

MSEP

First Step Guide Fifth Edition

Thank you for purchasing our product.
 Make sure to read the Safety Guide and detailed Instruction Manual as well as this First Step Guide to ensure correct use.
 This Instruction Manual is original.

Warning : Read the instruction manual carefully and follow the instruction manual when handling this equipment.
 Please downloaded the user's manual from our website.
 You can download it free of charge. User registration is required for first time users.
 URL: www.iai-robot.co.jp/data_d/CAD_MANUAL/
 Keep a printout of the introduction manual near the equipment in which this product is installed so that it can be checked at all times, or display it on your computer, tablet terminal, etc. so that you can check it immediately.
 If you need a bound copy of the instruction manual, order it from the nearest sales office listed in the First Step Guide or at the end of the instruction manual. It will be provided for a fee.

- Using or copying all or part of this Instruction Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

Product Check

This product is comprised of the following parts if it is of standard configuration.
 If you find any fault in the contained model or any missing parts, contact us or our distributor.

1. Parts

No.	Part Name	Model	Remarks
1	Controller Main Body	Refer to "How to read the model plate", "How to read the model No."	
Accessories			
2	Power Connector	FKC2.5HC/4-ST-5.08 (Supplier : PHOENIX CONTACT)	Recommended Cable Size • Control Power Supply 0.5 to 0.3mm² (AWG20 to 22) • Motor Driving Power Supply 2.5 to 0.5mm² (AWG12 to 20)
3	External Brake Input Connector	FMCD1.5/5-ST-3.5 (Supplier : PHOENIX CONTACT)	Recommended cable size 0.5 to 0.2mm ² (AWG20 to 24)
4	Drive Cutoff/Emergency Stop Input Connector	FMCD1.5/8-ST-3.5 (Supplier : PHOENIX CONTACT)	Recommended Cable Size • Emergency Stop 0.5 to 0.2mm² (AWG20 to 24) • Motor Power External Input 1.25 to 0.5mm² (AWG16 to 20)
5	System I/O Connector	FMCD1.5/4-ST-3.5 (Supplier : PHOENIX CONTACT)	Recommended cable size 0.5 to 0.2mm ² (AWG20 to 24)
6	I/O Flat Cable (For PIO Type)	CB-MSEP-PIO***	***shows the cable length (Example) *** : 020 = 2 [m]
7	CC-Link Connector (For CC-Link Type)	MSTB2.5/5-ST-5.08 ABGY AU (Supplier : PHOENIX CONTACT)	Terminal Resistance (130Ω1/2W, 110Ω1/2W) enclosed one unit each
8	DeviceNet Connector (For DeviceNet Type)	MSTB2.5/5-ST-5.08 ABGY AU (Supplier : PHOENIX CONTACT)	Prepare a terminal resistor separately if this controller is to be allocated at the terminal.
9	Absolute Battery Box (Option)	MSEP-ABU (Battery AB-7)	For Simple Absolute Type
10	First Step Guide	ME0298	
11	Safety Guide	M0194	

2. Teaching Tool (Please purchase separately)

A teaching tool such as PC software is necessary when performing the setup for position setting, parameter setting, etc. that can only be done on the teaching tool.
 Please prepare either of the following teaching tools.

No.	Part Name	Model
1	PC Software (Includes RS232C Exchange Adapter + Peripheral Communication Cable)	RCM-101-MW
2	PC Software (Includes USB Exchange Adapter + USB Cable + Peripheral Communication Cable)	RCM-101-USB
3	Teaching Pendant (Touch Panel Teaching)	CON-PTA
4	Teaching Pendant (Touch Panel Teaching with deadman switch)	CON-PDA
5	Teaching Pendant (Touch Panel Teaching with deadman switch + TP Adapter (RCB-LB-TG))	CON-PGA
6	Teaching Pendant (Touch Panel Teaching)	TB-01
7	Teaching Pendant (Touch Panel Teaching with deadman switch)	TB-01D
8	Teaching Pendant (Dead man's switch right mounted touch panel teaching)	TB-01DR

3. Instruction manuals related to this product.

No.	Name	Manual No.
1	MSEP Controller Instruction Manual	ME0299
2	PC Software RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
3	Touch Panel Teaching CON-PTA/PDA/PGA Instruction Manual	ME0295
4	Touch Panel Teaching TB-01/TB-01D/TB-01DR Instruction Manual	ME0324
5	XSEL controller RC Gateway Function Instruction Manual	ME0188

4. How to read the model plate

Model →	MODEL	MSEP-C-5-20PI-N-42PI-PI-10I-20LA-DV-2-0-ABU
Serial number →	SERIAL No.	SI-E18392
Manufactured date →	PRODUCT DATE	2012/02/01
Manual No. →	MANUAL No.	ME0299
Input power supply →	CP INPUT	DC24V 2.0A
	MP INPUT	DC24V 7.6A
AXIS No. /OUTPUT		
	0	0-24Vac 3ph 0-333Hz 1.0A
	1	
	2	0-24Vac 3ph 0-333Hz 2.0A
	3	0-24Vac 3ph 0-333Hz 2.0A
	4	0-24Vac 3ph 0-333Hz 1.3A
	5	0-24Vac 3ph 0-333Hz 1.3A
	6	
	7	
⚠ CAUTION: Connect the wiring correctly and properly. use IAI Corporation specified cables.		
Made In Japan		

5. How to read controller model code

(Example) Consists of 5 axes: Axis No.0=pulse motor type, Axis No.2,3=servo motor type, Axis No.4=No connected axis and Axis No.1=Ineffective axis

MSEP-C-5-20PWAI-PWAI-10I-20I-N-DV-2-0-ABU-***			
<Series>			Identification for IAI use only * There is no identification in some cases
<Type>	C : Standard Type		<Applicable for Simple Absolute Type> ABB : Simple Absolute Type (with absolute battery) ABBN : Simple Absolute Type (with no absolute battery) No indication : Incremental
<Connected Axes>	1 to 8: Number of driver axes		<Power Voltage> 0 : 24V DC
<Detail of Connected Axis>			<I/O Cable Length> 0 : No cable 2 : 2m (Standard) 3 : 3m 5 : 5m
[Pulse Motor Type]			<I/O Type> NP : NPN Type (Sink type) (Standard) PN : PNP Type (Source type) DV : DeviceNet Type CC : CC-Link Type PR : PROFIBUS-DP Type CN : CompoNet Type EP : EtherNet/IP Type EC : EtherCAT Type PRT : PROFINET-IO Type
20P : 20□ pulse motor	2 : 2W servo motor		
20SP : 20□ pulse motor	5 : 5W servo motor		
28P : 28□ pulse motor	5S : 5W servo motor		
28SP : 28□ pulse motor	10 : 10W servo motor		
35P : 35□ pulse motor	20 : 20W servo motor		
42P : 42□ pulse motor	20S : 20W servo motor		
56P : 56□ pulse motor	30 : 30W servo motor		
P : Ineffective axis (Pulse motor)	3D : 3W brushless DC electric motor		
N : Not connected	A : Ineffective axis (Servo motor)		
[Encoder Type]			
WAI : Incremental / Battery-less Absolute Shared (Pulse Motor Type)			
I : Incremental (Servo Motor Type)			
SA : Simple Absolute (Pulse Motor / Servo Motor)			
[Option]			
HA : High Acceleration/Deceleration Type (when servo motor selected)			
LA : Low Power Consumption Type (when servo motor selected)			
T : High-Output Setting Type (when actuator selected)			

Basic Specifications

List of Specifications

Specification Item		Driver for Servo Motor				Driver for Pulse Motor		
Number of Controlled Axes		8 axes MAX.						
Control/Motor Power Supply Voltage		24V DC ±10%						
Brake Release Power Supply Current Consumption		0.15A × Number of axes						
Control Power Current Consumption		1A (Brake release power supply current consumption excluded)						
Control Power In-Rush Current		MAX. 5A 30ms or less						
Motor Current Consumption		Motor Type	Rated	Low power	MAX. ^(Note 1)	Motor Flange Size	MAX. ^(Note 2)	
		2W	0.8A		4.6A	20P	2.0A	
		3W (RCD)	0.7A		1.5A	28P	2.0A	
		5W	1.0A		6.4A	35P	2.0A (High output invalid) 3.5A (Rated) / 4.2A (MAX.) (High output valid) (Note 4)	
		10W (RCL)	1.3A		6.4A	42P		
		10W (RCA/RCA2)		2.5A	4.4A			
		20W		1.3A	2.5A	4.4A		56P
		20W (20S Type)		1.7A	3.4A	5.1A		
		30W	1.3A	2.2A	4.0A			
Motor Power In-Rush Current		Number of slots × MAX. 10A 5ms or less						
Heat Generation		26W Max.						
Control System		Vector control (Rectangular waveform drive only for 3W of the motor type)				Weak field-magnet vector control		
Encoder Resolution	RCA, RCP2 to RCP5	All Types				800Pulse/rev		
	RCA2	RCA2-□□□N				1048Pulse/rev		
		Except for RCA2-□□□N				800Pulse/rev		
	RCL	RA1L • SA1L • SA4L • SM4L				715Pulse/rev		
		RA2L • SA2L • SA5L • SM5L				855Pulse/rev		
		RA3L • SA3L • SA6L • SM6L				1145Pulse/rev		
	RCD	All Types				400Pulse/rev		
Actuator Cable Length		MAX. 20m (Note) 10m maximum for Simple Absolute type						

Specification Item		Driver for Servo Motor	Driver for Pulse Motor
Serial Communication Interface (SIO Port: Only for teaching)		RS485 1CH (based on Modbus Protocol) Speed 9.6 to 230.4kbps	
External Interface	PIO Type	PIO Type:Signal I/O dedicated for 24V DC (to be selected when purchased NPN/PNP) Number of max. input: 4 points per axis, Number of max. output: 4 points per axis Cable length MAX. 10m	
	Field Network Type	DeviceNet, CC-Link, PROFIBUS-DP, CompoNet, EtherNet/IP, EtherCAT, PROFINET-IO (Reference) An operation by RC Gateway Function is available.	
Data Setting and Input		PC Software, Touch Panel Teaching, Gateway Parameter Create Tool	
Data Retention Memory		Position data and parameters are saved in the nonvolatile memory. (There is no limitation in number of writing)	
Number of Positioning Points		PIO Type: 2 or 3 points Field Network Type: 256 points (There is no limit for simple direct and direct indication modes) (The number of positioning points differs depending on the operation mode select by the parameter setting.)	
LED Display (Mounted on Front Panel)		8 LED lamps for driver status display (for each driver board) Status LED 4 points (PIO Type), 7 points (Field Network Type)	
Electromagnetic Brake Compulsory Release		Brake release available for each axis by compulsory release signal input (24V DC input)	
Protective functions (Note3)		Overcurrent Protection (Equipped with a built-in cutoff circuit using a semiconductor for each slot)	
Protection Function against Electric Shock		Class I basic insulation	
Insulation Resistance		500V DC 10MΩ	
Mass		620g, For simple absolute type, 690g plus 1950g for absolute battery box (for 8-axis type)	
Cooling Method		Forced air-cooling	
External Dimensions		123W × 115H × 95D	
Environment	Surrounding Air Temperature	0 to 40°C	
	Surrounding Humidity	5%RH to 85%RH (Should be no-condensing or freezing)	
	Surrounding Environment	[Refer to Installation Environment]	
	Surrounding Storage Temperature	-20 to 70°C 0 to 40°C for absolute battery	
	Surrounding storage humidity	5%RH to 85%RH (Should be no-condensing or freezing)	
	Usable Altitude	1000m or lower above sea level	
	Vibration Durability	Frequency 10 to 57Hz/ Swing width : 0.075mm Frequency 57 to 150Hz/ Acceleration : 9.8m/s ² XYZ Each direction Sweep time: 10 min. Number of sweep: 10 times	
	Shock Resistance	150mm/s ² 11ms Semi-sine wave pulse XYZ Each direction 3 times	
	Protection Class	IP20	

Note 1 The current becomes maximum when the excitation phase of the servo-motor is detected, which is performed during the initial servo-motor ON processing after the power is injected. (Normal: Approx. 1 to 2 sec, MAX.: 10 sec).

Note 2 The current is maximized at the excitation phase detection conducted in the first servo-on process after the power is supplied (ordinary 100ms).

Note 3 For servo-motor, the protection is triggered with the current greater in 1.4 times than the maximum load current.

Note 4 High-output type driver board can control one axis per board.

< Calculation of 24V DC Power Capacity >

For the calculation of 24V DC power capacity, figure out the numbers for (1) to (5) below, and then follow Step (7).

(1) Control Power Current Consumption: 0.8A.....(1)

(2) Current Consumption of Motor Power Supply:
 Total of motor current consumption of connected actuator.....(2)

(3) Current Consumption at Excitation Phase Detection:
 Maximum current in the total of maximum motor current to turn the servo on at the same time.....(3)

(4) Control Power In-Rush Current: 5A.....(4)

(5) Motor Power In-Rush Current: Number of slots × 10A.....(5)

(6) Current consumption of brake power supply: Number of actuators with brake × 0.15A.....(6)

(7) Selection of Power Supply:

Usually, the rated current is to be approximately 1.3 times higher than 1) + 2) + 6) above considering approximately 30% of margin to the load current. However, considering the current of 3) to 5), even though it is a short time, select a power supply with "peak load corresponding" type or that with enough capacity. For the current of 3) to 5), it can be avoided from the current consumption occurred at the same time by the timing for the emergency stop release (motor power-on) and servo-on being changed. In the case that the capacity margin is not sufficient, voltage might be dropped in a moment. In particular, be careful of the power unit with the remote sensing function.

(Note) Make short-circuit on 0V side when separate power sources are used for the control power and motor power.

(Reference) Selection of Power Supply Protection Circuit Breaker

It is recommended that the power supply protection is conducted on the primary side (AC power side) of the 24V DC power supply unit.

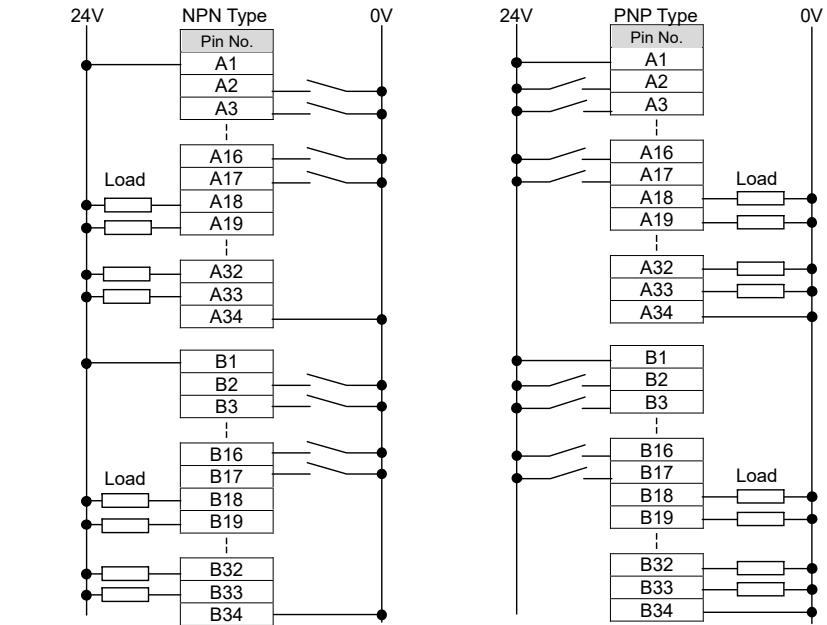
Pay attention to the in-rush current of 24V DC power supply unit and rated cutoff current of the circuit breaker.

• Rated Breaking Current > Short-circuit Current = Primary Power Supply Capacity/Power Voltage

• (Reference) In-rush Current of IAI Power Supply Unit PS241 = 50 to 60A, 3ms

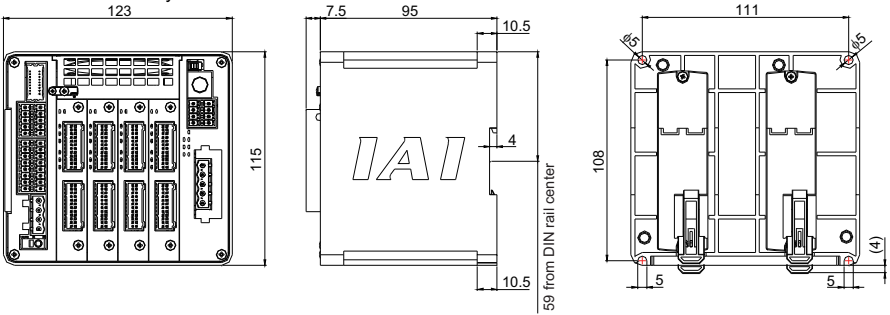
Specifications of PIO Interface

Specification	Input section		Output section	
	Input Voltage	24V DC $\pm 10\%$	Load Voltage	24V DC $\pm 10\%$
	Input Current	5mA 1 circuit	Peak Load Electric Current	50mA 1 circuit
	ON/OFF voltage	ON voltage MIN. 18V DC OFF voltage MAX. 6V DC	Leak Current	MAX. 2mA/1 point
External circuit insulation with photocoupler				
NPN				
PNP				

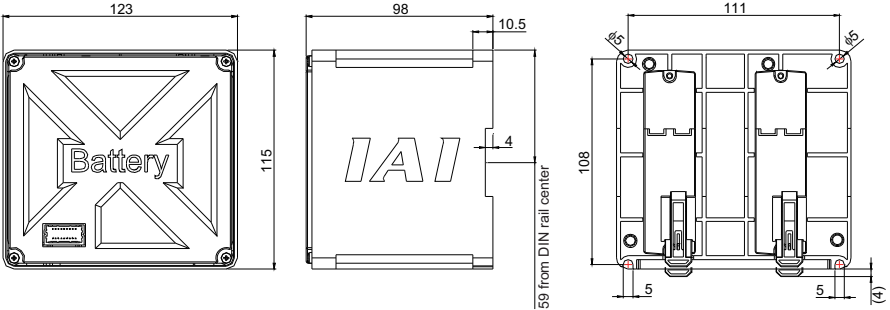


External Dimensions

Controller Main Body



Absolute Battery Box



Installation Environment

This product is capable for use in the environment of pollution degree 2¹ or equivalent.

*1 Pollution Degree 2 : Environment that may cause non-conductive pollution or transient conductive pollution by frost (IEC60664-1).

1. Installation Environment

Do not use this product in the following environment.

- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity is out of the range between 5%RH and 85%RH
- Location exposed to corrosive gases or combustible gases
- Location exposed to significant amount of dust, salt or iron powder
- Location subject to direct vibration or impact
- Location exposed to direct sunlight
- Location where the product may come in contact with water, oil or chemical droplets
- Environment that blocks the air vent [Refer to 1.7 Noise Elimination and Mounting Method]

When using the product in any of the locations specified below, provide a sufficient shield.

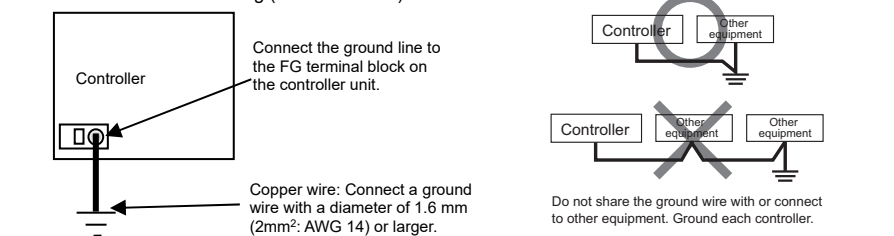
- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

2. Storage and Preservation Environment

- Storage and preservation environment follows the installation environment. Especially in a long-term storage, consider to avoid condensation of surrounding air. Unless specially specified, moisture absorber protection is not included in the package when the machine is delivered. In the case that the machine is to be stored in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.

Installation and Noise Elimination

1. Noise Elimination Grounding (Frame Ground)



2. Precautions regarding wiring method

- 1) Wire is to be twisted for the 24V DC power supply.
- 2) Separate the signal and encoder lines from the power supply and power lines.

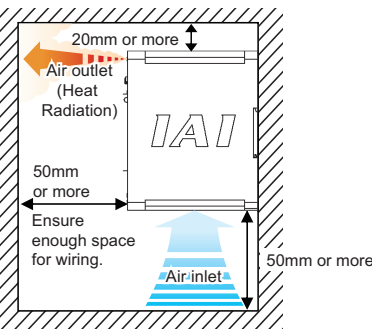
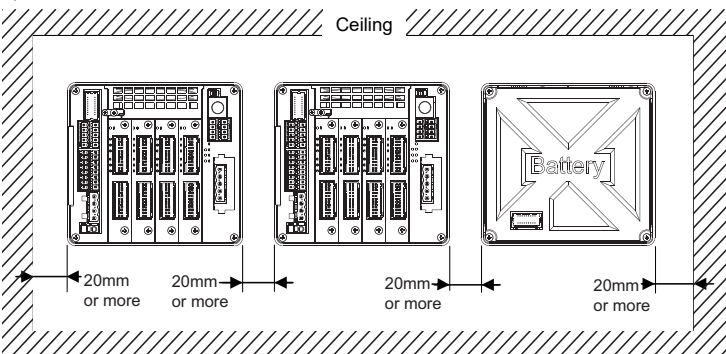
3. Noise Sources and Elimination

Carry out noise elimination measures for electrical devices on the same power path and in the same equipment.

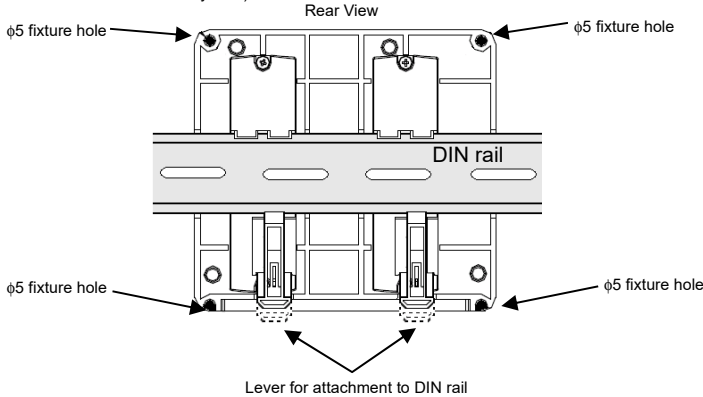
- The following are examples of measures to eliminate noise sources.
- 1) AC solenoid valves, magnet switches and relays
[Measure] Install a Surge absorber parallel with the coil.
 - 2) DC solenoid valves, magnet switches and relays
[Measure] Mount the windings and diodes in parallel. Select a diode built-in type for the DC relay.

4. Cooling Factors and Installation

Design and Build the system considering the size of the controller box, location of the controller and cooling factors to keep the surrounding temperature around the controller below 40°C. Pay a special attention to the battery unit since the performance of it would drop both in the low and high temperatures. Keep it in an environment in the room temperature as much as possible. (Approximately 20°C is the recommended temperature.)



For the attachment of the unit, use the fixture holes on the four corners or attach on the DIN rail. (Attachment should be the same for the absolute battery box.)



Operation Pattern Selected

This controller possesses 6 patterns of control methods for PIO type. Set the most suitable operation pattern for your use with Gateway Parameter Setting Tool.

• Operation Patterns for PIO Type

Operation Pattern	Description	Example for Electric Cylinder Connection	Example for Air Cylinder Connection (Reference)
PIO Pattern 0 Single Solenoid System (Standard Point-to-Point Movement)	The actuator point-to-point movement is available using the same control function as for the air cylinder. The target position setting (forward position and backward position) is available. Speed and acceleration settings in the actuator movement are available. The pressing operation is available.		
PIO Pattern 0 Double Solenoid System (Standard Point-to-Point Movement)	The actuator point-to-point movement is available using the same control function as for the air cylinder. The target position setting (forward position and backward position) is available. Speed and acceleration settings in the actuator movement are available. The pressing operation is available.		
PIO Pattern 1 Single Solenoid System (Point-to-Point Movement, Movement Speed Setting)	The actuator point-to-point movement is available using the same control function as for the air cylinder. The movement speed can be changed while the actuator is moving if the movement speed change signal is input. The target position setting (forward position and backward position) is available. Speed and acceleration settings in the actuator movement are available. The pressing operation is available.		
PIO Pattern 1 Double Solenoid System (Point-to-Point Movement, Movement Speed Setting)	The actuator point-to-point movement is available using the same control function as for the air cylinder. The movement speed can be changed while the actuator is moving if the movement speed change signal is input. The target position setting (forward position and backward position) is available. Speed and acceleration settings in the actuator movement are available. The pressing operation is available.		
PIO Pattern 2 Single Solenoid System (Point-to-Point Movement, Target Position Setting (Position Data) Change)	The actuator point-to-point movement is available using the same control function as for the air cylinder. The target position and operation condition can be changed while the actuator is moving if the target position change signal is input. The target position setting (forward position and backward position) is available. Speed and acceleration settings in the actuator movement are available. The pressing operation is available.		
PIO Pattern 2 Double Solenoid System (Point-to-Point Movement, Target Position Setting (Position Data) Change)	The actuator point-to-point movement is available using the same control function as for the air cylinder. The target position and operation condition can be changed while the actuator is moving if the target position change signal is input. The target position setting (forward position and backward position) is available. Speed and acceleration settings in the actuator movement are available. The pressing operation is available.		

Pin No.	Category	PIO Functions	Operation Pattern										Fieldbus connection
			0		1		2		3	4	5	6	
			Point-to-Point Movement		Movement speed setting		Target position change		2-Input, 3-Point Movement	3-Input, 3-Point Movement	Continuous reciprocating operation		
		Solenoid system	Single	Double	Single	Double	Single	Double	-	Double	-		
B1	-	COM	24V										
B2	Input (Axis No.4)	IN0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ASTR		
B3		IN1	*STP	ST1 (Note 1)	*STP	ST1 (Note 1)	*STP	ST1 (Note 1)	ST1 (Note 1)	ST1 (Note 1)	*STP		
B4		IN2	RES		SPDC (RES) (Note 2)		CN1 (RES) (Note 2)		RES	ST2 (RES) (Note 2)	RES		
B5		IN3	-/SON		-/SON		-/SON		-/SON	-/SON	-/SON		
B6	Input (Axis No.5)	IN0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ASTR		
B7		IN1	*STP	ST1 (Note 1)	*STP	ST1	*STP	ST1 (Note 1)	ST1 (Note 1)	ST1 (Note 1)	*STP		
B8		IN2	RES		SPDC (RES) (Note 2)		CN1 (RES) (Note 2)		RES	ST2 (RES) (Note 2)	RES		
B9		IN3	-/SON		-/SON		-/SON		-/SON	-/SON	-/SON		
B10	Input (Axis No.6)	IN0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ASTR		
B11		IN1	*STP	ST1 (Note 1)	*STP	ST1	*STP	ST1 (Note 1)	ST1 (Note 1)	ST1 (Note 1)	*STP		
B12		IN2	RES		SPDC (RES) (Note 2)		CN1 (RES) (Note 2)		RES	ST2 (RES) (Note 2)	RES		
B13		IN3	-/SON		-/SON		-/SON		-/SON	-/SON	-/SON		
B14	Input (Axis No.7)	IN0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ST0	ASTR		
B15		IN1	*STP	ST1 (Note 1)	*STP	ST1	*STP	ST1 (Note 1)	ST1 (Note 1)	ST1 (Note 1)	*STP		
B16		IN2	RES		SPDC (RES) (Note 2)		CN1 (RES) (Note 2)		RES	ST2 (RES) (Note 2)	RES		
B17		IN3	-/SON		-/SON		-/SON		-/SON	-/SON	-/SON		
B18	Output (Axis No.4)	OUT0	LS0/PE0		LS0/PE0		LS0/PE0		LS0/PE0	LS0/PE0	LS0/PE0		
B19		OUT1	LS1/PE1		LS1/PE1		LS1/PE1		LS1/PE1	LS1/PE1	LS1/PE1		
B20		OUT2	HEND/SV		HEND/SV		HEND/SV		HEND/SV	LS2/PE2	LS2/PE2		
B21		OUT3	*ALM/SV		*ALM/SV		*ALM/SV		*ALM/SV	*ALM/SV	*ALM/SV		
B22	Output (Axis No.5)	OUT0	LS0/PE0		LS0/PE0		LS0/PE0		LS0/PE0	LS0/PE0	LS0/PE0		
B23		OUT1	LS1/PE1		LS1/PE1		LS1/PE1		LS1/PE1	LS1/PE1	LS1/PE1		
B24		OUT2	HEND/SV		HEND/SV		HEND/SV		HEND/SV	LS2/PE2	LS2/PE2		
B25		OUT3	*ALM/SV		*ALM/SV		*ALM/SV		*ALM/SV	*ALM/SV	*ALM/SV		
B26	Output (Axis No.6)	OUT0	LS0/PE0		LS0/PE0		LS0/PE0		LS0/PE0	LS0/PE0	LS0/PE0		
B27		OUT1	LS1/PE1		LS1/PE1		LS1/PE1		LS1/PE1	LS1/PE1	LS1/PE1		
B28		OUT2	HEND/SV		HEND/SV		HEND/SV		HEND/SV	LS2/PE2	LS2/PE2		
B29		OUT3	*ALM/SV		*ALM/SV		*ALM/SV		*ALM/SV	*ALM/SV	*ALM/SV		
B30	Output (Axis No.7)	OUT0	LS0/PE0		LS0/PE0		LS0/PE0		LS0/PE0	LS0/PE0	LS0/PE0		
B31		OUT1	LS1/PE1		LS1/PE1		LS1/PE1		LS1/PE1	LS1/PE1	LS1/PE1		
B32		OUT2	HEND/SV		HEND/SV		HEND/SV		HEND/SV	LS2/PE2	LS2/PE2		
B33		OUT3	*ALM/SV		*ALM/SV		*ALM/SV		*ALM/SV	*ALM/SV	*ALM/SV		
B34	-	COM	0V										