

ROBO PUMP

RP-VPM/VPMV

Instruction Manual Second Edition ME3827-2B



Specifications	Chapter 1
Installation	Chapter 2
Wiring	Chapter 3
Operation	Chapter 4
Parameters	Chapter 5
Troubleshooting	Chapter 6
Maintenance and Inspection	Chapter 7
External Dimensions	Chapter 8
Life	Chapter 9
Appendix	Chapter 10
Warranty	Chapter 11

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please download 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.

ROBO PUMP Instruction Manual Configuration

Product name	Instruction manual name	Control number
ROBO PUMP	Instruction Manual (this document)	ME3827
ROBO PUMP	First Step Guide	ME3828

Teaching Tool Application Versions

Product name	Product model	Application start version
PC Teaching Software	IA-OS	14.00.00.00
Touch Panel Teaching Pendant	TB-02/02D	4.70
Touch Panel Teaching Pendant	TB-03	4.70
Remote Speed Controller	TBD-1WL	1.40

* Digital Speed Controller Teaching (TBD-1) are not applicable for ROBO PUMP.

Contents

Safety Guide	Intro-1
Precautions for Handling	Intro-8
International Standard Compliance	Intro-9
Precautions for Handling Wireless Operation	Intro-10
Precautions for Operation with Wireless Connection	Intro-13
Part Names	Intro-14

Chapter 1 Specifications

1.1 Checking the Product	1-1
1.1.1 Components	1-1
1.1.2 How to Read the Model Nameplate	1-2
1.1.3 How to Read the Model Number	1-3
1.2 Mechanical Specifications	1-4
1.2.1 RP-VPM (Standard)	1-4
1.2.2 RP-VPMV (Equipped with air blow)	1-5
1.3 Electrical Specifications	1-6
1.3.1 Common to RP-VPM (Standard) and RP-VPMV (Equipped with Air Blow)	1-6
1.3.2 LED Display	1-7
1.4 Duty Ratio	1-8
1.4.1 Duty Ratio Limit	1-8
1.5 Option	1-9
1.5.1 RCON-EC connection specification (Model: ACR)	1-9
1.5.2 PNP specification (Model: PN)	1-9
1.5.3 2-circuit power supply specification (Model: TMD2)	1-9
1.5.4 Wireless communication specification (Model: WL)	1-9

Chapter 2 Installation

2.1 Precautions for Transportation	2-1
2.2 Installation and Storage/Preservation Environment	2-2
2.2.1 Installation Environment	2-2
2.2.2 Storage/Preservation Environment	2-3
2.3 Installation Method	2-4
2.3.1 Installation Frame	2-4
2.3.2 Mounting Orientation	2-4
2.3.3 Bolts for Fixing	2-4
2.3.4 Body Mounting	2-5

2.3.5 External Filter Mounting	2-6
--------------------------------------	-----

Chapter 3 Wiring

3.1 System Configuration	3-1
3.2 Connection Arrangement Diagram	3-3
3.3 Interface Box Installation and Wiring	3-5
3.3.1 Precautions for Interface Box Installation	3-5
3.3.2 Interface Box	3-6
3.3.3 I/O Specifications	3-7
3.3.4 Power & Communication Cable	3-8
3.3.5 Interface Box Wiring	3-9
3.4 Frame Grounding Wiring	3-10
3.5 Way of Wiring (Connect to PIO Control / Connector)	3-12
3.5.1 Connector Wiring Method	3-13
3.5.2 24V DC Power Supply Wiring	3-14
3.5.3 Wiring of Drive Cutoff Switch in Order to Make Stop	3-16
3.5.4 PLC Wiring	3-19
3.6 Way of Wiring (Connect to PIO Control / Cables)	3-22
3.6.1 Power & I/O Cable	3-22
3.6.2 Power & I/O Cable Connection	3-25
3.6.3 24V DC Power Supply Wiring	3-26
3.6.4 Wiring of Drive Cutoff Switch in Order to Make Stop	3-28
3.6.5 PLC Wiring	3-29
3.7 Way of Wiring (Connecting to RCON-EC)	3-30
3.7.1 Power & Communication Cable	3-30
3.7.2 Wiring of ROBO PUMP and RCON-EC	3-31

Chapter 4 Operation

4.1 Basic of Operation	4-1
4.1.1 Basic of Operation	4-1
4.1.2 Order to Turn Power ON	4-2
4.1.3 Transition of Display Panel Windows	4-3
4.1.4 Order to Turn Power OFF	4-4
4.2 Teaching Tool Connections and Testing Operation	4-5
4.2.1 Connecting Controller Communication Cable	4-6
4.2.2 Connecting to IA-OS	4-7
4.3 Operation and Setup for Trial Run	4-9
4.3.1 Display in Trial Run Screen	4-9

4.3.2	Explanation of Trial Run Screen	4-10
4.3.3	How to Perform Trial Run	4-14
4.3.4	Operating Condition Setting / Adjustment	4-15
4.4	I/O Signals	4-16
4.4.1	I/O Signal List	4-16
4.4.2	Input Signal and Mode Transition	4-20
4.4.3	Error Operation Protection Time in Input Signal	4-22
4.5	Operating Method from Master Device	4-23
4.5.1	How to Operate in Double Solenoid Mode	4-23
4.5.2	How to Operate in Single Solenoid Mode	4-25
4.5.3	How to Operate in Double Solenoid 2 Mode	4-27
4.5.4	Input and Output Signal Timing when Connected to RCON-EC	4-29
4.6	Overload Warning Feature	4-30
4.6.1	About Overload Warning Feature	4-30
4.6.2	Overload Warning Level	4-31
4.6.3	Overload Warning Level Setting	4-32
4.7	JOG Switch	4-35

Chapter 5 Parameters

5.1	Precautions Regarding Parameters	5-1
5.2	How to Check/Edit Parameters	5-2
5.2.1	Procedures to Check Parameters	5-2
5.2.2	How to Edit Parameters	5-3
5.2.3	How to Transfer Parameters	5-5
5.3	Parameter List	5-6
5.4	Each Parameter Function Descriptions	5-7
5.4.1	Parameter No.1: Adsorption confirmation ON level (Adsorption Confirmation Level)	5-7
5.4.2	Parameter No.2: Adsorption Confirmation OFF Level (Desorption Confirmation Level)	5-8
5.4.3	Parameter No.3: Power Saving Mode	5-9
5.4.4	Parameter No.4: Adsorption Stop Level	5-10
5.4.5	Parameter No.5: Select PIO Pattern	5-11
5.4.6	Parameter No.6: Select Monitoring Mode	5-12
5.4.7	Parameter No.7: Monitoring Cycle	5-13
5.4.8	Parameter No.8: Select SIO Baud Rate	5-14
5.4.9	Parameter No.9: Slave Transmitter Activation Min. Latency	5-15
5.4.10	Parameter No.10: Silent Interval Magnification	5-16

5.4.11 Parameter No.11: Desorption Time	5-17
5.4.12 Parameter No.12: Air Blow Flow Rate Multiplier	5-18

Chapter 6 Troubleshooting

6.1 Troubleshooting Confirmations	6-1
6.1.1 Check in ROBO PUMP LED	6-1
6.1.2 RCON-EC LED Display	6-4
6.2 Troubleshooting Diagnosis	6-5
6.3 Troubleshooting with No Alarm Generated	6-6
6.3.1 Operation Failure	6-6
6.3.2 Abnormal or Unstable Operation	6-8
6.4 Troubleshooting by Each Alarm Groups	6-9
6.4.1 Alarm List	6-10
6.4.2 Alarm Causes and Countermeasures	6-11

Chapter 7 Maintenance and Inspection

7.1 Precautions for Maintenance or Inspection Work	7-1
7.2 Replace Components	7-2
7.2.1 Replacement component list	7-2
7.2.2 Replacing Suction Filter	7-4
7.2.3 Replacing Motor Unit	7-5
7.2.4 Replacing Coupling Spacer	7-7
7.2.5 Replacing Front Panel Assy's	7-8

Chapter 8 External Dimensions

8.1 ROBO PUMP	8-1
8.1.1 RP-VPM (Standard)	8-1
8.1.2 RP-VPMV (Equipped with Air Blow)	8-3
8.2 Interface Box	8-6
8.2.1 Interface Box	8-6
8.2.2 Interface Box 2	8-6

Chapter 9 Life

9.1 Concept of Life for ROBO PUMP	9-1
9.2 Concept of Life for Controller	9-2

Chapter 10 Appendix

10.1 Display Panel and Operation Switch	10-1
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10.1.1 Specifications for Operation Switch	10-1
10.1.2 Window Transition	10-2
10.1.3 Alarm Window	10-4
10.1.4 Environment Setting Window	10-4
10.1.5 Environment Setting Window	10-5
10.1.6 Tool in Connection Window	10-5
10.2 Teaching Pendant	10-6
10.2.1 Teaching Pendant Available to Use	10-6
10.2.2 Menu 1 Screen	10-7
10.2.3 Monitor Screen	10-8
10.2.4 ROBO PUMP Setting Screen	10-9
10.2.5 Parameter Edit Screen	10-13
10.2.6 TP Operation Mode Screen	10-14

Chapter 11 Warranty

11.1 Warranty Period	11-1
11.2 Scope of the Warranty	11-1
11.3 Honoring the Warranty	11-1
11.4 Limited Liability	11-2
11.5 Conformance with Applicable Standards/Regulations, etc., and Application Conditions	11-2
11.6 Other Items Excluded from Warranty	11-2

Revision History	Post-1
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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. • Using the devise in a way not indicated by IAI may lose the protection performance equipped to the device.

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. Do not attempt any handling or operation that is not indicated in this instruction manual.
3. Make sure to secure the ROBO PUMP properly in accordance with this instruction manual.

If the ROBO PUMP is not securely fixed, this may lead to abnormal noise, vibration, breakdown or shortened product life.
4. Make sure to observe the usage conditions and environment of the product.

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

International Standard Compliance

The ROBO PUMP 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 (Note 1)	
○	○	○	—

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 model 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.

EC Declaration of Conformity proving conformity to RE Directive may be modified without notice according to addition of conformed models, specification change and so on. Visit our homepage (www.iai-robot.co.jp) or contact our sales site if necessary.

(Note 1) RE Directive applies to ROBO PUMP with WL (wireless communication 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: IABL3827

Precautions for Handling Wireless Operation

When the option for wireless communication support (model: WL) is selected, There is a wireless communication circuit board built-in the interface box to be connected to ROBO PUMP. Certificates and self-declarations regarding the wireless function are handled under the model name below for the wireless circuit board.

Model name: 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).

Wireless frequency	2,400 to 2,483.5MHz
Wireless output	+5dBm

[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 colocated 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 être 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.
- Import Corporation Name : IAI Industrieroboter GmbH
- * The product can be used in any country which is a member of EU.

[中国／CHINA]

- 许可编号 : CMIT ID=2018DJ0331
- 申请公司名 : IAI 株式会社
- 机型名 : IABL3827
- 制造国 : 日本(Made in Japan)
- 进口企业名 : IAI(Shanghai)Co., Ltd.

[한국／KOREA]

- 식별 부호 : R-CRM-IAI-IABL3827
- 제조사명 : 주식회사 IAI
- 모델명 : IABL3827
- 제조국 : 일본(Made in Japan)
- 수입업자명 : IA KOREA Corp.

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다

[ประเทศไทย / Thailand]

- ผู้ผลิต : IAI CORPORATION.
- ชื่อโมเดล : IABL3827
- ประเทศผู้ผลิต : ญี่ปุ่น (Made in Japan)
- ผู้นำเข้า : IAI Robot (Thailand) Co., Ltd.

[México / Mexico]

- Número de Certificación : IFT : RCPIATB19-1956
- Nombre de la Empresa Solicitante : IAI Corporation
- Nombre del Modelo : IABL3827
- País de Fabricación : Japón (Hecho en Japón)
- Nombre de la Empresa Importadora : IAI America, Inc.

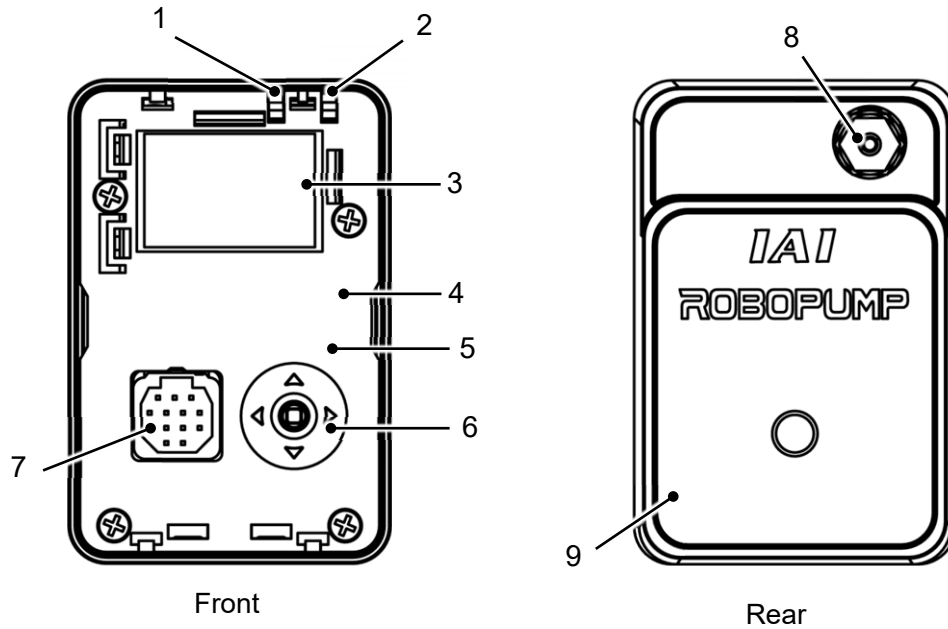
Precautions for Operation with Wireless Connection

Touch Panel Teaching Pendant TB-03 (V4.70 or later) can operate the option model code -WL ROBO PUMP 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 operation with wireless connection, operation testing (Adsorption, Desorption) 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 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.

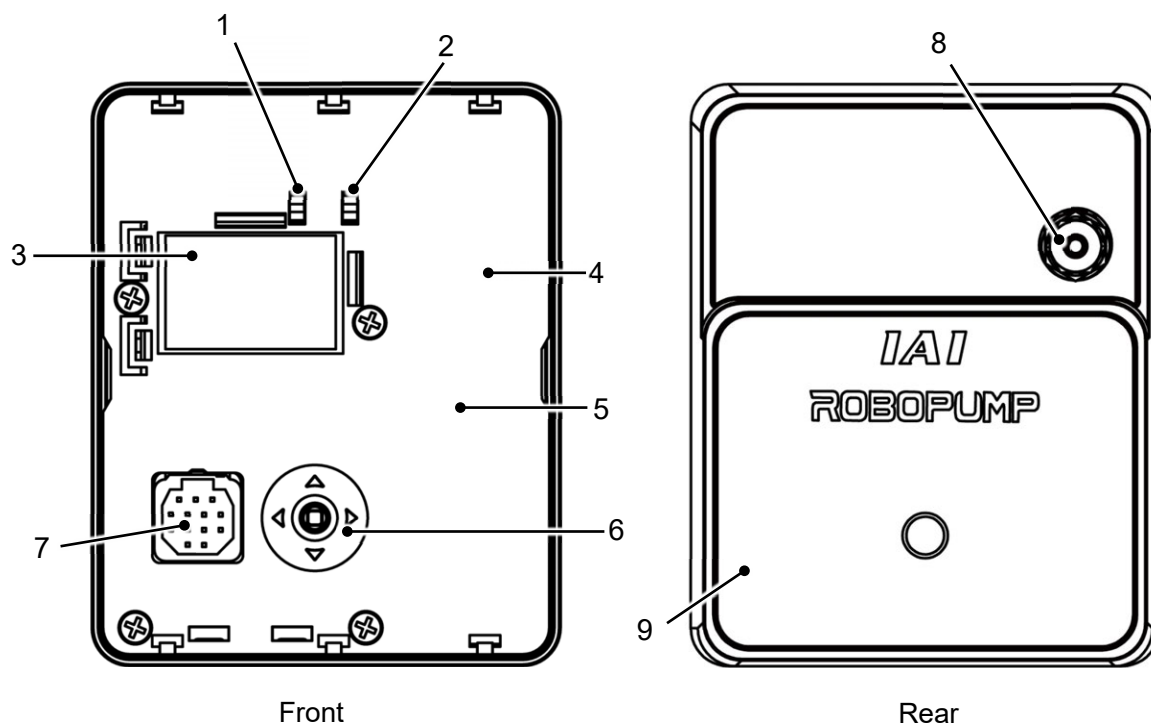
Part Names

[1] RP-VPM (Standard)



No.	Name	Content
1	Wireless status LED	LED to show wireless status (For details, refer to [1.3.2 LED Display]).
2	Status indicator LED	LED to show operation status (For details, refer to [1.3.2 LED Display]).
3	Display panel	OLED Display (Dot Matrix: 96 × 64 (0.96 inch))
4	Front panel sheet	Materials: Polycarbonate
5	Front panel	Materials: PPE
6	Operation switch	4 directions + 1 push leaver type operation switch
7	Connector	Materials: PBT
8	Air Suction Joint	Materials: Brass + Nickel plating, Connection Tube: $\phi 4 \times 2.5$
9	Cover	Materials: ABS330

[2] RP-VPMV (Equipped with Air Blow)



No.	Name	Content
1	Wireless status LED	LED to show wireless status (For details, refer to [1.3.2 LED Display]).
2	Status indicator LED	LED to show operation status (For details, refer to [1.3.2 LED Display]).
3	Display panel	OLED Display (Dot Matrix: 96 × 64 (0.96 inch))
4	Front panel sheet	Materials: Polycarbonate
5	Front panel	Materials: PPE
6	Operation switch	4 directions + 1 push lever type operation switch
7	Connector	Materials: PBT
8	Air Suction Joint	Materials: Brass + Nickel plating, Connection Tube: $\phi 4 \times 2.5$
9	Cover	Materials: ABS330

ROBO PUMP

Chapter 1

Specifications

1.1	Checking the Product	1-1
1.1.1	Components	1-1
1.1.2	How to Read the Model Nameplate	1-2
1.1.3	How to Read the Model Number	1-3
1.2	Mechanical Specifications	1-4
1.2.1	RP-VPM (Standard)	1-4
1.2.2	RP-VPMV (Equipped with air blow)	1-5
1.3	Electrical Specifications	1-6
1.3.1	Common to RP-VPM (Standard) and RP-VPMV (Equipped with Air Blow)	1-6
1.3.2	LED Display	1-7
1.4	Duty Ratio	1-8
1.4.1	Duty Ratio Limit	1-8
1.5	Option	1-9
1.5.1	RCON-EC connection specification (Model: ACR)	1-9
1.5.2	PNP specification (Model: PN)	1-9
1.5.3	2-circuit power supply specification (Model: TMD2)	1-9
1.5.4	Wireless communication specification (Model: WL)	1-9

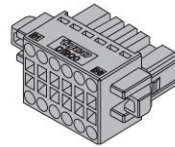
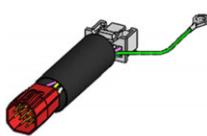
1. Specifications



1.1 Checking the Product

1.1.1 Components

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.

Body		
<u>ROBO PUMP</u> <u>Quantity:1</u>		
		
Accessories		
<u>Power & Communication cable</u> <u>Quantity: 1</u>	<u>Power & I/O Cable</u> <u>Quantity: 1</u>	<u>Power & I/O Connector</u> <u>Quantity: 1 (Note1)</u>
		
Components included as selected in the model number		
<u>Interface Box 2</u> <u>Quantity: 1 (Note1)</u>	<u>Interface Box Conversion cable</u> <u>Quantity: 1 (Note1) (Note2)</u>	<u>Safety Guide</u> <u>Quantity: 1</u>
		

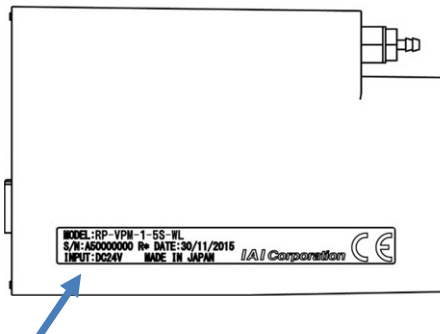
Note 1 It should not be enclosed when RCON-EC connection specification (ACR) is selected.

Note 2 For products shipped in or after 2026, an interface box conversion cable is not required.

1.1.2 How to Read the Model Nameplate

Model number	→	MODEL : RP-VPM-1-5S-WL	IAI Corporation 
Serial number	→	S/N : X01234500 DATE : 15/07/2022	
		MADE IN JAPAN	

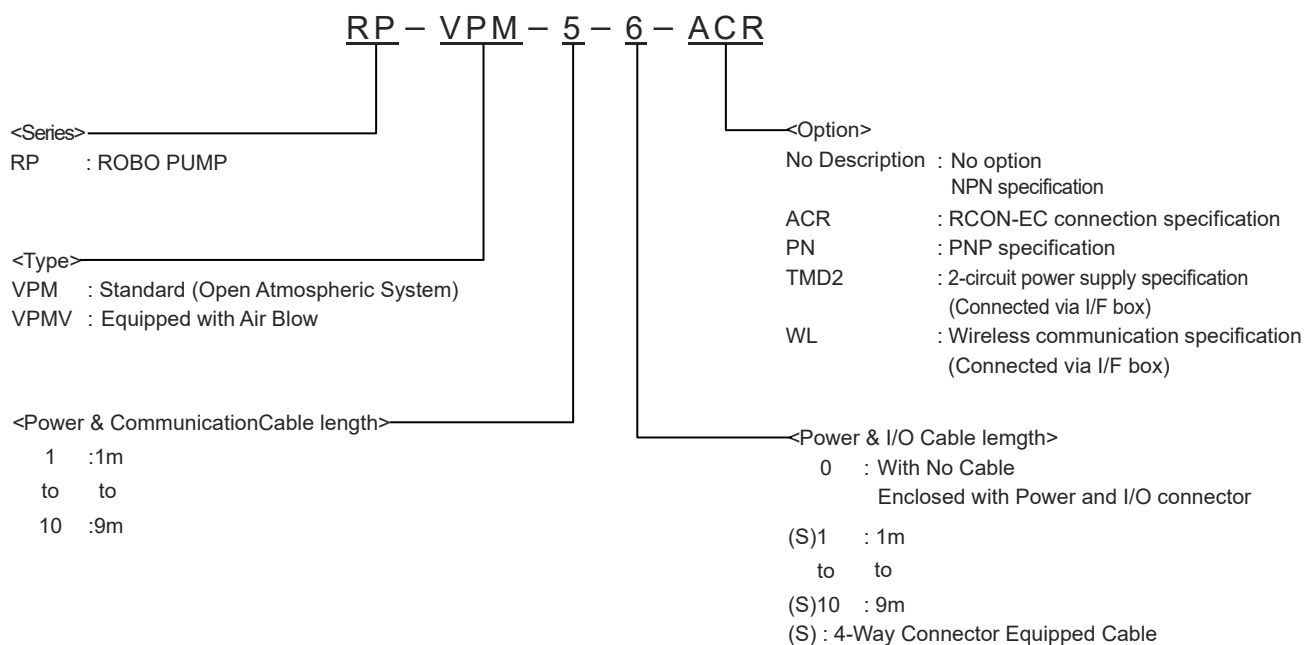
[Nameplate position]



1.1.3 How to Read the Model Number

It is a list of the model codes.

Available options should differ depending on conditions. Refer to the catalog for details.



1.2 Mechanical Specifications

1.2.1 RP-VPM (Standard)

Item	Content
Generated Pressure	-50kPa
Generated Flow	1.8L/min or more (20°C/1atm)
Air Joint Size	Φ4 × 2.5mm For Tube
Workpiece Desorption System	Open Atmospheric System with Electromagnetic Valve
Electromagnetic Valve Operation (Desorption) Time	0.3s
Mass	320g
Dimensions	42.5mm(W) × 64mm(H) × 98.7mm(D) (Refer to [8.1.1 RP-VPM] for External Dimensions)
Ambient operating temperature and humidity	0 to 40°C, 85%RH or less (Should be no condensation)
Ambient Atmosphere in Use	Not available for use in environment with dust / corrosive gas / water
Ambient storage temperature and humidity	-10 to 65°C, 90%RH or less (Should be no condensation)
Degree of protection	IP20

1.2.2 RP-VPMV (Equipped with air blow)

Item	Content
Generated Pressure (Negative Pressure)	-50kPa
Generated Flow Rate (Negative Pressure)	1.1L/min or more (20°C/1atm)
Generated Pressure (Positive Pressure)	+30kPa
Generated Flow Rate (Positive Pressure)	1.1L/min or more (20°C/1atm)
Air Joint Size	Φ4 × 2.5mm For Tube
Workpiece Desorption System	Air Blow by Solenoid Valve (Positive Pressure Applied)
Desorption (Air Blow) Time	0.3 to 9.9s (Factory default setting is 0.3s)
Air Blow Flow Rate Multiplier (Flow Rate Multiplier during Vacuum Release)	10 to 100% (Factory default setting is 50%)
Mass	400g
Dimensions	62mm(W) × 77mm(H) × 98.7mm(D) (Refer to [8.1.2 RP-VPMV] for External Dimensions)
Ambient operating temperature and humidity	0 to 40°C, 85%RH or less (Should be no condensation)
Ambient Atmosphere in Use	Not available for use in environment with dust / corrosive gas / water
Ambient storage temperature and humidity	0 to 50°C, 90%RH or less (Should be no condensation)
Degree of protection	IP20

1.3 Electrical Specifications

1.3.1 Common to RP-VPM (Standard) and RP-VPMV (Equipped with Air Blow)

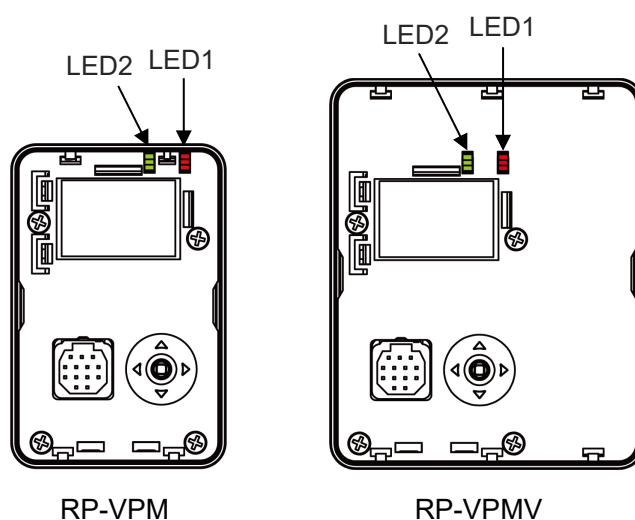
Item	Content
Power supply voltage	24V DC $\pm$ 10%
Power supply current ^(Note 1)	Rated 0.8A, Max. 1.3A
Current Amperage	Rated 19.2W, Max. 31.2W
Generated heat	5W
Inrush current ^(Note 2)	2A
Momentary power failure resistance	Max. 500 μ s
Motor size	ϕ 35
Motor rotary speed	3,600rpm
Motor output rated current	0.5A
Encoder type	Incremental (Resolution:14bit)
Teaching port specifications	RS-485 1ch (Modbus protocol compliant) (When interface box used)
Interface specifications (power input common with body)	Input $\times$ 3: Desorption comand, Adsorption command, Alarm reset Output $\times$ 3: Desorption confirmation signal, Adsorption confirmation signal, Alarm
Indicator	OLED (29 $\times$ 22.5 $\times$ 1.65mm)
Data setting and input methods	• PC software (IA-OS) • Teaching pendant TB-02, TB-03 • Display panel and operation switches on main body
Overvoltage category	I
Pollution degree	II
Insulation resistance	500V DC 10M Ω
Electric shock protection mechanism	Class III
Cooling method	Natural air cooling

Note 1 The power supply current includes 0.3A of the control power supply.

Note 2 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.

1.3.2 LED Display



Position	Display information	LED status	Content
LED1	Status LED	Green light ON	Current pressure is below adsorption confirmation level
		Red light ON	Alarm generated or stop motor voltage from teaching pendant has been dropped ^{*1}
		Orange light ON	Under initialization of power boot (Both green & red ON)
		Light OFF	Power not supplied, Condition of desorption confirmation level or higher
LED2	Wireless communication status display (WL)	Green light blinking	Wireless connection status (ON 150ms/OFF 150ms)
		Red light blinking	Wireless hardware error (ON 200ms/OFF 200ms)
		Orange light ON	Under initialization of power boot (Both green & red ON)
		Light OFF	Wireless hardware in initializing process, wireless not connected or in connection process to TP port

^{*1} Stop is effective only when a teaching pendant is wire-connected.

1.4 Duty Ratio

1.4 Duty Ratio

1.4.1 Duty Ratio Limit

The duty ratio is the operating rate, shown in percentage [%], of the ROBO PUMP operating time within one cycle.

- RP-VPM

Operation with the duty ratio at 100% is available in the usage temperature environment from 0 to 40°C.

[Calculation of Duty Ratio]

$$\text{Duty Ratio [\%]} = \text{Vacuum Time} / (\text{Vacuum Time} + \text{Stop Time})$$

- RP-VPMV

Operation with the duty ratio at 100% is available in the usage temperature environment from 5 to 40°C.

[Calculation of Duty Ratio]

$$(\text{Vacuum Time} + \text{Desorption (Air Blow) Time}) / (\text{Vacuum Time} + \text{Desorption (Air Blow) Time} + \text{Stop Time})$$

1.5 Option

1.5.1 RCON-EC connection specification (Model: ACR)

It can be connected to a field network via an R-unit (connected to RCON-EC).

- * When this option is selected, it is not available to select PN Option (PNP specification), TMD2 Option (2-circuit power supply specification).

1.5.2 PNP specification (Model: PN)

I/O input/output specifications are NPN specification as standard.

Specifying this option changes the unit to PNP specification.

- * PNP specification (PN) and 2-circuit power supply specification (TMD2) should not be available for selection when RCON-EC connection specification (ACR) is selected.

1.5.3 2-circuit power supply specification (Model: TMD2)

It is an option with the operation stop input equipped for an actuator.

It should be supplied to the motor power supply and control power supply separately. Select it when it is required to cut off the supply to the drive source of an actuator.

1.5.4 Wireless communication specification (Model: WL)

Wireless communication is available between the ROBO PUMP and the touch panel teaching pendant.

Trial run (adsorption and desorption) of the pump activation is available. However, it is not an operation device purposed for automatic drive. Check the caution notes regarding axis operation in wireless connection.

ROBO PUMP

Chapter 2

Installation

2.1	Precautions for Transportation	2-1
2.2	Installation and Storage/Preservation Environment	2-2
2.2.1	Installation Environment	2-2
2.2.2	Storage/Preservation Environment	2-3
2.3	Installation Method	2-4
2.3.1	Installation Frame	2-4
2.3.2	Mounting Orientation	2-4
2.3.3	Bolts for Fixing	2-4
2.3.4	Body Mounting	2-5
2.3.5	External Filter Mounting	2-6

2.1 Precautions for Transportation

[Handling the package]

- Do not damage or drop the package.

The package is not specially designed to withstand dropping or shock due to collision.

- Keep the unit in horizontal position for storage or transportation.
- Do not climb onto the package.
- Do not put anything that could deform the package on it.

[Handling after unpacking]

- Carry by the whole product
- Do not damage or drop the package during transportation.
- Do not apply excessive force to any part of the product.
- The display panel and connector are connected to the built-in controller, so be especially careful not to apply external force

For the names of each part, refer to [Part Names] on page Intro-14 to 15.

[Handling when assembled into machinery (system)]

- When suspending machinery (system) with ropes, be careful not to catch the rope on the ROBO PUMP or cable and the air tube.

2.2 Installation and Storage/Preservation Environment

2.2.1 Installation Environment

In general, the installation environment should be one in which an operator can work without protective gear.

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 1,000m

Also, provide sufficient work space for the following maintenance and inspection:

- Space to insert the teaching tool connector
- Space to replace the motor or controller

For details, refer to [Chapter 7 Maintenance and Inspection].

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

2.2.2 Storage/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 stable posture for storage and preservation.
If storing in the packaged condition, observe the conditions, if any, regarding storage orientation.

2.3 Installation Method

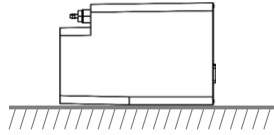
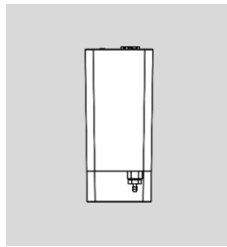
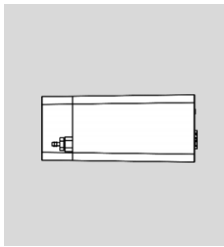
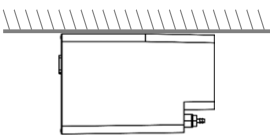
2.3.1 Installation Frame

- The mounting frame should have a structure rigid enough to prevent the generation of vibration.
- Also consider the necessary space for maintenance work such as ROBO PUMP replacement and inspection.

2.3.2 Mounting Orientation

Common for Types

○: Available for Installation, ×: Unavailable for Installation

			
Horizontal Installation	Vertical Installation	Horizontally Oriented Wall Mount	Ceiling Mount
○	×	×	×

2.3.3 Bolts for Fixing

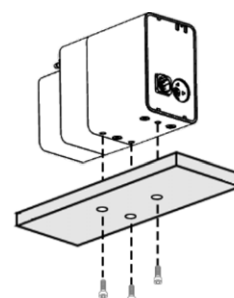
- Bolts for fixing to the installation surface need to be prepared by the user.
- Use high-strength bolts with ISO-10.9 or higher.
- Use "M3 coarse-thread screws" for installation.
- Pay attention to the length of the mounting screws. The screw engagement depth from the mounting surface should be approximately 5 mm.

If the screw is tightened beyond the depth of the threaded hole, it may damage the threads or internal components, potentially causing an unexpected accident.

2.3.4 Body Mounting

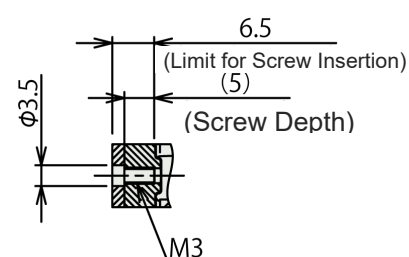
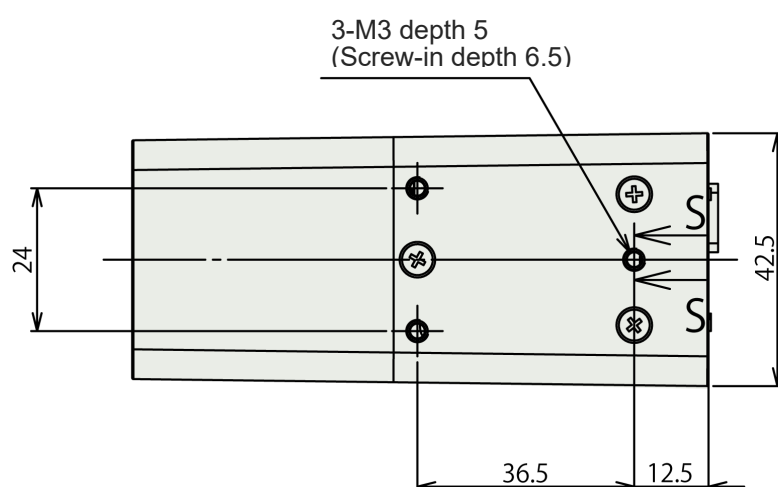
ROBO PUMP is to be installed using the threaded holes on the bottom.

- Attachment Screw: To use M3 coarse screws
- Screw Depth from ROBO PUMP Installation Surface:
5mm or more, 6mm or less
- Tightening torque 0.4 Nm
- Refer to [3.4 Frame Grounding Wiring] For Grounding



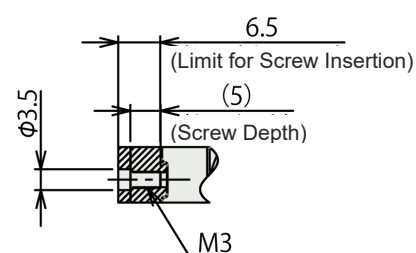
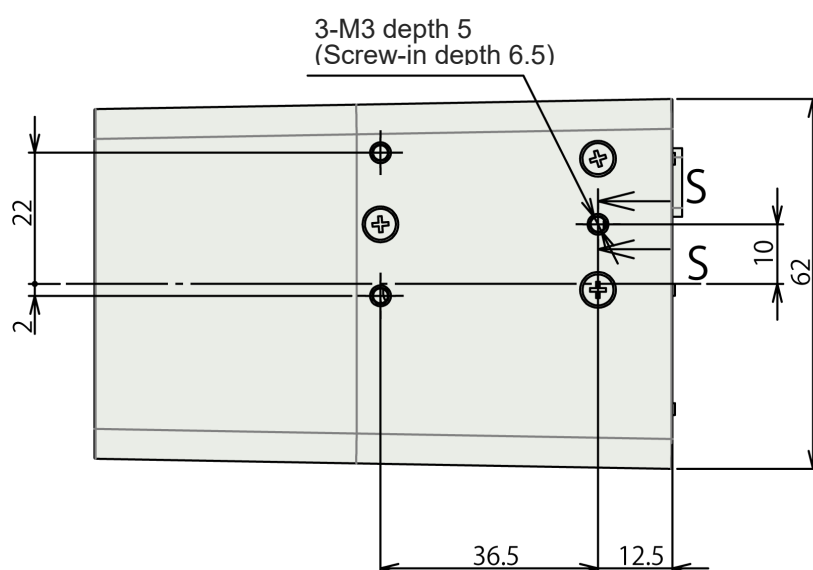
2. Installation

◆ RP-VPM (Open atmospheric system)



Section S-S

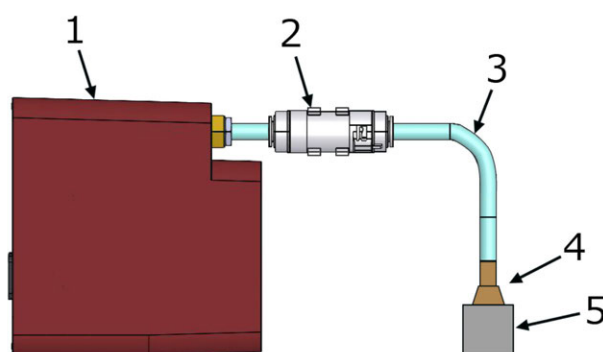
◆ RP-VPMV (Equipped with air blow)



Section S-S

2.3.5 External Filter Mounting

The ROBO PUMP has a built-in filter inside the unit. However, if there is a possibility of drawing in a large amount of dust or other particulate matter, the filter may become clogged prematurely, resulting in malfunction. Therefore, if dust or other particulate matter may be drawn in, it is recommended to install an external filter in the air piping between the ROBO PUMP and the tool.



No.	Type	Name	Size	Quantity	Tightening torque [N·m]
1	Common	ROBO PUMP	—	1	—
2	Common	Filter	—	1	—
3	Common	Tube	φ4	1	—
4	Common	Tools (adsorption pads, etc.)	—	—	—
5	Common	Work	—	—	—

Reference External Filters

Type	Part Name	Model	Manufacturer	Input/output tube O.D.
RP-VPM (Open Atmospheric System)	Vacuum Filter	VFU1-44-15P	PISCO	φ4
RP-VPMV (Equipped with air blow)	Positive/Negative Pressure Filter	SFU1-44	PISCO	φ4



Caution

- Perform periodic inspection and maintenance of the filter element. A clogged filter element may cause performance degradation or lead to malfunctions. For maintenance procedures, refer to the instruction manual for the product you are using.

ROBO PUMP

Chapter 3

Wiring

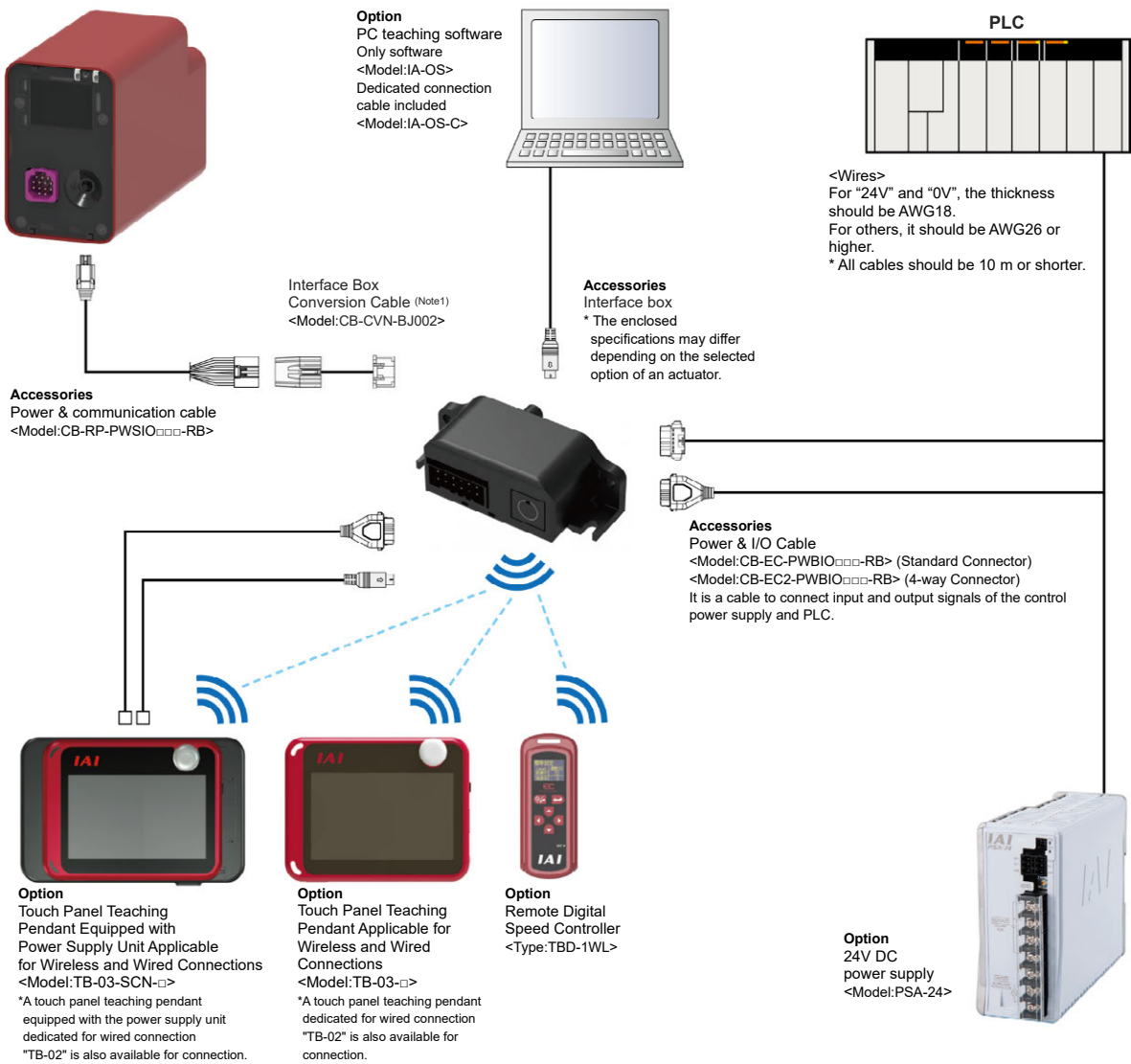
3.1	System Configuration	3-1
3.2	Connection Arrangement Diagram	3-3
3.3	Interface Box Installation and Wiring	3-5
3.3.1	Precautions for Interface Box Installation	3-5
3.3.2	Interface Box	3-6
3.3.3	I/O Specifications	3-7
3.3.4	Power & Communication Cable	3-8
3.3.5	Interface Box Wiring	3-9
3.4	Frame Grounding Wiring	3-10
3.5	Way of Wiring (Connect to PIO Control / Connector)	3-12
3.5.1	Connector Wiring Method	3-13
3.5.2	24V DC Power Supply Wiring	3-14
3.5.3	Wiring of Drive Cutoff Switch in Order to Make Stop	3-16
3.5.4	PLC Wiring	3-19
3.6	Way of Wiring (Connect to PIO Control / Cables)	3-22
3.6.1	Power & I/O Cable	3-22
3.6.2	Power & I/O Cable Connection	3-25

3.6.3	24V DC Power Supply Wiring	3-26
3.6.4	Wiring of Drive Cutoff Switch in Order to Make Stop	3-28
3.6.5	PLC Wiring	3-29
3.7	Way of Wiring (Connecting to RCON-EC)	3-30
3.7.1	Power & Communication Cable	3-30
3.7.2	Wiring of ROBO PUMP and RCON-EC	3-31

3.1 System Configuration

<PLC Direct Connection>

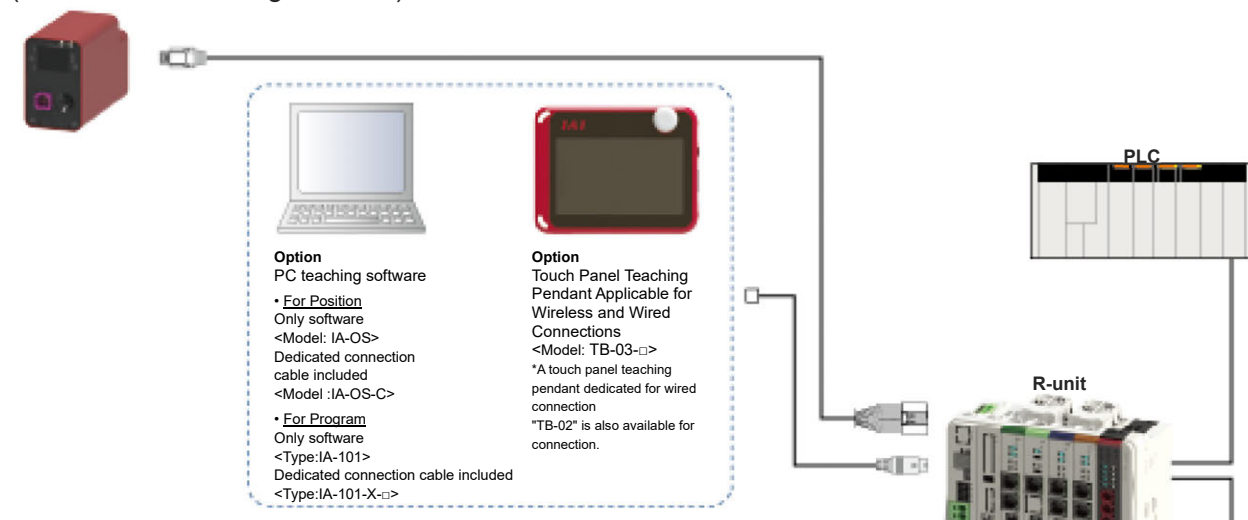
* Settings can be configured using the operation switches on the main unit even without a teaching tool.



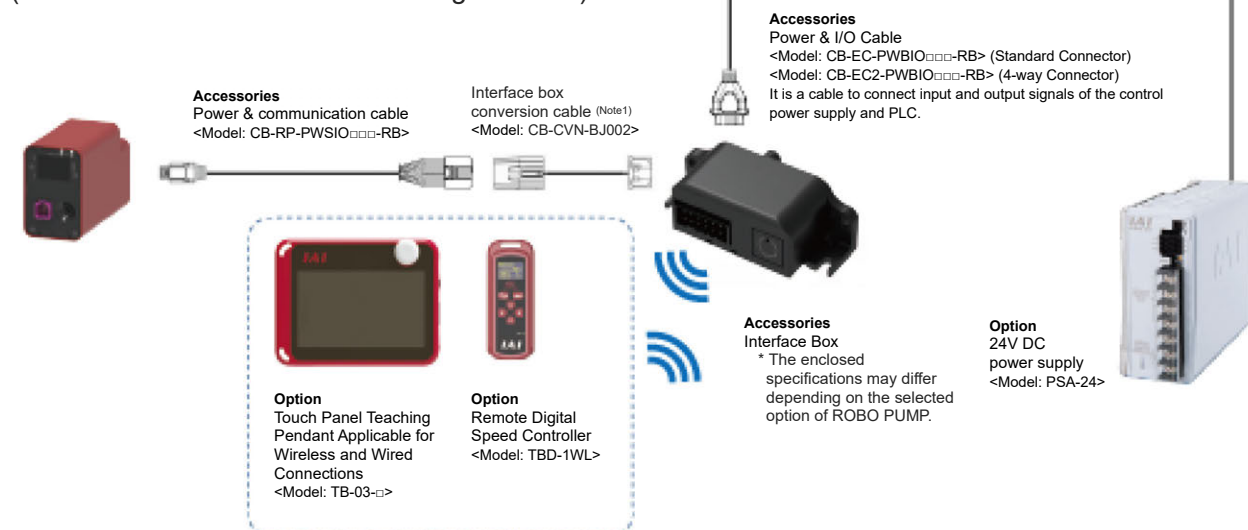
Note 1: For products shipped in or after 2026, an interface box conversion cable is not required.

<R-Unit (EC Connection Unit) Connection>

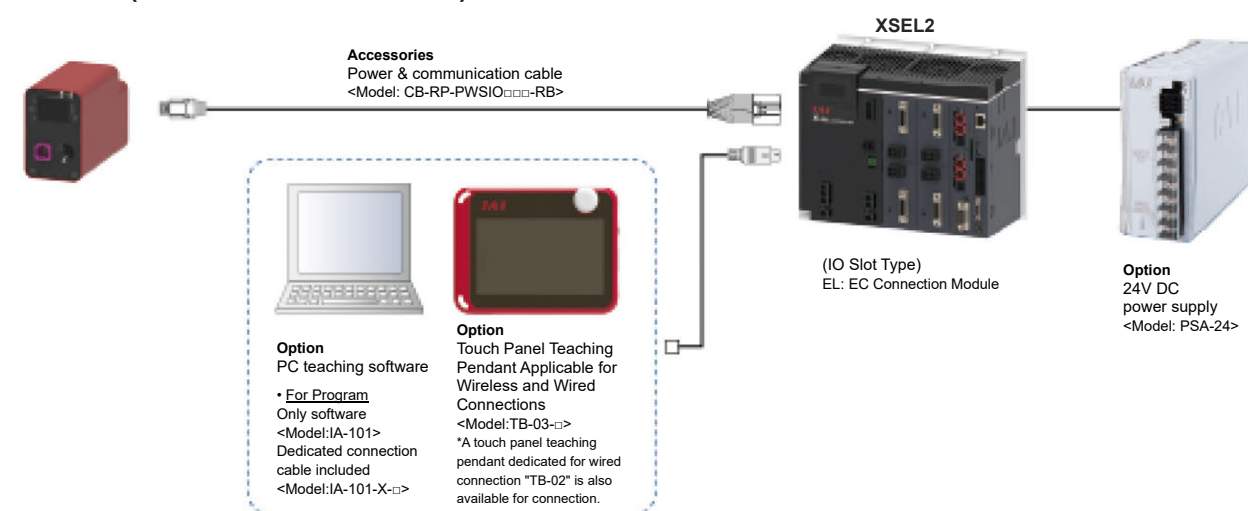
(for Wired of Teaching Pendant)



(for Wireless Connection of Teaching Pendant)



<XSEL2 (EC Connection Module) Connection>

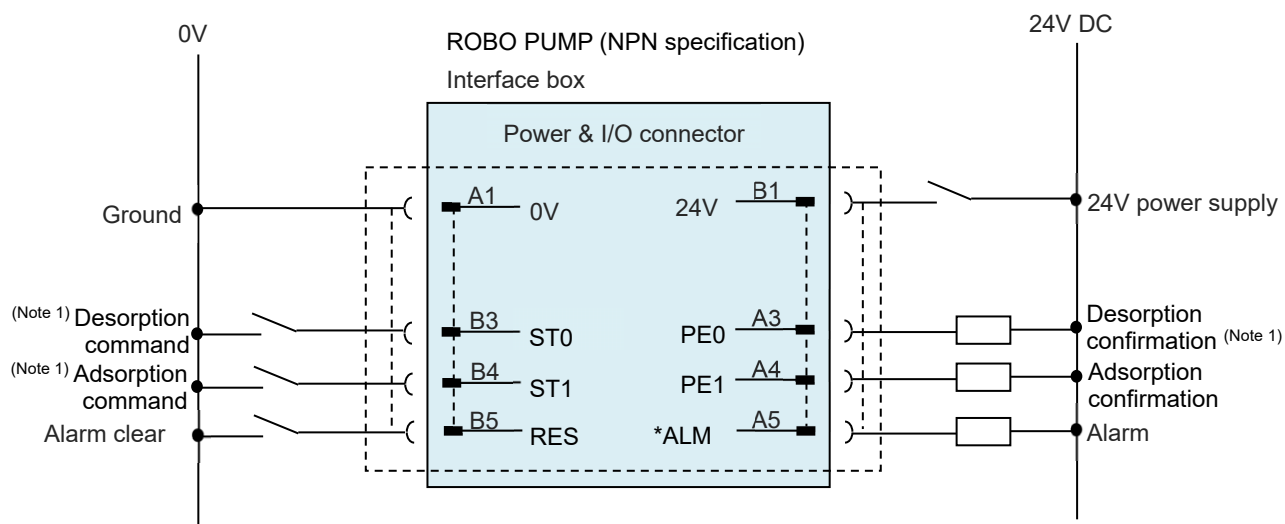


Note 1: For products shipped in or after 2026, an interface box conversion cable is not required.

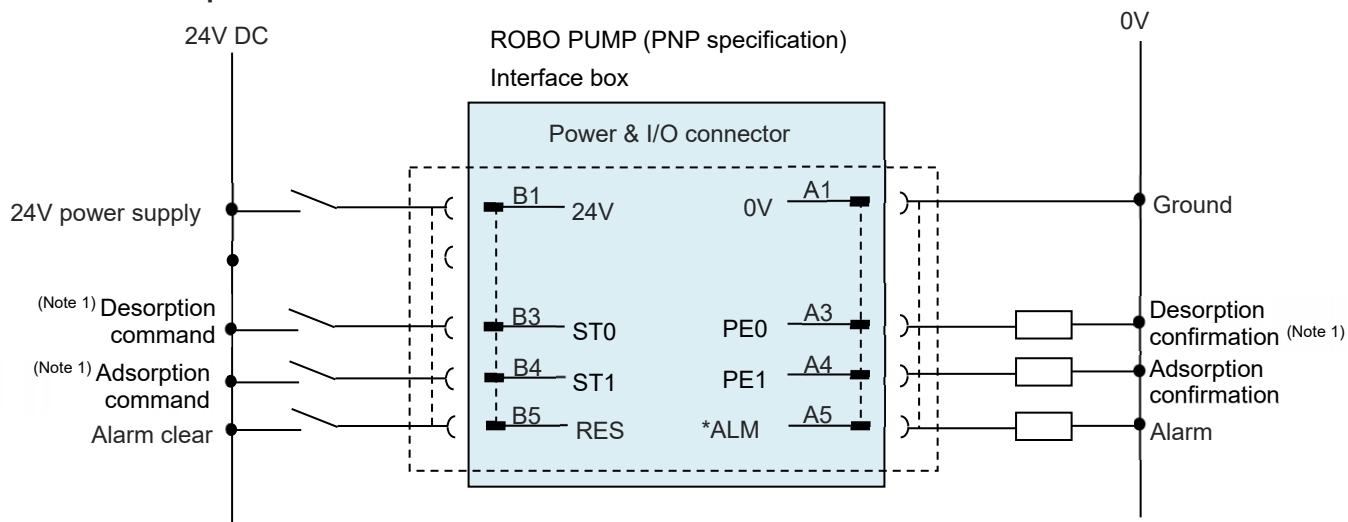
3.2 Connection Arrangement Diagram

How to wire when using a power supply cable & I/O connector of the ROBO PUMP (Interface box).

◆ For NPN specification



◆ For PNP specification



Caution

- "Note 1" should change the feature depending on the settings established in Parameter No. 5.

In this figure, shows the status of Double Solenoid Mode 2.

For details, refer to [5.4.5 Parameter No.5: PIO Pattern selection]

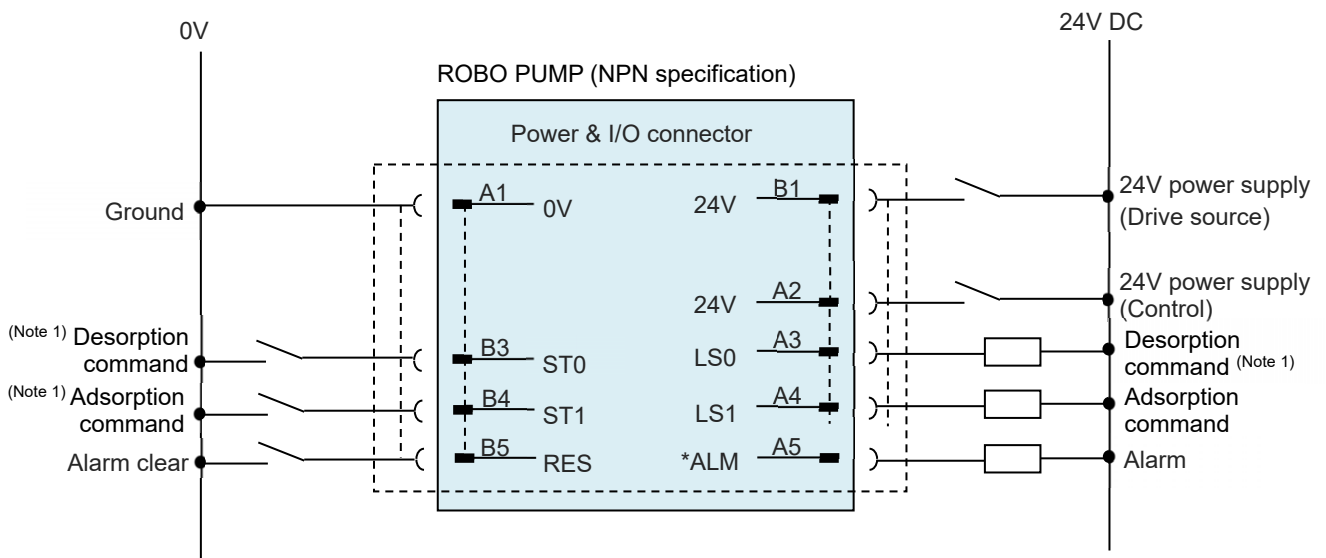
- "*ALM" is a b-contact (active-low) signal.

The output signal is ON in normal conditions and OFF when an alarm occurs.

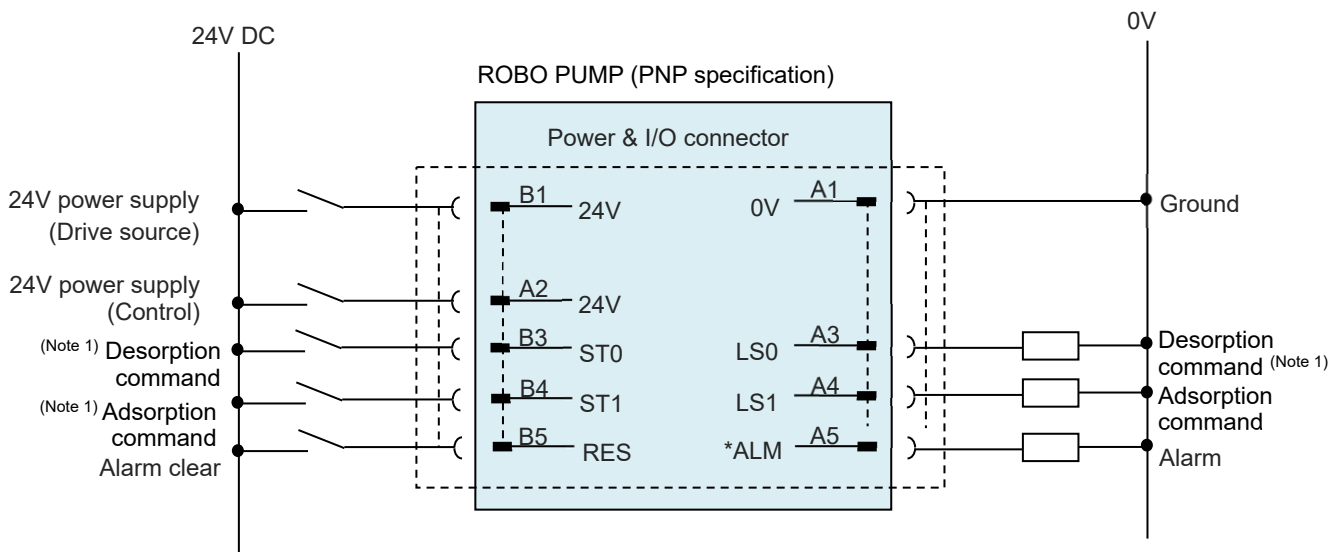
3.2 Connection Arrangement Diagram

◎2-circuit power supply specification TMD2 (Option)

◆ For NPN specification



◆ For PNP specification



Caution

- “Note 1” should change the feature depending on the settings established in Parameter No. 5.

In this figure, shows the status of Double Solenoid Mode 2.

For details, refer to [5.4.5 Parameter No.5: PIO Pattern selection]

- “*ALM” is a b-contact (active-low) signal.

The output signal is ON in normal conditions and OFF when an alarm occurs.

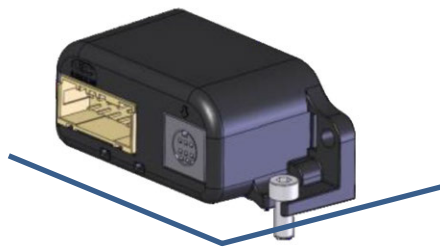
3.3 Interface Box Installation and Wiring

3.3.1 Precautions for Interface Box Installation

In order to control ROBO PUMP with PIO, it is necessary to use an interface box.
For interface box dimensions, refer to [8.2 Interface box].

- Connection to an interface box is also necessary when performing wireless connection in RCON-EC connection type.
- An interface box should be installed at a place where there is no water or dust applied.
- The interface box can be mounted on two body surfaces.
(Interface box orientation is irrelevant)

Horizontal surface mounting

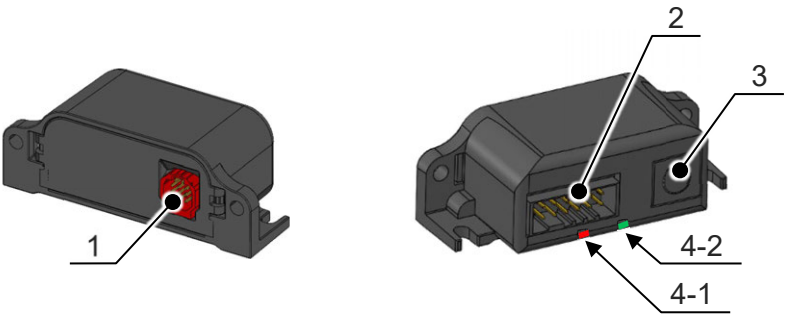


Vertical surface mounting



- When mounting the interface box on a vertical surface, prepare a cable pass-through hole of $\Phi 18\text{mm}$ or more for the actuator cable.
- 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 [3.4 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.

3.3.2 Interface Box

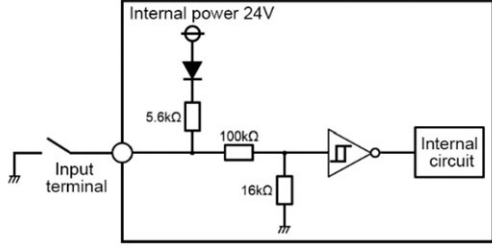
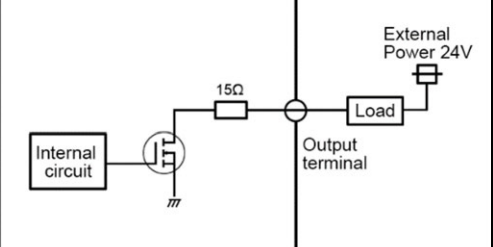
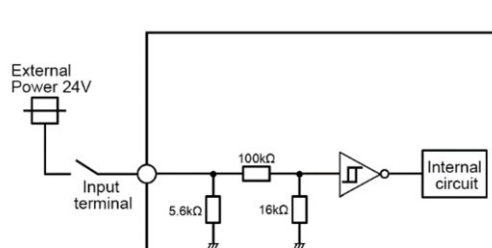
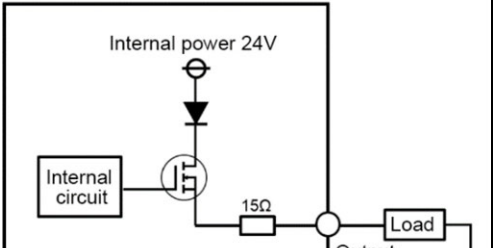


No.	Name		Content
1	Actuator connector		It is a connector to join an actuator. Products shipped before 2026 should be connected to the interface box using an interface box conversion cable.
2	Power & I/O connector		This connector connects power and I/O wiring.
3	Teaching port		This connector is for the connection of a teaching pendant or PC teaching software. When connecting, remove the cap.
4	Status LED*	1 LED1	The servo ON/OFF status and the alarm status should be indicated.
		2 LED2	The wireless status should be indicated.

* For the details of display states, refer to [6.2 Troubleshooting Diagnosis]

3.3.3 I/O Specifications

The PIO input and output (Interface box) specifications of ROBO PUMP should be as stated below.

I/O		Input part		Output part	
Specifications	Input voltage	24V DC $\pm$ 10%		Load voltage	24V DC $\pm$ 10%
	Input current	5mA/1 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				

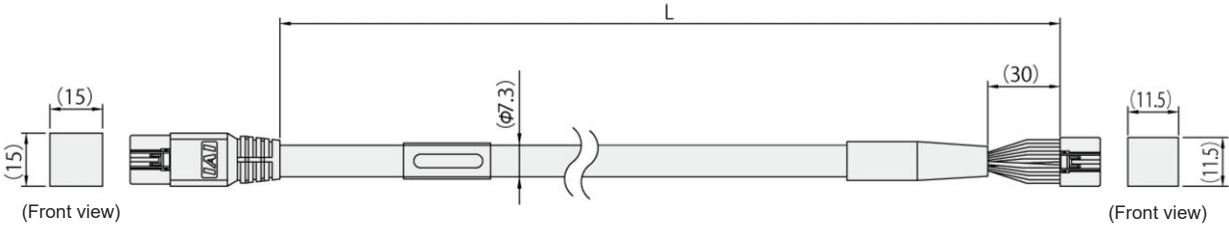


Caution

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

3.3.4 Power & Communication Cable

◆CB-RP-PWSIO□□□-RB



Actuator side

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

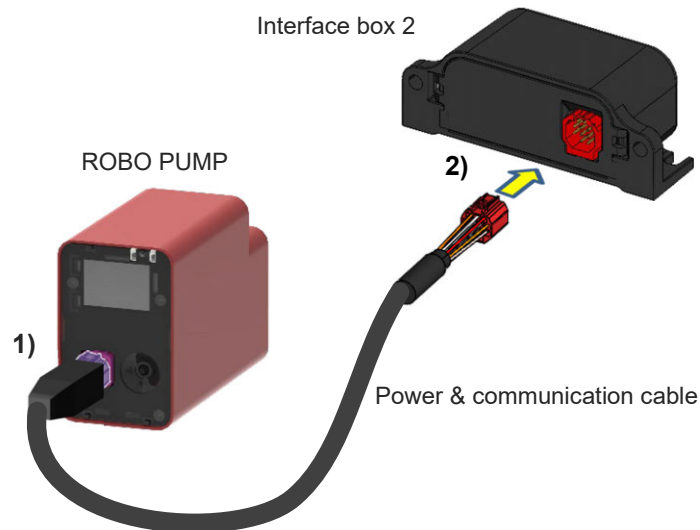
Color	Signal name	Pin No.	Pin No.	Signal name	Color
Black (AWG19)	0V	2	2	0V	Black (AWG19)
White (AWG19)	24V(MP)	1	1	24V(MP)	White (AWG19)
Red (AWG19)	24V(CP)	12	12	24V(CP)	Red (AWG19)
Green (AWG26)	STOP_EXT	7	7	STOP_EXT	Green (AWG26)
Red (AWG19)	RSV	11	11	RSV	Red (AWG19)
Orange/Red (AWG26)	main_SD+	6	6	main_SD+	Orange/Red (AWG26)
Orange/Blue (AWG26)	main_SD-	10	10	main_SD-	Orange/Blue (AWG26)
Gray/Red (AWG26)	sub_SD+	3	3	sub_SD+	Gray/Red (AWG26)
Gray/Blue (AWG26)	sub_SD-	4	4	sub_SD-	Gray/Blue (AWG26)
-	-	5	5	-	-
-	-	8	8	-	-
-	Not available	9	9	-	-
Green (AWG26)	FG	13	13	FG	Green (AWG26)

Yellow (AWG26)

- The cable length (L) is available from 1m to 10m. Specify the length in increments of 1m.
Sample model number: Cable length 3m → CB-RP-PWSIO030-RB

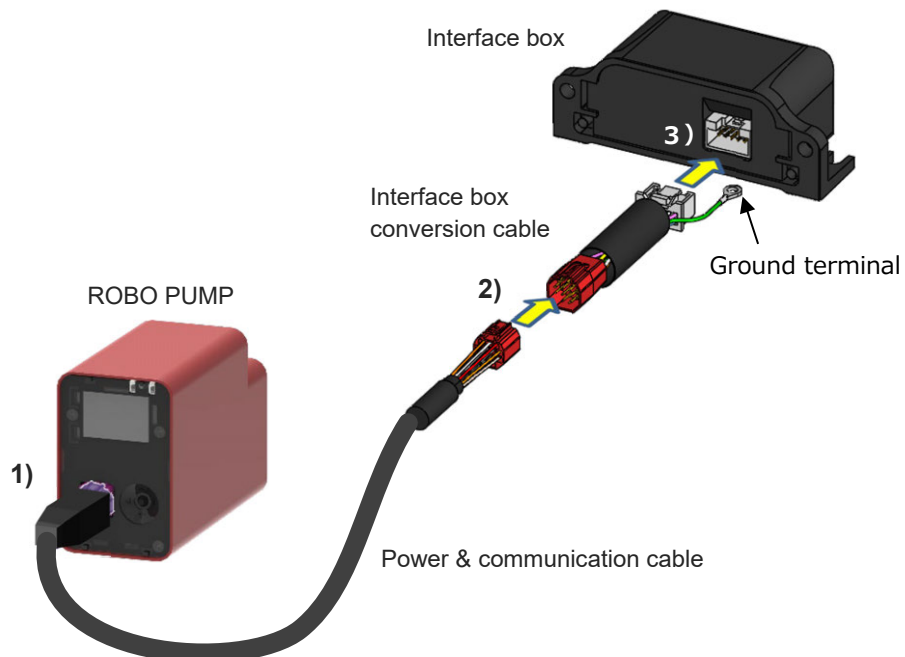
3.3.5 Interface Box Wiring

- 1) Connect a power & communication cable to the connector on the ROBO PUMP main body.
- 2) Join the actuator cable to the interface box.



* For products delivered in 2026 or earlier, an interface box conversion cable needs to be used to connect the interface box and the actuator cable.

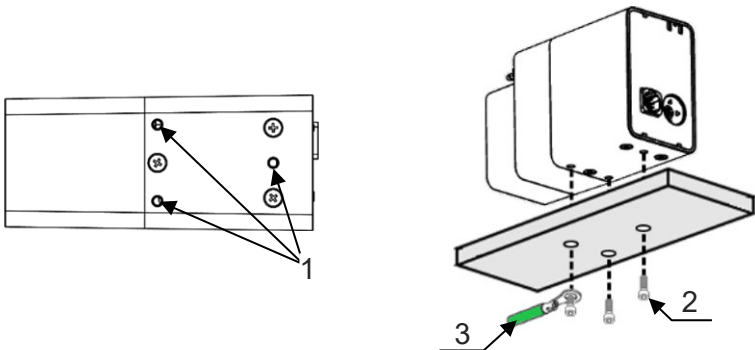
- 1) Connect the power and communication cables to the connector on the ROBO Pump main unit.
- 2) Connect the actuator cable to the interface box conversion cable.
- 3) Connect the interface box conversion cable to the interface box.
- 4) Connect the ground terminal. For details, refer to [3.4 Frame Ground Wiring].



3.4 Frame Grounding Wiring

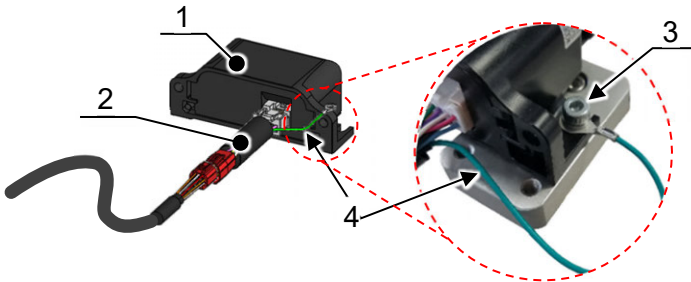
The ROBO PUMP has a built-in controller circuit board.
The controller frame grounding line is connected to the ROBO PUMP body and through to ground via the ROBO PUMP mounting surface.
* Wiring and Grounding screw is to be prepared by the customer.

- [1] Grounding of ROBO PUMP Main Unit
Connect the ground to one of the threaded holes on the bottom surface.



No.	Name	Size	quantity	Tightening torque
1	Bottom screw hole	M4 depth 6.5	1	—
2	Fixing bolt	M3	1	0.4N·m
3	Wiring	—	1	—

- [2] Grounding of Interface Box (Not required for Interface Box 2)
Fasten jointly the grounding terminal on the interface box conversion cable with fixing bolt.



No.	Name	Size	quantity	Tightening torque
1	Interface box	—	1	—
2	Interface box conversion cable	—	1	0.4N·m
3	Fixing bolt	M4	1	—
4	Grounding terminal	—	1	—

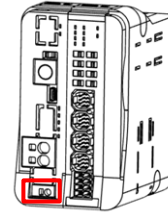
[3] Grounding for Noise Measure of the R-unit

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

Refer to [REC System Instruction Manual (ME0394)] for details.

Ground resistance 100Ω or below (Class D grounding construction)

*Annealed copper wire: 1.6 mm diameter (2mm²: AWG14) or more.



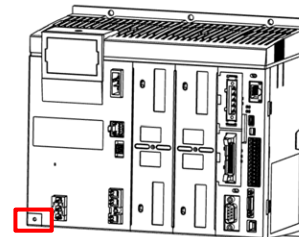
[4] Grounding for Noise Measure of XSEL2

Ground the FG (frame grounding)

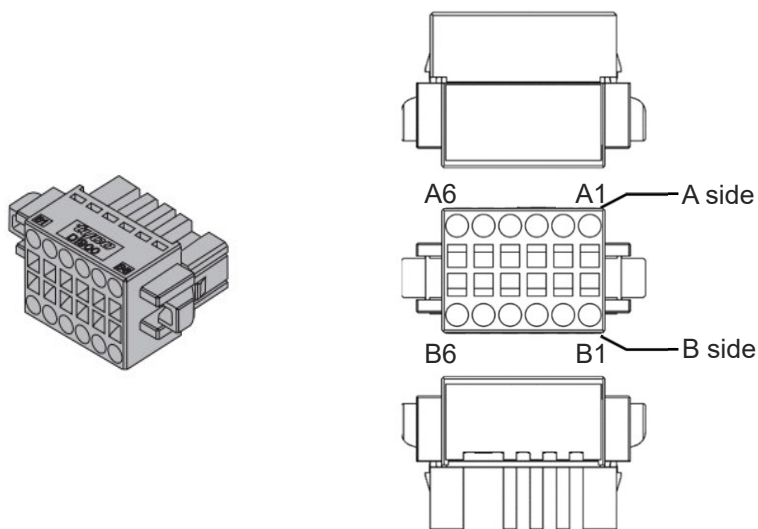
Refer to [XSEL2 Controller Instruction Manual (MJ0478)] for details.

Ground resistance 100Ω or below (Class D grounding construction)

*Annealed copper wire: 3.5 mm² (AWG12) or more.



3.5 Way of Wiring (Connect to PIO Control / Connector)



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

Pin No.	Signal name	Function
A1	0V	Ground
A2	Spare (CP: 2-circuit power supply specification)	Spare (24V for control power supply when power supply 2-system specification)
A3	Desorption confirmation	Desorption confirmation signal output
A4	Adsorption confirmation	Adsorption confirmation signal output
A5	Alarm	Alarm output (*b-contact output)
A6	Spare	Spare
B1	24V (MP: 2-circuit power supply specification)	24V power supply (24V for motor power supply when power supply 2-system specification)
B2	Spare	Spare
B3	Desorption command	Desorption command signal input
B4	Adsorption command	Adsorption command signal input
B5	Alarm release	Alarm release signal input
B6	Spare	Spare

3.5.1 Connector Wiring Method



Caution

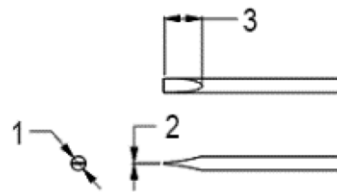
- Take care not to twist the core wire too far. This will reduce the retention force, causing the wire to fall out of the connector and possibly causing insufficient current or short circuit.
- Do not insert the precision screwdriver violently into the connector, or twist it hard. This may damage the 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 ROBO PUMP may be degraded.

◆Preparation

- Precision screwdriver

Recommended precision screwdriver

No	Item	Specification
1	Shaft diameter	$1.6 \pm 0.03\text{mm}$
2	Blade thickness	$0.2 \pm 0.1\text{mm}$
3	Tip angle length	$4.2 \pm 0.2\text{mm}$

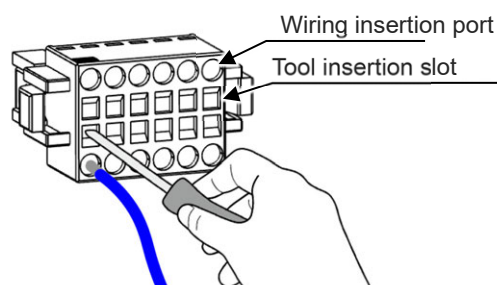
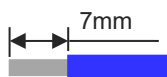


- Wiring

Compatible wire diameter: $\text{KIV}0.75\text{mm}^2$ (AWG18)

◆How to Conduct Wiring

- 1) Peel the sheath for 7mm and twist the core wires lightly.
- 2) Insert precision screwdrivers etc. fully into the tool insertion slot.
Press the spring within the connector down.
- 3) Insert the core wire.
- 4) Pull out the precision screwdrivers etc.
Confirm that the cable is not pulled out.



3.5.2 24V DC Power Supply Wiring

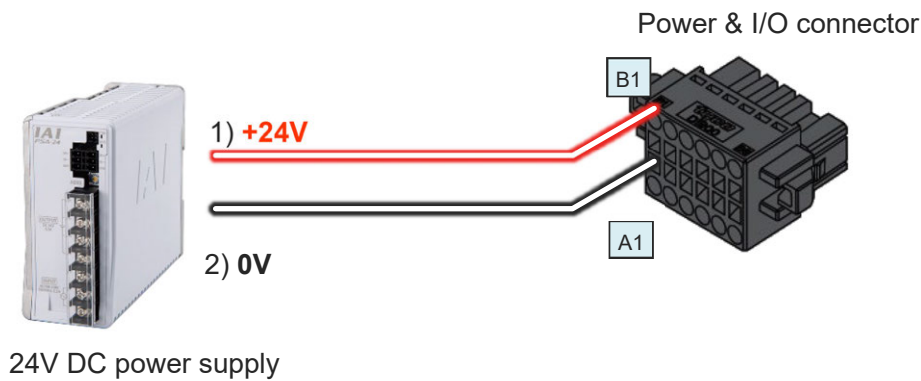
Refer to [1.3 Electrical Specifications] for electrical specifications.

[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	KIV0.75mm ² (AWG18)	Power supply voltage: 24V DC ±10% Power current: Max. 1.3A Wiring length: within 10m
A1	0V		

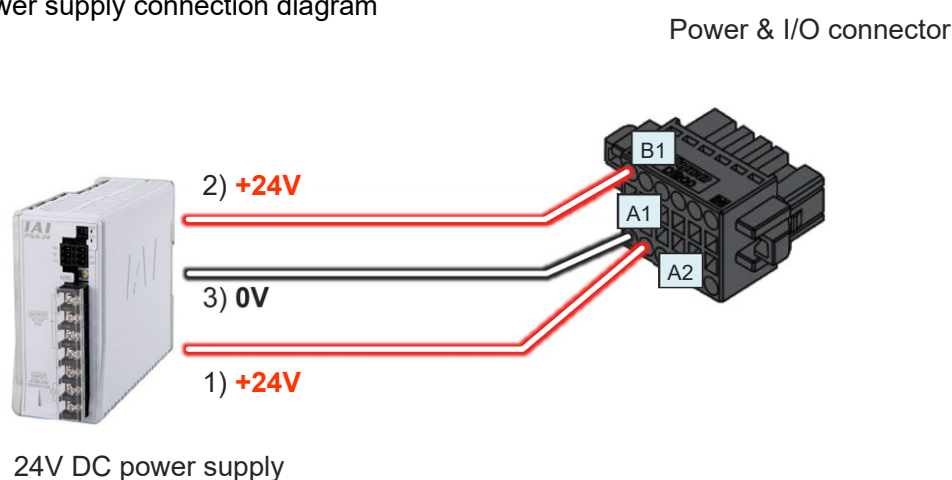
[2] Wiring for 2-Circuit Power Supply Specification TMD2 (Option)

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

Connect the 1) and 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.

24V DC power supply connection diagram



Pin No.	Connector nameplate name	Compatible wire diameter	Required specifications
B1	24V (Drive source)	KIV0.75mm ² (AWG18)	Power supply voltage: 24V DC $\pm 10\%$ Power current: Max. 1.3A Wiring length: within 10m
A2	24V (Control)		
A1	0V		

(Note) The power supply cable for 24V (control) of A2, 0.3mm² (AWG22) should be available.

It is recommended that you use a product complied with Electrical Appliances and Materials Safety Act.

3.5.3 Wiring of Drive Cutoff Switch in Order to Make Stop

When ROBO PUMP 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, ROBO PUMP 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 operation condition setting, 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 ROBO PUMP.

* For those not in the TMD2 specification (option), the control power supply of an controller should also turn off at the same time as the drive source. When it is not desired to turn the control power supply off, select the 2-circuit power supply specification TMD2 (option).



Caution

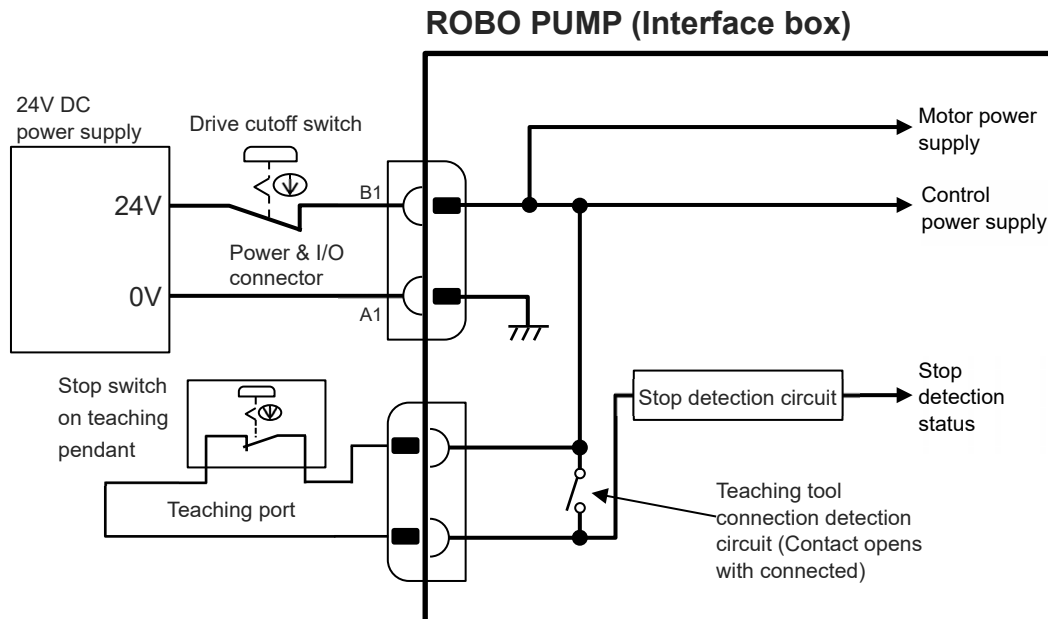
- When the power supply is conducted with turning on/off the 24V DC, keep the 0V connected, and have the +24V supplied/cut off (cutoff on one end).

Shutting power supply on the both ends may make the electric potential unstable when the power gets cut on the 0V end first.

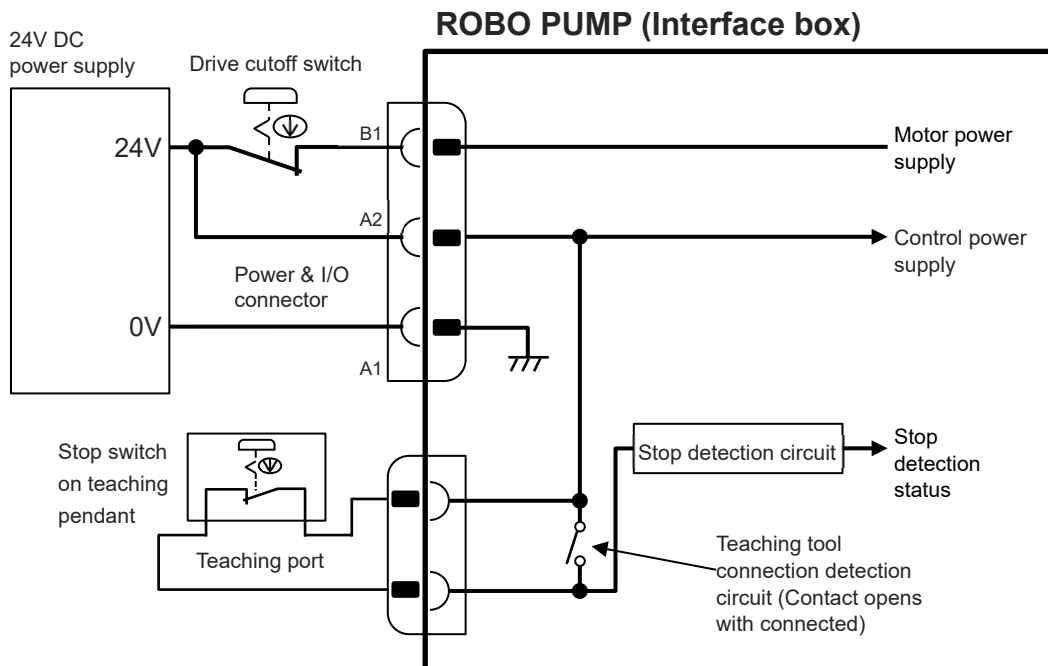
This may cause malfunction of components inside the controller.

- 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



[2] Example of circuit for 2-circuit power supply specification TMD2



[3] Way of wiring

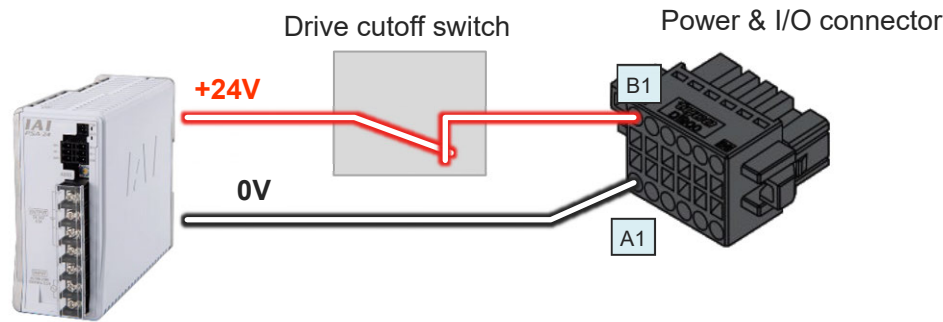
When wiring the power supply connection on the power & I/O connectors, refer to the connection diagram to connect the drive cut off switch to the power supply line (wiring of “B1” Terminal) for +24V.

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

Refer to [1.3 Electrical Specifications] for electrical specifications.

- ◆ 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	KIV0.75mm ² (AWG18)	Power supply voltage: 24V DC ±10% Power current: Max. 1.3A Wiring length: within 10m
A1	0V		

3.5.4 PLC Wiring

For I/O between the PLC and signals, the signal wiring must be connected to the connector terminal block.

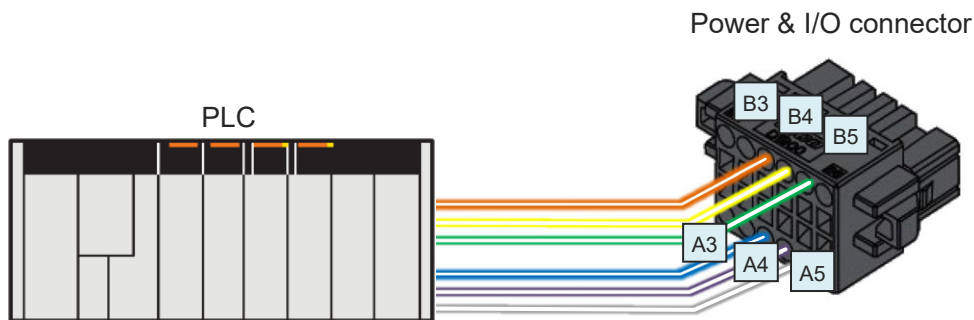
Connect the 1) to 6) wiring to the connector terminal block while referring to the connection diagram.

- 1) Connect the "B3" connector terminal and the "Desorption command" output terminal.
- 2) Connect the "B4" connector terminal and the "Adsorption command" output terminal.
- 3) Connect the "B5" connector terminal and the "Alarm clear" output terminal.
- 4) Connect the "A3" connector terminal and the "Desorption confirmation" input terminal.
- 5) Connect the "A4" connector terminal and the "Adsorption confirmation" input terminal.
- 6) Connect the "A5" connector terminal and the "Alarm" input terminal.

PLC connection diagram

* Before starting connector wiring, check the details on [3.5.1 Connector Wiring Method].

* On the PLC side, perform the appropriate terminal processing according to the specifications before carrying out the wiring.



◆ When Parameter No. 5 “PIO Pattern selection” is “0: Double solenoid mode”

Pin No.	Signal name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Desorption command	ST0	KIV0.20mm ² (AWG24)	Desorption command signal ON: Desorption Mode (On-Edge)
B4	Adsorption command	ST1		Adsorption command signal ON: Adsorption Mode (On-Edge)
B5	Alarm reset	RES		On to reset alarm
A3	—	NC		Not in use
A4	Adsorption confirmation	PE1		Adsorption confirmation signal ON: Vacuum pressure has reached adsorption confirmation level OFF: Vacuum pressure has reached desorption confirmation level
A5	Alarm (b-contact)	*ALM		Alarm detection (B-contact) OFF: In Normal Operation ON: Alarm Generated

◆ When Parameter No. 5 “PIO Pattern selection” is “1: Single solenoid mode”

Pin No.	Signal name	Signal abbreviation	Compatible wire diameter	Function overview
B3	—	NC	KIV0.20mm ² (AWG24)	Not in use
B4	Adsorption / Desorption command	ST1		Adsorption confirmation signal • Status ON (high) during standby mode: Transit to adsorption mode • Status OFF (Low) during adsorption mode: To standby mode after transited to desorption mode
B5	Alarm reset	RES		On to reset alarm
A3	—	NC		Not in use
A4	Adsorption confirmation	PE1		Adsorption confirmation signal ON: Vacuum pressure has reached adsorption confirmation level OFF: Vacuum pressure has reached desorption confirmation level
A5	Alarm (B-contact)	*ALM		Alarm detection (B-contact) OFF: In Normal Operation ON: Alarm Generated

◆ When Parameter No. 5 “PIO Pattern selection” is “2: Double solenoid mode2”

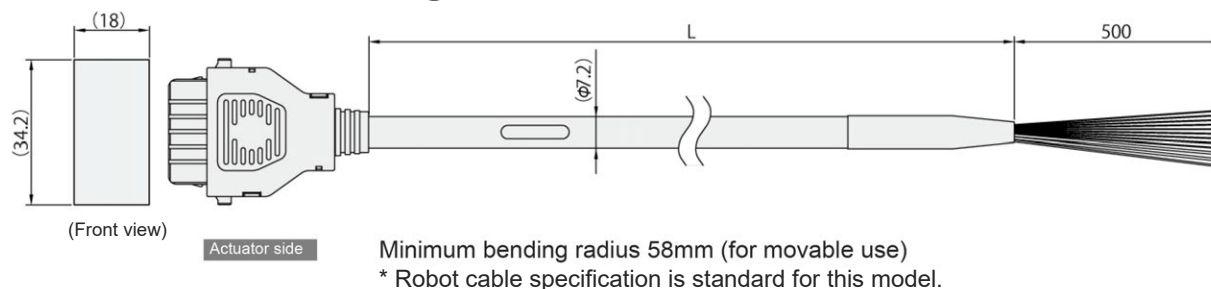
Pin No.	Signal name	Signal abbreviation	Compatible wire diameter	Function overview
B3	Desorption command	ST0	KIV0.20mm ² (AWG24)	Desorption command signal ON: Desorption Mode (On-Edge)
B4	Adsorption command	ST1		Adsorption command signal ON: Adsorption Mode (On-Edge)
B5	Alarm reset	RES		On to reset alarm
A3	Desorption confirmation	PE0		Desorption confirmation signal ON: Vacuum pressure has reached desorption confirmation level
A4	Adsorption confirmation	PE1		Adsorption confirmation signal ON: Vacuum pressure has reached adsorption confirmation level OFF: Vacuum pressure has reached desorption confirmation level
A5	Alarm (b-contact)	*ALM		Alarm detection (B-contact) OFF: In Normal Operation ON: Alarm Generated

3.6 Way of Wiring (Connect to PIO Control / Cables)

3.6.1 Power & I/O Cable

[1] Standard Connector

Model **CB-EC-PWBIO□□□-RB**



3-1871946-6

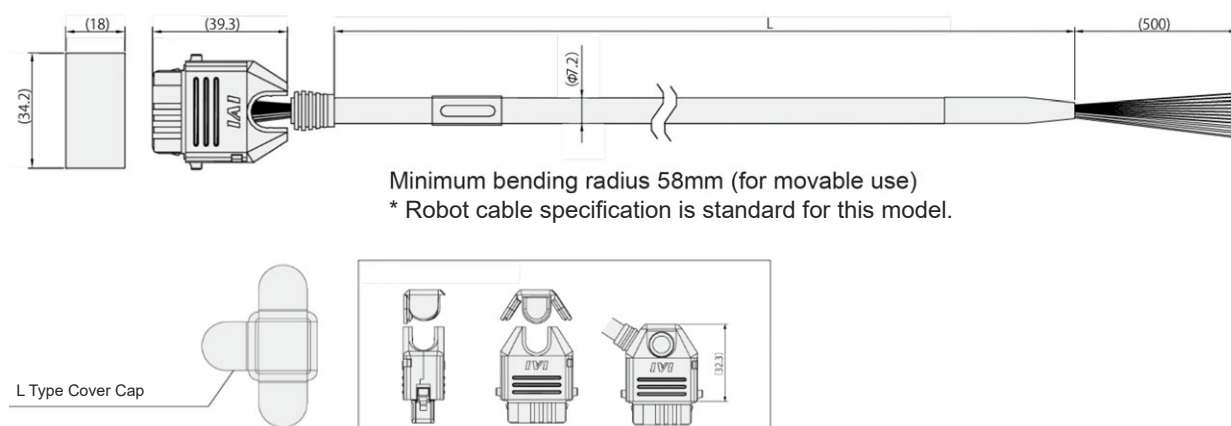
Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(Reserve) ^(Note 1)	A2
Orange (AWG26)	IN0	B3
Yellow (AWG26)	IN1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(Reserve)	B6
Blue (AWG26)	OUT0	A3
Yellow (AWG26)	OUT1	A4
Purple (AWG26)	* ALM	A5
White (AWG26)	(Reserve)	A6
Brown (AWG18)	BKRLS	B2

Note 1 It should be 24V (Control) when 2-circuit power supply specification (TMD2).

Note: The yellow/green and light gray wires are not used. (They have already been cut inside the heat-shrink tubing)

- 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.
Sample model number: Cable length 3m → CB-EC-PWBIO030-RB

[2] 4-way Connector

Model **CB-EC2-PWBIO□□□-RB**

1-1871940-6

Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22)	(Reserve) ^(Note 1)	A2
Orange (AWG26)	IN0	B3
Yellow (AWG26)	IN1	B4
Green (AWG26)	RES	B5
Pink (AWG26)	(Reserve)	B6
Blue (AWG26)	OUT0	A3
Purple (AWG26)	OUT1	A4
Gray (AWG26)	* ALM	A5
White (AWG26)	(Reserve)	A6
Brown (AWG18)	BKRLS	B2

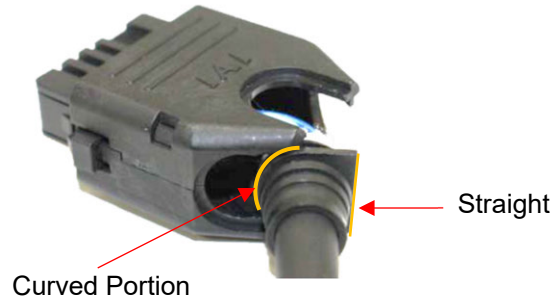
Note 1 It should be 24V (Control) when 2-circuit power supply specification (TMD2).

Note: The yellow/green and light gray wires are not used. (They have already been cut inside the heat-shrink tubing)

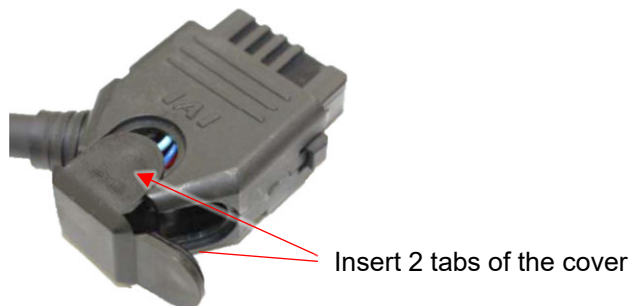
- The wiring on the opposite side of the connector has not been processed.
- The cable length (L) is available from 1m to 10m. Specify the length in increments of 1m.
- Sample model number: Cable length 3m → CB-EC2-PWBIO030-RB

◆ How to Build up 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.



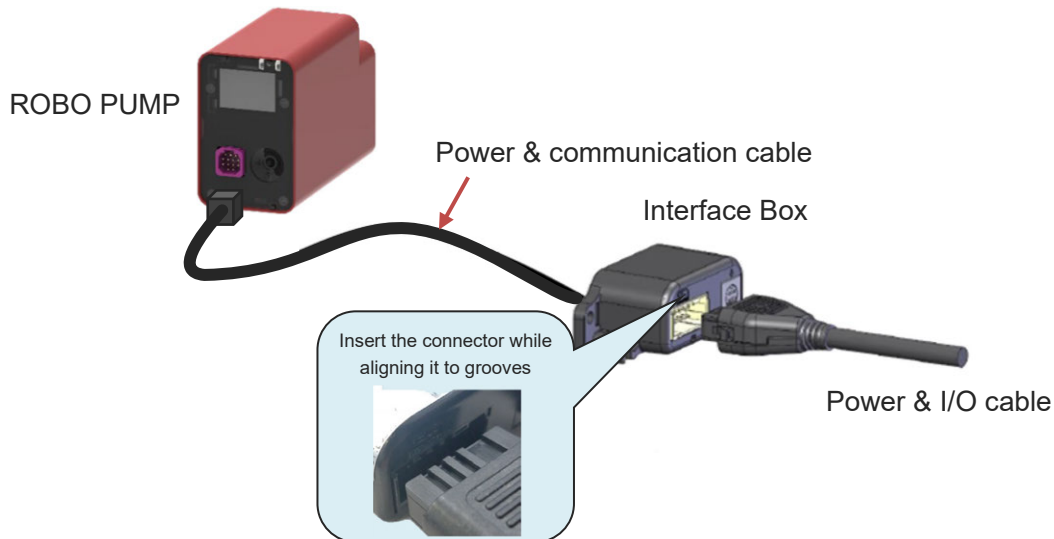
3. Then, push in the last tab to the socket.



3.6.2 Power & I/O Cable Connection

Connect the power & I/O cable to ROBO PUMP.
Insert the connector until you hear the feel a click.

Cable connection diagram



* Refer to [3.3.5 Interface Box Wiring] for how to establish connection between ROBO PUMP and interface box.



Caution

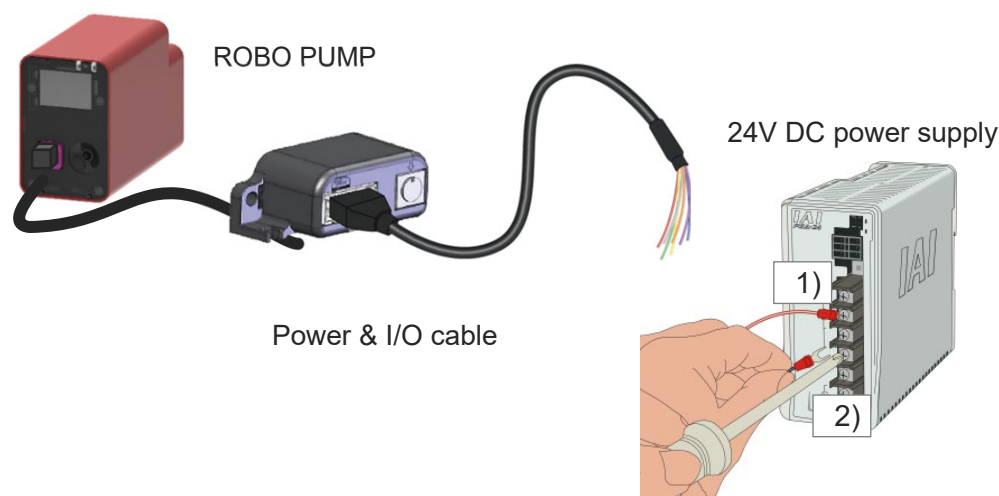
- The connector must be inserted in a given direction. Align the convex and concavity on the connectors and insert it until you hear the "click".
- Take appropriate care to prevent unused wiring in the loose wire end on the cable from shorting out other wires by protecting them with insulation tape.

3.6.3 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.
Refer to [1.3 Electrical Specifications] for electrical specifications.

- [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 $\pm 10\%$ Power supply current: Max. 1.3A Wiring length: within 10m
Black	0V	Ground	

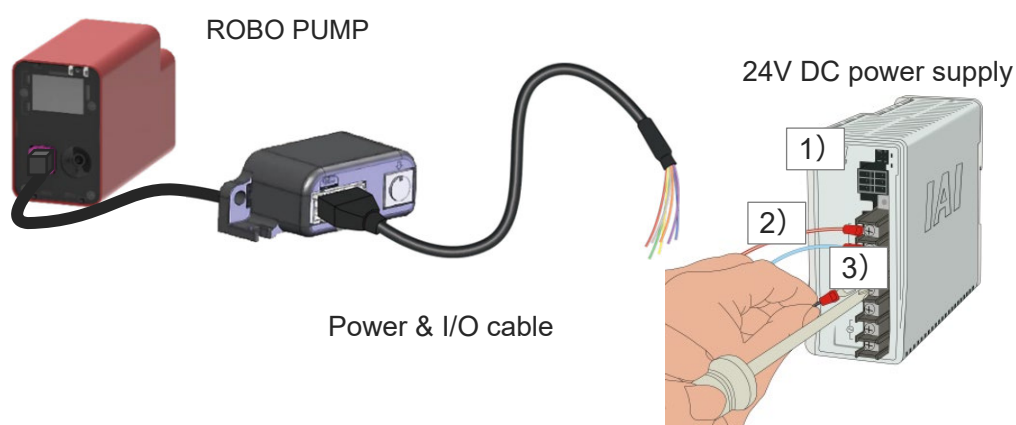
[2] 2-circuit power supply specification TMD2 (Option)

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 (Drive source), 24V (Control) and 0V wires of the power & I/O cable.

- 1) Connect the 24V (Drive 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 (Drive source)	Drive source power supply input	Power supply voltage: 24V DC $\pm 10\%$ Power current: Max. 1.3A Wiring length: within 10m
Light blue	24V (Control)	Control power supply input	
Black	0V	Ground	

3.6.4 Wiring of Drive Cutoff Switch in Order to Make Stop

There is only one way to make ROBO PUMP 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, ROBO PUMP 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.

When it is necessary to have a work such as to set up operational conditions, it is necessary to have an external drive cutoff switch.

For an example of wiring, refer to the [3.5.3 Wiring of drive cutoff switch in order to make stop].

3.6.5 PLC Wiring

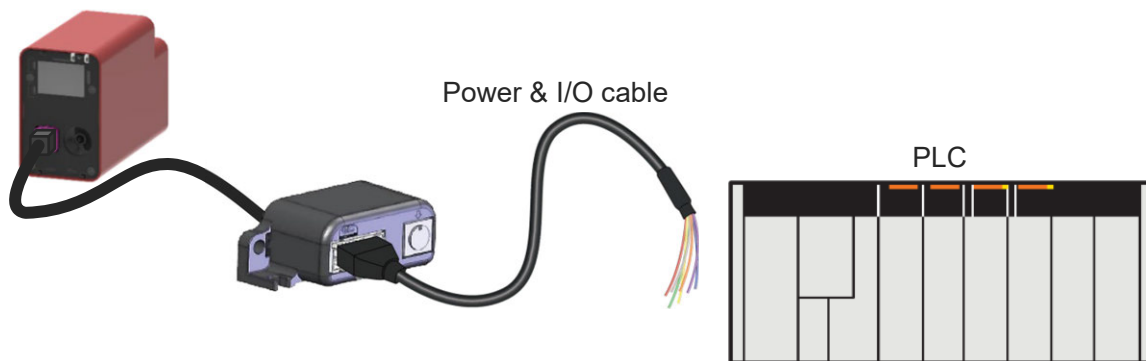
For I/O between the PLC and signals, the wiring of the power & I/O cable must be connected to the PLC.

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 “Desorption command” output terminal.
- 2) Connect the “yellow” cable wire and the “Adsorption command” output terminal.
- 3) Connect the “green” cable wire and the “Alarm clear” output terminal.
- 4) Connect the “blue” cable wire and the “Desorption confirmation signal” input terminal.
- 5) Connect the “purple” cable wire and the “Adsorption confirmation signal” input terminal.
- 6) Connect the “gray” cable wire and the “Alarm” input terminal.

PLC connection diagram

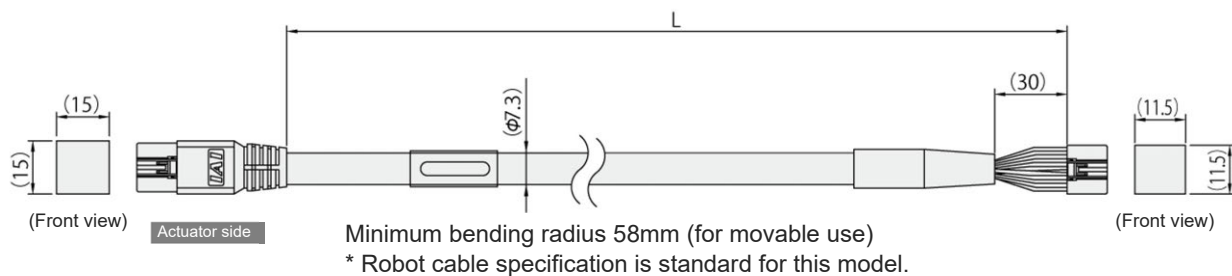
Process the terminals in accordance with PLC specifications in order to conduct wiring.



3.7 Way of Wiring (Connecting to RCON-EC)

3.7.1 Power & Communication Cable

◆Model **CB-RP-PWSIO□□□-RB**



DF62E-13S-2.2C(18)

Color	Signal name	Pin No.
Black (AWG19)	0V	2
White (AWG19)	24V(MP)	1
Red (AWG19)	24V(CP)	12
Green (AWG26)	STOP_EXT	7
Brown (AWG26)	RSV	11
Orange/Red (AWG26)	main_SD+	6
Orange/Blue (AWG26)	main_SD-	10
Gray/Red (AWG26)	sub_SD+	3
Gray/Blue (AWG26)	sub_SD-	4
—	—	5
—	—	8
—	Not available	9
Green (AWG26)	FG	13

DF62E-13S-2.2C(18)

Pin No.	Signal name	Color
2	0V	Black (AWG19)
1	24V(MP)	White (AWG19)
12	24V(CP)	Red (AWG19)
7	STOP_EXT	Green (AWG26)
11	RSV	Brown (AWG26)
6	main_SD+	Orange/Red (AWG26)
10	main_SD-	Orange/Blue (AWG26)
3	sub_SD+	Gray/Red (AWG26)
4	sub_SD-	Gray/Blue (AWG26)
5	—	—
8	—	—
9	—	—
13	FG	Green (AWG26)

Yellow (AWG26)

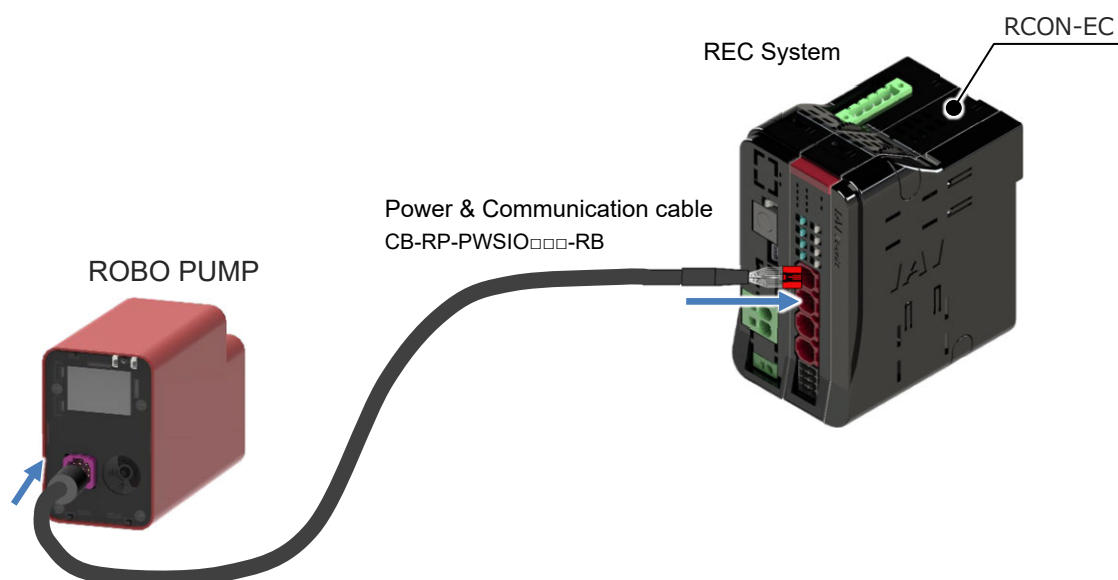
- The cable length (L) is available from 1m to 10m. Specify the length in increments of 1m.
Sample model number: Cable length 3m → CB-RP-PWSIO030-RB

3.7.2 Wiring of ROBO PUMP and RCON-EC

Insert the connectors to ROBO PUMP and the RCON-EC.

Push the connectors inward till it makes “click” sound.

The axis number should be determined by the position of the connector on the RCON-EC.



* Refer to [3.3.5 Interface Box Wiring] for how to connect cables to the main body of ROBO PUMP.

ROBO PUMP

Chapter 4

Operation

4.1	Basic of Operation	4-1
4.1.1	Basic of Operation	4-1
4.1.2	Order to Turn Power ON	4-2
4.1.3	Transition of Display Panel Windows	4-3
4.1.4	Order to Turn Power OFF	4-4
4.2	Teaching Tool Connections and Testing Operation	4-5
4.2.1	Connecting Controller Communication Cable	4-6
4.2.2	Connecting to IA-OS	4-7
4.3	Operation and Setup for Trial Run	4-9
4.3.1	Display in Trial Run Screen	4-9
4.3.2	Explanation of Trial Run Screen	4-10
4.3.3	How to Perform Trial Run	4-14
4.3.4	Operating Condition Setting / Adjustment	4-15
4.4	I/O Signals	4-16
4.4.1	I/O Signal List	4-16
4.4.2	Input Signal and Mode Transition	4-20
4.4.3	Error Operation Protection Time in Input Signal	4-22

4.5	Operating Method from Master Device	4-23
4.5.1	How to Operate in Double Solenoid Mode	4-23
4.5.2	How to Operate in Single Solenoid Mode	4-25
4.5.3	How to Operate in Double Solenoid 2 Mode	4-27
4.5.4	Input and Output Signal Timing when Connected to RCON-EC	4-29
4.6	Overload Warning Feature	4-30
4.6.1	About Overload Warning Feature	4-30
4.6.2	Overload Warning Level	4-31
4.6.3	Overload Warning Level Setting	4-32
4.7	JOG Switch	4-34

4.1 Basic of Operation

4.1.1 Basic of Operation

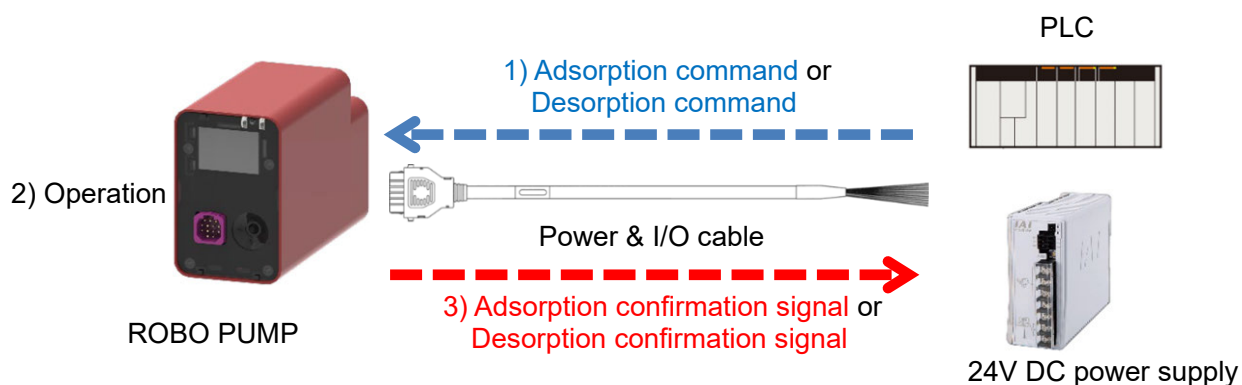
An input signal from a master device to the ROBO PUMP triggers operation of the ROBO PUMP. The ROBO PUMP status can also be determined when the master device receives signal output from the ROBO PUMP.

This manual introduces an example using a PLC connected as the master device.

● PLC/ROBO PUMP connection

- 1) Command signals for PLC should be input. (Adsorption command or desorption command)
- 2) The ROBO PUMP operates.
- 3) The status signal should get output once the vacuum pressure of ROBO PUMP reaches the set value. (Adsorption confirmation signal or desorption confirmation signal)

Connection image



Reference

- ROBO PUMP should differ for how to input command signals depending on the PIO patterns.
 - Operation should be made by detecting the rising of pulse for PIO Pattern 0 and 2.
 - Operation should be made by detecting the status of an input signal for PIO Pattern 1.

4.1.2 Order to Turn Power ON

Shown below is the recommended order to turn the power on.

[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 ROBO PUMP units.

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

- ROBO PUMP Unit : 1s or more after turning 24V DC power supply OFF

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

1s or more

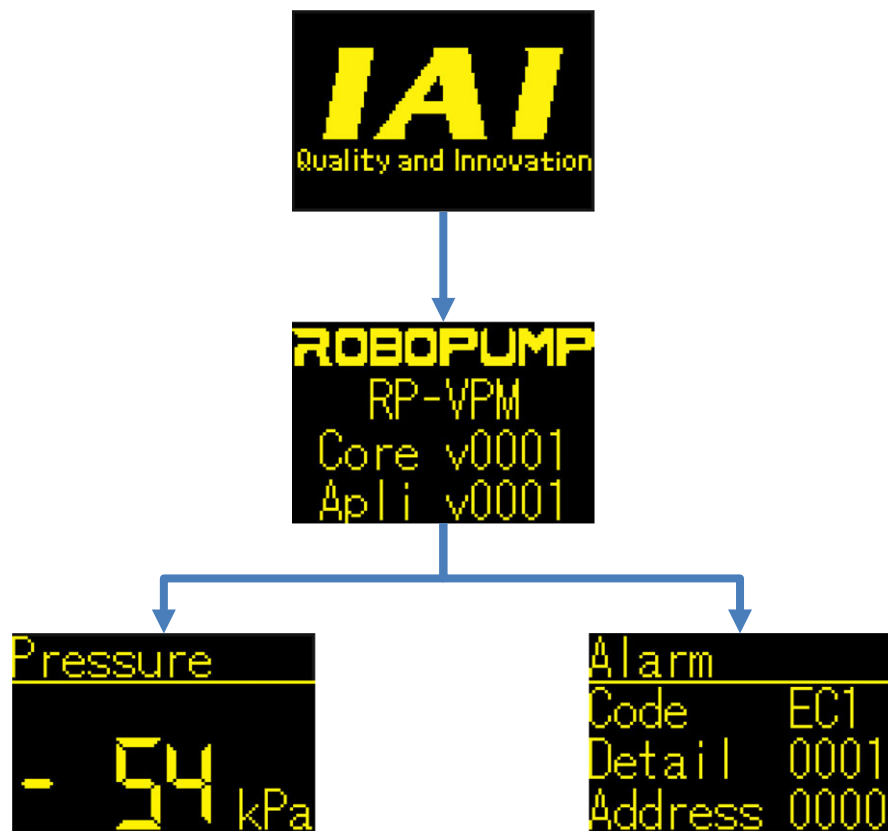
Reference

- For the process to turn the power on when ROBO PUMP is connected to RCON-EC, refer to [an instruction manual of the gateway unit or SEL unit] to be used.
-

4.1.3 Transition of Display Panel Windows

After the power is supplied, the display windows of the ROBO PUMP main unit should flow as shown below.

- 1) During initialization at the startup, "IAI" logo should be displayed.
- 2) The product logo "ROBO PUMP" and firmware version should be displayed.
- 3) A window for the current pressure should be displayed (transited to the alarm window when there is an alarm generated).



Reference

- The display panel windows of ROBO PUMP can be changed by operation of joystick at the bottom of the window.

For details, refer to [10.1 Display Panel and Operation Switch].

4.1.4 Order to Turn Power OFF

Shown below is the recommended order to turn the power OFF.

[Order to turn power OFF]

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

Reference

- For the process to turn the power on when ROBO PUMP is connected to RCON-EC, refer to [an instruction manual of the gateway unit or SEL unit] to be used.
-

4.2 Teaching Tool Connections and Testing Operation

A PC software IA-OS or teaching pendant can be used to test operation or configure data settings.

In this chapter, introduces how to operate using IA-OS.

Refer to the following First Step Guide for how to install IA-OS.

For how to operate, refer to the guiding features installed in IA-OS

Product name / Instruction manual name	Manual No.
IA-OS First Step Guide	ME0391

Also, the applicable version of IA-OS is as follows.

Instruction manual name	ROBO PUMP applicable version
IA-OS	V14.00.00.00 or later

Refer to [10.2 Teaching Pendant] for how to operate TB-02/02D and TB-03.

Operation is available also with using the switches on the front of the ROBO PUMP main body.
For details, refer to [10.1.1 Specifications for Operation Switch].

◆ Items to prepare

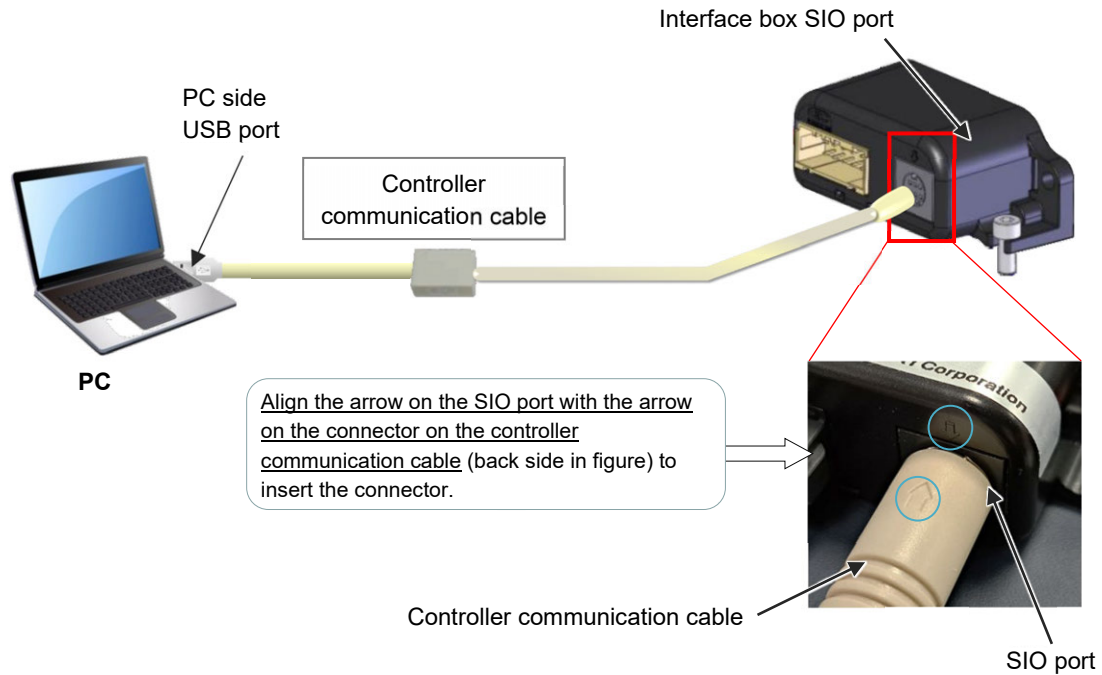
- ROBO PUMP (Interface box connection)
- PC / Controller communication cable
- Power & I/O cable
- 24V DC power supply

Reference

- For how to make operation when connecting ROBO PUMP to RCON-EC, refer to [an instruction manual of the gateway unit or SEL unit] to be used as well as this manual.

4.2.1 Connecting Controller Communication Cable

With the power supply turned OFF, join the PC and ROBO PUMP with the dedicated cable. Insert the round connector to the SIO port on Interface box.



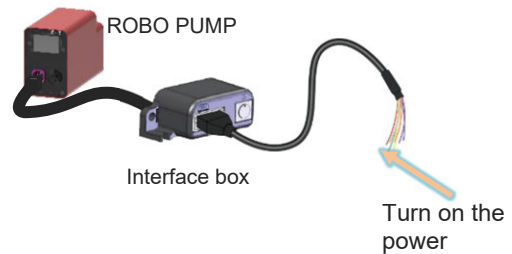
Caution

- When connecting the controller communication cable to the gateway unit SIO port, insert matching the two white arrows as shown in the red frame above. Inserting the connector from the wrong direction may damage the connector.

4.2.2 Connecting to IA-OS

[1] Connect the PC and ROBO PUMP system

1. After connecting the cable, turn on 24V DC power to ROBO PUMP.



2. Double-click the **IAI Toolbox** icon.



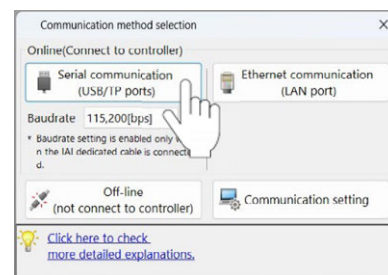
3. Click the **IA-OS** icon to start up the software.



[2] Connect the IA-OS and ROBO PUMP system

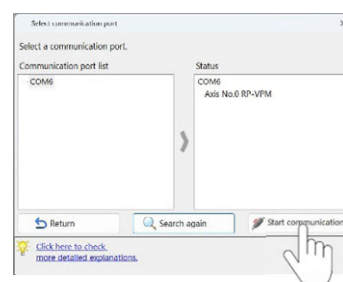
1. Start up IA-OS and the communication method selection screen should show.
Serial communication (USB/TP ports) Click.

Communication method selection screen



2. The Select communication port screen will be displayed. Select a COM number of the controller to be connected in the communication port list and click **Start communication**.

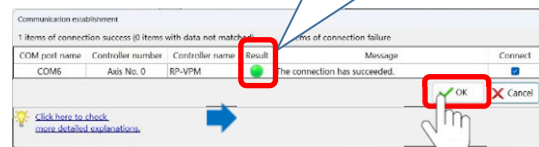
Select communication port screen



3. The “Connected axis check” screen will be displayed.
If a green lamp turns on in the result column, it means connection was established with the subject axis.

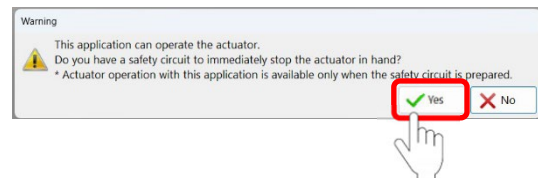
Click **OK**.

Communication Establishment screen



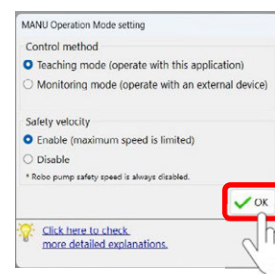
4. The Warning screen will be displayed.
Click **OK**.

Warning screen



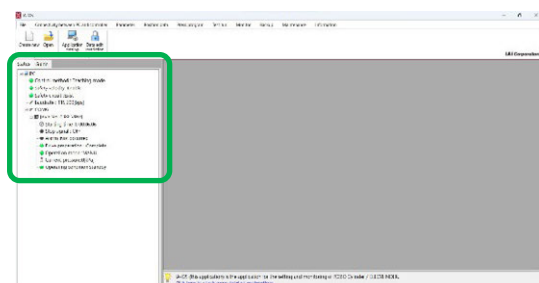
5. The MANU Operation Mode Select screen will be displayed.
Select an operation mode and click **OK**.

MANU Operation Mode Select screen



6. The IA-OS main screen opens.
The status of the connected axes should be displayed in the tree view in the left of the screen.

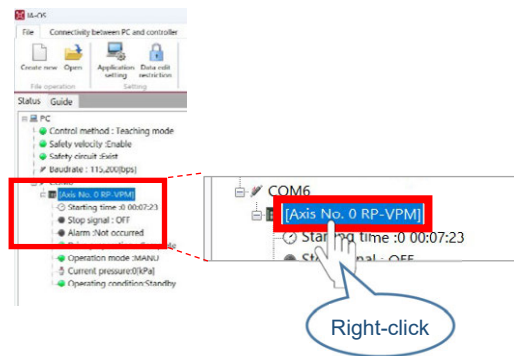
IA-OS main screen



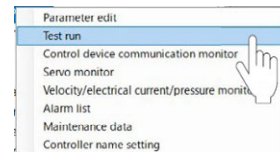
4.3.1 Display in Trial Run Screen

For how to check operation in the teaching pendant (TB-02/03), refer to an instruction manual of [10.2 Teaching Pendant].

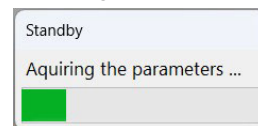
2. Click on **Test run**.



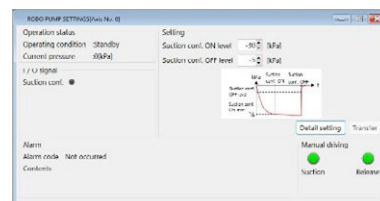
- ## Right-click menu



Acquiring the parameters screen



Trial Run screen



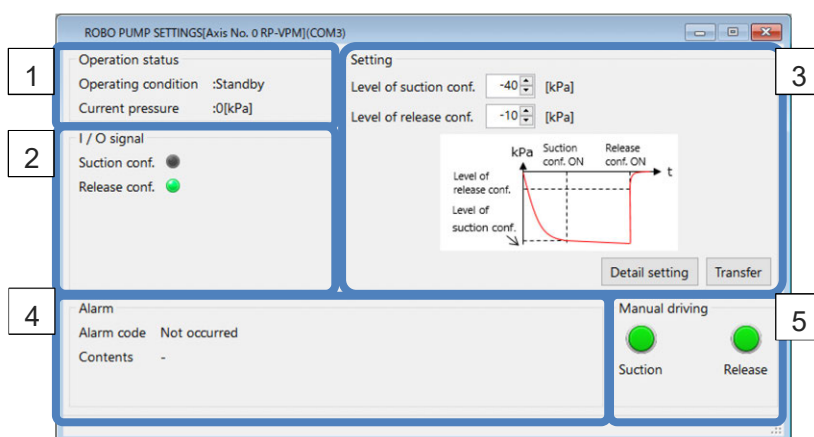
4.3.2 Explanation of Trial Run Screen

Here, explains how to perform a trial run.

In this screen, the operation setup of ROBO PUMP can be established as well as a trial run.

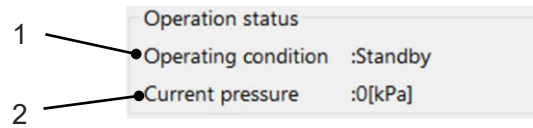
Details of screen contents are explained in the following pages.

Refer to [4.3.4 Operating Condition Setting / Adjustment] for the setting of operational conditions.



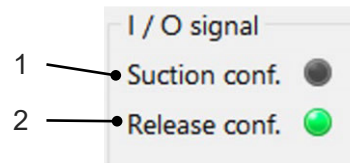
No.	Item	Description
1	Operation status	Operation status and current pressure [kPa] should be displayed.
2	I/O signal	The output signal status of adsorption and desorption for ROBO PUMP should be displayed.
3	Setup	Operational conditions for ROBO PUMP should be set up.
4	Alarm	An alarm currently being occurred should be displayed.
5	Manual operation	Trial for ROBO PUMP should be performed.

[1] Operation Status Trial Conditions



No.	Item	Description	
1	Operation status	Standby	Standing by for adsorption signal.
		Adsorption	In adsorbing process
		Desorption	In desorbing process
		Drive Ready Not Available	In a condition that the servo cannot be turned on due to an alarm or emergency stop
2	Current Pressure	The current pressure should be displayed in the [kPa] unit.	

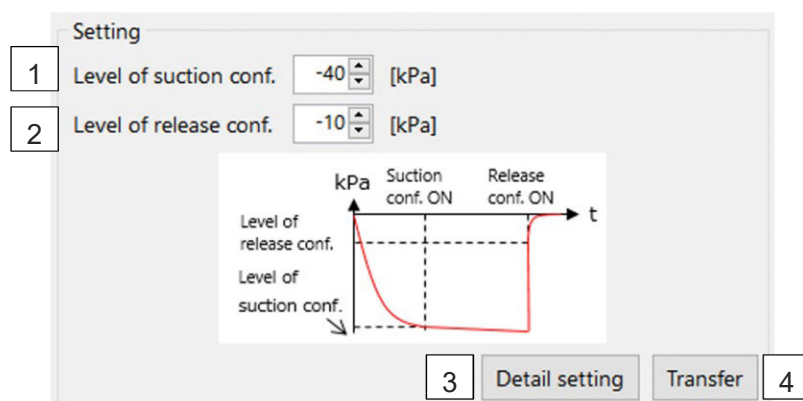
[2] I/O signal



No.	Item	Description
1	Adsorption confirmation	The signal should turn on when the pressure goes below that set in the adsorption confirmation level.
2	Desorption confirmation* ¹	The signal should turn on when the pressure goes above that set in the desorption confirmation level.

*¹ It should be displayed only when the PIO pattern is set to "2: Double Solenoid Mode 2".

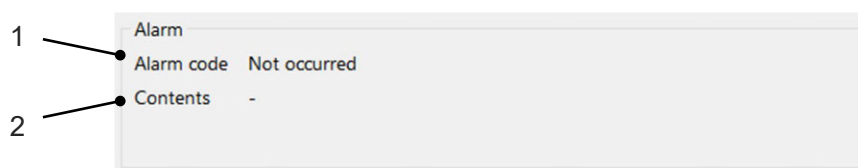
[3] Setup



No.	Item	Description
1*1	Adsorption confirmation level Adsorption confirmation ON level	The upper limit of pressure to complete adsorbing should be input in the [kPa] unit. In order to input a value directly, set the number up and down in the spin box.
2*1	Desorption confirmation level Adsorption confirmation OFF level	The lower limit of pressure to complete desorption should be input in the [kPa] unit. In order to input a value directly, set the number up and down in the spin box.
3	Detail Setup	Enable / disable of the power saving mode and adsorption / desorption confirmation level should be set up. Click it and the setup window should open.
4	Transfer	The changed contents should be transferred to a controller.

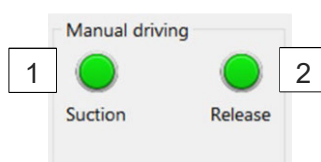
*1 The item names should differ depending on the PIO patterns to be used.

[4] Alarm



No.	Item	Description
1	Alarm code	Alarm codes and alarm names should be displayed.
2	Details	Details of an alarm should be displayed.

[5] Manual operation



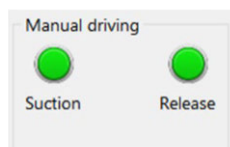
No.	Item	Description
1	Adsorption	Adsorption operation should start.
2	Desorption	Adsorption operation terminates and desorbing operation starts.

4.3.3 How to Perform Trial Run

Here, explains how to perform a trial run.

In order to operate ROBO PUMP, operation of buttons shown below should be conducted in the trial run screen.

Refer to [4.3.2 Explanation of Trial Run Screen [5] Manual operation] for the details of each button.



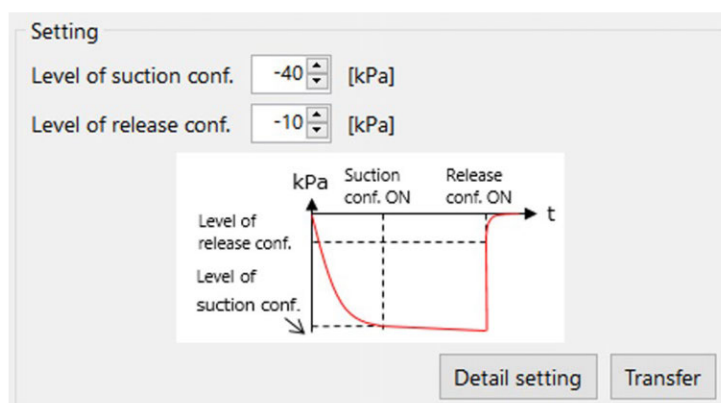
Caution

- Before operating ROBO PUMP, make sure that the connected air tubes and the adsorption pads are firmly connected.
- In case it is mounted to a moving part such as a robot, make sure that there is nothing to interfere in the operation range.

4.3.4 Operating Condition Setting / Adjustment

ROBO PUMP is programmed with operational conditions on delivery.

Operational conditions can be adjusted in the “Setup” boxes in the trial run screen.



* The desorption confirmation level should be set to -5kPa on delivery.

The explanation for each setting items is as follows.

Item	Description
Adsorption confirmation level Adsorption confirmation ON level	The upper limit of pressure to complete adsorbing should be input in the [kPa] unit. In order to input a value directly, set the number (Unit for switchover = 1 [kPa]) up and down in the spin box.
Desorption confirmation level Desorption confirmation ON level	The lower limit of pressure to complete desorption should be input in the [kPa] unit. In order to input a value directly, set the number (Unit for switchover = 1 [kPa]) up and down in the spin box.

(*) Refer to [5.4 Each Parameter Function Descriptions] for details of each item.

After setting up the parameters, click Transfer.



Caution

- Operational conditions cannot be changed during operation. In order to make a change to the settings, it is necessary to stop the operation before changing.
- Changing setting only should not enable the changes made.
- Conduct reboot of the power or software reset after a change is made.
After ROBO PUMP 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.

4.4 I/O Signals

4.4.1 I/O Signal List

The input and output signals should differ for the assignments depending on the settings of Parameter "Select PIO Pattern". The details of the parameters are as shown below.

I/O	0: Double solenoid		1: Single solenoid		2: Double solenoid 2	
	Signal name	Signal abbreviation	Signal name	Signal abbreviation	Signal name	Signal abbreviation
Input	Desorption command	ST0	-	NC	Desorption command	ST0
	Adsorption command	ST1	Adsorption/ Desorption command	ST1	Adsorption command	ST1
	Alarm reset	RES	Alarm reset	RES	Alarm reset	RES
Output	-	NC	-	NC	Desorption confirmation	PE0
	Adsorption confirmation	PE1	Adsorption confirmation	PE1	Adsorption confirmation	PE1
	Alarm [B-contact]	*ALM	Alarm [B-contact]	*ALM	Alarm [B-contact]	*ALM

[1] When Parameter No. 5 Select PIO pattern is "0: Double solenoid"

Category	Signal name	Signal name	Function overview
Input	Desorption command	ST0	It is an input signal for the desorption command. On-edge of the signal should transit to the desorption mode (to have the motor stopped and the solenoid to activate to open the valve on the vacuum pipe and sets back to the atmospheric pressure*).
	Adsorption command	ST1	It is an input signal for the adsorption command. On-edge of the signal should transit to the adsorption mode (a mode to have the motor activated to operate the pump).
	Alarm reset	RES	Turning ON resets the alarm. Alarm clear may not be possible depending on the alarm itself. For details, refer to [6.4.2 Alarm Causes and Countermeasures]
Output	Adsorption confirmation	PE1	It is a adsorption confirmation signal. It should turn ON when the vacuum pressure reaches at the adsorption confirmation level or below after the adsorption command is conducted. It also turns OFF when the vacuum pressure gets above the desorption confirmation level.
	Alarm (B-contact)	*ALM	ON in normal conditions. OFF when an alarm occurs. If it turns OFF, immediately take appropriate safety countermeasures with the equipment as a whole. For details, refer to [6.4.2 Alarm Causes and Countermeasures]

* Positive pressure should be applied for RP-VPMV (equipped with air blow).

[2] When Parameter No. 5 Select PIO pattern is "1: Single solenoid"

Category	Signal name	Signal name	Function overview
Input	Adsorption / Desorption command	ST1	It is a signal to make the adsorption / desorption commands. The signal should detect depends on the level. Once the signal turns ON (high condition), the mode transits to the adsorption mode (a mode to have the motor activated to operate the pump). If the signal turns from ON to OFF (low condition), the mode transits to the desorption mode (to have the motor stopped and the solenoid to activate to open the valve on the vacuum pipe and sets back to the atmospheric pressure*).
	Alarm reset	RES	Turning ON resets the alarm. An alarm may not be able to cancel due to content of the alarm. For details, refer to [6.4.2 Alarm Causes and Countermeasures]
Output	Adsorption confirmation	PE1	It should turn ON when the vacuum pressure reaches at the adsorption confirmation level or below while the adsorption / desorption command is ON. It also turns OFF when the vacuum pressure gets above the desorption confirmation level.
	Alarm (B-contact)	*ALM	ON in normal conditions. OFF when an alarm occurs. If it turns OFF, immediately take appropriate safety countermeasures with the equipment as a whole. For details, refer to [6.4.2 Alarm Causes and Countermeasures]

* Positive pressure should be applied for RP-VPMV (equipped with air blow).

[3] When Parameter No. 5 Select PIO pattern is "0: Double solenoid 1"

Category	Signal name	Signal name	Function overview
Input	Desorption command	ST0	It is an input signal for the desorption command. On-edge of the signal should transit to the desorption mode (to have the motor stopped and the solenoid to activate to open the valve on the vacuum pipe and sets back to the atmospheric pressure*).
	Adsorption command	ST1	It is an input signal for the adsorption command. On-edge of the signal should transit to the adsorption mode (a mode to have the motor activated to operate the pump).
	Alarm reset	RES	Turning ON resets the alarm. An alarm may not be able to cancel due to content of the alarm. For details, refer to [6.4.2 Alarm Causes and Countermeasures]
Output	Desorption confirmation	PE0	It is a desorption confirmation signal. It should turn ON when the vacuum pressure reaches at the desorption confirmation level after the desorption command is input. Also, it turns OFF when the desorption command is input while the desorption confirmation is ON.
	Adsorption confirmation	PE1	It is an adsorption confirmation signal. It should turn ON when the vacuum pressure reaches at the adsorption confirmation level or below after the adsorption command is conducted. It also turns OFF when the vacuum pressure gets above the desorption confirmation level.
	Alarm (B-contact)	*ALM	ON in normal conditions. OFF when an alarm occurs. If it turns OFF, immediately take appropriate safety countermeasures with the equipment as a whole. For details, refer to [6.4.2 Alarm Causes and Countermeasures]

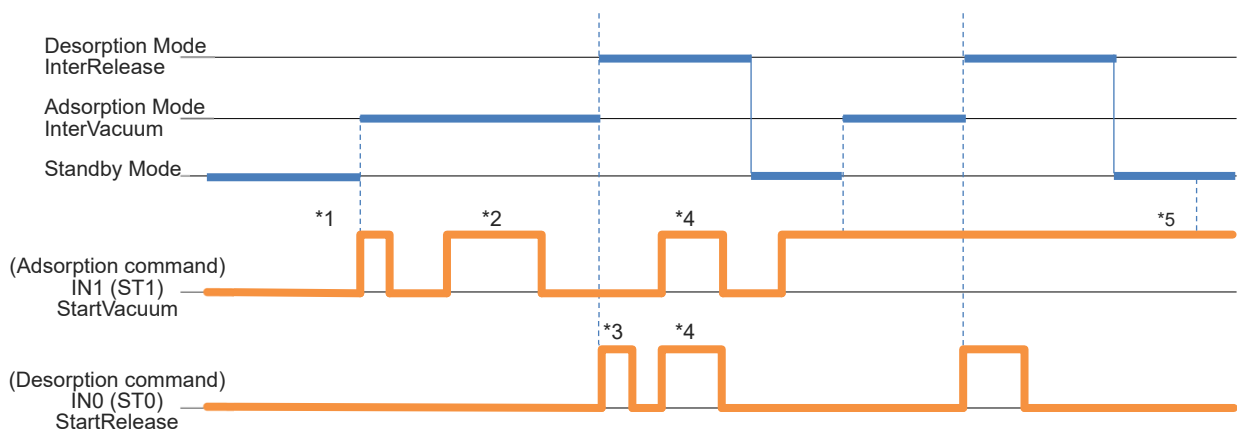
* Positive pressure should be applied for RP-VPMV (equipped with air blow).

4.4.2 Input Signal and Mode Transition

ROBO PUMP has difference in detection of input signals depending on the PIO patterns. An input signal should be detected with the rising of pulse for PIO Pattern 0 and 2. A signal should be detected by the status level of an input signal (adsorption / desorption command) for PIO Pattern 1.

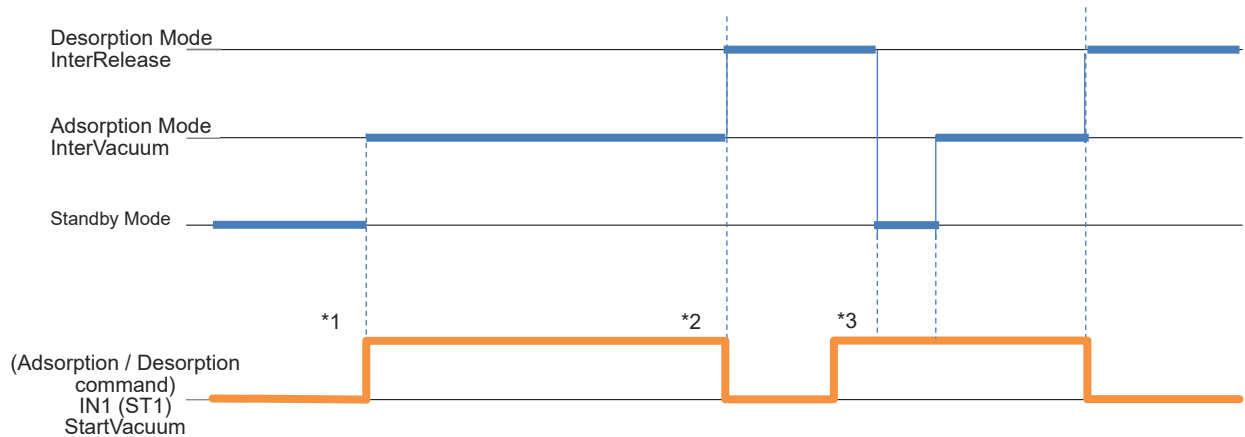
Also, transition among three modes, “Desorption Mode”, “Adsorption Mode” and “Standby Mode” should be conducted in accordance with the status of an input signal. Shown below is a diagram for the status transition.

[1] Input Signal and Mode Transition in PIO Pattern 0 and 2



- *1 For Standby Mode, rising of the adsorption command should transit to Adsorption Mode.
- *2 Adsorption Mode receives only the desorption command.
- *3 Standby Mode and Adsorption Mode should receive the desorption command.
- *4 Desorption Mode should not receive the adsorption command and desorption command.
- *5 If the desorption command has turn ON/OFF while the adsorption command is kept ON at transition to Adsorption Mode just before, adsorption command should not be received.
- * In any mode not described above (Drive Ready Not Available), the adsorption command and desorption command should not be received.

[2] Input Signal and Mode Transition in PIO Pattern 1

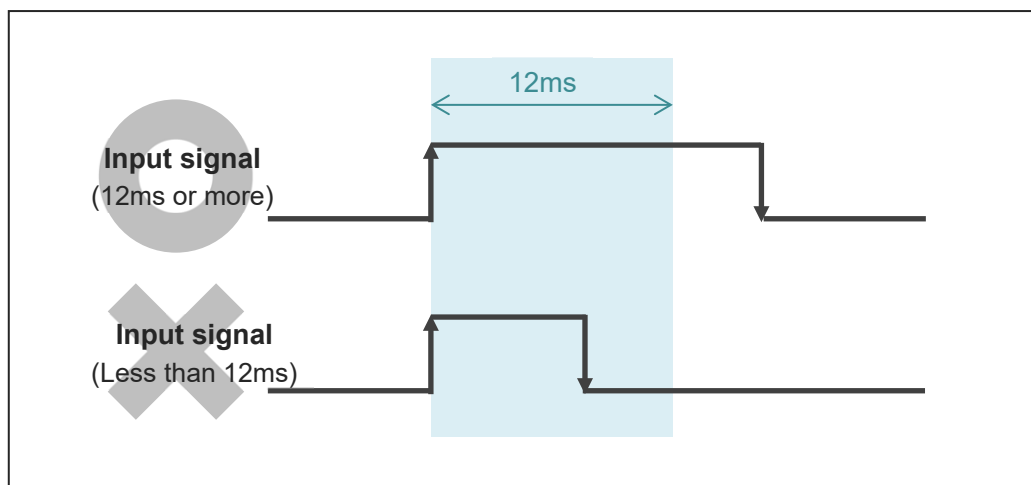


- *1 If the adsorption / desorption command gets to the High status in Standby Mode, the mode transits to Adsorption Mode.
- *2 If the adsorption / desorption command gets to the Low status in Adsorption Mode, the mode transits to Desorption Mode. (It will not transit to Standby Mode.)
- *3 If the adsorption / desorption command is in the High status in Standby Mode, the mode transits to Adsorption Mode.
However, it should not directly transits from Desorption Mode to Adsorption Mode. It once transits to Standby Mode, then to Adsorption Mode.
- * In any mode not described above (Drive Ready Not Available), the adsorption command and desorption command should not be received.

4.4.3 Error Operation Protection Time in Input Signal

The input signals are equipped with the error operation protection time for 12ms in order to protect it from an error operation due to chattering or noise.

As a signal less than 12ms cannot be identified, input a signal continuously for 12ms or more.

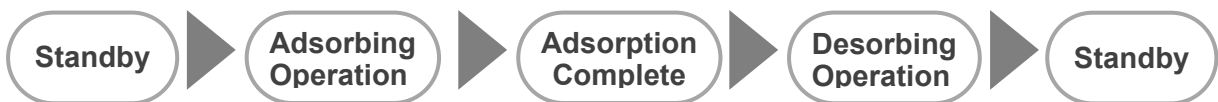


4.5 Operating Method from Master Device

4.5.1 How to Operate in Double Solenoid Mode

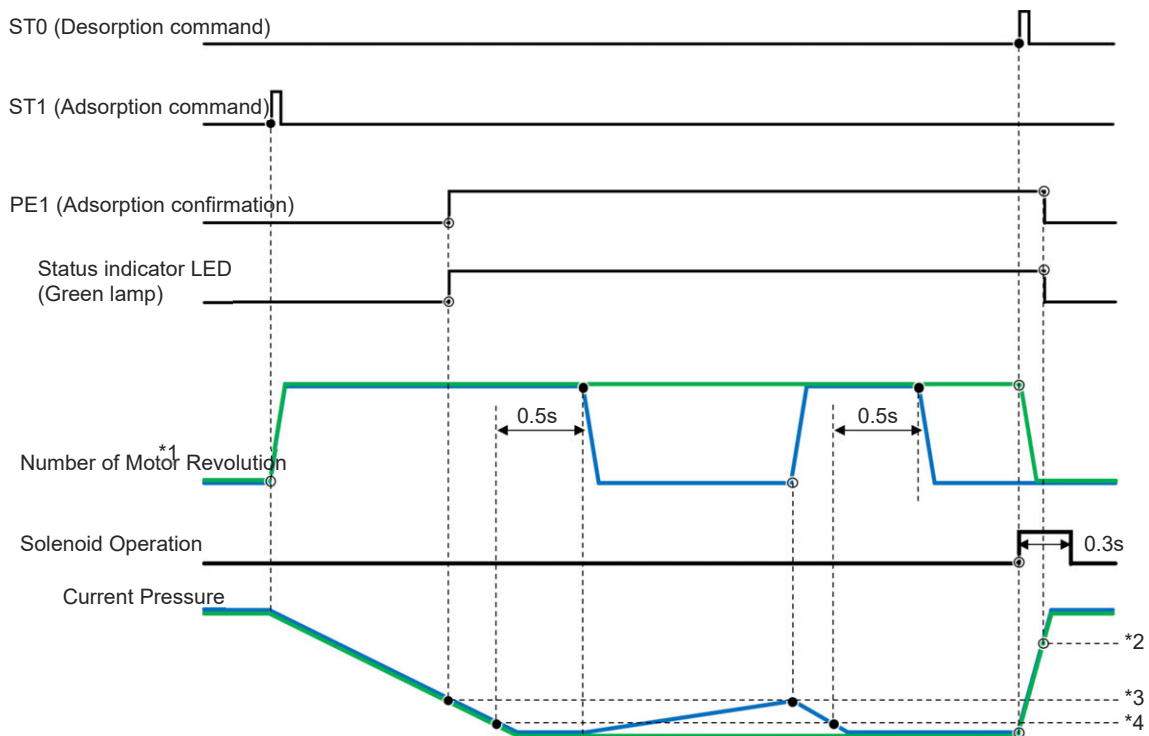
When Parameter No. 5 “Select PIO pattern” is set to “0: Double solenoid mode”, the timing chart should be shown.

The basic process is as follows.



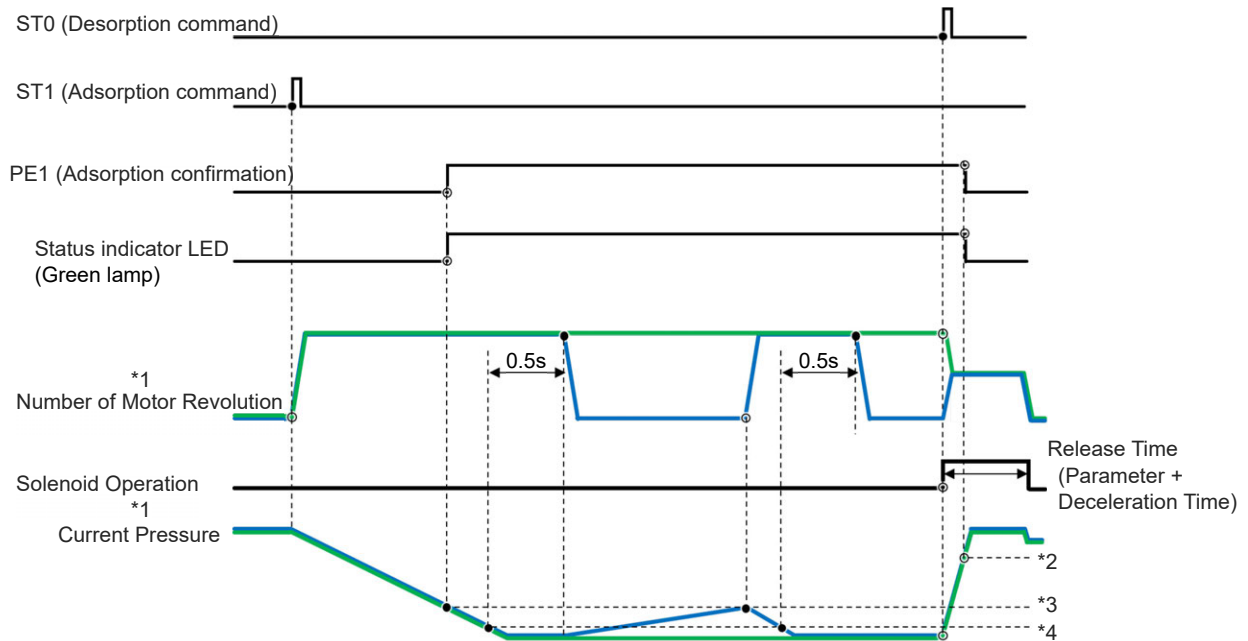
[Basic timing chart]

◆RP-VPM(Standard)



- *1 About “Number of Motor Revolution” and “Current Pressure”:
They behave in the green line when “Power Saving Mode” in the parameter is set to “0” while they behave in blue line when set to “1”.
- *2 It shows the value set in the parameter “Adsorption Confirmation OFF Level (Desorption Confirmation Level)”.
PE1 (Adsorption Confirmation) should turn OFF when the current pressure gets to the set value or higher.
- *3 It shows the value set in the parameter “Adsorption Confirmation ON Level (Adsorption Confirmation Level)”.
PE1 (Adsorption Confirmation) should turn ON when the current pressure gets to the set value or lower.
- *4 The value set in the parameter “Adsorption Stop Level” should be shown. While PE1 (Adsorption Confirmation) is ON, if the current pressure gets to the set value or lower, the motor should stop, and if the current pressure gets to the set value or higher, the motor should start turning.

◆RP-VPMV (Equipped with air blow)



*1 About “Number of Motor Revolution” and “Current Pressure”:

They behave in the green line when “Power Saving Mode” in the parameter is set to “0” while they behave in blue line when set to “1”.

*2 It shows the value set in the parameter “Adsorption Confirmation OFF Level (Desorption Confirmation Level)”.

PE1 (Adsorption Confirmation) should turn OFF when the current pressure gets to the set value or higher.

*3 It shows the value set in the parameter “Adsorption Confirmation ON Level (Adsorption Confirmation Level)”.

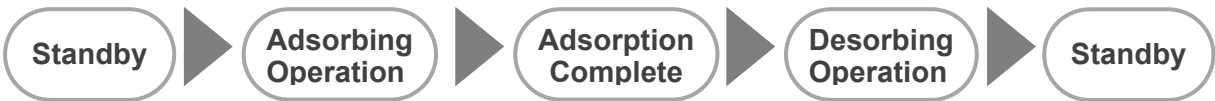
PE1 (Adsorption Confirmation) should turn ON when the current pressure gets to the set value or lower.

*4 The value set in the parameter “Adsorption Stop Level” should be shown. While PE1 (Adsorption Confirmation) is ON, if the current pressure gets to the set value or lower, the motor should stop, and if the current pressure gets to the set value or higher, the motor should start turning.

4.5.2 How to Operate in Single Solenoid Mode

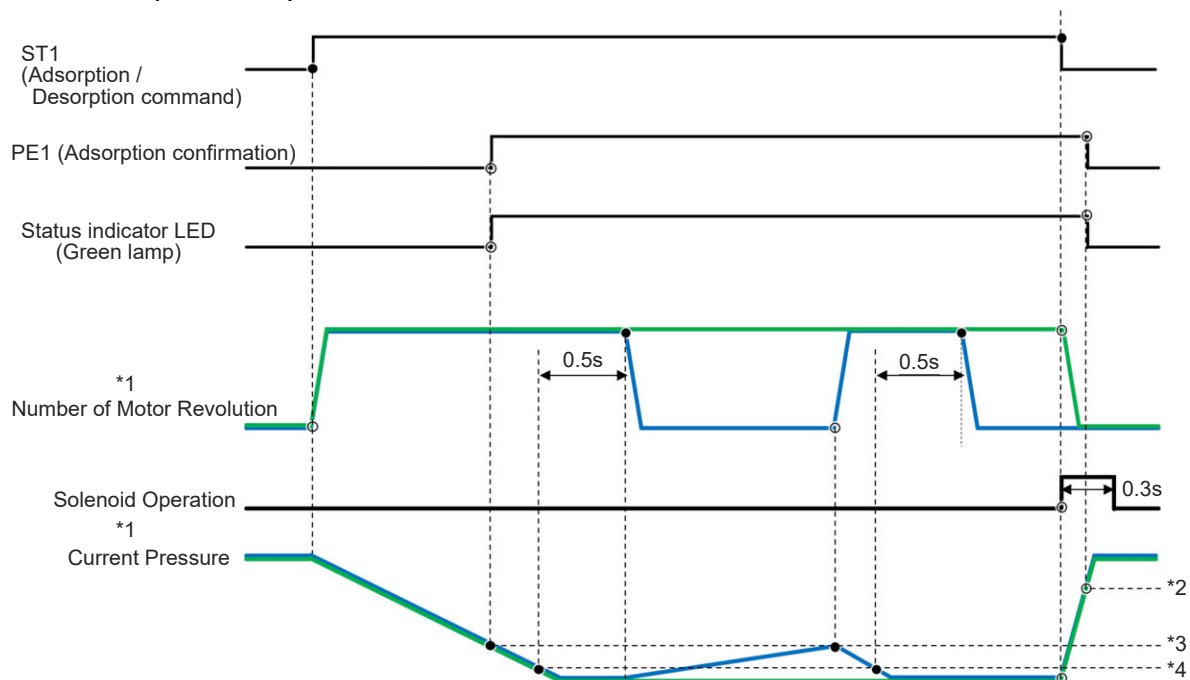
When Parameter No. 5 “Select PIO pattern” is set to “1: Single solenoid mode”, the timing chart should be shown.

The basic process is as follows.



[Basic timing chart]

◆ RP-VPM (Standard)



***1 About “Number of Motor Revolution” and “Current Pressure”:**

They behave in the green line when “Power Saving Mode” in the parameter is set to “0” while they behave in blue line when set to “1”.

***2 It shows the value set in the parameter “Adsorption Confirmation OFF Level (Desorption Confirmation Level)”.**

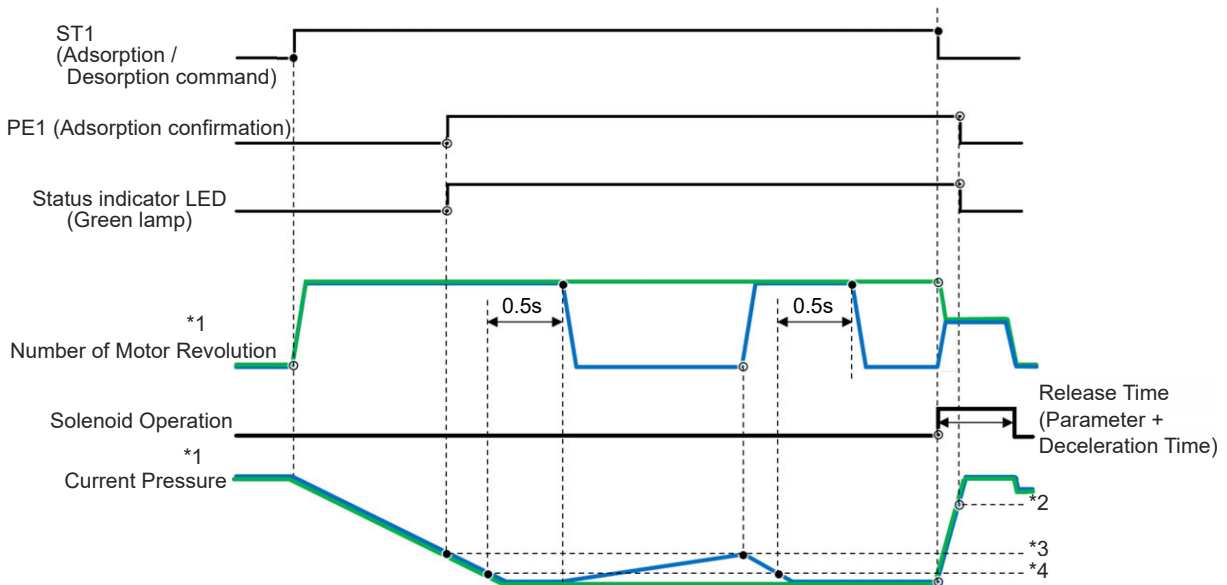
PE1 (Adsorption Confirmation) should turn OFF when the current pressure gets to the set value or higher.

***3 It shows the value set in the parameter “Adsorption Confirmation ON Level (Adsorption Confirmation Level)”.**

PE1 (Adsorption Confirmation) should turn ON when the current pressure gets to the set value or lower.

***4 The value set in the parameter “Adsorption Stop Level” should be shown. While PE1 (Adsorption Confirmation) is ON, if the current pressure gets to the set value or lower, the motor should stop, and if the current pressure gets to the set value or higher, the motor should start turning.**

◆ RP-VPMV (Equipped with air blow)



*1 About "Number of Motor Revolution" and "Current Pressure":

They behave in the green line when "Power Saving Mode" in the parameter is set to "0" while they behave in blue line when set to "1".

*2 It shows the value set in the parameter "Adsorption Confirmation OFF Level (Desorption Confirmation Level)".

PE1 (Adsorption Confirmation) should turn OFF when the current pressure gets to the set value or higher.

*3 It shows the value set in the parameter "Adsorption Confirmation ON Level (Adsorption Confirmation Level)".

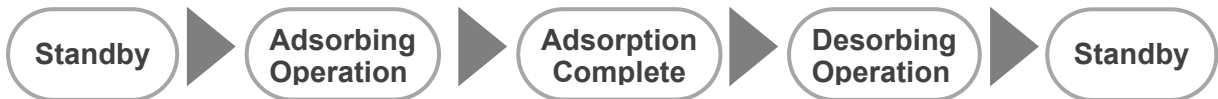
PE1 (Adsorption Confirmation) should turn ON when the current pressure gets to the set value or lower.

*4 The value set in the parameter "Adsorption Stop Level" should be shown. While PE1 (Adsorption Confirmation) is ON, if the current pressure gets to the set value or lower, the motor should stop, and if the current pressure gets to the set value or higher, the motor should start turning.

4.5.3 How to Operate in Double Solenoid 2 Mode

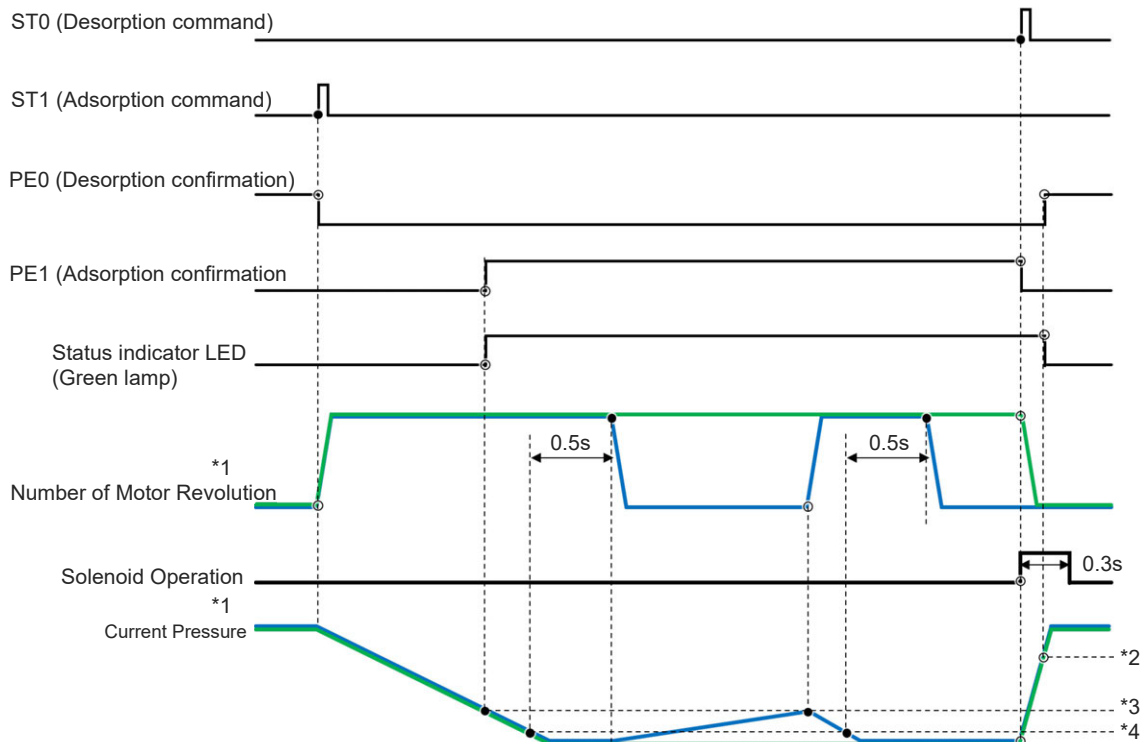
When Parameter No. 5 “Select PIO pattern” is set to “2: Double solenoid 2 mode”, the timing chart should be shown.

The basic process is as follows.



[Basic timing chart]

◆ RP-VPM (Standard)



*1 About “Number of Motor Revolution” and “Current Pressure”:

They behave in the green line when “Power Saving Mode” in the parameter is set to “0” while they behave in blue line when set to “1”.

*2 It shows the value set in the parameter “Adsorption Confirmation OFF Level (Desorption Confirmation Level)”.

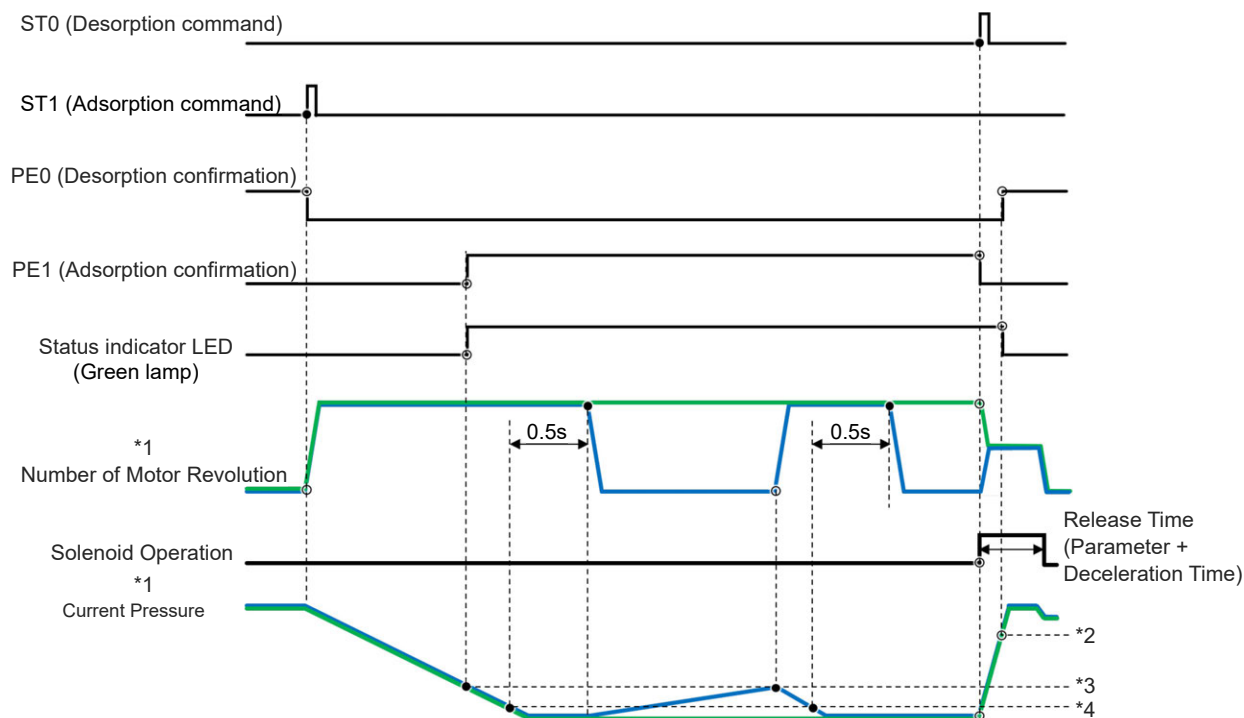
PE1 (Adsorption Confirmation) should turn OFF when the current pressure gets to the set value or higher.

*3 It shows the value set in the parameter “Adsorption Confirmation ON Level (Adsorption Confirmation Level)”.

PE1 (Adsorption Confirmation) should turn ON when the current pressure gets to the set value or lower.

*4 The value set in the parameter “Adsorption Stop Level” should be shown. While PE1 (Adsorption Confirmation) is ON, if the current pressure gets to the set value or lower, the motor should stop, and if the current pressure gets to the set value or higher, the motor should start turning.

◆RP-VPMV (Equipped with air blow)



4.5.4 Input and Output Signal Timing when Connected to RCON-EC

When the ROBO PUMP 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 ROBO PUMP and then the ROBO PUMP status signal returns to PLC can be expressed in the formula below.

PLC → Maximum Response Time from PLC to ROBO PUMP : $Y_t + (T_t \times 4) + F_t$

ROBO PUMP → Maximum Response Time from ROBO PUMP to PLC : $G_t + (T_t \times 2) + X_t$

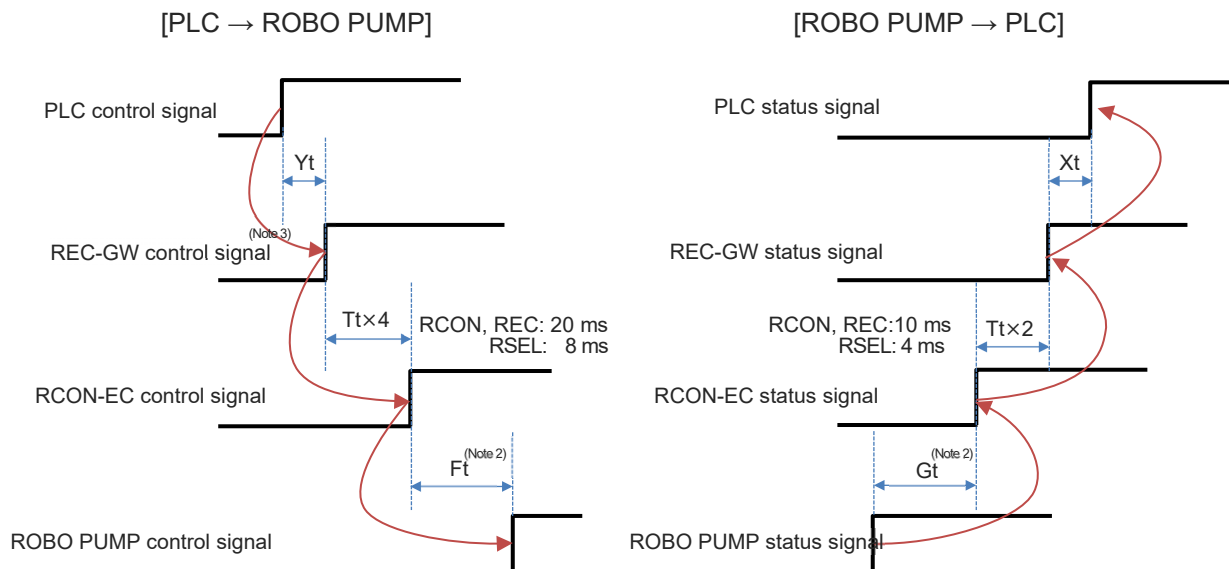
T_t = Transmission time (RCON-GW or REC-GW is 5ms, RSEL is 2ms)

Y_t = Master station→Remote I/O station transmission lag time } Field network transmission lag time (Note 1)

X_t = Remote I/O station→Master station transmission lag time }

F_t = Input Filter of ROBO PUMP (Note 2)

G_t = Input Filter of RCON-EC (Note 2)



Note 1 For the field network transfer latency, refer to [the instruction manual of each field network master unit and installed PLC].

Note 2 F_t and G_t should differ depending on how to connect ROBO PUMP and RCON-EC.

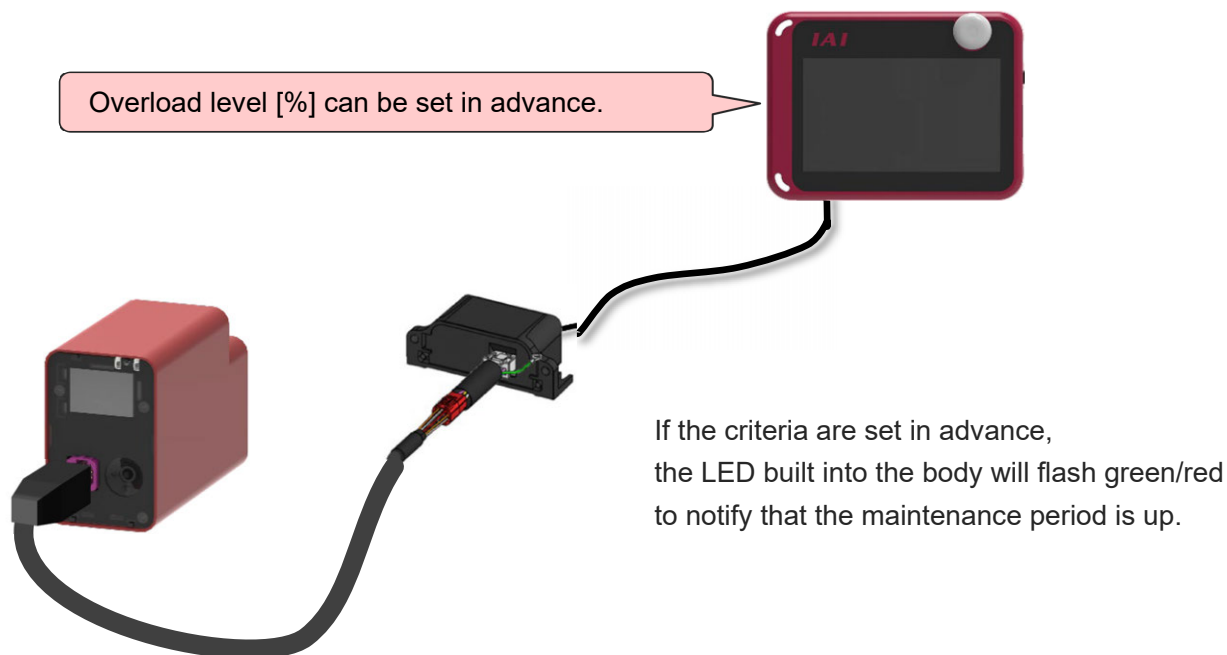
- When Connecting ROBO PUMP Directly: 40ms max.
- When Connecting ROBO PUMP via Interface Box: 26ms max.

Note 3 RCON-GW should also be included.

4.6 Overload Warning Feature

4.6.1 About Overload Warning Feature

The ROBO PUMP has a **predictive maintenance function** that notifies the user with an “overload warning” when the load exceeds normal status.



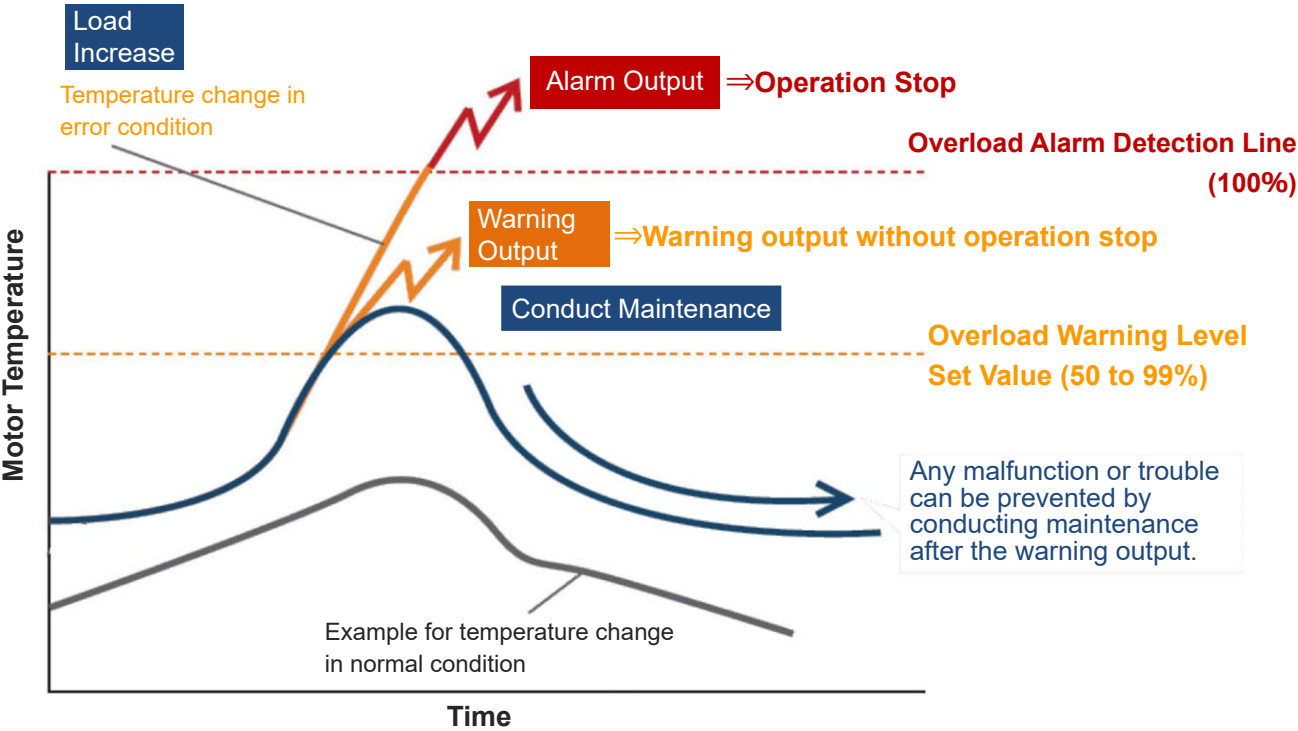
Predictive maintenance

- Maintenance that is performed when, based on regular equipment monitoring, an abnormality is predicted to occur.
- Predicts unexpected breakdowns.
- Prevents sudden line stoppages.

4.6.2 Overload Warning Level

Name	Unit	Input range	Default initial value setting
Overload warning level	%	50 to 100	100 (disabled setting)

- With the motor temperature raising value to generate the overload alarm as 100%, the level to output the overload warning should be set in the range from 50 to 99%.
- Once the motor temperature at operation has exceeded the ratio set in “Overload Warning Level”, there should be information in “Alarm code E48 (Driver overload warning)”.
- Once the motor temperature rise value has come below the ratio set in “Overload Warning Level”, “Alarm code E48” should automatically be cleared.
- When “Alarm code E48” 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.



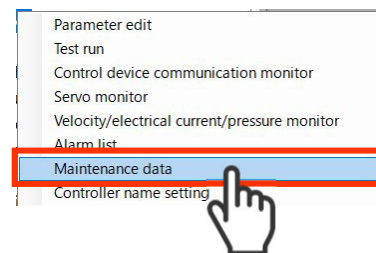
4.6.3 Overload Warning Level Setting

A teaching tool can be used to configured and changed maintenance information.
Shown below explains how to make a setup in IA-OS.

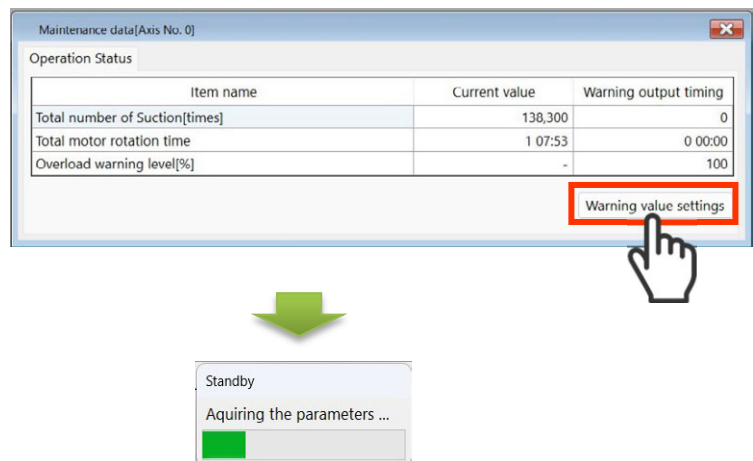
1. Select connected axis
([Axis No. 0 PR-VPM] in the example) in the tree view in the left of the main screen and right-click on it.



2. The right-click menu pops up.
Click [Maintenance data].

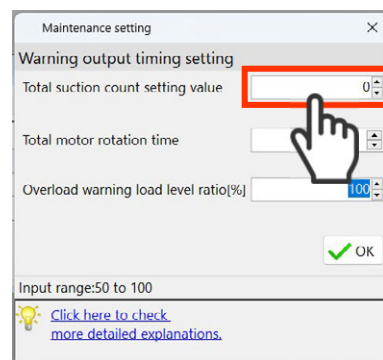


3. Click [Warning value settings].
The parameter acquirement in process screen comes up next.

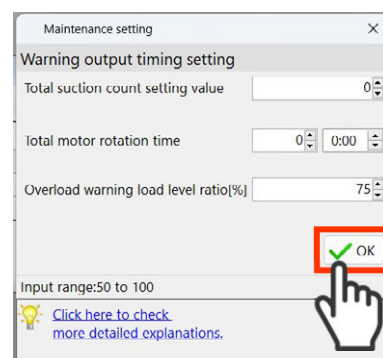


4. Once the maintenance setup screen is displayed:

- 1) Input a value to be set in the setting box in "Overload Level Ratio [%]".



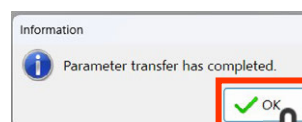
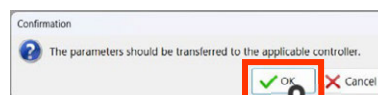
- 2) Decide the setting level and then click **OK**.



5. Follow the procedures below to transfer parameters.

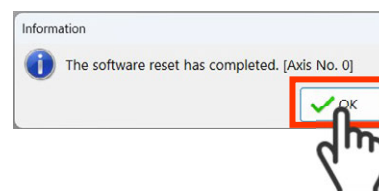
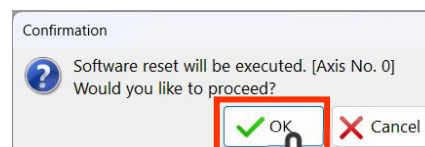
Once the confirmation screen for transfer to the controller appears, click **OK**.

Once the transfer is completed, click **OK**.



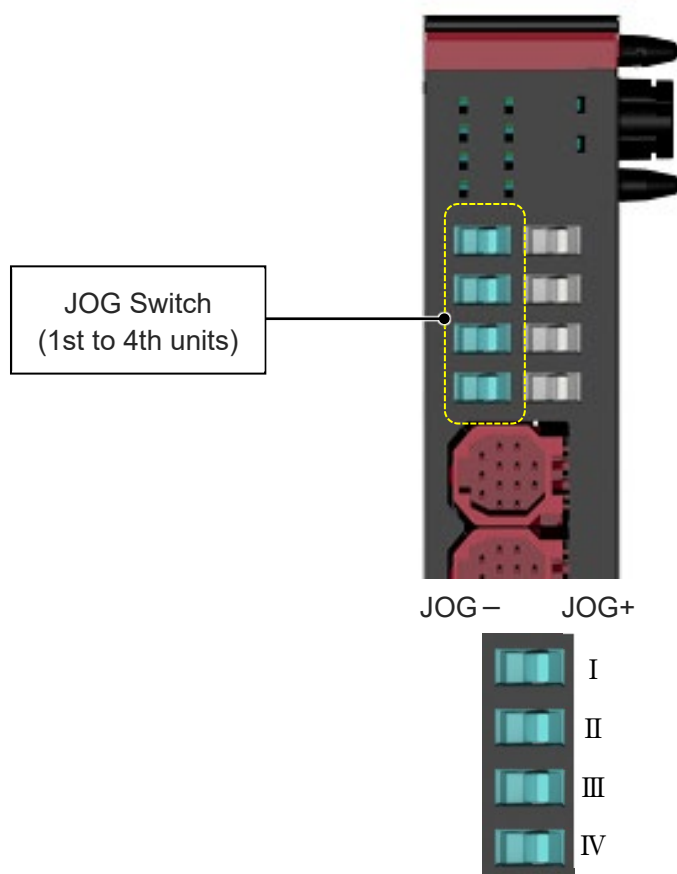
6. Click **OK** on the confirmation screen, and the software reset should start.

Once the software reset is completed, click **OK**.



4.7 JOG Switch

ROBO Pump can be operated manually using the jog switch on the front panel of R-unit.



- For PIO pattern 0 and 2

Tilt to Left (JOG-)	Center	Tilt to Right (JOG+)
Desorption	Remained in Operation State Just Before	Adsorption

- In the case of PIO Pattern 1, the state can be changed to the desorption state only from the adsorption state.

ROBO PUMP

Chapter 5

Parameters

5.1	Precautions Regarding Parameters	5-1
5.2	How to Check/Edit Parameters	5-2
5.2.1	Procedures to Check Parameters	5-2
5.2.2	How to Edit Parameters	5-3
5.2.3	How to Transfer Parameters	5-5
5.3	Parameter List	5-6
5.4	Each Parameter Function Descriptions	5-7
5.4.1	Parameter No.1: Adsorption confirmation ON level (Adsorption Confirmation Level)	5-7
5.4.2	Parameter No.2: Adsorption Confirmation OFF Level (Desorption Confirmation Level)	5-8
5.4.3	Parameter No.3: Power Saving Mode	5-9
5.4.4	Parameter No.4: Adsorption Stop Level	5-10
5.4.5	Parameter No.5: Select PIO Pattern	5-11
5.4.6	Parameter No.6: Select Monitoring Mode	5-12
5.4.7	Parameter No.7: Monitoring Cycle	5-13
5.4.8	Parameter No.8: Select SIO Baud Rate	5-14
5.4.9	Parameter No.9: Slave Transmitter Activation Min. Latency ..	5-15

5.4.10 Parameter No.10: Silent Interval Magnification.....	5-16
5.4.11 Parameter No.11: Desorption Time.....	5-17
5.4.12 Parameter No.12: Air Blow Flow Rate Multiplier	5-18

5.1 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 ROBO PUMP 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.

5.2 How to Check/Edit Parameters

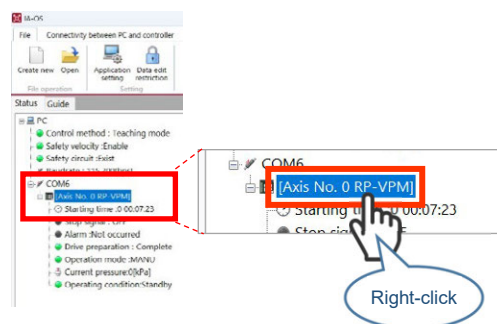
Here explains how to change parameters in ROBO PUMP. The teaching tool to be used is the PC teaching software (model code: IA-OS-*).

Refer to [10.2 Teaching Pendant] for how to check / set up parameters in a teaching pendant (TB-02/03).

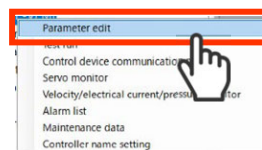
5.2.1 Procedures to Check Parameters

1. Right-click on the axis No. in the tree view on the left end of the main screen to expand each item.

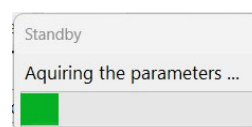
* [Axis No. 0 PR-VPM] in the example.



2. Click on [Parameter edit].



3. The acquiring the parameters screen is displayed.
Once the reading is complete, the parameter edit screen should appear.



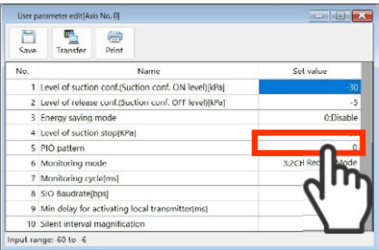
User parameter edit(Axis No. 0)		
No.	Item	Set value
1	Level of suction cont.(Suction cont. ON level)(kPa)	-30
2	Level of release cont.(Suction cont. OFF level)(kPa)	-5
3	Energy saving mode	0(Disable)
4	Level of suction stop(kPa)	-30
5	PIQ pattern	0
6	Monitoring mode	S/CH Record Mode
7	Monitoring cycle(ms)	1
8	SIO baudrate(bps)	38400(bps)
9	Min delay for activating local transmitter(ms)	5
10	Silent interval magnification	0

Input range: 60 to -6

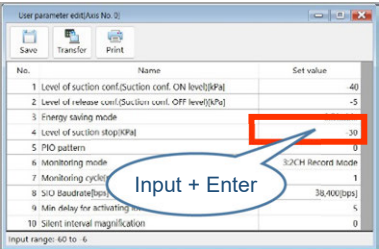
5.2.2 How to Edit Parameters

[1] Setting When Inputting Value

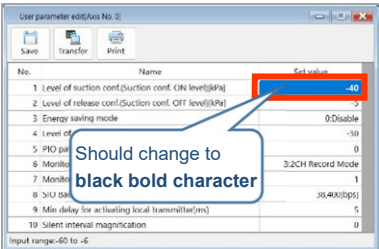
- 1. Click on “Setting Value” on the parameter set in a value.



- 2. Input a number on the PC keyboard and press the **Enter** key.

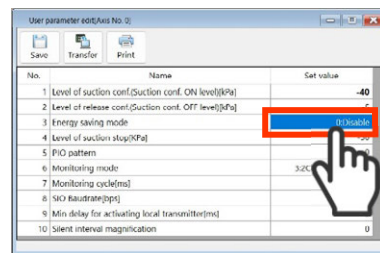


* The edited content should be displayed in **black bold character**.

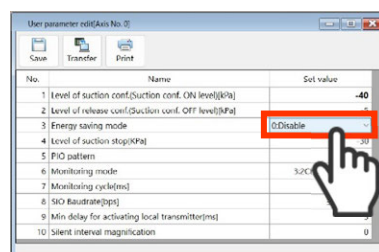


[2] Setting when Selecting from Combo box

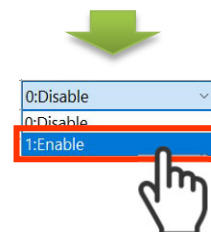
1. Click on "Set value" on the parameter set in a value.



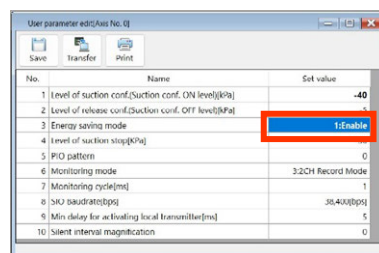
2. Click the setting value again, and a dropdown list should appear.



3. Select a content to set from the dropdown list and click on it.



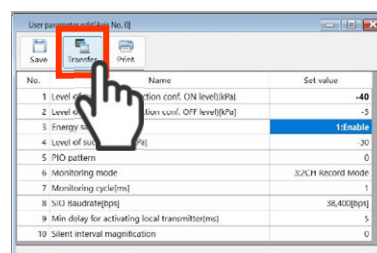
4. The content in the combobox should be reflected.



5.2.3 How to Transfer Parameters

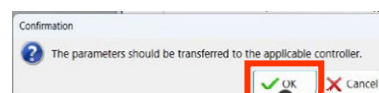
1. Proceed to transfer parameters in the following procedures.

Once the parameter setting for change is completed, click **Transfer**.

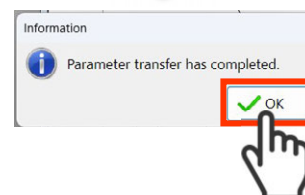


2. Follow the procedures below to transfer parameters.

Once the confirmation screen for transfer to the controller appears, click **OK**.

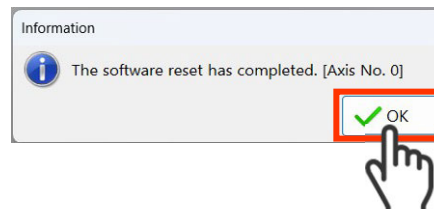
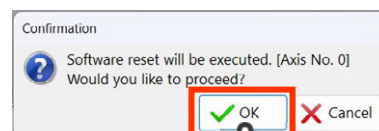


Once the transfer is completed, click **OK**.



3. Click **OK** on the confirmation screen, and the software reset should start.

Once the software reset is completed, click **OK**.



5.3 Parameter List

Shown below is a list of the parameters

No.	Name	Unit	Input range	Default setting at shipping	Reference item
1	Adsorption confirmation ON level (Adsorption confirmation level)	kPa	-60 to -5	-40	5.4.1
2	Adsorption confirmation OFF level (Desorption confirmation level)	kPa	-60 to -3	-5	5.4.2
3	Power Saving Mode	—	0: Disabled 1: Enabled	1: Enabled	5.4.3
4	Adsorption stop level	kPa	-99 to -1	-45	5.4.4
5	Select PIO Pattern	—	0 to 2	0	5.4.5
6	Select Monitoring Mode	—	0: Not in use 1: 4CH record mode 3: 2CH record mode	1: 4CH record mode	5.4.6
7	Monitoring cycle	ms	1 to 60,000	1	5.4.7
8	Select SIO Baud Rate	bps	9,600 to 230,400	38,400	5.4.8
9	Slave Transmitter Activation Min. Latency	ms	0 to 255	5	5.4.9
10	Silent Interval Magnification	Times	0 to 10	0	5.4.10
11	Desorption Time *	s	0.3 to 9.9	0.3	5.4.11
12	Air Blow Flow Rate Multiplier *	%	10 to 100	50	5.4.12

* This is a parameter used for RP-VPMV (equipped with air blow).

5.4 Each Parameter Function Descriptions

5.4.1 Parameter No.1: Adsorption confirmation ON level (Adsorption Confirmation Level)

No.	Name	Unit	Input range	Default setting at shipping
1	Adsorption confirmation ON level (Adsorption confirmation level)	kPa	-60 to -5	-40

The level (vacuum pressure) to turn the adsorption confirmation signal ON should be set in a value.

- This parameter can also be set from the “ROBO PUMP Trial Run screen”.
Refer to [4.3.4 Operating Condition Setting / Adjustment].
- The minimum setting unit is -1 [kPa].
- For value input, put - (negative).



Caution

- Set it up within the vacuum pressure set range of ROBO PUMP.
- For value input, put - (negative) for input.
Any setup not matched with above should generate an alarm on a teaching tool.

5.4.2 Parameter No.2: Adsorption Confirmation OFF Level (Desorption Confirmation Level)

No.	Name	Unit	Input range	Default setting at shipping
2	Adsorption confirmation OFF level (Desorption confirmation level)	kPa	-60 to -3	-5

The level (vacuum pressure) to turn the adsorption confirmation signal OFF should be set in a value.

- This parameter can also be set from the “ROBO PUMP Trial Run screen”.
Refer to [4.3.4 Operating Condition Setting / Adjustment].
- The minimum setting unit is -1 [kPa].
- For value input, put - (negative).



Caution

- Set it up within the vacuum pressure set range of ROBO PUMP.
- For value input, put - (negative) for input.
Any setup not matched with above should generate an alarm on a teaching tool.

5.4.3 Parameter No.3: Power Saving Mode

No.	Name	Unit	Input range	Default setting at shipping
3	Power Saving Mode	—	0: Disabled 1: Enabled	1: Enabled

Select whether to continue turning or stop the motor after adsorbing is completed.

- When set to “0: Disable”

The motor should continue turning till the desorption signal turns on. Turn the desorption signal on, and the motor should stop.

- When set to “1: Enabled”

The motor should stop its operation when the adsorption confirmation signal turns ON^{*1}. The motor should resume if the adsorption confirmation signal turns OFF when the motor is stopped and the desorption signal is OFF^{*2}. Turn the desorption signal ON, and the motor should stop.

^{*1} Once the current pressure value falls below the value set in the parameter “Adsorption Stop Level”, the operation of the motor should stop.

^{*2} Once the current pressure value exceeds the value set in the parameter “Adsorption Stop Level”, the operation of the motor will restart.

5.4.4 Parameter No.4: Adsorption Stop Level

No.	Name	Unit	Input range	Default setting at shipping
4	Adsorption stop level	kPa	-99 to -1	-45

- It is a parameter to set up the level to stop the motor while the power saving mode is enabled.

5.4.5 Parameter No.5: Select PIO Pattern

No.	Name	Unit	Input range	Default setting at shipping
5	Select PIO Pattern	—	0 to 2	0

- The way to control ROBO PUMP should be set. (Refer to [4.4.1] for the outline of features)

0: Double solenoid mode

Control is performed with three points of input signals (desorption, adsorption and alarm reset) and the status is checked with two points of output signals (adsorption confirmation and alarm [B-contact]).

1: Single solenoid mode

Control is performed with two points of input signals (adsorption / desorption and alarm reset) and the status is checked with two points of output signals (adsorption confirmation and alarm [B-contact]).

2: Double solenoid 2 mode

Control is performed with three points of input signals (desorption, adsorption and alarm reset) and the status is checked with three points of output signals (desorption confirmation, adsorption confirmation and alarm [B-contact]).

Pin No.	I/O	0: Double solenoid		1: Single solenoid		2: Double solenoid 2	
		Signal name	Signal abbreviation	Signal name	Signal abbreviation	Signal name	Signal abbreviation
B3	IN0	Desorption command	ST0	—	NC	Desorption command	ST0
B4	IN1	Adsorption command	ST1	adsorption / desorption command	FWBW	Adsorption command	ST1
B5	IN2	Alarm reset	RES	Alarm reset	RES	Alarm reset	RES
A3	OUT0	—	NC	—	NC	Desorption confirmation	PE0
A4	OUT1	Adsorption confirmation	PE1	Adsorption confirmation	PE1	Adsorption confirmation	PE1
A5	OUT2	Alarm [B-contact]	*ALM	Alarm [B-contact]	*ALM	Alarm [B-contact]	*ALM

5.4.6 Parameter No.6: Select Monitoring Mode

No.	Name	Unit	Input range	Default setting at shipping
6	Select Monitoring Mode	—	0: Not in use 1: 4CH record mode 3: 2CH record mode	1: 4CH record mode

- Connect IA-OS, and the servo monitoring can be performed. With this parameter, the monitoring mode feature (servomotor) can be selected.

Refer to [Help: Servomotor] in IA-OS for details.

Set value	Content
0	Not in use
1	Set in 4CH (30000) record mode
3	Set in 2CH (60000) record mode

5.4.7 Parameter No.7: Monitoring Cycle

No.	Name	Unit	Input range	Default setting at shipping
7	Monitoring cycle	ms	1 to 60,000	1

- The initial value ^(Note 1) of the periodic frequency to acquire data when the monitoring mode is selected (monitoring frequency) should be set up.
- By setting the value in this parameter large, the frequency to acquire data change enlarged. The default is set to 3,000ms. It can be set up to 60,000ms at the maximum in 1ms unit.

Note 1 The sampling frequency can be changed in the PC teaching software.

Record mode	1ms cycle setting	1,000ms cycle setting
2CH-60000	Max. Acquiring Period 60s	Max. Acquiring Period 60,000s (1,000 minutes)
4CH-30000	Max. Acquiring Period 30s	Max. Acquiring Period 30,000s (500 minutes)

5.4.8 Parameter No.8: Select SIO Baud Rate

No.	Name	Unit	Input range	Default setting at shipping
8	Select SIO Baud Rate	bps	9,600 to 230,400	38,400

- SIO baud rate at startup should be set up.
- Align it with the baud rate on the host side.
- The baud rate is available to select from 9,600, 14,400, 19,200, 28,800, 38,400, 76,800, 115,200 and 230,400bps.

5.4.9 Parameter No.9: Slave Transmitter Activation Min. Latency

No.	Name	Unit	Input range	Default setting at shipping
9	Slave Transmitter Activation Min. Latency	ms	0 to 255	5

- The time since receiving a command (received data) in the SIO communication till returning a response (sent data) to the host side should be set up.

5.4.10 Parameter No.10: Silent Interval Magnification

No.	Name	Unit	Input range	Default setting at shipping
10	Silent Interval Magnification	Times	0 to 10	0

- In order to have operation in the serial communication (RTU), have a silent interval (no communication) period for communication time of 3.5 characters or more before sending command data.
- When a teaching tool such as the PC teaching software is used, there is no need to make any change.
- It should be disabled when the setting value is "0".

5.4.11 Parameter No.11: Desorption Time

No.	Name	Unit	Input range	Default setting at shipping
11	Desorption Time	s	0.3 to 9.9	0.3

- This is a parameter used for RP-VPMV (equipped with air blow).
- The duration for which positive pressure is continuously supplied from the built-in pump after a desorption command is issued should be set.
- The solenoid valve that turns on in response to the desorption command will return to the OFF state when the motor decelerates and stops after the time set by this parameter has elapsed.

5.4.12 Parameter No.12: Air Blow Flow Rate Multiplier

No.	Name	Unit	Input range	Default setting at shipping
12	Air Blow Flow Rate Multiplier	%	10 to 100	50

- This is a parameter used for RP-VPMV (equipped with air blow).
- The flow rate multiplier when a desorption command is issued and positive pressure is supplied from the built-in pump will be set.

ROBO PUMP

Chapter 6

Troubleshooting

6.1	Troubleshooting Confirmations	6-1
6.1.1	Check in ROBO PUMP LED	6-1
6.1.2	RCON-EC LED Display	6-4
6.2	Troubleshooting Diagnosis	6-5
6.3	Troubleshooting with No Alarm Generated	6-6
6.3.1	Operation Failure	6-6
6.3.2	Abnormal or Unstable Operation	6-8
6.4	Troubleshooting by Each Alarm Groups	6-9
6.4.1	Alarm List	6-10
6.4.2	Alarm Causes and Countermeasures	6-11

6.1 Troubleshooting Confirmations

If a problem occurs, check the following points first in order to ensure quick recovery and prevent recurrence of the problem.

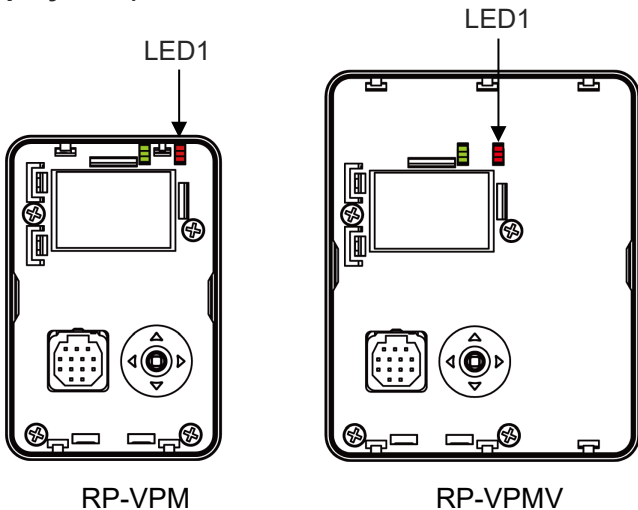


Caution

- 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.

6.1.1 Check in ROBO PUMP LED

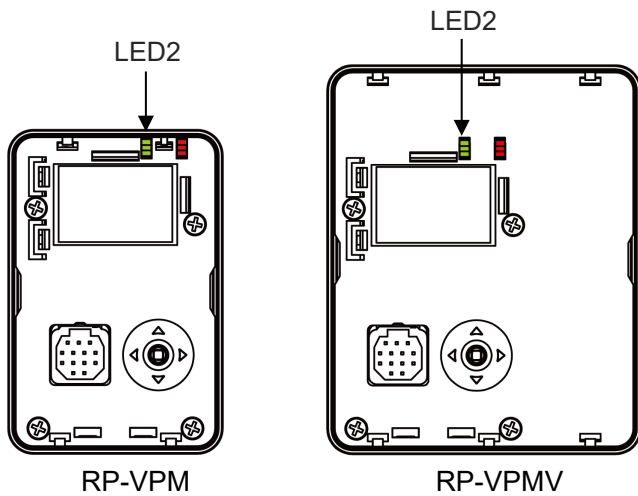
[1] LED 1 (Status Display LED)



○: Light ON ×: Light OFF ★: Blinking

Status Display LED		Operation status		*ALM signal output status
Green	Red			
×	×	Power not supplied		OFF
		[When Light On → Light Off] Turned off till current pressure gets to desorption confirmation level or higher	[When Light Off → Light On] Turned off till current pressure gets to adsorption confirmation level or lower	
×	○	Alarm generated		OFF
		Stop switch ON (When using teaching pendant)		ON
○	×	[When Light On → Light Off] Turned on till current pressure gets to desorption confirmation level or higher	[When Light Off → Light On] Turned on till current pressure gets to adsorption confirmation level or lower	ON
○ (both green and red ON)		In Initializing at Startup		OFF

[2] LED2 (Wireless Communication Status Display LED)



○: Light ON ×: Light OFF ★: Blinking

Wireless communication status display LED		Wireless communication status
Green	Red	
×	×	Wireless hardware initializing Wireless not connected (transmitting monitor data) Connecting from wired teaching pendant
×	★ Blinking of 200ms for ON and 200ms for OFF with 2.5Hz frequency	Wireless hardware error
★ Blinking of 150ms for ON and 150ms for OFF with 3.33Hz frequency	×	Connecting through wireless
○ (both green and red ON)		Initializing when power comes ON

[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.

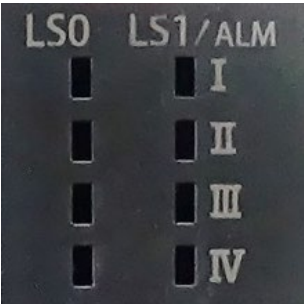
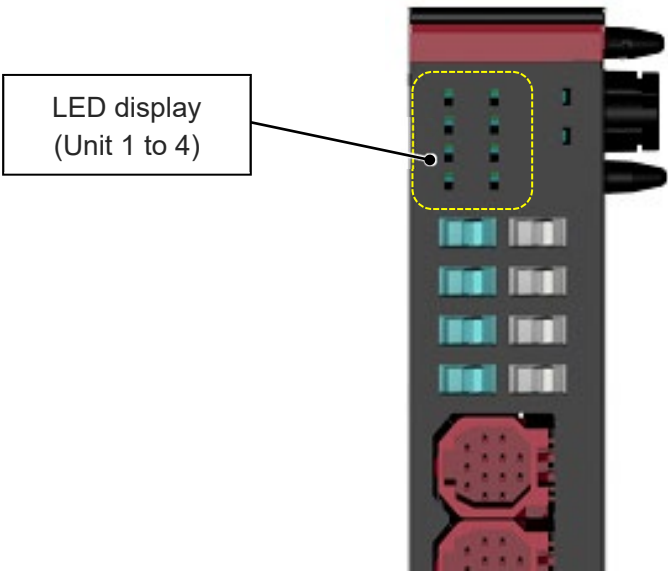
[8] Check the I/O signals

Use the master device and ROBO PUMP 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**

6.1.2 RCON-EC LED Display

It displays the operation status of ROBO PUMP and status of alarm occurrence in the LED lamps.



Status	LS0 (Green)	LS1 (Green)	LS1 (Orange)
Stationary communication error with ROBO PUMP	Light OFF	Light OFF	Blinking (2Hz)
Alarm generated in ROBO PUMP	Light OFF	Light OFF	Light ON
Stopped	Light OFF	Light OFF	Light OFF
Adsorption confirmation signal is OFF	—	Light OFF	Light OFF
Desorption confirmation signal is OFF ^(Note 1)	Light OFF	—	—
Adsorption confirmation signal is ON	—	Light ON	—
Desorption confirmation signal is ON ^(Note 1)	Light ON	—	—

Note 1 For PIO patterns with desorption confirmation signal equipped only

6.2 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, refer to [6.3 Troubleshooting with No Alarm Generated].

6.3.1 Operation Failure

6.3.2 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.

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[When an alarm is generated]

The status display LED lamp turns on in red and an alarm code should be displayed on the display panel.

For alarm codes to be generated and their details and countermeasures, refer to [6.4.2 Alarm Causes and Countermeasures].

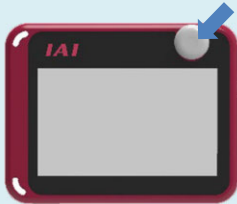
6.3 Troubleshooting with No Alarm Generated

6.3.1 Operation Failure

[Situation 1] Status display LED 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. • Be sure to check for disconnection or partial disconnection in connectors and wiring. →Refer to [3.5 to 3.7 Way of Wiring]
2	Controller breakdown	• Replace the controller. →Refer to [7.2.4 Replacing Front panel Assy's] • If the unit still does not recover, contact IAI.

[Situation 2] Status display LED light up red

No.	Possible cause	Confirmation/countermeasure
1	Alarm generated.	• Connect the teaching tool. • Upon checking the alarm code, resolve the cause. →Refer to [6.4.2 Alarm Causes and Countermeasures]
2	The stop switch of the teaching pendant is being pressed. 	Release the stop switch.

[Situation 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 ROBO PUMP) • 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. →Refer to [3.5 to 3.7 Way of Wiring]
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. →Refer to [3.5 to 3.7 Way of Wiring]
3	In the case of PIO pattern 1, the adsorption command and detachment command are input as edge signals.	Check the ladder sequence and input level signals.

* For details on I/O signals, refer to [4.4 I/O Signals].

6.3.2 Abnormal or Unstable Operation

[Situation 1] Pressure does not drop

No.	Possible cause	Confirmation/countermeasure
1	Leakage at pipes or connection error at tube or joints in system	- Check if there is any leakage on pipes in the system and repair it. - Check if there is any degradation on tubes and joints, and replace it if any failure is found.
2	Contamination getting into ROBO PUMP	Replace the filter. Or, send it for inspection and repair.
3	Wear-out of ROBO PUMP components	Send it for inspection and repair.

6.4 Troubleshooting by Each Alarm Groups

The status display LED lamp should turn on in red and an alarm code should be displayed on the display panel.

Alarm level	Status display LED	*ALM signal	Situation when generated	Clearing method
Alarm	Red ON	OFF	Servo OFF after operation stop	Cleared by resetting the alarm. If it cannot be cleared by resetting the alarm, turn off the power, then turn it on again.



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.

6.4.1 Alarm List

Below shows a list of alarms generated in ROBO PUMP.

○: Can be canceled by alarm reset, ×: Can be canceled by turning the power on again

Alarm code	Alarm name	Reset possible or not
E48	Driver overload warning	○
E4E	Adsorption count threshold exceeded	○
E4F	Accumulated motor revolution time setting exceeded	○
E5C	Receiving timeout	○
E5E	Delimiter error packet received	○
E6B	Maintenance information data error	○
E83	Desorption timeout	×
EA1	Parameter data error	×
EA8	Not supported motor / Encoder type	×
EAB	Command speed error	○
EB4	Pressure sensor error	×
EC0	Motor speed exceeded	×
EC1	Servo error	○
EC9	Drive power voltage error	×
ECA	Abnormal temperature	×
ECC	Control power supply voltage error	×
ECE	Control power voltage dropped	○
ED4	Drive source error	×
ED8	Deviation overflow	○
EE0	Overload	×
EE5	Encoder reception error	○
EF5	Non-volatile memory write verify error	○
EF6	Non-volatile memory write timeout	×
EF8	Non-volatile memory data destruction	×
EFA	Abnormal CPU error	×
EFC	Abnormal logic error	×

6.4.2 Alarm Causes and Countermeasures

Here, explains causes and countermeasures for each alarm.

Alarm code	Name	Cause	Countermeasures
E48	Driver overload warning	The current overload level has exceeded the "overload warning level" set in the maintenance information window.	Use it as a reference for regular inspection and product life. This alarm is not what expresses an error. * With the motor estimate rising temperature that generates the overload alarm as 100%, the overload warning should be output when the motor temperature exceeds the ratio set in this parameter. * To deactivate this warning, set "Overload Warning Level" in "Maintenance Information" to 100%. * The default of this parameter is set to "100%" (not to judge).
E4E	Adsorption count threshold exceeded	It notifies in advance that it has reached the "total adsorption count setting" (set in the Maintenance Information window) by a user.	Think to replace ROBO PUMP.
E4F	Total monitoring count time threshold exceeded	It notifies in advance that it has reached the "total motor rotation time setting" (set in the Maintenance Information window) by a user.	Think to replace ROBO PUMP.
E5C	Receive Timeout Error	Any effective data was not detected after five seconds passed after the start (header) was detected in the character string received via the serial communication (Modbus Communication). 1) Influence of noise. 2) Incorrect data transmitted by the host communication unit.	1) Do not supply power to the peripheral devices, and supply power only to the IAI products to check if this error occurs again or not. In case it occurs again, double check the noise prevention measure. 2) There is a possibility that no terminating character (delimiter) included in the sent command. Check the content of the sent data.
E5E	Delimiter Error Packet Reveal	In the character string received via the serial communication (Modbus Communication), error data was received or no effective data was detected after the start (header) detection. 1) Influence of noise. 2) Incorrect data transmitted by the host communication unit.	1) Do not supply power to the peripheral devices, and supply power only to the IAI products to check if this error occurs again or not. In case it occurs again, double check the noise prevention measure. 2) Check the content of the sent data.
E6B	Maintenance information data error	The maintenance information (total adsorption count and total motor rotation time) should get lost.	Contact IAI.

Alarm code	Name	Cause	Countermeasures
E83	Desorption timeout	It is a desorption error of a workpiece. It should occur when the pressure does not reach - 10kPa in the set time after desorbing operation. • Standard Type: Fixed value (300ms) 1) Total displacement (volume in pipes and adsorption pad) is too large 2) Malfunction of ROBO PUMP internal component or circuit board * When there is no operation noise of solenoid or electromagnetic valve even after power is rebooted.	1) Check if pipes are too long. [Reference] Length of $\phi 4 \times 2.5$ tube • Standard Type: Within 5m 2) It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the ROBO PUMP when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.
EA1	Parameter Data Error	It occurs when the parameter value set in the controller is not appropriate. * Note the code displayed in the address box before proceeding to the troubleshooting.	Return to the parameters before the change If you do not know the parameters before the change, do one of the following. • Transfer backup parameters. • Initialize the parameters If returning the parameters does not help, replace the controller.
EA8	Unsupported Motor / Encoder Types	Connection was made to an actuator with a motor or encoder not applicable to this controller. 1) There is a concern of mistaken in combination of the actuator and controller. 2) There is a concern that the firmware version of the controller is not applicable for the connected actuator. * In this case, upgrading of the firmware version is necessary.	1) Make sure the model code of the actuator started on the controller manufacturing code label and the actuator model code stated on the actuator manufacturing code label matches with each other. 2) Contact IAI.
EAB	Command speed error	A command velocity error was detected.	In case the problem occurs repeatedly even after the alarm reset is conducted, it is necessary to replace ROBO PUMP. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.

Alarm code	Name	Cause	Countermeasures
EB4	Pressure sensor error	There was an error detected on the pressure sensor. Use the product in an environment with the ambient temperature from 0 to 40degC where there is no condensation. 1) Operation error due to noise * In case when resolved with alarm reset 2) Malfunction of ROBO PUMP internal component or circuit board	1) Use it in an environment with no noise. Conduct the following noise prevention measures, and improvement may be expected. • When connected to RCON-EC-4, have grounding conducted with the FG terminal on the master unit (such as RCON-GW). • Attach a clamp filter on the power supply / I/O cables. 2) It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.
EC0	Motor speed exceeded	The motor speed reached an abnormal value. * It may be caught by deterioration of internal parts.	The alarm is not cleared even if the power is turned on again, contact IAI.
EC1	Servo error	It was detected that the motor does not rotate / stop as commanded.	If the alarm would not cancel even if turning the power on and off several times, it is malfunction of ROBO PUMP. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.

Alarm code	Name	Cause	Countermeasures
EC9	Drive power voltage error	The drive power voltage has exceeded the overvoltage judgement value 35V. 1) The drive power voltage has exceeded 35V. 2) Capacity not enough in 24V power supply A 24V DC power supply equipped with the remote sensing feature (voltage drop rectification) is used. 3) At power supply and cut off, both ends are cut off. 4) Malfunction of ROBO PUMP internal component or circuit board	1) [Countermeasure] Check if voltage $24V \pm 10\%$ is applied to the drive power input part. Output error of 24V DC power supply should be concerned when it exceeds the specified value. Replace the 24V DC power source. [How to Check] • When ROBO PUMP is cabled directly Measure among green black-red of CB-RP-PWSIO□□□-RB • For RCON-GW and RSEL Measure between 24V and 0V of MP terminal on power supply connector • For REC Measure between 24V and 0V of MP terminal on power supply connector 2) It is recommended to replace it to PSA-24(L) with high resistance to load fluctuation. When the remote sensing feature (voltage drop rectification) is used, there may voltage drop, overvoltage or overcurrent error occurred in response to the current load. Consider not to use the remote sensing feature when there is some margin to the power source capacity. 3) When supplying 24V DC power by turning on/off, keep the 0V connected and have +24V supply / cut off (cut on one side). 4) It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.

Alarm code	Name	Cause	Countermeasures
ECA	Abnormal temperature	The temperature sensor has detected 90°C or higher. 1) Ambient temperature is high. 2) Failure of parts and boards inside the ROBO PUMP.	1) In consideration of the arrangement and cooling of the ROBO PUMP, use the pump in an environment with an ambient temperature of 40°C or less. 2) The alarm is not cleared even if the power is turned on again, contact IAI.
ECC	Control power supply voltage error	The control power supply voltage has reached 120% of the overvoltage judgement value (24V DC). 1) The control power supply voltage has exceeded 28.8V. 2) A 24V DC power supply equipped with the remote sensing feature (voltage drop rectification) is used. 3) Malfunction of ROBO PUMP internal component or circuit board	1) [Countermeasure] Check if voltage 24V $\pm$10% is applied to the drive power input part. Output error of 24V DC power supply should be concerned when it exceeds the specified value. Replace the 24V DC power source. [How to Check] • When ROBO PUMP is cabled directly Measure among green black-light blue of CB-RP-PWSIO□□□-RB • For RCON-GW and RSEL Measure between 24V and 0V of CP terminal on power supply connector • For REC Measure between 24V and 0V of MP terminal on power supply connector 2) It is recommended to replace it to PSA-24(L) with high resistance to load fluctuation. When the remote sensing feature (voltage drop rectification) is used, there may voltage drop, overvoltage or overcurrent error occurred in response to the current load. Consider not to use the remote sensing feature when there is some margin to the power source capacity. 3) It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.

Alarm code	Name	Cause	Countermeasures
ECE	Drop in Control Supply Voltage	The control power supply voltage has fallen below the voltage drop judgment value (70% of 24V = 16.8V). 1) Lower control power voltage. 2) Lack of 24V DC power capacity. 3) A 24V DC power source with remote sensing function (voltage drop compensation) is used. 4) Defective connector contact. 5) Failure of parts and boards inside the ROBO PUMP.	1) [Countermeasure] Check if $24V \pm 10\%$ is applied to the control power input. If the specified value is below, the output of the 24V DC power source may be faulty. Replace the 24V DC power source. [How to Check] • When the ROBO PUMP is wired directly, measure the line between black and light blue of CB-RP-PWSIO□□□-RB • For RCON-GW, measure between the CP terminals 24V and 0V of the power connector. • For REC, measure between the MP terminal 24V and 0V of the power connector. 2) The power supply capacity required to drive the ROBO PUMP is 1A. Check the power supply capacity of all other devices connected to the 24V DC power source, and replace the 24V DC power source. 3) It is recommended to replace with PSA-24 which is resistant to load fluctuations. When the remote sensing function (voltage drop compensation) is used, it may cause a voltage drop, overvoltage or overcurrent error in response to the current load. If there is a margin in the power source, consider not using the remote sensing function. 4) Check that the wiring diameter and length are appropriate and that the connector is inserted all the way in. If you suspect a poor connector contact, try replacing the cable. 5) The alarm is not cleared even if the power is turned on again, contact IAI.

Alarm code	Name	Cause	Countermeasures
ED4	Drive source error	There was an error occurred at the driver IC protection. 1) When a dedicated terminal block is used, using a thin and long cable could cause voltage drop. 2) Capacity not enough in 24V DC power supply. Alarm gets generated even if voltage measurement with a tester shows a value in the range from 1.6V to 26.4V. It is generated during operation or when turning on the power supply. 3) Checked the above, improved the power supply environment, but the alarm still comes up.	1) Check if voltage $24V \pm 10\%$ is applied to the drive power input part. If the voltage is low, it can be considered that there is an output error on the 24V DC power supply. During Startup: Check if the cable diameter and length are appropriate, or if there is any connection error on connectors. During Production: Replace 24V DC power source. * Even though it is the $24V \pm 10\%$ specification, continuous use near the upper/lower limit in some environmental conditions may cause operation error. 2) [Countermeasure] The current amperage necessary for motor drive is not secured. Check the current amperage described in the ROBO PUMP instruction manual or catalog, and replace the 24V DC power source. (Others) (1) By offset the timing to turn the power supply on, the problem may be solved. (2) For a power source equipped with the remote sensing feature, deactivate the feature. (3) By replacing to a power source with high resistance to load fluctuation, the problem may be solved. * It is recommended to replace it to PSA-24(L) with high resistance to load fluctuation. * Even though it is the $24V \pm 10\%$ specification, continuous use near the upper/lower limit in some environmental conditions may cause operation error. 3) It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm ● Model Code (Mandatory) ● Serial Number (S/N) ● Error Code before making a request.

Alarm code	Name	Cause	Countermeasures
ED8	Deviation overflow	The revolution speed of the motor cannot be controlled.	It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.
EE0	Overload	Overload on the motor was detected.	It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.
EE5	Encoder reception error	Communication to the controller cannot be made, or an encoder error was detected. 1) The encoder data cannot be acquired properly due to influence of noise. * In case the power supply to peripheral devices is shut, and the problem does not happen again, or when reboot of the power supply improves it. 2) Contact error is occurred at a connector of a connection cable 3) Malfunction of ROBO PUMP internal component or circuit board.	1) Use it in an environment with no noise. Conduct the following noise prevention measures, and improvement may be expected. • When using RCON-GW, RSEL or REC, have grounding conducted with the FG terminal. • Attach a clamp filter on the power supply / I/O cables. 2) Make sure that the cables are securely reinstalled if cables or other components are removed for maintenance or other purposes. 3) It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.

Alarm code	Name	Cause	Countermeasures
EF5	Non-volatile memory write verify error	Writing did not complete properly when writing data into the non-volatile memory.	It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.
EF6	Non-volatile memory write timeout	Writing did not complete properly when writing data into the non-volatile memory.	It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm • Model Code (Mandatory) • Serial Number (S/N) • Error Code before making a request.
EF8	Non-Volatile Memory Data Destroyed	An error was detected in data when data check was conducted to the flash ROM at the controller startup. There is a concern that either the flash ROM is broken or the number of writing has exceeded the upper limit. Replace the controller.	Contact IAI.
EFA	CPU error	The CPU inside the controller is not operating. 1) Influence of noise 2) Malfunction of controller component	1) Shut the power off to the peripheral devices, and operate only the controller and actuator of IAI to see if this alarm is generated again. In case it occurs again, revise the noise prevention measure. 2) Contact IAI.

Alarm code	Name	Cause	Countermeasures
EFC	Abnormal logic error	The controller internal circuit does not work properly. - Noise influence - Malfunction of component in controller	- Use it in an environment with no noise. Conduct the following noise prevention measures, and improvement may be expected. - When using RCON-GW, RSEL or REC, have grounding conducted with the FG terminal. - Attach a clamp filter on the power supply / I/O cables. - It is malfunction of ROBO PUMP if the problem occurs even after rebooting the power. Replace it if there is a spare part. Repair the controller when there is no spare part available. Repair request can be made in the IAI homepage. Confirm - Model Code (Mandatory) - Serial Number (S/N) - Error Code before making a request.

ROBO PUMP

Chapter 7

Maintenance and Inspection

7.1	Precautions for Maintenance or Inspection Work	7-1
7.2	Replace Components	7-2
7.2.1	Replacement component list	7-2
7.2.2	Replacing Filter	7-3
7.2.3	Replacing Motor unit	7-4
7.2.4	Replacing Coupling Spacer	7-6
7.2.5	Replacing Front Panel Assy's	7-7

7.1 Precautions for Maintenance or Inspection Work

Make sure to read the following precautions before conducting any maintenance or inspection work.



Warning

- Do not put anything or climb on on the ROBO PUMP.
Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life.



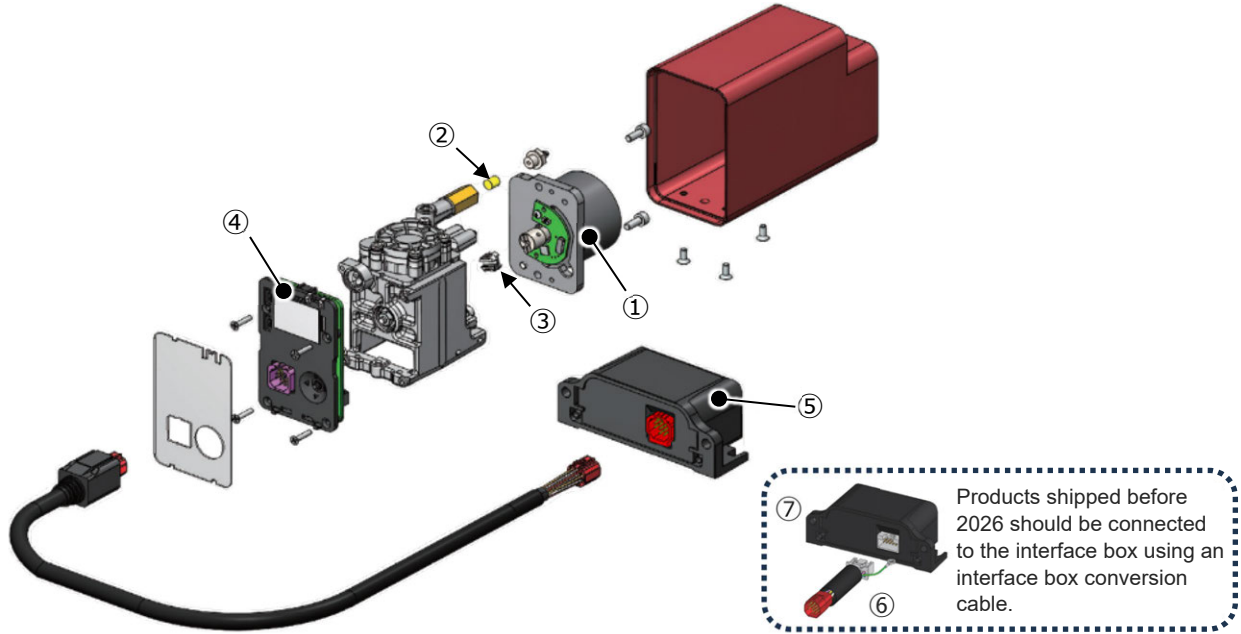
Caution

- Check that the power to the ROBO PUMP is OFF before conducting any maintenance or inspections.
- Be careful not to lose the cover or any removed screws.
Be sure to return the product to the original condition after maintenance and inspection work.
Mounting in an incomplete state may cause injuries or damage to the product.
- Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion under any circumstances.
- It is not necessary to conduct any inspection before the expected product life comes.
Refer to [Chapter 9 Life] for life.
- Check regularly that the required pressure flow is output.
It is recommended to have it replaced when the product life has been exceeded.
 - * The product life is assumed under the environment specified for the product, and it should get impacted by the actual environment of use and operational conditions.
- Do not use this product in locations exposed to direct sunlight (ultraviolet rays), in high-temperature or high-humidity environments, or in places where dust, salt, or iron particles are present. Also, do not use it in environments where the fluid or atmosphere contains organic solvents, phosphate ester-based hydraulic oil, sulfurous gas, chlorine gas, acids, or similar substances.

7.2 Replace Components

7.2 Replace Components

7.2.1 Replacement component list



① Motor unit

Type	Model
VPM	RP-MUVPM

③ Coupling spacer

Type	Model
VPM	CPG-RP-VPM

② Suction Filter

Type	Model
VPM	RP-FL-VPM

④ Front panel Assy's

Type	Model
VPM	FPA-RP-VPM
VPMV	PA-RP-VPMV

⑤ Interface box2

Type	Wireless	I/O	Basic Model	Option Model	
				RCON-EC Connection	2-Circuit Power Supply
VPM	None	NPN	EC-CVN-CB	—	EC-CVN-CB-TMD2
		PNP	EC-CVP-CB	—	EC-CVP-CB-TMD2
	WL/ WL 2	NPN	EC-CVNWL-CB	EC-CVNWL-CB-ACR	EC-CVNWL-CB-TMD2
		PNP	EC-CVPWL-CB	—	EC-CVPWL-CB-TMD2

⑥ Interface box Conversion Cable

Type	Model
VPM	CB-CVN-BJ002

⑦ Interface box

Type	Wireless	I/O	Basic Model	Option Model	
				RCON-EC Connection	2-Circuit Power Supply
VPM	None	NPN	ECW-CVN-CB	—	ECW-CVN-CB-TMD2
		PNP	ECW-CVP-CB	—	ECW-CVP-CB-TMD2
	WL/ WL 2	NPN	ECW-CVNWL-CB	ECW-CVNWL-CB-ACR	ECW-CVNWL-CB-TMD2
		PNP	ECW-CVPWL-CB	—	ECW-CVPWL-CB-TMD2

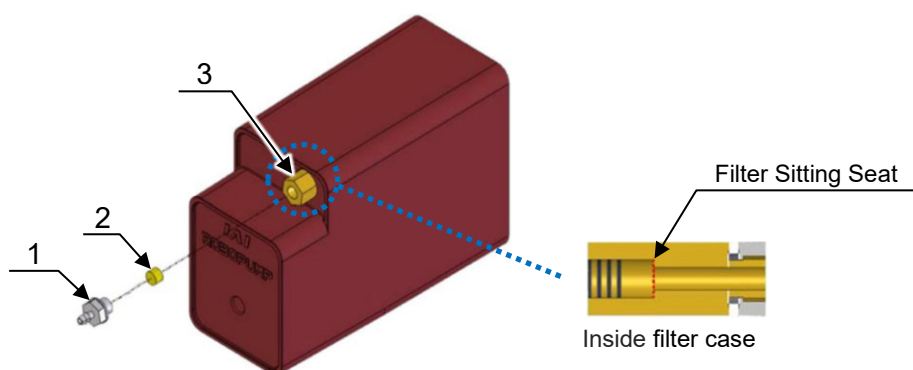
7.2.2 Replacing Suction Filter

◆ Preparation

- Filter for replacement: Model RP-FL-VPM
- Spanner (8mm/7mm)
- Tweezers

◆ Procedure for Replacement

1. Remove Minimal Joints.
 * Perform this operation while holding the filter case securely so that it does not move.
 * Pay attention not to lose the washer in Minimal Joints.
2. Remove Suction Filter from Filter case.
3. Install Suction Filter for replacement.
 * Push the filter in until it contacts the stepped portion inside the filter case.
4. Install Minimal Joints.

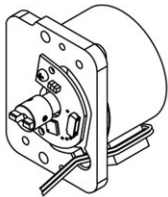


No.	Type	Name	Size	Quantity	Tightening Torque [N·m]
1	common	Minimal Joints	M5×0.8	1	1.25
2	common	Suction Filter	—	1	—
3	common	Filter case	—	1	—

7.2.3 Replacing Motor Unit

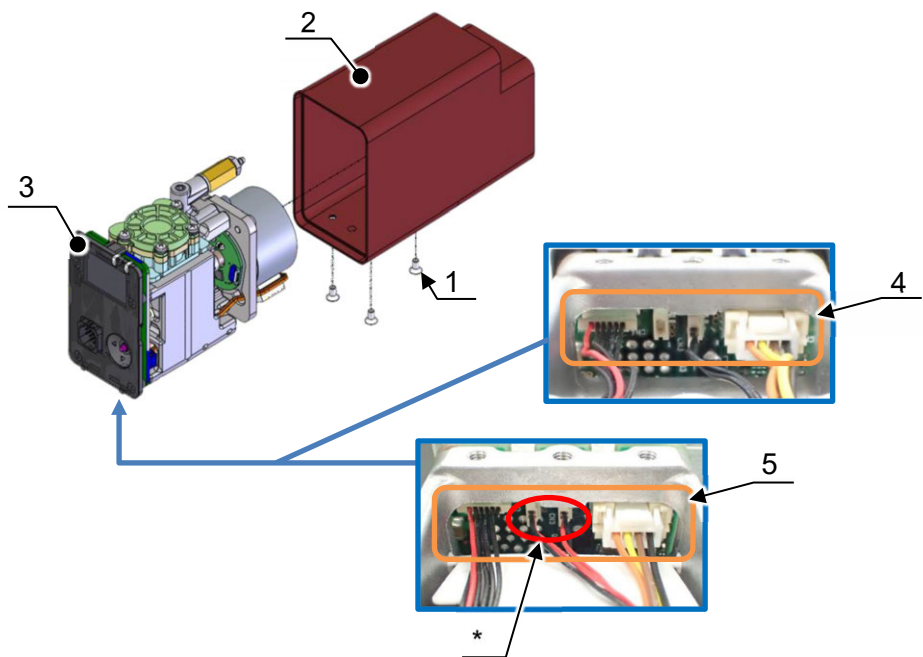
◆ Preparation

- Motor unit for replacement: Model RP-MUVPM
- Phillips screwdriver
- Hexagon wrench (for M3 bolt)



◆ Procedure for Replacement

1. Remove the Cross-recessed flat-head screws (3pcs).
2. Take off ROBO PUMP M Cover (Open Atmospheric System).
3. Remove the wiring connector from the front panel assembly.

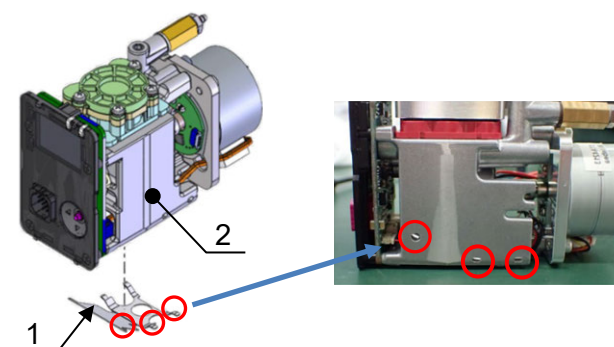


* Either the left or right connector may be used.

No.	Type	Name	Size	Quantity	Tightening Torque [N·m]
1	Common	Cross-recessed flat-head screw	M2.6×5	3	0.29
2	Common	ROBO PUMP M cover	—	1	—
3	Common	Front panel Assy's	—	1	—
4	Common	Connector (RP-VPM)	—	3	—
5	Common	Connector (RP-VPMV)	—	4	—

4. Remove the cable cover from the main frame.

* The protrusion on the cable cover fits into the notch on the main frame.



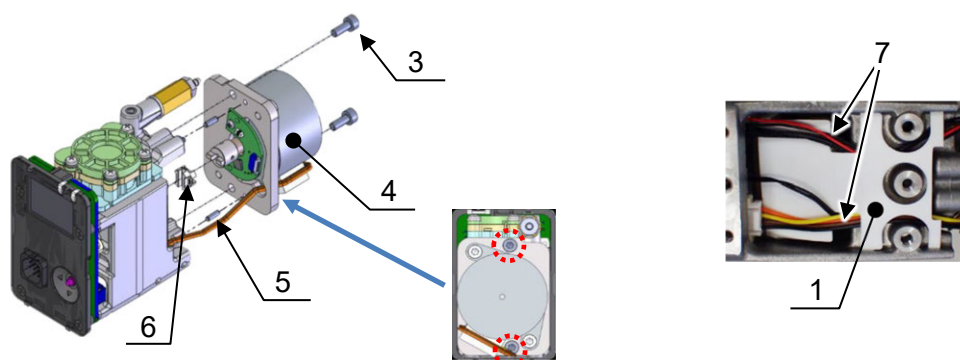
5. Remove the hex socket head cap screws (2pcs) to take the motor unit off.

* When removing the motor unit, there is a risk that the parallel pin and the coupling spacer may come loose.

Take care not to lose them.

6. Put a Motor unit for replacement on in the reversed order.

* Be careful not to pinch the wiring tubes or cables.



No.	Type	Name	Size	Quantity	Tightening Torque [N·m]
1	Common	Cable cover	—	1	—
2	Common	Main frame	—	1	—
3	Common	Hex socket head bolt	M3×8	2	0.89
4	Common	Motor unit	—	1	—
5	Common	Parallel Pin	Φ2×6 h7	2	—
6	Common	Coupling spacer	—	1	—
7	Common	Cable	—	—	—

7.2.4 Replacing Coupling Spacer

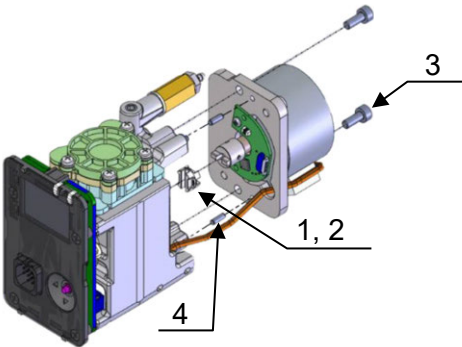
◆ Preparation

- Coupling spacer: for replacement: Model CPG-RP-VPM
- Phillips screwdriver
- Hexagon wrench (for M3 bolt)
- Grease: NOK Corporation NOXLUB TL1013 (Lithium-based)



◆ Procedure for Replacement

1. Process up to Step 5. in [7.2.3 Replacing Motor Unit].
* When removing the motor unit, there is a risk that the parallel pin may come loose.
Take care not to lose them.
2. Remove Coupling spacer.
3. Apply grease to the coupling spacer for replacement, and install it by following the reverse procedure.



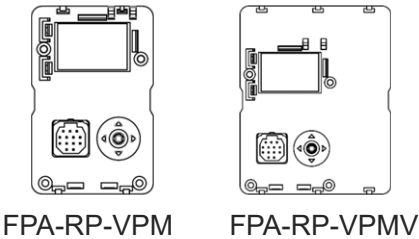
No.	Type	Name	Size	Quantity	Tightening Torque [N·m]
1	Common	Coupling spacer	—	1	—
2	Common	Grease	—	Appropriate Amount	—
3	Common	Hex socket head bolt	M3×8	2	0.89
4	Common	Parallel Pin	Φ2×6 h7	2	—

7.2.5 Replacing Front Panel Assy's

◆ Preparation

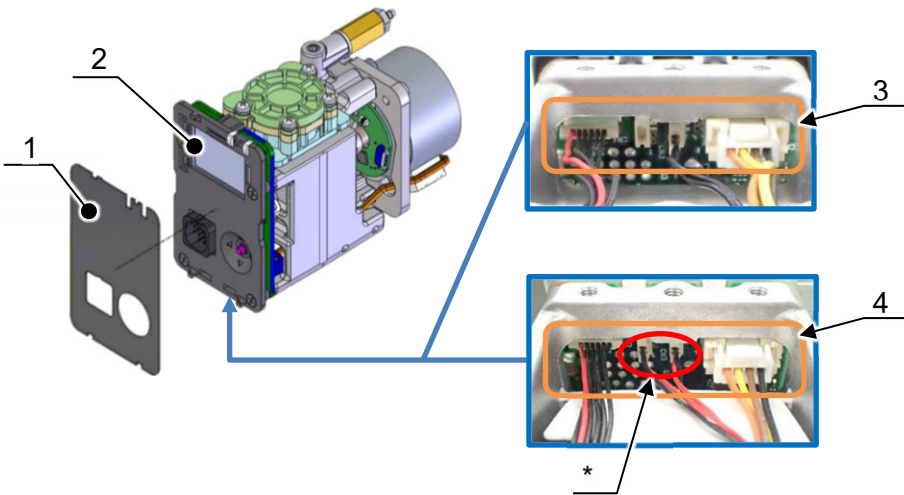
- Phillips screwdriver
- Front panel assy's

Type	Model
RP-VPM	FPA-RP-VPM
RP-VPMV	FPA-RP-VPMV



◆ Procedure for Replacement

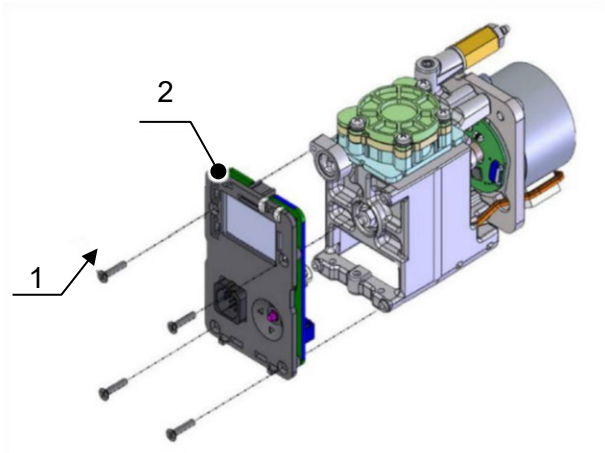
1. Process up to Step 2. in [7.2.3 Replacing Motor Unit].
2. Remove ROBO PUMP M panel sheet from Front panel assy's.
3. Remove the wiring connector from the Front panel assy's.



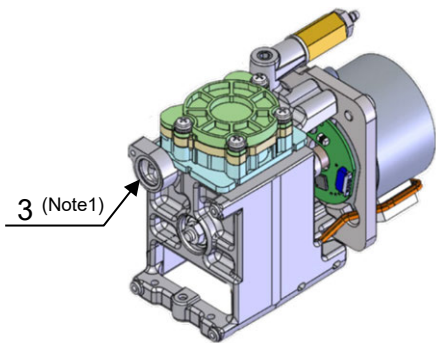
* Either the left or right connector may be used.

No.	Type	Name	Size	Quantity	Tightening Torque
1	Common	ROBO PUMP M panel sheet	—	1	—
2	Common	Front panel assy's	—	1	—
3	VPM	Connector	—	3	—
4	VPMV	Connector	—	4	—

4. Remove Cross-recessed flat-head screw and Front panel assy's.



5. Put a front panel assy's for replacement on in the reversed order.



Note1: An O-ring is used in this section. Confirm that the O-ring is properly in place before assembly.
If the O-ring is not installed, the pump will not function properly.

No.	Type	Name	Size	Quantity	Tightening Torque [N·m]
1	Common	Cross-recessed flat-head screw	M2×10	4	0.17
2	Common	Front panel assy's	—	1	—
3	Common	O-ring	—	1	—

ROBO PUMP

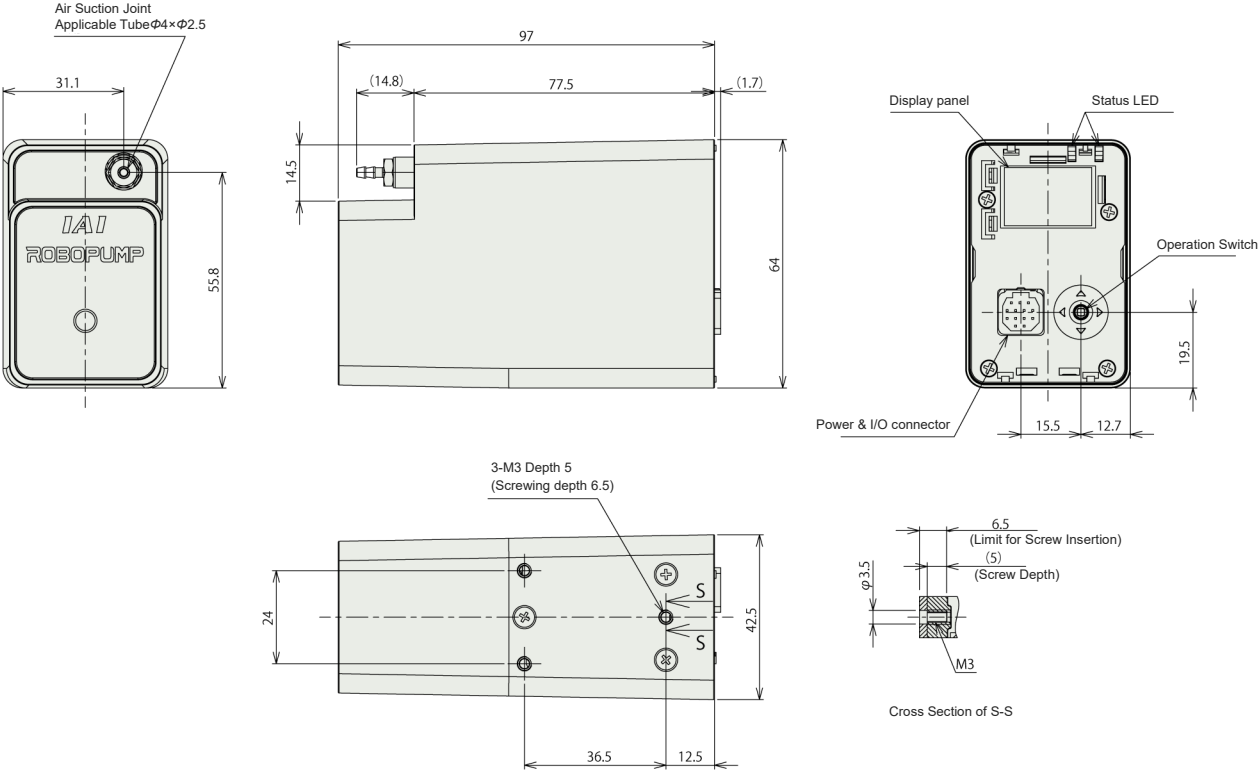
Chapter 8

External Dimensions

8.1	ROBO PUMP	8-1
8.1.1	RP-VPM (Standard)	8-1
8.1.2	RP-VPMV (Equipped with Air Blow)	8-3
8.2	Interface Box	8-5
8.2.1	Interface Box	8-5
8.2.2	Interface Box 2	8-5

8.1 ROBO PUMP

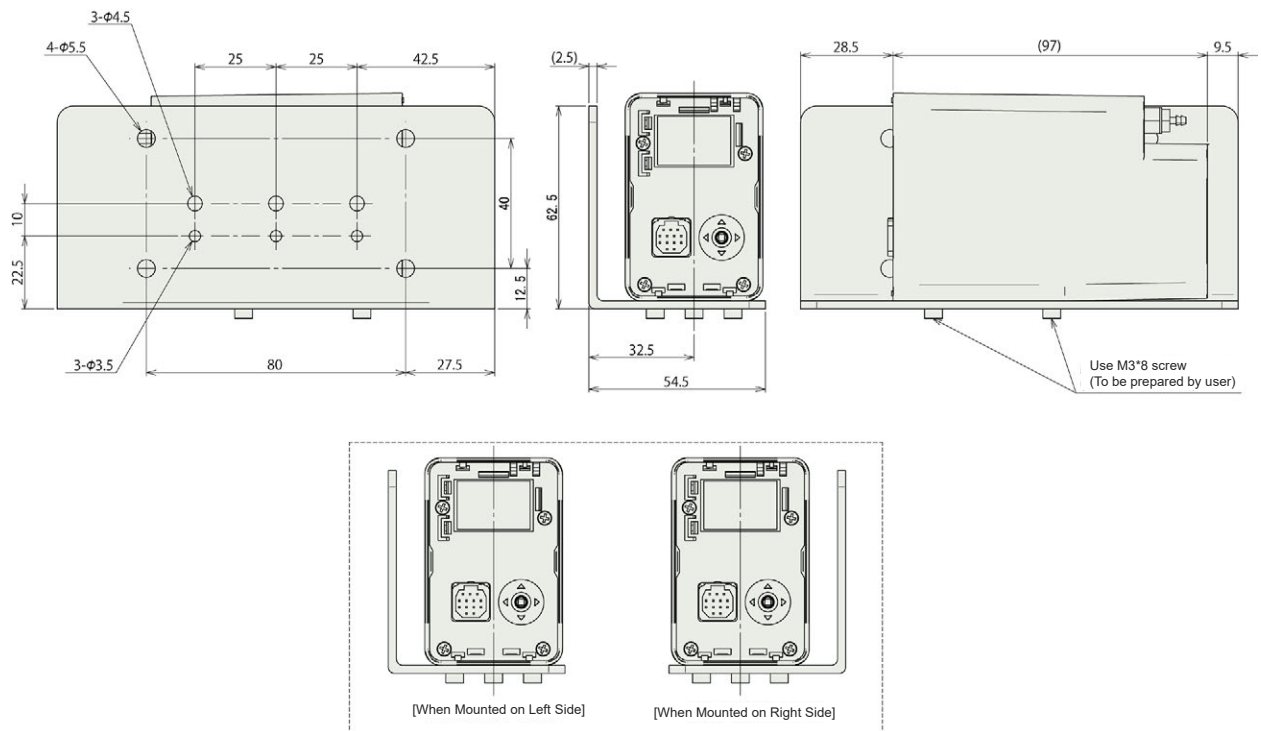
8.1.1 RP-VPM (Standard)



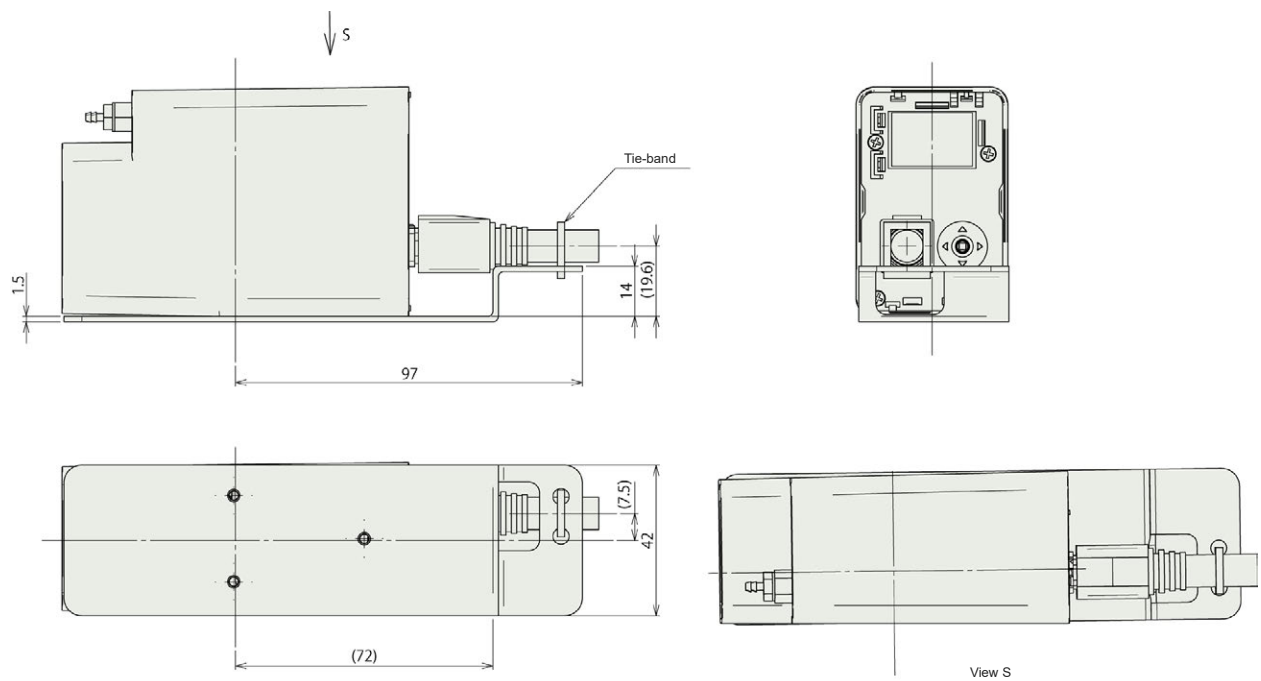
■ Mass

Item	Content
Mass	320g

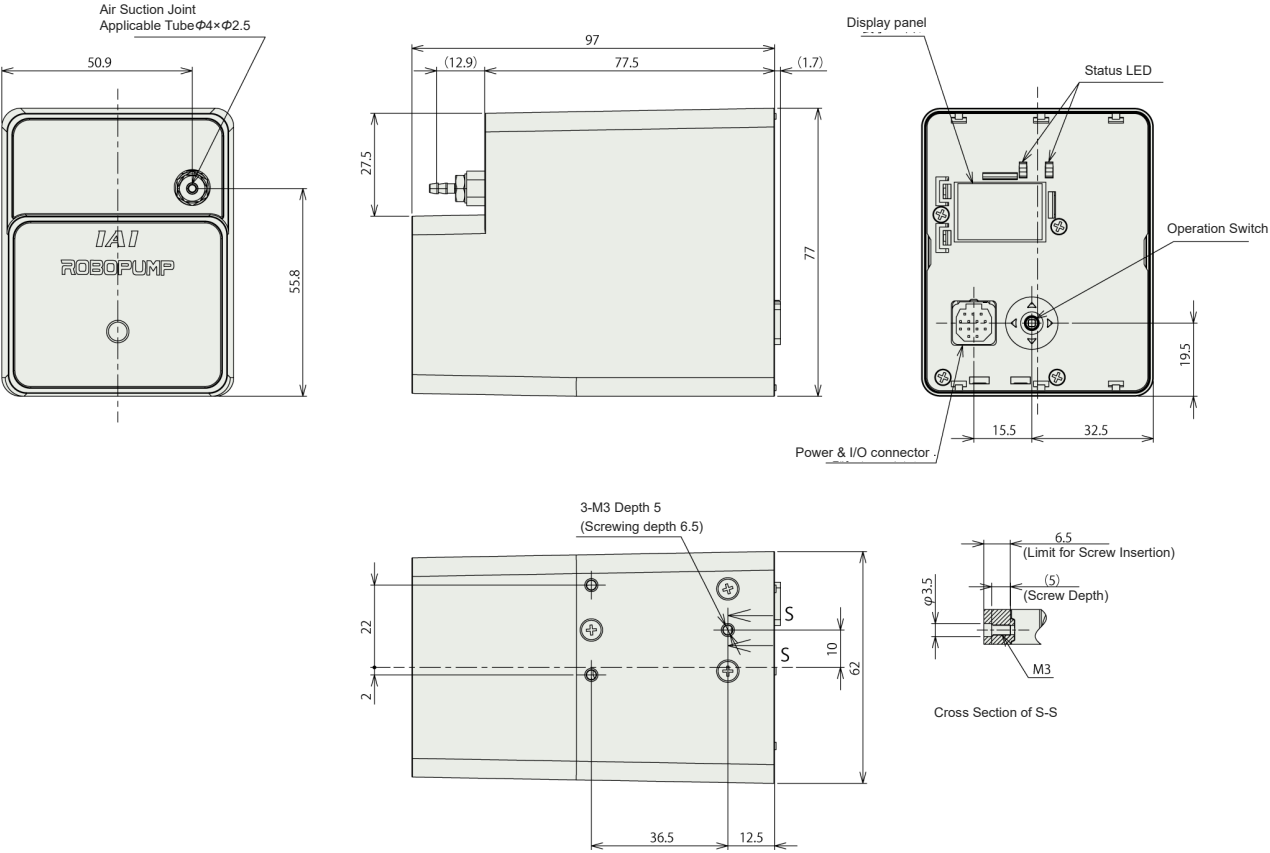
◆Equipped with Side Mounted Bracket



◆Equipped with Cable Support Bracket



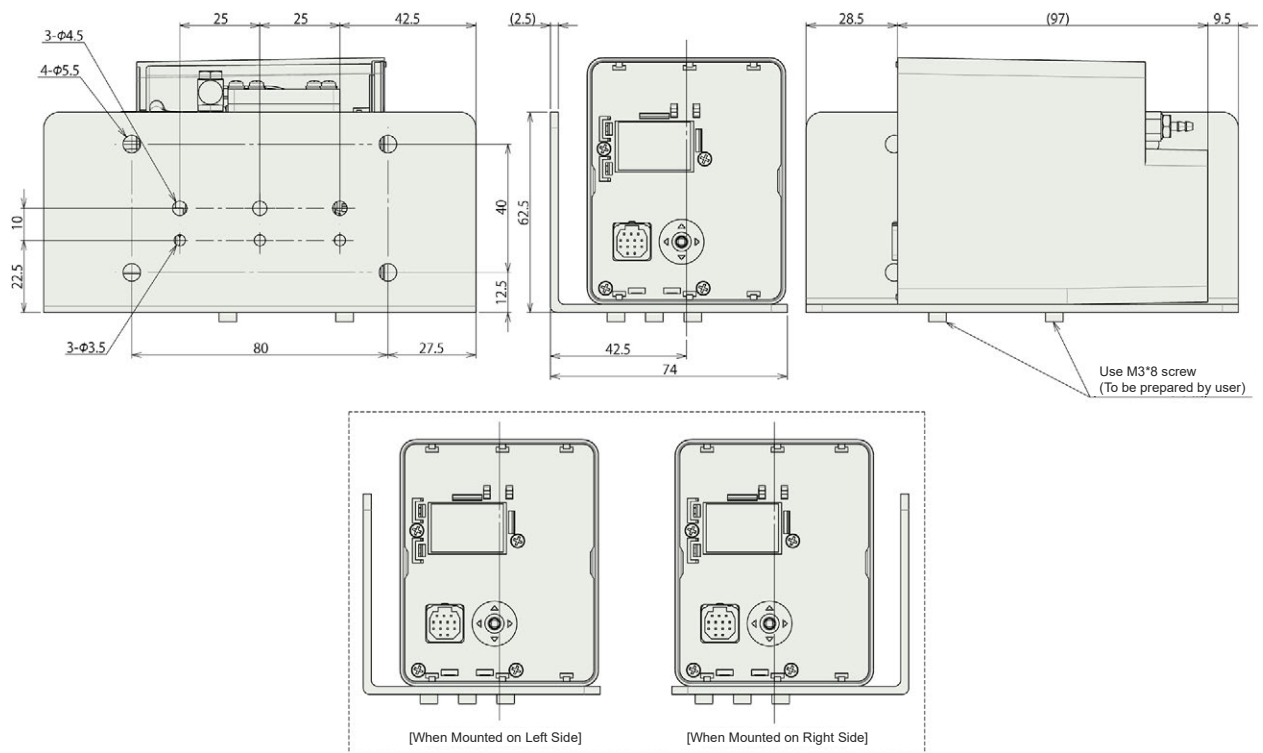
8.1.2 RP-VPMV (Equipped with Air Blow)



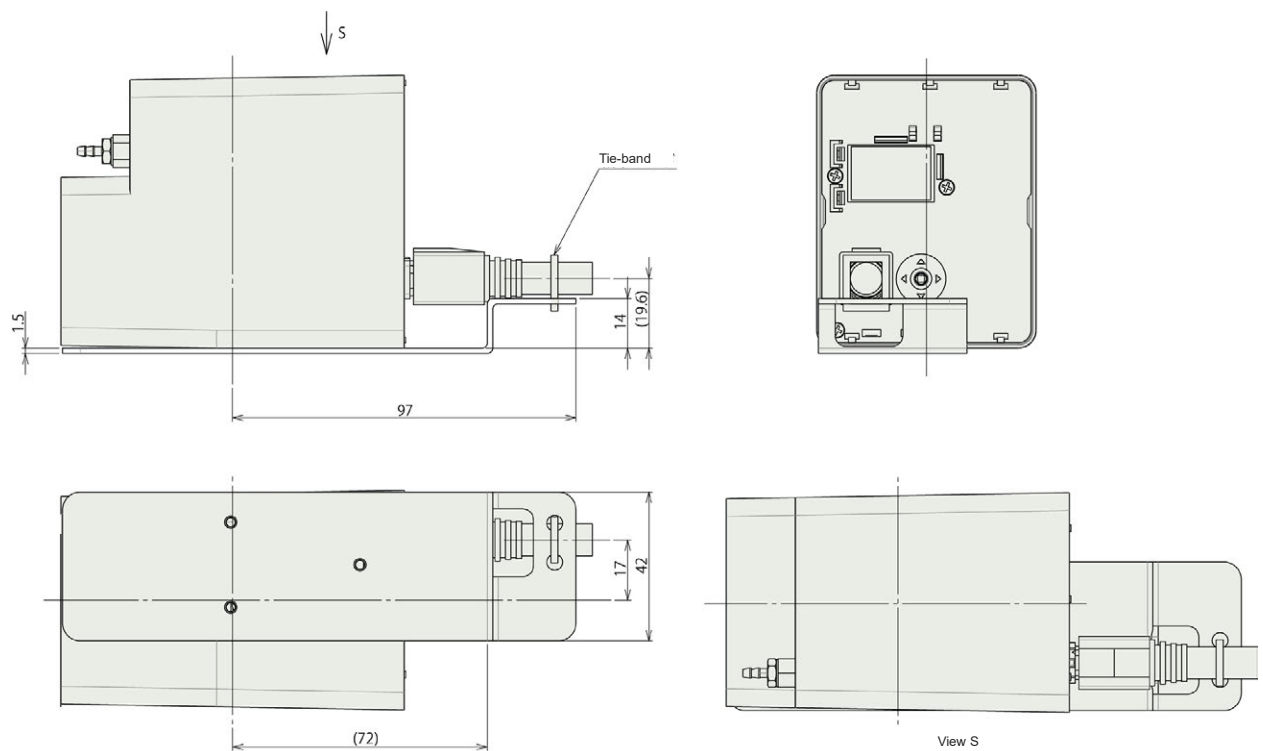
■ Mass

Item	Content
Mass	400g

◆Equipped with Side Mounted Bracket

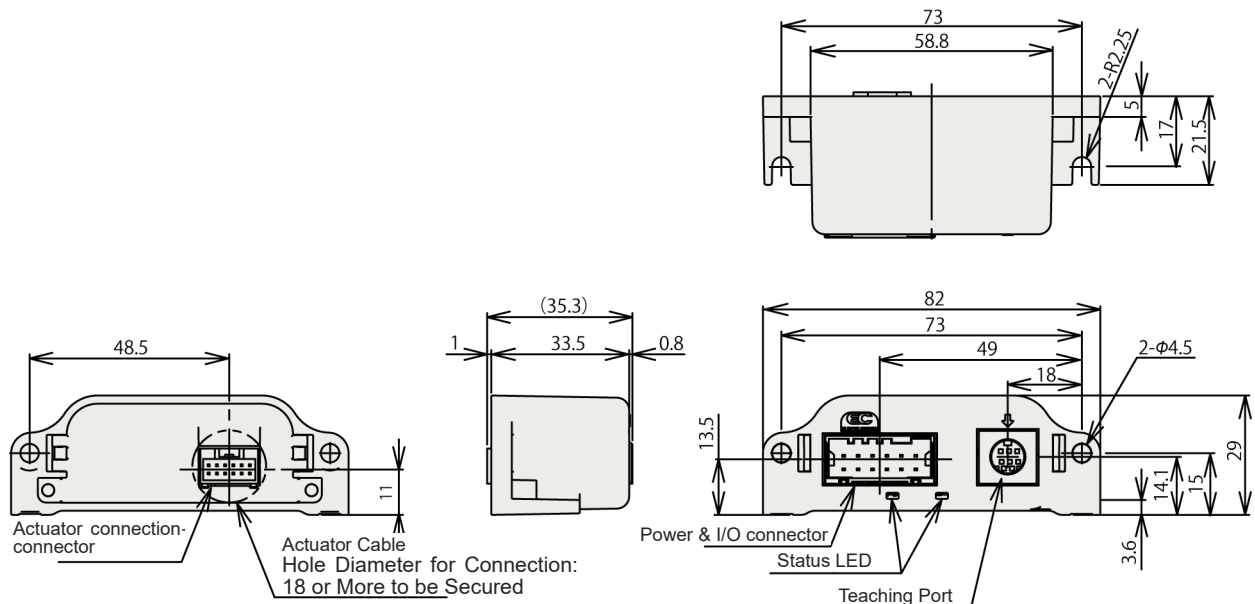


◆Equipped with Cable Support Bracket

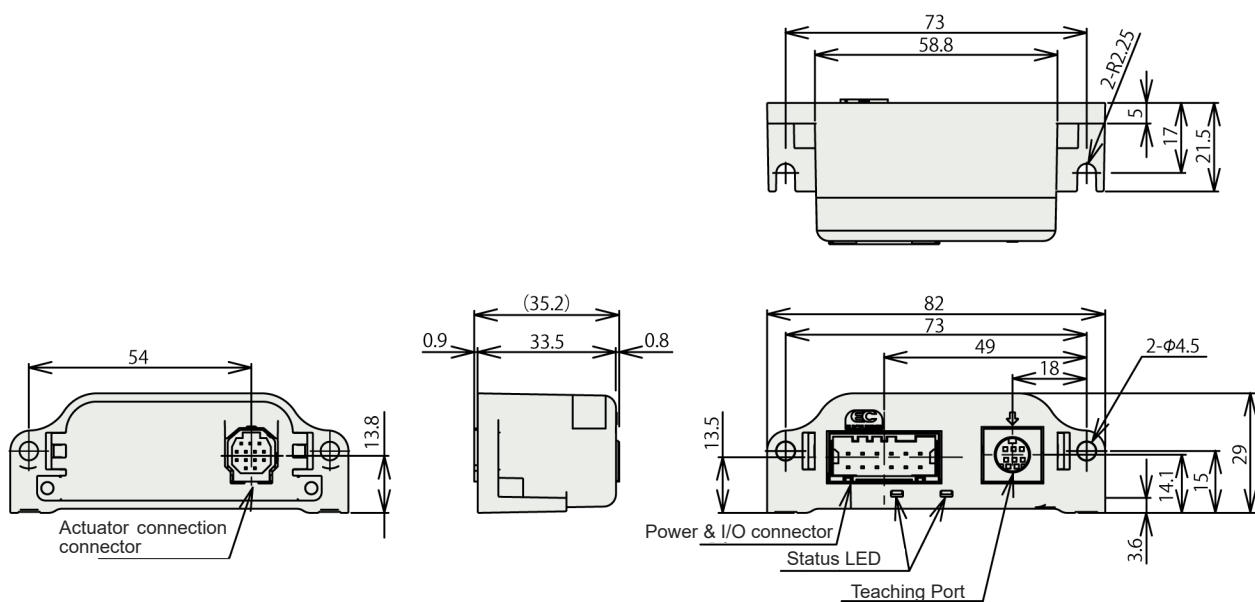


8.2 Interface Box

8.2.1 Interface Box



8.2.2 Interface Box 2



ROBO PUMP

Chapter 9

Life

9.1	Concept of Life for ROBO PUMP	9-1
9.2	Concept of Life for Controller	9-2

9.1 Concept of Life for ROBO PUMP

The ROBO PUMP affecting service life is as follows.

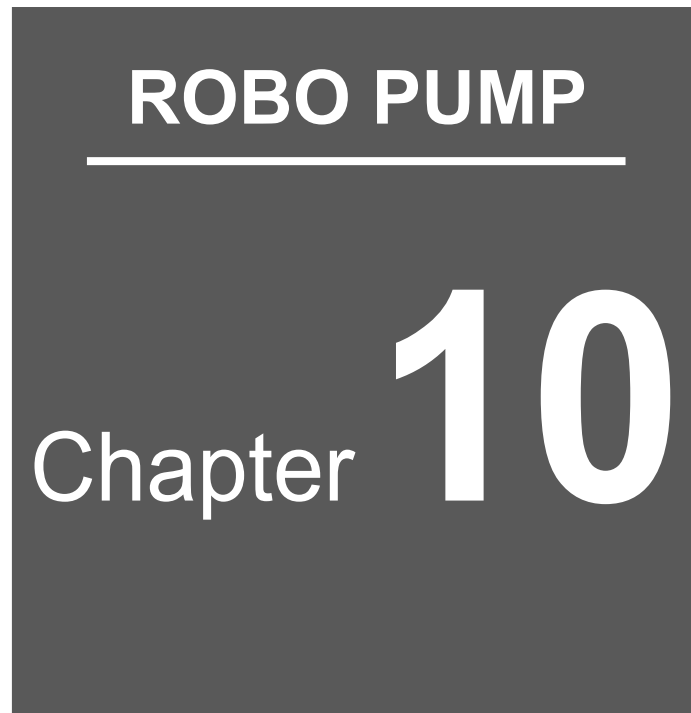
Product Life (Reference): 1 million times of adsorption - desorption cycles

The product life fluctuates drastically depending on the condition of use, environment and condition of maintenance.

9.2 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
OLED display	Approx. 3 years	Ambient temperature 40°C 24 hour operation



Appendix

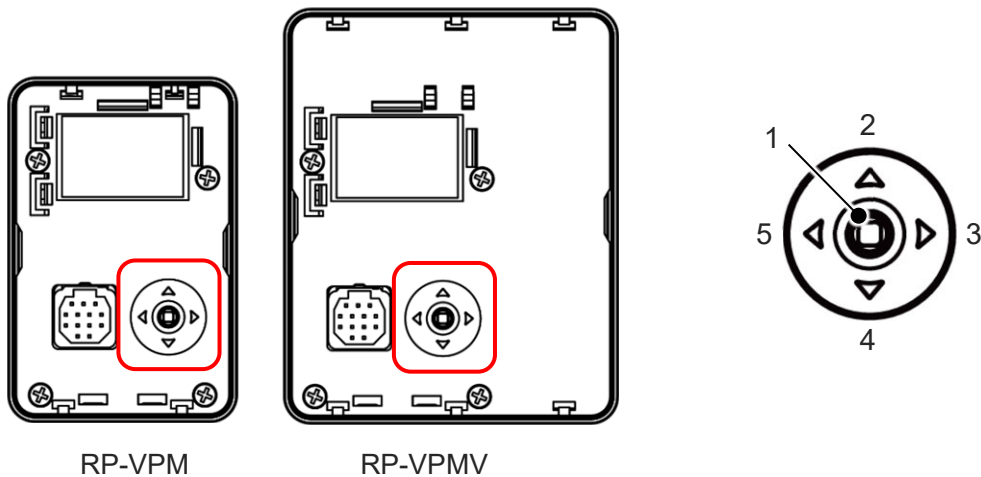
10.1	Display Panel and Operation Switch	10-1
10.1.1	Specifications for Operation Switch	10-1
10.1.2	Window Transition	10-2
10.1.3	Alarm Window	10-4
10.1.4	Environment Setting Window	10-4
10.1.5	Environment Setting Window	10-5
10.1.6	Tool in Connection Window	10-5
10.2	Teaching Pendant	10-6
10.2.1	Teaching Pendant Available to Use	10-6
10.2.2	Menu 1 Screen	10-7
10.2.3	Monitor Screen	10-8
10.2.4	ROBO PUMP Setting Screen	10-9
10.2.5	Parameter Edit Screen	10-13
10.2.6	TP Operation Mode Screen	10-14

10.1 Display Panel and Operation Switch

10.1.1 Specifications for Operation Switch

On the surface of the ROBO PUMP main unit, there are an OLED Display panel and an operation switch equipped.

The operation switch has the following features.

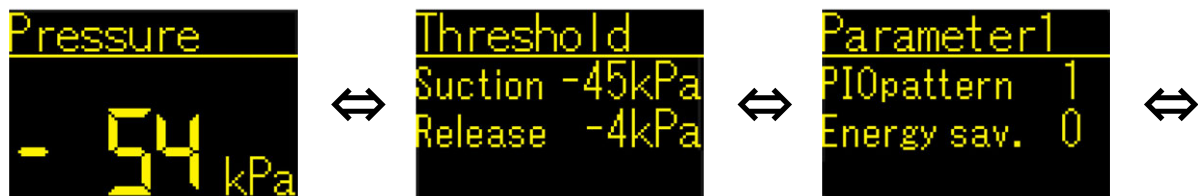


No.	Operation	Function
1	Press button	Enter, Confirm Input
2	Up input	Move Cursor, Increase Value, Adsorption Operation
3	Right input	Window Transition
4	Down input	Move Cursor, Decrease Value, Desorption Operation
5	Left input	Window Transition

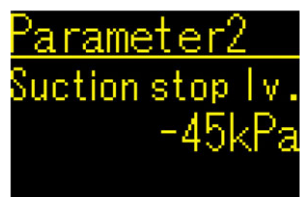
10.1.2 Window Transition

Ordinary, switchover among three windows should be available with operation right and left on the lever.

However, transition among the windows is not available during a trial run or when a change is being made to a value.



When the parameter “Power Saving Mode” is activated, the following “Change Parameter 2” window should get added between the “Change Parameter 1” window and the “Current Pressure” window.



Below, explains the details of each transited window.

[1] Current Pressure Display Window

It shows the current pressure [kPa].



[2] Set Pressure Window

In the Set Pressure window, the set value can be set.

While changing among windows, the values of "Adsorption Confirmation Level" and "Desorption Confirmation Level" in the parameter should be displayed.

Laying the lever up or down and it shows the cursor display, and items to change can be selected. The selected item should be displayed in highlight.

By pushing the lever at the center, it should turn to the edit mode and a value should get displayed blinking.

Laying the lever up or down while the display is blinking, and the value can be increased or decreased.

(Refer to [5.4 Explanation of Each Parameter Features] for the input range)

Increase or decrease the value to the desired one, push the lever at the center and the value gets entered.

[3] Change Parameter Window

In the "Change Parameter 1" window, values of "PIO Patterns" and "Power Saving Mode" in the parameters should be displayed.

Laying the lever up or down and it shows the cursor display, and items to change can be selected. The selected item should be displayed in highlight.

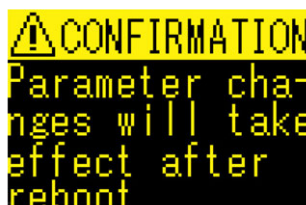
By pushing the lever at the center, it should turn to the edit mode and a value should get displayed blinking.

Laying the lever up or down while the display is blinking, and the value can be increased or decreased. The input range for "PIO pattern" is from 0 to 2, 0 or 1 should be selected for "Power Saving Mode".

(For details about parameter, refer to [5.4 Each Parameter Function Descriptions])

Increase or decrease the value to the desired one, push the lever at the center and the value gets entered, and it should be written in the parameter area of the controller.

When the PIO pattern is changed, the parameter should get effective after reboot. In the display panel on the ROBO PUMP, the following confirmation window should be displayed.



In the "Change Parameter 2" window, "Adsorption Stop Level" in the parameters should be displayed.

The input range from -99kPa to 0kPa.

(For details about parameter, refer to [5.4 Each Parameter Function Descriptions])

10.1.3 Alarm Window

In case of an alarm getting generated, the display should get changed to the alarm window regardless of displaying any window except for the environment setting window. However, when a value is being edited, it would not be transited to the alarm window before entering and confirming the value. For an operation cancelation level alarm, pushing at the center and the alarm can be reset. The screen goes to the pressure display window after the alarm gets cancelled.



Alarm
Code EC1
Detail 0001
Address 0000

10.1.4 Environment Setting Window

By push and hold it at the center to start up, it should go to the environment setting window. Laying the lever up or down, and the luminance can be changed. The setting can be adjusted in five levels.

Laying the lever right or left, and the language (Japanese / English / Chinese) can be changed. Push it at the center after tuning to save the setting values in the manufacturing information, and the screen moves to the pressure display window.



Env. Set.
◀ JP ENG CN ▶
▼ Brightness ▲

10.1.5 Environment Setting Window

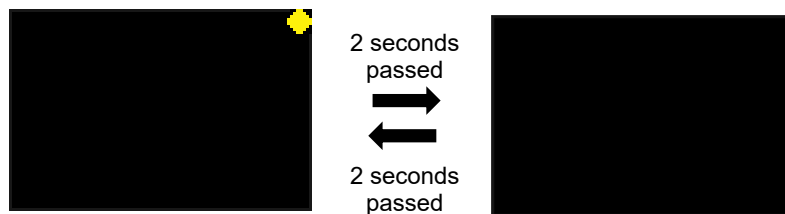
After two minutes passed with no adsorption / desorption command and no operation of the operation switch is confirmed in "Normal Mode", the screen should get turned off.

If the operation switch gets pressed while the screen is off, the screen should get turned on and show the window before it turned off. In this case, the display would not be transited even if the operation switch gets pushed, but the cursor should work.

The screen should not turn off while showing "Setting Mode", "Tool in Connection", "Alarm being Generated" or "Environment Setting".

While the screen is off, a circle mark should blink at the right top corner of the screen.

It should blink in frequency of "illuminated for two seconds / turned off for two seconds".



10.1.6 Tool in Connection Window

When a teaching tool (wired or wireless) is connected to the interface box or R-Unit, the "Tool in Connection" window should be displayed. Operation on the panel cannot be performed at this moment.

"Tool in Connection" should disable the power-off feature and the screen should always be turned on.

It should get back to the normal operation after the connection of the teaching tool is lost, and the screen should automatically transit to the current pressure display window.



10.2 Teaching Pendant

10.2.1 Teaching Pendant Available to Use

The following pendants can be used with ROBO PUMP.

- Touch Panel Teaching Pendant TB-02/02D (Wired link)
- Touch Panel Teaching Pendant TB-03 (Wired link/wireless link)

The applicable versions for the teaching pendants are as shown below.

Instruction manual name	ROBO PUMP applicable version
TB-02/02D (Wired link)	V.4.70
TB-03 (Wired link/wireless link)	V.4.70

For how to make operation on a teaching pendant, it is basically the same as when operating other actuators and controller. Except for wireless connection, the operation for TB-02/02D and TB-03 is the same.

For the operation procedure, refer to the following [each instruction manual].

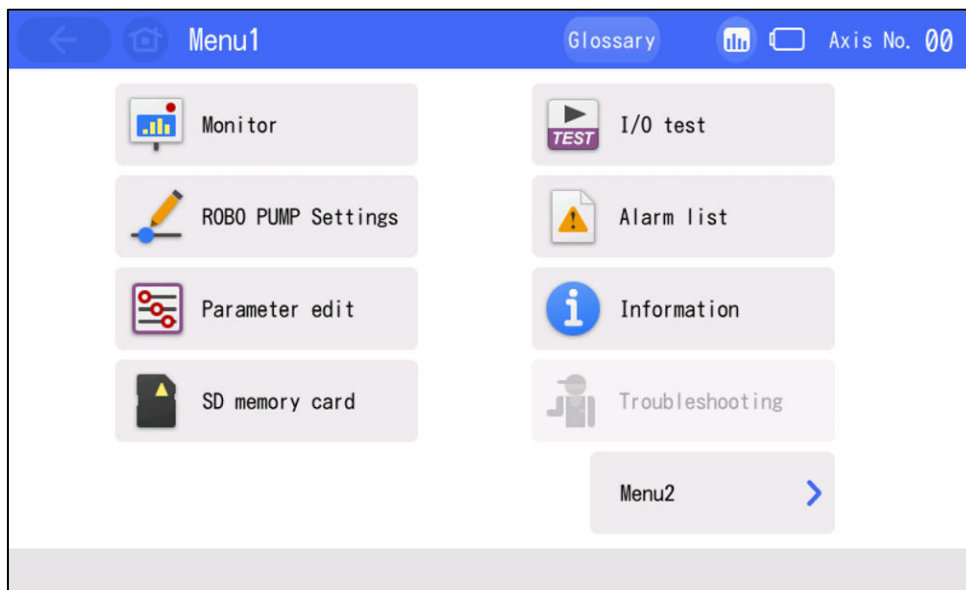
Product name / Instruction manual name	Control number
TB-02/02D Instruction manual	ME0355
TB-03 Wireless link instruction manual	ME0375
TB-03 Wired link instruction manual	ME0376

For how to make operation in connection via RSEL, refer to the following [instruction manuals for SEL systems].

Product name / Instruction manual name	Control number
TB-02/02D Instruction manual	ME0356
TB-03 Wired link instruction manual	ME0377

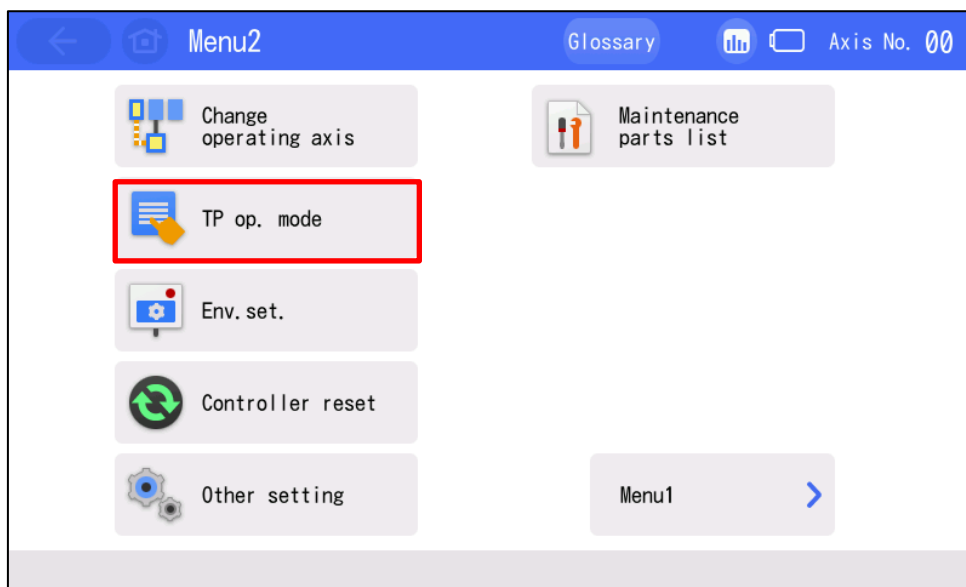
* TB-03 wireless connection does not support SEL system

10.2.2 Menu 1 Screen



Described below is regarding the ROBO PUMP dedicated screens.

- Monitor screen ----- Refer to [10.2.3 Monitor Screen]
- ROBO PUMP Setting screen-- Refer to [10.2.4 ROBO PUMP Setting screen]
- Parameter edit screen----- Refer to [10.2.5 Parameter Edit Screen]



- TP Operation mode screen ---- Refer to [10.2.6 TP Operation Mode Screen]

10.2.3 Monitor Screen

Monitoring of the input and output signals / stop status, drive source status, drive source standby condition, pressures, motor revolution count, overload level and temperature on circuit board is available.

The window display (Input/Output signal name) should differ depending on the setting in Parameter No. 5 "PIO pattern select".

When "0: Double solenoid mode" is Selected in "PIO pattern select"

The screenshot shows the 'Monitor' screen for 'Axis No. 04'. The screen is divided into several sections:

- Input signals:**

IN0	Release command	●
IN1	Suction command	●
IN2	Alarm reset	●
IN3	-	●
- Output signals:**

OUT0	-	●
OUT1	Conf. suction	●
OUT2	Alarm[norm clos]	●
OUT3	-	●
- Stop status:**

Stop.	●
Driving source.	●
Drive ready	●
- Operation status:**

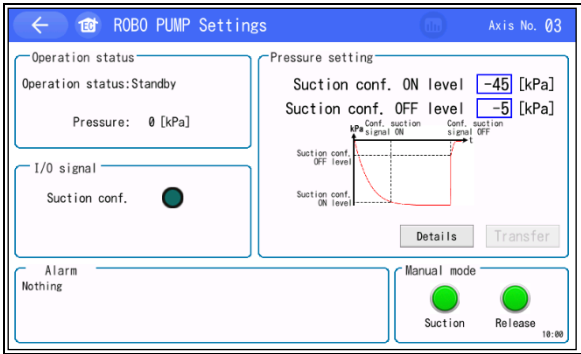
Operation status	Standby
Pressure	0 kPa
Motor speed	0 rpm
PCB temp.	34 °C
Overload level	0 %
Cmd. current value	2 mA
Cmd. current ratio	0.40 %
- Alarm code:**
- Serial No.:**

At the bottom of the screen, there are buttons for 'Production info' and 'Maint.', and a timestamp '14:03'.

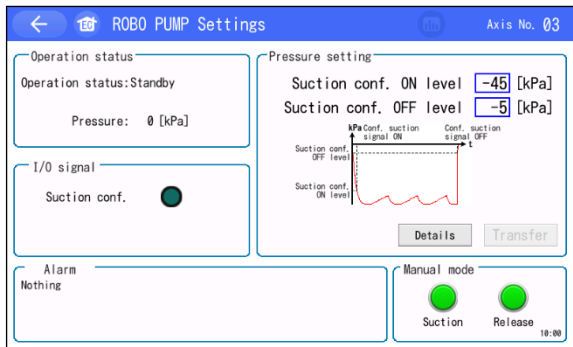
10.2.4 ROBO PUMP Setting Screen

The trial run condition setting, monitoring and operational commands for trial run are available.

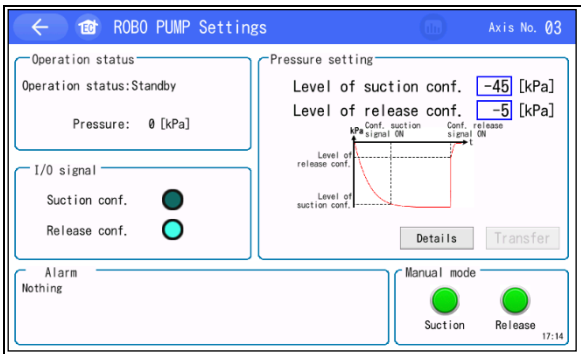
- * The contents of pressure setting may differ depending on the PIO patterns and enable or disable of the power saving mode.
 - When PIO pattern is 0 or 1, and power saving mode is disabled



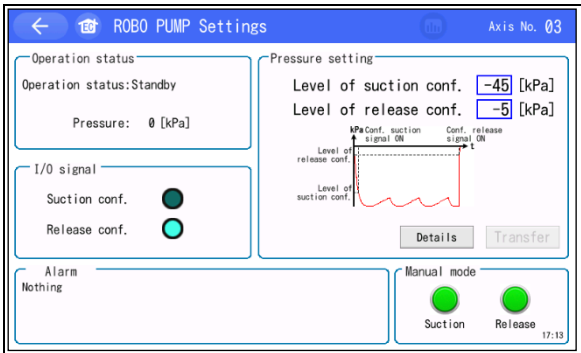
- When PIO pattern is 0 or 1, and power saving mode is enabled



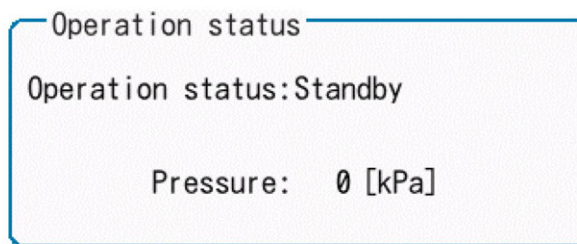
- When PIO pattern is 2, and power saving mode is disabled



- When PIO pattern is 2, and power saving mode is enabled



[1] Operation Status

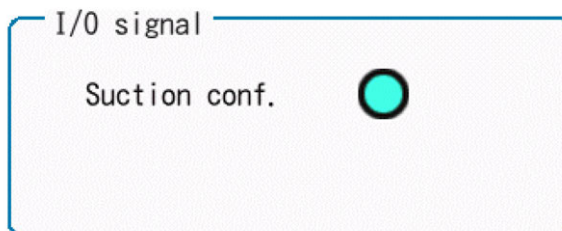


The detail of display is as follows:

- 1) Operation status: The operation status of ROBO PUMP should be displayed.
- 2) Pressure [kPa]: Pressure at the vacuum pump part should be displayed.

[2] I/O signal

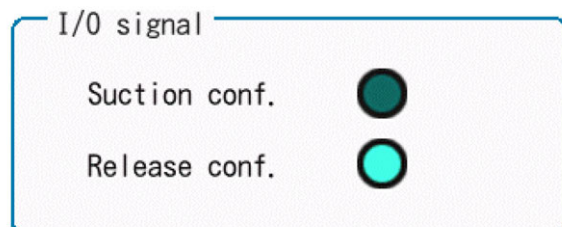
- When PIO pattern is 0 or 1



The detail of display is as follows:

- 1) Adsorption confirmation: It should turn on when adsorption is complete.
It should be off when adsorption is not complete.

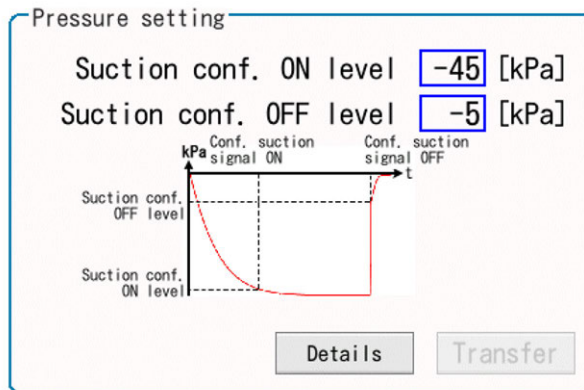
- When PIO pattern is 2



The detail of display is as follows:

- 1) Adsorption confirmation: It should turn on when adsorption is complete.
- 2) Desorption confirmation: It should turn on when desorption is complete.

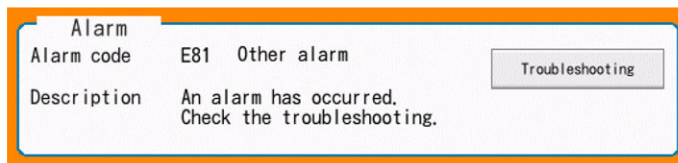
[3] Pressure Setting



The display, setting details and process when each button is touched are as shown below.

- 1) Adsorption confirmation ON level [kPa] :
The upper limit of pressure to terminate absorption should be set up.
The unit is [kPa] and integers in negative can also be input.
Settings cannot be changed during absorption or desorption in the monitoring mode.
- 2) Adsorption confirmation OFF level [kPa] :
The lower limit of pressure to terminate desorption should be set up.
The unit is [kPa] and integers in negative can also be input.
Settings cannot be changed during absorption or desorption in the monitoring mode.
- 3) Adsorption confirmation level [kPa]:
The upper limit of pressure to terminate absorption should be set up.
The unit is [kPa] and integers in negative can also be input.
Settings cannot be changed during absorption or desorption in the monitoring mode.
- 4) Desorption confirmation level [kPa]:
The lower limit of pressure to terminate desorption should be set up.
The unit is [kPa] and integers in negative can also be input.
Settings cannot be changed during absorption or desorption in the monitoring mode.
- 5) Details button:
The ROBO PUMP Advanced Settings window should be displayed
- 6) Transfer button:
The changed setting should be sent to ROBO PUMP.
When there is no change made to the settings or during absorption or desorption, the Transfer button should be deactivated.
- 7) Pressure setting graph:
The relation between the absorption confirmation ON and OFF levels and the pressure should be shown.

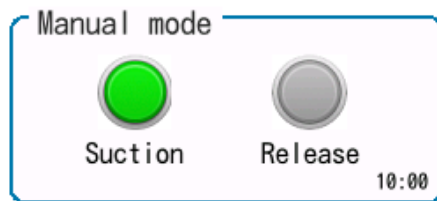
[4] Alarm



The display, setting details and process when each button is touched are as shown below.

- 1) Alarm code: An occurred alarm code should be displayed.
"None" should be shown when there is no alarm occurred.
- 2) Details: The details of an occurred alarm should be displayed.
- 3) Troubleshooting button: The screen moves to the troubleshooting window.

[5] Manual operation



The display, setting details and process when each button is touched are as shown below.

- 1) Adsorption button: Touch it and the absorption operation should start.
When it is in standby and data is not yet sent, it should be valid.
- 2) Desorption button: Touch it and the desorption operation should start.
When PIO Pattern = 0 or 2, it should be valid during separation or in standby.
When PIO Pattern = 1, it should be valid only during absorption.

10.2.5 Parameter Edit Screen

Setup for the parameters dedicated for ROBO PUMP should be conducted.

There are two types of input, one is to input a setting value and the other is to touch O (radio button) to select.

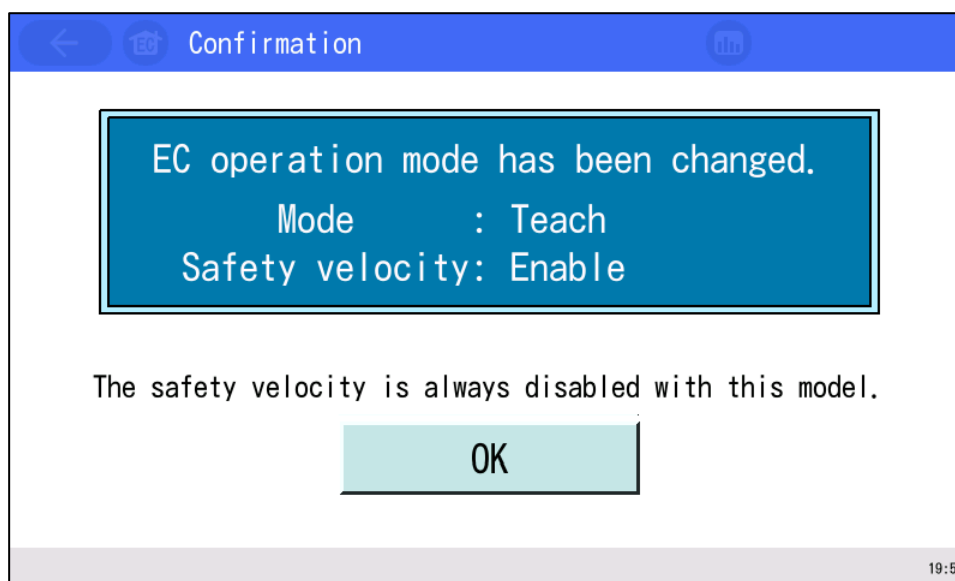
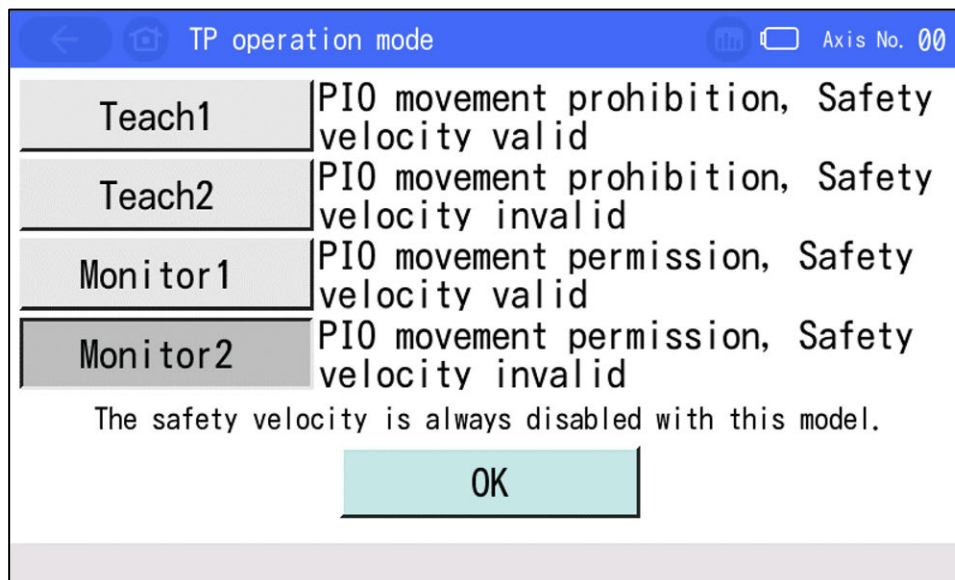
Touch Description and the explanation of that parameter should be displayed at the bottom of the screen.

Parameter		Axis No. 00
1. Suction conf. ON level	Descriptn	-40 kPa
2. Suction conf. OFF level	Descriptn	-5 kPa
3. Energy-saving mode	Descriptn	☐ Disable ☒ Enable
4. Level of suction stop	Descriptn	-45 kPa
5. PI0 pattern select	Descriptn	☐ 0 ☒ 1 ☐ 2
6. Monitoring mode select	Descriptn	☐ 0CH ☒ 2CH ☐ 4CH
7. Monitoring cycle	Descriptn	1 ms
8. SIO baudrate select	Descriptn	38,400 bps
By touching Descriptn (Description) button, the description of the parameter will be displayed.		↓ Nx pg

* Refer to [5.4 Each Parameter Function Descriptions] for details of each parameter.

10.2.6 TP Operation Mode Screen

As there is no safety velocity feature equipped to ROBO PUMP, "The safety velocity is always disabled for this model" should be displayed in the TP operation mode window and the TP operation mode change confirmation window.



ROBO PUMP

Chapter 11

Warranty

11.1	Warranty Period	11-1
11.2	Scope of the Warranty	11-1
11.3	Honoring the Warranty.....	11-1
11.4	Limited Liability	11-2
11.5	Conformance with Applicable Standards/Regulations, etc., and Application Conditions	11-2
11.6	Other Items Excluded from Warranty	11-2

11.1 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

11.2 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.

11.3 Honoring the Warranty

As a rule, the product must be consigned to IAI for repair under warranty.

11.4 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.

11.5 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.

11.6 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
2024.08	First Edition
2024.09	1B Edition Contents of 2-circuit power supply specification (TMD2) added 6.4.1 "EC0 Motor speed exceeded" added 6.4.2 Contents of Alarm Causes and Countermeasures added
2025.07	1C Edition Remote speed controller added in applicable version of teaching tool 1.2.4, 6.1 LED1 Operational Condition added 4.5.1 to 4.5.3 Changed the illustration for the [Basic timing chart] 6.1 Details on operation status added 6.4.2 Alarm Causes and Countermeasures EE5 contents added 8.1.1 External dimensions changed Correction made
2025.09	1D Edition 7.2.1 [Replacing Filter] * mark and image added 7.2.2 [Replacing Motor Unit] 4) and image added 7.2.4 Changed the [Replacing Front Panel Assy's] 3) image
2025.10	1E Edition Changes due to discontinuation of including the First Step Guide
2026.03	Second Edition RP-VPMV (equipped with air blow) added Interface Box2 added Layout changed 3.1 System Configuration added 6.4.1, 6.4.2 Alarm Code E81 [Workpiece dropped] deleted 7.1 Caution added 7.2.1 Replacement component list added 7.2.3, 7.2.5 Regarding Connectors for the RP-VPMV Addition added 7.2.3, 7.2.4 Notes about Parallel Pin added 7.2.5 Notes on O-rings due to the addition of RP-VPMV added 8.1.1 External Dimensions replaced 8.2 Interface Box added

變更履歷

Revision date	Revised content
2026.07	2B Edition 1.2.1, 1.2.2 Generated Pressure “or less” deleted 2.3.5 External Filter Mounting added 5.4.3 Parameter No.3: Power Saving Mode *2 Correction made 7.2.4 Replacing Coupling Spacer, Change the tightening torque of the mounting screw on the front panel assy's



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