IAI
Quality and Innovation

ROBO CYLINDER

ROBO Cylinder ®

Wide Slider Type

RCS4 -WSA10C/WSA12C/WSA14C/WSA16C
WSA10R/WSA12R/WSA14R/WSA16R
RCS4CR - WSA10C/WSA12C/WSA14C/WSA16C

Instruction Manual

First Edition

ME3770-1C

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.

The DVD enclosed with the product contains instruction manuals for IAI products.
When using the product, refer to the necessary sections of the applicable instruction manual by printing them out or displaying them on a PC.

After reading the instruction manual, keep it in a convenient place so that whoever is handling 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.
-
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

RCS4 Wide Slider Type Instruction Manual Configuration

Product name	Instruction manual name	Control number
RCS4	First Step Guide	ME3775
RCS4 Wide Slider Type	Instruction Manual (this document)	ME3770
SCON-CB/CFB Controller	SCON-CB/CFB Controller Instruction Manual	ME0340
SCON-CAL/CGAL Controller	SCON-CAL/CGAL Controller Instruction Manual	ME0243
MSCON-C Controller	MSCON-C Controller Instruction Manual	ME0306
SSEL-CS Controller	SSEL-CS Controller Instruction Manual	ME0157
XSEL-P/Q Controller	XSEL-P/Q Controller Instruction Manual	ME0148
XSEL-R/S Controller	XSEL-R/S Controller Instruction Manual	ME0313
XSEL-RA/SA Controller	XSEL-RA/SA Controller Instruction Manual	ME0359
PC Compatible Software for RC/EC	RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
PC Compatible Software for XSEL	IA-101-X-MW/IA-101-X-USBMW Instruction Manual	ME0154
Touch Panel Teaching Pendant	TB-01/01D/01DR Applicable for Position Controller Instruction Manual	ME0324
Touch Panel Teaching Pendant	TB-02/02D Applicable for Position Controller Instruction Manual	ME0355
Data Setter	TB-03 Applicable for Position Controller	ME0376
Touch Panel Teaching Pendant	TB-01/01D/01DR Applicable for Program Controller Instruction Manual	ME0325
Touch Panel Teaching Pendant	TB-02/02D Applicable for Program Controller Instruction Manual	ME0356
Data Setter	TB-03 Applicable for Program Controller	ME0377

Contents

Chapter 3 Connecting with the Controller

Chapter 4 Maintenance and Inspection

Chapter 5 External Dimensions

Chapter 6 Life

Chapter 7 Warranty

Chapter 8 Appendix

Safety Guide

The Safety Guide is intended to permit safe use of the product and thus to prevent risks and property damage. Be sure to read it before handling the product.

Safety Precautions for Our Products

Common safety precautions for the use of robots in various operations are indicated here.

No.	Operation	Precautions
1	Model Selection	● This product is not intended or designed for applications where high levels of safety are required, and so cannot guarantee that human lives will be protected. 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 or machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.) (3) Machinery components essential for safety (safety devices etc.) ● Do not use the product outside the range of the specifications. Otherwise, the product life may be drastically shortened, and product damage or facilities stoppage may occur. ● Do not use it in any of the following environments. (1) Locations with flammable gases, ignitable objects or explosives (2) Locations with potential exposure to radiation (3) Locations with ambient temperature or relative humidity exceeding the specifications range (4) Locations where radiant heat is applied by direct sunlight or other large heat source (5) Locations where condensation occurs due to abrupt temperature changes (6) Locations with corrosive gases (sulfuric acid, hydrochloric acid, etc.) (7) Locations exposed to significant amounts of dust, salt or iron powder (8) Locations subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If a model without brake is selected, the moving parts may fall when the power is turned OFF, causing accidents such as injury or workpiece damage.

No.	Operation	Precautions
2	Transportation	● When transporting heavy objects, do the work with two or more persons or utilize equipment such as a crane. ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● During transportation, carefully consider the carrying positions, weight, and weight balance, and be careful to avoid collisions or dropping. ● Use appropriate transportation measures for transport. The actuators available for transportation with a crane have eyebolts attached or tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not climb onto the package. ● Do not put anything heavy that could deform the package on it. ● When using a crane with capacity of 1t or more, have an operator qualified for crane operation and sling work. ● When using a crane or equivalent equipment, make sure not to suspend loads exceeding the equipment's rated load. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. Also, check to make sure that the hook is free of damage. ● Do not climb on loads suspended from cranes. ● Do not leave loads suspended from cranes for long periods. ● Do not stand under loads suspended from cranes.
3	Storage and Preservation	● For the storage and preservation environment, see the installation environment. However, give especial consideration to the prevention of condensation. ● Store the products so as to prevent them from falling over or down in the case of natural disasters such as earthquakes.

No.	Operation	Precautions
4	Installation and Startup	(1) Installation of robot body and controller, etc. ● Be sure to securely hold and fix the product (including the workpiece). If the product falls over, is dropped, or operates abnormally, it may lead to damage and injury. Also, be equipped for falls over or down due to natural disasters such as earthquakes. ● Do not climb on or put anything on the product. Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life. ● When using the product in any of the places specified below, provide sufficient shielding. (1) Locations where electrical noise is generated (2) Locations with strong electrical or magnetic fields (3) Locations with mains or power lines passing nearby (4) Locations where the product may come in contact with water, oil or chemical spray
		(2) Cable wiring ● Use IAI genuine cables for connecting the actuator and controller, and for the teaching tools. ● Do not scratch cables, bend them forcibly, pull them, coil them, snag them, or place heavy objects on them. Otherwise, this may lead to fire, electric shock, or abnormal operation due to leakage or conduction malfunction. ● Perform the wiring for the product after turning OFF the power to the unit, and avoid miswiring. ● When wiring DC power (+24V), be careful with the positive/negative polarity. Incorrect connections may lead to fire, product breakdown or abnormal operation. ● Connect the cable connector securely so that there is no disconnection or looseness. Otherwise, this may lead to fire, electric shock, or abnormal operation of the product. ● Never cut or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Otherwise, this may lead to fire or abnormal operation of the product.
		(3) Grounding ● Grounding must be performed, in order to prevent electric shocks or electrostatic charge, enhance noise-resistant performance and control unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, be sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For safeguard grounding, it is necessary to select an appropriate wire diameter for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D grounding (former Class 3 grounding, with ground resistance 100Ω or below).

No.	Operation	Precautions
4	Installation and Startup	(4) Safety measures ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● When the product is operating or in the ready mode, take safety measures (such as the installation of safety/protection fences) so that nobody can enter the area within the robot's movable range. Contact with an operating robot may lead to death or serious injury. ● Be sure to install an emergency stop circuit so that the unit can be stopped immediately in an emergency during operation. ● Take safety measures such that turning the power ON alone will not start up the unit. Otherwise, this may cause the product to start unexpectedly, leading to injury or product damage. ● Take safety measures such that emergency stop cancel or recovery after power failure alone will not start up the unit. Otherwise, this may lead to injury or equipment damage. ● When installation or adjustment operation is to be performed, display signs such as "Operating: No Power ON!" etc. Sudden power input may cause electric shock or injury. ● Take measures to prevent workpieces, etc. from falling during power failures or emergency stop. ● Wear protection gloves, goggles and safety shoes, as necessary, to secure safety. ● Do not insert fingers or objects into the openings in the product. Otherwise, this may lead to injury, electric shock, product damage, or fire. ● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces.
5	Teaching	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● Perform teaching operation from outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well. ● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur. ● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly. ● Place a sign indicating "Operating" where it can be seen easily. ● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces. * Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated.

No.	Operation	Precautions
6	Trial Operation	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● After teaching or programming, carry out trial operation step by step before switching to automatic operation. ● When trial operation is to be performed inside the safety/protection fence, use the same work procedure, determined in advance, as teaching operation. ● Be sure to confirm program operation at safe speeds. Otherwise, this may lead to accidents due to unexpected motion caused by program error, etc. ● Do not touch the terminal block or any of the various setting switches while the equipment is live. Otherwise, this may lead to electric shock or abnormal operation.
7	Automatic Operation	● Check before starting automatic operation or restarting after operation stop that there is nobody within the safety/protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is ready for automatic operation and that there is no alarm indication. ● Be sure to start automatic operation from outside the safety/protection fence. ● If the product produces abnormal heat, smoke, odor, or noise, immediately stop it and turn OFF the power switch. Otherwise, this may lead to fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Otherwise, this may lead to injury or product damage due to unexpected product motion during recovery from the power failure.
8	Maintenance and Inspection	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● Perform the work outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well. ● When work is to be performed inside the safety/protection fence, turn OFF the power switch as a rule. ● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur. ● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly. ● Place a sign indicating "Operating" where it can be seen easily. ● For the grease for the guide or ball screw, use appropriate grease according to the Instruction Manual for each model. ● Do not perform dielectric strength testing. Otherwise, this may lead to damage to the product.

No.	Operation	Precautions
8	Maintenance and Inspection	● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces. ● The slider or rod may be misaligned from the stop position if the servo is turned OFF. Avoid injury or damage due to unnecessary operation. ● Be careful not to lose the cover or any removed screws, and be sure to return the product to the original condition after maintenance and inspection work. Otherwise, this may lead to product damage or injury due to incomplete mounting. * Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated.
9	Modification and Disassembly	● Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion.
10	Disposal	● When the product exceeds its useful life or is no longer needed, dispose of it properly as industrial waste. ● When removing the actuator for disposal, avoid dropping components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may rupture or generate toxic gases.
11	Other	● If you are equipped with a medical device such as a pacemaker, do not approach the product or its wiring, as the device may be affected. ● See the Overseas Specifications Compliance Manual to check compliance with overseas standards if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure safety.

Precaution Indications

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 risk to persons and property	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 a situation in which, while injury is not a likely result, the precautions should be observed in order to use the product appropriately.	 Notice

Precautions for Handling

1. The Safety Guide attached with the product is intended to permit safe use of the product and thus to prevent risks and property damage. Be sure to read it before handling the product.

2. Do not attempt any handling or operation that is not indicated in this instruction manual.

3. Make sure to secure the actuator properly in accordance with this instruction manual.
   If the actuator is not securely fixed, this may lead to abnormal noise, vibration, breakdown or shortened product life.

4. Make sure to observe the usage conditions and environment of the product.
   Operation outside the warranty could cause decreased performance or product breakdown.
   Use within the allowable range for each item.

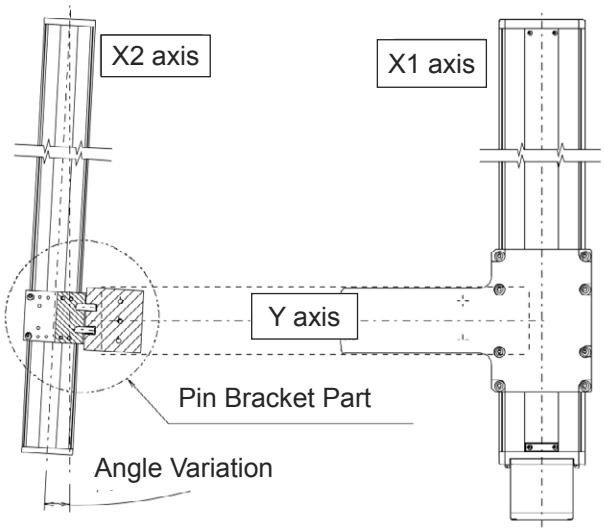
Item	Cautions for use	Problems or breakdowns which may occur if the allowable range is exceeded
Speed and acceleration/deceleration	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life.
Allowable moment	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life. In extreme cases, flaking may occur on the guide or ball screw.
Overhang load length		Mounting a load with an overhang length greater than the allowable values may lead to vibration or abnormal noise.

5. If return operations are continued over a short distance, they may rapidly degrade the film of grease.
   Continuous return operation within a distance less than 30mm may cause the grease film to degrade rapidly.
   As a guideline, in every 5,000 to 10,000 cycles, have approximately 5 cycles of return operation over a 50mm distance or more to regenerate the oil film. Continued use of the actuator in that state may lead to breakdown.
   In extreme cases, flaking may occur on the guide or ball screw.

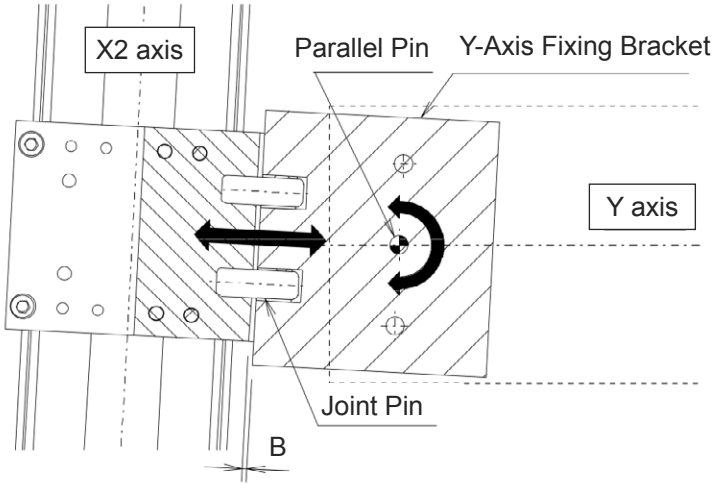
6. Do not attempt to have sliders collide with an obstacle at high speed.
   This may damage the coupling or other mechanical parts.

7. When constructing gantry structure with using the external guide, be careful to the traveling parallelism between the external guide and the actuator.
   For the joint to the external guide, use such item as a pin bracket which possesses degree of freedom so the assembly variation can be absorbed.

<<Top View for Gantry Assembly>>



<<Detail View of Pin Bracket Part>>



8. In case that excess vibration is applied to a transported object due to such reasons as the overhang of the transported object is long, have an external guide to reduce the vibration.

9. In some conditions of environment of use, postures of installation and conditions of operation, the base oil separated from the grease may come out of ROBO Cylinder.
   It is recommended to have a protection in case the peripheral devices could get influence of the base oil.

International Standard Compliance

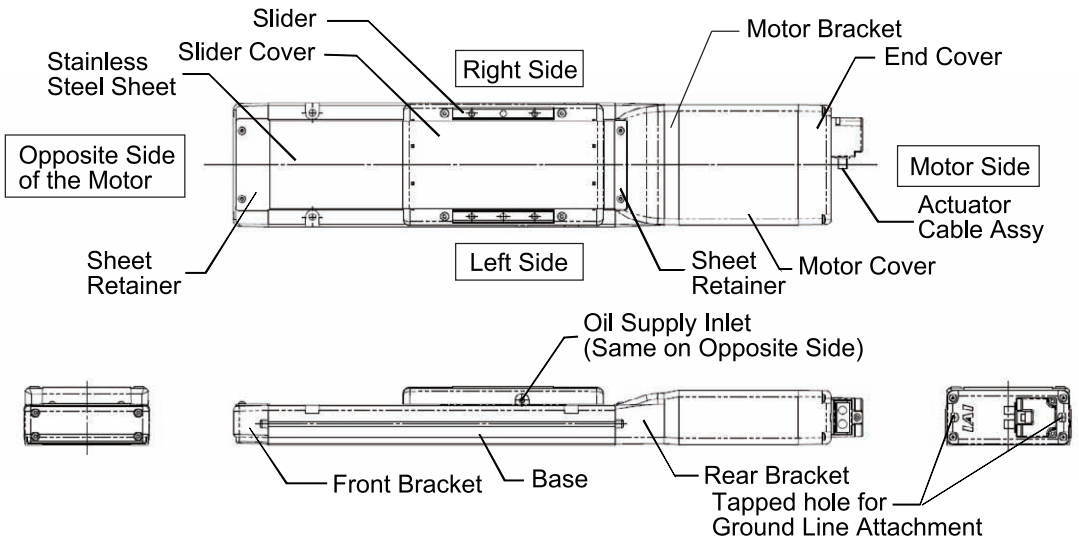
The ROBO Cylinder complies with the following overseas standards.
Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

CE Marking	RoHS Directive
○	○

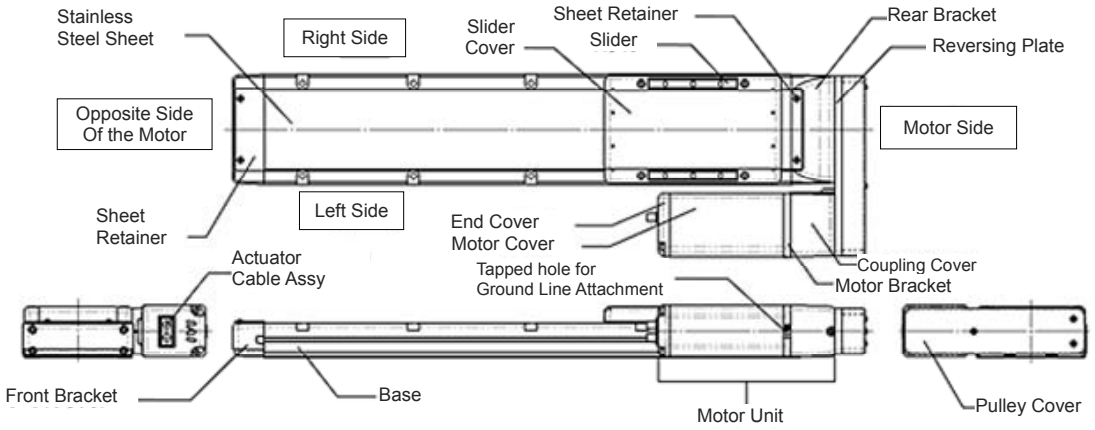
Names of the Parts

In this manual, the actuator left/right sides and motor/opposite sides are shown as in the figure below.

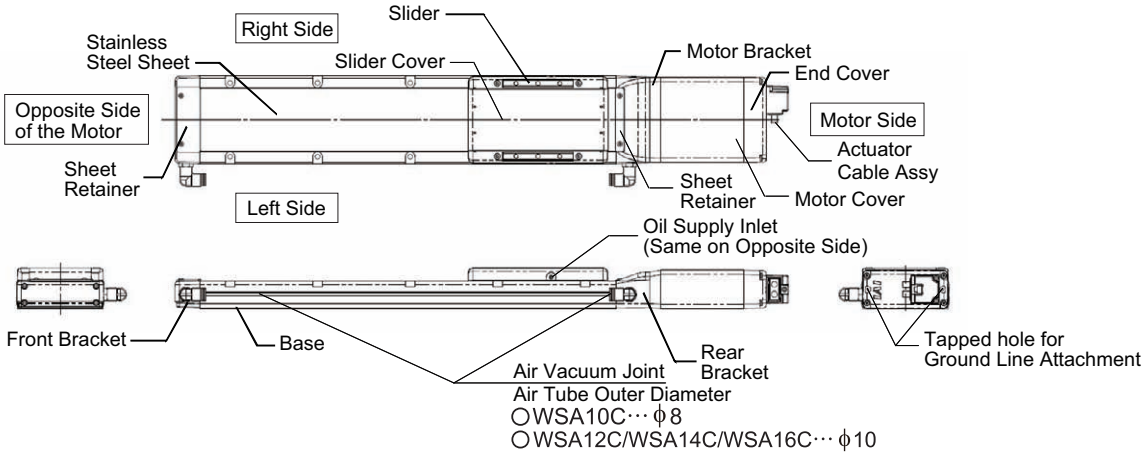
Standard Type Motor Straight Type



Standard Type Motor Reversing Type



Cleanroom Type Motor Straight Type



ROBO Cylinder

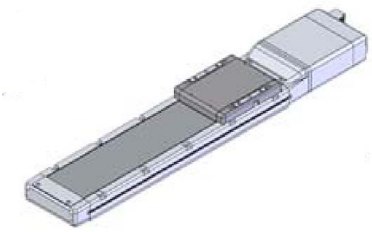
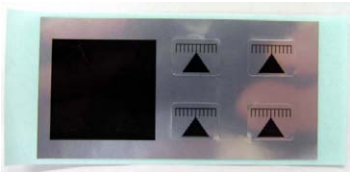
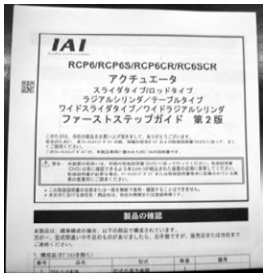
Chapter 1

Specifications

1.1 Checking the product

Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

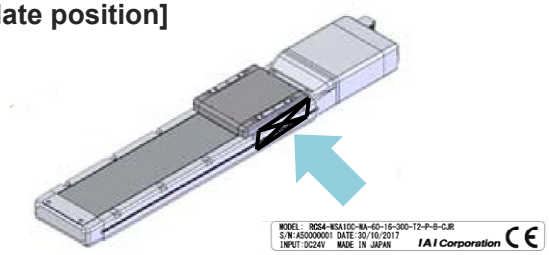
<table>
<tr><th colspan="2">Body</th><th colspan="2">Accessories</th></tr>
<tr><td colspan="2">Actuator
Quantity: 1
  </td><td>Motor Cable
Quantity: 1
  </td><td>Encoder Cable
Quantity: 1
  </td></tr>
<tr><th colspan="4">Accessories</th></tr>
<tr><td>In-house Made Seals
Quantity: 1
  </td><td colspan="2">Cross Recessed Pan Head Screw with Captive Washer M3 × 6
Quantity: 2
For affixing ground cable
  </td><td>Cable Band
Quantity: 2
For clamping connector cover
 
* Refer to International Application Manual (ME0287) for how to use it.</td></tr>
<tr><th colspan="4">Accessories (Documents/DVD)</th></tr>
<tr><td>First Step Guide
Quantity: 1
 
</td><td colspan="2">Safety Guide
Quantity: 1
 
</td><td>Instruction Manual DVD
Quantity: 1
 
</td></tr>
</table>

How to read the model nameplate

Model number →
Serial number →

MODEL: RCS4-WSA10C-WA-60-16-300-T2-P-B-CJR
S/N:A50000001 DATE:30/10/2017
INPUT:DC24V MADE IN JAPAN
IAI Corporation CE

[Nameplate position]



How to read the model number

RCS4 — [Type] — WA — [Motor Wattage] — [Ball Screw Lead] — [Stroke] — [Applicable Controller] — [Cable Length] — [Options]

Series: RCS4

Type

WSA10C	Body Width 100mm Coupling Type
WSA12C	Body Width 120mm Coupling Type
WSA14C	Body Width 140mm Coupling Type
WSA16C	Body Width 160mm Coupling Type
WSA10R	Body Width 100mm Motor-Reversed Type
WSA12R	Body Width 120mm Motor-Reversed Type
WSA14R	Body Width 140mm Motor-Reversed Type
WSA16R	Body Width 160mm Motor-Reversed Type

Encoder Type

WA	Battery-less Absolute

Motor Wattage

60	60W
100	100W
200	200W
400	400W

Ball Screw Lead

2.5	Lead 2.5mm
3	Lead 3mm
4	Lead 4mm
5	Lead 5mm
6	Lead 6mm
8	Lead 8mm
10	Lead 10mm
12	Lead 12mm
16	Lead 16mm
20	Lead 20mm
24	Lead 24mm
30	Lead 30mm
36	Lead 36mm

Stroke

50	50mm
to	to
1100	1100mm

(Setting available in every 50mm for pitch)

Applicable Controller

T2	SCON MSCON SSEL XSEL-P/Q XSEL-RA/SA

Cable Length

N	None
P	1m
S	3m
M	5m
X□□	Length Specification
R□□	Robot Cable

Options

B	With brake
CJT	Cable Exit Direction Changed (Top)
CJR	Cable Exit Direction Changed (Right)
CJL	Cable Exit Direction Changed (Left)
CJO	Cable Exit Direction Changed (Outward)
CJB	Cable Exit Direction Changed (Bottom)
HPR	High Precision Specifications
ML	Motor Left Reversed Direction
MR	Motor Right Reversed Direction
NM	Home reverse specification
SS	Slider spacer
SR	Slider Roller Specification

* Please note that the available range of ball screw lead, stroke and options will differ depending on the actuator type.

RCS4CR — [Type] — WA — [Motor Wattage] — [Ball Screw Lead] — [Stroke] — [Applicable Controller] — [Cable Length] — [Options]

Series: RCS4CR

Type

WSA10C	Body Width 100mm Coupling Type
WSA12C	Body Width 120mm Coupling Type
WSA14C	Body Width 140mm Coupling Type
WSA16C	Body Width 160mm Coupling Type

Encoder Type

WA	Battery-less Absolute

Motor Wattage

60	60W
100	100W
200	200W
400	400W

Ball Screw Lead

2.5	Lead 2.5mm
3	Lead 3mm
4	Lead 4mm
5	Lead 5mm
6	Lead 6mm
8	Lead 8mm
10	Lead 10mm
12	Lead 12mm
16	Lead 16mm
20	Lead 20mm
24	Lead 24mm

Stroke

50	50mm
to	to
1100	1100mm

(Setting available in every 50mm for pitch)

Applicable Controller

T2	SCON MSCON SSEL XSEL-P/Q XSEL-RA/SA

Cable Length

N	None
P	1m
S	3m
M	5m
X□□	Length Specification
R□□	Robot Cable

Options

B	With brake
CJT	Cable Exit Direction Changed (Top)
CJR	Cable Exit Direction Changed (Right)
CJL	Cable Exit Direction Changed (Left)
CJB	Cable Exit Direction Changed (Bottom)
HPR	High Precision Specifications
NM	Home reverse specification
VR	Vacuum Joint Attachment Opposite Type

* Please note that the available range of ball screw lead, stroke and options will differ depending on the actuator type.

Product list

Category	Type	Appearance	Body Width (mm)	Motor Wattage (W)	Lead (mm)	Positioning Repeatability (mm)	Stroke (mm)	Max. Speed (mm/s)	Rated Thrust (N)	Max. Payload (kg)	
										Horizontal	Vertical
Motor Straight Type	WSA10C		100mm	60	16	±0.01 [±0.005]	50 to 500 (Every 50 st)	960	53	7	-
					10			600	85	16	3
					5			300	170	27	5
					2.5			150	340	40	10
	WSA12C		120mm	100	30	±0.01	50 to 800 (Every 50 st)	1600	57	5	-
					20	±0.01 [±0.005]		1200	85	15	3
					12			720	142	25	8
					6			360	283	45	15
					3			180	566	55	15
	WSA14C		140mm	200	36	±0.01	50 to 800 (Every 50 st)	1800	95	7	-
					24			1440	142	20	2.5
					16	±0.01 [±0.005]		960	214	45	8
					8			480	427	65	10
					4			240	855	80	25
	WSA16C		160mm	400	30	±0.01	50 to 1100 (Every 50 st)	1800	226	30	12
					20	±0.01 [±0.005]		1200	339	60	20
					10			600	678	80	35
					5			300	1357	100	50
Motor Reversing Type	WSA10R		100mm	60	16	±0.01	50 to 500 (Every 50 st)	960	53	7	-
					10			600	85	16	3
					5			300	170	27	5
					2.5			150	340	40	10
	WSA12R		120mm	100	30	±0.01	50 to 800 (Every 50 st)	1600	57	5	-
					20			1200	85	13	3
					12			720	142	23	8
					6			360	283	43	15
					3			180	566	55	15
	WSA14R		140mm	200	36	±0.01	50 to 800 (Every 50 st)	1710	95	7	-
					24			1440	142	20	2.5
					16			960	214	45	8
					8			480	427	65	10
					4			240	855	75	25
	WSA16R		160mm	400	30	±0.01	50 to 1100 (Every 50 st)	1800	226	30	12
					20			1200	339	60	18
					10			600	678	80	35
					5			300	1357	100	50

Values in brackets [ ] show specifications for high-precision type

Cleanroom Type

Category	Type	Appearance	Body Width (mm)	Motor Wattage (W)	Lead (mm)	Positioning Repeatability (mm)	Stroke (mm)	Max. Speed (mm/s)	Rated Thrust (N)	Max. Payload (kg)		Cleanliness
										Horizontal	Vertical	
Motor Straight Type	WSA10C		100mm	60	16	±0.01 [±0.005]	50 to 500 (Every 50 st)	960	53	7	–	Class 10 (Fed.Std.209D Standards) Class 2.5 Equivalent (ISO14644-1 Standards)
					10			600	85	16	3	
					5			300	170	27	5	
					2.5			150	340	40	10	
	WSA12C		120mm	100	20	±0.01 [±0.005]	50 to 800 (Every 50 st)	1200	85	15	3	
					12			720	142	25	8	
					6			360	283	45	15	
					3			180	566	55	15	
	WSA14C		140mm	200	24	±0.01	50 to 800 (Every 50 st)	1440	142	20	2.5	
					16	±0.01 [±0.005]		960	214	45	8	
					8			480	427	65	10	
					4			240	855	80	25	
	WSA16C		160mm	400	20	±0.01 [±0.005]	50 to 1100 (Every 50 st)	1200	339	60	20	
					10			600	678	80	35	
					5			300	1357	100	50	

Values in brackets [ ] show specifications for high-precision type

1.2 Specifications

Specifications

[1] RCS4 (CR) - WSA10C

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
16	7	-	53
10	16	3	85
5	27	5	170
2.5	40	10	340

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 350 (Every 50mm)	400 (mm)	450 (mm)	500 (mm)
16	960	930	775	660
10	600	590	490	415
5	300	290	245	205
2.5	150	145	120	100

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

(Note) For Lead 16, there is no setting of the maximum payload type against the speed and acceleration to reduce the payload for vertical orientation. Use the slider type.

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
7	7	5	4	3	-	-	-	-	-

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
16	16	12	12	6	3	3	3	3	2

Lead 5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
27	27	20	18	-	5	5	5	5	-

Lead 2.5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
40	30	18	-	-	10	10	6	-	-

Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

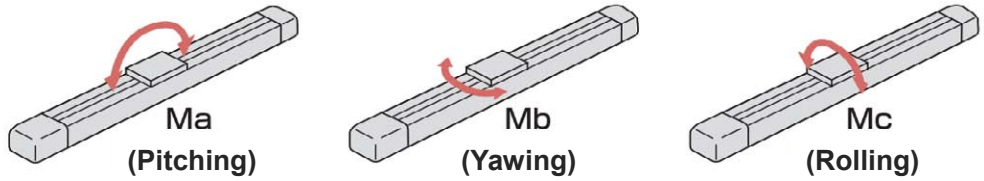
Item	Content
Drive System	Ball screw ϕ8mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 271 N·m, Mb direction: 271 N·m, Mc direction: 553 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 65.4 N·m, Mb direction: 65.4 N·m, Mc direction: 134 N·m
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 51.9 N·m, Mb direction: 51.9 N·m, Mc direction: 106 N·m
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 500mm or less

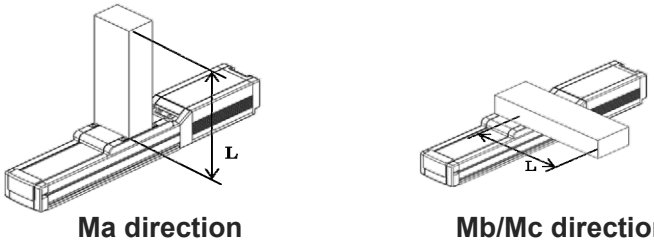
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 2.5 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

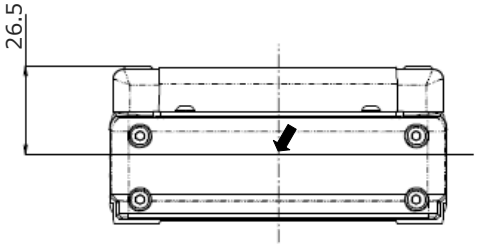
Slider type moment direction



Slider type overhang load length (L = 500mm or less)



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



Caution

If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

[2] RCS4 (CR) - WSA12C

* There is no Lead 30 prepared for Cleanroom Type RCS4CR-WSA12C.

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
30	5	-	57
20	15	3	85
12	25	8	142
6	45	15	283
3	55	15	566

[Stroke and Max. Speed]

Unit: mm/s

Lead (mm)	50 to 450 (Every 50mm)	500 (mm)	550 (mm)	600 (mm)	650 (mm)	700 (mm)	750 (mm)	800 (mm)
30	1600		1450	1260	1100	970	860	770
20	1200	1130	970	840	740	650	580	520
12	720	610	535	465	405	355	315	285
6	360	310	265	230	200	175	155	140
3	180	150	130	115	100	85	75	70

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

(Note) For Lead 30, there is no setting of the maximum payload type against the speed and acceleration to reduce the payload for vertical orientation. Use the slider type.

Lead 30

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
5	5	5	4	3	-	-	-	-	-

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
15	10	8	6	4	3	3	2	2	2

Lead 12

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
25	25	20	15	15	8	8	8	6	6

Lead 6

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
45	40	30	20	-	15	15	12	10	-

Lead 3

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
55	30	15	-	-	15	10	6	-	-

Caution

Do not attempt to configure settings for acceleration/deceleration above the specifications.

This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

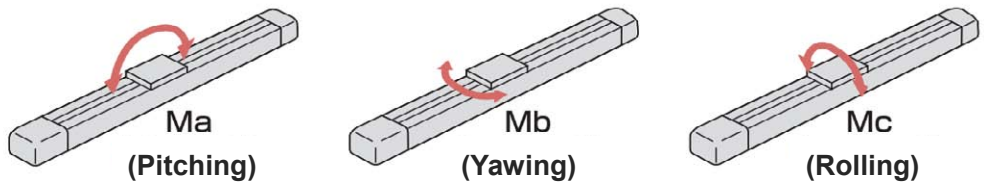
Item	Content
Drive System	Ball screw ϕ10mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 311 N·m, Mb direction: 311 N·m, Mc direction: 827 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 87.5 N·m, Mb direction: 87.5 N·m, Mc direction: 233 N·m
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 69.5 N·m, Mb direction: 69.5 N·m, Mc direction: 185 N·m
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 450mm or less

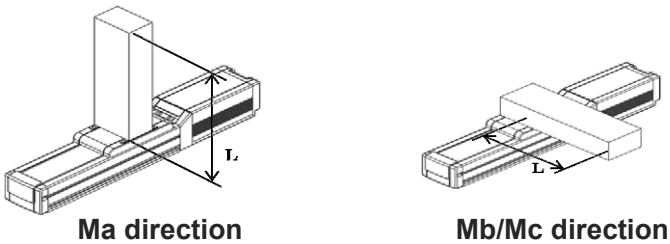
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 3 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

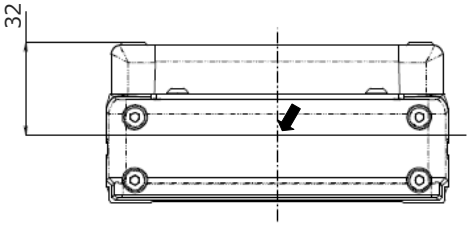
Slider type moment direction



Slider type overhang load length (L = 450mm or less)



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



Caution

- If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

[3] RCS4(CR) - WSA14C

* There is no Lead 36 prepared for Cleanroom Type RCS4CR-WSA14C.

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
36	7	-	95
24	20	2.5	142
16	45	8	214
8	65	10	427
4	80	25	855

[Stroke and Max. Speed]

Unit: mm/s

Lead (mm)	50 to 450 (Every 50mm)	500 (mm)	550 (mm)	600 (mm)	650 (mm)	700 (mm)	750 (mm)	800 (mm)
36	1800			1590	1400	1240	1110	990
24	1440	1420	1220	1060	930	830	740	665
16	960	920	790	690	610	550	490	440
8	480	460	400	350	305	270	240	215
4	240	230	200	170	150	135	120	105

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

(Note) For Lead 36, there is no setting of the maximum payload type against the speed and acceleration to reduce the payload for vertical orientation. Use the slider type.

Lead 36

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
7	6	6	4	3	-	-	-	-	-

Lead 24

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
20	15	15	10	5	2.5	2.5	2.5	2.5	2.5

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
45	30	20	20	18	8	8	8	8	8

Lead 8

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
65	50	40	40	-	10	10	10	10	-

Lead 4

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
80	60	30	-	-	25	20	12	-	-

Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

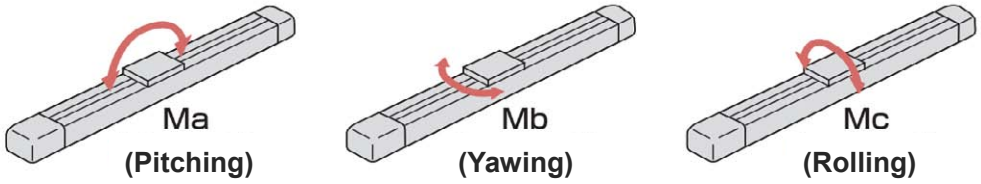
Item	Content
Drive System	Ball screw ϕ12mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 462 N·m, Mb direction: 462 N·m, Mc direction: 1170 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 122 N·m, Mb direction: 122 N·m, Mc direction: 308 N·m
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 96.8 N·m, Mb direction: 96.8 N·m, Mc direction: 245 N·m
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 550mm or less

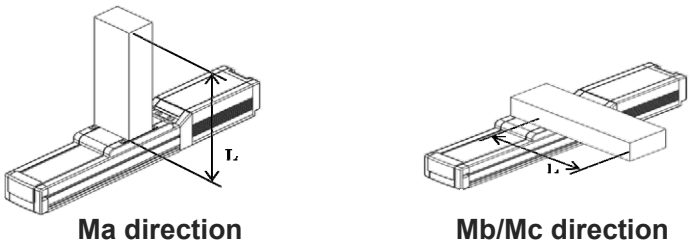
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 4 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

Slider type moment direction

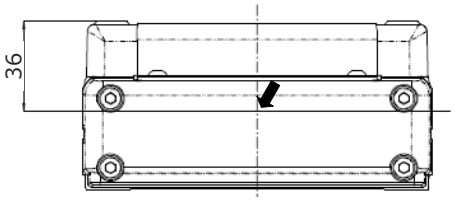


Slider type overhang load length (L = 550mm or less)



Ma direction **Mb/Mc direction**

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



Caution

- If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

[4] RCS4 (CR) - WSA16C

* There is no Lead 30 prepared for Cleanroom Type RCS4CR-WSA16C.

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
30	30	12	226
20	60	20	339
10	80	35	678
5	100	50	1357

[Stroke and Max. Speed]

Unit: mm/s

Lead (mm)	50 to 600 (Every 50mm)	500 (mm)	650 (mm)	700 (mm)	750 (mm)	800 (mm)	850 (mm)	900 (mm)	950 (mm)	1000 (mm)	1050 (mm)	1100 (mm)
30	1800	1680	1480	1320	1180	1060	960	870	790	730	670	620
20	1200	1120	990	880	780	715	645	590	535	490	450	415
10	600	560	490	440	395	355	320	290	265	240	225	205
5	300	280	240	220	195	175	160	145	130	120	110	100

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 30

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
30	25	20	10	8	12	12	8	8	6

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	40	25	22	20	20	15	15	12	10

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
80	80	70	60	-	35	35	35	30	-

Lead 5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
100	100	80	-	-	50	45	30	-	-

Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

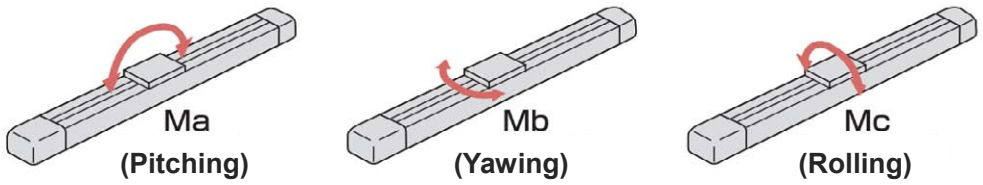
Item	Content
Drive System	Ball screw ϕ16mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 642 N·m, Mb direction: 642 N·m, Mc direction: 1610 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 161 N·m, Mb direction: 161 N·m, Mc direction: 404 N·m,
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 128 N·m, Mb direction: 128 N·m, Mc direction: 321 N·m
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 650mm or less

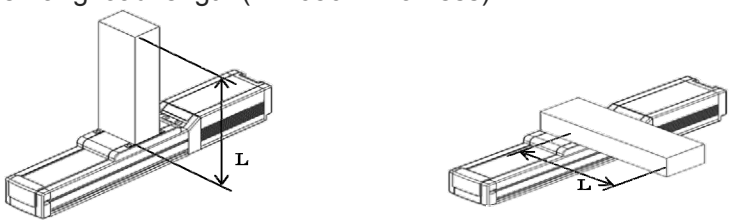
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 5 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

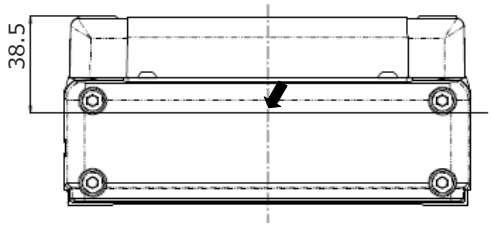
Slider type moment direction



Slider type overhang load length (L = 650mm or less)



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



Caution

- If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

[5] RCS4 - WSA10R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
16	7	-	53
10	16	3	85
5	27	5	170
2.5	40	10	340

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 350 (Every 50mm)	400 (mm)	450 (mm)	500 (mm)
16	960	930	775	660
10	600	590	490	415
5	300	290	245	205
2.5	150	145	120	100

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

(Note) For Lead 16, there is no setting of the maximum payload type against the speed and acceleration to reduce the payload for vertical orientation. Use the slider type.

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
7	7	5	4	–	-	-	-	-	-

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
16	16	12	12	-	3	3	3	3	-

Lead 5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
27	27	20	18	-	5	5	5	5	-

Lead 2.5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
40	30	18	-	-	10	10	6	-	-

Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

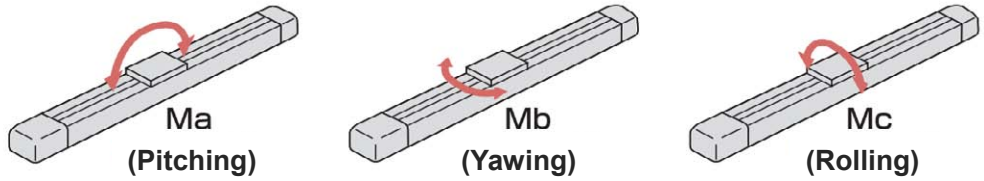
Item	Content
Drive System	Ball screw ϕ8mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 271 N·m, Mb direction: 271 N·m, Mc direction: 553 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 65.4 N·m, Mb direction: 65.4 N·m, Mc direction: 134 N·m
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 51.9 N·m, Mb direction: 51.9 N·m, Mc direction: 106 N·m
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 500mm or less

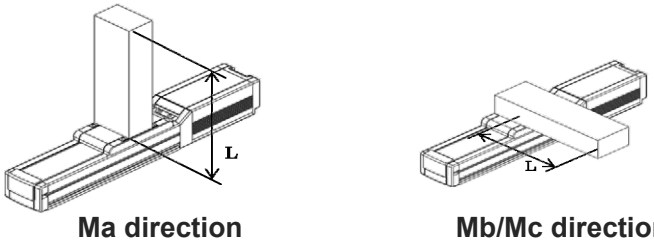
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 2.5 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

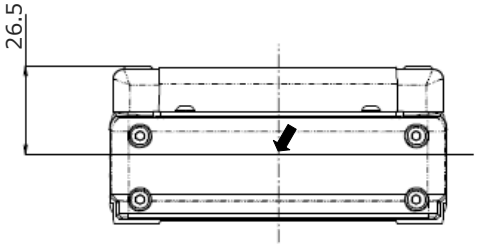
Slider type moment direction



Slider type overhang load length (L = 500mm or less)



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



Caution

- If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

[6] RCS4 - WSA12R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
30	5	-	57
20	13	3	85
12	23	8	142
6	43	15	283
3	55	15	566

[Stroke and Max. Speed]

Unit: mm/s

Lead (mm)	50 to 450 (Every 50mm)	500 (mm)	550 (mm)	600 (mm)	650 (mm)	700 (mm)	750 (mm)	800 (mm)
30	1600		1450	1260	1100	970	860	770
20	1200	1130	970	840	740	650	580	520
12	720	610	535	465	405	355	315	285
6	360	310	265	230	200	175	155	140
3	180	150	130	115	100	85	75	70

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

(Note) For Lead 30, there is no setting of the maximum payload type against the speed and acceleration to reduce the payload for vertical orientation. Use the slider type.

Lead 30

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
5	5	5	4	-	-	-	-	-	-

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
13	10	8	6	-	3	3	2	2	-

Lead 12

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
23	23	16	15	-	8	8	8	6	-

Lead 6

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
43	40	30	20	-	15	15	12	10	-

Lead 3

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
55	30	15	-	-	15	10	6	-	-

Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

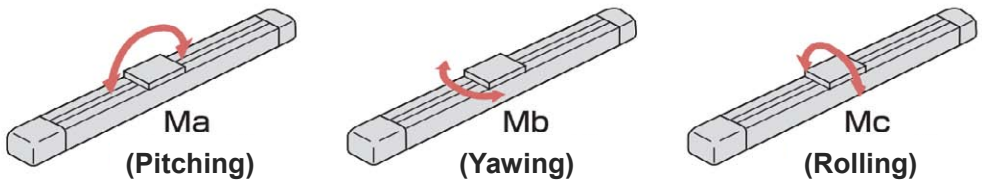
Item	Content
Drive System	Ball screw ϕ10 mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 311 N·m, Mb direction: 311 N·m, Mc direction: 827 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 87.5 N·m, Mb direction: 87.5 N·m, Mc direction: 233 N·m,
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 69.5 N·m, Mb direction: 69.5 N·m, Mc direction: 185 N·m
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 450mm or less

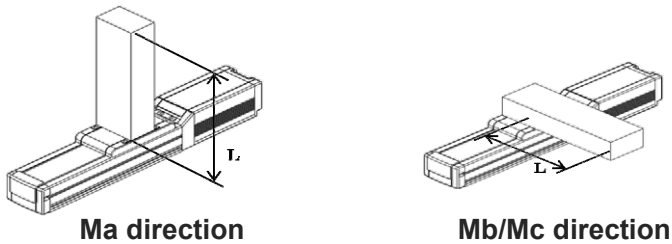
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 3 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

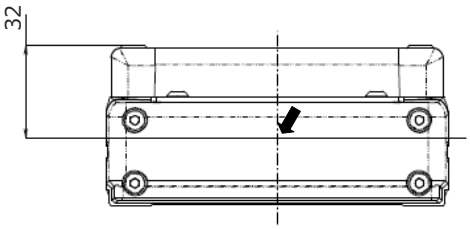
Slider type moment direction



Slider type overhang load length (L = 450mm or less)



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



Caution

- If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

[7] RCS4 (CR) - WSA14R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
36	7	-	95
24	20	2.5	142
16	45	8	214
8	65	10	427
4	75	25	855

[Stroke and Max. Speed]

Unit: mm/s

Lead (mm)	50 to 450 (Every 50mm)	500 (mm)	550 (mm)	600 (mm)	650 (mm)	700 (mm)	750 (mm)	800 (mm)
36	1710			1590	1400	1240	1110	990
24	1440	1420	1220	1060	930	830	740	665
16	960	920	790	690	610	550	490	440
8	480	460	400	350	305	270	240	215
4	240	230	200	170	150	135	120	105

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

(Note) For Lead 36, there is no setting of the maximum payload type against the speed and acceleration to reduce the payload for vertical orientation. Use the slider type.

Lead 36

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
7	6	6	4	-	-	-	-	-	-

Lead 24

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
20	15	15	10	-	2.5	2.5	2.5	2.5	-

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
45	30	20	20	-	8	8	8	8	-

Lead 8

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
65	50	40	40	-	10	10	10	10	-

Lead 4

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
75	60	30	-	-	25	20	12	-	-

Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

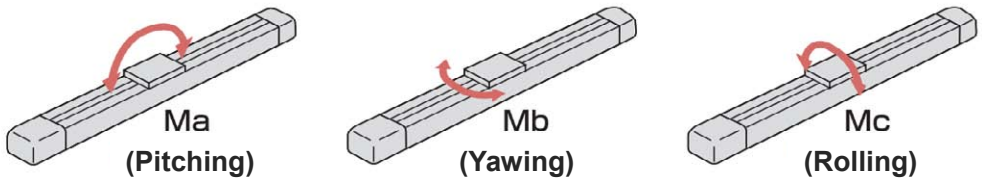
Item	Content
Drive System	Ball screw ϕ12mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 462 N·m, Mb direction: 462 N·m, Mc direction: 1170 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 122 N·m, Mb direction: 122 N·m, Mc direction: 308 N·m
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 96.8 N·m, Mb direction: 96.8 N·m, Mc direction: 245 N·m
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 550mm or less

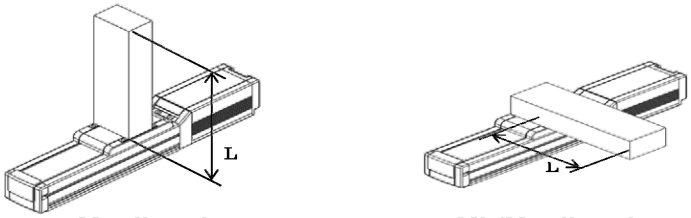
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 4 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

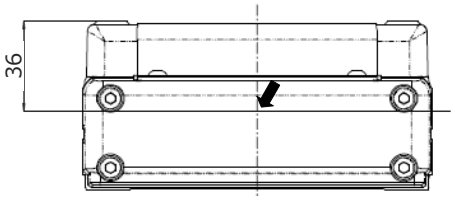
Slider type moment direction



Slider type overhang load length (L = 550mm or less)



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



Caution

- If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

[8] RCS4- WSA16R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
30	30	12	226
20	60	18	339
10	80	35	678
5	100	50	1357

[Stroke and Max. Speed]

Unit: mm/s

Lead (mm)	50 to 600 (Every 50mm)	500 (mm)	650 (mm)	700 (mm)	750 (mm)	800 (mm)	850 (mm)	900 (mm)	950 (mm)	1000 (mm)	1050 (mm)	1100 (mm)
30	1800	1680	1480	1320	1180	1060	960	870	790	730	670	620
20	1200	1120	990	880	780	715	645	590	535	490	450	415
10	600	560	490	440	395	355	320	290	265	240	225	205
5	300	280	240	220	195	175	160	145	130	120	110	100

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 30

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
30	25	20	10	-	12	12	8	8	-

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	40	25	22	-	18	15	15	12	-

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
80	80	70	60	-	35	35	35	30	-

Lead 5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
100	100	80	-	-	50	45	30	-	-

Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

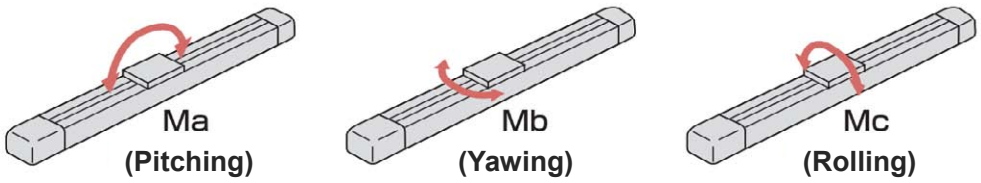
Item	Content
Drive System	Ball screw ϕ16 mm, rolled C10
Positioning repeatability (* 1)	±0.01mm [±0.005mm]
Lost motion	0.1mm or less
Base	Material: Aluminum, White Anodized
Static allowable moment	Ma direction: 642 N·m, Mb direction: 642 N·m, Mc direction: 1610 N·m
Dynamic allowable moment Reference rated life 5000km (* 2)	Ma direction: 161 N·m, Mb direction: 161 N·m, Mc direction: 404 N·m
Dynamic allowable moment Reference rated life 10000km (* 2)	Ma direction: 128 N·m, Mb direction: 128 N·m, Mc direction: 321 N·m,
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

• Overhang load length guideline: 650mm or less

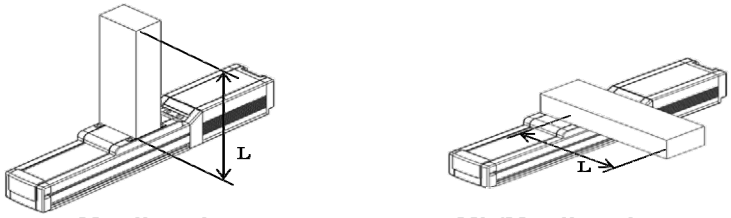
(* 1) Number in brackets [ ] show the specification for high precision type.

(* 2) Lead 5 should be applicable only for 5000km. The running life differs according to operation conditions and mounting status.

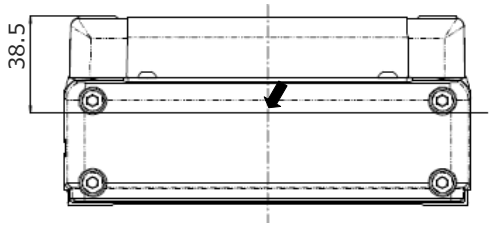
Slider type moment direction



Slider type overhang load length (L = 650mm or less)



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

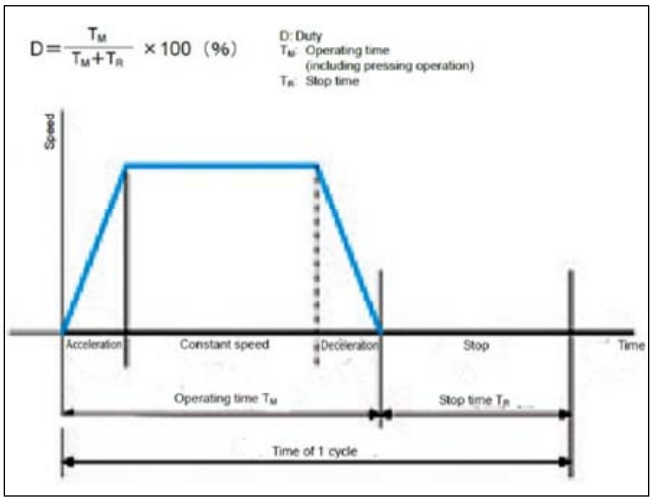


Caution

- If the actuator is used with excessive allowable moment and overhang load, it may not only lead to abnormal noise and vibration but also significantly reduce the life of the actuator.

Duty ratio

The duty ratio is the operating rate, shown in %, of the actuator operating time within one cycle.



As the reference for duty available to use may differ depending on the operation conditions (payload, acceleration / deceleration, etc.), it is necessary to figure out the load factor LF and acceleration / deceleration time ratio t_{od} using the calculation formulae below and find it out from the graph.

1) Figure out the load factor LF using the calculation formulae below.

Maximum payload at the acceleration 0.3G is described in 1.2 Specifications.

[When indicated acceleration / deceleration is at acceleration / deceleration 0.3G or below]

$$\text{Load Factor LF} = \frac{M \times \alpha}{M_r \times 0.3} \text{ [\%]}$$

Max. Payload at Acceleration 0.3G : M_r [kg]
Acceleration / Deceleration 0.3G : 0.3 [G]
Payload during Operation : M [kg]
Acceleration during Operation : α [G]

[When indicated acceleration / deceleration is at acceleration / deceleration 0.3G or above]

$$\text{Load Factor LF} = \frac{M \times \alpha}{M_d \times \alpha} = \frac{M}{M_d} \text{ [\%]}$$

Payload at Indicated Acceleration : M_d [kg]
Payload during Operation : M [kg]
Acceleration during Operation : α [G]

2) Figure out the acceleration / deceleration time ratio t_{od} using the calculation formulae below.

$$\text{Acceleration / Deceleration Time Ratio } t_{od} = \frac{\text{Acceleration Time during Operation} + \text{Deceleration Time during Operation}}{\text{Duration of Operation}} \text{ [\%]}$$

$$\text{Acceleration Time} = \frac{\text{Velocity during Operation [mm/s]}}{\text{Acceleration during Operation [mm/s}^2\text{]}} \text{ [sec]}$$

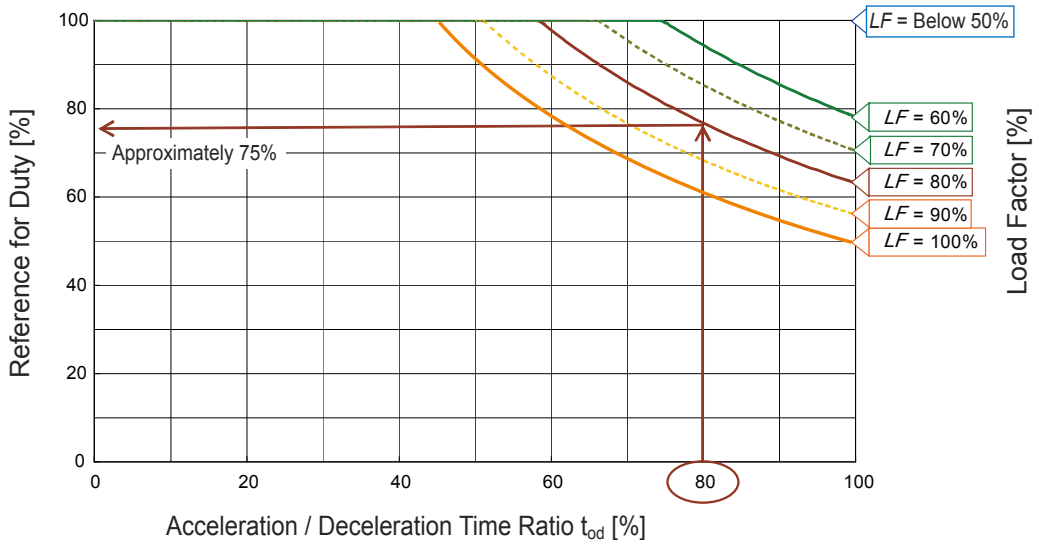
$$\text{Deceleration Time} = \frac{\text{Velocity during Operation [mm/s]}}{\text{Deceleration during Operation [mm/s}^2\text{]}} \text{ [sec]}$$

Acceleration [mm/s^2] = Acceleration [G]×9,800mm/s^2

Deceleration [mm/s^2] = Deceleration [G]×9,800mm/s^2

3) Read a reference for duty with the figured out "Load Factor" and "Acceleration / Deceleration Time Ratio".

e.g.) The reference for duty when the load factor LF is 80% and the acceleration / deceleration time ratio t_{od} is 80% should be approximately 75%.



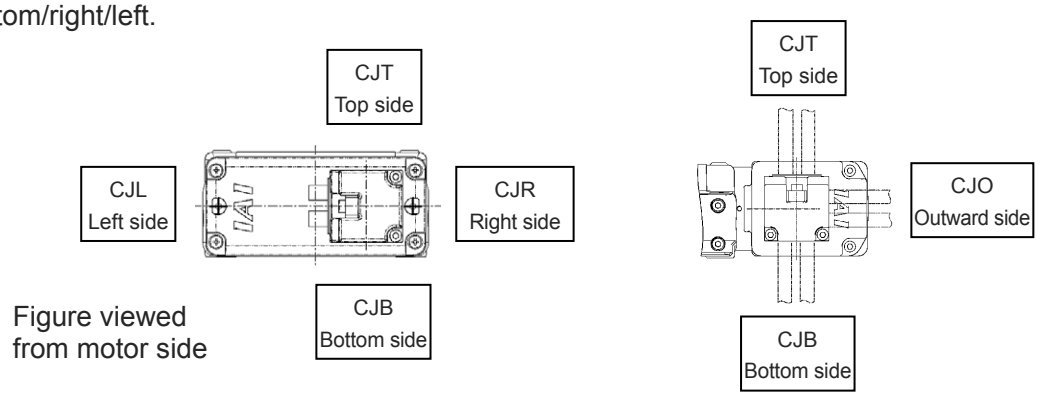
1.3 Options

With brake (Model Code: B)

This is used to prevent the slider from moving during power outages or when the servo is OFF.
It can also be used to prevent the slider from falling when mounted vertically.

Cable exit direction changed (Model Code: CJT, CJR, CJL, CJB and CJO)

The orientation of the motor / encoder cable to be installed on the actuator unit can be changed to top/bottom/right/left.



Motor straight type　　Motor reversing type

High precision specifications (Model Code: HPR)

Standard positioning repeatability is ± 0.01mm. When this option is specified, positioning repeatability will become ± 0.005mm. It should be available to order only for lead length 20mm or less.

Motor reversed direction (Model Code: ML and MR)

It is the code to indicate the direction of motor reversed when selecting the motor reversed type.
ML shows reversed to left and MR to right.

Home reverse specification (Model Code: NM)

The standard home position is on the motor side.
However, the opposite side specification is selected if the home position direction is reversed in accordance with equipment layout or assembly direction.

Slider roller specification (Model Code: SR)

The structure of the slider in the standard type can be changed to the roller structure same as the one in the cleanroom type.
If it gets chosen to have the slider roller type, the appearance and dimensions of the slider cover should become the same as the cleanroom type.

Vacuum joint attachment opposite type (Model Code: VR)

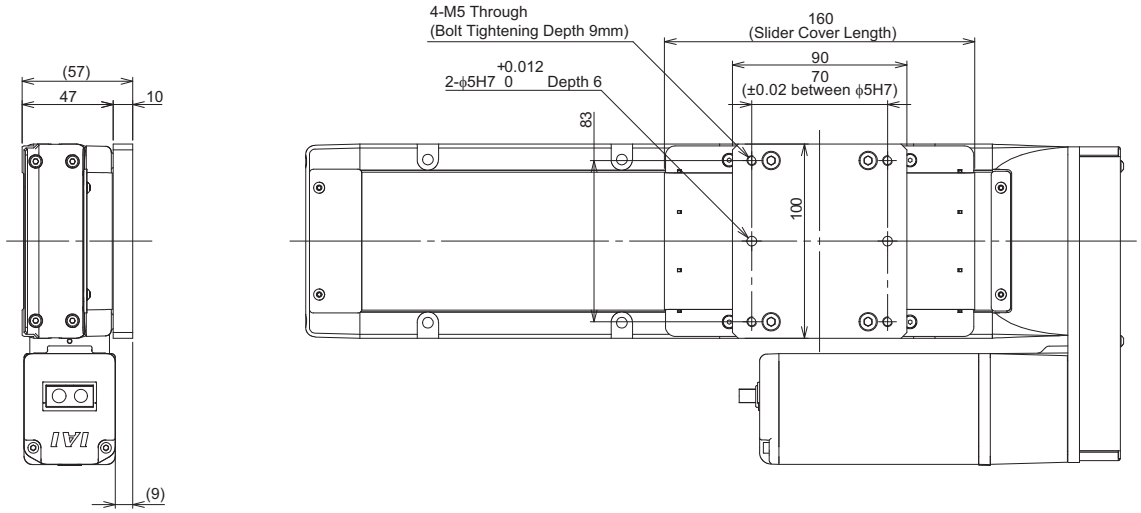
The vacuum joint should be attached on the left of the main unit in the view from the motor end in standard, which can be changed to the right (opposite) in option.

Slider spacer (Model Code: SS)

It is a spacer to set the top of the slider higher than the top of the motor cover.

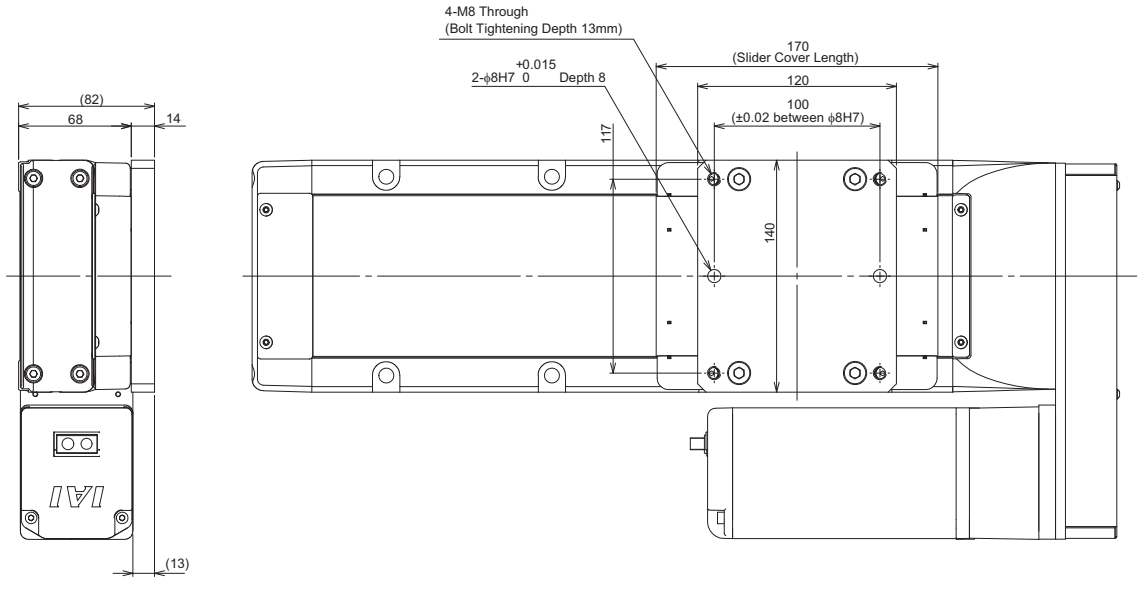
WSA10R

Model number of single product: RCS4-SS-WSA10



WSA14R

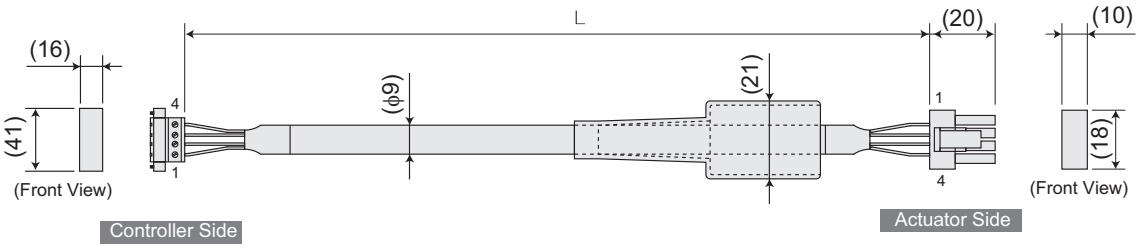
Model number of single product: RCS4-SS-WSA14



1.4 Accessories

Motor cable

Model Code: CB-RCC-MA□□□ / CB-RCC-MA□□□-RB



Minimum bending radius r = 51mm or more (for movable use)
* It is only robot cable available to use inside the cable track

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

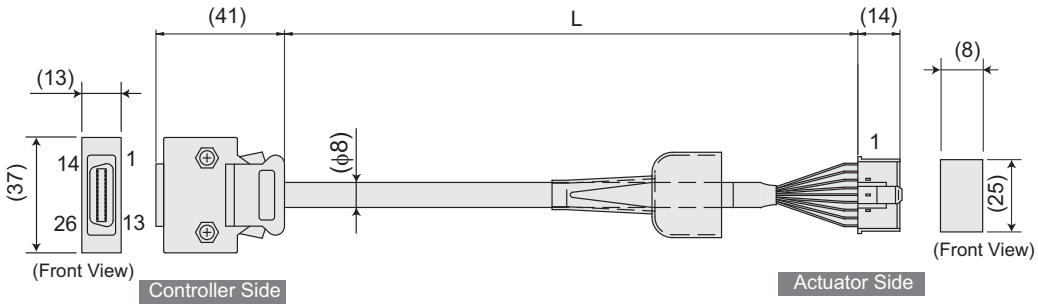
No.	Signal	Color	Wire Size
1	U	Red	0.75sq (Crimped)
2	V	White	
3	W	Black	
4	PE	Green	

- The cable length is available from 1m to 20m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

  Cable length **1**m → CB-RCC-MA**010** (-RB)
  Cable length **3**m → CB-RCC-MA**030** (-RB)
  Cable length **10**m → CB-RCC-MA**100** (-RB)

Encoder cable

Model code: CB-X1-PA□□□



Minimum bending radius r = 44mm or more (for movable use)
*Robot cable is standard for this model.

Wire Size	Color	Signal	No.
AWG26 (Soldered)	—	—	10
	—	—	11
	—	E24V	12
	—	OV	13
	—	LS	26
	—	CREEP	25
	—	OT	24
	—	RSV	23
	—	—	9
	—	—	18
	—	—	19
	—	A+	1
	—	A−	2
	—	B+	3
	—	B−	4
	—	Z+	5
	—	Z−	6
	Orange	SRD+	7
	Green	SRD−	8
	Purple	BAT+	14
	Gray	BAT−	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR−	20
	Yellow	BKR+	21
	—	—	22
Clamp the shield to the hood.			

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

Ground wire or braided shield wire

- The cable length is available from 1m to 20m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

  Cable length **1**m → CB-X1-PA**010**
  Cable length **3**m → CB-X1-PA**030**
  Cable length **10**m → CB-X1-PA**100**

ROBO Cylinder

Chapter 2

Installation

2.1 Precautions for transportation

[Handling the package]

- Do not damage or drop the package.
  The package is not specially designed to withstand dropping or shock due to collision.
- Keep the unit in horizontal orientation for stationary positioning or transportation.
- Do not climb onto the package.
- Do not put anything that could deform the package on it.

[Handling after unpacking]

- Hold the base part when you carry the unit.
- Do not carry the unit by its motor cover or stainless steel sheet.
- Do not damage or drop the package during transportation.
- Do not apply excessive force to any part

→ For the names of each part, refer to “Names of the Parts” on page Intro-12 and 13.

[Handling when assembled into machinery (system)]

- Secure sliders to prevent sudden movement during transport.
- If the body or any moving part is overhanging, fix it appropriately to avoid large wobbles due to external vibration. When transporting without fixing the tip, do not apply impact of 0.3G or more.
- When suspending machinery (system) with ropes, be careful not to catch the rope on the body or cable.

2.2 Installation and storage/preservation environment

Usage is possible in environments of pollution degree 2 or equivalent.

Pollution degree 2: Environment in which generally only nonconductive pollution occurs, but temporary conductive pollution may occur due to condensation (IEC 60664-1)

Installation environment

Avoid the following locations for installation.

In general, the installation environment should be one in which an operator can work without protective gear.

- Where the unit 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 unit receives direct sunlight
- Where the unit is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of dust, salt or iron (at levels exceeding those typical of an assembly plant)
- Where the unit is subject to splashed water or oil (including oil mist or cutting fluid) or chemical solutions
- Where the body receives impact or vibration
- Where the altitude is more than 2000m

Also, provide sufficient work space for the following maintenance and inspection:

- Space to replenish grease
- Space to replace the motor

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

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

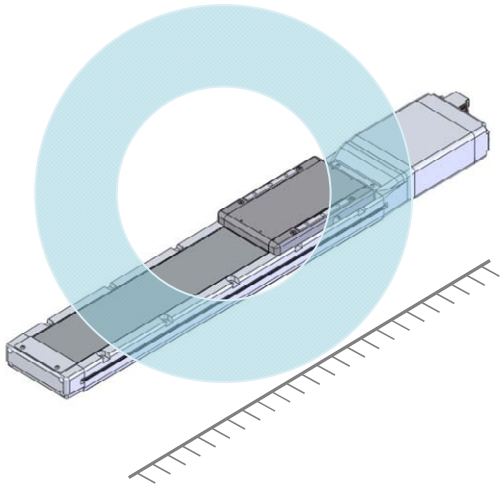
Storage/preservation environment

- For the storage and preservation environment, see the installation environment.
  However, give especial consideration to the prevention of condensation during long-term storage/preservation.
- Unless especially specified, desiccant is not included in the package at shipping.
  If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures.
- For short-term storage, it can be stored at 60°C or below.
  For storage of one month or more, make sure that the temperature does not exceed 50°C.
- The product should be placed horizontally for storage and preservation.
  If storing in the packaged condition, observe the conditions, if any, regarding storage orientation.

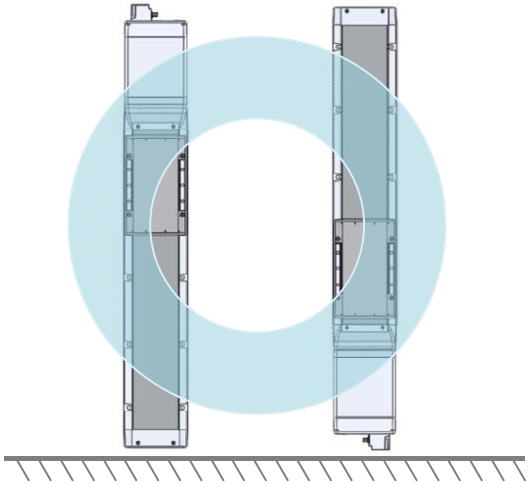
2.3 Installation

Mounting orientation Type: RCS4 - WSA10/WSA12/WSA14/WSA16

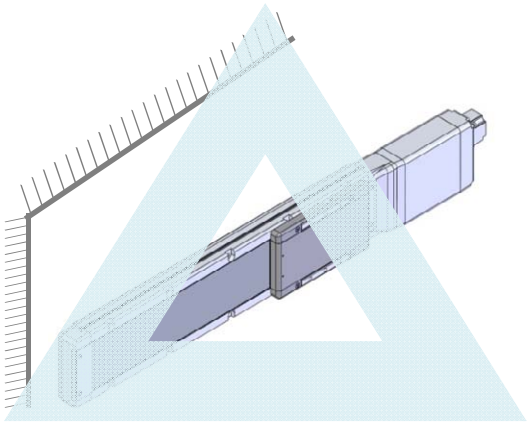
Horizontal installation



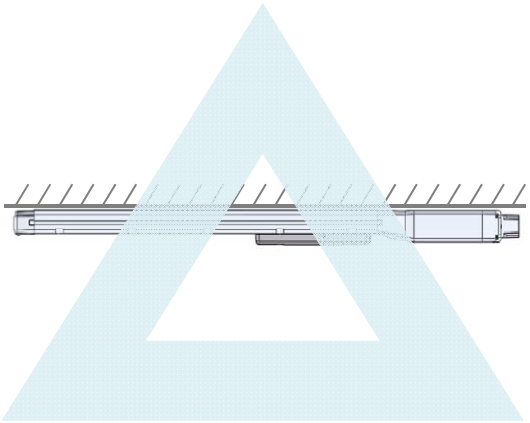
Vertical installation



Lateral installation



Ceiling mount installation



Caution

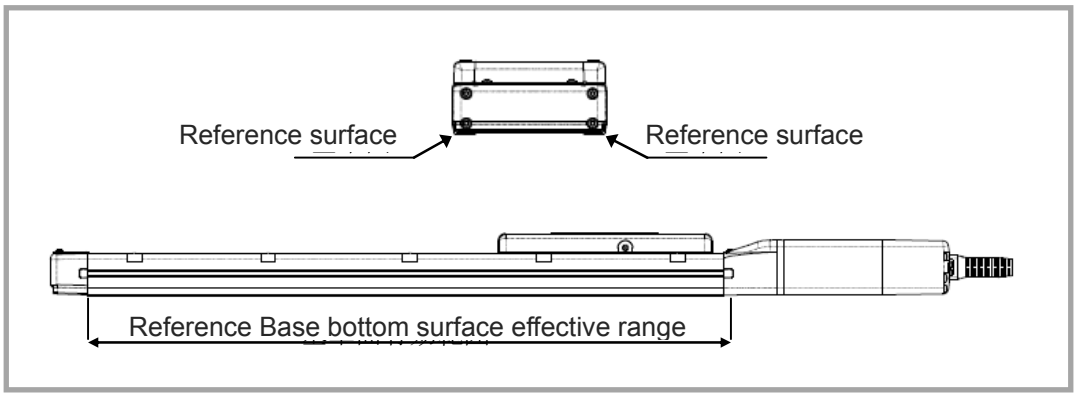
- When installing the unit vertically, keep the motor on top to the greatest extent possible.
- If the motor is installed on the bottom, the grease may separate due to long-term disuse, causing the base oil to flow into the motor part. The controller and motor/encoder may break down due to the entry of the base oil.

Precautions regarding stainless steel sheet

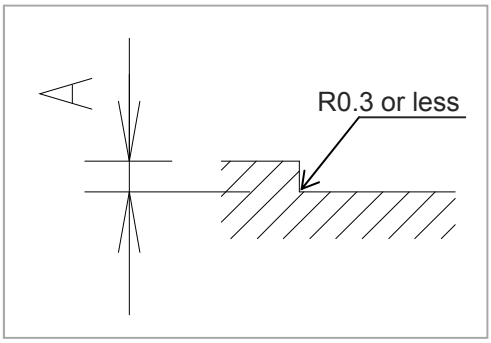
- During installation and transport, do not grasp or press on the stainless steel sheet. Otherwise, this may lead to stainless steel sheet damage.
- Although lateral or ceiling installation is possible, it may cause slackness or misalignment of the stainless steel sheet.
  Continued usage in this orientation may lead to damage to the stainless steel sheet.
- Adjust the stainless steel sheet if slackness or misalignment occurs.
- Keep adhesive, paint, and other viscous material off the stainless steel sheet. Such material adhering to the stainless steel sheet can lead to defective slider operation or sheet damage. Avoid installation in environments of this kind, or take safety measures to prevent adhesion.

Installation surface

- The body mounting surface should be a machined surface or a plane with similar accuracy, with flatness within 0.05mm/m.
- The mounting frame should have a structure rigid enough to prevent the generation of vibration, etc.
- Also consider the necessary space for maintenance work such as actuator replacement and inspection.
- The bottom surface and both side surfaces of the body base serve as the reference surfaces for slider running accuracy.
  Use these surfaces as the reference surfaces for mounting when running accuracy is required.



When mounting using the side reference surface, machine the installation surface according to the figure below.

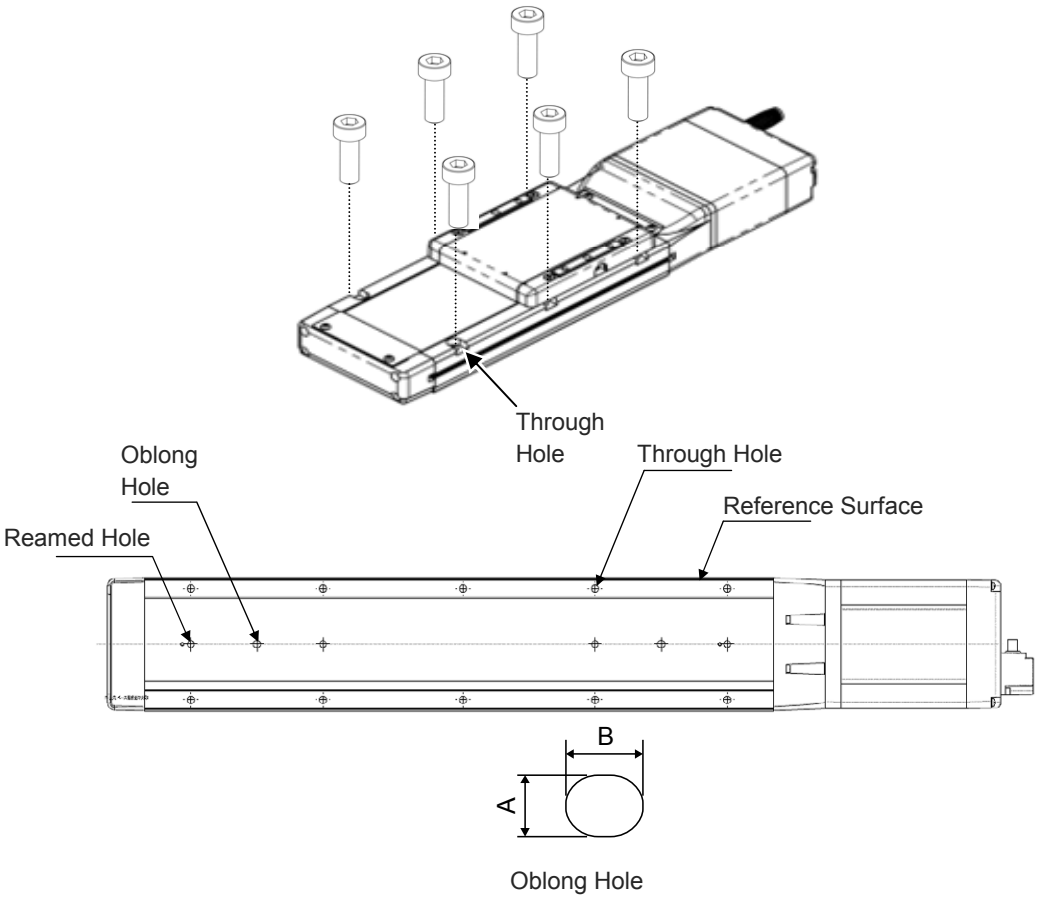


A dimension	
WSA10, WSA12, WSA14, WSA16	3 to 5mm

Body mounting

[Using the Tapped Holes on the Top of the Base]

This actuator has the tapped holes for mounting so it can be fixed from the top of the base.
There are reamed holes and oblong holes for positioning pins.
(Note) In the case of Strokes 50 and 100, oblong holes are not provided.



Apply the socket head cap screw indicated in the table below suitable for the platform material.

Model Name	Through Hole	Mounting Bolt	Tightening Torque
WSA10C **WSA10R**	ϕ5.5 Through, ϕ11 counterbore	M5	3.42N·m (0.35kgf·m)
WSA12C **WSA12R**	ϕ6.6 Through, ϕ12.5 counterbore	M6	5.36N·m (0.55kgf·m)
WSA14C **WSA14R**	ϕ9 Through, ϕ16.5 counterbore	M8	11.48N·m (1.17kgf·m)
WSA16C **WSA16R**	ϕ9 Through, ϕ16.5 counterbore	M8	11.48N·m (1.17kgf·m)

Model Name	Reamed Hole	Oblong Hole
WSA10C **WSA10R**	ϕ5H7 Depth 5	A: $5\,^{+0.012}_{0}$ B: 6 Depth 5mm or less
WSA12C **WSA12R**	ϕ6H7 Depth 6	A: $6\,^{+0.012}_{0}$ B: 7 Depth 6mm or less
WSA14C **WSA14R**	ϕ8H7 Depth 9	A: $8\,^{+0.015}_{0}$ B: 9 Depth 9mm or less
WSA16C **WSA16R**	ϕ8H7 Depth 9	A: $8\,^{+0.015}_{0}$ B: 9 Depth 9mm or less

Caution

Attempt not to drop the bolts, tools, etc. on the stainless steel sheet when tightening the bolts. Please avoid making a dent mark or scratches.

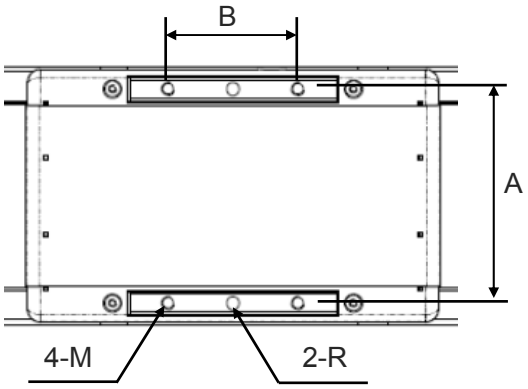
Notice

- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Make sure the internal thread and bolt effective engagement length is approximately 1.8 times the nominal diameter or more.

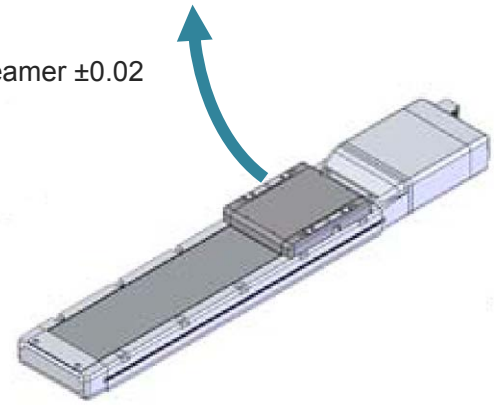
Mounting transported objects

[For WSA10C/R, WSA12C/R and WSA14C/R]

- Use the tapped mounting holes on the top surface of the slider to fix transported objects.
- There are 2 reamed holes on the top surface of the slider.
  Use these reamed holes if repeated attaching and detaching is required.
- If fine-tuning of perpendicularity, etc. is required, use one of the reamed holes for this adjustment.
- Refer to the figure below for the screw-in depth and reamed hole depth.



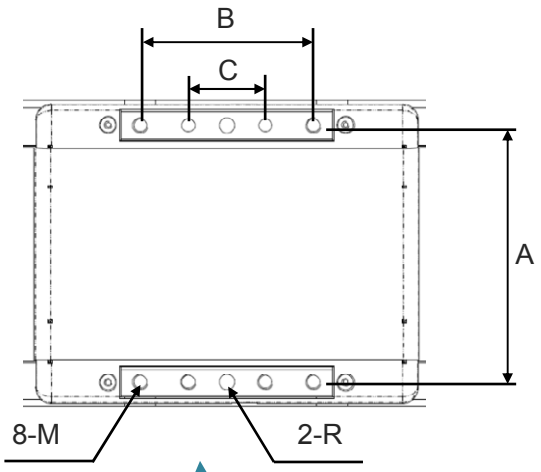
Pitch tolerance from reamer ±0.02



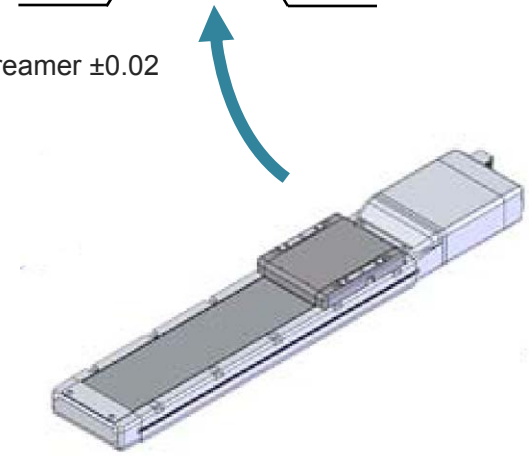
Model Name	A	B	Reamed Hole	Tapped Hole M	Mounting Bolt	
					Bolt Nominal Diameter	Tightening Torque
WSA10C, WSA10R	83	50	ϕ5H7 Depth 5	M5 Depth 14	M5	3.42N·m (0.35kgf·m)
WSA12C, WSA12R	101	50	ϕ6H7 Depth 6	M6 Depth 18	M6	5.36N·m (0.55kgf·m)
WSA14C, WSA14R	117	70	ϕ8H7 Depth 8	M8 Depth 22	M8	11.5N·m (1.17kgf·m)

[For WSA16C/R]

- Use the tapped mounting holes on the top surface of the slider to fix transported objects.
- There are 2 reamed holes on the top surface of the slider.
  Use these reamed holes if repeated attaching and detaching is required.
- If fine-tuning of perpendicularity, etc. is required, use one of the reamed holes for this adjustment.
- Refer to the figure below for the screw-in depth and reamed hole depth.



Pitch tolerance from reamer ±0.02



Model Name	A	B	C	Reamed Hole	Tapped Hole M	Mounting Bolt	
						Bolt Nominal Diameter	Tightening Torque
WSA16C, WSA16R	134	90	40	ϕ8H7 Depth 8	M8 Depth 24.5	M8	11.5N·m (1.17kgf·m)

Caution

- Be careful with regard to the length of the mounting bolt and positioning pin.
- The use of screw-in depth greater than that of the tapped or reamed mounting holes may damage the tapped hole or reduce the mounting strength of the transported object, leading to decreased accuracy or unexpected accidents.

Notice

- The mounting bolts are to be prepared by the customer.
- The use of high-strength bolts of ISO-10.9 or higher is recommended.

About Suction of the CleanroomType

● Cleanroom type actuators are able to exert performance corresponding to cleanroom class 10 (0.1μm, Fed.Std.209D) and class 2.5 equivalent (ISO 14644-1) by aspirating air from the vacuum joint. The guidelines of the suction amounts for the rated speeds of each model are shown in the following table.

[Suction amount guideline]

Model Number	Lead [mm]	Suction Amount Nl/min (L/min)
WSA10C	16	115 (124)
	10	70 (76)
	5	50 (54)
	2.5	35 (38)
WSA12C	20	140 (151)
	12	90 (97)
	6	60 (65)
	3	50 (54)
WSA14C	24	140 (151)
	16	110 (119)
	8	80 (86)
	4	75 (81)
WSA16C	20	130 (140)
	10	90 (97)
	5	85 (92)

Notice

● Please perform suction of air from the two vacuum joints located on the sides of the actuator according to the suction amounts (total amount of the two locations) shown in the table below. Also, please manage the joints so that the suction amounts of the two locations are equivalent.

● Please use the actuator in a state in which all of the base attachment holes on the bottom of the actuator are covered. When there is a hole that passes through the actuator, the level of cleanliness decreases.

ROBO Cylinder

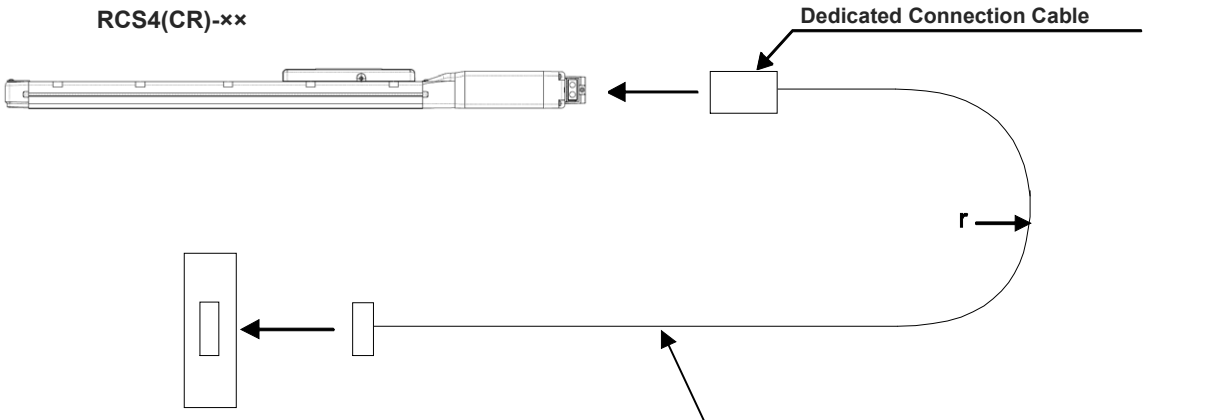
Chapter 3

Connecting with the Controller

3.1 Connecting with the Controller

As the connection cable for the controller and the actuator, use the IAI-dedicated connection cable. Please consult with IAI if you require a different kind of cable than the one supplied.

- 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.



Dedicated Cable
• Motor Cable: CB-RCC-MA□□□
• Motor Robot Cable: CB-RCC-MA□□□-RB
• Encoder Robot Cable: CB-X1-PA□□□
*** □□□ represents the cable length. The longest corresponds to 20m.**
e.g.) 080 = 8m

Caution

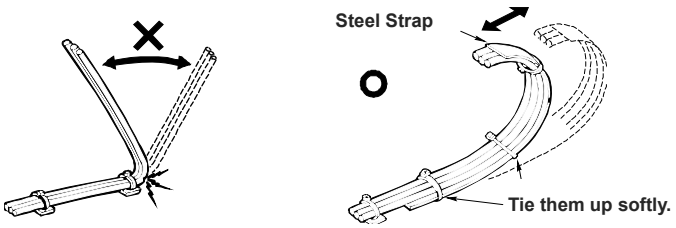
- For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, or an operation error, but also electric shock or electric leakage, or may even cause a fire.
- Use dedicated cables of IAI indicated in this instruction manual. Contact us if you wish to have a change to the specifications of the dedicated cables.
- Make sure to turn the power off in the process of power line or cable connection or disconnection.

  Do not attempt to cut a dedicated cable with connectors on both ends to extend, shorten or re-joint it.
- Hold the dedicated cable to avoid mechanical force being applied to the terminals and connectors.

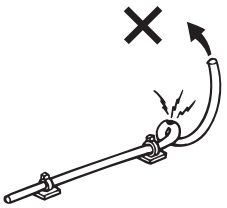
  Use a cable pipe or duct to have an appropriate protection when there is a possibility of mechanical damage on a dedicated cable.
- In case a dedicated cable is to be used at a moving part, make sure to lay out the cable without applying any force to pull the connector or extreme bend on the cable. Do not attempt to use the cable with a bending radius below the allowable value.
- Make certain that the connectors are plugged properly. Insufficient connection may cause an operation error, thus it is extremely risky.
- Do not lay out the cables to where the machine runs over them.
- Pay attention to the cable layout so it would not hit peripherals during an operation. In case it does, have an appropriate protection such as a cable track.
- When a cable is used hanging on the ceiling, prevent an environment that the cable swings with acceleration or wind velocity.
- Make sure there is not too much friction inside the cable storage equipment.
- Do not apply radiated heat to power line or cables.

Caution

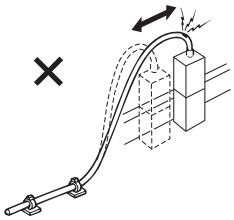
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.



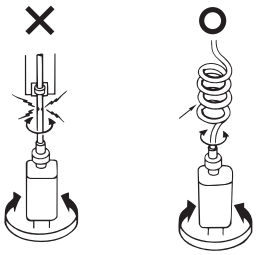
- Do not let the cable bend, kink or twist.



- Do not pull the cable with a strong force.

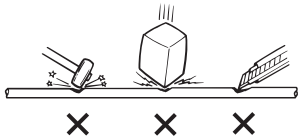


- Pay attention not to concentrate the twisting force to one point on a cable.

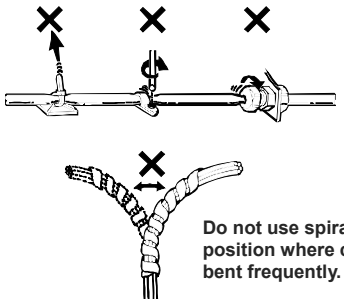


Caution

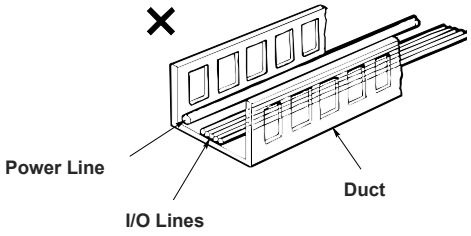
- Do not pinch, drop a heavy object onto or cut the cable.



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



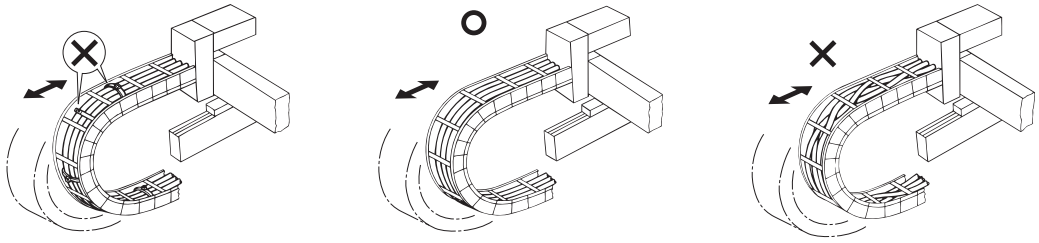
- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



Caution

Follow the instructions below when using a cable track.

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



ROBO Cylinder

Chapter 4

Maintenance and Inspection

4.1 Precautions for maintenance and inspection work

Make sure to read the following precautions before conducting any maintenance or inspection work.

Caution

- Do not climb on or put anything on the actuator.
  Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life.
- Before releasing the brake, make sure to check there is nothing that will interfere with moving parts within the operation range.
- The slider may fall, possibly injuring the operator or people nearby and damaging the actuator, workpiece or equipment.

Caution

- Check that the power to the actuator is OFF before conducting any maintenance or inspections.
- Be careful not to lose the cover or any removed screws.
  Be sure to return the product to the original condition after maintenance and inspection work.
  Mounting in an incomplete state may cause injuries or damage to the product.
- Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion under any circumstances.

Caution

The grease film may run out if the actuator performs return operation continuously over a distance of 30mm or less. As a guideline, every 5,000 to 10,000 cycles, have approximately 5 cycles of return operation over a 50mm distance or more to regenerate the oil film.
The ball screw or guide may be damaged if the oil film runs out.

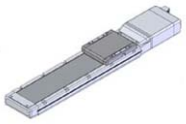
Notice

- First, be sure to wipe off the old grease, and then supply new grease.
- The degradation speed of grease may differ depending on the operating environment (temperature, humidity and ambient atmosphere).
  It is recommended to shorten the grease supply period if the actuator is used under poor environmental conditions such as high temperatures, high humidity or dusty atmospheres.
- Also, it is recommended to improve the environmental conditions in case the grease changes color notably due to poor operating conditions.
- Base oil may separate from the grease due to the mounting orientation or operating conditions.
  Base oil may also leak from the inside of the actuator to the exterior through gaps.
  Check visually for oil drips when supplying grease.
- An actuator stored for 6 months or more may suffer from grease degradation.
  Supply grease before the start of use.
  → For details, refer to “4.5 Greasing method”.

4.2 Inspection items and schedule

Follow the maintenance inspection schedule below.
It is assumed that the equipment is operating 8 hours per day.
If the equipment is running continuously night and day or otherwise running at a high operating rate, inspect more often as needed.

Wide Slider type



* Stainless steel sheet life guideline: 5,000km

Inspection period	External inspection	Internal inspection	Greasing
			Ball screw
Start of work inspection	○	-	-
1-month inspection	○	-	-
3-month inspection	-	-	○
3-month inspection on	-	-	Grease supply timing (Guideline) dependent
6-month inspection	○	○	
Every 6 months thereafter	○	○	

Grease supply timing (Guideline)

Maximum operating speed [mm/s]	Grease supply timing (Guideline)	
	Operation distance	Months
0 to 750 or less	1,250km	12 months
750 to 1500 or less	2,500km	
1500 to 1800	5,000km	

4.3 Visual inspection items

Refer to “4.6 How to replace components” for detailed information about specific component replacement and adjustment methods.

External visual inspection

Inspection items	Maintenance work
Is abnormal noise or vibration generated?	Take an action by referring to “Troubleshooting in Controller Instruction Manual”.
Are actuator mounting bolts loose?	Tighten them further.
Is the cable scratched?	Replace if the damage is severe.
Is the connector loose?	Re-insert correctly.
Is grease dripping out? (especially if vertically mounted)	Clean up any drips. Replenish the grease.
Is the stainless steel sheet scratched?	Replace the stainless steel sheet.
Is the stainless steel sheet misaligned or slack?	Adjust the alignment and hang.

Refer to “4.6 How to replace components” for detailed information about specific component replacement and adjustment methods.

Internal visual inspection

Inspection items	Maintenance work
Is play or dust generated?	The ball screw guide may be damaged. Contact IAI.
Has foreign matter penetrated inside?	Remove the foreign matter, clean, and inspect the interior for any damage.
Is the ball screw or guide grease not lubricating well? (Even if the grease is brown, lubrication is adequate if the running surface is shiny)	Wipe away the old grease, then replenish with new grease.
Is dust or foreign matter adhered to the ball screw or guide?	Replenish with new grease after cleaning.

Internal inspection method

1) Move the slider to the motor side.
2) Remove the screws on the sheet retainer with using a hex wrench.
3) Pick up the sheet to have an inspection and clean it up if necessary.
4) After finishing the inspection, build it up in the back order.

Caution

- Do not damage the stainless steel sheet by bending it forcefully during internal inspection.
  Do not tug on the stainless steel sheet or in any way attempt to reposition it.
  Change in the attached condition may cause the sheet to be mounted unevenly or impact the product life.
  Keep in mind that the edges of the stainless steel sheet can cause injuries. Always wear gloves when working on it.

4.4 Cleaning

External cleaning

- Clean exterior surfaces as necessary.
- Use a soft cloth to wipe away dirt and buildup.
- Do not blow too hard with compressed air, as it may cause dust to get in through gaps.
- Do not use petroleum-based solvents as they can harm resin and painted surfaces.
- To remove severe buildup, wipe gently with a soft cloth soaked in a neutral detergent or alcohol.

Internal cleaning

- Use a soft cloth to wipe away dirt and buildup.
- Do not blow too hard with compressed air, as it may cause dust to get in through gaps.
- Do not use petroleum-based solvents, neutral detergent or alcohol.

4.5 Greasing method

[1] Grease used: Use an equivalent product

◎ Standard Type: Except for Lead 30 in WSA12 and Lead 36 in WSA14

Application location	**During maintenance** (recommended product)	Default (reference)
Ball screw	Kyodo Yushi/Multemp PS No.2	Kyodo Yushi/Multemp PS No.2
Guide		

Caution

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

◎ Standard Type: Lead 30 in WSA12 and Lead 36 in WSA14

Application location	**During maintenance** (recommended product)	Default (reference)
Ball screw	Kyodo Yushi/Multemp ET-R No.2	Kyodo Yushi/Multemp ET-R No.2
Guide		

Caution

Never use lithium-based or fluorine-based grease.
Mixing with urea-based grease not only reduces the performance of the grease, it may even cause damage to the actuator.

◎ Cleanroom Type

Application location	**During maintenance** (recommended product)	Default (reference)
Ball screw	Kuroda Precision Industries /C grease	Kuroda Precision Industries /C grease
Guide		

Caution

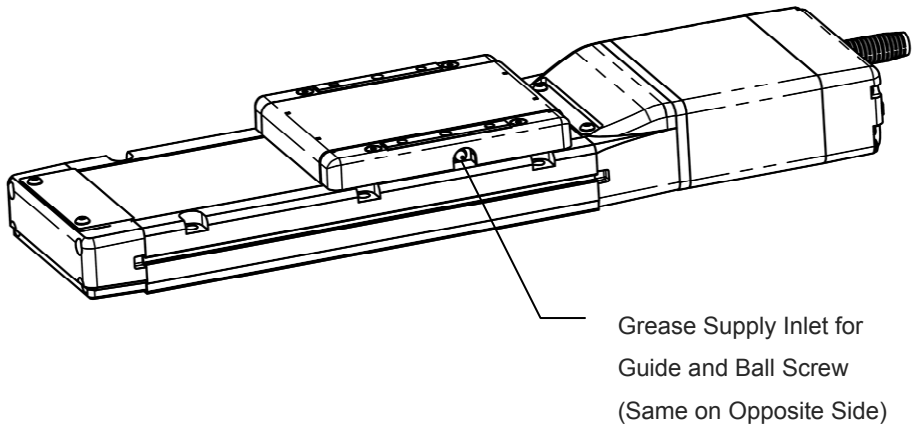
- For grease to be used with an actuator that has a cleanroom setting, please use a type of grease that emits a low amount of dust and is described for cleanroom use.
  When standard grease is used, dust may be emitted.
- Never use lithium-based or fluorine-based grease.
  Mixing with urea-based grease not only reduces the performance of the grease, it may even cause damage to the actuator.

[2] Greasing method: Ball screw/guide (supply to both through grease fitting)

Greasing method

There are grease nipples equipped on the sides of the slider. Conduct grease supply to the guidesand the ball screw on them.
Supply grease on the right side of the motor to the guide on the right side and ball screw.
Supply grease on the left side of the motor to the guide on the left side and ball screw.
(Grease supply to the ball screw can be conducted on both right and left grease nipples.)

1) Supply grease on the right and left grease nipples with using a grease gun.
   Supply grease on one side and it can be supplied to the ball screw.
   For the guides, supply grease on one side will grease up only on one side. It is necessary to supply grease on both right and left sides.



(Note) Make sure to use a grease gun that is applicable for the grease nipple inlet diameter shown below.

Model Name	Grease Nipple Diameter [mm]
WSA10C, WSA10R	ϕ3.5
WSA12C, WSA12R, WSA14C, WSA14R, WSA16C, WSA16R	ϕ6.0

Grease Gun Grease gun of mounting screw R1/8	Supplier
(Example) GC-57K	Yamada Corporation

Nozzle	Supplier
N Type + U Type Dedicated Nozzle N Type  U Type Dedicated Nozzle  ◎ Connect N type to the tip of U type dedicated nozzle, and attach it on the grease gun to use.  N Type U Type Dedicated Nozzle Grease Gun Attachment Screw R1/8	THK

Model	Amount of Grease Supply (Reference): For Each Grease Nipple
WSA10C, WSA10R	1.5cc to 2.0cc
WSA12C, WSA12R	1.5cc to 2.0cc
WSA14C, WSA14R	2.0cc to 2.5cc
WSA16C, WSA16R	3.0cc to 3.5cc

2) Rotate the slider by hand to spread the grease out evenly. It is difficult to move the slider by hand for low lead actuators. Do not attempt to move it forcefully, and connect a controller and move it with JOG operation.
Confirm that the ball feeding surfaces of the ball screw and the guides look glossy with grease oil. Supply grease again in case the grease is not spread enough.

3) Wipe off excess grease.

Caution

- Supplying too much grease may increase sliding resistance and load to the motor, resulting in a drop of performance.
  Also, excess grease on the ball screw may be splashed around in the ambience.
- Do not damage the stainless steel sheet by bending it forcefully during work.
- Keep in mind that the edges of the stainless steel sheet can cause injuries. Always wear gloves when working on it.
- The front bracket is supporting the ball screw. Do not detach it.
  If the front bracket loses its tuned condition, it may cause an increase of driving resistance, shortened life of each component or abnormal noise due to the center of the axis being off the right position.
- In case the grease got into your eye, wash it with clean water for 15 minutes and immediately go see the doctor to get appropriate care.
- After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease OFF.

4.6 How to replace components

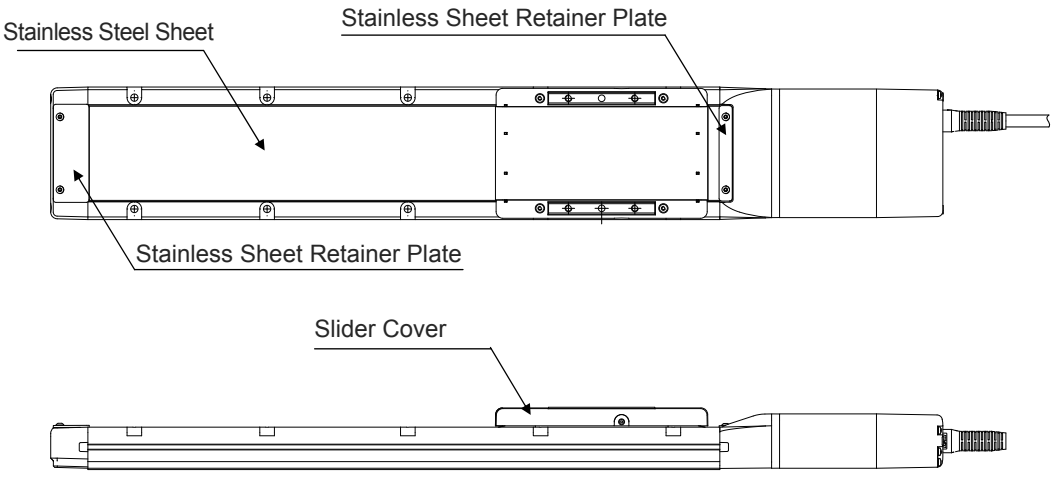
Stainless steel sheet replacement/adjustment

Preparation

(1) Items required for replacing the stainless steel sheet

- Replacement stainless steel sheet
- Hex wrench 2mm (WSA10C/10R),
  2.5mm (WSA12C/12R, WSA14C/14R and WSA16C/16R)
- Scale

Names of the Parts



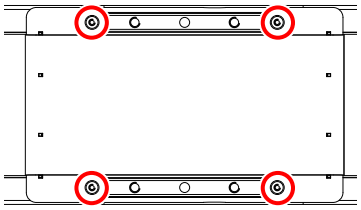
Caution

Degradation and wear-out of the stainless steel sheet relies on its tension of attachment. If the stainless steel sheet is pulled with a huge force and the gap between the sheet and the slider cover is large, there is a risk of metal fatigue.
If the tensile strength is too low, the stainless steel sheet would interfere with the back side of the slider cover and make dust to be generated.

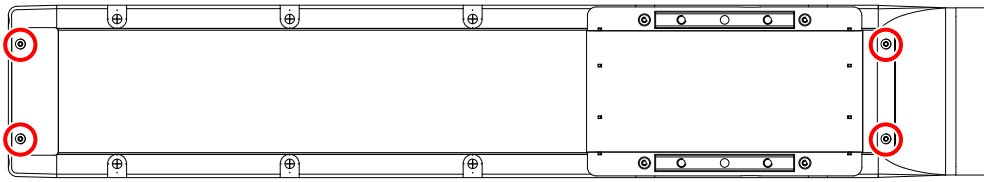
Stainless steel sheet replacement

1) Move the slider to the middle of the actuator.

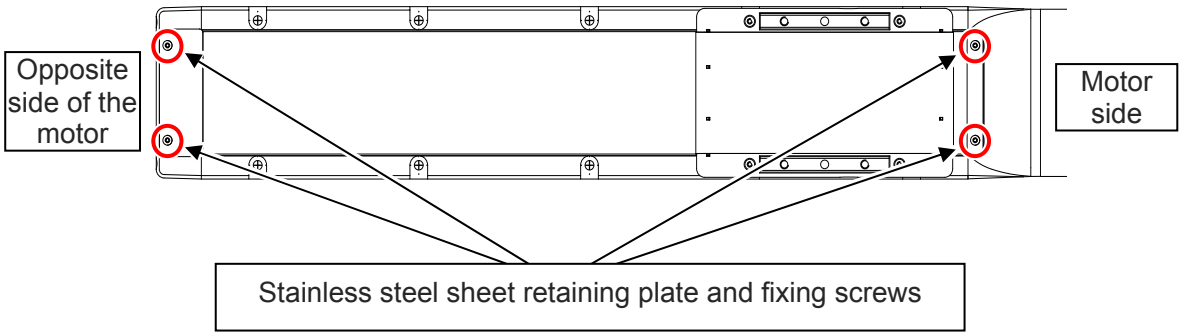
2) Remove the hex socket button head bolts on the slider cover with using a 2mm-sized (for WSA10C/10R) or 2.5mm-sized (for WSA12C/12R, WSA14C/14R and WSA16C/16R) hex wrench.



3) Remove the two hex socket button head bolts on each of left and right sides with using a 2mm-sized (for WSA10C/10R) or 2.5mm-sized (for WSA12C/12R, WSA14C/14R and WSA16C/16R) hex wrench, and detach the retainer plate and the old stainless steel sheet.

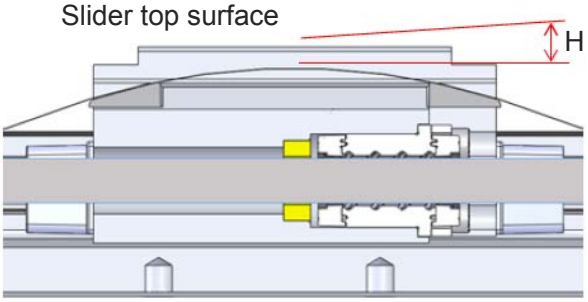


4) Affix a new stainless steel sheet and the retainer plate with hex socket button head bolts. At this time, fix only on the motor end and keep the side opposite the motor end loose.



5) Adjust the tension of the stainless steel sheet by pulling the stainless steel sheet back and forth.
Adjust the tension of the stainless steel sheet to have the distance between the peak of the sheet and the top surface of the slider as shown in the table below, and temporarily tighten the screws on the side opposite the motor end which were still loose so the stainless steel sheet would not move.

Distance from slider top surface to peak of stainless steel sheet (H)

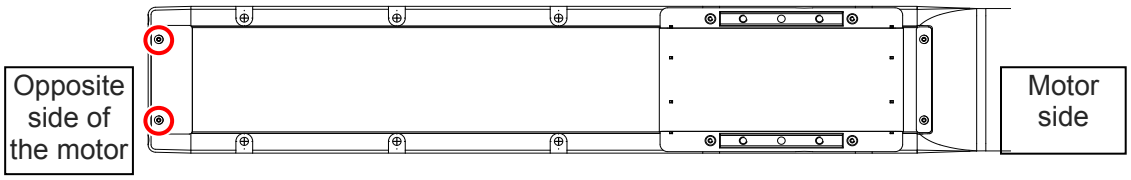


Distance between Peak of Stainless Steel Sheet and Slider Top Surface

Type		H [mm]
Standard type	WSA10C, WSA10R	3.7±0.3
	WSA12C, WSA12R	4.4±0.3
	WSA14C, WSA14R	4.1±0.3
	WSA16C, WSA16R	3.9±0.3

6) Confirm that there is no contact of the stainless steel sheet to the slider by moving the slider several times in the whole stroke range while also checking the tension of the sheet.
In case the slider cannot be moved by hand for such as low lead type or brake-equipped type, turn on the power to the controller and move the slider at approximately 20mm/s of speed with using a teaching pendant or PC software.

7) Once it is confirmed that gap is secured and no contact to the slider, tighten the two screws on the side that they were loosened in turns, and give finish-tightening with even torque at last to affix the stainless steel sheet. Unevenness in screw tightening could make the sheet winded or popped up.



Model	Tightening Torque
WSA10C, WSA10R	73.7N·cm
WSA12C, WSA12R WSA14C, WSA14R WSA16C, WSA16R	191N·cm

Caution

- Make sure that there is no misalignment or slack in the stainless steel sheet. This may lead to damage to the stainless steel sheet.
- When installing the sheet clamp, do not apply excessive force to the stainless steel sheet.

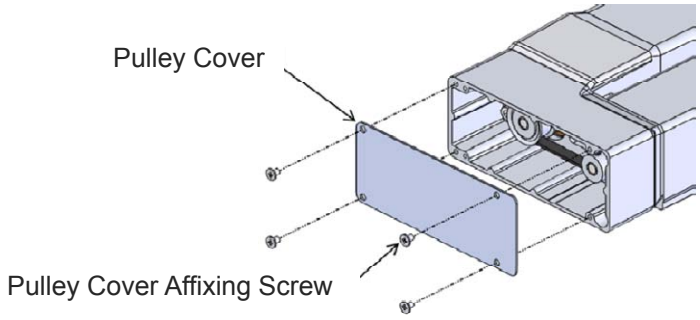
Notice

- As a guideline, the stainless steel sheet should last for about 5,000km of motion. However, depending on the usage or environment, replace the stainless steel sheet appropriately.
- Stainless steel sheet replacement can be performed by the customer. However, if you have any concerns regarding the work, we recommend that you bring the unit to IAI or have one of our technicians come to your site to perform the replacement.

Belt Replacement and Tuning

[Belt Inspection]

1) Detach the pulley cover affixing screws and take off the pulley cover.



2) Check the condition of the belt visually.

Judgment

- In generally speaking, it possesses bending life of several million times. However, the period of replacement for the belt cannot be clearly defined as the durability of it is impacted so much by the operational conditions.
- The timing belt gets worn away as the time passes, and it is necessary to have replacement at regular intervals with the following conditions as reference.
  - When the gear and belt area show obvious friction
  - When swelling occurs as a result of oil adhesion
  - When damages such as a crack occurs on the belt gear and back side
- For the toothed belt, it is recommended to set the interval of regular replacement cycle when in use under high wire fatigue condition in high acceleration and deceleration because it is difficult to judge the right timing for replacement by checking appearance or looseness of the wires strengthening the belt.

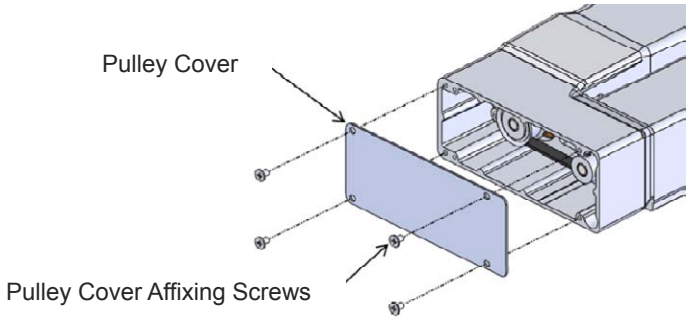
[Belt to Use]

IAI uses the following belt in our plant

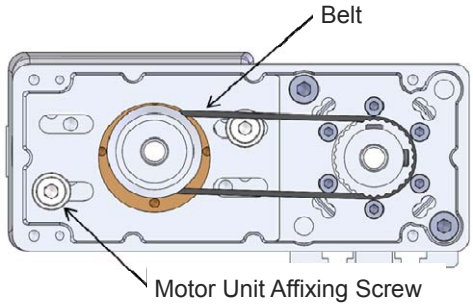
Model	Belt to Use	Supplier
WSA10R	60S2M222R	Bando Chemical Industries, Ltd.
WSA12R	60S3M261GB	Mitsuboshi belting Ltd.
WSA14R	100S3M315GB	Mitsuboshi belting Ltd.
WSA16R	365-EV5GT-15	Gates Unitta Asia Ltd.

[Belt Replacement: WSA10R, WSA12R and WSA14R]

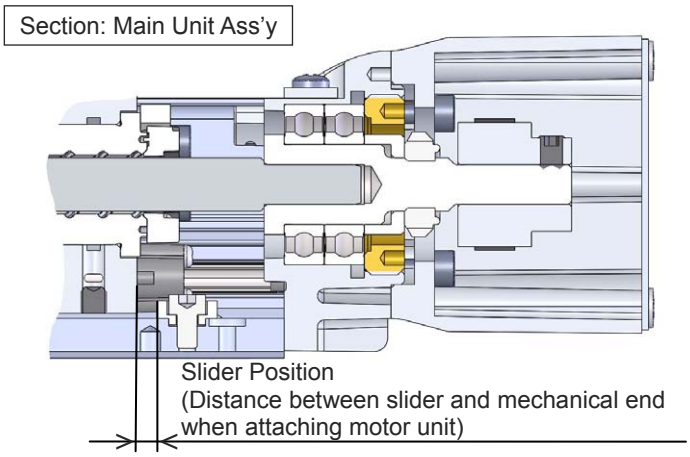
1) Detach the pulley cover affixing screws and take off the pulley cover.



2) Loosen the motor unit affixing screw and take off the belt.



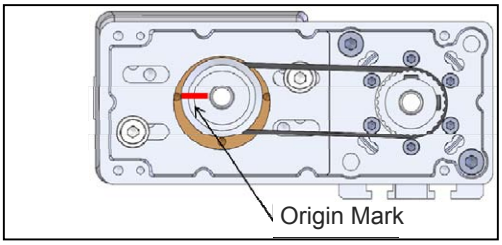
3) Keep the slider at the distance shown in the table below from the mechanical end.



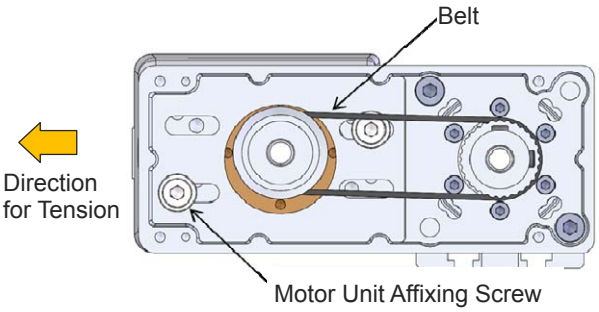
Slider Position

Model	Slider Position [mm]
WSA10R, WSA14R	2
WSA12R	2.5

4) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



5) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



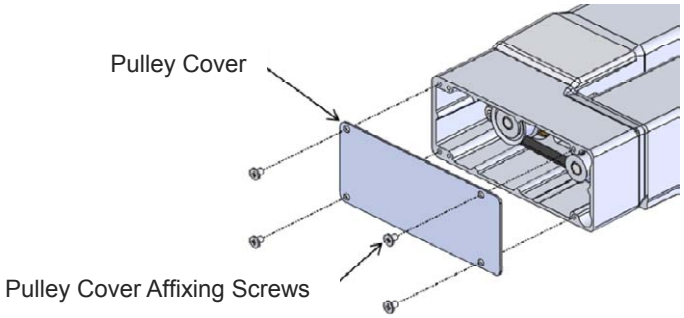
Tensile Force when Attaching Motor Unit

Model	Tension Force [N]
WSA10R	20 to 25
WSA12R	40 to 45
WSA14R	70 to 80

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
WSA10R, WSA12R	2.1
WSA14R	4.1

6) Tighten up the pulley cover with the pulley cover affixing screws in the specified torque.

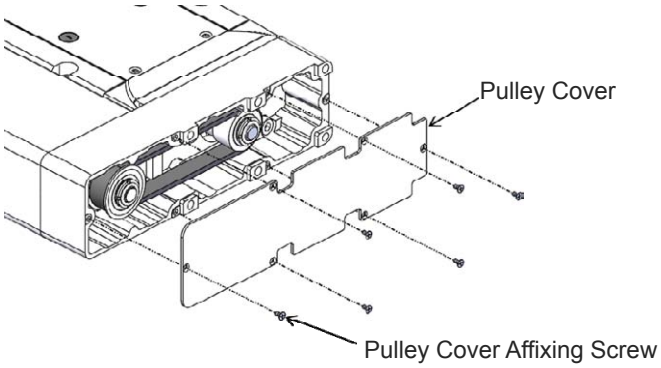


Pulley Cover Affixing Screw Tightening Torque

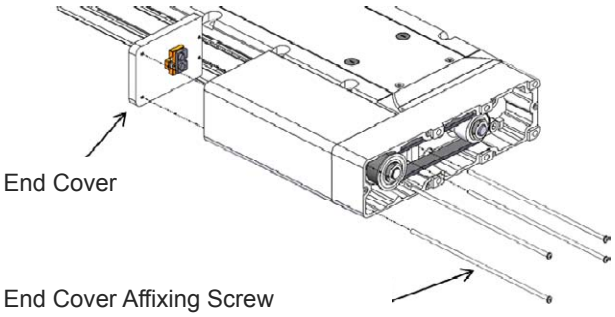
Model	Type of Screws	Tightening Torque [N·m]
WSA10R WSA12R WSA14R	Cross recessed button head screw (SUS): M3	0.9

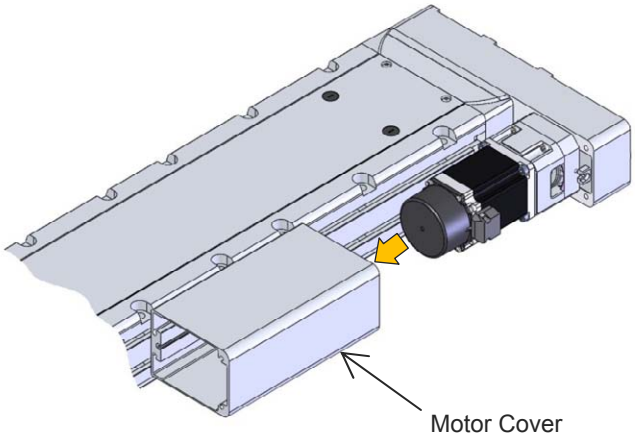
[Belt Replacement: WSA16R]

1) Detach the pulley cover affixing screws and take off the pulley cover.

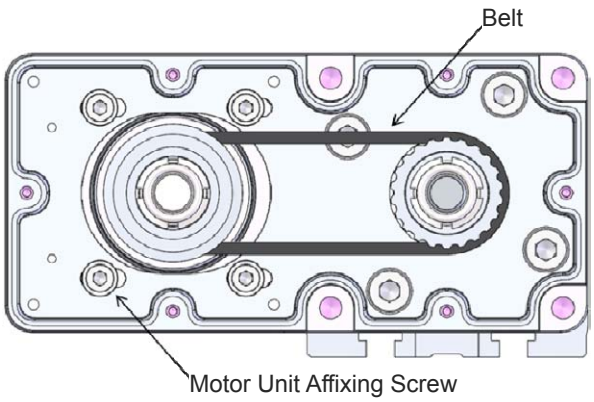


2) Detach the end cover affixing screws and take off the end cover and motor cover.

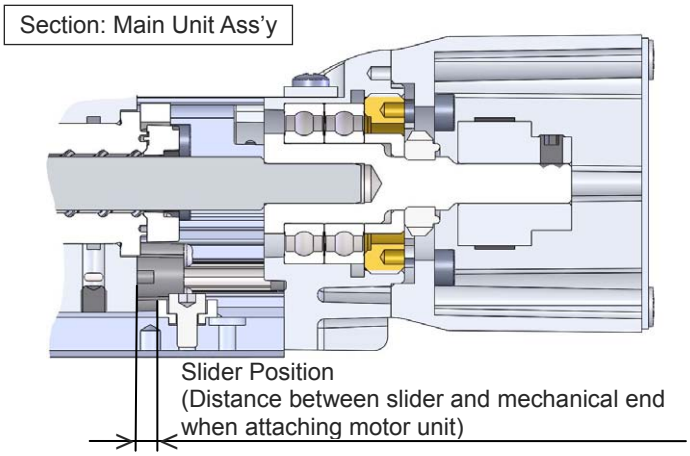




3) Loosen the motor unit affixing screw and take off the belt.



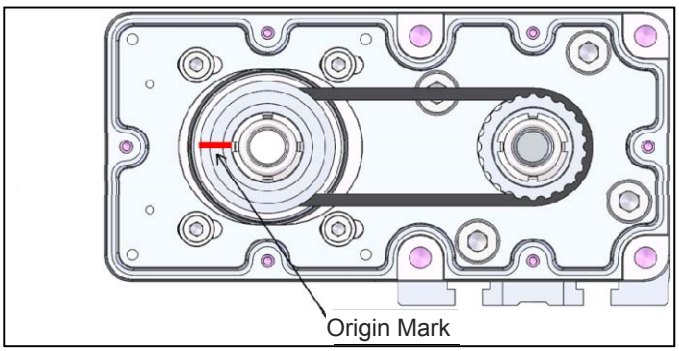
4) Keep the slider at the distance shown in the table below from the mechanical end.



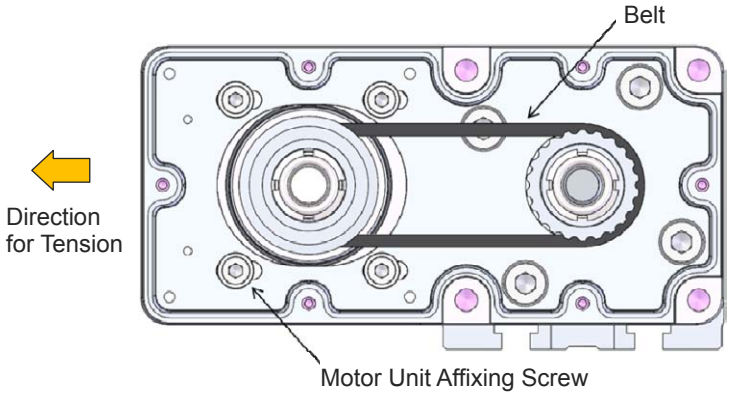
Slider Position

Model	Slider Position [mm]
WSA16R	2

5) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



6) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



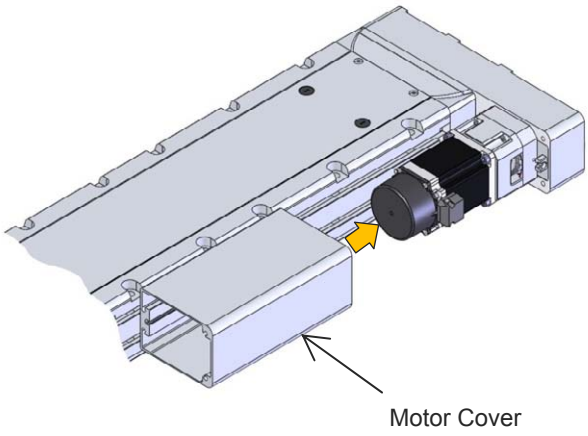
Tensile Force when Attaching Motor Unit

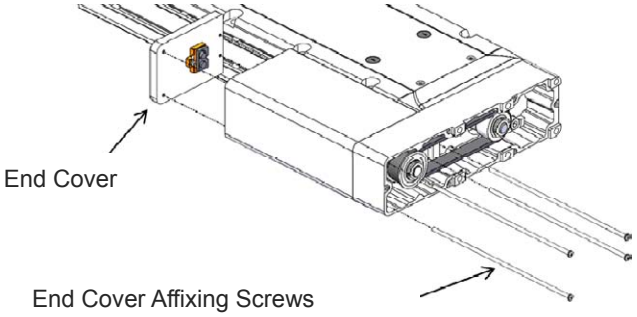
Model	Tension Force [N]
WSA16R	180 to 200

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
WSA16R	4.1

7) Affix the end cover and motor cover with the end cover affixing screws, and tighten them up with the specified tightening torque.

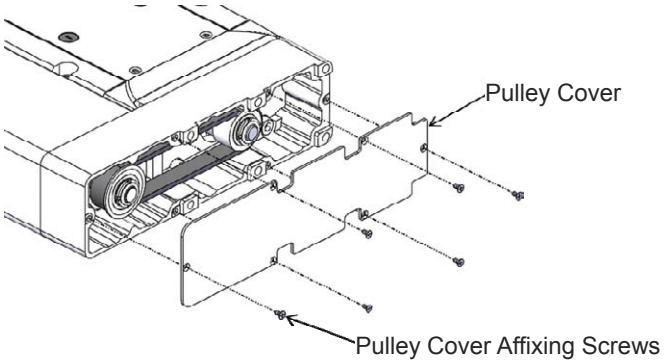




End Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
WSA16R	Cross recessed pan head machine screw: M4	1.0

8) Affix the pulley cover with the pulley cover affixing screws, and tighten them up with the specified tightening torque.



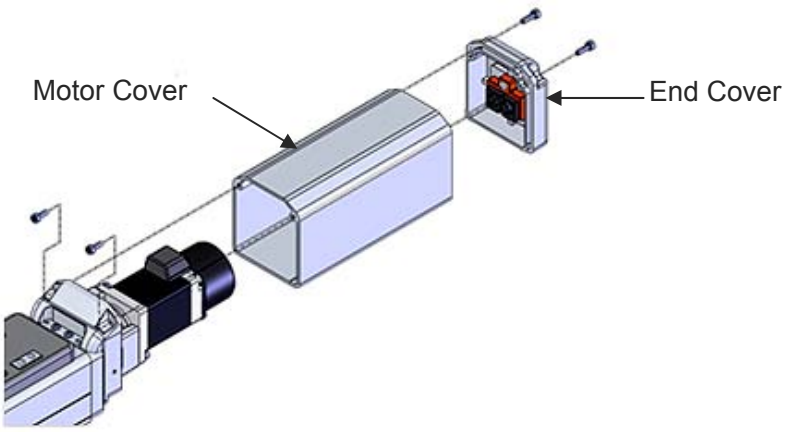
Pulley Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
WSA16R	Hex socket button head screw : M3	0.4

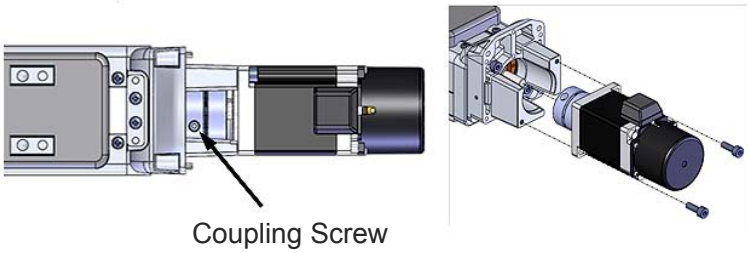
Motor replacement

[Motor Straight Type]

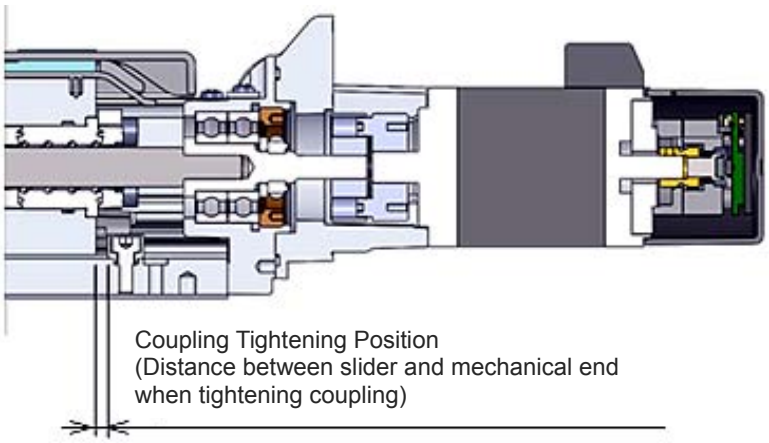
1) Detach the motor cover affixing screws.
2) Take off the end cover and motor cover.



3) Move the slider to the position where the coupling screw on the actuator side can be seen.
4) Loosen the coupling screw, detach the motor affixing screws and take off the motor.

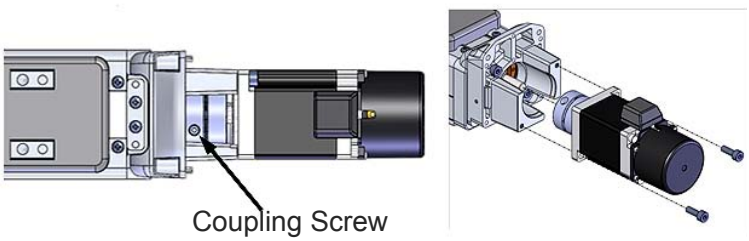


5) Keep the slider at the distance shown in the table below from the mechanical end.



Model	Coupling Tightening Position [mm] (Distance between Slider and Mechanical End)
WSA10C	2
WSA12C	2.5
WSA14C	2
WSA16C	2

6) Hold the new motor loosely with the motor affixing screws, and then tighten the coupling screw in the tightening torque shown in the table.

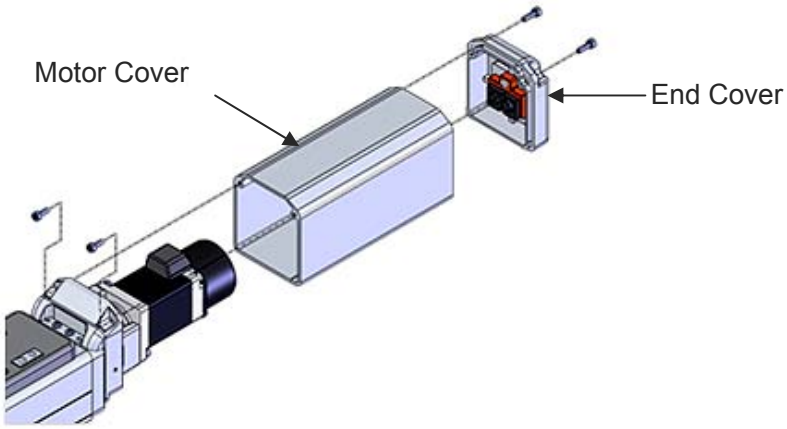


Model	Tightening Torque [N·m]
WSA10C	0.4
WSA12C	0.9
WSA14C	1.5
WSA16C	1.5

7) Fully tighten the motor affixing screws in the tightening torque shown in the table.

Model	Tightening Torque [N·m]
WSA10C	2.1
WSA12C	2.1
WSA14C	4.1
WSA16C	4.1

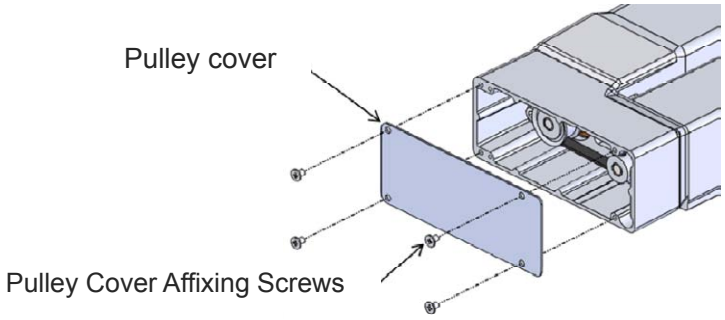
8) Attach the motor cover and end cover.
Tighten the motor cover affixing screws in the tightening torque shown in the table.
Pay attention not to get the cable pinched.



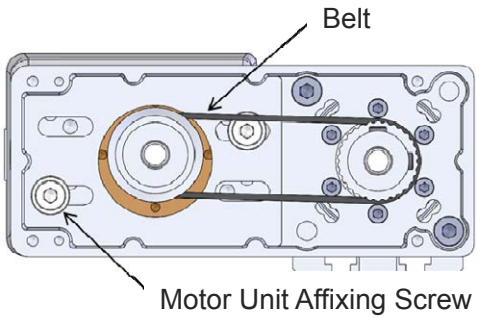
Model	Type of Screws	Tightening Torque [N·m]
WSA10C	Cross recessed pan head machine screw: M3	0.4
WSA12C	Hex socket pan head screw : M4	1.0
WSA14C	Hex socket pan head screw : M4	1.0
WSA16C	Hex socket pan head screw : M4	1.0

[Motor Reversing Type: WSA10R, WSA12R and WSA14R When Replacing Motor Unit]

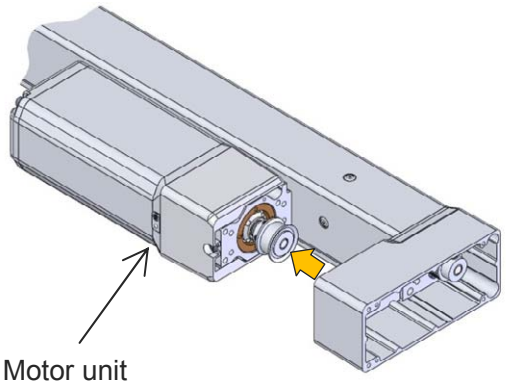
1) Detach the pulley cover affixing screws and take off the pulley cover.



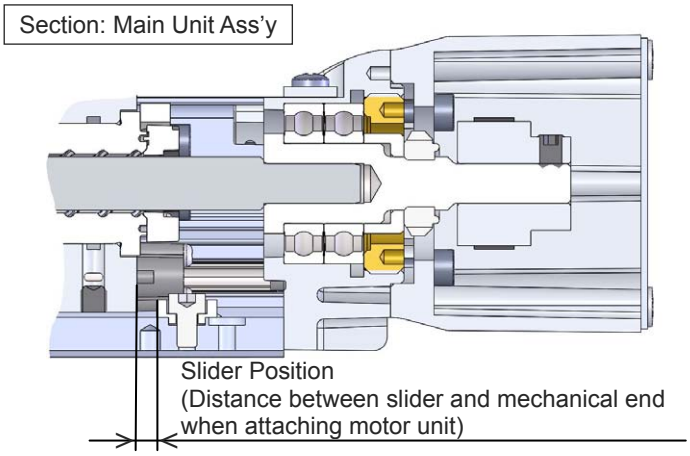
2) Detach the motor unit affixing screw and take off the belt.



3) Take off the motor unit.



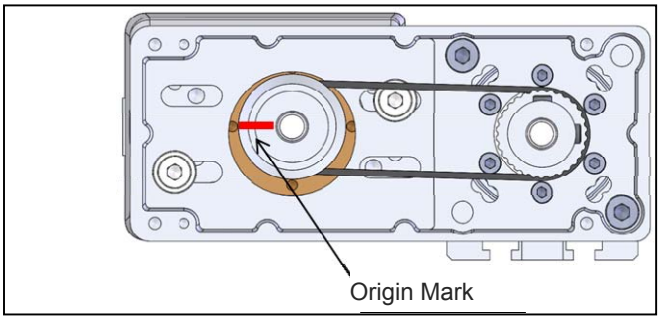
4) Attach the motor unit for replacement.
5) Keep the slider at the distance shown in the table below from the mechanical end.



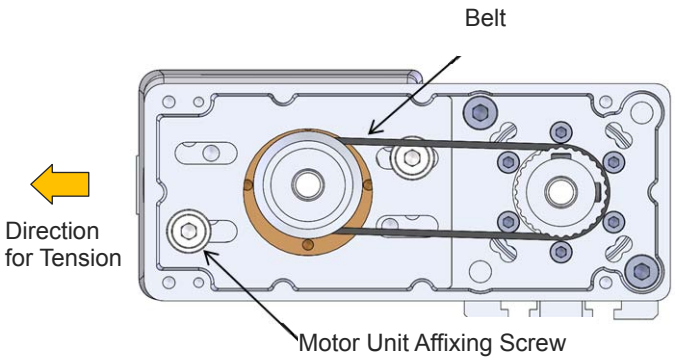
Slider Position

Model	Slider Position [mm]
WSA10R, WSA14R	2
WSA12R	2.5

6) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



7) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



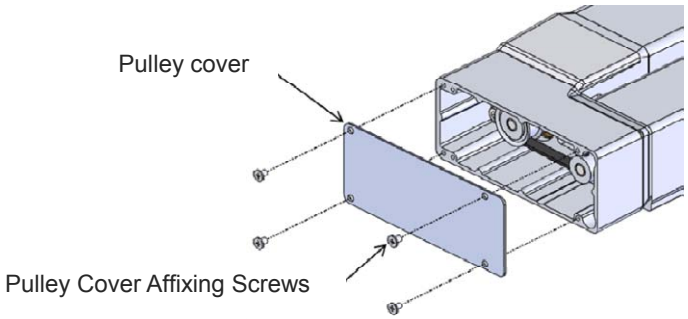
Tensile Force when Attaching Motor Unit

Model	Tension Force [N]
WSA10R	20 to 25
WSA12R	40 to 45
WSA14R	70 to 80

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
WSA10R, WSA12R	2.1
WSA14R	4.1

8) Tighten up the pulley cover with the pulley cover affixing screws in the specified torque.

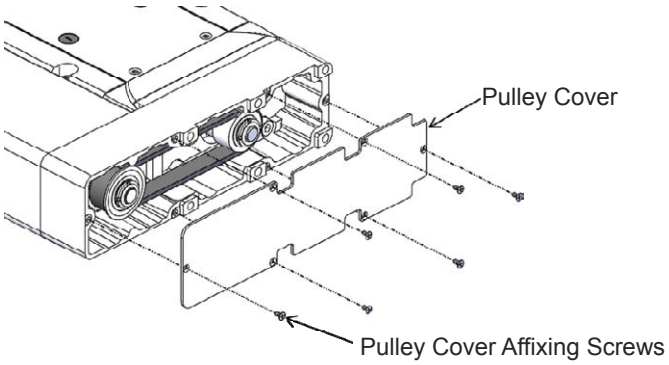


Pulley Cover Affixing Screw Tightening Torque

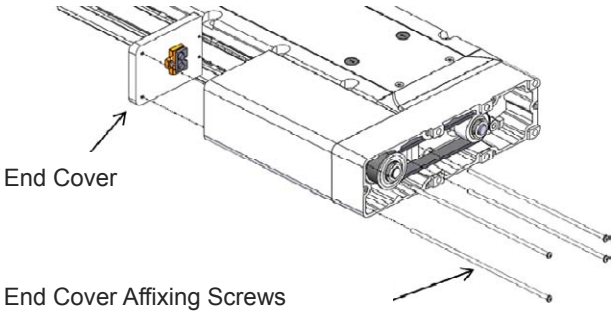
Model	Type of Screws	Tightening Torque [N·m]
WSA10R, WSA12R, WSA14R	Cross recessed button head screw (SUS): M3	0.9

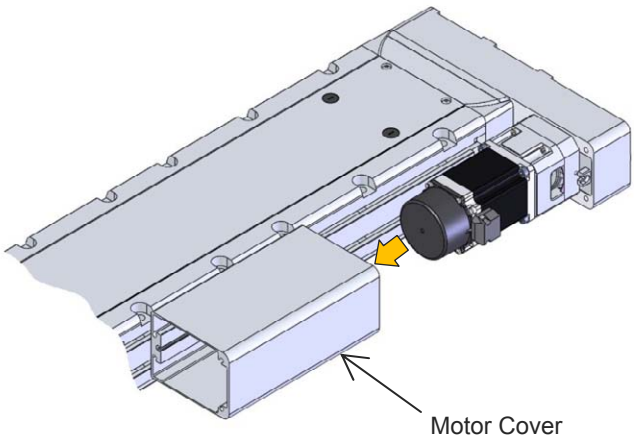
[Motor Reversing Type: WSA16R
When Replacing Motor Equipped with Pulley]

1) Detach the pulley cover affixing screws and take off the pulley cover.

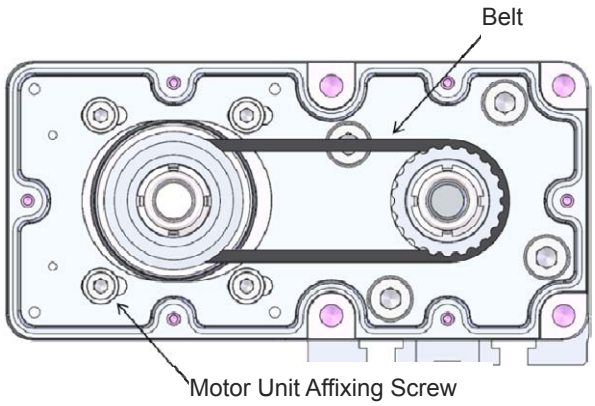


2) Detach the end cover affixing screws and take off the end cover and motor cover.

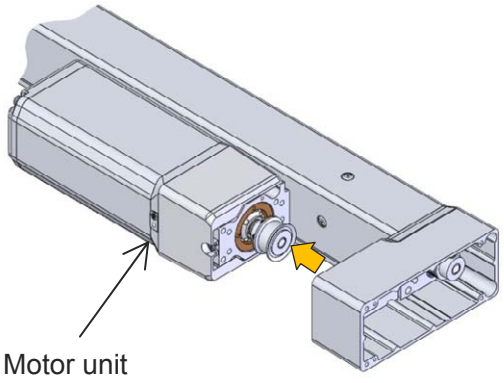




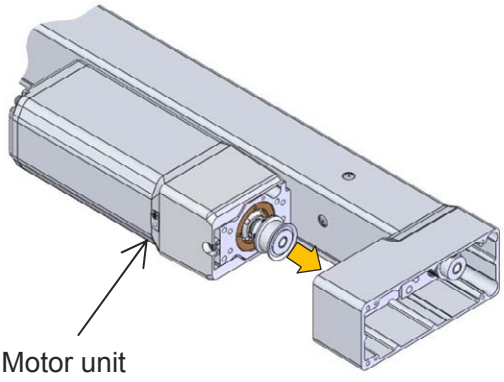
3) Detach the motor unit affixing screw and take off the belt.



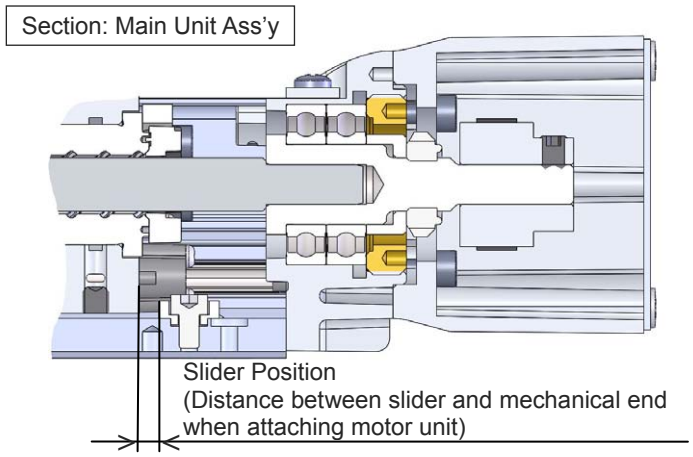
4) Take off the motor unit.



5) Attach the motor unit for replacement and hang the belt.



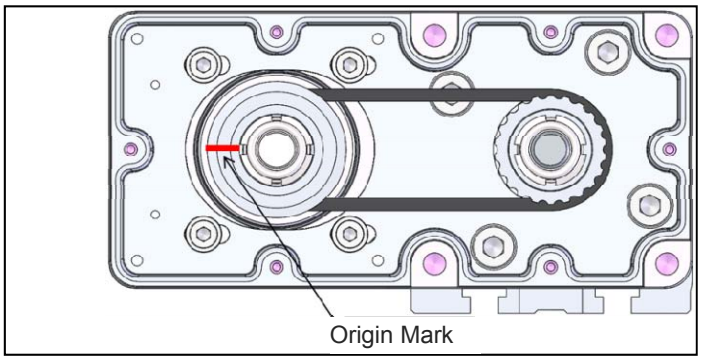
6) Keep the slider at the distance shown in the table below from the mechanical end.



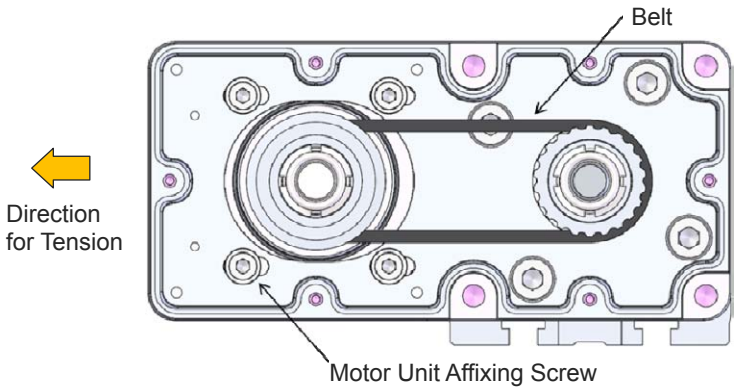
Slider Position

Model	Slider Position [mm]
WSA16R	2

7) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



8) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



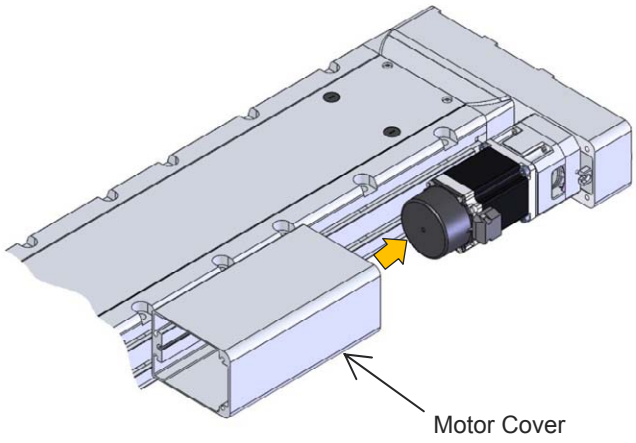
Tensile Force when Attaching Motor Unit

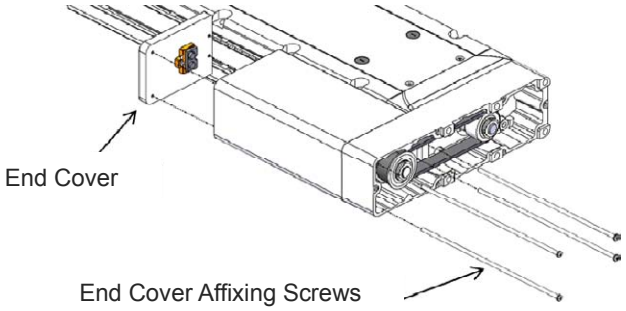
Model	Tension Force [N]
WSA16R	180 to 200

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
WSA16R	4.1

9) Affix the end cover and motor cover with the end cover affixing screws, and tighten them up with the specified tightening torque.

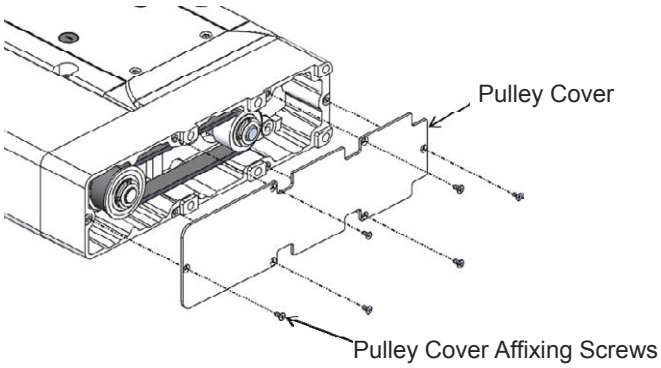




End Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
WSA16R	Cross recessed pan head machine screw: M4	1.0

10) Affix the pulley cover with the pulley cover affixing screws, and tighten them up with the specified tightening torque.



Pulley Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
WSA16R	Hex socket button head screw : M3	0.4

Caution

Make sure to hold the slider so it would not move in case of replacing a motor in vertical installation which is not equipped with a brake. It will be dangerous as the slider will be dropped, if it is not held, as soon as the motor gets taken off.

Notice

- Pay attention not to get the cable pinched when attaching the motor cover and end cover.
- When the actuator is not equipped with a brake, make sure that the motor is magnetized when attaching it so the shaft and the origin point get aligned.

ROBO Cylinder

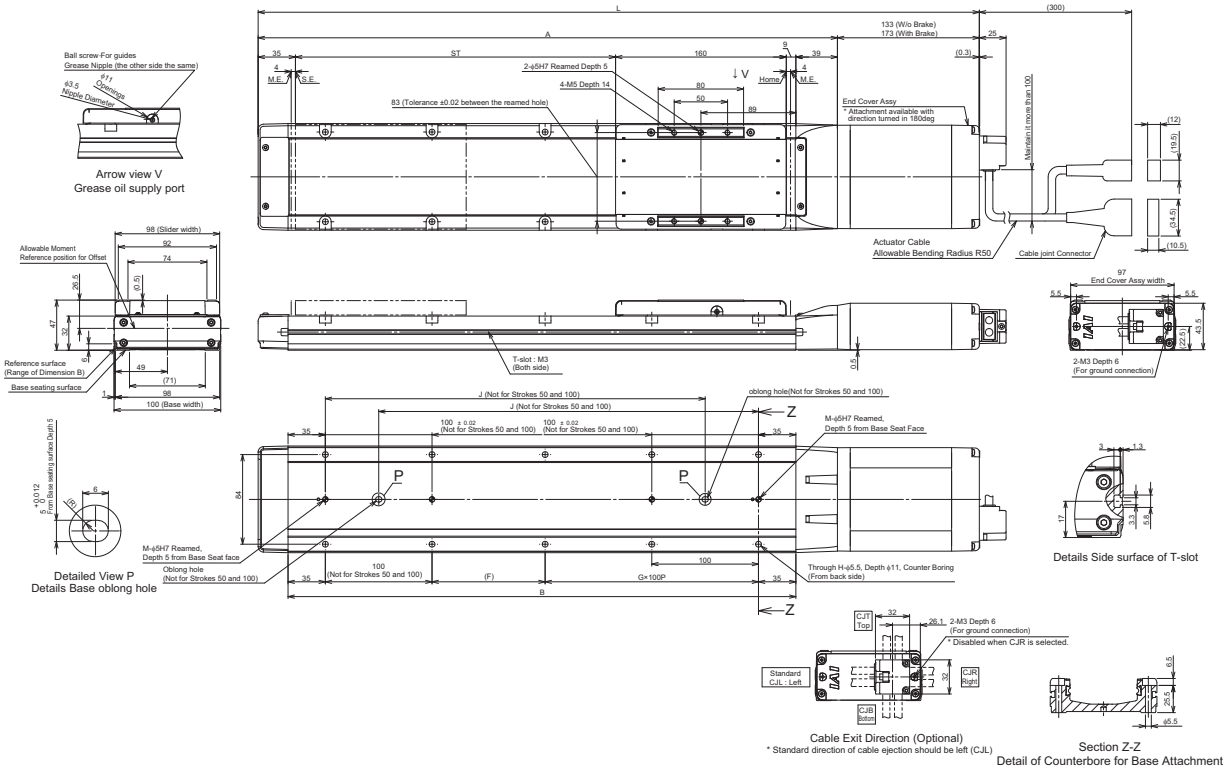
Chapter 5

External Dimensions

5.1 External dimensions

RCS4-WSA10C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



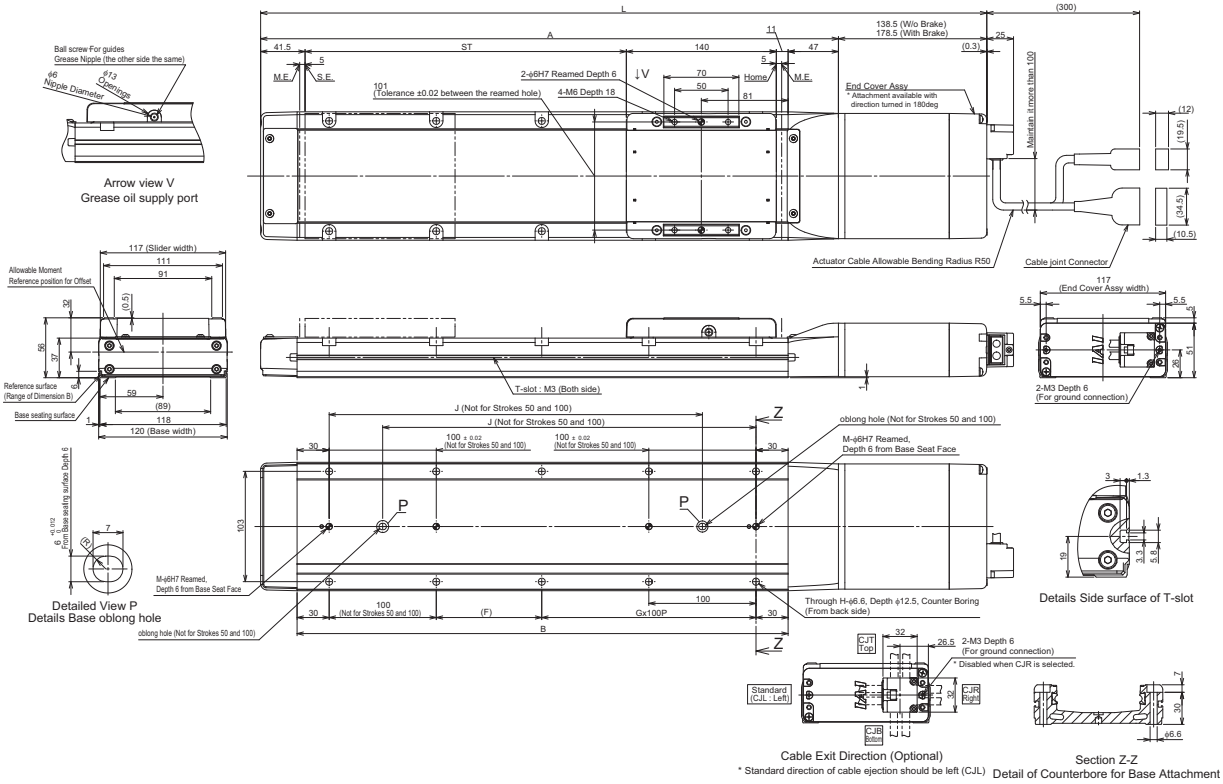
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	426	466	293	226	156	0	4	-	1	2.8	3.1
100	476	516	343	276	206	0	4	-	1	3.0	3.3
150	526	566	393	326	56	1	8	206	2	3.3	3.6
200	576	616	443	376	106	1	8	256	2	3.5	3.8
250	626	666	493	426	56	2	10	306	2	3.8	4.1
300	676	716	543	476	106	2	10	356	2	4.0	4.3
350	726	766	593	526	56	3	12	406	2	4.3	4.6
400	776	816	643	576	106	3	12	456	2	4.5	4.8
450	826	866	693	626	56	4	14	506	2	4.8	5.1
500	876	916	743	676	106	4	14	556	2	5.0	5.3

RCS4-WSA12C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



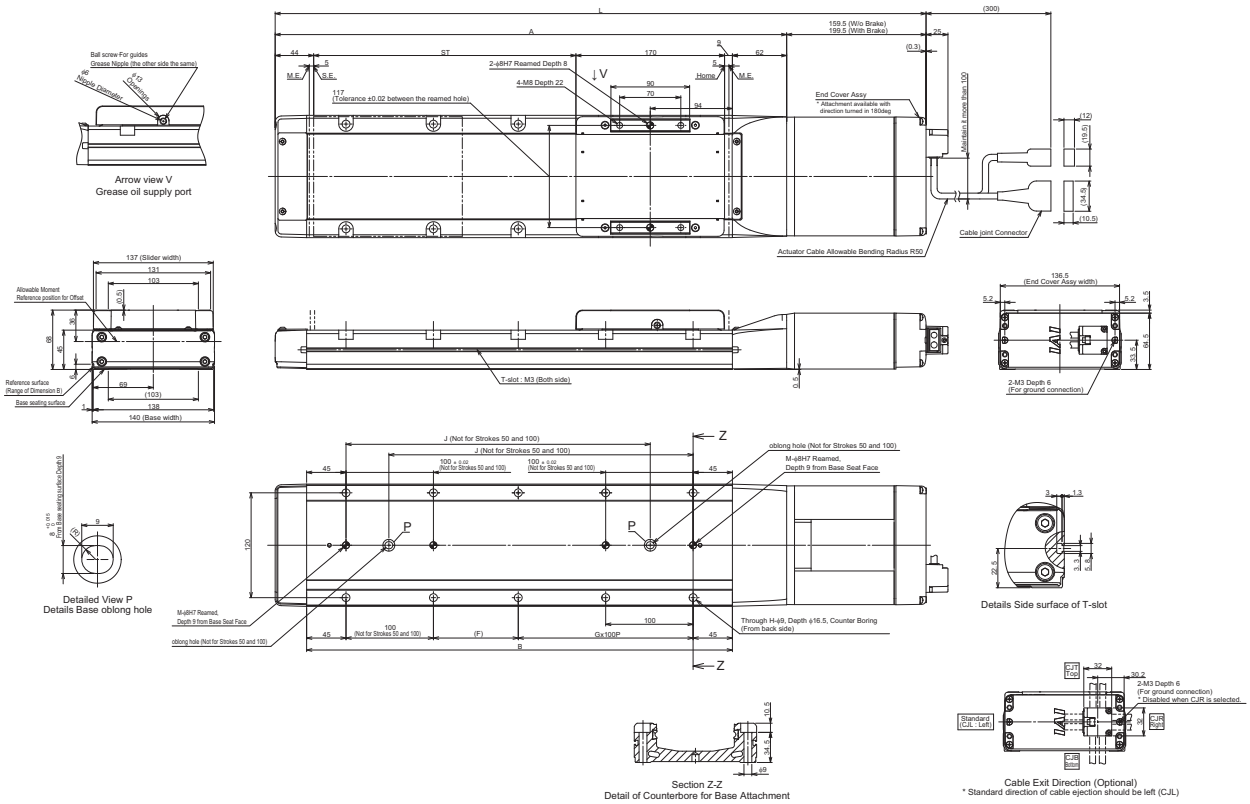
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	428	468	289.5	208.5	148.5	0	4	-	1	3.8	4.2
100	478	518	339.5	258.5	198.5	0	4	-	1	4.2	4.6
150	528	568	389.5	308.5	48.5	1	8	198.5	2	4.5	4.9
200	578	618	439.5	358.5	98.5	1	8	248.5	2	4.8	5.2
250	628	668	489.5	408.5	48.5	2	10	298.5	2	5.2	5.6
300	678	718	539.5	458.5	98.5	2	10	348.5	2	5.5	5.9
350	728	768	589.5	508.5	48.5	3	12	398.5	2	5.8	6.2
400	778	818	639.5	558.5	98.5	3	12	448.5	2	6.2	6.6
450	828	868	689.5	608.5	48.5	4	14	498.5	2	6.5	6.9
500	878	918	739.5	658.5	98.5	4	14	548.5	2	6.9	7.3
550	928	968	789.5	708.5	48.5	5	16	598.5	2	7.2	7.6
600	978	1018	839.5	758.5	98.5	5	16	648.5	2	7.5	7.9
650	1028	1068	889.5	808.5	48.5	6	18	698.5	2	7.9	8.3
700	1078	1118	939.5	858.5	98.5	6	18	748.5	2	8.2	8.6
750	1128	1168	989.5	908.5	48.5	7	20	798.5	2	8.5	8.9
800	1178	1218	1039.5	958.5	98.5	7	20	848.5	2	8.9	9.3

RCS4-WSA14C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



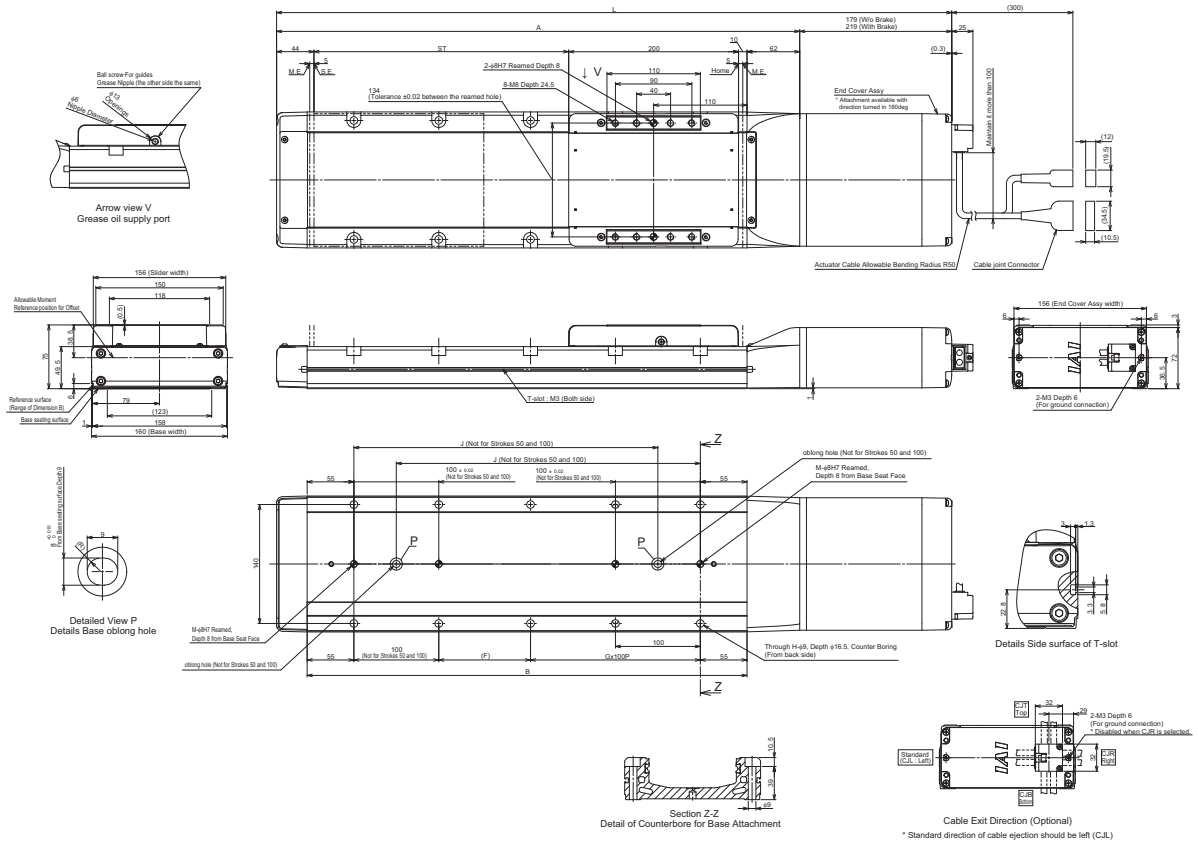
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	494.5	534.5	335	237	147	0	4	-	1	6.5	7.1
100	544.5	584.5	385	287	197	0	4	-	1	6.9	7.5
150	594.5	634.5	435	337	47	1	8	198	2	7.4	8.0
200	644.5	684.5	485	387	97	1	8	248	2	7.9	8.5
250	694.5	734.5	535	437	47	2	10	298	2	8.4	9.0
300	744.5	784.5	585	487	97	2	10	348	2	8.9	9.5
350	794.5	834.5	635	537	47	3	12	398	2	9.4	10.0
400	844.5	884.5	685	587	97	3	12	448	2	9.9	10.5
450	894.5	934.5	735	637	47	4	14	498	2	10.3	10.9
500	944.5	984.5	785	687	97	4	14	548	2	10.8	11.4
550	994.5	1034.5	835	737	47	5	16	598	2	11.3	11.9
600	1044.5	1084.5	885	787	97	5	16	648	2	11.8	12.4
650	1094.5	1134.5	935	837	47	6	18	698	2	12.3	12.9
700	1144.5	1184.5	985	887	97	6	18	748	2	12.8	13.4
750	1194.5	1234.5	1035	937	47	7	20	798	2	13.3	13.9
800	1244.5	1284.5	1085	987	97	7	20	848	2	13.8	14.4

RCS4-WSA16C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



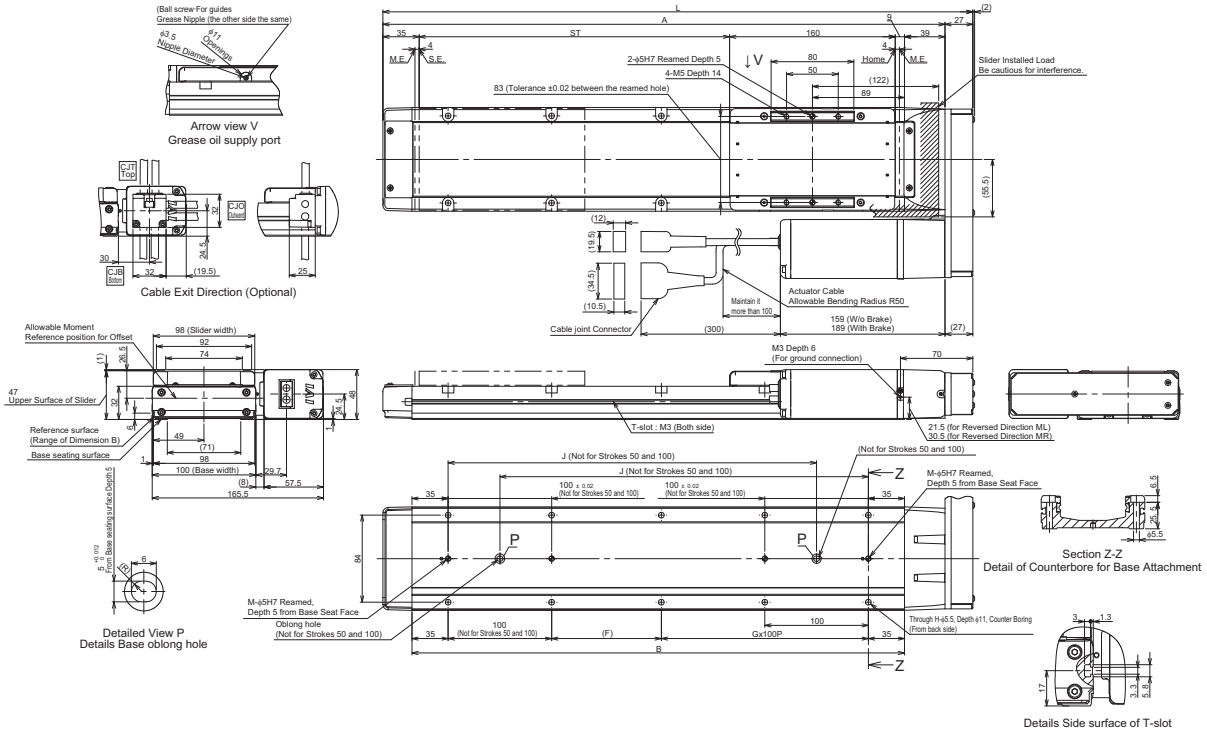
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	545	585	366	268	158	0	4	-	1	9.1	9.7
100	595	635	416	318	208	0	4	-	1	9.8	10.4
150	645	685	466	368	58	1	8	208	2	10.4	11.0
200	695	735	516	418	108	1	8	258	2	11.0	11.6
250	745	785	566	468	58	2	10	308	2	11.6	12.2
300	795	835	616	518	108	2	10	358	2	12.2	12.8
350	845	885	666	568	58	3	12	408	2	12.8	13.4
400	895	935	716	618	108	3	12	458	2	13.4	14.0
450	945	985	766	668	58	4	14	508	2	14.0	14.6
500	995	1035	816	718	108	4	14	558	2	14.7	15.3
550	1045	1085	866	768	58	5	16	608	2	15.3	15.9
600	1095	1135	916	818	108	5	16	658	2	15.9	16.5
650	1145	1185	966	868	58	6	18	708	2	16.5	17.1
700	1195	1235	1016	918	108	6	18	758	2	17.1	17.7
750	1245	1285	1066	968	58	7	20	808	2	17.7	18.3
800	1295	1335	1116	1018	108	7	20	858	2	18.3	18.9
850	1345	1385	1166	1068	58	8	22	908	2	18.9	19.5
900	1395	1435	1216	1118	108	8	22	958	2	19.6	20.2
950	1445	1485	1266	1168	58	9	24	1008	2	20.2	20.8
1000	1495	1535	1316	1218	108	9	24	1058	2	20.8	21.4
1050	1545	1585	1366	1268	58	10	26	1108	2	21.4	22.0
1100	1595	1635	1416	1318	108	10	26	1158	2	22.0	22.6

RCS4-WSA10R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

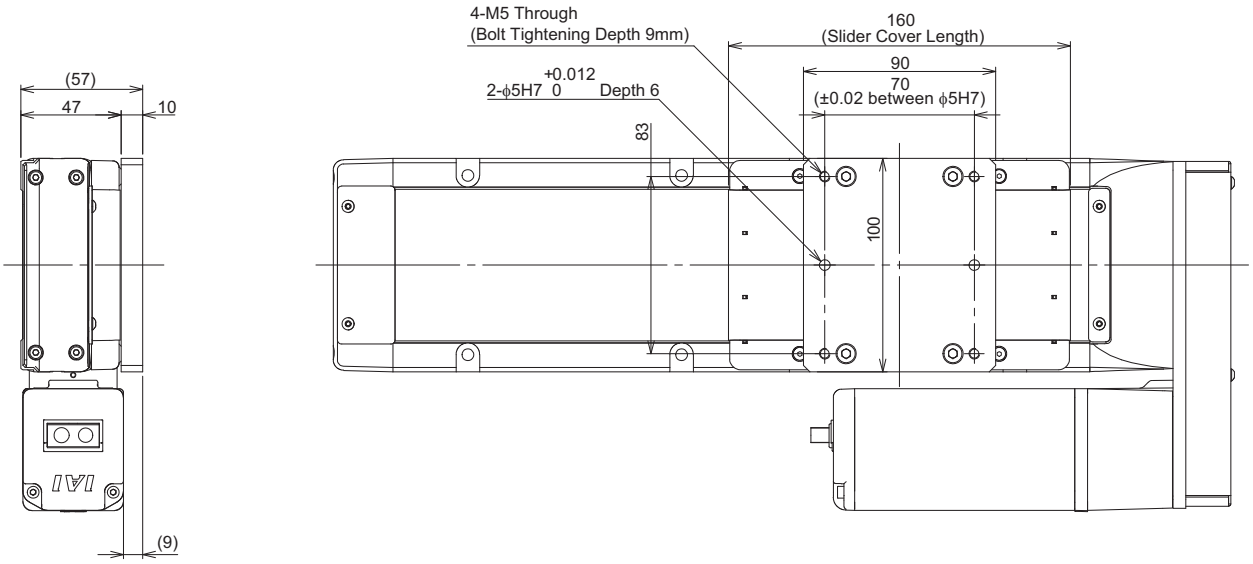


■ Dimensions and Mass by Stroke

Unite: mm

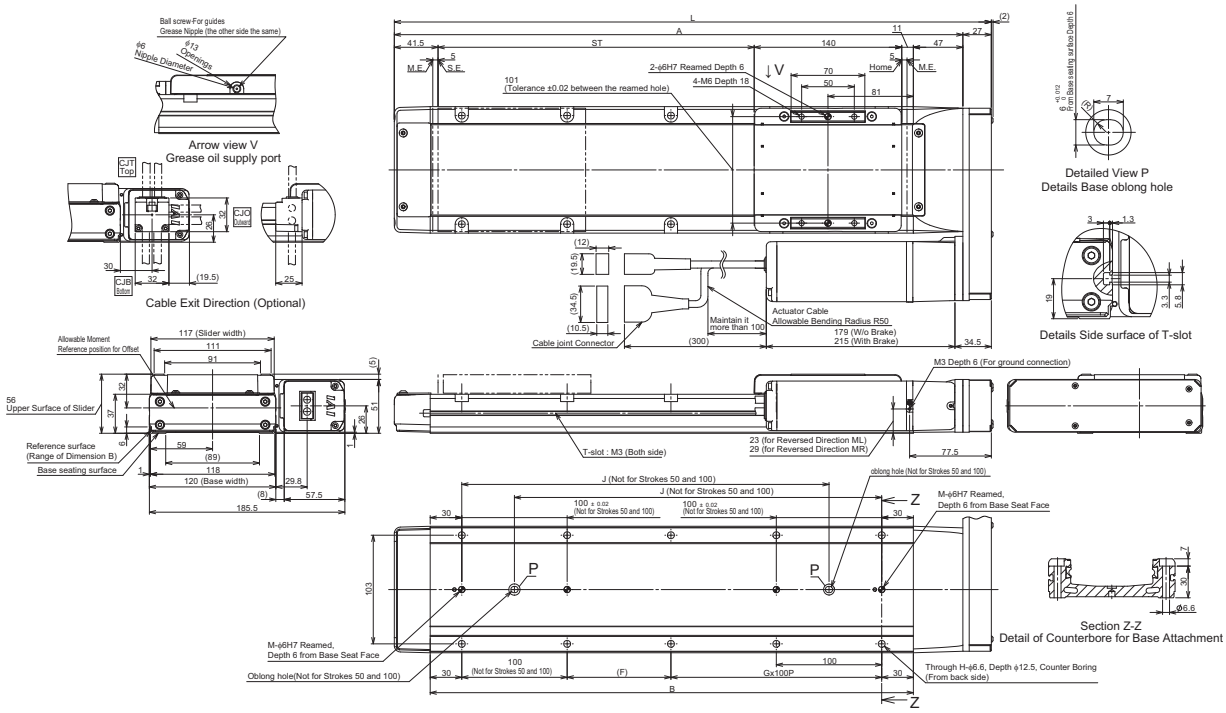
Stroke	L	A	B	F	G	H	J	M	Mass [kg]	
									W/o Brake	With Brake
50	320	293	226	156	0	4	-	1	3.2	3.5
100	370	343	276	206	0	4	-	1	3.5	3.8
150	420	393	326	56	1	8	206	2	3.7	4.0
200	470	443	376	106	1	8	256	2	4.0	4.3
250	520	493	426	56	2	10	306	2	4.2	4.5
300	570	543	476	106	2	10	356	2	4.5	4.8
350	620	593	526	56	3	12	406	2	4.7	5.0
400	670	643	576	106	3	12	456	2	4.9	5.2
450	720	693	626	56	4	14	506	2	5.2	5.5
500	770	743	676	106	4	14	556	2	5.4	5.7

Slider spacer (Option model code: SS)



RCS4-WSA12R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



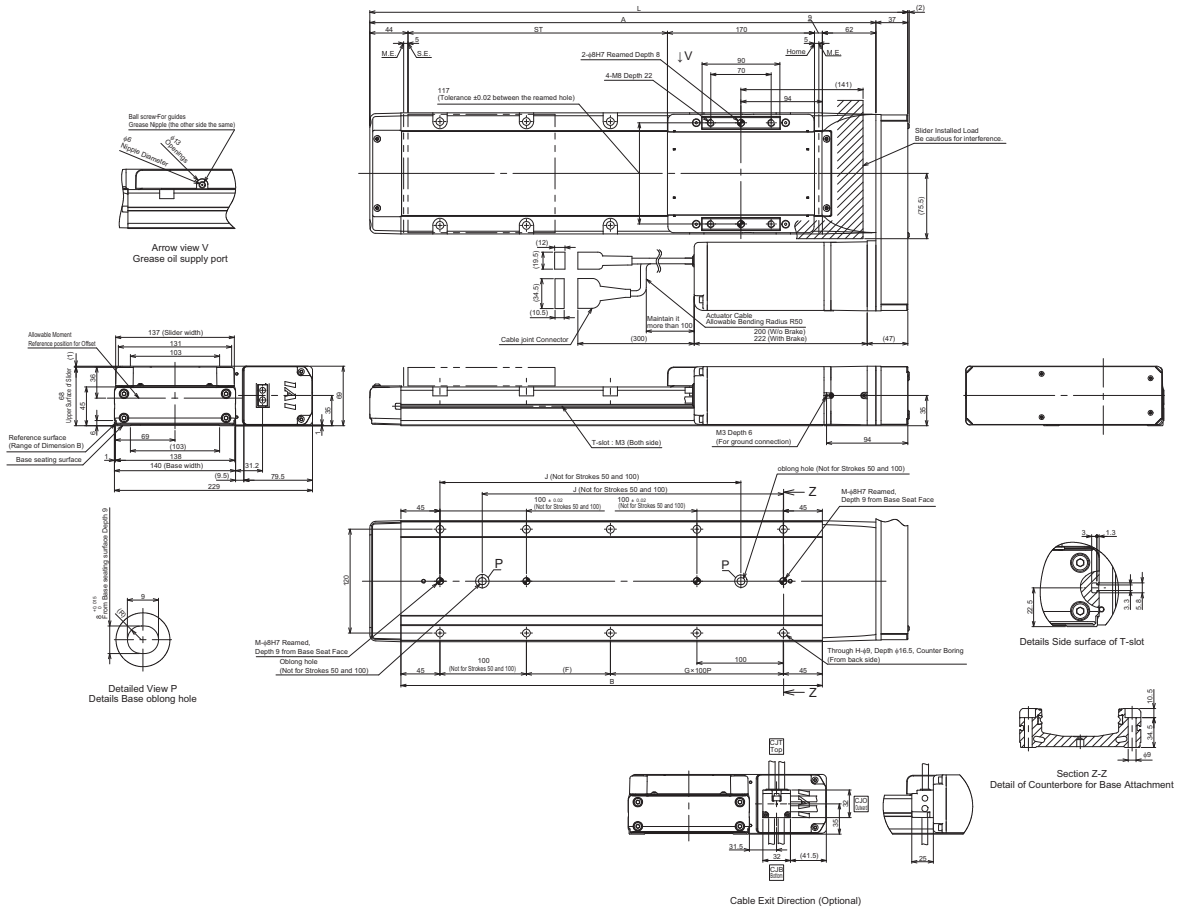
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L	A	B	F	G	H	J	M	Mass [kg]	
									W/o Brake	With Brake
50	316.5	289.5	208.5	148.5	0	4	-	1	4.2	4.5
100	366.5	339.5	258.5	198.5	0	4	-	1	4.5	4.8
150	416.5	389.5	308.5	48.5	1	8	198.5	2	4.9	5.2
200	466.5	439.5	358.5	98.5	1	8	248.5	2	5.2	5.5
250	516.5	489.5	408.5	48.5	2	10	298.5	2	5.6	5.9
300	566.5	539.5	458.5	98.5	2	10	348.5	2	5.9	6.2
350	616.5	589.5	508.5	48.5	3	12	398.5	2	6.2	6.5
400	666.5	639.5	558.5	98.5	3	12	448.5	2	6.6	6.9
450	716.5	689.5	608.5	48.5	4	14	498.5	2	6.9	7.2
500	766.5	739.5	658.5	98.5	4	14	548.5	2	7.2	7.5
550	816.5	789.5	708.5	48.5	5	16	598.5	2	7.6	7.9
600	866.5	839.5	758.5	98.5	5	16	648.5	2	7.9	8.2
650	916.5	889.5	808.5	48.5	6	18	698.5	2	8.3	8.6
700	966.5	939.5	858.5	98.5	6	18	748.5	2	8.6	8.9
750	1016.5	989.5	908.5	48.5	7	20	798.5	2	8.9	9.2
800	1066.5	1039.5	958.5	98.5	7	20	848.5	2	9.3	9.6

RCS4-WSA14R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

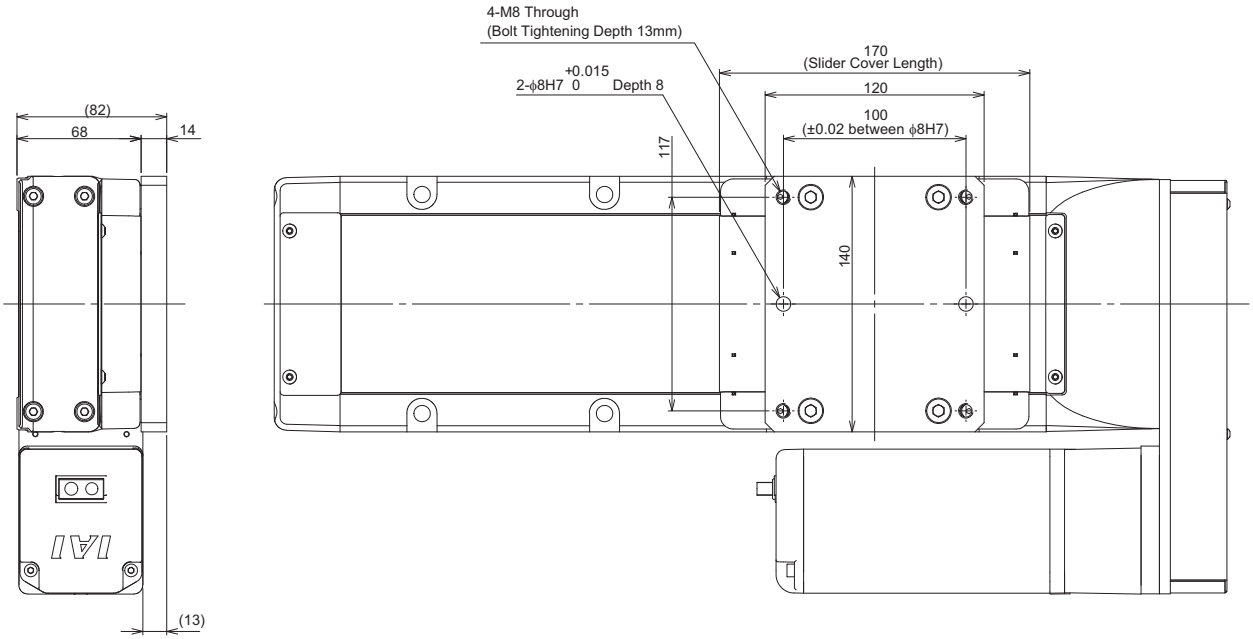


■ Dimensions and Mass by Stroke

Unite: mm

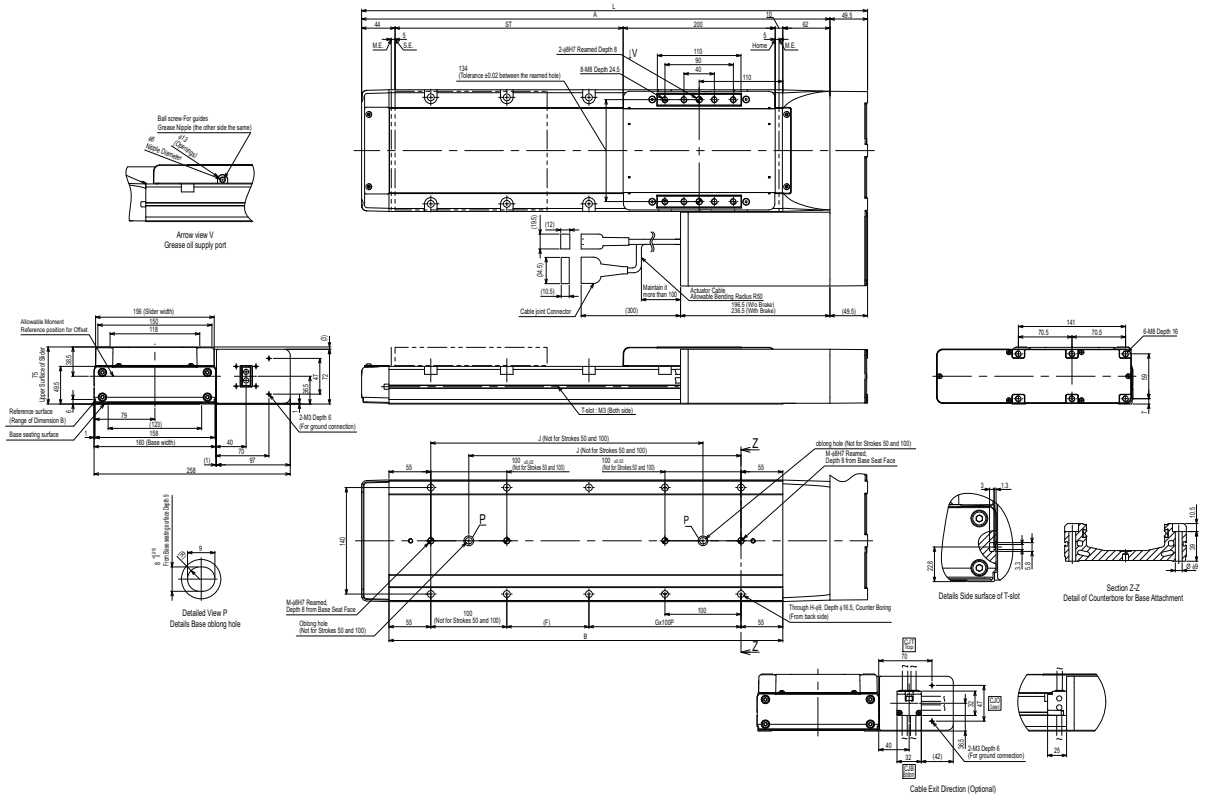
Stroke	L	A	B	F	G	H	J	M	Mass [kg]	
									W/o Brake	With Brake
50	372	335	237	147	0	4	-	1	7.4	8.0
100	422	385	287	197	0	4	-	1	7.9	8.5
150	472	435	337	47	1	8	198	2	8.4	9.0
200	522	485	387	97	1	8	248	2	8.9	9.5
250	572	535	437	47	2	10	298	2	9.4	10.0
300	622	585	487	97	2	10	348	2	9.9	10.5
350	672	635	537	47	3	12	398	2	10.3	10.9
400	722	685	587	97	3	12	448	2	10.8	11.4
450	772	735	637	47	4	14	498	2	11.3	11.9
500	822	785	687	97	4	14	548	2	11.8	12.4
550	872	835	737	47	5	16	598	2	12.3	12.9
600	922	885	787	97	5	16	648	2	12.8	13.4
650	972	935	837	47	6	18	698	2	13.3	13.9
700	1022	985	887	97	6	18	748	2	13.8	14.4
750	1072	1035	937	47	7	20	798	2	14.2	14.8
800	1122	1085	987	97	7	20	848	2	14.7	15.3

Slider spacer (Option model code: SS)



RCS4-WSA16R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



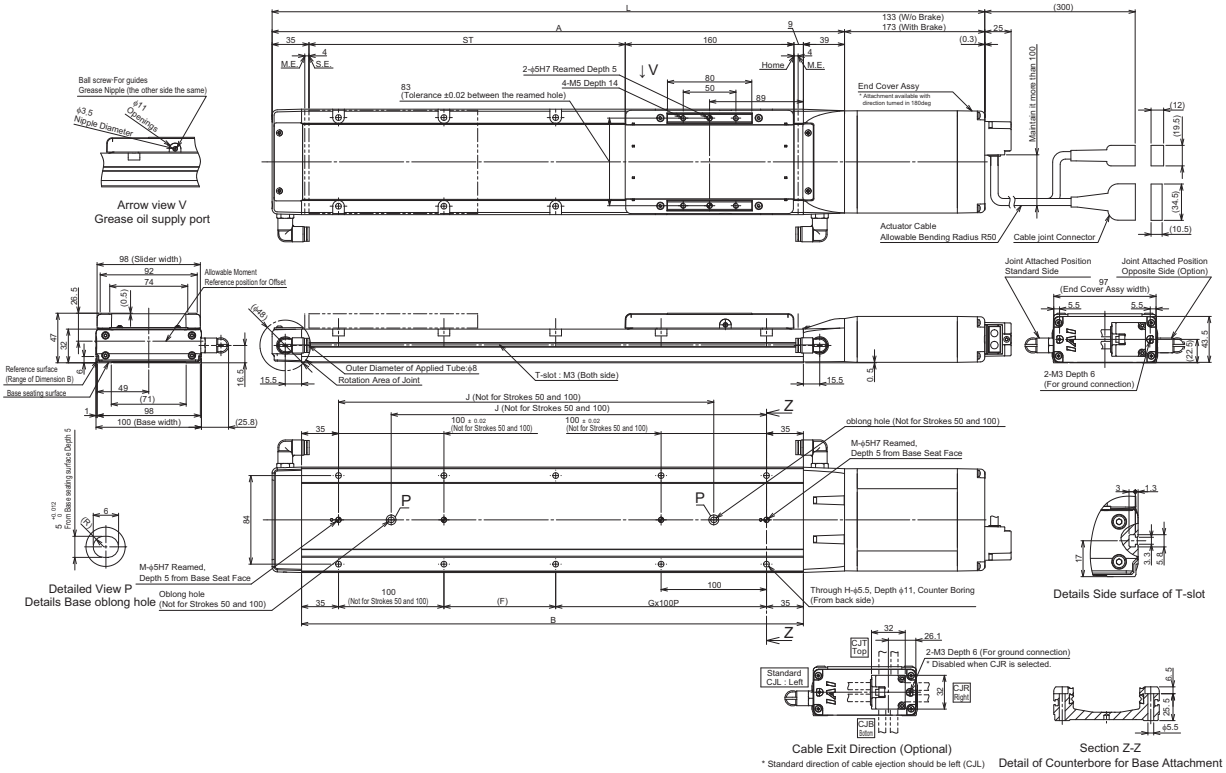
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L	A	B	F	G	H	J	M	Mass [kg]	
									W/o Brake	With Brake
50	415.5	366	268	158	0	4	-	1	10.6	11.2
100	465.5	416	318	208	0	4	-	1	11.2	11.8
150	515.5	466	368	58	1	8	208	2	11.8	12.4
200	565.5	516	418	108	1	8	258	2	12.4	13.0
250	615.5	566	468	58	2	10	308	2	13.0	13.6
300	665.5	616	518	108	2	10	358	2	13.6	14.2
350	715.5	666	568	58	3	12	408	2	14.2	14.8
400	765.5	716	618	108	3	12	458	2	14.9	15.5
450	815.5	766	668	58	4	14	508	2	15.5	16.1
500	865.5	816	718	108	4	14	558	2	16.1	16.7
550	915.5	866	768	58	5	16	608	2	16.7	17.3
600	965.5	916	818	108	5	16	658	2	17.3	17.9
650	1015.5	966	868	58	6	18	708	2	17.9	18.5
700	1065.5	1016	918	108	6	18	758	2	18.5	19.1
750	1115.5	1066	968	58	7	20	808	2	19.1	19.7
800	1165.5	1116	1018	108	7	20	858	2	19.8	20.4
850	1215.5	1166	1068	58	8	22	908	2	20.4	21.0
900	1265.5	1216	1118	108	8	22	958	2	21.0	21.6
950	1315.5	1266	1168	58	9	24	1008	2	21.6	22.2
1000	1365.5	1316	1218	108	9	24	1058	2	22.2	22.8
1050	1415.5	1366	1268	58	10	26	1108	2	22.8	23.4
1100	1465.5	1416	1318	108	10	26	1158	2	23.4	24.0

RCS4CR-WSA10C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



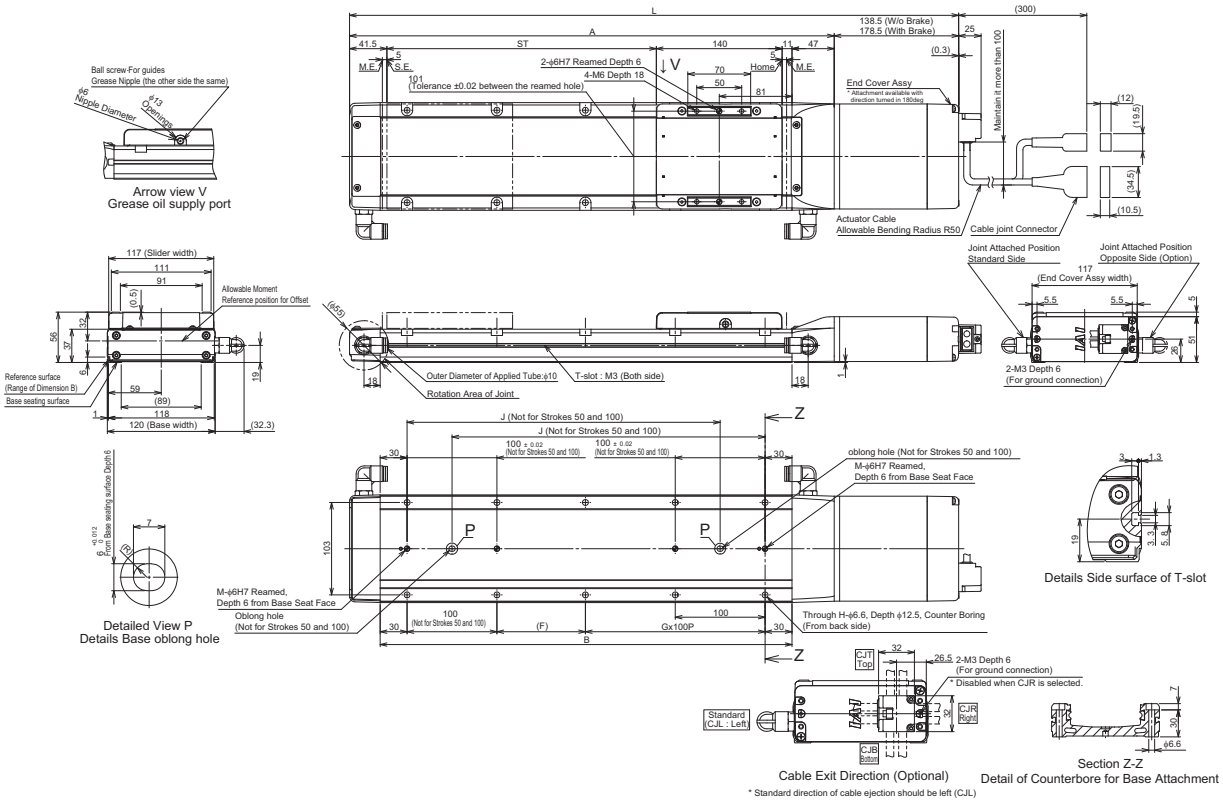
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	426	466	293	226	156	0	4	-	1	2.8	3.1
100	476	516	343	276	206	0	4	-	1	3.0	3.3
150	526	566	393	326	56	1	8	206	2	3.3	3.6
200	576	616	443	376	106	1	8	256	2	3.5	3.8
250	626	666	493	426	56	2	10	306	2	3.8	4.1
300	676	716	543	476	106	2	10	356	2	4.0	4.3
350	726	766	593	526	56	3	12	406	2	4.3	4.6
400	776	816	643	576	106	3	12	456	2	4.5	4.8
450	826	866	693	626	56	4	14	506	2	4.8	5.1
500	876	916	743	676	106	4	14	556	2	5.0	5.3

RCS4CR-WSA12C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



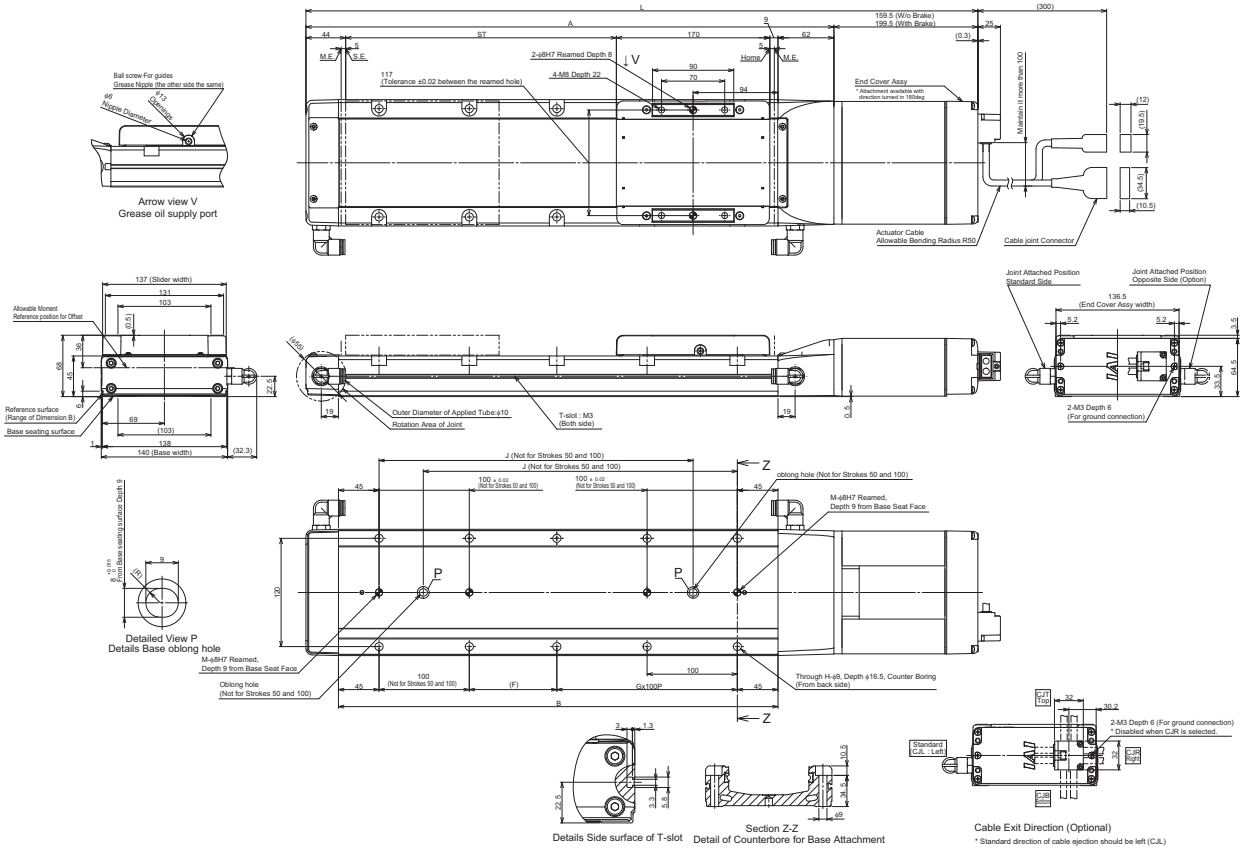
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	428	468	289.5	208.5	148.5	0	4	-	1	3.8	4.2
100	478	518	339.5	258.5	198.5	0	4	-	1	4.2	4.6
150	528	568	389.5	308.5	48.5	1	8	198.5	2	4.5	4.9
200	578	618	439.5	358.5	98.5	1	8	248.5	2	4.8	5.2
250	628	668	489.5	408.5	48.5	2	10	298.5	2	5.2	5.6
300	678	718	539.5	458.5	98.5	2	10	348.5	2	5.5	5.9
350	728	768	589.5	508.5	48.5	3	12	398.5	2	5.8	6.2
400	778	818	639.5	558.5	98.5	3	12	448.5	2	6.2	6.6
450	828	868	689.5	608.5	48.5	4	14	498.5	2	6.5	6.9
500	878	918	739.5	658.5	98.5	4	14	548.5	2	6.9	7.3
550	928	968	789.5	708.5	48.5	5	16	598.5	2	7.2	7.6
600	978	1018	839.5	758.5	98.5	5	16	648.5	2	7.5	7.9
650	1028	1068	889.5	808.5	48.5	6	18	698.5	2	7.9	8.3
700	1078	1118	939.5	858.5	98.5	6	18	748.5	2	8.2	8.6
750	1128	1168	989.5	908.5	48.5	7	20	798.5	2	8.5	8.9
800	1178	1218	1039.5	958.5	98.5	7	20	848.5	2	8.9	9.3

RCS4CR-WSA14C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



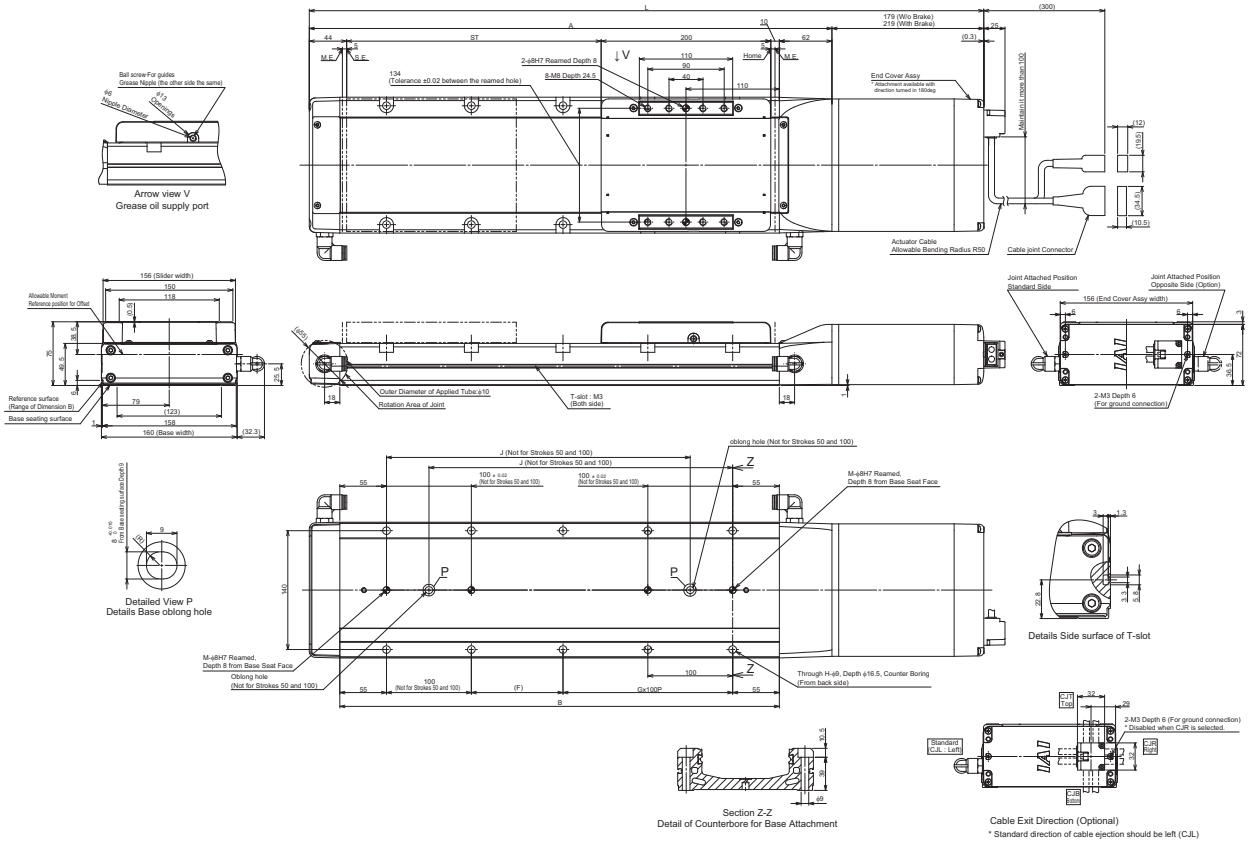
■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	494.5	534.5	335	237	147	0	4	-	1	6.5	7.1
100	544.5	584.5	385	287	197	0	4	-	1	6.9	7.5
150	594.5	634.5	435	337	47	1	8	198	2	7.4	8.0
200	644.5	684.5	485	387	97	1	8	248	2	7.9	8.5
250	694.5	734.5	535	437	47	2	10	298	2	8.4	9.0
300	744.5	784.5	585	487	97	2	10	348	2	8.9	9.5
350	794.5	834.5	635	537	47	3	12	398	2	9.4	10.0
400	844.5	884.5	685	587	97	3	12	448	2	9.9	10.5
450	894.5	934.5	735	637	47	4	14	498	2	10.3	10.9
500	944.5	984.5	785	687	97	4	14	548	2	10.8	11.4
550	994.5	1034.5	835	737	47	5	16	598	2	11.3	11.9
600	1044.5	1084.5	885	787	97	5	16	648	2	11.8	12.4
650	1094.5	1134.5	935	837	47	6	18	698	2	12.3	12.9
700	1144.5	1184.5	985	887	97	6	18	748	2	12.8	13.4
750	1194.5	1234.5	1035	937	47	7	20	798	2	13.3	13.9
800	1244.5	1284.5	1085	987	97	7	20	848	2	13.8	14.4

RCS4CR-WSA16C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



■ Dimensions and Mass by Stroke

Unite: mm

Stroke	L		A	B	F	G	H	J	M	Mass [kg]	
	W/o Brake	With Brake								W/o Brake	With Brake
50	545	585	366	268	158	0	4	-	1	9.1	9.7
100	595	635	416	318	208	0	4	-	1	9.8	10.4
150	645	685	466	368	58	1	8	208	2	10.4	11.0
200	695	735	516	418	108	1	8	258	2	11.0	11.6
250	745	785	566	468	58	2	10	308	2	11.6	12.2
300	795	835	616	518	108	2	10	358	2	12.2	12.8
350	845	885	666	568	58	3	12	408	2	12.8	13.4
400	895	935	716	618	108	3	12	458	2	13.4	14.0
450	945	985	766	668	58	4	14	508	2	14.0	14.6
500	995	1035	816	718	108	4	14	558	2	14.7	15.3
550	1045	1085	866	768	58	5	16	608	2	15.3	15.9
600	1095	1135	916	818	108	5	16	658	2	15.9	16.5
650	1145	1185	966	868	58	6	18	708	2	16.5	17.1
700	1195	1235	1016	918	108	6	18	758	2	17.1	17.7
750	1245	1285	1066	968	58	7	20	808	2	17.7	18.3
800	1295	1335	1116	1018	108	7	20	858	2	18.3	18.9
850	1345	1385	1166	1068	58	8	22	908	2	18.9	19.5
900	1395	1435	1216	1118	108	8	22	958	2	19.6	20.2
950	1445	1485	1266	1168	58	9	24	1008	2	20.2	20.8
1000	1495	1535	1316	1218	108	9	24	1058	2	20.8	21.4
1050	1545	1585	1366	1268	58	10	26	1108	2	21.4	22.0
1100	1595	1635	1416	1318	108	10	26	1158	2	22.0	22.6

ROBO Cylinder

Chapter 6

Life

6.1 Concept of life for slider type

The mechanical life of the slider type is represented by that of the linear guide receiving the greatest moment load.
The operation life of the linear guide is to be determined by the total driving distance reachable without flaking (peeling on rail surface) in 90% of a group of products operated under the same conditions.

Operation life can be calculated with the method shown below.

How to calculate operation life

For the operation life of the linear guide, use the dynamic allowable moment stated in "1.2 Specifications", and calculate with the formula below.

$$L = \left(\frac{C_M}{M}\right)^3 \times 5{,}000\text{km or } 10000\text{km}$$

L	: Operation life (km)
C_M	: Dynamic allowable moment (N·m)
M	: Moment acting (N·m)
5,000km or 10000km	: Standard rated life of ROBO Cylinder

(Note) For Lead 2.5mm of WSA10C and WSA10R, Lead 3mm of WSA12C and WSA12R, Lead 4mm of WSA14C and WSA14R and Lead 5mm of WSA16C and WSA16R, it is only 5,000km.

In addition, calculate with the formula below if the life may be shortened due to vibration or mounting status.

$$L = \left(\frac{C_M}{M} \bullet \frac{f_{WS}}{f_W} \bullet \frac{1}{f_\alpha}\right)^3 \times 5{,}000\text{km or } 10000\text{km}$$

L	: Operation life (km)	f_{WS}	: Standard load coefficient
C_M	: Dynamic allowable moment (N·m)	f_W	: Load coefficient
M	: Moment acting (N·m)	f_α	: Mounting coefficient
5,000km or 10000km: Standard rated life of ROBO Cylinder			

For "Standard load coefficient f_{WS}", "Load coefficient f_W" and "Mounting coefficient f_α", refer to the contents below for configuration and selection.

[Standard load coefficient: f_{WS}]

For ROBO Cylinders described in this manual, calculate with f_{WS} = 1.2.

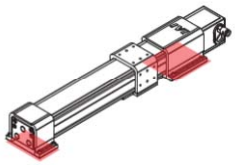
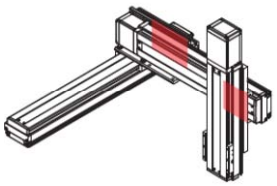
[Load coefficient: f_W]

This coefficient allows consideration of the effects on life due to operating conditions.

Load coefficient f_W	Operating conditions	Guideline for acceleration/deceleration
1.0 to 1.5	Low vibration/impact, slow operation	1.0G or less

[Mounting coefficient f_α]

This coefficient allows consideration of the effects on life due to ROBO Cylinder mounting status.

Mounting coefficient f_α	1.0	1.2	1.5
Mounting status	Fixed on entire surface	Fixed at both ends	Fixed locally
			

- The actuator used in the explanatory figures above is not the ROBO Cylinder. Replace with ROBO Cylinder and select the mounting coefficient.
- Even when seated over the total length of the product, select 1.2 or 1.5 for the mounting coefficient depending on the position of screw fixing and not "fixing over the entire surface".
- "Fixing over the entire surface" is considered to be the case only when fixing with all of the tapped holes (counterbored holes) on the seat surface.

Relation between operation life and moment

The operation life depends on the moment acting on the slider.
With a light load, it may be longer than 5,000km, the standard rated life.

With no consideration of vibration and mounting conditions, the operation life is 40,000km according to the calculation with the formula on the previous page, assuming that 0.5 C_M (half of dynamic allowable moment) of moment is applied.
We see that it can be 8 times longer than the standard rated life, which is 5,000km.

ROBO Cylinder

Chapter 7

Warranty

7.1 Warranty period

Whichever of the following periods is shorter:

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

7.2 Scope of the warranty

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

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

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

(a) Anything other than our product
(b) Modification or repair performed by a party other than IAI (unless approved by IAI)
(c) Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
(d) Natural disaster, unnatural disaster, incident or accident for which we are not liable
(e) Natural fading of paint or other symptoms of aging
(f) Wear, depletion or other expected result of use
(g) Operation noise, vibration or other subjective sensations not affecting function or maintenance

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

7.3 Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

7.4 Limited liability

(1) We 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 assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

7.5 Conformance with applicable standards/regulations, etc., and application conditions

(1) If our product is combined with another product or any system, equipment, 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 assume no liability 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 IAI if you must use our product for any of these applications:
    (a) Medical equipment used to maintain, control or otherwise affect human life or physical health
    (b) Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
    (c) Machinery components essential for safety (safety devices etc.)
    (d) Equipment used to handle cultural assets, art or other irreplaceable items
(3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

7.6 Other Items excluded from warranty

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

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

ROBO Cylinder

Chapter 8

Appendix

8.1 Index

8.2 Revision history

Revision Date	Revision Description
October 2017	First Edition
May 2018	1B Edition • P 1-8, 1-24 Max. velocity in stroke 500mm added • P 1-12, 1-28 Max. velocity in stroke 500mm and 550mm added
September 2018	1C Edition • P 2-14 Suction amount changed

Manual No.: ME3770-1C (September 2018)

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