CKD

Digital Electro-pneumatic Regulator

EVD-1000/3000 Series IO-Link Type

INSTRUCTION MANUAL

SM-A20758-A/4

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's **"EVD-1000/3000 Series IO-Link Type" digital electro-pneumatic regulator**.
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the pneumatic control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

ISO 4414 and JIS B 8370 (the latest edition of each standard)

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ DANGER

Use the product within the specified voltage range.
Applying voltage beyond the specified range may cause a malfunction, damage to the sensor, electric shock, or fire.

Do not connect a load exceeding the rated output.
The output circuit may become damaged or a fire may occur.

Precautions on Design and Selection

⚠ WARNING

Do not supply anything other than compressed air.

Use clean compressed air that does not contain corrosive gases.

Use "ISO Class 1.3.2" equivalent oil-free clean dry air.

Understand the compressed air characteristics before designing a pneumatic pressure circuit.

- Note that if the pressure needs to be stopped instantly at an emergency stop, the same functions as those for mechanical, hydraulic, or electrical regulators cannot be expected.
- The air may pop out, flow out, or leak out due to its compression and expansion characteristics.

Make sure that the product can withstand the working environment before use.

- The product cannot be used in an atmosphere where corrosive gas, chemical liquid, solvent vapor, water, and water vapor are present. If water drop, oil, or metal chips (such as spatter or cutting chips) may come into contact with the product, provide an appropriate protection.
- The product cannot be used in an explosive gas atmosphere.

Consider the effects of an emergency stop on the electric circuit and power outages on the cylinder when designing the system and selecting the product.

Install a pressure switch and a residual pressure exhaust valve on the compressed air supply side of the device.
The pressure switch prevents the product from operating if the set pressure is not reached. The residual pressure exhaust valve discharges compressed air remaining in the pneumatic pressure circuit in order to prevent the residual pressure from causing the pneumatic components to operate and to cause accidents.

Do not leave the pressure applied to the primary side of the product when the power is not turned on.
The secondary side pressure may rise to the same level as the primary side pressure. If there are safety concerns, design a system that ensures safety by providing measures such as installing a valve on the primary side or the secondary side.

⚠ CAUTION

Use the product within the working pressure range.

Specify maintenance conditions in the instruction manual of the customer's device.
Depending on the conditions of use, working environment, and maintenance conditions, the functions of the product may decline significantly and the safety may not be ensured. Proper maintenance will deliver optimum performance.

Use a constant voltage power supply.

Check for leakage currents from the external control devices to prevent a malfunction.
When using a control device such as a programmable controller, leakage currents from the control device may affect the product and cause it to malfunction.

Reference value	For 24 VDC	1.8 mA or less

⚠ CAUTION

If a stable reproducibility is necessary for the response time of the system, install a precision regulator before the product.

The response time is affected by the working pressure and the capacity of the load on the secondary side.

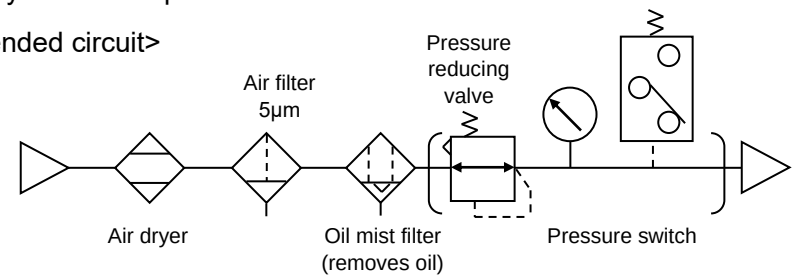
Take the following measures to prevent malfunctions caused by noise.

- Insert a line filter in the AC power supply line.
- Use a surge suppressor such as a CR or diode for the inductive load (such as a solenoid valve or a relay) to remove noise at its source.
- Install the wiring for the product away from strong electric fields.
- Connect the shielded wires to the ground on the power side.
- Wire the power lines as short as possible.
- Do not share the power supply with noise-generating devices such as inverters or motors.
- Do not wire the power cables and the signal cables in parallel with other power lines.

Do not use air of poor quality.

- For the source of pneumatic air, use clean air from which solids, moisture, and oil have been sufficiently removed with a dryer, an air filter, and an oil mist filter. Do not use air containing oil that adversely affects the product characteristics.

<Recommended circuit>



- When the secondary side pressure is reduced with an input signal, the secondary side air passes through the product and is discharged from the exhaust port. Maintain the inside of the pipes clean since contamination inside the secondary side pipes and the load also has an adverse effect on the product characteristics.

Do not expect the pressure on the secondary side to remain for a long period. Take measures to remove residual pressure as necessary.

The pressure on the secondary side will remain if the power is turned off while the pressure is applied but not for a long period. Reduce the set pressure with an input signal and then turn off the power or discharge the pressure using a residual pressure exhaust valve as necessary.

Make sure that the primary side pressure does not become lower than the minimum working pressure (EVD-1100: set pressure +50 kPa, EVD-1500/1900: set pressure +100 kPa).

Not supplying the primary side pressure for a long period while the power is turned on will shorten the product service life.

Before using the product as an air blow with the control pressure of the secondary side released to the atmosphere, test the usage under actual conditions of use or contact CKD.

The pressure may fluctuate depending on the piping and blowing conditions.

Select a dryer, an air filter, an oil mist filter, and a regulator that can accommodate a flow rate higher than the flow rate used for the product.

When using the product out of the specified conditions or for a special application, consult CKD about the specifications.

Do not use the product where it is exposed to direct sunlight or where water, oil, and other liquids may directly splash onto the product.

Do not install the product in places where moisture, saline matters, dusts, or cutting chips are present and pressure is applied or reduced.

The degree of protection of the product is equivalent to IP40. The product cannot be used where the temperature changes sharply or humidity is high as condensation may develop in the product

⚠ CAUTION

and cause damage.

If 0 MPa is required, bleed the secondary side or install a 3-way valve to release the pressure to the atmosphere.

Although the pressure control range of the product includes 0 MPa, the pressure on the secondary side will not be completely released (the pressure of 1%FS or less of the maximum control pressure will remain).

Working conditions for CE compliance

This product conforms to the EMC Directive and CE standard. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:

Conditions

The evaluation of this product is performed by using a cable that has a power supply line and a signal line, paired to assess the product's performance.

This product is not equipped with surge protection. Implement surge protection measures on the system side.

out UL standard

If this product is being used as a UL-compliant product, please take care the below.

- Maximum surrounding air temperature rating of 50°C or equivalent.
- Please use the "Class 2" power supply.

UL File No.	UL Standard	Description
E339318	UL 508	Industrial Control Equipment

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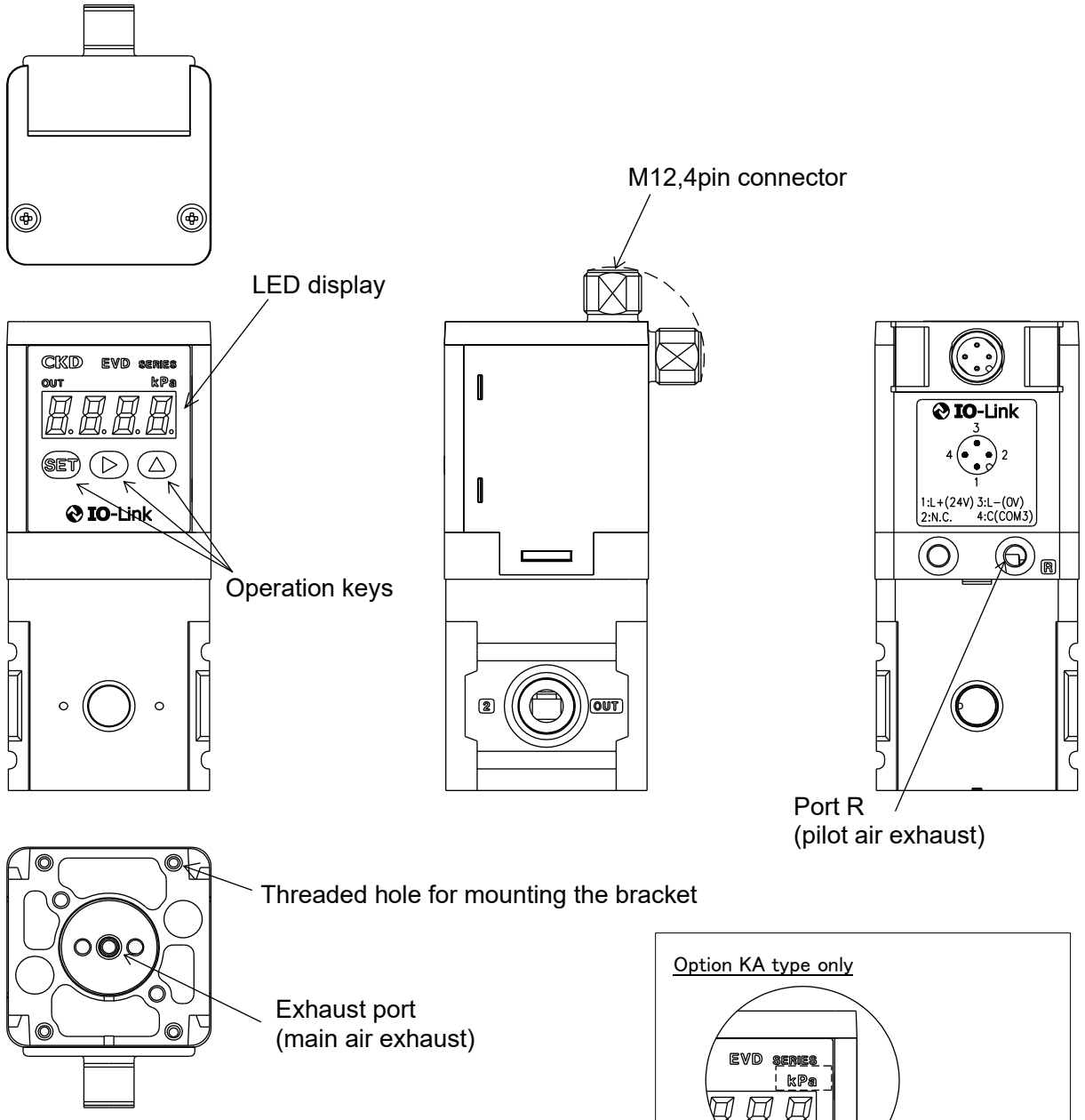
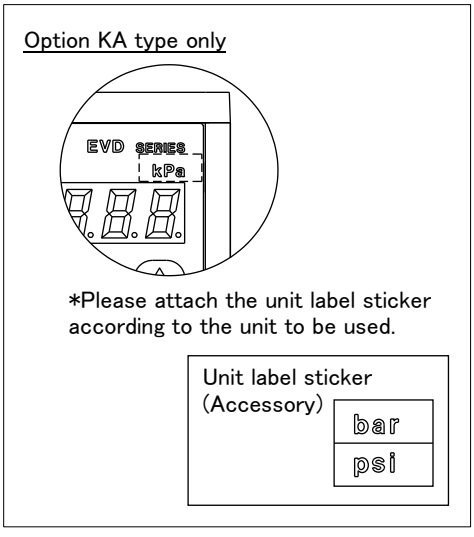
1. PRODUCT OVERVIEW

1.1 Part Name

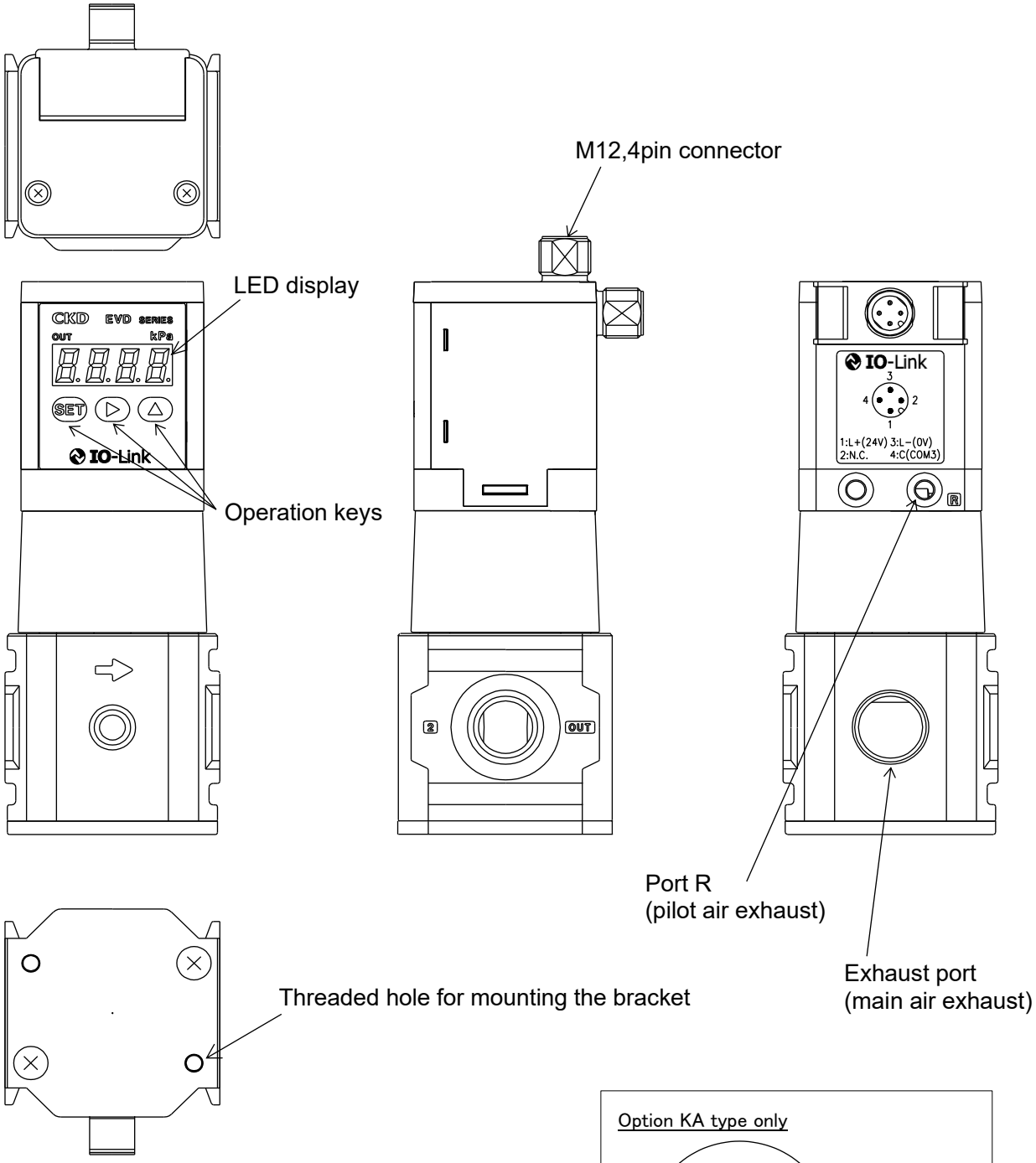
1.1.1 Body

■ **EVD-1000 Series**





■ EVD-3000 Series



Option KA type only

*Please attach the unit label sticker according to the unit to be used.

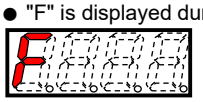
Unit label sticker (Accessory)

bar
psi

1.1.2 Names and functions of display and operation panel

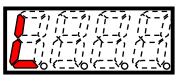
Function display

- "F" is displayed during function setting confirmation.

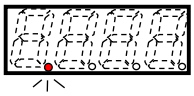


- "E" is lit when the error output is on.

* If there is an upper or lower limit in the function setting, one of the following is displayed.


or


- The red dot blinks during IO-Link communication. When communication is not established, the red dot lights.

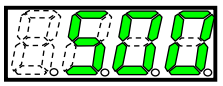


- During IO-Link communication, when Process Data Out becomes invalid due to a communication error between the IO-Link master and its upper network, etc., the green dot on the bottom right blinks.

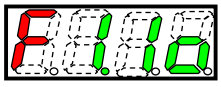
3-digit number LED display

- In the RUN mode (pressure display), the pressure or function setting data is displayed.
  * In the function setting data display mode, the setting mode number and setting are displayed.
- During data entry, a value or other types of data are displayed.
- Upon error display, the error code number is displayed.

<Pressure display>



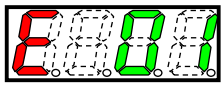
<Function setting data display>



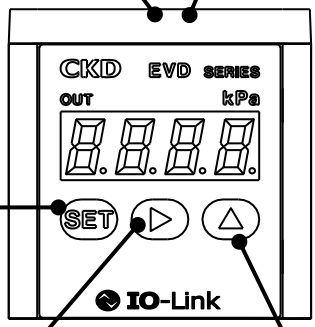
Setting

Setting mode no.

<Upon error output>



Code no.



SET key

- Press to start various setting modes.
- Press to confirm values during data entry.

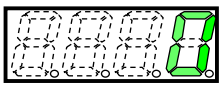
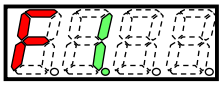
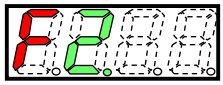
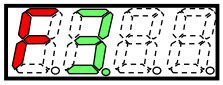
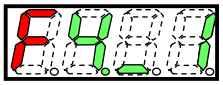
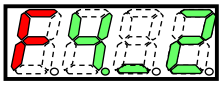
▷ key

- Press to select the digit place of values during data entry.

△ key

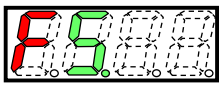
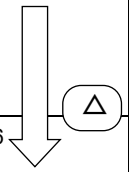
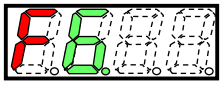
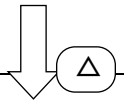
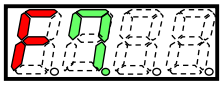
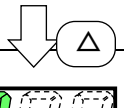
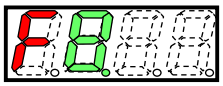
- In the RUN mode (pressure display), press to display various settings one by one.
- Press to select a setting item during data entry.
- Press to increase the value during data entry.

1.2 Functions

Screen	Description	Details (run mode)	Setting details (setting mode)	Related page
	**Pressure display**	Indicates the secondary side pressure with 3-digit number. The display value is converted to the set unit.		
Screen F1 	**Input signal type setting**	Indicates the selected input signal type, current pressure value and unit. *This function is set to the normal mode "F1.Io".	Input type can be selected from normal mode / preset / direct memory. For preset / direct input, enter the setting value on this screen. Preset input values can also be set via IO-Link communication. (Direct input value can be set only on this screen.)	P.32 P.37
Screen F2 	**Zero/span adjustment**	No available “F2.--" is displayed.		
Screen F3 	**Automatic power off**	Indicates whether automatic power off is enabled or disabled. *This function is set to disabled "F3.-- " at the factory setting.	Select to enable or disable the automatic power off. Note: The automatic power off time is set to approximately one minute and cannot be changed.	P.33 P.39
Screen F4  	**Switch output**	Indicates whether switch output is enabled or disabled and the set value. For "Mode 1 enabled", "F4.1" or "F4.2" is displayed, and the switch No. (1 or 2) and Mode (1), "−" tolerance range set value (L) and "+" tolerance range set value (H) are displayed in order. For "Mode 2 enabled", "F4.1" or "F4.2" is displayed, and the switch No. (1 or 2) and Mode (2), lower set value (L) and upper set value (H) are displayed in order. *This function is set to disabled "F4._1"⇔"1 --" "F4._2"⇔"2 --" at the factory setting.	Select to enable or disable the switch output. If enabled, "Mode 1" and "Mode 2" can be selected. +/− tolerance values and upper/lower values can be set randomly.	P.33 P.40

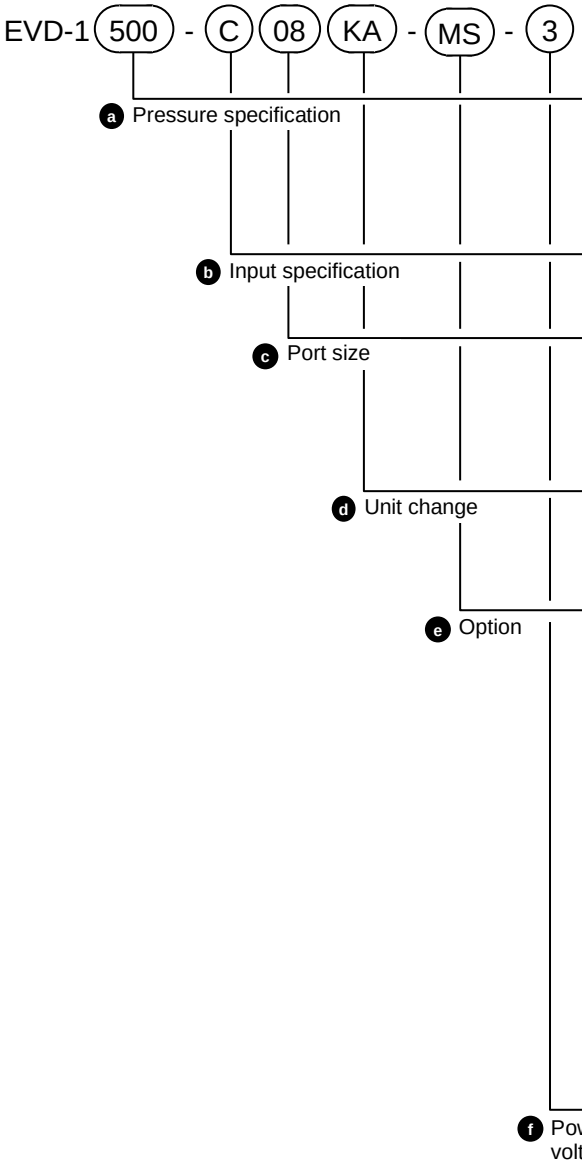
To screen F5

From screen F4

Screen	Description	Details (run mode)	Setting details (setting mode)	Related page
Screen F5  	**Proportional value change**	Indicates the validity of proportional value change and its set level. For "Higher proportional value", "F5.H" is displayed. For "Lower proportional value", "F5.L-" and its set level is displayed alternately. * The value is set to standard value "F5.--" at the factory setting.	Select to either using the standard value or changing the proportional value. The proportional value level can be set in this mode only if "Lower proportional value" is selected (10 levels).	P.34 P.42
Screen F6  	**Unit setting**	Indicates the pressure unit. For Unit change none (Symbol: Blank), "F6.--" is displayed. For Unit change available (Symbol: KA), "F6." and unit are displayed alternately. *This function is set to "kPa" at the factory setting.	Units can be selected from “kPa”, “psi”, and “bar” only when the unit change available (Symbol: KA) is selected. Unit cannot be selected when the unit change none (Symbol: Blank) is selected.	P.34 P.44
Screen F7  	**Operation setting when the communication error occurs**	Indicates the operation setting when the communication error occurs. *This function is set to " HOLD: F7. Ho" at the factory setting.	The operation of pressure control when IO-Link communication error occurs can be set from "HOLD" or "CLEAR".	P.35 P.44
Screen F8 	**Control stop function at zero input signal**	Indicates the control stop function at zero input signal. *This function is set to disabled "F8.-- " at the factory setting.	The control stop function at zero input signal can be selected "enable" or "disable".	P.35 P.46

1.3 Model Number Indication

■ EVD-1000 Series



Symbol	Description
a Pressure specification	
100	100kPa
500	500kPa
900	900kPa

b Input specification	
C	IO-Link

c Port size	
08	Rc1/4
08G	G1/4
08N	NPT1/4

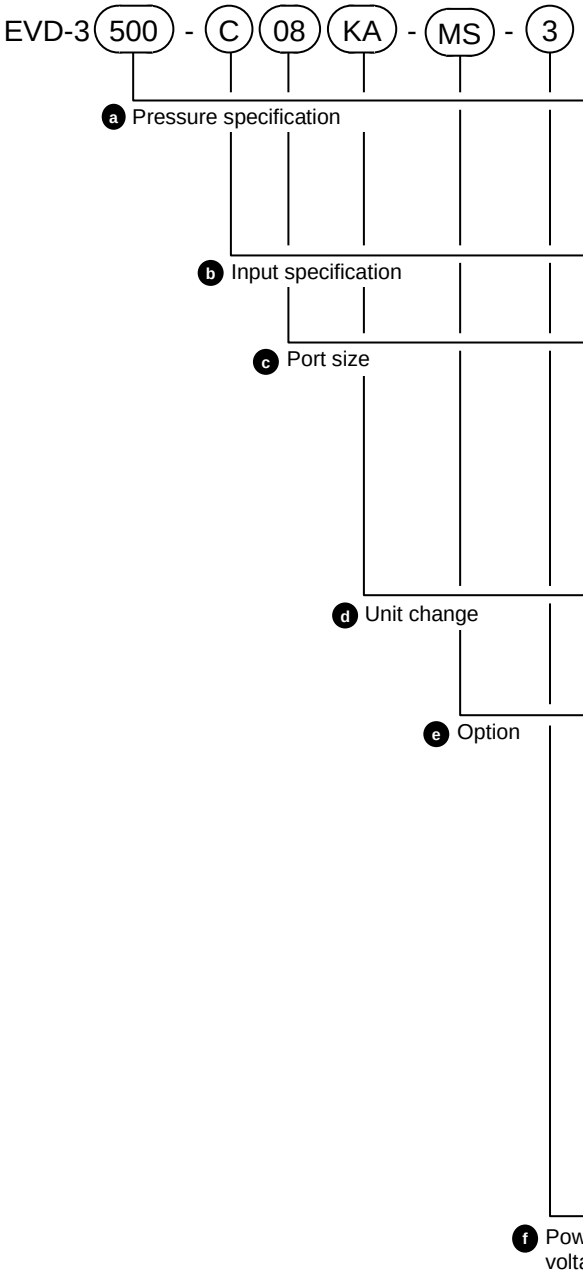
d Unit change	
Blank	Unit change none
KA	Unit change available

e Option	
Cable option	
Blank	None
MS	IO-Link M12 straight(female) /M12 straight(male), 3m
ML	IO-Link M12 L type(female) /M12 straight(male), 3m
MM	IO-Link M12 One side straight (female), 3m
Bracket option	
Blank	None
B1	B-type bracket, floor mounted
L1	L-type bracket, wall mounted

f Power supply voltage	
3	24 VDC

*Symbol ⓓ KA type is only available outside Japan.

■ EVD-3000 Series



Symbol	Description
a Pressure specification	
100	100kPa
500	500kPa
900	900kPa
b Input specification	
C	IO-Link
c Port size	
08	Rc1/4
10	Rc3/8
08G	G1/4
10G	G3/8
08N	NPT1/4
10N	NPT3/8
d Unit change	
Blank	Unit change none
KA	Unit change available
e Option	
Cable option	
Blank	None
MS	IO-Link M12 straight(female) /M12 straight(male), 3m
ML	IO-Link M12 L type(female) /M12 straight(male), 3m
MM	IO-Link M12 One side straight (female), 3m
Bracket option	
Blank	None
B1	B-type bracket, floor mounted
L1	L-type bracket, wall mounted
f Power supply voltage	
3	24 VDC

*Symbol ⓓ KA type is only available outside Japan.

1.4 Specifications

■ EVD-1100-C (maximum pressure: 100 kPa)

Item		EVD-1100-C [*2] [*3]- [*4] [*] -3
Working fluid		Clean compressed air (equivalent to ISO Class 1. 3. 2)
Max. working pressure		160 kPa
Min. working pressure		Control pressure +50 kPa
Proof pressure	Inlet side	240 kPa
	Outlet side	150 kPa
Pressure control range Note 1		0 kPa to 100 kPa
Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate of 1% or less)
Current consumption Note 2		0.15 A or less (starting current is 0.6 A or less when the power is turned on) (Port type A)
Input signal		IO-Link
Preset input		8-point (IO-Link)
Pressure display	Display method	3-digit 7-segment LED, display accuracy: ±2%FS or less
	Display range	0 kPa to 100 kPa
	Display resolution	1 kPa
Direct memory setting		1 kPa to 100 kPa (min. set width 1 kPa/set resolution 1 kPa)
Hysteresis Note 3		0.5%FS or less
Linearity Note 3		±0.3%FS or less
Resolution Note 3		0.2%FS or less
Repeatability Note 3		0.3%FS or less
Temperature characteristics	Zero point fluctuation	±0.15%FS/°C or less
	Span drift	±0.07%FS/°C or less
Max. flow rate (ANR) Note 4		60 L/min
Step response Note 5	No load	0.2 sec or less
	With 1000 cm^3 load	0.8 sec or less
Vibration resistance		98 m/ s^2 or less
Ambient temperature		5°C to 50°C
Fluid temperature		5°C to 50°C
Port size [*2]		[*2] =08 Rc1/4 [*2] =08G G1/4 [*2] =08N NPT1/4
Unit change [*3] Note 6	None	Without Unit change function
	KA	Unit change kPa / psi / bar (Accessory : Unit label sticker psi / bar)
Mounting orientation		No restriction
Weight (body)		250 g
Protection circuit		Power reverse connection protection

Note 1: There is 1%FS or less residual pressure (1 kPa or less) when the input signal is 0%.
Note 2: Use the power supply unit that have the power supply ability sufficiently to each port of IO-Link master.
Note 3: The above characteristics are based on the condition that power supply voltage is 24 VDC ± 0.1 VDC, working pressure is set to maximum control pressure +50 kPa, and control pressure is 10% to 90% (with no load, ambient temperature of 25°C ± 3°C).
Also, the specified values are only for when the secondary side is a closed circuit and pressure fluctuations will occur if the product is used for blowing or similar applications.
Note 4: The above characteristics are based on the condition that working pressure and control pressure are set to their maximum.
Note 5: The above characteristics are based on the condition that working pressure is set to maximum and the step amount is changed from { 50%F.S.→100%F.S. / 50%F.S.→60%F.S. / 50%F.S.→40%F.S.
Note 6: KA type is only available outside Japan.

■ EVD-1500-C (maximum pressure: 500 kPa)

Item		EVD-1500-C [∗2] [∗3]- [∗4] [∗5]-3
Working fluid		Clean compressed air (equivalent to ISO Class 1. 3. 2)
Max. working pressure		700 kPa
Min. working pressure		Control pressure +100 kPa
Proof pressure	Inlet side	1050 kPa
	Outlet side	750 kPa
Pressure control range Note 1		0 kPa to 500 kPa
Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate of 1% or less)
Current consumption Note 2		0.15 A or less (starting current is 0.6 A or less when the power is turned on) (Port type A)
Input signal		IO-Link
Preset input		8-point (IO-Link)
Pressure display	Display method	3-digit 7-segment LED, display accuracy: ±2%FS or less
	Display range	0 kPa to 500 kPa
	Display resolution	1 kPa
Direct memory setting		5 kPa to 500 kPa (min. set width 1 kPa/set resolution 1 kPa)
Hysteresis Note 3		0.5%FS or less
Linearity Note 3		±0.3%FS or less
Resolution Note 3		0.2%FS or less
Repeatability Note 3		0.3%FS or less
Temperature characteristics	Zero point fluctuation	±0.15%FS/°C or less
	Span drift	±0.07%FS/°C or less
Max. flow rate (ANR) Note 4		400 L/min
Step response Note 5	No load	0.2 sec or less
	With 1000 cm^3 load	0.8 sec or less
Vibration resistance		98 m/ s^2 or less
Ambient temperature		5°C to 50°C
Fluid temperature		5°C to 50°C
Port size [*2]		[*2] =08 Rc1/4 [*2] =08G G1/4 [*2] =08N NPT1/4
Unit change [*3] Note 6	None	Without Unit change function
	KA	Unit change kPa / psi / bar (Accessory : Unit label sticker psi / bar)
Mounting orientation		No restriction
Weight (body)		250 g
Protection circuit		Power reverse connection protection

Note 1: There is 1%FS or less residual pressure (5 kPa or less) when the input signal is 0%.
Note 2: Use the power supply unit that have the power supply ability sufficiently to each port of IO-Link master.
Note 3: The above characteristics are based on the condition that power supply voltage is 24 VDC ± 0.1 VDC, working pressure is set to maximum control pressure +100 kPa, and control pressure is 10% to 90% (with no load, ambient temperature of 25°C ± 3°C).
Also, the specified values are only for when the secondary side is a closed circuit and pressure fluctuations will occur if the product is used for blowing or similar applications.
Note 4: The above characteristics are based on the condition that working pressure and control pressure are set to their maximum.
Note 5: The above characteristics are based on the condition that working pressure is set to maximum and the step amount is changed from
- 50%F.S.→100%F.S.
- 50%F.S.→60%F.S.
- 50%F.S.→40%F.S.

Note 6: KA type is only available outside Japan.

■ EVD-1900-C (maximum pressure: 900 kPa)

Item		EVD-1900-C [∗2] [∗3]- [∗4] [∗5]-3
Working fluid		Clean compressed air (equivalent to ISO Class 1. 3. 2)
Max. working pressure		1000 kPa
Min. working pressure		Control pressure +100 kPa
Proof pressure	Inlet side	1500 kPa
	Outlet side	1350 kPa
Pressure control range Note 1		0 kPa to 900 kPa
Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate of 1% or less)
Current consumption Note 2		0.15 A or less (starting current is 0.6 A or less when the power is turned on) (Port type A)
Input signal		IO-Link
Preset input		8-point (IO-Link)
Pressure display	Display method	3-digit 7-segment LED, display accuracy: ±2%FS or less
	Display range	0 kPa to 900 kPa
	Display resolution	1 kPa
Direct memory setting		9 kPa to 900 kPa (min. set width 1 kPa/set resolution 2kPa)
Hysteresis Note 3		0.5%FS or less
Linearity Note 3		±0.3%FS or less
Resolution Note 3		0.2%FS or less
Repeatability Note 3		0.3%FS or less
Temperature characteristics	Zero point fluctuation	±0.15%FS/°C or less
	Span drift	±0.07%FS/°C or less
Max. flow rate (ANR) Note 4		400 L/min
Step response Note 5	No load	0.2 sec or less
	With 1000 cm^3 load	0.8 sec or less
Vibration resistance		98 m/ s^2 or less
Ambient temperature		5°C to 50°C
Fluid temperature		5°C to 50°C
Port size [*2]		[*2] =08 Rc1/4 [*2] =08G G1/4 [*2] =08N NPT1/4
Unit change [*3] Note 6	None	Without Unit change function
	KA	Unit change kPa / psi / bar (Accessory : Unit label sticker psi / bar)
Mounting orientation		No restriction
Weight (body)		250 g
Protection circuit		Power reverse connection protection

Note 1: There is 1%FS or less residual pressure (9 kPa or less) when the input signal is 0%.
Note 2: Use the power supply unit that have the power supply ability sufficiently to each port of IO-Link master.
Note 3: The above characteristics are based on the condition that power supply voltage is 24 VDC ± 0.1 VDC, working pressure is set to maximum control pressure +100 kPa, and control pressure is 10% to 90% (with no load, ambient temperature of 25°C ± 3°C).
Also, the specified values are only for when the secondary side is a closed circuit and pressure fluctuations will occur if the product is used for blowing or similar applications.
Note 4: The above characteristics are based on the condition that working pressure and control pressure are set to their maximum.
Note 5: The above characteristics are based on the condition that working pressure is set to maximum and the step amount is changed from { 50%F.S.→100%F.S.
50%F.S.→60%F.S.
50%F.S.→40%F.S.
Note 6: KA type is only available outside Japan.

■ EVD-3100-C (maximum pressure:100kPa)

Item		EVD-3100- C [∗2] [∗3]- [∗4] [∗5]-3
Working fluid		Clean compressed air (equivalent to ISO Class 1. 3. 2)
Max. working pressure		160 kPa
Min. working pressure		Control pressure +50 kPa
Proof pressure	Inlet side	240 kPa
	Outlet side	150 kPa
Pressure control range Note 1		0 kPa to 100 kPa
Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate of 1% or less)
Current consumption Note 2		0.15 A or less (starting current is 0.6 A or less when the power is turned on) (Port type A)
Input signal		IO-Link
Preset input		8-point (IO-Link)
Pressure display	Display method	3-digit 7-segment LED, display accuracy: ±2%FS or less
	Display range	0 kPa to 100 kPa
	Display resolution	1 kPa
Direct memory setting		1 kPa to 100 kPa (min. set width 1 kPa/set resolution 1 kPa)
Hysteresis Note 3		0.5%FS or less
Linearity Note 3		±0.3%FS or less
Resolution Note 3		0.2%FS or less
Repeatability Note 3		0.3%FS or less
Temperature characteristics	Zero point fluctuation	±0.15%FS/°C or less
	Span drift	±0.07%FS/°C or less
Max. flow rate (ANR) Note 4		700 L / min
Step response Note 5	No load	0.2 sec or less
	With 1000 cm^3 load	0.8 sec or less
Vibration resistance		98 m/ s^2 or less
Ambient temperature		5°C to 50°C
Fluid temperature		5°C to 50°C
Port size [*2]	IN, OUT Port	[*2] =08 Rc1/4, [*2] =10 Rc3/8 [*2] =08G G1/4, [*2] =10G G3/8 [*2] =08N NPT1/4, [*2] =10N NPT3/8
	EXH Port	[*2]=08,10 Rc3/8 [*2]=08G,10G G3/8 [*2]=08N,10N NPT3/8
Unit change [*3] Note 6	None	Without Unit change function
	KA	Unit change kPa / psi / bar (Accessory : Unit label sticker psi / bar)
Mounting orientation		No restriction
Weight (body)		470 g
Protection circuit		Power reverse connection protection

Note 1: There is 1%FS or less residual pressure (1 kPa or less) when the input signal is 0%.
Note 2: Use the power supply unit that have the power supply ability sufficiently to each port of IO-Link master.
Note 3: The above characteristics are based on the condition that power supply voltage is 24 VDC ± 0.1 VDC, working pressure is set to maximum control pressure +50 kPa, and control pressure is 10% to 90% (with no load, ambient temperature of 25°C ± 3°C).
Also, the specified values are only for when the secondary side is a closed circuit and pressure fluctuations will occur if the product is used for blowing or similar applications.
Note 4: The above characteristics are based on the condition that working pressure and control pressure are set to their maximum.
Note 5: The above characteristics are based on the condition that working pressure is set to maximum and the step amount is changed from { 50%F.S.→100%F.S. / 50%F.S.→60%F.S. / 50%F.S.→40%F.S.
Note 6: KA type is only available outside Japan.

■ EVD-3500-C (maximum pressure:500kPa)

Item		EVD-3500- C [∗2] [∗3]- [∗4] [∗5]-3
Working fluid		Clean compressed air (equivalent to ISO Class 1. 3. 2)
Max. working pressure		700 kPa
Min. working pressure		Control pressure +100 kPa
Proof pressure	Inlet side	1050 kPa
	Outlet side	750 kPa
Pressure control range Note 1		0 kPa to 500 kPa
Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate of 1% or less)
Current consumption Note 2		0.15 A or less (starting current is 0.6 A or less when the power is turned on) (Port type A)
Input signal		IO-Link
Preset input		8-point (IO-Link)
Pressure display	Display method	3-digit 7-segment LED, display accuracy: ±2%FS or less
	Display range	0 kPa to 500 kPa
	Display resolution	1 kPa
Direct memory setting		5 kPa to 500 kPa (min. set width 1 kPa/set resolution 1 kPa)
Hysteresis Note 3		0.5%FS or less
Linearity Note 3		±0.3%FS or less
Resolution Note 3		0.2%FS or less
Repeatability Note 3		0.3%FS or less
Temperature characteristics	Zero point fluctuation	±0.15%FS/°C or less
	Span drift	±0.07%FS/°C or less
Max. flow rate (ANR) Note 4		1500 L / min
Step response Note 5	No load	0.2 sec or less
	With 1000 cm^3 load	0.8 sec or less
Vibration resistance		98 m/s^2 or less
Ambient temperature		5°C to 50°C
Fluid temperature		5°C to 50°C
Port size [*2]	IN, OUT Port	[*2] =08 Rc1/4, [*2] =10 Rc3/8 [*2] =08G G1/4, [*2] =10G G3/8 [*2] =08N NPT1/4, [*2] =10N NPT3/8
	EXH Port	[*2]=08,10 Rc3/8 [*2]=08G,10G G3/8 [*2]=08N,10N NPT3/8
Unit change [*3] Note 6	None	Without Unit change function
	KA	Unit change kPa / psi / bar (Accessory : Unit label sticker psi / bar)
Mounting orientation		No restriction
Weight (body)		470 g
Protection circuit		Power reverse connection protection

Note 1: There is 1%FS or less residual pressure (5 kPa or less) when the input signal is 0%.
Note 2: Use the power supply unit that have the power supply ability sufficiently to each port of IO-Link master.
Note 3: The above characteristics are based on the condition that power supply voltage is 24 VDC ± 0.1 VDC, working pressure is set to maximum control pressure +100 kPa, and control pressure is 10% to 90% (with no load, ambient temperature of 25°C ± 3°C).
Also, the specified values are only for when the secondary side is a closed circuit and pressure fluctuations will occur if the product is used for blowing or similar applications.
Note 4: The above characteristics are based on the condition that working pressure and control pressure are set to their maximum.
Note 5: The above characteristics are based on the condition that working pressure is set to maximum and the step amount is changed from { 50%F.S.→100%F.S. / 50%F.S.→60%F.S. / 50%F.S.→40%F.S.
Note 6: KA type is only available outside Japan.

■ EVD-3900-C (maximum pressure：900kPa)

Item		EVD-3900-C [∗2] [∗3]- [∗4] [∗5]-3
Working fluid		Clean compressed air (equivalent to ISO Class 1. 3. 2)
Max. working pressure		1000 kPa
Min. working pressure		Control pressure +100 kPa
Proof pressure	Inlet side	1500 kPa
	Outlet side	1350 kPa
Pressure control range Note 1		0 kPa to 900 kPa
Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate of 1% or less)
Current consumption Note 2		0.15 A or less (starting current is 0.6 A or less when the power is turned on) (Port type A)
Input signal		IO-Link
Preset input		8-point (IO-Link)
Pressure display	Display method	3-digit 7-segment LED, display accuracy: ±2%FS or less
	Display range	0 kPa to 900 kPa
	Display resolution	1 kPa
Direct memory setting		9 kPa to 900 kPa (min. set width 1 kPa/set resolution 2 kPa)
Hysteresis Note 3		0.5%FS or less
Linearity Note 3		±0.3%FS or less
Resolution Note 3		0.2%FS or less
Repeatability Note 3		0.3%FS or less
Temperature characteristics	Zero point fluctuation	±0.15%FS/°C or less
	Span drift	±0.07%FS/°C or less
Max. flow rate (ANR) Note 4		1500 L / min
Step response Note 5	No load	0.2 sec or less
	With 1000 cm^3 load	0.8 sec or less
Vibration resistance		98 m/ s^2 or less
Ambient temperature		5°C to 50°C
Fluid temperature		5°C to 50°C
Port size [*2]	IN, OUT Port	[*2] =08 Rc1/4, [*2] =10 Rc3/8 [*2] =08G G1/4, [*2] =10G G3/8 [*2] =08N NPT1/4, [*2] =10N NPT3/8
	EXH Port	[*2]=08,10 Rc3/8 [*2]=08G,10G G3/8 [*2]=08N,10N NPT3/8
Unit change [*3] Note 6	None	Without Unit change function
	KA	Unit change kPa / psi / bar (Accessory ： Unit label sticker psi / bar)
Mounting orientation		No restriction
Weight (body)		470 g
Protection circuit		Power reverse connection protection

Note 1: There is 1%FS or less residual pressure (9 kPa or less) when the input signal is 0%.
Note 2: Use the power supply unit that have the power supply ability sufficiently to each port of IO-Link master.
Note 3: The above characteristics are based on the condition that power supply voltage is 24 VDC ± 0.1 VDC, working pressure is set to maximum control pressure +100 kPa, and control pressure is 10% to 90% (with no load, ambient temperature of 25°C ± 3°C).
Also, the specified values are only for when the secondary side is a closed circuit and pressure fluctuations will occur if the product is used for blowing or similar applications.
Note 4: The above characteristics are based on the condition that working pressure and control pressure are set to their maximum.
Note 5: The above characteristics are based on the condition that working pressure is set to maximum and the step amount is changed from { 50%F.S.→100%F.S. / 50%F.S.→60%F.S. / 50%F.S.→40%F.S.
Note 6: KA type is only available outside Japan.

1.5 Communication specifications

1.5.1 General

Item	Details
Communication protocol	IO-Link
Communication protocol revision	V1.1
Transmission rate	COM3(230.4 kbps)
Port Type	Class A
Process Data (Input)	6 byte
Process Data (Output)	4 byte

Item	Details
Min Cycle Times	2 ms
Data Storage	1 k byte
SIO Mode support	None
Device ID	Refer to the table below

■ Device ID

Device ID	Product Name	Note
0x215001	EVD-*100-C	100 kPa Type
0x215002	EVD-*500-C	500 kPa Type
0x215003	EVD-*900-C	900 kPa Type
0x215004	EVD-*100-C-KA	100 kPa Type (Unit change available)
0x215005	EVD-*500-C-KA	500 kPa Type (Unit change available)
0x215006	EVD-*900-C-KA	900 kPa Type (Unit change available)

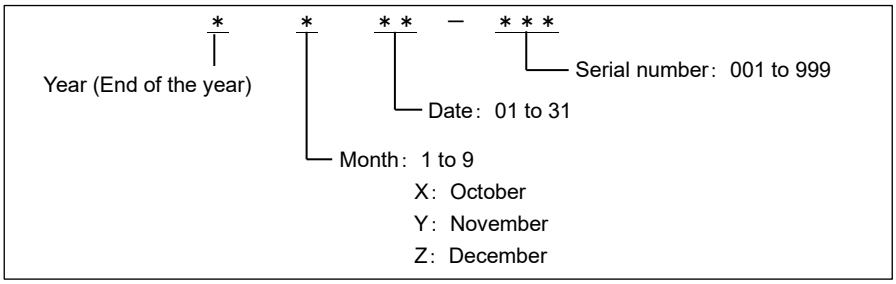
1.5.2 On demand data

■ Identification

Vendor ID：855(Decimal number)/ 357(Hexadecimal number)

Index	Sub index	Item	Value	Access	Data Length	Format
0x0010	0	Vendor Name	CKD Corporation	R	64 byte	String
0x0011	0	Vendor Text	https://www.ckd.co.jp/	R	64 byte	String
0x0012	0	Product Name	EVD-1500-C**-****-3 Note 1	R	40 byte	String
0x0013	0	Product ID	EVD-*500-C Note 1	R	64 byte	String
0x0014	0	Product Text	Digital Electro-pneumatic Regulator	R	64 byte	String
0x0015	0	Serial- Number	****-*** Note 2	R	16 byte	String
0x0016	0	Hardware Revision	V1.0 Note 1	R	64 byte	String
0x0017	0	Firmware Revision	V2.0 Note 1	R	64 byte	String
0x0018	0	Application Specific Tag	* * *	R/W	32 byte	String

R: read, R / W: read / write
Note 1: A reference example: EVD-1500 series.
Note 2: About serial number.



Pressure control range for each model

Model number	Select Unit	Pressure control			Note
		Display range (7-segment)	Process data Display value (kPa)	Process Data output value	
EVD-1100-C EVD-3100-C	None (kPa fixed)	0 to 100	0.0 to 100.0	0 to 1000	Unit change none
EVD-1500-C EVD-3500-C	None (kPa fixed)	0 to 500	0.0 to 500.0	0 to 5000	Unit change none
EVD-1900-C EVD-3900-C	None (kPa fixed)	0 to 900	0.0 to 900.0	0 to 9000	Unit change none
EVD-1100-C*KA EVD-3100-C*KA	kPa	0 to 100	0.0 to 100.0	0 to 1000	Unit change available
	psi	0 to 14.5	0.0 to 14.50	0 to 1450	
	bar	0 to 1.00	0.0 to 1.000	0 to 1000	
EVD-1500-C*KA EVD-3500-C*KA	kPa	0 to 500	0.0 to 500.0	0 to 5000	Unit change available
	psi	0 to 72.5	0.0 to 72.50	0 to 7250	
	bar	0 to 5.00	0.0 to 5.000	0 to 5000	
EVD-1900-C*KA EVD-3900-C*KA	kPa	0 to 900	0.0 to 900.0	0 to 9000	Unit change available
	psi	0 to 130	0.0 to 130.5	0 to 1305	
	bar	0 to 9.00	0.0 to 9.000	0 to 9000	

1.5.3 Parameter and commands

■ Common specification

Index	Sub index	Item	Value	Access	Data Length	Format
0x0002	0	System Command	Refer to the "Table 1"	W	1 byte	UInteger8
0x000C	0	Device Access Locks	0x0000: No lock 0x0001: Parameter lock 0x0002: Data storage lock	R	2 byte	Record
0x0020	0	Error Count	0	R	2 byte	UInteger16
0x0024	0	Device Status	0	R	1 byte	UInteger8
0x0025	0	Detailed Devices Status	Refer to the "Diagnosis"	R	33 byte	Array of 3 Octet string

R: read, W: write, R / W: read / write

Table 1: System Command

Value	Command	Description
0x82	Restore Factory Settings	Set the setting value to the shipping state.

■ Individual specification

Index	Sub index	Item	Value	Data storage	Access	Data length	Format
0x0100	0	Control stop function at zero input signal	0: OFF 1: ON	Y	R/W	2 byte	UInteger16
0x0101	0	Switch output 1 Mode Selection	0: OFF 1: Mode 1 2: Mode 2	Y	R/W	2 byte	UInteger16
0x0102	0	Switch output 2 Mode Selection	0: OFF 1: Mode 1 2: Mode 2	Y	R/W	2 byte	UInteger16
0x0103	0	Switch output 1 Mode 1 Lower limit value	0 Setting range: 0 to 50	Y	R/W	2 byte	UInteger16
0x0104	0	Switch output 1 Mode 1 Higher limit value	0 Setting range: 0 to 50	Y	R/W	2 byte	UInteger16
0x0105	0	Switch output 1 Mode 2 Lower limit value Note 1	0 Setting range: 0 to 90	Y	R/W	2 byte	UInteger16
0x0106	0	Switch output 1 Mode 2 Higher limit value Note 1	100 Setting range: 10 to 100	Y	R/W	2 byte	UInteger16
0x0107	0	Switch output 2 Mode 1 Lower limit value	0 Setting range: 0 to 50	Y	R/W	2 byte	UInteger16
0x0108	0	Switch output 2 Mode 1 Higher limit value	0 Setting range: 0 to 50	Y	R/W	2 byte	UInteger16
0x0109	0	Switch output 2 Mode 2 Lower limit value Note 1	0 Setting range: 0 to 90	Y	R/W	2 byte	UInteger16
0x010A	0	Switch output 2 Mode 2 Higher limit value Note 1	100 Setting range: 10 to 100	Y	R/W	2 byte	UInteger16
0x010B	0	Proportional value setting	0: OFF 1: Proportional value increase 2: Proportional value down	Y	R/W	2 byte	UInteger16
0x010C	0	Proportional value level down setting	1 Setting range: 1 to 10	Y	R/W	2 byte	UInteger16
0x010D	0	Automatic power off setting	0: OFF 1: ON	Y	R/W	2 byte	Integer16
0x010E	0	Key lock setting	0: Unlock 1: Lock	Y	R/W	2 byte	Integer16
0x010F	0	Input setting	0: Normal Mode 1: Preset Mode 2: Direct Mode	Y	R/W	2 byte	Integer16
0x0110	0	Preset memory 1	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16
0x0111	0	Preset memory 2	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16

R: read, W: write, R / W: read / write

: Default value

Note 1: In using Mode 2, set so that the Higher limit value is greater than or equal to “Lower limit value +10”. If this condition is not satisfied, the SW output will always be OFF.

Index	Sub index	Item	Value	Data storage	Access	Data length	Format
0x0112	0	Preset memory 3	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16
0x0113	0	Preset memory 4	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16
0x0114	0	Preset memory 5	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16
0x0115	0	Preset memory 6	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16
0x0116	0	Preset memory 7	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16
0x0117	0	Preset memory 8	0 Setting range: Depends on the pressure range.	Y	R/W	2 byte	Integer16
0x0118	0	Unit change Note 1	0：kPa 1：psi 2：bar	Y	R/W	2 byte	UInteger16
0x0119	0	Position decimal point of data	1：First digit 2：Second digit 3：Third digit	—	R	2 byte	UInteger16
0x011A	0	Operation while communication error occurred Note 2	0: HOLD 1：CLEAR	Y	R/W	2 byte	UInteger16

R: read, W: write, R / W: read / write
: Default value
Note 1：“1 (psi)” and “2 (bar)” cannot be set when the unit change none type (Symbol ⓓ: Blank) is selected.
Note 2：The operation while communication error occurred is as indicated in Table 1.

Table 1 Operation at communication error

State / Cause		Operation at communication error			Operation at error recovery		
		Normal mode	Preset mode	Direct mode	Normal mode	Preset mode	Direct mode
Communication error	**HOLD setting**	Controlled pressure is held in Process Data Out set value before an error occurrence.	Controlled pressure is held in Preset set value before an error occurrence.	Controlled pressure is controlled with Direct set value.	Controlled pressure is controlled with Process Data Out set value.	Controlled pressure is controlled with Preset set value.	Controlled pressure is controlled with Direct set value.
	CLEAR setting	Pressure control: 0	Pressure control: 0	Controlled pressure is controlled with Direct set value.	Controlled pressure is controlled with Process Data Out set value.	Controlled pressure is controlled with Preset set value.	Controlled pressure is controlled with Direct set value.

*Communication error is defined that Process Data Status is invalid state or Process Data Out becomes invalid.
When the C/Q line is disconnected, it becomes invalid. If the IO-Link master and its upper network are disconnected, process data output is disabled. (Depending on the specification of the IO-Link master, Process Data Out may not be disabled even if the wire is disconnected. Please check the specifications of the master.)
*HOLD/CLEAR/OPEN is the switch for controlling the operation when an error occurrence in the communication function.
They can be set using "On-request Data" in IO-Link communication.

1.5.4 Process data IN

PD	PD0								PD1							
Bit	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
	MSB															LSB
Data Name	Set Value for pressure															
Data Range	2byte															
Format	UInteger16															

PD	PD2								PD3							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data Name	Control pressure															
Data Range	2byte															
Format	UInteger16															

PD	PD4								PD5							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data Name	Error	Warning	Normal Operation	-	-	-	Switch output		MSB			LSB	Input Select		-	Start /Stop
							2	1	Error Code							
Data Range	True/False								0 to 15				0 to 2		-	True/False
Format	Boolean								UInteger4				UInteger2		-	Boolean

1.5.5 Process data OUT

⚠ CAUTION

Start energization to this product after clearing Process Data OUT to "0 ".
Unintended pressure may occur.

The setting in this product can be changed with IO-Link communication from the master to the device (this product) and key operation.
The setting that be set at last is reflected as this product's setting because there is no hierarchical relationship and precedence on both sides. In case that the setting is set on the device side, it is synchronized with the master side. But sometimes it is not reflected to the display unless the display is update or the setting uploaded depending on master. Take care of that.

The value in Process Data OUT can be operated only on the master side.
The value cannot be reflected as Process Data OUT even if the setting is changed with key operation on the device. Confirm Process Data IN and Parameter when confirming the product setting state on the master side.

PD	PD0								PD1							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data Name	Set Value for pressure															
Data Range	2byte															
Format	UInteger16															

PD	PD2								PD3							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data Name	Unused					Preset Note 1			-	-	-	-	-	-	-	Start/Stop Note 2,3
						3	2	1								
Data Range						0 to 7			-	-	-	-	-	-	-	True/False
Format						UInteger3			-	-	-	-	-		-	Boolean

Note 1: Refer to "**エラー! 参照元が見つかりません。** Preset input"

Note 2: When turning off the power of the EVD, be sure to set the Process data OUT pressure to zero (Bit16-31 = 0) , next to stop (Bit0 = False) and then turn off the power. The excessive operation data of solenoid valve are saved when transitioning from start (Bit0 = True) to stop (Bit0 = False).

Note 3: In case that controlling is performed using IO-Link communication, set this bit to 1(True). If this bit is 0(False), controlling cannot be performed.

1.5.6 Observation

Index	Sub index	Item	Value	Access	Data length	Format
0x0400	0	Solenoid valve energizing time Operating Time Note 1	0 h to 9,999,999 h 【0 to 9,999,999】	R	4byte	Integer32
0x0401	0	Excessive operation time of supply solenoid valve Note 1	0 h to 9,999,999 h	R	4byte	Integer32
0x0402	0	Number of excessive operations of supply solenoid valve	0 times to 9,999,999 times	R	4byte	Integer32
0x0403	0	Excessive operation time of exhaust solenoid valve Note 1	0 h to 9,999,999 h	R	4byte	Integer32
0x0404	0	Number of excessive operations of exhaust solenoid valve	0 times to 9,999,999 times	R	4byte	Integer32

R: read

Note 1: Be able to count more than 10 years of energization time.
Calculation: 9,999,999h÷7,488h≒1335.5 Year
24h/Day×26Day/Month×12 months=7,488h/Year

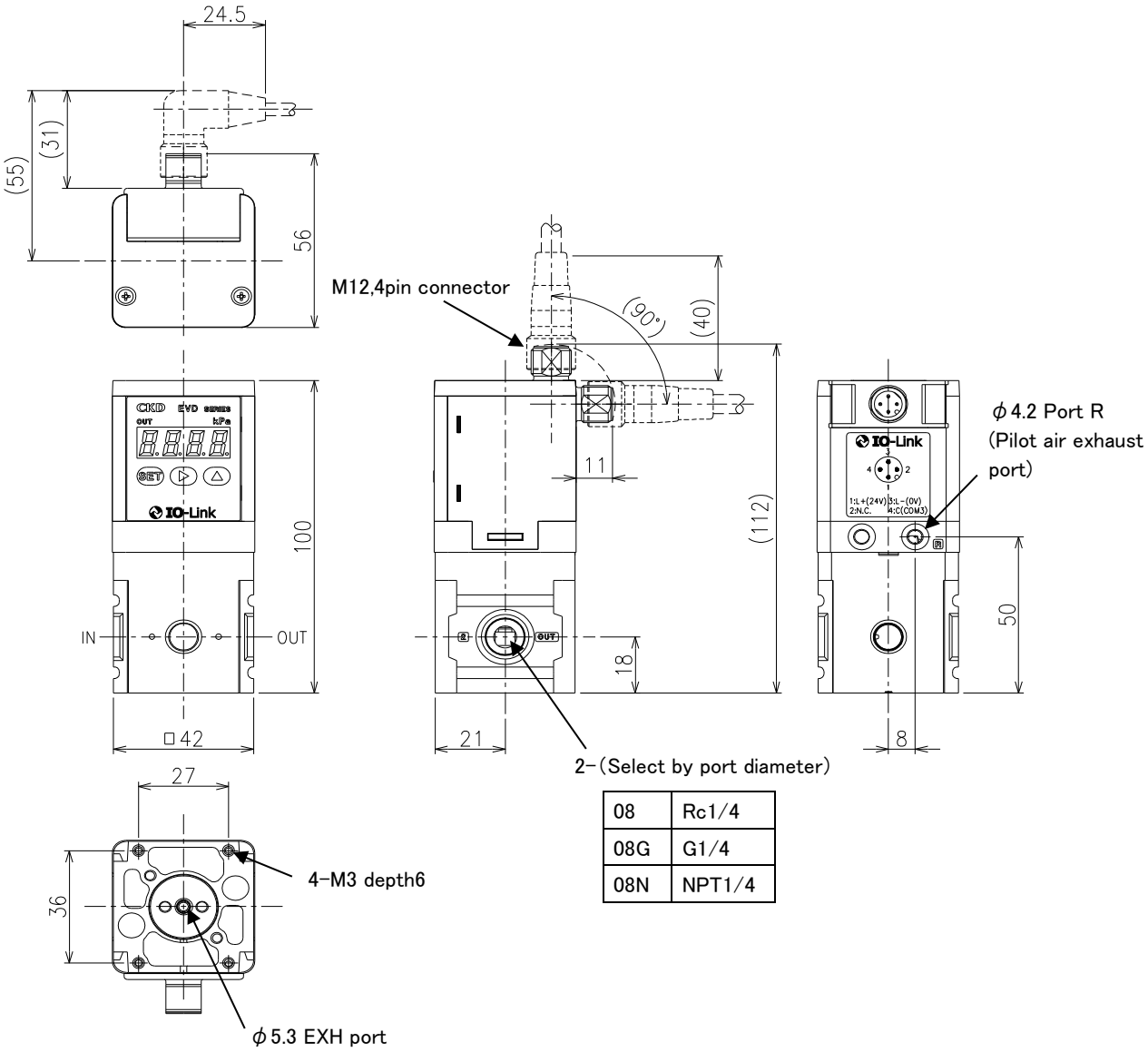
Note: The excessive operation data of solenoid valve are saved when transitioning from start (Bit0 = True) to stop (Bit0 = False). Please save the data periodically on the master side in case of unpredictable situations such as a power supply failure. When turning off the power of the EVD, be sure to set the Process data OUT pressure to zero (Bit16-31 = 0), next to stop (Bit0 = False) and then turn off the power.

1.5.7 Diagnosis

Event Code	Type	Device Status	Error Code	Cause	Solution
0x8D02	Error	Failure	E 01	Supplied power voltage is outside the rated range. (Detected at 19.5 VDC or less detection accuracy ±10 %)	・Turn on the power again.
0x8D03	Error	Failure	E 02	Input signal exceeds the rated range.	・Check the Input settings
0x8D04	Error	Failure	E 03	Internal memory error	・Turn on the power again.
0x8D05	Error	Failure	E 04	Error occurred during memory reading or writing.	・Turn on the power again.
0x8D06	Error	Failure	E 05	Secondary side pressure does not maintain the set value for five or more consecutive seconds.	・Check that the primary side pressure and the set value for pressure. ・Turn on the power again. ・Check that there is no leakage from the pipes, fittings, or other components, correctly connect the pipes and turn on the power again.
0x8D10	Warning	Out of specification	E 10	Excessive operation of supply solenoid valve	・Check the operating environment.
0x8D11	Warning	Out of specification	E 11	Excessive operation of supply solenoid valve	・Check the operating environment.
0x8D12	Warning	Out of specification	E 12	Mode2 of switch output 1 is set with abnormal threshold. lower set value (L) > upper set value (H) - 10 (for more than 5 seconds)	・Check the threshold of switch output 1.
0x8D13	Warning	Out of specification	E 13	Mode2 of switch output 2 is set with abnormal threshold. lower set value (L) > upper set value (H) - 10 (for more than 5 seconds)	・Check the threshold of switch output 2.
0x4210	Warning	Out of specification	E 14	Temperature of IO-Link driver is high.	・Check the operating environment.

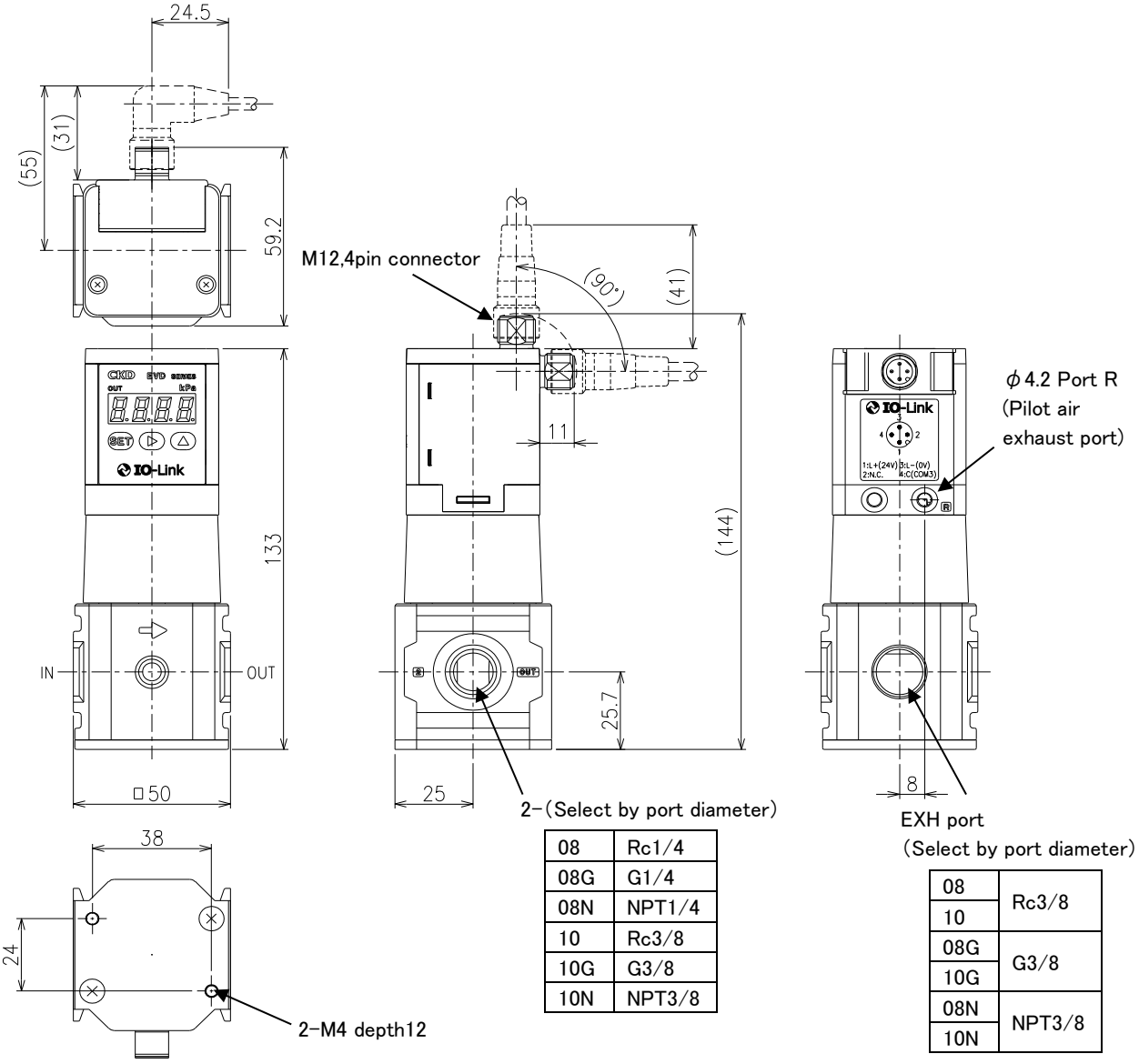
1.6 Dimensions

■ EVD-1000 Series



08	Rc1/4
08G	G1/4
08N	NPT1/4

■ EVD-3000 Series

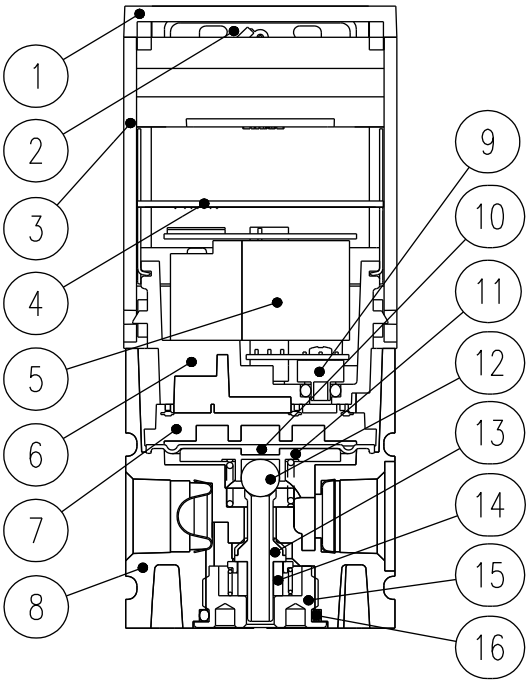


08	Rc1/4
08G	G1/4
08N	NPT1/4
10	Rc3/8
10G	G3/8
10N	NPT3/8

08	Rc3/8
10	
08G	G3/8
10G	
08N	NPT3/8
10N	

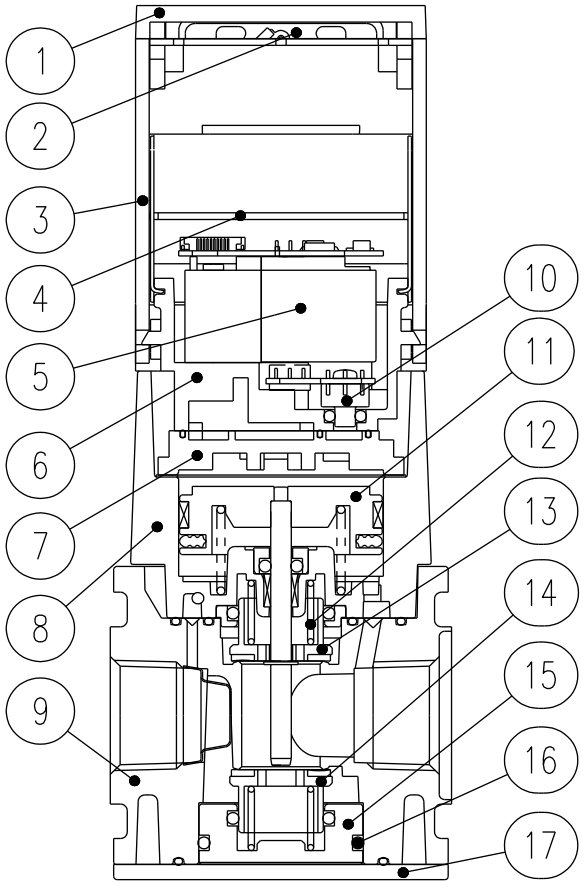
1.7 Internal Structure

■ EVD-1000 Series



No.	Part name	Material
①	Lid	PBT resin
②	M12 connector	———
③	Housing	ABS resin
④	Controller board	———
⑤	3-way valve	———
⑥	Valve base	Polyphenylene sulfide resin
⑦	Pilot chamber	Polyphenylene sulfide resin
⑧	Body	Aluminum alloy die-casting
⑨	Pressure sensor	———
⑩	Diaphragm	Special nitrile rubber
⑪	Relief sheet	Aluminum alloy
⑫	Steel ball (exhaust valve) Stainless	Stainless steel
⑬	Valve	Special nitrile rubber, Stainless steel
⑭	Bottom rubber	Silicone rubber
⑮	Bottom plug	Brass, electroless nickel plating
⑯	O-ring	Fluoro rubber

■ EVD-3000 Series



No.	Part name	Material
①	Lid	PBT resin
②	M12 connector	———
③	Housing	ABS resin
④	Controller board	———
⑤	3-way valve	———
⑥	Valve base	Polyphenylene sulfide resin
⑦	Pilot chamber	Polyphenylene sulfide resin
⑧	Piston body assy	Aluminum alloy die-casting etc.
⑨	Body	Aluminum alloy die-casting
⑩	Pressure sensor	———
⑪	Piston assy	Aluminum alloy, Stainless steel etc.
⑫	Spring	Stainless steel
⑬	Top valve	Brass, Special nitrile rubber
⑭	Bottom valve	Brass, Special nitrile rubber
⑮	Bottom cap	Brass
⑯	O-ring	Nitrile rubber
⑰	Base plate	Steel sheet

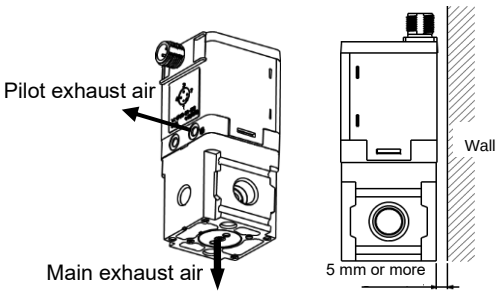
2. INSTALLATION

2.1 Mounting

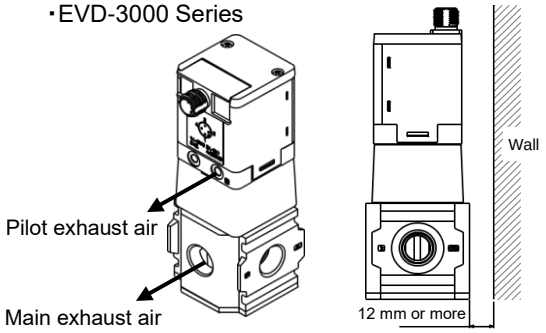
⚠ CAUTION

Secure sufficient space around the product for operation, mounting, removing, wiring, and piping.
Install a pneumatic filter immediately before the circuit in which pneumatic components are used.
Install the product so that the exhaust port is not blocked and there is sufficient space for exhaust.

・EVD-1000 Series

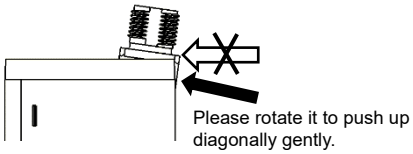


・EVD-3000 Series

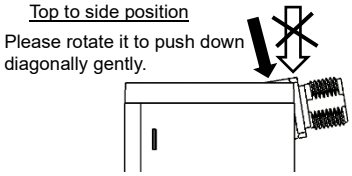


Do not force it in the direction of the arrow.
The case may be damaged.

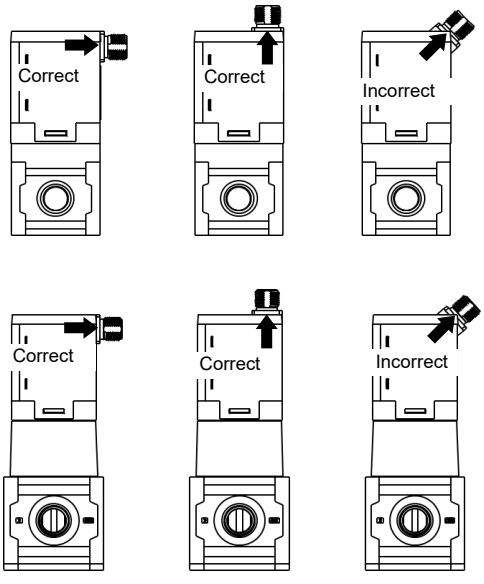
Side to top position



Top to side position

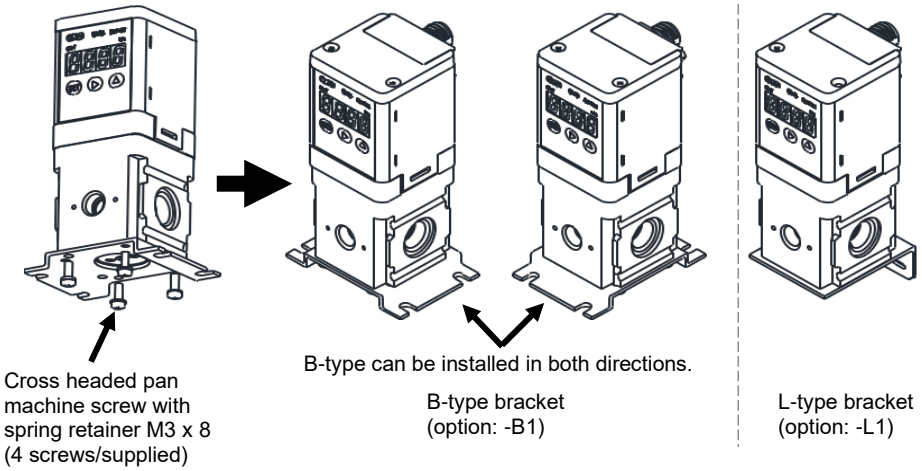


Make sure that the M12 connector faces up or sideways (not diagonally). If the cable can be moved, secure the cable.
The rotating mechanism of the M12 connector is not designed for use with cables that are not secured.

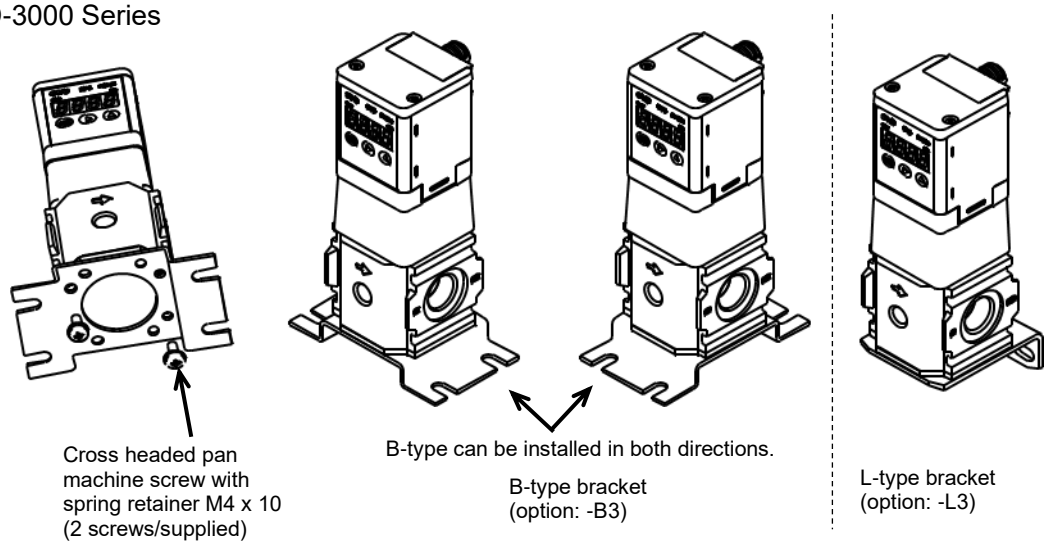


1 Attach the optional bracket to the bottom of the product.
For the optional bracket, refer to "6.1 Optional Part Model Number".

- EVD-1000 Series



- EVD-3000 Series



2 Install the body to the specified position.

2.2 Piping

⚠ CAUTION

Do not remove the port seal until just before piping.
If the port seal is removed before ready to begin piping, foreign matters may enter from the piping ports and cause a failure or malfunction.

Fully flush and clean the air pipe before use.

Open the exhaust port to the atmosphere.
The pressure cannot be properly controlled if the exhaust port is blocked with a plug.

Tighten the pipes with the appropriate tightening torque.
Observe the appropriate tightening torque to prevent air leakage and damage to the threads. To prevent damage to the screw threads, first use your hands to lightly tighten the pipe and use a tool to tighten the pipe further.

[Recommended tightening torque]

Port screw	Tightening torque N·m
1/4	6 to 8
3/8	13 to 15

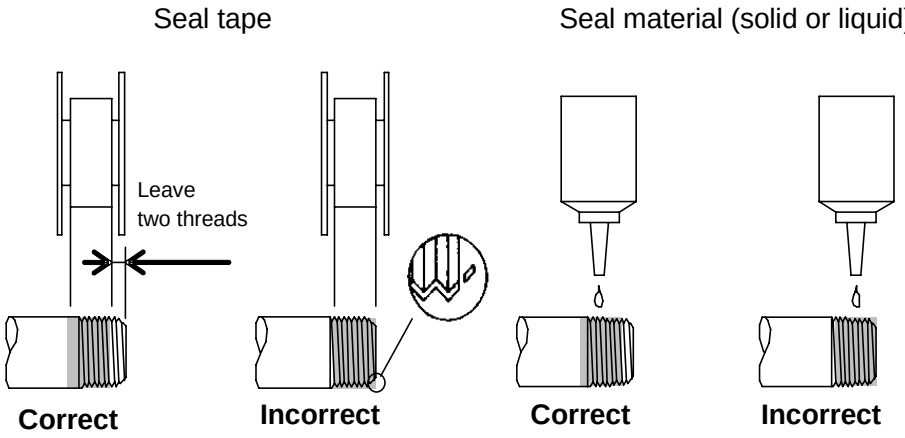
Do not apply high pressure suddenly when supplying the compressed air for the first time after connecting the pipes.

When supplying compressed air for the first time after piping is complete, make sure that there is no air leakage at the joints.
Apply leak detection agent to the joints in the piping using a brush to check for air leakage.

2.2.1 Seal material

Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the pipes or device and cause a failure.

When using a seal tape, wind it around the screw threads in the direction opposite from the screw threads and press it down with your fingers to attach it firmly.
When using a liquid seal material, be careful not to apply it to the resin parts. It damages the resin parts and causes a failure or malfunction. Also, do not apply it to the internal threads.



2.3 Wiring

⚠ WARNING

Check the connector pins and the cable conductor colors before wiring.
Incorrect wiring may cause damage, failure, and malfunctions of the product. Check the wire color described in the Instruction Manual before wiring.

Check the wiring insulation.
Make sure that the wires do not contact other circuits and there is no ground fault and insulation failure between terminals. Overcurrent may flow into the product and result in damage.

Use a DC stabilized power supply for the product that is within the rating and insulated from the AC power.
Uninsulated power may cause an electric shock. If the power is not stabilized, the peak value may exceed the rating. This may damage the product or lead to poor accuracy.

Stop the control device and the machinery and turn off the power before wiring.
Operating the product suddenly may cause an unexpected behavior and a dangerous situation. Perform an electrical current test with the control device and the machinery stopped and set the required data. Discharge static electricity from your body, tools, and devices before and during work. For movable sections, use wiring material with the same level of bending resistance as the robot wire.

Use the product within the power supply voltage range.
If voltage or AC power (100 VAC) out of the specified range is applied, the product may burst or an electric shock or a fire may occur.

Do not short-circuit the load.
The product may burst or burn.

⚠ CAUTION

Insulate unused wires to avoid contact with other wires.
The optional shielded cable connector is for a shielded wire. Ground the shielded wire to the power supply side.

If extending the cable, be less than the cable length 20m from the master to the device (this product).
Connecting unused wires accidentally to the ground may cause the product to malfunction or become damaged.

When using a cable other than the optional cable, use a cable that adapts to the IO-Link communication specifications.
Wiring colors and pin assignments are described in the IO-Link communication specifications. Depending on the cable, the relationship between the wiring color and the pin arrangement may not match, resulting in incorrect wiring.

2.3.1 M12 connector

⚠ CAUTION

Do not rotate the M12 connector.
The L type cable connector does note rotate. Never turn it.

Turn off the power before inserting or removing the M12 connector.
Be sure to turn off the power before inserting or removing the M12 connector.

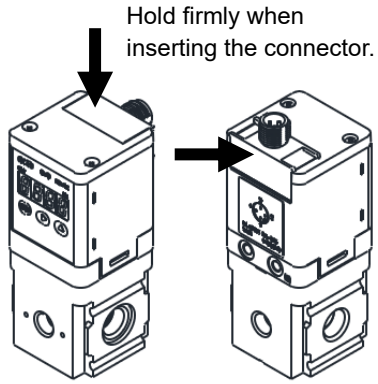
Always hold the connector when inserting or removing the M12 connector.
Do not pull on the cable.

When fitting the M12 connector, align the convex part of the main body side connector terminal with the concave part of the cable connector terminal.
After inserting it securely, hold the knurled part and tighten it clockwise so as not to damage the thread.

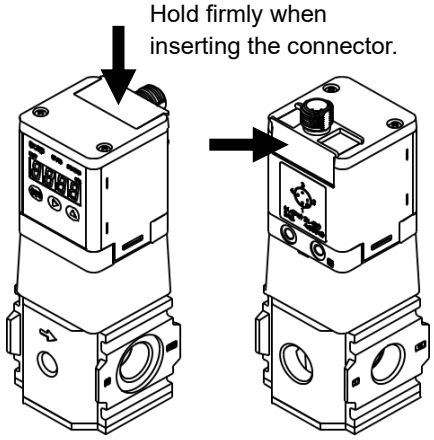
Be careful not to over-screw the connector.
If the connector is screwed excessively, the connector on the main unit may be damaged.
Recommended torque: 0.4 to 0.49 N · m

Hold the M12 connector firmly so that it faces up or sideways when inserting it.
The rotating mechanism of the Connector housing allows a 90-degree rotation.

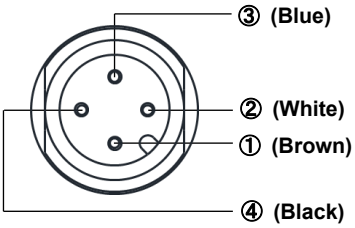
- EVD-1000 Series

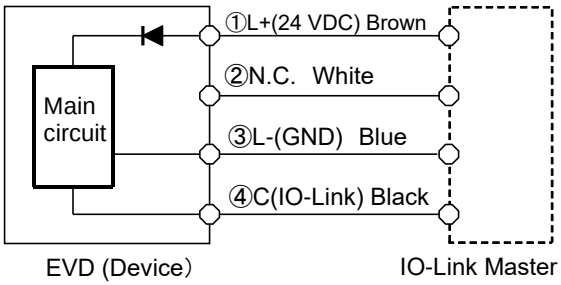


- EVD-3000 Series



2.3.2 Cable connection





Pin No.	Option Cable Color	Name
①	Brown	L+(24 VDC)
②	White	N.C.
③	Blue	L-(GND)
④	Black	C(IO-Link)

- The optional cable for our electro-pneumatic regulator EVR and EVS2 series is M12 connector type and can be connected to the connectors of this product. However, the combinations of terminal number and wiring color are different from those in the IO-Link cable specifications. Do not use it as it may lead to miswiring.
  Relevant model nos.: EVR-S1/EVR-S3/EVR-L1/EVR-L3/EV2000-C11/EV2000-C13

3. USAGE

⚠ CAUTION

Create a program and control circuit that ignores signals for approximately two seconds immediately after energized.
Pressure control will not operate for approximately two seconds immediately after energized for self-diagnosis.

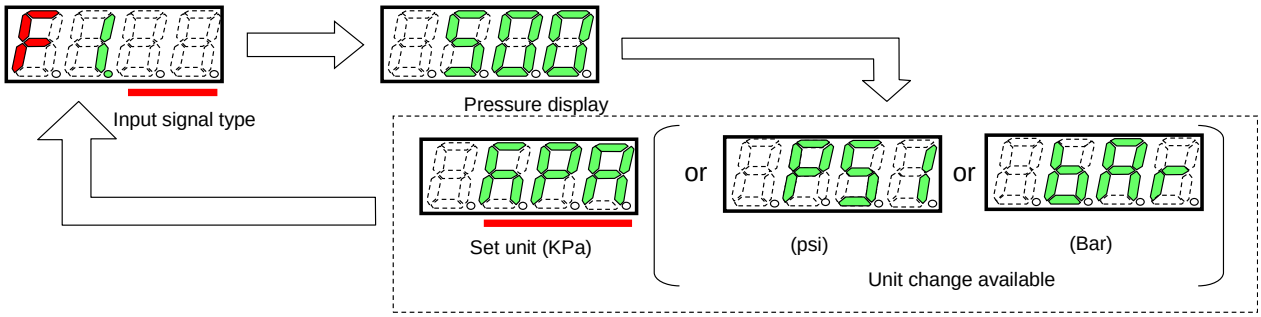
Stop the device before changing the set output value.
Control system devices may operate unintentionally.

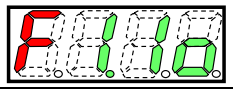
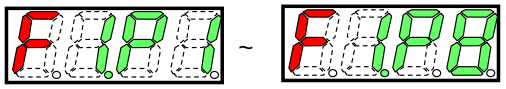
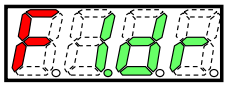
Release the key lock before changing settings.

3.1 Checking the Set Value (RUN Mode)

3.1.1 Input signal type setting

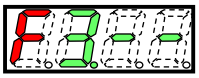
The F1 screen shows the input signal type and its set value.
The current input specification setting, pressure value and unit are displayed alternately.

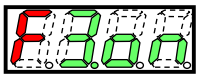


Input signal type symbol	Contents
	IO-Link communication 16bit input Input of 16bit using Process Data OUT
	Preset memory input Input of 3bit using Process Data OUT Displays the selected preset no.
	Direct memory input

3.1.2 Automatic power off

The F3 screen shows whether the automatic power off is enabled or disabled.

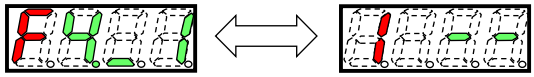
When the function is disabled: 

When the function is enabled: 

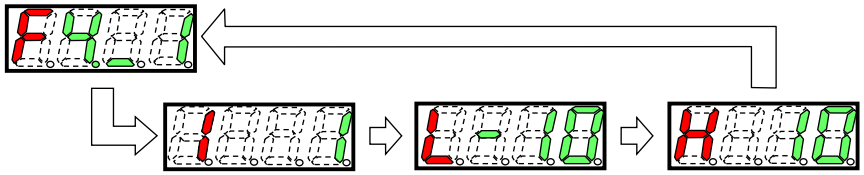
3.1.3 Switch output

The F4 screen shows whether the switch output is enabled or disabled and its set value.

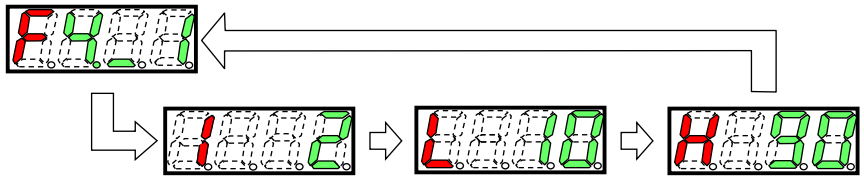
- Switch output 1

  When the function is disabled: 

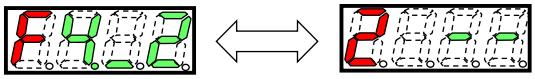
  Mode 1:

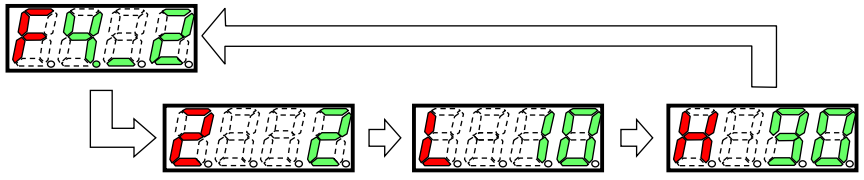
  Mode 2:

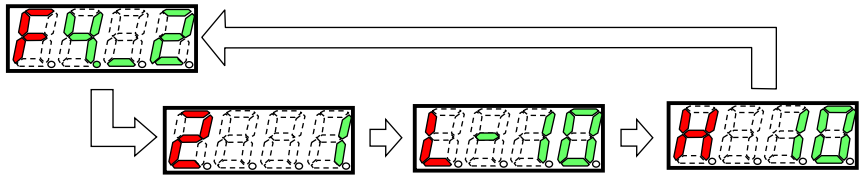
- Switch output 2

  When the function is disabled: 

  Mode 1:

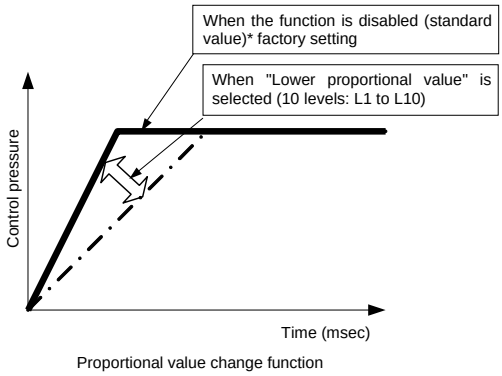
  Mode 2:

3.1.4 Proportional value change

In the F5 screen, whether the proportional value change is enabled or disabled and its set level can be confirmed.

- When disabled: Controls with standard values (factory setting).
- When enabled: "Higher proportional value" or "Lower proportional value" can be selected.
  The set value can be selected from 10 levels only when "Lower proportional value" is selected.



Proportional value change function

Note: The figure above is reference. The actual values will change depending on the piping and load conditions.

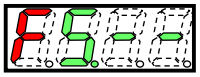
■ Effect of increasing the proportional value

A higher accuracy control can be achieved depending on the piping and load capacity conditions.
Note that hunting will occur easily.

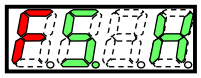
■ Effect of decreasing the proportional value

More stable control can be achieved depending on the piping and load capacity conditions. It is effective especially if control pressure fluctuates significantly or hunting occurs.

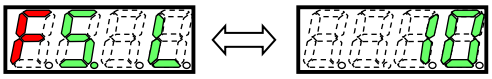
When the function is disabled:



When "Higher proportional value" is selected (H):



When "Lower proportional value" is selected (L):

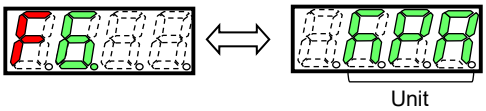


3.1.5 Unit setting

The F6 screen shows whether the unit is its set value.

When the Unit setting none:

When the Unit setting available:



3.1.6 Operation while communication error occurred setting

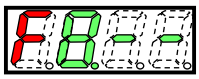
The F7 screen shows whether the operation while communication error occurred setting is its set value.

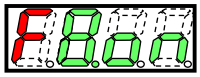
HOLD: 

CLEAR: 

3.1.7 Control stop function at zero input signal

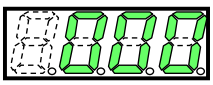
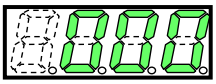
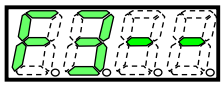
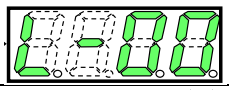
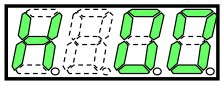
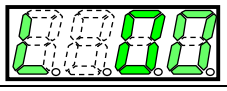
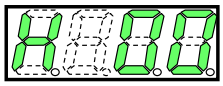
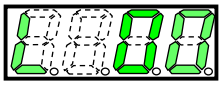
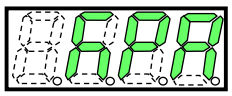
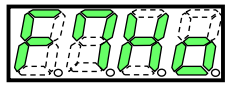
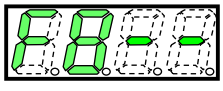
The F8 screen shows whether the control stop function at zero input signal is enabled or disabled.

When the function is disabled: 

When the function is enabled: 

3.2 How to Set (Setting Mode)

3.2.1 Setting ranges

Function	Display	Description	Specification
F1: Input specification setting - For Preset Mode - "F1.P1", "F1.P8"		Sets a set value (pressure).	Range: Note 1 1100 / 000 to 100 1500 / 000 to 500 1900 / 000 to 900 Min. set unit: 1 kPa
F1: Input specification setting - For Direct Mode - "F1.dr"		Sets a set value (pressure).	Range: Note 1 1100 / 000 to 100 1500 / 000 to 500 1900 / 000 to 900 Min. set unit: 1 kPa
F3: Automatic power off "F3. "		Sets enable/disable.	Disable: -- Enable: on
F4: Switch output - For Mode **1** - * Common for Switch output 1 and 2 "1_ _1", "2_ _1"		Sets a "-" set value.	Range: 00 to 50 Min. set unit: 1%
		Sets a "+" set value.	Range: 00 to 50 Min. set unit: 1%
F4: Switch output - For Mode **2** - * Common for Switch output 1 and 2 "1_ _2", "2_ _2"		Sets a lower limit value.	Range: 00 to 90 Note 2 Min. set unit: 1%
		Sets an upper limit value.	Range: 100 to 010 Note 2 Min. set unit: 1%
F5: Proportional value setting - Increases a proportional value - "F5. H"		Cannot set a level.	
F5: Proportional value setting - Decreases a proportional value - "F5. L"		Sets a level.	Range: 01 to 10 Min. set unit: 1
F6: Unit change * Selection option: KA only "F6. "		Sets a unit.	kPa (Default) psi bar
F7: Communication error setting "F7. "		Sets CLEAR/HOLD.	CLEAR HOLD
F8: Input zero operation function "F8. "		Sets disable/enable.	Disable: -- Enable: on

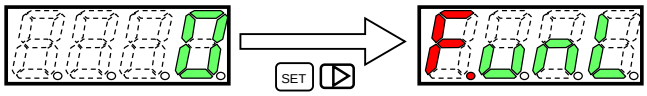
Note 1: If a pressure value is set to 1%FS or less, pressure may not be controlled due to residual pressure.
Note 2: The setting range may be limited depending on the set value.

3.2.2 Key lock

Key lock prevents incorrect operation.
When the power is turned on (including re-turn on), the key is locked. Release the key lock before changing the setting.

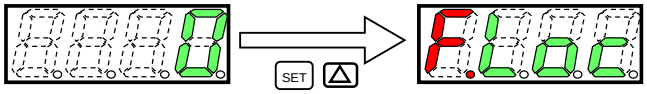
■ How to operation (Key operation)

- Release key lock



Press & hold both at least 2 seconds.

- Lock key



Press & hold both at least 2 seconds.

■ How to operation (IO-Link communication)

<Parameter settings>

- Release key lock
  Index: Write "0: Unlock" to 0x010E
- Lock key
  Index: Write "1: Lock" to 0x010E

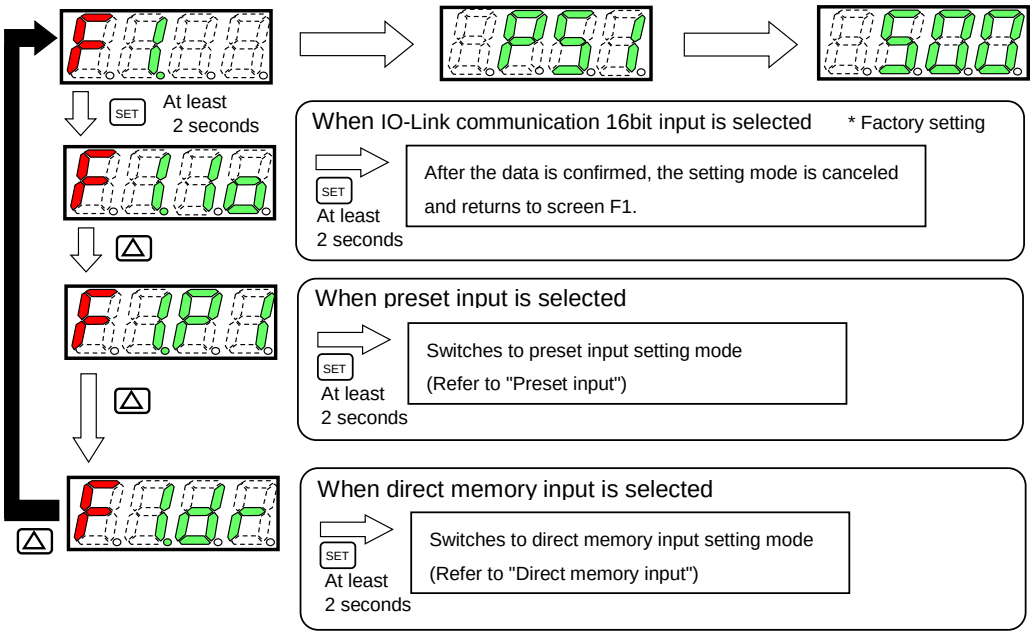
Parameter and Command

Index	Sub Index	Item	Value
0x010E	0	Key lock setting	0: Unlock 1: Lock

3.2.3 Input signal

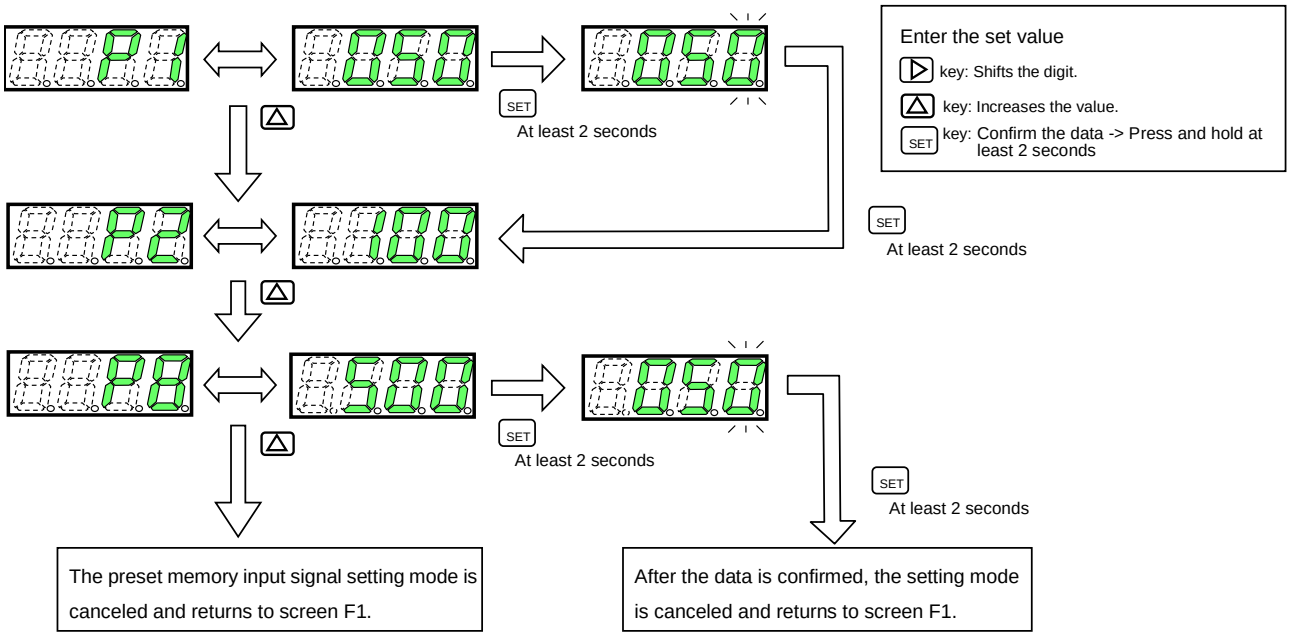
■ How to operation (Key operation)

In F1 screen, press and hold the [SET] key at least two seconds to switch to the setting mode.
For how to set using IO-Link communication, refer to ("3.3 Control procedure using IO-Link communication").
(Note) The 16-bit value entered using IO-Link communication cannot be changed by key operation.



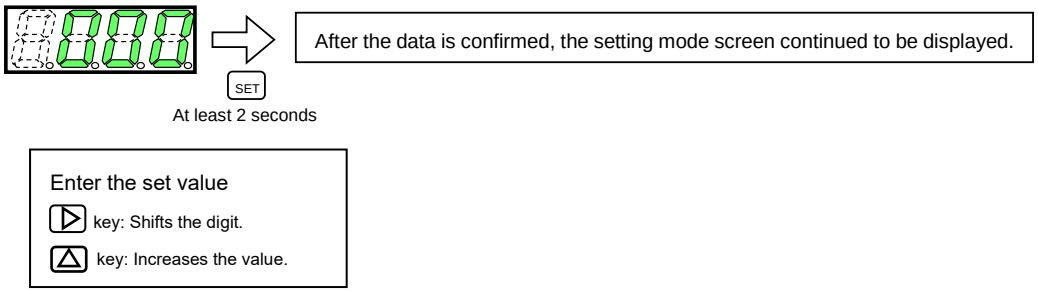
■ Preset input

Press and hold the [SET] key at least two seconds with the preset input selected in F1 screen.



■ Direct memory input

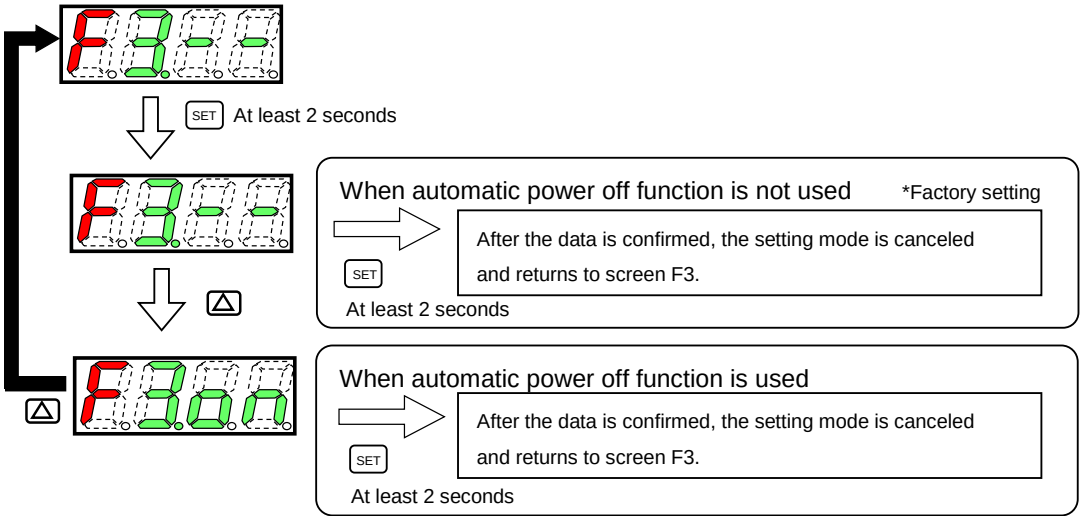
Press and hold the [SET] key at least two seconds with the direct memory input selected in F1 screen



3.2.4 Automatic power off

■ How to operation (Key operation)

In F3 screen, press and hold the [SET] key at least two seconds to switch to the setting mode.



■ How to operation (IO-Link communication)

<Parameter settings>

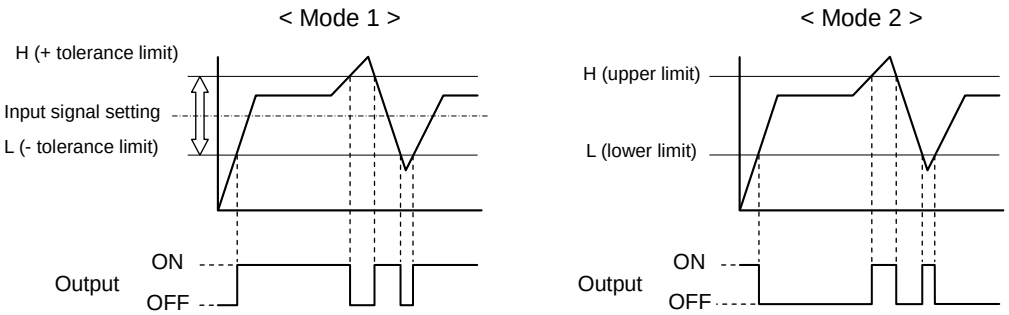
- Automatic power off setting "OFF".
  Index: Write "0: OFF" to 0x010D.

- Automatic power off setting "ON".
  Index: Write "1: ON" to 0x010D.

Parameter and Command

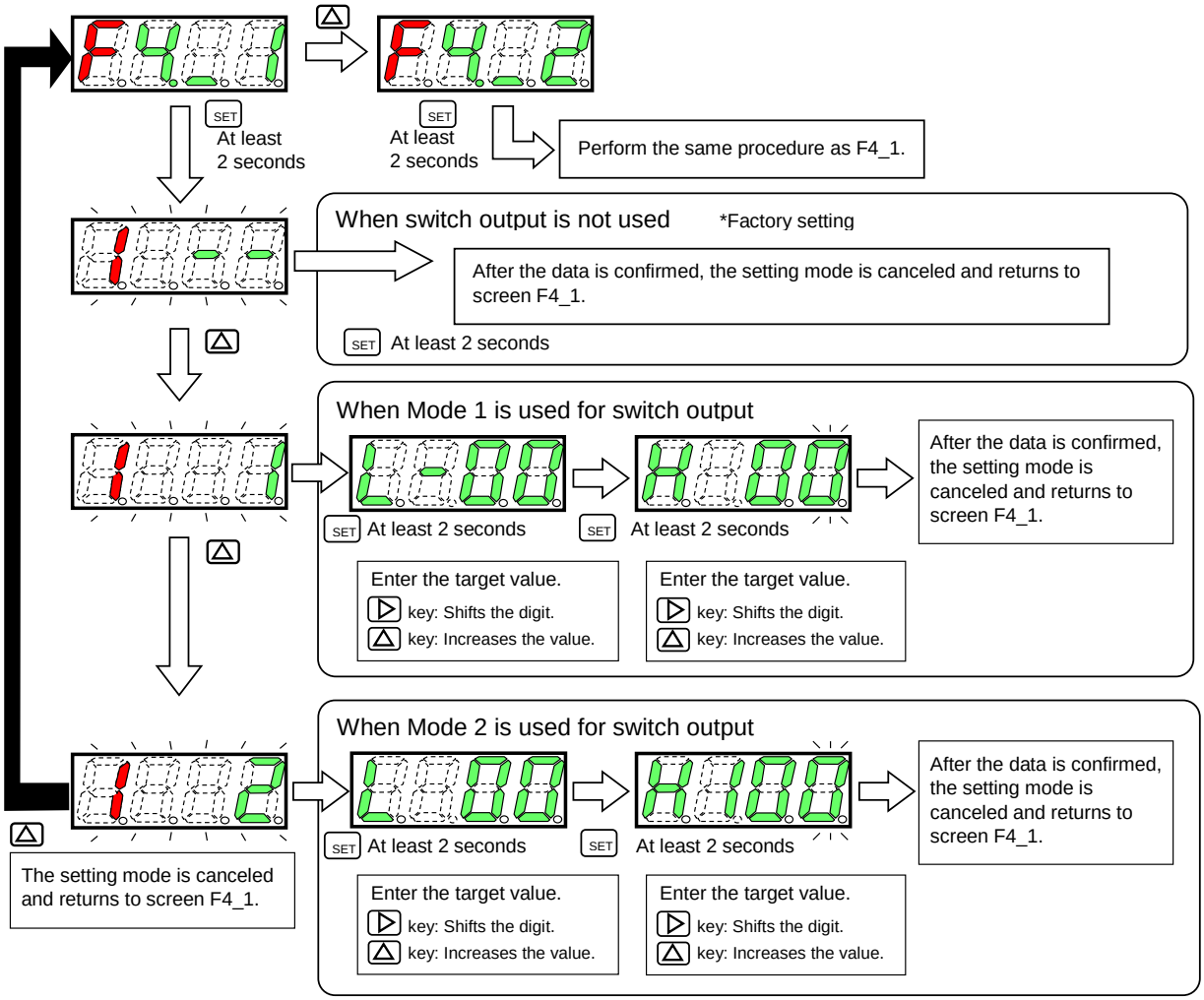
Index	Sub Index	Item	Value
0x010D	0	Automatic power off setting	0: OFF 1: ON

3.2.5 Switch output



■ How to operation (Key operation)

In F4_1 and F4_2 screen, press and hold the [SET] key at least two seconds to switch to the setting mode.



■ How to operation (IO-Link communication)

<Parameter settings>

Switch output 1 setting

- Switch output 1 OFF setting
  Index: Write "0: OFF" to 0x0101.

- Switch output 1 mode 1 setting
  Index: Write "1: Mode 1" to 0x0101.
  Index: Write lower limit value of Mode 1 to 0x0103.
  Index: Write higher limit value of Mode 1 to 0x0104.

- Switch output 1 mode 2 setting note 2
  Index: Write "2: Mode 2" to 0x0101.
  Index: Write lower limit value of Mode 2 to 0x0105.
  Index: Write higher limit value of Mode 2 to 0x0106.

Parameter and Command

Index	Sub Index	Item	Value
0x0101	0	Switch output 1 Mode selection	0: OFF 1: Mode 1 2: Mode 2
0x0103	0	Switch output 1 Mode 1 lower limit value	0 to 50 note
0x0104	0	Switch output 1 Mode 1 Higher limit value	0 to 50 note
0x0105	0	Switch output 1 Mode 2 lower limit value	0 to 90 note
0x0106	0	Switch output 1 Mode 2 Higher limit value	10 to 100 note

Switch output 2 setting

- Switch output 2 OFF setting
  Index: Write "0: OFF" to 0x0102.

- Switch output 2 mode 1 setting
  Index: Write "2: Mode 1" to 0x0102.
  Index: Write lower limit value of Mode 1 to 0x0107.
  Index: Write higher limit value of Mode 1 to 0x0108.

- Switch output 2 mode 2 setting note 2
  Index: Write "2: Mode 2" to 0x0102.
  Index: Write lower limit value of Mode 2 to 0x0109.
  Index: Write higher limit value of Mode 2 to 0x010A.

Parameter and Command

Index	Sub Index	Item	Value
0x0102	0	Switch output 2 Mode selection	0: OFF 1: Mode 1 2: Mode 2
0x0107	0	Switch output 2 Mode 1 lower limit value	0 to 50 note
0x0108	0	Switch output 2 Mode 1 Higher limit value	0 to 50 note
0x0109	0	Switch output 2 Mode 2 lower limit value	0 to 90 note
0x010A	0	Switch output 2 Mode 2 Higher limit value	10 to 100 note

Note 1: The set value represents a percentage of the full scale (FS).
(Ex.) To set a pressure of 100 kPa for 500 kPa type, set 20 by calculating as follows: 100/500 x 100 = 20.
Note 2: When Mode 2 is used, it should be set so as to achieve (Lower limit value + 10) ≤ Upper limit value.
When this requirement is not met, the Switch output is always OFF. 0x8D12 or 0x8D13 is generated in the Event Code of Diagnosis.
12 or 13 is displayed as the error code (Bit4-7) of PD5. See 1.5.7 Diagnosis, and 5.2 Error Code.

[Confirmation]

Process Data IN

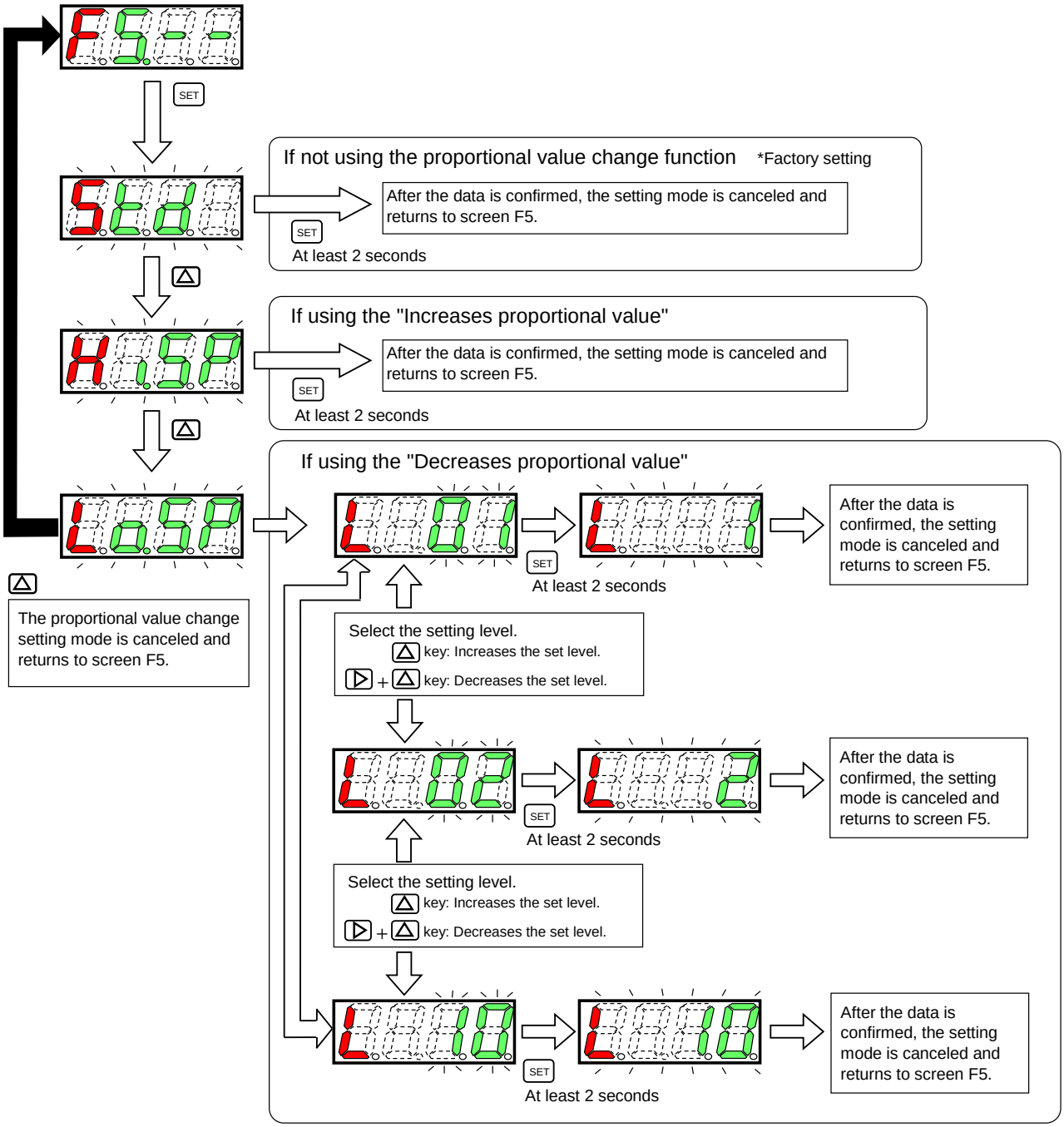
PD	PD4								PD5							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data Name	Error	Warning	Normal Operation	-	-	-	Switch output 2	Switch output 1	MSB Error Code			LSB	Input Select		-	Start / Stop

Check the Switch output of the Process Data IN.
Switch output 1 is stored in Bit 8, and Switch output 2 is stored in Bit 9.
For the Output, "0: OFF" and "1: ON".

3.2.6 Proportional value change setting

■ How to operation (Key operation)

In the F5 screen, press and hold the [SET] key at least two seconds to switch to the setting mode.



* For "Lower proportional value", operation takes place with the set level displayed on the screen while selecting a set level. When the set level is determined, press and hold the [SET] key at least two seconds to confirm the value.

■ How to operation (IO-Link communication)

<Parameter settings>

- Standard setting for proportional value
  Index: Write "0: OFF" to 0x010B.

- Increases proportional value setting
  Index: Write "1: Increases proportional value" to 0x010B.

- Decreases proportional value setting
  Index: Write "2: Decreases proportional value" to 0x010B.
  Index: Write " set level " to 0x010C.

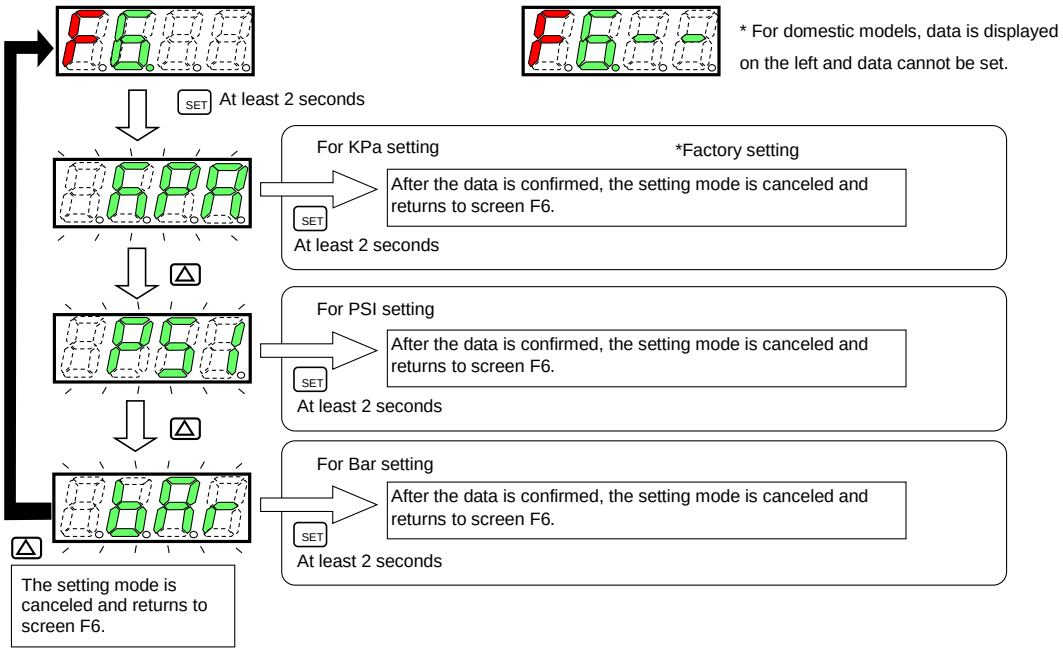
Parameter and Command

Index	Sub Index	Item	Value
0x010B	0	Proportional value setting	0: OFF 1: Increases proportional value 2: Decreases proportional value
0x010C	0	Setting level for the "Decreases proportional value"	1 to 10

3.2.7 Unit change (KA type)

■ How to operation (Key operation)

In the F6 screen, press and hold the [SET] key at least two seconds to switch to the setting mode.



■ How to operation (IO-Link communication)

<Parameter settings>

- Unit conversion
  Write a desired unit "0: kPa",
  "1: psi" or "2: bar" to Index:0x0118.

Parameter and Command

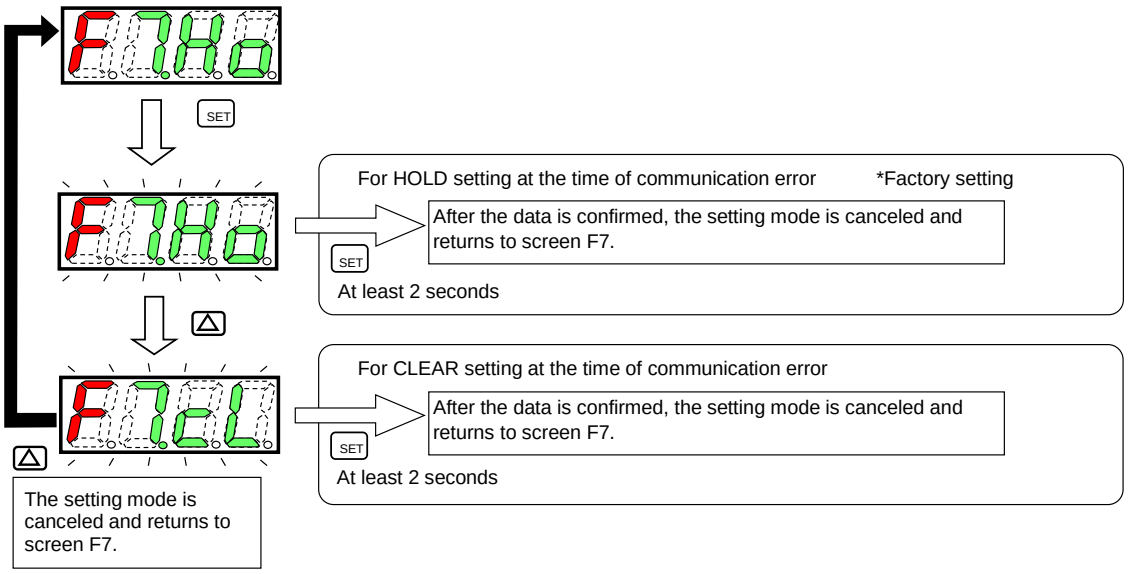
Index	Sub Index	Item	値
0x0118	0	Unit change	0: kPa 1: psi 2: bar

* When "Unit change none" is selected, only "0: kPa" is writable.
  Writing any other value results in a write error.

3.2.8 Operation while communication error occurred setting

■ How to operation (Key operation)

In the F7 screen, press and hold the [SET] key at least two seconds to switch to the setting mode.



■ How to operation (IO-Link communication)

<Parameter settings>

- HOLD settings
  Index: Write "0: HOLD" to 0x011A.

- CLEAR settings
  Index: Write "1: CLEAR" to 0x011A.

Parameter and Command

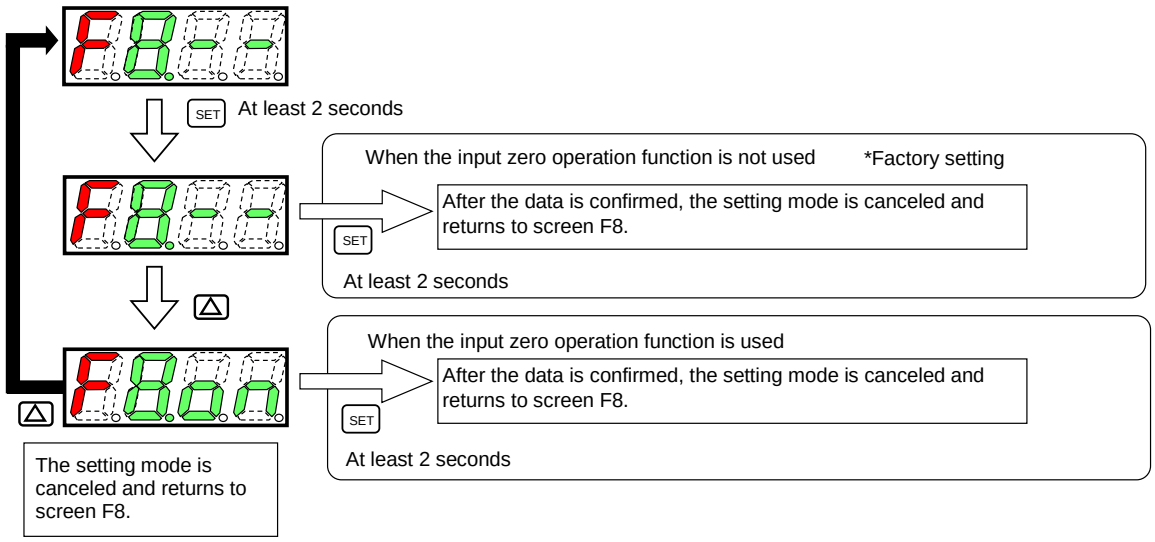
Index	Sub Index	Item	Value
0x011A	0	Operation while communication error occurred setting	0: HOLD 1: CLEAR

* An invalid Process Data Status represents a communication error.
  When the C/Q line is disconnected, it becomes invalid. If the IO-Link master and its upper network are disconnected, process data output is disabled. (Depending on the specification of the IO-Link master, Process Data Out may not be disabled even if the wire is disconnected. Please check the specifications of the master.)
  This applies only to the Normal and Preset Modes.
  In the Direct Mode, the operation continues even if a communication error occurs.

3.2.9 Control stop function at zero input signal

■ How to operation (Key operation)

In the F8 screen, press and hold the [SET] key at least two seconds to switch to the setting mode.



■ How to operation (IO-Link communication)

<Parameter settings>

- OFF setting
  Index: Write "0: OFF" to 0x0100.

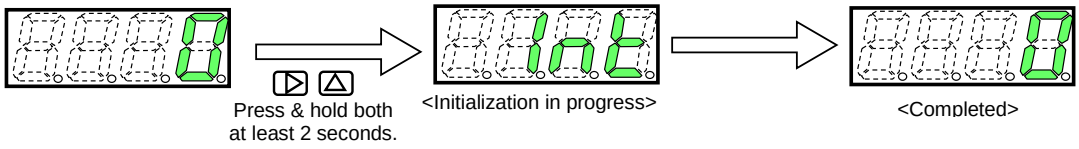
- ON setting
  Index: Write "0: ON" to 0x0100.

Parameter and Command

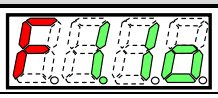
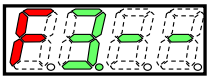
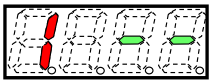
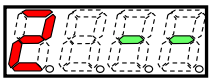
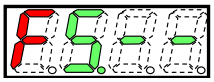
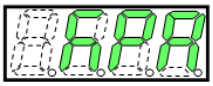
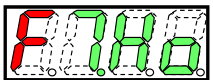
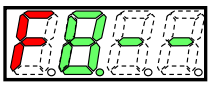
Index	Sub Index	Item	Value
0x0100	0	Control stop function at zero input signal	0: OFF 1: ON

3.2.10 Factory setting mode (initialization)

■ How to initialize



- Factory setting

Function	Name	Display of setting	Description of setting
F1	Input specification setting		Normal Mode
F3	Automatic power off		Automatic power off disabled
F4_1	Switch output 1		Switch output disabled
F4_2	Switch output 2		Switch output disabled
F5	Proportional value setting		Standard setting (Proportional value setting disabled)
F6	Unit change Note 1		kPa setting
F7	Communication error setting		Set to HOLD.
F8	Input zero operation function		Input zero operation disabled

Note 1: This function is enabled when "Unit change available" is selected.
"F6--" is displayed when "Unit change none" is selected.

3.3 Control procedure using IO-Link communication

3.3.1 Normal Mode

The pressure can be controlled with the "Set Value for pressure" of the Process Data OUT.
The set value cannot be changed by key operation.

■ Setting method using IO-Link communication

[Parameter setting]

- **Input signal setting**
  "0: Normal Mode" is written to Index:0x010F (Input setting).

Parameter and Command

Index	Sub Index	Item	Value
0x010F	0	Input setting	0: Normal Mode 1: Preset Mode 2: Direct Mode

[Operation]
Process Data OUT

PD	PD0								PD1							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Set pressure															

PD	PD2								PD3							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Unused					Preset			Unused							Start/Stop
						3	2	1								

- **Setting active state (pressure controlled state)**
  Set the "Start/Stop" bit of the Process Data OUT to "1" to create an active state.
  Pressure can be controlled by setting the "Set value for pressure" of the Process Data OUT.

⇓
”1”

Set pressure range for each model and unit

Model no.	Selected unit	Process Data OUT	Set pressure	Remarks
EVD-1100-C EVD-3100-C	Fixed at kPa	0 to 1000	0.0 to 100.0	-
EVD-1500-C EVD-3500-C	Fixed at kPa	0 to 5000	0.0 to 500.0	-
EVD-1900-C EVD-3900-C	Fixed at kPa	0 to 9000	0.0 to 900.0	-
EVD-1100-C*KA EVD-3100-C*KA	kPa	0 to 1000	0.0 to 100.0	Unit change available
	psi	0 to 1450	0.00 to 14.50	
	bar	0 to 1000	0.000 to 1.000	
EVD-1500-C*KA EVD-3500-C*KA	kPa	0 to 5000	0.0 to 500.0	Unit change available
	psi	0 to 7250	0.00 to 72.50	
	bar	0 to 5000	0.000 to 5.000	
EVD-1900-C*KA EVD-3900-C*KA	kPa	0 to 9000	0.0 to 900.0	Unit change available
	psi	0 to 1305	0.0 to 130.5	
	bar	0 to 9000	0.000 to 9.000	

- A pressure setting shall be entered in 4 digits. When you do not use IODD, you do not need to enter a decimal point; when you use IODD, you must include a decimal point.
- Do not enter a value outside the allowable range. User's programs should control the Process Data OUT setting so that it is within the allowable range.

[Confirmation]
Process Data IN

PD	PD0								PD1							
Bit	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
	MSB															LSB
Data name	Set pressure: The value of the "Set value for pressure" of the Process Data OUT is displayed here.															

PD	PD2								PD3							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Controlled pressure: EVD's controlled pressure value is displayed here.															

PD	PD4								PD5							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**	-	**1**
Data name	Error	Warning	Normal operation	-	-	-	Switch output		MSB			LSB	Input setting		-	Start/Stop
							2	1	Error code							

The controlled pressure, start/stop status, input setting, and set pressure can be checked with the Process Data IN.
The current set pressure should be checked with the "Set value for pressure" of the Process Data IN.

When the "Start/Stop" bit of Process Data IN is set to "0" (Stop) and the "Input setting" is not set to "0" (Normal Mode), the pressure is not controlled even when the "Set value for pressure" of the Process Data OUT is set.

3.3.2 Preset input

Switch the set pressure by specifying eight set pressures and using the three bits of the Process Data OUT.

Ex.) To control the set pressure (0, 50, 100, 150, 200, 300, 400 or 500 kPa) with preset input Select Preset Mode for "Input setting".
P1: 0 kPa, P2: 50 kPa, P3: 100 kPa, P4: 150 kPa
P5: 200 kPa, P6: 300 kPa, P7: 400 kPa, P8: 500 kPa
Make the above settings. When a signal is input with the Process Data OUT, the pressure is switched to the set pressure stored in memory.

■ How to set preset input (by key operation)

Set "Input setting" and enter set pressures for "Preset memory" P1 to P8 by key operation.
For the setting method by key operation, refer to pages 37 and 38.

■ How to set preset input (using IO-Link communication)

[Parameter setting]

- **Input signal setting**
  Write "1: Preset Mode" to "Index:0x010F (Input setting)".

- **Setting preset memory 1 to 8**
  Write set pressures to "Indexes: 0x0110 to 0x0117 (Preset memory 1 to 8)".

Parameter and Command

Index	Sub Index	Item	Value
0x010F	0	Input setting	0: Normal Mode 1: Preset Mode 2: Direct Mode
0x0110	0	Preset memory 1	Refer to "**Set pressure range for each model and unit**"
-	-	-	
0x0117	0	Preset memory 8	

- The set pressure shall be entered in 4 digits. When you do not use IODD, you do not need to enter a decimal point; when you use IODD, you must include a decimal point.
- Do not enter a value outside the allowable range. User's programs should control the pressure so that it is within the allowable range for each model.

[Operation]
Process Data OUT

PD	PD0								PD1							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Set pressure															

PD	PD2								PD3							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Unused					Preset			Unused							Start/Stop
						3	2	1								

- **Setting active state (pressure controlled state)**
  Set the "Start/Stop" bit of the Process Data OUT to "1" to create an active state. Control is performed at the pressure stored in the preset memory corresponding to the preset memory number.

- **Switching preset memory**
  The preset memory number can be switched according to the "Preset" setting of the Process Data OUT. Entering the 3 bits of the "Preset" according to the right table allows you to switch to any of the set pressures stored in the memory areas.

"Preset" of Process Data OUT			Preset memory number
Bit 3	Bit 2	Bit 1	
0	0	0	P1
0	0	1	P2
0	1	0	P3
0	1	1	P4
1	0	0	P5
1	0	1	P6
1	1	0	P7
1	1	1	P8

[Confirmation]
Process Data IN

PD	PD0								PD1							
Bit	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
	MSB															LSB
Data name	Set pressure: The set pressure in the preset memory area corresponding to the specified number is displayed.															

PD	PD2								PD3							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Controlled pressure: EVD’s controlled pressure value is displayed here.															

PD	PD4								PD5							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**1**	-	**1**
Data name	Error	Warning	Normal operation	-	-	-	Switch output		MSB			LSB	Input setting		-	Start/Stop
							2	1	Error code							

The controlled pressure, start/stop status, input setting, and set pressure can be checked with the Process Data IN.
Check the current set pressure with the "Set Value for pressure" in Process Data IN.

- When the "Start/Stop" bit of the Process Data IN is set to "0" (Stop) and the "Input setting" is not set to "1" (Preset Mode), the pressure is not controlled even after the "Preset" bit of the Process Data OUT is switched.

3.3.3 Direct memory input

"Input setting" can be changed to the direct memory input mode in the IO-Link communication, but the direct memory value itself cannot be set. To set the value, use key operation. Changing the "Input setting" does not clear the direct memory value. To change the set pressure in IO-Link communication, use the Normal Mode.

[Parameter setting]

- **Input signal setting**
  Write "2: Direct Mode" to "Index:0x010F (Input setting)".

Parameter and Command

Index	Sub Index	Item	Value
0x0115	0	Input setting	0: Normal Mode 1: Preset Mode 2: Direct Mode

[Confirmation]
Process Data IN

PD	PD0								PD1							
Bit	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
	MSB															LSB
Data name	Set pressure: The value set in the direct memory is displayed.															

PD	PD2								PD3							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Controlled pressure: EVD's controlled pressure value is displayed here.															

PD	PD4								PD5							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	-	-	-	-	-	-	1	0	-	1
Data name	Error	Warning	Normal operation	-	-	-	Switch output		MSB			LSB	Input setting		-	Start/Stop
							2	1	Error code							

The controlled pressure, start/stop status, input setting, and set pressure can be checked with the Process Data IN.
Check the current set pressure with the "Set Value for pressure" in Process Data IN.

- When the "Input setting" is not set to "2" (Direct Mode), the pressure is not controlled with the direct memory setting value.
- Regardless of the "Start/Stop" setting of the Process Data OUT, the pressure is controlled in the Direct Mode.

3.4 Monitoring overactive state of solenoid valve

3.4.1 Monitoring overactive state of solenoid valve

The IO-Link communication can be used to monitor the operating status of the two solenoid valves used inside the EVD and obtain data.
An overactive state can occur even when the product is operating normally. Analyze this information on the overactive state to help select a model (EVD-1000 or EVD-3000, etc.) for your system.
For the overactive state, refer to **"7 References"**.

<Example of use that tends to cause the overactive state>
- Blow control
- Filling large tanks with air, etc.

3.4.2 Acquired data

The following parameters are used to inform the status of the solenoid valve.

Index	Sub Index	Item	Value
0x0400	0	Solenoid valve energizing time	0 to 9,999,999h
0x0401	0	Operating time in overactive state of air supply-side solenoid valve	0 to 9,999,999h
0x0402	0	Number of operations in overactive state of air supply-side solenoid valve	0 to 9,999,999 times
0x0403	0	Operating time in overactive state of exhaust-side solenoid valve	0 to 9,999,999h
0x0404	0	Number of operations in overactive state of exhaust-side solenoid valve	0 to 9,999,999 times

Solenoid valve energizing time (Index: 0x0400)
Measure time in which the "Start/Stop" bit of the Process Data IN is set to "1".
Reading this index returns solenoid valve energization time in unit of time (h).

Operating time in overactive state of air supply-side solenoid valve (Index: 0x0401)
Measure time in which the air supply-side solenoid valve is operating in the overactive state.
Reading this index returns the operating time in the overactive state of the air supply-side solenoid valve in unit of time (h).

Number of operations in overactive state of air supply-side solenoid valve (Index: 0x0402)
Count the number of the operations in overactive state of the air supply-side solenoid valve.
Reading this index returns the number of the operations in overactive state of the air supply-side solenoid valve.
The number of operations is counted when the state is determined to have changed from the non-overactive state to the overactive state.

Operating time in overactive state of exhaust-side solenoid valve (Index: 0x0403)
Measure time in which the exhaust-side solenoid valve is operating in the overactive state.
Reading this index returns the operating time in the overactive state of the exhaust-side solenoid valve in unit of time (h).

Number of operations in overactive state of exhaust-side solenoid valve (Index: 0x0404)
Count the number of the operations in overactive state of the exhaust-side solenoid valve.
Reading this index returns the number of the operations in overactive state of the exhaust-side solenoid valve.
The number of operations is counted when the state is determined to have changed from the non-overactive state to the overactive state

Note: The solenoid valve overactive state data is saved when the Start/Stop bit (Bit0) of the Process Data OUT changes from start to stop. At the end of operation of the EVD, be sure to change the "Set Pressure" of the Process Data OUT to 0 (Bit16-31 = 0) and then Stop (Bit0 = 0) to 0, and then power off the EVD. For details, refer to "1.5.5 Process data OUT".

[Confirmation]
Process Data IN

When the solenoid valve is operating in the overactive state, the "Warning" flag of the Process Data IN changes to "1: ON" and the code corresponding to the error code is displayed, besides updating the values of the above parameters.
An IO-Link event code is stored in the Detailed Devices Status (Index:0x0025) of the parameter.

Error code	Event code	Error description	Control processing (Solenoid valve operation)
E 10	0x8D10	The air supply-side solenoid valve is in the overactive state.	The pressure control does not stop.
E 11	0x8D11	The exhaust-side solenoid valve is in the overactive state.	The pressure control does not stop.

* The EVD continues to controlled pressure even if it is determined to be in the overactive state.

3.4.3 How to obtain data

Data on solenoid valve's overactive state can be obtained by reading the index described in "Acquired data".

Ex: Monitoring of the overactive state of the air supply-side solenoid valve

Checking operating time in overactive state

Read Index: 0x0401.

When a data value of 3 is returned -> The operating time in the overactive state is 3 hours.

Checking the number of operations in overactive state

Read Index: 0x0402.

When the data value 10 is returned -> The number of the operations in the overactive state is 10.

4. MAINTENANCE AND INSPECTION

⚠ WARNING

Turn off the power, stop the supply of compressed air and make sure that there is no residual pressure before maintenance.

⚠ CAUTION

Plan and conduct daily and periodic inspections so that maintenance can be managed correctly.
If maintenance is not properly managed, the product's functions may deteriorate significantly and this may lead to faults (such as short service life, damage, and malfunctions) or accidents.

If an abnormality occurs during operation, immediately stop using the product, turn off the power, and shut off the pneumatic pressure source.

Conduct periodic inspections at least once a year to confirm that the product operates properly.

Do not use materials such as solvents, alcohol, or detergent to remove dirt or stains.
The case is made of resin and resin can be damaged by these materials. Use a waste cloth that is soaked in a diluted neutral detergent and wrung out well to wipe off dirt.

4.1 Periodic Inspection

Conduct periodic inspections at least once a year to prevent accidents or problems, such as functional deterioration, short service life, damage, or malfunctions.

■ Pressure of supplied compressed air

- Is the set pressure supplied?
- Does the pressure gauge indicate the set pressure during operation of the device?

■ Pneumatic filter

- Is drainage correctly discharged?
- Is the bowl or element clean enough to use?

■ Leakage of compressed air from piping connections

- Are all connections, especially at movable sections, correctly connected?
  (The product may not operate properly if leakage occurs from piping.)

■ Operational status

- Is there any delay in operation?
- Are the valves exhausting properly?

■ Operation of pneumatic actuator

- Are operations smooth?
- Is the actuator reaching the end stop properly?
- Are loads connected properly?

If an abnormality is found, contact your nearest CKD sales office or distributor.

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

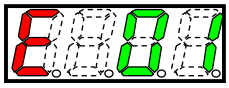
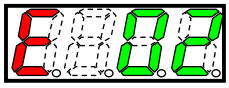
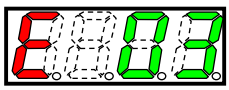
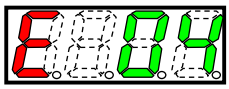
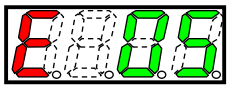
If the product does not operate as intended, check the table below for a possible solution.

Problem	Cause	Solution
Setting cannot be changed.	Key is locked.	Release the key lock according to "3.2.2 Key lock" and change the settings.
	Operation keys do not work.	Replace the product.
	Communication error occurs	Check the status of the IO-Link lamp. * When the red dot is lit, communication between the EVD and IO-Link master has not been established. Please check the wiring as there is a possibility of disconnection, etc. Check the status of the green dot on the bottom right. *When the green Dot is blinking, Process Data Out is disabled. Check the communication status, as communication may not be established between the IO-Link master and its upper network.
Pressure does not display.	Automatic power off function is enabled.	Press any operation key. * If the display turns on and then off after one minute, the automatic power off function is enabled. * Refer to "3.2.4 Automatic power off" to disable the automatic power off.
	Power supply is not connected correctly.	Connect the rated power correctly.
	There is disconnection inside EVD.	Replace the product.
Displayed pressure is abnormal.	Primary side pressure is insufficient.	Maintain the primary side supply pressure so that it is at least the minimum working pressure.
	There is leakage on secondary side piping.	Check if there is leakage from piping.
	There is a failure in pressure sensor.	Replace the product. Make sure that excessive pressure does not apply on the secondary side due to pressure entering from other pipes.
Switch output does not turn ON.	Switch output is disabled.	Refer to "3.2.5 Switch output ".
	There is a failure in EVD.	Replace the product.
Switch output does not turn OFF.	There is a failure in EVD.	Replace the product.
Loud noise is generated.	There is significant leakage which is greater than maximum flow rate.	Using the product in this state will shorten the service life extremely. Reconsider the usage.
	There is air entering from secondary side piping which exceeds relief performance.	Using the product in this state will shorten the service life extremely. Reconsider the usage.
	Power is turned on and input signal is set with no primary side pressure supplied.	Supply the primary side pressure and then turn on the power supply and set the input signal.
	Set input signal is greater than primary side pressure.	Maintain the primary side supply pressure so that it is at least the minimum working pressure.
	Primary side pressure is less than minimum working pressure.	Maintain the primary side supply pressure so that it is at least the minimum working pressure.

Problem	Cause	Solution
1%FS or more pressure is output even if power is turned off.	Zero point is increased with zero/span adjustment.	If the zero point is increased, the set pressure is output even when the power is turned off. If atmospheric pressure condition is required, install a 3-way valve on the secondary side.
	Power is turned off while input signal is set.	Turn on the power and set the input signal to 0%
	Product has been left with power turned off and with primary side pressure supplied for a long period.	If the product has been left unused for a long period, set the primary side pressure to zero. If the secondary side pressure rises, turn on the power and set the input signal to 0%.
	There is a failure in EVD.	Make sure that there is no abnormality in piping and wiring and then replace the product.
Primary side pressure is output as it is.	There is a failure in EVD.	Make sure that there is no abnormality in piping and wiring and then replace the product.
Pressure cannot be controlled.	Input signal is abnormal.	Check the Input signal type.
		Check the Setting range. (Refer to "On demand data")
	There is a failure in pressure sensor.	Replace the product. Make sure that excessive pressure does not apply on the secondary side due to pressure entering from other pipes.
Pressure is not output.	Primary side pressure is not supplied.	Check that the primary side pressure is normal.
	Wiring is abnormal.	Check that the wiring is normal. In addition, check that the connector is properly connected.
Pressure does not reach set pressure.	Primary side pressure is insufficient.	Maintain the primary side supply pressure so that it is at least the minimum working pressure.
Pressure does not drop.	Passage of exhaust port is blocked.	Mount the product so that the air can be exhausted from port R and the exhaust port.
Pressure is unstable.	Power supply voltage is unstable.	Use a stabilized power supply that satisfies the product specifications.
	Input signal is unstable.	Check whether the noise is affecting the signal. Connect the shielded wires to the ground on the power side.
	Primary side pressure is unstable.	Install a regulator on the primary side of the EVD to stabilize the primary side pressure.
	There is leakage from piping.	Check leakage from piping on the primary side and secondary side. * Changing the proportional value ("Lower proportional value") may stabilize the pressure (refer to "3.1.4 Proportional value change"). Note 1
Pressure oscillates.	Primary side pressure is too high against control pressure.	Reduce the primary side supply pressure as much as possible but maintain at least the minimum working pressure.
	Mismatched piping capacity, leakage, or foreign matter contamination on secondary side.	Oscillation may be avoided by changing the piping condition. Reconsider the diameter of the piping, increase or decrease the load capacity, or check leakage on the secondary side. * Changing the proportional value ("Lower proportional value") may stabilize the pressure (refer to "3.1.4 Proportional value change"). Note 1

5.2 Error Code

Turn off the power, check the cause of the error according to the table below, correct it, and turn on the power again.

Error indication	Classification	Name of error	Event code (IO-Link)	Error description	Control processing (Solenoid valve operation)
	Error	Power supply voltage error	0x8D02	The power supply voltage is not the rated voltage. Detection level is 19.5 V or lower.	The pressure control does not stop.
	Error	Input signal error	0x8D03	The input signal is out of the rated range. Detection level: Upper specification + 10%	The pressure control does not stop. * Controlled with input signals of 110%F.S.
	Error	EEPROM data error	0x8D04	Reading/writing EEPROM error	The pressure control is stopped.
	Error	ROM data error	0x8D05	Memory read/write error	The pressure control is stopped.
	Error	Controlled pressure error	0x8D06	The secondary side pressure continues to remain below the set value for 5 seconds or more. It falls below the set value by 20%F.S. or more. Detection accuracy: ±6%	The pressure control does not stop.
7-segment display is not performed. The error code is "E 10".	Warning	Air supply-side solenoid valve operating in overactive state	0x8D10	The air supply-side solenoid valve is in the overactive state.	The pressure control does not stop.
7-segment display is not performed. The error code is "E 11".	Warning	Exhaust-side solenoid valve operating in overactive state	0x8D11	The exhaust-side solenoid valve is in the overactive state.	The pressure control does not stop.
7-segment display is not performed. The error code is "E 12".	Warning	Switch output 1 setting error	0x8D12	The state of **lower limit > (upper limit - 10)** continues for more than 5 seconds for the threshold setting of Switch output 1 (Mode 2).	The pressure control does not stop.
7-segment display is not performed. The error code is "E 13".	Warning	Switch output 2 setting error	0x8D13	・The state of **lower limit > (upper limit-10)** continues for 5 seconds or longer for the threshold setting of Switch output 2 (Mode 2).	The pressure control does not stop.
7-segment display is not performed. The error code is "E 14".	Warning	IO-Link driver temperature error	0x4210	The temperature of the IO-Link driver is high.	The pressure control does not stop.

* When any of the errors of the above categories occurs, the "Error" flag of the Process Data IN is set to "1: ON" while displaying the error.
* When any of the warning of the above categories occurs, the "Warning" flag of the Process Data IN is set to "1: ON".
* About resetting of "E 05"

・Can be reset with Preset P1 or direct memory operation. It can be reset with IO-Link communication.
While the preset memory or direct memory setting is enabled, pressing and holding down the ▷ and △ keys for 2 seconds or longer during occurrence of error 5 changes the screen to the setting entry screen. Pressing and holding the SET key at least 2 seconds changes the set pressure to "0" and resets error 5.

* Note: This operation resets the set pressure to "0" and changes the output pressure to "0". Be sure to check the impact of resetting error 5 on the air pressure equipment before resetting.

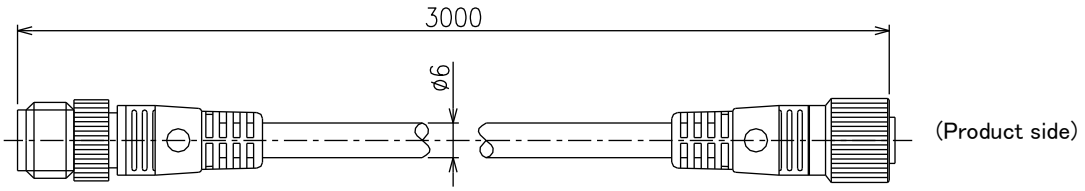
6. OPTION

6.1 Optional Part Model Number

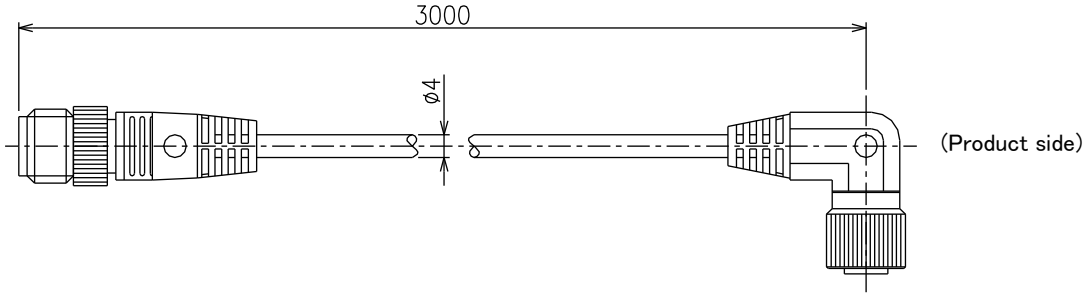
EVD- MS3

Symbol	Description
Optional cable	
MS3	IO-Link (M12 Straight(female)/M12 Straight(male)) 3m
ML3	IO-Link (M12 L Type(female)/M12 Straight(male)) 3m
MM3	IO-Link (M12 One side straight(female)) 3m

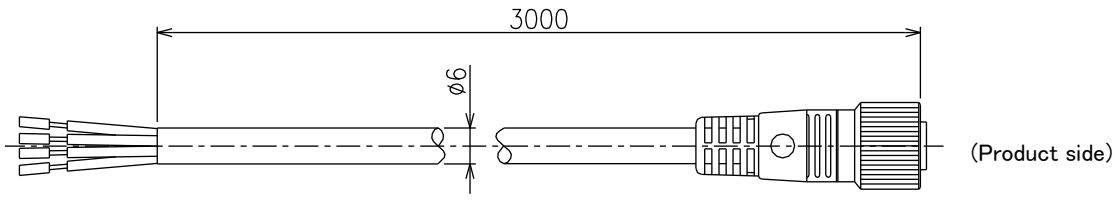
●EVD-MS3



●EVD-ML3



●EVD-MM3



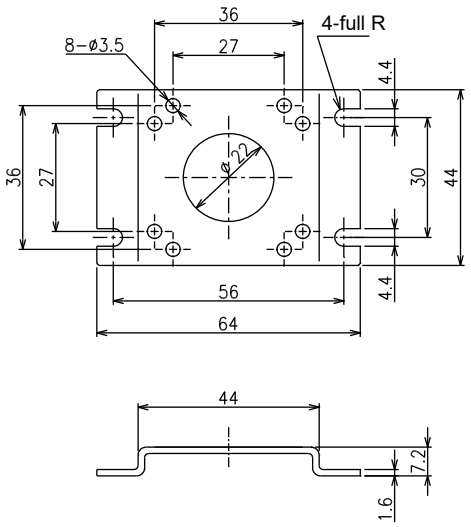
Cable Color	Name
Brown	L+(DC24V)
White	N.C. *
Blue	L-(GND)
Black	C(IO-Link)

* Please insulate to avoid contact with other wires.

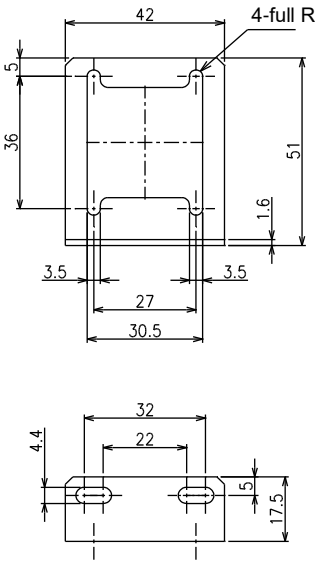
EVD- B1

Symbol	Description
Bracket option	
B1	B-type bracket, floor mounted, EVD-1000
L1	L-type bracket, wall mounted, EVD-1000
B3	B-type bracket, floor mounted, EVD-3000
L3	L-type bracket, wall mounted, EVD-3000

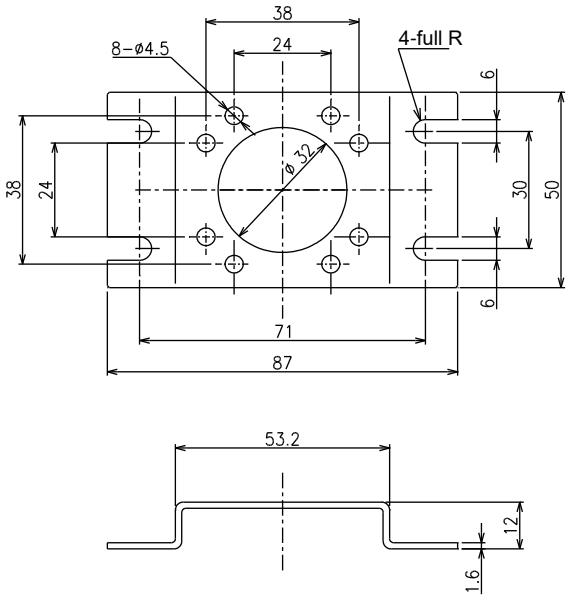
●EVD-B1



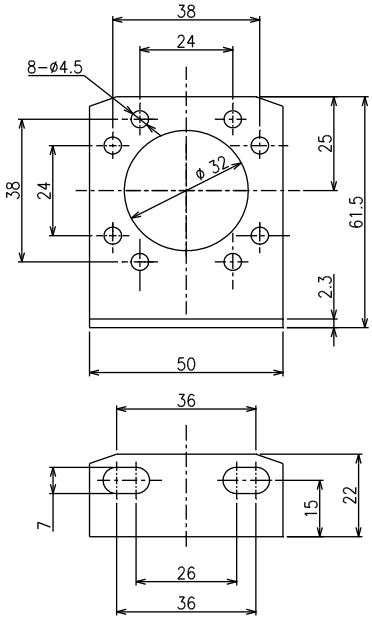
●EVD-L1



●EVD-B3



●EVD-L3



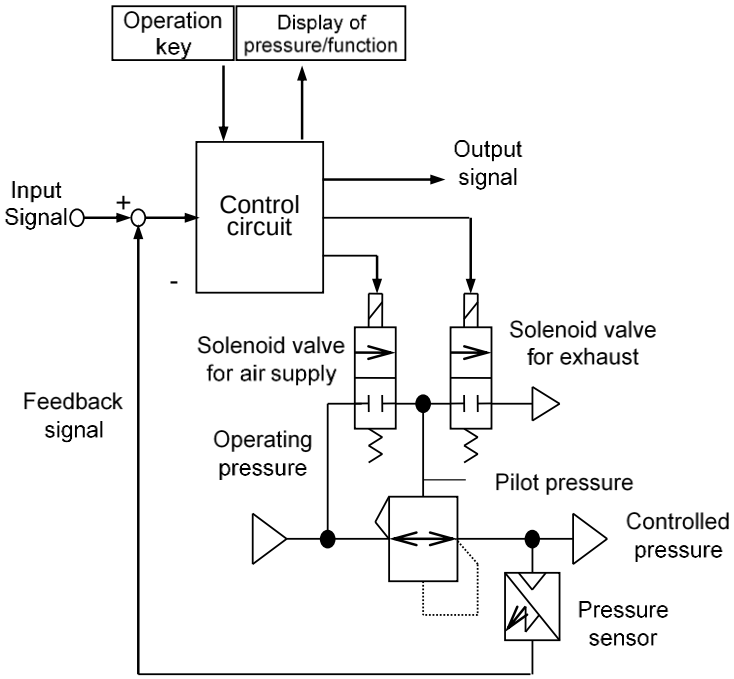
7. References

7.1 Operating principle of digital electro-pneumatic regulator

7.1.1 Operating principle

The digital electro-pneumatic regulator performs feedback control to control the pilot pressure by detecting controlled pressure using a pressure sensor, and PWM-driving two-port solenoid valves for air supply and exhaust.

■ Configuration of control circuit



■ PWM drive

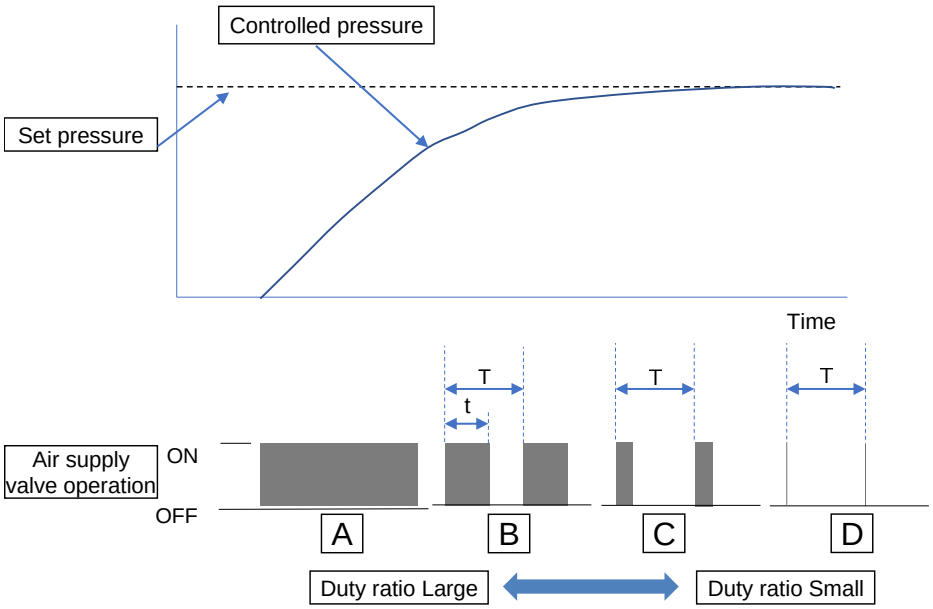
The pulse width modulation (PWM) is a form of electrical signal and controls the ratio of ON pulse width time to OFF pulse width time in a certain period of time (Duty ratio).

$$\text{Duty ratio} = t/T \times 100\ (\%)$$

■ Relationship between PWM driving and controlled pressure

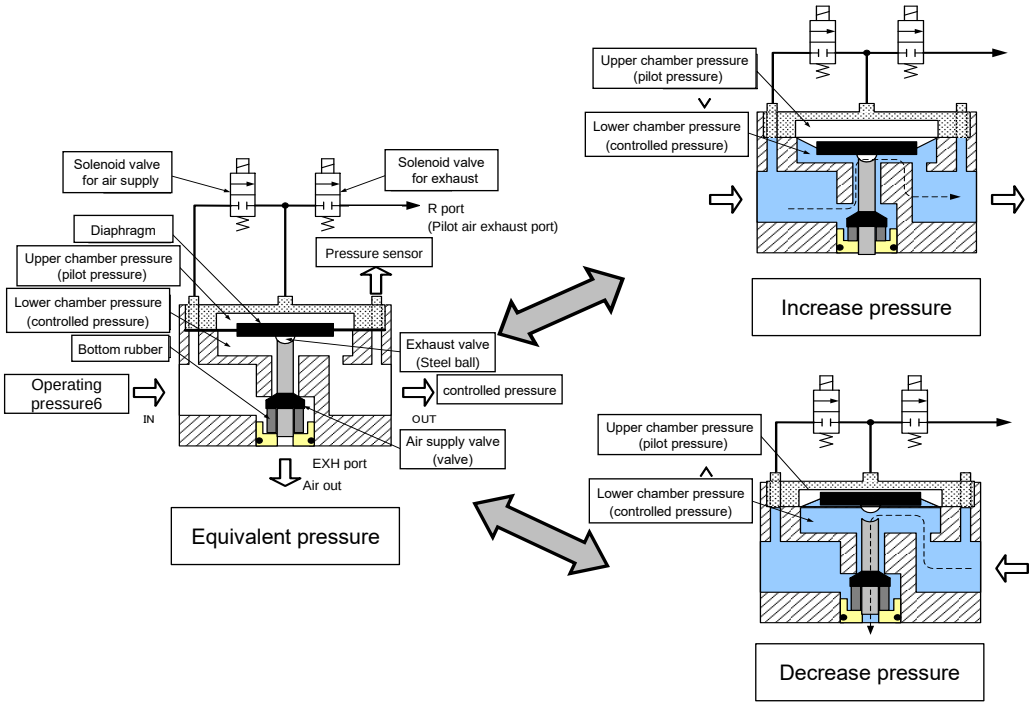
The set pressure and the controlled pressure are compared, and the solenoid valve ON time is varied based on the difference between the pressures to control the pilot pressure so that the controlled pressure equals the set pressure. A larger difference increases the Duty ratio and expands the solenoid valve ON time. A smaller difference reduces the Duty ratio and shortens the solenoid valve ON time.

・Pressure control diagram



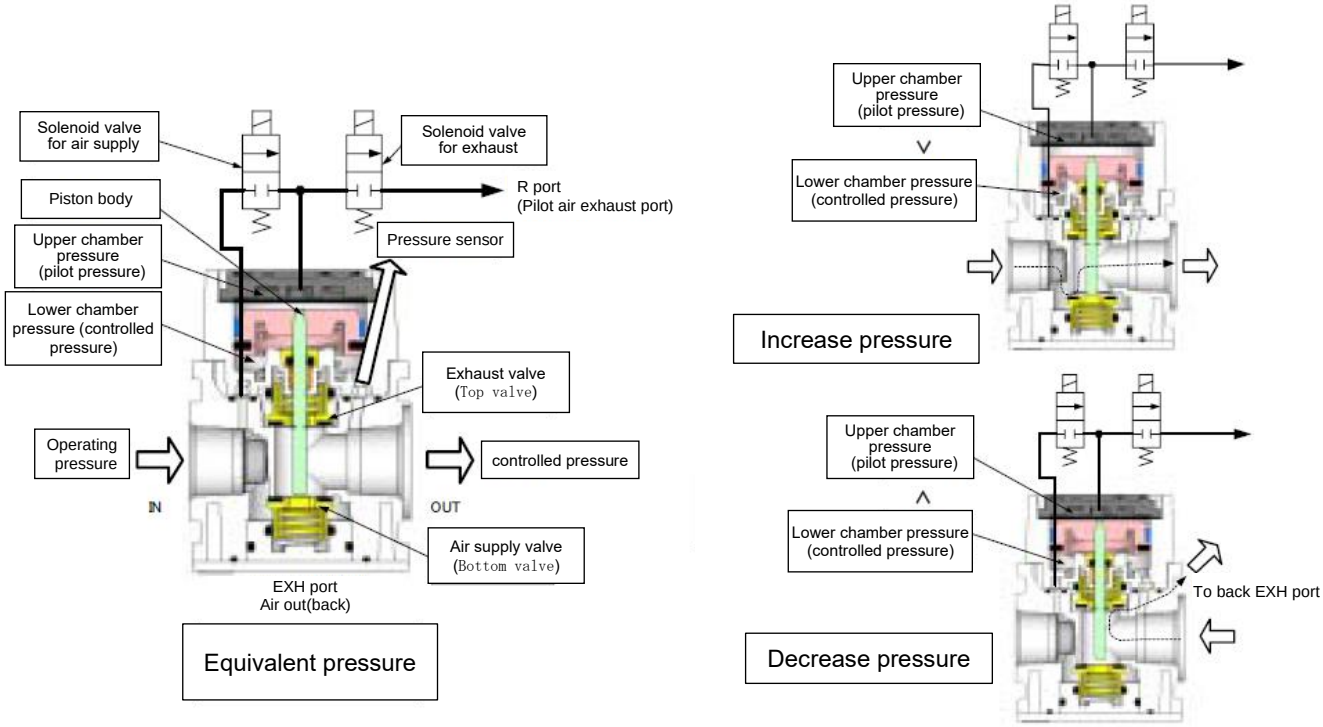
■ EVD-1000

The EVD-1000 series includes the pilot control section described above and a booster section for improving the flow characteristics. The booster section includes air supply and exhaust valves and a diaphragm for opening and closing them. The exhaust valve is connected to the diaphragm. The lower chamber of the diaphragm has the same pressure as the controlled pressure. The upper chamber controls the pilot pressure by PWM-driving the solenoid valve. This difference in pressure moves the diaphragm up and down to open and close the valve.
The EVD-1000 series senses the controlled pressure with a pressure sensor to constantly adjust the pilot pressure as follows for high-precision pressure control:
When the set pressure is lower than the controlled pressure, that is, the controlled pressure is to be boosted, the pilot pressure is controlled to achieve the following state:
Upper chamber pressure (pilot pressure) > Lower chamber pressure (controlled pressure)
When the set pressure is higher than the controlled pressure, that is, the controlled pressure is to be reduced, the pilot pressure is controlled to achieve the following state:
Upper chamber pressure (pilot pressure) > Lower chamber pressure (controlled pressure)



■ EVD-3000

The EVD-3000 series includes the pilot control section described above and a booster section for improving flow characteristics. The booster section includes an air supply valve (top valve), an exhaust valve (bottom valve), and a piston assembly to open and close them. The exhaust valve is connected to the piston assembly.
The lower chamber of the piston assembly has the same pressure as the controlled pressure. The upper chamber controls the pilot pressure by PWM-driving the solenoid valve. This difference in pressure moves the piston assembly up and down to open and close the valve.
The EVD-3000 series senses the controlled pressure with a pressure sensor to constantly adjust the pilot pressure as follows for high-precision pressure control:
When the controlled pressure is lower than the set pressure, that is, the controlled pressure is to be boosted, the pilot pressure is controlled to achieve the following state:
Upper chamber pressure (pilot pressure) > Lower chamber pressure (controlled pressure)
When the controlled pressure is higher than the set pressure, that is, the controlled pressure is to be reduced, the pilot pressure is controlled to achieve the following state:
Upper chamber pressure (pilot pressure) < Lower chamber pressure (controlled pressure)



7.1.2 About overactive state

Definition of overactive state: The overactive state is defined as a state in which the solenoid valve continues to turn ON and OFF repeatedly like the patterns B and C as shown in "・Pressure control diagram" above.
A continuous ON time like the pattern A or an extremely short ON time like the pattern D will not cause the overactive state.
If this overactive state continues for a long time, the life of the solenoid valve will be greatly affected.

8. WARRANTY PROVISIONS

8.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

8.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.