Compact flow rate Controller

RAPIFLOW® FCM

■ Flow rate controller



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FCM Series

Supports the IoT era! Flow rate controller equipped with predictive maintenance

Stainless steel body

[Applicable fluids / Flow rates]

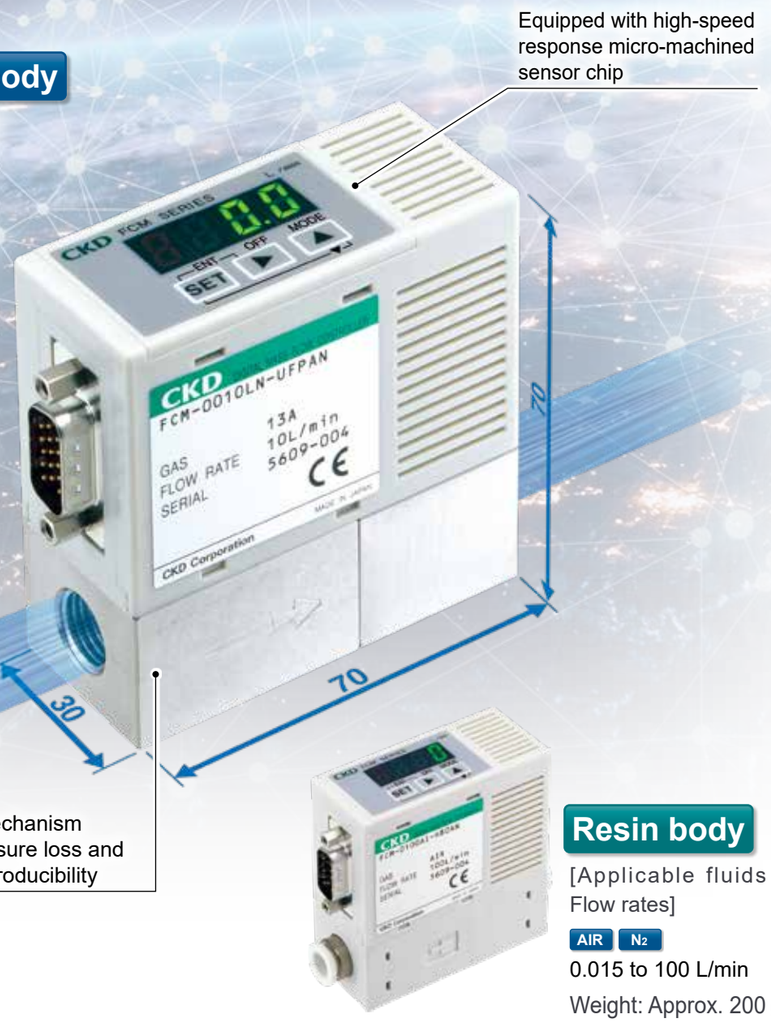
AIR N₂
0.015 to 50 L/min

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



Resin body

[Applicable fluids / Flow rates]

AIR N₂
0.015 to 100 L/min

Weight: Approx. 200 g

Compatible with various fluids

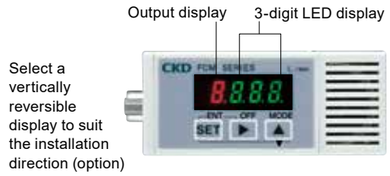
Compatible with various gases. It can be used in various applications.

Applicable fluid

Air Nitrogen Argon Oxygen City gas Methane
Propane Hydrogen Helium etc.

Equipped with a digital display that shows the control status at a glance.

- Digitally displays the flow rate value in 3 digits
- Error and output status (switch output ON-OFF) are displayed

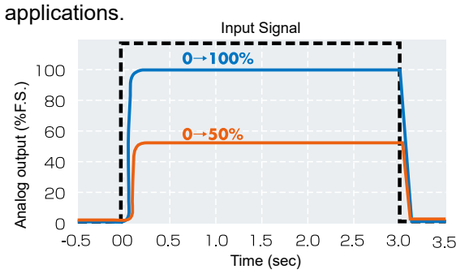


Low differential pressure model

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

High-speed control for 0.5 seconds

High speed control of 0.5sec is possible by using a platinum sensor chip based on silicon micromachining Compatible with various applications.



Dedicated power supply not required

24 VDC power supply voltage. It operates with a general purpose single power supply.

Highly reliable flow control

Our proprietary rectifying mechanism enables improved reproducibility, which affects flow controllability.

Reproducibility	±1% F.S.
Accuracy	±3% F.S.

Parallel input is available as standard

Controllable with parallel input (ON/OFF signal such as PLC, 10bit resolution 1024). Analog I/O components such as D/A converters are not required.



Compact and lightweight

70×70×30 (vertical/horizontal/width) size. Installable in narrow spaces or on movable parts, enabling equipment downsizing and weight reduction.

Volume
Compared with conventional models Approx. 30%
Weight
Compared with conventional models Approx. 20%



Multiple functions realized with built-in microcomputer

Error display function
Error display and notification by electric signal.

Zero/span adjustment function
Zero/span adjustment of input signal is possible to suit the user's needs.

Preset input function
Four arbitrary flow rates can be set, and the flow rate can be controlled with an external 2bit signal input (signal from PLC, etc.).

Direct memory function
Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.

Switch output function
Switch output function equipped with flow rate upper/lower limit setting. (Overcurrent protection integrated)

Flow rate integrating function
The flow rate integration display (max. 6 digits) and integration pulse output are possible.

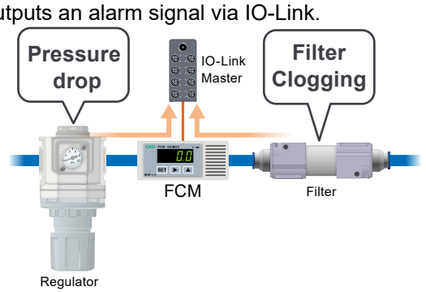
Auto cutoff function
The valve is automatically shut off in the event of an emergency at the time of an error.

IO-Link

System error detection (predictive maintenance)

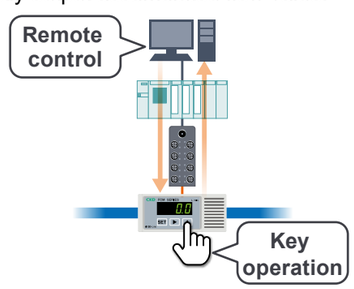
System error warning function

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.



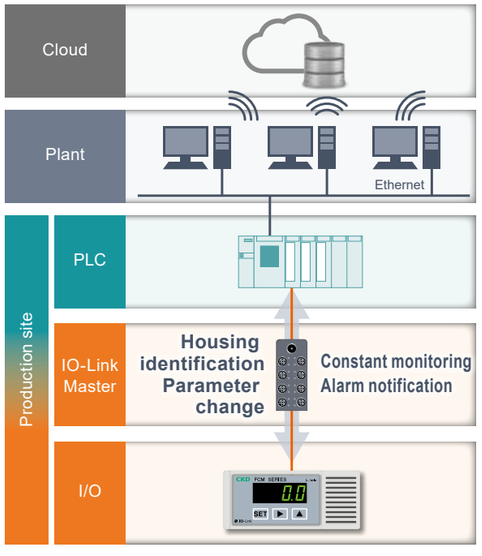
Improved existing communication with IO-Link

- 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 points (conventional)
  - ➡ Increased to 8 points.
- 4 switch output types can be set and output simultaneously.
- Directly output accumulated flow value.



IO-Link model available

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



Constant monitoring via digital data is possible.



Parameters can be set and changed via the network, enabling remote equipment operation.



Models, serial numbers, etc., can be confirmed on the network.



The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.



Device failure and disconnection can be confirmed.



It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

Communication specifications

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

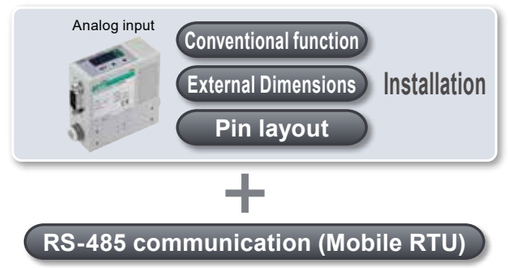
Item	Details
Process data length (output)	4 byte
Min. cycle time	2 ms
Data storage	1 kbyte
SIO mode support	None

RS-485

RS-485 communication supported

Stable noise-resistance and long-distance communication are possible

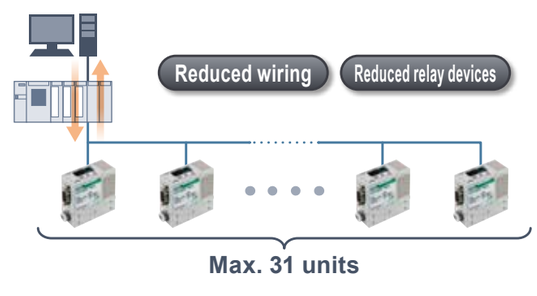
While maintaining the conventional functions and installation size, it supports RS-485, which is highly reliable in industrial network communication.



Reduce wiring and relay equipment costs

Up to 31 units can be connected

One master can connect up to 31 units at a time.
Wiring and analog units can be reduced.



Additional functions (1)

Can be set with both key operation and RS-485

Various settings can be set both with key operation and remote control with RS-485 communication

- **Input method switching**
- **Preset memory value input**
- **Flow rate control / forced OFF state switching**

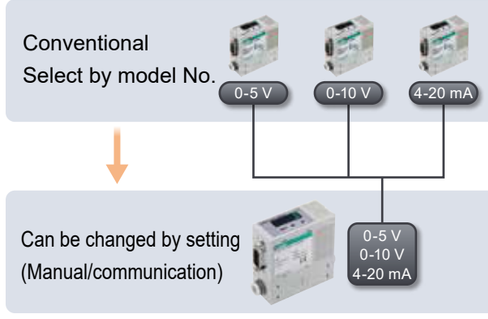
Communication specifications

Item	Details
Communication standards	RS-485 compliant
Communication method	Half-duplex
Communication protocol	Modbus RTU compliant
Communication speed	9.6/19.2/38.4 kbps

Additional functions (2)

Analog input specification can be switched

Switch input specifications to match the device

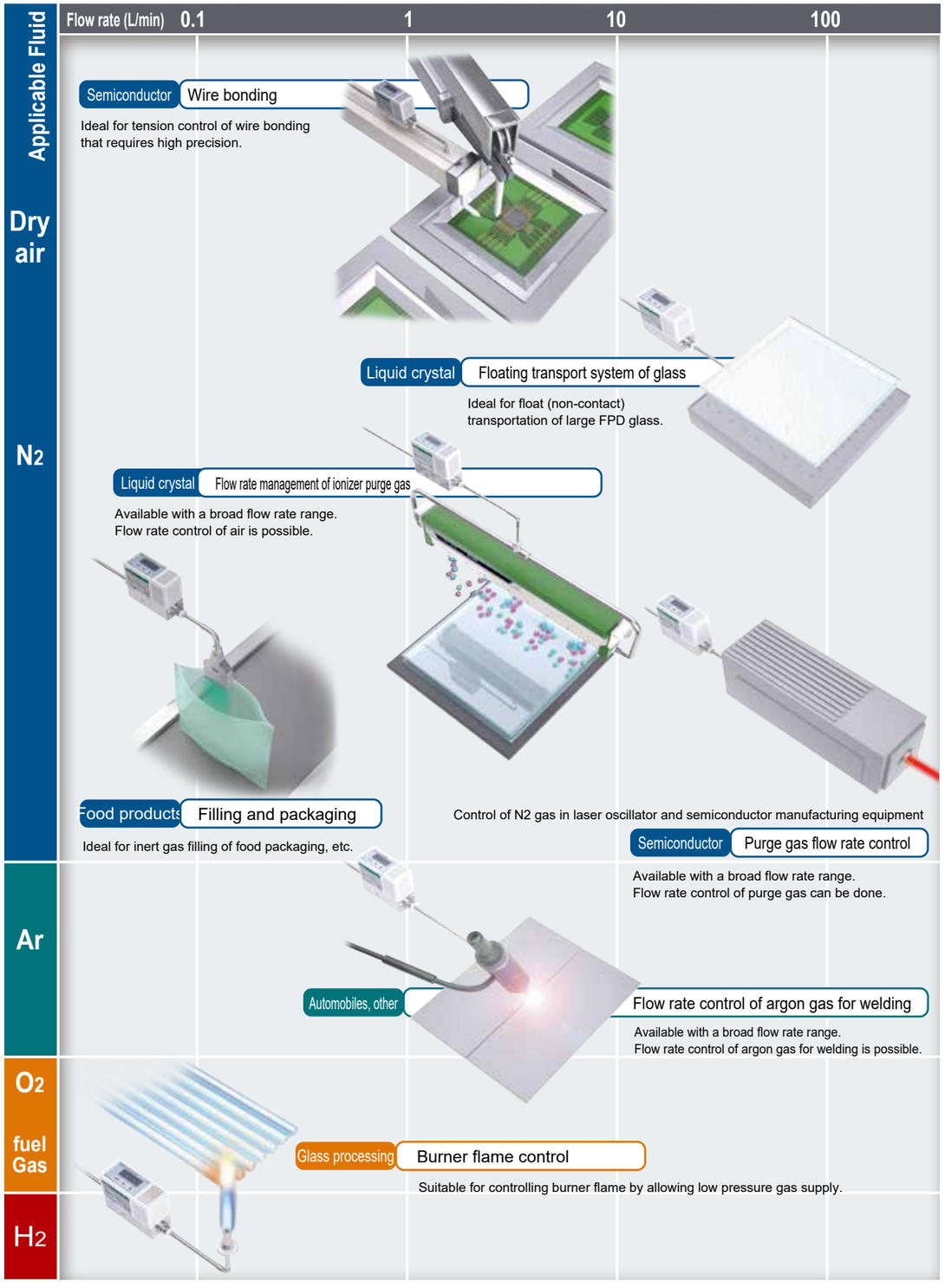


Item	Details
Parity bit	None / Odd / Even
Stop bit	1bit / 2bit
Components address	1 to 247 (broadcast-capable)

Examples of applications

Used in various fields

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



RAPIFLOW® FCM Series variation

Applicable fluids/flow rate control range

Applicable fluid	Model No.	Flow rate control range (L/min) 0.01 0.1 10 100		Body material	Port size
AIR Air / N2 Nitrogen	FCM-9500 AI		0.015 to 0.5	Resin	Resin: ø6 push-in, ø8 push-in
	FCM-0001 AI		0.03 to 1		
	FCM-0002 AI		0.06 to 2		
	FCM-0005 AI		0.15 to 5		
	FCM-0010 AI		0 to 0.3	SUS	SUS: Rc1/4, 9/16-18 UNF
	FCM-0020 AI		0.6 to 20		
	FCM-0050 AI		1.5 to 50		
	FCM-0100 AI (Resin type only)		3 to 100		
Ar Argon	FCM-9500 AR		0.015 to 0.5	SUS	Rc1/4, 9/16-18 UNF
	FCM-0001 AR		0.03 to 1		
	FCM-0002 AR		0.06 to 2		
	FCM-0005 AR		0.15 to 5		
	FCM-0010 AR		0 to 0.3		
	FCM-0020 AR		0.6 to 20		
	FCM-0050 AR		1.5 to 50		
O2 Oxygen / 13A City gas / CH4 Methane / C3H8 Propane	FCM-9500 O2/LN/C1/C3		0.015 to 0.5	SUS	Rc1/4, 9/16-18 UNF
	FCM-0001 O2/LN/C1/C3		0.03 to 1		
	FCM-0002 O2/LN/C1/C3		0.06 to 2		
	FCM-0005 O2/LN/C1/C3		0.15 to 5		
	FCM-0010 O2/LN/C1/C3		0 to 0.3		
H2 Hydrogen / He Helium	FCM-0002 H2/HE		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		
	FCM-0010 H2/HE		0.15 to 5		
	FCM-0020 H2/HE		0.6 to 20		

System Table I/O specifications

Input: Input signal: Specifications	Model No.	Output: Output Method	Specifications	Error output
Analog: 0-10 V	FCM-□-□0AN	Analog	1-5 V	NPN
	FCM-□-□0AP			PNP
Preset: 4 points (2 bit) (Note)	FCM-□-□0SN	Switch	NPN	NPN
	FCM-□-□0SP		PNP	PNP
Analog: 0-5 V	FCM-□-□1AN	Analog	1-5 V	NPN
	FCM-□-□1AP			PNP
Preset: 4 points (2 bit) (Note)	FCM-□-□1SN	Switch	NPN	NPN
	FCM-□-□1SP		PNP	PNP
Analog: 4-20 mA	FCM-□-□2AN	Analog	1-5 V	NPN
	FCM-□-□2AP			PNP
Preset: 4 points (2 bit) (Note)	FCM-□-□2SN	Switch	NPN	NPN
	FCM-□-□2SP		PNP	PNP
Parallel: 10bit	FCM-□-□PAN	Analog	1-5 V	NPN
	FCM-□-□PAP			PNP
	FCM-□-□PSN	Switch	NPN	NPN
	FCM-□-□PSP		PNP	PNP
IO-Link Preset: 8 points (3 bit)	FCM-□-□C	IO-Link		
RS-485 Analog: 0-10 V, 0-5 V, 4-20 mA *Can be changed with setting	FCM-□-□RAN	RS-485 Analog	1-5 V	NPN
	FCM-□-□RAP			PNP
RS-485 Preset: 4 points (2 bit)	FCM-□-□RSN	RS-485 Switch	NPN	NPN
	FCM-□-□RSP		PNP	PNP

Note: Preset 8 points (3 bit) input is available custom made. (In this case, the external accumulation reset signal input function cannot be used.) Contact the CKD Sales for details.



Compact flow rate controller RAPIFLOW

FCM Series

Analog input/parallel input

- For air, nitrogen, argon, oxygen, city gas, methane, propane (flow rate range: 0.5 to 100 L/min)
- For hydrogen, helium (flow rate range: 2.0 to 20 L/min)

Refer to the CKD website for detailed compatible model Nos.

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

Model No. Notation Method

FCM - 9500 AI - H6 0 AN R 1 B T

- FCM: Model No.
- 9500: ❶Flow rate range
- AI: ❷Applicable fluid
- H6: ❸Port size, body material
- 0: ❹Input signal
- AN: ❺Output specifications
- R: ❻Indicator direction
- 1: ❼Cable
- B: ❽Bracket
- T: ❾Traceability

❶Flow rate range

	Description	Code	❷Applicable fluid					
			AI	AR	O2	LN	C1	C3
Standard model	0 to 0.5 L/min	9500	●	●	●	●	●	●
	0 to 1 L/min	0001	●	●	●	●	●	●
	0 to 2 L/min	0002	●	●	●	●	●	●
	0 to 5 L/min	0005	●	●	●	●	●	●
	0 to 10 L/min	0010	●	●	●	●	●	●
	0 to 20 L/min	0020	●	●				
	0 to 50 L/min	0050	●	●				
	0 to 100 L/min (resin body only)	0100	●					
Low differential pressure model (stainless steel only)	0 to 0.5 L/min	L9500	●		●	●	●	●
	0 to 1 L/min	L0001	●		●	●	●	●
	0 to 2 L/min	L0002	●		●	●	●	●
	0 to 5 L/min	L0005	●		●	●	●	●
	0 to 10 L/min	L0010	●		●	●	●	●

❷Applicable fluid

Code	Description
AI	Compressed air, nitrogen gas
AR	Argon
O2	Oxygen (oil-prohibited specifications)
LN	City gas (13A)
C1	Methane (CH_4)
C3	Propane (C_3H_8)

❸Port size, body material

	Port size	Body material		Code	❷Applicable fluid					
					AI	AR	O2	LN	C1	C3
Push-in	ø6 (*1)	Resin body		H6	●					
	ø8			H8	●					
Screw-in	Rc1/4	Stainless steel body		8 A	●	●	●	●	●	●
	9/16-18 UNF (*2)			UF	●	●	●	●	●	●

*1: ❶Flow rate range excludes "0050" and "0100".
*2: For 9/16-18UNF screw shape, please refer to the dimensional outline drawing on Page 532.

❹Input signal

Code	Description
0	Analog 0-10 VDC
1	Analog 0-5 VDC
2	Analog 4-20 mADC
P	Parallel 10 bit

❺Output specifications

Code	Description
AN	1-5 V analog error (NPN)
AP	1-5V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❻Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❼Cable

Code	Description	
Blank	None	
1	1 m	
3	3 m	

Note: Shipped with the product.

❽Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❾Traceability

Code	Description
Blank	None
T	Inspection Report + Calibration Certificate + Traceability System Diagram
K	Inspection Report

Note: Shipped with the product.

Discrete option model No.

FCM - AC1

- AC1: ❶Option

❶Option

Code	Description	
AC1	Analog 9-conductor, cable 1 m	
AC3	Analog 9-conductor, 3 m cable	
PC1	Parallel 15-conductor, cable 1 m	
PC3	Parallel 15-conductor, 3 m cable	
LB1	Bracket	

Specifications for air, nitrogen, argon, oxygen, city gas, methane, propane

Item				FCM-[1] [2]-[3] [4] [5]						
Valve drive method				Proportional solenoid valve When not energized: Closed						
				Full scale flow rate	AI (Air, nitrogen)	AR (Argon)	02 (Oxygen)	LN (City gas)	C1 (Methane)	C3 (Propane)
Flow rate range *1	[1]	Standard model	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 only)	●					
		(stainless steel only) Low differential pressure model	L9500	500 mL/min	●		●	●	●	●
			L0001	1 L/min	●		●	●	●	●
			L0002	2 L/min	●		●	●	●	●
			L0005	5 L/min	●		●	●	●	●
			L0010	10 L/min	●		●	●	●	●
Applicable fluid *2	[2]		AI	Compressed air, nitrogen	●					
			AR	Argon		●				
			O2	Oxygen (oil-prohibited specifications)			●			
			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	●					
			8 A	Rc1/4, Stainless steel	●	●	●	●	●	●
			UF	9/16-18UNF, stainless steel	●	●	●	●	●	●
Control	Control range				3 to 100% F.S.					
	Response time	[1]	9500 to 0020, L9500 to L0010		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 temp. 25°C)					
	Pressure characteristics				Within ±1% F.S. per 98 kPa (standard differential pressure ref.)					
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	[3]	H6/H8 (Resin body)		490 kPa					
			8A/UF (SUS body)		980 kPa					
Operating ambient temperature, operating ambient humidity					0 to 50°C, 90% RH or less (no condensation)					
I/O	Input signal/ preset input	[4]	0		0-10 VDC (6.7 kΩ)/4 points (2 bit)					
			1		0-5VDC (10 kΩ)/4 point (2 bit))					
			2		4-20 mADC (250 Ω)/4 points (2 bit))					
			P		Parallel 10 bit/none					
	Output signal	[5]	AN		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less					
			AP		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less					
			SN		Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less					
			SP		Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less					
Flow rate display	Indicator method				7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit					
	Indicator range, display resolution				Refer to the separate table					
Integrating functions					Refer to the separate table					
Power Supply	Power supply voltage				24VDC ±10% (stabilized power supply with ripple rate 2% or less)					
	Current consumption *6				250 mA or less					
Mounting orientation					Unrestricted in vertical/horizontal direction					
Wetted section materials		[3]	H6/H8 (Resin body)		Polyamide resin, fluoro rubber, stainless steel, alumina, semiconductor silicon, soldering					
			8A/UF (SUS body)		Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering					
Weight		[3]	H6/H8 (Resin body)		Approx. 200 g					
			8A/UF (SUS body)		Approx. 480 g					
Degree of Protection					IEC standards IP40 or equivalent					
Protection circuit *7					Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit 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)

Applicable fluid [2]			Flow rate range [1] 9500	0001	0002	0005	0010	0020	0050	0100
	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)

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

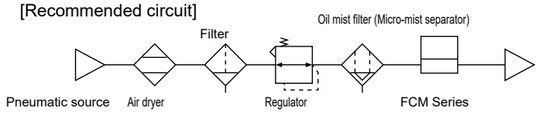
Indicator, integrating functions

		Flow rate range [1] 9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display *9	Indicator 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
	Indicator 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 *10	Indicator range	999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Indicator 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 ISO 8573-1: 2010 [1:1:1 to 1:6:2]. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the functionality of this product, install a filter, air dryer (minimum pressure dew point 10°C or less) and oil mist filter (maximum oil concentration 0.1 mg/m^3) on the primary side (upstream) of this product.

[Recommended circuit]



[Recommended device]
Air filter: F Series
Oil mist filter: M Series

*3: City gas 13A is for 88% methane (CH_4) gas produced 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 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: Current at 24 VDC, no load connected, and full-scale flow rate. Note that current consumption may vary depending on load conditions.

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

*8: When using a low pressure city gas line (1 to 2.5 kPa), the working pressure differential range is exceeded.

*9: The flow rate display is rounded off at approx. 1%F.S. or less (forced zero).

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

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

*12: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

■ For hydrogen, helium

Model No. Notation Method

FCM - 0002 H2 - 8A 0 AN R 1 B T

Model No. / ❶Flow rate range / ❷Applicable fluid / ❸Port size / ❹Input signal / ❺Output specifications / ❻Indicator direction / ❼Cable / ❽Bracket / ❾Traceability

❶Flow rate range

Code	Description	❷Applicable fluid	
		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	●	●

❷Applicable fluid

Code	Description
H2	Hydrogen
HE	Helium

❸Port size

Port size			Code	❷Applicable fluid	
				H2	HE
Screw-in	Rc1/4		8 A	●	●
	9/16-18UNF (Note)		UF	●	●
1/4" double barbed fitting			4S	●	●
1/4" JXR male fitting			4RM	●	●

Note: Refer to dimensions diagram on Page 532 for shape of 9/16-18UNF thread.

❹Input signal

Code	Description
0	Analog 0-10 VDC
1	Analog 0-5 VDC
2	Analog 4-20 mADC
P	Parallel 10 bit

❺Output specifications

Code	Description
AN	1-5 V analog error (NPN)
AP	1-5V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❻Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❼Cable

Code	Description	
Blank	None	
1	1 m	
3	3 m	

Note: Shipped with the product.

❽Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❾Traceability

Code	Description
Blank	None
T	Inspection Report + Calibration Certificate + Traceability System Diagram
K	Inspection Report

Note: Shipped with the product.

Discrete option model No.

FCM - AC1

❶Option

❶Option

Code	Description	
AC1	Analog 9-conductor, cable 1 m	
AC3	Analog 9-conductor, 3 m cable	
PC1	Parallel 15-conductor, cable 1 m	
PC3	Parallel 15-conductor, 3 m cable	
LB1	Bracket	

■ Specifications for hydrogen, helium

Item				FCM-[❶] [❷]-[❸] [❹] [❺]		
Valve drive method				Proportional solenoid valve When not energized: Closed		
				Full scale flow rate	H2 (Hydrogen)	HE (Helium)
Flow rate range *1	[❶]		0002	2 L/min	●	●
			0005	5 L/min	●	●
			0010	10 L/min	●	●
			0020	20 L/min	●	●
Applicable fluids *2	[❷]		H2	Hydrogen	●	
			HE	Helium		●
Port size	[❸]		8 A	Rc1/4	●	●
			UF	9/16-18UNF	●	●
			4S	1/4" double barbed fitting	●	●
			4RM	1/4" JXR male fitting	●	●
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 temp. 25°C)	
	Pressure characteristics				Within ±1% F.S. per 98 kPa (standard differential pressure ref.)	
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 (no condensation)	
External leakage					1 x 10^{-6} PA·m³/s or less (helium leakage rate)	
I/O	Input signal/ preset input	[❹]	0		0 to 10 VDC (6.7 kΩ)/4 point (2 bit)	
			1		0 to 5 VDC (10 kΩ)/4 point (2 bit)	
			2		4 to 20 mADC (250 Ω)/4 points (2 bit))	
			P		Parallel 10 bit/none	
	Output signal	[❺]	AN		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			AP		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SN		Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SP		Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
Flow rate display	Indicator method				7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit	
	Indicator 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				270 mA or less	
MountingOrientation					Unrestricted in vertical/horizontal direction	
Wetted section materials					Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering	
Weight		[❸]	8A/UF		Approx. 480 g	
			4S/4RM		Approx. 560 g	
Degree of Protection					IEC standards IP40 or equivalent	
Protection circuit *6					Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection	
EMC Directive					EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8	

Pressure

Standard differential pressure, working pressure differential

			Flow rate range [❶]			
			0002	0005	0010	0020
Applicable fluid[❷]	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

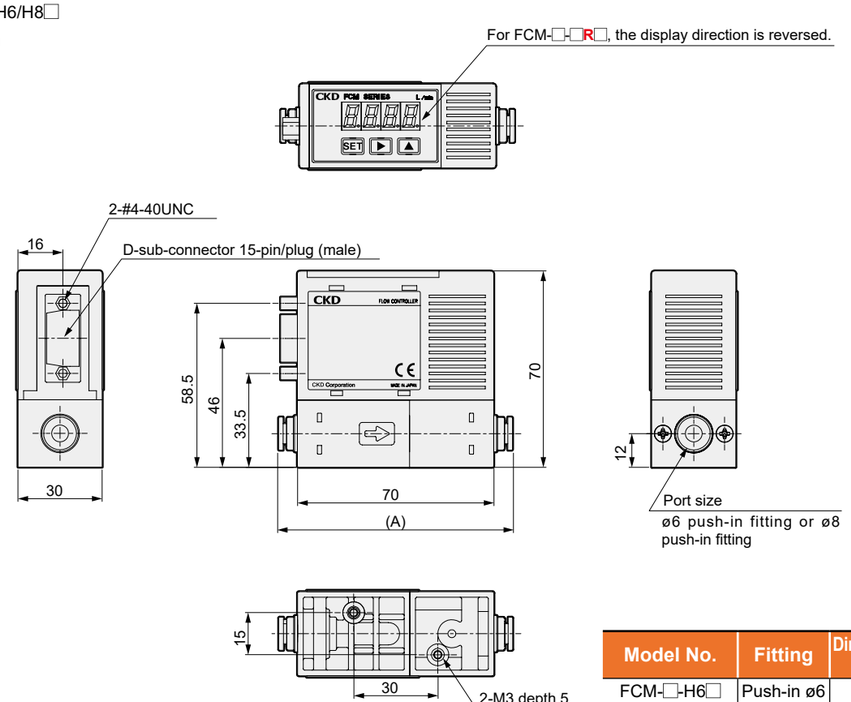
Indicator, integrating functions

		Flow rate range [❶]			
		0002	0005	0010	0020
Flow rate display *7	Indicator 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
	Indicator resolution	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min
Integrating functions *8	Indicator range	9999.99 L	9999.99 L	99999.9 L	99999.9 L
	Indicator 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: Flow rate for 24 VDC, when no load is connected, and when the flow rate is full scale. The current consumption will vary depending on the load.
*6: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*7: The flow rate display is rounded off at approx. 1%F.S. or less (forced zero).
*8: The accumulated flow is a calculated (reference) value. It is reset when the power is turned OFF.
*9: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.
*10: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

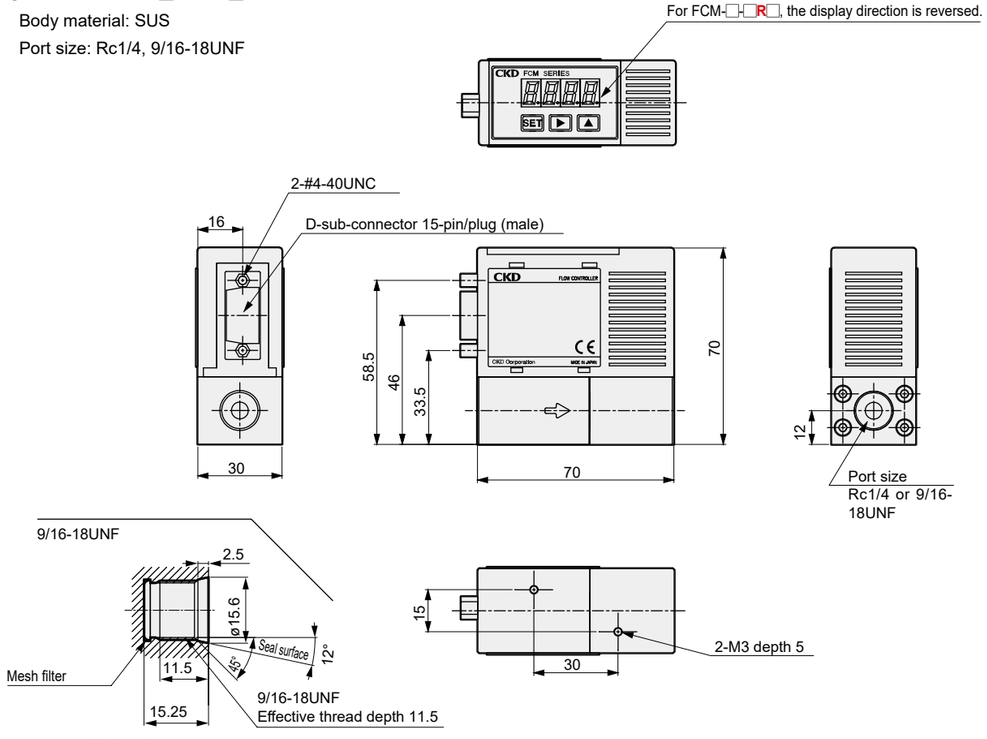
Dimensions

●Model No.: FCM-□-H6/H8□
Body material: Resin
Port size: ø6, ø8



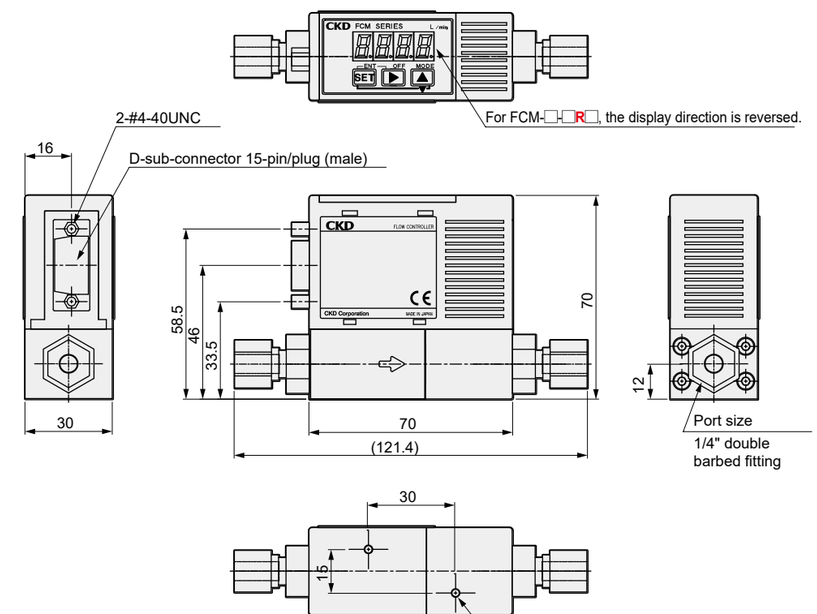
Model No.	Fitting	Dimension (A)
FCM-□-H6□	Push-in ø6	84
FCM-□-H8□	Push-in ø8	85

● Model No.: FCM-□-8A/UF□
Body material: SUS
Port size: Rc1/4, 9/16-18UNF

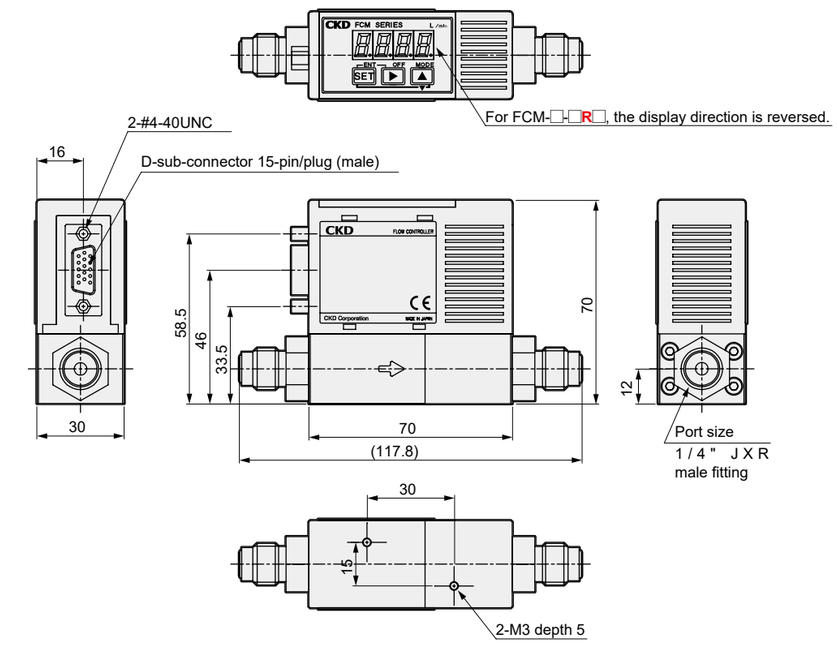


Dimensions

●Model No.: FCM-□-4S□
Body material: SUS
Port size: 1/4" double barbed fitting

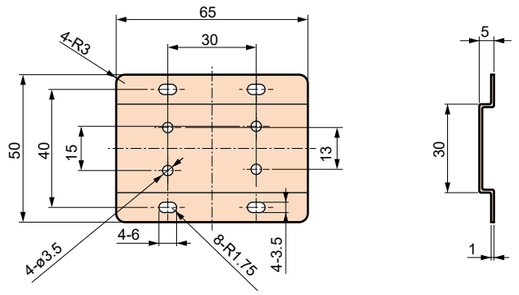


●Model No.: FCM-□-4RM□
Body material: SUS
Port size: 1/4" JXR male fitting

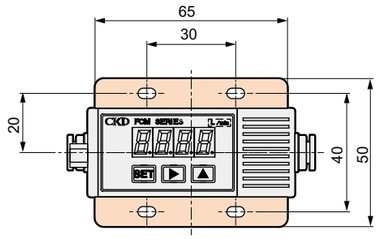


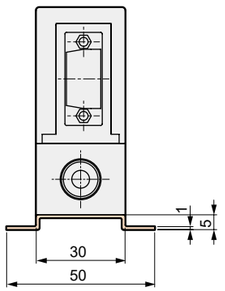
Dedicated bracket (floor mounted)

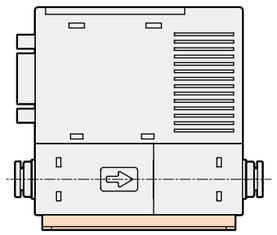
Discrete model No.:FCM-LB1

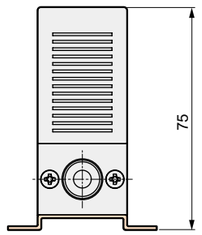


Material: Steel
Weight: 28 g



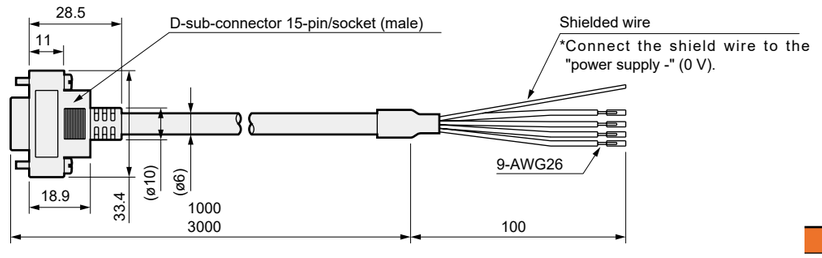






Cable optional dimensions

●9-conductor cable for analog input
Discrete option model No.:FCM-AC1, AC3

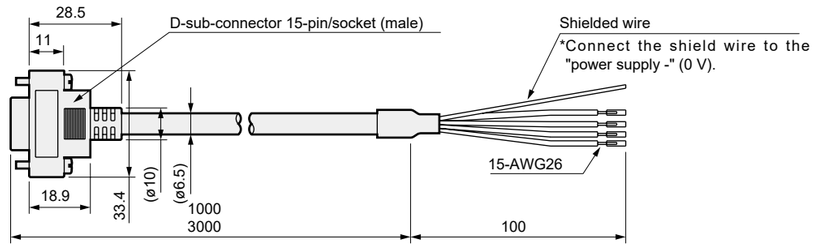


Cable	Weight g
FCM-AC1	68
FCM-AC3	166

D sub-socket pin No.	1	2	3	4	5	6	7	8	9	10	11			12	13		14	15
Insulator color	Brown	Orange	Yellow	–	Red	–	–	–	–	Gray	White			–	Green		Blue	Black
Name	Preset input signal		Integrating Reset Signal	Vacant	Power supply +	Vacant	Vacant	Vacant	Vacant	Common	Input signal			Vacant	Analog Output	Switch Output	Error output	Power supply -(0 V)
Input	Bit 1	Bit 2			+24 VDC						0-10 VDC	0-5 VDC	4-20 mADC	Vacant	1-5 VDC	NPN or PNP output	NPN or PNP output	

Note: The No. 10 pin common is the common for the preset input and accumulation reset signal (pin No. 1 to 6).

●15-conductor cable for parallel input
Discrete option model No.:FCM-PC1, PC3



Cable	Weight g
FCM-PC1	82
FCM-PC3	205

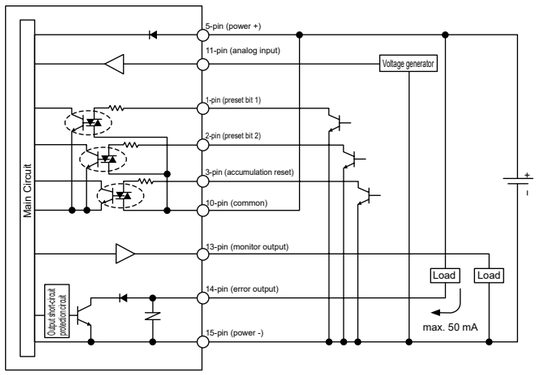
D sub-socket pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13		14	15
Insulator color	Brown	Orange	Yellow	Purple	Red	Light blue	Pink	White (black lineON)	Red (black lineON)	Gray	White	Green (black lineON)	Green		Blue	Black
Name	Parallel input signal				Power supply +	Parallel input signal				Common	Parallel input signal		Analog Output	Switch Output	Error output	Power supply -(0 V)
Input	Bit 1	Bit 2	Bit 3	Bit 4	+24 VDC	Bit 5	Bit 6	Bit 7	Bit 8		Bit 9	Bit 10	1-5 VDC	NPN or PNP output	NPN or PNP output	

Note: The No. 10 pin common is the common for the parallel input signal (pin No. 1 to 4, 6 to 9, 11, 12).

Example of internal circuit and load connection Analog input

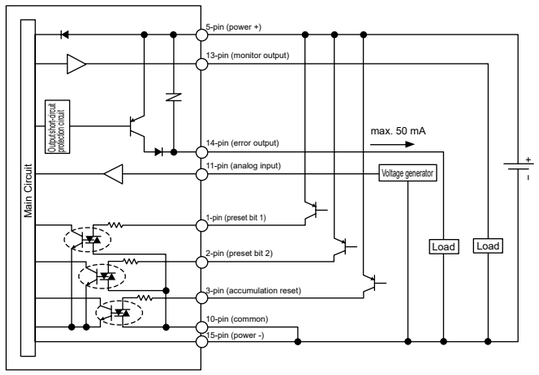
⚠ CAUTION Take care to prevent incorrect wiring.

FCM-□-□0/1/2 AN□
(Analog input, analog output + error output type NPN output)



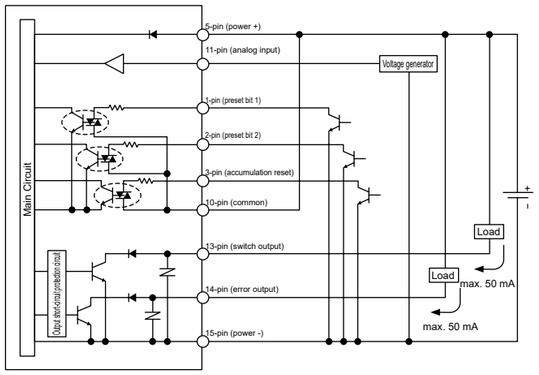
*Current consumption of pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 AP□
(Analog input, analog output + error output type PNP output)



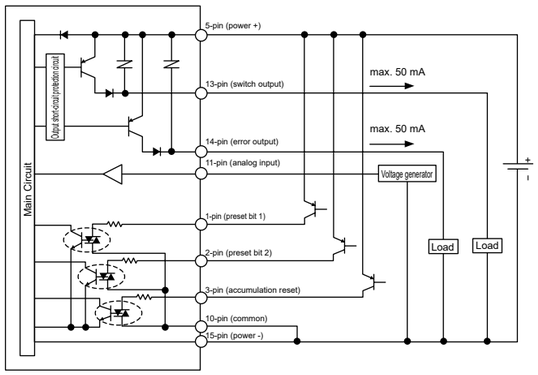
*Current consumption of pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 SN□
(Analog input, switch output + error output type NPN output)



*Current consumption of pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 SP□
(Analog input, switch output + error output type PNP output)



*Current consumption of pins 1 to 3 is approx. 6 mA.

■ Connector pin array (product side)
[Analog input]

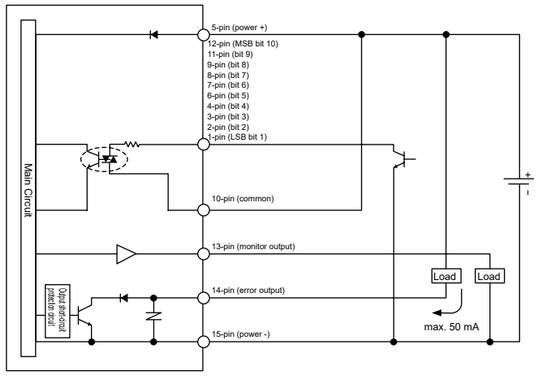
(1) (2) (3) (4) (5)
(6) (7) (8) (9) (10)
(11) (12) (13) (14) (15)

The analog input type
(4), (6), (7), (8), (9), (12) does not have a pin.

Example of internal circuit and load connection Parallel input

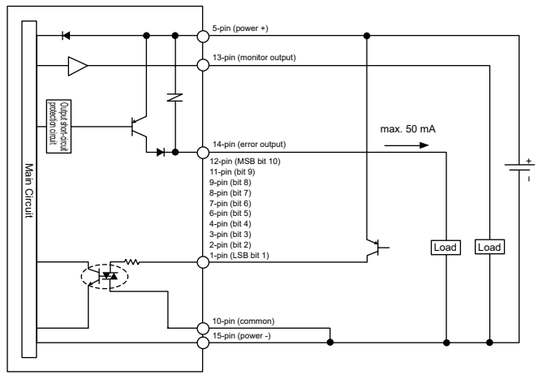
⚠ CAUTION Take care to prevent incorrect wiring.

FCM-□-□ PAN□
(Parallel input, analog output + error output type NPN output)



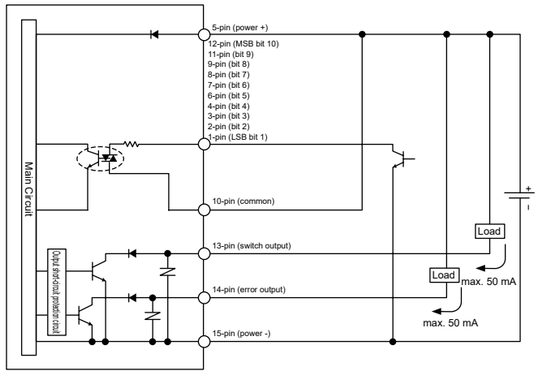
*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

FCM-□-□ PAP□
(Parallel input, analog output + error output type PNP output)



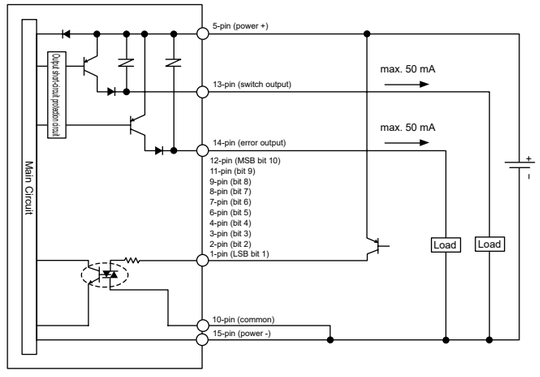
*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

FCM-□-□ PSN□
(Parallel input, switch output + error output type NPN output)



*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

FCM-□-□ PSP□
(Parallel input, switch output + error output type PNP output)



*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

■ Connector pin array (product side)
[Parallel input]

(1) (2) (3) (4) (5)
(6) (7) (8) (9) (10)
(11) (12) (13) (14) (15)

Names and functions of display / operation section

Output display (Red)



●F is displayed when confirming the function setting

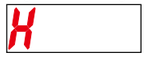


●When the switch output is ON, "-" lights up.(switch output only)
* Blinks when overcurrent is detected.
* Does not blink at integrated pulse output.

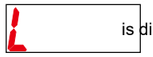


●E lights up when error output is ON.
* Blinks when overcurrent is detected.

*When there are upper/lower limits for function setting or when the higher digits or lower digits of accumulated flow display are indicated



or



is displayed.

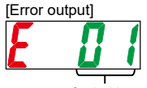
3-digit number LED display (green)

●Indicators 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.
●When setting each data, the values, etc., are displayed.
●Error code No. is displayed at the time of error display.

[At instantaneous flow rate display]



[Error output]



Code No.

[Setting details display]



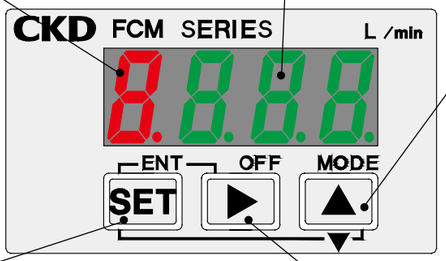
Setting details
Setting mode No.

[Disabled display]



Setting details
Setting mode No.

Flow rate 110% or more: Hi



UP key (MODE key)

●Used to count up values, etc.
●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)

●It is used to select the digits to the values, etc.
●Used to reset from forced OFF when performing forced OFF (control stop).

SET + Key (ENT key)

●Used to confirm the value.
●Used to release the key lock.
●Used to reset accumulation.

SET + Key (DOWN key)

●Used to count down values, etc.
●Used to set the key lock.

Key

●Used for resetting settings (initialization).

Compact flow rate controller Functions of FCM Series (analog/parallel)

No.	Function	Description	Function compatible model			
			Analog input		Parallel input	
			Analog Output	Switch Output	Analog Output	Switch Output
F1.- -	Direct memory function	Target value can be entered by key. Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.	○	○	○	○
	Preset input function	By specifying 4 arbitrary flow rates, the flow rate can be controlled with an external 2-bit input signal (signal from PLC, etc.).	○	○	-	-
	Analog input function	Flow rate can be controlled with an analog input signal.	○	○	-	-
	Parallel input function	Flow rate can be controlled with a parallel 10-bit (signal from PLC, etc.). Expensive input-output devices such as D/A converters are not required.	-	-	○	○
F2.- -	Input signal zero/span adjustment function	Zero point or span point of input signal can be changed. [When disabled] 100% Control flow rate 0% 100% Input signal [When enabled] 100% Zero point (L) setting range 0 to 50% Span point (H) setting range 10 to 100% 0% 100% Input signal	○	○	-	-
F3.- -	Auto-power OFF	Turns the flow rate display OFF if not operated for approx. 1 minute (control does not stop with auto-power OFF function). Turns off unneeded displays to enable energy-saving operation.	○	○	○	○
F4.- -	Switch output function	The switch functions below can be selected. • ①Tolerance mode: Turns the switch ON when the value is within tolerance against the control target value (arbitrary setting) • ②Designated range mode: Turns the switch ON when the value is outside the designated flow rate range • ③Integrated pulse: Outputs the integrated pulse when performing integration • ④ON at set integration or higher: Turns the switch ON when the value reaches the set accumulated flow [Mode 1: Tolerance mode] H (+ tolerance side) Input signal set value L (- tolerance side) Output ON OFF [Mode 2: Designated range mode] H (upper limit side) L (lower limit side) Output ON OFF [Mode 3: Integrated pulse] Approximately 50 msec ON OFF [Mode 4: ON at set integration or higher] ON OFF Refer to the specifications for details on the pulse output rate. Set integrated value	-	○	-	○
F5.- -	Integrating functions	Integrates the flow rate. As well as accumulated flow display, it has the following functions. • Closes the solenoid valve when the value reaches the set accumulated flow • Integrated pulse function (switch output only) *1 • Turns the switch ON when the value reaches the set accumulated flow (switch output only) *1 How to reset the integrated value • Analog input: External input, button operation • Parallel input: Button operation only	○ (*1)	○	○ (*1)	○
F6.- -	Error auto shut-off	Stops control when an error occurs, fully opens or closes valves, and turns error output ON.	○	○	○	○
F7.- -	Zero point adjustment	Adjusts the zero point of flow rate output.	○	○	○	○
	Error display function	Capable of displaying error state. As well as error display, it has the following functions. • Turns ON error output when an error occurs(Applicable only for E01, E02, E05) • Stops control automatically when an error occurs	○	○	○	○
	Key lock	Disables setting change to avoid incorrect operation.	○	○	○	○
	Reset setting	Returns the settings to default. (Input signal selection, switch output, input signal zero/span adjustment, auto-power OFF, zero adjustment only)	○	○	○	○

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual



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: 2.0 to 20 L/min)

CE UKCA RoHS

Refer to the CKD website for detailed compatible model Nos.

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

Model No. Notation Method

FCM - 9500 AI - H6 C R S B T

- FCM: Model No.
- 9500: ❶ Flow rate range
- AI: ❷ Applicable fluid
- H6: ❸ Port size, body material
- C: Input signal: IO-Link
- R: ❹ Indicator direction
- S: ❺ Cable
- B: ❻ Bracket
- T: ❼ Traceability

❶ Flow rate range

	Description	Code	❷ Applicable fluid					
			AI	AR	O2	LN	C1	C3
Standard model	0 to 0.5 L/min	9500	●	●	●	●	●	●
	0 to 1 L/min	0001	●	●	●	●	●	●
	0 to 2 L/min	0002	●	●	●	●	●	●
	0 to 5 L/min	0005	●	●	●	●	●	●
	0 to 10 L/min	0010	●	●	●	●	●	●
	0 to 20 L/min	0020	●	●				
	0 to 50 L/min	0050	●	●				
	0 to 100 L/min (resin body only)	0100	●					
Low differential pressure model (stainless steel only)	0 to 0.5 L/min	L9500	●		●	●	●	●
	0 to 1 L/min	L0001	●		●	●	●	●
	0 to 2 L/min	L0002	●		●	●	●	●
	0 to 5 L/min	L0005	●		●	●	●	●
	0 to 10 L/min	L0010	●		●	●	●	●

❷ Applicable fluid

Code	Description
AI	Compressed air, nitrogen gas
AR	Argon
O2	Oxygen (oil-prohibited specifications)
LN	City gas (13A)
C1	Methane (CH_4)
C3	Propane (C_3H_8)

❸ Port size, body material

	Port size	Body material		Code	❷ Applicable fluid					
					AI	AR	O2	LN	C1	C3
Push-in	ø6 (*1)	Resin body		H6	●					
	ø8			H8	●					
Screw-in	Rc1/4	Stainless steel body		8A	●	●	●	●	●	●
	9/16-18 UNF (*2)			UF	●	●	●	●	●	●

*1: Flow rate range excludes "0050" and "0100".
*2: For 9/16-18UNF screw shape, please refer to the dimensions diagram on Page 548

❹ Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❺ Cable

Code	Description	
Blank	None	
S	Straight (female), straight (male) 3 m	
L	L-type (female) / straight (male) 3 m	
M	One side straight (female) 3 m	

Note: Shipped with the product.

❻ Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❼ Traceability

Code	Description
Blank	None
T	Inspection Report + Calibration Certificate + Traceability System Diagram
K	Inspection Report

Note: Shipped with the product.

Discrete option model No.

FCM - MS3

- MS3: ❶ Option

❶ Option

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

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

Item \ Model No.				FCM-[❶] [❷]-[❸]C						
Valve drive method				Proportional solenoid valve When not energized: Closed						
				Full scale flow rate	AI (Air, nitrogen)	AR (Argon)	O2 (Oxygen)	LN (City gas)	C1 (Methane)	C3 (Propane)
Flow rate range *1	[❶]	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 only)	●					
		(stainless steel only) Low differential pressure	L9500	500 mL/min	●		●	●	●	●
			L0001	1 L/min	●		●	●	●	●
			L0002	2 L/min	●		●	●	●	●
			L0005	5 L/min	●		●	●	●	●
			L0010	10 L/min	●		●	●	●	●
Applicable fluid *2	[❷]		AI	Compressed air, nitrogen	●					
			AR	Argon		●				
			O2	Oxygen (oil-prohibited specifications)			●			
			LN	City gas (13A) *3				●		
			C1	Methane (CH4 100%)					●	
			C3	Propane (C3H8 100%)						●
Port size, body material	[❸]		H6	ø6 Push-in, resin (excluding 50 and 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	[❶] 9500 to 0020, L9500 to L0010	Within 0.5 sec. to setting ±5% F.S. (TYP.)
		[❶] 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	[❷] H6/H8 (Resin body)	490 kPa
		[❷] 8A/UF (SUS body)	980 kPa
Operating ambient temperature, operating ambient humidity			0 to 50°C, 90% RH or less (no condensation)
I/O	Input signal	C	IO-Link
Flow rate display	Indicator method		7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit
	Indicator 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	[❸]	H6/H8 (Resin body)	Polyamide resin, fluoro rubber, stainless steel, alumina, semiconductor silicon, soldering
		8A/UF (SUS body)	Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering
Weight	[❸]	H6/H8 (Resin body)	Approx. 200 g
		8A/UF (SUS body)	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 [❶] 9500	0001	0002	0005	0010	0020	0050	0100
Applicable fluid	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	100to 300	150to 300	140 to 250
		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	100to 300	150to 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 [❶] L9500	L0001	L0002	L0005	L0010
Applicable fluid	AI/O2 LN/C1 C3 *8	Standard differential pressure (kPa)	20	20	20	20	20
		Working pressure differential (kPa)	5 to 50	5 to 50	5 to 50	5 to 50	10 to 50
		Max. working pressure(kPa)	50	50	50	50	50

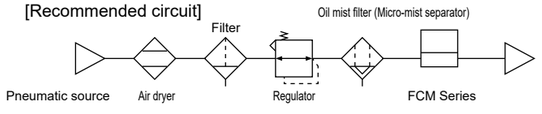
Indicator, integrating functions

		Flow rate range [❶] 9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display	Indicator 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
	Indicator 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	Indicator range	999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Indicator resolution	1mL	0.01 L	0.01 L	0.01 L	0.1 L	0.1 L	0.1 L	1L
	Pulse output rate	5 mL	0.01 L	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L

*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 ISO 8573-1: 2010 [1:1:1 to 1:6:2]. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the functionality of this product, a filter, air dryer (minimum pressure dew point 10°C or less) and oil mist filter (maximum oil concentration 0.1 mg/m^3) must be installed on the primary side (upstream) of this product.

[Recommended circuit]



[Recommended device]
Air filter: F Series
Oil mist filter: M Series

*3: City gas 13A is for 88% methane (CH_4) gas produced 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 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: Use an IO-Link master that has sufficient current supply per port.

*7: The product's protection circuitry is effective only against certain misconnections and does not protect against all misconnections.

*8: The low pressure line (1 to 2.5 kPa) 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.

■ For hydrogen, helium

Model No. Notation Method

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

- FCM: Model No.
- 0002: ❶ Flow rate range
- H2: ❷ Applicable fluid
- 8A: ❸ Port size
- C: Input signal: IO-Link
- R: ❹ Indicator direction
- S: ❺ Cable
- B: ❻ Bracket
- T: ❼ Traceability

❶ Flow rate range

Code	Description	❷ Applicable fluid	
		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	●	●

❷ Applicable fluid

Code	Description
H2	Hydrogen
HE	Helium

❸ Port size

Port size			Code	❷ Applicable fluid	
				H2	HE
Screw-in	Rc1/4		8A	●	●
	9/16-18UNF (Note)		UF	●	●
1/4" double barbed fitting			4S	●	●
1/4" JXR male fitting			4RM	●	●

Note: For 9/16-18UNF screw shape, please refer to the dimensions diagram on P. 548

❹ Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❺ Cable

Code	Description	
Blank	None	
S	Straight (female), straight (male) 3 m	
L	L-type (female) / straight (male) 3 m	
M	One side straight (female) 3 m	

Note: Shipped with the product.

❻ Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❼ Traceability

Code	Description
Blank	None
T	Inspection Report + Calibration Certificate + Traceability System Diagram
K	Inspection Report

Note: Shipped with the product.

Discrete option model No.

FCM - MS3

- MS3: ❶ Option

❶ Option

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

■ Specifications for hydrogen, helium

Item \ Model No.			FCM-[❶] [❷]-[❸]C		
Valve drive method			Proportional solenoid valve When not energized: Closed		
			Full scale flow rate	H2 (Hydrogen)	HE (Helium)
Flow rate range *1	[❶]	0002	2 L/min	●	●
		0005	5 L/min	●	●
		0010	10 L/min	●	●
		0020	20 L/min	●	●
Applicable fluid *2	[❷]	H2	Hydrogen	●	
		HE	Helium		●
Port size	[❸]	8A	Rc1/4	●	●
		UF	9/16-18UNF	●	●
		4S	1/4" Double barbed fitting	●	●
		4RM	1/4" JXR male fitting	●	●
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 (no condensation)	
External leakage				1 x 10^{-6}Pa·m³/s or less (helium leakage rate)	
I/O	Input signal	C		IO-Link	
Flow rate display	Indicator method			7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit	
	Indicator 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		[❸]	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 [❶]			
			0002	0005	0010	0020
Applicable fluid	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

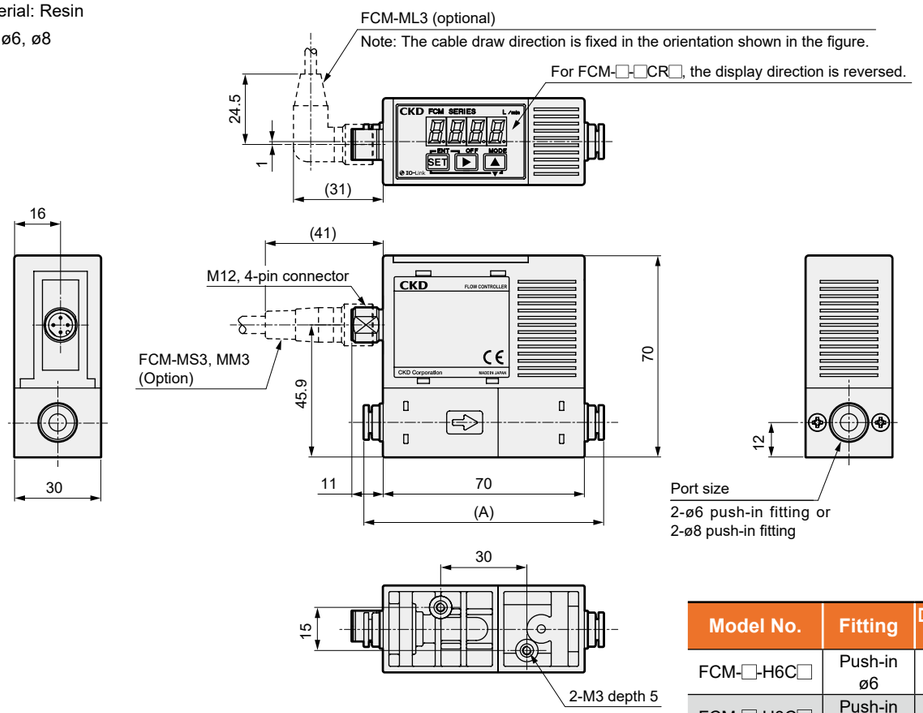
Indicator, integrating functions

		Flow rate range [❶]			
		0002	0005	0010	0020
Flow rate display	Indicator 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
	Indicator resolution	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min
Integrating functions *7	Indicator range	9999.99 L	9999.99 L	99999.9 L	99999.9 L
	Indicator 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: Use an IO-Link master that has sufficient current supply per port.
*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.

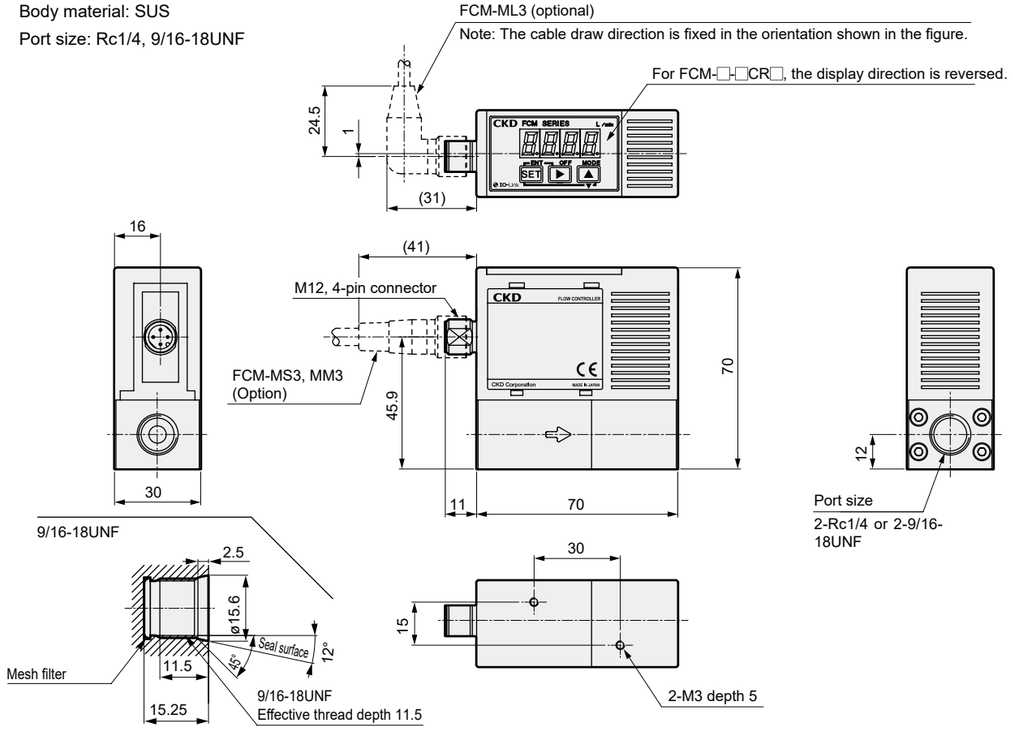
Dimensions

●Model No.: FCM-□-H6C/H8C□
Body material: Resin
Port size: ø6, ø8



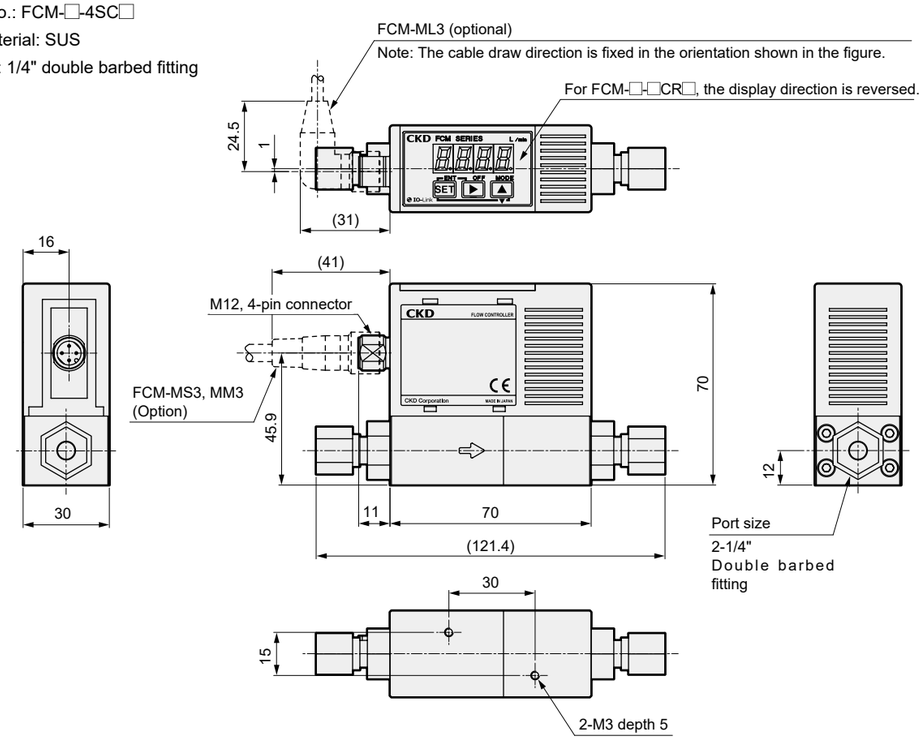
Model No.	Fitting	Dimension (A)
FCM-□-H6C□	Push-in ø6	84
FCM-□-H8C□	Push-in ø8	85

●Model No.: FCM-□-8AC/UFC□
Body material: SUS
Port size: Rc1/4, 9/16-18UNF

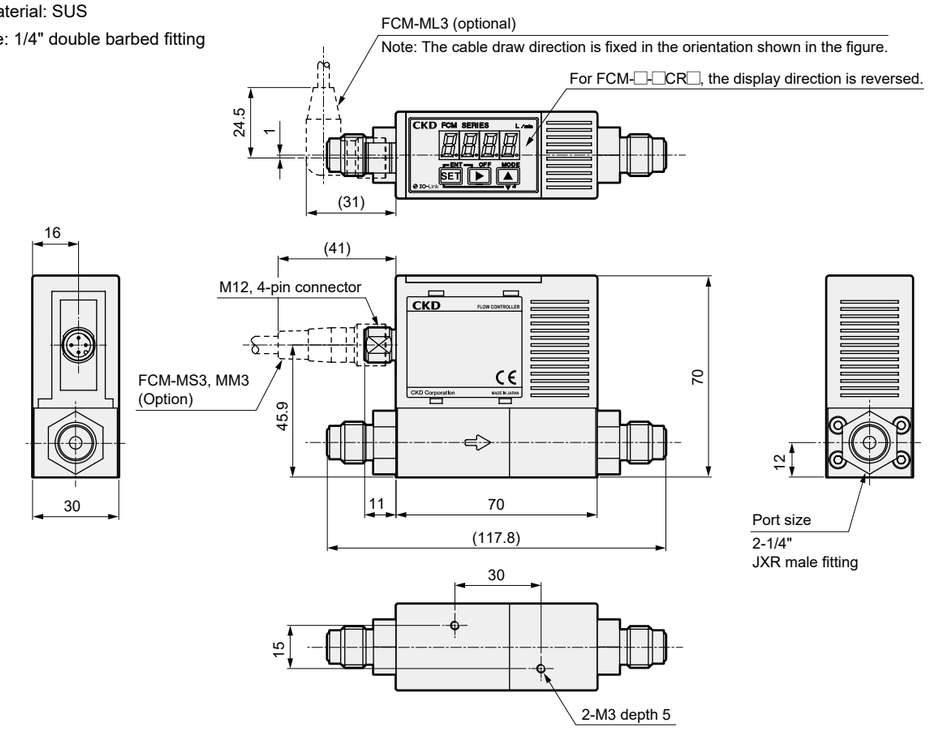


Dimensions

●Model No.: FCM-□-4SC□
Body material: SUS
Port size: 1/4" double barbed fitting

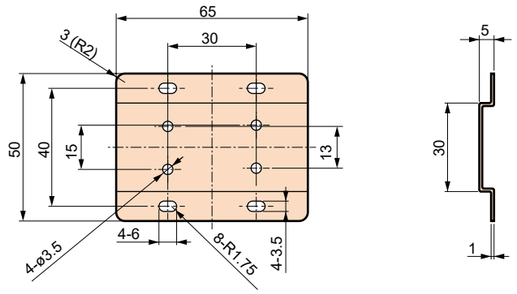


●Model No.: FCM-□-4RMC□
Body material: SUS
Port size: 1/4" double barbed fitting

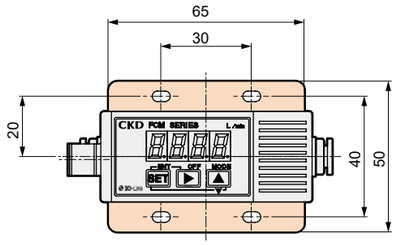


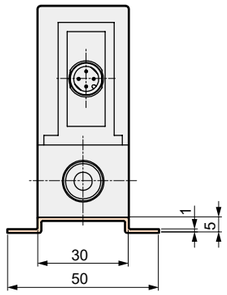
Dedicated bracket (floor mounted)

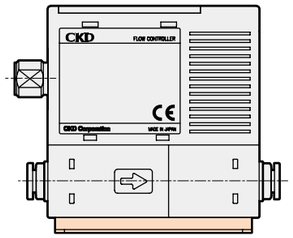
Discrete model No.:FCM-LB1

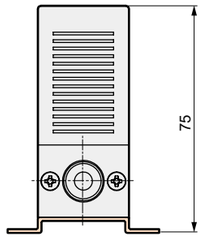


Material: Steel
Weight: 28 g



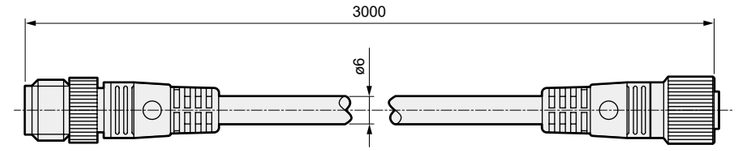




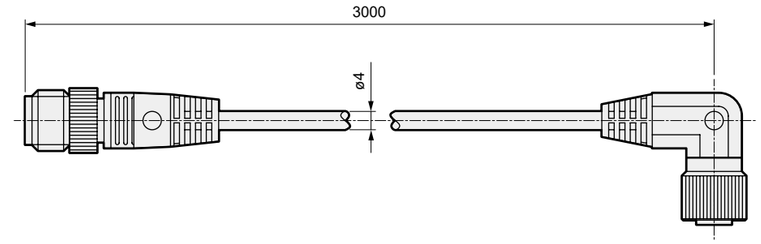


Cable optional dimensions

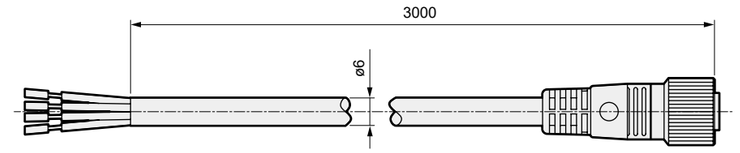
●Cable option (M12 straight (female), M12 straight (male))
Discrete model No.: FCM-MS3



●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



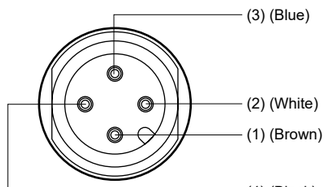
Cable color	Applications
Brown	L+ (24 DC)
White	NC Note
Blue	L- (GND)
Black	C (IO-Link)

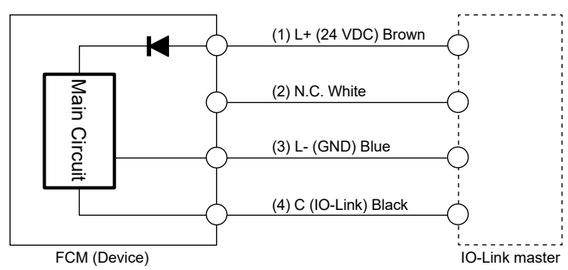
Note: Insulate so that there is no contact with other wires.

Wiring method

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)

Names and functions of display / operation section

Output display (Red)



●"F" is displayed when confirming the function setting.



●When the switch output is ON, "-" lights up.
*Does not blink at integrated pulse output.

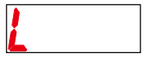


●E lights up when error output is ON.

*When there are upper/lower limits in the function setting, or when the higher digits or lower digits of the accumulated flow display are indicated,



or

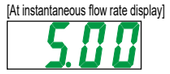


is displayed.

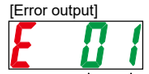
3-digit number LED display (green)

●Indicators instantaneous flow rate display and function setting details during RUN mode (instantaneous flow rate display).
*When displaying the function setting, the setting mode number and setting details are displayed.
●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]

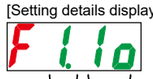


[Error output]



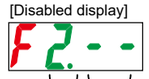
Code No.

[Setting details display]



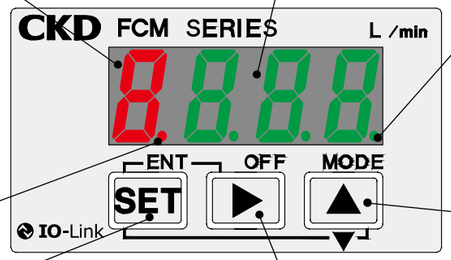
Setting details
Setting mode No.

[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.

Process Data OUT ineffective lamp (display right end green dot)

●Blinks when Process Data OUT is disabled.

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).

SET + Key (ENT key)

●Used to confirm the value.
●Used to release the key lock.
●Used to reset accumulation. (Accumulated flow display)

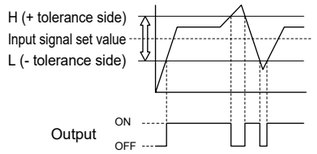
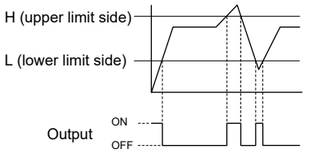
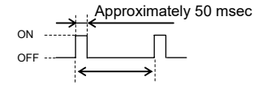
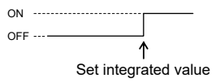
SET + Key (DOWN key)

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

+ Key

●Used for resetting settings (initialization).

Compact flow rate controller Functions of FCM Series (IO-Link type)

No.	Function	Description
F1.- -	Normal mode input function	Process Data OUT can be used to set an arbitrary flow rate.
	Direct memory function	Target value can be entered by key.
	Preset input function	By specifying 8 arbitrary flow rates (IO-Link parameter, key input), the flow rate can be controlled with the 3 bit of Process Data OUT.
F3.- -	Auto-power OFF	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.
F4.- -	Switch output function	The following switch functions can be set individually. · Switch output 1 (tolerance mode): Turns the switch ON when the value is within tolerance against the control target value (arbitrary setting) · Switch output 2 (designated range mode): Turns the switch ON when the value is outside 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 Normally open (NO) and normally closed (NC) can be set for each switch output. [Switch output 1: Tolerance mode]  [Switch output 2: Designated range mode]  [Switch output 3: Integrated pulse]  Refer to the specification display, integrating functions for details on pulse output rates. [Switch output 4: ON above set integrated value] 
F5.- -	· Integrating functions · Accumulated flow auto cutoff function	Integrates the flow rate. As well as accumulated flow display, it has the following functions. · Process Data OUT can be used to control the start/stop/reset of integrating functions · Integrated flow rate value output to Process Data IN · Closes the solenoid valve when the value reaches the set accumulated flow · Integrated pulse output (switch output 3) · Turns the switch ON when the value reaches the set accumulated flow (switch output 4) How to reset the integrated value · Process Data OUT, key input
F6.- -	Error auto shut-off	Stops control when an error occurs, fully closes valves, and turns error output ON.
F7.- -	Zero point adjustment	Adjusts the zero point of flow rate output.
F8.- -	Operation setting at communication error	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).
	Instantaneous flow rate display	Indicators 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.
	Error display function	Capable of displaying error state. As well as error display, it has the following functions. · 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).
	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: ±20%F.S.)
	Output when starting	Displays the total startup 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.

Communication specifications

Communication specifications

General

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM3(230.4kbps)
Port type	A
Process data length (input)	10 byte
Process data length (output)	4 byte

Item	Details
Min. cycle time	2 ms
Data storage	1 kbyte
SIO mode support	None
Device ID	Refer to table below
Vendor ID	855 (decimal)/357 (hexadecimal)

Parameters

Device ID

Device ID	Product ID	Remarks
0 x 216001	FCM-9500-C	500 mL/min Range
0 x 216002	FCM-0001-C	1 L/min range
0 x 216003	FCM-0002-C	2 L/min range
0 x 216004	FCM-0005-C	5 L/min range
0 x 216005	FCM-0010-C	10 L/min range
0 x 216006	FCM-0020-C	20 L/min range
0 x 216007	FCM-0050-C	50 L/min range
0 x 216008	FCM-0100-C	100 L/min Range

Table 1 Flow rate range for each model

Model No.	Instantaneous flow rate			Accumulated flow	
	Indicator range	Displayed value	ProcessData output value	Integration display range	Displayed 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 instruction manual SM-A19060 for setting parameters.
*Download the IO-Link setting file (IODD) from the CKD website (https://www.ckd.co.jp/en/).

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		Integration auto shutoff occurring	Start/stop
					4	3	2	1	Error code							
Data range	True/False								0 to 15				0 to 2		True/False	
Format	Boolean								UInteger4				UInteger2		Boolean	

*1: Displays the set flow rate for the current input setting. “9999” means "valve fully open". (Refer to Process data OUT Items.)
*2: For instantaneous flow rates, the 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	PD0								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 page 554 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		Integrating		Vacant		Reset	Start/ stop *3
						3	2	1			Reset	Stop				
Data range						0 to 7					True/False				True/False	
Format						UInteger3					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

Use device-side key operations or IO-Link communication Parameter to set preset memory contents.

*3: IO-Link communication used for control should be set to 1(True). Control will not occur if set to 0 (False). Note the following when using flow rate 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 switching by key operation.
When the "start/stop" bit is "1 (start)", however, the flow rate control ⇒ forced OFF by key input on the device side
The “Start/Stop” bit of Process Data IN is set to “0 (stop)” and the product is forced off, but the “Start/Stop” bit of Process Data OUT remains set to “1 (start)”.
The “Start/Stop” bit of Process Data IN is set to “0” (stop) and the product is forced to turn off. Therefore, be sure to check the “start/stop” status of the device with the “start/stop” bit of the 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 page 554 shows the accumulated flow as 99999.9 L.

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

MEMO



Compact flow rate controller RAPIFLOW

FCM Series

RS-485

- For air, nitrogen, argon, oxygen, city gas, methane, propane (flow rate range: 0.5 to 100 L/min)
- For hydrogen, helium (flow rate range: 2.0 to 20 L/min)

Refer to the CKD website for detailed compatible model Nos.

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

Model No. Notation Method

FCM - 9500 AI - H6 R AN R 1 B T

- FCM: Model No.
- 9500: ❶Flow rate range
- AI: ❷Applicable fluid
- H6: ❸Port size, body material
- R: Input signal: RS-485 + analog
- AN: ❹Output specifications
- R: ❺Indicator direction
- 1: ❻Cable
- B: ❼Bracket
- T: ❽Traceability

❶Flow rate range

	Description	Code	❷Applicable fluid					
			AI	AR	O2	LN	C1	C3
Standard model	0 to 0.5 L/min	9500	●	●	●	●	●	●
	0 to 1 L/min	0001	●	●	●	●	●	●
	0 to 2 L/min	0002	●	●	●	●	●	●
	0 to 5 L/min	0005	●	●	●	●	●	●
	0 to 10 L/min	0010	●	●	●	●	●	●
	0 to 20 L/min	0020	●	●				
	0 to 50 L/min	0050	●	●				
	0 to 100 L/min (resin body only)	0100	●					
Low differential pressure model (stainless steel only)	0 to 0.5 L/min	L9500	●		●	●	●	●
	0 to 1 L/min	L0001	●		●	●	●	●
	0 to 2 L/min	L0002	●		●	●	●	●
	0 to 5 L/min	L0005	●		●	●	●	●
	0 to 10 L/min	L0010	●		●	●	●	●

❷Applicable fluid

Code	Description
AI	Compressed air, nitrogen gas
AR	Argon
O2	Oxygen (oil-prohibited specifications)
LN	City gas (13A)
C1	Methane (CH_4)
C3	Propane (C_3H_8)

❸Port size, body material

	Port size	Body material		Code	❷Applicable fluid					
					AI	AR	O2	LN	C1	C3
Push-in	ø6 (*1)	Resin body		H6	●					
	ø8			H8	●					
Screw-in	Rc1/4	Stainless steel body		8 A	●	●	●	●	●	●
	9/16-18 UNF (*2)			UF	●	●	●	●	●	●

*1: ❶Flow rate range excludes "0050" and "0100".
*2: For the shape of the 9/16-18UNF thread, refer to the dimensions diagram on Page 566.

❹Output specifications

Code	Description
AN	1-5 V analog error (NPN)
AP	1-5 V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❺Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❻Cable

Code	Description	
Blank	None	
1	Parallel 15-conductor, cable 1 m	
3	Parallel 15-conductor, 3m cable	

Note: Shipped with the product.

❼Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❽Traceability

Code	Description
Blank	None
T	Inspection Report + Calibration Certificate + Traceability System Diagram
K	Inspection Report

Note: Shipped with the product.

Discrete option model No.

FCM- RC1

- RC1: ❶Option

❶Option

Code	Description	
RC1	Parallel 15-conductor, cable 1 m	
RC3	Parallel 15-conductor, 3m cable	
LB1	Bracket	

Note: The cable body is the same as FCM-PC1, PC3.

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

Item				FCM-[1] [2]-[3]R[4]						
Valve drive method				Proportional solenoid valve When not energized: Closed						
				Full scale flow rate	AI (Air, nitrogen)	AR (Argon)	02 (Oxygen)	LN (City gas)	C1 (Methane)	C3 (Propane)
Flow rate range *1	[1]	Standard model	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 only)	●					
		(stainless steel only)Low differential pressure model	L9500	500 mL/min	●		●	●	●	●
			L0001	1 L/min	●		●	●	●	●
			L0002	2 L/min	●		●	●	●	●
			L0005	5 L/min	●		●	●	●	●
			L0010	10 L/min	●		●	●	●	●
Applicable fluid *2	[2]		AI	Compressed air, nitrogen	●					
			AR	Argon		●				
			O2	Oxygen (oil-prohibited specifications)			●			
			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	●					
			8 A	Rc1/4, Stainless steel	●	●	●	●	●	●
			UF	9/16-18UNF, stainless steel	●	●	●	●	●	●
Control	Control range			3 to 100% F.S.						
	Response time	[1]	9500 to 0020, L9500 to L0010	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	[3]	H6/H8 (Resin body)	490 kPa						
			8A/UF (SUS body)	980 kPa						
Operating ambient temperature, operating ambient humidity				0 to 50°C, 90% RH or less (no condensation)						
I/O	Input signal/ preset input *6	-	R	RS-485 communication (Modbus RTU) / 0-10 VDC (6.7 kΩ) / 0-5 VDC (10 kΩ) / 4-20 mADC (250 Ω) *7 / preset input 4 points (2 bit) (switching with setting)						
	Output signal *8	[4]	AN	Analog output: 1-5V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less						
			AP	Analog output: 1-5V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less						
			SN	Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less						
			SP	Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less						
Flow rate display	Indicator method			7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit						
	Indicator 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 2% or less)						
	Current consumption *9			250 mA or less						
Mounting orientation				Unrestricted in vertical/horizontal direction						
Wetted section materials		[3]	H6/H8 (Resin body)	Polyamide resin, fluoro rubber, stainless steel, alumina, semiconductor silicon, soldering						
			8A/UF (SUS body)	Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering						
Weight		[3]	H6/H8 (Resin body)	Approx. 200 g						
			8A/UF (SUS body)	Approx. 480 g						
Degree of Protection				IEC standards IP40 or equivalent						
Protection circuit *10				Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit 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)

Applicable fluid [2]		Flow rate range [1]	9500	0001	0002	0005	0010	0020	0050	0100
	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	100to 300	150to 300	140 to 250
		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	100to 300	150to 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)

Applicable fluid [2]		Flow rate range [1]	L9500	L0001	L0002	L0005	L0010
	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 *11	Max. working pressure(kPa)	50	50	50	50	50

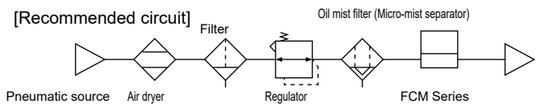
Indicator, integrating functions

		Flow rate range [1]	9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display	Indicator 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
	Indicator 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 *12	Indicator range		999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Indicator resolution		1mL	0.01 L	0.01 L	0.01 L	0.1 L	0.1 L	0.1 L	1L
	Pulse output rate		5 mL	0.01 L	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L

*1: The value is 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 ISO 8573-1: 2010 [1:1:1 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 content 0.1 mg/m^3) 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. This value differs with the flow rate range and applicable fluid. 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: The default is RS-485. Analog input or preset input can be used as needed. (It cannot be used together with RS-485.) Do not apply analog signals that differ from the set analog input specifications. Do not apply excessive voltage that exceeds the analog input specifications. Do not turn ON/OFF the power supply with an input signal applied. Excessive voltage could be applied, causing malfunction or damage to the product. Take special care when the current input is 4-20 mA.

*7: Use a current input signal that does not apply overvoltage of 10 V or more.

*8: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

*9: Current for when 24 VDC, no load is connected, and flow rate is full scale. The current consumption will vary depending on the load.

*10: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

*11: When using a low pressure city gas line (1 to 2.5 kPa), the working pressure differential range is exceeded.

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

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

Model No. Notation Method hydrogen, helium

FCM - 0002 H2 - 8A R AN R 1 B T

- FCM: Model No.
- 0002: ❶ Flow rate range
- H2: ❷ Applicable fluid
- 8A: ❸ Port size
- R: Input signal: RS-485 + analog
- AN: ❹ Output specifications
- R: ❺ Indicator direction
- 1: ❻ Cable
- B: ❼ Bracket
- T: ❽ Traceability

❶Flow rate range

Code	Description	❷Applicable fluid	
		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	●	●

❷Applicable fluid

Code	Description
H2	Hydrogen
HE	Helium

❸Port size

Port size			Code	❷Applicable fluid	
				H2	HE
Screw-in	Rc1/4		8A	●	●
	9/16-18UNF (Note)		UF	●	●
1/4" double barbed fitting			4S	●	●
1/4" JXR male fitting			4RM	●	●

Note: Refer to Dimensions diagram on page 566 for shape of 9/16-18UNF thread.

❹Output specifications

Code	Description
AN	1-5V analog error (NPN)
AP	1-5V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❺Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❻Cable

Code	Description	
Blank	None	
1	Parallel 15-conductor, cable 1 m	
3	Parallel 15-conductor, 3m cable	

Note: Shipped with the product.

❼Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❽Traceability

Code	Description
Blank	None
T	Inspection Report + Calibration Certificate + Traceability System Diagram
K	Inspection Report

Note: Shipped with the product.

Discrete option model No.

FCM- RC1

- RC1: ❶ Option

❶Option

Code	Description	
RC1	Parallel 15-conductor, cable 1 m	
RC3	Parallel 15-conductor, 3m cable	
LB1	Bracket	

Note: The cable body is the same as FCM-PC1, PC3.

■ Specifications for hydrogen, helium

Item			FCM-[❶] [❷]-[❸]R[❹]		
Valve drive method			Proportional solenoid valve When not energized: Closed		
			Full scale flow rate	H2 (Hydrogen)	HE (Helium)
Flow rate range *1	[❶]	0002	2 L/min	●	●
		0005	5 L/min	●	●
		0010	10 L/min	●	●
		0020	20 L/min	●	●
Applicable fluids *2	[❷]	H2	Hydrogen	●	
		HE	Helium		●
Port size	[❸]	8 A	Rc1/4	●	●
		UF	9/16-18UNF	●	●
		4S	1/4" Double barbed fitting	●	●
		4RM	1/4" JXR male fitting	●	●
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 (no condensation)	
External leakage				1 x 10^{-6} Pa·m³/s or less (helium leakage rate)	
I/O	Input signal/ preset input *5	-	R	RS-485 communication (Modbus RTU)/0-10 VDC (6.7 kΩ)/0-5 VDC (10 kΩ)/4-20 mADC (250 Ω) *6/preset input 4 points (2 bit) (switching with setting)	
	Output signal *7	[❹]	AN	Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			AP	Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SN	Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SP	Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
Flow rate display	Indicator method			7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit	
	Indicator 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 *8			270 mA or less	
Mounting orientation				Unrestricted in vertical/horizontal direction	
Wetted section materials				Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering	
Weight		[❸]	8A/UF	Approx. 480 g	
			4S/4RM	Approx. 560 g	
Degree of Protection				IEC standards IP40 or equivalent	
Protection circuit *9				Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection	
EMC Directive				EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8	

Pressure

Standard differential pressure, working pressure differential

			Flow rate range [❶]			
			0002	0005	0010	0020
Applicable fluid [❷]	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

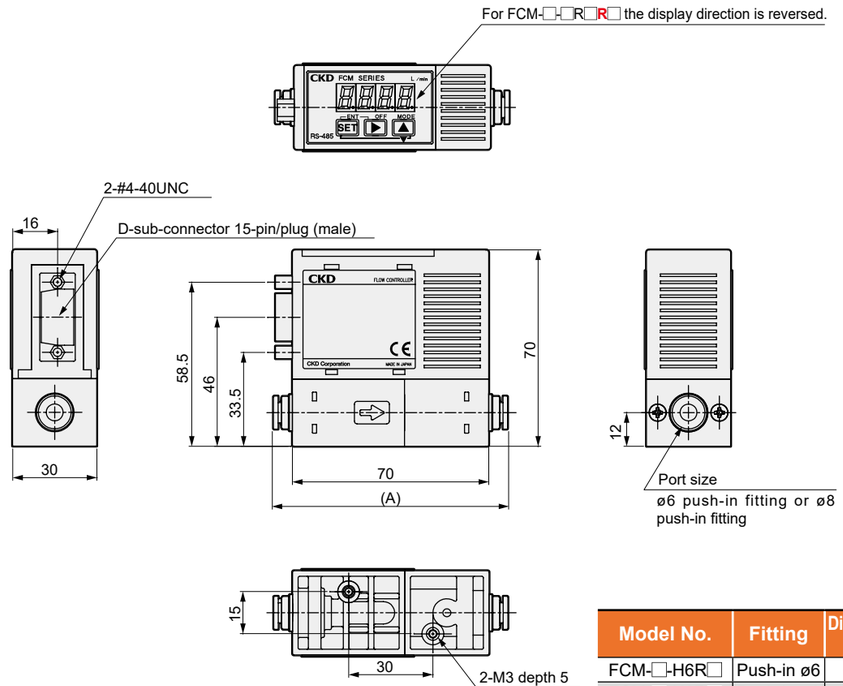
Indicator, integrating functions

		Flow rate range [❶]			
		0002	0005	0010	0020
Flow rate display	Indicator 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
	Indicator resolution	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min
Integrating functions *10	Indicator range	9999.99 L	9999.99 L	99999.9 L	99999.9 L
	Indicator 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: 20°C flow rate converted to volumetric flow rate at 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. This value differs with the flow rate range and applicable fluid. 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 operating differential pressure) 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: The default is RS-485. Analog input or preset input can be used as needed. (It cannot be used together with RS-485.) Do not apply analog signals that differ from the set analog input specifications. Do not apply excessive voltage that exceeds the analog input specifications. Do not turn ON/OFF the power supply with an input signal applied. Excessive voltage could be applied, causing malfunction or damage to the product. Take special care when the current input is 4-20 mA.
*6: Use a current input signal that does not apply overvoltage of 10 V or more.
*7: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
*8: Current for 24 VDC, when no load is connected, and when flow rate is full scale. The current consumption will vary depending on the load.
*9: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*10: The accumulated flow is a calculated (reference) value. It is reset when the power is turned OFF.
*11: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

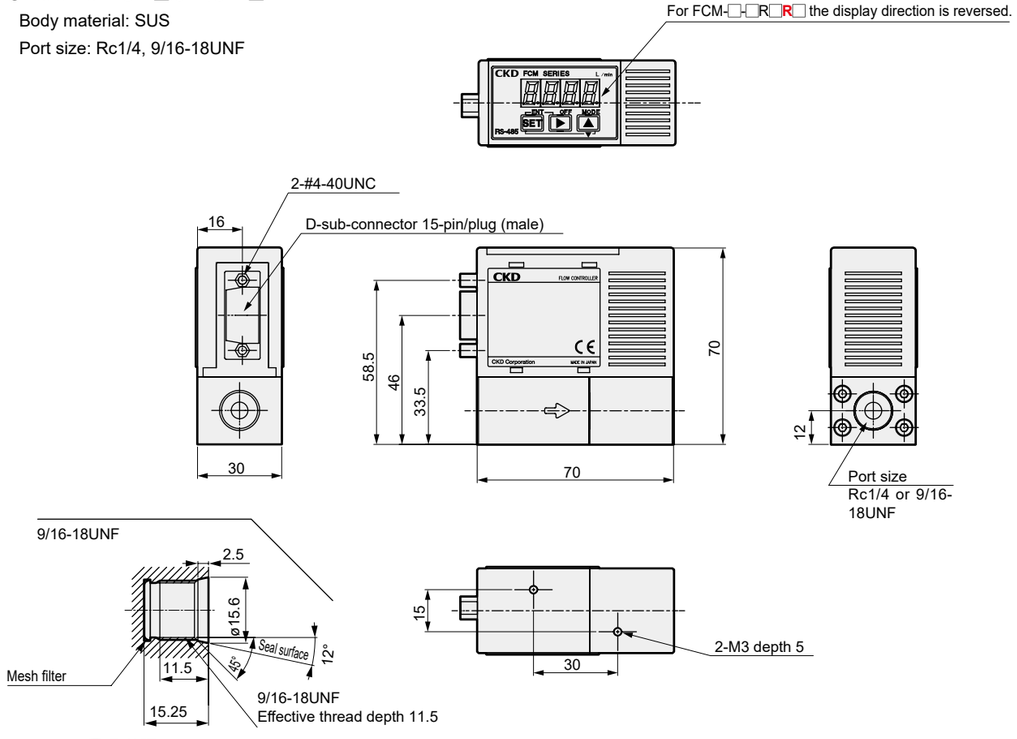
Dimensions

●Model No.: FCM-□-H6R/H8R□
Body material: Resin
Port size: ø6, ø8



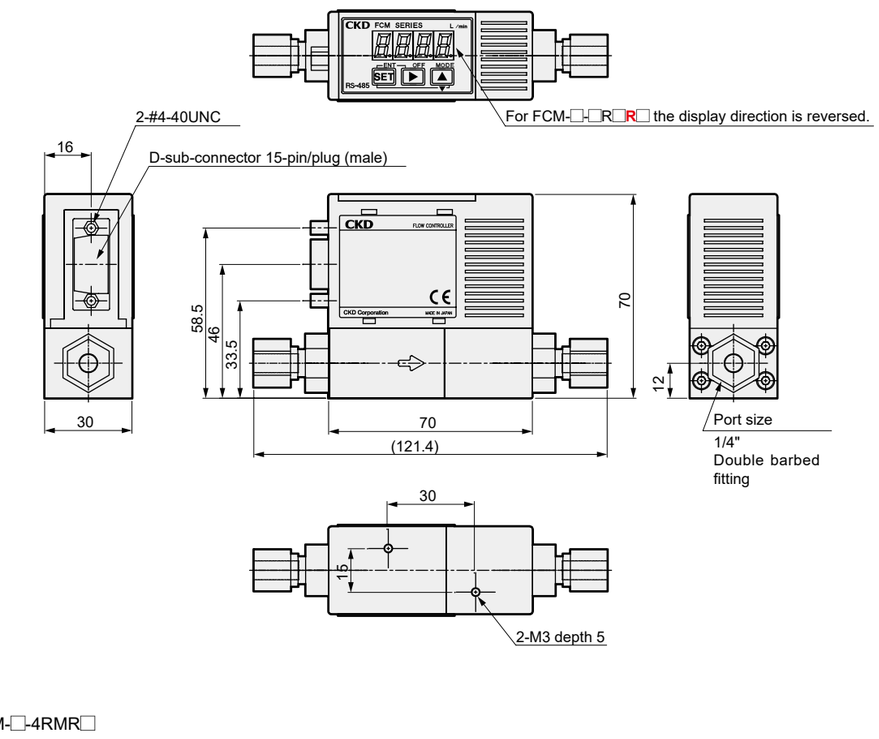
Model No.	Fitting	Dimension (A)
FCM-□-H6R□	Push-in ø6	84
FCM-□-H8R□	Push-in ø8	85

●Model No.: FCM-□-8AR/UFR□
Body material: SUS
Port size: Rc1/4, 9/16-18UNF

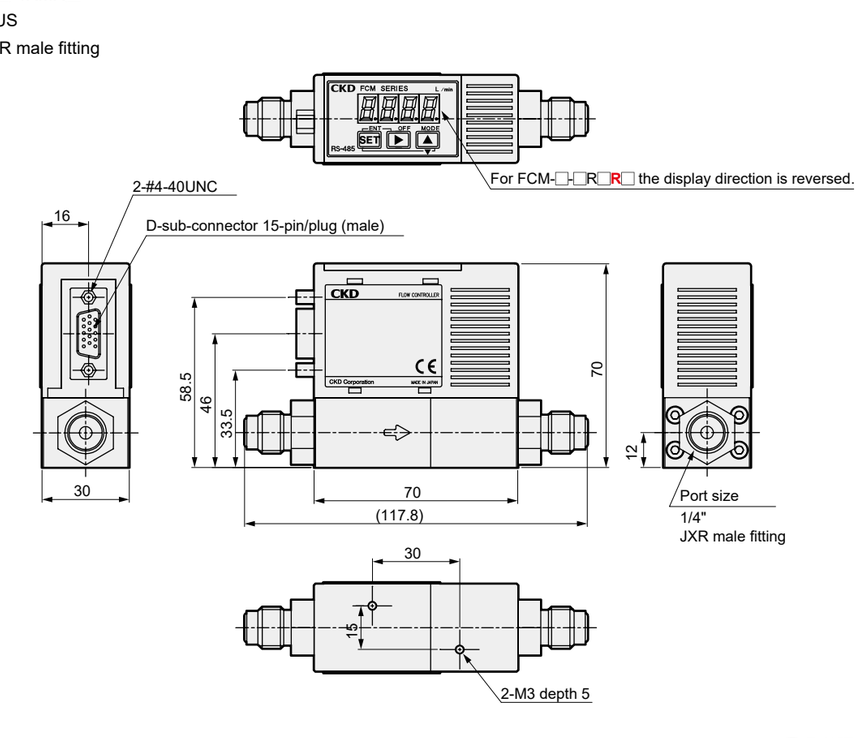


Dimensions

●Model No.: FCM-□-4SR□
Body material: SUS
Port size: 1/4" double barbed fitting

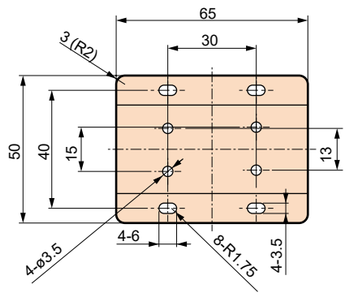


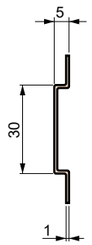
●Model No.: FCM-□-4RMR□
Body material: SUS
Port size: 1/4" JXR male fitting



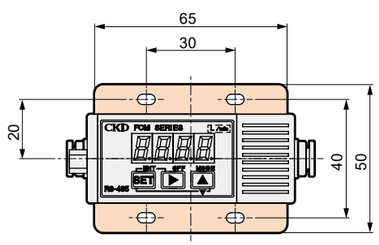
Dedicated bracket (floor mounted)

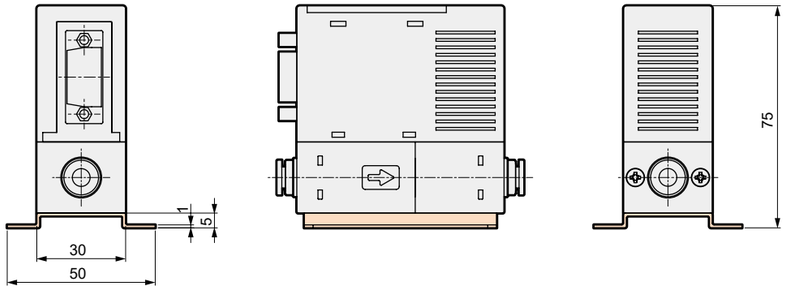
Discrete model No.:FCM-LB1



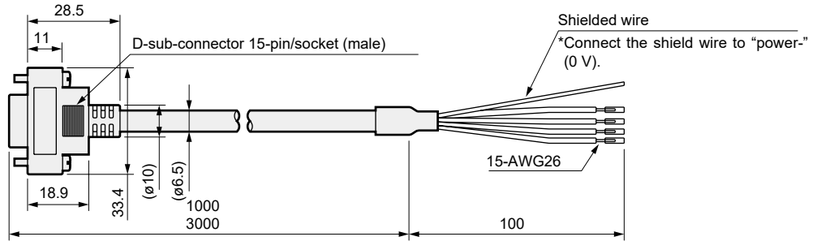


Material: Steel
Weight: 28 g



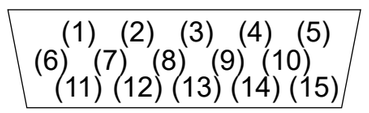


Cable optional dimensions



Cable	Weight g
FCM-RC1	82
FCM-RC3	205

■Connector pin array (product side)



D sub Socket Pin №	1	2	3	4	5	6	7	8	9	10	11	12	13		14	15
Insulator color	Brown	Orange	Yellow	Purple	Red	Light blue	Pink	White (with black line)	Red (with black line)	Gray	White	Green (with black line)	Green		Blue	Black
Name	Preset input signal		Integration reset signal	Digital signal ground	Power supply +	RS-485 communication line				Common	Analog input	Terminating resistor	Analog Output	Switch Output	Error output	Power supply - (0V)
Input	Bit 1	Bit 2			+24 VDC	A-IN (+)	B-IN (−)	A-OUT (+)	B-OUT (−)				1-5 VDC	NPN or PNP output	NPN or PNP output	

*1: Pin No. 4 is the signal ground for RS-485 communication.
*2: The No. 8 pin (A-OUT) and No. 9 pin (B-OUT) are for crossover wiring. Use when connecting multiple units.
*3: The No. 10 pin common is the common for the preset input and accumulation reset signal (pin No. 1 to 3).

Communication specifications

Item	Details
Communication standards	RS-485 compliant
Communication method	Half-duplex
Synchronization method	Step synchronization
Communication protocol	Modbus RTU compliant
Transmission bit rate	9.6/19.2/38.4 kbps
Data bit	8 bit

Item	Details
Parity bit	None / Odd / Even
Stop bit	1 bit/2 bit
Transmission distance	Max. 20 m
Components address	1 to 247
Connection	1: N (max. 31 units)

Names and functions of display / operation section

Output display (Red)



●"F" is displayed when confirming the function setting.



●When the switch output is ON, "-" lights up.
* Does not blink at integrated pulse output.
* Blinks when overcurrent is detected.

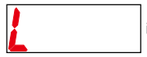


●E lights up when error output is ON.
* Blinks when overcurrent is detected.

*When there are upper/lower limits in the function setting, or when the higher digits or lower digits of the accumulated flow display are indicated,



or

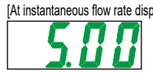


is displayed.

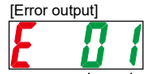
3-digit number LED display (green)

●Indicators instantaneous flow rate display and function setting details during RUN mode (instantaneous flow rate display).
*When displaying the function setting, the setting mode number and setting details are displayed.
●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]

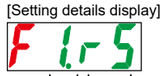


[Error output]



Code No.

[Setting details display]



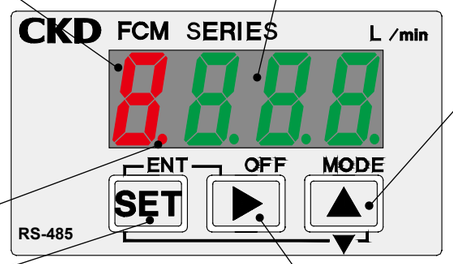
Setting details
Setting mode No.

[Disabled display]



Disabled display
Setting mode No.

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



Power lamp (red dot)

●Blinks during RS-485 communication.

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).

SET + Key (ENT key)

●Used to confirm the value.
●Used to release the key lock.
●Used to reset accumulation. (Accumulated flow display)

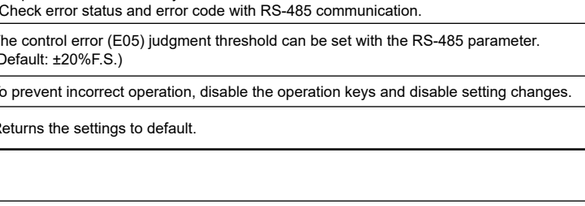
SET + Key (DOWN key)

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

+ Key

●Used for resetting settings (initialization).

Compact flow rate controller Functions of FCM Series (RS-485 type)

No.	Function	Description	Function compatible model: Analog Output	Function compatible model: Switch Output
F0.- -	RS-485 setting function	Device address, communication speed, parity, and stop bit can be set.	○	○
F1.- -	RS-485 input function	An arbitrary flow rate can be set to the target value with RS-485 communication.	○	○
	Direct memory function	Target value can be entered by key. Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.	○	○
	Preset input function	By specifying 4 arbitrary flow rates, the flow rate can be controlled with an external 2bit signal input (signal from PLC, etc.) or "Address: 0x0038 preset number selection" of RS-485 communication.	○	○
	Analog input function	Flow rate can be controlled with an analog input signal. Input signal can be selected from 0-10 V, 0-5 V or 4-20 mA.	○	○
F2.- -	Analog input signal zero/span adjustment function	Zero point or span point of analog input signal can be changed. [When disabled] [When enabled] 	○	○
F3.- -	Auto-power OFF	Turns the flow rate display OFF if not operated for approx. 1 minute. (Control does not stop with auto-power OFF function). Turns off unneeded displays to enable energy-saving operation.	○	○
F4.- -	Switch output function	The switch functions below can be selected. • ①Tolerance mode: Turns the switch ON when the value is within tolerance against the control target value (arbitrary setting). • ②Designated range mode: Turns the switch ON when the value is outside the designated flow rate range. • ③Integrated pulse: Outputs the integrated pulse when performing integration. • ④ON at set integration or higher: Turns the switch ON when the value reaches the set accumulated flow. [Mode 1: Tolerance mode] [Mode 2: Designated range mode] [Mode 3: Integrated pulse] [Mode 4: ON at set integration or higher] Refer to the specifications for pulse output rate. Set integrated value	-	○
F5.- -	Integrating functions	Integrates the flow rate. As well as accumulated flow display, it has the following functions. • Control of start/stop/reset of integrating functions with RS-485 communication. • Closes the solenoid valve when the value reaches the set accumulated flow. • Reads accumulated flow value via RS-485 communication. • Turns the switch ON when the value reaches the set accumulated flow. How to reset the integrated value • External input, key operation, RS-485 communication	○	○
F6.- -	Error auto shut-off	Stops control when an error occurs, fully opens or closes valves, and turns error output ON.	○	○
F7.- -	Zero point adjustment	Adjusts the zero point of flow rate output.	○	○
	Error display function	Capable of displaying error state. As well as error display, it has the following functions. • Turns ON error output when an error occurs. • Stops control automatically when an error occurs. • Check error status and error code with RS-485 communication.	○	○
	Control error threshold setting	The control error (E05) judgment threshold can be set with the RS-485 parameter. (Default: ±20%F.S.)	○	○
	Key lock	To prevent incorrect operation, disable the operation keys and disable setting changes.	○	○
	Reset setting	Returns the settings to default.	○	○

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

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 VDC ±0.01 V, standard differential pressure, secondary side released to atmosphere)
Repeatability	Calculated from the variation (D=Max-Min) after 20 consecutive cycles of 0% F.S. and 50% F.S. flow control at a cycle in which the control is sufficiently stabilized. (Reproducibility) = ±D/2/FS control flow rate x 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.
Indicator 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. Indicates 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 variable range on the data is 0 to 65535, but the variable range that can be taken by each data name is limited.
Integer	Signed integer. Indicates 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 representing 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 check and does not indicate a reverse flow.
Digit	Digit. Min. value of digital display when decimal points are ignored.
AWG	Abbreviation of American Wire Gauge. Standard for cables.

Flow rate controller

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

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.

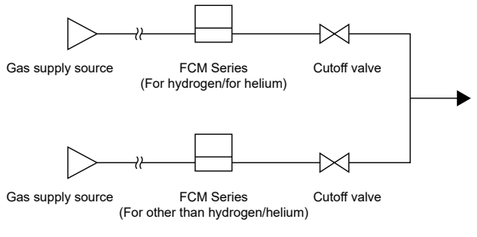
■For products without oil-free processing in gas-contacting parts, do not feed oxygen gas. Doing so could result in fire. Even for products with oil-free processing, do not use for oxygen gas if the product has been used even once for any other gas.

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 products 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 is not in each dedicated model, 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.)

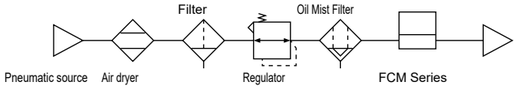
■When mixing hydrogen gas or helium gas with a gas other than hydrogen or helium, use caution regarding gas reverse flow. If hydrogen gas or helium gas flows into products in this series that is not in each dedicated model, the sensor safety circuit will activate and the product may not operate. (When the safety circuit is activated, flow rate measurement/control cannot be performed until the power has been turned OFF.) When cutting off the gas, provide individual cutoff valves as in the reference drawing below in order to prevent gas back-flow.



■Avoid the entry of foreign matter into the product. If foreign matter (foreign materials, water drops, or oil mist inside the piping, etc.) enters the product, accuracy or control properties may be adversely affected, leading to breakdown 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-mist separator) on the primary side (upstream side) of the product.
- When using compressed air, use clean air compliant with 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 breakdown 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 the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

■When using the valve with 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 environment
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 this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

■ Guaranteed proof pressure/working pressure differential range
Usage in applications exceeding the proof pressure or outside the working pressure differential could result in breakdown. 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 may be subject to vibration. Vibration or impact may lead to malfunction.

⚠ CAUTION

■ Check leakage current to prevent malfunction caused by leakage current from other fluid control components. When using a PLC, etc., leakage current could cause the product to malfunction.

■ When the current input type is wired, the power ground and signal common are shared. When operating this product in multiples with one PLC and D/A unit, depending on the D/A unit circuit, wiring trouble could prevent the correct signal from being input. Consult with the PLC manufacturer for use.

■ The current input type can be used with input signal 1-5 V, but as opposed to other voltage input types, input impedance is small (250 Ω). Use an appropriate voltage generator.

■ 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 the specification table for each type). Using the product outside the working pressure differential range could cause incorrect operation. 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 product's primary or secondary pressure may fluctuate repeatedly, or the product's control may not be track, leading to unstable flow rate control.

■ CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. 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.

3. Wiring and piping

⚠ WARNING

■ Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated 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.

⚠ CAUTION

■ When using 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 foreign materials, 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. Deflected currents may occur and 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.

Analog input/parallel input/RS-485

■ Cable extension
When extending the cable beyond 3 m, the analog output and analog input error may increase or the control may become unstable due to wiring resistance. Use of a cable within 3 m is recommended.

■ Extension of cable for RS-485 communication
- Make sure that the total extension distance of the RS-485 communication cable is within 20 m.
- Use a shielded twisted-pair cable for the communication cable to be extended.

■ When using RS-485 communication
- Install terminating resistors on both ends of the communication path. A terminating resistor (120Ω) is built into the product. Can be used as a terminating resistor by connecting the terminating resistor pin of pin No. 12 and pin No. 7 or pin No. 9.
- Be sure to connect the digital signal ground. Stable communication may not be possible if not connected.

IO-Link

■ IO-Link power supply
- Make sure that the length of the cable is within 20 m. If extending the cable, use 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.
- Use a power supply with sufficient current supply capacity. Use a IO-Link master that has sufficient current supply per port. If these specifications are not met, the product performance may not be achieved. In this case, connect a DC stabilized power supply with sufficient current supply capacity, not the IO-Link master, to L+ (2VDC) or L- (GND).

4. 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 barometric pressure (101 kPa) relative humidity 65%.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual