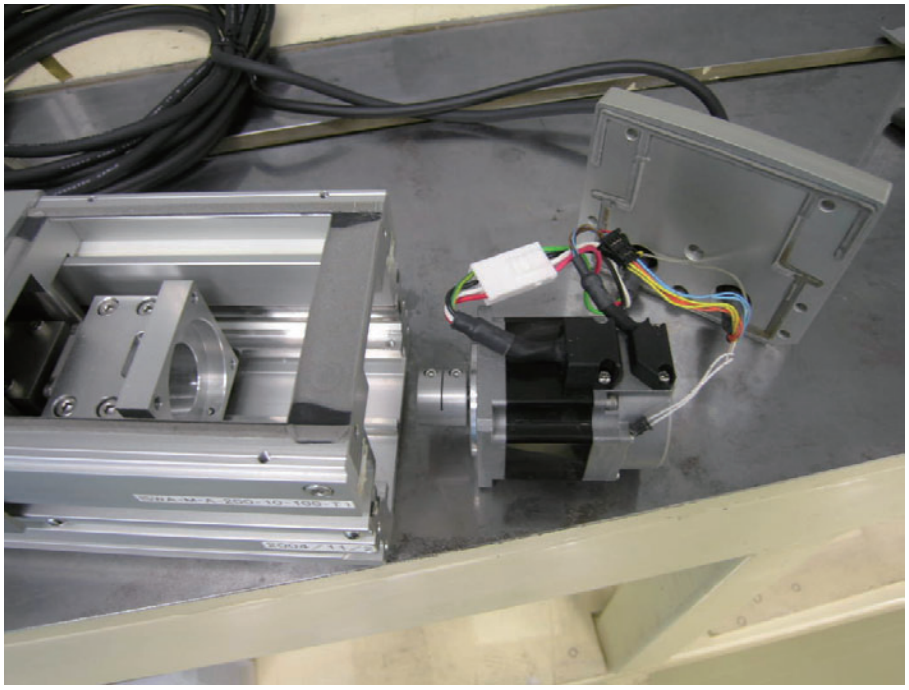


⚠ CAUTION : • Motor is to be mounted on the motor housing with the coupling attached and the slit in the coupling aligned with the home position marked on the motor. Under no circumstances should the coupling on the motor side be loosened. [Refer to 11.1.2.3 Aligning the Motor Position.]
The slit in the coupling is used as a reference when the relationship of the positions for the actuator and the encoder is determined. There may be a case that the home-returning function does not correctly operate if the coupling is loosened.

11.1.2.2 Aligning the Slider Position

(1) Connecting Motor Unit

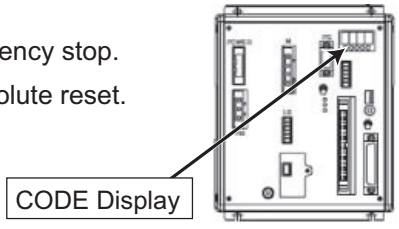
Connect the motor cable and encoder cable provided with the motor cover (which has been removed) to the motor unit, and then connect them to the controller using trunk cables (motor cable and encoder cable).



(2) Treatment Held When Error Occurred

When an alarm is generated and the CODE display on the front side of the controller does not show "rdy" or "Ardy" after the power is supplied to the controller, check the Instruction Manual. Contact us if the problem cannot be solved even after checking the Instruction Manual.

If the CODE display showing "Erg", means it is under an emergency stop.
If the CODE display showing "ECA1", means it requires an absolute reset.

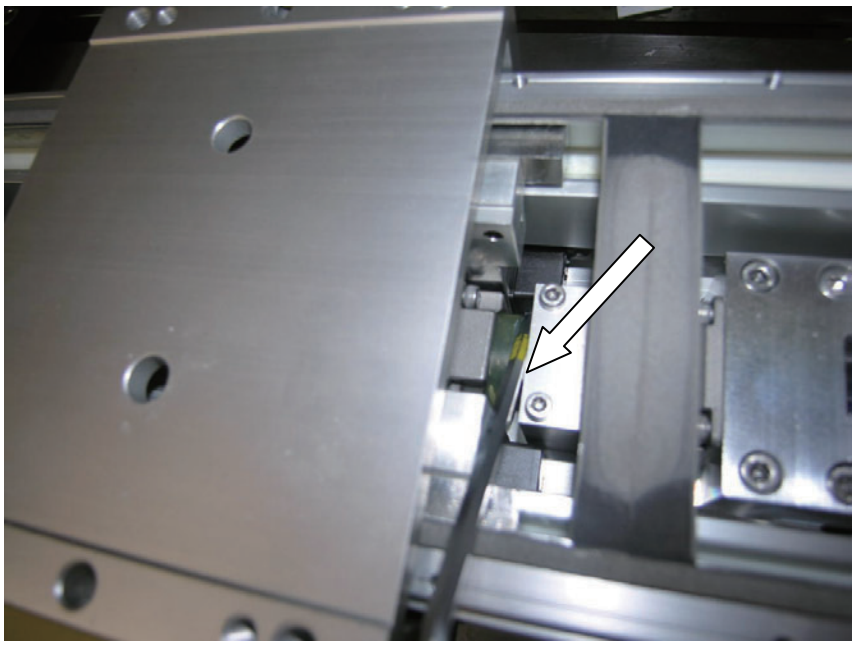


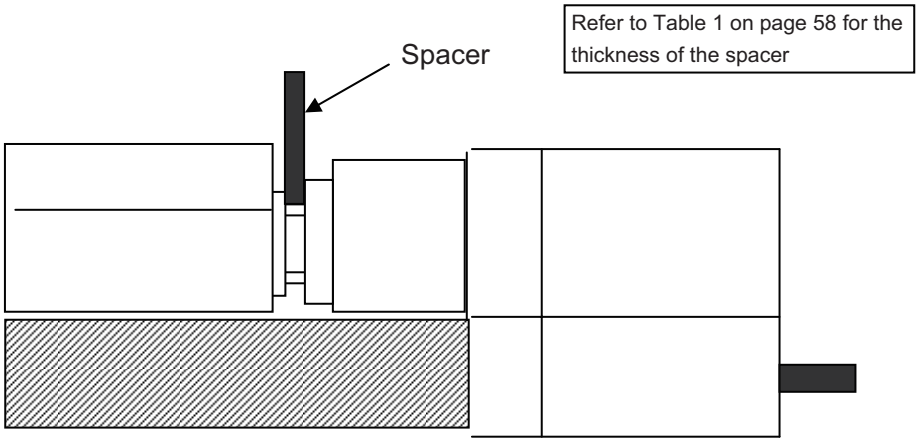
(3) Aligning Slider

An adjustment of the slider position is performed by putting a spacer (a jig or a block gauge) with the specified thickness between the mechanical end on the home side and the slider then pushing the slider until there is no gap.

* For IS(P)WA-S type, put a spacer with the specified thickness after the cover is removed.

For an actuator equipped with a brake, turn on the power supply to the controller and release the brake to move the slider.
After moving the slider, deactivate the brake release, turn off the power to the controller and disconnect the brake lead line connector.
The thickness of the spacer will differ according to the home offset distance, the SE (stroke end) to ME (mechanical end) distance and the actuator type. (See Page 58.)



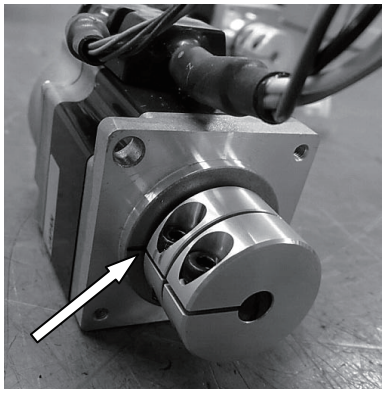


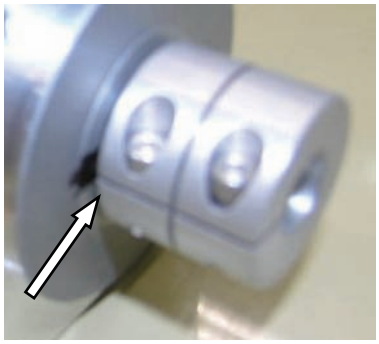
11.1.2.3 Aligning the Motor Position

Align the slit in the coupling to the marking line.

For the incremental type, turn on the power supply to the controller and turn the motor servo on by using the PC software or the teaching pendant.

For the absolute type, proceed until turning the servo on to the absolute reset after turning on the power supply to the controller.

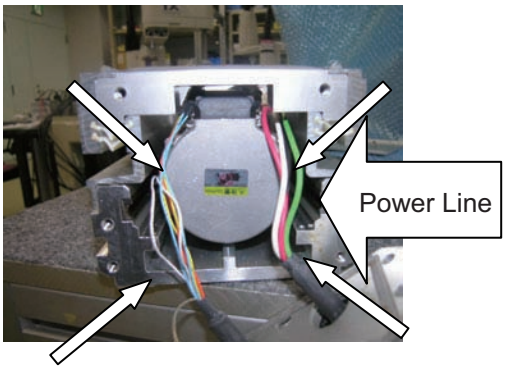




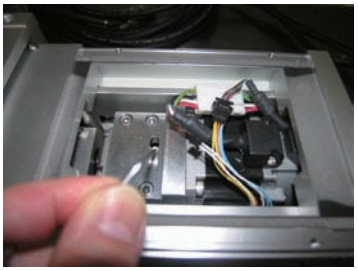
11.1.2.4 Installing the Motor Unit Temporarily

(1) With the motor servo turned on, fit the motor unit's coupling in the end of the ball screw shaft and fasten the motor housing and motor unit temporarily. (Tighten manually for this temporary purpose.)
When fastening the motor and motor housing temporarily, be sure to place them next to each other with no gaps or play.
Install the motor unit so that the motor power line is located on the right side.

Type	Motor Output (W)	Bolt to Use	Quantity
S	60	M4×10	2
M	100	M5×12	4
	200		
L	200		
	400		



(2) With the motor fastened temporarily, tighten the coupling bolts on the ball screw side.



Motor retainer screw, 4 or 2 places

<Tightening Torque by Coupling Bolt Type>
Coupling for S → 2N•m
Coupling for M → 2N•m
Coupling for L → 4N•m

(3) Turn off the power supply to the controller for the incremental type with this condition, and after complete the absolute reset for the absolute type.

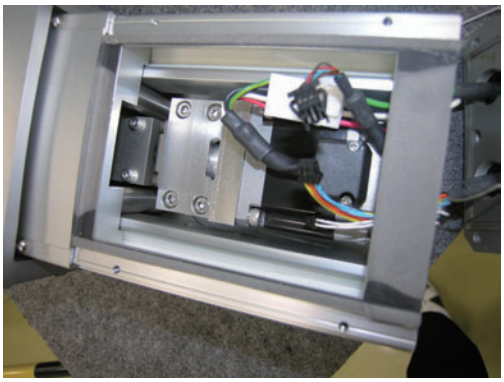
11.1.2.5 Centering and Securing the Motor Unit

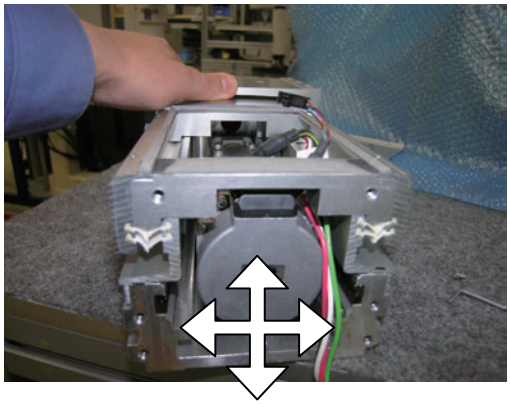
Loosen the motor mounting screws used for temporary fastening, and then move the slider back and forth three or four strokes (take as large a stroke length as possible). Move the slider home. Torque down the motor mounting screws per the following table. Move the slider back and forth three or four strokes to check for binding. Repeat this procedure if binding occurs.

[Bolt Tightening Torques for Securing the Motor Unit]

Type	Motor Output (W)	Bolt to Use	Tightening(N•cm)	
			Standard	Stainless steel type
S	60	M4×10	225	185
M	100	M5×12	486	373
	200			
L	200			
	400			

* If the actuator is equipped with a brake, connect the encoder cable, connect only the connector of the brake lead line and apply power to the controller. Then release the brake and move the slider. After securing the motor unit, deactivate the brake release, turn off the power to the controller and disconnect the encoder cable connector.

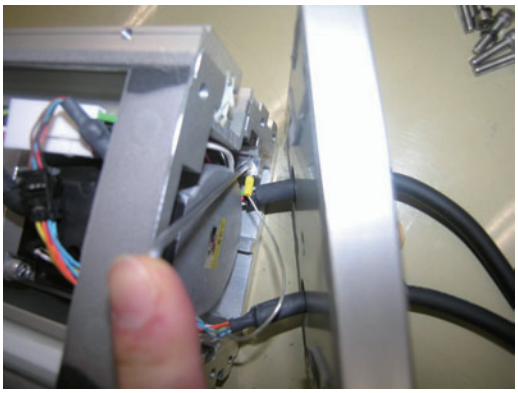




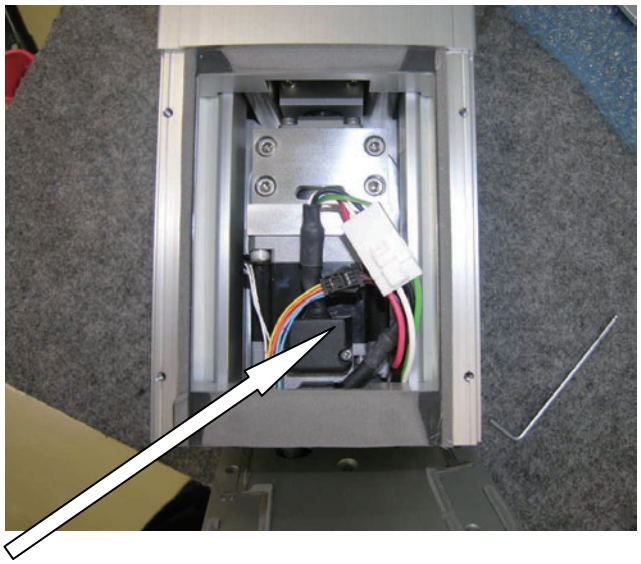
11.1.2.6 Assembling the Motor Cover

(1) Reconnect the motor cable and encoder cable connectors provided with the motor cover to the motor unit.

(2) Bolt the ground line to the motor bracket as it was previously secured.



(3) Store the motor connector beneath the motor and the encoder connector on the left side of the motor, and put all the wire/cable lines where they were previously.



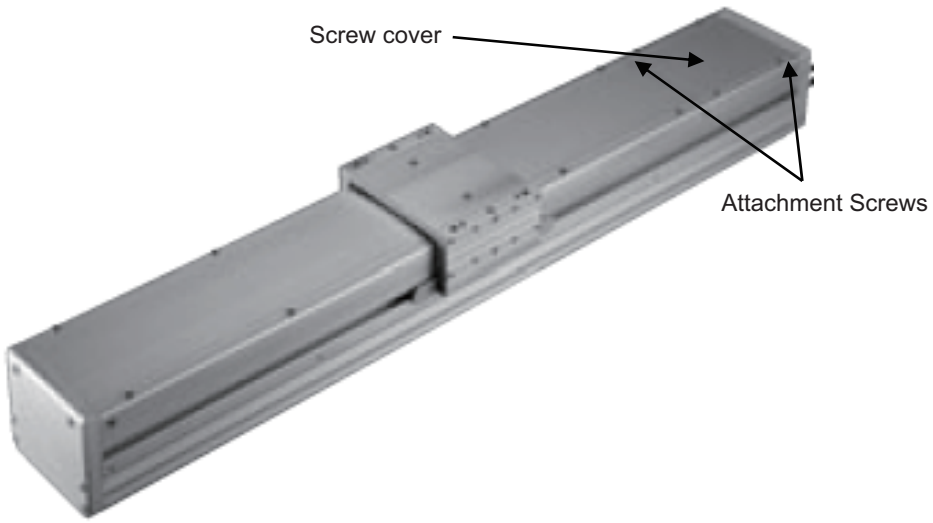
The encoder connector should be stored in a space on the left side of the motor.
* The brake connector should be stored in the same manner.

(4) Secure the motor cover in place.

⚠ CAUTION : Be careful not to pinch the cables between the main body and cover.

11.1.2.7 Installing the Screw Cover

Install the screw cover in the manner it was previously installed.



11.1.3 Adjustment of Position

(1) Connect the motor cable and encoder cable, and apply power to the controller.
(2) Perform a home-return operation using the PC software or the teaching pendant to confirm the home position. Perform it several times to make sure it returns to the same position.
(Perform an absolute reset for the absolute type.)
(3) Check the amount of position difference.
It is possible that the position is slightly different from that before the replacement.
Therefore, it is required that the amount of difference is measured by positioning at a position No. selected for the confirmation of position difference between before and after the replacement.
(4) The amount of difference needs to be included to the home preset value for XSEL and SSEL controllers and to the home-return offset value for SCON, MSCON controller.
[Refer to "11.2 Setting for Home Preset Value and Home-Return Offset Value" for the method of setting.]

* If the position differs in a large amount (more than 1 turn of the ball screw = more than 1 lead length), or if the home-return is not constant when the operation is repeated, repeat the process of motor unit attachment again following this Instruction Manual.
Please make sure that the correct size of spacer has been chosen. The correct size can be found as shown on the next page. Please also make sure that the slider has not moved since this is supposed to be pushed against the mechanical end.

11.1.4 Operation Check after Motor Replacement

After the replacement, perform a continuous operation to confirm that there is no abnormal vibration or noise.

• Table 1: Spacer Thickness for Each Model

~ Thickness of Spacer Used When Installing the Motor ~

The thickness of the spacer differs according to the actuator type and ball screw lead. Prepare a spacer by referring to the charts below.
To determine the actuator type and ball screw lead length, check the model code indicated on the label affixed to the actuator.

[How to Read the Model Code and Select a Spacer]

Series	Type	Encoder type	Motor output	Lead	Stroke	Applicable controller	Cable length	Option
ISWA	L	A	200	20	600	T1	M	NM

Since the above code includes the "L□□" type and 20mm lead, the spacer 4.0mm in thickness should be used.

<Standard>

Type	Lead (mm)	Spacer thickness (mm)
S	4	2.0
	8•16	4.0
M	5	2.5
	Other than 5	4.0
L	All	4.0

<Equipped with a limit switch = Equipped with a home position sensor>

Type	Lead (mm)	Spacer thickness (mm)
S	All	4.0
M	All	4.0
L	All	4.0

• Table 2: Distance for Each Model

Standard Home Specification

<Not equipped with a limit switch = Not equipped with a home position sensor >

Type	Lead	Adjust dimension to: (mm)
S	4	36
	8•16	37
M	5	49
	10•20	51
L	10•20	54

<Equipped with a limit switch = Equipped with a home position sensor>

Type	Lead	Adjust dimension to: (mm)
S	All	37.5
M	All	51
L	All	54

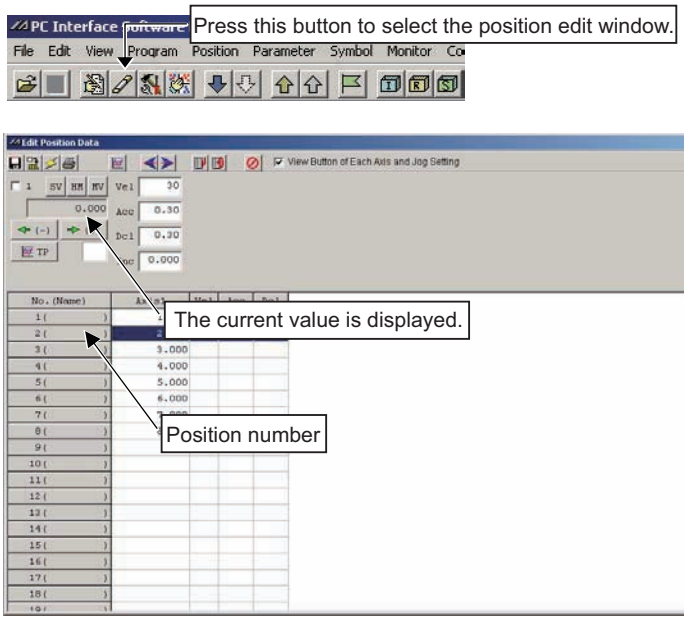
11.2 Setting for Home Preset Value and Home-Return Offset Value

Change the parameter of the home preset value for X-SEL and SSEL controllers and the home-return offset value for SCON, MSCON controller to adjust the position. Procedure to set the parameter is described below.

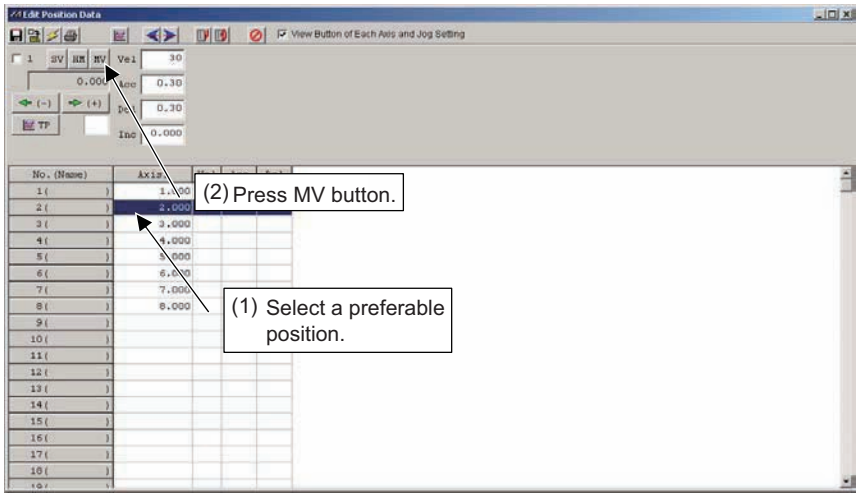
11.2.1 For XSEL and SSEL controllers

(1) Open the position edit screen.

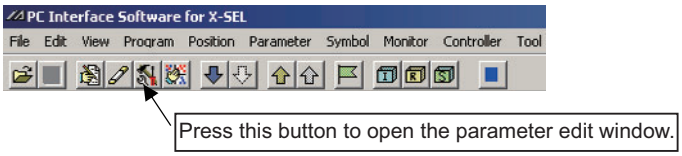
On the PC software, click → "Position No. Select"→ "OK" to open the window shown below.



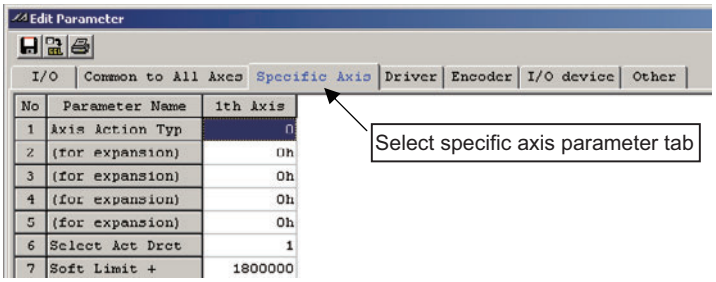
(2) Compare the current value and the value on the position No. that the actuator is randomly moved to confirm the amount of difference.



(3) Select a parameter.

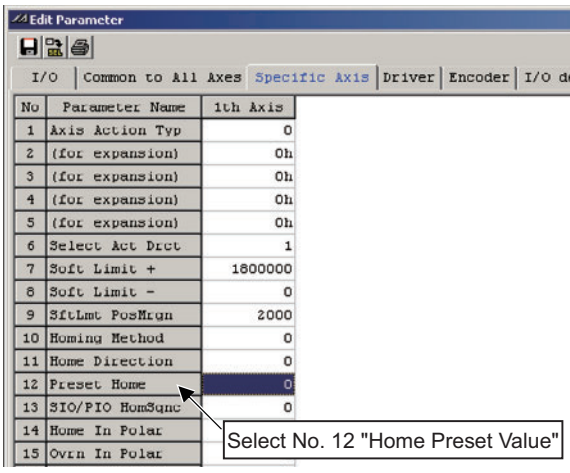


(4) Select the specific axis parameter tab.



No	Parameter Name	1th Axis
1	Axis Action Typ	0
2	(for expansion)	0h
3	(for expansion)	0h
4	(for expansion)	0h
5	(for expansion)	0h
6	Select Act Drct	1
7	Soft Limit +	1800000

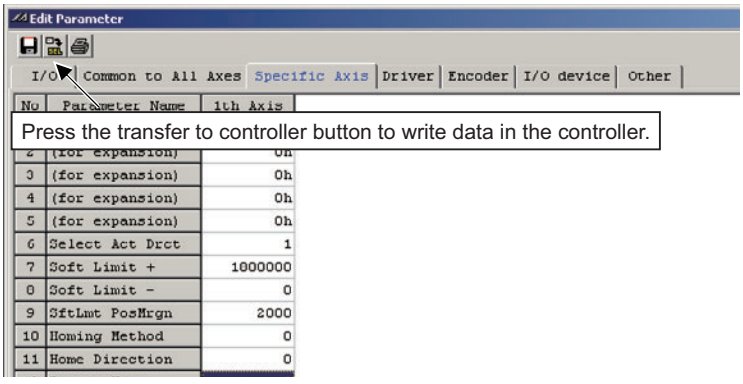
(5) Open the specific axis parameter and select No.12 "Home Preset Value".



No	Parameter Name	1th Axis
1	Axis Action Typ	0
2	(for expansion)	0h
3	(for expansion)	0h
4	(for expansion)	0h
5	(for expansion)	0h
6	Select Act Drct	1
7	Soft Limit +	1800000
8	Soft Limit -	0
9	SftLmt PosMrgn	2000
10	Homing Method	0
11	Home Direction	0
12	Preset Home	0
13	SIO/PIO HomSync	0
14	Home In Polar	
15	Ovrn In Polar	

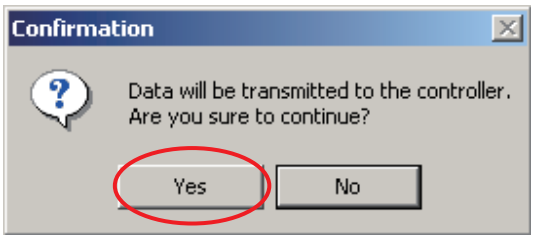
(6) Change the setting of specific axis parameter No. 12 (home preset value).
Add or subtract the value measured in (12) to/from the value currently input.
*The setting unit is 0.001mm.
Example: When subtracting 1mm
Home preset value = Current setting value -1000

(7) Write the new data.



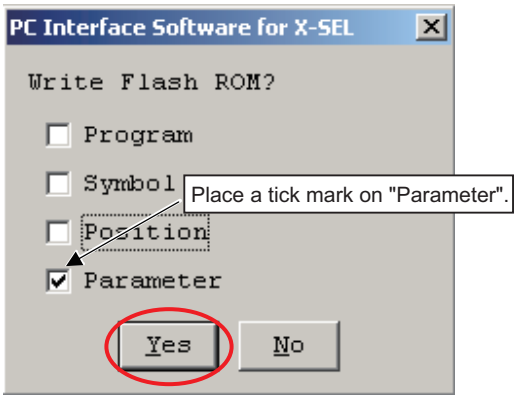
No	Parameter Name	1th Axis
3	(for expansion)	0h
4	(for expansion)	0h
5	(for expansion)	0h
6	Select Act Drct	1
7	Soft Limit +	1800000
8	Soft Limit -	0
9	SftLmt PosMrgn	2000
10	Homing Method	0
11	Home Direction	0

(8) Transfer data to the controller.

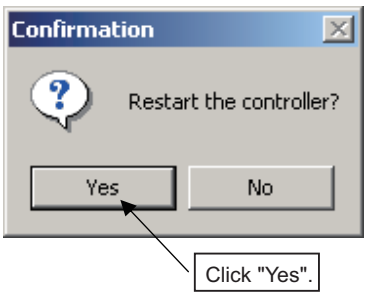


(9) Click "OK".

(10) Write data to the flash ROM.



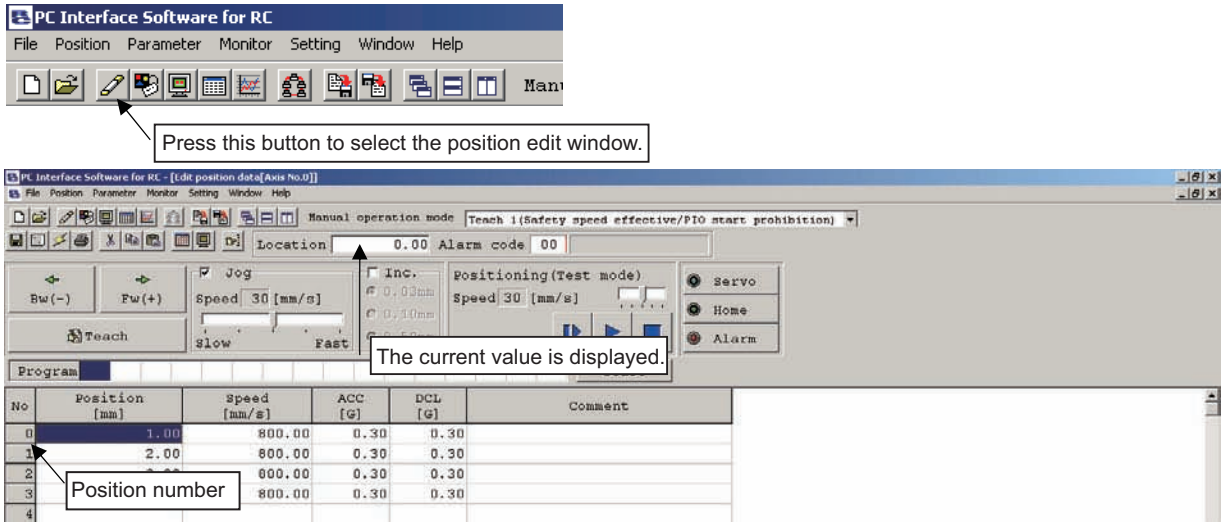
(11) Reboot the controller.



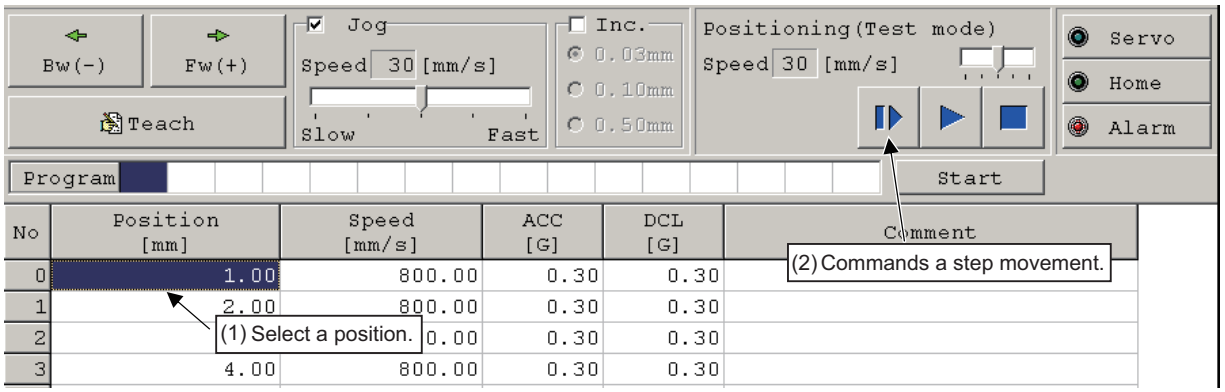
11.2.2 For ECON, SCON and MSCON controllers

(1) Open the position edit screen.

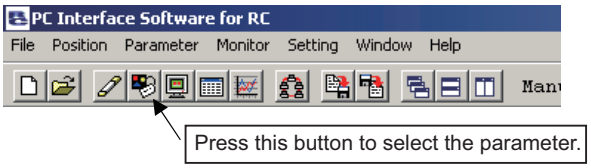
On the PC software, click → "Position No. Select"→ "OK" to open the window shown below.



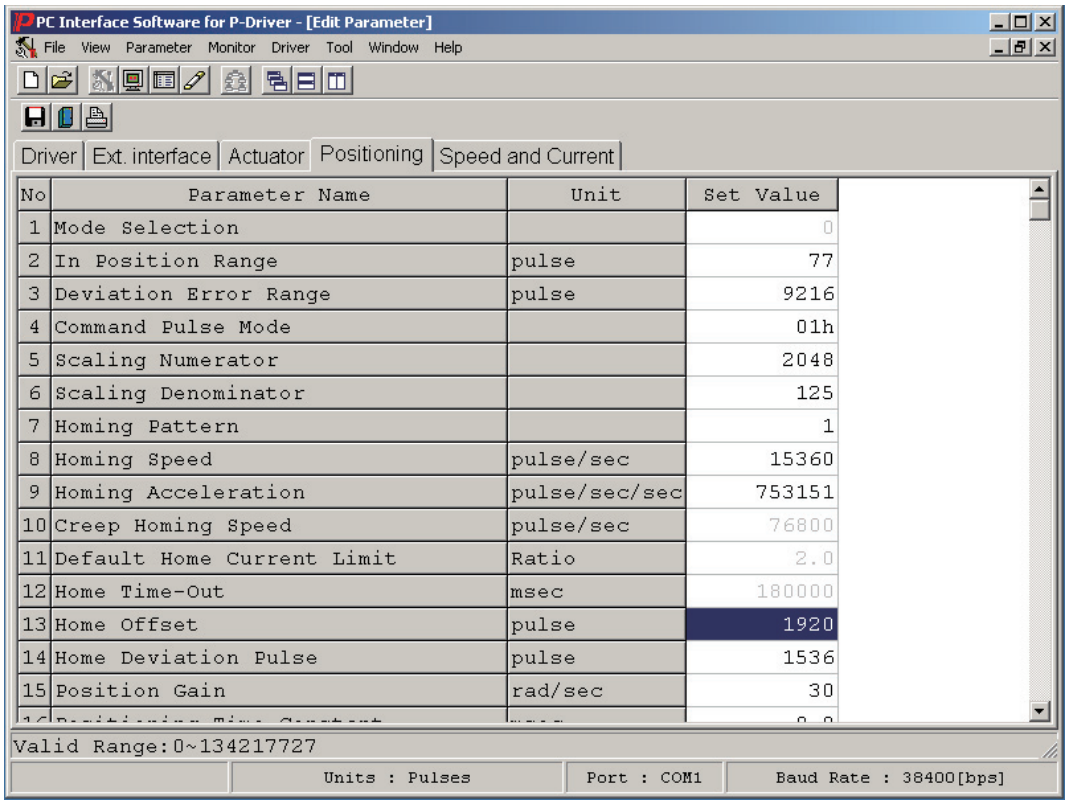
(2) Compare the current value and the value on the position No. that the actuator is randomly moved to confirm the amount of difference.



(3) Select a parameter.



(4) The user parameter screen appears.



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

(5) Change user parameter No. 22 (home offset).

*The setting unit is mm.

Add or subtract the value measured in (2) to/from the value currently input.

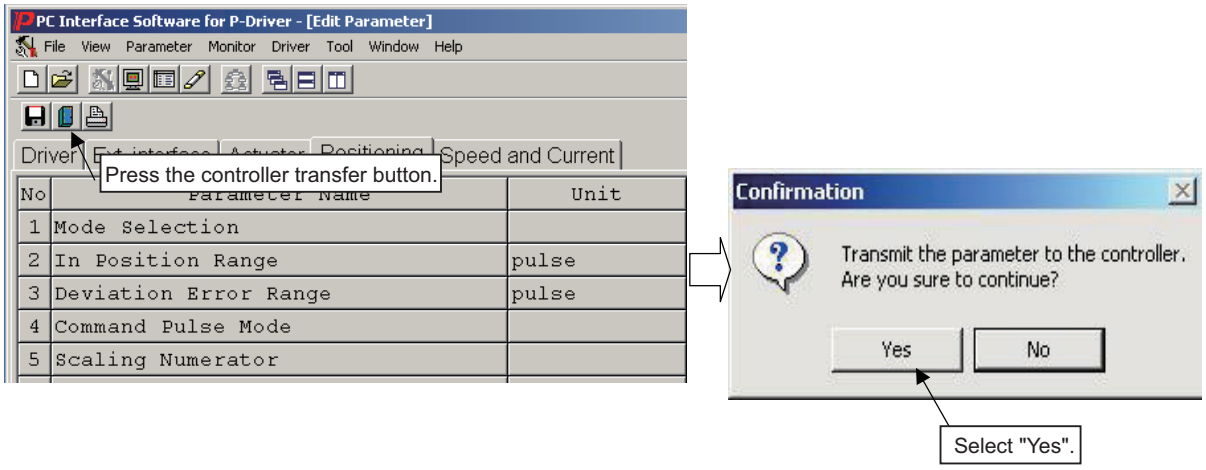
Example: When subtracting 0.5mm

Home offset = Current setting value -0.5mm

(6) Write the new data.

Click the controller transfer button, and then click OK.

* After the data has been written, turn off the controller power.

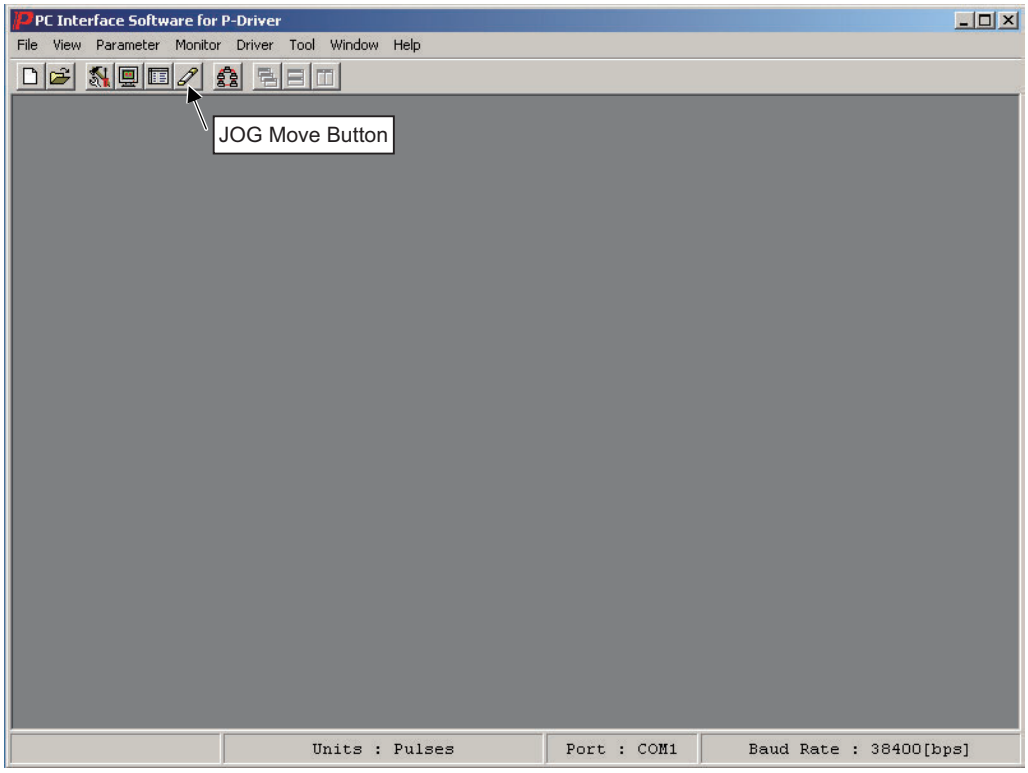


11.2.3 For P-Driver controller

(1) Open the jog screen.

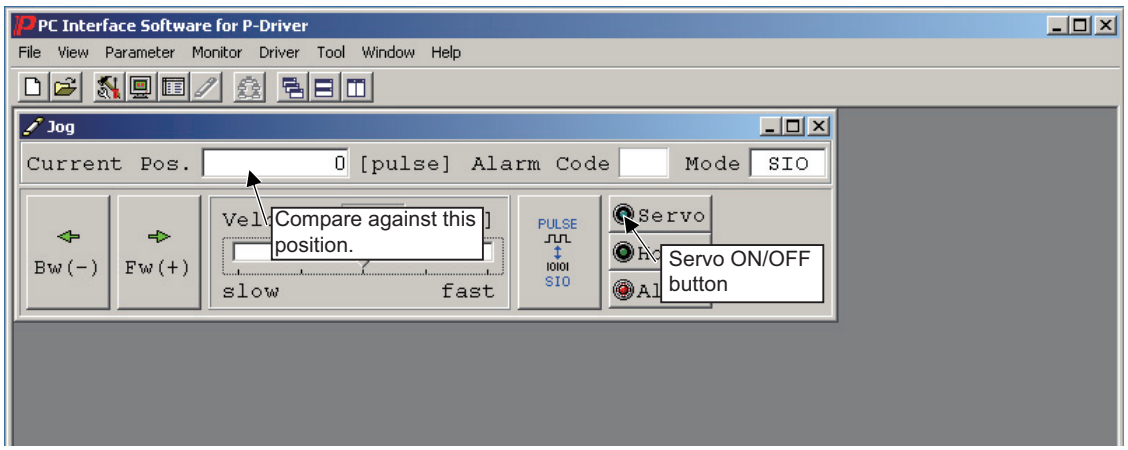
Click the jog button on the PC software screen.

Next, select the pulse mode.



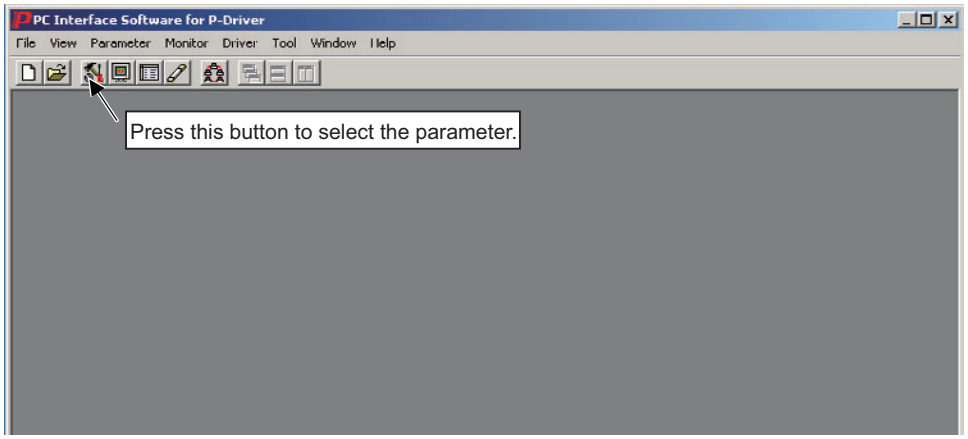
(2) Compare the positions where the actuator is moved to and the command pulse to move the actuator and memorize it.

Adjust the position by jogging the actuator or by turning off the servo and moving the actuator manually.



(3) Open the parameter edit screen.

Select the parameter by pressing this button.



(4) Change the setting of No. 13, "Home offset."

*The setting unit is pulse.

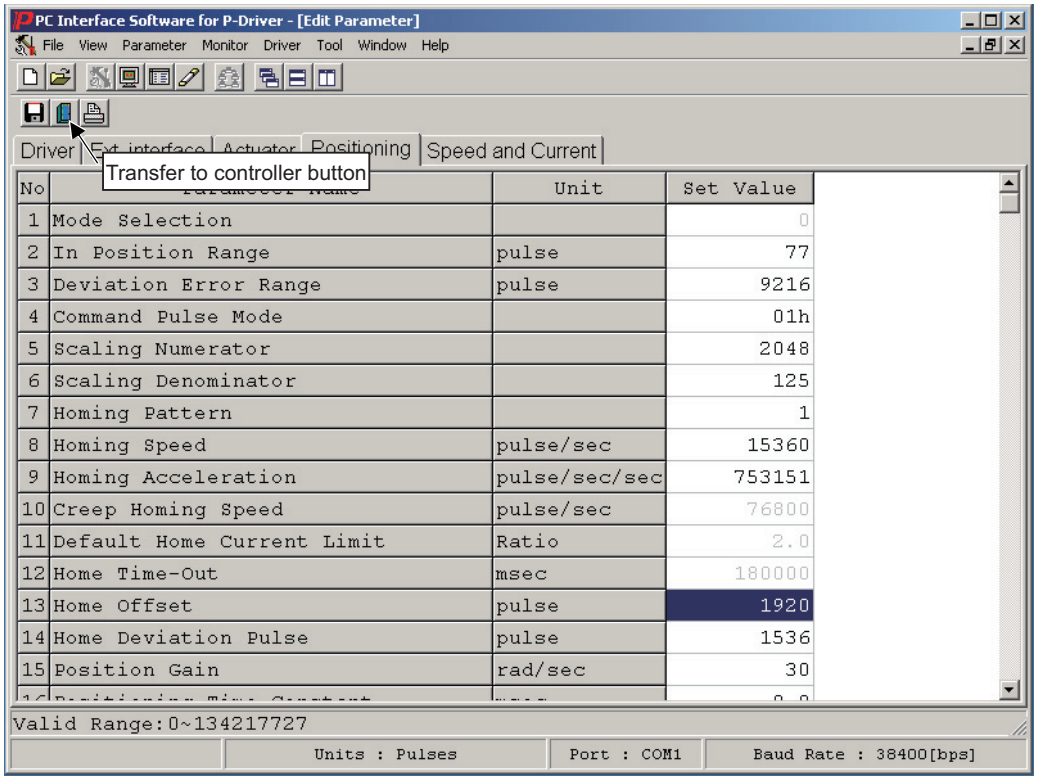
Add or subtract the value measured in (2) to/from the value currently input.

Example: When subtracting 150 pulses

Home offset = Current setting value -150

(5) Write the new data.

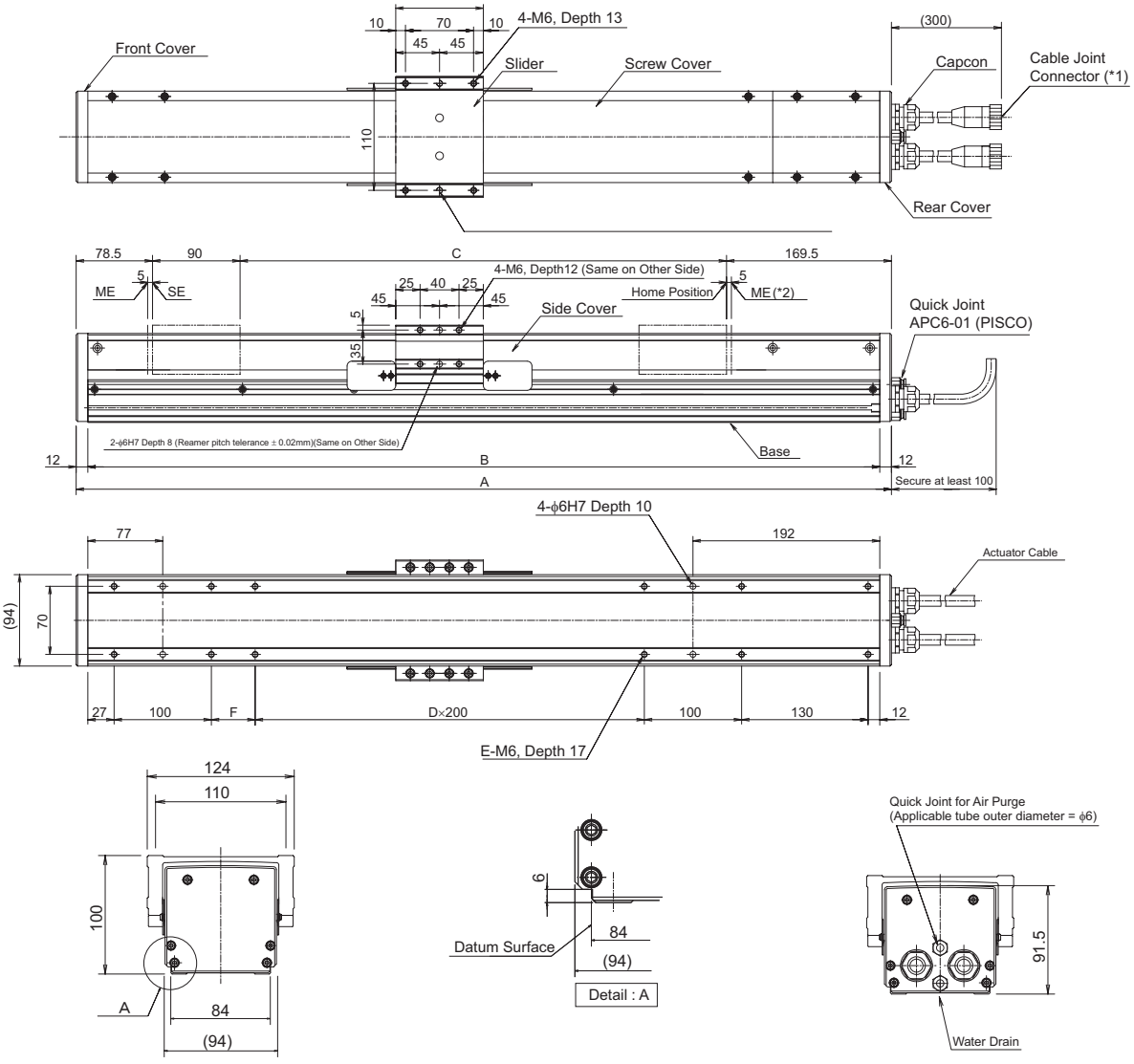
Click the transfer to controller button, click OK, and then click Yes. (The controller will restart.)



12. Appendix

12.1 External Dimensions

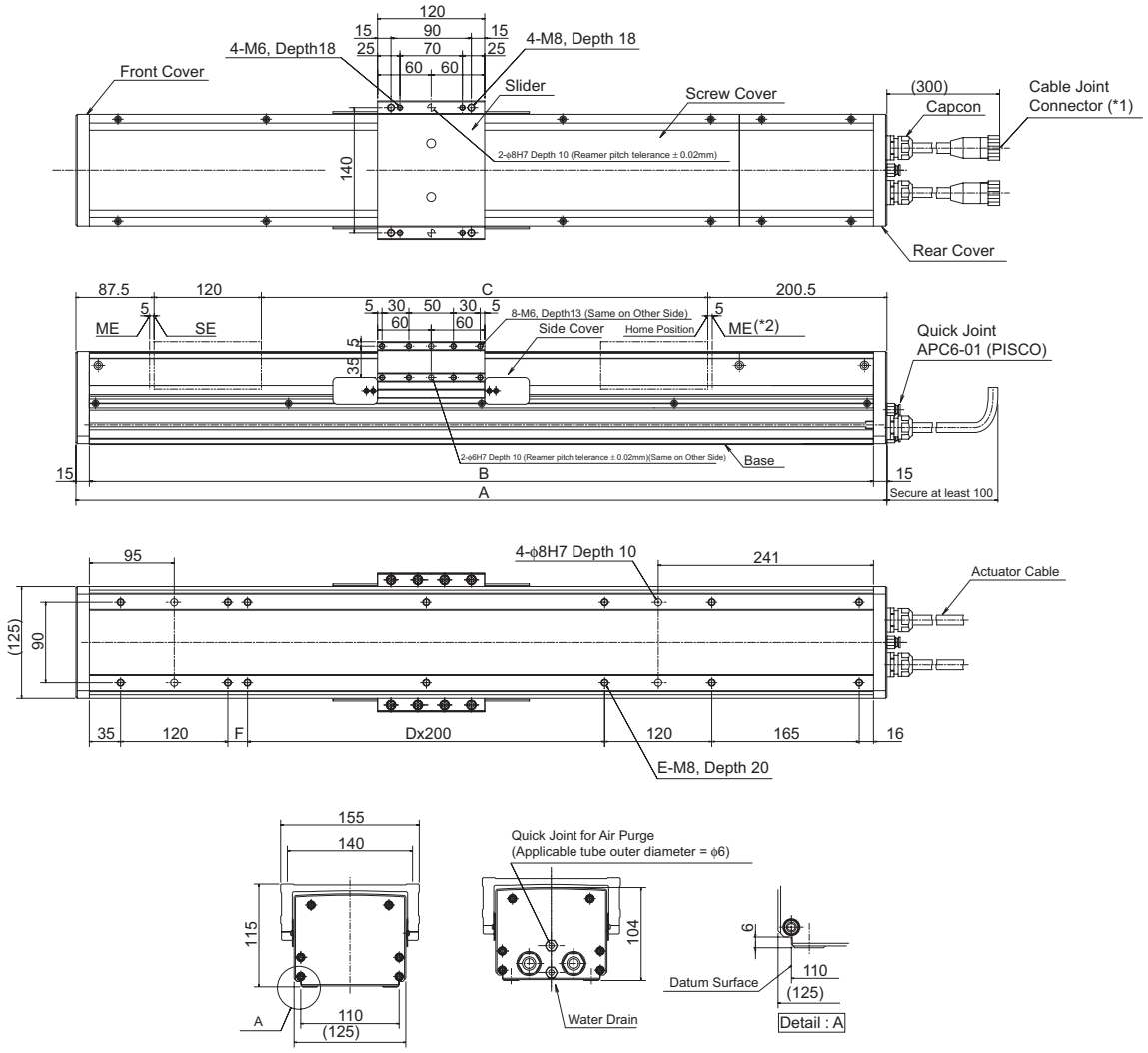
12.1.1 ISWA-S, ISPWA-S



*50 pitch stroke is a semi-standard setting.

Stroke	100	(150)	200	(250)	300	(350)	400	(450)	500	(550)	600
A	438	488	538	588	638	688	738	788	838	888	938
B	414	464	514	564	614	664	714	764	814	864	914
C	100	150	200	250	300	350	400	450	500	550	600
D	-	-	-	-	1	1	1	1	2	2	2
E	10	10	10	10	12	12	12	12	14	14	14
F	45	95	145	195	45	95	145	195	45	95	145
Weight (kg)	6.9	7.4	7.8	8.3	8.7	9.2	9.6	10.1	10.5	11.0	11.4

12.1.2 ISWA-M-100, ISPWA-M-100

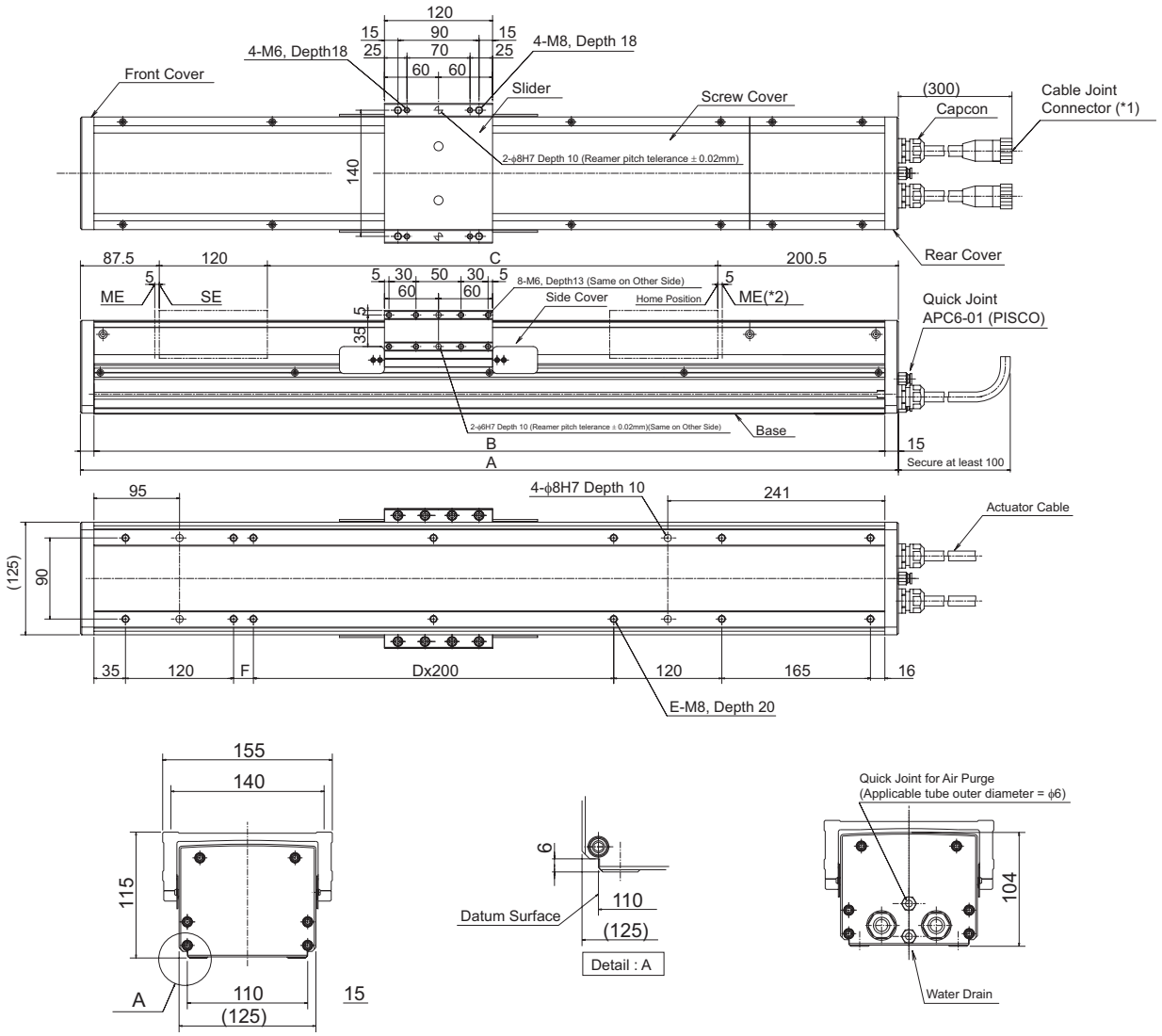


*50 pitch stroke is a semi-standard setting

Stroke	100	(150)	200	(250)	300	(350)	400	(450)	500	(550)	600
A	508	558	608	658	708	758	808	858	908	958	1008
B	478	528	578	628	678	728	778	828	878	928	978
C	100	150	200	250	300	350	400	450	500	550	600
D	-	-	-	-	1	1	1	1	2	2	2
E	10	10	10	10	12	12	12	12	14	14	14
F	22	72	122	172	22	72	122	172	22	72	122
Weight (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
A	1058	1108	1158	1208	1258	1308	1358	1408
B	1028	1078	1128	1178	1228	1278	1328	1378
C	650	700	750	800	850	900	950	1000
D	2	3	3	3	3	4	4	4
E	14	16	16	16	16	18	18	18
F	172	22	72	122	172	22	72	122
Weight (kg)	21.1	21.9	22.8	23.6	24.5	25.3	26.2	27.0

12.1.3 ISWA-M-200, ISPWA-M-200

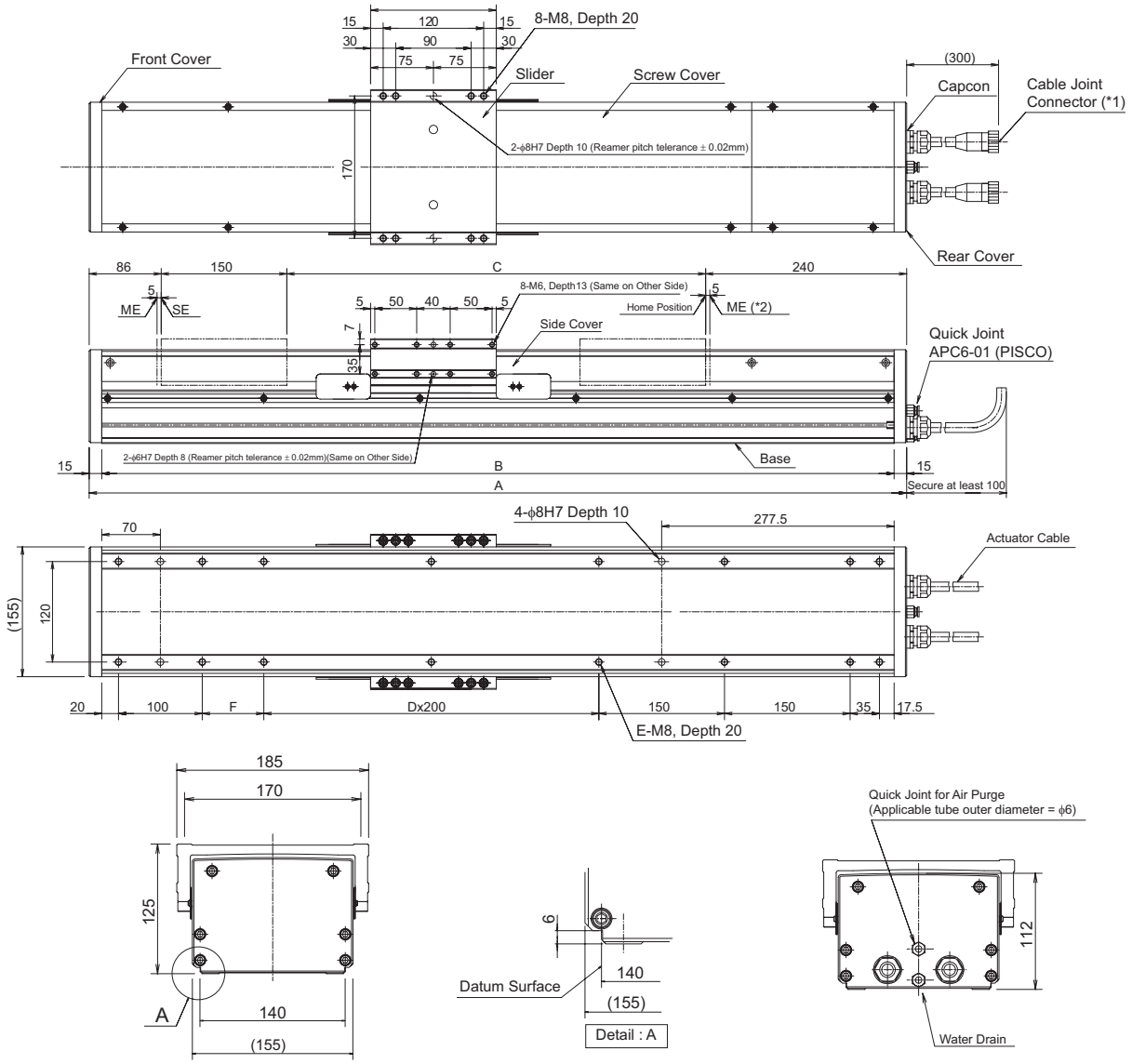


*50 pitch stroke is a semi-standard setting

Stroke	100	(150)	200	(250)	300	(350)	400	(450)	500	(550)	600
A	508	558	608	658	708	758	808	858	908	958	1008
B	478	528	578	628	678	728	778	828	878	928	978
C	100	150	200	250	300	350	400	450	500	550	600
D	-	-	-	-	1	1	1	1	2	2	2
E	10	10	10	10	12	12	12	12	14	14	14
F	22	72	122	172	22	72	122	172	22	72	122
Weight (kg)	11.9	12.8	13.6	14.5	15.3	16.2	17.0	17.9	18.7	19.6	20.4

Stroke	(650)	700	(750)	800	(850)	900	(950)	1000
A	1058	1108	1158	1208	1258	1308	1358	1408
B	1028	1078	1128	1178	1228	1278	1328	1378
C	650	700	750	800	850	900	950	1000
D	2	3	3	3	3	4	4	4
E	14	16	16	16	16	18	18	18
F	172	22	72	122	172	22	72	122
Weight (kg)	21.3	22.1	23.0	23.8	24.7	25.5	26.4	27.2

12.1.4 ISWA-L-200, ISPWA-L-200

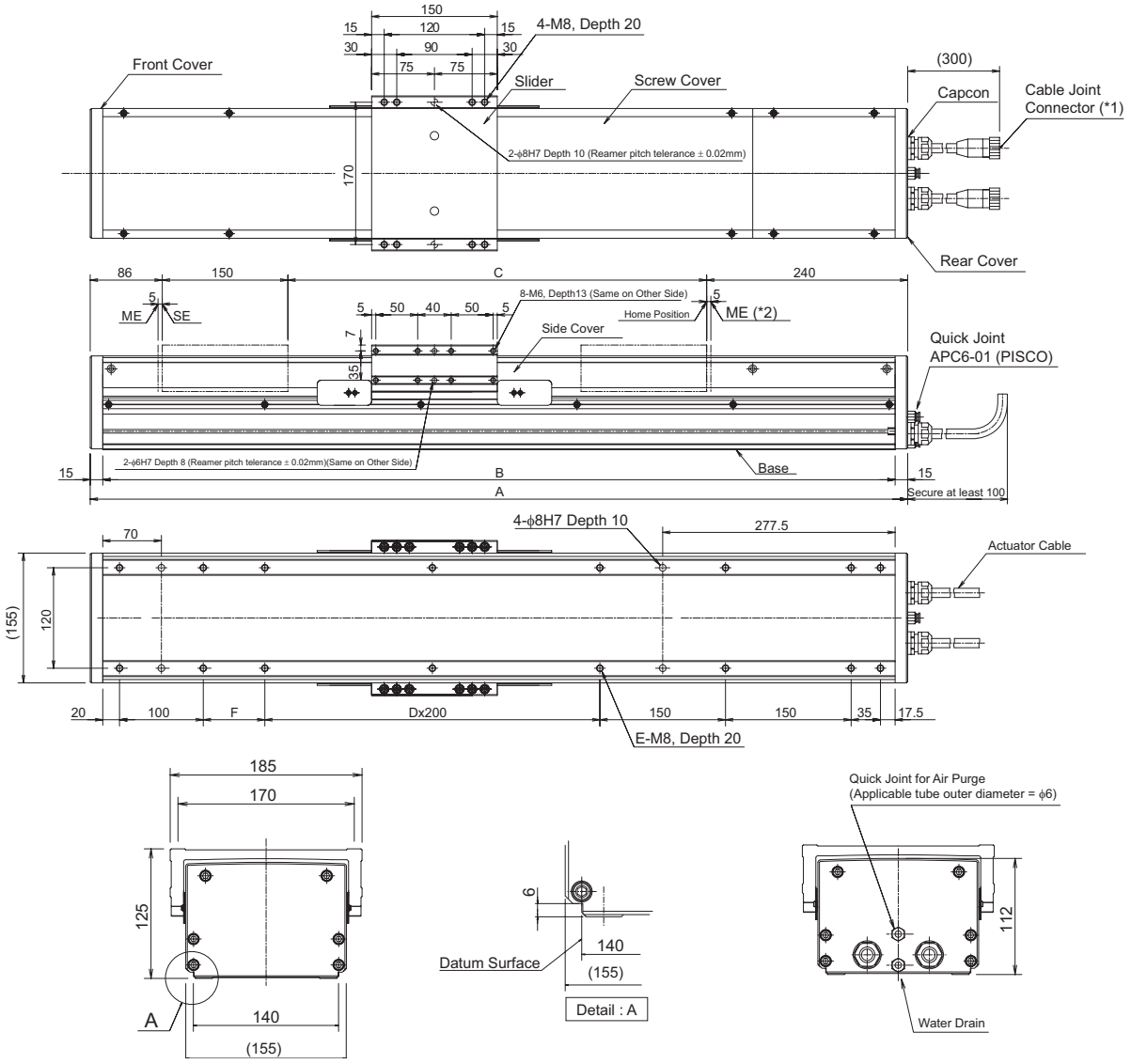


*50 pitch stroke is a semi-standard setting

Stroke	100	(150)	200	(250)	300	(350)	400	(450)	500	(550)	600	(650)	700
A	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	100	150	200	250	300	350	400	450	500	550	600	650	700
D	-	-	-	1	1	1	1	2	2	2	2	3	3
E	12	12	12	14	14	14	14	16	16	16	16	18	18
F	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
Weight (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
A	1226	1276	1326	1376	1426	1476	1526	1576	1626	1676
B	1196	1246	1296	1346	1396	1446	1496	1546	1596	1646
C	750	800	850	900	950	1000	1050	1100	1150	1200
D	3	3	4	4	4	4	5	5	5	5
E	18	18	20	20	20	20	22	22	22	22
F	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5	123.5	173.5
Weight (kg)	32.3	33.2	34.2	35.1	36.1	37.0	38.0	38.9	39.9	40.8

12.1.5 ISWA-L-400, ISPWA-L-400



*50 pitch stroke is a semi-standard setting

Stroke	100	(150)	200	(250)	300	(350)	400	(450)	500	(550)	600	(650)	700
A	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	100	150	200	250	300	350	400	450	500	550	600	650	700
D	-	-	-	1	1	1	1	2	2	2	2	3	3
E	12	12	12	14	14	14	14	16	16	16	16	18	18
F	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
Weight (kg)	20.1	20.6	22.0	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
A	1226	1276	1326	1376	1426	1476	1526	1576	1626	1676
B	1196	1246	1296	1346	1396	1446	1496	1546	1596	1646
C	750	800	850	900	950	1000	1050	1100	1150	1200
D	3	3	4	4	4	4	5	5	5	5
E	18	18	20	20	20	20	22	22	22	22
F	123.5	173.5	23.5	73.5	123.5	173.5	23.5	73.5	123.5	173.5
Weight (kg)	32.0	33.4	33.9	35.3	35.8	37.2	37.7	39.1	39.6	41.0

12.2 Method to Absolute Reset (for absolute type)

12.2.1 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

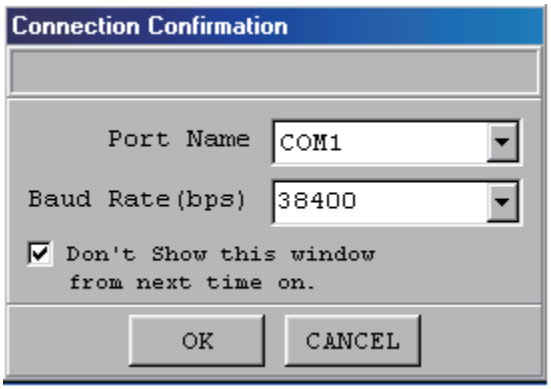
(1) Turn off the power supply to X-SEL controller. Turn on the power to PC and finish the boot of OS.

(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.

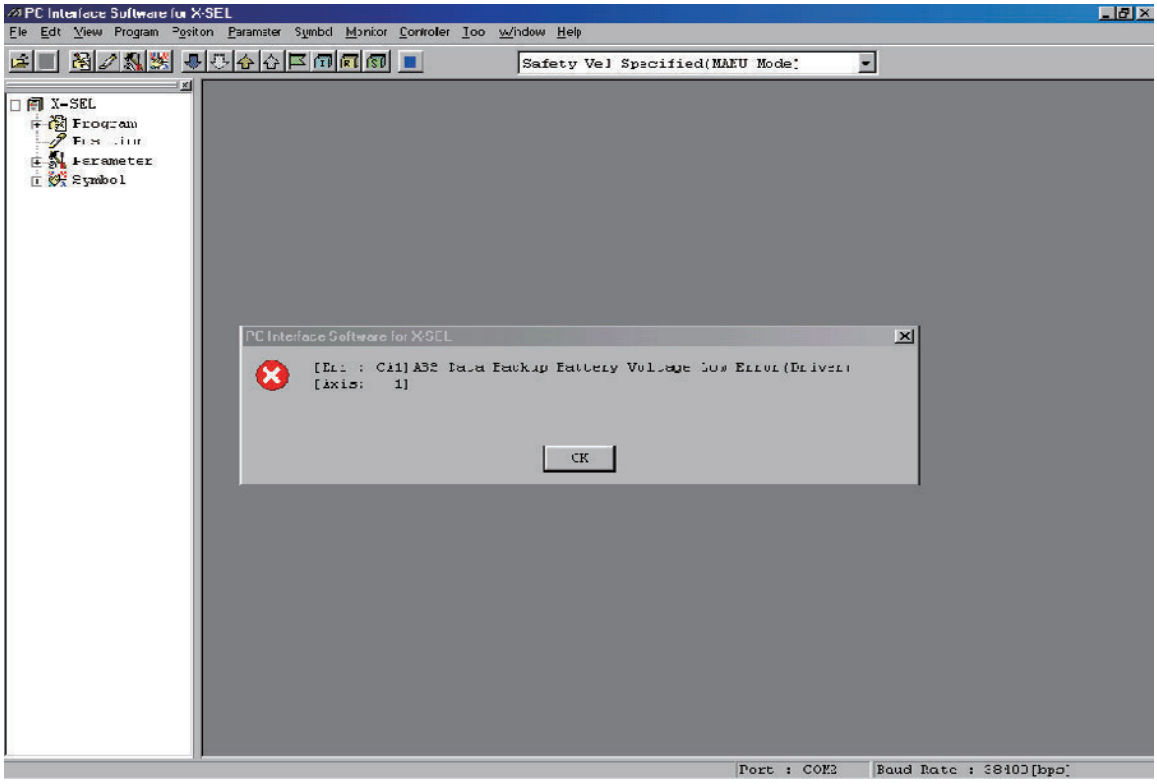
(4) Boot the X-SEL PC software (X_SEL.exe) on the computer.
Shown below is the explanation for the operation on X-SEL software.

(5) [Connection Check] dialog box appears. Adjust the communication port setting to the computer that you are using. Then, click OK .
(The baud rate will be automatically detected without any manual setting.)



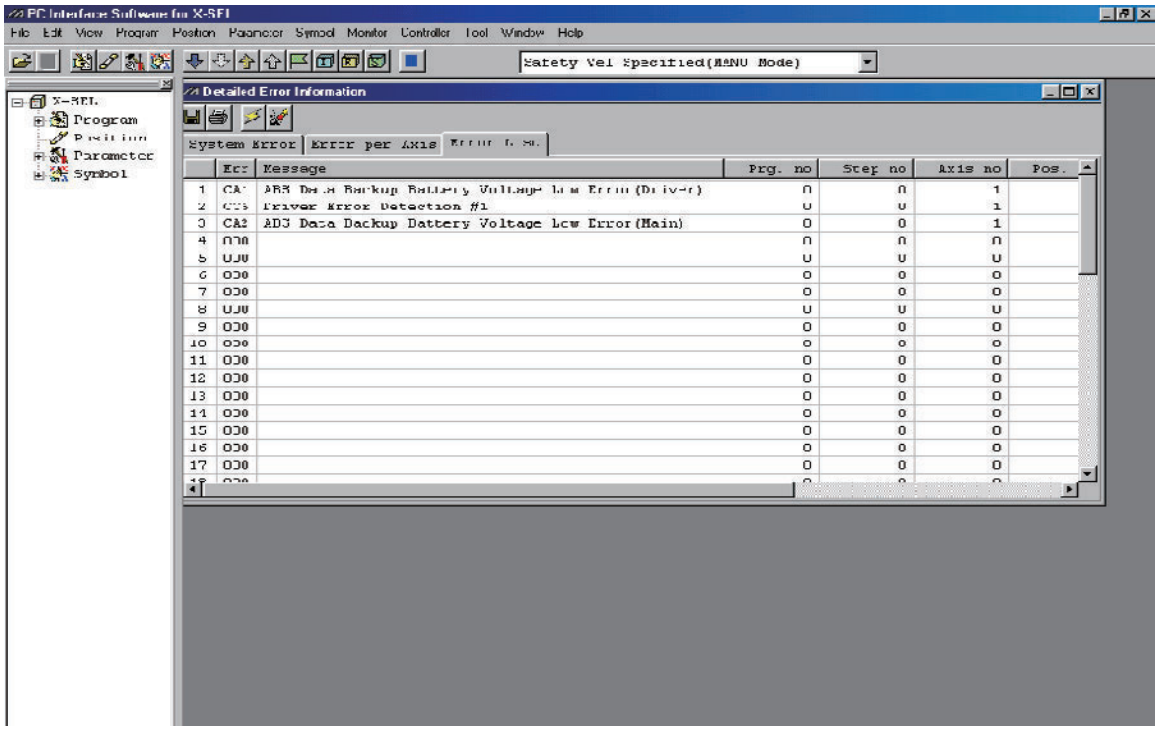
(6) A window for X-SEL PC software is displayed.

Click OK and the error message will be closed.



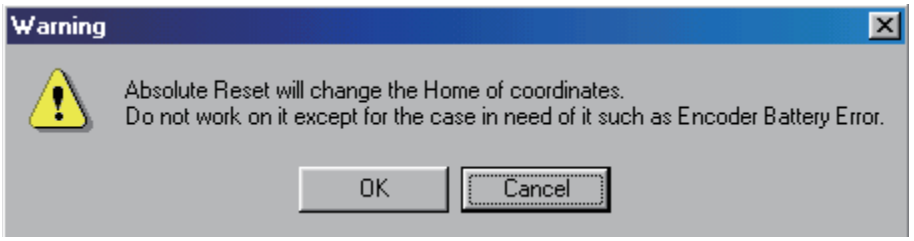
(7) Confirm the current error condition by selecting [Monitor (M)] → [Error Details (E)] menu.

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.



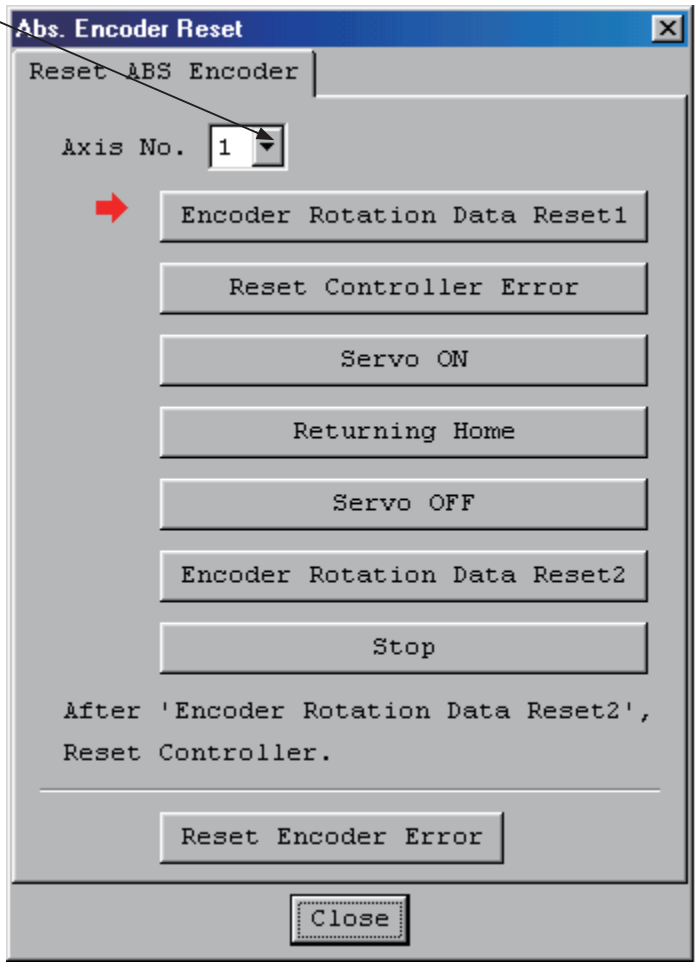
(8) Select the [Controller (C)] → [Absolute Reset (A)] menu.

(9) Click OK in [Warning] dialog box.

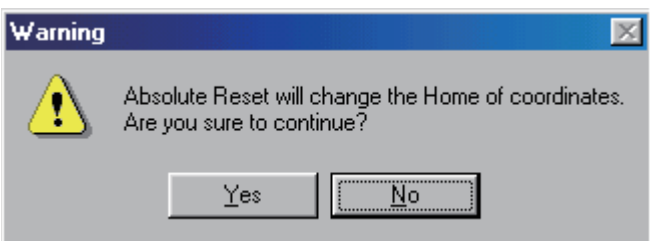


(10) [Absolute Reset] window opens.

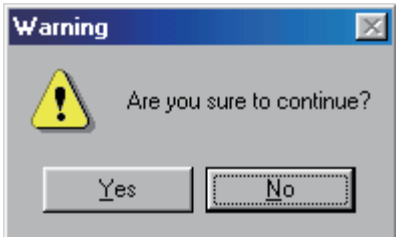
Click here to select the axis that the absolute reset is going to be performed.



(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

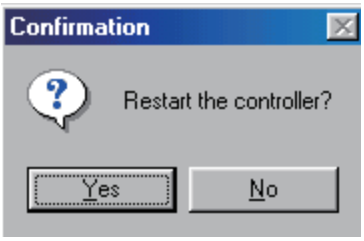
After Encoder Rotation Data Reset 2 is completed, the red arrow goes back to the top as shown in (10). When performing an absolute encoder reset on the multi axes type, select another axis here, and repeat the process after (10).

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.

12.2.2 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) "0EE" and "0EF" 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.

13. Warranty

13.1 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

13.2 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.

13.3 Honoring the Warranty

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

13.4 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.

13.5 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.

13.6 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

14. Change History

Revision Date	Revision Description		
2010.04	First Edition		
2010.07	Second Edition	Page 9	Precautions in Handling • duty more than 50% → duty that exceeds 50%
		Page 31	Section "6.2 Wiring with Dedicated Stand-Alone Cable (CS Series)" deleted
		Page 32	Statement changed to "Make sure to have a radius more than the minimum bending radius when using a cable track."
		Page 38	"○" added to "After 6 months of operation" in "Grease Supply"
		Page 40	Statement telling to wipe off the base oil when it is appeared on the sides of the guide rail is added
		Page 41	Statement telling to utilize the JOG operation for the low lead actuator is added
2011.04	Third Edition	A page for CE Marking added	
2012.03	Fourth Edition	Contents changed in Safety Guide Caution notes added for when working with two or more persons	
		Pages 22, 24	Note changed to 1.8 times more of the nominal diameter for the length of thread engagement on aluminum
2012.03	Fifth Edition	Page 1 to 7	Contents added and changed in Safety Guide
		Page 9	Note "Make sure to attach the actuator properly by following this instruction manual." added in Caution in Handling
		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.
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

Manual No.: ME3688-8A (April 2015)

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