

High-precision Fuel Flow Meter

FD/FM/FP/FX/FZ/DF Series

Measure transient flow rate change
with high-speed response and high accuracy



Fuel Density Meter



Volumetric Flow Detector



Digital Flow Meter



Massflow Meter



Mass-Burette Flow Detector

ONOSOKKI

Achieve accurate mass flow measurement from small to large flow rate

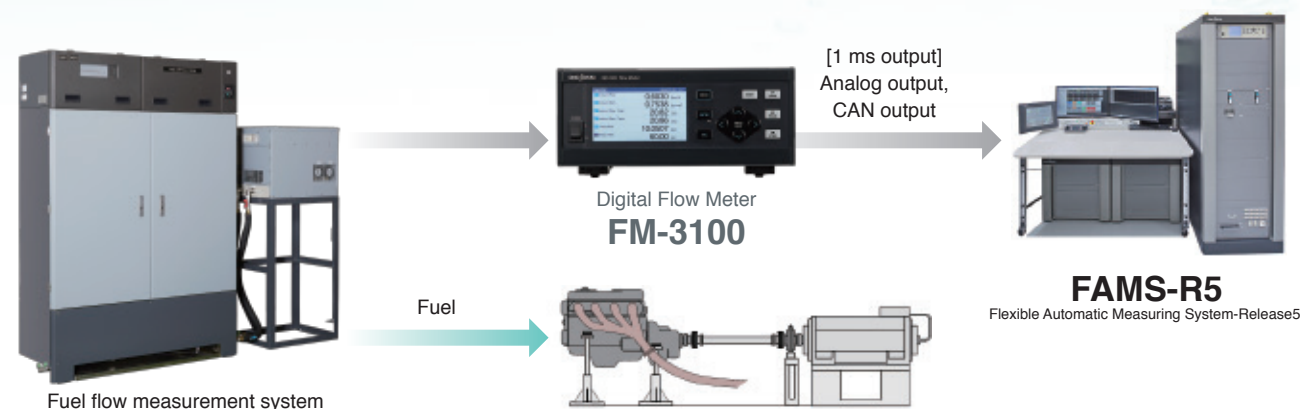
In the field of engine development, it is required to improve the accuracy of flow rate measurement in the small flow rate range and to evaluate the fuel consumption characteristics in transient duration. The FM-3100 is the answer that meets various requirements in the field of engine development.



Digital Flow Meter
FM-3100

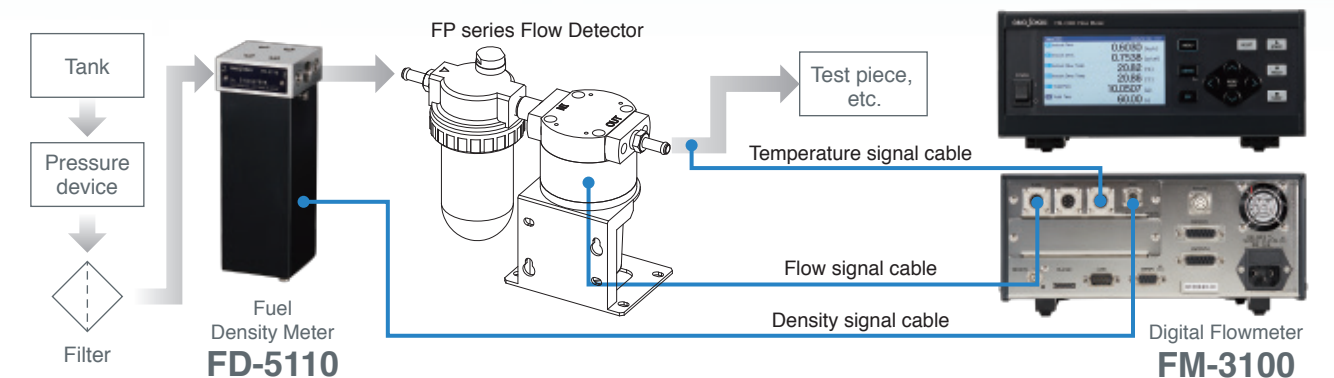
1 High-speed response measurement for the transient flow changes

It captures transient flow rate changes and outputs analog signal and CAN at 1ms update.



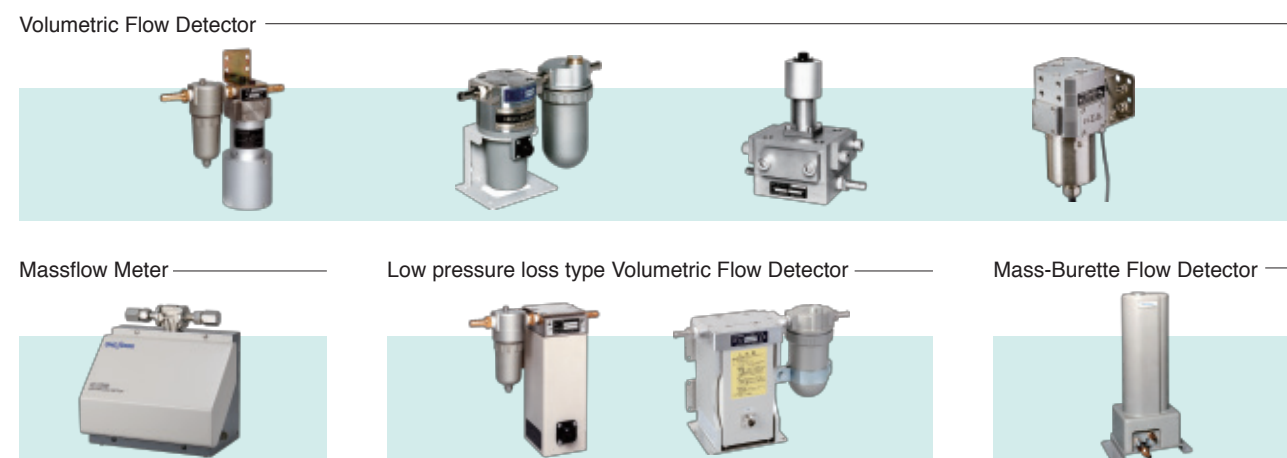
3 Various fuel flow measurement

The FM-3100 has the function to compensate the density based on the calculation of the temperature fluctuation between the FD-5110 Fuel Density Meter and the Flow Detector, which enables the accurate mass flow measurement.

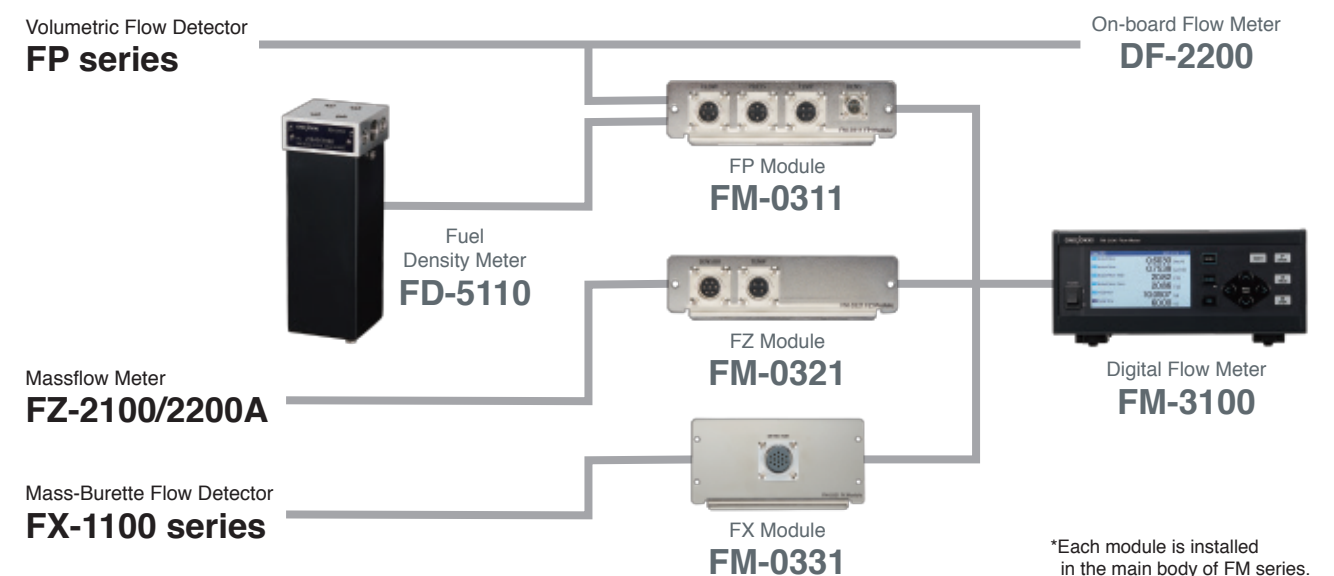


2 Applicable to various detectors

It connects to FP series Volumetric Flow Detectors, FX series Mass-Burette Flow Detector and FZ series Coriolis type Massflow Meter.



4 Digital Flow Meter System Configuration



*Each module is installed in the main body of FM series.

Achieve mass flow measurement with high rangeability with a new fuel density meter and volumetric flow detector

Improving the energy efficiency of an engine is now an important issue to tackle. The FD-5100 Fuel Density Meter and FP series Volumetric Flow Detectors with real-time measurement and wide rangeability are the best choice for achieving the accurate mass flow measurement.



Fuel Density Meter
FD-5110

1 Low pressure loss

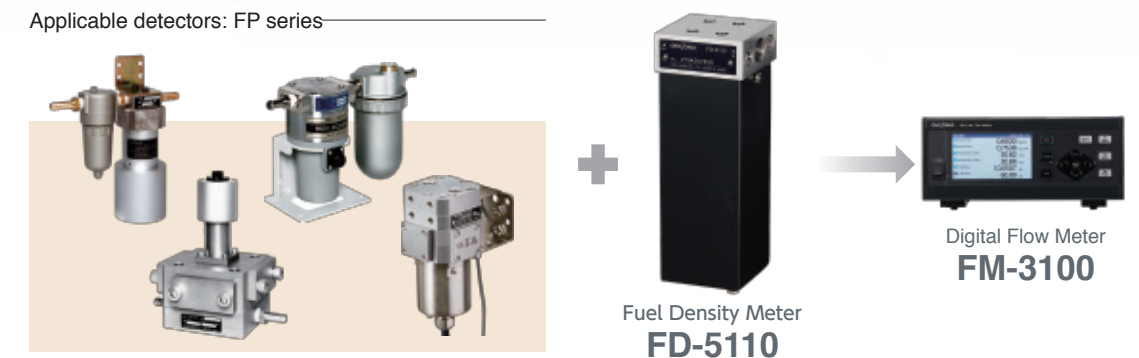
Achieve the pressure loss of 20 kPa or less (at 60 L/h) using with the FP series volumetric flow detector. The detector can be installed with the minimum pressure fluctuations in the flow path.



3 Applicable to various volumetric flow detectors

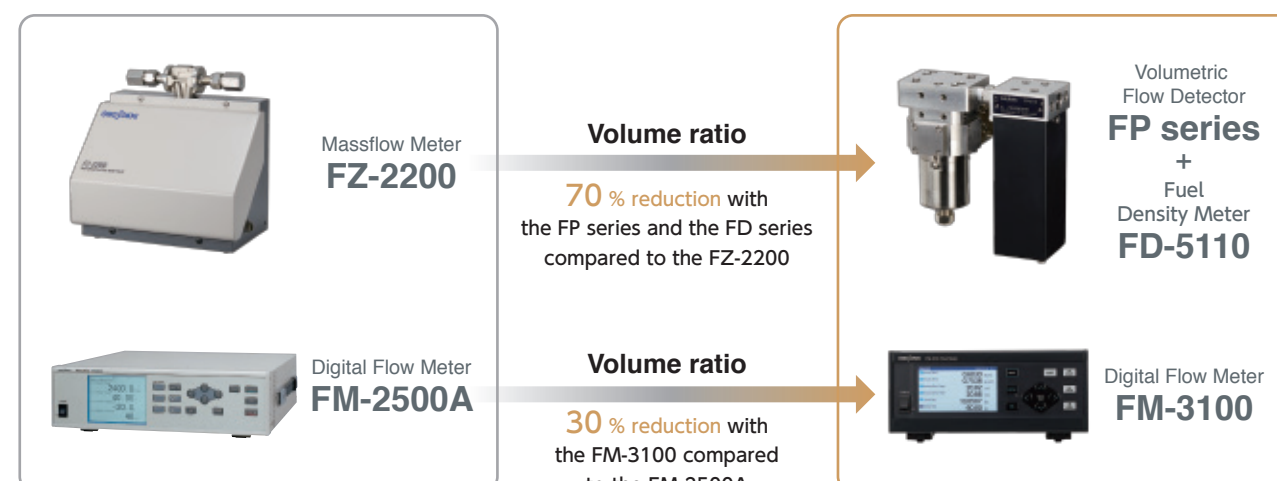
Achieve various mass flow measurement selecting a volumetric flow detector from small to large flow.

Applicable detectors: FP series



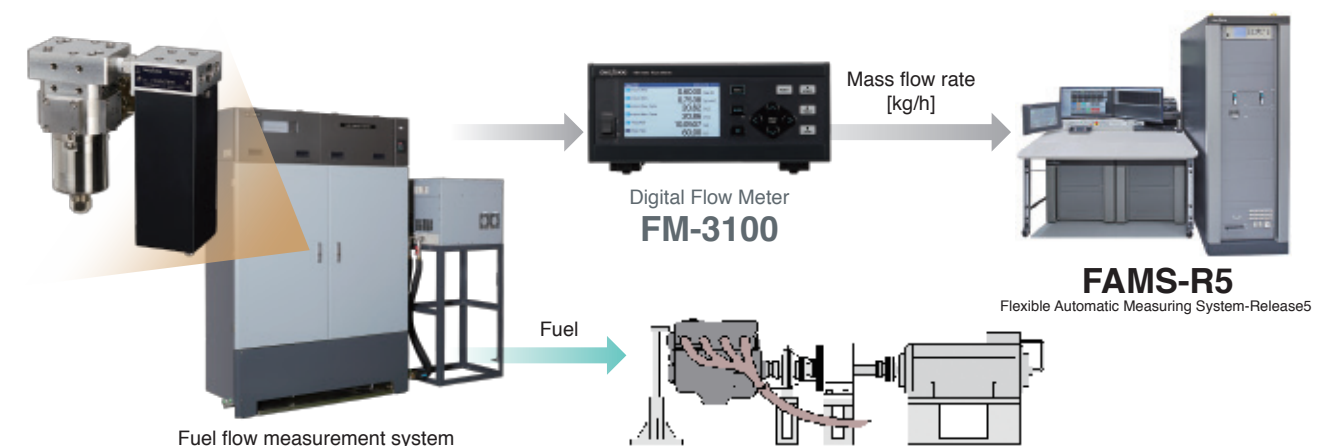
2 Compact and light weight system

Space-saved design system for the mass flow measurement.



4 Make the procedures in mode and performance tests simple

Depending on the area and installation location, various factors such as fuel type and density are varied. Ono Sokki's mass flow measurement system does not require the troublesome density data input with real-time density measurement and the mass conversion.

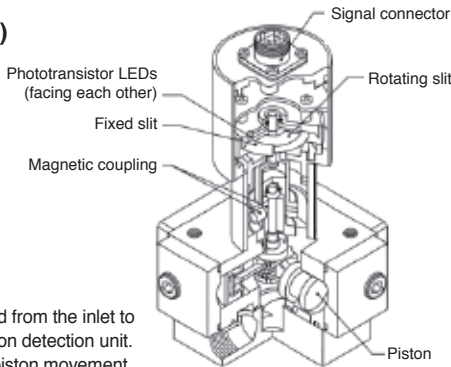


FP series

- Features**
- Wide measurement range thanks to a flow rate ratio (range ability 1: 400 or more)
 - Capable of compensating errors caused by forward or reverse with the function for judging the rotation direction
 - High reproducibility and high-speed response result in superb reliability
 - Capable of simultaneous measurement of temperature and pressure during flow rate measurement (FP-2240HA/2250A/FP-4135)
- *Pressure measurement with FP-4135 is an option.
- High resistance to the environment. (FP-4135)

Detection Principle

Four pistons are arranged radially in the flow detection unit, and move back and forth repeatedly due to the flow of fluid from the inlet to the outlet. The pistons are rotated by the crankshaft, and their movement is transmitted to the magnetic-coupled rotation detection unit. The rotary encoder mounted on the rotation detection unit generates pulse signals in accordance with the amount of piston movement.



FP series		Small flow rate type FP-213	Medium flow rate type FP-2140H	Large flow rate type FP-215	Environment resistant type FP-4135
•Standard type		Gasoline, light oil, kerosene, general petroleum-based hydraulic oil*1			
Usable fluids	Alcohol, biofuel	Option			
	Flow rate	0.06 to 60 L/h	0.3 to 120 L/h*2	1 to 1440 L/h	0.1 to 200 L/h
Measurement range	Temperature	—	—	—	-30 to +100 °C
	Flow rate	within ±0.0009 L/h (0.06 to 0.18 L/h) within ±0.5 % of reading (0.18 to 60 L/h)	within ±0.2 % of reading	within ±0.5 % of reading	within ±0.2 % of reading
Accuracy	Temperature	—	—	—	Pt100 Ω class A
	Pressure loss	8 kPa or less (at 40 L/h, for gasoline)	2 kPa or less*3 (at 60 L/h, for gasoline)	7.5 kPa or less (at 500 L/h, for light oil)	4 kPa or less*3 (at 60 L/h, for gasoline)
Operating temperature	Fluid	0 to +65 °C	0 to +65 °C	0 to +65 °C	-30 to +100 °C
	Ambient	0 to +65 °C	0 to +65 °C	0 to +65 °C	-30 to +100 °C*6
Resolution		0.01 mL/Pulse 0.001 mL/Pulse (option)	0.1 mL/Pulse 0.01 mL/Pulse (option)	1 mL/Pulse 0.1 mL/Pulse (option)	0.01 mL/Pulse
Connection diameter		IN: Rc1/4 OUT: Rc1/8	IN: Rc3/8 OUT: Rc3/8	IN: Rc1/2 OUT: Rc1/2	IN: Rc1/4*5 OUT: Rc1/4*5
Operating pressure		980 kPa*4	980 kPa*4	3.4 MPa*4	8 MPa

•Simultaneous measurement of temperature and pressure type		FP-2240HA	FP-2250A
Measurement range	Temperature	0 to +99.9 °C	0 to +99.9 °C
	Pressure	0 to 980 kPa	0 to 980 kPa
Accuracy	Temperature	Pt100 class B	Pt100 class B
	Pressure	±0.5 % F.S	±0.5 % F.S

•Low pressure loss type		FP-213S	FP-2140S*7
Accuracy	Flow rate	within ±0.5 % of reading (over the entire range 0.06 to 60 L/h)	within ±0.2 % of reading
	Pressure loss	0.01 kPa or less (excluding pressure loss at filter section)	0.01 kPa or less *3 (excluding pressure loss at filter section)
Operating temperature	Fluid	0 to +60 °C	0 to +60 °C
	Ambient	0 to +60 °C	0 to +60 °C

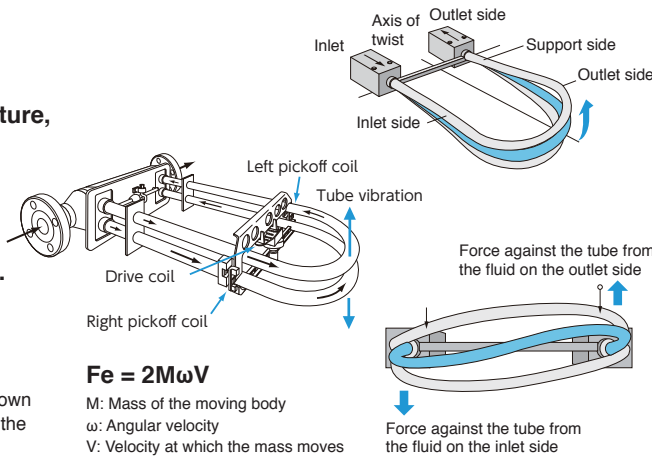
*1 Please consult us for details.
*2 0.3 to 200 L/h, 0.3 to 300 L/h flow rate measurement range can be provided.
Please consult us for details.
*3 Please take note the instant flow rate may be varied in the following operating condition:
if the inlet pressure is lower than the pressure loss.
if the outlet of a detector is open to the atmosphere.
*4 Please consult us if you require the specifications other than the above.
*5 The joint is provided as an option.
*6 For FP-4135, signal processing part: 0 to 70 °C.
*7 For FP-2140S, flow rate range: 0.05 to 200 L/h.

FZ-2100 / 2200A

- Features**
- Continuous measurement without being affected by temperature, pressure, and density
 - High measurement accuracy (up to range ability 1: 40 within ±0.1 % of reading accuracy)
 - Density measurement enabled
 - The case for purging internal air is provided to each detector.

Detection Principle

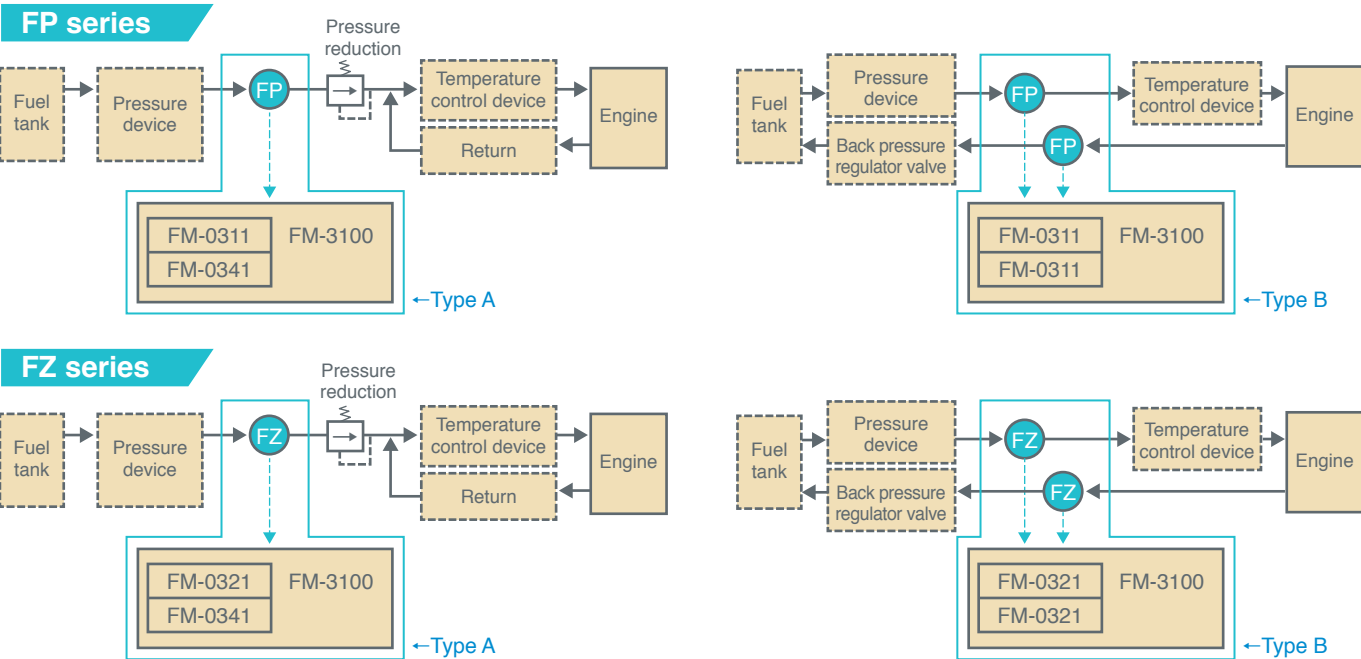
The fluid that entered from the inlet passes through the tube and goes out through the outlet. With this flow meter, the application of its inherent vibration to the tube causes a movement equivalent to the angular velocity, thereby generating a Coriolis force. As shown in the figures above, since the tube with Coriolis force generates a twist proportional to the mass flow rate, the mass flow rate is calculated from the amount of this twist.



Model Name	FZ-2100	FZ-2200A
Measurement items	Flow rate, temperature, density	
Usable fluids	Standard	Gasoline, light oil, kerosene, general petroleum-based hydraulic oil
	Option	Alcohol fuels
Measurement range	Normal mass flow	0.2 to 82 kg/h
	Normal volume flow	0.27 to 109 L/h at 0.75 g/cm³
	Max. flow	108 kg/h
	Density*2	0 to 1 g/cm³
Accuracy	Flow	±0.1 % of reading at 2 to 82 kg/h within ±(0.002 kg/h / flow) × 100 % of reading at 0.2 to 2 kg/h
	Density	±0.0005 g/cm³
	Density Repeatability	±0.0002 g/cm³
	Density Temp. Characteristics	±0.000015 g/cm³/°C
Pressure loss (for gasoline)		Approx. 100 kPa at 82 kg/h
Withstand voltage		10 MPa
Operating temperature range		0 to +40 °C
Weight		Approx. 12 kg

*1 CNG (compressed natural gas), LPG (liquefied petroleum gas) etc. are also available (option). Please contact us for details.
*2 Please consult us for the measurement that temperature or density exceeds rated range.

System configuration outline



Type A: Standard system configuration when one detector is used.
Type B: A detector is installed at both the supply and return sides to calculate the fuel consumption using the difference. Each side independently displaying available.
(— Delineated area: each type / FP FZ : detectors)

FX-1100 series

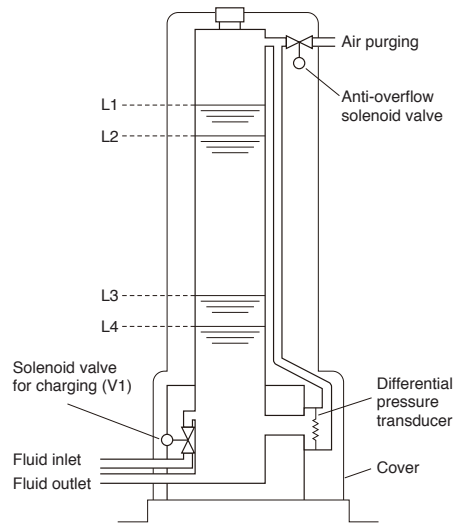
Features

- High-accuracy flow rate measurement over a wide range
- Built-in air purging function to counteract the mixing air bubbles
- Alarm function against overflows and low fluid levels
- Density corrections due to changes in the temperature are no longer required.
- Increased pressure and pressure feed are available as options.
- Measurement accuracy: within the combined range of $\pm 0.2\%$ of reading value and $\pm 0.01\%$ of F.S.

Detection Principle

If the fluid level falls below L3, the pressure signal generated by the detector causes the solenoid valve V1 to open and more fluid to flow in. When the fluid level reaches L2, valve V1 closes. Measurement of the flow rate starts after the specified time for the surface of the fluid to reach the fixed level has elapsed. As the fluid level falls from L2 as it is being consumed, the output from the differential pressure transducer changes in accordance with the gravity of the consumed fluid, and the gravity flow rate is obtained from this changed amount.

Alarms are generated if the fluid reaches the L1 overflow level or falls to the L4 insufficient fluid level.

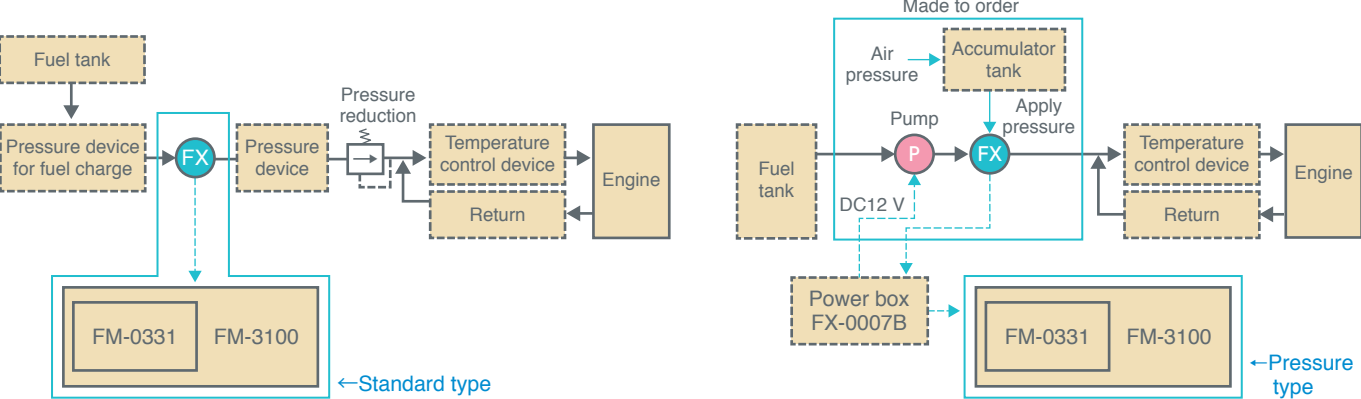


Model Name			
Item	FX-1110	FX-1120	FX-1130
Usable fluids	Gasoline, light oil, kerosene, alcohol fuels (option)		
Measurement range	0 to 10 g/s (0 to 36 kg/h)	0 to 25 g/s (0 to 90 kg/h)	0 to 50 g/s (0 to 180 kg/h)
Accuracy*1	Within the combined range of ±0.2 % of reading value and ±0.01 % of F.S.		
Instantaneous flow resolution	0.001 g/s	0.01 g/s	
Integration flow resolution	0.01 g		0.1 g
Maximum integration amount (single fill operation)	200 g	500 g	1000 g
Operating maximum pressure	196 kPa		
Operating temperature range*2	0 to +40 °C (with no freezing)		
Open-atmosphere processing	Solenoid valve for overflow protection		
Inlet, outlet, and return joints	R3/8 Internal diameter: ϕ6 External diameter: ϕ9 Hose nipple (for both IN and OUT)	R1/2 Internal diameter: ϕ12 External diameter: ϕ16 Hose nipple (for both IN and OUT)	
Weight	Approx. 13 kg		

*1 If the temperature changes rapidly during measurement, the above accuracy cannot be guaranteed.
*2 Even within the operating temperature range, measurement may not be available due to the vapor phenomenon.

System configuration outline

FX series



Standard type: Standard system configuration when one detector is used.
(when it has fuel supply pressure)
(— Delineated area: standard type/ **FX** : detectors)
*Only one FM-0331 can be installed on the FM-3100.

Pressure type: An accumulator tank is used to increase in pressure. Used this method when fuel cannot be supplied due to reasons such as not being able to install the detector in a high position.
(FM-0007B power box: option)

FD-5110

Features

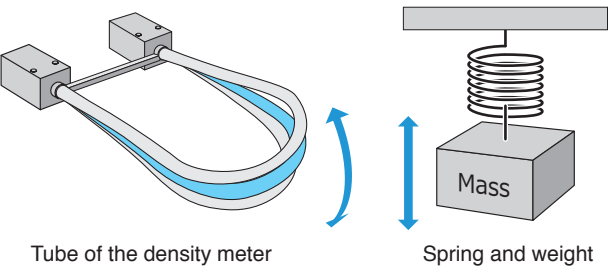
- Compact
- Low pressure loss
- The temperature at the same point can also be measured.
- Measurement accuracy: $\pm 0.0010\text{ g/cm}^3$

Detection Principle

As shown in the figure on the right, when an object of mass M is suspended by a spring and made to vibrate freely up and down, the frequency of vibration is determined by mass M and the spring constant.

The FD-5110 has a vibrating tube and its frequency is determined by the sum of the spring constant of the tube, the mass of the tube and the mass of the liquid filled in it.

The density of the liquid is measured by making the use of the fact that the frequency of vibration will change according to the liquid density.



Usable fluids	Gasoline, light oil, kerosene, general petroleum-based hydraulic oil and alcohol
Measurement range	0.5000 to 2.0000 g/cm³
Uncertainty	0.0010 g/cm³
Temperature accuracy	$\pm 0.1\text{ }^{\circ}\text{C}$
Operating temperature range	10 to 60 °C (liquid temperature) -10 to 50 °C (ambient temperature)
Dimension	60 x 60 x 176 mm
Weight	Approx. 1.5 kg
Power	DC5 V 60 mA (supplied by FM-3100)
Conforming standard	EMC Directive 2014/30 EU Standard EN61326-1 Class A Group 1 RoHS Directive 2011/65 EU Standard EN50581

System configuration outline



FM series

FM-3100 Digital Flow Meter

High performance type flow meter for FP series, FZ series, FX series, FD series and MF series flow detectors

- Option
- FM-0200 Remote box

Remote controller for START,STOP,RESET at total measurement mode



FM-3100 Digital Flow Meter

General Specification

Power supply voltage	AC100 V to 240 V ±10 %
Current consumption	80 VA or less (when connected to the FP-2140S)
Operating temperature range	0 to +50 °C
Operating humidity range	10 to 85 % (without condensation)
Storage temperature range	-10 to +60 °C
Storage humidity range	10 to 85 % (without condensation)
Outer dimension	240.0 (W) × 99.0 (H) × 297.0 (D) mm * The projection is not included.
Weight	Approx. 3 kg
Conforming standard	CE marking (FM-0311) LVD Directive 2014/35/EU Standard EN61010-1 EMC Directive 2014/30/EU Standard EN61326-1 Class A Group 1 RoHS Directive 2011/65/EU Standard EN50581

FM-0311 FP Module

Applicable detectors	FP-4135, FP-213/213S, FP-2140H, FP-2240HA, FP-2140S, FP-215, FP-2250A, MF-3200
Calculation items	Instant Flow, Lap Flow, Lap Avg Flow, Total Flow, Total Avg Flow, Instant Inj, Lap Avg Inj, Total Avg Inj, Convert Dens, Instant Press, Instant Dens, Dens Temp
Calculation cycle	1 ms
Forward and Forward/Reverse mode	When calculating the Total Flow and Lap Avg Flow, Forward and Forward/ Reverse mode are selectable. The reverse flow is calculated as zero flow rate (0 L/h) in Forward mode. The reverse flow is calculated as a negative rate in Forward + Reverse mode. When calculating the Instant flow rate, the reverse flow is displayed as a negative flow rate regardless of the mode.
Temperature measurement	Signal input and calculation from the temperature sensor are available.
Pressure measurement	Signal input and calculation from the pressure sensor are available.
Density measurement (FD-5110)	Density, temperature measurement are available.
Display accuracy	±1 count for the pulse weight of input frequency

FM-0321 FZ Module

Applicable detectors	FZ-2100, FZ-2200A
Calculation items	Instant Flow, Lap Flow, Lap Avg Flow, Total Flow, Total Avg Flow, Instant Inj, Lap Avg Inj, Total Avg Inj, Convert Dens, Instant Dens, Instant Flow Temp
Calculation cycle	1 ms
Zero calibration (ZeroCal)	Function to adjust the output value as 0 when no flows.
LowFlowCut	Function to set the flow rate below the fixed rate as 0 L/h
Display accuracy	±1 count for the pulse weight of input frequency
Temperature measurement	Signal input and calculation from the temperature sensor are available.

FM-0331 FX Module

Applicable detectors	FX-1100, FX-1120, FX-1130
Calculation items	Instant Flow, Lap Flow, Lap Avg Flow, Total Flow, Total Avg Flow, Instant Inj, Lap Avg Inj, Total Avg Inj
Calculation cycle	100 ms
Density setting	Range: 0.0001 to 5.0000 g/cm³ Initial value: 1.0000
Delay Time	Range: 2 to 99 s (initial value: 2 s)
Charge Level	Range: 0 to 95 % (initial value: 0 %)
Overflow signal	Relay output, contact voltage capacity (DC48V, AC120V), flowing current at contact (500 mA or less)

DF series

DF-2200 On-Board Flow Meter

This is a compact fuel flow meter for FP series detector and MF-3200 On-board Flow Detector.

- Option
- DF-0223 Remote box

This is a remote switch for START / STOP / RESET at total measurement.
- CT-0676 Light Shielding Hood

This is designed to protect the body from heat caused by sunlight when mounted on vehicle.



DF-2200 On-Board Flow Meter

Applicable detectors			FP-4135, FP-213/213S, FP-2140H, FP-2240HA, FP-2140S, MF-3200
Display method			Fluorescent display tube 11.45 mm × 69.85 mm (2-stage display)
Display item and digit number	Integration flow		0000000.0 <ul style="list-style-type: none">• The decimal point is variable according to the weight per selected pulse. 0.001 mL/ Pulse selected: displays to the third decimal point 0.01 mL/ Pulse selected : displays to the second decimal point 0.1 mL/ Pulse selected : displays to the first decimal point• When the display value reaches its maximum, the position of decimal point is changed, and displays as follows; 0.000 to 99999.999, 100000.00 to 999999.99, 1000000.0 to 9999999. 9• When the multiplication is ON, adds one decimal digit to the above values.
	Instantaneous flow		000.0000 <ul style="list-style-type: none">• The decimal point is variable according to the weight per selected pulse. 0.001 mL/ Pulse selected: displays to the third decimal point 0.01 mL/ Pulse selected : displays to the second decimal point 0.1 mL/ Pulse selected : displays to the first decimal point• When the multiplication is ON, it adds one decimal digit to the above values.
	Pressure		0000.0 (to the first decimal point) <ul style="list-style-type: none">• Display unit: kPa
	Temperature		000.0 (to the first decimal point) <ul style="list-style-type: none">• Display unit: °C
	Total time		0000.00 (to the second decimal point) <ul style="list-style-type: none">• Display unit: s• When the display digits become full, displays the value by round up after the decimal point.
Output section	Voltage output	Instantaneous flow	Voltage output: 0 to 10 V Range setting: 0 to 60/100/120/200/300 (unit: L/h and kg/h) Update period: 10 ms (standard)/1 ms (option) •Average indexation settings (Standard): 1 ≤ N ≤1000 (initial value N=30) (Option): 1 ≤ N ≤10000 (initial value N=300)
		Temperature	Voltage output: 0 to 10 V Range setting: select from 0 to 100, -50 to 100 °C Update period: 100 ms •Average indexation settings 1 ≤ N ≤10 (initial value N=2)
		Pressure	Voltage output: 0 to 10 V Range setting: select from 200/500/980/1000 kPa (for input: 0 to +5 V) Update period: 10 ms/1 ms (option) •Average indexation settings (Standard): 1 ≤ N ≤100 (initial value N=20) (Option): 1 ≤ N ≤10000 (initial value N=200)
	Pulse output		The number of output pulse: 0.001/0.01/0.1 (mL/Pulse or g/Pulse) and direct Minimum pulse duration: approx. 1 μs Output waveform: square wave duty 50 % High level: +4.5 V or more Low level: +0.4 V or less Output item: instantaneous flow
	CAN output		Protocol: conforms to CAN Ver. 2.0B Bus data format: Endian : Big Endian (Motorola) ID: 0x721 (initial value) 0x001 to 0x7FF Variable Termination resistor: ON/OFF function Baud rate: 125 kbps/250 kbps/500 kbps/1 Mbps Output update cycle: select from OFF/1 Hz/2 Hz/5 Hz/10 Hz/20 Hz/100 Hz/1 kHz (option) Output item: instantaneous flow (L/h)/ temperature (°C)/pressure (kPa)/total flow (L) (option)/ total time (s) (option)
	RS-232C (option)		Serial communication (asynchronous method): 9600 bps/38400 bps
Function section	Instantaneous flow average		Displays the data obtained through moving average from 0.5 to 10 s of the instantaneous flow which is updated and displayed every 500 ms or 1 s.
	Instantaneous flow analog output		OFF/ON (N=1 to 1000)
	Indexation average		OFF/ON (N=1 to 1000)
	Reverse flow correction		Detect a reverse flow and correct the flow amount
	Density temperature correction function (convert into mass)		Correction function when obtaining mass flow rate from volumetric flow rate
	Output calibration (CAL)		V_OUT ZERO: 0 V V_OUT FULL: 10 V
Factor		1000 to 100000	
General specification	Power source		Battery connection: 10 to 28 VDC (battery clipping type cable provided as standard) When using AC adapter (option): 100 to 240 VAC 50/60 Hz
	Current consumption		28 VA or less (when 12 VDC)
	Operating environment		Indoor, in a vehicle
	Altitude		Elevation 2000 m or less
	Operating temperature range		0 to +50 °C *Operating temperature range of AC adapter: 0 to +40 °C
	Storage temperature range		-10 to +60 °C
	Operating humidity range		5 to 80 %
	Storage humidity range		5 to 85 %
	Outer dimensions		170 (W) × 49 (H) × 120 (D) * The projection is not included.
Weight		Approx. 800g	
Safety		IEC61010-1: Over-voltage category II Protection Class II Pollution level II <ul style="list-style-type: none">• When using an optional AC adapter	
Standard	CE marking		LVD Directive 2014/35/EU Standard EN61010-1 (with AC adapter) EMC Directive 2014/30/EU Standard EN61326-1 RoHS Directive 2011/65/EU Standard EN50581

Flow Rate Measurement System (Applications)

■ Mass Flow Rate Detection System

This system uses the two types of detectors, FP series Volumetric Flow Detector and FD-5110 Fuel Density Meter. The volumetric flow rate value is converted with high accuracy using the density measurement value and displayed as mass value.

Features

- Continuous measurement without being affected by temperature, pressure or density
- Wide measurement range (up to range ability 1: 1000 within ±0.35 % of measurement range reading accuracy)
- Density measurement
- A function for removing air bubbles to enable the supply of bubble-free fuel is provided.
- A mechanism purging initial air at the time of workpiece replacement is provided.

Measurement items		Flow rate, temperature, and density
Usable fluids		Gasoline, light oil, kerosene, general petroleum-based hydraulic oil alcohol fuels (option)
Measurement range	Normal mass flow rate	0.23 to 150 kg/h at 0.75 g/cm ³
	Normal volumetric flow rate	0.3 to 200 L/h
	Maximum flow rate	225 kg/h (300 L/h at 0.75 g/cm ³)
	Density *1	0.5 to 2 g/cm ³
Accuracy	Flow rate	Within ±0.35 % of reading at 0.3 to 200 L/h
	Density accuracy	±0.0010 g/cm ³
Pressure loss		—
Operating temperature range *1		0 to +40 °C
Weight		Approx. 200 kg (including a solenoid valve controller)

*1 Please consult us for temperature and density that exceed the above ranges.

■ LPG Mass Flow Rate Detection System

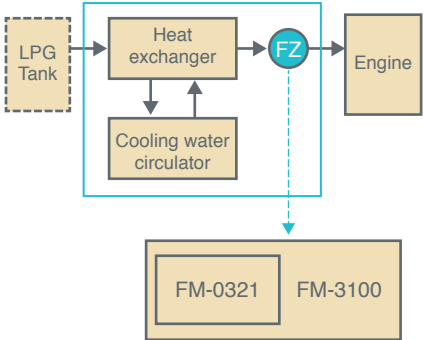
This system uses the mass flow detector for high-accuracy detection of the mass of an LPG flow rate.

Measurement items		Flow rate, temperature, and density
Measurement range	Mass flow rate	0.2 to 60 kg/h
	Density *1	0 to 1.0 g/cm ³
	Temperature	-20 to +55 °C
Accuracy	Flow rate	±0.1 % of reading at 2 to 60 kg/h ±(0.002 kg/h/flow rate) × 100 % of reading at 2 kg/h or less
	Density	±0.0005 g/cm ³
	Temperature	±1 °C ± 0.005 × reading value °C
Pressure loss		Approx. 100 kPa at 82 kg/h
Operating temperature range *1		0 to +40 °C
Weight		Approx. 200 kg

*1 Please consult us for temperature and density that exceed the above ranges.



LPG Mass Flow Rate Detection System (delineated by —)



Flow Meter Peripheral Devices

■ MF-3200 On-board Flow Detector (using FP-2140H)

The MF-3200 is an On-board Flow Detector using the FP-2140H for the detecting section. Fuel flow rate is measured by combination with the FM-3100 Digital Flow Meter (FM-0311 FP Module) and the DF-2200 On-board Flow Meter. MF-3200: for only diesel engines (other than in-tank fuel pump cars)

* Please contact us separately for other than diesel engine.

Features

- High accuracy within ± 0.2 % (reading value)
- Reduction in size and weight by blocking each component
- Fuel cooling function is provided as standard equipment.
- Temperature and pressure can be measured simultaneously with flow rate measurement.

Model name		MF-3200
Item		
Measurement items		Flow rate, temperature and pressure
Used flow rate detector		FP-2140H
Usable fluids		Light oil
Measurement range	Flow rate	0.3 to 120 L/h
	Pressure	0 to 980 kPa
	Temperature	0 to +99.9 °C
Measurement accuracy	Flow rate	Within ±0.2 % of reading value
	Pressure	±0.5 %F.S.
	Temperature	Pt100 class B
Return processing		Pressure control method (Using the precise pressure reducing valve)
Operating temperature range		0 to +65 °C (both liquid and ambient)
Weight		Approx. 15 kg
Outer dimensions		260 (W) × 243 (H) × 243 (D) mm



MF-3200

■ EH-049 Regulator Valve / EH-059 Relief Valve

Model name		EH-049	EH-059
Item			
Setting pressure range		20 to 70 kPa	50 to 200 kPa
Withstand pressure		Max. 0.8 MPa	
Operating temperature range		0 to +70 °C	
Connection diameter		Rc1/4 (for both IN and OUT)	
Body material		Aluminum	
Weight		Approx. 500 g	

■ Compatible Filters and Filter Elements

Compatible detectors		For FP-213S/213	For FP-2140H/2240HA	For FP-215/2250A
Item				
For models with standard specification	Filter	EH-106A	EH-1050	*
	Element	Provided together with the filter unit	EH-015 (one set for 5 pieces)	*
For models that can detect alcohol fuels	Filter	*	EH-107A	*
	Element	*	*	*

* Please contact us for details.

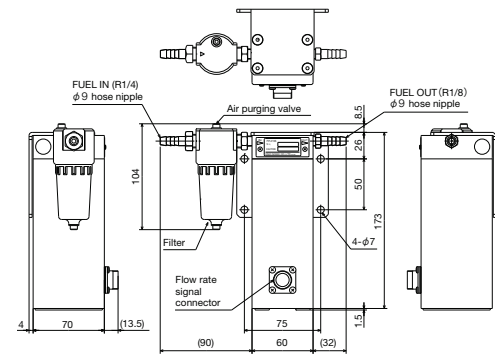
■ MF-015 Automatic Air Purging Tank

The MF-015 is an automatic air purging tank that uses a precision float valve. When fluid enters the flow line, the air is automatically purged to the atmosphere.

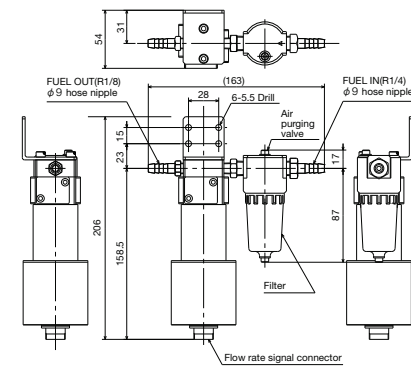
Item	Specification
Usable fluids	Gasoline, light oil and kerosene
Maximum flow rate	Approx. 100 L/h
Tank capacity	0.7 L
Withstand pressure	200 kPa
Joint	Hose nipple
	R1/4 Internal diameter: ϕ6 mm
	External diameter: ϕ9 mm
	(for both IN and OUT)
Weight	Approx. 1.8 kg
Outer dimensions	ϕ93 (W) × 197 (H) mm (not including protruded section)



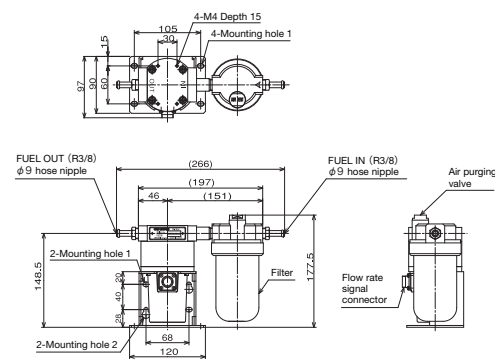
① FP-213S



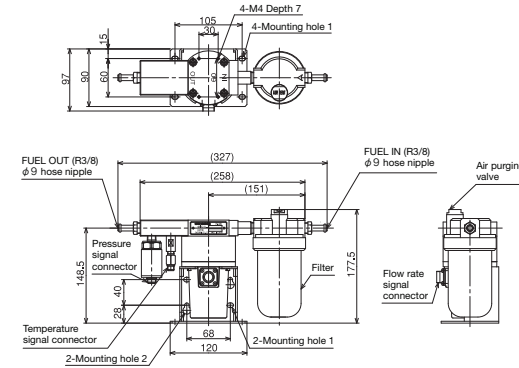
② FP-213



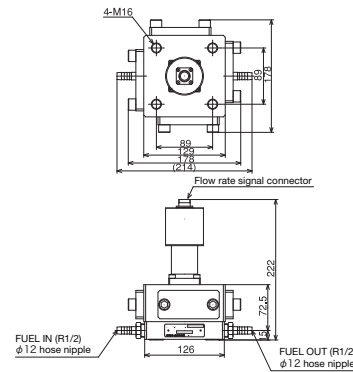
③ FP-2140H



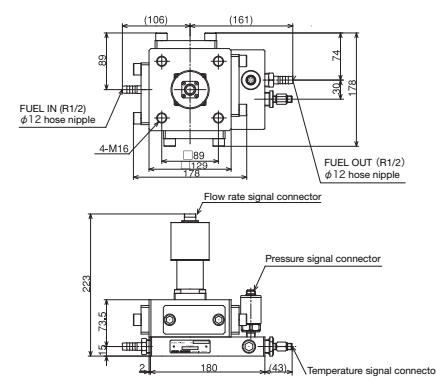
④ FP-2240HA



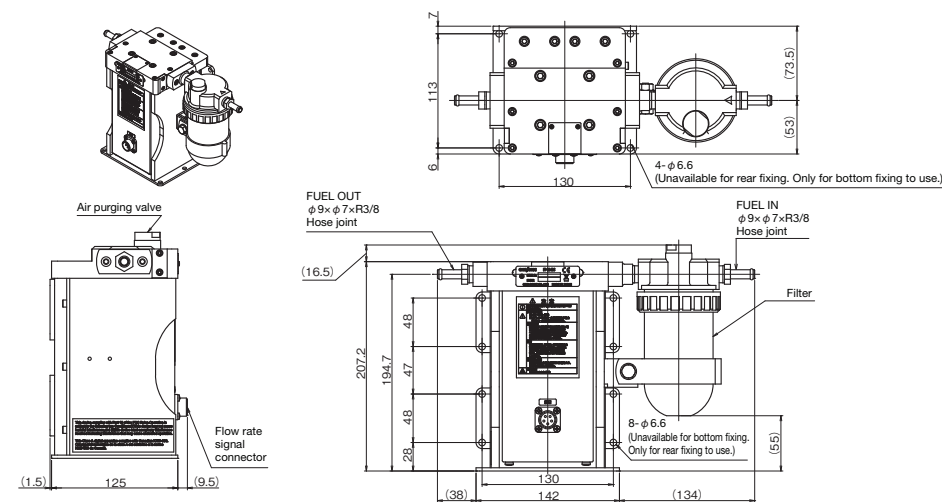
⑤ FP-215



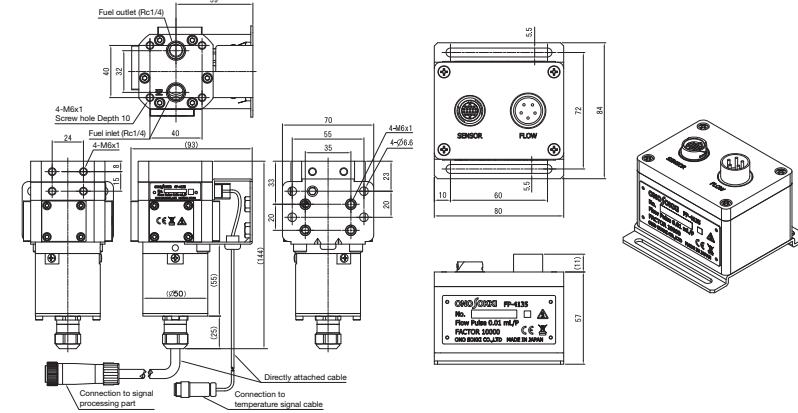
⑥ FP-2250A



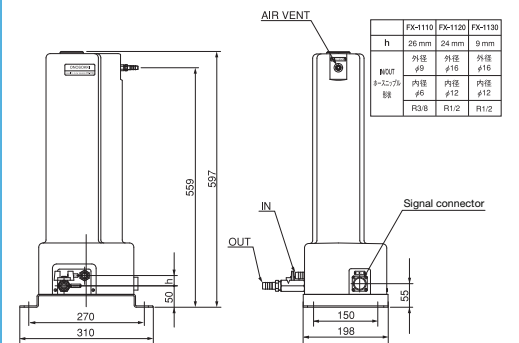
⑦ FP-2140S



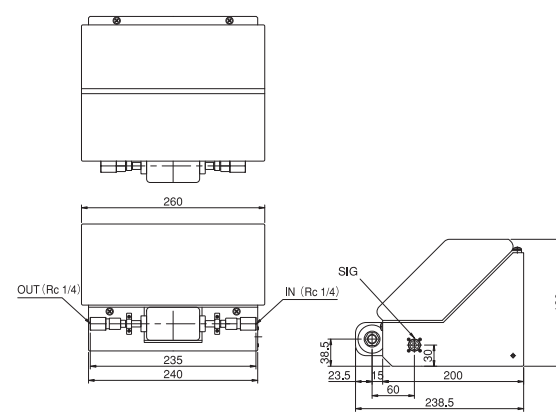
⑧ FP-4135



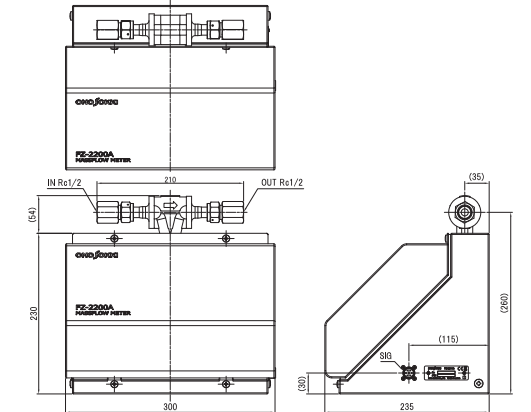
⑨ FX-1100



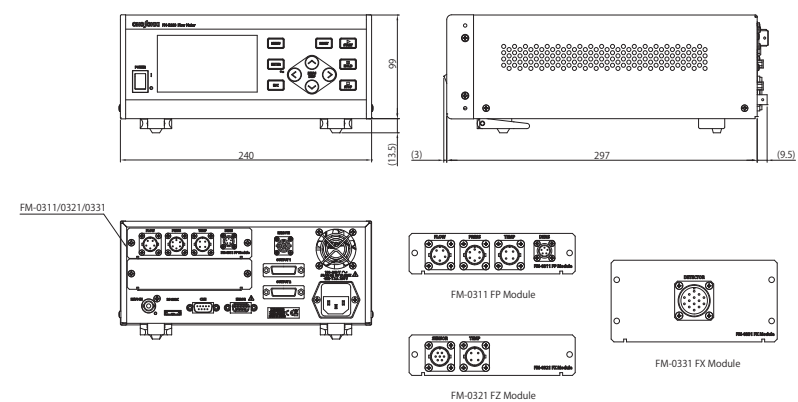
⑩ FZ-2100



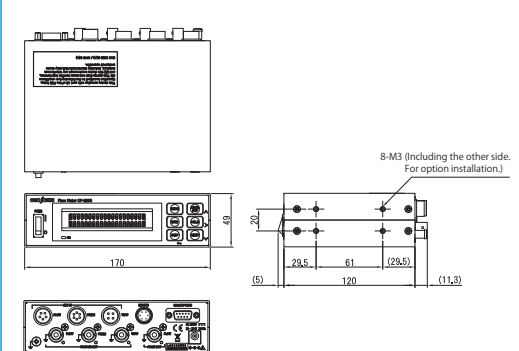
⑪ FZ-2200A



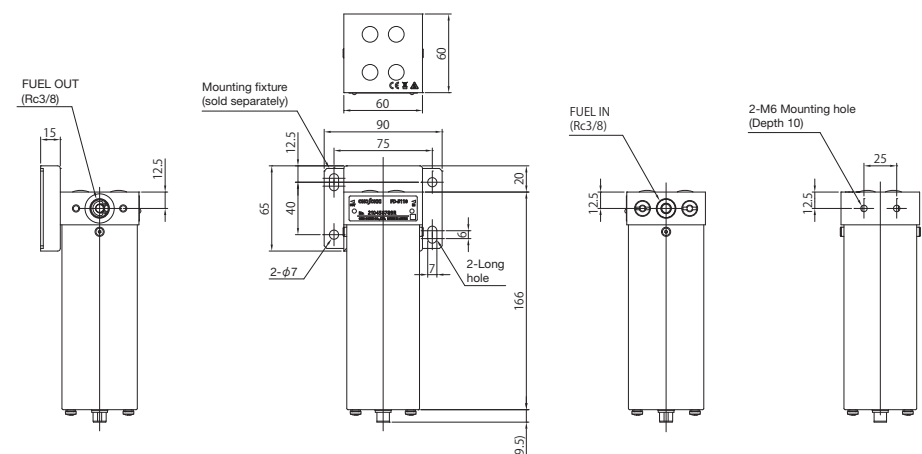
⑫ **FM-3100**



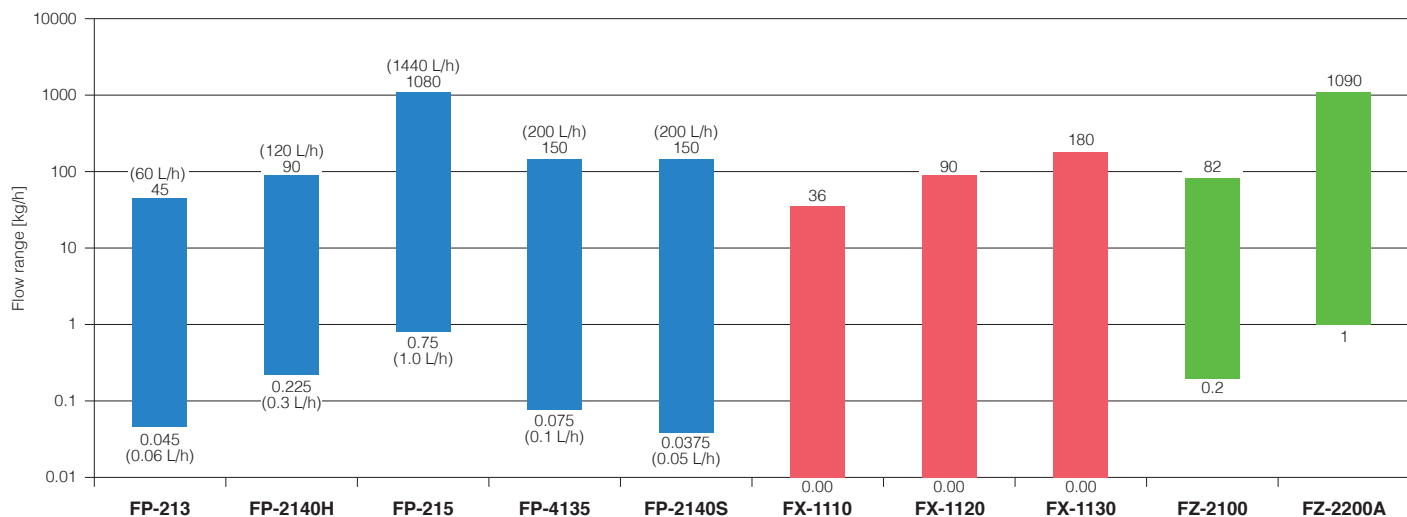
⑬ DF-2200



⑭ FD-5110



Detectors Measurement Range Comparison Chart



Product list

Flow Detectors FP/FX series, and FZ series

Product name	Model	Specification
Volumetric Flow Detector	FP-213	0.06 to 60 L/h
	FP-213S	Pressure compensation function added type of FP-213
	FP-2140H	0.3 to 120 L/h
	FP-2240HA	FP-2140H + temperature/pressure detector
	FP-215	1 to 1440 L/h
	FP-2250A	FP-215 + temperature/pressure detector
	FP-4135	On-Board volumetric flow detector
Mass-Burette Flow Detector	FP-2140S	Pressure compensation function added type of FP-2140
	FX-1110	0 to 10 g/s (0 to 36 kg/h)
	FX-1120	0 to 25 g/s (0 to 90 kg/h)
Massflow Meter	FX-1130	0 to 50 g/s (0 to 180 kg/h)
	FZ-2100	0.2 to 82 kg/h
	FZ-2200A	1 to 1090 kg/h

Fuel Density Meter FD-5110

Product name	Model	Specification
Fuel Density Meter	FD-5110	0.5000 to 2.0000 g/cm ³

On-board Flow Meter DF-2200 series

Product name	Model	Specification
On-board Flow Meter	DF-2200	On-board flow Meterr
	DF-0221	Auto-stop function
	DF-0222	RS-232C communication function
	DF-0223	Remote box
	DF-0224	High speed output function
	DF-0225	CAN integrated value output function
	PS-P20023E	AC adapter
	VM1391-VM1700	Battery cable for AC adapter 2 m (for Japan)
	CT-0673	Panel mounting fixture
	CT-0675	Protection plate
	CT-0676	Light shielding hood

Digital Flow Meter FM-3100 series

Product name	Model	Specification
Digital Flow Meter	FM-3100	For FP/FX/FZ series detectors
Measurement module	FM-0311	For FP/FD series detectors
	FM-0321	For FX series detectors
	FM-0331	For FZ series detectors
	FM-0341	Blank panel
Remote box	FM-0200	For FM-3100 series

On-board Flow Detector MF-3200

Product name	Model	Specification
On-board flow detector	MF-3200	For light oil vehicle 0.3 to 120 L/h

Peripheral device for flow detector

Product name	Model	Specification
Automatic air purging tank	MF-015	Tank capacity: approx.0.7 L

Signal cable between the FP series detector and display units

Object	Model	Length	Detector model
For flow rate	FP-0011	5 m	FP-213/213S/2140H/2240HA/215/2250A/MF-3200
	FP-0012	10 m	
	FP-0014	20 m	
	FP-0015	5 m	FP-2140S/4135
	FP-0016	10 m	
	FP-0017	20 m	
For temperature	FP-0025	5 m	FP-2240HA/FP-2250A/4135/MF-3200
	FP-0026	10 m	
	FP-0027	20 m	
For pressure	FP-0035	5 m	FP-2240HA/FP-2250A/MF-3200
	FP-0036	10 m	
	FP-0037	20 m	

Signal cable for connecting the FX series detector with display units

For flow rate	FX-0021	5 m	FX-1110/1120/1130
	FX-0022	10 m	
	FX-0023	20 m	

Signal cable for connecting the FZ series detector with the display units

For flow rate	FZ-0011	5 m	FZ-2100/2200A
	FZ-0012	10 m	
	FZ-0013	20 m	

Signal cable for connecting the FD-5110 Fuels Density Meter with the display units

For density	FD-0011	5 m	FD-5110
	FD-0012	10 m	
	FD-0013	15 m	

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* Outer appearance and specifications are subject to change without prior notice.

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