



Thermal Mass Flow Meter / Controller

MODEL 8700 SERIES

INSTRUCTION MANUAL

KOFLOC Corp.

Please read this manual thoroughly prior to installing and using the product. This way it is possible to ensure the performance and safety of the product and prevent possible accidents and damage to the product due to incorrect use.

When the product has failed or is considered to require readjustment, please contact our sales office. Our experienced technical staff will give you appropriate advice. Please follow the instructions given.

Please note that if you repair/modify the product yourself, not only serious accidents may occur, but our warranty will become void.

The contents of the manual are subject to change without notice for improvement. Prior to shipment, every care has been taken in preparing this manual not to mention the product itself, but if you notice any imperfections, errors or omission, please contact KOFLOC.

<< Prior to use >> and << Precautions for use >>

Various alert symbols and signal words are used in this manual and attached to the product to ensure correct use of the product and to prevent possible personal injury or loss of life and property damage. The symbols and meanings of the signal words are as follows:



DANGER

Ignoring this symbol and handling the product incorrectly will immediately result in loss of life or serious injury.



WARNING

Ignoring this symbol and handling the product incorrectly may result in loss of life or serious injury.



CAUTION

Ignoring this symbol and handling the product incorrectly may result in personal injury or damage to property.

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1. Foreword

Thank you for your selection of the mass flow meter/controller Model 8700 Series. Prior to using your new equipment, please read this manual thoroughly to ensure it is used in the correct way.

2. Precautions for Use

(1) Peripheral Equipment to Connect

- ① The connector pin assignment of Model 8700 Series is different from that of Model 8500 Series and D8500 Series. For details, refer to 7. Connector and Pin Assignment.
- ② Model 8700 Series allows the use of the same AC adapter as that for Model 8500 Series and D8500 Series. (The outside of the jack is +24 V.)
- ③ Check to see if the voltage (24 VDC), polarity and current capacity (0.3A or over) of the power supply are correct.
- ④ Check to see if the analog set input is the signal within the allowable input range. The allowable maximum input voltage is 10 V and the allowable maximum input current is 30 mA.
- ⑤ When the analog flow rate output signal is to be used, make sure that the proof pressure on the input equipment side is sufficient. The output may possibly be in a range of -1 to 7 V in the case of voltage and 0 to 26 mA in the case of current.

(2) Items to Check about the Product

Do the specifications shown on the label match your order?

(The ordered product has been assembled and adjusted one by one according to the specifications. The ID plate attached to the back of the case shows the gases to use, flow rate and other specifications. Check to see if they comply with your order specifications.)

① MODEL **8700MC** - 0

8700MC : Controller	0 : Integrated indicator type
8700MM : Meter	S1 : Separate indicator type 1 m
8750MC : Controller	S3 : Separate indicator type 3 m
8750MM : Meter	S5 : Separate indicator type 5 m

② Fluid name

③ Flow rate/calibration temperature

SCCM	=	ml/min	at	0°C	: 1 atm
SLM	=	l/min	at	0°C	: 1 atm
NCCM	=	ml/min	at	20°C	: 1 atm
NLM	=	l/min	at	20°C	: 1 atm

※ "SCCM" stands for Standard Cubic Centimeter per Minute and normally refers to the state at 0°C, but there are many industries where the normal state is at 20°C. KOFLOC indicates the units of flow rate together with the calibration temperature and atmosphere.

If the calibration temperature is different, the actual flow rate will become different largely. Always check it prior to use.

④ Presence of the serial No.

(3) Precautions for Transportation

Wherever possible, transport the product in the condition in which it has been received from KOFLOC to the installation site in order to prevent damage due to accidents during transportation

(4) Precautions for Storage of the Product

If the product is not put in use for a long time after it was received, unexpected troubles may occur.

When it is expected that the product will be kept in storage for a long time, take the following precautions:

- Store the product in the package in which it was received from KOFLOC, wherever possible.
 - Store the product in a place described below:
 - ① A place free of rain and water.
 - ② A place free of vibration and impact.
 - ③ A place of normal temperature and normal humidity (around 25°C, 65%).
 - ④ A place free of dust.
 - ⑤ A place free of corrosive gases.
 - ⑥ A place free of a strong electric/magnetic field.
 - To store the product that has been used, purge it with clean air or N₂ so that measuring gas will not remain in the flow meter.
- Cover the inlet and outlet sides (joints) of measuring gas with caps to prevent intrusion of dust and dirt.

3. Overview and Configuration of the Product

(1) Overview of the product

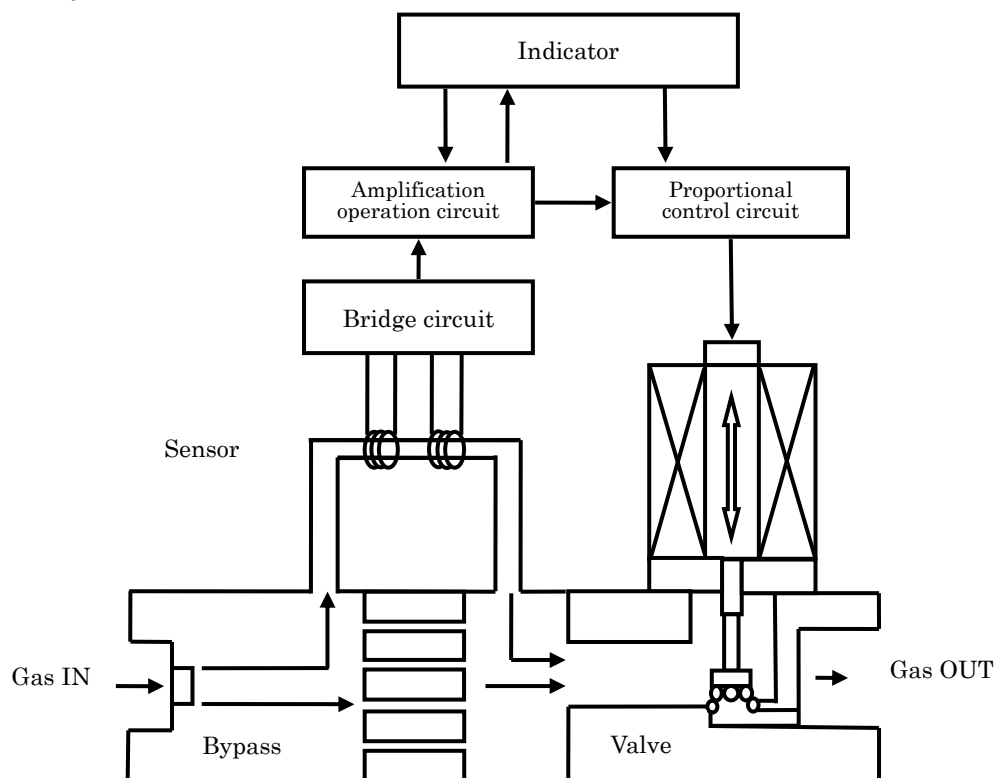
Model 8700 Series is a gas flow control/measuring equipment with an integrated flow sensor developed based on the principle of the thermal flow sensor, flow control valve (controller type) and indicator.

8700 Series has the following functions and features:

- Normally closed type. (Controller type)
- A large flow rate realized by a small body by employing a high-lift actuator. (Controller type)
- An indicator is installed and can be operated with a single 24 VDC power supply only.
- Both of digital control (indicator, communications, contact) and control by analog signals are possible. (Voltage signal: 0 – 5 V or current signal: 4 – 20 mA)

(2) Configuration

Model 8700 Series is configured with a sensor, bypass, electric circuit and valve (controller type only) as shown below.



4. Standard Specifications

Item		Specifications	
Model Name		8700 MC/MM	8750MC/MM
F.S. flow rate (N ₂)		10SCCM~20SLM	20SLM~100SLM
Specifiable gas		N ₂ , Air, O ₂ , CO ₂ , Ar, H ₂ , He, etc.	
Sensor type		Thermal winding sensor	
Valve actuator※1		Solenoid normally closed type	
Control	Control range※2	2~100% F.S.	5~100%F.S.
	Response	2 sec Max. (0→98%)	3 sec Max. (0→98%)
Accuracy	Accuracy	±1.0 % F.S. (25°C)	±1.5 % F.S. (25°C)
	Repeatability	±0.5 % F.S.	
Pressure	Proof pressure	1 MPa (G)	
	Operating pressure	500kPa (G) Max.	
	Operating differential pressure※1	50~300kPa (F.S. ≤5SLM)	150~300kPa (F.S. ≤50SLM)
		100~300kPa (F.S. >5SLM)	200~300kPa (F.S. >50SLM)
Pressure characteristic	0.3% F.S./100 kPa		
Temperature	Working temperature	5~45°C	
	Temperature characteristic	0.1%F.S./°C	0.2%F.S./°C
Humidity	Allowable operating humidity	10 – 90 % (no condensation)	
Flow rate setting ※1※3	Digital	① Indicator ② Communications ③ Event input selection	
	Analog	Standard: 0 – 5 V (Input impedance 100 kΩ min.) Selection: 4 – 20 mA (Input impedance approx. 250 Ω)	
Flow rate output ※3	Analog	Standard: 0 – 5 V (External load resistance 250 kΩ min.) Selection: 4 – 20 mA (External load resistance approx. 300 Ω max.)	
Display	Method	7-segment LED, 4 digits	
Other input/output functions	Event input	5 contacts	
	Alarm output	1x NPN open collector output Max 35V : 50mA	
	Event output	2x NPN open collector output Max 35V : 50mA	

Power supply	Rating	24 VDC, power consumption 300 mA max.	
	Allowable voltage range	DC22.5V~25.2V	
Installation posture		Any posture	
Materials of parts in contact with gas		SUS316 , SUS316L , SUS430 , Fluor rubber , PTFE , Chloroprene rubber (Optional)	
Joint		Rc1/4 Rc3/8 (Optional : 1/4SWL,1/8SWL,1/4VCR, 3/8SWL)	
Weight		Integrated type approx. 1200 g/ separate type approx. 1400 g	Integrated type approx. 1500 g/ separate type approx. 1700 g

※1 Applicable to the controller only.

※2 Measuring range in the case of the meter.

※3 The analog input/output is changeable on the indicator.

5. Special Functions

(1) Indicator function

- Indication: 7-segment LED, 4 digits
- Indication update cycle: Selected from 50 msec , 100 msec , 200 msec, 500 msec and 1000 msec/time
- Status indicator lamp: Green 7 pieces / Red 1 pieces
- Key switch: 6 pieces

(2) Integration function

※To make setting about integration, refer to 13. Applied Operating Procedure.

①Maximum integrated flow rate

Maximum 12-digit integration measurement is possible.

For details, refer to 11. Basic Operation of the Indicator.

②Integration timing

An instantaneous flow rate value is added every one second.

③Power failure measure

The integrated flow rate is stored/held every one minute and as soon as the power is recovered, integration will restart. When this happens, the integrated flow rate for one minute maximum from the storage to the power failure is lost.

(3) Upper/lower limit flow rate alarm allowable range (OK judgment) function

※To use this function, refer to 13. Applied Operating Procedure.

- ① When the instantaneous flow rate value is above the upper limit alarm value or below the lower limit alarm value, the ALM LED lights and the alarm output is turned on.
- ② When the instantaneous flow rate value is between the lower limit alarm value and the upper limit alarm value, the OK LED lights.

(4) Zero adjust and auto zero functions

① Zero adjust function

Pressing the yellow [ZERO] adjust switch on the side face of the main unit corrects the zero point.

② Auto zero function

When the operation mode is the fully closed state or when the set flow rate is 0 and the instantaneous flow rate value is 2% of the full scale or less, the zero point is automatically corrected.

※Refer to “D-08” and “D-09” in 14. List of Functions Setting Modes.

6. Installation

(1) Installation place

- ① This equipment is designed for indoor use.
Never install the equipment in a place where it is likely to be wetted by water or rain. The equipment may fail. Install the equipment in a place where sufficient ventilation is provided and changes in humidity are minimal.
- ② Install the equipment in a place free of vibration and impact.
- ③ Do not use the equipment under direct sunlight or at high temperature/humidity.
- ④ Install the equipment in a place free of dust.
- ⑤ Install the equipment in a place free of corrosive gases.
- ⑥ Install the equipment in a place free of a strong electric/magnetic field.
- ⑦ Install the equipment in a place where ambient temperature is 15 to 35°C.

The use of the equipment in a condition deviating from the conditions described in the specifications is a cause of failure.



CAUTION

When installing the mass flow unit, noise generating sources in the vicinity of installation, environment filled with moisture and dust and very hot, corrosive gas ambient must be avoided. Such conditions are causes of serious failure.

(2) Installation method

Install the equipment using the threaded holes (M4) on the bottom of the body.
For installation hole dimensions, refer to 19. External View on page 33.

(3) Installation posture

The basic installation posture is horizontal. If the equipment is to be installed vertically, warm up the equipment fully and conduct the zero point adjustment.
Determine the direction of gas inlet and outlet as indicated by the arrows on the ID plate.

(4) Piping and filters

When using commercially available pipes and joints for piping, make sure that they have been cleaned completely or they are clean.

Install a line filter (finer than 100 μm) on the inlet side of gas. A standard filter has been installed on the inlet side of the equipment, but if a large amount of impurities sticks to it, gas will not flow smoothly, disabling accurate measurement and control.

In particular, when using air from a compressor or blower, a large amount of oil mist or water droplets may be produced. Install an oil filter or water-removing filter before the equipment.



CAUTION

Never wash the piping system after the mass flow unit has been installed. Such a practice may cause serious failure.



WARNING

Check to see if the connections of gas piping are not leaking. If such a check is omitted and unsafe gas is used, serious accidents may occur.



CAUTION

Give careful attention to piping after the unit also to ensure that water droplets condensed within the piping will not enter the unit due to counterflow.



CAUTION

Make sure that the installation direction (gas flow direction) is correct. Due to the characteristics of the mass flow controller, if counterflow occurs, the fully opening action may occur even if controlled.



CAUTION

The valve of Model 8700 Series Controller Type is intended for precise control and is different from valves designed for complete shutoff. Where complete shutoff is required, install a valve dedicated to shutoff in the upstream or downstream.

(5) Wiring

Connect wires referring to 7. Connector and Pin Assignment.

Use the included dedicated connector. Firmly insert the connector to the designated place.

7. Connector and Pin Assignment

(1) Connector

Connector type : D-sub half-pitch connector, 20 pins

Main unit connector : DX10M-20S (Hirose-made)

Recommended matching connector : DX40M-20P (Hirose-made)

Cover : DX30M-20-CV (Hirose-made)

(2) Pin assignment

Pin No.	Signal Name	Remarks
1	Power supply GND	It is recommended to connect both of two to prevent a voltage drop.
2	Power supply GND	
3	Flow rate setting input GND	COM to all signal inputs & outputs.
4	Power supply 24VDC	It is recommended to connect both of two to prevent a voltage drop.
5	Power supply 24VDC	
6	Flow rate setting input	*1 0 - 5 V / 4 - 20 mA
7	Flow rate output	*2 0 - 5 V / 4 - 20 mA
8	Operation mode input	5V: FULL OPEN / S.GND: CLOSE / OPEN: CONTROL
9	5V output	(≒5V) Valve motion mode input only.
10	ALARM output	NPN open collector output (Max. spec.: 35 V, 50 mA)
11	EVENT output 1	
12	EVENT output 2	
13	Flow rate setting pattern 1 changeover input	ON when short circuited to signal input/output GND
14	Flow rate setting pattern 2 changeover input	
15	Flow rate setting pattern 3 changeover input	
16	Flow rate setting pattern 4 changeover input	
17	Flow rate setting pattern 5 changeover input	
18	TR+	RS485 communications
19	TR-	
20	TR COM	

* 1: Input impedance Voltage input: approx. 100 k Ω min, current input: approx. 250 Ω

* 2: Load resistance Voltage output: 250 k Ω min, current output: 300 Ω max.

**DANGER**

Do not connect different power supplies to the power input terminals of the above connector and the pin jack power terminals simultaneously. Such a practice may cause a fire or damage to the equipment.

8. Preparation Prior to Use

(1) Warming up

In the state that no gas pressure is being applied to inlet side of the main unit (a pressure difference between the inlet side and the outlet side is completely zero), turn on the power. When the operation mode is “fully open” or “control,” warm up the equipment for 15 minute or longer under the condition of “fully open” or “set flow rate zero.”

If the equipment is operated without warming up, its accuracy will deteriorate.

(2) Zero point adjustment

This equipment has the **zero adjust function**.

Pressing the [ZERO] switch on the side of the main unit corrects deviation of the zero point.

This step is not needed when the auto zero function is active.

(3) Introducing gas

After confirming the type of gas to use and making sure that the supply pressure is correct, supply gas.

Then the equipment is ready for control.

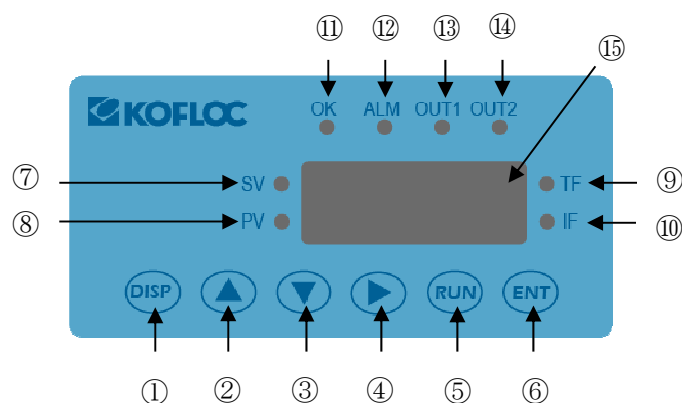
- Is the pressure of supply gas within the working pressure range?
- When a highly reactive gas is used, check to see if the piping has been purged with N₂.

(4) Charging gas

To use a gas other than air, purge is necessary until the inside of the equipment and piping has been filled with gas.

In the case of the controller type, take such a measure as setting the operation mode to “fully open.”

9. Nomenclature and Functions of the Indicator



① DISP key (DISPLAY)

Used to switch over the indication of the instantaneous flow rate, set flow rate, integrated flow rate, etc.

② ▲ key (UP)

Increments the indicated value when setting a flow rate and various functions.

③ ▼ key (DOWN)

Decrements the indicated value when setting a flow rate and various functions.

④ ▶ key (Digit)

Used to select a digit of the indicated value to change when setting a flow rate and various functions.

⑤ RUN key

Used to change over the operation mode between “fully closed” / “control” / “fully opened.”

⑥ ENT key (ENTER)

Used to accept a changed value when setting a flow rate and various functions.
Also used to reset the integrated flow rate.

⑦ SV lamp (Set Value)

Lights when a set flow rate is being indicated.

⑧ PV lamp (Process Value)

Lights when an instantaneous flow rate is being indicated.

⑨ TF lamp (Total Flow)

Lights when an integrated flow rate is being indicated.

⑩ IF lamp

Lights in the function setting mode.

⑪ OK lamp

Lights when an instantaneous flow rate is within the set flow rate \pm allowable range.

⑫ ALM lamp (ALARM)

Lights when an alarm has occurred.

⑬ OUT1 lamp (Event 1 output)

Lights when the event output 1 is on.

⑭ OUT2 lamp (Event 2 output)

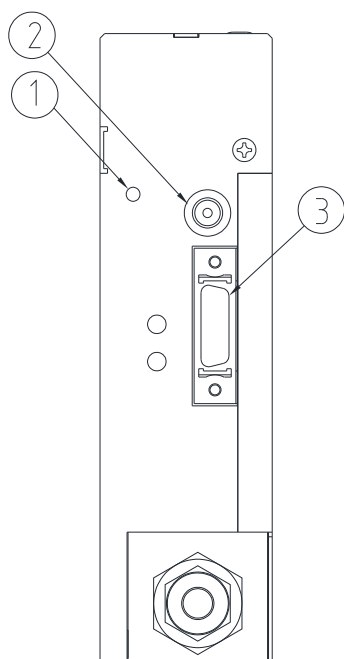
Lights when the event output 2 is on.

⑮ 7-segment LED, 4 digits

Indicates various flow rates and function set modes.

10. Nomenclature and Functions of the Main Unit

« Side view of the main unit »



①[ZERO] adjust switch

Pressing this switch adjusts the zero point.

②Jack for AC adapter

Connect the dedicated AC adapter: PSK-85CE.

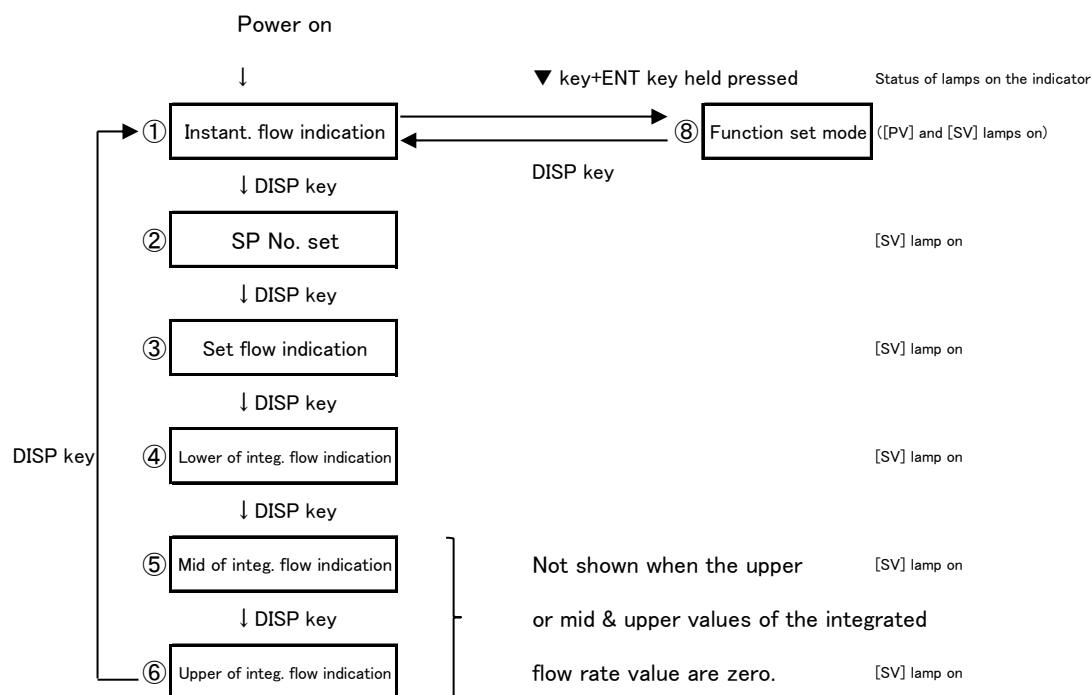
③Connector

Used for RS 485 communications and various inputs/outputs.

※Never peel off the protective seal on the right side of the main unit. Such action will void the product warranty.

11. Basic Operation of the Indicator

- (1) Changing over the indication of the instantaneous flow rate, set flow rate and integrated flow rate



① Instantaneous flow rate indication

The present flow rate is indicated.

The unit of indication is based on the ordered scaling (ex. 1.000 in the case of 1 SLM).

When the operation mode is changed, the operation mode is indicated for a certain time.

② SP No. set (Controller type only)

This equipment can hold six SPs (set points) maximum.

※When the SP No. is being shown, if no key is operated for 10 seconds, the indication will automatically change to the instantaneous flow rate.

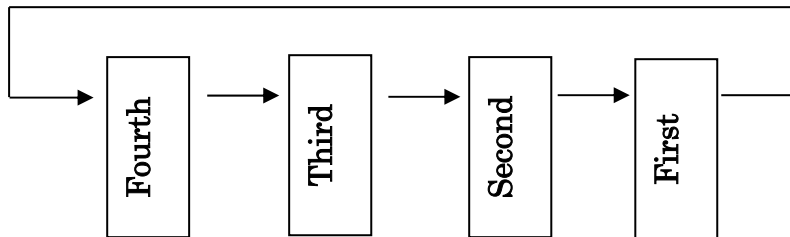
③ **Set flow rate indication**(Controller type only)

Determine a flow rate to control with this equipment.

When the [ENT] key is pressed while this set flow rate is being indicated (“VL” lamp lit), the figure on the left end (most significant) flashes.

Go to the digit of the set value to change with the [▶] key and change the figure with the [▲/▼] keys.

- Order of movement of the flashing digit (change digit) with [▶] key



Auto addition/subtraction function

When the [▲] key or [▼] key is pressed and held, the auto addition/subtraction mode is set and addition/subtraction is done continuously every 0.5 second.

Determination of a numeric value

After getting a desired numeric value by the above operation, press the [ENT] key. The flashing will stop and the set value will be indicated.

When the [ENT] key is pressed, the change will become valid and the set value will be saved.

• Precautions for operation

※If the [DISP] key is pressed without pressing the [ENT] key (flashing state), the indication will change to the instantaneous flow rate.

In this state, since the [ENT] key has not been pressed, the numeric value will not be changed and the value before the changing operation will remain.

※When the set flow rate is being indicated, if no key is operated for 10 seconds, the indication will automatically change to the instantaneous flow rate.

④ to ⑥ Integrated flow rate indication

- The integrated value is indicated by 12 digits maximum of;

0 – $\underbrace{999, 999, 999, 999}_{\text{Upper}} \quad \underbrace{}_{\text{Middle}} \quad \underbrace{}_{\text{Lower}}$

For this reason, a value is divided to 4 digits each and indicated three times.

- Resetting the integrated flow rate

When an integrated value is being indicated (“TF” lamp lit), pressing and holding the [ENT] key for 3 seconds or longer resets the value to zero.

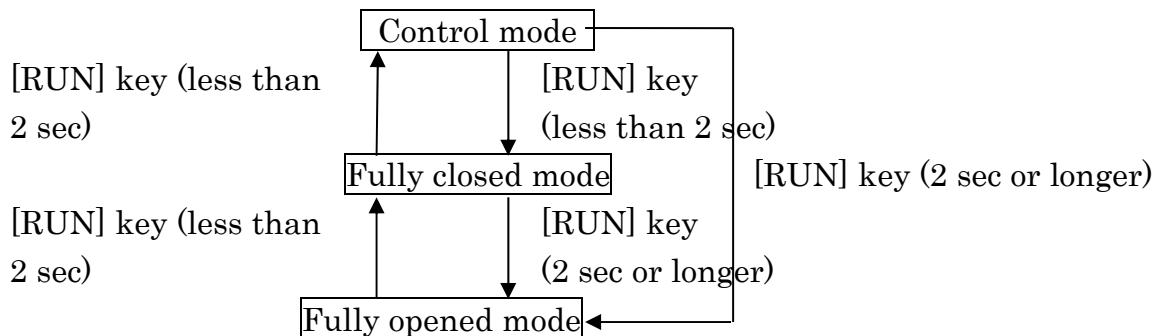
⑧ Function set mode

- Used to change the settings of various modes on the indicator.

For specific description, refer to 14. List of Function Setting Modes on page 25.

12. Changing Over the Operation Modes

The valve has three operation modes; “control mode,” “fully closed mode” and “fully opened mode.” When the equipment is shipped, it is in the control mode. It can be forced to the “fully closed mode” (valve fully closed) or “fully opened mode” (valve fully opened). Each time the [RUN] key is pressed, the mode is changed over between “control” and “fully closed” alternately as shown below. To change the control mode to the fully opened mode, press and hold the [RUN] key for 2 seconds or longer.



© Indication of the operation modes

The operation modes are indicated on the indicator as shown below:

Operation Mode	Indication	Remarks
Fully closed	OFF	After OFF is shown for 10 seconds, instantaneous flow rate is indicated.
Control	ON	After ON is shown for 1 second, instantaneous flow rate is indicated.
Fully opened	FULL	After FULL is shown for 1 second, instantaneous flow rate is indicated.

13. Applied Operating Procedure

(1) Changing the SP by external contact inputs (controller type only)

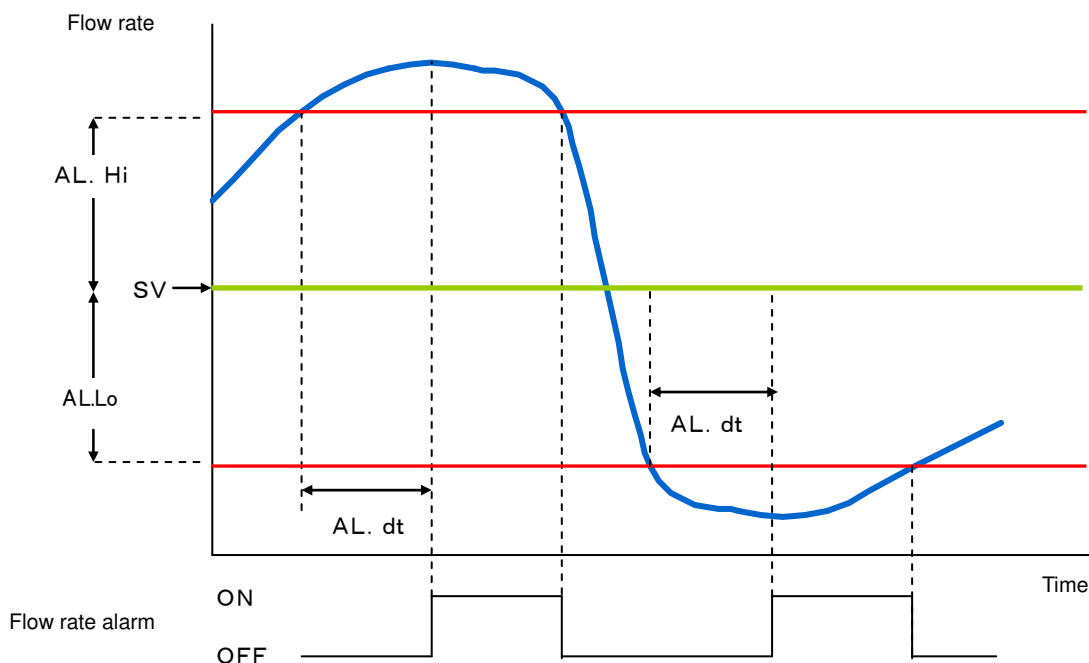
In the state of “00: Digital setting” in “D-01: Flow rate setting method selection” in 14. List of Function Setting Modes, six SP values (SP0 – 5) can be changed over by event inputs as shown below. In the case of no event input or multiple event inputs, “SP No. set” on the indicator will become valid.

EVENT input 1	SP1
EVENT input 2	SP2
EVENT input 3	SP3
EVENT input 4	SP4
EVENT input 5	SP5

(2) Using the upper/lower limit alarms(controller type)

Overview of the upper/lower limit alarm action:

When PV: instantaneous flow rate (blue line) changes largely relative to SV: set flow rate (green line) as time passes, the flow rate alarm is judged.



AL. Hi : Flow rate alarm upper limit value (D-15)

AL. Lo : Flow rate alarm lower limit value (D-16)

AL. dt : Flow rate alarm delay time (D-17)

SV : Set flow rate (green line)

PV : Instantaneous flow rate (blue line)

① Upper limit alarm

When the “PV value” exceeded the “SV value + AL. Hi”, the flow rate alarm is turned on after the passage of “AL. dt”.

② Lower limit alarm

When the “PV value” dropped below the “SV value – AL. Lo”, the flow rate alarm is turned on after the passage of “AL. dt”.

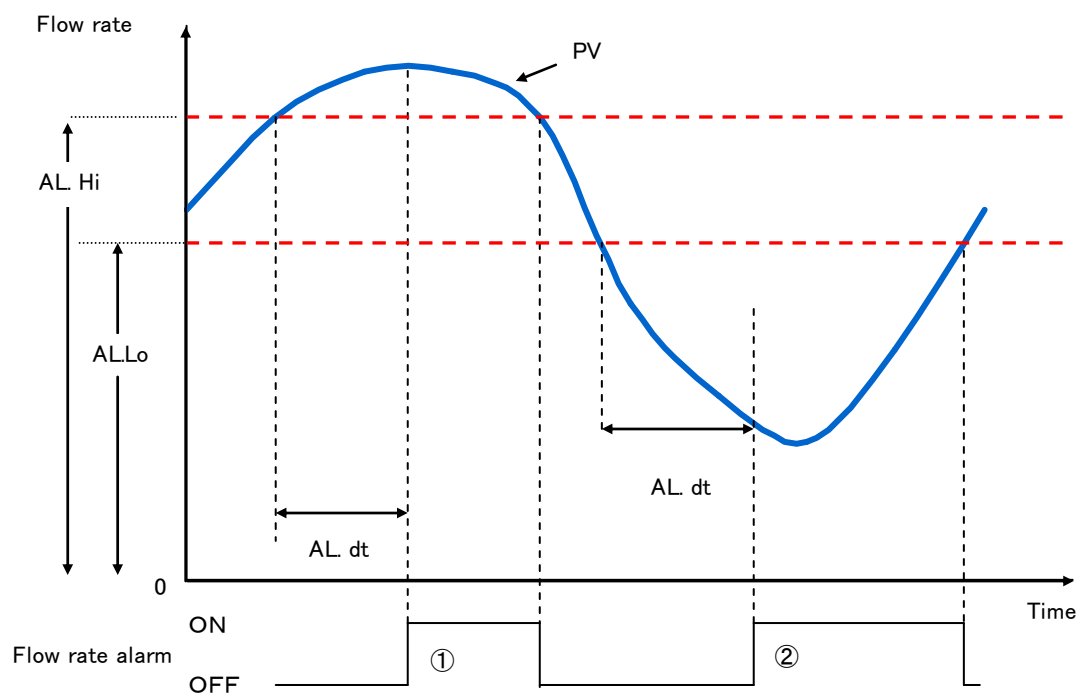
※ The above action is limited to the case where “00 : Control continue” has been selected in “D-14 : Selection of action when flow rate alarm occurs”.

If “01 : Forced to fully closed” is selected, the valve fully closing action will start when a flow rate alarm occurs. In this case, PV: Instantaneous flow rate is set to zero, but the alarm indication and output continue.

(3) Using the upper/lower limit alarms (meter type)

Overview of the upper/lower limit alarm action:

When PV: instantaneous flow rate changes as time passes, the flow rate alarm is judged.



AL. Hi : Flow rate alarm upper limit value (D-15)

AL. Lo : Flow rate alarm lower limit value (D-16)

AL. dt : Flow rate alarm delay time (D-17)

PV : Instantaneous flow rate

① Upper limit alarm

When the “PV value” exceeded the “AL. Hi”, the flow rate alarm is turned on after the passage of “AL. dt”.

② Lower limit alarm

When the “PV value” dropped below the “AL. Lo”, the flow rate alarm is turned on after the passage of “AL. dt”.

※For alarm codes, refer to 15. Alarm Codes and Corrective Actions.

(4) Using the allowable range (OK judgment) function (controller type)

When the instantaneous flow rate value (PV) is in a range of the flow rate set value (SV) \pm Flow rate OK judgment range: D-22, the OK LED lights.

※Refer to D-18 to D-21 in 14. List of Function Setting Modes.

(5) Using the allowable range (OK judgment) function (meter type)

When the instantaneous flow rate value (PV) is in a range between the lower limit alarm value and the upper limit alarm value, the OK LED lights.

※Refer to D-18 to D-21 in 14. List of Function Setting Modes.

(6) Using the integration setting function

① Integration event occurrence

When an integration event flow rate value is set in advance, the event will be output when the integrated flow rate value is reached.

To use this function, it is necessary to set D-18 or D-19 in 14. List of Function Setting Modes to “01” and an integration event flow rate value in D-10 to D-12.

② Integration reset

Resettable either on the indicator or in communications.

In the case of the indicator, refer to ④ Integrated flow rate indication in 11. Basic Operation of the Indicator.

14. List of Function Setting Modes

(Some items are not shown on the meter.)

Set No.	Description	Initial	Set Value	Remarks
D-01	Flow rate setting method selection	00	00 : Digital setting 01 : Analog setting	00 : Setting by the indicator, communications and contact input is valid. 01 : Setting by analog voltage or analog current is valid.
D-02	Flow rate reference temperature selection	※	00 : 20°C, 1 atm 01 : 0°C, 1 atm 02 : 25°C, 1 atm 03 : 23°C, 1 atm	Indication of a flow rate at the selected reference temperature and 1 atm.
D-06	Key lock setting	00	00 : No key lock 01 : Flow rate setting (Key lock of settings other than SP) 02 : Key lock of all settings	
D-07	RUN key action selection	01	00 : [RUN] key not used 01 : [RUN] key used	
D-08	Auto zero function	00	00 : OFF 01 : ON	01 : The zero point is automatically adjusted when the delay time set in D-09 has passed.
D-09	Auto zero function delay time (sec)	3.0	0.0~999.9	Invalid when D-08 is "00".
D-10	Integration event flow rate (lower 4 digits)	0000	0000~9999 (The position of the decimal point is the same as the full scale.)	Event output is made when "integrated flow rate value" reaches the "integration event follow rate value". Valid only when D-18 or D-19 is "01"
D-11	Integration event flow rate (middle 4 digits)	0000	0000~9999	
D-12	Integration event flow rate (upper 4 digits)	0000	0000~9999	

※The initial values are different depending on the specifications of the product.

(Some items are not shown on the meter.)

Set No.	Description	Initial	Set Value	Remarks
D-13	Flow rate alarm setting	00	00 : Not used 01 : Only upper limit alarm used 02 : Only lower limit alarm used 03 : Upper/lower limit alarms used	When "01 - 03" are selected, set "D-14 - D-17" at the same time.
D-14	Selection of action when flow rate alarm occurs	00	00 : Control continue 01 : Forced to fully closed	To cancel "01: Forced to fully closed", it is necessary to change over the motion modes such as "fully closed" → "control" once.
D-15	Flow rate alarm upper limit value (%F.S.)	10.0	Settable range : 0.5~100.0	For Controller
		100.0	Settable range : 0.0~100.0	For Meter
D-16	Flow rate alarm lower limit value (%F.S.)	10.0	Settable range : 0.5~100.0	For Controller
		0.0	Settable range : 0.0~100.0	For Meter
D-17	Flow rate alarm delay time (sec)	10.0	Settable range : 0.5 to 999.9	
D-18	Event output 1 type selection	00	00 : Not used (normally OFF) 01 : ON when integration flow rate event occurs 02 : ON when flow rate is OK 03 : ON when operation mode = Control 04 : ON when operation mode = Fully opened 05 : ON when operation mode = Fully closed	
D-19	Event output 2 type selection			
D-20	Event output 1 delay time (sec)	0.0	Settable range : 0.0 to 999.9	
D-21	Event output 2 delay time (sec)	0.0	Settable range : 0.0 to 999.9	

(Some items are not shown on the meter.)

Set No.	Description	Initial	Set Value	Remarks
D-22	Flow rate OK judgment range (%F.S.)	1.0	Settable range : 0.5~100.0	
D-26	Set flow rate tracking function	00	00 : Invalid 01 : Valid	00 : When setting a flow rate on the indicator, the flow rate will not be changed until the [ENT] key is pressed.
D-27	PV filter (instantaneous flow rate averaging)	02	00 : No PV filter 01 : Moving average of sampling 2 times 02 : Moving average of sampling 4 times 03 : Moving average of sampling 8 times 04 : Moving average of sampling 16 times 05 : Moving average of sampling 32 times	
D-28	Indication update cycle (indicator)	02	00 : No update cycle 01 : 50-msec cycle 02 : 100-msec cycle 03 : 200-msec cycle 04 : 500-msec cycle 05 : 1000-msec cycle	
D-29	0-2% range indication setting	00	00 : 0-2% flow rate indication 01 : 0 indication	01 : Zero indication when a flow rate is within 0±2%.
D-30	Full scale	※	Determined according to flow rates Settable range : 100 to 1000	Do not change these for normal operations. If they are changed, each SP value will be reset to zero.
D-31	Position of decimal point of full scale	※	00 : Decimal point not used (1000) 01 : Decimal point used (100.0) 02 : Decimal point used (10.00) 03 : Decimal point used (1.000)	

※The initial values are different depending on the specifications of the product.

(Some items are not shown on the meter.)

Set No.	Description	Initial	Set Value	Remarks
D-32	SP upper limit flow rate (%F.S.)	100.0	Settable range : 0.0~100.0	Used to limit the SP settable range. Setting must be "D-32 > D-33"
D-33	SP lower limit flow rate (%F.S.)	0.0	Settable range : 0.0~100.0	
D-35	SP0 (Set flow rate)	0000	Settable range : 0 to full scale	
D-36	SP1 (Expanded set flow rate)	0000	Settable range : 0 to full scale	
D-37	SP2 (Expanded set flow rate)	0000	Settable range : 0 to full scale	
D-38	SP3 (Expanded set flow rate)	0000	Settable range : 0 to full scale	
D-39	SP4 (Expanded set flow rate)	0000	Settable range : 0 to full scale	
D-40	SP5 (Expanded set flow rate)	0000	Settable range : 0 to full scale	
D-43	Equipment address	0001	Settable range : 0 to 127	If 0, no communications.
D-44	Analog input/output setting	0	0: Voltage input, voltage output 1: Current input, current output 2: Voltage input, current output 3: Current input, voltage output	For Controller
		0	0: Voltage output 1: Current output	For Meter

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15. Alarm Codes and Corrective Actions

Code	Description	Possible Cause	Corrective Action
AL-1	Shipment adjustment / user set data error	Data has been destroyed or the circuit board is faulty.	Request for repair.
AL-3	Auto close activated	The supply of gas stopped during control. Or, 5 minutes have passed with no pressure difference.	To stop the supply of gas, set the operation mode to the fully closed mode or reset the set flow rate to zero. This will prevent counterflow.
AL-4	Upper limit alarm	Insufficient flow rate alarm delay time, unstable gas supply pressure, faulty valve, faulty circuit board, faulty sensor.	Review the settings such as lengthening the delay time.
AL-5	Lower limit alarm	Insufficient flow rate alarm delay time, insufficient or excessive differential pressure, allowable ambient temperature exceeded.	If causes listed on the left side do not apply, request for repair.

16. Troubleshooting and Precautions for Servicing

(1) Troubleshooting and corrective action

Symptom	Possible Cause	Check and Action
1. The sensor will not output.	a. The power is not on.	1. Check to see if the power lamp is on.
	b. Connection with the indicator is not correct.	1. Reconnect. Check wire colors to see if wires are connected correctly
	c. Gas is not being supplied.	1. Check to see if the source pressure of the cylinder is sufficient and the valve is open. 2. Check to see if the solenoid valve, 3-way valve, etc. in the line are working properly. 3. Check the line filter for clog.
	d. The outlet side piping of the mass flow controller is blocked.	1. Check the solenoid valve, 3-way valve, air valve, etc.
	e. The forced close signal has been input to the mass flow controller.	1. Check to see if the valve forced close signal GND has not been input to Pin No. 8
	f. The power supply is faulty.	1. Disconnect the cable and check the power supply voltage 24 VDC ($\pm 5\%$ max.) with a tester. If no voltage is present, replace the power supply.
	g. The orifice is clogged.	1. The orifice needs to be overhauled and cleaned or replaced. Please send it to KOFLOC.
	h. The sensor tube is clogged.	1. If the tube is clogged, gas keeps flowing. Check it. The sensor needs to be replaced. Please send it to KOFLOC.
2. The output will not become zero (power on 45 minutes or longer)	a. The control valve is leaking internally or externally.	1. Disconnect the piping before the mass flow controller to remove gas and check to see if the output will become zero.
	b. The command and external setter are not connected correctly.	1. Check wiring of the command and external setter.
	c. If the above wiring has no problem, the sensor is faulty or the electronic circuit is faulty.	1. The electronic circuit is faulty. Please send it to KOFLOC.
	D. The sensor is faulty or the electronic circuit is faulty.	1. The zero point may be adjusted for reuse, but the flow accuracy will be impaired. Please send it to KOFLOC.
3. When gas is flowing, the indicated flow rate is not stable.	a. The supply pressure on the inlet side of the mass flow controller is unstable constantly.	1. Install a pressure regulator on the inlet side to make the pressure constant.
	b. The control valve is faulty.	1. Please send it to KOFLOC.
	c. The indicator is faulty.	1. Replace the indicator.
	d. The connector is not connected correctly.	1. Check to see if the connector has been fitted firmly.

4. The set indication cannot be obtained.	a. The pressure on the inlet side of the mass flow controller is too high or the controller is faulty. Or, a pressure difference between the inlet side and outlet side is not adequate.	1. Adjust the pressure to the adequate level as shown in the brochure or set an adequate differential pressure.
	b. The pressure loss of piping is large. Or the pressure loss has increased as the filter, check valve, etc. has become nearly clogged.	2. Set a pressure gauge immediately before and after the mass flow controller and check to see if the pressure difference is adequate. Make adjustment to get an adequate differential pressure.
	c. The orifice in the control valve is almost clogged.	3. If the problem is solved by increasing the pressure, it is most likely that the orifice is clogged. To replace the orifice, please send it to KOFLOC.
5. The flow rate is clearly less than the indicated flow rate.	a. The piping line is leaking.	1. Using the evacuation method, leak detect fluid, etc., investigate causes of leak such as failure to tighten piping line nuts, insufficient tightening of such nuts or others and retighten the nuts of leaking places or take other corrective actions to stop leak.
	b. The mass flow main unit is leaking.	1. Same as above. When checking leak using leak detect fluid, apply such fluid only to the joints before and after the unit, but do not apply it to the inside of the main unit cover. After checking, wipe off leak detect fluid completely so that it will not remain at all.
	c. The bypass is clogged.	1. To replace the bypass part, please send it to KOFLOC.
6. The flow rate is clearly larger than the indicated flow rate.	a. The sensor tube is nearly clogged.	1. To replace the sensor tube, please send it to KOFLOC.
7. Even if the command is set to zero, gas keeps flowing.	a. The equipment is not in the analog setting mode. Or, the external input set voltage is not zero. Or, the printed board is faulty. Or, the wiring of the command soldered part is broken.	1. Change the equipment to the analog setting mode and check the operation. If the operation will not become normal, check the external input set voltage.
		2. Input the valve forced close signal GND to Pin No. 8 and see if gas stops. If gas does not stop, the valve needs to be readjusted. Please send it to KOFLOC. If gas stops, a possible cause is a faulty electronic circuit. Please send it to KOFLOC.
	b. Internal leak due to adhesion of dust, etc. to the sealing area of the control valve.	1. To overhaul and clean the control valve, please send it to KOFLOC.
c. The zero point voltage has moved to the negative side.	1. The zero point voltage is abnormal. See Symptom 2. The output will not become zero.	

17. After-Sale Service

This product has been subjected to strict inspection prior to shipment. Should it fail, however, please contact the dealer or sales agent.

18. Product warranty

Thank you very much for usually using Kofloc products regularly.

Now, when ordering our products by this catalog and when there is no statement of special mention matters, such as estimate, contract and specifications, we apply following requirements and the following contents of a warranty.

1. The contents of warranty

① Warranty period

The warrant period shall be one year after the shipment.

② Warranty range

If a malfunction of the product you purchased occurs because of our responsible reasons, offer of substitute or it will be charge-free repaired in our factory. But if a malfunction of the machine occurs due to the following reasons, even within the warrant period, it becomes the outside for a warranty.

(a) Malfunctions due to erroneous applications, repairs or remodeling.

(Including the case in which the manufacturing specification differs from the application conditions.)

(b) Malfunctions due to the falling after the purchase.

(c) Malfunctions caused by natural disasters such as fire, earthquake, water disaster and lightning stoke, or riots or wars.

(d) Malfunctions caused by mixing-in of foreign matters out of the piping.

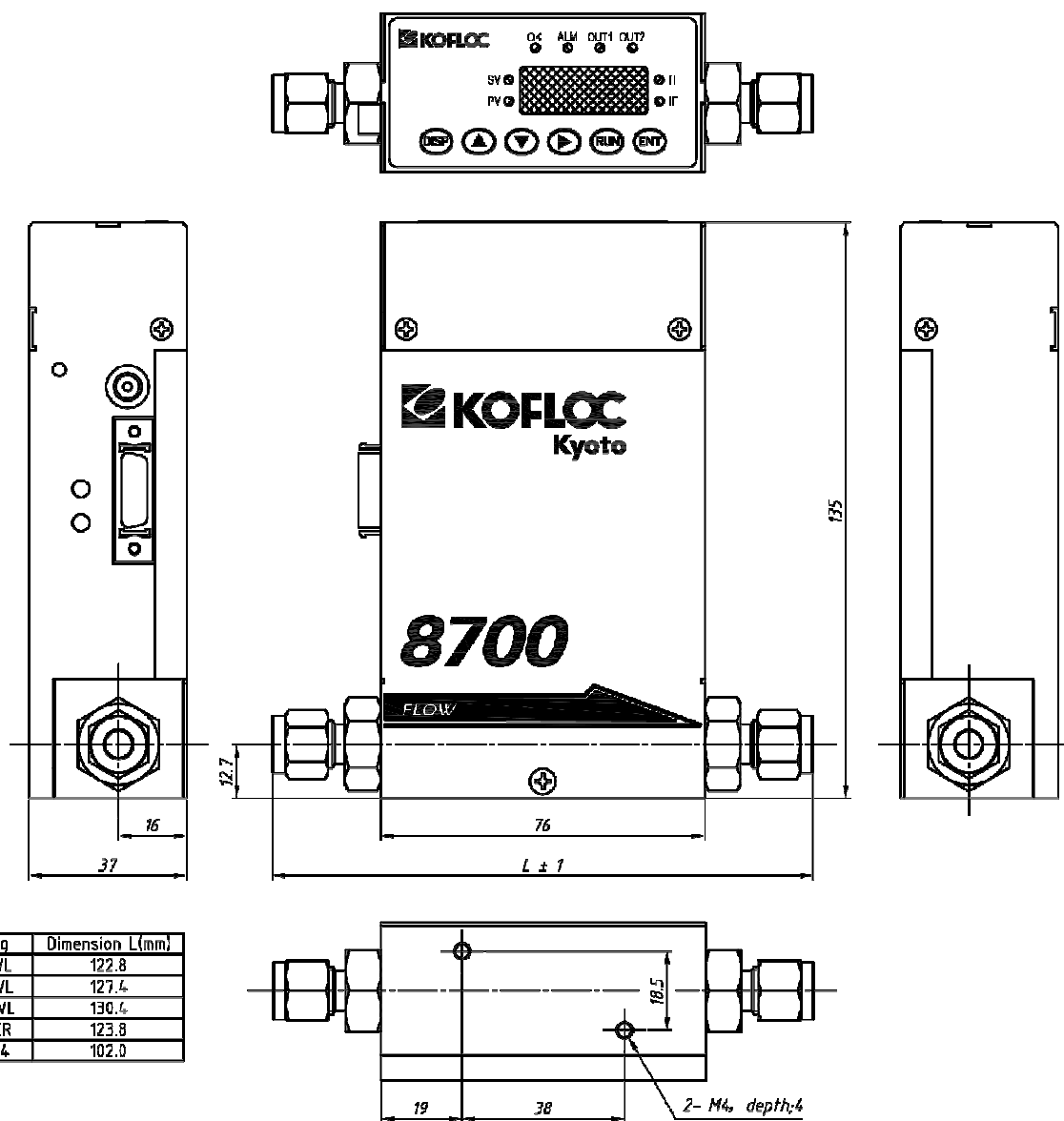
(e) Malfunctions caused by the peculiar problems due to combinations with other built in equipment.

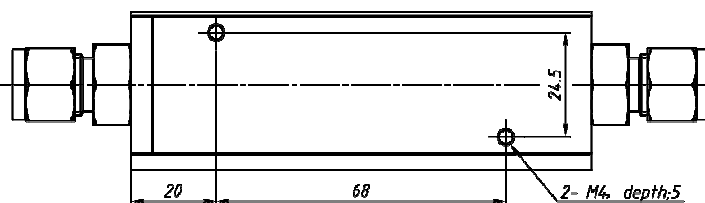
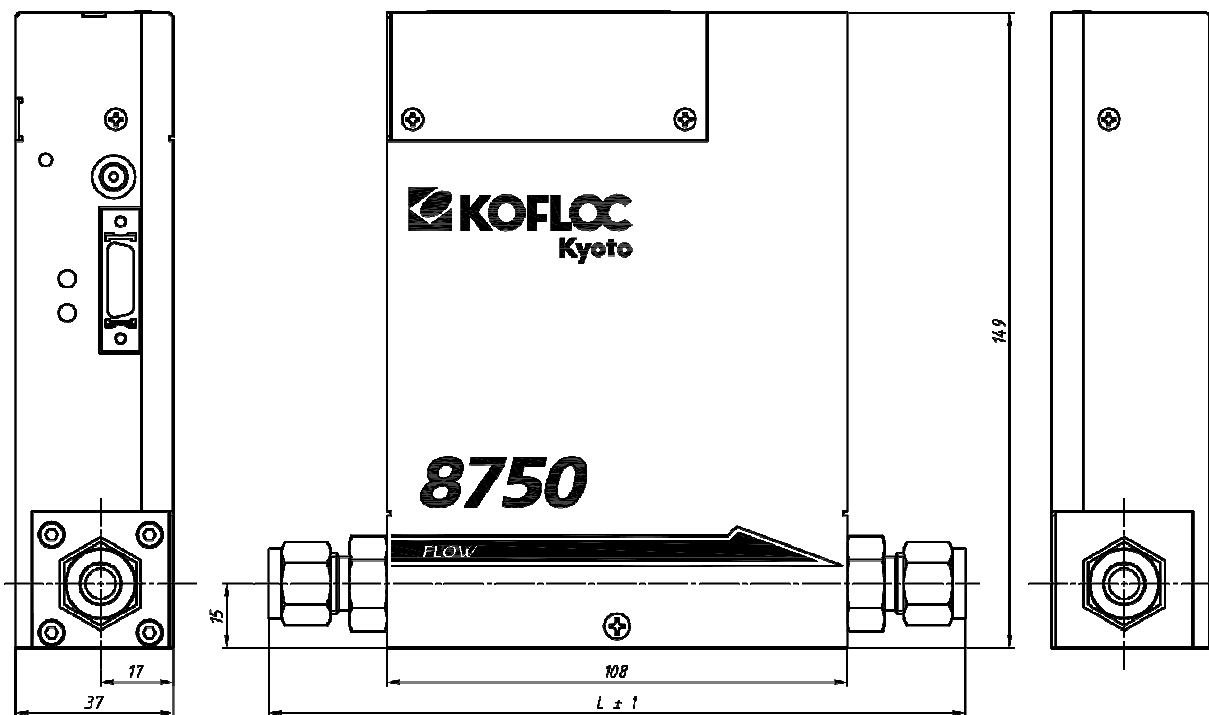
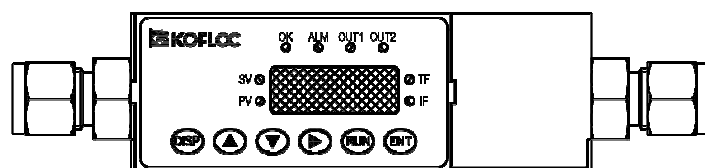
In addition, a warranty here means the warranty of the product simple substance of our company.

So the damage induced by failure of the products of our company shall be eliminated from the object of warranty.

19. External View

(1) Integrated indicator type

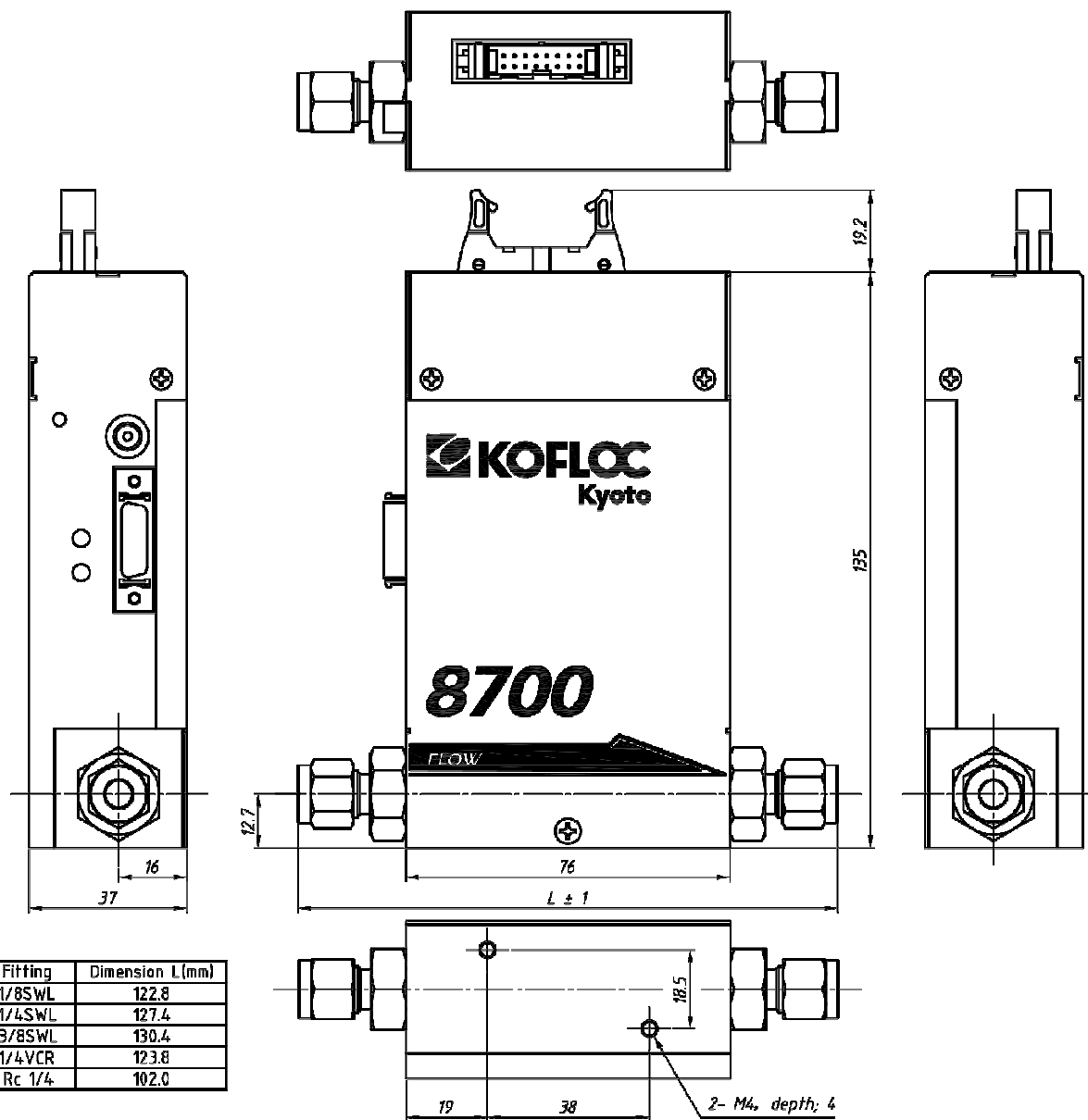


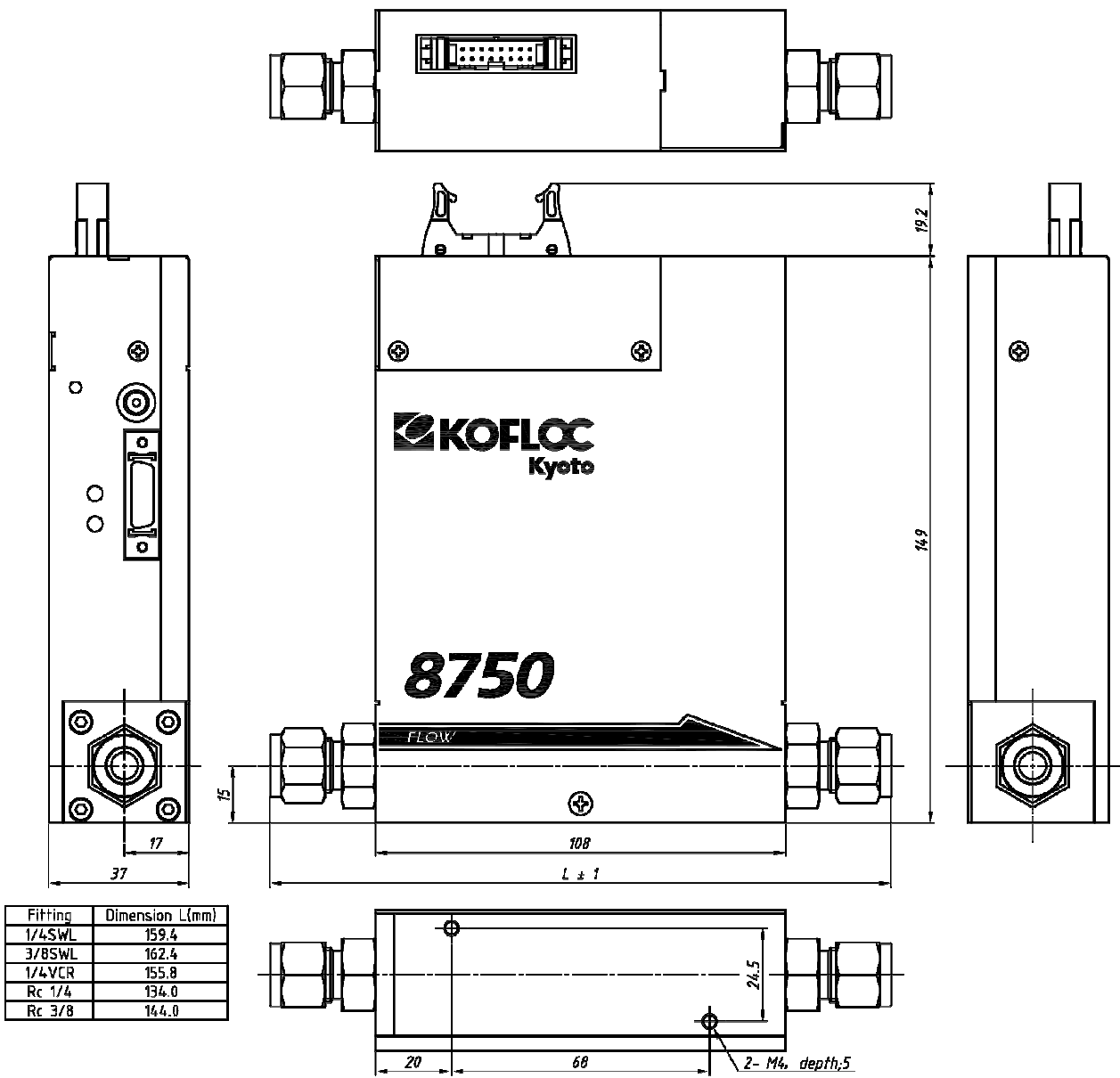


Fitting	Dimension L(mm)
1/4SWL	159.4
3/8SWL	162.4
1/4VCR	155.8
Rc 1/4	134.0
Rc 3/8	144.0

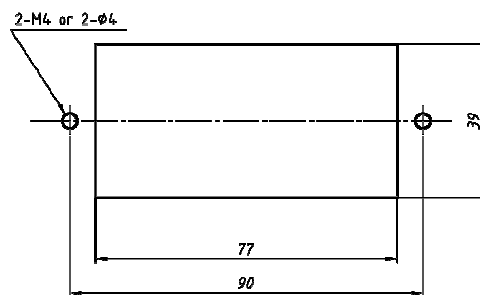
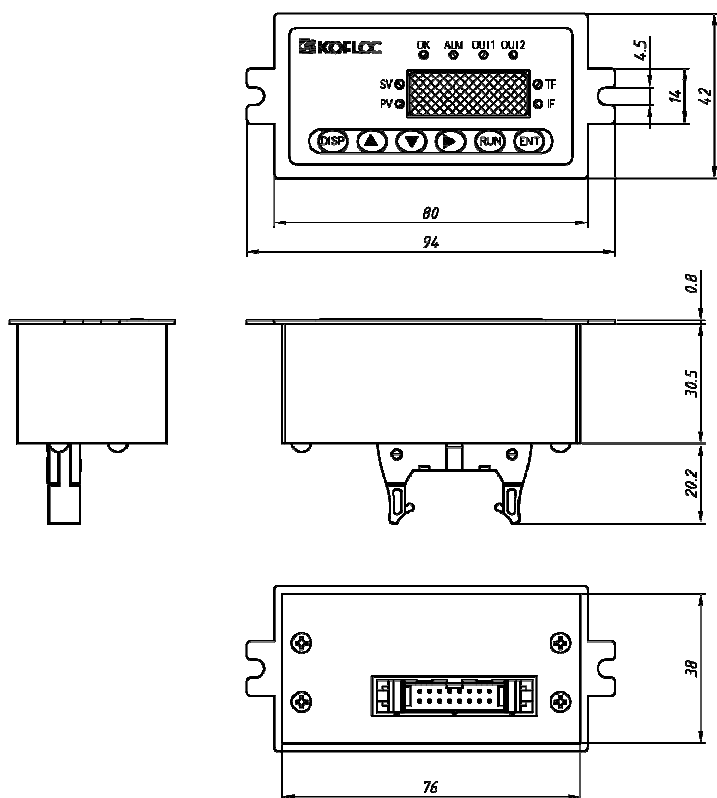
(2) Separate indicator type

① Main unit





② Indicator



Panel Cut Dimensions

KOFLOC Corp.

URL : <http://www.kofloc.co.jp>