KEYENCE

Non-Wetted Electrode Electromagnetic Flow Sensors

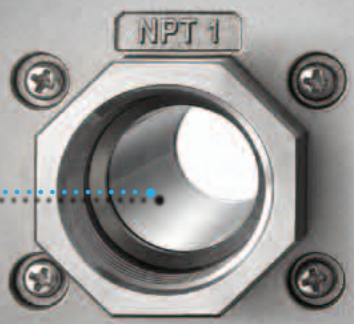
FD-M Series

Introducing the **KEYENCE FD-M Series** Flow Sensor

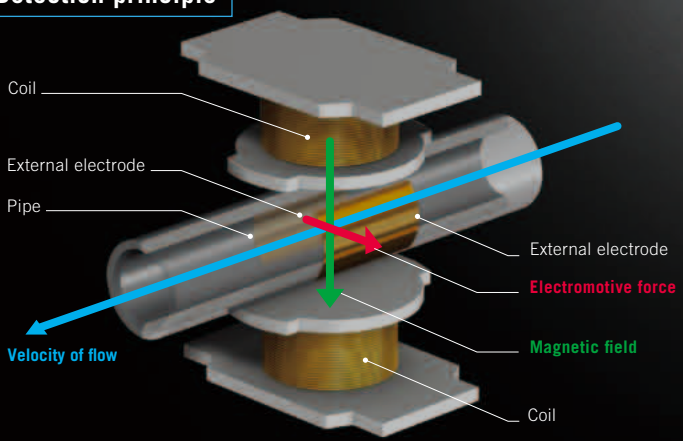
New Flow Sensor with Free Flowing Technology

FIRST IN THE AUTOMATION INDUSTRY

No Obstructions
No Paddle Wheel
No Electrodes

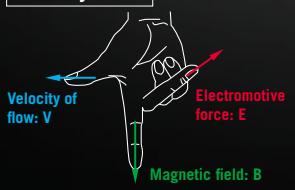


Detection principle



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.

Faraday's Law



When conductive fluid flows through a magnetic field, electric voltage is generated in proportion to the flow velocity of the fluid. The flow can be determined by measuring this voltage.

SUS430

Dual output

Flow indicators

Flow value display

Threshold value

Alarm output indicator

Select and toggle buttons

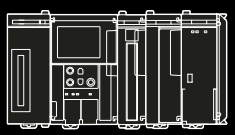
Data collection

NPT 3/8(10A)
Display range: 0.14 - 6.35 G/min (0.50 - 30 L/min)

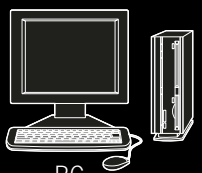
NPT 3/4(20A)
Display range: 0.7 - 26.4 G/min (2.5 - 100 L/min)

NPT 1(25A)
Display range: 1.4 - 52.8 G/min (5.0 - 200 L/min)

4-20mA Scaleable



Programmable logic controller



PC

Using conventional technology...

Float/Area Type Flow Meter

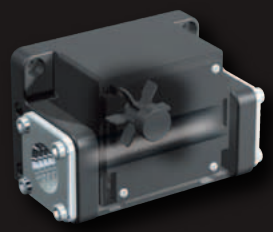
<Principle>

As liquid enters the bottom of the tube, the float begins to rise. The position of the float varies directly with the flow rate. Its exact position rests at the point where the differential pressure between the upper and lower surfaces balance the weight of the float.

As time passes...

- **Contamination requires disassembly for maintenance**
- **Poor visibility**
- **Clogging due to the deposit of slurry/sludge**

Paddle Wheel/Turbine/Gear Type Flow Meter



<Principle>

Units consists of a multiple-bladed rotor, obstruction mounted, within a pipe. The rotor spins as the liquid passes the blades. The rotational speed is a direct function of flow rate and can be sensed by a magnetic pick-up, photoelectric cell, or gears.

- **Clogging due to the deposit of slurry/sludge**
- **Axle/bearing wear**
- **Contamination requires disassembly for maintenance**

Unstable flow control

Temperature fluctuation
⇓
Increased process variation
⇓
Decreased quality control

With the

With the

KEYENCE FD-M

The FD-M Series with Free Flowing Technology

NO OBSTRUCTION
No pressure loss. Reduces the load on pumps and saves energy.

NO PADDLE WHEEL
No moving parts. Maintenance free.

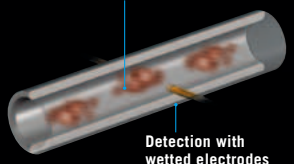
NO ELECTRODES
No errors due to buildup. Maintain accurate flow control from outside the pipe.

Resistant to deposits

▸ Free-flowing pipe

Conventional flow sensor

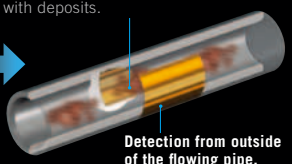
Generates an error when the electrodes are covered with deposits.



Detection with wetted electrodes

The FD-M Series with Free Flowing Technology

Stable detection even though the measurement area is covered with deposits.



Detection from outside of the flowing pipe.

Resistance test to insulating material

Flow examination is done with deposits on the electrode or the measurement component.

Conventional flow sensor	The FD-M Series with Free Flowing Technology
Generates an error with deposit of 0.39 Mil (10μm)	Stable detection, even with deposits of 19.69 Mil (500 μm)

*Comparison of FD-M with a KEYENCE conventional sensor

Three advantages
to reach the goal of flow management

KEYENCE FD-M

1. Productivity enhancement

2. Quality improvement

3. Maintenance free

The FD-M Series is used in such manufacturing fields as:

Powertrain components





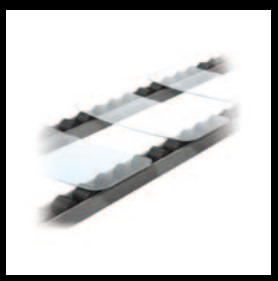

Typical manufacturing equipment

Die cast machine **P08**

Forging machine

Deburring machine

Automotive interior/exterior parts






Typical manufacturing equipment

Molding machine.....**P12**

Paint

Assembly machine

Automotive tires



Typical manufacturing equipment

Molding machine.....**P12**

Vulcanizing process

Cutting, grinding, quenching and powder casting products






Typical manufacturing equipment

Cutting or grinding machine.....**P10**

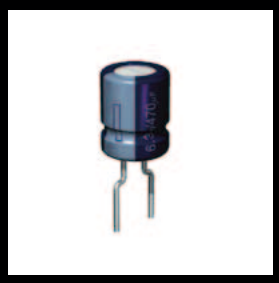
Quenching.....**P14**

Welding machine.....**P14**

Electronic and precision molded parts





Typical manufacturing equipment

Molding machine.....**P12**

Washer.....**P14**

Assembly machine

Others



Typical manufacturing equipment

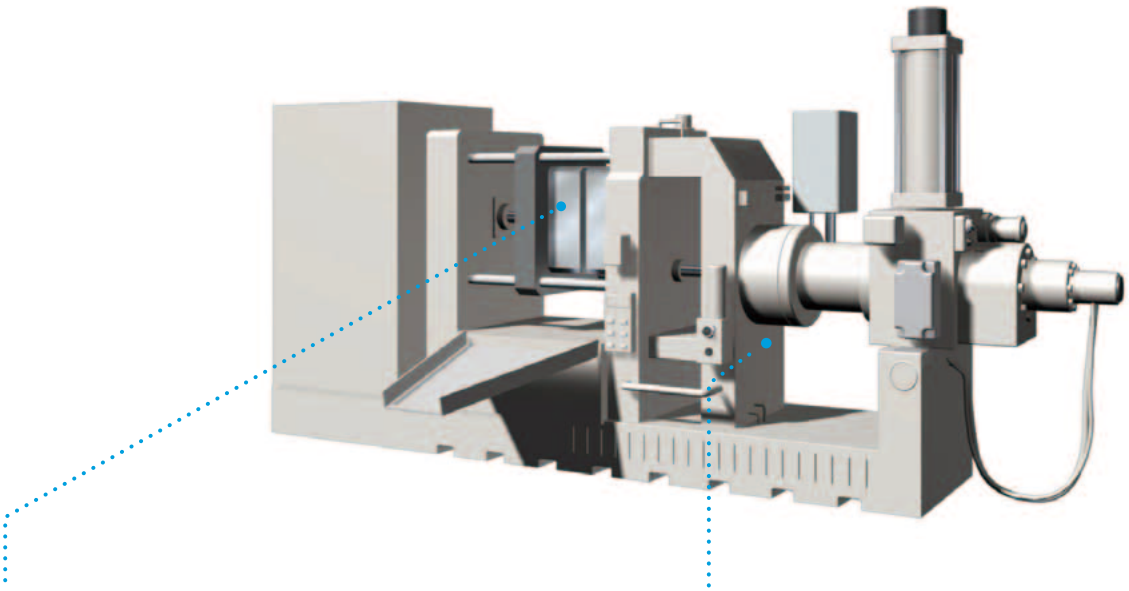
Molding machine.....**P12**

Washer.....**P14**

For Diecast Machines

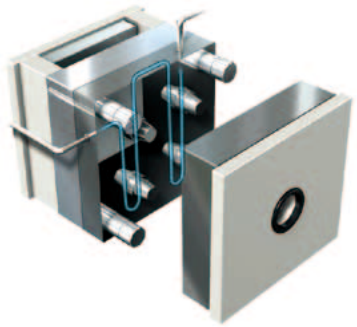
Flow control in diecast machines

Diecasting is widely used in the manufacturing industry as an efficient and economical process for producing high quality metal components. However, recovery after defects are produced or damage to the tooling occurs is both time consuming and expensive. If the temperature of the die is too hot or too cold, defects such as blowholes, sink marks, hot tearing, or bubbles can occur. Flow control is necessary in order to manage the die temperature and prevent these types of defects. Also, the critical application of die lubricant can be monitored and controlled by a flow sensor.



Die cooling

Heat-resistant FD-M sensors are ideal for diecasting applications where hot cooling water is used.



Cooling water lines used for die temperature control can become blocked due to their thin and complex design. Since cooling liquid flow is closely related to die temperature, flow control is critical to ensure that proper temperatures are maintained. The Diecasting process involves high temperature and therefore the cooling liquids themselves frequently reach extreme temperatures. The KEYENCE FD-M is designed for this environment with a temperature rating of up to 85°C (185°F).

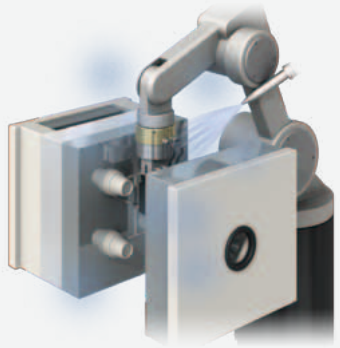
Die lubricant coating

The importance of flow control in die lubricant applications

Efficient utilization of die lubricants in the casting process can extend the life of dies and contribute to enhanced product quality. These lubricants will protect the surface from considerable temperature peaks that occur when the molten metal enters the die cavity. Also, fluctuations in die lubricant can cause temperature related quality issues and products to become stuck in the die after cooling. Therefore, the amount of lubricant used during the application process is a critical variable in die casting. This variable can be controlled with the addition of a KEYENCE FD-M flow sensor to your die lubricant spraying system.

Strategies for cost reduction

Boosting profit by reducing maintenance costs



Diecast machines use water for various cooling purposes. Fluctuations in the flow of cooling water within the die may result in damaged product or machine components due to increased temperatures and uneven cooling.

Conventional: Flow control using float type meters may not eliminate poor part quality or machine damage due to insufficient cooling as a result of fluid contamination or clogged pipes.

KEYENCE FD-M: The free-flowing pipe configuration eliminates downtime and damage to dies due to clogging.

Example of running costs

Die damage: 1 piece × Number of occurrences per year: 1 time = $5,500 USD

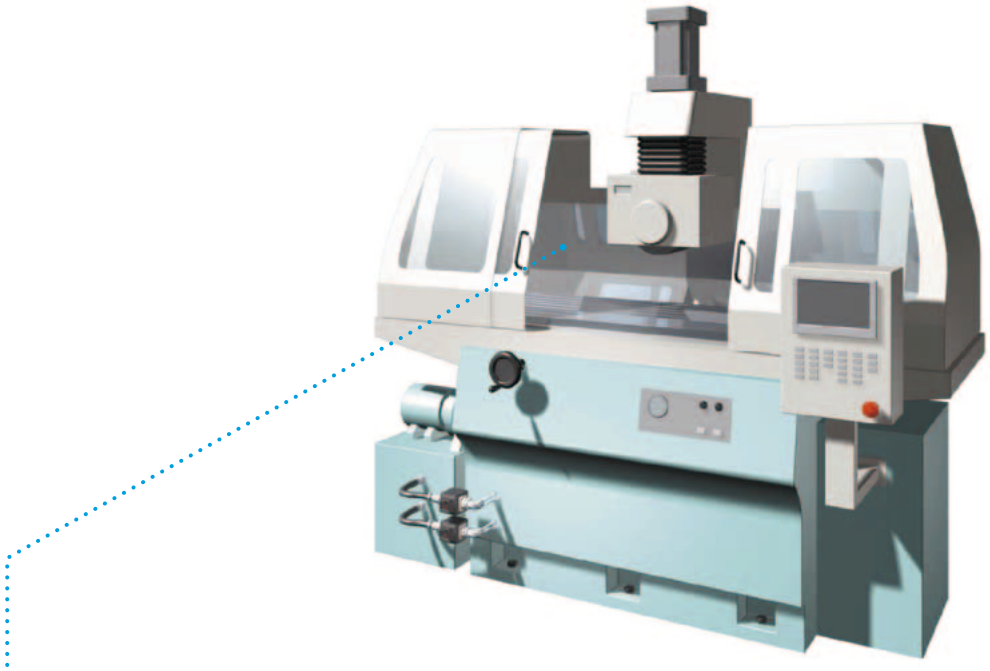
Machine downtime: 3 hours × Number of occurrences per year: 1 time × Productivity: $1,000 USD = $3,000 USD

Reduced Costs!

For Grinding Machines

Flow control in grinding and polishing

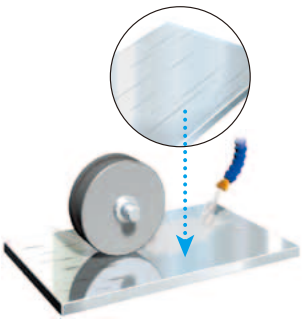
Some polishing applications involve micron-level machining, which requires that a variety of conditions be controlled. Of these conditions, an important element is coolant flow control. The main objective of coolant flow is temperature control, which serves to reduce heat generated during grinding. Too little coolant can lead to defects, grinding wheel damage, and dimensional errors due to thermal expansion, while too much coolant can cause defects due to grinding wheel slippage.



Grinding wheel cooling

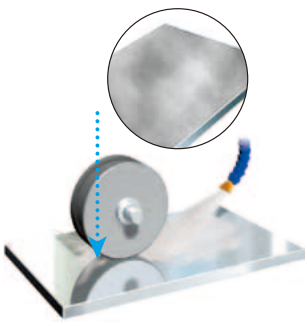
Flow control

When the fluid flow is too low



Foreign materials, sludge and abrasion grains are not properly rinsed from the part, resulting in flaws on the surface.

When the fluid flow is too high



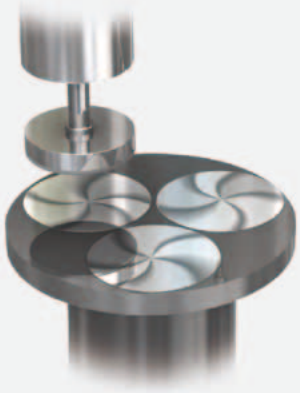
The fluid forms a layer between the grindstone and the workpiece, resulting in uneven surface roughness.

Ceramic and CBN grinding wheels

Grinding machines that use CBN grinding wheels require extremely thorough flow control. Once the process has begun, grinding machines cannot be quickly stopped, so a fluctuation in flow of even a few liters can result in significant profile changes up to several microns. To improve product quality, it is necessary to monitor machine operations to ensure that coolant flow remains within the prescribed range.
Conventional flow technology can be affected by contamination in the cooling process. The KEYENCE FD-M was designed to eliminate this concern with its Free Flowing Technology.
Another concern may be the cost of grinding wheels. Products such as CBN Wheels can deteriorate due to excessive heat in the grinding process. With replacement costs of several thousand dollars, the addition of reliable flow control can be easily justified.

Strategies for cost reduction

Boosting profit through reduced labor costs



Coolants play an important role in grinding and cutting processes. Because of this, flow management is vital as its reduction may result in damage to cutting tools, polishing stones or part quality.

Conventional: Flow control using float type meters is unreliable as a result of clogging due to metal powder/chips and oil within the coolant.

KEYENCE FD-M: The free-flowing pipe configuration eliminates downtime due to clogging and therefore results in labor and tooling cost savings.

Example of running costs

Maintenance labor hours: **30 hours** × Number of occurrences per year: **3 times** = **$1,800 USD**

*Example of labor hour costs: $20 USD/hour

Machine downtime: **5 hours** × Number of occurrences per year: **3 times** × Productivity: **$500 USD** = **$7,500 USD**

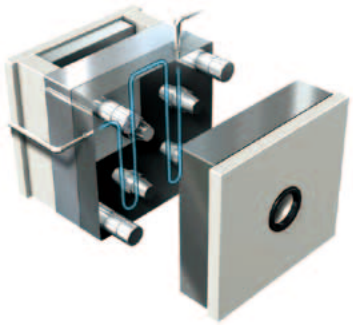
Reduced Costs!

For Injection Molding Machines

Flow control in injection molding machines

Production operating times for molded plastic products is long and production volumes are subject to machine capacity. Injection molding machines are almost completely automated, so defective products can mean the difference between a profit or a loss. In many cases, temperature is the deciding factor behind quality. Flow control of cooling fluids has a significant affect on temperature control. Since the injection molding process involves rapidly heating and cooling plastics, the key is to completely control variables associated with temperature.

Mold cooling



Hopper gate cooling

Hopper gate cooling is required in factories with fully automated production.

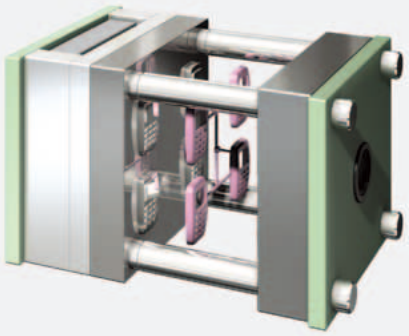
Optimum temperature in plastic molding machines

Variations in mold temperature can lead to sink marks, short shots, cracks, and other defects. Keeping the mold as close as possible to the optimum temperature is very important. Flow control is the most important factor in controlling this variable.
Because plastic molding machines generally operate on long cycles, maximum daily production volume is based on machine capacity. If downtime is a result of defective products or mechanical issues, production cannot resume until the mold temperature is stabilized.

Restarting the molding process while the temperature of the mold is still unstable will produce products that are defective. It generally takes about two hours of waiting time until production can be resumed, resulting in huge losses. Due to this lengthy recovery time, temperature related downtime can lead to production schedules not being met. A single problem can be the difference between a profit or a loss. Reliable flow control can be used to avoid this risk.

Strategies for cost reduction

Cost reduction through reduced maintenance labor hours



Injection molding machines use water for cooling of multiple components. Unstable cooling flow to the mold may have an adverse effect on product quality due to uneven cooling, while insufficient cooling at the hopper gate may damage the materials in the hopper.

Conventional: Flow control using paddle wheel type meters requires regularly scheduled maintenance and downtime to prevent clogging cause by contamination.

KEYENCE FD-M: The free-flowing pipe configuration maintains stable flow and eliminates downtime costs due to sensor maintenance. Product quality and productivity remain high due to stable, uninhibited operation.

Example of running costs

Maintenance labor hours		Number of occurrences per year		Number of machines		
5 hours	×	2 times	×	30	=	$6,000 USD

*Example of labor hour costs: $20 USD/hour

Machine downtime		Number of occurrences per year		Productivity		
5 hours	×	1 time	×	$500 USD	=	$2,500 USD

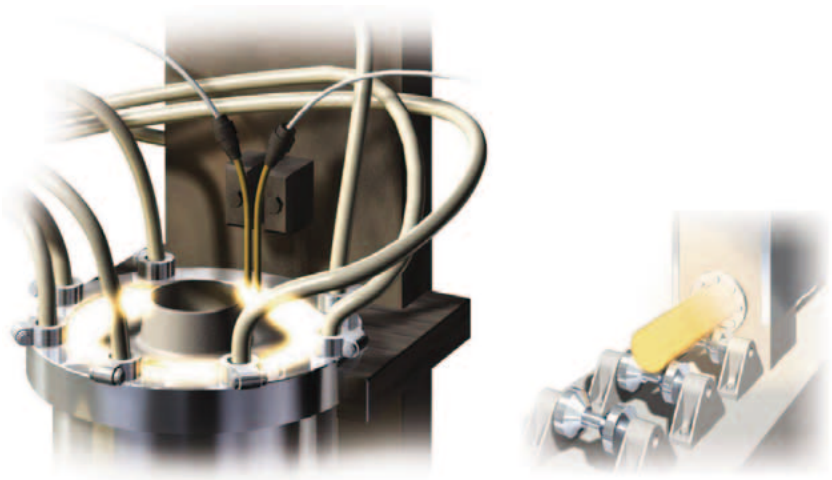
Reduced Costs!

For Induction Hardening Machines

Flow control in induction hardening machines

Metal is hardened by wrapping it in a coil of copper wire to which a high-frequency AC current is applied (induction heating). This method inherently generates large amounts of heat in the coil and oscillating tubes, which can cause equipment damage if not cooled. Many of the components that can be damaged are typically very expensive and have long delivery times. Furthermore, if the product is not properly cooled, the desired degree of hardness will not be produced, resulting in the manufacture of defective products.

For the stable control of cooling water for high-frequency hardening



Welding machine

Baking furnace

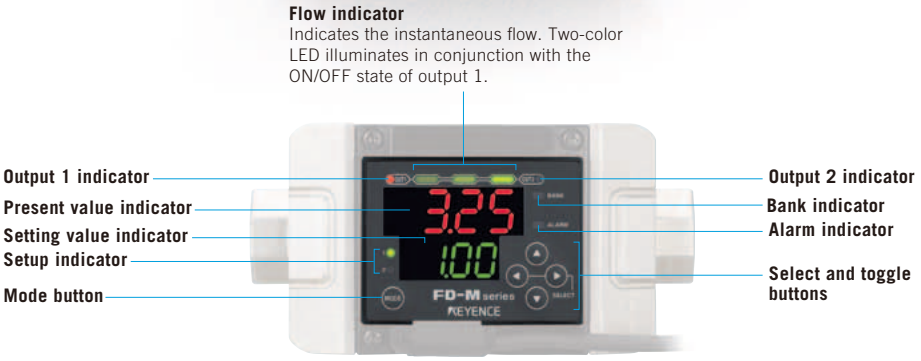
Processing machine

Washer

Features of the FD-M Series

Dual digital display with easy setup

Dual colored digital display allows you to adjust setting values, while monitoring the present flow.



Protected housing: IP65

The IP65 housing allows the FD-M to be used in harsh environments.

Switchable flow direction

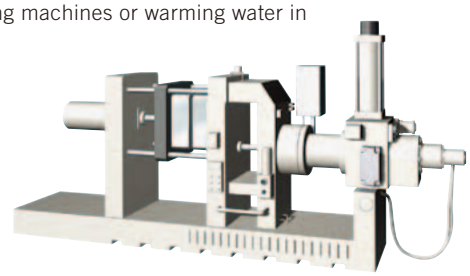
The flow direction can be switched by using the mode setting; you can mount the flow sensor at any location that can provide easy-to-view monitoring.

Use in low conductivity liquid applications as low as 5µS/cm

Low conductivity liquids, such as purified or deionized water, can be measured as low as 5µS/cm.

Use with high-temperature liquids up to 185˚F (85˚C)

Allows the FD-M to be used in high temperature cooling applications, such as recovered cooling water in forming machines or warming water in mold tools.



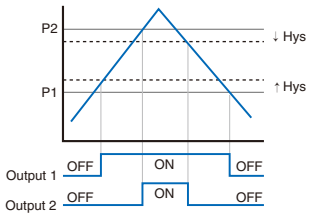
Multiple Outputs

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

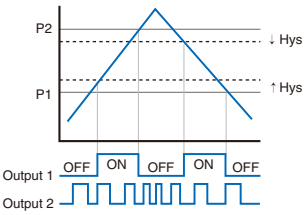
[F-1] Upper / lower limit setting mode

Output is provided for each upper and lower limit.



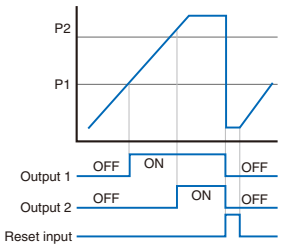
[F-2] Window + Accumulated pulse mode

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



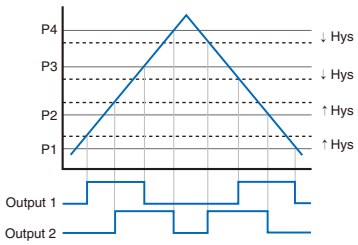
[F-3] Accumulated flow mode

Two values can be set for the accumulated value.



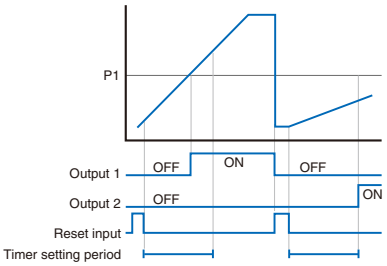
[A-1] Flow level mode

Two windows can be set at the same time.



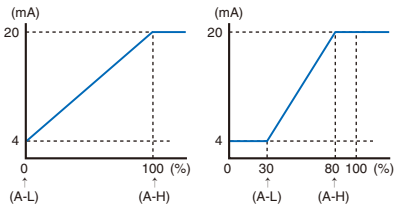
[A-2] Accumulated flow + Timeout mode

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



Free range analog

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%. Analog output can be used in parallel with each mode.



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

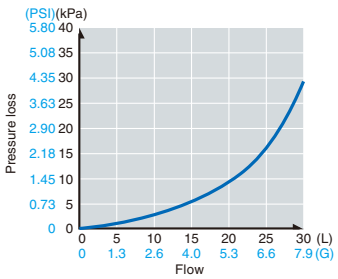
You can use the button to easily switch between the instantaneous and integrating flows.

Peak and bottom hold function

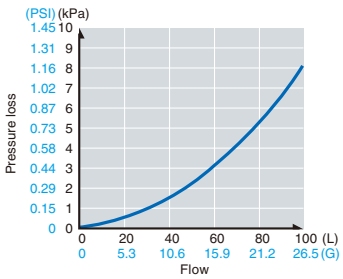
You can use the button to easily switch between the peak-hold and bottom-hold indication.

Pressure loss characteristics (Measurement fluid: water)

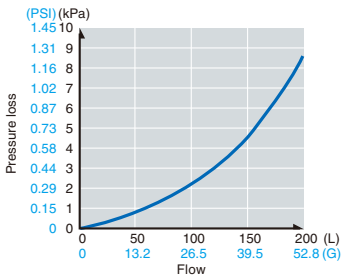
FD-MZ10AT/YK(P)



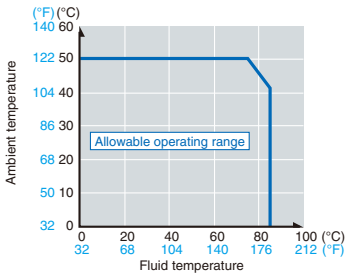
FD-MZ50AT/YK(P)



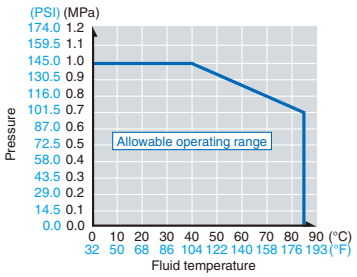
FD-MZ100AT/YK(P)



Allowable ambient operating temperature versus fluid temperature



Allowable operating pressure range versus fluid temperature



Specifications

Model*1	Type of piping	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
	NPN output	FD-MZ10ATK	FD-MZ10AYK	FD-MZ50ATK	FD-MZ50AYK	FD-MZ100ATK	FD-MZ100AYK
	PNP output	FD-MZ10ATKP	FD-MZ10AYKP	FD-MZ50ATKP	FD-MZ50AYKP	FD-MZ100ATKP	FD-MZ100AYKP
Appearance							
Configuration		Built-in amplifier					
Rated flow range*1		0.14 - 2.60 G/min (0.50 - 10 L/min)		0.7 - 13.0 G/min (2.5 - 50 L/min)		1.4 - 26.0 G/min (5.0 - 100 L/min)	
Displayable range*2		0.14 - 6.35 G/min (0.50 - 30 L/min)		0.7 - 26.4 G/min (2.5 - 100 L/min)		1.4 - 52.8 G/min (5.0 - 200 L/min)	
Settable range		0 - 6.35 G/min (0 - 30 L/min)		0 - 26.4 G/min (0 - 100 L/min)		0 - 52.8 G/min (0 - 200 L/min)	
Minimum flow*3		0.14 G/min (0.50 L/min)		0.7 G/min (2.5 L/min)		1.4 G/min (5 L/min)	
Connection bore diameter		NPT3/8 (10 A)		NPT3/4 (20 A)		NPT1 (25 A)	
Detectable fluids		Water or non-corrosive liquid					
Conductivity of detection fluids		5 µS/cm or higher					
Detectable fluid temperature		0 to +85 °C 32 to 185 °F (No freezing)					
Operating pressure range		Max. 145 PSI (1.0 MPa)					
Pressure resistance		290 PSI (2.0 MPa)					
Pressure loss		Max. 1.45 PSI (0.01 MPa)					
Display method		Dual row display with 4-digit, 7 segment LED, bar display (2 colors), output indicators, flow indicator					
Display resolution		0.01/0.1 (G/min, L/min) selectable		0.1/1 (G/min, L/min) selectable			
Repeatability *4		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)		0.5 s/1 s/2.5 s/5 s/10 s/30 s/60 s variable					
Accumulated flow unit		0.01/0.1/1/10/100 (G, L) selectable		0.1/1/10/100/1000 (G, L) selectable			
Accumulation data storage cycle		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*5 (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,Select either the accumulation output or the accumulation pulse by setting the mode					
Analog output		4-20 mA, max. load resistance 260 Ω Analog 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					
Environmental resistance	Ambient operating temperature	0 to +50 °C 32 to 122 °F (No freezing)					
	Ambient operating humidity	35 to 85% RH (No condensation)					
	Vibration resistance	10 to 55 Hz, compound amplitude 1.5 mm 0.06", 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		Approx. 865 g		Approx. 1130 g		Approx. 1340 g	
Accessory		Instruction Manual, Connector cable (2.7 m 106.3")					

*1 The rated flow range indicates recommended operating range.
*2 Can be used within the display range as well as within the rated flow range.
*3 Flow below the minimum flow is displayed as 0 G/min (0 L/min).
*4 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-MZ10ATK(P)/YK(P) in the range of 5.20 to 6.35 G/min (20 to 30L/min) is the double of the value listed in the table. The repeatability is the error of the detection point when fluids flow repeatedly under the same conditions.
*5 Maximum 20 mA for alarm output.

Lineup

Model	Applicable fluid	Detecting range*1		Bore diameter	Pipe direction	Output
		Display range	Rated range			
FD-MZ10ATK	Water, noncorrosive liquid (electrical conductivity: 5 µS/cm or more)	0.14 - 6.35 G/min (0.50 - 30 L/min)	0.14 - 2.60 G/min (0.50 - 10 L/min)	NPT3/8 (10A)	Vertical	NPN
FD-MZ10ATKP						PNP
FD-MZ10AYK					Horizontal	NPN
FD-MZ10AYKP						PNP
FD-MZ50ATK		0.7 - 26.4 G/min (2.5 - 100 L/min)	0.7 - 13.0 G/min (2.5 - 50 L/min)	NPT3/4 (20A)	Vertical	NPN
FD-MZ50ATKP						PNP
FD-MZ50AYK					Horizontal	NPN
FD-MZ50AYKP						PNP
FD-MZ100ATK		1.4 - 52.8 G/min (5.0 - 200 L/min)	1.4 - 26.0 G/min (5.0 - 100 L/min)	NPT1 (25A)	Vertical	NPN
FD-MZ100ATKP						PNP
FD-MZ100AYK					Horizontal	NPN
FD-MZ100AYKP						PNP

*1 Twice the rated flow range can be displayed.

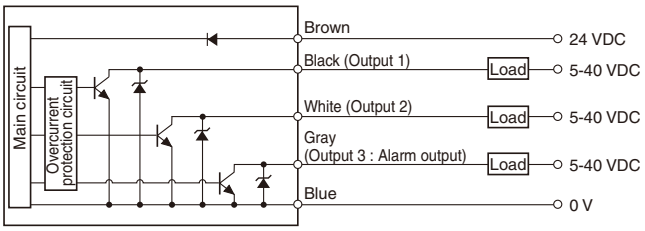
L-shaped mounting bracket
OP-42193
(sold separately)

Flat mounting bracket
OP-42194
(sold separately)

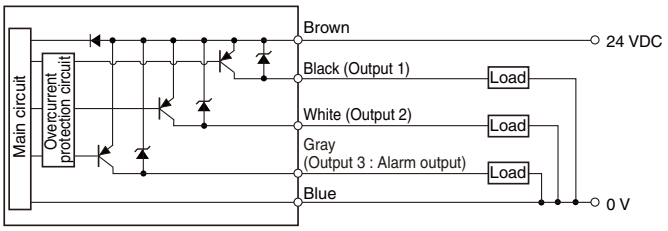
Connections and I/O Circuits

I/O circuits

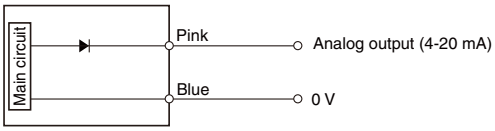
NPN type



PNP type

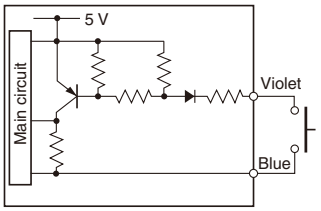


Analog output circuit



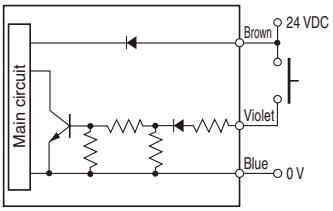
External input circuit (accumulation reset and bank switching)

NPN type



(Short-circuit current: Approx. 0.7 mA)

PNP type

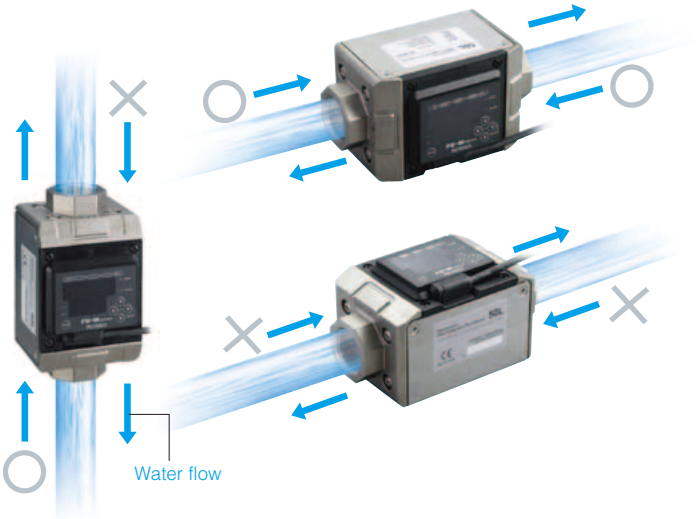


(Short-circuit current: Approx. 1 mA)

Mounting Recommendations

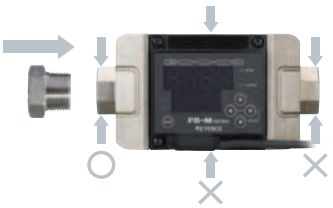
Mounting direction

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-MZ10AK Series	23 Nm
FD-MZ50AK Series	35 Nm
FD-MZ100AK Series	40 Nm

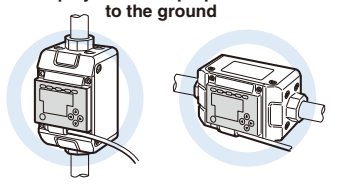
<Note> For more information on mounting and other advisories, see the instruction manual before installation.

Precautions for Piping and Installation

Installation direction

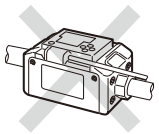
Installing the unit with the display screen perpendicular to the ground reduces the effects of bubbles, and enables more stable operation.

Display screen is perpendicular to the ground



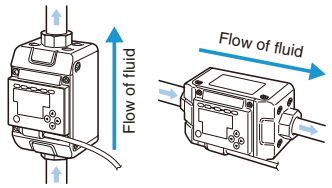
FD-MZ **ATK(P) Series FD-MZ **AYK(P) Series

Display screen is not perpendicular to the ground



Flow direction

The flow direction of the fluid can be switched by changing the menu settings. For more information about changing the settings, see page 7 of the instruction manual. The default flow direction is shown in the diagram below when the sensor is shipped from the factory.



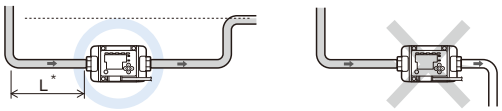
FD-MZ **ATK(P) Series FD-MZ **AYK(P) Series

NOTE
Install the FD-MZ **ATK(P) Series so that the fluid flows upward. If the FD-MZK Series is installed so that the fluid flows downward, bubbles may appear, making it difficult to completely fill the pipe. This can cause the values to fluctuate and errors to appear on the display.

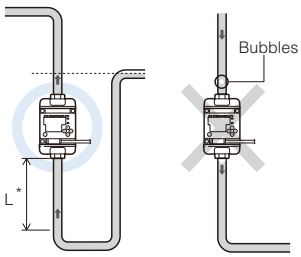
Sensor and pipe installation

Arrange piping so that the sensor and surrounding pipes are always filled with the liquid.

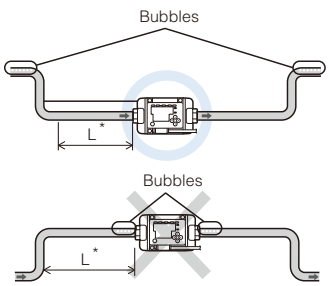
Ex: FD-MZ ** AYK(P) Series



Ex: FD-MZ ** ATK(P) Series



Ex: FD-MZ ** ATK(P) Series



Arrange piping so that gas will not enter it. When the fluid contains bubbles, install the FD-MZK Series in a location where the least amount of bubbles will occur.

L = At least 5 times longer than the bore diameter of the unit

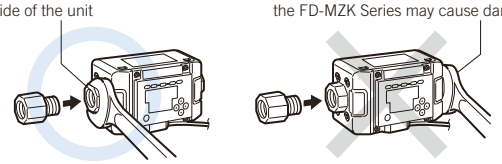
* Make sure that the straight section of pipe that is directly connected to the inlet bore of the unit is at least 5 times longer than the bore diameter. (At least 20 times longer is recommended when turbulent flow occurs)

Installing joints

Notice When installing joints to the FD-MZK Series, you must use a tool to hold the bore on the installation side of the unit. Holding the body or the bore on the other side of the FD-MZK Series may cause damage to the unit.

Hold the bore on the installation side of the unit

Holding the body or the bore on the other side of the FD-MZK Series may cause damage



Tightening torque for joints

Use a tightening torque that is less than the value listed in the table below.

Series name	Tightening torque
FD-MZ10AK Series	23 Nm
FD-MZ50AK Series	35 Nm
FD-MZ100AK Series	40 Nm

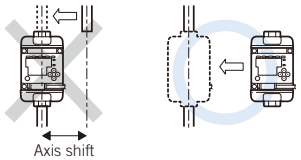
NOTE
If fluid leaks from the pipes even when using the torque shown above, do not attempt to tighten the joints further. Instead, check for flaws in the threaded portion or sealing tape.

Sensor installation

Be careful not to apply excessive stress or vibration from the pipes to the FD-MZK Series.

Notice An excessive stress or vibration on the FD-MZK Series may cause damage or unstable operation.

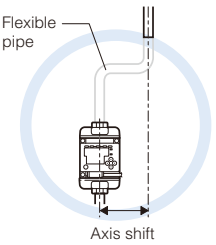
Align the pipes directly connected to the FD-MZK Series.



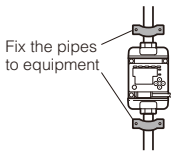
Notice Do not pipe the FD-MZK Series to correct the axis shift. Doing so applies an excessive stress to the bore.

When the axis shift cannot be corrected, use a flexible pipe or similar to connect the pipe so that the stress is not applied to the bore.

* Make sure that the straight section of the pipe that is directly connected to the inlet bore of the unit is at least 5 times longer than the bore diameter. (At least 20 times longer is recommended when turbulent flow occurs)



Secure the connected pipes to other equipment so that the pipe load is not directly applied to the FD-MZK Series. Vibration and stress can be reduced by securing the connected pipes to other equipment. The secured positions of the pipes should be as close to the bores of the FD-MZK Series as possible.



Notice Be careful not to cause axis shift when securing the pipes. When vibration and load (stress) cannot be reduced, secure in two or more places.

Precautions on Regulations and Standards

CE marking

KEYENCE corporation has confirmed that this product complies with the essential requirements of the applicable EC Directives, based on the following specifications. Be sure to consider the following specifications when using this product in the Member States of European Union.

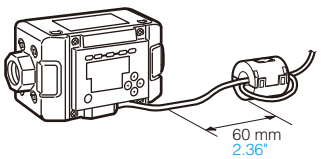
EMC Directive (2004/108/EC)

- Applicable Standard EMI: EN61326-1, ClassA
  EMS: EN61326-1
- Use the FD-MZK Series with a ferrite core (OP-84289) attached to the input and output cable.

IMPORTANT These specifications do not provide any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive.

Attaching the ferrite core

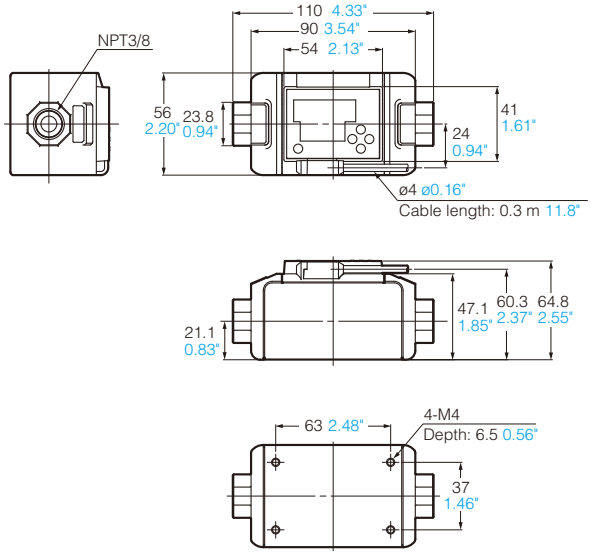
Attach the ferrite core at a position within 60 mm (2.36"), from the FD-MZK Series by winding the cable once as shown in the diagram.



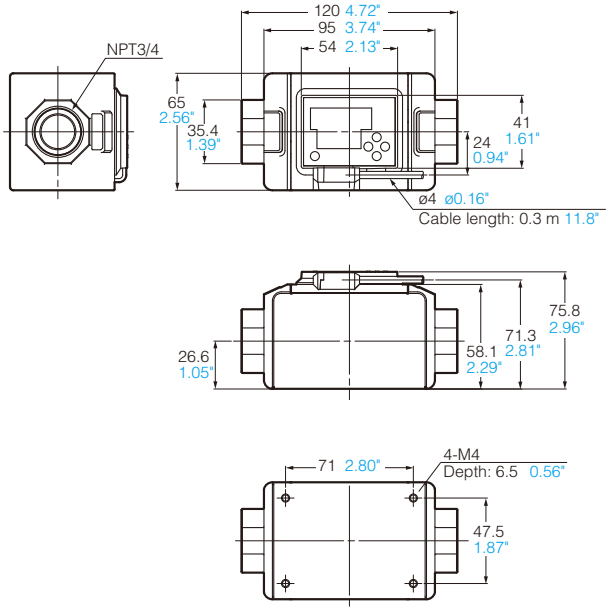
Dimensions

Unit: mm inch

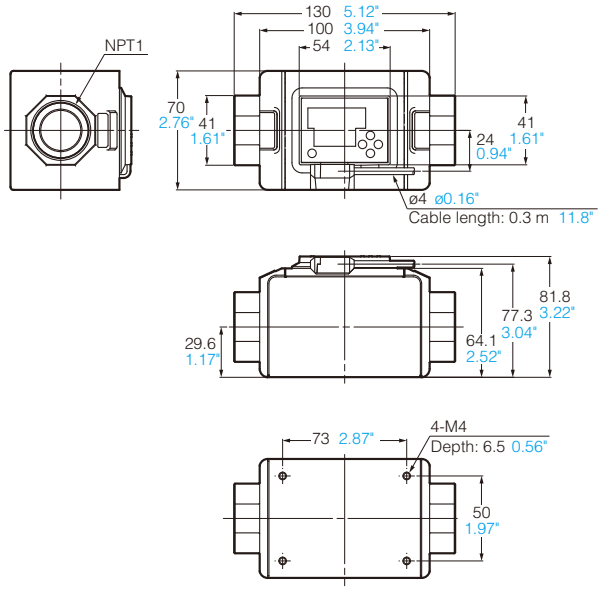
FD-MZ10AK Series



FD-MZ50AK Series



FD-MZ100AK Series



NOTE

The dimensions shown on this page reflect the FD-MZ ** AYK(P) Series. The direction of the FD-MZ ** ATK(P) Series display is rotated by 90 degrees.

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