IAI
Quality and Innovation

ELECYLINDER®

Electricity Section Pulse motor
24V AC Servo motor
200V AC Servo motor

Instruction Manual Fifth Edition

ME3816-5B

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

In this instruction manual, explains the electrical specifications and the way to handle ELECYLINDER, which provides you necessary information for you to use it 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.

Please downloaded the user's manual from our website.
You can download it free of charge. User registration is required for the first time downloading.
URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

ELECYLINDER Instruction Manual Configuration

Product name	Instruction manual name	Control number
ELECYLINDER	Quick Start Guide	ME3765
ELECYLINDER	Digital Speed Controller Quick Start Guide	ME3810
ELECYLINDER	Electricity Section Instruction Manual (This document)	ME3816
PC Software	IA-OS First Step Guide * Refer to the guidance feature stored in IA-OS for how to operate	ME0391
PC Software for RC/EC	RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
Touch Panel Teaching Pendant	Applicable for ELECYLINDER TB-02/02D Instruction Manual	ME0355
Touch Panel Teaching Pendant	Applicable for ELECYLINDER TB-03 Wireless Link Instruction Manual	ME0375
Touch Panel Teaching Pendant	Applicable for ELECYLINDER TB-03 Wired Link Instruction Manual	ME0376
RCON System	RCON Instruction Manual	ME0384
RSEL System	RSEL Instruction Manual	ME0392
REC System	REC Instruction Manual	ME0394
Digital Speed Controller	Digital Speed Controller Instruction Manual	ME3818
ELECYLINDER	Slim and Small Type	ME3778

Product name	Instruction manual name	Control number
ELECYLINDER	Rod Type Dust and Splash Proof Specification	ME3779
ELECYLINDER	Slider Type	ME3793
ELECYLINDER	Rod Type	ME3794
ELECYLINDER	Belt Type	ME3798
ELECYLINDER	Stopper Cylinder	ME3799
ELECYLINDER	Rotary Type	ME3800
ELECYLINDER	Clean Room Specifications	ME3804
ELECYLINDER	Gripper Type	ME3806
ELECYLINDER	Slider Type Simple Dust and Splash Proof Specification	ME3814
ELECYLINDER	Ultra Mini Type	ME3815
ELECYLINDER	Slider Type AC200V Servo Motor	ME3801
ELECYLINDER	Long Stroke Gripper	ME3824
ELECYLINDER	Slider, Radial cylinder (20mm width base type)	ME3825
ELECYLINDER	Compact Type	ME3826

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Chapter 1 Warranty

Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the instruction manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

Precautions for Handling

1. The Safety Guide attached with the product is intended to permit safe use of the product and thus to prevent risks and property damage. Be sure to read it before handling the product.

2. In this instruction manual describes electrical contents of ELECYLINDER. For the mechanical contents, refer to an instruction manual of each type of ELECYLINDER.

3. Do not attempt any handling or operation that is not indicated in this instruction manual.

4. Make sure to secure the ELECYLINDER properly in accordance with each models instruction manual.

   If the ELECYLINDER is not securely fixed, this may lead to abnormal noise, vibration, breakdown or shortened product life.

5. Make sure to observe the usage conditions and environment of the product.

   Operation outside the warranty could cause decreased performance or product breakdown.

   Use within the allowable range for each item.

Item	Cautions for use	Problems or breakdowns which may occur if the allowable range is exceeded
Speed and acceleration/deceleration	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life.
Allowable load moment	Use within the allowable range (Static/dynamic)	May lead to abnormal noise, vibration, breakdown, or shortened product life. In extreme cases, flaking may occur on the guide or ball screw.
Overhang load length		Mounting a load with an overhang length greater than the allowable values may lead to vibration or abnormal noise.

6. In the single solenoid system, when a connection cable *1 of FWBW Signal breaks the signal turns OFF and movement turns to the drive to the backward end. Please note and pay attention.

   *1 The connection cable of B3 on the power & I/O connector or the orange cable on CB-EC-PWBIO-□□-RB.

7. There are some models that require an interface box separately when wireless communication is to be conducted. Refer to an instruction manual for each ELECYLINDER.

8. ELECYLINDER (option model code: ACR) is not available for operating in the single solenoid system when operation is made with connectivity to RCONEC.
   Do not attempt to have Parameter No. 9 Electromagnetic Valve System Select set to Single.
   ELECYLINDER may not operate as the host indicates.
   Have the operation made in the double solenoid system (parameter set on delivery).

International Standard Compliance

The ELECYLINDER complies with the following overseas standards.
Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

CE Marking			UL
RoHS3 Directive	EMC Directive	RE Directive (Note1)	
○	○	○	-

If it is necessary to announce EC Declaration of Conformity with this product built in your facility, as this product itself declares the conformity to EU Directives in some specific conditions as stated below, you would be able to utilize this declaration.

EU Directives Applicable for EC Declaration of Conformity
EMC Directive (2014/30/EU)·····To be checked in CE marking described in product nameplate.
RoHS3 Directive (2011/65/EU + (EU)2015/863)·····Same as above.
RE Directive (2014/53/EU) ·····To be checked in EC Declaration of Conformity.

There is EC Declaration of Conformity attached in [Appendix Chapter 1 EU Declaration of Conformity] showing conformity to Wireless Directive.
This EC Declaration of Conformity to may be modified without notice according to addition of conformed models, specification change and so on. Consult with our sales person in charge if necessary.

(Note 1) RE Directive applies to ELECYLINDERs with WL (wireless communication specification) or WL2 (Wireless axis operation specification) in model name options.
Certificates and self-declarations regarding the wireless function are handled under the model name below for the wireless circuit board.
MODEL: IABL3826, IABL3827

Precautions for Handling Wireless Operation

When the option for wireless communication support (model: WL, WL2) is selected, a wireless communication circuit board is built into the ELECYLINDER. Certificates and self declarations regarding the wireless function are handled under the model name below for the wireless circuit board.

Model name: IABL3826、IABL3827

This product uses the 2.4 GHz radio band known as an ISM band. This frequency range is used by various devices such as microwave ovens and wireless LAN, so that communication may be disrupted by radio disturbance.

Use of this device is permitted within the following countries (regions) only. Use in other countries (regions) requires certification to be obtained based on the laws and regulations of the relevant country (region).

登録モデル名／Registered model name		IABL3826	IABL3827
無線周波数／Wireless frequency		2,400～2,483.5MHz	
無線出力／Wireless output		+5dBm	
メーカー名／Manufacturer name		株式会社アイエイアイ／IAI CORPORATION	
製造国／Country of manufacture		日本／（Made in Japan）	
アメリカ／US	Import Corporation Name	IAI America, Inc.	
カナダ／Canada	Import Corporation Name	IAI America, Inc.	
EU 加盟国／ EU Member States	Import Corporation Name	IAI Industrieroboter GmbH	
中国／China	□可□号	CMIT ID=2017DJ6836	CMIT ID=2018DJ0331
	申请公司名	IAI 株式会社	
	机型名	IABL3826	IABL3827
	制造国	日本（Made in Japan）	
	进口企业名	IAI（Shanghai）Co., Ltd.	
한국／KOREA	식별 부호	MSIP-CRM-IAI-IABL3826	R-CRM-IAI-IABL3827
	제조사명	주식회사 IAI	
	모델명	IABL3826	IABL3827
	제조국	일본(Made in Japan)	
	수입업자명	IA KOREA Corp.	
ประเทศไทย / Thailand	ผู้ผลิต	IAI CORPORATION.	
	ชื่อโมเดล	IABL3826	IABL3827
	ประเทศผู้ผลิต	ญี่ปุ่น (Made in Japan)	
	ผู้นำเข้า	IAI Robot (Thailand) Co., Ltd.	
México / Mexico	Número de Certificación	IFT：RCPIATB19-1956-A1	IFT：RCPIATB19-1956
	Nombre de la Empresa Solicitante	IAI Corporation	
	Nombre del Modelo	IABL3826	IABL3827
	País de Fabricación	Japón (Hecho en Japón)	
	Nombre de la Empresa Importadora	IAI America, Inc.	

[日本]

本製品で使用している無線モジュールは、工事設計認証を受けていますので、以下の事項を行うと法律で罰せられることがあります。

- 無線モジュールを分解/改造すること

[US]

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference and
2. This device must accept any interference received, including interference that may cause undesired operation of the device.

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure limits. This transmitter must not be collocated or operating with any other antenna or transmitter.

[CANADA]

This device complies with Industry Canada licence-exempt RSS standards.

Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence

L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC RF Radiation Exposure Statement:

To comply with IC RF exposure requirements, this device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

Pour se conformer aux exigences de conformité RF canadienne l'exposition, cet appareil et son antenne ne doivent pas étre co-localisés ou fonctionnant en conjonction avec une autre antenne ou transmetteur.

[EU Member States]

- For details of the applicable standards, please refer to above mentioned international standards compliances.

  * The product can be used in any country which is a member of EU.

[한국 / KOREA]

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다

Precautions for Axis Operation with Wireless Connection

Touch Panel Teaching Pendant TB-03 (V2.30 or later) can operate the option model code -WL2 ELECYLINDER with wireless connection. For operation with wireless connection, secure safety by following the precautions below before use.

- The stop switch on Touch Panel Teaching Pendant TB-03 will not function during wireless connection. Prepare a device / circuit to stop the operation when emergency stop is required.
- For axis operation with wireless connection, operation testing (movement to forward and backward ends, jog operation, inching operation) is possible, but the control device is not designed for purposes of automatic operation. Construct a mechanical system based on the risks of the operating environment.
- Carry out risk assessment based on the standard/spec requirements of the machinery for installation. Dangerous operation, such as that requiring an automatic stop when control signals cannot be received (including disabled communication) is not acceptable.
- Stopping axis operation by wireless network cannot be used as a safety feature as defined in EN ISO 13849-1: 2015. It is also not compliant with Safety Category B or Categories 1 to 4 stated in EN ISO 13849-1: 2015.

Caution in Installation and Operation of Digital Speed Controller

Digital speed controller (hereinafter described as “DS”) is assumed to be operated in set-up change (1) at startup of equipment and (2) during equipment run, and work is assumed to be done in a safety fence. Touching partly to the moving parts or carrier parts may cause an injury to an operator.
Follow the caution notes below when you operate DS.

1. Grasp the operation range of the moving parts and carrier parts so you may not touch partly to them. Make sure to have only the operators who have got safety education to operate the equipment.
2. If a wired or wireless teaching pendant or PC is connected, there should be “Tool Connected” displayed in the DS display window and operation on DS gets unavailable.
   When you check the display, make sure to grasp the operation range and get away from the range far enough so you may not touch partly to the moving parts or carrier parts.
3. Separate the DS operation part from any moving part or carrier part, install an area sensor such as the light curtain so you would not get caught on finger or hand.
4. DS is set in low speed at 250mm/s or less at delivery for safety. In case you set the speed above 250mm/s, increase the setting speed step by step to consider safe operation.
5. Have two or more operators for operation to secure an operator to watch the work in addition to an operator to operate DS.
   Build up an appropriate safety circuit and equip it with an emergency stop button and an enable switch with three positions. The watcher should stop the equipment immediately in case of any emergency to ensure safety of the DS operator.
6. Build up the safety circuit that does not start up only with power supply or restoration from power outage.
7. Install the actuator with DS considering a position easy to operate or see the DS to secure your body position or posture while operating DS. Failure to do so could hurt your back, neck or wrist.
8. Check that there is no abnormality on the safety circuit or DS itself before you start operating on the DS. Have an appropriate measure when any abnormality is found before start operation.
9. Create a “Operation Standard” necessary to secure safety, educate an operator based on this standard, and have only operators who is well educated with the standard (operators who received safety education).
10. When it is a work in a safety fence, make sure to put up a sign showing “Work on-going in Safety Fence” at a place where the sign can be seen from outside the fence before starting the work.
11. Make sure to secure safety and wear a helmet, safety gloves and safety goggles as necessary.

12. Have a risk assessment conducted so any risks that could be considered get reduced and removed to the acceptable level.

The notes above are the caution notes for installation and operation of DS, but they are also general caution for any case other than use of DS, thus some descriptions could duplicate with “Safety Precautions for Our Products”.

Reference

Refer to [Digital Speed Controller Instruction Manual (ME3818)] provided separately for the detailed explanation about the digital speed controller.

Actuator Coordinate System

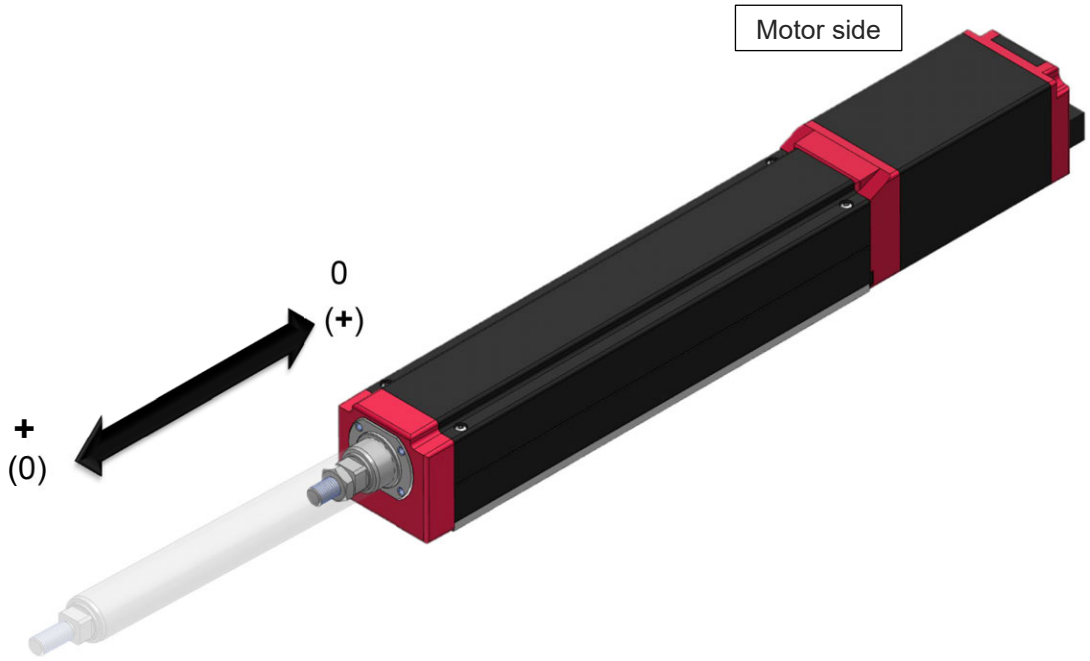
Unless otherwise there is an indication of the home reversed specification (option), the home return orientation should be on the motor side for the linear axis type and outside (open end) for the gripper type, counterclockwise moving end for the rotary axis type and the opposite motor side for the stopper cylinder type.

Caution

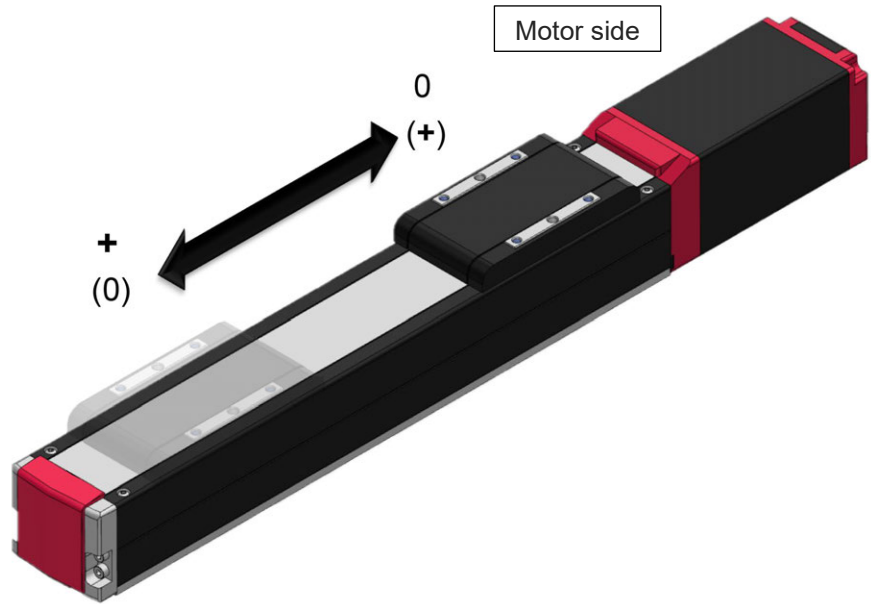
- Homing direction cannot be changed with some models.
- If it becomes necessary to reverse the homing direction after assembly to equipment, check the model of the applicable actuator to ensure that the homing direction is changeable.
- For models with which change is not possible, the actuator must be replaced. Contact IAI if anything is unclear.

The “0” in the figure below shows home. The parentheses show home reverse specification.

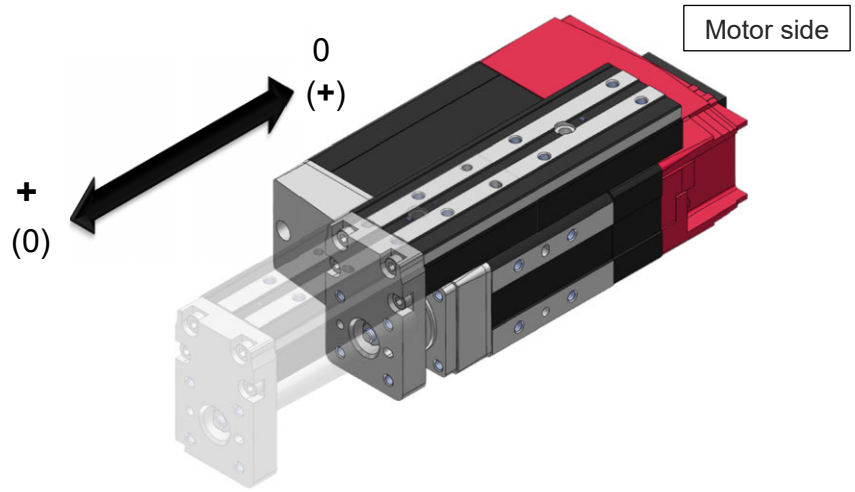
(1) Rod type



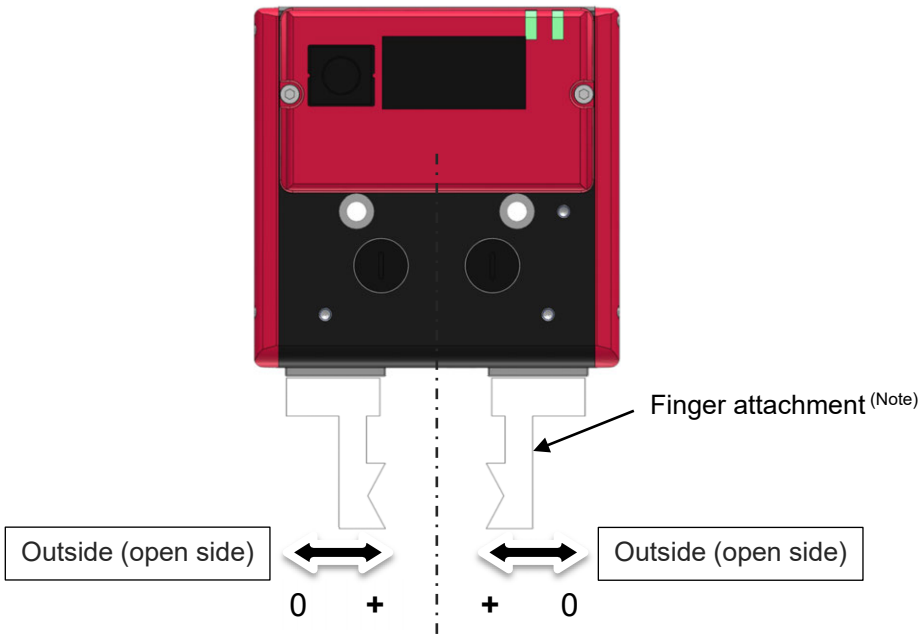
(2) Slider type



(3) Table type

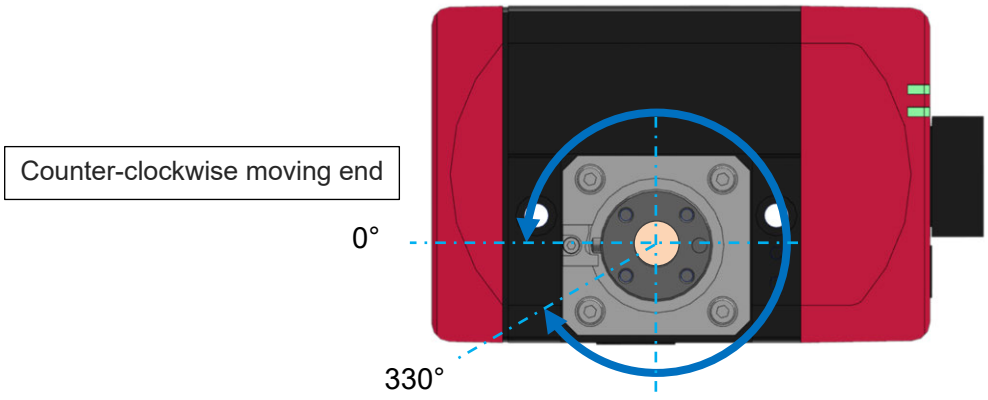


(4) Gripper type



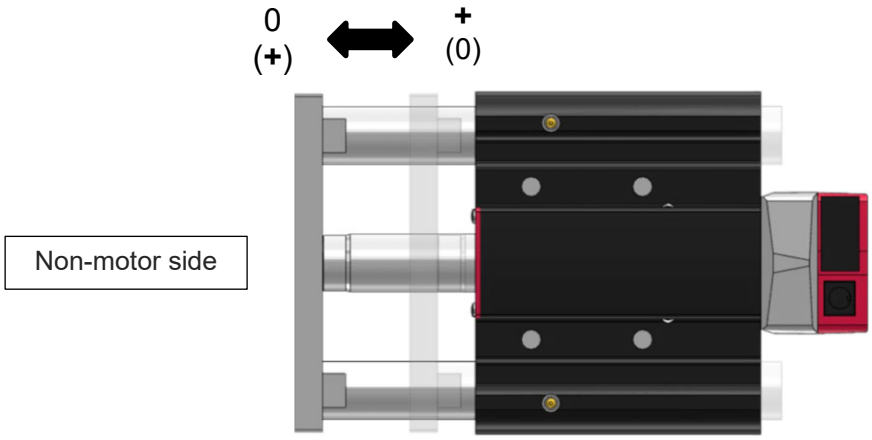
Note: The finger attachment is not an accessory for the actuator.
It is to be prepared by the customer. (It is applicable in option for some models. Refer to [ELECYLINDER Gripper Type Instruction Manual] or [ELECYLINDER Long Stroke Gripper Instruction Manual] for details.)

(5) Rotary type



(330° rotation specification)

(6) Stopper cylinder



Specifications Section

Chapter 1

ELECYLINDER Overview

1.1 Overview

ELECYLINDER (hereinafter described as EC) is a controller built-in electrical actuator specialized for 2-point positioning.

EC was developped under a concept of a product that is easy for users who use an electrical actuator for the first time and that enables them to have "simple" operations. It is made to be simple enough for operation with small number of PIO points (3 in / 3 out) so it can be handles just like an air cylinder.

EC mainly equips two type, one in the pulse motor mounted models and the other in the 200VAC servomotor mounted models. Refer to [an instruction manual of each ELECYLIDER] for the mounted motor.
Also, there are three types for ejection methods of external interface for pulse motor mounted models.
The "interface built-in type" possesses connectors and serial ports equipped on ELECYLINDER main body to put I/O and power supply cables directly. The "dust and splash proof type" possesses a structure to have its interface away from the ELECYLINDER main body in order to ensure dust and splash proof performance on the ELECYLINDER main body.
The "interface separate type" possesses the specification to attach an interface box when PIO control is to be performed and to join the actuator cable directly for connection to the EC connection unit to be used in the RCON system. (Refer to [Specification Edition 2.1])

As an option of the EC series, there is "digital speed controller" which can be operated directly in your hand by mounting a panel for operation on an actuator without a teaching tool. This product enables a user for installation of equipment or a user who does not have a teaching tool to operate EC simply and intuitively and to lower a bar further to introduce ELECYLINDER.
Refer to [Digital Speed Controller Instruction Manual (ME3818)] for the digital speed controller.

Refer to instruction manuals for such as EC main unit, teaching pendant and PC teaching software together with this manual when in the actual installation of equipment or a malfunction is occurred.

It is impossible to state everything including unexpected phenomena such as a complicated signal change at a dangerous timing which are out of the normal operation.
Therefore, take the things that are not described in this manual as an “impossible” thing.

* Keep this manual to a place easy to access when necessary to read again.
* The contents in this manual should cover everything considerable, however, please contact IAI in case of any awareness to mistakes or consideration.

1.2 Characteristics

The characteristics of this product are as shown below.

- Product Specifications
  - It is applicable for 3IN/3OUT and NPN/PNP that are the least for the input and output points in all the controllers ever.
  - It is simple specifications with the number of positioning points limited to 2 points at the forward end and backward end only and equipped with 1 signal of input and 1 signal of complete signal only.
  - The encoder is applicable for the incremental 800 pulse optical in the standard type and for the battery-less absolute in the option.
    * The 200V AC servomotor equipped models should be in the battery-less absolute type for 14 bit in standard.
      The ultra mini type is equipped with the incremental 15 bit magnetic type encoder.
    * There is the incremental specification only in the ultra mini type.
      The small grippers (EC-GRC6, GRC7 and GRST3) adopts a magnetic encoder with 14 bits for both incremental and battery-less absolute types.
  - It is applicable for PowerCON in standard. (High Thrust Type, Slim and Small Type and Ultra Mini Type excluded)
  - The unit is equipped with the wireless communication feature to link with a teaching pendant equipped with wireless feature (option).
    BLE (Bluetooth Low Energy) is adopted for the wireless communication.

- External Interface
  - By having a connector on the cable side of an external interface connector to be a spring terminal type connector, a user can directly lay out the cable to the connector on the cable without using a dedicated cable. Also, the dedicated cable is available as an option.
  - On the side of the connector on the cable side of the external interface connector, there is the terminal name described. With this, wiring work can be easily performed without referring to an instruction manual.
  - The anti-dust and anti-drip specification type is capable of conducting the signal input and output with external devices by using an interface box.
  - For the models equipped with the interface separate type pulse motor and the models equipped with 24V AC servomotor, there are two types of ways to select from as shown below for the interface connection.
    1. Connecting Directly to RCON-EC (*)
    2. Establish connection using an interface box
       * When the wireless features are to be used, it is necessary to prepare an interface box equipped with the wireless features separately.

    Also, the actuator cable is a pigtail which is capable of connecting directly to RCON-EC. When using an interface box, it is necessary to have a conversion cable separately to connect indirectly.

- Hardware configuration
  - There are two types prepared for the power supply circuit.
    1. 24V input 1 system specification (standard) without dividing control power supply and motor power supply
    2. Power supply 2 system specification (option) capable of performing drive cutoff only without cutting off control power supply
  - The construction of PC board is a single layer for the standard type controller and double layer for the slim and small type, dust and splash proof type and high thrust type controllers.
    * The PC board differs for PIO specification (NPN/PNP), power supply 2 system specification (option) and so on.
      Also, the PC board is mounted separately for the digital speed controller specification and RCON-EC specification.
  - The construction of the PC boards for an ultra mini type controller is triple layer and consists of driver board, CPU board and encoder board.
  - The motor power supply in standard, dust and splash proof specification and high-thrust specification are equipped with a semiconductor type drive cutoff circuit. This circuit works also as a high-side overcurrent detection feature.
    * This circuit is not equipped in the slim and small type and ultra mini type.
  - The external interfaces for the types equipped with the 200V AC servomotor should be the same as those equipped with the pulse motor except for the motor power supply connector. It is applicable for the size from 100 to 750W for a motor. Also, the motor power supply (280V DC9 can be provided from the external power supply PSA-200 via the dedicated cable.

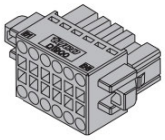
- Features of Software
  - In the simple data setting window, the position setting can be performed in numeric input. Also, it is available to establish the setting in percentage [%] input individually for AVD (acceleration / velocity / deceleration).
  - With "Operation Sound Tuning", the sound during run and when stop can be tuned without having a complicated servo gain adjustment.

1.3 Checking the product

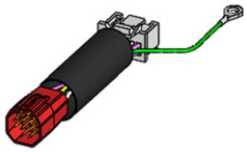
1.3.1 Items to prepare

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

[1] Things Necessary for ELECYLINDER (Pulse Motor Equipped Models)

ELECYLINDER Quantity 1 Model: EC 	Power & I/O Cable Quantity 1 Model: CB-EC-PWBIO□□□-RB  Please prepare either one. * Select depending on model of ELECYLINDER	Power & I/O connector Quantity 1 Model: 1-1871940-6  * Select depending on model of ELECYLINDER
24V DC Power Supply Quantity 1 Model: PSA-24*  * Sold separately *Commercially available 24V power supply can also be used.	Teaching Pendant Quantity 1 Model: TB-03-□-□  Please prepare either one. * Sold separately * It's possible to connect TB-02, too.	PC Teaching Software Quantity 1 Model: IA-OS-C  * Sold separately

Things Necessary for Specific Types of ELECYLINDER

Interface Box Quantity 1  * Enclosed for dust proof / splash proof ELECYLINDER Enclosed for some ELECYLINDER in interface separate type depending on specifications.	Interface Box Conversion Cable Quantity 1 Model: CB-CVN-BJ002  * Enclosed for some ELECYLINDER in interface separate type depending on specifications.

[2] Things Necessary for ELECYLINDER (24V AC Servomotor Equipped Models)

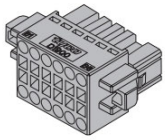
ELECYLINDER Quantity 1
Model: EC

Power & I/O Cable Quantity 1
Model: CB-EC-PWBIO□□□-RB

* Select depending on model of ELECYLINDER

Please prepare either one.

Power & I/O connector Quantity 1
Model: 1-1871940-6



* Select depending on model of ELECYLINDER

24V DC Power Supply Quantity 1
Model: PSA-24*

* Sold separately
* Commercially available 24V power supply can also be used.

Teaching Pendant Quantity 1
Model: TB-03-□-□

* Sold separately
* It's possible to connect TB-02, too.

Please prepare either one.

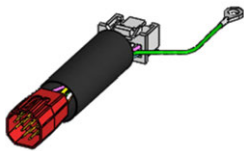
PC Teaching Software Quantity 1
Model: IA-OS-C

* Sold separately

Interface Box Quantity 1

* Included depending on ELECYLINDER specifications.

Interface Box
Conversion Cable Quantity 1
Model: CB-CVN-BJ002



* Included depending on ELECYLINDER specifications.

[3] Things Necessary for ELECYLINDER (200V AC Servomotor Equipped Models)

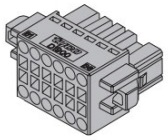
ELECYLINDER Quantity 1
Model: EC

Power & I/O Cable Quantity 1
Model: CB-EC-PWBIO□□□-RB

* Select depending on model of ELECYLINDER

Please prepare either one.

Power & I/O Cable connector
Quantity 1
Model: 1-1871940-6



* Select depending on model of ELECYLINDER

Motor Power Supply Cable
Quantity 1
Model: CB-EC-PW□□□-RB

* Select depending on model of ELECYLINDER

DC Power Supply for Motor Drive
Quantity 1
Model: PSA-200-*

* Needs to be prepared separately

Set of Motor Drive DC Power Supply Connector
Power supply connector: MSTB2,5/6-STF-5,08

Status output connector: DFMC1,5/3-STF-3,5

* Enclosed in motor drive DC power supply

24V DC Power Supply Quantity 1
Model: PSA-24*

*Commercially available 24V power supply can also be used.

Teaching Pendant Quantity 1
Model: TB-03-□-□

* Sold separately

* It's possible to connect TB-02, too.

Please prepare either one.

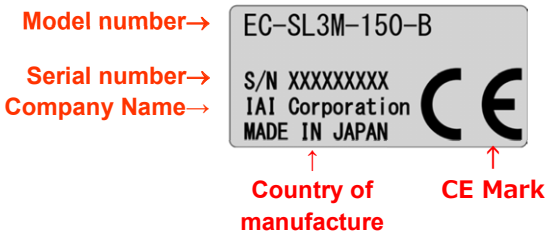
PC Teaching Software Quantity 1
Mode: IA-OS-C

* Sold separately

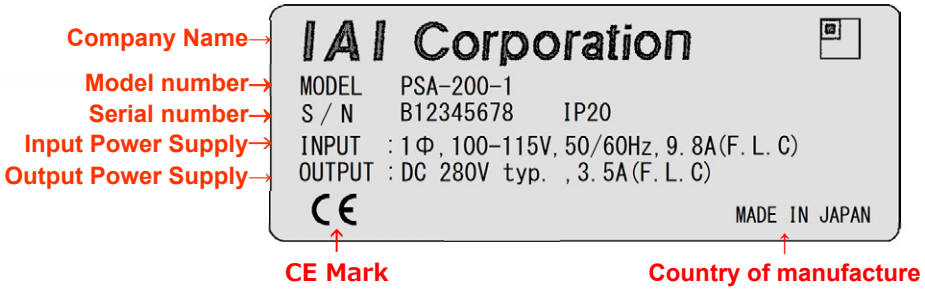
1.3.2 How to read the model nameplate

(1) ELECYLINDER Model Nameplate

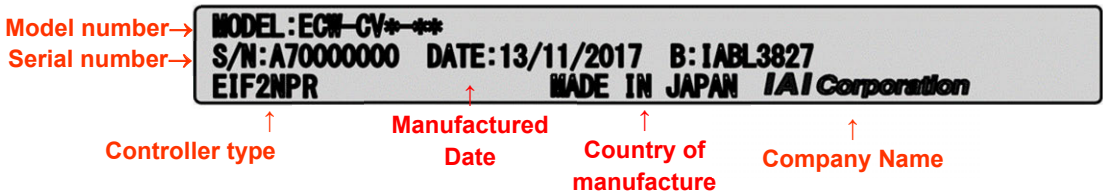
(2) Ultra Mini ELECYLINDER Model Nameplate



(3) Model Plate for Motor Drive DC Power Supply PSA-200



(4) Interface Box Model Nameplate



1.3.3 How to read the model number

The model code of each series of ELECYLINDER is constructed basically with information described below.
Refer to the explanation below for the content.
Also, the type of encoders available for selection or range of selection (lead, stroke, etc.) should differ for each model.
Check in [an instruction manual of each ELECYLINDER] for details.

(Example)

EC	-	DS7S(R)	-	200	-	1	-	B
(1) Series		(2) Type (3) specification		(4) Stroke		(5) Power & I/O cable length		(6) Option

(1) Series: ELECYLINDER ® series

(2) Type: Type (eg. Slider), unit width (eg. Width 70mm), ball screw lead (*) are to be described in the contents.

* The lead of the ball screw (the distance that the slider drives when the ball screw turns for one turn) should be expressed in alphabets. The lead expressed with an alphabet should differ depend on a model.
  Check in [Chapter 1 Specification in an instruction of each ELECYLINDER] for details.

(3) specification: Contents of stiffness, motor joint system (reversed), environment (cleanroom, dust proof, dust and splash proof) should be expressed.

(4) Stroke: It should express the stroke (operational range) of an actuator.

(5) Power & I/O cable length: Cable for connecting power and PLC I/O signals.
It expresses the cable length (1 to 10m) or connectors only (when selected 0) enclosed.

* 4 Put "S" In front of the number when a four-way connector cable is to be selected.
* For the models equipped with the interface separate type pulse motor and the models equipped with 24V AC servomotor, the actuator cable length is also to be selected. Check in [Model Code Item] in a page of the specifications for each product for details.
* Whether to select RCON-EC connection type (ACR) or not should differ the cable to be enclosed.

(6) Option: It expresses an option to be mounted to an actuator.

1.4 Options

Below states the electric related options of ELECYLINDER.

1.4.1 RCON-EC connection specification (Model: ACR)

It is to be used when the field network is to be established via R-unit (connected to RCON-EC).

(*) The specifications linked directly to RCON-EC should be shown for the interface separate type pulse motor and the models equipped with 24V AC servomotor. It is necessary to prepare the interface box, interface box conversion cable and the power & I/O cables separately when wireless communication is performed.

1.4.2 With brake (Model: B)

The moveable part will be retained when there is a power cutoff or the servo gets off.
It is a retainer feature to prevent an attached object from being damaged by a slider or rod being dropped when the power is turned off or the servo is turned off when an actuator is installed vertically. It is also a retainer feature to prevent an attached object from being damaged by an output axis being rotated unexpectedly with its own weight when the power is turned off or the servo is turned off when a rotary type is installed in horizontally oriented wall mount.

1.4.3 3 position mode specification (Model: MF)

This is an option that enables 3-point positioning (intermediate stop).
For details, refer to the separate volume [an instruction manual of ELECYLINDER 3 position mode specification (ME3837)].

1.4.4 Home reverse specification (Model: NM)

The home position of the standard type should be set on the motor side for the linear axis, counterclockwise drive end for the rotary axis, outside (open end) for the gripper type and opposite motor side for the stopper cylinder.
However, the opposite side specification is selected if the home position direction is reversed in accordance with equipment layout or assembly direction.

1.4.5 PNP specification (Model: PN)

I/O input/output specifications are NPN specification as standard.
Specifying this option changes the unit to PNP specification.

1.4.6 2-circuit power supply specification (Model: TMD2)

It is an option to equip an actuator with the operation stop input.
The motor power supply and the control power supply are to be provided separately.
It is to be selected when only the drive source of an actuator is to be cut off.

1.4.7 Battery-less absolute encoder specification (Model: WA)

EC Series is equipped with the incremental encoder specification in standard.
By indicating this option, the battery-less absolute encoder should be mounted.
The 200V AC servomotor equipped models are in the battery-less absolute encoder specification in standard.
As following models are the models dedicated for the incremental encoder, this option cannot be selected.

Equipped Motor	Type	Model
Pulse motor	Slider	EC-SL3□
	Rod	EC-GDB3□
	Table	EC-T3□
	Gripper	EC-GRB8M
	Stopper	EC-ST15ME, EC-GDS3L
24V AC Servomotor	Rod	EC-CRP3□, CRP5□, CGD3□, CGD5□
	Table	EC-CTC3□, CTC5□

1.4.8 Wireless communication specification (Model: WL)

The models with wireless communication specification have built-in wireless circuit boards and enable wireless communication between ELECYLINDERs and Touch Panel Teaching Pendant (TB-03) or Remote Digital Speed Controller.
Refer to [an instruction manual of ELECYLINDER] to be used for certification and self-declaration related to the wireless features.

1.4.9 Wireless axis operation specification (Model: WL2)

The wireless axis operation specification includes a built-in wireless circuit board enabling wireless communication between the ELECYLINDER and the Touch Panel Teaching Pendant or Remote Digital Speed Controller.
Specifying WL2 enables operation testing of axis operation (movement to forward and backward ends, jog operation, inching operation) as well as the operation via wireless communication enabled with WL. However, the control device is not designed for purposes of automatic operation.
Be sure to refer to the Precautions for Axis Operation with Wireless Communication.
Refer to [an instruction manual of ELECYLINDER] to be used for certification and self-declaration related to the wireless features.

(Note) Changes from WL to WL2 and from WL2 to WL cannot be performed by the customer. Please contact us.

Specifications Section

Chapter 2

System Configuration

2.1 System Construction of Pulse Motor Equipped Models

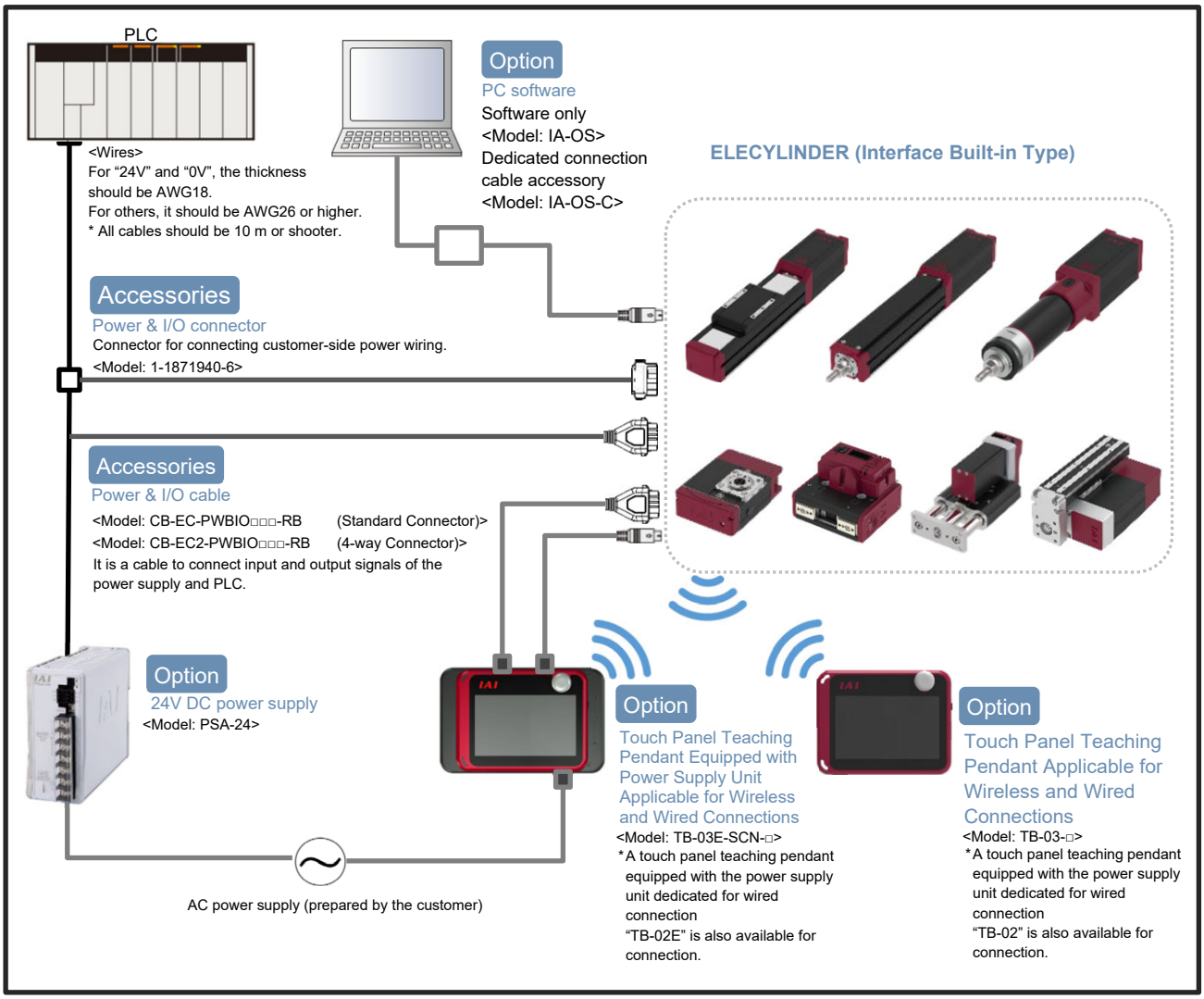
There are following three types of the system constructions in the pulse motor mounted models.

- Interface Built-in Type (Refer to [2.2.1 Interface Built-in Type] for details)
- Dust-Proof/Splash-Proof Type (Refer to [2.2.2 Dust and Splash Proof Type] for details)
- Interface Separate Type (Refer to [2.2.3 Interface Separate Type] for details)

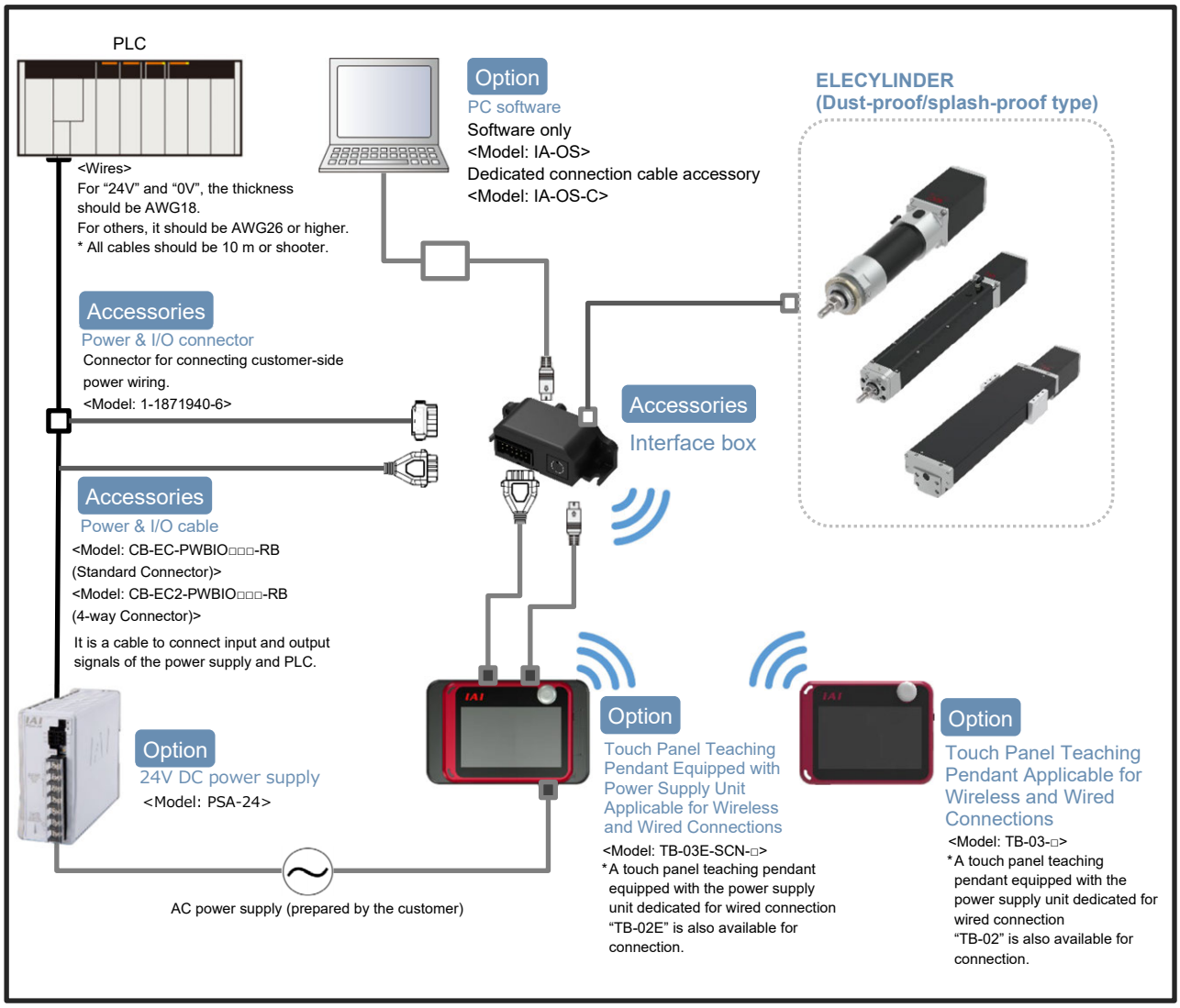
Shown below is the list of applicable models for each system construction.

System Construction	Type	Model
Interface Built-in Type	Slider	EC-(D)S3□/(D)S3□A/(D)S4□/(D)S4□A (D)S6□/(D)S6□A(D)S7□/(D)S7□A/S8□/S8□A/S8X□A (D)S3□R/(D)S3□AR/(D)S4□R/(D)S4□AR (D)S6□R/(D)S6□AR/(D)S7□R/(D)S7□AR/S8□R/S8□AR/S8X□AR (D)S6□AH/(D)S7□AH/(D)S6X□AH/(D)S7X□AH/S6□H/S7□H (D)S6□AHR/(D)S7□AHR/(D)S6X□AHR/(D)S7X□AHR (D)WS10□/(D)WS12□/(D)WS10□R/(D)WS12□R
	Belt	EC-(D)B6□/(D)B7□/B8S
	Rod	EC-(D)R6□/(D)R7□, EC-SRG11□/SRG15□, EC-RP4□/RP5□/GS4□/GD4□/GD5□
	Radial cylinder	EC-(D)RR3□/(D)RR4□/(D)RR6/(D)RR7/RR6□H/RR7□H/RR8□/RR10□ (D)RR3□R/(D)RR4□R/(D)RR6□R/(D)RR7□R//RR8□R/RR10□R (D)RR6□AH/(D)RR7□AH/(D)RR6X□AH/(D)RR7X□AH (D)RR6□AHR/(D)RR7□AHR/
	Table	EC-TC4□/TC5□/TW4□/TW5□
	Gripper	EC-GRB8/GRB10/GRB13, EC-GRST6□/GRST7□
	Rotary	EC-RTC9M/RTC12M/RTC18M
	Stopper	EC-ST11□/ST15L/ST15ME
	Clean	EC-(D)S3□CR/(D)S4□CR/(D)/S6□CR/(D)S7□CR/S8□CR (D)S3□ACR/(D)S4□ACR/(D)S6□ACR/(D)S7□ACR/S8□ACR (D)S6□AHCR/(D)S7□AHCR/(D)S6X□AHCR/(D)S7X□AHCR/S8X□ACR (D)WS10□CR/(D)WS12□CR
Dust-proof/ splash-proof type	Slider	EC-S6□D/S7□D、EC-S6□W/S7□W
	Rod	EC-EC-R6□W/R7□W/RR6□W/RR7□W
Interface Separate Type	Slider	EC-S2□, S2□R, EC-SL3□
	Rod	EC-GDB3□, EC-RP3□/GD3□
	Radial cylinder	EC-RR2□, RR2□R
	Table	EC-T3□, EC-TC3□/TW3□
	Gripper	EC-GRBP8M(W)/GRBP10M(W)/GRBP13□(W), EC-GRC6M/GRC7□, EC-GRST3□
	Rotary	EC-RTB4M
	Stopper	EC-GDS3L

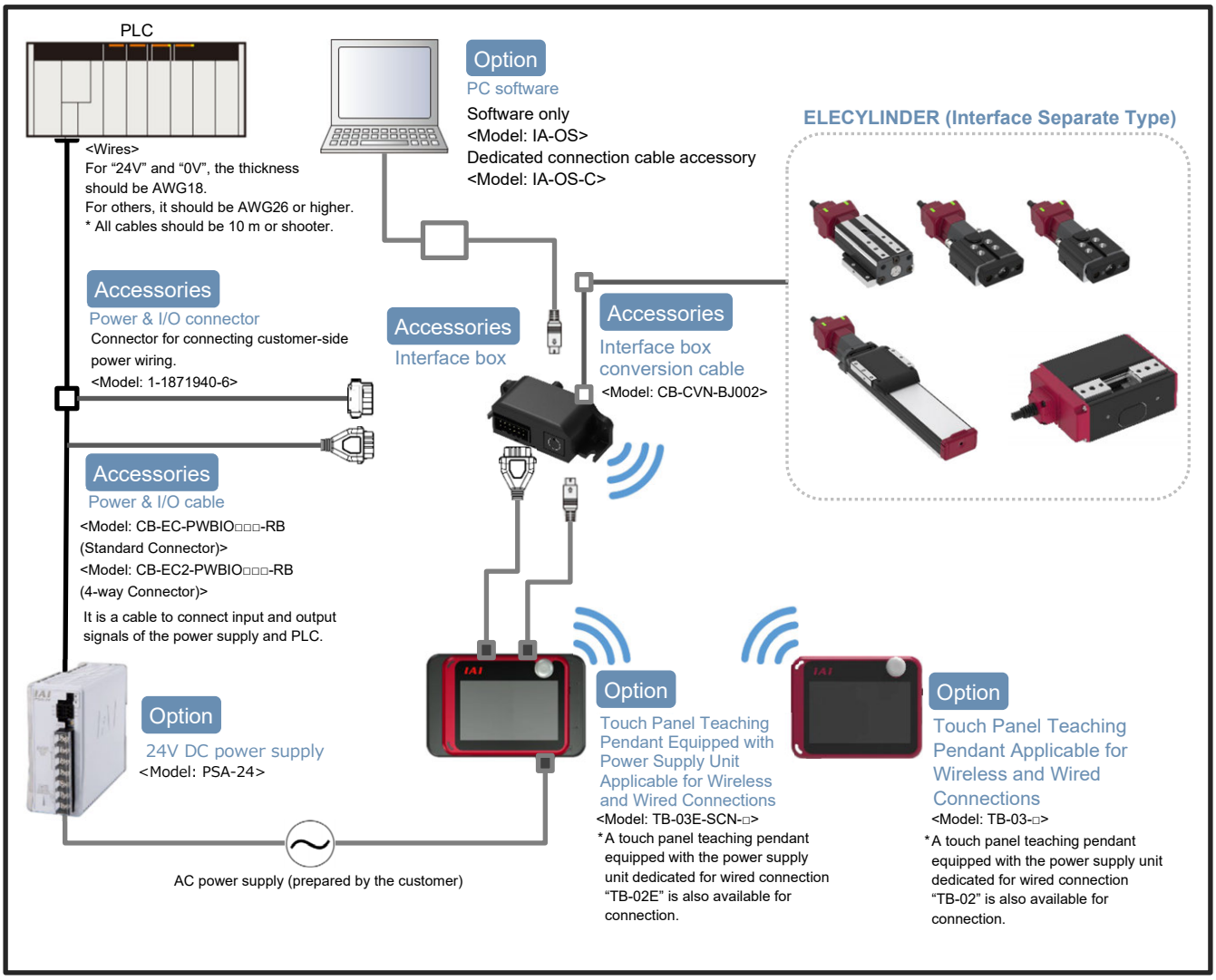
2.1.1 Interface built-in type



2.1.2 Dust-proof/splash-proof type



2.1.3 Interface separate type

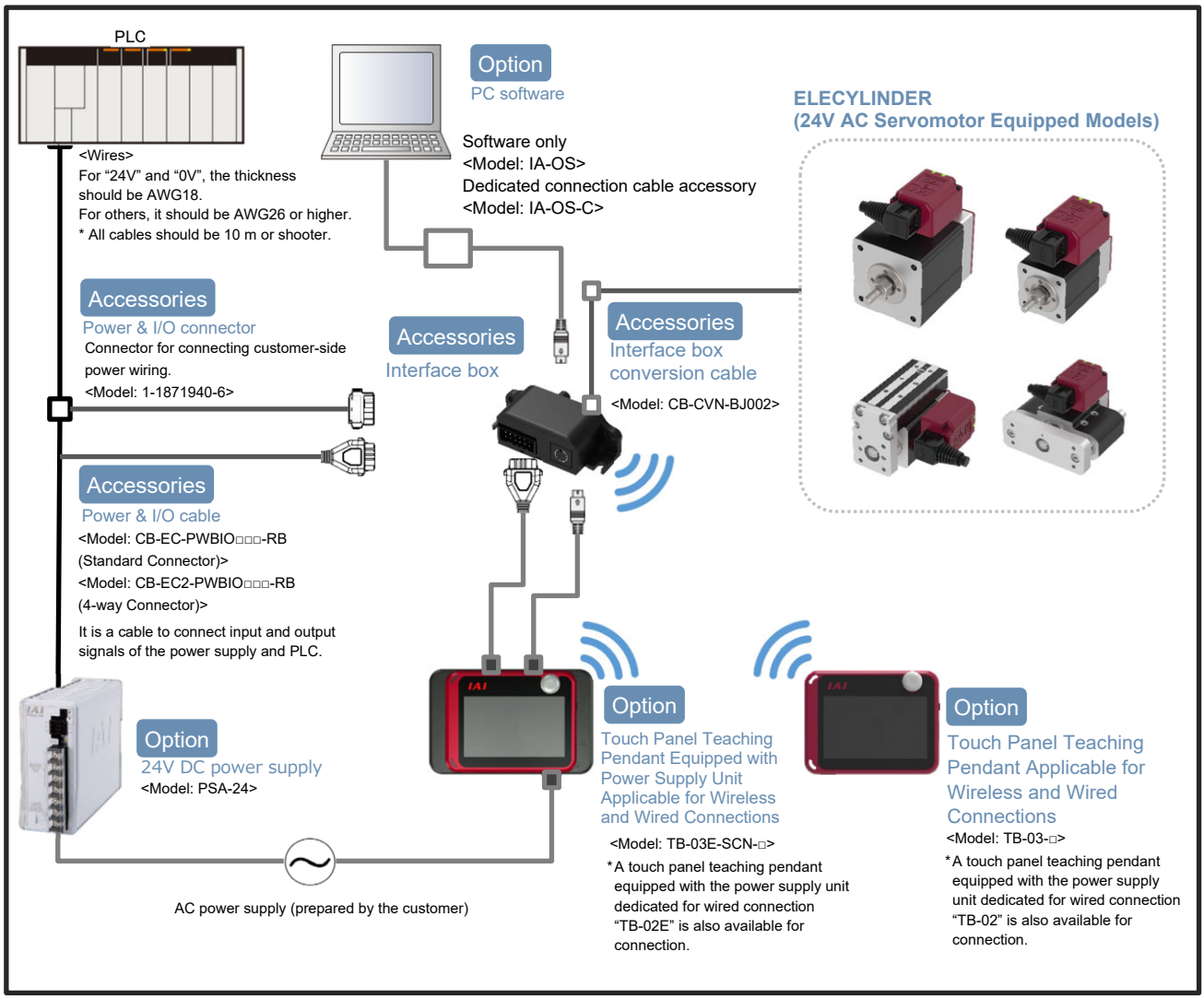


2.2 System Construction of 24V AC Servomotor Equipped Models

Shown below are the types that are applicable for the models equipped with the 24V AC servomotor.

Type	Model
Rod	EC-CRP3□, CRP5□, CGD3□, CGD5□
Table	EC-CTC3□, CTC5□

Shown below is the system structure.

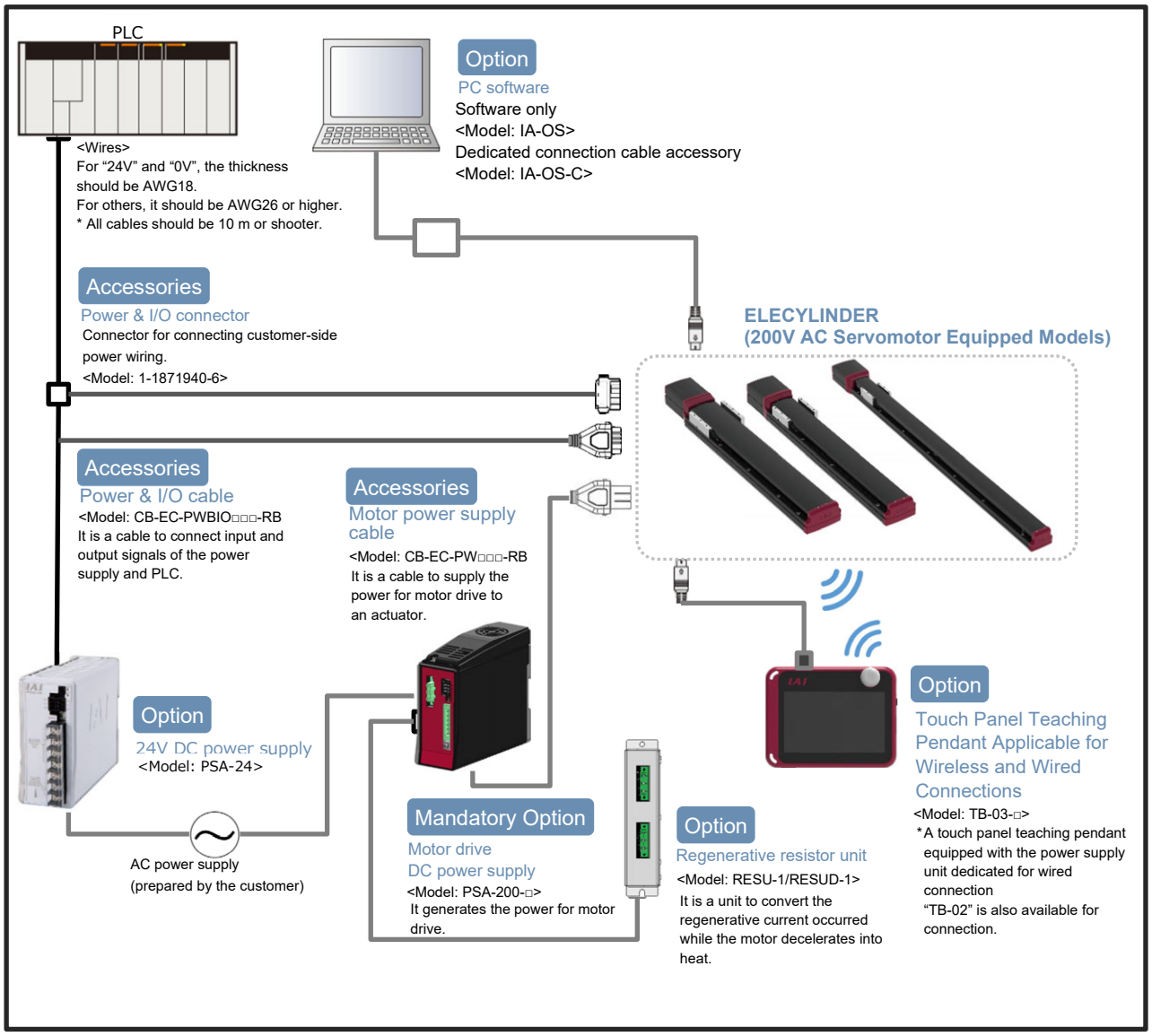


2.3 System Construction of 200V AC Servomotor Equipped Models

Shown below are the types that are applicable for the models equipped with the 200V AC servomotor.

Type	Model
Slider	EC-S10□/S10X□, S13□/S13X□, S15□/S15X□, S18□/S18X□/S18□LP/S18X□LP
Belt drive	B8□SS

Shown below is the system structure.

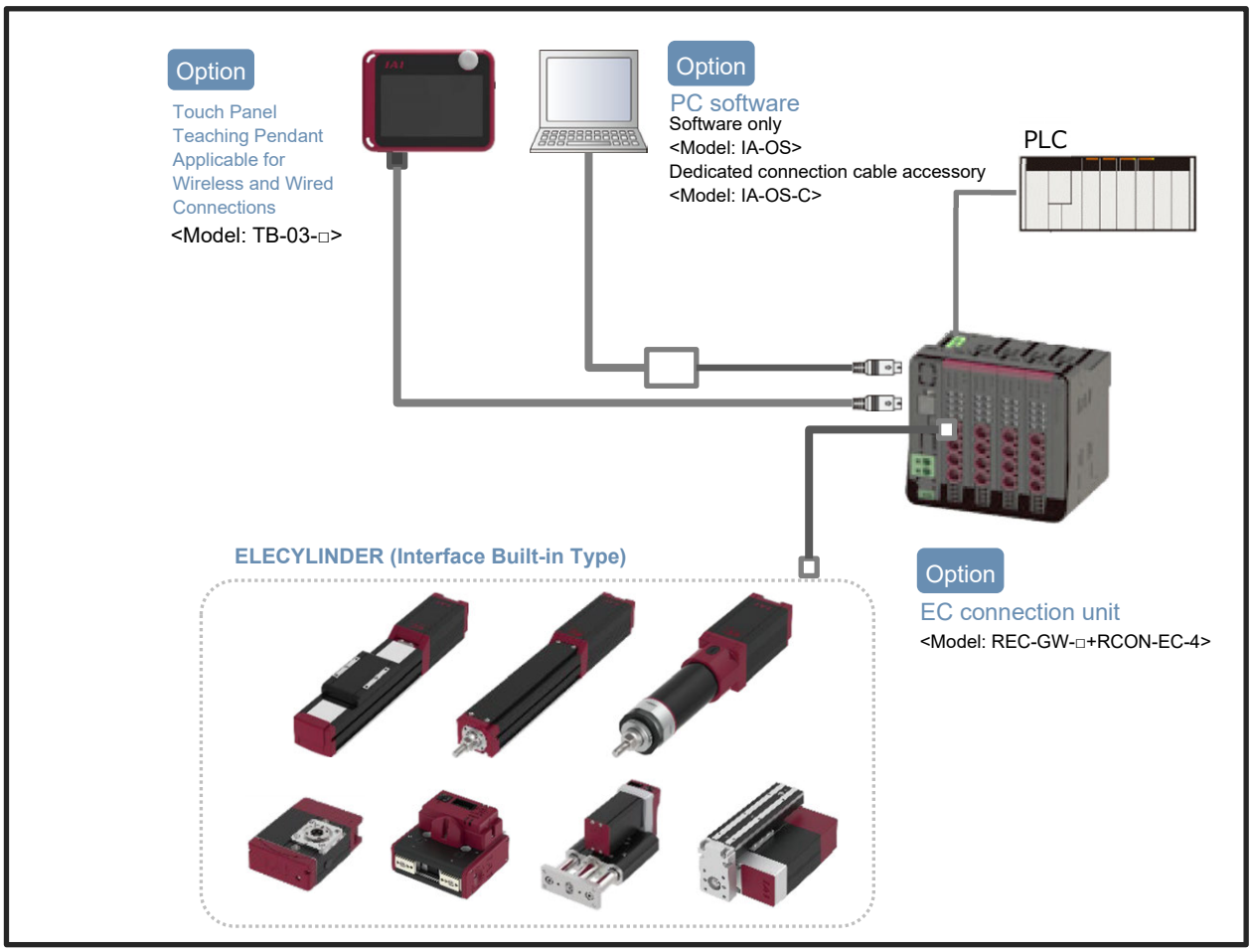


2.4 System Construction when Connecting to RCON-EC

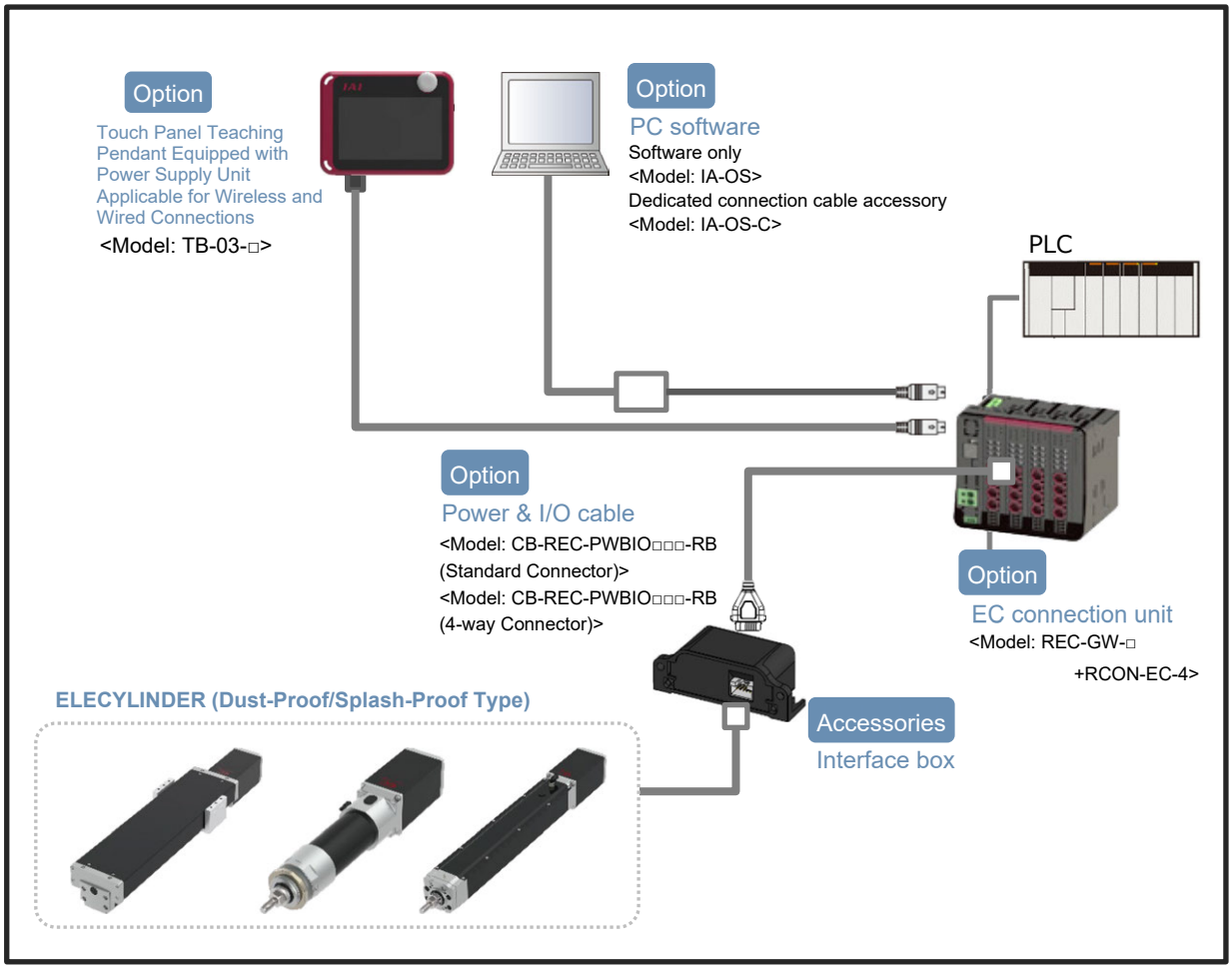
The following shows the system configuration.

2.4.1 Pulse Motor Equipped Models

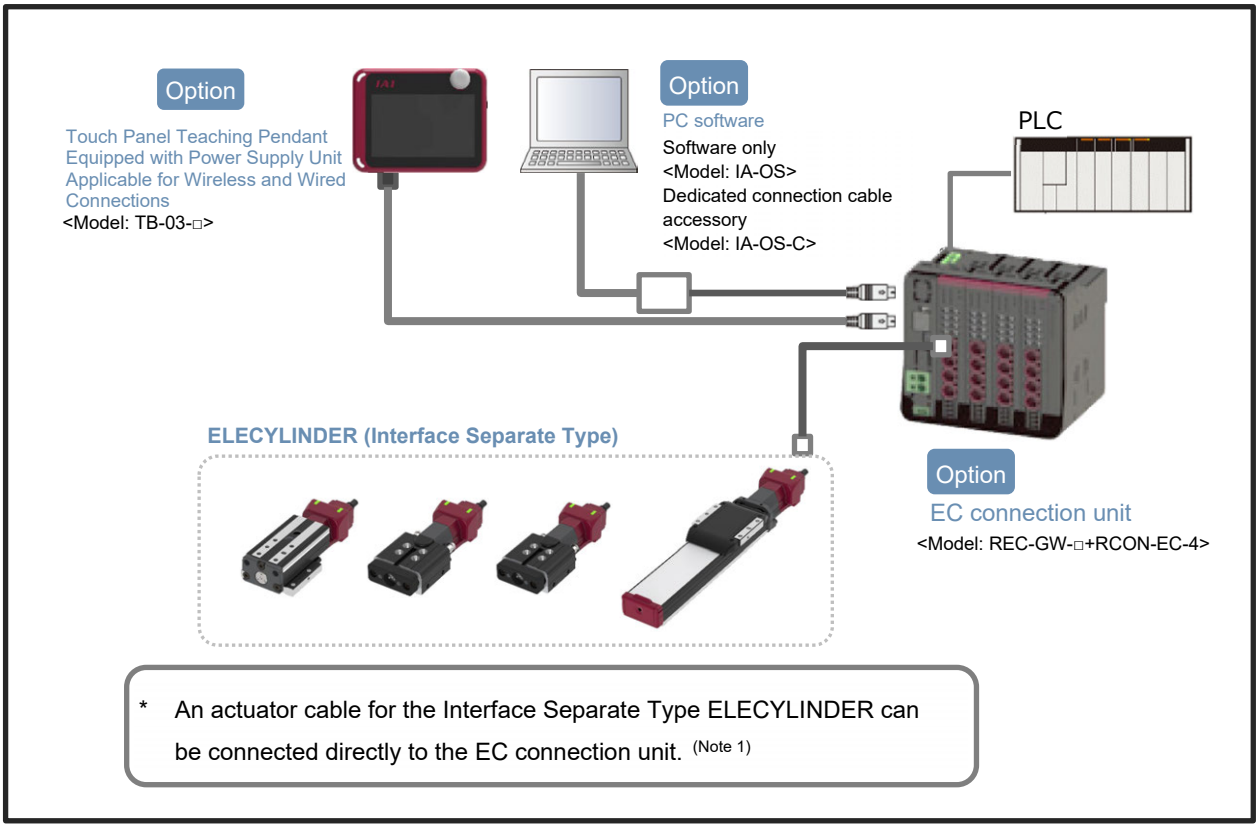
[1] Interface Built-in Type



[2] Dust-proof / Splash-proof type

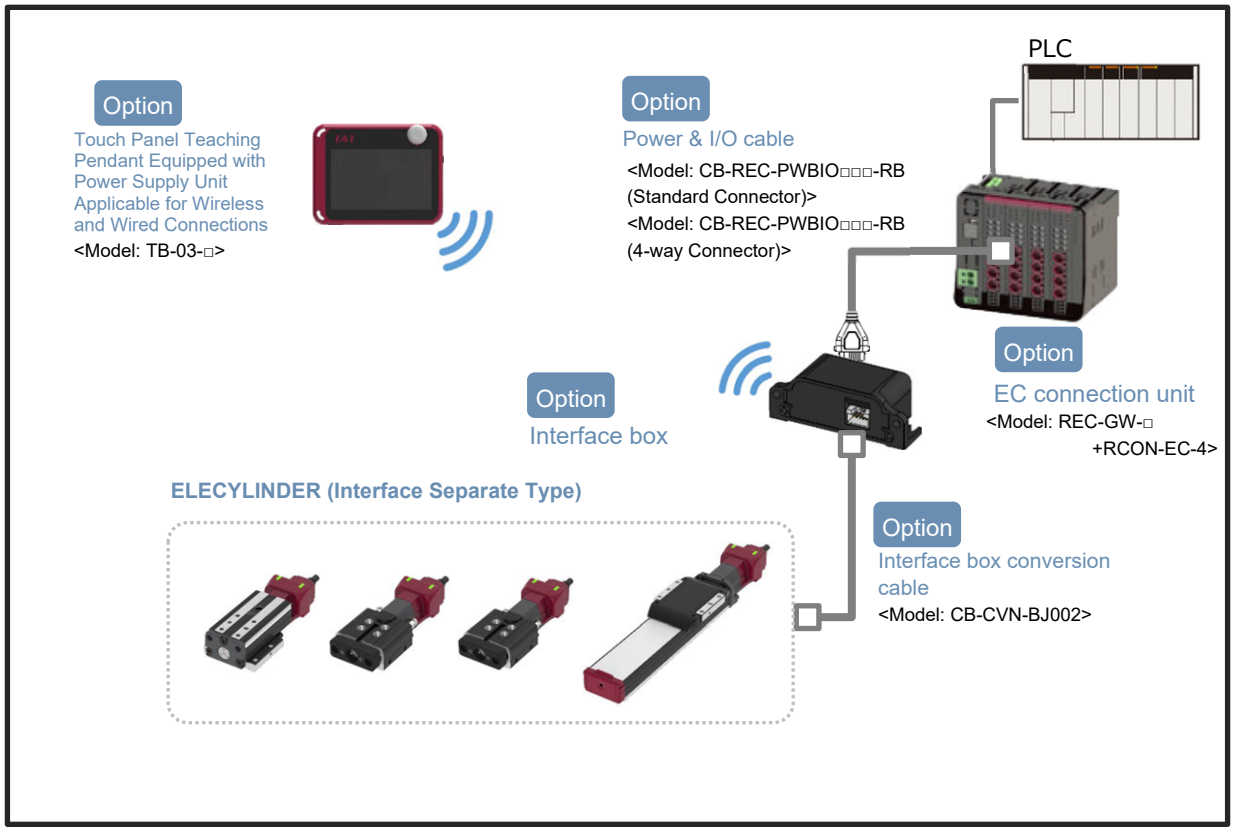


[3] Interface Separate Type (When Connected to RCON-EC Directly)



(Note 1) Refer to [Startup Section 6.3.1 When Connecting Directly to EC Connection Unit] for details how to lay out wiring.

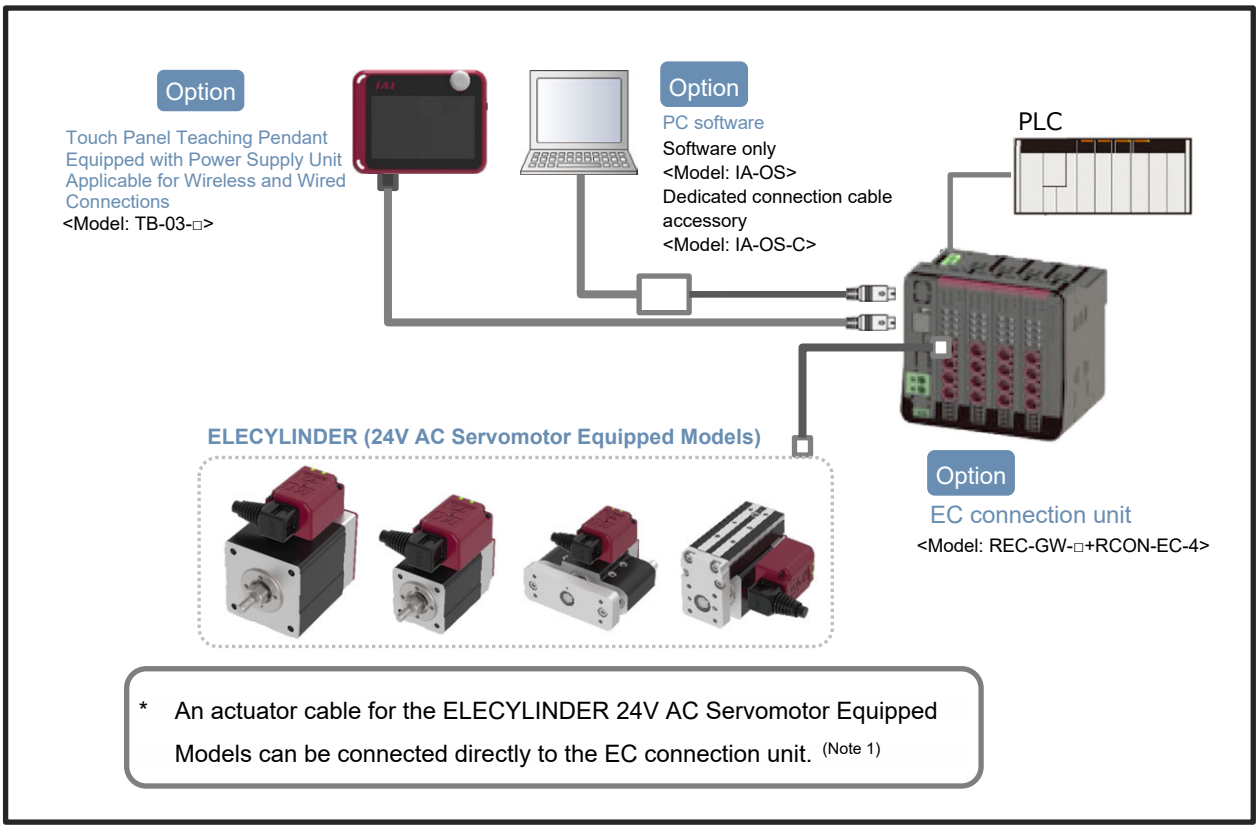
[4] Interface Separate Type (When Using Teaching Pendant Wireless Connection)



(*) When the actuator of Interface Separate Type is to be connected to the EC connection unit using the wireless teaching tool in parallel, it is necessary to have an interface box applicable for wireless connected.
Refer to [Startup Section 6.3.2 When Connecting from Interface Box to RCON-EC] for details how to lay out wiring.

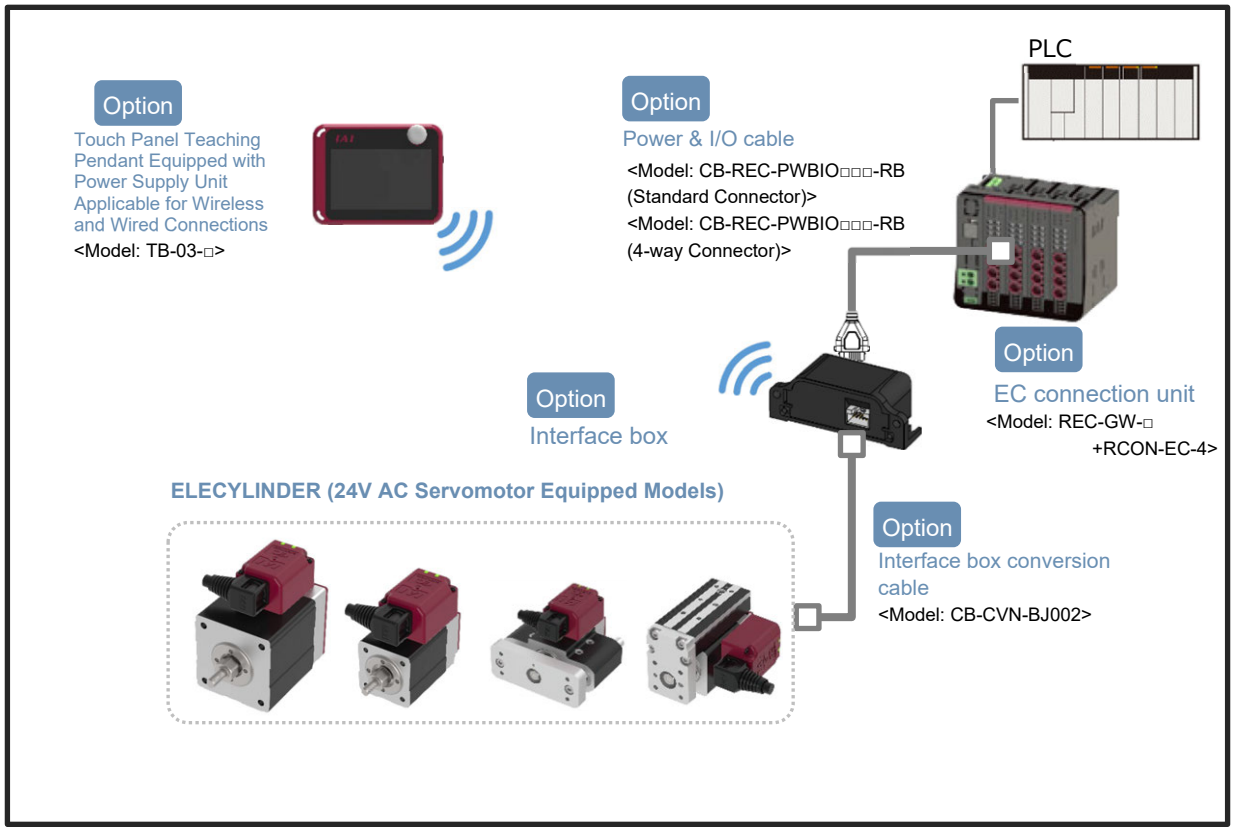
2.4.2 AC Servomotor Equipped Models

[1] When Connected to RCON-EC Directly



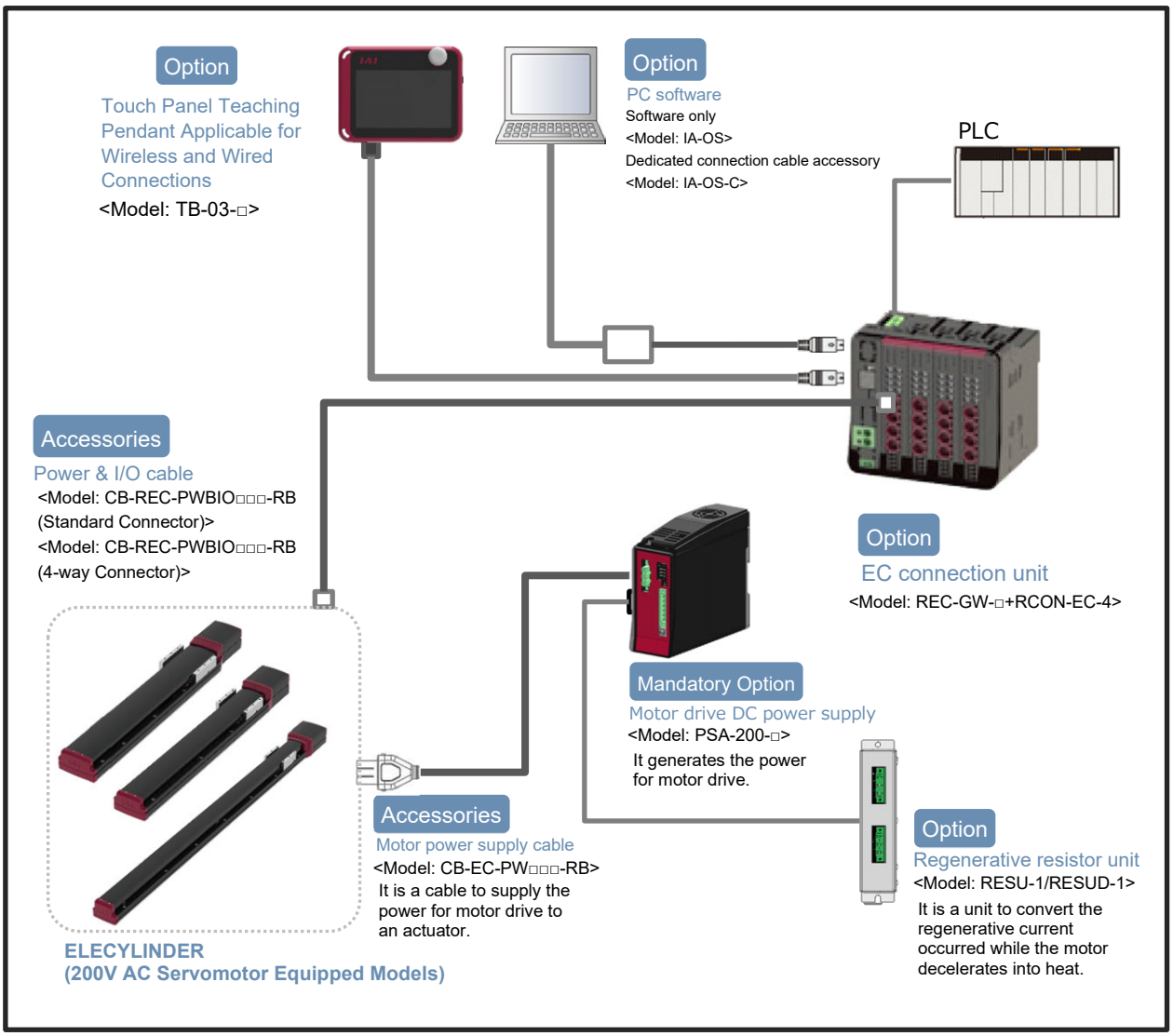
(Note 1) Refer to [Startup Section 6.3.1 When Connecting Directly to EC Connection Unit] for details how to lay out wiring.

[2] When Using Teaching Pendant Wireless Connection



(*) When the actuator of 24V AC Servomotor Equipped Models is to be connected to the EC connection unit using the wireless teaching tool in parallel, it is necessary to have an interface box applicable for wireless connected.
Refer to [Startup Section 6.3.2 When Connecting from Interface Box to RCON-EC] for details how to lay out wiring.

2.4.3 200V AC Servomotor Equipped Models



Specifications Section

Chapter 3

Electrical Specifications

(Pulse Motor Equipped Models)

3.1 Basic specifications

The basic specifications of ELECYLINDER (Pulse motor equipped models) should be as described follows.

Item		Content
Number of controlled axes		1 axis
Power supply voltage		24V DC±10%
Power supply current		Refer to [3.2 Power supply current]
Brake release power supply		24V DC±10%, 200mA (only for external brake release)
Generated heat		Refer to [3.3 Generated heat]
Inrush current		Refer to [3.4 Inrush current]
Momentary power failure resistance		Max. 500μs
Motor size	Other than the following	□20, □28, □35, □42, □56
	SL3□, GDB3□, T3□, GDS3L	Φ20
	S8□, B8S, RR8□/10□, RTC18M	□56SP, □60, Φ86
Motor output rated current	Other than the following	1.2A
	GR8, SL3□, GDB3□, T3□, GDS3L	0.4A
	S2□, RR2□, RP3□, GD3□, TC3□, TW3□, GRBP8M(W), GRC6M, GRST3□	0.65A
	S8□, B8S, RR8□/10□, RTC18M	4.0A
Motor control system		Weak field type vector control
Encoder (Position detector)	Other than the following	Incremental (resolution of 800p/r)
		Battery-less absolute (resolution of 800p/r)
	S2□, RR2□, RP3□, GD3□, TC3□, TW3□, GRBP8M(W)/10M(W)/13□(W), GRC6M/7□, GRST3□, RTB4M	Incremental (resolution of 16384p/r) Battery-less absolute (resolution of 16384p/r)
	SL3□, GDB3□, T3□, GDS3L	Incremental (resolution of 32768p/r)
Teaching port specifications		RS-485 1ch (Modbus protocol compliant)
Interface specifications (power input common with body)		Input x 3 (Forward, Backward, Alarm Cancelation) output x 3 (Forward Complete, Backward Complete, Alarm)
Data setting and input methods		PC software/ Teaching pendant TB-02, TB-03, Digital Speed Controller
Insulation resistance		500V DC 10MΩ
Electric shock protection mechanism		Class I basic insulation
Cooling method		Natural air cooling

3.2 Power supply current

The power supply current of ELECYLINDER (pulse motor equipped models) should be as described follows.

Type	Power-saving setting	Power supply current	
		Rated	Max.
SL3□, GDS3L, GDB3□, T3□	-	0.7A	1.1A
S2□, RR2□, RP3□, GD3□, TC3□, TW3□, GRBP8M(W), GRC6M	-	0.95A	1.25A
GRB8M	-	-	1.0A
GRBP10M(W)/GRBP13□(W), GRC7□, GRCT3□, RTB4M	-	1.5A	2.0A
RP4□, GS4□, GD4□, TC4□, TW4□, RTC9, GRB10M/13□	-	-	2.0A
(D)S3□(CR), (D)RR3□	-	-	2.2A
ST15ME	-	3.5A	4.2A
S8□, B8S, RR8□, RR10□, RTC18M	-	-	6.0A
Other than the above	Disabled	3.5A	4.2A
	Enabled	-	2.2A

(Note) The power supply current includes 0.3A of the control power supply.

(Note) Refer to [Chapter 5 Electrical Specifications (200V AC Servomotor Equipped Models)] for EC-S□□, EC-B8SS (200V AC servomotor equipped models).

3.3 Generated heat

The generated heat of ELECYLINDER (pulse motor equipped models) should be as described follows.

Type	Power-saving setting	Generated heat
SL3□, GDS3L, GDB3□, T3□, GRB8M, GRC6M, GRC7□, GRST3□, RTB4M	-	2W
S2□, RR2□, RP3□, GD3□, TC3□, TW3□, GRBP8M(W)	-	3W
(D)S3□(□A), (D)S3□(□CR), (D)RR3□, RP4□, GS4□, GD4□, TC4□, TW4□, GRB10M/13□, GRBP10M(W)/13□(W), RTC9M	-	5W
S8□, B8S, RR8□, RR10□, RTC18M	-	19.2W
Other than the above	Disabled	8W
	Enabled	5W

(Note) The heat radiation shows the values when the duty ratio is 100%.

3.4 Inrush current

The inrush current of ELECYLINDER (pulse motor equipped models) should be as stated below.

Type	Inrush current
S2□, S3□(CR), RR2□/3□, RP3□/4□, GS4□, GD3□/4□, TC3□/4□, TW4□, RTB4M, RTC9, GRB8M/10M/13□, GRBP8M(W)/10M(W)/13□(W), SL3□, GDS3L, GDB3□, T3□, GRC6M, GRC7□, GRST3□	2A
S8□, B8S, RR8□, RR10□, RTC18M	10A
Other than the above	8.3A

Caution

- Inrush current will flow for approximately 5ms after the power is turned on (at 40°C). The value of inrush current differs depending on the impedance of the power supply line.

3.5 LED display

The LED display of ELECYLINDER (pulse motor equipped models) should be as stated below.

Item	Content
Controller status display (SV/ALM)	Green light ON: Servo ON Red light ON: Alarm generated or stop sent from teaching pendant Orange light ON: Under initialization of power boot (Both green & red ON) Light OFF: Servo OFF Green light blinking: In process of automatic servo OFF (*1) Green/red alternately blinking: Maintenance warning, light malfunction alarm
Wireless Communication Status Display (WL)	Green light blinking: Wireless connection status Red light blinking: Wireless hardware error Orange light ON: Initializing for power supply Light OFF: Wireless hardware in initializing process, wireless not connected or in connection process to TP port
Forward end / backward end display (Note 1)	Orange light ON: Forward end / backward end, Pressing missing detection Orange light blinking: Pressing Complete

Note 1 This feature is applicable for the Ultra Mini ELECYLINDER (EC-SL3□, GDB3□, T3□, GDS3L) only. It is necessary to set up the parameters when this feature is to be used. Refer to [Operation Section 4.4.10 Parameter No.10: LED lighting system automatic switch setting] for details.

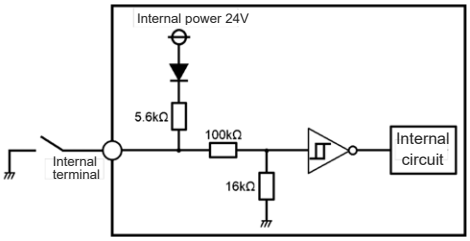
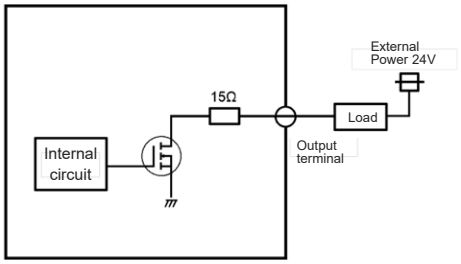
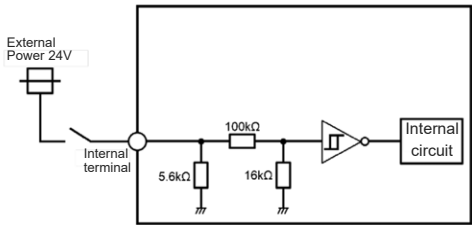
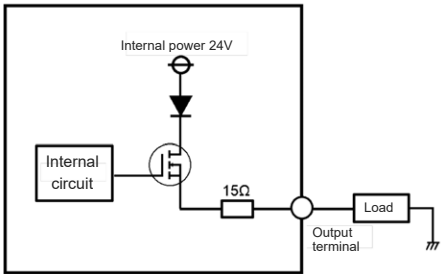
*1 Blinking in process of the automatic servo OFF is in frequency of 0.5Hz.

(Example)

LED display	Content
The LED on the ELECYLINDER flashes red/green alternately for maintenance warnings 1 to 3. 🔴/🟢Alternately blinking 	When the total travel count has exceeded the total travel count setting (Maintenance warning 1) When the total travel distance has exceeded the total travel distance setting (Maintenance warning 2) When the overload level has exceeded the set ratio (Maintenance warning 3)

3.6 I/O specifications

The PIO input and output specifications of ELECYLINDER (pulse motor equipped models) should be as stated below.

I/O		Input part		Output part	
Specifications		Input voltage	24V DC±10%	Load voltage	24V DC±10%
		Input current	5mA per circuit	Max. load current	50mA per point
		ON/OFF voltage	ON voltage Min. 18V DC OFF voltage Max. 6V DC	Residual voltage	2V or less
		Leakage current	Max. 1mA per point	Leakage current	Max. 0.1mA per point
Isolation type		Non-isolated from external circuitry		Non-isolated from external circuitry	
I/O logic	NPN				
	PNP				

Caution

- In the PIO circuit, both input and output are non-isolated. Make sure to have a grounding for external devices connected to ELECYLINDER such as PLC in common with the grounding for ELECYLINDER.

3.7 Power Supply Current at Brake Release

The ELECYLINDER brake is a non-excitation actuating solenoid brake.
The brake should be released automatically during normal operation, but it will activate when the servo is turned off or the power is turned off.
In order to move the moving part by hand, it is necessary to release the brake. (Refer to [Startup Section 3.5.6 Brake release wiring]).

The brake specifications of ELECYLINDER (Pulse motor equipped models) should be as described follows.

Item	Content
Brake release power supply	24V DC ±10%, 200mA (only for external brake release)

Specifications Section

Chapter 4

Electrical Specifications

(24V AC Servomotor Equipped Models)

4.1 Basic Specifications

The basic specifications of ELECYLINDER (24V AC servomotor equipped models) should be as described follows.

Item		Content
Number of controlled axes		1 axis
Power supply voltage		24V DC±10%
Power supply current		CRP3/CTC3/CDG3 : Rated 1.0A, Momentary max. 2.0A CRP5/CTC5/CDG5 : Rated 1.5A, Momentary max. 2.5A
Brake release power supply		24V DC±10%, 200mA (only for external brake release)
Generated heat		5W
Inrush current		8.5A
Momentary power failure resistance		Max. 500μs
Motor size	CRP3/CTC3/CDG3	External Φ30（hollow）
	CRP5/CTC5/CDG5	External Φ42（hollow）
Motor output rated current	CRP3/CTC3/CDG3	1.7A
	CRP5/CTC5/CDG5	1.6A
Motor control system		Weak field type vector control
Encoder (Position detector)		Incremental (resolution of 16,384pulse/rev)
Teaching port specifications		RS-485 1ch (Modbus protocol compliant)
Interface specifications (power input common with body)		Input x 3 (Forward, Backward, Alarm Cancelation) output x 3 (Forward Complete, Backward Complete, Alarm)
Data setting and input methods		PC software/ Teaching pendant TB-02, TB-03, Digital Speed Controller
Insulation resistance		500V DC 10MΩ
Electric shock protection mechanism		Class I basic insulation
Cooling method		Natural air cooling

(Note) The power supply current includes 0.3A of the control power supply.
(Note) The heat radiation shows the values when the duty ratio is 100%.

Caution

- Inrush current will flow for approximately 5ms after the power is turned on (at 40°C). The value of inrush current differs depending on the impedance of the power supply line.

4.2 LED Display

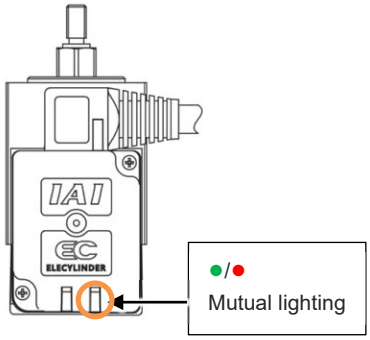
The LED display of ELECYLINDER (24V AC servomotor equipped models) should be as stated below.

Item	Content
Controller status display (SV/ALM)	Green light ON: Servo ON Red light ON: Alarm generated or stop sent from teaching pendant Orange light ON: Under initialization of power boot (Both green & red ON) Light OFF: Servo OFF Green light blinking: In process of automatic servo OFF (Note 1) Green/red alternately blinking: Maintenance warning, light malfunction alarm
Wireless Communication Status Display (WL)	Green light blinking: Wireless connection status Red light blinking: Wireless hardware error Orange light ON: Initializing for power supply Light OFF: Wireless hardware in initializing process, wireless not connected or in connection process to TP port
Forward end / backward end display (*1)	Orange light ON: Forward end / backward end, Pressing missing detection Orange light blinking: Pressing Complete

*1 Refer to [Operation Section 4.4.10 Parameter No.10: LED lighting system automatic switch setting] for details.

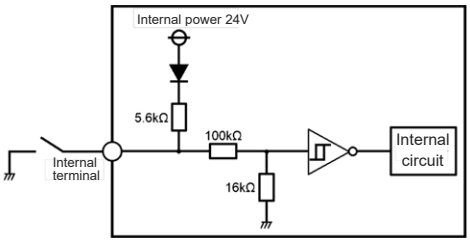
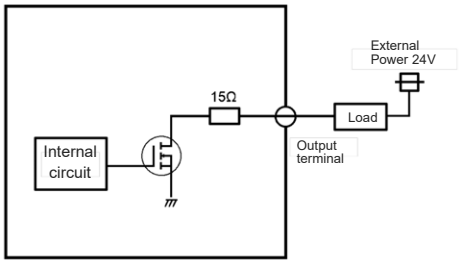
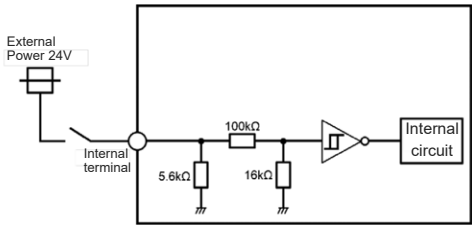
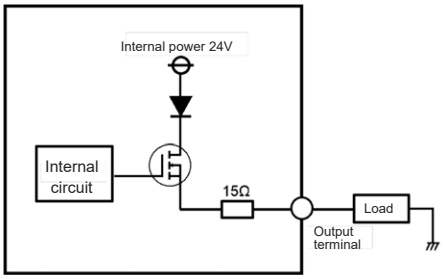
Note 1 Blinking in process of the automatic servo OFF is in frequency of 0.5Hz.

(Example)

LED display	Content
The LED on the ELECYLINDER flashes red/green alternately for maintenance warnings 1 to 3. 	When the total travel count has exceeded the total travel count setting (Maintenance warning 1) When the total travel distance has exceeded the total travel distance setting (Maintenance warning 2) When the overload level has exceeded the set ratio (Maintenance warning 3)

4.3 I/O Specifications

The PIO input and output specifications of ELECYLINDER (24V AC servomotor equipped models) should be as stated below.

I/O		Input part		Output part	
Specifications		Input voltage	24V DC±10%	Load voltage	24V DC±10%
		Input current	5mA per circuit	Max. load current	50mA per point
		ON/OFF voltage	ON voltage Min. 18V DC OFF voltage Max. 6V DC	Residual voltage	2V or less
		Leakage current	Max. 1mA per point	Leakage current	Max. 0.1mA per point
Isolation type		Non-isolated from external circuitry		Non-isolated from external circuitry	
I/O logic	NPN				
	PNP				

Caution

- In the PIO circuit, both input and output are non-isolated. Make sure to have a grounding for external devices connected to ELECYLINDER such as PLC in common with the grounding for ELECYLINDER.

4.4 Power Supply Current at Brake Release

The ELECYLINDER brake is a non-excitation actuating solenoid brake.
The brake should be released automatically during normal operation, but it will activate when the servo is turned off or the power is turned off.
In order to move the moving part by hand, it is necessary to release the brake. (Refer to [Startup Section 3.5.6 Brake release wiring]).

The brake specifications of ELECYLINDER (24V AC servomotor equipped model) should be as described follows.

Item	Content
Brake release power supply	24V DC ±10%, 200mA (only for external brake release)

Specifications Section

Chapter 5

Electrical Specifications

(200V AC Servomotor Equipped Models)

5.1 Basic Specifications

The basic specifications of ELECYLINDER (200V AC servomotor equipped models) should be as described follows.

Item	Content
Number of controlled axes	1 axis
Motor power voltage	Supplied from PSA-200 (DC280V typ) Refer to [6.1 Power Supply Type of DC Power Supply for Motor Drive (PSA-200)]
Control power voltage	24V DC±10%
Control power current	Refer to [5.2 Control power current]
Motor power capacity	Refer to [6.1 Power Supply Type of DC Power Supply for Motor Drive (PSA-200) [Power Amperage and Heat Radiation]]
Brake release power supply	DC24V±10% Refer to [5.5 Power Supply Current at Brake Release] in this chapter for the power supply current for each model.
Generated heat	Refer to [6.1 Power Supply Type of DC Power Supply for Motor Drive (PSA-200) [Power Amperage and Heat Radiation]]
Inrush current	Refer to [6.4 Inrush Current]
Momentary power failure resistance	Max. 500μs
Corresponding motor size	100W, 200W, 400W, 600W, 750W
Motor control system	Sine wave PWM vector current control
Encoder (Position detector)	Battery-less absolute encoder (resolution of 16,384pulse/rev)
Teaching port specifications	RS-485 1ch (Modbus protocol compliant)
Interface specifications (power input common with body)	Input x 3 (Forward, Backward, Alarm Cancelation) Output x 3 (Forward Complete, Backward Complete, Alarm)
Data setting and input methods	PC Software/ Teaching pendant TB-02, TB-03, Digital Speed Controller Teaching, Remote Digital Speed Controller
Insulation resistance	500V DC 10MΩ
Electric shock protection mechanism	Class I basic insulation
Cooling method	Natural air cooling

5.2 Control power current

The control power capacity of ELECYLINDER (200V AC servomotor equipped models) should be as described follows.

Type	Specification	Power supply current
B8SS	Without brake	0.32 A
S10□/S10X□	Without brake	0.32 A
	With brake	0.54 A
S13□/S13X□ S15□/S15X□	Without brake	0.32 A
	With brake	1.2 A
S18□/S18X□ S18LP/S18XLP	Without brake	0.32 A
	With brake	1.073 A

(Note) 0.15A should be added to the power supply current when a teaching pendant is to be connected.

5.3 LED display

The LED display of ELECYLINDER (200V AC servomotor equipped models) should be as described follows.

[Status display LED]

Item	Content
Controller status display (SV/ALM)	Green light ON: Servo ON Red light ON: Alarm generated or stop sent from teaching pendant Red light blinking: Under initialization of power boot (Both green & red ON) Light OFF: Servo OFF Green light blinking: In process of automatic servo OFF (*1) Green light blinking: Maintenance warning, light malfunction alarm (*2)
Motor power LED	Green light ON: Motor power ON Green light blinking: Motor power OFF Orange light ON: Initializing for power supply
Wireless status display (WL)	Green light blinking: Wireless connection status Red light blinking: Wireless hardware error Orange light ON: Initializing for power supply Light OFF: Wireless hardware in initializing process, wireless not connected or in connection process to TP port

*1 Blinking in process of the automatic servo OFF is in frequency of 0.5Hz.

*2 Blinking in the maintenance warning and the light malfunction alarm is in frequency of 1.0Hz.

[Battery charge display LED]

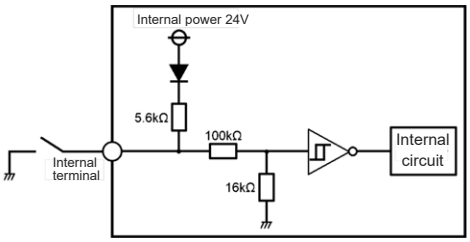
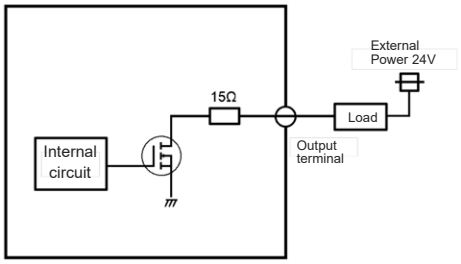
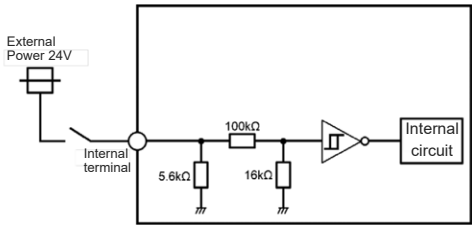
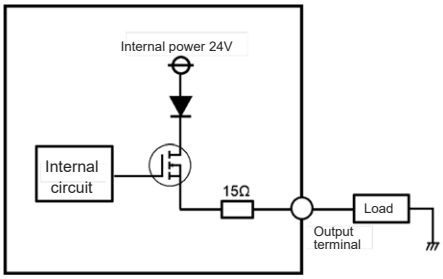
Display color	Content
Red	The internal circuit is charged.
Light OFF	The internal circuit is not charged.

Warning

- Do not attempt to touch the product when the battery charge status display LED is turned on in red. You may get electrical shock.
  Make sure to turn the power off and to confirm that the battery charge status display LED is turned off before touching the product for such purposes inspection.

5.4 I/O specifications

The PIO input and output specifications of ELECYLINDER (200V AC servomotor equipped models) should be as stated below.

I/O		Input part		Output part	
Specifications		Input voltage	24V DC±10%	Load voltage	24V DC±10%
		Input current	5mA per circuit	Max. load current	50mA per point
		ON/OFF voltage	ON voltage Min. 18V DC OFF voltage Max. 6V DC	Residual voltage	2V or less
		Leakage current	Max. 1mA per point	Leakage current	Max. 0.1mA per point
Isolation type		Non-isolated from external circuitry		Non-isolated from external circuitry	
I/O logic	NPN				
	PNP				

Caution

- In the PIO circuit, both input and output are non-isolated. Make sure to have a grounding for external devices connected to ELECYLINDER such as PLC in common with the grounding for ELECYLINDER.

5.5 Power Supply Current at Brake Release

The brake on the 200V AC servomotor equipped model ELECYLINDER adopts a non-exciting operation electromagnetic brake.
The brake should be released automatically during normal operation, but it will activate when the servo is turned off or the power is turned off.

The specifications for the brake are as shown below.

Item		Content	
Brake release power supply	Power voltage	24V DC ±10%	
	Power supply current	**Model**	**Specification**
		S10□/S10X□	0.22 A (No overexcitation)
		S13□/S13X□ S15□/S15X□	0.875 A (when in overexcitation) 0.085 A (when steady)
		S18□/S18X□ S18LP/S18XLP	0.753 A (No overexcitation)

Caution

- It is used only when releasing a brake externally.

Specifications Section

Chapter 6

DC Power Supply for Motor Drive

6.1 Power Supply Type of DC Power Supply for Motor Drive (PSA-200)

Caution

- In the PIO circuit, both input and output are non-isolated. Make sure to have a grounding for external devices connected to ELECYLINDER such as PLC in common with the grounding for ELECYLINDER.

[Basic Specifications]

The specifications of the motor drive (PSA-200) should be as shown below.

Item	Specifications	
	Single-Phase 100V AC type	Single-Phase 200V AC type
Power Supply Input Voltage Range	100 to 115V AC ±10%	200 to 230V AC ±10%
Input Frequency Range	50/60Hz ±5%	
In-Rush Current (Note 1)	Refer to [6.4 Inrush Current]	
Output voltage	280V DC typ	
Max. Motor Connection Wattage	800W	1,600W
Max. Axis Count Available for Drive	6 axes	6 axes
Transient Power Outage Resistance	50Hz: 20ms, 60Hz: 16ms	
Insulator Voltage Resistance (between Primary and FG)	1,500V AC 1 minute	
Insulation Resistance	500V DC 10MΩ or more	
Leak Current	Total 3.1mA (When recommended noise filter used (*1), 6 axes connected)	
Electric Shock Protection Feature	Class I Basic Insulation	
Pollution degree	2	
Cooling method	Forced air cooling by fan unit	
Degree of protection	IP20	

Note 1 Inrush current should flow for approximately 20ms after the power is turned on. Be aware that the inrush current could vary depending on the impedance and the internal element temperature (thermistor) in the power supply line.

*1 Recommended noise filter: NF2010A-UP (Maker: Soshin Electric),
NAC-10-472 (Maker: COSEL)

[Power Amperage and Heat Radiation]

For the power amperage and heat radiation on each axis, use the values shown in the table and figure out in the formulas below.

Figure out the power amperage and heat radiation for the axes connected to the DC power supply for motor drive.

The total should be the power amperage and heat radiation of the DC power supply for motor drive.

Rated power amperage [VA] = Motor power amperage [VA] + Control transient max. power amperage [VA]

Transient max. power amperage [VA] = Motor transient max. power amperage [VA] + Control transient max. power amperage [VA]

Heat radiation [W] = Motor power supply heat radiation [W] + Control power supply heat radiation [W] + Fixed resistor heat radiation [W]

Model	Number of motor wattage	Motor power supply			Control power supply		Fixed Resistor
		Power amperage [VA]	Transient max. power amperage [VA]	Heat radiation [W]	Power amperage [VA]	Heat radiation [W]	Heat radiation [W]
EC-S10□ EC-S10X□	100W	238	714	1.0	14.5	8.7	16.2
EC-B8SS EC-S13□ EC-S13X□	200W	402	1206	1.7			
EC-S15□ EC-S15X□	400W	772	2316	3.3			
EC-S18□ EC-S18X□	600W	1119	3358	4.8			
EC-S18LP EC-S18XLP	750W	1408	4225	6.0			

(Note) The control power supply shows the values at the maximum load.

(Note) The values for the motor power supply may differ depending on load. It shows the maximum performance of the controller.

(Note) Current up to three times of the rated current at the maximum should flow during acceleration. Therefore, the transient maximum power amperage should be three times of the power amperage.

6.2 Max. Number of Connectable Axes for DC Power Supply for Motor Drive (PSA-200)

The restrictions regarding the motor drive DC power supply (PSA-200) should be as shown below.

Specifications	Number of max connection axis	Number of max connection motor wattage
100V AC power supply type	6 axes	800W
200V AC power supply type	6 axes	1,600W

The number of axes that the total of the motor wattage of connected ELECYLINDER would not exceed the restricted values in the table above can be connected. However, the maximum number of connectable axes is six.
The motor wattage of ELECYLINDER should be as described below.

Model	Number of motor wattage
EC-S10□ EC-S10X□	100W
EC-B8SS EC-S13□ EC-S13X□	200W
EC-S15□ EC-S15X□	400W
EC-S18□(Note 1) EC-S18X□	600W
EC-S18LP EC-S18XLP	750W

Note 1 The EC-S18LP/S18XLP is not included

Caution

- The maximum length of the motor power supply cable CB-EC-PW□□□-RB between the ELECYLINDER and the DC power supply for motor drive (PSA-200) is 10m.
- Even though the maximum number of connectable axes is six axes, the motor power supply cable may not reach depending on the layout of the ELECYLINDER.
  Be aware that an additional unit of the DC power supply for motor drive (PSA-200) is needed in case the cable does not reach.

6.3 Selection of Circuit Breaker for Power Supply Protection

6.3.1 Selection of Circuit Breaker

Follow the instructions below when selecting a circuit breaker.

- The current to a controller should flow as three time as much at the maximum during acceleration and deceleration. Select one that would not trip when this much current flows. Select a breaker with the rated current one rank higher in case it trips. (Check the performance in the operation characteristics curve shown in a product catalog.)
- Select a breaker that would not trip with inrush current. (Check the performance in the operation characteristics curve shown in a product catalog.)
- For the rated cutoff current, select a current value that can be cut off certainly even if short-circuit current flows.

  Rated cutoff current > Short-circuit current = Primary power amperage / Power voltage
- Select a circuit breaker with margin to the rated current.

  Circuit breaker rated current > Motor power amperage [VA] / AC input voltage * Safety margin (1.2 to 1.4)

6.3.2 Selection of Leakage Breaker

- A clear purpose is necessary when selecting a leakage breaker such as to protect from fire or protection of personnel.
- As the leak current may vary depending on the motor wattage, cable length and ambient environment, it is required to have a measurement of leak current at the point to install a leakage breaker when a leakage protection measure is to be taken.
- For leakage breaker, use a high frequency applicable type.

6.4 Inrush Current

The in-rush current of the motor drive DC power supply (PSA-200) is as stated below.

Item	Internal temperature	Inrush current
Motor power	40°C	50A
	55°C	70A
Control power	40°C	40A
	55°C	60A

Note 1 Inrush current should flow for approximately 20ms after the power is turned on. Be aware that the inrush current could vary depending on the impedance and the internal element temperature (thermistor) in the power supply line.

6.5 Number of Connectable Regenerative Resistor Units (Reference)

Shown below is a reference for the number of the regenerative resistor units connectable to the DC power supply for motor drive (PSA-200).
When the total motor wattage of ELECYLINDER in horizontal orientation is 800W and the total in vertical orientation is 400W for example, the value where 800W in horizontal and 400W in vertical crosses shows that the regenerative resistor units should be two units (reference).
Refer to [7.1 Regenerative Resistor Unit] for the specifications of the regenerative resistor unit.

Motor wattage count		Horizon								
		0	200	400	600	800	1000	1200	1400	1600
Vertical	0	0	0	0	0 (1)	0 (1)	0 (1)	1	1 (2)	1 (2)
	200	0	1	1	1	1	1	1 (2)	1 (2)	-
	400	1	1	1	1	2	2	2	-	-
	600	1 (2)	1 (2)	2	2	2	2	-	-	-
	800	1 (2)	2	2	2 (3)	2 (3)	-	-	-	-
	1000	2	2	2	2 (3)	-	-	-	-	-
	1200	2 (3)	2 (3)	3	-	-	-	-	-	-
	1400	2 (3)	3	-	-	-	-	-	-	-
	1600	3 (4)	-	-	-	-	-	-	-	-

(*) Value in brackets shows the number of connected units when using including S18/S18X.

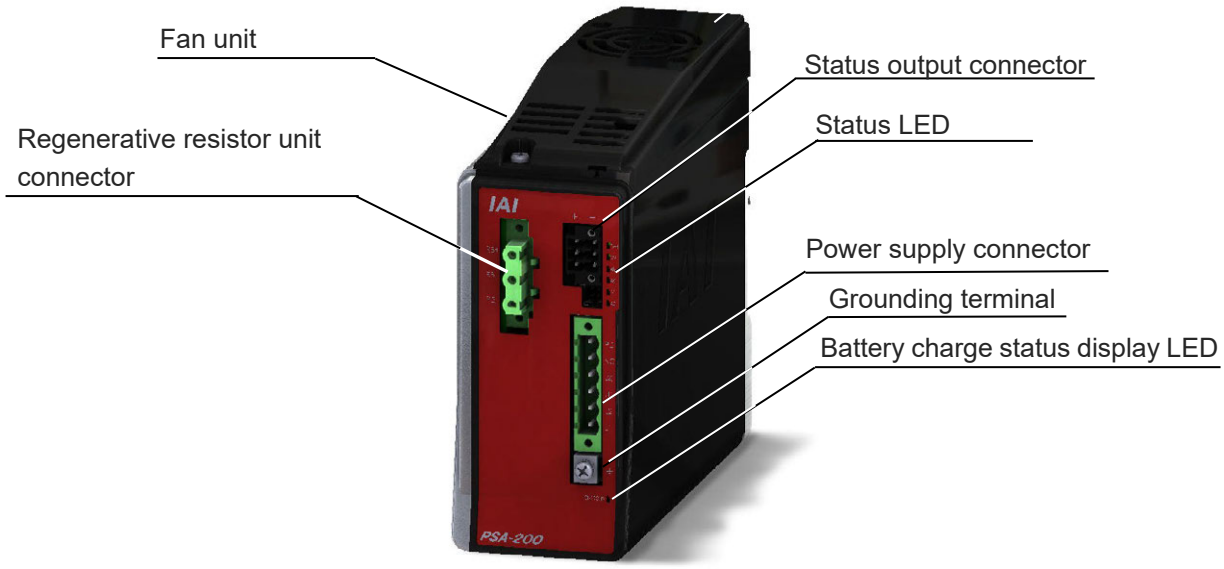
Caution

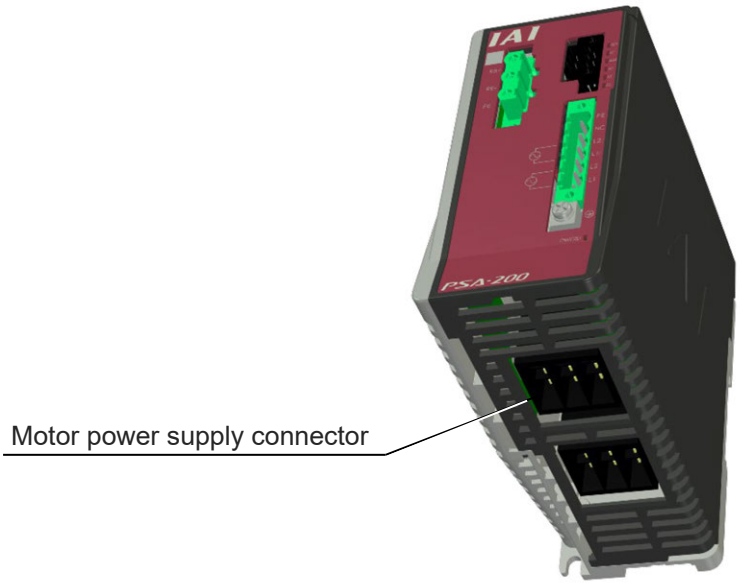
- The table above shows a reference when an ELECYLINDER makes a back and forth operation under the condition of rated acceleration/deceleration, rated load, stroke at 1,000mm and 50% of duty ratio.
  * Value in brackets shows the number of connected units when using including S18/S18X.
- Regenerative energy should be absorbed also in a controller. When it exceeds the allowance range, “Estimated Regenerative Discharge Power Excess Alarm” should get generated. In such a case, connect an additional regenerative resistor unit externally.
- If the duty ratio of operation is higher than 50% or load is high in vertical orientation, it is necessary to have more regenerative resistor units to be connected than what is shown in the able above.
  Also, the number of connectable regenerative resistor units should be five at the maximum.
  Connecting more than five units may cause malfunction. Make sure not to do so.

6.6 Part Names / Functions

Here explains the name of each parts on the DC power supply for motor drive (PSA-200) and its feature.

6.6.1 Name of each parts





6.6.2 Status display LED

The status of PSA-200 (status of control power supply, status of motor power supply and status of alarms) should be displayed in the LED lamps.

●PWR (Control power supply) / MP (Motor power supply)

Panel notation	Display color	Status	Description
PWR	Green	Light ON	Normal startup
		Light OFF	Control power supply cutoff
MP	Green	Light ON	Motor power supply normal output
		Light OFF	Drive source cutoff

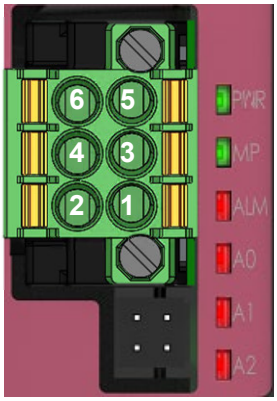
●ALM (Alarm)

Panel notation				Drive source	Alarm name	Detail description Reference
ALM	A0	A1	A2			
-	☆			Non interception	Internal Relay Life Count Alert	Refer to [Page D1-25 “Alarms in Motor Drive DC Power Supply (PSA-200)”]
-		☆		Non interception	Electrolytic Capacitor Life Alert	
-			☆	Non interception	Fan Revolution Drop	
○	○			Non interception	Motor Power Drop Voltage	
○		○		Cutoff	Fan Error Detected	
○			○	Cutoff	Regenerative Discharge Excess Power	
○	○	○		Cutoff	Motor Power Excess Voltage	
○	○		○	Cutoff	PCB Temperature Error	
○		○	○	Cutoff	Power Device Overheated	
○	○	○	○	Cutoff	Critical Malfunction	

○: Illuminated in red, -: Turned off, ☆: Flashing in red (frequency in 500ms), Blank: flashing or illuminated for another reason

6.6.3 Status output connector

It outputs the status of control power supply (short-circuit / released), status of motor power supply (short-circuit / released) and alarm status (H/L level). The output should link with PWR, MP and ALM LED lamps. Keep it unconnected when not to be used.



Connector model	DMC 1,5/ 3-G1F-3,5-LRP20THR		
Manufacturer	Phoenix Contact		
Pin No.	**Signal name**	**Description**	
6	PWR+	Control Power Supply Contact Output	Photocoupler Isolation Open Collector Output
5	PWR-		
4	MP+	Motor Power Supply Contact Output	
3	MP-		
2	*ALM+	Alarm Contact Output	
1	*ALM-		

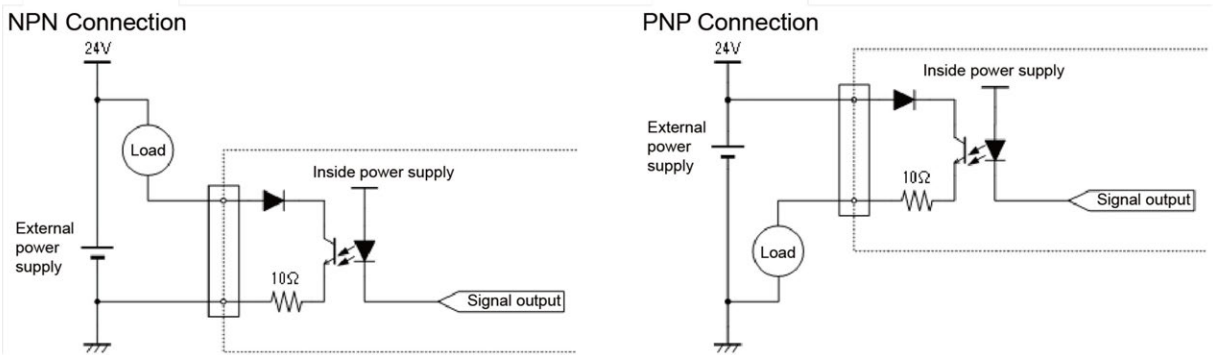
Connection cable type

Item	**Specifications**
Compatible wire	AWG24 to 16 (0.2 to 1.3mm^2)
Max. cable length	10m
Strip length	10mm
Mating connector	
Model	DFMC 1,5/3-STF-3,5
Manufacturer	Phoenix Contact

The output should be the open collector output of a photocoupler.

As it does not have a common terminal, it should be applicable for both NPN/PNP due to wiring.

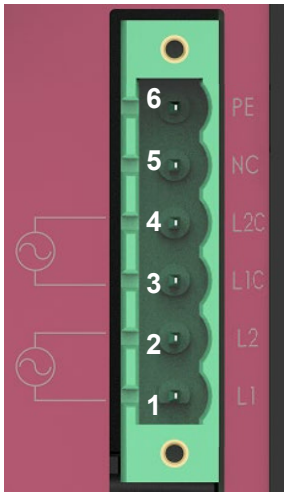
Item	Specifications
Output Points	3 points
Rated Load Voltage	24V DC ±10%
Max. load current	50mA / 1 circuit
Leak Current	Max.0.1mA / 1 point
Residual Voltage	2V or less
Isolation System	Photocoupler Isolation



* In case the current exceeding the maximum load current flows, the circuit may get damaged and the output should become open.

6.6.4 Power supply connector

It is a connector for a connection to the AC power supply. The input should be split into the control power supply side and the motor power supply side.



Connector model	MSTB 2,5/6-GF-5.08	
Manufacturer	Phoenix Contact	
Pin No.	Signal name	Description
6	PE	Ground
5	NC	(Not connected)
4	L2C	Control power supply AC input (Grounding End)
3	L1C	Control power supply AC input (Non-Grounding End)
2	L2	Motor power supply AC input (Grounding End)
1	L1	Motor power supply AC input (Non-Grounding End)

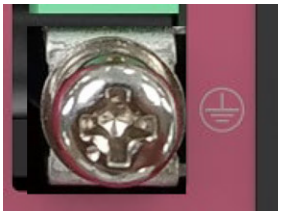
Connection cable type

Item	Pin No.	Signal name	Contents	Compatible wire diameter
Compatible wire	6	PE	Ground	AWG14 (2.0 to mm^2)
	5	NC	(Not connected)	-
	4	L2C	Control power supply AC input (Grounding End)	AWG18 (0.75mm^2)
	3	L1C	Control power supply AC input (Non-Grounding End)	
	2	L2	Motor power supply AC input (Grounding End)	AWG14 (2.0 to mm^2)
	1	L1	Motor power supply AC input (Non-Grounding End)	
Strip length	7mm			
Mating connector				
Model	MSTB2,5/6-STF-5.08 (*1)			
Manufacturer	Phoenix Contact			

*1 It is the model code before attaching the connector seal.

6.6.5 Grounding terminal

It is a screw for the protection grounding. Make sure that you ground it.

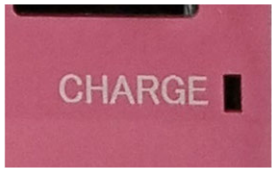


Terminal Model	OT-010-M4
Accessory screw	Pan Head Machine Screw with Captive Washer M4×8

* It is connected to PE on the power supply connector internally.

6.6.6 Battery charge status display LED

It is an LED lamp to show that the internal circuit is on charge.

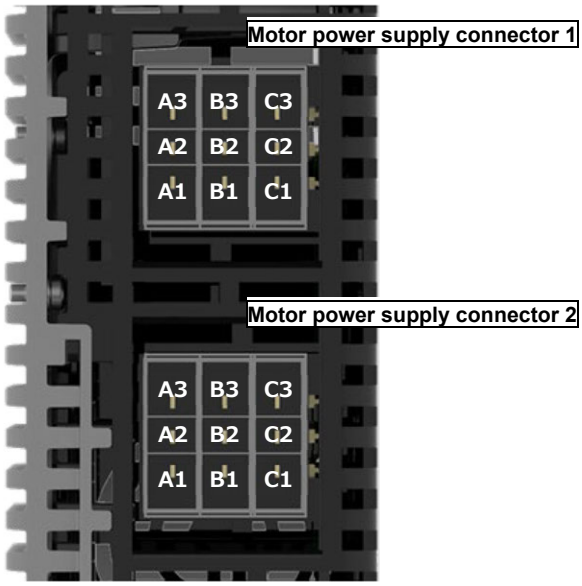


Warning

- Do not attempt to touch the product while the charge status display LED lamp is illuminated in red. It may cause electric shock.
  In case when you touch this product for such a purpose as inspection, turn the power off and make sure that the battery charge status display LED lamp is turned off before touching the product.

6.6.7 Motor power supply connector

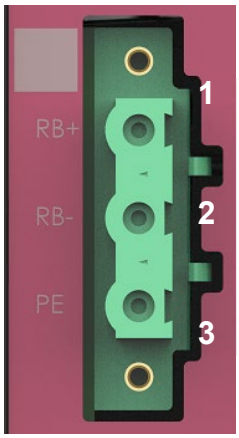
It is a connector to supply the motor power (280V DC typ) to the 200V type ELECYLINDER.
There are two connectors equipped on the bottom of PSA-200.
The motor power cables can be each connector has three inlets thus six inlets are available for connection in total.
As they are connected in parallel internally, there is no difference due to connected position.



Name	Pin No.		Signal name	Contents	Remarks
Motor power supply connector 1	A	1	MP	Motor power supply DC output (+ side)	The same signals are to be connected to each other internally. The 280V DC typ. should be output.
	B	1			
	C	1			
	A	2	MN	Motor power supply DC output (- side)	
	B	2			
	C	2			
	A	3	PE	Ground	
	B	3			
	C	3			
Motor power supply connector 2	A	1	MP	Motor power supply DC output (+ side)	The same signals are to be connected to Motor Power Supply Connector 1 internally.
	B	1			
	C	1			
	A	2	MN	Motor power supply DC output (- side)	
	B	2			
	C	2			
	A	3	PE	Ground	
	B	3			
	C	3			

6.6.8 Regenerative resistor unit connector

It is a connector to connect a resistor unit that absorbs the regenerative current generated when an ELECYLINDER decelerates and stops. It is available to connect the regenerative resistor unit RESU-1.



Connector model	GIC 2.5/3-GF-7.62	
Manufacturer	Phoenix Contact	
Pin No.	**Signal name**	**Description**
1	RB+	Regenerative resistor unit connection terminal (+ side)
2	RB-	Regenerative resistor unit connection terminal (- side)
3	PE	Ground
Connection cable		
Model	CB-ST-REU010 (Cable length: 1m)	

The description of the specifications of the regenerative resistor unit is shown in [7.1 Regenerative Resistor Unit].

6.6.9 Fan unit

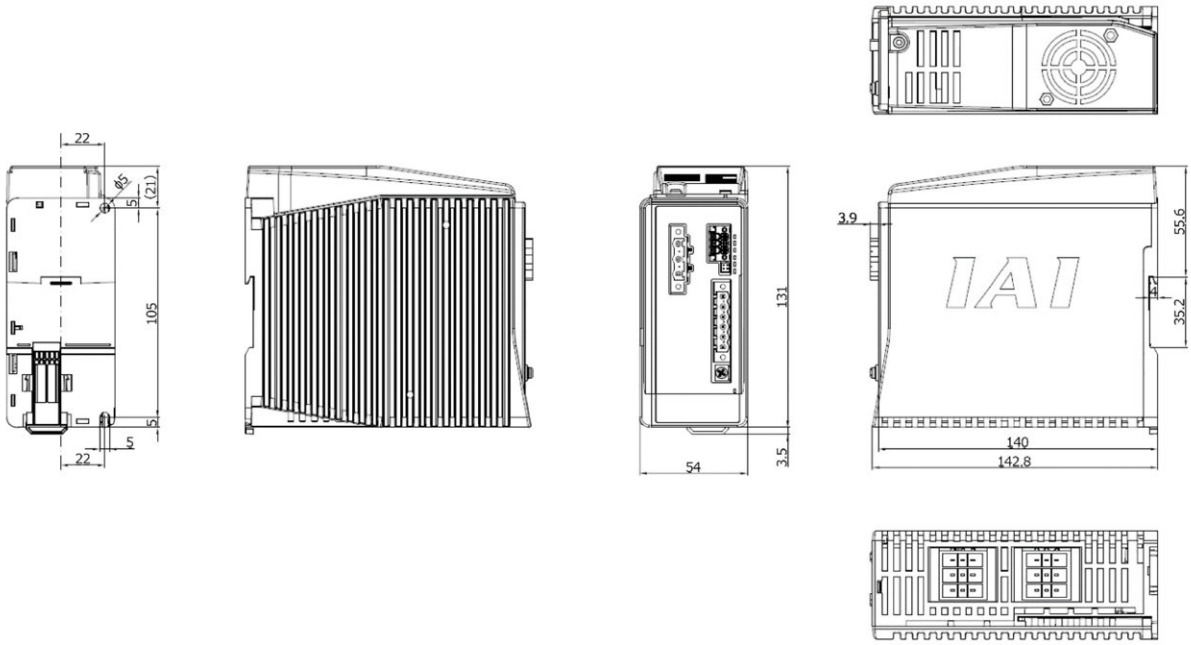
It is a fan to perform forced air cooling. It is to be used by connecting to the fan connector on the power supply unit.

Unit model	PSA-FNB

6.7 External Dimensions

[PSA-200]

Item	Specifications
External dimensions	W54mm×H131mm×D140mm
Mass	About 840g
External view	See figure below



Specifications Section

Chapter 7

Option

7.1 Regenerative Resistor Unit

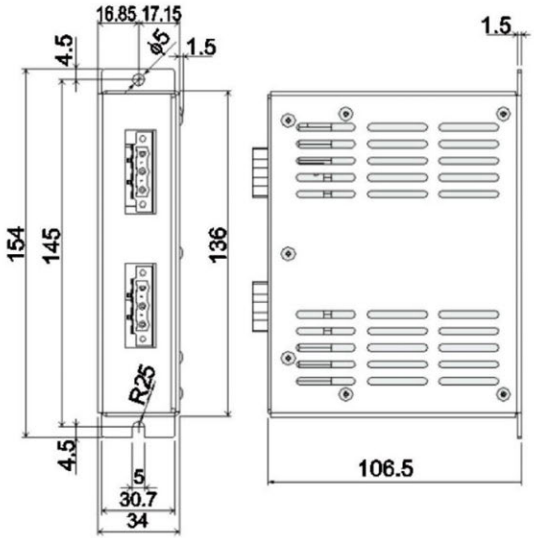
7.1.1 Regenerative Resistor Unit: RESU-1, RESUD-1

Regenerative resistance unit: A unit that converts to heat the regenerative current generated when the motor decelerates.
To be used for the drive power supply (DC power supply for motor drive) for the 200V type ELECYLINDER.

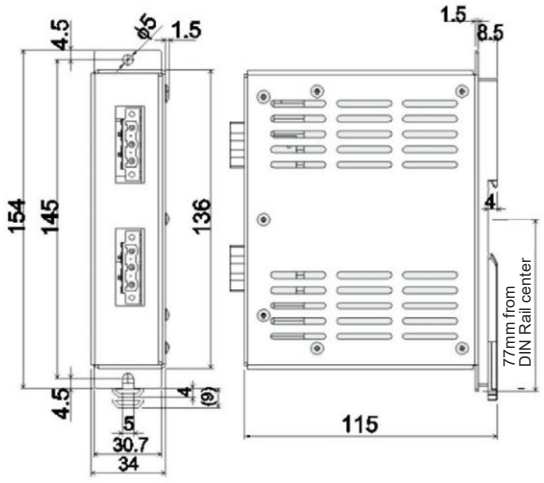
[Specifications]

Item		Specifications
Internal Regenerative Resistor		235Ω 80W
Generated heat		Max.32W
Enclosed (Note 1)		Controller connection cable (Model Code CB-ST-REU010) 1m
Environment	Ambient operating temperature	0 to 40°C
	Ambient operating humidity	85%RH or less (Should be no condensation)
	Ambient Atmosphere in Use	(Refer in section of installation environment)
	Ambient storage temperature	-20 to 70°C
	Ambient Humidity for Storage	85%RH or less (Should be no condensation)
	Degree of protection	IP20
	Pollution degree	Pollution degree 2
External Dimensions		W34×H154×D106.5mm (RESU-1) W34×H158×D115mm (RESUD-1)
Mass		About 0.4kg

[External dimensions]



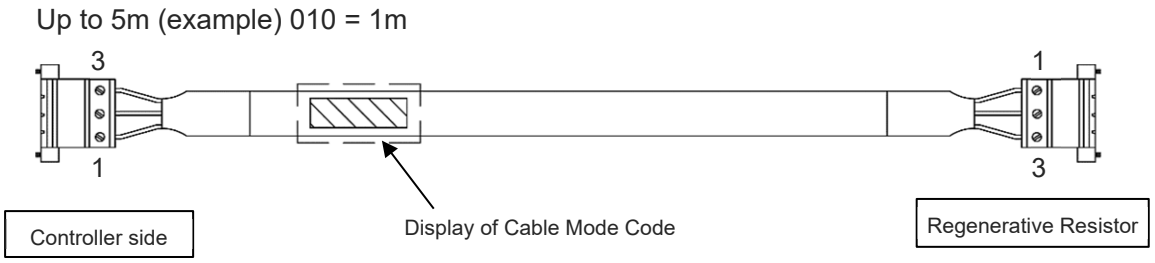
Screw attachment type (RESU-1)



DIN rail attachment type (RESUD-1)

7.1.2 Regenerative resistor unit connection cable

Regenerative resistor unit connection cable (CB-ST-REU□□□) □□□ indicates the cable length



Wiring	Color	Signal	NO.		NO.	Signal	Color	Wiring
0KIV 1.0mm² (AWG17)	Blue	RB+	1		1	RB+	Blue	KIV 1.0mm² (AWG17)
	Brown	RB-	2		2	RB-	Brown	
	Green/Yellow	PE	3		3	PE	Green/Yellow	

Startup
Section

Chapter 1

Startup Procedure

1.1 Step1 To install

First of all, refer to [Specification Section 1.3.1 Items to Prepare] or [1.1.1 Construction in an instruction manual of each type of ELECYLINDER] to prepare necessary items.
Next, prepare the screws, nuts and tools required for installation.
Refer to [Chapter 2 Installation in an instruction manual of each type of ELECYLINDER] to perform installation and mount of the ELECYLINDER.

Caution

- Install with proper length of screws and tightening torque.
- Do not apply external force to the ELECYLINDER during installation.
- When installing an external guide, please perform the centering adjustment.

1.2 Step2 Wiring

The wiring procedure is shown below.
Refer to [Startup Section Chapter 3 Wiring] for details regarding pin assignment and how to perform wiring.

- ●When pulse motor equipped models is used
  [Chapter 3 Pulse Motor Equipped Models Wiring]
- ●When 24V AC servomotor equipped models is used
  [Chapter 4 24V AC Servomotor Equipped Models Wiring]
- ●When 200V AC servomotor equipped models is used
  [Chapter 5 200V AC Servomotor Equipped Models wiring]

(1) Cable connector connection

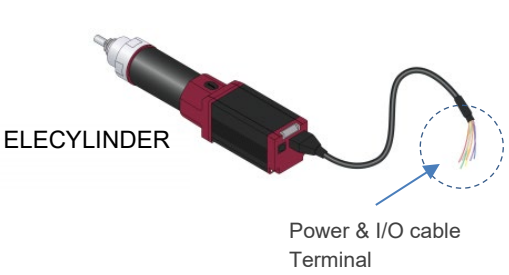
Connect the power & I/O cable or Power & I/O Connector to the ELECYLINDER.
Join also the motor cable for the 200V AC servomotor.
Insert the connector until you hear the "click".

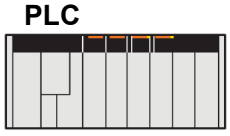
(2) Connecting to power supply

In order to supply power, join ELECYLINDER to the 24V DC power supply.
For the 200V AC servomotor, join 100V AC or 200V AC to the control power supply and the motor power supply and connect the motor cable to PSA-200.

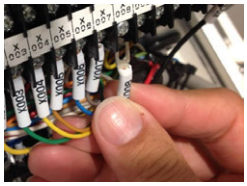
(3) Connecting to PLC

Connect the cable power & I/O cable terminal to the PLC.





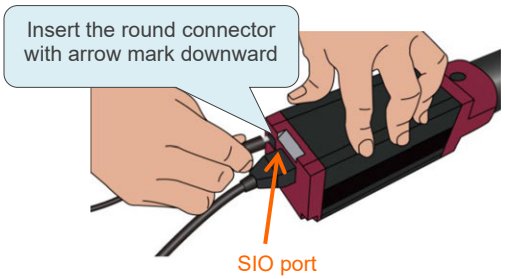
Wire the processed terminal according to the specifications of the PLC.



1.3 Step3 Operation

Here shows an example of when operating by a teaching pendant.
Refer to [Operation Section 1.2 Teaching tool connections and testing operation] for details.

1) Insert the round connector of TB-03 to the SIO port of the ELECYLINDER.



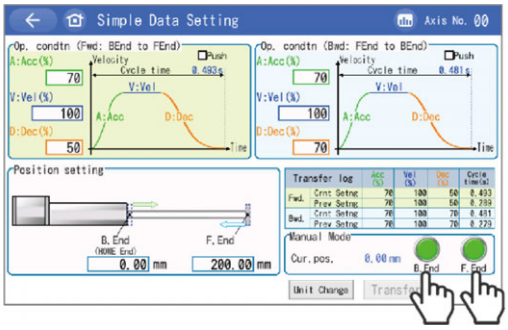
2) Turn ON the 24VDC power supply.
(Turn on the power to the DC power supply for the motor drive for the 200V AC servomotor equipped models.)
Start up the menu screen of TB-03, and then touch Simple Data Setting.

3) Touch the Homing.

Caution

- The ELECYLINDER will move.

4) Touch the F.End (forward) or B.End (backward).



Caution

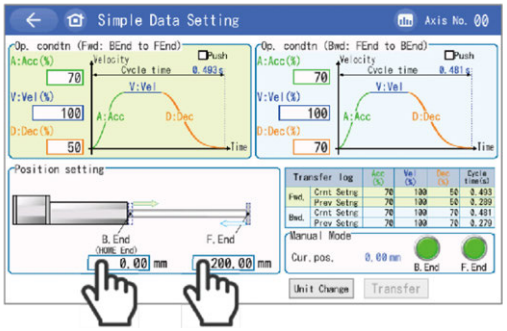
- The ELECYLINDER will move.

1.4 Step4 Adjust

Adjust the stop position of ELECYLINDER and AVD.
Refer to [Operation Section 1.3 Stop position/operational conditions (AVD) setting/adjustment] for details how to make adjustment.

(1) Adjusting the Stop Position

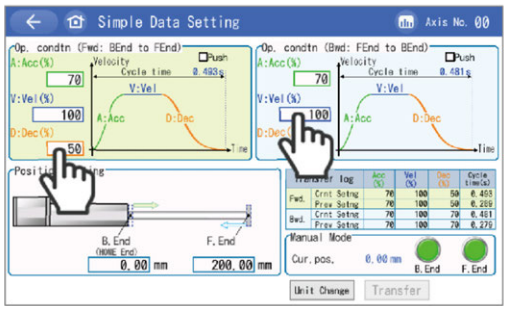
1) Touch the value of B.End or F.End.



2) After setting the numerical value, touch the ENT.
After returning to the simple data setting window, touch the Transfer.

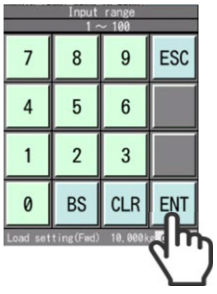
(2) Adjustment of Operating Conditions (AVD)

1) Touch the condition you want to adjust.



2) After setting the numerical value, touch the ENT.
After returning to the simple data setting window, touch the Transfer.

The adjustment completes.



Startup Section

Chapter 2

Installation and Storage/ Preservation Environment

2.1 Installation Environment

Avoid the following locations for installation.

- Where the unit receives radiant heat from strong heat sources such as heat treatment furnaces
- Where the ambient temperature exceeds the range of 0 to 40°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the unit receives direct sunlight
- Where the unit is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of dust, salt or iron (at levels exceeding those typical of an assembly plant)
- Where the unit is subject to splashed water or oil (including oil mist or cutting fluid) or chemical solutions
- Where the body receives impact or vibration
- Where the altitude is more than 1,000 m

Provide sufficient work space for the following maintenance and inspection:

- Space to insert the teaching tool connector
- Space to replenish grease
- Space to replace the motor or controller
  For details, refer to [instruction manual for each ELECYLINDER].

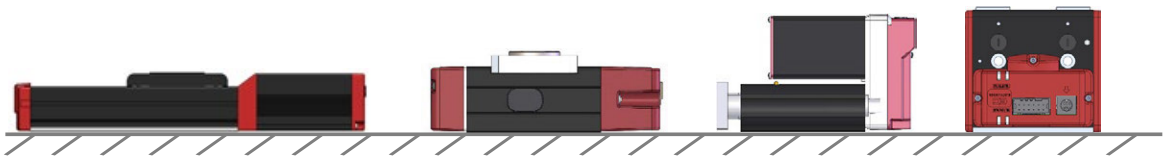
If the unit is used in any of the following locations, provide sufficient shielding measures:

- Where noise is generated due to static electricity, etc.
- Where the unit is subject to a strong electric or magnetic field
- Where the unit is subject to ultraviolet or radiation

2.2 Storage and Preservation Environment

- For the storage and preservation environment, see the installation environment.
  However, give especial consideration to the prevention of condensation during long-term storage/preservation.
- Unless especially specified, desiccant is not included in the package at shipping.
  If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures.
- For short-term storage, it can be stored at 60°C or below.
  For storage of one month or more, make sure that the temperature does not exceed 50°C.
- The product should be placed horizontally for storage and preservation.
  If storing in the packaged condition, observe the conditions, if any, regarding storage orientation.

(Example of horizontal installation)

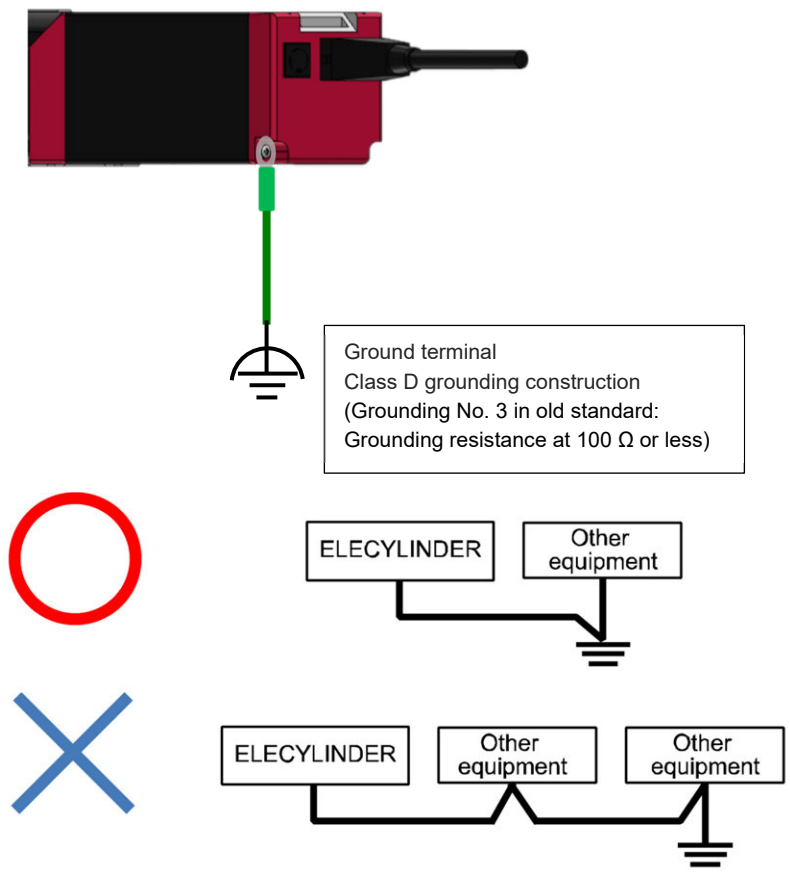


2.3 Grounding for Noise Countermeasures

The ELECYLINDER has a built-in controller circuit board.
The controller frame grounding line is connected to the ELECYLINDER body and through to ground via the ELECYLINDER mounting surface.

2.3.1 Pulse Motor Equipped Model

Grounding for noise countermeasures (frame ground) For pulse motor equipped model

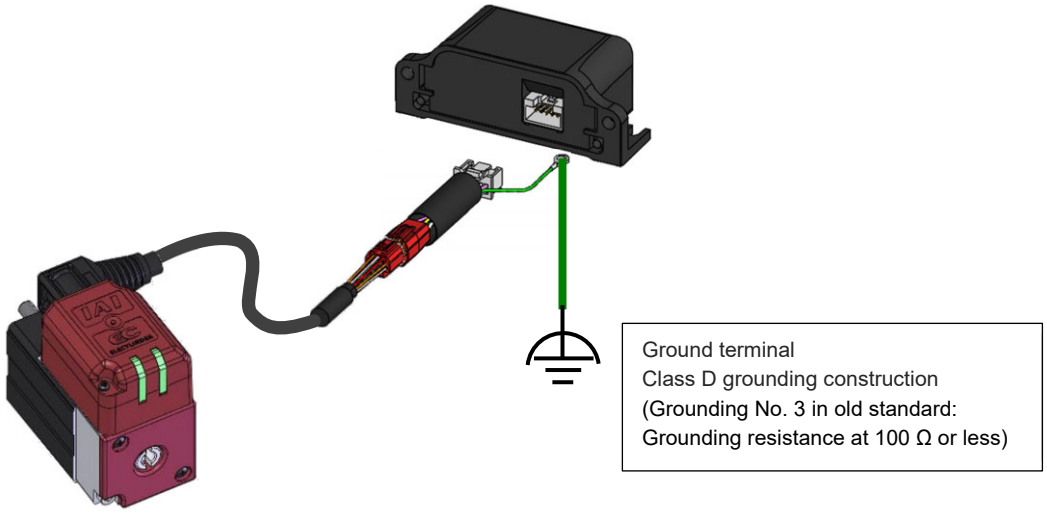


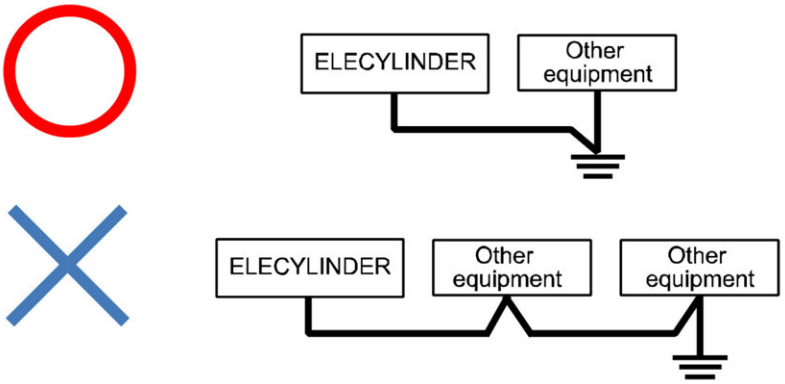
* Make sure to ground individually for each power supply and do not share it with other devices or link with them.

(*) Refer to [Chapter 3 Pulse Motor Equipped Models Wiring 3.3 Frame grounding wiring] for details how to perform wiring.

2.3.2 24V AC Servomotor Equipped Models noise countermeasures

Grounding for noise countermeasures (frame ground) For 24V AC servomotor equipped model





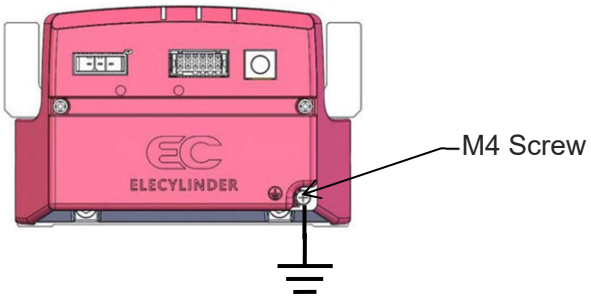
* Make sure to ground individually for each power supply and do not share it with other devices or link with them.

(*) Refer to [Chapter 4 24V AC Servomotor Equipped Models Wiring 4.3 Frame grounding wiring] for details how to perform wiring.

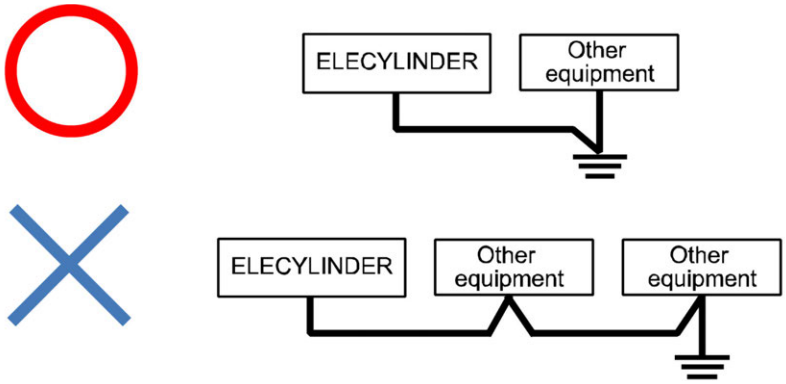
2.3.3 200V AC Servomotor Equipped Models

Grounding for noise countermeasures (frame ground) For 200V AC servomotor equipped model

The ELECYLINDER has a built-in controller circuit board.
Make sure to perform grounding as shown in the figure below in order to prevent electric shock and electrostatic charge, to improve noise durability performance and to control unexpected radiation.



Class D for grounding class
(Grounding No. 3 in old standard: Grounding resistance at 100Ω or less)



(*) Refer to [Chapter 5 200V AC Servomotor Equipped Models Wiring 5.2 Frame grounding wiring] for details how to perform wiring.

2.3.4 Notes on wiring method

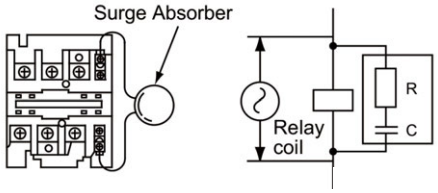
The grounding should be Class D grounding (former Class 3 grounding: Grounding resistor 100Ω or less).

1) Have the power supply wires twisted.
2) In order to reduce influence to each other, the I/O cable, communication cable and power supply cable should be allocated separate from each other.

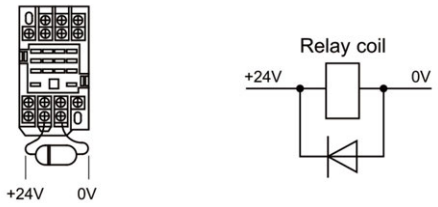
2.3.5 Noise sources and noise prevention

For the same power supply circuit and power supply device in the same device, take measures against noise.
Countermeasure examples for noise sources are shown below.

1) AC solenoid valve / magnetic switch / relay
   [Measure] Install an anti-noise device in parallel with the coil.



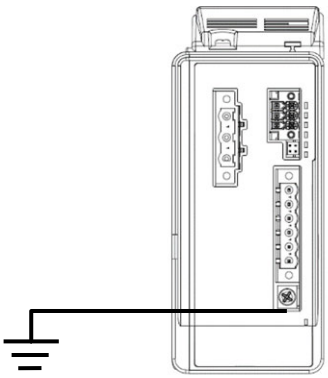
2) DC solenoid valve / magnetic switch / relay
   [Measure] Install a diode in parallel with the coil or use the diode built-in type.



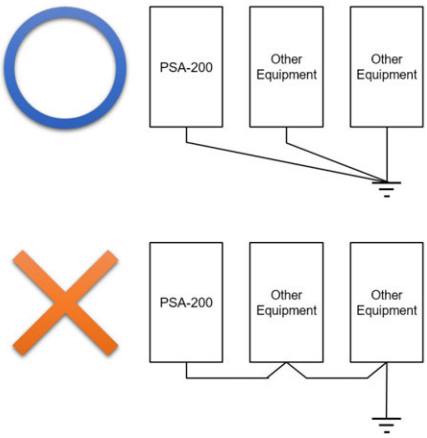
2.4 Security Grounding (DC Power supply for motor drive)

The grounding of the motor cutoff DC power supply (PSA-200) should be Class D grounding (former Class 3 grounding: Grounding resistor 100Ω or less).
For wiring, use a strand or an annealed copper wire with 2.0mm^2 (AWG14) or more.

[Motor drive DC power supply (PSA-200)]



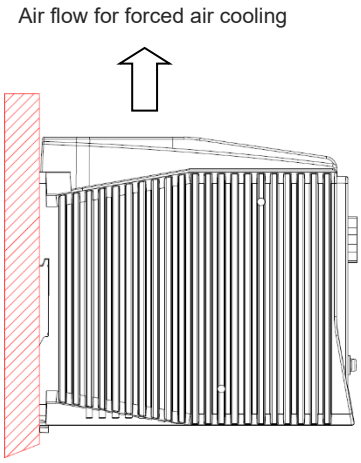
Class D for grounding class
(Grounding No. 3 in old standard:
Grounding resistance at 100 Ω or less)



Make sure to ground individually for each power supply and do not share it with other devices or link with them.

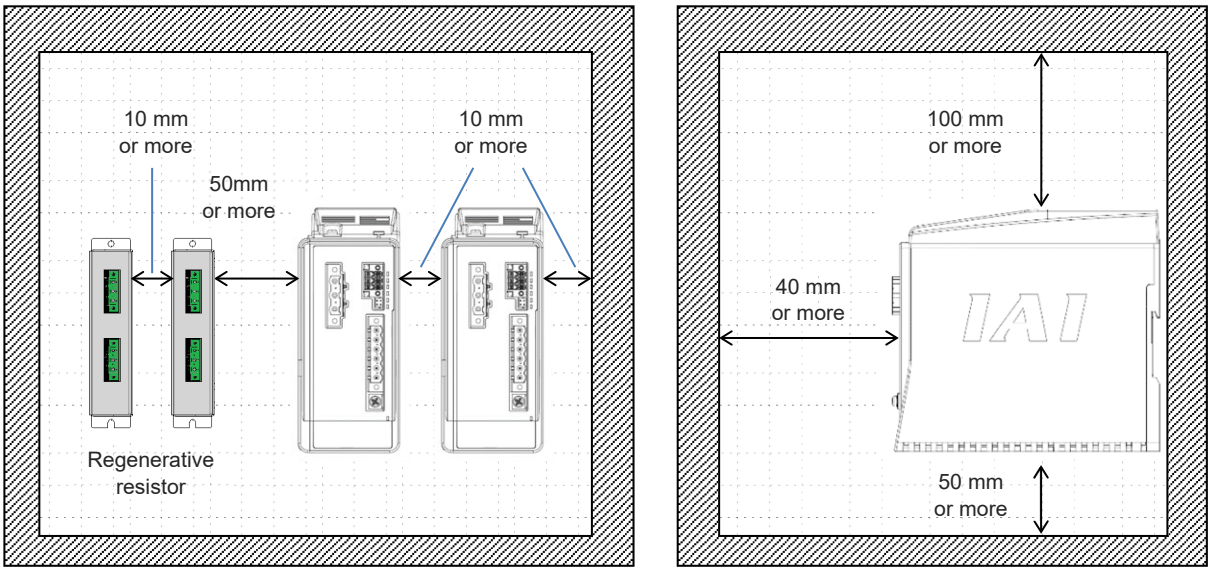
2.5 Heat Radiation and Installation (DC Power supply for motor drive)

The way to install the motor drive DC power supply should be by affixing with screws or on DIN rails.
(Note) Refer to [Specifications Section 5.7 External Dimensions] for dimensions.
Install the unit vertically as shown in the figure below for orientation.



Orientation of installation inside control panel

Follow the figure below for the minimum distance to a wall and the minimum distance to peripheral devices. Design and build the control panel considering the ambient temperature for use of this power supply unit falling into the temperature range from 0 degC to 55 degC at the installation place.



Restriction of ambient environment (PSA-200)

Startup Section

Chapter 3

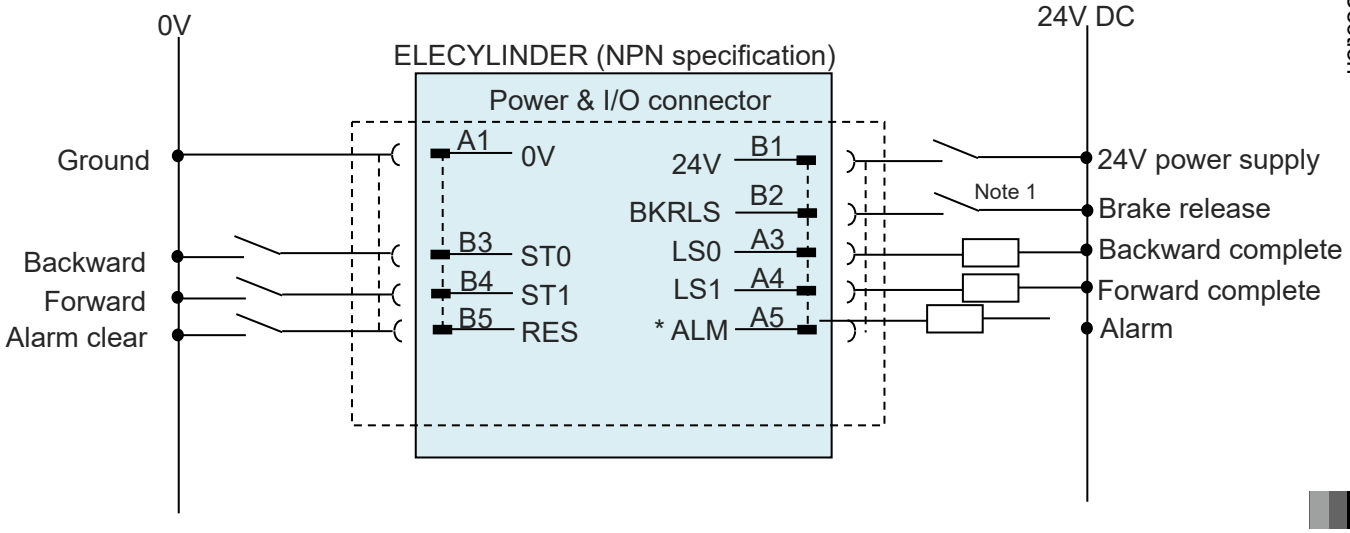
Pulse Motor Equipped Models Wiring

3.1 Connection arrangement diagram

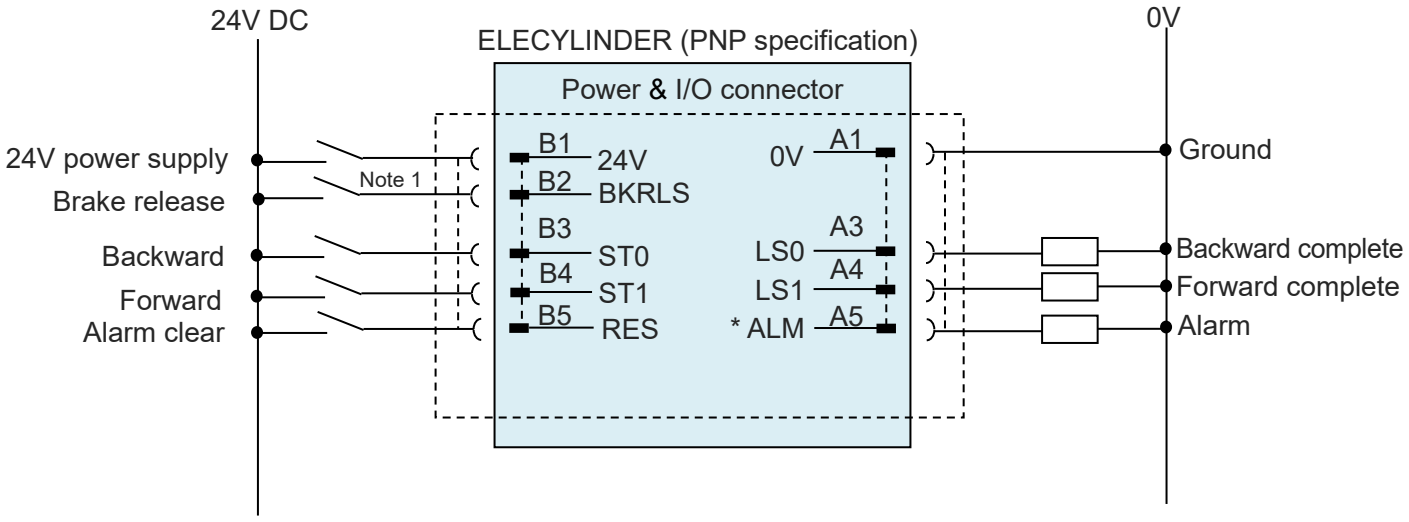
Here introduces how to wire when using a power supply cable & I/O connector of the pulse motor equipped model.

[Double solenoid system]

♦For NPN specification



♦For PNP specification

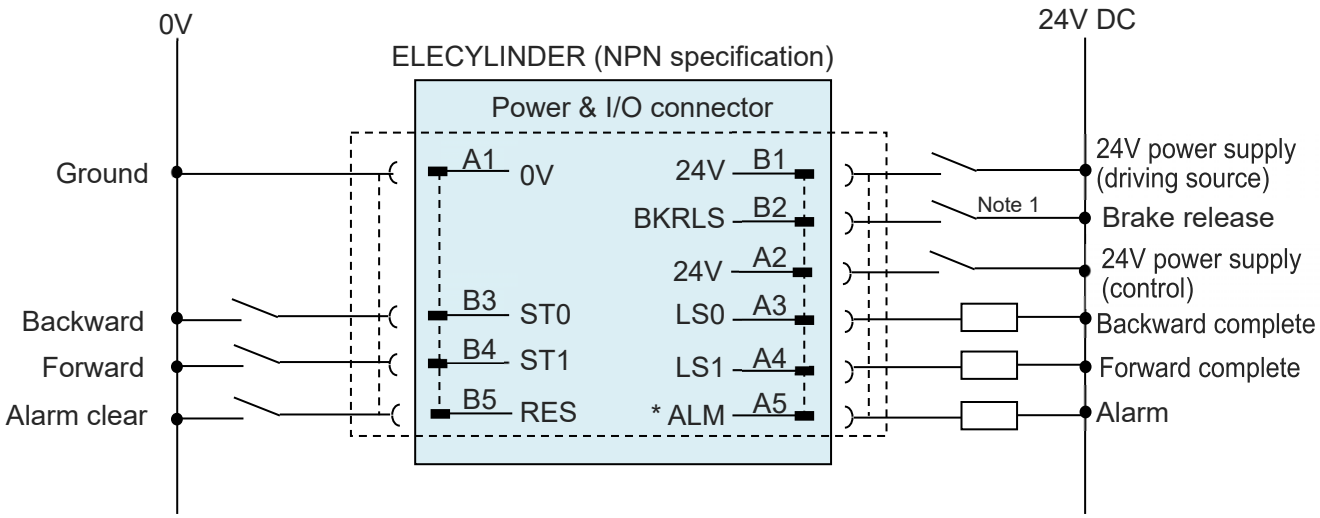


Caution

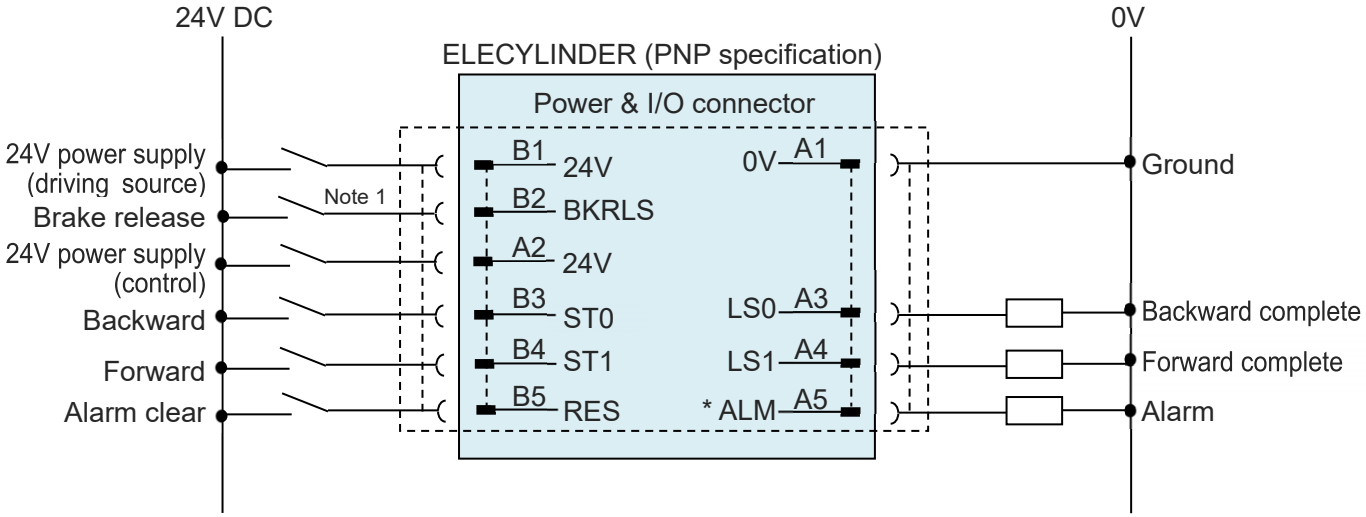
- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake. The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal. The output signal is ON in normal conditions and OFF when an alarm occurs.

⊙ 2-circuit power supply specification TMD2 (Option)

♦For NPN specification



♦For PNP specification

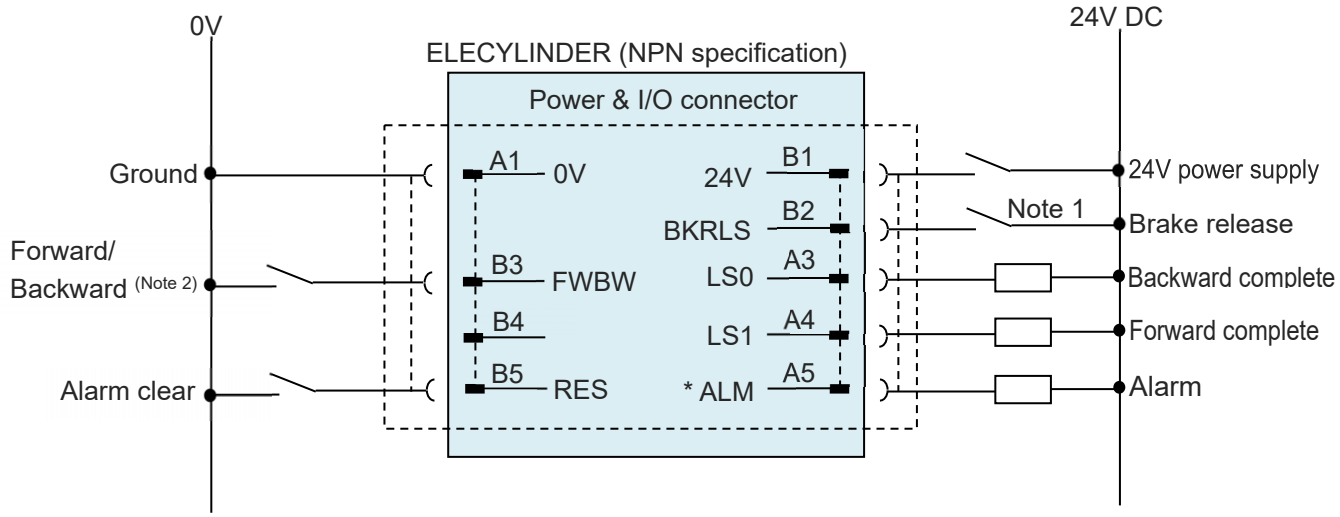


Caution

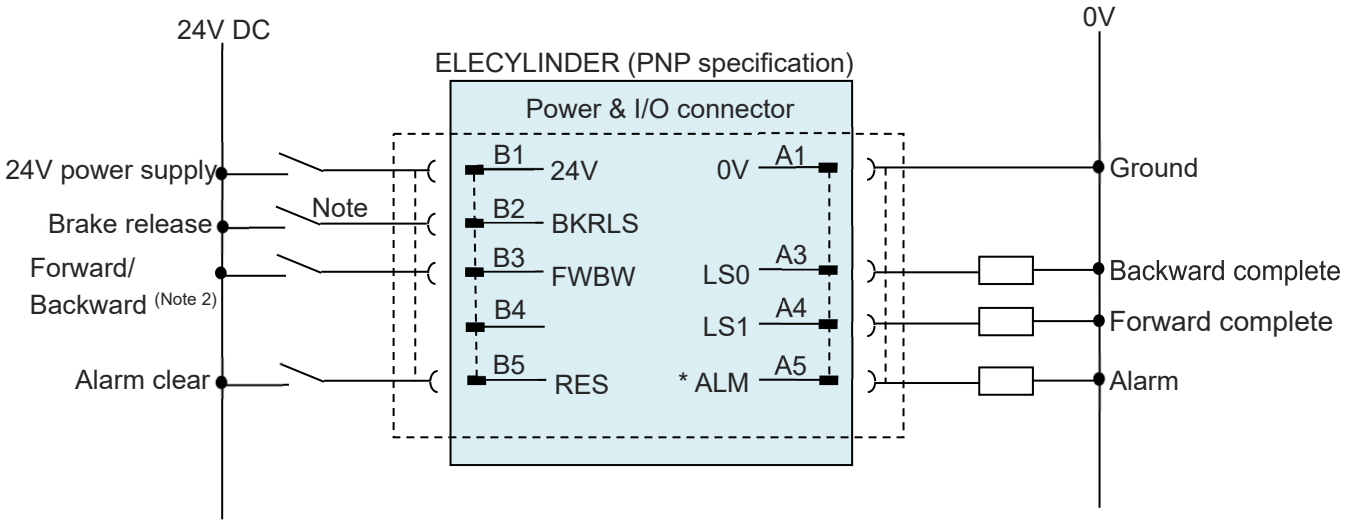
- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake.
  The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal.
  The output signal is ON in normal conditions and OFF when an alarm occurs.

[Single solenoid system]

♦For NPN specification



♦For PNP specification



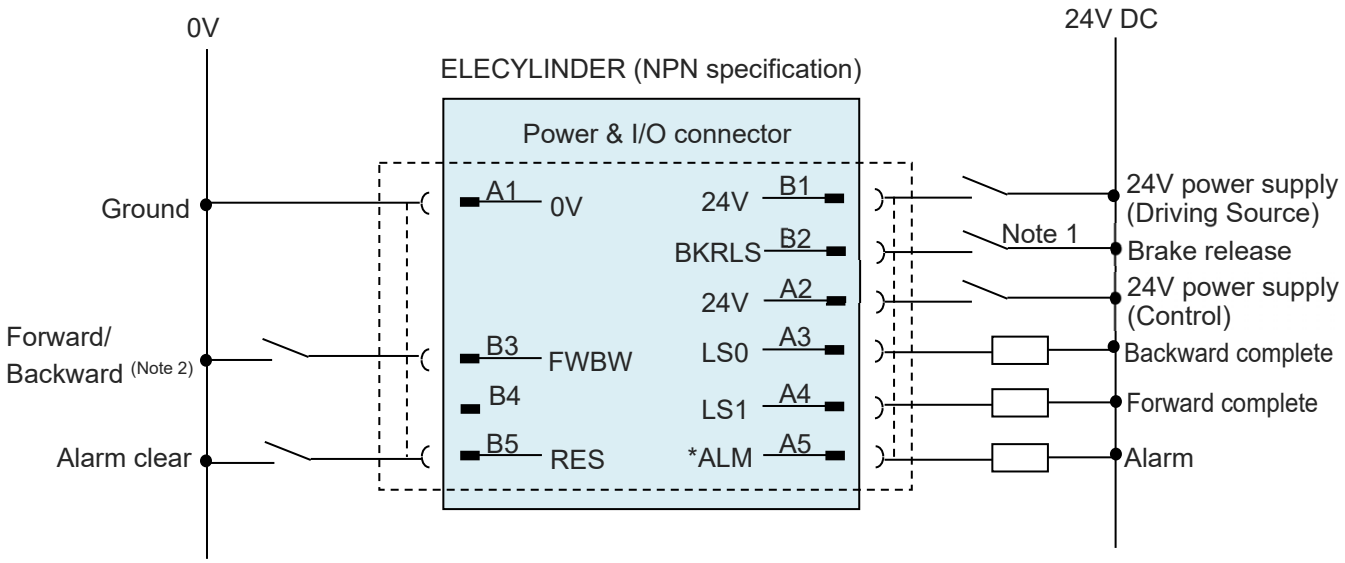
Note 2 The display for the power & I/O connector should stay "Backward".

Caution

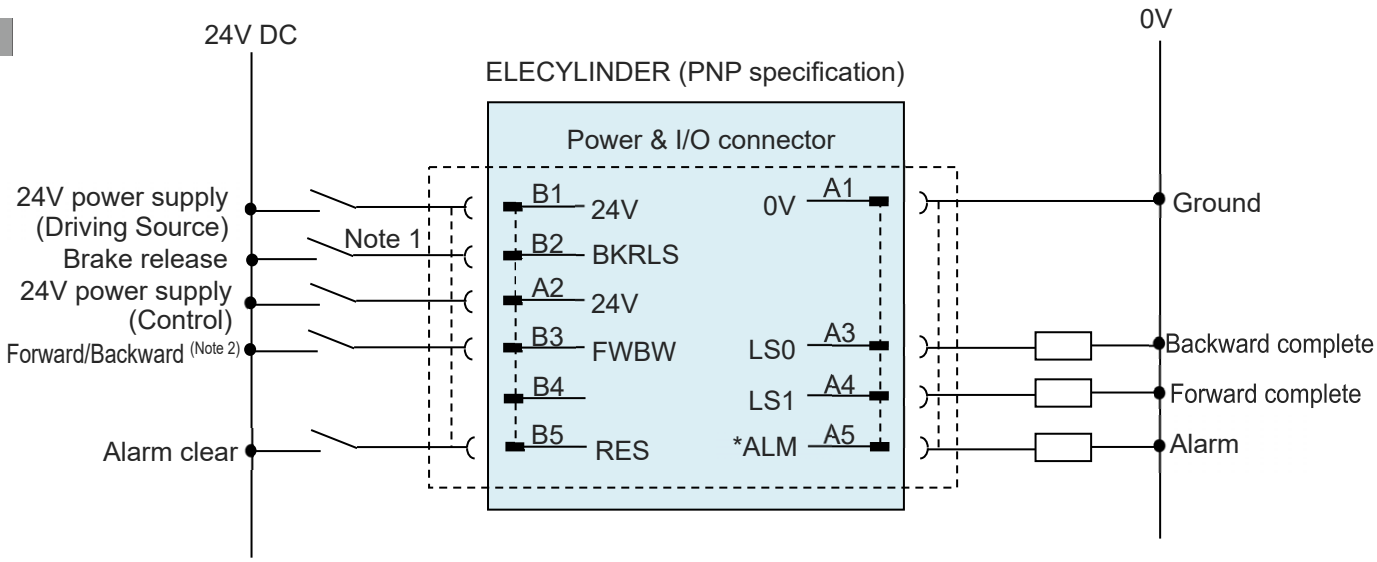
- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake.
  The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal.
  The output signal is ON in normal conditions and OFF when an alarm occurs.

⊙ 2-circuit power supply specification TMD2 (Option)

♦For NPN specification



♦For PNP specification



Note 2 The display for the power & I/O connector should stay "Backward".

Caution

- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake.
  The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal.
  The output signal is ON in normal conditions and OFF when an alarm occurs.

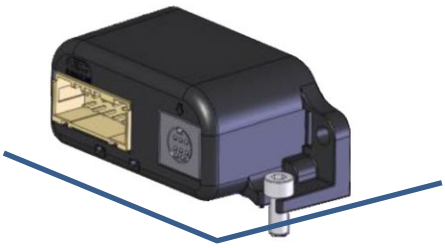
3.2 Interface box installation and wiring

3.2.1 Precautions for interface box installation

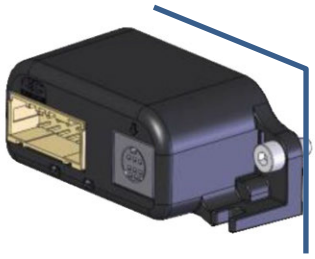
The interfacing box is to be used for the pulse motor type ELECYLINDER in the dust and splash proof type or ELECYLINDER for interface separate type.
Refer to [Specification Section 2.1 System Construction of Pulse Motor Equipped Models] for the applicable models of dust and splash proof type and interface separate type.

- When the PIO control is to be performed on the ELECYLINDER for interface separate type, it is necessary to have an interface box connected. Connection to an interface box is also necessary when performing wireless connection in RCON-EC connection type.
- IAs there is no dust and splash proof function in the interfacing box, pay attention not to have it exposed to water or dust.
- The interface box can be mounted on two body surfaces. (Interface box orientation is irrelevant)

Horizontal surface mounting

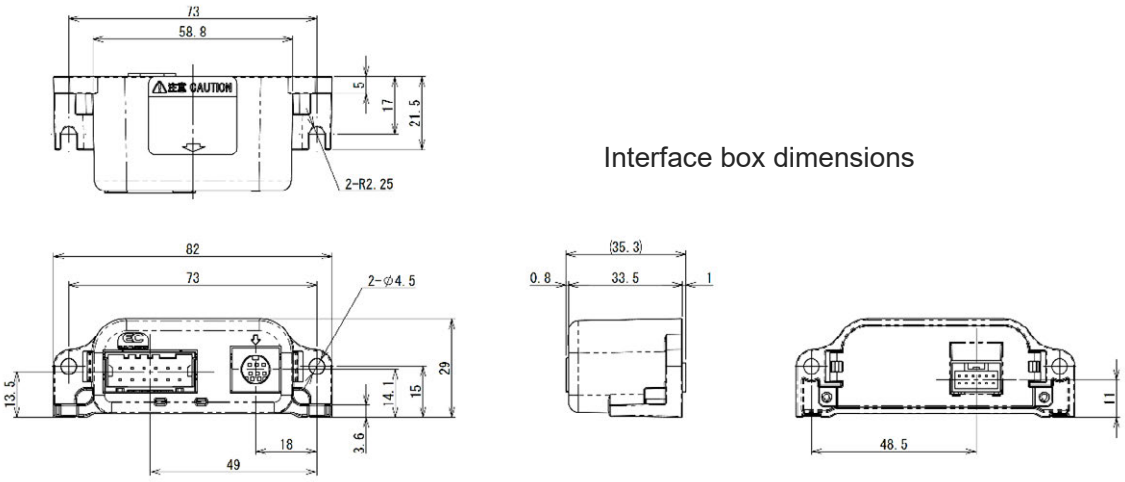


Vertical surface mounting



- When mounting the interface box on a vertical surface, prepare a cable pass-through hole of Φ18mm or more for the actuator cable.

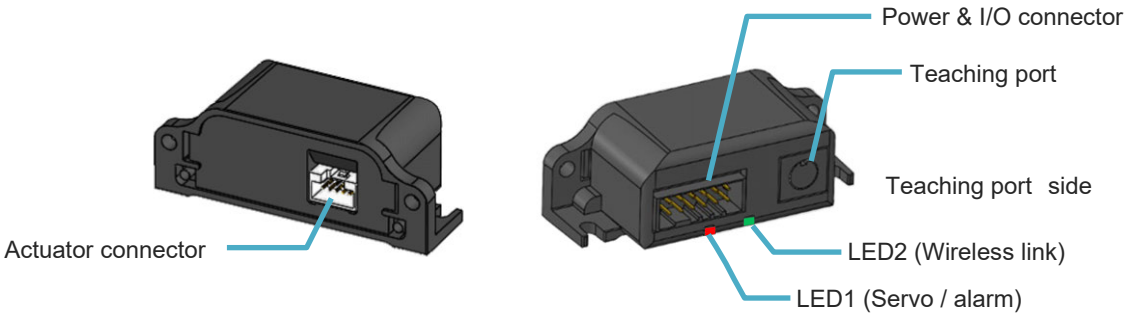
Interface box dimensions



- The solderless ring tongue terminal (0.5-5 R type) on the actuator cable (ELECYLINDER in dust and splash proof type) or the interfacing box conversion cable (interface separate type) should be fixed at a position where it can be used as a FG (frame grounding).
  (Fasten jointly with the interface box fixing bolt, or fix with a dedicated screw holes)
  For details, refer to [3.3 Frame grounding wiring].

- Install the wireless specification interface box so that it is not separated from the touch panel teaching pendant by metal panels, etc. Obstacles of this kind may adversely affect wireless communication.

3.2.2 Interface box



[Actuator connector]

It is a connector to join an actuator.

Direct connection to the actuator cable is not available.

Use the enclosed interface box conversion cable to connect the interface box.

[Status indicator LED]

It is LED1 (Servo/Alarm) on the right side from the view of teaching port side that shows the ON/OFF status of the servo and the status of alarm generated, and LED2 (Wireless) on the left to show the wireless status.

For the details of display states, refer to [Maintenance Section 1.1 Troubleshooting diagnosis (for models with pulse motor equipped)].

[Teaching port]

This connector is for the connection of a teaching pendant or PC teaching software.

When connecting, remove the cap.

[Power & I/O connector]

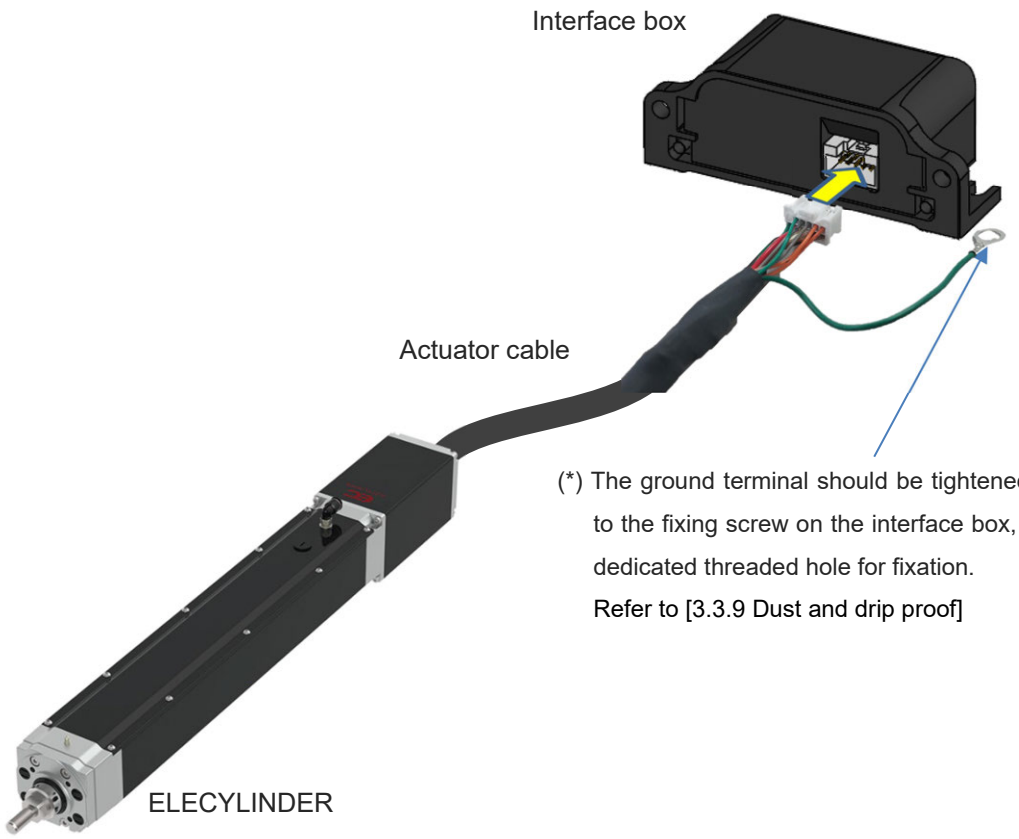
This connector connects power and I/O wiring.

3.2.3 Interface box wiring

[1] Wiring between Dust and Splash Proof Type ELECYLINDER and Interfacing Box

Connect the actuator cable and interface box.

Figure: Cable Connection

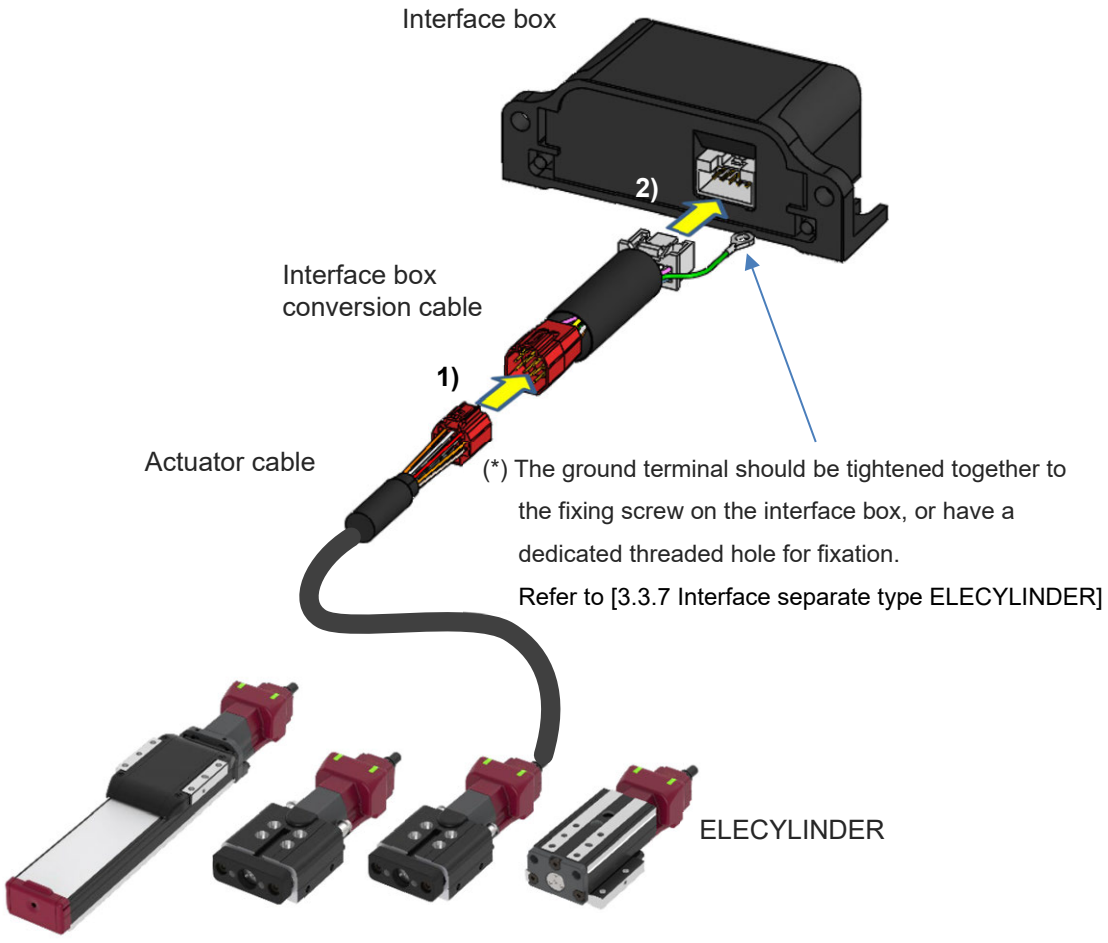


[2] Wiring of interface separate type ELECYLINDER and interface box

Use the interface box conversion cable for wiring between the interface box and the actuator cable.

1) Join the actuator cable to the interface box conversion cable.
2) Join the interface box conversion cable to the interface box.

Figure: Cable Connection

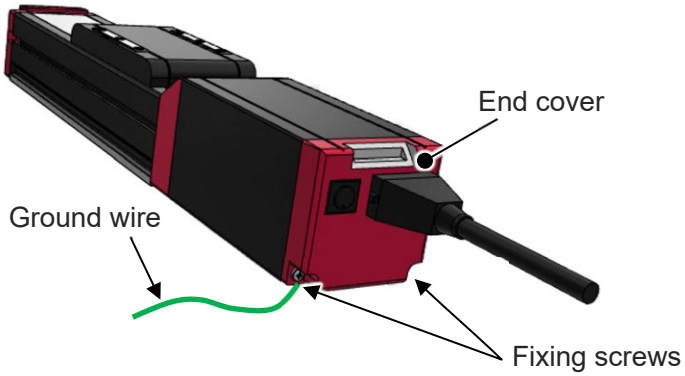


3.3 Frame grounding wiring

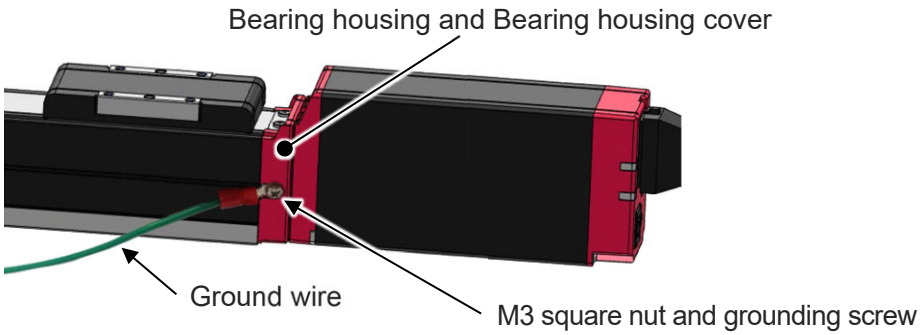
The ELECYLINDER has a built-in controller circuit board.
The controller frame grounding line is connected to the ELECYLINDER body and through to ground via the ELECYLINDER mounting surface.
* The Ground wire, Grounding screw and the M3 square nut is to be prepared by the customer.

3.3.1 Slider type

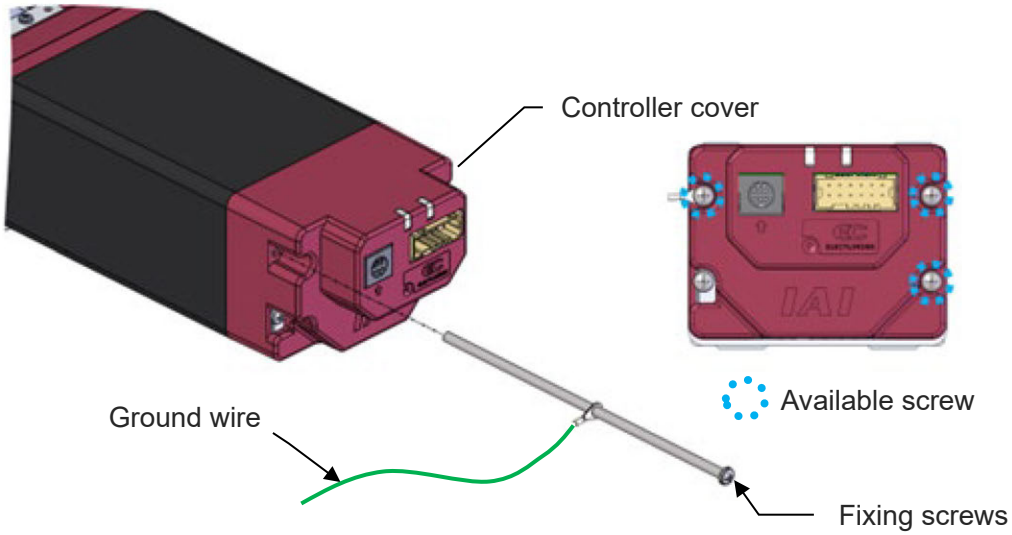
If not grounding through the mounting surface, there are fixing screws (2 locations) under the end cover, of which either one can be used for the ground wire connection.



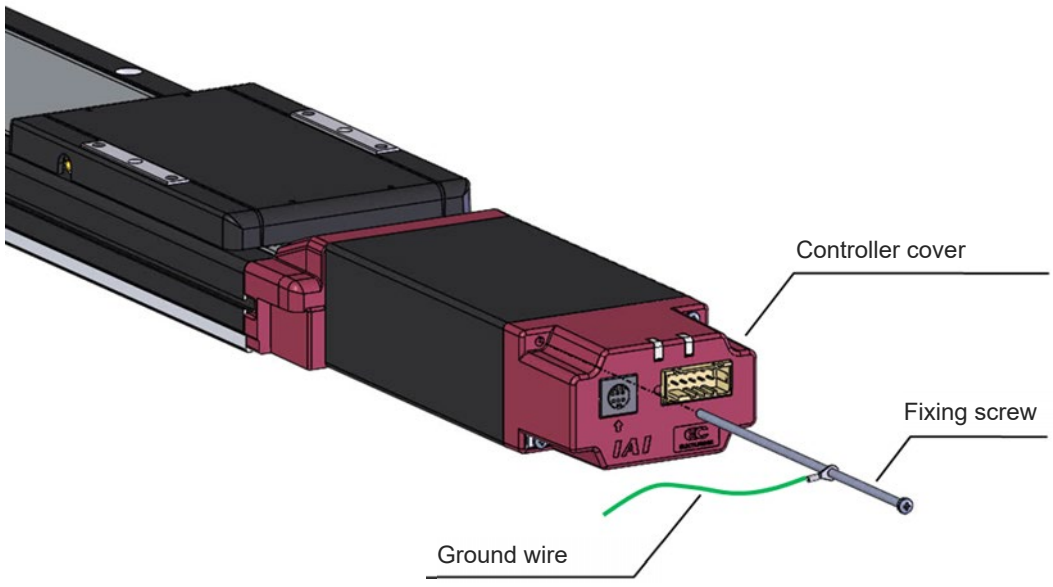
When grounding cannot be secured on the installation surface for EC-(D)S3□(A)/(D)S4□(A), grounding can also be performed with the following method.
Insert a M3 square nut in the T-shaped slot on the bearing housing and the side face of the bearing housing cover and put through a ground wire perform grounding.



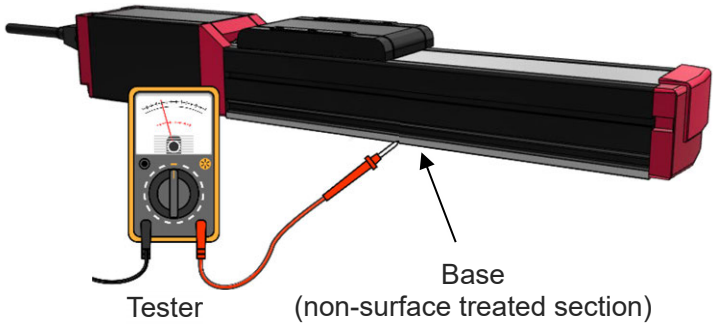
If the EC-S8□ is not grounding through the mounting surface, there are fixing screws (3 locations) the controller cover, of which either one can be used for the ground wire connection.



If the EC-WS is not grounding through the mounting surface, there are fixing screws (4 locations) the controller cover, of which either one can be used for the ground wire connection.

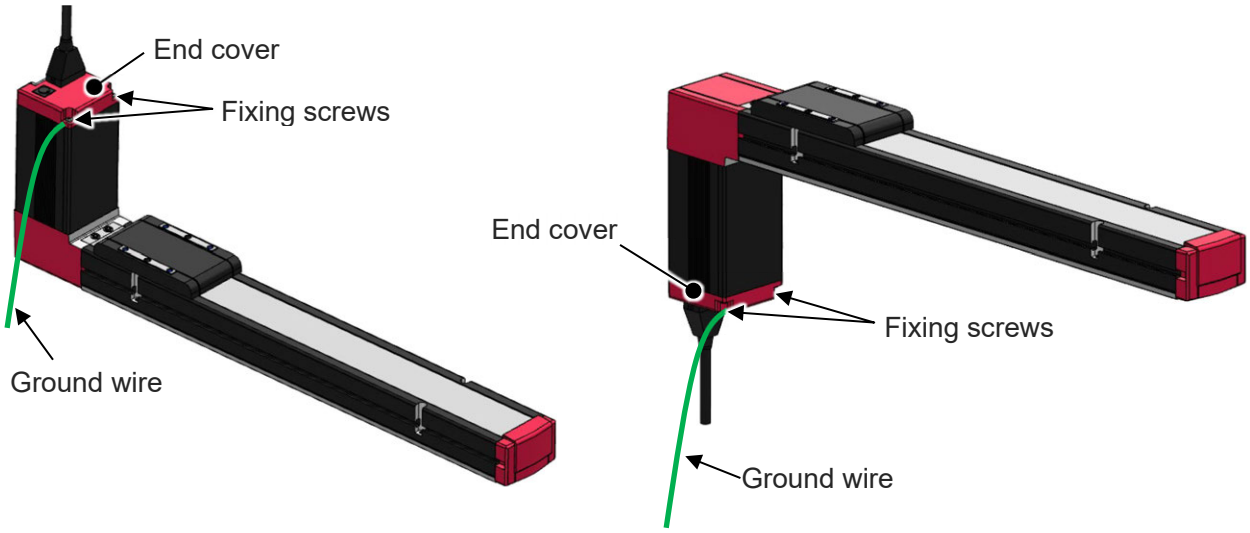


Use a tester to measure the continuity between the fixing screws or grounding screws and grounding surface to check whether it is grounded or not.
Conduction can be checked in the area on the base bottom where no surface treatment is applied.



3.3.2 Belt drive type

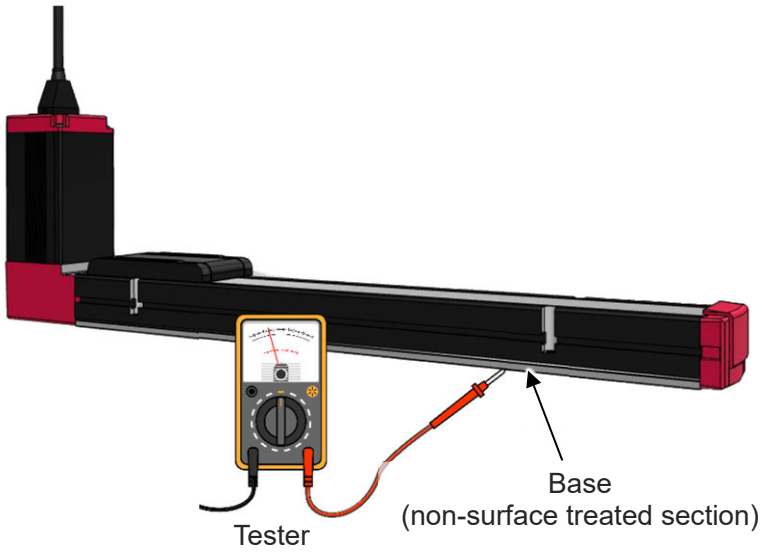
If not grounding through the mounting surface, there are fixing screws (2 locations) under the end cover, of which either one can be used for the ground wire connection.



Motor on Top　　Motor on Bottom

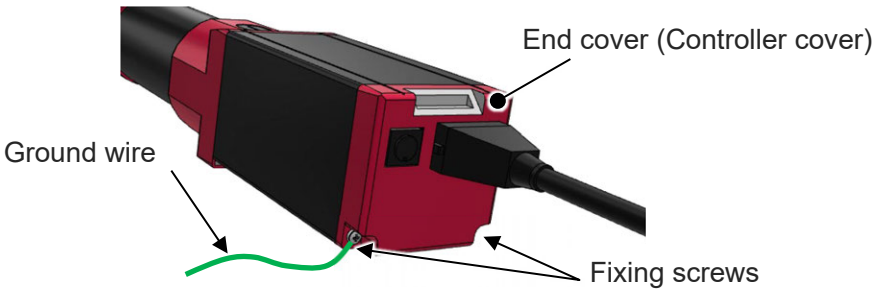
* Pay attention to the wiring of the ground wire so it would not contact the moving part of the slider.

Use a tester to measure the continuity between the fixing screws and grounding surface to check whether it is grounded or not.
Conduction can be checked in the area on the base bottom where no surface treatment is applied.

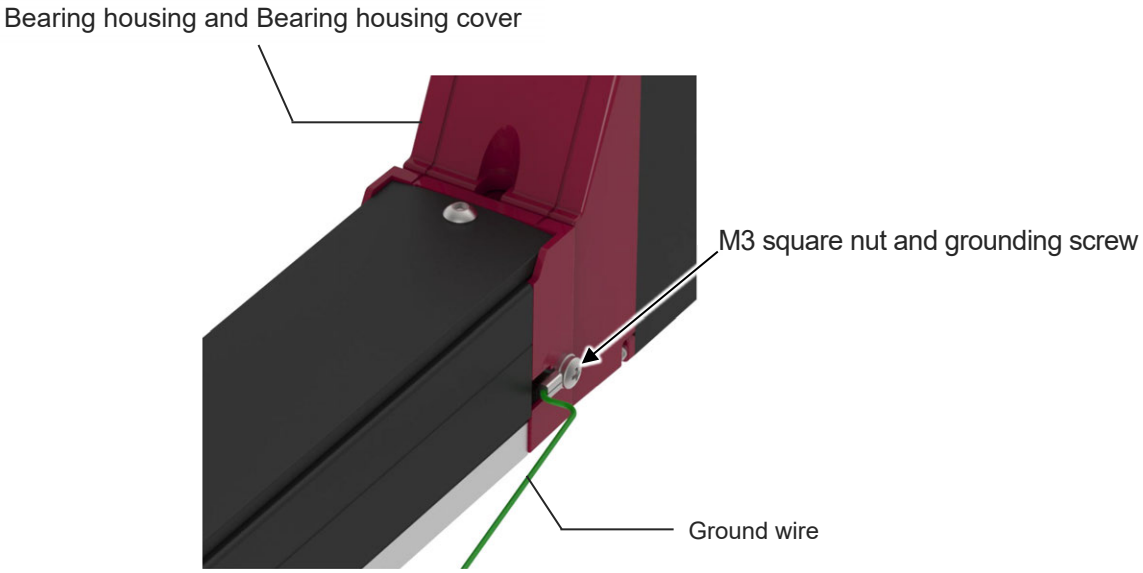


3.3.3 Rod type, Radial cylinder type

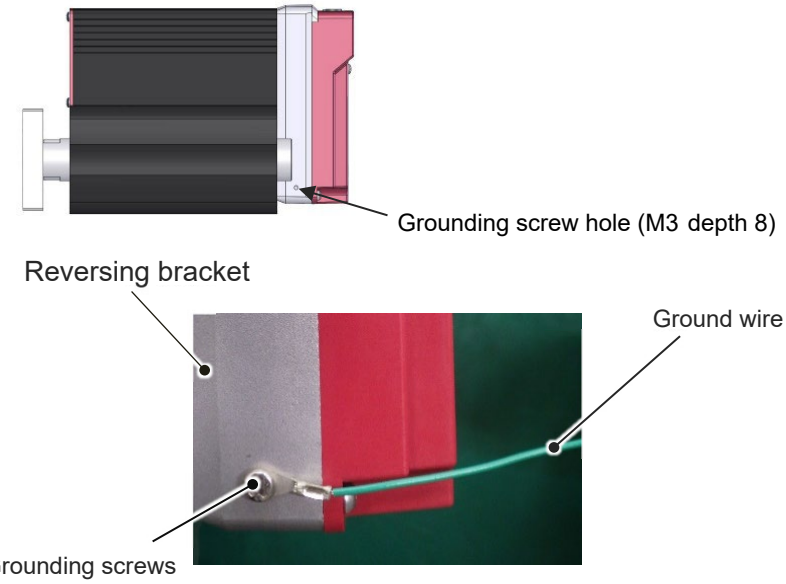
If not grounding through the mounting surface, there are fixing screws the end cover or controller cover, of which either one can be used for the ground wire connection.



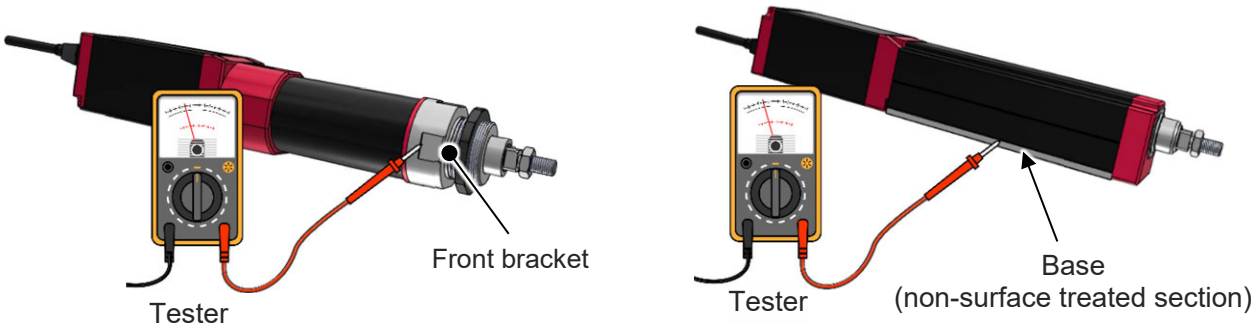
When grounding cannot be secured on the installation surface for EC-(D)RR3□/(D)RR4□, grounding can also be performed with the following method.
Insert a M3 square nut in the T-shaped slot on the bearing housing and the side face of the bearing housing cover and put through a ground wire perform grounding.



For EC-SRG11□/SRG15□, if grounding cannot be conducted at the attachment surface, connect the ground wire at one of the grounding screw holes equipped on the right and left sides of the reversing bracket in order to conduct grounding.



Use a tester to measure the continuity between the fixing screws or grounding screws and grounding surface to check whether it is grounded or not.
Conductivity can be secured where there is no surface treatment applied on the front bracket for the rod type and on the bottom of the base for the radial cylinder type.

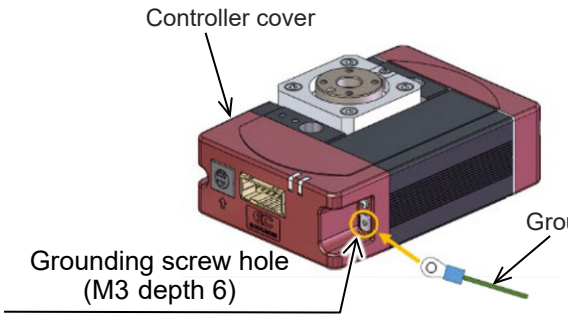


<Rod type>

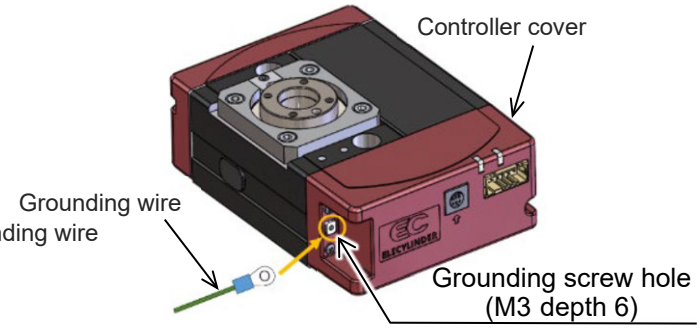
<Radial cylinder type>

3.3.4 Rotary type

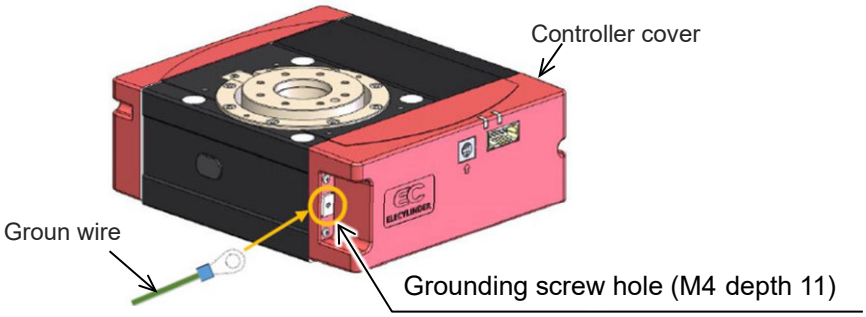
If not grounding through the mounting surface, use the screw hole for grounding equipped on the side of the controller cover.



EC-RTC9



EC-RTC12

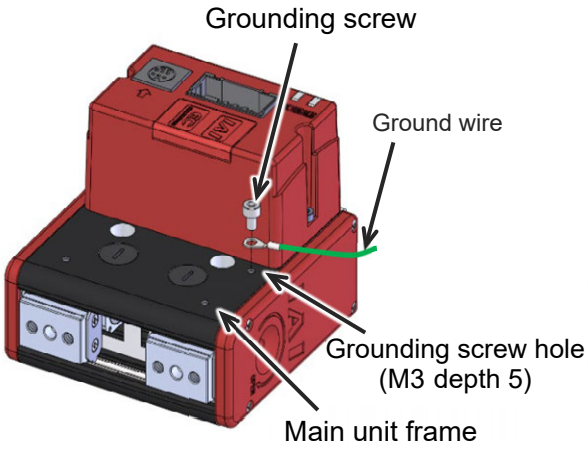


EC-RTC18

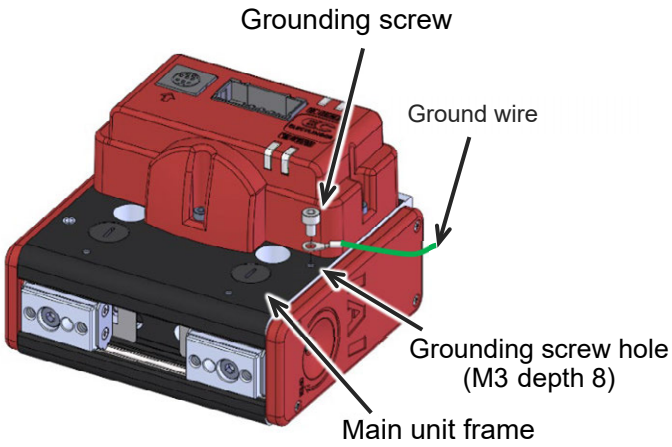
Measure the conductivity at the grounding screw and grounding surface with a tester to confirm that grounding is established.

3.3.5 Gripper type

If not grounding through the mounting surface, use the grounding screw hole for grounding equipped on the side of the controller cover.



EC-GRB8

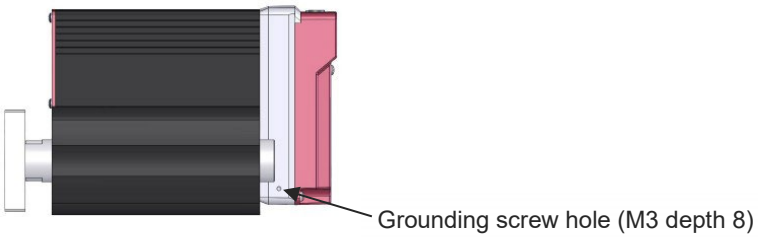


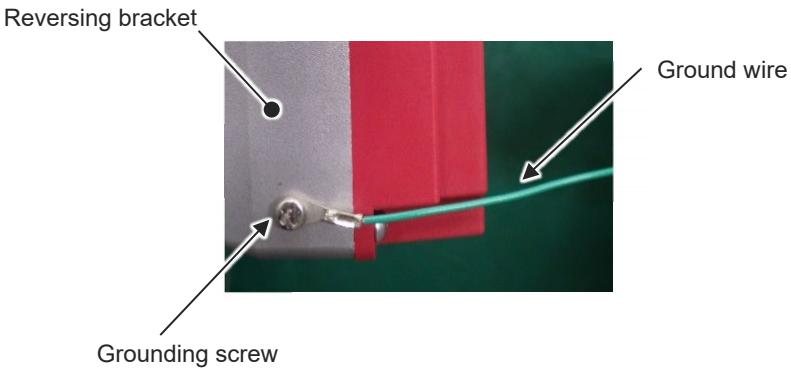
EC-GRB10/GRB13

Measure the conductivity at the grounding screw and grounding surface with a tester to confirm that grounding is established.

3.3.6 Stopper cylinder

If not grounding through the mounting surface, connect the ground wire at one of the grounding screw holes equipped on the right and left sides of the reversing bracket in order to conduct grounding.



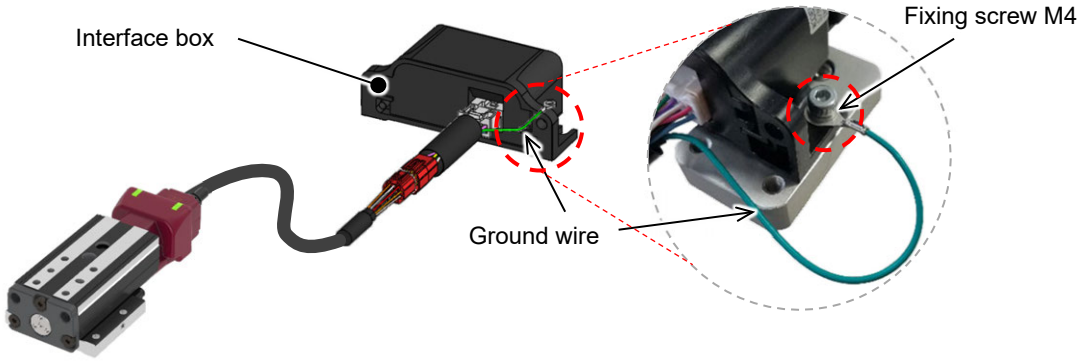


Measure the conductivity at the grounding screw and grounding surface with a tester to confirm that grounding is established.

3.3.7 Interface separate type / 24V AC servomotor equipped models

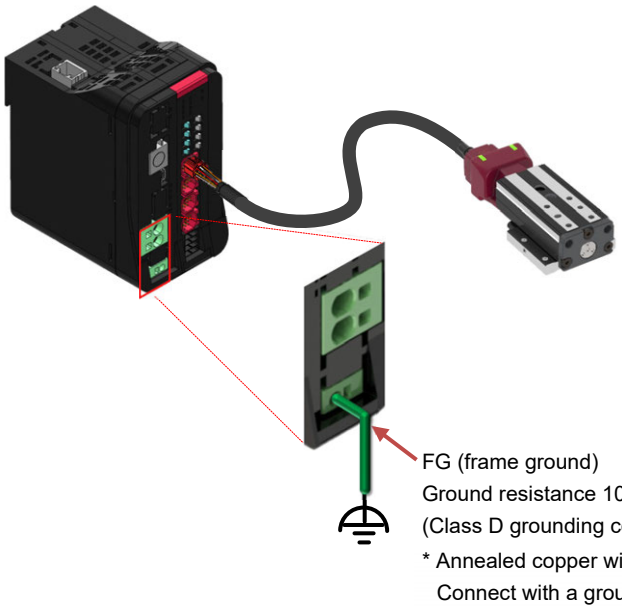
♦ When connecting to interface boxes

Connect the ground terminal on the conversion cable.



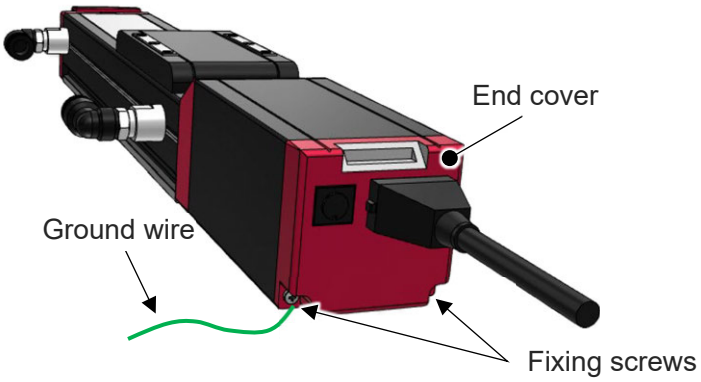
♦ When connecting directly to RCON-EC

Ground the FG (frame grounding) on the gateway unit or SEL unit side.

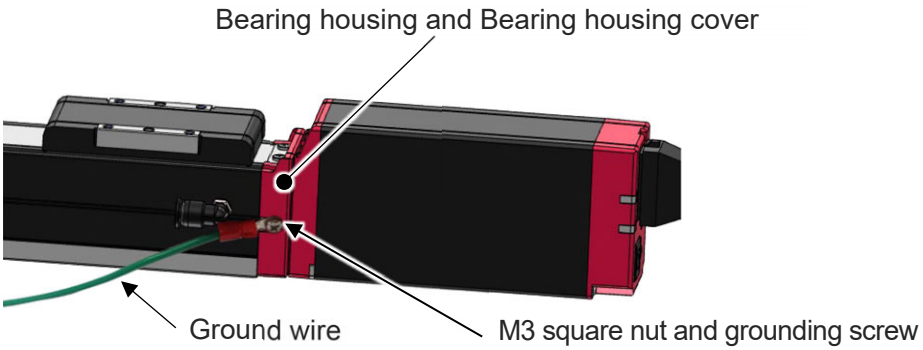


3.3.8 Cleanroom specification

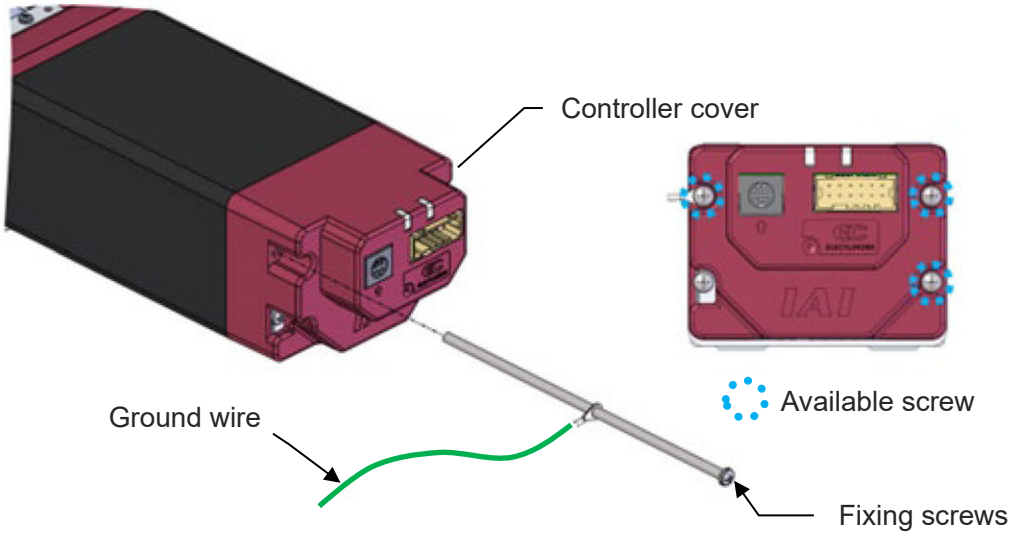
If not grounding through the mounting surface, there are fixing screws (2 locations) under the end cover, of which either one can be used for the ground wire connection.



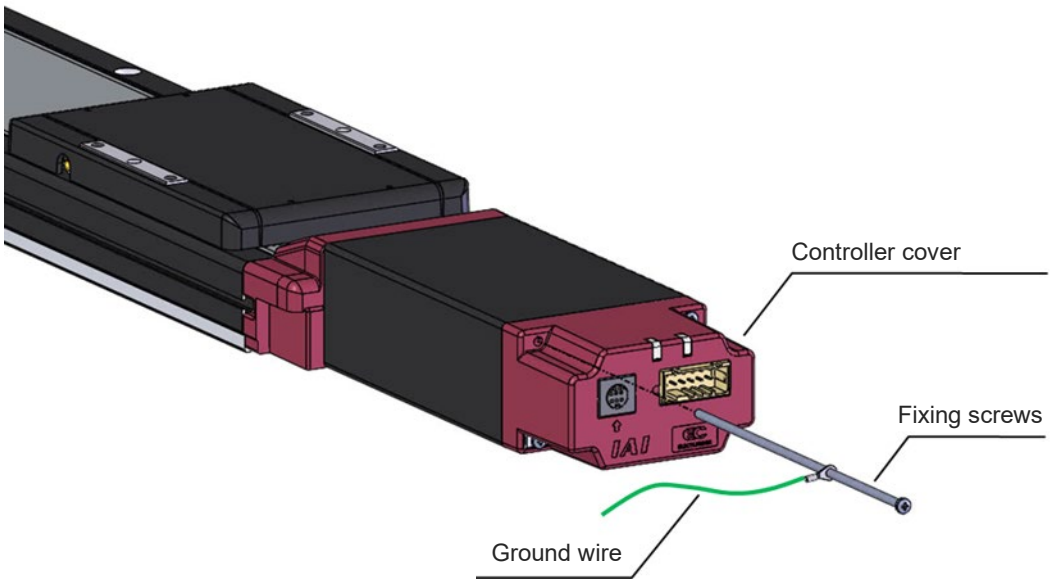
For EC-(D)S3□CR/(D)S4□CR, if grounding cannot be conducted at the attachment surface, insert an M3 square nut to the T-slot equipped on the side of the bearing housing and the bearing housing cover to connect the ground cable in order to perform grounding.



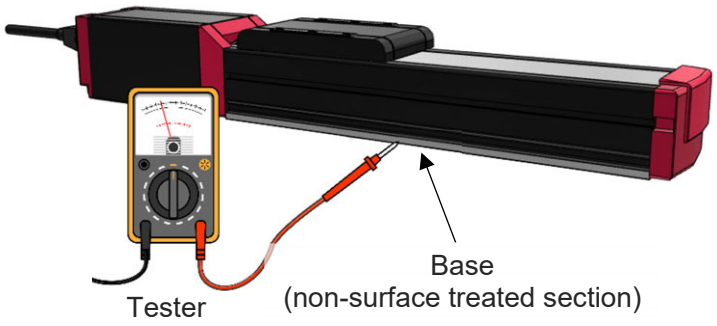
If the EC-S8□□CR is not grounding through the mounting surface, there are fixing screws (3 locations) the controller cover, of which either one can be used for the ground wire connection.



If the EC-(D)WS10□CR/(D)WS12□CR is not grounding through the mounting surface, there are fixing screws (4 locations) the controller cover, of which either one can be used for the ground wire connection.



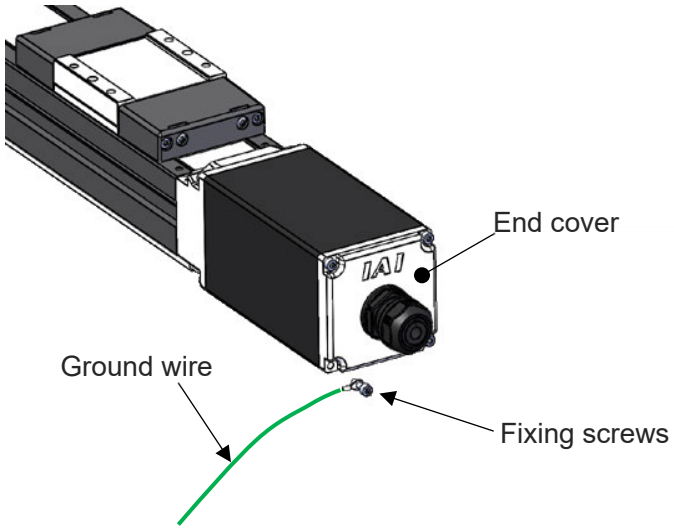
Use a tester to measure the continuity between the fixing screws or grounding screws and grounding surface to check whether it is grounded or not.
Conduction can be checked in the area on the base bottom where no surface treatment is applied.



3.3.9 Dust and drip proof

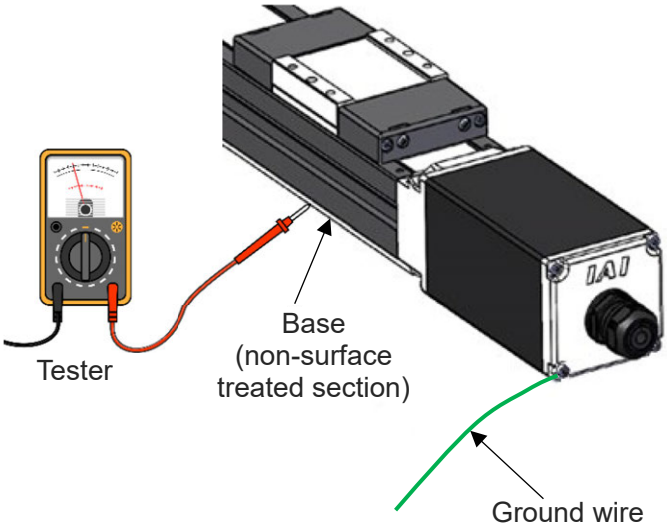
♦ For Slider type

If not grounding through the mounting surface, there are fixing screws (4 locations) under the end cover, of which either one can be used for the ground wire connection.



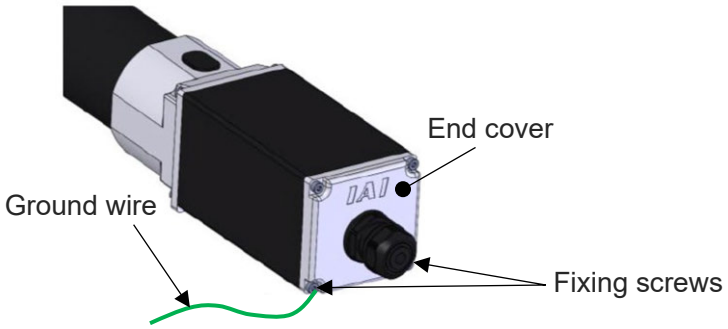
Use a tester to measure the continuity between the fixing screws and grounding surface to check whether it is grounded or not.

Conduction can be checked in the area on the base bottom where no surface treatment is applied.



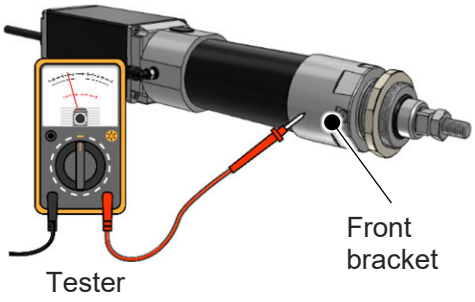
♦ For Rod type, Radial cylinder type

If not grounding through the mounting surface, there are fixing screws (4 locations) under the end cover, of which either one can be used for the ground wire connection.

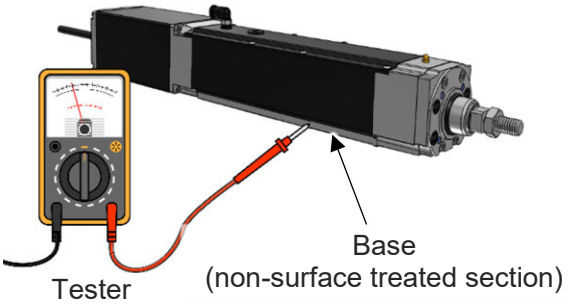


Use a tester to measure the continuity between the fixing screws and grounding surface to check whether it is grounded or not.

Conductivity can be secured where there is no surface treatment applied on the front bracket for the rod type and on the bottom of the base for the radial cylinder type.



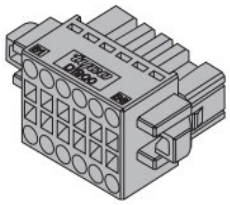
<Rod type>

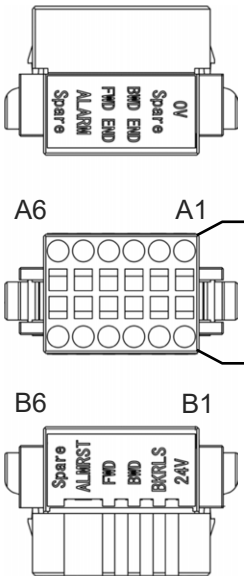


<Radial cylinder type>

3.4 Way of wiring (for connect to PIO control / connector)

Here the way of wiring with a power & I/O connector is introduced.
It should be enclosed when "0" is indicated in the model code for the cable length.
The connector should be connected to the interface box.





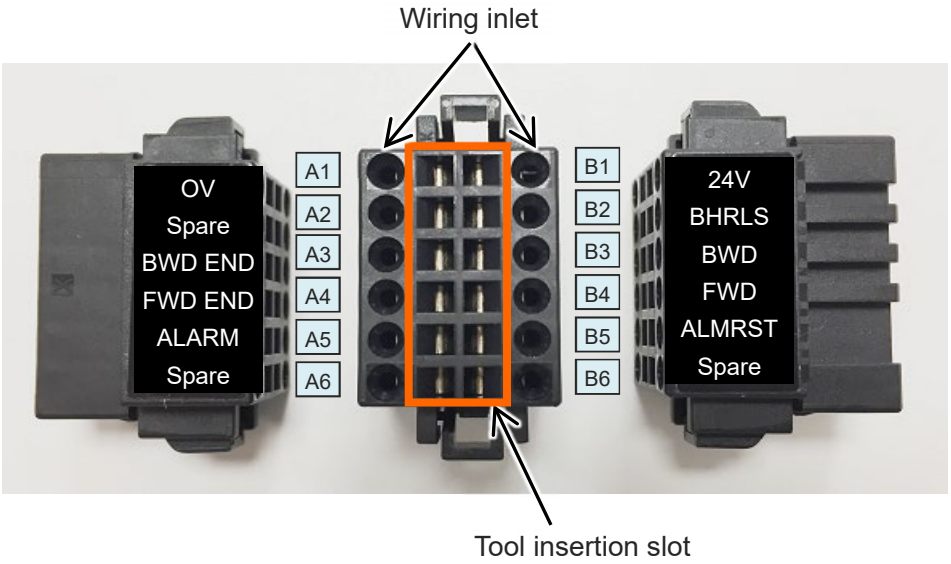
Name	Model	Quantity
Power & I/O connector	1-1871940-6 (Tyco Electronics)	1

Pin No.	Signal name	Function
A1	0V	Ground
A2	Reserve (CP : 2-circuit power supply specification)	Reserve (When 2-circuit power supply specification, 24V for control power supply)
A3	Backward complete	Backward complete (During pressing operation / Pressing complete 0)
A4	Forward complete	Forward complete (During pressing operation / Pressing complete 1)
A5	Alarm	Alarm output
A6	Reserve	Reserve
B1	24V (MP: 2-circuit power supply specification)	24V power supply (When 2-circuit power supply specification, 24V for motor power supply)
B2	Brake release	Brake release input
B3	Forward	Forward command
B4	Backward	Backward command
B5	Alarm clear	Alarm clear signal input
B6	Reserve	Reserve

3.4.1 Connector wiring method

The name of each terminal is affixed to the power & I/O connector.

The connector nameplate name and pin number relationship is as below.

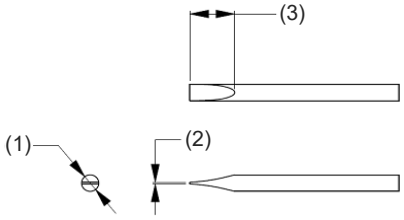


♦ **Preparation**

• Precision screwdriver

Recommended precision screwdriver

Item	Specification
(1) Shaft diameter	1.6±0.03mm
(2) Blade thickness	0.2±0.1mm
(3) Tip angle length	4.2±0.2mm

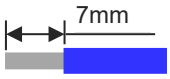


• Wiring

Compatible wire diameter: KIV0.75mm^2 (AWG18)

♦ How to Conduct Wiring

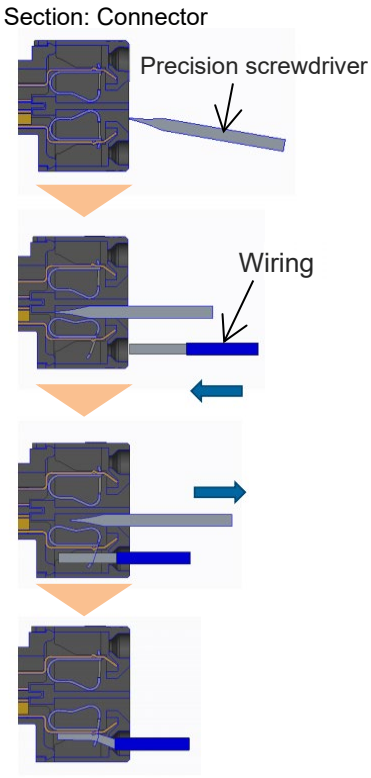
1) Peal the sheath for 7mm and twist the core wires lightly.



2) Insert a precision screwdriver fully into the tool insertion slot.
Press the spring within the connector down.

3) Insert the core wire.

4) Pull out the precision screwdriver.
Confirm that the cable is not pulled out.



Caution

- Take care not to twist the core wire too far. This will reduce the retention force, causing the wire to fall out of the connector and possibly causing insufficient current or short circuit.
- Do not insert the precision screwdriver violently into the connector, or twist it hard. This may damage the connector housing and internal spring
- If an electric wire thinner than the applicable diameter or wiring longer than 10m is used, insufficient current may trigger an alarm and the performance of the ELECYLINDER may be degraded.

3.4.2 24V DC power supply wiring

[1] Wiring for Power Supply Standard Type

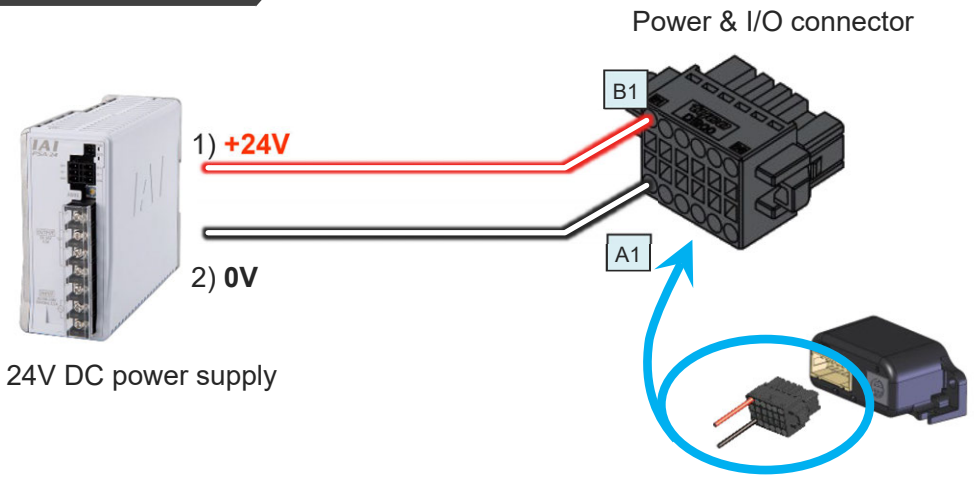
Connect the power wiring to the power & I/O connector.

Connect the 1) and 2) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B1" connector terminal and the +24V terminal of the 24V DC power supply.

2) Connect the "A1" connector terminal and the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V	KIV 0.75mm^2 (AWG18)	Power supply voltage: 24V DC ±10% Power current: Depends on Used Model Refer to [Specification Section 3.2 Power supply current]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
A1	0V		

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. This shuts off the 24V (driving source) power supply in the stopped state (control/drive power OFF).

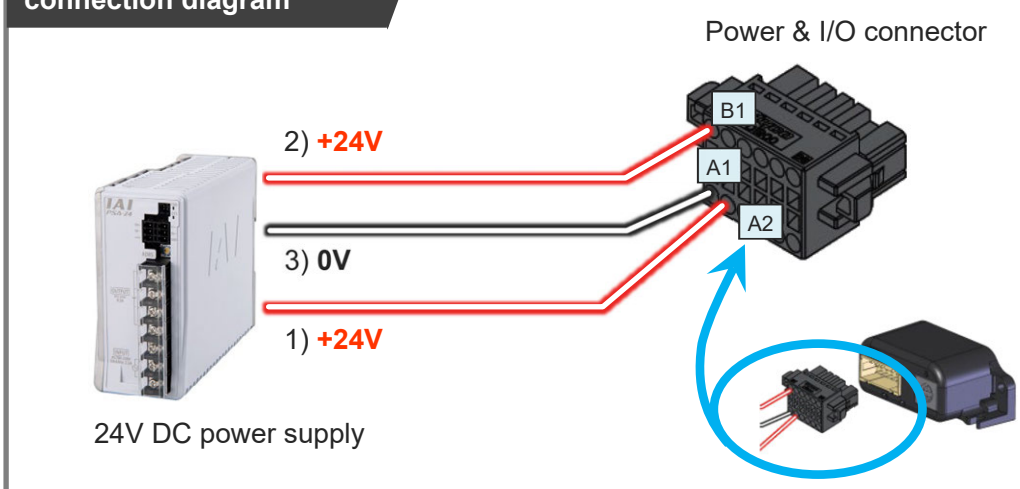
[2] 2-circuit power supply specification TMD2 (Option) wiring

Connect the power wiring to the power & I/O connector.

Connect the 1) to 3) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B1" connector terminal and the +24V (Driving Source) terminal of the 24V DC power supply.
2) Connect the "A2" connector terminal and the +24V (Control) terminal of the 24V DC power supply.
3) Connect the "A1" connector terminal and the 0V terminal of the 24V DC power supply.

24VDC power supply connection diagram



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V (Driving Source)	KIV 0.75mm^2 (AWG18)	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 3.2 Power supply current]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
A2	24V (Control)		
A1	0V		

(Note) Wire for 24V (control) on A2 can apply 0.3mm^2 (AWG22). It is recommended to use a device permitted by Electrical Appliances and Materials Safety Act.

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. This shuts off the 24V (driving source) power supply in the stopped state (control/drive power OFF).

3.4.3 Wiring of drive cutoff switch in order to make stop

When ELECYLINDER is to be stopped with an external switch, the motor drive source should be cut off.
By setting an external switch on the +24V power supply line for the drive power source, ELECYLINDER can be stopped.
Even though there is a stop switch on a teaching pendant, there is no such stop switch equipped in the PC software.
In order to have a work such as teaching, it is necessary to have a drive cutoff switch externally.

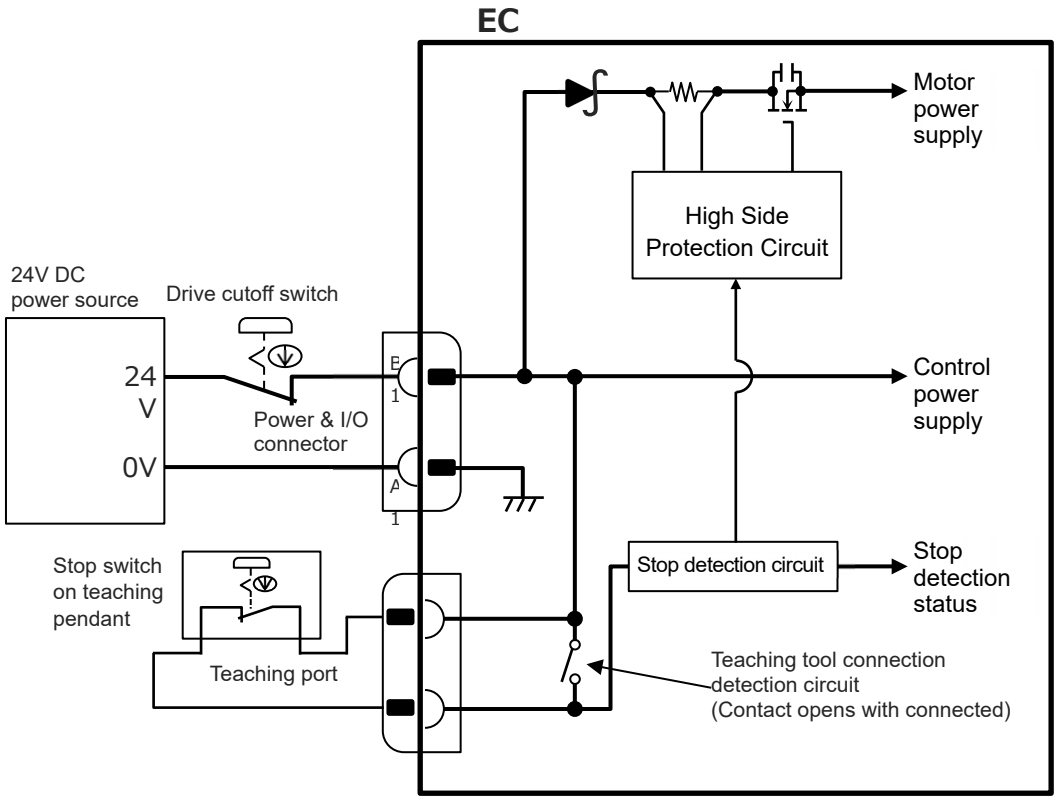
Here shows an example of having a cutoff of the power supply on one unit of ELECYLINDER.
(*) Unless it is TMD2 type (option), the control power supply to a controller should turn off at the same time as the drive power supply. When cutting off the control power supply is not desired, select TMD2 with 2-circuit power supply specification (option).

Caution

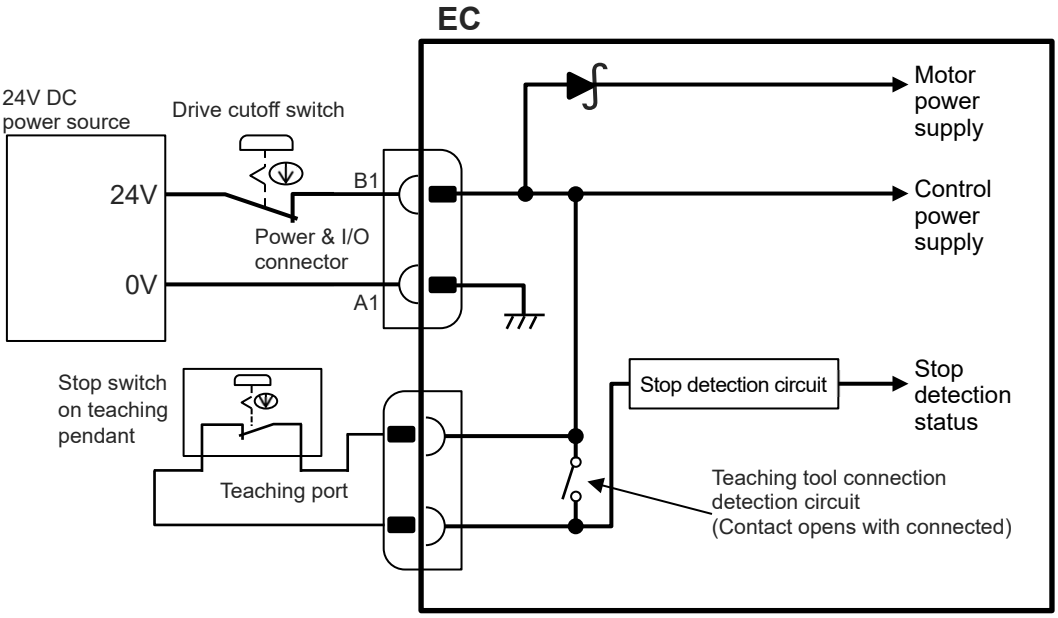
- When the power supply is conducted with turning on/off the 24V DC, keep the 0V connected, and have the +24V supplied/cut off (cutoff on one end).
  Shutting power supply on the both ends may make the electric potential unstable when the power gets cut on the 0V end first.
  This may cause malfunction of components inside the controller.
- Make sure to secure 1second or more after shutting off the power supply before rebooting.
- Do not attempt to supply only the motor power supply while there is no control power supply.

(1) Example of circuit: For case without TMD2 with 2-circuit power supply specification

● Standard / High rigidity (PowerCON Equipped Models)

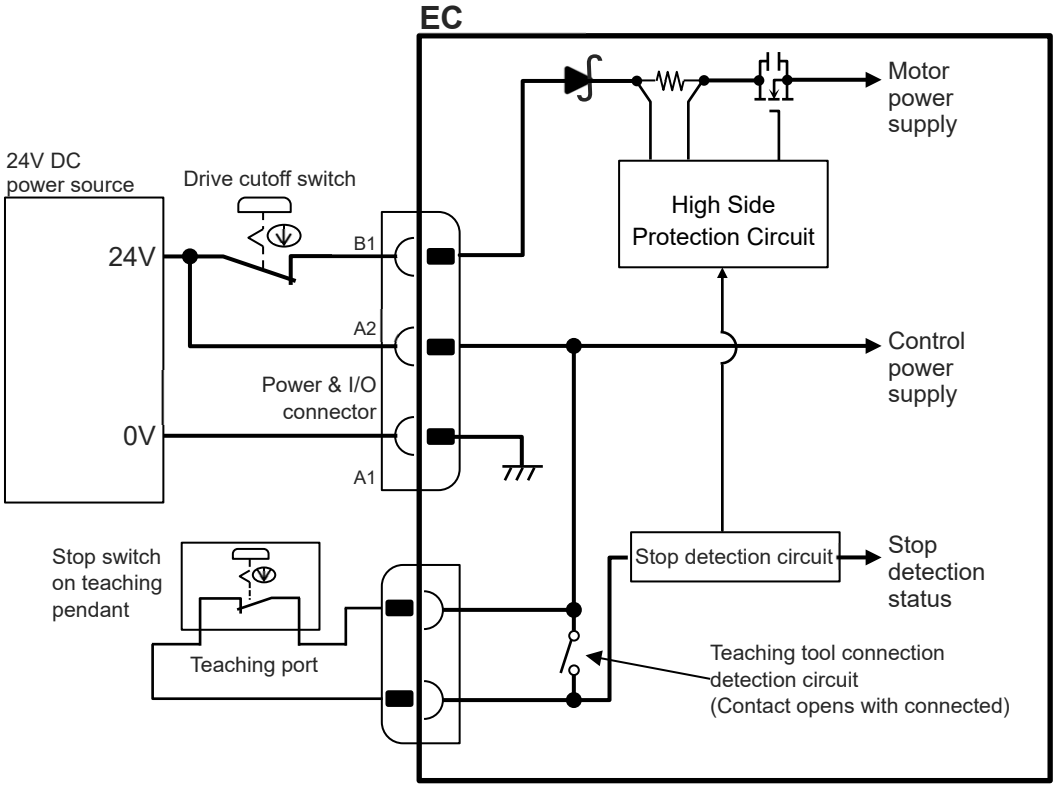


● Slim, compact / Ultra Mini / High Thrust (Models Not Equipped with PowerCON)

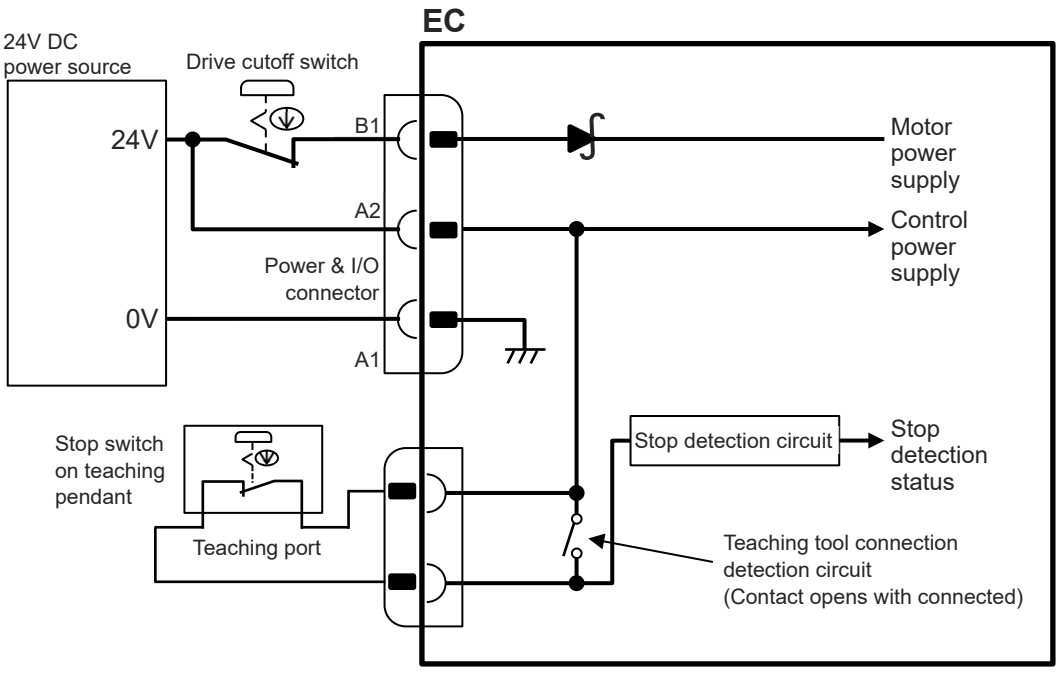


(2) Example of Circuit: For Case with TMD2 with 2-circuit power supply specification

● Standard / High rigidity (PowerCON Equipped Models)



● Slim, compact / Ultra Mini / High Thrust (Models Not Equipped with PowerCON)



(3) Way of wiring

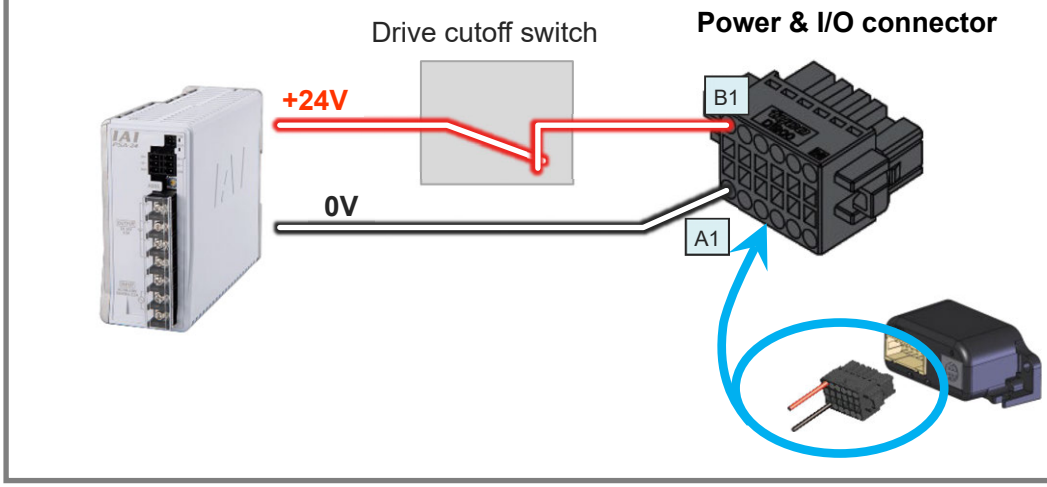
When wiring the power supply connection on the power & I/O connectors, refer to the connection diagram to connect the drive cut off switch to the power supply line (wiring of "B1" Terminal) for +24V.

By cutting off the power supply of 24V, it should turn into the stop state (control/drive power supply off, drive power supply off for TMD2).

♦Stop switch

- Dry contact (b-contact)
- Refer to the requirement specifications in the table below for the current amperage

Connection diagram for drive cutoff switch



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V	KIV 0.75mm^2 (AWG18)	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 3.2 Power supply current]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
A1	0V		

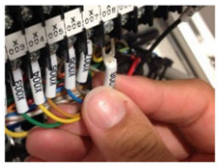
3.4.4 PLC wiring

For I/O between the PLC and signals, the signal wiring must be connected to the connector terminal block.
Connect the 1) to 6) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B3" connector terminal and the "Backward" ("Forward/Backward" for single solenoid system) output terminal.
2) Connect the "B4" connector terminal and the "Forward" output terminal.
   (Note) There is no need of connecting "B4" terminal for the single solenoid system.
3) Connect the "B5" connector terminal and the "Alarm clear" output terminal.
4) Connect the "A3" connector terminal and the "Backward complete" input terminal.
5) Connect the "A4" connector terminal and the "Forward complete" input terminal.
6) Connect the "A5" connector terminal and the "Alarm" input terminal.

PLC connection diagram

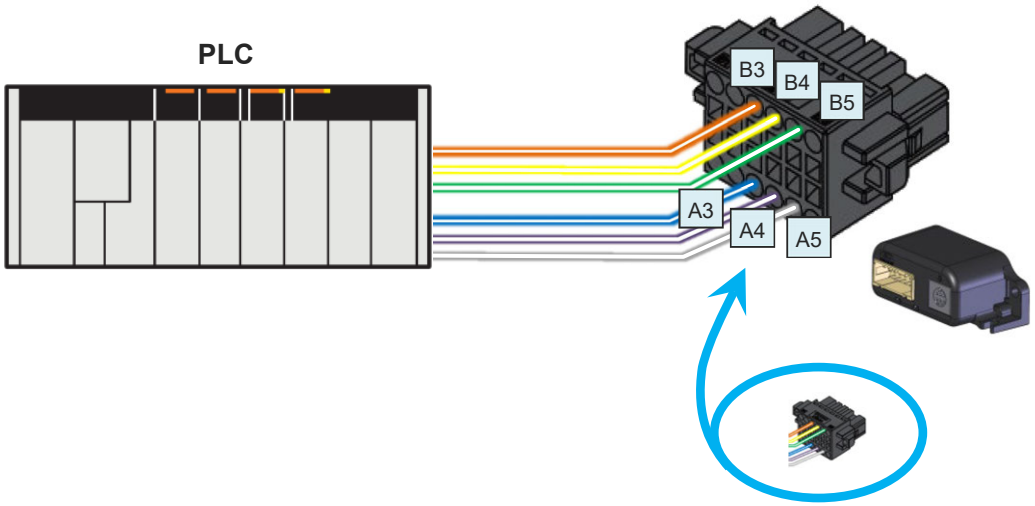
Process the terminals in accordance with PLC specifications in order to conduct wiring.



Before starting connector wiring, check the details on [3.4.1 Connector wiring method]

Power & I/O connector

PLC



♦Double solenoid system

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Backward	ST0	KIV 0.20mm^2 (AWG24)	Backward command
B4	Forward	ST1		Forward command
B5	Alarm clear	RES		Alarm clear
A3	Backward complete	LS0 or PE0		Backward complete or pressing complete
A4	Forward complete	LS1 or PE1		Forward complete or pressing complete
A5	Alarm	* ALM		Alarm detection (b-contact)

♦Single solenoid system

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Backward	FWBW	KIV 0.20mm^2 (AWG24)	Forward/Backward Command
B4	Forward (Note1)	-		-
B5	Alarm clear	RES		Alarm clear
A3	Backward complete	LS0 or PE0		Backward complete or pressing complete
A4	Forward complete	LS1 or PE1		Forward complete or pressing complete
A5	Alarm	* ALM		Alarm detection (b-contact)

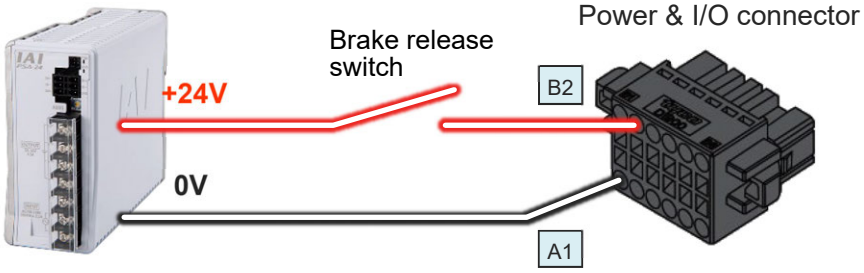
Note1 It is not to be used in the single solenoid system.

3.4.5 Brake release wiring

For the specification with brake, when installing a forcible brake release switch, connect wiring to the "B2" connector terminal.
It is not necessary to layout cables when the ELECYLINDER is not equipped with a brake or when it is not required to have the compulsory brake release.
Power capacity of 24V DC ±10% / 200mA or higher is required.

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Required specifications
B2	Brake release	BKRLS	KIV 0.20mm^2 (AWG24)	24V DC ±10% / 200mA or more

Connection diagram for drive cutoff switch



(Note) Brake release is available also from a teaching tool.
Refer to [Operation Section Chapter1 1.2 Teaching tool connections and testing operation] for detail.

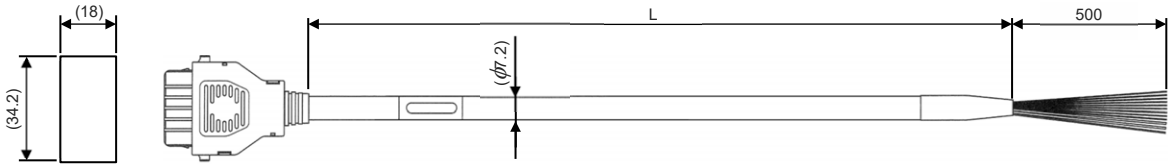
3.5 Way of wiring (for connect to PIO control / cables)

Here the way of wiring with a power & I/O cable is introduced.
The connector on the ELECYLINDER end should be connected to the interface box.

3.5.1 Power & I/O cable

(1) Power & I/O cable (user wiring specification)

Model **CB-EC-PWBIO□□□-RB**



Minimum bending radius r=58mm or more (for movable use)
* Robot cable specification is standard for this model.

Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(Reserve) (Note 1)	A2
Orange (AWG26)	ST0	B3
Yellow (AWG26)	ST1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(Reserve)	B6
Blue (AWG26)	LS0/PE0	A3
Purple (AWG26)	LS1/PE1	A4
Gray (AWG26)	* ALM	A5
White (AWG26)	(Reserve)	A6
Brown (AWG26)	BKRLS	B2

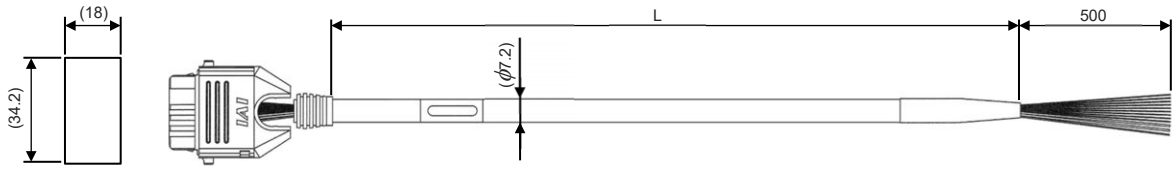
Note1 TMD2 is 24V (control)
(Note) Cable in light green and light gray not in use.
(Already cut in shrink tube)
(Note) In the case of the single solenoid system,
pin No.B3 is signal name FWBW.
Pin No. B4 is not for use.

- The wiring on the opposite side of the connector has not been processed.
- The cable length (L) is available from 1m to 10m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

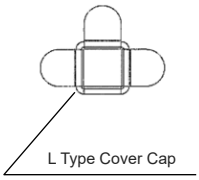
Cable length **1**m → CB-EC-PWBIO**010**-RB
Cable length **3**m → CB-EC-PWBIO**030**-RB
Cable length **10**m → CB-EC-PWBIO**100**-RB

(2) Power & I/O cable (user wiring specification, 4-way Connector)

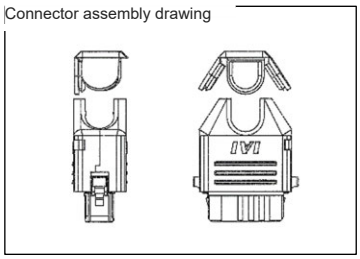
Model **CB-EC2-PWBIO□□□-RB**



Minimum bending radius r=58mm or more (for movable use)
* Robot cable specification is standard for this model.



Connector assembly drawing



Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(Reserve) (Note 1)	A2
Orange (AWG26)	ST0	B3
Yellow (AWG26)	ST1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(Reserve)	B6
Blue (AWG26)	LS0/PE0	A3
Purple (AWG26)	LS1/PE1	A4
Gray (AWG26)	* ALM	A5
White (AWG26)	(Reserve)	A6
Brown (AWG26)	BKRLS	B2

Note1 TMD2 is 24V (control)
(Note) Cable in light green and light gray not in use.
(Already cut in shrink tube)
(Note) In the case of the single solenoid system,
pin No.B3 is signal name FWBW.
Pin No. B4 is not for use.

- The wiring on the opposite side of the connector has not been processed.
- The cable length (L) is available from 1m to 10m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

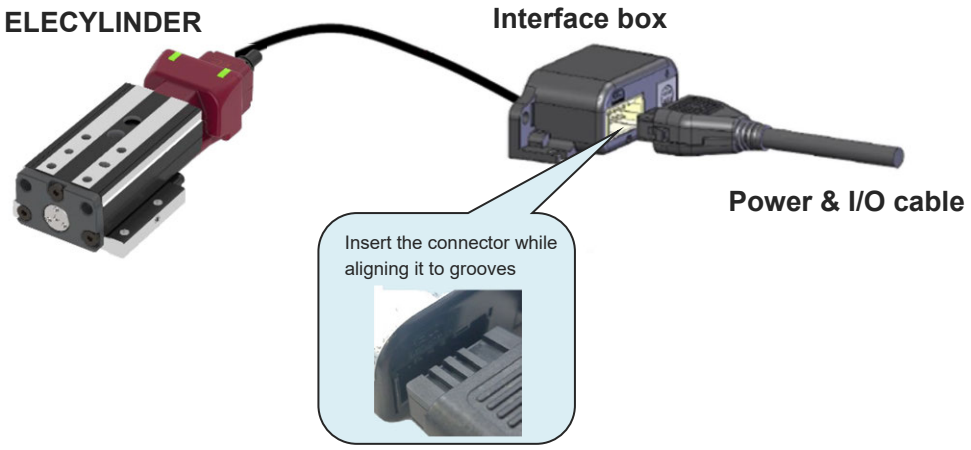
Cable length **1**m → CB-EC2-PWBIO**010**-RB
Cable length **3**m → CB-EC2-PWBIO**030**-RB
Cable length **10**m → CB-EC2-PWBIO**100**-RB

Refer to [6.1.3 How to Assemble 4-Way Connector Cable] for how to assemble the four-way connector.

3.5.2 Power & I/O cable connection

Connect the power & I/O cable to ELECYLINDER or interface box.
Insert the connector until you hear the "click".

Cable connection diagram (Example of connection for Interface separate type)



(*) Refer to [3.2.3 Interface box wiring] for how to establish connection between ELECYLINDER and interface box.

Caution

- The connector must be inserted in a given direction. Align the convex and concavity on the connectors and insert it until you hear the "click".
- Take appropriate care to prevent unused wiring in the loose wire end on the cable from shorting out other wires by protecting them with insulation tape.

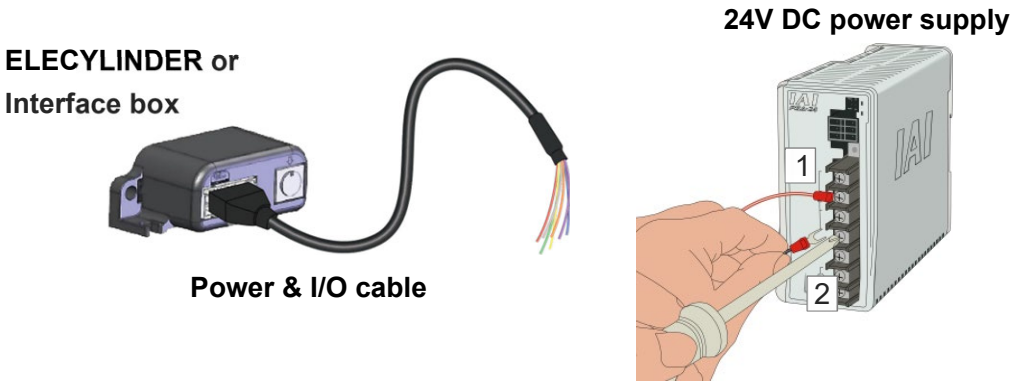
3.5.3 24V DC power supply wiring

Connect the power wiring to the power & I/O cable.
Connect the 24V DC power supply to the terminal block after terminal-processing the 24V and 0V wires of the power & I/O cable.

[1] Wiring for Power Supply Standard Type

1) Connect the 24V wire (insulation color: red) to the +24V terminal of the 24V DC power supply.
2) Connect the 0V wire (insulation color: black) to the 0V terminal of the 24V DC power supply.

24VDC power supply connection diagram



Wiring color	Signal abbreviation	Function overview	Required specifications
Red	24V	Power supply input	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 3.2 Power supply current]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
Black	0V	Ground	

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. By cutting off the power supply of 24V (driving source), it should turn into the stop state (drive power supply off).

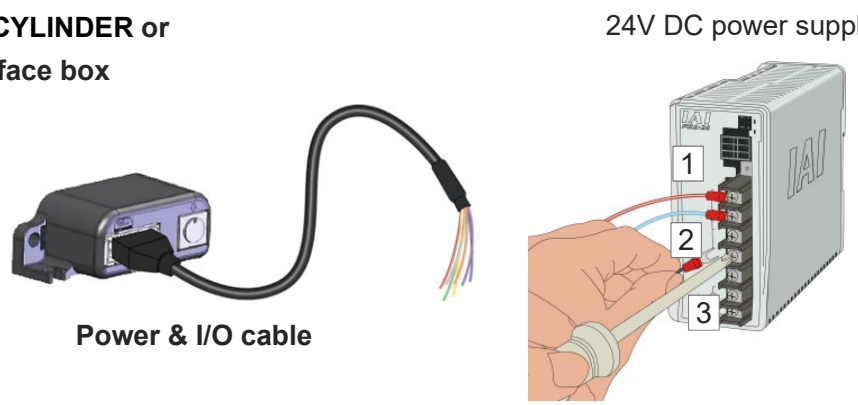
[2] 2-circuit power supply specification TMD2 (Option)

Connect the power wiring to the power & I/O cable.

Connect the 24V DC power supply to the terminal block after terminal-processing the 24V (Driving Source), 24V (Control) and 0V wires of the power & I/O cable.

1) Connect the 24V (Driving Source) wire (insulation color: red) to the +24V terminal of the 24V DC power supply.
2) Connect the 24V (Control) wire (insulation color: light blue) to the +24V terminal of the 24V DC power supply.
3) Connect the 0V wire (insulation color: black) to the 0V terminal of the 24V DC power supply.

24VDC power supply connection diagram



Wiring color	Signal abbreviation	Function overview	Required specifications
Red	24V (Driving Source)	Driving Source Power supply input	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 3.2 Power supply current]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
Light Blue	24V (Control)	Control Power supply input	
Black	0V	Ground	

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. By cutting off the power supply of 24V (driving source), it should turn into the stop state (drive power supply off).

3.5.4 Wiring of drive cutoff switch in order to make stop

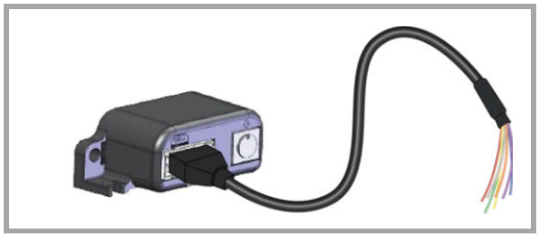
There is only one way to make ELECYLINDER stop with an external switch, which is to cut off the driver power source.
By setting an external switch on the +24V power supply line for the drive power source, ELECYLINDER can be stopped.

Even though there is a stop switch on a teaching pendant, there is no such stop switch equipped in the PC teaching software.
In order to have a work such as teaching, it is necessary to have a drive cutoff switch externally.
For an example of wiring, refer to the [3.4.3 Wiring of drive cutoff switch in order to make stop].

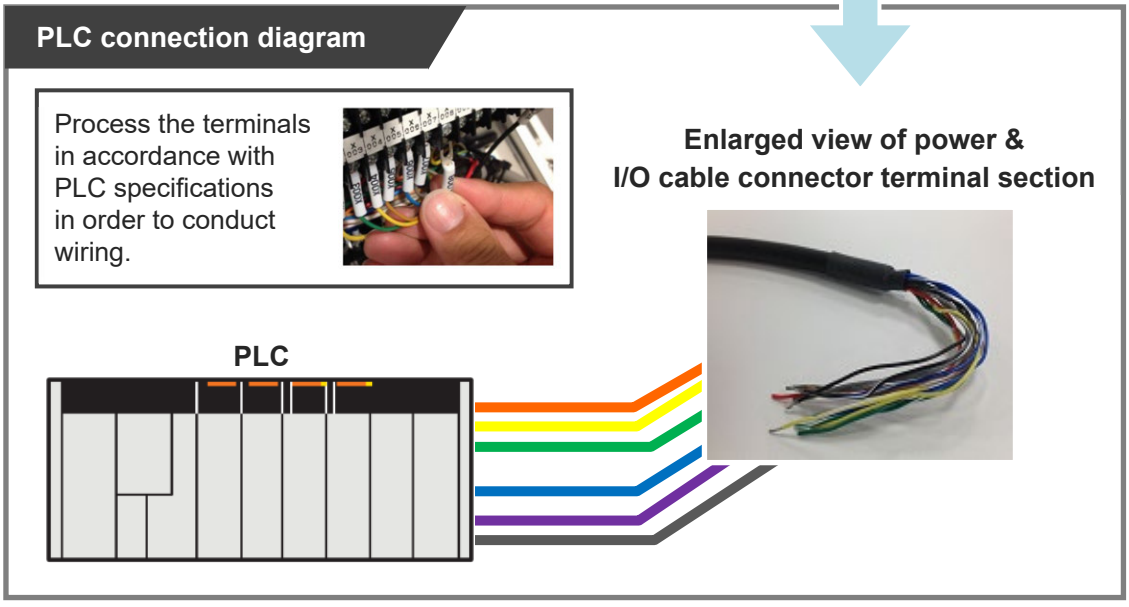
3.5.5 PLC wiring

For I/O between the PLC and signals, the wiring of the power & I/O cable must be connected to the PLC.
Connect the 1) to 6) wiring to the PLC terminal block while referring to the connection diagram.

1) Connect the "orange" cable wire and the "Backward" ("Forward/Backward" for single solenoid system) output terminal.
2) Connect the "yellow" cable wire and the "Forward" output terminal.
   (Note) There is no need of connecting the "yellow" cable for the single solenoid system.
3) Connect the "green" cable wire and the "Alarm clear" output terminal.
4) Connect the "blue" cable wire and the "Backward complete" input terminal.
5) Connect the "purple" cable wire and the "Forward complete" input terminal.
6) Connect the "gray" cable wire and the "Alarm" input terminal.



ELECYLINDER / Interface box, Power & I/O cable

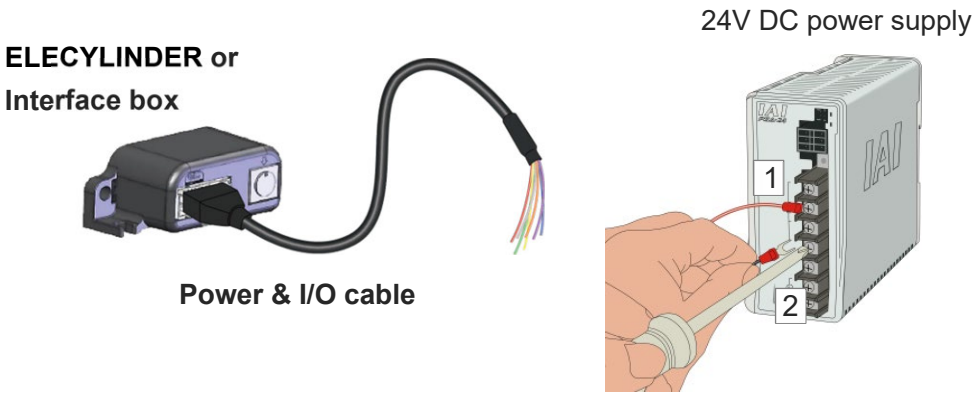


3.5.6 Brake release wiring

For the specification with brake, when installing a forcible brake release switch, connect the "brown" cable wire.
It is not necessary to layout cables when the ELECYLINDER is not equipped with a brake or when it is not required to have the compulsory brake release.
Power capacity of 24V DC ±10% / 200mA or higher is required.

1) Connect the cable on BKRLS (color: brawn) to the +24V terminal on the 24V DC power supply.
2) Connect the 0V cable (color: black0 to the 0V terminal on the 24V DC power supply.

24VDC power supply connection diagram



Wiring color	Signal abbreviation	Function overview	Required specifications
Brown	BKRLS	Brake release	24V DC ±10% / 200mA or higher

Startup Section

Chapter 4

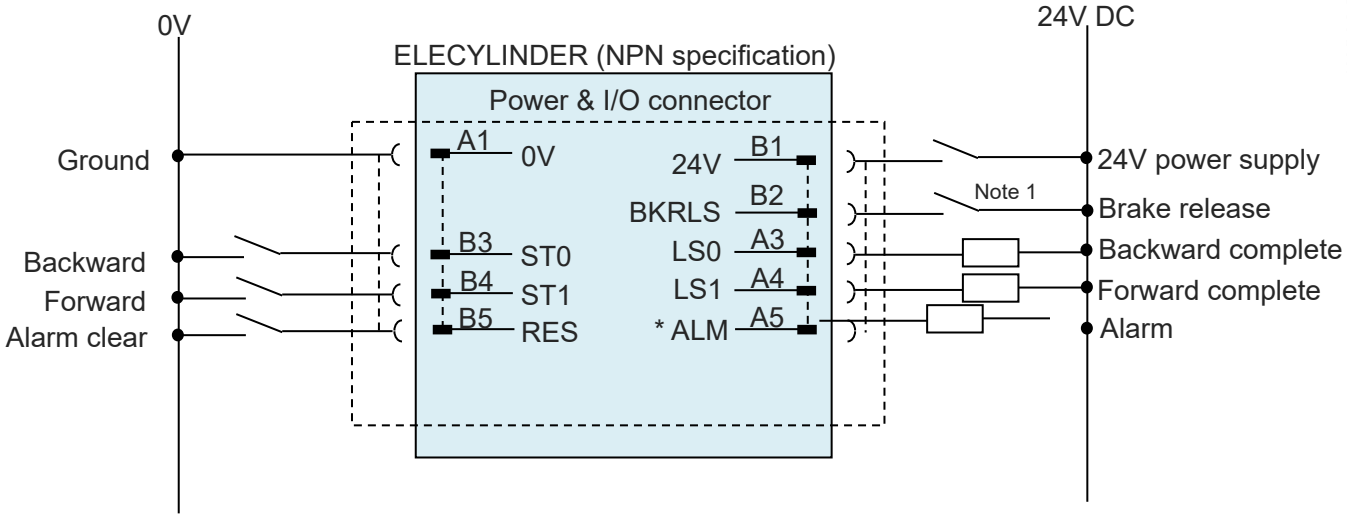
24V AC Servomotor Equipped Models Wiring

4.1 Connection arrangement diagram

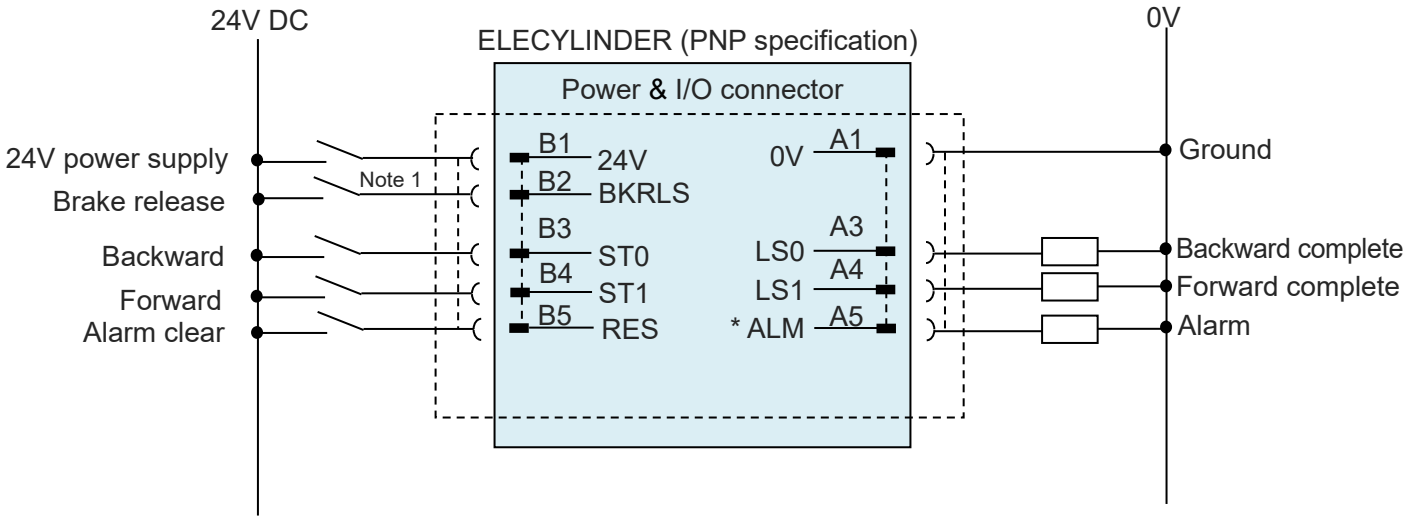
Here introduces how to wire when using a power supply cable & I/O connector of the 24V AC Servomotor Equipped Model.

[Double solenoid system]

♦For NPN specification



♦For PNP specification

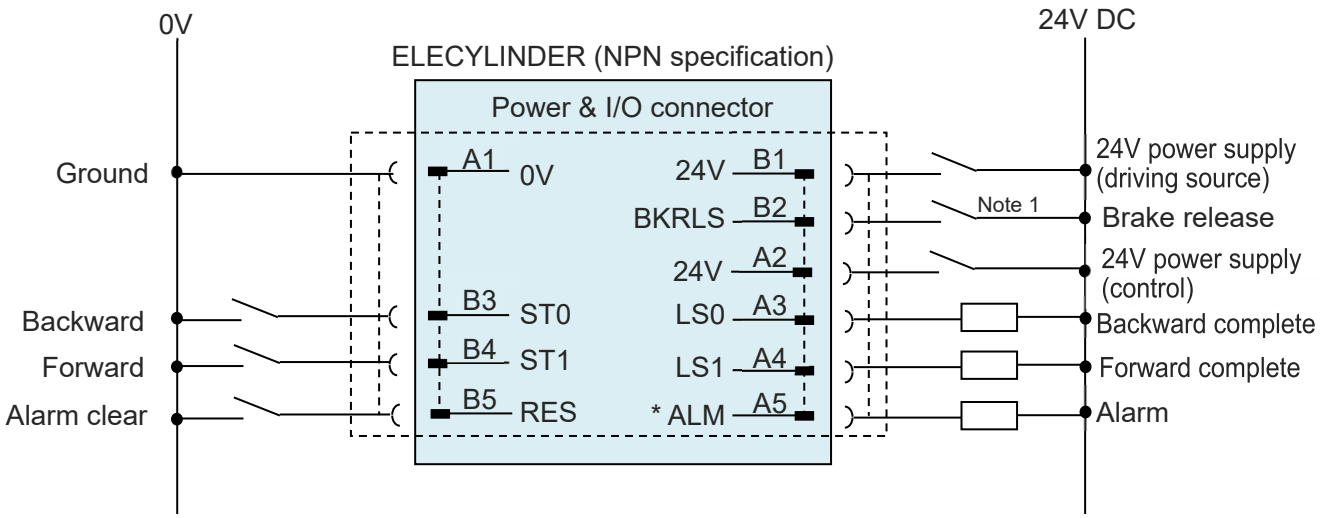


Caution

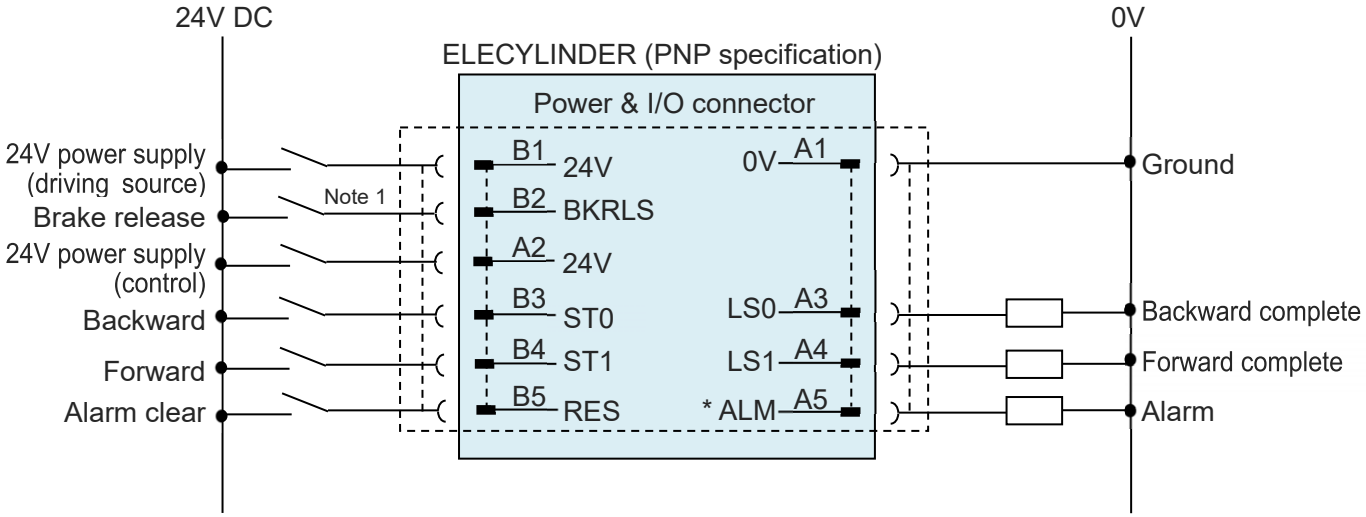
- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake. The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal. The output signal is ON in normal conditions and OFF when an alarm occurs.

⊙ 2-circuit power supply specification TMD2 (Option)

♦For NPN specification



♦For PNP specification

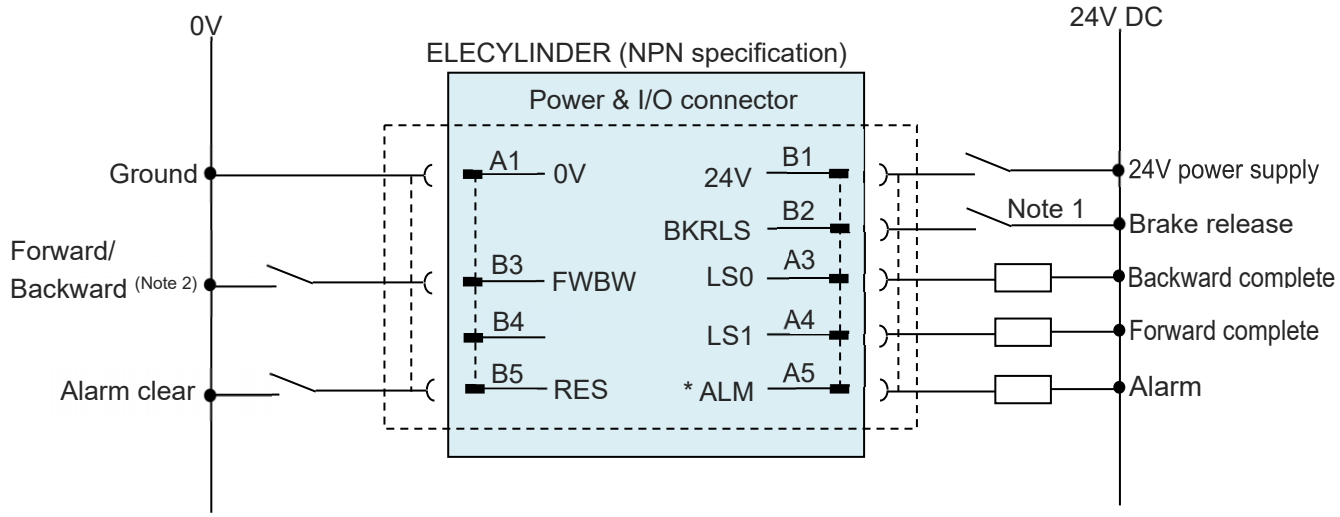


Caution

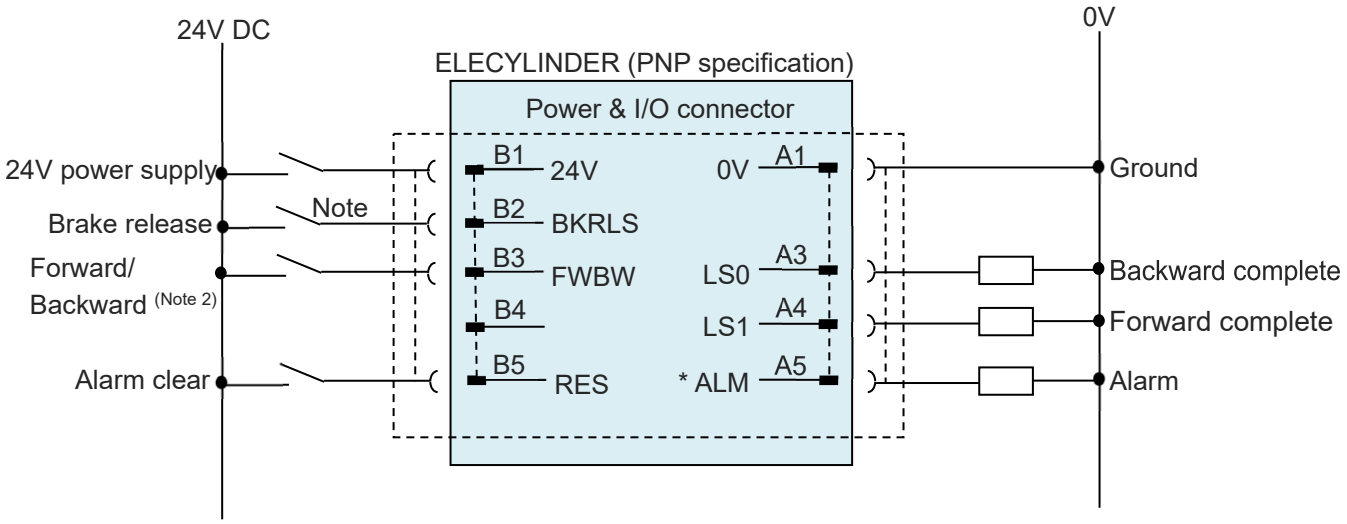
- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake.
  The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal.
  The output signal is ON in normal conditions and OFF when an alarm occurs.

[Single solenoid system]

♦For NPN specification



♦For PNP specification



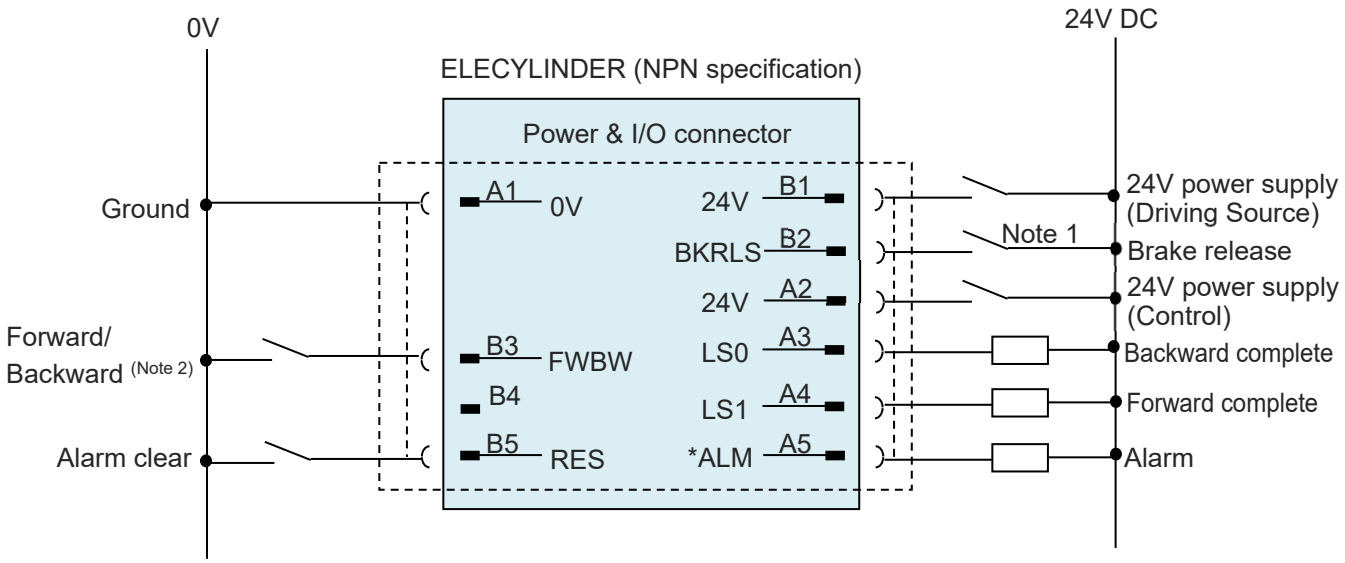
Note 2 The display for the power & I/O connector should stay "Backward".

Caution

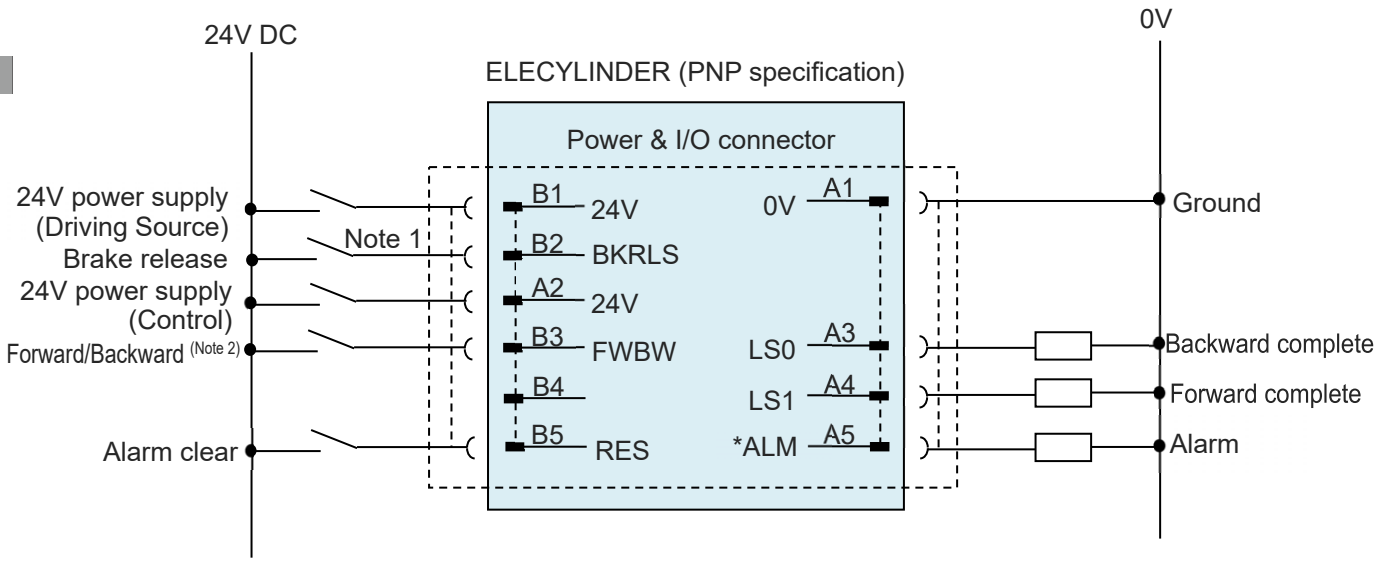
- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake.
  The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal.
  The output signal is ON in normal conditions and OFF when an alarm occurs.

⊙ 2-circuit power supply specification TMD2 (Option)

♦For NPN specification



♦For PNP specification



Note 2 The display for the power & I/O connector should stay "Backward".

Caution

- "Note 1" is a switch releases the brake forcibly for actuators equipped with a brake.
  The switch power capacity requires 24V DC ±10% and 200mA or more.
- "*ALM" is a b-contact (active-low) signal.
  The output signal is ON in normal conditions and OFF when an alarm occurs.

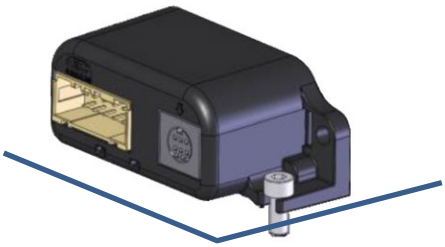
4.2 Interface box installation and wiring

4.2.1 Precautions for interface box installation

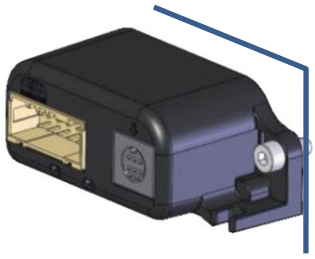
When a 24V AC servomotor equipped model is to be controlled with PIO, an interface box should be used.

- Connection to an interface box is also necessary when performing wireless connection in RCON-EC connection type.
- IAs there is no dust and splash proof function in the interfacing box, pay attention not to have it exposed to water or dust.
- The interface box can be mounted on two body surfaces. (Interface box orientation is irrelevant)

Horizontal surface mounting

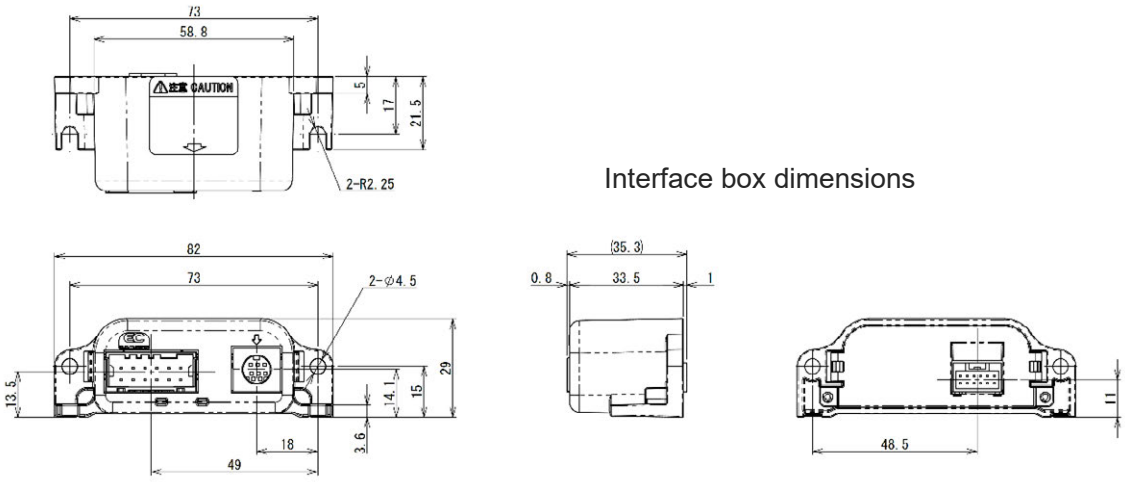


Vertical surface mounting



- When mounting the interface box on a vertical surface, prepare a cable pass-through hole of Φ18mm or more for the actuator cable.

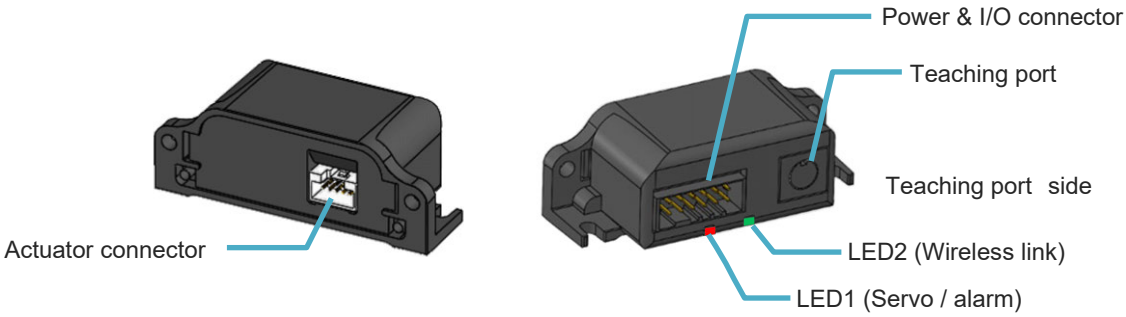
Interface box dimensions



- The solderless ring tongue terminal (0.5-5 R type) on the interfacing box conversion cable should be fixed at a position where it can be used as a FG (frame grounding).
  (Fasten jointly with the interface box fixing bolt, or fix with a dedicated screw holes)
  For details, refer to [4.3 Frame grounding wiring].

- Install the wireless specification interface box so that it is not separated from the touch panel teaching pendant by metal panels, etc. Obstacles of this kind may adversely affect wireless communication.

4.2.2 Interface box



[Actuator connector]

It is a connector to join an actuator.

Direct connection to the actuator cable is not available.

Use the enclosed interface box conversion cable to connect the interface box.

[Status indicator LED]

It is LED1 (Servo/Alarm) on the right side from the view of teaching port side that shows the ON/OFF status of the servo and the status of alarm generated, and LED2 (Wireless) on the left to show the wireless status.

For the details of display states, refer to [Maintenance Section 1.2 Troubleshooting diagnosis (for 24V AC servomotor equipped model)].

[Teaching port]

This connector is for the connection of a teaching pendant or PC teaching software.

When connecting, remove the cap.

[Power & I/O connector]

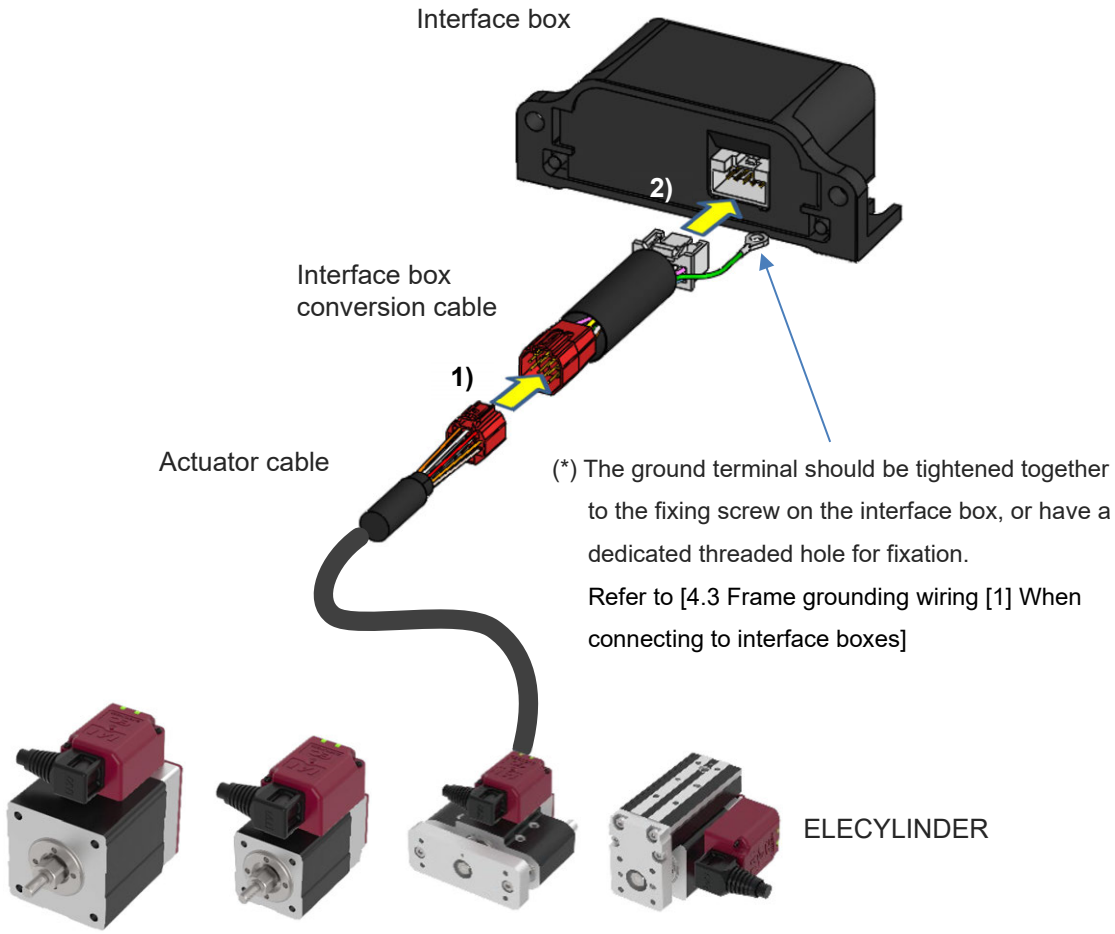
This connector connects power and I/O wiring.

4.2.3 Interface box wiring

Use the interface box conversion cable for wiring between the interface box and the actuator cable.

1) Join the actuator cable to the interface box conversion cable.
2) Join the interface box conversion cable to the interface box.

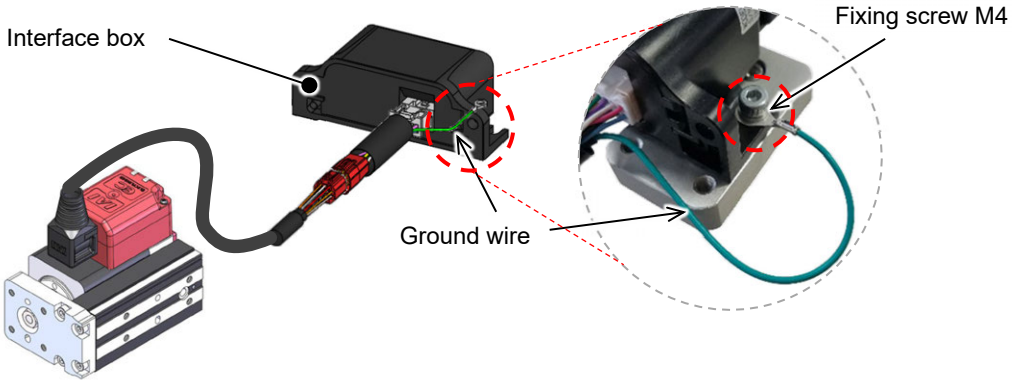
Figure: Cable Connection



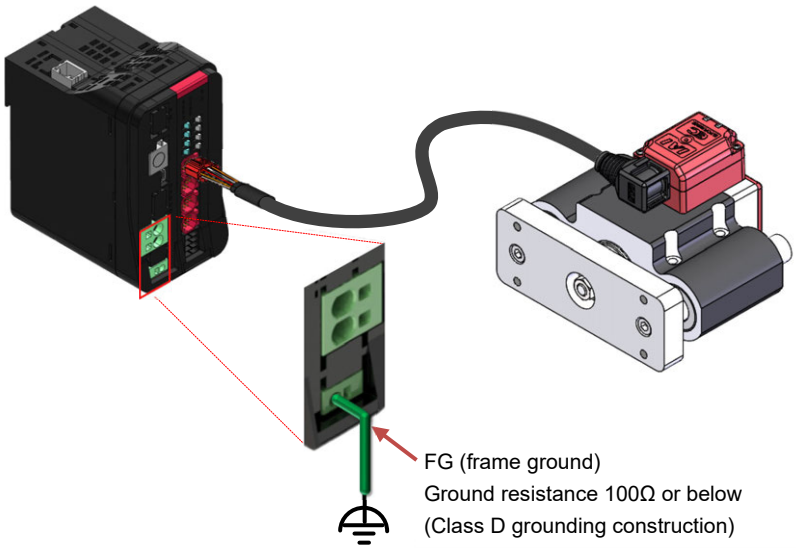
4.3 Frame grounding wiring

The ELECYLINDER has a built-in controller circuit board.
The controller frame grounding line is connected to the ELECYLINDER body and through to ground via the ELECYLINDER mounting surface.
* The Ground wire, Grounding screw and the M3 square nut is to be prepared by the customer.

[1] When connecting to interface boxes
Connect the ground terminal on the conversion cable.

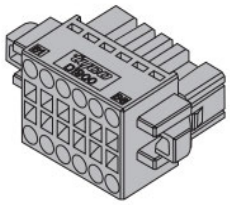


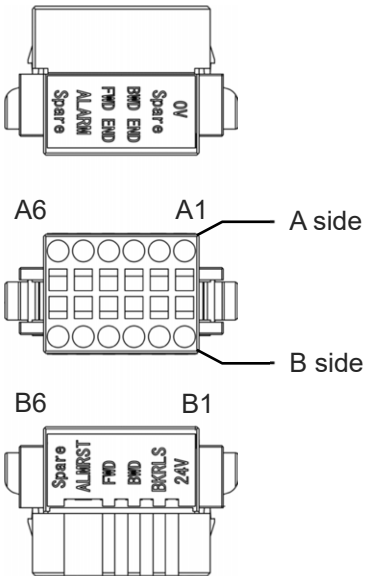
[2] When connecting directly to RCON-EC
Ground the FG (frame grounding) on the gateway unit or SEL unit side.



4.4 Way of wiring (for connect to PIO control / connector)

Here the way of wiring with a power & I/O connector is introduced.
It should be enclosed when "0" is indicated in the model code for the cable length.
The connector should be connected to the interface box.





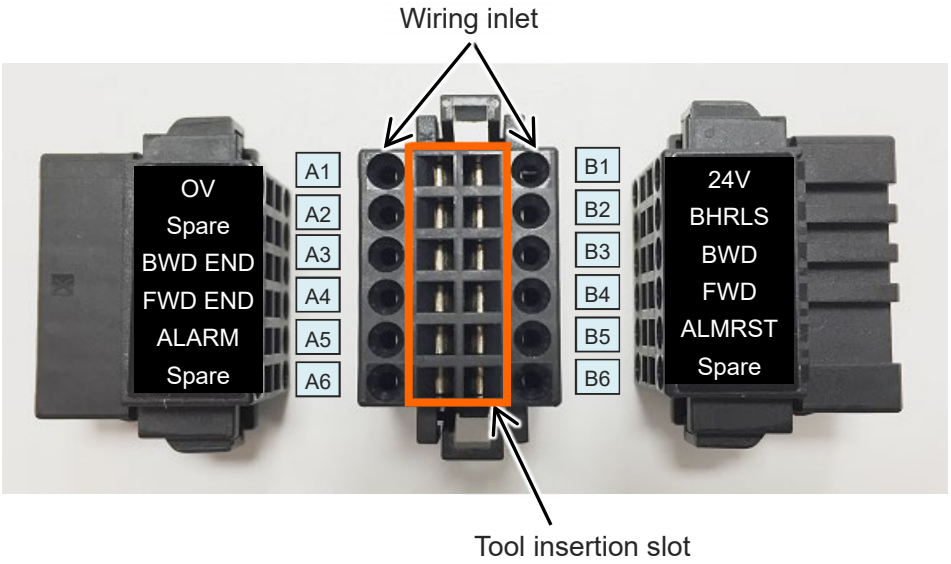
Name	Model	Quantity
Power & I/O connector	1-1871940-6 (Tyco Electronics)	1

Pin No.	Signal name	Function
A1	0V	Ground
A2	Reserve (CP : 2-circuit power supply specification)	Reserve (When 2-circuit power supply specification, 24V for control power supply)
A3	Backward complete	Backward complete (During pressing operation / Pressing complete 0)
A4	Forward complete	Forward complete (During pressing operation / Pressing complete 1)
A5	Alarm	Alarm output
A6	Reserve	Reserve
B1	24V (MP: 2-circuit power supply specification)	24V power supply (When 2-circuit power supply specification, 24V for motor power supply)
B2	Brake release	Brake release input
B3	Forward	Forward command
B4	Backward	Backward command
B5	Alarm clear	Alarm clear signal input
B6	Reserve	Reserve

4.4.1 Connector wiring method

The name of each terminal is affixed to the power & I/O connector.

The connector nameplate name and pin number relationship is as below.

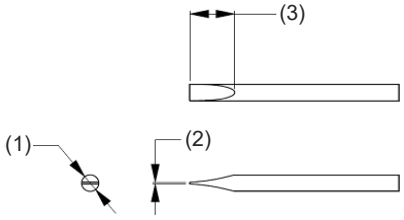


♦ **Preparation**

• Precision screwdriver

Recommended precision screwdriver

Item	Specification
(1) Shaft diameter	1.6±0.03mm
(2) Blade thickness	0.2±0.1mm
(3) Tip angle length	4.2±0.2mm

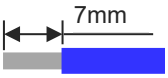


• Wiring

Compatible wire diameter: KIV0.75mm^2 (AWG18)

♦ How to Conduct Wiring

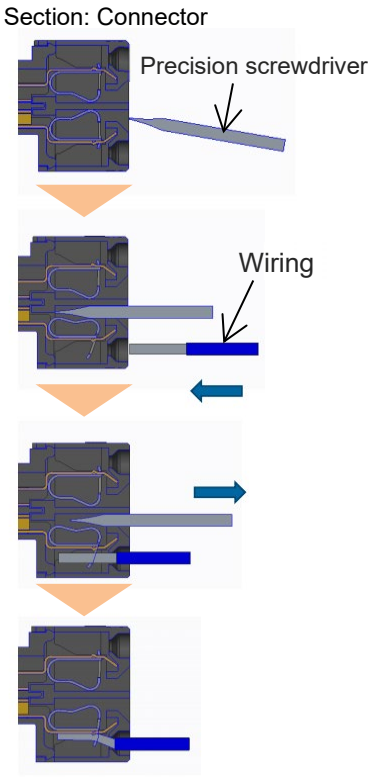
1) Peal the sheath for 7mm and twist the core wires lightly.



2) Insert a precision screwdriver fully into the tool insertion slot.
   Press the spring within the connector down.

3) Insert the core wire.

4) Pull out the precision screwdriver.
   Confirm that the cable is not pulled out.



Caution

- Take care not to twist the core wire too far. This will reduce the retention force, causing the wire to fall out of the connector and possibly causing insufficient current or short circuit.
- Do not insert the precision screwdriver violently into the connector, or twist it hard. This may damage the connector housing and internal spring
- If an electric wire thinner than the applicable diameter or wiring longer than 10m is used, insufficient current may trigger an alarm and the performance of the ELECYLINDER may be degraded.

4.4.2 24V DC power supply wiring

[1] Wiring for Power Supply Standard Type

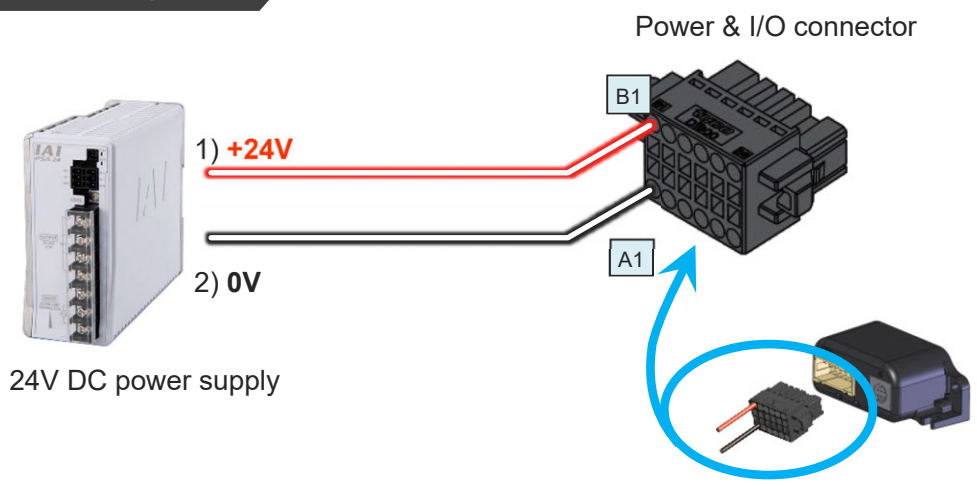
Connect the power wiring to the power & I/O connector.

Connect the 1) and 2) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B1" connector terminal and the +24V terminal of the 24V DC power supply.

2) Connect the "A1" connector terminal and the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V	KIV 0.75mm^2 (AWG18)	Power supply voltage: 24V DC ±10% Power current: Depends on Used Model Refer to [Specification Section 5.1 Basic Specifications]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
A1	0V		

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. This shuts off the 24V (driving source) power supply in the stopped state (control/drive power OFF).

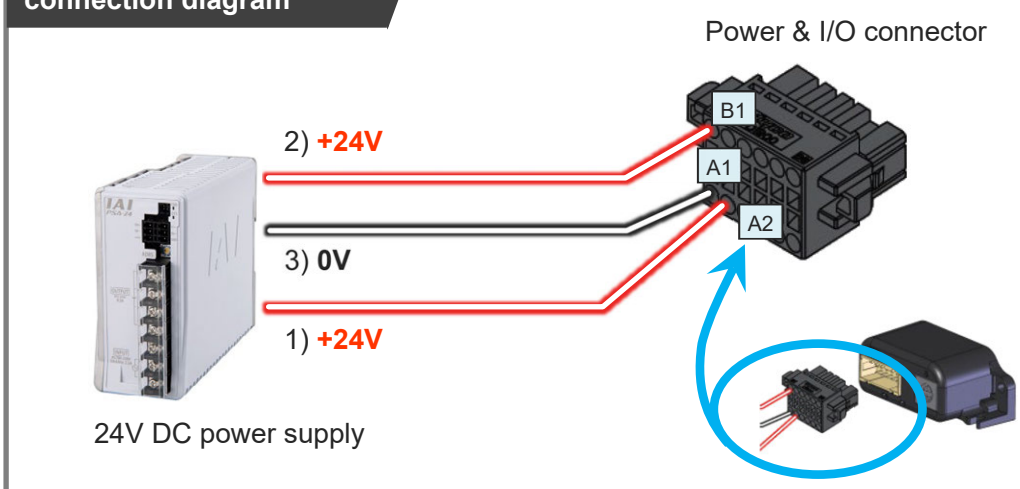
[2] 2-circuit power supply specification TMD2 (Option) wiring

Connect the power wiring to the power & I/O connector.

Connect the 1) to 3) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B1" connector terminal and the +24V (Driving Source) terminal of the 24V DC power supply.
2) Connect the "A2" connector terminal and the +24V (Control) terminal of the 24V DC power supply.
3) Connect the "A1" connector terminal and the 0V terminal of the 24V DC power supply.

24VDC power supply connection diagram



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V (Driving Source)	KIV 0.75mm^2 (AWG18)	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 5.1 Basic Specifications]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
A2	24V (Control)		
A1	0V		

(Note) Wire for 24V (control) on A2 can apply 0.3mm^2 (AWG22). It is recommended to use a device permitted by Electrical Appliances and Materials Safety Act.

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. This shuts off the 24V (driving source) power supply in the stopped state (control/drive power OFF).

4.4.3 Wiring of drive cutoff switch in order to make stop

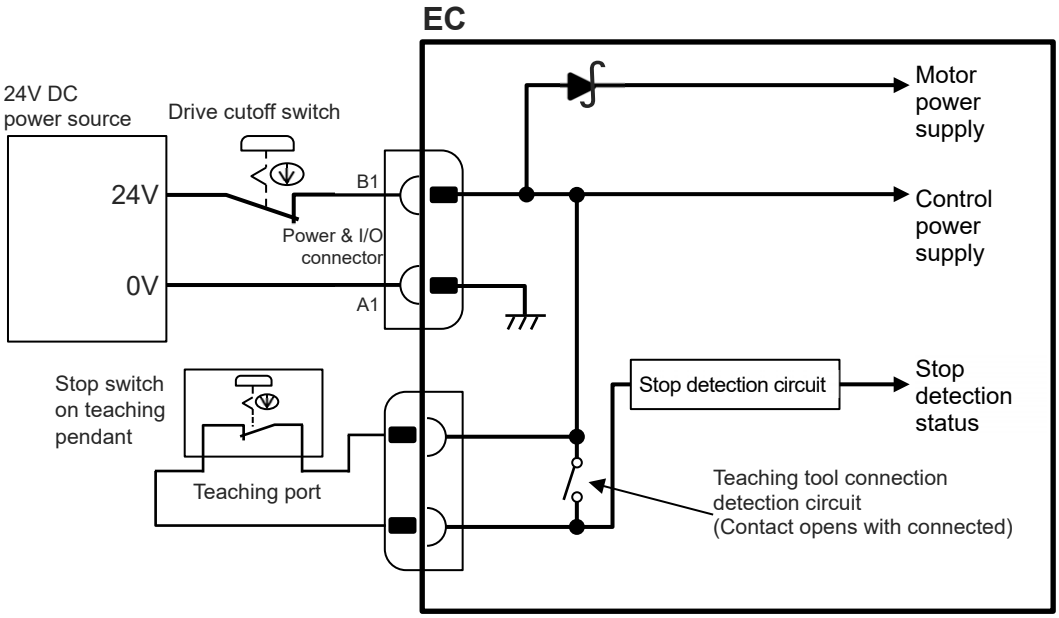
When ELECYLINDER is to be stopped with an external switch, the motor drive source should be cut off.
By setting an external switch on the +24V power supply line for the drive power source, ELECYLINDER can be stopped.
Even though there is a stop switch on a teaching pendant, there is no such stop switch equipped in the PC software.
In order to have a work such as teaching, it is necessary to have a drive cutoff switch externally.

Here shows an example of having a cutoff of the power supply on one unit of ELECYLINDER.
(*) Unless it is TMD2 type (option), the control power supply to a controller should turn off at the same time as the drive power supply. When cutting off the control power supply is not desired, select TMD2 with 2-circuit power supply specification (option).

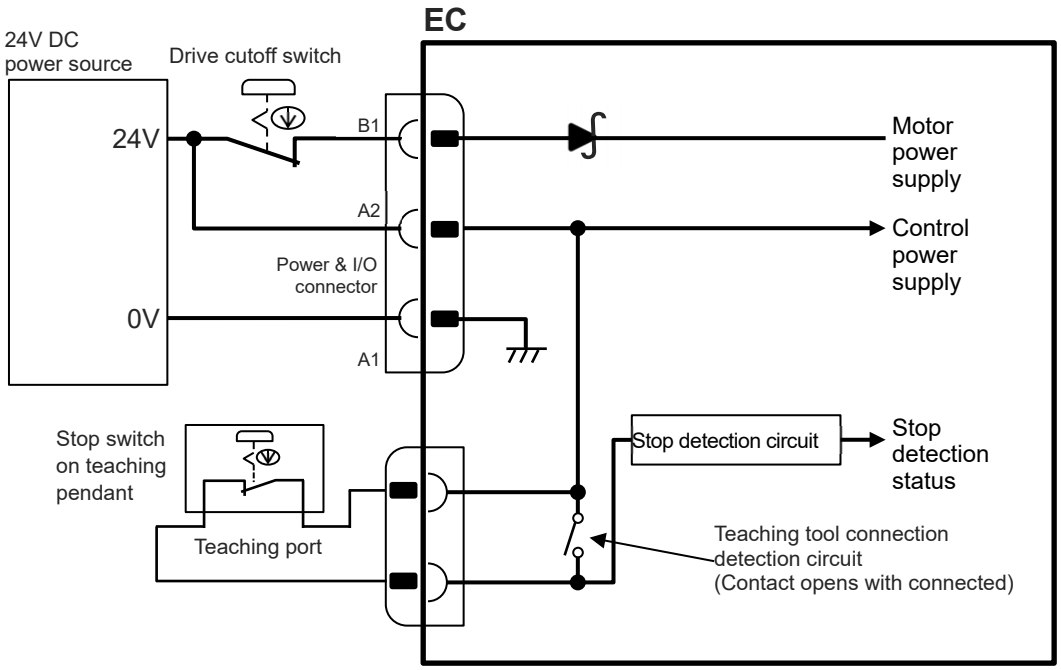
Caution

- When the power supply is conducted with turning on/off the 24V DC, keep the 0V connected, and have the +24V supplied/cut off (cutoff on one end).
  Shutting power supply on the both ends may make the electric potential unstable when the power gets cut on the 0V end first.
  This may cause malfunction of components inside the controller.
- Make sure to secure 1second or more after shutting off the power supply before rebooting.
- Do not attempt to supply only the motor power supply while there is no control power supply.

(1) Example of circuit: For case without TMD2 with 2-circuit power supply specification



(2) Example of circuit: For Case with TMD2 with 2-circuit power supply specification



(3) Way of wiring

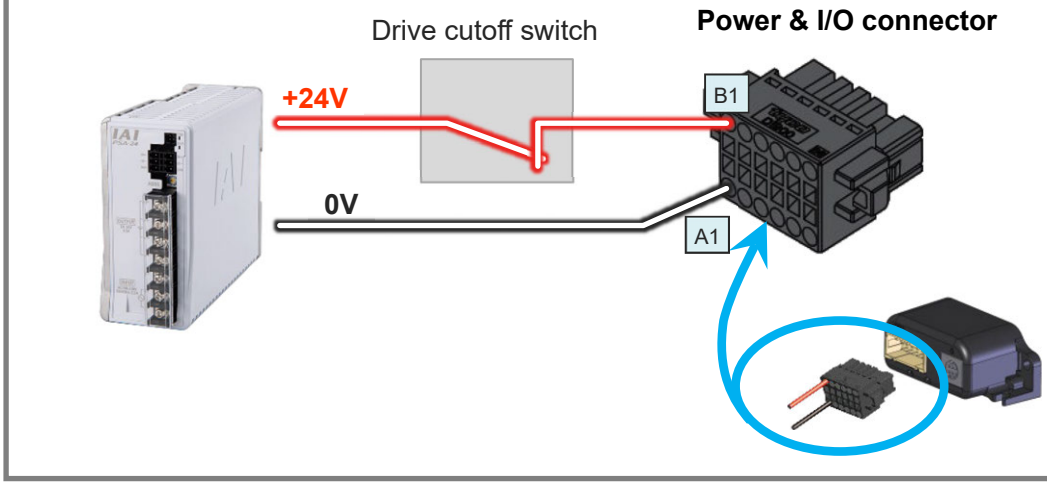
When wiring the power supply connection on the power & I/O connectors, refer to the connection diagram to connect the drive cut off switch to the power supply line (wiring of "B1" Terminal) for +24V.

By cutting off the power supply of 24V, it should turn into the stop state (control/drive power supply off, drive power supply off for TMD2).

♦Stop switch

- Dry contact (b-contact)
- Refer to the requirement specifications in the table below for the current amperage

Connection diagram for drive cutoff switch



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V	KIV 0.75mm^2 (AWG18)	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 5.1 Basic Specifications]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
A1	0V		

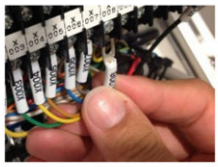
4.4.4 PLC wiring

For I/O between the PLC and signals, the signal wiring must be connected to the connector terminal block.
Connect the 1) to 6) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B3" connector terminal and the "Backward" ("Forward/Backward" for single solenoid system) output terminal.
2) Connect the "B4" connector terminal and the "Forward" output terminal.
   (Note) There is no need of connecting "B4" terminal for the single solenoid system.
3) Connect the "B5" connector terminal and the "Alarm clear" output terminal.
4) Connect the "A3" connector terminal and the "Backward complete" input terminal.
5) Connect the "A4" connector terminal and the "Forward complete" input terminal.
6) Connect the "A5" connector terminal and the "Alarm" input terminal.

PLC connection diagram

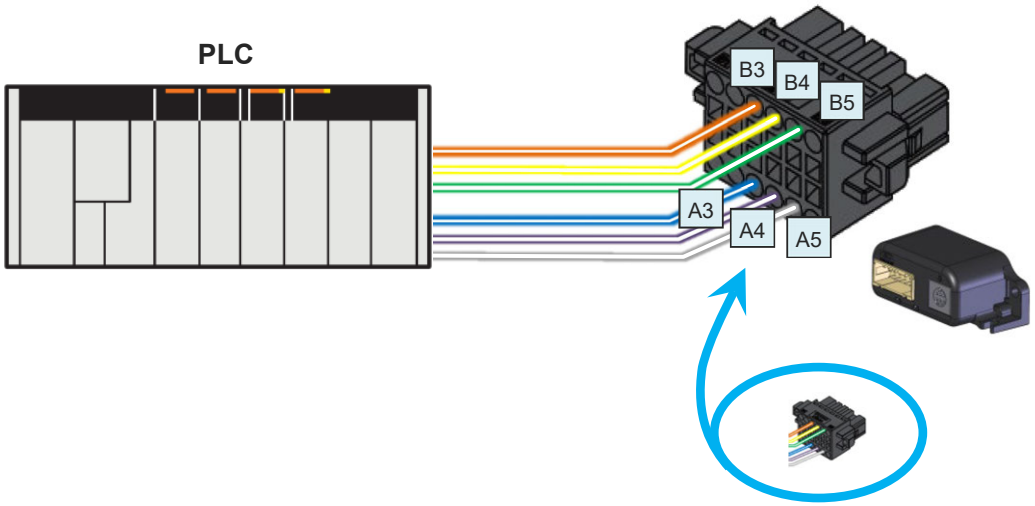
Process the terminals in accordance with PLC specifications in order to conduct wiring.



Before starting connector wiring, check the details on [3.4.1 Connector wiring method]

Power & I/O connector

PLC



♦Double solenoid system

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Backward	ST0	KIV 0.20mm^2 (AWG24)	Backward command
B4	Forward	ST1		Forward command
B5	Alarm clear	RES		Alarm clear
A3	Backward complete	LS0 or PE0		Backward complete or pressing complete
A4	Forward complete	LS1 or PE1		Forward complete or pressing complete
A5	Alarm	* ALM		Alarm detection (b-contact)

♦Single solenoid system

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Backward	FWBW	KIV 0.20mm^2 (AWG24)	Forward/Backward Command
B4	Forward (Note1)	-		-
B5	Alarm clear	RES		Alarm clear
A3	Backward complete	LS0 or PE0		Backward complete or pressing complete
A4	Forward complete	LS1 or PE1		Forward complete or pressing complete
A5	Alarm	* ALM		Alarm detection (b-contact)

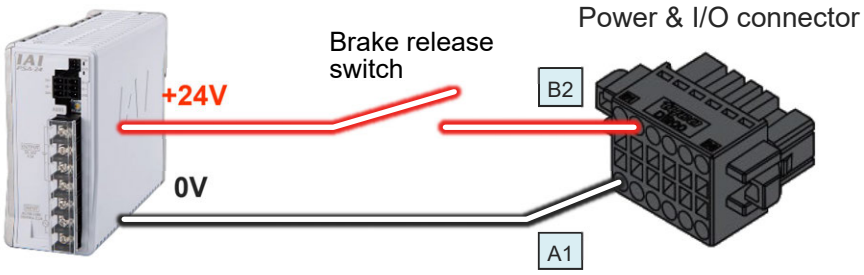
Note1 It is not to be used in the single solenoid system.

4.4.5 Brake release wiring

For the specification with brake, when installing a forcible brake release switch, connect wiring to the "B2" connector terminal.
It is not necessary to layout cables when the ELECYLINDER is not equipped with a brake or when it is not required to have the compulsory brake release.
Power capacity of 24V DC ±10% / 200mA or higher is required.

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Required specifications
B2	Brake release	BKRLS	KIV 0.20mm^2 (AWG24)	24V DC ±10% / 200mA or more

Connection diagram for drive cutoff switch



(Note) Brake release is available also from a teaching tool.
Refer to [Operation Section Chapter1 1.2 Teaching tool connections and testing operation] for detail.

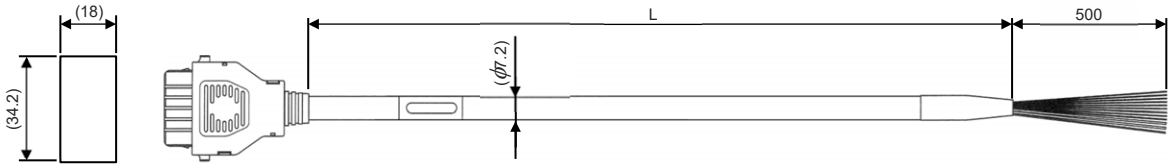
4.5 Way of wiring (for connect to PIO control / cables)

Here the way of wiring with a power & I/O cable is introduced.
The connector on the ELECYLINDER end should be connected to the interface box.

4.5.1 Power & I/O cable

(1) Power & I/O cable (user wiring specification)

Model **CB-EC-PWBIO□□□-RB**



Minimum bending radius r=58mm or more (for movable use)
* Robot cable specification is standard for this model.

Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(Reserve) (Note 1)	A2
Orange (AWG26)	ST0	B3
Yellow (AWG26)	ST1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(Reserve)	B6
Blue (AWG26)	LS0/PE0	A3
Purple (AWG26)	LS1/PE1	A4
Gray (AWG26)	* ALM	A5
White (AWG26)	(Reserve)	A6
Brown (AWG26)	BKRLS	B2

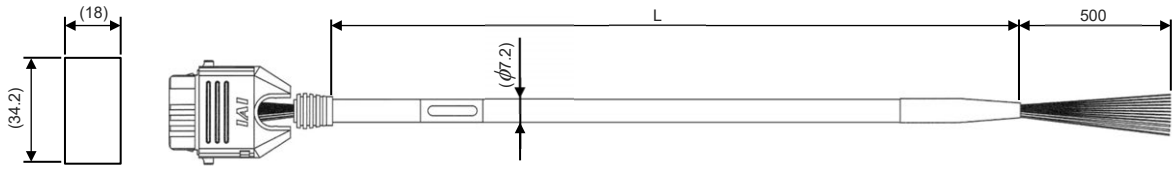
Note1 TMD2 is 24V (control)
(Note) Cable in light green and light gray not in use.
(Already cut in shrink tube)
(Note) In the case of the single solenoid system,
pin No. B3 is signal name FWBW.
Pin No. B4 is not for use.

- The wiring on the opposite side of the connector has not been processed.
- The cable length (L) is available from 1m to 10m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

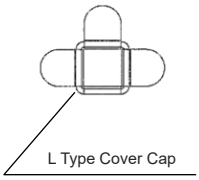
Cable length **1**m → CB-EC-PWBIO**010**-RB
Cable length **3**m → CB-EC-PWBIO**030**-RB
Cable length **10**m → CB-EC-PWBIO**100**-RB

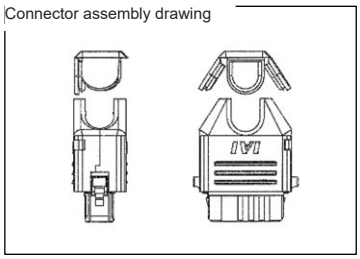
(2) Power & I/O cable (user wiring specification, 4-way Connector)

Model **CB-EC2-PWBIO□□□-RB**



Minimum bending radius r=58mm or more (for movable use)
* Robot cable specification is standard for this model.





Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(Reserve) (Note 1)	A2
Orange (AWG26)	ST0	B3
Yellow (AWG26)	ST1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(Reserve)	B6
Blue (AWG26)	LS0/PE0	A3
Purple (AWG26)	LS1/PE1	A4
Gray (AWG26)	* ALM	A5
White (AWG26)	(Reserve)	A6
Brown (AWG26)	BKRLS	B2

Note1 TMD2 is 24V (control)
(Note) Cable in light green and light gray not in use.
(Already cut in shrink tube)
(Note) In the case of the single solenoid system,
pin No. B3 is signal name FWBW.
Pin No. B4 is not for use.

- The wiring on the opposite side of the connector has not been processed.
- The cable length (L) is available from 1m to 10m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

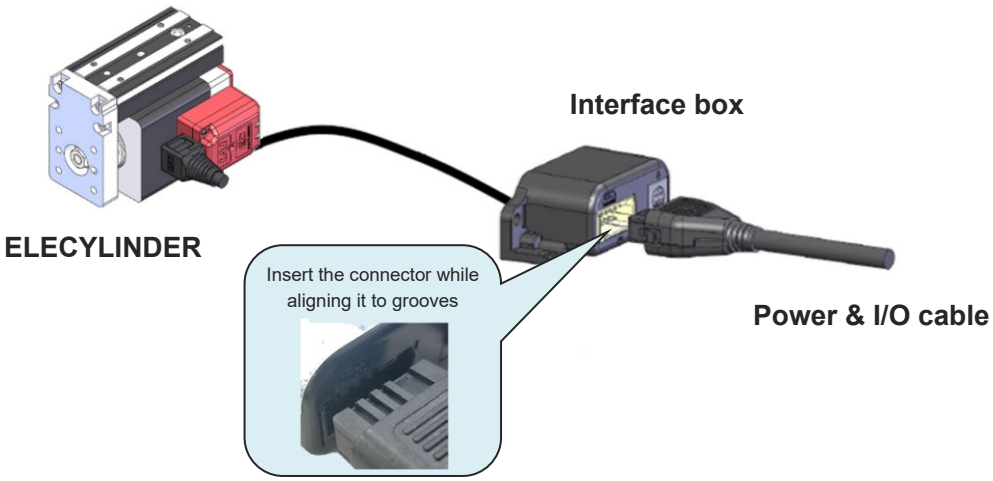
Cable length **1**m → CB-EC2-PWBIO**010**-RB
Cable length **3**m → CB-EC2-PWBIO**030**-RB
Cable length **10**m → CB-EC2-PWBIO**100**-RB

Refer to [6.1.3 How to Assemble 4-Way Connector Cable] for how to assemble the four-way connector.

4.5.2 Power & I/O cable connection

Connect the power & I/O cable.
Align the convex and concavity on the connectors and insert it until you hear the "click".

Cable connection diagram



(*) Refer to [4.2.3 Interface box wiring] for how to establish connection between ELECYLINDER and interface box.

Caution

- The connector must be inserted in a given direction. Align the convex and concavity on the connectors and insert it until you hear the "click".
- Take appropriate care to prevent unused wiring in the loose wire end on the cable from shorting out other wires by protecting them with insulation tape.

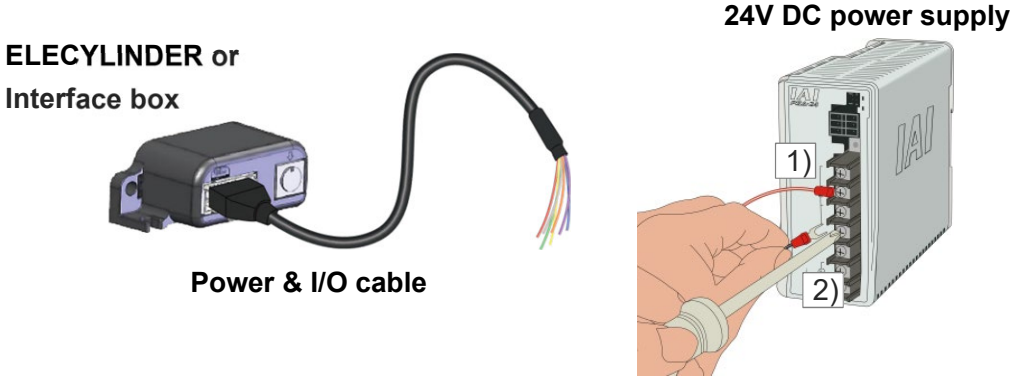
4.5.3 24V DC power supply wiring

Connect the power wiring to the power & I/O cable.
Connect the 24V DC power supply to the terminal block after terminal-processing the 24V and 0V wires of the power & I/O cable.

[1] Wiring for Power Supply Standard Type

1) Connect the 24V wire (insulation color: red) to the +24V terminal of the 24V DC power supply.
2) Connect the 0V wire (insulation color: black) to the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram



Wiring color	Signal abbreviation	Function overview	Required specifications
Red	24V	Power supply input	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 4.1 Basic Specifications]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
Black	0V	Ground	

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. By cutting off the power supply of 24V (driving source), it should turn into the stop state (drive power supply off).

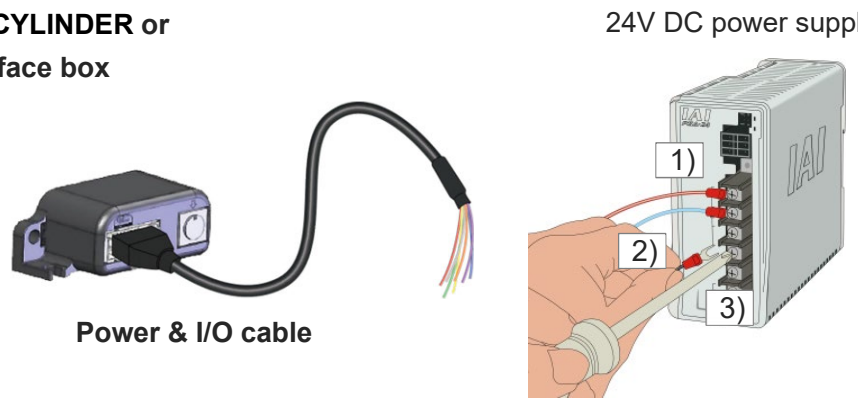
[2] 2-circuit power supply specification TMD2 (Option)

Connect the power wiring to the power & I/O cable.

Connect the 24V DC power supply to the terminal block after terminal-processing the 24V (Driving Source), 24V (Control) and 0V wires of the power & I/O cable.

1) Connect the 24V (Driving Source) wire (insulation color: red) to the +24V terminal of the 24V DC power supply.
2) Connect the 24V (Control) wire (insulation color: light blue) to the +24V terminal of the 24V DC power supply.
3) Connect the 0V wire (insulation color: black) to the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram



Wiring color	Signal abbreviation	Function overview	Required specifications
Red	24V (Driving Source)	Driving Source Power supply input	Power supply voltage: 24V DC ±10% Power capacity: Depends on Used Model Refer to [Specification Section 4.1 Basic Specifications]. Wiring length: 10m max (The models to use an interface box are total of actuator cable + power & I/O cable is 10m max)
Light Blue	24V (Control)	Control Power supply input	
Black	0V	Ground	

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. By cutting off the power supply of 24V (driving source), it should turn into the stop state (drive power supply off).

4.5.4 Wiring of drive cutoff switch in order to make stop

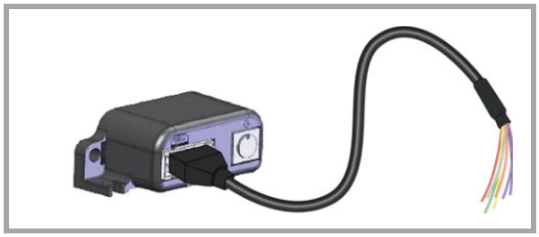
There is only one way to make ELECYLINDER stop with an external switch, which is to cut off the driver power source.
By setting an external switch on the +24V power supply line for the drive power source, ELECYLINDER can be stopped.

Even though there is a stop switch on a teaching pendant, there is no such stop switch equipped in the PC teaching software.
In order to have a work such as teaching, it is necessary to have a drive cutoff switch externally.
For an example of wiring, refer to the [4.4.3 Wiring of drive cutoff switch in order to make stop].

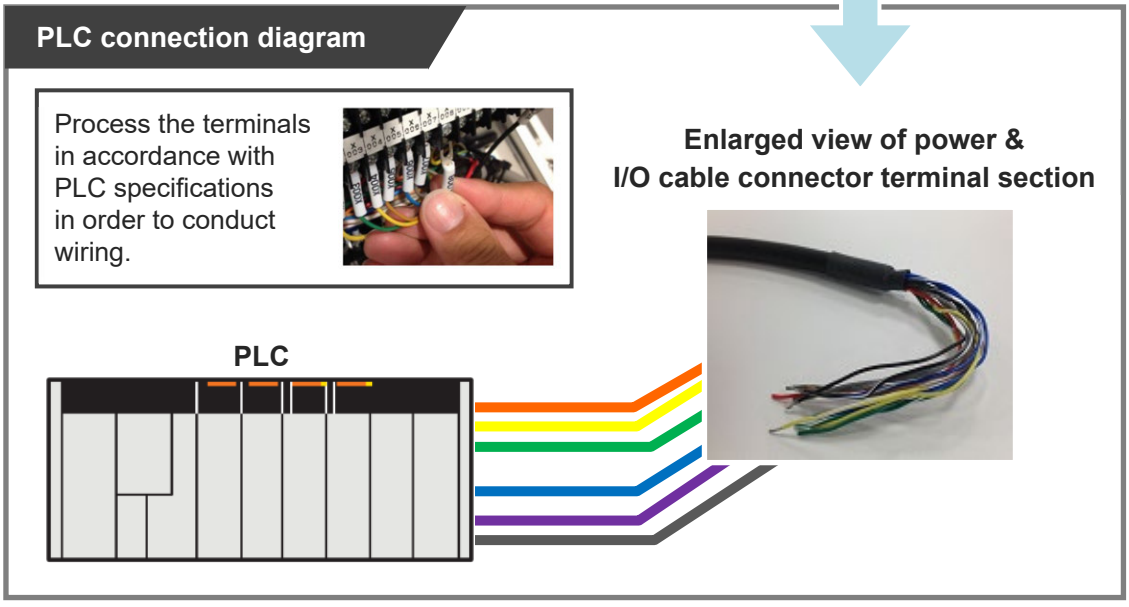
4.5.5 PLC wiring

For I/O between the PLC and signals, the wiring of the power & I/O cable must be connected to the PLC.
Connect the 1) to 6) wiring to the PLC terminal block while referring to the connection diagram.

1) Connect the "orange" cable wire and the "Backward" ("Forward/Backward" for single solenoid system) output terminal.
2) Connect the "yellow" cable wire and the "Forward" output terminal.
   (Note) There is no need of connecting the "yellow" cable for the single solenoid system.
3) Connect the "green" cable wire and the "Alarm clear" output terminal.
4) Connect the "blue" cable wire and the "Backward complete" input terminal.
5) Connect the "purple" cable wire and the "Forward complete" input terminal.
6) Connect the "gray" cable wire and the "Alarm" input terminal.



ELECYLINDER / Interface box, Power & I/O cable

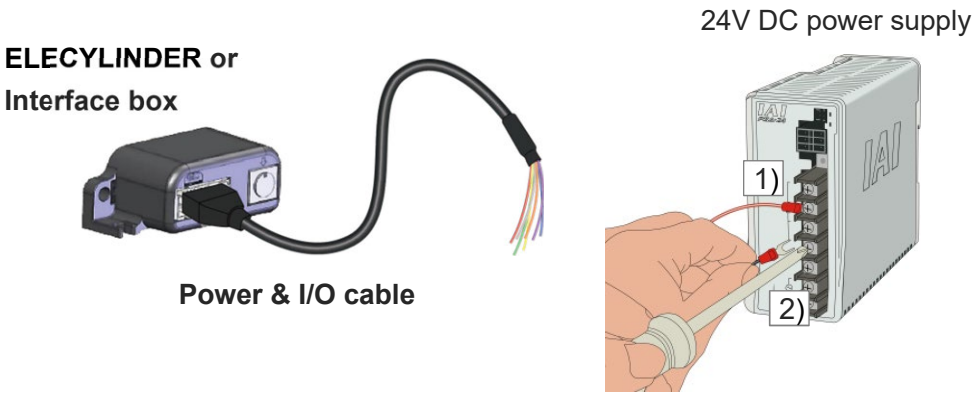


4.5.6 Brake release wiring

For the specification with brake, when installing a forcible brake release switch, connect the "brown" cable wire.
It is not necessary to layout cables when the ELECYLINDER is not equipped with a brake or when it is not required to have the compulsory brake release.
Power capacity of 24V DC ±10% / 200mA or higher is required.

1) Connect the cable on BKRLS (color: brawn) to the +24V terminal on the 24V DC power supply.
2) Connect the 0V cable (color: black0 to the 0V terminal on the 24V DC power supply.

24V DC power supply connection diagram



Wiring color	Signal abbreviation	Function overview	Required specifications
Brown	BKRLS	Brake release	24V DC ±10% / 200mA or higher

Startup Section

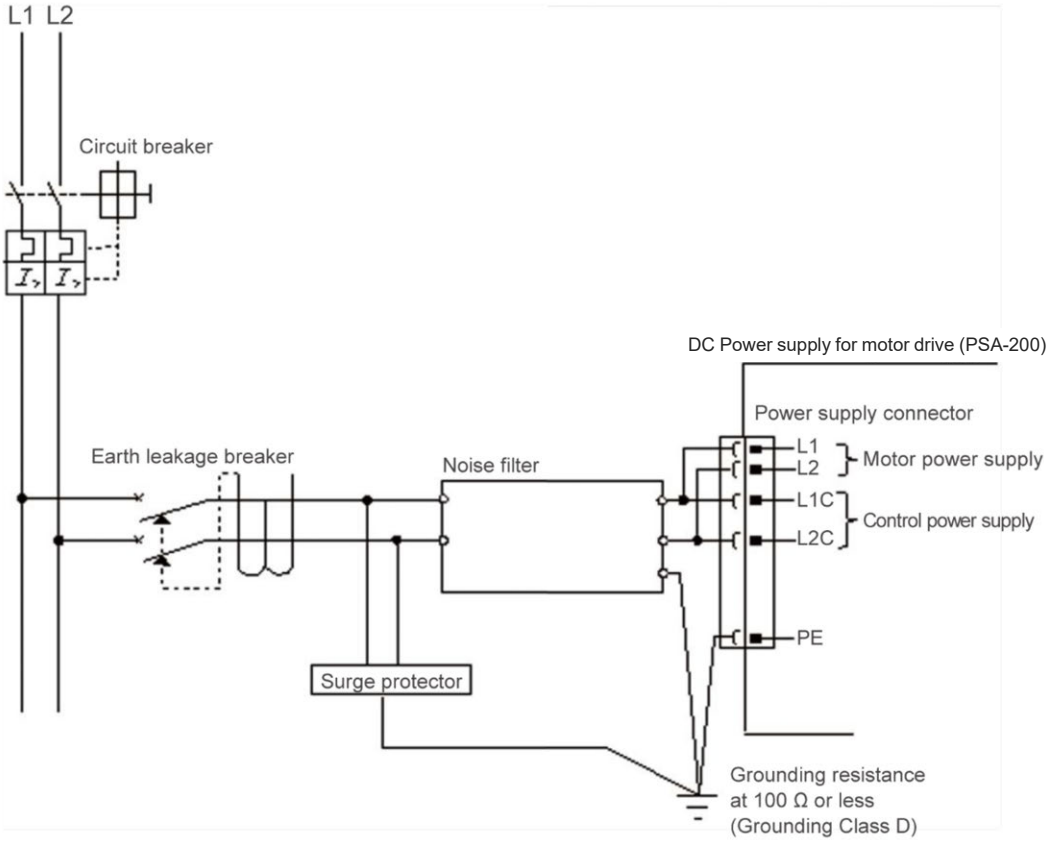
Chapter 5

200V AC Servomotor Equipped Models Wiring

5.1 Connection diagram

5.1.1 DC Power supply for motor drive (PSA-200)

[1] Main power circuit



(Note) The input power voltage (100V AC/200V) of PSA-200 cannot be changed.

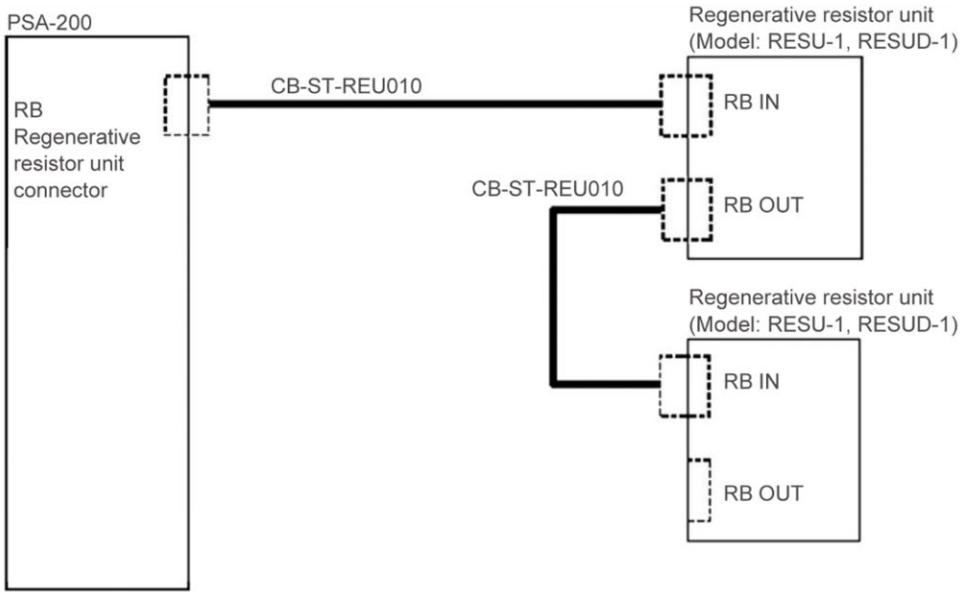
Parts name	Model code	Supplier	Position to attach
Noise filter	NF2010A-UP (Note)	SOSHIN ELECTRIC CO., LTD	Attach in range of 300mm or less from controller
	NAC-10-472	COSEL	
Surge protector	R·A·V-781BWZ-2A	Okaya ELECTRIC CO., LTD	Attach at the input terminal of noise filter

Note: It is the model code when one unit of noise filter is connected to one unit of PSA-200.

Caution

- For the noise filter, it is recommended to have one unit connected to one unit of PSA-200. Attach the surge protector if necessary considering the power supply condition. It is recommended to attach it even though it is not mandatory.

[2] Regenerative resistor unit

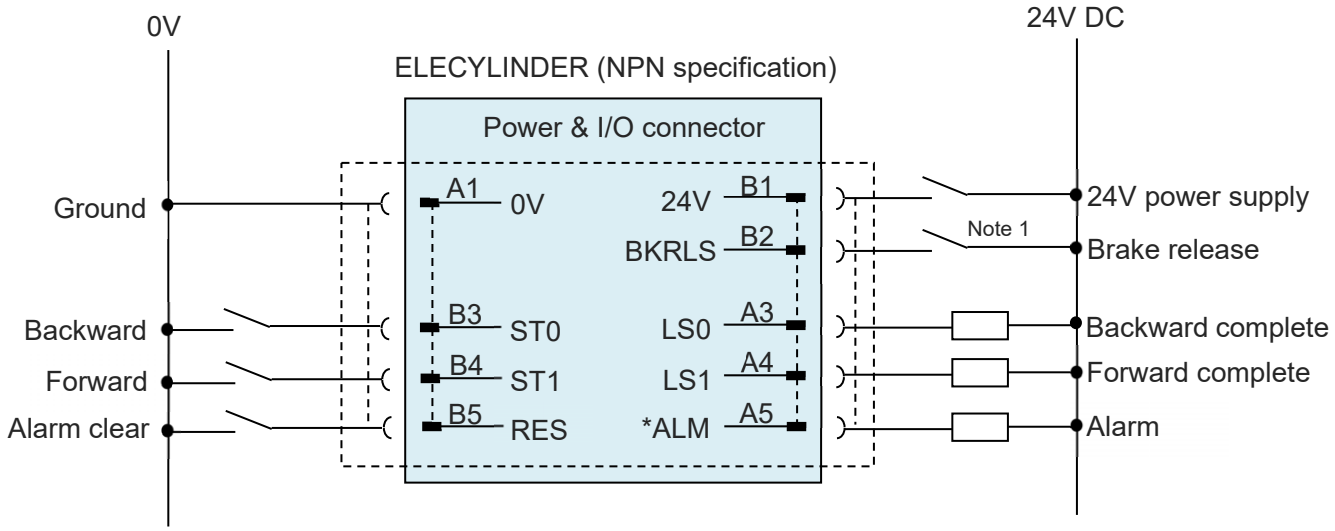


5.1.2 Power & I/O connector

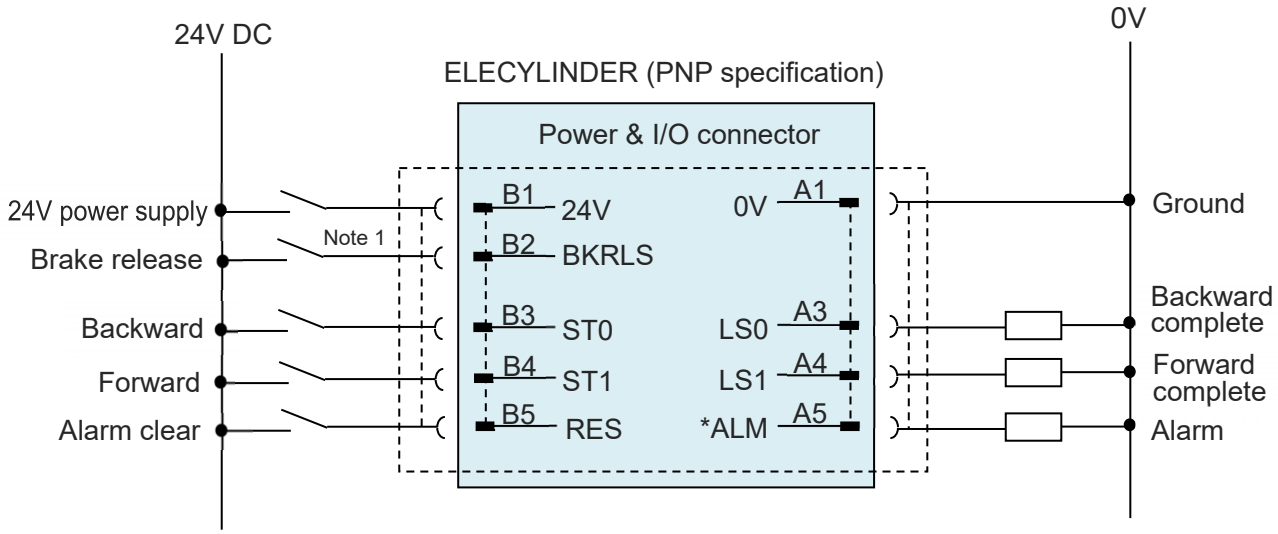
Here the way of wiring with a power & I/O connector is introduced.

[Double solenoid type]

♦For NPN specification



♦For PNP specification

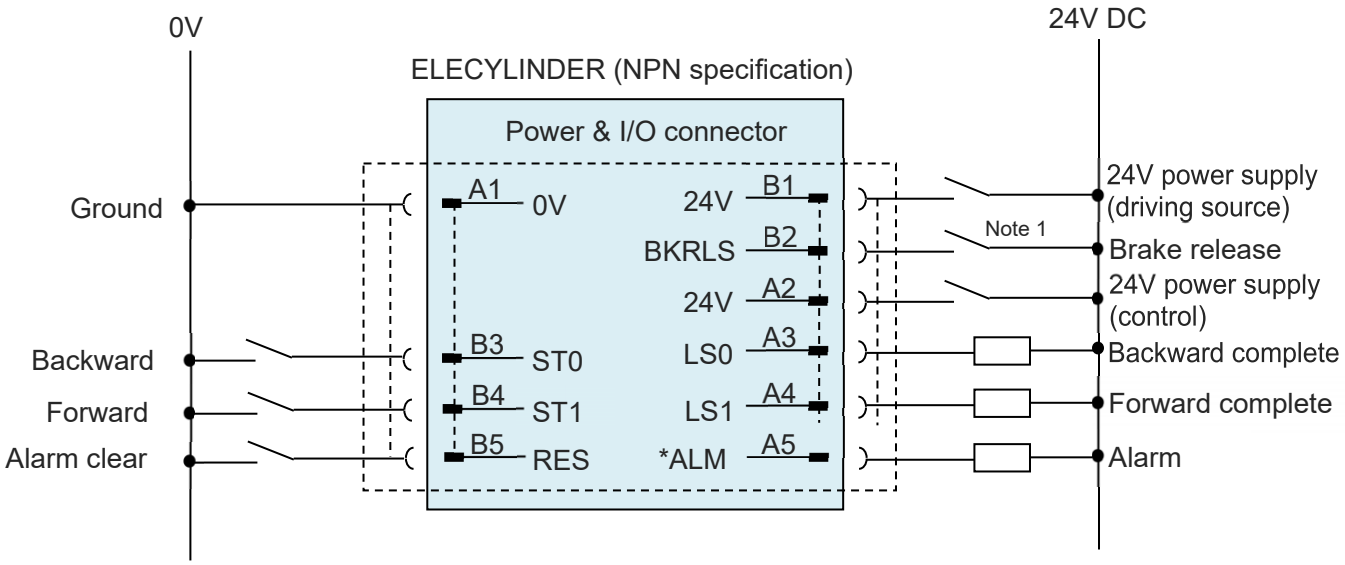


Caution

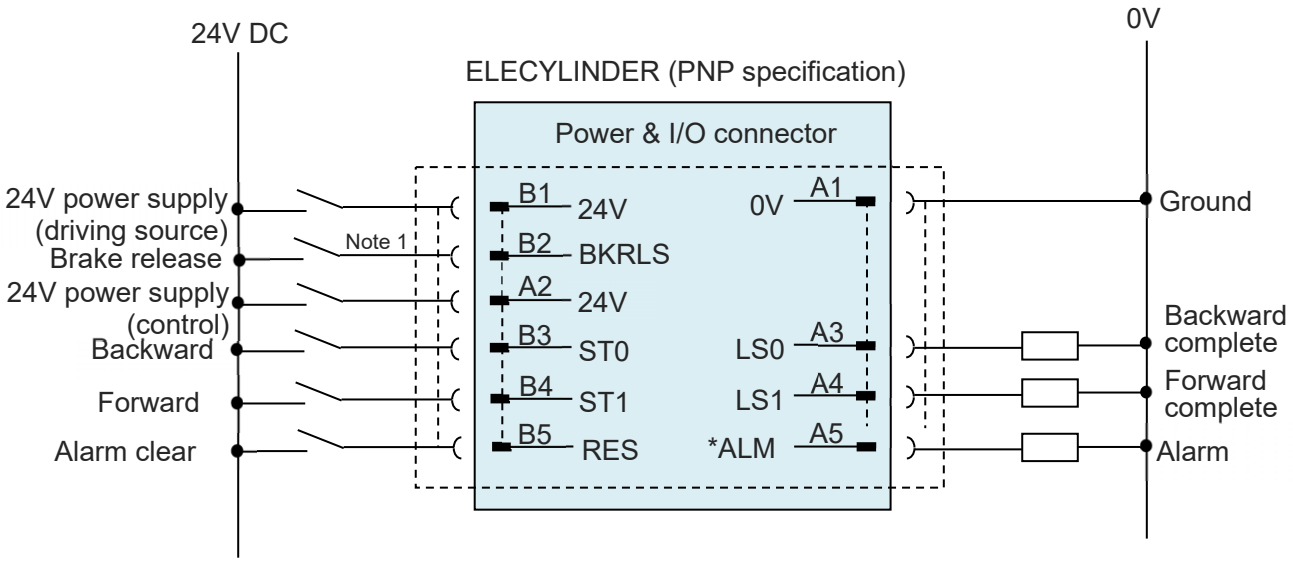
- "Note 1" This switch releases the brake forcibly for actuators equipped with a brake. The switch power capacity, refer to [Specifications Section 5.5 Power Supply Current at Brake Release].
- "*ALM" is a b-contact (active-low) signal. The output signal is ON in normal conditions and OFF when an alarm occurs.

⊙Two-circuit power supply specification TMD2 (Option)

♦For NPN specification



♦For PNP specification

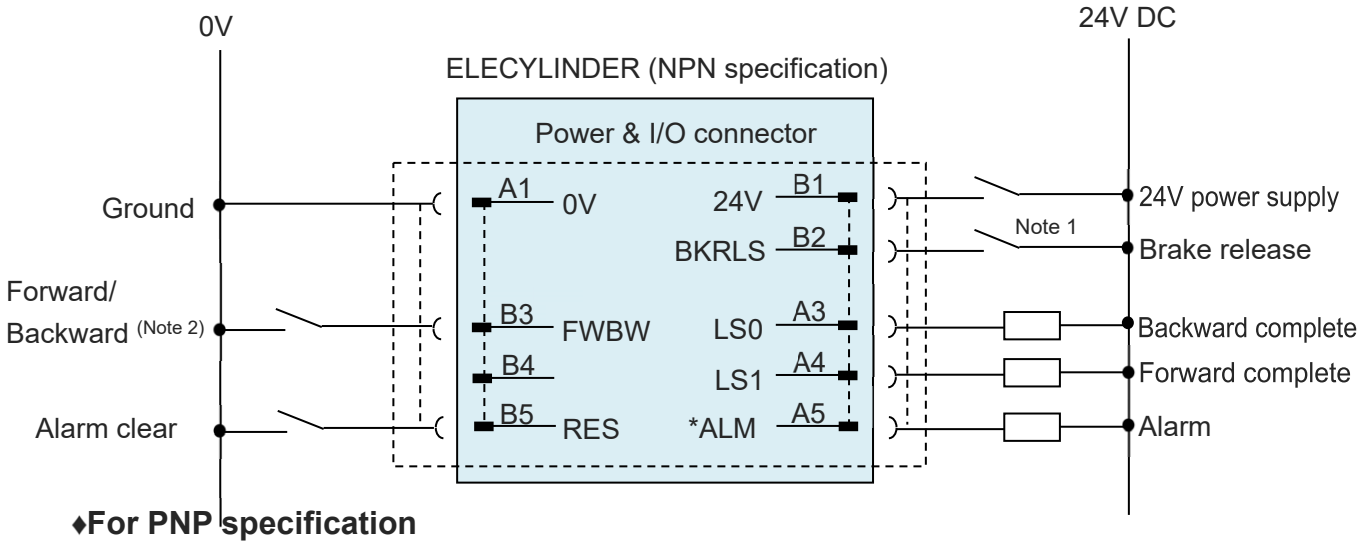


Caution

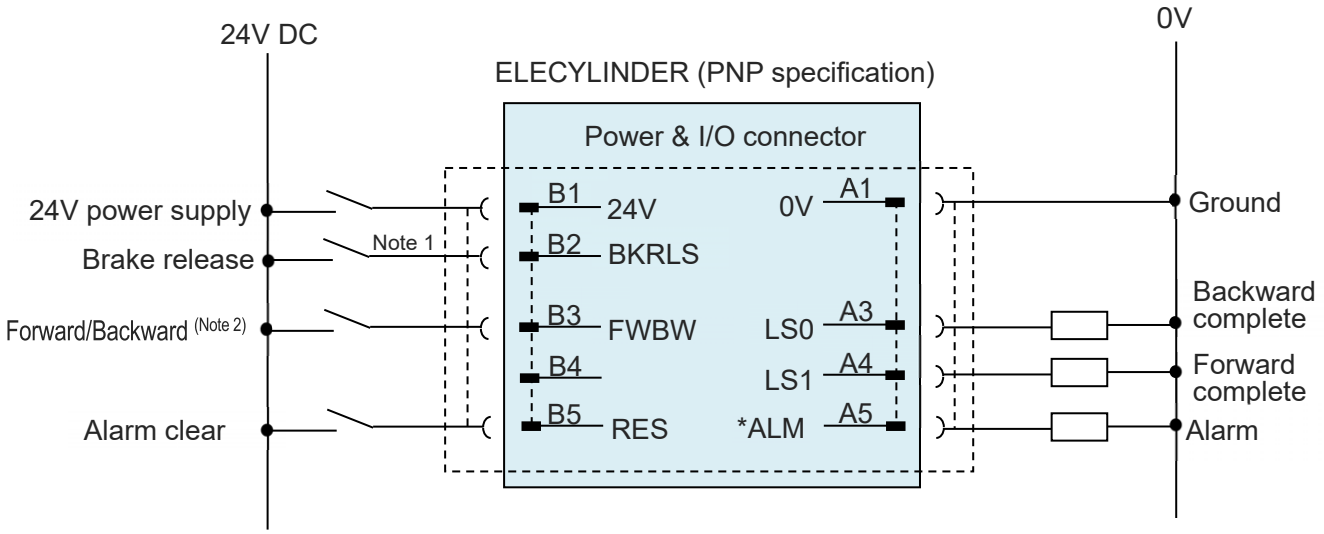
- "Note 1" This switch releases the brake forcibly for actuators equipped with a brake. The switch power capacity, refer to [Specifications Section 5.5 Power Supply Current at Brake Release].
- "*ALM" is a b-contact (active-low) signal. The output signal is ON in normal conditions and OFF when an alarm occurs.

[Single solenoid type]

♦For NPN specification



♦For PNP specification



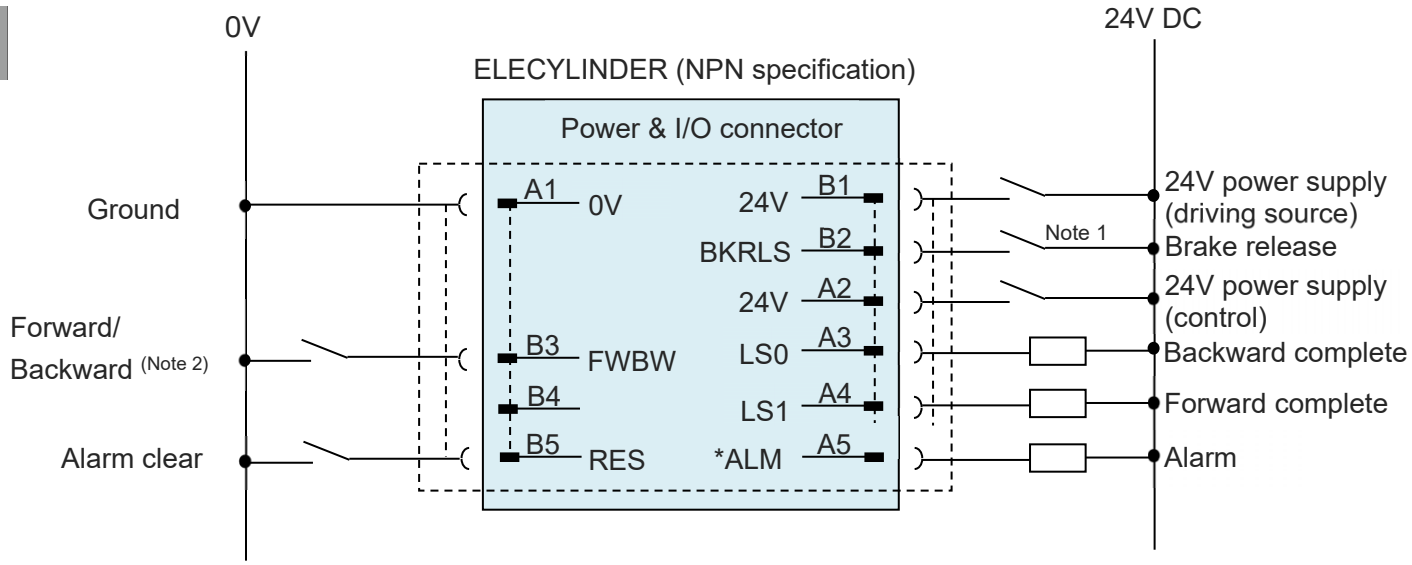
Note 2 The display for the power & I/O connector should stay "Backward".

Caution

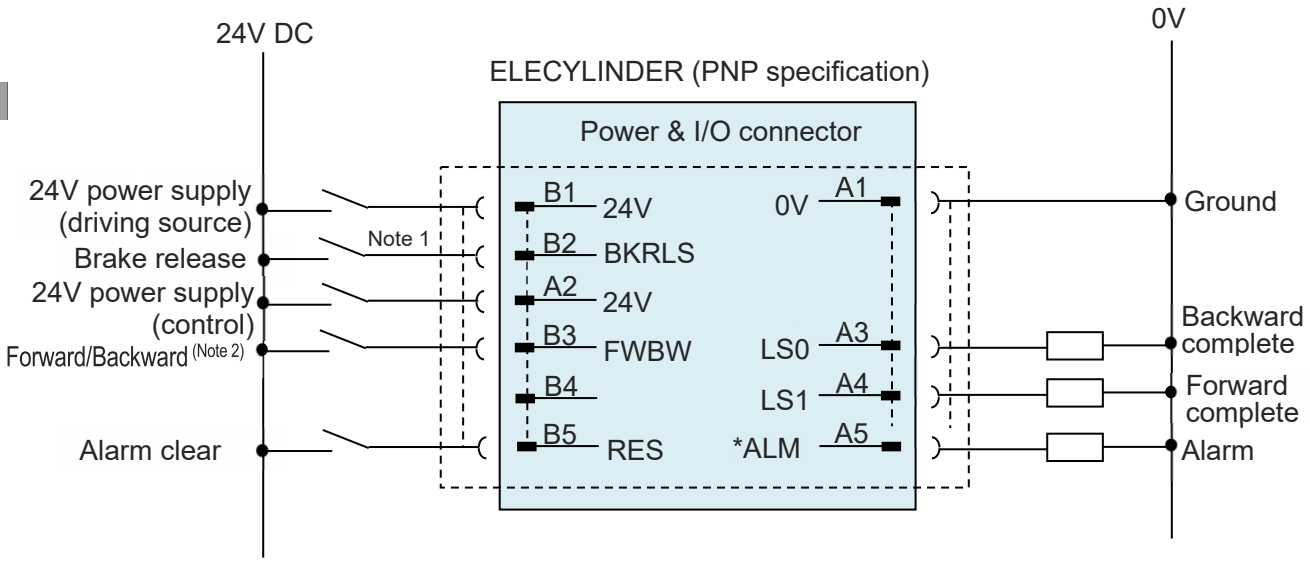
- "Note 1" This switch releases the brake forcibly for actuators equipped with a brake.
  The switch power capacity, refer to [Specifications Section 5.5 Power Supply Current at Brake Release].
- "*ALM" is a b-contact (active-low) signal.
  The output signal is ON in normal conditions and OFF when an alarm occurs.

⊙2-Circuit Power Supply Specification TMD2 (Option)

♦For NPN specification



♦For PNP specification



Note 2 The display for the power & I/O connector should stay "Backward".

Caution

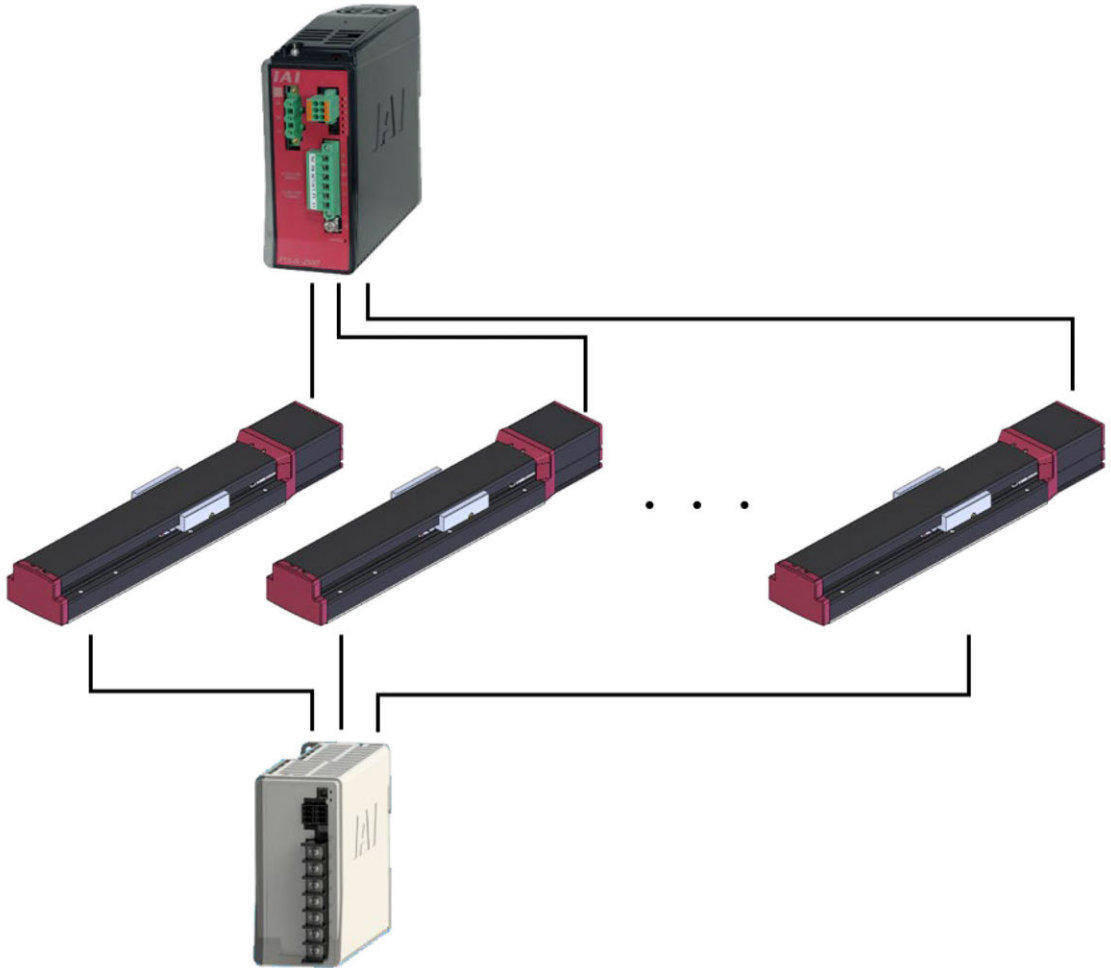
- "Note 1" This switch releases the brake forcibly for actuators equipped with a brake. The switch power capacity, refer to [Specifications Section 5.5 Power Supply Current at Brake Release].
- "*ALM" is a b-contact (active-low) signal. The output signal is ON in normal conditions and OFF when an alarm occurs.

5.1.3 ELECYLINDER

PSA-200 motor power supply is available to have six axes at the maximum for connection.
The number of axes connectable should depend on the motor wattage.

Refer to [Specifications section 6.2 Max. Number of Connectable Axes for DC Power Supply for Motor Drive (PSA-200)] for the maximum number of connection and [5.4 Way of wiring (PIO control/for connector connection)] or, [5.5 Way of wiring (PIO control/for cable connection)] Way of wiring] for how to perform wiring.

DC Power supply for motor drive
(Model: PSA-200-*)

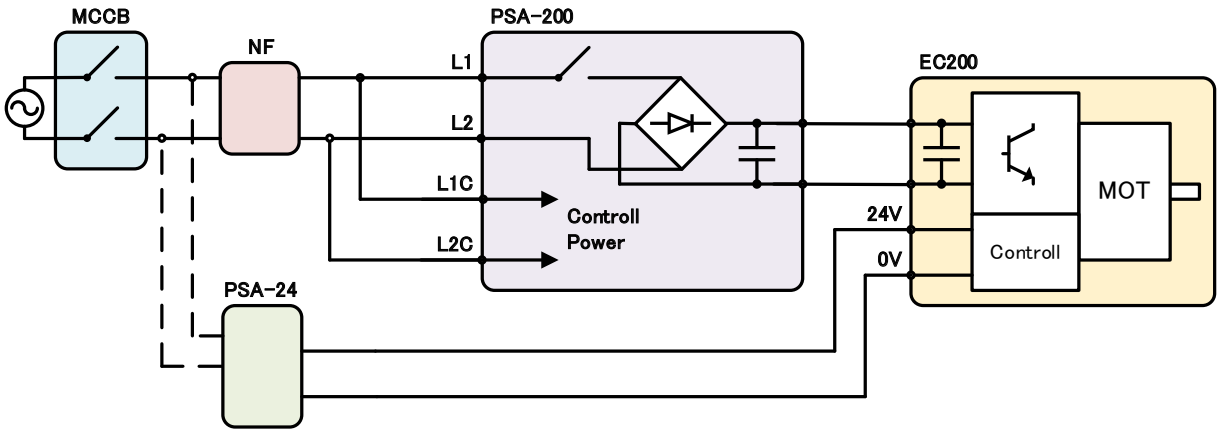


24V DC Control power supply
(Model: PSA-24(L))

5.1.4 Example for wiring ELECYLINDER and motor drive DC power supply

[1] Standard type

Shown in the figure below is an example of wiring for a standard type.
Make sure to have a power cutoff after stop of an ELECYLINDER.



Example for wiring of standard type

Caution

- There may be a case that you face to a condition described below in case the AC power gets cut off during operation of an ELECYLINDER:
  While in Acceleration ... Motor power supply voltage drop, Sudden stop due to deviation alarm
  While in Deceleration ... Operation continues as commanded until an alarm gets generated

[2] Two-circuit power supply specification (Option)

Shown in the figure below is an example of wiring for a TMD2 type.

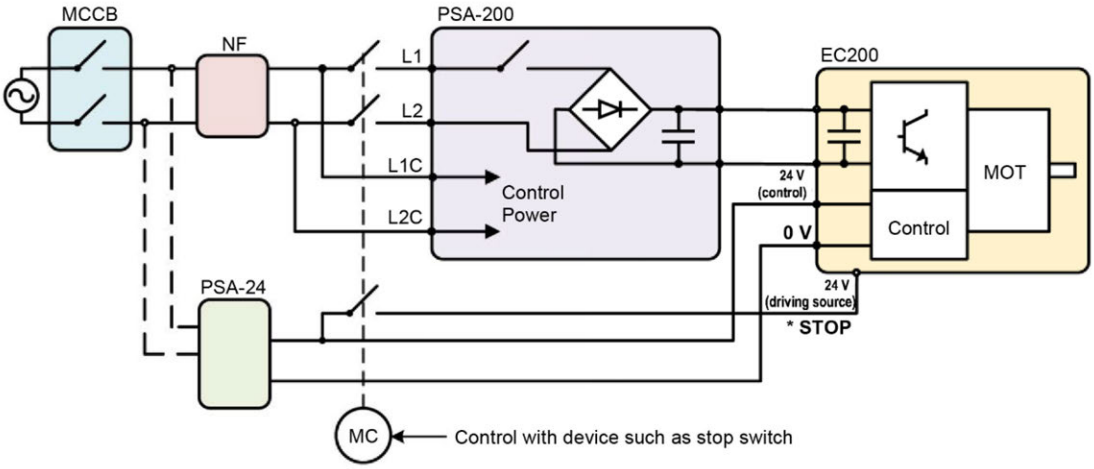
When it is required to have a drive cutoff without turning the ELECYLINDER control power supply off, select this specification.

Unlike the pulse motor type ELECYLINDER, “B1 24V (driving source)” Signal should be the one to perform the stop process of an actuator. "B1 24V (drive source)" signal is cut off, it stops suddenly (Note).

(Note) A sudden stop should be made by the emergency stop torque.

No alarm is generated at this time.

In order to cut off the drive source, it is necessary to cut off the AC power on PSA-200.

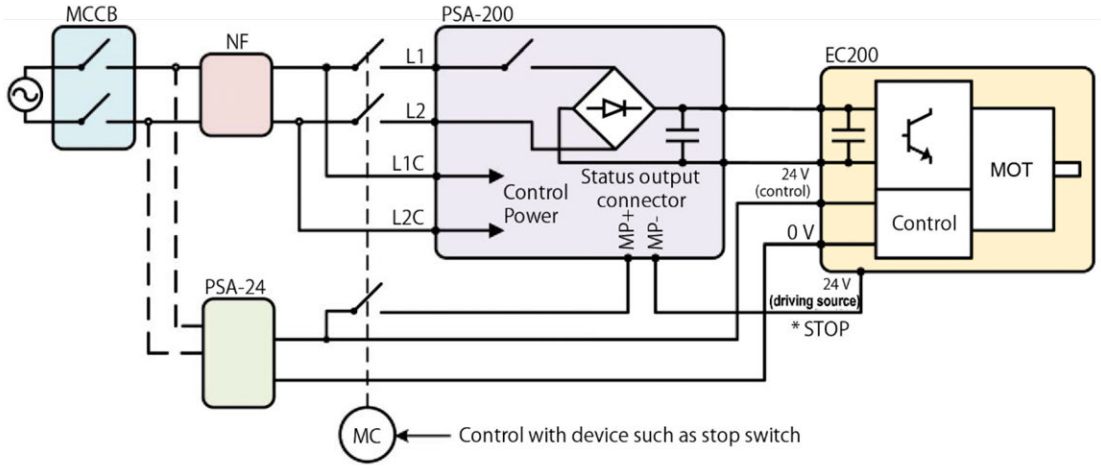


[3] Two-circuit power supply specification (Option) (Connection of PSA-200 status output signal)

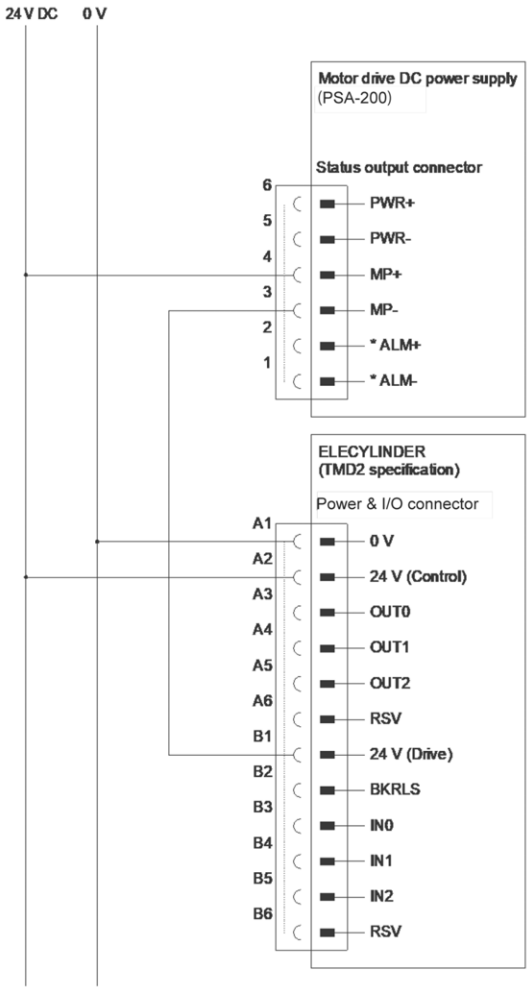
Shown in the figure below is an example of the wiring diagram when having the PSA-200 status output signal connected to the TMD2 type.

Although the operation should basically be the same as the diagram above, there may be a sudden stop of ELECYLINDER when the motor power supply of PSA-200 is cut off due to such reason as an alarm *1.

* 1 Refer to [Maintenance Section 1.3 [4] Check in status LED on motor drive DC power supply]. The power supply should be cut off when an alarm described as the drive cutoff has occurred.



If it is required to stop the ELECYLINDER operation when the motor power supply on the motor drive DC power supply (PSA-200) gets cut off, establish the connectivity of the power & I/O connector and the status output connector on ELECYLINDER (TMD2 type) as shown in the diagram below.

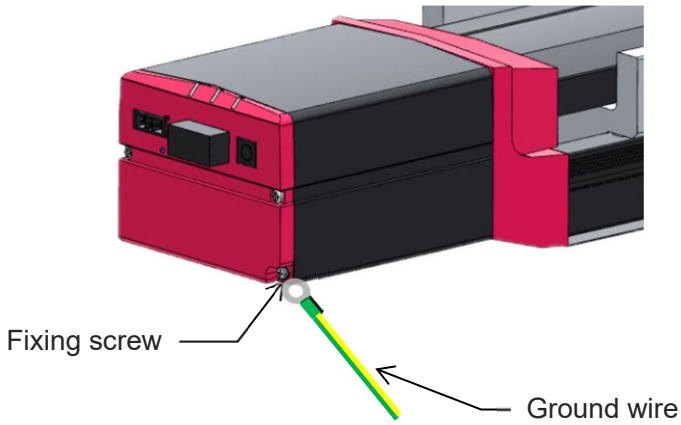


5.2 Frame grounding wiring

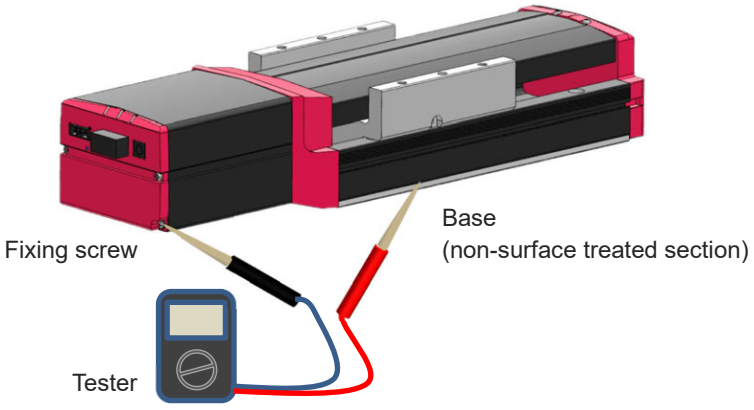
The ELECYLINDER has a built-in controller circuit board.

5.2.1 Slider type

Make sure to perform grounding as shown in the figure below in order to prevent electric shock and electrostatic charge, to improve noise durability performance and to control unexpected radiation.

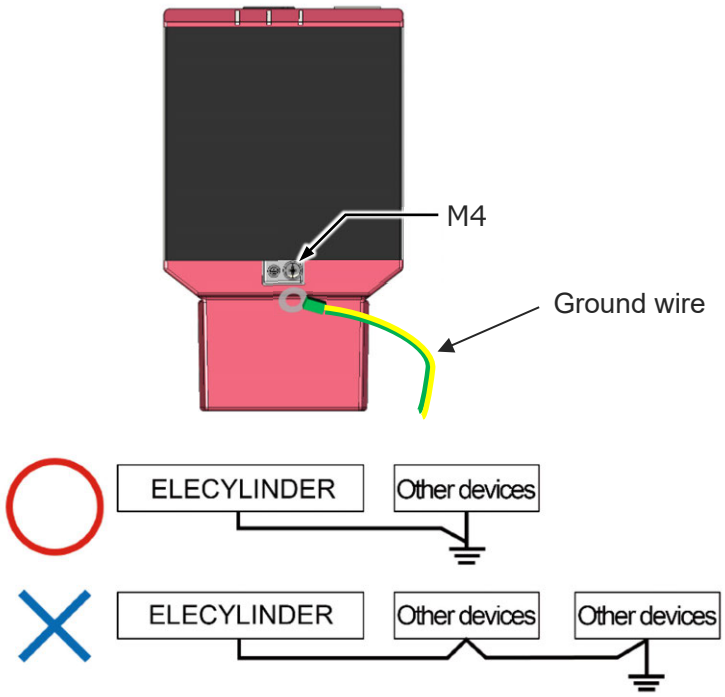


Use a tester to measure the continuity between the fixing screws and grounding surface to check whether it is grounded or not.
If slider type, Conduction can be checked in the area on the base bottom where no surface treatment is applied.



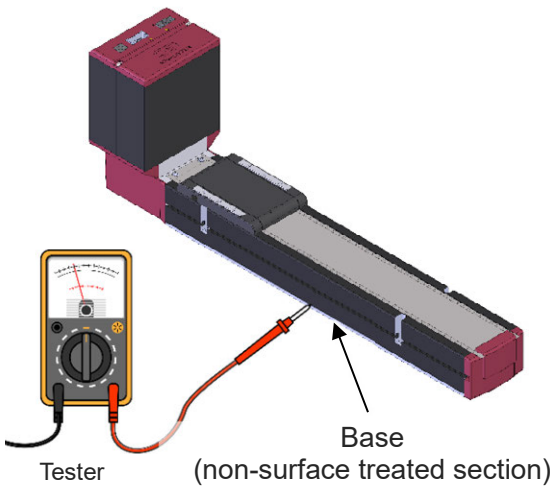
5.2.2 Belt type

In order to for electric shock prevention, electrostatic charging prevention, to improve noise resistance performance and to control unnecessary radiation, make sure to certainly perform the grounding as shown in the figure below.



Grounding wires should not be connected in common with other devices and separate controllers should be grounded.

Use a tester to measure the continuity between the fixing screws and grounding surface to check whether it is grounded or not.
Conduction can be checked in the area on the base bottom where no surface treatment is applied.



5.3 DC power supply for motor drive wiring

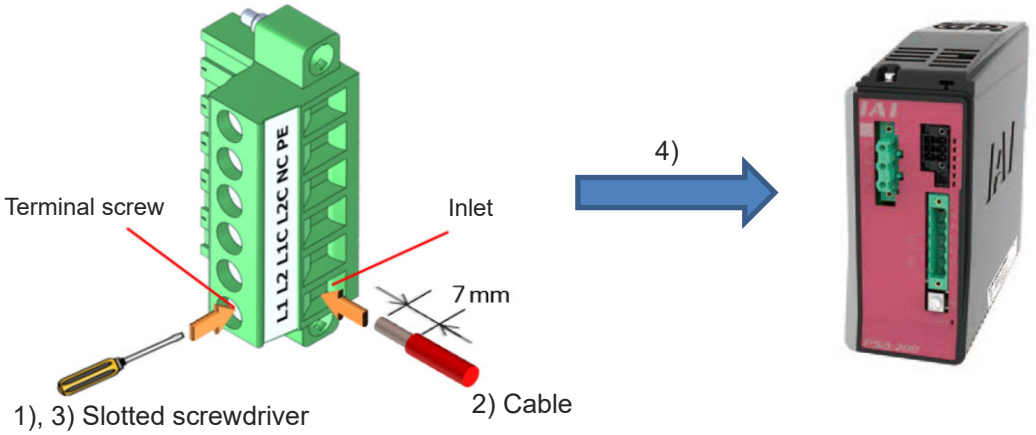
In addition to the 24V power supply for control, it is necessary to connect the DC power supply for the motor drive for the 200V AC servomotor equipped models of ELECYLINDER. Shown below is an example of wiring.

5.3.1 Power supply connector wiring

Name	Model number	Quantity
Power supply connector	MSTB2.5/6-STF-5.08 (Phoenix Contact)	1

Follow the processes below to set up a connectivity of power supply cables for 100V AC or 200V AC.

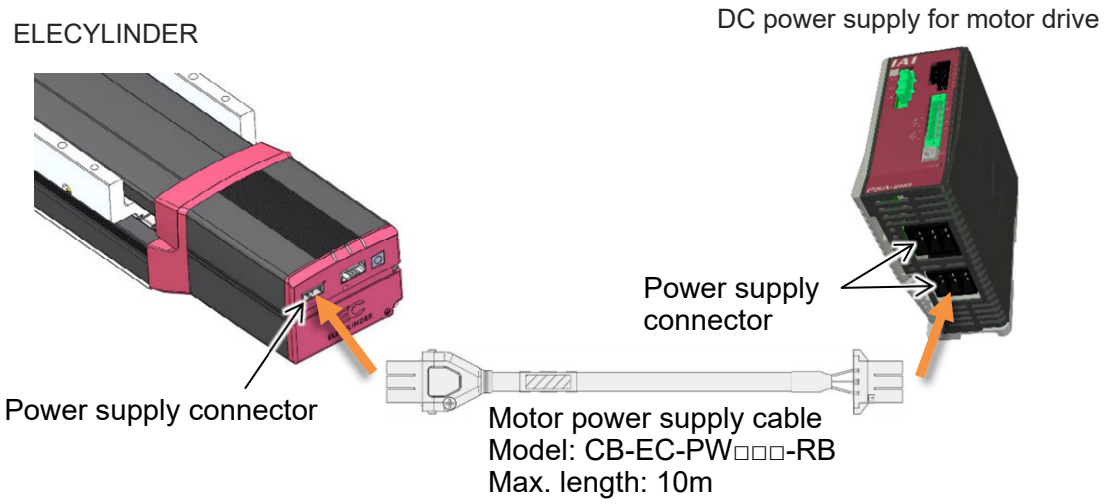
1) Loosen the terminal screw with using such as a slotted screwdriver to open up the inlet.
2) Reveal the sheath for 7mm on the cable tip that satisfies the cable diameter complies the specification shown in the table below and put it in the inlet.
3) Tighten the terminal screw with using such as a slotted screwdriver, to affixes the wire.
4) Connect all the wires in the same manner and insert the enclosed connector to the power supply connector.



Pin No.	Connector labeled name	Contents	Applicable cable diameter
1	L1	Motor AC power input	KIV2.0mm^2 (AWG14)
2	L2		
3	L1C	Control AC power input	KIV0.75mm^2 (AWG18)
4	L2C		
5	NC	Unconnected	—
6	PE	Protective ground line	KIV2.0mm^2 (AWG14)

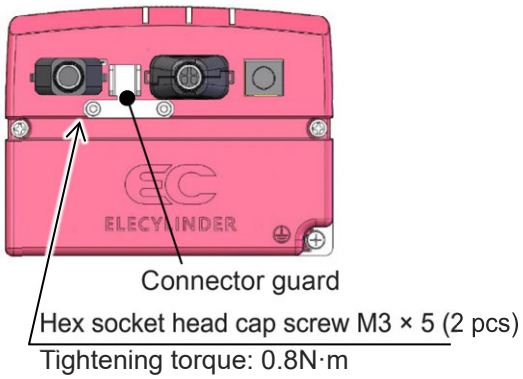
5.3.2 Connectivity between ELECYLINDER and DC power supply for motor drive

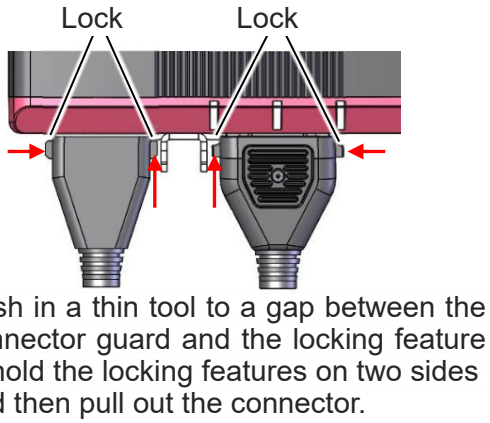
Set up a connectivity between ELECYLINDER and motor drive DC power supply using the motor power supply cable CB-EC-PW□□□-RB.
As the motor drive DC power supply is capable for connection of six axes, there are six connectors prepared.



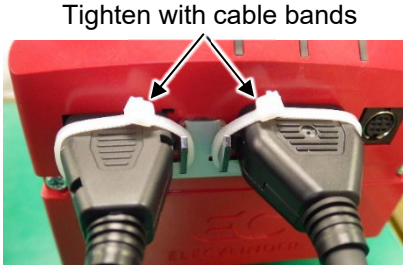
[Connector guard] (Enclosed on Delivery)

As the cables equipped with a connector guard, a risk of them getting pulled out can be prevented. When pulling out the connector, insert a thin tool in a gap between the connector guard and the connector to hold the locking feature, hold the other side at the same time and then pull it out.





Also, by tightening the matching parts of the connector guards and the connectors with a cable band, concern of contact error at the connectors caused by vibration on the cables can be reduced.

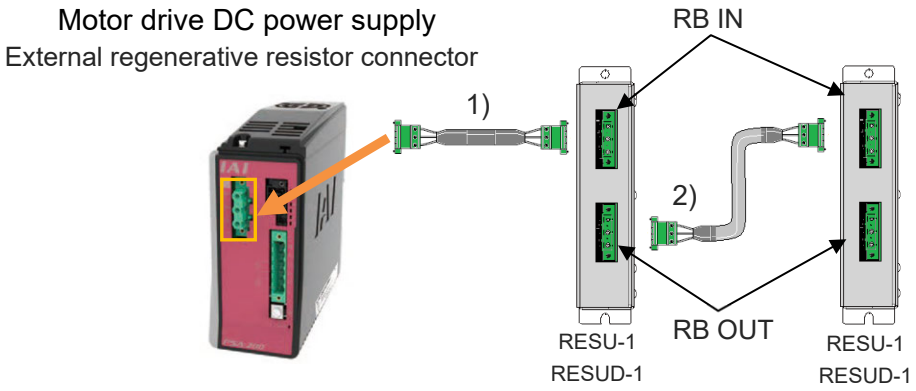


5.3.3 Regenerative resistor unit

Connect regenerative resistor unit (s) with attached cables as shown in the figure below.

1) When connecting 1 unit : Connect RESU(D)-1 with the enclosed cable (CB-ST-REU)
2) When connecting 2 or more units : Connect RESU(D)-1 with the enclosed cable (CB-ST-REU)

[Wiring Image]



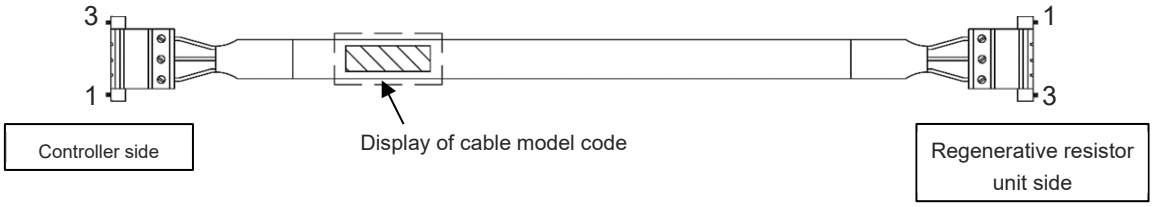
[Specifications of external regenerative resistor connector]

Item	Items and Model	
Connector name	External regenerative resistor connector (RB)	
Model	Controller side: GIC2.5/3-GF-7.62	Cable side: GIF2.5/3-STF-7.62

[Pin assignment]

Pin No.	Signal Name	Items	Remark
1	RB+	Regeneration resistor+ (Motor drive DC voltage)	Dedicated cable is enclosed to regenerative resistor unit
2	RB-	Regeneration resistor-	
3	PE	Ground terminal	

♦Regenerative resistor unit connection cable (CB-ST-REU□□□) □□□ indicates the cable length
5m at Max. (Example) 010 = 1m

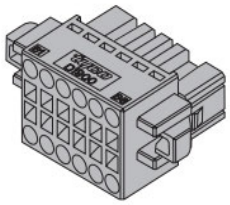


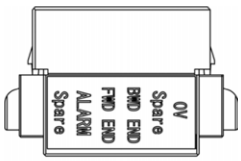
Wiring	Color	Signal	NO.
KIV1.0mm² (AWG17)	Light blue	RB+	1
	Brown	RB-	2
	Green/Yellow	PE	3

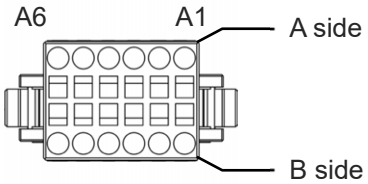
NO.	Signal	Color	Wiring
1	RB+	Light blue	KIV1.0mm² (AWG17)
2	RB-	Brown	
3	PE	Green/Yellow	

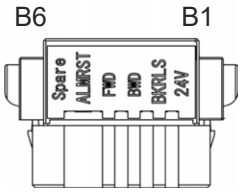
5.4 Way of wiring (for connect to PIO control / connector)

Here the wiring connection method with a power & I/O connector is introduced.
Supplied when cable length is specified as "0" in the model number. The connector is to be connected to the interfacing box for wiring.







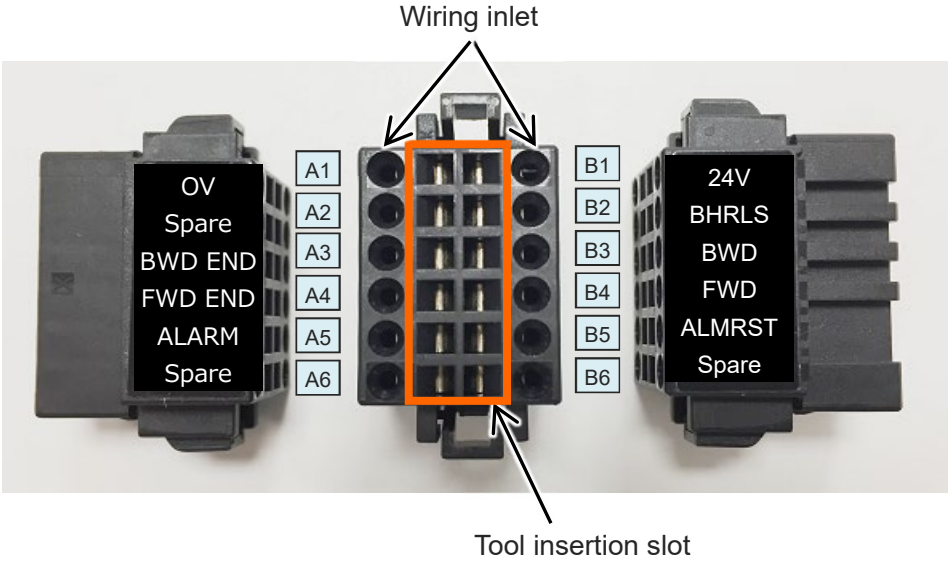


Name	Model number	Quantity
Power & I/O connector	1-1871940-6 (Tyco Electronics)	1

Pin No.	Signal name	Function
A1	0V	Ground
A2	Reserve (CP: 2-Circuit Power Supply Specification)	Reserve (24V for control power supply when 2-system type power supply)
A3	Backward complete	Backward complete (pressing operation,pressing complete 0)
A4	Forward complete	Forward complete (pressing operation,pressing complete 1)
A5	Alarm	Alarm output
A6	Reserve	Reserve
B1	24V (MP: 2-Circuit Power Supply Specification)	24V power supply (24V for motor power supply when 2-system type power supply)
B2	Brake release	Brake release input
B3	Backward	Backward Command
B4	Forward	Forward Command
B5	Alarm clear	Alarm Cancelation Signal Input
B6	Reserve	Reserve

5.4.1 Connector wiring method

The name of each terminal is affixed to the power & I/O connector.
The connector nameplate name and pin number relationship is as below.

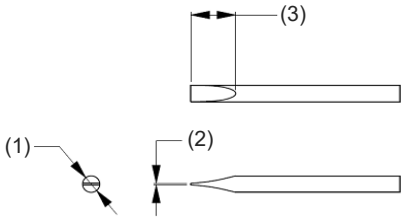


♦ **Preparation**

• Precision screwdriver

Recommended precision screwdriver

Item	Specification
(1) Shaft diameter	1.6±0.03mm
(2) Blade thickness	0.2±0.1mm
(3) Tip angle length	4.2±0.2mm

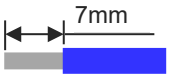


• Wiring

Compatible wire diameter: KIV0.75mm^2 (AWG18)

♦ **How to Conduct Wiring**

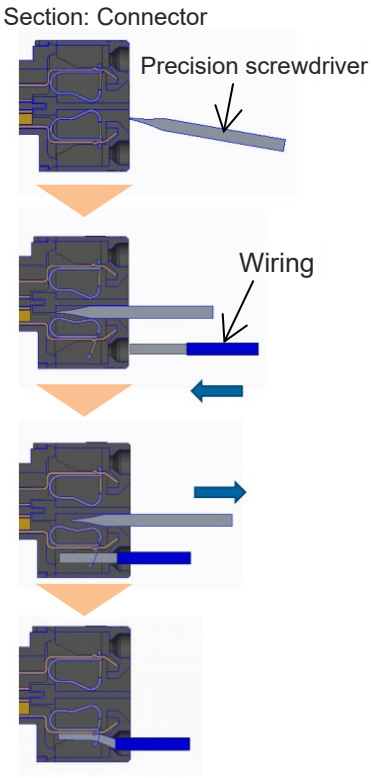
1) Peal the sheath for 7mm and twist the core wires lightly.



2) Insert a precision screwdriver fully into the tool insertion slot.
Press the spring within the connector down.

3) Insert the core wire.

4) Pull out the precision screwdriver.
Confirm that the cable is not pulled out.



Caution

- Take care not to twist the core wire too far. This will reduce the retention force, causing the wire to fall out of the connector and possibly causing insufficient current or short circuit.
- Do not insert the precision screwdriver violently into the connector, or twist it hard. This may damage the connector housing and internal spring.
- If an electric wire thinner than the applicable diameter or wiring longer than 10m is used, insufficient current may trigger an alarm and the performance of the ELECYLINDER may be degraded.

5.4.2 24V DC power supply wiring

(1) Wiring for Power Supply Standard Type

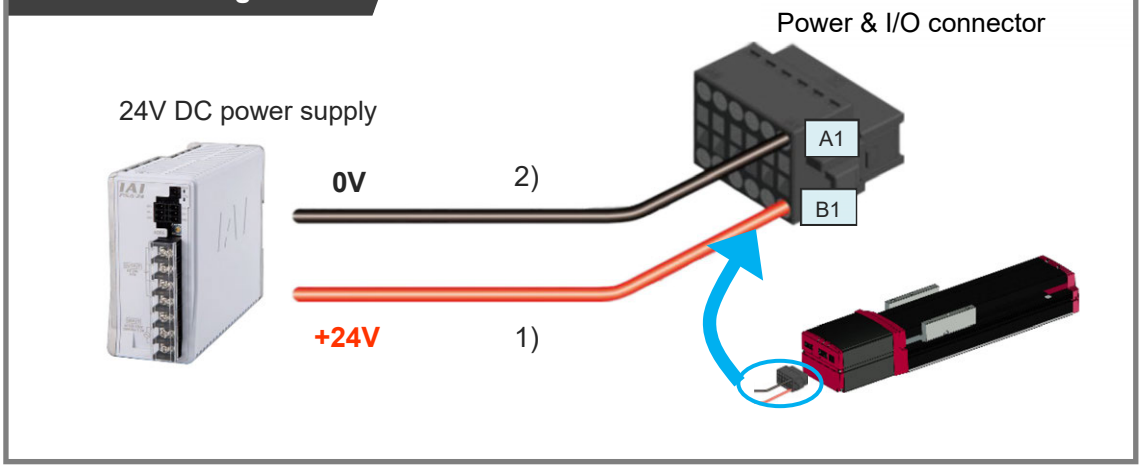
Connect the power wiring to the power & I/O connector.

Connect the 1) and 2) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B1" connector terminal and the +24V terminal of the 24V DC power supply.
2) Connect the "A1" connector terminal and the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram

Before starting connector wiring, check the details on [5.4.1 Connector wiring method].



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V	KIV0.75mm^2 (AWG18)	Control power voltage: 24V DC ±10% Control power current: 0.32A Brake power supply (for the brake option is selected): S10/S10X 0.22A (No overexcitation) S13/S13X/S15/S15X 0.875A (when in overexcitation) S18/S18X 0.753A (No overexcitation) When teaching pendant used: 0.15A Wiring length: 10m or less
A1	0V		

(2) Two-circuit power supply specification TMD2 (Option) wiring

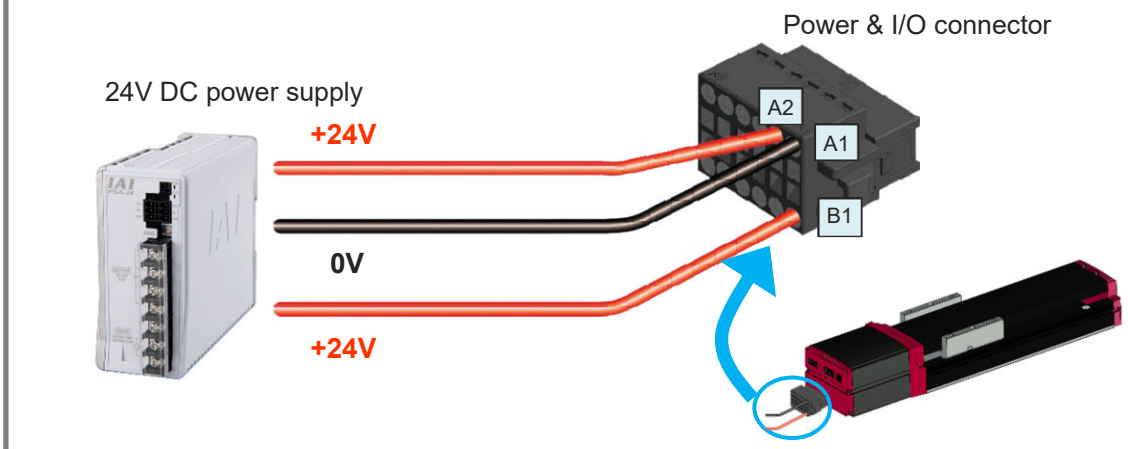
Connect the power wiring to the power & I/O connector.

Connect the 1) to 3) wiring to the connector terminal block while referring to the connection diagram.

1) Connect the "B1" connector terminal and the +24V (drive source) terminal of the 24V DC power supply.
2) Connect the "A2" connector terminal and the +24V (control) terminal of the 24V DC power supply.
3) Connect the "A1" connector terminal and the 0V terminal of the 24V DC power supply.

24 V DC power supply connection diagram

Before starting connector wiring,
check the details on [5.4.1 Connector wiring method]



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V (Drive source)	KIV0.75mm^2 (AWG18)	Control power voltage: 24V DC ±10% Control power current: 0.32A Brake power supply (for the brake option is selected): S10/S10X 0.22A (No overexcitation) S13/S13X/S15/S15X 0.875A (when in overexcitation) S18/S18X 0.753A (No overexcitation) When teaching pendant used: 0.15A Wiring length: 10m or less
A2	24V (Control)		
A1	0V		

Reference

- When establishing an external stop switch, add a b-contact switch to the "B1" terminal wiring. This shuts off the 24V power supply in the stopped state (drive power OFF). Refer to [5.1.4 Example for wiring ELECYLINDER and motor drive DC power supply] for details.

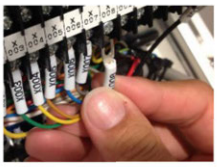
5.4.3 PLC wiring

For I/O between the PLC and signals, the signal wiring must be connected to the connector terminal block.
Connect the 1) to 6) wiring to the connector terminal block while referring to the connection diagram.

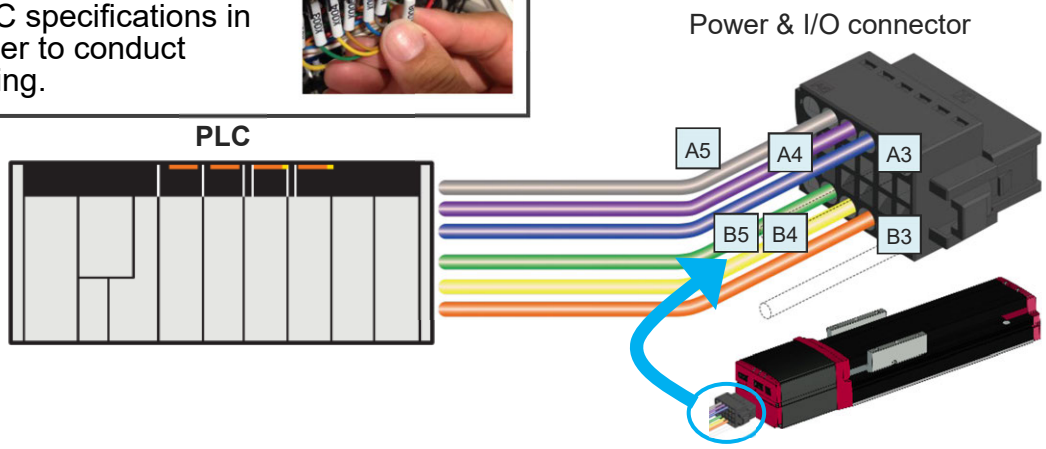
1) Connect the "B3" connector terminal and the "Backward" ("Forward/Backward" for single solenoid type) output terminal.
2) Connect the "B4" connector terminal and the "Forward" output terminal.
   (Note) There is no need of connecting "B4" terminal for the single solenoid type.
3) Connect the "B5" connector terminal and the "Alarm clear" output terminal.
4) Connect the "A3" connector terminal and the "Backward complete" input terminal.
5) Connect the "A4" connector terminal and the "Forward complete" input terminal.
6) Connect the "A5" connector terminal and the "Alarm" input terminal.

PLC connection diagram

Process the terminals in accordance with PLC specifications in order to conduct wiring.



Before starting connector wiring, check the details on [5.4.1 Connector wiring method]



♦**Double solenoid type**

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Backward	ST0	KIV0.20mm^2 (AWG24)	Backward command
B4	Forward	ST1		Forward command
B5	Alarm clear	RES		Alarm clear
A3	Backward complete	LS0/PE0		Backward complete/pressing complete
A4	Forward complete	LS1/PE1		Forward command/pressing complete
A5	Alarm	*ALM		Alarm detection (b-contact)

♦**Single solenoid type**

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Forward/Backward (Note 1)	FWBW	KIV0.20mm^2 (AWG24)	Forward/Backward command
B4	—	—		—
B5	Alarm clear	RES		Alarm clear
A3	Backward complete	LS0 or PE0		Backward complete or pressing complete
A4	Forward complete	LS1 or PE1		Forward complete or pressing complete
A5	Alarm	*ALM		Alarm detection (b-contact)

Note1 The display for the power & I/O connector should stay "Backward".

5.4.4 Brake release wiring

For the specification with brake, when installing a forcible brake release switch, connect wiring to the "B2" connector terminal.
Refer to the requirement specifications in the table below for the current amperage.

Pin No.	Connector nameplate name	Signal abbreviation	Compatible wire diameter	Required specifications
B2	Brake release	BKRLS	KIV0.20mm^2 (AWG24)	24V DC ±10% / S10/S10X: 0.22A (No overexcitation) S13/S13X/S15/S15X: 0.875A (when in overexcitation) 0.085A (when steady) S18/S18X: 0.753A (No overexcitation)

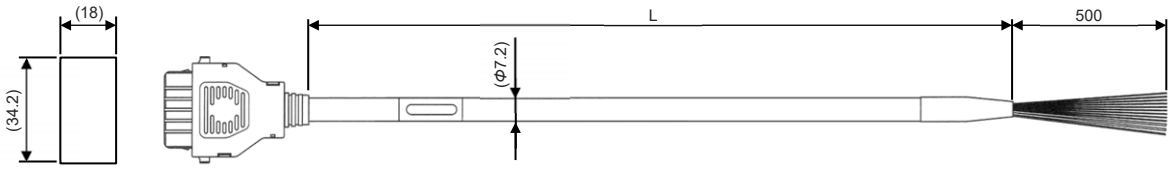
5.5 Way of wiring (for connect to PIO control / connector)

Here the way of wiring with a power & I/O cable is introduced.
The connector on the ELECYLINDER side is to be connected to the interfacing box.

5.5.1 Power & I/O cable

[1] Power & I/O cable (User Wiring Type)

Model **CB-EC-PWBIO□□□-RB**



Minimum bending radius r = 58 or more (for movable use)
*Robot cable is standard for this model.

Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(reserve) (Note 1)	A2
Orange (AWG26)	ST0	B3
Yellow (AWG26)	ST1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(reserve)	B6
Blue (AWG26)	LS0/PE0	A3
Purple (AWG26)	LS1/PE1	A4
Gray (AWG26)	*ALM	A5
White (AWG26)	(reserve)	A6
Brown (AWG26)	BKRLS	B2

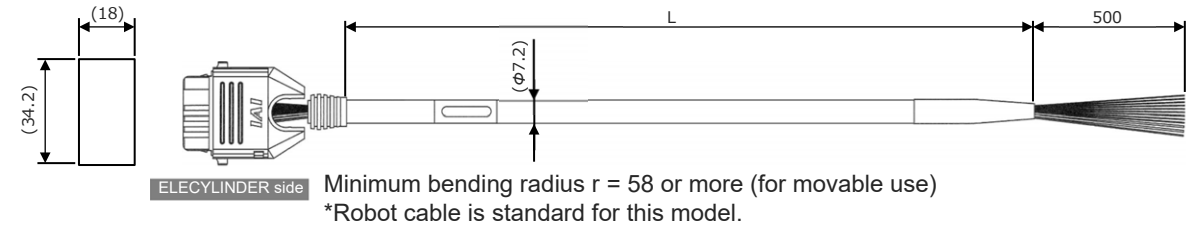
Note 1 TMD2 is 24V (control)
(Note) Cable in light green and light gray not in use
(Already cut in shrink tube)
(Note) In the case of the single solenoid system,
pin No.B3 is signal name FWBW.
Pin No. B4 is not for use.

- The wiring on the opposite side of the connector has not been processed.
- The cable length is available from 1m to 10m. Specify the length (L) in increments of 1m.
- The following shows a sample model number.

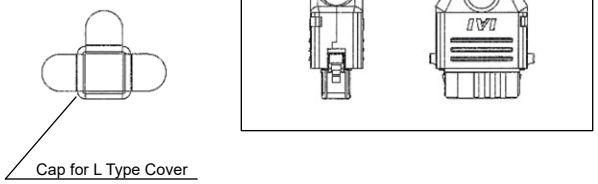
Cable length **1**m → CB-EC-PWBIO**010**-RB
Cable length **3**m → CB-EC-PWBIO**030**-RB
Cable length **10**m → CB-EC-PWBIO**100**-RB

[2] Power & I/O cable (User Wiring Type, 4-way Connector)

Model **CB-EC2-PWBIO□□□-RB**



Minimum bending radius r = 58 or more (for movable use)
*Robot cable is standard for this model.



Color	Signal name	Pin NO.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(reserve) (Note 1)	A2
Orange (AWG26)	ST0	B3
Yellow (AWG26)	ST1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(reserve)	B6
Blue (AWG26)	LS0/PE0	A3
Purple (AWG26)	LS1/PE1	A4
Gray (AWG26)	*ALM	A5
White (AWG26)	(reserve)	A6
Brown (AWG26)	BKRLS	B2

Note 1 TMD2 is 24V (control)
(Note) Cable in light green and light gray not in use
(Already cut in shrink tube)
(Note) In the case of the single solenoid system,
pin No.B3 is signal name FWBW.
Pin No. B4 is not for use.

- The wiring on the opposite side of the connector has not been processed.
- The cable length is available from 1m to 10m. Specify the length (L) in increments of 1m.
- The following shows a sample model number.

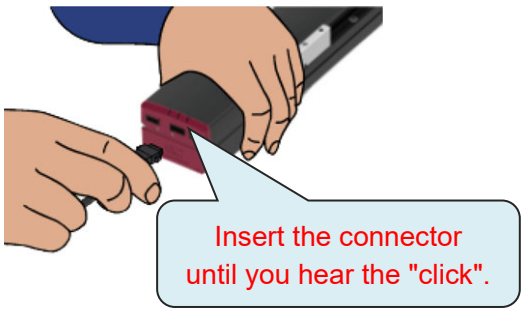
Cable length **1**m → CB-EC2-PWBIO**010**-RB
Cable length **3**m → CB-EC2-PWBIO**030**-RB
Cable length **10**m → CB-EC2-PWBIO**100**-RB

Refer to [6.1.3 How to Assemble 4-Way Connector Cable] for how to assemble the four-way connector.

5.5.2 Power & I/O cable connection

Connect the power & I/O cable.
Insert the connector until you hear the "click".

Cable connection diagram



Caution

- The connector must be inserted in a given direction.
  Align the convex and concavity on the connectors and join them inserting until you hear the "click".
- Take appropriate care to prevent unused wiring in the loose wire end on the cable from shorting out other wires by protecting them with insulation tape.

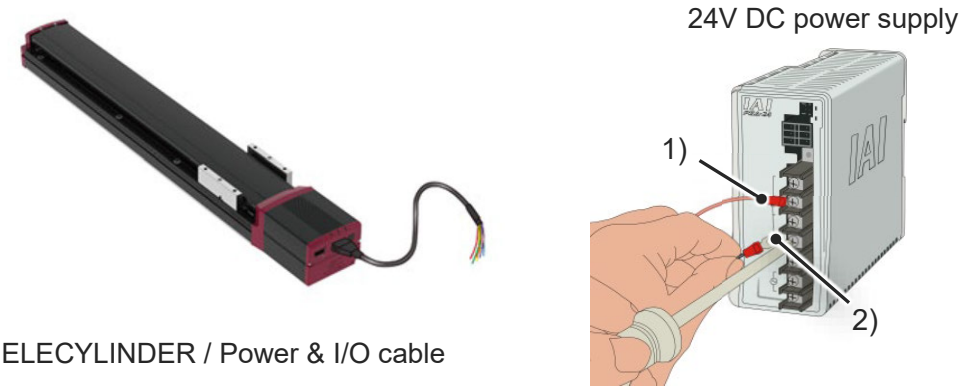
5.5.3 24V DC power supply wiring

Connect the power wiring to the power & I/O cable.
Connect the 24V DC power supply to the terminal block after terminal-processing the 24V and 0V wires of the power & I/O cable.

[1] Wiring for Power Supply Standard Type

1) Connect the 24V wire (insulation color: red) to the +24V terminal of the 24V DC power supply.
2) Connect the 0V wire (insulation color: black) to the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram



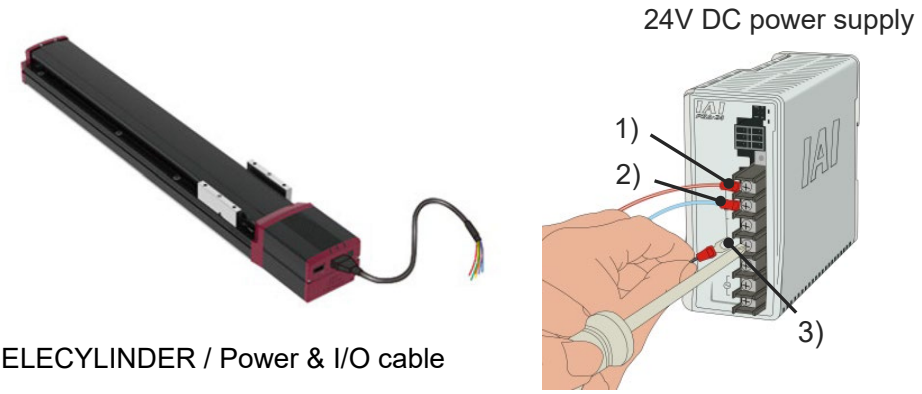
Wiring color	Signal abbreviation	Function overview	Required specifications
Red	24V	Power supply input	Control power voltage: 24V DC ±10% Control power current: 0.32A Brake power supply (for the brake option is selected): S10/S10X 0.22A (No overexcitation) S13/S13X/S15/S15X 0.875A (when in overexcitation) S18/S18X 0.753A (No overexcitation) When teaching pendant used: 0.15A
Black	0V	Ground	

[2] Two-circuit power supply specification TMD2 (Option)

Connect the power wiring to the power & I/O cable.
Connect the 24V DC power supply to the terminal block after terminal-processing the 24V (driving source), 24V (control) and 0V wires of the power & I/O cable.

1) Connect the 24V (driving source) wire (insulation color: red) to the +24V terminal of the 24V DC power supply.
2) Connect the 24V (control) wire (insulation color: light blue) to the +24V terminal of the 24V DC power supply.
3) Connect the 0V wire (insulation color: black) to the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram



Wiring color	Signal abbreviation	Function overview	Required specifications
Red	24V (driving source)	Driving source power supply input	Control power voltage: 24V DC ±10% Control power current: 0.32A Brake power supply (for the brake option is selected): S10/S10X 0.22A (No overexcitation) S13/S13X/S15/S15X 0.875A (when in overexcitation) S18/S18X 0.753A (No overexcitation) When teaching pendant used:0.15A
Light blue	24V (control)	Control power supply input	
Black	0V	Ground	

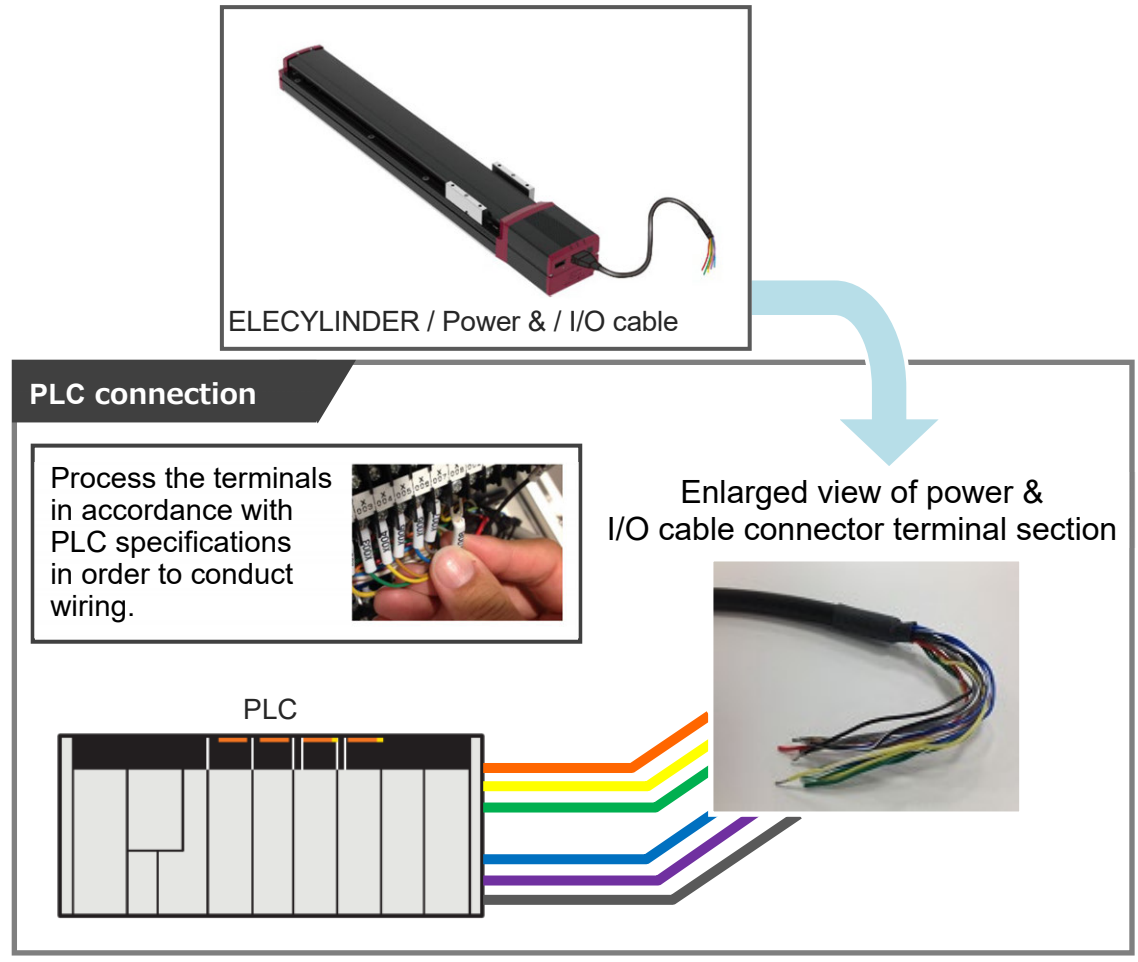
Reference

- By cutting off the 24V (drive source) (insulation color: red), it turns to the stop condition. Refer to [5.1.4 Example for wiring ELECYLINDER and motor drive DC power supply].

5.5.4 PLC wiring

For I/O between the PLC and signals, the wiring of the power & I/O cable must be connected to the PLC.

1) Connect the "orange" cable wire and the "Backward" ("Forward/Backward" for single solenoid type) output terminal.
2) Connect the "yellow" cable wire and the "Forward" output terminal.
   (Note) There is no need of connecting the "yellow" cable for the single solenoid type.
3) Connect the "green" cable wire and the "Alarm clear" output terminal.
4) Connect the "blue" cable wire and the "Backward complete" input terminal.
5) Connect the "purple" cable wire and the "Forward complete" input terminal.
6) Connect the "gray" cable wire and the "Alarm" input terminal.

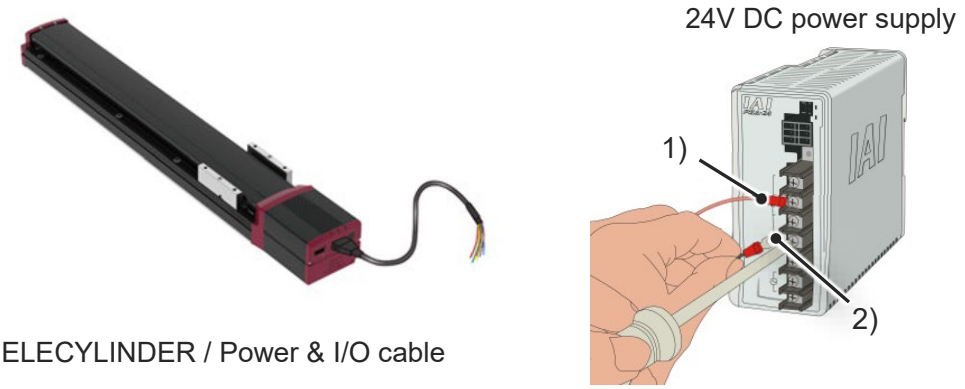


5.5.5 Brake release wiring

For the specification with brake, when installing a forcible brake release switch,
Perform the wiring as shown below.

1) Connect the 24V wire (insulation color: brown) to the +24V terminal of the 24V DC power supply.
2) Connect the 0V wire (insulation color: black) to the 0V terminal of the 24V DC power supply.

24V DC power supply connection diagram



Refer to the requirement specifications in the table below for the current amperage.

Wiring color	Signal abbreviation	Function overview	Required specifications
Brown	BKRLS	Brake release	24V DC ±10% / S10/S10X: 0.22A (No overexcitation) S13/S13X/S15/S15X : 0.875A (when in overexcitation) : 0.085A (when steady) S18/S18X: 0.753A (No overexcitation)

Startup Section

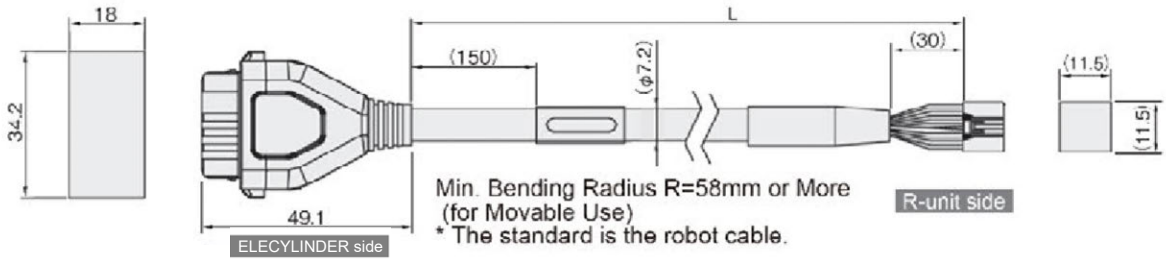
Chapter 6

EC Connection Unit Wiring

6.1 Power & I/O Cable

6.1.1 Power & I/O Cable (RCON-EC connection type)

Model **CB-REC-PWBIO□□□-RB**



3-1871946-6

Color	Signal name	Pin No
BK (AWG18)	0V	A1
RD (AWG18)	24V(MP)	B1
LB (AWG22)	24V(CP)	A2
OR (AWG26)	IN0	B3
YW (AWG26)	IN1	B4
GR (AWG22)	IN2	B5
YGR (AWG22)	SD+	B6
LGL (AWG22)	SD-	A6
BL (AWG26)	OUT0	A3
PU (AWG26)	OUT1	A4
GL (AWG26)	OUT2	A5
BR (AWG26)	BKRLS	B2

DF62C-13S-2.2C(18)

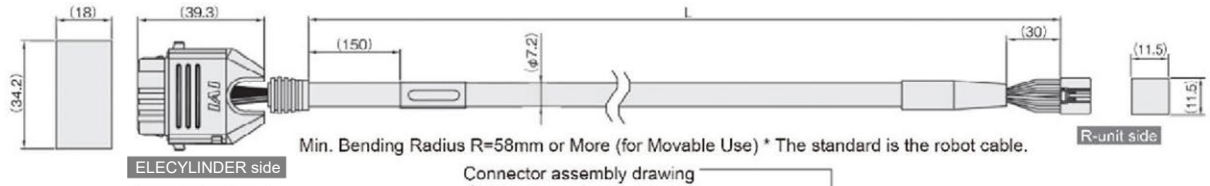
Pin No	Signal name	Color
2	0V	BK (AWG18)
1	24V(MP)	RD (AWG18)
12	24V(CP)	LB (AWG22)
7	OUT0	OR (AWG26)
8	OUT1	YW (AWG26)
9	OUT2	GR (AWG26)
6	SD+	YGR (AWG26)
10	SD-	LGL (AWG26)
3	IN0	BL (AWG26)
4	IN1	PU (AWG26)
5	IN2	GL (AWG26)
11	BKRLS	BR (AWG26)
13	FG	GR (AWG26)

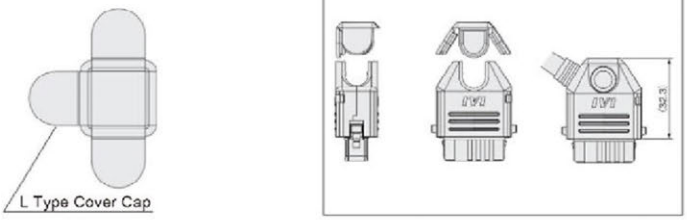
- The cable lengths (L) should be 1m at shortest and 10m at longest.
  Order can be made in every 1m of length.
- Shown below is an example for the model types.

  Cable Length **1**m → CB-REC-PWBIO**010**-RB
  Cable Length **3**m → CB-REC-PWBIO**030**-RB
  Cable Length **10**m → CB-REC-PWBIO**100**-RB

6.1.2 Power & I/O Cable (RCON-EC connection type, 4-way Connector)

Model **CB-REC2-PWBIO□□□-RB**





1-1871946-6

Color	Signal name	Pin No.
BK (AWG18)	0V	A1
RD (AWG18)	24V(MP)	B1
LB (AWG22)	24V(CP)	A2
OR (AWG26)	IN0	B3
YW (AWG26)	IN1	B4
GR (AWG26)	IN2	B5
YGR (AWG26)	SD+	B6
LGL (AWG26)	SD-	A6
BL (AWG26)	OUT0	A3
PU (AWG26)	OUT1	A4
GL (AWG26)	OUT2	A5
BR (AWG26)	BKRLS	B2

DF62C-13S-2C(18)

Pin No.	Signal name	Color
2	0V	BK (AWG22)
1	24V(MP)	RD (AWG22)
12	24V(CP)	LB (AWG22)
7	OUT0	OR (AWG26)
8	OUT1	YW (AWG26)
9	OUT2	GR (AWG26)
6	SD+	YGR (AWG26)
10	SD-	LGL (AWG26)
3	IN0	BL (AWG26)
4	IN1	PU (AWG26)
5	IN2	GL (AWG26)
11	BKRLS	BR (AWG26)
13	FG	GR (AWG26)

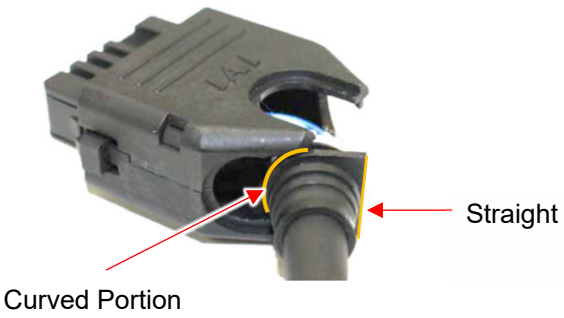
- The cable lengths (L) should be 1m at shortest and 10m at longest.
  Order can be made in every 1m of length.
- Shown below is an example for the model types.

  Cable Length **1**m → CB-REC2-PWBIO**010**-RB
  Cable Length **3**m → CB-REC2-PWBIO**030**-RB
  Cable Length **10**m → CB-REC2-PWBIO**100**-RB

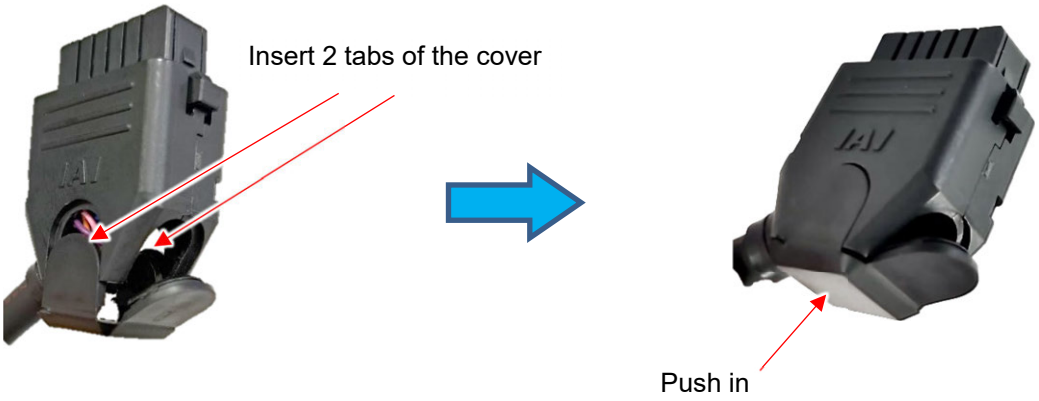
6.1.3 How to Build up 4-Way Connector Cable

Here states how to build up a 4-way connector cable.

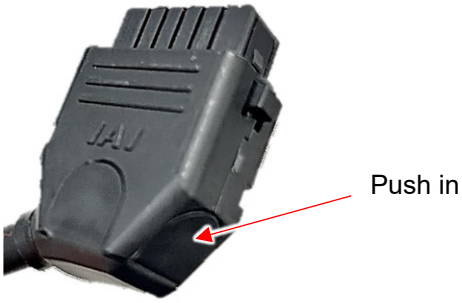
1) Insert the cable sliding from the curved edge on the semicylindrical shape along the grooves.



2) Be sure to check that the cable is settled firmly and insert 2 tabs of the cover along the slits of socket and push it in.



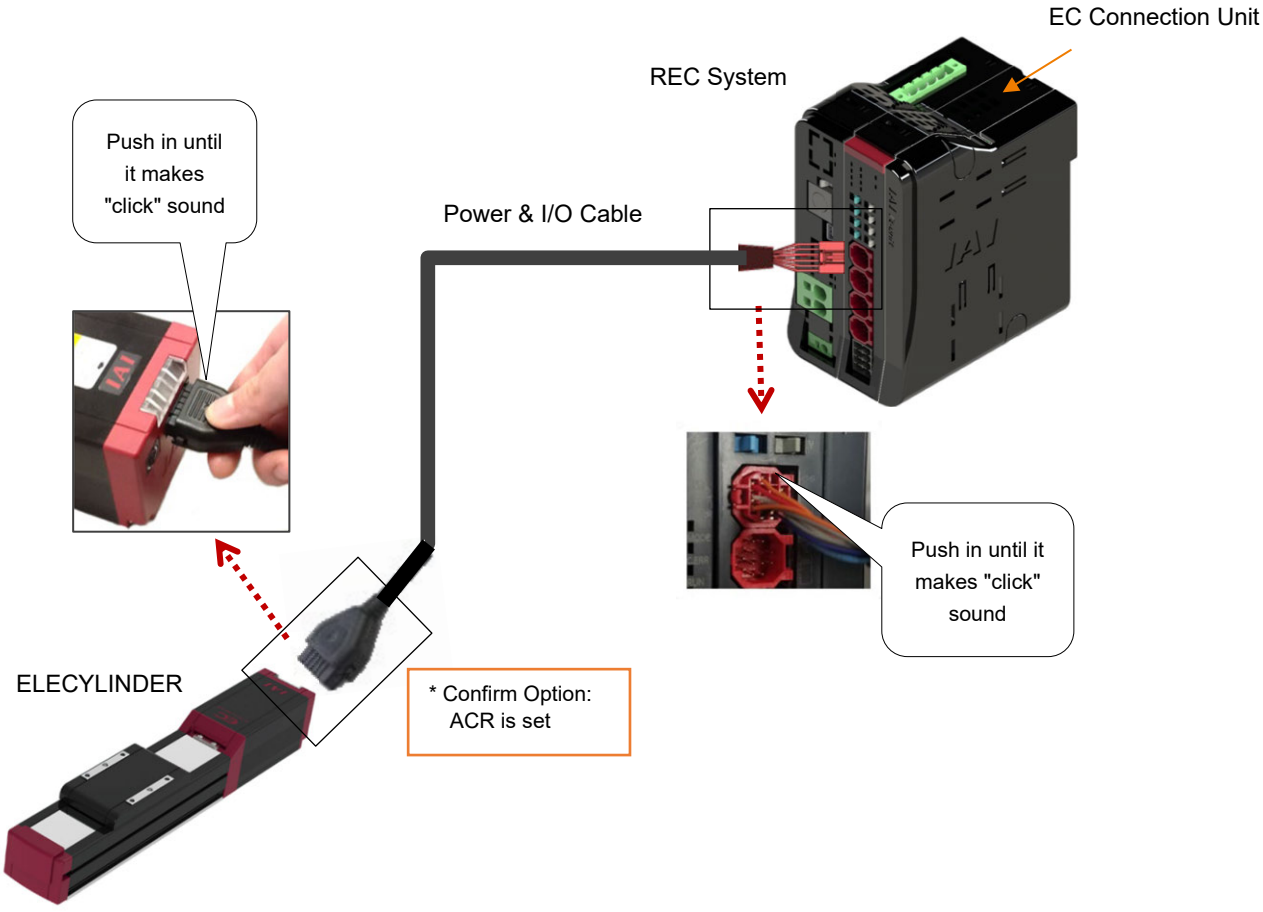
3) Then, push in the last tab to the socket.



6.2 Wiring Method (Pulse Motor Equipped Models)

6.2.1 Interface Built-in Type / Dust-proof/splash-proof type Wiring

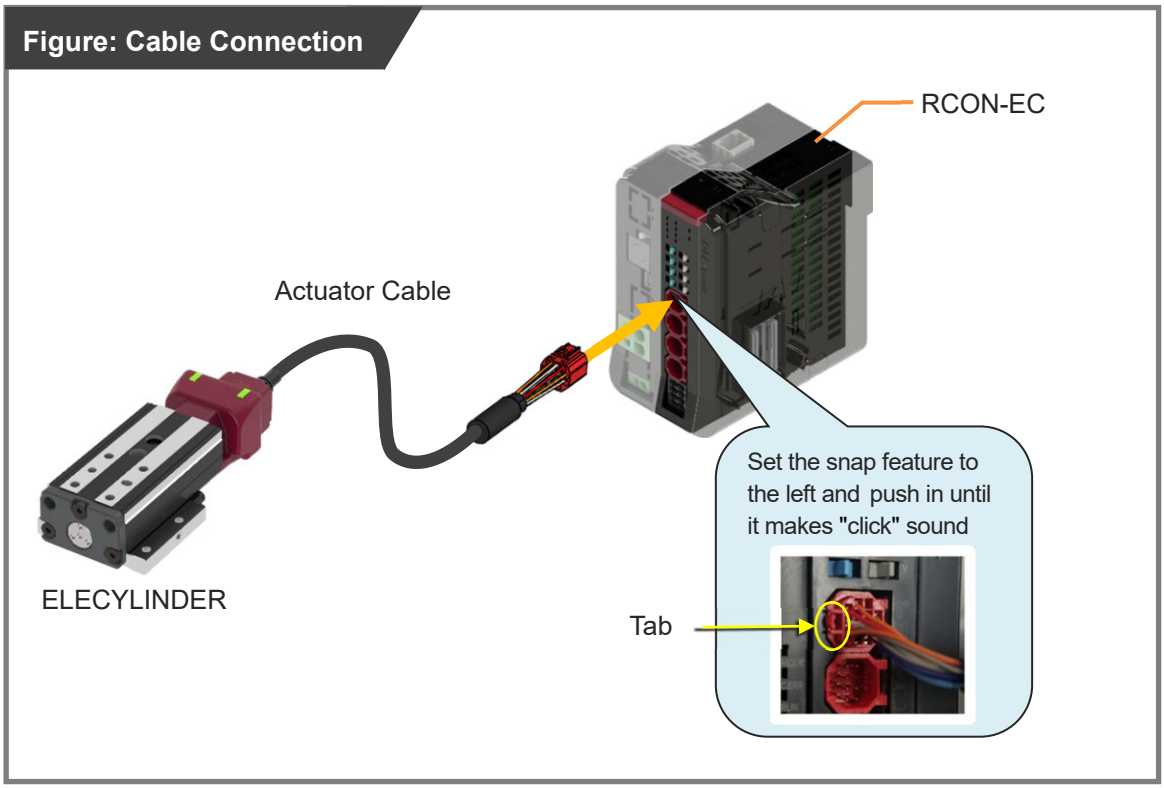
Refer to the example of connection below to insert the connectors to ELECYLINDER and the EC connection unit. Push the connectors inward till it makes "click" sound.
The axis number should be determined by the position of the connector on the EC connection unit.



6.2.2 Interface Separate Type Wiring (Connecting Directly to EC Connection Unit)

Connect the actuator cable to the EC connection unit (RCON-EC).

Figure: Cable Connection



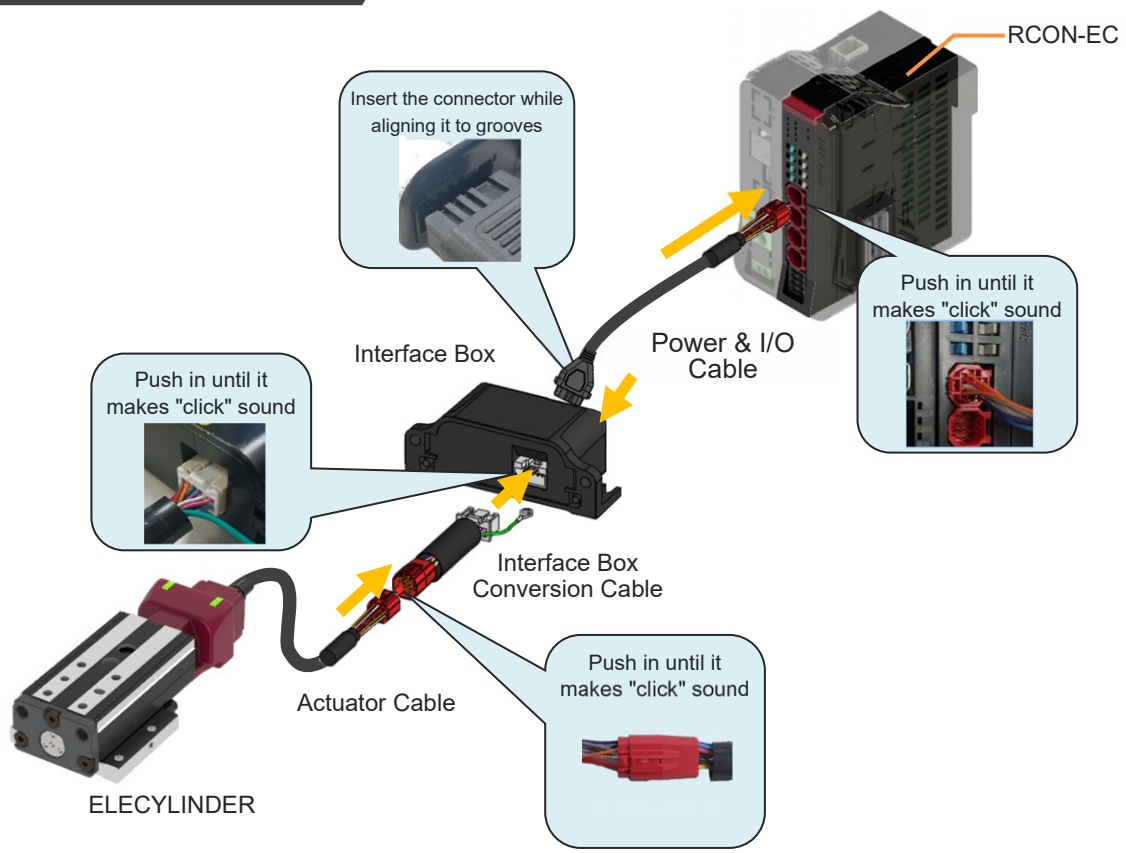
Caution

- There is an orientation for insertion to the connector.
  Align the orientation to the profile of the connector and push in until it makes "click" sound.

6.2.3 Interface Separate Type Wiring (When Interface Box is used)

When connecting to an EC connection unit using an interface box, perform the wiring as shown in the figure below.

Figure: Cable Connection



Caution

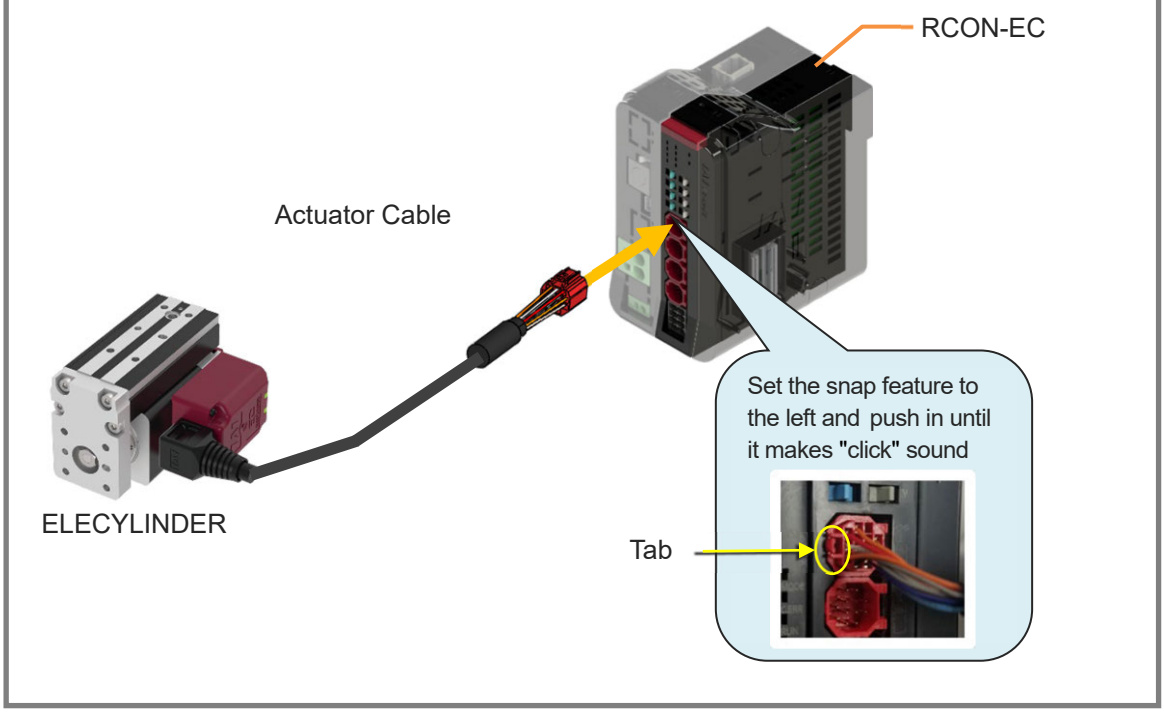
- There is an orientation for insertion to the connector.
  Align the orientation to the profile of the connector and push in until it makes "click" sound.

6.3 Wiring Method (24V AC Servomotor Equipped Models)

6.3.1 When Connecting Directly to EC Connection Unit

Connect the actuator cable to the EC connection unit (RCON-EC).

Figure: Cable Connection



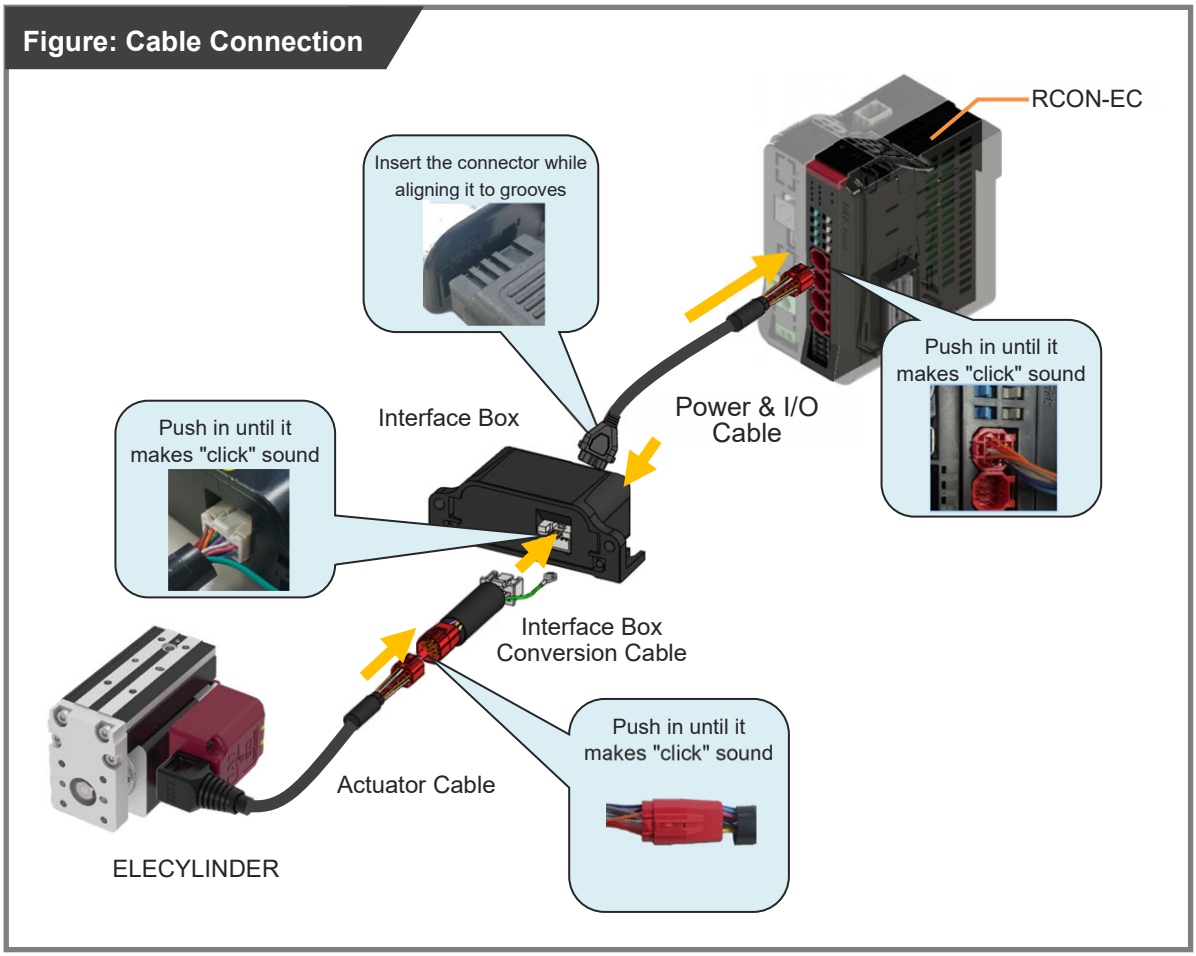
Caution

- There is an orientation for insertion to the connector.
  Align the orientation to the profile of the connector and push in until it makes "click" sound.

6.3.2 When Connecting from Interface Box to RCON-EC

When connecting to an EC connection unit using an interface box, perform the wiring as shown in the figure below.

Figure: Cable Connection

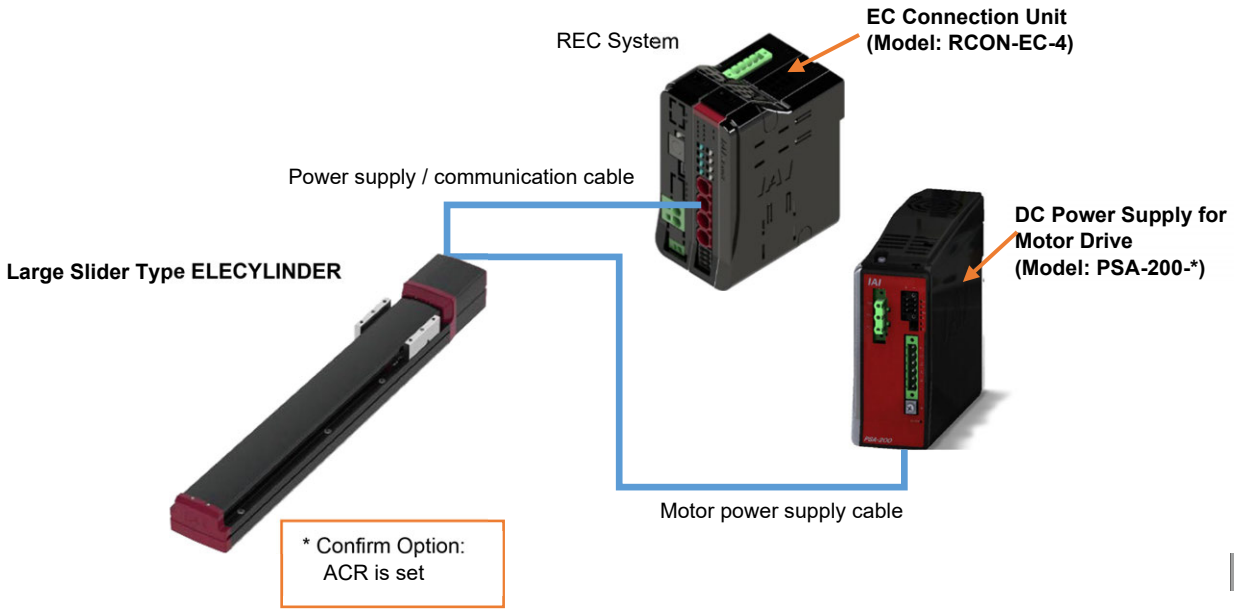


Caution

- There is an orientation for insertion to the connector.
  Align the orientation to the profile of the connector and push in until it makes "click" sound.

6.4 Wiring Method (200V AC Servomotor Equipped Models)

When the large slider type ELECYLINDER is to be connected to an EC connection unit, it is necessary to have a connectivity established with a DC power supply for motor drive as well as 24V power supply.
Shown below is an example of this specific wiring layout.



Caution

- Make sure to confirm that option ACR (RCON-EC connection specifications) is selected for ELECYLINDER before connecting.
  The ELECYLINDER model code is described on the production label on the left side of the main unit.

For the DC power supply for motor drive wiring, refer to [Startup Section Chapter 5 200V AC Servomotor Equipped Models Wiring]

Operation Section

Chapter 1

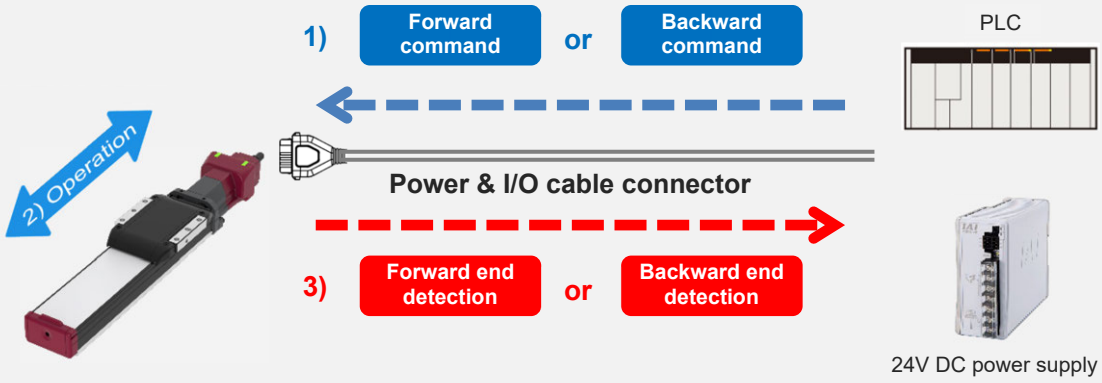
Operation from Teaching Tool

1.1 Basic operation

An input signal from a master device to the ELECYLINDER triggers operation of the ELECYLINDER.
The ELECYLINDER status can also be determined when the master device receives signal output from the ELECYLINDER.
Control is just as simple as when using a solenoid valve (Solenoid valve) and air cylinder drive.
This manual introduces an example using a PLC connected as the master device.

Connection image **PLC/ELECYLINDER connection**

1) **Input a movement command signal from the PLC. (forward or backward)**
2) **The ELECYLINDER operates.**
3) **A position detection signal is output from the ELECYLINDER. (forward end or backward end)**



Reference

- The ELECYLINDER continues operation while a movement command signal is input, outputting a position detected signal when the movement is complete. Turning the movement command signal OFF before the movement is complete interrupts the operation and causes a gradual stop. Home return operation is similar.

1.1.1 Order to turn power on

Shown below is the recommended order to turn the power on. There should be no problem even if the order is swapped.

♦ For Models with Pulse Motor Equipped and 24V AC Servomotor Equipped Model

[Order to turn power on]

1) Turn ON the power to the peripheral devices such as PLC.
2) Turn ON the control power supply (24V DC) to ELECYLINDER units.

[Time before turning ON power supply after turning it OFF]

● ELECYLINDER Unit : 1s or more after turning 24V DC power supply OFF

[Time required for ELECYLINDER startup (Power supply to initialization)]

Approx. 1s

♦ For Models with 200V AC Servomotor Equipped

[Order to turn power on]

1) Turn ON the power to the peripheral devices such as PLC.
2) Turn ON the control power supply (24V DC) to ELECYLINDER units.
3) Turn on the DC power supply (PSA-200) for motor drive.
   After supplying the control power (L1C-L2C), supply the motor driver power (L1-L2).
   Or, turn both of them at the same time.

[Time before turning ON power supply after turning it OFF]

● ELECYLINDER Unit: 1s or more after turning 24V DC power supply OFF
● DC power supply (PSA-200) for motor drive:
2s or more after turning 24V DC power supply OFF

[Time required for ELECYLINDER startup (Power supply to initialization)]

Approx. 3s

1.1.2 Order to turn power off

Shown below is the recommended order to turn the power off. There should be no problem even if the order is swapped.

♦ For Models with Pulse Motor Equipped and 24V AC Servomotor Equipped Model

[Order to turn power off]

1) Turn OFF the control power supply (24V DC) to ELECYLINDER units.
2) Turn OFF the power to the peripheral devices such as PLC.

♦ For Models with 200V AC Servomotor Equipped

[Order to turn power off]

1) Turn OFF the motor drive DC power supply (PSA-200).
   Turn the motor drive power (L1-L2) off first, and then turn the control power (L1C-L2C) off.
   Or, turn them off at the same time.
2) Turn OFF the control power supply (24V DC) to ELECYLINDER units.
3) Turn OFF the power to the peripheral devices such as PLC.

1.2 Teaching tool connections and testing operation

A teaching pendant or PC software can be used to test operation or configure data settings. Refer to the following instruction manuals for how to use each tool.
This manual introduces operating methods when a teaching pendant is connected to an interface box. Except for the wireless connection, the operation windows for TB-02 and TB-03 should be the same.

Product name / Instruction manual name	Manual No.
IA-OS First Step Guide * For how to operate, refer to the help features installed in IA-OS	ME0391
RCM-101-MW/RCM-101-USB	ME0155
Applicable for ELECYLINDER TB-02/02D Instruction Manual	ME0355
Applicable for ELECYLINDER TB-03 Wireless Link Instruction Manual	ME0375
Applicable for ELECYLINDER TB-03 Wired Link Instruction Manual	ME0376

Caution

- Maximum stroke operation is configured at shipping.
- Before operating the ELECYLINDER, make sure to check there is nothing that will interfere with moving parts within the operation range.

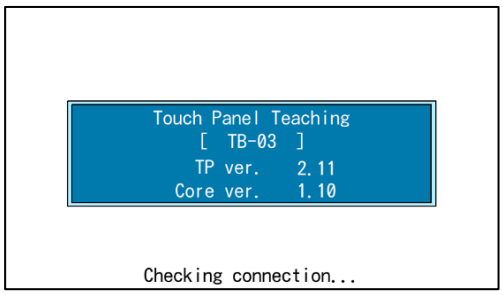
Reference

- Refer to the instruction manual of a [Gateway Unit or SEL Unit Instruction Manual] to be used for how to operate when ELECYLINDER is connected to RCON-EC.

1.2.1 Wireless Link to teaching pendant (TB-03)

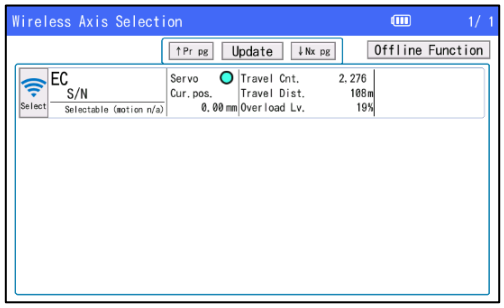
1. Turn the ELECYLINDER power on, and then turn on the power of the TB-03.
   It is recommended to have distance between TB-03 and ELECYLINDER of 5m or less with no interruption.

2. Initial display window starts up.



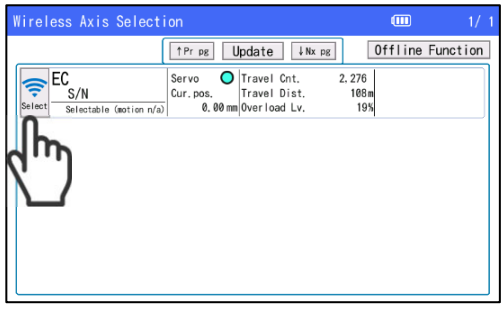
3. Wireless axis selection window appears.

   It may take time to show the display depending on the reception of the signal.

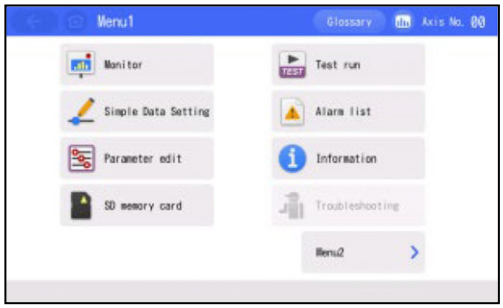


4. Select the ELECYLINDER you want to connect, and touch 

.

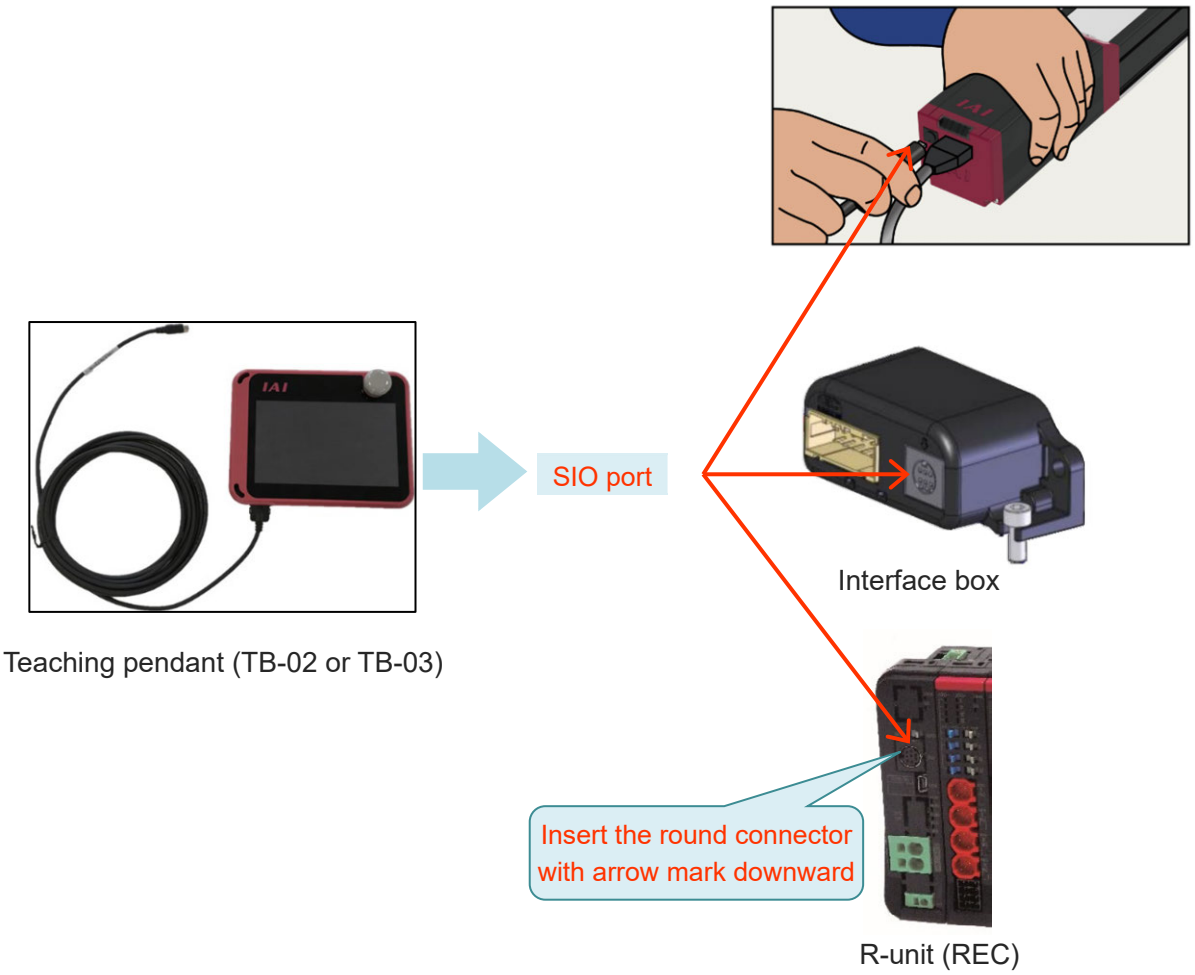


5. When the connection is successful, the Menu screen will be displayed.



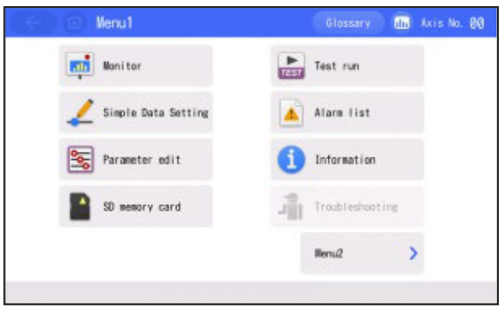
1.2.2 Wired link to teaching pendant (TB-02 or TB-03)

1. Connect the teaching pendant (TB-02 or TB-03).
   While the power is turned off, insert the round connector on the teaching pendant to the SIO port on the ELECYLINDER (interfacing box for some products) or R-unit.



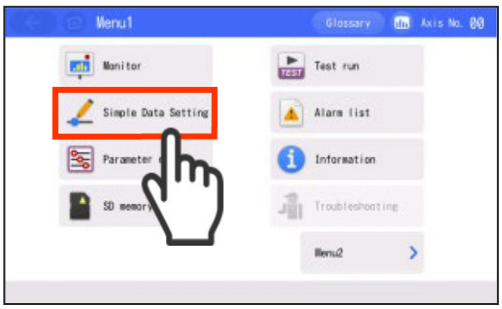
2. Turn ON the 24V DC power supply.

   The teaching pendant will start up and the menu screen will be displayed.



1.2.3 ELECYLINDER test operation

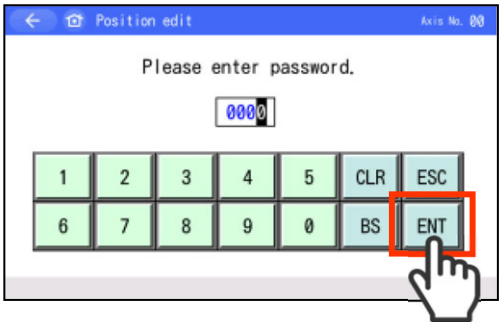
1. Touch the Simple Data Setting .



The screen will switch to the Simple Data Setting window.
If the position edit password is set to a value other than "0000", the password input screen will be displayed.

> If the operating mode is not Monitor mode, the Message screen will be displayed.
> Switch to Monitor mode by following the displayed instructions.

2. If the position edit password is set to a value other than "0000", enter the password and press the ENT on the touch panel.

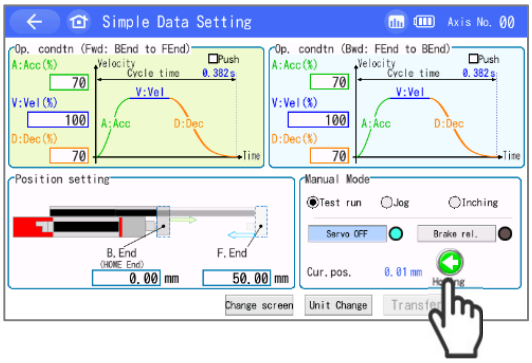


The screen will switch to the Simple Data Setting window.

Reference

- The position edit password is set to "0000" at shipping.
  Refer to the [TB-02 Instruction Manual (ME0355)] [TB-03 Instruction Manual (ME0375, ME0376)] for information about changing the password.

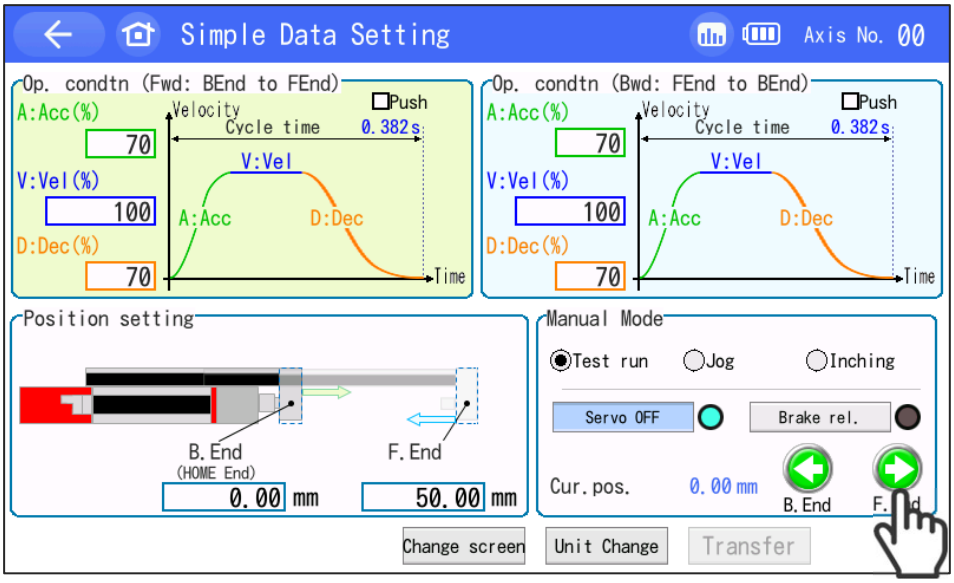
3. Touch the Homing .



The ELECYLINDER returns to the home position.
After home return operation completes, the B.End and F.End will appear.

4. Touch the F.End or B.End .

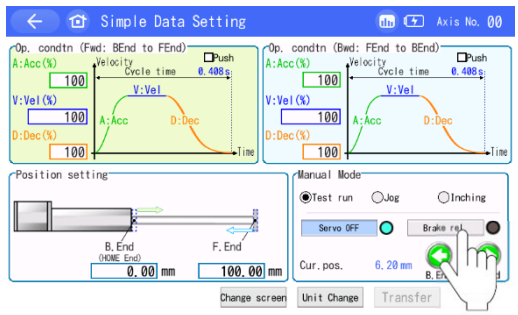
The moving part will move toward the forward or backward end.
Releasing the controls during operation will cause the unit to slow to a stop.

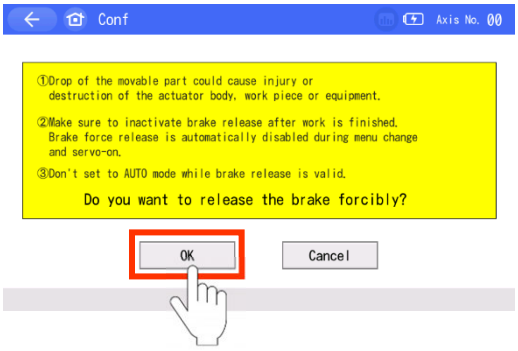


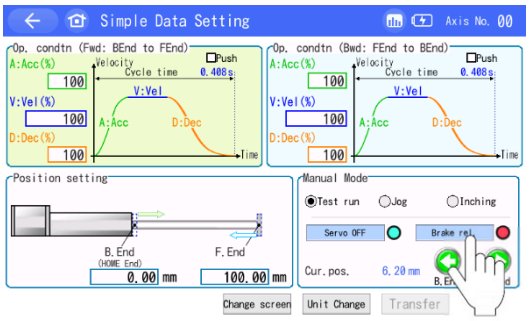
(Note) For wireless connection, it must be WL2 specification to work.

5. Touch Compulsory Brake Release.
A confirmation window should appear.
Touch OK and the brake should get released.

Touch Compulsory Brake Release again and the signal should turn off (brake activated).







Warning

- Be careful when releasing the brake. Releasing carelessly may cause injury or damage to ELECYLINDER, workpiece or surrounding devices due.
- After releasing the brake, be sure to return the brake to the enabled status. It is very dangerous to operate with the brake released. May cause injury or damage to ELECYLINDER, workpiece or surrounding devices due.
- Make sure that this signal is turned off (brake activated) when the power to a controller is turned on.
- It is prohibited to switch over between AUTO and MANU while this signal is ON (brake is released).

1.3 Stop position / operating conditions (AVD) setting / adjustment

The stop position and operating conditions are set for the ELECYLINDER at shipping.
The Simple Data Setting screen can be used to adjust the stop position and operating conditions.

Caution

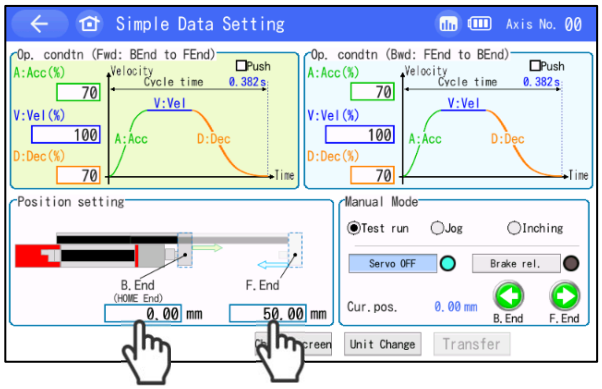
- Be sure to touch the Transfer after configuring or adjusting data.
- The data will return to the previous state if the screen is changed without pressing transfer.
  Moreover, the Manual Mode will not work if data is not transferred.

1.3.1 Stop position setting / adjustment (forward end / backward end)

Setting item	Unit	Explanation
Backward end, forward end	mm	Enter as the distance from the home position. Entries can be made in increments of 0.01mm.

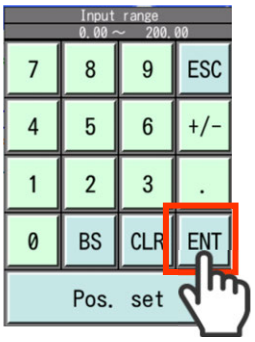
1. Touch the position you want to configure/adjust.

Ten Key window will open.



2. After setting the numerical value, touch the [ENT] .
Then touch the [Transfer] .

A value will be written to the controller and the [B.End] and [F.End] will turn green.



3. Press the [F.End] or [B.End] to operate.

Check the results of the new setting/adjustment.
If you stop touching during operation, the moving parts will decelerate and stop from the spot.

1.3.2 Operating conditions (AVD) setting / adjustment

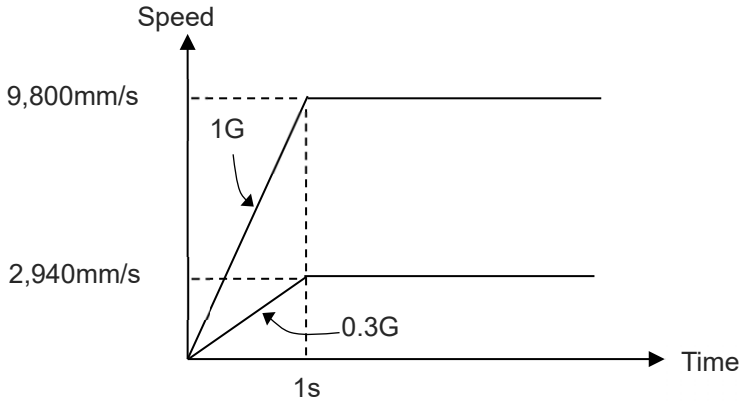
A:Acceleration
V:Velocity
D:Deceleration
→AVD

Setting item	Unit	Explanation
A: Acceleration	[%] or [G]	Set the acceleration between 1 and 100%. Touch the Unit Change to switch the units to [G], allowing entries to be made in increments of 0.01G.
V: Velocity	[%] or [mm/s]	Set the acceleration speed 1 and 100%. Touch the Unit Change to switch the units to [mm/s], allowing entries to be made in increments of 0.01mm/s.
D: Deceleration	[%] or [G]	Set the deceleration between 1 and 100%. Touch the Unit Change to switch the units to [G], allowing entries to be made in increments of 0.01G.

Reference

The acceleration/deceleration unit of [G] is described below.

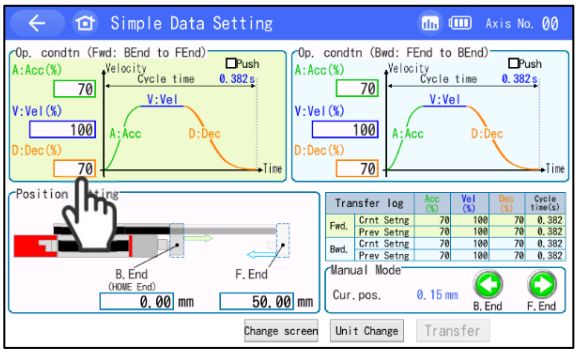
1G = 9,800mm/s^2: Acceleration possible up to 9,800mm/s per second.
For 0.3G, the acceleration per second is 9,800mm/s^2 × 0.3 = 2,940mm/s^2.



The procedure on the following page can be used to configure/adjust the operating conditions (AVD).
Note that the ELECYLINDER has an automatic calculation function for "Maximum velocity and maximum acceleration/deceleration".

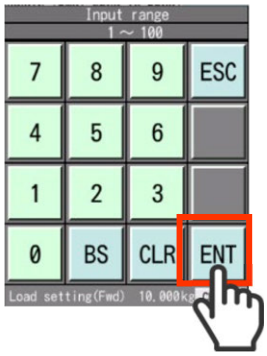
1. Touch the position you want to configure/adjust.

   Ten Key window will open.



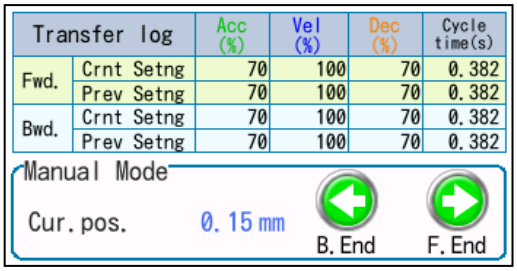
2. After setting the numerical value, touch the [ENT] .
   Then touch the [Transfer] .

   A value will be written to the controller and the [B.End] and [F.End] will turn green.
   The "Transfer log" will also be updated.



3. "Crnt Setng" and "Prev Setng" cycle time calculation results are updated.

   Press the [F.End] or [B.End] to operate.
   Check the results of the new setting/adjustment.



Caution

- If abnormal noise, vibration or impacts occur when the ELECYLINDER is operated, lower the acceleration and deceleration rates.
  Usage without lowering these rates may lead to breakdowns.

1.3.3 Pressing operation setting

Caution

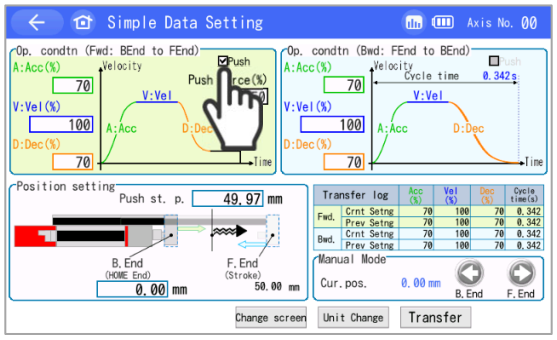
- The models equipped with the 200V AC servomotor and Belt type (EC-B6/B7/B8) should not be applicable for the pressing operation.

Setting item	Unit	Explanation
Pressing starting point	[mm]	The position where pressing operation starts. Enter as the distance from the home position. Entries can be made in increments of 0.01mm.
Pressing force	[%] or [N]	The current limit value during the pressing operation. Touch the Unit Change to switch the units to [N], allowing entries to be made in increments of 0.01N.
		The pressing speed may vary depending on models. If "V: Velocity" is set to pressing velocity or below, pressing will take place at the speed of "V: Velocity".

Caution

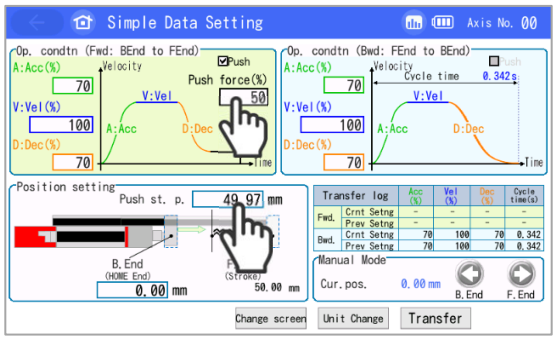
- The pressing force displayed in newton [N] serves as a guideline.
  Refer to [instruction manual for each ELECYLINDER, Chapter 1 Specifications] for reference of pressing force.
- When the pressing speed is 20mm/s or less, the pressing force will become unstable, and failure to operate normally is possible.

1. Check "Push".
   The screen will switch to the pressing operation window.



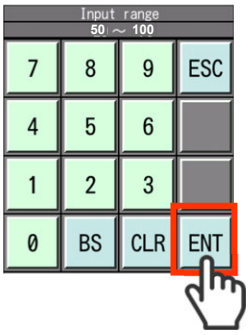
2. Select "Pressing Force" and "Pressing Start Point" and set the values.

   Ten Key window will open.



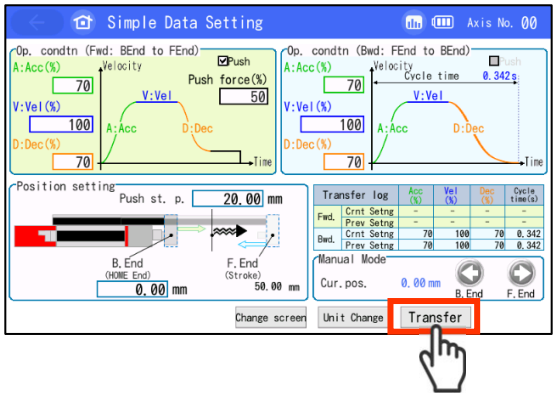
3. After setting the numerical value, touch the [ENT] .

   The screen will switch to the Simple Data Setting window.



4. Touch the [Transfer] .

   The numerical values will be written to the controller.
   The [B.End] and [F.End] will turn green.



5. Press the [F.End] or [B.End] to operate.

   Check the results of the new setting/adjustment.

1.4 Operation noise adjustment

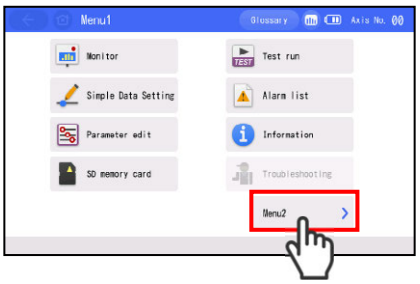
1.4.1 Operation sound adjustment overview

The operation noise of ELECYLINDER can be tuned.
When there is abnormal noise, especially when during stop or in low speed, there is extreme high noise, the abnormal noise may get improved by raising the setting level.
Also, by pulling down the setting level, low operation noise may be able to be reduced.
Setting from levels from 0 to 14 (when ultra mini EC, 1 to 9) is available in the operation sound tuning window.
However, setting the level too high may cause vibration.

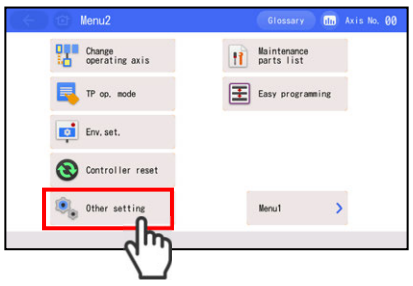
1.4.2 Setting method

Stated below explains how to set up in the teaching pendants (TB-03 or TB-02).

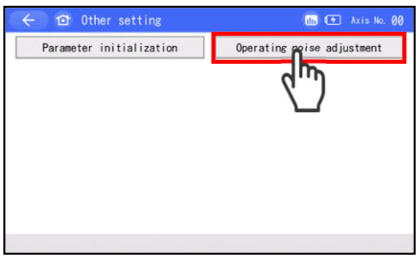
1. Menu 2 screen is displayed.



2. Touch Other setting in Menu 2 screen.

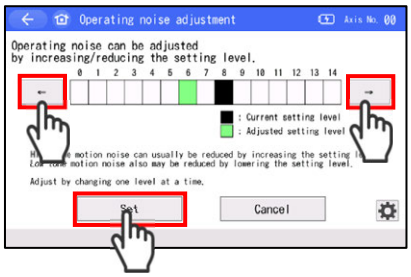


3. Touch the Operation noise adjustment .



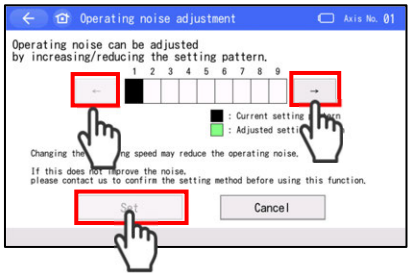
4. Touch ← and → on the right and left of the levels (from 0 to 14) to adjust the level one by one to perform tuning. Once the tuning is finished, touch Set .

[Operation Sound Tuning Window for Other Than Ultra Mini EC]



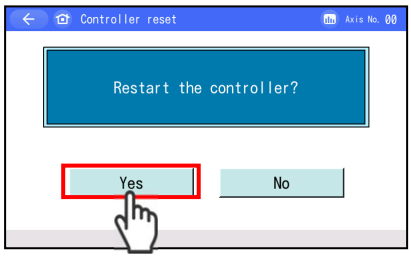
* The contents in Operation noise tuning window in the Ultra Mini ELECYLINDER should differ from those for ELECYLINDER other than this type.

[Operation Sound Tuning Window for Ultra Mini EC]



5. Touch the Yes .

Touch No and a reboot of the controller would not be performed and the screen goes back to the previous screen.



The controller is restarted. Returns to Menu 1 screen.

Caution

- Changing settings only should not enable the changes made.
- Conduct reboot of the power or software reset after a change is made.
  After ELECYLINDER is started up, the parameter changes should become enable.
- Do not attempt to turn the power off while the data are being overwritten. Doing so may damage the controller.

1.5 Automatic servo OFF function

1.5.1 Automatic servo OFF function overview

Automatic Servo OFF Function of ELECYLINDER can be set up.
With automatic servo OFF function, the servo turns OFF automatically after a certain period of time once (delay time) positioning is completed.
Conduct the next movement command input and the servo should turn on automatically and the positioning operation should be executed.
Since holding current does not flow during the stop, power consumption can be reduced.

[Pressing operation]
When it is necessary to have the pressing operation performed, do not set up Automatic Servo OFF Function.
Once ST Signal turns off after the pressing completed, Automatic Servo OFF Function should be activated and the servo gets turned off.

Compatible versions of Teaching software and Teaching tools.

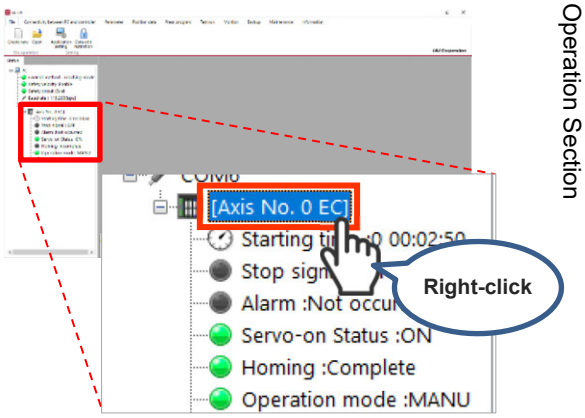
IA-OS : Ver.12.00.02.00 or later
TB-02 : Ver.4.00 or later
TB-03 : Ver.4.00 or later

* The digital speed controller teaching and remote speed controller are not applicable for this function.

1.5.2 Setting method

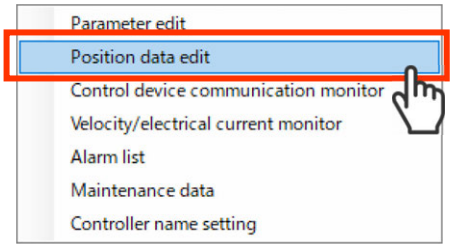
Below explains how to set it up in the PC teaching software [IA-OS].
Refer to "PC Teaching Software IA-OS First Step Guide (ME0391)" for how to install, connect and start up IA-OS.

1. Right-click [Axis No.0 EC] in the status box in the IA-OS main screen.



2. Click Position data edit from the displayed menu.

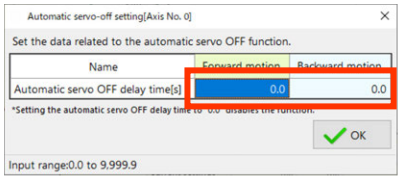
• The simple data setup screen should be displayed.



3. Click Automatic servo-off on the simple data setup screen.

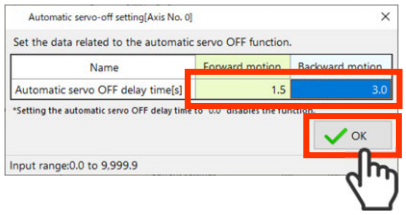
• The Automatic servo-off setting screen should be displayed.

4. Set the duration from the time after positioning complete until Automatic servo OFF, the Automatic servo-off setting screen.



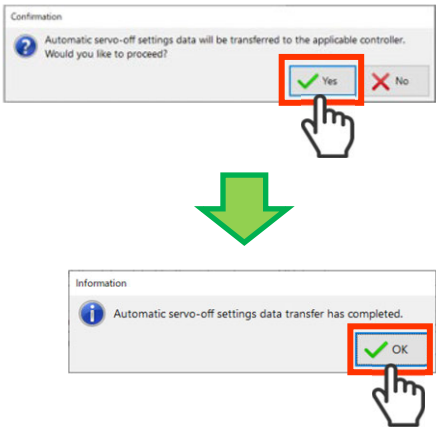
- Input for both the way forth (forward) and the way back (backward).
- The Automatic servo OFF delay time can be set in unit of 0.1 second.

5. Input the Automatic servo OFF delay time, and click OK.

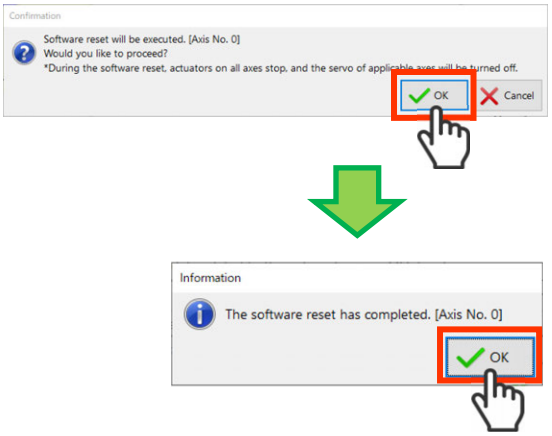


・Set it to "0.0" and this function will inactivated.
(The servo will not turn off.)

6. Once the confirmation screen for transfer to the controller appears, click OK.
Once the transfer is completed, click OK.



7. Once the execution confirmation window for the software reset appears, click Yes.
Once the software reset is completed, click OK.



This is the end of the setup.

Caution

- Changing parameters only should not enable the changes made.
- Conduct reboot of the power or software reset after a change is made.
  After ELECYLINDER is started up, the parameter changes should become enable.
- Do not attempt to turn the power off during the setting transfer.
  Doing so may damage the controller.
- Do not use Automatic servo OFF with push-motion operation. When the pressing operation is conducted, it should be effective only when the pressing is missed (operation complete without touching subject = same condition as completion when positioning).
- There is no holding torque during Automatic servo OFF. The actuator will move if external force is applied. Take extra care when setting. Pay attention to interference and safety when setting up.
- Automatic servo OFF does not function if operating in teaching mode with PC software.

Operation Section

Chapter 2

Operation from Master Device

2.1 I/O signals

2.1.1 I/O signal list

ELECYLINDER I/O signals are as follows.

[Double solenoid system]

Category	Signal name	Signal abbreviation	Function overview
Input	Backward	ST0	Turning ON sends it backward. Turning OFF midway through operation will cause a gradual stop.
			Turning ON when home return is not complete triggers home return operation. Turning OFF midway through operation will cause a gradual stop.
	Forward	ST1	Turning ON sends it forward. Turning OFF midway through operation will cause a gradual stop.
			Turning ON when home return is not complete triggers home return operation. Turning OFF midway through operation will cause a gradual stop.
	Alarm clear	RES	Turning ON resets the alarm.
	Brake release	BKRLS	Inputting 24V DC releases the brake.
Output	Backward complete or Pressing complete	LS0 or PE0	ON when entering the backward end detection range. ON when pressing operation is complete.
	Forward complete or Pressing complete	LS1 or PE1	ON when entering the forward end detection range. ON when pressing operation is complete.
	Alarm (b-contact)	*ALM	ON in normal conditions. OFF when an alarm occurs.

Caution

- When home return is complete and when it is not, the "ST0" signal and "ST1" signal have different functions.

[Single solenoid system]

Category	Signal name	Signal abbreviation	Function overview
Input	Forward/ Backward	FWBW	Moves forward when it is turned ON. Moves backward when it is turned OFF. Turn it OFF from the state of ON during operation and it decelerates and reverses to the backward operation. Turn it ON from the state of OFF during operation and it decelerates and reverses to the forward operation.
			Turn it ON while the home-return operation is incomplete and the home-return operation should be performed and moves forward.
			Turn it ON and it starts up, and turn it OFF while the home-return operation is incomplete and the home-return operation should be performed and moves backward.
	Alarm clear	RES	ON resets the alarm.
	Brake release	BKRLS	Inputting 24V DC releases the brake.
Output	Backward complete or Pressing complete	LS0 or PE0	ON when entering the backward end detection range. ON when pressing operation is complete.
	Forward complete or Pressing complete	LS1 or PE1	ON when entering the forward end detection range. ON when pressing operation is complete.
	Alarm (b-contact)	*ALM	ON in normal conditions. OFF when an alarm occurs.

2.1.2 Double solenoid system "ST0", "ST1" signals: Movement command input (backward/forward)

The ST signal function automatically switches depending on whether the unit has completed home return or not.

Signal name	Signal abbreviation	Function overview by status	
		Home return: Not complete	Home return: Complete
Backward	ST0	Backward after home return operation	Backward
Forward	ST1	Forward after home return operation	Forward

[Home return status: Not complete]

- When the "ST0" signal is turned ON, home return operation begins.
  The actuator should move to the backward end after the home-return operation completes.
- When the "ST1" signal is turned ON, as with the "ST0" signal, home return operation begins.
  The actuator should move to the forward end after the home-return operation completes.
- Turning the ST signal OFF midway through home return operation will cause a gradual stop.

[Home return status: complete]

- When the ST signal is turned ON, the moving part moves Backward or Forward.
- While the ST signal is ON, operation will continue until the Backward end or Forward end is reached.
- Turning the ST signal OFF midway through operation will cause a gradual stop.
  For details, refer to [2.2 Operating method from master device].

Caution

- If stopped when the LS or PE signals are not ON, the ELECYLINDER may be stopped on the way to the backward or forward end, or it may have stopped at the backward or forward end during pressing operation with no contact.
  We recommend first inputting the "ST0" signal and then performing the following actions after returning to the backward end.
- When the encoder is the incremental type, the condition after the power is rebooted should be in the home-return incomplete. Also, it is necessary to perform the home-return operation (absolute reset) when parameters are changed in "Home-Return Direction Change", "Home Position Adjustment" as the condition of home-return should get to incomplete.
  For details, refer to [4.4 Parameter function descriptions].

2.1.3 Single solenoid system "FWBW" signals: Movement command input (backward/forward)

The "FWBW" signal function automatically switches depending on whether the unit has completed home return or not.

Signal name	Signal abbreviation	Function overview by status	
		Home return: Not complete	Home return: Complete
Forward/ Backward	FWBW	Forward/backward after home-return operation	Forward/Backward

[Home return status: Not complete]

- When the "FWBW" signal is turned ON, home return operation begins.
  It makes a movement forward after the home-return operation is completed.
- Turn "FWBW" signal OFF during the home-return operation and it makes a movement backward after the home-return operation is completed.

[Home return status: complete]

- When the "FWBW" signal is turned ON, the moving parts moves Forward.
  When the "FWBW" signal is turned OFF, the moving parts moves Backward.
- While the signal is ON, operation will continue until the "Forward end" is reached.
  While the signal is OFF, operation will continue until the "Backward end" is reached.
- Turn "FWBW" signal OFF during the home-return operation and it decelerates and reverses to the backward operation.
  Turn "FWBW" signal ON during the home-return operation and it decelerates and reverses to the Forward operation.
  For details, refer to [2.2 Operating method from master device].

Caution

- If stopped when the LS or PE signals are not ON, the ELECYLINDER may be stopped on the way to the backward or forward end, or it may have stopped at the backward or forward end during pressing operation with no contact.
  It is recommended to turn "FWBW" signal first to set it back to the backward end, and then move on to the next operation.
- For the incremental type, it is necessary to perform the home-return operation as it gets to the condition home-return incomplete once the power is rebooted. Also, for the battery-less absolute type, when a parameter change such as "home-return direction change" and "home position tuning", the home-return condition gets incomplete. Perform the absolute reset.
  For details, refer to [4.4 Parameter function descriptions].

2.1.4 "RES" signal: Alarm clear input

- When the "RES" signal is turned ON, the currently triggered alarm will be cleared.
- Alarm clear may not be possible depending on the alarm itself.
  For details, refer to [Maintenance Section 1.6 Troubleshooting by alarm groups].

2.1.5 "BKRLS" input: Brake release input

- To release the brake, input 24V DC into "BKRLS" input.
- The brake will release while the signal is input.
- Refer to the following for the necessary power current while the brake is released.
  - For Models with Pulse Motor Equipped
    [Specifications Section 3.7 Power Supply Current at Brake Release]
  - For Models with 24V AC Servomotor Equipped
    [Specifications Section 4.4 Power Supply Current at Brake Release]
  - For Models with 200V AC Servomotor Equipped
    [Specifications Section 5.5 Power Supply Current at Brake Release]

Reference

- The ELECYLINDER brake is a non-excitation actuating solenoid brake.
- In normal operation the brake is automatically released, but when the servo is OFF or power is OFF the brake engages. The brake must be released in order to move the movable part (rod) by hand.

Warning

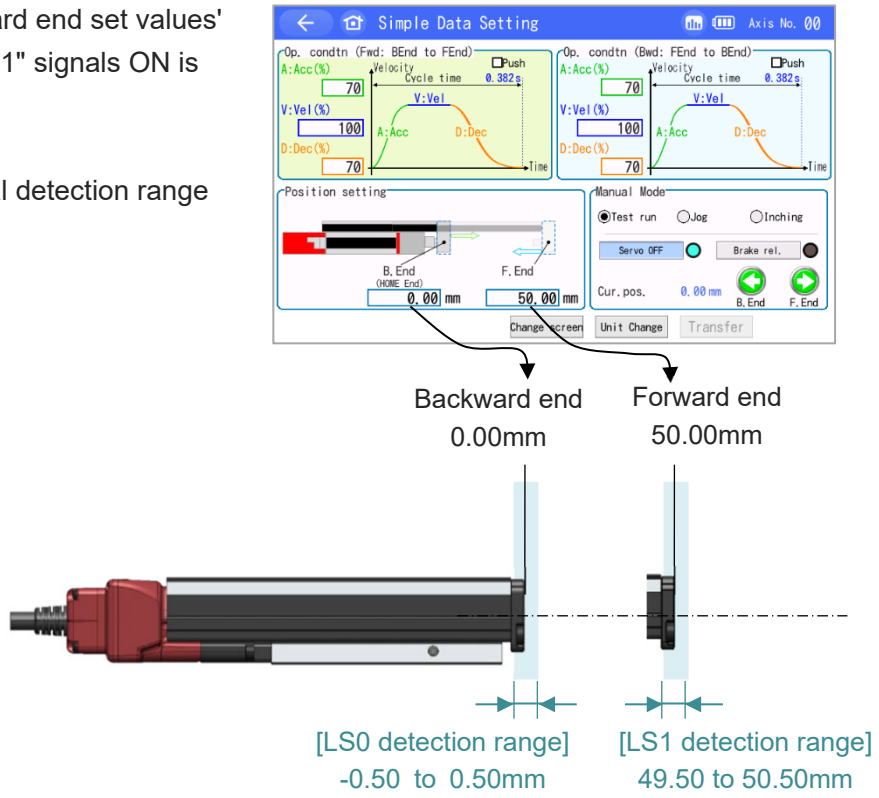
- Before releasing the brake, make sure to check there is nothing that will interfere with moving parts within the operation range.
- The moving parts may fall, possibly injuring the operator or people nearby and damaging the ELECYLINDER, workpiece or equipment.

2.1.6 "LS0", "LS1" signals: Position detection output (backward end/forward end)

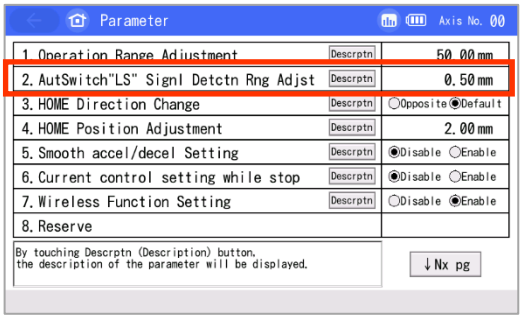
- The LS signals perform the same operation as an air cylinder automatic switch.
- The LS signals turn ON when the current ELECYLINDER position is within the detection range configured at the backward and forward ends.
- They turn ON when within the detection range regardless of whether the servo is ON or OFF if home return has completed.

The backward end and forward end set values' relationship to "LS0" and "LS1" signals ON is as follows.

In this example, the LS signal detection range is ±0.50mm.



To adjust the LS signal detection range, open the "edit parameters window".
Parameter No.2 "AutSwitch"LS" Signl Detctn Rng Adjst" can be used to make adjustments.



Caution

- If the pulse motor mounted type is in the battery-less absolute specification and also TMD2 type is used, "LS0" or "LS1" will not turn on even if the position is in the detection range when the power is turned off while the motor power supply is cut off.
  Turn the servo on after the power is supplied, and "LS0" and "LS1" signals should turn on.

2.1.7 "PE0", "PE1" signals: Pressing complete output (backward end/forward end)

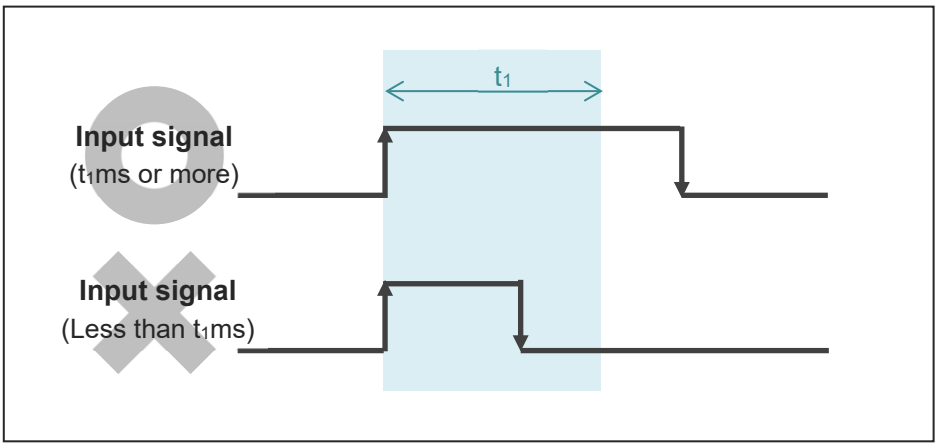
- Turns ON when "pressing complete" is determined during pressing operation.
- Turns OFF if no contact can be made.
  Refer to [2.2.1 [2] Pressing operation: "ST0", "ST1", "PE0", "PE1" signals] for details about pressing operation.

2.1.8 "*ALM" signal: Alarm output

- Turns ON when the ELECYLINDER is in normal status.
  Turns OFF when an alarm occurs.
- Always monitor the "*ALM signal" using the master device.
  If it turns OFF, immediately take appropriate safety countermeasures with the equipment as a whole.
  For details, refer to [Maintenance Section 1.6 Troubleshooting by alarm groups].

2.1.9 Signal input time constant

In order to prevent mis-operation due to chattering or noise, "ST0", "ST1", "FWBW" and "RES" signals are set with a t_1 [ms] input time constant.
For signals less than t_1 [ms] the device will not consistently recognize the signal, so input signals continuously for t_1 [ms] or longer.



Also, t_1 [ms] should differ depending on the models of ELECYLINDER. In the following page, shows a list of the input time constants.

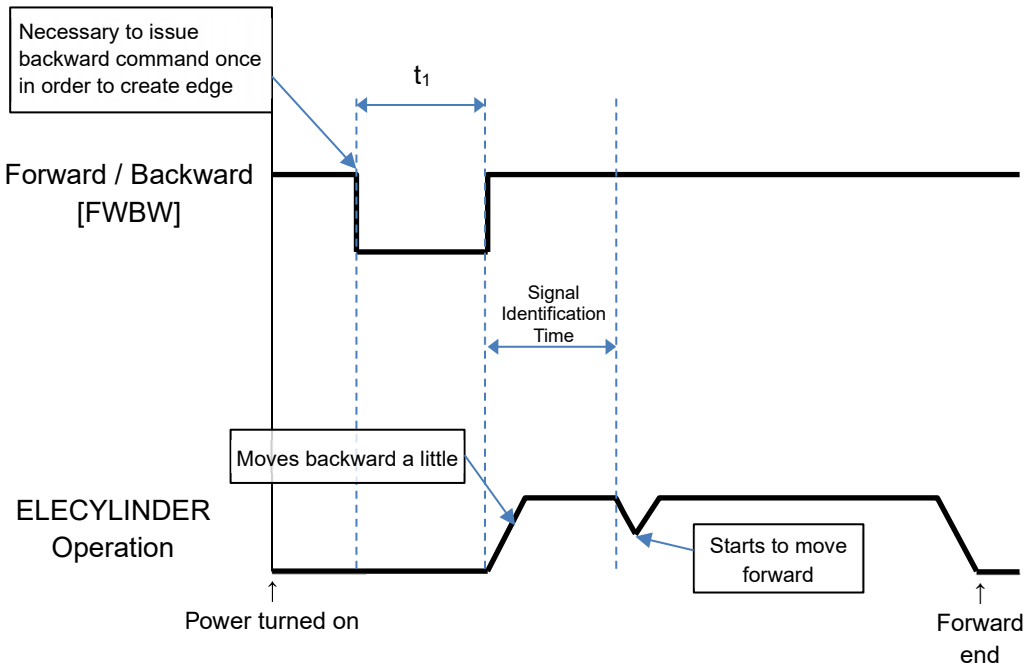
Table: List of Input Time Constants (t_1 [ms]) for Each Model

t_1	Type	Model
6ms or less	Slider	EC- EC-(D)S6□/(D)S7□/(D)S6□A/(D)S7□A/S6□H/S7□H/ (D)S6□AH/(D)S7□AH/(D)S6X□AH/(D)S7X□AH/ (D)S6□R/(D)S7□R/(D)S6□AR/(D)S7□AR/(D)S6□AHR/ (D)S7□AHR/(D)S6X□AHR/(D)S7X□AHR
	Belt	EC-(D)B6□/(D)B7□/B8S/B8SS
	200V AC servo motor slider	EC-S10(X)□/S13(X)□/S15(X)□/S18(X)□/S18(X)LP
	Rod	EC-(D)R6□/(D)R7□
	Radial cylinder	EC-(D)RR6/(D)RR7/RR6□H/RR7□H/(D)RR6□AH/(D)RR7□AH/ (D)RR6X□AH/(D)RR7X□AH/(D)RR6□R/(D)RR7□R/ (D)RR6□AHR/(D)RR7□AHR/
	Stopper cylinder	EC-ST11□/ST15L/ST15ME
	Gripper	EC-GRST6/GRST7
	Clean	EC-(D)S6□CR/(D)S7□CR/(D)S6□ACR/(D)S7□ACR/ (D)S6□AHCR/(D)S7□AHCR/(D)S6X□AHCR/(D)S7X□AHCR
12ms or less	Slider	EC-S2□/S2□R/(D)S3□/(D)S4□/(D)S3□A/(D)S4□A/(D)S3□R/ (D)S4□R/(D)S3□AR/(D)S4□AR/S8□/S8□A/S8□R/S8□AR/ S8X□A/S8X□AR/(D)WS10□/(D)WS12□/(D)WS10□R/ (D)WS12□R
	Radial cylinder	EC-RR2□/RR2□R(D)RR3□/(D)RR4□/(D)RR3□R/(D)RR4□R/ RR8□/RR8□R/RR10□/RR10□R
	Rod	EC-SRG11□/SRG15□ EC-CRP3□/CRP5□/CGD3□/CGD5□
	Table	EC-CTC3□/CTC5□
	Thin and Small	EC-RP3□/GD3□/TC3□/TW3□/RP4□/GS4□/GD4□/TC4□/TW4□/ RP5□/GD5□/TC5□/TW5□
	Ultra Mini	EC-SL3□/GDS3L/GDB3□/T3□
	Rotary	EC-RTB4M/RTC9/RTC12/RTC18
	Gripper	EC-GRB8/GRB10/GRB13/GRC6/GRC7/GRST3
	Clean	EC-(D)S3□CR/(D)S4□CR/(D)S3□ACR/(D)S4□ACR/ S8□CR/S8□ACR/S8X□ACR/(D)WS10□CR/(D)WS12□CR
	Dust-proof slider	EC-S6□D/S7□D
	Dust-proof, Splash resistant slider	EC-S6□W/S7□W
	Dust-proof, Splash resistant rod	EC-R6□W/R7□W/RR6□W/RR7□W

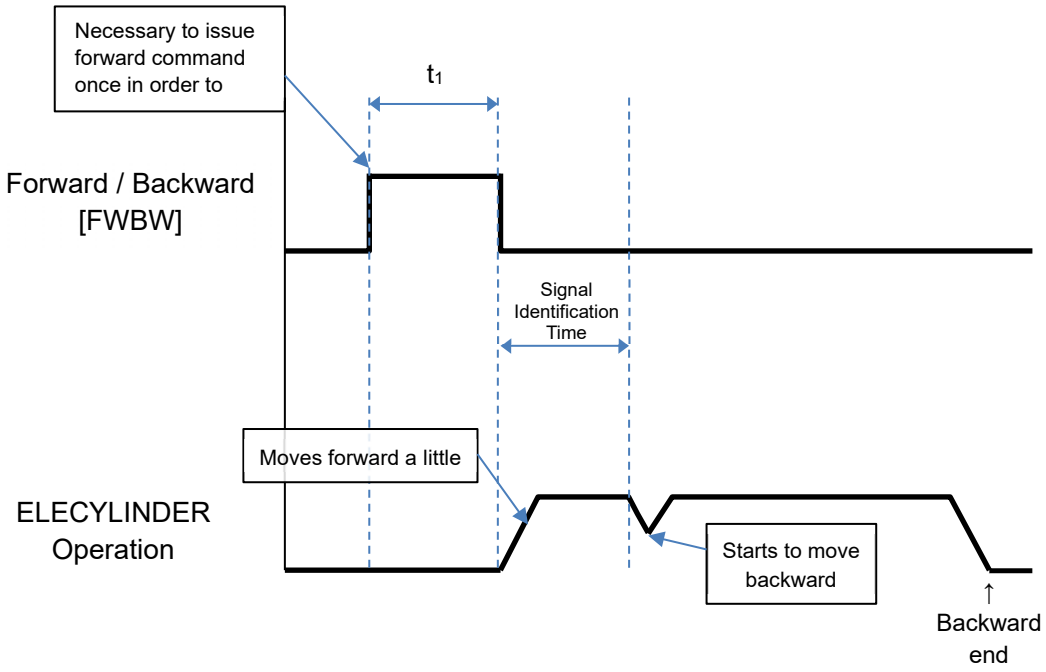
2.1.10 Caution in "FWBW" signal input in single solenoid system

"FWBW" Signal is to be detected at edges. Therefore, operation would not be made if the state of "FWBW" Signal is the same as the direction of move when it becomes ready to receive an input signal.
When "FWBW" Signal is in ON state alike the forward movement in such a case as shown below, it is necessary to have the signal level set OFF once.
As the signal level OFF is a command to make a movement to the backward end, when positioning has not been conducted at the backward end, movement should be made in the direction to the backward end once and then to the forward end.

- At powering
- When alarm canceled with RES Signal after alarm generated
- When 24V drive cutoff released (for TMD2)



Also, when "FWBW" Signal is in OFF state alike the backward movement, it is necessary to have the signal level set ON once.
As the signal level ON is a command to make a movement to the forward end, when positioning has not been conducted at the forward end, movement should be made in the direction to the forward end once and then to the backward end.



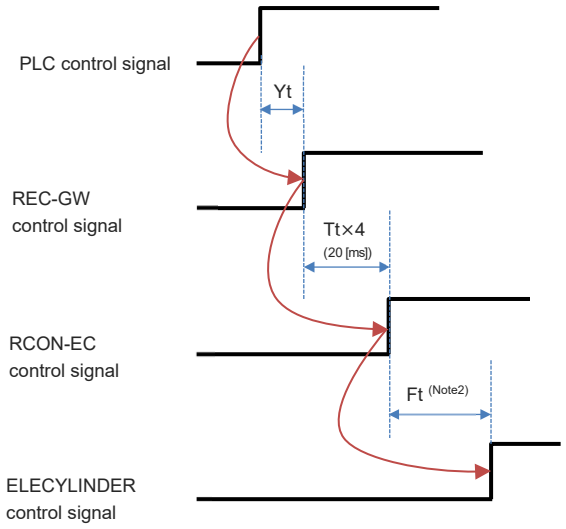
2.1.11 Input and Output Signal Timing when Connected to RCON-EC

When this product is to be connected to the EC connection unit (RCON-EC) and operation is to be conducted with a sequence program of PLC, the maximum response time since the control signal turns on until it reaches ELECYLINDER and then the ELECYLINDER status signal returns to PLC can be expressed in the formula below.

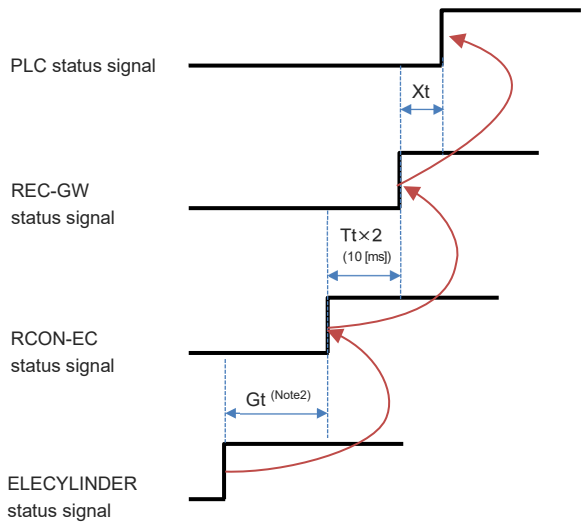
PLC → Maximum Response Time from PLC to ELECYLINDER : Yt + (Tt × 4) + Ft
ELECYLINDER → Maximum Response Time from PLC to PLC : Gt + (Tt × 2) + Xt

Tt = Transmission time (5ms for RCON-GW or REC-GW and 2ms for RSEL)
Yt = Master station→Remote I/O station transmission lag time
Xt = Remote I/O station→Master station transmission lag time
} Field network transmission lag time (Note 1)
Ft = Input Filter of ELECYLINDER (Note 2)
Gt = Input Filter of RCON-EC (Note 2)

[PLC → ELECYLINDER]



[ELECYLINDER → PLC]



Note 1 Refer to [instruction manual for each field network master unit and mounted PLC] for the field network transition latency.

Note 2 Ft and Gt differ depending on how to connect between ELECYLINDER and RCON-EC.
- When Connecting interface separate type or 24V AC Servomotor equipped models Directly : 40ms Max.
- When Connecting interface separate type or 24V AC Servomotor equipped models with Relay of Interfacing Box : 26ms Max.
- ELECYLINDER other than interface separate type or 24V AC Servomotor equipped models : 6 to 26ms

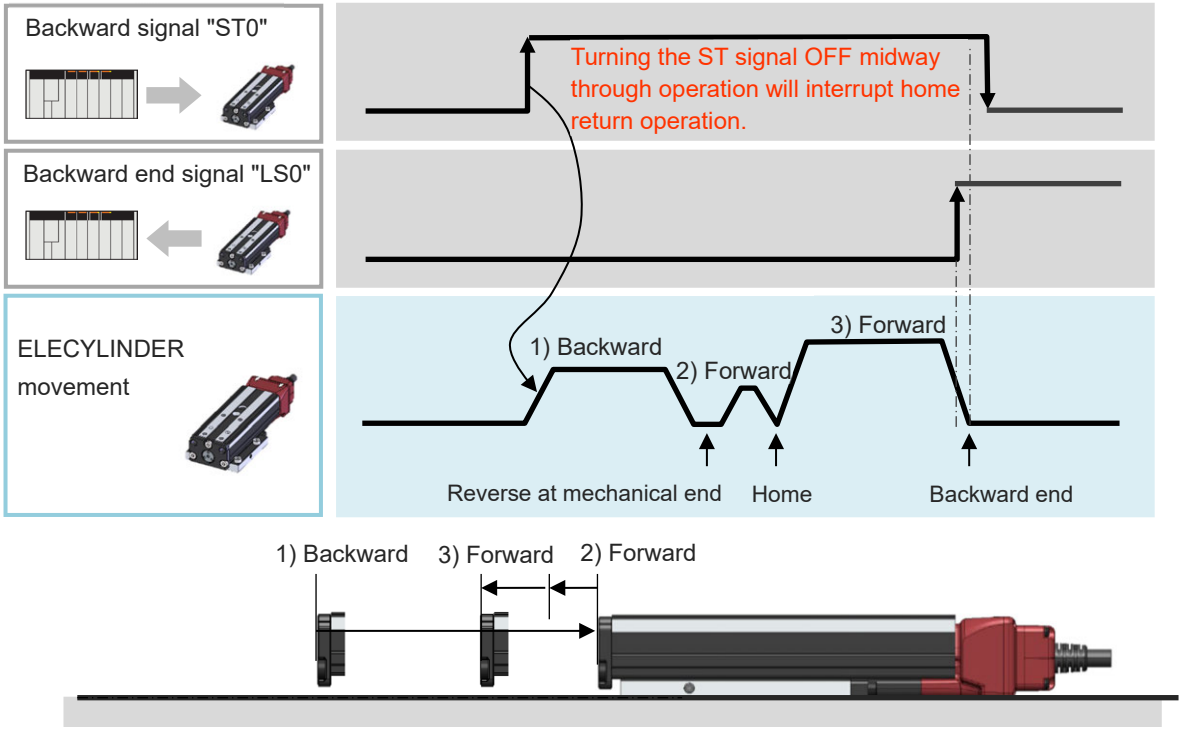
2.2 Operating method from master device

2.2.1 Double solenoid system

"Parameter No. 9 Electromagnetic Valve System" is to be set to "Double".

[1] Home return operation/positioning operation: "ST0", "LS0", "ST1", "LS1" signals

Turning the "ST0" signal ON when home return is not complete will first trigger home return operation. After a momentary stop at the home position, it will then move to the backward end. As well, when the "ST1" signal is turned ON, the unit will move to the forward end after home return operation. However, for battery-less absolute encoder specification, the positioning operation should be conducted without having the home return operation.



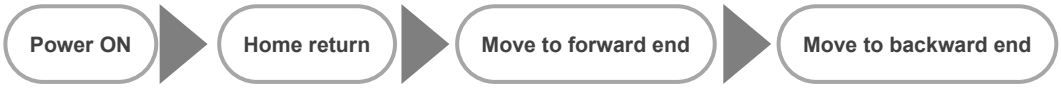
Operation Behavior While Home-Return Operation (When "ST0" Signal is Used)

1) When the "ST0" signal is turned ON, backward motion begins towards the mechanical end. The movement speed is 20mm/s.
2) Once the mechanical end is struck, the direction will be reversed and forward motion will begin. The unit will move forward until the home position, then stop.
3) After that, it will continuously move forward until the backward end, where it stops as operation is complete.

Caution

- In the home reverse specification (model: NM), home return operation is in the reverse direction.

This shows the PLC timing chart for operating the ELECYLINDER.
The basic process is as follows.



[Basic timing chart]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

Category		Signal abbreviation	Timing chart	Remarks
1	**Power**	Power ON	LED status: OFF → Orange ON → Green ON	24V DC power supply is turned ON.
2	Output	* ALM		Turns ON if no alarm has been triggered.
3	Input	ST0	Δt1	When the "ST0" signal is turned ON, home return operation begins.
4	Output	LS0	Δt2	Home return operation is complete and the unit moves to the backward end.
5	Input	ST1	Δt2	Moves to the forward end.
6	Output	LS1		Moved to the forward end.
7	Input	ST0	Δt2	Moves to the backward end.
8	Output	LS0		Moved to the backward end.
9	After this, "**5**" to "**8**" repeat.			

Δt1: Wait approximately 0.5 seconds from when the "*ALM" signal turns ON before inputting the first command.

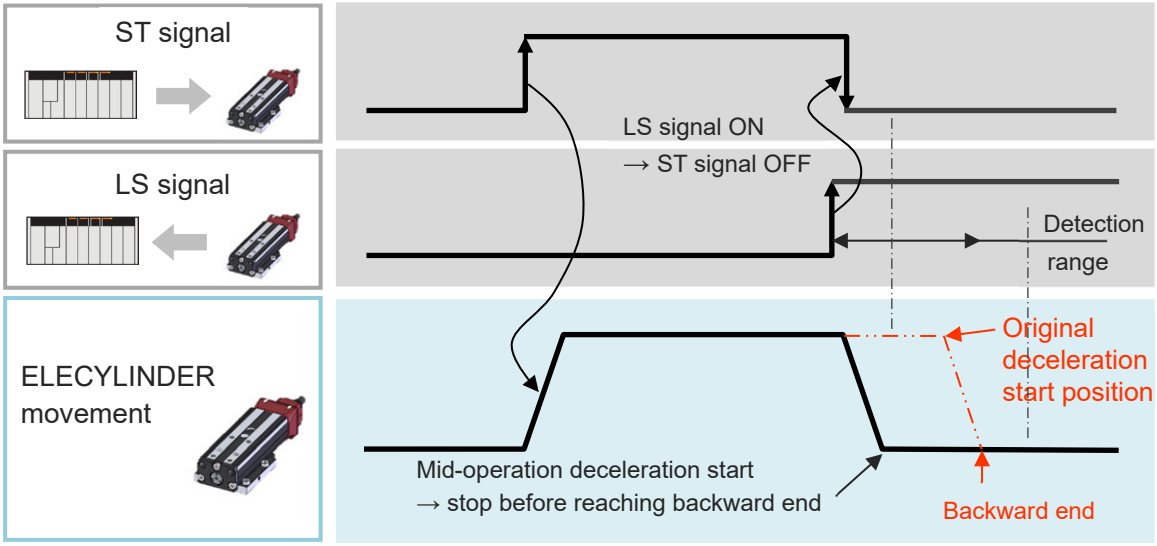
Δt2: The time taken for the ELECYLINDER actually to reach the forward or backward end after the LS signal turns ON. Consider Δt2 when giving instructions for the next operation from the PLC to the ELECYLINDER.

Δt2 becomes longer for larger detection ranges.

Δt2 also changes with the size of the transported load and acceleration/deceleration speeds.

Turning the ST signal OFF midway through operation will cause a gradual stop.
For example, be careful of the following point with a large LS signal detection range.

If the sequence is set to turn the ST signal OFF immediately after the LS signal turns ON, the moving parts may not have reached the forward/backward end.

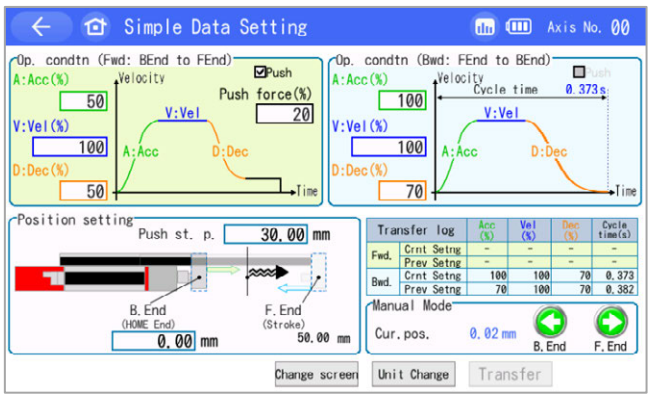


Caution

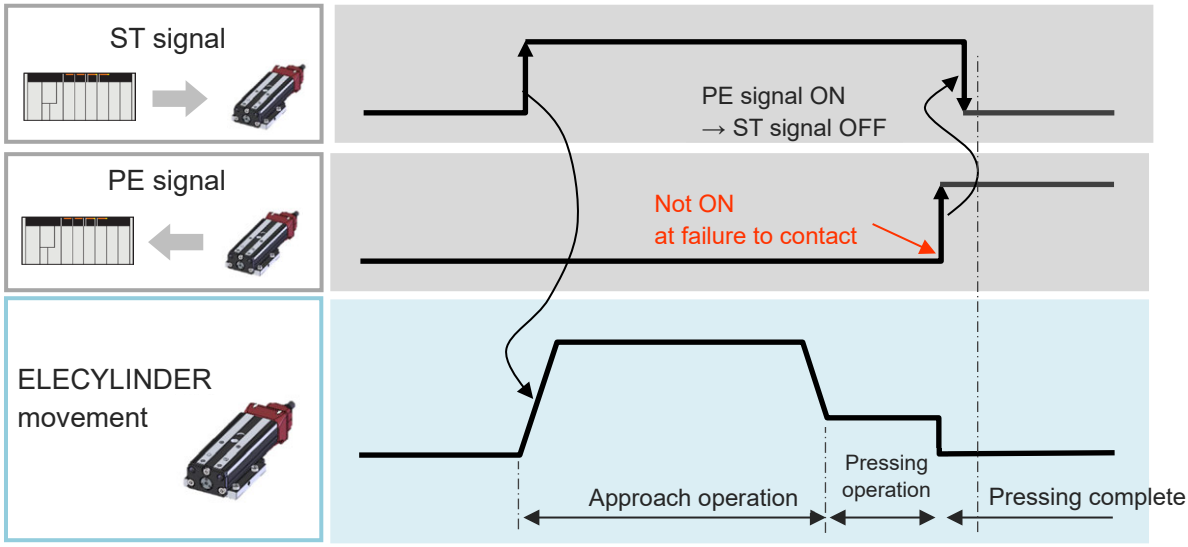
- Turning the "ST" signal ON again after the gradual stop causes the ELECYLINDER to begin operation again.
- Within the detection range, the LS signal turns ON even if the ELECYLINDER is mid-operation.
- Make sure that "ST0" and "ST1" do not turn ON simultaneously.
  "ST0" Signal should be prioritized when both are turned ON at the same time, and "ST0" Signal should get input.

[2] Pressing operation: "ST0", "ST1", "PE0", "PE1" signals

Before conducting pressing operation, refer to [Operation Section Chapter 1 1.3.3 Pressing operation setting] and configure the operating conditions and position settings using the Simple Data Setting screen.



The basic time chart is as follows.



Caution

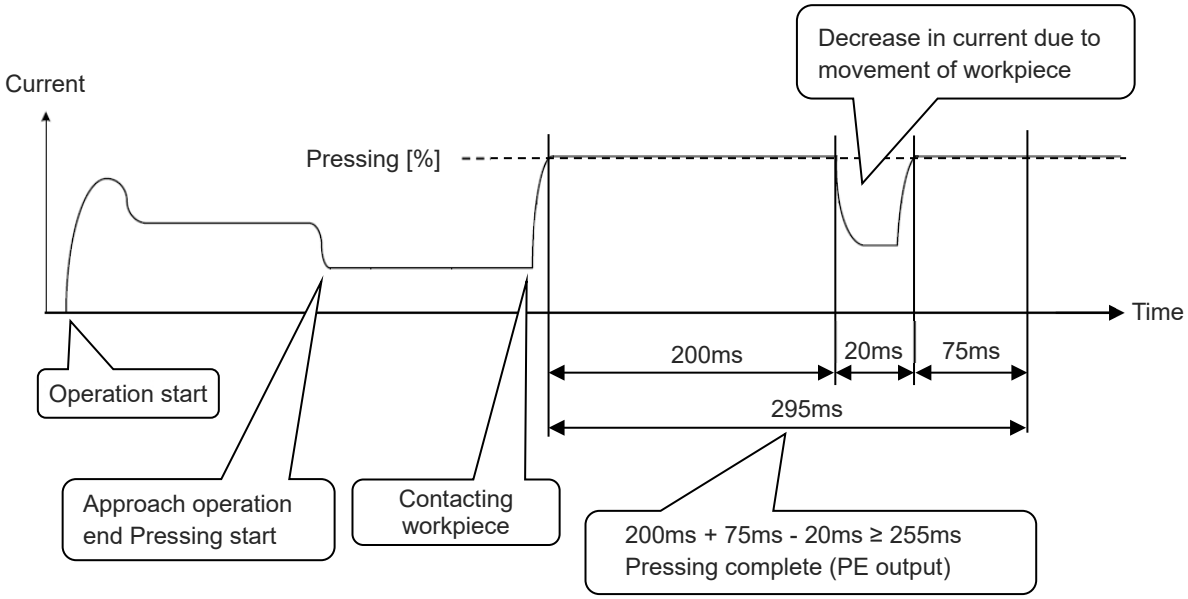
- The pressing operation speed may vary depending on models.
- The workpiece remains pressed after the pressing is completed. If the workpiece moves or pushes back, it may be pressed even further.
- When the actuator hits a workpiece during approaching operation, any of alarm or pressing complete signal would be output but pressing operation should be continued.
- When stop after miss-pressing, the actuator should move to the position set in the operation range tuning in the parameter at the forward end, and should move to 0mm at the backward end.

The torque (current limit value) configured for "Pressing force" in the Simple Data Setting screen judges completion of pressing operation.

When the ELECYLINDER is performing pressing operation, satisfying the following conditions will produce a judgment of pressing complete, turning ON the PE signal.

"Accumulated time in which current has reached pressing value [%]" –
"Accumulated time in which current is less than pressing value [%]" ≥ 255ms

Reference



Reference

Here are some caution for when operation to the forward end or backward end is terminated with a miss-pressing.
Consider a master device sequence or detection method based on the content below.

- PE Signal should not turn on when there is a miss-pressing. It is necessary to make a judgment whether miss-pressing was happened or not with using such a tool as a timer.
- After a miss-pressing, the pressing current should retain and positioning stop.
  There may be an error occurred when an actuator is pushed back due to external force.
- If the workpiece shifts once pressing complete is determined and the PE signal is ON, the ELECYLINDER will start another pressing operation with the PE signal still ON.
  If the workpiece cannot be pressed again, it will remain ON even with no contact.

[3] 2-circuit power supply specification TMD2 (Option)

The 2-circuit power supply specification is capable of supply the motor power (drive source) and the control power individually.
Select the 2-circuit power supply specification (TMD2) when it is required to cut the drive power source off without keeping the control power supply to ELECYLINDER not turned off.
Refer to [Startup Edition Chapter 3 Pulse Motor Equipped Models Wiring] and [Startup Edition Chapter 5 200V AC Servomotor Equipped Models Wiring].

Here shows the timing chart of when the 2-circuit power supply specification (TMD2) is selected.

(1) Pulse motor equipped models

1. At startup (Encoder: For WA specifications)
   • The absolute reset is to be completed already.
   • It is to be a state of being at the backward end when the power is turned on.
   (In range of Parameter "Auto Switch "LS" Signal Detection Range Adjustment [mm]")

[Timing chart]

Output ELECYLINDER → output signals to PLC

Category		Signal abbreviation	Timing chart	Remarks
1	**Control power**	CP	ON, Startup time	Control power is turned ON.
2	**Motor power**	MP	ON	Motor power is turned ON.
3	Output	*ALM	ON, Servo ON delay time	Turns ON if no alarm has been triggered.
4	Output	LS0	ON	It should turn on when LS0 Signal is detected.
	ELECYLINDER movement		Forward end, Backward end	

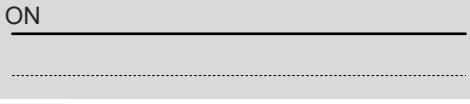
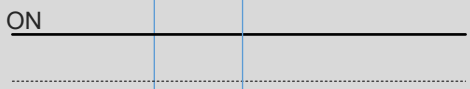
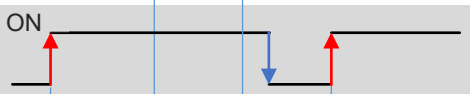
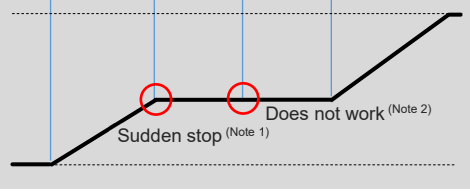
* LS Signal would not turn on before the initial servo on when it is the battery-less absolute type and also TMD2 type at the same time.
* The servo-on latency should differ depending on the model.

2. Move to forward end (Cut of motor power supply during operation)
   - The absolute reset is to be completed already.
   - It is to be a state of being at the backward end after the power is turned on.
     (In range of Parameter "Auto Switch "LS" Signal Detection Range Adjustment [mm]")

[Timing chart]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

Category		Signal abbreviation	Timing chart	Remarks
1	Control power	CP		Control power is ON.
2	Motor power	MP		Motor power is turned OFF/ON.
3	Output	*ALM		Turns ON if no alarm has been triggered.
4	Input	ST1		Forwarding command conducted to ELECYLINDER
5	Output	LS0		It should turn on when LS0 (Backward end) Signal is detected.
6	Output	LS1		It should turn on when LS1 (Forward end) Signal is detected.
	ELECYLINDER movement			

Note 1 A sudden stop should be made by the emergency stop torque. The distance of movement at sudden stop should be the stop distance when an actuator stops at the maximum deceleration speed from the operation velocity just before the motor power gets turned off or less.
When the drive power supply is cut off, it should come to "stop Signal: Motor voltage Drop" without generating an alarm.

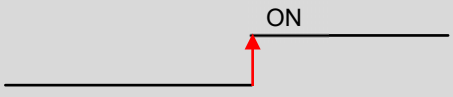
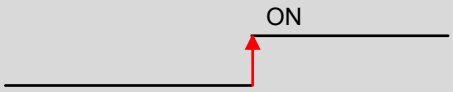
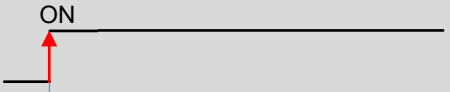
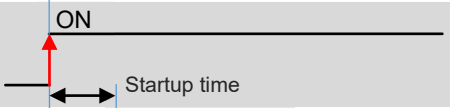
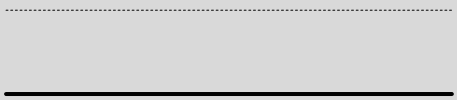
Note 2 ELECYLINDER would not operate after the motor power cutoff even if the motor power gets supplied again while the forward signal (ST1) or backward signal (ST0) is on.
In case of making it operated, it is necessary to turn either ST1 or ST0 off and turn it back on.

(2) 200V AC servo motor equipped models

1. At startup (Encoder: For WA specifications)
   - The absolute reset is to be completed already.
   - It is to be a state of being at the backward end when the power is turned on.
     (In range of Parameter "Auto Switch "LS" Signal Detection Range Adjustment [mm]")

[Timing chart]

Output ELECYLINDER → output signals to PLC

	Category	Signal abbreviation	Timing chart	Remarks
1	PSA-200 Control power (L1C, L2C)			Turn on control power AC input.
2	PSA-200 Motor power (L1, L2)			Turn on motor power AC input.
3	**24V (Drive source)**	MP (*STOP)		Turn on motor power (24V).
4	**24V (Control)**	CP		Turn on control power (24V).
5	Output	*ALM		Turns ON if no alarm has been triggered.
6	Output	LS0		It should turn on when LS0 (Backward end) Signal is detected.
	ELECYLINDER movement			

2. Move to forward end (cutting off 24V (drive source) and motor power supply (L1 and L2) during operation)
   - The absolute reset is to be completed already.
   - It is to be a state of being at the backward end after the power is turned on.
     (In range of Parameter "Auto Switch "LS" Signal Detection Range Adjustment [mm]")

[Timing chart]

Output ELECYLINDER → output signals to PLC　**Input** PLC → input signals to ELECYLINDER

	Category	Signal abbreviation	Timing chart	Remarks
1	PSA-200 Control power (L1C, L2C)		ON	Control power supply AC input is on.
2	PSA-200 Motor power (L1, L2)		ON / OFF	Turn off/on motor power AC input.
3	**24V (Drive source)**	MP (*STOP)	ON / OFF	Turn off/on motor power (24V).
4	**24V (Control)**	CP	ON	Control power supply (24V) AC input is on.
5	Output	*ALM	ON	Turns ON if no alarm has been triggered.
6	Input	ST1	ON	Forwarding command conducted to ELECYLINDER
7	Output	LS0	OFF	It should turn on when LS0 (Backward end) Signal is detected.
8	Output	LS1	OFF / ON	It should turn on when LS1 (Forward end) Signal is detected.
	ELECYLINDER movement		Backward end / Sudden stop (Note 1) / Does not work (Note 2) / Forward end	

Note 1 A sudden stop should be made by the emergency stop torque. The distance of movement at sudden stop should be the stop distance when an actuator stops at the maximum deceleration speed from the operation velocity just before the motor power gets turned off or less.
It should come to "stop Signal: Stop" without generating an alarm.

Note 2 ELECYLINDER would not operate after the motor power cutoff even if the motor power gets supplied again while the forward signal (ST1) or backward signal (ST0) is on.
In case of making it operated, it is necessary to turn either ST1 or ST0 off and turn it back on.

Caution

- ELECYLINDER would not stop suddenly when only motor power supply (L1 and L2) is cut off. Cut the "24V (drive source)" off at the same time.

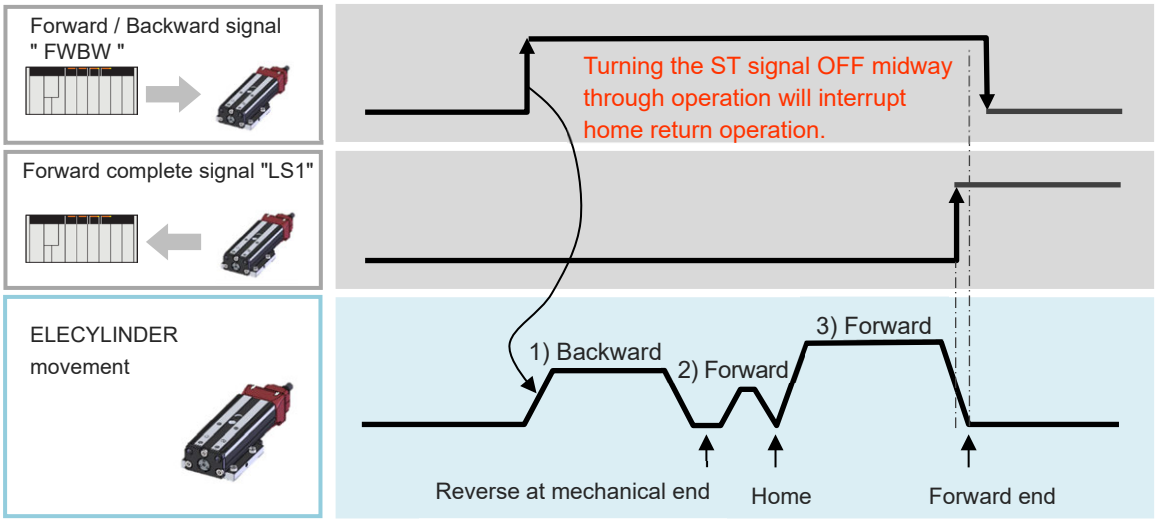
2.2.2 Single solenoid system

"Parameter No. 9 Electromagnetic Valve System" is to be set to "Single".

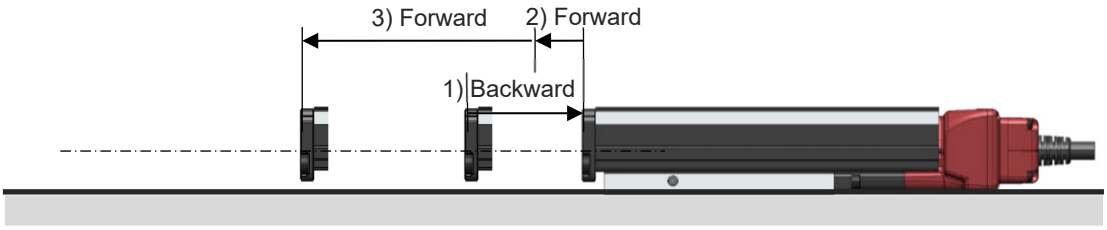
[1] Home return operation/positioning operation: "FWBW", "LS0", "LS1" signals

Turning the "FWBW" signal ON when home return is not complete will first trigger home return operation.

After a momentary stop at the home position, it will then move to the backward end.



* "LS0" should turn ON for a short period of time after the home-return operation when passing through the backward end.

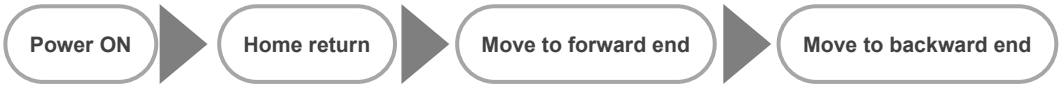


1) When the "FWBW" signal is turned ON, backward motion begins towards the mechanical end. The movement speed is 20mm/s.
2) Once the mechanical end is struck, the direction will be reversed and forward motion will begin. The unit will move forward until the home position, then stop.
3) After that, it will continuously move forward until the forward end, where it stops as operation is complete.

Caution

- In the home reverse specification (model: NM), home return operation is in the reverse direction.

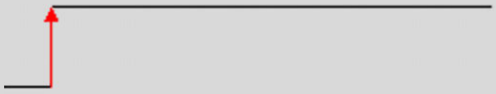
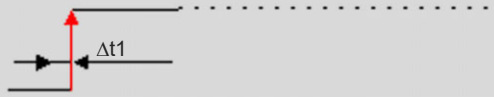
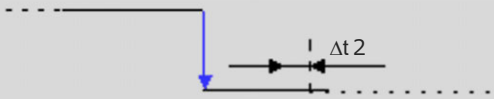
This shows the PLC timing chart for operating the ELECYLINDER.
The basic process is as follows.



[Basic timing chart]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

Category		Signal abbreviation	Timing chart	Remarks
1	**Power**	Power ON		24V DC power supply is turned ON.
2	Output	* ALM		Turns ON if no alarm has been triggered.
3	Input	FWBW		When the "FWBW" signal is turned ON, home return operation begins.
4	Output	LS1		Home return operation is complete and the unit moves to the forward end.
5	Input	FWBW		Turn "FWBW" Signal OFF and it starts moving to the backward end.
6	Output	LS0		Moved to the backward end.
7	Input	FWBW		Turn "FWBW" Signal ON and it starts moving to the forward end.
8	Output	LS1		Moved to the forward end.
9	After this, "**5**" to "**8**" repeat.			

Δt1: Wait approximately 0.5 seconds from when the "*ALM" signal turns ON before inputting the first command.

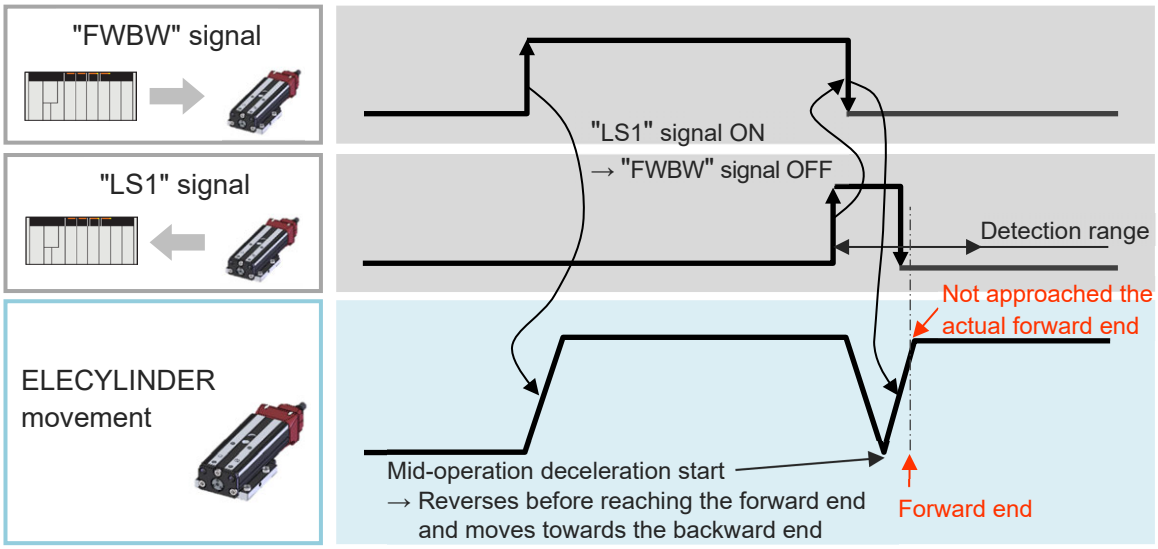
Δt2: The time taken for the moving parts actually to reach the forward or backward end after the LS signal turns ON. Consider Δt2 when giving instructions for the next operation from the PLC to the ELECYLINDER.

Δt2 becomes longer for larger detection ranges.

Δt2 also changes with the size of the transported load and acceleration/deceleration speeds.

Turn "FWBW" Signal OFF from the state of ON (turn it ON from the state of OFF) during operation and it starts decelerating and reverses, and then moves towards the backward (or forward) end.
For example, be careful of the following point with a large LS signal detection range.

If the sequence is set to turn the "FWBW" signal OFF immediately after the "LS1" signal turns ON, the ELECYLINDER may not have reached the forward end.
If the sequence is set to turn the "FWBW" signal ON immediately after the "LS0" signal turns ON, the ELECYLINDER may not have reached the backward end.

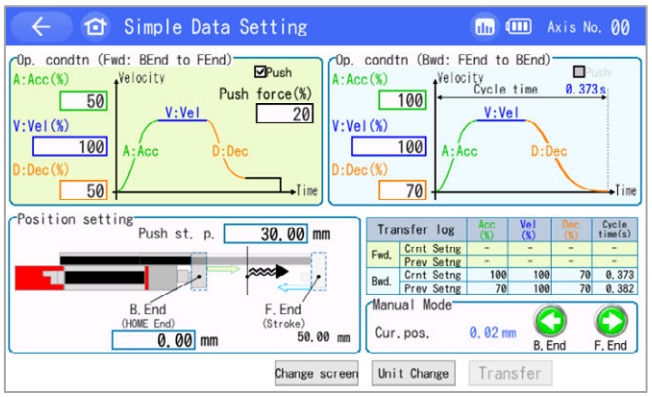


Caution

- Within the detection range, the LS signal turns ON even if the ELECYLINDER is mid-operation.

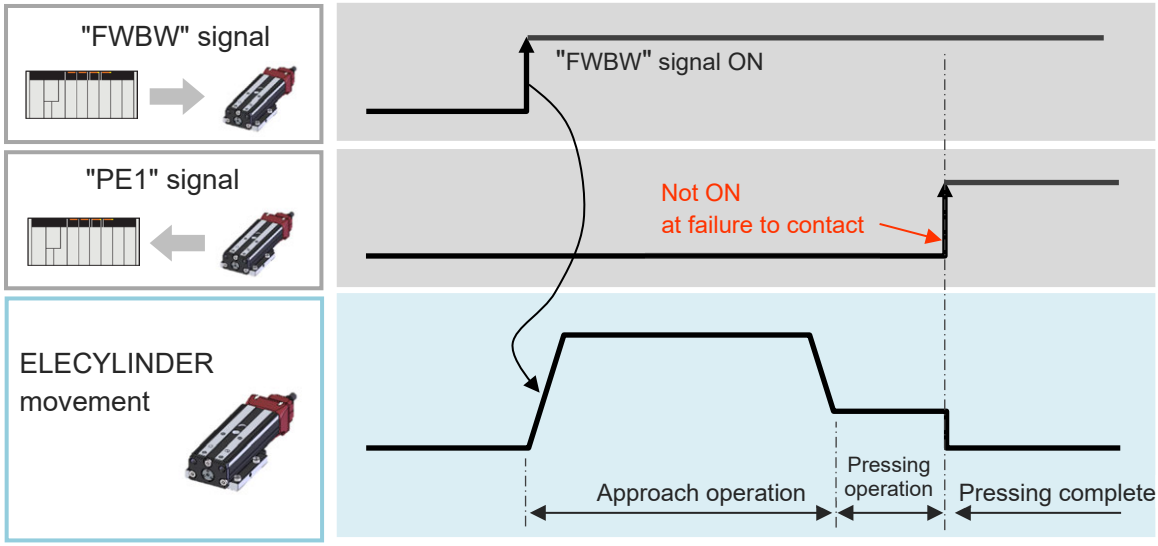
[2] Pressing operation: "FWBW", "PE0", "PE1" signals

Before conducting pressing operation, refer to [1.3.3 Pressing operation setting] and configure the operating conditions and position settings using the Simple Data Setting screen.

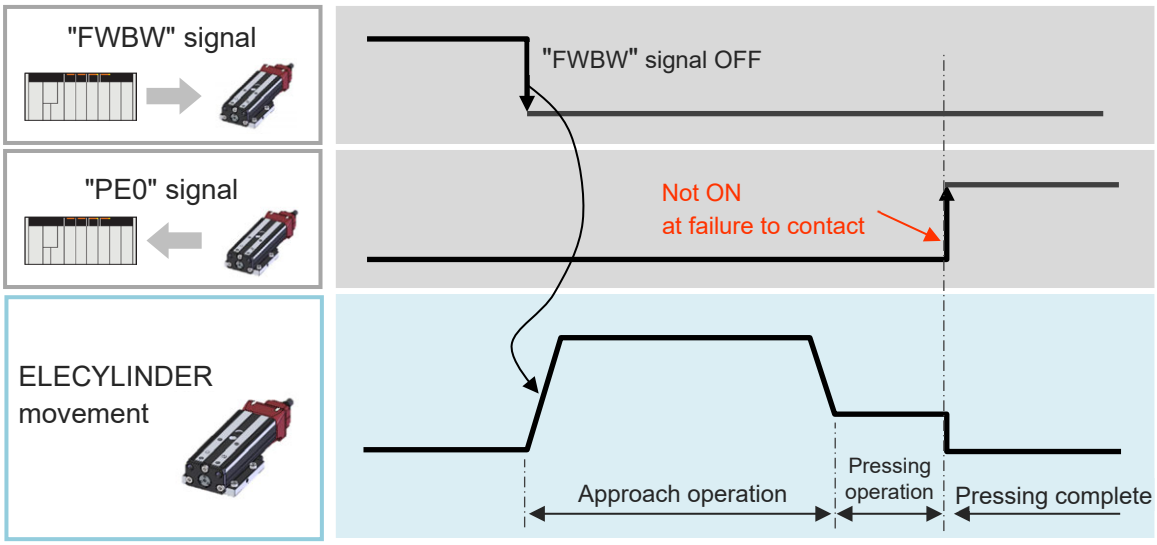


The basic time chart is as follows.

[Pressing towards forward end]



[Pressing towards backward end]



Caution

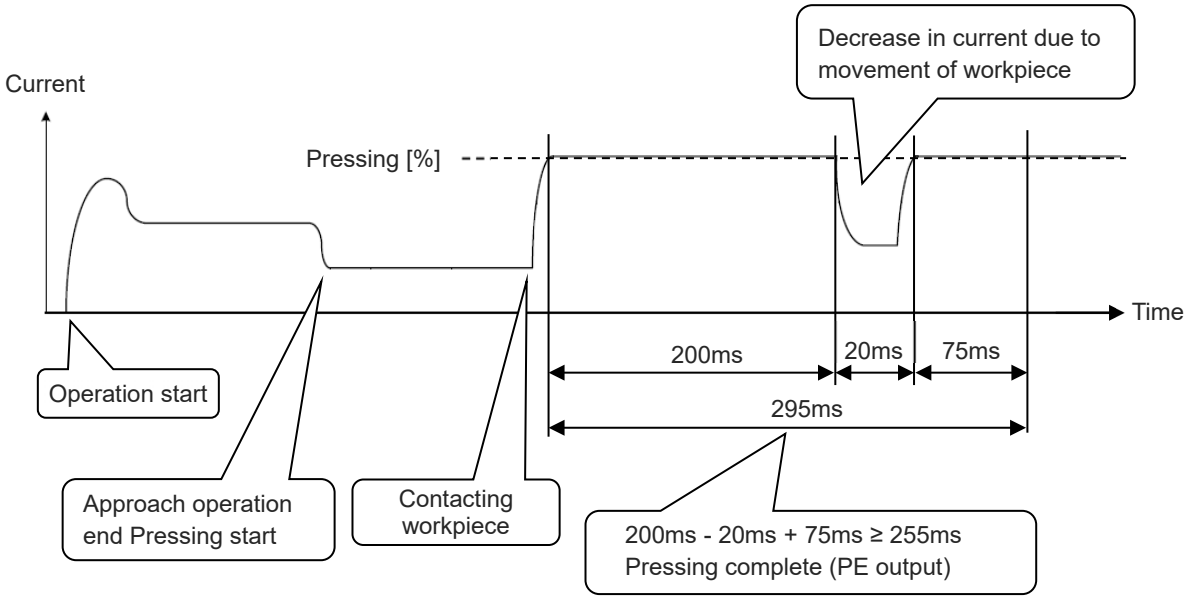
- The pressing operation speed is 20mm/s.
- The workpiece remains pressed after the pressing is completed. If the workpiece moves or pushes back, it may be pressed even further.
- When the actuator hits a workpiece during approaching operation, any of alarm or pressing complete signal would be output but pressing operation should be continued.

The torque (current limit value) configured for "Pressing force" in the Simple Data Setting screen judges completion of pressing operation.

When the ELECYLINDER is performing pressing operation, satisfying the following conditions will produce a judgment of pressing complete, turning ON the PE signal.

"Accumulated time in which current has reached pressing value [%]" –
"Accumulated time in which current is less than pressing value [%]" ≥ 255ms

Reference



Reference

Here are some caution for when operation to the forward end or backward end is terminated with a miss-pressing.
Consider a master device sequence or detection method based on the content below.

- PE Signal should not turn on when there is a miss-pressing. It is necessary to make a judgment whether miss-pressing was happened or not with using such a tool as a timer.
- After a miss-pressing, the pressing current should retain and positioning stop.
  There may be an error occurred when an actuator is pushed back due to external force.
- If the workpiece shifts once pressing complete is determined and the PE signal is ON, the ELECYLINDER will start another pressing operation with the "PE" signal still ON.
  If the workpiece cannot be pressed again, it will remain ON even with no contact.

[3] 2-circuit power supply specification TMD2 (Option)

The 2-circuit power supply specification is capable of supply the motor power (drive source) and the control power individually.
Select the 2-circuit power supply specification (TMD2) when it is required to cut the drive power source off without keeping the control power supply to ELECYLINDER not turned off.
Refer to [Startup Edition Chapter 3 Pulse Motor Equipped Models Wiring], [Startup Edition Chapter 4 24V AC Servomotor Equipped Models Wiring] and [Startup Edition Chapter 5 200V AC Servomotor Equipped Models Wiring].

ELECYLINDER should move at recovery from stop status when an actuator has stopped during movement to the forward end / backward end (out of LS signal detection range).
ELECYLINDER would not move even if recovered from stop status when an actuator has stopped at the forward end / backward end (inside LS signal detection range). When required to move it, turn "FWBW" signal on or off after recovery.

Warning

- ELECYLINDER should move at recovery from stop status when an actuator has stopped during movement to the forward end / backward end (out of LS signal detection range). Secure safety for the surrounding before recovery.

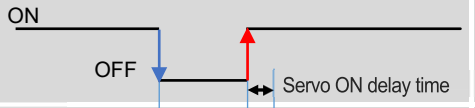
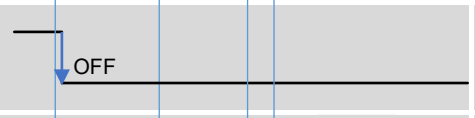
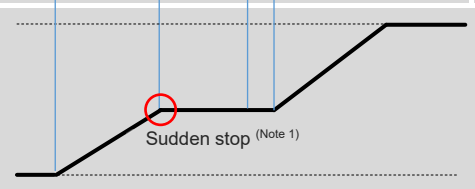
Here shows a timing chart for the case when an actuator has stopped during movement to the forward end / backward end (out of LS signal detection range).

- The absolute reset is to be completed already.
- It is to be a state of being at the backward end after the power is turned on.
  (In range of Parameter "Auto Switch "LS" Signal Detection Range Adjustment [mm]")

(1) Pulse motor equipped models (Encoder: For WA specifications)
Move to forward end (Cut of motor power supply during operation)

[Timing chart]

Output ELECYLINDER → output signals to PLC　　**Input** PLC → input signals to ELECYLINDER

	Category	Signal abbreviation	Timing chart	Remarks
1	Control power	CP		Control power is turned ON.
2	Motor power	MP		Motor power is turned OFF/ON.
3	Output	*ALM		Turns ON if no alarm has been triggered.
4	Input	FWBW		When ON, it commands the advance to the ELECYLINDER.
5	Output	LS0		It should turn on when LS0 (Backward end) Signal is detected.
6	Output	LS1		It should turn on when LS1 (Forward end) Signal is detected.
	ELECYLINDER movement			

Note 1　A sudden stop should be made by the emergency stop torque.
When the drive power supply is cut off, it should come to "stop Signal: Motor voltage Drop" without generating an alarm.

*1　ELECYLINDER should drive backward when "FWBW" signal at recovery from the stop status is off.

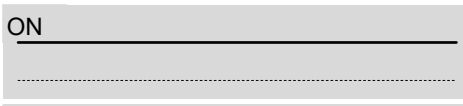
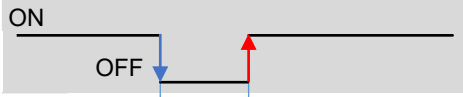
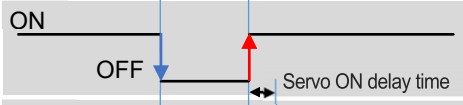
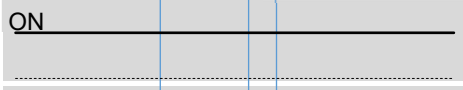
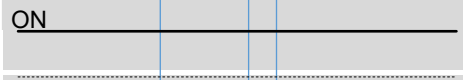
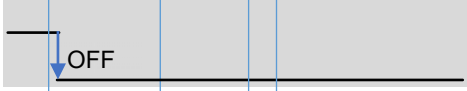
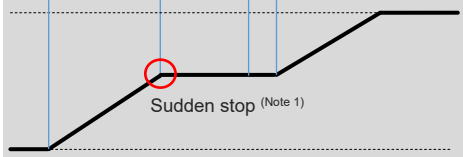
(2) 200V AC servo motor equipped models

Move to forward end (cutting off 24V (drive source) and motor power supply (L1 and L2) during operation)

[Timing chart]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

	Category	Signal abbreviation	Timing chart	Remarks
1	PSA-200 Control power (L1C, L2C)			Control power supply AC input is on.
2	PSA-200 Motor power (L1, L2)			Turn off/on motor power AC input.
3	**24V (Drive source)**	MP (*STOP)		Turn off/on motor power (24V).
4	**24V (Control)**	CP		Control power supply (24V) AC input is on.
5	Output	*ALM		Turns ON if no alarm has been triggered.
6	Input	FWBW		When ON, it commands the advance to the ELECYLINDER.
7	Output	LS0		It should turn on when LS0 (Backward end) Signal is detected.
8	Output	LS1		It should turn on when LS1 (Forward end) Signal is detected.
	ELECYLINDER movement			Backward end Forward end

Note 1 A sudden stop should be made by the emergency stop torque.
It should come to "stop Signal: Stop" without generating an alarm.

*1 ELECYLINDER should drive backward when "FWBW" signal at recovery from the stop status is off.

Caution

- ELECYLINDER would not stop suddenly when only motor power supply (L1 and L2) is cut off. Cut the "4V (drive source)" ff at the same time.

2.2.3 When set to automatic servo OFF

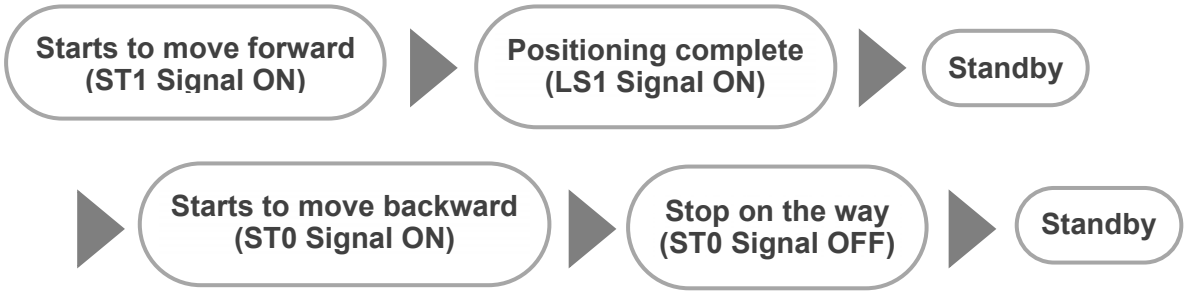
Here shows a timing chart for operation.

* Automatic Servo OFF should activate after the home-return operation is complete.

• In Normal Operation

The basic process is as follows.

Also, this operation should start after the home-return operation of ELECYLINDER is completed and also movement to the backward end is completed.



[Timing chart 1]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

	Category	Signal abbreviation	Timing chart	Remarks
1	Output	*ALM	ON / OFF	Turns ON if no alarm has been triggered.
2	Input	ST1		ELECYLINDER should move forward when it is on.
3	Output	LS1		It should turn on when LS1 Signal is detected.
4	Input	ST0		ELECYLINDER should move backward when it is on. (It should stop on the way while moving backward.)
5	Output	LS0		It should turn on when LS0 Signal is detected.
	Servo	Main LED	△t1 Servo OFF △t2 △t3 Servo OFF	LED lamp should flash when the servo is off.
	ELECYLINDER movement		Speed 0 Time	

△t1 : Automatic servo OFF delay time in forward travel

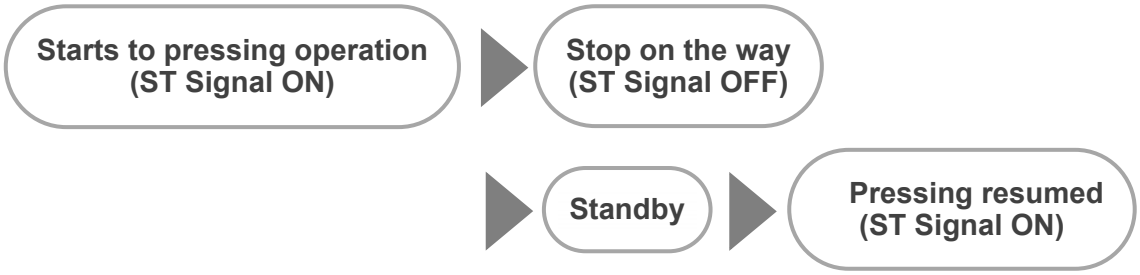
△t2 : Servo ON delay time (Varies depending on model.)

△t3 : Automatic servo OFF delay time in backward travel

Here shows a timing chart for when Automatic servo OFF Function is set during pressing operation.

• Pressing operation : ST Signal off during pressing
(Same as normal operation during approach)

The basic process is as follows.



[Timing chart 2]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

	Category	Signal abbreviation	Timing chart	Remarks
1	Output	*ALM	ON / OFF	Turns ON if no alarm has been triggered.
2	Input	ST		Pressing operation conducted when it is on.
3	Output	PE	ON / OFF	It should turn on when the pressing is complete.
	Servo	Main LED	△t1, Servo OFF (*1), △t2	LED lamp should flash when the servo is off.
	ELECYLINDER movement		Speed, Approach operation, Pressing operation, Pressing resumed, Time, 0	

△t1 : Automatic servo OFF delay time in pressing direction (forward or backward)
△t2 : Servo ON delay time (Varies depending on model.)

(*1) The motor should become Torque 0 (Servo-off). An actuator may get pushed back or workpiece may move.

• Pressing operation : Miss-pressing

The basic process is as follows.

[Timing chart 3]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

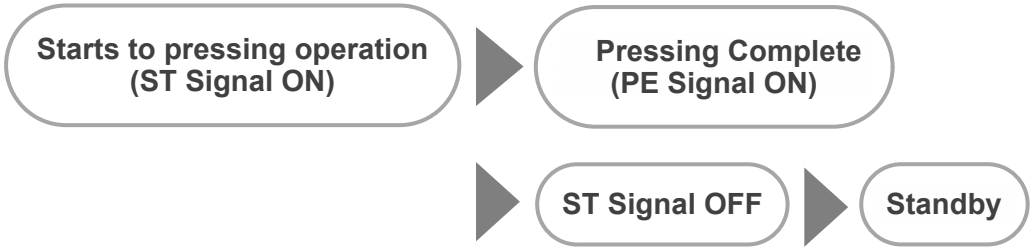
	Category	Signal abbreviation	Timing chart	Remarks
1	Output	*ALM	ON / OFF	Turns ON if no alarm has been triggered.
2	Input	ST		Pressing operation conducted when it is on.
3	Output	PE	ON / OFF	It should turn on when the pressing is complete.
	Servo	Main LED	△t, (*1) Servo OFF	LED lamp should flash when the servo is off.
	ELECYLINDER movement		Speed, 0, Approach operation, Pressing operation, Forward end, Time	

△t : Automatic servo OFF delay time in pressing direction (forward or backward)

(*1) The motor should become Torque 0 (Servo-off). An actuator may get pushed back or workpiece may move.

• Pressing operation : ST Signal off after pressing complete

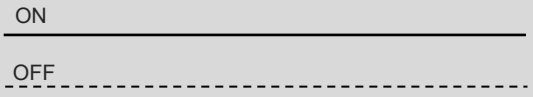
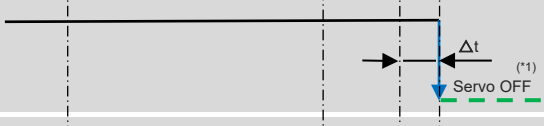
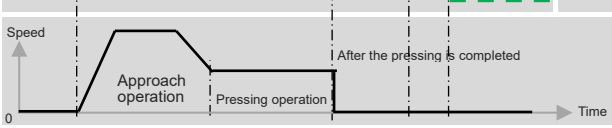
The basic process is as follows.



[Timing chart 4]

Output ELECYLINDER → output signals to PLC

Input PLC → input signals to ELECYLINDER

	Category	Signal abbreviation	Timing chart	Remarks
1	Output	*ALM		Turns ON if no alarm has been triggered.
2	Input	ST		Pressing operation conducted when it is on.
3	Output	PE		It should turn on when the pressing is complete.
	Servo	Main LED		LED lamp should flash when the servo is off.
	ELECYLINDER movement			
△t : Automatic servo OFF delay time in pressing direction (forward or backward)				

(*1) The motor should become Torque 0 (Servo-off). An actuator may get pushed back or workpiece may move.

Supplementation

- In condition of servo-off after the positioning is completed, it moves out of "Automatic Switch "LS" Signal Detection Range", and Automatic Servo OFF Function will get inactivated when the power is turned on again.
- With brake option : The behavior of a brake should become the same as servo, and the brake will activate during the automatic servo is off.
- The applied Automatic servo OFF delay time should be the value set in the movement direction of the signal input just before the servo-off gets effective.

Operation Section

Chapter 3

Preventive/ Predictive Maintenance

3.1 Preventive and predictive maintenance

The ELECYLINDER has a **predictive maintenance function** that notifies the user with an "overload warning" when the load exceeds normal status.
It also has a **preventive maintenance function** that prompts the user to perform maintenance if the travel count or the travel distance exceeds the set values.

Preventative maintenance	Predictive maintenance
Travel distance [km/m] (Count of back and forth between 0 and 180 deg. (To be figured out from total distance) [times])	Overload warning
Travel count [times]	

If the criteria are set in advance,
the LED built into the body will flash green/red
to notify that the maintenance period is up.

Preventative maintenance

- Regular maintenance that is performed based on a reference period regardless of whether or not there are equipment breakdowns.
- Prevents unexpected breakdowns.
- Extends service life.

Predictive maintenance

- Maintenance that is performed when, based on regular equipment monitoring, an abnormality is predicted to occur.
- Predicts unexpected breakdowns.
- Prevents sudden line stoppages.

3.2 Maintenance information

This section introduces three items that can be configured and managed as maintenance information.
When the set values are exceeded, a "maintenance warning" is issued and the LED1 (Servo / Alarm) flash alternately in red and green.
* Only the servo (green) LED lamp should flash for the 200V AC servomotor equipped models.

Even if a "maintenance warning" is generated, the ELECYLINDER will continue to operate without interruption.

3.2.1 Total travel count

Name	Unit	Input range	Default setting at shipping
Total travel count	times	0 to 999,999,999	0 (disabled setting)

- When the total travel count exceeds the set value, the user will be notified with "Maintenance warning 1".
- When "Maintenance warning 1" is output, maintenance is recommended, such as greasing. Set the target value to a value larger than the present one and update.
- Setting it to "0 times" will disable this function.

3.2.2 Total travel distance

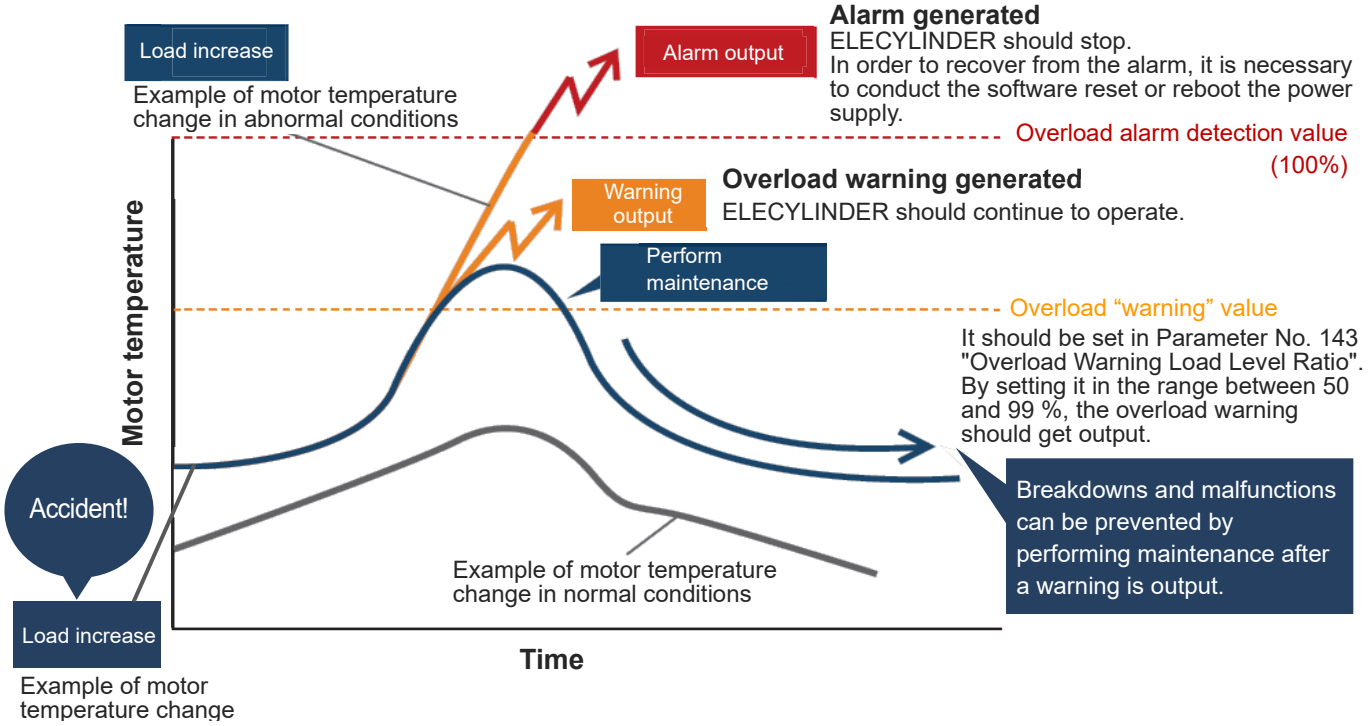
Name	Unit	Input range	Default setting at shipping
Total travel distance	m	0 to 999,999,999	0 (disabled setting)

- When the total travel distance exceeds the set value, the user will be notified with "Maintenance warning 2".
- When "Maintenance warning 2" is output, maintenance is recommended, such as greasing. Set the target value to a value larger than the present one and update.
- Setting it to "0m" will disable this function.
- The displayed units can be switched. [m ⇔ km]

3.2.3 Overload warning load level ratio

Name	Unit	Input range	Default setting at shipping
Overload warning load level ratio	%	50 to 100	100 (disabled setting)

- The load level to the rating set in ELECYLINDER as 100%, the level to output the overload warning should be set from 50 to 99%.
- Once the overload level at operation has exceeded the ratio set in "Overload Warning Load Level Ratio", there should be information in "Maintenance Warning 3".
- Once the overload level has come below the ratio set in "Overload Warning Load Level Ratio", "Maintenance Warning 3" should automatically be cleared.
- When "Maintenance warning 3" is output, investigate the cause of the increase in load. Maintenance such as greasing or reviewing the operating conditions is recommended.
- Setting it to "100%" will disable this function.



Contents such as follows should be detected from the warning output.

▮Greasing time ▮Component Replacement time ▮Mechanical adjustment implementation time

3.3 Setting maintenance information

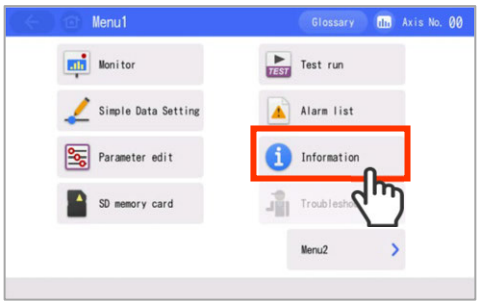
A teaching pendant or PC teaching software can be used to configured and changed maintenance information. Refer to [3.3.1 How to set up in teaching pendant] for when using a teaching pendant and [3.3.2 How to set up in PC teaching software (IA-OS)] for when using the PC teaching software.
For details refer to the following instruction manuals for how to use method each tool.

Product name / Instruction manual name	Manual No.
IA-OS First Step Guide * For how to operate, refer to the guiding features installed in IA-OS	ME0391
RCM-101-MW/RCM-101-USB	ME0155
Applicable for ELECYLINDER TB-02/02D Instruction Manual	ME0355
Applicable for ELECYLINDER TB-03 Wireless Link Instruction Manual	ME0375
Applicable for ELECYLINDER TB-03 Wired Link Instruction Manual	ME0376

3.3.1 How to set up in teaching pendant

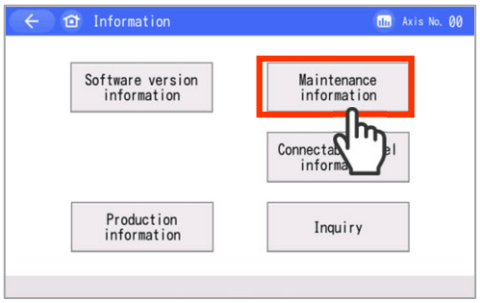
[1] Switch to maintenance information screen

Touch Information on the Menu 1 screen.

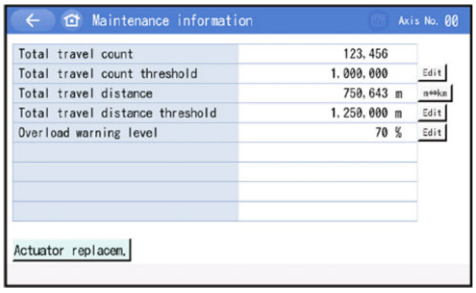


The screen will switch to the Information screen.
If the TP operation mode is not Monitor mode, a confirmation window will appear for switching to Monitor mode.

Touch Maintenance information on the Information screen.



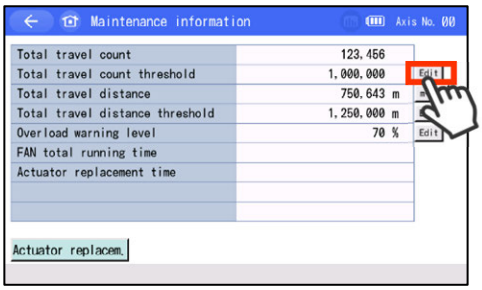
The maintenance information window opens.



[2] Setting method

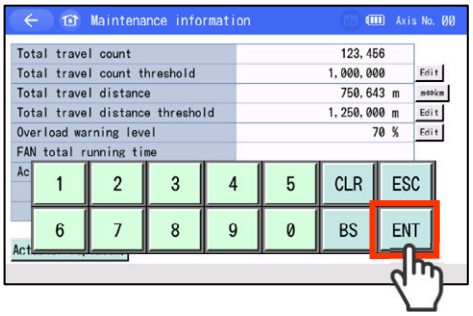
1. To set the target value, touch the Edit of the relevant item.

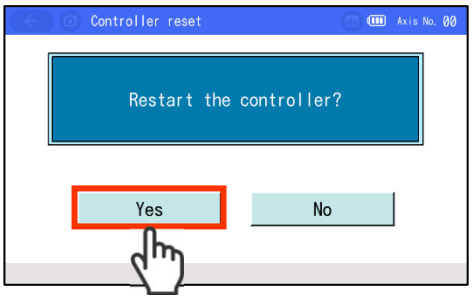
   The set value will blink and Ten Key screen will open.



2. Enter the value with the Ten Key pad and touch the ENT .

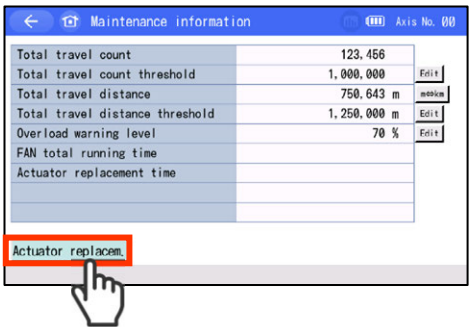
   • The target value will change.
   If you touch ESC ,
   the target value will not be changed and
   the original screen will return.
   • A confirmation message will be displayed to reboot the controller when leaving the maintenance screen.
   The setting change will take effect after rebooting.





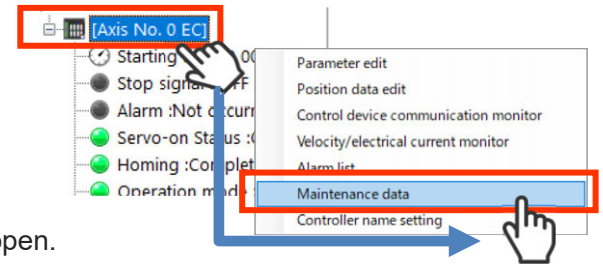
3. When the total travel count and the total travel distance are to be reset,
   touch the Actuator replacem. .

   "Total travel count" and "Total travel distance" will be cleared to "0".



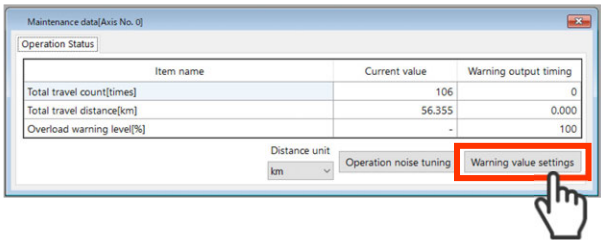
3.3.2 How to set up in PC teaching software (IA-OS)

1. Right-click an axis to set up in the IA-OS main window, and click on Maintenance Information.



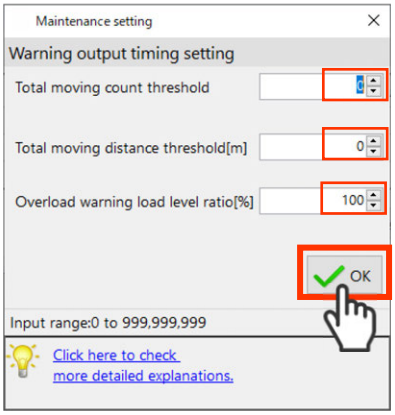
The Maintenance Information window should open.

2. Click Warning value settings in the Maintenance Information window.



The Maintenance Information window should open.

3. Input a value in the subject item and click OK .



* Transfer parameters and conduct software reset when setting.

Operation Section

Chapter 4

Parameters

4.1 Precautions regarding parameters

Parameter data should be set/adjusted appropriately according to the application requirements. Incorrect settings may lead to mis-operation, which could cause significant influence to its operation.

When making a change, back up the data before the change so the settings can be recovered. Back up the data after making changes as well.
This will be required for investigating causes of failure or when the ELECYLINDER is replaced.

Caution

- Understand the control methods in advance if making a change or performing a setting in accordance with the system and application.
  Contact IAI if anything is unclear.

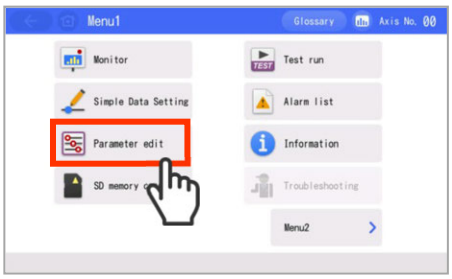
4.2 How to change parameters

A teaching pendant or PC software can be used to change parameters. This manual introduces operating methods using a teaching.
Refer to the following instruction manuals for how to use each tool.

Product name / Instruction manual name	Manual No.
IA-OS First Step Guide * For how to operate, refer to the guiding features installed in IA-OS	ME0391
RCM-101-MW/RCM-101-USB	ME0155
Applicable for ELECYLINDER TB-02/02D Instruction Manual	ME0355
Applicable for ELECYLINDER TB-03 Wireless Link Instruction Manual	ME0375
Applicable for ELECYLINDER TB-03 Wired Link Instruction Manual	ME0376

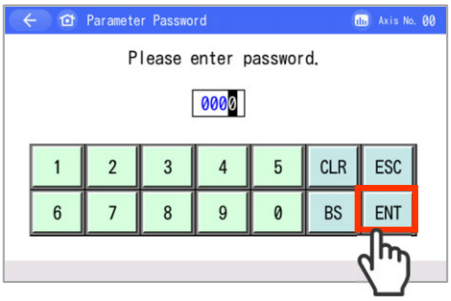
4.2.1 Parameter edit window

1. Touch [Parameter edit] on the Menu 1 screen.



The screen will switch to the Edit parameters window.
If the TP operation mode is not Teach mode, a confirmation window will appear for switching to Teach mode.
Also, if the parameter edit password is set to a value other than "0000", the password input screen will be displayed.

2. If the parameter edit password is set to a value other than "0000", enter the password and press the [ENT] on the touch panel.



The Parameter edit window will open.

Reference

The parameter edit password is set to "0000" at shipping.
Refer to the [TB-02 Instruction Manual (ME0355)] [TB-03 Instruction Manual (ME0375, ME0376)] for information about changing the password.

4.2.2 Basic operation

1. If setting parameters numerically, touch the [set value] .

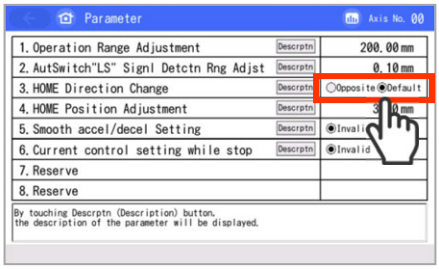
   The set value will blink and
   Ten Key window will open.

2. Enter the value with the Ten Key pad and touch the [ENT] .

   The parameter will be changed.
   However, if you touch [ESC] , the parameter will not be changed and the edit window will return.

3. If setting parameters with radio buttons, touch the radio buttons.

   The parameter will be changed.

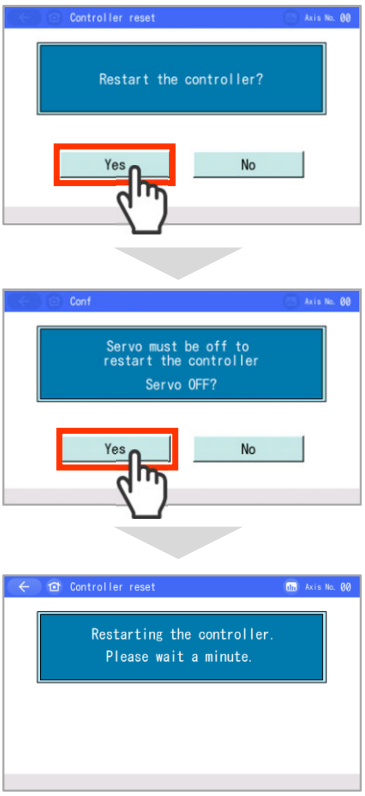


4. When all parameter changes are complete, Touch the home button .

   A confirmation window will appear to ask for controller reboot when a change is made to the parameters.

5. Touch the Yes .

The controller will restart,
enabling parameter changes.
However, if you touch No , the reboot will be canceled and the Edit parameters window will return.



Reference

Touching the Descrptn displays a description of each parameter at the bottom of the screen.

By touching Descrptn (Description) button,
the description of the parameter will be displayed.

Caution

- Simply changing the parameters alone is not sufficient to enable the changes.
- After making changes, the power must be turned off and on or a software reset performed. After the ELECYLINDER restarts, the parameter changes will be enabled.
- Do not attempt to turn OFF the power while writing the parameters. This may damage the controller.

4.3 Parameter list

No.	Category	Name	Input range	Input range	Default setting at shipping	Reference items
1(Note 1)	A	Operation range adjustment	mm or degree	0 to 9999.69	Maximum stroke	4.4.1
2(Note 1)	A	Auto switch "LS" signal detection range adjustment	mm or degree	Actuator Depended to 9999.99	According to ELECYLINDER specifications	4.4.2
3(Note 1)	C	Home return direction change	—	Reverse, forward	According to ELECYLINDER specifications	4.4.3
4(Note 1)	B	Home position adjustment	mm or degree	0 to 9999.99	According to ELECYLINDER specifications	4.4.4
5	A	Smooth accel/decel setting	—	Disabled, enabled	Disabled	4.4.5
6(Note 2)	A	Current control setting at stop	—	Disabled: Powerful stop Enabled Enabled: Energy-saving stop	Disabled	4.4.6
7(Note 3)	A	Wireless function setting	—	Disabled, enabled	Enabled	4.4.7
8(Note 2)	A	Energy-saving setting	—	Disabled, enabled	Disabled	4.4.8
9	A	Electromagnetic valve system select	—	Double, single	Double	4.4.9
10(Note 4)	A	LED Lighting System Automatic Switch Setting	—	Disabled, enabled	Disabled	4.4.10

The categories in the table below indicate whether parameters should be set or not.
There are 3 categories, as follows.
Not displayed on PC software/teaching pendant screen.

A : Check or change the settings based on the usage method.
B : Use as set at shipping, as a rule.
C : Set at shipping in accordance with ELECYLINDER specifications.
Normally, setting is not required.

Note 1 The default values on delivery from the factory should differ depending on the types of ELECYLINDER.
Note 2 There should be some items that may not be displayed depending on the models.
Note 3 ELECYLINDER not equipped with the wireless PC board (the models with no indication of WL or WL2 in the option model code) should not be displayed.
Note 4 Only the Ultra Mini ELECYLINDER (type: SL3□/GDS3L/GDB3□/T3□) should be available to use. This feature should not be used in any other type of ELECYLINDER.

4.4 Parameter function descriptions

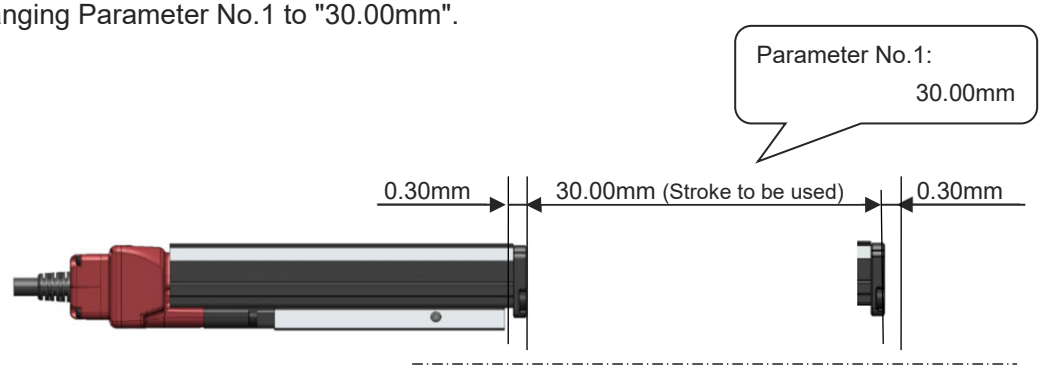
4.4.1 Parameter No.1: Operation range adjustment

No.	Category	Name	Unit	Input range	Default setting at shipping
1	A	Operation range adjustment	mm or degree	0 to 9999.69	Maximum stroke

- The ELECYLINDER operation range can be adjusted to suit your system.
- The minimum setting unit is 0.01mm (Rotary type is 0.01 degrees).
- Set to your desired stroke length.
  The controller automatically adds 0.30mm (Rotary type is 0.30 degrees) and controls/monitors the operation range.

(Setting example)

Set the operating stroke between 0 and 30mm
by changing Parameter No.1 to "30.00mm".



Caution

- Set within the ELECYLINDER movable range.
  Setting to a value that exceeds the maximum stroke will result in collision with the forward side mechanical stopper and this may damage the ELECYLINDER, workpiece or peripheral devices.

4.4.2 Parameter No.2: Auto switch "LS" signal detection range adjustment

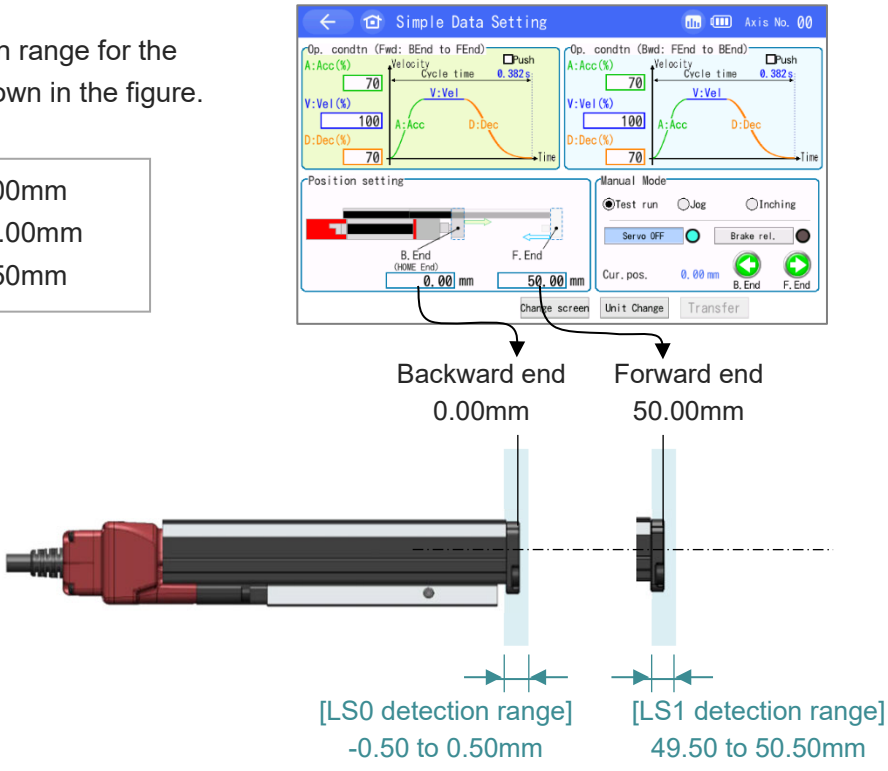
No.	Category	Name	Unit	Input range	Default setting at shipping
2	A	Auto switch "LS" signal detection range adjustment	mm or degree	Actuator Depended to 9999.99	According to ELECYLINDER specifications

- Sets the backward complete/forward complete ON trigger range relative to the backward end/forward end.
- When the ELECYLINDER enters the detection range, the backward complete or forward complete signal turns ON.
- The minimum setting unit is 0.01mm (Rotary type is 0.01 degrees).

(Setting example)

The LS signal detection range for the conditions below is shown in the figure.

Backward end	: 0.00mm
Forward end	: 50.00mm
Parameter No.2	: 0.50mm



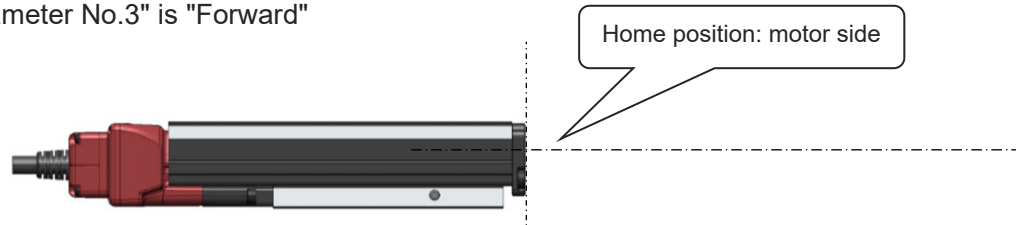
4.4.3 Parameter No.3: Change home return direction

No.	Category	Name	Unit	Input range	Default setting at shipping
3	C	Home return direction change	—	Reverse, Forward	According to ELECYLINDER specifications

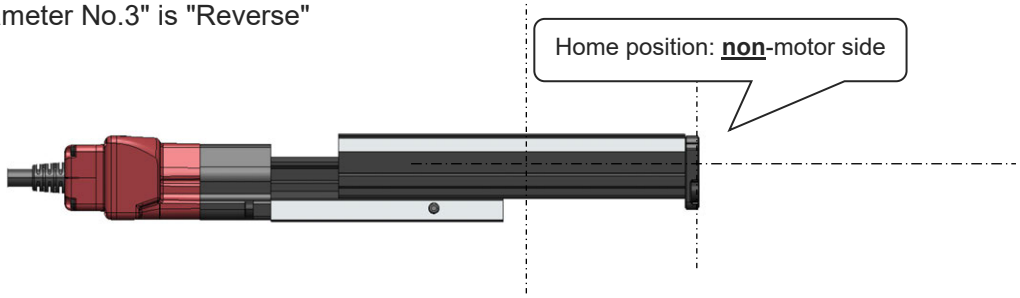
- The home return operation direction can be selected.
- To set the opposite direction, switch to the opposite setting value. ("Forward" → "Reverse" or "Reverse" → "Forward")
- For standard specification, the motor side is home.

(Setting example)

If "Parameter No.3" is "Forward"



If "Parameter No.3" is "Reverse"



Caution

- Changing the home return direction reverses the operation direction.
- After changing this parameter, always perform home return reset (absolute reset).
- Even if the operation direction is reversed, check that the moving parts do not interfere with any other objects. If the moving parts collide, they may damage the ELECYLINDER, workpiece or peripheral devices.
- Changing the home return direction after purchasing will cause a mismatch with the ELECYLINDER model number. Make sure to change parameters again if the controller or body is replaced.

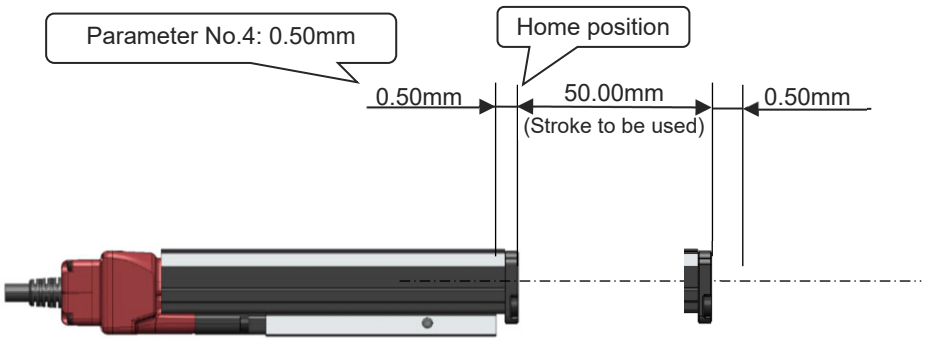
4.4.4 Parameter No.4: Home position adjustment

No.	Category	Name	Unit	Input range	Default setting at shipping
4	B	Home position adjustment	mm or degree	0 to 9999.99	According to ELECYLINDER specifications

- Sets the distance between the home side mechanical stopper and the home position.
- The minimum setting unit is 0.01mm (Rotary type is 0.01 degrees).
- Adjustment with this parameter is possible in the following situations.
  1. To match the ELECYLINDER home position and the mechanical home position after assembly into equipment.
  2. To adjust the new home position upon reversing the default home return direction after purchase.
  3. To eliminate a slight deviation from the previous home position generated after replacing the ELECYLINDER.

(Setting example)

If "Parameter No.4" is "0.50mm",
the relationship between mechanical stopper and home position is as follows.



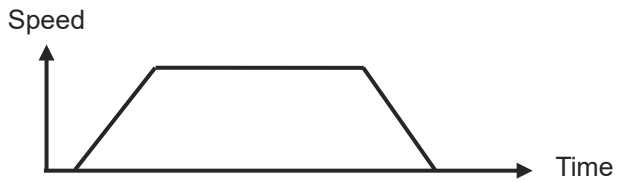
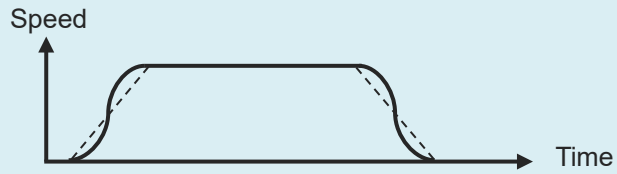
Caution

- If adjusting Parameter No.4, simultaneously adjust Parameter No.1.
  "Operation range adjustment with parameter No.1" uses the home position as the datum.
- Do not set Parameter No.4 to a value smaller than the default setting at shipping.
  This may result in abnormal home return operation, alarm triggering or abnormal operation. If the value must be set small, please contact IAI.
- After changing this parameter, always perform home return reset (absolute reset).

4.4.5 Parameter No.5: Smooth accel/decel setting

No.	Category	Name	Unit	Input range	Default setting at shipping
5	A	Smooth accel/decel setting	—	Disabled, Enabled	Disabled

- The movement waveform for ELECYLINDER operation can be selected.
- When "Enabled", accel/decel operation becomes smoother (less abrupt).
  This softens the shocks of acceleration/deceleration without delaying the operation time.
- If "Disabled", the above functionality is not enabled.

Setting	Acceleration/ deceleration pattern	Operation waveform image
Disabled	Trapezoid	
Enabled	S-motion	

Caution

- For operation in which the acceleration time or deceleration time exceeds 2 seconds, do not "Enable" "smooth accel/decel settings".
  Normal operation will not be possible.
- Avoid momentary stops during acceleration or deceleration operation. Sudden changes (acceleration) will occur, which may be dangerous.

4.4.6 Parameter No.6: Current control setting at stop

No.	Category	Name	Unit	Input range	Default setting at shipping
6	A	Current control setting at stop	—	Disabled : Powerful stop Enabled : Energy-saving stop	Disabled

- The control method for ELECYLINDER stop can be selected.
- If "Disabled", a constant current value will be transmitted to the motor, stopping it. This limits fine vibration when stopping, bringing the unit to a complete stop.
- If "Enabled", a current appropriate to the load will be transmitted to the motor, stopping it. This limits the amount of power consumed while stopping.
- If abnormal noise or vibration occurs during a gradual stop, setting to "Enabled" may fix the issue. Moreover, setting to "Enabled" can also fix issues in which the command position cannot quite be attained.

Caution

- If "Disabled", even if a pulse deviation within ±2 from the target position remains, movement towards the target position will not continue.
- If "Enabled", if a pulse deviation of ±1 or more from the target position remains, movement towards the target position will continue.

4.4.7 Parameter No.7: Wireless function setting

No.	Category	Name	Unit	Input range	Default setting at shipping
7	A	Wireless function setting	—	Disabled, Enabled	Enabled

- Either Enabled / Disabled can be selected for the ELECYLINDER wireless function.
- When "Enabled" is selected, wireless communication between the ELECYLINDER and the Touch Panel Teaching Pendant or Remote Digital Speed Controller is possible.
- When "Disabled" is selected, wireless communication between the ELECYLINDER and the Touch Panel Teaching Pendant or Remote Digital Speed Controller is not possible.
  The data transfer on the electric wave for wireless communication will get inactivated.
  Therefore wireless communication will get disabled.

Caution

- This parameter is not displayed on ELECYLINDERs without wireless circuit boards (no WL, WL2 in the Option model number).

4.4.8 Parameter No.8: Energy-saving setting

No.	Category	Name	Unit	Input range	Default setting at shipping
8	A	Energy-saving setting	—	Disabled, Enabled	Disabled

- Either Enabled or Disabled can be selected for the ELECYLINDER Energy-saving setting.
- When "Enabled," the power capacity can be reduced up to 40% compared to "Disabled" mode, but the maximum speed, maximum acceleration/deceleration, and payload decrease in comparison.
  Refer to the following sections in [Chapter 1 Specifications in an instruction manual of each ELECYLINDER] for the details of specifications when power saving feature is set to "Enable":
  • [Lead and Payload (Power-saving: Enable)]
  • [Stroke and Max. Speed (Power-saving: Enable)]
  • [Payload by Speed/Acceleration (Power-saving: Enable)]
- When "Disabled," the maximum speed, maximum acceleration/deceleration, and payload increase compared to "Enabled" mode.
  Refer to the following sections in [Chapter 1 Specifications in an instruction manual of each ELECYLINDER] for the details of specifications when power saving feature is set to "Disable":
  • [Lead and Payload (Power-saving: Disable)]
  • [Stroke and Max. Speed (Power-saving: Disable)]
  • [Payload by Speed/Acceleration (Power-saving: Disable)]

4.4.9 Parameter No.9: Electromagnetic valve system select

No.	Category	Name	Unit	Input range	Default setting at shipping
9	A	Electromagnetic valve system select	—	Double, Single	Double

- Either of the double solenoid system or the single solenoid system can be selected as the electromagnetic valve system for ELECYLINDER.
- Set it to the "double" and it should be set to the double solenoid system and the movement forward and backward should be conducted using the two signals, "ST0" and "ST1".
- Set it to the "single" and it should be set to the single solenoid system and the movement forward and backward should be conducted using the one signal, "FWBW".

Caution

- When operating with an ELECYLINDER (option model code: ACR) connected to RCON-EC, do not attempt to set electromagnetic valve system select to single. ELECYLINDER may not operate as commanded from the host system. Make operation in the double solenoid system (parameter set on delivery).

4.4.10 Parameter No.10: LED lighting system automatic switch setting

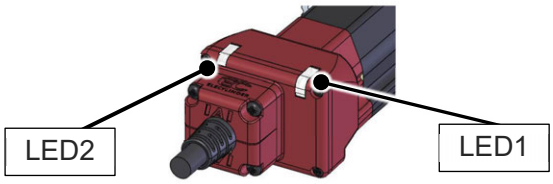
No.	Category	Name	Unit	Input range	Default setting at shipping
10	A	LED lighting system automatic switch setting	—	Disabled, Enabled	Disabled

- The ELECYLINDER shown in the table below is capable of adding a display of such as forward end / backward end just like an automatic switch on an air-cylinder to the LED.

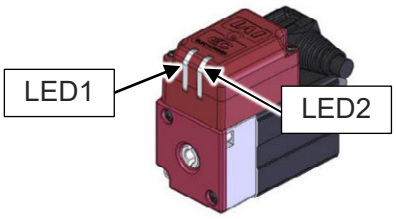
Type	Model
Slider type	EC-S2□/S2□R, SL3□
Rod type	EC-GDB3□, CRP3□, CRP5□, CGD3□, CGD5□
Radial cylinder	EC-RR2□/RR2□R
Table type	EC-T3□, CTC3□, CTC5□
Stopper Cylinder	EC-GDS3L

- Set it to "Disable (default setting on delivery from factory)" and the ordinary status LED display (servo-on/off, emergency stop, alarms, wireless status, etc.) should be performed.
- Set it to "Enable" and "Forward End / Backward End", "Pressing Complete" and "Miss- Pressing Detected" should be shown in addition to the ordinary status LED displays.

Example of EC-SL3□



Example of EC-CRP3□



Set it to "Disable"

LED2	LED1	color	Operation status
×	×	-	Power OFF
			Servo OFF
●	●	Orange	In Initializing at Startup
★	×	Green	In Wireless Connection
★	×	Red	Wireless Hardware Error
×	●	Red	Alarm
×			In Emergency Stop
×	★⇔★	Green, Red	Minor malfunction alarm
×	●	Green	Servo ON
×	★	Green	In process of automatic servo OFF

Set it to "Enabled"

LED2	LED1	color	Operation status
In addition to LED displays in "Disable", following displays are to be added.			
●	×	Orange	Backward End [LS0]
×	●	Orange	Forward End [LS1]
★	×	Orange	Pressing Complete in Backward End Direction [PE0]
×	★	Orange	Pressing Complete in Forward End Direction [PE1]
●	×	Orange	Miss-Pressing Detected in Backward End Direction
×	●	Orange	Miss-Pressing Detected in Forward End Direction

● : Light ON, ★ : Blinking, × : Light OFF

Caution

- This feature is available only for the target models listed on the previous page.
  This feature is not available for use for other models of ELECYLINDER.
- When Connecting Interface Box:
  The LED display on the interface box should be the one in "Disable" regardless of the parameter setting.
- Settings of "Enable" should not be reflected while in wireless connection.

Maintenance Section

Chapter 1

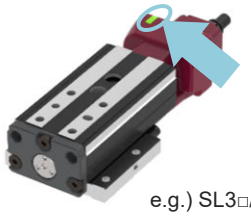
Troubleshooting

1.1 Troubleshooting diagnosis (for models with pulse motor equipped)

If a problem occurs, check the following points first in order to ensure quick recovery and prevent recurrence of the problem.
Shown below, is having the EC-T3□ (Ultra Mini ELECYLINDER) as an example.
The LED display at any trouble being occurred is in common for all the pulse motor equipped models.
Refer to [an instruction manual of each ELECYLINDER] for the position of LED lamps.

[1] Check LED1 (Servo / Alarm)

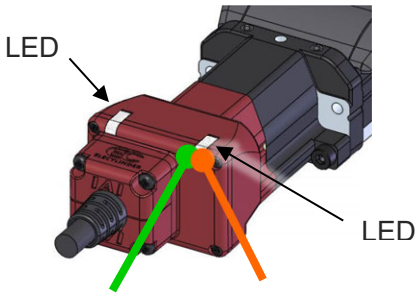
○ : Light ON
× : Light OFF
★ : Blinking



e.g.) SL3□/GDS3L/GDB3□/T3□

LED1 (Servo / Alarm)		Operation status	*ALM signal (*1) output status
SV (green)	ALM (red)		
×	×	Power OFF, Servo OFF	OFF
×	○	Alarm generated	OFF
		Stop switch ON (When using teaching pendant)	ON
○	×	Power ON, Servo ON	ON
★ (Green 500ms ⇔ Red 500ms alternate blinking in 1 Hz cycle)		Maintenance warning generated (When the travel count or the travel distance has exceeded the set value, or when overload warning is generated)	ON
★ (Blinking in green, 1000 ms, 0.5 Hz frequency)	×	In process of automatic servo OFF	ON
○ (both green and red ON)		Initializing when power comes ON	OFF

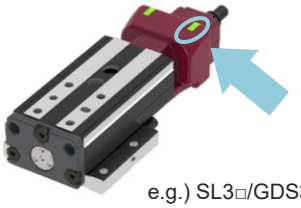
*1 *ALM Signal is a signal of the break contact output.



e.g.) SL3□/GDS3L/GDB3□/T3□

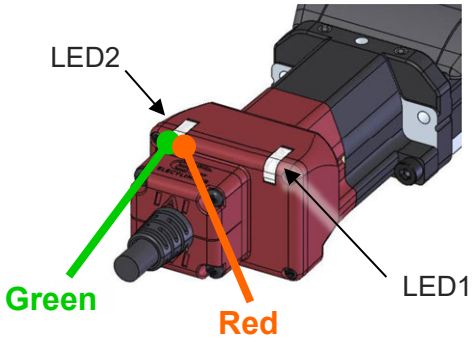
[2] Check LED2 (wireless)

○ : Light ON
× : Light OFF
★ : Blinking



e.g.) SL3□/GDS3L/GDB3□/T3□

LED2 (Wireless)		Wireless status
Green	Red	
×	×	Wireless hardware initializing Wireless not connected (transmitting monitor data) Connecting from wired teaching pendant
×	★ (ON 200ms/ OFF 200ms alternate blinking)	Wireless hardware error
★ (ON 150ms/ OFF 150ms alternate blinking)	×	Connecting through wireless



e.g.) SL3□/GDS3L/GDB3□/T3□

[3] Check for abnormality in the master device (PLC, etc.)

[4] Check the voltage of the main power supply (24V DC)

Check for momentary power failure, voltage drop, power failure, etc.

[5] Confirm the generated alarm

Check the alarm information with the teaching tool.

[6] Check the connectors for disconnection or incomplete connection

[7] Check the cables for connection error, disconnection or snagging

Cut off the main power supply of the equipment (to avoid electric shock) and remove the cables around the measurement point (to avoid conductivity through the surrounding circuit) before checking the conductivity.

[8] Check the I/O signals

Use the master device and ELECYLINDER teaching tool to check for inconsistency or abnormality in the input/output signal status of the two units.

[9] Check the noise elimination measures (grounding, connection of noise suppressor, etc.)

[10] Check the events leading to the occurrence of the problem, as well as the operating conditions at the time of occurrence

[11] Analyze the cause

[12] Countermeasures

Caution

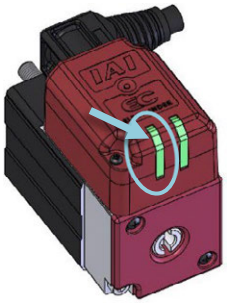
- When troubleshooting, exclude normally functioning parts from the targets to narrow down the causes.
- First, check [1] to [10] so that countermeasures can be taken swiftly.

1.2 Troubleshooting diagnosis (for models with 24V AC servomotor equipped)

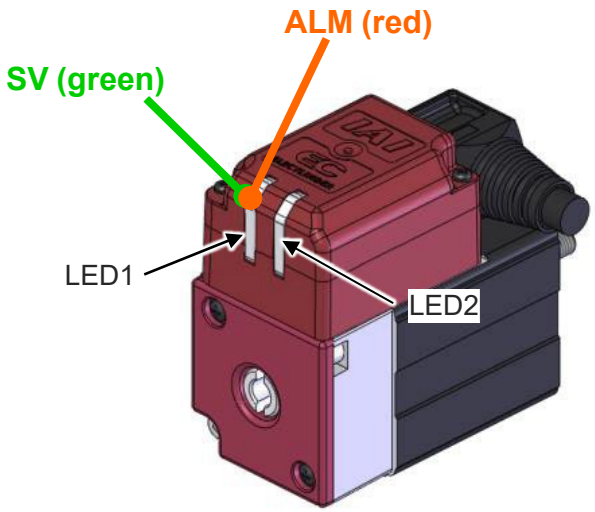
If a problem occurs, check the following points first in order to ensure quick recovery and prevent recurrence of the problem.

[1] Check in ELECYLINDER main body of status LED1 (Servo / Alarm)

○ : Light ON
× : Light OFF
★ : Blinking

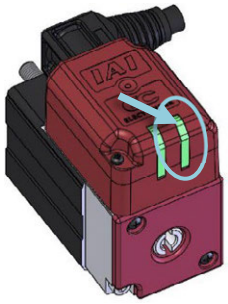


LED1 (Servo / Alarm)		Operation status	*ALM signal (*1) output status
SV (green)	ALM (red)		
×	×	Power OFF, Servo OFF	OFF
×	○	Alarm generated	OFF
		Stop switch ON (When using teaching pendant)	ON
○	×	Power ON, Servo ON	ON
★ (Green 500ms ⇔ Red 500ms alternate blinking in 1 Hz cycle)		Maintenance warning generated (When the travel count or the travel distance has exceeded the set value, or when overload warning is generated)	ON
○ (both green and red ON)		Initializing when power comes ON	OFF

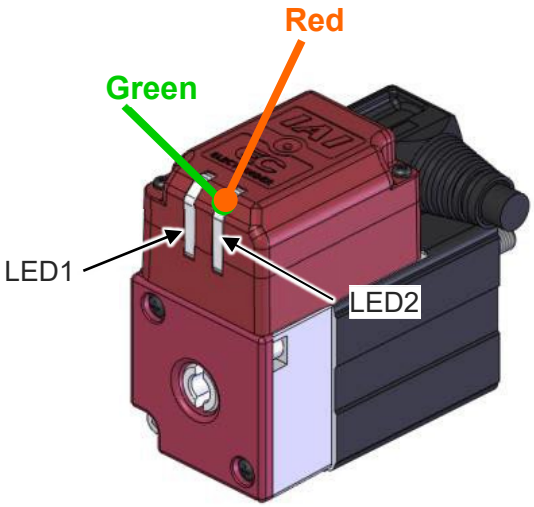


[2] Check in ELECYLINDER main body of status LED2 (wireless)

○ : Light ON
× : Light OFF
★ : Blinking



LED2 (Wireless)		Wireless status
Green	Red	
×	×	Wireless hardware initializing Wireless not connected (transmitting monitor data) Connecting from wired teaching pendant
×	★ (ON 200ms/ OFF 200ms alternate blinking)	Wireless hardware error
★ (ON 150ms/ OFF 150ms alternate blinking)	×	Connecting through wireless



[3] Check for abnormality in the master device (PLC, etc.)

[4] Check the voltage of the main power supply (24V DC)

Check for momentary power failure, voltage drop, power failure, etc.

[5] Confirm the generated alarm

Check the alarm information with the teaching tool.

[6] Check the connectors for disconnection or incomplete connection

[7] Check the cables for connection error, disconnection or snagging

Cut off the main power supply of the equipment (to avoid electric shock) and remove the cables around the measurement point (to avoid conductivity through the surrounding circuit) before checking the conductivity.

[8] Check the I/O signals

Use the master device and ELECYLINDER teaching tool to check for inconsistency or abnormality in the input/output signal status of the two units.

[9] Check the noise elimination measures (grounding, connection of noise suppressor, etc.)

[10] Check the events leading to the occurrence of the problem, as well as the operating conditions at the time of occurrence

[11] Analyze the cause

[12] Countermeasures

Caution

- When troubleshooting, exclude normally functioning parts from the targets to narrow down the causes.
- First, check [1] to [10] so that countermeasures can be taken swiftly.

Reference

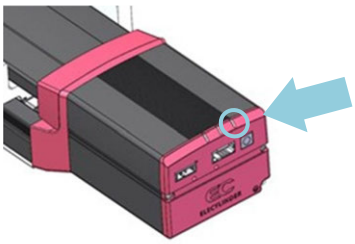
- For details/countermeasures of an occurred alarm, it is also available to check in the help window in IA-OS or touch panel teaching tool.

1.3 Troubleshooting diagnosis (for models with 200V AC servomotor equipped)

If a problem occurs, check the following points first in order to ensure quick recovery and prevent recurrence of the problem.

[1] Check in status LED (SV/ALM LED)

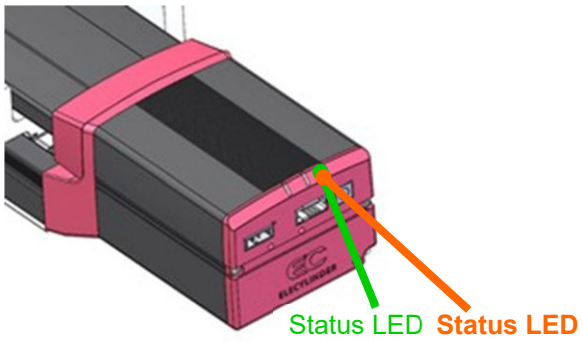
○ : Light ON
× : Light OFF
★ : Blinking



SV/ALM LED (Right side as seen from the motor side)		Operation status	*ALM signal (*1) output status
SV (green)	ALM (red)		
×	×	Control power OFF	OFF
		Servo OFF	ON
×	○	Alarm generated	OFF
		Stop switch ON (When using teaching pendant)	ON
○	×	Control Power ON, Servo ON	ON
★ (*2) (Blinking in green, 500 ms, 1 Hz frequency)	×	Maintenance warning generated (When the travel count or the travel distance has exceeded the set value, or when overload warning is generated)	ON
★ (*2) (Blinking in green, 1000 ms, 0.5 Hz frequency)	×	In process of automatic servo OFF	ON
○ (both green and red ON)		Initializing when power comes ON	OFF

*1 *ALM Signal is a signal of the break contact output.

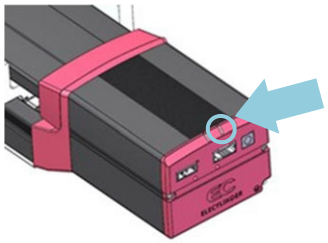
*2 Pay attention to blinking frequency as it is different for the maintenance warning and automatic servo OFF.



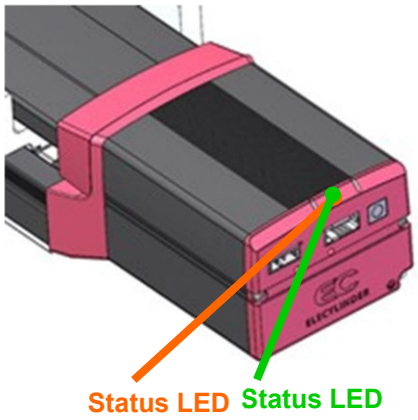
Right side as seen from the motor side

[2] Check in status LED (Motor power supply status LED)

○ : Light ON
× : Light OFF
★ : Blinking



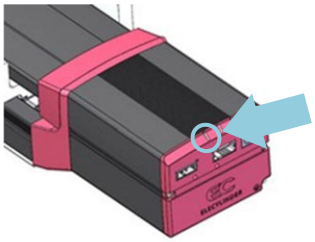
Motor Power Supply Status LED (In the middle in the view from motor side)		Motor power supply status
Green	Red	
○	×	Motor power turned ON
★	×	Motor power turned OFF
○	○	Initializing when power comes ON



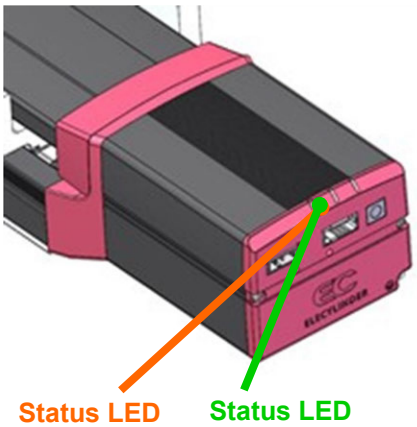
In the middle in the view from motor side

[3] Check in status LED (Wireless status LED)

○ : Light ON
× : Light OFF
★ : Blinking



Wireless status LED (Left side as seen from the motor side)		Operation status
Green	Red	
×	×	Wireless not connected (transmitting monitor data) Connecting from wired teaching pendant
×	★ (ON 200ms/ OFF 200ms alternate blinking)	Wireless hardware error
★ (ON 150ms/ OFF 150ms alternate blinking)	×	Connecting through wireless
○	○	Initializing when power comes ON



Left side as seen from the motor side

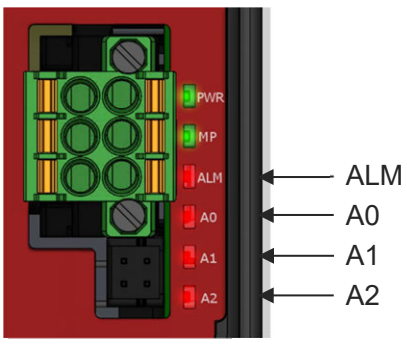
[4] Check in status LED on motor drive DC power supply

○ : Light ON
× : Light OFF
★ : Blinking

Status LED				Status	Drive source	*ALM signal (*1) output status
ALM	A0	A1	A2			
×	×	×	×	Normal	—	ON
×	★	×	×	Internal relay life count warning (Note 1)	No Cutoff	ON
×	×	★	×	Electrolytic capacitor life warning (Note 1)	No Cutoff	ON
×	×	×	★	Fan revolution drop warning (Note 1)	No Cutoff	ON
○	○	×	×	Motor power supply voltage drop	No Cutoff	OFF
○	×	○	×	Fan Error Detection	Cutoff	OFF
○	×	×	○	Excess regenerative electric discharge	Cutoff	OFF
○	○	○	×	Motor power supply excess voltage	Cutoff	OFF
○	○	×	○	PC board temperature error	Cutoff	OFF
○	×	○	○	Power device overheated	Cutoff	OFF
○	○	○	○	Critical malfunction	Cutoff	OFF
○	○	○	○	Initializing when power comes ON * Both PWR and MP are on	—	OFF

*1 *ALM Signal is a signal of the break contact output.

Note 1 If warnings occur at the same time, multiple LED lamps will flash at the same time.



Status LED

[5] Check for abnormality in the master device (PLC, etc.)

[6] Check on 100V AC or 200V AC voltage supplied to DC power supply for motor drive voltage

Check for momentary power failure, voltage drop, power failure, etc.

[7] Check in voltage of 24V DC control power supply

Check for momentary power failure, voltage drop, power failure, etc.

[8] Confirm the generated alarm

Check the alarm information with the teaching tool.

[9] Check the connectors for disconnection or incomplete connection

[10] Check the cables for connection error, disconnection or snagging

Cut off the main power supply of the equipment (to avoid electric shock) and remove the cables around the measurement point (to avoid conductivity through the surrounding circuit) before checking the conductivity.

[11] Check the I/O signals

Use the master device and ELECYLINDER teaching tool to check for inconsistency or abnormality in the input/output signal status of the two units.

[12] Check the noise elimination measures (grounding, connection of noise suppressor, etc.)

[13] Check the events leading to the occurrence of the problem, as well as the operating conditions at the time of occurrence

[14] Analyze the cause

[15] Countermeasures

Caution

- When troubleshooting, exclude normally functioning parts from the targets to narrow down the causes.
- First, check [1] to [10] so that countermeasures can be taken swiftly.

1.4 Troubleshooting diagnosis

Based on the status of the problem occurring, proceed with the diagnosis as follows.

[When no alarm is generated]

Abnormal conditions can be roughly divided into the following two types.
For details and countermeasures, see [Maintenance Section Chapter 1, 1.5 Troubleshooting with no alarm generated].

1.5.1 Operation failure
1.5.2 Abnormal or unstable operation

If the issue is not resolved after checking and taking countermeasures, contact IAI. If the issue is not resolved after checking and taking countermeasures, contact IAI.

[When an alarm is generated]

The alarm groups and warnings are as follows.
For details and countermeasures, see [Maintenance Section Chapter 1, 1.6 Troubleshooting by alarm groups].

Alarm group	Content	Main content and typical countermeasures	
A	Overload alarm	[Content] [Countermeasure]	Moving parts stopped abnormally. Make sure that there are no obstructions or obstacles.
B	Motor error alarm	[Content] [Countermeasure]	Motor abnormality occurred. Replace the motor unit.
C	Controller error alarm	[Content] [Countermeasure]	Controller abnormality occurred. Replace the motor unit.
D	Controller-encoder abnormality alarm	[Content] [Countermeasure]	An abnormality occurred between the controller and encoder. Turn the power off and then on again. If the unit still does not recover, replace the motor unit.
E	Power supply voltage / Power supply capacity error alarm	[Content] [Countermeasure]	Controller abnormality occurred. Check the power supply voltage for any abnormality.

Alarm level	Content	Main content and typical countermeasures	
Warning	Maintenance warning	[Content] [Countermeasure]	The "maintenance period" has come to an end. Perform maintenance for the unit.

1.5 Troubleshooting with no alarm generated

1.5.1 Operation failure

[Condition 1] LED1 (Servo/Alarm) do not light up

No.	Possible cause	Confirmation/countermeasure
1	The specified power is not supplied.	● Make sure that normal voltage is secured and wiring processing is correct. ● Also, be sure to check for disconnection or partial disconnection in connectors and wiring. For details, refer to [Startup Section 3.4 or 3.5] for models with pulse motor equipped. For details, refer to [Startup Section 4.4 or 4.5] for models with 24V AC servomotor equipped. For details, refer to [Startup Section 5.4 or 5.5] for models with 200V AC servomotor equipped.
2	The unit is switched to servo OFF with the teaching tool.	Turn ON the servo with PC teaching software or teaching pendant.
3	Controller breakdown	● Replace the motor unit. For details, refer to [Instruction manual for each ELECYLINDER, Motor unit replacement]. ● If the unit still does not recover, contact IAI.

[Condition 2] LED1 (Servo/Alarm) light up red

No.	Possible cause	Confirmation/countermeasure
1	Alarm generated.	● Connect the teaching tool. ● Upon checking the alarm code, resolve the cause. For details, refer to [1.6 Troubleshooting by alarm groups].
2	The stop switch of the teaching pendant is being pressed. 	Release the stop switch.

[Condition 3] The unit does not operate even when a command is sent from a master device such as a PLC

No.	Possible cause	Confirmation/countermeasure
1	I/O signal communication is not established	● Check the input/output status of the I/O signal with the monitoring function of the teaching tool. (both the master device and the ELECYLINDER) ● Make sure the I/O signal voltage is normal. ● Check whether the length of the I/O signal cable is within 10m, and whether the wire diameter is thinner than the applicable value. ● Make sure the wiring processing is correct. For details, refer to [Startup Section 3.4 or 3.5] for models with pulse motor equipped. For details, refer to [Startup Section 4.4 or 4.5] for models with 24V AC servomotor equipped. For details, refer to [Startup Section 5.4 or 5.5] for models with 200V AC servomotor equipped.
2	Disconnection of power & I/O cable, disconnection or contact failure of power & I/O connector	● Check whether the cable is disconnected/partially disconnected. ● Make sure that the connector and cable are not pulled out. For details, refer to [Startup Section 3.4 or 3.5] for models with pulse motor equipped. For details, refer to [Startup Section 4.4 or 4.5] for models with 24V AC servomotor equipped. For details, refer to [Startup Section 5.4 or 5.5] for models with 200V AC servomotor equipped.
3	Movement command issued to stopping position When stopping at "Forward end", check the ladder sequence by sending a "Forward" command etc.	Check the ladder sequence and the setting of the forward end/backward end.
4	Edge signals are input to "Forward" and "Backward".	Check the ladder sequence and input level signals.

* For details on I/O signals, refer to [Operation Section 2.1 I/O signals].

1.5.2 Abnormal or unstable operation

[Condition 1] Home return completes in the middle of home return operation

During home return operation, the ELECYLINDER moves until it hits the mechanical end, then reverses and stops at home. When the load is excessive or the unit hits interference, it may determine that the mechanical end has been reached, without actually having done so.

No.	Possible cause	Confirmation/countermeasure
1	A load exceeding the maximum payload is applied.	Reduce the load.
2	A moving part is hitting interference while moving.	Remove the interfering object.
3	The body or guide is twisted due to the fixing method of the ELECYLINDER.	● Loosen the fixing bolt and check whether the moving part moves smoothly. ● If it does, check whether the mounting surface is distorted. ● Re-mount according to the mounting method described in the instruction manual. For details, refer to the instruction manual for each ELECYLINDER [Chapter 2 Installation].
4	The sliding resistance of the ELECYLINDER is excessive.	Contact IAI.

[Condition 2] The movement is complete, but the LS signal is not output

No.	Possible cause	Confirmation/countermeasure
1	LS signal (I/O signal) communication is not established	● Check the input/output status of the LS signal (I/O signal) with the monitoring function of the teaching tool. (both the master device and the ELECYLINDER) ● Make sure the LS signal (I/O signal) voltage is normal. ● Check whether the length of the I/O signal cable is within 10m, and whether the wire diameter is thinner than the applicable value. ● Make sure the wiring processing is correct. For details, refer to [Startup Section 3.4 or 3.5] for models with pulse motor equipped. For details, refer to [Startup Section 4.4 or 4.5] for models with 24V AC servomotor equipped. For details, refer to [Startup Section 5.4 or 5.5] for models with 200V AC servomotor equipped.
2	The detection range of the LS signal is set below the minimum resolution	Adjust Parameter No. 2 "Auto switch "LS" signal detection range adjustment" appropriately. For details, refer to [Operation Section 4.4.2 Parameter No.2: Auto switch "LS" signal detection range adjustment].

[Condition 3] Shock or vibration is observed in acceleration/deceleration

No.	Possible cause	Confirmation/countermeasure
1	● Acceleration/deceleration setting is too high. ● A load susceptible to acceleration and deceleration is mounted. ● The ELECYLINDER is mounted on equipment with a structure susceptible to acceleration and deceleration.	● Lower the acceleration/deceleration setting. ● Enable Parameter No. 5 "Smooth accel/decel setting" and check its effect. For details, refer to [Operation Section 4.4.5 Parameter No.5: Smooth accel/decel setting].
2	Load inertia is excessive.	Lower the deceleration and suppress overshoot.

[Condition 4] The unit vibrates slightly while stopped

No.	Possible cause	Confirmation/countermeasure
1	● A load susceptible to vibration is mounted ● The ELECYLINDER is mounted on a frame with a structure susceptible to vibration	● Lower the acceleration/deceleration setting. ● If Parameter No. 6 "Current control setting at stop" is disabled, enable it and check its effect. For details, refer to [Operation Section 4.4.6 Parameter No.6: Current control setting at stop].

1.6 Troubleshooting by alarm groups

Alarms are classified into "alarms" and "warnings" depending on the content.
"Alarms" are grouped into 5 types.

Alarm level	LED1 (Servo/Alarm)	* ALM signal	Situation when generated	Clearing method
Alarm	Red ON	OFF	Servo OFF after gradual stop	Cleared by resetting the alarm. If it cannot be cleared by resetting the alarm, turn off the power, then turn it on again.
Warning	[For Models with Pulse Motor Equipped] Red/green alternate blinking [For Models with 200V AC Servomotor Equipped] Green blinking	ON	Continued operation	● Maintenance Warnings 1, 2 (Total travel count/Total travel distance) are cleared by updating the set values in the maintenance information window. ● Maintenance Warning 3 (Overload warning) is cleared by resetting the alarm. ● Maintenance Warnings 4 (Capacitor assumed life exceeded warning) is cleared by resetting the alarm. However, should occur again after power reboot. (*1)

*1 Maintenance Warning 4 is a warning feature dedicated for the 200V AC servomotor equipped models.
This Warning should occur again after power reboot.

Caution

- Clear alarms only after investigating and resolving the cause.
- If the same alarm recurs after clearance, it is highly probable that the cause of the alarm has not been resolved.
- If the cause of the alarm cannot be resolved or the alarm cannot be cleared after resolving the cause, contact IAI.

1.6.1 Alarm group A: Overload alarm

Moving parts of ELECYLINDER stopped abnormally while moving to the target position.

No.	Cause	Countermeasure
1	Operation may not be possible due to contact with or snagging on external obstacles.	Remove any external obstacles or other external loads.
2	The ELECYLINDER may be being used under conditions exceeding the specifications.	Check the specification values such as payload, acceleration/deceleration and speed, and adjust them appropriately.
3	Causes may include foreign matter, brake failure or motor failure.	Visually check for the depletion of grease on the ball screw / guide inside the ELECYLINDER, intrusion of foreign matter, etc. If this is the case, clean the inside of the ELECYLINDER and replenish the grease.
		Check the sliding movement of the ELECYLINDER body. If there is no abnormality in the sliding motion, there is a possibility of motor or brake failure. Replacement of the motor unit is recommended.
4	The base may have been distorted when mounting the ELECYLINDER, increasing the sliding resistance of the guide.	The ELECYLINDER mounting surface should be a machined surface or a plane with similar accuracy, have its flatness at 0.02mm/m max. and straightness at 0.01mm max. Refer to the instruction manual of each ELECYLINDER [How to Install] for the recommended tightening torque of the bolt for fixing the base.
5-1	[For Models with Pulse Motor Equipped] The peak power capacity of the 24V power supply is less than 2.0A.	Use a power supply with peak current of 2.0A or higher (per axis).
5-2	[For Models with 200V AC Servomotor Equipped] The power voltage on 100V AC (or 200V AC) has dropped.	Check on the power voltage of 100V AC (or 200V AC). In case it has been dropped, take a counteraction so it gets back to the specified power voltage. In case a cable below AWG14 is used, apply one with AWG14.
6	The resistance is high because the cables used are those with their wire diameter less than AWG18. Or, there is a contact error at the connector terminal which has blocked the flow of peak current.	Make sure that the wiring for power supply use is AWG18 and that there is no looseness, contact failure, disconnection or the like at the connection terminal/connector etc.

No.	Cause	Countermeasure
7	The deceleration distance was insufficient and the calculation result of the arrival position exceeded the operation range of the ELECYLINDER due to the next movement command being issued too soon during operation with Smooth accel/decel setting enabled.	Adjust the timing of the next movement command so that the command will be given after the first movement is completed.
8-1	[For Models with Pulse Motor Equipped] 24V power was turned ON while the moving parts of the ELECYLINDER were immobilized or pressed against the mechanical stopper.	Resolve the state of immobilization. If the unit is pressed against the mechanical stopper, move it at least 5mm away, then turn on the power again.
8-2	[For Models with 200V AC Servomotor Equipped] 24V DC and 100V AC (or 200V AC) was turned ON while the moving parts of the ELECYLINDER were immobilized or pressed against the mechanical stopper.	Resolve the state of immobilization. If the unit is pressed against the mechanical stopper, move it at least 5mm away, then turn on 24V DC and 100V AC (or 200V AC) again.

1.6.2 Alarm group B: Motor abnormality alarm

Motor abnormality occurred.

No.	Cause	Countermeasure
1	The internal temperature of the motor may be too high.	Improve the surrounding environment of the motor so that the ambient temperature is 40°C or less. If the abnormality is resolved upon turning the power back on after the ambient temperature is lowered, the internal temperature may have been excessive. [Countermeasure examples] Remove the heat source/turn OFF the heat source/install a fan/install a temperature shield/improve thermal conductivity of the base/install a heat dissipation fin, etc.
2	The ELECYLINDER may be being used under conditions exceeding the specifications.	Check the specification values such as payload, acceleration/deceleration and speed, and adjust them appropriately.
3	If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the motor has failed.	Replace the motor unit. For details, refer to the [Instruction manual for each ELECYLINDER, Maintenance and Inspection].

1.6.3 Alarm group C: Controller abnormality alarm

Controller abnormality occurred.

No.	Cause	Countermeasure
1	The controller is affected by the noise of a peripheral device and cannot operate normally.	Shut down the power supply of the peripheral device and operate only with the ELECYLINDER, then check to see whether this alarm persists. If it does not, there is a possibility that the ELECYLINDER is affected by the noise from the peripheral device. Reconsider the noise countermeasures (grounding, power line wiring, electrostatic shielding, etc.) for the peripheral device.
2	If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the controller has failed.	Replace the motor unit. For details, refer to the [Instruction manual for each ELECYLINDER, Maintenance and Inspection].

1.6.4 Alarm group D: Controller-encoder abnormality alarm

An abnormality occurred between the controller and encoder.

No.	Cause	Countermeasure
1	If a similar alarm persists after turning the power supply back on, it is likely that a contact failure has occurred at the connector of the cable that connects the controller and motor.	After shutting off the power supply, remove the cable connector and firmly re-insert it all the way. If this does not improve the situation, the cable may be disconnected, in which case the connection cable should be replaced.
2	The communication between the controller and encoder is affected by the noise of a peripheral device and cannot operate normally.	Shut down the power supply of the peripheral device and operate only with the ELECYLINDER, then check to see whether this alarm persists. If it does not, there is a possibility that the ELECYLINDER is affected by the noise from the peripheral device. Reconsider the noise countermeasures (grounding protection, power line wiring, electrostatic shielding, etc.) for the peripheral device.
3	If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the motor or controller has failed.	Replace the motor unit or PC board. For details, refer to the [Instruction manual for each ELECYLINDER, Maintenance and Inspection].
4	A change was made to Parameter No. 3 or No. 4 while WA (battery-less absolute encoder type) is selected in an option.	Reset the alarm and then perform the homereturn operation.

1.6.5 Alarm group E: Supply voltage/power capacity abnormality alarm

An abnormality occurred in the power supply voltage and capacity supplied to the rear of the ELECYLINDER.

No.	Cause	Countermeasure
1	The ELECYLINDER may be being used under conditions exceeding the specifications.	Check the specification values such as payload, acceleration/deceleration and speed, and adjust them appropriately.
2	The power supply voltage has been detected outside the range of 21.6 to 26.4V.	[Countermeasure 1] 1) Inspect with a tester to see whether the power supply voltage is in the range of 21.6V to 26.4V. If it is out of range, the 24V DC power supply voltage has insufficient capacity. Check the necessary capacity and improve the power supply environment. 2) Confirm that there is no gap in the voltage between 24V and 0V on the 24V power supply side from the voltage between 24V to 0V on the EC side.
		[Countermeasure 2] Check if the total length of an actuator cable and a power & I/O cable is 10m or less, and whether the wire diameter is smaller than the applicable value. Make sure the wiring processing is correct. ・For Models with Pulse Motor Equipped Refer to [Startup Section 3.4 or 3.5 Way of wiring]. ・For Models with 24V AC Servomotor Equipped Refer to [Startup Section 4.4 or 4.5 Way of wiring]. ・For Models with 200V AC Servomotor Equipped Refer to [Startup Section 5.4 or 5.5 Way of wiring].
3	Overcurrent has occurred on the I/O output part.	1) Check if the current has exceeded the rated output current on the I/O output part. If it is exceeded, set the output current to fall into the rated range, and then reboot the power supply. 2) Check if there is a connectivity error to the host device. Make sure it is established correctly and then reboot the power.
4	If this alarm recurs after performing the inspection above and improving the power supply environment, it is highly likely that the controller has failed.	Replace the motor unit. For details, refer to the [Instruction manual for each ELECYLINDER, Maintenance and Inspection].

1.6.6 Alarm in DC power supply for motor drive (PSA-200)

There was an error occurred to the DC power supply for motor drive (PSA-200) connected to a 200V AC servomotor equipped model.

No.	Alarm name	Cause	Countermeasure
1	Motor power supply voltage drop	The output voltage has dropped below the threshold.	1) Check on the motor drive DC power supply (PSA-200). (Check such things as power voltage) 2) There is a concern of malfunction on the motor drive DC power supply (PSA-200).
2	Fan error detection	The fan revolution has dropped or stopped.	1) Check the connectivity of the fan unit. 2) Replace the fan unit.
3	Excess regenerative electric discharge	Regenerative electric discharge in the internal regenerative resistance has risen above the threshold.	1) Add a regenerative resistor unit.
4	Motor power supply excess voltage	The output voltage has risen a above the threshold.	1) Check on the motor drive DC power supply (PSA-200). (Check such things as power voltage) 2) Add a regenerative resistor unit.
5	PC board temperature error	The thermo sensor on the PC board had detected an overheat.	1) Check the total wattage of the connected actuators. 2) Check the ambient temperature. 3) Add a regenerative resistor unit.
6	Power device overheated	The thermo sensor on the PC board had detected an overheat.	1) Check the total wattage of the connected actuators. 2) Check the ambient temperature. 3) Add a regenerative resistor unit.
7	Critical malfunction	A non-recoverable error except for No. 1 to No. 6 was detected.	Replace the motor drive DC power supply.

1.6.7 Maintenance warning 1: Total travel count

This is an alert that the target value of the "total travel count" set by the customer has been reached.

No.	Content	Countermeasure
1	For safe use and long service life of the ELECYLINDER, periodic lubrication is recommended. * To disable this warning, change the target value to 0.	[Countermeasure 1] Perform maintenance and inspection such as greasing. For details, refer to the [Instruction manual for each ELECYLINDER, Greasing method].
		[Countermeasure 2] When updating this function, be sure to set the target value to a value larger than the current value.

* For setting, refer to [Operation Section 3.2 Maintenance information or 3.3 Setting maintenance information].

1.6.8 Maintenance warning 2: Total travel distance

This is an alert that the target value of the "total travel distance" set by the customer has been reached.

No.	Content	Countermeasure
1	For safe use and long service life of the ELECYLINDER, periodic lubrication is recommended. * To disable this warning, change the target value to 0.	[Countermeasure 1] Perform maintenance and inspection such as greasing. For details, refer to the [instruction manual for each ELECYLINDER, Greasing method].
		[Countermeasure 2] When updating this function, be sure to set the target value to a value larger than the current value.

* For setting, refer to [Operation Section 3.2 Maintenance information or 3.3 Setting maintenance information].

1.6.9 Maintenance warning 3: Overload warning level

This is an alert that the target value of the "overload warning level" set by the customer has been reached.

No.	Content	Causes and countermeasures
1	Before the ELECYLINDER stops operation due to the "overload alarm", follow the troubleshooting procedure and conduct visual inspection and maintenance. * To disable this warning, change the "overload warning level" in "Maintenance Information" to 100%.	[Causes] The warning may be caused by the depletion of grease on the sliding screw/guide inside the ELECYLINDER, brake failure, motor failure, contact with peripheral equipment, etc.
		[Countermeasure 1] Visually check for the depletion of grease on the sliding screw/guide inside the ELECYLINDER, intrusion of foreign matter, etc. If this is the case, clean the inside of the ELECYLINDER and replenish the grease. For details, refer to the [instruction manual for each ELECYLINDER, "Cleaning" or "Greasing method"].
		[Countermeasure 2] Check the sliding movement of the ELECYLINDER body. If there is no abnormality in the sliding motion, there is a possibility of motor or brake failure. Replacement of the motor unit is recommended. For details, refer to the [instruction manual for each ELECYLINDER, "Maintenance and Inspection"].

* For setting, refer to [Operation Section 3.2 Maintenance information or 3.3 Setting maintenance information].

1.6.10 Maintenance warning 4: Capacitor assumed life exceeded warning

The life of the capacitor mounted on the controller PC board is close to the end.

No.	Content	Causes and countermeasures
1	The life of the capacitor mounted on the controller PC board has reached the end.	The warning being generated is not stating there is no capacity in the capacitor (dry-up), however, it is recommended to have the controller PC board replaced as early as possible.

1.6.11 Warnings in DC power supply for motor drive (PSA-200)

The DC power supply for motor drive (PSA-200) has generated a warning.

No.	Content	Causes and countermeasures	Countermeasure
1	Internal relay life count warning	Open/close count of the internal relay has reached the end of the life.	Replace the DC power supply for motor drive.
2	Electrolytic capacitor life warning	The electrolytic capacitor has reached the end of its life.	The warning being generated is not stating there is no capacity in the capacitor (dry-up), however, it is recommended to have the DC power supply for motor drive replaced as early as possible.
3	Fan revolution drop warning	The fan revolution count has dropped below the threshold.	The warning being generated is not stating the fan revolution count has stopped, however, it is recommended to have the fan unit replaced as early as possible.

Maintenance Section

Chapter 2

Life

2.1 Concept of Life for Controller

The controller part affecting service life is as follows.

Target part	Life	Condition
Electrolytic capacitor	5 years	Ambient temperature 40°C Rated operation

* The product life fluctuates drastically depending on the condition of use, environment and condition of maintenance.

2.2 How to Take Concept of Product Life for DC Power Supply for Motor Drive (PSA-200)

The consumable components in the DC power supply for motor drive (PSA-200) are as shown below.

Target part	Life	Condition
Electrolytic capacitor	5 years	Ambient temperature 55°C Continuous rated output
Fan	3 years	Ambient temperature 55°C Continuous rated output
Internal relay	100,000 times	

Maintenance Section

Chapter 3

Component Replacement

3.1 Replacing Fan on DC Power Supply for Motor Drive (PSA-200)

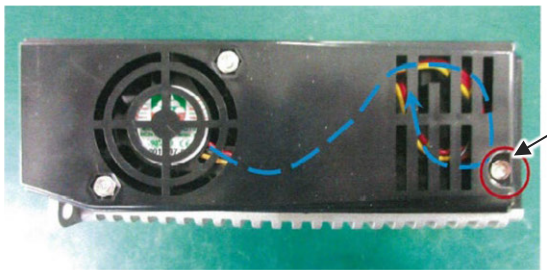
[1] Ready

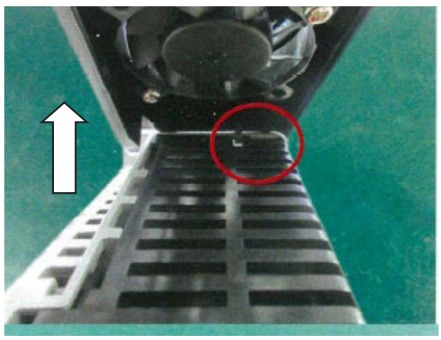
- Hex Wrench and Torque Wrench Opposite side:2.5
- Fan unit for PSA-200 (Accessories : Hexagon socket head bolt M3×6)

Fan unit model
PSA-FNB

[2] Replacement procedure

1) Remove the hex socket head cap screw and take off the fan unit.

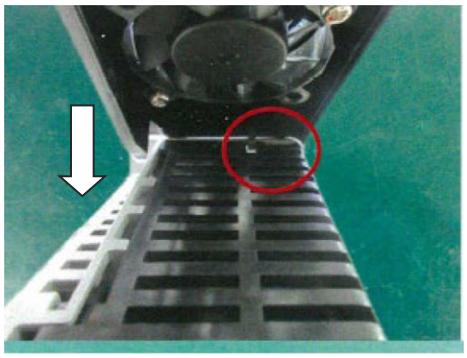


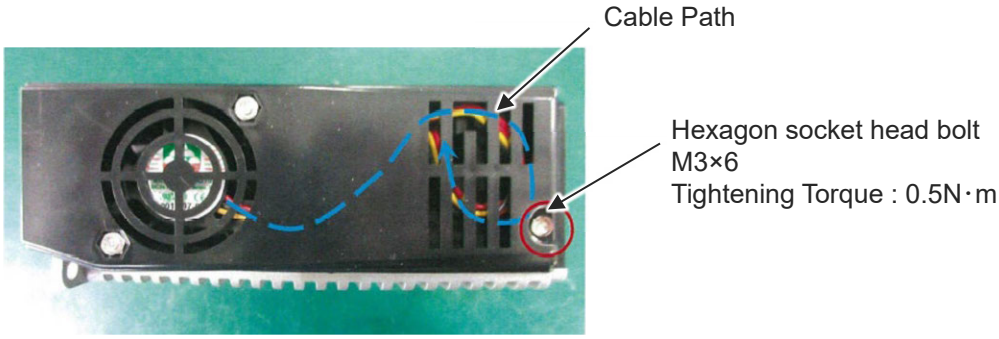


2) Take the black connector on the fan unit off the connector on the top of the power supply.

3) Connect the black connector on the replacement fan unit to the connector on the top of the power supply.

4) Set the cables on the fan unit referring to the figures below, hang the hook equipped at the back on the hole allocated on the power supply, and affix the fan unit with the hex socket head cap screws.





(Note) Pay attention to the cable not to stick it out to the front of the slit on the fan unit.

Appendix

Chapter 1

EU Declaration of Conformity

1.1 EU Declaration of Conformity

As this product is complied with Wireless Machinery Directive, hereafter attaches EU Declaration of Conformity.

IAI Quality and Innovation

IAI CORPORATION
577-1 Obane, Shimizu-Ku, Shizuoka City, Shizuoka 424-0103 Japan

EU DECLARATION OF CONFORMITY

Manufacturer:

IAI CORPORATION
577-1 Obane, Shimizu-Ku, Shizuoka City, Shizuoka 424-0103 Japan

Authorized representative within the Community:

IAI Industrieroboter GmbH
Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany

We make this declaration under the responsibility of the manufacturer.
Hereby declares that the equipment described below:

Equipment:

RADIO EQUIPMENT SYSTEM

TB-03 series
IABL series

Complies with the provisions of the RED 2014/53/EU, European Directives and the following harmonized standards:

EN 55032: 2015
ETSI EN 300 328 V2.2.2

And also complies with the provisions of the RoHS Directive 2011/65/EU+(EU)2015/863, based on the following specifications applied:

EN IEC 63000: 2018

Done at Shizuoka, Japan,

On July 30 , 2021

President Toru Ishida

CE

ORIGINAL

Warranty

Chapter 1

Warranty

1.1 Warranty period

Whichever of the following periods is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to a specified location
- 2,500 operational hours

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

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

- Anything other than our product
- Modification or repair performed by a party other than IAI (unless approved by IAI)
- Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
- Natural disaster, unnatural disaster, incident or accident for which we are not liable
- Natural fading of paint or other symptoms of aging
- Wear, depletion or other expected results of use
- Operation noise, vibration or other subjective sensations 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.

1.3 Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

1.4 Limited liability

(1) We 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 assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

1.5 Conformance with applicable standards/regulations, etc., and application conditions

(1) If our product is combined with another product or any system, equipment, 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 assume no liability 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 IAI if you must use our product for any of these applications:
- Medical equipment used to maintain, control or otherwise affect human life or physical health
- Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
- Machinery components essential for safety (safety devices etc.)
- Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

1.6 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:

- Guidance for mounting/adjustment and witnessing of test operation
- Maintenance and inspection
- Technical guidance and education on operating/wiring methods, etc.
- Technical guidance and education on programming and other items related to programs

Revision history

Revision date	Revised content
2022. 08	First Edition
2022.11	Second Edition • Specifications Section 1.2, 3.2 Explanation added regarding 200V AC servomotor equipped models 1.4.6 EC-ST15ME added to incremental encoder dedicated models 2.3 Description added stating interface box applicable for wireless 3.2 Reference added for 200V AC servomotor equipped models 3.5 Example of LED display added 4.3 Contents revised for LED displays (200V AC servomotor equipped models) • Startup Section 1.4 Image of keyboard changed 3.2.2 Explanation added regarding Interface box 3.3 Image of frame ground wiring changed 5.1.3 Image of how to build up a 4-way connector cable changed 5.2 Image of wiring changed • Operation Section 1.2 Operation to release brake added 1.3.3 Contents revised for pressing operation setting 2.1.6 Descriptions added 4.3 Descriptions revised, format changed in parameter list 4.3, 4.4 Change made to Parameter No. 2 Default Values on Delivery from Factory 4.4.10 Explanation revised in Parameter No. 10 • Maintenance Section 1.5 Added case of 200V AC servomotor equipped models in LED display Chapter 3 Component Replacement added • Correction made, terms unified.
2023.01	Third Edition • Specifications Section 3.5, 4.3 Green light blinking : In process of automatic servo OFF added • Operation Section 1.5 Automatic servo OFF function added 2.2.3 When Set to Automatic Servo OFF added 3.3 Change made to contents of Setting maintenance information 3.3.2 How to set up in PC teaching software (IA-OS) added 4.4.10 In process of automatic servo OFF added in table of [Set to "Enable"]

Revision date	Revised content
2023.01	• Maintenance Section 1.1 In process of automatic servo OFF added in table 1.2 Contents changed for in maintenance warning and in process of automatic servo OFF added in table • Correction made
2023.05	3B Edition Added EC-B8S/B8SS related • Operation Section 2.2 [2] Change made to caution for pressing operation 2.2.1 [3], 2.2.2 [3] 2-circuit power supply specification TMD (Option) added 2.2.3 Change made to flowchart 1 and 2 for when set to automatic servo OFF 3.2.3 Change made to overload warning load level ratio
2023.06	3C Edition Added EC-S8, RR8, RR10 related
2023.07	3D Edition • Specifications Section 3.1 Contents added in High thrust of motor size 5.6.7 Motor power supply connector change of the pin number in the image • Startup Section 2.5 Illustration change of restriction of ambient environment (PSA-200) • Operation Section 2.2.1 [2] Change made to reference for pressing operation 2.2.2 [2] Change made to reference and caution for pressing operation
2023.10	Fourth Edition • Overall • Models added: Gripper types (EC-GRC6M/GRC7□, EC-GRST3□/GRST6□/GRST7□) • Title changed (Specification Edition Chapter 2.1, Sections 2.1.1 to 2.1.3, Chapter 2.2 and Chapter 2.3) • Three types defined for ejection methods of interface for pulse motor mounted models • Preliminaries • Note added for finger attachment option of gripper in Actuator Coordinate System (4)

Revision date	Revised content
2023.10	• Specifications Section 1.1 Explanation added regarding ejection of interface for pulse motor mounted models 1.2 EC-GRC6M/GRC7□/GRST3□ encoder type added in product specification section 2.1 Classification table added for each interface ejection type in pulse motor mounted models 2.3.1 Change made to title name 3.1, 3.2, 3.3, 3.4 GRC6M, GRC7□, GRST3□ encoder type added • Startup Section 3.3.7 Section tiles changed from Slim and Small Type to "Interface Separate Type" • Operation Section 2.1.9 Gripper Type (EC-GRC6M/GRC7□, EC-GRST3□/GRST6□/GRST7□) added in list of input time constant 4.4.10 Correction made partially to explanation of parameters • Appendix 1.1 Correction made
2024.02	4B Edition • Overall • Models added: Slider types (S2□(R)) Radial cylinder types (RR2□(R)) Slim and Small Rod Type (RP3□, GD3□) Slim and Small Table type (TC3□, TW3□) Rotary type (RTB4M) • Specifications Section 1.2 Explanation partially revised for external interface • Operation Section 2.1.9 Model added and description partially corrected in input time constant list (Additional models: S2□, RR2□, RP3□, GD3□, TC3□, TW3□) 2.2.1 [3] Supplemental explanation added regarding "Sudden Stop" in description of time chart
2024.04	Fifth Edition • Overall • 24V AC servomotor equipped model added
2025.03	5B Edition 1.4.3 3 position mode specification added

Manual No.: ME3816-5B (March 2025)

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