IAI
Quality and Innovation

ROBO CYLINDER

GB

24 VDC Pulse Motor Controller-Integrated Type

ERC2 - Rod Type

with ERC2 controller

Catalogue Extract
3rd revised Edition

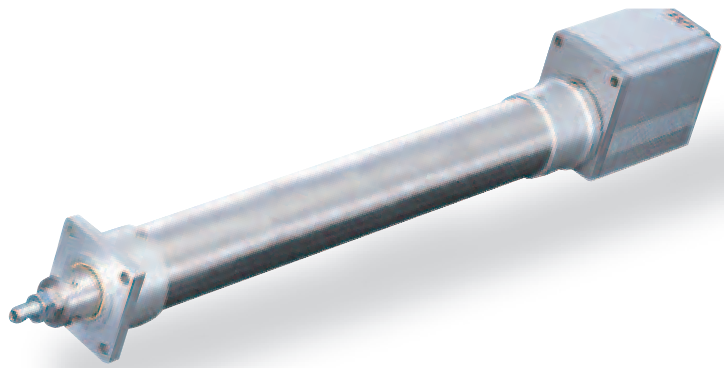
ERC2-RA6C

Controller-Integrated Rod Type 58mm Width Pulse Motor Straight Type

■ Configuration: ERC2 — RA6C — I — PM — [Lead] — [Stroke] — [I/O Type] — [Cable Length] — [Option]

Series	Type	Encoder	Motor	Lead	Stroke	I/O Type	Cable Length	Option
ERC2	RA6C	I: Incremental	PM: Pulse motor	12 : 12mm 6 : 6mm 3 : 3mm	50: 50mm ⁀ 300: 300mm (50mm pitch increments)	NP : PIO (NPN) type PN : PIO (PNP) type SE : SIO type	N : None P : 1m S : 3m M : 5m X□□ : Custom W□□ : Double-ended cable R□□ : Robot cable RW□□: Double-ended Robot cable	B : Brake FT : Foot bracket NM: Reversed-home

* See page Pre-35 for an explanation of the naming convention.



Technical References P. A-5

POINT Notes on Selection

(1) When the stroke increases, the maximum speed will drop to prevent the ball screw from reaching the critical rotational speed.
Use the actuator specification table below to check the maximum speed at the stroke you desire.

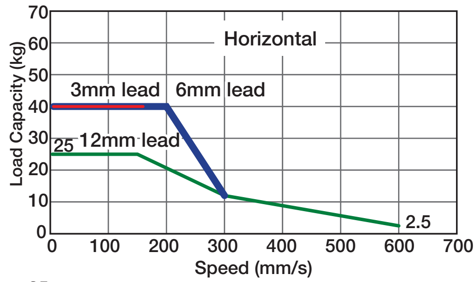
(2) Since the ERC2 series use a pulse motor, the load capacity decreases at high speeds. Check in the Speed vs. Load Capacity graph to see if your desired speed and load capacity are supported.

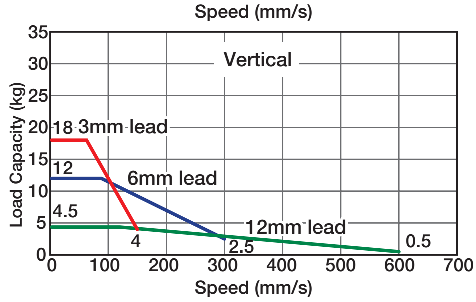
(3) The load capacity is based on operation at an acceleration of 0.3G (0.2G for the 3mm-lead model, or when used vertically). This is the upper limit of the acceleration.

(4) The value for the horizontal load capacity is with an external guide.

■ Speed vs. Load Capacity

Due to the characteristics of the pulse motor, the ERC2 series' load capacity decreases at high speeds. In the table below, check if your desired speed and load capacity are supported.





Actuator Specifications

■ Lead and Load Capacity

(Note 1) Please note that the maximum load capacity decreases as the speed increases.

Model	Lead (mm)	Max. Load Capacity (Note 1) Horizontal (kg)	Max. Load Capacity (Note 1) Vertical (kg)	Maximum Push Force (N)(Note 2)	Stroke (mm)
ERC2-RA6C-I-PM-12-①-②-③-④	12	～25	～4.5	78	50～300 (50mm increments)
ERC2-RA6C-I-PM-6-①-②-③-④	6	～40	～12	157	
ERC2-RA6C-I-PM-3-①-②-③-④	3	40	～18	304	

Legend ① Stroke ② I/O Type ③ Cable length ④ Options

(Note 2) See page A-64 for the pushing force graphs.

■ Stroke and Maximum Speed

Lead \ Stroke	50 ～ 250 (50mm increments)	300 (mm)
12	600	500
6	300	250
3	150	125

(Unit: mm/s)

Cable List

Type	Cable Symbol	
Standard	P (1m)	
	S (3m)	
	M (5m)	
Special Lengths	X06 (6m) ～ X10 (10m)	
Double-Ended	W01 (1m) ～ W03 (3m)	
	W04 (4m) ～ W05 (5m)	
	W06 (6m) ～ W10 (10m)	
Robot Cable	R01 (1m) ～ R03 (3m)	
	R04 (4m) ～ R05 (5m)	
	R06 (6m) ～ R10 (10m)	
Double-Ended Robot Cable	RW01 (1m)～ RW03 (3m)	
	RW04 (4m)～ RW05 (5m)	
	RW06 (6m)～ RW10 (10m)	

* See page A39 for cables for maintenance.

Actuator Specifications

Item	Description
Drive System	Ball screw ø10mm C10 grade
Positioning Repeatability	±0.02mm
Lost Motion	0.1mm or less
Rod Diameter	ø22mm special SUS type
Non-rotating accuracy of rod	±1.5 deg
Ambient Operating Temp./Humidity	0 ～ 40°C, 85% RH or less (non-condensing)

Option List

Name	Option Code	See Page	
Brake	B	→ A-25	
Foot bracket	FT	→ A-29	
Reversed-home	NM	→ A-33	

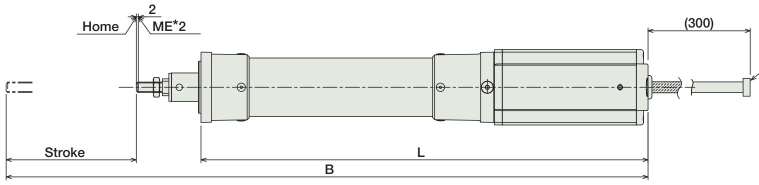
Dimensions

CAD drawings can be downloaded from IAI website. www.robocylinder.de

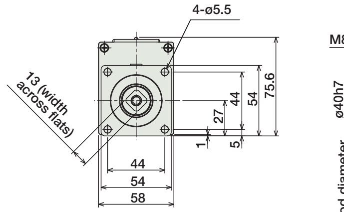
2/3D CAD

For Special Orders P. A-9

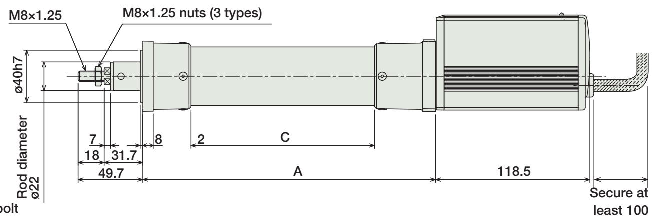
Note:
Do not apply any external force on the rod from any direction other than the direction of the rod's motion. If a force is exerted on the rod in a perpendicular or rotational direction, the detent may become damaged.

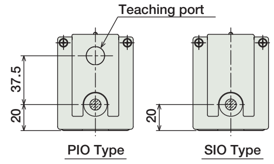


*1
Connect the power and I/O cables.
See page A-39 for details on cables.
*2
When homing, the slider moves to the ME; therefore, please watch for any interference with the surrounding objects.
ME: Mechanical end



(Note) The actual orientation of the bolt may differ by product.

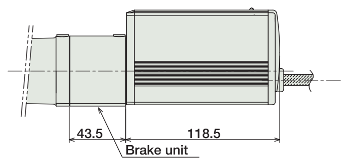




* The SIO type does not have a teaching port.

Brake Specifications Diagram

* Compared to the standard model, the brake-equipped model is longer by 43.5mm and heavier by 0.5kg.



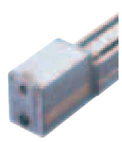
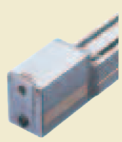
■ Dimensions/Weight by Stroke

Stroke	50	100	150	200	250	300
L	293.5	343.5	393.5	443.5	493.5	543.5
A	175	225	275	325	375	425
B	393.2	493.2	593.2	693.2	793.2	893.2
C	91	141	191	241	291	341
Weight (kg)	1.6	1.7	1.8	2.0	2.1	2.2

I/O Type (Built-In Controller)

I/O Type

The integrated controller in the ERC2 series can be selected from the following 3 types based on the type of external input and output (I/O). Select the controller according to your applications.

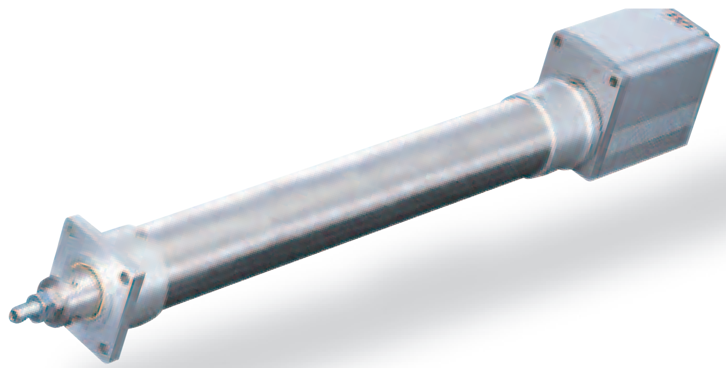
Name	External View	Model	Description	Max. Positioning Points	Input Voltage	Power Supply Capacity		See Page
PIO Type (NPN)		ERC2-RA6C-I-PM-□-□-NP-□-□	Easy to control, capable of positioning up to 16 points	16				
PIO Type (PNP)		ERC2-RA6C-I-PM-□-□-PN-□-□	Supports the PNP I/O, commonly used overseas.	16	DC24V	2A max.		→ P515
SIO Type		ERC2-RA6C-I-PM-□-□-SE-□-□	For connecting to a field network (gateway unit used)	64				

ERC2-RA7C Controller-Integrated Rod Type 68mm Width Pulse Motor Straight Type

■ Configuration: ERC2 — RA7C — I — PM — ☐ — ☐ — ☐ — ☐ — ☐

Series	Type	Encoder	Motor	Lead	Stroke	I/O Type	Cable Length	Option
ERC2	RA7C	I: Incremental	PM: Pulse motor	16 : 16mm 8 : 8mm 4 : 4mm	50: 50mm ⟆ 300: 300mm (50mm pitch increments)	NP : PIO (NPN) type PN : PIO (PNP) type SE : SIO type	N : None P : 1m S : 3m M : 5m X □□ : Custom W □□ : Double-ended cable R □□ : Robot cable RW □□: Double-ended Robot cable	B : Brake FT : Foot bracket NM: Reversed-home

* See page Pre-35 for an explanation of the naming convention.



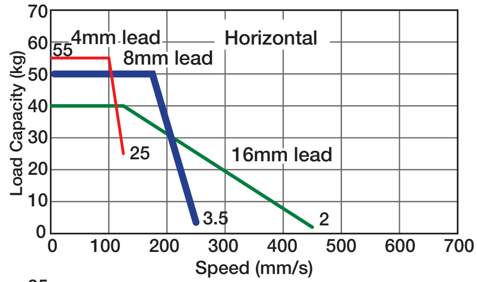
Technical References P. A-5

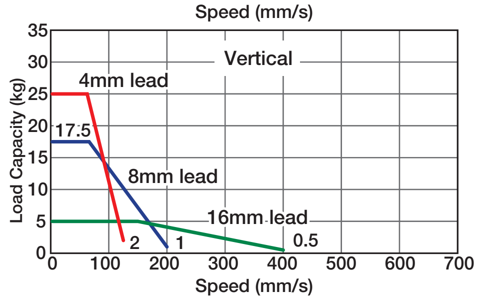
POINT Notes on Selection

(1) When the stroke increases, the maximum speed will drop to prevent the ball screw from reaching the critical rotational speed. Use the actuator specification table below to check the maximum speed at the stroke you desire.
(2) Since the ERC2 series use a pulse motor, the load capacity decreases at high speeds. Check in the Speed vs. Load Capacity graph to see if your desired speed and load capacity are supported.
(3) The load capacity is based on operation at an acceleration of 0.3G (0.2G for the 4mm-lead model, or when used vertically). This is the upper limit of the acceleration.
(4) The value for the horizontal load capacity is with an external guide.

■ Speed vs. Load Capacity

Due to the characteristics of the pulse motor, the ERC2 series' load capacity decreases at high speeds. In the table below, check if your desired speed and load capacity are supported.





Actuator Specifications

■ Lead and Load Capacity

(Note 1) Please note that the maximum load capacity decreases as the speed increases.

Model	Lead (mm)	Max. Load Capacity (Note 1) Horizontal (kg)	Max. Load Capacity (Note 1) Vertical (kg)	Maximum Push Force (N)(Note 2)	Stroke (mm)
ERC2-RA7C-I-PM-16-①-②-③-④	16	～40	～5	220	50～300 (50mm increments)
ERC2-RA7C-I-PM-8-①-②-③-④	8	～50	～17.5	441	
ERC2-RA7C-I-PM-4-①-②-③-④	4	～55	～25	873	

Legend ① Stroke ② I/O Type ③ Cable length ④ Options

(Note 2) See page A-64 for the pushing force graphs.

■ Stroke and Maximum Speed

Lead \ Stroke	50～300 (50mm increments)
16	450 <400>
8	250 <200>
4	125

* The values enclosed in < > apply for vertical usage. (Unit: mm/s)

Cable List

Type	Cable Symbol	
Standard	P (1m)	
	S (3m)	
	M (5m)	
Special Lengths	X06 (6m) ～ X10 (10m)	
Double-Ended	W01 (1m) ～ W03 (3m)	
	W04 (4m) ～ W05 (5m)	
	W06 (6m) ～ W10 (10m)	
Robot Cable	R01 (1m) ～ R03 (3m)	
	R04 (4m) ～ R05 (5m)	
	R06 (6m) ～ R10 (10m)	
Double-Ended Robot Cable	RW01 (1m)～ RW03 (3m)	
	RW04 (4m)～ RW05 (5m)	
	RW06 (6m)～ RW10 (10m)	

* See page A-39 for cables for maintenance.

Option List

Name	Option Code	See Page	
Brake	B	→ A-25	
Foot bracket	FT	→ A-29	
Reversed-home	NM	→ A-33	

Actuator Specifications

Item	Description
Drive System	Ball screw ø12mm C10 grade
Positioning Repeatability	±0.02mm
Lost Motion	0.1mm or less
Rod Diameter	ø30mm special SUS type
Non-rotating accuracy of rod	±1.5 deg
Ambient Operating Temp./Humidity	0 ～ 40°C, 85% RH or less (non-condensing)

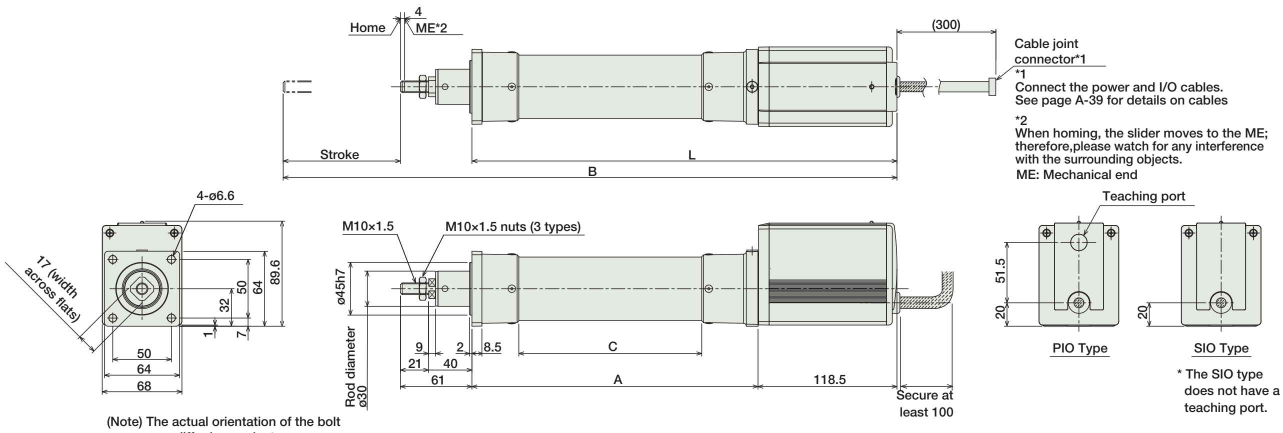
Dimensions

CAD drawings can be downloaded from IAI website. www.robocylinder.de

2/3D CAD

For Special Orders P. A-9

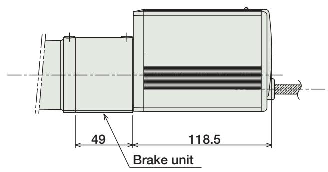
Note:
Do not apply any external force on the rod from any direction other than the direction of the rod's motion.
If a force is exerted on the rod in a perpendicular or rotational direction, the detent may become damaged.



(Note) The actual orientation of the bolt may differ by product.

Brake Specifications Diagram

* Compared to the standard model, the brake-equipped model is longer by 49mm and heavier by 0.5kg.



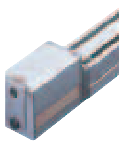
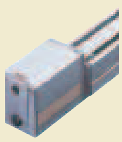
■ Dimensions/Weight by Stroke

Stroke	50	100	150	200	250	300
L	312.5	362.5	412.5	462.5	512.5	562.5
A	194	244	294	344	394	444
B	423.5	523.5	623.5	723.5	823.5	923.5
C	106	156	206	256	306	356
Weight (kg)	2.7	2.9	3.0	3.2	3.3	3.5

I/O Type (Built-In Controller)

I/O Type

The integrated controller in the ERC2 series can be selected from the following 3 types based on the type of external input and output (I/O). Select the controller according to your applications.

Name	External View	Model	Description	Max. Positioning Points	Input Voltage	Power Supply Capacity		See Page
PIO Type (NPN)		ERC2-RA7C-I-PM-□-□-NP-□-□	Easy to control, capable of positioning up to 16 points	16	DC24V	2A max.		→ P515
PIO Type (PNP)		ERC2-RA7C-I-PM-□-□-PN-□-□	Supports the PNP I/O, commonly used overseas.	16				
SIO Type		ERC2-RA7C-I-PM-□-□-SE-□-□	For connecting to a field network (gateway unit used)	64				

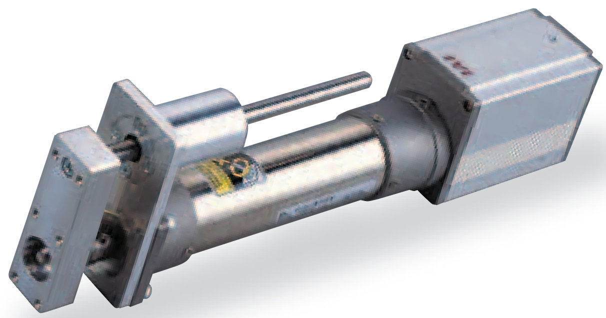
ERC2-RGS6C

Controller-Integrated Rod Type with Single Guide 58mm Width Pulse Motor Straight Type

■ Configuration:

ERC2	RGS6C	I	PM	☐	☐	☐	☐	☐
Series	Type	Encoder	Motor	Lead	Stroke	I/O Type	Cable Length	Option
		I: Incremental	PM: Pulse motor	12 : 12mm 6 : 6mm 3 : 3mm	50: 50mm ~ 300: 300mm (50mm pitch increments)	NP : PIO (NPN) type PN : PIO (PNP) type SE : SIO type	N : None P : 1m S : 3m M : 5m X☐☐ : Custom W☐☐ : Double-ended cable R☐☐ : Robot cable RW☐☐: Double-ended Robot cable	B : Brake FT : Foot bracket NM: Reversed-home

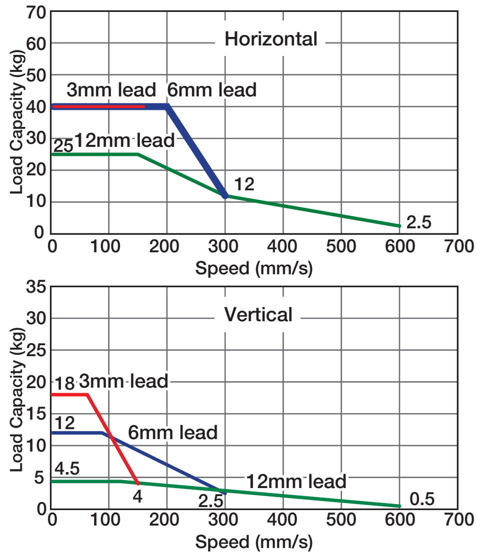
* See page Pre-35 for an explanation of the naming convention.



Technical References P. A-5

■ Speed vs. Load Capacity

Due to the characteristics of the pulse motor, the ERC2 series' load capacity decreases at high speeds. In the table below, check if your desired speed and load capacity are supported.



Notes on Selection

(1) When the stroke increases, the maximum speed will drop to prevent the ball screw from reaching the critical rotational speed. Use the actuator specification table below to check the maximum speed at the stroke you desire.

(2) Since the ERC2 series use a pulse motor, the load capacity decreases at high speeds. Check in the Speed vs. Load Capacity graph to see if your desired speed and load capacity are supported. In doing so, use the load capacity values without the weight of the guide (see right of page).

(3) The load capacity is based on operation at an acceleration of 0.3G (0.2G for the 3mm-lead model, or when used vertically). This is the upper limit of the acceleration.

(4) The value for the horizontal load capacity is with an external guide.

Actuator Specifications

■ Lead and Load Capacity

(Note 1) Please note that the maximum load capacity decreases as the speed increases.

Model	Lead (mm)	Max. Load Capacity (Note 1) Horizontal (kg)	Vertical (kg)	Maximum Push Force (N)(Note 2)	Stroke (mm)
ERC2-RGS6C-I-PM-12-①-②-③-④	12	~ 25	~ 4.5	78	50~300 (50mm increments)
ERC2-RGS6C-I-PM-6-①-②-③-④	6	~ 40	~ 12	157	
ERC2-RGS6C-I-PM-3-①-②-③-④	3	40	~ 18	304	

Legend ① Stroke ② I/O Type ③ Cable length ④ Options

(Note 2) See page A-64 for the pushing force graphs.

■ Stroke and Maximum Speed

Lead \ Stroke	50~250 (50mm increments)	300 (mm)
12	600	500
6	300	250
3	150	125

(Unit: mm/s)

Cable List

Type	Cable Symbol	
Standard	P (1m)	
	S (3m)	
	M (5m)	
Special Lengths	X06 (6m) ~ X10 (10m)	
Double-Ended	W01 (1m) ~ W03 (3m)	
	W04 (4m) ~ W05 (5m)	
	W06 (6m) ~ W10 (10m)	
Robot Cable	R01 (1m) ~ R03 (3m)	
	R04 (4m) ~ R05 (5m)	
	R06 (6m) ~ R10 (10m)	
Double-Ended Robot Cable	RW01 (1m)~ RW03 (3m)	
	RW04 (4m)~ RW05 (5m)	
	RW06 (6m)~ RW10 (10m)	

* See page A-39 for cables for maintenance.

Actuator Specifications

Item	Description
Drive System	Ball screw ø10mm C10 grade
Positioning Repeatability	±0.02mm
Lost Motion	0.1mm or less
Rod Diameter	ø22mm special SUS type
Non-rotating accuracy of rod	±0.05 deg
Ambient Operating Temp./Humidity	0 ~ 40°C, 85% RH or less (non-condensing)

Option List

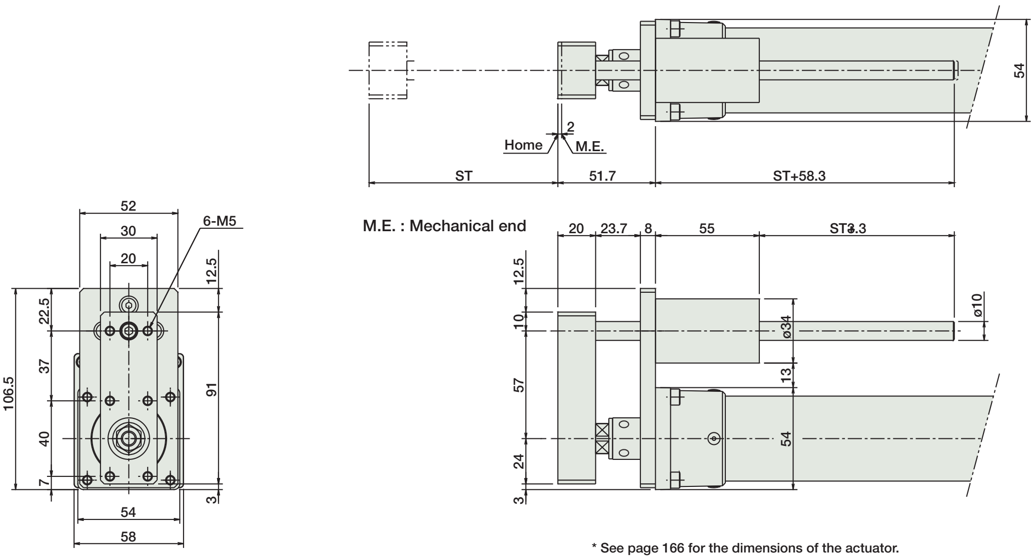
Name	Option Code	See Page	
Brake	B	→ A-25	
Foot bracket	FT	→ A-29	
Reversed-home	NM	→ A-33	

Dimensions

CAD drawings can be downloaded from IAI website. www.robocylinder.de

2/3D CAD

For Special Orders P. A-9



* See page 166 for the dimensions of the actuator.

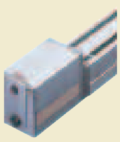
■ Dimensions/Weight by Stroke

Stroke	50	100	150	200	250	300
Guide weight (kg)	0.2	0.2	0.3	0.3	0.3	0.4
Guide + actuator weight (kg)	1.8	1.9	2.1	2.3	2.4	2.6

I/O Type (Built-In Controller)

I/O Type

The integrated controller in the ERC2 series can be selected from the following 3 types based on the type of external input and output (I/O). Select the controller according to your applications.

Name	External View	Model	Description	Max. Positioning Points	Input Voltage	Power Supply Capacity		See Page
PIO Type (NPN)		ERC2-RGS6C-I-PM-□-□-NP-□-□	Easy to control, capable of positioning up to 16 points	16				
PIO Type (PNP)		ERC2-RGS6C-I-PM-□-□-PN-□-□	Supports the PNP I/O, commonly used overseas.	16	DC24V	2A max.		→ P515
SIO Type		ERC2-RGS6C-I-PM-□-□-SE-□-□	For connecting to a field network (gateway unit used)	64				

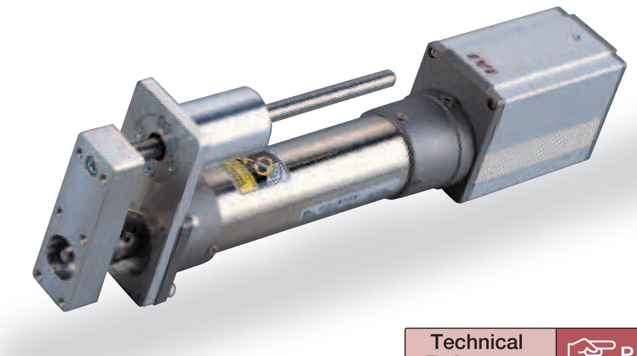
ERC2-RGS7C

Controller-Integrated Rod Type 68mm Width Pulse Motor Straight Type

■ Configuration:

ERC2	–	RGS7C	–	I	–	PM	–	☐	–	☐	–	☐	–	☐	–	☐
Series	–	Type	–	Encoder	–	Motor	–	Lead	–	Stroke	–	I/O Type	–	Cable Length	–	Option
				I: Incremental		PM: Pulse motor		16 : 16mm 8 : 8mm 4 : 4mm		50: 50mm ⁀ 300: 300mm (50mm pitch increments)		NP : PIO (NPN) type PN : PIO (PNP) type SE : SIO type		N : None P : 1m S : 3m M : 5m X ☐☐ : Custom W ☐☐ : Double-ended cable R ☐☐ : Robot cable RW ☐☐: Double-ended Robot cable		B : Brake FT : Foot bracket NM: Reversed-home

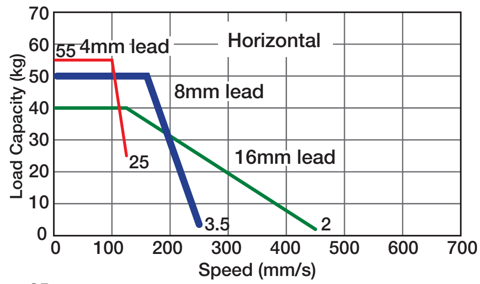
* See page Pre-35 for an explanation of the naming convention.

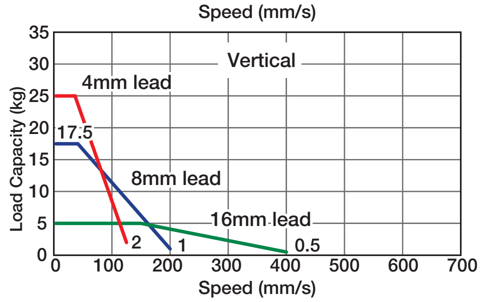


Technical References P. A-5

■ Speed vs. Load Capacity

Due to the characteristics of the pulse motor, the ERC2 series' load capacity decreases at high speeds. In the table below, check if your desired speed and load capacity are supported.





POINT Notes on Selection

(1) When the stroke increases, the maximum speed will drop to prevent the ball screw from reaching the critical rotational speed. Use the actuator specification table below to check the maximum speed at the stroke you desire.

(2) Since the ERC2 series use a pulse motor, the load capacity decreases at high speeds. Check in the Speed vs. Load Capacity graph to see if your desired speed and load capacity are supported. In doing so, use the load capacity values without the weight of the guide (see right of page).

(3) The load capacity is based on operation at an acceleration of 0.3G (0.2G for the 4mm-lead model, or when used vertically). This is the upper limit of the acceleration.

(4) The value for the horizontal load capacity is with an external guide.

Actuator Specifications

■ Lead and Load Capacity

(Note 1) Please note that the maximum load capacity decreases as the speed increases.

Model	Lead (mm)	Max. Load Capacity (Note 1) Horizontal (kg)	Max. Load Capacity (Note 1) Vertical (kg)	Maximum Push Force (N) (Note 2)	Stroke (mm)
ERC2-RGS7C-I-PM-16-①-②-③-④	16	～40	～5	220	50～300 (50mm increments)
ERC2-RGS7C-I-PM-8-①-②-③-④	8	～50	～17.5	441	
ERC2-RGS7C-I-PM-4-①-②-③-④	4	～55	～25	873	

Legend ① Stroke ② I/O Type ③ Cable length ④ Options

(Note 2) See page A-64 for the pushing force graphs.

■ Stroke and Maximum Speed

Lead \ Stroke	50～300 (50mm increments)
16	450 <400>
8	250 <200>
4	125

* The values enclosed in < > apply for vertical usage. (Unit: mm/s)

Cable List

Type	Cable Symbol	
Standard	P (1m)	
	S (3m)	
	M (5m)	
Special Lengths	X06 (6m) ～ X10 (10m)	
Double-Ended	W01 (1m) ～ W03 (3m)	
	W04 (4m) ～ W05 (5m)	
	W06 (6m) ～ W10 (10m)	
Robot Cable	R01 (1m) ～ R03 (3m)	
	R04 (4m) ～ R05 (5m)	
	R06 (6m) ～ R10 (10m)	
Double-Ended Robot Cable	RW01 (1m)～ RW03 (3m)	
	RW04 (4m)～ RW05 (5m)	
	RW06 (6m)～ RW10 (10m)	

* See page A-39 for cables for maintenance.

Actuator Specifications

Item	Description
Drive System	Ball screw ø12mm C10 grade
Positioning Repeatability	±0.02mm
Lost Motion	0.1mm or less
Rod Diameter	ø30mm special SUS type
Non-rotating accuracy of rod	±0.05 deg
Ambient Operating Temp./Humidity	0 ～ 40°C, 85% RH or less (non-condensing)

Option List

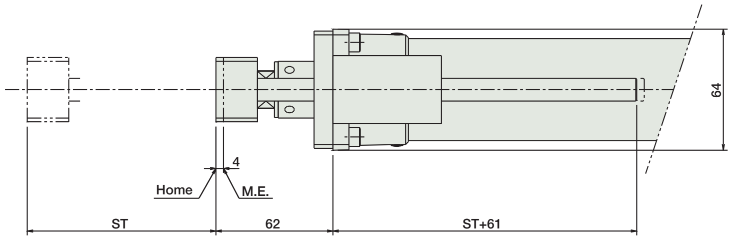
Name	Option Code	See Page	
Brake	B	→ A-25	
Foot bracket	FT	→ A-29	
Reversed-home	NM	→ A-33	

Dimensions

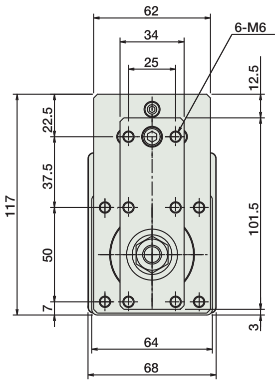
CAD drawings can be downloaded from IAI website. www.robocylinder.de

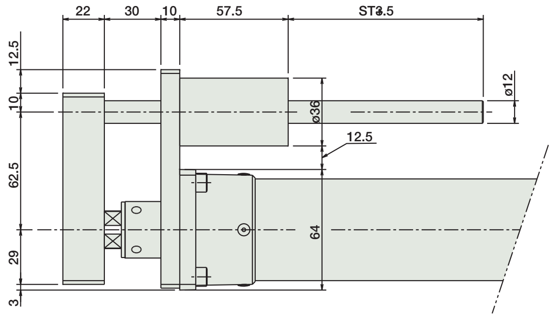
2/3D CAD

For Special Orders P. A-9



M.E. : Mechanical end





* See page 168 for the dimensions of the actuator.

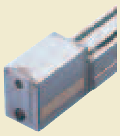
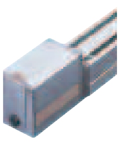
Dimensions/Weight by Stroke

Stroke	50	100	150	200	250	300
Guide weight (kg)	0.3	0.3	0.4	0.4	0.5	0.5
Guide +actuator weight (kg)	3.0	3.2	3.4	3.6	3.8	4.0

I/O Type (Built-In Controller)

I/O Type

The integrated controller in the ERC2 series can be selected from the following 3 types based on the type of external input and output (I/O). Select the controller according to your applications.

Name	External View	Model	Description	Max. Positioning Points	Input Voltage	Power Supply Capacity		See Page
PIO Type (NPN)		ERC2-RGS7C-I-PM-□-□-NP-□-□	Easy to control, capable of positioning up to 16 points	16				
PIO Type (PNP)		ERC2-RGS7C-I-PM-□-□-PN-□-□	Supports the PNP I/O, commonly used overseas.	16	DC24V	2A max.		→ P515
SIO Type		ERC2-RGS7C-I-PM-□-□-SE-□-□	For connecting to a field network (gateway unit used)	64				

Slider Type
Mini
Standard
Controllers Integrated
Rod Type
Mini
Standard
Controllers Integrated
Table/Arm /Flat Type
Mini
Standard
Gripper/ Rotary Type
Linear Motor Type
Cleanroom Type
Splash Proof
Controllers
PMEC /AMEC
PSEP /ASEP
ROBO NET
ERC2
PCON
ACON
SCON
PSEL
ASEL
SSEL
XSEL
Pulse Motor
Servo Motor (24V)
Servo Motor (230V)
Linear Motor

Slider Type
Mini
Standard
Controllers Integrated
Rod Type
Mini
Standard
Controllers Integrated
Table/Arm /Flat Type
Mini
Standard
Gripper/ Rotary Type
Linear Motor Type
Cleanroom Type
Splash Proof
Controllers
PMEC /AMEC
PSEP /ASEP
ROBO NET
ERC2
PCON
ACON
SCON
PSEL
ASEL
SSEL
XSEL
Pulse Motor
Servo Motor (24V)
Servo Motor (230V)
Linear Motor

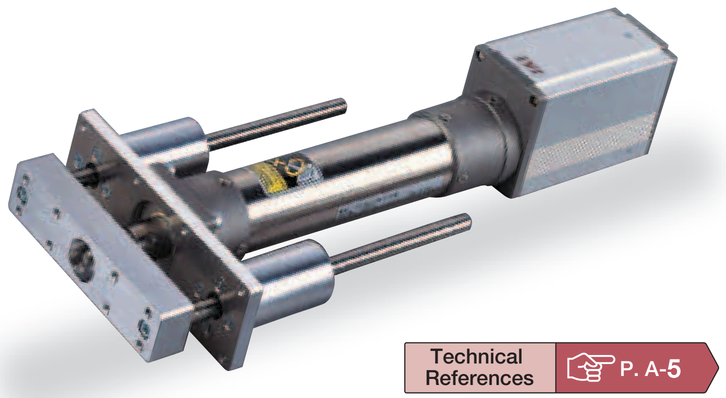
ERC2-RGD6C

Controller-Integrated Rod Type with Double Guide 58mm Width
Pulse Motor Straight Type

■ Configuration: ERC2 — RGD6C — I — PM — [ ] — [ ] — [ ] — [ ] — [ ]

Series	Type	Encoder	Motor	Lead	Stroke	I/O Type	Cable Length	Option
ERC2	RGD6C	I: Incremental	PM: Pulse motor	12 : 12mm 6 : 6mm 3 : 3mm	50: 50mm ⁀ 300: 300mm (50mm pitch increments)	NP : PIO (NPN) type PN : PIO (PNP) type SE : SIO type	N : None P : 1m S : 3m M : 5m X □□ : Custom W □□ : Double-ended cable R □□ : Robot cable RW □□: Double-ended Robot cable	B : Brake FT : Foot bracket NM: Reversed-home

* See page Pre-35 for an explanation of the naming convention.



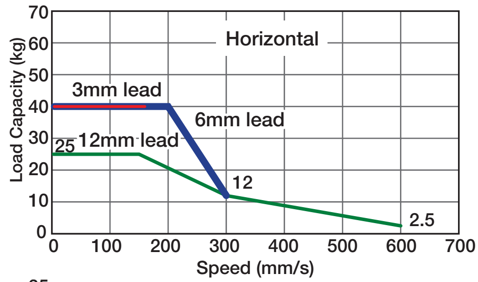
Technical References P. A-5

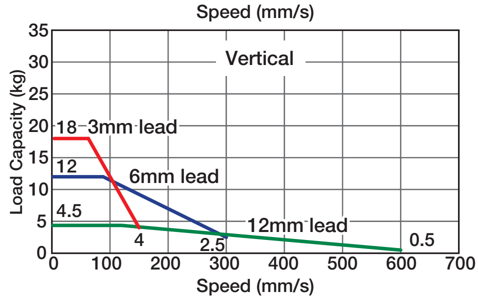
POINT Notes on Selection

(1) When the stroke increases, the maximum speed will drop to prevent the ball screw from reaching the critical rotational speed. Use the actuator specification table below to check the maximum speed at the stroke you desire.
(2) Since the ERC2 series use a pulse motor, the load capacity decreases at high speeds. Check in the Speed vs. Load Capacity graph to see if your desired speed and load capacity are supported.
In doing so, use the load capacity values without the weight of the guide (see right of page).
(3) The load capacity is based on operation at an acceleration of 0.3G (0.2G for the 3mm-lead model, or when used vertically).
This is the upper limit of the acceleration.
(4) The value for the horizontal load capacity is with an external guide.

■ Speed vs. Load Capacity

Due to the characteristics of the pulse motor, the ERC2 series' load capacity decreases at high speeds. In the table below, check if your desired speed and load capacity are supported.





Actuator Specifications

■ Lead and Load Capacity

(Note 1) Please note that the maximum load capacity decreases as the speed increases.

Model	Lead (mm)	Max. Load Capacity (Note 1) Horizontal (kg)	Max. Load Capacity (Note 1) Vertical (kg)	Maximum Push Force (N)(Note 2)	Stroke (mm)
ERC2-RGD6C-I-PM-12-①-②-③-④	12	~25	~4.5	78	50~300 (50mm increments)
ERC2-RGD6C-I-PM-6-①-②-③-④	6	~40	~12	157	
ERC2-RGD6C-I-PM-3-①-②-③-④	3	40	~18	304	

Legend ① Stroke ② I/O Type ③ Cable length ④ Options

(Note 2) See page A-64 for the pushing force graphs.

■ Stroke and Maximum Speed

Lead \ Stroke	50~250 (50mm increments)	300 (mm)
12	600	500
6	300	250
3	150	125

(Unit: mm/s)

Cable List

Type	Cable Symbol	
Standard	P (1m)	
	S (3m)	
	M (5m)	
Special Lengths	X06 (6m) ~ X10 (10m)	
Double-Ended	W01 (1m) ~ W03 (3m)	
	W04 (4m) ~ W05 (5m)	
	W06 (6m) ~ W10 (10m)	
Robot Cable	R01 (1m) ~ R03 (3m)	
	R04 (4m) ~ R05 (5m)	
	R06 (6m) ~ R10 (10m)	
Double-Ended Robot Cable	RW01 (1m)~ RW03 (3m)	
	RW04 (4m)~ RW05 (5m)	
	RW06 (6m)~ RW10 (10m)	

* See page A-39 for cables for maintenance.

Actuator Specifications

Item	Description
Drive System	Ball screw ø10mm C10 grade
Positioning Repeatability	±0.02mm
Lost Motion	0.1mm or less
Rod Diameter	ø22mm special SUS type
Non-rotating accuracy of rod	±0.05 deg
Ambient Operating Temp./Humidity	0 ~ 40°C, 85% RH or less (non-condensing)

Option List

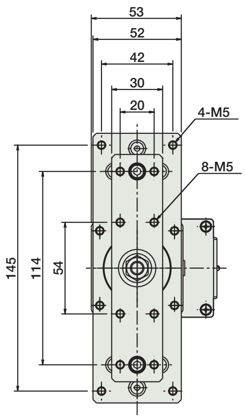
Name	Option Code	See Page	
Brake	B	→ A-25	
Foot bracket	FT	→ A-29	
Reversed-home	NM	→ A-33	

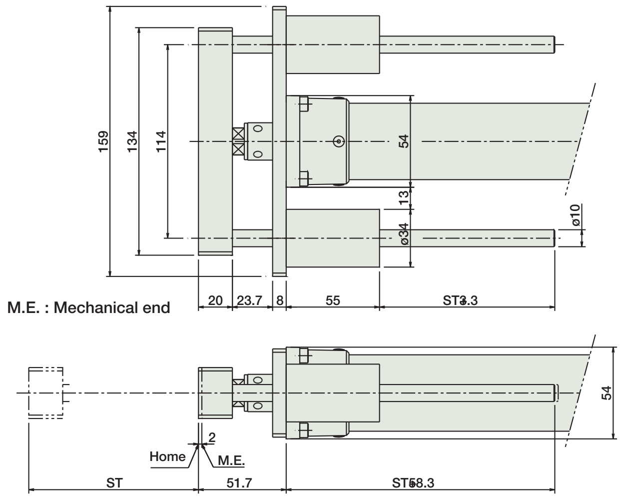
Dimensions

CAD drawings can be downloaded from IAI website. www.robocylinder.de

2/3D CAD

For Special Orders P. A-9





* See page 166 for the dimensions of the actuator.

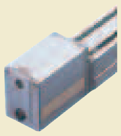
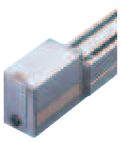
■ Dimensions/Weight by Stroke

Stroke	50	100	150	200	250	300
Guide weight (kg)	0.4	0.4	0.5	0.6	0.6	0.7
Guide + actuator weight (kg)	2.0	2.1	2.3	2.6	2.7	2.9

I/O Type (Built-In Controller)

I/O Type

The integrated controller in the ERC2 series can be selected from the following 3 types based on the type of external input and output (I/O). Select the controller according to your applications.

Name	External View	Model	Description	Max. Positioning Points	Input Voltage	Power Supply Capacity		See Page
PIO Type (NPN)		ERC2-RGD6C-I-PM-□-□-NP-□-□	Easy to control, capable of positioning up to 16 points	16	DC24V	2A max.		→ P515
PIO Type (PNP)		ERC2-RGD6C-I-PM-□-□-PN-□-□	Supports the PNP I/O, commonly used overseas.	16				
SIO Type		ERC2-RGD6C-I-PM-□-□-SE-□-□	For connecting to a field network (gateway unit used)	64				

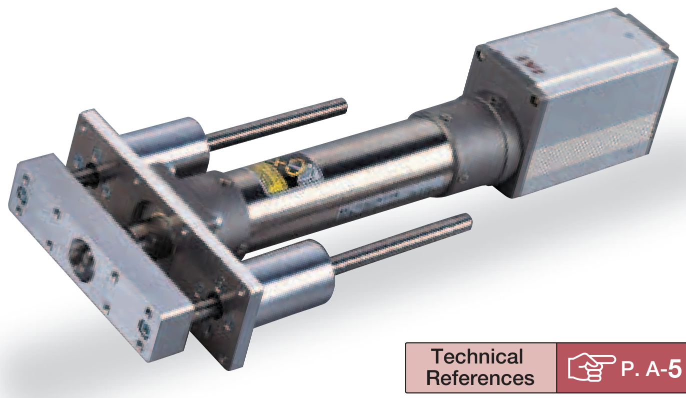
ERC2-RGD7C

Controller-Integrated Rod Type 68mm Width Pulse Motor Straight Type

■ Configuration: ERC2 — RGD7C — I — PM — [ ] — [ ] — [ ] — [ ] — [ ]

Series	Type	Encoder	Motor	Lead	Stroke	I/O Type	Cable Length	Option
ERC2	RGD7C	I: Incremental	PM: Pulse motor	16 : 16mm 8 : 8mm 4 : 4mm	50: 50mm ⟆ 300: 300mm (50mm pitch increments)	NP : PIO (NPN) type PN : PIO (PNP) type SE : SIO type	N : None P : 1m S : 3m M : 5m X □□ : Custom W □□ : Double-ended cable R □□ : Robot cable RW □□: Double-ended Robot cable	B : Brake FT : Foot bracket NM: Reversed-home

* See page Pre-35 for an explanation of the naming convention.



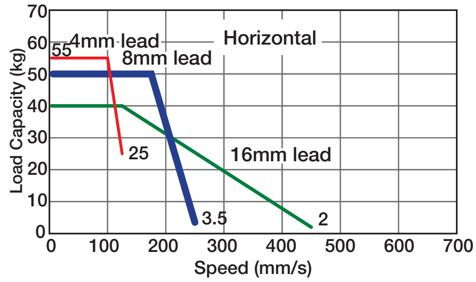
Technical References P. A-5

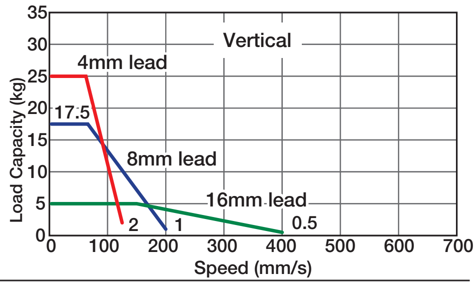
POINT Notes on Selection

(1) When the stroke increases, the maximum speed will drop to prevent the ball screw from reaching the critical rotational speed. Use the actuator specification table below to check the maximum speed at the stroke you desire.
(2) Since the ERC2 series use a pulse motor, the load capacity decreases at high speeds. Check in the Speed vs. Load Capacity graph to see if your desired speed and load capacity are supported. In doing so, use the load capacity values without the weight of the guide (see right of page).
(3) The load capacity is based on operation at an acceleration of 0.3G (0.2G for the 4mm-lead model, or when used vertically). This is the upper limit of the acceleration.
(4) The value for the horizontal load capacity is with an external guide.

■ Speed vs. Load Capacity

Due to the characteristics of the pulse motor, the ERC2 series' load capacity decreases at high speeds. In the table below, check if your desired speed and load capacity are supported.





Actuator Specifications

■ Lead and Load Capacity

(Note 1) Please note that the maximum load capacity decreases as the speed increases.

Model	Lead (mm)	Max. Load Capacity (Note 1) Horizontal (kg)	Max. Load Capacity (Note 1) Vertical (kg)	Maximum Push Force (N)(Note 2)	Stroke (mm)
ERC2-RGD7C-I-PM-16-①-②-③-④	16	~40	~5	220	50~300 (50mm increments)
ERC2-RGD7C-I-PM-8-①-②-③-④	8	~50	~17.5	441	
ERC2-RGD7C-I-PM-4-①-②-③-④	4	~55	~25	873	

Legend ① Stroke ② I/O Type ③ Cable length ④ Options

(Note 2) See page A-64 for the pushing force graphs.

■ Stroke and Maximum Speed

Lead \ Stroke	50~300 (50mm increments)
16	450 <400>
8	250 <200>
4	125

* The values enclosed in < > apply for vertical usage. (Unit: mm/s)

Cable List

Type	Cable Symbol	
Standard	**P** (1m)	
	S (3m)	
	M (5m)	
Special Lengths	**X06** (6m) ~ **X10** (10m)	
Double-Ended	**W01** (1m) ~ **W03** (3m)	
	W04 (4m) ~ **W05** (5m)	
	W06 (6m) ~ **W10** (10m)	
Robot Cable	**R01** (1m) ~ **R03** (3m)	
	R04 (4m) ~ **R05** (5m)	
	R06 (6m) ~ **R10** (10m)	
Double-Ended Robot Cable	**RW01** (1m)~ **RW03** (3m)	
	RW04 (4m)~ **RW05** (5m)	
	RW06 (6m)~ **RW10** (10m)	

* See page A-39 for cables for maintenance.

Actuator Specifications

Item	Description
Drive System	Ball screw ø12mm C10 grade
Positioning Repeatability	±0.02mm
Lost Motion	0.1mm or less
Rod Diameter	ø30mm special SUS type
Non-rotating accuracy of rod	±0.05 deg
Ambient Operating Temp./Humidity	0 ~ 40°C, 85% RH or less (non-condensing)

Option List

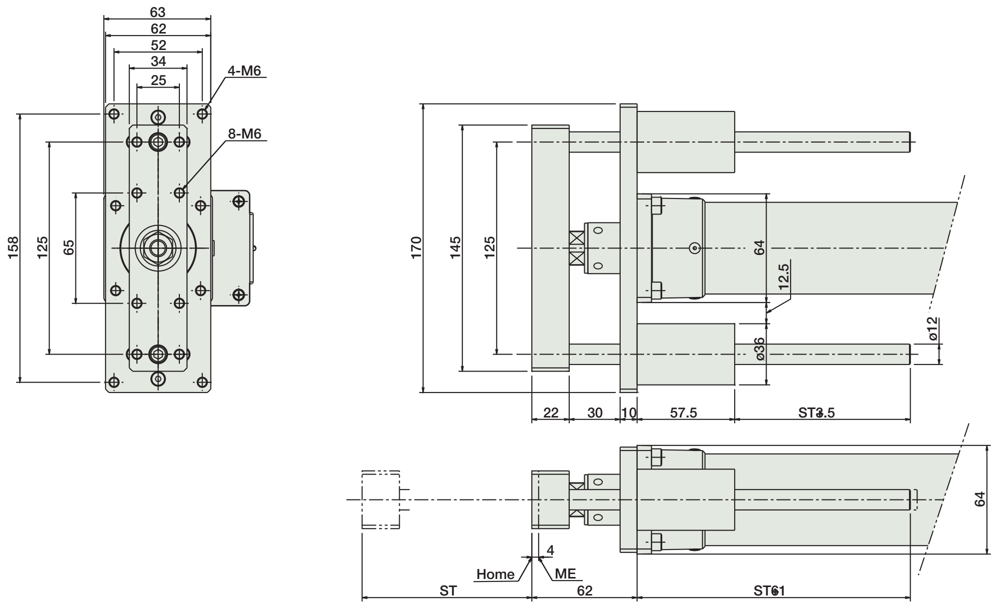
Name	Option Code	See Page	
Brake	B	→ A-25	
Foot bracket	FT	→ A-29	
Reversed-home	NM	→ A-33	

Dimensions

CAD drawings can be downloaded from IAI website. www.robocylinder.de

For Special Orders P. A-9

2/3D CAD



ME: Mechanical end

* See page 168 for the dimensions of the actuator.

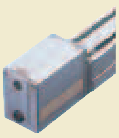
■ Dimensions/Weight by Stroke

Stroke	50	100	150	200	250	300
Guide weight (kg)	0.5	0.6	0.7	0.8	0.9	1.0
Guide +actuator weight (kg)	3.2	3.5	3.7	4.0	4.2	4.5

I/O Type (Built-In Controller)

I/O Type

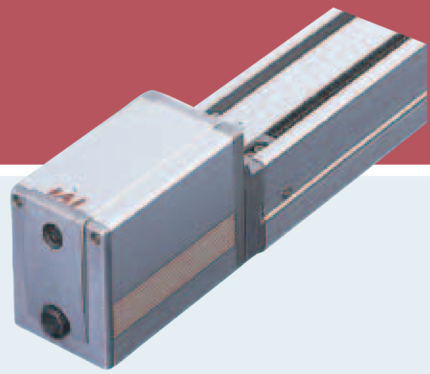
The integrated controller in the ERC2 series can be selected from the following 3 types based on the type of external input and output (I/O). Select the controller according to your applications.

Name	External View	Model	Description	Max. Positioning Points	Input Voltage	Power Supply Capacity		See Page
PIO Type (NPN)		ERC2-RGD7C-I-PM-□-□-NP-□-□	Easy to control, capable of positioning up to 16 points	16				
PIO Type (PNP)		ERC2-RGD7C-I-PM-□-□-PN-□-□	Supports the PNP I/O, commonly used overseas.	16	DC24V	2A max.		→ P515
SIO Type		ERC2-RGD7C-I-PM-□-□-SE-□-□	For connecting to a field network (gateway unit used)	64				

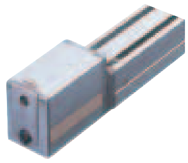
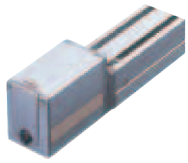
ERC2

■ Model: NP / PN / SE

Controller module of controller-integrated actuator



List of Models

I/O type	NP	PN	SE
Name	PIO type (NPN Specification)	PIO type (PNP Specification)	Serial Communication Type
External View			
Description	Controller that moves by designating position numbers with NPN PIO via PLC.	Controller that moves by designating position numbers with PNP PIO via PLC.	Controller that is used by connecting to the field network via the gateway unit.
Position points	16 points	16 points	64 points

Model

ERC2 – [Type] – I – PM – [Lead] – [Stroke] – [I/O Type] – [Cable Length] – [Option]

Series / Type / Encoder / Motor / Lead / Stroke / I/O Type / Cable Length / Option

Type

SA6C	Slider type (52mm width)
SA7C	Slider type (58mm width)
RA6C	Rod type (52mm width)
RA7C	Rod type (58mm width)
RGS6C	Rod type with single guide (52mm width)
RGS7C	Rod type with single guide (58mm width)
RGD6C	Rod type with double guide (52mm width)
RGD7C	Rod type with double guide (58mm width)

Encoder

I	Incremental

Motor

PM	Pulse Motor

Lead

16	16mm
12	12mm
8	8mm
6	6mm
4	4mm
3	3mm

Stroke

50 ~ 600	50mm ~ 600mm (50mm increments)

I/O Type

NP	PIO Type (NPN)
PN	PIO Type (PNP)
SE	SIO Type

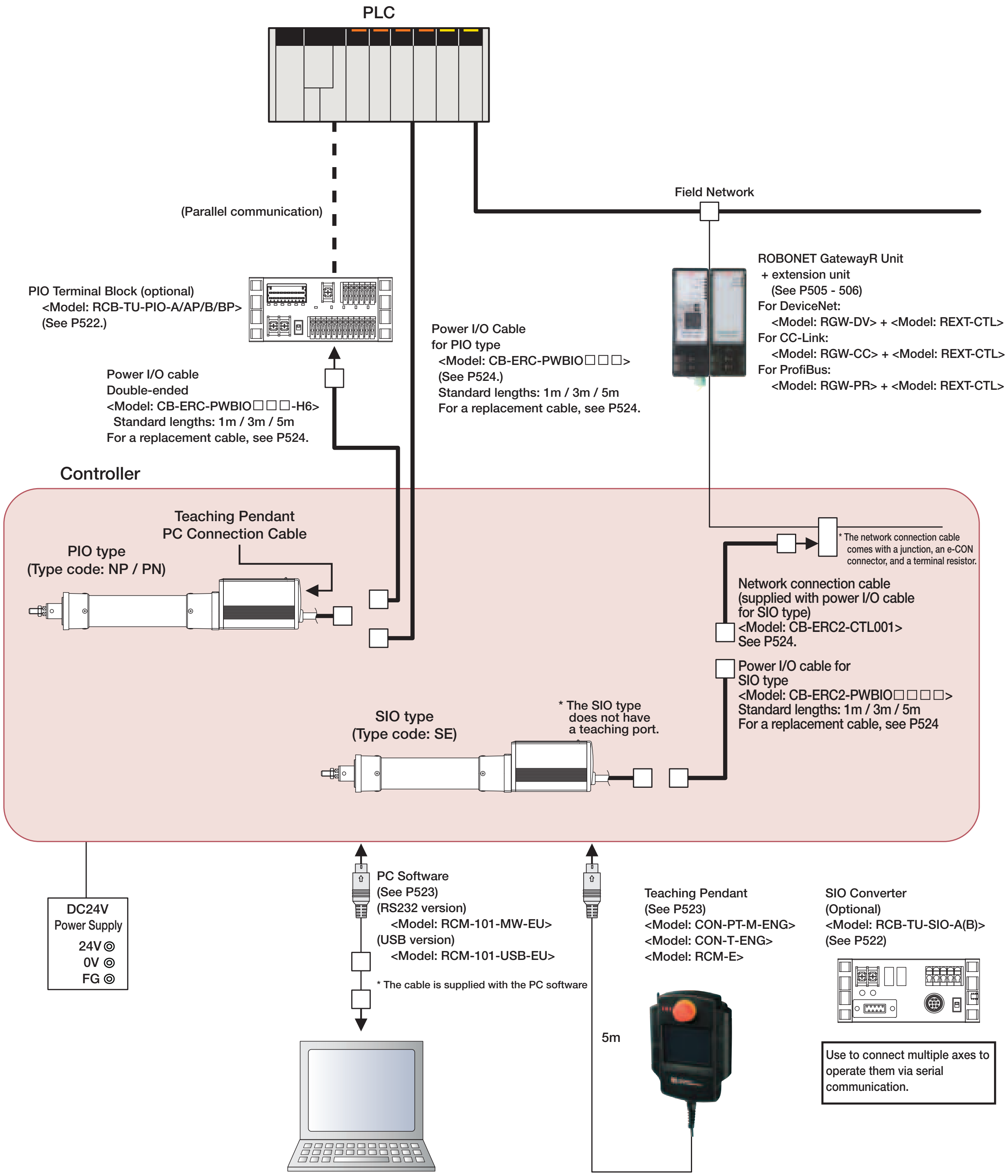
Cable Length

N	No cable
P	1m
S	3m
M	5m
X□□	Custom length
R□□	Robot Cable
W□□	Cable with connectors at both ends
RW□□	Robot cable with connectors at both ends

Option

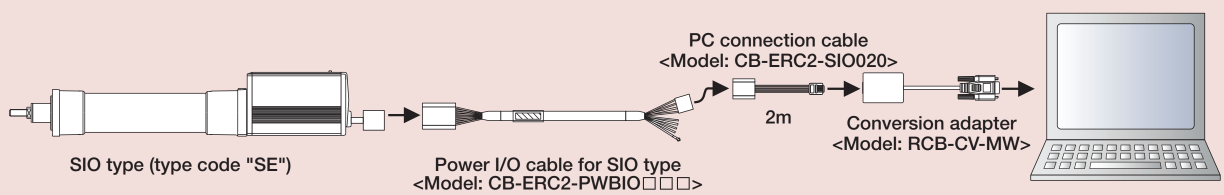
B	Brake
NM	Reversed-home
FT	Foot bracket

System configuration



Wiring Diagram to Connect to a PC

When connecting the SIO type to the PC directly, use the following cable.



I/O specification (PIO type)

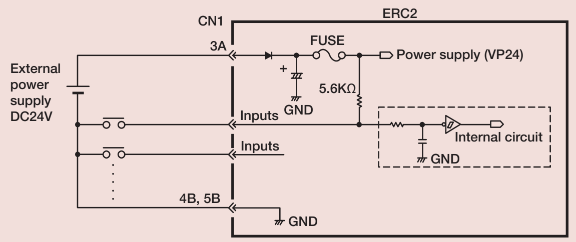
■ Input section External input specifications

Item	Specifications
Input points	6 points
Input voltage	DC24V +/-10%
Input current	4mA/circuit
Leak current	Max. 1mA/point
Operating voltage	ON voltage: Min. 18V (3.5mA) OFF voltage: Max. 6V (1mA)

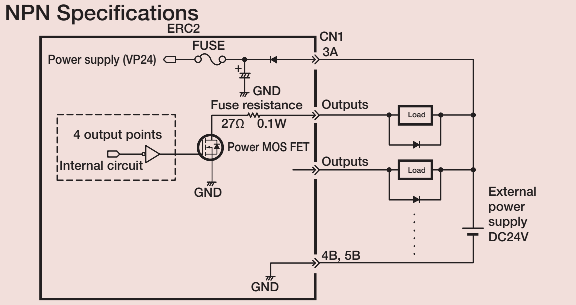
■ Output section External output specifications

Item	Specifications
Input points	4 points
Nominal load voltage	DC24V
Max. current	60mA/point
Remaining voltage	2V or less
Short-circuit, reverse voltage, protection	Fuse resistance (27Ω0.1W)

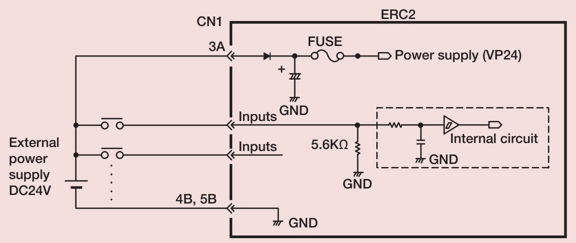
NPN Specifications



NPN Specifications



PNP Specifications



PNP Specifications

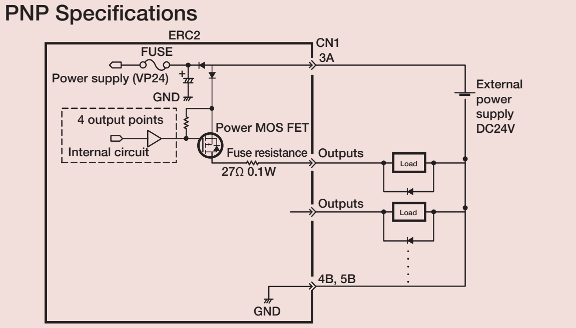


Table of I/O signals (PIO type)

Parameter (PIO pattern select)	PIO pattern	Pin No.
0	8-point type	A standard specification providing eight positioning points, plus a home return signal, zone signal,etc. (The parameter has been set to this pattern prior to the shipment.)
1	3-point type (Solenoid valve type)	Simply turn ON three signals of ST0 to ST2 to move the actuator to the corresponding positions (0 to 2), just like you do with solenoid valves (This allows for easy conversion from air cylinders).
2	16-point type (Zone signal type)	Can be positioned for up to 16 points. (Same as the 8-point type, except that this pattern provides no home return signal.)
3	16-point type (Position zone signal type)	A 16-point pattern with a position zone signal instead of a zone signal.

Pin No.	Classification	Wire color	Parameters (select PIO pattern)			
			0	1	2	3
			Conventional type	3-point type (Solenoid valve type)	16-point type (Zone signal type)	16-point type (Position zone signal type)
1A	SIO	Orange (Red 1)	SGA			
1B		Orange (Black 1)	SGB			
2A	Signal	Light Blue (Red 1)	EMS1			
2B	Signal	Light Blue (Black 1)	EMS2			
3A	24V	White (Red 1)	24V			
3B	0V	White (Black 1)	BLK			
4A	24V	Yellow (Red 1)	MPI			
4B	0V	Yellow (Black 1)	GND			
5A	24V	Pink (Red 1)	MPI			
5B	0V	Pink (Black 1)	GND			
6A	Input	Orange (Red 2)	PC1	ST0	PC1	PC1
6B		Orange (Black 2)	PC2	ST1	PC2	PC2
7A		Light Blue (Red 2)	PC4	ST2	PC4	PC4
7B		Light Blue (Black 2)	HOME	–	PC8	PC8
8A		White (Red 2)	CSTR	RES	CSTR	CSTR
8B		White (Black 2)	* STP	* STP	* STP	* STP
9A	Output	Yellow (Red 2)	PEND	PE0	PEND	PEND
9B		Yellow (Black 2)	HEND	PE1	HEND	HEND
10A		Pink (Red 2)	ZONE	PE2	ZONE	PZONE
10B		Pink (Black 2)	* ALM			

Signals marked with an asterisk (*) (ALM/STP) are negative logic signals so they are normally on.

Signal names

Classification	Signal Name	Signal abbreviations	Function overview
SIO	Serial Communication	SGA SGB	Used for serial communication.
24V 0V	Emergency stop	EMS1 EMS2	These signals are wired to enable the emergency stop switch on the teaching pendant (see P521).
	Brake release	BKR	By connecting to 0V (150mA needed) the brake is forcibly released.
Input	Command position No.	PC1 PC2 PC4 PC8	Designates the position number using 4-bit binary signals (or 3-bit binary signals if the 8-point PIO pattern is selected). (Example) Position 3 → Input PC1 and PC2 Position 7 → Input PC1 and PC2 and PC4
	Position movement	ST0 ST1 ST2	Turn the ST0 signal on to move the actuator to position 0. Same for ST1 and ST2 (Operation can be started with these signals alone. No need to input a start signal).
	Home return	HOME	Home-return operation starts at the leading edge of this signal.
	Start	CSTR	Input a command position number signal and turn this signal ON, and the actuator will start moving to the specified position.
	Reset	RES	Turning this signal ON resets the alarms that are present. When it is paused (*STP is off), it is possible to cancel the residual movement.
	Pause	＊STP	Normal operation is allowed while this signal is ON (negative logic) The actuator starts to decelerate to a stop at the ON → OFF leading edge of this signal.
Output	Positioning complete	PEND	This signal turns ON once the actuator has moved to the target position and completed the positioning by entering the specified positioning band. Used to determine if positioning has completed.
	Complete position No.	PE0 PE1 PE2	PE0 is output upon completion of movement to position 0. Same for PE1 and PE2. (These signals are valid only when the 3-point PIO pattern is selected.)
	Home return complete	HEND	This signal turns ON upon completion of home return.
	Zone	ZONE	This signal turns ON upon entry into the zone signal range set by parameters.
	Position zone	PZONE	This signal turns ON upon entry into the zone signal range set in the position table.
	Alarm	＊ALM	The signal remains ON in normal conditions and turns OFF upon generation of the alarm (negative logic). Synchronized with the LED at the top of the motor cover (green: normal state, red: alarm on).

Signals marked with an asterisk (*) (ALM/STP) are negative logic signals, so they are normally on.

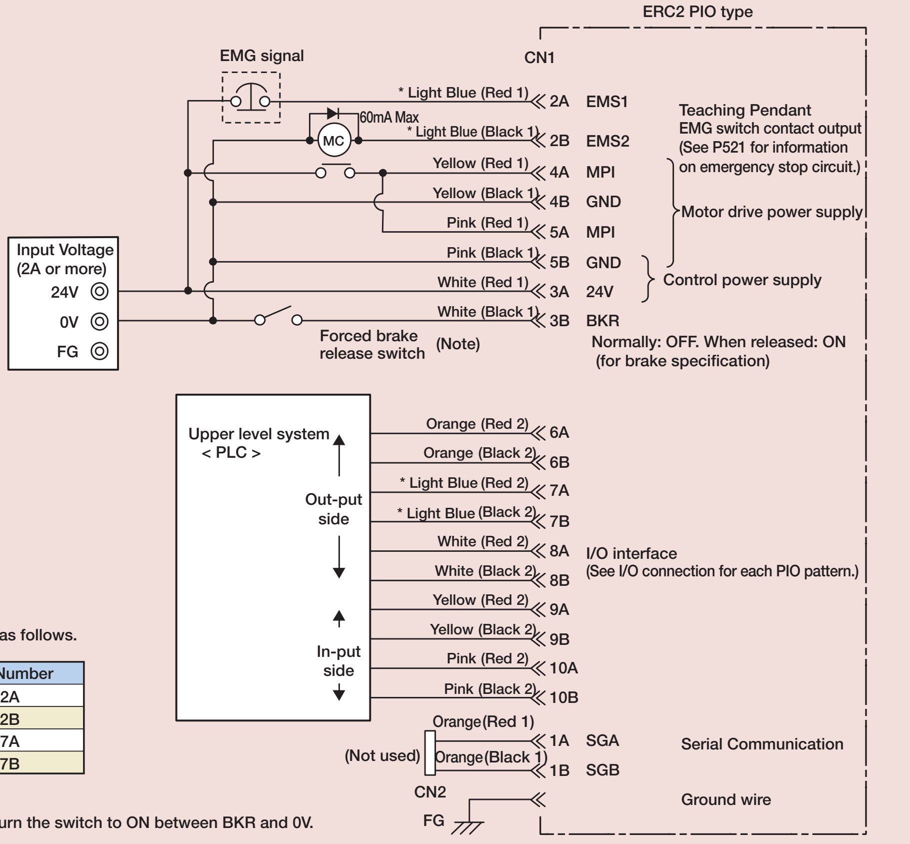
Specification Table

Specification		Details	
Type		PIO specification (NP / PN)	SIO specification (SE)
Control method		Low field vector control (patent pending)	
Positioning command		Position No. designation	Position No. designation / Direct value designation
Position No.		Max. 16 points	Max. 64 points
Backup memory		Position number data and parameters are stored in nonvolatile memory. Serial EEPROM with a rewrite life of 100,000 times	
PIO		6 dedicated input points/4 dedicated output points	None
Electromagnetic brake		Built-in circuit DC24V±10% 0.15A max.	
2-color LED display		Servo ON (green), Alarm/motor drive power supply shut-down (red)	
I/O power (Note 1)		Common to control power (non-isolated)	
Serial Communication		RS485 1ch (External termination)	
Absolute function		None	
Forced release of electromagnetic brake		Forced release when connected to 0V (NP), or 24V (PN)	Forced release when connected to 24V
Cable Length		I/O cable: 10m max. SIO connector communication cable: 5m or shorter	
Dielectric strength voltage		DC500V 10MΩ	
EMC		EN55011 Class A Group1 (3m)	
Power supply voltage		DC24V ± 10%	
Power supply current		2A max.	
Environment	Ambient operating temperature	0 ～ 40°C	
	Ambient operating humidity	85% RH or lower (non-condensing)	
	Ambient operating atmosphere	Free from corrosive gases	
Protection class		IP20	

Use the isolated PIO terminal block (option P522) to isolate the I/O power supply.

I/O wiring drawing

PIO Type NP (NPN Specification)

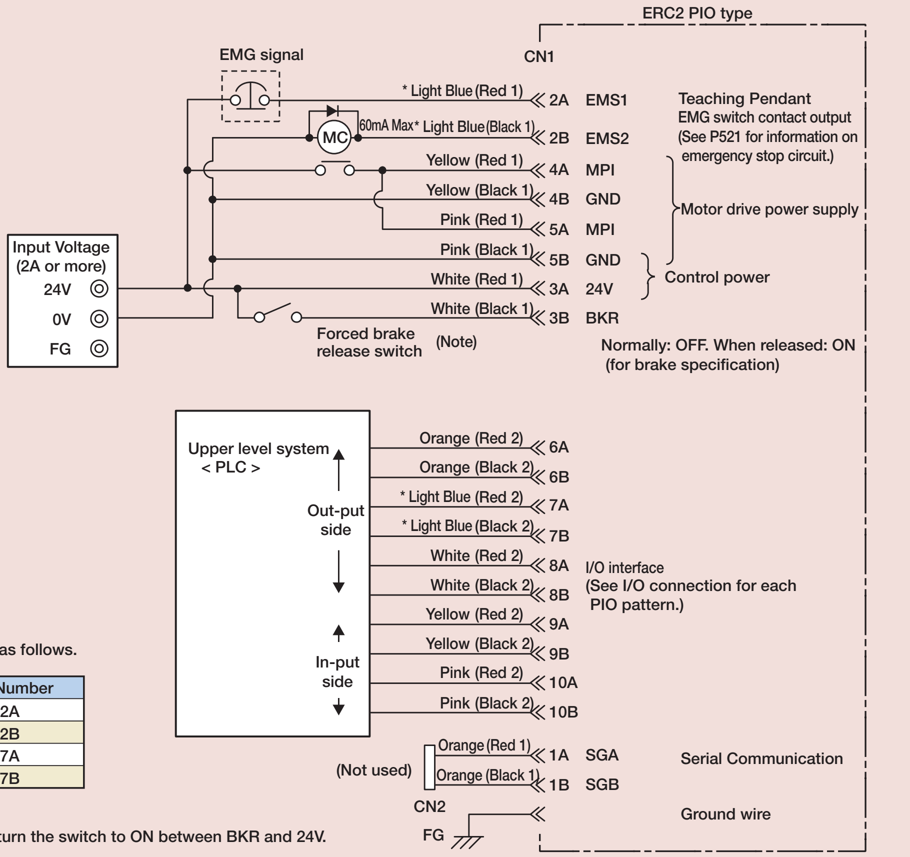


* For robot cables, the wire colors as as follows.

Wire color	Pin Number
Gray (Red 1)	2A
Gray (Black 1)	2B
Gray (Red2)	7A
Gray (Black 2)	7B

(Note) To forcibly release the brake, turn the switch to ON between BKR and 0V.

PIO Type PN (PNP Specification)

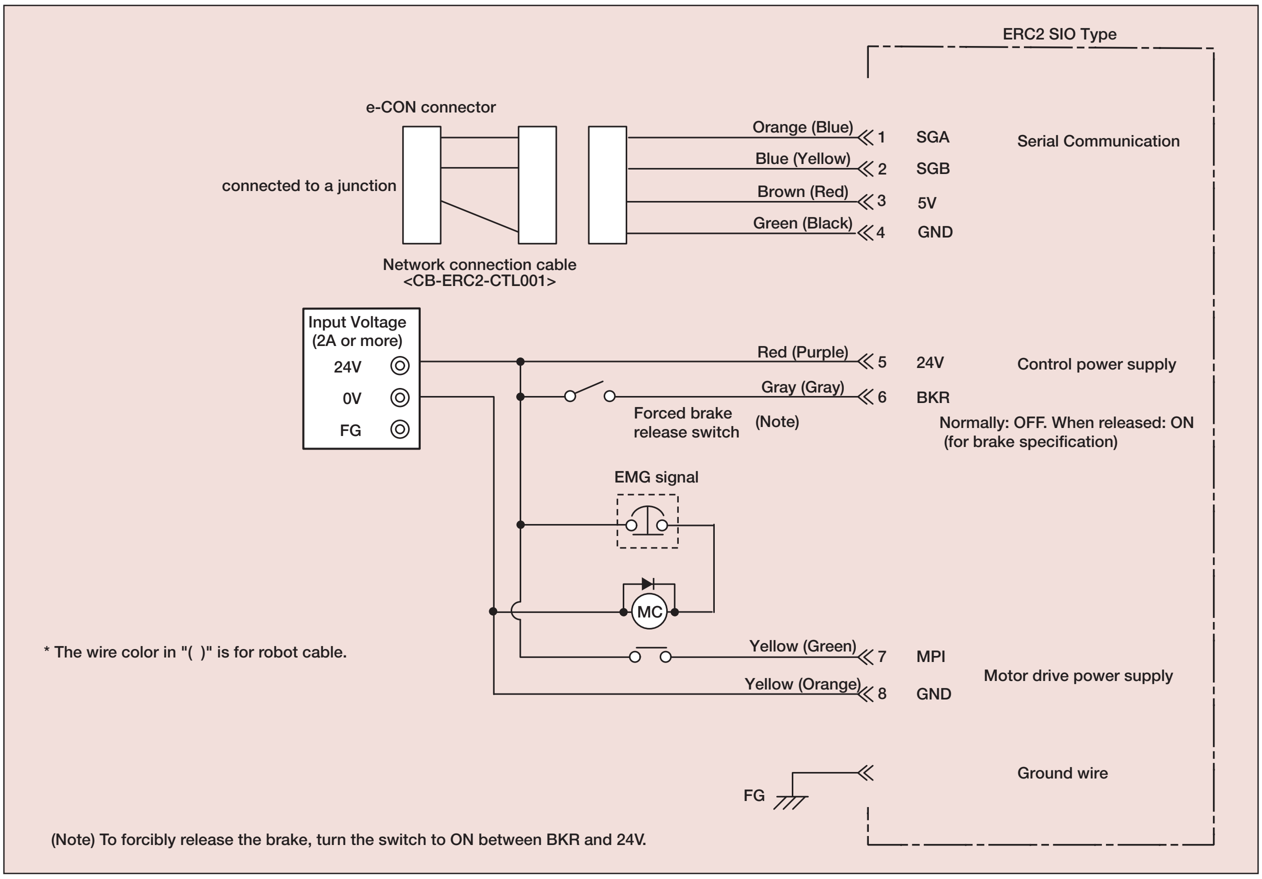


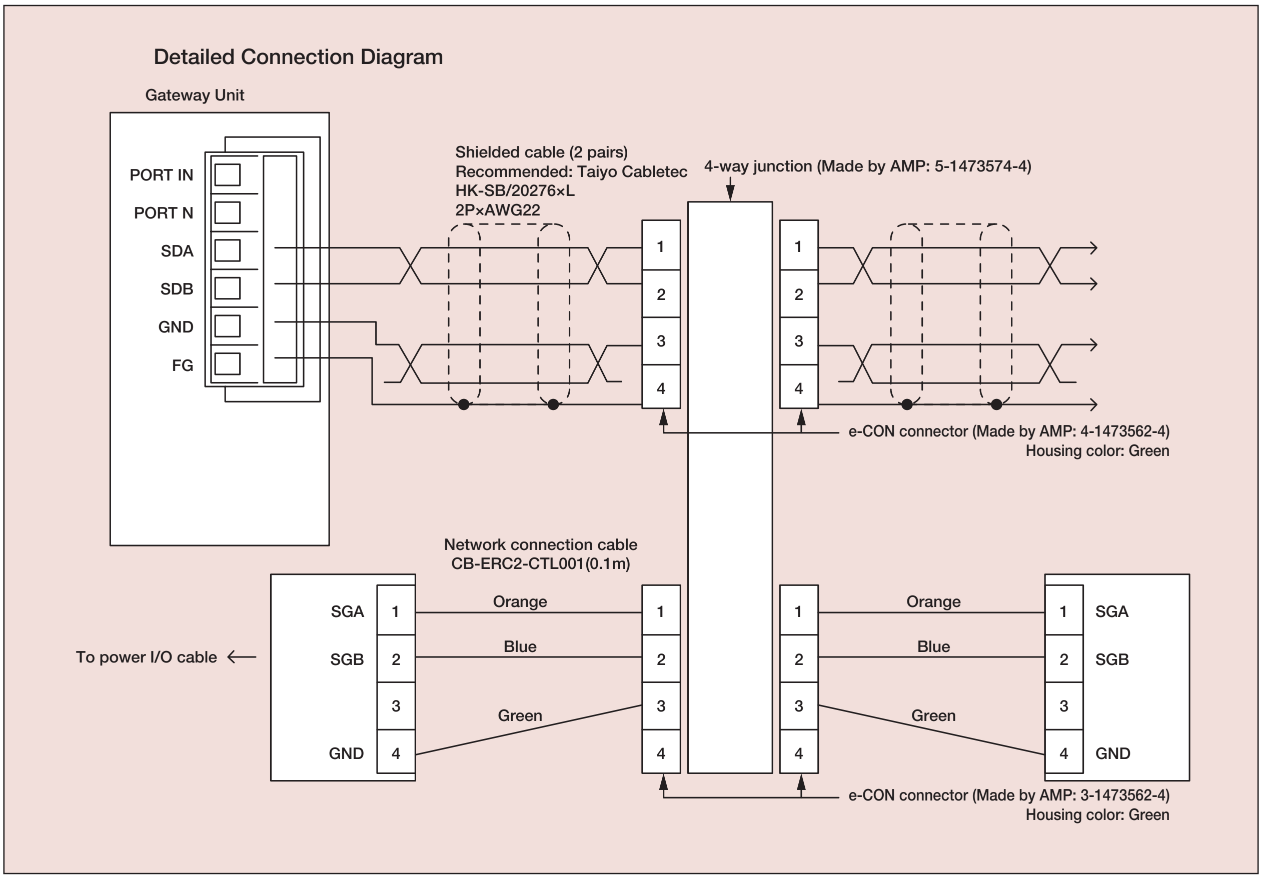
* For robot cables, the wire colors as as follows.

Wire color	Pin Number
Gray (Red 1)	2A
Gray (Black 1)	2B
Gray (Red2)	7A
Gray (Black 2)	7B

(Note) To forcibly release the brake, turn the switch to ON between BKR and 24V.

SIO Type SE


ERC2 SIO Type
e-CON connector
connected to a junction
Orange (Blue)
Blue (Yellow)
Brown (Red)
Green (Black)
1 SGA
2 SGB
3 5V
4 GND
Serial Communication
Network connection cable
<CB-ERC2-CTL001>
Input Voltage
(2A or more)
24V
0V
FG
Red (Purple)
Gray (Gray)
5 24V
6 BKR
Control power supply
Forced brake release switch
(Note)
Normally: OFF. When released: ON
(for brake specification)
EMG signal
MC
* The wire color in "( )" is for robot cable.
Yellow (Green)
Yellow (Orange)
7 MPI
8 GND
Motor drive power supply
FG
Ground wire
(Note) To forcibly release the brake, turn the switch to ON between BKR and 24V.

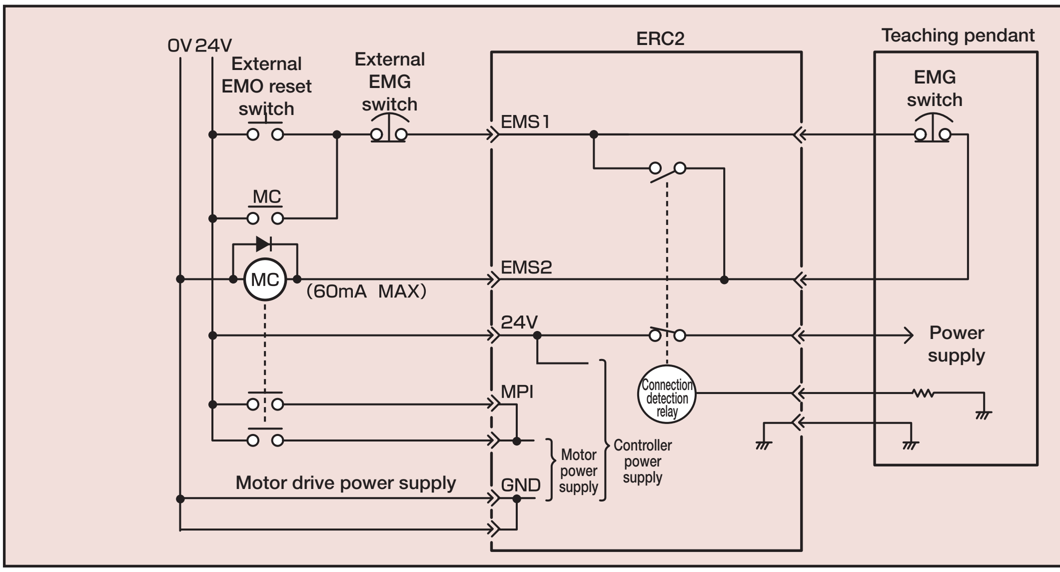

Detailed Connection Diagram
Gateway Unit
PORT IN
PORT N
SDA
SDB
GND
FG
Shielded cable (2 pairs)
Recommended: Taiyo Cabletec
HK-SB/20276×L
2P×AWG22
4-way junction (Made by AMP: 5-1473574-4)
1
2
3
4
e-CON connector (Made by AMP: 4-1473562-4)
Housing color: Green
Network connection cable
CB-ERC2-CTL001(0.1m)
To power I/O cable
SGA
SGB
GND
Orange
Blue
Green
e-CON connector (Made by AMP: 3-1473562-4)
Housing color: Green

Slider Type
Mini
Standard
Controllers Integrated
Rod Type
Mini
Standard
Controllers Integrated
Table/Arm /FlatType
Mini
Standard
Gripper/ Rotary Type
Linear Motor Type
Cleanroom Type
Splash-Proof
Controllers
PMEC /AMEC
PSEP /ASEP
ROBO NET
ERC2
PCON
ACON
SCON
PSEL
ASEL
SSEL
XSEL
Pulse Motor
Servo Motor (24V)
Servo Motor (230V)
Linear Motor

Emergency Stop Circuit

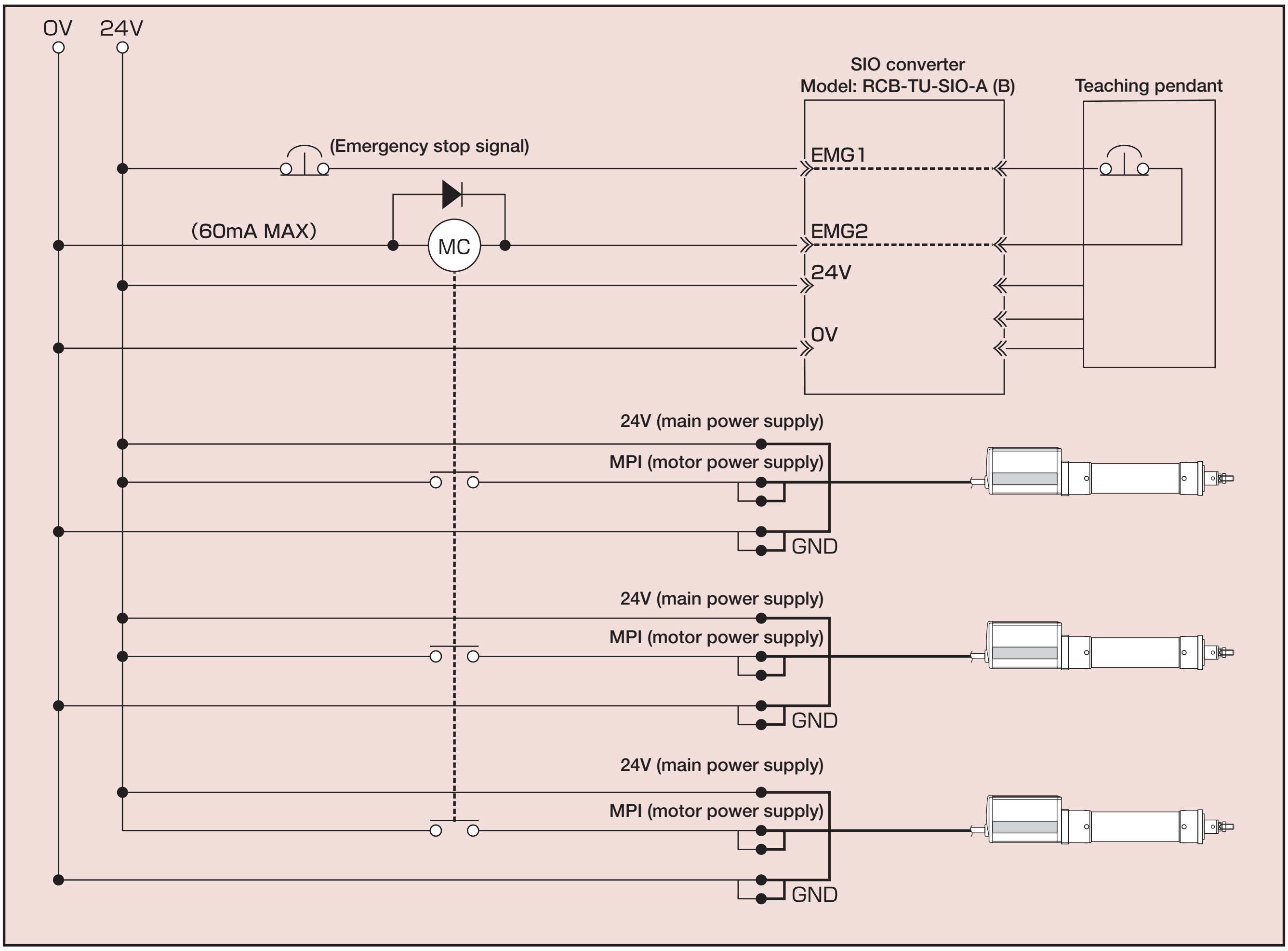
The ERC2 series has no built-in emergency stop circuit, so the customer must provide an emergency stop circuit based on the logic explained below.
(The circuit below is simplified for explanation purposes. Provide a ready circuit, etc., according to your specification.)

Single Axis: To provide an emergency stop circuit for a single-axis configuration, operate a relay using the EMS1 and EMS2 contacts of the power & I/O cable to cut off MPI (motor power).



* The circuit on the left is for the PIO specification. A teaching pendant cannot be connected with the SIO specification, so shut off the motor drive power supply at the external emergency stop circuit.

Multiple Axis: To provide an emergency stop circuit for a multiple-axes configuration, operate a relay using the EMG1 and EMG2 contacts of the SIO converter to cut off MPI (motor power) for each axis.



Option

Isolated PIO Terminal Block

This terminal block is used to isolate the I/O power or simplify the wiring with a PLC.
*When a terminal block is used, the optional power & I/O cable with connectors on both ends must be used.

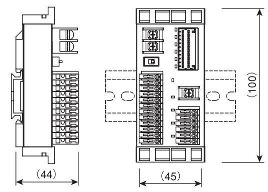
Features - The input and output ports are non-polar, so both NPN and PNP are compatible with the I/O specifications on the PLC side.
- An input/output-signal monitor LED is equipped to check the ON/OFF status of signals.

Specifications

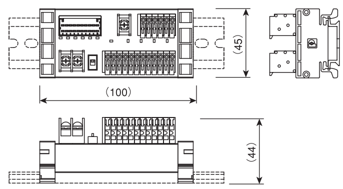
Item		Specifications
Power supply voltage		DC24V±10%
Ambient Operating Temp./Humidity		0 to 55°C, 85% RH or below (non-condensing)
Input area	Input points	6 points
	Input voltage	DC24V±10%
	Input current	7mA/circuit (bipolar)
	Allowable leaked current	1mA/point (at room temperature, about 2mA)
	Operating voltage (with respect to ground)	Input ON: Min. 16V (4.5mA) OFF：Max. 5V (1.3 mA)
Output area	Output points	4 points
	Rated load voltage	DC24V
	Max. current	60mA/point
	Residual voltage	2V or less/60mA
	Short circuit Overcurrent protection	Fuse resistance (27Ω0.1W)

Note:
If you are using the ERC2-PN (PNP specification), use RCB-TU-PIO-AP/BP (compatible with PNP specification).

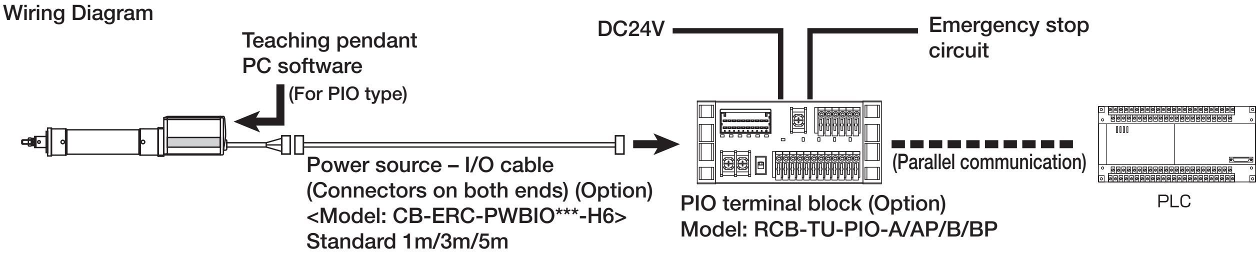
■Vertical Model: RCB-TU-PIO-A/AP



■Horizontal Model: RCB-TU-PIO-B/BP



Wiring Diagram



SIO Converter

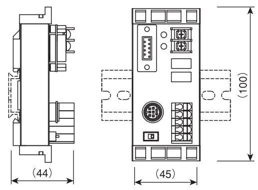
This converter can be used for RS232 communication by connecting a serial communication wire (SGA, SGB) for the power-I/O cable, and using a D-sub 9-pin cross cable to connect a computer.

Features - The connection port for teaching-pendant or a PC cable can be installed at any position away from the actuator.
- Multiple axes can be connected and operated from a PC via serial communication.

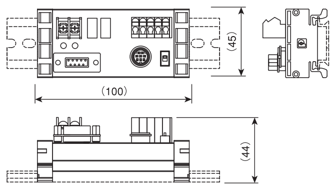
Specifications

Item	Specifications
Power supply voltage	DC24V ±10%
Ambient Operating Temp./ Humidity	0 to 55°C, 85% RH or below (non-condensing)
Terminal resistor	120Ω (built-in)

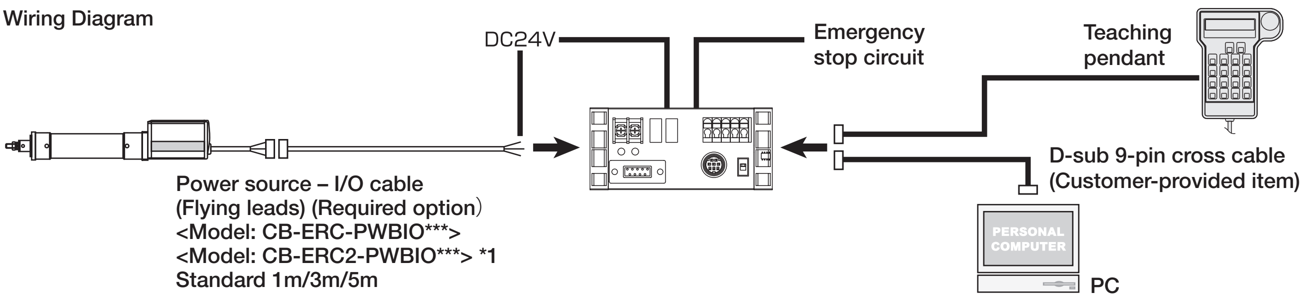
■ Vertical specification
Model: RCB-TU-SIO-A



■ Horizontal specification
Model: RCB-TU-SIO-B



Wiring Diagram

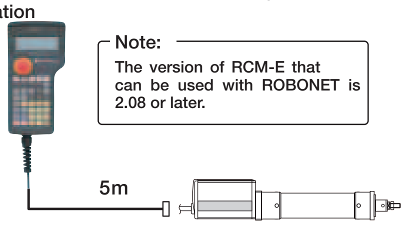


*1 For the SIO model, connect to the SIO converter using the network connection cable.

Option

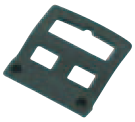
Teaching Pendant

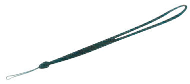
- **Features** This is a teaching device that provides information on functions such as position input, test runs, and monitoring.
- **Model** **CON-PT-M-ENG** (Touch panel teaching pendant)
  CON-T-ENG (Standard type)
  RCM-E (Simple teaching pendant)
- **Configuration**



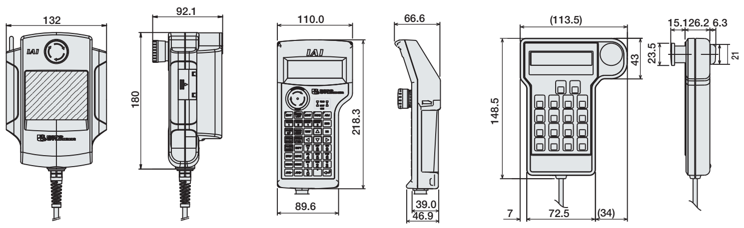
Note:
The version of RCM-E that can be used with ROBONET is 2.08 or later.

- **CON-T-ENG Options**
  - Wall-mounting hook
    Model HK-1
  - Strap
    Model STR-1





CON-PT-M-ENG　　CON-T-ENG　　RCM-E



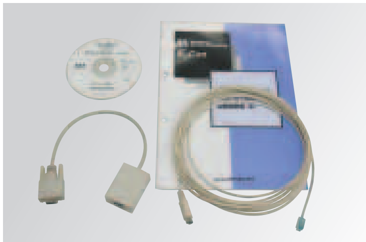
Specifications

Item	CON-PT-M-ENG	CON-T-ENG	RCM-E
Data Input	○	○	○
Actuator motion	○	○	○
Ambient Operating Temp./Humidity	Temp: 0~40°C; Humidity: 85% RH or below		
Ambient Operating Atmosphere	No corrosive gases. Especially no dust.		
Protection class	IP40	IP54	–
Weight	Approx. 750g	Approx. 400g	Approx. 400g
Cable Length	5m		
Display	3-color LED touch panel with backlight	20 char. × 4 lines LCD display	16 char. × 2 lines LCD display

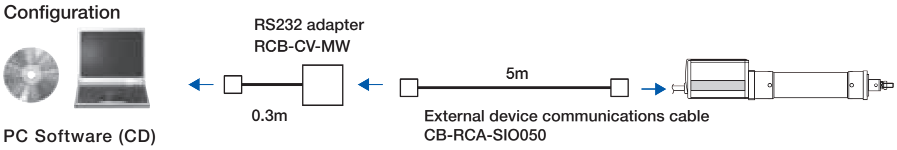
PC Software (Windows Only)

- **Features** A startup support software for teaching positions, performing test runs, and monitoring.
  With enhancements for adjustment functions, the startup time is shortened.

- **Model** **RCM-101-MW-EU** (External device communications cable + RS232 conversion unit)

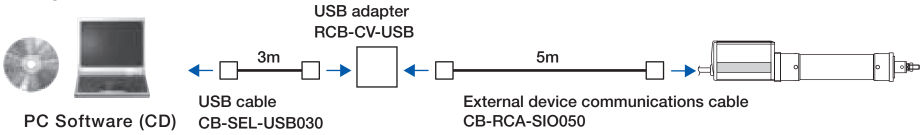


- **Configuration**



- **Model** **RCM-101-USB-EU** (External device communications cable + USB adapter + USB cable)

- **Configuration**

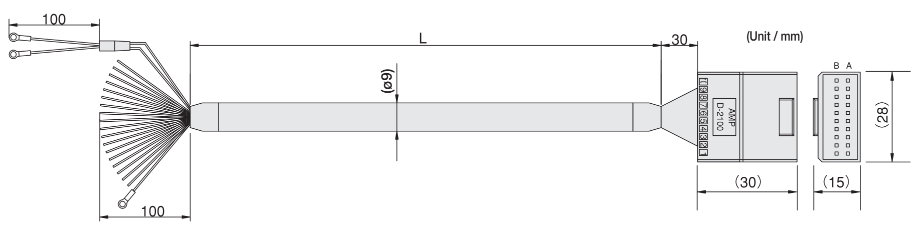


Cables & Spare Parts

Power & I/O Cable, Power & I/O Robot Cable For PIO

Model CB-ERC-PWBIO□□□/CB-ERC-PWBIO□□□-RB

* Enter the cable length (L) into □□□. Compatible to a maximum of 10 meters. Ex.: 080 = 8 m

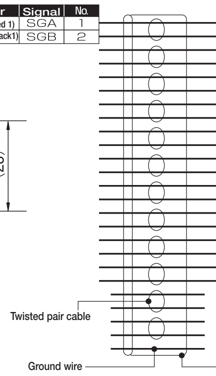


PLC side

Mechanical side

Min. bend radius r = 50 mm or larger (when movable type is used)
* Only the robot cable is to be used in a cable track.

Color	Signal	No.
Orange (Red 1)	SGA	1
Orange (Black1)	SGB	2

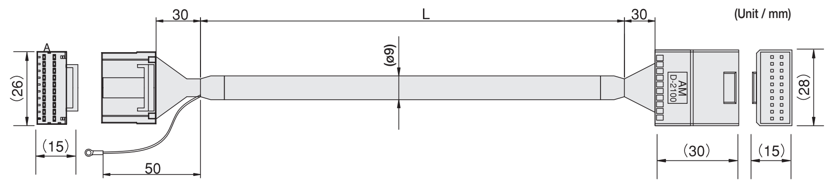


No.	Signal	Wire color	
		Standard Cable	Robot Cable
1A	SGA	Orange (Red 1)	←
1B	SGB	Orange (Black1)	←
2A	EMS1	Light Blue (Red 1)	Gray (Red 1)
2B	EMS2	Light Blue (Black 1)	Gray (Black 1)
3A	24V	White (Red 1)	←
3B	BKR	White (Black 1)	←
4A	MPI	Yellow (Red 1)	←
4B	GND	Yellow (Black 1)	←
5A	MPI	Pink (Red 1)	←
5B	GND	Pink (Black 1)	←
6A	IN1	Orange (Red 2)	←
6B	IN2	Orange (Black2)	←
7A	IN3	Light Blue (Red 2)	Gray (Red 2)
7B	IN4	Light Blue (Black 2)	Gray (Black 2)
8A	IN5	White (Red 2)	←
8B	IN6	White (Black 2)	←
9A	OUT1	Yellow (Red 2)	←
9B	OUT2	Yellow (Black 2)	←
10A	OUT3	Pink (Red 2)	←
10B	OUT4	Pink (Black 2)	←

Power & I/O Cable, Power-I/O Robot Cable (Connectors on Both Ends)

Model CB-ERC-PWBIO□□□-H6/CB-ERC-PWBIO□□□-RB-H6

* Enter the cable length (L) into □□□. Compatible to a maximum of 10 meters. Ex.: 080 = 8 m



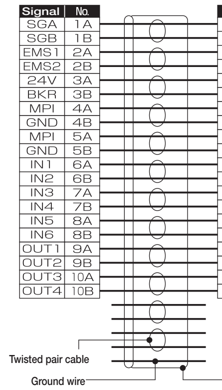
Receptacle housing: 1-1318118-9 (AMP)
Receptacle contact: 1318108-1(AMP)

PIO terminal block side

Mechanical side

Min. bend radius r = 50 mm or larger (when movable type is used)
* Only the robot cable is to be used in a cable track.

Signal	No.
SGA	1A
SGB	1B
EMS1	2A
EMS2	2B
24V	3A
BKR	3B
MPI	4A
GND	4B
MPI	5A
GND	5B
IN1	6A
IN2	6B
IN3	7A
IN4	7B
IN5	8A
IN6	8B
OUT1	9A
OUT2	9B
OUT3	10A
OUT4	10B



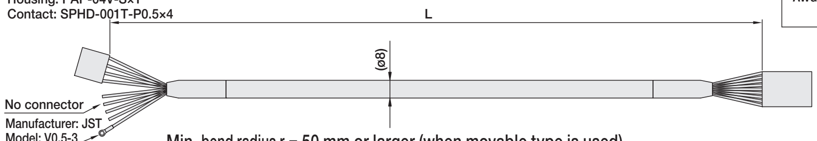
No.	Signal
1A	SGA
1B	SGB
2A	EMS1
2B	EMS2
3A	24V
3B	BKR
4A	MPI
4B	GND
5A	MPI
5B	GND
6A	IN1
6B	IN2
7A	IN3
7B	IN4
8A	IN5
8B	IN6
9A	OUT1
9B	OUT2
10A	OUT3
10B	OUT4

Power & I/O Cable, Power & I/O Robot Cable For SIO Type

Model CB-ERC2-PWBIO□□□/CB-ERC2-PWBIO□□□-RB

* Enter the cable length (L) into □□□. Compatible to a maximum of 10 meters. Ex.: 080 = 8 m

CN2
Manufacturer: JST
Housing: PAP-04V-S×1
Contact: SPHD-001T-P0.5×4



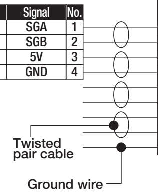
No connector
Manufacturer: JST
Model: V0.5-3

Network side

Mechanical side

Min. bend radius r = 50 mm or larger (when movable type is used)
* Only the robot cable is to be used in a cable track.

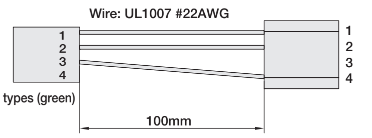
Wire	Color	Signal	No.
AWG26	Orange	SGA	1
	Blue	SGB	2
	Brown	5V	3
	Green	GND	4



No.	Signal Name	Wire color	
		Standard Cable	Robot Cable
1	SGA	Orange	Blue
2	SGB	Blue	Yellow
3	5V	Brown	Red
4	GND	Green	Black
5	Control power	Red	Purple
6	Brake	Gray	Gray
7	MPI	Yellow	Green
8	GND	Black	Orange
9	Shield	Shield	Shield

Network Connection Cable

Model CB-ERC2-CTL001



CN2
Manufacturer: AMP
e-CON connector plugs - 4 types (green)
Model: 4-1473562-4

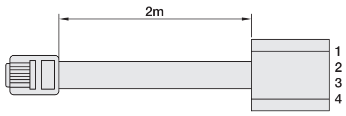
CN1
JST
Housing: PALR-04VF×1
Contact: SPAL-001T-P0.5×4

Wire	Color	Signal	No.
CN2 AWG22	Orange	SGA	1
	Blue	SGB	2
	Green	GND	3
		NC	4

No.	Signal	Color	Wire
1	SGA	Orange	CN1 AWG22
2	SGB	Blue	
3	5V	—	
4	GND	Green	

Communication Cable to Connect to PC

Model CB-ERC2-SIO020



CN2
Japan Chain Terminal (JCT)
Modular plug: NTC-66R

CN1
JST
Housing: PALR-04VF×1
Contact: SPAL-001T-P0.5×4

Wire	Signal	No.
AWG26	5V	1
	SGA	2
	GND	3
	SGB	4
	GND	5
	5V	6

No.	Signal	Wire
1	SGA	AWG26
2	SGB	
3	5V	
4	GND	

■ Notes on Specifications in this Catalog (All Models)

1. Speed

This refers to the set speed when moving the slider (or rod, arm, output axis) of the actuator.
The slider accelerates from rest to the specified speed, and continues to move at that speed until it decelerates to a stop at the specified target position.

<Note>

❶ For models equipped with a pulse motor (ERC2, RCP3, and RCP2), the maximum speed changes with the weight of the load being transported.
When selecting an actuator, refer to the "Speed vs. Load Capacity" (on each product page).

❷ If the axis has a short stroke, or if it has a long stroke but the travel distance is short, the specified speed may not be reached.

❸ As the stroke becomes longer, the maximum speed decreases, due to hazardous RPMs.
For details, see "■ Stroke vs. Maximum Speed" on each product page.

❹ For the RCP2 high-speed slider type (HS8C/HS8R) and belt type, vibration and/or resonance may occur when operated at low speeds. Therefore, use these models at 100mm/s or faster.

❺ For PMEC/AMEC controllers, a minimum speed is set for each actuator.
See the instructions manual for the PMEC/AMEC controllers.

❻ When calculating the time travelled, take into account the time taken to accelerate, decelerate, and converge, as opposed to only the time travelled at the specific speed.

2. Acceleration/Deceleration

Acceleration is the rate of change in speed from rest until a specified speed is reached.

Deceleration is the rate of change in speed from the specified speed to a state of rest.

Both are specified in "G" in programs (0.3G = 2940mm/sec^2).

* For rotary type, 0.3G = 2940 degrees/sec^2

<Note>

❶ Increasing the acceleration (deceleration) speeds up acceleration (deceleration), shortening the travel time.
However, caution should be exercised, as excessively high acceleration/deceleration may cause an error or a malfunction.

❷ The rated acceleration (deceleration) is 0.3G (2.0G, if the lead is 2.5, 3, or 4, or if used vertically)
With the exception of the high-acceleration/deceleration model, use the actuators at or below the rated acceleration.

❸ For models such as RCS2-SRA7 and RCS2-RA13R, use the actuator at or below the acceleration (deceleration) mentioned in "Notes on Selection" on the respective product page.

3. Duty

IAI's actuators should be used at a duty of 50% or below.

If used at over 50% duty, an excessive load error may occur depending on the load, speed, or acceleration.

4. Positioning Repeatability

A JIS B6192-compliant method for evaluating performance.

In this method, a positioning operation (stopping of the actuator at target point) is repeated seven times from the same direction, each time measuring the end position. Then the difference between the maximum and minimum values is calculated.

By using this measuring method for both end-points and the mid-point of the maximum stroke, the largest calculated value is multiplied by 1/2 and expressed with a ±.

5. Lead Screw

When using a lead screw type actuator, note the following:

<Note>

❶ This type is suited for applications with low frequency of use. (As a point of reference, one motion per 10 seconds, 24 hours per day, 240 days per year = approximately 5 years)

❷ This is suited for applications in which the load capacity and load requirements are low. (1kg or less)

❸ Use for applications that do not require a positioning repeatability smaller than ±0.05mm.

❹ Set up in a place that allows for easy maintenance.

6. Home Position

The home position is the reference point from which the actuator determines the target position.
Note that if the home position becomes misaligned, the target position also shifts by the same amount.

<Note>

❶ Actuators with an incremental encoder must be homed upon power-on.

❷ During homing operation, the slider (rod, table) moves to actuator's mechanical end, and then reverses. Therefore, watch for any interference with its surroundings.

❸ By default, the home position is on the motor-side (i.e. the open side on the gripper type, or the left side on the rotary type (looking down at the output shaft.)) Optionally, the home position can be moved to the opposite side (i.e. away from the motor). To change the home position after the actuator has been delivered, it must be sent back to IAI for adjustment.

❹ Models without the option code "NM" do not support reversed home position.

7. Encoder Type (Incremental/Absolute/Simple Absolute)

There are two types of encoders that can be used in an actuator, "incremental" and "absolute" encoders.

Incremental encoder ....When an incremental encoder is powered off, its coordinate data is erased. Therefore, homing is necessary each time it is powered back on.

Absolute encoder ....When an absolute encoder is powered off, it uses a battery to store its coordinate data. Therefore, homing is not necessary when it is powered back on. However, note that it cannot be operated once the battery for storing data runs out.

<Note>

In addition to the above two types of encoders, there is the "simple absolute" type, which is an incremental encoder with a dedicated simple absolute unit connected to the actuator's controller, for storing its coordinate data. This eliminates the need for homing upon power-on. Note that the simple absolute actuators (encoders) fall under the incremental type and not the absolute type.

8. Encoder Pulse Number

The pulse number of the encoder varies depending on the actuator. See the table below for the pulse number of each actuator.

Series	Type	Encoder Pulse Number
RCP3	All models	800
RCP2	All models	800
RCA2	RN□N/RP□N/GS□N/GD□N/SD□N/TCA□N/TWA□N/TFA□N	1048
	All other models	800

Series	Type	Encoder Pulse Number
RCA	All models	800
RCL	SA1L/RA1L	715
	SA2L/RA2L	855
	SA3L/RA3L	1145
RCS2	SRA7BD	3072
	All other models	16384

9. Motor

Different motors are used depending on the series.

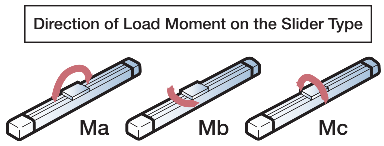
- ERC2/RCP2 (CR)/RCP3: Pulse motor
- RCA (CR)/RCA2: Servo motor (24V)
- RCS2 (CR): Servo motor (230V)

Pulse motors and 24V servo motors may exhibit slight vibration when the motor is excited while the servo is on.

■ Notes on Specifications in this Catalog (All Models)

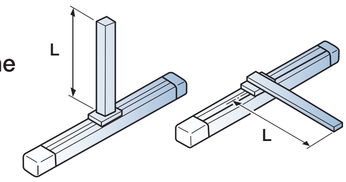
10. Allowable Load Moment (Ma, Mb, Mc)

Models with a built-in linear guide have static and dynamic allowable moments. Please note that using the guide with a load moment that exceeds specification will result in shorter service life of the guide.
(See page A-5 for details on load moment and its calculation method)



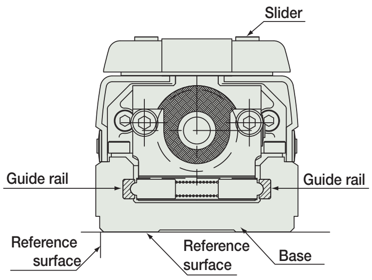
11. Overhang Load Length (L)

When mounting a workpiece or a bracket at an offset distance from the center of actuator/slider, the overhang load length indicates the maximum offset at which the actuator can operate smoothly.
Please make sure to keep the overhang load length within the allowable value, as exceeding the allowable value for for each model may cause vibration or shorten the service life .



12. Actuator Body Precision

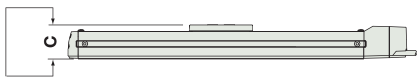
Below are the measures of precision for the body of the slider-type RoboCylinder. Moreover, the side and bottom surfaces of the actuator's base provide references for the run of the slider, and hence can be used as a guide to ensure parallel mounting of the actuator.



* Parallelism does not apply to RCP2W-SA16C, due to its sliding guide.

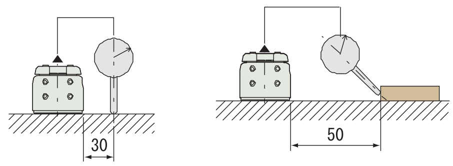
Parallelism: Base Underside & Load Surface (Top Side)

ERC2: ≤ ±0.1mm/m
RCP2/RCA/RCS2: ≤ ±0.05mm/m



Parallelism When Mounted onto a Frame (Fixed onto a Smooth Surface*1)

ERC2: ≤ ±0.1mm/m
RCP2/RCA/RCS2: ≤ ±0.05mm/m



Condition: The above values were measured at 20°C. *1: 0.05mm or less deviation from flatness.

13. Rod Type (Rod End vibration)

The standard rod-type actuators do not take into account any vibration or load resistance (The non-rotational accuracy values documented in the actuator specifications are initial values, and the backlash will increase with operation). If the rod vibrates or if the non-rotational accuracy fluctuates, or if a there is a force being applied from any direction other than the actuator's linear movement, use the guide-equipped actuator type, or use an external guide.

14. Vertical Setup and Use

When using the actuator in a vertical setup, add the optional brake to prevent the slider (or rod) from falling and breaking the machine when the power is turned off or an emergency stop is activated.
However, when mounting a brake-equipped RoboCylinder, be aware that the slider (or rod) will not move unless it is connected to the controller and the brake is released.

15. Moving the Slider Manually

For ball screws with a low (1, 2.5, 3, 4) lead, the actuator's slider cannot be moved by hand, even if the power and/or servo is off, due to high sliding resistance.
To move the slider on a low-lead actuator, use the teaching box or the JOG function of the computer software.

16. Actuator Cable

The actuator cable is the cable that extends from the rear of the actuator's motor.
Secure the actuator cable in place so that it does not move, as any force exerted on the actuator cable may cause a malfunction. If the cable must support bending motion, use a motor-encoder cable, designed for robots.

17. Motor-Encoder Cable

The motor-encoder cable is the cable that connects the actuator and the controller.
Depending on the actuator type, some models use a motor-encoder cable that is split into a separate motor cable and an encoder cable, and other models use an integrated motor-encoder cable.
Moreover, there are two different specifications of this cable: The standard cable specification and the robot cable specification, which has an outstanding flex resistance.
To use in a cable track, be sure to use the robot cable, using caution not to bend beyond the minimum bend radius R for the cable. (The minimum bend radius R is specified for each cable on the respective pages.)
To check the cable type for each model, see "Table of Actuator-Controller Connection Cable Types" on page A-39.

18. About the Splash-Proof Actuator Cable

Although the scope of protective construction of the splash-proof type includes the cable, the connector at the end of the actuator cable is not splash proof. Therefore, secure the end of the actuator cable in a place that is not prone to water spills. (For this reason, the actuator cable for a splash-proof model is 2m long)

19. Service Life

The service life of the actuator is directly related to the service life of the components that make up the actuator (guide, ball screw, motor, etc.).
Moreover, the service life for these components changes significantly depending on the usage requirements.
For example, each guide has an allowable load moment (see page A-5). If the guide is hypothetically used at half the moment of the allowable moment, its service life is eight times more than the specified service life.
If used conservatively, it can be used for 10 years or more.
Therefore, when selecting a model, it is recommended that you select a model with more head room.

20. Warranty

The warranty period expires upon elapse of one of the following periods, whichever occurs first.

- 18 months after shipment from IAI factory in Japan
- 12 months after delivery to the location specified
- 2500 hours after start of operation

IAI will repair free of charge any actuator defects due to craftsmanship or material that may occur during the above warranty period despite use under appropriate conditions. Note, however, that defects resulting from handling or use in any condition or environment not specified in the catalog, operation manual are excluded from the scope of warranty. The warranty covers only the actuator delivered by IAI or by IAI authorized distributors, and any secondary losses arising from a failure of the delivered product is excluded from the scope of warranty.
The defective actuator must be sent in for repair.

Considerations when Switching from Air Cylinders

Air Cylinder and RoboCylinder

Air cylinders are devices used to push and grasp objects by means of supplying and releasing compressed air. Air cylinders are used widely in all industries, mainly for transfer equipment, assembly systems, various automation systems, etc.
Air cylinders generally have diameters of between 4mm and 320mm, and their lengths (strokes) can also be set in fine steps. There are several tens to hundreds of thousands of different air cylinder products, which makes it easy to select optimal models for a variety of applications. However, since product lines are overly complex, many with identical specs, it can be difficult to select the best model for your specifications.
For this reason, there are many cases where air cylinders are selected largely out of past experience and familiarity.
RoboCylinders are easy-to-use electric cylinders offering a variety of functions not achievable with air cylinders. The RoboCylinder product family makes it easy for you to select the model that best suits the needs of your application. However, the controls and configuration possibilities of RoboCylinders are completely different from air cylinders.
This section explains some of the key points to consider when switching from air cylinders to RoboCylinders.

Overview of Switching

The following explains the differences in the basic items to be checked when selecting RoboCylinders and air cylinders.
Since both are linear motion actuators, there are some common matters that must be taken into consideration. However, the different configurations and controls described above result in different designations for adjustments and check items between the two. A comparison of these various items is shown at right.

[Air Cylinders]
- Thrust (Diameter)
- Mechanical stopper selection
- Absorber selection
- Wiring diameter
- Installation space

→

[RoboCylinders]
- Load capacity
- Maximum speed
- Acceleration
- Deceleration, Positioning accuracy
- Installation space

The above diagram shows that the two have different mechanical viewpoints to consider.

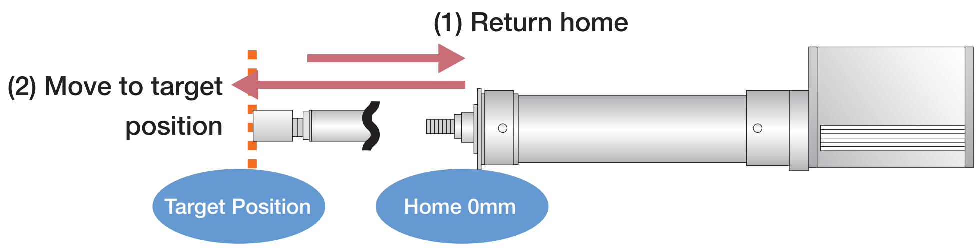
Installation Space

RoboCylinders are driven by a motor. Compared with air cylinders, simply from a size perspective, the RoboCylinder requires more attention paid to space requirements for installation.

Home Return

Unlike air cylinders, RoboCylinder operation is based on a “coordinates” concept. A home return operation is necessary at the beginning of operation because operations are controlled in movement quantities that are always referenced against a home point (0 point).
Specifically, in the case of incremental specifications, bear in mind that a pushing operation to the actuator stroke end will be performed as the initial operation when the power is turned ON.

- Incremental Specification: Return home operation after power is turned ON
- Absolute Specification : Absolute reset operation during initialization



Critical Rotating Speed

The ball screw inevitably deflects due to bending and its own deadweight. The RoboCylinder operates at high speeds causing the ball screw to rotate faster, and as the rotations increase the screw deflection also increases until the rotating axis is ultimately damaged. Hazardous rotational speeds that may damage the rotary axis are referred to as "critical speeds", "whirling speeds" or "whipping speeds".
Ball screw type RoboCylinders operate linearly as the ball screw is rotated with the end of the ball screw supported by a bearing. Although the maximum speed is specified for each RoboCylinder in accordance with the actuator type, some models with certain strokes have their maximum speed set in consideration of the aforementioned critical rotating speeds.

General Purpose (Types, Modes, Parameters)

RoboCylinders offer the "air-cylinder specification (or air cylinder mode)" that allows the RoboCylinder to be used just like an air cylinder. When using these, it is possible to operate the actuator by simple ON/OFF control by an external signal in exactly the same way as an air cylinder. This type or mode may be sufficient in the case of a simple swap-out, but a variety of types and parameters have been introduced for customers who desire higher value-added uses.
Feel free to contact IAI to discuss features to match your use conditions and needs when the equipment is actually installed.

Maintenance

The key maintenance points of air cylinders and RoboCylinders are compared.
Air cylinders require periodic maintenance performed according to the frequency and conditions of use. Although air cylinders offer a certain level of flexibility in that minor damage or malfunction can be ignored by means of increasing the source air pressure and moving the cylinder with a greater force, ignoring maintenance will inevitably shorten the service life of the air cylinder.
On the other hand, RoboCylinders have a more complex structure and use a greater number of parts and are therefore seen as requiring cumbersome maintenance work. This is wrong. RoboCylinders are clearly easier to use and offer longer life than air cylinders. Of course, RoboCylinders also require lubrication of sliding parts just as air cylinders do. However, RoboCylinders are equipped with a lubrication unit (AQ Seal) for ball screw and the sliding parts of the guides. This ensures a long maintenance-free period (5000 km of traveled distance, or three years). After 5000 km or travel or 3 years, greasing every 6 months to 1 year as instructed in the Operating Manual will vastly prolong the service life of the product.
In addition, absolute type controllers are currently equipped with a position retention battery. Since this is a consumable part, it must be periodically replaced (for periods that vary with the product).

[Primary Maintenance Tasks]

[Air Cylinders]

- Lubricating sliding parts
- Replacing gasket
- Draining
- Replacing absorber

[RoboCylinders]

- Lubricating ball screw and guide (after AQ seals have worn out)
- Replacing battery (absolute encoder types only)

Operation

Air cylinders are generally operated with the use of a direction control valve to determine the direction of reciprocating motion, as well as a flow control valve (speed controller) to determine the speed. Immediately after their system is started up, many users operate the air cylinder at low speed by restricting the flow control valve.
The same procedure is also recommended for RoboCylinders after the system is started up.
With RoboCylinders, "speed setting" replaces the flow control valve. Operate your RoboCylinder at speeds where safety is ensured, and then change to the desired speed after safety is confirmed.

Service Life and Moment

One of the main factors related to an actuator's service life is the "load rating".
There are two types of load rating: A static load is the weight of a load that leaves a small amount of indentation when the load is applied. A dynamic load is the weight of a load that maintains a constant survival probably of the guide when the load is applied while moving a constant distant.
Guide manufacturers rate dynamic load values to maintain a 90% survival rate at a travel distance of 50km. However, when taking account the speed of movement and work rate, the actual travel distance needs to be 5000 to 10000km.
While the life of a guide is sufficiently long for radial loads, it is actually the moment load that is offset from the guide center that is most problematic to its service life.
The service life for IAI actuators as documented in this catalog shows the allowable dynamic moment based on a 5000 or 10000km service life.

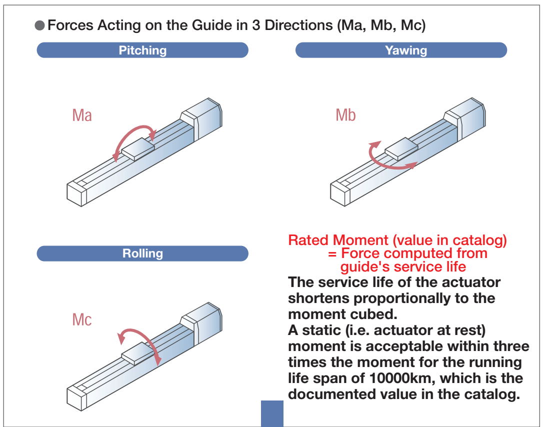
IAI uses the following equation calculate the service life:
(for 10000km service life)

$$L_{10}=\left(\frac{C_{IA}}{P}\right)^3 \cdot 10000\text{km}$$

L_{10} : Service life (90% Survival Probability)
C_{IA} : Allowable Dynamic Moment in IAI Catalog
P : Moment used

Allowable Dynamic Moment

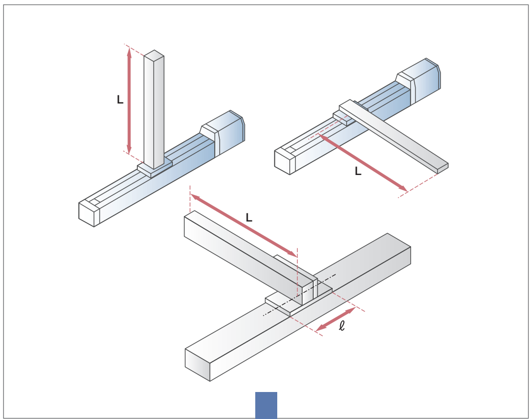
The allowable dynamic moment is the maximum offset load exerted on the slider, calculated from the guide service life. The direction in which force is exerted on the guide is categorized into 3 directions - Ma (pitch), Mb (yaw), Mc (roll) - the tolerance for each of which are set for each actuator. Applying a moment exceeding the allowable value will reduce the service life of the actuator. Use an auxiliary guide when working within or in excess of these tolerances.



The allowable dynamic moment is calculated from the service life of the guide.

Overhang load length

An overhang load length is specified for a slider-type actuator to indicate the length of overhang (offset) from the actuator.
When the length of an object mounted to the slider actuator exceeds this length, it will generate vibration and increase the settling time. So, pay attention to the allowable overhang length as well as the allowable dynamic moment.



The allowable overhang load length is determined by the slider length.

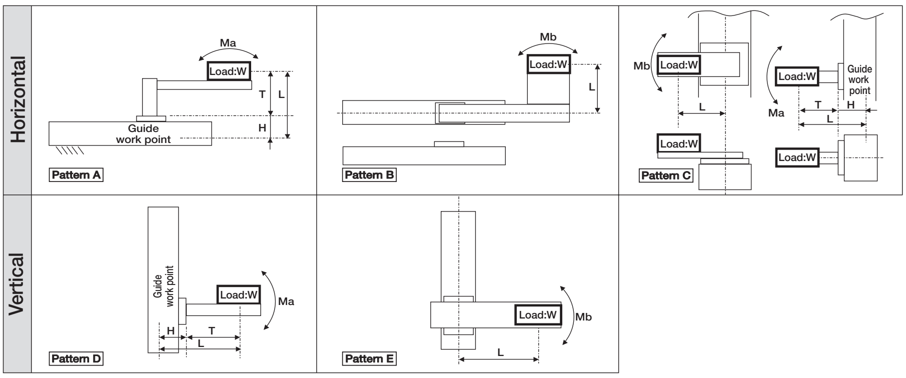
An overhang that exceeds the allowable overhang length will generate vibration and increase settling time.

L/ℓ = 5 or less
* Between 3 to 4 for a camera-equipped measuring machine.

● For example:
L/ℓ =1.2 Mechanical machine
L/ℓ = 3 Measuring machine
L/ℓ = 5 Robot

How to calculate allowable dynamic moment

M2 (N•m) = W (kg) × L (mm) × a (G) × 9.8/1000



W : Load
L : Distance from work point to the center of gravity of payload (L=T+H)
T : Distance from top surface of slider to the center of gravity of payload
H : Distance from guide work point to the top surface of slider
a : Specified acceleration

Allowable Dynamic Moment and Allowable Static Moment

There are two types of moment that can be applied to the the guide: the allowable dynamic moment and the allowable static moment.
The allowable dynamic moment is calculated from the travel life (when flaking occurs) when moved with the moment load applied.
In contrast, the static moment is calculated from the load that causes permanent deformation to the steel ball or its rolling surface (i.e. rated static moment), taking into account the rigidity and deformity of the base.

[Allowable Dynamic Moment]

IAI's catalog contains the allowable dynamic moments based on a load coefficient of 1.2 and 10000km or 5000km.
This value is different from the so-called basic rated dynamic moment, which is based on a 50km travel life.
To calculate the basic rated dynamic moment for a 50km travel life, use the following equation.

$$M_{50}=f_w \times M_S \div \left(\frac{50}{S}\right)^{\frac{1}{3}}$$ • • • • Equation 1

M_S : Allowable dynamic moment at an assumed travel distance (catalog value)
S : IAI catalog assumed travel life (5000km or 10000km)
f_w : Load coefficient (=1.2)
M_{50} : Basic rated dynamic moment (50km travel life)

The allowable dynamic moments mentioned in the catalog (10000km or 5000km life) are based on a load coefficient fw=1.2. To calculate the service life of a guide with a different load coefficient, use Table 1 below to determine the load coefficient that matches your requirements.

Table 1: Load Coefficients

Operation and Load Requirements	Load Coefficient fw
Slow operation with light vibration/shock (1500mm/s or less, 0.3G or less)	1.0~1.5
Moderate vibration/shock, abrupt braking and accelerating (2500mm/s or less, 1.0G or less)	1.5~2.0
Operation with abrupt acceleration/deceleration with heavy vibration/shock (2500mm/s or faster, 1.0G or faster)	2.0~3.5

$$L_{10}=\left(\frac{C_{IA}}{P}\cdot\frac{1.2}{f_w}\right)^3 \times S$$ • • • • Equation (2)

L_{10} : Service life (90% Survival Probability)
C_{IA} : Allowable dynamic moment in IAI Catalog (5000km or 10000km)
P : Moment used ($\leq$ CIA)
S : IAI catalog assumed travel life (5000km or 10000km)
f_w : Load coefficient (from Table 1)

[Allowable Static Moment]

The maximum moment that can be applied to a slider at rest.
These values are calculated by taking the basic rated static moment of the slider and multiplying with the safety rate that takes into consideration any effects from the rigidity and deformity of the base.
Therefore, if a moment load is applied to the slider at rest, keep the moment within this allowable static moment. However, use caution to avoid adding any unexpected shock load from any inertia that reacts on the load.

[Basic Rated Static Moment]

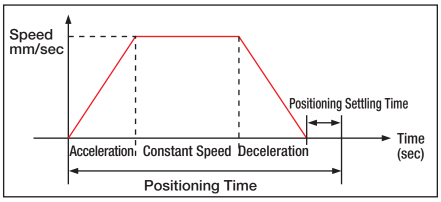
The basic rated static moment is the moment value at which the sum of the permanent deformation at the center of contact between the rolling body (steel ball) and the rolling surface (rail) is 0.0001 times the diameter of the rolling body.
These values are simply calculated strictly from the permanent deformation done to the steel ball and its rolling surface. However, the actual moment value is restricted by the rigidity and deformation of the base. Hence, the allowable static moment the actual moment that can be applied statically, taking into account those factors.

Technical Information

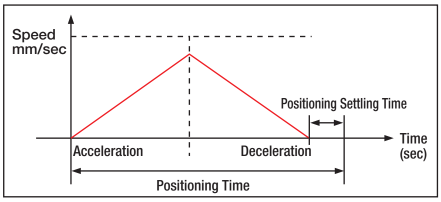
How to calculate positioning time

The actuator positioning time can be found from an equation.
Depending on the distance to be moved and the amount of acceleration/deceleration to be applied, the positioning operation can follow one of two patterns, shown below:

A Trapezoidal Pattern



B Triangular Pattern



First confirm the movement pattern as trapezoidal or triangular, then calculate the positioning time using the respective equation.

Confirming the Movement Pattern

Whether a movement pattern is trapezoidal or triangular can be determined by whether the peak speed reached after accelerating over a distance at a specified rate is greater than or less than the specified speed.

$$\text{Peak speed (Vmax)} = \sqrt{\text{Distance travelled S(mm)} \times \text{Specified acceleration}}$$

$$= \sqrt{\text{Smm} \times 9800\text{mm/sec}^2 \times \text{Acceleration setting (G)}}$$

If Vmax > V: Trapezoidal pattern

If Vmax < V: Triangular pattern, where Vmax is the peak speed reached and V is the speed that was specified.

Method of Calculating the Positioning Time

A Trapezoidal Pattern

$$\text{Positioning Time (T)} = \frac{\text{Distance (mm)}}{\text{Speed (mm/sec)}} + \frac{\text{Speed (mm/sec)}}{\text{Accel. (mm/sec}^2\text{)}} + \text{Positioning Settling Time}$$

B Triangular Pattern

$$\text{Positioning Time} = 2\sqrt{\frac{\text{Distance (mm)}}{\text{Accel. (mm/sec}^2\text{)}}} + \text{Positioning Settling Time}$$

$$\text{Accel. Time} = \frac{\text{Speed* (mm/sec)}}{\text{Accel. (mm/sec}^2\text{)}}$$

$$\text{Distance Accelerated} = \frac{\text{Accel. (mm/sec}^2\text{)} \times (\text{Accel. Time (sec)})^2}{2}$$

* Here, "Speed" refers to the specified speed in the trapezoid pattern, and the peak speed in the triangle pattern.

Note

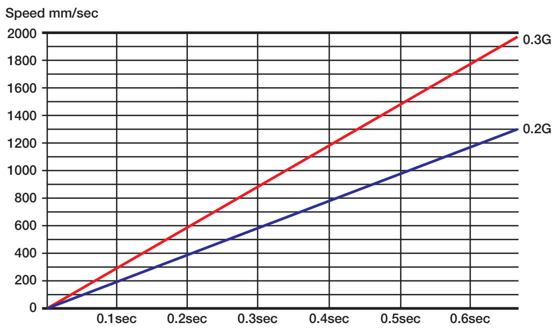
- The acceleration is calculated by the following: Acceleration setting in the controller (G)×9800mm/sec^2. If the acceleration setting in the controller is 0.3G, then 0.3×9800mm/sec^2 = 2940mm/sec^2.
- The positioning settling time is the time required to determine the completion of movement to the target position, typically around 0.15sec for ball screw types and 0.2sec for belt types.

Positioning time (sec)

Accel. Setting	Specified Speed (mm/sec)	Distance Moved (mm) 10	20	30	40	50	100	150	200	250	300	350	400	450	500	600	1000	1100	1300	1400
0.3G	100	0.13	0.23	0.33	0.43	0.53	1.03	1.53	2.03	2.53	3.03	3.53	4.03	4.53	5.03	6.03	10.03	11.03	13.03	14.03
	200	0.12	0.17	0.22	0.27	0.32	0.57	0.82	1.07	1.32	1.57	1.82	2.07	2.32	2.57	3.07	5.07	5.57	6.57	7.07
	300	0.12	0.16	0.2	0.24	0.27	0.44	0.6	0.77	0.94	1.1	1.27	1.44	1.6	1.77	2.1	3.44	3.77	4.44	4.77
	400	0.12	0.16	0.2	0.23	0.26	0.39	0.51	0.64	0.76	0.89	1.01	1.14	1.26	1.39	1.64	2.64	2.89	3.39	3.64
	500	0.12	0.16	0.2	0.23	0.26	0.37	0.47	0.57	0.67	0.77	0.87	0.97	1.07	1.17	1.37	2.17	2.37	2.77	2.97
	600	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.54	0.62	0.7	0.79	0.87	0.95	1.04	1.2	1.87	2.04	2.37	2.54
	700	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.6	0.67	0.74	0.81	0.88	0.95	1.1	1.67	1.81	2.1	2.24
	800	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.65	0.71	0.77	0.83	0.9	1.02	1.52	1.65	1.9	2.02
	900	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.7	0.75	0.81	0.86	0.97	1.42	1.53	1.75	1.86
	1000	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.79	0.84	0.94	1.34	1.44	1.64	1.74
	1750	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82	0.9	1.17	1.37	1.56	1.65
	2000	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82	0.9	1.17	1.22	1.33	1.48

Note: Does not include the positioning settling time (0.15sec for ball screw, and 0.2sec for belt).
Triangular Pattern (shaded cells)

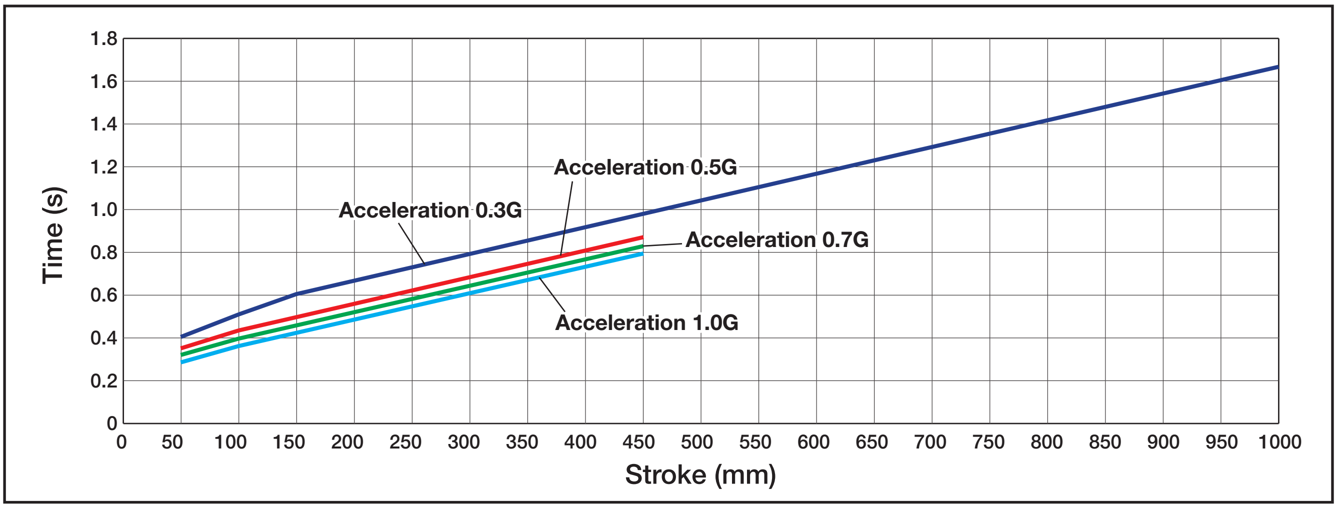
Acceleration time



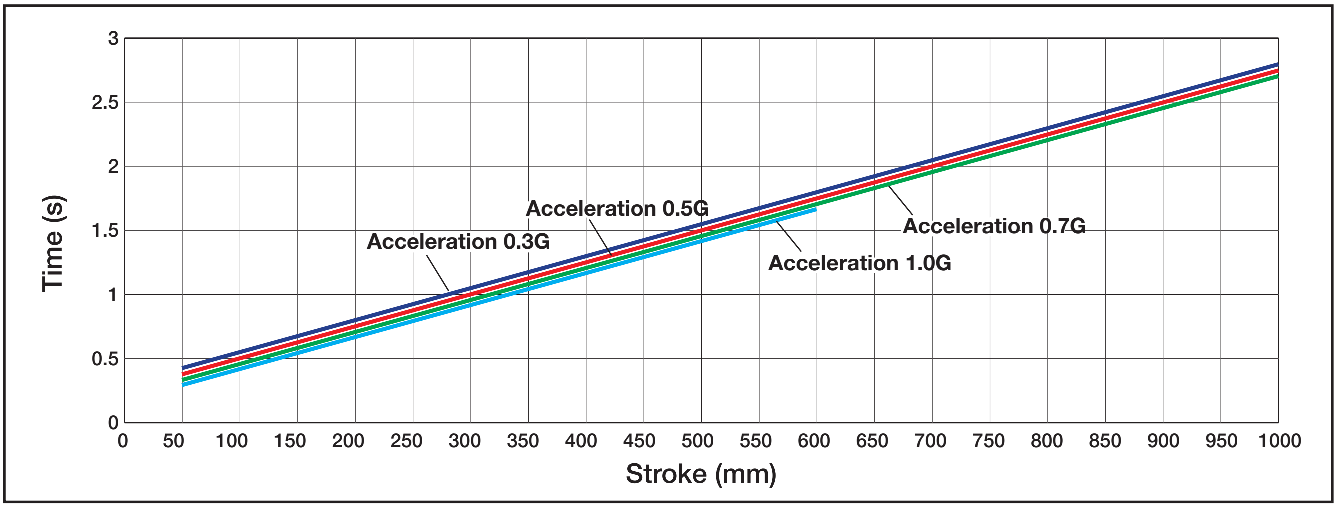
Reference Chart of Movement Time per Speed/Acceleration

The charts below show the estimated time required for the movement per speed/acceleration. Please use it as a reference for cycle time.
(Note) Stroke indicates the one-sided and unidirectional movement distance. For RCP2, RCP3 and ERC2, please note that the maximum speed varies depending on load capacity.

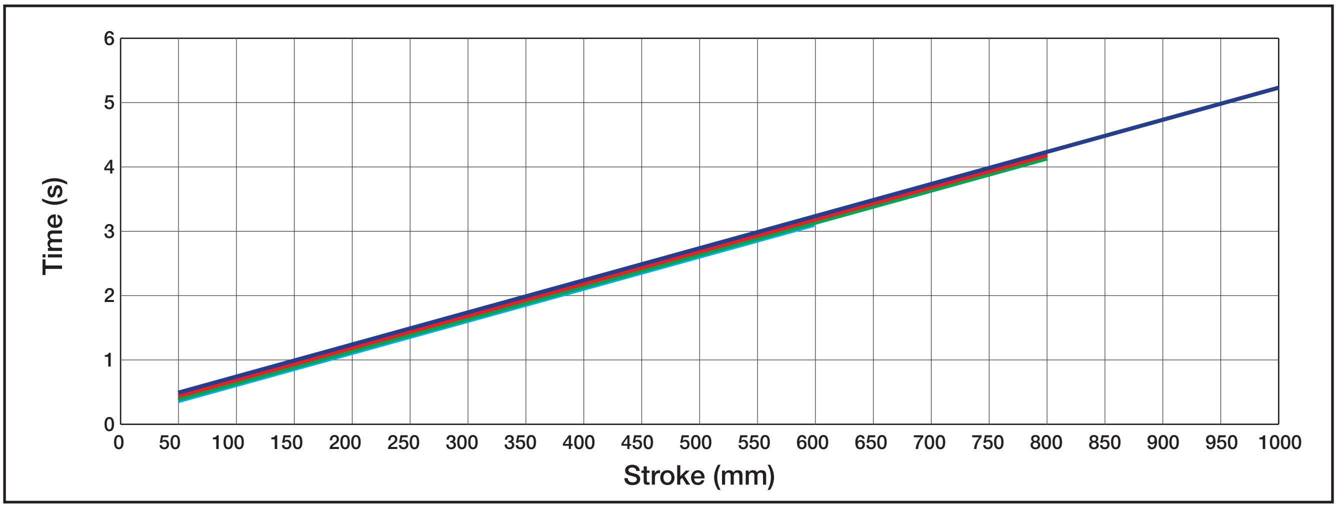
Speed 800mm/s



Speed 400mm/s



Speed 200mm/s



Information on special orders

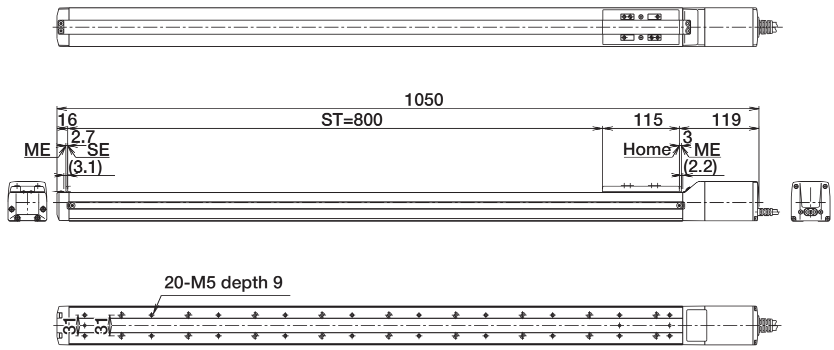
If you don't find your desired product in this catalog,
feel free to contact us, as we are able to fill special orders.
Some typical special orders are shown below for your reference.

Caution:

Special order is not always available for all the models. Please feel free to contact us for details.

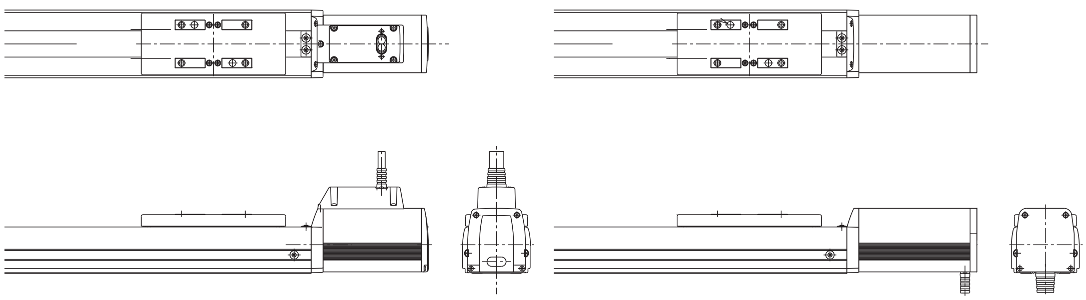
Special Stroke

Ex.) RCP2-SA6 800 Stroke (Non-standard stroke)



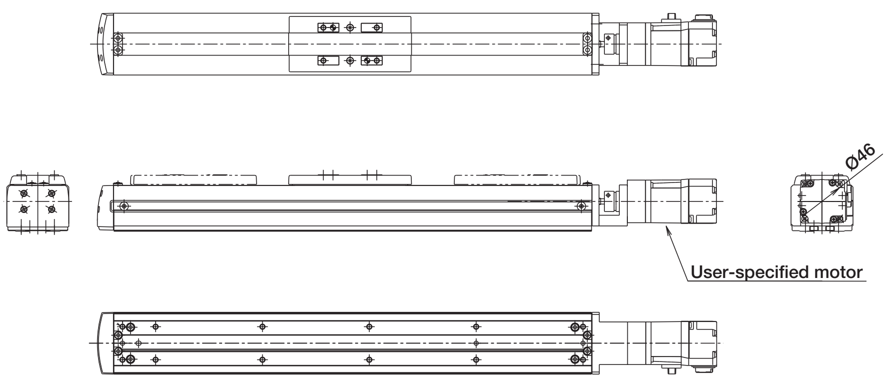
Cable Outlet Directional Changes

Ex.) Actuator cable outlet top/bottom



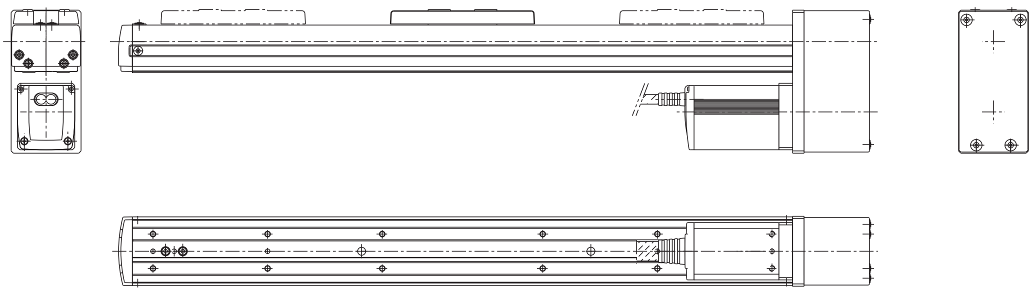
Special Motor

Ex.) Mount Customer-Specified Motor Specification



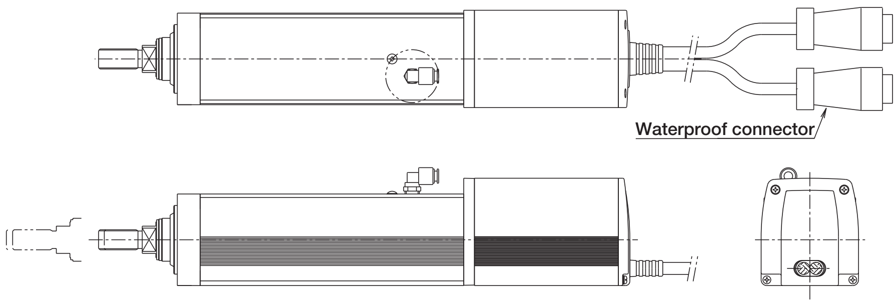
Side-Mount Motor Orientation

Ex.) Side-Mount Motor to the Bottom



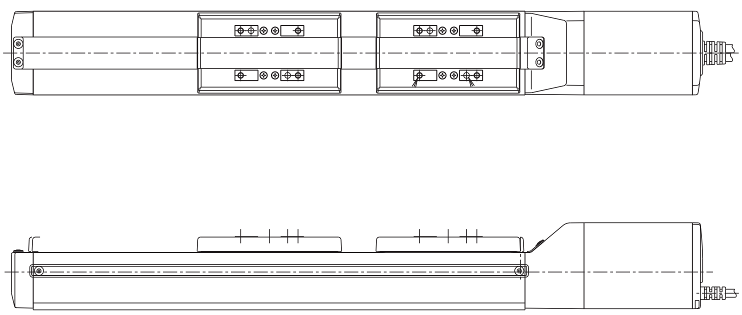
Special Connector

Ex.) Change motor-encoder connector to waterproof connector



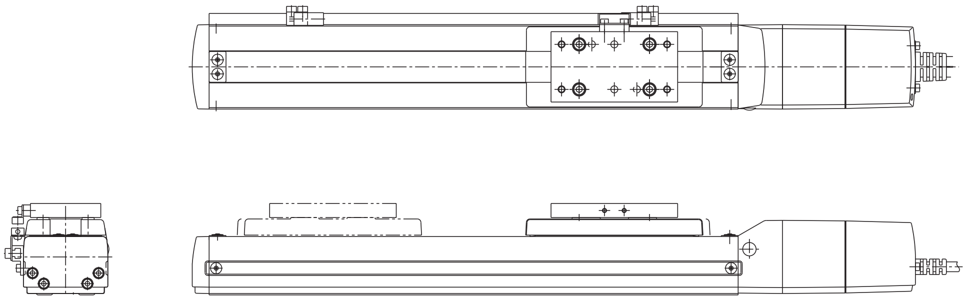
Special Slider

Double Slider Specification (Add non-driven slider)



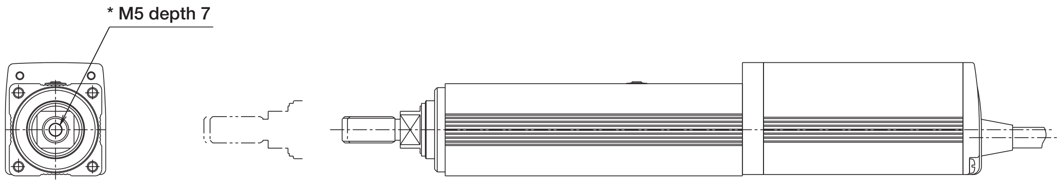
Sensor Specifications

Ex.) Sensor Mounting Specifications



Lead-End Tapped Hole Processing

Ex.) Add a tapped hole to the lead-end of the rod in a rod type



Other

- Special Ball Screw Lead
- Raydent Treated Ball Screw
- ESD (Electrostatic Discharge) Specification
- Assembly Unit

Explanation of Terms

(This terminology is related to IAI products, and so the definitions are more limited than usual.)

10,000km service life

Around 10000 hours are guaranteed for actual use in the field. When considering the speed, work ratio, etc, this translates to a distance of 5000 to 10000km. While the life of a guide is sufficiently long for radial loads, it is the uneven loads due to moment loads that are problematic to its service life.
For this reason, the 10000km service life is established by specifying the rated dynamic load moment that can guarantee 10000km of travel distance.

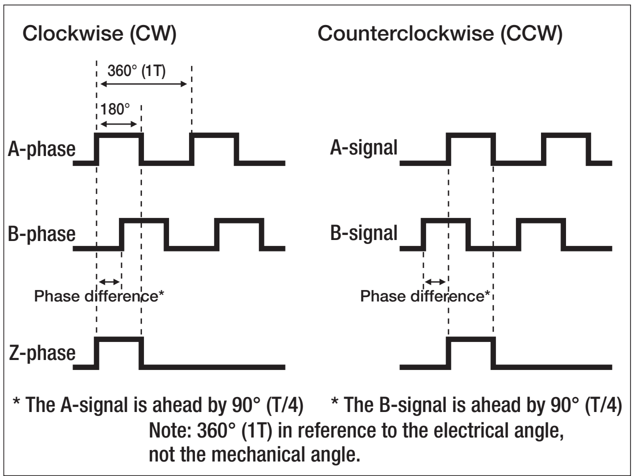
50km service life

A way of expressing the allowable load capacity, submitted by the guide manufacturer. This is the value at which the probability of the guide not breaking (i.e. survival probability) when used with this allowable radial load (basic dynamic rated load) is 90%.
Calculating the actual distance of travel, considering the motion velocity and work rate, etc, an actual industrial equipment, it is necessary to ensure 5000km to 10000km of travel. From that viewpoint, this data is difficult to understand and difficult to utilize.

A-phase (signal) output / B-phase (signal) output

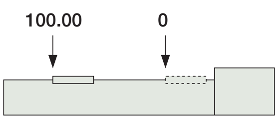
The direction of rotation (CW or CCW) of the axis is determined from the phase difference between the A-phase and the B-phase of the incremental encoder output, as shown in the diagram below.
In a clockwise rotation, the A-phase is ahead of the B-phase.

■ Diagram of Output Modes



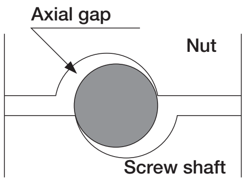
Absolute positioning accuracy

When positioning is performed to an arbitrary target point specified in coordinate values, the difference between the coordinate values and the actual measured values.



Backlash

As shown in the figure on the right, there is a gap between the nut and the ball (steel ball) and the screw shaft. Even if the screw shaft moves, the nut will not move the extent of the gap. The mechanical play in the direction of this slider movement is called the backlash. The measurement method used is to feed the slider, then use the reading for the slight amount of movement time shown on a test indicator as a standard. Also, in that condition, without using the feed device, move the slider in the same direction with a fixed load, then without the load. Then find the difference between the standard value and the time when the load was removed. This measurement is conducted at the midpoint of the distance of movement and at points nearly at the two ends. The maximum value obtained among the values is used as the measurement value.



Bellows

A cover to prevent the infiltration of dust or debris from outside.

Brake

Primarily used for the vertical axis to prevent the slider from dropping when the servo is turned off. The brake activates when the power is turned off.

C10

One of the grades of a ball screw. The lower the number, the higher the precision.
Grade C10 has a typical movement error of ±0.21mm for a 300mm stroke.

CCW (Counterclockwise rotation)

Abbreviation for counterclockwise rotation.
It describes a rotation to the left, as viewed from above, i.e. opposite of the rotation of a clock's hands.

Explanation of Terms

Cleanliness

Grade of cleanliness for cleanrooms according to ISO standard. ISO class 4 (equivalent to US FED STD class 10) indicates an environment in which there are fewer than 10 pieces of debris 0.5μm or smaller per cubic foot.

Coupling

A component used as a joint to join a shaft to another shaft.
e.g. The joint between the ball screw and the motor.

Creep sensor

An optional sensor to allow high-speed homing operation.

Critical speed

Ball screw resonation with slider speed (No. of ball screw rotations). The maximum physical speed limit that can be utilized.

CW (Clockwise rotation)

Abbreviation for clockwise rotation.
It describes a rotation to the right, as viewed from above, i.e. same as the rotation of a clock's hands.

Cycle time

The time taken by one process.

Dispenser

A device that controls the flow rate of a liquid. This is integrated into devices for applying adhesives, sealants, etc.

Duty

Indicates the work ratio in the equipment industry. (e.g. The time that the actuator operates in one cycle.)

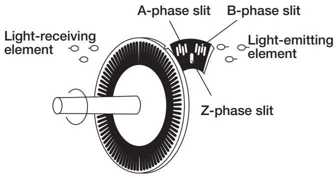
Dynamic brake

A brake that uses the motor's regenerative energy.

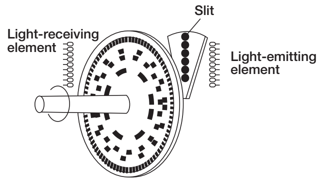
Encoder

A device for recognizing the RPM and the direction of a rotation by shining a light onto a disc with slits, and using a sensor to detect whether the light is ON or OFF as the disc is rotated. (i.e. a device that converts rotation into pulses.) The controller uses this signal from the encoder to determine the position and speed of the slider.

■ Incremental



■ Absolute



An incremental encoder
detects the rotational angle and the RPM of the axis from the number of output pulses. To detect the rotational angle and the RPM, a counter is needed to cumulatively add the number of output pulses. An incremental encoder allows you to electrically increase the resolution by using the rise and fall points on the pulse waveform to double or quadruple the pulse generation frequency.

An absolute encoder
detects the rotation angle of the axis from the state of the rotation slit, enabling you to know the absolute position at all times, even when the rotating slit is at rest. Consequently, the rotational position of the axis can always be checked even without a counter.
In addition, since the home position of the input rotation axis is determined at the time it is assembled into the machine, the number of rotations from home can always be accurately expressed, even when turning the power ON during startup or after a power outage or an emergency stop.

Excess voltage

Voltage applied to motor that exceeds regulation value when commanded speed is too fast.

External operation mode

This is the operation mode started by a start signal from an external device (PLC, etc.). This is also called automatic operation.

Flexible hose

Tube for SCARA Robot MPG cable that the user passes wiring through.

Gain

The numeric value of an adjustment of the controller's reaction (response) when controlling the servo motor. Generally, the higher the gain the faster the response, and the lower it is the slower the response.

Gantry

A type of two-axis (X and Y) assembly in which a support guide is mounted to support the Y-axis, so that heavier objects can be carried on the Y-axis.

Grease

High-viscosity oil applied to contact surfaces to make the guide and the ball screw move smoothly.

Greasing

Injection or application of grease to sliding parts.

Guide

A mechanism for guiding (supporting) the slider of the actuator. A bearing mechanism that supports linear motions.

Guide module

An axis in a two-shaft assembly that is used in parallel with the X-shaft to support the end of the Y-shaft when the Y-shaft overhang is long. Typical models include the FS-12WO and FS-12NO.

Home

Reference point for actuator operation. The pulse counts are determined and recorded for all positions the actuator moves to / from home.

Home accuracy

The amount of variation among the positions when home return is performed (if home varies, all positions vary).

Key slotted

A rotary shaft or mounting component is machined with a slot for key mounting.
(Key: One means of preventing positional slip in the rotation direction of the rotary axis and the mounting component)

Lead

The lead of the feed screw is the distance moved after the motor (hence the feed screw) has rotated one turn.

Understanding lead value

The lead value changes the actuator speed and thrust.

- Speed: With an AC230V servo motor, the rated rpm is 3000rpm. In other words, this is 50 revolutions per second. In this case, with a 20mm screw lead,
  the speed is 50 revolutions/s×20mm/revolution = 1000mm/s.
- Thrust: If the lead is large, then the thrust is small; and vice-versa.

Load capacity (Payload)

The weight of objects that can be moved by the actuator's slider or rod.

Lost Motion [mm]

First, for one position, run with positioning straight in front and then measure that position. Next, make a movement in the same direction by issuing a command. Then, issue the same command for movement in a negative direction from the position. Conduct positioning in the negative direction and measure that position. Again, issue a command for a movement in the negative direction, and issue the same command for a positioning movement straight ahead from that position. Then measure that position.
Using this method, repeat measurement in positive and negative directions, seven times each. Conduct positioning for each and obtain the deviation from the average value for each stop position. Determine the position for the center of the movements in these measurements and positions nearly at both ends. The measurement value will be the maximum value among those obtained. (Complies with JIS B6201)

Mechanical end

Position where actuator slider comes to mechanical stop. Mechanical stopper. (Example: Urethane rubber)

Offline

A state in which the PC software is started without the RS232 cable connected to the controller.

Explanation of Terms

Offset

To shift from a position.

Online mode

The state in which the PC software is started with the RS232 cable connected to the controller.

Open collector output

A system with no overload resistance in the voltage output circuit, that outputs signals by sinking the load current. Since this circuit can turn the load current ON/OFF regardless of voltage potential to which the current is connected, it is useful for switching an external load and is widely used as a relay or ramp circuit or the like for switching external loads, etc.

Open loop system

A type of control system. This system only outputs commands and does not take feedback.
A typical example of this is the stepping motor. Since it does not compare each actual value against the commanded value, even if a loss of synchronization (i.e signal error) occurs, the controller would not be able to correct it.

Operation

Operation.

Overhang

The state in which the object that is mounted onto the actuator extends out to the front/rear, left/right, or above/below the axis of movement.

Overload check

A check for overload. (One of the protection functions)

Override

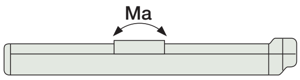
A setting for the percentage with respect to the running speed. (e.g. If VEL is set to 100mm/sec, an override setting of 30 will yield 30mm/sec)

Pitch error [pitch deviation or lead deviation]

Due to problems in the manufacturing, such as the heat treatment process used, the deviations of the ball screws, which are a key mechanical element of the actuator, are not always small when inspected closely. A JIS rating is used to indicate the qualitative accuracy of these items.
These items made for the market must meet tolerance values set as Class C10.
The accuracy required to meet the C10 standard is to be within a margin of error of ±0.21mm for every 300mm of length. Generally the screw pitch error deviation accumulates in a plus or minus direction. One method of improving these items is to grind them in a finishing process.
[e.g.] When positioning 300mm from home:
The machine accepts a set position of 300 ±0.21. Supposing that the actual stop position is 300.21, if this position is repeatable and maintained at 300.21 ± 0.02 using a JIS6201-compliant method, then the repeatability standard for accuracy is met.

Pitching

Forward-backward motion along the axis of the slider's movement. (Direction of Ma)



PLC

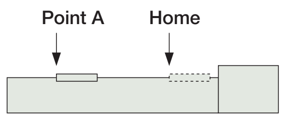
Abbreviation for Programmable Logic Controller.
(Also referred to as sequencers or programmable controllers).
These are controllers that can be programmed to control production facilities and equipment.

Positioning band

The span within which a positioning operation is deemed as complete with respect to the target point. This is specified by a parameter. (PEND BAND)

Positioning repeatability

The variation in stop position accuracy for repeated positioning toward the same point.



Positioning settling time

The gap between the actual movement time and the ideal calculated value for movement. (Positioning operation time; processing time for internal controller operations.) The broader meaning includes the time for convergence of the mechanical swing.

Radial load

Load up to down in a direction 90° to horizontal slider.

Regenerative energy

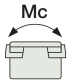
Energy, generated by the motor's rotation. When the motor decelerates, this energy returns to the motor's driver (controller). This energy is called regenerative energy.

Regenerative resistance

The resistance that discharges the regenerative current.
The regenerative resistance required for IAI's controllers is noted in the respective page of each controller.

Rolling

An angular movement around the axis of the slider's movement. (Mc direction)



SCARA

SCARA is an acronym for Selective Compliance Assembly Robot Arm, and refers to a robot that maintains compliance (tracking) in a specific direction (horizontal) only, and is highly rigid in the vertical direction.

Screw type

The types of screws for converting rotary motion of a motor to linear motion are summarized on the right.
IAI's single-axis robots and electric cylinders use rolled ball screws as a standard feature.

		Characteristics
Ball screw	Polished	Screws are polished for good precision, but expensive
	Rolled	Since the screws are rolled, they can be mass produced
Lead screw		Cheap, but poor precision and short life. Also not suitable for high-speed operation.

SEL language

The name of IAI's proprietary programming language, derived from an acronym for SHIMIZUKIDEN ECOLOGY LANGUAGE.

Semi-closed loop system

A system for controlling the position information or velocity information sent from the encoder with constant feedback to the controller.

Servo-free (servo OFF)

The state in which the motor power is OFF. The slider can be moved freely.

Servo-lock (servo ON)

The state in which, opposite to the above, the motor power is turned ON. The slider is continually held at a determined position.

Slider mounting weight [kg]

The maximum mounting weight of the slider when operating normally, without major distortion in the velocity waveform or current waveform, when operated at the specified acceleration/deceleration factor (factory settings).

Software limit

A limit in the software beyond which a given set stroke will not advance.

Stainless sheet

A dust-proof sheet used in slider types.

Stepper motor (Pulse motor)

A motor that performs angular positioning in proportion to an input pulse signal by means of open loop control.

Thrust load

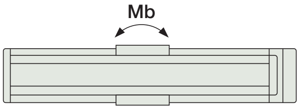
The load exerted in the axial direction.

Work rate

The ratio between the time during which the actuator is operating and the time during which it is stopped. This is also called duty.

Yawing

Motion at an angle in a left-right direction along slider movement axis. (Mb direction)



Along with pitching, laser angle measurement system is used for measurement, and the reading is the indication of maximum difference.

Z-phase

The phase (signal) that detects the incremental encoder reference point, used to detect the home position during homing operation.
Searching for the Z-phase signal for the reference during homing is called the "Z-phase search".

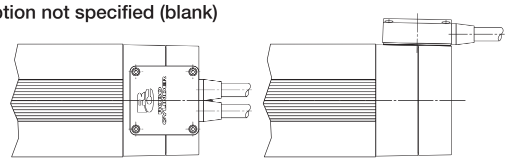
Cable exit direction

■ Models A1, A2, and A3

Applicable models	RCP2 / RCP2W-RA10C RCS2-RA5C / RA5R / SRA7BD
Description	Specify this option when you wish to change the direction from which the actuator cable is taken out.

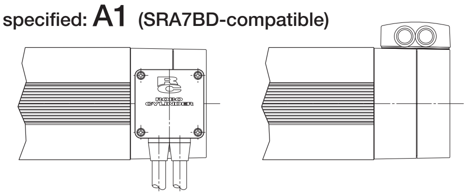
Actuator cable taken out from motor side (standard)

■ Option not specified (blank)



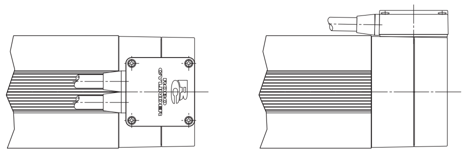
Actuator cable taken out from left

■ Option specified: A1 (SRA7BD-compatible)



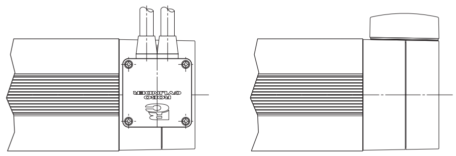
Actuator cable taken out from rod side

■ Option specified: A2 (RA5C/RA5R/SRA7BD-compatible)



Actuator cable taken out from right

■ Option specified: A3 (SRA7BD-compatible)



Brake

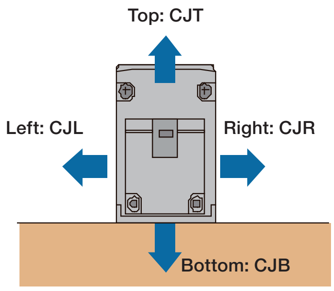
■ Models B, BE, BL and BR

Applicable models	All slider-type models (excluding RCP3-SA2A□ / SA2B□ and RCP2-BA6 / BA7) All rod-type models (excluding RCP2-RA2C / RA3C, RCA2-RN□N, RP□N, GS□N, GD□N, SD□N and RCA / RCS2 built-in types) All table-type models (excluding TCA□N, TWA□N and TFA□N) All arm-type and flat-type models (the arm type is a standard feature) Linear Motor Rod type All cleanroom type models Dust-proof / Splash-proof type (excluding RCP2W-SA16C, RCAW-RA3 / 4D and RCS2W-RA4D)
Description	A retention mechanism used on an actuator positioned vertically to prevent the slider from dropping and damaging the part, etc., when the power or servo is turned off.

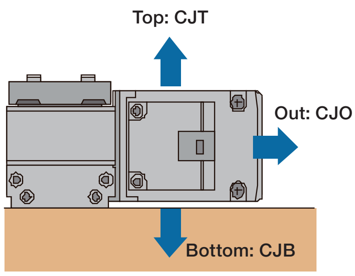
Cable exit direction

■ Models CJT, CJR, CJL, CJB and CJO

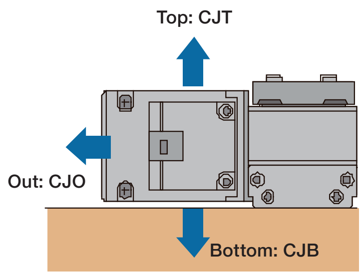
Applicable models	RCP3 (RCA2)-SA3C / SA4C / SA5C / SA6C / SA3R / SA4R / SA5R / SA6R RCP3 (RCA2)-TA4C / TA5C / TA6C / TA7C / TA4R / TA5R / TA6R / TA7R
Description	The direction of the motor-encoder cable mounted on the actuator can be changed vertically or horizontally.



Straight Type



Side-Mounted Motor Type
Mounted on left side (ML)



Side-Mounted Motor Type
Mounted on right side (MR)

Selection Standard (Speed vs. Load Capacity Graph)

ERC2 Series Slider Type

Select horizontal or vertical use

From the device cycle time, select speed type

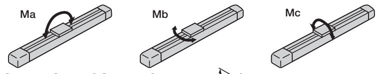
Use the graphs below to select a model for your purpose

Cautionary Notes

- When using a slider type, if the overhang from the center of the object mounted on the slider is large, please consider the moment load and the overhang load length.

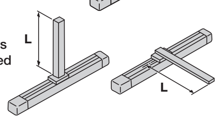
Moment Load

Please ensure the moment loads are within the specified range for Ma, Mb, and Mc.



Overhang Load Length

The value when the mounted object's center of gravity is L/2. If the mounted object overhangs in the direction of Ma, Mb, or Mc, make sure that the length is within range.

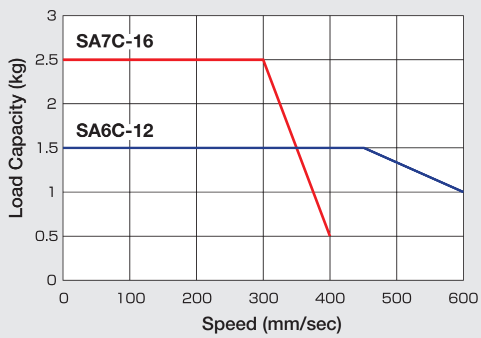
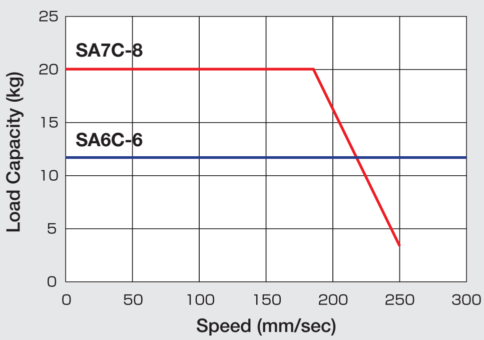
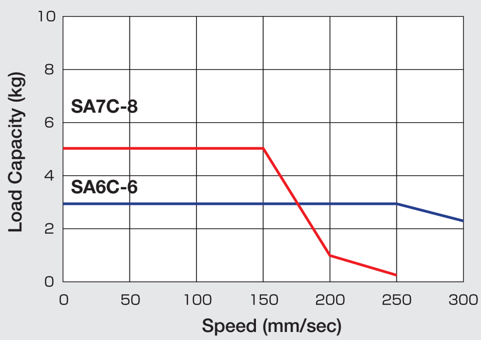
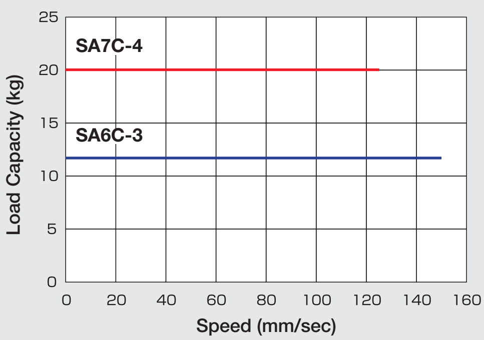
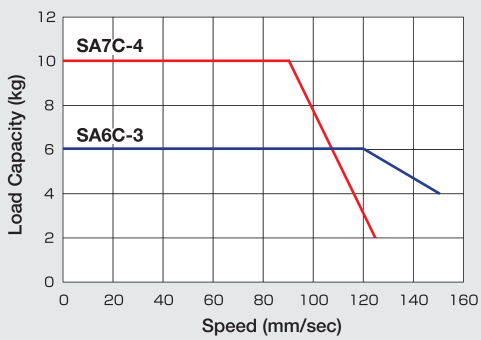


- The maximum speed for the SA6 type's 600 strokes is limited by the relation to the critical number of rotations. 600 stroke (Lead 12:515mm/sec, Lead 6:255mm/sec, Lead 3:125mm/sec)

Maximum Speed 600 mm/sec

300 mm/sec

150 mm/sec

	Horizontal Setting	Vertical Setting
High-Speed Type		
Medium-Speed Type		
Low-Speed Type		

Note: In the graph above, the number after the type is the lead number.

ERC2 Series | Rod Type (Straight Type)

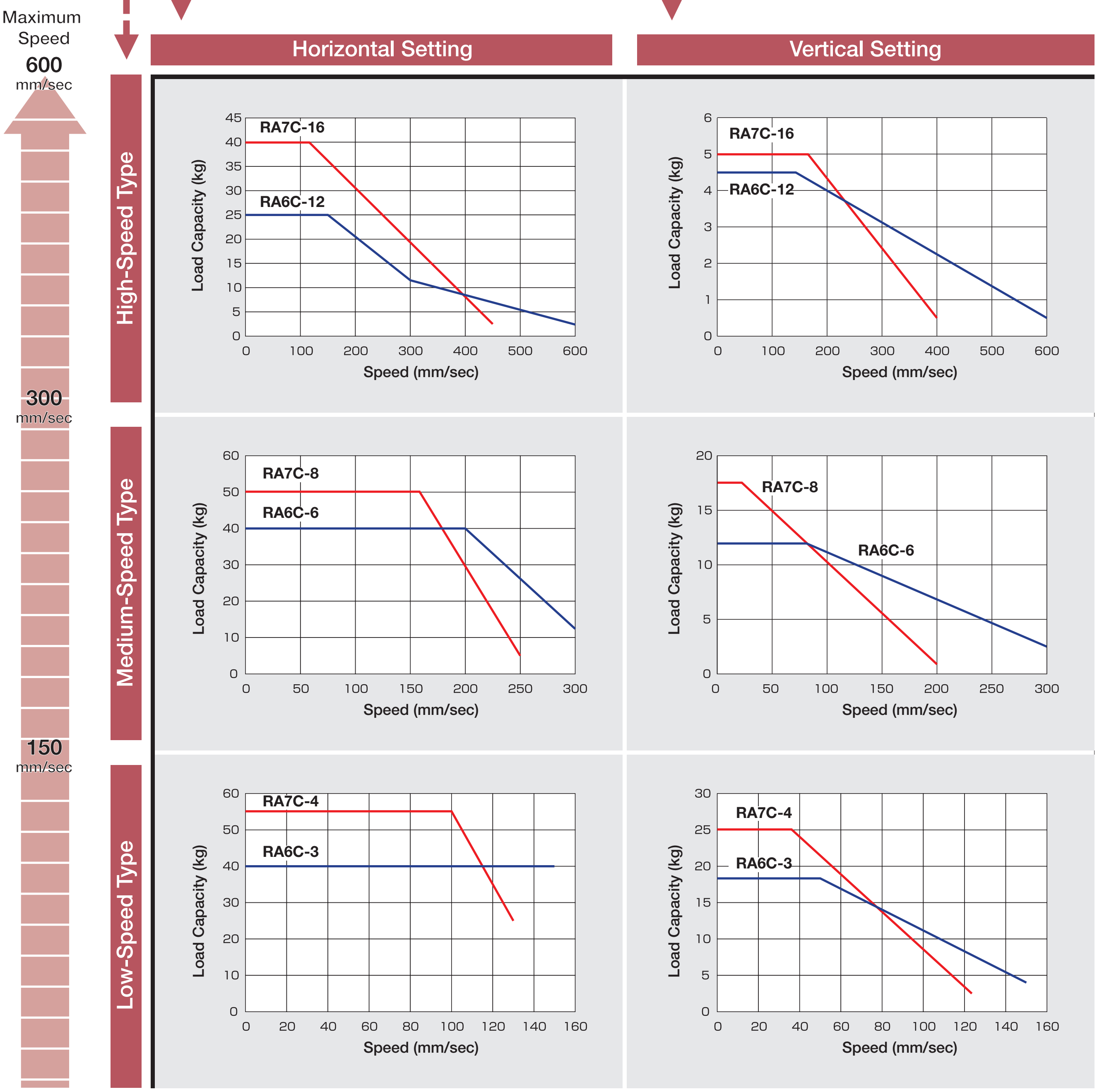
Select horizontal or vertical use

From the device cycle time, select speed type

Use the graphs below to select a model for your purpose

Cautionary Notes

- Absolutely no external force is considered for the rod type, other than that coming from the direction of the rod's advance. Please use a high-rigidity model or add a guide if an external force is applied at a right angle to the rod and in the direction of the rotation.
- The graphs below for the horizontal setting show the values when an external guide is used.
- The maximum speed for the SA6 type's 300 strokes is limited by the relation to the critical number of rotations. 300 stroke (Lead 12:500mm/sec, Lead 6:250mm/sec, Lead 3:125mm/sec)

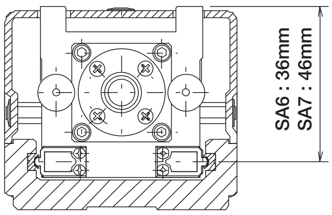


Note: In the graph above, the number after the type is the lead number.

Selection Guide (Push Force and Electric Current Limitation Correlation Graph)

ERC2 Series | Slider Type

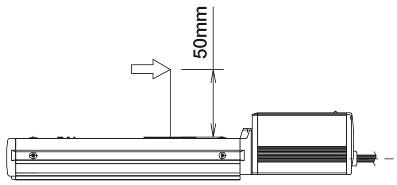
When using slider type for pressing operation, limit pressing current to prevent anti-moment generated by push force from exceeding 80% of the catalog spec rating for moment (Ma, Mb).
To calculate moment, use the guide moment action position shown in the figure below, and consider the amount of offset at the push force action position.
Be aware that, if excess force above the rated moment is applied, the guide can be damaged and its use life can be shortened. Therefore, carefully set the current with safety in mind.



Moment operation position

> Caution:
> Note: The movement speed during pressing is fixed at 20mm/s.

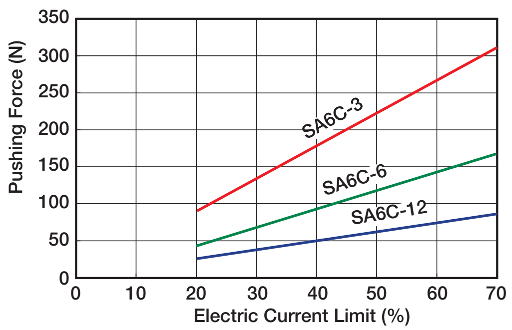
Example of calculation:
With this type, at the position shown in the figure at the right, when there is 100N of pressing
the moment received by the guide is Ma = (46 + 50) x 100
= 9600 (N•m)
= 9.6 (N•m).
The SA7 rated moment is Ma = 13.8 (N•m)
and 13.8 x 0.8 = 11.04 > 9.6, which means it is OK.
Also, when pressing generates moment Mb, use the overhang calculation to similarly confirm that the moment is within 80% of the rated moment.



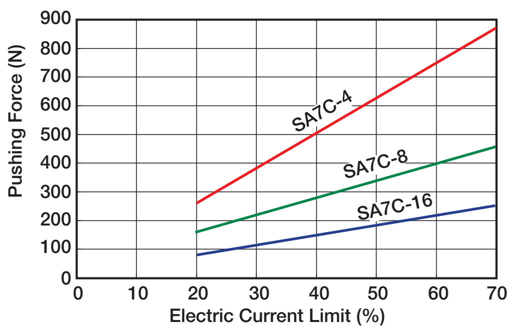
Push force and current limit correlation graph

* In the table below, standard figures are shown. Actual figures will differ slightly.

SA6C Type



SA7C Type



ERC2 Series Rod Type (Straight Type)

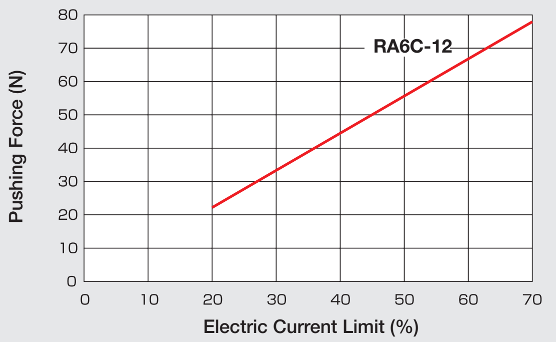
The push force during pressing operation can be freely changed by changing the controller current limit value.
The maximum push force changes according to the type of device, so please select the push force you need from the table below.

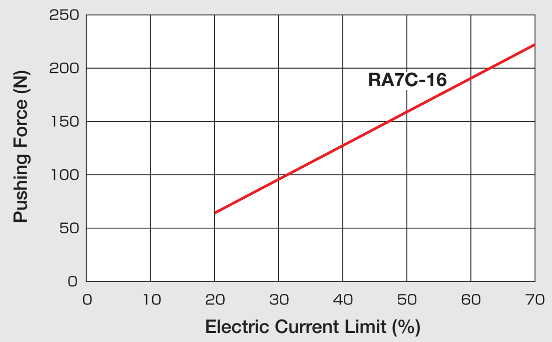
Caution for Use

- The push force and current limit correlation figures are given as standard. Actual figures will slightly differ.
- When the current limit is less than 20%, the push force may vary. Therefore use a current limitation that is 20% or higher.
- Movement speed during pressing operation is fixed at 20mm/s.

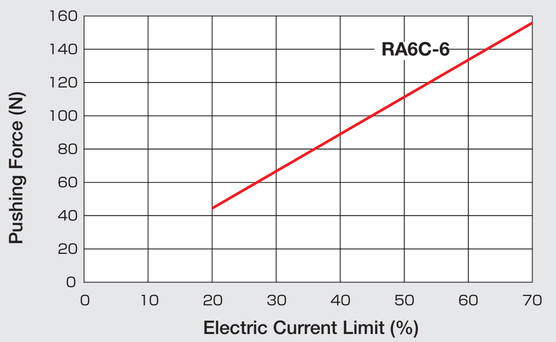
RA6C Type / RA7C Type

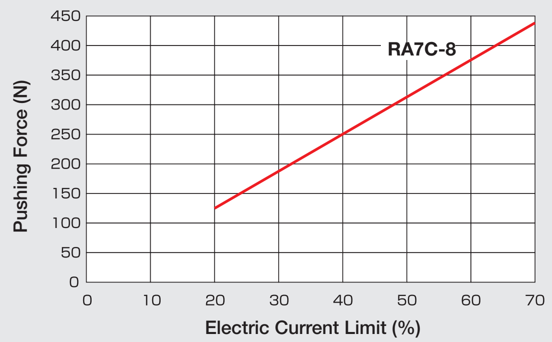
High-Speed Type



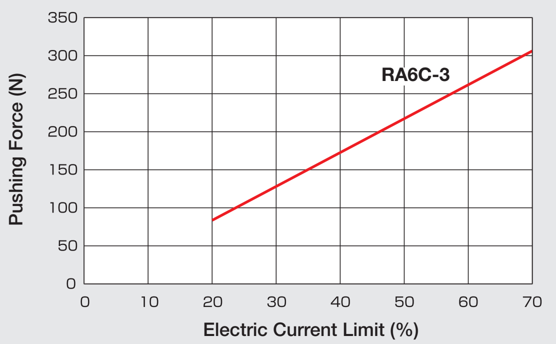


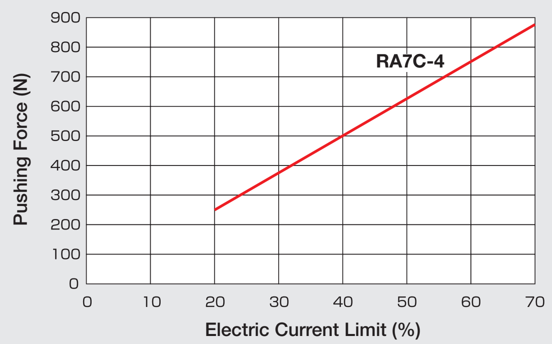
Medium-Speed Type





Low-Speed Type





Note: In the graph above, the number after the type is the lead number.

Selection Guide (Push Force / Continuous Operation Thrust)

Using the selection method:

Condition 1. Confirm push operation time

By comparing our push time of 3 seconds with the maximum push time for a push order value of 200%, which is 13 seconds (see Table 1 on page A-71), it is clear that the pressing time is acceptable.

Condition 2. Calculate the continuous operation thrust

Substitute the above operational pattern to the previously mentioned equation for continuous operation thrust.

$$F_t = \sqrt{\frac{F_{1a}^2 \times t_{1a} + F_{1f}^2 \times t_{1f} + F_{1d}^2 \times t_{1d} + F_0^2 \times t_0 + F_{2a}^2 \times t_{2a} + F_{2f}^2 \times t_{2f} + F_{2d}^2 \times t_{2d} + F_w^2 \times t_w}{t}}$$

At this point, by looking at the motion pattern for t1a/t1d/t2a/t2d, the peak speed (Vmax) $=\sqrt{0.05 \times 0.098} \rightarrow 0.07$m/s, which is greater that the set speed, 62mm/s (0.06m/s). Hence this is a trapezoidal pattern.

Hence, $t_{1a}/t_{1d}/t_{2a}/t_{2d} = 0.062 \div 0.098 \rightarrow 0.63$s

Next, calculate t_{1f}/t_{2f}:
Distance moved at constant speed $= 0.05-\{(0.062 \times 0.062) \div (2 \times 0.098)\} \times 2 \rightarrow 0.011$m, so $t_{1f}/t_{2f} = 0.011 \div 0.062 \rightarrow 0.17$s.

Also, calculating the F1a/F1f/F1d/F2a/F2f/F2d from the equations yields the following:
$F_{1a} = F_{2d} = (9+100) \times 9.8-(9+100) \times 0.098 \rightarrow 1058$N
$F_{1d} = F_{2a} = (9+100) \times 9.8+(9+100) \times 0.098 \rightarrow 1079$N
$F_{1f} = F_{2f} = f_w = (9+100) \times 9.8 \rightarrow 1068$N

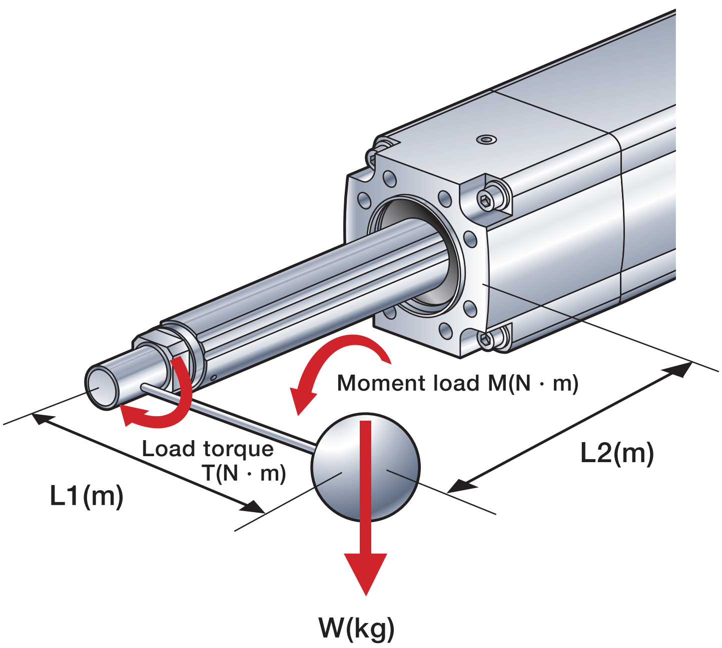
By substituting these values to the continuous operation thrust equation,

$$F_t = \sqrt{\{(1058 \times 1058) \times 0.63+(1068 \times 1068) \times 0.17+(1079 \times 1079) \times 0.63+(19600 \times 19600) \times 3+(1079 \times 1079) \times 0.63 +(1068 \times 1068) \times 0.17+(1058 \times 1058) \times 0.63+(1068 \times 1068) \times 2\} \div (0.63+0.17+0.63+3+0.63+0.17+0.63+2)} \rightarrow 12113\text{N}$$

Since this exceeds the rated thrust for the 2-ton ultra-high-thrust actuator, which is 10200N, operation with this pattern is not possible.

In response, let us increase the wait time. (i.e. decrease the duty)
Recalculating with tw=6.12s(t=12s) will change the thrust to F_t=9814N, making it operable.

Information on Moment Selection



The ultra-high-thrust actuator can apply a load on the rod within the range of conditions calculated below.

M+T ≦ 120 (N · m)
Moment Load $M = Wg \times L_2$
Load Torque $T = Wg \times L_1$

* g = Gravitational acceleration 9.8
* L1 = Distance from the center of rod to the center of gravity of the work piece
* L2 = Distance from the actuator mounting surface to the center of gravity of the work piece + 0.07

If the above condition is not met, consider installing an external guide, or the like, so that the load is not exerted on the rod.

Rotary Type Technical Materials

Selection Guide

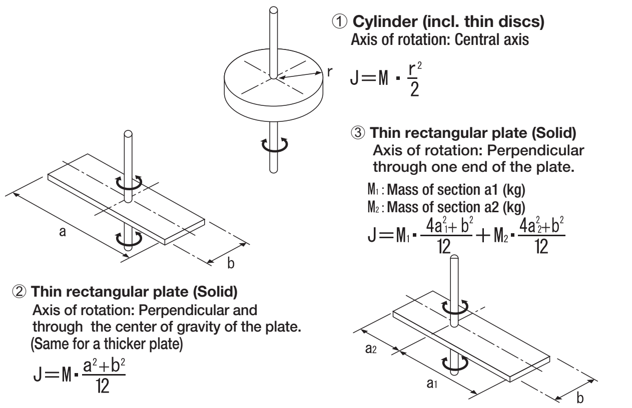
Check the following two points to confirm whether the RoboCylinder rotary type is compatible with your desired service conditions.

1 Inertial Moment

Inertial moment expresses the amount of inertia in a rotational motion, and corresponds to weight for linear motion.
The greater the inertial moment, the more difficult it is for that object to move and stop.
In other words, when choosing a rotary-type unit, a factor in that selection is whether or not it is possible to control the inertial moment of the object being rotated.
Inertial moment differs with the weight and shape of the object, but refer to the calculation formula in the typical example illustrated on the right.
The allowable inertial moment value for a RC rotary type is expressed as **load inertia.**
A RC rotary type can be used if the calculated inertial moment is less than its load inertia.

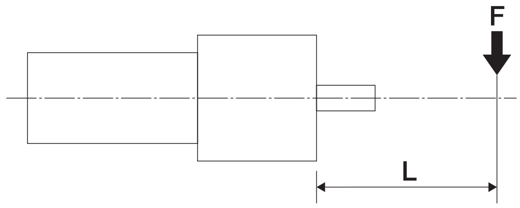
●Calculating the Moment of Inertia for Typical Shapes

J: Moment of inertia (kg•m^2) / M: Mass (kg) / r: Radius (m) / a, b: Length of sides (m



2 Load Moment

If the inertial moment is a controllable (electrical) guide, the load moment is a guide for the limit to forced (mechanical) use.
Using the actuator body end of the output shaft mounting base as the reference position for moment, check whether the load moment exerted on the output axis is within the load moment tolerances in the catalog.
Use in excess of the allowable load moment may cause damage and shortened service life.



Load Moment (N · m) = F (N) × L (m)

Precautions regarding range of motion and home-return

Please note that, when a RCS2 rotary type performs home-return, there are cases in which the direction or rotation in the return-home operation will differ depending on the stopping position of the axis.
In the RCS2 rotary type home-return operation, the axis turns and the home-return sensor detects, and the home-return is completed at the position where the Z-phase is detected as inverted. At this time, the axis rotates in the counter-clockwise direction ①, seen from the direction of the axis, and rotation stops when the sensor detection is inverted ② and the Z-phase is detected ③. (See Figure 1)
However, if the axis is detected by the sensor when home-return begins, it rotates in the clockwise direction from that position ④ and stops when the Z-phase is detected ⑤.
(Figure 2)
The range of operation of the RCS2-RT6/RT6R/RT7R is 300 degress, but since there is no stopper, there are cases in which the range of operation is exceeded when the axis is manually turned with the servo OFF, etc.
Please note that there are cases where the sensor will be detected when the range of operation has been exceeded.

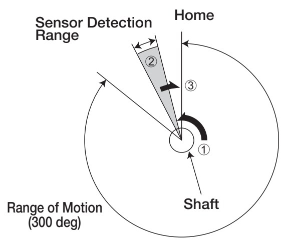


Figure 1

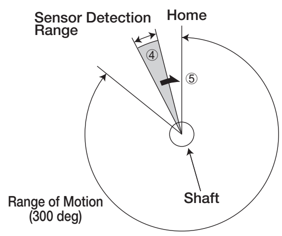


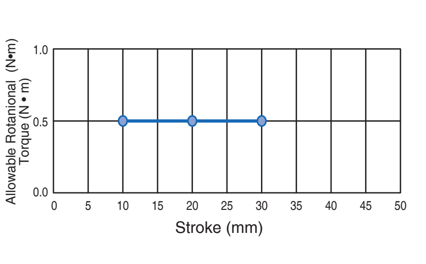
Figure 2

Guide-Equipped Type RCA2/ERC2/RCP2/RCA/RCS2

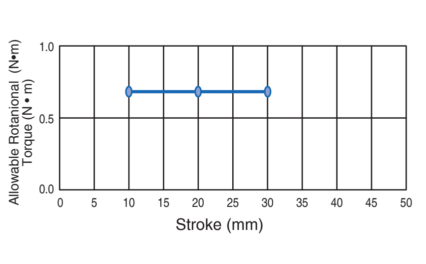
Allowable Rotating Torque

The allowable torque for each model is as shown below.
When rotational torque is exerted, use within the range of the values below. Further, single-guide types cannot be subjected to rotational torque.

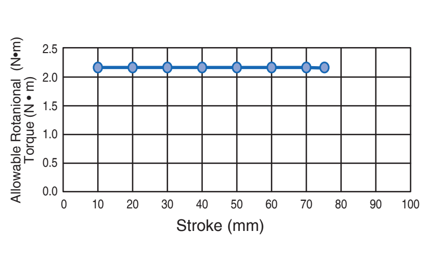
RCA2-GD3NA Type



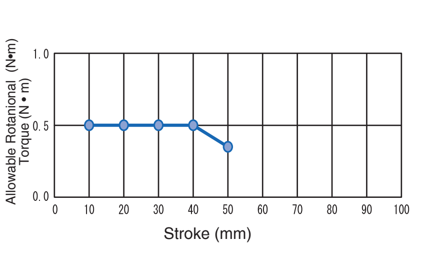
RCA2-GD4NA Type



RCS2-GD5N Type

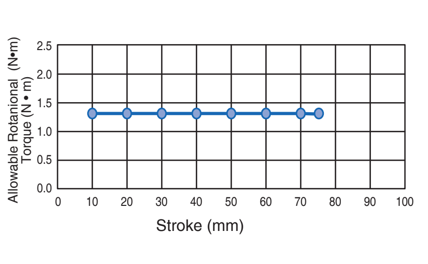


RCA2-SD3NA Type



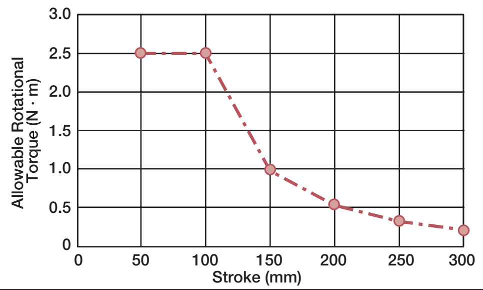
RCA2-SD4NA Type

RCS2-SD5N Type



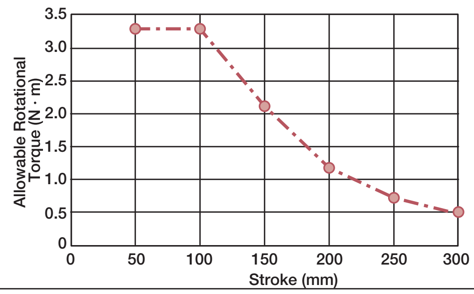
ERC2-RGD6C Type

■ Double-guide



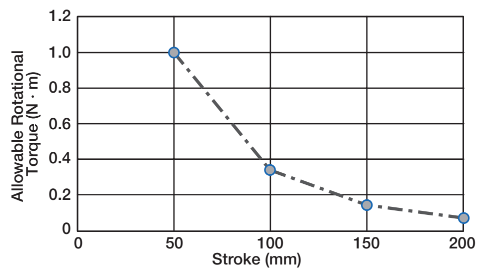
ERC2-RGD7C Type

■ Double-guide



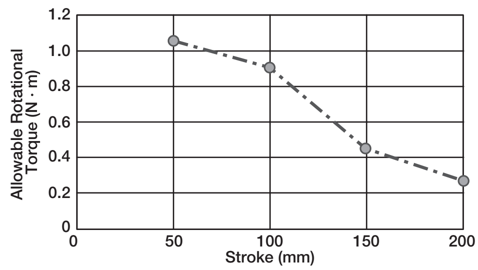
RCA / RCS2-RGD3□ Type

■ Double-guide



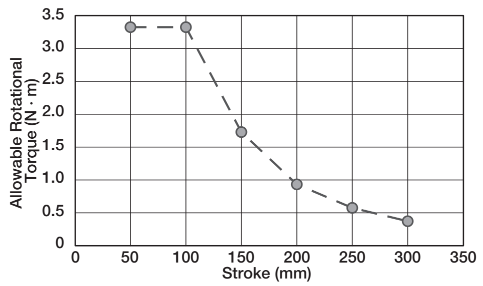
RCS2-RGD4□ Type

■ Double-guide



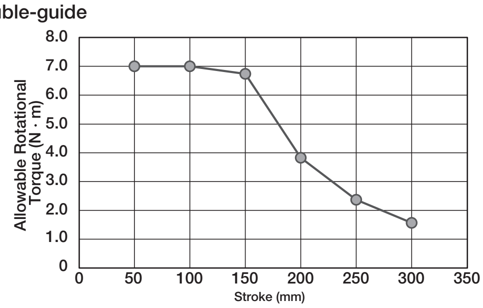
RCS2-RGD5C Type

■ Double-guide

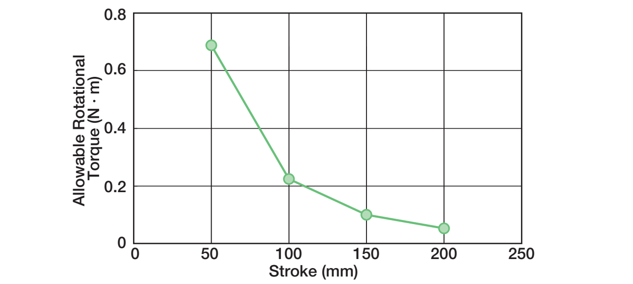


RCS2-SRGD7BD Type

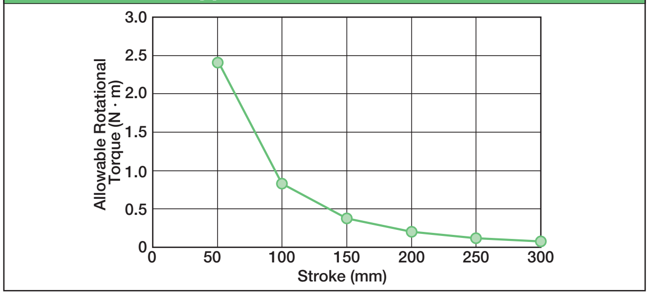
■ Double-guide



RCP2-RGD3C Type

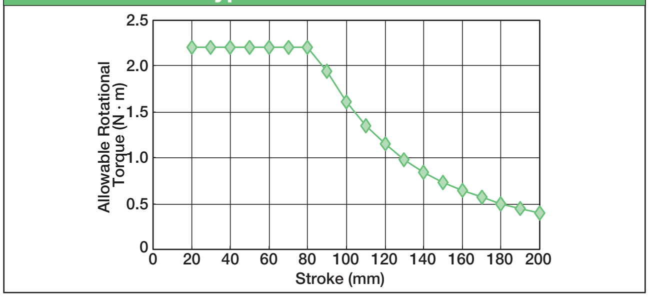


RCP2-RGD4C Type



RCP2-RGD6C Type

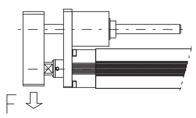
RCP2-SRGD4R Type



Relationship Between Allowable Load at Tip & Running Service Life

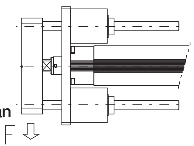
The greater the load at the guide tip, the shorter the running service life.
Select the appropriate model, considering balance between load and service life.

■ Single-guide type

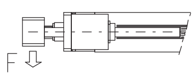


■ Double-guide type

<Vertical>



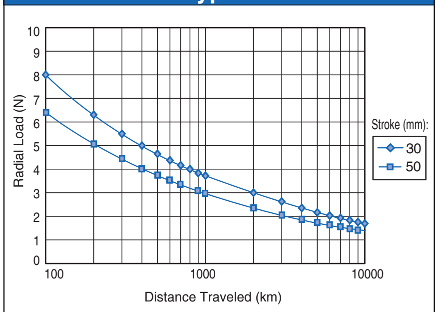
<Horizontal>



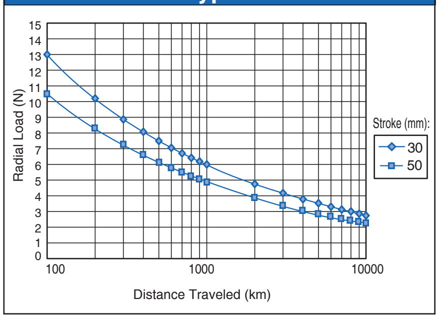
* The single-guide specification can only be used with vertical loads.

Single-guide

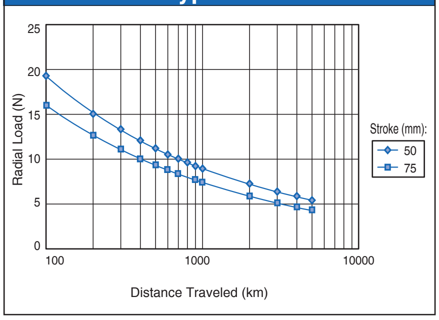
RCA2-GS3NA Type



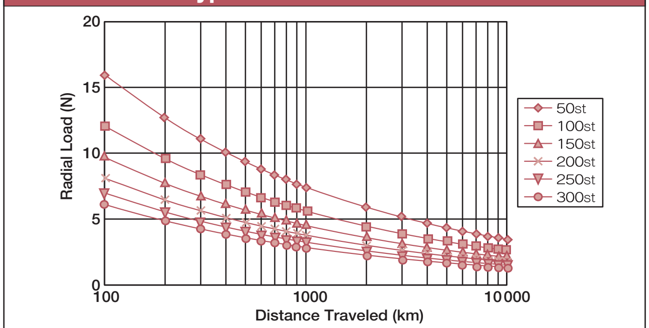
RCA2-GS4NA Type



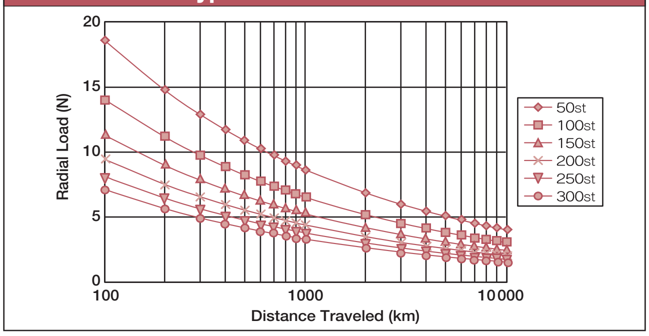
RCS2-GS5N Type



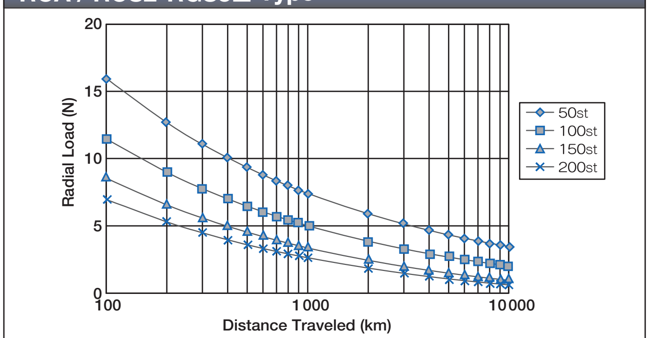
ERC2-RGS6C Type



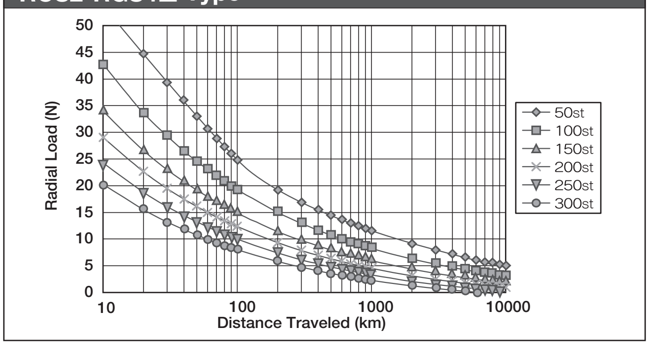
ERC2-RGS7C Type



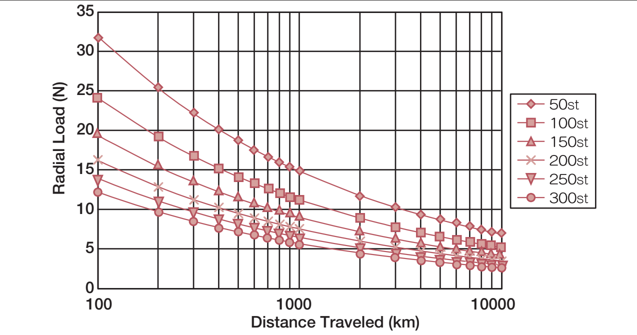
RCA / RCS2-RGS3□ Type



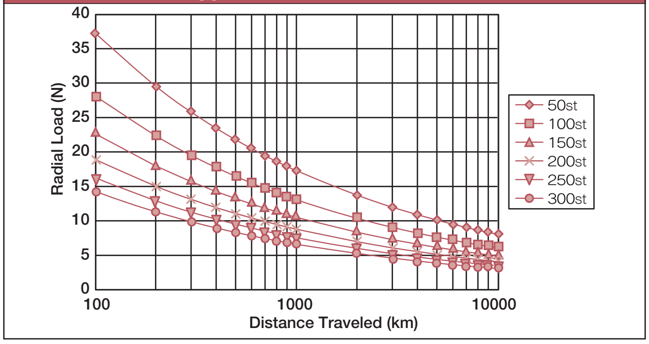
RCS2-RGS4□ Type



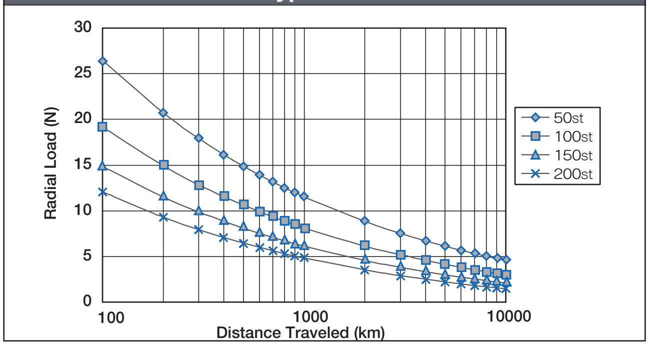
ERC2-RGD6C Type



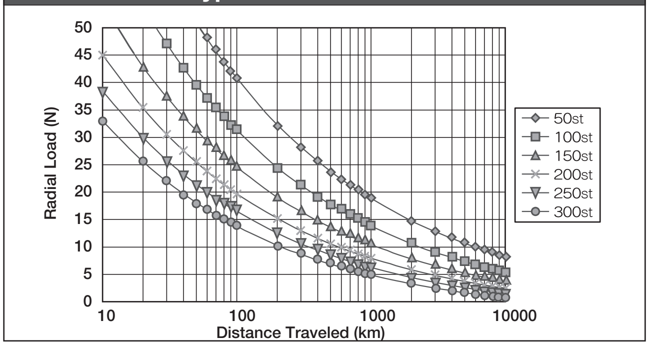
ERC2-RGD7C Type



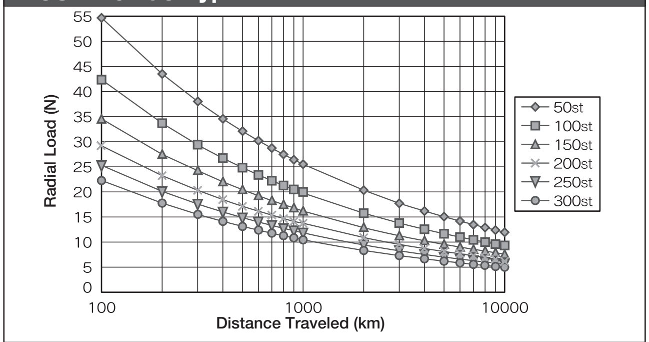
RCA / RCS2-RGD3□ Type



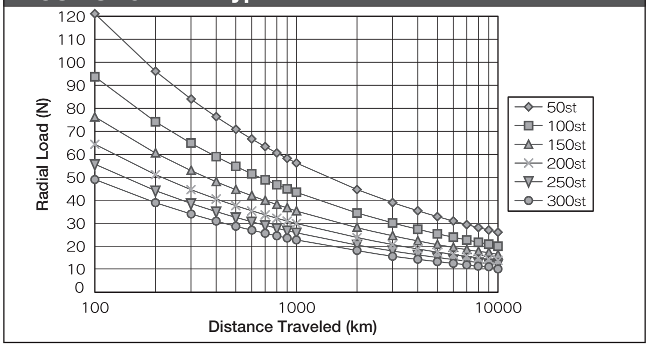
RCS2-RGD4□ Type



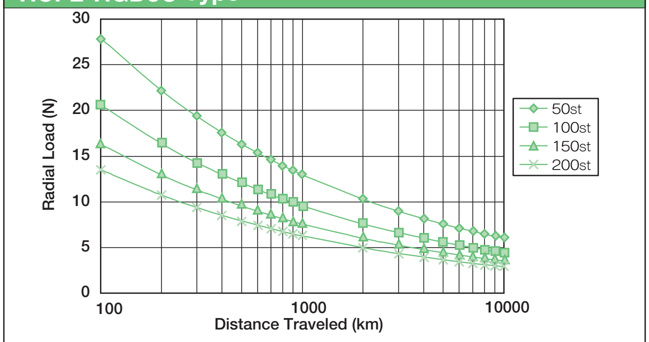
RCS2-RGD5C Type



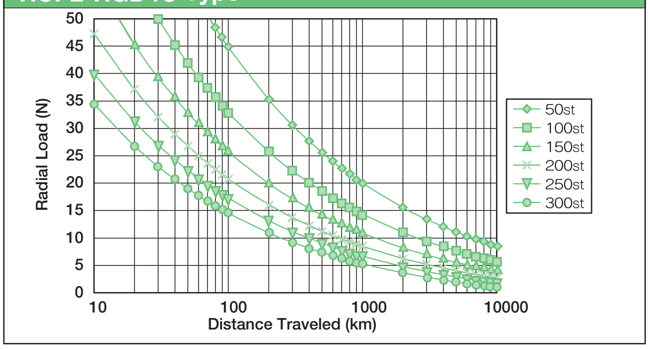
RCS2-SRGD7BD Type



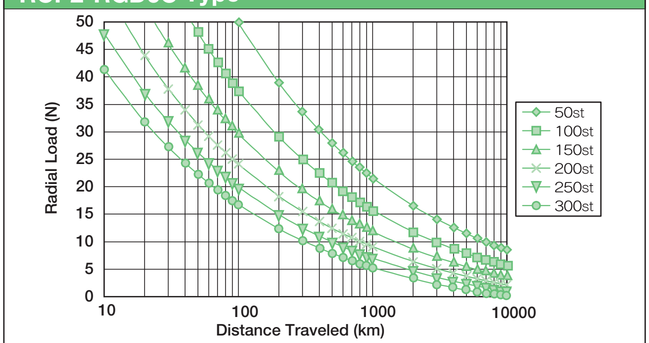
RCP2-RGD3C Type



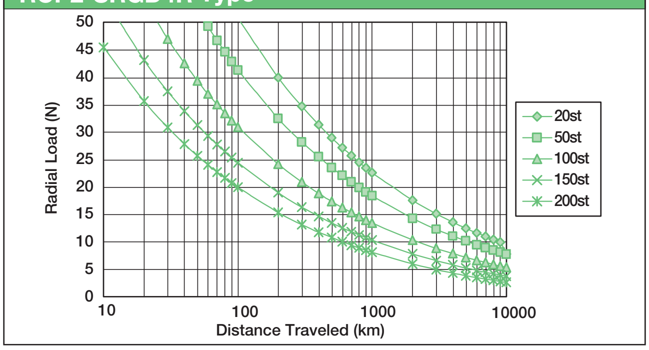
RCP2-RGD4C Type



RCP2-RGD6C Type



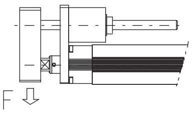
RCP2-SRGD4R Type



Radial Load & Tip Deflection

The graph below shows the correlation between the load exerted at the guide tip and the amount of deflection generated.

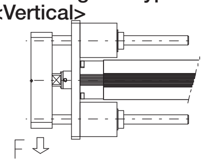
■ Single-guide type



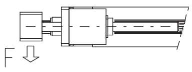
* The single-guide specification can only be used with vertical loads.

■ Double-guide type

<Vertical>

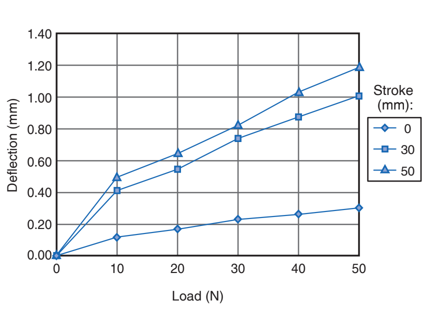


<Horizontal>

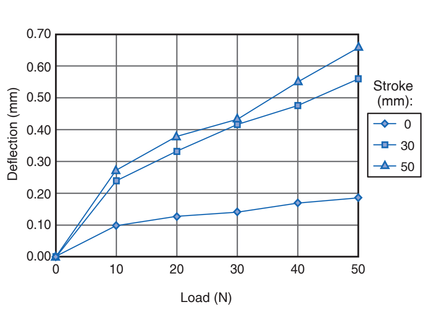


Single-guide

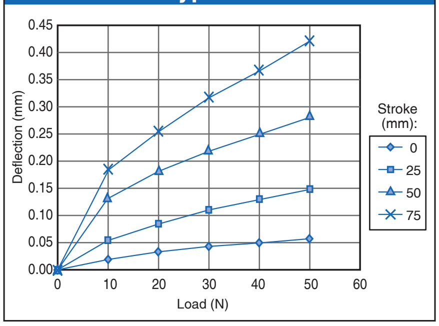
RCA2-GS3NA Type



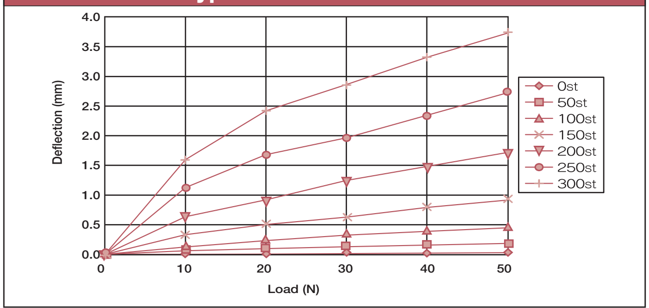
RCA2-GS4NA Type



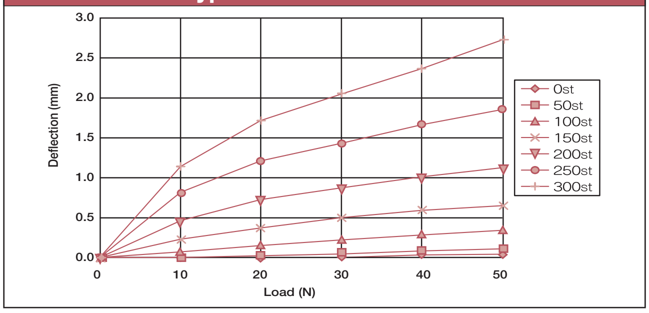
RCS2-GS5N Type



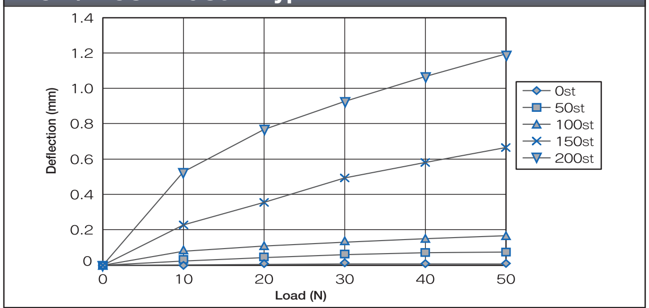
ERC2-RGS6C Type



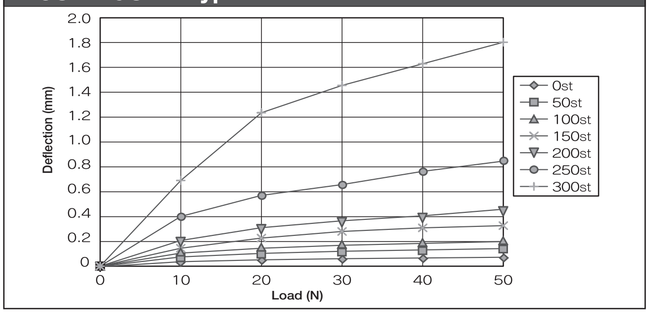
ERC2-RGS7C Type



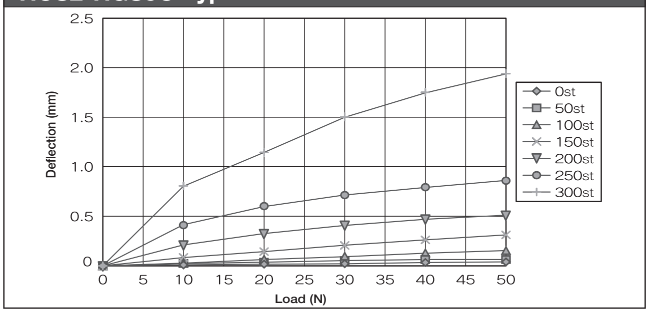
RCA / RCS2-RGS3☐ Type



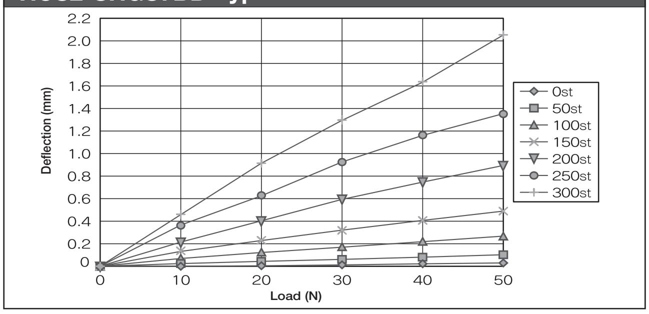
RCS2-RGS4☐ Type



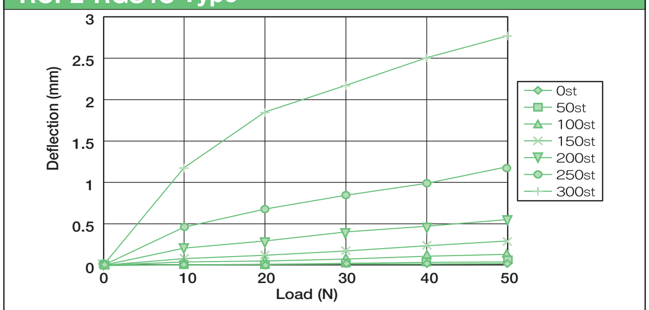
RCS2-RGS5C Type



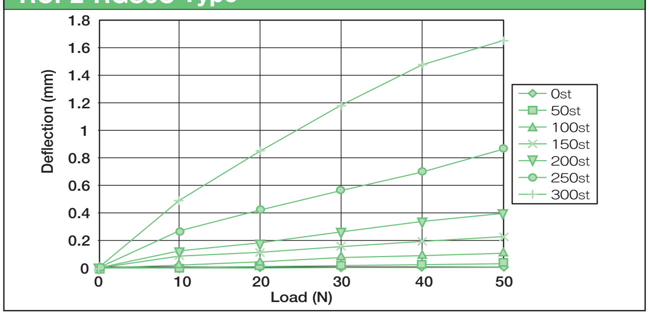
RCS2-SRGS7BD Type



RCP2-RGS4C Type

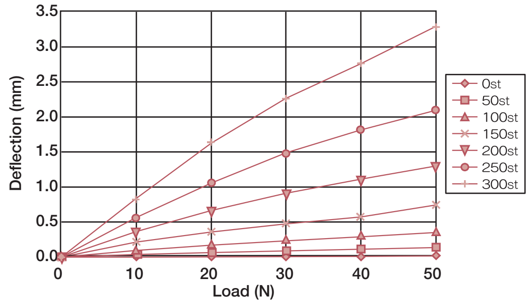


RCP2-RGS6C Type



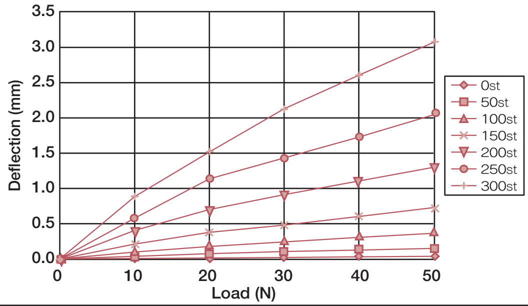
ERC2-RGD6C Type

■Double-Guide ‹Horizontal› Specification



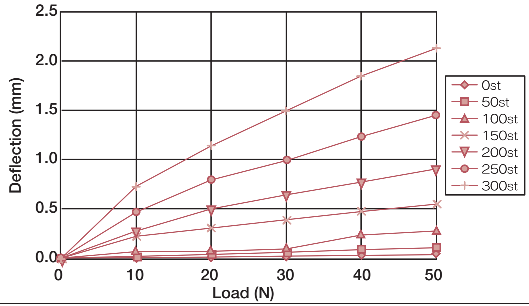
ERC2-RGD6C Type

■Double-Guide ‹Vertical› Specification



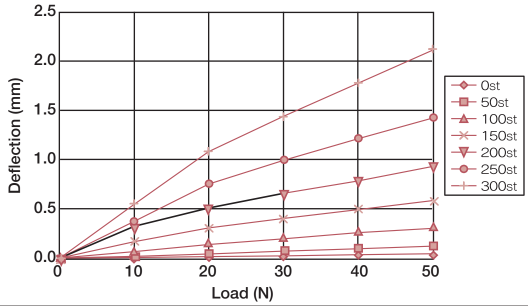
ERC2-RGD7C Type

■Double-Guide ‹Horizontal› Specification



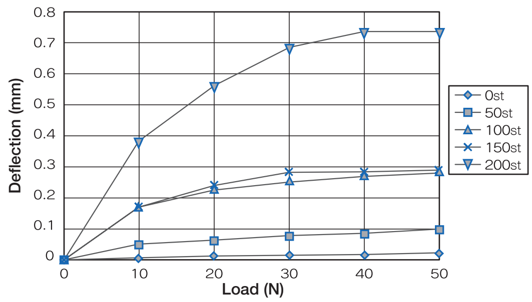
ERC2-RGD7C Type

■Double-Guide ‹Vertical› Specification



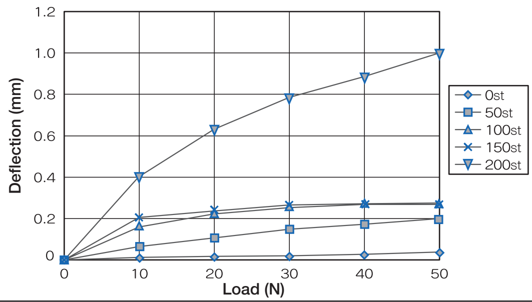
RCA / RCS-RGD3□ Type

■Double-Guide ‹Horizontal› Specification



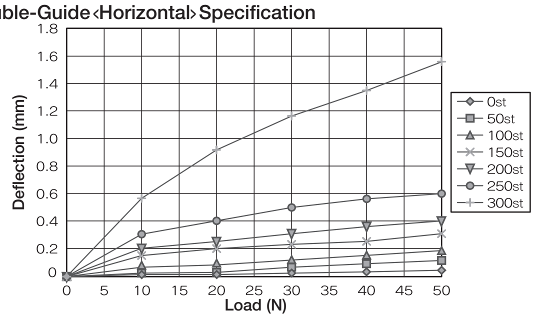
RCA / RCS-RGD3□ Type

■Double-Guide ‹Vertical› Specification



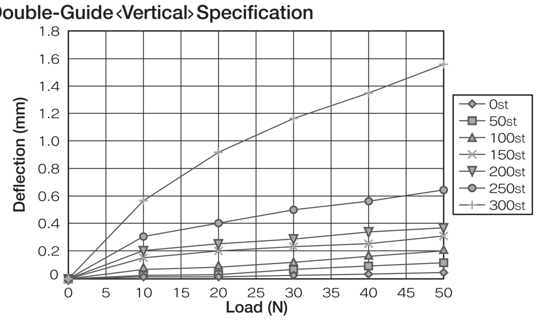
RCS2-RGD4□ Type

■Double-Guide ‹Horizontal› Specification



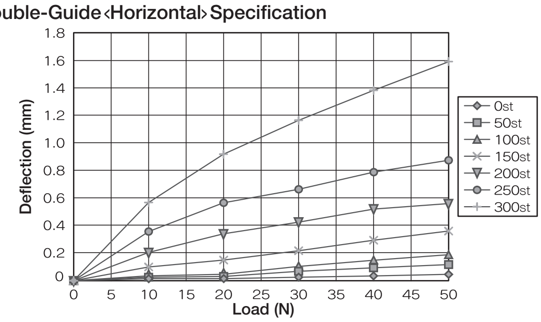
RCS2-RGD4□ Type

■Double-Guide ‹Vertical› Specification



RCS2-RGD5C Type

■Double-Guide ‹Horizontal› Specification



RCS2-RGD5C Type

■Double-Guide ‹Vertical› Specification