CKD

SMALL SIZE FLOW CONTROLLER FCM SERIES

CKD Corporation

Compact, high-speed, multifunction solution

High-speed-response micro processing sensor chip

Reach high accuracy and multifunction with microcomputers

Stainless steel body

■ Applicable fluids/Flow rates

AIR **N2**
0.015~50 ℓ/min

Ar
0.015~50 ℓ/min

O2 **13A** **CH4** **C3H8**
0.015~10 ℓ/min

■ Weight: 480 g

CKD
FCM-0010LN-UFPAN

GAS   13A
FLOW RATE   10L/min
SERIAL   5609-004

CKD Corporation

70

70

30

Rectifying ensures low-pressure loss and realizes repeatability

Resin body

■ Applicable fluids/Flow rates

AIR **N2**
0.015~100 ℓ/min

■ Weight: 200 g

Ultimate ideal multi-functions flow controller

Small size flow controller

FCMSeries

Compact Flow Controller FCM Series
Combining compact flow rate sensor FCM and compact solenoid valve technology.
High performance and cost efficient sensing, proportional control, and valve functions, this will match customer's needs.

CKD Green Technology

New Low differential pressure model

The flow rate of combustion gas with low supply pressure is controlled, such as for controlling burner flame.

Compact and lightweight

Just 70_70_30mm (H_D_W), this controller is installed in small spaces or movable sections, enabling equipment to be downsized and lightened.

Volume **30%** compared to conventional model
Weight **20%** compared to conventional model

0.5 s high-speed control

The platinum sensor chip with silicon micromachining is capable of 0.5 s high-speed control. This controller is used for different applications.
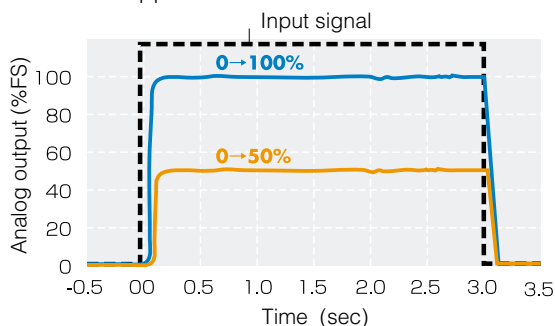
Dedicated power not necessary

This controller uses a 24V DC power supply, and is operated with a general-purpose single power supply.

Highly reliable flow control

CKD's original rectifying mechanism improves repeatability affecting flow control.

Repeatability	±**1**% FS
Accuracy	±**3**% FS

Compatible with different fluids

This controller is used with air, nitrogen, and gases such as argon, oxygen, methane, butane, and propane, enabling use with different applications.
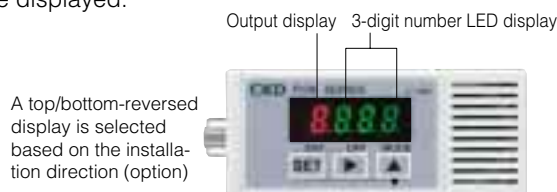
RoHS Directive-compliant   RoHS

All substances, such as lead and hexavalent chrome, that could adversely affect the global environment have been eliminated from materials used in this controller.

Digital display for easy confirmation of control

• The flow rate is shown on a 3-digit display.
• Errors and the output state (switch output ON-OFF) are displayed.

Output display   3-digit number LED display

A top/bottom-reversed display is selected based on the installation direction (option)

Parallel input is standard

Control is possible with parallel input PLC, etc., ON/OFF signal, 10-bit resolution 1024. Analog input/output devices, such as D/A converters, are not required.

Realize multi-functions with microcomputer

●Error display
Error occurrence is indicated with displays and electric signals.

●Zero span adjustment
The input signal's zero span is adjusted based on the application.

●Preset input
When four random flow rate points are set, the flow rate is controlled by inputting a 2-bit signal from an external source (signals from PLC, etc.).

●Direct memory
Even without input signals from an external source, control flow rate is freely adjusted with the product's operation keys.

●Switch output
A switch output using flow rate upper/lower limit settings is incorporated. Integrated overcurrent protection.

●Flow rate integrator function
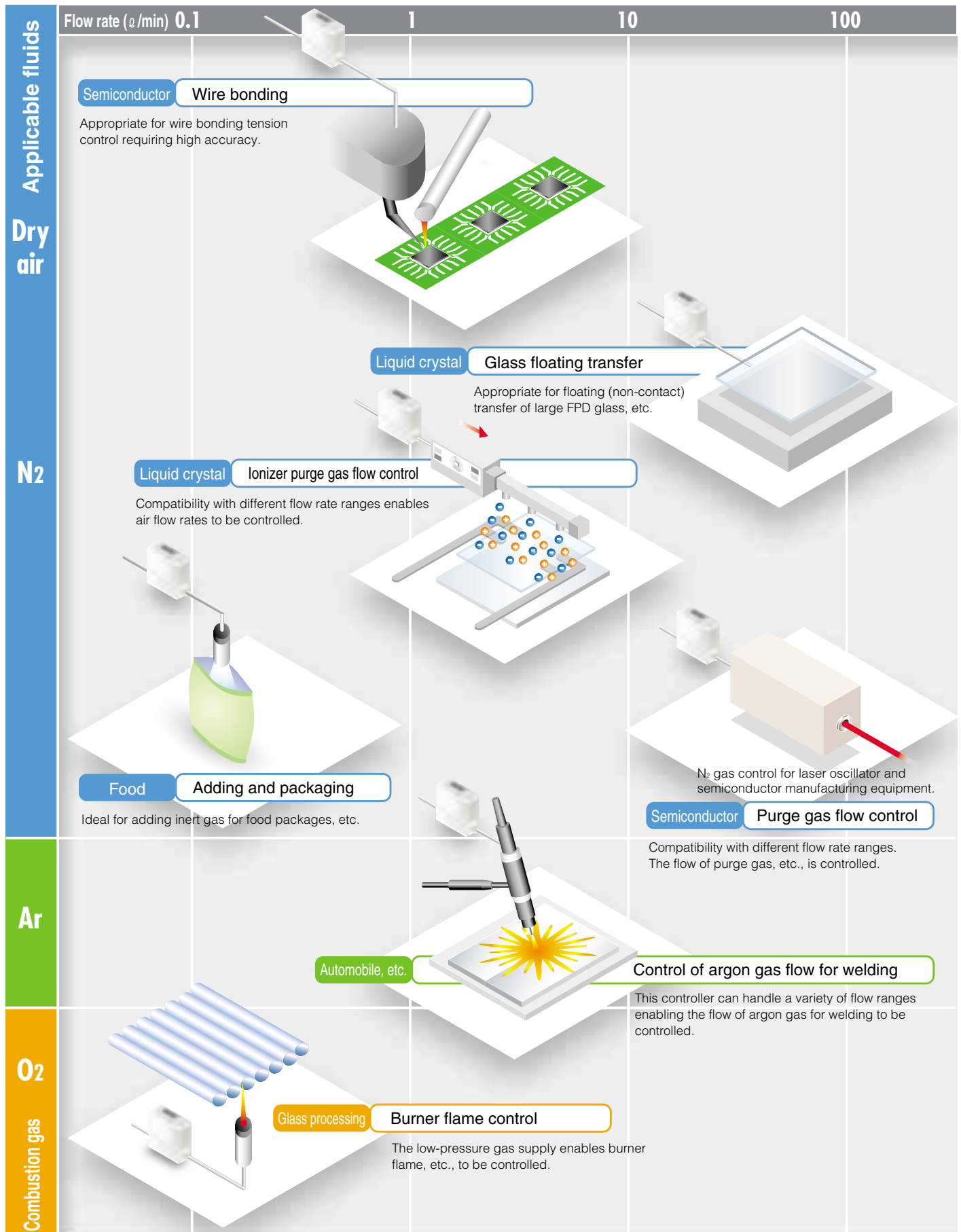A flow rate integration display (6 digits maximum) and integrating pulse output are possible.

●Automatic shutoff
If an emergency, such as an error occurs, the valve is automatically shut off.

FCM Series INDEX

Examples of applications

Useful in different fields

This small size flow controller is used for different applications including machinery, automobile, and precision device fields, advanced fields such as semiconductors and biotechnology, medicine and food.

Applicable fluids

Flow rate (ℓ/min) 0.1   1   10   100

Dry air

Semiconductor | Wire bonding

Appropriate for wire bonding tension control requiring high accuracy.

Liquid crystal | Glass floating transfer

Appropriate for floating (non-contact) transfer of large FPD glass, etc.

N₂

Liquid crystal | Ionizer purge gas flow control

Compatibility with different flow rate ranges enables air flow rates to be controlled.

Food | Adding and packaging

Ideal for adding inert gas for food packages, etc.

N_2 gas control for laser oscillator and semiconductor manufacturing equipment.

Semiconductor | Purge gas flow control

Compatibility with different flow rate ranges. The flow of purge gas, etc., is controlled.

Ar

Automobile, etc. | Control of argon gas flow for welding

This controller can handle a variety of flow ranges enabling the flow of argon gas for welding to be controlled.

O₂

Combustion gas

Glass processing | Burner flame control

The low-pressure gas supply enables burner flame, etc., to be controlled.

FCM Series

Applicable fluids and flow control ranges

Model No.	Applicable fluids	Flow rate control range (ℓ/min)	Body material	Port size
Air type				
FCM-9500 AI	AIR Air / N2 Nitrogen	0.015 to 0.5	Resin / SUS	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		SUS: Rc1/4, 9/16-18 UNF
FCM-0010 AI		0.3 to 10		
FCM-0020 AI		0.6 to 20		
FCM-0050 AI		1.5 to 50		
FCM-0100 AI (only resin type)		3 to 100		
Gas type				
FCM-9500 AR	Ar Argon	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		0.3 to 10		
FCM-0020 AR		0.6 to 20		
FCM-0050 AR		1.5 to 50		
Gas type				
FCM-9500 O2/LN/C1/C3	O2 Oxygen / 13A City gas / CH4 Methane / C3H8 Propane	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		0.3 to 10		

Input/output specifications

Input signal: Specifications	Model No.	Output type	Specifications	Error output
Analog: 0 to 10 V	FCM-*-*0AN	Analog	1 to 5 V	NPN
	FCM-*-*0AP	Analog	1 to 5 V	PNP
Pre-set: 4 points (2bit) (Note)	FCM-*-*0SN	Switch	NPN	NPN
	FCM-*-*0SP	Switch	PNP	PNP
Analog: 0 to 5 V	FCM-*-*1AN	Analog	1 to 5 V	NPN
	FCM-*-*1AP	Analog	1 to 5 V	PNP
Pre-set: 4 points (2bit) (Note)	FCM-*-*1SN	Switch	NPN	NPN
	FCM-*-*1SP	Switch	PNP	PNP
Analog: 4 to 20 mA	FCM-*-*2AN	Analog	1 to 5 V	NPN
	FCM-*-*2AP	Analog	1 to 5 V	PNP
Pre-set: 4 points (2bit) (Note)	FCM-*-*2SN	Switch	NPN	NPN
	FCM-*-*2SP	Switch	PNP	PNP
Parallel: 10bit	FCM-*-*PAN	Analog	1 to 5 V	NPN
	FCM-*-*PAP	Analog	1 to 5 V	PNP
	FCM-*-*PSN	Switch	NPN	NPN
	FCM-*-*PSP	Switch	PNP	PNP

Note: Preset 8-point (3-bit) input is used customized. The external integration reset signal input cannot be used. Contact your CKD Sales Office for details.

Small size flow controller

FCM Series

● Flow rate: 0.5, 1, 2, 5, 10, 20, 50, 100 ℓ/min

Specifications

Descriptions					FCM-[*1] [*2]-[*3] [*4] [*5]					
Valve drive type					Proportional solenoid valve When not energized: Closed					
				Flow range	AI (air, nitrogen)	AR (argon)	O₂ (oxygen)	LN (city gas)	C₁ (methane)	C₃ (propane)
Full scale flow rate Note 1	*1	Standard model	9500	0 to 500 mℓ/min	●	●	●	●	●	●
			0001	0 to 1 ℓ/min	●	●	●	●	●	●
			0002	0 to 2 ℓ/min	●	●	●	●	●	●
			0005	0 to 5 ℓ/min	●	●	●	●	●	●
			0010	0 to 10 ℓ/min	●	●	●	●	●	●
			0020	0 to 20 ℓ/min	●	●				
			0050	0 to 50 ℓ/min	●	●				
			0100	0 to 100 ℓ/min (only resin type)	●					
		Low differential press. (only stainless steel)	L9500	0 to 500 mℓ/min	●		●	●	●	●
			L0001	0 to 1 ℓ/min	●		●	●	●	●
			L0002	0 to 2 ℓ/min	●		●	●	●	●
			L0005	0 to 5 ℓ/min	●		●	●	●	●
			L0010	0 to 10 ℓ/min	●		●	●	●	●
Applicable fluids Note 2	*2		AI	Compressed air, nitrogen	●					
			AR	Argon		●				
			O2	Oxygen (oil-prohibit specifications)			●			
			LN	City gas (13A) Note 3				●		
			C1	Methane (CH4 100%)					●	
			C3	Propane (C3H8 100%)						●
Port size, Body material	*3		H6	ø6 push in, resin (excluding 50, 100 ℓ/min)	●					
			H8	ø8 push in, resin	●					
			8A	Rc1/4, stainless steel	●	●	●	●	●	●
			UF	9/16-18UNF, stainless steel	●	●	●	●	●	●

Control	Control range			3 to 100% F.S.
	Responsiveness	*1	9500 to 0020, L9500 to L0020	Within 0.5 sec at setting ±5%F.S. (TYP)
			0050 to 0100, L0050 to L0100	Within 1 sec at setting ±5%F.S. (TYP)
	Accuracy			±3% F.S. or less
	Repeatability			±1% F.S. or less
	Temperature characteristics			±0.1% F.S./˚C or less (25˚C standard)
	Pressure characteristics			±1%F.S. or less per 98kPa (standard differential pressure reference)
Pressure	Standard differential pressure Note 4			Refer to separate table.
	Operation differential pressure range Note 5			Refer to separate table.
	Withstanding pressure	*3	H6/H8 (resin body)	490 kPa
			8A/UF (SUS body)	980 kPa
Ambient temperature and humidity				0 to 50 ˚C, 90% RH or less (with no dew condensation)

Input/output	Input signal/ Pre-set input	*4	0	0 to 10 VDC (6.7kΩ)/4 points (2bit)
			1	0 to 5 VDC (10kΩ)/4 points (2bit)
			2	4 to 20 mA DC (250 Ω)/4 points (2bit)
			P	Parallel 10bit/none
	Output signal	*5	AN	Analog output: 1-5V (connected load impedance 500kΩ and over) Error output: NPN open collector output, 50mA or less, voltage drop 2.4V or less
			AP	Analog output: 1-5V (connected load impedance 500kΩ and over) Error output: PNP open collector output, 50mA or less, voltage drop 2.4V or less
			SN	Switch output: NPN open collector output, 50mA or less voltage drop 2.4V or less Error output: NPN open collector output, 50mA or less, voltage drop 2.4V or less
			SP	Switch output: PNP open collector output, 50mA or less, voltage drop 2.4V or less Error output: PNP open collector output, 50mA or less, voltage drop 2.4V or less

Flow rate display	Display method		3-digit 7-segment LED, display accuracy: control accuracy ± 1 digit
	Display range and resolution		Refer to separate table.
Integrating function			Refer to separate table.
Power supply	Power supply voltage		24VDC±10% (stabilized power with ripple rate 2% or less)
	Current consumption		250 mA or less
Installation attitude			Free
Wetted area material	*3	H6/H8 (resin body)	Polyamide resin, fluoro rubber, stainless steel, alumina, silicon, solder
		8A/UF (SUS body)	Stainless steel, fluoro rubber, alumina, silicon, solder
Weight	*3	H6/H8 (resin body)	Approx. 200g
		8A/UF (SUS body)	Approx. 480g
Protective structure			IEC standards IP40
Protective circuit	Note 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 and operation differential pressure Note 4, 5

(Standard model)

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

(Low differential pressure model)

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

Display and integrating function

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

Note 1: Converted to volumetric flow at 20˚C 1 barometric pressure (101 kPa).

Note 2: When using compressed air, use clean air complying with JIS B 8392-1:2003 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage (water, oxidized oil, foreign matter, etc.). Install a filter (filtration: 5 μm), 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 of this product to maintain product function.

<Recommended circuit >

Pneumatics pressure source   Air dryer   Filter   Regulator   Oil mist filter (micro alescer)   FCM series
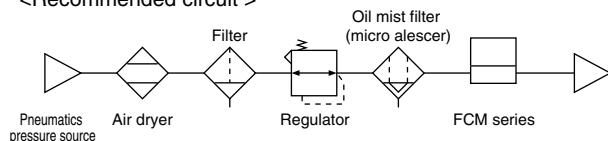
<Recommended component >
Air filter: F series
Oil mist filter: M series

When using for purposes other than compressed air, use dry gas that does not contain corrosive elements such as chlorine, sulfur or acids, and clean gas that does not contain dust or oil mist.

Note 3: City gas 13 A is for methane (CH_4) 88% gas generated from LNG.

Note 4: The standard differential pressure is the differential pressure when this product is calibrated.

Note 5: The operating differential pressure is the differential pressure required for this product to operate normally. Contact CKD when using this product at a level exceeding the operating differential pressure.

Note 6: This product's protective circuit is effective only for specific incorrect connections and load short-circuits. It does not necessarily provide protection for all incorrect connections.

FCM Series

How to order

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

Model No.

Ⓐ Flow rate range
Ⓑ Applicable fluids
Ⓒ Port/body material
Ⓓ Input specifications
Ⓔ Output specifications
Ⓕ Display direction
Ⓖ Cable
Ⓗ Bracket
Ⓘ Traceability

Symbol	Descriptions						
Ⓐ Flow rate range							
	Applicable fluids	AI	AR	O2	LN	C1	C3
9500	0 to 0.5 ℓ/min	●	●	●	●	●	●
0001	0 to 1 ℓ/min	●	●	●	●	●	●
0002	0 to 2 ℓ/min	●	●	●	●	●	●
0005	0 to 5 ℓ/min	●	●	●	●	●	●
0010	0 to 10 ℓ/min	●	●	●	●	●	●
0020	0 to 20 ℓ/min	●	●				
0050	0 to 50 ℓ/min	●	●				
0100	0 to 100 ℓ/min (only resin body)	●					
L9500	0 to 0.5 ℓ/min	●		●	●	●	●
L0001	0 to 1 ℓ/min	●		●	●	●	●
L0002	0 to 2 ℓ/min	●		●	●	●	●
L0005	0 to 5 ℓ/min	●		●	●	●	●
L0010	0 to 10 ℓ/min	●		●	●	●	●

(9500–0100: Standard model; L9500–L0010: Low differential press. (Only stainless steel))

Ⓑ Applicable fluids	
AI	Compressed air, nitrogen gas
AR	Argon
O2	Oxygen (oil-prohibit specifications)
LN	City gas (13A)
C1	Methane (CH4)
C3	Propane (C3H8)

Ⓒ Port/body material							
	Applicable fluids	AI	AR	O2	LN	C1	C3
H6	Push in (ø6), resin body (Excluding flow ranges 0050 and 0100)	●					
H8	Push in (ø8), resin body	●					
8A	Rc1/4, stainless steel body	●	●	●	●	●	●
UF Note 1	9/16-18 UNF, stainless steel body	●	●	●	●	●	●

Ⓓ Input specifications	
0	Analog 0 to 10 VDC
1	Analog 0 to 5 VDC
2	Analog 4 to 20 mADC
P	Parallel 10bit

Ⓔ Output specifications	
AN	1 to 5 V analog error (NPN)
AP	1 to 5 V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

Ⓕ Display direction	
Blank	Positive direction
R	Reverse direction

Ⓖ Cable	
Blank	None
1	1 m
3	3 m

Ⓗ Bracket	
Blank	None
B	With bracket

Ⓘ Traceability	
Blank	None
T	Traceability certificate, system diagram, inspection results included
K	Inspection results included

<Example of model No.>
FCM-0001AI-H81ANR1BK

Model: Small size flow controller FCM series
Ⓐ Flow rate range : 0 to 1 ℓ/min
Ⓑ Applicable fluids : Compressed air, nitrogen
Ⓒ Port/body material : Push in (ø8), resin body
Ⓓ Input specifications : Analog 0 to 5 VDC
Ⓔ Output specifications : 1 to 5 V analog, error (NPN)
Ⓕ Display direction : Reverse direction
Ⓖ Cable : 1 m
Ⓗ Bracket : With bracket
Ⓘ Traceability : Inspection results included

⚠ Note on model No. selection

Note 1: Refer to the dimensions on page 4 for the 9/16-18UNF screw shape.
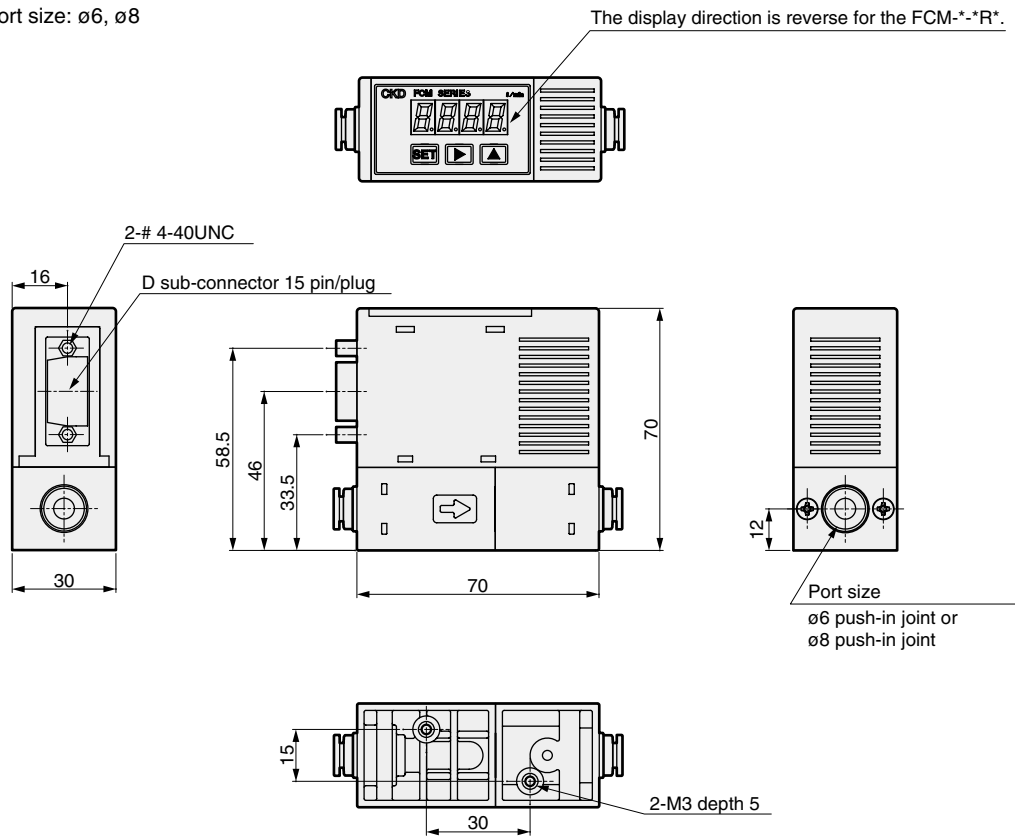
Discrete option model

FCM - AC1

Symbol	Descriptions
AC1	9-conductor analog cable 1m
AC3	9-conductor analog cable 3m
PC1	15-conductor parallel cable 1m
PC3	15-conductor parallel cable 3m
LB1	Bracket

Dimensions

Body material: Resin, port size: ø6, ø8

● FCM-*-H8/H6*

The display direction is reverse for the FCM-*-*R*.

2-# 4-40UNC

D sub-connector 15 pin/plug

16

30

58.5

46

33.5

70

70

30

15

2-M3 depth 5

12

Port size
ø6 push-in joint or
ø8 push-in joint

Body material: Stainless steel, port size: Rc1/4, 9/16-18UNF

● FCM-*-8A/UF

The display direction is reverse for the FCM-*-*R*.

2-# 4-40UNC

D sub-connector 15 pin/plug

16

30

58.5

46

33.5

70

70

12

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

9/16-18UNF

2.5

ø15.6

45°

12°

Seal surface

Mesh filter

11.5

15.25

9/16-18UNF
Effective length of threaded part 11.5

15

30

2-M3 depth 5

CKD

4
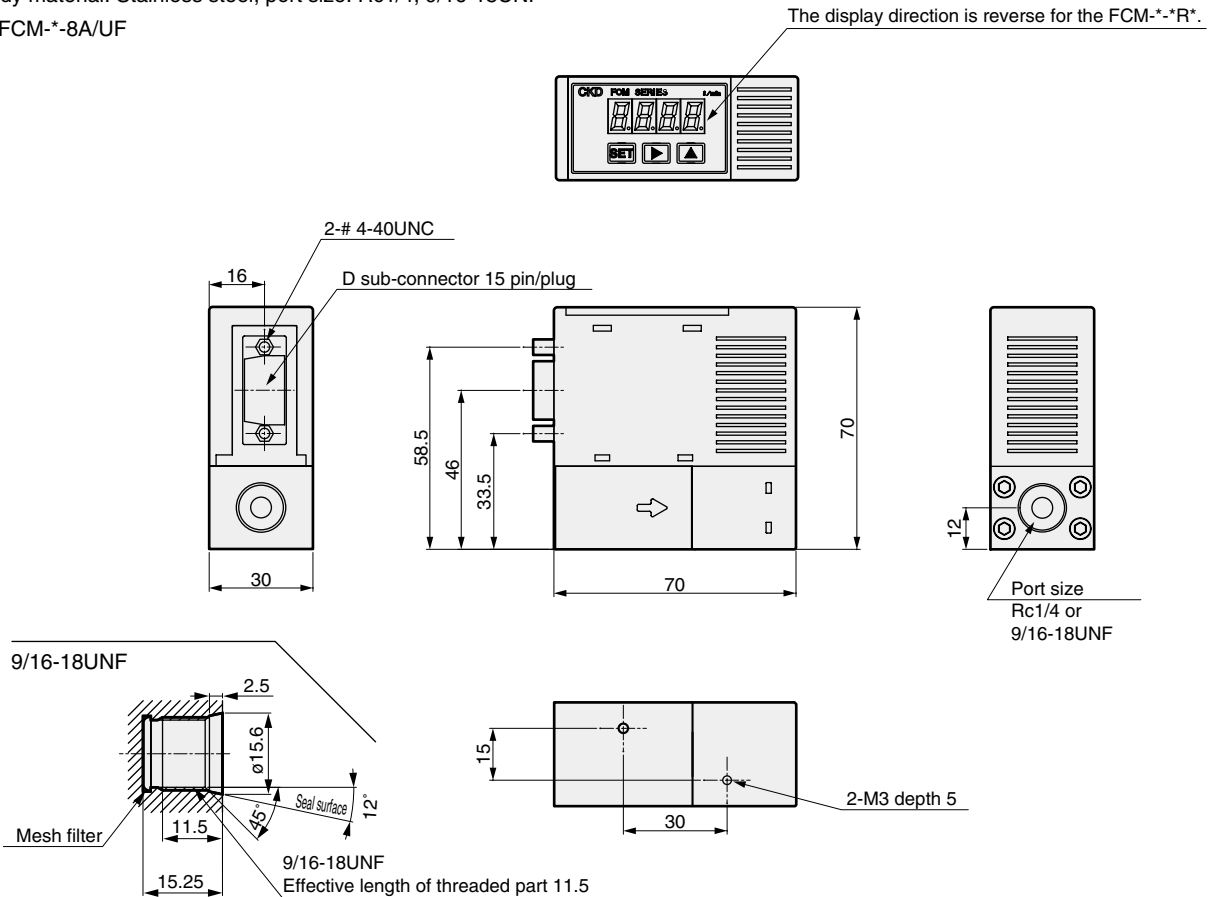
Dedicated bracket (Floor installation type)

Discrete model: FCM-LB1
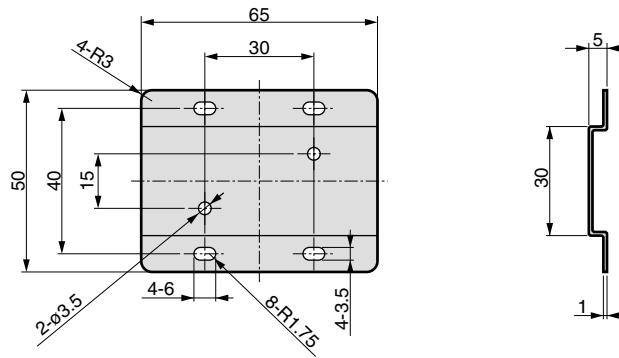
Cable option dimension drawing

● 9-conductor cable for analog input type
Discrete option model: FCM-AC1, AC3

Shield cable
*Connect the shield cable to the - power supply (0V).

9-AWG26

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	Pre-set input function		Integration reset signal	Not used	Power supply+	Not used	Not used	Not used	Not used	Common	Input signal zero/span adjustment function			Not used	Analog input	Switch output	Error output	Power supply- (0V)
Type of input	Bit 1	Bit 2			+24 VDC						0 to 10 VDC	0 to 5 VDC	4 to 20 mADC	Not used	1 to 5 VDC	NPN or PNP output	NPN or PNP output	

Note: The No. 1 pin common is common for the preset input and integration reset signal (No 1 to 3 pins).

● 15-conductor cable for parallel input type
Discrete option model: FCM-PC1, PC3

Shield cable
*Connect the shield cable to the - power supply (0V).

15-AWG26

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 (with black line)	Red (with black line)	Gray	White	Green (with black line)	Green		Blue	Black
Name	Parallel input signal				Power supply+	Parallel input signal				Common	Parallel input signal		Analog input function	Switch output function	Error automatic shutdown applicable error (Note)	Power supply- (0V)
Type of input	Bit 1	Bit 2	Bit 3	Bit 4	+24 VDC	Bit 5	Bit 6	Bit 7	Bit 8		Bit 9	Bit 10	1 to 5 VDC	NPN or PNP output	NPN or PNP output	

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

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Wiring method

Example of internal circuit and load connection, analog input type

FCM-*-*0/1/2 AN*
(Analog input, analog output + error output type NPN output)
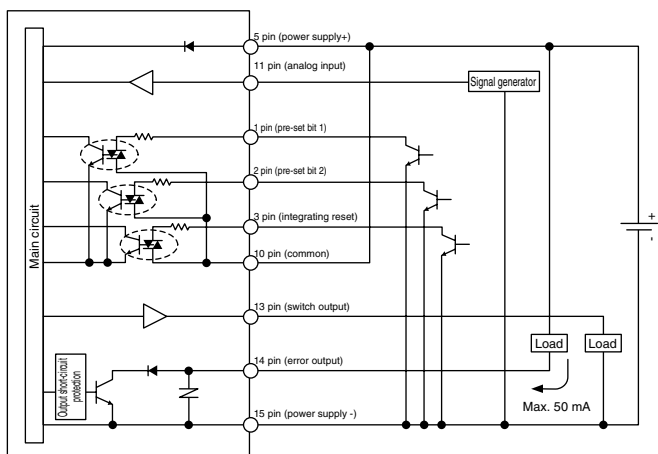
FCM-*-*0/1/2 AP*
(Analog input, analog output + error output type PNP output)
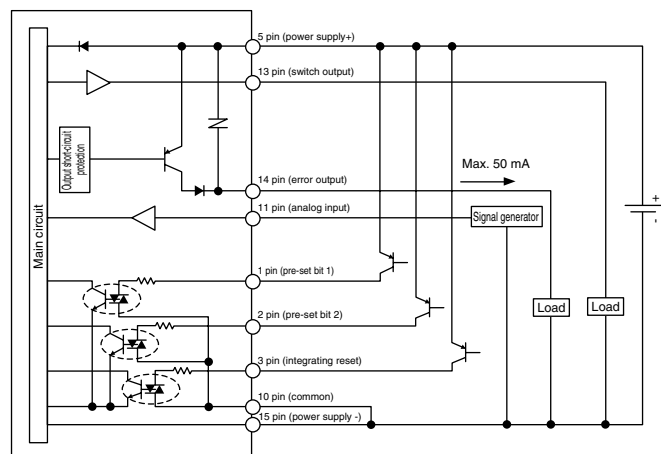
FCM-*-*0/1/2 SN*
(Analog input, switch output + error output type NPN output)
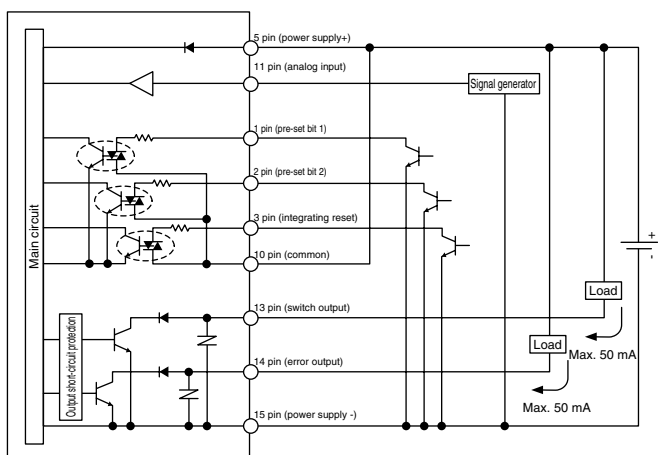
FCM-*-*0/1/2 SP*
(Analog input, switch output + error output type PNP output)
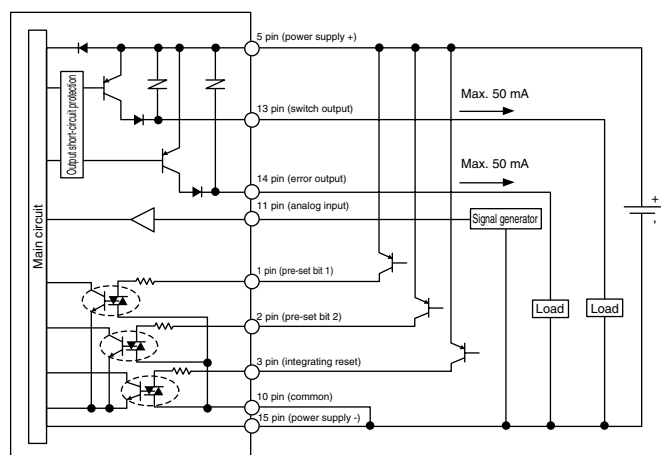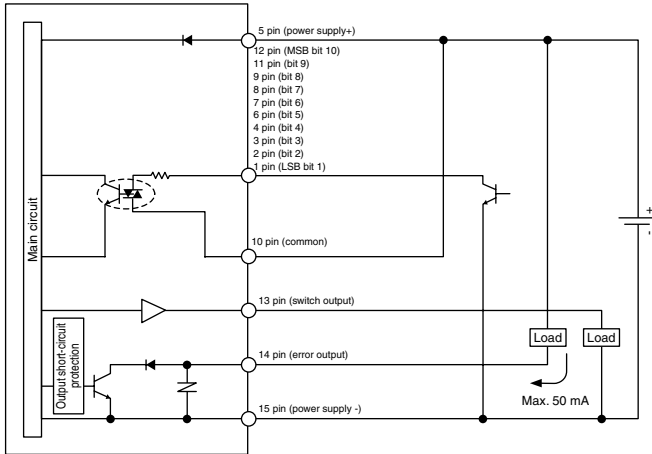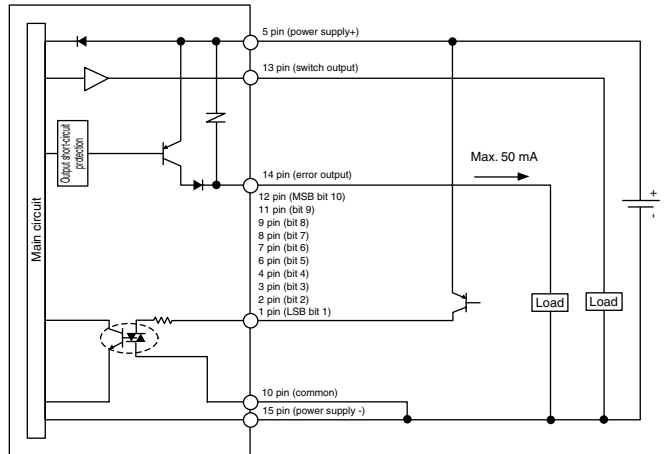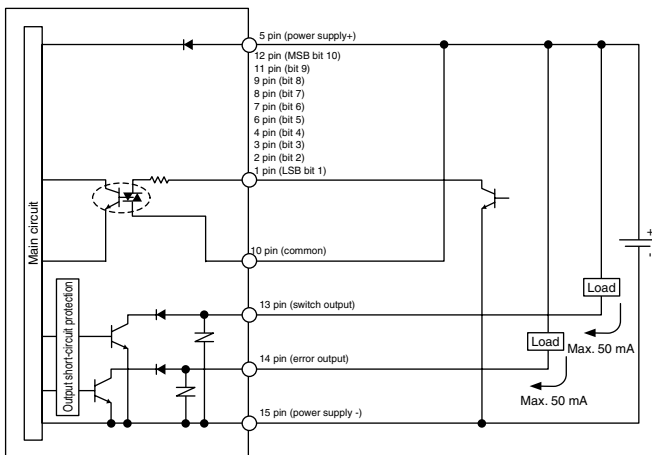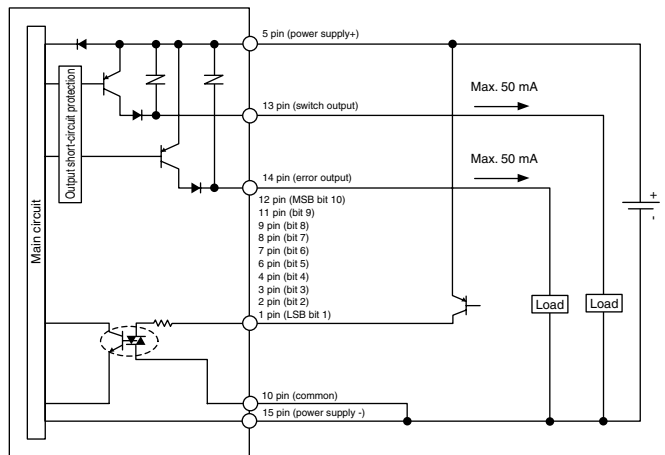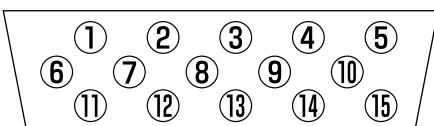
■ Connector pin layout (body side)

[Analog input type]
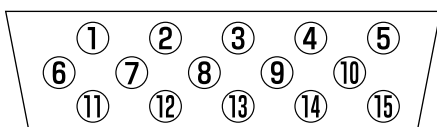
The analog input type does not have the 4, 6, 7, 8, 9 or 12 pins.

CKD

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FCM Series

Example of internal circuit and load connection, parallel input type

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

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

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

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

■ Connector pin layout (body side)
[Parallel input type]

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Small Flow Controller FCM Series Functions

Explanation of functions

Function	Details	Compatible models				Operation
		Analog input		Parallel input		
		Analog output function	Switch output function	Analog output function	Switch output function	
Direct memory function	The target is input with keys. Even if input signals from an external source are not used, control flow rate is freely adjusted with controller operation keys.	○	○	○	○	P10, 11 P21
Preset input function	When four random flow rate points are set, the flow rate is controlled by inputting a 2-bit signal from an external source (signals from PLC, etc.).	○	○			P12 P21
Analog input function	The flow rate is controlled with analog input signals.	○	○			P14 P21
Parallel input function	The flow rate is controlled with a parallel 10-bit (signal from PLC, etc.) Expensive input/output devices, such as a D/A converter, are not required.			○	○	P15 P21
Integrating function	The flow rate is integrated. The following functions are used in addition to the integrated flow display. • The solenoid valve is closed and stopped at the set integrated flow. • Integrated pulse function (only switch output) • Switch ON at set integrated flow (only switch output) Resetting the integrated value • Analog input: External input, button operations • Parallel input: Only button operations	○ **No integrated pulse switch**	○	○ **No integrated pulse switch**	○	P16 P17 P20 P22 P23
Switch output function	The following switch functions are selected. • (1) Tolerance mode: The switch turns ON when the level is within the tolerance (randomly set) of control target. • (2) Range designation mode: The switch turns ON when the level is not within the designated flow rate range. • (3) Integrated pulse: The integrated pulse is output during integration. • (4) ON when higher than set integration: The switch turns ON at the set integrated flow. <Mode 1: Tolerance mode> <Mode 2: Range designation mode> H (+ tolerance) Input signal setting L (- tolerance) H (upper limit side) L (lower limit side) Output ON OFF Output ON OFF <Mode 3: Integrated pulse> <Mode 4: ON when higher than set integration> Approx. 50 ms ON OFF ON OFF See page 2 for details on the pulse output rate. Set integration		○		○	P17 P18 P19 P22
Input signal zero/span adjustment function	The input signal's zero point and span point is changed. <When invalid> <When valid> Control flow 100% 0% 100% Input signal 100% 0% 100% Input signal Zero point (L) setting range 0 to 50% Span point (H) setting range 10 to 100%	○	○			P22
Zero point adjustment	The flow rate output's zero point is adjusted.	○	○	○	○	P23
Automatic power off	The flow rate display turns OFF if there are no operations for one minute. (Control does not stop when the auto power OFF function activates.) Power is saved since the display is turned OFF when not needed.	○	○	○	○	P22
Error display function	The error state is displayed. The following functions are used for the error display. • Error output is turned ON if an error occurs • Control stops automatically an error occurs	○	○	○	○	P9 P23
Error automatic shutoff	If an error occurs, control is stopped, the valve is fully opened, and error output is turned ON.	○	○	○	○	P23
Key lock	Setting changes are disabled to prevent incorrect operations.	○	○	○	○	P20
Setting reset	Settings are returned to defaults.	○	○	○	○	P20

CKD

Names and functions of display and operation section

Output display (red)

● "F" is displayed while confirming function settings.

● "-" is displayed when switch output is ON.
  (Only switch output)
  * The display blinks when overcurrent is detected.
  * The display does not blink with integrated pulse output.

● "E" is displayed when error output is ON.
  * The display blinks when overcurrent is detected.

* If an upper/lower limit applies when setting the function, or when displaying both the high-order digit and low-order digit of the integrated flow display, H or L is displayed.

3-digit number LED display (green)

● The instantaneous flow rate display and function setting details are displayed in the RUN mode (instantaneous flow rate display).
  * The setting mode No. and setting details are displayed when displaying details of function settings.
● Values, etc., are displayed when setting each data.
● The error code No. is displayed when the error is displayed.

<Instantaneous flow rate display> <Setting details display> <Error output> <Invalid display>

Setting mode No. — Setting details
Code No.
Setting mode No. — Setting details

CKD FCM SERIES L/min

ENT — OFF — MODE
SET ▶ ▲

▲ UP key (MODE key)

● Press to count up the value, etc.
● Press to change the setting mode.
● Press to change the setting item.

SET key

● Press to set the setting mode.
● Press to set the setting item.
● Press to change to the integrated display.

▶ Shift key (OFF key)

● Press to select the digit for a number, etc.
● When forced OFF (control stop) is executed, this key is pressed to restore operation from the forced OFF state.

SET + ▶ key (ENT key)

● Press to set the value.
● Press to unlock the key lock.
● Press to execute integration reset.

SET + ▲ key (DOWN key)

● Press to count down the value, etc.
● Press to lock keys.

▶ + ▲ key

● Press to initialize values.

Error code table

Error display	Cause	Measures	Errors subject to error automatic shutoff (Note)
E.01	The supplied power voltage is not within the rating.	● Check controller power specifications, set power voltage within the rating range, and turn power ON again.	○
E.02	The input signal exceeds the rating range.	● Check the controller input signal type, set the input signal within the rating range, and turn power ON again.	○
E.03	An error occurred during EEPROM reading or writing.	● Contact your nearest CKD Sales Office or dealer.	
E.04	An error occurred during memory reading or writing.	● Contact your nearest CKD Sales Office or dealer.	
E.05	The flow rate did not reach the setting for five and over consecutive seconds.	● Check the primary pressure, supply pressure within the rated operating differential pressure range, and turn power ON again. ● Check that there are no leaks from piping, joints, or other devices, correct connect pipes, and turn power ON again. ● Contact your nearest CKD Sales Office or dealer.	○
E.06	An output error is occurring in the sensor.	● Stop the supply of fluids to the controller, set the flow rate to zero, and turn the controller power ON again. If this error occurs again, contact your nearest CKD Sales Office or dealer.	○
(blinking)	Switch output overcurrent protection circuit is activated.	● Check whether load current exceeds the rating, correctly connect the controller, and turn power ON again.	

Errors are basically automatically reset. However, if the error is not reset, turn power OFF, check the cause and correct the error. Then, turn power ON again.
Note: The default is error automatic shutoff set to OFF (valve fully closed if an error occurs). See page 23 for details.

Controlling the flow rate

(1) Controlling the flow rate with direct memory

The target is input with keys. Even if input signals from an external source are not used, control flow rate is freely adjusted with controller operation keys. Direct memory has two operation modes.
- Direct memory (1): Settings are applied when the value is changed.(Even if the value is not set, the flow rate is adjusted by changing the value. This is handy for finely adjusting the flow rate. Set the setting once the flow rate is determined.)
- Direct memory (2): Changes are applied when the value is set. (The flow rate does not change unless the value is set.)

<Direct memory (1) operation>

(1) Turn power ON. The instantaneous flow rate is displayed.

(2) When the ▲ key is pressed, the <F1: Input signal confirmation> screen is displayed. The current input signal setting state is displayed. The current input signal type and input are alternately displayed.
(The instantaneous flow rate display is displayed if 3 seconds pass without a button being pressed.)

(3) "F1.dr" blinks when the SET key is held down for 2 seconds.

(4) Hold down the SET key for 2 seconds and open the <Direct Memory 1 Setting screen>.

(5) The flow rate changes when the value is change. The flow rate is adjusted by changing the value even if the value is not set.

<Flow rate setting range>

Full-scale flow rate

Flow rate: zero   Set flow rate   Valve fully opened
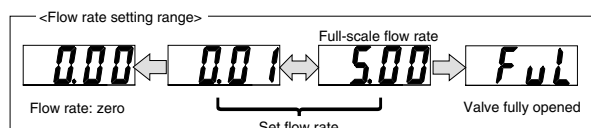
(6) Hold down the SET and ▶ keys together for 2 seconds, and set the value. The <F1: input signal confirmation> screen is displayed.

(7) The instantaneous flow rate display is redisplayed after 3 seconds.

<Instantaneous flow rate display >

The instantaneous flow rate display is redisplayed after 3 s.

<F1: Input signal confirmation>   <Input display>

Alternate display

Hold down for 2 s.

<Input signal type >
Direct memory input	: dr
Analog input 0 to 10V	: A0
Analog input 0 to 5V	: A1
Analog input 4 to 20 mA	: A2
Parallel input	: PA
Pre-set input	: P1

Hold down for 2 s.

<Target setting>
▶ key : Moves the digit
▲ key : Counts up the value
SET ▲ key : Count down the value

SET ▶ Hold down for 2 s.

<F1: Input signal confirmation>   <Input display>

Alternate display

<Instantaneous flow rate display >

Forced OFF (flow rate zero)

The controller is forcibly stopped (flow rate zero) by holding down the ▶ key for 2 seconds in the flow control state (instantaneous flow rate display).
The flow control state is entered again by holding down the ▶ key for 2 seconds in the flow control stopped state (forced OFF).

<Instantaneous flow rate display>   <Forced OFF display>
Flow control state   Flow control stopped state

Hold down for 2 s.

The solenoid valve forced OFF state is displayed. Control is forcibly stopped even the input signal is input.

Controlling the flow rate

<Direct memory (2) operation>

(1) Turn power ON. The instantaneous flow rate is displayed.

<Instantaneous flow rate display >

0.00

The instantaneous flow rate display is redisplayed after 3 s.

(2) When the ▲ key is pressed, the <F1: Input signal confirmation> screen is displayed. The current input signal setting state is displayed. The current input signal type and input are alternately displayed. (The instantaneous flow rate display is displayed if 3 seconds pass without a button being pressed.)

<F1: Input signal confirmation>   <Input display>

F 1.dr ⇄ Alternate display **0.00**

SET Hold down for 2 s.

(3) "F1.dr" blinks when the **SET** key is held down for 2 seconds.

F 1.dr

<Input signal type >
Direct memory input	: dr
Analog input 0 to 10V	: A0
Analog input 0 to 5V	: A1
Analog input 4 to 20 mA	: A2
Parallel input	: PA
Pre-set input	: P1

SET ▶
Hold down for 2 s.

(4) Hold down the **SET** and ▶ keys for 2 seconds, and open the <direct memory (2) setting screen>.

2 0.00

<Target setting>
▶ key :	Moves the digit
▲ key :	Counts up the value
SET ▲ key :	Count down the value

(5) Change the value.
(The flow rate does not change unless the value is set.)

2 5.00

SET ▶ Hold down for 2 s.

(6) Hold down the **SET** and ▶ keys together for 2 seconds, and set the value. The <F1: input signal confirmation> screen is displayed.

<F1: Input signal confirmation>   <Input display>

F 1.dr ⇄ Alternate display **5.00**

(7) The instantaneous flow rate display is redisplayed after 3 seconds.

<Instantaneous flow rate display >

5.00

Forced OFF (flow rate zero)

The controller is forcibly stopped (flow rate zero) by holding down the ▶ key for 2 seconds in the flow control state (instantaneous flow rate display).
The flow control state is entered again by holding down the ▶ key for 2 seconds in the flow control stopped state (forced OFF).

<Instantaneous flow rate display >
Flow control state

5.00 ⇄ ▶ **oFF**

Hold down for 2 s.

<Forced OFF display>
Flow control stopped state

The solenoid valve forced OFF state is displayed. Control is forcibly stopped even the input signal is input.

Note:
- Control does not stop while setting direct memory. Take safety into consideration, and stop control (forced stop) if necessary.
- The flow control/forced OFF state (setting) is held even if power is turned OFF.

Controlling the flow rate

(2) Controlling the flow rate with preset input (only analog input)

When four random flow rate points are set, the flow rate is controlled by inputting a 2-bit signal from an external source.

Example: To control 0, 1, 2, and 5 ℓ/min with preset input, select Preset Input for the input setting mode, and set each of the following:
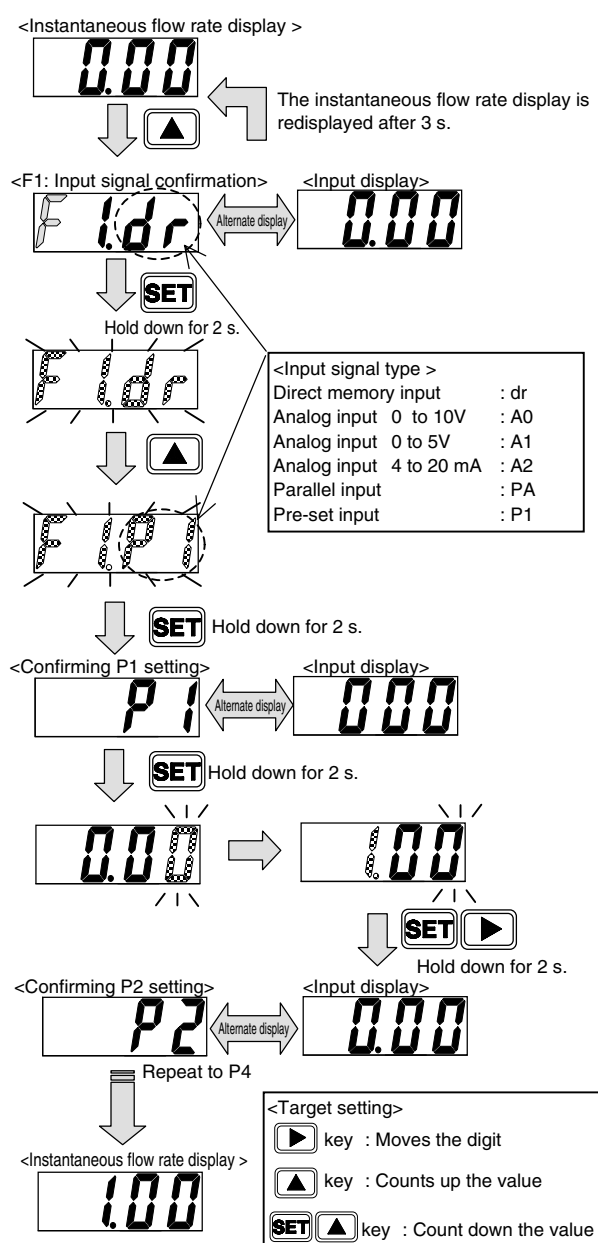P1: 0 ℓ/min P2: 1 ℓ/min
P3: 2 ℓ/min P4: 5 ℓ/min
When signals are input from a PLC, etc., as indicated in the table at right, the flow rate is controlled to each preset flow rate.

D-sub socket pin No.	2	1	Pre-set memory No.
Cable option insulator color	Orange	Brown	
Type of input	Bit 2	Bit 1	
Input signal	OFF	OFF	P1
	OFF	ON	P2
	ON	OFF	P3
	ON	ON	P4

<Controlling with the preset input signal>

(1) Turn power ON. The instantaneous flow rate is displayed.

(2) When the [▲] key is pressed, the <F1: Input signal confirmation> screen is displayed. The current input signal setting state is displayed.
The current input signal type and input are alternately displayed.
(The instantaneous flow rate display is displayed if 3 seconds pass without a button being pressed.)

(3) "F1.dr" blinks when the [SET] key is held down for 2 seconds.

(4) When the [▲] key is pressed twice, "F1.P1" will blink.

(5) Hold down the [SET] key for 2 seconds, and open the P1 setting confirmation screen.

(6) Hold down the [SET] key for 2 seconds, and open the target input screen.
Input the target.

(7) When the [SET] and [▶] key are held down for 2 seconds, the target is set in memory, and the P2 setting confirmation screen is displayed.
Set all of the targets up to P4 with this.

(8) The instantaneous flow rate display is redisplayed after 3 seconds.
The flow is controlled with preset input.

<Instantaneous flow rate display >

The instantaneous flow rate display is redisplayed after 3 s.

<F1: Input signal confirmation>   <Input display>

Alternate display

Hold down for 2 s.

<Input signal type >
Direct memory input   : dr
Analog input   0 to 10V   : A0
Analog input   0 to 5V   : A1
Analog input   4 to 20 mA : A2
Parallel input   : PA
Pre-set input   : P1

Hold down for 2 s.

<Confirming P1 setting>   <Input display>

Alternate display

Hold down for 2 s.

Hold down for 2 s.

<Confirming P2 setting>   <Input display>

Alternate display

Repeat to P4

<Instantaneous flow rate display >

<Target setting>
[▶] key   : Moves the digit
[▲] key   : Counts up the value
[SET][▲] key : Count down the value

FCM Series

(3) Changing settings with shortcut keys (only when using direct memory and preset input)

When controlling the flow using direct memory or preset input, the setting change screen is opened with a single key operation.

Note: The input signal setting change screen opens the instant that the shortcut key is pressed.
(Example: The P2 setting change screen opens when controlling the flow with the preset input P2.)
This cannot be used when controlling the flow with analog input or parallel input.

<Changing the setting with a shortcut>

(1) Turn power ON. The instantaneous flow rate is displayed. (This is used only when controlling with direct memory or preset input.)

<Instantaneous flow rate display >

Control when flowing with preset memory P2

Hold down for 3 s.
<F1: input signal confirmation> and <input display> are alternately displayed during this time.

(2) When the [▲] key is held down for 3 seconds, and the [▲] key is pressed, the input signal setting change screen is displayed.

<Target setting>
[▶] key : Moves the digit
[▲] key : Counts up the value
[SET][▲] key : Count down the value

(3) The flow rate changes when the value is change. The flow rate is adjusted by changing the value even if the value is not set.

[SET][▶] Hold down for 2 s.

<F1: Input signal confirmation>   <Input display>

Alternate display

(4) Hold down the [SET] and [▶] keys together for 2 seconds, and set the value. The <F1: input signal confirmation> screen is displayed.

<Instantaneous flow rate display >

(5) The instantaneous flow rate display is redisplayed after 3 seconds.

Note: Do not change the preset external input while changing the setting with the shortcut key.
The setting could be set into an incorrect preset No.
Data is not saved in memory if power is turned OFF before setting the value. Set the value before turning power OFF.

Controlling the flow rate

(4) Controlling the flow rate with analog input (Only analog input)

The flow rate is controlled with analog input signals.

<Instantaneous flow rate display >

0.00

The instantaneous flow rate display is redisplayed after 3 s.

<Controlling with analog input signals>

(1) Turn power ON. The instantaneous flow rate is displayed.

(2) When the [▲] key is pressed, the <F1: Input signal confirmation> screen is displayed. The current input signal setting state is displayed. The current input signal type and input are alternately displayed. (The instantaneous flow rate display is displayed if 3 seconds pass without a button being pressed.)

<F1: Input signal confirmation>   <Input display>

F 1.dr   Alternate display   **0.00**

SET Hold down for 2 s.

(3) "F1.dr" blinks when the SET key is held down for 2 seconds.

F 1.dr

<Input signal type >	
Direct memory input	: dr
Analog input 0 to 10V	: A0
Analog input 0 to 5V	: A1
Analog input 4 to 20 mA	: A2
Parallel input	: PA
Pre-set input	: P1

(4) When the [▲] key is pressed once, "F1.A⬚" will blink. (The number shown in ⬚ differs based on the model.)

F 1.A0

SET Hold down for 2 s.

(5) Hold down the SET key for 2 seconds and set the value. The <F1: input signal confirmation> screen is displayed.

<F1: Input signal confirmation>   <Input display>

F 1.A0   Alternate display   **5.00**

<Instantaneous flow rate display >

5.00

(6) The instantaneous flow rate display is redisplayed after 3 seconds.
The flow rate is controlled with analog input.

Note: Fully open (FUL) cannot be set with analog input.

Controlling the flow rate

(5) Controlling the flow rate with parallel input (Only parallel input)

The flow rate is controlled with a parallel 10-bit (signal from PLC, etc.) Expensive input/output devices, such as a D/A converter, are not required. The parallel input signal is a 10-point signal so when converted to a decimal, it becomes 0-1023. A 0.1% resolution is attained.

Input signal = Set flow/full-scale flow x 1023

Example: To set 300 mℓ/min with a full-scale flow 500 mℓ/min

300 (mℓ/min)/500 (mℓ/min) x 1023 = 613.8 → 614

When 614 (decimal) is converted to binary, it becomes 1001100110. 1 sets the input signal ON, and 0 sets the input signal OFF. (Refer to following table.)

D-sub socket pin No.	12	11	9	8	7	6	4	3	2	1
Cable option insulator color	Green (Black line)	White	Red (Black line)	White (Black line)	Pink	Light blue	Purple	Yellow	Orange	Brown
Type of input	Bit 10 MSB	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1 LSB
Decimal [For 614 (decimal)]	1	0	0	1	1	0	0	1	1	0
Input signal	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF

<Controlling with parallel input signals>

(1) Turn power ON. The instantaneous flow rate is displayed.

(2) When the [▲] key is pressed, the <F1: Input signal confirmation> screen is displayed. The current input signal setting state is displayed.
The current input signal type and input are alternately displayed. (The instantaneous flow rate display is displayed if 3 s pass without a button being pressed.)

(3) "F1.dr" blinks when the [SET] key is held down for 2 s.

(4) When the [▲] key is pressed once, "F1.PA" will blink.

(5) Hold down the [SET] key for 2 s and set the value.
The <F1: input signal confirmation> screen is displayed.

(6) The instantaneous flow rate display is redisplayed after 3 seconds.
The flow rate is controlled with parallel input.

Note: Fully open (FUL) cannot be set with parallel input.

<Instantaneous flow rate display >

The instantaneous flow rate display is redisplayed after 3 s.

<F1: Input signal confirmation>   <Input display>

Alternate display

Hold down for 2 s.

<Input signal type >
Direct memory input   : dr
Analog input 0 to 10V   : A0
Analog input 0 to 5V   : A1
Analog input 4 to 20 mA : A2
Parallel input   : PA
Pre-set input   : P1

[SET] Hold down for 2 s.

<F1: Input signal confirmation>   <Input display>

Alternate display

<Instantaneous flow rate display >

<Reference>

If a high resolution is not required, the number of input points is reduced.

Example: If 2% resolution is acceptable, operate with a 6-point input (0-63 when converted to decimal).
Bits 5 to 1 in the above table are shorted in a bundle. When turned ON and OFF as one bit (LSB), control is executed with 6 points.

CKD

Integrating the flow rate

(1) Displaying the integrated flow

The flow rate is integrated and displayed. The display range is shown below.

Model No. FCM-		9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display	Display range	0 to 500 mℓ/min	0.00 to 1.00 ℓ/min	0.00 to 2.00 ℓ/min	0.00 to 5.00 ℓ/min	0.0 to 10.0 ℓ/min	0.0 to 20.0 ℓ/min	0.0 to 50.0 ℓ/min	0 to 100 ℓ/min
Integrating function	Display range	999999 mℓ	9999.99 ℓ	9999.99 ℓ	9999.99 ℓ	99999.9 ℓ	99999.9 ℓ	99999.9 ℓ	999999 ℓ
	Display resolution	1 mℓ	0.01 ℓ	0.01 ℓ	0.01 ℓ	0.1 ℓ	0.1 ℓ	0.1 ℓ	1 ℓ
	Pulse output rate	5 mℓ	0.01 ℓ	0.02 ℓ	0.05 ℓ	0.1 ℓ	0.2 ℓ	0.5 ℓ	1 ℓ

<Integrated display>

(1) Instantaneous flow rate display
The integration starts when power is turned ON.
(The integrated value is reset when power is turned OFF.)

(2) The integrated display screen opens when the [SET] key is held down for 2 seconds. Press the [SET] key for 2 seconds to return to the instantaneous flow rate display. The display digit changes when the [▶] key is pressed.

(3) Integration is reset when the [SET] and [▶] keys are held down for 2 seconds. With analog, integration is reset with the external input (No. 3 pin). Integration is also reset when power is turned OFF.

<Instantaneous flow rate display>
[SET] Hold down for 2 s.   [SET] Hold down for 2 s.

<Integrated flow display>
High-order 3-digit display   Low-order 3-digit display

[SET] [▶] Hold down for 2 s.

Integration reset
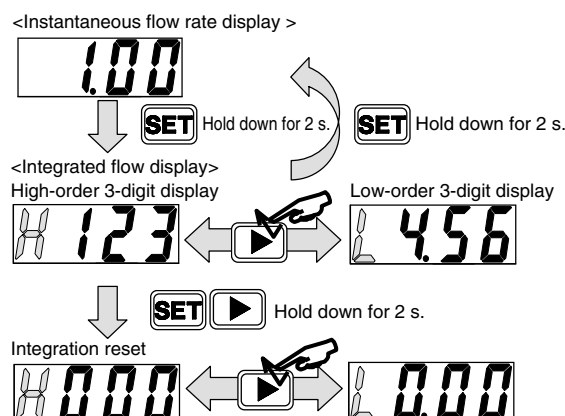
(2) Closing and stopping the solenoid valve with set integrated flow

The solenoid valve is closed and stopped when the set integrated flow is attained. This is suitable for processes in which a set amount is supplied, etc.

<Operation>

(1) Instantaneous flow rate display

(2) Press the [▲] key five times and open the <F5: integration automatic shutoff setting screen>. If integration automatic shutoff is valid, "F5.on" and the current setting are alternately displayed. (The instantaneous flow rate display is displayed if 3 seconds pass without a button being pressed.)

(3) When the [SET] key is held down for 2 seconds, "F5.--" blinks. When not using integration automatic shutoff, hold down the [SET] key for 2 seconds. The <F5 screen> is redisplayed, and after 3 seconds, the instantaneous flow rate screen is displayed.

(4) To use integration automatic shutoff, press the [▲] key so that "F5.on" blinks. Then, hold down the [SET] key for 2 s.
After setting the high-order digit, hold down the [SET] key and [▶] key for 2 seconds.
After setting the low-order digit, hold down the [SET] key and [▶] key for 2 seconds.
The <F5 screen> is displayed, and after 3 seconds, the instantaneous flow rate screen is displayed.
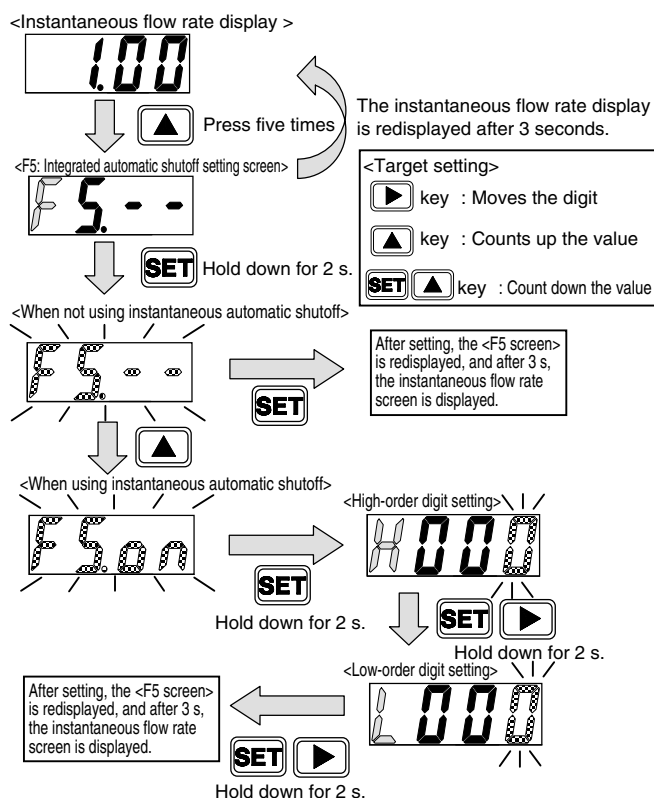
<Instantaneous flow rate display>
[▲] Press five times
The instantaneous flow rate display is redisplayed after 3 seconds.

<F5: Integrated automatic shutoff setting screen>
[SET] Hold down for 2 s.

<Target setting>
[▶] key : Moves the digit
[▲] key : Counts up the value
[SET] [▲] key : Count down the value

<When not using instantaneous automatic shutoff>
[SET]
After setting, the <F5 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

[▲]

<When using instantaneous automatic shutoff>
[SET]

<High-order digit setting>
[SET] Hold down for 2 s.
[SET] [▶] Hold down for 2 s.

<Low-order digit setting>
[SET] [▶] Hold down for 2 s.

After setting, the <F5 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

* Only in this mode, the integrated value is reset when the input signal reaches zero. (Valid only after automatic shutoff.)
* The solenoid valve is automatically shut off and the switch functions when the set integrated flow is reached.
* If the display for automatic shutoff is "OFF", the switch output lamp does not turn ON. The flow rate display is redisplayed when the integrated value is reset (button operation or external input).
* Even if automatic shutoff is invalidated during automatic shutoff, it does not function until the integrated value is reset.
* The integrated value is reset when automatic shutoff is set to "on" and the value is set.

CKD

FCM Series

Integrating the flow rate

(3) Outputting the integrated pulse (Only switch output)

The integrated pulse is output. Refer to the table on page 16 for the pulse rate.
Refer to the connection (page 5), examples of internal circuit and load connection (pages 6 and 7) for details on connecting switch output.

<Operation >

(1) Instantaneous flow rate display

(2) Press the [▲] key four times and open the <F4: switch output setting screen>. If switch output setting is valid, "F4.□" and the current setting are alternately displayed. (The instantaneous flow rate display is displayed if 3 s pass without a button being pressed.)
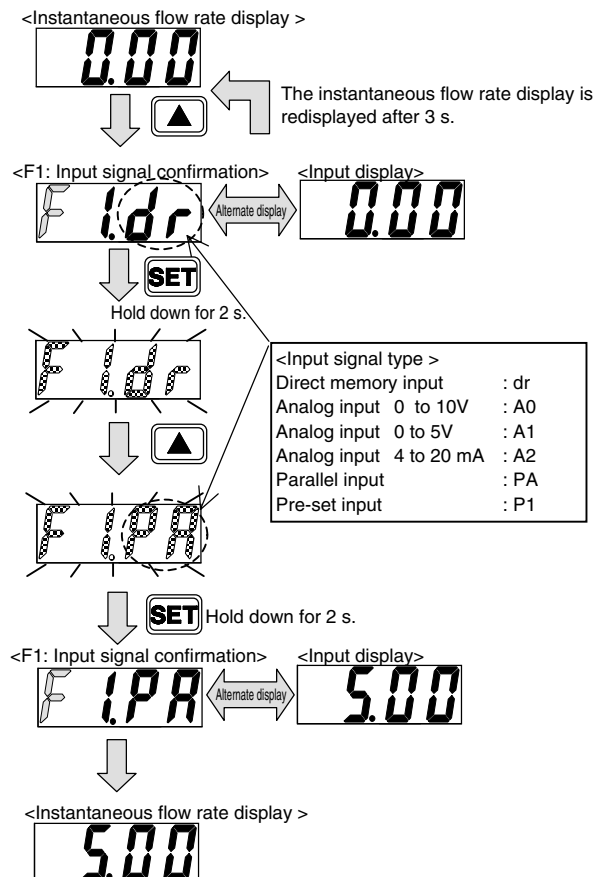
(3) Hold down the [SET] key for 2 seconds, and enter switch output setting mode.

(4) When the [▲] key is pressed three times, "F4.3" blinks. When the [SET] key is held down for 2 s, the integrated pulse output is set. The <F4 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

<Instantaneous flow rate display >

[▲] Press four times — The instantaneous flow rate display is redisplayed after 3 s.

<F4: switch output setting screen>

[SET] Hold down for 2 s.

[▲] Press three times

<Integrated pulse setting screen >

After setting, the <F4 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

[SET] Hold down for 2 s.
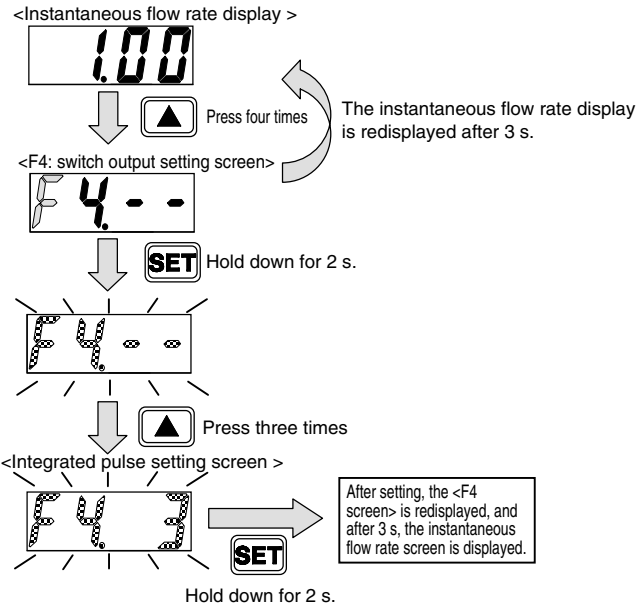
(4) Turning the set integrated flow ON with a switch (Only switch output)

Switch output is turned ON at the set integrated flow.
See the connection (page 5), examples of internal circuit and load connection (pages 6 and 7) for details on connecting switch output.

<Operation >

(1) Instantaneous flow rate display

(2) Press the [▲] key four times and open the <F4: switch output setting screen>. If switch output setting is valid, "F4.□" and the current setting are alternately displayed. (The instantaneous flow rate display is displayed if 3 s pass without a button being pressed.)

(3) Hold down the [SET] key for 2 s, and enter switch output setting mode.

(4) When the [▲] key is pressed four times, "F4.4" blinks. Hold down the [SET] key for 2 seconds, and open the target setting screen.
After setting the high-order 3 digits of the target, hold down the [SET] and [▶] keys for 2 s.
After setting the low-order 3 digits of the target, hold down the [SET] and [▶] keys for 2 s. The integrated value is reset after the target is set.

(5) The <F5 screen> is displayed, and after 3 s, the instantaneous flow rate screen is displayed.

<Instantaneous flow rate display >

[▲] Press four times — The instantaneous flow rate display is redisplayed after 3 s.

<F4: switch output setting screen>

[SET] Hold down for 2 s.

[▲] Press four times

[SET] Hold down for 2 s.

<High-order digit setting>

<Target setting>
[▶] key : Moves the digit
[▲] key : Counts up the value
[SET][▲] key : Count down the value

[SET] [▶] Hold down for 2 s.

<Low-order digit setting>

After setting, the <F4 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

[SET] [▶] Hold down for 2 s.

CKD
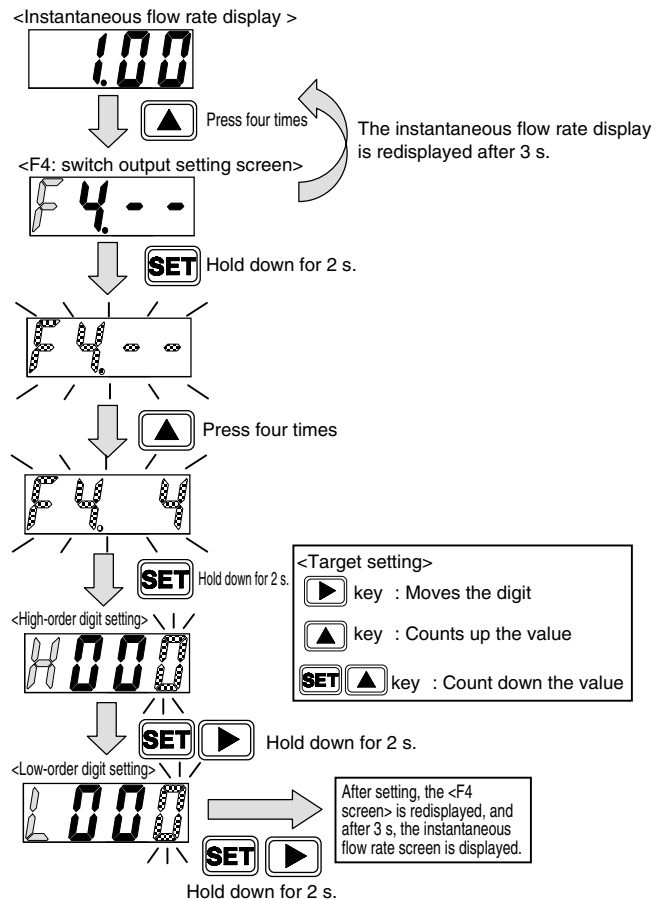
Using switch output (Only switch output)

(1) Using the tolerance mode

Switch output turns ON when the level is within the tolerance of the input signal setting.
The tolerance is set for both the plus side and minus side as a %FS (full-scale)
See the connection (page 5), examples of internal circuit and load connection (pages 6 and 7) for details on connecting switch output.

H (+ tolerance)
Input signal setting
L (- tolerance)

ON
Output
OFF

<Operation >

(1) Instantaneous flow rate display

(2) Press the [▲] key four times and open the <F4: switch output setting screen>. If switch output setting is valid, "F4.□" and the current setting are alternately displayed. (The instantaneous flow rate display is displayed if 3 s pass without a button being pressed.)

(3) Hold down the [SET] key for 2 s, and enter switch output setting mode.
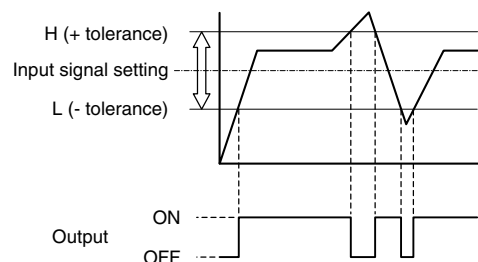
(4) When the [▲] key is pressed once, "F4.1" blinks. Hold down the [SET] key for 2 s, and open the target setting screen.

(5) After setting the tolerance (minus side), hold down the [SET] and [▶] keys for 2 s.
Minus side setting range: -50 to 0% FS

(6) After setting the tolerance (plus side), hold down the [SET] and [▶] keys for 2 s.
Plus side setting range: 0 to 50% FS

(7) The <F4 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

<Instantaneous flow rate display >

[▲] Press four times — The instantaneous flow rate display is redisplayed after 3 s.

<F4: switch output setting screen >

[SET] Hold down for 2 s.

[▲] Press once

<Target setting>
[▶] key : Moves the digit
[▲] key : Counts up the value
[SET][▲] key : Count down the value

[SET] Hold down for 2 s.

<- tolerance setting (%)>

[SET][▶] Hold down for 2 s.

<+ tolerance setting (%)>

[SET][▶] Hold down for 2 s.

After setting, the <F4 screen> is redisplayed, and after 3 seconds, the instantaneous flow rate screen is displayed.

FCM Series

Using switch output (Only switch output)

(2) Using the range designation mode

The switch turns ON when the level is not within the designated flow rate range. The upper and lower limit values are set regardless of the input signal setting (control target).
Both the upper limit and lower limitre set as % FS (full-scale).
Refer to the connection (page 5), examples of internal circuit and load connection (pages 6 and 7) for details on connecting switch output.

H (upper limit side)

L (lower limit side)

Output ON

OFF

<Operation >

 (1) Instantaneous flow rate display

 (2) Press the ▲ key four times and open the <F4: switch output setting screen>. If switch output setting is valid, "F4.□" and the current setting are alternately displayed. (The instantaneous flow rate display is displayed if 3 s pass without a button being pressed.)

 (3) Hold down the SET key for 2 s, and enter switch output setting mode.
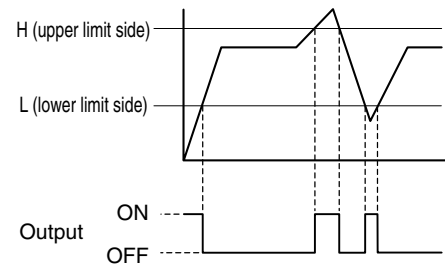
 (4) When the ▲ key is pressed twice, "F4.2" blinks. Hold down the SET key for 2 s, and open the target setting screen.

 (5) After setting the lower limit value, hold down the SET and ▶ keys for 2 s.
  Lower limit value setting range: 0 to 90% FS

 (6) After setting the upper limit value, hold down the SET and ▶ keys for 2 s.
  Upper limit value setting range: 10 to 100% FS
  Note that the gap between the upper and lower limits must be 10% FS and over.

 (7) The <F4 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

<Instantaneous flow rate display >

▲ Press four times — The instantaneous flow rate display is redisplayed after 3 s.

<F4: switch output setting screen >

SET Hold down for 2 s.

▲ Press twice

<Target setting>
▶ key : Moves the digit
▲ key : Counts up the value
SET ▲ key : Count down the value

SET Hold down for 2 s.

<Lower limit setting (%)>

SET ▶ Hold down for 2 s.

<Upper limit setting (%)>

SET ▶ Hold down for 2 s.

After setting, the <F4 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

Operation (List)

Note: • Keys are unlocked when the controller is shipped. Lock keys if necessary.
The key lock/unlock state is held even if power is turned OFF.
• Control does not stop during the F1: input signal selection or F2: input signal zero/span setting. Take safety into consideration and stop control (forced stop) if necessary.
• The flow control/forced OFF state is held even if power is turned OFF.

<Normal display>

<Instantaneous flow rate display >
Flow control state

5.00

The current instantaneous flow rate is displayed.

Hold down for 2 s.

<Forced OFF display>
Flow control stopped state

oFF

The solenoid valve forced OFF state is displayed. Control is forcibly stopped even when the input signal is input.

<Automatic shutoff display>
Flow control stopped state

oFF

The integration automatic shutoff state is displayed.

<Key lock>

SET ▲ Hold down together for 2 s.

F.Loc

The instantaneous flow rate display is displayed after 2 s.

<Key unlock>

SET ▶ Hold down together for 5 s.

F.unL

The instantaneous flow rate display is displayed after 2 s.

<Initialization>

▶ ▲ Hold down together for 3 s.

Int

The instantaneous flow rate display is displayed after 2 s.

SET Hold down for 2 s.

Note: The flow control/forced OFF state is held even if power is turned OFF.

<Integrated flow display>

H 123 ← ▶ → **L 4.56**

High-order 3-digit display   Low-order 3-digit display

SET ▶ Hold down together for 2 s.

Integration reset

H 000 ← ▶ → **L 0.00**

The current integrated flow is displayed. Integration starts when power is turned ON.
Integration is reset when the SET and ▶ keys are held down. With analog, integration is reset with the external input.
Integration is also reset when power is turned OFF.

<F1: input signal selection >

Operation (List)

<F1: input signal selection >

Select which input style to use for control.

After 3 seconds
<Instantaneous flow rate display>

<F1 screen >

Alternate display

Input signal type

Input display

<Direct memory input setting>

Hold down for 2 s.

Hold down together for 2 s.

Direct memory (1): The setting is applied when the value is changed.

Hold down for 2 s.

Hold down together for 2 s.

After setting, the setting mode is exited, and the <F1 screen> is displayed.

Direct memory (2): The setting is applied after it is set.

Hold down together for 2 s.

After setting, the setting mode is exited, and the <F1 screen> is displayed.

<Target setting>

▶ key : Moves the digit

▲ key : Counts up the value

SET ▲ key : Count down the value

<Input signal type >
Direct memory input	: dr
Analog input 0 to 10V	: A0
Analog input 0 to 5V	: A1
Analog input 4 to 20 mA	: A2
Parallel input	: PA
Pre-set input	: P1

<Analog input (parallel input) setting>

Hold down for 2 s.

After setting to the analog input (parallel input) mode, the <F1 screen> is displayed.

<Preset input setting> (Not used for parallel input)

P1 target display

Target setting

Hold down for 2 s.

Alternate display

Hold down for 2 s.

Hold down together for 2 s.

P2 target display

Target setting

Alternate display

Hold down for 2 s.

Hold down together for 2 s.

Set P3 target in same manner

Setting mode is exited, and the <F1 screen> is displayed.

P4 target display

Target setting

Alternate display

Hold down for 2 s.

Hold down together for 2 s.

After setting, the setting mode is exited, and the <F1 screen> is displayed.

<Flow rate setting range>

Full scale flow rate

Flow rate: zero

Set flow rate

Valve fully open

Note: Integration automatic shutdown (F5.on) does not function while the input signal is set. However, once the setting is set, the integrated automatic shutdown is applied. If the integrated flow is higher than the set value at this time, automatic shutdown will occur.

<F2: input signal zero span adjustment >

Operation (List)

After 3 s
<Instantaneous flow rate display>

<F2: input signal zero span adjustment>

<F2 screen>

When using with full-scale

SET Hold down for 2 s.

SET Hold down for 2 s.
After setting, the setting mode is exited, and the <F2 screen> is displayed.

<Target setting>

▶ key : Moves the digit

▲ key : Counts up the value

SET ▲ key : Count down the value

When using with zero and panel adjusted

<Zero point adjustment (%)> **SET** Hold down for 2 s.

<Span point adjustment (%)> **SET** ▶ Hold down together for 2 s.

SET ▶ Hold down together for 2 s.

After setting, the setting mode is exited, and the <F2 screen> is displayed.

Note: If the preset memory input or direct memory input is selected with F1 (input signal selection function), this function cannot be used. Full-scale applies.
If the zero point is changed, the integration automatic shutoff cannot be reset (reset by zero input signal).

After 3 s
<Instantaneous flow rate display>

<F3: Automatic power off setting>

<F3 screen>

When not using auto power OFF function

SET Hold down for 2 s.

SET Hold down for 2 s.
After setting, the setting mode is exited, and the <F3 screen> is displayed.

* If any key is pressed during auto power OFF, the display turns ON.
* The auto power OFF setting time is one minute. This time cannot be changed.
* Control does not stop during auto power OFF.

When using auto power OFF function

SET Hold down for 2 s.
After setting, the setting mode is exited, and the <F3 screen> is displayed.

After 3 s
<Instantaneous flow rate display>

<F4: switch output setting>

<F4 screen>

When not using switch output

SET Hold down for 2 s.

SET Hold down for 2 s.
After setting, the setting mode is exited, and the <F4 screen> is displayed.

<Target setting>

▶ key : Moves the digit

▲ key : Counts up the value

SET ▲ key : Count down the value

When using mode 1 (tolerance mode)

<- tolerance setting (%)> **SET** Hold down for 2 s.

<+ tolerance setting (%)> **SET** ▶ Hold down together for 2 s.

SET ▶ Hold down together for 2 s.

After setting, the setting mode is exited, and the <F4 screen> is displayed.

- tolerance setting range: -50 to 0% FS + tolerance setting range: 0 to 50% FS

When using mode 2 (range designation mode)

<Lower limit setting (%)> **SET** Hold down for 2 s.

<Upper limit setting (%)> **SET** ▶ Hold down together for 2 s.

SET ▶ Hold down together for 2 s.

After setting, the setting mode is exited, and the <F4 screen> is displayed.

Lower limit setting range: 0 to 90% FS Upper limit setting range: 10 to 100% FS
Note that the gap between the upper and lower limits must be 10% FS and over.

When using mode 3 (integrated pulse)

SET Hold down for 2 s.
After setting, the setting mode is exited, and the <F4 screen> is displayed.

* Refer to 1.1 Specifications for details on the integrated pulse rate.
* If reset is executed with external input, the integration is reset, so pulses are not output.
* The OUT light does not turn ON while integrated pulses are output.

When using mode 4 (ON when above integration)

<High-order digit setting> **SET** Hold down for 2 s.

<Low-order digit setting> **SET** ▶ Hold down together for 2 s.

SET ▶ Hold down together for 2 s.

After setting, the setting mode is exited, and the <F4 screen> is displayed.

* The integrated value is cleared immediately after mode 4 is set.

Note: Switch output setting mode cannot be entered with the analog output.

<F5: Integrated automatic shutoff setting screen>

FCM Series

Operation (List)

<F5: Integrated automatic shutoff setting screen>

<F5 screen>

When not using integrated flow automatic shutoff

SET Hold down for 2 s. → **SET** Hold down for 2 s. → After setting, the setting mode is exited, and the <F5 screen> is displayed.

When using integrated flow automatic shutoff

<High-order digit setting> **SET** Hold down for 2 s. → **SET** ▶ Hold down together for 2 s. <Low-order digit setting> → **SET** ▶ Hold down together for 2 s. → After setting, the setting mode is exited, and the <F5 screen> is displayed.

* Only in this mode, the integrated value is reset when the input signal reaches zero. (Valid only after automatic shutoff.)
* The solenoid valve is automatically shut off and the switch functions when the set integrated flow is reached.
* If the display for automatic shutoff is "OFF", the switch output light does not turn ON. The flow rate display is redisplayed when the integrated value is reset (button operation or external input).
* Even if automatic shutoff is invalidated during automatic shutoff, it does not function until the integrated value is reset.
* The integrated value is reset when automatic shutoff is set to "on" and the value is set.

After 3 s <Instantaneous flow rate display>

<F6: Error automatic shutoff setting>

<F6 screen>

When not using error automatic shutoff

SET Hold down for 2 s. → **SET** Hold down for 2 s. → After setting, the setting mode is exited, and the <F6 screen> is displayed.

When using error automatic shutoff (Valve fully closed at error)

SET Hold down for 2 s. → After setting, the setting mode is exited, and the <F6 screen> is displayed.

When using error automatic shutoff (Valve fully opened at error)

SET Hold down for 2 s. → After setting, the setting mode is exited, and the <F6 screen> is displayed.

* Errors causing error automatic shutoff
• Sensor error: State when sensor signal error or input signal error has occurred, or when power voltage is not within range.
• Control error: State when flow cannot be controlled to set value.

After 3 s <Instantaneous flow rate display>

<F7: Zero adjust (flow rate output)>

<F7 screen>

When not using integrated flow automatic shutoff

SET Hold down for 2 s. → New adjust value → 2 s. after new adjust value is displayed, <F7 screen> is displayed.

Alternate display

Current adjust value

Note: Execute forced OFF (stop control) before adjusting the zero point.
• To prevent malfunctions, the zero point cannot be adjusted unless forced OFF is executed.
• F.Loc is displayed when forced OFF is not executed.
• Purge to working gas before adjusting the zero point.

After 3 s <Instantaneous flow rate display>

<Instantaneous flow rate display>

CKD

Custom-order Parts

Custom-order parts with the following functions are used. Contact the CKD Sales Office for details.

8-point preset input

This type is compatible with eight preset points. (Note that the external integration reset signal input cannot be used with this type.)

Oil-prohibition specifications (Only stainless steel body)

This option is available for stainless steel body (excluding oxygen models).

Related Products

Small size flow sensor FSM series

Three compact flow sensor series compatible with different applications

FSM-H series
■ Compact, high-speed, extremely small flow
  Detect extremely small flows of 1mℓ/min or less at a high speed
■ Positive/negative pressure types both used

FSM series
■ Compact, high-speed response
■ Compatible with argon (Ar) and carbon oxide (CO_2)

FSM-V series
■ Ultra-compact, super high-speed response
  Capable of 5 ms high-speed response

Inline Clean Filter FCS500/FCS1000 Series

Ideal as the final filter in different clean applications (For air and inert gas)

■ 0.01 ∝m high filtration, 99.99% removal efficiency
  A 0.01 ∝m filtration accuracy and 99.99% removal efficiency are attained with the hollow fiber membrane element.
■ Long life
  The greatly improved life is 5 times longer than the flat membrane type.
■ Compact, lightweight, large flow
  A filtration area 3 to 10 times larger than the flat membrane type with same capacity is adopted, enabling large flows to be processed with a low pressure loss. With the same capacity, the unit is downsized and lightened.
■ Oil-prohibition specifications
  All parts have been degreased and washed. All production from assembly to packaging is done in a clean room.
■ Easy maintenance
  The resin type has a transparent cover so element contamination is visually confirmed.
■ Ample variations
  The available variations include the 500 and 1000 flow rates, resin or stainless steel, and a push-in joint, male thread pipe or female thread pipe installation.