

# SMALL SIZE FLOW CONTROLLER FCM SERIES

**BIBUS®**  
SUPPORTING YOUR SUCCESS

SMALL SIZE FLOW CONTROLLER RAPIFLOW® FCM SERIES



# FLOW CONTROLLER FCM (RAPIFLOW) SERIES

FLOW CONTROLLER  
FCM (RAPIFLOW) SERIES

Neu!

Kleiner Durchfluss Regler

Kleines und leichtes Design (30\*70\*70mm, 200g)

Präzise und schnelle Ansprechzeit (0.5sec)

Geeignet für verschiedene Gas Klassen (AIR, N2, Ar, O2, CH4, C3H8)

Viele Funktionen erhältlich (integrating function, auto-shut-off-safety)

Äußerst zuverlässiger Durchfluss Regler (repeatability +/-1%FS, accuracy +/-3%FS)

Small flow controller

Miniature /light weight (30\*70\*70mm, 200g)

High speed response (0.5sec)

For various gas classes (AIR, N2, Ar, O2, CH4, C3H8)

Various functions available (integrating function, auto-shut-off-safety)

High reliable flow control (repeatability +/-1%FS, accuracy +/-3%FS)

## COMPARISON WITH CONVENTIONAL PARTS

VOLUME IS 30% OF  
CONVENTIONAL  
PARTS

WEIGHT IS 20% OF  
CONVENTIONAL  
PARTS



# Compact, high-speed, multifunction solution

Reach high accuracy  
and multifunction  
with microcomputers

High-speed-response micro  
processing sensor chip

**Stainless steel body**

Applicable fluids/Flow rates

AIR N<sub>2</sub>  
0.015~50 l/min

Ar  
0.015~50 l/min

O<sub>2</sub> 13A CH<sub>4</sub> C<sub>3</sub>H<sub>8</sub>  
0.015~10 l/min

Weight: 480 g



Rectifying ensures low-  
pressure loss and realizes  
repeatability

**Resin body**

Applicable fluids/Flow rates

AIR N<sub>2</sub>  
0.015~100 l/min

Weight: 200 g



**Ultimate ideal multi-functions  
flow controller**

**Small size flow controller**

**FCM Series**

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.



## 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

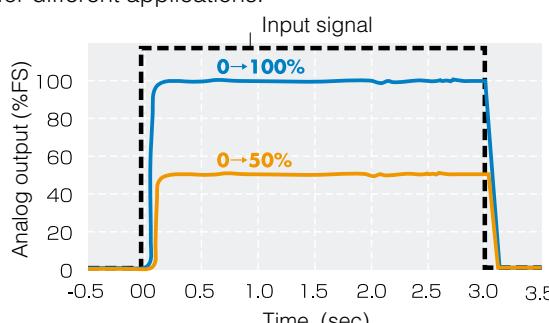
Just 70\_70\_30mm (H\_D\_W), this controller is installed in small spaces or movable sections, enabling equipment to be downsized and lightened.

**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	$\pm 1\% \text{ FS}$
Accuracy	$\pm 3\% \text{ FS}$

## 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



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

## FCM Series INDEX

Specifications — 1

Dimensions — 4

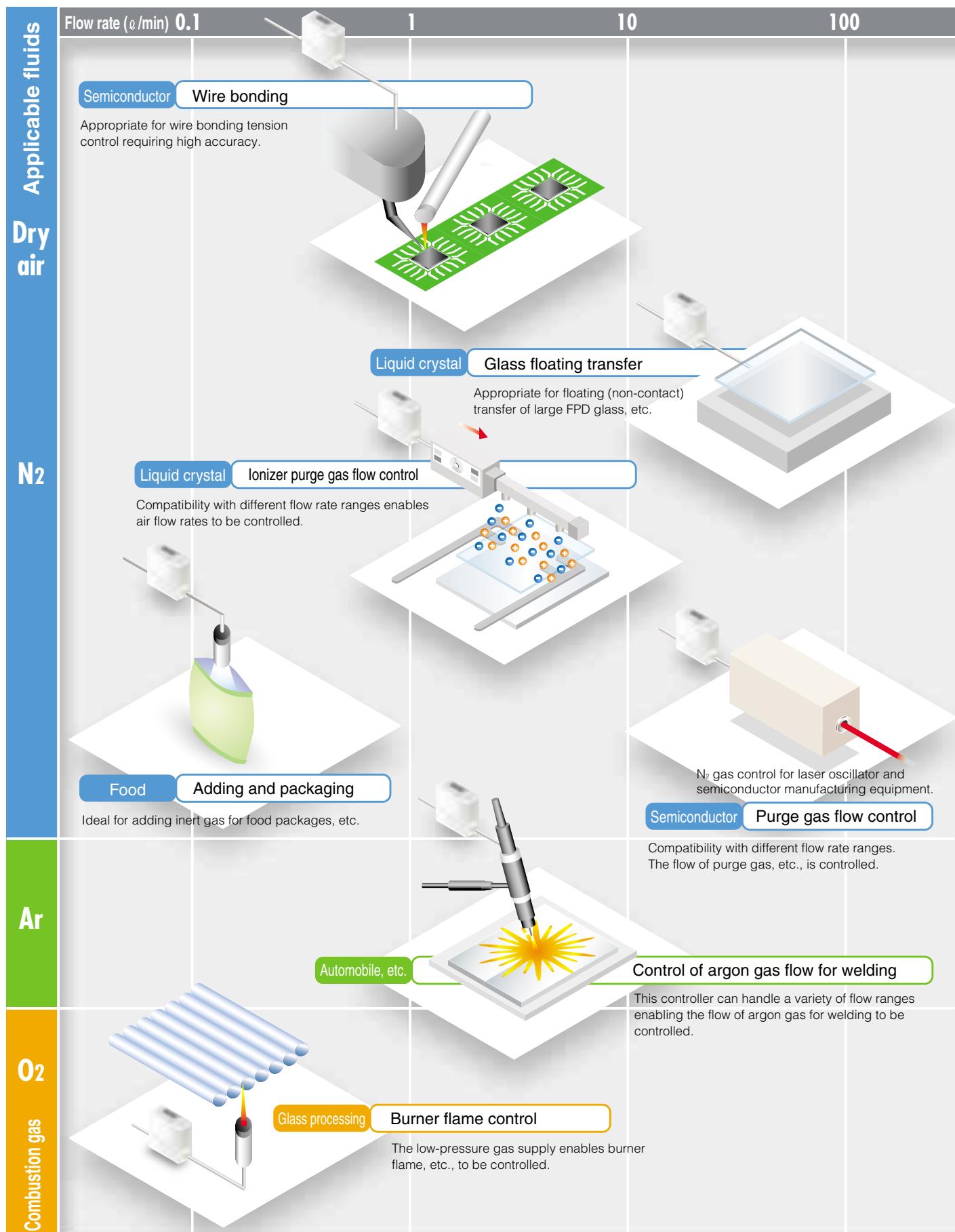
Explanation of functions — 8

Operation method — 9

# 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.



# FCM Series



## Applicable fluids and flow control ranges

Model No.	Applicable fluids	Flow rate control range (ℓ/min)					Body material	Port size
		0.01	0.1	1	10	100		
Air type	AIR Air N2 Nitrogen					0.015 to 0.5	Resin	Resin
						0.03 to 1		ø6 push in
						0.06 to 2		ø8 push in
						0.15 to 5		SUS
						0.3 to 10		Rc1/4
						0.6 to 20		9/16-18 UNF
						1.5 to 50		
						3 to 100		
Gas type	Ar Argon					0.015 to 0.5	SUS	Rc1/4 9/16-18 UNF
						0.03 to 1		
						0.06 to 2		
						0.15 to 5		
						0.3 to 10		
						0.6 to 20		
						1.5 to 50		
Gas type	O2 Oxygen 13A City gas CH4 Methane C3H8 Propane					0.015 to 0.5	SUS	Rc1/4 9/16-18 UNF
						0.03 to 1		
						0.06 to 2		
						0.15 to 5		
						0.3 to 10		



## Input/output specifications

Input	Model No.	Output		
		Output type	Specifications	Error output
Input signal: Specifications	<b>FCM-**0AN</b>	Analog	1 to 5 V	NPN
	<b>FCM-**0AP</b>			PNP
	<b>FCM-**0SN</b>	Switch	NPN	NPN
	<b>FCM-**0SP</b>		PNP	PNP
Input signal: Specifications	<b>FCM-**1AN</b>	Analog	1 to 5 V	NPN
	<b>FCM-**1AP</b>			PNP
	<b>FCM-**1SN</b>	Switch	NPN	NPN
	<b>FCM-**1SP</b>		PNP	PNP
Input signal: Specifications	<b>FCM-**2AN</b>	Analog	1 to 5 V	NPN
	<b>FCM-**2AP</b>			PNP
	<b>FCM-**2SN</b>	Switch	NPN	NPN
	<b>FCM-**2SP</b>		PNP	PNP
Input signal: Specifications	<b>FCM-**PAN</b>	Analog	1 to 5 V	NPN
	<b>FCM-**PAP</b>			PNP
	<b>FCM-**PSN</b>	Switch	NPN	NPN
	<b>FCM-**PSP</b>		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.



# Flow controller Safety Precautions

Always read before starting use

## Small size flow controller FCM series

### Design & Selection

#### 1. Working fluid

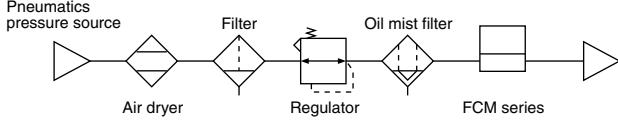
##### ⚠ DANGER

- Do not feed gas at the explosion limit. There is a risk of explosion.
- Do not feed oxygen gas to wetted sections that are not oil-prohibited. There is a risk of fire. Even if the product has oil prohibited, if gas other than oxygen gas has passed even once, do not use the product for oxygen gas.

##### ⚠ WARNING

- This product cannot be used as a business meter. This product does not comply with Measurement Laws, and cannot be used for commercial business.
- Do not use any fluids not specified because accuracy and controllability, etc., cannot be satisfied.
- Prevent entry of foreign matter into this product. If foreign matter gets into this product (dirt, water, or oil mist into pipes), accuracy and controllability could drop or the product could fail.  
If foreign matter could enter the product, install a filter, dryer, or oil mist filter upstream from the product.
  - The mesh provided in this product is used to rectify the flow in pipes. It is not a filter for removing foreign matter.
  - Compressed air from the compressor contains drainage (water, oxidized oil, foreign matter, etc.), so install a filter, air dryer, and oil mist filter (microalescer) upstream from the product.

<Recommended circuit >



- When using a valve on the primary side of this product, only use an oil-prohibit specification valve. This controller could malfunction or fail if subject to splattering grease or oil, etc.
- When using this controller for liquified gas such as propane gas, evaporate the gas. This controller could fail if liquified gas is fed.
- When using this product to control burner air-fuel ratio, take measures in the design stages to prevent backfire, and to prevent adverse effect to this product even if a backfire should occur. A rise in the pipe's internal pressure and flame caused by a burner's backfire could damage this product.

#### 2. Working environment

##### ⚠ WARNING

- Corrosive environment  
Do not use this product in an environment containing corrosive gases such as sulfurous acid.
- Ambient temperature, fluid temperature  
Keep the ambient temperature and fluid temperature within 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 withstanding pressure and operating pressure difference range.  
Using this product at a level exceeding the guaranteed withstanding pressure and operating pressure difference could cause damage. Follow the specified range.

##### ■ Drip-proof environment

This product's protective structure is IP40 or equivalent. Do not install it where it could be subject to water, salt, dust, or cutting chips, or a compressed or decompressed environment. This product cannot be used where the temperature changes sharply or in a highly humid environment as dew condensation in the product could cause damage.

- This product's solenoid proportional valve does not have a complete close-stop.  
If a complete close-stop is required, provide a separate external shutoff valve.  
When the external shutoff valve is closed, wait until this product's valve fully closed (set flow rate: zero). If this product is left in normal control while this external shutoff valve is closed, an instant overflow could occur when the external shutoff valve is opened.  
When using for applications that turn ON/OFF at a high frequency, the life of the proportional valve may be shortened depending on use. Contact CKD when using for applications that turn ON/OFF at a high frequency.

- Do not install this product at a place that moves or vibrates. Vibration or impact could cause this controller to malfunction.

##### ⚠ CAUTION

- Check the leakage current to prevent malfunction caused by current leaking from other controllers.  
When using a programmable controller, etc., the leakage current could cause this product to malfunction.
- Due to wiring, the current input power ground and signal common are the same.  
When driving several of these products with one PLC and D/A unit, depending on the D/A unit's circuit, the correct signal may not be input because of wiring problems. Consult with the PLC maker before using.



# Flow controller Safety Precautions

Always read before starting use

## Small flow controller FCM series

### Design & Selection

#### 2. Working environment

##### ⚠ CAUTION

- Current input is used with input signal 1-5 V, but unlike other voltage input, the input impedance is small at 250  $\Omega$ , so a signal generator that matches this impedance must be used.
- Monitor the pipe's pressure loss  
When piping this product, check that the differential pressure between the upstream side and downstream side is within the operating pressure difference range (refer to page 2). Controller may not operate properly if used outside of the operating pressure difference range.

#### 3. Flow unit

##### ⚠ CAUTION

- This controller's flow rate is measured with mass flow not affected by pressure. The unit is  $\ell/\text{min}$ , that is the mass flow converted to volumetric flow at 20°C 1 barometric pressure (101 kPa).

### Installation & Adjustment

#### 1. Wiring

##### ⚠ DANGER

- Use the power voltage and output within the specified voltage. If a voltage exceeding the specified voltage is applied, the product could malfunction, be damaged, or electric shock or fires could occur. Do not use loads that exceed the output rating. The output could be damaged or fires could start.

##### ⚠ WARNING

- Check the connector pin and cable core wire color when wiring. Incorrect connections could result in sensor damage, problems, and malfunctions, so check the wire color against the instruction manual before wiring.
- Check wiring insulation.  
Check that wires do not contact other circuits, that there is no ground fault, and that the insulator between terminals is not defective. An overload could flow to the product, and result in damage.
- Use a DC stabilized power supply, within the specified rating, insulated from the AC power supply. Failure to insulate the power supply could result in electric shock. If power is not stabilized, the peak could be exceeded during the summer. This could damage this product or cause accuracy to drop.
- Stop controller and devices, and turn power OFF before wiring. Starting operation suddenly could result in unpredictable operation and hazards. Conduct an energized test with controllers and devices stopped, and set target switch data. Discharge any static electricity accumulated by personnel or tools before and during work. Connect and wire bending

resistant material, such as robot wire material, for movable sections.

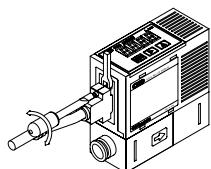
- Do not use this controller at levels exceeding the power voltage range. If voltage exceeding the specified range is applied, or if an AC power (100V AC) is applied, the controller could break or burn.
- Separate this product and its wiring as far away from sources of noise such as power distribution wires. Provide separate measures for surge applied to the power cable.
- Do not short-circuit the load. This product could break or burn.
- Use stabilized DC power completely separated from the AC primary side for stainless steel construction. Connect either the plus or minus side of the power supply to the FG. A varistor (limit voltage. 40 V) is connected between the stainless steel internal power circuit and stainless steel device to prevent dielectric breakdown of the sensor. Do not conduct a withstand voltage test or insulation resistance test between the internal power circuit and stainless steel device. Disconnect wiring if this testing is required. An excessive potential difference between the power and stainless steel device will cause the internal parts to burn.  
After installing, connecting, and wiring the stainless steel device, electrical welding of the device or frame or short-circuit accidents, etc., could cause the welding current, the excessive high voltage caused by welding, or a surge voltage, etc., to run through wiring or ground wire connected between the above devices. This could result in damage to wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

## Installation & Adjustment

### 1. Wiring

#### ⚠ CAUTION

- The option shield cable connector is a shielded wire. Insulate wires that are not being used so that they do not contact other wires, including shielded wires. If inadvertently connected to the ground, etc., the controller could malfunction or break.
- Securely insert the D-sub connector into the back.
- Lock the D-sub connector so that it does not dislocate. Before loosening the lock, fix the fixing block with a tool, etc.



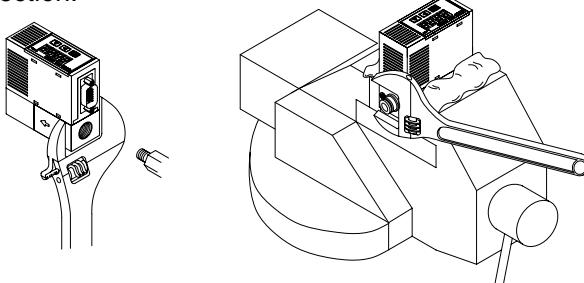
### 2. Piping

#### ⚠ CAUTION

- Pipe based on the fluid direction and the direction indicated on the device.
- Before piping, clean pipes with compressed air to remove any foreign matter or cutting chips, etc. The rectifying unit or platinum sensor could be damaged if foreign matter or cutting chips get in.
- When attaching piping to this product, use the following torques as reference so that excessive screwing torque or load torque is not applied to the connection port.

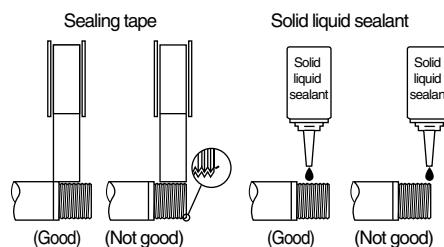
Set screw	Tightening torque N·m
Rc1/4	6~8
9/16-18UNF	6~8

- When piping, put a wrench, etc., on the stainless steel device so that force is not applied to the resin section.



- Check that sealing tape or adhesive does not get inside when piping.

When winding fluorine resin sealing tape around threads, wind the sealing tape one to two times, leaving two to three threads open at the end of the screw. Press down on the tape to stick it onto threads. When using liquid sealing agent, leave one to two threads open from the end, and avoid applying too much. Check that the sealing agent does not get on the device's threads.



- Connect a joint even when using the stainless steel device with the OUT side opened. The port filter could come off.

- When using resin body, do not bend the tube near the push-in joint. If strain could be applied to the tube near the push-in joint, attach an insert ring onto the tube and insert into the push-in joint.
- When using resin body, accurately insert the tube and confirm that it does not dislocate even when pulled. Cut the tube at a right angle with a dedicated cutter before using.

- After piping, confirm that no gas is leaking.

- When using this product for oxygen gas, monitor the following points.

- Piping work must be completed by personnel with expertise on handling oxygen gas.
- Use oil-treated pipes.
- Remove any dirt or burrs from piping before attaching to this product.
- Attach a filter to the primary side of this product.



# Flow controller Safety Precautions

Always read before starting use

## Small flow controller FCM series

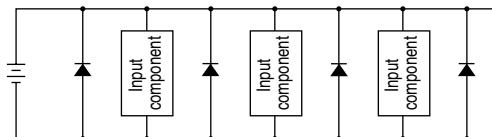
### During use & Maintenance

#### ⚠ CAUTION

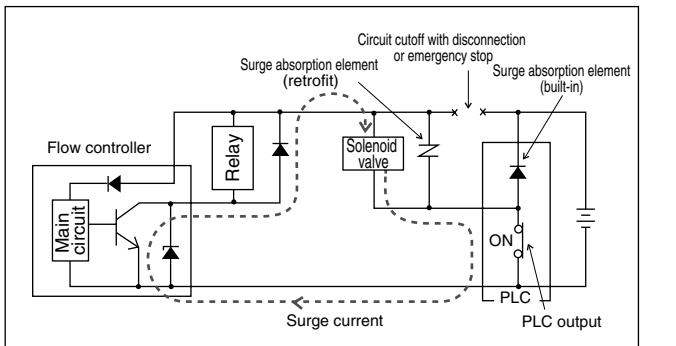
- Output accuracy is affected by the temperature characteristics and heat self-generated when energized. Provide a standby time (10 minutes or longer after turning power ON) when using.
- If a failure occurs during operation, turn power OFF immediately and stop use. Contact your dealer.
- This product does not flow control for two seconds after power is turned ON so it completes self-diagnosis. Provide a control circuit and program that ignore signals for two seconds after power is turned ON.
- Keep this product's flow within the rated flow range.
- Use this product within the operating differential pressure range.
- When the setting is changed, control devices could operate unintentionally. Stop devices before changing settings.
- Regularly inspect the product at least once a year and confirm that it is operating correctly.
- Do not disassemble or modify this product. Doing so could result in faults.
- This case is made of resin. Do not use solvent, alcohol, or detergent to remove any dirt, etc., as the resin could be impregnated. Wipe off any dirt with a rag soaked in a diluted neutral detergent solution and wrung out well.
- Monitor leading of the surge current  
When controller power is shared with an inductive load that generates a surge, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, the surge current could enter the output circuit and cause damage depending on where the surge absorption element is installed.

Take the following types of measures to prevent damage from surge current led in.

- ① Separate the power supply for output comprising the inductive load, such as the solenoid valve and relay, and input, such as the flow controller.
- ② If separate power supplies cannot be used, directly install a surge absorption element for all inductive loads. Note that the surge absorption element connected to the PLC, etc., protects only that device.
- ③ Connect a surge absorption element to the following on power wiring as shown below as a measure against disconnections in unspecific areas.



When devices are connected to a connector, the output circuit could be damaged by the above if the connector is disconnected while power is ON. Turn power OFF before connecting or disconnecting the connector.





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)	O <sub>2</sub> (oxygen)	LN (city gas)	C <sub>1</sub> (methane)	C <sub>3</sub> (propane)		
Full scale flow rate Note 1	*1	Standard model	9500	0 to 500 m 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 type)	●						
			L9500	0 to 500 m ℓ/min	●		●	●	●		
			L0001	0 to 1 ℓ/min	●		●	●	●		
Applicable fluids Note 2	*2		L0002	0 to 2 ℓ/min	●		●	●	●		
			L0005	0 to 5 ℓ/min	●		●	●	●		
			L0010	0 to 10 ℓ/min	●		●	●	●		
			AI	Compressed air, nitrogen	●						
			AR	Argon		●					
Port size, Body material	*3		O2	Oxygen (oil-prohibit specifications)			●				
			LN	City gas (13A) Note 3				●			
			C1	Methane (CH <sub>4</sub> 100%)				●			
			C3	Propane (C <sub>3</sub> H <sub>8</sub> 100%)					●		
			H6	ø6 push in, resin (excluding 50, 100 ℓ/min)	●						
Control		Control range	H8	ø8 push in, resin	●						
			8A	Rc1/4, stainless steel	●	●	●	●	●		
			UF	9/16-18UNF, stainless steel	●	●	●	●	●		
			Responsiveness *1			3 to 100% F.S.					
			9500 to 0020, L9500 to L0020			Within 0.5 sec at setting ±5%F.S. (TYP)					
Pressure		Accuracy	0050 to 0100, L0050 to L0100			Within 1 sec at setting ±5%F.S. (TYP)					
			Repeatability			±3% F.S. or less					
			Temperature characteristics			±1% F.S. or less					
			Pressure characteristics			±0.1% F.S./°C or less (25°C standard)					
			Standard differential pressure Note 4			±1%F.S. or less per 98kPa (standard differential pressure reference)					
Ambient temperature and humidity		Operation differential pressure range Note 5	Refer to separate table.								
			Withstanding pressure *3			Refer to separate table.					
			H6/H8 (resin body)			490 kPa					
Input/output		Output signal *5	8A/UF (SUS body)			980 kPa					
			Display method			0 to 50 °C, 90% RH or less (with no dew condensation)					
			Display range and resolution			3-digit 7-segment LED, display accuracy: control accuracy ± 1 digit					
			Integrating function			Refer to separate table.					
			Power supply voltage			Refer to separate table.					
			Current consumption			24VDC±10% (stabilized power with ripple rate 2% or less)					
			Installation attitude			250 mA or less					
			Wetted area material *3			Free					
			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					
Protective structure			8A/UF (SUS body)			Approx. 480g					
Protective circuit Note 6			IEC standards IP40			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	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
LN/C1							
C3							

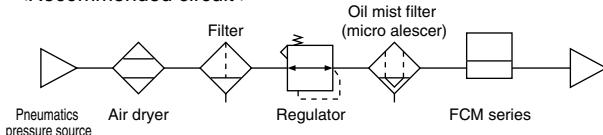
## Display and integrating function

			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 m l/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 m l/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 m l	9999.99 l	9999.99 l	9999.99 l	99999.9 l	99999.9 l	99999.9 l	999999 l
		Display resolution	1 m l	0.01 l	0.01 l	0.01 l	0.1 l	0.1 l	0.1 l	1 l
		Pulse output rate	5 m l	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/m³) on the primary side of this product to maintain product function.

<Recommended circuit >



<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 (CH₄) 88% gas generated from LNG.

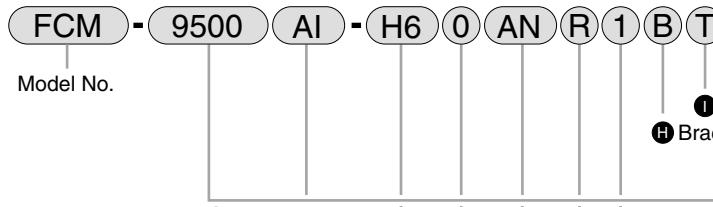
Note 4: The standard differential pressure is the differential pressure when this product is calibrated.

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



● Traceability  
● Bracket

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

Symbol	Descriptions					
B Applicable fluids						
Applicable fluids	AI	AR	O2	LN	C1	C3
AI	Compressed air, nitrogen gas					
AR	Argon					
O2	Oxygen (oil-prohibit specifications)					
LN	City gas (13A)					
C1	Methane (CH <sub>4</sub> )					
C3	Propane (C <sub>3</sub> H <sub>8</sub> )					

Symbol	Descriptions					
C 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	●	●	●	●	●

Symbol	Descriptions					
D Input specifications						
Applicable fluids	0	1	2	LN	C1	C3
0	Analog 0 to 10 VDC					
1	Analog 0 to 5 VDC					
2	Analog 4 to 20 mADC					
P	Parallel 10bit					

Symbol	Descriptions					
E Output specifications						
Applicable fluids	AN	AP	SN	SP		
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)					

Symbol	Descriptions					
F Display direction						
Applicable fluids	Blank	R				
Blank	Positive direction					
R	Reverse direction					

Symbol	Descriptions					
G Cable						
Applicable fluids	Blank	1	3			
Blank	None					
1	1 m					
3	3 m					

Symbol	Descriptions					
H Bracket						
Applicable fluids	Blank	B				
Blank	None					
B	With bracket					

Symbol	Descriptions					
I Traceability						
Applicable fluids	Blank	T	K			
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

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

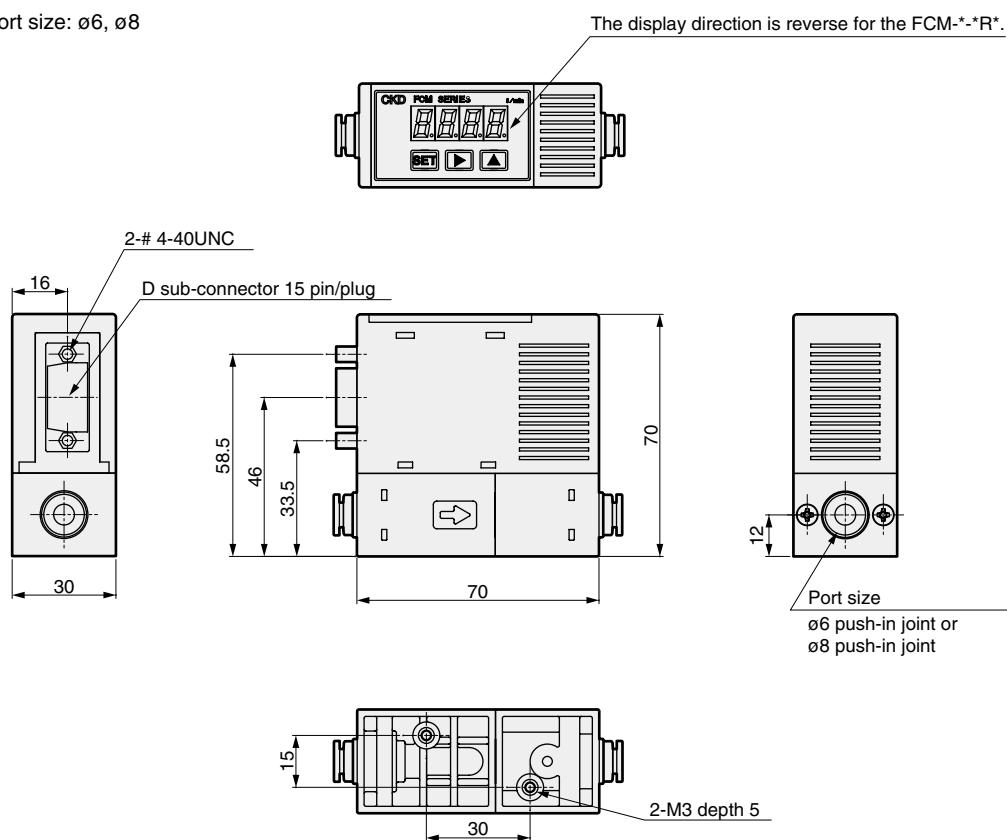
**FCM - AC1**

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

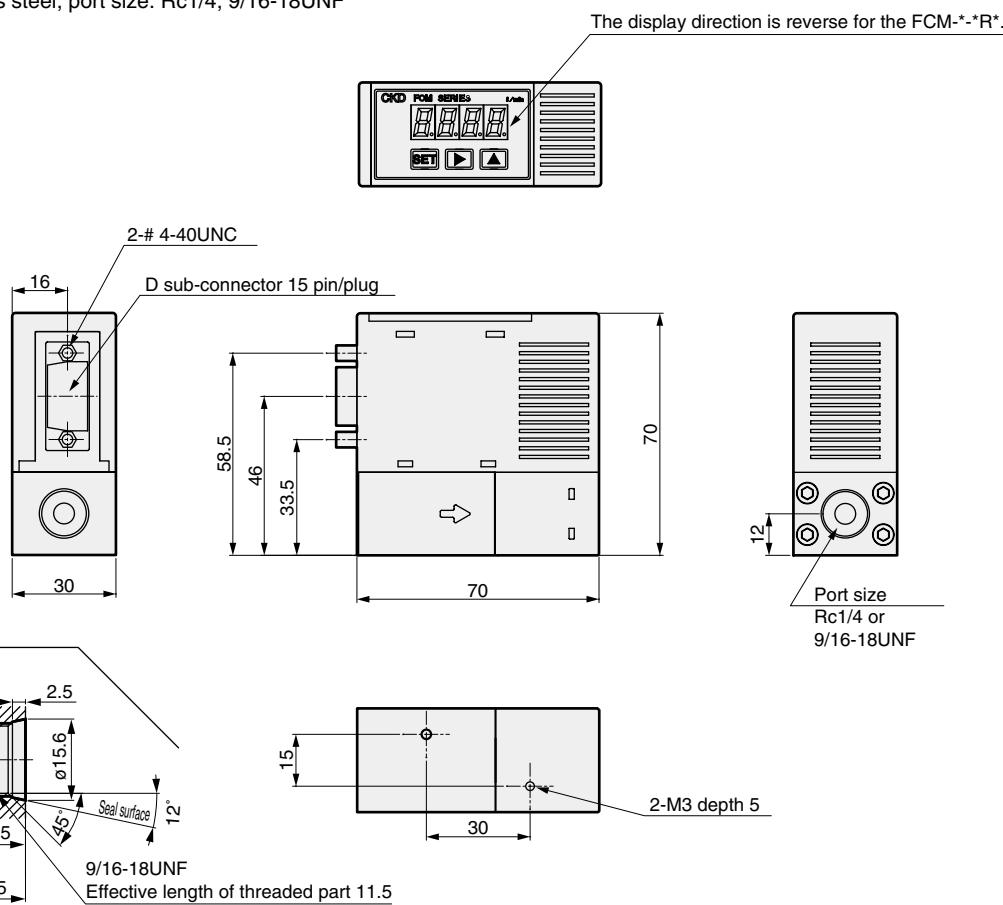
Body material: Resin, port size: ø6, ø8

- FCM-\*H8/H6\*



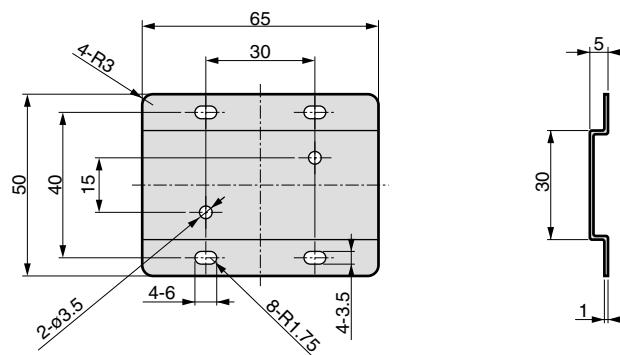
Body material: Stainless steel, port size: Rc1/4, 9/16-18UNF

- FCM-\*8A/UF



## Dedicated bracket (Floor installation type)

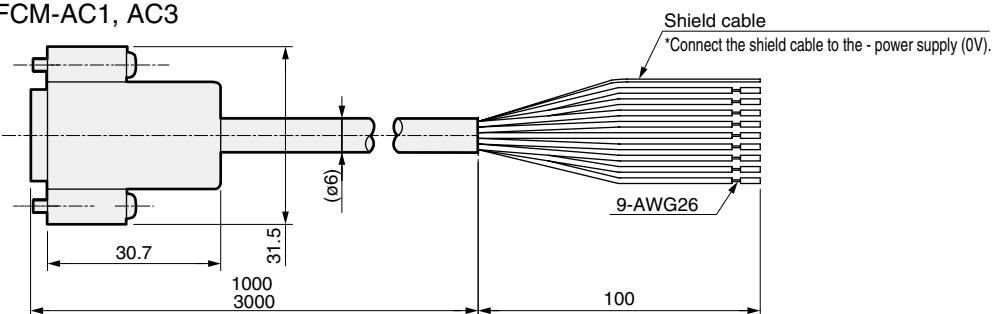
Discrete model: FCM-LB1



## Cable option dimension drawing

- 9-conductor cable for analog input type

Discrete option model: FCM-AC1, AC3

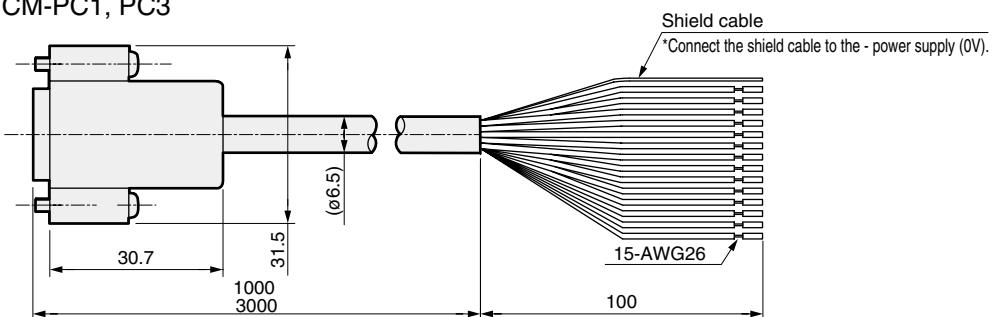


D sub socket pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Insulator color	Brown	Orange	Yellow	-	Red	-	-	-	-	Gray	White	-	Green	Blue	Black
Name	Pre-set input function		Integration reset signal		Power supply+					Input signal zero/span adjustment function	Not used	Analog input	Switch output	Error output	
Type of input	Bit 1	Bit 2		Not used	+24 VDC	Not used	Not used	Not used	Not used	Common	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
															Power supply- (0V)

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



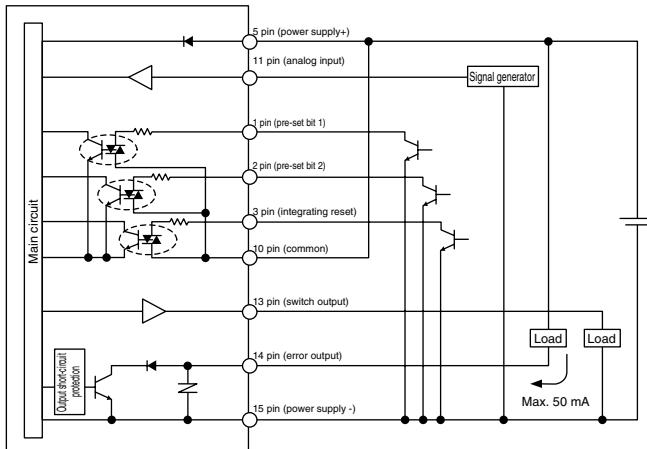
D sub Socket Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Insulator color	Brown	Orange	Yellow	Purple	Red	Light blue	Pink	White (with black line)	Red (with black line)	Gray	White	Green (with black line)	Green	Blue	Black
Name	Parallel input signal				Power supply+	Parallel input signal					Parallel input signal	Analog input function	Switch output function	Error automatic shutdown applicable error (Note)	
Type of input	Bit 1	Bit 2	Bit 3	Bit 4	+24 VDC	Bit 5	Bit 6	Bit 7	Bit 8	Common	Bit 9	Bit 10	1 to 5 VDC	NPN or PNP output	NPN or PNP output
															Power supply- (0V)

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

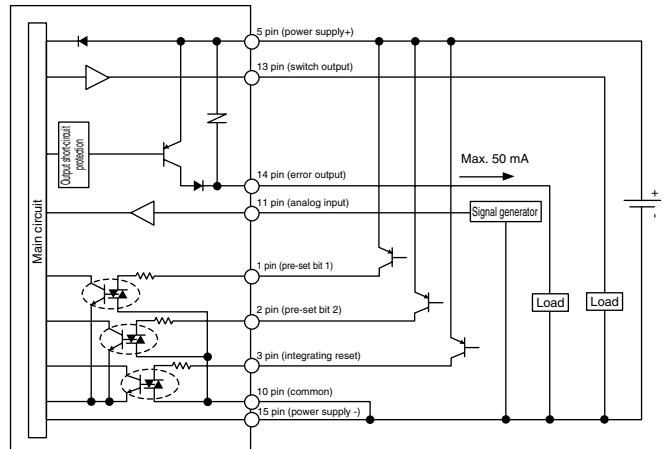
## Wiring method

### Example of internal circuit and load connection, analog input type

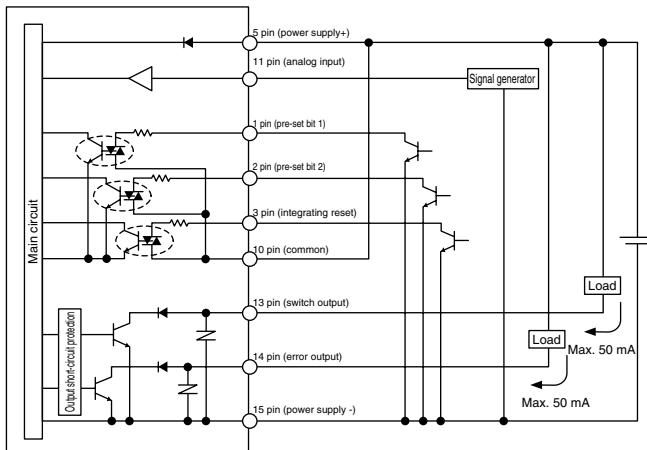
**FCM-\*-\*0/1/2 AN\***  
(Analog input, analog output + error output type NPN output)



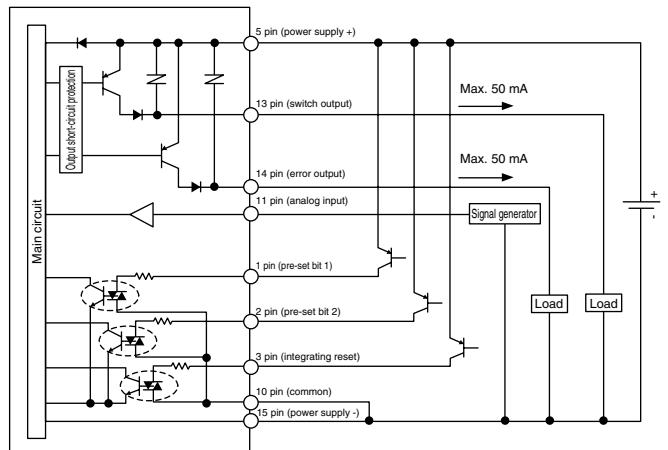
**FCM-\*-\*0/1/2 AP\***  
(Analog input, analog output + error output type PNP output)



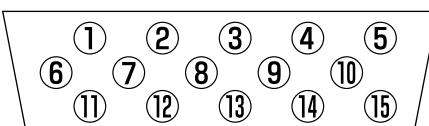
**FCM-\*-\*0/1/2 SN\***  
(Analog input, switch output + error output type NPN output)



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



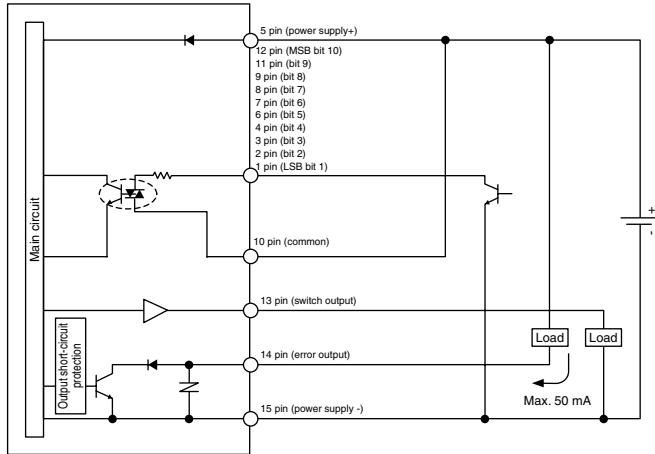
#### ■ Connector pin layout (body side) [Analog input type]



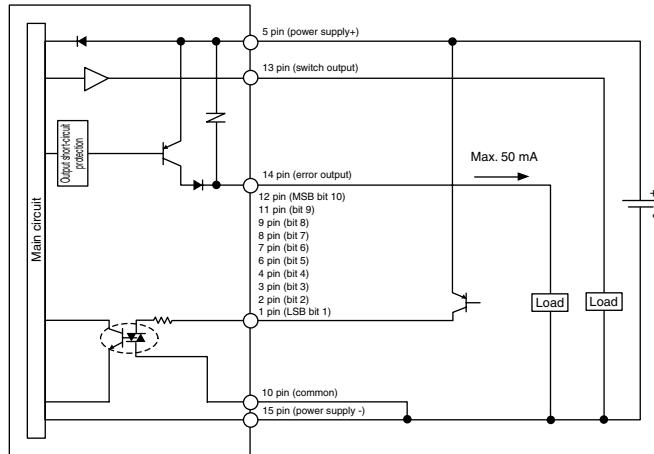
The analog input type does not have the 4, 6, 7, 8, 9 or 12 pins.

## Example of internal circuit and load connection, parallel input type

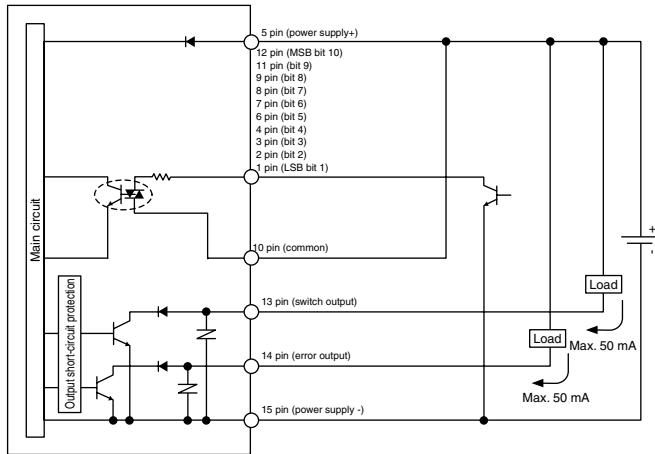
**FCM-\*-\*PAN\***  
(Parallel input, analog output + error output type NPN output)



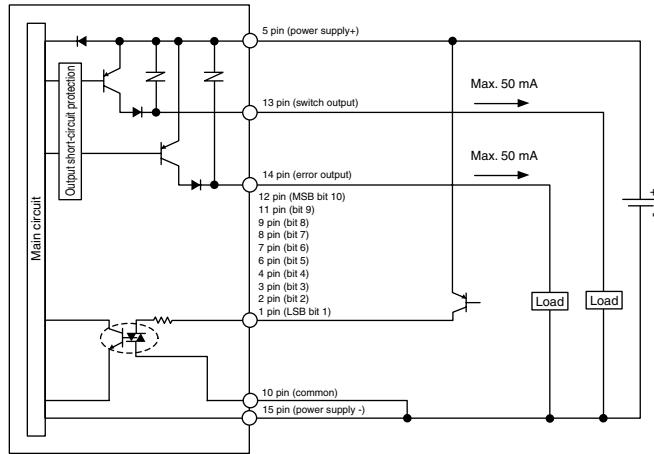
**FCM-\*-\*PAP\***  
(Parallel input, analog output + error output type PNP output)



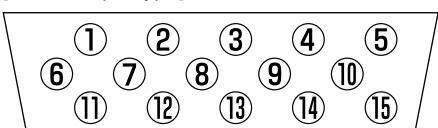
**FCM-\*-\*PSN\***  
(Parallel input, switch output + error output type NPN output)



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

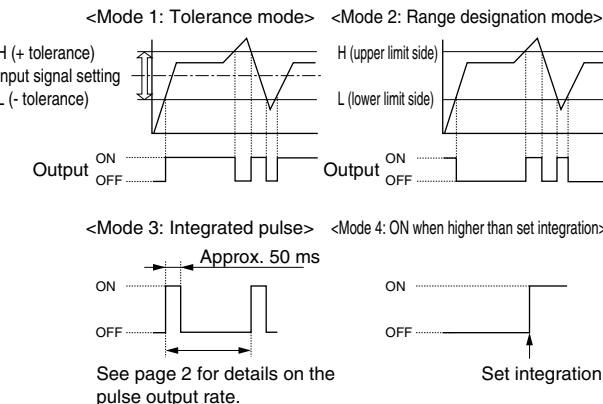


- Connector pin layout (body side)  
[Parallel input type]



## Small Flow Controller FCM Series Functions

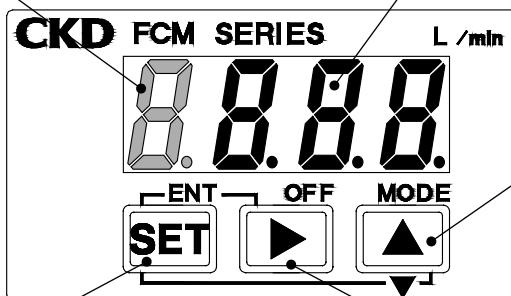
## Explanation of functions

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.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	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.).	<input type="radio"/>	<input type="radio"/>			P12 P21	
Analog input function	The flow rate is controlled with analog input signals.	<input type="radio"/>	<input type="radio"/>			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.			<input type="radio"/>	<input type="radio"/>	P15 P21	
Integrating function	<p>The flow rate is integrated. The following functions are used in addition to the integrated flow display.</p> <ul style="list-style-type: none"> <li>• The solenoid valve is closed and stopped at the set integrated flow.</li> <li>• Integrated pulse function (only switch output)</li> <li>• Switch ON at set integrated flow (only switch output)</li> </ul> <p>Resetting the integrated value</p> <ul style="list-style-type: none"> <li>• Analog input: External input, button operations</li> <li>• Parallel input: Only button operations</li> </ul>	<input type="radio"/>	<input type="radio"/> No integrated pulse switch	<input type="radio"/>	<input type="radio"/> No integrated pulse switch	<input type="radio"/> P16 P17 P20 P22 P23	
Switch output function	<p>The following switch functions are selected.</p> <ul style="list-style-type: none"> <li>• (1) Tolerance mode: The switch turns ON when the level is within the tolerance (randomly set) of control target.</li> <li>• (2) Range designation mode: The switch turns ON when the level is not within the designated flow rate range.</li> <li>• (3) Integrated pulse: The integrated pulse is output during integration.</li> <li>• (4) ON when higher than set integration: The switch turns ON at the set integrated flow.</li> </ul>  <p>See page 2 for details on the pulse output rate.</p>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	P17 P18 P19 P22	
Input signal zero/span adjustment function	The input signal's zero point and span point is changed.	<input type="radio"/>	<input type="radio"/>			P22	
Zero point adjustment	The flow rate output's zero point is adjusted.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	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.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	P22	
Error display function	The error state is displayed. The following functions are used for the error display.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	P9 P23	
Error automatic shutoff	If an error occurs, control is stopped, the valve is fully opened, and error output is turned ON.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	P23	
Key lock	Setting changes are disabled to prevent incorrect operations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	P20	
Setting reset	Settings are returned to defaults.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	P20	

## 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.	<Instantaneous flow rate display>	<Setting details display>	<Error output>
● Values, etc., are displayed when setting each data.			
● The error code No. is displayed when the error is displayed.			
	Setting mode No.	Code No.	Setting mode No.



**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.

<b>SET + ▶ key (ENT key)</b>
<ul style="list-style-type: none"> <li>● Press to set the value.</li> <li>● Press to unlock the key lock.</li> <li>● Press to execute integration reset.</li> </ul>

<b>SET + ▲ key (DOWN key)</b>
<ul style="list-style-type: none"> <li>● Press to count down the value, etc.</li> <li>● Press to lock keys.</li> </ul>

<b>▶ + ▲ key</b>
<ul style="list-style-type: none"> <li>● Press to initialize values.</li> </ul>

## Error code table

Error display	Cause	Measures	Errors subject to error automatic shutoff (Note)
	The supplied power voltage is not within the rating.	<ul style="list-style-type: none"> <li>● Check controller power specifications, set power voltage within the rating range, and turn power ON again.</li> </ul>	○
	The input signal exceeds the rating range.	<ul style="list-style-type: none"> <li>● Check the controller input signal type, set the input signal within the rating range, and turn power ON again.</li> </ul>	○
	An error occurred during EEPROM reading or writing.	<ul style="list-style-type: none"> <li>● Contact your nearest CKD Sales Office or dealer.</li> </ul>	
	An error occurred during memory reading or writing.	<ul style="list-style-type: none"> <li>● Contact your nearest CKD Sales Office or dealer.</li> </ul>	
	The flow rate did not reach the setting for five and over consecutive seconds.	<ul style="list-style-type: none"> <li>● Check the primary pressure, supply pressure within the rated operating differential pressure range, and turn power ON again.</li> <li>● Check that there are no leaks from piping, joints, or other devices, correct connect pipes, and turn power ON again.</li> <li>● Contact your nearest CKD Sales Office or dealer.</li> </ul>	○
	An output error is occurring in the sensor.	<ul style="list-style-type: none"> <li>● Stop the supply of fluids to the controller, set the flow rate to zero, and turn the controller power ON again.</li> <li>    If this error occurs again, contact your nearest CKD Sales Office or dealer.</li> </ul>	○
	Switch output overcurrent protection circuit is activated.	<ul style="list-style-type: none"> <li>● Check whether load current exceeds the rating, correctly connect the controller, and turn power ON again.</li> </ul>	

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>

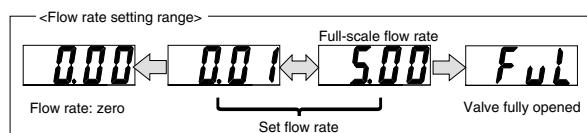
(1) Turn power ON. The instantaneous flow rate is displayed.

(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 key is held down for 2 seconds.

(4) Hold down the 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.



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

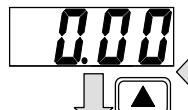
(7) The instantaneous flow rate display is redisplayed after 3 seconds.

#### 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 >

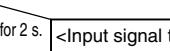
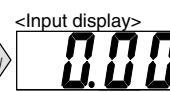


The instantaneous flow rate display is redisplayed after 3 s.

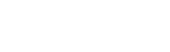
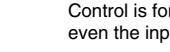
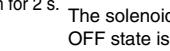
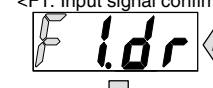
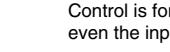
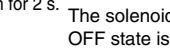
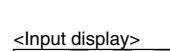
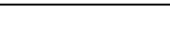
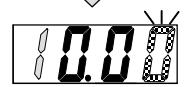
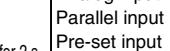
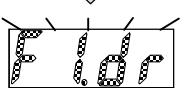
#### <F1: Input signal confirmation>



#### <Input display>



<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



## Controlling the flow rate

### <Direct memory (2) 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 key is held down for 2 seconds.

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

(5) Change the value.

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

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

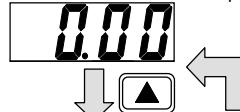
(7) The instantaneous flow rate display is redisplayed after 3 seconds.

### 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>



The instantaneous flow rate display is redisplayed after 3 s.

<F1: Input signal confirmation>

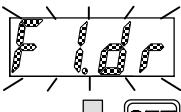


<Input display>



<Input signal type>

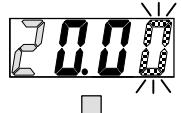
Direct memory input	:	dr
Analog input 0 to 10V	:	A0
Analog input 0 to 5V	:	A1
Analog input 4 to 20 mA	:	A2
Parallel input	:	PA
Pre-set input	:	P1



Hold down for 2 s.



Hold down for 2 s.

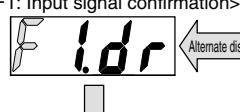


<Target setting>

- key : Moves the digit
- key : Counts up the value
- key : Count down the value



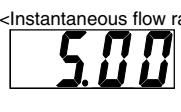
<F1: Input signal confirmation>



<Input display>



<Instantaneous flow rate display>



<Instantaneous flow rate display>

Flow control state



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 key is held down for 2 seconds.

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

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

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

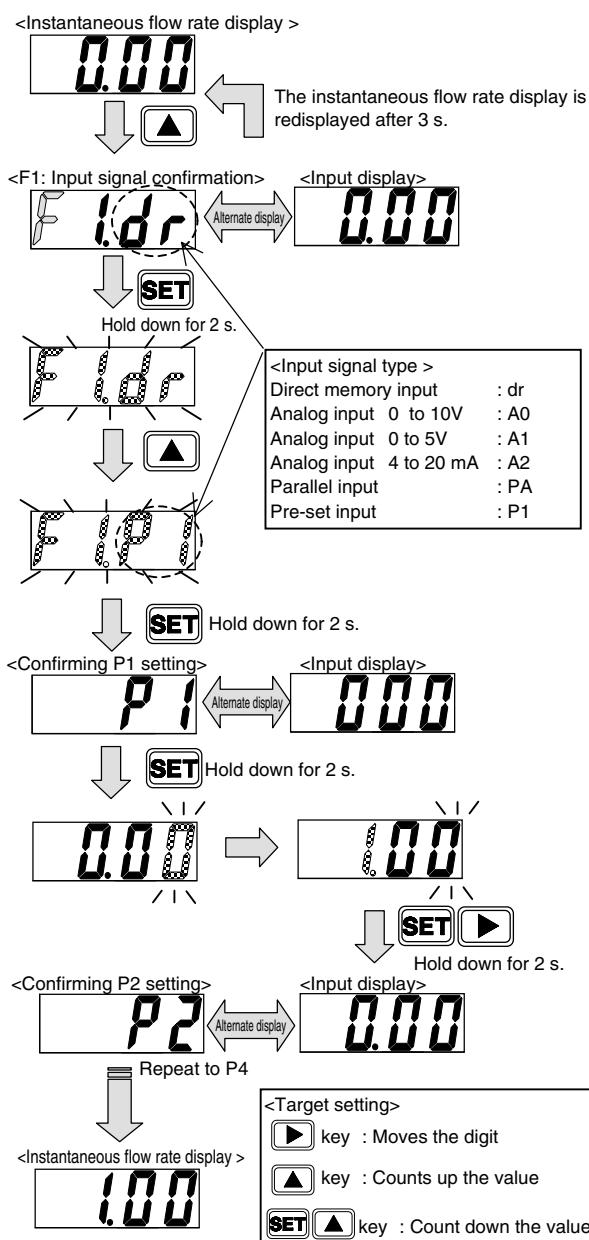
Input the target.

(7) When the 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.



## Controlling the flow rate

### (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.

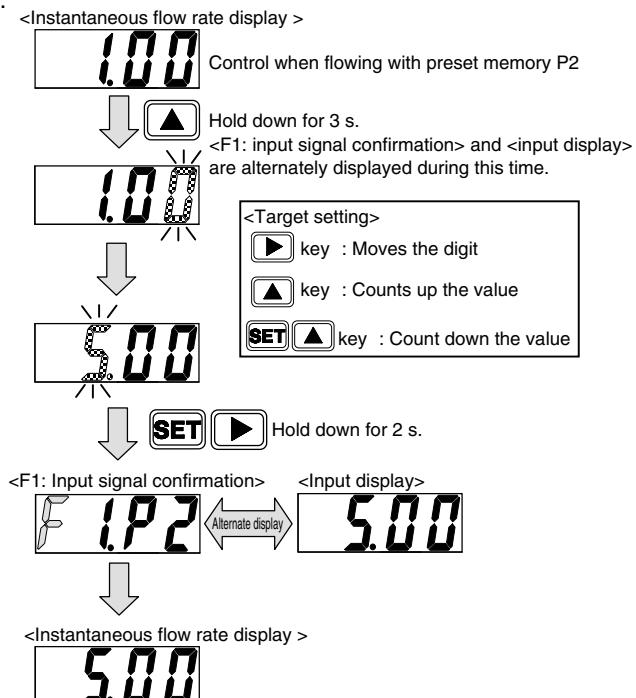
(This is used only when controlling with direct memory or preset input.)

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

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

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

- (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.

#### <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.)

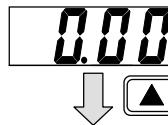
(3) "F1.dr" blinks when the key is held down for 2 seconds.

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

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

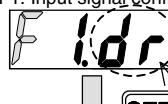
(6) The instantaneous flow rate display is redisplayed after 3 seconds. The flow rate is controlled with analog input.

#### <Instantaneous flow rate display >



The instantaneous flow rate display is redisplayed after 3 s.

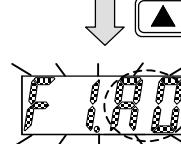
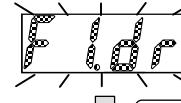
#### <F1: Input signal confirmation>



#### <Input display>

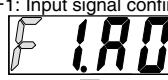


Hold down for 2 s.

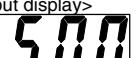


<Input signal type >	
Direct memory input	: dr
Analog input 0 to 10V	: A0
Analog input 0 to 5V	: A1
Analog input 4 to 20 mA	: A2
Parallel input	: PA
Pre-set input	: P1

Hold down for 2 s.



#### <Input display>



#### <Instantaneous flow rate display >



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 × 1023

Example: To set 300 m<sup>3</sup>/min with a full-scale flow 500 m<sup>3</sup>/min

$$300 \text{ (m}^3\text{/min})/500 \text{ (m}^3\text{/min)} \times 1023 = 613.8 \rightarrow 614$$

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 key is held down for 2 s.

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

(5) Hold down the 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.

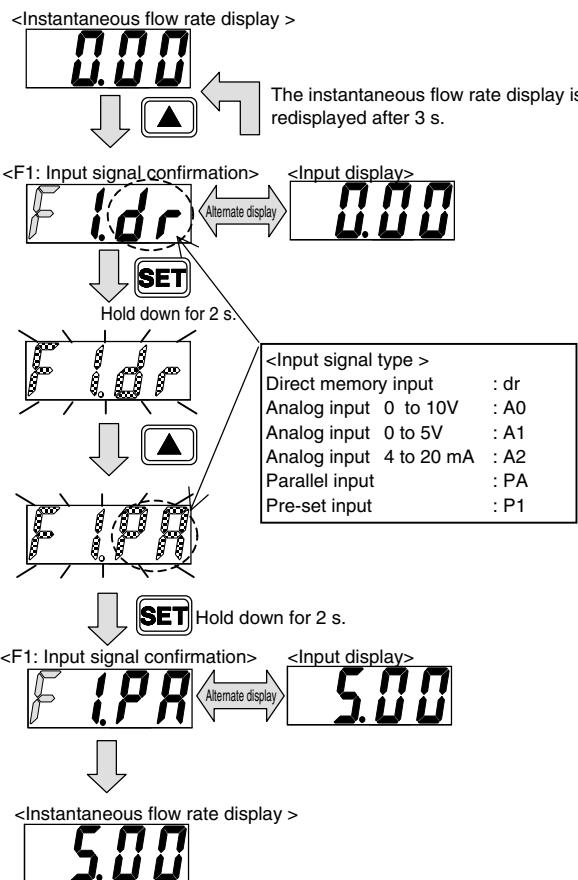
Note: Fully open (FUL) cannot be set with parallel input.

#### <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.



## 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 m l/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 m l	9999.99 l	9999.99 l	9999.99 l	99999.9 l	99999.9 l	99999.9 l	999999 l
	Display resolution 1 m l	0.01 l	0.01 l	0.01 l	0.1 l	0.1 l	0.1 l	1 l
	Pulse output rate 5 m l	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

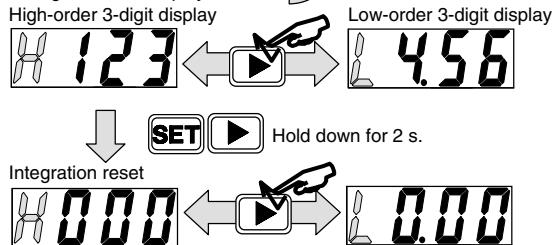
The integration starts when power is turned ON.  
(The integrated value is reset when power is turned OFF.)

#### <Instantaneous flow rate display>



##### (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.

#### <Integrated flow display>



##### (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.

#### Integration reset



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

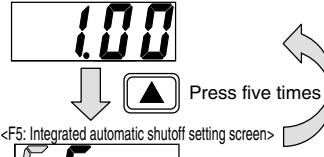
The solenoid valve is closed and stopped when the set integrated flow is attained. This is suitable for processes in which a set amount is supplied, etc.

#### <Operation>

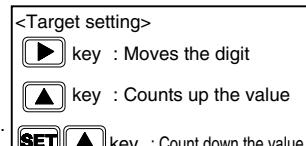
##### (1) Instantaneous flow rate display

##### (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.)

#### <Instantaneous flow rate display>

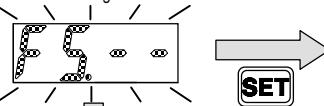


The instantaneous flow rate display is redisplayed after 3 seconds.



##### (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.

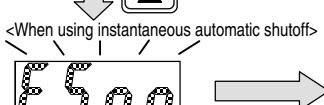
#### <When not using instantaneous automatic shutoff>



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

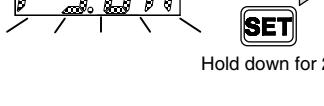
##### (4) To use integration automatic shutoff, press the **▲** key so that "F5.on" blinks. Then, hold down the **SET** key for 2 s.

#### <When using instantaneous automatic shutoff>



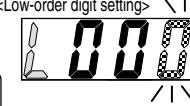
After setting, the <F5 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

##### 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.



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

##### The <F5 screen> is displayed, and after 3 seconds, the instantaneous flow rate screen is displayed.



Hold down for 2 s.

\* 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.

## 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 >

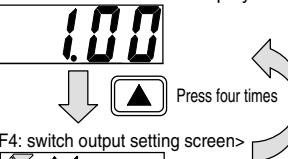
(1) Instantaneous flow rate display

(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 key for 2 seconds, and enter switch output setting mode.

(4) When the key is pressed three times, "F4.3" blinks. When the 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 >



The instantaneous flow rate display is redisplayed after 3 s.

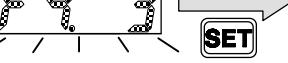
<F4: switch output setting screen>



<F4 - ->



<Integrated pulse setting screen >



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

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.

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 key for 2 s, and enter switch output setting mode.

(4) When the key is pressed four times, "F4.4" blinks.

Hold down the key for 2 seconds, and open the target setting screen.

After setting the high-order 3 digits of the target, hold down the and keys for 2 s.

After setting the low-order 3 digits of the target, hold down the 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 >



The instantaneous flow rate display is redisplayed after 3 s.

<F4: switch output setting screen>



<F4 - ->



<Target setting>



<Target setting>

key : Moves the digit

key : Counts up the value

key : Count down the value

<High-order digit setting> / \



<High-order digit setting> / \

Hold down for 2 s.

<Low-order digit setting> / \



<Low-order digit setting> / \

Hold down for 2 s.

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

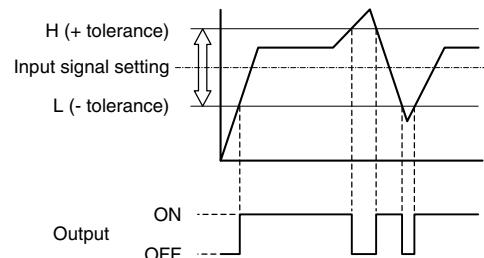
## Using switch output (Only switch output)

### (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.



#### <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.)

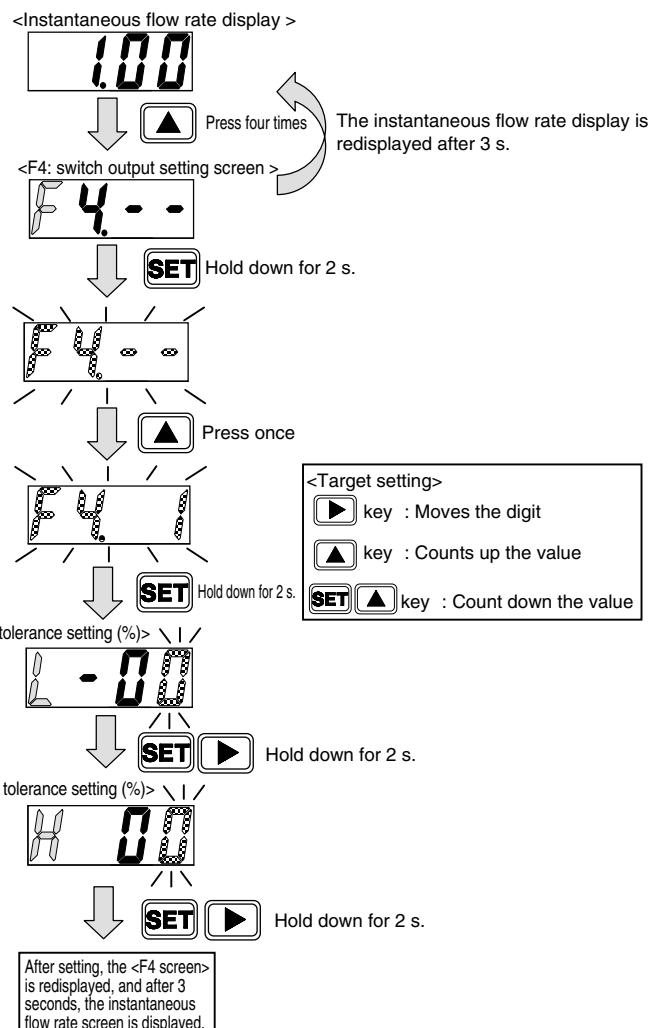
(3) Hold down the **SET** key for 2 s, and enter switch output setting mode.

(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.



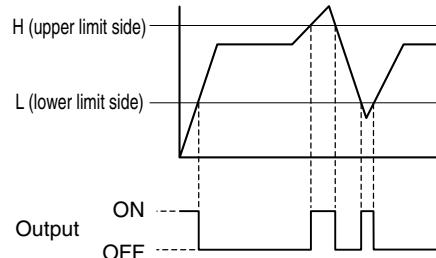
## Using switch output (Only switch output)

### (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 limit are 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.



#### <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

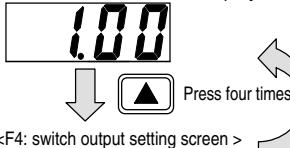
(6) After setting the upper limit value, hold down the **SET** and **▶** keys for 2 s.

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.

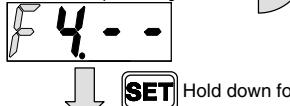
(7) The <F4 screen> is redisplayed, and after 3 s, the instantaneous flow rate screen is displayed.

#### <Instantaneous flow rate display >

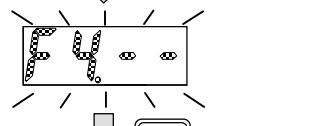


The instantaneous flow rate display is redisplayed after 3 s.

#### <F4: switch output setting screen >

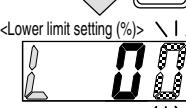


.

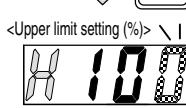


#### <Target setting>

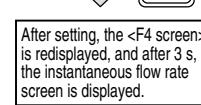
**▶** key : Moves the digit  
**▲** key : Counts up the value  
**SET** **▲** key : Count down the value



.



.

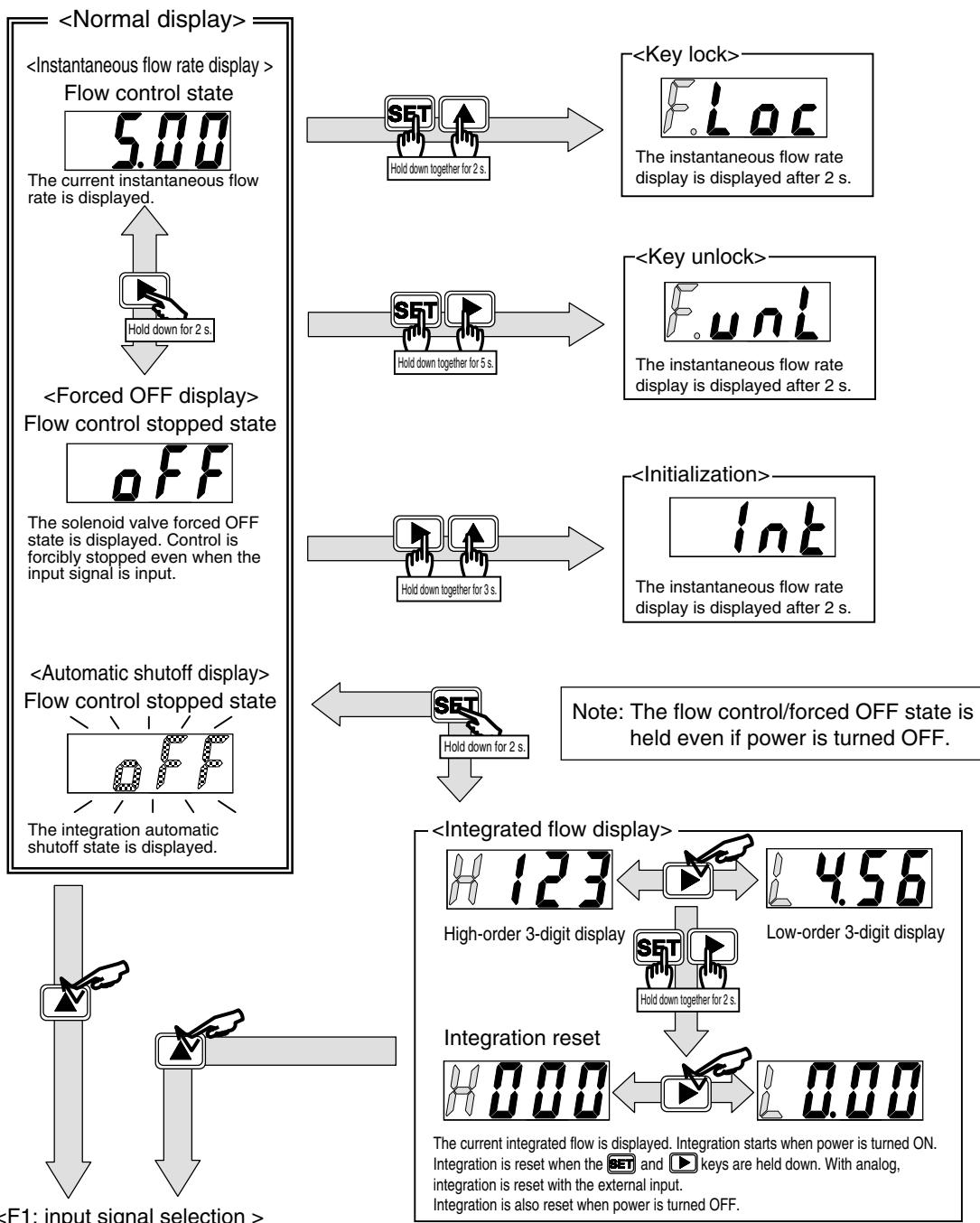


## Operation (List)

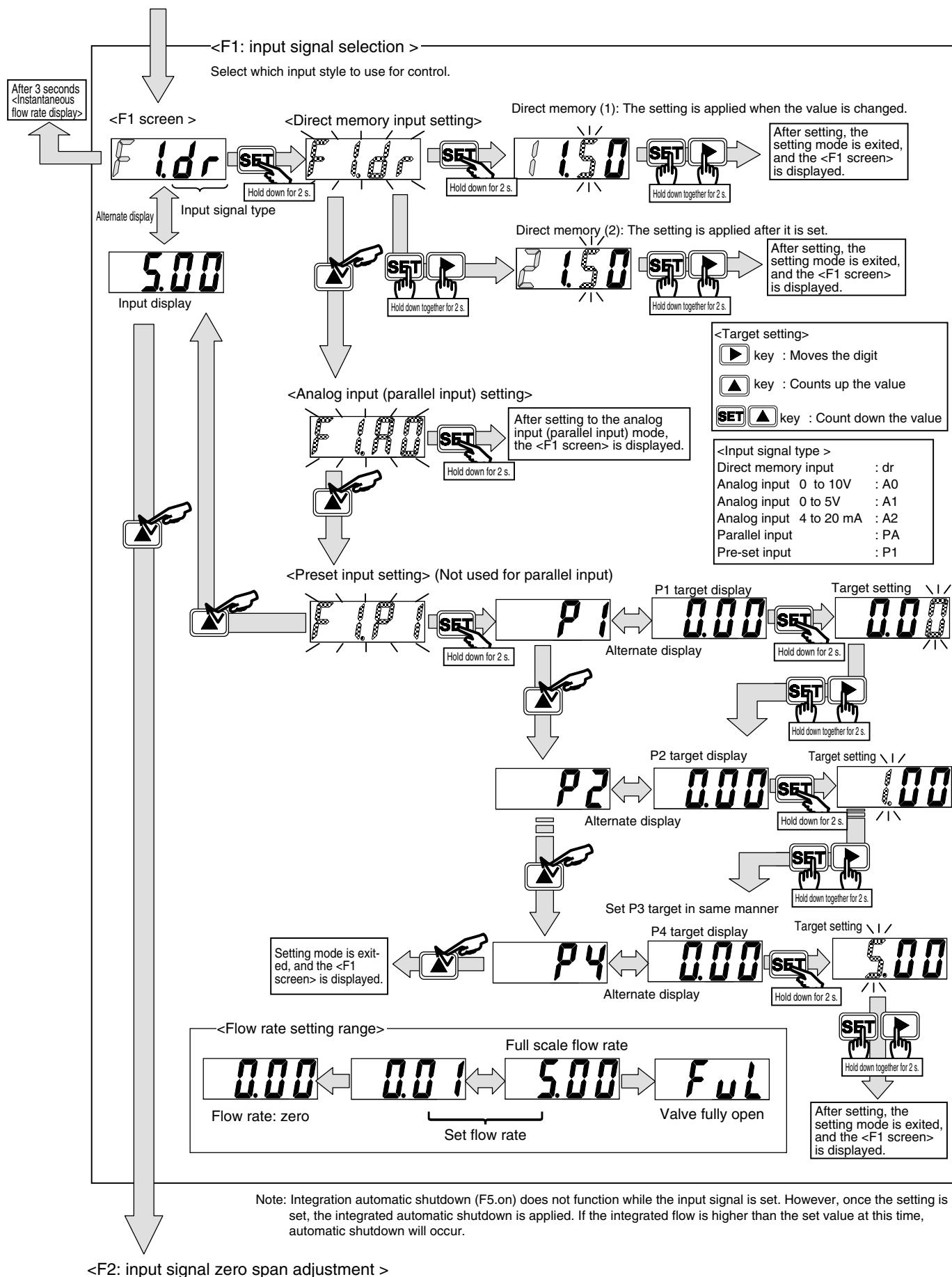
Note: • Keys are unlocked when the controller is shipped. Lock keys if necessary.

The key lock/unlock state is held even if power is turned OFF.

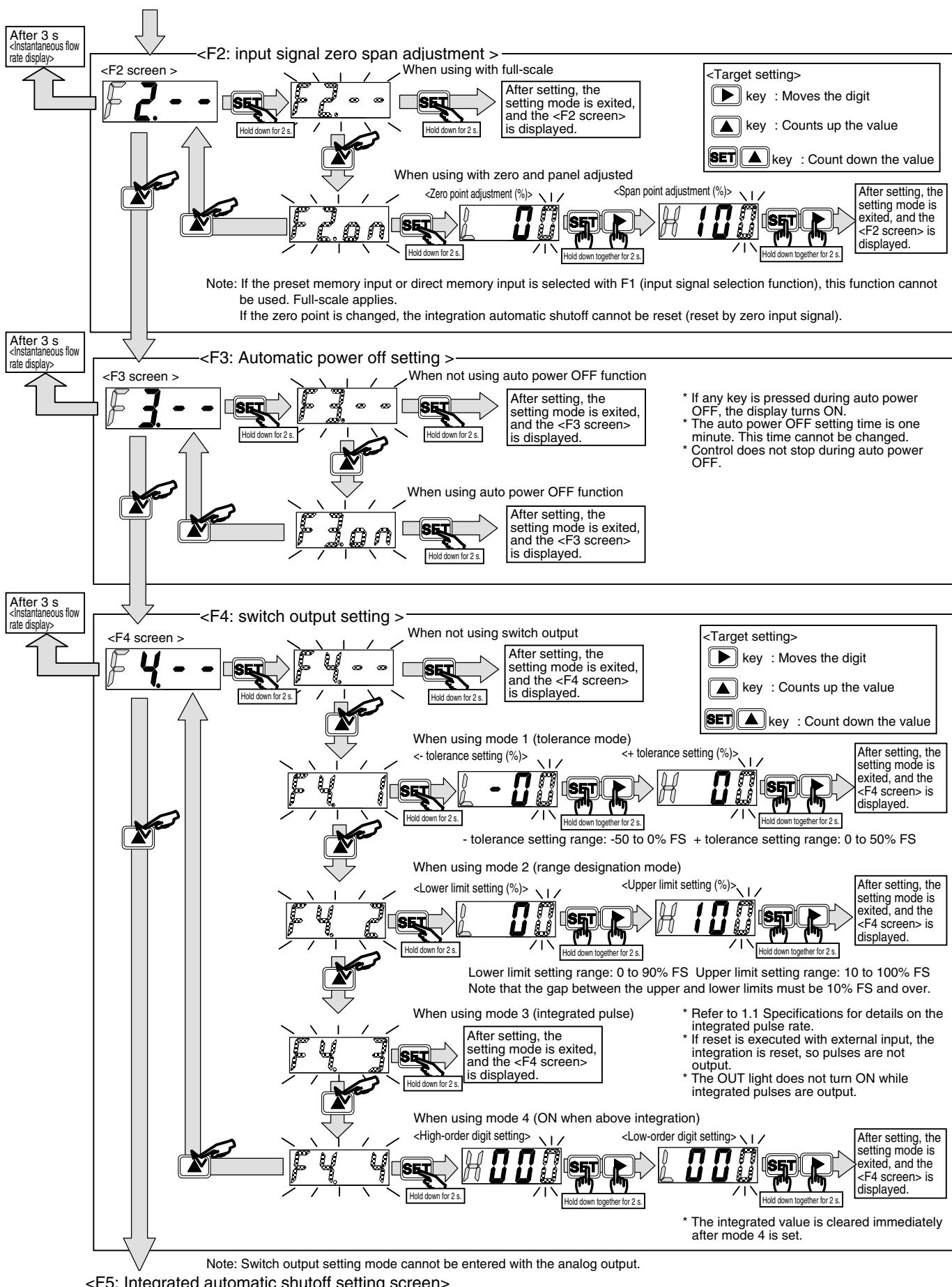
- Control does not stop during the F1: input signal selection or F2: input signal zero/span setting. Take safety into consideration and stop control (forced stop) if necessary.
- The flow control/forced OFF state is held even if power is turned OFF.



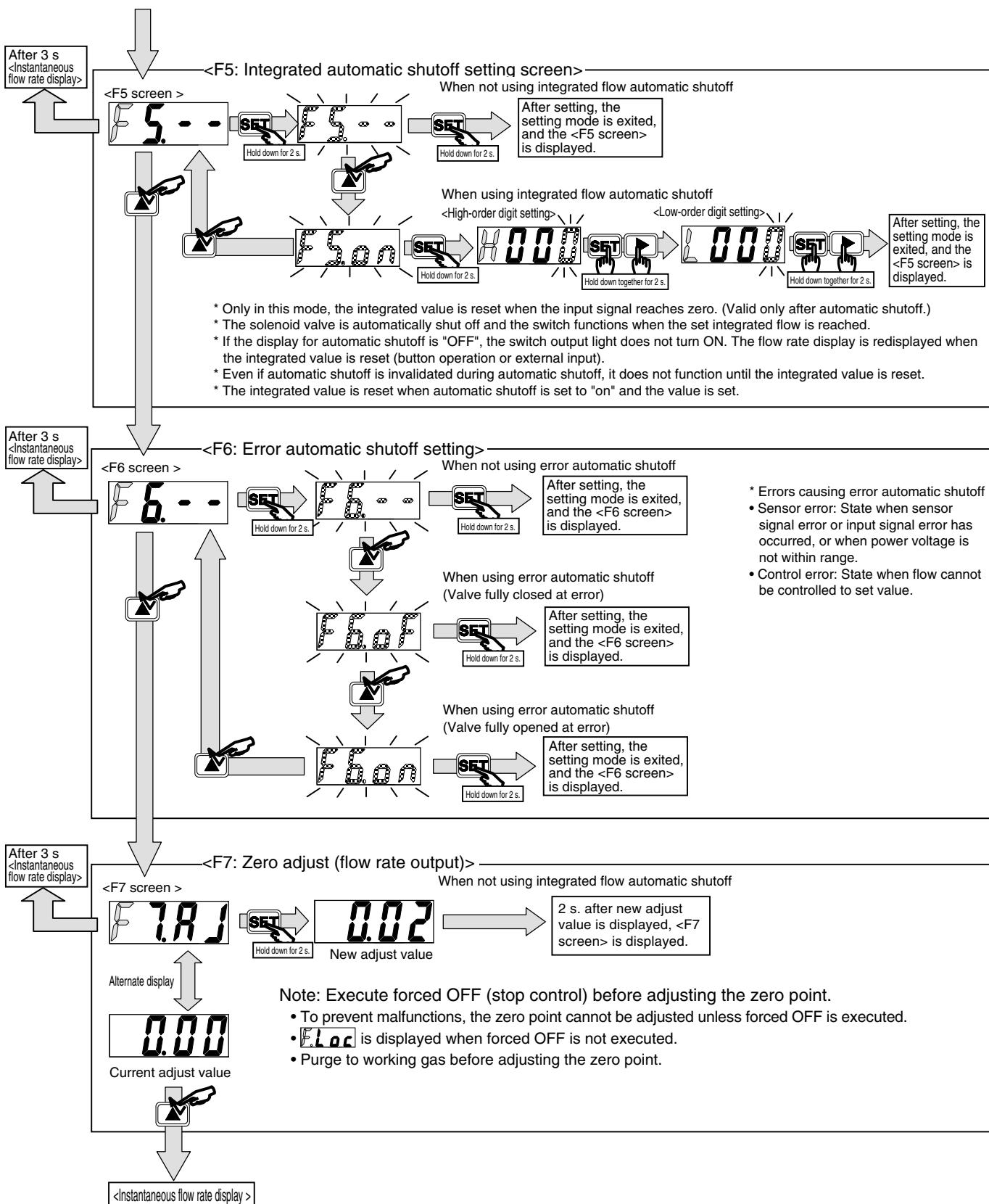
## Operation (List)



## Operation (List)



## Operation (List)



## 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  $1\text{m l/min}$  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 ( $\text{CO}_2$ )

#### FSM-V series

- Ultra-compact, super high-speed response  
Capable of 5 ms high-speed response

Catalog No. CC-687A



### Inline Clean Filter FCS500/FCS1000 Series

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

- 0.01  $\mu\text{m}$  high filtration, 99.99% removal efficiency  
A 0.01  $\mu\text{m}$  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.

