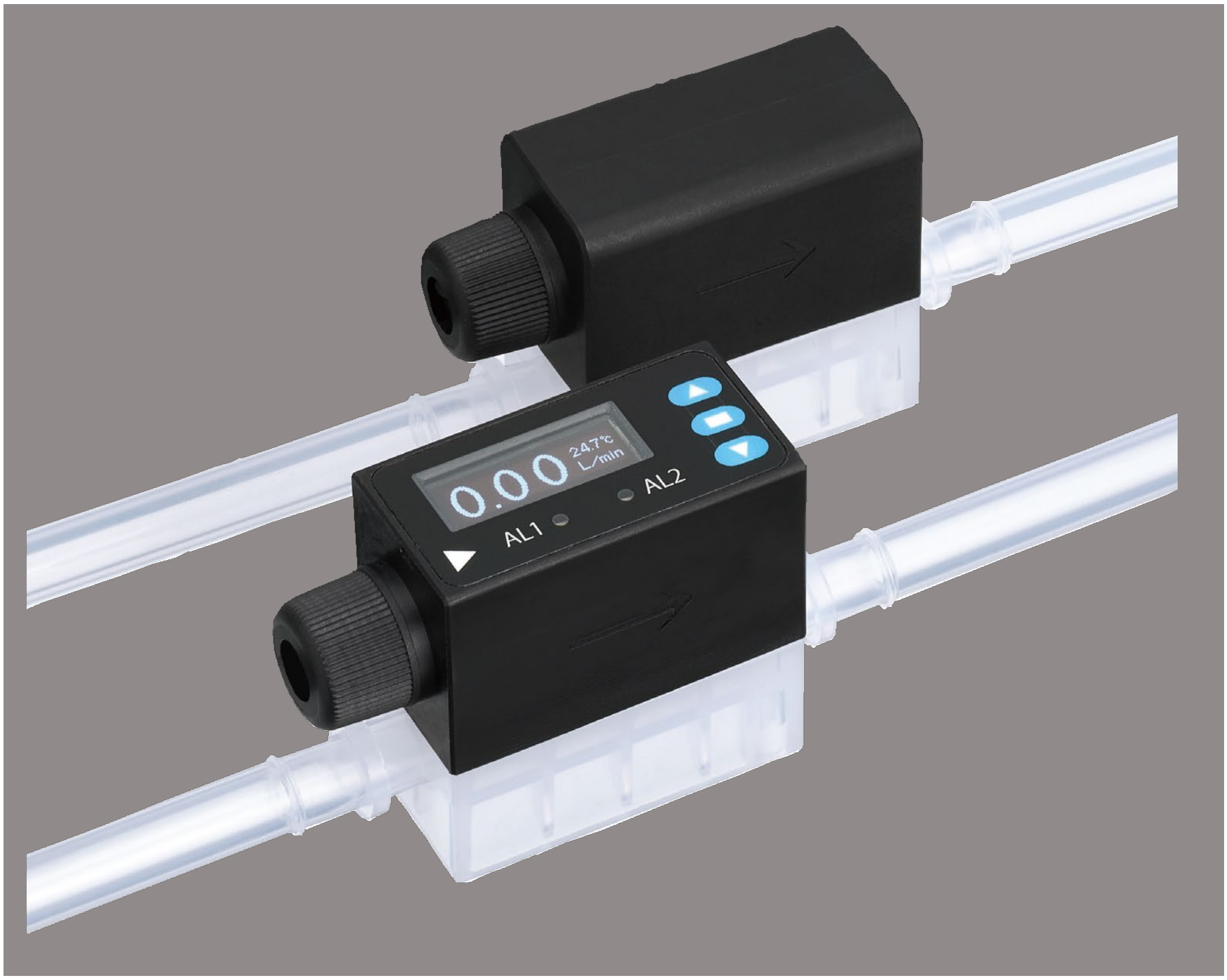
Liquid Vortex Flow Meter with Temperature Correction

MODEL FML-300 SERIES

MODEL FML-300 Series is a vortex flow meter with a temperature sensor incorporated to realize highly precise flow measurement when liquid temperature changes, which has been difficult with conventional meters. This Series covers a wide flow range from small (F.S. 2.5 L/min) to large (F.S. 100 L/min) to meet various flow measurement needs and features ModBus-RTU communication.



KOFLOC Kyoto

▶The installation of a temperature sensor enables monitoring of fluid temperature when fluid is flowing.
▶The incorporated temperature correction feature reduces accuracy error due to liquid temperature change.
▶O-ring eliminated design for all New PFA in the area in contact with liquid.
▶Smaller and large space saving than conventional types.
▶Waterproof performance equivalent to IP65.
▶Driven by single power supply of 12-24 VDC.

Product Specifications

Type		FML-301	FML-302	FML-303	FML-304	FML-305
Fluid		Pure water or chemicals				
Piping connection		3/8″ Tube	3/8″ Tube	1/2″ Tube	3/4″ Tube	1″ Tube
Max. operating pressure, @25℃		1MPa(G)			0.75MPa(G)	0.65MPa(G)
Material in contact with liquid		New PFA				
Flow range		0.3 ~ 2.5L/min	0.4 ~ 4.0L/min	2.0 ~ 16L/min	5.0 ~ 50L/min	10 ~ 100L/min
Accuracy ※1		±2.0%F.S.(Fluid temperature:15℃ to 60℃)				±3.0%F.S. (Fluid temp. 15℃ to 60℃)
Repeatability		±0.5%F.S.				
Output	No display	Flow rate: current 4–20mA(0–100%F.S.) ※2 or Pulse output ※3 Temperature: 1–5VDC(0–100℃) ※4 ※8				
	Display included	Flow rate: current 4–20mA(0–100%F.S.) ※2 or Pulse output ※3 Temperature: Current 4–20mA(0–100℃.) ※5 ※8 Integrated flow rate: pulse output ※5 ※6 Alarm contact: 2 points NPN open collector output ※7 ModBus-RTU				
Temperature accuracy		±2℃ ±0.15×ΔT℃ ΔT:|ambient temp. – fluid temp.|				
Fluid temperature		0 to 90℃ (No freezing, no boiling)				
Ambient temperature		0 to 50℃ (No freezing)				
Ambient humidity		95%RH max.				
Storage temperature		-10 to 70℃ (No freezing)				
Power supply	No display	12 to 24VDC ±10% Current consumption 80mA max.				
	Display included	12 to 24VDC ±10% Current consumption 140mA max.				
Protection structure		Equivalent to IP65 (Drip-proof & dust-proof spec.)				
Cable length		2m terminated, preliminary soldering				
Applicable standard		RoHS 10 hazardous substances, CE mark				
Weight	No display	160g max.			175g max.	200g max.
	Display included	165g max.			180g max.	205g max.

※1: Ambient temperature 25℃
※2: Allowable load resistance：24VDC input: 250 to 500Ω, 12VDC input: 250Ω max.
※3: 1kHz @F.S. Duty:50% NPN open collector output Max. 30VDC/80mA
※4: External load resistance：250 kΩ or over
※5: Select one, temperature output or integrated flow rate output.
※6: Unit: 10mL/P, width: 5ms (FML-301D, 302D, 303D) / Unit: 100mL/P, width: 5ms (FML-304D, 305D)
※7: Max. 30VDC/80mA
※8: Temperature output is available only when fluid is flowing.

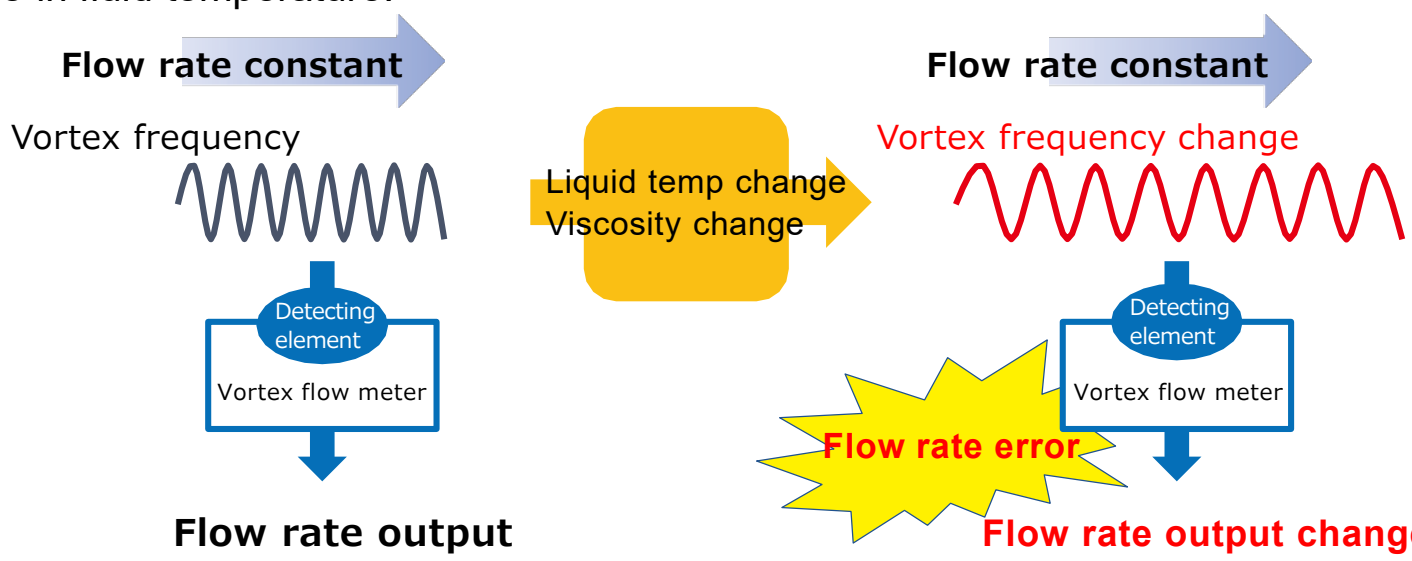
Measurement Principle

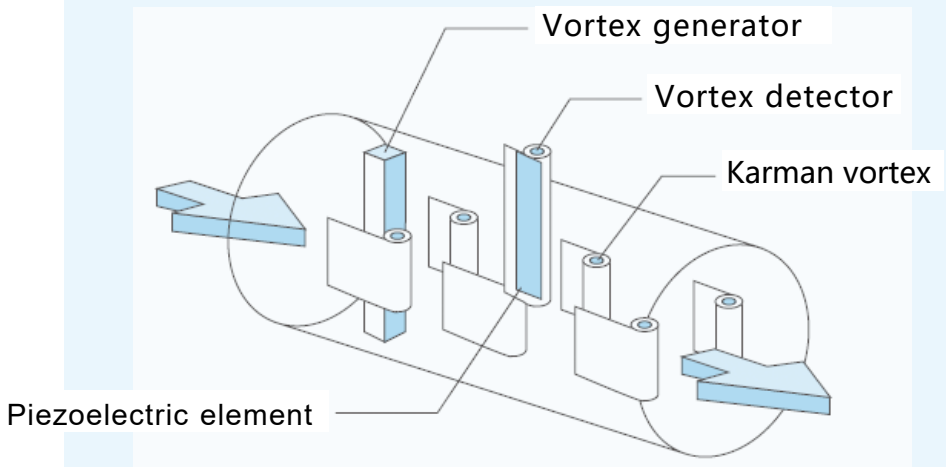
When an obstacle (columnar object/vortex generating object) is placed in the flow path, regular Karman vortices are generated on the back of the object. The frequency of a vortex generated is linearly proportional to the flow velocity within a given range. This vortex flow meter employs this principle and detects the frequency of each vortex generated with an incorporated vortex detector (piezoelectric element), and then outputs a signal proportional to the volumetric flow from the signal processing circuit.

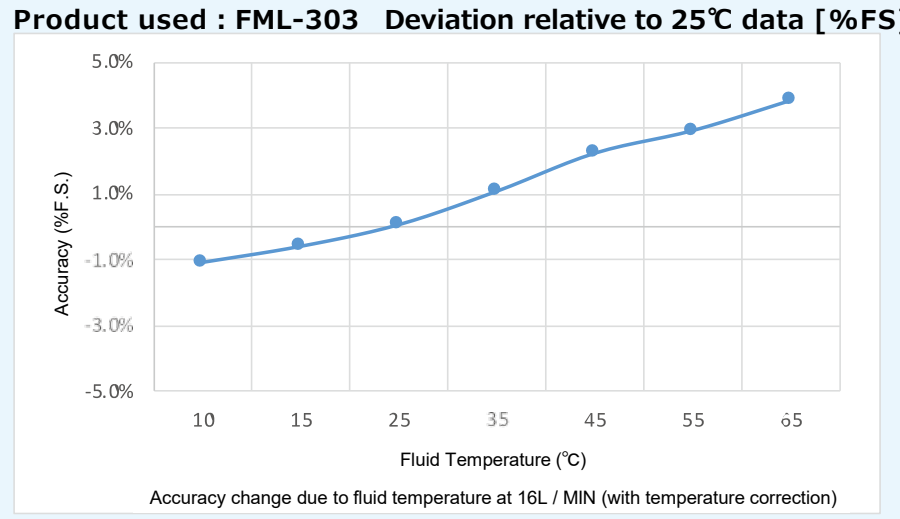
Accuracy error due to liquid temperature change reduced

Vortex flow meter without temperature correction function

In general, conventional vortex flow meters have a problem of flow rate accuracy error due to change in fluid temperature.



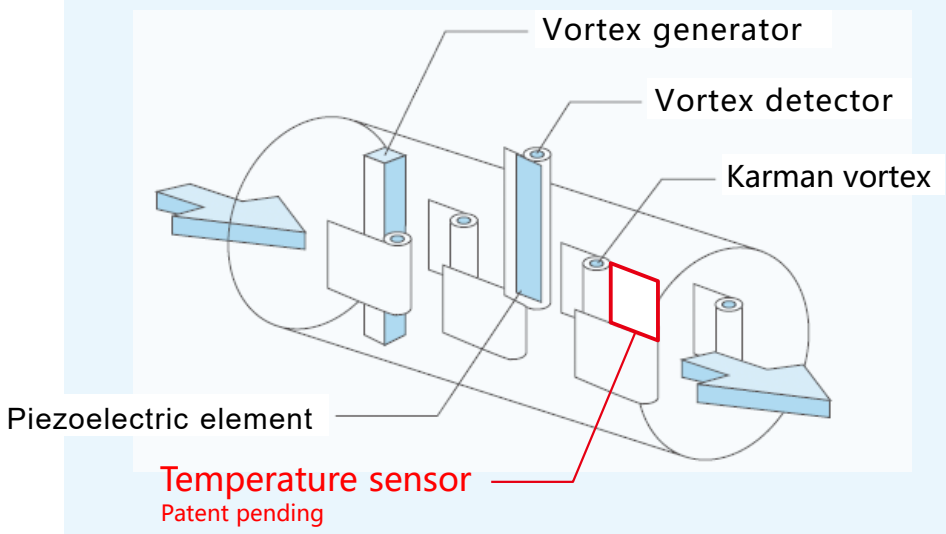


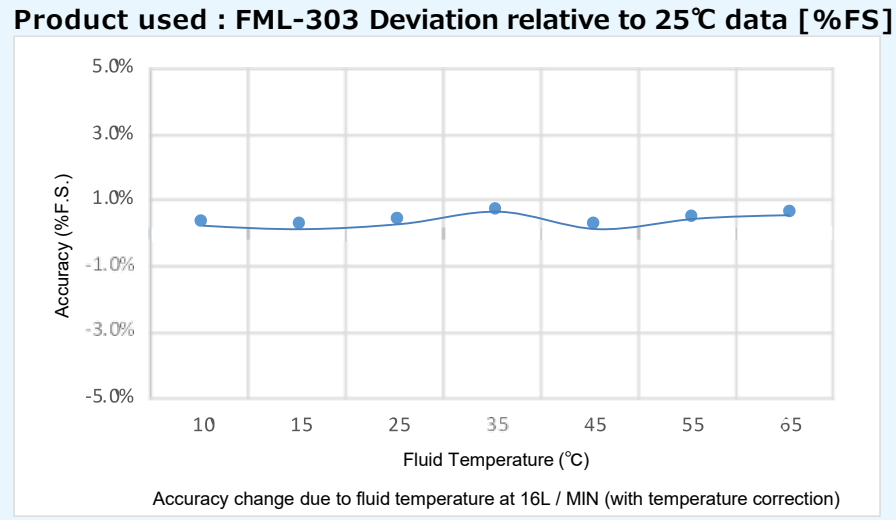


FML-300 Series with Temperature Correction Function

FML-300 Series has realized highly precise flow rate measurement in the case of fluid temperature change by measuring fluid temperature with a temperature sensor installed in the flow path and correcting the vortex frequency based on the measured temperature information.

※An additional function to output measured temperature information itself has also been installed when fluid is flowing.



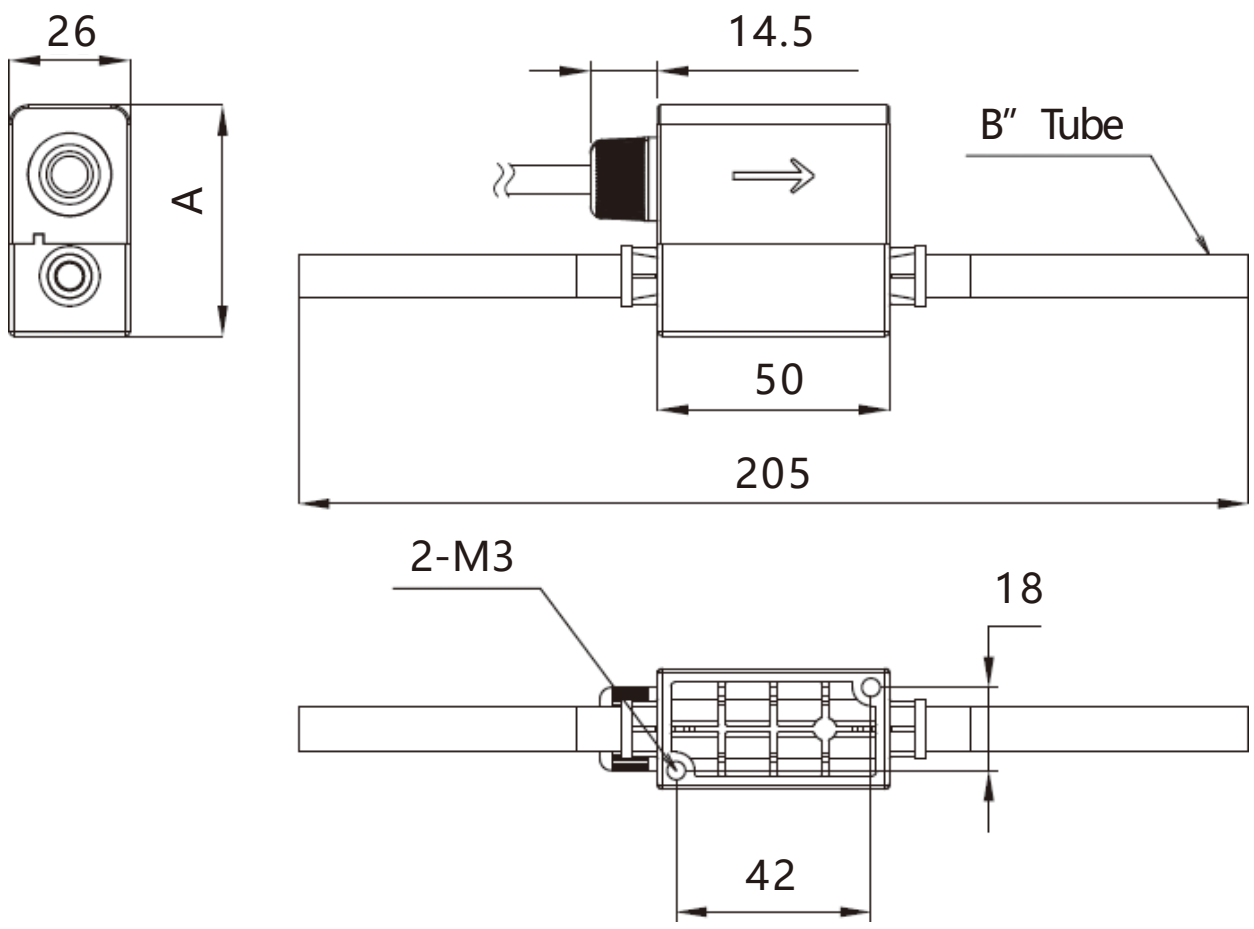


Order Form

Item	Specification Code				Specifications
Flow range	FML-301				0.3-2.5L/min
	FML-302				0.4-4L/min
	FML-303				2-16L/min
	FML-304				5-50L/min
	FML-305				10-100L/min
Output signal		I			Current output 4-20mA
		P			Pulse output
Display			N		Not included
			D		Included※9
Cable length				O	2m
				X	Special spec.
Connection type				O	Tube end
				X	Special spec.

※9 : Display spec. type allows output signals to be switched between current and pulse.

External dimensions (without display) ※ Same dimensions as the display included type. (Unit: mm)



	301	302	303	304	305
A mm	50	50	50	52	61
B inch	3/8	3/8	1/2	3/4	1

Signal (without display)	Color
Power12-24VDC	Red
PowerCOM	Green
FlowOUT 4-20mA / Pulse ※	Orange
FlowOUTCOM	Blue
Temp.OUT 1-5VDC	White
Temp.COM	Black
N.C.	Yellow
N.C.	Brown
Shield	

※ Open collector (80mA, 30VDC Max.)

Signal (with display)	Color
Power12-24VDC	Red
PowerCOM / AnalogOUT COM	Green
FlowOUT 4-20mA / Totalizer Pulse ※	Orange
Alarm#1 OUT ※	Blue
Temp.OUT 4-20mA / Pulse	White
Alarm#2 OUT ※	Black
TR (-)	Yellow
TR (+)	Brown
Shield	

※ Open collector (80mA, 30VDC Max.)

For inquiries, please contact the following:

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