Non-Wetted Electrode Electromagnetic Flow Sensors

FD-M Series

NEW

Refer to P.933 for a list of products complying with EU Directives.

Refer to P.958 for UL Certified Products.

Lowers maintenance

Unlike general floating element and paddle wheel flow metres, the FD-M Series has a “free flowing structure” that is completely free of moving parts and obstructions. There is no trouble with dirt and rust clogging the mechanical parts, greatly reducing maintenance.

Long lifespan

Due to the absence of moving parts, it does not experience axial wear and other types of mechanical wear. Through its “free flowing structure” the FD-M Series has achieved a significantly longer lifespan.

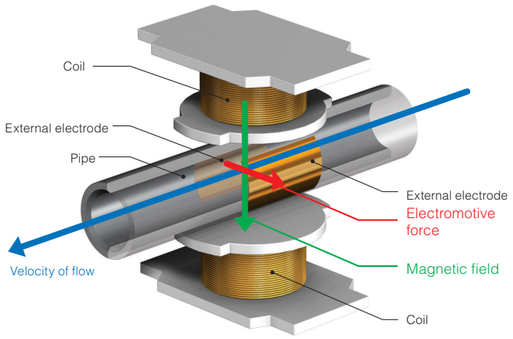
Energy saving

Due to its “free flowing structure”, the FD-M Series has almost no pressure loss. Does not apply a large load on pumps and thus saves energy.

Resistant to the adherence of insulating materials

With conventional electrode types, detection could not be performed when the electrodes were covered in insulated adhered material. However, the FD-M Series with “free flowing structure” detects from outside its flow pipe, which originally does not conduct electricity, and because of this, the FD-M Series is capable of detection even with the adherence of insulating materials.

Detection principle



The FD-M Series uses Faraday’s Law to determine the flow rate of conductive liquids. A typical electromagnetic flow sensor employs the electrodes, wetted within the pipe, to detect the electromotive force of a liquid. The FD-M Series determines this value from outside the pipe by means of electrostatic capacitance.

Features

- Built-in amplifier type/Separate-amplifier type
- Long lifespan
- Energy saving
- Reliable detection against insulating and sticking material

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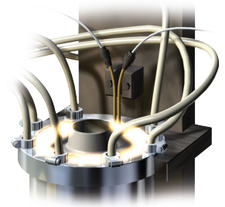
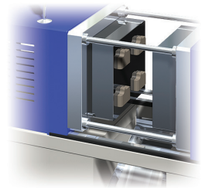
Applications

Equipment protection



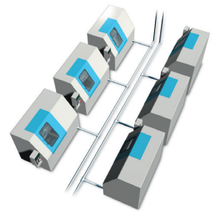
Cooling-water flow control for high-frequency quenching equipment

Quality control



Cooling water flow control for moulded products and dies

Cost management



Checking the amount of cooling water used

Lineup

Built-in Amplifier

Model	Appearance	Applicable fluid	Detecting range*1		Bore diameter	Pipe direction	Output
FD-M5AT		Water, noncorrosive liquid (electrical conductivity: 5 µS/cm or more)	Rated range	0.25 - 5 L/min	Rc3/8 (10A)	Vertical	NPN
FD-M5ATP							PNP
FD-M5AY			Display range	0.15 - 10 L/min		Horizontal	NPN
FD-M5AYP							PNP
FD-M10AT			Rated range	0.5 - 10 L/min	Rc3/8 (10A)	Vertical	NPN
FD-M10ATP							PNP
FD-M10AY			Display range	0.5 - 30 L/min		Horizontal	NPN
FD-M10AYP							PNP
FD-M50AT			Rated range	2.5 - 50 L/min	Rc3/4 (20A)	Vertical	NPN
FD-M50ATP							PNP
FD-M50AY			Display range	2.5 - 100 L/min		Horizontal	NPN
FD-M50AYP							PNP
FD-M100AT			Rated range	5 - 100 L/min	Rc1 (25A)	Vertical	NPN
FD-M100ATP							PNP
FD-M100AY			Display range	5 - 200 L/min		Horizontal	NPN
FD-M100AYP							PNP

*1 Twice the rated flow range can be displayed.

Separate Sensor Head

Model	Appearance	Applicable fluid	Detecting range*1		Bore diameter	Pipe direction
FD-MH10A		Water, noncorrosive liquid (electrical conductivity: 5 µS/cm or more)*2	Rated range	0.5 - 10 L/min	Rc3/8 (10A)	Vertical/ Horizontal
			Display range	0.5 - 30 L/min		
FD-MH50A			Rated range	2.5 - 50 L/min	Rc3/4 (20A)	
			Display range	2.5 - 100 L/min		
FD-MH100A			Rated range	5 - 100 L/min	Rc1 (25A)	
			Display range	5 - 200 L/min		
FD-MH500A			Rated range	25 - 500 L/min	Rc2 (50A)	
			Display range	25 - 1000 L/min		

*1 Twice the rated flow range can be displayed.
*2 When the **FD-MH500A** experiences flow at 500-1000 L/min, the electrical conductivity is 20 µS/cm or more.

Separate Temperature Sensor

Model	Appearance	Type	Main/Expansion	Output
FD-MA1A		DIN mounted	Main unit	NPN
FD-MA2A			Expansion unit	
FD-MA1AP			Main unit	PNP
FD-MA2AP			Expansion unit	
FD-MA5A		Panel	—	NPN
FD-MA5AP				mounted

以下フッタ同様に修正

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CAD DATA Download
www.keyence.com.sg/CADG
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FD-M Non-Wetted Electrode Electromagnetic Flow Sensors

Specifications

Built-in Amplifier

Model*1						
NPN output	For vertical piping	FD-M5AT	FD-M10AT	FD-M50AT	FD-M100AT
	For horizontal piping	FD-M5AY	FD-M10AY	FD-M50AY	FD-M100AY
PNP output	For vertical piping	FD-M5ATP	FD-M10ATP	FD-M50ATP	FD-M100ATP
	For horizontal piping	FD-M5AYP	FD-M10AYP	FD-M50AYP	FD-M100AYP
Configuration		Built-in amplifier			
Rated flow range*2		0.25 to 5L/min	0.5 to 10L/min	2.5 to 50L/min	5 to 100L/min
Display range*3		0.15 to 10L/min	0.5 to 30L/min	2.5 to 100L/min	5 to 200L/min
Settable range		0 to 10L/min	0 to 30L/min	0 to 100L/min	0 to 200L/min
Minimum flow*4		0.15L/min	0.5L/min	2.5L/min	5L/min
Connection bore diameter		Rc3/8 (10A)	Rc3/8 (10A)	Rc3/4 (20A)	Rc1 (25A)
Detection fluids		Water or non-corrosive liquid			
Conductivity of detection fluids		5 µS/cm or higher			
Detection fluid temperature		0 to +85°C (no freezing)			
Operating pressure range		Max. 1.0 MPa			
Pressure resistance		2.0 MPa			
Pressure loss		Max. 0.01 MPa			
Display method		Dual row display with 4-digit, 7 segment LED, bar display (2 colours), output indicators, flow indicator			
Display resolution		0.05*5/0.1 (L/min) selectable	0.01/0.1 (L/min) selectable	0.1/1 (L/min) selectable	
Repeatability*6		0.5 s: ±5% of F.S. 10 s: ±1% of F.S.	1 s: ±3.5% of F.S. 30 s: ±0.8% of F.S.	2.5 s: ±2.5% of F.S. 60 s: ±0.6% of F.S.	5 s: ±1.6% of F.S.
Hysteresis		Variable			
Response time (chatter prevention)		500 ms/1 s/2.5 s/5 s/10 s/30 s/60 s variable			
Accumulated flow unit		0.01/0.1/1/10/100 (L) selectable		0.1/1/10/100/1000 (L) selectable	
Accumulation data storage		Save to memory every 10 seconds			
Memory backup		EEPROM (Data storage length: 10 years or longer, Data read/write frequency: 1 million times or more)			
Control output/Accumulation pulse output/ Error alarm output		NPN/PNP open collector, max. 100 mA/ch*7 (NPN: 40 V or less, PNP: 30 V or less), residual voltage 1 V or less, 3 outputs (N.O./N.C. switchable)			
Accumulation reset/bank switching/zero flow function		Input time: 20 ms or greater, Either accumulation reset or bank switching mode can be selected			
Analogue output		4-20 mA, max. load resistance 260Ω, Analogue output range can be set to any value			
Power supply voltage		24 V DC ±10%, ripple (P-P) ±10% or less, Class 2			
Power consumption (Current consumption)		Normal: 1700 mW (70 mA), Power save: 1000 mW (40 mA)			
Enclosure rating		IP65 (including the cable connection area)			
Environmental resistance	Ambient operating temperature	0 to +50°C (no freezing)			
	Ambient operating humidity	35 to 85% RH (No condensation)			
	Vibration resistance	10 to 55 Hz, compound amplitude 1.5 mm, XYZ axes 2 hours for each axis			
Materials	Liquid end materials	Bore: SCS13, Measurement pipe: PPS, O ring: fluoro-rubber (FKM)			
	Other materials	Plastic case areas: PPS, Metal case areas: SUS430, Cable: PVC			
Weight (FD-M)		Approx. 835 g		Approx. 1100 g	Approx. 1310 g
Accessory		Instruction Manual			

*1 The models with "A" at the end of the name have additional functions such as display averaging. *2 The rated flow range indicates the range that is supposed to be used in general.
*3 Can be used within the display range as well as within the rated flow range. *4 Flow below the minimum flow is displayed as 0L/min.
*5 When it is 0.05, the display flow can be set in 0.05 increments between 0.15 and 0.5L, and set in 0.01 increments for values above 0.5L.
*6 The repeatability is effective within the display range. Convert the F.S. (full scale) listed in the table according to the rated flow range. The repeatability for **FD-M5AT(P)/Y(P)** is ±7.5% of F.S. at a response time of 0.5 s and ±5% of F.S. at a response time of 1 s. The repeatability for **FD-M10AT(P)/Y(P)** in the range of 20 to 30L/min is the double of the value listed in the table.
*7 Maximum 20 mA for alarm output.

Separate Temperature Sensor

Model		FD-T1
Connected model*1		FD-MH10A/50A/100A/500A
Display, alarm output compatible models		FD-MA1A(P)/MA2A(P)/MA5A(P)
Temperature detection range		0 to 90.0°C (no freezing)*2
Settable range		0.1 to 99.9°C (no freezing)
Display resolution		0.1°C
Display precision		±2.5°C
Display/output response		5 s *3
Alarm output*4		Window settings x1 output
Hysteresis		1°C fixed*5
Connection bore diameter		R3/8 (10A)
Detectable fluid		Water or non-corrosive fluid
Operating pressure range		1.0 MPa max.
Pressure resistance		2.0 MPa
Enclosure rating		IP67
Power consumption (Current consumption)*6		2 µW (20 µA): When using 85°C
Environmental resistance	Surrounding air temperature	0 to +50°C (no freezing)
	Relative humidity	35 to 85% RH (No condensation)
	Vibration resistance	10 to 55 Hz, compound amplitude 0.75 mm, XYZ axes 2 hours for each axis
Materials		Metal parts: SUS304, Plastic parts: PBT, Cables: PVC, Protective cap: PE
Weight		Approx. 130 g
Accessory		None

*1 The FD-M (built-in type) cannot be connected.
*2 The operating fluid temperature for the FD-MH Series is "0 to +85°C". Do not use the FD-MH Series with fluid exceeding +85°C. The temperature limit for the sensor part of the FDT1 temperature sensor is 90°C. Although the display shows up to 99.9°C, the temperature sensor may be damaged if it is used over 90°C. *3 The display/output response is fixed regardless of the FD-MA settings.
*4 Cannot handle analogue output or pulse output. *5 Set the hysteresis within the window (enters in the window).
*6 Consumption power (current consumption) is the value just for the temperature sensor. Power is supplied from the connected model.

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Separate Amplifier Unit

Model*1		FD-MH10A	FD-MH50A	FD-MH100A	FD-MH500A
Configuration		Separate amplifier			
Rated flow range*2		0.5-10L/min	2.5-50L/min	5-100L/min	25-500L/min
Display range*3		0.5-30L/min	2.5-100L/min	5-200L/min	25-1000L/min
Connection bore diameter		Rc3/8 (10A)	Rc3/4 (20A)	Rc1 (25A)	Rc2 (50A)
Detection fluids		Water or non-corrosive fluid			
Conductivity of detection fluids		5 µS/cm or higher			With 25-500 L/min : 5 µS/cm or higher With 500-1000 L/min : 20 µS/cm or higher
Detection fluid temperature		0 to +85°C (no freezing)			
Operating pressure range		1.0 MPa max.			
Pressure resistance		2.0 MPa			
Pressure loss		0.01 MPa max.*4			
Display method		Bar display (2 colours), other indicators			
Enclosure rating		IP67			
Environmental resistance	Surrounding air temperature	0 to +50°C (no freezing)			
	Relative humidity	35 to 85% RH (No condensation)			
	Vibration resistance	10 to 55 Hz, compound amplitude 1.5 mm, XYZ axes 2 hours for each axis			
Materials	Fluid end materials	Bore: SCS13, Measurement pipe: PPS, O ring: fluoro-rubber (FKM)			
	Other materials	Plastic case areas: PBT, Indicator: polyalylate, Metal case areas: SUS430, Cable: PVC			
Weight		Approx. 800 g	Approx. 1070 g	Approx. 1280 g	Approx. 3700 g
Accessory		Warnings			

*1 The models with "A" at the end of the name support the amplifier type A. They operate normally even when connecting the conventional amplifier without "A" at the end.
*2 The rated flow range indicates the range that is supposed to be used in general.
*3 Can be used within the display range as well as within the rated flow range.
*4 Excluding times when using **FD-MH500A** at 500L/min to 1000L/min.

Separate Temperature Sensor

Model*1			FD-MA1A (Main unit)/FD-MA2A (Expansion unit)			
	NPN output	DIN mounted*2				
		Panel mounted*3	FD-MA5A			
	PNP output	DIN mounted*2	FD-MA1AP (Main unit)/FD-MA2AP (Expansion unit)			
		Panel mounted*3	FD-MA5AP			
Head combination			FD-MH10A	FD-MH50A	FD-MH100A	FD-MH500A
Rated flow range*4			0.5-10L/min	2.5-50L/min	5-100L/min	25-500L/min
Display range*5			0.5-30L/min	2.5-100L/min	5-200L/min	25-1000L/min
Settable range			0-30L/min	0-100L/min	0-200L/min	0-999.9L/min
Minimum flow*6			0.5L/min	2.5L/min	5L/min	25L/min
Display method			Dual row display with 4-digit, 7 segment LED, other indicators			
Display resolution			0.01/0.1 (L/min) selectable	0.1/1 (L/min) selectable		
Repeatability*7			0.5 s: ±5% of F.S.,1 s: ±3.5% of F.S., 2.5 s: ±2.5% of F.S., 5 s: ±1.6% of F.S., 10 s: ±1% of F.S., 30 s: ±0.8% of F.S., 60 s: ±0.6% of F.S.			
Hysteresis			Variable			
Response time (chatter prevention)			500 ms/1 s/2.5 s/5 s/10 s/30 s/60 s variable			
Accumulated flow unit			0.01/0.1/1/10/100 (L) selectable	0.1/1/10/100/1000 (L) selectable		1/10/100/1000/10000 (L) selectable
Accumulation data storage cycle			Save to memory every 10 seconds			
Memory backup			EEPROM (Data storage length: min. 10 years, Data read/write frequency: min. 1 million times)			
Control output/Accumulation pulse output/ Error alarm output			NPN/PNP open collector, max. 100 mA/ch*8 (NPN: 40 V or less, PNP: 30 V or less), residual voltage 1 V or less, 3 outputs (N.O./N.C. switchable)			
Accumulation reset/Bank switching/zero flow function			Iinput time: 20 ms or greater, Either accumulation reset or bank switching mode can be selected			
Analogue output			4-20 mA, max. load resistance 260Ω, Analogue output range can be set to any value			
Power supply voltage			24 VDC ±10%, ripple (P-P) ±10% or less			
Power consumption (Current consumption)			Normal: 1700 mW (70 mA), Power save: 1440 mW (60 mA)			
Environmental resistance	Surrounding air temperature		0 to +50°C (no freezing)			
	Relative humidity		35 to 85% RH (No condensation)			
	Vibration resistance		10 to 55 Hz, compound amplitude 1.5 mm, XYZ axes 2 hours for each axis			
Materials			Main case: polycarbonate, Key tops : polyacetal, Front sheet : polycarbonate, Cable : PVC			
Weight	DIN mounted type		Approx. 115 g			
	Panel mounted type		Approx. 105 g			
Accessory	DIN mounted type		Main unit: instruction manual, Expansion unit: none			
	Panel mounted type		Panel mounting bracket, front protective cover, instruction manual			

*1 The models with "A" at the end of the name have additional functions such as display averaging. Use the head with "A" at the end of the name. When connecting conventional heads without "A" at the end, the FD-MH operates in the same way as the conventional models.
*2 Only connect to the back of **DL-RS1(A)** or FD-MA.
*3 There are not any expansion units for the panel mounted type.
*4 The rated flow range indicates the range that is supposed to be used in general.
*5 Can be used within the display range as well as within the rated flow range.
*6 Flow below the minimum flow is displayed as 0L/min.
*7 The repeatability is effective within the display range. Convert the F.S. (full scale) listed in the table according to the rated flow range. The repeatability for **FD-MH10A** in the range of 20 to 30L/min is the double of the value listed in the table.
*8 Maximum 20 mA for alarm output. When using the FD-MH Series with a total of 6 to 10 expansion units, make sure to limit each output current to 10 mA or less.

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How to select FD-M Series

Follow the steps to select a suitable sensor.

step 1 Check the target fluid ▸ step 2 Check flow and temperature ▸ step 3 Sensor head ▸ step 4 Amplifier ▸ step 5 Temperature sensor Communication unit ▸ step 6 Mounting bracket

step 1 Check the target fluid

This Series can be used with fluids where electrical conductivity is 5µS/cm or greater. Be sure to verify that the liquid to be measured meets this requirement.

Fluids that are likely to be measured

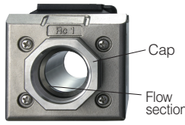
○ Coolant/heating water (tap water, groundwater, or industrial water)
Water-soluble coolant (diluted with water)

Fluids that are not likely to be measured

× Oil, ultra-pure water, drug solutions, salt water, alcohol, and organic solvents

*Electrical conductivity is generally low except for drug solutions and salt water.

The path of the FD-M Series uses the materials indicated to the right. Make sure that target liquids will not corrode these materials.



Cap: SCS13
Flow section: PPS (Polyphenylene sulfide)
O ring: Fluoropolymer

»NOTE
If you are not sure of the electrical conductivity, of your target fluid, contact the manufacturer of the fluid.

step 2 Check instantaneous flow and temperature

This Series can be used with fluids where electrical conductivity is 5µS/cm or greater. Be sure to verify that the liquid to be measured meets this requirement.

Instantaneous flow of fluids FD-M Series can be used with

0.15-1000 L/min.

»NOTE
1 L = 1000 liter

Temperature of fluids FD-M Series can be used with is 0 to +85°C.

step 3 Select a specific sensor model

Select a sensor from built-in amplifier type and separate-amplifier type depending on installation conditions.

▼ Select a sensor from the lineup based on the flow you have confirmed in the step 2.

Built-in amplifier type

Built-in Amplifier

Instantaneous flow (liter/min.)	Bore diameter	Pipe direction	Output	Model
0.15-10	Rc3/8 (10A)	Vertical	NPN	FD-M5AT
			PNP	FD-M5ATP
		Horizontal	NPN	FD-M5AY
			PNP	FD-M5AYP
0.5-30		Vertical	NPN	FD-M10AT
			PNP	FD-M10ATP
		Horizontal	NPN	FD-M10AY
			PNP	FD-M10AYP
2.5-100	Rc3/4 (20A)	Vertical	NPN	FD-M50AT
			PNP	FD-M50ATP
		Horizontal	NPN	FD-M50AY
			PNP	FD-M50AYP
5-200	Rc1 (25A)	Vertical	NPN	FD-M100AT
			PNP	FD-M100ATP
		Horizontal	NPN	FD-M100AY
			PNP	FD-M100AYP

Contact KEYENCE if you require a connector-type sensor.

Separate-amplifier type

Separate Sensor Head

Instantaneous flow (liter/min.)	Bore diameter	Pipe direction	Output	Model
0.5-30	Rc3/8(10A)	Vertical/ Horizontal	Depends on amplifier	FD-MH10A
2.5-100	Rc3/4(20A)	Vertical/ Horizontal	Depends on amplifier	FD-MH50A
5-200	Rc1(25A)	Vertical/ Horizontal	Depends on amplifier	FD-MH100A
25-1000	Rc2(50A)	Vertical/ Horizontal	Depends on amplifier	FD-MH500A

▶ Go to step 6 if you have selected a built-in amplifier type.

▶ Go to step 4 if you have selected a separate-amplifier type.

step 4 Select an amplifier and optional parts of a separate-amplifier type.

They are necessary to use a separate-amplifier type. Select one depending on installation conditions.

DIN mounted type

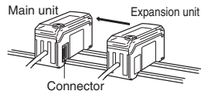
Panel mounted type

Separate Temperature Sensor

Type		Model	
		NPN output	PNP output
DIN mounted	Main unit	FD-MA1A	FD-MA1AP
	Expansion unit	FD-MA2A	FD-MA2AP
Panel		FD-MA5A	FD-MA5AP

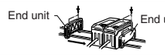
DIN-rail mounted type supports wire saving. Up to 9 expansion units can be added to one main unit. Expansion will save wiring of expansion units.

DIN-rail mounted type of expanding main and expansion units
Expanded with a connector on the lateral side. If you add some expansion units, separately purchase end units (OP-26751).



»NOTE
Select a DIN-rail mounted type if you use communication units (introduced in step 5) to import flow data to a PLC and PC.

Options dedicated to separate-amplifier type

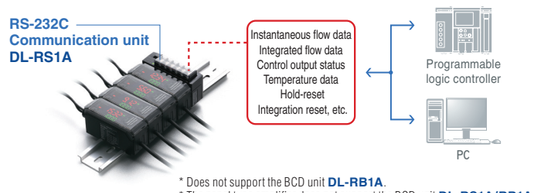
Type	Description	Model
DIN amplifier mounting fixture (sold separately)	Sensors can be mounted without DIN rails. 	OP-76877
End unit (sold separately)	They hold up and fix amplifiers when expansion units are added. Make sure to use them for expansion. (2 units included) 	OP-26751
Panel mounting bracket (Supplied with panel type amplifiers)	This is supplied with a panel-type amplifier. Use this in such cases of loss and damage.	OP-76876

step 5 Select a communication unit as necessary

They are used for separate-amplifier type, and cannot be used for build-in types.

Communication unit [For separate type DIN-rail mounted amplifier]

Model: DL-RS1A Data communication to PLCs and PCs can be executed by using communication units.



* Does not support the BCD unit DL-RB1A.
* The panel type amplifier does not support the BCD unit DL-RS1A/RB1A.

step 6 Select a mounting bracket as necessary

Mounting brackets can be uses for all separate-type heads and all built-in type amplifiers other than a separate-type head FD-MH500.

L-shaped mounting bracket
OP-42193(sold separately)

Flat mounting bracket
OP-42194(sold separately)

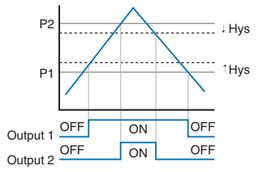
Multiple Outputs

All FD-M Series models provide multiple outputs including dual discrete, 4-20mA, alarm and pulse outputs, eliminating the need to choose between different versions.

Modes and Functions

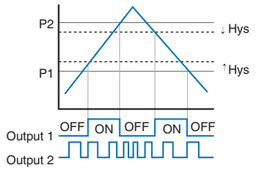
[F-1] Upper/lower limit setting mode

Output is provided for each upper and lower limit.



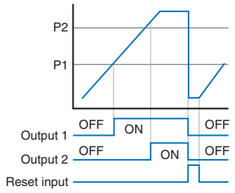
[F-2] Window + Accumulated pulse mode

Output is provided for the set range. Pulse output is provided depending on the selected amount.



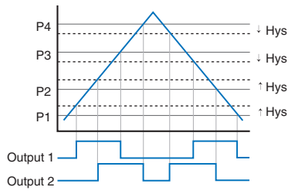
[F-3] Accumulated flow mode

Two values can be set for the accumulated value.



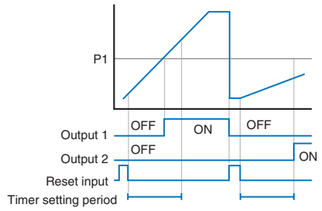
[A-1] Flow level mode

Two windows can be set at the same time.



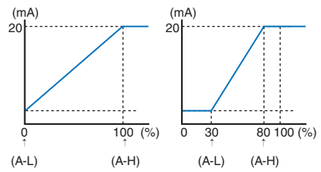
[A-2] Accumulated flow + Timeout mode

Unless output 1 turns on within the timer setting period, output 2 (timeout output) will turn on.



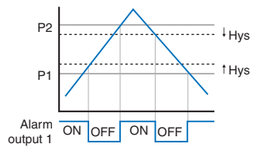
Free range analogue

Output is provided with 4-20 mA for the lower limit (A-L) and upper limit (A-H). The setting range is 0% for 0 L/min, and the maximum value of indication range is 100%. Analogue output can be used in parallel with each mode.



Temperature alarm
* Separate-amplifier type only

Outputs an alarm when the temperature goes beyond the range that has been set. Alarm output (output 3) is shared with other error outputs.



Bank switch function (for F-1 and F-2 only)

With the bank input provided, the setting values in each mode can be switched to another bank set.

Indication switch function for instantaneous flow/accumulated flow

You can use the button to easily switch between the instantaneous and integrating flows.

Peak and bottom hold function

You can use the button to easily switch between the peak-hold and bottom-hold indication.

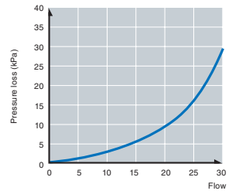
FLOW SENSOR FD-M
SELF-CONTAINED AP-C30W/30
SEPARATE AMP. AP-C40W/V40AW/40
MULTI-FLUID GP-M AP-V80W
TEMPERATURE SENSOR FT

Fibreoptic
Photoelectric
Proximity
Safety/ Area Sensors
Flow/Pressure/ Temperature
Multi Function
High Precision
PLC/Touch Panel
Static Elimination
Recorder
Vision System
Laser Marker
Barcode
Microscope

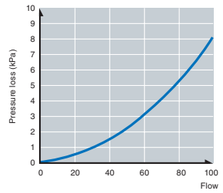
Characteristics

Pressure loss characteristics (Measurement fluid: water)

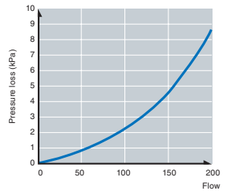
FD-M5AT/Y, M10AT/Y, FD-MH10A



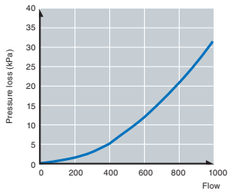
FD-M50AT/Y,FD-MH50A



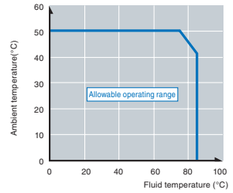
FD-M100AT/Y,FD-MH100A



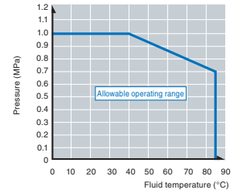
FD-MH500A



Allowable ambient operating temperature versus fluid temperature



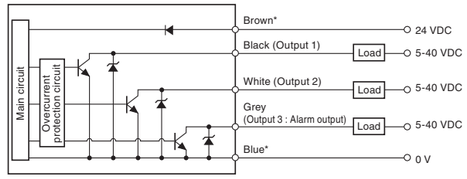
Allowable operating pressure range versus fluid temperature



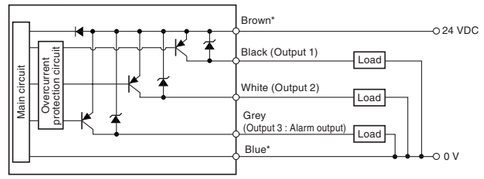
Input/Output Circuits

I/O circuits

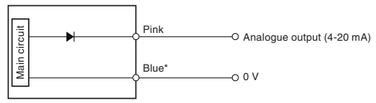
NPN type



PNP type



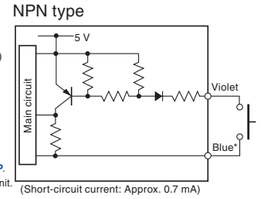
Analogue output circuit



* The **FD-MA2A** and **MA2AP** do not have brown or blue wires.
The FD-MA2A and MA2AP are internally common with the **FD-MA1A** and **MA1AP**.
* The 0 V line is internally common with bores and the metallic parts of the main unit.

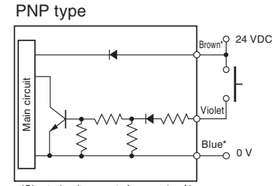
External input circuit (accumulation reset and bank switching)

NPN type



(Short-circuit current: Approx. 0.7 mA)

PNP type

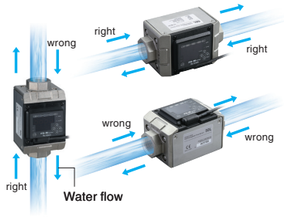


(Short-circuit current: Approx. 1 mA)

Hints on Correct Use

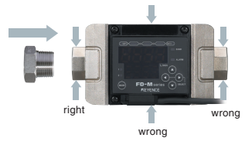
Mounting direction

Installing the unit with the display screen perpendicular to the ground reduces the effects of bubbles and enables more stable operation. Also, note that mounting the sensor in a location where the fluid flows downward may result in cavitation. The flow direction can be switched by changing the menu settings.



Joint Installation

To mount a joint to a sensor, make sure to hold the pipe sleeve closest to the joint. Holding the sensor body on the opposite side of pipe sleeve may cause damage.



Sensor Installation

A straight section of pipe, of at least 5 times the bore diameter, should be installed before and after the sensor. In turbulent flow conditions, a longer straight pipe section (20 times or more) may reduce the influence of turbulence.

Tightening torque

Apply tightening torque according to the following table:

Series name	Tightening torque
FD-M5AT/Y, FD-M10AT/Y, FD-MH10A	23 Nm
FD-M50AT/Y. FD-MH50A	35 Nm
FD-M100AT/Y, FD-MH100A	40 Nm
FD-M500A	80 Nm

<Note>
For more information on mounting and other advisories, see the instruction manual before installation.

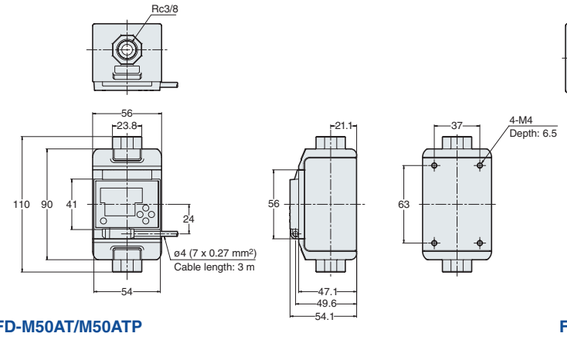
FLOW SENSOR FD-M
SELF-CONTAINED AP-C30W/30
SEPARATE AMP. AP-C40W/V40AW/40
MULTI-FLUID GP-M AP-V80W
TEMPERATURE SENSOR FT

Dimensions

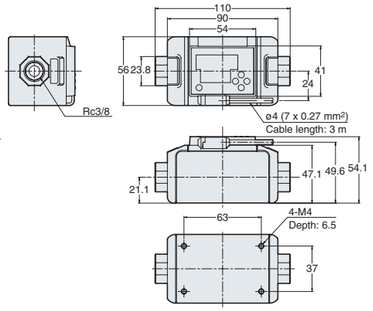
Unit: mm

Built-in amplifier

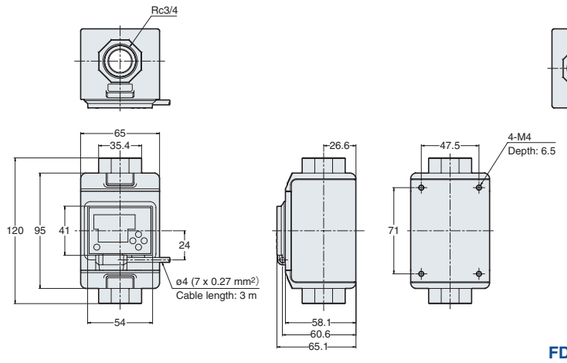
FD-M5AT/M5ATP/M10AT/M10ATP



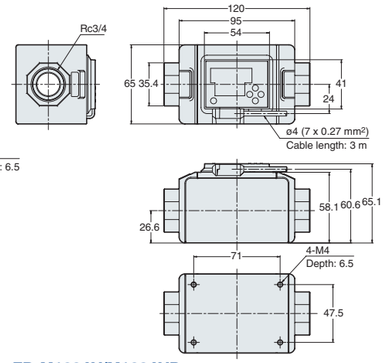
FD-M5AY/M5AYP/ M10AY/M10AYP



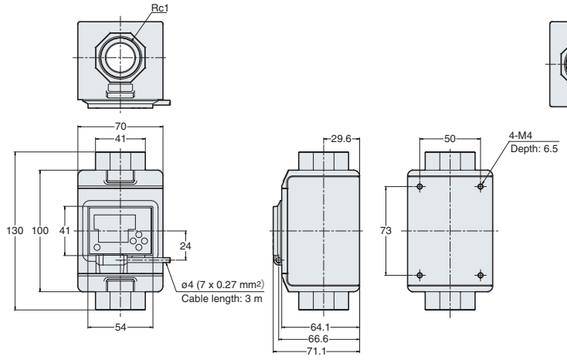
FD-M50AT/M50ATP



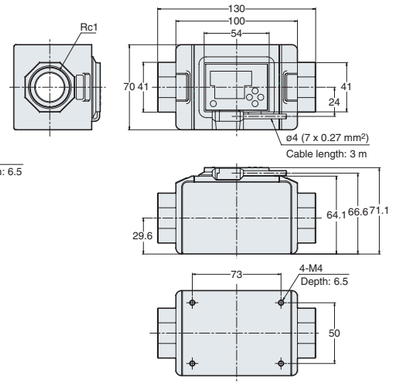
FD-M50AY/M50AYP



FD-M100AT/M100ATP

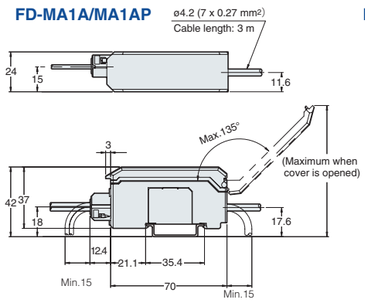


FD-M100AY/M100AYP

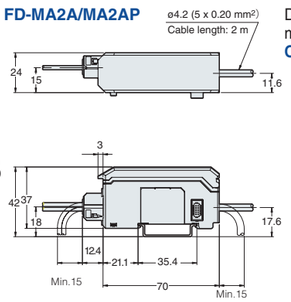


Amplifier Unit (DIN-rail mount type)

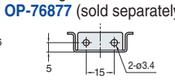
FD-MA1A/MA1AP



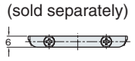
FD-MA2A/MA2AP

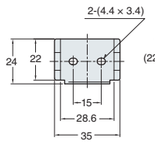


DIN amplifier mounting fixture **OP-76877** (sold separately)

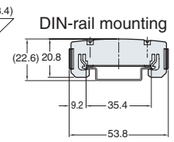


End unit (2 units included) **OP-26751** (sold separately)





Material : SPCC steel



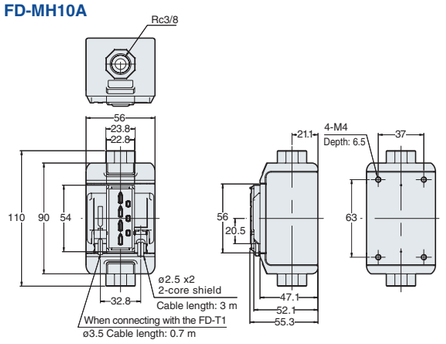
Material: Polycarbonate, SUS

TECHNICAL GUIDE: P.844

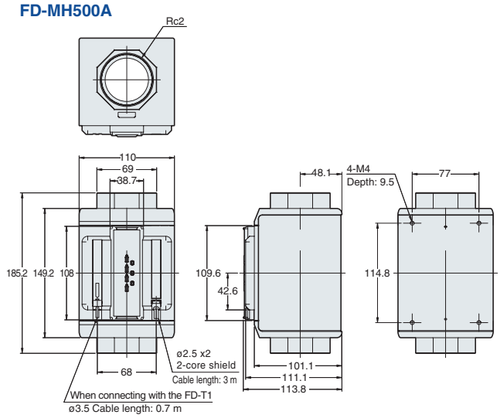
CAD DATA Download: www.keyence.com.sg/CADG

Separate Amplifier Unit

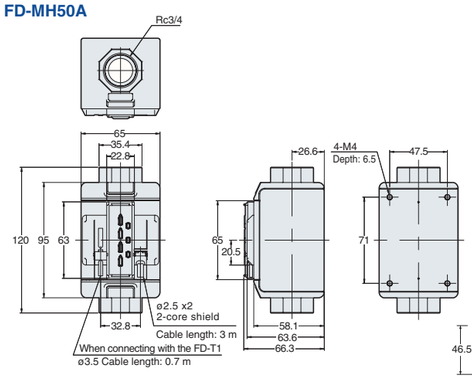
FD-MH10A



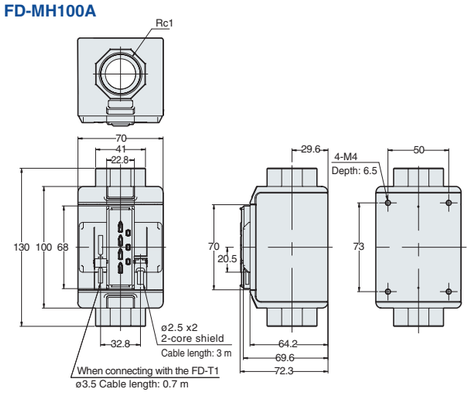
FD-MH500A



FD-MH50A

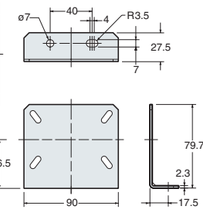


FD-MH100A

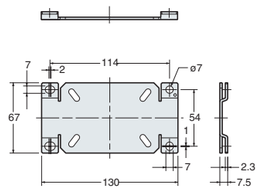


Mounting bracket

L-shaped mounting bracket **OP-42193** (sold separately)

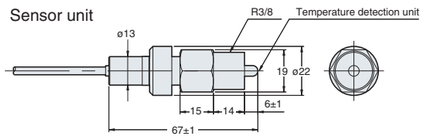


Flat mounting bracket **OP-42194** (sold separately)



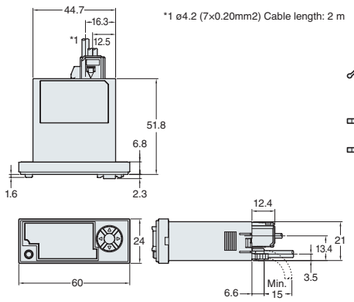
Temperature Sensor

FD-T1

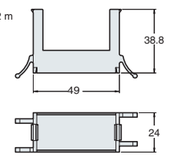


Amplifier Unit (Panel mount type)

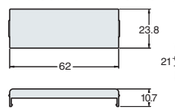
FD-MA5A/MA5AP



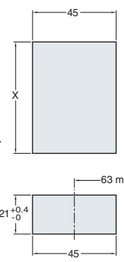
Panel mounting bracket **OP-76876** (accessory)



Protective front cover



Panel cut-out



X=24x(A-1)+21
When A-amplifier units are closely mounted

Panel mounting