

IO-Link Compatible Compact Flow Rate Controller RAPIFLOW[®] FCM Series



**IO-Link makes it possible!
Predictive maintenance from
a flow rate controller**



IO-Link

Supports the IoT generation!

Flow rate controller equipped with predictive maintenance functions

Stainless steel body

[Applicable fluids/flow rates]

- AIR** **N₂**
0.015 to 50 L/min
- Ar**
0.015 to 50 L/min
- O₂** **13A** **CH₄** **C₃H₈**
0.015 to 10 L/min
- H₂** **He**
0.06 to 20 L/min

Weight: Approx. 480 g

Rectifying mechanism reduces pressure loss and improves reproducibility

Equipped with high-speed response micro-machined sensor chip

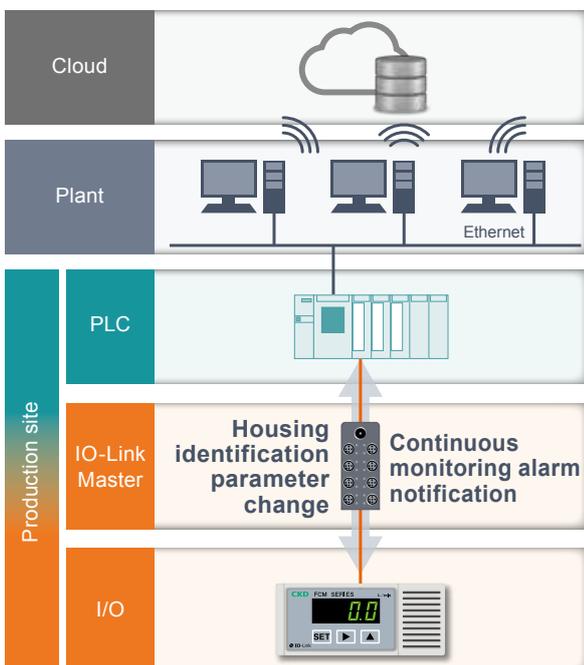
Resin body

[Applicable fluids/flow rates]

- AIR** **N₂**
0.015 to 100 L/min
- Weight: Approx. 200 g**

Introducing the IO-Link model IO-Link

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)
Unlike analog communication, it enables the transmission of parameters and event data.



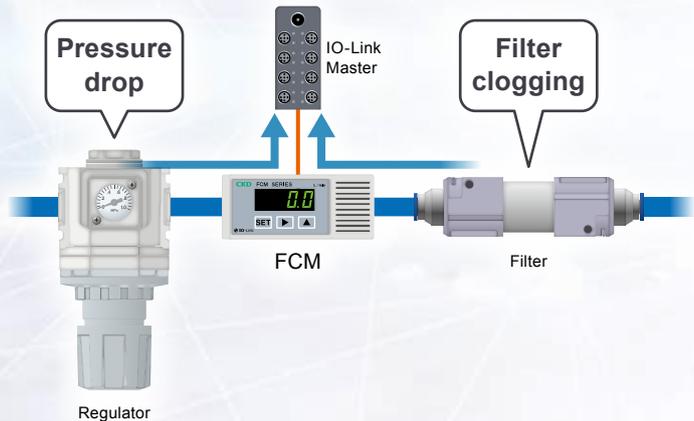
Features of IO-Link

- Digital signal**
Constant monitoring via digital data is possible.
- Parameter remote control**
Parameters can be set and changed via the network, enabling remote equipment operation.
- Housing identification**
Models, serial numbers, etc., can be confirmed on the network.
- Data storage**
The settings can be copied from the master (scanner), making parameter reconfiguration after maintenance obsolete.
- Error notification**
Device failure and disconnection can be confirmed.
- Connection to fieldbus**
It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

System error detection (predictive maintenance)

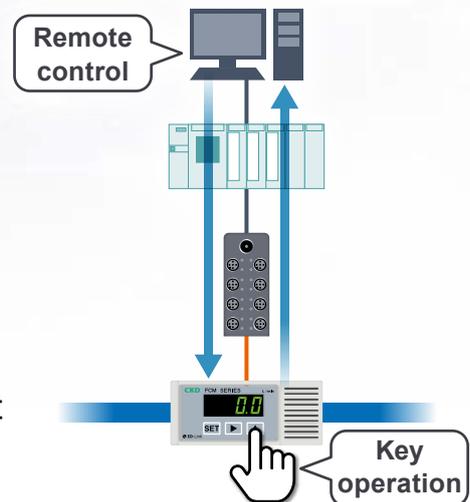
[System abnormality warning functions]

In addition to self-detection functions for detecting the deterioration of sensors and proportional solenoid valves, abnormalities with peripheral systems can also be detected. Outputs an alarm signal via IO-Link.



IO-Link Enhances Conventional Features

- Various settings are possible with key operations and configuration is possible remotely.
 - Input method switching
 - Preset memory value input
 - Flow rate control / forced OFF state switching
- 4 preset memory items (conventional type)
 - ➔ Increased to 8 items.
- 4 switch output types can be configured and output simultaneously.
- Directly output accumulated flow value.



Compatible with various fluids

Compatible with various gases. It can be used in various applications.

Lineup of even lower differential pressure models.

Suitable for controlling burner flame or other flammable gases with low supply pressure.

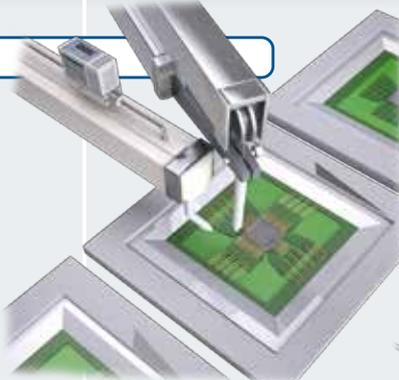
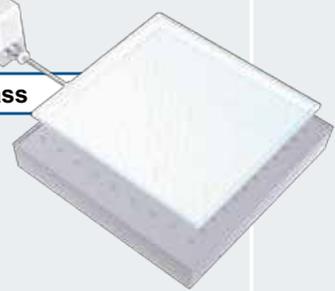
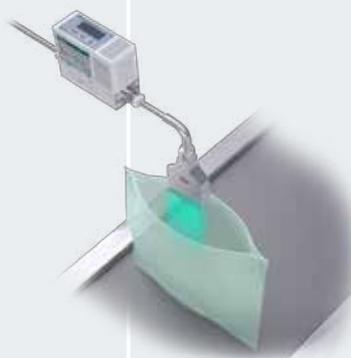
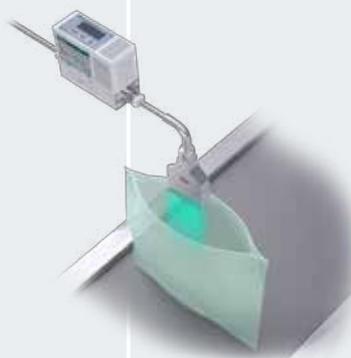
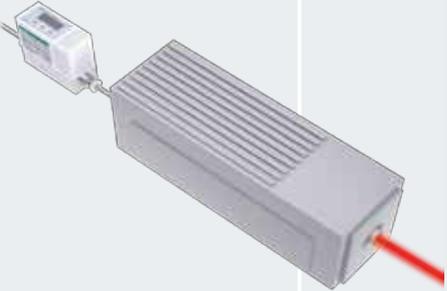
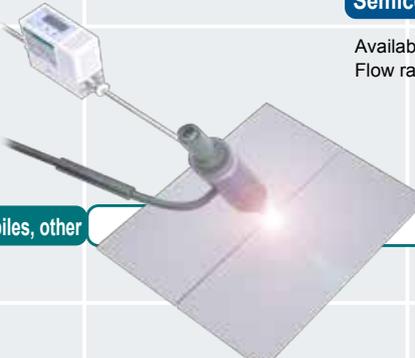
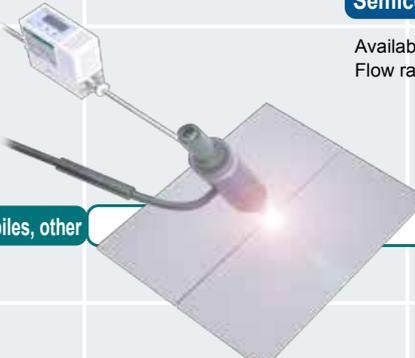
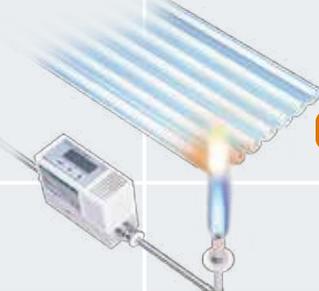
Applicable fluids



Applications

Used in various fields

RAPIFLOW is available for a wide variety of applications in industries such as machinery, automobiles, precision components, and cutting-edge fields such as semiconductors and biotechnology, medical care, foodstuffs, and more.

	Flow rate (L/min) 0.1	1	10	100
Applicable fluids	<p>Semiconductor Wire bonding</p> <p>Ideal for tension control of wire bonding that requires high precision.</p> 			
	<p>Liquid crystal Floating transport system of glass</p> <p>Ideal for float (non-contact) transportation of large FPD glass.</p> 			
Dry air	<p>Liquid crystal Flow rate management of ionizer purge gas</p> <p>Available with a broad flow rate range. Flow rate control of air is possible.</p> 			
	<p>Foodstuffs Filling and packaging</p> <p>Ideal for inert gas filling of food packaging, etc.</p> 			
N ₂				<p>Control of N₂ gas in laser oscillator and semiconductor manufacturing equipment</p> 
				<p>Semiconductor Purge gas flow rate control</p> <p>Available with a broad flow rate range. Flow rate control of purge gas can be done.</p> 
Ar			<p>Automobiles, other Flow rate control of argon gas for welding</p> <p>Available with a broad flow rate range. Flow rate control of argon gas for welding is possible.</p> 	
O ₂ Flammable gas				<p>Glass processing Burner flame control</p> <p>Suitable for controlling burner flame by allowing low pressure gas supply.</p> 
H ₂				

RAPIFLOW[®] FCM Series Variation

Applicable fluids/flow rate control range

Model No.	Applicable fluids	Flow rate control range (L/min)					Body material	Port size
		0.01	0.1	1	10	100		
FCM-9500 AI	<div style="border: 1px solid black; padding: 2px; display: inline-block;">AIR</div> Air <div style="border: 1px solid black; padding: 2px; display: inline-block;">N₂</div> Nitrogen	0.015 to 0.5				0.015 to 0.5	Resin	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Resin</div> ø6 push-in ø8 push-in
FCM-0001 AI		0.03 to 1				0.03 to 1		
FCM-0002 AI		0.06 to 2				0.06 to 2	SUS	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SUS</div> Rc1/4 9/16-18 UNF
FCM-0005 AI		0.15 to 5				0.15 to 5		
FCM-0010 AI		0.3 to 10				0.3 to 10		
FCM-0020 AI		0.6 to 20				0.6 to 20		
FCM-0050 AI		1.5 to 50				1.5 to 50		
FCM-0100 AI (Resin type only)		3 to 100				3 to 100		
FCM-9500 AR	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ar</div> Argon	0.015 to 0.5				0.015 to 0.5	SUS	Rc1/4 9/16-18 UNF
FCM-0001 AR		0.03 to 1				0.03 to 1		
FCM-0002 AR		0.06 to 2				0.06 to 2		
FCM-0005 AR		0.15 to 5				0.15 to 5		
FCM-0010 AR		0.3 to 10				0.3 to 10		
FCM-0020 AR		0.6 to 20				0.6 to 20		
FCM-0050 AR		1.5 to 50				1.5 to 50		
FCM-9500 O₂/LN/C1/C3	<div style="border: 1px solid black; padding: 2px; display: inline-block;">O₂</div> Oxygen <div style="border: 1px solid black; padding: 2px; display: inline-block;">13A</div> City gas <div style="border: 1px solid black; padding: 2px; display: inline-block;">CH₄</div> Methane <div style="border: 1px solid black; padding: 2px; display: inline-block;">C₃H₈</div> Propane	0.015 to 0.5				0.015 to 0.5	SUS	Rc1/4 9/16-18 UNF
FCM-0001 O₂/LN/C1/C3		0.03 to 1				0.03 to 1		
FCM-0002 O₂/LN/C1/C3		0.06 to 2				0.06 to 2		
FCM-0005 O₂/LN/C1/C3		0.15 to 5				0.15 to 5		
FCM-0010 O₂/LN/C1/C3		0.3 to 10				0.3 to 10		
FCM-0002 H₂/HE	<div style="border: 1px solid black; padding: 2px; display: inline-block;">H₂</div> Hydrogen <div style="border: 1px solid black; padding: 2px; display: inline-block;">He</div> Helium	0.06 to 2				0.06 to 2	SUS	Rc1/4 9/16-18 UNF 1/4" double barbed fitting 1/4" JXR male fitting
FCM-0005 H₂/HE		0.15 to 5				0.15 to 5		
FCM-0010 H₂/HE		0.3 to 10				0.3 to 10		
FCM-0020 H₂/HE		0.6 to 20				0.6 to 20		

Communication specifications

Descriptions	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM3 (230.4 kbps)
Port type	A
Process data length (input)	10 byte

Descriptions	Details
Process data length (output)	4 byte
Min. cycle time	2 ms
Data storage	1k byte
SIO mode support	No



Compact flow rate controller RAPIFLOW

FCM Series

IO-Link

- For air, nitrogen, argon, oxygen, city gas, methane, propane (flow rate range: 0.5 to 100 L/min)
- For hydrogen, helium (flow rate range: 0 to 20 L/min)



■ FCM Series for air, nitrogen, argon, oxygen, city gas, methane, propane Specifications

Descriptions		Model No.	FCM-[*1][*2]-[*3]C						
Valve drive method		Proportional solenoid valve - When not energized: Closed							
		Full scale flow rate	Al (Air, nitrogen)	AR (Argon)	O2 (Oxygen)	LN (City gas)	C1 (Methane)	C3 (Propane)	
Flow rate range *1	Standard	9500	500 mL/min	●	●	●	●	●	
		0001	1 L/min	●	●	●	●	●	
		0002	2 L/min	●	●	●	●	●	
		0005	5 L/min	●	●	●	●	●	
		0010	10 L/min	●	●	●	●	●	
		0020	20 L/min	●	●				
		0050	50 L/min	●	●				
		0100	100 L/min (Resin type only)	●					
	Low differential pressure type (Stainless steel only)	L9500	500 mL/min	●		●	●	●	●
		L0001	1 L/min	●		●	●	●	●
L0002		2 L/min	●		●	●	●	●	
L0005		5 L/min	●		●	●	●	●	
L0010		10 L/min	●		●	●	●	●	
Applicable fluids *2	*2	Al	Compressed air, nitrogen	●					
		AR	Argon		●				
		O2	Oxygen (Oil-prohibited)			●			
		LN	City gas (13A) *3				●		
		C1	Methane (CH4 100%)					●	
		C3	Propane (C3H8 100%)						●
Port size, body material	*3	H6	ø6 push-in, resin (excluding 50, 100 L/min)	●					
		H8	ø8 push-in, resin	●					
		8A	RC1/4, stainless steel	●	●	●	●	●	
		UF	9/16-18UNF, stainless steel	●	●	●	●	●	
Control	Control range		3 to 100% F.S.						
	Response time *1	9500 to 0020	Within 0.5 sec. to setting ±5% F.S. (TYP.)						
		0050 to 0100	Within 1 sec. to setting ±5% F.S. (TYP.)						
	Accuracy		Within ±3% F.S.						
	Repeatability		Within ±1% F.S.						
Temperature characteristics		Within ±0.2% F.S./ °C (base temperature 25 °C)							
Pressure characteristics		Within ±1% F.S. per 98 kPa (standard differential pressure reference)							
Pressure	Standard differential pressure *4		Refer to the separate table						
	Working pressure differential *5		Refer to the separate table						
	Max. working pressure *5		Refer to the separate table						
	Proof pressure *2	H6/H8	490 kPa						
8A/UF		980 kPa							
Operating ambient temperature, operating ambient humidity			0 to 50 °C, 90% RH or less (non-condensing)						
I/O	Input signal	C	IO-Link						
Flow rate display	Display method		7-segment LED 3-digit, indicator accuracy: control accuracy ±1 digit						
	Display range, display resolution		Refer to the separate table						
Integrating functions			Refer to the separate table						
Power supply	Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate 1% or less)						
	Current consumption *6		200 mA or less (Port type A)						
Mounting orientation			Unrestricted in vertical/horizontal direction						
Wetted section materials	*3	H6/H8	Polyamide resin, fluoro rubber, stainless steel, alumina, semiconductor silicon, soldering						
		8A/UF	Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering						
Weight	*3	H6/H8	Approx. 200 g						
		8A/UF	Approx. 480 g						
Degree of protection			IEC standards IP40 or equivalent						
Protection circuit		*7	Power supply reverse connection protection						
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8						

Pressure

Standard differential pressure, working pressure differential *4, 5

(Standard model)

		Flow rate range *1								
		9500	0001	0002	0005	0010	0020	0050	0100	
Applicable fluids *2	AI	Standard differential pressure (kPa)	50	100	100	100	100	150	200	300
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100 to 300	150 to 300	250 to 350
		Max. working pressure (kPa)	150	200	250	250	250	300	300	350
	AR	Standard differential pressure (kPa)	50	100	100	100	100	150	200	
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100 to 300	150 to 300	
		Max. working pressure (kPa)	150	200	250	250	250	300	300	
	O2	Standard differential pressure (kPa)	50	100	100	100	100			
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250			
		Max. working pressure (kPa)	150	200	250	250	250			
	LN/C1	Standard differential pressure (kPa)	50	50	50	50	50			
		Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150			
		Max. working pressure (kPa)	150	150	150	150	150			
C3	Standard differential pressure (kPa)	50	50	50	50	50				
	Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150				
	Max. working pressure (kPa)	150	150	150	150	150				

(Low differential pressure model)

		Flow rate range *1					
		L9500	L0001	L0002	L0005	L0010	
Applicable fluids *2	AI/O2	Standard differential pressure (kPa)	20	20	20	20	20
	LN/C1	Working pressure differential (kPa)	5 to 50	5 to 50	5 to 50	5 to 50	10 to 50
	C3 *8	Max. working pressure (kPa)	50	50	50	50	50

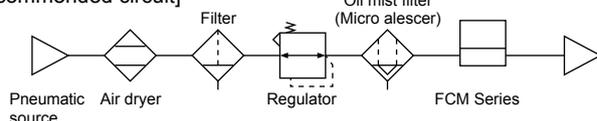
Display, integrating functions

		Flow rate range *1							
		9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display	Display range	0 to 500 mL/min	0.00 to 1.00 L/min	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min	0.0 to 50.0 L/min	0 to 100 L/min
	Display resolution	1 mL/min	0.01 L/min	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min	0.1 L/min	1 L/min
Integrating functions *9	Display range	999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Display resolution	1 mL	0.01 L	0.01 L	0.01 L	0.1 L	0.1 L	0.1 L	1 L
	Pulse output rate	5 mL	0.01 L	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1 L

*1: The value converted to volumetric flow rate at standard condition (20 °C 1 barometric pressure (101 kPa) relative humidity 65%). Full scale stands for max. scale flow rate in the flow rate range.

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air compliant with JIS B8392-1: 2012 (ISO 8573-1: 2010) [1: 1 to 1: 6: 2]. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, install a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil concentration 0.1 mg/m³) on the primary side (upstream side) of this product.

[Recommended circuit]



[Recommended device]

Air filter: F Series

Oil mist filter: M Series

*3: The value for city gas 13A is a value for methane (CH₄) 88% gas generated from LNG.

*4: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)

*5: Working pressure differential is the differential pressure required for normal operation of this product. Note that the values depend on the flow rate range and applicable product(s) fluids. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of working pressure differential) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.

*6: Ensure that the current supply capacity per IO-Link master port is sufficient.

*7: This product's protection circuit is effective only for specific misconnections. It does not provide protection for all misconnections.

*8: The low pressure line (1 to 2.5kPa) of city gas is outside the working pressure differential range.

*9: The accumulated flow is a reference value. It is reset when the power is turned OFF

*10: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

■ FCM Series for hydrogen, helium Specifications

Descriptions		Model No.	FCM-[*1][*2]-[*3]C		
Valve drive method		Proportional solenoid valve - When not energized: Closed			
		Full scale flow rate	H2 (Hydrogen)	HE (Helium)	
Flow rate range *1	*1	0002	2 L/min	●	●
		0005	5 L/min	●	●
		0010	10 L/min	●	●
		0020	20 L/min	●	●
Applicable fluids *2	*2	H2	Hydrogen	●	
		HE	Helium		●
Port size	*3	8A	RC1/4 (stainless steel)	●	●
		UF	9/16-18UNF (stainless steel)	●	●
		4S	1/4" double barbed fitting (stainless steel)	●	●
		4RM	1/4" JXR male fitting (stainless steel)	●	●
Control	Control range		3 to 100% F.S.		
	Response time		Within 0.5 sec. to setting ±5% F.S. (TYP.)		
	Accuracy		Within ±3% F.S.		
	Repeatability		Within ±1% F.S.		
	Temperature characteristics		Within ±0.2% F.S./°C (base temperature 25°C)		
	Pressure characteristics		Within ±1% F.S. per 98 kPa (standard differential pressure reference)		
Pressure	Standard differential pressure *3		Refer to the separate table		
	Working pressure differential *4		Refer to the separate table		
	Max. working pressure *4		Refer to the separate table		
	Proof pressure		980 kPa		
Operating ambient temperature, operating ambient humidity		0 to 50°C, 90% RH or less (non-condensing)			
External leakage		1×10 ⁻⁶ Pa·m ³ /s (helium leakage rate) or less			
I/O	Input signal	C	IO-Link		
Flow rate display	Display method		7-segment LED 3-digit, indicator accuracy: control accuracy ±1 digit		
	Display range, display resolution		Refer to the separate table		
Integrating functions		Refer to the separate table			
Power supply	Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate 1% or less)		
	Current consumption *5		220 mA or less (Port type A)		
Mounting orientation		Unrestricted in vertical/horizontal direction			
Wetted section materials		Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering			
Weight	*3	8A/UF	Approx. 480 g		
		4S/4RM	Approx. 560 g		
Degree of protection		IEC standards IP40 or equivalent			
Protection circuit		*6	Power supply reverse connection protection		
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8			

Pressure

Standard differential pressure, Working pressure differential

			Flow rate range *1			
			0002	0005	0010	0020
Applicable fluids *2	H2	Standard differential pressure (kPa)	20	50	50	50
		Working pressure differential (kPa)	10 to 50	30 to 80	30 to 80	30 to 80
		Max. working pressure (kPa)	50	80	80	80
	HE	Standard differential pressure (kPa)	50	100	100	100
		Working pressure differential (kPa)	20 to 100	50 to 150	50 to 150	50 to 150
		Max. working pressure (kPa)	100	150	150	150

Display, integrating functions

			Flow rate range *1			
			0002	0005	0010	0020
Flow rate display	Display range	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min	
	Display resolution	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min	
Integrating functions *7	Display range	9999.99 L	9999.99 L	99999.9 L	99999.9 L	
	Display resolution	0.01 L	0.01 L	0.1 L	0.1 L	
	Pulse output rate	0.02 L	0.05 L	0.1 L	0.2 L	

*1: Flow rate converted to volumetric flow rate at 20°C, 1 barometric pressure (101 kPa). Full scale stands for max. scale flow rate in the flow rate range.

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.

*3: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)

*4: Working pressure differential is the differential pressure required for normal operation of this product. Note that the values depend on the flow rate range and applicable fluids. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of working pressure differential) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.

*5: Ensure that the current supply capacity per IO-Link master port is sufficient.

*6: This product's protection circuit is effective only for specific misconnections. It does not provide protection for all misconnections.

*7: The accumulated flow is a reference value. It is reset when the power is turned OFF.

*8: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

■ Air, nitrogen, argon, oxygen, city gas, methane, propane

How to order

FCM - **9500** **AI** - **H6** **C** **R** **S** **B** **T**

Model No.

A Flow rate range

B Applicable fluids

C Port size, body material

D Input signal

E Display direction

F Cable

G Bracket

H Traceability

[Example of model No.]

FCM-0001AI-H8CRSBK

- A** Flow rate range : 0 to 1 L/min
- B** Applicable fluids : Compressed air, nitrogen
- C** Port size, body material : Push-in (ø8), resin body
- D** Input signal : IO-Link
- E** Display direction : Reverse direction
- F** Cable : Straight (female), straight (male) 3 m
- G** Bracket : Bracket
- H** Traceability : With inspection certification

Discrete option model No.

FCM - **MS3**

Code	Content
MS3	Straight (female), straight (male) 3 m
ML3	L type (female) / straight (male) 3 m
MM3	One side straight (female) 3 m
LB1	Bracket

Code	Content							
A Flow rate range								
Applicable fluids		AI	AR	O2	LN	C1	C3	
9500	Standard differential pressure model	0 to 0.5 L/min	●	●	●	●	●	
0001		0 to 1 L/min	●	●	●	●	●	
0002		0 to 2 L/min	●	●	●	●	●	
0005		0 to 5 L/min	●	●	●	●	●	
0010		0 to 10 L/min	●	●	●	●	●	
0020		0 to 20 L/min	●	●				
0050		0 to 50 L/min	●	●				
0100		0 to 100 L/min (resin body only)	●					
L9500		Low differential pressure model (Stainless steel only)	0 to 0.5 L/min	●		●	●	●
L0001			0 to 1 L/min	●		●	●	●
L0002	0 to 2 L/min		●		●	●	●	
L0005	0 to 5 L/min		●		●	●	●	
L0010	0 to 10 L/min		●		●	●	●	
B Applicable fluids								
AI	Compressed air, nitrogen gas							
AR	Argon							
O2	Oxygen (oil-prohibited specifications)							
LN	City gas (13A)							
C1	Methane (CH ₄)							
C3	Propane (C ₃ H ₈)							
C Port size, body material								
Port size, body material		AI	AR	O2	LN	C1	C3	
H6	Push-in (ø6), resin body (Excluding flow rate ranges of 50 or 100 L/min)	●						
H8	Push-in (ø8), resin body	●						
8A	Rc1/4, stainless steel body	●	●	●	●	●	●	
UF *1	9/16-18UNF, stainless steel body	●	●	●	●	●	●	
D Input signal								
C	IO-Link							
E Display direction								
Blank	Forward direction							
R	Reverse direction							
F Cable *2								
Blank	None							
S	Straight (female), straight (male) 3 m							
L	L type (female) / straight (male) 3 m							
M	One side straight (female) 3 m							
G Bracket *2								
Blank	None							
B	Bracket							
H Traceability *2								
Blank	None							
T	Traceability certification with series variation diagram and inspection certification							
K	With inspection certification							

*1: Refer to dimensions on page 7 for the shape of 9/16-18UNF threads.
*2: If (HE), (TO), (CHI) is selected then it will be attached to the delivered product.

■ For hydrogen, helium

How to order

FCM - **0002** **H2** - **8A** **C** **R** **S** **B** **T**

Model No.

A Flow rate range

B Applicable fluids

C Port size

D Input signal

E Display direction

F Cable

G Bracket

H Traceability

Code	Content	
A Flow rate range		
	Applicable fluids	
		H2
		HE
0002	0 to 2 L/min	●
0005	0 to 5 L/min	●
0010	0 to 10 L/min	●
0020	0 to 20 L/min	●
B Applicable fluids		
H2	Hydrogen	
HE	Helium	
C Port size		
	Port size	
		H2
		HE
8A	Rc1/4	●
UF	9/16-18UNF	●
4S	1/4" double barbed fitting	●
4RM	1/4" JXR male fitting	●
D Input signal		
C	IO-Link	
E Display direction		
Blank	Forward direction	
R	Reverse direction	
F Cable *2		
Blank	None	
S	Straight (female), straight (male) 3 m	
L	L type (female) / straight (male) 3 m	
M	One side straight (female) 3 m	
G Bracket *2		
Blank	None	
B	Bracket	
H Traceability *2		
Blank	None	
T	Traceability certification with series variation diagram and inspection certification	
K	With inspection certification	

[Example of model No.]

FCM-0002H2-8ACRSBK

- A** Flow rate range : 0 to 2 L/min
- B** Applicable fluids : Hydrogen
- C** Port size : Rc1/4
- D** Input signal : IO-Link
- E** Display direction : Reverse direction
- F** Cable : Straight (female), straight (male) 3 m
- G** Bracket : Bracket
- H** Traceability : With inspection certification

*1: Refer to dimensions on page 7 for the shape of 9/16-18UNF threads.
 *2: If (HE), (TO), (CHI) is selected then it will be attached to the delivered product.

Discrete option model No.

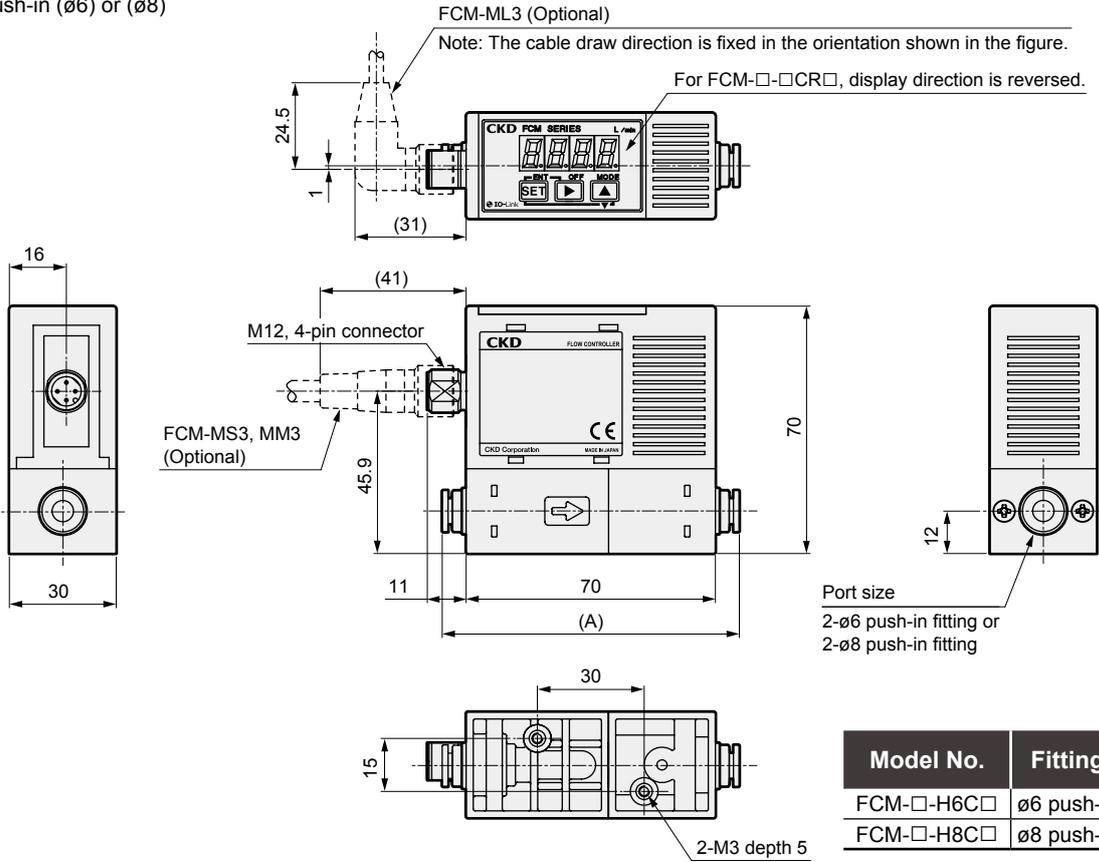
FCM - **MS3**

Code	Content
MS3	Straight (female), straight (male) 3 m
ML3	L type (female) / straight (male) 3 m
MM3	One side straight (female) 3 m
LB1	Bracket

Dimensions

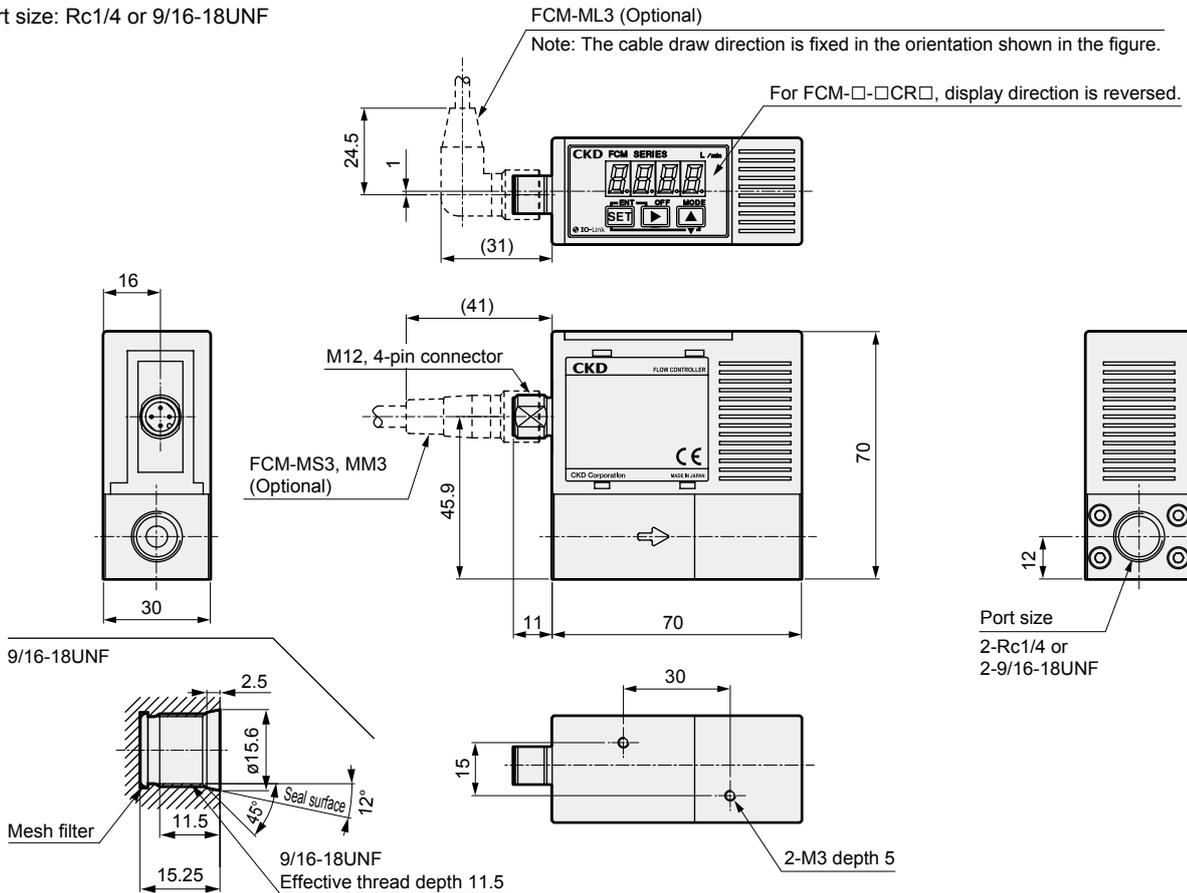
Model No.: FCM-□-H6C/H8C□

Port size: Push-in (ø6) or (ø8)



Model No.: FCM-□-8AC/UFC□

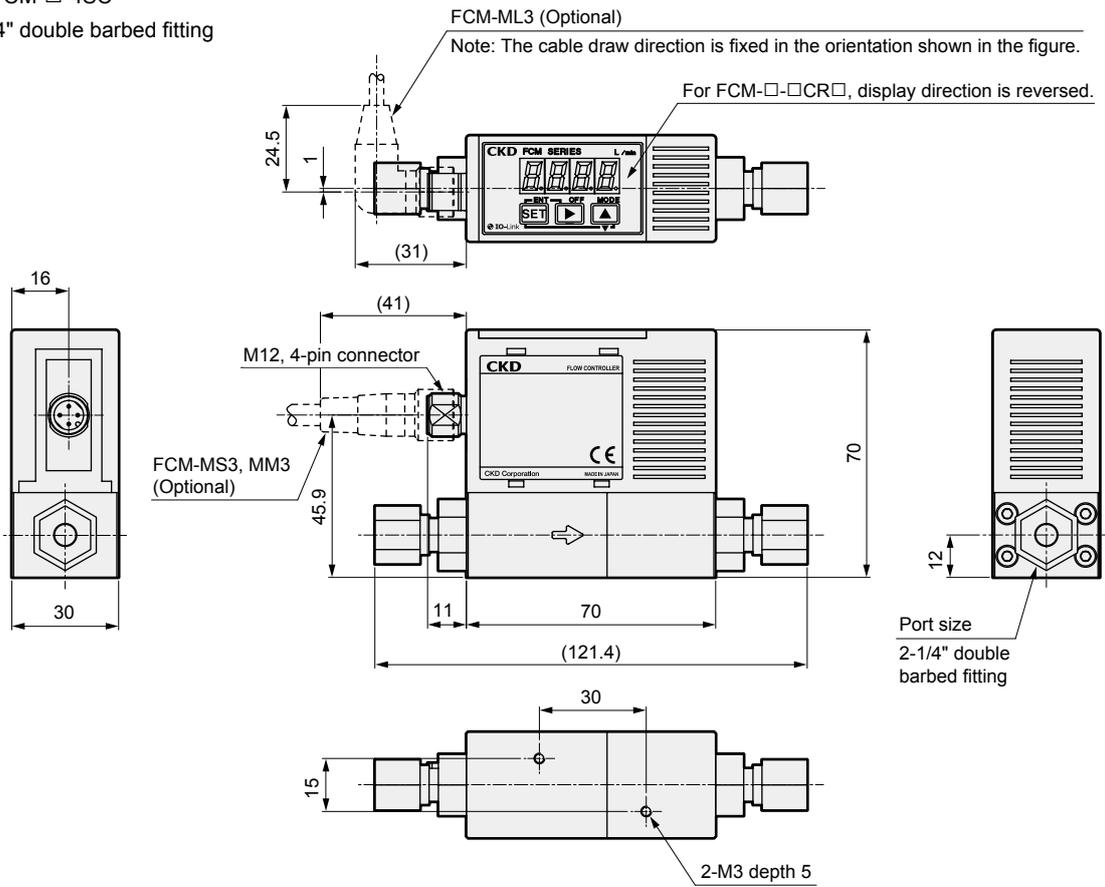
Port size: Rc1/4 or 9/16-18UNF



Dimensions

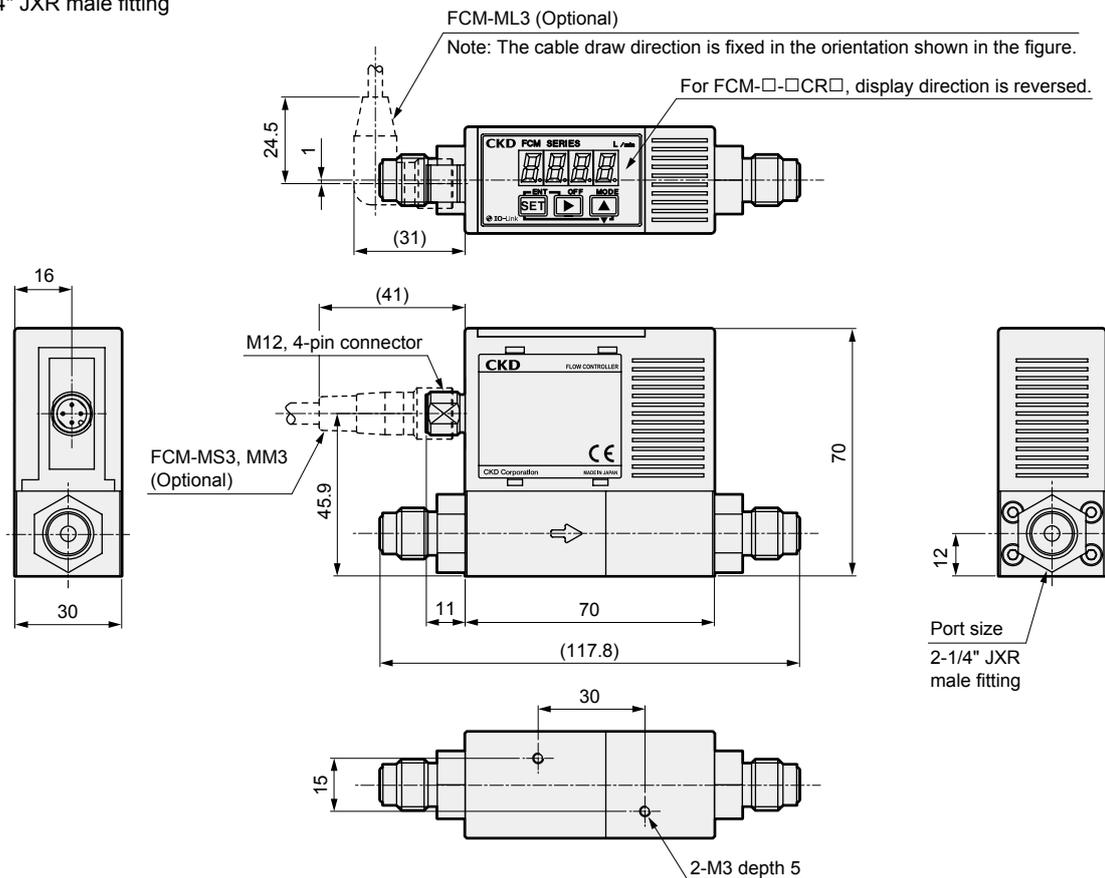
Model No.: FCM-□-4SC

Port size: 1/4" double barbed fitting



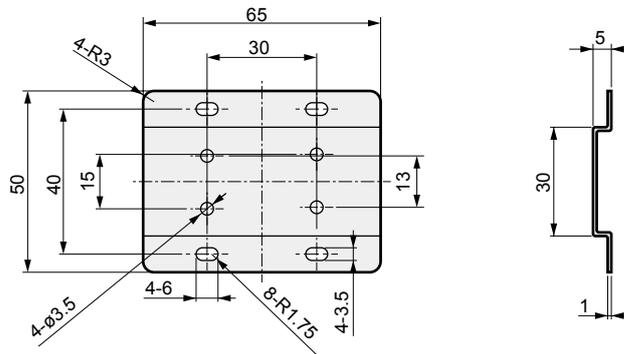
Model No.: FCM-□-4RMC

Port size: 1/4" JXR male fitting



Dedicated bracket (floor mounted)

Discrete model No.: FCM-LB1

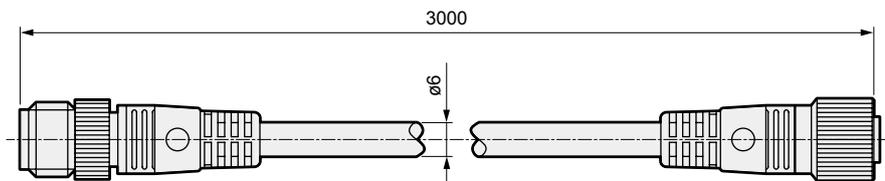


Material : Steel
Weight : 28 g

Cable optional dimensions

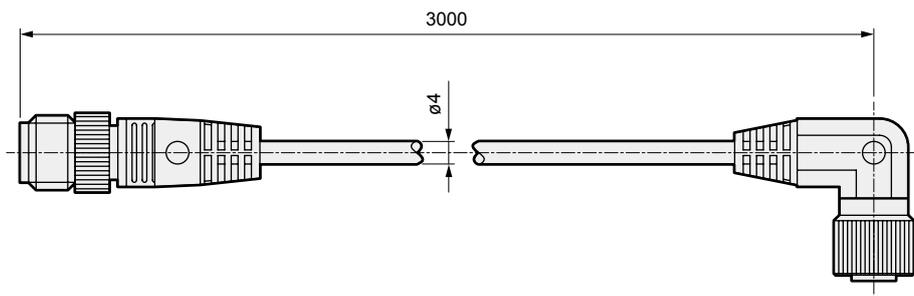
- Cable option (M12 straight (female), M12 straight (male))

Discrete model No.: FCM-MS3



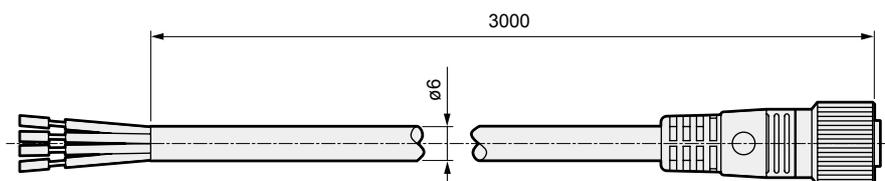
- Cable option (M12 L type (female), M12 straight (male))

Discrete model No.: FCM-ML3



- Cable option (M12 one side straight (female))

Discrete model No.: FCM-MM3

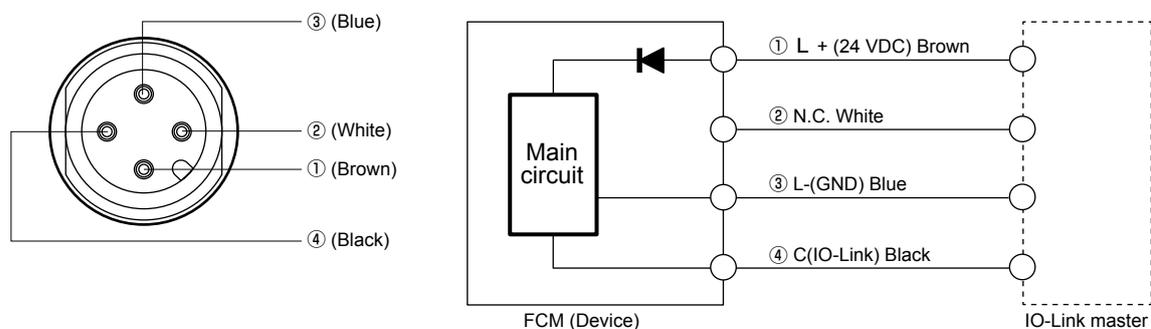


Cable color	Applications
Brown	L + (24 DC)
White	N.C. *
Blue	L-(GND)
Black	C(IO-Link)

* Insulate wires so that they do not contact other wires.

Wiring method

⚠ CAUTION: Take care to prevent incorrect wiring.



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

Compact flow rate controller - About FCM series functions

Functions

Function	Content
Instantaneous flow rate display	Displays the instantaneous flow rate. Instantaneous flow rate values are output to Process Data IN.
Set flow rate output	Process Data IN outputs the current flow rate setting.
<ul style="list-style-type: none"> Integrating functions Accumulated flow auto cutoff function (F5) 	Integrates the flow rate. As well as accumulated flow display, it has the following functions. <ul style="list-style-type: none"> Process Data OUT can be used to control the start/stop/reset of integrating functions Integrated flow rate values are output to Process Data IN Closes the solenoid valve when the value reaches the set accumulated flow Accumulated pulse output (switch output 3) Switch ON using the accumulated flow rate (switch output 4) How to reset the integrated value <ul style="list-style-type: none"> Process Data OUT, key input
Normal Mode Input Function (F1)	Process Data OUT can be used to set an arbitrary flow rate.
Direct memory function (F1)	Target value can be entered by key.
Preset input function (F1)	8 items can be specified arbitrarily for the flow rate (IO-Link parameter, key input), which can be controlled with the 3bits from Process Data OUT.
Error display function	Capable of displaying error state. Other than the error display, the following functions are available. <ul style="list-style-type: none"> Process Data IN error signal output during an error Process Data IN error code output during an error Stops control automatically when an error occurs
Normal operation output	Outputs a signal to Process Data IN when operating normally (without an error).
Switch output function (F4)	The following switch functions can be configured individually. <ul style="list-style-type: none"> Tolerance mode: Turns the switch ON when the value is within tolerance against the control target value (freely configurable) Switch output 2 (designated range mode): Turns the switch ON when the value is within the designated flow rate range Switch output 3 (integrated pulse): Outputs the integrated pulse when performing integration Switch output 4 (ON at set integration or higher): Turns the switch ON when the value reaches the set accumulated flow NO (normally open) and NC (normally closed) output modes can be configured for each switch output. <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p><Switch output 1: Tolerance mode></p> </div> <div style="text-align: center;"> <p><Switch output 2: Designated range mode></p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p><Switch output 3: Accumulated pulse></p> <p>Approx. 50 msec</p> </div> <div style="text-align: center;"> <p><Switch output 4: ON above set integrated value></p> <p>Set integrated value</p> </div> </div> <p>Refer to the display, integrating functions on P2 and P4 for details about pulse output rates.</p>
Zero point adjustment (F7)	Adjusts the zero point of flow rate output.
Auto-power OFF (F3)	Turns the flow rate display OFF if a key is not operated for approx. 1 minute (control does not stop with auto-power OFF function). Enables energy-saving operation.
Error auto shut-off (F6)	Stops control when an error occurs, fully closes valves, and turns error output ON.
Key lock	Disables setting changes by key operation to avoid incorrect operation.
Reset setting	Returns the settings to default.
Control error threshold setting	The control error judgment threshold can be set with the IO-Link parameter. (Default: $\pm 20\%$ F.S.)
Communication error operation and settings (F8)	The operation of the product when a communication error occurs can be set from HOLD (holds the set value before the error occurs) / CLEAR (valve fully closed) / VALVE OPEN (valve fully open).
Output when starting	Displays the total start time from the start of use. This time is not reset even if the power turns OFF. (Also not reset when using the reset setting.)
Data storage function	Uploading set values to the master and downloading set values from the master are possible. (Can be copied by the same model No.)

* Input signal zero/span adjustment function (F2) cannot be used with IO-Link types.

Names and functions of display/operation section

Output display (Red)

- "F" is displayed when confirming the function setting.
- "-" is lit when switch output is ON.
* Does not blink at integrated pulse output.
- "E" is lit when error output is ON.

* When function settings have upper/lower limits or when high-order digit or low-order digit of accumulated flow display is indicated, or will be displayed.

3-digit number LED display (green)

- Displays instantaneous flow rate display and function setting details during RUN mode (instantaneous flow rate display).
* The setting mode No. and setting details are displayed when displaying details of function settings.
- The values are displayed when setting each piece of data.
- Error code No. is displayed at the time of error display.

[At instantaneous flow rate display]

[Error output] Code No.

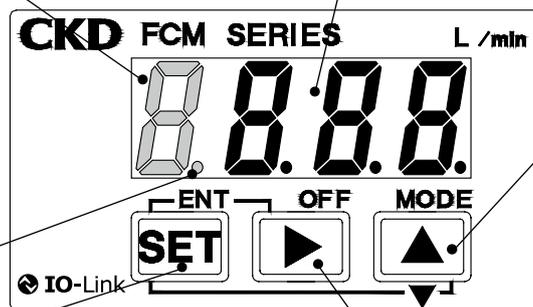
[Setting details display] Setting details
Setting mode No.

[Disabled display] Setting details
Setting mode No.

Flow rate 110% F.S. or more: Hi

Power lamp (red dot)

- Blinks during IO-Link communication.
- Lights when a communication error occurs.



UP key (MODE key)

- Used to count up values.
- Used to change the setting mode.
- Used to change the settings item.

SET Key

- Used to confirm the setting mode.
- Used to confirm the setting item.
- Used to change to the integration display.

Shift key (OFF key)

- Used to select the digit of the values.
- Used to reset from forced OFF when performing forced OFF (control stop).

+ Key (ENT key)

- Used to confirm the value.
- Used to release the key lock.
- Used to reset accumulation. (Accumulated flow displayed)

+ Key (DOWN key)

- Used to count down values.
- Used to set the key lock.

+ Key

- Used for resetting settings (initialization).

Error code table



Generally, the error resets automatically; however, if it does not do so, hit the emergency stop or turn OFF the power supply, check and correct the cause of the error as per the following table, clear the emergency stop and then turn ON the power supply again.

Category	Display processing	Error display	Control processing (Solenoid valve operation)	Countermeasure
Error	The power voltage is not within the rating. Detection level: 19.5 V or less		Depending on F6 setting. (*2)	<ul style="list-style-type: none"> Set the power voltage within the rated range, then turn the power ON again.
Error	The input signal exceeded the rating range. Detection level: 110% F.S. or more		Depending on F6 setting. (*2)	<ul style="list-style-type: none"> Set the input signal to within the rated range.
Error	An error occurred during EEPROM reading or writing		Flow rate control stop.	<ul style="list-style-type: none"> Turn power ON again. Replace the device.
Error	An error occurred during memory reading or writing		Flow rate control stop.	<ul style="list-style-type: none"> Turn power ON again. Replace the device.
Error	The flow rate did not reach the setting value for 5 secs. or more consecutively. 20% F.S.(*1) or less of the set value was not attained		Depending on F6 setting. (*2)	<ul style="list-style-type: none"> Check the primary pressure and supply pressure within the rating working pressure differential, then turn the power ON again. Check that there are no leaks from pipes, fittings, or other devices. Correctly connect, then turn the power ON again.
Error	Sensor output failure has occurred		Flow rate control stop. Valve closed.	<ul style="list-style-type: none"> Stop the supply of fluid to the device, set the flow rate setting to zero, and then turn ON the device power supply again. Replace the device.
Error (*3)	The valve was not forced to the OFF state during zero adjustment		Flow rate control will not stop.	<ul style="list-style-type: none"> Force the valve to OFF before operation.
Error (*3)	The flow rate exceeds the zero adjustment range. (Flow $\geq \pm 10\%$ F.S.)		Flow rate control will not stop.	<ul style="list-style-type: none"> Check that the primary pressure and supply pressure are within the rated working pressure differential, then turn the power ON again.
Warning (*3)	The proportional valve used the limiting value continuously for over 10 seconds.	7-segment display not used. Error code is [E10]	Flow rate control will not stop.	<ul style="list-style-type: none"> Check that the primary pressure and supply pressure are within the rated working pressure differential, then turn the power ON again. Check that there are no blockages from pipes, fitting, or other devices then turn the power ON again.
Warning (*3)	High IO-Link driver temperature	7-segment display not used. Error code is [E11]	Flow rate control will not stop.	<ul style="list-style-type: none"> Check the usage environment.

*1: IO-Link parameters enable the threshold to be changed.

*2: [F6: Error auto cutoff setting] configured contents determine the operation.

*3: This error only occurs with IO-Link types.

Communication specifications

■ Communication specifications

General

Descriptions	Details
Communication protocol	IO-Link
Communication protocol version	1.1 V
Transmission bit rate	COM3 (230.4 kbps)
Port type	A
Process data length (input)	10 byte
Process data length (output)	4 byte

Descriptions	Details
Min. cycle time	2 ms
Data storage	1 kbyte
SIO mode support	No
Device ID	Refer to table below
Vendor ID	855 (decimal)/357 (hexadecimal)

■ Parameter

Device ID

Device ID	Product ID	Remarks
0x216001	FCM-9500-C	500 mL/min Range
0x216002	FCM-0001-C	1 L/min Range
0x216003	FCM-0002-C	2 L/min Range
0x216004	FCM-0005-C	5 L/min Range
0x216005	FCM-0010-C	10 L/min Range
0x216006	FCM-0020-C	20 L/min Range
0x216007	FCM-0050-C	50 L/min Range
0x216008	FCM-0100-C	100 L/min Range

Table 1 Flow rate range per model

Model No.	Instantaneous flow rate			Accumulated flow	
	Display range	Display value	ProcessData output value	Accumulated display range	Display value
FCM-(L)9500*-*C	0 to 500.0 mL/min	0 to 500	0 to 5000	0 to 999999 mL	0 to 999999
FCM-(L)0001*-*C	0.00 to 1.000 L/min	0 to 1.00	0 to 1000	0 to 9999.99 L	
FCM-(L)0002*-*C	0.00 to 2.000 L/min	0 to 2.00	0 to 2000		
FCM-(L)0005*-*C	0.00 to 5.000 L/min	0 to 5.00	0 to 5000		
FCM-(L)0010*-*C	0.0 to 10.00 L/min	0 to 10.0	0 to 1000	0 to 99999.9 L	
FCM-0020*-*C	0.0 to 20.00 L/min	0 to 20.0	0 to 2000		
FCM-0050*-*C	0.0 to 50.00 L/min	0 to 50.0	0 to 5000		
FCM-0100*-*C	0 to 100.0 L/min	0 to 100	0 to 1000	0 to 999999 L	

* Refer to the SM-A19060 instruction manual for parameter configuration.

* The IO-Link setting file (IODD) can be downloaded from the CKD website (<https://www.ckd.co.jp>).

Process data IN

PD	PD0								PD1							
Bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
	MSB															LSB
Data name	Integrating flow unit upper byte															
Data range	2 byte															
Format	UInteger16															

PD	PD2								PD3							
Bit	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
	MSB															LSB
Data name	Integrating flow unit lower byte															
Data range	2 byte															
Format	UInteger16															

PD	PD4								PD5							
Bit	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
	MSB															LSB
Data name	Set flow rate *1															
Data range	2 byte															
Format	UInteger16															

PD	PD6								PD7							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Instantaneous flow rate *2															
Data range	2 byte															
Format	Integer16															

PD	PD8								PD9							
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 *3				MSB			LSB	Input setting *4		Accumulated auto cutoff occurring	Start/stop
Data range	True/False								Error code			0 to 2		True/False		
Format	Boolean								UInteger4			UInteger2		Boolean		

*1: Displays the configured flow rate for the current input setting.

"9999" means "valve fully open". (Refer to the Process data OUT item.)

*2: For instantaneous flow rates a negative value is used to check the shift from the zero point and does not indicate a reverse flow.

*3

Switch output	Switch function
1	Tolerance mode
2	Designated range mode
3	Integrated pulse
4	ON at set integration or higher

*4

Input setting	Input mode
0	Normal mode (flow rate value)
1	Preset mode (3 bit)
2	Direct memory mode (key operation)

Process data OUT

PD	PDO								PD1							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Set flow rate *1															
Data range	2 byte (depends on model. Refer to P14 Table 1 ProcessData output values)															
Format	UInteger16															

PD	PD2								PD3											
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
Data name	Vacant								Preset *2			Vacant		Accumulation		Vacant			Reset	Start/stop *3
Data range									3 2 1					True/False					True/False	
Format	UInteger3								Boolean		Boolean		Boolean			Boolean				

*1: Set to "9999" for "valve fully open".

*2: Preset memory number and bit combination

Process Data OUT Preset			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

Perform preset memory content settings using key operations on the device or using IO-Link communication parameters.

*3: Set this bit to 1 (True) if using IO-Link communication control. Control will not execute if set to 0 (False).

Note the following when using flow control/forced OFF via device key input.

Note: The "start/stop" bit of Process Data OUT has the same role as "Flow control/Forced OFF" status switched by key operation.

However, when the "start/stop" bit is "1 (Start)", if the flow control is forcibly turned OFF via key input from the device, the "start/stop" bit of Process Data IN will be "0 (Stop)" and the product will be in the forced OFF, but the "start/stop" bit of Process Data OUT will remain as "1 (Start)". Therefore, always check the "start/stop" status of the device using the "start/stop" bit of Process Data IN.

Also, when switching the "start (flow control)" state from the master in this state, set it to "0 (stop)" and then set it to "1 (start)" again.

[Reference]

Accumulated flow calculation example

Bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
hex	000F															
Data name	Integrating flow unit upper byte															

Bit	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
	0	1	0	0	0	0	1	0	0	0	1	1	1	1	1	1
hex	423F															
Data name	Integrating flow unit lower byte															

000F 423F (hex) ⇒ 999999 (dec)

For FCM-0005*-*C, Table 1 on P14 shows the integrating flow as 99999.9 L.

Refer to the SM-A19060 instruction manual for usage methods.



Safety Precautions

Always read this section before use.

When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.

It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely.

Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.

WARNING

- 1** This product is designed and manufactured as a general industrial machine part.
It must be handled by an operator having sufficient knowledge and experience in handling.
- 2** Use this product in accordance with specifications.
This product must be used within its stated specifications. In addition, never modify or additionally machine this product. This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments.
(Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)
 - ①** Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
 - ②** Use for applications where life or assets could be significantly affected, and special safety measures are required.
- 3** Observe organization standards and regulations, etc. related to the safety of device design and control, etc.
ISO4414, JIS B 8370 (General rules for pneumatic systems)
JFPS2008 (Principles for pneumatic cylinder selection and use)
Including High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, body standards and regulations, etc.
- 4** Do not handle, pipe, or remove devices before confirming safety.
 - ①** Inspect and service the machine and devices after confirming safety of all systems related to this product.
 - ②** Note that there may be hot or charged sections even after operation is stopped.
 - ③** When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility. Discharge any compressed air from the system, and pay attention to possible water leakage and leakage of electricity.
 - ④** When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.
- 5** Observe warnings and cautions in the following pages to prevent accidents.

■ The precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

 **DANGER:** When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning.

 **WARNING:** If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury.

 **CAUTION:** When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. Every item provides important information and must be observed.

Limited warranty and disclaimer

1 Warranty period

This warranty shall be valid for one year after delivery to the customer's designated site.

2 Scope of warranty

If any faults, found to be the responsibility of CKD, occur during the above warranty term, the product shall be replaced, the required replacement parts provided free of charge, or shall be repaired at the CKD factory free of charge.

This Limited Warranty will not apply to:

- (1) Failures due to use outside the conditions and environments set forth in the catalog or these specifications.
- (2) Failures resulting from factors other than this product.
- (3) Failures caused by improper use of the product.
- (4) Failures resulting from modifications or repairs made without CKD consent.
- (5) Failures caused by matters that could not be predicted with the technologies in practice when the product was delivered.
- (6) Failures resulting from natural disasters or accidents for which CKD is not liable.

The warranty covers the actually delivered product, and does not cover any damage resulting from losses induced by faults in the delivered product.

3 Compatibility check

The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.



Flow rate controller

Safety Precautions

Be sure to read this section before use.

Product-specific cautions: Compact flow rate controller FCM Series

Design/selection

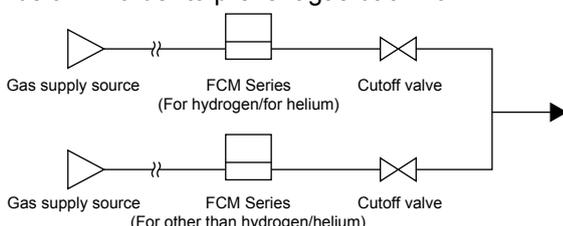
1. Working fluids

DANGER

- Do not feed gas at the explosion limit. There is a risk of explosive accidents.
- When using this product for hydrogen, be sure to purge with inert gas such as nitrogen or argon before use. Usage without purging with inert gas could result in explosive accidents.
- For products without oil-free processing in gas-contacting parts, do not feed oxygen gas. Doing so could result in fire. Even for products with oil-free processing, do not use for oxygen gas if the product has been used even once for any other gas.

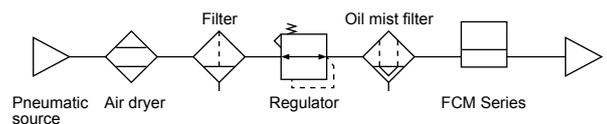
WARNING

- This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act.
- This product is only for use with the gases indicated in the model No. Do not use fluids other than the applicable fluids, as specifications such as accuracy and control properties cannot be met. In particular, note that if hydrogen gas or helium gas flows into products in this series that are for use with other gases, the sensor safety circuit will activate and the product may not operate. (When the safety circuit is activated, flow rate measurement/control cannot be performed until the power has been turned OFF.)
- When mixing hydrogen gas or helium gas with a gas other than hydrogen or helium, use caution regarding gas reverse flow. If hydrogen gas or helium gas flows into products in this series that are for use with other gases, the sensor safety circuit will activate and the product may not operate. (When the safety circuit is activated, flow rate measurement/control cannot be performed until the power has been turned OFF.) Especially when cutting off the gas, provide individual cutoff valves as in the reference drawing below in order to prevent gas back-flow.



- Ensure that foreign substances do not flow into the product. If foreign matter (dirt, water drops, or oil mist inside the piping, etc.) enters the product, accuracy or control properties may be adversely affected, leading to failure in some cases. If the entry of foreign matter is possible, install a filter, air dryer, and oil mist filter on the primary side (upstream side) of the product.
 - The mesh inside the product rectifies flow in the pipe. Note that it does not filter out foreign matter.
 - As compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), install a filter, air dryer, and oil mist filter (micro alescerc) on the primary side (upstream side) of the product.
 - When using compressed air, use clean air compliant with JIS B8392-1: 2012 (ISO 8573-1: 2010) [1.1.1 to 1.6.2].

[Recommended circuit]



- When using a valve on the primary side of the product, use only valves with oil-prohibited specifications. The product could malfunction or fail if exposed to splattering grease, oil, etc.
- Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.
- Depending on fluid quality, retaining the fluid for long periods could adversely affect performance. Do not seal the fluid in the pipe for long periods of time.
- When using liquefied gases such as propane gas, always vaporize the gas. Failure may result if liquefied gas enters the product.
- When using this product to control the burner air-fuel ratio, take design measures to prevent backfire and to avoid the effect of backfire on the product. Internal pressure increase in the piping or fire due to burner backfire may lead to failure.
- Check that the pressure inside the fluid supply line is within the working differential pressure range before using. If the source pressure is low or the pressure at the secondary side is high, the differential pressure becomes insufficient and the fluid does not flow.
- Due to the flow characteristics of the primary side regulator, the pressure is unstable when the flow rate flows, and FCM output may fluctuate.

2. Working environment

⚠ WARNING

- **Corrosive environments**
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.
- **Ambient/fluid temperatures**
Use at ambient/fluid temperatures within the specified range of 0 to 50°C.
Even if the temperature is within the specified range, do not use in a location where the ambient temperature and fluid temperature could suddenly change and cause condensation.
- **Guaranteed proof pressure/working pressure differential**
Usage in applications exceeding the proof pressure or outside the working pressure differential could result in failure. Use only within the specified range. If the source pressure is low or the pressure at the secondary side is high, the differential pressure decreases and the fluid does not flow.
- **Drip-proof environment**
The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.
- **The solenoid proportional valve inside this product does not have a fully closed function.**
When a fully closed state is required, separately provide a cutoff valve outside the product.
When the external cutoff valve is closed, keep the product valve in standby at a fully closed state (setting flow rate zero). If the product is left in the normal control state with the external cutoff valve closed, excessive flow is produced for a moment when the external cutoff valve is opened.
When using with frequent ON/OFF operations, its service life as a proportional valve may be reduced depending on the working conditions.
- **Do not install this product in movable sections or where it will be subject to vibration. Vibration or impact may lead to malfunction.**

⚠ CAUTION

- **Be alert for pressure loss in the piping.**
When piping to this product, keep the differential pressure between upstream and downstream sides within the working pressure differential range (refer to pages 2 and 4). Using the product outside the working pressure differential range can inhibit normal use.
In particular, an orifice or restriction in the secondary side (downstream side) of the product could cause incorrect operation. Please be careful. In addition, the pressure on the primary side or secondary side of the product may fluctuate repeatedly, or the product control may not be able to track pressure changes, leading to unstable flow rate control.
- **Working conditions for CE compliance**
This product is CE-marked, indicating conformity with the EMC Directives.
EN61000-6-2; regulation matched to immunity applies to this product. Conditions below are necessary to comply with these standards.
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.

3. Flow rate unit

⚠ CAUTION

- **This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is the display when the mass flow rate is converted to volumetric flow rate at 20°C 1 atmosphere (101 kPa) relative humidity 65%.**

Mounting, installation and adjustment

1. Wiring

⚠ DANGER

- Use power supply voltages and outputs within the specified voltage.
If voltage exceeding the specified voltage is applied, the product could malfunction or be damaged, or electrical shock or fire could occur.

⚠ WARNING

- Check the connector pin and cable core wire color when wiring. Incorrect connections could cause product damage, problems, or malfunctions. Check the wire color against instructions and precautions before wiring.
- Ensure that wires are properly insulated.
Check that wires do not come into contact with other circuits, that no ground faults occur, and that the insulator between terminals is not defective. Otherwise, overcurrent may flow into the product, causing damage.
- Use a stabilized DC power supply within the specified rating that has been insulated from the AC power supply. A non-insulated power supply could result in electrical shock. If power is not stabilized, the peak value in hot summer could exceed the rating and damage the product or reduce precision.
- Stop the control device and equipment and turn power OFF before wiring. Starting operation suddenly could cause unpredictable and dangerous operation. First, conduct an energized test with controls and machinery stopped, and set target data. Be sure to discharge any accumulated electrostatic charge among personnel, tools, or equipment before and during work. Connect and wire bending resistant material, such as robot wire material for movable sections.
- Do not use at levels exceeding the power supply voltage range. The product could rupture or burn if voltage exceeding the specification range or AC power supply (100 VAC) is applied.
- Install this product and wiring as far away as possible from sources of noise such as power distribution wires. Provide separate countermeasures for surge applied to the power cable.

- The power supply for the stainless steel body is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. Between the internal power circuit and stainless steel body, a varistor (limit voltage approx. 40 V) is connected to prevent dielectric breakdown of the product. Do not conduct a withstand voltage test or insulation resistance test between the internal power circuit and stainless steel body. Disconnect wiring first if this testing is required. An excessive potential difference between power and stainless steel body will burn internal parts.

After installing, connecting and wiring the stainless steel body, electrical welding of the device/frame, or short-circuit accidents, etc., could cause welding current, excessive high voltage caused by welding, or surge voltage, etc., to run through wiring, ground wire, or fluid path connected between such devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

⚠ CAUTION

- L type cable connectors do not rotate.
Never attempt to rotate them.
- Be sure to disconnect the power supply before inserting/removing M12 connectors.
- Always hold the connector part when inserting/removing M12 connectors. Do not hold by the cable to pull out.
- When fitting the M12 connector, align the protrusions on the main unit connector terminal with the recesses on the cable connector terminal and insert them securely, then hold the knurled part and tighten it clockwise to avoid damaging the threads.
- Take care as tightening with excessive force may lead to damage of the body connector.
Recommended torque: 0.4 to 0.49 N·m
- If extending the cable, use a wiring length of 20 m or less between the master and device (this product).
- Insulate wires not being used so that they do not contact other wires.
Unintended connection of unused wires to the ground, etc., could cause malfunction or damage to the product.

Mounting, installation and adjustment

2. Piping

⚠ CAUTION

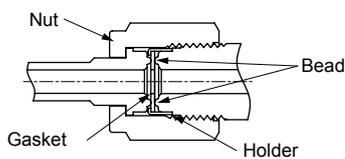
■ Align the fluid flow direction to the direction indicated on the body when connecting the pipes.

■ Fitting tightening with 4S, 4RM port size (hydrogen/helium model).

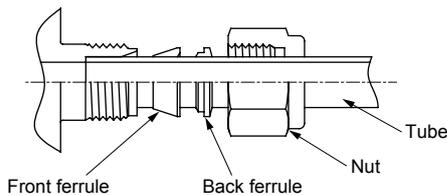
① Fitting tightening method

4RM (1/4" JXR male fitting)...when the gasket material is nickel/SUS316

Tighten the nut with fingers until the gasket contacts the bead surface, and then tighten another 1/8 turn with a tool.



4S (double barbed fitting)...Confirm that the front ferrule, back ferrule and nuts are properly attached, and then insert the tube until it contacts the back of the body. Tighten the nuts as far as possible with fingers, and then tighten 1 1/4 turn with a tool.



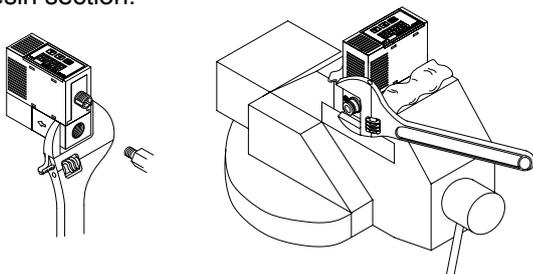
■ Before installing the piping, clean out the pipes using an air blower to remove all foreign matter and chips from the pipes.

The rectifier or platinum sensor could be damaged if foreign matter, cutting chips, etc., should enter.

■ When installing this product on piping, refer to the torque below so that excessive screw-in torque or load torque is not applied to the connection port.

Port thread	Tightening torque N·m
Rc1/4	6 to 8
9/16-18UNF	6 to 8

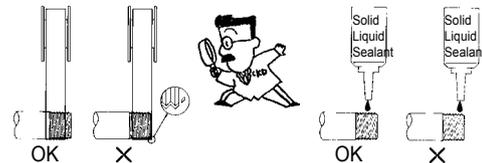
■ Hook a wrench to the stainless steel body when tightening pipes so that force is not applied to the resin section.



■ Make sure that no sealing tape or adhesive enters the pipes when connecting the piping.

■ When connecting pipes, wrap sealing tape in the opposite direction from the threading, from the inside position to within 2 mm from the pipe end.

- If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the solenoid valve, causing failures.



When using a liquid sealant, make sure to keep it away from resin parts

Please be careful. Otherwise resin parts could be damaged, which is dangerous.

■ If the piping is removed once, sealant may remain on the thread part.

When repiping, remove the remaining sealant.

■ Be sure to connect a fitting even when using the stainless steel body with the OUT side opened.

The port filter could come off.

■ When the resin body is used, do not bend the tube near the push-in fitting. If stress is applied to the tube near the push-in fitting, insert an insert ring into the tube, and connect the tube to the push-in fitting.

■ When the resin body is used, securely insert the tube, and make sure that it cannot be pulled out. Cut the tube at a right angle with a dedicated cutter before use.

■ After piping, check that there are no gas leaks.

■ When using this product for oxygen gas, take special care with the points below.

- The piping work should be performed by an expert in the handling of oxygen gas.
- Use piping with oil-free processing.
- Make sure to remove dirt, burrs, etc., in the piping before installing the product.
- Install a filter on the primary side of the product.

■ Do not install regulator/solenoid valve, etc., immediately before this product. Generated drift may cause errors. Provide a straight piping section if required.

■ Although the mounting is "unrestricted in vertical/horizontal direction", the flow rate may vary depending on difference in the mounting orientation or piping conditions.

■ Do not install multiple bodies in close contact. The mutual generation of heat could cause the product body's temperature to rise, hastening changes in characteristics or in the resin material. When using the products in a row, set intervals of distance of 10 mm or more.

Use/maintenance

⚠ WARNING

- Output accuracy is affected by temperature characteristics and heat generated when energized. Provide sufficient stand-by time (10 minutes or more after energizing) before use.

⚠ CAUTION

- This product uses a micro-sensor chip, and must be installed where it will not be subject to dropping, impact or vibration. Treat the product as a precision component during installation and transportation.
- If a problem occurs during operation, immediately turn the power OFF, stop use, and contact your dealer.
- Immediately after power is turned ON, the product does not start flow rate control operation for approx. 2 seconds to complete self-diagnosis. Provide a control circuit/program that ignores signals for at least two seconds after power is turned ON.
- Keep this product's flow rate within the rated flow range.
- Use this product within the working pressure differential.
- When changing the setting value, turn OFF the equipment first in order to prevent unexpected operation of the control system.
- Do not disassemble or modify this product. Doing so could result in faults.
- The case is made of resin. Do not use solvent, alcohol or detergent in cleaning, since the resin could absorb it. There is a risk of affecting the resin. Wipe off dirt with a rag soaked in a diluted neutral detergent solution and wrung out well.
- Pay attention to surge current flow-around.
- The accuracy may vary from the initial status depending on the working environment or working conditions.
It is recommended to check the operation of the product periodically.
- The sensor chip will degrade when used for long periods and cause the detected flow rate to fluctuate. Periodically inspect the sensor chip.

- Clear each Process Data OUT to "0" before powering this product. Gas may flow unintentionally.
- The settings of this product can be changed in two ways: IO-Link communication from the master and key input on the device (the product itself). There is no hierarchical relationship or priority given to either side, instead the most recently applied setting is reflected as the setting of this product. When settings are made on the device side, the master side is also synchronized. However, note that some masters may not reflect the new settings in the display unless the display is updated or settings are uploaded.
- Process Data OUT values can only be operated by the master. Even if a setting is changed via key operation on a device, these changes will not be reflected on Process Data OUT values. Check the Process Data IN / Parameter settings to check the product setting status on the master side.
- The "start/stop" bit of Process Data OUT has the same role as "Flow control/Forced OFF" status switched by key operation, but the "start/stop" bit is "1 (Start)". Consequently, the "start/stop" bits of Process Data OUT remain as "1 (Start)" even if the flow control → forced OFF is switched by key input on the device side.
When the "start/stop" bit of Process Data IN is "0 (Stop)", the product will be in the forced OFF state. When switching the "start (flow control)" state from the master in this state, set it to "0 (stop)" and then set it to "1 (start)" again.

FCM Glossary

Applicable to compact flow rate controller FCM.

Term	Explanation
Control range	Calibration range of this product.
Accuracy	Calibration error from CKD reference device. (Conditions: Temperature 25 ±3°C, power supply voltage 24±0.01 VDC, standard differential pressure, secondary side released to atmosphere)
Repeatability	Calculated from variation (D = Max. - Min.) when flow rate controls of 0% F.S. and 50% F.S. are repeated 20 times continuously in a cycle where the control is sufficiently stabilized. (Reproducibility) = $\pm D/2/FS$ control flow rate×100[%]
Temperature characteristics	Indicates the fluctuation of the flow rate value according to changes in the ambient temperature and fluid temperature (reference temperature 25°C) converted per 1°C. Calibration is performed at a temperature of 25°C.
Pressure characteristics	Indicates the fluctuation of the flow rate value according to changes in the working pressure. Calibration is performed at standard differential pressure.
Standard differential pressure	Differential pressure when this product is calibrated. (Secondary side released to atmosphere)
Working pressure differential	Differential pressure required for normal operation of this product.
Proof pressure	Pressure at which the product will not be damaged.
Display resolution	Min. step at which the display changes.
(Integrated) pulse output rate	Accumulated flow per pulse when the integrated pulse is output.
LSB	Shows the lowest order bit of the data. (Abbreviation for Least Significant Bit)
MSB	Shows the highest order bit of the data. (Abbreviation for Most Significant Bit)
UInteger	Unsigned integer. Shows the data type. Ex. If the data format is UInteger16 (Process data OUT setting flow rate, etc.) Expressed as 16 (digits) bits (0/1). The possible variable range is from 0 to 65535, but the variable range that can be taken by each data name is limited.
Integer	Signed integer. Shows the data type. Ex. If the data format is Integer16 (Process data IN instantaneous flow rate, etc.) Expressed as 16 (digits) bits (0/1) with the most significant bit showing the sign. Data value can range from -32768 to +32767, but for instantaneous flow rates a negative value is used to check the shift from the zero point to be checked and does not indicate a flow rate implying reverse flow.
digit	Digit. Min. value of digital display when decimal points are ignored.
AWG	Abbreviation of American Wire Gauge. Standard for cables.

MEMO

Related products

Compact flow rate controller RAPIFLOW FCM Series (Standard Type)

- Compact/high speed/high precision
70 × 70 × 30 (H × D × W) size.
Installable in narrow spaces or on movable parts, enabling equipment downsizing and weight reduction.
- Compatible with various fluids
Applicable fluids can be used with various gases such as air, nitrogen, argon, oxygen, methane and propane. In addition, hydrogen and helium have been added to the applicable product(s) fluid list. It can be used in various applications.
- Capable of 0.5 sec high speed control
- Equipped digital display makes control status visible at a glance
 - Digitally displays the flow rate value in 3 digits
 - Error and output state (switch output ON/OFF) are displayed

Catalog No. CB-024SA



Electro pneumatic regulator EVR Series

- High precision pressure
 - Hysteresis: 0.3% F.S., linearity: ±0.5% F.S., resolution: 0.1% F.S., repeatability: 0.2% F.S.
- Improvement of temperature stability and durability
 - Zero point fluctuation: 0.06% F.S., span fluctuation: 0.06% F.S., durability: 3 times longer (compared with conventional models)
- Equipped with new functions
 - Residual pressure 0 when the input signal is 0% F.S. Select pressure control pattern.
- Easy operation
 - "Zero point adjustment", "span point adjustment", and "pressure control pattern" can be operated with two buttons.
- Compatibility/installation
 - Compatible mounting with the conventional product (EV2500).
 - Two types of connectors are available. (Straight and L type, 1 m and 3 m each)

Catalog No. CC-1174A



Inline clean filter FCS500/FCS1000 Series

Ideal as a final filter (for air or inert gases) for various clean applications

- 0.01 μm high precision filtration, 99.99% removal efficiency
Hollow fiber membrane element has enabled 0.01 μm high precision filtration and 99.99% removal efficiency.
- Long service life
Considerably longer service life. Approximately five times longer than the flat membrane type.
- Compact/lightweight/large flow rate
A three to ten times filtration area enables larger flow rate and less pressure loss than the flat membrane type of the same capacity.
If the flow rate is the same, the hollow fiber membrane can be more compact and lighter.
- Oil-prohibited specifications
Parts are all degreased and cleaned. The manufacturing processes from assembling to packaging are performed in clean room.
- Easy maintenance
As the case of resin type is transparent, it is easy to visually check for dirt of the element.
- Wide range of choices
Two kinds of flow rate (500 and 1000 Series), resin and stainless steel materials, and the mounting options of push-in fitting and male thread piping are available.

Catalog No. CB-024SA



IO-Link related products

Compact flow rate sensor (RAPIFLOW) FSM3 Series

- IO-Link compatible
- Five types of gases can be measured with just one unit
- Reduction of pressure loss
- High precision/high-speed response
- Bi-directional fluid measurement
- Rotatable LCD display
- Variety of fitting variations

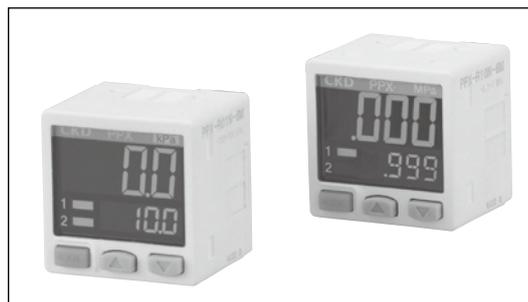
Catalog No. CC-1393A



Digital pressure sensor PPX Series

- IO-Link compatible
- Increased visibility
- Analog current output is added to the high-function type
- Power consumption is further reduced
- Direct setting with 2-screen display
- Copy function helpful for reducing work processes and preventing misoperation

Catalog No. CB-024SA



Digital gap switch GPS3 Series

- IO-Link compatible
- High precision 2-point output (threshold setting available for two distant points within the detection range scale)
- This single unit allows finished surface roughness and material surface roughness settings within the detection range scale from 0.03 mm and 0.4 mm. Short-range types are newly added. (Detection range scale: 0.02 mm to 0.15 mm)
- High maintainability (Direct blow available. Structure can be disassembled and cleaned if orifice becomes clogged. A function is provided to indicate the probable location of clogging with the blinking lamp.)

Catalog No. CC-1291A



Karman vortex flow rate sensor for water FLUEREX WFK2 Series

- IO-Link compatible
- Compatible with a wide range of flow rates (0.4 to 250 L/min)
- All models equipped as standard with water temperature measuring function
- Manual valve available as an option for easy flow rate adjustment
- Handles water up to 95 °C
- The LCD display can be rotated 90° in each direction without moving the body
- Displays the setting value or temperature, etc., simultaneously with an easy-to-read 2-screen color liquid crystal

Catalog No. CC-1342A

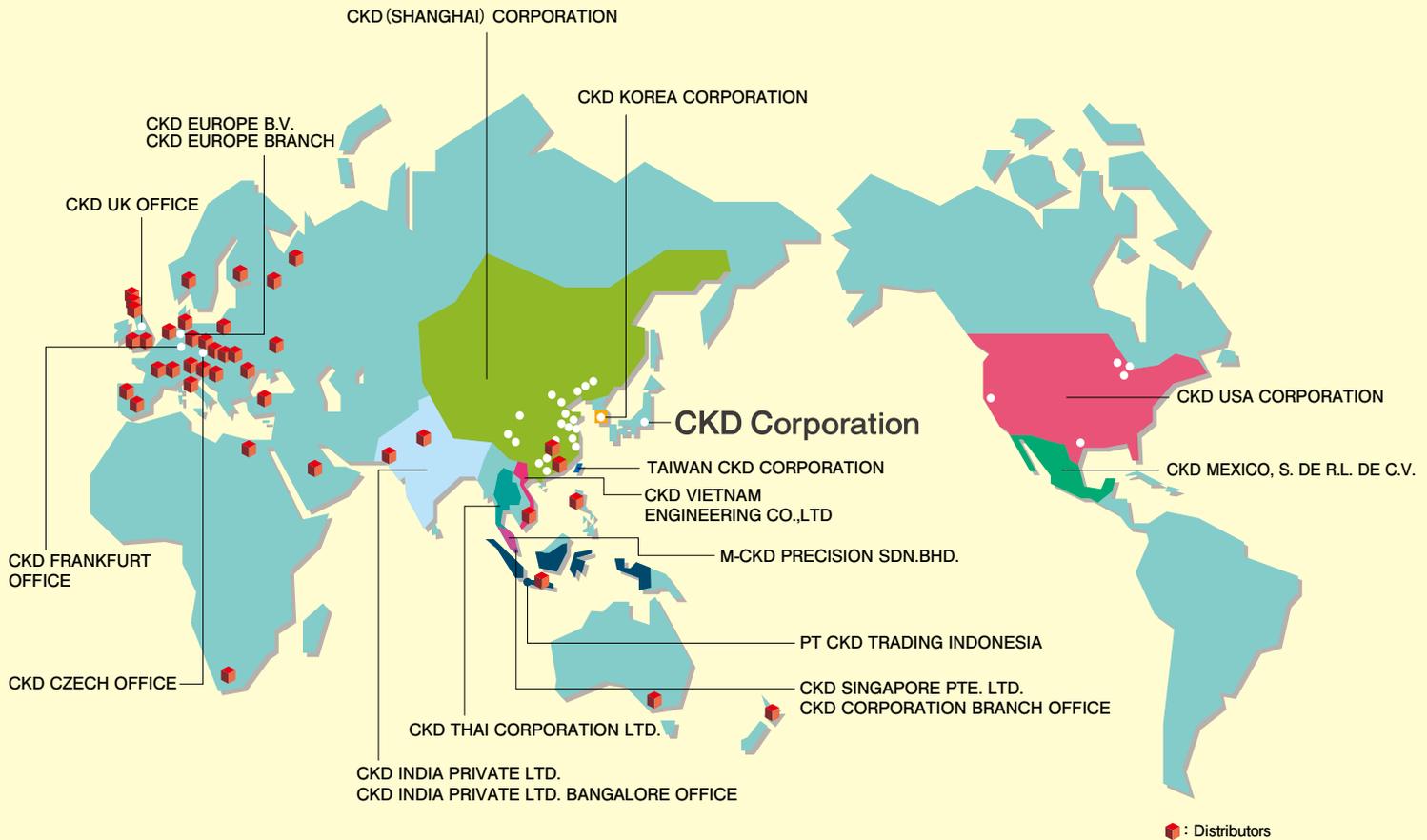


Capacitance electromagnetic flow sensor WFC Series

- IO-Link compatible
- The Flo-Thru structure allows even water of poor quality to be used.
- The capacitance structure eliminates detection failures caused by foreign matter deposited onto the electrode.
- Ensures elbow piping repeatability
- No stabilized power supply or anti-noise ferrite core required.
- Allows zero point adjustment by external input
- With 180° invertible display function
- Reverse flow detection function equipped

Catalog No. CC-1230A





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