



# NO PIPE MODIFICATION NECESSARY



Multi-Sensor Controller  
MU-N Series

# ALL YOU NEED TO DO IS **CLAMP-ON**



## CLAMP-ON FLOW SENSOR FD-Q Series

# 1

### EASY TO INSTALL FOR ANY USER

- No need for special tools or parts
- No special knowledge required
- No machine downtime



# 2

### EASY TO INTEGRATE INTO EXISTING PROCESSES

- No pressure loss or contamination
- Detect water (DI), oil, chemicals, etc.
- Detect through metal and resin pipes



# 3

### EASY TO SET UP AND USE

- Preprogrammed detection modes
- Live monitoring of instantaneous flow
- Quick setting codes



# WHY IS FLOW IMPORTANT?

## COMMON USES FOR FLUIDS IN FACTORY ENVIRONMENTS

Fluids are used all throughout facilities, each with its own usage and purpose. Example: Water to cool a die in an injection molding machine.

What types of FLUIDS do you utilize in your processes?

WATER

OIL

CHEMICAL

PRODUCT

How are these fluids used?

COOLING

CLEANSING

HANDLING

OTHER

How are you addressing these common flow issues?

QUALITY CONTROL

MACHINE PROTECTION

USAGE OF ACTUAL FLUID

## FACTORS THAT CAUSE VARIATIONS IN FLOW

Scenarios that lead to inconsistent flow amounts :

### Equipment Related

Example **STRAINER**

A clogged basket may lead to slower flow.



### Human Error/Deviation

Example **IMPROPER VALVE POSITION**

Improper valve control can lead to very costly mistakes.



## HOW FLOW SENSORS CAN HELP CONTROL FLOW

Digital flow sensors provide several layers of benefits for any flow application.



1

**Display**

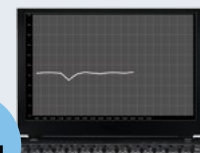
Monitor flow directly on unit



2

**Alert**

Send signals to a PLC, light, etc.



3

**Record**

Track operations to improve efficiency

# EASY TO INSTALL FOR ANY USER

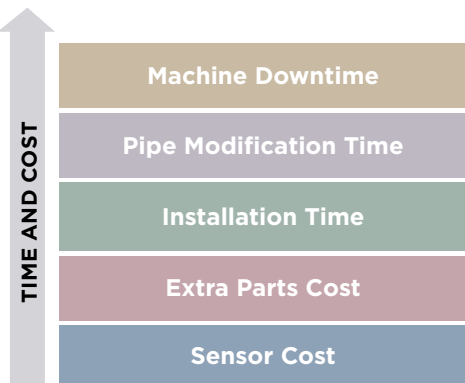
## □ SIMPLE AND EASY MOUNTING

FD-Q can be mounted quickly and easily with only a screw driver, no pipe modifications necessary.

### Installing a conventional flow sensor



Extremely difficult, requiring special knowledge, tools, and machine downtime



#### Conventional Method

- Shut down machine and remove liquid from pipe
- Cut the pipe
- Thread each end of the pipe
- Attach the sensor to a union joint
- Attach the sensor and union joint to the pipe
- Turn on machine and allow liquid to fill the pipe
- Adjust flow amount to the original value
- Check for fluid leakage

### Installing FD-Q Series



Anyone can easily mount with just a screwdriver

Total Cost Reduction



#### FD-Q Series




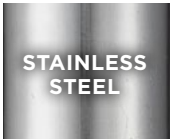



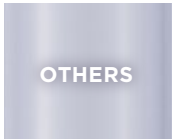
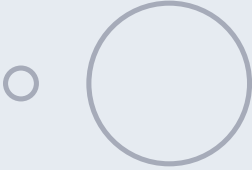
- Attach the bracket with 4 screws
- Attach the controller to the bracket with 2 screws

# EASY TO INTEGRATE INTO EXISTING PROCESSES



## COMPATIBLE WITH COUNTLESS FLOW SETUPS

FD-Q can detect and handle all sorts of fluids, pipe materials, and pipe sizes.

<p><b>1</b> Detectable fluids</p>	 <p>WATER</p>	 <p>OIL</p>	 <p>CHEMICAL</p>		
<p><b>2</b> Compatible pipe materials</p>	<p><b>METAL PIPES</b> Stainless Steel/Iron/Copper</p>		<p><b>RESIN PIPES</b> PVC/Others</p>		
	 <p>STAINLESS STEEL</p>	 <p>IRON</p>	 <p>COPPER</p>	 <p>PVC</p>	 <p>OTHERS</p>
<p><b>3</b> Compatible pipe sizes</p>	<p><b>1/4" to 2"</b> (13.8 mm to 60.5 mm)*1</p> 				

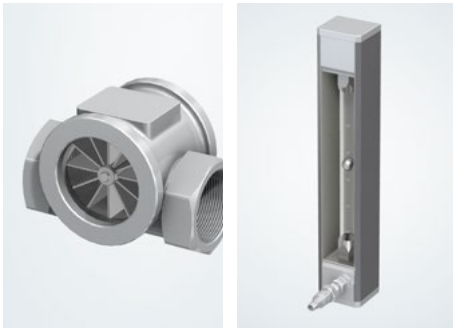
\*1 Outer Pipe Diameter Size



## COMMON ISSUES WITH CONVENTIONAL FLOW SENSORS

### Mechanical Types

(i.e. paddle wheel type, floating element type, etc.)



Pressure Loss

Continual Maintenance

Contamination

The moving parts lead to pressure losses. Also, continual maintenance is required to prevent clogging around the moving parts.

### Thermal Types



Pressure Loss

Extra Maintenance

Unstable Readings

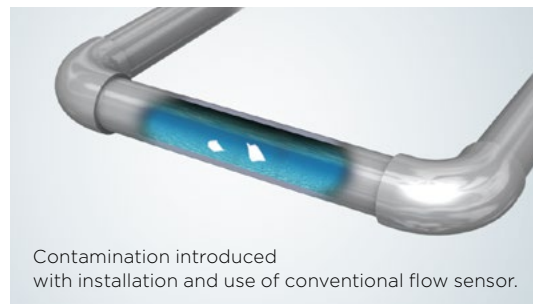
Temperature variations often lead to unstable readings. The probe portion of the sensor also causes pressure losses and requires continual maintenance.

## INNOVATIVE CLAMP-ON DESIGN PREVENTS THESE COMMON ISSUES

The clamp-on style of the FD-Q prevents pressure losses, contamination, and excessive downtime associated with conventional flow sensors. This is due to the non-contact, clamp-on design of the FD-Q Series.



Pressure loss caused by sensor impeding flow.



Contamination introduced with installation and use of conventional flow sensor.

# EASY TO SET UP AND USE

## 1 Display Selection

### □ EASY TO READ DISPLAYS



## 2 I/O Selection

### □ SELECTABLE I/O

1 Control  
Output

2 Control  
Outputs

1 Control Output  
+ 1 External Input

1 Control Output  
+ 1 Analog Output

## 3 Operation Mode Selection

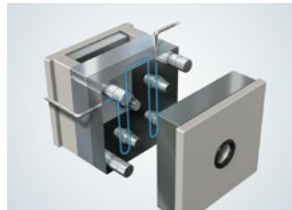
### □ SELECTABLE OPERATION MODES



#### Typical flow control

[ STANDARD ]

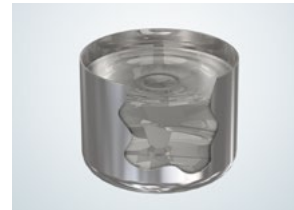
Output turns ON below or above a user defined threshold



#### Flow rate monitoring

[ AREA ]

Output turns ON outside of a user defined window



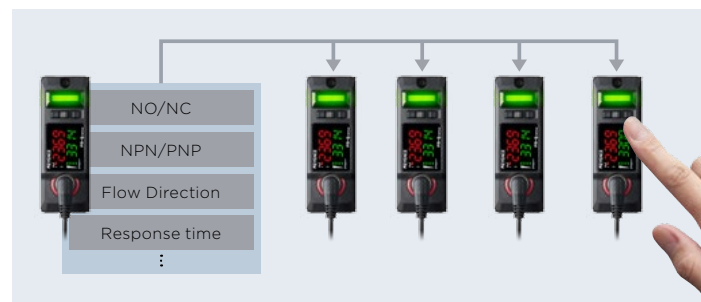
#### Consumption management

[ ACCUMULATION ]

Output turns ON after a user defined amount of flow has passed

## 4 Sensor Settings Duplication

### □ QUICK SETTING CODE



Easily copy the settings from one sensor to a new one by simply inputting an 8 digit code.



# ADDITIONAL FEATURES

## WITHSTAND HARSH ENVIRONMENTS



IP65: Light Washdown IP67: Submersion in Water

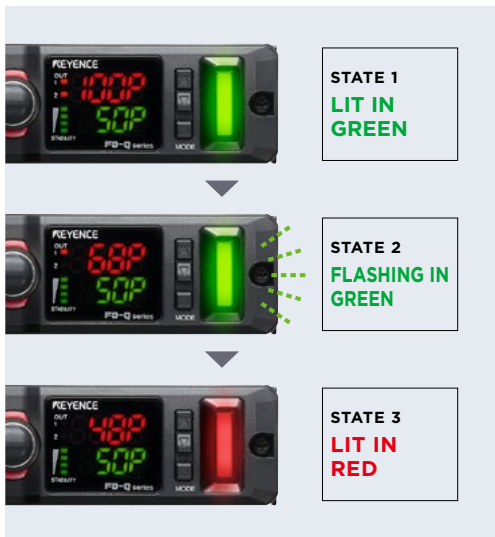
High water resistance enables use in even the harshest environment

## COMPACT DESIGN



The slim design enables mounting in close proximity or in tight spaces

## 3 STATE LARGE INDICATOR



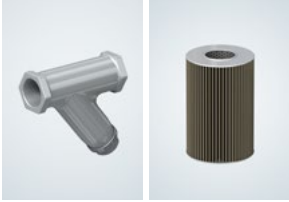

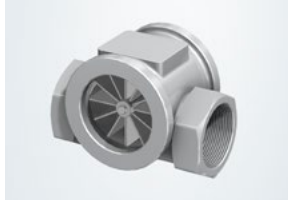






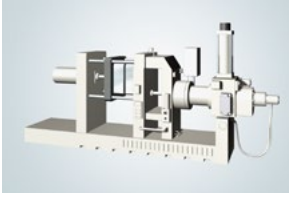


The FLASHING indicator is useful for indicating the need for Preventive Maintenance (PM)

## SIMULATION MODE



Easily test the operation of the outputs without the need for actual flow

# OTHER PLACES TO MOUNT AND SPECIFIC USAGES

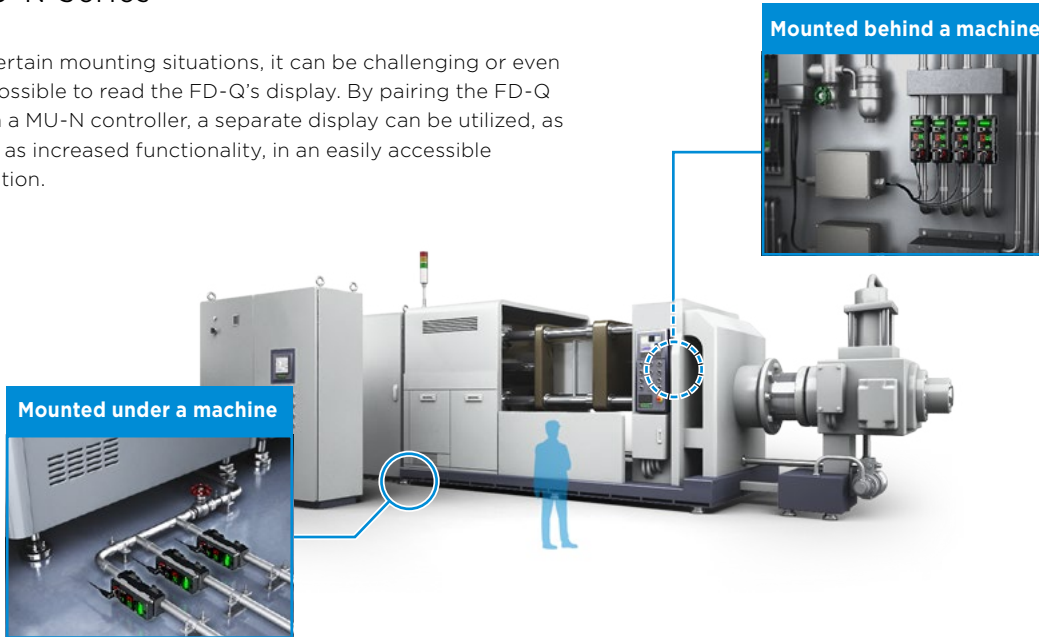
<p><b>NEAR IMPORTANT EQUIPMENT</b></p>	<p><b>FILTER</b></p>  <p>Filter contamination or saturation can lead to a decrease in flow</p>	<p><b>BALL/NEEDLE VALVE</b></p>  <p>Valve positioning may be incorrect or left unopened due to operator error</p>	<p><b>CURRENT SENSOR</b></p>  <p>The mechanical portion of these flow sensors may cause inconsistencies in flow rates</p>
<p><b>DIFFICULT MOUNTING SITUATIONS</b></p>	<p><b>DIVERGING PIPES</b></p>  <p>Mounting several flow sensors in close proximity was nearly impossible with bulky conventional flows sensors</p>	<p><b>BACK OF THE MACHINE</b></p>  <p>These tight spaces made pipe modification problematic</p>	<p><b>HIGH PRESSURE PIPES</b></p>  <p>These pipes are hard to modify and require pressure resistant sensors</p>
<p><b>SPECIFIC FLUID</b></p>	<p><b>CHEMICALS</b></p>  <p>Pipe modifications can cause unsafe exposure to hazardous chemicals</p>	<p><b>EASILY CONTAMINATED LIQUIDS</b></p>  <p>The detection of flow where contact with the flow sensor can cause contamination</p>	<p><b>PROPRIETARY FLUIDS</b></p>  <p>Controlling the amount of flow for proprietary fluids is needed to prevent costly waste</p>
<p><b>OTHER USAGES</b></p>	<p><b>CONTRACTED EQUIPMENT</b></p>  <p>Pipe modifications may not be possible if the equipment is contracted</p>	<p><b>MACHINE WITH WARRANTY</b></p>  <p>Physical changes made to the equipment could potentially void the machine warranty</p>	<p><b>KEEPING PROCESS NOTES</b></p>  <p>Requiring an operator to keep process notes is costly and inefficient.</p>

# Remote Display with Added Functionality



## Multi-Sensor Controller MU-N Series

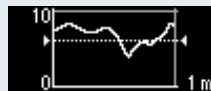
In certain mounting situations, it can be challenging or even impossible to read the FD-Q's display. By pairing the FD-Q with a MU-N controller, a separate display can be utilized, as well as increased functionality, in an easily accessible location.



## Intuitive Displays

The MU-N features a clear, OLED display that offers real time graphing for simplified flow monitoring.

Minute Trends



Day Trends



## Settings Back-Up Function

The Settings Back-Up Function allows users to save sensor settings on the MU-N and quickly transfer them to new sensors.

Transfer settings



## Sensor Identification Function

Easily identify which FD-Q is connected to a given MU-N controller by making that unit's indicator flash.

Quickly recognize which sensor is connected.



## Network Compatibility

By combining the MU-N Series with the KEYENCE NU Series, users can transmit data over a standard industrial network.

EtherNet/IP™

CC-Link V2

DeviceNet™



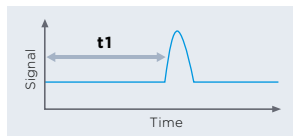
# OPERATING PRINCIPLE AND TECHNOLOGY

## BASIC OPERATING PRINCIPLE

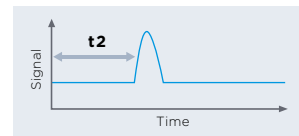


The FD-Q measures the time it takes an ultrasonic signal to transmit from point A on the sensor to point B ( $t_1$ ). When the flow rate increases, the signal is accelerated, leading to less time for the transmission from A to B ( $t_2$ ). Using the correlation between the time duration and the speed of the flow, the FD-Q measures the instantaneous flow rate.

### LOW FLOW



### HIGH FLOW



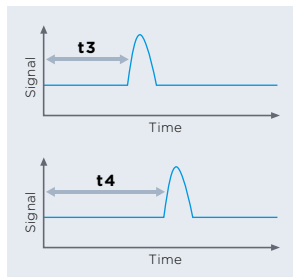
## TECHNOLOGY FOR STABLE DETECTION

### □ dTOF technology

Conventional ultrasonic flow sensors are known for their unstable detection. This is due to the fact that the speed of the ultrasonic signal is not only affected by the flow of the liquid, but also external factors such as clogging or temperature change. Instead of simply measuring the duration of a single pulse, FD-Q emits and receives two different sets of ultrasonic pulses. One traveling from A to B and the other traveling from B to A. By doing this, the FD-Q can stably monitor flow by comparing the two signal. This method of detection minimizes the effects of any external factors.

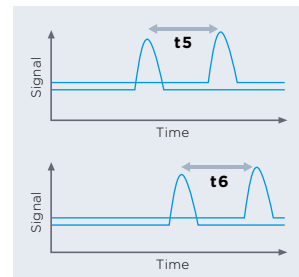
#### Basic Principle

The duration of the pulse is easily influenced by external factors.



#### Delta TOF

External factors do not affect detection as the time DIFFERENCE between A to B and B to A remains the same.



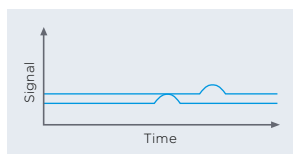
### □ DSS Function

The stable transmission of the ultrasonic signal is imperative for consistently stable detection. Build up or rust on the inside a pipe can become problematic overtime for conventional flow sensors. By utilizing the DSS Function, the FD-Q automatically adjusts its power to compensate for this build-up and provide long periods of stable detection.

#### [What happens after any clogging occurs or the pipe rusts]

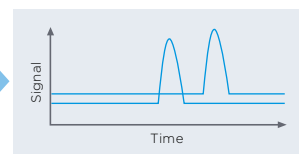
##### Without DSS

The received ultrasonic waves become weaker, leading to unstable detection.















##### With DSS

When FD-Q recognizes weak signals, it automatically increases the power of the ultrasonic pulses.




LINEUP

■ Sensor



Appearance	Model	Rated flow range	Connection Bore Diameter
	FD-Q10C	20 L/min 5.2 gal/min 	1/4"(8 A) ø13 mm to ø16 mm
		30 L/min 7.9 gal/min 	3/8"(10 A) ø16 mm to ø18 mm
	FD-Q20C	60 L/min 15.9 gal/min 	1/2"(15 A) ø18 mm to ø23 mm
		100 L/min 26.4 gal/min 	3/4"(20 A) ø23 mm to ø28 mm
	FD-Q32C	200 L/min 52.8 gal/min 	1"(25 A) ø28 mm to ø37 mm
		300 L/min 79.3 gal/min 	1 1/4"(32 A) ø37 mm to ø44 mm
	FD-Q50C	400 L/min 105.7 gal/min 	1 1/2"(40 A) ø44 mm to ø52 mm
		500 L/min 132.1 gal/min 	2"(50 A) ø52 mm to ø64 mm

■ Protection cover

Appearance	Model	Name	Material
	FD-QP1	Display Protection Cover	Polysulfone

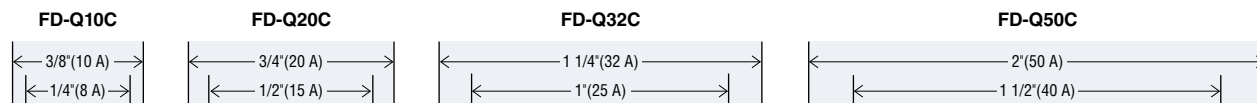
When using the sensor without the controller: Select a suitable power supply cable from the table below.

■ Power supply cable

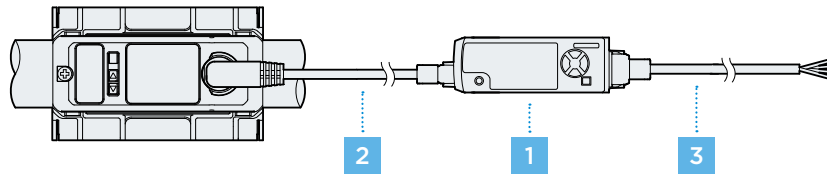
Appearance	Model	Material	Connector type	Cable termination	Length
	OP-75722	PVC (Polyvinyl chloride)	M12 4 pins L-shape	Loose wire	2 m 6.6'
	OP-87274				10 m 32.8'
	OP-87640	PUR (Polyurethane) (Oil Resistant)	M12 4 pins L-shape	Loose wire	2 m 6.6'
	OP-87641				10 m 32.8'

**Bore Diameter Guide [The diagrams below display the applicable pipe widths]**

(Each model contains a mounting bracket that can accommodate two different pipe sizes)



**When using the sensor with the controller:** Select a controller and the appropriate cables from the tables below.



### 1 Controller

Appearance	Model	Type	Control output	External input	Analog output
	MU-N11	Main unit	2 outputs max.	1 input max.	1 output max.
	MU-N12	Expansion unit			—

\* Power supply cable is not included.

### 2 Sensor-to-controller cable

Appearance	Model	Cable material	Sensor side	Controller side	Length
	OP-88027	PVC (Polyvinyl chloride)	M12 4-pin L-shape	Connector	2 m 6.6'
	OP-88028*				10 m 32.8'

\* The 10 m 32.8' cable includes one spare connector for the controller side.

### 3 Power supply cable for controller

Appearance	Model	Applicable unit	Cable material	Controller side	Cable end	Length
	MU-CB4	Main unit	PVC (Polyvinyl chloride)	Connector	4-core loose wires	2 m 6.6'
	MU-CB2	Expansion unit			2-core loose wires	2 m 6.6'
	MU-CC4	Main unit			M12 4-pin straight	0.3 m 1.0'

### Optional accessories

Appearance	Model	Type	Applicable model	Description
	OP-76877	Mounting adapter (for main unit)	MU-N11	Allows the main unit to be mounted without a DIN rail.
	OP-26751	End unit (for expansion)	MU-N11/N12	Used to secure the main and expansion units to DIN rail from both ends. End units must be used when an expansion unit is connected. (2 pieces included)
	OP-88029	Connector set for sensor-to-controller connection for PVC (Polyvinyl chloride) cable	OP-75722/87274	This set is required when the sensor cable end is loose wires or when the sensor-to-controller cable is cut.
	OP-88030	Connector set for sensor-to-controller connection for PUR (Polyurethane) cable	OP-87640/87641	



SPECIFICATIONS

■ Sensor

Model		FD-Q10C		FD-Q20C		FD-Q32C		FD-Q50C	
Supported pipe diameter	Outer diameter of pipe (mm)	ø13 to ø16	ø16 to ø18	ø18 to ø23	ø23 to ø28	ø28 to ø37	ø37 to ø44	ø44 to ø52	ø52 to ø64
	NPS (Nominal Pipe Size)	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DN (Diameter Nominal)		8 A	10 A	15 A	20 A	25 A	32 A	40 A	50 A
Supported pipe materials		Metal pipe/Resin pipe*1							
Supported fluids		Various liquid [i.e. water (including DI), oils, chemicals, etc.]*1							
Supported fluid temperature (Pipe surface temperature)		0 to 85°C 32 to 185°F (No freezing on the pipe surface)*2							
Maximum rated flow		20 L/min 5.2 gal/min	30 L/min 7.9 gal/min	60 L/min 15.9 gal/min	100 L/min 26.4 gal/min	200 L/min 52.8 gal/min	300 L/min 79.3 gal/min	400 L/min 105.7 gal/min	500 L/min 132.1 gal/min
Zero cut flow rate (Default) *3		1.0 L/min		2.5 L/min		5 L/min		25 L/min	
Display method		Status indicator, output indicator, dual row display with 4-digit, 7 segment LED, stability level indicator							
Display update cycle		Approx. 3 Hz							
Display resolution (L/min)		0.01/ 0.1/ 1 (Default: 0.1)		0.1/ 1 (Default: 0.1)		0.1/ 1 (Default: 1)			
Response time		0.5 s / 1.0 s / 2.5 s / 5 s / 10 s / 30 s / 60 s							
Repeatability /F.S.*4 (Specific to selected response time)		0.5 s:±2.0%, 1 s:±1.5%, 2.5 s:±1.0%, 5 s:±0.5%, 10 s:±0.35%, 30 s:±0.2%, 60 s:±0.15%							
Hysteresis		Variable							
Integrated flow unit display (L)		0.1/ 1/ 10/ 100/ 1000 (Default: 1)				1/ 10/ 100/ 1000/ 10000 (Default: 1)			
Integrated flow 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)							
Power I/O connector		M12 4-pin connector							
Input/ Output (Selectable)*5	Output (ch.1/ch.2)	Control output/ Pulse output/ Error output (Selectable, Default: ch.1 control output/ ch.2 not used), NPN/PNP setting switchable, open collector output 30 V or less, max. 100 mA/ch., residual voltage 2.5 V or less							
	Analog output (ch.2)	4 to 20 mA/0 to 20 mA (Selectable, Default: not used), load resistance 500 Ω or less							
	External input (ch.2)	Integrated flow reset input/ Flow rate zero input/ Origin adjustment input (Selectable, Default: not used), short-circuit current 1.5 mA or less, input time 20 ms or more							
Power source	Power supply voltage	20 to 30 VDC, ripple (P-P) 10% max, Class2/LPS							
	Current consumption	100 mA or less (Load current excluded)*6				130 mA or less (Load current excluded)*6			
Protection circuit		Power supply reverse connection protection, power supply surge protection, each output short-circuit protection, each output surge protection							
Environmental resistance	Enclosure rating	IP65/IP67 (IEC60529)							
	Ambient temperature	-10 to 60°C 14 to 140°F (No freezing)							
	Ambient 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							
Material	Shock resistance	100 m/s <sup>2</sup> 16 ms pulse X, Y, Z 1000 times for each axis							
	Sensor main unit	PPS/PES/PBT/SUS303/SUS304/SUSXM7							
	Sensor surface	Rubber							
	Mounting bracket	SUS304/PA/SUSXM7				SUS304/PA/POM/SUSXM7			
Weight (including mounting bracket)		Approx. 340 g		Approx. 400 g		Approx. 530 g		Approx. 640 g	

\*1 Liquid must allow for the passage of an ultrasonic pulse, as well as not contain large air pockets or excessive bubbles. Detection may be unstable on certain non-standard pipes. (i.e. lined pipes)

\*2 Contact KEYENCE when the temperature of the pipe is greater than 85°C 185°F.

\*3 The zero cut flow rate can be changed in the settings. When using the unit with a low flow rate range, perform an origin adjustment when the fluid is not moving if you change the zero cut flow rate.

\*4 This specification is valid when the flow velocity distribution is stable. This value does not take into account the effects of pulsation or fluctuations in flow velocity distribution due to facility factors. Convert the F.S. (full scale) listed in the table according to the rated flow range.

\*5 IO-Link: Compatible with Specification v1.1 / COM2 (38.4 kbps) The setting file can be downloaded from the KEYENCE website. (<http://www.keyence.com>) If using the unit in the environment where downloading the file is not possible via internet, contact your nearest KEYENCE office. IO-Link is either registered trademarks or trademarks of PROFIBUS Nutzerorganisation e.V. (PNO)

\*6 When including the loads, please add 200 mA to this value.

■ Controller

Model		MU-N11		MU-N12	
Type		Main unit		Expansion unit	
Response time		0.5 s / 1.0 s / 2.5 s / 5 s / 10 s / 30 s / 60 s			
Power supply	Power voltage	24 VDC, ripple (P-P) 10% or less, Class 2 or LPS			
	Current consumption	with FD-Q10C/Q20C	170 mA or less (without load)*1		155 mA or less (without load)*2
		with FD-Q32C/Q50C	200 mA or less (without load)*1		185 mA or less (without load)*2
Input/Output (Selectable)	Output (ch.1/ch.2)	Control output/Pulse output/Error output (Selectable, Default: ch.1 control output/ch.2 not used), NPN/PNP setting switchable, open collector output 24 V or less, Main unit: max. 50 mA/ch.*3, Expansion unit: 20 mA/ch., residual voltage 2 V or less			
	Analog output (ch.2)	4 to 20 mA, load resistance: 450 Ω or less/0 to 10 V		—	
	External input (ch.2)	Integrated flow reset input/Flow rate zero input/Origin adjustment input (Selectable, Default: not used), short-circuit current NPN: 1 mA or less/PNP: 2 mA or less			
Protection circuit		Protection against reverse power connection, power supply surge, output overcurrent, output surge, and reverse output connection			
Unit expansion		Up to 4 units per main unit*4			
Environmental resistance	Ambient temperature	-20 to +50°C -4 to 122°F (no freezing)			
	Ambient humidity	35 to 85%RH (no condensation)			
	Shock resistance	1000 m/s <sup>2</sup> in X, Y, Z axis directions respectively 6 times			
	Vibration resistance	10 to 55 Hz Double amplitude 1.5 mm 0.06* in the X, Y, Z axis directions respectively, 2 hours			
Material		Case and dust cover: Polycarbonate, Button: Polyacetal, Display panel: Acrylic			
Weight		Approx. 70 g			

\*1 When including the loads, please add 100 mA to this value.

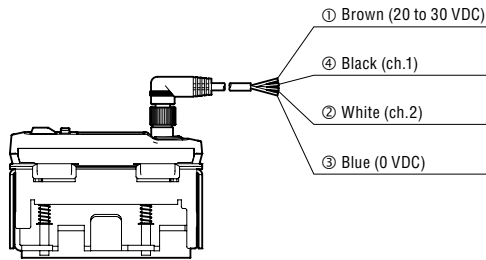
\*2 When including the loads, please add 40 mA to this value.

\*3 20 mA/ch. or less when an expansion unit is connected.

\*4 Up to 5 N-bus devices, including the main unit (or network unit), can be linked together.

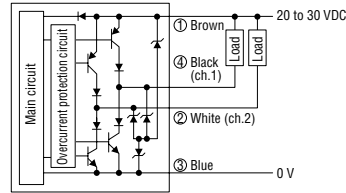
## I/O CIRCUIT DIAGRAM

### When using the sensor without the controller

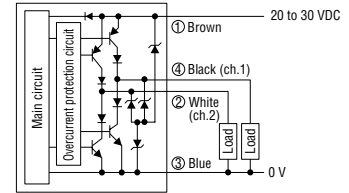


#### ■ When "Control Output" is selected for ch.2\*

When NPN is selected

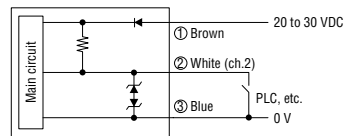


When PNP is selected

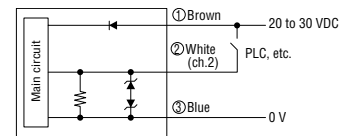


#### ■ When "External Input" is selected for ch.2\*

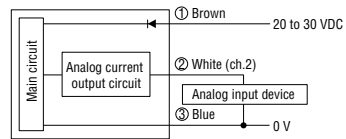
When NPN is selected



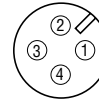
When PNP is selected



#### ■ When "Analog Output" is selected for ch.2\*

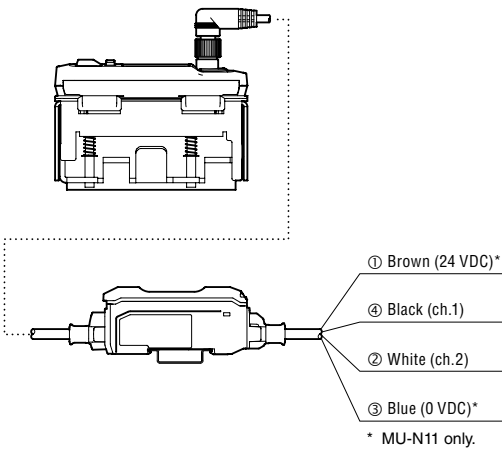


#### ■ M12 Connector pin layout



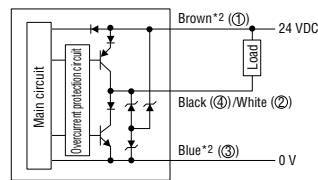
\* When "OFF" is selected for ch.2 (default), ② White will not be used.

### When using the sensor with the controller

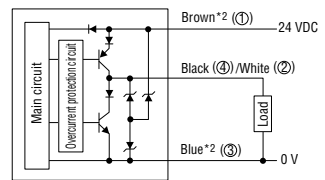


#### ■ When "Control Output" is selected for ch.2\*<sup>1</sup>

When NPN is selected

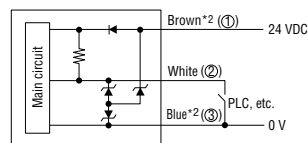


When PNP is selected

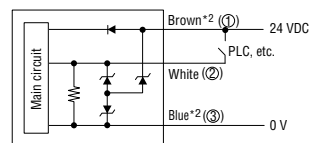


#### ■ When "External Input" is selected for ch.2\*<sup>1</sup>

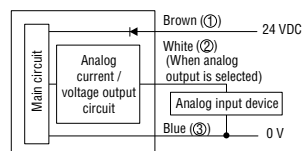
When NPN is selected



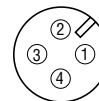
When PNP is selected



#### ■ When "Analog Output" is selected for ch.2\*<sup>1</sup><sup>2</sup>



#### ■ Pin layout when the M12 connector (4-pin) cable is used



\*<sup>1</sup> When "OFF" is selected for ch.2 (default), ② White will not be used.

\*<sup>2</sup> MU-N11 only.

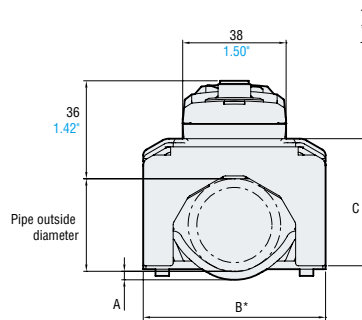
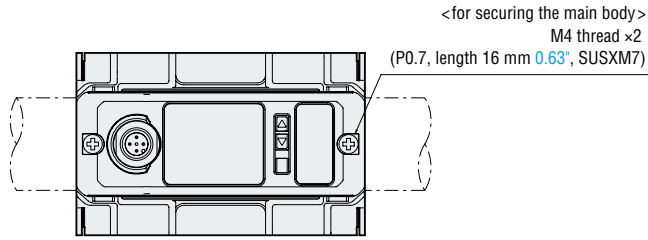
## DIMENSIONS

Unit: mm inch

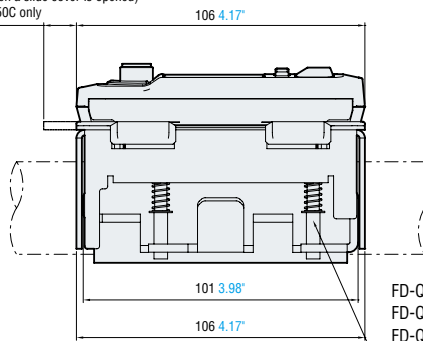
### Sensor

Model	A	B	C
FD-Q10C	2* 0.08"	38 1.50"	25.3 1.00"
FD-Q20C	max.2.5 0.10"	48 1.89"	30 1.18"
FD-Q32C	max.4.2 0.17"	67 2.64"	46.7 1.84"
FD-Q50C	max.3.6 0.14"	88 3.46"	56 2.20"

\* When installing the unit on a 1/4" pipe, the threaded portion of the screw will protrude by approximately 0.8 mm 0.03".



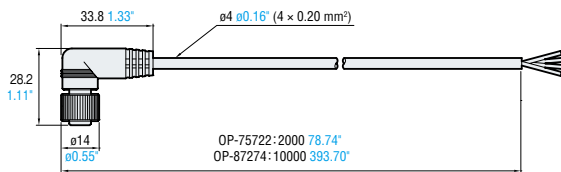
12 0.47" (When a slide cover is opened)  
\* FD-Q32C/Q50C only



\* When using the FD-Q10C, the width of the sensor and the bracket are the same.

<for securing the bracket>  
FD-Q10C : M4 thread x4 (P0.7, length 13 mm 0.51", SUSXM7)  
FD-Q20C : M4 thread x4 (P0.7, length 19 mm 0.75", SUSXM7)  
FD-Q32C : M5 thread x4 (P0.8, length 30 mm 1.18", SUSXM7)  
FD-Q50C : M5 thread x4 (P0.8, length 38 mm 1.50", SUSXM7)

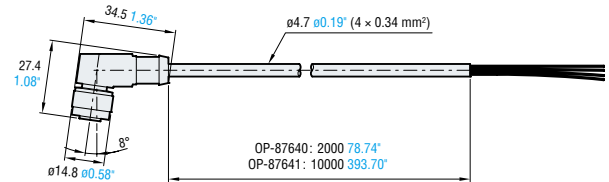
### M12 connector cable PVC (polyvinyl chloride) OP-75722/87274



#### Pin layout

No.	Color
①	Brown
②	White
③	Blue
④	Black

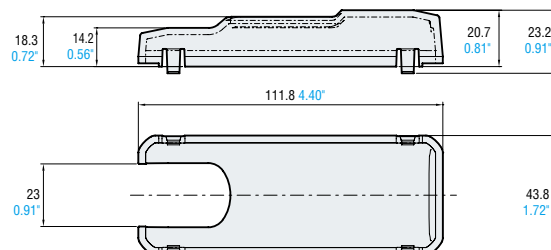
### M12 connector cable PUR (polyurethane) OP-87640/87641



#### Pin layout

No.	Color
①	Brown
②	White
③	Blue
④	Black

### Protective cover FD-QP1



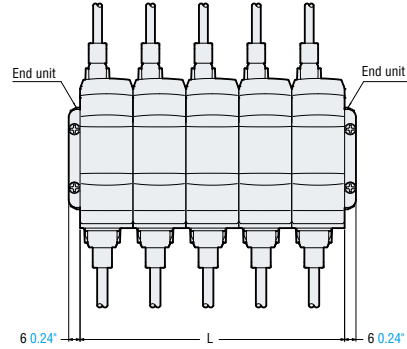
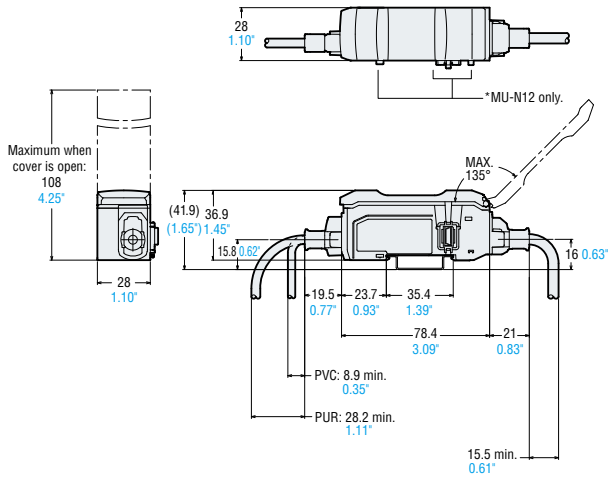
## DIMENSIONS

Unit: mm inch

### Controller

#### MU-N11 (Main unit)/ MU-N12 (Expansion unit)

When expansion units are connected

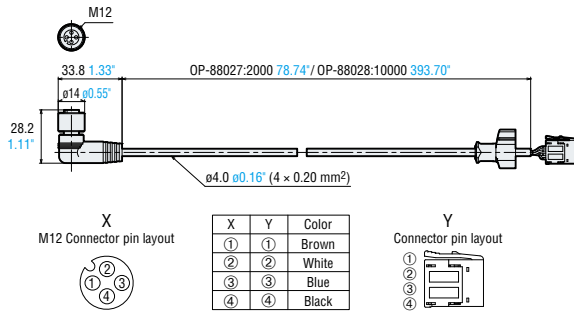


\* End units must be used when an expansion unit is connected. (OP-26751)

No. of expansion units	L
1	28 (1.10")
2	56 (2.20")
3	84 (3.31")
4	112 (4.41")
5	140 (5.51")

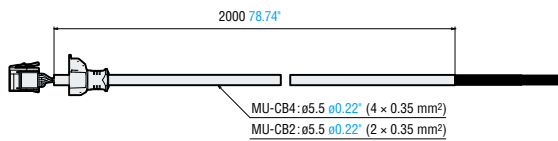
### Sensor-to-controller cable

#### OP-88027/88028

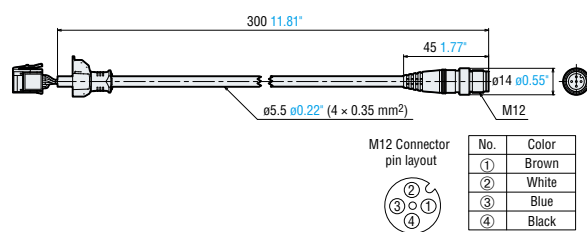


### Power supply cable for controller

#### MU-CB4/CB2



#### MU-CC4



## PRECAUTIONS FOR INSTALLATION

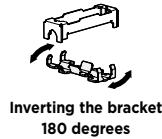
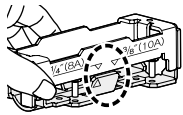
### Installation method

#### STEP1 Align the base bracket direction according to the bore diameter.

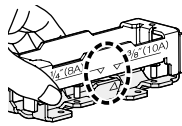
- By inverting the base bracket 180 degrees, supported diameters will change.
- Align the bore diameter of the pipe to be used with the corresponding diameter printed on the sides of upper and base brackets.

(Example of FD-Q10C)

[1] 1/4" (8A)



[2] 3/8" (10A)

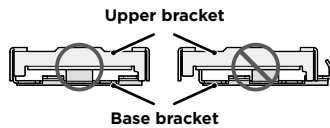


#### Available bore diameters for each model

Model	[1]	[2]
FD-Q10C	1/4"(8A) $\phi$ 13 mm to $\phi$ 16 mm	3/8"(10A) $\phi$ 16 mm to $\phi$ 18 mm
FD-Q20C	1/2"(15A) $\phi$ 18 mm to $\phi$ 23 mm	3/4"(20A) $\phi$ 23 mm to $\phi$ 28 mm
FD-Q32C	1"(25A) $\phi$ 28 mm to $\phi$ 37 mm	1 1/4"(32A) $\phi$ 37 mm to $\phi$ 44 mm
FD-Q50C	1 1/2"(40A) $\phi$ 44 mm to $\phi$ 52 mm	2"(50A) $\phi$ 52 mm to $\phi$ 64 mm

#### Point

Align the position so the base bracket is completely covered by the upper bracket.



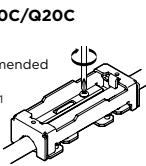
#### STEP2 Fix the brackets to the pipe.

Point Secure the brackets together uniformly to prevent uneven mounting.

#### FD-Q10C/Q20C

M4

Recommended torque: 1.5 N·m<sup>1</sup>

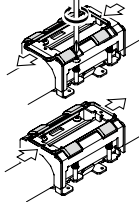


#### FD-Q32C/Q50C

M5

Recommended torque: 1.5 N·m<sup>1</sup>

After the brackets are fixed, shift the slide cover to the center.

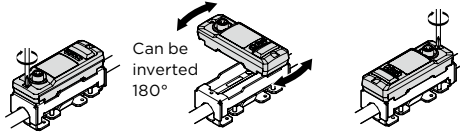


#### STEP3 Fix the sensor main unit to the brackets.

Point Secure the main unit uniformly to prevent uneven mounting.

M4

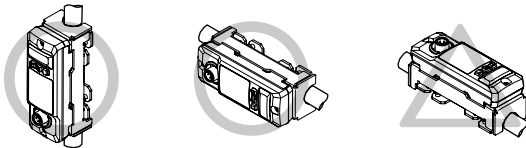
Recommended torque: 1.0 N·m<sup>1</sup>



[Reference] The flow direction relative to the sensor main unit can be changed in the settings.

<sup>1</sup> Do not exceed recommended torque rating. Apply torque until the unit is sufficiently secured to the pipe. If you are mounting to thin-walled metal pipes or brittle resin pipes, contact KEYENCE for detail as damage may occur to the pipe even under the recommended torque rating.

### Precautions for piping and installation



- Installing the sensor as above ( $\Delta$ ) is not recommended, because the detection becomes unstable when the pipe is not completely filled with fluid.
- If there is rust or contaminants on the pipe surface, please try to remove it prior to installation or move the unit to an area without these characteristic.
- When installing the sensor, ensure that there are no seams in line with the main unit of the sensor.
- To improve the detection stability, it is recommended that the sensor be installed in a location with straight sections of pipe upstream that are at least five times the length of the inside diameter.

### General cautions



- Do not use the FD-Q Series out of the specification ranges. Comply with the contents described in the instruction manual when using the product.
- Do not use the FD-Q Series for facilities where death or serious property damage is possible, such as nuclear power generation, aircraft, railway, ship, vehicles, medical equipment, playground equipment, etc.
- Do not use this product for the purpose of protecting a human body or a part of human body.
- This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.



- Do not modify the FD-Q Series.

### Precautions for handling



- When installing the FD-Q Series on a high-temperature pipe, the main unit can become hot. Be careful not to burn yourself.



- Do not drop the FD-Q Series, hit it against something, or apply excessive force.
- Do not use a sharply pointed object to press the setting keys.

### Precautions for detectable fluid



- High-viscosity, high-turbidity, or sparkling fluid may cause unstable detection. Keep this in mind before using.
- When the fluid temperature rises or pressure is reduced, air bubbles may form in the fluid within the pipe, resulting in unstable detection.

### Precautions for wiring



- Before wiring the FD-Q Series, check the colors of wires.
- Use the FD-Q Series within the rated range. The FD-Q Series is a product that uses a DC (direct current) power source. Do not apply AC (alternating current) or other power supplies. Do not use a load that exceeds the allowable limit.
- If the temperature of the pipe exceeds 80°C/176°F, arrange the cable so it does not come in contact with the pipe.



- Use an insulated stabilizing power supply.
- Do not apply excessive tensile force to the cable.
- Ensure that the cable tip is not submerged in water during wiring work.
- Isolate the cable from power supply lines or power lines when wiring.
- Isolate the cable as far away as possible from any source of noise.
- Do not use a cable longer than 20m/65.62' in length.

### Precautions for installation



- Do not install the FD-Q Series in locations used as footholds.



- Install the FD-Q Series at a location where the inside the measuring pipe is always filled with the fluid.
- To prevent a situation where the FD-Q Series is affected by air bubbles or the pipe not being filled with fluid, it is recommended to secure it in a position where the display surface is perpendicular to the ground.
- Arrange piping so that gas does not enter it. When the fluid contains bubbles, detection performance of the FD-Q may be affected.
- When installing the FD-Q Series on a vertical pipe, choose the position where the fluid flows in the upward direction.
- To improve the detection stability, it is recommended that the sensor be installed in a location with straight sections of pipe upstream that are at least five times the length of the pipe inside diameter.
- Install the sensor on the upstream side of a flow regulating valve, etc.
- Install the FD-Q Series on a surface with no seams or rust.
- Do not install the FD-Q Series in a location exposed to intense light, such as direct sunlight, or radiation from a heat source.
- Do not install the FD-Q Series at a location where it may become submerged in a liquid.
- When installing the FD-Q Series at a location where vibrations occur, fix the pipe with tubes or supports as close to the main unit as possible. Excessive vibration may cause unstable operation.
- To avoid interference of detection signals, do not install multiple units closely in series.

### Other precautions



- When power is applied to the sensor, it enters a 6 second "start-up" process before it is ready to use. Do not use the outputs from the sensor during this period.
- Initial drift may occur after the power is turned on. To detect a subtle difference in the flow rate, let the FD-Q Series warm up for approx. 15 to 30 minutes before use.
- Do not bring a strong magnet or magnetic field close to the main body of the FD-Q Series.



The FD-Q Series cannot be used as a measuring instrument for measurement in business deal or certification.

# KEYENCE Pressure Sensor Line-up

Self-Contained

Separate Amplifier

Liquid Type

Oil  
Water  
Mist

## GP-M Series

**[Pressure Range]**  
-29.9 inchHg to 5,802 PSI

**[Minimum Resolution]**  
0.1 inchHg/0.05 PSI

**[Outputs]**  
Control output  
(max. 2)  
Analog output  
(4 to 20 mA)



## AP-V80 Series

**[Pressure Range]**  
-29.9 inchHg to 7,250 PSI

**[Minimum Resolution]**  
0.01 inchHg/0.005 PSI

**[Outputs]**  
2 Control output  
Analog output  
(4 to 20 mA)



Air Type

Dry Air

## AP-C30 Series

**[Pressure Range]**  
-29.9 inchHg to 145 PSI

**[Minimum Resolution]**  
0.1 inchHg/0.05 PSI

**[Outputs]**  
1 Control output  
Analog output  
(1 to 5 V)



## AP-V40/C40 Series

**[Pressure Range]**  
-29.9 inchHg to 145 PSI

**[Minimum Resolution]**  
0.01 inchHg/0.005 PSI

**[Outputs]**  
Control output  
(max. 2)  
Analog output  
(4 to 20 mA)



\* Specification varies by each model. Please contact KEYENCE for detail.

# KEYENCE

CALL TOLL FREE TO CONTACT YOUR LOCAL OFFICE  
**1-888-KEYENCE**  
1 - 8 8 8 - 5 3 9 - 3 6 2 3

[www.keyence.com](http://www.keyence.com)



### SAFETY INFORMATION

Please read the instruction manual carefully in order to safely operate any KEYENCE product.

CONTACT YOUR NEAREST OFFICE FOR RELEASE STATUS

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<b>AL</b> Birmingham	<b>CA</b> San Jose	<b>CO</b> Denver	<b>IL</b> Chicago	<b>MI</b> Detroit	<b>MO</b> St. Louis	<b>NC</b> Raleigh	<b>PA</b> Philadelphia	<b>TN</b> Nashville	<b>WI</b> Milwaukee
<b>AR</b> Little Rock	<b>CA</b> Cupertino	<b>FL</b> Tampa	<b>IN</b> Indianapolis	<b>MI</b> Grand Rapids	<b>NJ</b> Elmwood Park	<b>OH</b> Cincinnati	<b>PA</b> Pittsburgh	<b>TX</b> Austin	
<b>AZ</b> Phoenix	<b>CA</b> Los Angeles	<b>GA</b> Atlanta	<b>KY</b> Louisville	<b>MN</b> Minneapolis	<b>NY</b> Rochester	<b>OH</b> Cleveland	<b>SC</b> Greenville	<b>TX</b> Dallas	
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