KEYENCE

Clamp-on Flow Sensor
FD-Q Series

NO PIPE MODIFICATION NECESSARY

Multi-Sensor Controller
MU-N Series

SPECIFICATIONS

Sensor

Model									
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 surfacetemperature)		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							
	Shock resistance	100 m/s² 16 ms pulse X, Y, Z 1000 times for each axis							
Material	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				
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 load resistance: 5 kΩ or more (Selectable, Default: not used)	—
	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/s² 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	

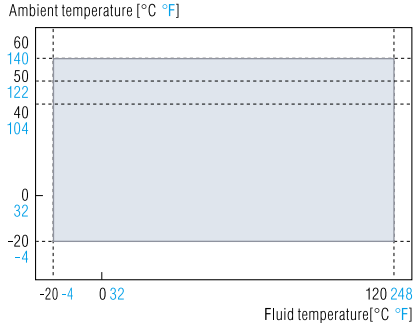
*1 When including the loads, please add 100 mA to this value.
*2 When including the loads, please add 40 mA to this value.
*3 20 mA/ch. or less when an expansion unit is connected.
*4 Up to 5 N-bus devices, including the main unit (or network unit), can be linked together.

SPECIFICATIONS

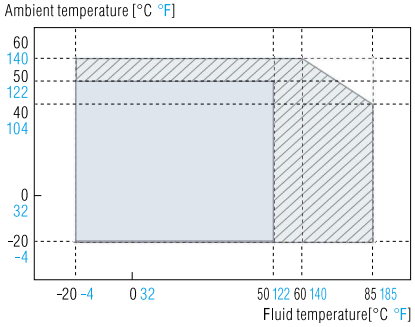
Model		FD-R50		FD-R80		FD-R125		FD-R200	
Supported pipe diameter	DN (Diameter Nominal)	40 A	50 A	65 A	80 A	100 A	125 A	150 A	200 A
	NPS (Nominal Pipe Size)	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"
	Outer diameter of pipe (mm)	ø44 to ø55 1.73" to 2.17"	ø55 to ø64 2.17" to 2.52"	ø64 to ø83 2.52" to 3.27"	ø83 to ø100 3.27" to 3.94"	ø100 to ø127 3.94" to 5.00"	ø127 to ø152 5.00" to 5.98"	ø152 to ø191 5.98" to 7.52"	ø191 to ø220 7.52" to 8.66"
Supported pipe materials		Metal/resin *1							
Supported fluids		Various liquids (i.e. water, oils, chemicals)*1							
Fluid temperature		-20 to +120°C -4.0 to +248 °F (no freezing on the pipe surface)*2							
Rated flow velocity range		5.0 m/s							
	Flow rate range (Typical)	(400 L/min 100 gal/min 24 m³/h)	(600 L/min 150 gal/min 36 m³/h)	(1000 L/min 260 gal/min 60 m³/h)	(1500 L/min 390 gal/min 90 m³/h)	(2500 L/min 660 gal/min 150 m³/h)	(3700 L/min 990 gal/min 220 m³/h)	(5500 L/min 1400 gal/min 330 m³/h)	(9500 L/min 2500 gal/min 570 m³/h)
Zero cut (default)*3		0.3 m/s							
	Flow rate (Typical)	(36 L/min 9 gal/min 2.4 m³/h)		(90 L/min 24 gal/min 5.4 m³/h)		(220 L/min 60 gal/min 12 m³/h)		(570 L/min 150 gal/min 36 m³/h)	
Display method		Dual row, 5-digit display with white, 14-segment LED; Large status indicator; Output indicators; Stability indicator; Unit indicator							
Display update cycle		Approx. 3 Hz							
Display resolution		0.1 / 1 (L/min)		1 (L/min)					
Response time		0.5 s / 1.0 s / 2.5 s / 5.0 s / 10.0 s / 30.0 s / 60.0 s / 120.0 s / 200.0 s (variable)							
Measurement accuracy	Between 20 and 100% of F.S.	±2.0% of RD *4, 5							
	Between 6 and 20% of F.S.	±0.4% of F.S.*4, 5							
Zero point error		±0.5% of F.S.*4, 6							
Hysteresis		Variable							
Flow units		L/min, m³/h, gal/min							
Integrated flow unit display		1/10/100/1000/10000 (L)							
Pipe temperature measurement accuracy (ambient operating temperature of 25°C 77°F)*4		±3°C ±5.4°F (liquid temperature of -20 to + 50°C, -4 to +122°F) ±5°C ±9°F (liquid temperature of 50 to +120°C, 122 to 248°F)							
Wiring specifications	Power supply	DC power supply: M12 4-pin connector/AC power supply: M4 screw terminal block (selectable)							
	I/O	When using a DC power supply: M12 4-pin connector/when using an AC power supply: M3 screw terminal block							
I/O *7 (selectable)	Control output (ch.1/ch.2)	Control output/Integrated pulse output/Error output/Temperature alarm, NPN/PNP setting switchable, open collector output 30 VDC or less, max. 100 mA/ch., residual voltage: 2.5 V or less							
	Analog output (ch.1/ch.2)	Flow rate analog output/Temperature analog output and 4-20 mA / 0-20 mA (selectable), load resistance: 500 Ω or less							
	External input (ch.2)	Integrated flow reset input/Flow rate zero input/Origin adjustment input (selectable), short-circuit current: 1.5 mA or less, input time: 20 ms or more							
Rating	Power supply voltage	20 to 30 VDC including 10% ripple (P-P), Class 2/100 to 240 VAC - 15% or + 10%(50/60 Hz)							
	Current consumption	When using a DC power supply: 200 mA or less (load current excluded),400 mA or less (load current included) When using an AC power supply: 15 VA or less							
Protection circuit		Power supply reverse connection protection, Power supply surge protection, Short-circuit protection for each output, Surge protection for each output							
Environmental resistance	Enclosure rating	IP65/67(IEC60529), IP69K(ISO20653), Enclosure Type 4X(NEMA250)							
	Ambient temperature	-20 to +60°C -4.0 to 140 °F (no freezing)*2							
	Ambient humidity	5 to 90%RH (no condensation)							
	Vibration resistance	10 to 55 Hz, compound amplitude 1.5 mm 0.06", XYZ axes 2 hours for each axis							
	Shock resistance	100 m/s², 16 ms pulse, XYZ axes, 1000 times for each axis							
Material	Main unit	Body: aluminum die-casting + coating/PPS, display: reinforced glass, connectors: SUS304-equivalent							
	Unit rear	Rubber							
	Upper/lower bracket	SUS304							
Weight	Main unit	Approx. 1.0 kg							
	Upper/lower bracket (including sub unit)	Approx. 1.5 kg 3.31 lb		Approx. 2.0 kg 4.41 lb		Approx. 2.3 kg 5.07 lb		Approx. 2.5 kg 5.51 lb	
Main unit size		218.5 mm × 66.9 mm × 70.7 mm 8.60" × 2.63" × 2.78"							

*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 due to the type and status of the pipes.
*2 Perform derating depending on the ambient temperature and liquid temperature when using an AC power supply.
*3 The zero cut flow rate can be changed in the settings.
*4 This value is guaranteed by KEYENCE inspection facilities. Errors will be introduced by the type and status of the pipes, the type and temperature of the fluid, and the zero cut flow rate.
*5 This is the value when considering linearity + span error + repeatability in a stable environment of 25°C 77°F.
*6 It is possible to enhance the precision of zero point error by performing an origin adjustment.
*7 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 an environment where downloading the file is not accessible via Internet, contact your nearest KEYENCE office. IO-Link is either registered trademarks or trademarks of PROFIBUS Nutzerorganisation e.V. (PNO)

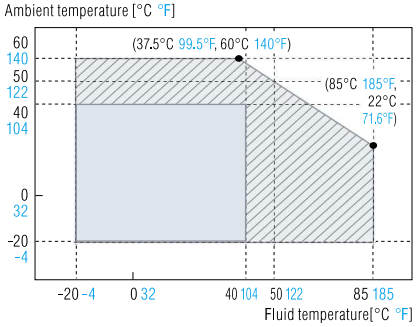
Temperature range when supplying DC power to the unit



Temperature range when supplying AC power to this product



Temperature range when supplying AC power to the unit and being exposed to radiation such as direct sunlight.



When using the FD-R Series in the temperature condition shown by oblique lines, use cables with heat resistance of 90°C 194°F or higher for the power cables and the I/O cables.