CKD

Electric Actuator
ESM Series

INSTRUCTION MANUAL

SM-629347-A/3

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's "**ESM Series" electric actuator.**
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product, which uses electric actuator such as the actuator body, motor, sensor, and end effector, targets users who have sufficient knowledge about materials, machinery, control, wiring, and electricity. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training with respect to electric actuator.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or may cause an accident due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used depending on the application and usage.

CAUTION:

This product is not equipped with a motor.

You need to prepare, install, and adjust a motor and driver by yourself.

Make sure to install a motor properly in accordance with the instructions given in this Instruction Manual.

On how to adjust a motor, refer to the documents such as the instruction manual.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, check that the safety of the machine mechanism of the device and the electric system that controls such mechanism are ensured.

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Be sure to read this Instruction Manual thoroughly and understand its descriptions before using the product.

To explicitly indicate the extent of actual and potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard that improper handling may cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard that improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard that improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ DANGER

Do not use the product for the following applications:

- Critical equipment pertaining to sustainment and management of human life and body
- Mechanism and mechanical device for conveyance and transportation of people
- Important safety part of a mechanical device

<Installation>

- Do not use the product in a place where dangerous substances such as ignitable, inflammable or explosive materials are present.
  Ignition, inflammation, or explosion may occur.
- Do not splash water droplets or oil droplets onto the product. A fire or failure may occur.
- Be sure to hold and secure the product (including workpieces) while installing the product.
  An injury may be caused due to a fall, drop and abnormal operation of the product.
- Do not enter the operating range of the product where the product can be ready to operate.
  The product may move suddenly and lead to injury.

<Maintenance/Inspection/Repair>

- Wiring work and inspections must be performed by a specialized technician.
- Perform wiring work after installing the product. Failure to do so may result in an electric shock.
- Do not operate the product with wet hands. Failure to do so may result in an electric shock.
- If you find any abnormality of the belt such as wear or tear on cogs, and sides of the belt, longitudinal cracks on cogs, cracks or softening on the back side of the belt, and partial clefts, stop the operation immediately.
  Usage environment or conditions may not be correct for the product.

⚠ WARNING

- Use this product in accordance with the specifications range.
- Read the instruction manuals for the motors.

<Design/Selection/Installation>

- Please ensure that the carrier travels at the speed within specification range.
- You cannot fix the carrier and use the rail as a movable part.
- Install a protection cover in case of possible danger to the operator. Do not enter the operating range of the product when it is ready to operate. The product may move suddenly and lead to injury.
  Take appropriate countermeasures to prevent damage to human body by the moving part of the product.
- Design the safety circuit/device so that the product's movement causes no damage to the operator or equipment if the machine stops due to emergency, power outage, or other system errors.
- Determine how the machine should be re-started after an emergency stop or abnormal stop.
  Design the system and apply measures so that restarting does not cause any personal injuries or damages on the machine. If you should reset the electric driven actuator to the starting position, design the system with a safety device.

- Install the product indoors and keep it away from humid places. Current leakage or fire may occur in places where the product is exposed to rainwater or humidity (80% or more, or dew condensed).
  Oil mist is also strictly prohibited.
  Using the product in such an environment may lead to a damage or malfunction.
- Do not use the product in water, in oil, in powder, or where it will come into contact with cutting fluid or cutting chips, as these may lead to malfunction.
- Install the product at a location free of direct sun, dust, heat source, corrosive gases, explosive gases, flammable gases, and flammables.
  Chemical resistance is not taken into account for this product. It could fail, explode, or ignite.
- Operate and store the product in conditions without dew condensation or freeze by observing operating and storage temperatures.(Storage temperature: -10 to 50°C, storage humidity: 35 to 80%, operating temperature: 5 to 40°C, operating humidity: 35 to 80%)
  Failure to do so may result in abnormality, shorter life or failure of the product. Ventilate the place if the heat is trapped there. Failure to do so may result in damage or malfunction of the product, or the cause of ignition.
- Operate or store the product at a location free of strong electromagnetic waves, ultraviolet rays, and radiation. It could malfunction or fail.
- Be sure to install a safety cover where the system goes over/through aisles and work areas or where a hand or body part may come into contact.
- Attach the product to nonflammable items. Attachment of the product directly to or near flammable items could cause fire and risk of burn injury.
- Do not step on the product and not put any object on it.
  This may cause tumbling accident, injuries due to tumbling or dropping of the product, and runaway, and malfunction due to the breakage of the product
  Take into consideration the possibility of power supply failure. Apply measures with the system so that a power supply failure does not cause any personal injuries or damages on the machine. This may lead to an unexpected accident.
- Even if the belt is damaged, broken, etc., please take measures to prevent damage to the human body and equipment. It may lead to unexpected accidents.
- When malfunctions occur, stop the operation immediately and contact CKD's local sales office.
- Consider the possibility of a failure in the installed motor. Take appropriate measures so that no damage will occur to the operator or equipment even if the power source fails.
- Perform D-class grounding (with ground resistance of 100 ohms or less) with the product. In the event of current leakage, there is a possibility of an electric shock and product malfunction.
- Do not damage, apply undue stress to, place heavy objects on, or tuck cables of the systems related to the product. Doing so may lead to poor conduction or an electric shock.

<Operation>

- Before supplying power to the installed motor, always confirm safety of its operating range. Carelessly supplying power to it may lead to an electric shock or injury.
- Do not touch or come into contact with the product body during operation or immediately after it stops operating. Doing so may result in burns.
- Before setting the position of the installed motor, make sure that it is safe if the actuator runs.

<Maintenance/Inspection/Repair>

- If an abnormal condition develops in the product, such as generating heat, smoke, odor, noise, or vibration, immediately turn the power off. Failure to do so may cause product breakdown or fire due to continued flow of current.

⚠ CAUTION

<Design/Selection/Installation>

- Read the instruction manuals for the motors and the control devices installed on the product. When you design or wire the product, pay particular attention to safety.
- Avoid scratching the rail with a workpiece or a tool dropped by an error during mounting or removal of a workpiece
  Failure to observe this could result in operation faults.
- If a foreign object gets lodged between the carrier unit and the rail, the product may malfunction.

- Use the product in standard factory room temperatures of 5 to 40°C.
- Do not use the product in places where corrosion may occur.
- For the standard installation, supporting pillars should be placed for every 3 m.
- Consider that no twisting, bending, or pulling force applies to the rail when you attach supporting pillars or beams.
- Do not tap the product with a hammer to move it. Do not lift it directly with wire.
- Ensure sufficient room around the stroke end as below:
  (1) Room to mount/remove workpieces.
  (2) Room for the motor.
  (3) Room to replace the belt at the tensioner.
- After completing installation, move the carrier manually to ensure that nothing will interfere with the movement of the carrier within the operating range.
- The product has precision parts inside it. Never let it fall or give vibration/impact to it during running. It may result in breakage of a part.
- When you temporarily place it on the ground, put it horizontally.
- Do not climb on the packaging or put an object on it.
- Do not apply a load to the product which is greater than or equal to the allowable value listed in the materials for selection.
- The belt runs inside the rail. Ensure that foreign objects such as cutting chips do not enter the unit during assembly.
- Use the product within a range so that the carrier unit, hands and workpieces never collides with the stroke end.
- When installing, setting up, adjusting, and servicing the product, read through the instruction manual and follow the instructions carefully.
- The product is manufactured in accordance with various regulations and standards. Never modify the product.
- The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.
- Regular cleaning is required for smooth rotation of the guide roller when you use the product at a location where the rails tend to become dirty easily. In addition, felt wear particles inside the carrier may fall on the rail. Please clean accordingly.
- When wiring the motor/control to be installed on the product, route the power cables so that they avoid any areas with a large electric current and strong magnetic field and do not share the same conduit with, as well as run along, the (multi-conductor) cables for a large motor not for this product; this is to prevent the influence of magnetic induction noise. Also be careful of the inverter power supply used in robots and of the wiring section (do not share the cables or conduit). Ground the frame for the inverter power supply and always provide the inverter output connectors with a filter.
- Select a motor power supply that can supply more sufficient power for the quantity of installed products. Insufficient capacity can cause product malfunction. (Refer to the instruction manuals of the motor/control installed by the customer.)
- When turning on the power of the motor/control installed on the product, the origin position may be detected. If there is an external stopper or a holding mechanism (such as a break), the product may detect an unintended position as the origin point. Take care on the location of an external stopper so that the origin position is definitely detected after the power is turned on.
- Do not move the carrier part before attaching the motor to this product with the belt attached. The belt inside the product may be bent or scratched to become early damaged.
- Do not use the product in a place where it is exposed to ultraviolet radiation or atmospheres containing corrosive gas or salt. Doing so may cause degradation in strength due to performance degradation, abnormal operation or rust formation.

- Do not use the product in a place where dew condensation can occur due to rapid change of ambient temperature.
- Do not install the product in places subject to strong vibration or impact. Doing so may result in malfunction.
- Any twisting or bending force may not be inflicted on the product when installing it.
- When installing this product on the installation surface, screw with the proper tightening torque. M3:0.7N•m, M4:1.5N•m, M5:3.0N•m, M6:5.2 N•m, M8:12.5 N•m, M10:24.5 N•m

<Operation>

- Use the product so that the carrier does not hit the stroke end. During return-to-origin movement, do not let the product hit the mechanical stopper, etc. while it is performing any operation other than the pressing action. Such hitting may cause malfunction.
- During return-to-origin movement, do not apply an external force to the product. The origin point may be recognized incorrectly.
- The recommended servomotors have a gain adjustment function to suppress vibrations. Adjust the gain and operate the product under vibration-suppressed conditions. If the product is operated under vibration/resonance conditions, the product life may be shortened.
- If the servomotor is turned off with gravity and inertial force applied, the workpiece may continue to move or drop. Such operation must be performed in an equilibrium state with no gravity or inertial force, or after conforming safety.
- Do not operate the moving part of the product or decelerate rapidly by an external force. The regenerative current may cause product malfunction or breakdown.
- Durability varies depending on transport load or environment. Sufficient settings for the allowable load/moment are required. Do not apply load exceeding the allowance value to the product.

<Maintenance/Inspection/Repair>

- Conduct a daily inspection to make sure that the product works properly.
- Before performing maintenance, inspection, or repair, always stop the power supply to the product. Call attention to the others around you so that the third party does not turn the power on, or operate carelessly.
- Properly maintain the tension of the belts. You should pay attention to stress relaxation (loosening) of the belts. If the tension is incorrect, vibration or noise may increase resulting in shortened service life, jumping of belt cogs over pulley or part breakdown.
- When disposing of this product, follow the Law on Waste Disposal and Cleaning, and make sure to have it disposed of by a specialized waste disposer.
- Specify the maintenance conditions in the equipment instruction manual. Product functions may deteriorate significantly due to usage, use environment, or maintenance of the equipment. This may result in failure to ensure safety.

Precautions on Product Disposal

⚠ CAUTION

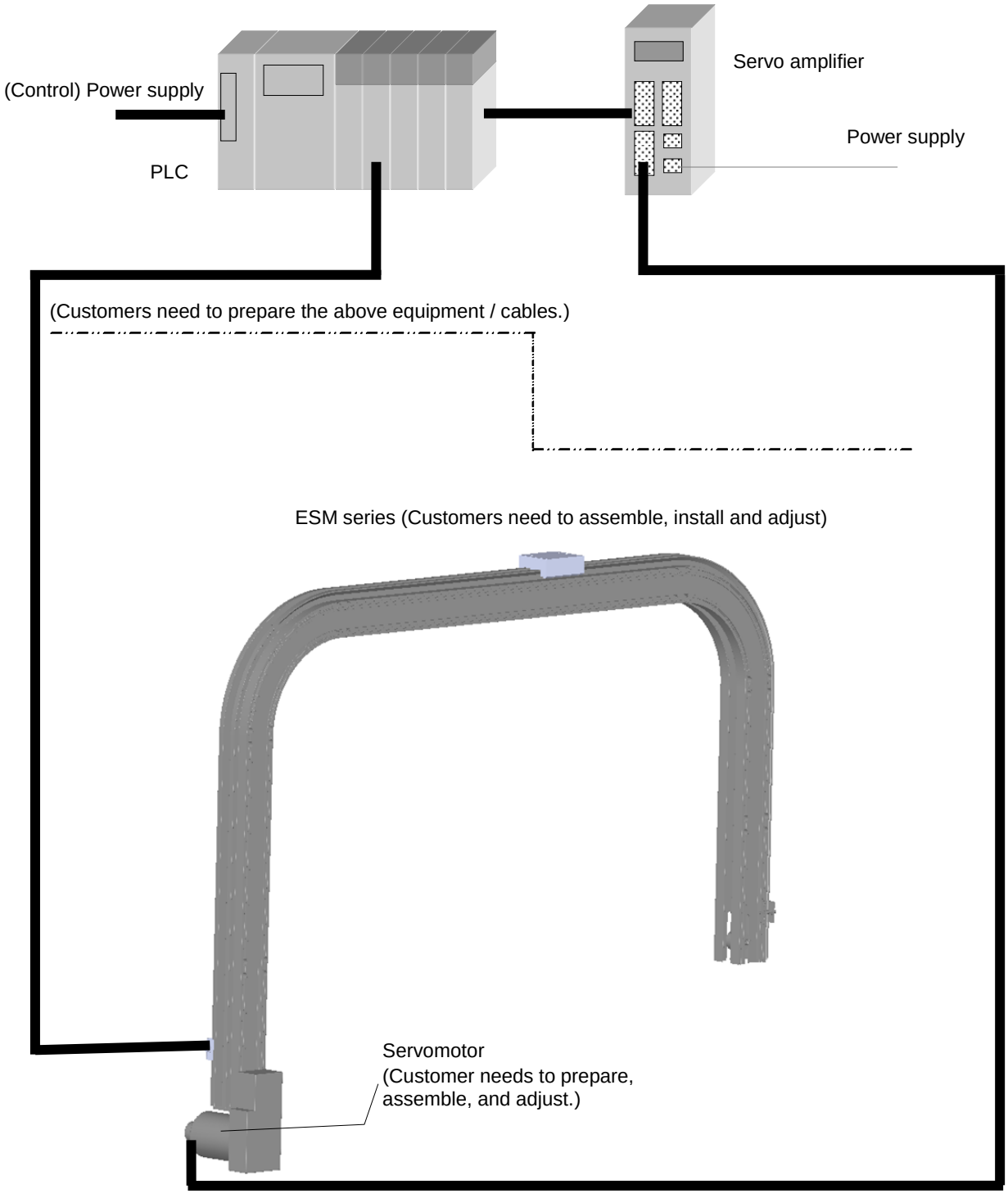
When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

CONTENTS

1. PRODUCT OVERVIEW

1.1 System Overview

1.1.1 System structure



1.2 Specifications

1.2.1 Product specifications

Specifications

Descriptions	ESM
Motor power supply voltage	Three-phase 200 V
Max. load capacity	4 kg
Maximum speed	Straight section: 2000 mm/s or lower Curved section: 1500 mm/s or lower
Max. transfer distance (Note 1)	20 m
Vertical differences (Note 2)	3 m
Repeatability	±0.5 mm
Lubrication	Not available
Applicable motor (Note 3)	AC servomotor 750 W For recommended motors, refer to page 4
Detection sensor (Note 4)	Proximity switch OMRON E2E-X2D1-N
Working environment	Use inside general plant (room temperature 5 to 40°C)

Note 1: Contact CKD if the stroke length exceeds 20 m.
Note 2: The vertical difference is the difference between the heights at the highest spot and the lowest spot in the transporting path.
Note 3: Contact CKD if you want to use a motor other than the recommended motors.
Note 4: If you need to detect the origin and overruns on both ends, you need three of these. (Place an order for the required quantity. Refer to page 4 for the model no. and page 8 for the specifications.)
Note 5: Use each acceleration and deceleration 0.4G or less. (1G≒9.8m/s2)
Note 6: The products do not come with a motor. Customers are required to prepare, install, and adjust the motor and driver.
Note 7: The products are sold as a unit. Customer are required to install and adjust them.
Note 8: If a curve unit is directly connected to the motor drive unit, the PP unit (air supply unit) cannot be used.
Note 9: It cannot be used on horizontally and upside down.

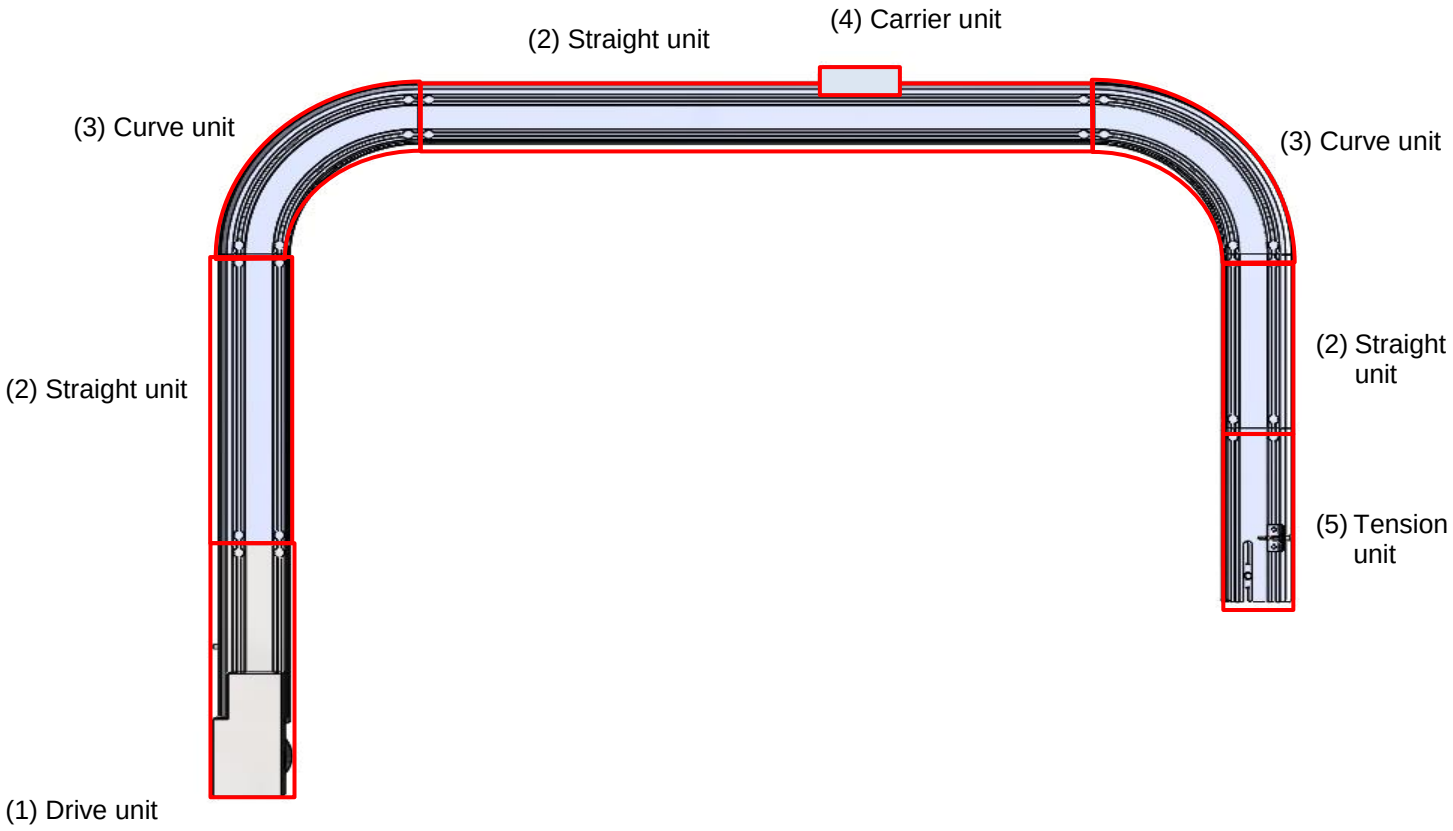
Weight

Unit name	Unit model no.	Weight (kg)
Carrier unit	ESM-CA	0.7
Motor drive unit	ESM-HDU-M	4
Straight unit	ESM-ST-100 (Note 1)	0.5
Tension unit	ESM-TTU	2
Curve unit	ESM-VC-90-1	3.7
	ESM-VC-90-2	3.9
	ESM-VC-45-1	1.9
	ESM-VC-45-2	2

Note 1: The weight increases by 0.5 kg as the stroke length becomes longer by 100 mm.

1.3 Name of each part

1.3.1 ESM series



1.4 Model number

1.4.1 ESM series

(1) Motor drive unit

ESM - **HDU** - **M**

Motor installation specifications	
M	Select the most suitable motor specifications from the table below.
Y	* Contact CKD for the manufactures and models not mentioned in the table.

Motor installation specifications and recommended motor model no. (rated output 750 W)

Manufacturer	Symbol	Motor (Without brake)	Motor (With brake)
MITSUBISHI	M	HF-KP73	HF-KP73B
Yaskawa Electric	Y	SGMJV-08ADA21	SGMJV-08ADA2C
Keyence	Y	SV-M075□□	SV-B075□□

(2) Tension unit

ESM - **TTU**

(3) Carrier unit

ESM - **CA**

(4) Straight unit

ESM - **ST** - **100**

Straight unit length	
100 to 2000	100 mm to 2000 mm

Note: We accept special orders for the length between 100 mm to 2000 mm by 1 mm increment.
7 square units (S-NT) to be mounted every 2 m interval are attached

(5) Curve unit

ESM - **VC** - **90-1**

Angle	
90-1	90 degrees inside
90-2	90 degrees outside
45-1	45 degrees inside
45-2	45 degrees outside

(6) Belt

ESM - **B** - **01370**

Belt length	
01370 to 40570	1370 mm to 40570 mm

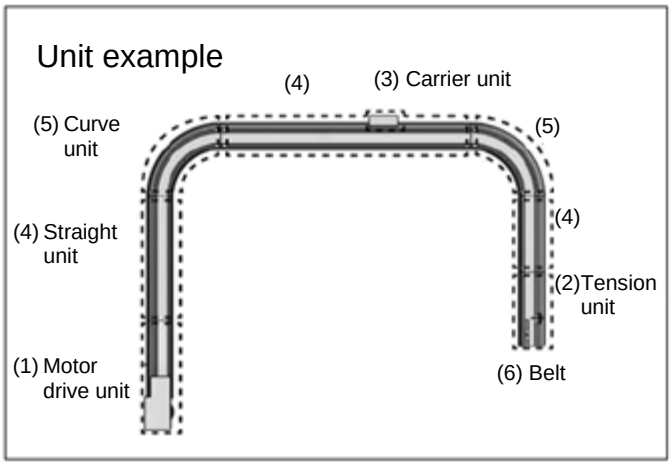
Note: Refer to "Selection guide" on pages 5 and 6 to select the belt length. Please round off the first digit.

● Other unit

ESM - **PP1**

Model no.	Descriptions
PP1 (Note 1)	PP unit (air supply unit)
SE	Detection sensor
T-NT (Note 2)	T-shaped flat nut
S-NT (Note 3)	Square nut

Unit example



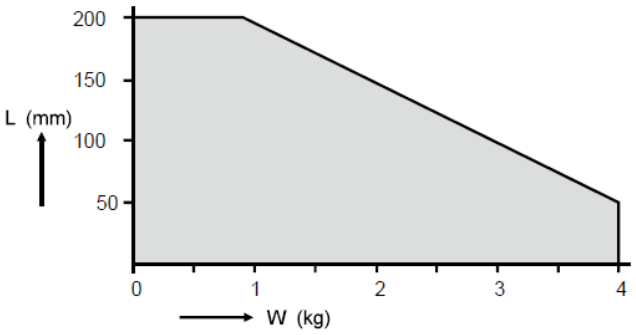
Note 1: This is an air supply unit installed on the carrier. This unit supplies air to the terminal end.
Note 2: It is a bracket for mounting to the main unit.
Note 3: Seven square nuts are attached per 2 m straight unit.

*** Those other than "Other units" are required to create a set.**

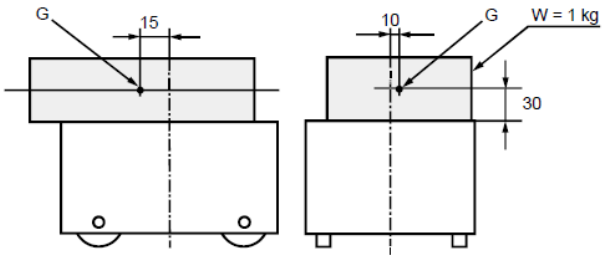
1.5 Confirm maximum allowable load

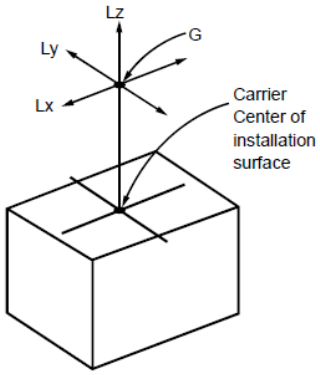
1.5.1 Confirm maximum load

The maximum allowable load may vary depending on the overhang of the center of gravity of the load.
* The allowable load weight may vary depending on the overhang amount.
  Use this product within the range of the following graph.
* Refer to the examples of selection when calculating the overhang amount L.



● Example of selection





W: Load weight
G: Center of gravity of load
Lx: Displacement of G in the X direction
Ly: Displacement of G in the Y direction
Lz: Displacement of G in the Z direction
L: Amount of overhang
L = Lx + Ly + Lz

W = 1 kg

Lx = 15 mm
Ly = 10 mm
Lz = 30 mm
L = 15 + 10 + 30 = 55 mm

For the displacement of the center of gravity of the load, L = 55 mm is allowed as it remains within the range of the graph if W = 1 kg

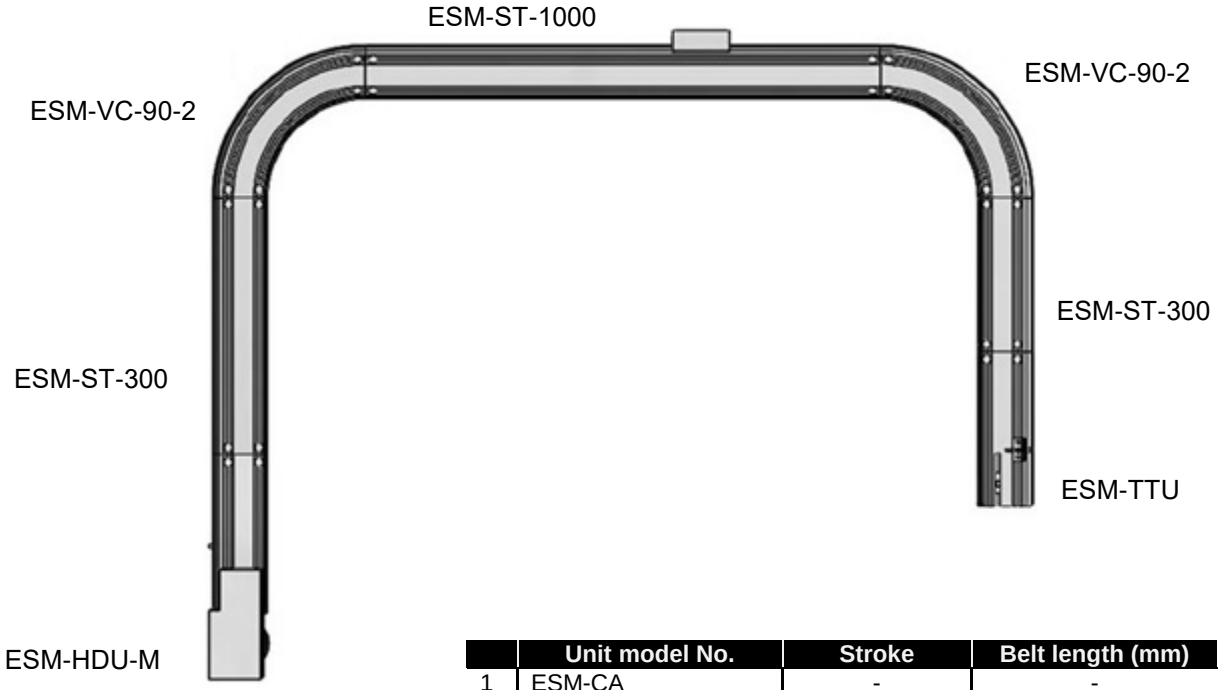
1.6 Checking the stroke and belt length for each unit

1.6.1 Checking the stroke and belt length for each unit

The stroke length and belt length of each unit are as follows.

Unit name	Model no.	Stroke (mm)	Belt length (mm)
Motor drive unit	ESM-HDU	150	1170 (including the tension unit) (fixed length)
Tension unit	ESM-TTU	150	Refer to the motor drive unit (fixed length)
Inside 90-degree curve unit	ESM-VC-90-1	360	910 (fixed length)
Outside 90-degree curve unit	ESM-VC-90-2	550	910 (fixed length)
Inside 45-degree curve unit	ESM-VC-45-1	180	455 (fixed length)
Outside 45-degree curve unit	ESM-VC-45-2	275	455 (fixed length)
Straight unit	Example ESM-ST-100	100	200
	ESM-ST-200	200	400
	ESM-ST-1200	1200	2400
	ESM-ST-2000	2000	4000

1.6.2 Unit combination examples



	Unit model No.	Stroke	Belt length (mm)
1	ESM-CA	-	-
2	ESM-HDU-M	150	HDU + TTU = 1170
3	ESM-ST-500	500	1000
4	ESM-VC-90-2	550	910
5	ESM-ST-1000	1000	2000
6	ESM-VC-90-2	550	910
7	ESM-ST-300	300	600
8	ESM-TTU	150	-

* Transporting distance: 3200 mm
* Belt length: 6590 mm

Belt length selection and examples

Calculate the belt length based on the unit combination given above.

1. The belt length for HDU unit and the tension unit is 1170 mm (fixed length).
2. Double the stroke length of the straight section.
   (stroke length of [ESM-ST-500] + stroke length of [ESM-ST-1000]
   +stroke length of [ESM-St-300]) × 2
   = (500 + 1000 + 300) × 2
   = 3600 mm
3. Belt length for the 90-degree curve unit is 910 mm.
   Since there are two of them, the total will be: 910 × 2 = 1820 mm
4. “Add the belt lengths obtained in steps 1, 2, and 3.”

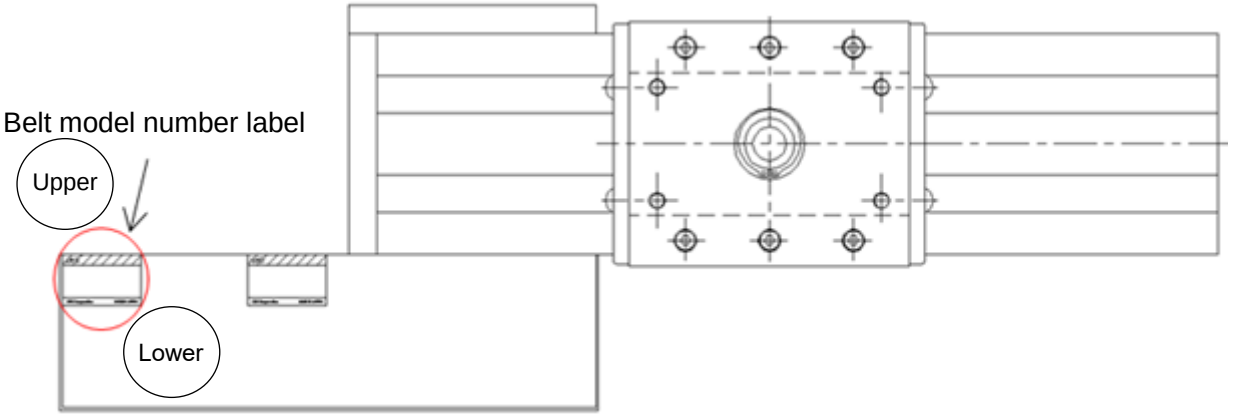
“Belt length for HDU unit and the tension unit” + “Double the belt length for stroke length of straight section”+ “Belt length for the curve unit × quantity”
=1170 mm + 3600 mm + 1820 mm
=6590 mm

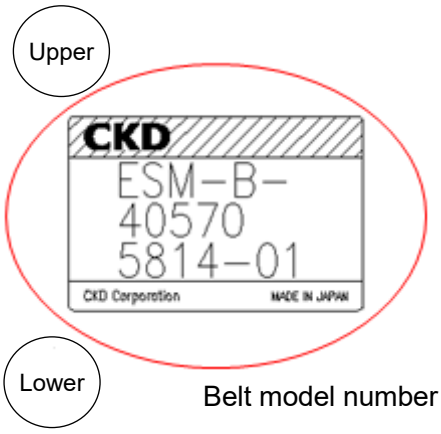
Hence, the belt length is 6590 mm
Belt model no. : ESM-B-06590

1.6.3 When ordering a belt separately

- When ordering a belt separately, the model number label of the belt is attached.
- Attach the belt model number label to the motor drive unit.
- Refer to the figure below for the placement of the belt model number label.

<Belt model number label attaching position>





Belt model number label printing example

1.7 Sensor specification

1.7.1 Sensor type

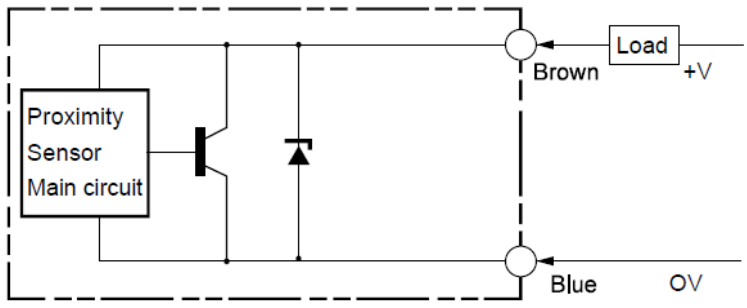
Type	Manufacture	Model
Proximity sensor	**OMRON**	**E2E-X2D1-N**

1.7.2 Sensor specification

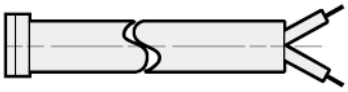
[Sensor specification]

Cylindrical type detection head size	M8
Type	Shield type
Detection method	Induction type
Detection range	2 mm ±10%
Distance setting	0 to 1.6 mm
Hysteresis	15% or less of the detection range
Detectable materials	Magnetic metals (Detection range decreases for non-magnetic metals)
Standard object for detection	Iron 8 × 8 × 1 mm
Response frequency	DC: 1.5 kHz (average)
Power supply voltage	12 to 24 VDC ripple (P-P) 10% or less
Working voltage range	10 to 30 VDC
Leakage current	0.8 mA or less
Control output(output type)	Two-wire DC Polarized
Control output (switching capacity)	3 to 100 mA
Indicator light	Power indicator (red) and setting indicator(green)
Ambient temperature range	During operation: -25 to 70°C, In storage: -40 to 85°C
Ambient humidity range	During operation: 35 to 95% RH, In storage: 35 to 95% RH
Thermal effect	Detection range varies within ±15% in the temperature range of -25 to +70°C. (detection range at 23°C as the standard)

Output circuit



Wiring diagram



Terminal arrangement

Color	Arrangement
Brown	+V
Blue	0V

2. ASSEMBLY

2.1 ASSEMBLY

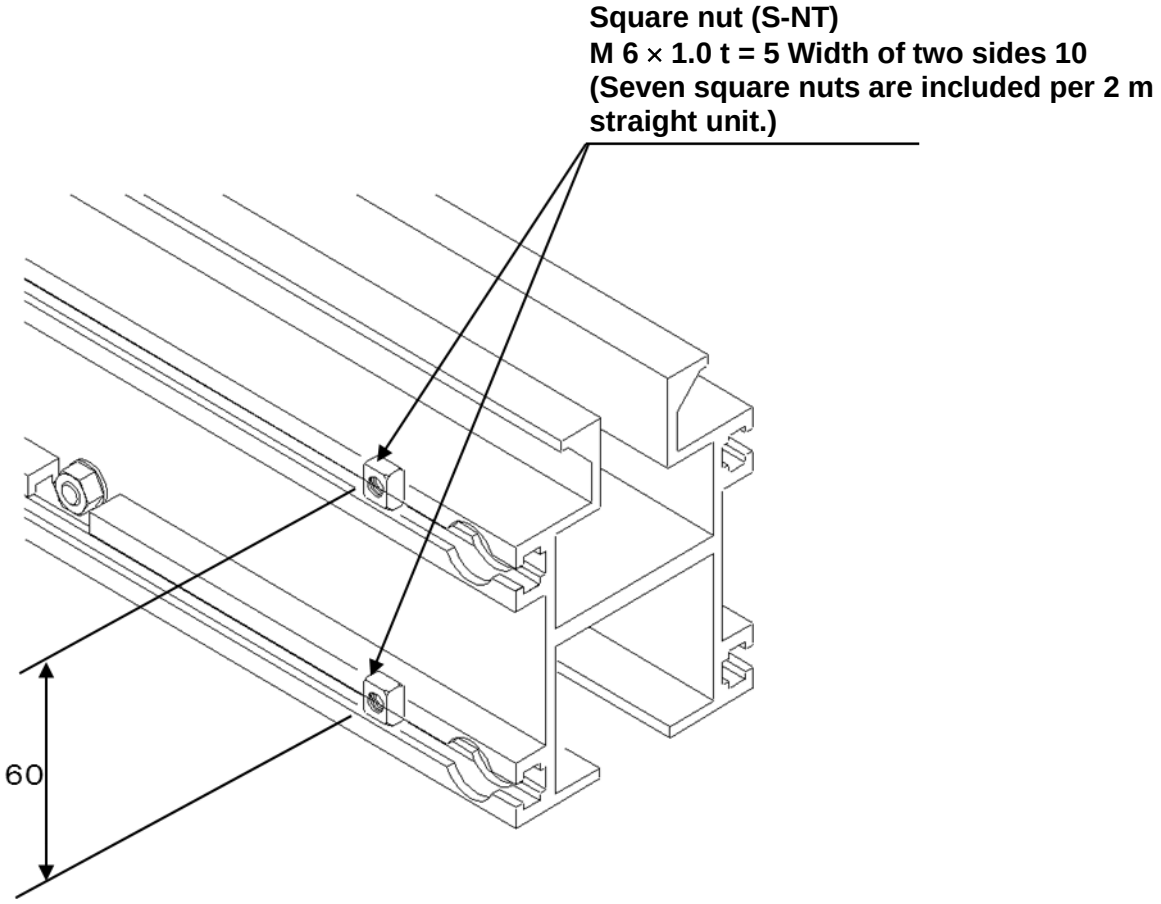
2.1.1 Be careful when assembling (fixing)

- Professional knowledge and skills are required for motor installation and adjustment work. It is dangerous for people who do not have expertise or skills to do work. Be sure to turn off the motor power and the sensor power when performing work.
- For the standard installation, supporting pillars should be placed for every 3 m.
- Do not tap the product with a hammer to move it. Do not lift it directly with wire.
- Be sure to install a safety cover where the system goes over/through aisles and work areas or where a hand or body part may come into contact.
- Ensure sufficient room around the stroke end as below:
  - (1) Room to mount/remove workpieces.
  - (2) Room for the motor.
  - (3) Room to replace the belt at the tensioner.
- After completing installation, move the carrier manually by hand to ensure that nothing will interfere with the movement of the carrier within the operating range.
- Do not let foreign objects enter inside the frame and the belt.

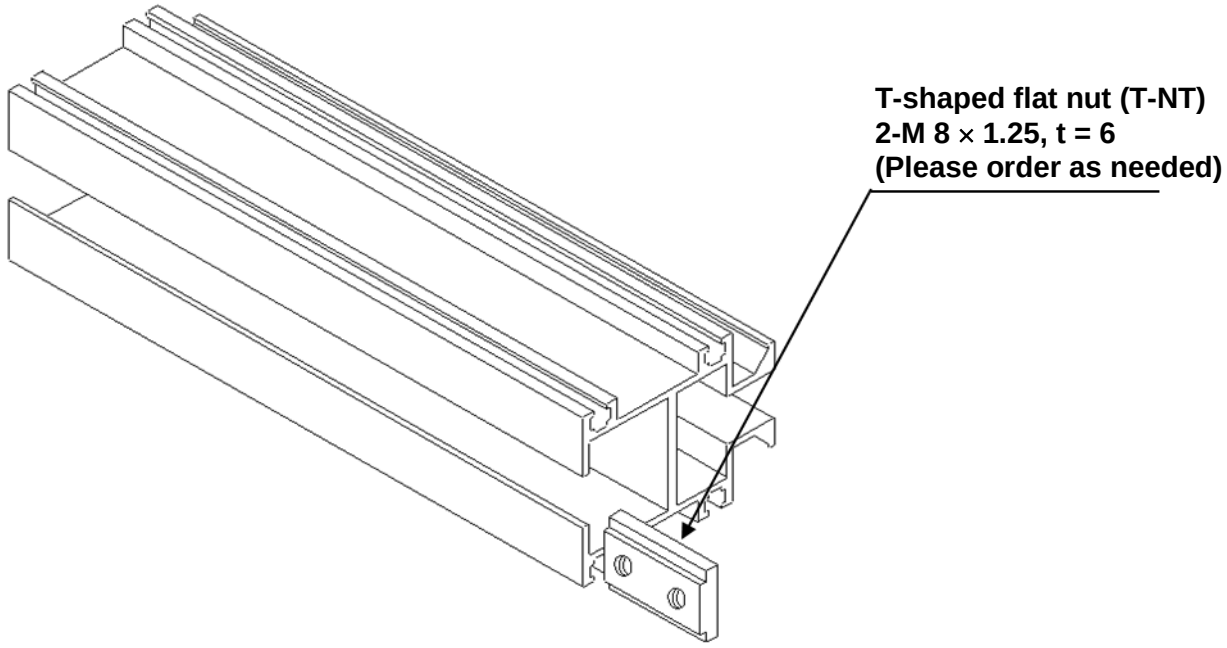
2.1.2 How to install the legs

When installing the legs please attach the legs using the T-groove part of the straight unit or the lower part of the rail.

(1) Use of T-groove of straight unit

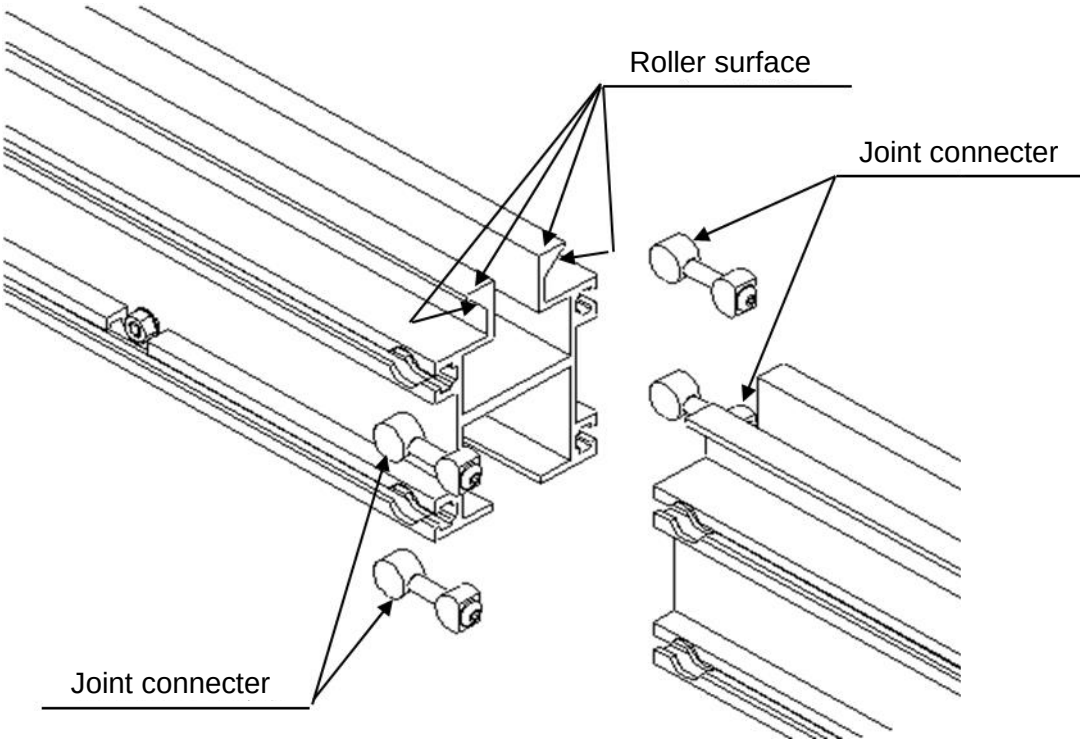


(2) Use the slit under the rail

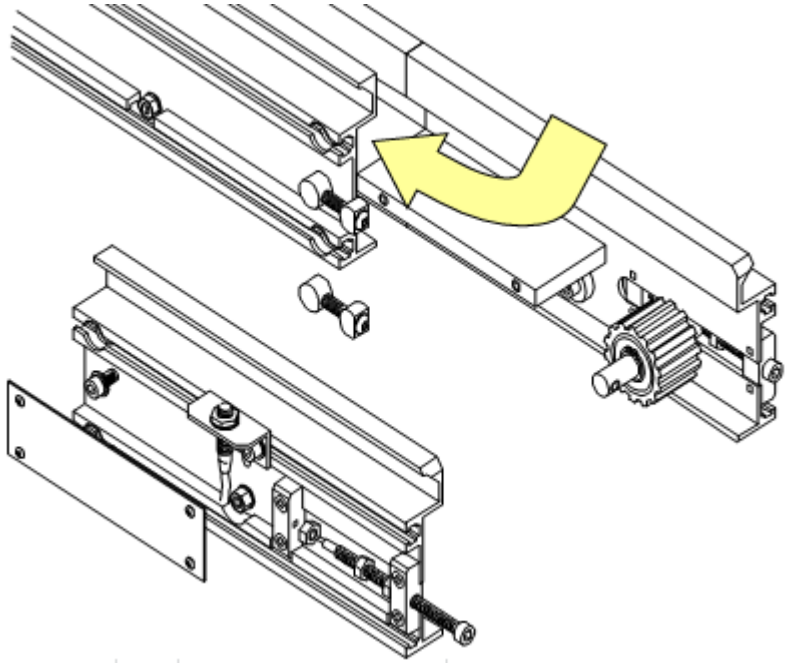


2.1.3 How to joint each unit

- Install necessary number of square nuts in the T-groove.
- Put each section of the Rail and put the joint connecter which Lock-Tite is applied.
- Tighten the bolt of the joint connecter lightly and adjust rails to not make bump on the roller surface. If there is a step, it will cause a running failure or abnormal noise.
- Screw the bolts equally (bolt size: M5, fastening torque: 6.0 Nm ± 10%)
- Confirm that there is no step on the roller surface. (step standard: 0.1 mm or less)
  If there is a step, please try again.



2.1.4 How to belt joint and tension adjustment



1 Disassemble the tension unit into half.

2 Put the belt in the direction of the arrow. Pass the string (customer preparation) through the hole for the joint of the belt. See below, Retract the belt. Note: Insert the belt so that it passes inside the device. Refer to "<supplement> positional relationship between belt, bearing and pulley. (Refer to page 14)" and confirm that the belt is passing (see photo)

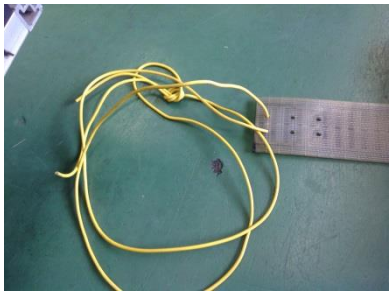


Photo: Passing a belt through a string

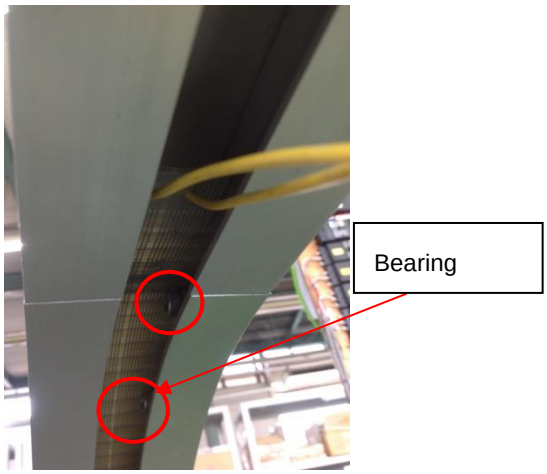


Photo: Insert inside the unit so that the belt passes

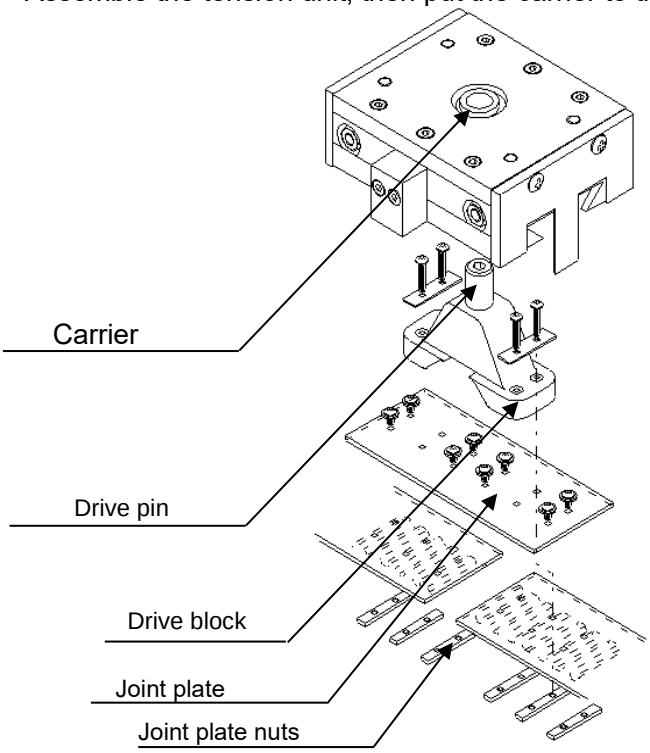
<Supplemental explanation>

Please refer to the positional relationship between the belt and the bearing and pulley (see page 14).

3 When the insertion of the belt is completed, joint the belt at the tension section.

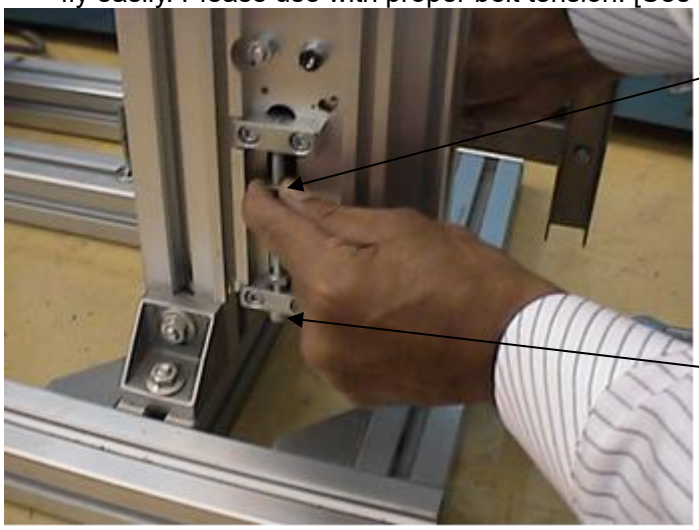
4 Put the belt between the Joint Plate Nuts and Joint Plate, and fix it with screws.
Fix the drive block to the joint plate nuts. Please apply loosening prevention adhesive (customer preparation) to thread part. Screw clamping without adhesive applying may result in slackness and coming off of the screw. Assemble the set screw of the joint plate flat so that it does not protrude from the joint plate nut. Please attach the screw so that the joint plate does not deform.

5 Assemble the tension unit, then put the carrier to the drive pin and fix it.



6 Adjust belt tension.
Before fixing the tension bolt: tension 83 to 9 3N (Push-pull scale measurement)

<<Confirmation method at assembly>>
Perform with the fixing nut of the tension bolt loosened. Pull the tension shaft with a tension of 83 to 93 N. Confirm movement of about 1 mm. If the tension is applied to the belt too much, it will affect the damage of parts such as pulleys and repetition accuracy. If the tension is too loose, the teeth will fly easily. Please use with proper belt tension. [See the figure below]



7 Fully tighten the fixing nut of the tension bolt.

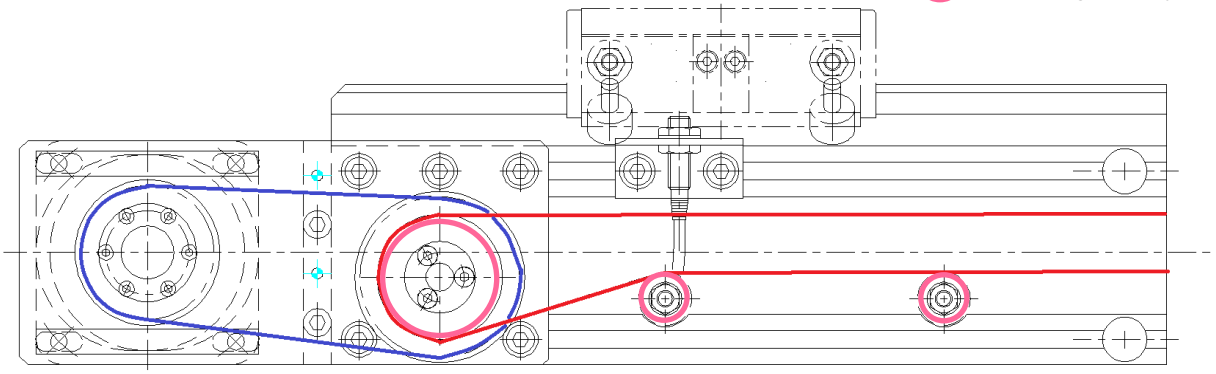
8 Perform trial run to confirm that the belt is not close to one side.

2.1.5 <Supplement> Positional relationship between belt and bearing and pulley

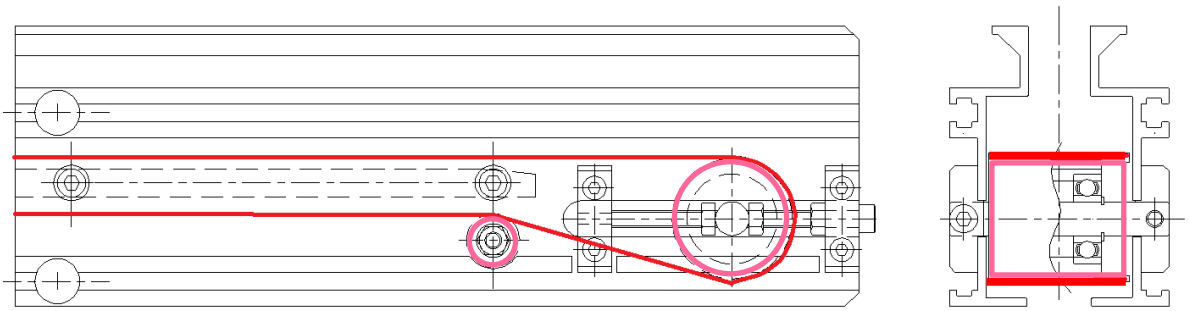
The figure below shows the positional relationship between the belt and the bearing of each unit.

: Belt
: Drive belt
: Bearing, pulley

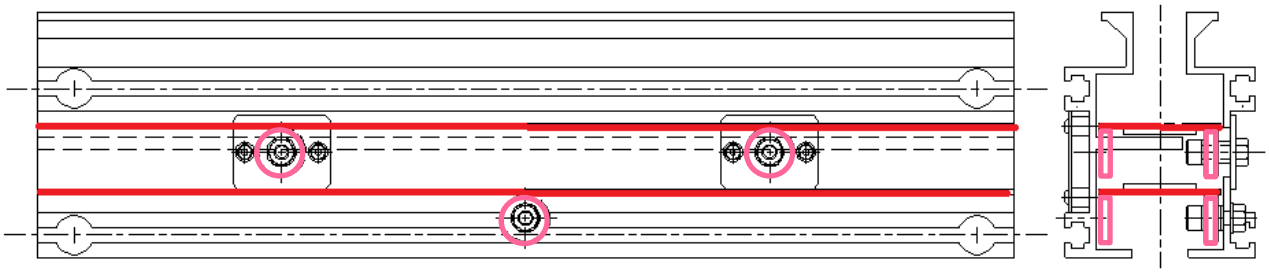
1 Motor drive unit



2 Tension unit

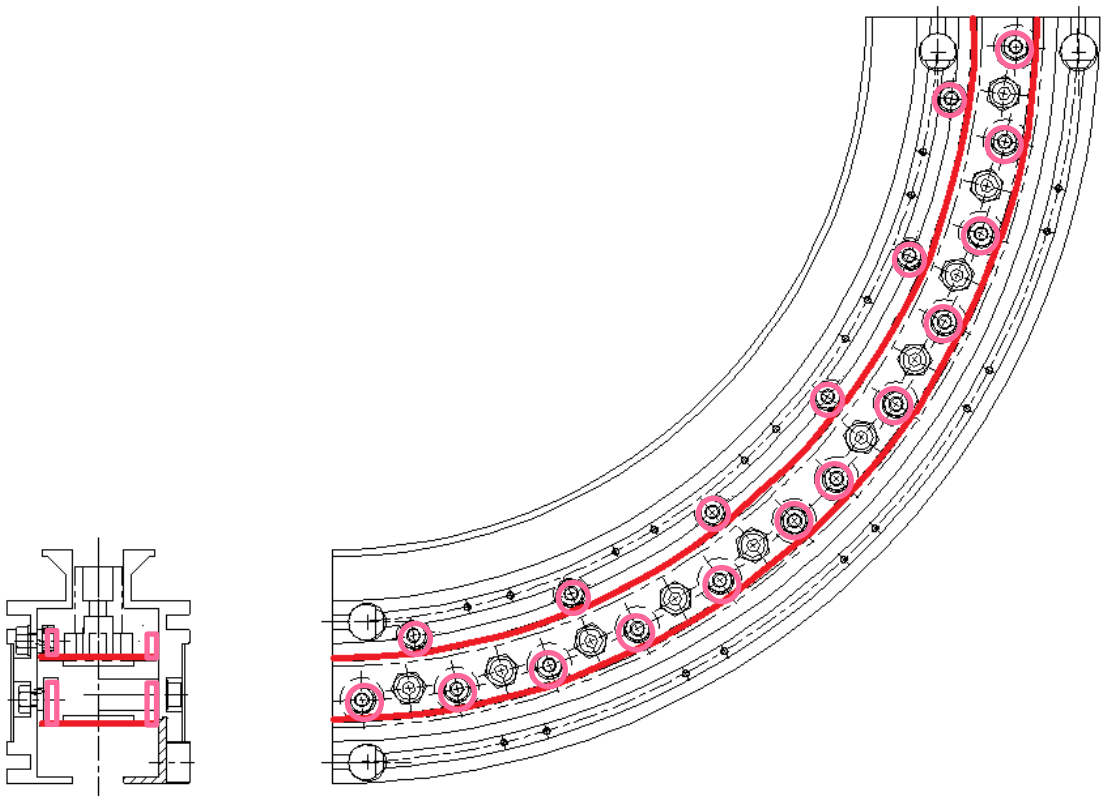


3 Straight unit

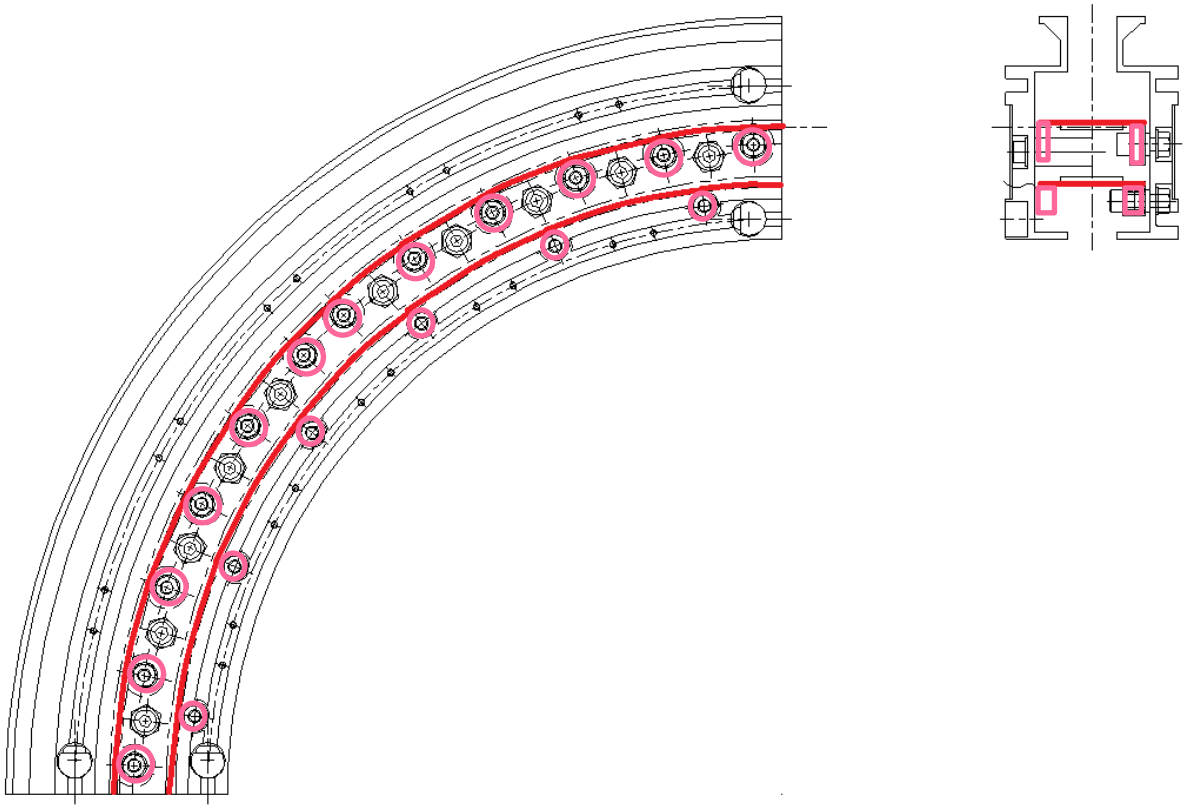


4 Curve unit 90 degrees inside

: Belt
: Bearing

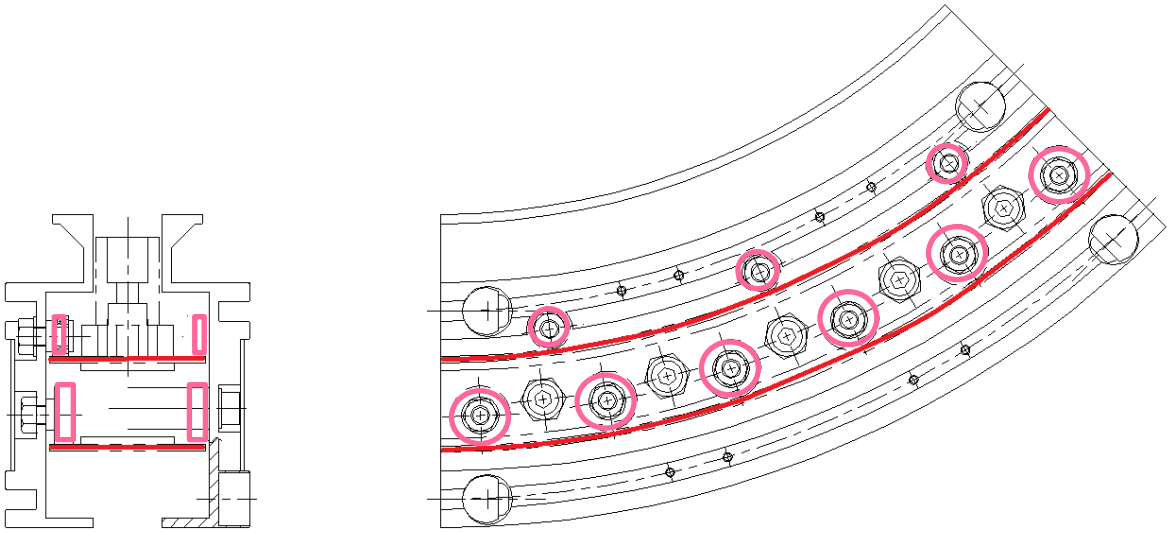


5 Curve unit 90 degrees outside

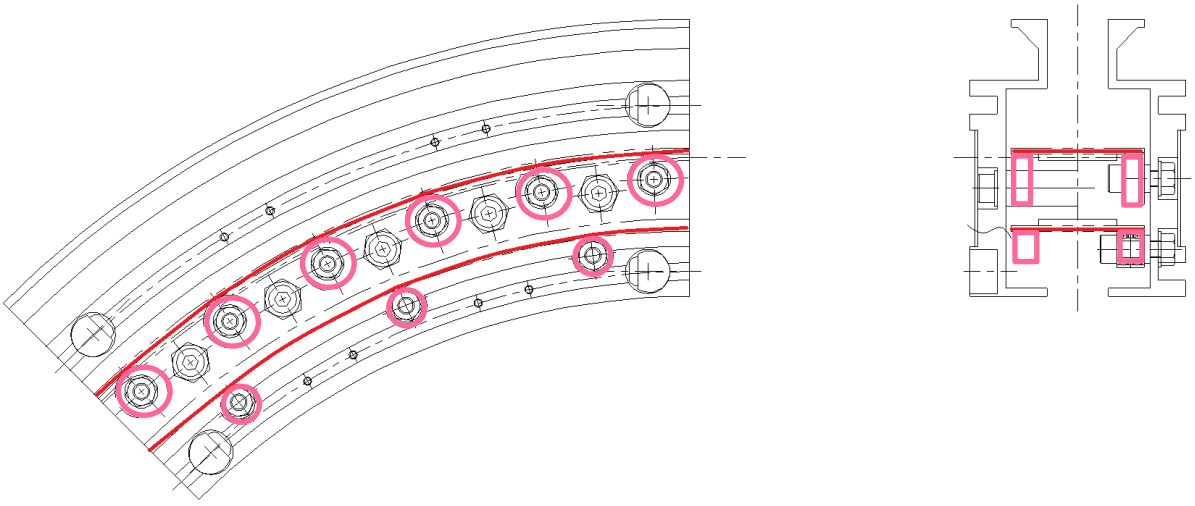


6 Curve unit 45 degrees inside

: Belt
: Bearing



7 Curve unit 45 degrees outside

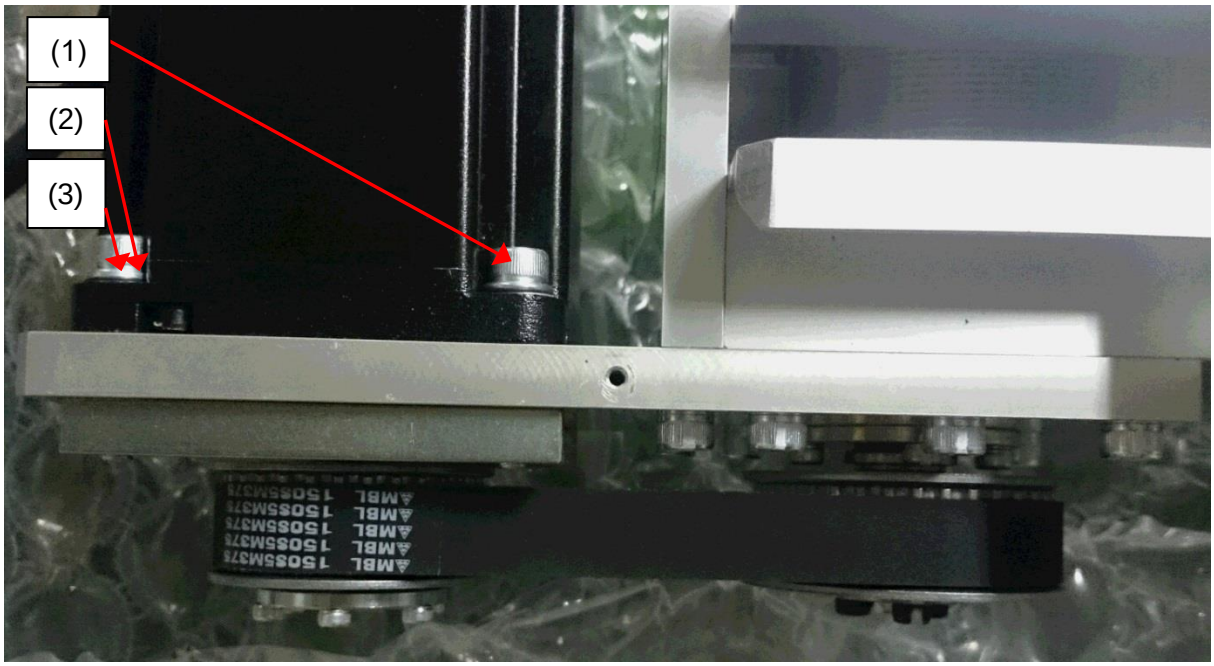


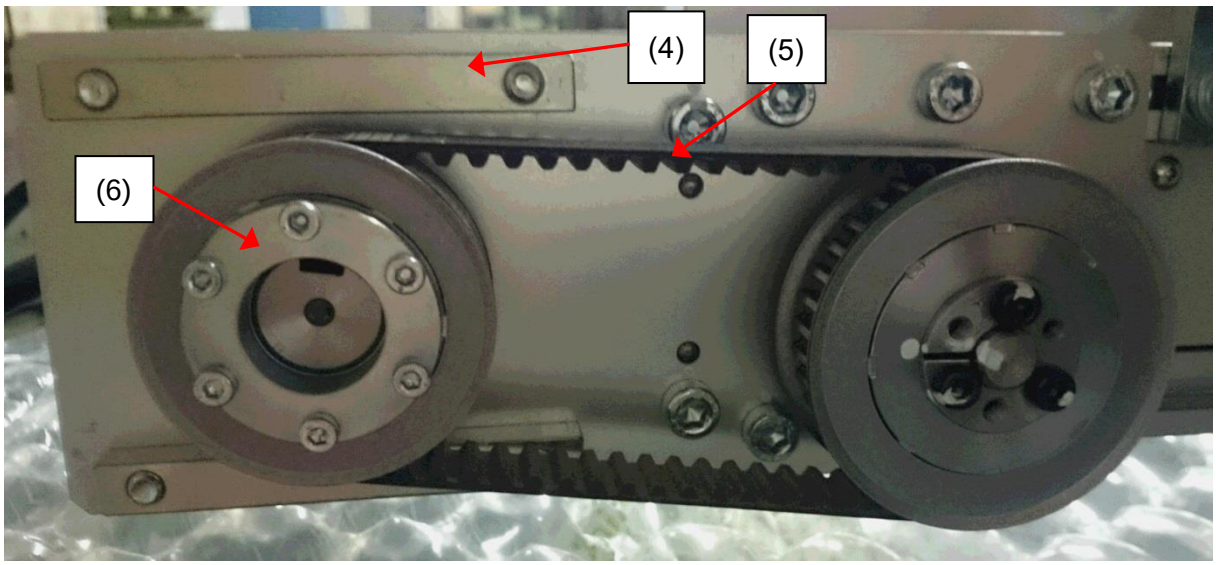
2.2 How to install motor and drive belt

2.2.1 Supplied items of motor drive unit

The following components are included in the motor drive unit.

No	Part name	Pieces	Remarks
(1)	Hexagon socket head cap screw	4	M6 × 30
(2)	Spring washer	4	Steel
(3)	Washer	4	Steel
(4)	Plate nut	2	Steel
(5)	Drive belt	1	Rubber
(6)	Pulley with power lock	1	Power lock type: PL019-24E



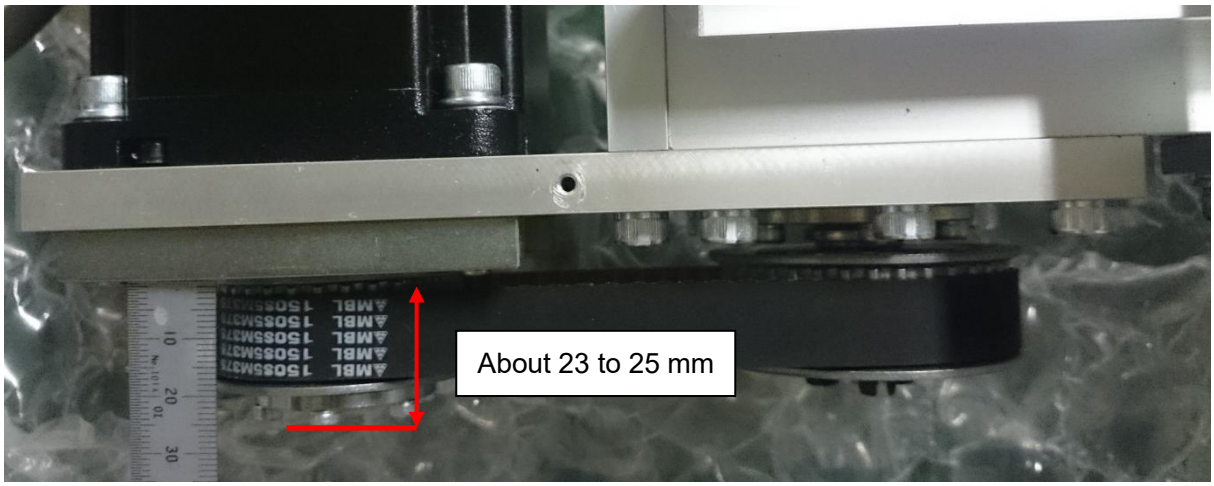


2.2.2 How to install motor and pulley with power lock

1 Attach the spring washer and the washer to the hexagon socket head bolt (M6). Temporarily tighten the motor and the plate nut together with them.

2 Attach the pulley with power lock. The height reference value of the pulley assembly is about 23 to 25 mm from the plate nut to the bolt head of the pulley.
Attach the motor cover and check that it does not interfere.

3 Tighten the pulley hexagon socket head bolt (M3-6 pieces).
Recommended tightening torque: 1.5 to 1.7 Nm



4 Assemble the motor side belt.

5 Slide the motor position so that the tension of the motor side belt becomes 83 to 93 N.
Fully tighten the motor fixing hexagon socket head bolt.
(At the start of use, the drive belt causes initial elongation. Periodically inspect the tension of the belt at the start of use.)

- Note: If the tension is applied to the belt too much, it will affect the damage of parts such as pulleys and repetition accuracy. If the tension is too loose it will be easier for tooth jumping and so use it with proper belt tension.

< Motor side belt specification value>

Weight: 3.4 g/m
Width: 15 mm
Span length: 105 mm

- Note: Please be careful not to rub the belt and pulley spit.

<Carrier transfer amount per motor revolution>

The amount of carrier movement per motor revolution is 116.657 mm.
Approximate motor rotation speed is 2000 mm/s at 1028 rpm and 1500 mm/s at 771 rpm.

- Note: Operating speed: Set the linear part to 2000 mm/s or less and the curve part to 1500 mm/s or less.

3. Installation

3.1 Confirmation of Delivered Product

Please confirm that the delivered product is the product (model) as per order.
Also inspect the product for any transport damage and deformation.

- If you have any questions as to the descriptions on the product, do not use it. Please contact the dealer or the distributor from whom you purchased it immediately.

3.2 Instructions on Handling Delivered Product

3.2.1 Handling of Packed Product

- Handle the product carefully so as not to drop it and apply impact on the package.
- Do not carry a heavy package by one person alone.
- When placing the product in a static position, place it horizontally.
- Never get on the package.
- Do not place heavy objects that deform the package or objects that concentrate the load on the package.

3.2.2 Handling of Unpacked Product

- When unpacking the actuator from the package, pick it up by the body part.
  Be very careful not to be injured by a sensor dog, etc.
- When carrying the actuator, be careful not to apply impact on it due to dropping, etc.
- Do not apply an external force to any part of the actuator.

3.3 Installation Environment

- Check the ambient temperature and atmosphere described in the product specifications for product storage and operation.
- Do not install or use the product in a place where the product can be exposed to water or oil.
  * Doing so may result in current leakage or fire accident.
    Exposure to oil droplets or oil mist is also strictly prohibited.
- Use the product in a place where the operating ambient temperature is 0 to 40°C. Ventilate the place if the heat is trapped there.
- Install the product in a place where it is not exposed to direct sunlight, dust, vicinity of heat generating element and where there are no corrosive gas, explosive gas, flammable gas, and flammables. This product is not designed to be resistant to chemical substances.
- Do not install the product in places subject to strong vibration or impact. Doing so may result in malfunction.

3.4 Installation of Product Body

- The flatness of the installation surface of this product should be 0.05 mm or less per 200 mm so that twisting or bending force is not applied.
  * If it is mounted on a surface with dents, it may cause malfunction or breakage of the actuator.
- When installing the product on the mounting surface, tighten the screws with proper torque. Bolts may become loose due to vibration or external force. Please take measures to prevent loosening as necessary.

M4	1.5 N•m
M5	3.0 N•m
M6	5.2 N•m
M8	12.5 N•m
M10	24.5 N•m

3.5 Installation of Carriers

- The flatness of the mounting surface where the carrier to be attached to the product should be 0.05 mm or less per 200 mm, and do not give twist or bending force to the product.
- Use the product within the specified transport load, allowable moment, and overhang amount.

4. Operation

- **Please read “Introduction” of this Instruction Manual thoroughly, and use the product within its specifications.**
- **This product has no motor.**
  Please obtain, install, and adjust the motor and driver by yourself.
  For details on how to install the motor properly, refer to this Instruction Manual.
  For details on how to adjust the motor, refer to the instruction manual of the motor you prepared.
- **The recommended servomotors have a gain adjustment function to control vibrations.**
  Adjust the gain and operate the product under vibration-controlled conditions
  (during operation/halts).
  If the product is operated under vibration/resonance conditions,
  the product life may be shortened.
  Set the acceleration time / deceleration time in operation to 0.5 sec or more.
  Operating speed: Set the linear part to 2000 mm/s or less and the curve part to 1500 mm/s or less.
  The amount of carrier movement per motor revolution is 116.657 mm.
  Approximate motor rotation speed is 2000 mm/s at 1028 rpm and 1500 mm/s at 771 rpm.
- **Please drive after trial operation.**
  At the start of use, the drive belt may come loose. Periodically inspect the tension of the belt and use by a proper tension.

5. Maintenance & Inspection

To ensure longer service life of the product, carry out the following inspections and perform maintenance as necessary.
Maintenance and inspection should be conducted with securing safety.
Be sure to turn off the power when performing maintenance check except for <Confirmation of No. 3 sound and vibration> and <No. 6>.

[Maintenance items]

Maintenance items	How to Maintenance	Maintenance frequency	Treatment
No.1 For products, carried object, fixing brackets (legs) is the bolt loose?	Looseness inspection of bolt	Daily	Retighten.
No.2 There should be no scratches or cracks on the cables	Visual confirmation	Daily	Repair is necessary.
No.3 Shuttle body and movable part • No abnormal noise and vibration • No abnormal scratches or dents • There are no obstacles or foreign substances hindering movement of carriers • The rail is not dirty No foreign matter accumulated Good sliding of moving parts	Visual confirmation Tactile confirmation Auditory confirmation	Daily	As needed, please clean.*1 Estimate: Every 3 months or every 100 km*1
No.4 Is the tension of the belt appropriate?	Confirmation of belt tension	Every time	Adjust belt tension Tension: 83 to 93 N
No.5 Is there a belt abnormality? Check for any abnormality of the belt such as wear or tear on cogs and sides of the belt, partial cutting, longitudinal cracks at cogs, and cracks on the back side of the belt. • Please confirm that there is no abnormality (crack, elongation) on the joint plate part	Visual confirmation	Every 3 months or every 3000km	Repair (replacement) is required.
No.6 Confirm that there is no vibration or noise during stop, during operation.	Auditory confirmation	Daily	Please adjust the gain. Repair is necessary.
No.7 Carrier • Check the roller for wear. • Check whether the joint block is abnormal (cracked, blooming, solidification).	Visual confirmation	Every 3 months or every 3000km	Repair (replacement) is required.

• *1: Please use soft cloth or the like for cleaning. Please be careful not to leave any foreign matter in the moving part.

6. Repair parts

6.1 Repair parts

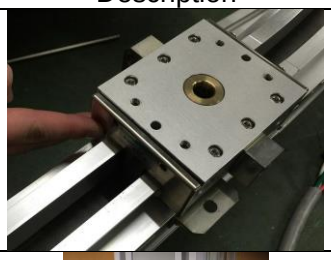
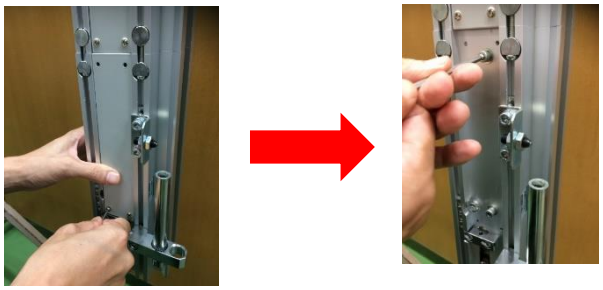
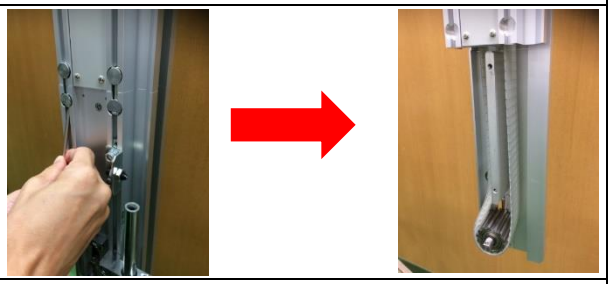
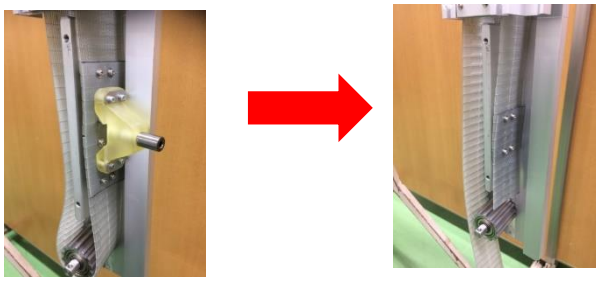
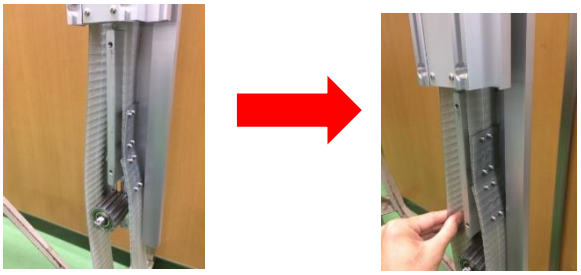
The following are consumable parts. In order to use this product for a long time, periodically do maintenance and inspection. We will recommend replacement when the parts replacement time comes. **Also, if abnormality is confirmed during maintenance, replacement is recommended. Parts may need to be replaced even if the replacement time does not come.** When abnormal and ordering, please contact the nearest our office.

Set name	Set No.	Set descriptions
Roller set	ESM-RO	Rollers, shafts, and bearing assemblies (for 1 unit)
Joint set	ESM-JO	Drive block, Joint plate, and screws
Carrier side belt	Belt for ESM-B-****	Belts for specially modified for customer’s measure.
Motor side belt	ESM-B-K	One for the motor pulley

- * Specify the set No. when you place an order.
- * Avoid sunlight, oil, water, and ozone for rubber and polyurethane parts in the set. Store them in a cool and low-humidity place.

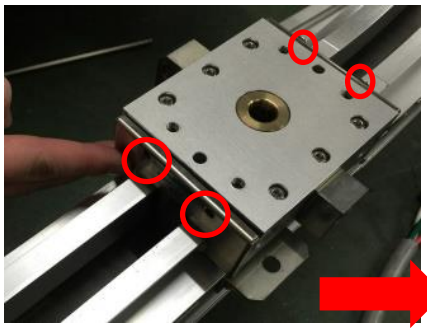
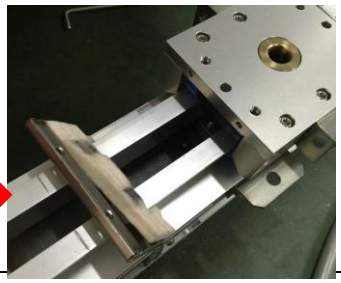
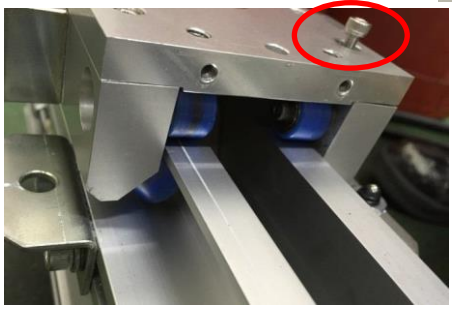
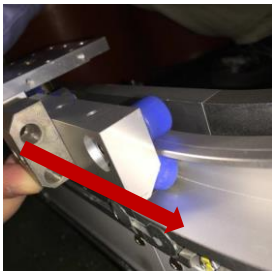
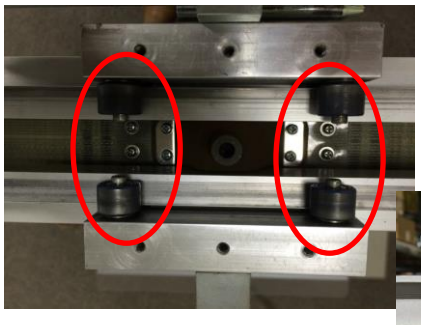
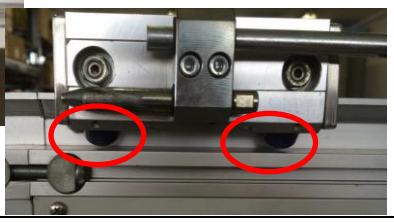
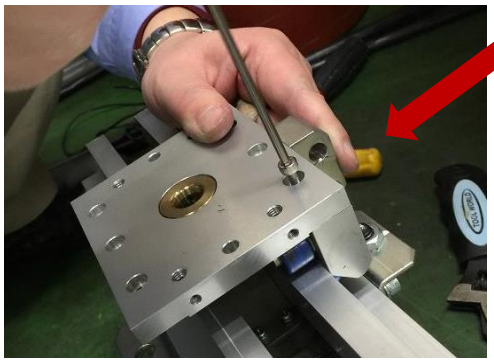
6.2 Replacement of belt

Befor replacing the belt, turn the power off.

Order	Procedure	Description
(1)	Remove the carrier unit.	
(2)	Remove the tension bolt (one side) that attaches to the tension unit.	
(3)	Remove the cover of the tension unit and remove the inner bolt.	
(4)	Remove the two joint connectors and divide the tension unit in half.	
(5)	Remove the drive block. Remove one side belt from the joint plate. (Be careful not to drop the joint plate nut on the back side.)	
(6)	Attach a new belt to the joint plate. You can replace the old belt with the new one by pulling it. Remove the old belt, adjust the tension and assemble it back.	

6.3 Replacement of roller

Before replacing the roller, turn the power off.

Order	Procedure	Description
(1)	Remove the round screws in 4 places on the front and back.	 
(2)	Remove the 6 hexagon socket head cap screw on the top surface. Note: Slide the roller assembly.	 
(3)	4 rollers on upper side, 4on the lower side. There are 8 places in total.	 ←Top surface ↓Bottom surface 
(4)	When reassembling, apply force inward to assemble. Assemble with no rattling of the rollers.	

7. WARRANTY PROVISIONS

7.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual
- Failure caused by incorrect use such as careless handling or improper management
- Failure not caused by the product
- Failure caused by use not intended for the product
- Failure caused by modifications/alterations or repairs not carried out by CKD
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery
- Failure caused by fire, earthquake, flood damage, lightning strike, other natural disasters, landslides, pollution, salt damage, gas hazard, abnormal voltage, other causes beyond control of CKD

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

7.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.