CKD Corporation

SM-9905-A

INSTRUCTION MANUAL

Compressed Air Flow Sensor
PF500·1000·2000·4000·8000SERIES

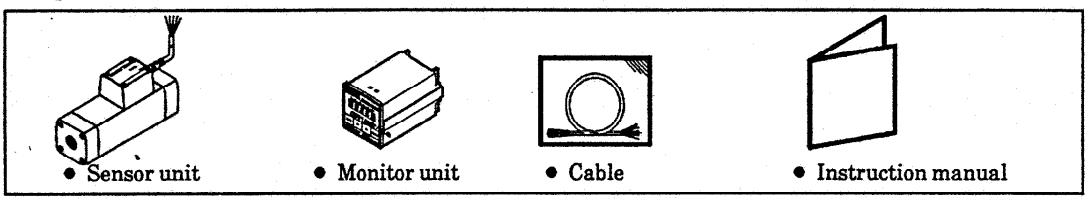
CONTENTS

Instruction Manual
for
Compressed Air Flow Sensor
PF500·PF1000·PF2000·PF4000·8000SERIES
SM-9905-A

1. PRODUCT

1-1. Accessories

This product consists of the following components.Check for missing components



- Sensor unit
- Monitor unit
- Cable
- Instruction manual

1-2. Specifications

Type		PF500 -10	PF500 -15	PF1000 -10	PF1000 -15	PF2000 -10	PF2000 -15	PF4000 -15	PF4000 -25	PF8000 -15	PF4000 -15
Item											
Specifications	Flow rate range (Nℓ/min)	25~500		50~1000		100~2000		200~4000		400~8000	
	Bore	Rc3/8	Rc1/2	Rc3/8	Rc1/2	Rc3/8	Rc1/2	Rc1/2	Rc1	Rc1	Rc11/2
	Pressure loss	0.02 MPa (0.2 kgf/cm²)									
Operating conditions	Applicable fluid	Compressed air									
	Quality of air used	Condensation forming point at atmospheric pressure, 17°C or lower									
	Allowable withstanding pressure	1.4 MPa (14.3 kgf/cm²)									
	Ambient temperature	0 - 50°C, 85% RH or less									
	Max. operating pressure	1 MPa (10.2 kgf/cm²)									
	Fluid temperature	0 - 40°C									
Accuracy	Linearity	±1.5% FS									
	Pressure characteristic	±1.5% FS (0.4 - 0.7 MPa)									
	Temperature characteristic	±2.0% FS (0 - 40°C)									
Response time		1.25 sec									
Output	Output voltage	DC 0 - 5V (Linear output)									
	Switch output	Relay contact (1 ch, a contact)									
Power source voltage		AC 100 V (10 W or less)									
Cable		3 m, with connector, (conductor)									
Set value holding function		To be held semi-permanently because of the use of E²ROM									
Mounting	Mounting direction	Vertically or horizontally									
	Lead-in straight tube	Unnecessary									
Protective structure		1P64 (the sensor unit only, however)									

1-3. Type indication method

PF4000 — 15 — B

① ② ③

①Flow rate range		②Bore		③Bracket	
500	25~500 Nℓ/min	10	Rc3/8	No symbol	None
		15	Rc1/2	B	Bracket
1000	50~ 1000Nℓ/min	10	Rc3/8		
		15	Rc1/2		
2000	100~ 2000Nℓ/min	10	Rc3/8		
		15	Rc1/2		
4000	200~ 4000Nℓ/min	15	Rc1/2		
		25	Rc1		
8000	400~ 8000Nℓ/min	25	Rc1		
		40	Rc11/2		

Note: Type of bracket,
PF500,1000,2000,4000 TypePF4000-F4-191730
PF8000 TypePF8000-F4-191731

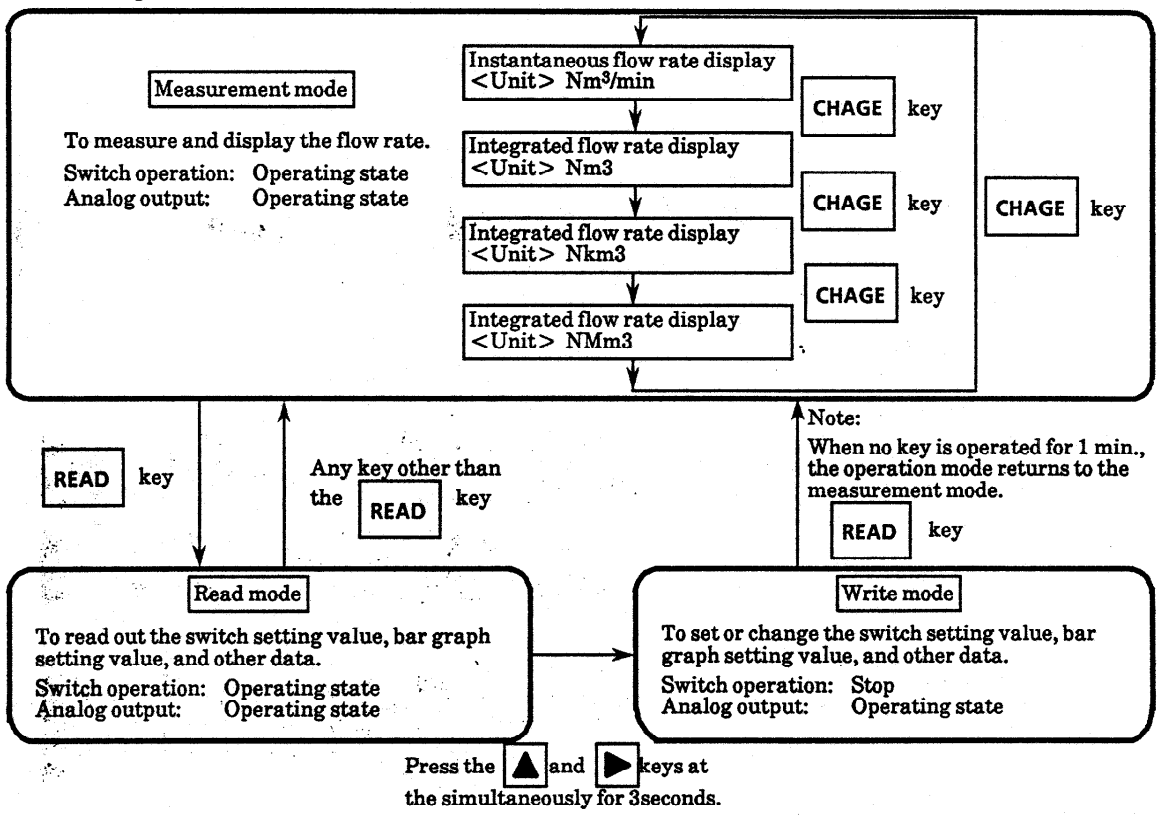
Example of type indication,

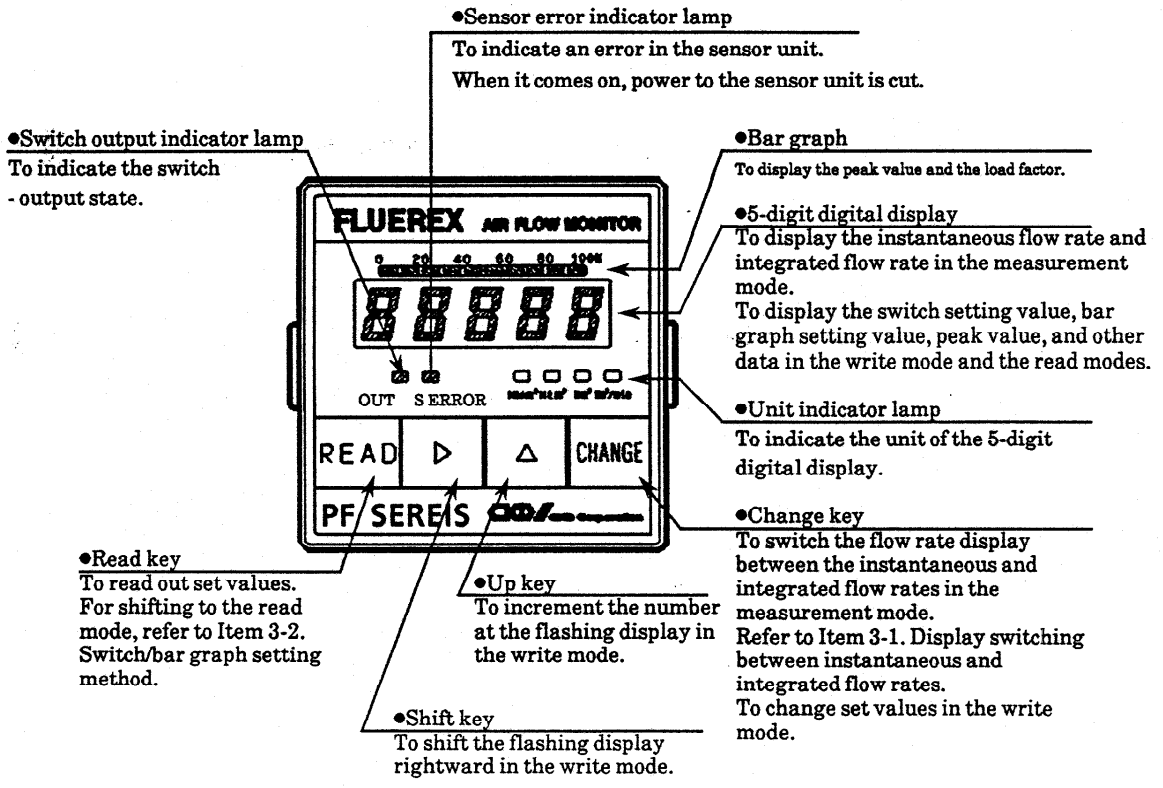
PF4000-15-B .....

- Flow rate range
- Bore
- Indicates that the bracket is provided.

1-4. Name and function of each component

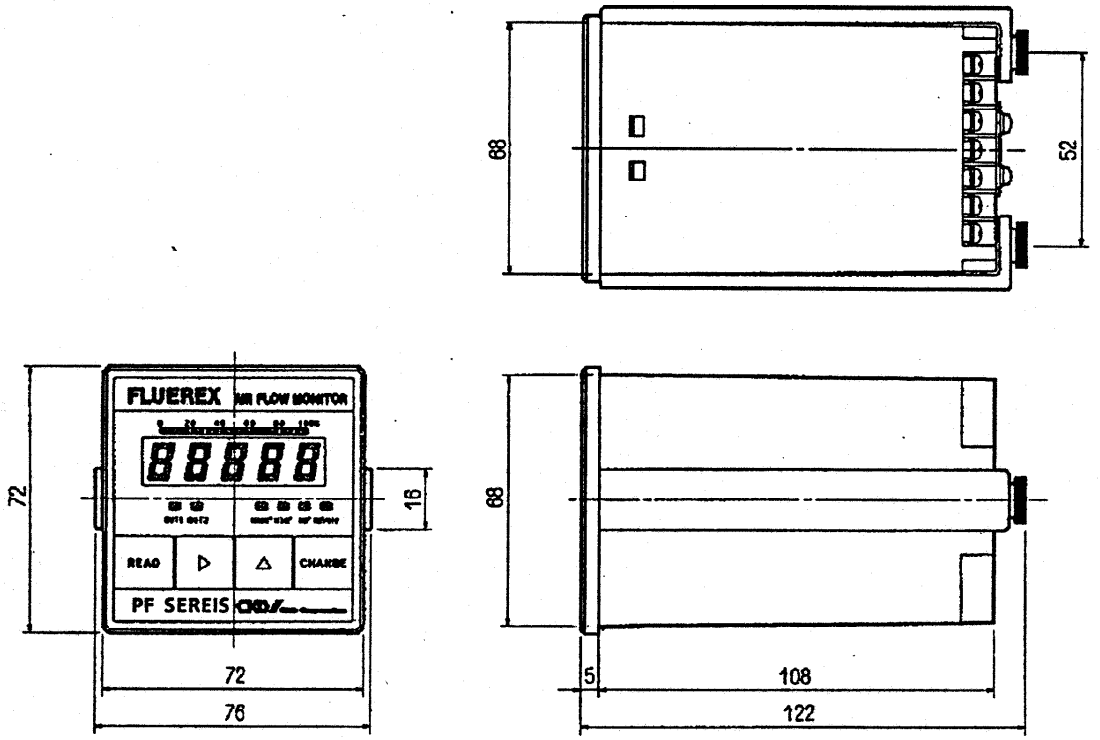
●Description of mode



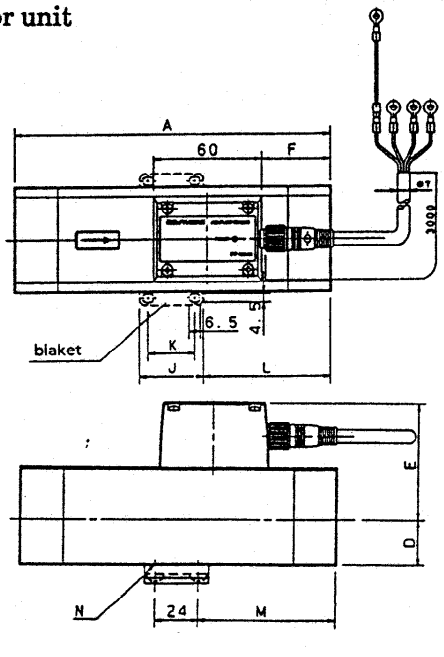


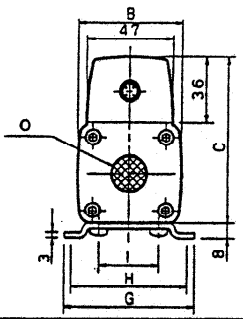
1-5.Dimensioned outline drawing

- Monitor unit



- Sensor unit





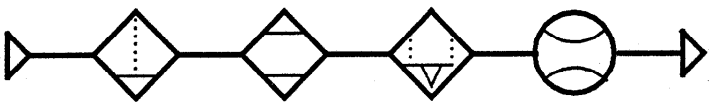
	o
-10	Rc 3/8
-15	Rc 1/2
-25	Rc 1
-40	Rc 1 1/2

MODEL No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N
PF300-**/PF1000-** PF2000-**	135	52	82	22.5	59.5	24	72	64	33	36	26	49.5	55.5	M4 deep 9
PF4000-**	176	57	91	27	64	38	72	64	33	36	26	70	76	M4 deep 9
PF8000-**	188	66	99	31	68	44	84	74	42	40	28	74	82	M5 deep 6

2. PRECAUTIONS

2-1. Precautions concerning use

When the compressed air contains drain (water, oxidized oil, foreign matter, etc.), attach the filter, air dryer, and micro Eressa to the primary side system



Filter Air dryer Micro Eressa PF SERIES

2-2. Switch output

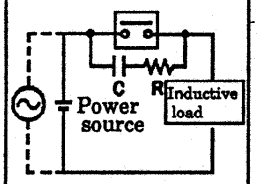
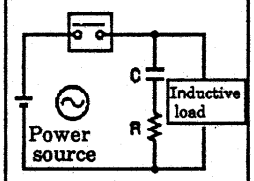
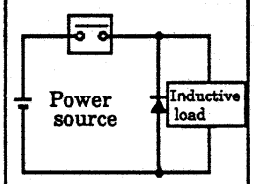
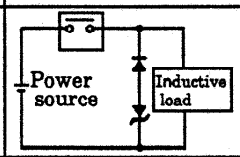
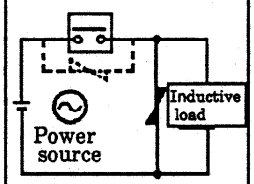
One independent contact is provided in the monitor unit. Use it according to the following precautions.

- Contact portion specifications

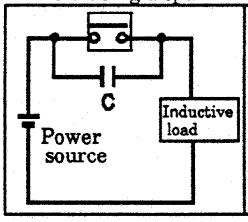
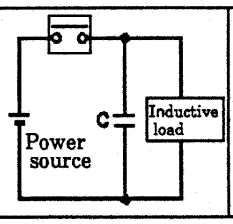
(Built-in relay:G2Q-187P-V, Omron)

Item \ Load	Resistive load (COSØ)	Inductive load (COSØ=0.4, L/R=7ms)
Rated load	AC 110 V 0.5 A DC 24 V 1 A	AC 110 V 0.2 A DC 24 V 0.3 A
Rated load current	2 A	
Max. contact voltage	AC 125 V, DC 60 V	
Max. contact current Max. open/close capacity	60 VA, 30 W	30 VA, 15 W
Min. applicable load (P level, reference value)]	DC 5 V, 1 mA	

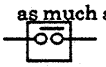
Protection of the monitor unit

Example of circuit		Application AC	Application DC	Features and other descriptions	How to select elements
CR type		* △	○	When used with an AC source, the impedance of the load should be much smaller than that of the CR.	Standards of C and R C: 1 to 0.5 uF with a contact current of 1 A. R: 0.5 to 1 ohm with a contact voltage of 1 V. Actual values do not completely conform to the above values for reasons of a variation in load characteristics. Confirm the discharge suppression effect of C upon contact separation and the current limiting role of R upon contact closing, by conducting experiments. The withstanding voltage of C should generally be between 200 and 300 volts. When an AC circuit is used, use a capacitor for AC (without polarities).
		○	○	When the load is a relay, solenoid, etc., the reset time is delayed. When the power source voltage is within 24 or 48 volts, connection of the C and R across the load is effective. When the power source voltage is within 100 to 200 volts, connection of the C and R across the contact is effective.	
Diode type		×	○	The energy stored in the coil is conducted to the coil in the form of current by means of the diode in parallel to the coil, and is radiated as thermal energy by the resistive component of the inductive load. In this type, the reset time is delayed more than in the CR type.	Use such a diode that the withstanding inverse voltage is 10 times or more than the circuit voltage and the forward current is larger than the inverse current. In an electronic circuit, when the circuit voltage is not so high, such a diode that the withstanding inverse voltage is nearly 2 to 3 times the power source voltage may be used.
Diode and Zener diode type		×	○	The use of this type is effective when the reset time is delayed too much with the diode type.	Use such a zener diode that the zener voltage is close to the power source voltage.
Varistor type		○	○	This type prevents application of too high a voltage between contacts, by utilizing the constant voltage characteristic of the varistor. In this type as well, the reset time is delayed a little. When the power source voltage is within 24 to 48 volts, connection of the varistor across the load is effective. When the power source voltage is within 100 to 200 volts, connection of the varistor across the contacts is effective.	Select the cut-off voltage Vc so as to satisfy the following condition. In the case of an AC circuit, the cut-off voltage should be multiplied by the square root of 2. Contact withstanding voltage > Vc > Power source voltage

●Avoid using a spark killer in the following manner.

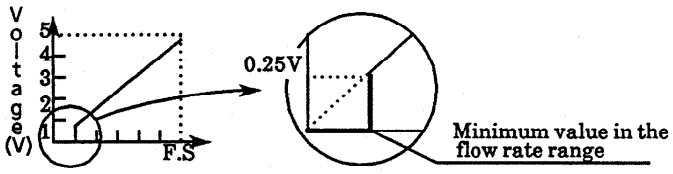
	This is very effective in extinguishing arcs generated upon separation. However, because an electricity is stored in C when the contacts are separated, a short-circuit current is discharged when contact is made; the contacts are welded.		This is very effective in extinguishing arcs generated upon separation. However, because the current which charges C flows when contact is made, the contacts are easily welded.

It is usually thought that a DC inductive load is difficult to switch on and off when compared to a resistive load. However, the use of an appropriate spark killer enhances the DC inductive load to almost the same performance as that for a resistive load.

- The wires should be as short as possible so as not to be affected by noise, and should be separated as much as possible from noise sources such as strong current carrying wires.
-  indicates a relay within the monitor.

2-3. Analog output

The relationship between the flow rate and the analog output (0 to 5 volts DC) is shown below.



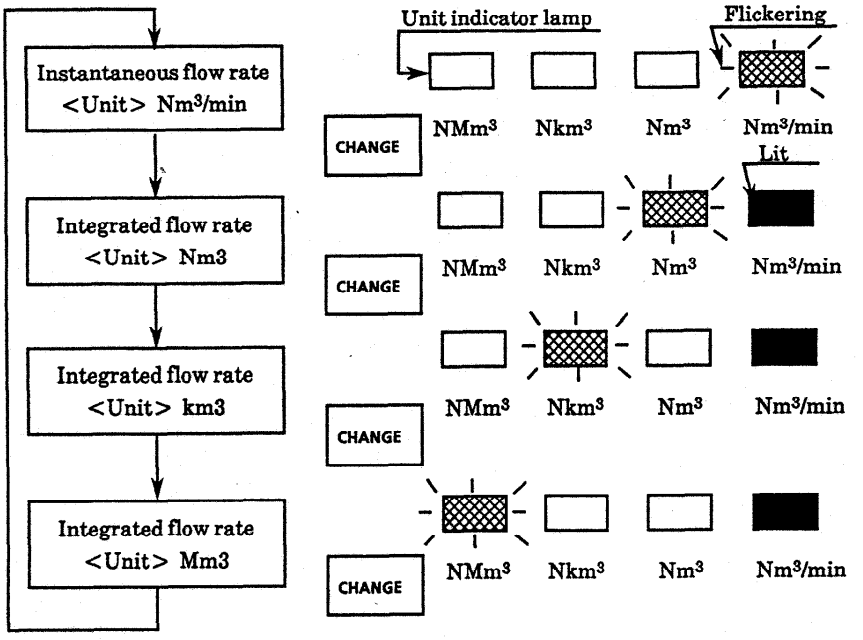
Type	Min. value (Nℓ/min)	FS (Nℓ/min)
PF500	25	500
PF1000	50	1000
PF2000	100	2000
PF4000	200	4000
PF8000	400	8000

However, the monitor unit displays a value even lower than the minimum value.

- When external equipment such as a recorder is connected, its load resistance should be 10 kilohms or larger.
- The analog output terminal (AO) should never be shorted with an other terminal so as to prevent failures.
- The wires should be as short as possible so as not to be affected by noise, and should be separated as much as possible from noise sources such as strong current carrying wires.

3. OPERATION

3-1. Changing display between instantaneous and integrated flow rates



Temporary switching of flow rate display *1	Switching of flow rate display usually shown *2
1) Press the CHANGE key and the display will be switched as above. 2) During temporary display, the unit indicator lamp is flickers. 3) After 10 seconds, the original display will appear.	1) Make the desired display appear by pressing the CHANGE key, and in that state, continue to press the same key for 5 seconds. 2) When the unit indicator lamp which was flickering has changed to the continuously lit state, the change is complete. 3) After shipment from the factory, the instantaneous flow rate is usually displayed.

* 1Temporary switching of flow rate display
To be used when you want to display the integrated flow rate for a short time.

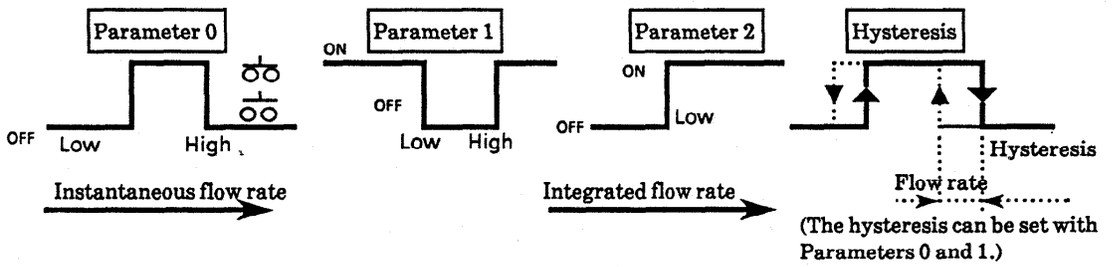
* 2 Changing of flow rate display usually shown

To be used to select the flow rate which you want to display at all times

3-2. Switch/bar graph setting method

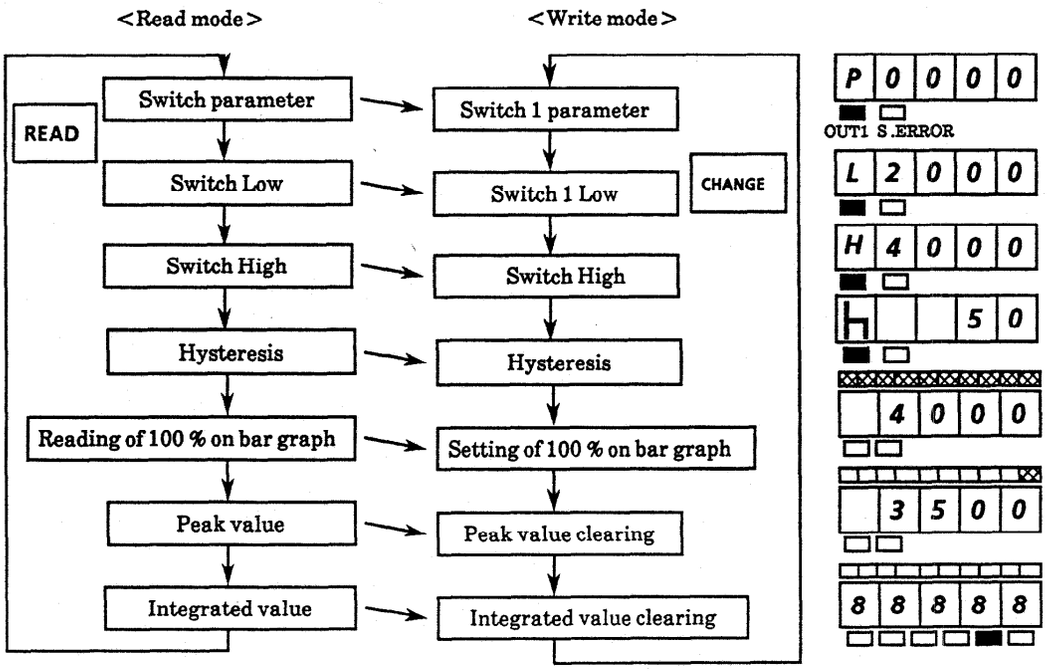
(1) Switch parameter and switch hysteresis

The sensor can be used in various ways by setting the relay contact built in the monitor as follows.



(2) Reading Read mode and setting Write mode of switch/bar graph setting values.

Press the ▲ and ▶ keys simultaneously for 3 seconds.



<To change over to the instantaneous flow rate display (or the integrated flow rate display) usually shown>

Read mode — CHANGE key

Write mode — READ key

<Set value for 100 % on bar graph>
To display the load factor, etc., set the 100 % flow rate on the bar graph.

<Peak value (Peak value clearing)>
To display the peak value during 24 hours from power ON or peak value clearing.
Execution of an operation of the CHANGE mode clears the peak value.
(However, the ▶ and ▲ keys should be pressed simultaneously for 10 seconds.)

<Integrated value clearing>
To clear the integrated flow rate in the CHANGE mode.
(However, the ▶ and ▲ keys
should be pressed simultaneously for 10 seconds.)

4. INSTALLATION

4-1. Installation of the monitor unit

(1) Installation place

① Ambient temperature and humidity
Ambient temperature ..... 0 - 50°C
Ambient humidity ..... 85% RH or less

② Avoid places where the temperature transition is steep or temperature fluctuation are large.

③ When installing in a place exposed to radiant heat from heat sources, take measures in respect to heat insulation and ventilation.

④ Avoid places subjected to vibration and impact.

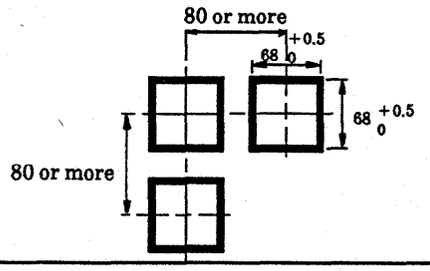
(2) Panel mounting

Remove the fitting and fit the monitor unit in the panel. Then, attach the fitting again.

- Cut panel dimensions

The standard cut panel dimensions is as shown below.

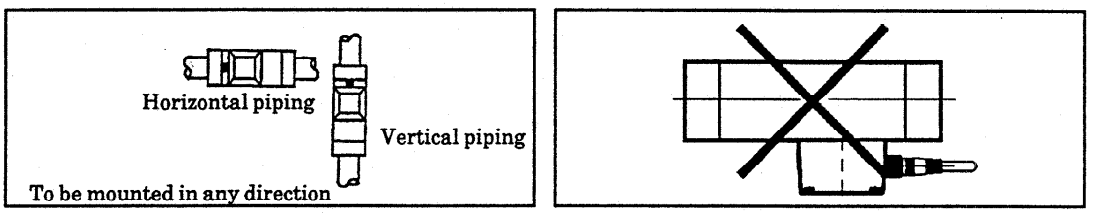
Note: The appropriate panel thickness is 1 to 4 mm.



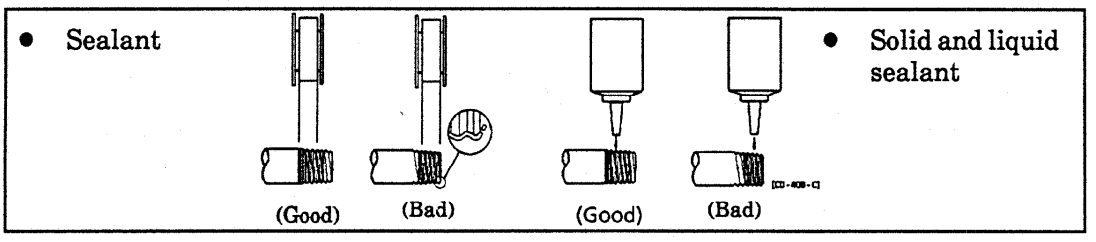
4-2. Sensor unit mounting

When mounting the sensor unit, pay attention to the following points.

- To connect to the sensor unit, use Rc1/2, Rc1, and Rc1 1/2 screws.
- Mount the unit in such a manner that the flow direction of measured fluid and the arrow marked on the sensor unit conform to each other.
- The unit can be mounted in the vertical, horizontal, or any other direction. However, the plastic cover part should not face downward.

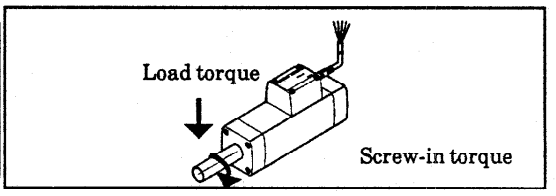


- When connecting piping to the sensor unit, use care so as to prevent foreign matter from entering the pipes. Pay particular attention to the amount and application of sealant and tape.

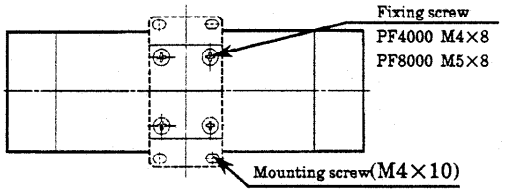


- When connecting piping to the sensor unit, do not apply excessive screw-in torque or load torque to the passage, pipes, etc. Also, do not apply a force to the plastic cover part.

	PF500 PF1000 PF2000	PF4000	PF8000
Max. screw-in torque (kgf-cm)	500	500	750
Max. load torque (kgf-cm)	400	400	500



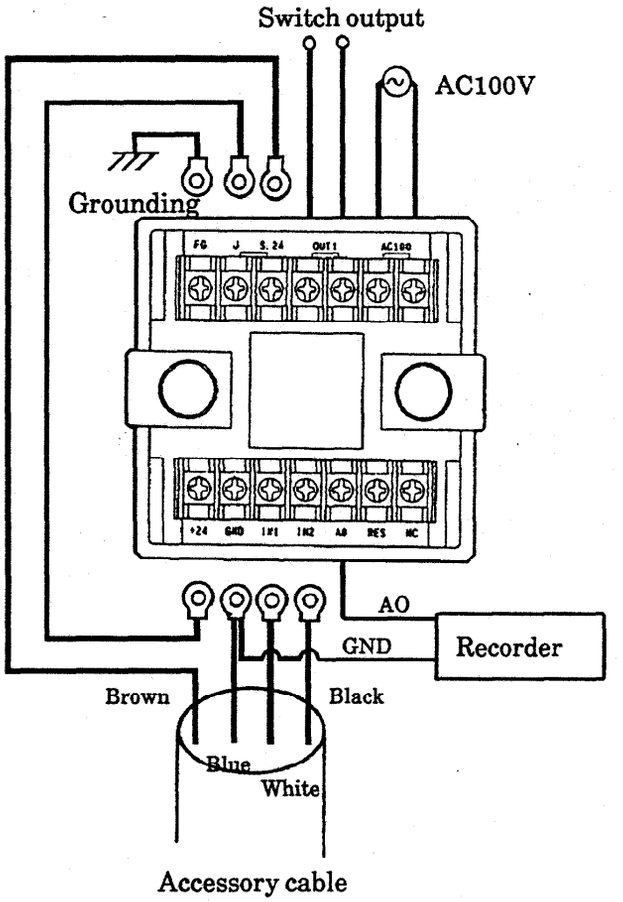
- When mounting the sensor unit with the bracket, fix the optional bracket to the bottom (the face opposite to the plastic cover) of the sensor unit with the optional accessory screws, and then mount the unit anywhere.



	Fixing screw	Mounting screw
PF4000	M4×8	M4×10
PF8000	M5×8	M4×10

4-3. Wiring method

●For wiring the sensor unit and the monitor unit, use the accessory cables

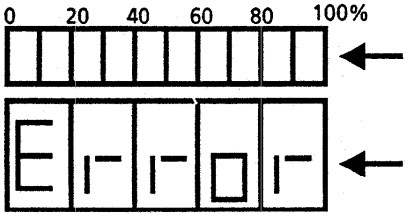


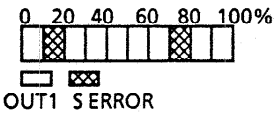
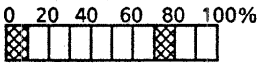
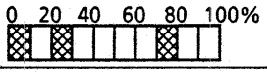
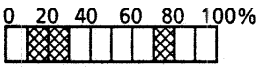
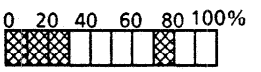
- For wiring between the sensor unit and the monitor unit, use the accessory cable.
- Connect a Class 3 grounding (100 ohms or lower) to the FG terminal. However, do not share the grounding cable for the FG terminal with strong current carrying wires.
- Keep the accessory cables separated as much as possible from noise sources such as strong current carrying wires.
- For the power line, use a 600-volt vinyl seated wire or equivalent. Use a noise filter, as required.
- Keep the monitor unit separated as much as possible from high-voltage wires, high-voltage equipment, and power plants.
- Before wiring, confirm that the terminal block is free from chips, wire strands, etc.

5. MAINTENANCE

5-1. When an error display appears

When an error code is shown on the 5-digit digital display, take measures in accordance with the table below.



Error code	Meaning	Measures	Resetting method
	Rated flow rate exceeded, or water droplets have entered pipe	The flow rate has exceeded the rated value. Use within the rated flow rate range. When the same error code is displayed even if the flow rate is reduced to within the rated flow rate range, water droplets are present in the pipe. Remove water from the pipe.	Refer to <Reset 1>. Automatic resetting
	Disconnection or breakage of accessory cable	Confirm that the terminals of accessory cables have not loosened or become disconnected. When loosened or disconnected, tighten or reattach them. When an accessory cable is broken, replace it with a new one.	Automatic resetting
	Too high a temperature	The temperature correction function is incorrect, and thus the accuracy is not assured. Moreover, because this condition may lead to breakage of the sensor, stop use at once.	——
	Too low a temperature		
	Memory error	An error occurred in E2ROM. Inform your nearest CKD office.	——

<Reset 1>

After taking the above measures, continue to press the ▲ and ▶ keys simultaneously for 10 seconds.

Note: Power is not supplied to the sensor unit while an error code is being displayed.

CKD Corporation

2-7-2 Meieki Minami, Nakamura-ku,
Nagoya-city 450 Japan
PHONE (052) 581-3751 FAX (052) 583-9710

Canada
MILLER FLUID POWER CANADA LTD.
1214 Kamato Road. Mississauga · Ontario L4W1Y1 Canada
PHONE (416) 628-2780 FAX (416) 625-8724

U. S. A.
MILLER FLUID POWER CORPORATION
800 N.York Road Bensenville.IL 60106 U.S.A
PHONE (708) 437-9727 FAX (708) 437-9728
WILKERSON CORPORATION
1201 W. Mansfield Ave. Englewood, CO. 80110 U. S. A
PHONE (303) 761-7601 FAX (303) 781-8462

EUROPE
CKD EUROPE
P. O. Box 1428. 1211 Geneva 26. Switzerland
PHONE (022) 342-2922 FAX (022) 342-2921

MALAYSIA
M-CKD PRECISION SDN. BHD.
Lot No.6, Jalan Modal 23/2 40000 Shan Alam,
Selangor Darui Shsan, Malaysia
PHONE (03) 5411468 (6 lines) FAX (03) 5411533

SINGAPORE
CKD SINGAPORE PTE LTD.
No. 705 Sims Drive #03-01 Shun Li Industrial
Complex, Singapore 1438
PHONE 7442623 FAX7442486

THAILAND
CKD THAI CORPORATION LTD
Bangpakong Industrial Estate 2, 700/58 Moo 1, Tambol Bankao,
Amphur Panthong, Chonburi 20160, Thailand
PHONE (038) 214-646-8, (038) 213-388 FAX (038) 213-389
CKD SALES THAI CORPORATION LTD
14/1 Soi Saladaeng 1, North Satharn Rd., Bangrak, Bangkok 10500
PHONE 267-6300-4 FAX 267-6305

CHINA
WUXI CKD PNEUMATIC INDUSTRY CO., LTD.
Qingyang South No.3 Road, Wuxi. Jiangsu. China
PHONE (0510) 559598 FAX (0510) 559598
Post Code : 214023

TAIWAN
TAIWAN CKD CORPORATION
Office : 8F, No.46 Sec 1st, Nan-King E Road Taipei, 10407 Taiwan
PHONE (02) 5513235 FAX (02) 5223033
Factory : No.362, Sec 1st, Kwanfu-Road, Shinchu, 30054, Taiwan
PHONE (035) 783162 · 780572 FAX (035) 780571

199508