L-0424-3E

EPM (End Point Monitor)

EPM Sensor

Instruction Manual

- For your safety, carefully read and understand this instruction manual before starting the work.
- Always keep this instruction manual in a certain place so that you can read it whenever necessary.

LUBE Corporation

Introduction

■ Intended use of device

The EPM sensor is a device for monitoring the flow of the lubricant fed from each valve of our lubrication system to each lubrication point on the machine body and the temperature change of the machine components.
Do not use the device for other purposes.

■ Symbols used in this instruction manual

In this instruction manual, safety precautions for preventing crippling accidents are described with the following symbols. Be sure to carefully read and fully understand the precautions with these symbols before starting the work.

	This indicates a potentially hazardous situation which, if ignored, could result in death or serious injury.
	This indicates a potentially hazardous situation which, if ignored, may result in mild or moderate disabilities.

In this instruction manual, the following symbols are used. In order to use the device correctly, be sure to read the items with these symbols.

	This indicates information or points to which special attention should be paid during work. Ignoring them could result in damage to the device and the machine body.
	This indicates information or points which are helpful during the work.
	This indicates an item to be referenced.

■ Contact information

If you have any questions on this instruction manual, contact the following.

■ Japan
Order Reception and Customer Support Center, LUBE Corporation
(Located in Tsukuba Plant)
15-1, Okubo, Tsukuba, Ibaraki, 300-2611
TEL: 029-877-5506 FAX: 029-865-3176

■ China
LUBE LUBRICATING SYSTEM (SHANGHAI) CO., LTD.
No.88, Taigu Road, Waigaoqiao Pilot Free Trade Zone, Shanghai
TEL: 021-5868-3818 FAX: 021-5868-3880

■ U.S.A
LUBE USA, Inc.
1075 Thousand Oaks Blvd, Greenville, SC 29607
TEL: 800-326-3765 FAX: 864-242-1652

■ Specification change

Please note that the explanations and figures in this instruction manual may slightly differ from the actual device due to the improvement of the device.

■ Resale and lending of device

When reselling or lending the device, include all the documents that were attached to the device at the time of delivery.

■ Disposal of device/grease

When disposing of the device or grease, follow the laws and regulations stipulated by the country and region.

Table of Contents

1. Safety Precautions

1-1 Basic Safety Precautions

⚠WARNING

- Before starting the work, carefully read and fully understand this instruction manual.
- Keep this instruction manual in a certain place so that you can read it whenever necessary.
- The device can only be operated by personnel with knowledge and technique of installing and adjusting a lubrication system.
- Do not modify or change the device without our permission.

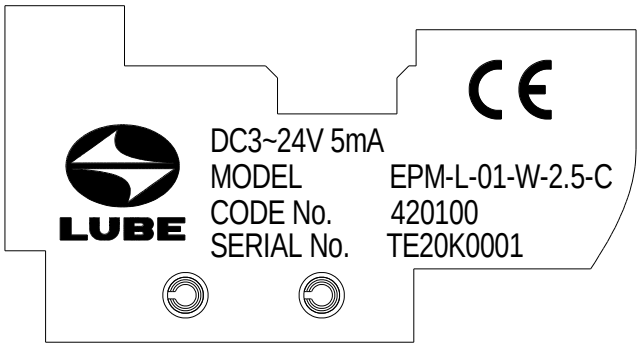
1-2 Label Types and Locations

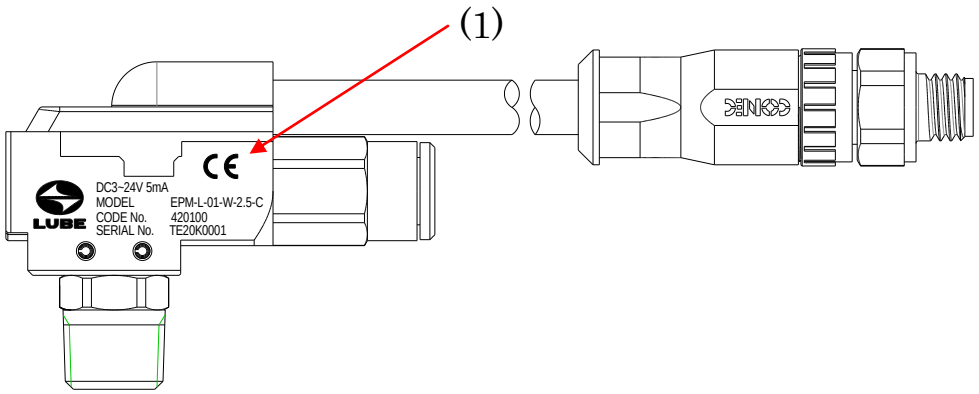
The device has the following labels and engraved marks.

⚠CAUTION

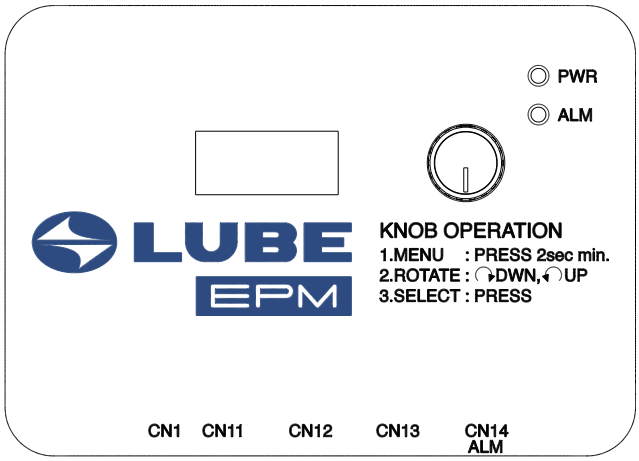
- Before starting the work, carefully read and fully understand this instruction manual.

(1) EPM sensor specification and serial No. (engraved on the body)

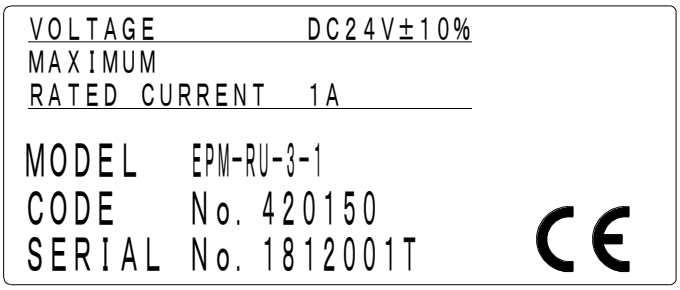


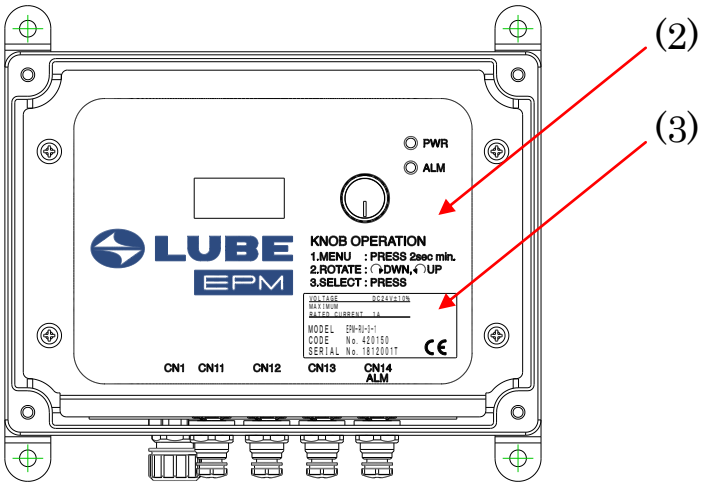


(2) Relay board unit nameplate

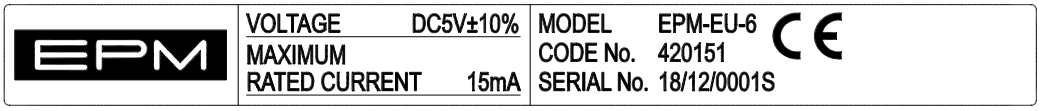


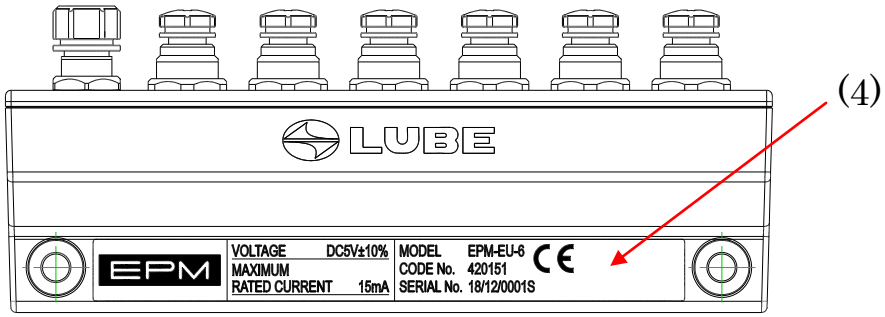
(3) Relay board unit specification and serial No.





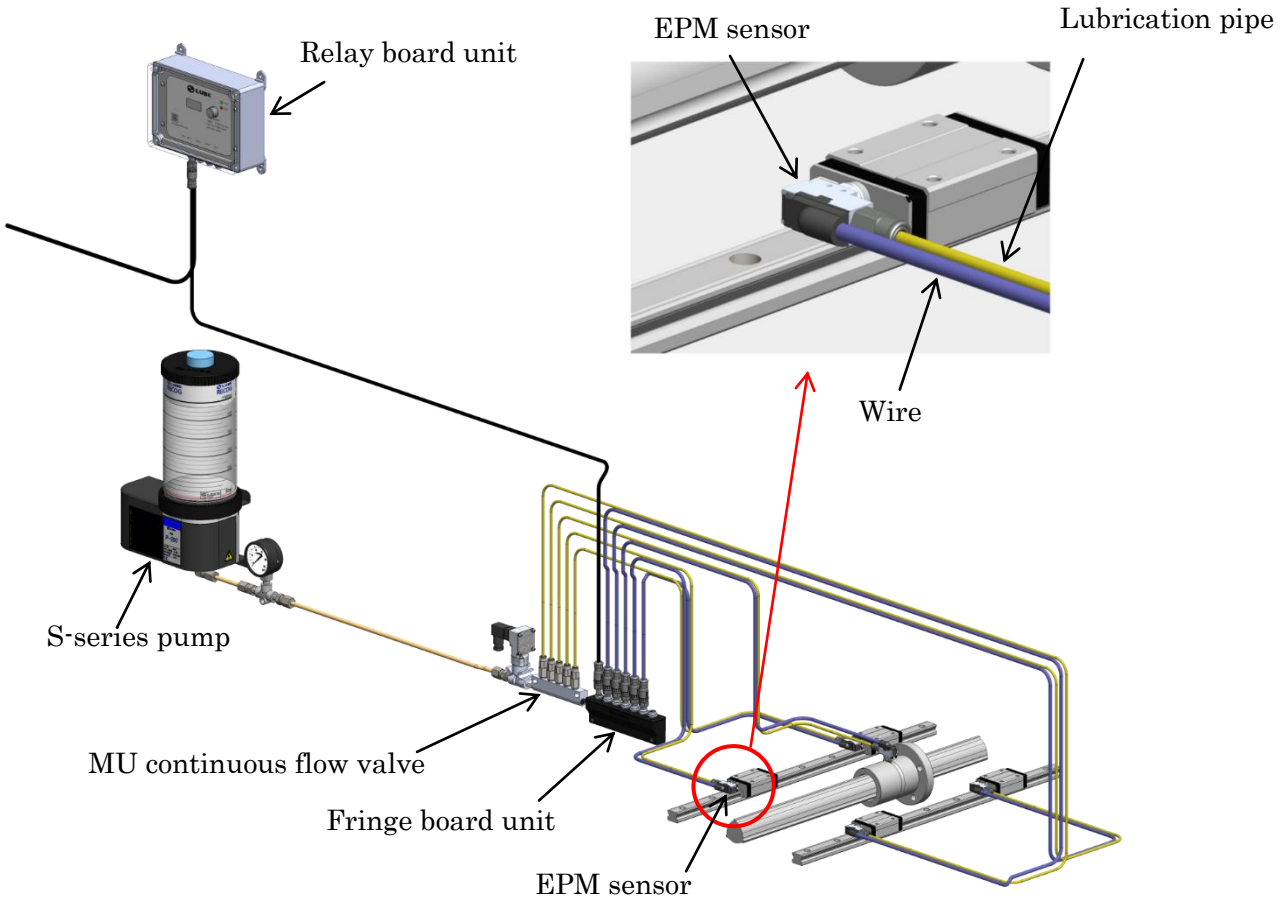
(4) Fringe board unit specification and serial No.





2. Specifications and Overview

2-1 EPM System Overview



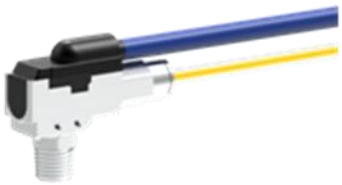
System example: case of LHL

(1) The EPM system measures the lubrication flow and temperature at the lubrication point of the machine.
(2) The EPM sensor information is sent to the relay board unit via the fringe board unit.
(3) The relay board unit aggregates the fringe board unit information and sends it to the control-level equipment.
(4) The relay board unit can output the alarm by itself.
(5) Use the PC alarm setting tool when setting the alarm.
(6) To display the data aggregated by the relay board unit on a computer and perform logging, use the PC monitoring tool.

■ EPM sensor
The sensor detects lubricant discharge (contact) signals and temperature (K type thermocouple) signals detects.

■ Fringe board unit
The unit aggregates the EPM sensor wires and sends measured values by communication. (Contact ON/OFF information, temperature measurement information)

■ Relay board unit
The unit aggregates information on the fringe board unit and outputs it to the outside by RS485 communication.
Power supply to the fringe board unit
Pump operation signal capturing
Dial code setting of fringe board unit
Alarm output



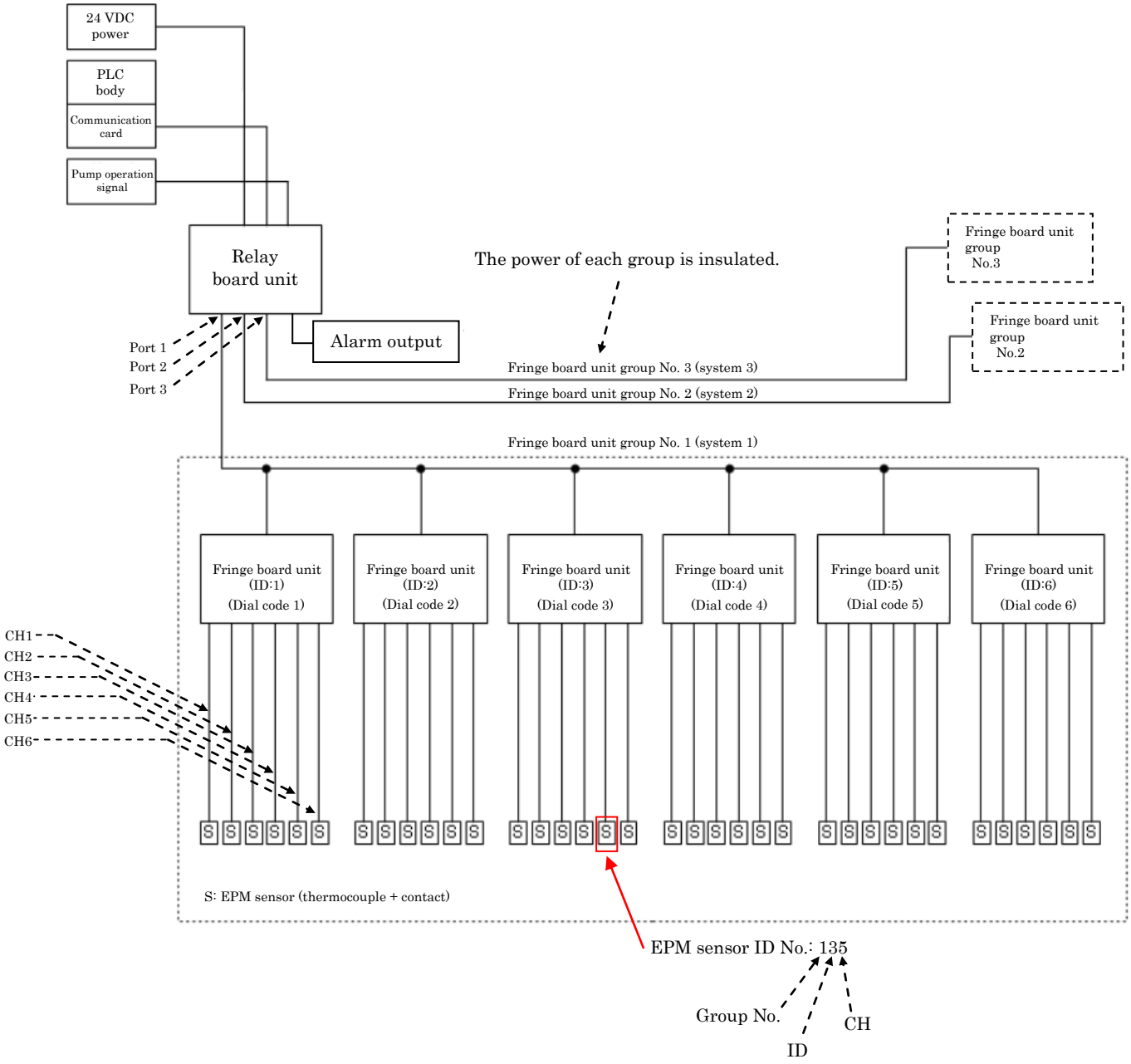
Information on the temperature and the discharge states is aggregated.

Information on the fringe board unit is aggregated.

Information aggregated by the RS485 communication is output.

(1) The product can only be used with our lubrication system and the designated lubricant.
(2) The product detects the flow of the lubricant discharged from the continuous flow valve.
(3) The product is for detecting the presence of the lubricant flow and not for detecting the change in the discharged amount (increase and degrease in the lubricant).
(4) For the product to perform next detection after detecting the lubricant flow, the sensor must be returned (the contact must be ON).
The time until the sensor returns differs depending on the system state and the individual difference between the EPM sensors.
(5) When using the EPM sensor by itself, check the specification.

2-2 EPM System Configuration Diagram

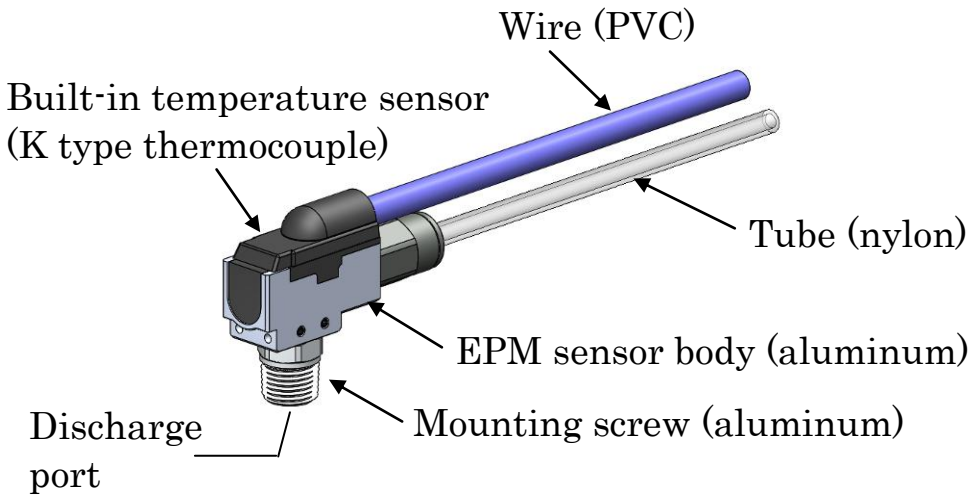


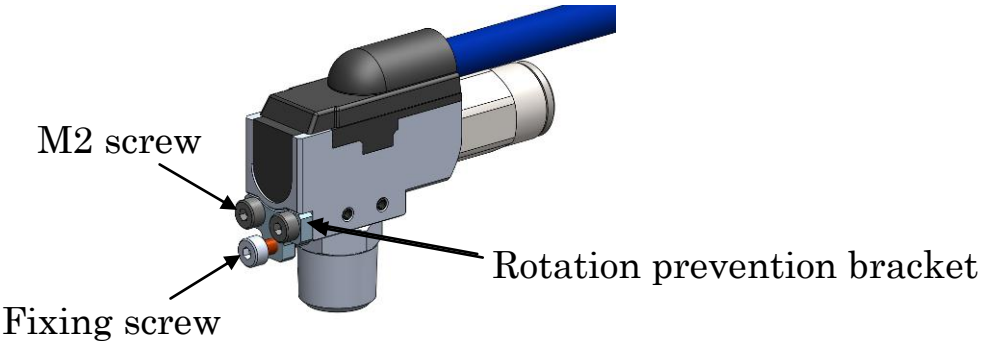
(1) The EPM sensor system consists of the relay board unit and the fringe board unit.
(2) 6 EPM sensors can be connected to 1 fringe board unit.
(3) To each port of the relay board unit, 6 fringe board units can be connected at maximum. A total of 18 fringe board units can be connected at maximum.
(4) The relay board unit sends the aggregated data to the control-level PLC by RS485 communication in a cycle of 0.5 seconds.

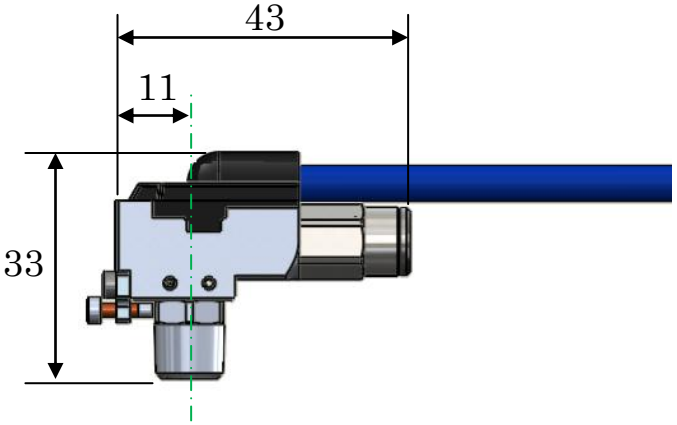
2-3 EPM Sensor Overview

The EPM system is installed at the end lubrication point of the lubrication system. When the lubricant flows, the internal contact opens and the flow is detected. In addition, the built-in temperature sensor monitors the temperature by indirectly measuring the lubrication point temperature.

Part names

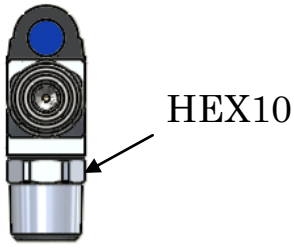






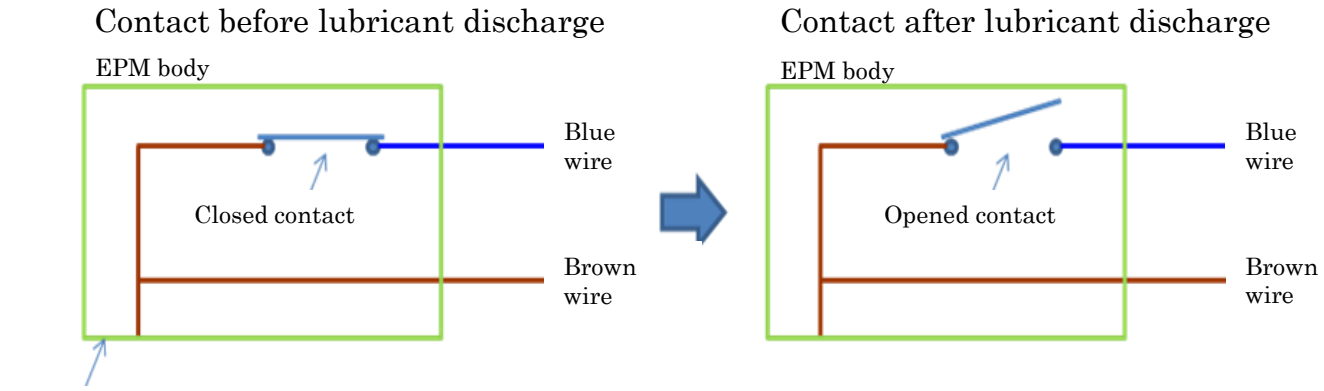
Pipe insertion amount

One-touch fitting:	18 mm
Bushing fitting:	9 mm



Electrical structure

The contact inside the EPM sensor is normally closed. It opens when the lubricant is discharged. It closes when the lubricant flow stops and a certain time elapses.



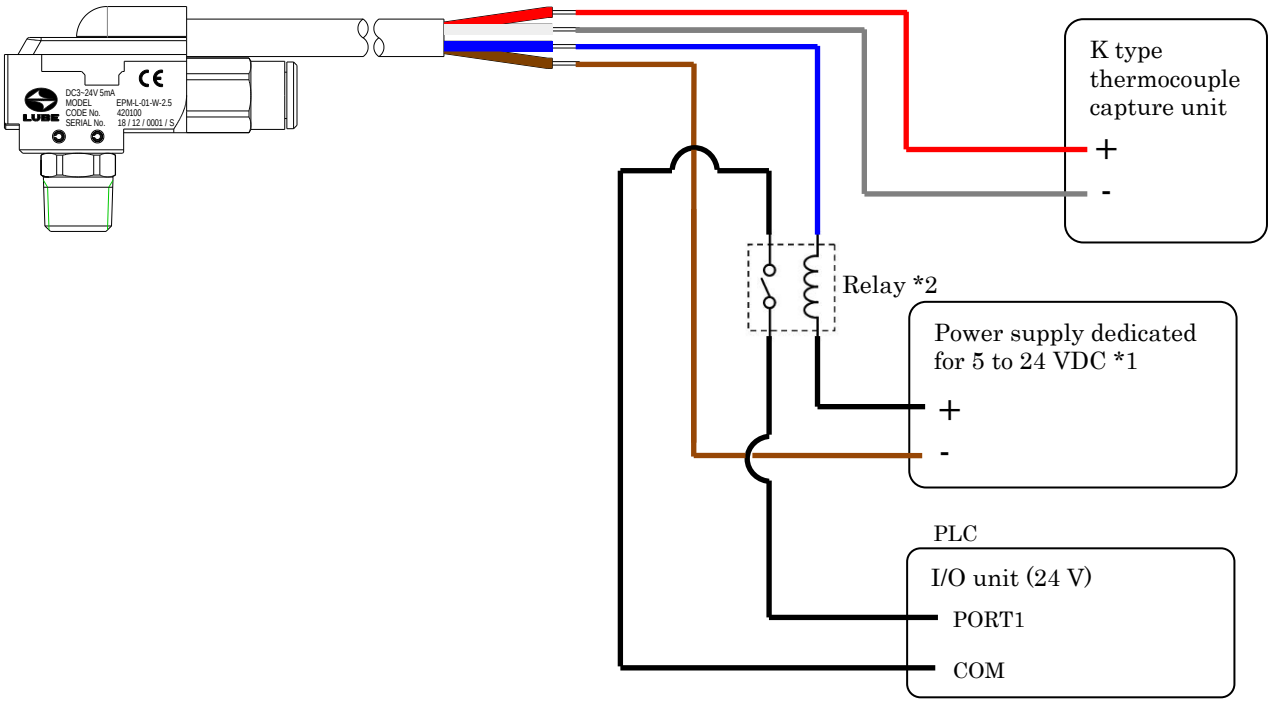
The brown wire and the EPM body metal are conductive.

(1) The brown wire is the GND (COM) and always conductive with the metal part of the EPM body. When attaching several EPM sensors, please note that the brown wire is conductive via the metal part of the machine. Via the metal part of the machine, the brown wire and the metal part of the several EPM bodies are conductive. See the next page (page 13) when connecting the EPM sensor directly to the control machine without using the relay board unit and the fringe board unit.

(1) By using the relay board unit and the fringe board unit, there is no need to worry that the metal part of the EPM body and the brown wire are conductive. When the relay board unit and the fringe board unit are used, the EPM body and the 24 VDC power are insulated.

(2) Each port (group) of the relay board unit uses the power insulated for each port (group).

When directly connecting the EPM sensor (use of PNP or NPN allowed)
(When not using the relay board unit or the fringe board unit)



*1 ・ Use an NEC Class 2 power supply.
・ For the power supply of 5 to 24 VDC, use a separate power dedicated for EPM sensors, or use an insulated DC-DC converter for the power circuit dedicated for EPM sensors (do not connect other devices).

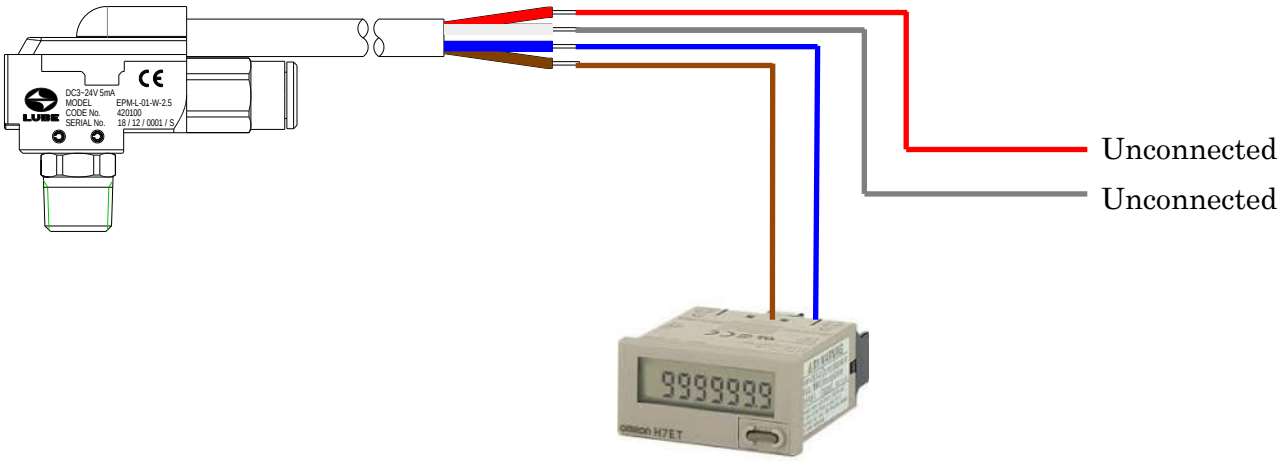
*2 ・ For relays, use an SSR with low power consumption.
By visually checking the operation lamp of the relay, you can check the state (ON/OFF) of the EPM sensor contact.

(1) Recommended : KHNA30F-5 by COSEL CO., LTD. (5 V power)
: KHNA30F-24-C by COSEL CO., LTD. (24 V power)
(2) Recommended : G3TA-IDZR02S DC5-24 by OMRON Corporation (5 to 24 V relay)
: P7TF-05 by OMRON Corporation (relay socket)
(3) Recommended : DDR-15G-24 by MEAN WELL Enterprises Co., Ltd. (insulation DC-DC converter)

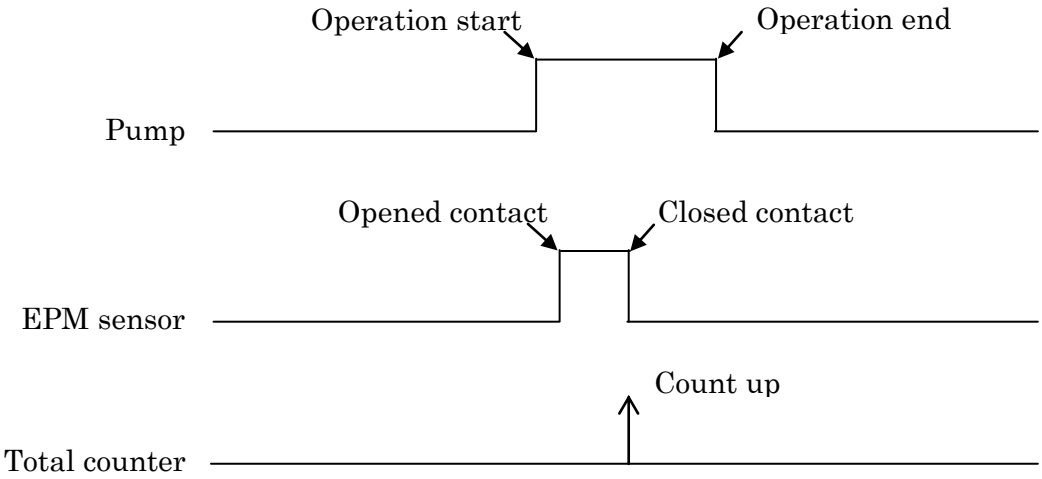
*1 ・ Please select the most suitable power supply capacity according to your needs.

When connecting the EPM sensor to the total counter

(When not using the relay board unit or the fringe board unit)



Counter operation timing chart



(1) Recommended product: H7EC-N small total counter by OMRON Corporation (battery type)

2-4 EPM Sensor (LHL Type)

The discharge (contact) and the temperature (K-type thermocouple) of the LHL is detected.

Contact configuration	NC (B contact)
Rated voltage	3 to 24 VDC
Rated current	5 mA
Used grease	LHL-X100
Operating temperature range	0°C to 50°C (discharge detection)
Cracking pressure	0.3 MPa
Standard	IP67, RoHS (2011/65/EU,(EU)2015/863)
Mounting direction	No limit
Used lubrication pipe/length	NT-4, NT-4H, ST-4Z, CT-4 Length: 2000 mm or below Recommended length: 1000 mm or below
Connection continuous flow valve	MU type valve (discharge amount: 0.05 to 0.5 mL) Recommended valve size: 0.1 mL or above
Connection screw diameter *1	M6 × 0.75 tapered, M6 × 1 tapered, M8 × 1.25 tapered, R1/8 (cannot be used as a swivel joint)
Pipe connection port	One-touch type Bushing type (CB-4 is used)
Wire	Exterior: PVC ϕ 5.2, Length: 2500 mm Four-line (for contacts/thermocouples) Minimum bending radius: 30 mm
Built-in temperature sensor	K type thermocouple (EPM sensor temperature is measured) (temperature of the lubrication point is measured indirectly)
Temperature measurement range	0°C to 90°C
Accessories	HEX8-10 spanner: 1 pc Hexagonal wrench with nominal diameter of 1.5: 1 pc Hexagonal wrench with nominal diameter of 0.89: 1 pc Rotation prevention bracket (SUS304): 1 pc M2 × 4 mounting bolt: 2 pcs M2 looseness prevention screw: 1 pc

*1 Regarding the width across flat of the connection screw, R1/8 and M8 × 1.25 tapered type and HEX10.
M6 × 0.75 tapered type and M6 × 1 tapered type are HEX8.

Even a very small foreign substance can cause operation failure if it gets inside.
Please be careful when handling.

2-5 EPM Sensor (FS2 Type)

The discharge (contact) and the temperature (K-type thermocouple) of the grease is detected.

Contact configuration	NC (B contact)
Rated voltage	3 to 24 VDC
Rated current	5 mA
Used grease	FS2
Operating temperature range	0°C to 50°C (discharge detection)
Cracking pressure	0.8 MPa
Standard	IP67 RoHS (2011/65/EU,(EU)2015/863)
Mounting direction	No limit
Used lubrication pipe/length	NT-4H, ST-4Z, CT-4 Length: 2000 mm or below Recommended length: 1000 mm or below
Connection continuous flow valve	MG2 type valve (discharge amount: 0.05 to 0.5 mL) Recommended valve size: 0.1 mL or above
Connection screw diameter *1	M6 × 0.75 tapered, M6 × 1 tapered, M8 × 1.25 tapered, R1/8 (cannot be used as a swivel joint)
Pipe connection port	One-touch type Bushing type (CB-4 is used)
Wire	Exterior: PVC ϕ 5.2, Length: 2500 mm Four-line (for contacts/thermocouples) Minimum bending radius: 30 mm
Built-in temperature sensor	K type thermocouple (EPM sensor temperature is measured) (temperature of the lubrication point is measured indirectly)
Temperature measurement range	0°C to 90°C
Accessories	HEX8-10 spanner: 1 pc Hexagonal wrench with nominal diameter of 1.5: 1 pc Hexagonal wrench with nominal diameter of 0.89: 1 pc Rotation prevention bracket (SUS304): 1 pc M2 × 4 mounting bolt: 2 pcs M2 looseness prevention screw: 1 pc

*1 Regarding the width across flat of the connection screw, R1/8 and M8 × 1.25 tapered type and HEX10.
M6 × 0.75 tapered type and M6 × 1 tapered type are HEX8.

Even a very small foreign substance can cause operation failure if it gets inside.
Please be careful when handling.

2-6 EPM Sensor (OIL Type)

The discharge (contact) and the temperature (K-type thermocouple) of the oil is detected.

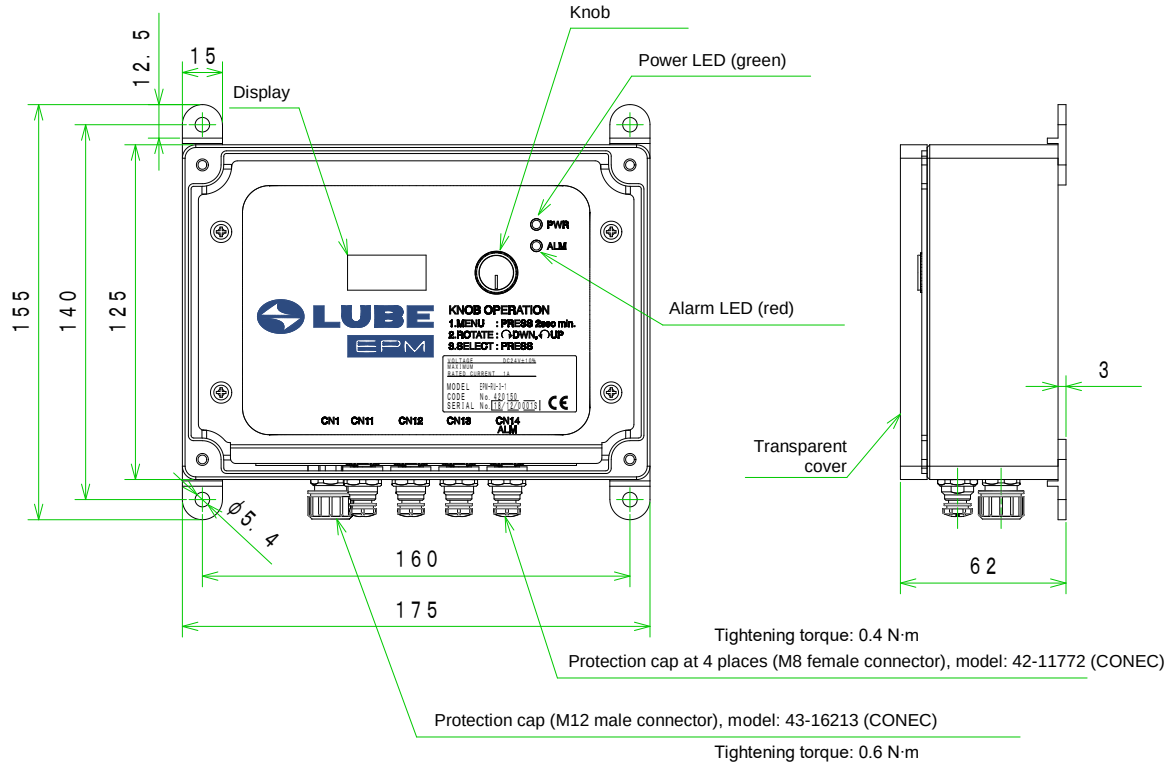
Contact configuration	NC (B contact)
Rated voltage	3 to 24 VDC
Rated current	5 mA
Operating viscosity range	22 to 2600 mm^2/s
Operating temperature range	0°C to 50°C (discharge detection)
Cracking pressure	0.06 MPa
Standard	IP67 RoHS (2011/65/EU,(EU)2015/863)
Mounting direction	No limit
Used lubrication pipe/length	NT-4, NT-4H, ST-4Z, CT-4 Length: 2000 mm or below Recommended length: 1000 mm or below
Connection continuous flow valve	MO2 type valve (discharge amount: 0.03 to 0.5 mL) Recommended valve size: 0.1 mL or above
Connection screw diameter *1	M6 × 0.75 tapered, M6 × 1 tapered, M8 × 1.25 tapered, R1/8 (cannot be used as a swivel joint)
Pipe connection port	One-touch type Bushing type (CB-4 is used)
Wire	Exterior: PVC ϕ 5.2, Length: 2500 mm Four-line (for contacts/thermocouples) Minimum bending radius: 30 mm
Built-in temperature sensor	K type thermocouple (EPM sensor temperature is measured) (temperature of the lubrication point is measured indirectly)
Temperature measurement range	0°C to 90°C
Accessories	HEX8-10 spanner: 1 pc Hexagonal wrench with nominal diameter of 1.5: 1 pc Hexagonal wrench with nominal diameter of 0.89: 1 pc Rotation prevention bracket (SUS304): 1 pc M2 × 4 mounting bolt: 2 pcs M2 looseness prevention screw: 1 pc

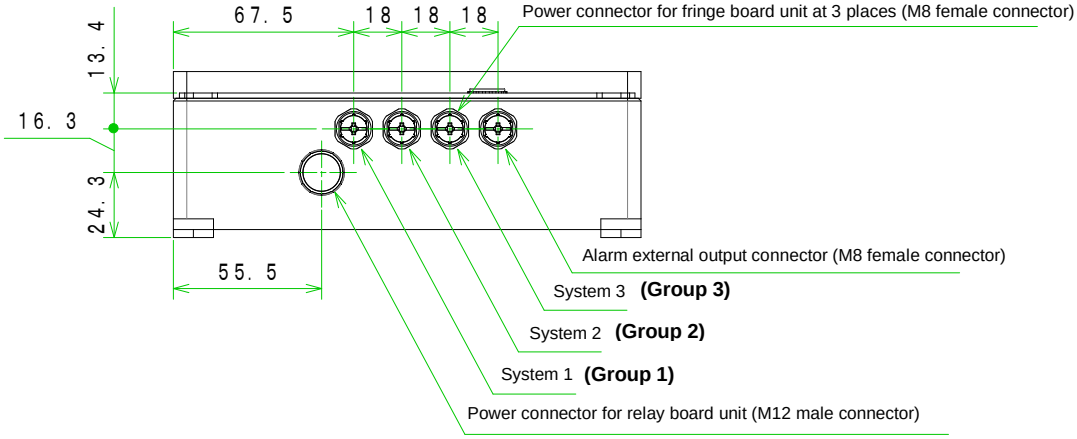
*1 Regarding the width across flat of the connection screw, R1/8 and M8 × 1.25 tapered type and HEX10.
M6 × 0.75 tapered type and M6 × 1 tapered type are HEX8.

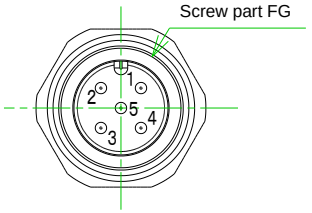
Even a very small foreign substance can cause operation failure if it gets inside. Please be careful when handling. Provide a line filter to the main pipe. Filtration accuracy of 40 μ or below is recommended.

(1) The EPM sensor has the structure of a check valve. The internal clearance is very small that it causes operation failure when a foreign substance gets in.
(2) When using the product with an oil system, provide a line filter to the main pipe to prevent foreign substances from entering the system. Filtration accuracy of 40 μ or below is recommended.
(3) The EPM sensor has cracking pressure. Check that the lubrication system has a sufficient pump operation time.
(4) The EPM sensor has cracking pressure and cannot be used for a resistive lubrication system.
(5) The contact may react to the expansion of the lubricant inside the lubrication pipe by the temperature range even when the pump is not operating.
(6) The temperature measurement inside the EPM sensor is affected by the temperature of the installation environment (machine or mold temperature).
(7) The EPM sensor return time becomes longer when the temperature is low. When the FS2 grease is used, the variation in the open time becomes larger. Make the setting range of the alarm wide.
(8) When using the relay board unit and end board unit, refer to "Temperature measurement VCC Make sure to read "Short circuit error". When VCC is shorted, the ON-OFF signal for discharge confirmation may malfunction. Be sure to confirm that VCC is not short-circuited when checking discharge.
(9) If you do not lubricate for a long time after installing the EPM sensor, the contact will not return properly.
may become See Troubleshooting on page 67 please give me.
(10) If you wish to purchase the EPM system, consult us.

2-7 Part Names/Dimensions of Relay Board Unit

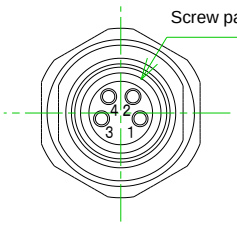






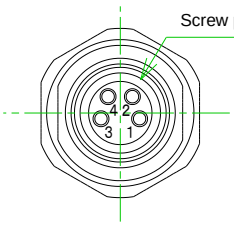
1 Power input (24 V)
2 Power input (0 V)
3 RS485 AY (+)
4 RS485 BZ (−)
5 Pump operation signal input

M12 male connector pin No.



1 Power output (5 V)
2 Power output (0 V)
3 Fringe board unit communication
4 Pump operation status output

M8 female connector
Systems 1 to 3 pin No.



1 Photo-coupler output (collector side (+ side))
2 Do not use this.
2 Do not use this.
4 Photo-coupler output (emitter side (- side))

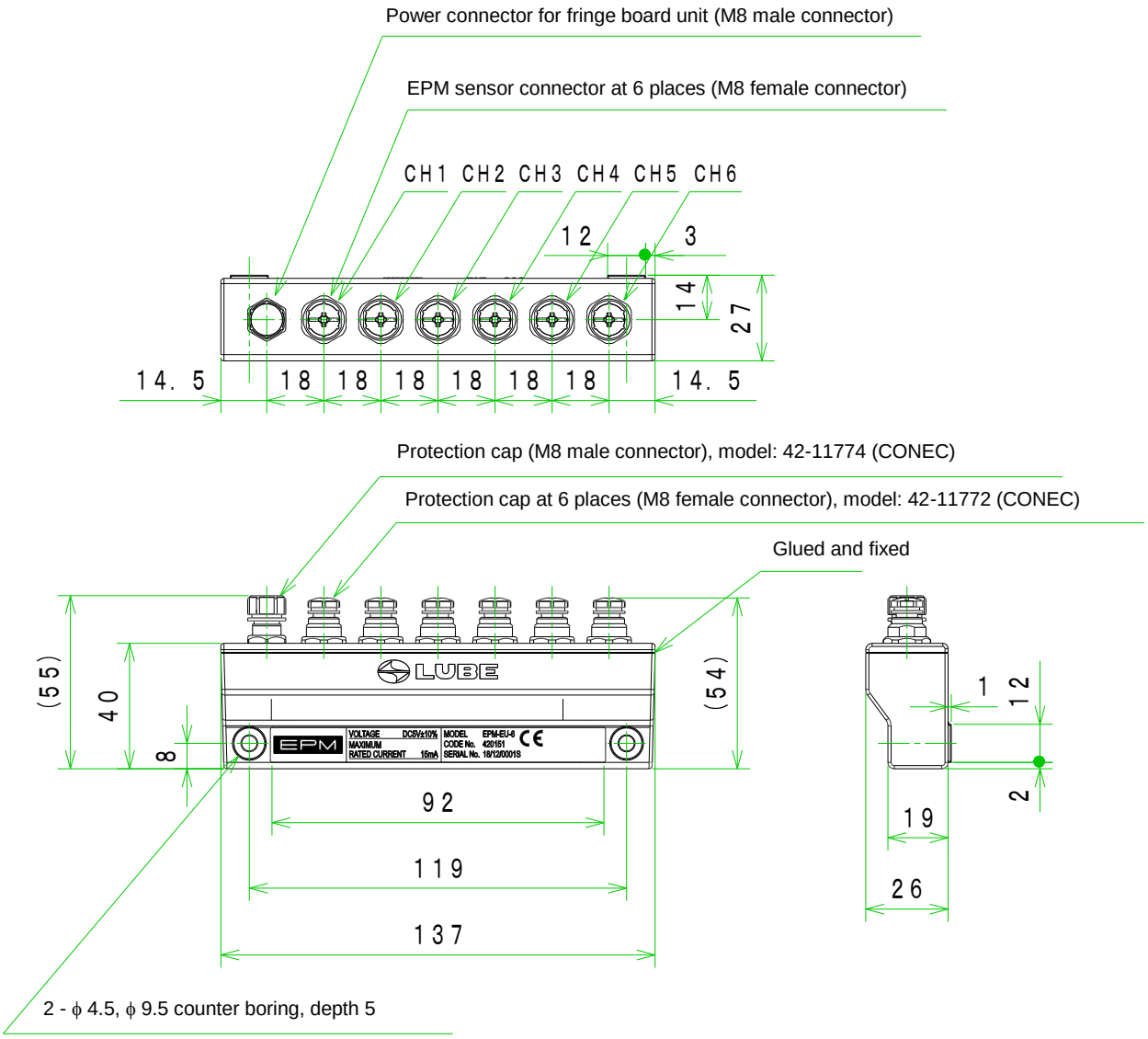
M8 female connector
Alarm external output connector pin No.

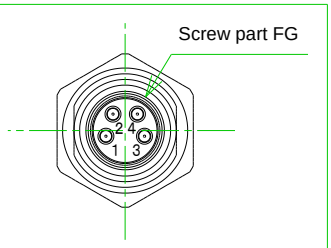
2-8 Specifications of Relay Board Unit

Power supply voltage	24VDC Use an NEC Class 2 power supply or use a 2 A UL Listed fuse. Install the fuse near the equipment.
Maximum power consumption	1 A (when 18 fringe board units are connected)
Input signal	Pump operation signal
Control-level communication	RS-485 (temp., contact info.)
Device-level communication	LIN communication (maximum distance is 20 m when AWG20 wire is used) (maximum distance is 15 m when AWG23 wire is used)
Connection	Up to 6 fringe board units per system (group) connectable (36 EPM sensors) Maximum number of connections : 18 fringe board units : 108 EPM sensors
Standard	IP65, RoHS2
Connector	M12 male (code-A), M8 female (code-A)
Case material	Polycarbonate resin
Ambient temperature	0°C to 50°C
RS485 communication (2-wire) type	
Communication protocol	The measurement data is output in a cycle of 500 ms.
Wire communication setting	Baud rate : 38400 bps Start bit : 1-bit Data bit : 8-bit, LSB first Parity : none Character set : binary

(1) When connecting the RS485 to a PC, use an RS485-USB converter or an RS485-LAN converter.
(2) The fieldbus has been designed to be used with an HMS module, but it is not mounted.
(3) Put a protection cap (IP67) on the unused port.

2-9 Part Names/Dimensions of Fringe Board Unit





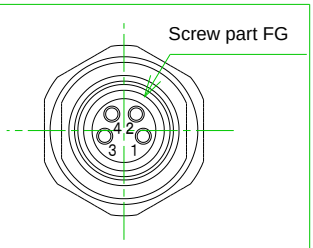
1 Power output (5 V)

2 Power output (0 V)

3 Fringe board communication

4 Pump operation signal input
In operation: 5 V
Non-operation: Open

M8 male connector pin No.



1 K type thermocouple plus

2 K type thermocouple minus

3 Contact input
ON: Short circuit to 0 V (Terminal 4)
OFF: Open

4 Contact input (0 V common)

M8 female connect or pin No.

2-10 Specifications of Fringe Board Unit

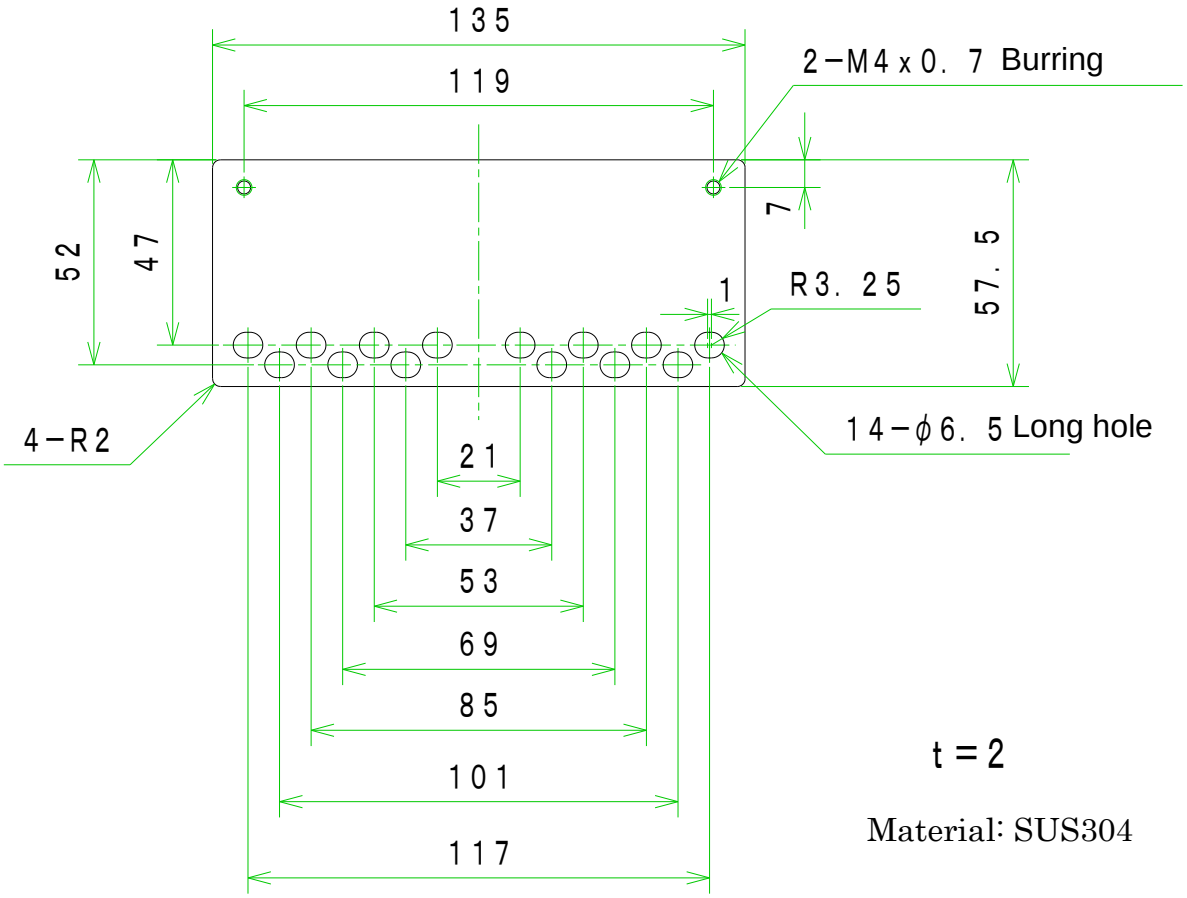
The unit aggregates the EPM sensor wires and sends measured values by communication.
(Temperature measurement value, contact open time count value, contact ON-OFF information)

Power supply voltage	5 VDC (supplied from the relay board)
Communication (output)	LIN communication slave (temp., contact info.), proprietary protocol
Standard	IP67, RoHS2
Connector	M8 male (code-A), M8 female (code-A)
Number of input points	6 points
Case material	Polyamide resin (PA6-GF30)
Ambient temperature	0°C to 50°C
Accessories	Mounting plate fringe board unit (SUS304): 1 pc M4 × 20 SUS cap bolt with SW: 2 pcs

(1) When connecting multiple fringe board units to one system (group), it is necessary to set the dial code to the fringe board unit.
(2) There are dial codes 1 to 6. Make sure the numbers do not overlap in each system.
(3) The dial code is set by connecting 1 fringe board unit to system 1 (group 1) of the relay board unit.
(4) Put a protection cap (IP67) on the unused port.
(5) Use an M8 branch connector when dividing the power communication wire for fringe boards.

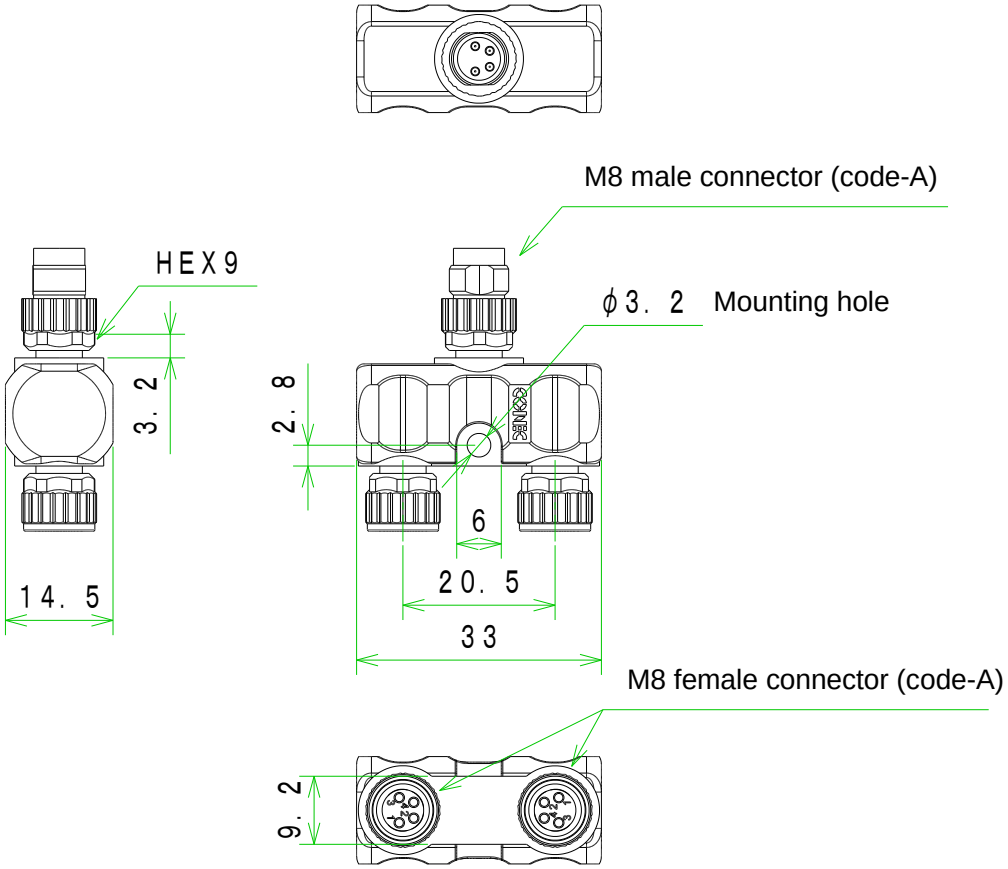

See page 24.

2-11 Part Names/Dimensions of Fringe Board Unit Mounting Plate



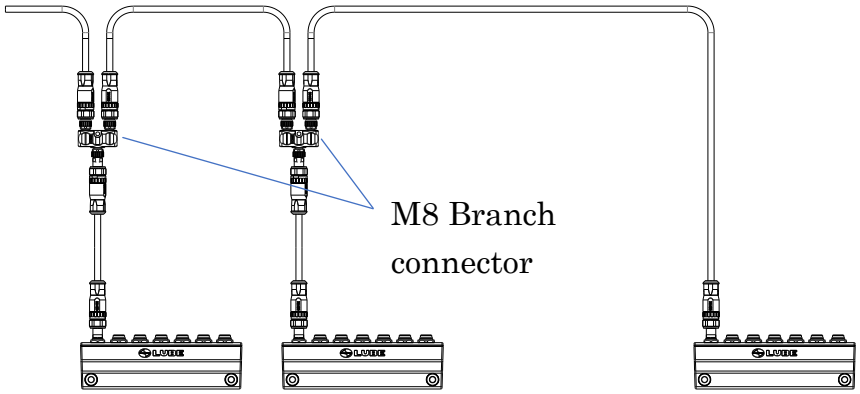
(1) The mounting frame comes with the fringe board unit.

2-12 Part Names/Dimensions of M8 Branch Connector

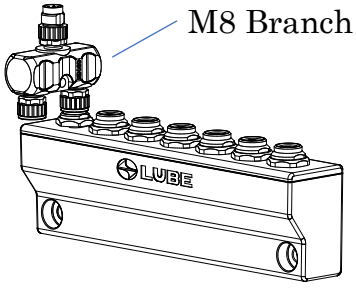


Code No. 733574

Connection method 1

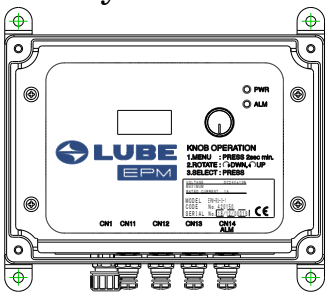


Connection method 2



2-13 Model and Code No. List

Relay board unit

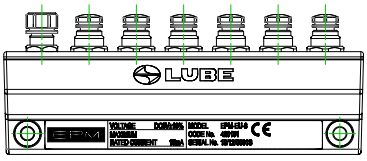


Model

EPM-RU-3-1

	Number of input ports		Communication form
1	3 ports	1	RS485

Fringe board unit

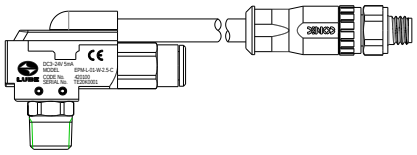


Model

EPM-EU-6

	Number of input ports
1	6 ports

EPM sensor



Model

EPM-□-□-□-□-□

Lubricant used

L	LHL-X100
H	FS2
O	Oil

Fitting size

01	R1/8
02	M6 × 0.75 tapered
03	M6 × 1.0 tapered
04	M8 × 1.25 tapered

Pipe connection

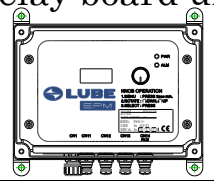
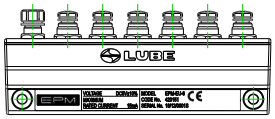
W	ϕ 4 one-touch
B	ϕ 4 bushing

Wire length

2.5	2.5 m

With or without connector

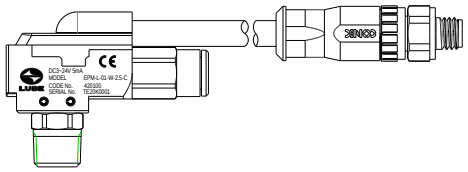
None	Without connector
C	With connector

Product	Model	Code No.
Relay board unit 	EPM-RU-3-1	420150
Fringe board unit 	EPM-EU-6	420151

Product	Name	Code No.
	M8 harness ASSY 5 m for fringe board unit	420060
	M8 harness ASSY 10 m for fringe board unit	420061
	M8 harness ASSY 20 m for fringe board unit	420062
	M12 harness ASSY 1 m for relay board unit	420080
	M12 harness ASSY 3 m for relay board unit	420081
	M12 harness ASSY 5 m for relay board unit	420082
	M8 2-core wire ASSY 3 m for alarm	420400
	M8 2-core wire ASSY 5 m for alarm	420401
	M8 2-core wire ASSY 10 m for alarm	420402
	EPM extension wire ASSY 2.5 m	420410
	EPM extension wire ASSY 5 m	420411
	EPM extension wire ASSY 10 m	420412

* M8 and M12 connectors are both screw type connectors, which allow disassembly and reassembly.

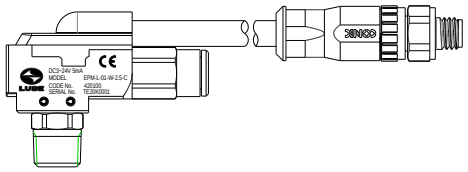
EPM sensor



Model		Code No.
EPM-L-01-W-2.5-C	LHL-W R1/8	420100
EPM-L-02-W-2.5-C	LHL-W M6 × 0.75, tapered	420101
EPM-L-03-W-2.5-C	LHL-W M6 × 1.0, tapered	420102
EPM-L-04-W-2.5-C	LHL-W M8 × 1.25, tapered	420103
EPM-L-01-B-2.5-C	LHL-B R1/8	420104
EPM-L-02-B-2.5-C	LHL-B M6 × 0.75, tapered	420105
EPM-L-03-B-2.5-C	LHL-B M6 × 1.0, tapered	420106
EPM-L-04-B-2.5-C	LHL-B M8 × 1.25, tapered	420107
EPM-L-01-W-2.5	LHL-W R1/8, no C	420110
EPM-L-02-W-2.5	LHL-W M6 × 0.75, tapered, no C	420111
EPM-L-03-W-2.5	LHL-W M6 × 1.0, tapered, no C	420112
EPM-L-04-W-2.5	LHL-W M8 × 1.25, tapered, no C	420113
EPM-L-01-B-2.5	LHL-B R1/ 8, no C	420114
EPM-L-02-B-2.5	LHL-B M6 × 0.75, tapered, no C	420115
EPM-L-03-B-2.5	LHL-B M6 × 1.0, tapered, no C	420116
EPM-L-04-B-2.5	LHL-B M8 × 1.25, tapered, no C	420117
EPM-H-01-W-2.5-C	FS2-W R1/8	420200
EPM-H-02-W-2.5-C	FS2-W M6 × 0.75, tapered	420201
EPM-H-03-W-2.5-C	FS2-W M6 × 1.0, tapered	420202
EPM-H-04-W-2.5-C	FS2-W M8 × 1.25, tapered	420203
EPM-H-01-B-2.5-C	FS2-B R1/8	420204
EPM-H-02-B-2.5-C	FS2-B M6 × 0.75, tapered	420205
EPM-H-03-B-2.5-C	FS2-B M6 × 1.0, tapered	420206
EPM-H-04-B-2.5-C	FS2-B M8 × 1.25, tapered	420207

* M8 connectors are screw type connectors, which allow disassembly and reassembly.

EPM sensor



Model		Code No.
EPM-H-01-W-2.5	FS2-W R1/ 8, no C	420210
EPM-H-02-W-2.5	FS2-W M6 × 0.75, tapered, no C	420211
EPM-H-03-W-2.5	FS2-W M6 × 1.0, tapered, no C	420212
EPM-H-04-W-2.5	FS2-W M8 × 1.25, tapered, no C	420213
EPM-H-01-B-2.5	FS2-B R1/ 8, no C	420214
EPM-H-02-B-2.5	FS2-B M6 × 0.75, tapered, no C	420215
EPM-H-03-B-2.5	FS2-B M6 × 1.0, tapered, no C	420216
EPM-H-04-B-2.5	FS2-B M8 × 1.25, tapered, no C	420217
EPM-O-01-W-2.5-C	OIL-W R1/8	420300
EPM-O-02-W-2.5-C	OIL-W M6 × 0.75, tapered	420301
EPM-O-03-W-2.5-C	OIL-W M6 × 1.0, tapered	420302
EPM-O-04-W-2.5-C	OIL-W M8 × 1.25, tapered	420303
EPM-O-01-B-2.5-C	OIL-B R1/8	420304
EPM-O-02-B-2.5-C	OIL-B M6 × 0.75, tapered	420305
EPM-O-03-B-2.5-C	OIL-B M6 × 1.0, tapered	420306
EPM-O-04-B-2.5-C	OIL-B M8 × 1.25, tapered	420307
EPM-O-01-W-2.5	OIL-W R1/8, no C	420310
EPM-O-02-W-2.5	OIL-W M6 × 0.75, tapered, no C	420311
EPM-O-03-W-2.5	OIL-W M6 × 1.0, tapered, no C	420312
EPM-O-04-W-2.5	OIL-W M8 × 1.25, tapered, no C	420313
EPM-O-01-B-2.5	OIL-B R1/8, no C	420314
EPM-O-02-B-2.5	OIL-B M6 × 0.75, tapered, no C	420315
EPM-O-03-B-2.5	OIL-B M6 × 1.0, tapered, no C	420316
EPM-O-04-B-2.5	OIL-B M8 × 1.25, tapered, no C	420317

* M8 connectors are screw type connectors, which allow disassembly and reassembly.

Repair parts

Product	Name	Code No.
	M8 male connector	733570
	M8 female connector	733572
	M12 female connector	733575
	M8 Branch connector	733574
	5-core wire 20 m for relay board unit	733624
	4-core wire 20 m for fringe board unit	733613
	2-core wire 20 m for alarm	733639
	Blue wire 20 m for EPM sensor	733638
	Rotation prevention bracket	650407
	Fringe board mounting bracket	650408

* M8 and M12 connectors are both screw type connectors, which allow disassembly and reassembly.

3. Handling

3-1 Environmental Conditions of Operation

Use the EPM sensor in following environments.
- Ambient temperature: 0 to +50°C
- Humidity: 35 to 85% RH
- For indoor use
- Altitude: up to 2000 m
- Pollution level: 2

Use the relay board unit in following environments.
- Ambient temperature: 0 to +50°C
- Humidity: 35 to 85% RH
- For indoor use
- Altitude: up to 2000 m
- Pollution level: 2

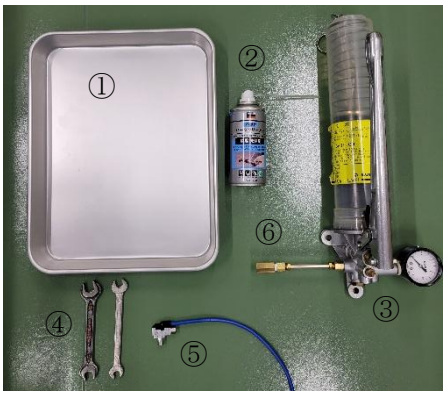
Use the fringe board unit in following environments.
- Ambient temperature: 0 to +50°C
- Humidity: 35 to 85% RH
- For indoor use
- Altitude: up to 2000 m
- Pollution level: 2

3-2 Cleaning Instruction

If the product becomes dirty, do not wipe it with wet cloth, benzine, thinner, or alcohol. The product may be discolored or deformed.
If the product becomes extremely dirty, remove the connector first. Put a thin neutral detergent on a cloth, wring it out, and wipe off the dirt. Wipe the product with a soft, dry cloth.

3-3 Disassembly/cleaning/assembly

If an abnormality occurs in the EPM sensor itself, the abnormality may be recovered by disassembling, cleaning, and reassembling according to the following procedure.



① Pallet
② Parts cleaner
③ Hand pump (10MPa boost)
④ Spanner (10mm, 11mm)
⑤ EPM sensor
⑥ Coupling connecting EPM sensor mounting screw and hand pump

Disassembly

①

remove discharge nipple

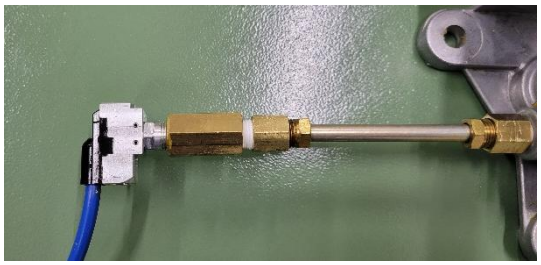
②

1 rotation of discharge nipple
Temporarily fix the internal parts.

③

Connect the EPM sensor mounting screw to the hand pump. In this state, increase the pressure to 10 MPa and remove the press-fitting of the internal

④



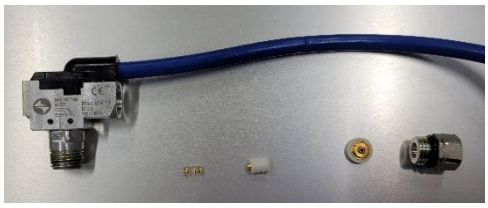
Remove the discharge nipple, let the hand pump discharge more grease, and remove the internal parts.

⑤

Remove the discharge nipple, let the hand pump discharge more grease, and remove the internal

Cleaning

⑥



Clean the removed parts with parts cleaner. Be careful not to deform or damage parts when cleaning.

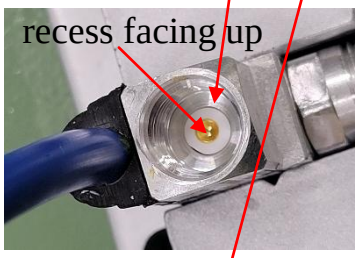
組立

⑦

⑧

Center the spring.

⑨



Insert the piston with the recess facing up.

⑩

Insert in the orientation of the image.

⑪

Tighten discharge nipple。

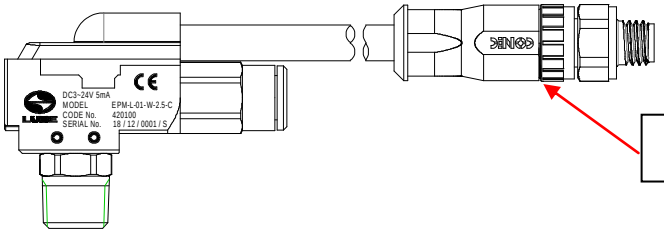
4. Wiring

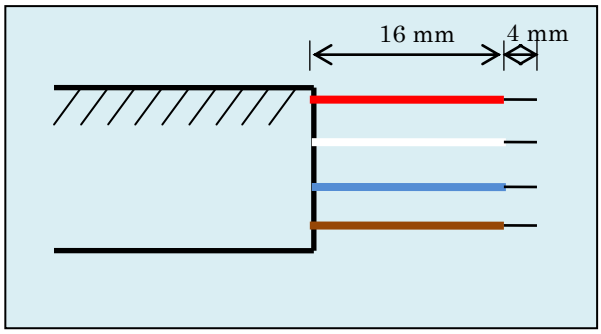
⚠WARNING The wiring work must be carried out by a qualified electrician.

See the figure below and check + and - before the work. The system does not work if + and - are wrongly connected.

If the external lead lines from the 24 VDC power supply comes into contact with hands, the outside of the machine, or surrounding objects, use insulated wires.

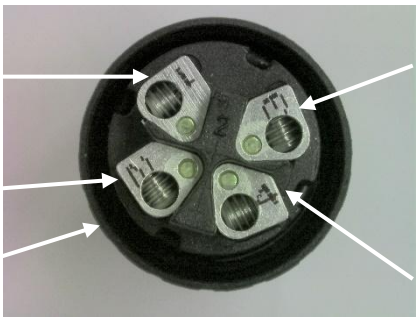
4-1 Wiring Between EPM Sensor and Fringe Board Unit





Red: K type thermocouple plus
White: K type thermocouple minus
Blue: contact input (NC)
Brown: contact input (COM)

See page 12.

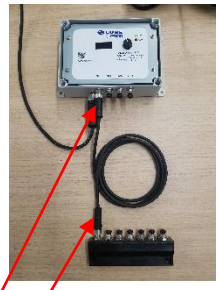


Wire specifications

- Conductor cross section area: 0.15 mm^2
- Exterior covering: ϕ 5.2 mm
- Exterior covering material: 105°C fire retardant PVC
- Minimum bending radius: 30 mm

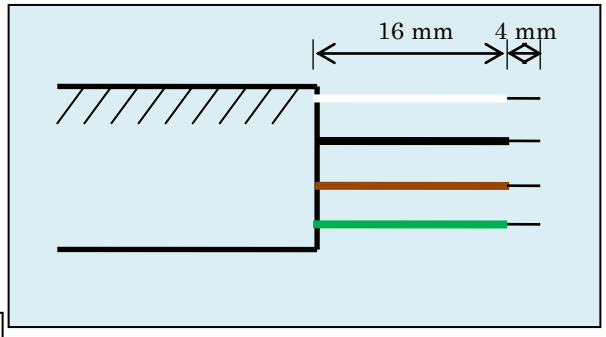
(1) Before connecting the wire to the connector, check that there is no short circuit with other connector electrodes.
(2) When extending the wire, use the EPM sensor extension wire.
(3) When making your own extension cable, the contact signal can be acquired if the wire is connected to pins 3 and 4. However, when using the fringe board unit, pins 1 and 2 must be shorted. If pins 1 and 2 are not shorted, it will be judged that the EPM sensor is not connected and an error will be output.

4-2 Wiring Between Fringe Board Unit and Relay Board Unit

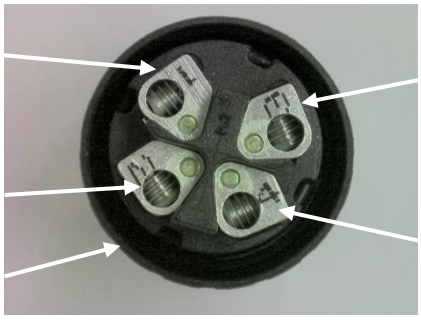


M8 female connector

M8 male connector



White: power output (5 V)
Black: power output (0 V)
Brown: fringe board unit communication
Green: pump operation signal
In operation: 5 V
Non-operation: Open



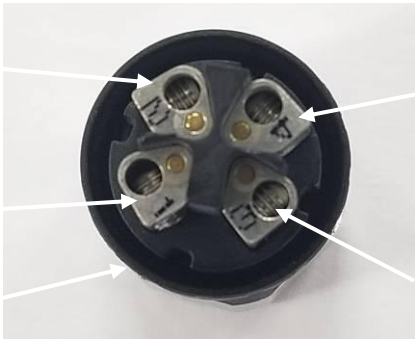
White: power output (5 V)

Black: power output (0 V)

M8 male connector

Brown: fringe board unit communication

Green: pump operation signal
In operation: 5 V
Non-operation: Open



Black: power output (0 V)

White: power output (5 V)

M8 female connector

Green: pump operation signal
In operation: 5 V
Non-operation: Open

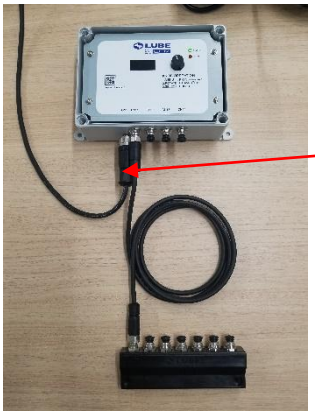
Brown: fringe board unit communication

Wire specifications

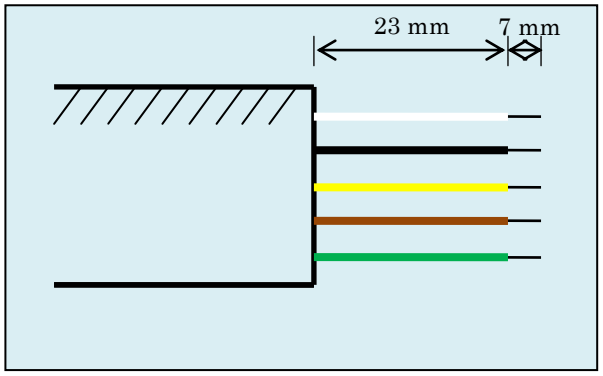
- Conductor cross section area: 0.519 mm^2
- Exterior covering: ϕ 5.2 mm
- Exterior covering material: heat resistant PVC
- Minimum bending radius: 30 mm
- Rated voltage: 30 V
- Rated temperature: 80°C
- Usable for moving part

(1) Before connecting the wire to the connector, check that there is no short circuit with other connector electrodes.

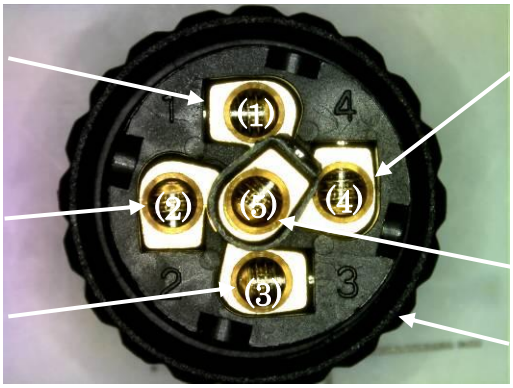
4-3 Power Communication Wiring of Relay Board Unit



M12 female connector



White: power input (24 V)
Black: power input (0 V)
Yellow: RS485 AY (+)
Brown: RS485 BZ (-)
Green: pump operation signal
In operation:
Short green and black wires.
Non-operation:
Open green and black wires.



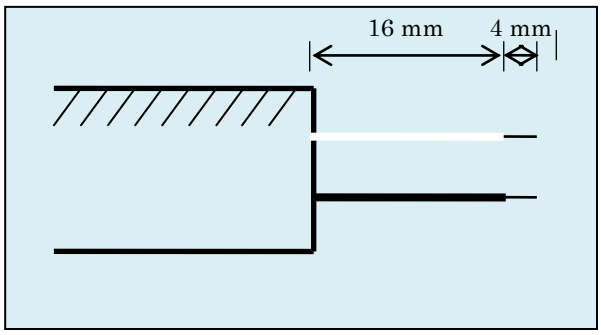
Wire specifications

- Conductor cross section area: 0.519 mm^2
- Exterior covering: ϕ 5.8 mm
- Exterior covering material: heat resistant PVC
- Minimum bending radius: 35 mm
- Rated voltage: 30 V
- Rated temperature: 80°C
- Usable for moving part

(1) Before connecting the wire to the connector, check that there is no short circuit with other connector electrodes.

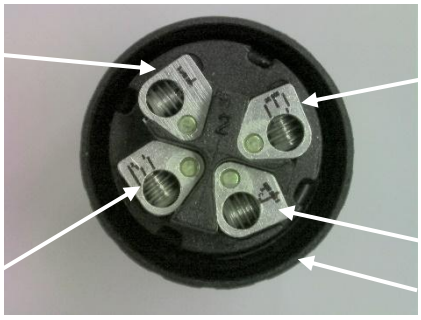
4-4 Alarm Wiring of Relay Board Unit

M8 male connector



White: photo MOS output (+ side)
Black: photo MOS output (- side)
Maximum applied voltage: 26.4 VDC
Maximum flowing current: 100 mA (when the temperature is 25°C)

See page 63 of the instruction manual of the relay board unit.



Wire specifications

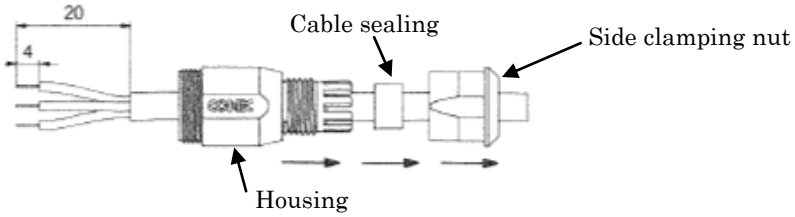
- Conductor cross section area: 0.5 mm^2
- Exterior covering: ϕ 4.2 mm
- Exterior covering material: heat resistant PVC
- Minimum bending radius: 30 mm
- Rated voltage: 150 V
- Rated temperature: 80°C
- Unusable for moving part

(1) Before connecting the wire to the connector, check that there is no short circuit with other electrodes.

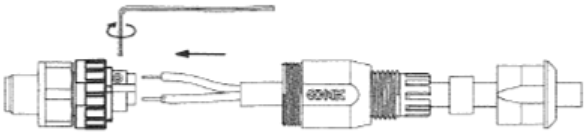
4-5 How to Connect M8 Connectors

(1) Put the side clamping nut, cable sealing, and housing on the wire.

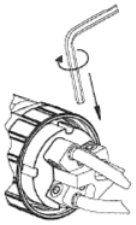
(2) Peel off the wire.



(3) Insert the peeled off wire to the all the way in.



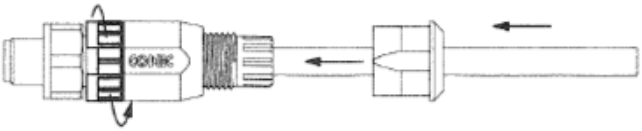
(4)



Tighten the screw with a hexagonal wrench.

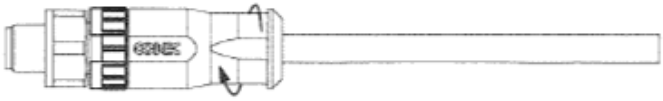
* Appropriate tightening torque: 0.1 N·m
Hexagonal wrench size: 0.89 mm
(Included with the EPM sensor)

(5) Attach the housing with a housing nut.
Attach the side cable sealing and the housing.

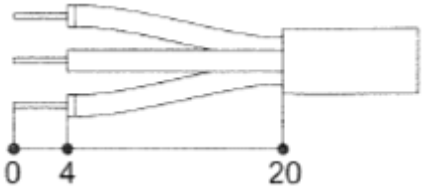


Insert the cable in the connector.

(6) Tighten the clamping nut.

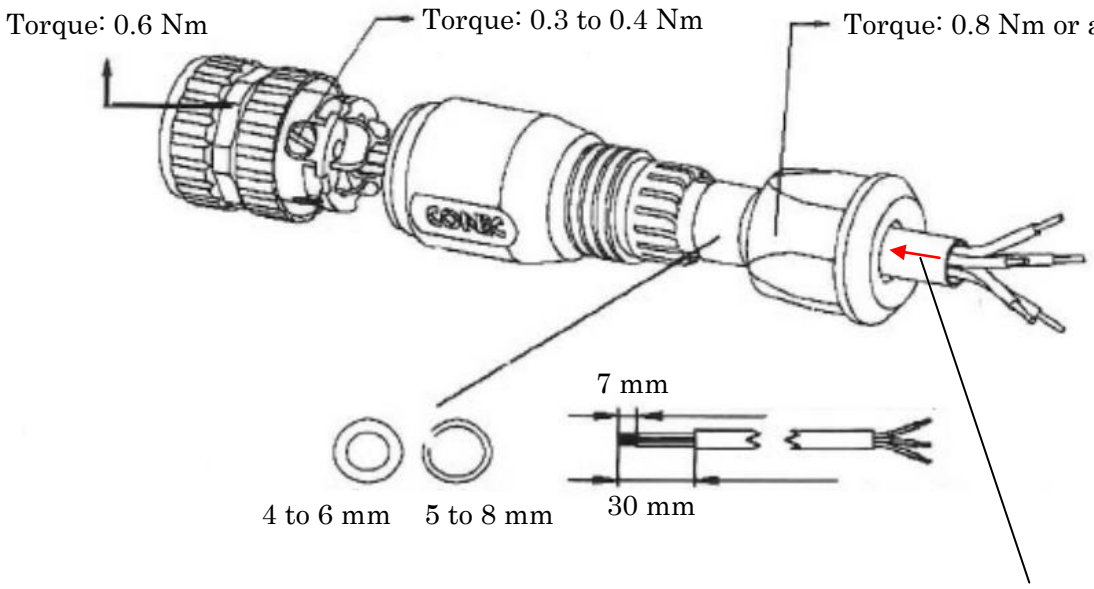


* Reference diagram of wire stripe



cable	wire
Ø4 - 5,5mm	0,14 - 0,50mm² AWG 26 - 20

4-6 How to Connect M12 Connectors

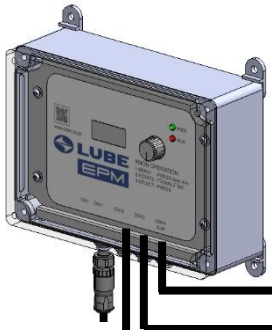


Insert the cable in the connector.

5. Relay Board Unit Setting

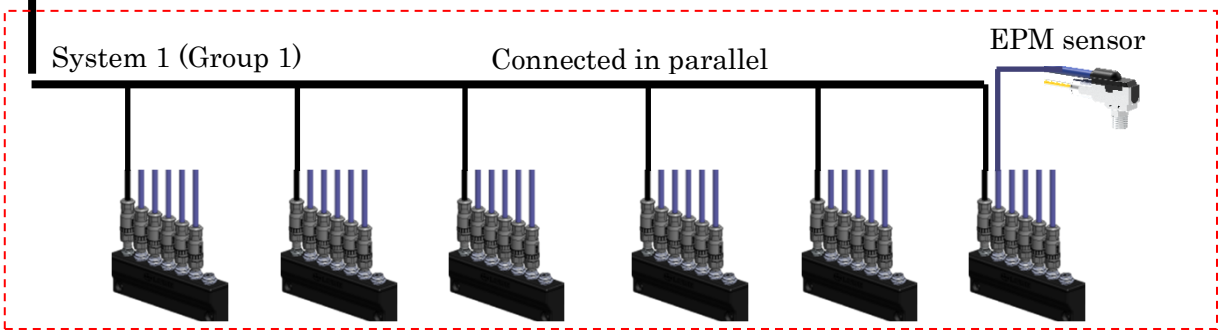
5-1 Setting Overview of Relay Board Unit Communication

The relay board unit collects information by communication with the fringe board unit and sends the information to the control-level equipment.
When the relay board unit performs communication with the fringe board unit, it is necessary to set the dial code (ID) to the fringe board unit.



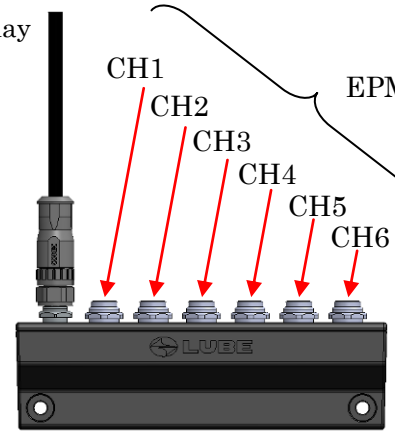
When connecting the ID of the fringe board unit, it is necessary to set the ID (dial code) number before installation.

System 3 (Group 3)
System 2 (Group 2)
System 1 (Group 1)
Connected in parallel
EPM sensor



ID 1 (Dial code 1) ID 2 (Dial code 2) ID 3 (Dial code 3) ID 4 (Dial code 4) ID 5 (Dial code 5) ID 6 (Dial code 6)

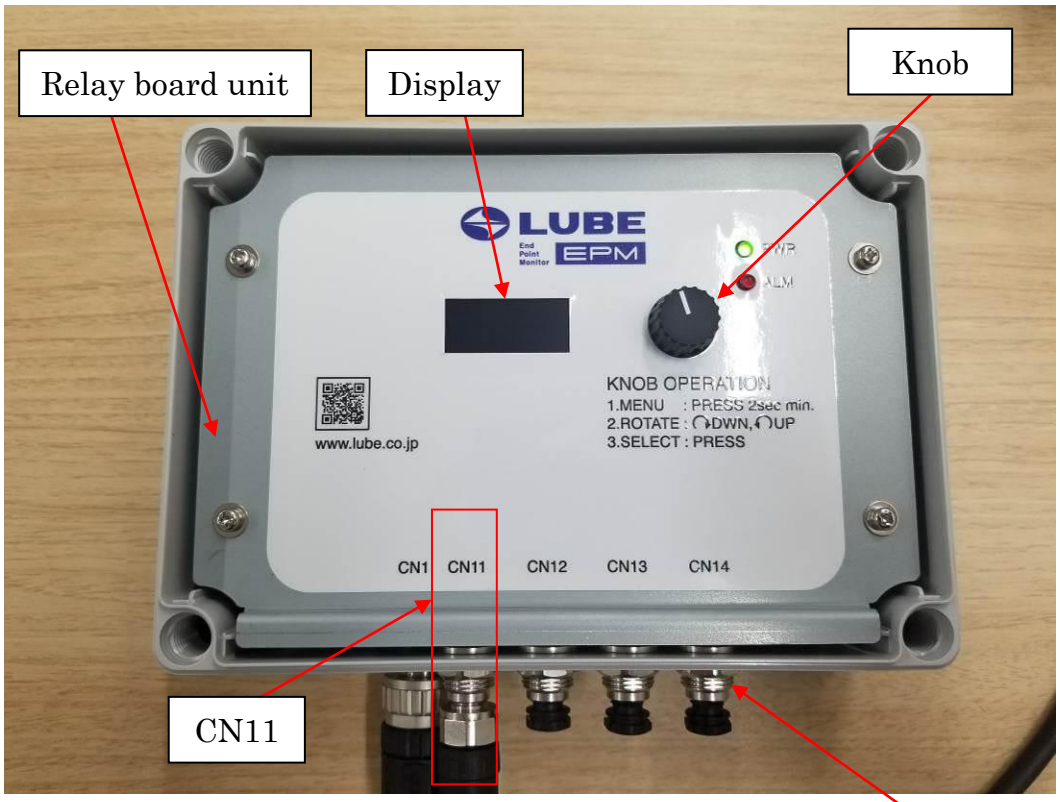
Connection to relay board unit
CH1
CH2
CH3
CH4
CH5
CH6
EPM sensor connection



Fringe board unit

EPM sensor ID No.: 135 to 366
Group No.
ID
CH

5-2 How to Set Dial Code (ID) of Fringe Board Unit



Basic operation

<1> How to display menu screen

(1)

RUNNING	

Press the knob, and display "RUNNING" as shown on the left.

(2)

MENU >1. LANG	

Press the knob for 1 or more seconds, and display "MENU" as shown on the left.

* The display turns off when there is no operation for 60 seconds.

<2> How to set language

(1)

MENU >1. LANG	

Display “MENU” shown on the left, and select “1. LANG”.

(2)

2. ENG >2. JPN	

Rotate the knob clockwise, and select “JPN”.

* This is the setting step in Japanese.

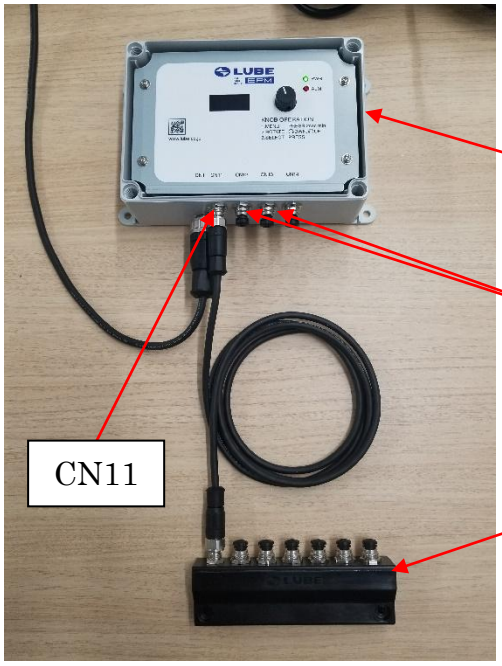
(3)

1. JPN >BACK	

Rotate the knob clockwise, and select “BACK” to display the menu screen.

<3> How to set ID (dial code)

As shown below, connect only 1 fringe board unit to system 1 of the relay board unit.



* The default ID is set to 1.
  This setting should be made only when multiple terminal board units are to be connected.

Relay board unit

Do not connect the fringe board to CN12 or CN13 when the ID is set.

Fringe board unit

Connect only 1 fringe board unit when the ID is set.

(1)

1. LANG >2. ID	From the menu screen, select “2. ID”.

(2)

>1. READ 2. WRITE	When the screen on the left appears, select “2. WRITE”.

(3)

SetID=1 >2. WRITE	Check that the screen on the left is shown and set “SetID” to 1. * ID can be set from 1 to 6.

(4)

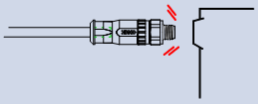
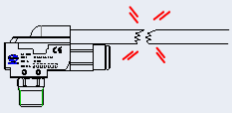
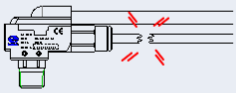
>1. READ 2. WRITE	When the screen on the left appears, select “1. READ” and check the setting.

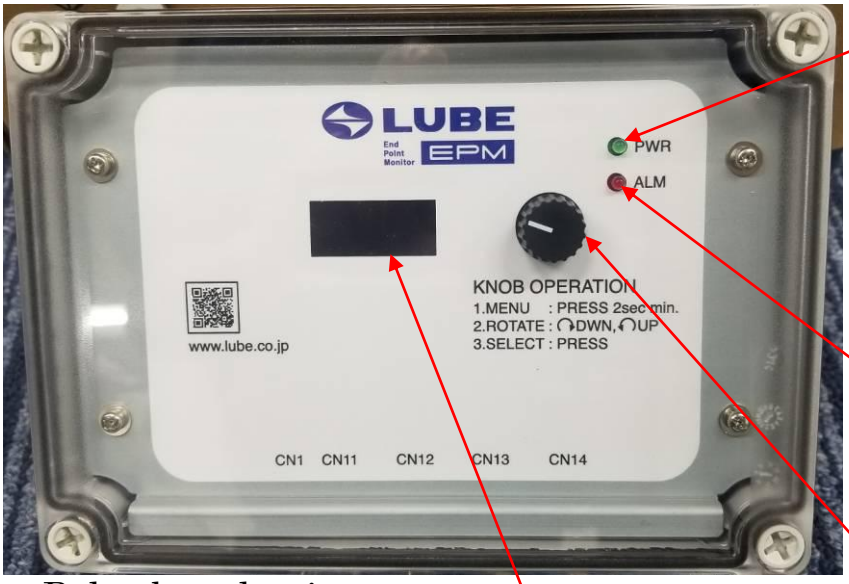
(5)

ReadID=1 >BACK	Check that the ID is set to 1. Select “BACK” to return to the menu screen and complete the setting.

5-3 Overview of Relay Board Unit Alarms

The relay board unit detects and outputs the connection error, disconnection error, temperature error, discharge error, and communication error. The alarm is set by the alarm setting software.

Error name	Description	Image
I. Configuration error	The alarm is output when there is difference between the connection configuration registered to the relay board unit and the actual wire connection of the EPM sensor and the fringe unit. (The default setting is set by a PC.)	
II. Disconnection error	The alarm is output when the wire of the EPM sensor is disconnected.	
III. Temperature error	The alarm is output when the temperature exceeds the set value.	
IV. Discharge error	The alarm is output after the ON/OFF of the sensor contact and the time are confirmed.	
V. Communication error	The error is output when the communication between the relay unit and the fringe unit fails by the influence of the machine or electrical noise.	



Relay board unit

On: In operation and all EPMs are closed.
Flashing: In operation and there is an unreturned EPM.
Off: Operation is paused. (No power)

Flashing: There is an alarm.
Off: There is no alarm.

Knob
Hold down the knob (for two seconds) to move to the menu screen.

Display screen shows;
Alarm details
Menu screen

6. Necessary Parts and Tools

6-1 Parts

(1) Relay board unit

(2) Fringe board unit
(including accessories)

(3) EPM sensor
(including accessories)

(4) Relay board unit
M12 wire ASSY

(5) Fringe board unit
M8 wire ASSY

(6) Relay board unit
M8 alarm wire

(7) 2-core wire

(8) EPM sensor extension wire

(9) M8 branch connector

(10) PC
(provided by customer)

(11) USB converter
(provided by customer)

(12) 24 VDC power unit
(provided by customer)

6-1-1 Parts Description

(1) Relay board unit: 1 pc
- It is mounted by four M5 screws.
- It is unnecessary when directly connecting the EPM sensor to the machine.
- IP65

See page 12.

(2) Fringe board unit: 1 or more pcs
- It is mounted by two M4 screws.
- One fringe board mounting plate and two M4 × 20 bolts come with the unit.
- 6 EPM sensors can be connected to 1 fringe board unit.
- It is unnecessary when directly connecting the EPM sensor to the machine.
- IP67

See page 12.

(3) EPM sensor: 1 or more pcs
- Use the attached thin spanner for mounting.
- If the EPM sensor attached to the moving part rotates, use the attached rotation prevention bracket.
- Wrap a seal tape around the mounting screw part.

See page 11.

(4) M12 wire ASSY for relay board unit
- The M12 connector can be connected by a flathead screwdriver.
- Minimum bending radius: 35 mm, Usable for moving part
- Rated voltage: 30 V, Rated temperature: 80°C

See page 37.

(5) M8 wire ASSY for fringe board unit
- The M8 connector can be connected by a 0.89 hexagonal wrench.
- Minimum bending radius: 30 mm, Usable for moving part
- Rated voltage: 30 V, Rated temperature: 80°C

See page 36.

(6) M8 alarm wire of relay board unit
- The M8 connector can be connected by a 0.89 hexagonal wrench.
- Minimum bending radius: 30 mm, Unusable for moving part
- The 2-core wire of (7) is used.

See page 38.

(7) 2-core wire

- It is used for extending the communication wire of RS485.
- It is used for capturing pump operation signals.
- It can also be used as a wire of alarm output.
- Unusable for moving part
- Rated voltage: 150 V, Rated temperature: 80°C

(8) EPM sensor extension wire

- It is used for extending the EPM sensor wire to 2.5 m or above.

See page 27.

(9) M8 branch connector

- It is necessary to connect multiple fringe board units to one system.

See page 30.

(10) PC

- It is used to display the EPM sensor waveforms and perform logging.
- It is used for setting the alarm threshold value of the relay board unit.

Instruction manual of the PC monitoring tool for EPM sensors
Instruction manual of the PC alarm setting tool for EPM sensors

(11) USB converter

- It is used for connecting RS485 to the PC (USB).
- It is necessary to install the driver of the USB converter.
- For a converter with a DIP switch, perform setting to 2-wire type RS485.

- USB-003 Rev.5 by HuMANDATA LTD.

See Chapter 2-2 of the instruction manual of the PC alarm setting tool for EPM sensors.

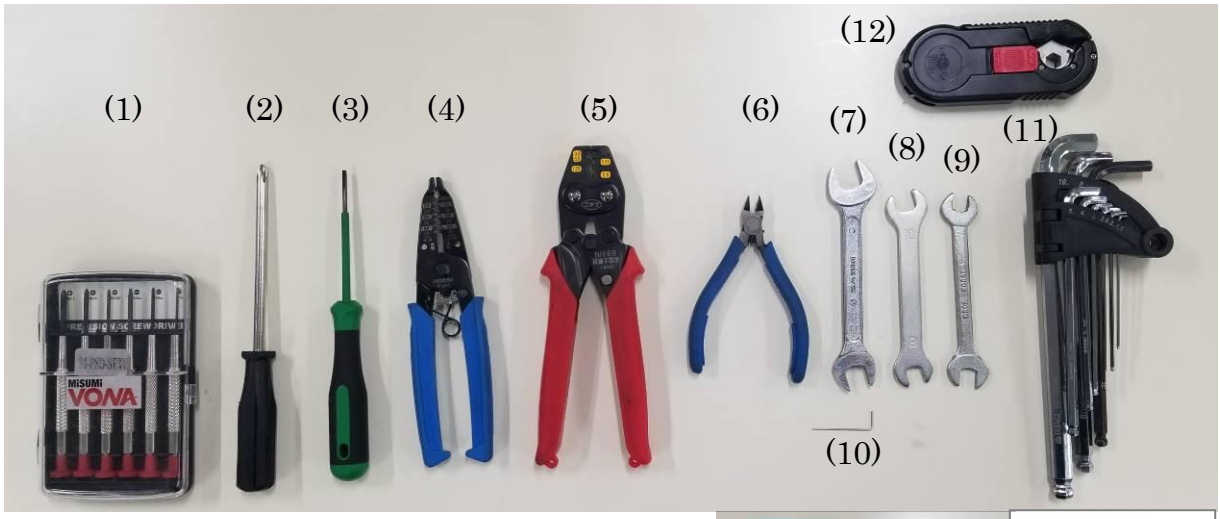
(12) 24 VDC power unit

- Use an NEC Class 2 power supply or a 2 A fuse.
- Use a UL listed fuse.
- Install the fuse near the equipment.
- Use a power supply of 24 VDC and 30 W or above.

- 24 VDC power supply by COSEL CO., LTD. (model KHNA30F-24-C): 1 pc
- DIN rail 35 mm × 100 mm
- WAGO relay (model: 859-304): 1 pc
- WAGO relay cover (model: 859-525): 1 pc
- WAGO terminal block (model: 2000-1301): 5 pcs
- WAGO terminal block cover (model: 2000-1301): 5 pcs
- WAGO stopper (model: 249-116): 2 pcs

See page 53.

6-2 Tools



(1) Precision driver set
(2) Phillips screwdriver
(3) Flathead screwdriver (width: about 3 mm)
- It is used for connecting M12 connectors and WAGO terminal block wires.

(4) Wire stripper
(5) Crimping tool
(6) Nipper
(7) HEX13 spanner
- It is used for tightening M8 connectors (tightening torque: 0.4 Nm).

(8) HEX8-10 thin spanner
- It is used for mounting EPM sensors (the spanner comes with the EPM sensor).
- Thin spanner (thickness: 3.2 mm or below)

(9) HEX9 thin spanner
- It is used for tightening M8 branch connectors.

(10) Hexagonal wrench: 0.89 mm
- It is used for connecting M8 connectors (it comes with the EPM sensor connector).

* It should be prepared separately when no connector is used.

(11) Hexagonal wrench: (1.5 mm to 10 mm, the short type is also prepared)
- It is used for mounting fringe board mounting brackets (nominal size: 5 mm).
- It is used for mounting fringe boards (nominal size: 3 mm).
- It is used for mounting rotation prevention brackets (nominal size: 1.5 mm, comes with the EPM sensor).

(12) Nylon tube cutter
(13) Tester
(14) Hand pump

6-3 Fixtures

(1) Large cable ties

- T50R by HellermannTyton Co., Ltd.

(2) Small cable ties

- AB80-W by HellermannTyton Co., Ltd.

(3) Insulation sleeves

(4) Crimping terminals

- 1.25Y-3.5 by NICHIFU Co.,Ltd.

Others

- Parts cleaner
- Seal tape
- Waste cloth
- Lead wires
- Bolts and nuts
- Pallet
- Vinyl tape (for protecting M8 connectors as necessary)

7. Installation Method/Procedure

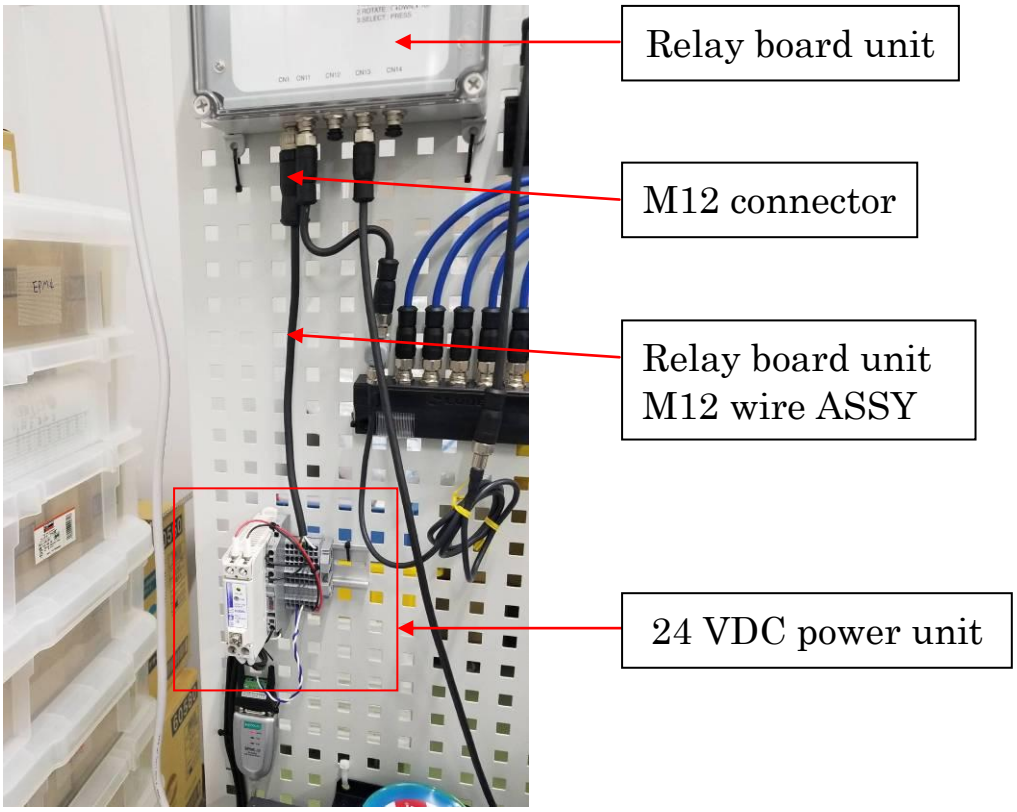
Step 1: Installation of Relay Board Unit

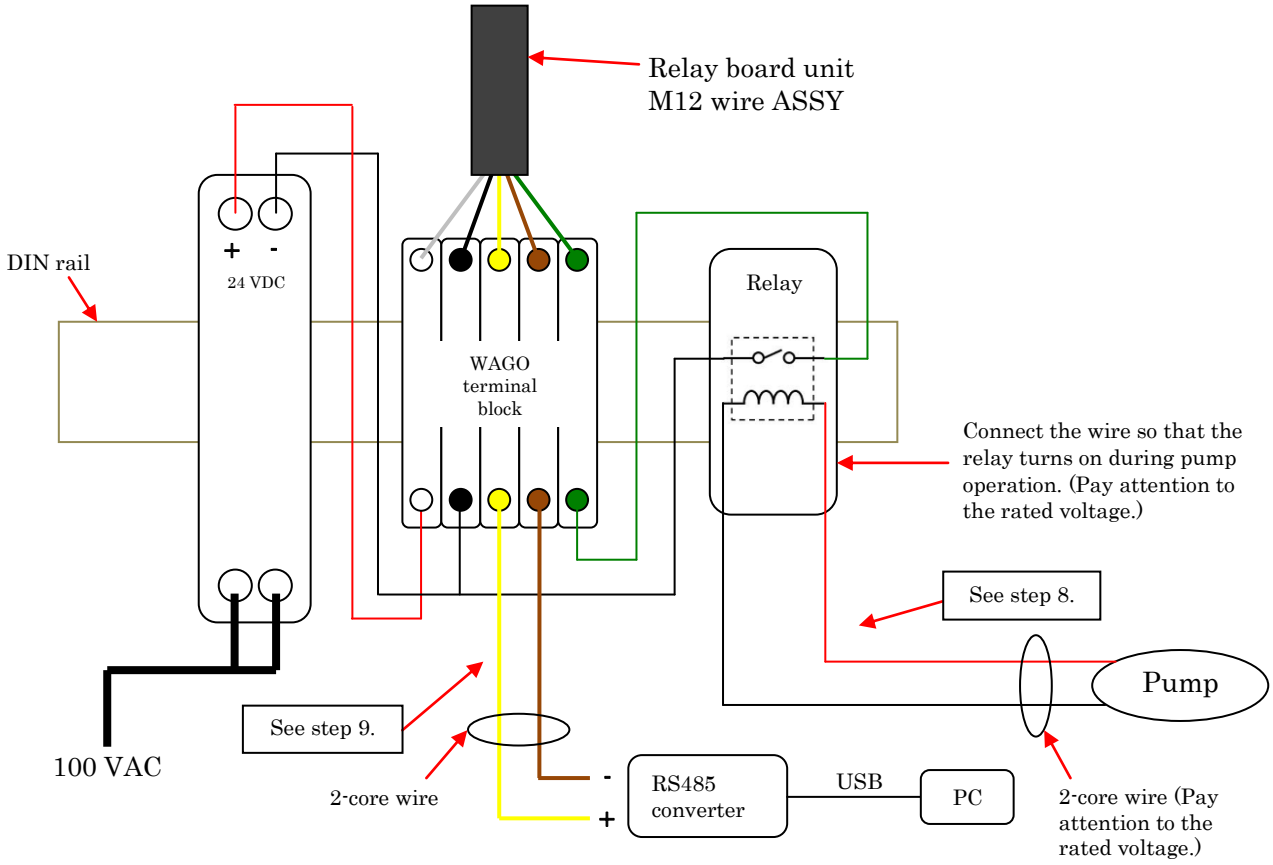
First, determine the installation location of the relay board unit. Prepare the M5 screws for mounting.

*See page 19 for mounting dimensions.

Step 2: Installation/Wiring of 24 VDC Power Unit

Install the 24 VDC power unit, and connect wires.

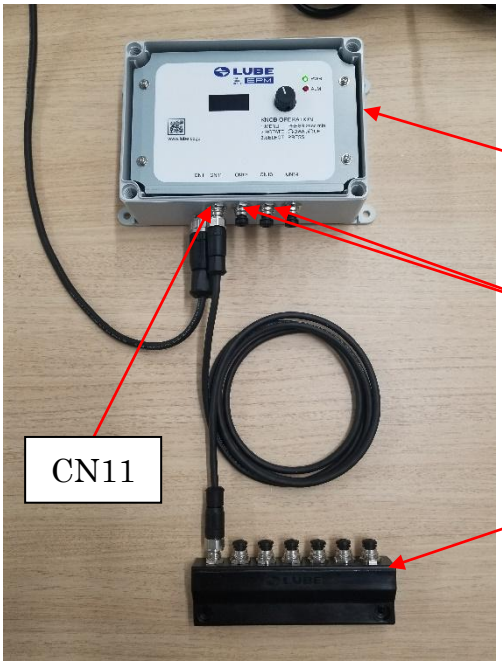




See page 37.

Step 3: Dial Code Setting of Fringe Board Unit

Turn on the power of the relay board unit, and set the dial code of the fringe board unit.



* The default ID is set to 1.
This setting should be made only when multiple terminal board units are to be connected.

Relay board unit

Do not connect the fringe board to CN12 or CN13 when the ID is set.

Fringe board unit

Connect only 1 fringe board unit when the ID is set.

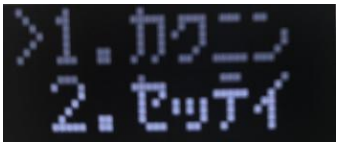
(1)

```
  2. LANG
>2. ID
```

From the menu screen, select “2. ID”.

(2)

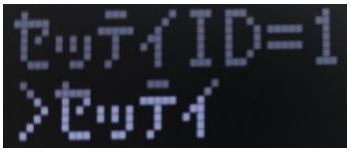
```
>1. READ
  2. WRITE
```



When the screen on the left appears, select “2. WRITE”.

(3)

```
SetID=1
>2. WRITE
```

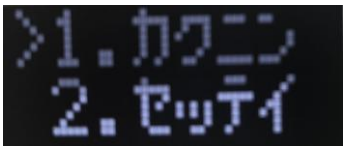


Check that the screen on the left is shown and set “SetID” to 1.

* ID can be set from 1 to 6.

(4)

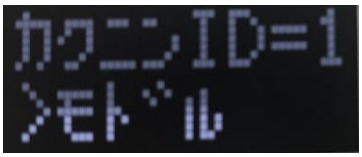
```
>1. READ
  2. WRITE
```



When the screen on the left appears, select “1. READ” and check the setting.

(5)

```
ReadID=1
>BACK
```



Check that the ID is set to 1. Select “BACK” to return to the menu screen and complete the setting.

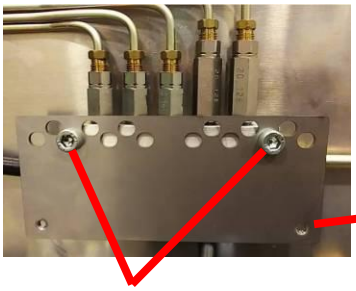
Step 4: Installation of Fringe Board Unit

Determine the place for installing the fringe board unit, and install it. Use M4 screws for mounting. When tightening the fringe board unit together with the valve junction, use the fringe board mounting plate.

Mounting bracket
A junction of 1 to 7 ports is supported.

Fringe board unit

Remove the fixing bolt of the continuous flow valve junction.



Tighten the mounting bracket together with the valve junction.

The fringe board unit has undergone burring processing. Face the surface with projections to the lower side.

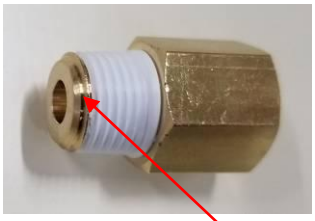
Fix the fringe board unit with M4 bolts.

It can also be used in the opposite direction. Install it in the direction that suits your requirements.

Step 5: Mounting EPM Sensor

Mount the EPM sensor to the lubrication point.

Precautions for pipe construction (seal tape)



Good example

Leave one thread without wrapping a seal tape.

Bad example

The sealing tape may break when screwed in, resulting in foreign substance.

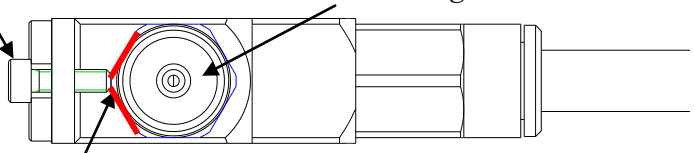
(1) Select the appropriate EPM sensor for each lubricant.
(2) Check that the lubrication point is not clogged up.
(3) Wrap a seal tape around the connection screw.
(4) When mounting the EPM sensor, use a HEX8 or HEX10 thin spanner or the attached spanner (spanner thickness: 3.2 mm or below).
(5) The internal clearance of the EPM sensor is very small that it causes operation failure when a foreign substance gets in. Make sure that no foreign substances get into the senor during mounting. When installing new piping, clean it well to prevent burrs and other contaminants from entering.
(6) Protect the M8 connector with a vinyl tape as necessary.
(7) Fix the lubrication pipe to the facility so that the EPM sensor does not rotate, or use the rotation prevention bracket.
(8) When supplying grease, use a hand gun and keep the internal pressure of the EPM sensor not to exceed 5MPa. Do not supply grease with an electric grease gun or a pneumatic grease gun. The internal part may break.
(9) Clean the hand gun used for grease filling well, and make sure that no foreign substances get inside the EPM. In addition, by connecting the pipe after a small amount of grease is discharged, it is possible to prevent foreign substances on the grease surface from entering the system.
(10) If a different lubricant has been supplied, replaced it with the designated one.
(11) Do not supply the lubricant from the discharge port of the EPM sensor. (Do not make the lubricant flow back.)
(12) The lubrication pipe length must be 2000 mm or below.
(13) The minimum bending radius of the EPM sensor is 30 mm. The life of the pipe of the moving part is extended by making the bend large.
(14) Make sure to release the air in the EPM sensor and the lubrication pipe. When air enters the system, the EPM sensor response may differ from the normal state.
(15) Discharge lubricant from the valve several times until the operation of the EPM sensor becomes stable.

Rotation prevention bracket mounting

Fixing screw

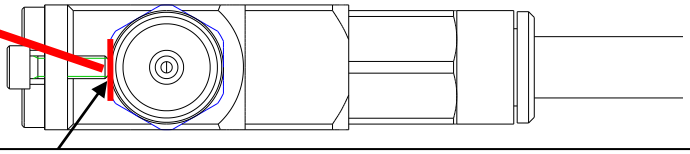
Mounting screw

Bad example



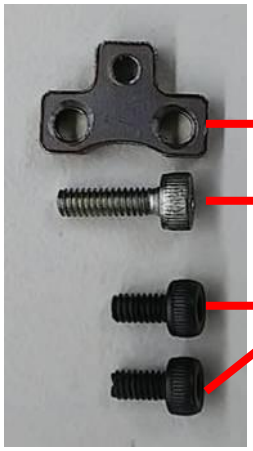
The mounting screw is not fixed at the hexagonal flat surface.

Good example



The hexagonal flat surface of the mounting screw is perpendicular to the fixing screw.

Fix the mounting screw so that the hexagonal flat surface of the rotation part comes in front of the fixing screw.



Rotation prevention bracket

Fixing screw

Screws for fixing rotation prevention bracket

Fix the rotation prevention bracket to the EPM sensor. (Use a hexagonal wrench of 1.5 mm)

Tighten the fixing screw to suppress rotation. (Use a hexagonal wrench of 1.5 mm)

* Note that excessive tightening causes grease leaks and damage.

(1) Tighten the fixing screws for about 90° after they come into contact with the rotation prevention bracket. After tightening, check that the EPM sensor is firmly fixed.

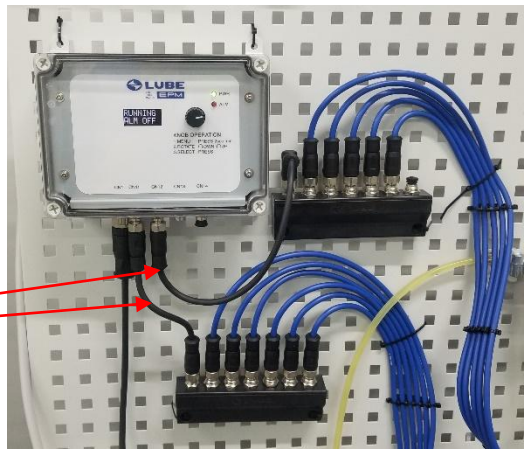
Step 6: Wiring of Relay and Fringe Board Units

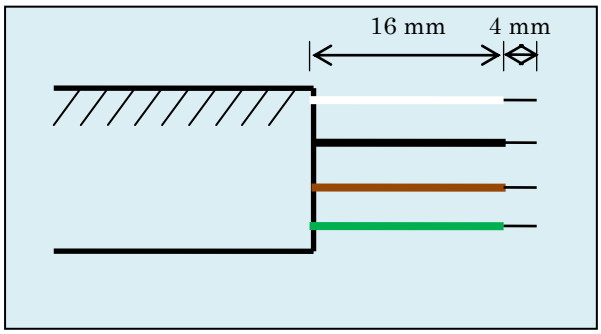
Connect the M8 connector of the relay board unit and the fringe board unit. Protect the M8 connector with a vinyl tape as necessary.

M8 female connector
Fringe board unit connection

Tightening torque
0.4 Nm

(5) Fringe board unit
M8 wire ASSY



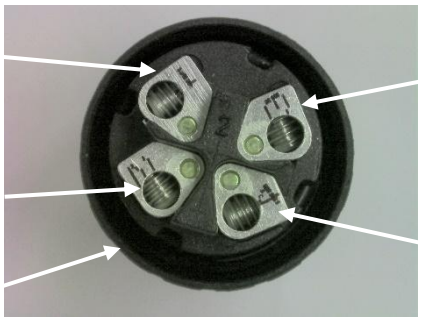


White: power output (5 V)
Black: power output (0 V)
Brown: fringe board unit communication
Green: pump operation signal
In operation: 5 V
Non-operation: Open

White: power output (5 V)

Black: power output (0 V)

M8 male connector
M8 female connector



Brown: fringe board unit communication

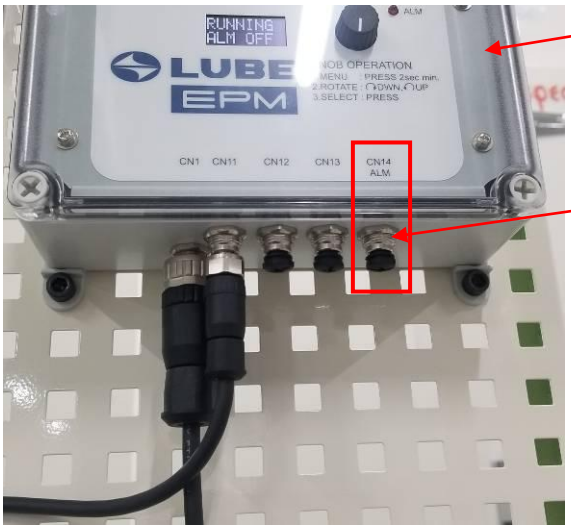
Green: pump operation signal
In operation: 5 V
Non-operation: Open

See page 36.

Step 7: Alarm Wire Connection

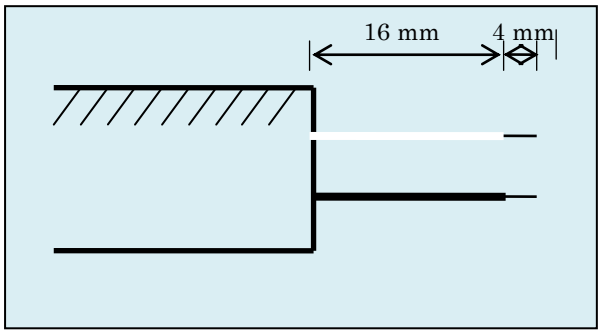
To output alarms to the outside, connect the wire to the alarm output port of the relay board unit.

(6) Relay board unit
M8 alarm wire

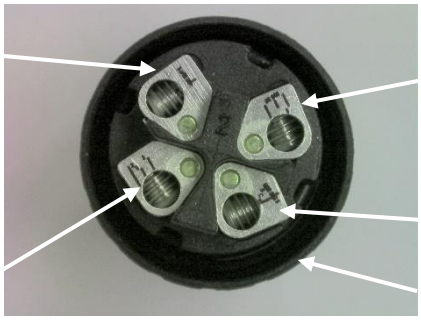


Relay board unit

Alarm output port
(M8 female connector)



White: photo MOS output (+ side)
Black: photo MOS output (- side)



White: photo MOS output (+ side)

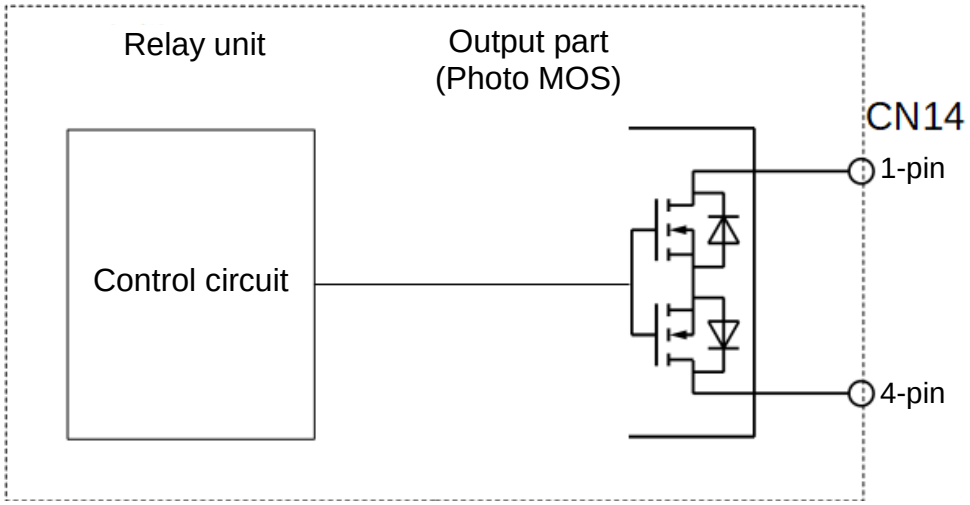
Unconnected

Black: photo MOS output (- side)

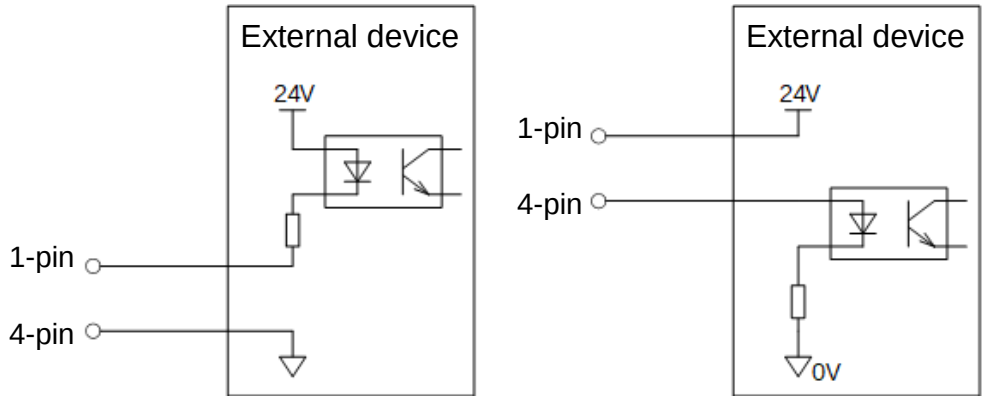
Unconnected

M8 male connector

See page 38.



Alarm output block diagram



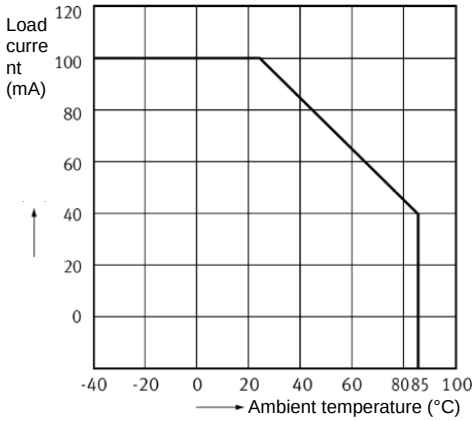
Connect the wire in accordance with the polarity of the external device.

External device connection example

Item	Description
Alarm output	Photo MOS output Maximum applied voltage: 26.4 VDC (24 VDC + 10%), maximum flowing current: 100 mA (when the ambient temperature is 25°C), temperature derating (see the figure below) (30 VDC type of surge protection element built-in, overcurrent protection function built-in)

1. Characteristic of load current - ambient temperature

Allowed ambient temperature: -40 to +85°C



Maximum flowing current temperature derating of alarm output part

Step 8: Pump Operation Signal Wiring

The pump operation signals are imported to the relay board unit.
(See the circuit diagram in step 2.)

Rated voltage: 150 V
Rated temperature: 80°C
Prepare another wire if the rated voltage is to be exceeded.

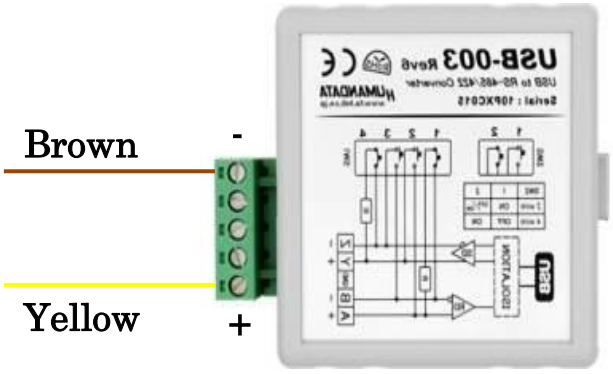
(7) 2-core wire

Step 9: Communication Wire Connection

Extend the RS485 communication wire, and connect it with the RS485 converter.
(See the circuit diagram in step 2.)

Rated voltage: 150 V
Rated temperature: 80°C

(7) 2-core wire



Step 10: Installation of RS485 Converter Driver

The RS485 converter driver is installed to the PC.

Step 11: Setting of RS485 Converter Switch

Set the switch of the USB-003.

RS485 communication
→ USB converter

SW2 1 ON
2 0FF

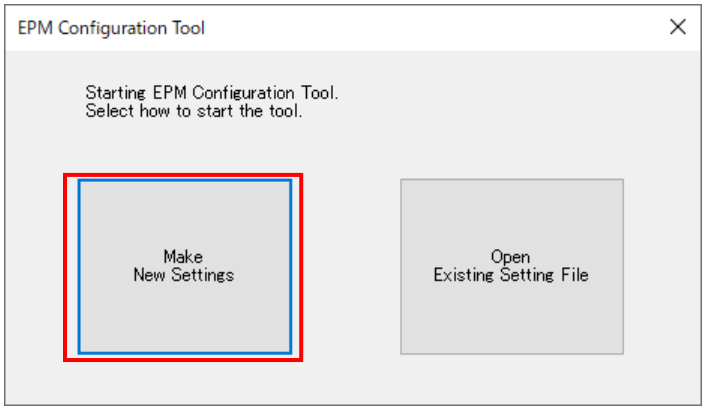
SW1 1 ON
2 ON
3 ON
4 OFF

Step 12: Alarm Setting of Relay Board Unit

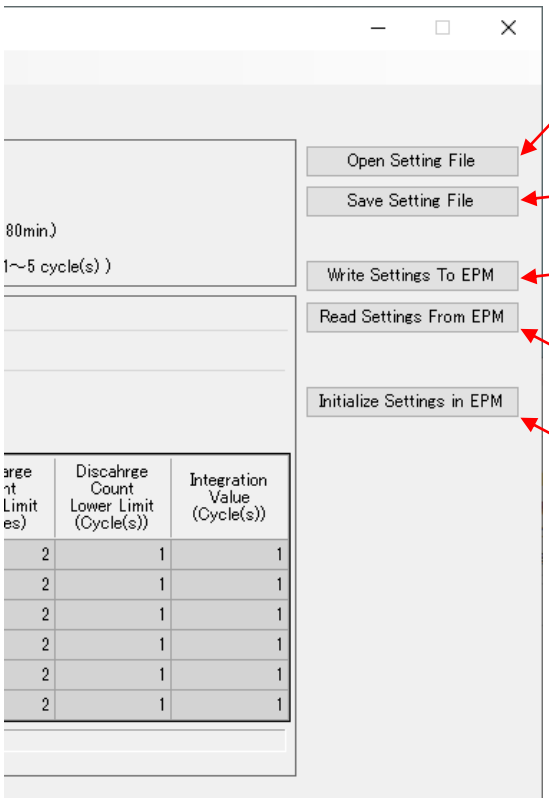
Start the PC alarm setting tool to perform the alarm setting of the relay board unit.

* The setting can be performed by a single relay board unit. See the instruction manual of the relay board unit.

Double-click Epm Config TooL.exe.



How to write and read setting details



Click this to use the setting that has been saved in the PC beforehand.
Double click on the file name to move to the set data.

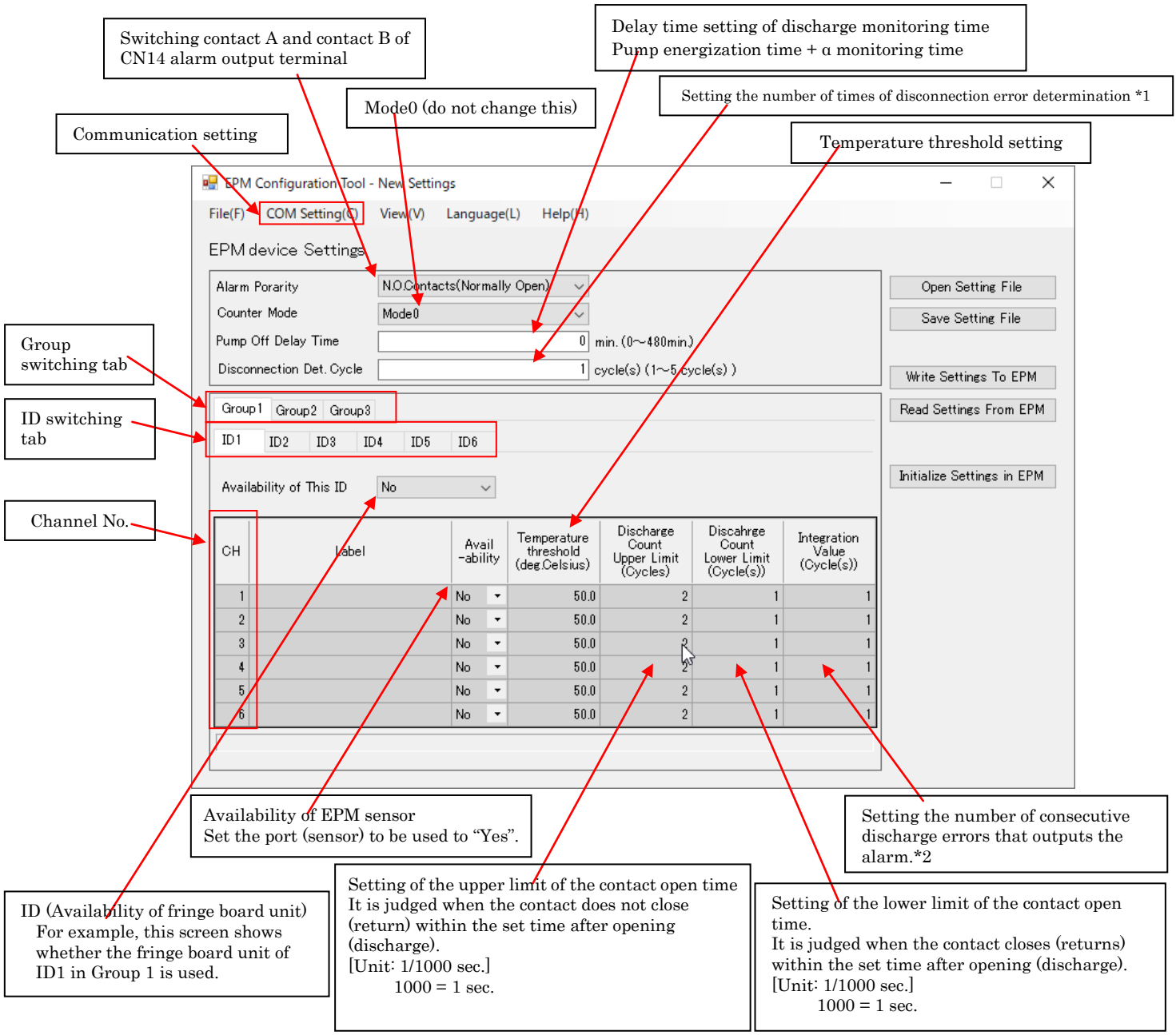
This is to overwrite the set data in the PC.

This is to write the set (changed) data to the relay board unit. (After the data is written, read it out and check that the data has been written correctly.)

When changing the setting, click here first and read out the current setting of the relay board unit.

Use this to initialize the relay board unit.

How to change the setting details/values



*1 Number of disconnection error detections
The count value is increased by 1 when a disconnection error occurs.
The count value is reset to 0 when the unit operates normally after the disconnection error.

*2 Number of discharge error detections
The count value is increased by 1 when a discharge error occurs.
The count value is decreased by 1 when the unit operates normally after the discharge error.

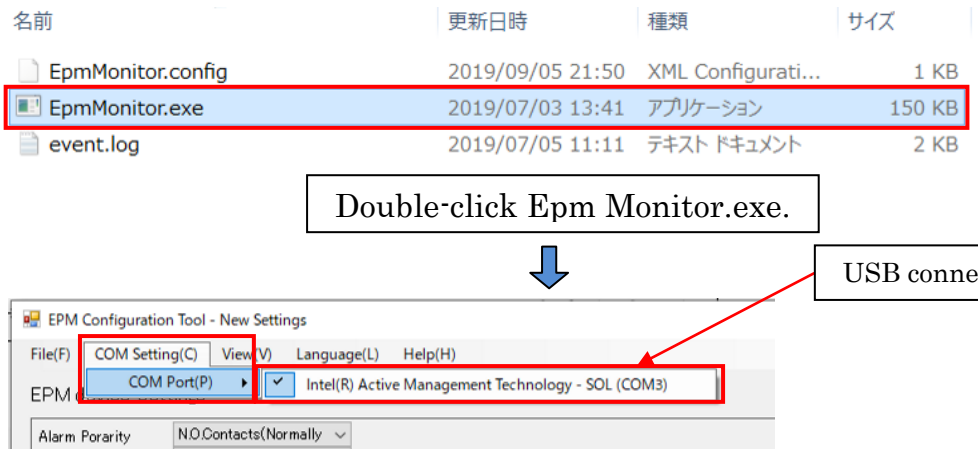
In the communication setting, select COM port of the RS485 converter.

Press Write Settings To EPM button to write the setting in the relay board unit.

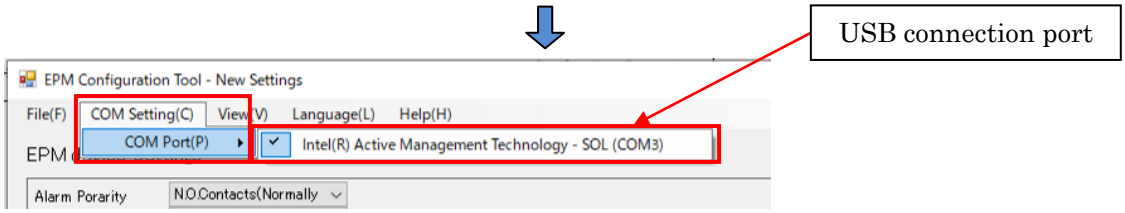
Step 13: Logging

Use the PC monitoring tool to perform logging.

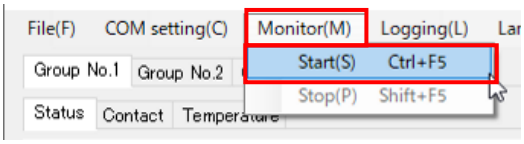
How to start logging software



Double-click Epm Monitor.exe.

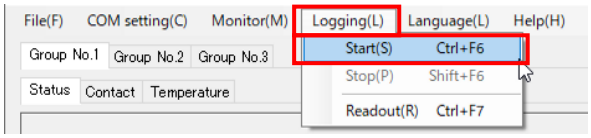


Click COM Setting → COM Port → USB connection port to be used.



For monitoring, click Monitor → Start.

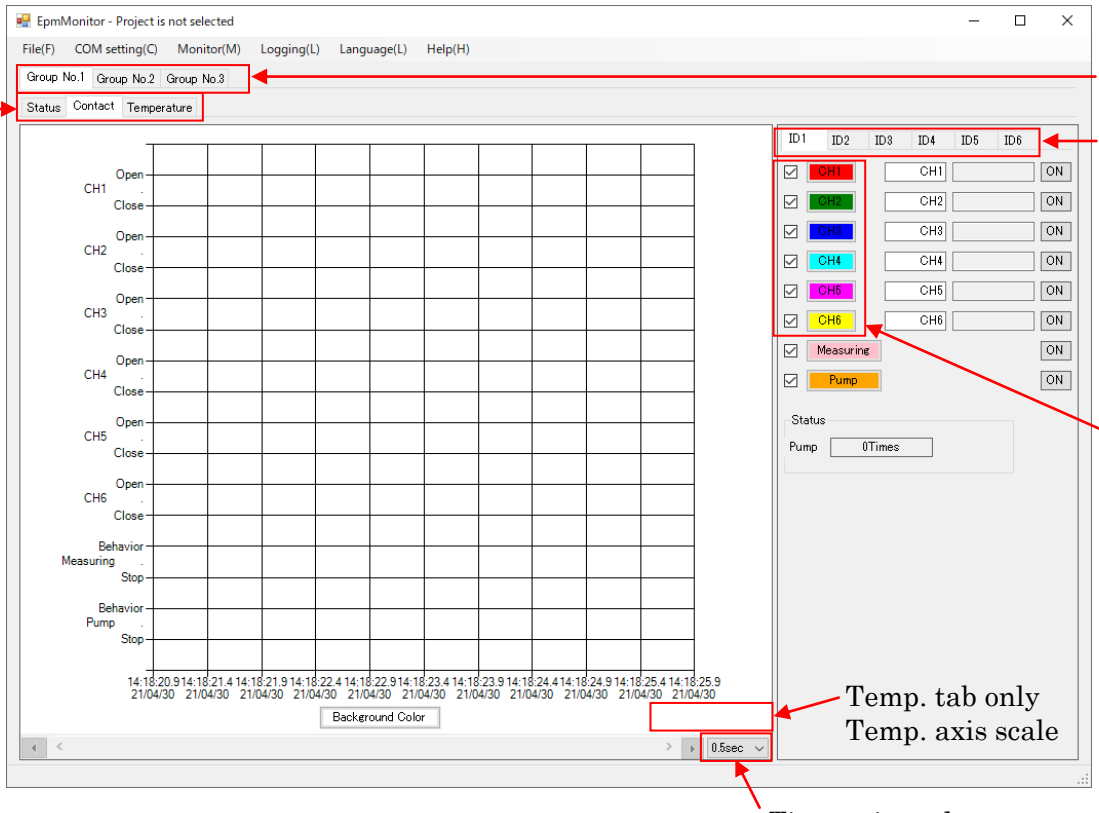
The screen moves on to the monitoring screen.
(The monitoring screen is just for checking, and data is not saved.)



For logging, click Logging → Start.

The screen moves on to the logging screen.
(In the logging screen, the data is automatically saved for every hour.)

Monitoring screen



Contact/ temperature switching tab

Group switching tab

Fringe board unit ID switching tab

Fringe board unit channel

Temp. tab only
Temp. axis scale

Time axis scale

Change the temperature scale/time axis to values that are easy to read.

8. Troubleshooting

8-1 For EPM Sensor

If trouble occurs, take actions in accordance with the table below.

Symptom	Cause	Cause identification and solution
The EPP sensor does not open.	The lubrication part is clogged up.	Remove the EPM sensor, and use a hand gun to check the lubrication load on the lubrication part. If the lubrication part is clogged up, remove it.
	The lubrication pipe is broken.	Visually check the breakage of the lubrication pipe. If the lubrication pipe is broken, replace it with a new one.
	There is air in the lubrication pipe.	Check that there is no air in the lubrication pipe. If there is air inside, release it. There may be air in the EPM sensor, operate the pump for about three times and check the operation of the EPM sensor.
	There is air in the continuous flow valve.	If a continuous flow valve with a small amount of discharge is used for oil lubrication, the air inside the valve may not be released, making the operation of the EPM sensor unstable. Make the pressure of the valve secondary side negative with a syringe.
	The wire is wrongly connected.	Check the connection of the M8 connector of the EPM sensor. Correct the connection.
	The remaining amount of grease is insufficient.	Check the remaining amount of grease. Replace the cartridge with a new one.
	A foreign substance is inside.	Carry out disassembly, cleaning, and assembly ☞ See page 32.

Symptom	Cause	Cause identification and solution
The EPP sensor does not close.	A foreign substance is inside.	Replace it with a new one.
	The lubrication part is clogged up.	If the lubrication part is clogged up, remove it.
	The wire is disconnected.	Replace it with a new one.
	Solidification of lubrication pipe	Replace the grease in the lubrication pipe.
	Solidification of EPM sensor	Carry out disassembly, cleaning, and assembly ☞ See page 32.
The reaction of the EPM sensor is unstable.	There is air in the lubrication pipe and the continuous flow valve.	Release the air in the lubrication pipe. Release the air in the continuous flow valve.
	The temperature change of the lubrication pipe is severe. The lubrication pipe is too long for the lubrication amount.	Change the material of the lubrication pipe to a material with small expansion. Raise the discharge amount of the valve.  Contact us if the fault does not improve.
	Others	Carry out disassembly, cleaning, and assembly ☞ See page 32.
The return time of the EPM sensor is long.	The ambient temperature is low.	Check the operating temperature range.
	A foreign substance is inside.	Carry out disassembly, cleaning, and assembly ☞ See page 32.
	The remaining amount of grease is insufficient	Replace the grease in the lubrication pipe.
	Solidification of EPM sensor	Carry out disassembly, cleaning, and assembly ☞ See page 32.

8-2 For Relay/Fringe Board Units

Symptom	Cause	Cause identification and solution
The configuration error is not corrected.	The configuration is not correct.	An error occurs when the connection is insufficient or redundant with respect to the configuration. Make the connection correct with respect to the configuration.

8-3 For PC Software

Symptom	Cause	Solution
The software cannot be connected.	The RS485 converter driver has not been installed.	Install the driver.
	The PC alarm setting tool and the PC monitoring tool are connected simultaneously.	Do not connect the PC alarm setting tool and the PC monitoring tool simultaneously.