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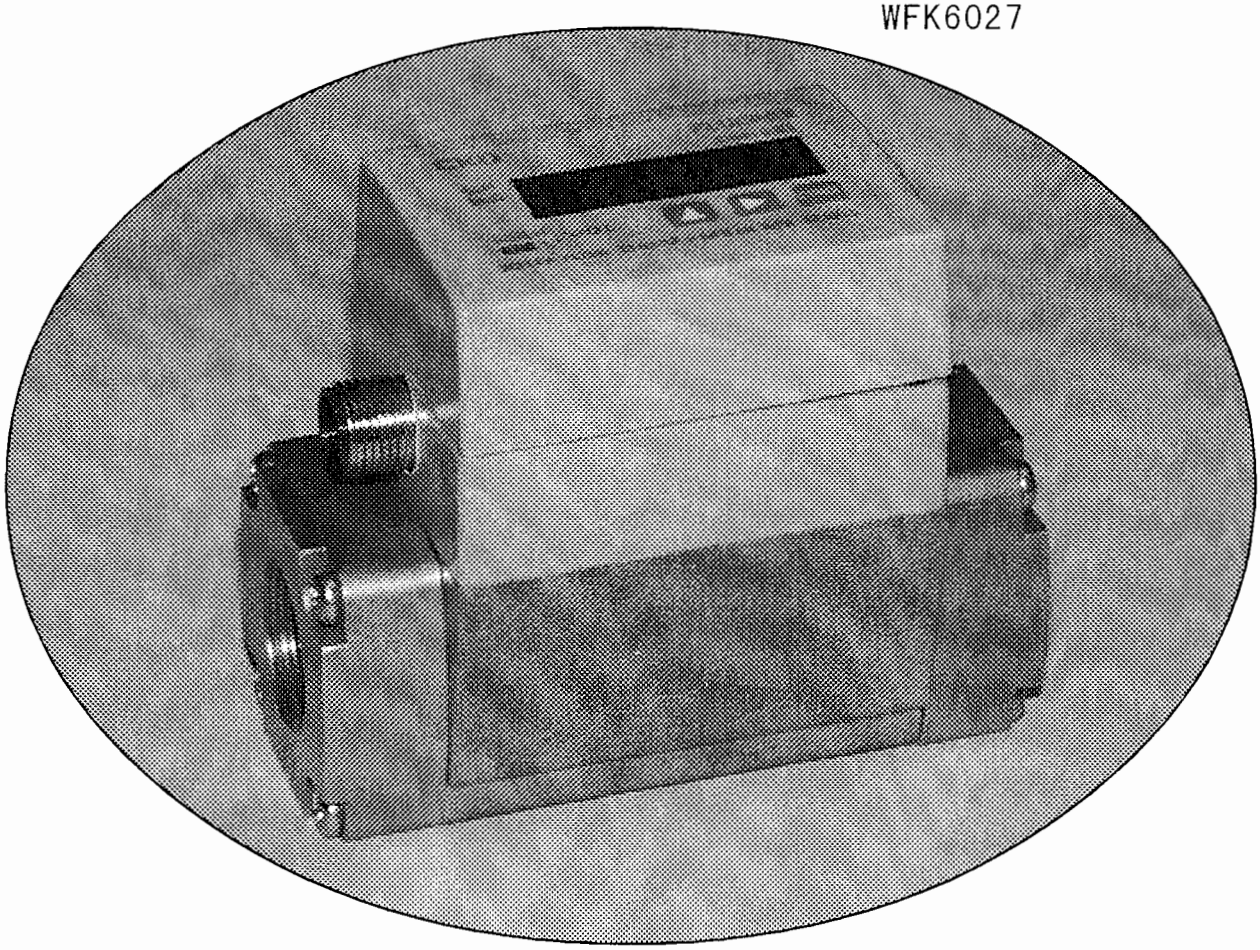
CKD

Instruction Manual

WATER FLOW SENSOR FLUEREX

WFK series

WFK5008 WFK7050
WFK6008 WFK7100
WFK5027 WFK7200
WFK6027



- Thoroughly read this Instruction Manual before starting the sensor .
- Keep this Manual near the sensor where all concerned personnel have easy access to it.

CKD Corporation
AUG.28.2000 4th SM-12216-A

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1. Safety instructions

This manual is intended for personnel who are familiar with basic knowledge about electricity, compressed air, fluid, piping, and refrigerant. CKD shall not be held responsible for troubles or accidents that result from installation, operation or repairs made by personnel who are not qualified or trained for the above subjects.
Improper handling may cause the machine not to be operated at its maximum performance level or lead to accidents or personal injury.
Always confirm the machine specification and operate the machine in the correct manner designated by CKD.
This machine is equipped with various safety and other protective devices.
However, improper handling of the machine may cause personal injury and/or damage to the machine. Read this operation manual carefully and fully comprehend its contents before operation.
Read the contents of the following warning labels, as well as cautions stated in the operation manual, and follow the instructions contented therein.
Keep this operation manual near the machine where all concerned personnel have easy access to it.

Safety precautions are classified into the following groups, DANGER, WARNING and CAUTION.

: This denotes hazards which WILL result in severe personal injury or death, if not avoided.

: This denotes hazards which COULD result in severe personal injury or death, if not avoided.

: This denotes hazards which COULD result in minor personal injury and/or product or property damage, if not avoided.

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2. Cautions for operation

2-1 Cautions for design selection

◆ Fluid used ◆

DANGER

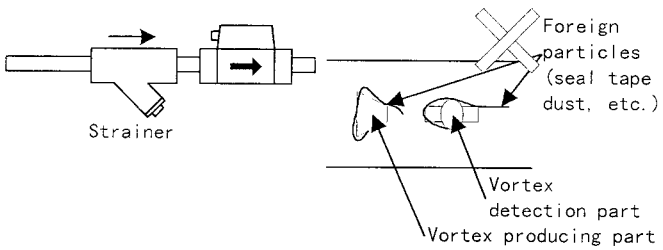
● Do not use the fluid coming from this flow rate sensor as drinking water.
Do not use this flow rate sensor to measure the water entering the human body since this unit does not conform to the food sanitary regulations. The unit must always be used as an industrial sensor.
● Do not use this flow rate sensor for flammable fluid.

WARNING

● Do not use this flow rate sensor as a measuring instrument for business deals.
Do not use this flow rate sensor for business deals since this unit does not conform to the measuring regulations. The unit must always be used as an industrial sensor.
● The integrated value of flow rate includes the integrated error of measurement. So it should be used as a reference.
● This flow rate sensor is designed for water (industrial water and city water). Do not use this unit for fluid other than those specified. When incorrect fluid is used, the accuracy cannot be guaranteed. If use of inert fluid is required, contact CKD.

CAUTION

● If it is predicted that foreign particles enter the fluid, install a filter(strainer) on the primary side. If foreign particles stick to the vortex producing part or vortex detection part, the accurate measurement cannot be made.



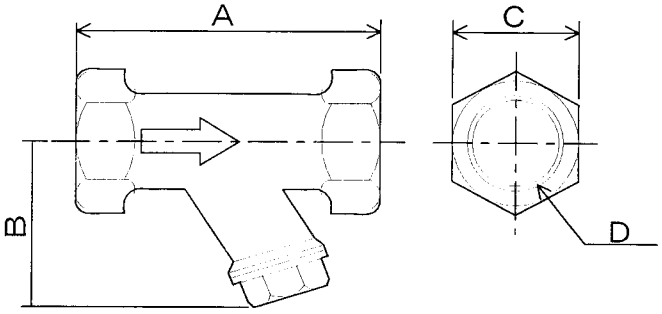
Strainer specifications

Item	Specifications
Fluid used	Water
Withstanding pressure(MPa)	2
Operating pressure range(MPa)	0~1
Working temperature range(℃)	1~90

Major component materials

Body	Bronze casting
Strainer	Stainless

Outside dimensions of strainer



Model No.	A	B	C	D
WF-FL-280730	70	44	23	Rc 3/8
WF-FL-280731	80	49	28	Rc 1/2
WF-FL-280732	100	57	35	Rc 3/4
WF-FL-280733	115	72	43	Rc 1
WF-FL-280734	135	82	52	Rc1 1/4
WF-FL-280735	160	98	59	Rc1 1/2

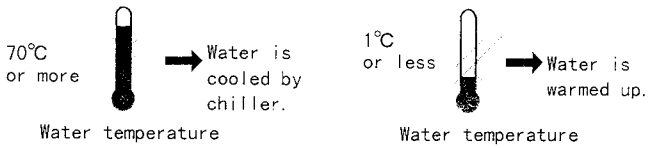
◆ Ambient condition ◆

DANGER

● Explosion environment
Never use this flow rate sensor in the explosive gas atmosphere. Doing so may cause the unit to explode or burn since it has no explosion-proof structure.

WARNING

● Corrosive environment
Never use this flow rate sensor in the corrosive gas atmosphere, such as sulphur dioxide.
● Fluid temperature
Keep the fluid temperature in a range of 1-70℃.
If the temperature of the fluid exceeds 70℃, cool it using a cooling unit, such as chiller.
Additionally, if water may be frozen, drain water or warm up water to prevent it from being frozen.
Do not use the flow rate sensor if the ambient temperature may fluctuate rapidly even though it is within the specified range.



● Maximum operating pressure
If this flow rate sensor is operated at a pressure exceeding its maximum operating pressure level, this may cause the unit to malfunction. Always operate the unit at its maximum operating pressure or less.
Particularly, take the following appropriate measures so that water hammer does not cause the pressure to exceed the specified maximum operating pressure level.
①Use a water hammer absorption valve to make the valve closing speed slower.

②Use elastic piping materials, such as rubber hoses or accumulator to absorb impact pressure.
③Make the pipe length as short as possible.
● Drip-proof environment (In conformity with IP64)
Since this flow rate sensor uses dust-proof and drip-proof structure, it can be used in an environment where water is splashed onto it during maintenance and cleaning work.
However, do not use this flow rate sensor in a place where water is always splashed onto it or where water or oil scatters keenly.

CAUTION

● Vibration and impact
Do not use this flow rate sensor in a place where a vibration of 2G or more and/or an impact of 10G or more exist.
Since this unit uses Karman's vortex street as detection principle, it may malfunction or be damaged if it is used in a place having excessive vibration and/or impact.

Vibration 2G or more Impact 10G or more

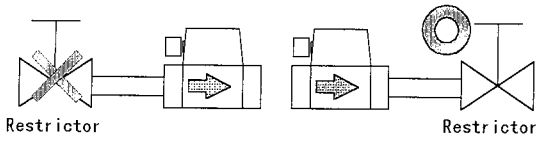
● Ambient temperature
Always use this flow rate sensor in an ambient temperature range of 0-50℃

2-2 Cautions for mounting, piping, and wiring

◆ Piping ◆

CAUTION

● This flow rate sensor is designed to install in any posture, vertical or horizontal directions. However, always carry out the piping so that the piping is filled with fluid and the fluid flows smoothly. If the flow rate sensor is installed in the vertical direction.
● If the piping size is restricted rapidly or if a restriction, such as valve is located on the primary side, cavitation may occur in the piping, causing inaccurate measurement. In such case, connect the piping to the secondary side of the sensor. If the piping size is restricted rapidly or if a restriction, such as valve is located on the primary side, cavitation may occur in the piping, causing inaccurate measurement. In such case, connect the piping to the secondary side of the sensor.
Cavitation
Water vapor bubbles are produced as the static pressure at the rear, such as screws of the ship lowers below the water vapor pressure. This may cause the efficiency to lower or the screws to break.

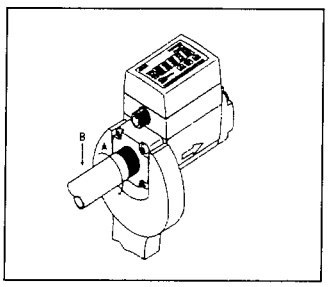


● When the Elbow or the Bushing are used in the piping, be sure to have the straight piping part that is 10D(inside), 5D(outside) or more at WFK7000series.
Make sure that the port size down by the Bushing should be only one size (i.e. if the port size is Rc1, it should be Rc3/4.).
Without the straight piping part, be careful that the accuracy of the sensor may be worse because of the disordered velocity/pressure distribution. (For WFK5000/6000series no need for the straight piping part.)
* "D" means the internal diameter of piping material. Refer to the table below for detailed value.

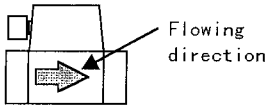
Port size	Rc3/4 (20A)	Rc1 (25A)	Rc11/4 (32A)	Rc11/2 (40A)
5D	100㎜	125㎜	160㎜	200㎜
10D	200㎜	250㎜	320㎜	400㎜

● When attaching the sensor to the piping, refer to the reference torque data listed below so that excessive screwing-in torque and/or loading torque are not applied to the connecting port.

Model No.	WFK50**-10 WFK60**-10	WFK50**-15 WFK60**-15	WFK50**-20 WFK60**-20	
A. Maximum screwing-in torque N·m	40	50	60	
B. Maximum loading torque N·m	40			
Model No.	WFK7***-20	WFK7***-25	WFK7***-32	WFK7***-40
A. Maximum screwing-in torque N·m	60	70	80	90
B. Maximum loading torque N·m	60			

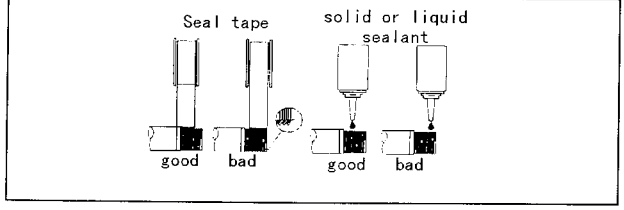


● Make the fluid flowing direction and direction indicated on the body matched. If the connection is made in the reverse direction, 0 or a smaller flow rate is indicated.



● Before starting the piping work, blow the air to remove foreign particles and cutting chips from the piping.
● Pay special attention so that no stress is applied to resin parts during piping work.
● Carefully carry out the piping work so that no seal tape dust and/or glue enter the piping.

To wind a fluoro resin seal tape on the screw thread part, wind the tape on the screw thread part once or twice so that the tape is not wound on 2 – 3 threads. Press the tape by fingernail to tightly contact the tape with the screw threads. When applying the liquid sealant, carefully apply it so that an excessive amount of sealant is not applied and sealant is not applied to 1 – 2 threads. Additionally, do not apply the sealant to the internal thread.



◆ Wiring ◆

DANGER

●Keep the power supply voltage and output at their specified voltage levels.
If a voltage exceeding the specified level is applied, this may cause the flow rate sensor to malfunction or break, and/or an electric shock or fire.
Additionally, do not use a load exceeding the rated output. Doing so may cause the output to break or a fire.

WARNING

● Always check the wire colors and terminal numbers during wiring.
Even though protective circuits, such as overcurrent protection circuit for output transistors and incorrect wiring prevention circuit for reverse connection of diodes are provided, the flow rate sensor is not applicable to all incorrect wiring problems. Since incorrect wiring may cause breakage or defect of the sensor or the flow rate sensor to malfunction. Carefully check the wire colors and terminal numbers while referring to the instruction manual.
● Always check the wire insulation.
Make sure that the flow rate sensor is not in contact with other circuits and that the faulty grounding or faulty insulation between terminals does not exist.
If an incorrect part exists, an overcurrent may flow into the sensor, causing it to break.

CAUTION

●Keep the cables away from the noise source, such as strong current carrying wires.
Failure to do so may cause the flow rate sensor to malfunction due to noise.
● Keep the wires not in use away from other wires.
● Do not make output transistors short-circuited.
If a load is short-circuited, the overcurrent protection circuit is activated to prevent the output transistors from being broken. However, if a load is left short-circuited for an extended period of time, breakage of the output transistors may result.
Overcurrent protection: Approximately 70 mA
●Do not use a load that produces a surge voltage.
Even though zener diodes to protect the surge voltage are inserted, the flow rate sensor may be damaged if a surge voltage is applied to the flow rate sensor repeatedly.
If the flow rate sensor is used to directly drive a load that produces a surge voltage, such as relay or solenoid valve, use an appropriate model incorporating the surge absorption element.
Additionally, if a surge voltage producing source exists in the same power source line, take appropriate surge voltage prevention measures accordingly.
● Do not bend the lead wires repeatedly and apply tensile force to the wires. Doing so may cause disconnection.

2-3 Cautions for operation

CAUTION

● If a problem is found during operation, immediately shut-down the power source to stop operation, and contact the local sales representative. The display may become slightly hot (approximately 40℃), but this is not a problem.
●After the power source is turned ON, the internal setting, such as hardware check is made. It may take approximately 10 sec. Note that the display and output do not function correctly during that period.
Particularly, if the transistor output is connected to the interlock circuit of the control unit, emergency stop may be activated during above period. If this occurs, mask the output while the internal setting is being made.
● To change the output set values, always stop the flow rate sensor completely. Failure to do so may cause the control unit to function in a manner other than that intended.
● Do not apply excessive rotational force to the display.
The display is designed to allow turning it up to 270° . Turn the display to a position where values on the display can be seen easily. If the display is turned by an excessive force, this may cause the stopper to break.

2-4 Cautions for inspection and maintenance

CAUTION

● Always carry out the periodic inspection to make sure that the unit functions correctly.
● Do not attempt to disassemble or modify the flow rate sensor. Doing so may cause the unit to malfunction.
●To clean the flow rate sensor, always use proper cleaning agent, such as neutral detergent that produces less pollution.

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3. Product

3-1 Type indication method

Item	Type		1st hyphen	2nd hyphen (Option)			Specifications	Note				
Port type (Material)	WFK5 WFK6 WFK7						Stainless port Modular structure Large flow					
Flow rate		008 027 050 100 200					1.0 ~ 8.0 ℓ/min 3.0 ~ 27 ℓ/min 10 ~ 50 ℓ/min 20 ~ 100 ℓ/min 40 ~ 200 ℓ/min					
Port size			*1 -10(N) -15(N) -20(N) -25(N) -32(N) -40(N)					WFK50**	WFK60**	WFK7050	WFK7100	WFK7200
							Rc 3/8 (3/8NPT)	○	○			
							Rc 1/2 (1/2NPT)	○	○			
							Rc 3/4 (3/4NPT)	○	○	○		
							Rc 1 (1NPT)			○	○	
							Rc 1 1/4 (1 1/4NPT)				○	○
							Rc 1 1/2 (1 1/2NPT)					○
Alarm output type				No symbol -P			NPN Transistor open collector PNP Transistor open collector					
Analog output					No symbol -A1 -A2 -A3 -A4 -A5		DC0-5V DC4-20mA DC1-5V DC0-10V Without analog output 2-point alarm outputs					
Bracket						No symbol -B	Without Bracket With Bracket					

Notes 1) Second hyphens are used to show the alarm output type, analog output and bracket in that order. If no markings are used, subsequent markings are moved left.

2) When selecting "-A1" for the analog output, the alarm output cannot be used.

3) When selecting "-A5" for the analog output, the analog output cannot be used.

4) *1 For tapered U.S. piping screws, "N" is added to the connecting port diameter.
Example : 3/8NPT → -10N

3-2 Accessories

- Accessory cable
- Instruction manual

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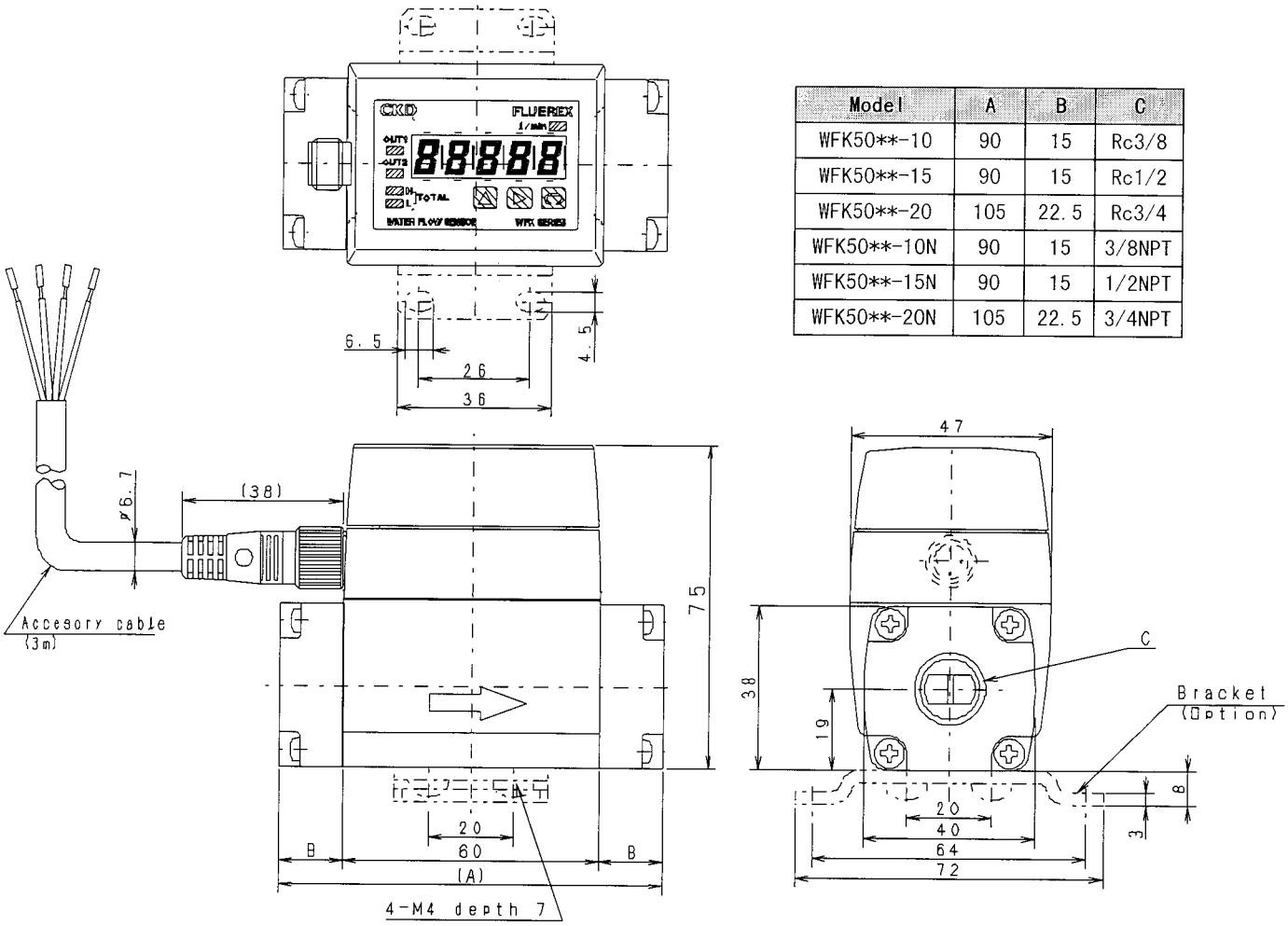
3-3 Specifications/Outlene drawing

◆ WFK5000 series

Model / Item			WFK5008-10	WFK5008-15	WFK5008-20	WFK5027-10	WFK5027-15	WFK5027-20
Specifications	Flow rate range		1.0~8.0 ℓ/min			3.0~27.0 ℓ/min		
	Connecting port size		Rc3/8	Rc1/2	Rc3/4	Rc3/8	Rc1/2	Rc3/4
	Connecting Material		Stainless : SUS					
	Pressure loss		0.045MPa(at 8.0ℓ/min)			0.04MPa(at 27.0ℓ/min)		
Operating Conditions	Applicable fluid		Water,Industrial Water					
	MAX. operating pressure		1.0MPa					
	Fluid temperature		1~70℃					
	Ambient temperature		0~50℃(under 85%RH)					
Marking			5-digit digital display					
Integrated flow rate			The maximum number of digits for the integrated flow rate is 9.					
Output	Alarm output	Point	1Point (NPN/PNP Transistor open collector)					
		Rating	MAX. 50mA					
		Internal voltage drop of alarm output	Under 2.0V					
	Analog output		DC0~5V(Linear output) Standard					
	Accuracy		±2.5%F.S.±1digit					
Response time			Approx. 1.0sec					
Power source voltage			DC15~24V±10%(MAX.100mA)					
Cable			3m, With connector (conductor size 0.5mm^2)					
Mounting direction			Vertically or horezontally					
Protective structure			equivalent to IP64					
Mass			630g	600g	650g	630g	600g	650g



Model	A	B	C
WFK50**-10	90	15	Rc3/8
WFK50**-15	90	15	Rc1/2
WFK50**-20	105	22.5	Rc3/4
WFK50**-10N	90	15	3/8NPT
WFK50**-15N	90	15	1/2NPT
WFK50**-20N	105	22.5	3/4NPT

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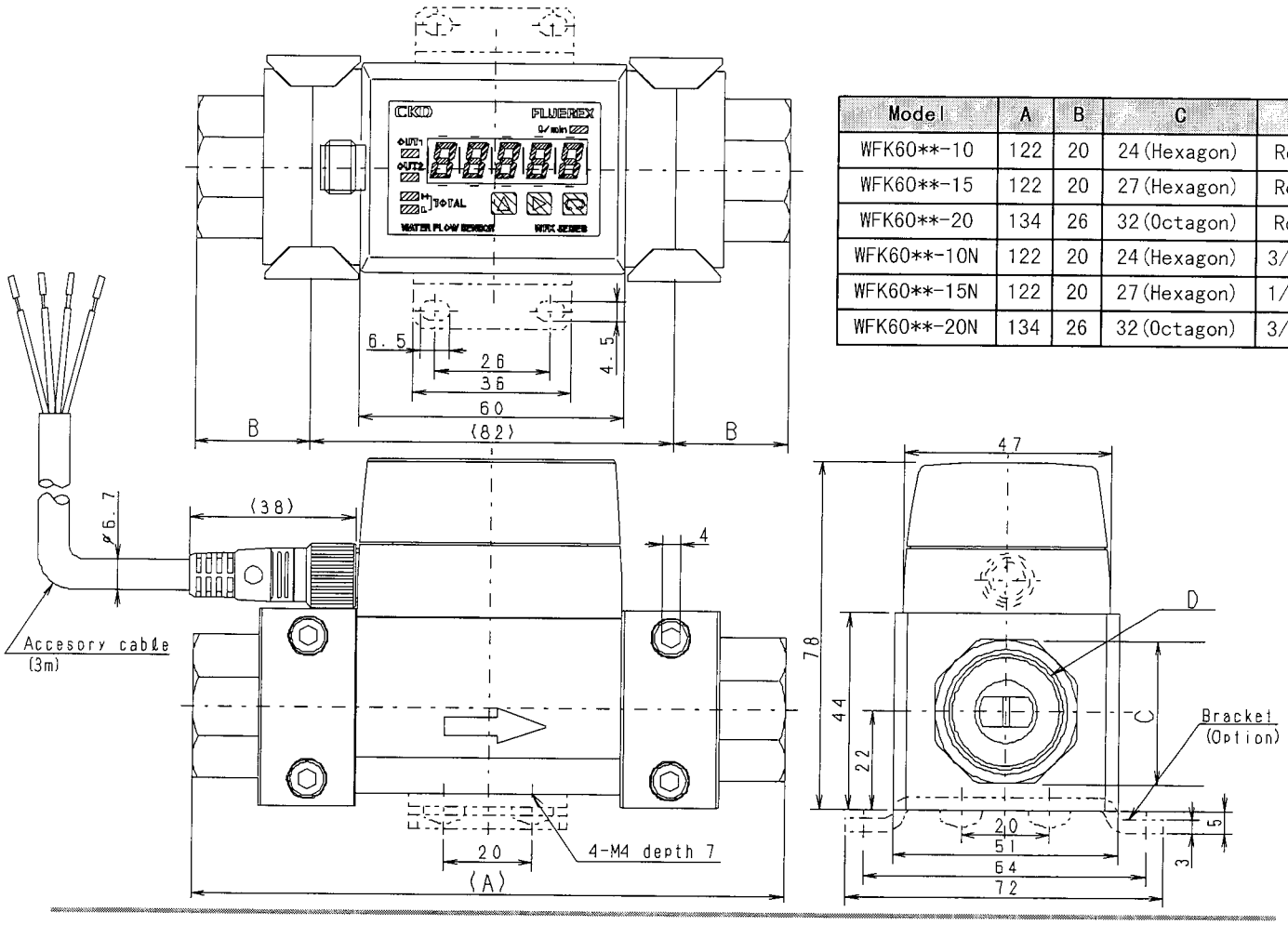
◆ WFK6000 series

Model / Item			WFK6008-10	WFK6008-15	WFK6008-20	WFK6027-10	WFK6027-15	WFK6027-20
Specifications	Flow rate range		1.0～8.0 ℓ/min			3.0～27.0 ℓ/min		
	Connecting port size		Rc3/8	Rc1/2	Rc3/4	Rc3/8	Rc1/2	Rc3/4
	Connecting Material		Stainless : SUS					
	Pressure loss		0.045MPa(at 8.0ℓ/min)			0.04MPa(at 27.0ℓ/min)		
Operating Conditions	Applicable fluid		Water,Industrial Water					
	MAX. operating pressure		1.0MPa					
	Fluid temperature		1～70℃					
	Ambient temperature		0～50℃(under 85%RH)					
Marking			5-digit digital display					
Integrated flow rate			The maximum number of digits for the integrated flow rate is 9.					
Output	Alarm output	Point	1Point (NPN/PNP Transistor open collector)					
		Rating	MAX. 50mA					
		Internal voltage drop of alarm output	Under 2.0V					
	Analog output		DC0～5V(Linear output) Standard					
	Accuracy		±2.5%F.S.±1digit					
Response time			Approx. 1.0sec					
Power source voltage			DC15～24V±10%(MAX.100mA)					
Cable			3m, With connector (conductor size 0.5mm^2)					
Mounting direction			Vertically or horezontally					
Protective structure			equivalent to IP64					
Mass			830g	810g	850g	830g	810g	850g



Model	A	B	C	D
WFK60**-10	122	20	24 (Hexagon)	Rc3/8
WFK60**-15	122	20	27 (Hexagon)	Rc1/2
WFK60**-20	134	26	32 (Octagon)	Rc3/4
WFK60**-10N	122	20	24 (Hexagon)	3/8NPT
WFK60**-15N	122	20	27 (Hexagon)	1/2NPT
WFK60**-20N	134	26	32 (Octagon)	3/4NPT

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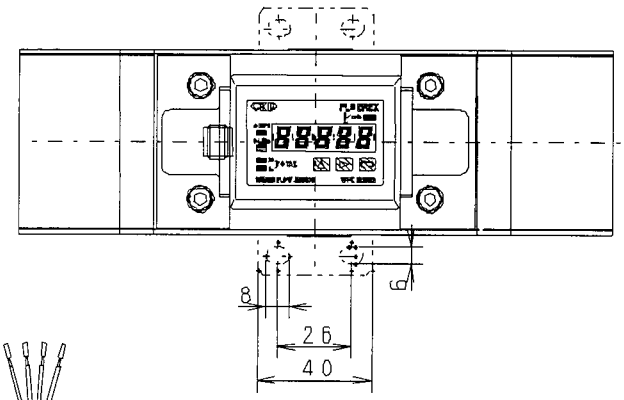
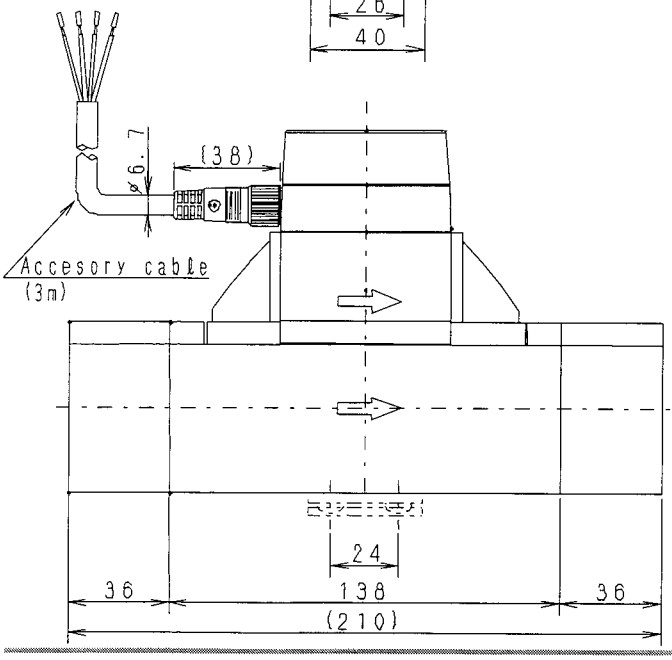
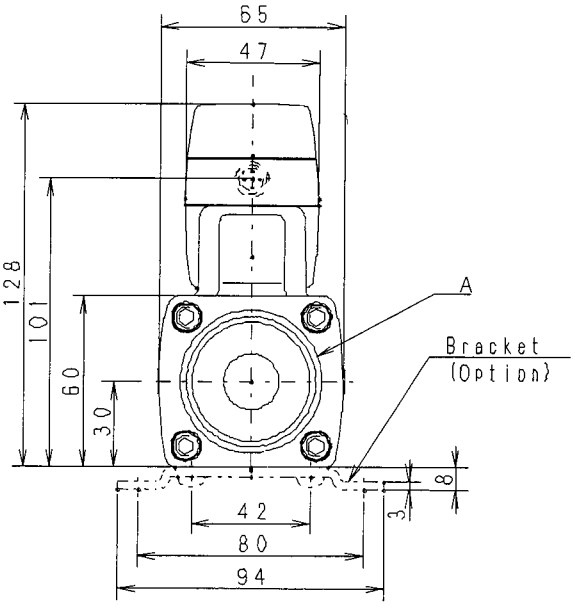
◆ WFK7000

Model / Item			WFK7050-20	WFK7050-25	WFK7100-25	WFK7100-32	WFK7200-32	WFK7200-40
Specifications	Flow rate range		10～50 ℓ/min		20～100 ℓ/min		40～200 ℓ/min	
	Connecting port size		Rc 3/4	Rc 1	Rc 1	Rc 1 1/4	Rc 1 1/4	Rc 1 1/2
	Connecting Material		Stainless : SUS					
	Pressure loss		0.045MPa(at 50ℓ/min)		0.045MPa(at 100ℓ/min)		0.045MPa(at 200ℓ/min)	
Operating Conditions	Applicable fluid		Water、Industrial Water					
	MAX. operating pressure		1.0MPa					
	Fluid temperature		1～70℃					
	Ambient temperature		0～50℃(under 85%RH)					
Marking			5－digit digital display					
Integrated flow rate			The maximum number of digits for the integrated flow rate is 9.					
Output	Alarm output	Point	1Point (NPN/PNP Transistor open collector)					
		Rating	MAX. 50mA					
		Internal voltage drop of alarm output	Under 2.0V					
	Analog output		DC0～5V(Linear output) Standard					
	Accurracy		±2.5%F.S.±1digit					
Response time			Approx. 1.0sec					
Power source voltage			DC15～24V±10%(MAX.100mA)					
Cable			3m、With connector、(conductor size 0.5mm^2)					
Mounting direction			Vertically or horezontally					
Protective structure			equivalent to IP64					
Mass			4400 g	4200 g		4000 g		3800 g



Model	A	Model	A
WFK7050-20	Rc3/4	WFK7050-20N	3/4NPT
WFK7050-25	Rc 1	WFK7050-25N	1 NPT
WFK7100-25	Rc 1	WFK7100-25N	1 NPT
WFK7100-32	Rc1 1/4	WFK7100-32N	1 1/4NPT
WFK7200-32	Rc1 1/4	WFK7200-32N	1 1/4NPT
WFK7200-40	Rc1 1/2	WFK7200-40N	1 1/2NPT





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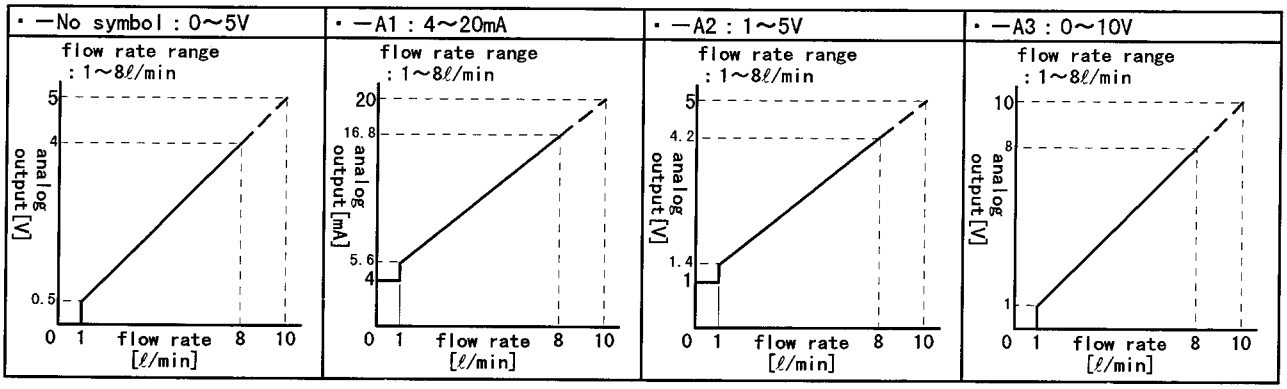
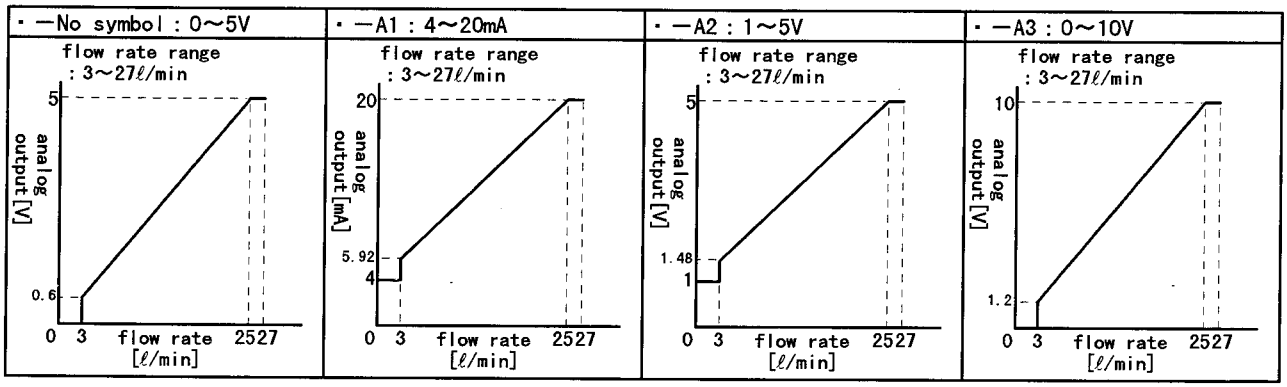
3-4 Analog output

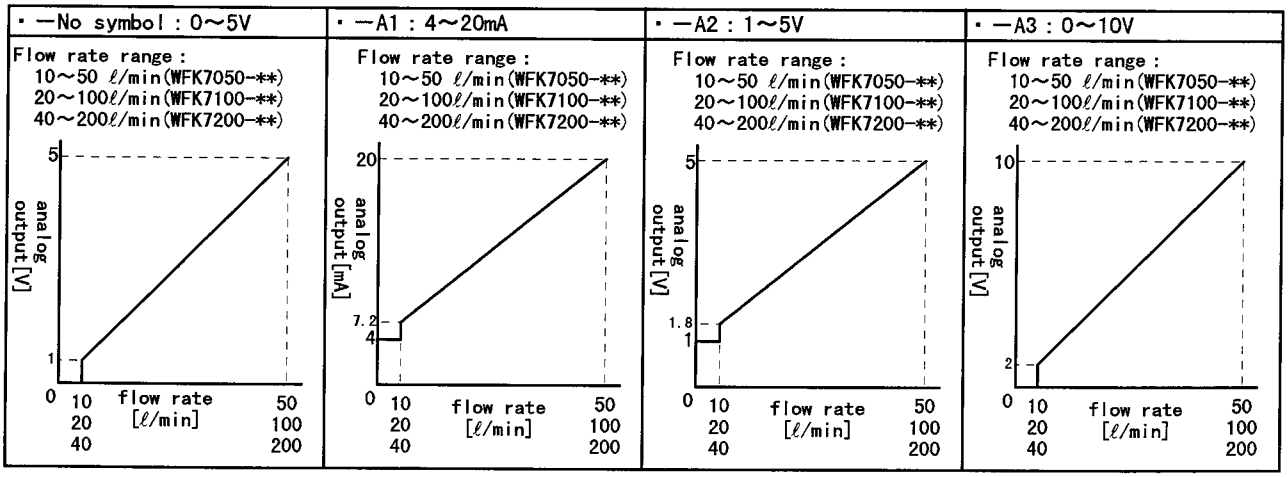
● WFK5008-**/WFK6008-**



● WFK5027-**/WFK6027-**



● WFK7050-**/WFK7100-**/WFK7200-**



Note 1) The analog output is not output correctly at a flow rate below the minimum flow rate level.
Note 2) A unit, to which the analog output is connected, must satisfy the fllowing load conditions.

Item	No symbol [0~5V]	-A1 [4~20mA]	-A2 [1~5V]	-A3 [0~10V]
Allowable load	1MΩ or more	500 Ω or more	1MΩ or more	1MΩ or more

4. Installation

・Before installing the flow rate sensor, thoroughly read the cautions stated in section 2-2, "Cautions for mounting, piping, and wiring".
Additionally, for details of water quality and installation place, see section 2-1, "Cautions for design selection".
・Install the flow rate sensor so that the flowing direction of the fluid to be measured and arrow mark on the body of the flow rate sensor are matched.
・Always operate the flow rate sensor with its inside filled with fluid. If the inside of the piping is composed of two layers, water and air, the flow rate cannot be measured accurately. Additionally, if air bubbles enter the flow rate sensor, this may also cause incorrect measurement.

4-1 Recommended piping

・Fig. 4-1 shows the recommended piping. To ensure easy inspection of the vortex producing and detection parts, and improve the maintenance ability during cleaning, it is recommended to use model WFK 6000 series which can be attached and detached without turning of the piping. For customers using the WFK 5000 series, installation of the bypass plumbing is convenient.

4-2 Piping method avoiding entry of air bubbles

・If air bubbles (mixed flow of gas and liquid) are produced depending on the piping conditions, carry out the piping work while referring to Figs. 4-2, 4-3, and 4-4.

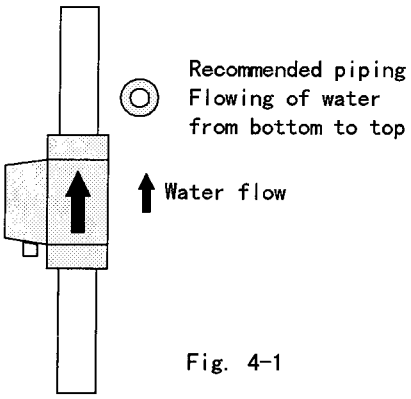
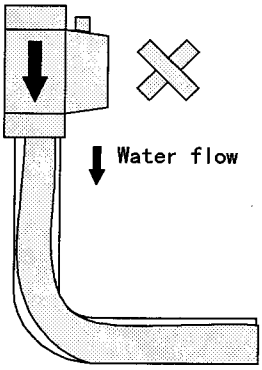


Fig. 4-1



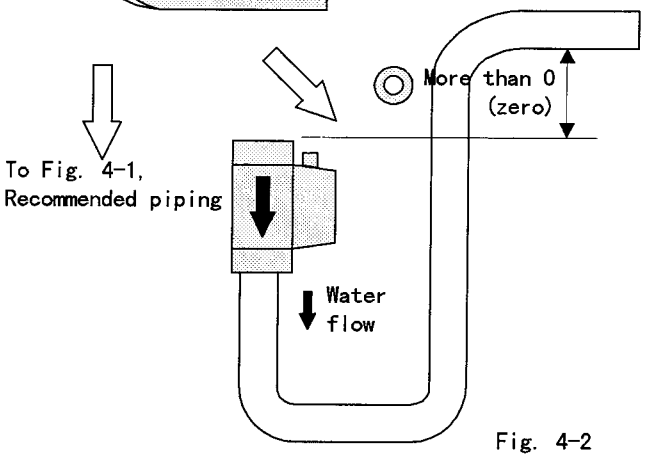


Fig. 4-2

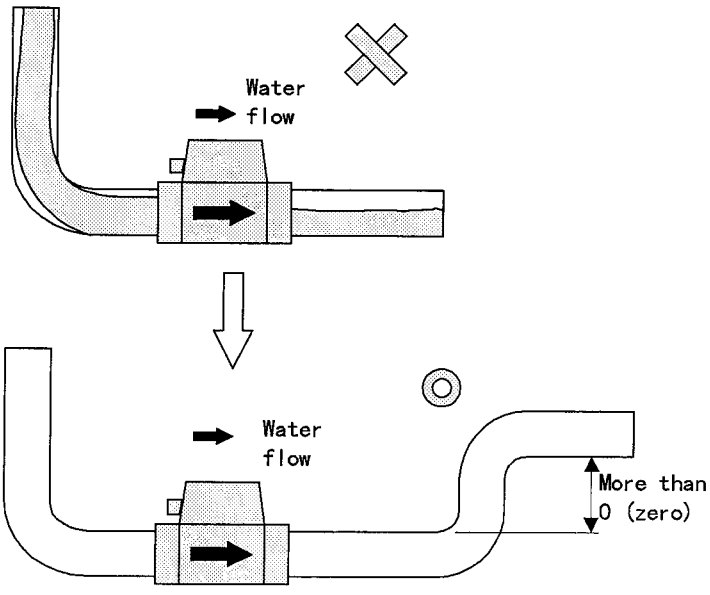


Fig. 4-3

Discontinue

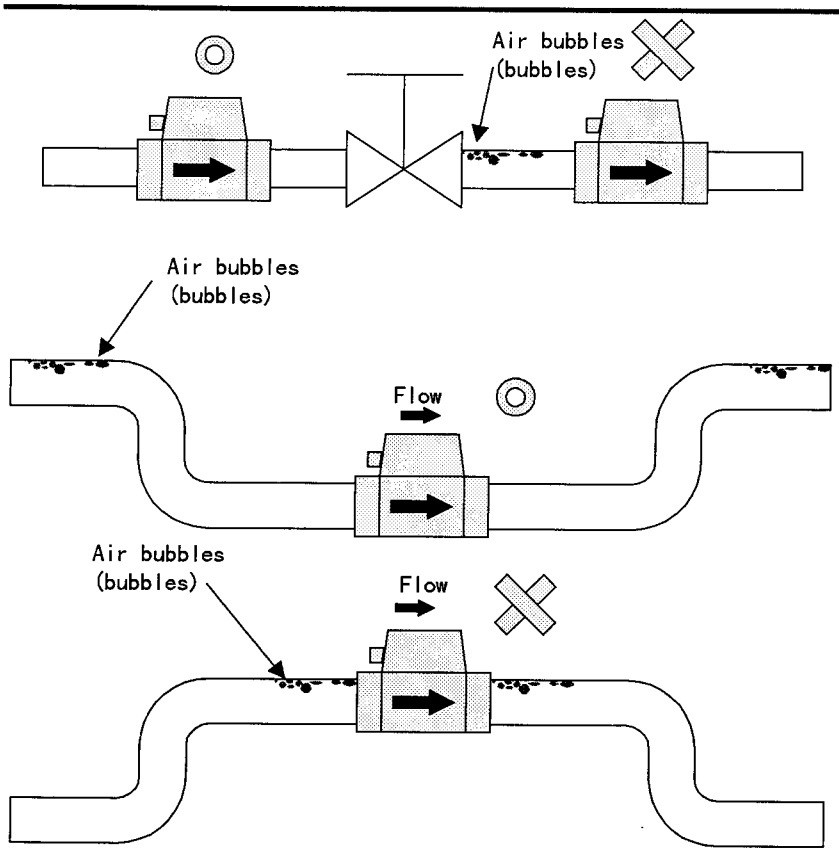


Fig. 4-4

4-3 Changing of display direction

・The display (7-segment LED) on the top can be turned up to 270° . Turn the display to a position where values on the display can be seen easily. (See Fig. 4-5.)

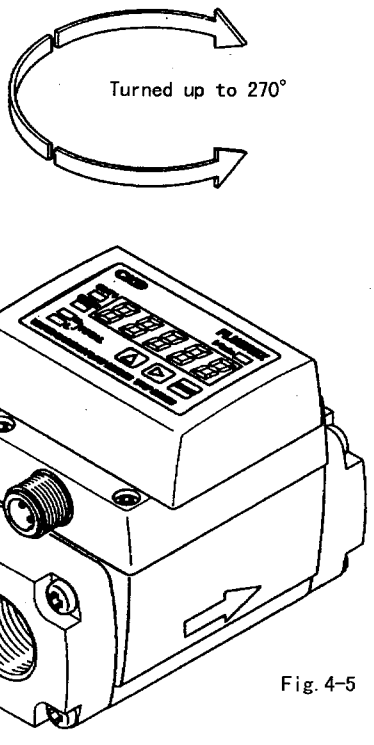


Fig. 4-5

4-4 Changing of connector taking direction

・If the connector taking direction is opposite to the wiring direction, remove four M3 screws and turn the connector case 180° . At this time, pay special attention so that cables are not caught in the case. See Fig. 4-6.
The sensor is installed on the upstream side before shipment from the factory.

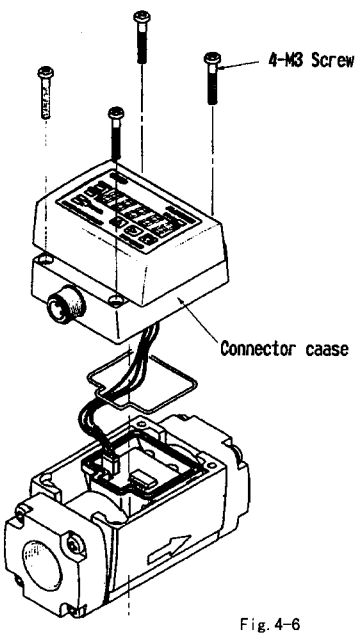
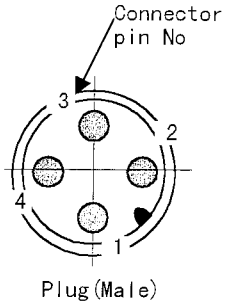


Fig. 4-6

4-5 Wiring method

・Note;2. Cautions for design selection

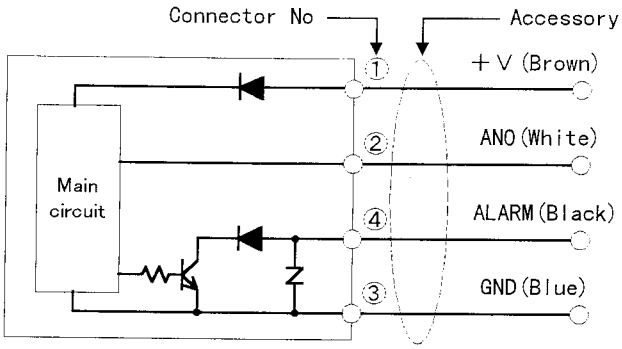
Connector (Maker Correns Corporation) : Type TM-4DSX3HG4
Specification DC, 4 wires, 0.5mm²



・Option (Analog output, Alarm output)

No symbol : (0-5[V], NPN)	-P : (0-5[V], PNP)
-A1 : (4-20[mA], —)	
-A2 : (1-5[V], NPN)	-PA2 : (1-5[V], PNP)
-A3 : (0-10[V], NPN)	-PA3 : (0-10[V], PNP)
-A4 : (Without analog output, NPN)	-PA4 : (Without analog output, PNP)
-A5 : (2-point alarm output, NPN)	-PA5 : (2-point alarm output, PNP)

1) No symbol, -A2, -A3, -A4 (Alarm output type: NPN)



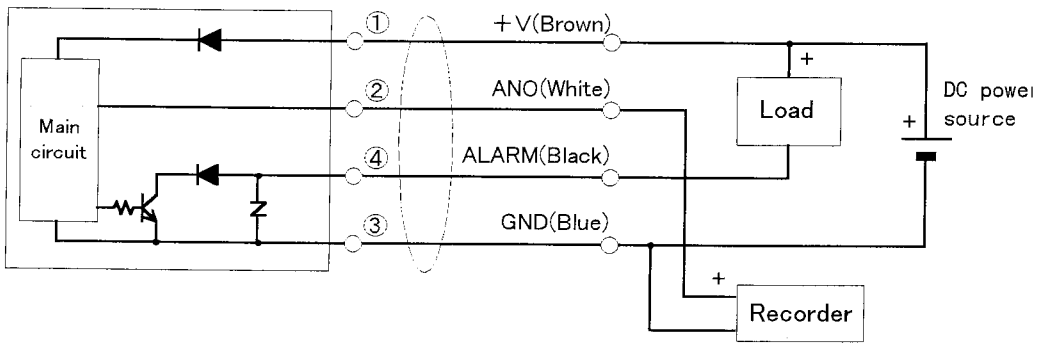
・・・Connector should be connected to plus[+]side of direct current source : DC 15～24V±10%

・・・Analog output : Voltage output in propotion to flow

・・・Alarm output (NPN) : MAX DC 30V・50mA

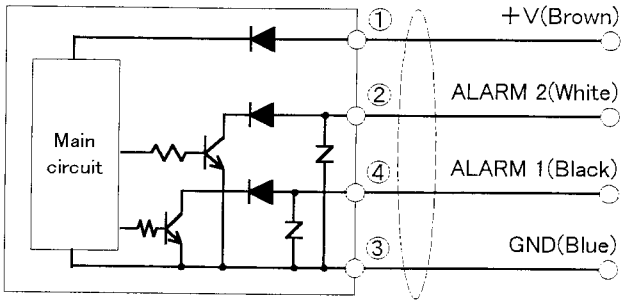
・・・Connector should be connected to minus[-]side of direct durrent source : DC 0V

Example of connection to relay/resistand load/recorder



2) -A5 (2-point alarm output: NPN)

・When you select 2-point alarm output type, you can't use the alanog output.



・・・Connector should be connected to plus[+]side of direct current source : DC 15～24V±10%

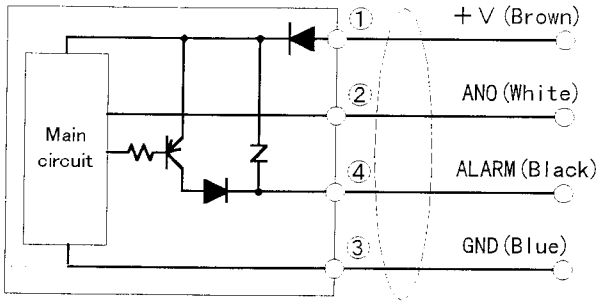
・・・Alarm 2 (OUT2) output (NPN) : MAX DC 30V・50mA

・・・Alarm 1 (OUT1) output (NPN) : MAX DC 30V・50mA

・・・Connector should be connected to minud[-]side of direct current source : DC 0V

Discontinue

3) -P, -PA2, -PA3, -PA4 (Alarm output type: PNP)



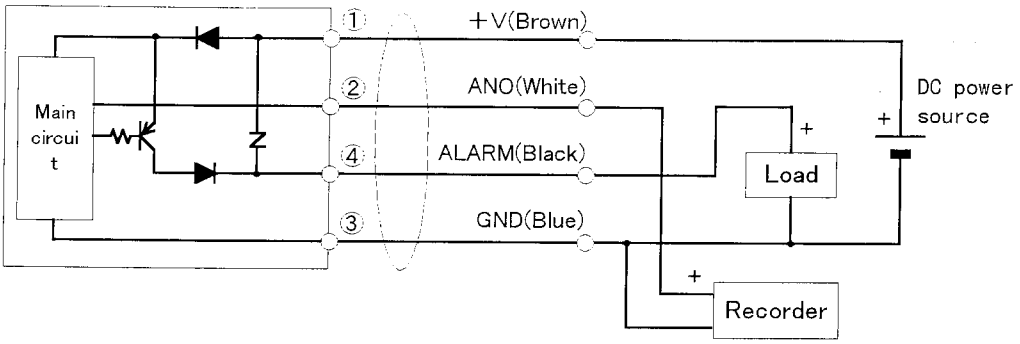
・・・Connector should be connected to plus[+]side of direct current source : DC 15～24V±10%

・・・Analog output : Voltage output in propotion to flow

・・・Alarm output (PNP) : MAX 50mA

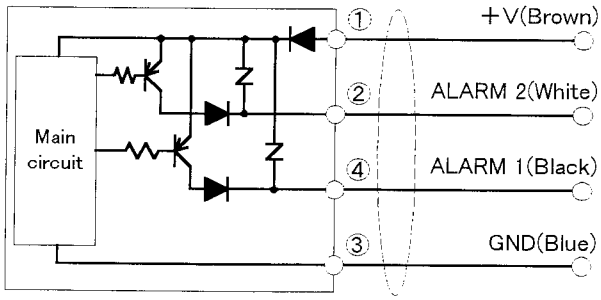
・・・Connector should be connected to minus[-]side of direct durrent source : DC 0V

Example of connection to relay/resistand load/recorder



4) -PA5 (2-point alarm output: PNP)

・When you select 2-point alarm output type, you can't use the alanog output.



・・・Connector should be connected to plus[+]side ofdirect current source : DC 15～24V±10%

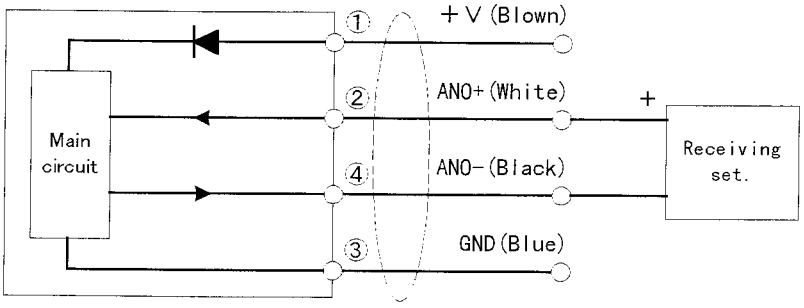
・・・Alarm 2 (OUT2) output (PNP) : MAX 50mA

・・・Alarm 1 (OUT1) output (PNP) : MAX 50mA

・・・Connector should be connected to minud[-]side of direct current source : DC 0V

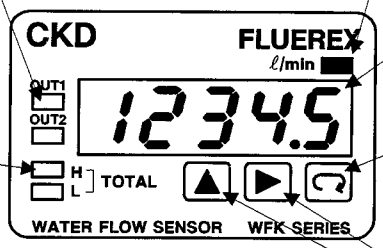
5) -A1 (4-20mA)

・When you select 4-20mA output type, you can't use the alarm output.



5. Operation

5-1 Part names and functions



● Output lamp
Indicates the alarm output status. OUT2 is effective only when option A5 is selected.

● Unit lamp for integrated flow rate
<L>
・Indicates lower digits of the integrated flow rate. Unit : ℓ
<H>
・Indicates higher digits of the integrated flow rate. Unit : ℓ

<H> Higher digits <L>Lower digits
The maximum number of digits for the integrated flow rate is 9. 0 9 9 9 9 9 9 9 9 9

● Unit lamp for instantaneous flow rate
・When this lamp is lit, it shows that the instantaneous flow rate is displayed on the 5-digit digital display.

● 5-digit digital display
・Displays the instantaneous or integrated flow rate.
<Write mode>
・Displays the output set values.

● Change key
<Measurement mode>
・Used to switch between the instantaneous and integrated flow rat displays.
<Write mode>
・Used to set an input value.

● Up key
<Measurement mode>
・Used to switch between H and L when the integrated flow rate is displayed.
<Write mode>
・Displays the output set values.

● Shift key
<Measurement mode>
・Keeping this key pressed for 2 sec. will change the mode to the write mode.
<Write mode>
・Pressing this key will shift the flashing digit right.

Fig. 5-1

5-2 Alarm parameters

・Three kinds of settings are available depending on the application.

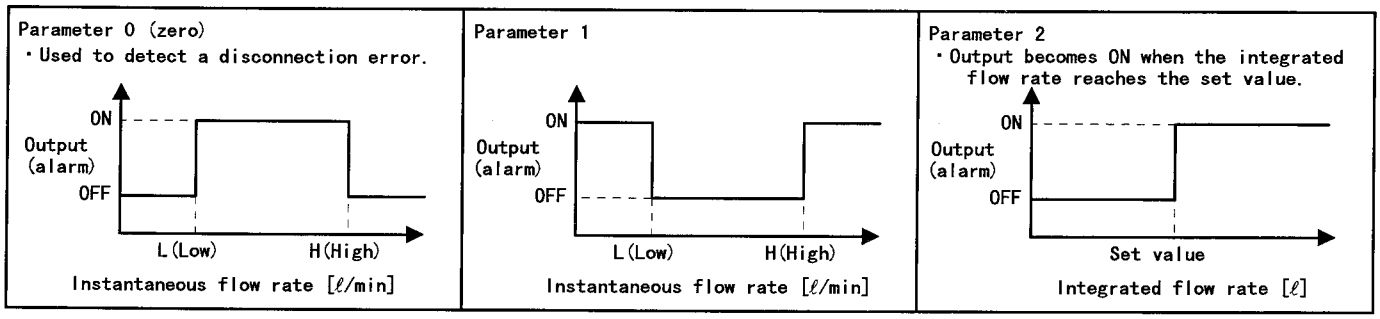


Fig. 5-2

Notes)
1) The output (alarm) ON status shows that the transistor is turned ON.
2) To ensure operational safety, always make the output settings after the upper units are stopped.
3) Set the parameters 0 and 1 so that the following conditions are met. If the conditions are not met completely, correct operation cannot be guaranteed.
$0 < L < H$
$0 < (L - h) \leqq L < (H - h)$
However, note that the output is always OFF when $L = H = h = 0$ (at shipment from the factory).

5-3 Hysteresis

・The hysteresis is set if the flow rate pulsates, causing the alarm to chatter.
・When selecting 2-point alarm output (Option-A5) , Hysteresis width of OUT1 is same as OUT2.

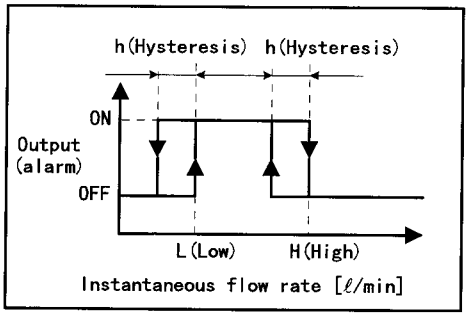


Fig. 5-3

5-4 Clearing of integrated value

1) Clear the integrated value using key operation in the write mode.
2) Clear the integrated value by turning OFF the power source.

5-5 Switching between instantaneous and integrated flow rate displays

・Every time the change key is pressed, the 5-digit display shows the instantaneous and integrated flow rate alternately. Additionally, it is also possible to temporarily switch the instantaneous flow rate display to the integrated flow rate display (for 10 sec.). Select a desired flow rate display as required.

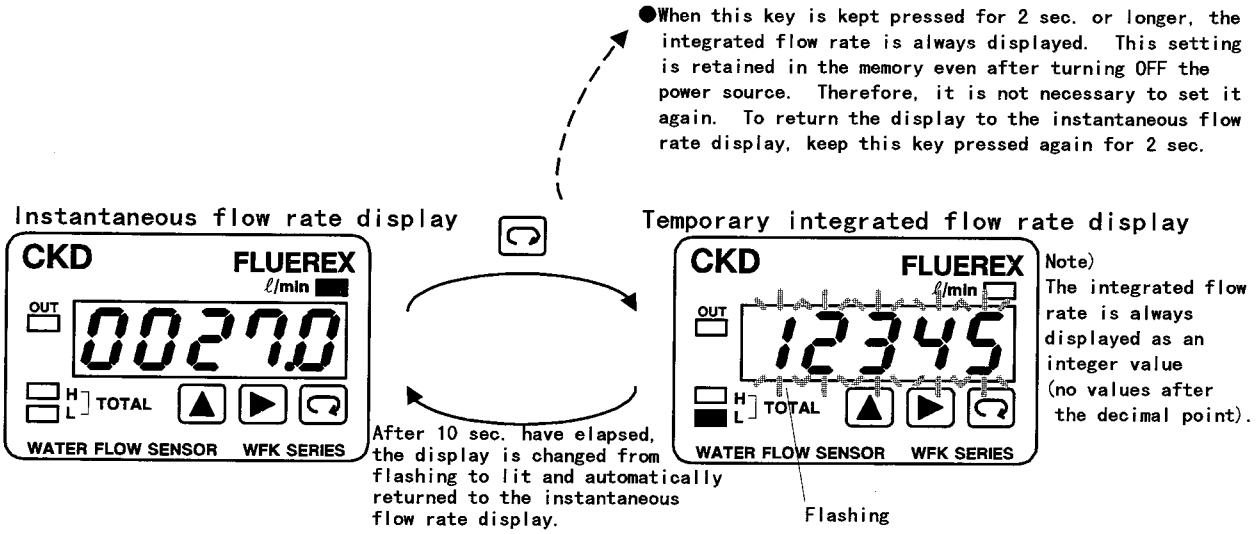


Fig. 5-4

5-6 Alarm setting procedure (instantaneous flow rate)

・The flow rate sensor enters the flow rate measurement state (measurement mode) as shown in Fig. 5-5 immediately after the power source is turned ON. The following describes procedures from the measurement mode with the values listed below.

P(Parameter) ... 0
L(Low) 10
H(High) 20
h(Hysteresis) ... 1

(To check the hardware of the flow rate sensor, all the LEDs are lit for 2 sec., and then the indication showing the flow rate range is lit for 1 sec. immediately after the power source is turned ON.)

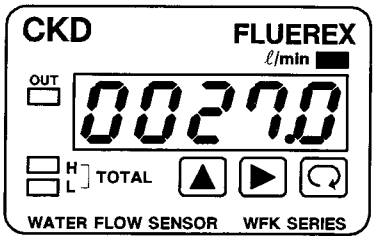
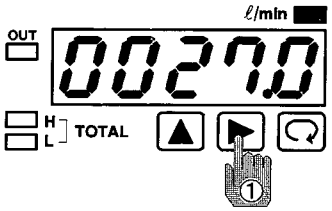


Fig.5-5

①Changing from measurement mode to write (setting) mode

・Keep the shift key ▶ pressed for 2 sec.

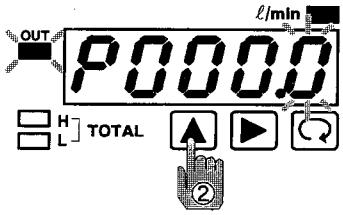
The OUT LED starts flashing, "P" is displayed at the first digit from the left end of the 7-segment LED display, and the LED at the fifth digit from the left end starts flashing.



②Parameter setting

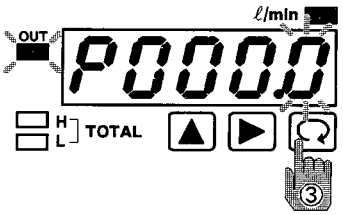
・Set a parameter using the up key ▲.

<If the parameter is 0, press the change key ↻ directly.>



③Changing of mode to Low setting

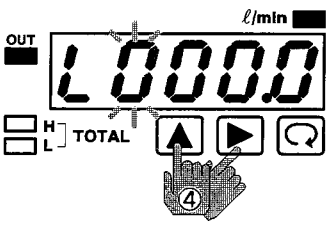
・Press the change key ↻. "L" is displayed at the first digit from the left end of the 7-segment LED display and the LED at the second digit from the left end starts flashing.



④Low setting

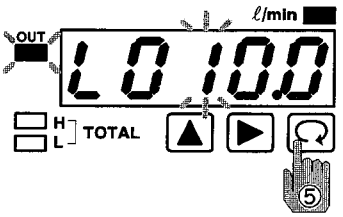
・Set a Low value using the shift ▶ and up ▲ keys.

<For example, to set "10" for Low, press the shift key once and the up key once.>



⑤Changing of mode to High setting

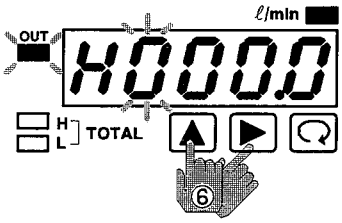
・Press the change key ↻. "H" is displayed at the first digit from the left end of the 7-segment LED display and the LED at the second digit from the left end starts flashing.



⑥High setting

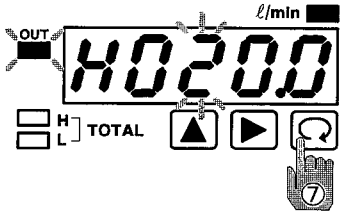
・Set a High value using the shift ▶ and up ▲ keys.

<For example, to set "20" for High, press the shift key once and the up key twice.>



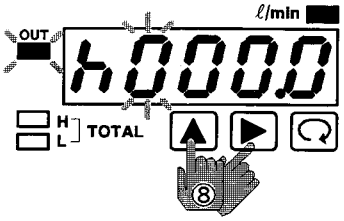
⑦Changing of mode to hysteresis setting

・Press the change key . "h" is displayed at the first digit from the left end of the 7-segment LED display and the LED at the second digit from the left end starts flashing.



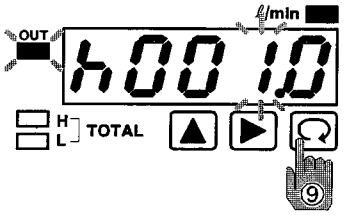
⑧Hysteresis setting

・Set a hysteresis value using the shift and up keys.
<For example, to set "1" for the hysteresis value, press the shift key twice and the up key once.>



⑨Changing of mode to integrated value clear mode

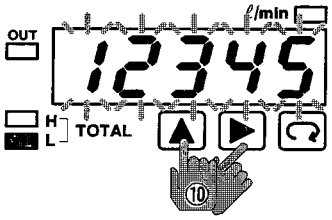
・Press the change key . The 7-segment LED display then shows the integrated flow rate and values at all digits start flashing. Additionally, the unit indication lamp "L-TOTAL" is lit.



⑩Clearing of integrated value

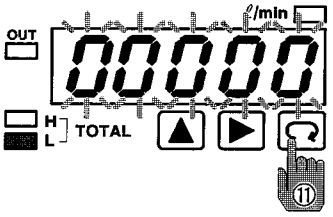
・To clear the integrated value, keep the shift and up keys pressed at the same time for 5 sec.

Note) If the integrated value does not need to clear, skip this step and jump to step (11), Completion.



⑪Completion

・Press the change key . The setting is completed and the display is returned to that appears immediately after the power source is turned ON. Fig. 5-5



<2-point alarm outputs>

・Parameter, Low, and High settings for OUT2 are added. After pressing the change key in above step (7), repeat operation steps (2) through (7). At this time, to show whether the OUT1 or OUT2 set value is indicated on the display, the OUT1 or OUT2 indication lamp is lit accordingly.

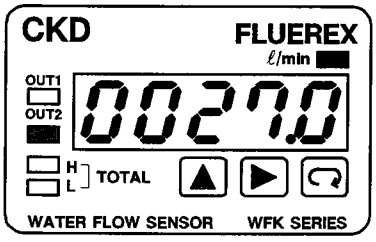


Fig. 5-6

Discontinue

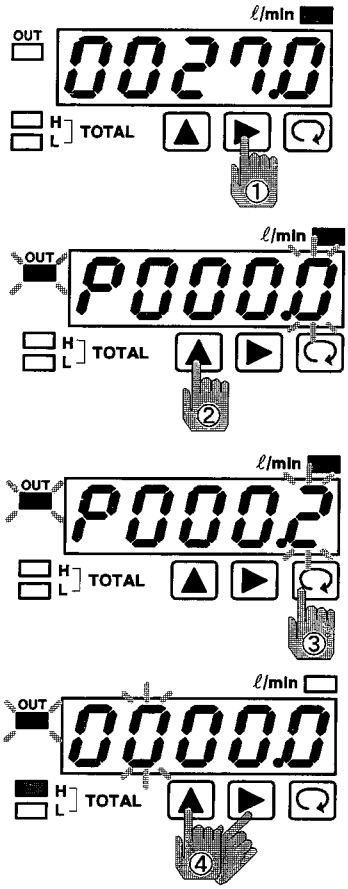
5-7 Alarm setting procedure (integrated flow rate)

・The flow rate sensor enters the flow rate measurement state (measurement mode) as shown in Fig. 5-5 immediately after the power source is turned ON. The following describes procedures from the measurement mode with the values listed below.

P(Parameter) ... 2 (Setting of integrated flow rate)

Set value 200,000

(To check the hardware of the flow rate sensor, all the LEDs are lit for 2 sec., and then the indication showing the flow rate range is lit for 1 sec. immediately after the power source is turned ON.)



① Changing from measurement mode to write (setting) mode

・Keep the shift key ▶ pressed for 2 sec.

The OUT LED starts flashing, "P" is displayed at the first digit from the left end of the 7-segment LED display, and the LED at the fifth digit from the left end starts flashing.

② Parameter setting

・Set a parameter using the up key ▲.

<If the parameter is 2, press the up key ▲ twice.>

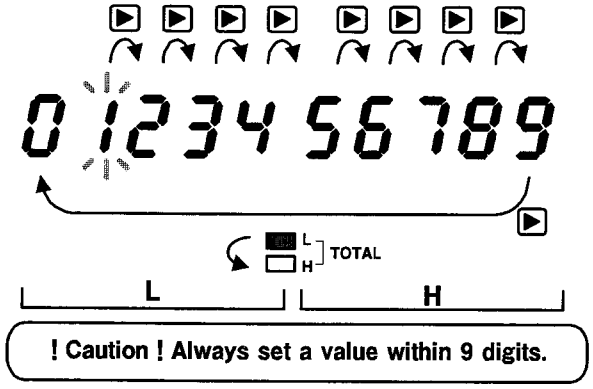
③ Changing of mode to integrated flow rate setting

・Press the change key ↻. The "H-TOTAL" indication lamp lights up and the LED at the second digit from the left end of the 7-segment LED display starts flashing. (At this time, the value indicated on the display is the previously set value. (Zero (0) is indicated at shipment from the factory.)

④ Integrated flow rate setting

・Set an integrated flow rate set value using the shift ▶ and up ▲ keys.

9-digit integrated flow rate set value is displayed by changing H and L. Every time the shift key ▶ is pressed, the digit is moved as shown below.

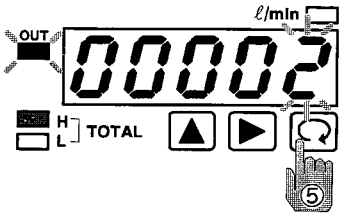


! Caution ! Always set a value within 9 digits.

<For example, to set "200,000" for the integrated flow rate set value, press the shift key three times and the up key twice.>

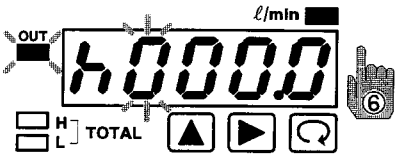
⑤Changing of mode to hysteresis setting

・Press the change key . "h" is displayed at the first digit from the left end of the 7-segment LED display and the LED at the second digit from the left end starts flashing.



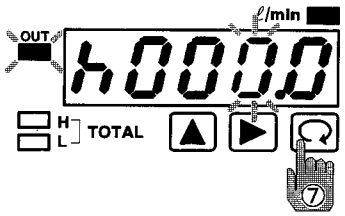
⑥Hysteresis setting

・Do not set any value.



⑦Changing of mode to integrated value clear mode

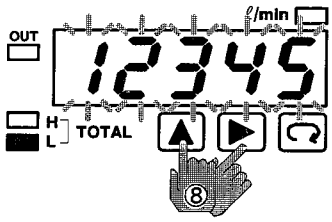
・Press the change key . The 7-segment LED display then shows the integrated flow rate and values at all digits start flashing. Additionally, the unit indication lamp "L-TOTAL" is lit.



⑧Clearing of integrated value

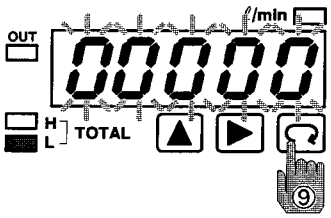
・To clear the integrated value, keep the shift and up keys pressed at the same time for 5 sec.

Note) If the integrated value does not need to clear, skip this step and jump to step (11), Completion.



⑨Completion

・Press the change key . The setting is completed and the display is returned to that appears immediately after the power source is turned ON. Fig. 5-5

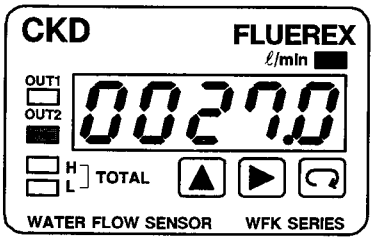


＜2-point alarm outputs＞

・Parameter, integrated flow rate settings for OUT2 are added.

After pressing the change key in above step (4), repeat operation steps (2) through (4). At this time, to show whether the OUT1 or OUT2 set value is indicated on the display, the OUT1 or OUT2 indication lamp is lit accordingly.

・It is also possible to individually set the instantaneous flow rate for OUT1 and integrated flow rate for OUT2.



6. Maintenance

6-1 Prohibition of disassembly and modification

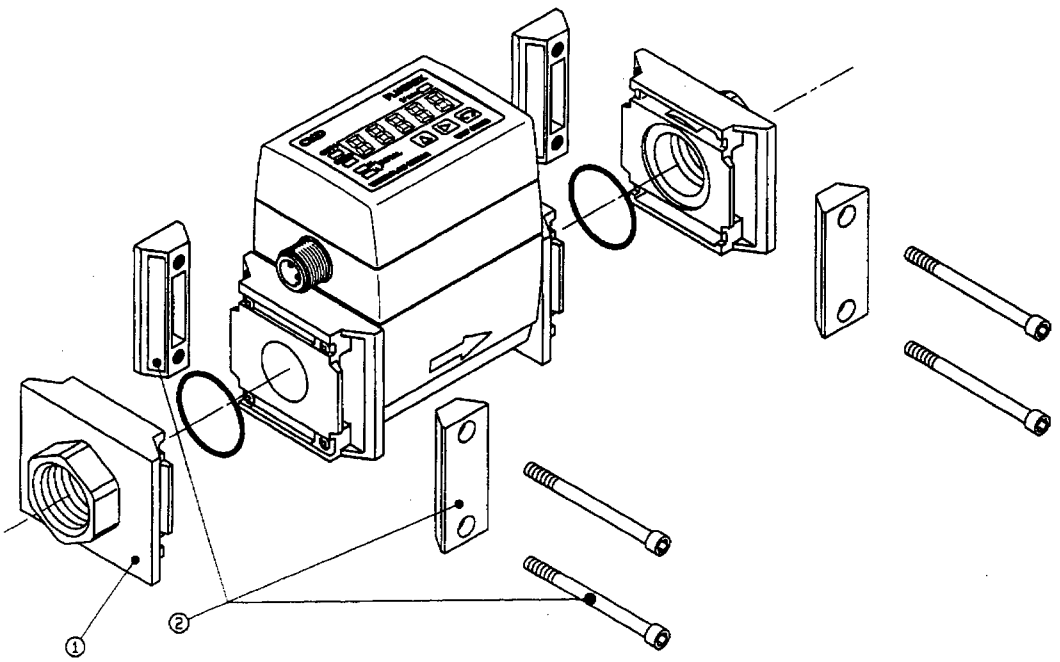
CAUTION

● Except for the WFK6000 series module, no parts cannot be replaced and repaired by the customer since this unit is a high precision sensor.
● If the unit needs to repair, always return it to the manufacturer. If any foreign particles, such as seal tape dust is sticking to the inside of the piping, remove it using tweezers.
At this time, never apply a strong impact to the vortex producing and/or vortex detection parts.

6-2 Construction of WFK6000 series module

CAUTION

● Always discharge drain from the piping before replacing the module.
● If the o-ring deteriorates excessively or if scratches are found, replace the o-ring with a new one.
o-ring size: P21 JIS B2401



7. Troubleshooting

Classification	Symptom	Cause	Remedies and measures
Display	Nothing is displayed.	Disconnection	Correct the wiring while referring to section 4-5, Wiring method.
		Low voltage	Measure the power supply voltage with a tester. If the voltage is below 10V DC, the display does not function. Always apply a specified voltage.
	Instantaneous flow rate display fluctuates largely.	Display fluctuates due to pulsation of the pump.	Install an accumulator (tank) on the upstream side of the sensor to attenuate the pulsation. If the pulsation cannot be solved in the above step, make the sensor responsibility slower to stabilize the display. Contact the manufacturer separately.
		Flow rate cannot be measured correctly due to cavitation (air bubbles), causing the display to fluctuate.	Eliminate the cavitation. (Noise may be produced if cavitation occurs.) See section 4-2, Piping method avoiding entry of air bubbles. If the flow rate sensor is used continually with the cavitation occurred, this may cause the sensor to break.
	Instantaneous flow rate display does not show 0 (zero) even though the valve is closed and the flow rate is 0 (zero).	Vortex detector detects a vibration.	Reduce a vibration applied to the sensor to 2G or less. If the piping vibrates, secure the piping to a solid place using a bracket.
		Noise is applied.	Ground the SUS part of the sensor or the negative voltage line of the DC power source whichever affects efficiently.
	Instantaneous flow rate display shows a value less than the actual flow rate.	Fluid flowing direction and sensor detection direction are not matched.	Correct the sensor direction. At this time, if the connector position becomes opposite, change the connector direction while referring to section 4-4, Changing of connector taking direction.
		Measurement cannot be made precisely due to cavitation (air bubbles), causing a value less than the actual flow rate to be displayed.	Eliminate the cavitation. (Noise may be produced if cavitation occurs.) See section 4-2, Piping method avoiding entry of air bubbles. If the flow rate sensor is used continually with the cavitation occurred, this may cause the sensor to break.
		Fluid flows at a flow rate 1.5 times larger than the rated level.	Use a flow rate sensor having a proper flow rate range. At this time, gradually close the restrictor and check that the flow rate increases at a certain point.
	Display that appears after the power is turned ON is repeated several times.	Noise (inverter noise) is applied repeatedly.	Ground the unit (inverter) that may produce noise to reduce the noise level.
Alarm	Nothing is output from the alarm.	Disconnection	Correct the wiring while referring to section 4-5, Wiring method. Even though a short-circuit protection circuit is provided, the flow rate sensor may break if any wiring is short-circuited continually for an extended period of time. Short-circuit protection current:70mA
	Alarm output chatters.	Pulsating flow rate fluctuates at above or below the value set on the alarm.	Set the hysteresis to a level larger than the pulsation value.
	When the power source is turned ON, an error occurs and the valve is closed, causing the fluid not to flow.	Alarm does not function correctly for 5 sec. of hardware check after the power source is turned ON.	Mask alarm operation for 5 sec. immediately after the power source is turned ON. Fig. 7-1 shows the reference circuit with the valve.

<Example circuit to shut off the flow rate if leak occurs in the piping>

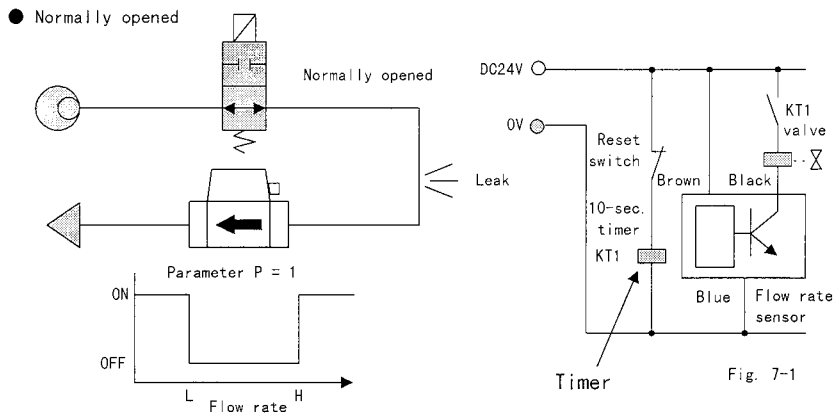


Fig. 7-1

Discontinue

Analog output	Analog output is not output.	Disconnection	Correct the wiring while referring to section 4-5, Wiring method. Even though a short-circuit protection circuit is provided, the flow rate sensor may break if any wiring is short-circuited continually for an extended period of time.
		*At this time, if the display value also decreases, check the troubleshooting item, "Instantaneous flow rate display shows a value less than the actual flow rate".	
		Impedance of the load is not correct.	Make the impedance of the load proper. See section 3-4, "Analog output".
	Analog output is not stable.	Noise is applied.	Reduce the noise. Measure the AC voltage of the analog output. If the voltage is more than 0.1V, the analog output may be oscillated. Ground the SUS part of the sensor or the negative voltage line of the DC power source, or keep the cable and sensor away from the power units (compressor and pump) and power distribution lines.
Others	Main unit is excessively hot.	Internal circuit is faulty.	Immediately stop the use of the flow rate sensor and contact the manufacturer. The display may become slightly hot (approximately 40℃), but this is not a problem.