Discontinue

CKD

SM－166910－A

INSTRUCTION MANUAL

Compresserd Air Flow Sensor

PFK500D・1000D・2000D・4000D
8000DSERIES

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

AUG.26.1999 2nd

CKD Corporation

Thank you very much for purchasing one of CKD's products.
Because CKD's products are manufactured under strict quality control, they are safe.

This Instruction Manual is made up of the following 5 parts.

- The product
- Precautions
- Operation
- Installation
- Maintenance

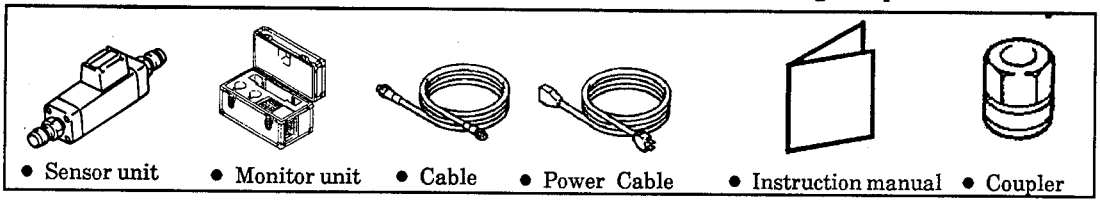
CONTENTS

Instruction Manual
for
Compressed Air Flow Sensor
PFK500D·PFK1000D·PFK2000D·PFK4000D·PFK8000DSERIES
SM-166910-A

1. PRODUCT

1-1. Accessories

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



● Sensor unit ● Monitor unit ● Cable ● Power Cable ● Instruction manual ● Coupler

1-2. Specifications

Type / Item		PFK500D	PFK1000D	PFK2000D	PFK4000D	PFK8000D
Specifications	Flow rate range (Nℓ/min)	25~500	50~1000	100~2000	200~4000	400~8000
	Bore	Rc1/2	Rc1/2	Rc1/2	Rc1	Rc11/2
Operating conditions	Applicable fluid	Compressed air				
	Quality of air used	Condensation forming point at atmospheric pressure,- 17°C or lower				
	Max.operating pressure	1.5 MPa				
	Min.operating pressure	0.1 MPa				
	Allowable withstanding pressure	2.25 MPa				
	Ambient temperature	0-50°C, 85% RH or less				
	Fluid temperature	0-40°C				
Accuracy	Linearity	±1.5% FS(0.7MPa,20°C)				
	Pressure characteristic	±1.5% FS (0.1 ~ 1.5 MPa,at0.7MPa Standard)				
	Temperature characteristic	±2.0% FS (0 - 40°C,at20°C Standard)				
Response time		1.25 sec				
Output	Output voltage	DC0~5V Refer to Analog 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 $E^{2P}ROM$				
Mounting	Mounting direction	Vertically or horizontally				
	Lead-in straight tube	Unnecessary				
Protective structure		IP64 (the sensor unit only, however)				

1-3. Type indication method

Item	Type	1th hyphen	2th hyphen (option)	Specifications (Flow rate range)
Flow rate range	PFK500D			25~500Nℓ/min,Rc1/2
	PFK1000D			50~1000Nℓ/min,Rc1/2
	PFK2000D			100~2000Nℓ/min,Rc1/2
	PFK4000D			200~4000Nℓ/min,Rc1
	PFK8000D			400~8000Nℓ/min,Rc11/2

Example of type indication,

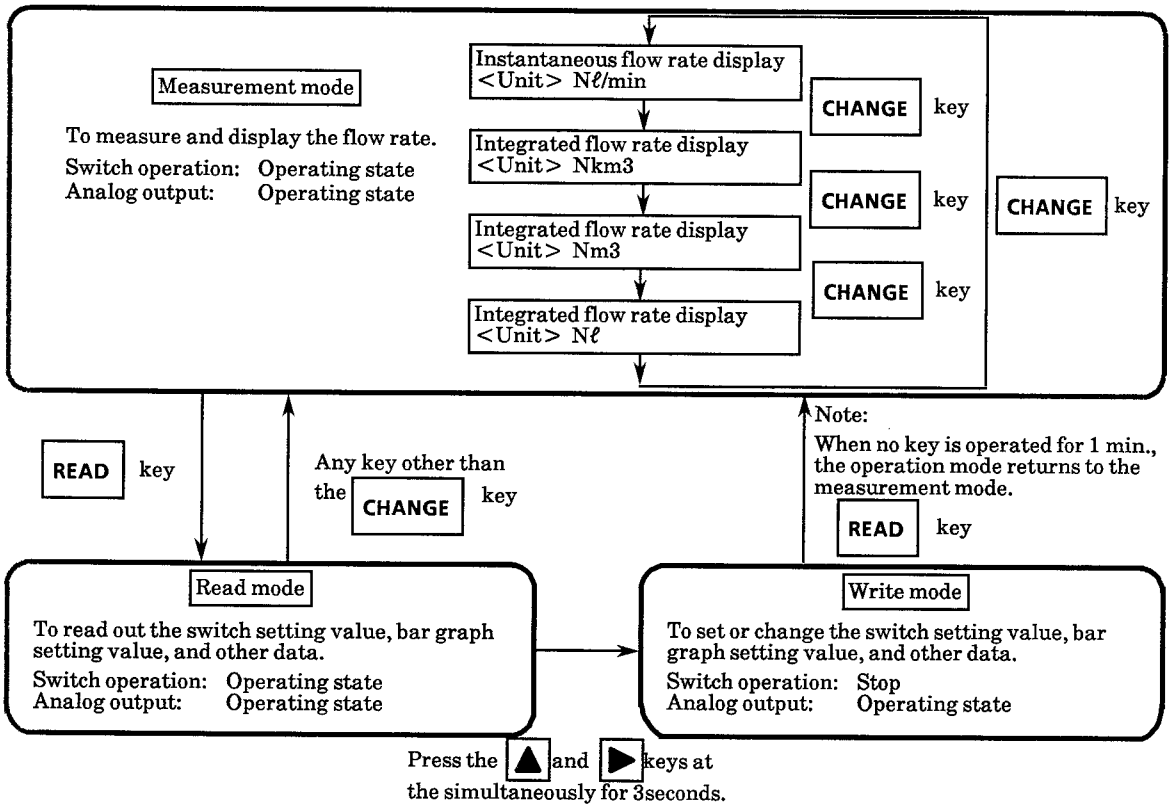
PFK500D

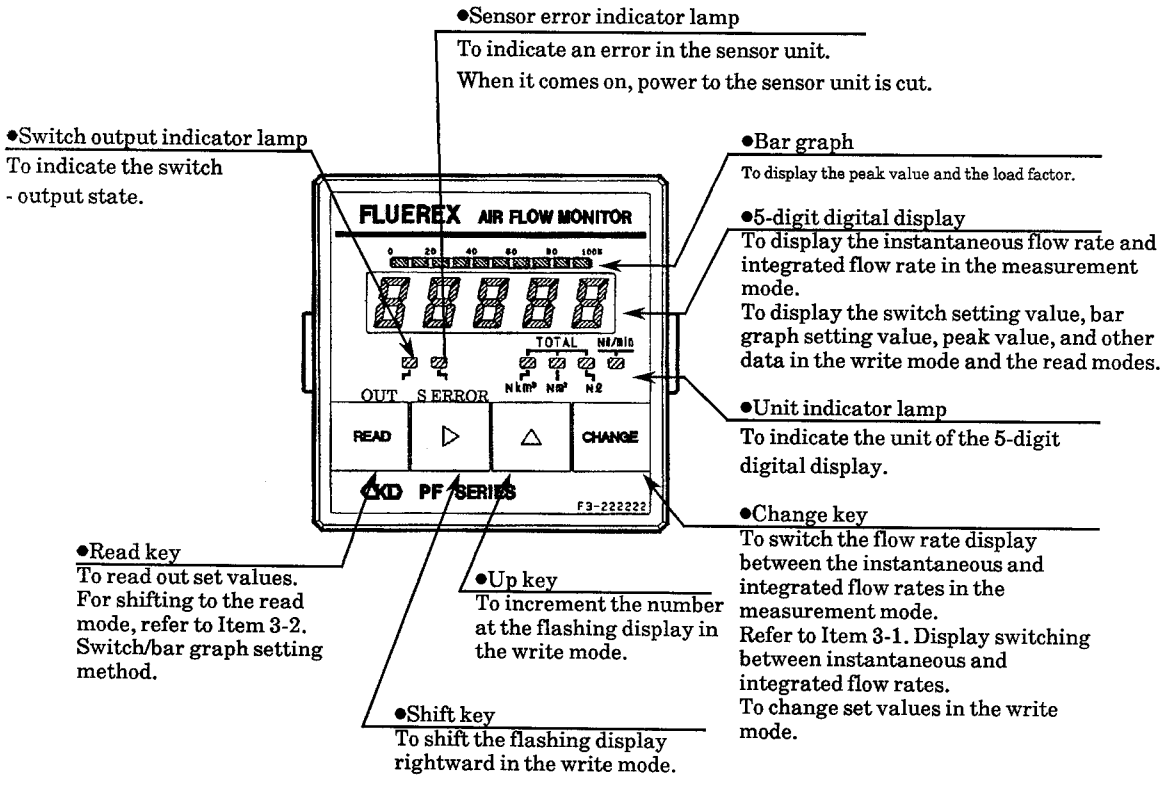
(Specifications)

- Flow rate range
  25~500Nℓ/min
- Bore Rc1/2

1-4. Name and function of each component

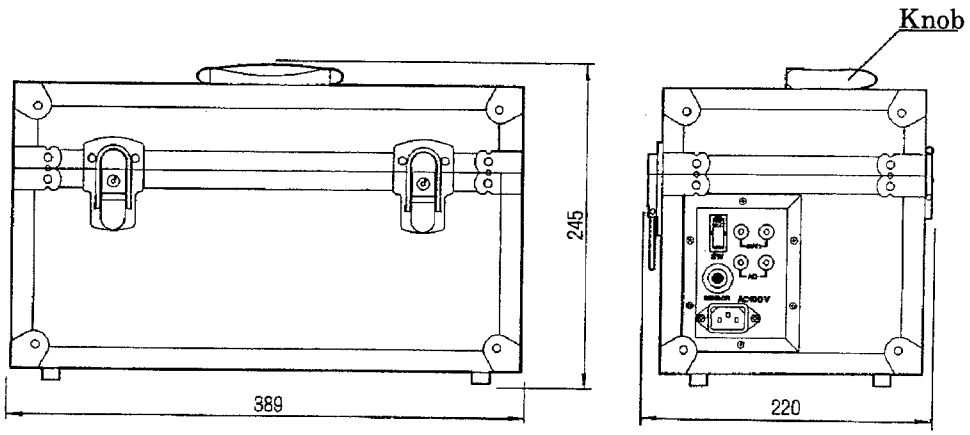
●Description of mode



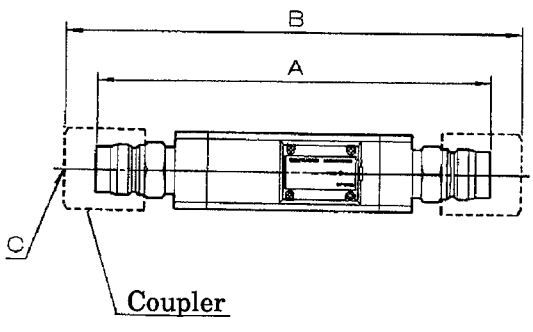


1-5.Dimensioned outline drawing

- Monitor unit



- Sensor unit

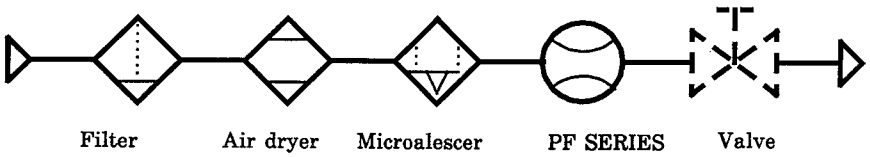


Item / Sensor unit	A	B	C
PFS500D PFS1000D PFS2000D	215	251	Rc1/2
PFS4000D	292	338	Rc1
PFS8000D	338	390	Rc1 1/2

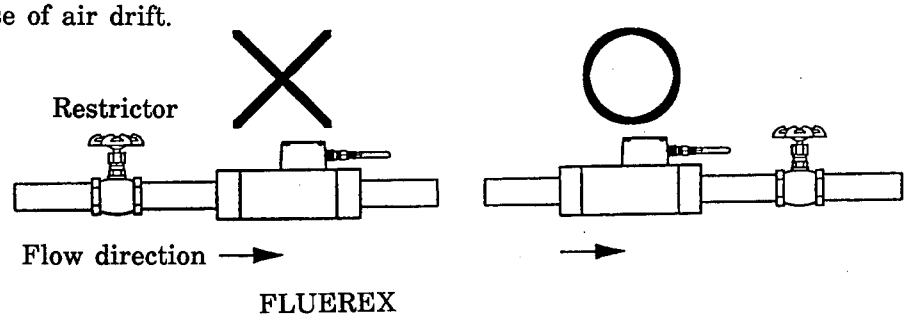
2. PRECAUTIONS

2-1. Precautions concerning use

1) The compressed air generated by compressor containes various impurities such as drain i.e. water, oxidized oil and foreign particles.
Therefore, install the filter, air dryer and micro-alescer filter at the primary side of the FLUEREX used.
Otherwise, it is possible to breakage the FLUEREX due to the drain.
Additionaly, Three meshes (steinless steel) are build in the FLUEREX are not useful to remove the foreigen particles.
(Eep : Monitor unit PFK1000D, Sensor unit PFS1000D)



2) Mount the restrictor such as globe valve, ball vall at secondary side (downstream) of the FLUEREX, when it is necessary to change the flow rate.
When the restrictor is mounted at primary side, measurement error may be caused becouse of air drift.



FLUEREX

3) Use the stop valve at a state in which it is kept fully open or closed, when stop valve is mounted at primary side in oder to make the maintenance and inspection.

2-2. Switch output

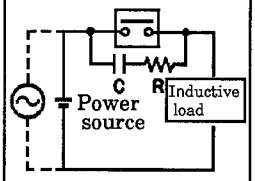
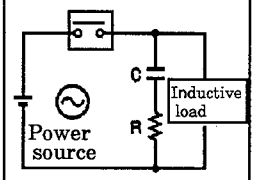
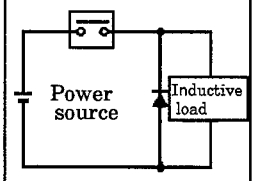
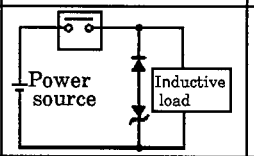
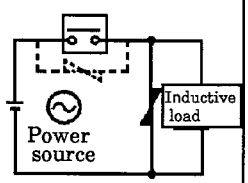
One independent contact is provided in the monitor unit. Use it according to the following precautions.

- Contact portion specifications

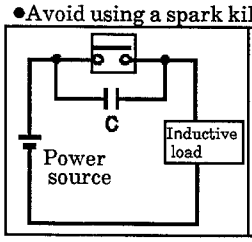
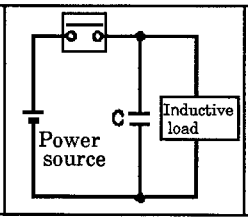
(Built-in relay:G2Q-187P-V, Omron)

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	

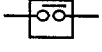
Protection of the monitor unit

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

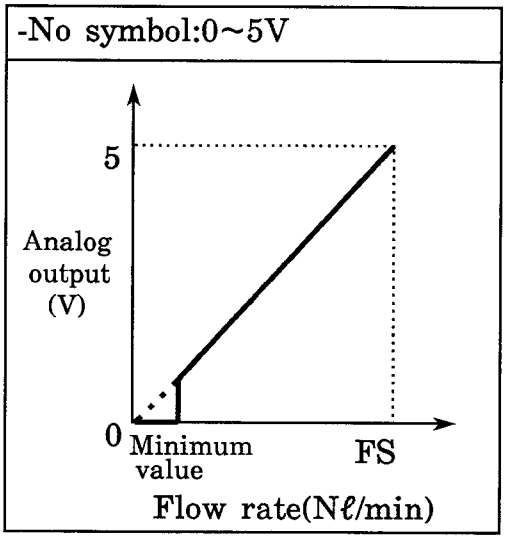
●Avoid using a spark killer in the following manner.

	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



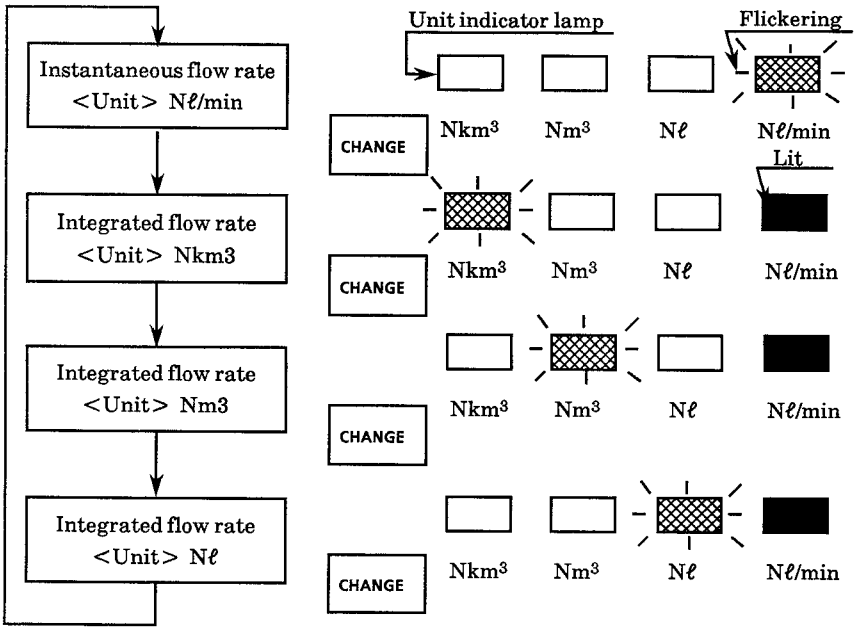
Type	Min. value (Nℓ/min)	FS (Nℓ/min)
PFK500D	25	500
PFK1000D	50	1000
PFK2000D	100	2000
PFK4000D	200	4000
PFK8000D	400	8000

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.

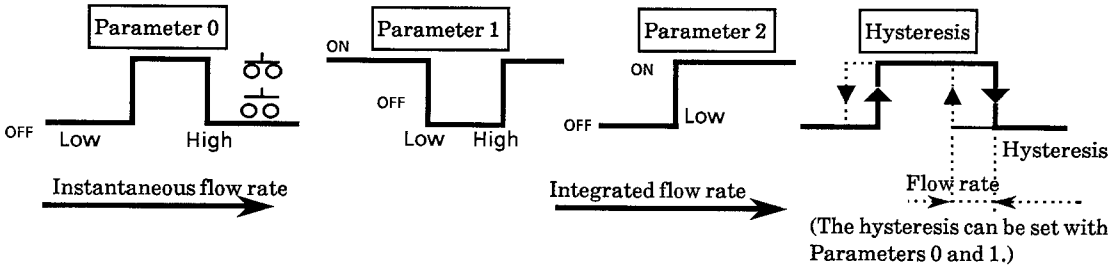
* 1Temporary switching of flow rate display
To be used when you want to display the integrated flow rate for a short time.

* 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

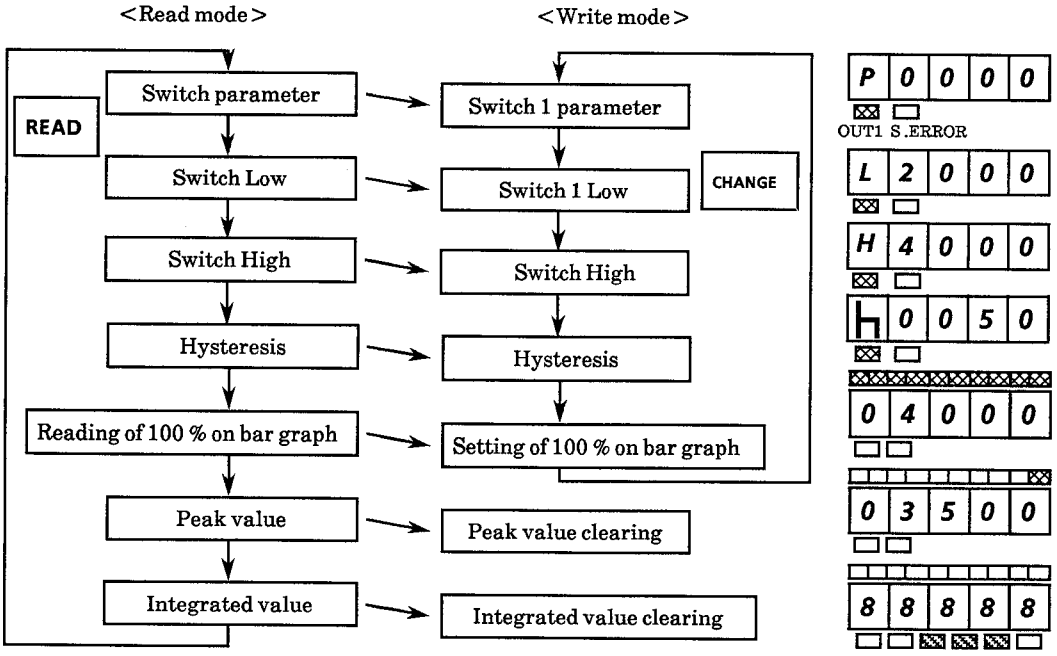
The sensor can be used in various ways by setting the relay contact built in the monitor as follows.



(The hysteresis can be set with Parameters 0 and 1.)

(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.

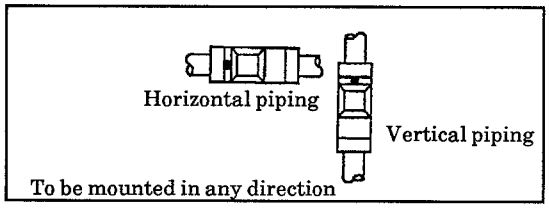
③ When installing in a place exposed to radiant heat from heat sources, take measures in respect to heat insulation and ventilation.

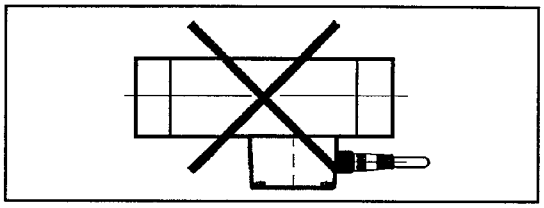
④ Avoid places subjected to vibration and impact.

4-2. Sensor unit mounting

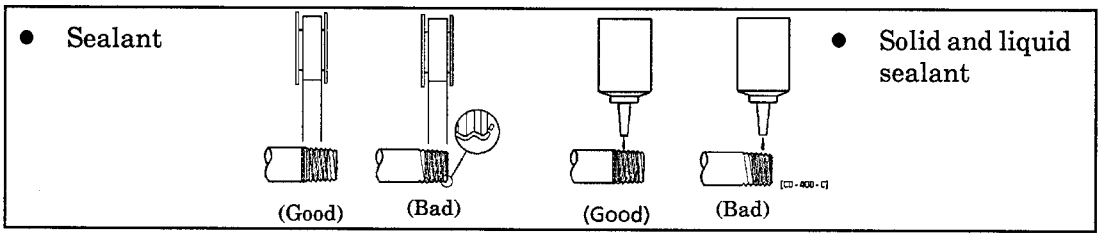
When mounting the sensor unit, pay attention to the following points.

- To connect to the sensor unit, use Rc3/8, 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.



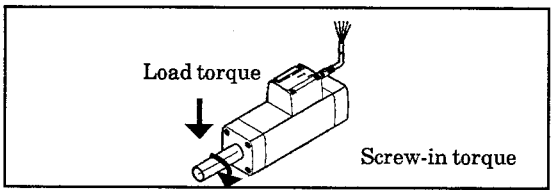


- When connecting piping to the sensor unit, use care so as to prevent foreign matter from entering the pipes. Pay particular attention to the amount and application of sealant and tape.



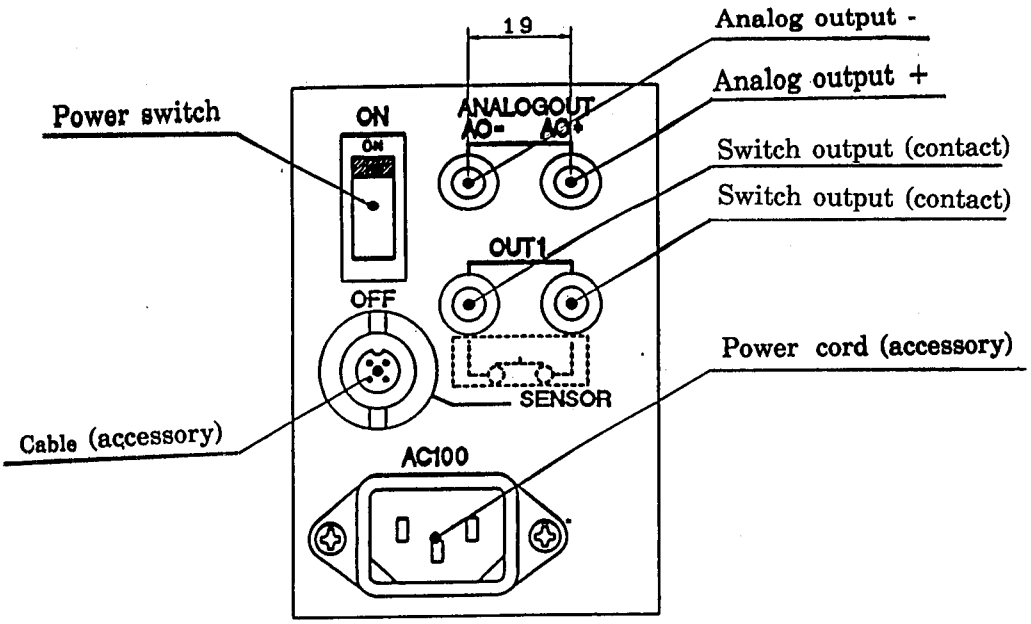
- When connecting piping to the sensor unit, do not apply excessive screw-in torque or load torque to the passage, pipes, etc. Also, do not apply a force to the plastic cover part.

	PFS500D PFS1000D PFS2000D	PFS4000D	PFS8000D
Max. screw-in torque (N·m)	30	50	75
Max. load torque (N·m)	15	40	50



4-3. Wiring method

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

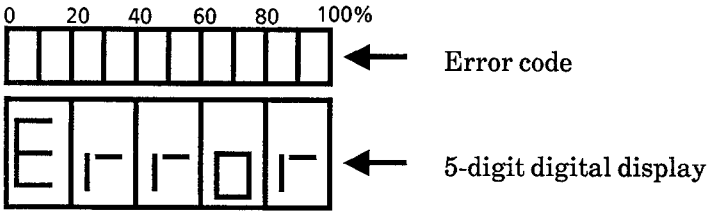


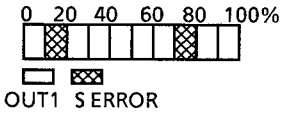
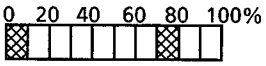
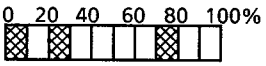
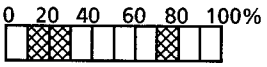
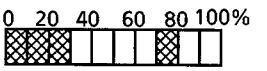
- For wiring between the sensor unit and the monitor unit, use the accessory cable.
- Keep the accessory cables separated as much as possible from noise sources such as strong current carrying wires.
- For the power line, use a 600-volt vinyl seated wire or equivalent. Use a noise filter, as required.
- 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.