

INSTRUCTION MANUAL

Flow & Pressure Sensor



MFP01 series

220301

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Cost Control
User-friendly
High Performance

DRY AIR, N₂

RS-485 MODBUS CONTROL



High Precision

	Flow	Pressure
Indicator accuracy	± 3% F.S.	± 2% F.S.
Repeatability	± 1% F.S.	± 0.2% F.S.

Cost Reduction

Traditional

- 2 × Sensor cost
- 2 × Power supply
- 2 × Plumbing costs & Time
- 2 × Wiring work cost & Time
- 2 × Location of installation

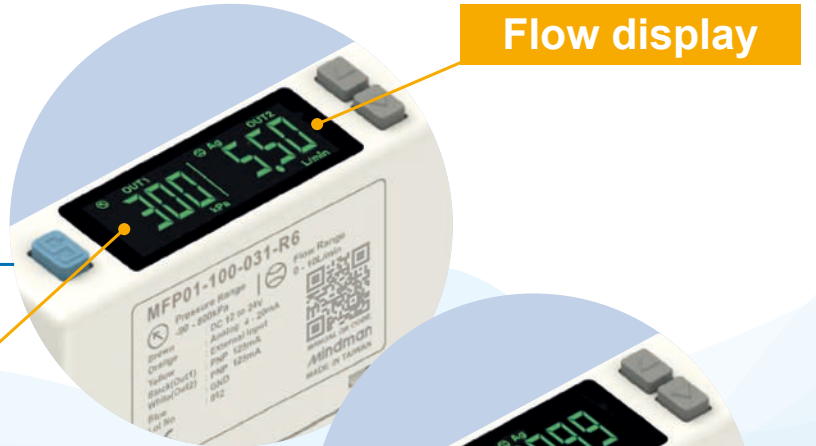
COST

MFP01

Total cost & Time Reduction

2-in-1 Design

Pressure and flow rate simultaneous monitoring



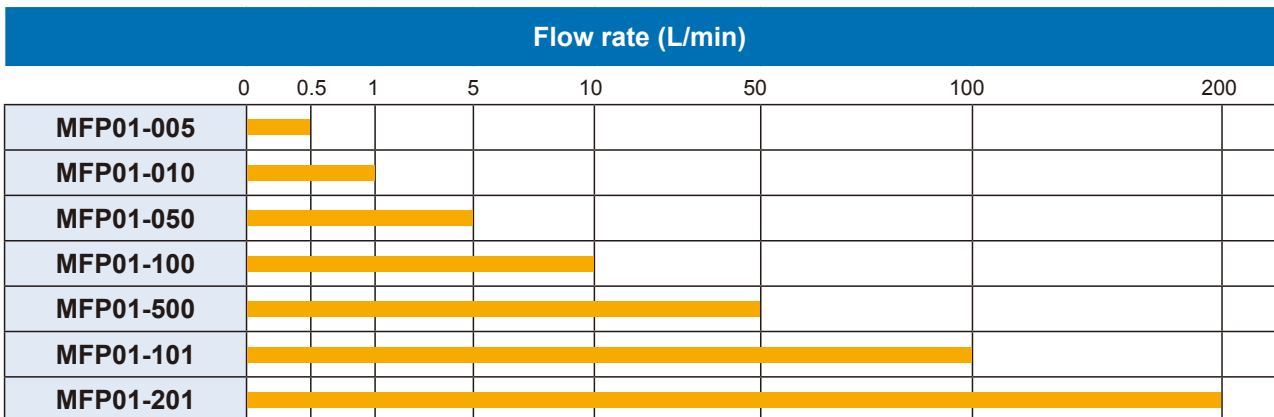
Accumulated flow rate display at a glance

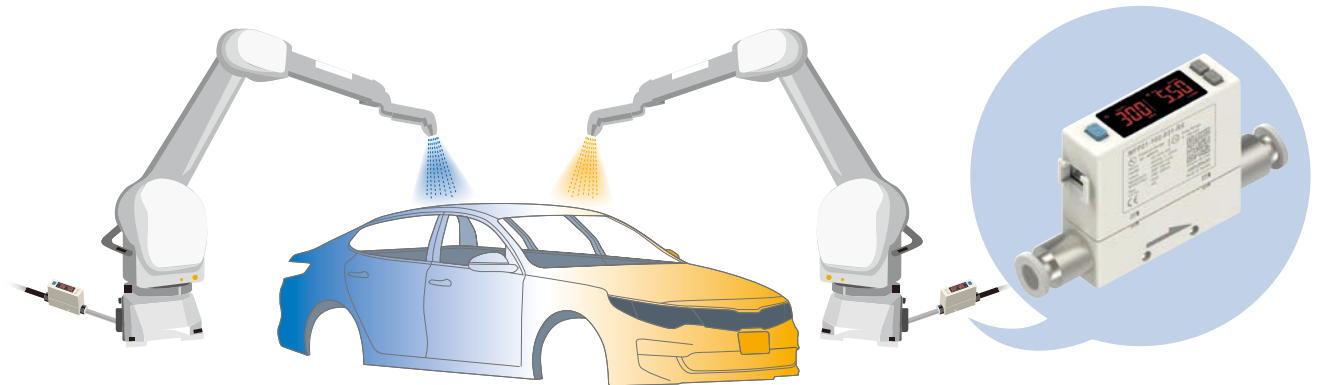


Multiple output function

Digital display	Switch output	Analog output	Accumulated pulse output
Instantaneous flow value Accumulated flow value Pressure value	NPN output PNP output	Voltage output 1~5V Current output 4~20 mA	50ms pulse output

Wide range of flow rates



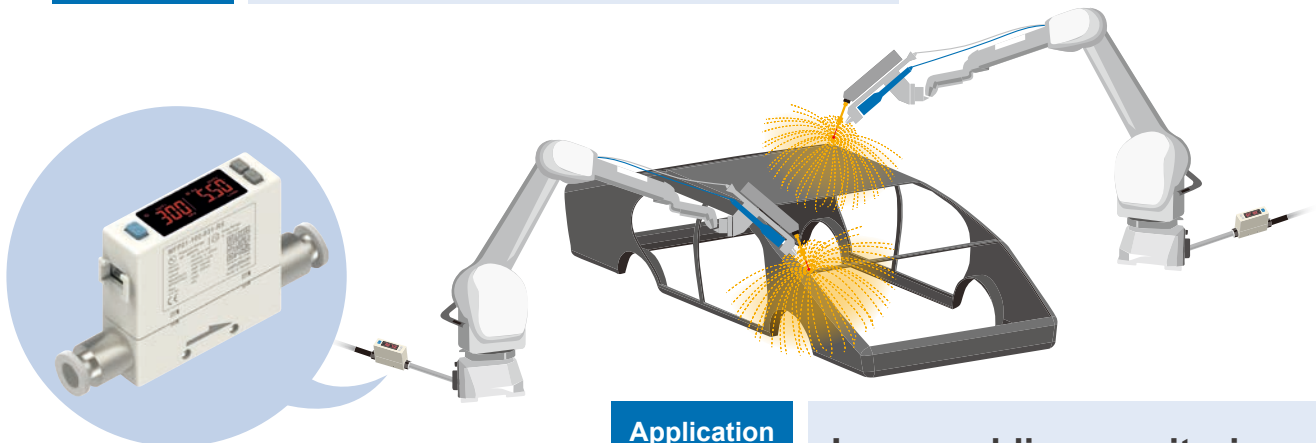


Application

01

Paint and coating flow monitoring

Air flow and pressure management of paint and coating processes.



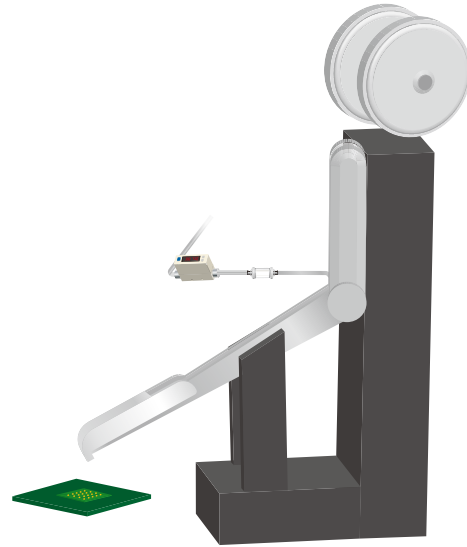
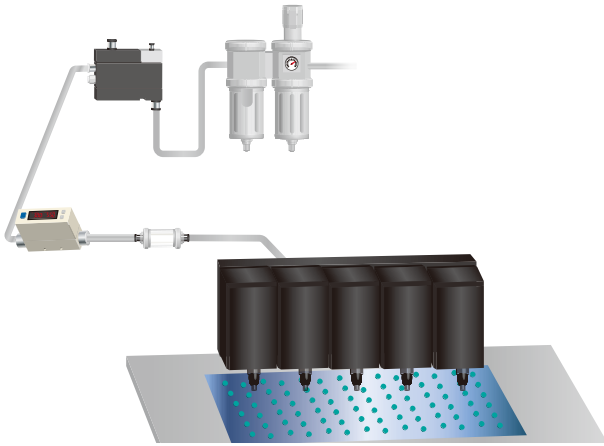
Application

02

Laser welding monitoring

Precision management of shielding gas, flow rate and pressure.





Application

03

Suction operation

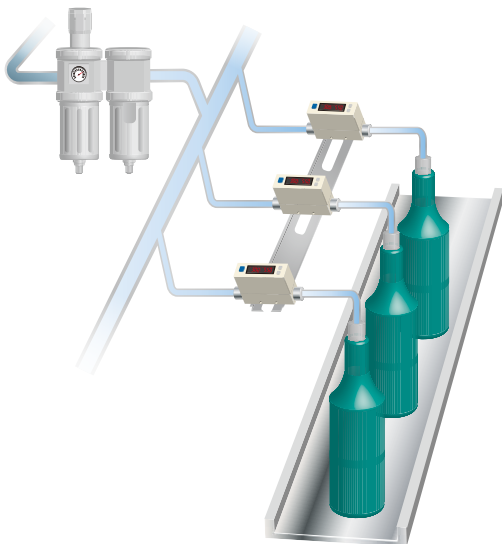
Detect the suction state of micro-electronic parts by flow rate.

Application

04

Electronic part installation

Control the tension of gold wire for bonding electronic parts.



Application

05

Leakage detect

Container with gas and inspect whether it leaks.

Application

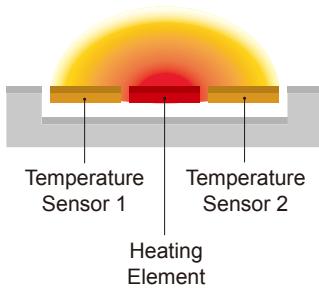
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Air consumption monitoring

Monitor air consumption of devices.

Thermal mass flow sensor principles

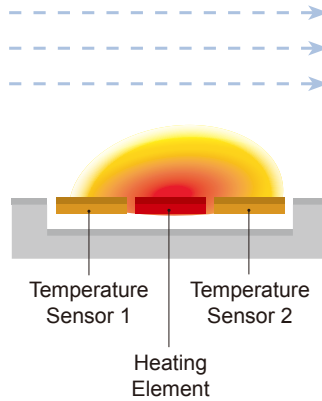
Symmetric temperature profile



(a) No flow

In the absence of flow, the heat from the heater spreads evenly left and right, so the temperature distribution is like (a).

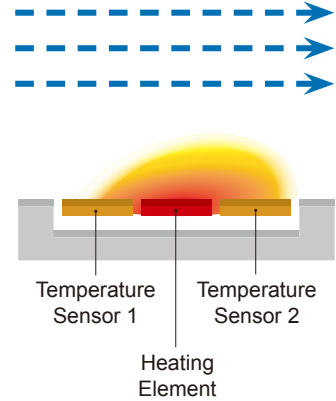
Skewed temperature profile



(b) Small flow

When flow begins, the inlet side is cooled by the flow, the outlet side is warmed by the heat of the inlet side of the heater, and the temperature distribution is like (b).

Skewed temperature profile



(c) Large flow

When the flow increases, it becomes a distribution like (C). Since the temperature distribution before and after the heater is proportional to the flow rate, the flow rate can be determined from the ratio.

Order example

MFP01 – 005 – 010 – R6

MODEL

FLOW RATE RANGE

005: 500 (ml/min)
010: 1000 (ml/min)
050: 5 (l/min)
100: 10 (l/min)
500: 50 (l/min)
101: 100 (l/min)
201: 200 (l/min)

OUTPUT SPEC.

010: 2 NPN output + Analog output 1 ~ 5 V
011: 2 NPN output + Analog output 4 ~ 20 mA
02 : 2 NPN output + RS485
030: 2 PNP output + Analog output 1 ~ 5 V
031: 2 PNP output + Analog output 4 ~ 20 mA
04 : 2 PNP output + RS485

PORT SIZE

R6: ø6 mm, for flow rate range 005, 010, 050, 100, 500.
R8: ø8 mm, for flow rate range 101, 201.
F1C: Rc1/8", with internal threads, for flow rate range 005, 010, 050, 100, 500
F4C: Rc1/4", with internal threads, for flow rate range 101, 201

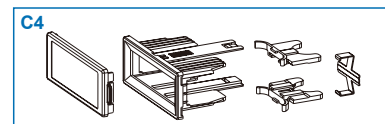
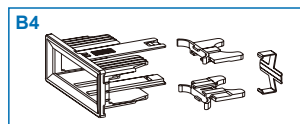
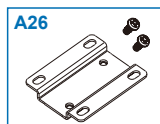
Mounting accessories

MP – A26

MODEL

OPTION PARTS

A26: Mounting bracket
B4: Panel adapter
C4: Panel adapter + Front protective lid



MFP01 Specifications



FLOW & PRESSURE SENSOR (INSTRUCTION MANUAL)

mindman

Model		005	010	050	100	500	101	201	
Fluid		Dry air, N ₂ , Non-corrosive / Non-flammable gas							
Sensor element	Flow	Measured flow rate range	0 ~ 500 mL/min	0 ~ 1000 mL/min	0 ~ 5 L/min	0 ~ 10 L/min	0 ~ 50 L/min	0 ~ 100 L/min	0 ~ 200 L/min
		Flow direction	Unidirection						
Sensor element	Pressure	Rated pressure range	-90 ~ 800 kPa						
	Display		4 digital × 4 digital, 7 segment LCD display (Red / Green / Orange)						
Display	Instant flow rate	Display range	0 ~ 525 mL/min	0 ~ 1050 mL/min	0 ~ 5.25 L/min	0 ~ 10.50 L/min	0 ~ 52.5 L/min	0 ~ 105.0 L/min	0 ~ 210 L/min
		Min. setting scale	1 mL/min		0.01 L/min		0.1 L/min		1 L/min
	Accumulated Flow	Display range	99999999 mL		999999.99 L		999999.9 L		9999999 L
		Min. Setting Scale *1	1 mL		0.01 L		0.1 L		1 L
Pressure Display	Display range	-100 ~ 1000 kPa							
	Min. Setting Scale	1							
		0.01							
Accuracy	Flow	Guaranteed range	2 ~ 100 % F.S.						
		Indicator accuracy	± 3 % F.S. ± 1 digit *2						
		Analog output accuracy	± 5 % F.S. *2						
		Repeatability	± 1 % F.S. ± 1 digit *3						
		Linearity	± 3 % F.S. *3						
	Pressure	Temp. characteristic	± 2 % F.S. (15 ~ 35 °C) ; ± 5 % F.S. (0 ~ 15 °C, 35 ~ 50 °C) (compare with *3)						
		Pressure characteristic	± 5 % F.S. ± 1 digit *4						
		Guaranteed range	0 ~ 100 % F.S.						
		Indicator accuracy	± 2 % F.S. ± 1 digit *5						
		Analog output accuracy	± 2.5 % F.S. *5						
Switch output	Response time	Flow	800 ms (50 ms, 80 ms, 120 ms, 200 ms, 400 ms, 1500 ms selectable)				2 PNP : open collector 2 outputs Max. Load Current : 125 mA Max. Supply Voltage : 28 V DC Voltage Drop : ≤ 1.5 V		
		Pressure	2.5 ms (25 ms, 100 ms, 250 ms, 500 ms, 1000 ms, 1500 ms selectable)				2 PNP : open collector 2 outputs Max. Load Current : 125 mA Max. Supply Voltage : 24 V DC Voltage Drop : ≤ 1.5 V		
	Output mode	Flow	Hysteresis Mode, Window Comparator Mode, Accumulated Output, Accumulated Pulse Output						
	Hysteresis	Pressure	One Point Set Mode, Hysteresis Mode, Window Comparator Mode						
Switch output	Output short circuit protection	Adjustable							
	Accumulated pulse output *1	5 mL/Pulse	10 mL/Pulse	0.05 L/Pulse	0.1 L/Pulse	0.5 L/Pulse	1 L/Pulse	2 L/Pulse	
Analog output	Voltage output	Voltage output range : 1 ~ 5 V *6 ; Output impedance : 1 KΩ							
	Current output	Current output range : 4 ~ 20 mA *6 ; Load impedance : ≤ 300 Ω							
	Response time	Pressure : ≤ 50 ms ; Flow : ≤ 100 ms							
External input		Non-voltage input, < 0.4 V, ≥ 30 ms							
Communication interface		RS-485 *7, 8							
Power	Power supply voltage	12 ~ 24 V DC ± 10 % , Ripple (P-P) ≤ 10 %							
	Current consumption	≤ 50 mA							
Environment	Withstand Pressure	1000 kPa							
	Enclosure	IP40							
	Working Fluid Temp.	0 ~ 50 °C (No condensation or freezing)							
	Ambient Temp. Range	Operation : 0 ~ 50 °C ; Storage : -10 ~ 60 °C (No condensation or freezing)							
	Ambient Humidity Range	Operation / Storage : 35 ~ 85 % R.H. (No condensation)							
	Insulation Resistance	≥ 50 MΩ (500 V DC, between case and lead wire)							
	Withstand Voltage	1000 V AC in 1-min (between case and lead wire)							
	Vibration	Total amplitude 1.5 mm or 10 G, 10 Hz ~ 55 Hz ~ 10 Hz scan for 1 minute, 2 hours each direction of X, Y and Z							
Shock	100 m/s ² (10 G), 3 times each in direction of X, Y and Z								
EMC	IEC 61000-6-2, IEC 61000-6-4								
Lead wire		ø4 Oil-resistance cable (PVC) - 26 AWG (0.15 mm ²) - 6 cores							
Port Size	R6, F1C	●	●	●	●	●			
	R8, F4C						●	●	
Weight (with 2 meter lead wire)		Approx. 109.3 g (ø6 port) ; Approx. 112.7 g (ø8 port) ; Approx. 118 g (Rc1/4" port) ; Approx. 128.5 g (Rc1/8" port)							

*1. CFM (ft³/min*10⁻²) and ft³*10⁻²

*2. Condition: Inlet pressure: 300 kPa , Outlet pressure: 1 atmospheric pressure, 25 °C

*3. Condition: Outlet pressure: 1 atmospheric pressure, 25 °C

*4. -90 ~ 800 kPa, Outlet pressure: 1 atmospheric pressure, 25 °C

*5. Outlet flow rate = 0 L/min, 25 °C

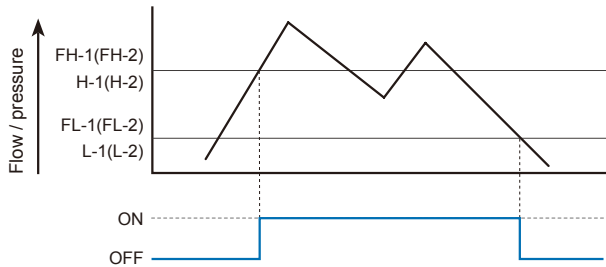
*6. PWM output, corresponding to pressure sensor 0 ~ 1000 kPa

*7. This function only available for Output Specification -02 and -04

*8. Read pressure sensor data range 1~4 data number.

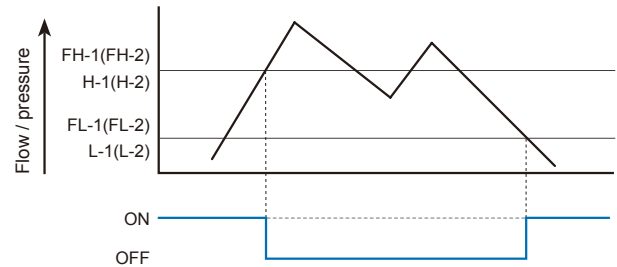
Normal open mode

● Hysteresis mode

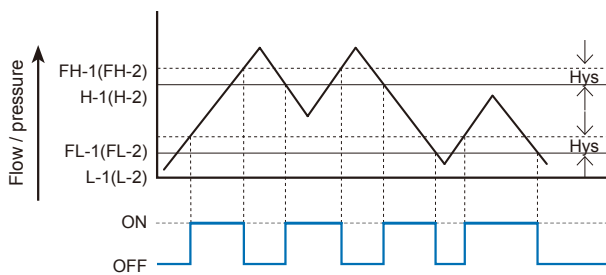


Normal close mode

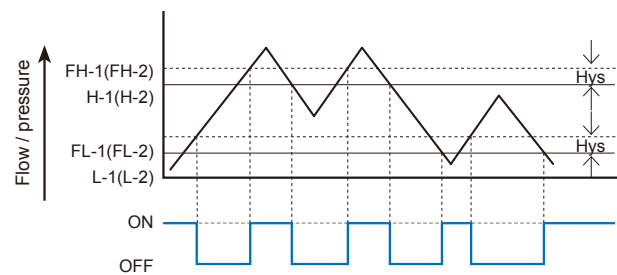
● Hysteresis mode



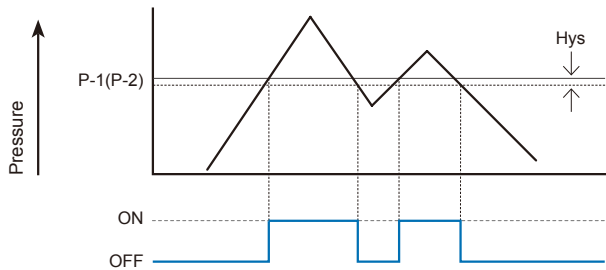
● Window comparator mode



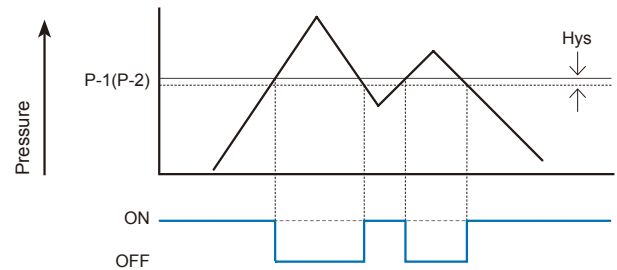
● Window comparator mode



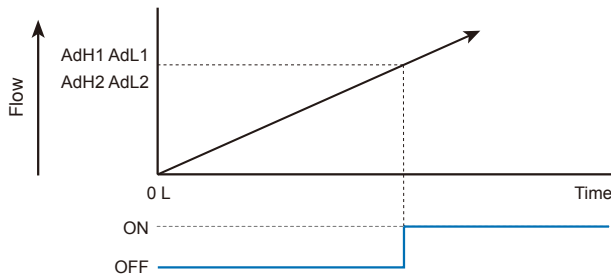
● One point set mode



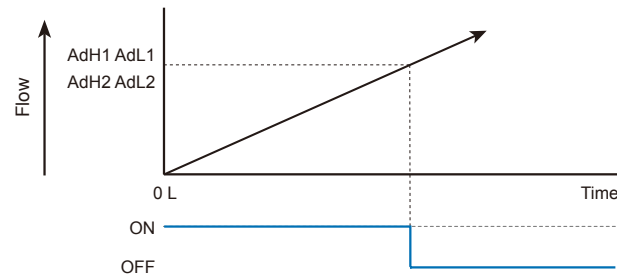
● One point set mode



● Accumulated output mode



● Accumulated output mode



● Accumulated pulse output mode



Flow range	500mL	1000 mL	5 L	10 L	50 L	100 L	200 L
Pulse output rate	5 mL	10 mL	0.05 L	0.1 L	0.5 L	1 L	2 L

NOTE

1. In case hysteresis is set at less than or equal to 2 digits, switch output may chatter if input pressure fluctuates near the set point.
2. When using window comparator mode, the difference between two set points must be greater than the fixed hysteresis, otherwise will cause the switch output to malfunction.

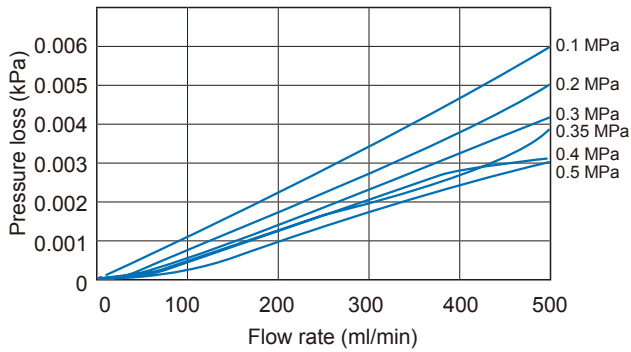
MFP01 Pressure loss characteristics



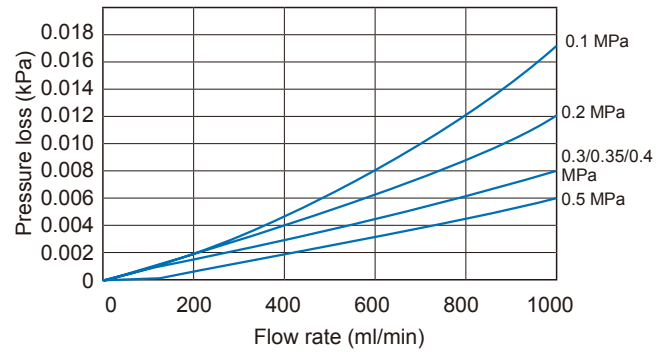
FLOW & PRESSURE SENSOR (INSTRUCTION MANUAL)

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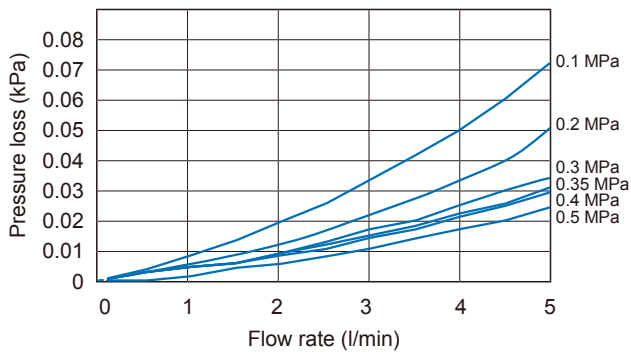
● MFP01 - 005 - □ - □



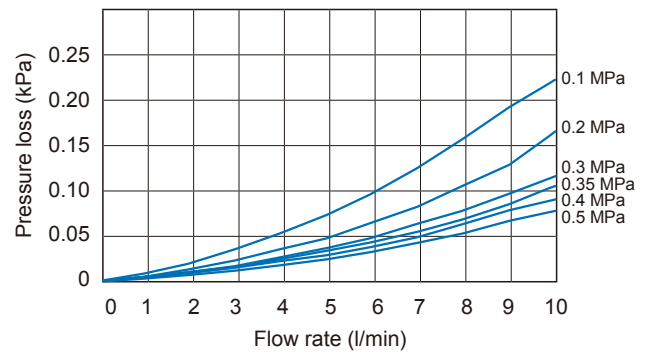
● MFP01 - 010 - □ - □



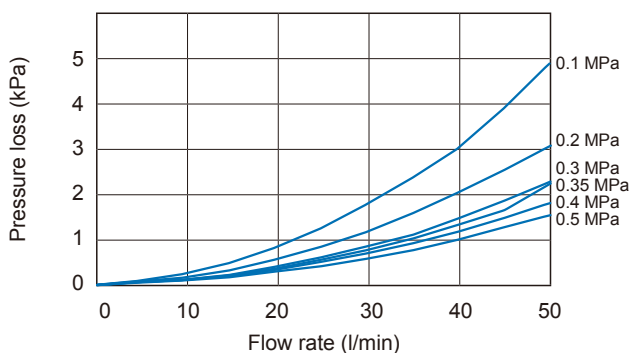
● MFP01 - 050 - □ - □



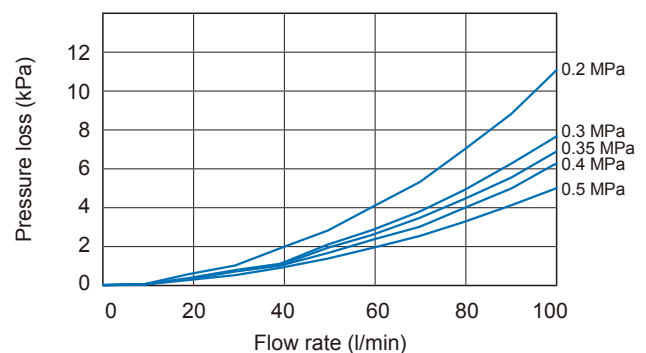
● MFP01 - 100 - □ - □



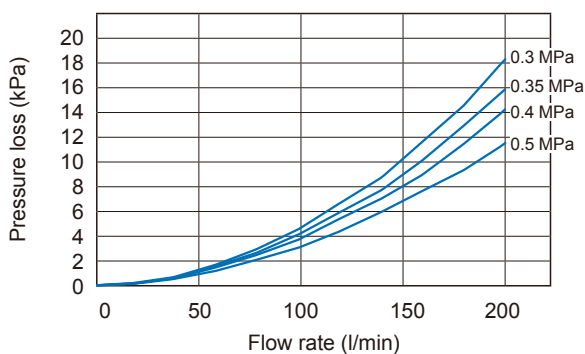
● MFP01 - 500 - □ - □



● MFP01 - 101 - □ - □



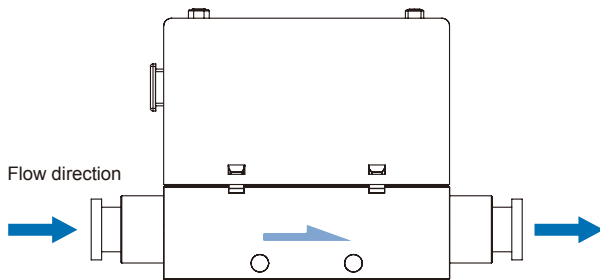
● MFP01 - 201 - □ - □



Installation instructions

• Piping

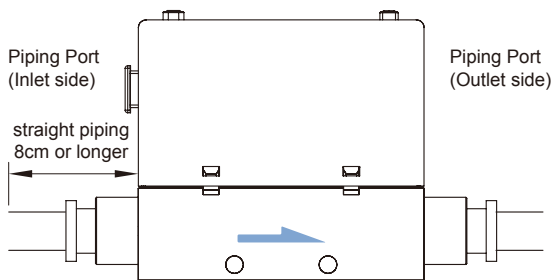
Install the pipe by following the arrow indication that shows the air flow direction on the product.



Use straight piping 8cm or longer to connect the Piping Port (Inlet side).

If straight piping is not installed, the accuracy may vary by $\pm 2\%$ F.S..

* **Straight Piping:** The pipe is without bending and the cross sectional areas of the pipe keeps the same.

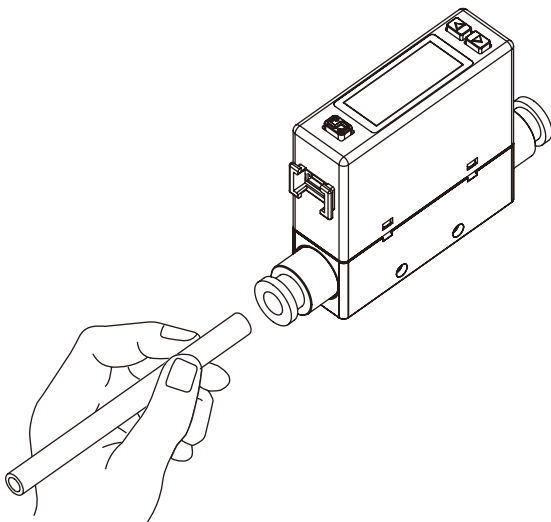


Blow the air to flush out the foreign matters, dust and etc. before installing the pipe.

Uncleaned air may cause malfunction or damage to the product.

Piping for the One-Touch Fitting, insert the tube firmly into the fitting and make sure it cannot be pulled out.

Also using the proper tube cutter is recommended to ensure square edge tube.

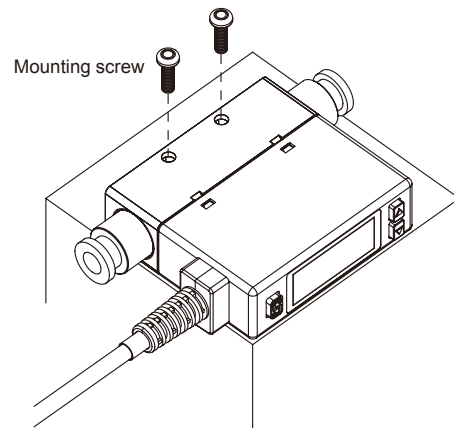


• Mounting Bracket / Optional Parts

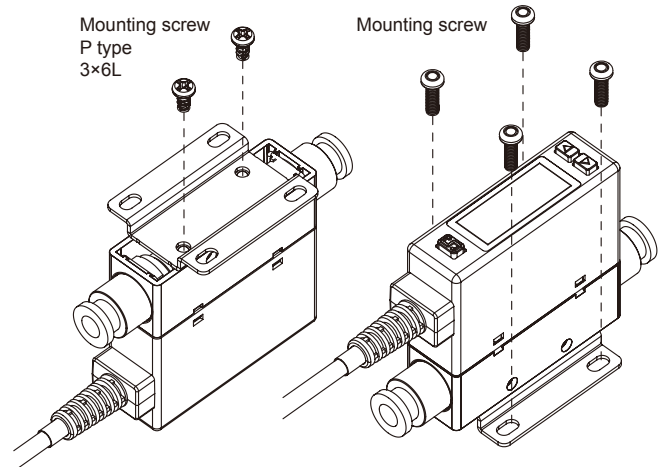
The LCD display may be difficult to see at certain angles. The sensor can be installed horizontally or vertically, but the flow rates

may change because of the installation way of the product or piping.

The tightening torque for screws should be under 0.5 ± 0.1 N.m.



Horizontal mounting (by Through-Hole)



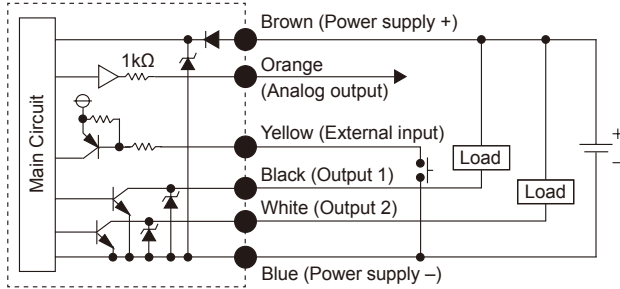
Bracket mounting

* The tightening torque for bracket mounting screws should be under 0.5 ± 0.1 N.m.

• Wiring diagrams

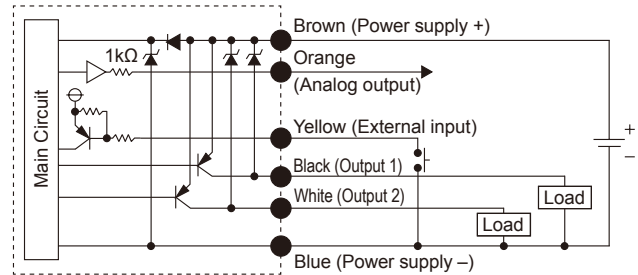
NPN Output, Analog Output and External Input

• NPN Output / Analog Voltage Output / External Input

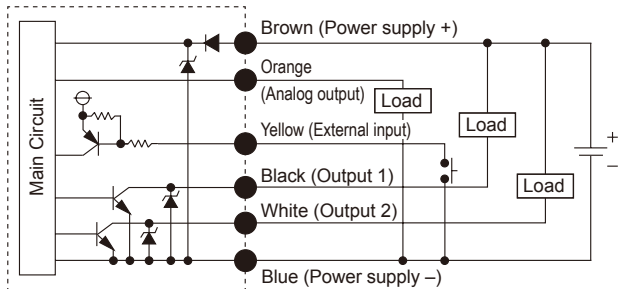


PNP Output, Analog Output and External Input

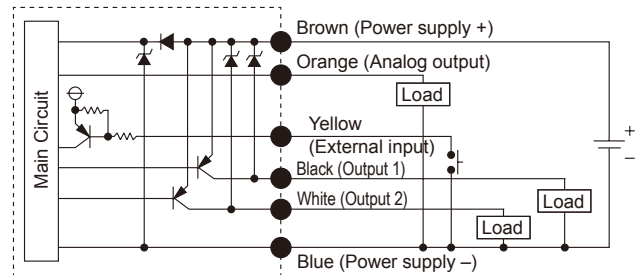
• PNP Output / Analog Voltage Output / External Input



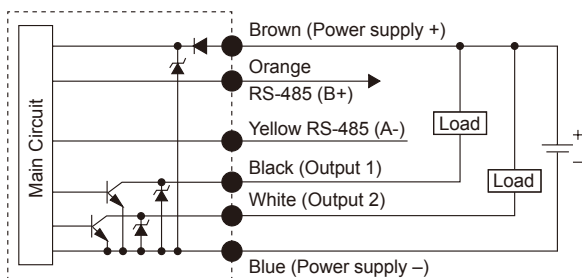
• NPN Output / Analog Current Output / External Input



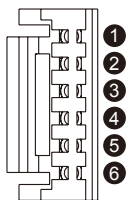
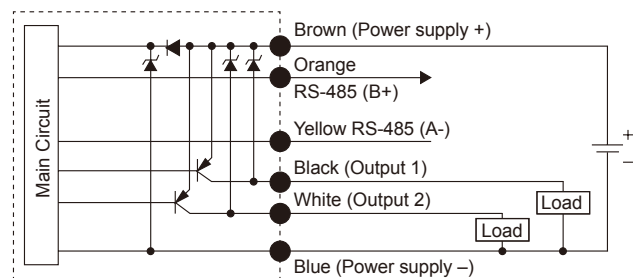
• PNP Output / Analog Current Output / External Input



• NPN Output, RS-485 Modbus



• PNP Output, RS-485 Modbus



Pin. no.	Line color	Content	Content (RS-485 Modbus)
1	Brown	Power supply (DC 12 to 24V DC)	Power supply (DC 12 to 24V DC)
2	Orange	Analog voltage output: 1 ~ 5V Analog current output: 4 ~ 20mA	RS-485 (B+)
3	Yellow	External input	RS-485 (A-)
4	Black	Output 1 (Max. load current: 125mA)	Output 1 (Max. load current: 125mA)
5	White	Output 2 (Max. load current: 125mA)	Output 2 (Max. load current: 125mA)
6	Blue	0V (GND)	0V (GND)

NOTE

Procedure to wiring RS485 products : To prevent product damage due to short circuit, MUST do RS485 line connection BEFORE power line connection.

MFP01 Dimensions



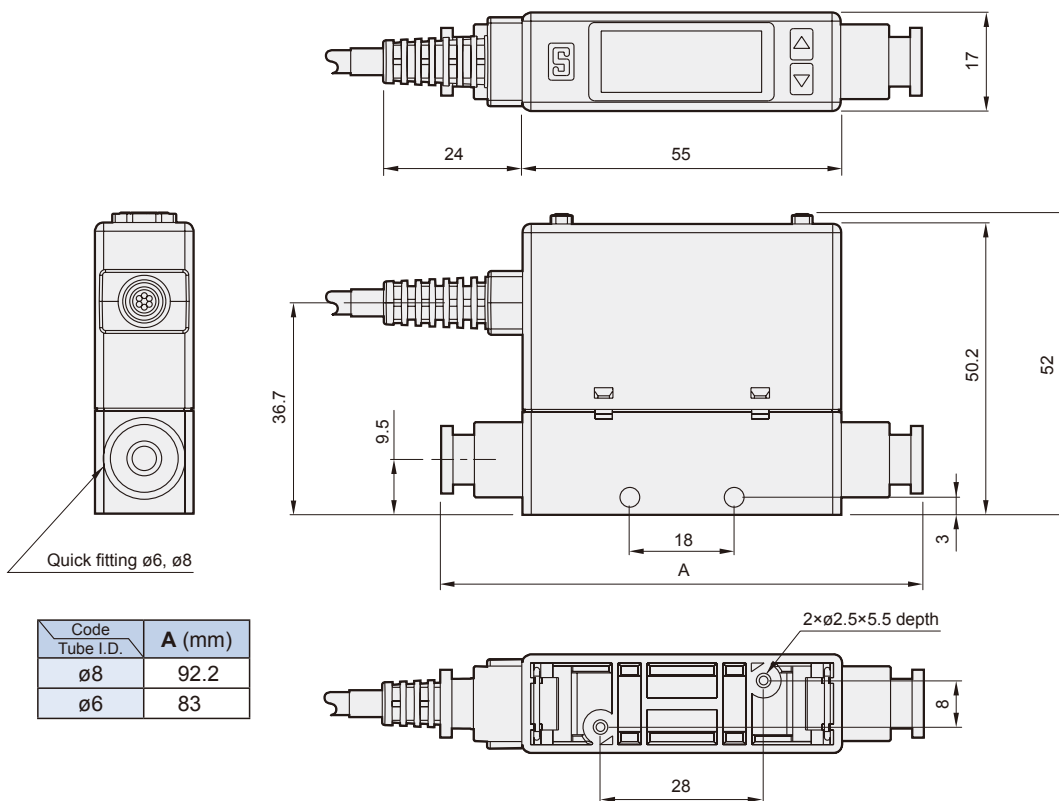
FLOW & PRESSURE SENSOR (INSTRUCTION MANUAL)

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Port size

R6 (ø6)

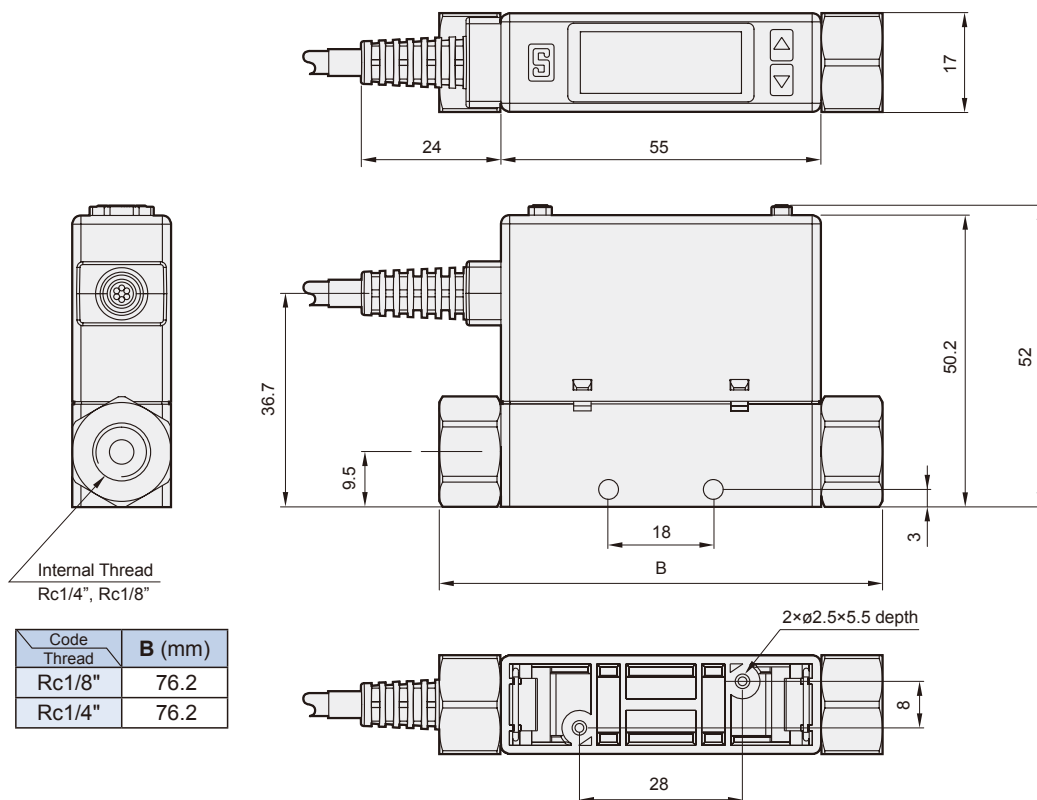
R8 (ø8)



Port size

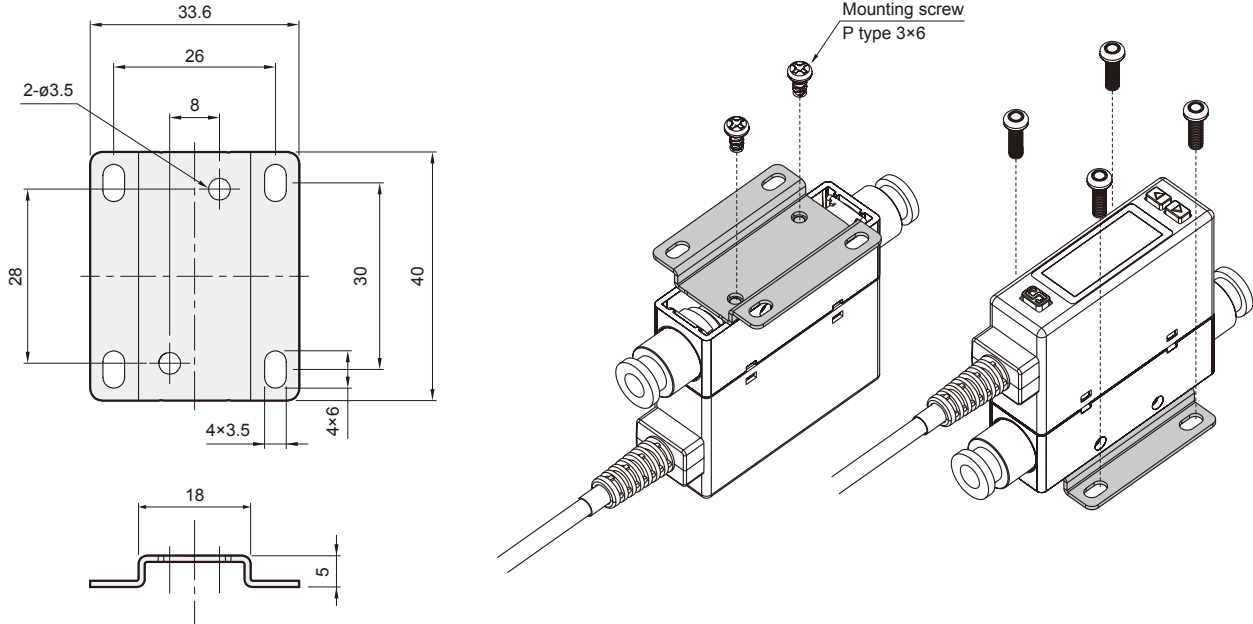
F1C (Rc1/8")

F4C (Rc1/4")



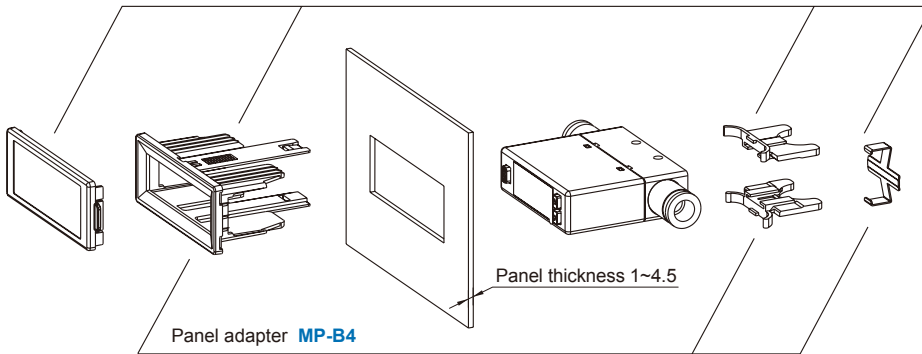
Mounting bracket

MP-A26

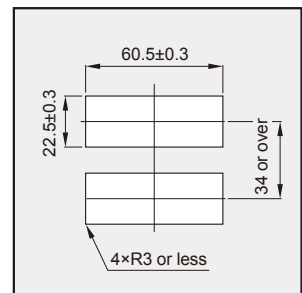


Panel type

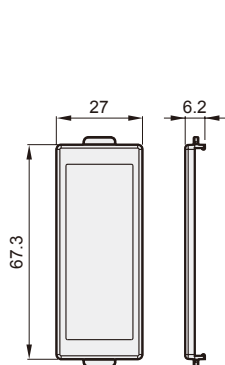
Front protective lid + Panel adapter MP-C4



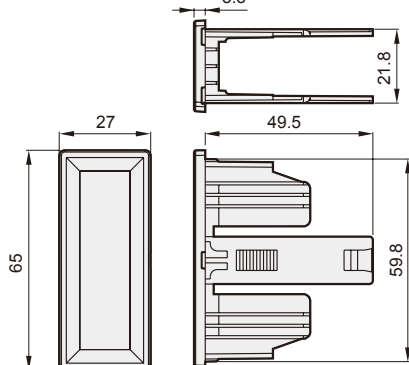
Panel cut dimensions



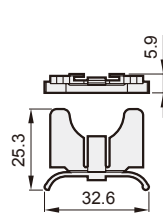
Front protective lid



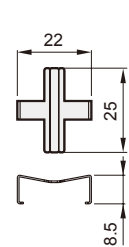
Panel adapter



Panel adapter



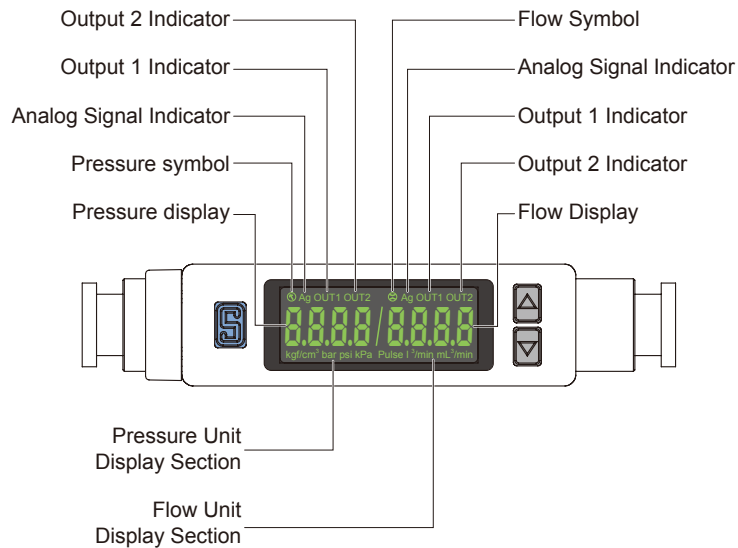
Panel adapter



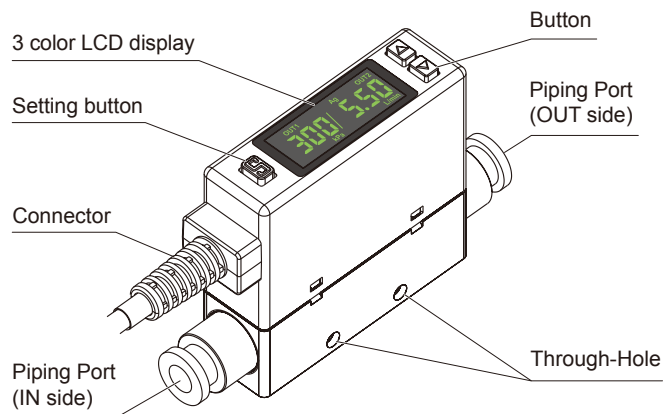
How to use

• Names and Functions of Individual Parts

Panel description



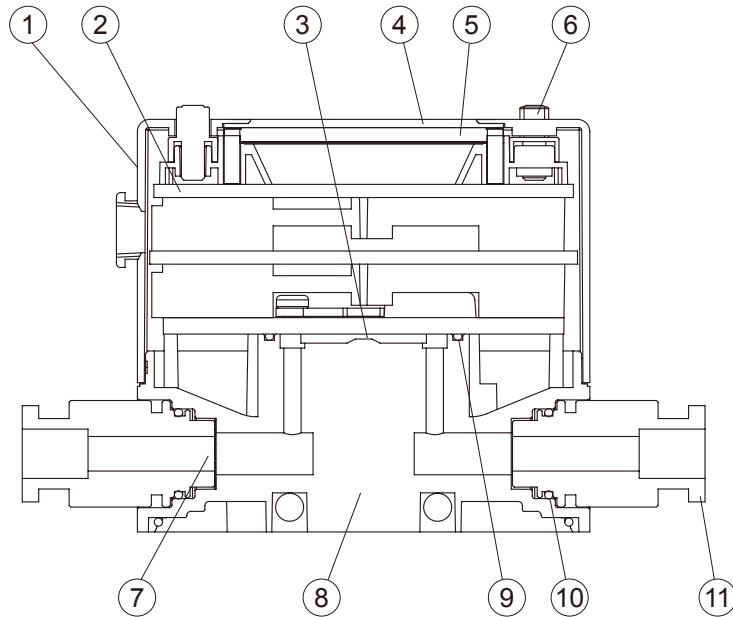
Body description



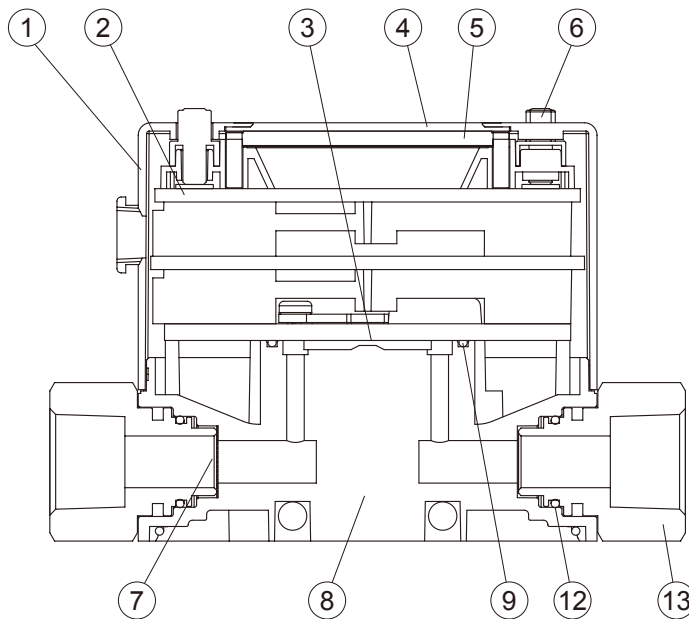
MFP01 How to use – Internal structure

FLOW & PRESSURE SENSOR (INSTRUCTION MANUAL)

Port size
R6 (ø6)
R8 (ø8)



Port size
F1C (Rc1/8")
F4C (Rc1/4")



No.	Part name (Material)
1	Case (PC + ABS)
2	Electronic circuit board
3	Sensor (SiC)
4	Liquid crystal cover (PC)
5	Liquid crystal
6	Button (Silicone)
7	Port Filter (Stainless Steel)

No.	Part name (Material)
8	Resin Body (PBT)
9	O-ring (Viton)
10	O-ring (NBR)
11	Quick-Fitting
12	O-ring (Viton)
13	Internal thread (SUS303)

Function setting mode

Function code	Item	Default setting	Explanation	
F-01	oUt 1	OUT1 setting	oUt 1	
	oUt 1	OUT1 sensor correspondence	FLoY	
	FLoY	OUT1 output mode	HY5	
	oUt 1	OUT1 output type	no	
	FL-1	OUT1 set value input	50 % of maximum measured flow rate 005 : 250 mL/min, 010 : 500 mL/min 050 : 2.50 L/min, 100 : 5.00 L/min 500 : 25.0 L/min, 101 : 50.0 L/min 201 : 100 L/min	Select output 1 corresponding to flow sensor or pressure sensor. Set the flow rate or pressure value to switch ON / OFF.
	FH-1	OUT1 set value input	60 % of maximum measured flow rate 005 : 300 mL/min, 010 : 600 mL/min 050 : 3.00 L/min, 100 : 6.00 L/min 500 : 30.0 L/min, 101 : 60.0 L/min 201 : 120 L/min	
F-02	oUt 2	OUT2 setting	oUt 2	
	oUt 2	OUT2 sensor correspondence	FLoY	
	FLoY	OUT2 output mode	HY5	
	oUt 2	OUT2 output type	no	
	FL-2	OUT2 set value input	50 % of maximum measured flow rate 005 : 250 mL/min, 010 : 500 mL/min 050 : 2.50 L/min, 100 : 5.00 L/min 500 : 25.0 L/min, 101 : 50.0 L/min 201 : 100 L/min	Select output 2 corresponding to flow sensor or pressure sensor. Set the flow rate or pressure value to switch ON / OFF.
	FH-2	OUT2 set value input	60 % of maximum measured flow rate 005 : 300 mL/min, 010 : 600 mL/min 050 : 3.00 L/min, 100 : 6.00 L/min 500 : 30.0 L/min, 101 : 60.0 L/min 201 : 120 L/min	
F-03	CLor	LCD display setting	CLor	
	d 5P	LCD display corresponding to output	oUt 1	Select back light color and display mode.
	d 5P	LCD display color selection	SoG	
F-04	rESP	Response time selection	rESP	Select the response time for analog output. Pressure sensor: 2.5 ms ~ 1500 ms Flow sensor: 50 ms ~ 1500 ms
	rESP	Flow / Pressure sensor selection	FLoY	
	FLoY	Response time selection	800 (ms)	
F-05	UPdR	Display refreshtime selection	UPdR	Display refresh cycle can be set in 200 ms, 500 ms or 1000 ms.
	UPdR	Flow / Pressure sensor selection	FLoY	
	UPdR	Display refresh time of flow sensor selection	500 (ms)	
F-06	Un it	Unit selection	Un it	Select the UNIT of pressure / flow sensor.
	FLoY	Flow unit selection	L Pñ	
	PrES	Pressure unit selection	PR	

Function code	Item		Default setting	Explanation
F-07	rEFE	Flow reference standard selection	rEFE	Select the flow value is shown under standard (ANR) or normal condition (NOR).
	rEFE	Flow reference standard selection	Rnr	
F-08	RnG	Analog output selection	RnG	Select the analog corresponding to pressure or flow sensor. (*1)
	FLoY	Analog output selection	FLoY	
F-09	EEPf	Accumulated value hold selection	EEPf	To save the last accumulated flow value every 2 or 5 minutes.
	EEPf	Accumulated value hold selection	oFF	
F-10	dIS	Flow sensor display mode selection	dIS	Select to display Instantaneous Flow or Accumulated Flow Mode.
	dSP	Flow sensor display mode selection	InS	
F-80	YSn	Sync the value of flow analog output and display	oFF	Turn ON to synchronize the value of flow analog output and display. (*1,3)
F-91	ECo	Power-Save mode selection	ECo	Select if turn on powersave mode to reduce power consumption.
	ECo	Power-Save mode selection	no	
F-92	InP	External input selection	InP	Select for Accumulated flow rate zero clear, Auto-Shift or Auto-Shift zero. (*1)
	InP	External input selection	r-r	
F-93	rBUS	Modbus RTU setting	rBUS	Set ID number, baud rate and transmission format. (*2)
	Id	ID number setting	1	
	rRt	Baud rate setting	96 (9600 Bd)	
	For	Transmission format setting	rB 1	
	trA	Communications protocol setting	rTU	
F-94	F'nE	Fine adjustment setting	F'nE	The displayed value can be adjusted slightly.
	F'nE	Fine adjustment setting	oFF	
F-95	FoUt	Forced output function	FoUt	To turn the analog ON / OFF forcibly.
	oUt 1	Forced output function	oFF	
	oUt 2	Forced output function	oFF	
F-99	rESt	Reset to the default setting	rESt	Return to the factory default setting.
	rSt	Reset to the default setting	oFF	

*1. This function is not available with Output Specification -02 and -04.




*2. This function only available for Output Specification -02 and -04.

*3. This function is available for output of flow rate only.

Measurement mode

Item	Explanation
Pressure display	Display pressure value.
Flow display	Display instantaneous flow rate.
Accumulated flow rate display	Display accumulated flow rate.
Pressure zero setting	The displayed pressure value can be adjusted to "0".
Instantaneous flow rate zero setting	The displayed instantaneous flow rate value can be adjusted to "0".
Accumulated flow rate zero clear	The accumulated flow rate can be set to "0".
Peak value display	The maximum pressure or instantaneous flow can be detected when the power is supplied for a period.
Bottom value display	The minimum pressure or instantaneous flow can be detected when the power is supplied for a period.
Key lock / unlock mode	To prevent errors occurring due to unintentional changes of the set values.

• Operation setting instructions

At Measurement Mode, press  button for more than 3 sec. to display [F-01]. Press  or  button to select other setting functions.

Press  for 3 sec. at Function Setting Mode to return to Measurement Mode.



Press  button for more than 3 sec.

Function selection mode





Press  button

Enter in each function setting

• [F-01] OUT1 setting selection

Setting corresponding sensor and operating mode of OUT1.

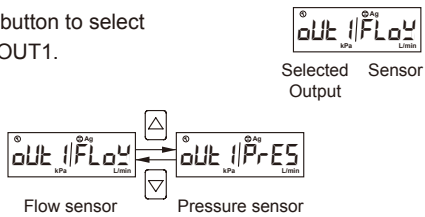
Flow sensor setting

Press  or  button at Function Setting Mode to display [F-01] [OUT1].

Press  button

Sensor selection

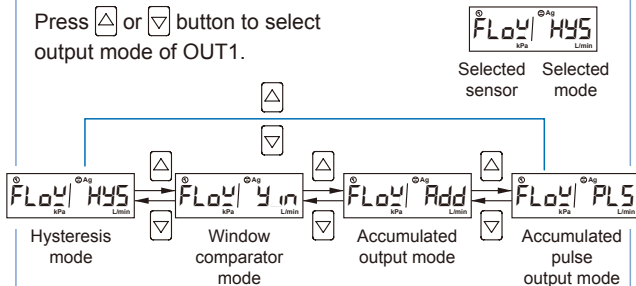
Press  or  button to select flow sensor of OUT1.



Press  button

Output mode setting

Press  or  button to select output mode of OUT1.



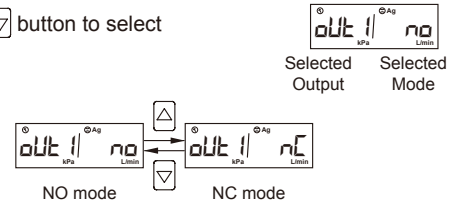
NOTE The Accumulated Pulse Output Mode can only be set in OUT1, and OUT2 does not have this setting.

Press  button

Output Type Setting

OUT1 type setting

Press  or  button to select OUT1 type.



NOTE

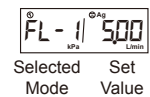
Type setting will not display when accumulated pulse output mode is set.

Press  button

Set Value Setting

Out1 set value setting

Press  or  button to adjust the set value.



Hysteresis mode [HYS]: [FL-1], [FH-1]
Window comparator mode [Win]: [FL-1], [FH-1]
Accumulated output mode [Add]: [RdL1], [RdH1]

NOTE

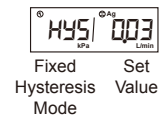
Set value setting will not display when accumulated pulse output is set.

Press  button

Fixed Hysteresis Setting

Fixed hysteresis setting

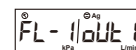
Press  or  button to adjust fixed hysteresis value.



NOTE

Fixed hysteresis setting will not display when hysteresis mode, accumulated output Mode and accumulated pulse output mode is set.



Press  button to return to Function Selection Mode



• [F-01] OUT1 setting selection

Setting corresponding sensor and operating mode of OUT1.



Pressure sensor setting

Press  or  button at Function Setting Mode to display [F-01] [oUt 1].

Press  button

Press  button



Sensor Selection

Press  or  button to select pressure sensor of OUT1.



oUt 1 ^{0.00} / ^{0.00} FLOW _{L/min}

Selected Sensor
Output

oUt 1 ^{0.00} / ^{0.00} PRES _{L/min}



Flow sensor

Pressure sensor

Set Value Setting

Out1 set value setting

Press  or  button to adjust the set value.



oUt 1 ^{0.00} / ^{0.00} L-1 _{L/min}

Selected Mode
Set Value

Hysteresis mode [HYS]: [L-1], [H-1]
 Window comparator mode [Win]: [L-1], [H-1]
 One point set mode [oPS]: [P-1]



Press  button

Output Mode Setting



Press  or  button to select output mode of OUT1.

oUt 1 ^{0.00} / ^{0.00} HYS PRES _{L/min}



Selected Sensor
Mode

Hysteresis mode



Window comparator mode

One point set mode

Fixed Hysteresis Setting

Fixed hysteresis setting

Press  or  button to adjust fixed hysteresis value.

oUt 1 ^{0.00} / ^{0.00} 3 HYS _{L/min}



Set Fixed
Value Hysteresis
Mode

NOTE
 Fixed hysteresis setting will not display when hysteresis mode is set.

Press  button to return to Function Selection Mode



Output Type Setting

OUT1 type setting



Press  or  button to select OUT1 type.

oUt 1 ^{0.00} / ^{0.00} NO _{L/min}

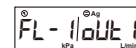
Selected Output
Mode

NO Mode

NC Mode



• [F-02] OUT2 setting selection

Setting corresponding sensor and operating mode of OUT2.

< Operation >

A – Press or button at function setting mode to start "OUT 2 Setting" [F-02] [OUT2].

B – Check the [F-01] for the same follow setting.

NOTE

The OUT2 setting dose not have accumulated pulse output mode.

• [F-03] LCD display color selection

4 LCD Display Color Modes of output value selection.

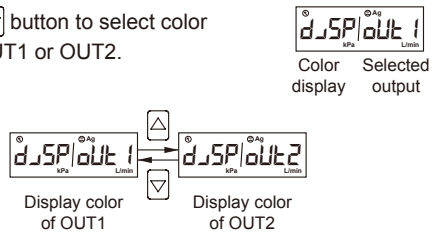
< Operation >

Press or button at function selection mode to display [F-03] [CLor].

Press button

Output Selection

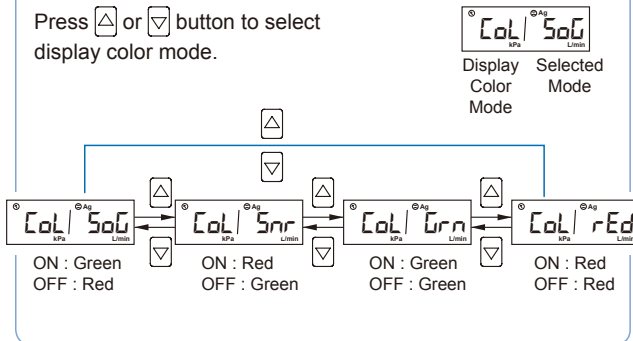
Press or button to select color display for OUT1 or OUT2.



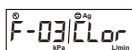
Press button

Display Color Mode Selection

Press or button to select display color mode.



Press button to return to Function Selection Mode



• [F-04] Response time selection

Select proper response time to avoid switch output chattering.

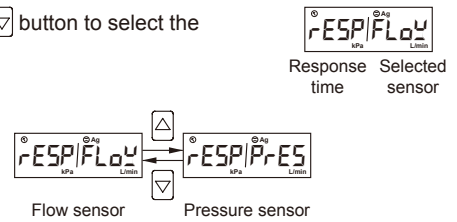
Flow sensor setting

Press or button at Function Selection Mode to display [F-04] [rESP].

Press button

Sensor Selection

Press or button to select the flow sensor.

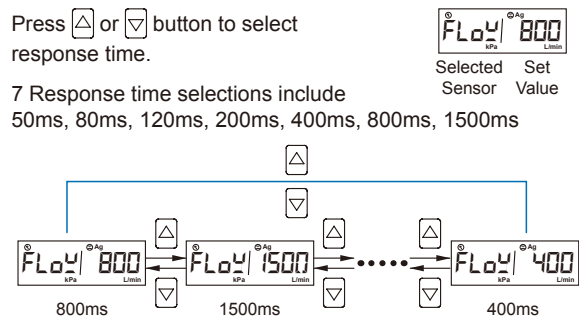


Press button

Response Time Selection

Press or button to select response time.

7 Response time selections include 50ms, 80ms, 120ms, 200ms, 400ms, 800ms, 1500ms



Press button to return to Function Selection Mode



• [F-04] Response time selection

Select proper response time to avoid switch output chattering.

[Pressure sensor setting](#)

Press or button at Function Selection Mode to display [F-04] [rESP].

Press button

Sensor Selection

Press or button to select the pressure sensor.

Flow sensor

Pressure sensor

Response Selected
time sensor

Press button

Response Time Selection

Press or button to response time.

2.5ms

25ms

1500ms

7 Response time selections include
50ms, 80ms, 120ms, 200ms, 400ms, 800ms, 1500ms

Set Selected
Value Sensor

Press button to return to Function Selection Mode



• [F-05] Display refresh time selection

Select the proper display refresh time to reduce frequently changing value.

[Flow sensor setting](#)

Press or button at function selection mode to display [F-05] [UPdR].

Press button

Sensor Selection

Press or button to select the flow sensor.

Flow sensor

Pressure sensor

Refresh Selected
time sensor

Press button

Display Refresh Time Setting

Press or button to select refresh time.

500ms

1000ms

200ms

3 display refresh time selections include
200ms, 500ms, 1000ms

Refresh Set
time value

Press button to return to Function Selection Mode



• [F-05] Display refresh time selection

Select the proper display refresh time to reduce frequently changing value.

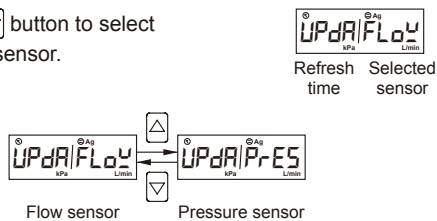
Setting display refresh time of pressure sensor

Press or button at function selection mode to display [F-05] [UPdR].

Press button

Sensor Selection

Press or button to select the pressure sensor.

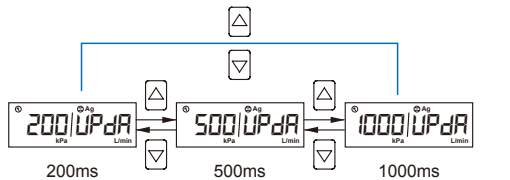


Press button

Display Refresh Time Setting

Press or button to select refresh time.

3 display refresh time selections include 200ms, 500ms, 1000ms



Press button to return to Function Selection Mode

• [F-06] Unit selection

Select the flow unit and pressure unit of the sensor.

< Operation >

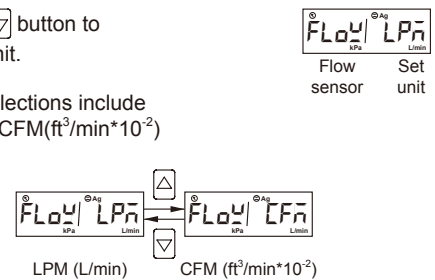
Press or button at function selection mode to display [F-06] [Un it].

Press button

Flow Unit Selection

Press or button to select flow unit.

2 flow unit selections include LPM(L/min), CFM(ft³/min*10⁻²)



NOTE

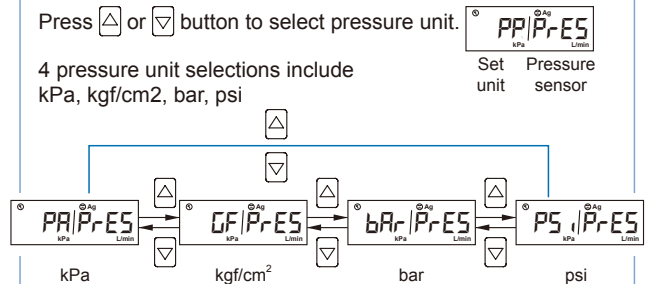
When the measured flow rate range is 500mL/min or 1000mL/min, the unit of LPM is selected to represent the unit in mL/min.

Press button

Pressure Unit Selection

Press or button to select pressure unit.

4 pressure unit selections include kPa, kgf/cm², bar, psi





Press button to return to Function Selection Mode

• [F-07] Flow reference standard selection

Select the flow value is shown under standard or normal condition.


< Operation >

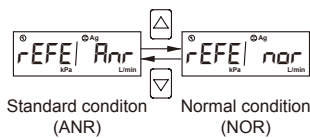
Press  or  button at function selection mode to display [F-07] [rEFE].

Press  button

Flow Reference Standard Selection

Press  or  button to select the standard or normal condition.

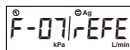
 Flow Selected reference condition



NOTE

1. Standard condition (ANR)
The display value is calculated under 20°C, 1atm.
2. Normal condition (NOR)
The display value is calculated under 0°C, 1atm.
3. Flow rate in the specification is the value at standard condition (ANR).



Press  button to return to Function Selection Mode



• [F-08] Analog output selection

Select the analog output signal is for flow sensor or pressure sensor.

< Operation >

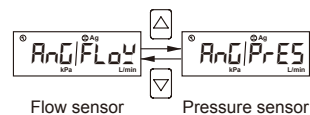
Press  or  button at function selection mode to display [F-08] [rnc].

Press  button

Sensor Selection

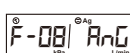
Press  or  button to select the sensor of analog output.

 Analog Selected sensor



NOTE This function is not available with Output Specification -02 and -04.



Press  button to return to Function Selection Mode



• [F-09] Accumulated value hold selection



The default setting is "OFF", the accumulated flow value is zeroed when the power supply is turned off. Select this function to keep accumulated flow value to be stored in permanent memory and reload the recent saved accumulated value after power supply turns on.

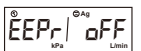
< Operation >

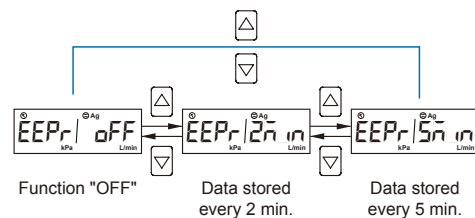
Press  or  button at function selection mode to display [F-09] [EEPr].

Press  button

Accumulated Value Hold Selection

Press  or  button to turn off the function or select the data stored cycle.

 Accumulated Selected value hold function



Press  button to return to Function Selection Mode



NOTE

The maximum writable limit of the memory device is 1 million cycles. If the sensor is operated 24 hours per day, the durability is calculated as below:

- 5 minutes x 1 million cycles = 5 million minutes = 9.5 years
- 2 minutes x 1 million cycles = 2 million minutes = 3.8 years

• [F-10] Flow sensor display mode selection

Select to display Instantaneous Flow or Accumulated Flow Mode.

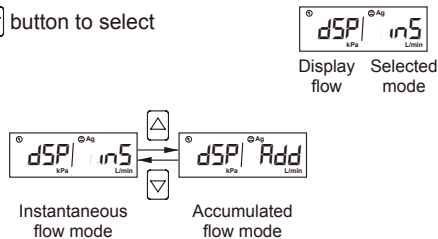
< Operation >

Press or button at function selection mode to display [F-10] [d.5].

Press button

Display Mode Selection

Press or button to select display mode.



NOTE

When the measured flow rate range is 500mL/min or 1000mL/min, the accumulated flow is selected and the unit will become in mL/min.

Press button to return to Function Selection Mode



• [F-80] Sync the value of flow analog output and display

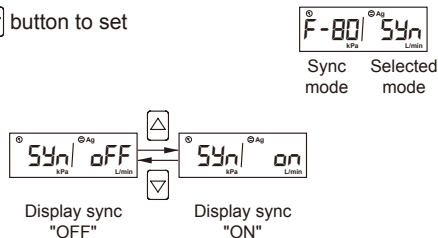
< Operation >

Press or button at function selection mode to display [F-80] [54n].

Press button

Display Mode Selection

Press or button to set display sync.



NOTE

1. This function is not available with Output Specification -02 and -04.
2. This function is available for output of flow rate only.

Press button to return to Function Selection Mode



• [F-92] External input selection

Accumulated flow external reset: The accumulated flow value will reset to "0" when an external input signal is applied.

Auto-shift: The instantaneous flow rate will regard as the standard when the external input signal is applied. The switch output function operates relative to its change.

Auto-shift zero: The instantaneous flow rate is reset to zero to regard as standard when the external input signal is applied. The switch output function operates relative to its change.

This function is only for output 1 corresponding to flow sensor action point.

When external signal is input, please connect the input wire to GND for 30 ms or more.

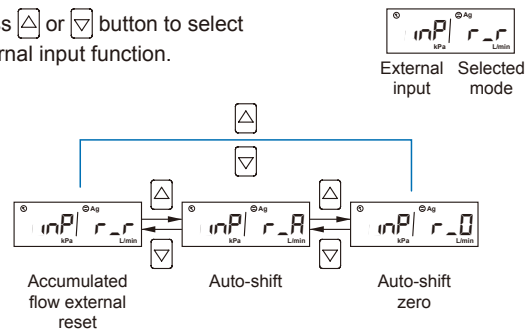
< Operation >

Press or button at function selection mode to display [F-92] [inP].

Press button

External Input Selection

Press or button to select external input function.



NOTE

1. This function is not available with Output Specification -02 and -04.
2. When external signal is input, the instantaneous flow rate value will be shown "0000".



Press button to return to Function Selection Mode



• [F-91] Power save mode selection

Select Power-Save Mode at Measurement Mode. During the Power-Save Mode, the main display will turned off if no buttons is pressed in 30 sec., press any keys to leave the Power-Save Mode.

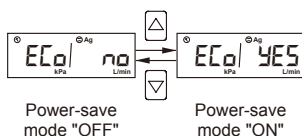
< Operation >

Press Δ or ∇ button at function selection mode to display [F-91] [ECo].

Press [Menu] button


Power-Save Mode Selection

Press Δ or ∇ button to turn on the power-save mode.



Power-save mode "OFF" Power-save mode "ON"

NOTE During the Power-Save Mode, the decimal point will flash.



Press [Menu] button to return to Function Selection Mode



• [F-93] MODBUS RTU Setting

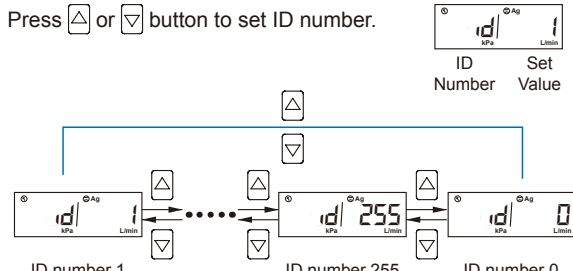
MODBUS transmission protocol can be set according to user requirements.

Press Δ or ∇ button at Function Selection Mode to display [F-93] [ModBUS].

Press [Menu] button

ID Number Setting

Press Δ or ∇ button to set ID number.



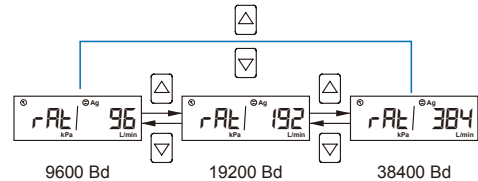
ID number 1 ID number 255 ID number 0

NOTE This function only available for output specification -02 and -04.

Press [Menu] button

Baud Rate Setting

Press Δ or ∇ button to set baud rate.



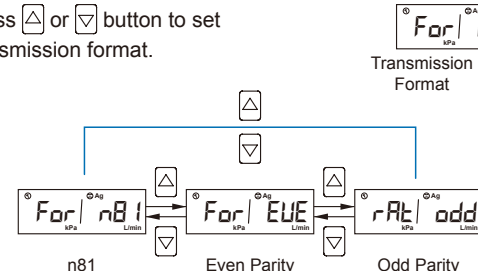
9600 Bd 19200 Bd 38400 Bd

NOTE This function only available for output specification -02 and -04.

Press [Menu] button

Transmission Format Setting

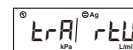
Press Δ or ∇ button to set transmission format.



n81 Even Parity Odd Parity

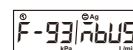
NOTE This function only available for output specification -02 and -04.

Press [Menu] button



RTU mode

Press [Menu] button to return to Function Selection Mode



* NOTE: The maximum number of reads in a single time is 4, if you exceed this limit, please read in batches.

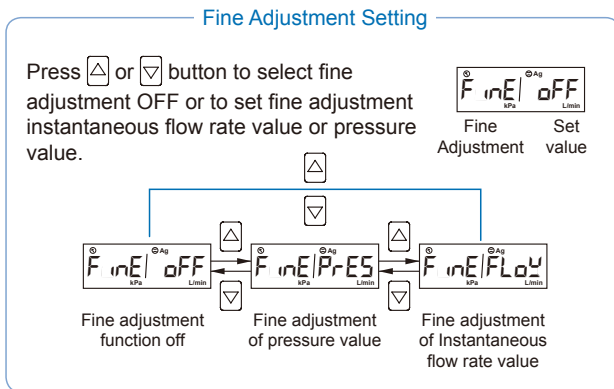
• [F-94] Fine adjustment setting

This function is to fine adjust flow and pressure display values. Display values can be calibrated to within $\pm 2.5\%$ R.D.

Fine adjustment of instantaneous flow value

Press Δ or ∇ button at Function Selection Mode to display [F-94] [F inE].

Press M button



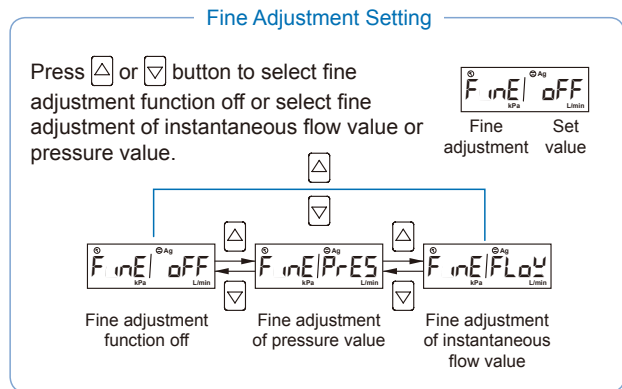
• [F-94] Fine adjustment setting

This function is to fine adjust flow and pressure display values. Display values can be calibrated to within $\pm 2.5\%$ R.D.

Fine adjustment of pressure value

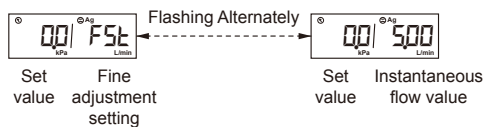
Press Δ or ∇ button at Function Selection Mode to display [F-94] [F inE].

Press M button



Fine Adjustment of Instantaneous Flow Rate Value

Press Δ or ∇ button to set fine adjustment value.



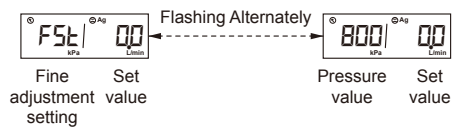
NOTE Display will flashing between instantaneous flow value and "FST".

Press M button

Return to the measurement mode

Fine Adjustment of Pressure Value

Press Δ or ∇ button to setting fine adjustment of display value.



NOTE Display will flashing between pressure value and "FST".

Press M button

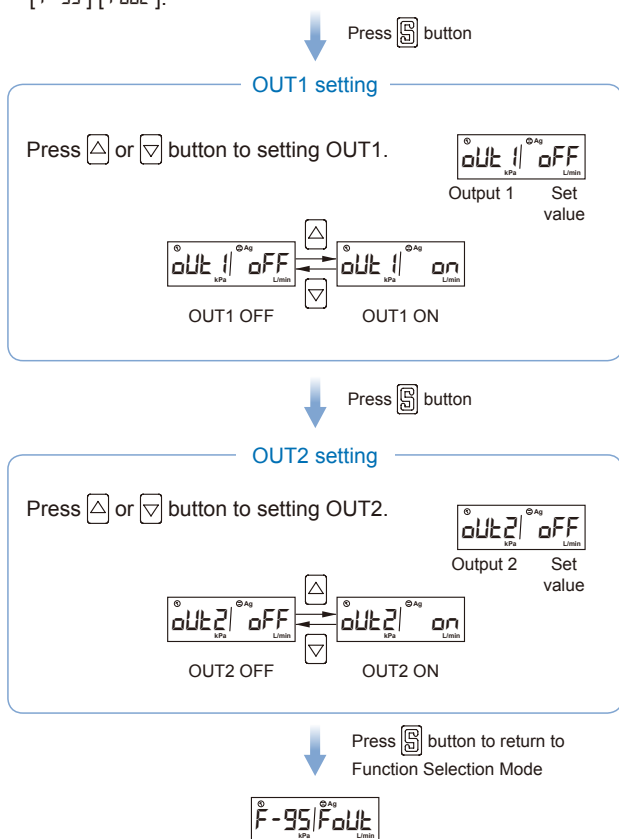
Return to the measurement mode

• [F-95] Forced output function

To turn the analog ON/OFF forcibly.

< Operation >

Press or button at Function Selection Mode to display [F-95] [F_oU_t].

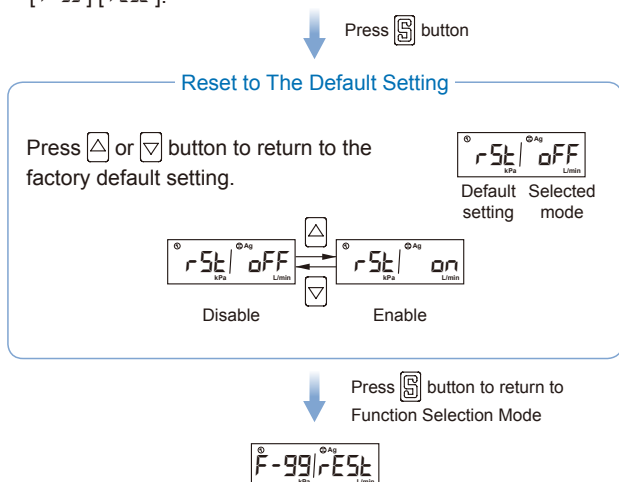


• [F-99] Reset to the default setting

The factory default settings can be restored.

< Operation >

Press or button at function selection mode to display [F-99] [rESt].

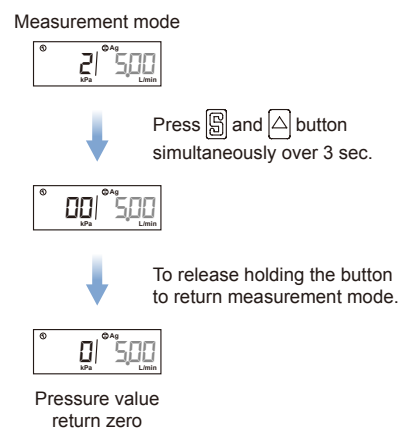


• Pressure zero adjustment function

The displayed value can be adjusted to "0" when the pressure is within $\pm 3\%$ F.S. of the zero point at the time of shipment from the factory.

< Operation >

Press and button simultaneously over 3 sec. at the measurement mode (not Accumulated flow value display mode) until display [00]. And release holding the button to return measurement mode.

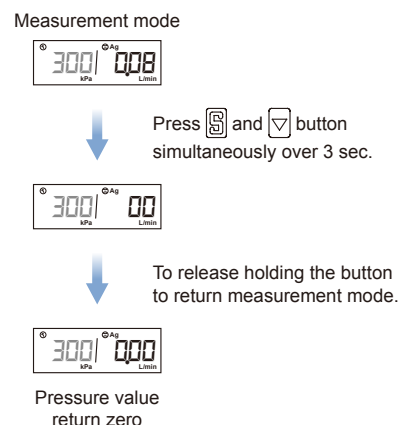


• Instantaneous flow zero adjustment function

The displayed value can be adjusted to "0" when the measured flow is within $\pm 5\%$ F.S. of the zero point at the time of shipment from the factory.

< Operation >

Press and button simultaneously over 3 sec. at the measurement mode (not Accumulated flow value display mode) until display [00]. And release holding the button to return measurement mode.

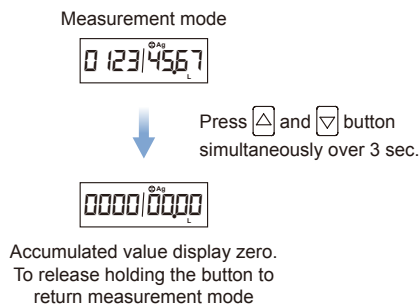


● Reset accumulated flow function

Accumulate flow value return to zero.

< Operation >

Press or button simultaneously over 3 sec. at the measurement mode (Accumulated flow value mode) until display zero.
And release holding the button to return measurement mode.

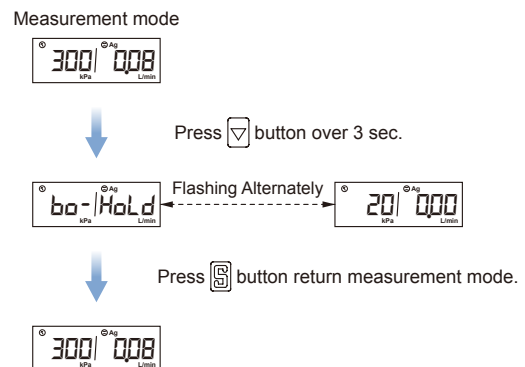


● Bottom value display

The minimum pressure and instantaneous flow, from when the power was supplied to this moment, is detected and updated.

< Operation >

Press button over 3 sec. at the measurement mode. The minimum value will be displayed flashing, and is held.
Press button return to the measurement mode.

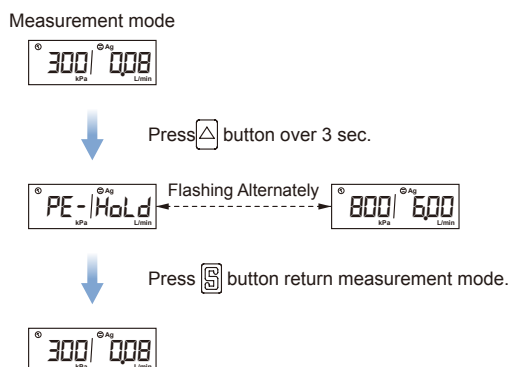


● Peak value display

The maximum pressure and instantaneous flow, from when the power was supplied to this moment, is detected and updated.

< Operation >

Press button over 3 sec. at the measurement mode. The maximum value will be displayed flashing, and is held.
Press button return to the measurement mode.

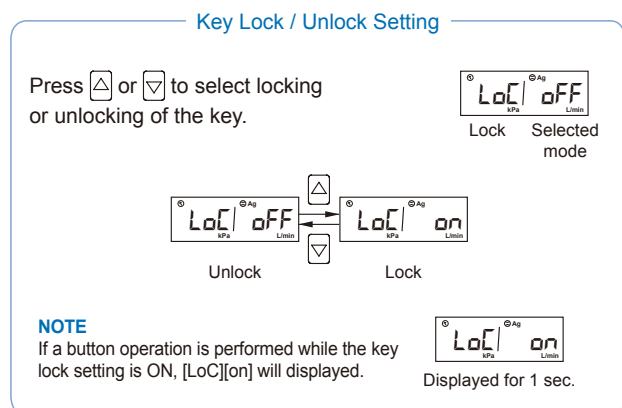


● Key lock / Unlock mode

To prevent errors occurring due to unintentional changes of the set values. If a button operation is performed while the key lock setting is ON, [LoC] [on] is displayed for 1 sec.

< Operation >

Press button over 5 sec. at measurement mode to select key lock/unlock setting



Function code	Explanation	Operation
0000H	ID Number (0 ~ 255) Range : 0 ~ 255	Read / Write
0001H	Baud rate setting 0 : 9600 bps 1 : 19200 bps 2 : 38400 bps	Read / Write
0002H	Transmission format setting 0 : N.8.1 1 : E.8.1 2 : O.8.1	Read / Write
0003H	Communications protocol setting 0 : RTU	Read / Write
0004H	Measured flow rate range 005 : 0 ~ 500 mL/min 010 : 0 ~ 1000 mL/min 050 : 0 ~ 5 L/min 100 : 0 ~ 10 L/min 500 : 0 ~ 50 L/min 101 : 0 ~ 100 L/min 201 : 0 ~ 200 L/min	Read
0005H	Instantaneous flow value	Read
0006H	Flow unit 0 : LPM (L/min or mL/min) 1 : CFM (ft ³ /min)	Read / Write
0007H	Decimal place for flow value 0 : None 1 : One decimal place 0.1 2 : Two decimal places 0.01 3 : Three decimal places 0.001	Read
0008H	Accumulated flow value (ADL) XXXX 9999	Read
0009H	Accumulated flow value (ADH) 9999 XXXX	Read
000AH	Flow reference standard 0 : ANR (Standard condition) 1 : NOR (Normal condition)	Read / Write
000BH	Flow sensor display mode 0 : Instantaneous flow 1 : Accumulated flow	Read / Write
000CH	Accumulated value hold 0 : None 1 : 2 min/times 2 : 5 min/times	Read / Write

Function code	Explanation	Operation
000DH	Flow display refresh time 0 : 200 ms 1 : 500 ms 2 : 1000 ms	Read / Write
000EH	Rated pressure range 3 : -0.100 ~ 1.000 MPa	Read
000FH	Display pressure value	Read
0010H	Pressure unit 0 : kPa 1 : Kg/cm ² 2 : bar 3 : psi	Read / Write
0011H	Decimal place for pressure value 1 : One decimal place 0.1 2 : Two decimal places 0.01 3 : Three decimal places 0.001	Read
0012H	Pressure display refresh time 0 : 200 ms 1 : 500 ms 2 : 1000 ms	Read / Write
0013H	Fine Adjustment Setting 0 : OFF 1 : FLOW SENSOR 2 : PRESSURE SENSOR	Read / Write
0014H	Fine adjustment of display value -25 ~ 25 (-2.5 % ~ +2.5 %)	Read / Write
0015H	Response time of flow sensor 0 : 50 ms 1 : 80 ms 2 : 120 ms 3 : 200 ms 4 : 400 ms 5 : 800 ms 6 : 1500 ms	Read / Write
0016H	Response time of pressure sensor 0 : 2.5 ms 1 : 25 ms 2 : 100 ms 3 : 250 ms 4 : 500 ms 5 : 1000 ms 6 : 1500 ms	Read / Write
0017H	OUT1 corresponding sensor 0 : FLOW SENSOR 1 : PRESSURE SENSOR	Read / Write

(Continued)

Function code	Explanation		Operation
0018H	OUT1 output mode		Read / Write
	FLOW 0 : HYS 1 : WIN 2 : ADD 3 : PLS	PRESSURE 0 : OPS 1 : HYS 2 : WIN	
0019H	OUT1 output type 0 : N.O. mode 1 : N.C. mode		Read / Write
001AH	Flow setting value FL-1		Read / Write
001BH	Flow setting value FH-1		Read / Write
001CH	Flow setting value ADL1		Read / Write
001DH	Flow setting value ADH1		Read / Write
001EH	Fixed hysteresis setting for flow value HYS 0 ~ 8		Read / Write
001FH	Pressure setting value P-1 or L-1		Read / Write
0020H	Pressure setting value H-1		Read / Write
0021H	Fixed hysteresis setting for pressure value HYS 0 ~ 8		Read / Write
0022H	OUT1 switch 0 : OFF 1 : ON		Read
0023H	OUT2 corresponding sensor 0 : FLOW SENSOR 1 : PRESSURE SENSOR		Read / Write
0024H	OUT2 output mode		Read / Write
	FLOW 0 : HYS 1 : WIN 2 : ADD	PRESSURE 0 : OPS 1 : HYS 2 : WIN	Read / Write
0025H	OUT2 output type 0 : N.O. mode 1 : N.C. mode		Read / Write
0026H	Flow setting value FL-2		Read / Write
0027H	Flow setting value FH-2		Read / Write
0028H	Flow setting value ADL2		Read / Write

Function code	Explanation	Operation
0029H	Flow setting value ADH2	Read / Write
002AH	Fixed hysteresis setting for flow value HYS 0 ~ 8	Read / Write
002BH	Pressure setting value P-2 or L-2	Read / Write
002CH	Pressure setting value H-2	Read / Write
002DH	Fixed hysteresis setting for pressure value HYS 0 ~ 8	Read / Write
002EH	OUT2 switch 0 : OFF 1 : ON	Read
002FH	Color display for OUT1 or OUT2 selection 0 : OUT1 1 : OUT2	Read / Write
0030H	Display color setting 0 : SOG (Switch on Green) 1 : SOR (Switch on Red) 2 : GRN (Always is Green) 3 : RED (Always is Red)	Read / Write
0031H	Power-save mode 0 : NO 1 : YES	Read / Write
0032H	Reset to the default setting 0: RECALL	Write
0033H	Instant flow zero adjustment 0 : When over $\pm 5\%$ F.S., error code 03H will show	Write
0034H	Pressure zero adjustment 0 : When over $\pm 3\%$ F.S., error code 03H will show	Write
0035H	Reset accumulated flow 0 : Accumulated flow value return to zero	Write
0036H	Key lock / unlock setting 0 : OFF 1 : ON	Read / Write
0037H	Switch output 0 : NPN 1 : PNP	Read

MFP01 Error code instructions






FLOW & PRESSURE SENSOR (INSTRUCTION MANUAL)

mindman

Error Type	Error Code	Error Condition	Troubleshooting																																
OUT1 excess load current error		Output 1 load current is more than 125 mA.	Turn power off and check the cause of overload current or lower the current load under 125 mA, then restart.																																
				OUT2 excess load current error		Output 2 load current is more than 125 mA.		Zero adjustment error		The instant flow is within $\pm 5\%$ F.S. of the zero point.	Perform the zero clear function again under no flow conditions.		The pressure value is over $\pm 3\%$ F.S. of the zero point.	Perform the zero clear function again under no pressure conditions.	System error		Memory error	Turn power off, and then restart. If error condition remains, please return to factory for inspection.		Internal data error		Internal data error		System parameter error	Applied flow / pressure error		The instant flow has exceeded the upper limit of the flow display range.	Reduce the flow to the display range.		The pressure has exceeded the upper limit of the pressure display range.	Reduce the pressure to the display range.		The instant flow has exceeded the lower limit of the flow display range.	Ensure the flow is in the correct direction.	
OUT2 excess load current error		Output 2 load current is more than 125 mA.																																	
				Zero adjustment error		The instant flow is within $\pm 5\%$ F.S. of the zero point.	Perform the zero clear function again under no flow conditions.		The pressure value is over $\pm 3\%$ F.S. of the zero point.	Perform the zero clear function again under no pressure conditions.	System error		Memory error	Turn power off, and then restart. If error condition remains, please return to factory for inspection.			Internal data error			Internal data error		System parameter error	Applied flow / pressure error			The instant flow has exceeded the upper limit of the flow display range.	Reduce the flow to the display range.		The pressure has exceeded the upper limit of the pressure display range.	Reduce the pressure to the display range.		The instant flow has exceeded the lower limit of the flow display range.	Ensure the flow is in the correct direction.		The pressure has exceeded the lower limit of the pressure display range.
Zero adjustment error		The instant flow is within $\pm 5\%$ F.S. of the zero point.	Perform the zero clear function again under no flow conditions.																																
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Applied flow / pressure error		The instant flow has exceeded the upper limit of the flow display range.	Reduce the flow to the display range.																																
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		The pressure has exceeded the lower limit of the pressure display range.	Reduce the pressure to the display range.																																

This section indicate the levels of risks with the labels of Danger, Warning and Caution.

 DANGER	Danger indicates high level of risk, will lead to fatal or serious injuries if not avoided.
 WARNING	Warning indicates medium level of risk, it might cause death or serious injuries.
 CAUTION	Caution indicates low level of risk, it might result in minor injuries, such as scald, electric shock, etc. and the product, equipment and machines might be damaged.

WARNING

Precautions for use

① Operated within the specified voltage.

Malfunction or damaged product, electric shock or fire may be resulted by exceeding the specified voltage range.

② Do not exceed the maximum load current.

It may damage the product.

③ Do not use any load that generates surges.

Surge protection is present but applying surge voltage repeatedly will ultimately damage the product.

When using with inductive load (such as relay or solenoid), please install a flyback diode across the load (polarity must be observed).

④ Observed the internal voltage drop.

When used at a specified voltage, if the sensor is functional but the load does not work, please check if the operating voltage of the load meets the following formula.

$$\text{Power Supply voltage} > \text{Internal voltage drop of sensor} > \text{Minimum operating voltage of load}$$

⑤ Do not operate the product outside the specifications.

The sensor will be damaged by exceeding the flow rate and working pressure.

⑥ Do not use flammable fluids and/or permeable fluids.

They may cause fire, explosion or corrosion.

Working fluid and working environment

① Do not use in an explosive gas atmosphere.

The sensor does not have explosion-proof structure, fire, explosion or corrosion can result.

② Do not use near a surge voltage generated area.

Solenoid lifters, high frequency induction furnaces and motors, etc. can generate high surge voltages, if using near the sensor will cause the internal circuit components to deteriorate and cause damages.

③ Sensors can not withstand lightning strikes.

The product is CE compliant, but can not resist surge voltage of lightning strikes, take measures to avoid lightening strikes in the system.

④ Do not use in an environment where sensors could be splashed by water or oil.

Enclosure rating is IP40, please avoid water or oil splashed environment to prevent adversely effects.

⑤ Do not use in an environment subject to large temperature cycling.

Internal components of the sensor will be affected adversely by large heating/cooling cycles other than ordinary changes in temperature.

⑥ Do not mount the product in locations where it is exposed to radiant heat.

This could result in damage and / or malfunction.

Wiring Precautions

① Check wire color and terminal number when wiring.

Incorrect wiring can cause permanent damages to the sensor, check wire color and terminal number against the manual before wiring.

② Avoid repeatedly bending or stretching the lead wire.

It can cause damage to the sheath, or breakage of the wire.

③ Confirm wiring insulation

Please avoid poor insulations (and interference from another circuit, poor insulation between terminals, etc.) it can lead to over current being applied to the product, causing damage.

④ Do not route wires and cables together with power or high voltage cables.

The product may malfunction due to interference or noise and surge voltage from power and high voltage cables.

⑤ Do not short-circuit the load.

When the load is short-circuited, an error will be displayed. But excess current may cause damage to the sensor.

⑥ Do not connect wire when the power is on.

It may cause damages to the sensors/equipment/machines.

⑦ RS485 products must be connected the communication wire first.

To prevent product damage due to short circuit, MUST do RS485 line connection BEFORE power line connection.

Maintenance Precautions

- ❶ The accuracy could change by 2 to 3% when the piping is removed or replaced.
- ❷ Do not insert a stick or wire into the piping ports.
- ❸ Do not touch the terminals or connectors when power is on.

Installation Precautions

- ❶ Ensure the flow direction of the fluid.
Please follow the flow direction indicator for installation and piping.
- ❷ Flush out all dirt and dust by air blow before connect the piping to the sensor.
- ❸ Do not drop or hit.
When installation, do not drop, hit or apply excessive shock (100m/s^2). Internal damage can cause malfunction even if the housing appears to be undamaged.
- ❹ Do not install multiple products in close proximity.
The heat generated from each product could cause the temperature to rise and change the characteristics of product or deterioration of the plastic parts. Please set the products 10mm apart from each other.
- ❺ Hold the sensor body when installing.
The tensile strength of the cable is 24.5 N and apply excessive pulling force can cause damage to the sensor.

CAUTION

Installation Precautions

- ❶ Please follow the specified tightening torque.
Over tighten will damage the product.
- ❷ Do not mount the sensor in a place that will be used as a foothold.
The product may damage if sit or step on it accidentally.
- ❸ When mounting without a bracket, please use P type self-tapping screw- M3×L 6mm.
- ❹ Do not remove the fixed pin for the One-Touch Fitting.
To avoid losing the internal parts and cause malfunction.
- ❺ Please do not replace fittings by yourself.
- ❻ While installing the KFP01-101/201 to the pipe, please apply air tube with I.D. 5 mm.
While installing the KFP01-005/010/050/100/500 to the pipe, please apply air tube with I.D. 4 mm.

Other Precautions

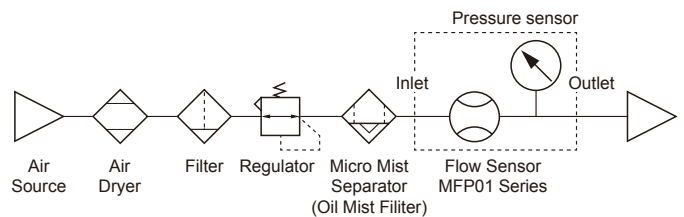
- ❶ After power is supplied, the output will remain off until the display is turned on. Please operate the sensor after the value is shown.
- ❷ Stop the control systems before perform setting changes.
During the initial flow and pressure setting, the product will switch the output according to the existing settings until the changes are complete.

WARNING

Fluid

- ❶ Check the regulator and flow adjustment valve before introducing the fluid.
If the pressure or flow rate exceeded the specified range, the sensing element may be damaged.
- ❷ The sensing element cannot measure properly if foreign matter adheres to it.
- ❸ On the inlet side, be sure to install an air filter below the filtration level of 10 μm .

Recommended Equipments and Installation



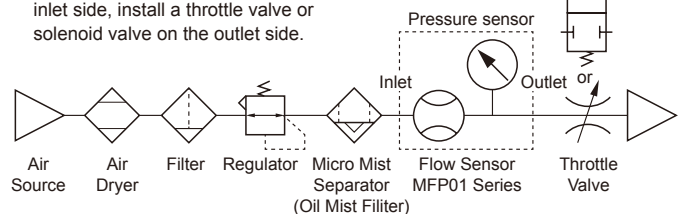
NOTE

When measuring the pressure of the inlet side, install a throttle valve or solenoid valve on the outlet side.
When measuring the pressure of the outlet side, install a throttle valve or solenoid valve on the inlet side.

Recommended Equipments and Installation Example

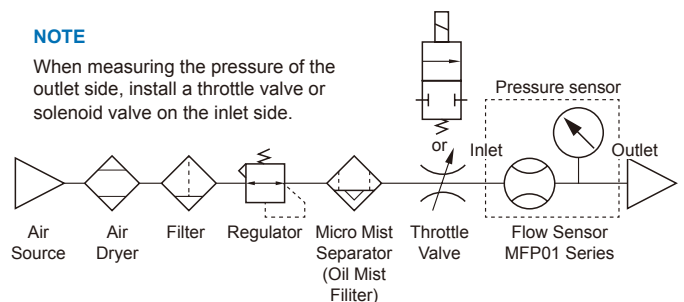
NOTE

When measuring the pressure of the inlet side, install a throttle valve or solenoid valve on the outlet side.



NOTE

When measuring the pressure of the outlet side, install a throttle valve or solenoid valve on the inlet side.



Disclaimer

- ❶ Our warranty applies solely to our product, not to any other damages and injuries which occur by earthquakes, fires, the acts by third party, other matters, acts intentionally, acts accidentally, misuse, or other abnormal conditions that are not the responsible of Mindman.
- ❷ Our warranty applies solely to our product, not to any ther additional damages (the loses of business profits, business interruption, etc.) incurred due to using or misusing the product.
- ❸ Our warranty excludes any injuries and damages happened by using the product beyond the specified range of catalog or/and not following the instruction manual.