



IAI

Quality and Innovation

ERC2 Actuator

First Step Guide

Second 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_dl/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 (The option is excluded.)

No.	Part Name		Model
1	Actuator Main Body		[Refer to "4. How to read the model plate", "5 How to read the model"]
Accessories			
2	Connection Cable	Power I/O Cable for PIO Type	CB-ERC-PWBIO*** CB-ERC-PWBIO***-RB (*** indicates the cable length, RB indicates a robot cable)
		Power I/O Cable for SIO Type	CB-ERC2-PWBIO*** CB-ERC2-PWBIO***-RB CB-ERC2-CTL001 (*** indicates the cable length, RB indicates a robot cable)
3	Home Position Marking Sticker		Included in the slider type
4	First Step Guide		ME0226
5	Safety Guide		M0194

2. Controller and Teaching Tool

The PC software or teaching pendant is necessary to perform setup operations such as position and parameter settings through teaching or other means.
Prepare either PC software or teaching pendant.
For SIO (SE) type, an SIO converter (option) needs to be prepared to connect to the teaching tool.

No.	Name	Model
1	PC Software*1	RCM-101-USB/MW
2	Touch Panel Teaching Pendant (with deadman switch)	TB-02(D)
3	Touch Panel Teaching Pendant	TB-03
4	Teaching pendant*2	CON-PT/PD/PG
5	Teaching pendant*2	CON-T/TG
6	Simplified Teaching Pendant*2	RCM-E
7	Data setter*2*3	RCM-P
8	Touch Panel Indicator*2*4	RCM-PM-01

*1 For SIO (SE) type, a relay cable (CB-ERC2-SIO020) or a SIO converter (RCB-TU-SIO) needs to be prepared separately.
*2 For SIO (SE) type, an SIO converter (RCB-TU-SIO) needs to be prepared separately.
*3 For the data setter, the actuator can not be moved.
*4 For the touch panel indicator, there are some parameters that can not be set.

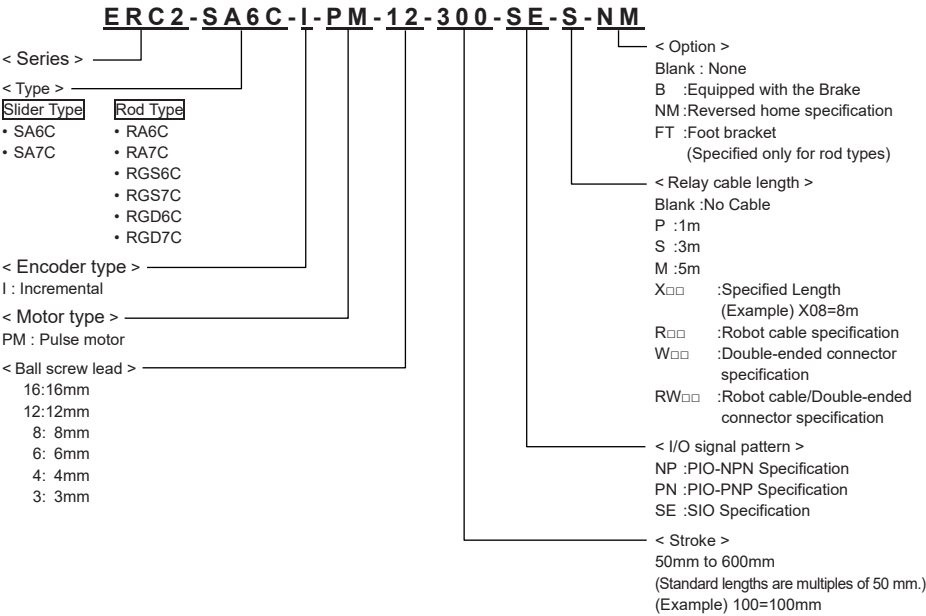
3. Operation manuals related to this product

No.	Name	Manual No.
1	Operation Manual for the actuator with integrated ERC2 controller <PIO type>	ME0158
2	Operation Manual for the actuator with integrated ERC2 controller <SIO type>	ME0159
3	PC Software RCM-101MW/RCM-101-USB Operation Manual	ME0155
4	Touch Panel Teaching Pendant TB-02	ME0355
5	Touch Panel Teaching Pendant TB-03	ME0376
6	Teaching pendant CON-T/TG	ME0178
7	Teaching pendant CON-PT/PD/PG	ME0227
8	Simplified Teaching Pendant RCM-E Operation Manual	ME0174
9	Data setter RCM-P Operation Manual	ME0175
10	Touch Panel Indicator RCM-PM-01 Operation Manual	ME0182
11	Operation Manual for SIO isolator (Option)	ME0207
12	Operation Manual for the serial communication [for Modbus]	ME0162

4. How to read the model plate



5. How to read the model



Precautions in Handling

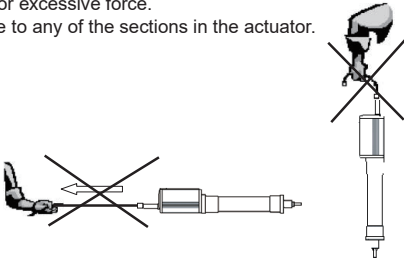
Handle it with great care, and keep the following instructions. Failure to do so may cause damage to the product.

1. Handling of the Carton

- Take the greatest care in transporting the product, not to bump or drop it.
- When setting down the packed actuator keep it horizontal.
 - Do not climb on the carton.
 - Do not place any heavy article on top of the package that may deform the package.

2. Handling of the Unpacked Product

- Do not transport the actuator by holding the cable or move it by pulling the cable.
- When the actuator is taken out from the package and handled, hold the base or frame section.
 - When carrying and installing the actuator, do not bump or drop the actuator or otherwise cause the actuator to receive any impact or excessive force.
 - Do not give any excessive force to any of the sections in the actuator.



Installation Environment, Storage Environment

1. Installation Environment

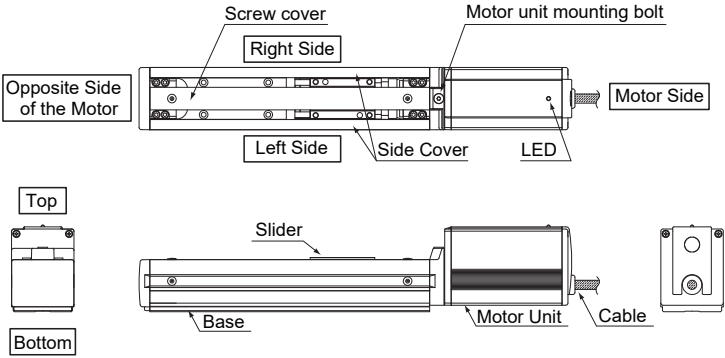
- An environment that satisfies the following conditions is required during installation. Generally speaking, it should be an environment where a worker can work without any protective gear.
- There should be no direct sunlight.
 - Any radiant heat from a large heat source such as heat treatment furnace should not be directed at the machine main body.
 - The ambient temperature should be 0 to 40°C.
 - The relative humidity should be 85% or less. There should not be dew condensation.
 - There should not be corrosive gas or flammable gas.
 - It should be a normal assembling work environment where there is not too much dust.
 - Oil mist or cutting liquid should not be directed at the machine.
 - Chemical liquid should not be splashed on it.
 - An impact or vibration should not be transmitted to it.
 - There should not be strong electromagnetic waves, ultraviolet rays or radiation.
 - The working space required for maintenance or inspection should be secured.

2. Storage Environment

- The storage environment should comply with the standards same as those for the installation environment.
In particular when the machine is to be stored for a long time: pay close attention to environmental conditions so that no dew condensation forms.
Unless specially specified, moisture absorbcency 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.
- The maximum storage temperature is 60°C for a short storage period. If the robot is to be stored for more than a month, the ambient temperature should not exceed 50°C.

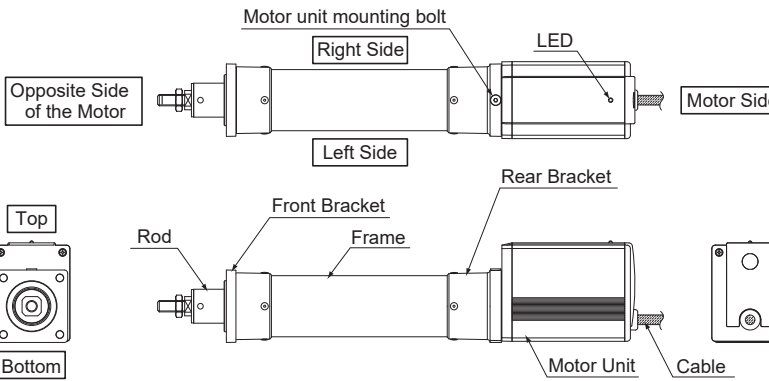
Names of the Parts

• Slider Type



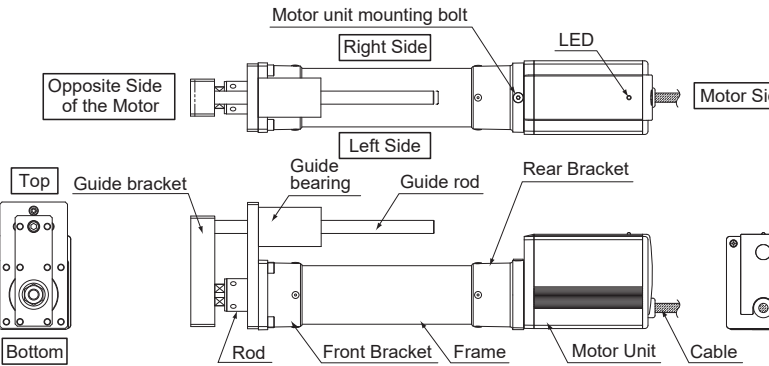
• Rod Type

(Unguided)



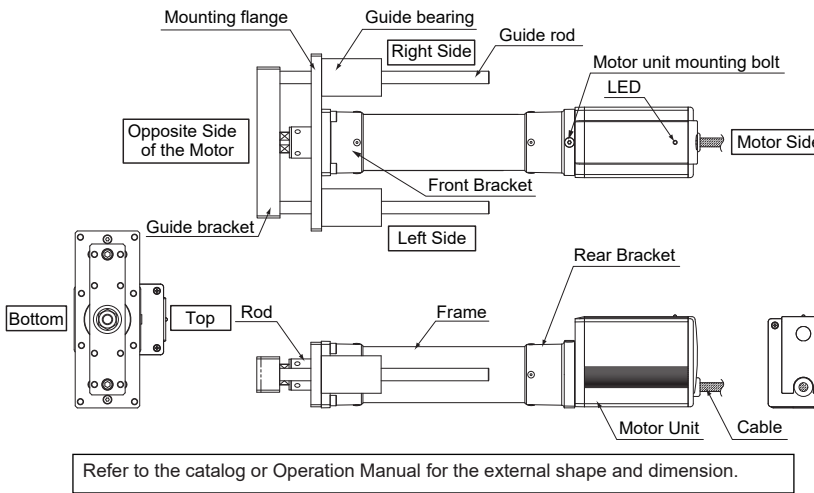
• Rod Type

(With single guide)



• Rod Type

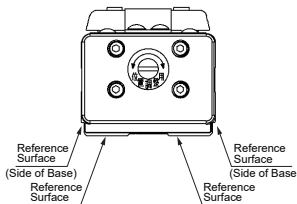
(With double guides)



Attachment

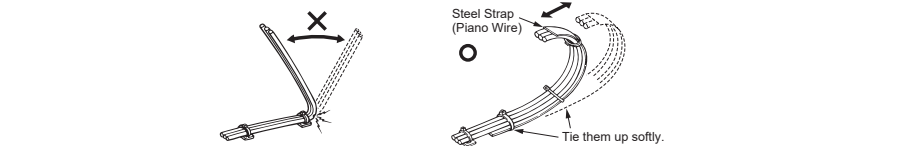
Refer to the Operation Manual for the attachments of the actuator and loads.

[Precautions for Attachments]

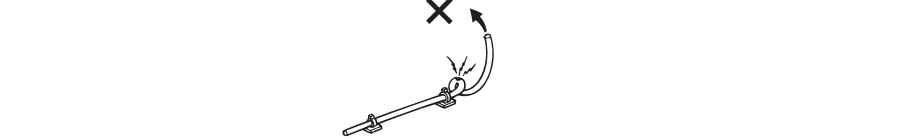
No.	Item	Precautions
1	Attachment Surface	- The base has to have a structure with sufficient rigidity to prevent oscillation. - The actuator mounting surface and other surfaces that are used as a datum should be flat enough with an accuracy of machining or equivalent treatment, and the flatness of the mounting surface needs to be $\pm 0.05\text{mm/m}$ or less. - Secure the space where maintenance work can be performed. - The side and the bottom surfaces of the base of the slider type actuator are the datum for the slider drive. If accuracy for its run is required, use these surfaces as a datum of the installation. 
2	Bolt to be used	- For the bolt to be used, a high-tensile bolt complying with ISO-10.9 or more is recommended. - If using the tapped holes, use screws with the length less than the effective depth of the holes. Exercise precaution so the screw tips do not exceed the surface. - Secure the following value or more for effective fitting length for bolts and screws. In the case of the stainless steel male screw: A screw with the same length as the nominal diameter is used. In the case of the aluminum screw: A screw with the length as much as twice of the nominal diameter, is used. - If using bolts of M8 or larger size when using the foot base to mount on a platform, use washers dedicated for a high-tensile bolt. No washer is needed for M6 or smaller bolts. Also, do not use a normal washer.
3	Tightening Torque	Please follow the specification values stated in the Operation Manual for the tightening torque. Failure to do so may cause an operation problem.
4	Moment Applied by Load and Overhang Length	- Please follow the specification values stated in the Operation Manual for the moment loaded to the slider and arm and the overhang length. Failure to do so may cause an operation problem. - Please do not apply any external force from other than rod moving direction (radial load) to the rod. Any perpendicular or radial force to the rod may cause damage to the actuator or operation problem. Equip an actuator with a guide or a guide in the direction of the load if any external force from other direction than the rod movement.
5	Stainless sheet (Slider Type)	- Please do not hold the stainless sheet directly with hands. Please be careful not to make a dent on the stainless sheet by dropping tools or work. Stainless sheet is easy to get dented because it is thin. Using it with a dent on may cause a breakage. - Please do not cause dust or metal contamination around the stainless sheet. If caused, please wipe it off after the work. Operation with the stainless sheet that has foreign matters on its surface may cause problems such as sheet damage, waviness, etc. inside the slider. - Stainless sheet is adhered to a magnet. Magnetic object like metal contamination in the atmosphere may cause problem to the magnet.
6	Load Attachment to Rod	- Do not apply rotation torque on the rod (slide shaft). It may cause damage inside. - Tighten the nut on the rod tip with holding the rod with a wrench or an equivalent tool. 

[Prohibited Items in the Cable Processing]

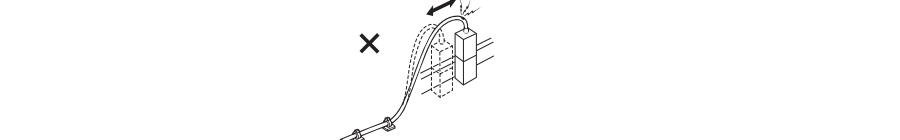
- Do not pull or bend forcibly the cable so as not to give any extra load or tension to the cable.
- Do not process the cable for extension or shortening by means of cutting out, reconnecting or connecting with another cable.
- Do not let the cable flex at a single point.



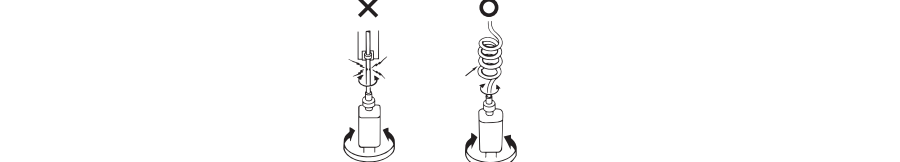
- Do not let the cable fold, kink or twist.



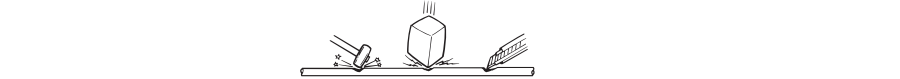
- Do not pull the cable with a strong force.



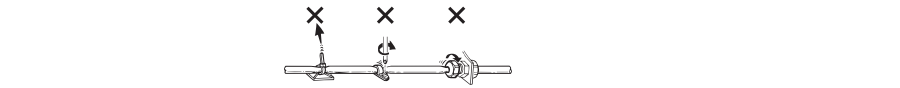
- Do not let the cable receive a turning force at a single point.



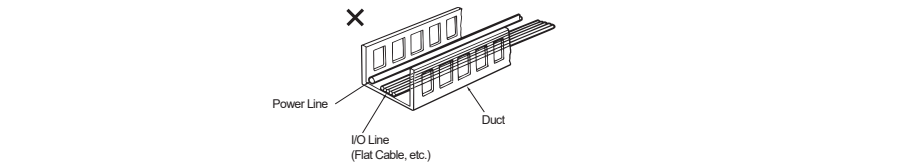
- Do not pinch, drop a heavy object onto or cut the cable.



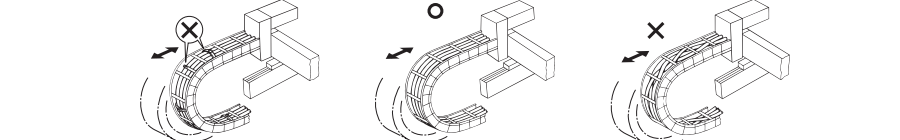
- When fixing the cable, provide a moderate slack and do not tension it too tight.



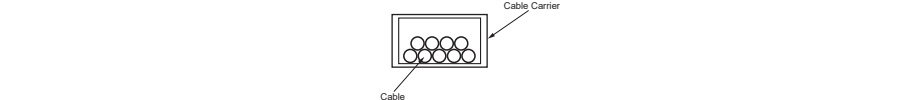
- Separate the I/O line, communication line and power line from each other. Arrange so that such lines are independently routed in the duct.



- Take care of the following items using the cable track.
- Arrange the wiring so that there is no entanglement or kink of the cables in the cable track or flexible tube, and do not bind the cables so that the cables are relatively free (Do not bend it at an angle of 90°C or less).



- The occupied volume rate for the cables, etc., inside the cable track should be 60% or less.



 Note

- When the cable is connected or disconnected, make sure to turn off the power to the controller. When the cable is connected or disconnected with the controller power turned ON, it might cause a malfunction of the actuator and result in a serious injury or damage to the machinery.
- When the connector connection is not correct, it would be dangerous because of a malfunction of the actuator. Make sure to confirm that the connector is connected correctly.

- Controller Section

Basic Specifications

Specification Item		PIO Type	SIO Type
Number of controlled axes		1-axis	
Power-supply	Voltage	24VDC±10%	
	Control current	0.5A	
	Motor current* ¹	2A (Max), 1.2A (Rated)	
	Rush current* ²	Max 25A	
Heating value		9.6W	
Control method		Weak field-magnet vector control	
Data input method		Teaching pendant, PC software	
Protective functions		Overvoltage, Motor over current, Motor overload, Driver temperature abnormality, Encoder abnormality etc.,	
Backup Memory		Save the position data and parameters onto the non-volatile memory. (EEPROM) About 100,000 times of reloading (Note1)	
Encoder Resolution		Incremental specification 800Pulse/rev	
LED indication		Servo ON: Green Light is turned ON, In alarming: Red Light is turned ON	
Number of positions		16 points (Max)	64 points (Max)
I/O		Dedicated Input 6 Points / Dedicated Output 4 Points	None
Serial communication* ³ (External termination is required)		RS485 1ch (conforming to the Modbus protocol)	
Forced release of electromagnetic brake		Released with +24V (150mA) supplied to BKR terminal	
Cable length		Actuator Cable:10m or less	
Insulation strength		500VDC 10MQ	
Environment	Surrounding air temperature	0 to 40°C	
	Surrounding humidity	85%RH or less (non-condensing)	
	Surrounding environment	Refer to Installation Environment section.	
	Surrounding storage temperature	-10 to 65°C	
	Surrounding storage humidity	90%RH or less (non-condensing)	
	Vibration resistance	10 to 57 Hz in XYZ Each direction/Pulsating amplitude 0.035mm (continuous), 0.075mm (intermittent) 57 to 150Hz 4.9m/s2 (continuous) 9.8m/s2(intermittent)	
Protection class		IP20	
Cooling method		Natural air-cooling	

*1 The current reaches its maximum level when the servo-motor exciting phase is detected which is to be performed in the first servo-motor turning ON processing after the power injection. (Normal 100msec) <u>However, a current of approx. 6.0A flows if the motor driving power is turned on again after its shutdown. (for approx. 1 to 2 msec)</u> *2 The rush current, which is approx. 5 to 12 times the rated current, flows for approx. 1 to 2msec after power-on. Please note that the rush current value varies depending on the impedance of the power line.		As a +24V DC power supply, select the power supply of the "peak load support" specification or one with sufficient capacity. 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.
--	---	--

As a +24V DC power supply, select the power supply of the "peak load support" specification or one with sufficient capacity.

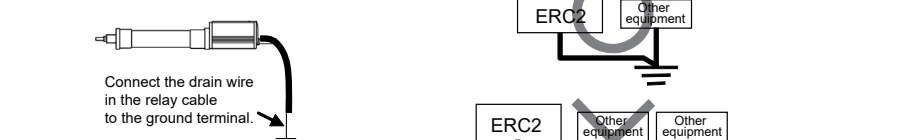
In the case that the capacity margin is not sufficient, voltage might be dropped in a moment. In particular, be careful of the power unit with the remote sensing function.

*3 Serial communication line is not insulated inside the controller. Using the SIO isolator enables to insulate the line.

Note1: Position data and parameters are written to EEPROM. The limitation for the reload is about 100,000 times.
Take the greatest care.
Do not turn OFF the power to the unit during the reloading operation.

Installation and Noise Elimination

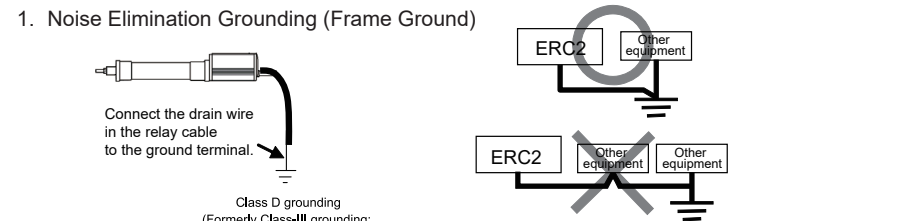
1. Noise Elimination Grounding (Frame Ground)



Class D grounding
(Formerly Class-III grounding;
Grounding resistance at 100Ω or less)



Do not share the ground wire with or connect

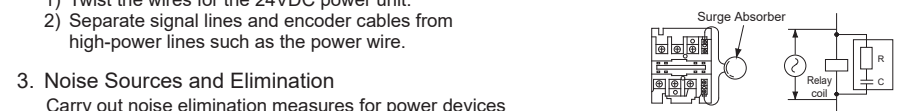


Grounding resistance at 100Ω or less

Do not share the ground wire with or connect to other equipment. Ground each controller.

2. Precautions regarding wiring method

- 1) Twist the wires for the 24VDC power unit.
 - 2) Separate signal lines and encoder cables from high-power lines such as the power wire.
- 
- The diagram shows a surge absorber connected to a power line and a signal line. The surge absorber is represented by a rectangular block with two terminals. One terminal is connected to a power line (indicated by a thick line) and the other terminal is connected to a signal line (indicated by a thin line). The connection is shown with a ground symbol.



3. Noise Sources and Elimination

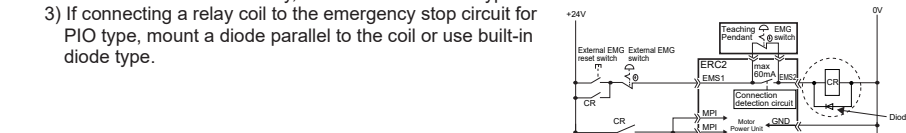
Carry out noise elimination measures for power devices on the same power path and in the same equipment.

The following are examples of measures to eliminate noise sources.

- 1) AC solenoid valves, magnet switches and relays
[Measure] Attach the surge absorber in parallel with the coil.
- 2) DC solenoid valves, magnet switches and relays
[Measure] Attach the diode in parallel with the coil.

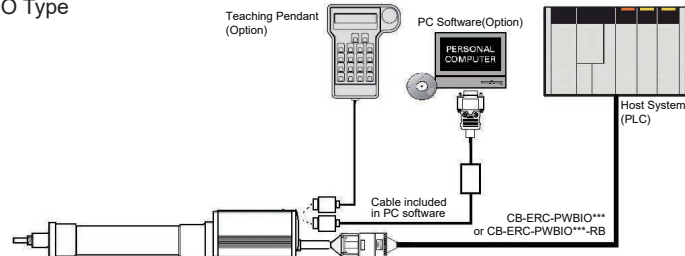
For the DC relay, use the built-in diode type.

- 3) If connecting a relay coil to the emergency stop circuit for PIO type, mount a diode parallel to the coil or use built-in diode type.

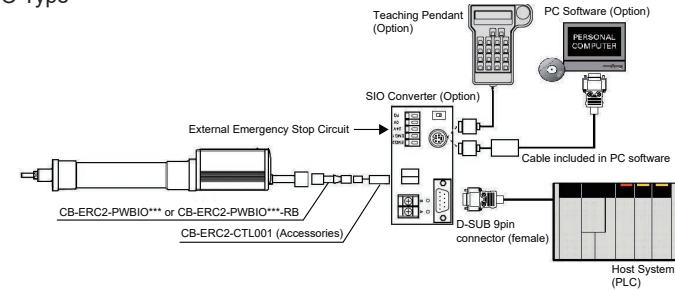


Wiring Layout

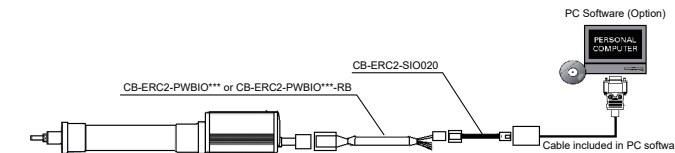
1. For PIO Type



2. For SIO Type



3. Connecting SIO type directly to PC

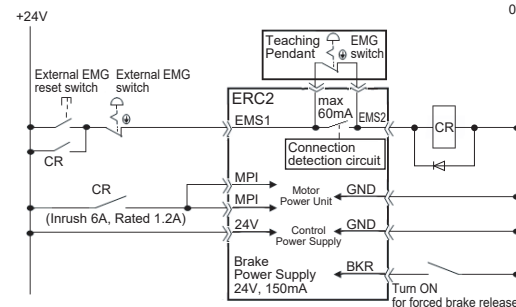


Note Turn off the power supply before inserting and pulling out the connector of the teaching pendant. Doing so during the power is on may damage the internal circuit.

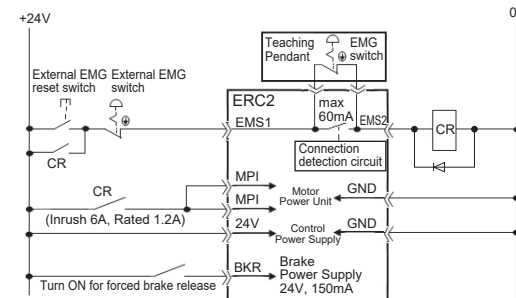
Power Source and Emergency Stop Circuit

Shown below is an example of connection.

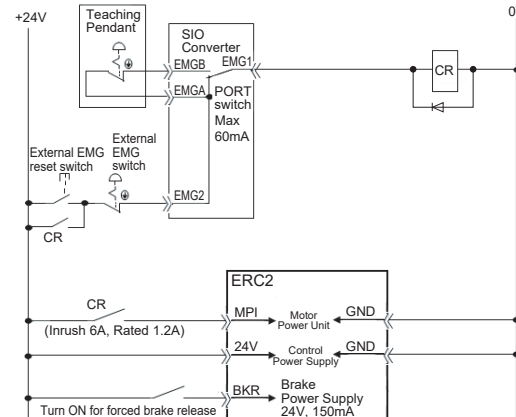
PIO Type NPN Specification



PIO Type PNP Specification



SIO Type



I/O Signal (PIO Type)

Function description for I/O Signals

Category	Signal Abbreviation	Signal Name	Details of Controls
Input	CSTR	Start	The actuator will start to move to the position set by the command position number.
	PC1 to PC8	Command position number	Input of the position number to move (binary input)
	*STP	Pause	When this signal turns OFF while the actuator is moving, the actuator will decelerate to stop. The remaining movement is retained and will resume when the signal is turned ON again.
	RES	Reset	An alarm will be reset when this signal is turned ON. The remaining movement can be canceled when the pause signal is OFF (*STP is OFF).
	HOME	Home return	The controller will perform home return operation when this signal is turned ON.
	ST0 to ST2 (For solenoid valve type only)	Start position command	In the solenoid valve mode, the actuator will move to the specified position when this signal is ON. (The start signal is not required.)
Output	PEND	Positioning completion	This signal will turn ON when the target position has been reached after movement and the actuator has entered the in-position range. The PEND signal will not turn OFF.
	HEND	Home return completion	This signal will turn ON when home return has been completed.
	ZONE	Zone	This signal will turn ON when the current actuator position enters the range set by the parameters.
	PZONE	Position zone	This signal will turn ON when the current actuator position enters the range specified in the position data after position movement. The combined use with ZONE 1 is possible, but PZONE becomes effective only for movement to the set position.
	*ALM	Alarm	This signal remains ON in normal conditions of use and turns OFF when an alarm is generated.
	PE0 to PE2 (For solenoid valve type only)	Completed position number	The same operation as of the limit switch of the air cylinder is performed. They turn on when the actuator reaches to the positioning band of the target position, and turn off when it exceeds the band.

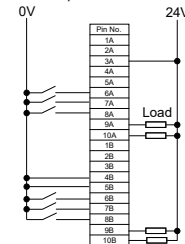
Pin No.	Category	Number of positioning points	Setting of Parameter No. 25 (PIO Pattern Selection)			
			0	1	2	3
			Normal Type	Solenoid Valve Type	Zone Signal Type	Position Zone Signal Type
			8 points	3 points	16 points	16 points
		Zone signal	○	×	○	×
		Position zone signal	×	×	×	○
1A	SIO	OR (RD 1)			SGA	
1B		OR (BK 1)			SGB	
2A		SB (RD 1)			EMS1	
2B		SB (BK 1)			EMS2	
3A		WT (RD 1)			24V	
3B	Power-supply	WT (BK 1)			BKR	
4A		YW (RD 1)			MPI	
4B		YW (BK 1)			0V	
5A		PK (RD 1)			MPI	
5B		PK (BK 1)			0V	
6A	Input	OR (RD 2)	PC1	ST0	PC1	PC1
6B		OR (BK 2)	PC2	ST1	PC2	PC2
7A		SB (RD 2)	PC4	ST2	PC4	PC4
7B		SB (BK 2)	HOME	—	PC8	PC8
8A		WT (RD 2)	CSTR	RES	CSTR	CSTR
8B	Output	WT (BK 2)	*STP*1	*STP*1	*STP*1	*STP*1
9A		YW (RD 2)	PEND	PE0	PEND	PEND
9B		YW (BK 2)	HEND	PE1	HEND	HEND
10A		PK (RD 2)	ZONE	PE2	ZONE	ZONE
10B		PK (BK 2)			*ALM*2	

*1 *STP is stopped temporarily when it is turned OFF.

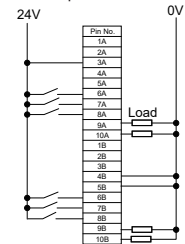
*2 *ALM is a signal which is ON at the normal operation.

Specification	Input section		Output section	
	Input voltage	24VDC±10%	Load voltage	24VDC
	Input current	4mA 1 circuit	Peak load electric current	60mA/1 point
	ON/OFF voltage	ON voltage MIN.18VDC OFF voltage MAX.6VDC	Residual voltage	2V or less
	Leakage current	MAX.1mA/1 point		
NPN				
PNP				

NPN Specification

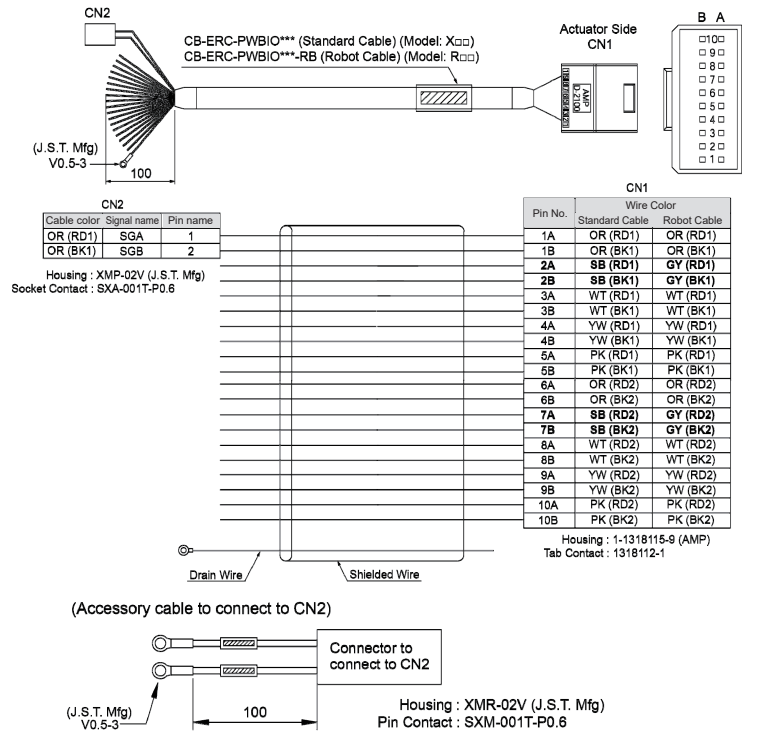


PNP Specification



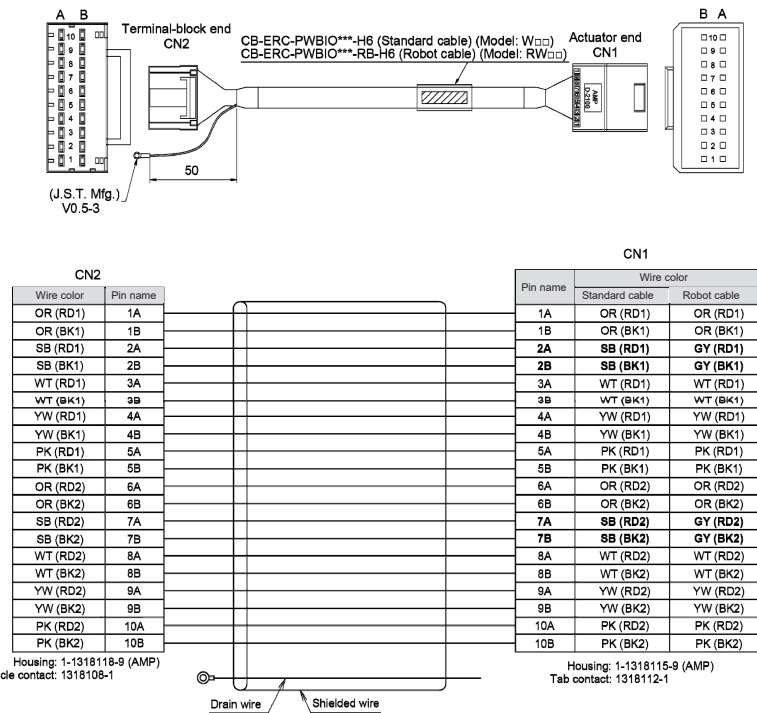
Note • Diagrams above show only the areas related to I/O. Refer to the previous page for the power supply and emergency stop.
• I/O circuit is not isolated inside the controller. If isolation is necessary, use the isolation type PIO terminal block (RCB-TU-PIO-* : option).

•No connector on the counter-actuator end (When connecting the actuator directly to a host system)



(Note) Failure will occur if 24V is applied accidentally to SGA/SGB wire for the serial communication.

•Connectors on both ends (When using an isolated PIO terminal block)

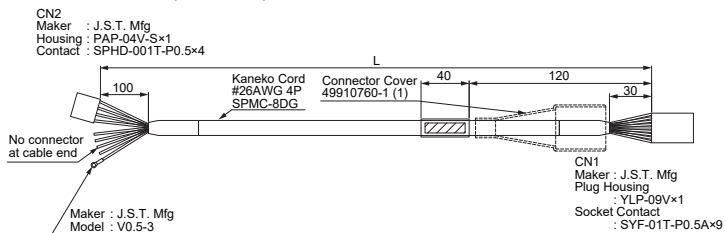


I/O Signal (SIO Type)

Pin No.	Category	Signal name
1	SIO	SGA
2		SGB
3	Power-supply	5V
4		GND
5		24V
6		BKR
7		MPI
8		GND
9	Shield	—

●Relay Cable 1

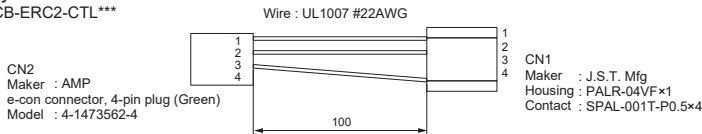
CB-ERC2-PWBIO*** (Standard cable)
CB-ERC2-PWBIO***-RB (Robot cable)



CN2				CN1			
Wire color		Signal name	No.	Wire color		Signal name	No.
Robot Cable	Standard Cable			Robot Cable	Standard Cable		
BL	OR	SGA	1	1	SGA	OR	BL
YW	BL	SGB	2	2	SGB	BL	YW
RD	BR	5V	3	3	5V	BR	RD
BK	GN	GND	4	4	GND	GN	BK
				5	Control Power Supply	RD	PP
				6	Brake	GY	GY
				7	MPI	YW	GN
				8	GND	BK	OR
				9	Shield	Shield	Shield

●Relay Cable 2

CB-ERC2-CTL***

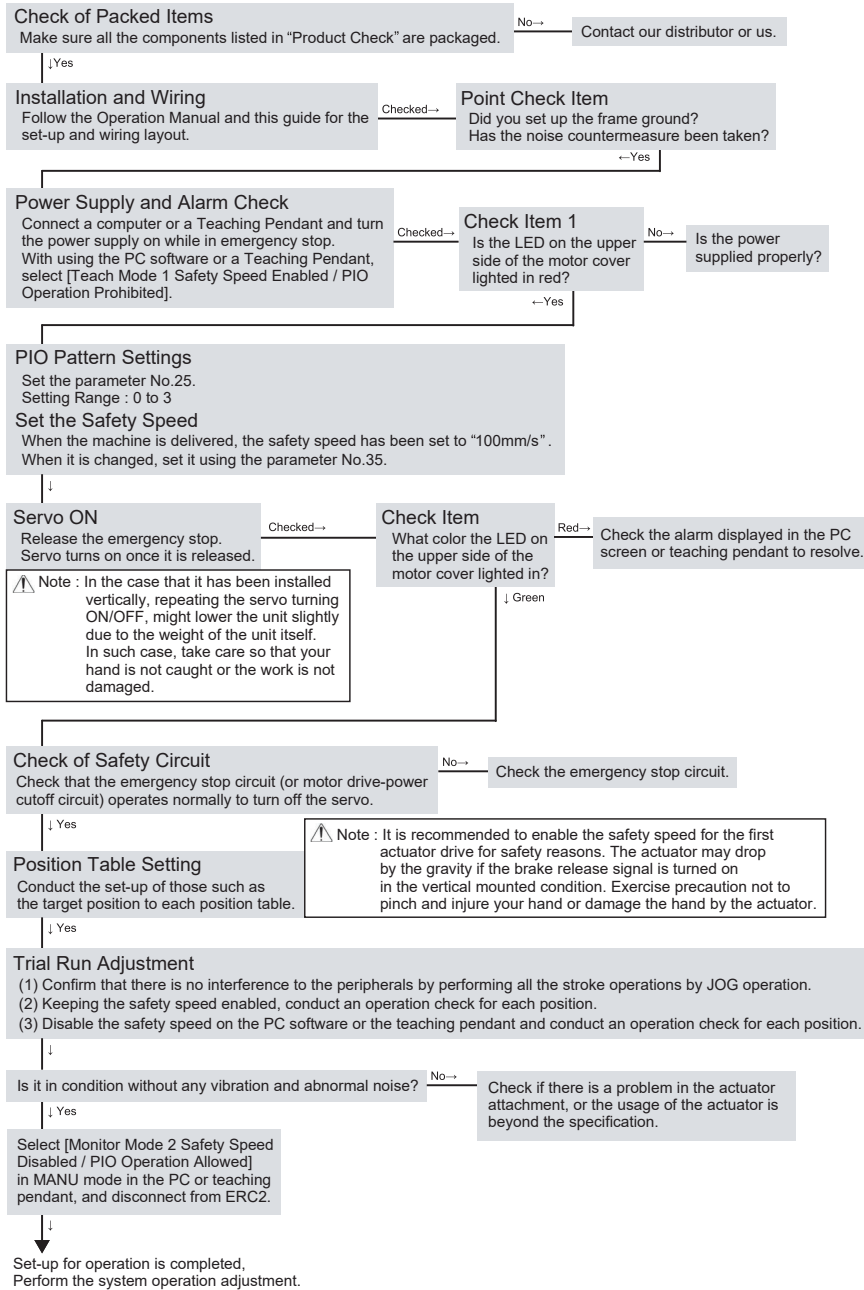


Wiring	Color	Signal name	No.	No.	Signal name	Color	Wiring
CN2 AWG22	OR	SGA	1	1	SGA	OR	CN1 AWG22
	BL	SGB	2	2	SGB	BL	
	GN	GND	3	3	5V		
		NC	4	4	GND	GN	

*This cable comes with the following parts :
· e-con connector ×1 Unit
· e-con connector (with terminal resistor) ×1 Unit
· 4-way junction ×1 Unit

Starting Procedures

When using this product for the first time, make sure to avoid mistakes and incorrect wiring by referring to the procedure below.



IAI
Quality and Innovation

IAI Corporation

Head Office: 577-1 Obane Shimizu-KU Shizuoka City Shizuoka 424-0103, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL (310) 891-6015 FAX (310) 891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL (847) 908-1400 FAX (847) 908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL (678) 354-9470 FAX (678) 354-9471
website: www.intelligentactuator.com

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL 06196-88950 FAX 06196-889524
website: www.iai-automation.com

Technical Support available in Great Britain

LC Automation
control & safety

Duttons Way, Shadsworth Business Park, Blackburn, Lancashire, BB1 2QR, United Kingdom
TEL 01254-685900
website: www.lcautomation.com

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL 021-6448-4753 FAX 021-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825 PhairojKijja Tower 7th Floor, Debaratana RD., Bangna-Nuea, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456
website: www.iai-robot.co.th