

ESM

Overhead Transfer System (Belt Drive)

Electric Shuttle Mover
Servo Motor Compatible
Motorless Specification



CONTENTS

Product Introduction	436
● Model Number Indication	438
● Specifications	439
● External Dimension Drawings	440
● Circuit Example for Air Gripper Use	444
● Consumable and Repair Parts	444
● Detection Sensor	445
● Unit Selection	446
▲ Precautions for Use	448

Servo motor compatible

EBS

EBR

ETS

ETS
Multi
Axis

ECS

ETV

ECV

EKS

ESM

Ending

Servo motor compatible

EBS

EBR

ETS

ETS
Multi
Axis

ECS

ETV

ECV

EKS

ESM

Ending

Servo motor compatible
EBS
EBR
ETS
ETS Multi Axis
ECS
ETV
ECV
EKS
ESM

Servo motor compatible
EBS
EBR
ETS
ETS Multi Axis
ECS
ETV
ECV
EKS
ESM



Overhead Conveyor System

Overhead transfer system made by combining rails

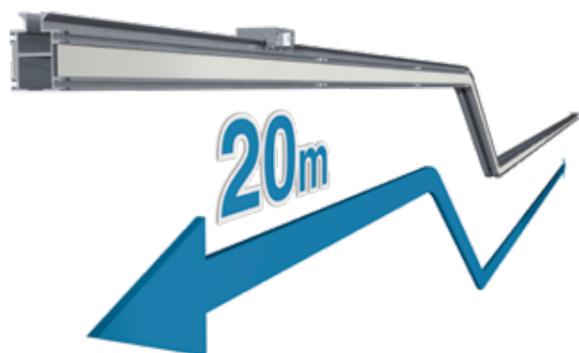
By connecting units such as straight and curved sections, overhead transfer is achieved with a single motor. Effectively utilizes space and contributes to space savings.



Space saving
Productivity improved
Easy adjustment

Long stroke

Breaking the conventional concept of electric actuators, it supports an unprecedented long stroke. It can also be used in applications where linear motors are considered.



High versatility
Productivity improved

List of supported motor manufacturers * Refer to each model page compatible model and capacity

Servo Motor
Mitsubishi Electric Corporation Yaskawa Electric Corporation Keyence Corporation

Solution Examples

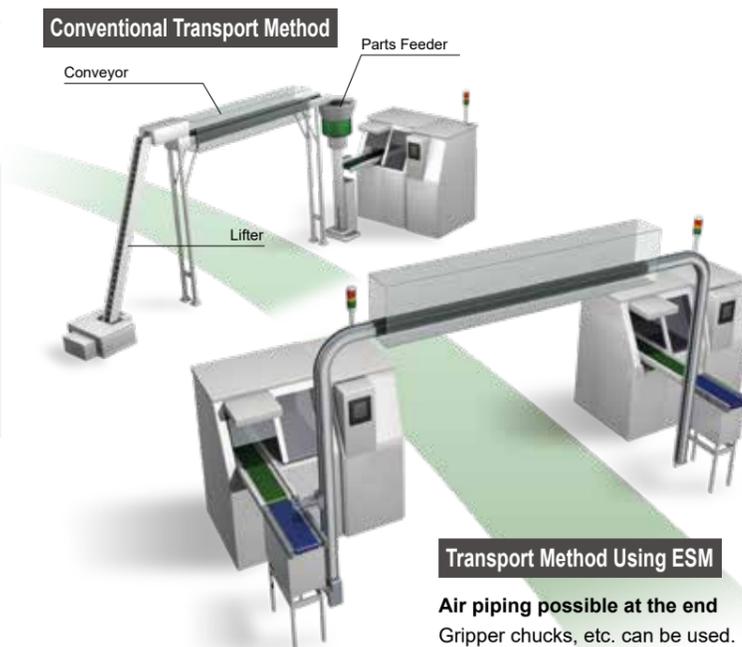
Effective Use of Space

Transfer between equipment for the next process

Transferring workpieces from one piece of equipment to another while maintaining conventional passageways.

Example of Effects 2D Transport

- High speed transport possible (straight part: Max. 2,000 mm/s Curve section: Max. 1,500 mm/s)
- Multi-point stop at any position (repeatability ± 0.5 mm)
- Control of soft start and stop
- Configure path using a combination of straight line and curve unit
- Easy layout change after installation



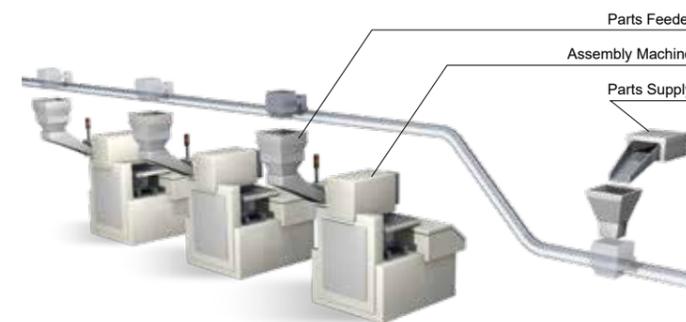
Want to improve production efficiency

Supplying parts to identical devices in parallel

Supplying assembly parts to multiple identical devices in a row, unified with a single actuator.

Example of Effects Long Stroke/Multi-point Positioning

- * The waste of the production line was eliminated, and the productivity was improved.
- * Reduced staff workload.
- * The assembly machines are linearly arranged, enabling effective use of plant space.



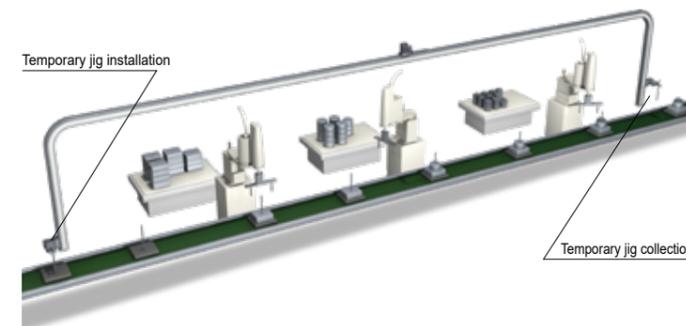
Do not want to make large-scale capital investments or modifications

Temporary pin collection on the free-flow line

At the start of assembly, the pins that temporarily held the workpiece are collected at the end. Return to the starting location.

Example of Effects Long Stroke/High Speed

- * The transport workload of the staff has been reduced.
- * The device layout has been improved with little change.





Electric Shuttle Mover
ESM Series
 ● 3D conveyor system



Model No. Notation Method

① Motor Drive Unit

ESM - HDU - M

① Mounting Motor Specifications

M	Select the mounted motor specification from the table at right.
Y	*Contact CKD regarding other motor manufacturers and models.

Mounting Motor Specification and Recommended Motor Model Number (Rated Output 750 W)

Manufacturer	Code	Motor
Mitsubishi Electric Corporation	M	HG-KR73
Yaskawa Electric Corporation	Y	SGM7 J-08
Keyence Corporation	Y	SV2-□075

② Tension Unit

ESM - TTU

③ Carrier Unit

ESM - CA

⑥ Belt

ESM - B - 01370

① Belt length	
01370 to 40570	1370 mm to 40570 mm

* For belt length selection, please refer to P. 446, 447 of the model selection guide.
 * Please round to the nearest whole number.

● Other units

ESM - PP1

Model No.	Content
PP1*1	PP Unit (Air Supply Unit)
SE	Detection sensor (see P. 445 for details)
T-NT*2	T-shaped plate nut

*1 This is an air intake unit that attaches to the carrier. Used for air supply at the end. The PP unit (air supply unit) cannot be used with the curve unit directly connected to the motor drive unit.
 *2 This is a bracket for mounting the main body.

④ Straight Unit

ESM - ST - 100

① Straight Unit Length

100 to 2000	100 mm to 2000 mm
--------------------	-------------------

* Production is possible from 100 mm to 2000 mm, selectable in 1 mm increments.

⑤ Curve Unit

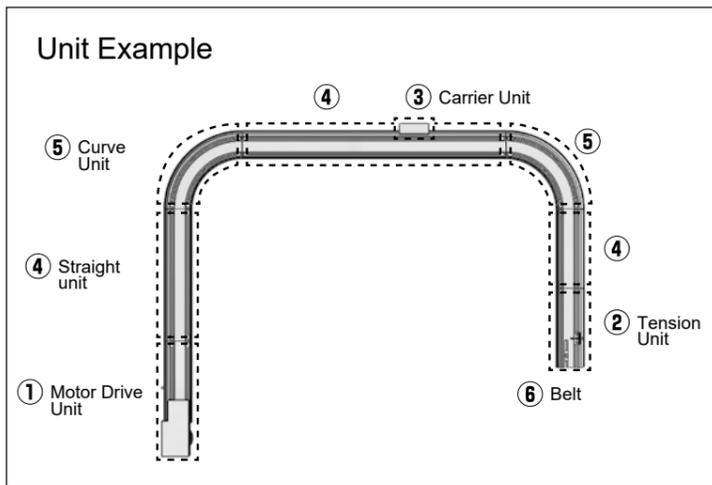
ESM - VC - 90-1

① Angle

Jan-90	Inside 90 degrees
Feb-90	Outside 90 degrees
Jan-45	Inside 45 degrees
Feb-45	Outside 45 degrees

* A maximum of 180 degrees in total can be used for one set.
 Example: 90 degrees: Up to 2 units, 45 degrees: Up to 4 units

Unit Example

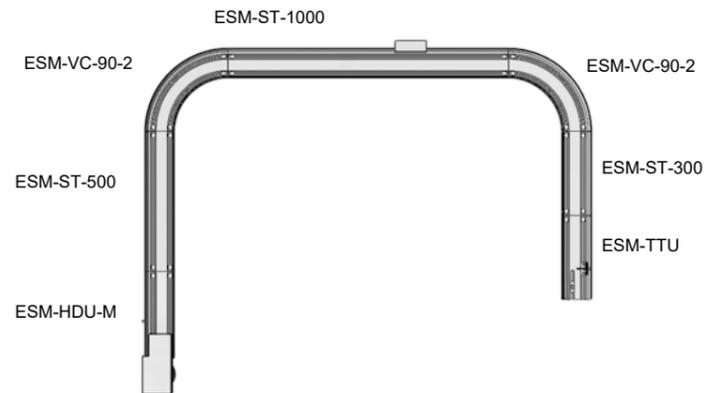


Specifications

Motor Power Supply Voltage	Three-phase 200 V
Max. Payload kg	4
Max. Speed mm/s	Straight section: 2000 or less Curve section: 1500 or less
Max. transporting distance *1 m	20
Vertical difference *2 m	3
Repeatability mm	±0.5
Lubrication	Not allowed
Applicable Motor *3	AC Servo Motor 750 W See P. 438 for recommended motors
Detection Sensor *4	Proximity Switch OMRON E2 E-X2D1-N
Operating Environment	General factory indoor (room temperature 5 to 40°C)

*1 For strokes exceeding 20 m, please consult with us.
 *2 Height difference is the value obtained by subtracting the lowest height from the highest height in the transport path.
 *3 For motors other than the recommended ones, please consult with us.
 *4 If home and both-side overrun detection is required, 3 pieces are necessary. (Please order the required quantity. For the model No., refer to P. 438, and for specifications, refer to P. 445.)
 * Please use with acceleration/deceleration of 0.4 G or less. * 1 G ≈ 9.8 m/s².
 * This product does not have a motor attached. The motor and driver should be prepared, mounted, and adjusted by the customer.
 * This product is sold as a unit. Please perform installation and adjustment yourself.
 * The PP unit (air supply unit) cannot be used with the curve unit directly connected to the motor drive unit.
 * Cannot be used on its side or upside down.

Unit Combination Example



	Unit Model Number	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	-

● Transport distance: 3200 mm
 ● Belt length: 6590 mm

Specification and Unit Combination Example

Weight

Unit Name	Unit Model Number	Weight (kg)
Carrier Unit	ESM-CA	0.7
Motor Drive Unit	ESM-HDU-M	4
Straight Unit	ESM-ST-100 *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

*1 If the stroke length increases by 100 mm, the weight increases by 0.5 kg.

Belt Length Selection Method and Example

Calculate the belt length using the unit combination above as an example. (For details, please refer to P. 446)

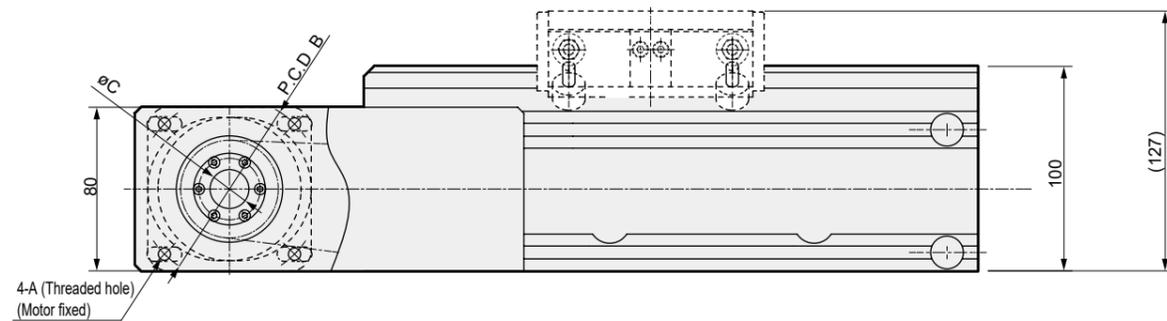
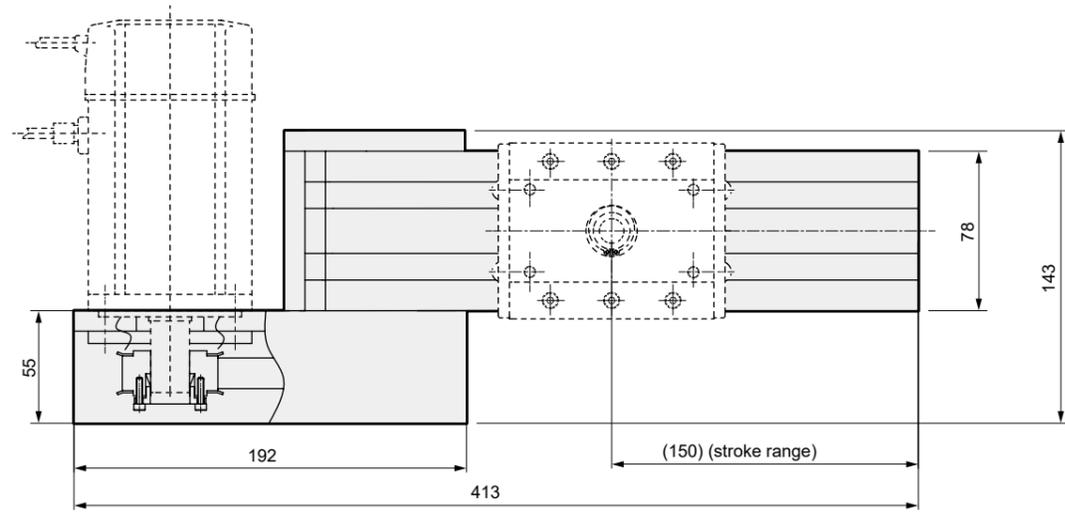
- Belt length of motor drive unit and tension unit section: 1170 mm (fixed value)
- Calculate twice the stroke length of the straight section.
 (Stroke length of [ESM-ST-500] + Stroke length of [ESM-ST-1000] + Stroke length of [ESM-ST-300]) x 2
 = (500+1000+300)x2
 = 3600 mm
- 90-degree curve unit belt length: 910 mm
 Since there are 2 units, 910 x 2 = 1820 mm
- 'Add the belt length given by Item 1, Item 2, and Item 3 above' (Round off the first digit)

Belt length of motor drive unit and tension unit section + "Twice the stroke length of the straight section" + "Belt length of curve unit x number of units"
 = 1170 mm + 3600 mm + 1820 mm
 = 6590 mm

Therefore, the belt length is : 6590 mm
 Belt model No. : ESM-B-06590

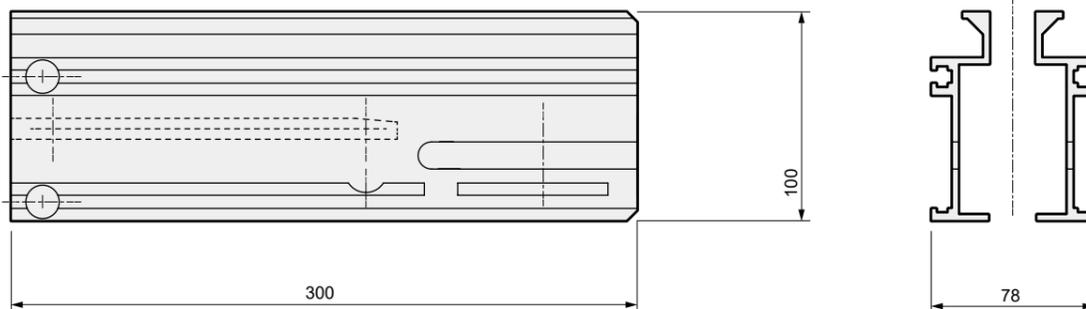
* All units other than "Other Units" are necessary to configure one set.

● Motor drive unit (ESM-HDU-□)

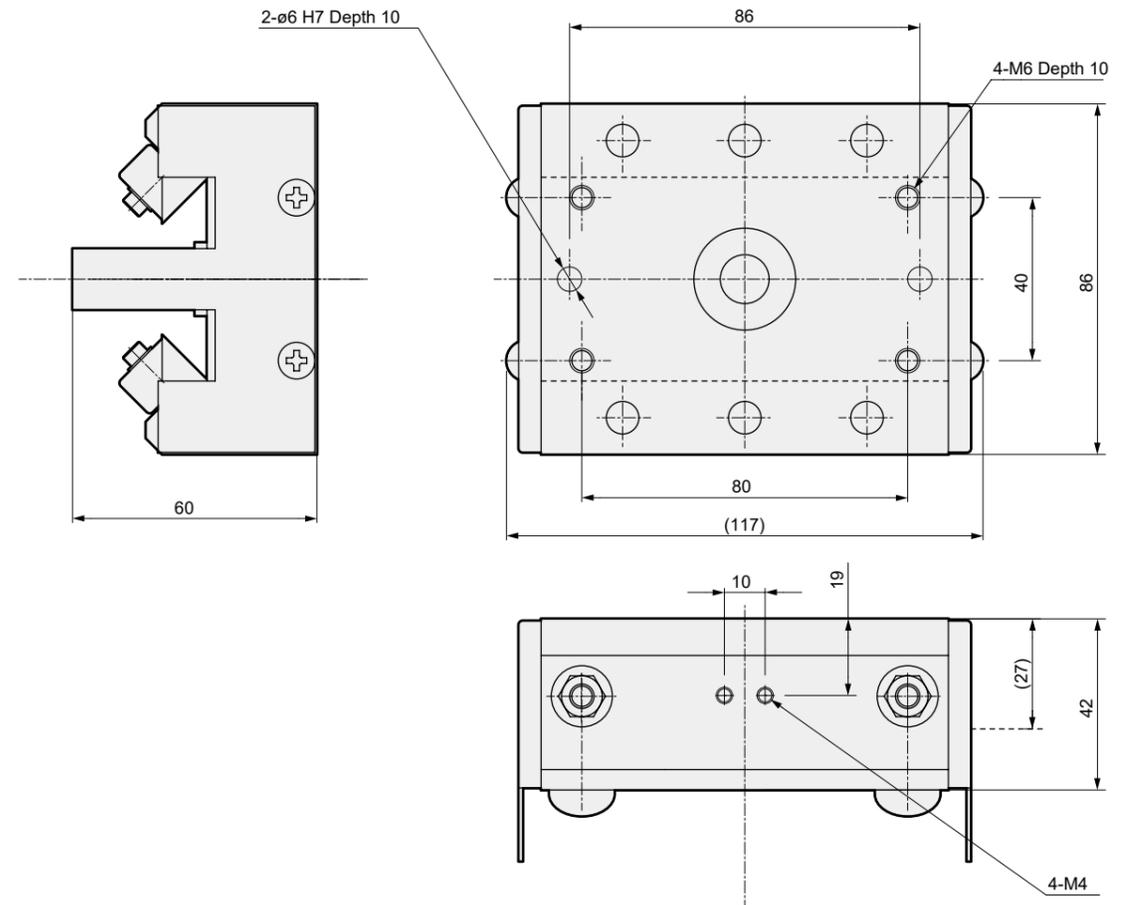


Mounting Motor Specification	A	B	C
M	M6	ø90	ø19
Y	M6	ø90	ø19

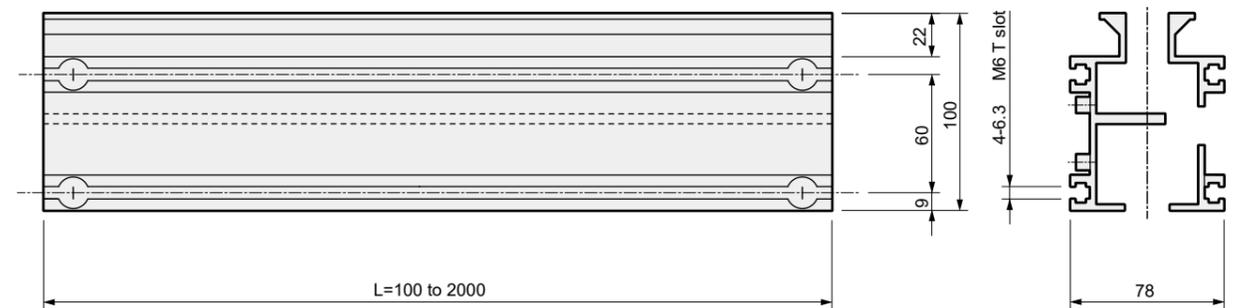
● Tension unit (ESM-TTU)



● Carrier unit (ESM-CA)



● Straight unit (ESM-ST-□)



* 7 square nuts for mounting are attached every 2 m.

Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

ECV

EKS

ESM

Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

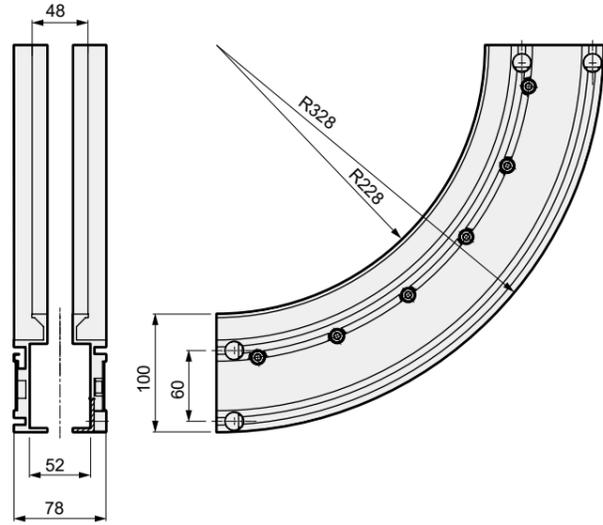
ECV

EKS

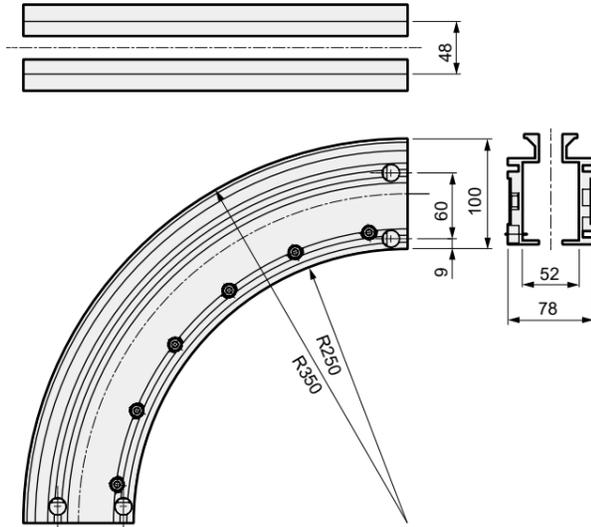
ESM

External Dimension Drawings

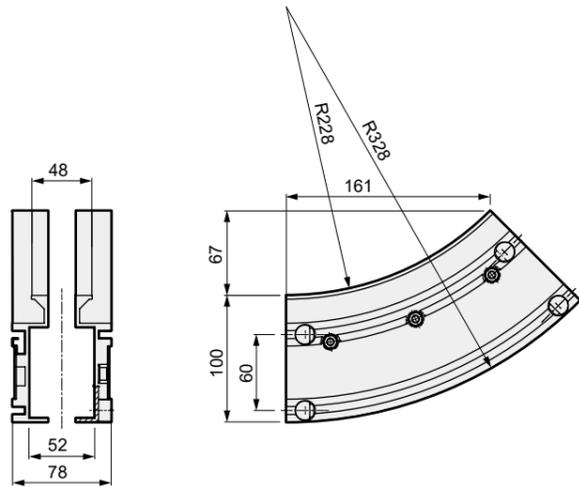
● Curve Unit: Inside (ESM-VC-90-1)



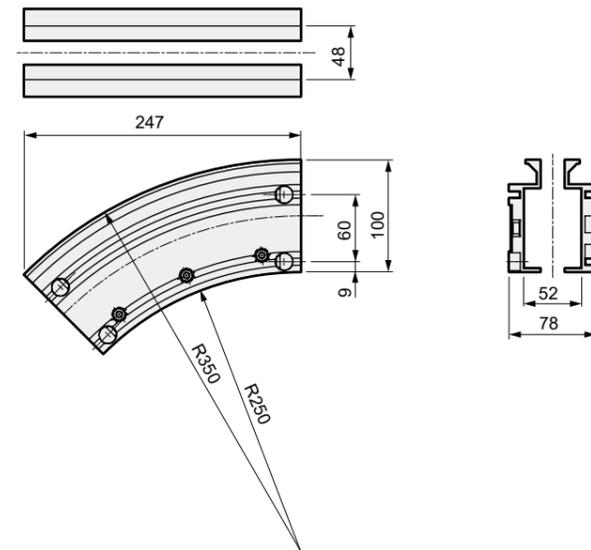
● Curve Unit: Outside (ESM-VC-90-2)



● Curve Unit: Inside (ESM-VC-45-1)



● Curve Unit: Outside (ESM-VC-45-2)

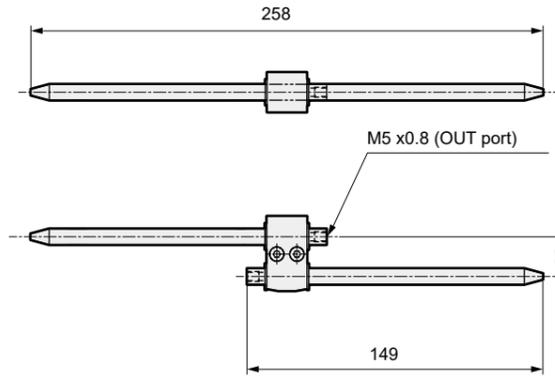


External Dimension Drawings

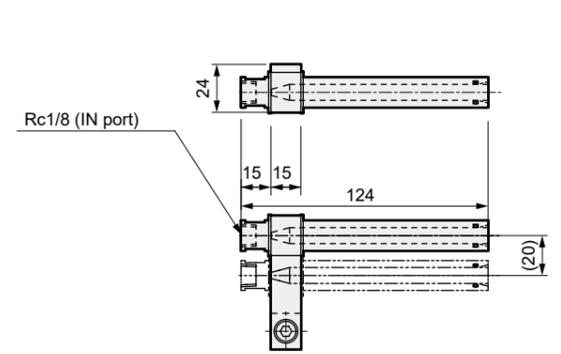
External Dimension Drawings

● PP unit (ESM-PP1, air supply unit)

● Carrier unit side nozzle

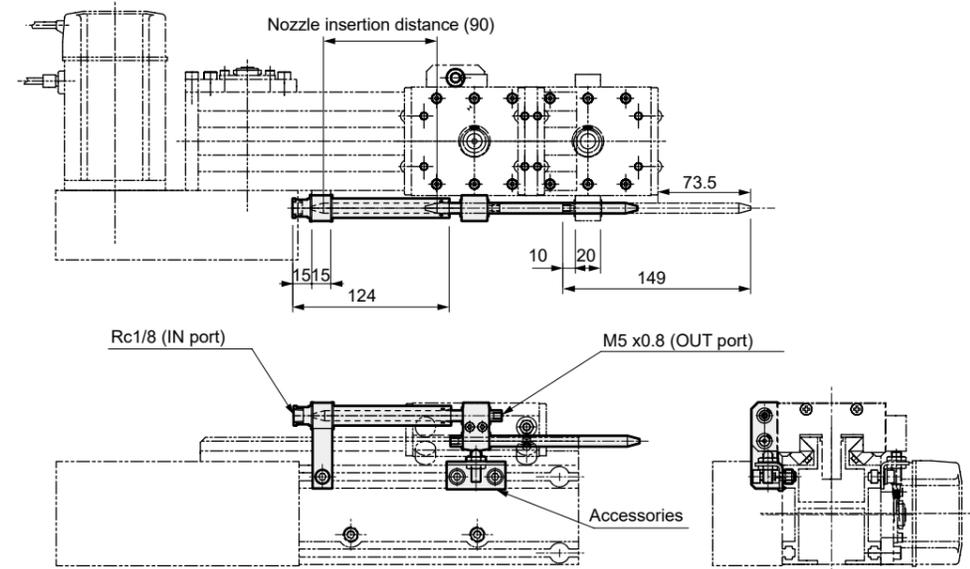


● Motor drive unit, tension unit side nozzle

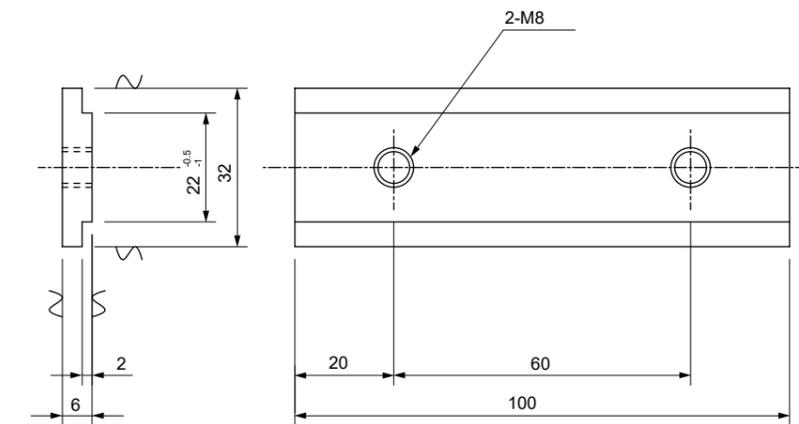


* The PP unit (air supply unit) cannot be used with the curve unit directly connected to the motor drive unit.

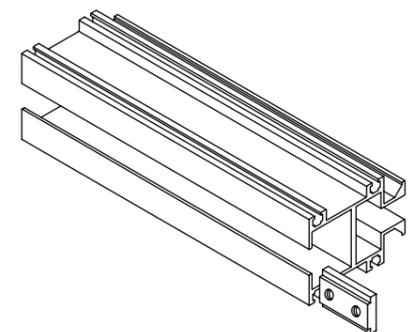
● Configuration diagram when PP unit is installed (Reference)



● T-shaped plate nut



[Mounting Reference Example]



Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

ECV

EKS

ESM

Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

ECV

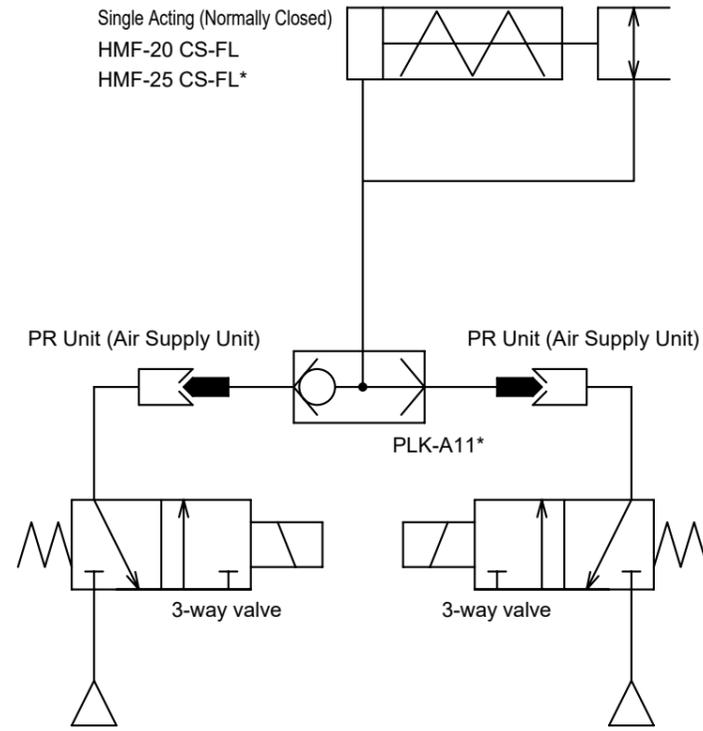
EKS

ESM

Ending

Ending

Circuit Example for Air Gripper Use

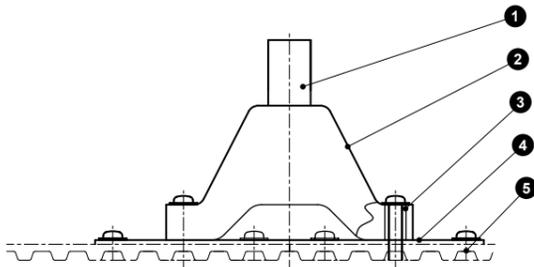
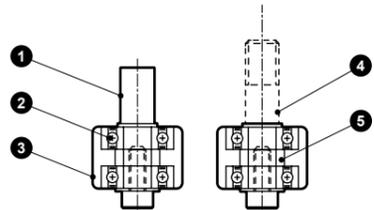


* For details and specifications, please contact us.

Consumable and Repair Parts

● Roller set: ESM-RO

● Joint set: ESM-JO



Part Number	Part Name	Quantity
1	Roller shaft A	4
2	Small diameter ball bearing	16
3	Roller	8
4	Roller shaft B	4
5	Color	8

Part Number	Part Name	Quantity
1	Drive pin	1
2	Drive bracket	1
3	Color	4
4	Joint plate	1
5	Joint nut	6

Parts	Model No.	Description
Carrier side belt	Refer to belt (6) on P. 438.	Belt processed to customer dimensions
Motor side belt	ESM-B-K	1 for motor pulley
Square nut	ESM-S-NT	Square nut 10 pcs/bag (set)

* Store the rubber and urethane parts of each set in a place with low temperature and humidity, avoiding direct sunlight, oil, water, ozone, etc.

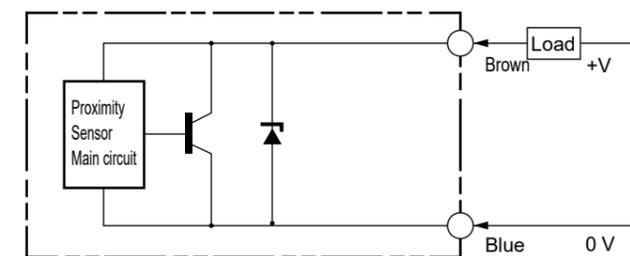
Detection Sensor

Type	Manufacturer	Model
Proximity Sensor	OMRON	E2 E-X2D1-N

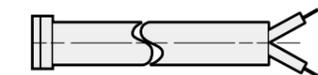
Performance

Item	Specification
Cylindrical type detection head size	M8
Type	Shielded type
Detection method	Inductive type
Sensing distance	2 mm ±10%
Setting distance	0 to 1.6 mm
Hysteresis	15% or less of sensing distance
Detectable object	Magnetic metal (sensing distance decreases for non-magnetic metals)
Standard sensing object	Iron 8 x8 x1 mm
Response frequency	DC: 1.5 kHz (average value)
Power Supply Voltage	12 to 24 VDC, Ripple (p-p) 10% or less
Operating voltage range	10 to 30 VDC
Leakage Current	0.8 mA or less
Control output (Output format)	DC 2-wire type
Control output (Switching capacity)	3 to 100 mA
Indicator Light	Operation indicator (red), setting indicator (green)
Ambient Temperature Range	Operating: -25 to 70°C, Storage: -40 to 85°C (no freezing or condensation)
Ambient humidity range	Operating: 35 to 95% RH, Storage: 35 to 95% RH (no condensation)
Temperature influence	Variation in sensing distance within ±15% in the temperature range of -25 to +70°C (Based on sensing distance at 23°C)
Cable length	2 m

Output circuit



Wiring Diagram



Terminal arrangement

Color	Arrangement
Brown	+V
Blue	0 V

Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

ECV

EKS

ESM

Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

ECV

EKS

ESM

Ending

Ending

Unit Selection

STEP-1 Confirming the stroke and belt length of each unit

Unit Name	Model No.	Stroke (mm)	Belt length (mm)
Motor Drive Unit	ESM-HDU	150	1170 (including tension unit section) (Fixed length)
Straight Unit	Example ESM-ST-100	100	200
	ESM-ST-200	200	400 (Stroke x2)
	ESM-ST-1200	1200	2400
	ESM-ST-2000	2000	4000
Tension Unit	ESM-TTU	150	- (See motor drive unit)
Inner 90-degree curve unit	ESM-VC-90-1	360	910 (fixed length)
Outer 90-degree curve unit	ESM-VC-90-2	550	910 (fixed length)
Inner 45-degree curve unit	ESM-VC-45-1	180	455 (fixed length)
Outer 45-degree curve unit	ESM-VC-45-2	275	455 (fixed length)

STEP-2 Shortest combination dimension of curve unit * A maximum of 180 degrees in total can be used for one set.

● 90° Outside - 90° Outside ● 90° Outside - 90° Inside ● 90° Inside - 90° Inside

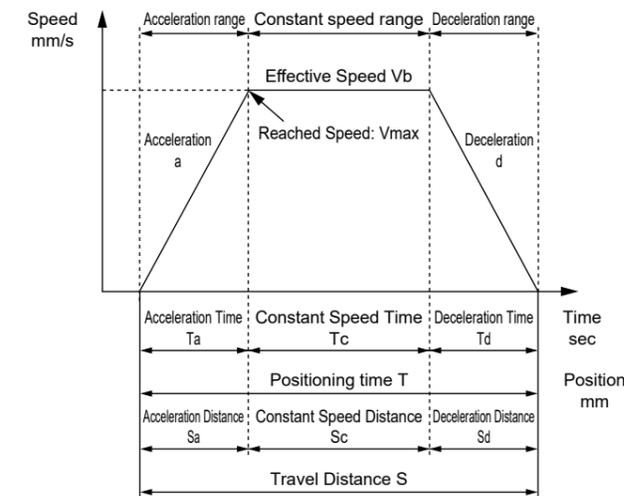
● 45° Outside - 90° Outside ● 90° Outside - 45° Inside ● 90° Inside - 45° Outside ● 90° Inside - 45° Inside

● 45° Outside - 45° Outside ● 45° Outside - 45° Inside ● 45° Inside - 45° Inside

Unit Selection

STEP-3 Confirming Cycle Time

Calculate the cycle time for the selected product according to the example below and check if it meets the requirements. Select the rotation speed and rotation acceleration/deceleration from the specification table of each model (P. 438, 439) and the motor selected by the customer.



	Content	Code	Unit	Remarks
Setting Value	Set Speed	V	mm/s	
	Set Acceleration	a	mm/s ²	
	Set Deceleration	d	mm/s ²	
Calculated Value	Travel Distance	S	mm	
	Reached Speed	Vmax	mm/s	= {2 axdxS/(a+d)} ^{1/2}
	Effective Speed	Vb	mm/s	The smaller of V and Vmax
	Acceleration Time	Ta	s	=Vb/a [0.5 sec or more]
	Deceleration Time	Td	s	=Vb/d [0.5 sec or more]
	Constant Speed Time	Tc	s	= Sc / Vb
	Acceleration Distance	Sa	mm	=(axTa ²)/2
	Deceleration Distance	Sd	mm	=(dxTd ²)/2
	Constant Speed Distance	Sc	mm	= S - (Sa+Sd)
Positioning Time	T	s	= Ta+Tc+Td	

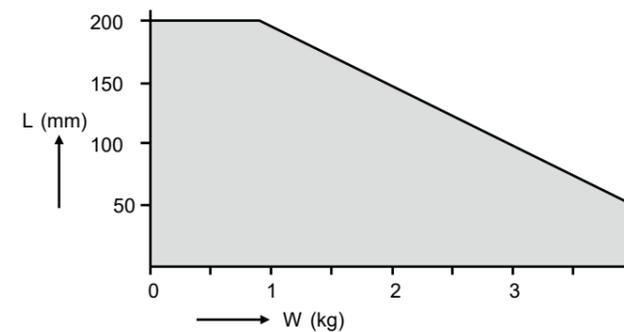
- Do not use at speeds higher than specified.
- The setting of acceleration/deceleration by acceleration/deceleration time varies depending on The set speed and stroke.
- Depending on the acceleration/deceleration and stroke, a trapezoidal velocity profile may not be formed (the set speed may not be reached). Please compare Vmax with the set speed.
- Please use with an acceleration/deceleration of 0.4 G or less.
- 1 G ≈ 9.8 m/s².

Model Selection

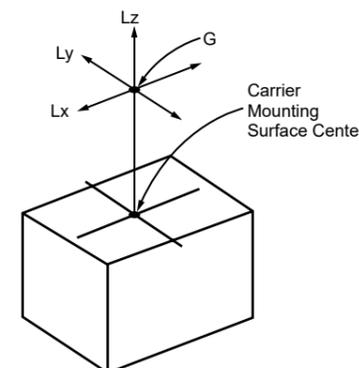
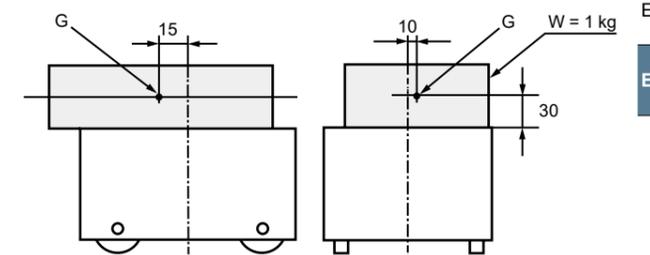
STEP-4 Confirming Max. Allowable Load

The maximum allowable load varies depending on the overhang of the load's center of gravity.

- * Allowable payload varies depending on the amount of overhang. Please use within the range of the graph below.
- * For calculation of overhang amount L, please refer to the selection examples.



● Selection Examples



- W :Payload
- G :Load's center of gravity
- Lx :Deviation of G in the X direction
- Ly :Deviation of G in the Y direction
- Lz :Deviation of G in the Z direction
- L :Overhang amount
- L=Lx+Ly+Lz

- W=1 kg
- Lx=15 mm
- Ly=10 mm
- Lz=30 mm
- L=15+10+30=55 mm

For the deviation of the load's center of gravity position, if W=1 kg, then L=55 mm is within the range of the graph and is acceptable.

Servo motor compatible

Servo motor compatible

EBS

EBS

EBR

EBR

ETS

ETS

ETS Multi Axis

ETS Multi Axis

ECS

ECS

ETV

ETV

ECV

ECV

EKS

EKS

ESM

ESM

Ending

Ending



To Use This Product Safely

Be sure to read this before use.

For general precautions regarding electric actuators, please see P. 15 of the opening section.

Individual Precautions: Electric Shuttle Mover ESM Series

During Design and Selection

Danger

- Do not use in locations where hazardous materials such as ignitable, flammable, or explosive substances are present. There is a possibility of ignition, fire, or explosion.
- Ensure that the product is free of water droplets and oil droplets. This can cause fire or failure.
- When mounting the product, be sure to securely hold and fix it (including the workpiece). There is a risk of injury due to the product tipping over, falling, or malfunctioning.

Warning

- Always keep the travel speed of the carrier unit within the specified speed.
- It is not possible to fix the carrier unit and use the rail portion as a mobile unit.
- Do not damage the rail with a workpiece, etc., that has been dropped by mistake during mounting or removal of a workpiece, etc. This can cause malfunction.
- Snagging a foreign object between the carrier unit and the rail will cause a malfunction.
- Provide a safety cover to prevent the operating area and position locking.
- Use this product in a working environment where people work normally in a general factory. (Operating temperature 5 to 40°C, operating humidity 35 to 80% RH, no condensation)
- This product cannot be used in water, oil, or powder, or in places where the product will be exposed to cutting fluid or cutting chips. Otherwise operation faults may occur.
- This product cannot be used in corrosive environments.

- Use within the product's specified operating range.
- Design a safety circuit or equipment so that damage to equipment, injury to persons, etc., does not occur when the machine stops in the event of a system failure such as emergency stop or power outage.
- Install indoors with low humidity. In places exposed to rain or high humidity (over 85% RH, with condensation), there is a risk of electric leakage and fire. Oil drops and oil mist are also strictly prohibited.
 - Use in such environments can cause damage and malfunction.
- Install in a location free from direct sunlight, dust, and corrosive gas/explosive gas/inflammable gas/combustibles, and away from heat sources. In addition, this product has not been considered for chemical resistance. This can cause failure, explosion, or fire.
- Use and store in a location free from strong electromagnetic waves, ultraviolet rays, and radiation. This can cause malfunction or failure.
- Consider the possibility of power source failure.
 - In case of breakdown in the power source, take countermeasures without causing trouble or damage to the operator or equipment.
- Consider the operating state when restarting after an emergency stop or abnormal stop.
 - Design so that restarting does not cause harm to people or damage to the equipment. Also, if it is necessary to reset the electric actuator to the starting position, design a safe control device. Consider the possibility of failure of the installed motor. Take measures to prevent injury to personnel or damage to equipment in the event of a power source failure.
- Avoid using this product where vibration and impact are present.
- Do not apply a load to the product that is greater than or equal to the allowable load listed in the materials for selection.
- Cannot be used on its side or upside down.

Caution

- A belt runs inside the rail. Be careful not to let chips, etc., enter during assembly.
- Carrier unit Do not use in a range where the cylinder could collide with the stroke end and break.
- Clearly state the maintenance conditions in the equipment's instruction manual.
 - The functionality of this product may be significantly reduced and safety may not be ensured depending on the usage conditions, environment, and maintenance. If maintenance is performed correctly, the product's functions can be fully utilized.

- Regarding installing, setting up, adjusting and maintaining the product, read through the instruction manual and operate correctly.
- The product is manufactured in conformity with the related standards. Never modify.
- Refer to the instruction manual of the motor mounted to the product and control for your safety before wiring and designing.
- The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.

For precautions regarding mounting, installation, adjustment, operation, and maintenance, please refer to the CKD Equipment Product Site(<https://www.ckd.co.jp/kiki/en/>) → 'model No.' → [Instruction Manual](#).

Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

ECV

EKS

ESM

Ending

Servo motor compatible

EBS

EBR

ETS

ETS Multi Axis

ECS

ETV

ECV

EKS

ESM

Ending