PMEC/AMEC

MEC Controller

Operation Manual Tenth Edition

IAI America, Inc.

Please Read Before Use

Thank you for purchasing our product.

This Operation Manual explains the handling methods, structure and maintenance of this product, among others, providing the information you need to know to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.
The CD that comes with the product contains operation manuals for IAI products.
When using the product, refer to the necessary portions of the applicable operation manual by printing them out or displaying them on a PC.

After reading the Operation Manual, keep it in a convenient place so that whoever is handling this product can reference it quickly when necessary.

[Important]

- This Operation Manual is original.
- The product cannot be operated in any way unless expressly specified in this Operation Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Operation Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
- Using or copying all or part of this Operation Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

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Safety Guide

This “Safety Guide” is intended to ensure the correct use of this product and prevent dangers and property damage. Be sure to read this section before using your product.

Notes on Safety of Our Products

Common items you should note when performing each task on any IAI robot are explained below.

No.	Task	Note
1	Model selection	● This product is not planned or designed for uses requiring high degrees of safety. Accordingly, it cannot be used to sustain or support life and must not be used in the following applications: [1] Medical devices relating to maintenance, management, etc., of life or health [2] Mechanisms or mechanical devices (vehicles, railway facilities, aircraft facilities, etc.) intended to move or transport people [3] Important safety parts in mechanical devices (safety devices, etc.) ● Do not use this product in the following environments: [1] Place subject to flammable gases, ignitable objects, flammables, explosives, etc. [2] Place that may be exposed to radiation [3] Place where the ambient temperature or relative humidity exceeds the specified range [4] Place subject to direct sunlight or radiated heat from large heat sources [5] Place subject to sudden temperature shift and condensation [6] Place subject to corrosive gases (sulfuric acid, hydrochloric acid, etc.) [7] Place subject to excessive dust, salt or iron powder [8] Place where the product receives direct vibration or impact ● Do not use this product outside the specified ranges. Doing so may significantly shorten the life of the product or result in product failure or facility stoppage.
2	Transportation	● When transporting the product, exercise due caution not to bump or drop the product. ● Use appropriate means for transportation. ● Do not step on the package. ● Do not place on the package any heavy article that may deform the package. ● When using a crane of 1 ton or more in capacity, make sure the crane operators are qualified to operate cranes and perform slinging work. ● When using a crane, etc., never hoist articles exceeding the rated load of the crane, etc. ● Use hoisting equipment suitable for the article to be hoisted. Calculate the load needed to cut off the hoisting equipment and other loads incidental to equipment operation by considering a safety factor. Also check the hoisting equipment for damage. ● Do not climb onto the article while it is being hoisted. ● Do not keep the article hoisted for an extended period of time. ● Do not stand under the hoisted article.
3	Storage/ preservation	● The storage/preservation environment should conform to the installation environment. Among others, be careful not to cause condensation.
4	Installation/ startup	(1) Installing the robot, controller, etc. ● Be sure to firmly secure and affix the product (including its work part). If the product tips over, drops, malfunctions, etc., damage or injury may result. ● Do not step on the product or place any article on top. The product may tip over or the article may drop, resulting in injury, product damage, loss of/drop in product performance, shorter life, etc. ● If the product is used in any of the following places, provide sufficient shielding measures: [1] Place subject to electrical noise [2] Place subject to a strong electric or magnetic field [3] Place where power lines or drive lines are wired nearby [4] Place subject to splashed water, oil or chemicals

No.	Task	Note
4	Installation/ startup	(2) Wiring the cables ● Use IAI's genuine cables to connect the actuator and controller or connect a teaching tool, etc. ● Do not damage, forcibly bend, pull, loop round an object or pinch the cables or place heavy articles on top. Current leak or poor electrical continuity may occur, resulting in fire, electric shock or malfunction. ● Wire the product correctly after turning off the power. ● When wiring a DC power supply (+24 V), pay attention to the positive and negative polarities. Connecting the wires in wrong polarities may result in fire, product failure or malfunction. ● Securely connect the cables and connectors so that they will not be disconnected or come loose. Failing to do so may result in fire, electric shock or product malfunction. ● Do not cut and reconnect the cables of the product to extend or shorten the cables. Doing so may result in fire or product malfunction.
		(3) Grounding ● Be sure to provide class D (former class 3) grounding for the controller. Grounding is required to prevent electric shock and electrostatic charges, improve noise resistance and suppress unnecessary electromagnetic radiation.
		(4) Safety measures ● Implement safety measures (such as installing safety fences, etc.) to prevent entry into the movement range of the robot when the product is moving or can be moved. Contacting the moving robot may result in death or serious injury. ● Be sure to provide an emergency stop circuit so that the product can be stopped immediately in case of emergency during operation. ● Implement safety measures so that the product cannot be started only by turning on the power. If the product starts suddenly, injury or product damage may result. ● Implement safety measures so that the product will not start upon cancellation of an emergency stop or recovery of power following a power outage. Failure to do so may result in injury, equipment damage, etc. ● Put up a sign saying "WORK IN PROGRESS. DO NOT TURN ON POWER," etc., during installation, adjustment, etc. If the power is accidently turned on, electric shock or injury may result. ● Implement measures to prevent the work part, etc., from dropping due to a power outage or emergency stop. ● Ensure safety by wearing protective gloves, protective goggles and/or safety shoes, as necessary. ● Do not insert fingers and objects into openings in the product. Doing so may result in injury, electric shock, product damage, fire, etc. ● When releasing the brake of the vertically installed actuator, be careful not to let the actuator drop due to its dead weight, causing pinched hands or damaged work part, etc.
5	Teaching	● Whenever possible, perform teaching from outside the safety fences. If teaching must be performed inside the safety fences, prepare "work rules" and make sure the operator understands the procedures thoroughly. ● When working inside the safety fences, the operator should carry a handy emergency stop switch so that the operation can be stopped any time when an abnormality occurs. ● When working inside the safety fences, appoint a safety watcher in addition to the operator so that the operation can be stopped any time when an abnormality occurs. The safety watcher must also make sure the switches are not operated inadvertently by a third party. ● Put up a sign saying "WORK IN PROGRESS" in a conspicuous location.

No.	Task	Note
5	Teaching	● When releasing the brake of the vertically installed actuator, be careful not to let the actuator drop due to its dead weight, causing pinched hands or damaged work part, etc. * Safety fences --- Indicate the movement range if safety fences are not provided.
6	Confirmation operation	● After teaching or programming, carry out step-by-step confirmation operation before switching to automatic operation. ● When carrying out confirmation operation inside the safety fences, follow the specified work procedure just like during teaching. ● When confirming the program operation, use the safety speed. Failure to do so may result in an unexpected movement due to programming errors, etc., causing injury. ● Do not touch the terminal blocks and various setting switches while the power is supplied. Touching these parts may result in electric shock or malfunction.
7	Automatic operation	● Before commencing automatic operation, make sure no one is inside the safety fences. ● Before commencing automatic operation, make sure all related peripherals are ready to operate in the auto mode and no abnormalities are displayed or indicated. ● Be sure to start automatic operation from outside the safety fences. ● If the product generated abnormal heat, smoke, odor or noise, stop the product immediately and turn off the power switch. Failure to do so may result in fire or product damage. ● If a power outage occurred, turn off the power switch. Otherwise, the product may move suddenly when the power is restored, resulting in injury or product damage.
8	Maintenance/ inspection	● Whenever possible, work from outside the safety fences. If work must be performed inside the safety fences, prepare “work rules” and make sure the operator understands the procedures thoroughly. ● When working inside the safety fences, turn off the power switch, as a rule. ● When working inside the safety fences, the operator should carry a handy emergency stop switch so that the operation can be stopped any time when an abnormality occurs. ● When working inside the safety fences, appoint a safety watcher in addition to the operator so that the operation can be stopped any time when an abnormality occurs. The safety watcher must also make sure the switches are not operated inadvertently by a third party. ● Put up a sign saying “WORK IN PROGRESS” in a conspicuous location. ● Use appropriate grease for the guides and ball screws by checking the operation manual for each model. ● Do not perform a withstand voltage test. Conducting this test may result in product damage. ● When releasing the brake of the vertically installed actuator, be careful not to let the actuator drop due to its dead weight, causing pinched hands or damaged work part, etc. * Safety fences --- Indicate the movement range if safety fences are not provided.
9	Modification	● The customer must not modify or disassemble/assemble the product or use maintenance parts not specified in the manual without first consulting IAI. ● Any damage or loss resulting from the above actions will be excluded from the scope of warranty.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When disposing of the product, do not throw it into fire. The product may explode or generate toxic gases.

Indication of Cautionary Information

The operation manual for each model denotes safety precautions under “Danger,” “Warning,” “Caution” and “Note,” as specified below.

Level	Degree of danger/loss	Symbol
Danger	Failure to observe the instruction will result in an imminent danger leading to death or serious injury.	Danger
Warning	Failure to observe the instruction may result in death or serious injury.	Warning
Caution	Failure to observe the instruction may result in injury or property damage.	Caution
Note	The user should take heed of this information to ensure the proper use of the product, although failure to do so will not result in injury.	Note

Handling Precautions

- Emergency measure
  Should you find this product in a dangerous condition, quickly turn off the power switches of the product and all devices connected to it, or pull out all power cables from the power outlets.
  (“Dangerous condition” refers to a condition where fire or injury may occur due to abnormal heat generation, smoke, ignition, etc.)

- Caution when setting the positioning band (user parameter No. 1)
  The positioning band (user parameter No. 1) does not get reflected on the controller simply by changing the setting with a teaching tool.
  (1) MEC PC software
  Set the “push force” to 0% for each of the stop positions in the operating condition entry table (enter 0% again even if it is already set to 0%), and then transfer the data to the controller.
  The positioning band setting change will be reflected upon completion of the transfer.
  (2) CON-PT
  Set the “push force” to 0% for each position data in positioning setting (enter 0% again even if it is already set to 0%). The positioning band setting will be reflected when the setting is completed.
  (3) SEP-PT
  After the positioning band setting is changed, press the “Write” button on the positioning setting screen to transfer the setting to the controller and to reflect the change.

- Caution when using a rotary actuator
  Push operation cannot be performed during the rotating axis index mode when using a rotary actuator.
  In the rotating axis index mode, be sure to select “No push operation.”
  With MEC PC software, the push force cannot be set to 0%, nor can data be transferred.
  (Please note that data can be transferred, but push operation cannot be performed using other teaching tools.)

CE Marking

If a compliance with the CE Marking is required, please follow Overseas Standards Compliance Manual (ME0287) that is provided separately.

Name of Each Part

The figure shows the PMEC, but the details of the AMEC are also the same.

1. Installation and Wiring

1.1 Startup Procedure

If you are using this product for the first time, work carefully by following the procedure below to avoid missed checks and wiring errors.

1.2 Product Check

This product, if of the standard configuration, consists of the components listed below.
If the shipped product is of a wrong model number or any of the items listed below is missing, please contact your IAI dealer or IAI.

1.2.1 Components (Excluding Options)

No.	Item		Model number	Remarks
1	Controller		Refer to “How to Read Model Plate/Model Number.”	
Accessories				
2	Power cable	100 VAC specification	EST-ECCB-VCT-7AL2000	2 m For AMEC and PMEC of 100 VAC specification
		200 VAC specification	CB-APMEC-PW020-TM	2 m For PMEC of 100 VAC to 240 VAC specification
3	PIO 10-pin plug		FMC1.5/10-ST-3.5 (Manufacturer: Phoenix Contact)	Applicable wire size: 0.2 to 1.5 mm^2
4	PIO flat cable		CB-APMC-PIO020-NC	2 m
5	USB cable for MEC PC software		CB-SEL-USB030	3 m
6	EMG 2-pin plug		FMC1.5/10-ST-3.5 (Manufacturer: Phoenix Contact)	Applicable wire size: 0.2 to 1.5 mm^2 The terminals are shorted before shipment.
7	Standard mounting bracket x 2		MEC-AT-H	Including 4 mounting screws
8	First step guide			
9	Operation manual (CD)			
10	Safety guide			

1.2.2 Option

No.	Item	Model number	Remarks
1	Touch-panel teaching pendant	CON-PT	
2	Touch-panel teaching pendant (with deadman switch)	CON-PD	
3	Touch-panel teaching pendant (with deadman switch + TP adapter (RCB-LB-TG))	CON-PG	
4	Touch-panel teaching pendant	SEP-PT	
5	DIN rail mounting bracket	MEC-AT-D	Including 8 mounting screws

1.2.3 Operation Manuals Relating to This Product Stored in the Operation Manual CD

No.	Name	Control No.
1	MEC Operation Manual (this document)	ME0245
2	Touch-panel teaching pendant CON-PT/PD/PG	ME0227
3	Touch-panel teaching pendant SEP-PT	ME0217
4	Operation Manual for MEC PC Software	ME0248

1.2.4 How to Read Model Nameplate

1.2.5 How to Read Controller Model Number

PMEC-C-20PI-NP-2-1

<Series>
P : RCP2/RCP3
A : RCA/RCA2/RCL

<Type>
C: Standard

<Motor type>
[PMEC]
20P: 20 square pulse motor
28P: 28 square pulse motor
28SP: 28 square pulse motor (RA3C only)
35P: 35 square pulse motor
42P: 42 square pulse motor
56P: 56 square pulse motor
[AMEC]
2: 2-watt motor
5: 5-watt motor
10: 10-watt motor
20: 20-watt motor
20S: 20-watt motor (RCA2-SA4C/RCA-RA3□ only)
30: 30-watt motor

<Power-supply voltage>
1: Single-phase 100 VAC
2: Single-phase 100 to 240 V
(Note) "2" indicates the limited specification for PMEC.

<I/O flat cable length>
2: 2 m
3: 3 m (Option)
5: 5 m (Option)

<Input/output signal pattern>
NP: NPN (Sink type) (Standard)
PN: PNP (Source type)

<Encoder model>
I: Incremental type
<AMEC options>
LA: Power-saving type
HA: High-acceleration/deceleration type

1.3 Basic Specifications

1.3.1 Specification List

Features

[1] Actuator operation signals are the same as those signals normally used to operate air cylinders (solenoid valves), so you can use your current PLC programs directly. PMEC/AMEC controllers support air cylinders of both single-solenoid and double-solenoid types.

[2] Moving positions and other settings can be input easily using the MEC PC software and other teaching tools.

Specification List

Specification item		AMEC	PMEC	
Number of controlled axes		1 axis		
Power-supply voltage		100 VAC ±10%	100 VAC to 115 VAC±10%	100 VAC to 240 VAC±10%
Rated current		2.4 A	1.3 A	0.67 A (100 VAC)/ 0.36 A (200 VAC)
Rush current		15 A	30 A	15 A (100 VAC)/ 30 A (200 AVC)
Leak current		0.5 mA MAX.	0.5 mA MAX	0.4 mA MAX. (100 VAC)/ 0.75 mA MAX. (200 AVC)
Heat output		10 W	11 W	11 W (100 VAC)/ 11 W (200 VAC)
Number of positioning points		2 or 3 points		
Backup memory		Position data and parameters are saved in the non-volatile memory (serial EEPROM). The memory can be written approx. 100,000 times.		
PIO interface		24 VDC input/output		
Communication port		USB connector: Dedicated connector for MEC PC software		
		Teaching connector: Dedicated connector for touch-panel teaching pendant		
Cable length		Actuator cable: 20 m or less		
		I/O flat cable: 10 m or less		
Withstand voltage		1500 VAC, 1 minute		
Isolation resistance		500 VDC, 10 MΩ or more		
Environment	Ambient operating temperature	0 to 40°C		
	Ambient operating humidity	10% to 85%RH (non-condensing)		
	Operating ambience	Free from corrosive gases		
	Ambient storage temperature	-25 to 65°C		
	Ambient storage humidity	90%RH or less (non-condensing)		
	Vibration resistance	In XYZ directions: 10 to 57 Hz, pulsating amplitude, 0.035 mm (continuous)/0.075 mm (intermittent) 57 to 150 Hz, 4.9 m/s^2 (continuous)/9.8 m/s^2 (intermittent)		
Protection class		IP20		
Cooling method		Built-in cooling fan		
Weight		614 g	500 g	508 g
External dimensions		85 W x 200 H x 80 D (mm)		

⚠ Caution

- Position data, parameters, etc., are written to the EEPROM. Take note that the EEPROM can be written only up to 100,000 times or so. Do not turn off the power while the EEPROM is being written.

1.4 External Dimensions

The figure shows the PMEC, but the details of the AMEC are also the same.

1.5 Mounting Brackets

The figure shows the PMEC, but the details of the AMEC are also the same.

1.5.1 Standard Mounting Bracket

[Mounting bracket]

Use the supplied mounting screws to install the mounting bracket to the dedicated holes provided at the back of the controller. (1 mounting bracket at the top and bottom, or a total of 2 brackets)

1.5.2 DIN Rail Mounting Bracket (Option: Model number MEC-AT-D)

[Assembly drawing]

[How to install]

[How to remove]

1.6 Installation Environment

PMEC/AMEC controllers can be used in an environment of pollution degree 2[*1] or equivalent.

*1 Pollution degree 2: Pollution is normally limited to nonconductive contaminants, but conductive contaminants may also generate temporarily due to condensation. (IEC60664-1)

The installation location should avoid the following places:

- Place where the ambient temperature falls below 0°C or rises above 40°C
- Place where condensation occurs due to significant temperature shift
- Place where the relative humidity drops below 10% RH or rises above 85% RH
- Place exposed to corrosive or flammable gases
- Place exposed to significant levels of powder dust, salt content or iron powder
- Place where the controller is subject to direct vibration or shock
- Place exposed to direct sunlight
- Place exposed to splashed water, oil or chemicals

If the location of use meets any of the following conditions, provide sufficient shielding measures:

- Place subject to generation of noise due to electrostatics, etc.
- Place subject to generation of strong electric field or magnetic field
- Place where power or drive lines are wired nearby

1.7 Installation and Noise Elimination Measure

(1) Grounding for noise elimination

Ground each controller without sharing the grounding wire with other equipment or interconnecting it with other grounding wire.

> ⚠ **Caution**
>
> To provide power connection using a terminal block, cut the 3-P plug and connect the grounding wire without fail.

(2) Notes on wiring method
Separate the signal wire and encoder wiring from the power wire and drive wire.

(3) Noise sources and prevention of noise
Implement noise prevention measures if the power supply uses the same power circuit or is housed in the same system.
Examples of measurers that can be taken on noise sources are given below:
[1] AC solenoid valves, magnet switches and relays
[Action] Install a noise killer in parallel with the coil.
[2] DC solenoid valves, magnet switches and relays
[Action] Install a diode in parallel with the coil. Use DC relays with built-in diode.

(4) Waterproof type is not available. (IP20)

(5) A cooling fan is installed in the controller, so do not block the air exhaust and intake ports. Prevent foreign objects from entering the cooling fan from the exhaust and intake ports.

(6) Take note that the operation panel uses PET sheet switches that scratch easily.

(7) Secure the AC cables to prevent them from coming off.

(8) Heat radiation and mounting
Design and fabricate the control box so that the ambient temperature of the controller does not exceed 40°C.

The figure shows the PMEC, but the details of the AMEC are also the same.

1.8 Wiring Diagram

The figure shows the PMEC, but the details of the AMEC are also the same.

Caution

Do not connect the touch-panel teaching pendant and MEC PC software at the same time. Doing so may result in breakdown or malfunction.

1.9 Operation Patterns and PIO Signals

(1) Operation patterns

AMEC/PMEC controllers have two operation patterns.
An overview of the operation specification in each pattern is given below. [For the setting method, refer to “Initial Settings and Stop Position Settings.”]

Operation pattern		Description	Air cylinder circuit (Reference)	Connection method for motorized cylinder
2-point stop (2-point positioning)	1 input, moving between 2 points [Single-solenoid type]	The actuator can be moved between 2 points just like you normally do using an air cylinder. End and start points can be set. Moving speed and acceleration/deceleration can be specified. Push-motion operation is possible. When ST0 turns ON, the actuator moves to the end point. When the signal turns OFF, the actuator returns to the start point.		
3-point stop (3-point positioning)	2 input, moving between 2 points [Double-solenoid type]	The actuator can be moved between 2 points just like you normally do using an air cylinder. End and start points can be set. You can also set an intermediate point and position the actuator to the intermediate point. Moving speed and acceleration/deceleration can be specified. Push-motion operation is possible. When ST1 turns ON, the actuator moves to the end point. When ST0 turns ON, the actuator moves to the start point. [Intermediate-movement type, both ON] When both ST0 and ST1 are turned ON, the actuator positions itself to and stops at the intermediate point. When both ST0 and ST1 are turned OFF, the actuator stops in the middle of movement. [Intermediate-movement type, both OFF] When both ST0 and ST1 are turned OFF, the actuator positions itself to and stops at the intermediate point. When both ST0 and ST1 are turned ON, the actuator stops in the middle of movement.	 	
	2 input, moving between 3 points [3-point positioning]			

(2) Details of PIO signals

Signal type	Signal name	Signal description	Function		
			2-point stop (2-point positioning)	3-point stop (3-point positioning)	
			1 input, moving between 2 points [Single-solenoid type]	2 input, moving between 2 points [Double-solenoid type]	2 input, moving between 3 points [3-point positioning]
PIO power	24 V	I/O power+	Common I/O circuit power line. Connect to the positive side of 24 VDC+.		
	0 V	I/O power-	Common I/O circuit power line. Connect to the negative side of 24 VDC-.		
Input	ST0	Move signal 1	When the ON level is detected, the actuator positions itself to the end point. When the OFF level is detected, the actuator positions itself to the start point.	When the ON level is detected, the actuator positions itself to the corresponding position. Move to the end point when ST0 is OFF and ST1 is ON. Move to the start point when ST0 is ON and ST1 is OFF. [Intermediate-movement type, both ON] The actuator stops in the middle of movement when ST0 is OFF and ST1 is also OFF. ⚠ Caution If ST0 is ON and ST1 is also ON, the actuator positions itself to the intermediate point.	When the ON level is detected, the actuator positions itself to the corresponding position. Move to the end point when ST0 is OFF and ST1 is ON. Move to the start point when ST0 is ON and ST1 is OFF. [Intermediate-movement type, both ON] The actuator moves to the intermediate point when ST0 is ON and ST1 is also ON. The actuator stops in the middle of movement when ST0 is OFF and ST1 is also OFF. [Intermediate-movement type, both OFF] The actuator moves to the intermediate point when ST0 is OFF and ST1 is also OFF. The actuator stops in the middle of movement when ST0 is ON and ST1 is also ON.
	ST1	Move signal 2			
	RES	Alarm reset	Upon detection of the leading edge from OFF to ON, all present alarms are reset. * Some alarms may not be reset depending on the level of the alarm. [For details, refer to 2.7, “Alarms.”]		
Output	Push function – Do not use – LS0	Start point detection	It operates in the same manner an air cylinder sensor would. Each signal turns ON when the actuator is currently within the positioning band of the applicable position detection output.		
	Push function – Do not use – LS1	End point detection			
	Push function – Do not use – LS2	Intermediate point detection			
	Push function – Use – PE0	Positioning to start point complete	Each signal turns ON upon completion of push-motion operation or positioning (even when the actuator has missed the work part). The signal turns OFF when a move signal to other position is issued.		
	Push function – Use – PE1	Positioning to end point complete			
	Push function – Use – PE2	Positioning to intermediate point complete			
	HEND	Home return complete	This signal turns ON upon completion of home return operation. If the 3-point stop (3-point positioning) operation pattern is selected, this signal is not available.		
	*ALM	Alarm output signal	This signal is ON when the controller is normal, and OFF when an alarm is present.		

(3) I/O circuits

	Input part		Output part	
Specification	Input voltage	24 VDC ±10%	Load voltage	24 VDC
	Input current	4 mA per circuit	Maximum load current	50 mA per point
	ON/OFF voltage	ON voltage: 18 VDC min. OFF voltage: 6 VDC max.	Leak current	0.1 mA max. per point
NPN				
PNP				

(4) PIO signal connector

A 2-m flat cable with connector is supplied as a standard accessory. Use this cable or other equivalent cable to connect the PLC. The wire colors below assume that the supplied cable is used.

Operation pattern			2-point stop (2-point positioning)	3-point stop (3-point positioning)
Function			• Move between 2 points • Move by push motion • Addition and selection of stop operation • Status check	• Move between/among 2/3 points • Push-motion operation • Addition and selection of stop operation • Status check
Pin No.	Wire color	Signal type	Signal name	Signal name
1	Brown	PIO power	24 V	24 V
2	Red		0 V	0 V
3	Orange	Input	ST0 (Solenoid A: Move to start point/end point)*1	ST0 (Solenoid A: Move signal 1)
4	Yellow		-	ST1 (Solenoid B: Move signal 2)
5	Green		RES (Alarm reset)	RES (Alarm reset)
6	Blue		-	-
7	Purple	Output	LS0 (Start point detection)/PE0 (Positioning to start point complete)*2	LS0 (Start point detection)/PE0 (Positioning to start point complete)*2
8	Gray		LS1 (End point detection)/PE1 (Positioning to end point complete)*2	LS1 (End point detection)/PE1 (Positioning to end point complete)*2
9	White		HEND (Home return complete)	LS2 (Intermediate point detection)/PE2 (Positioning to intermediate point complete)*2
10	Black		* ALM (Alarm) *3	* ALM (Alarm) *3

[PIO 10-pin plug]
FMC1,5/10-ST-3,5 (by Phoenix Contact)

*1: The actuator moves to the end point when ST0 turns ON, or to the start point when the signal turns OFF.
*2: The output signals LS0 to 2/PE0 to 2 function as PE0 to 2 if the controller is initially set to use the push function, or as LS0 to 2 if not.
*3: The *ALM signal remains ON when the controller is normal, and turns OFF if an alarm occurs.

1.10 Expanded Connection Diagram (Example)

A circuit example that stops the actuator upon emergency stop actuated on the system side (via a device assembled into the controller) is shown below.
The emergency stop switch on the touch-panel teaching pendant is effective only on the controller to which the switch is connected, and cannot stop the entire system.

(1) NPN connection

(2) PNP connection

*1 Connect the emergency stop relay (CR) contacts to each controller. The CR contact specification should be at least 24 VDC and 100 mA.
If a safety category must be met, make sure an appropriate action is taken such as cutting off the power.

1.11 Wiring Cables

(1) Power cable (2 m)
[1] 100 VAC specification: EST-ECCB-VCT-7AL2000 (Manufacturer: ECHO ELECTRIC CO., LTD)

[2] 200 VAC specification: CB-APMEC-PW020-TM

Round crimp terminal: v1.25-M4 (JST)

(2) USB cable (3 m) CB-SEL-USB030

(3) PIO cable (2 m) CB-APMEC-PIO020-NC

Strip one end of the cable to expose the conductor wires and connect them, by matching the wire colors, to the supplied PIO connector FMC1,5/10-ST-3,5 (by Phoenix Contact).

2. Operation

2.1 Operation Panel Functions

The figure shows the PMEC, but the details of the AMEC are also the same.

2.1.1 Switches Used for Selecting the Mode (Automatic ⇔ Manual)

If a teaching tool is connected to the USB connector or teaching connector, the following operations cannot be performed.

Switch to the automatic mode (Manual → Automatic)		Press and hold the Auto button for at least 1 second to switch to the auto mode. When the mode has switched, a beep sound is output and the Auto lamp becomes lit.
Switch to the manual mode (Automatic →Manual)		Press and hold the Manual button for at least 1 second to switch to the manual mode. When the mode has switched, a beep sound is output and the Manual lamp becomes lit.

2.1.2 Switch Used for Home Return

If a teaching tool is connected to the USB connector or teaching connector, the following operations cannot be performed.

Perform home return (This is effective in the manual mode.)		Press the HOME button. The Complete lamp blinks while home return is in progress and once home return is complete, the Complete lamp changes to a steady light.

2.1.3 Switches Used for Manual Operation

If a teaching tool is connected to the USB connector or teaching connector, the following operations cannot be performed.

Move forward via manual operation (This is effective in the manual mode.)		The actuator moves forward while this button is pressed. Once the button is released, the actuator stops. The lamp blinks while the actuator is moving forward, and changes to a steady light once the end point (intermediate point) is reached.
Move backward via manual operation (This is effective in the manual mode.)		The actuator moves backward while this button is pressed. Once the button is released, the actuator stops. The lamp blinks while the actuator is moving backward, and changes to a steady light once the start point is reached.

2.1.4 Switch Used for Releasing the Brake

This switch can be used to forcibly release the brake of the actuator that has a brake.
If a teaching tool is connected to the USB connector or teaching connector, the following operations cannot be performed.

Release brake	Normal Release Brake	Tilting the switch to the Release side forcibly releases the brake. To move the actuator when attaching a work part or for direct teaching, perform this operation if the brake needs to be released. ⚠ • If the actuator is installed vertically, be careful not to let the actuator drop due to its dead weight, causing a pinched hand or damaged work part. • After changing the switch position is the Release side, remember to return it to the Normal side.

⚠ Caution

All operations on the operation panel are disabled if a touch-panel teaching pendant or USB cable is connected.
To operate the panel, remove the touch-panel teaching pendant or USB cable is connected.

2.1.5 Switches Used for Changing the Number of Positioning Points

You can set the number of positioning points (stop at 2 points or stop at 3 points).
If a teaching tool is connected to the USB connector or teaching connector, the following operations cannot be performed.
(Note) This function is now supported on MEC controllers whose software version of the panel board applciation is “0002” or later.

Check the currently set number of positioning points (This is effective in the teaching mode.)		While the RUN button is pressed, the following lamps blink to indicate the currently set number of positioning points. Stop at 2 points: Auto lamp + Manual lamp A beep sound is output twice. Stop at 3 points: Auto lamp + Manual lamp + Complete lamp A beep sound is output three times.
Change the number of positioning points		Press the HOME button, Manual button and Auto button together to turn on the power. After you hear the buzzer sound for 2 seconds, release the buttons. If “Stop at 2 points” is currently set → The setting is changed to “Stop at 3 points.” If “Stop at 3 points” is currently set → The setting is changed to “Stop at 2 points.”

⚠ Caution

(1) All operations on the operation panel are disabled if a touch-panel teaching pendant or USB cable is connected.
To operate the panel, remove the touch-panel teaching pendant or USB cable is connected.

(2) If the number of positioning points are changed after position teaching, teach the new positions again. Otherwise, the actuator may move to an unintended position and create a dangeraous situation.

2.1.6 Switches Used for Position Teaching

When you select the position teaching mode, you can register positions (forward path, backward path, intermediate point) simply by moving the actuator, without having to use any teaching tool.
The following two types of position teaching methods are available:

(1) Direct teaching
(2) Jog teaching

To switch to the position teaching mode from the manual mode, perform the operation explained below.
The following operation cannot be performed if home return is not yet completed or a teaching tool is connected to the USB connector or teaching connector.

(Note) This function is now supported on MEC controllers whose software version of the panel board applciation is “0002” or later.

Switch to the position teaching mode (Manual → Teaching)		Pressing the Manual button and STOP button together switches the mode to position teaching. Once the mode is switched, the SAVE lamp blinks. Pressing the Manual button and STOP button together once again switches the mode to back to manual. Once the mode is switched, the SAVE lamp blinks.
Cancel the position teaching mode (Teaching → Manual)		

(1) Registering positions by direct teaching
This function is effective in the teaching mode.

Turn off the servo		Pressing the Manual button turns off the servo. While the servo is off, the actuator can be moved by hand. Manually move the actuator to a desired position you want to register.
Release the brake		Sliding this switch to the Release position forcibly releases the brake. ⚠ • If the actuator is installed vertically, be careful not to let your hand pinched or the work part damaged by the actuator falling due to its weight. • After setting the switch to the Release position, remember to return it to the Normal position.
Register the forward path (end point) position		Press and select the FWD POS (end point) button. Once the setting is switched, the lamp of this button you have just pressed comes on.
		Press the SAVE button. Once the position has been saved, a beep sound is output and the lamp comes on.
Register the backward path (start point) position		Press and select the BACK POS (start point) button. Once the setting is switched, the lamp of this button you have just pressed comes on.
		Press the SAVE button. Once the position has been saved, a beep sound is output and the lamp comes on.
Register an intermediate point		Press the FWD POS and BACK POS buttons together. Once the setting is switched, the lamps of these two buttons come on.
		Press the SAVE button. Once the position has been saved, a beep sound is output and the lamp comes on. You cannot register an intermediate point while “Stop at 2 points” is selected.
Turn on the servo		Press the Manual button again to turn on the servo. You are now ready to perform operation.

(2) Registering positions by jog teaching (jogging/inching operation)
This function is effective in the teaching mode.

Move forward via manual operation	FWD	Move the actuator forward to a desired position you want to register. Pressing the FWD button causes the actuator to inch forward(Note 1). Continue to press this button, and the actuator will jog(Note 1). Hold down this button further, and the jogging speed will increase slowly in steps(Note 1).
Move backward via manual operation	BACK	Move the actuator backward to a desired position you want to register. Pressing the BACK button causes the actuator to inch backward(Note 1). Continue to press this button, and the actuator will jog(Note 1). Hold down this button further, and the jogging speed will increase slowly in steps(Note 1).
Register the forward path (end point) position	FWD POS	Press and select the FWD POS (end point) button. Once the setting is switched, the lamp of this button you have just pressed comes on.
	SAVE	Press the SAVE button. Once the position has been saved, a beep sound is output and the lamp comes on.
Register the backward path (start point) position	BACK POS	Press and select the BACK POS (start point) button. Once the setting is switched, the lamp of this button you have just pressed comes on.
	SAVE	Press the SAVE button. Once the position has been saved, a beep sound is output and the lamp comes on.
Register an intermediate point	FWD POS BACK POS	Press the FWD POS and BACK POS buttons together. Once the setting is switched, the lamps of these two buttons come on.
	SAVE	Press the SAVE button. Once the position has been saved, a beep sound is output and the lamp comes on. You cannot register an intermediate point while “Stop at 2 points” is selected.

(Note 1) When registering a position in the jog/inch mode, pressing and holding the FWD POS or BACK POS button switches the actuator operation as follows:

[1] The actuator inches for a distance of 0.5 mm.
↓ (After 1.6 seconds)
[2] The actuator jogs at a speed of 1 mm/s.
↓ (After 1 second)
[3] The actuator jogs at a speed of 10 mm/s.
↓ (After 1 second)
[4] The actuator jogs at a speed of 30 mm/s.
↓ (After 1 second)
[5] The actuator jogs at a speed of 50 mm/s.
↓ (After 1 second)
[6] The actuator jogs at a speed of 100 mm/s.

If the button is released while the actuator is jogging/teaching, the next time a jog button is pressed the actuator operation will start from [1] again.

Caution

Continuing to hold a jog button increases the speed gradually. Accordingly, once the actuator has reached a point near the target position, release the button and inch the actuator to the exact position. Otherwise, the actuator may overshoot and crash with the end.

The position teaching function cannot be selected in the following conditions:

(1) Home return is not completed yet.
Complete a home return operation first, before performing the operation to switch to the position teaching mode.

(2) All operations on the operation panel are disabled if a touch-panel teaching pendant or USB cable is connected.
To operate the panel, remove the touch-panel teaching pendant or USB cable.

2.1.7 Switches and Volume Used for Setting the Acceleration/Deceleration and Speed

The traveling speed and the acceleration/deceleration of the actuator in the forward and backward paths, and to the intermediate point can be set.

If a teaching tool is connected to the USB connector or teaching connector, the following operations cannot be performed.

Register acceleration/deceleration (This is effective in the manual mode.)	FWD POS / BACK POS	Press and select the FWD POS or BACK POS button. To register acceleration/deceleration for an intermediate point, press both buttons together. When the selection has switched, the lamp of the pressed button becomes lit.
	Accel	Turn the Accel knob to a desired position. (Setting range: 1 to 100%)
	SAVE	Press the SAVE button. When the acceleration has been registered, a beep sound is output and the lamp becomes lit. (The acceleration is registered together with the speed.)
Register speed (This is effective in the manual mode.)	FWD POS / BACK POS	Press and select the FWD POS or BACK POS button. To register acceleration/deceleration for an intermediate point, press both buttons together. When the selection has switched, the lamp of the pressed button becomes lit.
	Speed	Turn the Speed knob to a desired position. (Setting range: 1 to 100%)
	SAVE	Press the SAVE button. When the acceleration has been registered, a beep sound is output and the lamp becomes lit. (The speed is registered together with the acceleration.)

2.1.8 Switches Used for Trial Operation

If a teaching tool is connected to the USB connector or teaching connector, the following operations cannot be performed.

Perform continuous operation (This is effective in the automatic mode.)	RUN	Pressing this button starts continuous operation. If the 2-point positioning is selected, the actuator operates continuously in the sequence of end point → start point → end point. If the 3-point positioning is selected, the actuator operates continuously in the sequence of intermediate point → end point → start point → intermediate point. The lamp blinks while continuous operation is in progress.
Stop continuous operation (This is effective in the automatic mode.)	STOP	Pressing this button stops operation. Once the operation has stopped, the lamp becomes lit.

2.2 Trial Operation via Operation Panel

Turn on the power		Tilt the switch to the [-] position.
	Power Green: Normal Red: Alarm	The Power lamp and Normal/Alarm lamp illuminate in green.
If an alarm occurs	Power Green: Normal Red: Alarm	If an alarm occurs, the Normal/Alarm lamp illuminates in red. Use the MEC PC software or touch-panel teaching pendant to check the alarm code and take an appropriate action [Refer to 2.7, “Alarms.”]

- Select the mode (Automatic → Manual).

(Note) Confirm that neither a PC nor touch-panel teaching pendant is connected.

- Perform home return.

- Perform a manual operation.
  Confirm that home return has been completed and the Complete lamp is lit.
  If the Complete lamp is unlit, meaning that home return is not yet completed, perform home return.

Manual operation (2-point positioning)

Moving forward

End point (forward path)

The actuator moves forward while the FWD button is pressed until the end point is reached. The FWD lamp blinks during forward movement. Once the button is released, the actuator stops.

Moving backward

Start point (backward path)

The actuator moves backward while the BACK button is pressed until the start point is reached. The BACK lamp blinks during backward movement. Once the button is released, the actuator stops.

Manual operation (3-point positioning)

Moving forward (starting from the home position)

Intermediate point (intermediate)

The actuator moves forward while the FWD button is pressed until the intermediate point is reached. The FWD lamp blinks during forward movement. Once the button is released, the actuator stops.

End point
(forward path)

Again the actuator moves forward while the FWD button is pressed until the end point is reached. The FWD lamp blinks during forward movement. Once the button is released, the actuator stops.

Moving backward

Start point (backward path)

The actuator moves backward while the BACK button is pressed until the start point is reached. The BACK lamp blinks during backward movement. Once the button is released, the actuator stops.

● Check the current number of positioning points.

[1]

Switch to the position teaching mode.
Press the Manual button and STOP button together.

A beep sound is output and
the SAVE lamp blinks.

[2]

While the RUN button is pressed, the following lamps blink to indicate the currently set number of positioning points.

Stop at 2 points: Auto lamp + Manual lamp
A beep sound is output twice.
Stop at 3 points: Auto lamp + Manual lamp + Complete lamp
A beep sound is output three times.

● Change the number of positioning points.

Press the HOME button, Manual button and Auto button together to turn on the power.
After you hear the buzzer sound for 2 seconds, release the buttons.

If “Stop at 2 points” is currently set
→ The setting is changed to “Stop at 3 points.”
If “Stop at 3 points” is currently set
→ The setting is changed to “Stop at 2 points.”

● Register positions.
Confirm that home return has completed and the Complete lamp is lit.
If the Complete lamp is unlit, meaning that home return is not completed yet, perform home return.

(1) Registering positions by direct teaching

[1] Switch to the position teaching mode.
Press the Manual button and STOP button together.

A beep sound is output and the SAVE lamp blinks.

[2] Press the Manual button to turn off the servo.

While the servo is off, you can move the actuator by hand.

[3] Manually move the actuator to a desired position you want to register.

If the actuator has a brake, slide the brake release switch to the Release position.

⚠
- If the actuator is installed vertically, be careful not to let your hand pinched or the work part damaged by the actuator falling due to its weight.
- After setting the switch to the Release position, remember to return it to the Normal position.

[4]

Registering the forward path

End point (forward path)

Press the FWD POS button.

The FWD POS lamp becomes lit.

Registering the backward path

Start point (backward path)

Press the BACK POS button.

The BACK POS lamp becomes lit.

Registering an intermediate point

Intermediate point (intermediate)

This operation cannot be performed while “2-point stop” is selected.

Press the FWD POS button and BACK POS button together.

The FWD POS lamp and BACK POS lamp become lit.

[5]

Register the position.

Press the SAVE button.

When the registration is complete, a beep sound is output and the SAVE lamp becomes lit.

[6]

Press the Manual button to turn on the servo.

(2) Registering positions by jog teaching (jogging/inching operation)

[1]

Switch to the position teaching mode.
Press the Manual button and STOP button.

A beep sound is output and the SAVE lamp blinks.

[2]

Press the FWD or BACK button to move the actuator to a desired position you want to register.

[3]

Registering the forward path

End point (forward path)

Press the FWD POS button. The FWD POS lamp becomes lit.

Registering the backward path

Start point (backward path)

Press the BACK POS button. The BACK POS lamp becomes lit.

Registering an intermediate point

Intermediate point (intermediate)

This operation cannot be performed while “2-point stop” is selected.

Press the FWD POS button and BACK POS button together. The FWD POS lamp and BACK POS lamp become lit.

[4]

Register the position.

Press the SAVE button. When the registration is complete, a beep sound is output and the SAVE lamp becomes lit.

- Register acceleration and speed.
  Confirm that home return has been completed and the Complete lamp is lit.
  If the Complete lamp is unlit, meaning that home return is not yet completed, perform home return.

[1] Select the forward path, backward path and intermediate point.

Selecting the forward path
End point (forward path)

Press the FWD POS button.

The FWD POS lamp becomes lit.

Selecting the backward path
Start point (backward path)

Press the BACK POS button.

The BACK POS lamp becomes lit.

Selecting the intermediate point
Intermediate point (intermediate)

This operation cannot be performed while “2-point stop” is selected.

Press the FWD POS button and BACK POS button together.

The FWD POS lamp and BACK POS lamp become lit.

[2] Set the acceleration and speed.

Accel

Speed

Turn the knobs to adjust to desired values.

Accel knob:	Turning the knob clockwise causes the actuator to move more rapidly. Turning it counterclockwise causes the actuator to move more gradually.
Speed knob:	Turning the knob clockwise causes the actuator to move faster. Turning it counterclockwise causes the actuator to move slower.

[3] Register the settings.

Press the SAVE button.

When the registration is complete, a beep sound is output and the SAVE lamp becomes lit.

- Perform trial operation.

If the position teaching mode is selected, switch to the manual mode.
(This step is not necessary if it is already set to the manual mode.)

Pressing the Manual button and the STOP button together switches the mode to manual.

Once the mode is switched, the SAVE lamp goes off.

Continuous operation

Pressing the RUN button starts continuous operation. The RUN button blinks during continuous operation.

Pressing the STOP button stops continuous operation.

- Switch to the auto operation.

Press the Ext. Start button.

Now you can operate the actuator using external signals (PIOs).

A beep sound is output and the Auto lamp becomes lit.

2.3 Default Settings and Stop Position Setting with a Teaching Tool

Teaching tools let you set the speed, acceleration and deceleration preregistered on the operation panel as well as positioning stop positions, push-motion operation and other settings numerically.

2.3.1 Teaching Tool Types

The operation manual is separately provided.
Please refer to the operation manual supplied (on CD) for operation details.

(1) MEC PC software (Operation manual control number: ME0248)
(2) Touch panel teaching pendant CON-PT/PD/PG (Operation manual control number: ME0227)
(3) Touch panel teaching pendant SEP-PT (Operation manual control number: ME0217)

2.3.2 Setting the Operating Conditions (Operating Condition Table)

The following operating condition table is stored in the controller.
Positioning is performed using the data of the operating condition table shown below.
Values are set using the operation panel on the front face of the controller, MEC PC software or other teaching tool.

Positioning information

PIO (I/O) signal used		Stop position*2	[1]	[2]	[3]	[4]	[5]	[6]	[7]
2-point stop	3-point stop		Position [mm]	Speed [mm/s]	Acceleration [G]	Deceleration [G]	Push force [%]	Push band [mm]	Energy-saving function
$\overline{\text{ST0}}$ *1	ST0	Start point (forward path)	10.00	50.00	0.1	0.1	0	0	Enabled
-	ST0, ST1	Intermediate point (intermediate)	50.00	50.00	0.1	0.1	70	1.00	Enabled
ST0 *1	ST1	End point (backward path)	100.00	50.00	0.1	0.1	0	0	Enabled

*1 In the 2-point stop pattern, the actuator moves to the end point when ST0 turns ON, and to the start point when the signal turns OFF.

*2 On the SEP-PT, the start point, end point and intermediate point are referred to as “rear end position, “front end position” and “intermediate position,” respectively.

[1] Position [mm] ... Positioning stop position. Set each position from the home. The respective positions have the following relationship:
Start point < Intermediate point < End point

[2] Speed [mm/s] ... Set the speed at which the actuator operates.
The maximum speed varies depending on the actuator.
Refer to the catalog or operation manual for your actuator.

[3] Acceleration [G] ... Set the acceleration at which the actuator starts.

[4] Deceleration [G] ... Set the deceleration at which the actuator stops.

(Reference) Acceleration is explained. The same concept applies to deceleration.
1 G = 9800 mm/s^2: Acceleration at which the actuator can accelerate to up to 9800 mm/s per second
0.3 G: Acceleration at which the actuator can accelerate to up to 9800 mm/s x 0.3 = 2940 mm/s

Caution

Setting the acceleration/deceleration

(1) Make sure the acceleration/deceleration you set does not exceed the rated acceleration/deceleration stated in the catalog or this operation manual. If the rated acceleration/deceleration is exceeded, the life of the actuator may drop significantly.

(2) If the actuator or work part receives impact or vibrates, lower the acceleration/deceleration. If the actuator is used continuously in such condition, the life of the actuator will drop significantly.

(3) If the transferring mass is significantly smaller than the rated payload capacity, accelerations/decelerations greater than the rating may be set. You can shorten the tact time this way, so contact IAI if you are interested. When contacting IAI, let us know the weight, shape and installation method of the work part as well as installation condition of the actuator (horizontal/vertical).

[5] Push force [%] ... Set the push torque (current-limiting value) to be used in push-motion operation as a percent (%) value.
Increasing the current-limiting value increases the push force.
If “0” is set, positioning operation is performed.
[For the relationship of push force and current-limiting value, refer to the catalog or Appendix 2, “Push Force and Current-limiting Value.”].

[6] Push band [mm] ... Set the travel during push-motion operation.
When push-motion operation is performed, the actuator moves at the speed and rated torque set as part of positioning information, just like normal positioning, until the remaining travel enters the range set here. Once the remaining travel enters this range, the actuator moves to the position set in [1] while pushing the work part.
The speed of push-motion operation is set in parameter No. 7. [For the speed of push-motion operation, refer to Appendix 1, “List of Specifications of Connectable Actuators.”]
Do not use any setting that causes this speed to be exceeded.
If the setting in [2] is less than the push speed, the actuator pushes the work part at the set speed.
How the actuator operates as it pushes the work part toward the end point, start point and intermediate point is illustrated below.

[Pushing toward the end point or intermediate point]

[Pushing = pulling toward the start point or intermediate point]

[7] Energy-saving function ... When the energy-saving function is enabled, you can have the motor power (servo) turned off automatically upon elapse of a specified period to save power after completion of positioning. Set the applicable period beforehand using a parameter.

Parameter No.	Parameter name	Initial value	Setting range
10	Auto servo OFF delay time [sec]	1	0 to 9999

[Auto motor power (servo) OFF]
The motor power (servo) will turn off automatically upon elapse of a specified period after completion of positioning. When the next positioning command is issued, the motor power (servo) turns on automatically and positioning is performed. Since no holding current flows while the motor is at standstill, power consumption can be reduced.

[Statuses of position detection output signals when the push function is not used]
Even when the motor power (servo) is turned off, as long as the actuator is positioned within the positioning band (parameter No. 1) the start point detection signal (LS0), end point detection signal (LS1) or intermediate point detection signal (LS2) will turn ON according to the applicable position, just like when a sensor is used. Accordingly, the position detection signal that has turned ON will remain ON after completion of positioning unless the actuator moves.

[Status of position complete signals when the push function is used]
In push-motion operation, the motor power (servo) does not turn off automatically while the actuator is pushing the work part.
If the actuator has missed the work part, the motor power (servo) turns off automatically.
Once the motor power (servo) turns off, a position complete status is lost. Accordingly, the push complete signal 0 (PE0), push complete signal 1 (PE1) and push complete signal 2 (PE2) will all turn OFF regardless of the stop position.

⚠ Caution

No holding torque is applied in the auto motor power (servo) OFF mode. Since the actuator will move in this condition if an external force is applied, pay due attention to contact and safety when setting any operation involving auto motor power (servo) OFF.

2.4 Power ON and PIO Control

2.4.1 Input Signal Control

An input time constant of 10 msec is set for input signals used by this controller to prevent malfunction due to chattering, noise, etc.
Accordingly, make sure each input signal is input for at least 10 msec. If a signal is input for less than 10 msec continuously, the signal cannot be recognized.

2.4.2 Power ON

Turn on the power according to the following sequence:

[1] Turn on the controller power.
The controller has a built-in power switch.
Turn on this power switch, and the power lamp on the front face of the controller will become lit.

[2] Supply the 24-VDC PIO power.

[3] Cancel the emergency stop. The motor power (servo) of the controller is now turned on. If the EMG connector terminals are still short-circuited by a jumper wire (as delivered condition), the motor power (servo) will turn on the moment the power is turned on.

[4] The controller can now operate via PIOs.

⚠ Caution

If the operation panel is set to the manual operation mode (= the Manual lamp on the operation panel is lit), PIOs are disabled. To perform PIO operation, press the Auto button on the operation panel to select the auto mode. If the manual mode is selected while the actuator is operating via PIOs, the actuator will decelerate to a stop.
PIO output signals will be maintained after switching to the manual mode. When selecting the manual mode, therefore, stop the device (system) in which this product is incorporated, stop the control device (PLC, etc.) or take other appropriate action to ensure safety.

2.4.3 Home Return

This product adopts an incremental specification, meaning that it must perform home return operation after the power is turned on.
Press the HOME button on the operation panel of the controller, or use an appropriate PIO signal to perform home return operation.
If the actuator has not yet performed any home return after the power was turned on, you can perform home return by turning ON move signal 1 (ST0).

[1] When the operation pattern is “2-point stop (2-point positioning)”
If home return is not yet performed on the operation panel, the actuator will return home upon the first input of move signal 1 (ST0) to the end point. After returning home, the actuator will move to and stop (position itself) at the end point.

*1: If “Use push function” is selected as part of the initial settings, this signal serves as a position complete signal (PE1) for end point.

[2] When the operation pattern is “3-point stop (3-point positioning)”
After returning home, the actuator will stop (position itself) at the start point. If any value other than the home (= 0) is input for the start point, however, the actuator will return home and then position itself at the applicable position (to complete the home return). Move signal 2 (ST1) to the end point is disabled until the home return is complete.

*1: If “Use push function” is selected as part of the initial settings, this signal serves as a position complete signal (PE0) for start point.

2.4.4 Normal Positioning Operation in the “2-point Stop (2-point Positioning)” Operation Pattern

When move signal 1 (ST0) turns ON, the actuator positions itself at the end point. When the signal turns OFF, it returns to (positions itself at) the start point.

*1: If “Use push function” was selected as part of initial settings, this signal serves as a position complete signal (LS0 → PE0, LS1 → PE1) when positioning is performed.

2.4.5 Normal Positioning Operation in the “3-point Stop (3-point Positioning)” Operation Pattern

When move signal 1 (ST0) turns ON, the actuator positions itself at the start point. When move signal 2 (ST1) turns ON, it positions itself at the end point. If ST0 and ST1 are both turned ON*1, the actuator positions itself at the intermediate point. If both signals turn OFF*1 while the actuator is moving, the actuator decelerates to a stop.

*1 ON and OFF can be swapped by initial settings.

- Intermediate point specification mode is set to “Both ON”:
  The actuator positions itself at the intermediate point when both ST0 and ST1 turn ON, and decelerates to a stop in the middle of movement when both turn OFF.
- Intermediate point specification mode is set to “Both OFF”:
  The actuator positions itself at the intermediate point when both ST0 and ST1 turn OFF, and decelerates to a stop in the middle of movement when both turn ON.

*2 If “Do not use push function” was selected as part of the initial settings, LS0 to 2/PE0 to 2 are handled as LS signals. If “Use push function” was selected, they are handled as PE signals.

2.4.6 Pushing toward the End Point in the “2-point Stop (2-point Positioning)” Operation Pattern

When move signal 1 (ST0) turns ON, the actuator performs push-motion operation toward the end point. Upon completion of push*1, the positioning to end point complete signal (PE1) turns ON.
*1 PE1 also turns ON even when the actuator has reached the end point after missing the work part.

2.4.7 Pushing in the “3-point Stop (3-point Positioning)” Operation Pattern

Shown below is a timing chart of how the actuator pushes the work part while moving to the end point. When move signal 2 (ST1) turns ON, the actuator moves to the end point while pushing the work part. Upon completion of push, the positioning to end point complete signal (PE1) turns ON. Pushing toward the start point and intermediate point can be performed by simultaneously controlling move signals 1 and 2, just like normal positioning in the 3-point stop pattern (where PE0 turns ON upon completion of push toward the start point, while PE2 turns ON upon completion of push toward the intermediate point). Push-motion operation can also be performed from the start point or end point toward the intermediate point.

⚠ Caution

Even if the actuator has reached the end point after missing the work part, PE1 still turns ON. If you must detect missing of the work part, therefore, set a larger push band and make judgment using a timer, etc.

2.5 User Parameters

No.	Name	Default value	Setting range	Description
1	Positioning band [mm]	Actuator-specific value	0.01 to actuator-specific value	Set the output range of the LS signal and PE signal relative to the target position.
2	Jog speed [mm/sec]	Actuator-specific value	0.01 to actuator-specific value	Set the moving speed by jogging.
3	Servo gain number	6	0 to 15	These parameters are set to standard specifications before shipment.
4	Torque filter time constant	Actuator-specific value	0 to 2500	
5	Speed loop proportional gain	Actuator-specific value	1 to 27661	
6	Speed loop integral gain	Actuator-specific value	1 to 217270	
7	Push speed [mm/sec]	Actuator-specific value	1 to actuator-specific value	Set the speed of push-motion operation.
8	Push stop judgment time [msec]	255	0 to 9999	Set the time after the actuator contacts the work part in push-motion operation until completion of operation is recognized.
9	Current limiting after missing work part [0: Standstill current / 1: Push current]	0	0 to 1	Set the torque that applies when the actuator has reached the target position after missing the work part in push-motion operation. With the AMEC, selecting “Standstill current” limits the torque at the moving current-limiting value if the work part is missed.
10	Auto servo OFF delay time [sec]	1	0 to 9999	If the energy-saving function is enabled, set the time after the positioning is completed until the motor power (servo) turns off automatically.
11	Stop mode selection [0: Complete stop / 1: Servo stop]	0	0 to 1	This parameter is effective only with the PMEC. If “0” is selected, after the positioning the actuator retains the current position at the torque set by parameter No. 12. If “1” is selected, the actuator retains the current position via servo control.
12	Current-limiting value after positioning stop [%]	35	0 to 70	This parameter is effective only with the PMEC. To be specific, it is effective only when parameter No. 11 is set to “0.” Increasing the value increases the holding torque at standstill. If the actuator experienced hunting while standstill due to application of a large external force, increase this value.
13	Current-limiting value during home return [%]	Actuator-specific value	0 to 120	Current-limiting value that applies while the actuator is pushing against the mechanical end during home return.
14	Positioning wait time in auto operation [sec]	0.010	0.010 to 60.000	This parameter is not used with AMEC and PMEC controllers.
15	Soft limit [mm]	Actuator-specific value	0.01 to 999.69	Set the effective stroke range.
16	Home return offset [mm]	Actuator-specific value	0.00 to actuator-specific value	Change this parameter if you want to fine-tune the home position.
17	Home return direction [0: Reverse / 1: Forward]	Actuator-specific value	0 to 1	“Forward” indicates the motor side, while “Reverse” indicates the counter-motor side. * The home return direction cannot be changed for rod-type actuators.
20	Position data change password	0000	0000 to 9999	If “0000” is set, you no longer need to enter a password.

2.6 Servo Adjustment

Before the controller is shipped from the factory, its parameters are set so that the applicable actuator will operate stably in response to position commands within the rated (maximum) payload capacity of the actuator.
In the actual location of use, however, the load condition may not always be ideal. In many cases the actuator must be operated under various undesirable conditions such as resonance, induced vibration and load variation.
It goes without saying that the actuator will have the more stable operation characteristics when the servo is adjusted optimally to address the actual loads and operating conditions that will occur in the final installed condition. However, general-purpose actuators such as IAI's actuators which are set to operate under an unspecified number of conditions may require servo adjustments depending on the condition.

2.6.1 Adjustment

No.	Condition where adjustment is needed	Adjustment method
1	Settling time after positioning is long / Positioning precision is low / Want to shorten the tact time	Increase the value of “Servo gain number.” Increasing the set value improves compliance with the position command. Try increasing the value one by one. If an excessively large value is set, the actuator will overshoot easily and noise or vibration may occur. If the value of “Servo gain number” has been increased, also adjust the value of “Speed loop proportional gain” in the increasing direction to ensure sufficient stability of the control system.
2	Vibration occurs during acceleration/deceleration	Decrease the values of “Acceleration/deceleration setting” and “Servo gain number.” This problem is caused by lack of rigidity of the mechanical structure. Accordingly, the first step should be to reinforce the machine itself. Lowering the value of “Servo gain number” too much will increase the settling time after positioning.
3	Speed fluctuates during movement / Speed precision is low	Increase the value of “Speed loop proportional gain.” Increasing the set value improves compliance with the speed command. If an excessively large value is set, mechanical vibration will occur easily. As a setting guideline, try increasing the default value by 20% or so at a time.
4	Abnormal noise occurs / In particular, noticeable high-pitch noise occurs while the actuator is at standstill or operating at low speed (50 mm/sec or below)	Input an appropriate value of “Torque filter time constant.” As a setting guideline, try increasing the value by 50 or so at a time. If an excessively large value is set, the control system will become unstable and vibration may occur. ⊙ Before adjustment This phenomenon tends to occur when the mechanical system lacks rigidity. Even when one actuator is used in a standalone condition, resonance may still occur if the stroke exceeds 600 mm or the actuator uses belt drive. Accordingly, check the following items before adjustment: [1] Are the values of “Servo gain number,” “Speed loop proportional gain” and “Speed loop integral gain” not excessive? [2] Is the rigidity of the load maintained as much as possible? Is there looseness, play, etc., at the mounting points? [3] Is the actuator installed securely? [4] Is the actuator mounting surface distorted?

2.6.2 Servo Parameters

- User parameter No. 3, “Servo gain number”
  This parameter determines the response of the position control loop.
  Increasing the set value improves compliance with the position command.
  Note, however, that setting an excessively large value causes the actuator to overshoot easily.
  If the set value is small, compliance with the position command drops and positioning takes a longer time.

- User parameter No. 4, “Torque filter time constant”
  This parameter determines the filter time constant relative to the torque command.
  If the resonance frequency of the machine is equal to or less than the response frequency of the servo loop, the motor will vibrate.
  You can increase the set value of this parameter to suppress this mechanical resonance.
  Note, however, that setting an excessively large value may affect the stability of the control system.

- User parameter No. 5, “Speed loop proportional gain”
  This parameter determines the response of the speed control loop.
  Increasing the set value improves compliance with the speed command (increases the servo rigidity).
  The greater the load inertia, the larger the set value of this parameter should be.
  Note, however, that setting an excessively large value causes the actuator to overshoot or oscillate, resulting in frequent vibration of mechanical system.

- User parameter No. 6, “Speed loop integral gain”
  This parameter determines the response of the speed control loop.
  Increasing the set value improves response to the speed command and also increases the resilience to load variation.
  Setting an excessively large value causes the actuator to overshoot or oscillate, resulting in frequent vibration of mechanical system. If the set value is too small, on the other hand, compliance with the position command drops and positioning takes a longer time.

2.7 Alarms

2.7.1 Alarm Levels

Alarms are classified into two levels according to the natures of corresponding errors.

Alarm levels	Normal/alarm lamp	What happens upon occurrence of alarm	How to reset
Operation cancellation	Illuminates in red.	The actuator is forcibly stopped. (The actuator decelerates to a stop, after which the motor power (servo) turns off.)	Input the reset signal (RES) or perform a reset using the MEC PC software or other teaching tool.
Cold start	Illuminates in red.	The actuator is forcibly stopped. (The actuator decelerates to a stop, after which the motor power (servo) turns off. The home return complete status is cancelled.)	Reconnect the power. (Home return must be performed again.)

Before resetting any alarm, always identify and remove the cause.
If the cause of the alarm cannot be removed or the alarm cannot be reset after removing the cause, contact IAI.

Caution

- If the same error occurs after resetting the alarm, the cause of the alarm is not yet removed. Remove the cause and then reset the alarm again.

2.7.2 Alarm Codes and Troubleshooting

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Operation cancellation	○	○	080	Move command during servo OFF	Cause: Jogging or other operation was performed from the touch-panel teaching pendant when the motor power (servo) was off. Action: Turn on the motor power (servo) and then perform jogging or other operation.
	○	○	082	Move command before completion of home return	Cause: A move command was input when home return was not yet complete. Action: Input the ST0 signal to perform home return.
	○	○	084	Move command during home return	Cause: A move command was input when home return was still in progress. Action: Cancel the move command, reset the alarm, and then perform home return again.
	○	○	090	Soft reset during servo ON	Cause: A soft reset was performed when the motor power (servo) was on. Action: Perform a soft reset after confirming that the motor power (servo) is off.
	○	○	0A1	Parameter data error	Cause: Invalid data input range in the parameter area. Action: Change the data to an appropriate value by referring to the user parameter table.
	○	○	0A2	Position data error	Cause: [1] A move command was input when the target position was not yet set in the position data table. [2] The position data value for target position exceeds the set value of soft limit. Action: [1] Set the target value. [2] Change the target position to a value less than the set value of soft limit.
	○	○	0A3	VEL/ACC data error	Cause: The speed or acceleration/deceleration exceeds the maximum value that can be set. Action: Change the setting to an appropriate value.
	○	○	0A7	Command deceleration error	The soft limit may be exceeded if the speed is changed (increased) near the end point or start point and the deceleration setting is low. Cause: The speed change command was not issued in a timely manner while the actuator was moving. Action: Quicken the speed change timing to prevent the actuator from overshooting beyond the soft limit.
Cold start	○	○	0A8	Unsupported motor/encoder type	Cause: The motor type or encoder type set by the parameter is not supported. Action: Set the parameter again.
		○	0B4	Inconsistent electrical angle	Cause: The AMEC detects the magnetic pole phase (pole sensing) when the motor power (servo) is turned on for the first time after the power on. This pole sensing could not be performed because the slider or rod was locked by an external force, etc., or otherwise did not move. Action: If the slider or rod is locked and does not move, remove the cause of lock. If the actuator is suspected as the cause, contact IAI.

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Operation cancellation		○	0B5	Z-phase position error	Cause: Defective encoder. Action: Contact IAI.
		○	0B6	Z-phase detection timeout	The AMEC detects the magnetic pole phase (pole sensing) when the motor power (servo) is turned on for the first time after the power on. During pole sensing, the encoder Z-phase signal could not be recognized after a specified time. Cause: [1] The actuator cable connector may be loose or the cable may be broken. [2] If the actuator has a brake, the brake may not be released. [3] The motor load may have increased due to an external force. [4] The slide resistance of the actuator itself may be high. Action: [1], [2] Check the wiring condition of the actuator cable. [3] Check the assembly condition of mechanical parts for abnormality. [4] If the load weight is normal, turn off the power and manually move the actuator to check the slide resistance. If the actuator is suspected as the cause, contact IAI.
Cold start		○	0B7	Indeterminable magnetic pole	This controller detects the magnetic pole phase when the motor power (servo) is turned on for the first time after the power on. This magnetic pole phase could not be detected after a specified time. Cause: [1] The actuator cable connector may be loose or the cable may be broken. [2] If the actuator has a brake, the brake may not be released. [3] The motor load may have increased due to an external force. [4] The power was turned on when the actuator was contacting the mechanical end. [5] The slide resistance of the actuator itself may be high. Action: [1], [2] Check the wiring condition of the actuator cable. [3] Check the assembly condition of mechanical parts for abnormality. [4] Move the actuator away from the mechanical end, and then reconnect the power. [5] If the load weight is normal, turn off the power and manually move the actuator to check the slide resistance. If the actuator is suspected as the cause, contact IAI.

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Cold start	○		0B8	Excitation detection error	The PMEC detects the excitation phase when the motor power (servo) is turned on for the first time after the power on. The specified encoder signal level could not be detected after the specified excitation time. Cause: [1] The actuator cable connector may be loose or the cable may be broken. [2] If the actuator has a brake, the brake may not be released. [3] The motor load may have increased due to an external force. [4] The power was turned on when the actuator was contacting the mechanical end. [5] The slide resistance of the actuator itself may be high. Action: [1], [2] Check the wiring condition of the motor cable. [3] Check the assembly condition of mechanical parts for abnormality. [4] Move the actuator away from the mechanical end, and then reconnect the power. [5] If the load weight is normal, turn off the power and manually move the actuator to check the slide resistance. If the actuator is suspected as the cause, contact IAI.
	○	○	0BA	Home sensor not yet detected	The actuator using a home check sensor has not yet successfully completed home return operation. Cause: [1] The work part contacted a surrounding structure, part, etc., during home return. [2] The slide resistance of the actuator may have increased in some areas. [3] The home check sensor may be installed improperly, faulty or its wire may be broken. Action: If the work part is not contacting any surrounding structure, part, etc., [2] or [3] is suspected. Contact IAI.
	○	○	0BE	Home return timeout	Cause: Home return did not complete after the specified time following the start of home return. (This alarm should not generate during normal operation.) Action: The controller and actuator combination may be wrong, among others. Contact IAI.

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Cold start	○	○	0C0	Excessive actual speed	Cause: The motor speed exceeds the maximum speed set by the manufacturer parameter. (This alarm should not generate during normal operation.) [1] The slide resistance of the actuator may have decreased in some areas. [2] The load may have decreased due to momentary application of an external force. This alarm may generate if the load decreased before a servo error as detected due to [1] or [2] and the actuator operated suddenly as a result. Action: Check the assembly condition of mechanical parts for abnormality. If the actuator is suspected as the cause, contact IAI.
	○		0C1	Servo error	The motor could not operate for 2 seconds or more after the move command was accepted and before the target position was reached. Cause: [1] The actuator cable connector may be loose or the cable may be broken. [2] If the actuator has a brake, the brake may not be released. [3] The load may have increased due to an external force. [4] The slide resistance of the actuator itself may be high. Action: [1], [2] Check the wiring condition of the actuator cable. [3] Check the assembly condition of mechanical parts for abnormality. [4] If the load weight is normal, turn off the power and manually move the actuator to check the slide resistance. If the actuator is suspected as the cause, contact IAI.
		○	0C8	Overcurrent	Cause: The output current in the power circuit became abnormally high. Isolation degradation of the motor coil is suspected. Action: Measure resistance between motor wires U, V and W, as well as isolation resistance relative to ground, to check for isolation degradation. If you wish to perform this measurement, contact IAI.
Operation cancellation	○		0C9	Overvoltage	The voltage of the 24-V power supply became excessive (24 V + 20%: 28.8 V or above). Cause: [1] The voltage of the 24-V power supply may be high. [2] A faulty component in the controller is suspected. Action: Check the input power voltage. If the voltage is normal, contact IAI.

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Cold start	○	○	0CA	Overheat	Cause: [1] The internal temperature of the controller became high (95°C or above). [2] Regenerative resistance energy may have become insufficient due to a high deceleration setting when the vertically installed actuator was moving downward. [3] A faulty component in the controller is suspected. [4] There is an obstruction near the cooling fan. Action: [1] Lower the ambient temperature of the controller. [2] Readjust the setting conditions so that the deceleration curve becomes gradual. If [1] and [2] are not the cause, contact IAI. [4] Eliminate the obstruction near the cooling fan.
Operation cancellation		○	0CB	Current sensor offset adjustment error	An error was detected in the current detection sensor during initialization after the startup. Cause: [1] The current detection sensor or any nearby part may be faulty. [2] Offset adjustment may have been inappropriate. Action: The board must be replaced or offset adjustment performed again. Contact IAI.
	○	○	0CC	Control power-supply voltage error	The voltage of the 24-V power supply became excessive (24 V + 20%: 28.8 V or above). Cause: [1] The voltage of the 24-V power supply may be high. [2] A faulty component in the controller is suspected. Action: If the power-supply voltage of the controller is normal, contact IAI.
	○	○	0CE	Control power-supply undervoltage	The voltage of the 24-V power supply became low (24 V -20%: 19.2 V or below). Cause: [1] The voltage of the 24-V power supply may be low. [2] A faulty component in the controller is suspected. Action: If the power-supply voltage of the controller is normal, contact IAI.
		○	0D2	Motor power-supply overvoltage	The voltage of the motor power supply became excessive (24 V + 58%: 38 V or above). Cause: [1] The voltage of the 24-V power supply may be high. [2] A faulty component in the controller is suspected. Action: If the power-supply voltage of the controller is normal, contact IAI.
Cold start	○	○	0D6	Fan error detection	Cause: The cooling fan generated an error. Action: If the error persists after reconnecting the power, contact IAI.
Operation cancellation	○	○	0D8	Deviation overflow	The position deviation counter overflowed. Cause: The speed may have dropped due to an external force, etc., while the actuator was moving. Action: Check the load condition such as whether the work part is contacting any surrounding structure, part, etc., and if the brake is released, and remove the applicable cause.

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Operation cancellation	○	○	0C9	Software stroke limit over	Cause: [1] It caused the actuator to overshoot and the software limit may have been exceeded due to a large load or high deceleration setting when the target position of the vertically installed actuator is close to the soft limit. [2] The motor power (servo) may have been turned on after the actuator was moved to outside the soft limits when the motor power (servo) was off. Action: [1] Set an appropriate deceleration curve that will not cause the actuator to overshoot when stopping. [2] Return the actuator to inside the soft limits and turn on the motor power (servo).
	○	○	0CD	Push-motion operation range over	This alarm generates when the actuator was pushed back to the start position of push after completion of push, due to an excessive push-back force. Review the entire system.
Cold start		○	0E0	Overload	Cause: [1] The load may have increased due to an external force. [2] If the actuator has a brake, the brake may not be released. [3] The slide resistance of the actuator may have increased in some areas. Action: [1] If any abnormal external force is applied, remove the external force. [2] Turn on the motor power (servo) to check if the brake is released. If the brake is not released, a faulty brake, broken cable or faulty component in the controller is suspected, among others. [3] If the work part can be moved by hand, move the work part by hand to check if the slide resistance increases at any point. If [2] or [3] is the cause, contact IAI. Note: Be sure to remove the cause of the alarm before resuming the operation. If the power was cut off, wait for at least 30 minutes before turning the power back on to prevent the motor coil from suffering burned damage.
	○	○	0E5	Encoder receive error	Cause: The connector in the controller may be loose or disconnected. Action: If the alarm occurs again after reconnecting the controller power, contact IAI.
		○	0E7	Open phase A/B/Z	Encoder signals are not detected normally. Cause: The actuator cable connector may be loose or the cable may be broken. Action: Check the connection condition of the actuator cable and also check its electrical continuity. If the check results are normal, contact IAI.

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Cold start	○		0E8	Open phase A/B	Encoder signals are not detected normally. Cause: The actuator connector cable may be loose or the cable may be broken. Action: Check the connection condition of the actuator connector cable and also check its electrical continuity. If the check results are normal, contact IAI.
	○		0E9	Open phase A	
	○		0EA	Open phase B	
		○	0F0	Driver logic error	Cause: Excessive load, inconsistent parameter (motor type), noise or controller failure is suspected, among others. Action: Contact IAI.
	○	○	0F4	PCB mismatch error	Each controller has its board (PCB) components mounted differently according to the motor capacity. This error occurs if the startup check finds that the motor type does not match the board. Cause: Parameter setting error or board assembly error is suspected. Action: If this error has occurred, contact IAI.
Operation cancellation	○	○	0F5	Non-volatile memory write verification error	When data is written to the non-volatile memory (EEPROM), the stored data is compared with the written data to confirm consistency. This error occurs if the two sets of data do not match. Cause: [1] The non-volatile memory may be faulty. [2] The memory may have been written more than 100,000 times. (As a guide, the nominal life of the non-volatile memory corresponds to 100,000 times of writing.) Action: If the error persists after reconnecting the power, contact IAI.
	○	○	0F6	Non-volatile memory write timeout	This alarm indicates that no response was received within the specified time after writing data to the non-volatile memory. Cause: [1] The non-volatile memory may be faulty. [2] The memory has been written more than 100,000 times. (As a guide, the nominal life of the non-volatile memory corresponds to 100,000 times of writing.) Action: If the error persists after reconnecting the power, contact IAI.
Cold start	○	○	0F8	Corrupt non-volatile memory data	Abnormal data was detected in the non-volatile memory check after the startup. Cause: [1] The non-volatile memory is faulty. [2] The memory may have been written more than 100,000 times. (As a guide, the nominal life of the non-volatile memory corresponds to 100,000 times of writing.) Action: If the error persists after reconnecting the power, contact IAI.

Error level	PMEC	AMEC	Code	Alarm name	Cause/action
Cold start	○	○	0FA	CPU error	The CPU is not operating normally. Cause: [1] The CPU itself may be faulty. [2] Malfunction due to noise is suspected. Action: If the error persists after reconnecting the power, contact IAI.
	○	○	0FC	Logic error	Internal circuits of the controller are not functioning normally. Cause: Malfunction due to a faulty component in the controller or noise is suspected. Action: If the error persists after reconnecting the power, contact IAI.

Appendix

1. List of Specifications of Connectable Actuators

The specifications included in this specification list are limited to those needed to set operating conditions and parameters. For other detailed specifications, refer to the catalog or operation manual for your actuator.

⚠ Caution

- The push force is based on the rated push speed (factory setting) indicated in the list, and provides only a guideline.
- Make sure the actual push force is equal to or greater than the minimum push force. If not, the push force will not stabilize.
- Do not change the setting of push speed (parameter No. 7). If you must change the push speed, consult IAI.
- If, among the operating conditions, the positioning speed is set to a value equal to or smaller than the push speed, the push speed will become the set speed and the specified push force will not generate.

[1] PMEC

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (rod type)	RA2C	Ball screw	800	1	Horizontal/ vertical	1.25	25	0.05	50	100	3
	RA3C	Ball screw	800	5	Horizontal/ vertical	6.25	187	0.2	21	73.5	20
				2.5	Horizontal/ vertical	3.12	114		50	156.8	
	RGD3C	Ball screw	800	5	Horizontal/ vertical	6.25	187	0.2	21	73.5	20
				2.5	Horizontal	3.12	114		50	156.8	
					Vertical		93				
	RA4C	Ball screw	800	10	Horizontal/ vertical	12.5	458 (at to 250st) 350 (at 300st)	0.2	30	150	20
				5	Horizontal/ vertical	6.25	250 (at 50 to 200st) 237 (at 250st) 175 (at 300st)		75	284	
				2.5	Horizontal	3.12	125 (at 50 to 200st) 118 (at 250st) 87 (at 300st)		150	358	
					Vertical		114				
	RGS4C	Ball screw	800	10	Horizontal/ vertical	12.5	458 (at to 250st) 350 (at 300st)	0.2	30	150	20
				5	Horizontal/ vertical	6.25	250 (at 50 to 200st) 237 (at 250st) 175 (at 300st)		75	284	
				2.5	Horizontal	3.12	125 (at 50 to 200st) 118 (at 250st) 87 (at 300st)		150	358	
					Vertical		114				

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (rod type)	RGD4C	Ball screw	800	10	Horizontal/ vertical	12.5	458 (at to 250st) 350 (at 300st)	0.2	30	150	20
				5	Horizontal/ vertical	6.25	250 (at 50 to 200st) 237 (at 250st) 175 (at 300st)		75	284	
				2.5	Horizontal	3.12	125 (at 50 to 200st) 118 (at 250st) 87 (at 300st)		150	358	
					Vertical		114				
	RA6C	Ball screw	800	16	Horizontal	20	450	0.2	75	240	20
					Vertical		400				
				8	Horizontal/ Vertical	10	210		130	470	
				4	Horizontal/ vertical	5	130		300	800	
	RGS6C	Ball screw	800	16	Horizontal	20	450	0.2	75	240	20
					Vertical		400				
				8	Horizontal/ vertical	10	210		130	470	
				4	Horizontal/ vertical	5	130		300	800	
	RGD6C	Ball screw	800	16	Horizontal	20	450	0.2	75	240	20
					Vertical		400				
				8	Horizontal/ vertical	10	210		130	470	
				4	Horizontal/ vertical	5	130		300	800	
	SRA4R	Ball screw	800	5	Horizontal/ vertical	6.25	250	0.3	26	90	20
				2.5	Horizontal	3.12	124	0.2	50	170	
					Vertical		125				
RCP2 (slider type)	SRGS4R	Ball screw	800	5	Horizontal/ vertical	6.25	250	0.3	26	90	20
				2.5	Horizontal	3.12	124	0.2	50	170	
					Vertical		125				
	SRGD4R	Ball screw	800	5	Horizontal/ vertical	6.25	250	0.3	26	90	20
				2.5	Horizontal	3.12	124	0.2	50	170	
					Vertical		125				

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SA5C	Ball screw	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 550st) 980 (at 600st) 850 (at 650st) 740 (at 700st) 650 (at 750st) 580 (at 800st)	0.7	11	39	20
					Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 600st) 740 (at 700st) 650 (at 750st) 580(at 800st)	0.2			
				12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.7	40	115	
					Vertical			0.3			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.7	70	210	
					Vertical			0.3			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.7	140	330	
					Vertical			0.3			
	SA5R	Ball screw	800	12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.2	–	–	–
					Vertical			0.2			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SA6C	Ball screw	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 550st) 980 (at 600st) 850 (at 650st) 740 (at 700st) 650 (at 750st) 580 (at 800st)	0.7	11	39	20
					Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 600st) 740 (at 700st) 650 (at 750st) 580 (at 800st)	0.2			
				12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.7	40	115	
					Vertical			0.3			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.7	70	210	
					Vertical			0.3			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.7	140	330	
					Vertical			0.3			
	SA6R	Ball screw	800	12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.2	–	–	–
					Vertical			0.2			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SA7C	Ball screw	800	16	Horizontal	20	380 (at 50st) 470 (at 100st) 533 (at 150 to 750st) 480 (at 800st)	0.3	90	250	20
					Vertical			0.2			
				8	Horizontal	10	266 (at 50 to 700st) 240 (at 800st)	0.3	150	500	
					Vertical			0.2			
				4	Horizontal	5	133 (at 50 to 700st) 120 (at 800st)	0.2	280	800	
					Vertical			0.2			
	SA7R	Ball screw	800	16	Horizontal	20	380 (at 50st) 470 (at 100st) 533 (at 150 to 750st) 480 (at 800st)	0.3	–	–	–
					Vertical		400	0.2			
				8	Horizontal	10	266 (at 50 to 700st) 240 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				4	Horizontal	5	133 (at 50 to 700st) 120 (at 800st)	0.2	–	–	–
					Vertical			0.2			
	SS7C	Ball screw	800	12	Horizontal	15	600 (at 50 to 500st) 470 (at 600st)	0.3	40	120	20
					Vertical			0.2			
				6	Horizontal	7.5	300 (at 50 to 500st) 230 (at 600st)	0.3	75	220	
					Vertical			0.2			
				3	Horizontal	3.75	150 (at 50 to 500st) 115 (at 600st)	0.2	140	350	
					Vertical			0.2			
	SS7R	Ball screw	800	12	Horizontal	15	600 (at 50 to 500st) 470 (at 600st)	0.3	–	–	–
					Vertical		440 (at 50 to 500st) 440 (at 600st)	0.2			
				6	Horizontal	7.5	250 (at 50 to 500st) 230 (at 600st)	0.3	–	–	–
					Vertical			0.2			
				3	Horizontal	3.75	105 (at 50 to 500st) 105 (at 600st)	0.2	–	–	–
					Vertical			0.2			
	SS8C	Ball screw	800	20	Horizontal	25	666 (at 50 to 800st) 625 (at to 900st) 515 (at to 1000st)	0.3	50	180	20
					Vertical		600 (at 50 to 800st) 600 (at to 900st) 515 (at to 1000st)	0.2			
				10	Horizontal	12.5	333 (at 50 to 800st) 310 (at to 900st) 255 (at to 1000st)	0.3	95	320	
					Vertical		300 (at 50 to 800st) 300 (at to 900st) 255 (at to 1000st)	0.2			
				5	Horizontal	6.25	165 (at 50 to 800st) 155 (at to 900st) 125 (at to 1000st)	0.2	180	630	
					Vertical		150 (at 50 to 800st) 150 (at to 900st) 125 (at to 1000st)	0.2			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SS8R	Ball screw	800	20	Horizontal	25	600 (at 50 to 800st) 600 (at to 900st) 515 (at to 1000st)	0.3	–	–	–
					Vertical		333 (at 50 to 800st) 333 (at to 900st) 333 (at to 1000st)	0.2			
				10	Horizontal	12.5	300 (at 50 to 800st) 300 (at to 900st) 255 (at to 1000st)	0.3	–	–	–
					Vertical		250 (at 50 to 800st) 250 (at to 900st) 250 (at to 1000st)	0.2			
				5	Horizontal	6.25	160 (at 50 to 800st) 155 (at to 900st) 125 (at to 1000st)	0.2	–	–	–
					Vertical		140 (at 50 to 800st) 140 (at to 900st) 140 (at to 1000st)	0.2			
	HS8C	Ball screw	800	30	Horizontal	37.5	1200 (at 50 to 800st) 1000 (at to 900st) 800 (at to 1000st)	0.3	–	–	–
					Vertical		750 (at 50 to 800st) 750 (at to 900st) 750 (at to 1000st)	0.2			
RCP2 (belt type)	BA6/ BA6U	Belt	800	Equivalent to 54	Horizontal	67.5	1000	0.5	–	–	–
	BA7/ BA7U	Belt	800	Equivalent to 54	Horizontal	67.5	1500	0.5	–	–	–
RCP2 (gripper type)	GRSS	–	800	1.57	–	1.96	78	–	4	14	20
	GRLS	–	800	12	–	15 (deg/s)	600 (deg/s)	–	1.8	6.4	5 (deg/s)
	GRS	–	800	1	–	1.25	33.3	–	9	21	5
	GRM	–	800	1.1	–	1.37	36.7	–	23	80	5
	GRST	–	800	1.05	–	1.31	34	–	15	40	5
		–	800	2.27	–	2.83	75	–	7.5	20	5
	GR3LS	–	800	12	–	15	200	–	5	18	5 (deg/s)
	GR3LM	–	800	12	–	15	200	–	15	51	5 (deg/s)
	GR3SS	–	800	2.5	–	3.12	40	–	7	22	5
	GR3SM	–	800	3	–	3.75	50	–	30	102	5
	GRHM	–	800	2	–	2.5	100	–	25	125	5
	GRHB	–	800	2	–	2.5	100	–	60	200	5

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (rotary type)	RTBS	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTBSL	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTCS	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTCSL	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTB	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTBL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTC	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTCL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTBB	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTBBL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTCB	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTCBL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (rod type)	RA2AC	Lead screw	800	4	Horizontal/ vertical	5	180 (at 25st) 200 (at 50 to 100st)	0.2	0.9	16.1	5
				2		2.5	100		1.9	28.3	
				1		1.25	50		3.8	39.5	
	RA2BC	Lead screw	800	6	Horizontal/ vertical	7.5	180 (at 25st) 28 0(at 50st) 300 (at 75 to 150st)	0.2	0.6	11.9	5
				4		5	180 (at 25st) 200 (at 50 to 150st)		0.9	16.1	
				2		2.5	100		1.9	28.3	
	RA2AR	Lead screw	800	4	Horizontal/ vertical	5	180 (at 25st) 200 (at 50 to 150st)	0.2	0.9	16.1	5
				2		2.5	100		1.9	28.3	
				1		1.25	50		3.8	39.5	
	RA2BR	Lead screw	800	6	Horizontal/ vertical	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.2	0.6	11.9	5
				4		5	180 (at 25st) 200 (at 50 to 150st)		0.9	16.1	
				2		2.5	100		1.9	28.3	
RCP3 (slider type)	SA2AC	Lead screw	800	4	Horizontal	5	180 (at 25st) 200 (at 50 to 100st)	0.2	–	–	–
				2		2.5	100				
				1		1.25	50				
	SA2BC	Lead screw	800	6	Horizontal	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.2	–	–	–
				4		5	180 (at 25st) 200 (at 50 to 150st)				
				2		2.5	100				
	SA2AR	Lead screw	800	4	Horizontal	5	180 (at 25st) 200 (at 50 to 100st)	0.2	–	–	–
				2		2.5	100				
				1		1.25	50				
	SA2BR	Lead screw	800	6	Horizontal	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.2	–	–	–
				4		5	180 (at 25st) 200 (at 50 to 150st)				
				2		2.5	100				
	SA3C	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	20
					Vertical			0.2			
				4	Horizontal	5	200	0.3	14	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	27	44	
					Vertical			0.2			
	SA3R	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	–
					Vertical			0.2			
				4	Horizontal	5	200	0.3	14	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	27	44	
					Vertical			0.2			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (slider type)	SA4C	Ball screw	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100 to 500st)	0.7	20	34	20
					Vertical			0.3			
				5	Horizontal	6.25	250	0.7	40	68	
					Vertical			0.3			
				2.5	Horizontal	3.12	125	0.7	82	136	
					Vertical			0.3			
	SA4R	Ball screw	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100 to 500st)	0.3	20	34	–
					Vertical			0.2			
				5	Horizontal	6.25	250	0.3	40	68	
					Vertical			0.2			
				2.5	Horizontal	3.12	125	0.2	82	136	
					Vertical			0.2			
	SA5C	Ball screw	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 600st) 910 (at 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.7	17	28	20
					Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.2			
				12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.7	28	47	
					Vertical			0.3			
				6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.7	57	95	
					Vertical			0.3			
				3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.7	113	189	
					Vertical			0.3			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (slider type)	SA5R	Ball screw	800	12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	30	47	20
					Vertical			0.2			
				6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	112	189	
					Vertical			0.2			
	SA6C	Ball screw	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 600st) 910 (at 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.7	17	28	20
					Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.2			
				12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.7	28	47	
					Vertical			0.3			
				6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.7	57	95	
					Vertical			0.3			
				3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.7	113	189	
					Vertical			0.3			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (slider type)	SA6R	Ball screw	800	12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	30	47	20
					Vertical			0.2			
				6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	112	189	
					Vertical			0.2			
RCP3 (table type)	TA3C	Ball screw	800	6	Horizontal	7.5	300	0.3	5.4	9	20
					Vertical		200	0.2			
				4	Horizontal	5	200	0.3	8.4	14	
					Vertical		133	0.2			
				2	Horizontal	2.5	100	0.2	16.8	28	
					Vertical		67	0.2			
	TA3R	Ball screw	800	6	Horizontal	7.5	300	0.3	5.4	9	20
					Vertical		200	0.2			
				4	Horizontal	5	200	0.3	8.4	14	
					Vertical		133	0.2			
				2	Horizontal	2.5	100	0.2	16.8	28	
					Vertical		67	0.2			
	TA4C	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	20
					Vertical			0.2			
				4	Horizontal	5	200	0.3	13.2	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	26.4	44	
					Vertical			0.2			
	TA4R	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	20
					Vertical			0.2			
				4	Horizontal	5	200	0.3	13.2	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	26.4	44	
					Vertical			0.2			
	TA5C	Ball screw	800	10	Horizontal	12.5	465	0.3	20	34	20
					Vertical		400	0.2			
				5	Horizontal	6.25	250	0.3	40	68	
					Vertical			0.2			
				2.5	Horizontal	3.12	125	0.2	82	136	
					Vertical			0.2			
	TA5R	Ball screw	800	10	Horizontal	12.5	465	0.3	20	34	20
					Vertical		400	0.2			
				5	Horizontal	6.25	250	0.3	40	68	
					Vertical			0.2			
				2.5	Horizontal	3.12	125	0.2	82	136	
					Vertical			0.2			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (table type)	TA6C	Ball screw	800	12	Horizontal	15	560	0.3	30	47	20
					Vertical		500	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			
	TA6R	Ball screw	800	12	Horizontal	15	560	0.3	30	47	20
					Vertical		500	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			
	TA7C	Ball screw	800	12	Horizontal	15	600	0.3	30	47	20
					Vertical		580	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			
	TA7R	Ball screw	800	12	Horizontal	15	600	0.3	30	47	20
					Vertical		580	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			

[2] AMEC

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RA3C	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25	250	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12	125	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RGS3C	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25	250	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12	125	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RGD3C	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25	250	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12	125	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RA3D	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RGS3D	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RGD3D	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RA3R	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RGD3R	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RA4C	Ball screw	20	800	12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
			30		12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RGS4C	Ball screw	20	800	12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
			30		12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RGD4C	Ball screw	20	800	12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
			30		12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RA4D	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	RGS4D	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	RGD4D	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	RA4R	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RGD4R	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	SRA4R	Ball screw	20	800	5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	SRGS4R	Ball screw	20	800	5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	SRGD4R	Ball screw	20	800	5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (slider type)	SA4C	Ball screw	20	800	10	Horizontal/ vertical	12.5	665	Energy-saving spec.: 0.3 High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25	330	Energy-saving spec.: 0.3 High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12	165	Energy-saving spec.: 0.2 High acc/dec spec.: 0.2	–	–	–
	SA4D	Ball screw	20	800	10	Horizontal/ vertical	12.5	665	0.3	–	–	–
					5	Horizontal/ vertical	6.25	330	0.3	–	–	–
					2.5	Horizontal/ vertical	3.12	165	0.2	–	–	–
	SA4R	Ball screw	20	800	10	Horizontal/ vertical	12.5	665	0.3	–	–	–
					5	Horizontal/ vertical	6.25	330	0.3	–	–	–
					2.5	Horizontal/ vertical	3.12	165	0.2	–	–	–
	SA5C	Ball screw	20	800	20	Horizontal	25	1300	Energy-saving spec.: 0.3	–	–	–
						Vertical		800	High acc/dec spec.: 0.8	–	–	–
					12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st)	Energy-saving spec.: 0.3 High acc/dec spec.: 0.8	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st)	Energy-saving spec.: 0.3 High acc/dec spec.: 0.8	–	–	–
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st)	Energy-saving spec.: 0.2 High acc/dec spec.: 0.2	–	–	–
	SA5D	Ball screw	20	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st)	0.2	–	–	–
	SA5R	Ball screw	20	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st)	0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (slider type)	SA6C	Ball screw	30	800	20	Horizontal	25	1300 (at50 to 500st) 1160 (at 550st) 990 (at 600st)	Energy-saving spec.: 0.3	–	–	–
						Vertical		800	High acc/dec spec.: 0.8	–	–	–
					12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0			
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0			
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2			
	SA6D	Ball screw	30	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	0.2	–	–	–
	SA6R	Ball screw	30	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	0.2	–	–	–
	SS4D	Ball screw	20	800	10	Horizontal/ vertical	12.5	665	0.3	–	–	–
					5	Horizontal/ vertical	6.25	330	0.3	–	–	–
					2.5	Horizontal/ vertical	3.12	165	0.2	–	–	–
	SS5D	Ball screw	20	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st)	0.3	–	–	–
					3	Horizontal/ vertical	3.25	200 (at 50 to 450st) 190 (at 500st)	0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (slider type)	SS6D	Ball screw	30	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	0.3	–	–	–
					3	Horizontal/ vertical	3.25	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	0.2	–	–	–
RCA (arm type)	A4R	Ball screw	20	800	10	Horizontal/ vertical	12.5	330	0.2	–	–	–
					5		6.25	165	0.2	–	–	–
	A5R	Ball screw	20	800	12		15	400	0.2	–	–	–
					6		7.5	200	0.2	–	–	–
	A6R	Ball screw	30	800	12		15	400	0.2	–	–	–
					6		7.5	200	0.2	–	–	–
RCA2 (rod type)	RN3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	RP3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	GS3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	GD3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	SD3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	RN4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (rod type)	RP4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	GS4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	GD4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	SD4N	Ball screw	20	1048	6	Horizontal	5.72	240 (at 25st) 300 (at 50 to 75st)	0.3	–	–	–
						Vertical		200 (at 25st) 300 (at 50 to 75st)	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	200 (at 25st) 300 (at 50 to 75st)	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (slider type)	SA3C	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA3R	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA4C	Ball screw	20	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100 to 500st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA4R	Ball screw	20	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100 to 500st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (slider type)	SA5C	Ball screw	20	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 600st) 910 (at 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.3	–	–	–
						Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.2	–	–	–
					12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA5R	Ball screw	20	800	12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (slider type)	SA6C	Ball screw	30	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 600st) 910 (at 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.3	–	–	–
						Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.2	–	–	–
					12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA6R	Ball screw	30	800	12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (table type)	TC3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	TW3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	TF3N	Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100				
					1		0.95	50				
	TC4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TW4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TF4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA4C	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (table type)	TA4R	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA5C	Ball screw	20	800	10	Horizontal	12.5	465	0.3	–	–	–
						Vertical		400	0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA5R	Ball screw	20	800	10	Horizontal	12.5	465	0.3	–	–	–
						Vertical		400	0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA6C	Ball screw	20	800	12	Horizontal	15	560	0.3	–	–	–
						Vertical		500	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA6R	Ball screw	20	800	12	Horizontal	15	560	0.3	–	–	–
						Vertical		500	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA7C	Ball screw	30	800	12	Horizontal	15	600	0.3	–	–	–
						Vertical		580	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA7R	Ball screw	30	800	12	Horizontal	15	600	0.3	–	–	–
						Vertical		580	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–
RCL	RA1L	Linear	–	715	–	Horizontal/ Vertical	42	300	2	0.75	2	2
	RA2L			855		Horizontal/ Vertical	42	340	2	1.5	4	4
	RA3L			1145		Horizontal/ Vertical	42	450	2	3	8	8
	SA1L			715		Horizontal	42	420	2	–	–	–
	SA2L			855		Horizontal	42	460	2	–	–	–
	SA3L			1145		Horizontal	42	600	2	–	–	–
	SA4L			715		Horizontal	42	1200	2	–	–	–
	SM4L			715		Horizontal	42	1200	2	–	–	–
	SA5L			855		Horizontal	42	1400	2	–	–	–
	SM5L			855		Horizontal	42	1400	2	–	–	–
	SA6L			1145		Horizontal	42	1600	2	–	–	–
	SM6L			1145		Horizontal	42	1600	2	–	–	–

2. Push Force and Current-limiting Value

Caution

- The relationship of push force and current-limiting value is based on the rated push speed (factory setting) and provides only a guideline.
- Make sure the actual push force is equal to or greater than the minimum push force. If not, the push force will not stabilize.
- Do not change the setting of push speed (parameter No. 7). If you must change the push speed, consult IAI.
- If, among the operating conditions, the positioning speed is set to a value equal to or smaller than the push speed, the push speed will become the set speed and the specified push force will not generate.

RCP2 Series | Rod Type

RA2C Type

RA3C/RGD3C | RA4C/RGS4C/RGD4C | RA6C/RGS6C/RGD6C

High-speed type

Medium-speed type

Low-speed type

RCP2 Series Short Type

SRA4R/SRGS4R/SRGD4R

RCP2 Series Slider Type

SA5C/SA6C/SS7C Type

SA7C Type

SS8C Type

GRSS

GRLS

GRS

GRM

GRST

GR3LS
Gripping force (N)
25
20
15
10
5
0 10 20 30 40 50 60 70
Current-limiting value (ratio, %)

GR3LM
Gripping force (N)
60
50
40
30
20
10
0 10 20 30 40 50 60 70
Current-limiting value (ratio, %)

GR3SS
Gripping force (N)
25
20
15
10
5
0 10 20 30 40 50 60 70
Current-limiting value (ratio, %)

GR3SM
Gripping force (N)
120
100
80
60
40
20
0 10 20 30 40 50 60 70
Current-limiting value (ratio, %)

RCP3 Series | Slim, Compact Rod Type

RA2AC/RA2AR Lead 1

RA2BC/RA2BR Lead 2

RA2AC/RA2AR Lead 2

RA2BC/RA2BR Lead 4

RA2AC/RA2AR Lead 4

RA2BC/RA2BR Lead 6

RCP3 Series Slider Type

SA3C Type

SA4C Type

SA5C/SA6C Type

RCP3 Series Slim, Compact Table Type

TA3C/TA3R Type

TA4C/TA4R Type

RCP3 Series Table Type

TA5C Type

TA6C/TA7C Type

RA1L/RA2L/RA3L
Push force (N)
0
1
2
3
4
5
6
7
8
20
30
40
50
60
70
80
RA3L
RA2L
RA1L
Current-limiting value (ratio, %)

Warranty

1. Warranty Period

One of the following periods, whichever is shorter:

- 18 months after shipment from our factory
- 12 months after delivery to a specified location

2. Scope of Warranty

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

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

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

[1] Anything other than our product
[2] Modification or repair performed by a party other than us (unless we have approved such modification or repair)
[3] Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
[4] A natural disaster, man-made disaster, incident or accident for which we are not liable
[5] Natural fading of paint or other symptoms of aging
[6] Wear, depletion or other expected result of use
[7] Operation noise, vibration or other subjective sensation not affecting function or maintenance

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

3. Honoring Warranty

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

4. Limited Liability

[1] We shall assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
[2] We shall not be liable for any program or control method created by the customer to operate our product or for the result of such program or control method.

5. Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications

(1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.

(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:

[1] Medical equipment pertaining to maintenance or management of human life or health
[2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
[3] Important safety parts of mechanical equipment (such as safety devices)
[4] Equipment used to handle cultural assets, art or other irreplaceable item

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

6. Other Items Excluded from Warranty

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

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

Change History

Revision Date	Description of Revision
February 2010	First edition
March 2010	Second edition • Changed the title on the cover to “MEC Controller.” • Added the Japanese phonetic pronunciation of “MEC” in each title after the letters “MEC” (applicable to the Japanese version). • Changed the figure for [PIO 10-pin plug] in (4), “PIO signal connector” under 1.9, “Operation Patterns and PIO Signals” on p. 23. • Changed the maximum stroke to maximum speed in the table of “List of Specifications of Connectable Actuators” in the Appendix.
April 2010	Third edition • Changed the descriptions in 5, “IX SCARA robots” under “Applicable Modes of IAI’ s Industrial Robot” in “Safety Guide.” • Divided the power cables into “100 VAC specification” and “200 VAC specification” in the table of 1.2.1, “Components (Excluding Options)” on p. 11. • Added [2], “200 VAC specification” under (1), “Power cable (2 m)” in 1.11, “Wiring Cables” on p. 25. • Changed the addresses of our Head Office and Shizuoka Sales Office.
June 2010	Fourth edition • Added “MEC PC Software” in 1.2.3, “Operation Manuals Relating to This Product Included in Its Operation Manual (CD)” on p. 11.
August 2010	Fifth edition • Added the caution when setting the positioning band and when using a rotary actuator in “Handling Precautions” on page 8. • To add the function to change the number of positioning points from the operation panel and the position teaching function, replaced 2.1, "Operation Panel Functions,” 2.2, "Operation via Operation Panel,” and 2.3, "Default Settings and Stop Position Setting” on page 26 onward.
December 2010	Sixth edition • Changed “Encoder resolution” to “Number of encoder pulses” in the table provided under “List of Connectable Actuator Specifications” and changed the upper limit of maximum acceleration and deceleration to 0.3 [G] of PMEC controller in Appendix 1, among others. Seventh edition • Skipped
February 2011	Eighth edition • Made changes to comply with the CE Mark standard.
April 2011	Ninth edition • Swapped over the page for CE Marking
July 2011	Tenth edition • Contents changed and added in Appendix: List of Specifications of Connectable Actuators. • Contents changed in Warranty in p. 97 to p. 98

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