Linear Servo Actuator
LSA Series
Shaft Type

Operating Manual

Fourth Edition

LSA-S6, S8, S10

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

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

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

Please downloaded the user's manual from our website.
You can download it free of charge. User registration is required for the first time downloading.
URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

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

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

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
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MJ3646-4F

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Safety Guide

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

Safety Precautions for Our Products

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

No.	Operation Description	Description
1	Model Selection	● 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 (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).

No.	Operation Description	Description
4	Installation and Start	(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 removed cover or 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. ● Using the devise in a way not indicated by IAI may lose the protection performance equipped to the device.

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

Caution in Handling

1. Make sure to follow the usage condition, environment and specification range of the product.
   In case it is not secured, it may cause a drop in performance or malfunction of the product.

2. Back and forth operation in a short distance may cause wear of grease.
   If the actuators are moved back and forth continuously over a short distance of 30 mm or less, grease film may run out. As a guide, move the actuators back and forth repeatedly for around 5 cycles over a distance of 50 mm or more after every 5,000 to 10,000 cycles. Keep using the actuators with the grease worn out may cause malfunction.

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

⚠ Warning: Do not get closer than 30cm if you are a person who needs a support of a medical device such as a pacemaker. This actuator uses high-performance rare-earth permanent magnets. Therefore an unexpected operation may be caused to a medical device especially when using such a device such as a pacemaker.

⚠ Caution:
- Do not attempt to get a magnetic card close to the product. Having a magnetic storage medium close to the product may disable the medium by destroying data.
- Do not attempt to get a precision instrument such as an electric watch close to the product. Doing so may cause a trouble to the instrument

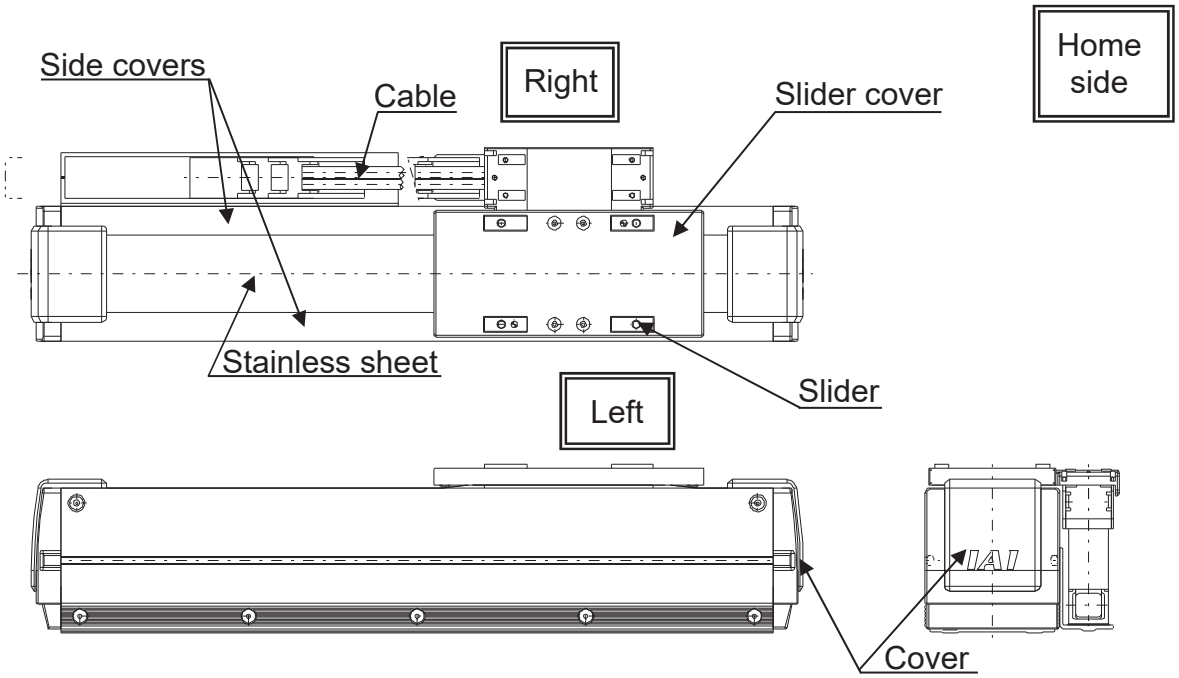
International Standards Compliances

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

RoHS3 Directive	CE Marking
○	×

Names of the Parts

This manual defines the right and left of the actuator by putting it horizontally as shown in the figures below and viewing it from the top and home side. Also the front side means the opposite of the home side.



Drawings for Standard Type

(Reference) In the above figure, the cables are facing top, while the home is located on the right side.
The actuator is shipped with its home adjusted to the side specified by the customer. Accordingly, the home position on your actuator may be different from the direction shown in the figure.

1. Specifications Check

1.1 Checking the Product

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

1.1.1 Parts

No.	Name	Model number	Quantity	Remarks
1	Actuator	Refer to “How to Read the Model Nameplate” and “How to Read the Model Number.”	1	
Accessories				
2	Motor • encoder cables (Note1)		1 set	
3	Safety Guide		1	

Note1 The motor • encoder cables differ between the standard model and robot cable.
[Refer to 1.5 “Motor • Encoder Cables.”]

1.1.2 Operating Manuals for the Controllers Related to this Product

(1) Manuals Related to XSEL-P/Q Controllers

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

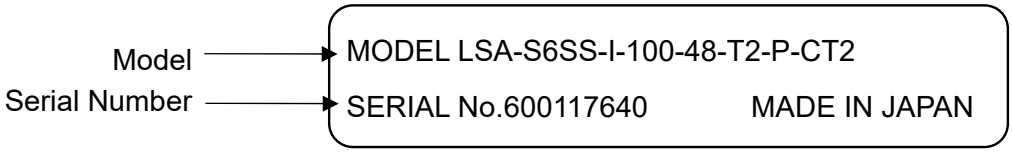
(2) Manuals Related to SSEL Controllers

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

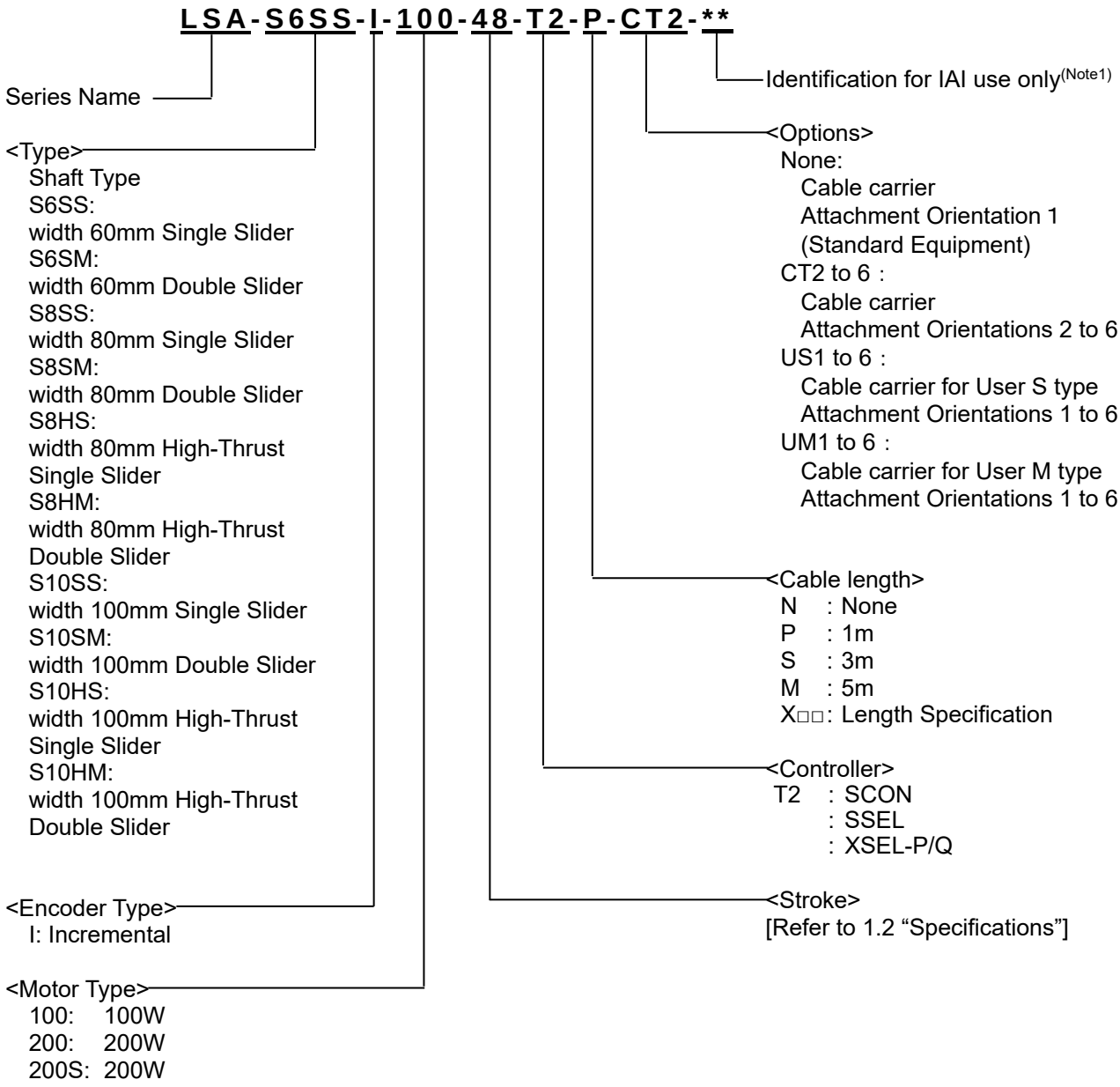
(3) Manuals Related to SCON Controllers

No.	Name	Control No.
1	Operating Manual for SCON Controller	ME0161
2	Operating Manual for SCON-CA Controller SCON-CA	ME0243
3	Operating Manual for PC Software RCM-101-MW/RCM-101-USB	ME0155
4	Operating Manual for Teaching Pendant CON-T/TG	ME0178
5	Operating Manual for Touch Panel Teaching CON-PT/PD/PG	ME0227
6	Operating Manual for Touch Panel Teaching CON-PTA/PDA/PGA	ME0295
7	Operating Manual for Simplified Teaching Pendant RCM-E	ME0174
8	Operating Manual for Data setter RCM-P	ME0175
9	Operating Manual for Touch Panel Display RCM-PM-01	ME0182
10	Operating Manual for DeviceNet	ME0124
11	Operating Manual for CC-Link	ME0123
12	Operating Manual for PROFIBUS-DP	ME0153

1.1.3 How to Read the Model Nameplate



1.1.4 How to Read the Model Number



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

1.2 Specification

1.2.1 Speed

[1] S6SS

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]												
		48	96	144	192	240	288	336	384	432	480	528	576	624
100	1	2500												
		672	720	768	816	864	912	960	1008	1056	1104	1152	1200	1248
		2500												

[2] S6SM

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]										
		40	88	136	184	232	280	328	376	424	472	520
100	1	2500										
		568	616	664	712	760	808	856	904	952	1000	1048
		2500										

[3] S8SS

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]													
		60	120	180	240	300	360	420	480	540	600	660	720	780	840
100	1	2500													
		900	960	1020	1080	1140	1200	1260	1320	1380	1440	1500	1560	1620	-
		2500													-

[4] S8SM

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]											
		60	120	180	240	300	360	420	480	540	600	660	720
100W	1	2500											
		780	840	900	960	1020	1080	1140	1200	1260	1320	1380	1440
		2500											

[5] S8HS

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]													
		60	120	180	240	300	360	420	480	540	600	660	720	780	840
100	1	2500													
		900	960	1020	1080	1140	1200	1260	1320	1380	1440	1500	1560	1620	-
		2500													-

[6] S8HM

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]											
		60	120	180	240	300	360	420	480	540	600	660	720
100	1	2500											
		780	840	900	960	1020	1080	1140	1200	1260	1320	1380	-
		2500											-

[7] S10SS

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]											
		90	180	270	360	450	540	630	720	810	900	990	1080
200	1	2500											
		1170	1260	1350	1440	1530	1620	1710	1800	1890	1980	2070	-
		2500											-

[8] S10SM

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]										
		60	150	240	330	420	510	600	690	780	870	960
200	1	2500										
		1050	1140	1230	1320	1410	1500	1590	1680	1770	1860	-
		2500										-

[9] S10HS

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]											
		90	180	270	360	450	540	630	720	810	900	990	1080
200S	1	2500											
		1170	1260	1350	1440	1530	1620	1710	1800	1890	1980	2070	-
		2500											-

[10] S10HM

Speed limits (Unit: mm/s)

Motor Type	Minimum Speed	Stroke [mm]									
		105	195	285	375	465	555	645	735	825	915
200S	1	2500									
		1005	1095	1185	1275	1365	1455	1545	1635	1725	1815
		2500									

1.2.2 Maximum acceleration/deceleration, Maximum load capacity and Rated thrust

Type	Item	Specifications
S6SS, S6SM	Maximum acceleration/deceleration (Note 1)	3G
	Maximum load capacity (Note 1)	3kg
	Rated thrust	15N
S8SS, S8SM	Maximum acceleration/deceleration (Note 1)	3G
	Maximum load capacity (Note 1)	5kg
	Rated thrust	25N
S8HS, S8HM	Maximum acceleration/deceleration (Note 1)	3G
	Maximum load capacity (Note 1)	7kg
	Rated thrust	35N
S10SS, S10SM	Maximum acceleration/deceleration (Note 1)	3G
	Maximum load capacity (Note 1)	15kg
	Rated thrust	65N
S10HS, S10HM	Maximum acceleration/deceleration (Note 1)	3G
	Maximum load capacity (Note 1)	20kg
	Rated thrust	80N

Note 1 The available acceleration/deceleration and the transportable weight may differ depending on the operational conditions.
[Refer to 1.3 “Operating conditions”]

1.2.3 No. of Encoder Pulses

Type	No. of Encoder Pulses	Lead Length [mm]
S6SS, S6SM	48000	48
S8SS, S8SM	60000	60
S8HS, S8HM	60000	60
S10SS, S10SM	90000	90
S10HS, S10HM	90000	90

1.2.4 Positioning Precision

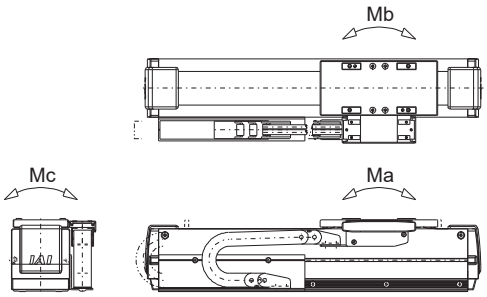
Type	Item	Specifications
S6SS, S6SM	Positioning Repeatability	±0.005mm
	Lost Motion	0.02mm or less
S8SS, S8SM	Positioning Repeatability	±0.005mm
	Lost Motion	0.02mm or less
S8HS, S8HM	Positioning Repeatability	±0.005mm
	Lost Motion	0.02mm or less
S10SS, S10SM	Positioning Repeatability	±0.005mm
	Lost Motion	0.02mm or less
S10HS, S10HM	Positioning Repeatability	±0.005mm
	Lost Motion	0.02mm or less

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

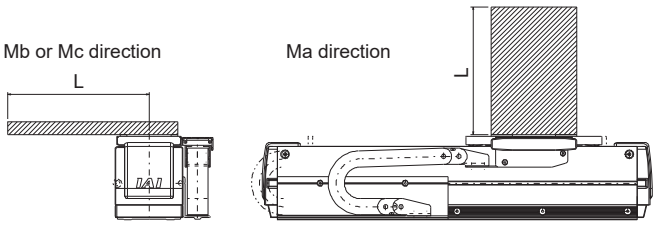
1.2.5 Allowable Moments of the Actuator

Type	Dynamic allowable moment [N·m]			Allowable overhang load length (L) (Note 1)
	Ma	Mb	Mc	
S6SS, S6SM	50.3	71.8	17.9	Ma direction: 300mm or less Mb, Mc direction: 300mm or less
S8SS, S8SM	43.2	61.6	29.9	Ma direction: 300mm or less Mb, Mc direction: 300mm or less
S8HS, S8HM	79.9	114	29.9	
S10SS, S10SM	56.1	80.2	48.4	Ma direction: 300mm or less Mb, Mc direction: 300mm or less
S10HS, S10HM	86.5	124	48.4	

Note 1: The values for allowable overhang load length are those when the center of the gravity of the load is at 1/2 of the overhang length.

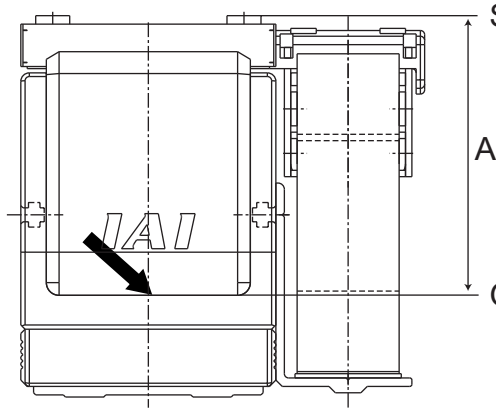


Drawings for Standard Type



Drawings for Standard Type

Conduct moment calculations for Ma and Mc with the point indicated with an allow below as the datum.



Dimension A
S6SS, SM : 69mm
S8SS, SM, HS, HM : 79mm
S10SS, SM, HS, HM : 99mm

⚠ Caution: Using the product above the allowable moment or overhang load length may cause not only to generate abnormal noise or vibration, but also to shorten the product life remarkably.

1.2.6 Duty Ratio in Continuous Operation

The duty ratio may differ depending on the acceleration/deceleration and transported weight.
[Refer to 1.3 “Operating conditions”]

1.3 Operating conditions

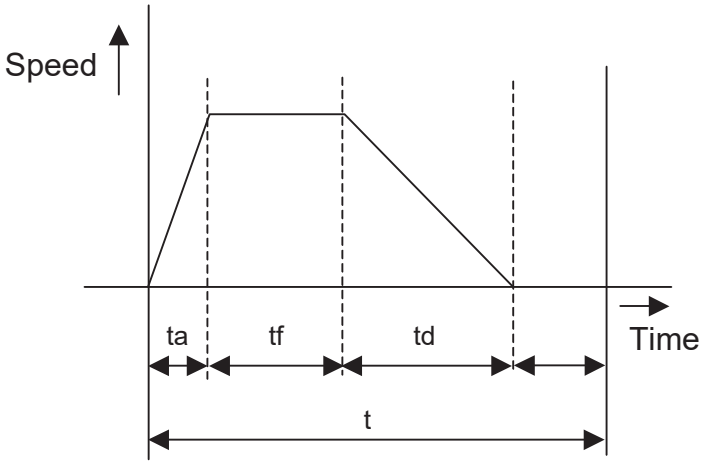
1.3.1 Available Conditions for Operation

When selecting a desired model of shaft-type linear servo actuator, you must ensure that the selected actuator satisfies the following two conditions.

[Condition 1]
The thrust required for acceleration must not exceed the maximum thrust of the shaft-type linear servo actuator.

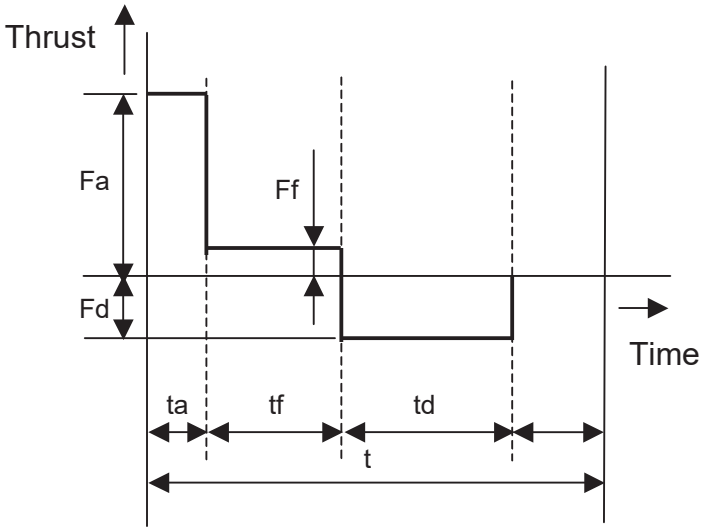
[Condition 2]
The thrust during continuous operation must not exceed the rated thrust of the shaft-type linear servo actuator.

The above conditions are explained by using a trapezoid operation as an example.



t : Operation time per cycle (sec)
ta : Acceleration time (sec)
tf : Moving time at constant speed (sec)
td : Deceleration time (sec)

The above operation pattern can be expressed differently in a graph where the vertical axis represents thrust.



Fa : Thrust required for acceleration (N)
Ff : Traveling resistance (N)
Fd : Thrust required for deceleration (N)

1.3.2 Availability Judgment for each Operational Condition

[1] Condition 1 Judgment of Thrust Necessary for Acceleration

For the slider to accelerate according to a command, the thrust required for acceleration, or Fa, must be smaller than the maximum thrust of the shaft-type linear servo actuator.

$Fa = (M + m) \cdot a + Ft$

Here,
M : Slider weight (kg)
m : Slider payload (kg)
a : Commanded acceleration (m/s^2)* *1G = $9.8m/s^2$
Ff : Traveling resistance (N)

[Slider weight]

S6SS, S6SM	: 1.4kg
S8SS, S8SM	: 1.7kg
S8HS, S8HM	: 2.0kg
S10SS, S10SM	: 3.5kg
S10HS, S10HM	: 4.0kg

In the case of a shaft-type linear servo actuator, the traveling resistance is determined by the speed and empirically calculated as specified below.

[Traveling resistance]
The table below lists the traveling resistance of each model.

	Traveling resistance Ff (N)
S6SS, S6SM	5V + 5
S8SS, S8SM	9V + 7
S8HS, S8HM	9V + 7
S10SS, S10SM	20V + 13.5
S10HS, S10HM	20V + 13.5

V: Slider speed (m/s)
(Achieved speed is used in a triangle wave operation.)

If the obtained Fa is smaller than the maximum thrust of the shaft-type linear servo actuator, condition 1 is satisfied.

	Maximum thrust (N)
S6SS, S6SM	60
S8SS, S8SM	100
S8HS, S8HM	140
S10SS, S10SM	260
S10HS, S10HM	320

[2] Condition 2 Judgment of Thrust for Continuous Operation

It is necessary that the continuous operational thrust Ft considering the load and duty is smaller than the rated thrust.

$$F_t = \sqrt{\frac{F_a{}^2 \cdot t_a + F_f{}^2 \cdot t_f + F_d{}^2 \cdot t_d}{t}}$$

Fa : Thrust required for acceleration (N)
ta : Acceleration time (sec)
td : Deceleration time (sec)
Ff : Traveling resistance (N)
tf : Moving time at constant speed (sec)
t : Operation time per cycle (sec) (t = ta + tf + td + 0.15)

[Stabilization time tc]

S6SS, S6SM	: 0.15 sec
S8SS, S8SM	: 0.2 sec
S8HS, S8HM	: 0.2 sec
S10SS, S10SM	: 0.2 sec
S10HS, S10HM	: 0.2 sec

Here, Fd indicates the thrust required for deceleration and can be calculated as follows:

Fd = (M +m) • d – Ff

M : Slider weight (kg)
m : Slider payload (kg)
d : Commanded deceleration (m/s^2)
Ff : Traveling resistance (N)

Condition 2 is satisfied if the continuous operational thrust Ft figured out as described above is smaller than the rated thrust.

	Rated thrust (N)
S6SS, S6SM	15
S8SS, S8SM	25
S8HS, S8HM	35
S10SS, S10SM	65
S10HS, S10HM	80

The actuator can be used in any operating conditions that satisfy both conditions 1 and 2 specified above.
If either condition cannot be satisfied, take appropriate measures such as reducing the slider load, acceleration or duty.

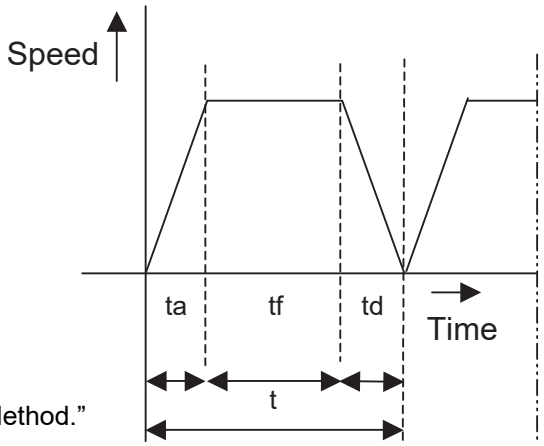
1.3.3 Example for Judging Operation Availability by Operational Conditions

1G = 9.8m/s^2

[Operating conditions]

- Applicable model : S8SS/S8SM type
- Speed : 2.0m/s
- Acceleration : 24.5m/s^2 (The deceleration is assumed to be the same.)
- Travel : 1.5m
- Slider payload : 2kg
- The actuator moves back and forth over a stroke of 1.5m.

The above operation pattern can be illustrated by the graph shown to the right.



Now, let's start calculation according to "Selection Method."

1) Figure out the maximum thrust of Condition 1.
Apply the above operation pattern to the aforementioned equation of maximum thrust.

Fa = (M +m) • a + Ff

Here,
M : Slider weight (1.7kg for the S8SS/S8SM)
m : Slider load (kg) : 2kg in this example
a : Commanded acceleration (m/s^2) : 24.5m/s^2 in this example
Ff : Traveling resistance (N) : 25N in this example

From above, Fa is calculated as follows:
Fa = (3.7 × 24.5 + 25) → 115.65N

The calculated value exceeds the maximum thrust 100N of the S8SS/S8SM.

Let's lower the specified acceleration to 19.6m/s^2. Fa changes as follows:
Fa = (3.7 × 19.6 + 25) → 97.52N.

The calculated value is smaller than the maximum thrust 100N of the S8SS/S8SM.

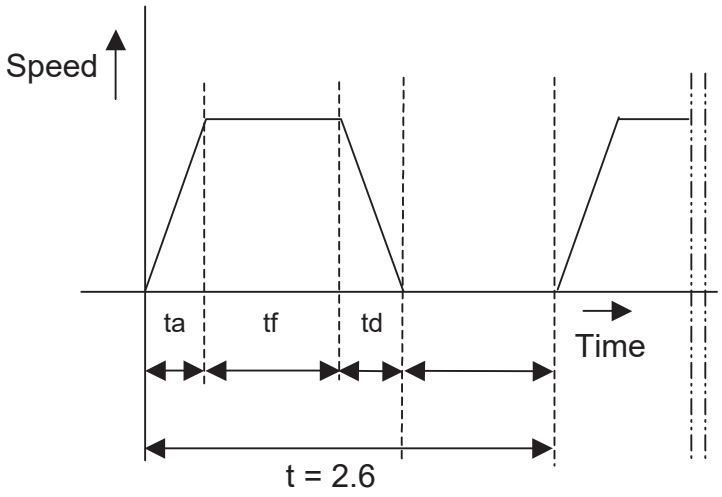
2) Figure out the continuous operational thrust of Condition 2.
Substitute the operation pattern of the previous page to the continuous operational thrust formula.
Based on the examination result of maximum thrust, the specified acceleration is assumed as 19.6m/s^2.

$$F_t = \sqrt{\frac{F_a{}^2 \cdot t_a + F_f{}^2 \cdot t_f + F_d{}^2 \cdot t_d}{t}}$$

Here,
Fa = 97.52N, Ff = 25N, Fd = 47.52N, ta = td = 0.10sec, tf = 0.65sec, t = 0.85sec

From the above, Ft is calculated as 43.16N.

Since this value exceeds the rated thrust 25N of the S8SS/S8SM, this actuator cannot be used in the aforementioned operation pattern.
Let's lower the duty and see what happens.
Repeat the above calculation based on t = 2.6sec.



This time, Ft is calculated as 24.68N.
Accordingly, the actuator can be used in this operation pattern.

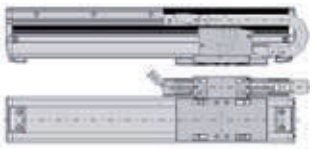
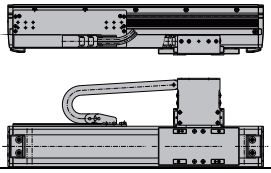
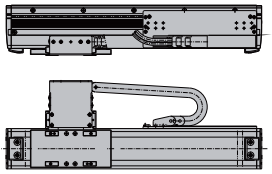
1.4 Option

1.4.1 Cable carrier Attachment Orientations 2 to 6 (Model: CT2 to CT6)

These are the attachment orientation indications with no cable carrier for user (option).
The attachment orientation of cable carrier is either the four orientations in Standard Horizontal Orientation Mount or two orientations in Horizontally Oriented Wall Mount.
Refer to the table below for the availability of Single Slider and Double Slider.

Option Model	Attachment Orientation	Single Slider	Double Slider
None	Attachment Orientation 1	○	○
CT2	Attachment Orientation 2	○	×
CT3	Attachment Orientation 3	○	×
CT4	Attachment Orientation 4	○	×
CT5	Attachment Orientation 5	○	○
CT6	Attachment Orientation 6	○	×

[Attachment Orientation]

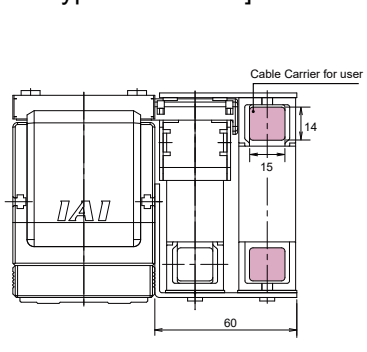
Attachment Orientation 1 (Standard)	Attachment Orientation 2 (Opposite Type) CT2	Attachment Orientation 3 CT3
Single Slider is to be attached in the orientation shown in the figure below. Multi Slider is to be attached in the orientation shown in the figure below on both right and left sides.	It is the opposite type in the attachment to Attachment Orientation 1 (Standard).	It is the type with the home position on the opposite side from Attachment Orientation 1 (Standard).
Attachment Orientation 4 CT4	**Attachment Orientation 5 (Standard Horizontally Oriented Wall Mount) CT5**	**Attachment Orientation 6 (Opposite Type Horizontally Oriented Wall Mount) CT6**
It is the opposite type in the attachment to and also the home position on the opposite side from Attachment Orientation 1 (Standard). 	Single Slider is to be attached in the orientation shown in the figure below. Multi Slider is to be attached in the orientation shown in the figure below on both right and left sides. 	It is the opposite type in the attachment to Attachment Orientation 6 (Standard Horizontally Oriented Wall Mount). 

1.4.2 Cable carrier for User S Type Attachment Orientations 1 to 6 (Model: US1 to US6)

These are the indications when attaching S Type User Cable carrier to the standard cable carrier. Attachment orientation is also to be indicated. The attachment orientation of cable carrier is either the four orientations in Standard Horizontal Orientation Mount or two orientations in Horizontally Oriented Wall Mount. [Refer to "[Attachment Orientation]" in the "1.4.1 Cable carrier Attachment Orientations 2 to 6 (Model: CT2 to CT6)"]
Refer to the table below for the availability of Single Slider and Double Slider.

Option Model	Attachment Orientation	Single Slider	Double Slider
US1	Attachment Orientation 1	○	○
US2	Attachment Orientation 2	○	×
US3	Attachment Orientation 3	○	×
US4	Attachment Orientation 4	○	×
US5	Attachment Orientation 5	○	○
US6	Attachment Orientation 6	○	×

[Dimensional Drawing for S Type User Cable]



Horizontal Type

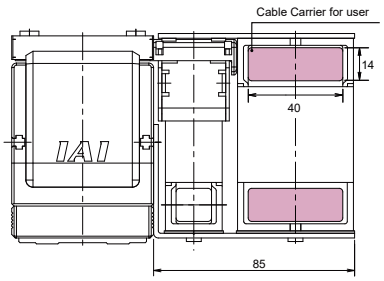
Horizontally Oriented Wall Mount Type

1.4.3 Cable carrier for User M Type Attachment Orientations 1 to 6 (Model: UM1 to UM6)

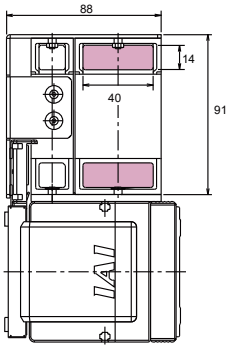
These are the indications when attaching M Type User Cable carrier to the standard cable carrier. Attachment orientation is also to be indicated. The attachment orientation of cable carrier is either the four orientations in Standard Horizontal Orientation Mount or two orientations in Horizontally Oriented Wall Mount. [Refer to "[Attachment Orientation]" in the "1.4.1 Cable carrier Attachment Orientations 2 to 6 (Model: CT2 to CT6)"]
Refer to the table below for the availability of Single Slider and Double Slider.

Option Model	Attachment Orientation	Single Slider	Double Slider
UM1	Attachment Orientation 1	○	○
UM2	Attachment Orientation 2	○	×
UM3	Attachment Orientation 3	○	×
UM4	Attachment Orientation 4	○	×
UM5	Attachment Orientation 5	○	○
UM6	Attachment Orientation 6	○	×

[Dimensional Drawing for M Type User Cable]



Horizontal Type



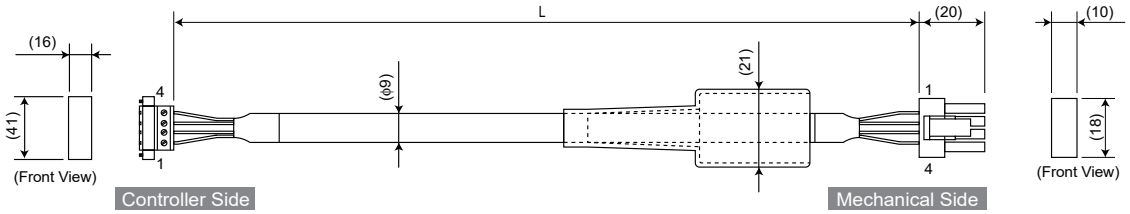
Horizontally Oriented Wall Mount Type

1.5 Motor • Encoder Cables

1.5.1 Motor • Encoder Cables for Linear Servo Actuator

[1] Motor Cable (Model : CB-X-MA□□□)

□□□ indicates the cable length (L) (Example: 080=8m),
Max. XSEL-P/Q : 30m, SSEL and SCON : 20m



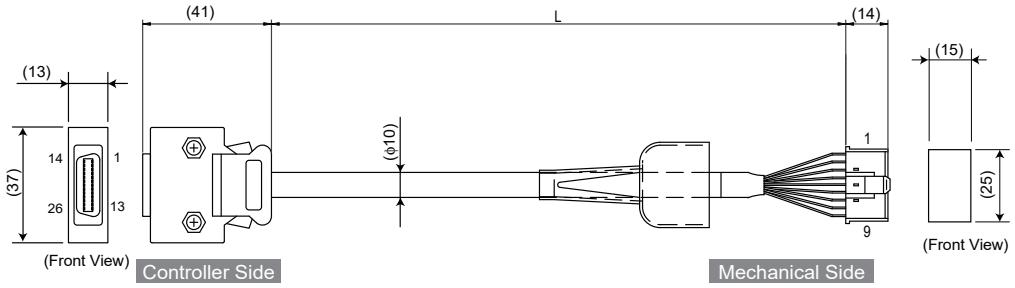
Width	Electric Wire Color	Signal Abbreviation	Pin No.
AWG 19 (0.75mm²)	Green	PE	1
	Red	U	2
	White	V	3
	Black	W	4

Pin No.	Signal Abbreviation	Electric Wire Color	Width
1	U	Red	AWG 19 (0.75mm²) (Solderless)
2	V	White	
3	W	Black	
4	PE	Green	

[Bending Radius]
When used under moving condition : 51mm
When used in fixed condition : 34mm

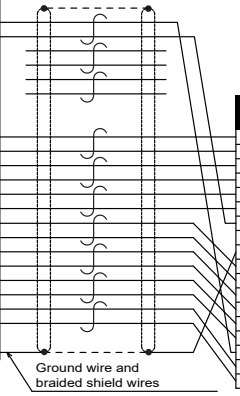
[2] Encoder Cable (Model : CB-X3-PA□□□)

□□□ indicates the cable length (L) (Example: 080=8m),
Max. XSEL-P/Q : 30m, SSEL and SCON : 20m



Width	Electric Wire Color	Signal Abbreviation	Pin No.
AWG26 (0.12mm²) (Soldered)	-	-	10
	-	-	11
	-	E24V	12
	White/Green	0V	13
	White/Orange	LS	26
	-	CREEP	25
	-	OT	24
	-	RSV	23
	-	-	9
	-	-	18
	-	-	19
	White/Blue	A+	1
	White/Yellow	A-	2
	White/Red	B+	3
	White/Black	B-	4
	White/Purple	Z+	5
	White/Gray	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Gray	BAT-	15
	Red	VCC	16
	Brack	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	-	-	22
The shield is clamped to the hood			

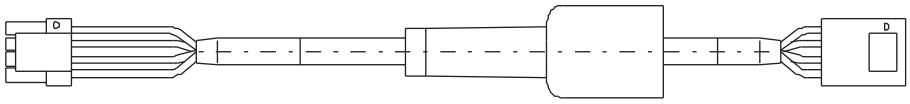
[Bending Radius]
When used under moving condition : 58mm
When used in fixed condition : 38mm



Pin No.	Signal Abbreviation	Electric Wire Color	Width
1	A	White/Blue	AWG26 (0.12mm²) (Solderless)
2	Ā	White/Yellow	
3	B	White/Red	
4	B̄	White/Black	
5	Z	White/Purple	
6	Z̄	White/Gray	
7	LS+	White/Orange	
8	-	-	
9	FG	Ground	
10	SD	Orange	
11	S̄D̄	Green	
12	BAT+	Purple	
13	BAT-	Gray	
14	VCC	Red	
15	GND	Black	
16	LS-	White/Green	
17	BK-	Blue	
18	BK+	Yellow	

1.5.2 Cable in the bearer

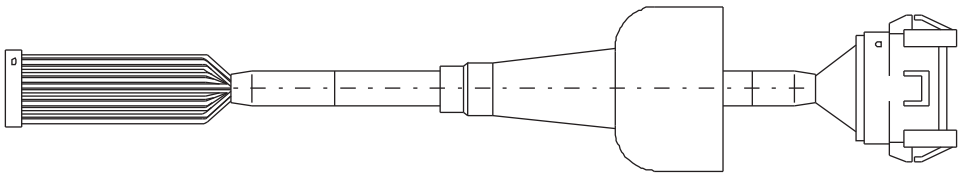
[1] Motor cable



Width	Electric Wire Color	Signal Abbreviation	Pin No.
AWG 20 (0.5mm²)	Red	U	1
	White	V	2
	Black	W	3
	Green	PE	4

Pin No.	Signal Abbreviation	Electric Wire Color	Width
1	U	Red	AWG 20 (0.5mm²)
2	V	White	
3	W	Black	
4	PE	Green	

[2] Encoder cable



Width	Electric Wire Color	Signal Abbreviation	Pin No.
AWG 26 (0.12mm²)	1B/Light blue	EN_A	1
	1R/Light blue	EN_/A	2
	1B/Pink	EN_B	3
	1R/Pink	EN_/B	4
	1B/Light green	EN_Z	5
	1R/Light green	EN_/Z	6
	1B/Orange	SD	7
	1R/Orange	/SD	8
	1B/Gray	5V	9
	-	NC	10
	1R/Gray	GND	11
	Shield	FG	12

Pin No.	Signal Abbreviation	Electric Wire Color	Width
1	EN_A	1B/Light blue	AWG 26 (0.12mm²)
2	EN_/A	1R/Light blue	
3	EN_B	1B/Pink	
4	EN_/B	1R/Pink	
5	EN_Z	1B/Light green	
6	EN_/Z	1R/Light green	
7	NC	-	
8	NC	-	
9	FG	Shield	
10	SD	1B/Orange	
11	/SD	1R/Orange	
12	NC	-	
13	NC	-	
14	5V	1B/Gray	
15	GND	1R/Gray	
16	NC	-	
17	NC	-	
18	NC	-	

2. Installation

2.1 Transportation

⚠ Warning: This actuator uses high-performance rare-earth permanent magnets. Therefore, those who are wearing a pacemaker or any other medical device must not come within 30 cm of the actuator.

[1] Handling of the Actuator

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

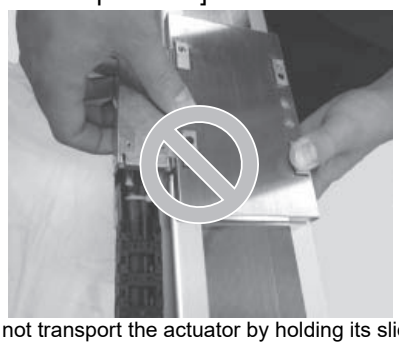
(1) Handling the Packed Unit

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

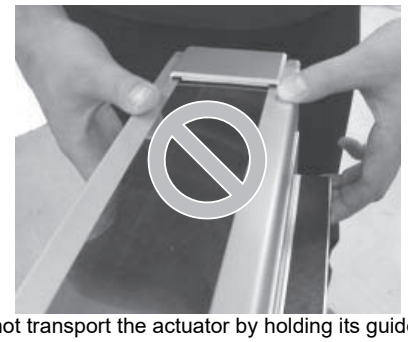
(2) Handling the Actuator After Unpacking

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

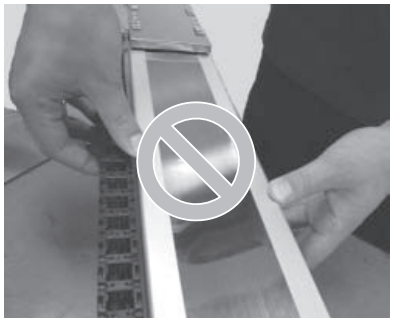
[Taboos in transportation]



Do not transport the actuator by holding its slider.



Do not transport the actuator by holding its guide rail.



Do not transport the actuator by holding its cable carrier.

Do not transport the actuator by holding its stainless sheet.

[2] Handling in the Assembled Condition

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

(1) How to Handle the Package

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

(2) How to Handle after Unpackaged

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

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

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

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

2.2 Installation and Storage • Preservation Environment

[1] Installation Environment

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

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

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

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

[2] Storage • Preservation Environment

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

2.3 How to Install

⚠ Warning: This actuator uses high-performance rare-earth permanent magnets. Therefore, those who are wearing a pacemaker or any other medical device must not come within 30 cm of the actuator.

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

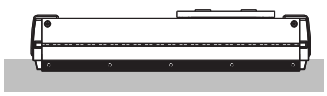
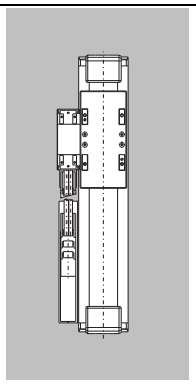
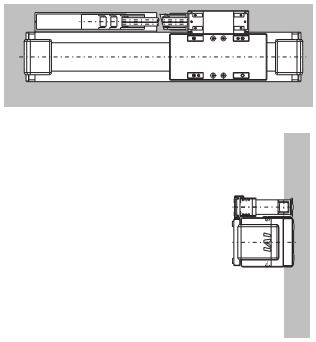
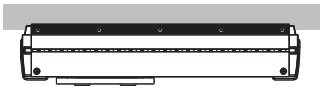
2.3.1 Installation

Follow the information below when installing the actuator, as a rule.
Do pay attention to these items (except with custom-order models).

○ : Possible × : Not possible

Horizontal installation	Vertical installation	Horizontally Oriented Wall Mount installation	Ceiling Mount installation
○	×	○	×

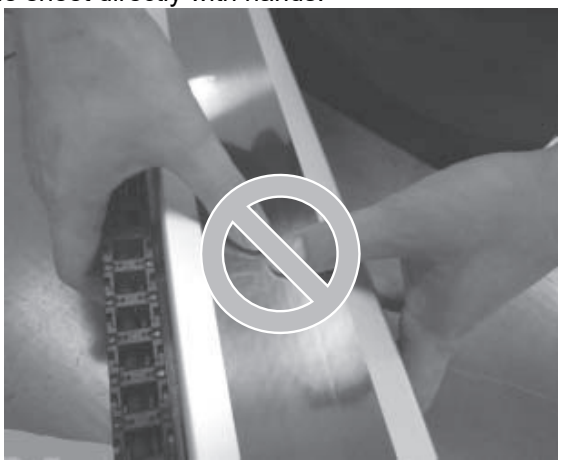
Installation Orientation

Horizontal	Vertical	Horizontally Oriented Wall Mount	Ceiling Mount
			

2.3.2 Installation of Main Unit

⚠ Caution: The stainless sheet is designed very thin (thickness: 0.1 mm) in order to ensure flexibility. Therefore, the stainless sheet is easily dented or scratched.
When installing the stainless sheet, pay attention to the following points:

1. Do not press the sheet directly with hands.

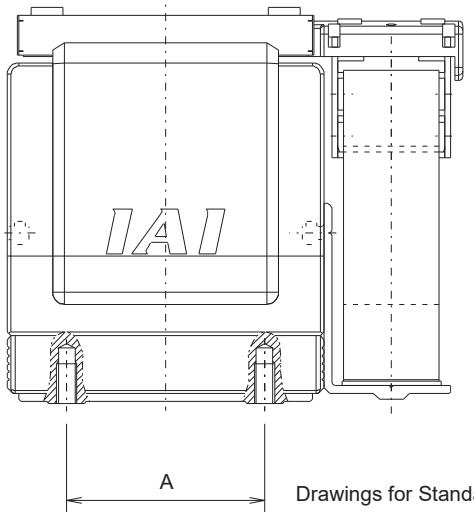


2. Be careful not to drop a tool or a work piece on the sheet and make a dent mark.
3. Do not generate powder dust or iron powder around the stainless sheet.
   There are magnets attached on the side cover to grip the stainless steel sheet. Handle the product with special care so the magnets would not grip metal pieces and dusts.
   If dust/powder has generated, thoroughly remove attached dust/powder from the stainless sheet after the operation.
   If the actuator is operated with the stainless sheet carrying foreign particles, the particles may enter the slider and damage the sheet or cause the sheet to deform, lift or present other problems.

The surface to mount the main unit should be a machined surface or a plane that possesses an equivalent accuracy and the flatness should be within 0.05mm/m.

The side surfaces and bottom surface of the base of the body have good parallelism to the guide. Utilize these surfaces when accuracy in the actuator drive is required.

This actuator has tapped mounting holes that can be used to affix the actuator from its back (take note that the tap size is different depending on the model: Refer to the figure below and “8. External Dimensions”.)
There are also reamed holes for accepting positioning pins.



Drawings for Standard Type

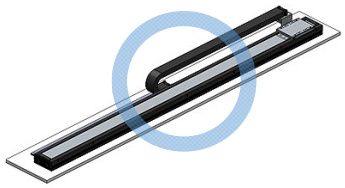
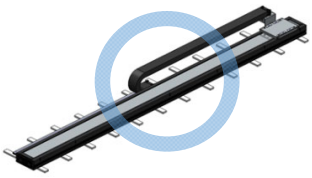
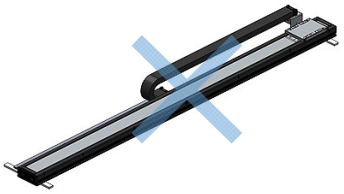
Model Name	Tapped Hole Size	Tapped Holes Depth	Tightening Torque		Pitch (A) [mm]	Reamed Hole [mm]
			In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:		
S6	M4	4mm or more 10mm or less	3.59N·m (0.37kgf·m)	1.76N·m (0.18kgf·m)	30	ϕ3H7, depth 3
S8	M5	5mm or more 10mm or less	7.27N·m (0.74kgf·m)	3.42N·m (0.35kgf·m)	50	ϕ4H7, depth 5
S10	M5	5mm or more 10mm or less	7.27N·m (0.74kgf·m)	3.42N·m (0.35kgf·m)	70	ϕ4H7, depth 5

About Tightening Screws
- Use a hex socket head cap bolt for the attachment to the base.
- It is recommended to use high-tensile bolts with ISO-10.9 or more.
- Make sure to have the effective length of bolt engagement described below or more for the tightening of a bolt and a female screw.
  When female screw is on steel → Thread length same as nominal diameter
  When female screw is on aluminum → Thread length 1.8 times longer them nominal diameter

⚠ Caution: Pay special attention when selecting the bolt length. In case that an inappropriate length of a bolt is applied, it may cause damage on the tapped holes or insufficiency in attachment strength, which may result in a drop in the operation accuracy or an unexpected accident.

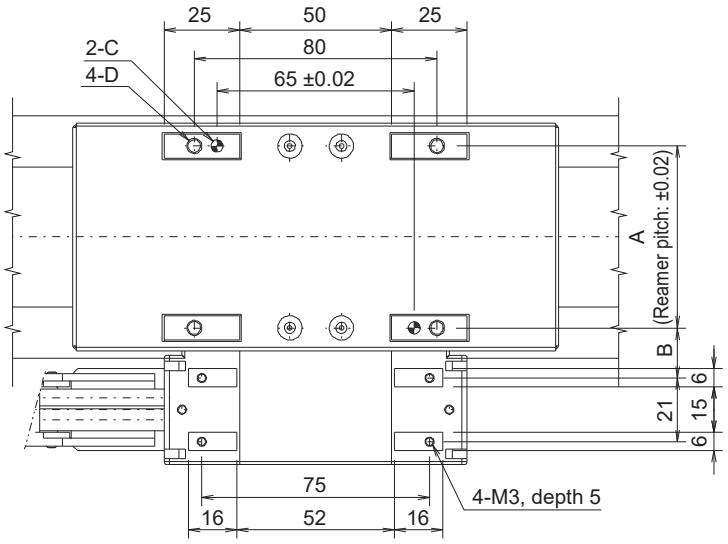
◎ Caution for Installation of Main Unit

- Basically, all of the tapped holes should be used in order to hold on the whole area.
- In case that the accuracy in drive is not required, it is available to make foot brackets to hold the unit. In this case also, all the tapped holes are to be used to hold the unit.
- Do not attempt to hold only on ends. It could make the base warped and sliding resistance may get high on ends. It could cause an error.

Hold on Whole Area Use All of Tapped Holes	Hold with Foot Brackets Use All of Tapped Holes	Hold Only on Ends
		

2.3.3 Attachment of Transported Object

- There are tapped holes on the top surface of the slider. Affix the work part (transported object) here.
- The procedure to affix a load on the slider shall conform to the actuator installation procedure.
- There are two reamed holes on the top surface of the slider. Use these reamed holes if repeatability of attaching and detaching is required. Also, if small tuning such as perpendicularity is required, use one of the reamed holes for the tuning.
- Refer to the following table for the screwed depth and reamed depth. Screwing further than indicated in the table may destroy the tapped hole or lower the reinforcement of the attachment of the work part, result in the drop of the accuracy or an unexpected accident.



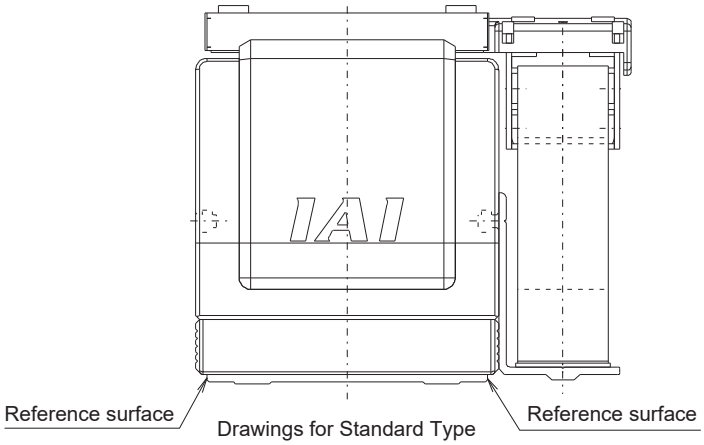
Model Name	A	B	C	D	Mounting Bolt	
					Nominal Bolt Diameter	Tightening Torque
S6	45	14	ϕ4H7, depth 8	M4, depth 10	M4	1.76N·m (0.18kgf·m)
S8	60	16.5	ϕ4H7, depth 8	M5, depth 10	M5	3.42N·m (0.35kgf·m)
S10	80	16.5	ϕ6H7, depth 10	M6, depth 10	M6	5.36N·m (0.55kgf·m)

About Tightening Screws
- Use a hex socket head cap bolt for the attachment to the base.
- It is recommended to use high-tensile bolts with ISO-10.9 or more.
- Make sure to have the effective length of bolt engagement described below or more for the tightening of a bolt and a female screw.
  When female screw is on steel → Thread length same as nominal diameter
  When female screw is on aluminum → Thread length 1.8 times longer them nominal diameter

⚠ Caution: Pay special attention when selecting the bolt length. In case that an inappropriate length of a bolt is applied, it may cause damage on the tapped holes or insufficiency in attachment strength, which may result in a drop in the operation accuracy or an unexpected accident.

2.3.4 Installation Surface

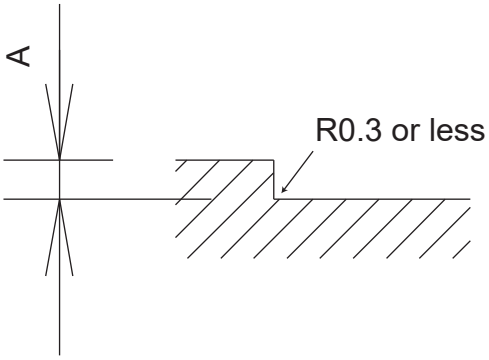
- For the platform to install the actuator, ensure the structure that possesses enough stiffness to avoid vibration being generated.
- Install the actuator on a machined surface or other flat surface of equivalent accuracy. The flatness of the installation surface must be 0.05 mm/m or less.
- Provide sufficient space to allow for maintenance work.
- The side and bottom surfaces of the actuator base provide reference surfaces used for alignment of slider travel.
- If you require higher traveling accuracy, install the actuator using these reference surfaces.



Drawings for Standard Type

As shown above, each side surface of the base provides a reference surface used for alignment of slider travel. If you require higher traveling accuracy, therefore, install the actuator with reference to either side surface of the base.

When installing the actuator on the frame using the base reference surfaces, provide the necessary machining by following the drawing below.

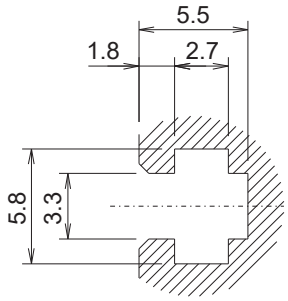


Model	Dimension A (mm)
S6, S8	1.5 ~ 2 or less
S10	1.5 ~ 3 or less

2.3.5 Mount of Connector Box and Others

T-slots (M3) are provided on the side faces of the actuator for installation of a connector box or other external equipment.
If you are using a wiring kit, install a connector box using these T-slots.
T-slots can also be used for other purposes, such as installing sensors or securing cables.
The T-slot dimensions are specified below.

- Use of square nuts is recommended in T-slots, but hex nuts can also be used.
- When installing an object using T-slots, select bolts of an appropriate length so that the tip of the bolt will not contact the bottom of the T-slot.

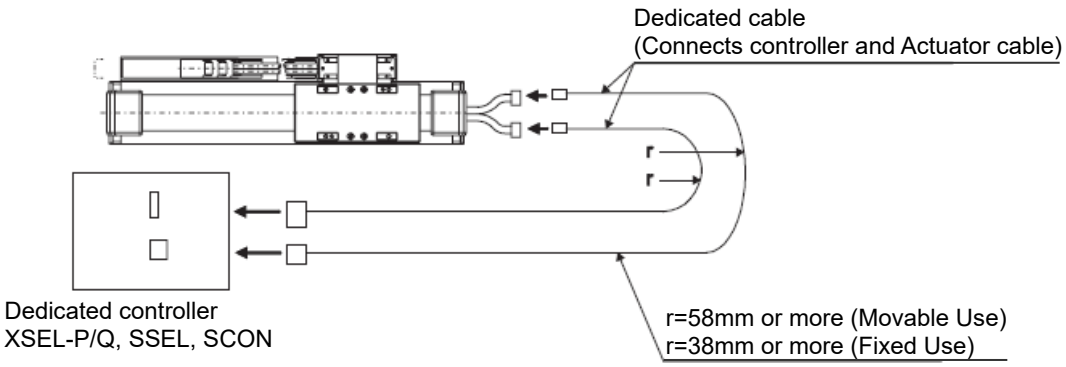


3. Connecting with the Controller

Use the IAI dedicated connection cable for the connection of the actuator to the controller.

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

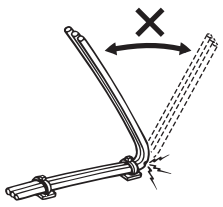
Please consult with IAI if you require a different kind of cable than the one supplied.

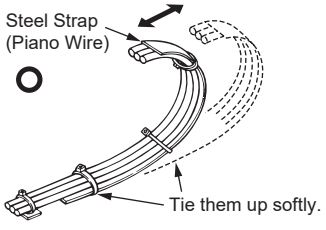


Dedicated cables
- Motor cable (Robot cable) CB-X-MA□□□
- Encoder cable CB-X3-PA□□□
  □□□ indicates the cable length.
  30m at the maximum can be applied to XSEL-P/Q.
  20m at the maximum can be applied to SSEL and SCON.
  Example) 080 = 8m

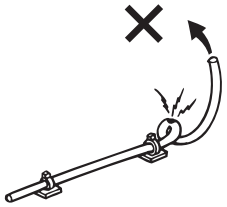
⚠ Warning: For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure,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

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

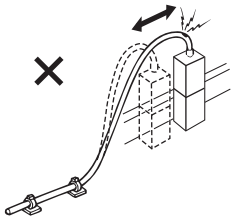




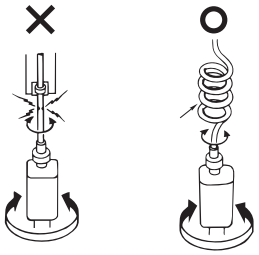
- Do not let the cable bend, kink or twist.



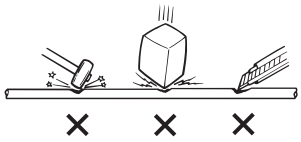
- Do not pull the cable with a strong force.



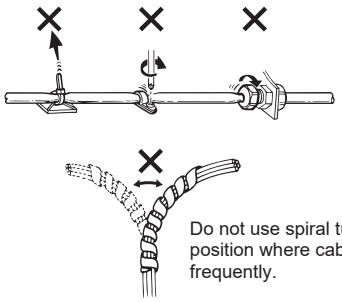
- Pay attention not to concentrate the twisting force to one point on a cable.



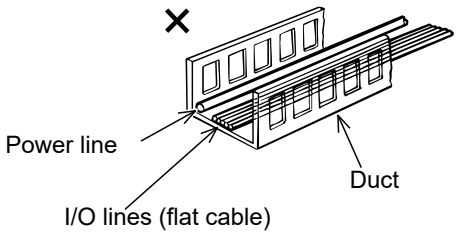
- Do not pinch, drop a heavy object onto or cut the cable.



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

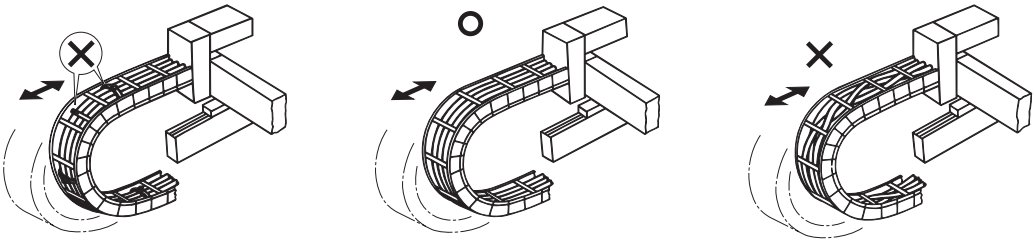


- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



Follow the instructions below when using a cable carrier.

- If there is an indication to the cable for the space factor in a cable carrier, refer to the wiring instruction given by the supplier when storing the cable in the cable carrier.
- Avoid the cables to get twined or twisted in the cable carrier, and also to have the cables move freely and do not tie them up. (Avoid tension being applied when the cables are bent.)
  Do not pile up cables. It may cause faster abrasion of the sheaths or cable breakage.



4. Operation

4.1 Home Return

4.1.1 Principle of Home-Return Operation

Home return is performed in the sequence specified below.

1) When a home return command is issued, the moving direction is determined from the specified parameter.
2) During home return, the mechanical end is detected via the software.
3) The actuator reverses upon contacting the mechanical end, after which it detects a Z phase signal and recognizes this position as the reference point.
4) The actuator moves further by the offset specified by the applicable parameter and recognizes the achieved position as the home.

4.1.2 Fine-tuning the Home Position

The actuator is shipped with its motor travel after the actuator contacts the stopper until a Z phase signal is output pre-adjusted. The table below lists the standard reversing distance for each model, where the reversing distance indicates the distance moved by the slider after it contacts the stopper and reverses, until it stops at the home position.

Model	Reversing distance from mechanical stopper
S6SS, S6SM	Approx. 5mm
S8SS, S8SM S8HS, S8HM	
S10SS, S10SM S10HS, S10HM	

If the home return direction remains the same, changing the parameter based on this value allows you to fine-tune the home position of your actuator. Perform this fine-tuning by following the procedure below.

1) Perform home return to check the home.
2) Thereafter, move the actuator to a desired home. Check the difference and correct the parameter accordingly. The parameter accepts a positive value to set an offset in the moving direction of the actuator. (Negative values cannot be set.)
3) Increasing the offset reduces the moving range by the amount incremented. If you have specified an offset exceeding 1mm, also adjust the soft limits.
   [Refer to PC Software Instruction Manual for details of how to set up the parameters]

4.1.3 Changing the Home Direction

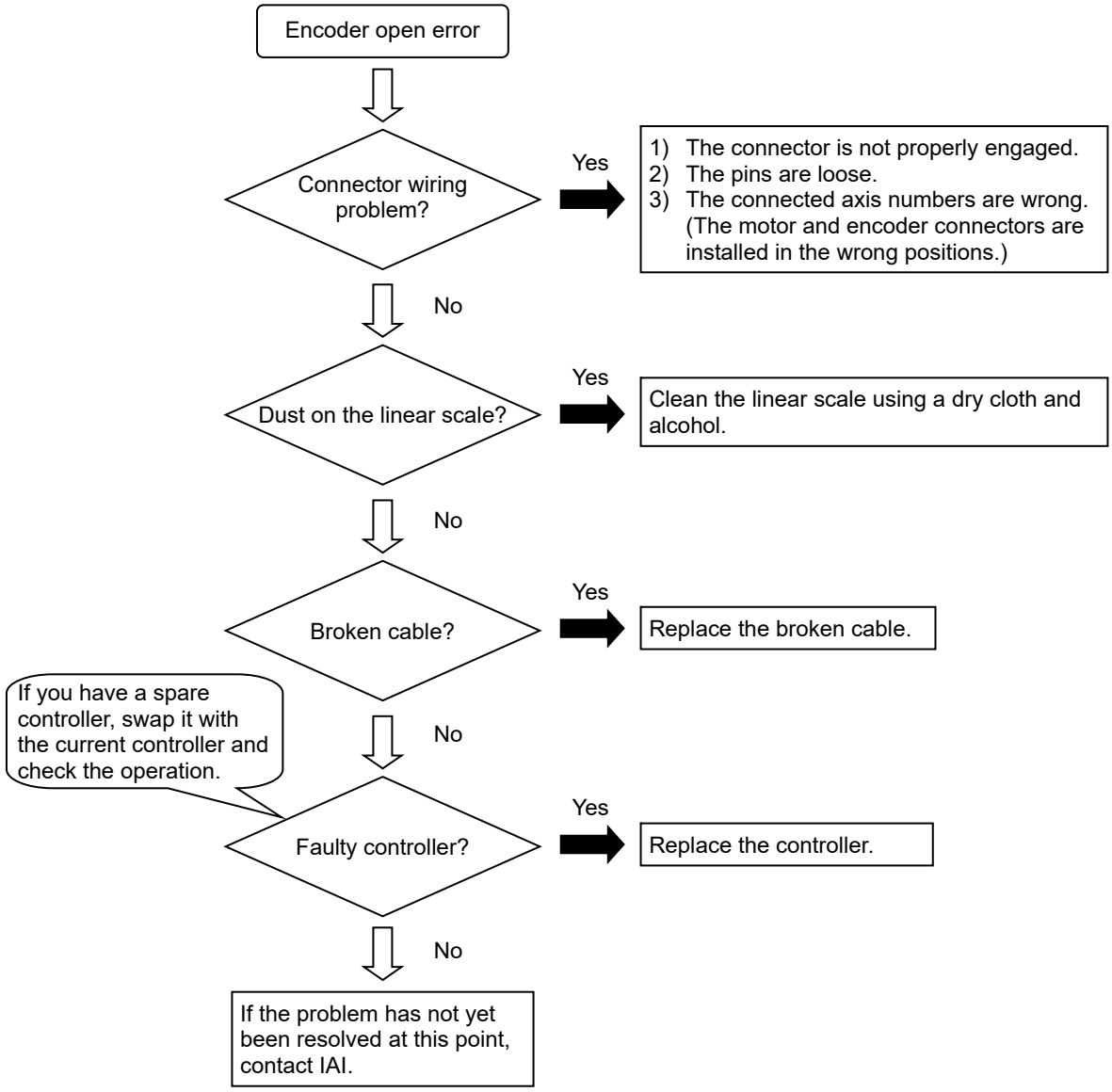
Changing the factory-set home direction after the delivery requires the moving direction parameter to be changed and the encoder readjusted. Please consult IAI.

⚠ Warning: The encoder not only detects position and home signals, but it also plays an important role in the switching of AC-servo power phases. Since the AC-servo power phases have been adjusted precisely, never touch the encoder to change the home.

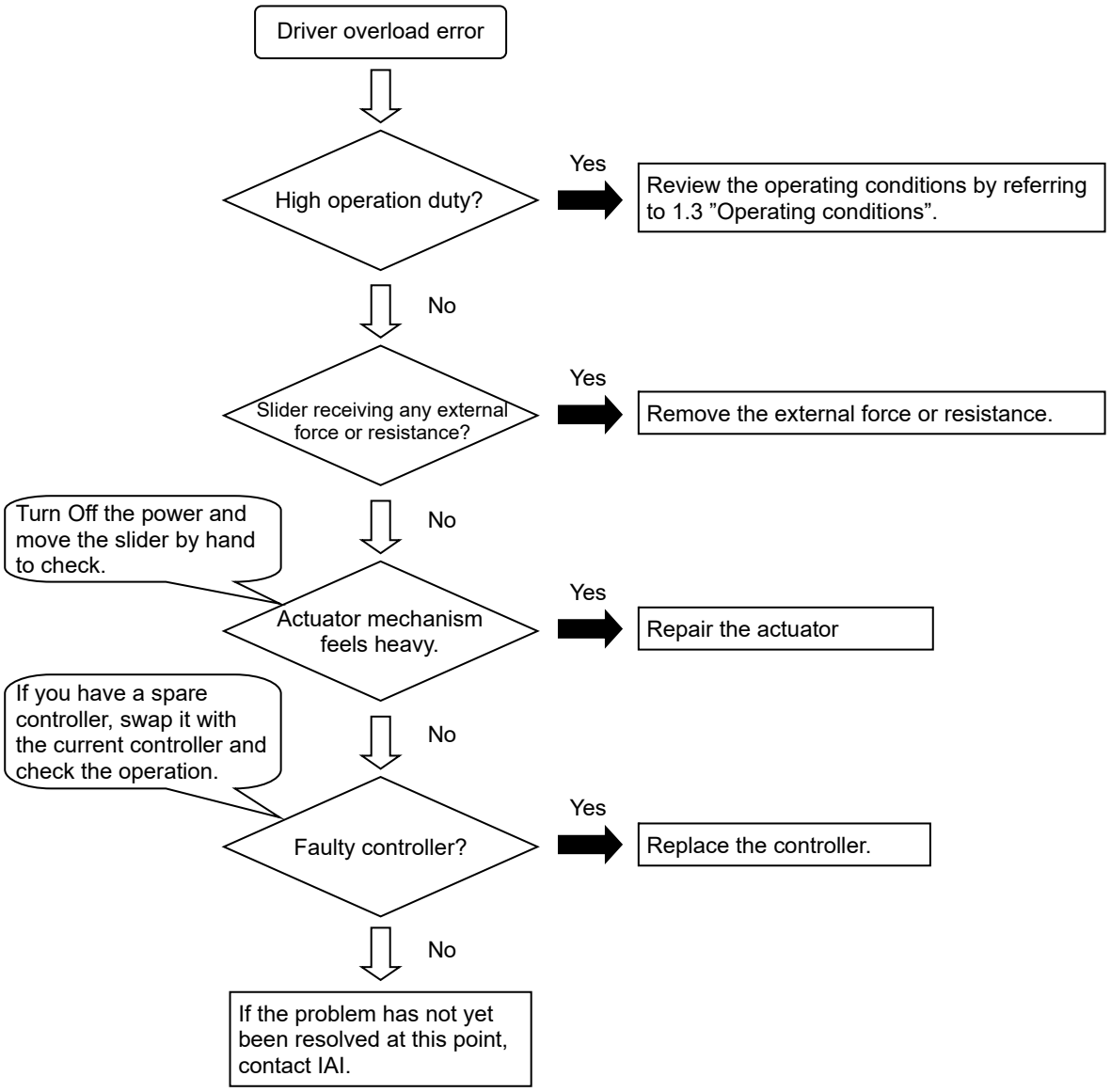
5. Troubleshooting

If the actuator has experienced an encoder open error, driver overload error, deviation overflow error or any other error, check the procedures explained below before concluding that the robot or controller is faulty. If the problem persists after the applicable measures have been taken, contact IAI with the detailed condition.

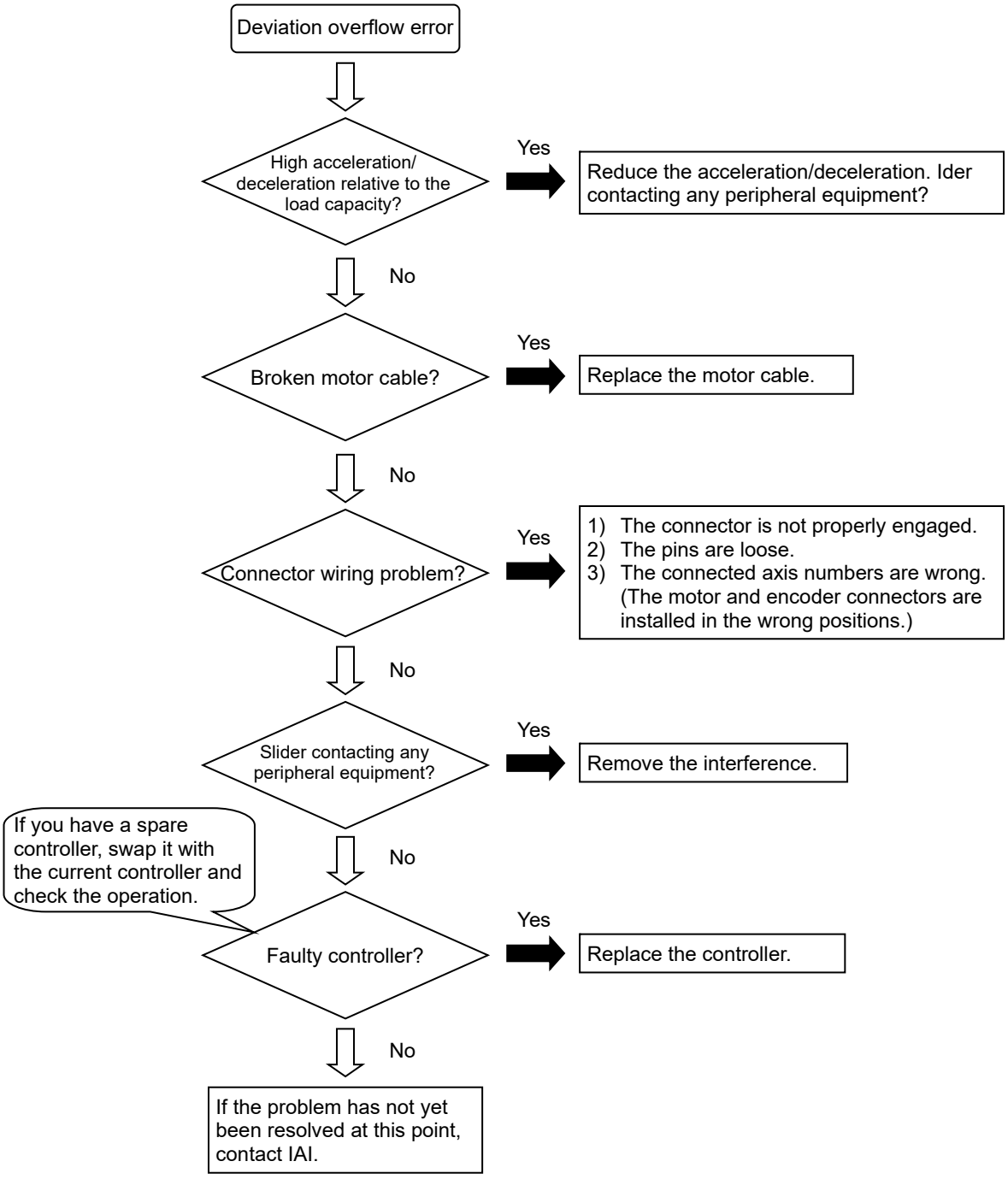
5.1 Encoder Open Error (Error Code: D12)



5.2 Driver Overload Error (Error Code: D0A)



5.3 Deviation Overflow Error (Error Code: C6B)



6. Maintenance and Inspection

> ⚠ Warning: This actuator uses high-performance rare-earth permanent magnets. Do not get closer than 30cm if you are a person who needs a support of a medical device such as a pacemaker.

6.1 Inspection Items and Schedule

Perform maintenance and inspection at the intervals specified below.
This schedule assumes that the actuator is operated eight hours a day.
If the actuator is operated at a higher utilization, such as when the machine is used continuously day and night, reduce the inspection intervals accordingly.

	Visual inspection of exterior	Inspection of interior
Start-up inspection	○	
After 1 month of operation	○	
After 6 months of operation	○	○
After 1 year of operation	○	○
Every 6 months thereafter	○	
Every 1 year	○	○

The product is equipped in standard with A. Q. Seal which supplies lubricant oil in a long term, thus there is no need of grease supply in regular terms.

6.2 External Visual Inspection

An external visual inspection should check the following things.

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

- Adjust the tension of the stainless sheet in case it is deviated or slacked.
  [Refer to 6.6.2 “Adjusting the Stainless Sheet Tension” and 6.6.3 “Operation Check”.]
- The life of the stainless sheet should be 5000km of driving distance as a reference.
  However, replace the stainless sheet when it is necessary depending on the condition of use.
  The sheet can be replaced by the user, but make sure there is no deviation or slack on the stainless sheet. Deviation or slack on the stainless sheet may damage the sheet. It is recommended that you bring the unit to us or have our service engineer visit your site for replacement work if you have any concern in the work.

6.3 Cleaning

- Clean the exterior surface as necessary.
- Wipe dirty areas using a soft cloth, etc.
- Do not blow highly compressed air onto the actuator, as it may cause dust to enter the actuator through gaps between parts.
- Do not use petroleum-based solvent as it damages resin and coated surfaces.
- To remove stubborn stains, take neutral detergent or alcohol into a soft cloth, etc., and wipe the area gently.

6.4 Interior Inspection

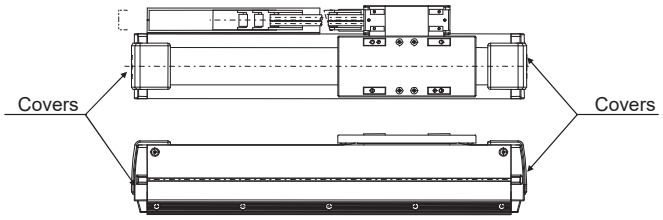
With the power supply turned OFF, turn up the stainless sheet and visually inspect the interior. Check the following items inside the actuator.

Actuator	Loosening of actuator mounting bolts, etc.
Guide	Lubrication condition, soiling

Visually check the interior condition. Focus on entry of dust and other foreign matters and the lubrication condition.
Even if grease has turned brown, the actuator is lubricated properly if its traveling surface is glossy. Contact IAI if an abnormality is found on the guide part.

The procedure to check the interior is specified below:

1) Move the slider toward the home side.
2) Remove the covers.



3) Remove the screws securing the sheet using a hex wrench with a width across flats of 2.5mm.
4) Turn up the sheet and check the interior.
5) After the check, assemble the parts by following the same steps in the reverse order.

⚠ Caution:
- When peeling off the stainless steel sheet, be careful not to get pulled in the body by the strong magnetic force of the magnets inside.
  In case of getting pulled by the magnets inside, the stainless steel sheet may get damaged and may not be used any more. Contact IAI if the sheet is damaged.
- Do not attempt to change the mounting condition by pulling the sheet. Change in the mounting condition may give an impact to the alignment of the sheet or the life of it.
- When working with the stainless sheet, wear gloves or take other appropriate precautions to prevent cuts by the edges of the sheet.

6.5 Cleaning the Interior

- Wipe dirty areas using a soft cloth, etc.
- Do not blow highly compressed air onto the actuator, as it may cause dust to enter the actuator through gaps between parts.
- Do not use petroleum-based solvent, neutral detergent or alcohol.

6.6 Procedures for Replacement and Adjustment of Stainless Steel Sheet

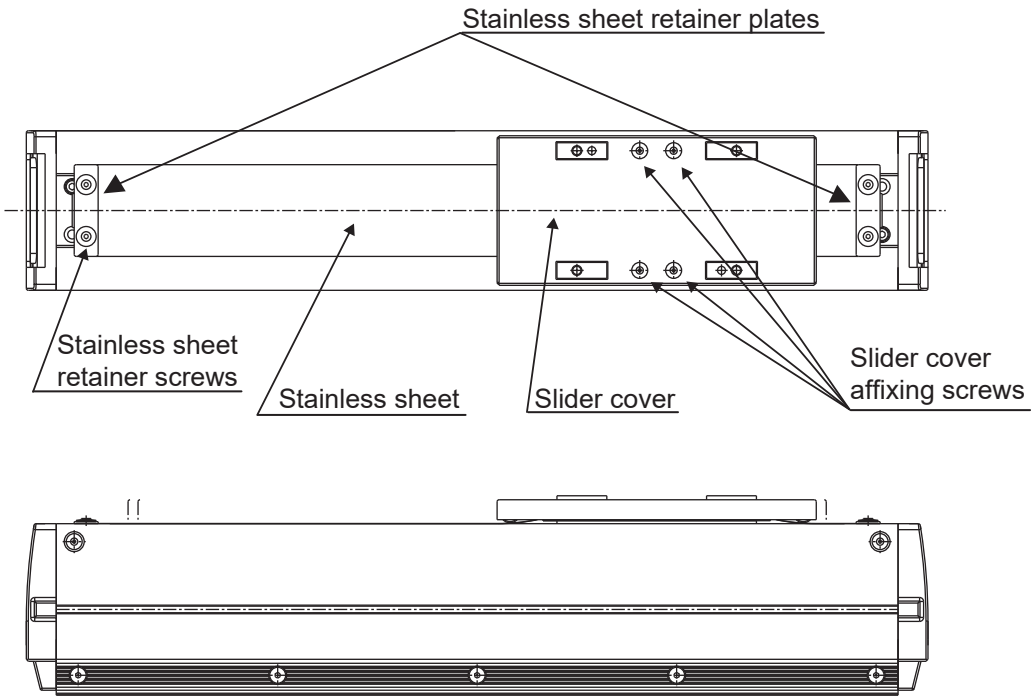
Described below explains how to replace and adjust the stainless steel sheet.
Those parts such as screws taken off for replacement work are necessary when assembling the product back. It is recommended to prepare a storage box in advance to starting the work, so the taken off parts can be kept in it.

[Required Items]
- Replacement stainless sheet
- Hex wrench set
- Scale
- Box-end wrench (7mm)
- Adhesive tape
- Oil-based marker
- Tension gauge (having two forked hooks)

[Notes]
(1) Stainless sheet tension
Improper tension of the stainless sheet can promote deterioration and wear of the sheet.
If the stainless sheet is too taut and the clearance from the slider cover becomes exceeds 1mm, the stainless sheet may undergo fatigue failure.
On the other hand, excessive slacks cause the stainless sheet to contact the back of the slider cover.

(2) Checking the clearance between the stainless sheet and the back of the slider cover
The stainless sheet is replaced without removing the slider cover.
Therefore, the clearance between the stainless sheet and the back of the slider cover cannot be measured or checked directly.
The stainless sheet must be tensioned so that this clearance becomes 1mm.

[Name of each part]
The figure below shows the actuator with its right and left covers removed to expose the stainless sheet retainer plates.

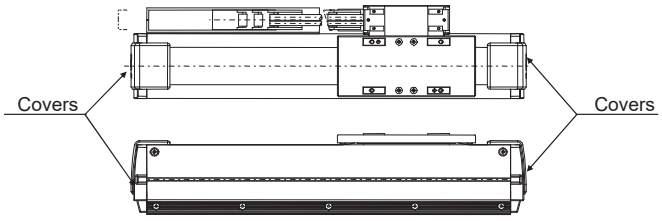


Replace the stainless steel sheet with the procedures from 6.6.1 to 6.6.3.
Adjust the tension of the stainless steel sheet with the procedures in 6.6.2 and 6.6.3.

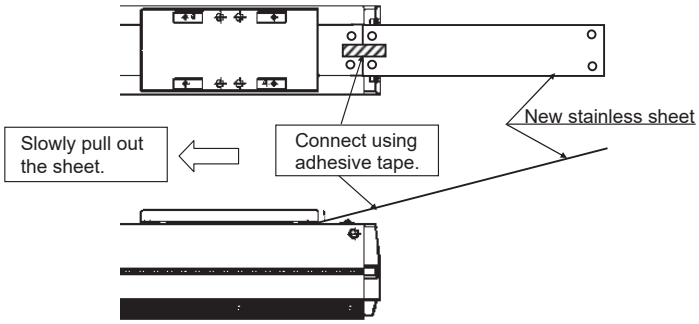
6.6.1 Replacement Procedure for Stainless Sheet

Replace the degraded stainless steel sheet with a new one by following the steps described below.

1) Remove the right and left covers. To remove each cover, hold both ends and pull out the cover slowly.



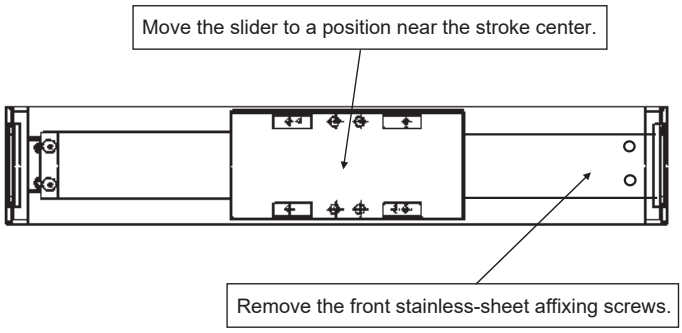
2) Check a new stainless sheet to confirm absence of scratches or soiling.
3) Loosen the screws affixing the damaged stainless steel sheet with a 2.5mm-sized hex wrench, and remove the retainer plates.
4) Connect the damaged stainless sheet and new stainless sheet using adhesive tape.
5) Slowly pull out the damaged stainless sheet.
6) Confirm that the new stainless sheet has been installed in the slider.



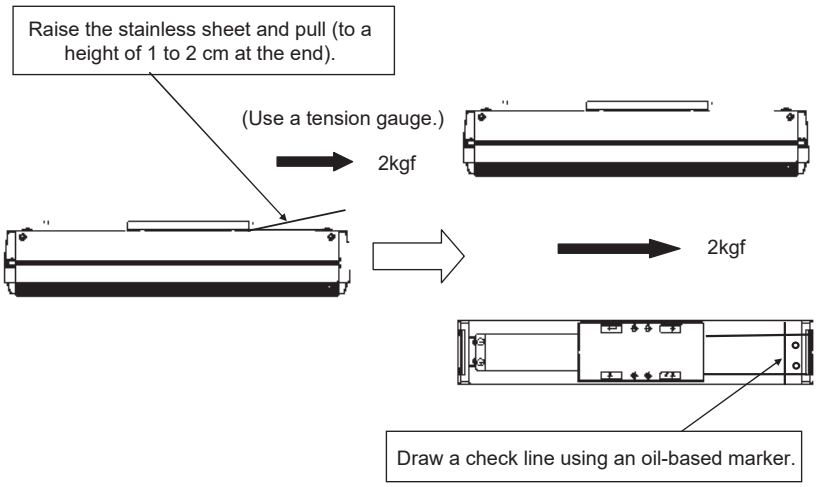
Connect the damaged stainless sheet and new stainless sheet using adhesive tape, and then slowly pull out the damaged stainless sheet so that the new sheet takes its position.

6.6.2 Adjusting the Stainless Sheet Tension

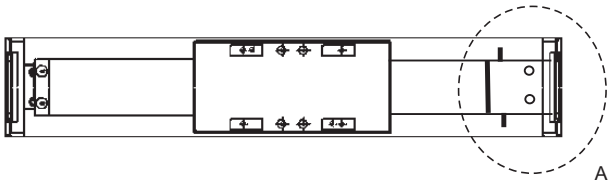
1) First, affix the stainless sheet uniformly on the right and left in a manner free from meandering. (The stainless steel sheet is gripped on with the magnets. Detach the sheet in a manner of peeling it once from one edge. Also adjust the stainless sheet from the slider center toward both ends.)
2) Move the slider to a position near the stroke center, and unscrew the screws holding the stainless steel sheet with a 2.5mm-sized hex wrench on one side and remove the retainer plate.

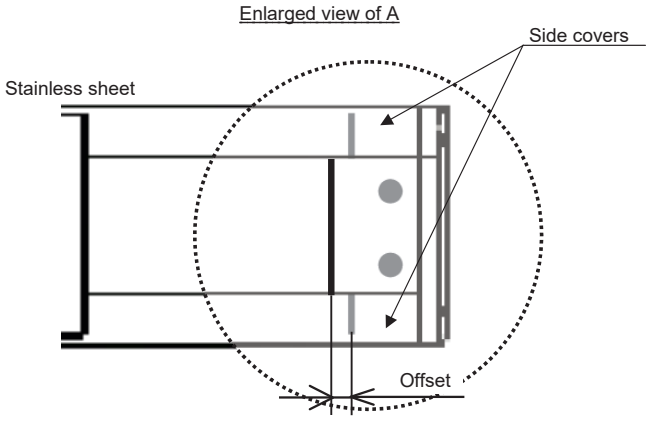


3) Prepare for tension adjustment of the stainless sheet.
   - As shown below, raise the stainless sheet by 1 to 2cm at the end where the screws were removed in step 2), and then by using a tension gauge, pull the sheet in the direction of the free end with a force of 2kg. (Use a tension gauge having two forked hooks at its tips and hook the gauge at two locations on the stainless sheet.)
   - With the stainless sheet tensioned by a force of 2kg, allow the stainless sheet to be attracted to the magnets from the slider end toward the other end, and then remove the tension gauge. (Once attracted to the magnets, the stainless sheet will not move.)
   - Use an oil-based marker and ruler to draw a straight check line that crosses over the side covers and stainless sheet. [Refer to the figure below.]



4) Adjusting the Stainless Sheet Tension
Adjust the stainless sheet in the direction of the arrow until the check lines on the side covers are offset from the check line on the stainless sheet by 0.5mm. (Refer to the enlarged view of A.)
(The stainless steel sheet is gripped on with the magnets. Detach the sheet in a manner of peeling it once from one edge.)

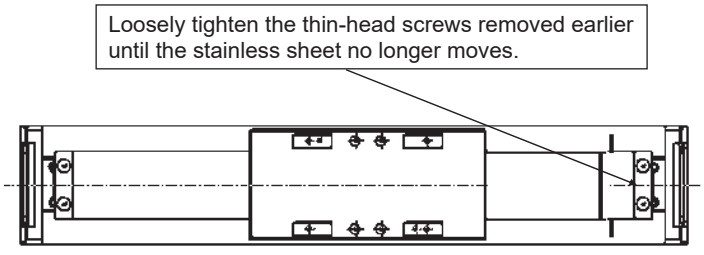




Move the stainless sheet in the direction of the arrow to fine-tune the sheet position until the check lines on the side covers are offset from the check line on the stainless sheet by 0.5mm.

Once this adjustment is complete, an approximately 1mm clearance has been achieved between the top surface of the stainless sheet and the back of the slider cover at the center of the slider cover.

5) After the sheet has been positioned, loosely tighten the thin-head screws removed earlier until the stainless sheet no longer moves.

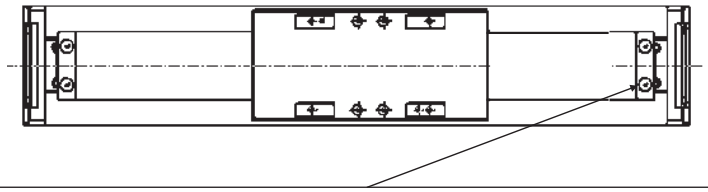


6.6.3 Operation Check

1) Move the slider to check the tension of the stainless sheet.
Move the slider to check the tension. Specifically, check if the stainless sheet is positioned uniformly on the right and left without presenting meandering or waving over the entire stroke range.
If the stainless sheet is not uniformly positioned on the right and left or is waving, repeat the adjustment.

2) Securely tighten the thin-head screws that have been loosened with a 2.5mm-sized hex wrench to affix the stainless steel sheet in position.

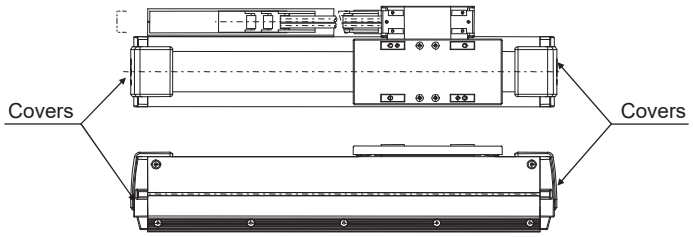
Tightening torque for thin-head screws (reference value)
359 N•cm (36.7 kgf•cm)



Alternately tighten the two thin-head screws that have been tightened loosely until both screws are tightened to a uniform torque. Ensure uniformity of torque, because if the two screws are not tightened uniformly, the sheet may meander or lift.

Move the slider to check once again if the stainless sheet is tensioned properly. Lastly, remove the check lines using alcohol, etc.

3) Install the right and left covers. To install each cover, hold the right and left sides and push in the cover.



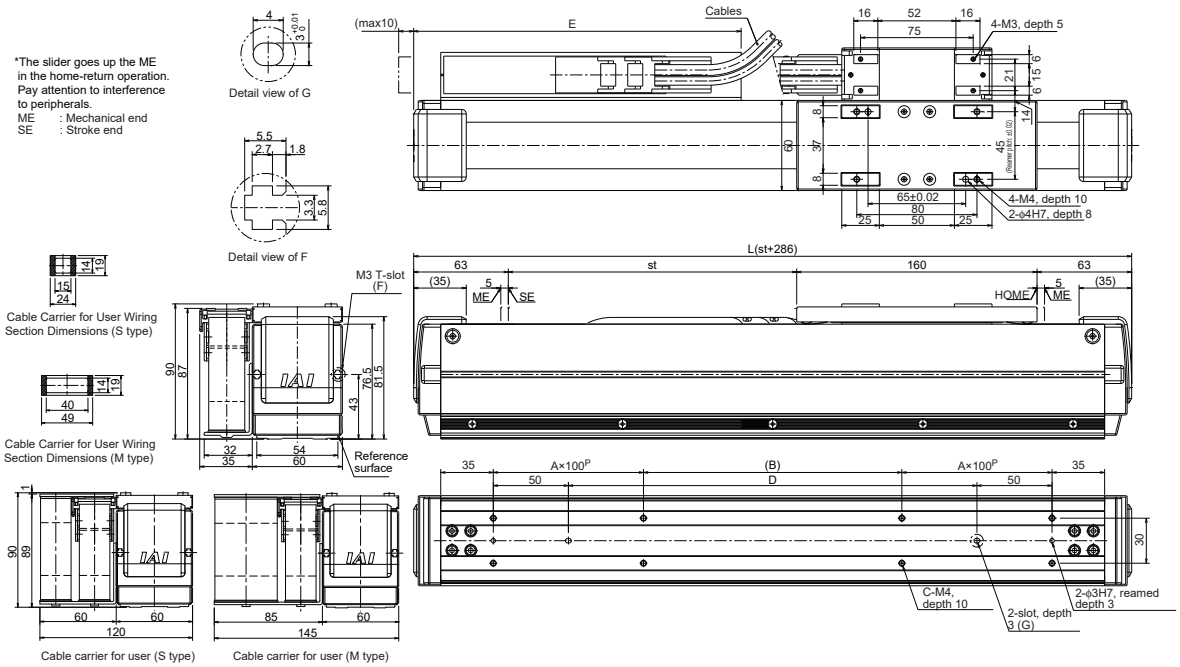
7. Life

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

8. External Dimensions

8.1 S6SS

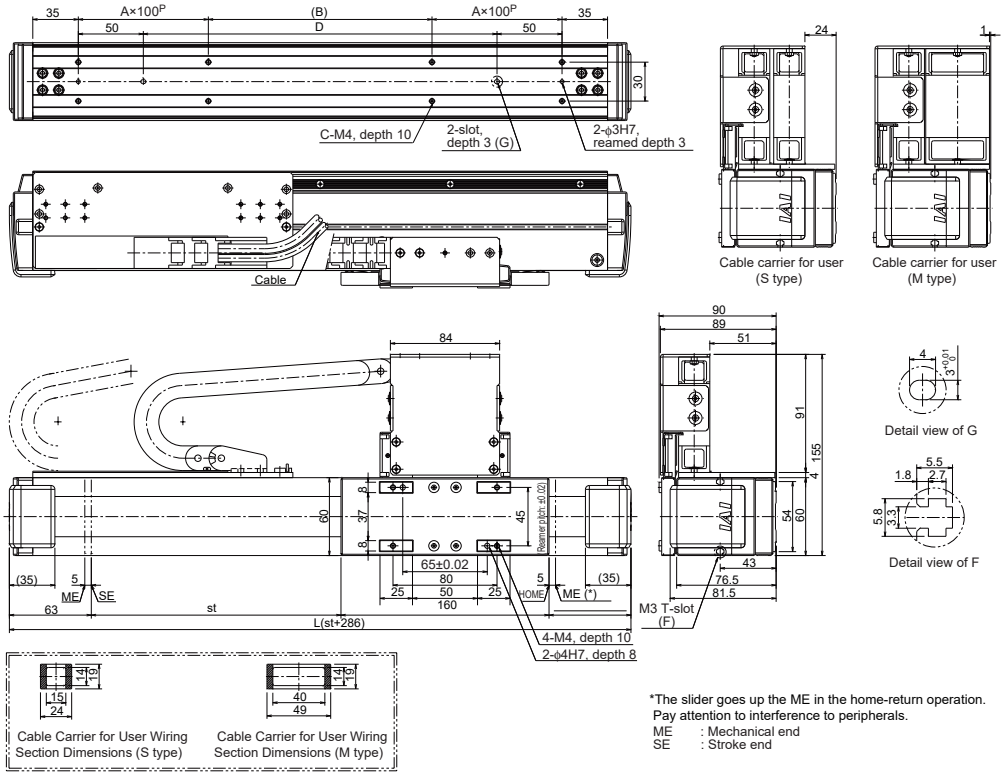
8.1.1 Standard Type



S6SS Standard Type

No.	st	L	A	B	C	D	E	Weight (kg)
1	48	334	1	28	8	128	143	3.1
2	96	382	1	76	8	176	168	3.3
3	144	430	1	124	8	224	193	3.5
4	192	478	1	172	8	272	218	3.7
5	240	526	2	20	12	320	243	3.9
6	288	574	2	68	12	368	268	4.1
7	336	622	2	116	12	416	293	4.3
8	384	670	2	164	12	464	318	4.5
9	432	718	3	12	16	512	343	4.7
10	480	766	3	60	16	560	368	5.0
11	528	814	3	108	16	608	393	5.2
12	576	862	3	156	16	656	418	5.4
13	624	910	3	204	16	704	443	5.6
14	672	958	4	52	20	752	468	5.8
15	720	1006	4	100	20	800	493	6.1
16	768	1054	4	148	20	848	518	6.2
17	816	1102	4	196	20	896	543	6.4
18	864	1150	5	44	24	944	568	6.6
19	912	1198	5	92	24	992	593	6.8
20	960	1246	5	140	24	1040	618	7.0
21	1008	1294	5	188	24	1088	643	7.3
22	1056	1342	6	36	28	1136	668	7.5
23	1104	1390	6	84	28	1184	693	7.7
24	1152	1438	6	132	28	1232	718	7.9
25	1200	1486	6	180	28	1280	743	8.1
26	1248	1534	7	28	32	1328	768	8.3

8.1.2 Horizontally Oriented Wall Mount Type (Standard)(Option)

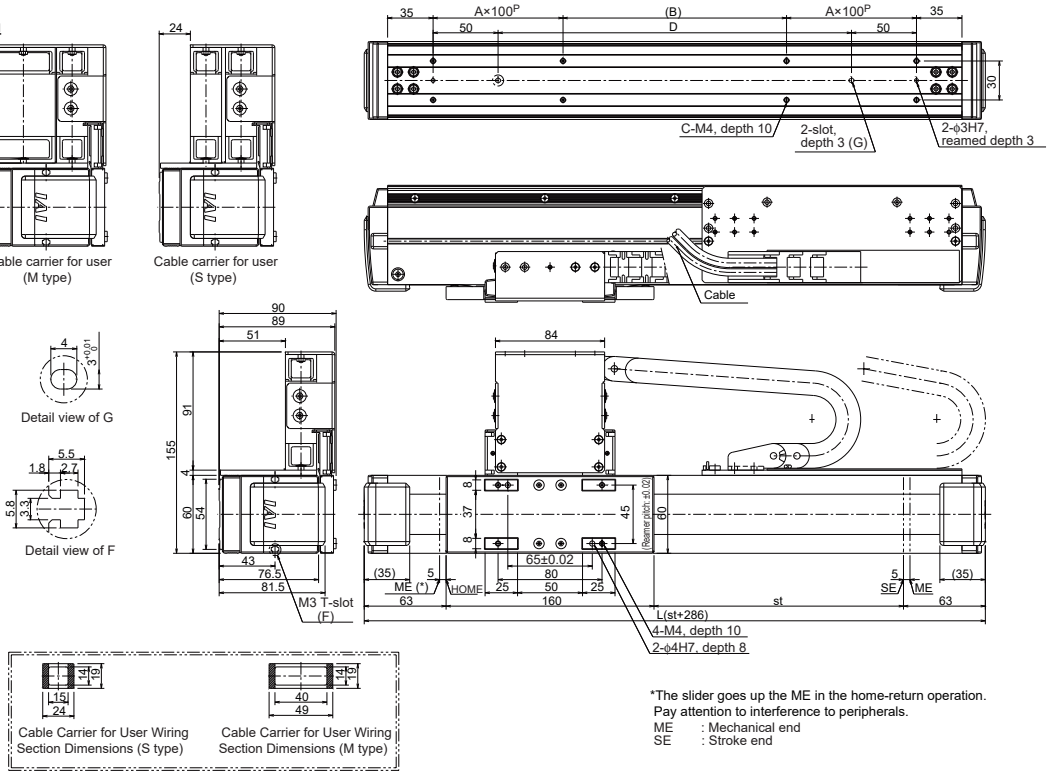


*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S6SS Horizontally Oriented Wall Mount Type (Standard) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	48	334	1	28	8	128	3.6
2	96	382	1	76	8	176	3.8
3	144	430	1	124	8	224	4.0
4	192	478	1	172	8	272	4.2
5	240	526	2	20	12	320	4.4
6	288	574	2	68	12	368	4.6
7	336	622	2	116	12	416	4.8
8	384	670	2	164	12	464	5.0
9	432	718	3	12	16	512	5.2
10	480	766	3	60	16	560	5.5
11	528	814	3	108	16	608	5.7
12	576	862	3	156	16	656	5.9
13	624	910	3	204	16	704	6.1
14	672	958	4	52	20	752	6.3
15	720	1006	4	100	20	800	6.5
16	768	1054	4	148	20	848	6.7
17	816	1102	4	196	20	896	6.9
18	864	1150	5	44	24	944	7.1
19	912	1198	5	92	24	992	7.3
20	960	1246	5	140	24	1040	7.5
21	1008	1294	5	188	24	1088	7.8
22	1056	1342	6	36	28	1136	8.0
23	1104	1390	6	84	28	1184	8.2
24	1152	1438	6	132	28	1232	8.4
25	1200	1486	6	180	28	1280	8.6
26	1248	1534	7	28	32	1328	8.8

8.1.3 Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

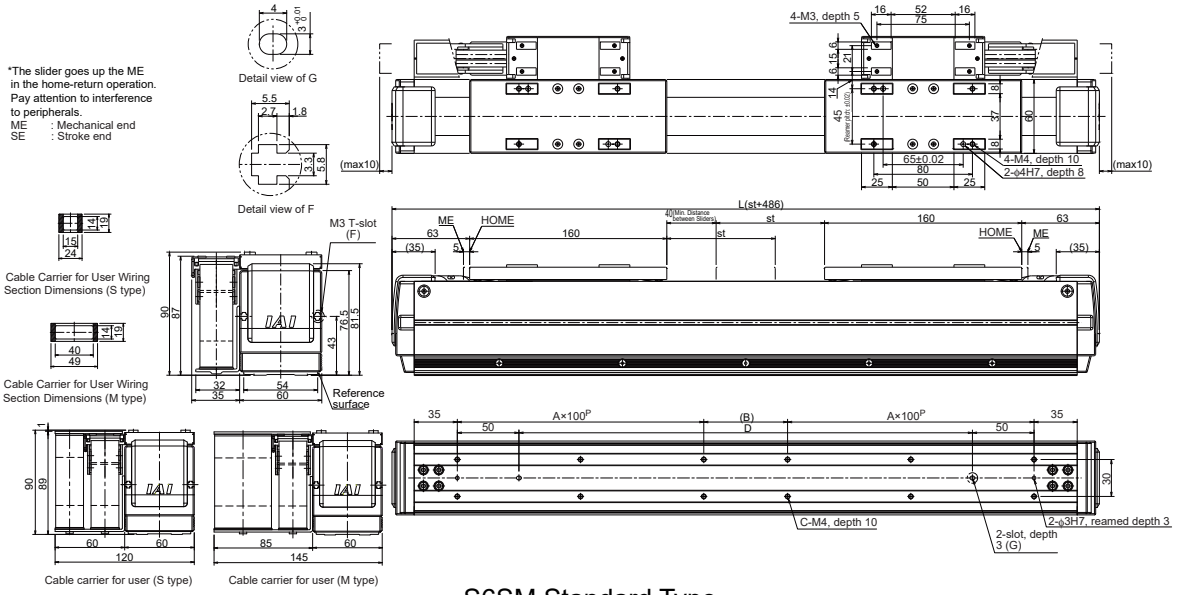


S6SS Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	48	334	1	28	8	128	3.6
2	96	382	1	76	8	176	3.8
3	144	430	1	124	8	224	4.0
4	192	478	1	172	8	272	4.2
5	240	526	2	20	12	320	4.4
6	288	574	2	68	12	368	4.6
7	336	622	2	116	12	416	4.8
8	384	670	2	164	12	464	5.0
9	432	718	3	12	16	512	5.2
10	480	766	3	60	16	560	5.5
11	528	814	3	108	16	608	5.7
12	576	862	3	156	16	656	5.9
13	624	910	3	204	16	704	6.1
14	672	958	4	52	20	752	6.3
15	720	1006	4	100	20	800	6.5
16	768	1054	4	148	20	848	6.7
17	816	1102	4	196	20	896	6.9
18	864	1150	5	44	24	944	7.1
19	912	1198	5	92	24	992	7.3
20	960	1246	5	140	24	1040	7.5
21	1008	1294	5	188	24	1088	7.8
22	1056	1342	6	36	28	1136	8.0
23	1104	1390	6	84	28	1184	8.2
24	1152	1438	6	132	28	1232	8.4
25	1200	1486	6	180	28	1280	8.6
26	1248	1534	7	28	32	1328	8.8

8.2 S6SM

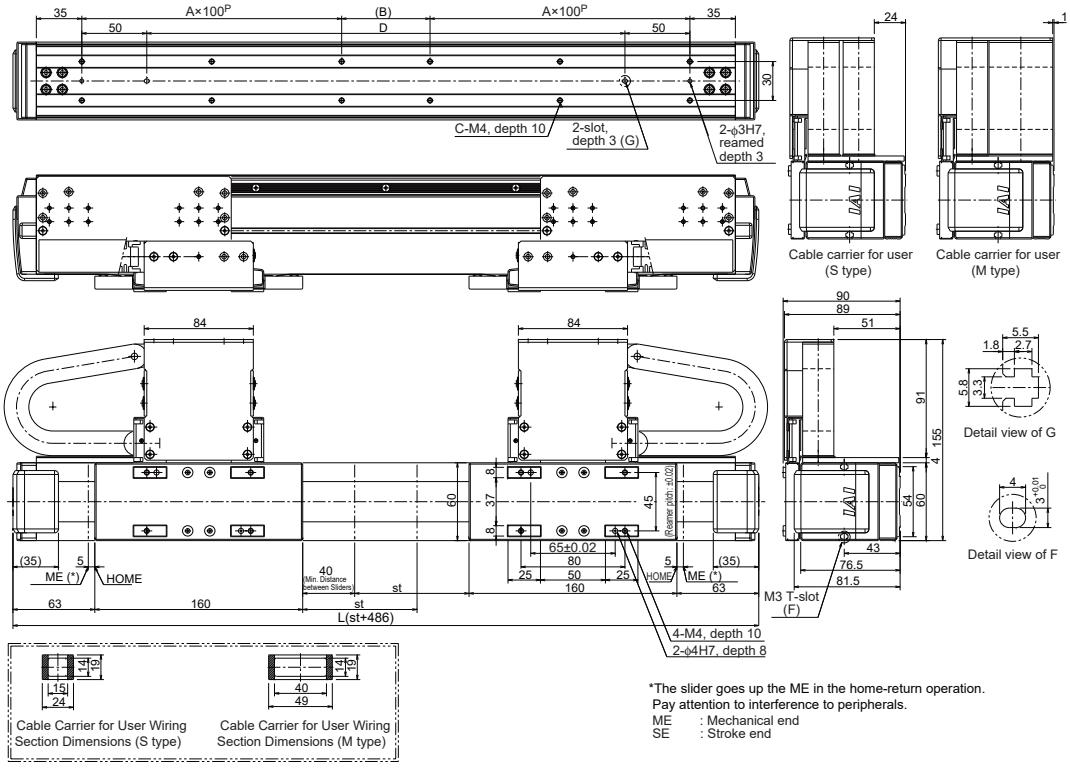
8.2.1 Standard Type



S6SM Standard Type

No.	st	L	A	B	C	D	Weight (kg)
1	40	526	2	20	12	320	5.4
2	88	574	2	68	12	368	5.6
3	136	622	2	116	12	416	5.8
4	184	670	2	164	12	464	6.0
5	232	718	3	12	16	512	6.2
6	280	766	3	60	16	560	6.4
7	328	814	3	108	16	608	6.6
8	376	862	3	156	16	656	6.8
9	424	910	3	204	16	704	7.0
10	472	958	4	52	20	752	7.2
11	520	1006	4	100	20	800	7.5
12	568	1054	4	148	20	848	7.7
13	616	1102	4	196	20	896	7.9
14	664	1150	5	44	24	944	8.1
15	712	1198	5	92	24	992	8.3
16	760	1246	5	140	24	1040	8.5
17	808	1294	5	188	24	1088	8.7
18	856	1342	6	36	28	1136	8.9
19	904	1390	6	84	28	1184	9.1
20	952	1438	6	132	28	1232	9.3
21	1000	1486	6	180	28	1280	9.5
22	1048	1534	7	28	32	1328	9.8

8.2.2 Horizontally Oriented Wall Mount Type (Option)



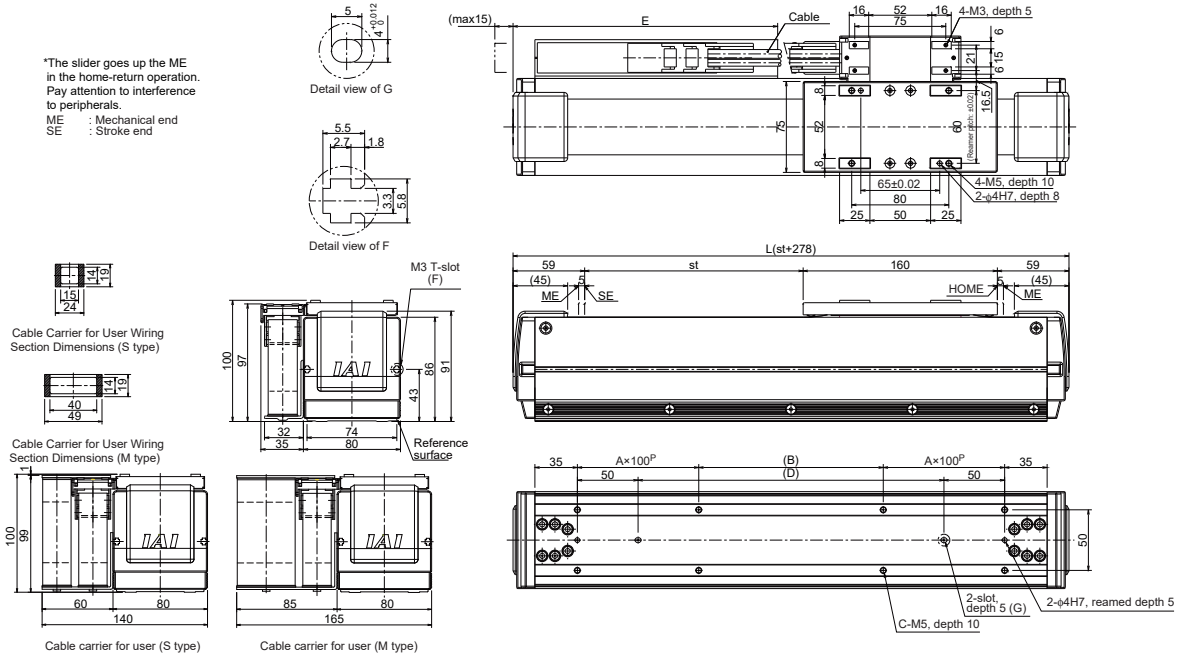
*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S6SM Horizontally Oriented Wall Mount Type (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	40	526	2	20	12	320	6.4
2	88	574	2	68	12	368	6.6
3	136	622	2	116	12	416	6.8
4	184	670	2	164	12	464	7.0
5	232	718	3	12	16	512	7.2
6	280	766	3	60	16	560	7.4
7	328	814	3	108	16	608	7.6
8	376	862	3	156	16	656	7.8
9	424	910	3	204	16	704	8.0
10	472	958	4	52	20	752	8.2
11	520	1006	4	100	20	800	8.5
12	568	1054	4	148	20	848	8.7
13	616	1102	4	196	20	896	8.9
14	664	1150	5	44	24	944	9.1
15	712	1198	5	92	24	992	9.3
16	760	1246	5	140	24	1040	9.5
17	808	1294	5	188	24	1088	9.7
18	856	1342	6	36	28	1136	9.9
19	904	1390	6	84	28	1184	10.1
20	952	1438	6	132	28	1232	10.3
21	1000	1486	6	180	28	1280	10.5
22	1048	1534	7	28	32	1328	10.8

8.3 S8SS

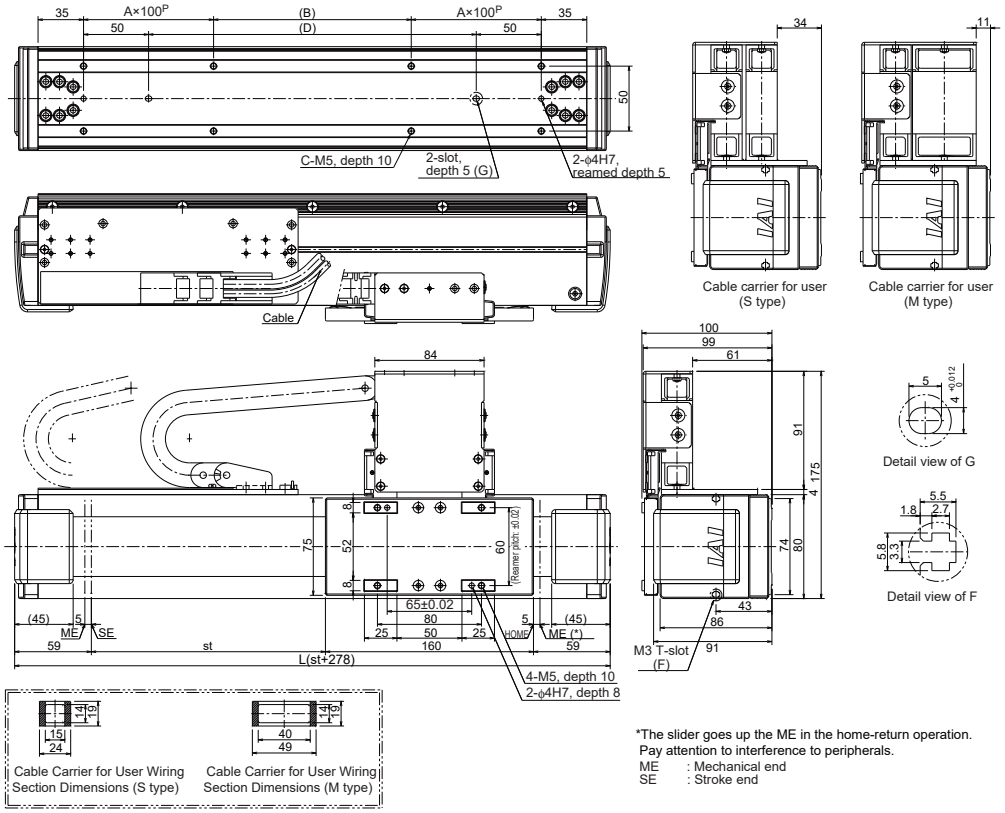
8.3.1 Standard Type



S8SS Standard Type

No.	st	L	A	B	C	D	E	Weight (kg)
1	60	338	1	32	8	132	168	4.4
2	120	398	1	92	8	192	193	4.7
3	180	458	1	152	8	252	218	5.1
4	240	518	2	12	12	312	243	5.4
5	300	578	2	72	12	372	268	5.8
6	360	638	2	132	12	432	293	6.1
7	420	698	2	192	12	492	318	6.5
8	480	758	3	52	16	552	343	6.9
9	540	818	3	112	16	612	393	7.2
10	600	878	3	172	16	672	418	7.6
11	660	938	4	32	20	732	443	7.9
12	720	998	4	92	20	792	468	8.3
13	780	1058	4	152	20	852	493	8.7
14	840	1118	5	12	24	912	543	9.0
15	900	1178	5	72	24	972	568	9.4
16	960	1238	5	132	24	1032	593	9.7
17	1020	1298	5	192	24	1092	618	10.1
18	1080	1358	6	52	28	1152	643	10.4
19	1140	1418	6	112	28	1212	693	10.8
20	1200	1478	6	172	28	1272	718	11.2
21	1260	1538	7	32	32	1332	743	11.5
22	1320	1598	7	92	32	1392	768	11.9
23	1380	1658	7	152	32	1452	793	12.2
24	1440	1718	8	12	36	1512	843	12.6
25	1500	1778	8	72	36	1572	868	12.9
26	1560	1838	8	132	36	1632	893	13.3
27	1620	1898	8	192	36	1692	918	13.7

8.3.2 Horizontally Oriented Wall Mount Type (Standard)(Option)

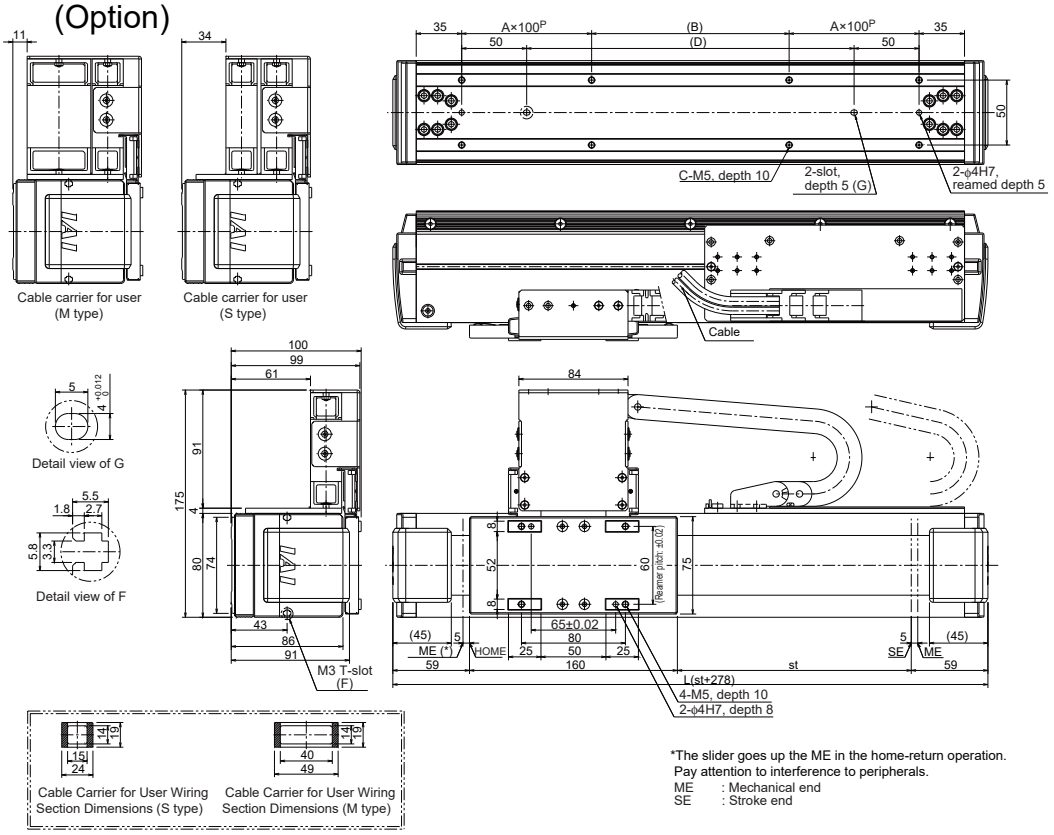


*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S8SS Horizontally Oriented Wall Mount Type (Standard) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	60	338	1	32	8	132	4.9
2	120	398	1	92	8	192	5.2
3	180	458	1	152	8	252	5.6
4	240	518	2	12	12	312	5.9
5	300	578	2	72	12	372	6.3
6	360	638	2	132	12	432	6.6
7	420	698	2	192	12	492	7.0
8	480	758	3	52	16	552	7.4
9	540	818	3	112	16	612	7.7
10	600	878	3	172	16	672	8.1
11	660	938	4	32	20	732	8.4
12	720	998	4	92	20	792	8.8
13	780	1058	4	152	20	852	9.2
14	840	1118	5	12	24	912	9.5
15	900	1178	5	72	24	972	9.9
16	960	1238	5	132	24	1032	10.2
17	1020	1298	5	192	24	1092	10.6
18	1080	1358	6	52	28	1152	10.9
19	1140	1418	6	112	28	1212	11.3
20	1200	1478	6	172	28	1272	11.7
21	1260	1538	7	32	32	1332	12.0
22	1320	1598	7	92	32	1392	12.4
23	1380	1658	7	152	32	1452	12.7
24	1440	1718	8	12	36	1512	13.1
25	1500	1778	8	72	36	1572	13.4
26	1560	1838	8	132	36	1632	13.8
27	1620	1898	8	192	36	1692	14.2

8.3.3 Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)



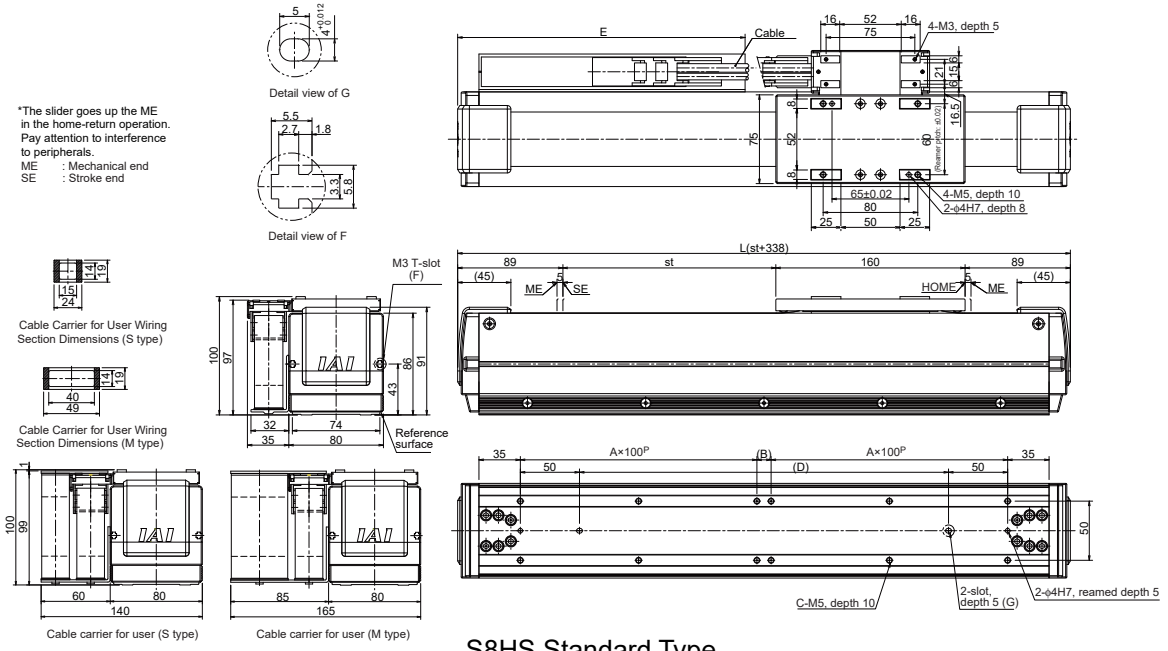
*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S8SS Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	60	338	1	32	8	132	4.9
2	120	398	1	92	8	192	5.2
3	180	458	1	152	8	252	5.6
4	240	518	2	12	12	312	5.9
5	300	578	2	72	12	372	6.3
6	360	638	2	132	12	432	6.6
7	420	698	2	192	12	492	7.0
8	480	758	3	52	16	552	7.4
9	540	818	3	112	16	612	7.7
10	600	878	3	172	16	672	8.1
11	660	938	4	32	20	732	8.4
12	720	998	4	92	20	792	8.8
13	780	1058	4	152	20	852	9.2
14	840	1118	5	12	24	912	9.5
15	900	1178	5	72	24	972	9.9
16	960	1238	5	132	24	1032	10.2
17	1020	1298	5	192	24	1092	10.6
18	1080	1358	6	52	28	1152	10.9
19	1140	1418	6	112	28	1212	11.3
20	1200	1478	6	172	28	1272	11.7
21	1260	1538	7	32	32	1332	12.0
22	1320	1598	7	92	32	1392	12.4
23	1380	1658	7	152	32	1452	12.7
24	1440	1718	8	12	36	1512	13.1
25	1500	1778	8	72	36	1572	13.4
26	1560	1838	8	132	36	1632	13.8
27	1620	1898	8	192	36	1692	14.2

8.4 S8HS

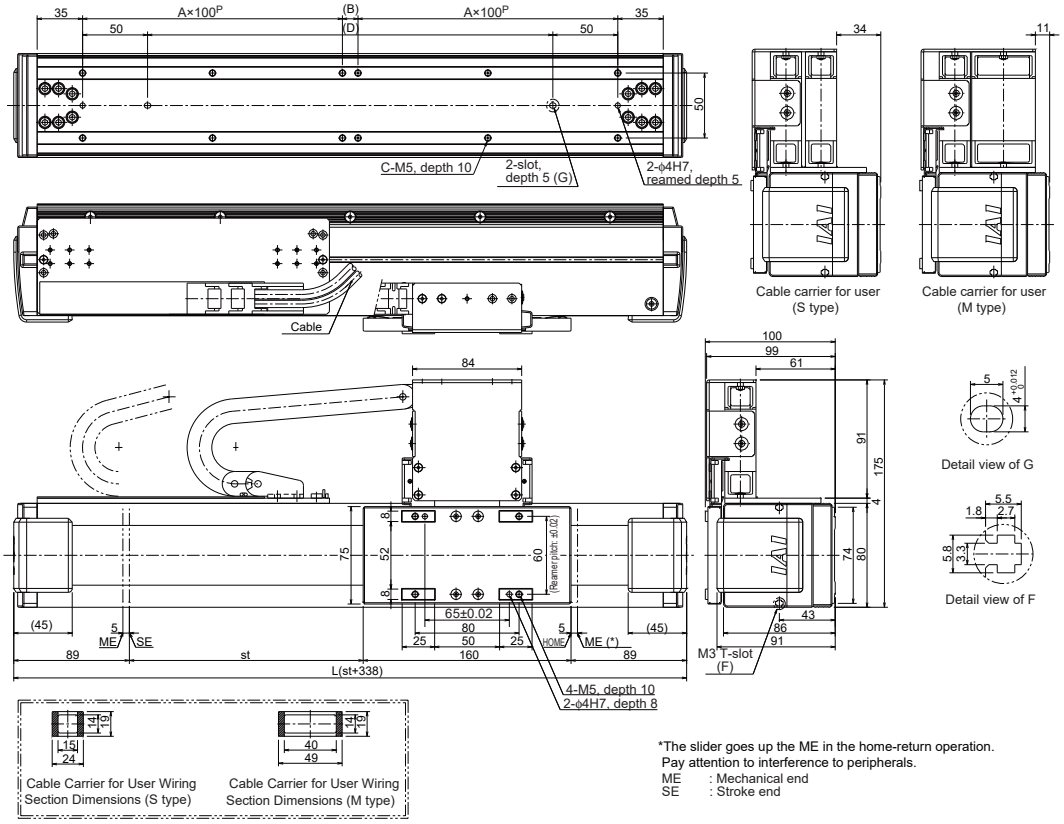
8.4.1 Standard Type



S8HS Standard Type

No.	st	L	A	B	C	D	E	Weight (kg)
1	60	398	1	92	8	192	193	5.0
2	120	458	1	152	8	252	218	5.4
3	180	518	2	12	12	312	243	5.7
4	240	578	2	72	12	372	268	6.1
5	300	638	2	132	12	432	293	6.4
6	360	698	2	192	12	492	318	6.8
7	420	758	3	52	16	552	343	7.1
8	480	818	3	112	16	612	393	7.5
9	540	878	3	172	16	672	418	7.9
10	600	938	4	32	20	732	443	8.2
11	660	998	4	92	20	792	468	8.6
12	720	1058	4	152	20	852	493	8.9
13	780	1118	5	12	24	912	543	9.3
14	840	1178	5	72	24	972	568	9.6
15	900	1238	5	132	24	1032	593	10.0
16	960	1298	5	192	24	1092	618	10.4
17	1020	1358	6	52	28	1152	643	10.7
18	1080	1418	6	112	28	1212	693	11.1
19	1140	1478	6	172	28	1272	718	11.4
20	1200	1538	7	32	32	1332	743	11.8
21	1260	1598	7	92	32	1392	768	12.1
22	1320	1658	7	152	32	1452	793	12.5
23	1380	1718	8	12	36	1512	843	12.9
24	1440	1778	8	72	36	1572	868	13.2
25	1500	1838	8	132	36	1632	893	13.6
26	1560	1898	8	192	36	1692	918	13.9
27	1620	1958	9	52	40	1752	943	14.3

8.4.2 Horizontally Oriented Wall Mount Type (Standard)(Option)

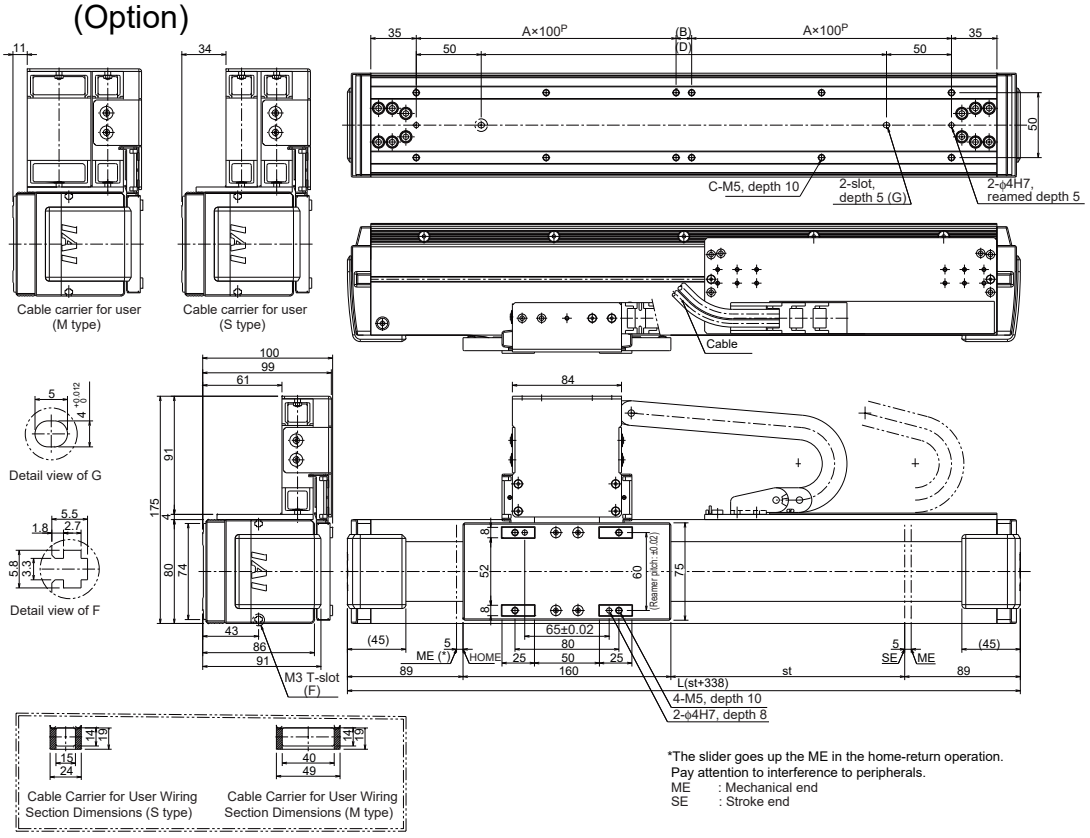


*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S8HS Horizontally Oriented Wall Mount Type (Standard)(Option)

No.	st	L	A	B	C	D	Weight (kg)
1	60	398	1	92	8	192	5.5
2	120	458	1	152	8	252	5.9
3	180	518	2	12	12	312	6.2
4	240	578	2	72	12	372	6.6
5	300	638	2	132	12	432	6.9
6	360	698	2	192	12	492	7.3
7	420	758	3	52	16	552	7.6
8	480	818	3	112	16	612	8.0
9	540	878	3	172	16	672	8.4
10	600	938	4	32	20	732	8.7
11	660	998	4	92	20	792	9.1
12	720	1058	4	152	20	852	9.4
13	780	1118	5	12	24	912	9.8
14	840	1178	5	72	24	972	10.1
15	900	1238	5	132	24	1032	10.5
16	960	1298	5	192	24	1092	10.9
17	1020	1358	6	52	28	1152	11.2
18	1080	1418	6	112	28	1212	11.6
19	1140	1478	6	172	28	1272	11.9
20	1200	1538	7	32	32	1332	12.3
21	1260	1598	7	92	32	1392	12.6
22	1320	1658	7	152	32	1452	13.1
23	1380	1718	8	12	36	1512	13.4
24	1440	1778	8	72	36	1572	13.7
25	1500	1838	8	132	36	1632	14.1
26	1560	1898	8	192	36	1692	14.4
27	1620	1958	9	52	40	1752	14.8

8.4.3 Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

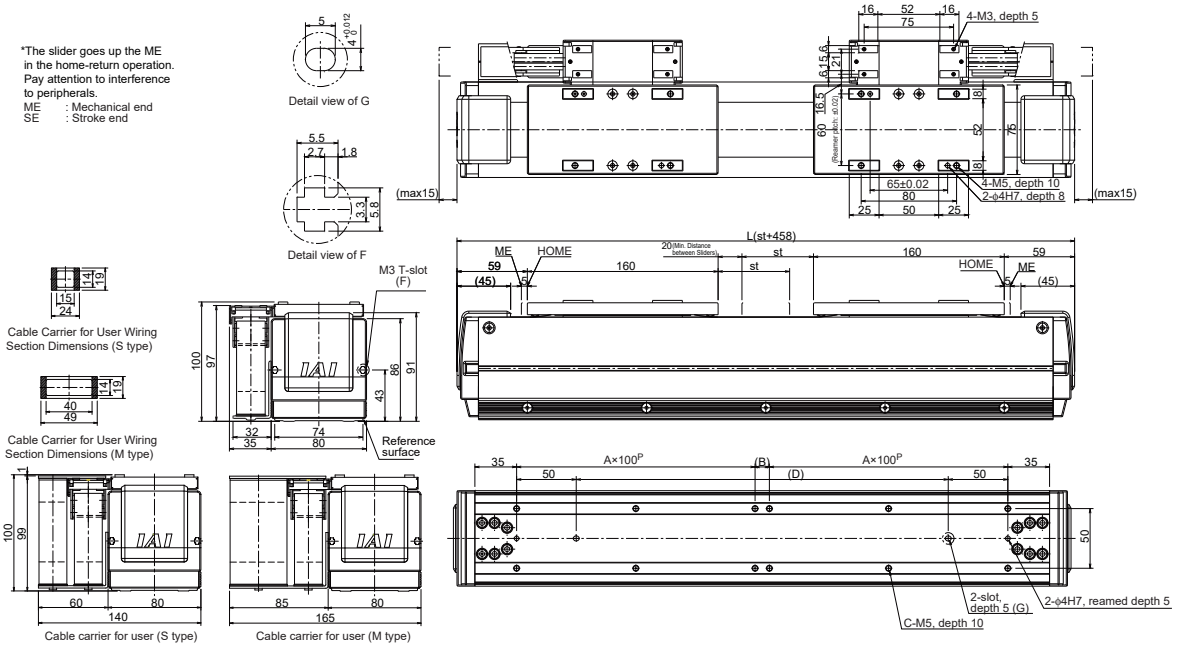


S8HS Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	60	398	1	92	8	192	5.5
2	120	458	1	152	8	252	5.9
3	180	518	2	12	12	312	6.2
4	240	578	2	72	12	372	6.6
5	300	638	2	132	12	432	6.9
6	360	698	2	192	12	492	7.3
7	420	758	3	52	16	552	7.6
8	480	818	3	112	16	612	8.0
9	540	878	3	172	16	672	8.4
10	600	938	4	32	20	732	8.7
11	660	998	4	92	20	792	9.1
12	720	1058	4	152	20	852	9.4
13	780	1118	5	12	24	912	9.8
14	840	1178	5	72	24	972	10.1
15	900	1238	5	132	24	1032	10.5
16	960	1298	5	192	24	1092	10.9
17	1020	1358	6	52	28	1152	11.2
18	1080	1418	6	112	28	1212	11.6
19	1140	1478	6	172	28	1272	11.9
20	1200	1538	7	32	32	1332	12.3
21	1260	1598	7	92	32	1392	12.6
22	1320	1658	7	152	32	1452	13.1
23	1380	1718	8	12	36	1512	13.4
24	1440	1778	8	72	36	1572	13.7
25	1500	1838	8	132	36	1632	14.1
26	1560	1898	8	192	36	1692	14.4
27	1620	1958	9	52	40	1752	14.8

8.5 S8SM

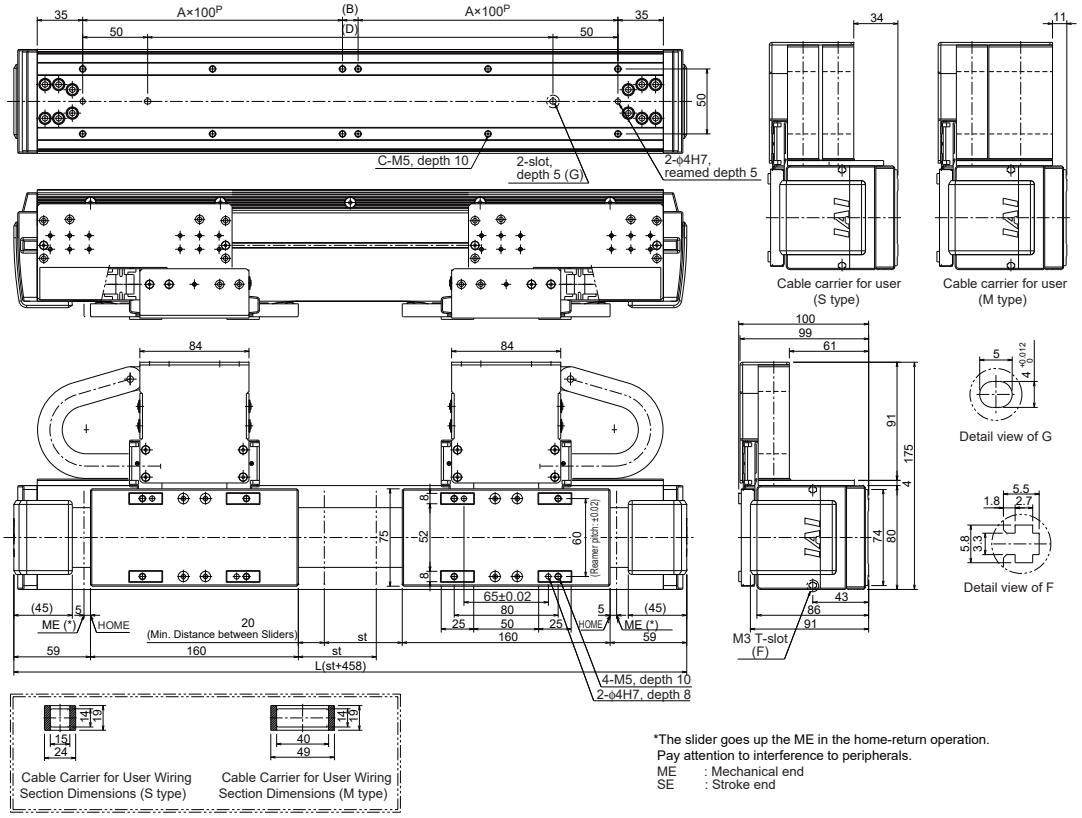
8.5.1 Standard Type



S8SM Standard Type

No.	st	L	A	B	C	D	Weight (kg)
1	60	518	2	12	12	312	7.4
2	120	578	2	72	12	372	7.7
3	180	638	2	132	12	432	8.1
4	240	698	2	192	12	492	8.4
5	300	758	3	52	16	552	8.8
6	360	818	3	112	16	612	9.1
7	420	878	3	172	16	672	9.5
8	480	938	4	32	20	732	9.9
9	540	998	4	92	20	792	10.2
10	600	1058	4	152	20	852	10.6
11	660	1118	5	12	24	912	10.9
12	720	1178	5	72	24	972	11.3
13	780	1238	5	132	24	1032	11.6
14	840	1298	5	192	24	1092	12.0
15	900	1358	6	52	28	1152	12.4
16	960	1418	6	112	28	1212	12.7
17	1020	1478	6	172	28	1272	13.1
18	1080	1538	7	32	32	1332	13.4
19	1140	1598	7	92	32	1392	13.8
20	1200	1658	7	152	32	1452	14.1
21	1260	1718	8	12	36	1512	14.5
22	1320	1778	8	72	36	1572	14.9
23	1380	1838	8	132	36	1632	15.2
24	1440	1898	8	192	36	1692	15.6

8.5.2 Horizontally Oriented Wall Mount Type (Option)



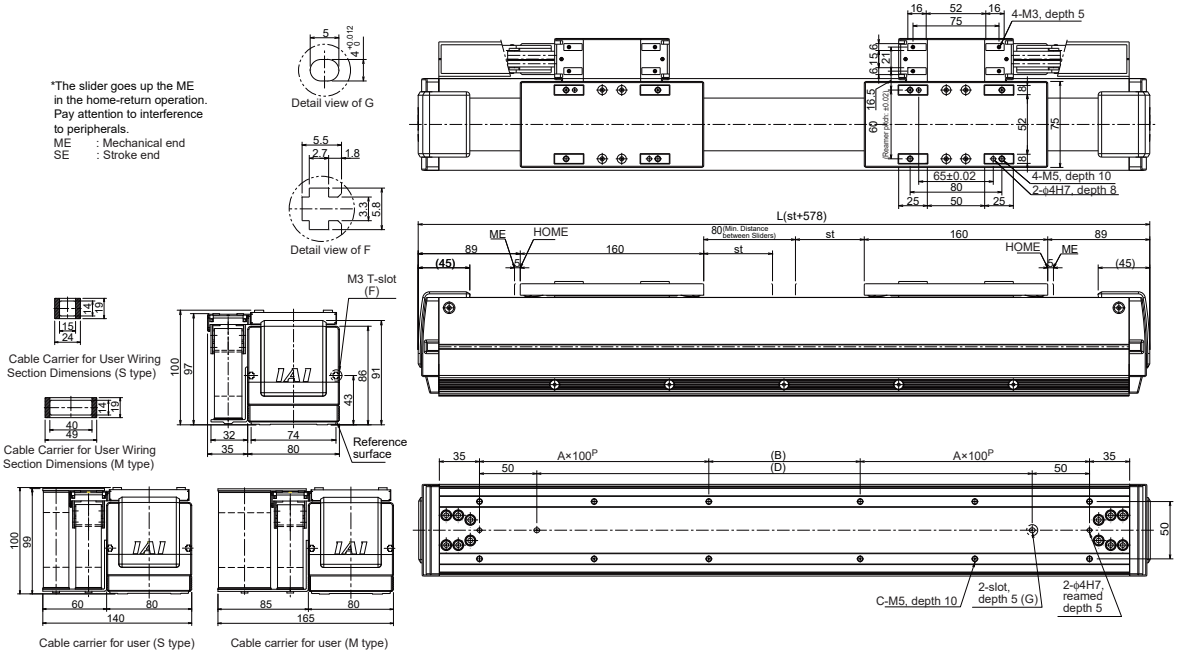
*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S8SM Horizontally Oriented Wall Mount Type (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	60	518	2	12	12	312	8.4
2	120	578	2	72	12	372	8.7
3	180	638	2	132	12	432	9.1
4	240	698	2	192	12	492	9.4
5	300	758	3	52	16	552	9.8
6	360	818	3	112	16	612	10.1
7	420	878	3	172	16	672	10.5
8	480	938	4	32	20	732	10.9
9	540	998	4	92	20	792	11.2
10	600	1058	4	152	20	852	11.6
11	660	1118	5	12	24	912	11.9
12	720	1178	5	72	24	972	12.3
13	780	1238	5	132	24	1032	12.6
14	840	1298	5	192	24	1092	13.0
15	900	1358	6	52	28	1152	13.4
16	960	1418	6	112	28	1212	13.7
17	1020	1478	6	172	28	1272	14.1
18	1080	1538	7	32	32	1332	14.4
19	1140	1598	7	92	32	1392	14.8
20	1200	1658	7	152	32	1452	15.1
21	1260	1718	8	12	36	1512	15.5
22	1320	1778	8	72	36	1572	15.9
23	1380	1838	8	132	36	1632	16.2
24	1440	1898	8	192	36	1692	16.6

8.6 S8HM

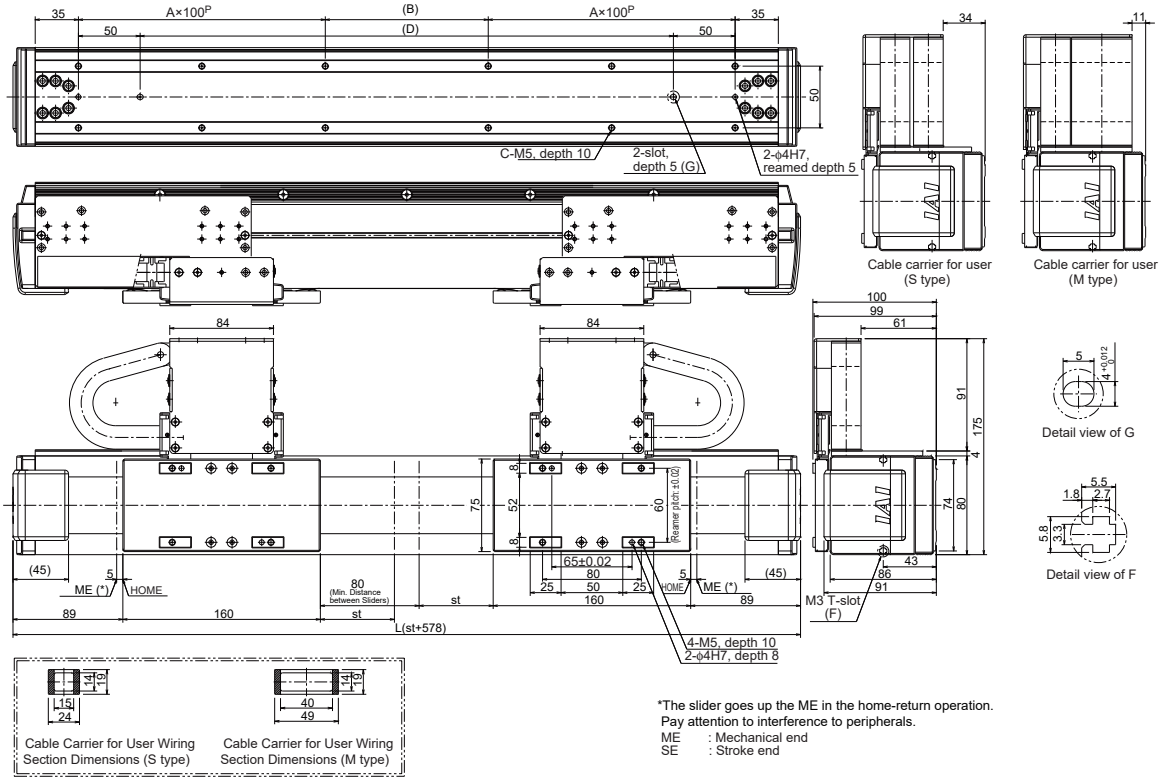
8.6.1 Standard Type



S8HM Standard Type

No.	st	L	A	B	C	D	Weight (kg)
1	60	638	2	132	12	432	8.6
2	120	698	2	192	12	492	9.0
3	180	758	3	52	16	552	9.3
4	240	818	3	112	16	612	9.7
5	300	878	3	172	16	672	10.1
6	360	938	4	32	20	732	10.4
7	420	998	4	92	20	792	10.8
8	480	1058	4	152	20	852	11.1
9	540	1118	5	12	24	912	11.5
10	600	1178	5	72	24	972	11.9
11	660	1238	5	132	24	1032	12.2
12	720	1298	5	192	24	1092	12.6
13	780	1358	6	52	28	1152	12.9
14	840	1418	6	112	28	1212	13.3
15	900	1478	6	172	28	1272	13.6
16	960	1538	7	32	32	1332	14.0
17	1020	1598	7	92	32	1392	14.4
18	1080	1658	7	152	32	1452	14.7
19	1140	1718	8	12	36	1512	15.1
20	1200	1778	8	72	36	1572	15.4
21	1260	1838	8	132	36	1632	15.8
22	1320	1898	8	192	36	1692	16.1
23	1380	1958	9	52	40	1752	16.5

8.6.2 Horizontally Oriented Wall Mount Type (Option)



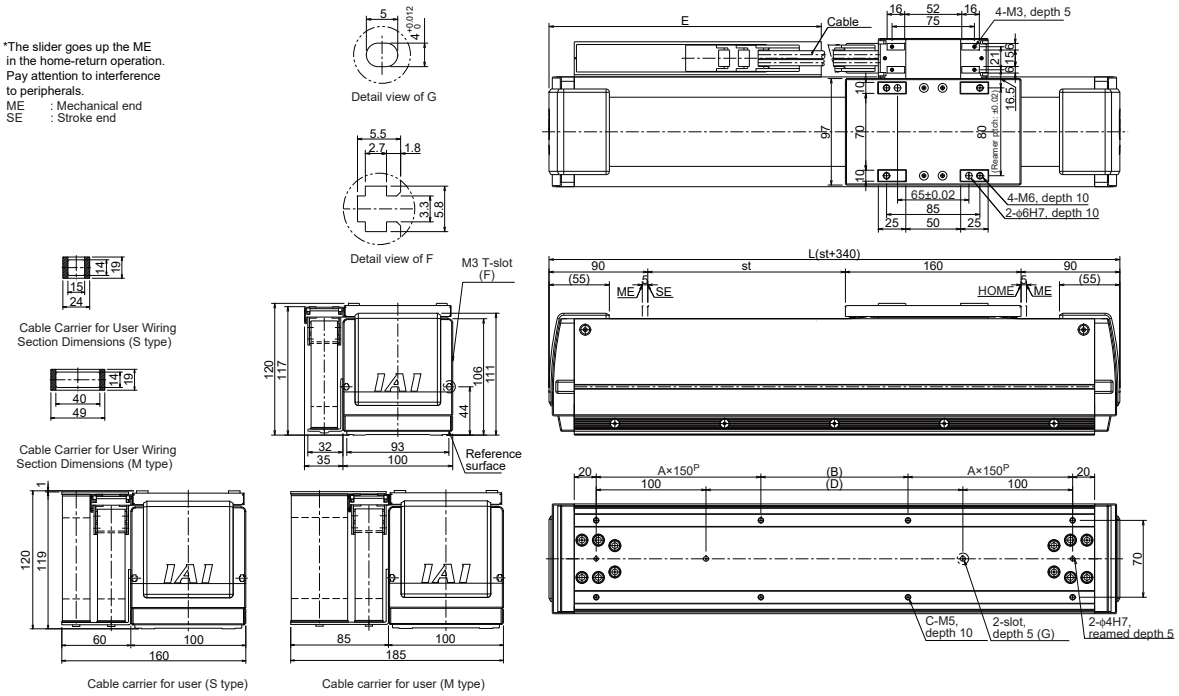
*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S8HM Horizontally Oriented Wall Mount Type (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	60	638	2	132	12	432	9.6
2	120	698	2	192	12	492	10.0
3	180	758	3	52	16	552	10.3
4	240	818	3	112	16	612	10.7
5	300	878	3	172	16	672	11.1
6	360	938	4	32	20	732	11.4
7	420	998	4	92	20	792	11.8
8	480	1058	4	152	20	852	12.1
9	540	1118	5	12	24	912	12.5
10	600	1178	5	72	24	972	12.9
11	660	1238	5	132	24	1032	13.2
12	720	1298	5	192	24	1092	13.6
13	780	1358	6	52	28	1152	13.9
14	840	1418	6	112	28	1212	14.3
15	900	1478	6	172	28	1272	14.6
16	960	1538	7	32	32	1332	15.0
17	1020	1598	7	92	32	1392	15.4
18	1080	1658	7	152	32	1452	15.7
19	1140	1718	8	12	36	1512	16.1
20	1200	1778	8	72	36	1572	16.4
21	1260	1838	8	132	36	1632	16.8
22	1320	1898	8	192	36	1692	17.1
23	1380	1958	9	52	40	1752	17.5

8.7 S10SS

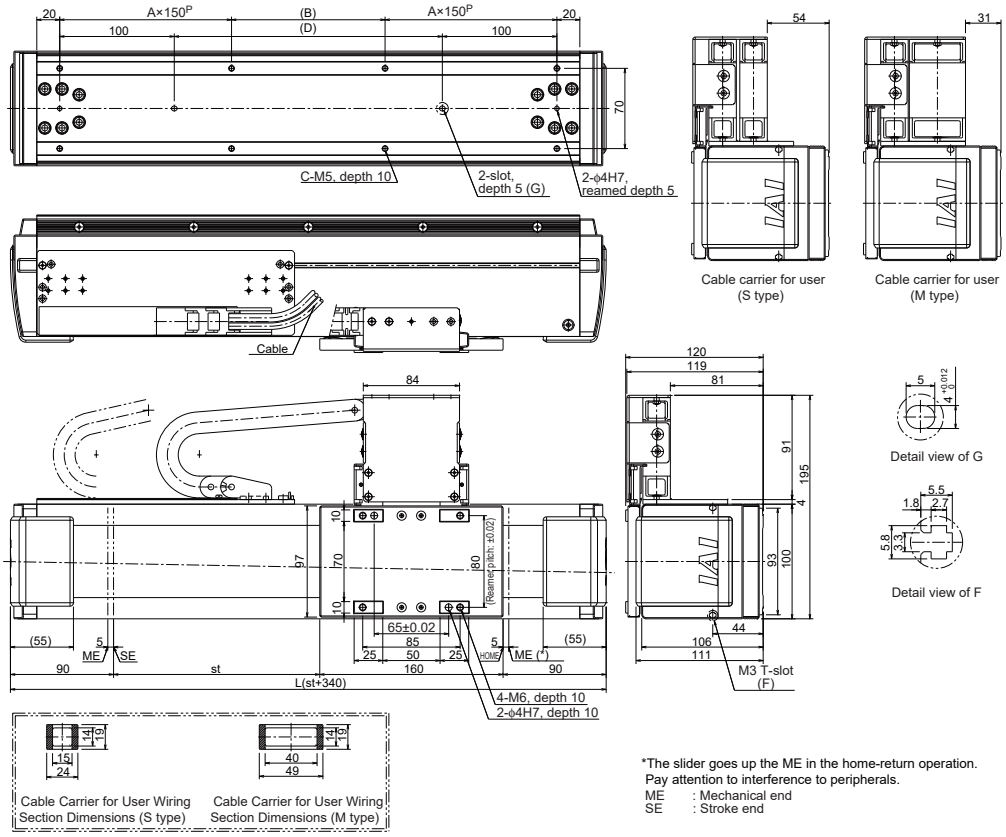
8.7.1 Standard Type



S10SS Standard Type

No.	st	L	A	B	C	D	E	Weight (kg)
1	90	430	1	44	8	144	198	8.4
2	180	520	1	134	8	234	248	9.2
3	270	610	1	224	8	324	273	10.1
4	360	700	2	14	12	414	323	10.9
5	450	790	2	104	12	504	373	11.7
6	540	880	2	194	12	594	423	12.6
7	630	970	2	284	12	684	473	13.4
8	720	1060	3	74	16	774	498	14.2
9	810	1150	3	164	16	864	548	15.1
10	900	1240	3	254	16	954	598	15.9
11	990	1330	4	44	20	1044	648	16.7
12	1080	1420	4	134	20	1134	698	17.6
13	1170	1510	4	224	20	1224	723	18.4
14	1260	1600	5	14	24	1314	773	19.2
15	1350	1690	5	104	24	1404	823	20.1
16	1440	1780	5	194	24	1494	873	20.9
17	1530	1870	5	284	24	1584	923	21.7
18	1620	1960	6	74	28	1674	948	22.6
19	1710	2050	6	164	28	1764	998	23.4
20	1800	2140	6	254	28	1854	1048	24.2
21	1890	2230	7	44	32	1944	1098	25.1
22	1980	2320	7	134	32	2034	1148	25.9
23	2070	2410	7	224	32	2124	1173	26.7

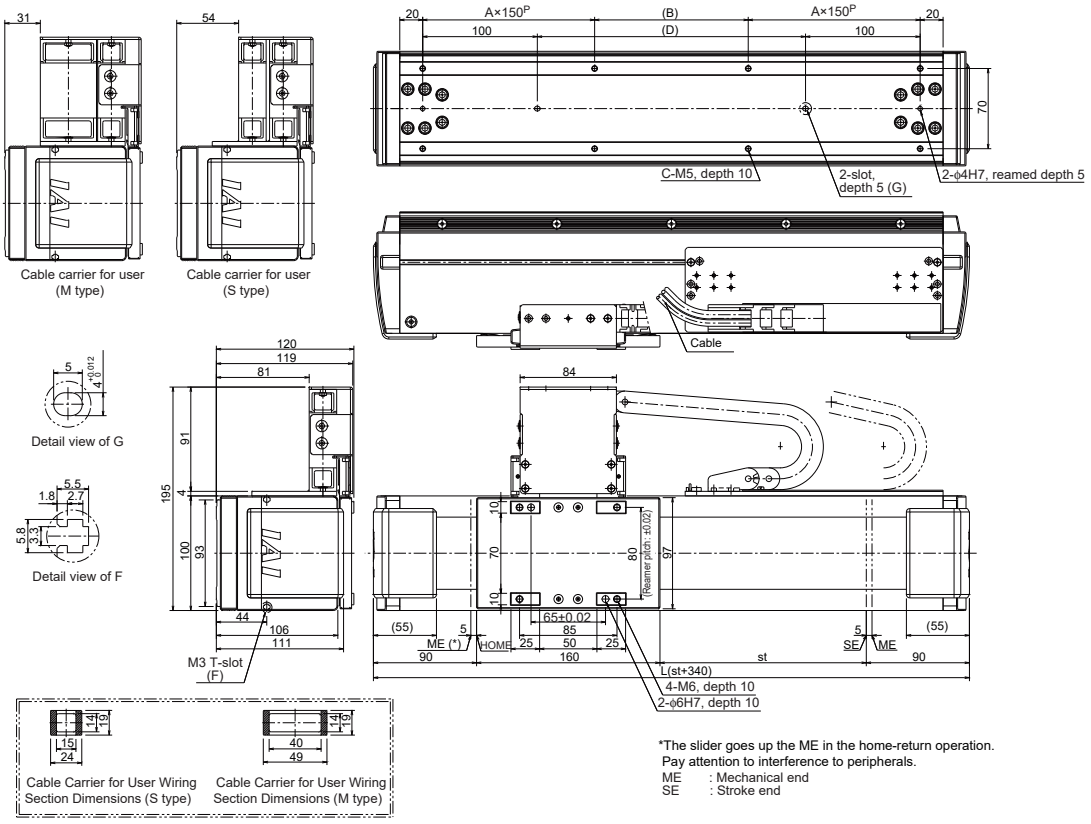
8.7.2 Horizontally Oriented Wall Mount Type (Option)



S10SS Horizontally Oriented Wall Mount Type (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	90	430	1	44	8	144	8.9
2	180	520	1	134	8	234	9.7
3	270	610	1	224	8	324	10.6
4	360	700	2	14	12	414	11.4
5	450	790	2	104	12	504	12.3
6	540	880	2	194	12	594	13.1
7	630	970	2	284	12	684	13.9
8	720	1060	3	74	16	774	14.7
9	810	1150	3	164	16	864	15.6
10	900	1240	3	254	16	954	16.4
11	990	1330	4	44	20	1044	17.2
12	1080	1420	4	134	20	1134	18.1
13	1170	1510	4	224	20	1224	18.9
14	1260	1600	5	14	24	1314	19.7
15	1350	1690	5	104	24	1404	20.6
16	1440	1780	5	194	24	1494	21.6
17	1530	1870	5	284	24	1584	22.2
18	1620	1960	6	74	28	1674	23.1
19	1710	2050	6	164	28	1764	23.9
20	1800	2140	6	254	28	1854	24.7
21	1890	2230	7	44	32	1944	25.6
22	1980	2320	7	134	32	2034	26.4
23	2070	2410	7	224	32	2124	27.2

8.7.3 Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

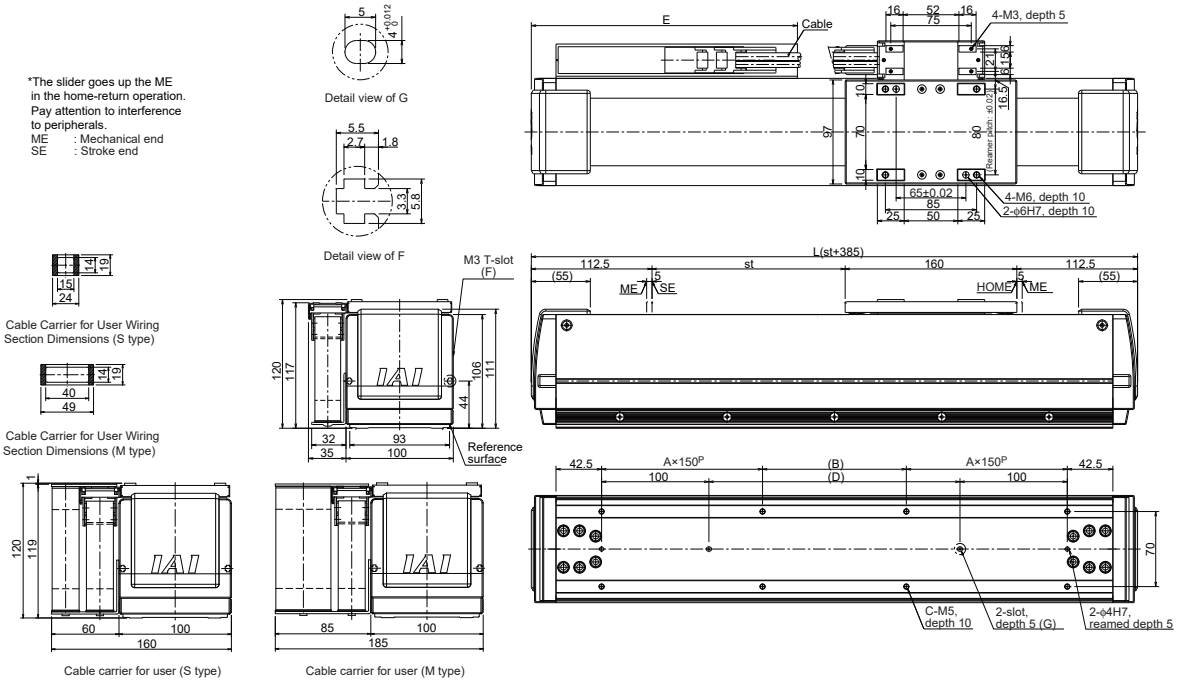


S10SS Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	90	430	1	44	8	144	8.9
2	180	520	1	134	8	234	9.7
3	270	610	1	224	8	324	10.6
4	360	700	2	14	12	414	11.4
5	450	790	2	104	12	504	12.3
6	540	880	2	194	12	594	13.1
7	630	970	2	284	12	684	13.9
8	720	1060	3	74	16	774	14.7
9	810	1150	3	164	16	864	15.6
10	900	1240	3	254	16	954	16.4
11	990	1330	4	44	20	1044	17.2
12	1080	1420	4	134	20	1134	18.1
13	1170	1510	4	224	20	1224	18.9
14	1260	1600	5	14	24	1314	19.7
15	1350	1690	5	104	24	1404	20.6
16	1440	1780	5	194	24	1494	21.4
17	1530	1870	5	284	24	1584	22.2
18	1620	1960	6	74	28	1674	23.1
19	1710	2050	6	164	28	1764	23.9
20	1800	2140	6	254	28	1854	24.7
21	1890	2230	7	44	32	1944	25.6
22	1980	2320	7	134	32	2034	26.4
23	2070	2410	7	224	32	2124	27.2

8.8 S10HS

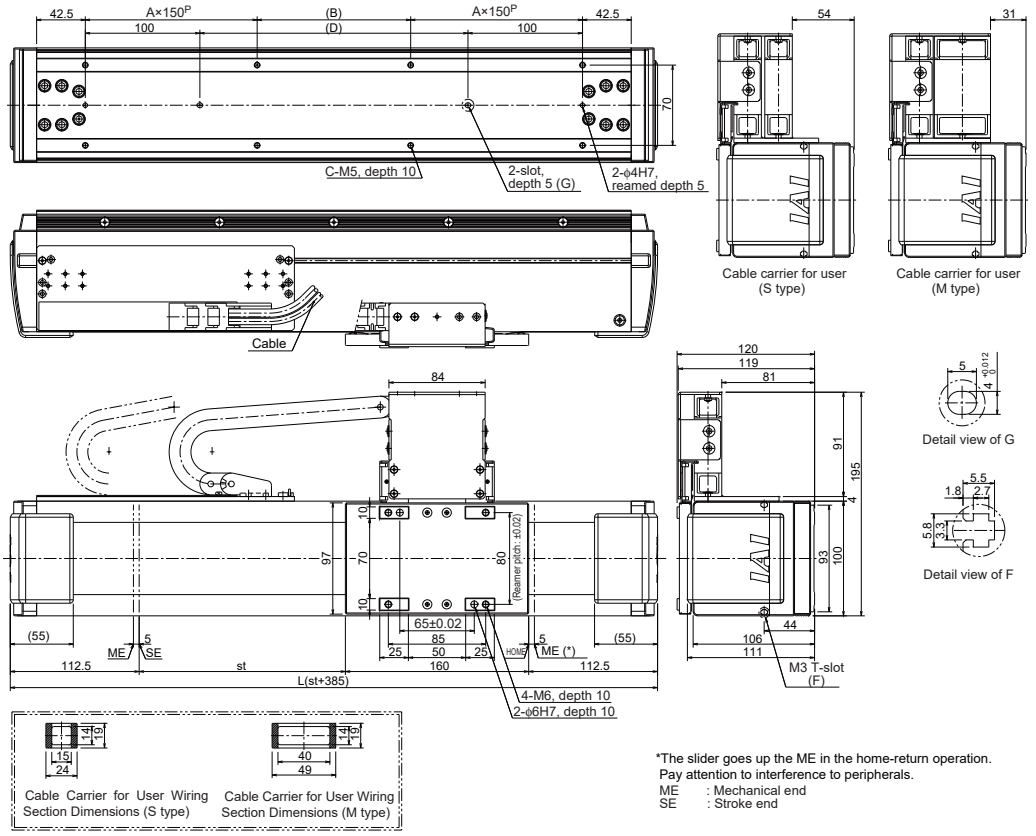
8.8.1 Standard Type



S10HS Standard Type

No.	st	L	A	B	C	D	E	Weight (kg)
1	90	475	1	44	8	144	198	9.2
2	180	565	1	134	8	234	248	10.0
3	270	655	1	224	8	324	298	10.9
4	360	745	2	14	12	414	348	11.7
5	450	835	2	104	12	504	398	12.5
6	540	925	2	194	12	594	448	13.4
7	630	1015	2	284	12	684	473	14.2
8	720	1105	3	74	16	774	523	15.0
9	810	1195	3	164	16	864	573	15.9
10	900	1285	3	254	16	954	623	16.7
11	990	1375	4	44	20	1044	673	17.6
12	1080	1465	4	134	20	1134	698	18.4
13	1170	1555	4	224	20	1224	748	19.2
14	1260	1645	5	14	24	1314	798	20.1
15	1350	1735	5	104	24	1404	848	20.9
16	1440	1825	5	194	24	1494	898	21.7
17	1530	1915	5	284	24	1584	923	22.6
18	1620	2005	6	74	28	1674	973	23.4
19	1710	2095	6	164	28	1764	1023	24.2
20	1800	2185	6	254	28	1854	1073	25.1
21	1890	2275	7	44	32	1944	1123	25.9
22	1980	2365	7	134	32	2034	1148	26.7
23	2070	2455	7	224	32	2124	1198	27.6

8.8.2 Horizontally Oriented Wall Mount Type (Standard) (Option)

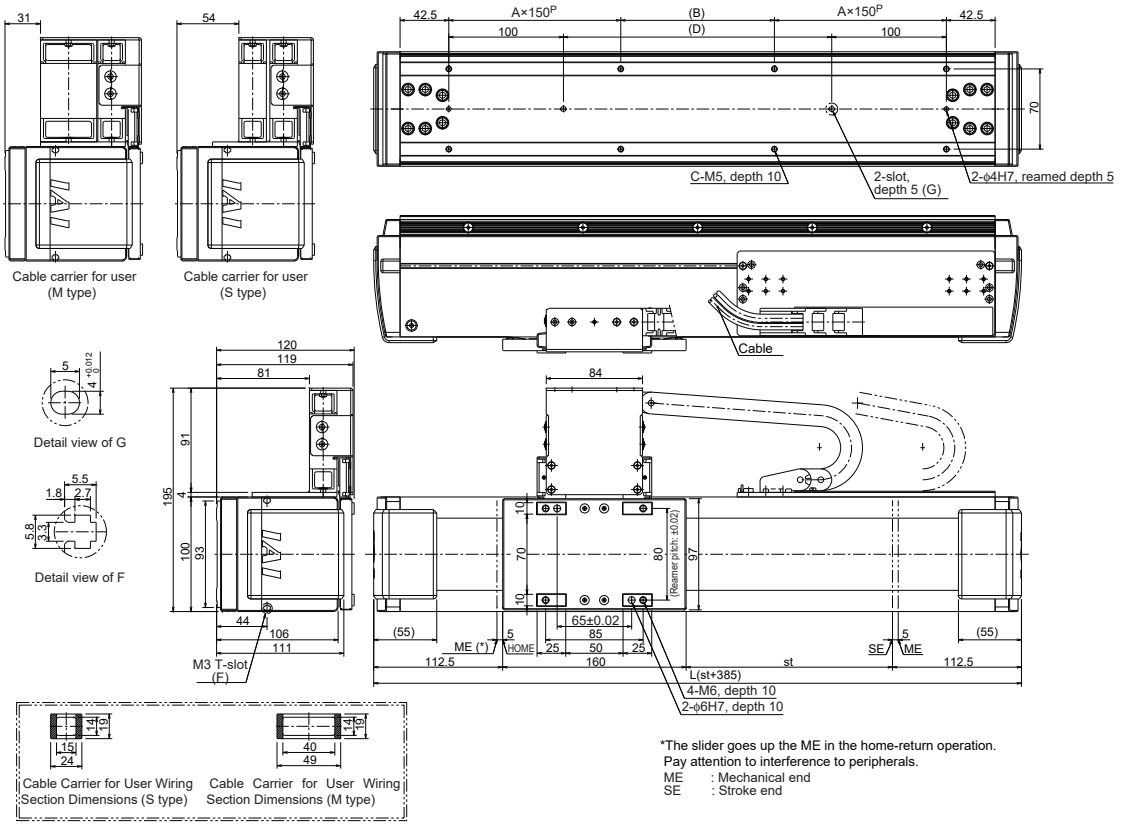


*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S10HS Horizontally Oriented Wall Mount Type (Standard) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	90	475	1	44	8	144	9.7
2	180	565	1	134	8	234	10.5
3	270	655	1	224	8	324	11.4
4	360	745	2	14	12	414	12.2
5	450	835	2	104	12	504	13.0
6	540	925	2	194	12	594	13.9
7	630	1015	2	284	12	684	14.7
8	720	1105	3	74	16	774	15.5
9	810	1195	3	164	16	864	16.4
10	900	1285	3	254	16	954	17.2
11	990	1375	4	44	20	1044	18.1
12	1080	1465	4	134	20	1134	18.9
13	1170	1555	4	224	20	1224	19.7
14	1260	1645	5	14	24	1314	20.6
15	1350	1735	5	104	24	1404	21.4
16	1440	1825	5	194	24	1494	22.2
17	1530	1915	5	284	24	1584	23.1
18	1620	2005	6	74	28	1674	23.9
19	1710	2095	6	164	28	1764	24.7
20	1800	2185	6	254	28	1854	25.6
21	1890	2275	7	44	32	1944	26.4
22	1980	2365	7	134	32	2034	27.2
23	2070	2455	7	224	32	2124	28.1

8.8.3 Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

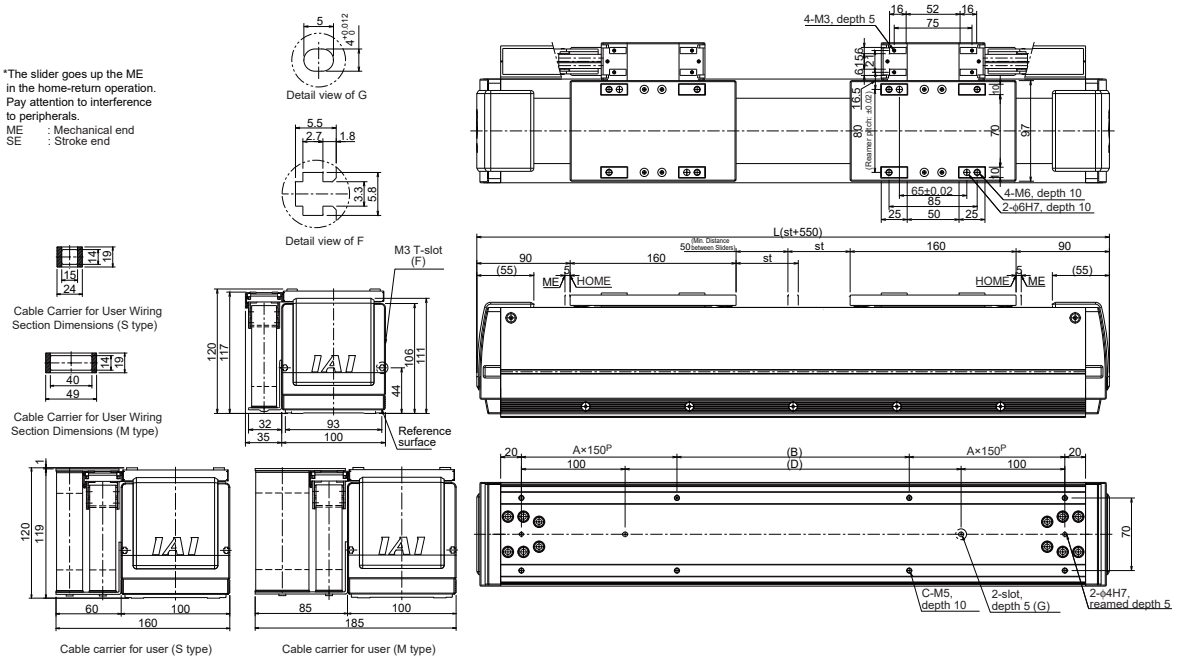


S10HS Horizontally Oriented Wall Mount Type (Cable carrier Opposite Type) (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	90	475	1	44	8	144	9.7
2	180	565	1	134	8	234	10.5
3	270	655	1	224	8	324	11.4
4	360	745	2	14	12	414	12.2
5	450	835	2	104	12	504	13.0
6	540	925	2	194	12	594	13.9
7	630	1015	2	284	12	684	14.7
8	720	1105	3	74	16	774	15.5
9	810	1195	3	164	16	864	16.4
10	900	1285	3	254	16	954	17.2
11	990	1375	4	44	20	1044	18.1
12	1080	1465	4	134	20	1134	18.9
13	1170	1555	4	224	20	1224	19.7
14	1260	1645	5	14	24	1314	20.6
15	1350	1735	5	104	24	1404	21.4
16	1440	1825	5	194	24	1494	22.2
17	1530	1915	5	284	24	1584	23.1
18	1620	2005	6	74	28	1674	23.9
19	1710	2095	6	164	28	1764	24.7
20	1800	2185	6	254	28	1854	25.6
21	1890	2275	7	44	32	1944	26.4
22	1980	2365	7	134	32	2034	27.2
23	2070	2455	7	224	32	2124	28.1

8.9 S10SM

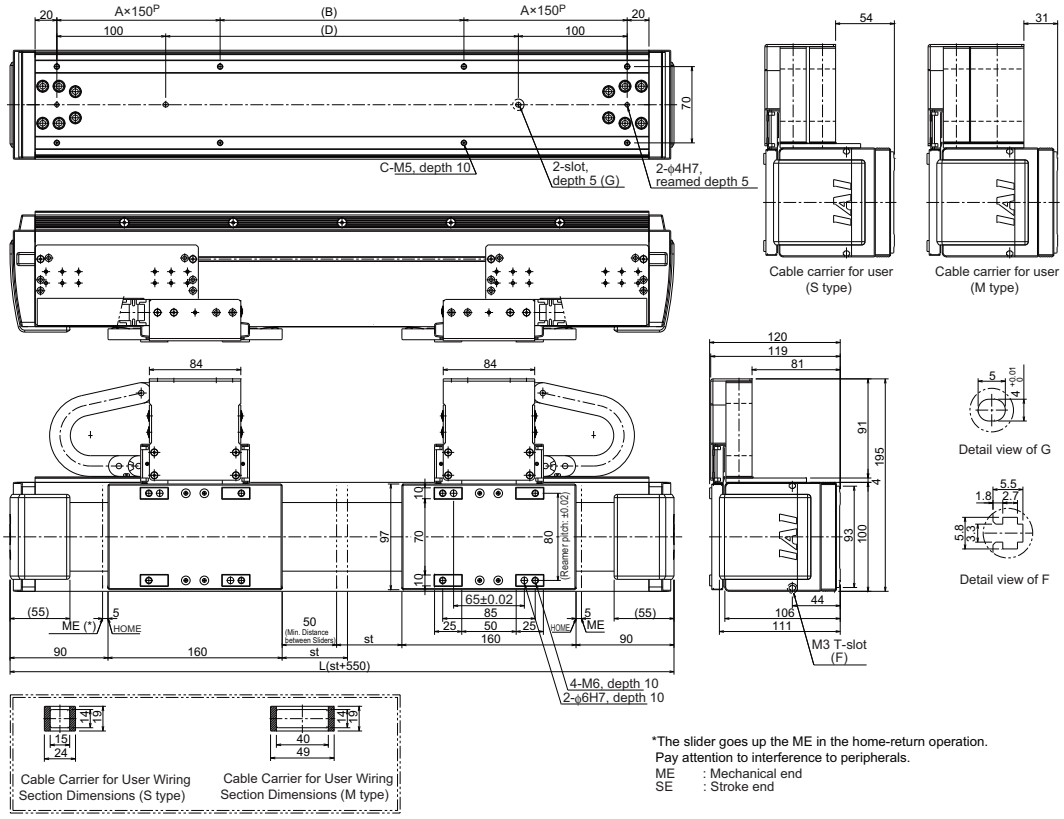
8.9.1 Standard Type



S10SM Standard Type

No.	st	L	A	B	C	D	Weight (kg)
1	60	610	1	224	8	324	13.5
2	150	700	2	14	12	414	14.4
3	240	790	2	104	12	504	15.2
4	330	880	2	194	12	594	16.0
5	420	970	2	284	12	684	16.9
6	510	1060	3	74	16	774	17.7
7	600	1150	3	164	16	864	18.6
8	690	1240	3	254	16	954	19.4
9	780	1330	4	44	20	1044	20.2
10	870	1420	4	134	20	1134	21.1
11	960	1510	4	224	20	1224	21.9
12	1050	1600	5	14	24	1314	22.7
13	1140	1690	5	104	24	1404	23.6
14	1230	1780	5	194	24	1494	24.4
15	1320	1870	5	284	24	1584	25.2
16	1410	1960	6	74	28	1674	26.1
17	1500	2050	6	164	28	1764	26.9
18	1590	2140	6	254	28	1854	27.7
19	1680	2230	7	44	32	1944	28.6
20	1770	2320	7	134	32	2034	29.4
21	1860	2410	7	224	32	2124	30.2

8.9.2 Horizontally Oriented Wall Mount Type (Option)



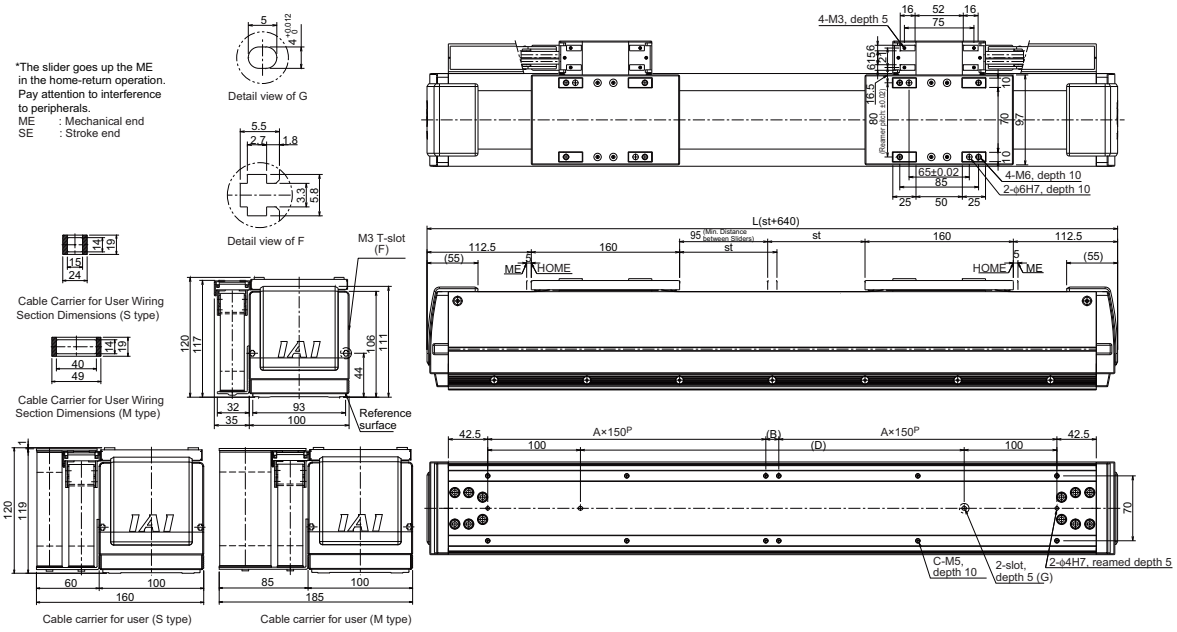
*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S10SM Horizontally Oriented Wall Mount Type (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	60	610	1	224	8	324	14.5
2	150	700	2	14	12	414	15.4
3	240	790	2	104	12	504	16.2
4	330	880	2	194	12	594	17.0
5	420	970	2	284	12	684	17.9
6	510	1060	3	74	16	774	18.7
7	600	1150	3	164	16	864	19.6
8	690	1240	3	254	16	954	20.4
9	780	1330	4	44	20	1044	21.2
10	870	1420	4	134	20	1134	22.1
11	960	1510	4	224	20	1224	22.9
12	1050	1600	5	14	24	1314	23.7
13	1140	1690	5	104	24	1404	24.6
14	1230	1780	5	194	24	1494	25.4
15	1320	1870	5	284	24	1584	26.2
16	1410	1960	6	74	28	1674	27.1
17	1500	2050	6	164	28	1764	27.9
18	1590	2140	6	254	28	1854	28.7
19	1680	2230	7	44	32	1944	29.6
20	1770	2320	7	134	32	2034	30.4
21	1860	2410	7	224	32	2124	31.2

8.10 S10HM

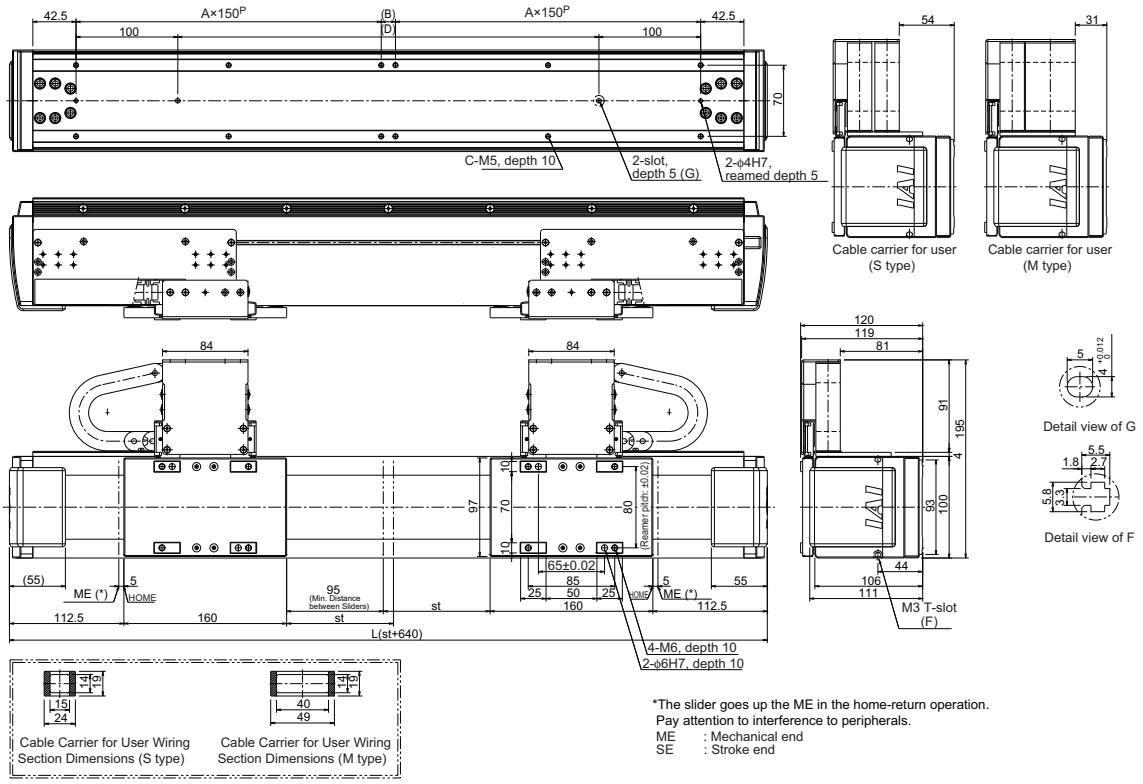
8.10.1 Standard Type



S10HM Standard Type

No.	st	L	A	B	C	D	Weight (kg)
1	105	745	2	14	12	414	15.6
2	195	835	2	104	12	504	16.4
3	285	925	2	194	12	594	17.3
4	375	1015	2	284	12	684	18.1
5	465	1105	3	74	16	774	18.9
6	555	1195	3	164	16	864	19.8
7	645	1285	3	254	16	954	20.6
8	735	1375	4	44	20	1044	21.4
9	825	1465	4	134	20	1134	22.3
10	915	1555	4	224	20	1224	23.1
11	1005	1645	5	14	24	1314	23.9
12	1095	1735	5	104	24	1404	24.8
13	1185	1825	5	194	24	1494	25.6
14	1275	1915	5	284	24	1584	26.4
15	1365	2005	6	74	28	1674	27.3
16	1455	2095	6	164	28	1764	28.1
17	1545	2185	6	254	28	1854	28.9
18	1635	2275	7	44	32	1944	29.8
19	1725	2365	7	134	32	2034	30.6
20	1815	2455	7	224	32	2124	31.4

8.10.2 Horizontally Oriented Wall Mount Type (Option)



*The slider goes up the ME in the home-return operation.
Pay attention to interference to peripherals.
ME : Mechanical end
SE : Stroke end

S10HM Horizontally Oriented Wall Mount Type (Option)

No.	st	L	A	B	C	D	Weight (kg)
1	105	745	2	14	12	414	16.6
2	195	835	2	104	12	504	17.4
3	285	925	2	194	12	594	18.3
4	375	1015	2	284	12	684	19.1
5	465	1105	3	74	16	774	19.9
6	555	1195	3	164	16	864	20.8
7	645	1285	3	254	16	954	21.6
8	735	1375	4	44	20	1044	22.4
9	825	1465	4	134	20	1134	23.3
10	915	1555	4	224	20	1224	24.1
11	1005	1645	5	14	24	1314	24.9
12	1095	1735	5	104	24	1404	25.8
13	1185	1825	5	194	24	1494	26.6
14	1275	1915	5	284	24	1584	27.4
15	1365	2005	6	74	28	1674	28.3
16	1455	2095	6	164	28	1764	29.1
17	1545	2185	6	254	28	1854	29.9
18	1635	2275	7	44	32	1944	30.8
19	1725	2365	7	134	32	2034	31.6
20	1815	2455	7	224	32	2124	32.4

9. Warranty

9.1 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

9.2 Scope of the Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:
(1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.
(2) The breakdown or problem in question occurred during the warranty period.
(3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the instruction manual and catalog.
(4) The breakdown of problem in question was caused by a specification defect or problem, or by a quality issue with our product.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:
- Anything other than our product
- Modification or repair performed by a party other than us (unless we have approved such modification or repair)
- Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
- A natural disaster, man-made disaster, incident or accident for which we are not liable
- Natural fading of paint or other symptoms of aging
- Wear, depletion or other expected result of use
- 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.

9.3 Honoring the Warranty

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

9.4 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.

9.5 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:
- Medical equipment pertaining to maintenance or management of human life or health
- A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
- Important safety parts of mechanical equipment (such as safety devices)
- Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or instruction manual.

9.6 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:

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

Change History

Revision Date	Description of Revision
March 2013	Third edition Revised overall
April 2015	Fourth edition Pg.18 Dynamic allowable moment value changed
November 2016	Edition 4B • P. 27, 28, 39 Note added stating cable length is 20m at maximum for SSEL and SCON
February 2017	Edition 4C • P. 47 Change made in the caution note for stainless sheet external visual inspection
March 2019	Edition 4D • P. 37 Note added for caution for installation of main unit
February 2026	Edition 4E • Changes due to discontinuation of including the Instruction Manual DVD • Changes due to discontinuation of including the First Step Guide • International Standards Compliances complied with RoHS3 Directive
July 2026	Edition 4F • Terms integrated (cable carrier)

Manual No.:ME3646-4F (July 2026)

IAI
Quality and Innovation

IAI Corporation

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

IAI America, Inc.

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

Technical Support available in Europe

IAI Industrieroboter GmbH

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

Technical Support available in Great Britain

LC Automation
control & safety

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

IAI (Shanghai) Co., Ltd.

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

IAI Robot (Thailand) Co., Ltd.

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

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