

Capacitance electromagnetic flow sensor

WFC

■ Flow rate sensor



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Flow rate sensor with "No clogging" Flo-Thru structure



No clogging of foreign matter

The Flo-Thru structure allows even water of poor quality to be used.

No detection failure

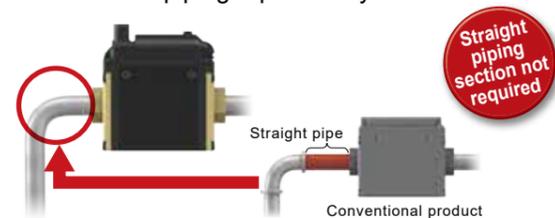
The capacitance structure reduces the likelihood of detection failures caused by foreign matter deposited onto the electrode.

Noise resistance

Stabilized power supply and anti-noise ferrite core are not required.

Improved installation

Ensures elbow piping repeatability.

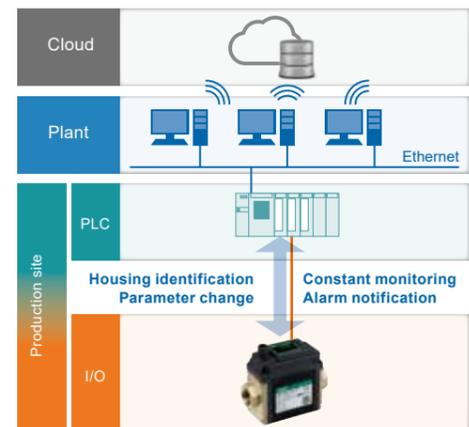


IO-Link model available



IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)

Unlike analog communication, it enables the transmission of parameters and event data.



Features of IO-Link

- Digital signal**: Constant monitoring via digital data is possible.
- Plug & Play**: The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.
- Parameter remote control**: Parameters can be set and changed via the network, enabling remote equipment operation.
- Error notification**: Device failure and disconnection can be confirmed.
- Housing identification**: Models, serial numbers, etc., can be confirmed on the network.
- Connection to fieldbus**: It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

Fluid temperature measuring function (option)

Saves space and wiring time with no need for a separately installed fluid temperature sensor.



Remote zero adjustment

Allows zero point adjustment by external input.



Allows parallel installation

Changing the mode allows parallel installation.



Max. working pressure 2.0 MPa

Usable even with medium pressure coolants.

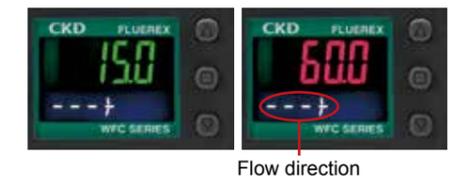
With 180° invertible display

It can be displayed flexibly to suit the device.



Improvement of visibility

The 2-color display and flow direction arrow allow easy recognition.



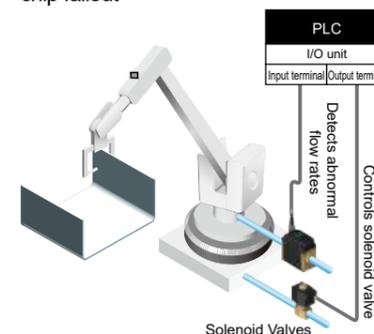
Easy setting

Settings can be easily changed using shortcut operation.

Examples of applications

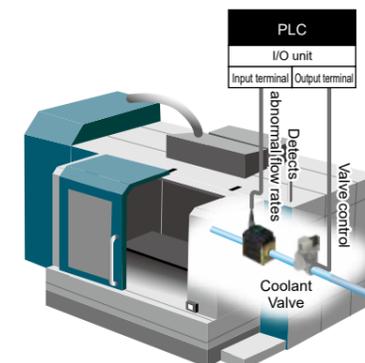
Welding Spot welding machine

Spot welding machine coolant control and flow rate abnormality detection for chip fallout



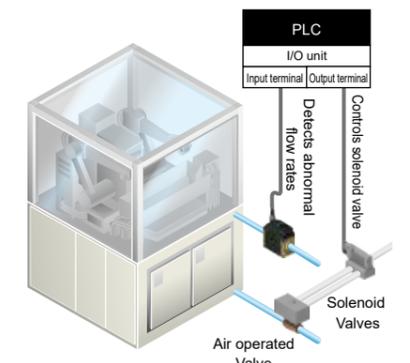
Machining Machine tools

Flow rate management of water-soluble coolant



Tempering Induction hardening device

Quantitative management of cooling water



Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

Ending

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

Ending



Capacitance electromagnetic flow sensor

WFC Series

Standard

● Flow rate range: 0.5 to 15 / 2.0 to 60 L/min

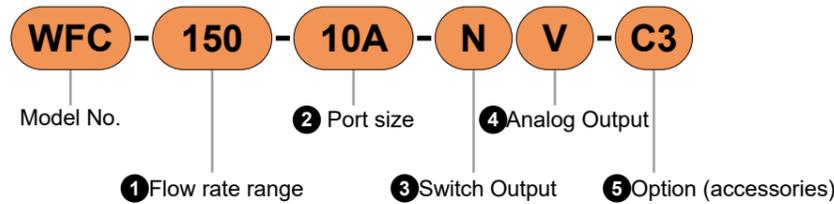


Refer to the CKD website for detailed compatible model Nos.

Specifications

Item	WFC-150		WFC-600	
	Rc3/8, G3/8, 3/8NPT	Rc1/2, G1/2, 1/2NPT	Rc3/4, G3/4, 3/4NPT	
Port size	Rc3/8, G3/8, 3/8NPT		Rc1/2, G1/2, 1/2NPT	Rc3/4, G3/4, 3/4NPT
Applicable fluid	Fluids (conductive fluids) that do not corrode water/wetted part materials			
Available fluid conductivity	5 μs/cm or more			
Detection	Capacitance			
Rated flow range	0.5 to 15 L/min		2.0 to 60 L/min	
Low flow cut flow rate *1	Measured range max. flow rate of 3%			
Working fluid temperature *2	0 to 85°C (no freezing)			
Unit indicated	Instantaneous flow rate L/min Accumulated flow L, kL, ML			
Repeatability *3	±2.0% F.S.			
Temperature characteristics	Ambient temperature characteristics *3		±5.0%F.S (base temperature 25°C)	
	Liquid temperature characteristics *3		±5.0%F.S (base temperature 25°C)	
Working pressure (according to the fluid temperature conditions) *2	0 to 1.0 MPa (0 to 85°C), 0 to 2.0 MPa (0 to 50°C)			
Proof pressure	3.0 MPa			
Response time *4	0.25 s, 0.5 s, 1 s, 2 s, 5 s (default 1 s)			
Accumulated flow range	0.0 to 99999999.9 L			
	0.1 L increments			
Pressure loss *5	0.02 MPa or less (at max. rated flow)			
Switch Output	NPN or PNP transistor output			
	Max. load current	50 mA		
	Max. applied voltage	30 VDC		
	Internal voltage drop	NPN: 2.0 V or less PNP: 2.4 V or less		
	Output protection	Overcurrent abnormal alarm, overcurrent protection		
	Output mode	Select from hysteresis mode, window comparator mode, integrated output mode, integrated pulse output mode, alarm output mode		
Analog Output	Output voltage	Voltage output: 1 to 5 V load impedance: 50 kΩ or more		
	Output current	Current output: 4 to 20 mA Load impedance: 500 Ω or less		
Switch input	Input time	20 ms or more		
	Short-circuit current	Approx. 2 mA		
Indicator	2-screen display (main screen: green/red 2-color LED, sub-screen: white) Screen flip possible Instantaneous flow rate: 3 digits Integrating flow: 4 digits Screen refresh cycle 5 times/sec			
Power supply voltage	24 VDC ±10% (ripple P-P ±10% or less)			
Current consumption	65 mA or less			
Environmental resistance	Degree of Protection	IP65 equiv. *6		
	Operating ambient temperature range	0 to 50°C (no condensation)		
	Ambient humidity range	35 to 85% RH (no condensation)		
Mounting orientation	Unrestricted in vertical/horizontal direction			
Compliant standards	EC Directives (EMC Directive, RoHS Directive)			
Material of wetted parts	PPS, FKM, CAC804, C6931			
Weight	Body *7	Approx. 460 g	Approx. 490 g	Approx. 520 g
	Cable	Cable	Approx. 170 g	
		L-type cable		
	Bracket	Approx. 30 g		

Model No. Notation Method



1 Flow rate range

Code	Description
150	0.5 to 15 L/min
600	2.0 to 60 L/min

2 Port size

Code	Description	1 Flow rate range	
		150	600
10*	3/8	●	
15*	1/2		●
20*	3/4		●
*Thread			
A	Rc thread		
G	G thread		
N	NPT thread		

3 Switch Output

Code	Description
N	NPN transistor output
P	PNP transistor output

4 Analog Output

Code	Description
V	Voltage output (1 to 5 V)
A	Current output (4 to 20 mA)

5 Option (accessories)

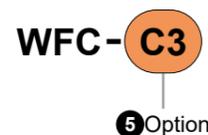
Code	Description
Blank	None
C3	Cable (M12/4-conductor/3 m) attached
L3	L-type cable (M12/4-conductor/3 m) attached
B	Bracket included

Note: Codes of attachments are not indicated in the product body model No. display section.

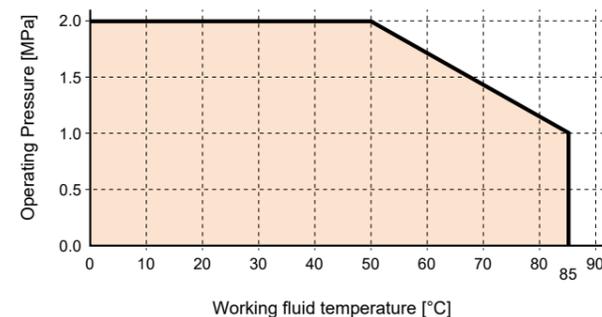
For example, with WFC-150-10A-NV-C3B
Product body (display): "WFC-150-10A-NV"
Cable (packaging display): "WFC-C3"
Bracket (packaging display): "WFC-B"

Of these three sets, "WFC-150-10A-NV-C3B" is displayed on the bag or box containing the entire package.

Discrete option (cable, bracket) model No.



Operating ambient temperature range



*1: If the flow rate is less than the low flow cut flow rate, 0 L/min is displayed.

*2: Fluid temperature when the working pressure is 0 to 1.0 MPa. When working pressure is 0 to 2.0 MPa, use with a fluid temperature of 0 to 50 °C. (Refer to the graph on the previous page for the usable range.)

*3: Characteristics when the response time is 1 s.

*4: The response time to reach 63% of the value in relation to the step input.

*5: JIS B 8570-1, ISO 4064-1 and ISO 4064-3.

*6: Degree of protection is when the cable option is mounted.

*7: When using options, add the weight of optional parts.

*8: For parallel installation at intervals of 50 mm or less, please consult with us.

*9: Piping port and body metal part are grounded to DC (-) / blue wire. This product cannot be used in (+) ground power supply. Contact CKD if using in (+) ground power supply.



Capacitance electromagnetic flow sensor

WFC Series

With IO-Link, fluid temperature measurement function

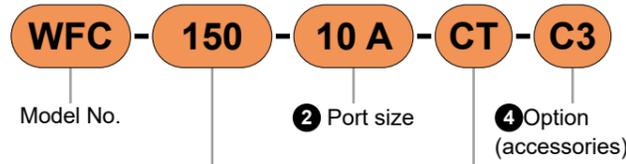
● Flow rate range: 0.5 to 15 / 2.0 to 60 L/min



Refer to the CKD website for detailed compatible model Nos.

Specifications with IO-Link, fluid temperature measurement function

Model No. Notation Method



1 Flow rate range 2 Port size 3 IO-Link/fluid temperature measurement 4 Option (accessories)

1 Flow rate range

Code	Description
150	0.5 to 15 L/min
600	2.0 to 60 L/min

2 Port size

Code	Description	1 Flow rate range	
		150	600
10*	3/8	●	
15*	1/2		●
20*	3/4		●
*Thread			
A	Rc thread		
G	G thread		
N	NPT thread		

3 IO-Link/fluid temperature measurement

Code	Description
C	IO-Link compatible
CT	With IO-Link compatible, fluid temperature measurement function
T	With fluid temperature measuring function

Note: Configuration to analog output/switch output is also possible. Refer to page 456 for details.

4 Option (accessories)

Code	Description
Blank	None
C3	Cable (M12/4-conductor/3 m) attached
L3	L-type cable (M12/4-conductor/3 m) attached
B3	Two-sided connector cable (M12/4-conductor/3 m) attached
G3	L-type two-sided connector cable (M12/4-conductor/3 m) attached
B	Bracket included

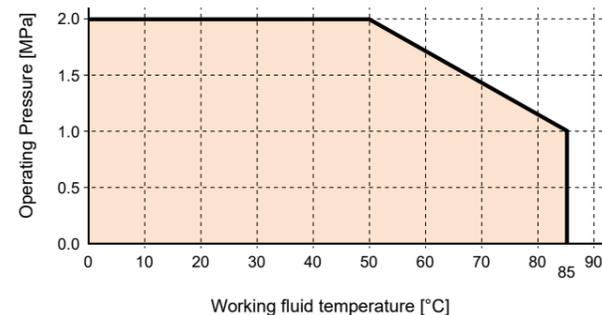
Note: Codes of attachments are not indicated in the product body model No. display section.
 For example, with WFC-150-10A-CT-C3B
 Product body (display): "WFC-150-10A-CT"
 Cable (Packaging Display): "WFC-C3"
 Bracket (Packaging Display): "WFC-B"
 Of these three sets, "WFC-150-10A-CT-C3B" is displayed on the bag or box containing the entire package.

Discrete option (cable, bracket) model No.

WFC - C3

4 Option

Operating ambient temperature range

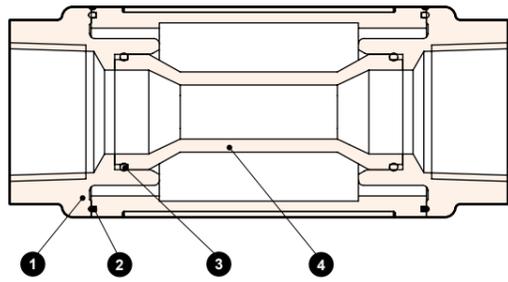


Specifications

Item	WFC-150		WFC-600	
	Rc3/8, G3/8, 3/8NPT	Rc1/2, G1/2, 1/2NPT	Rc3/4, G3/4, 3/4NPT	
Port size	Rc3/8, G3/8, 3/8NPT		Rc1/2, G1/2, 1/2NPT	Rc3/4, G3/4, 3/4NPT
Applicable fluid	Fluids (conductive fluids) that do not corrode water/wetted part materials			
Available fluid conductivity	5 μs/cm or more			
Detection	Capacitance			
Rated flow range	0.5 to 15 L/min		2.0 to 60 L/min	
Low flow cut flow rate *1	Measured range max. flow rate of 3%			
Working fluid temperature *2	0 to 85°C (no freezing)			
Unit indicated	Instantaneous flow rate L/min Accumulated flow L, kL, ML Fluid temperature °C			
Flow rate	Repeatability *3	±2.0% F.S.		
	Ambient temperature characteristics *3	±5.0% F.S (base temperature 25 °C)		
	Fluid temperature characteristics *3	±5.0% F.S (base temperature 25 °C)		
Fluid temperature	Measurement range	0 to 85 °C (operational range is -10 to 110 °C)		
	Measurement accuracy	±2 °C (less than 50 °C) *The difference between the fluid temperature and the ambient temperature is within ±5 °C ±5°C (50°C and over) Ambient temperature within -35°C for*fluid temperature		
Working pressure (according to the fluid temperature conditions) *2	0 to 1.0 MPa (0 to 85°C), 0 to 2.0 MPa (0 to 50°C)			
Proof pressure	3.0 MPa			
Response time *4	0.1 s, 0.25 s, 0.5 s, 1 s, 2 s, 5 s (default 1 s)			
Accumulated flow range	0.0 to 99999999.9 L			
	0.1 L increments			
Pressure loss *5	0.02 MPa or less (at max. rated flow)			
Switch Output	NPN or PNP MOS-FET output (switchable with settings)			
	Max. load current	50 mA		
	Max. applied voltage	30 VDC		
	Internal voltage drop	NPN: 2.0 V or less PNP: 2.4 V or less		
	Output protection	Overcurrent abnormal alarm, overcurrent protection		
Analog Output	Output voltage	Voltage output: 1 to 5 V load impedance: 50 kΩ or more		
	Output current	Current output: 4 to 20 mA Load impedance: 500 Ω or less		
Switch input	Input time	20 ms or more		
	Short-circuit current	Approx. 2 mA		
Indicator	2-screen display (main screen: green/red 2-color display, sub-screen: white) screen inversion possible Instantaneous flow rate: 3 digits Liquid temperature: 2 digits Integrating flow: 4 digits Screen refresh cycle 5 times/sec			
Power supply voltage	When setting switch output: 24 VDC ±10% (ripple P-P ±10% or less)			
	When setting IO-Link: 20 to 30 VDC (ripple P-P ±10% or less)			
Current consumption	65 mA or less (with 24 VDC, 25 °C)			
Environmental resistance	Degree of Protection	IP65 equiv. *6		
	Operating ambient temperature range	0 to 50°C (no condensation)		
	Ambient humidity range	35 to 85% RH (no condensation)		
Mounting orientation	Unrestricted in vertical/horizontal direction			
Compliant standards	EC Directives (EMC Directive, RoHS Directive)			
Material of wetted parts	PPS, FKM, CAC804, C6931			
	Body *7	Approx. 460 g	Approx. 490 g	Approx. 520 g
Weight	Cable	Cable	Approx. 170 g	
		L-type cable	Approx. 180 g	
		Two-sided connector cable	Approx. 100 g	
		L-type two-sided connector cable	Approx. 30 g	
Bracket	Approx. 30 g			

*1: If the flow rate is less than the low flow cut flow rate, 0 L/min is displayed.
 *2: Fluid temperature when the working pressure is 0 to 1.0 MPa. When working pressure is 0 to 2.0 MPa, use with a fluid temperature of 0 to 50 °C. (Refer to the graph on the previous page for the usable range.)
 *3: Characteristics when the response time is 1 s.
 *4: The response time to reach 63% of the value in relation to the step input.
 *5: JIS B 8570-1, ISO 4064-1 and ISO 4064-3.
 *6: Degree of protection is when the cable option is mounted.
 *7: When using options, add the weight of optional parts.
 *8: For parallel installation at intervals of 50 mm or less, please consult with us.
 *9: Piping port and body metal part are grounded to DC (-) / blue wire. This product cannot be used in (+) ground power supply. Contact CKD if using in (+) ground power supply.
 *10: Refer to the instruction manual for IO-Link Parameter specifications. IODD files can be downloaded from the CKD website. <https://www.ckd.co.jp/en/>

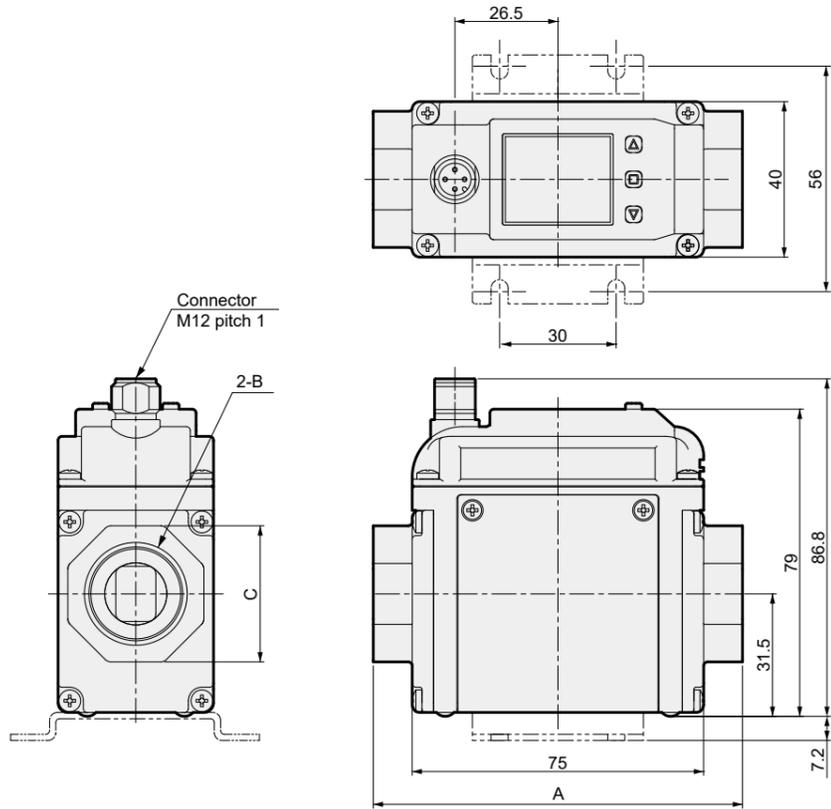
Internal Structure Diagram / Material



Part No.	Part name	Material	Quantity
1	Socket	CAC804 or C6931 Brass	2
2	Packing	FKM Fluoro rubber	2
3	O-ring	FKM Fluoro rubber	2
4	Measuring tube	PPS resin	1

Note: This shows the structure of the parts when viewed from the front.

Dimensions

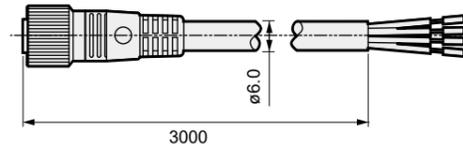


Model No.	A	B	C
WFC-150-10A	90	Rc3/8	24
WFC-150-10G		G3/8	
WFC-150-10N		3/8NPT	
WFC-600-15A	95	Rc1/2	28
WFC-600-15G		G1/2	
WFC-600-15N		1/2 NPT	
WFC-600-20A	35	Rc3/4	35
WFC-600-20G		G3/4	
WFC-600-20N		3/4NPT	

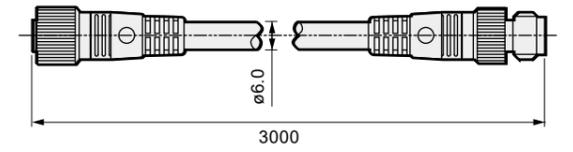
Optional dimensions

●Cable option

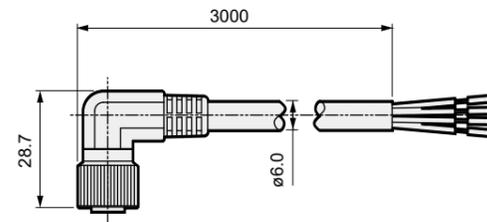
Discrete option model No.: **WFC-C3**



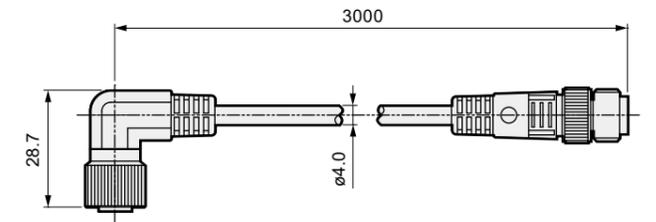
Discrete option model No.: **WFC-B3**



Discrete option model No.: **WFC-L3**

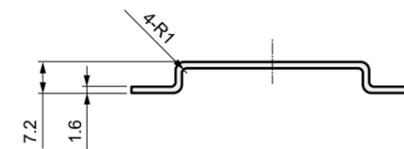
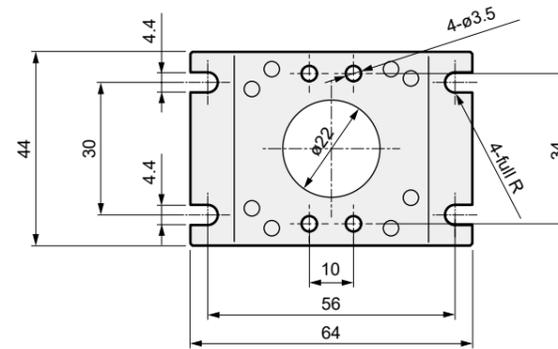


Discrete option model No.: **WFC-G3**



●Bracket option

Discrete option model No.: **WFC-B**



Flow rate sensor

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (air)

Compact flow sensor (liquid)

Compact flow sensor (liquid)

Water Manifold Unit

Water Manifold Unit

Ending

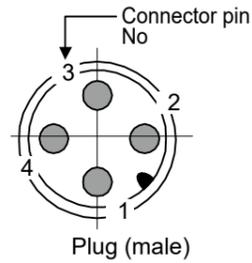
Ending

Wiring method

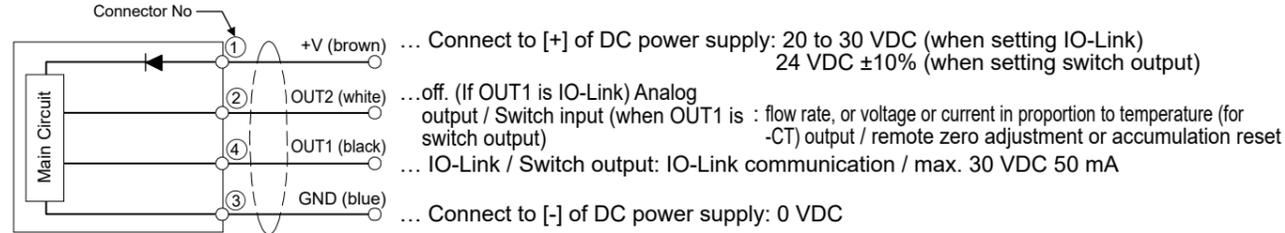
· Always read the safety precautions before wiring.

Note: Keep the cable far away from power cords or other things that may cause noise. Noise can cause malfunctions.

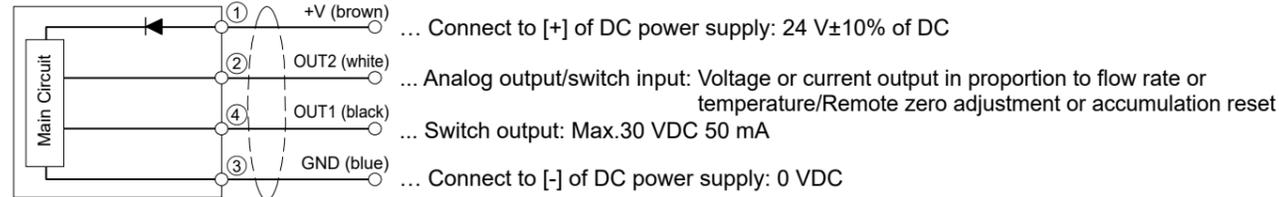
1), 2) are used with the "With IO-Link, fluid temperature measurement" wiring diagram, and 3), 4) are used with the "Standard" wiring diagram.



1) -C, -CT

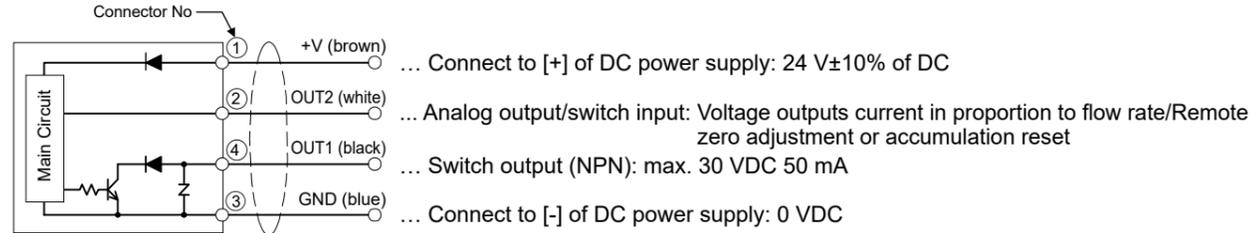


2) -T

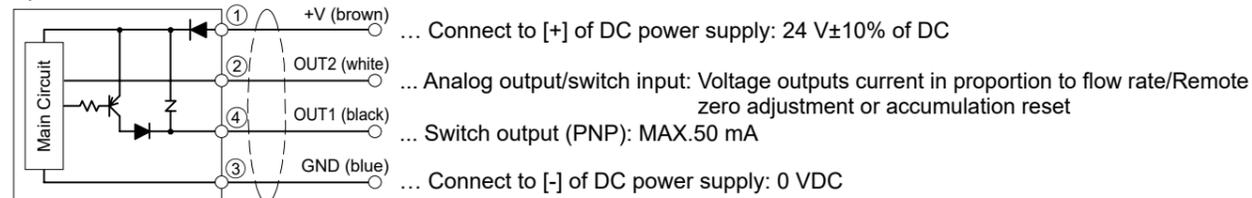


Note: With -C, -CT and -T, the switch output NPN/PNP can be switched from settings. The voltage/current of analog output can also be switched from settings.

3) -NV, -NA



4) -PV, -PA



Note: Wiring when cable option is mounted.

	Switch output	Analog Output
-NV	NPN	1 to 5 [V]
-NA	Transistor output	4 to 20 [mA]
-PV	PNP	1 to 5 [V]
-PA	Transistor output	4 to 20 [mA]

Piping method

[Piping]

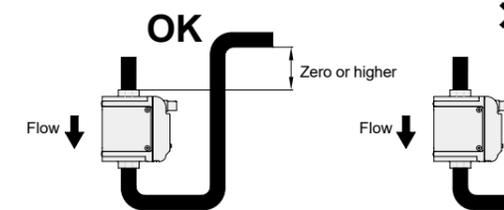
- Perform piping so that the flow path of the product is always full of water. If it is not full of water, a flow rate may be displayed even if the flow is halted.
- Only use the zero adjustment operation after confirming that the product's flow path is full and the flow is halted.
- Do not allow gas to enter the piping.
- Though mounting orientation is unrestricted, display surface horizontal to the ground is recommended in lateral pull piping so as to be less susceptible to the influence of air bubbles.
- Set the flow direction for piping and flow rate sensor correctly.
- Provide flow rate adjusting valve, etc. on the downstream side of the sensor.

[Piping method]

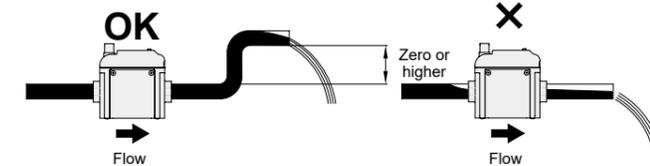
Install with the flow direction from bottom to top



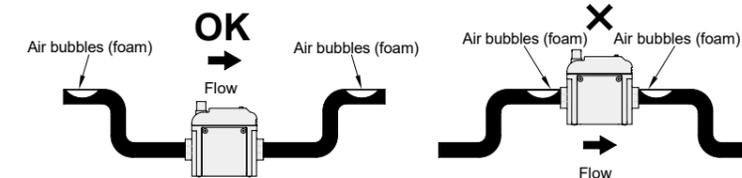
When the flow is from top to bottom
Route the downstream piping higher than the sensor position



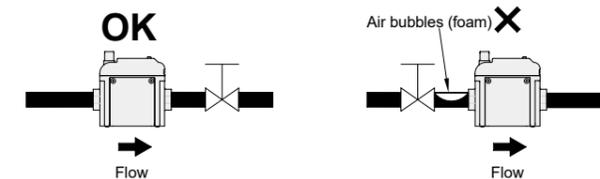
When the sensor downstream side is open to the atmosphere
Install the sensor below the discharge port



Mount the sensor in a position where air bubbles will not accumulate



Install a flow control valve, etc., downstream of the sensor



If the flow path may become empty due to reverse flow caused by water head pressure when water is stopped, installation of the check valve is recommended.



Use CKD's CCH Series check valve.

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

Ending

Ending

IO-Link parameter specifications

1. General

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM2 (38.4 kbps)
Port	M12 Class A
Process data (input)	4 byte
Process data (output)	0 byte
Min. cycle time	5 ms
Data storage	1 kbyte
SIO mode support	None

2. Process data

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Data name	Instantaneous flow rate															
Data range	Refer to Table 1															
Format	UInteger16															

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Data name	Error	WARNING	-	-	-	-	Switch Output		MSB	Fluid temperature							LSB
Data range	True/False						2		1		-10 to 110 °C						
Format	Boolean								Integer8								

Data range (Table 1)

Flow rate range	150	600
Data range	0.0 to 18.0 L/min	0.0 to 72.0 L/min

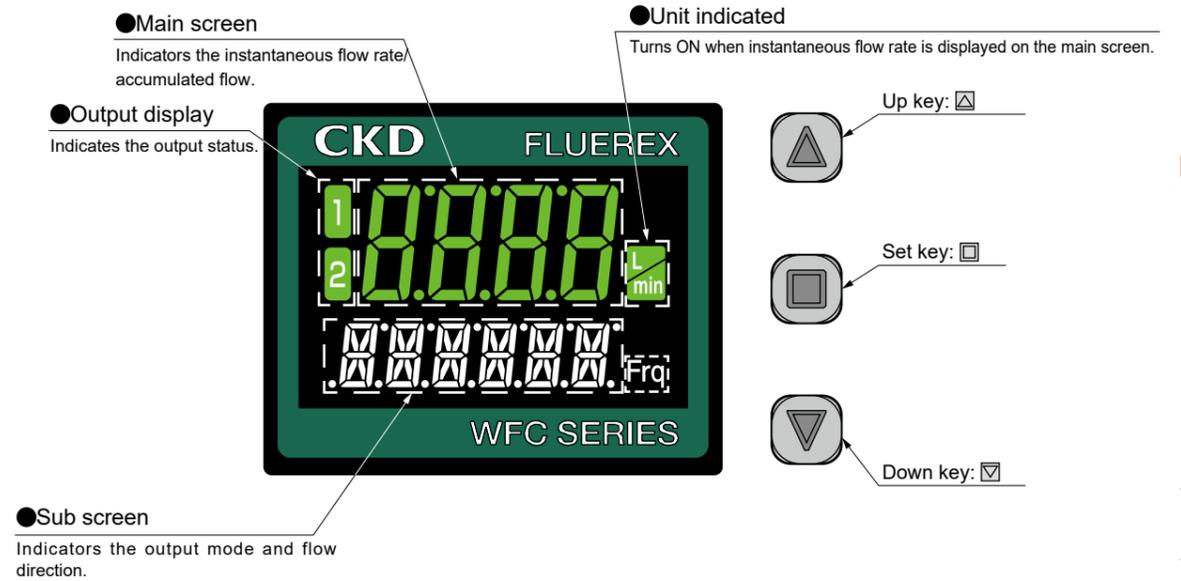
Note: IODD files can be downloaded from the CKD website. <https://www.ckd.co.jp/en/>

●Description of functions

Item	Explanation
Instantaneous flow rate	Instantaneous flow rate is sent to the master as cycle data.
Fluid temperature	Fluid temperature is sent to the master as cycle data.
Switch output function	The switch output operation function can be set. (Instantaneous flow rate, integrating flow, temperature)
Error notification	Errors and error details can be confirmed.
Peak hold function	The peak values of instantaneous flow rate and fluid temperature can be confirmed and reset.
Accumulated flow	Integrating flow can be confirmed and reset.
Power ON time	Total power ON time can be confirmed. (Power ON time cannot be reset.)
Indicator setting	The display contents, colors, and vertical inversion of the main screen and sub screen can be changed.
Key lock	Button operations can be locked and unlocked.
Flow direction	Flow direction can be changed.
Integrating flow unit	Integrating flow unit can be changed.
Eco mode	ECO mode can be set to ON and OFF.
Parallel mode	Parallel mode can be set to ON and OFF.
Response time	Response time can be changed.
Optional characters	The optional characters to be displayed on the sub screen can be changed.
Low flow cut	The threshold at which the flow rate value becomes 0 can be set.
Zero adjustment	The zero point of flow rate can be set.
Reset function	The product can be returned to factory settings.
Data storage function	Set values can be uploaded to and downloaded from the master.
Unit identification function	Manufacturer, model No., serial No., and other information can be confirmed.

Note: Refer to the Instruction Manual for details of IO-Link parameter specifications.

Functions



Measurement mode

[Normal screen]

Instantaneous flow rate display	Hysteresis mode	Window comparator mode	Accumulated output mode	Integrated pulse output mode
	Analog output (flow rate)	Analog output (fluid temperature)	Switch input: remote zero adjustment	Digital input: Accumulation reset
	Alarm output mode	Fluid temperature	Frequency pulse output mode	IO-Link communication mode
	Flow direction		Select any character	No sub-screen display
Total accumulated flow display	Accumulated units can be switched to "L", "KL", "ML" with up key: ▲ and down key: ▼.			

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Ending

Output mode and output operation

(1) Hysteresis mode	
(2) Window comparator mode	
(3) Accumulated output mode	<p>● Increment mode</p> <p>● Decrement mode</p>
(4) Integrated pulse output	
(5) Alarm output mode	
(6) Analog output mode	
(7) Frequency pulse output mode	

Easy setting (shortcut mode)

By shortcut operation, settings with high frequency of use can be moved from the normal screen to the settable state.

Main screen	<p>Normal screen → (Current screen blinks) → [] or [] select "instantaneous value display", "total integrated value display", and [] to confirm.</p>
Hysteresis mode	<p>[] or [] set judgment value, and [] to confirm.</p>
Accumulated output mode	<p>[] Integrated value is reset with []</p>
Analog output mode	<p>[] or [] change F.S. with, and [] to confirm.</p>
Flow direction	<p>[] or [] to change flow direction, and [] to confirm.</p>
Total integrated value reset	<p>Reset by []. [] or [] can be canceled.</p>
Setting key lock	<p>[] or [] to change, and [] to confirm.</p>



Water-use components

Safety Precautions

Be sure to read this section before use.
Refer to Intro 17 for General Precautions.

MEMO

Design / Selection

1. Working environment/working fluids

⚠ CAUTION

- Do not exceed the specified range.
- This product is for fluids that do not corrode water/wetted part materials with conductivity 5 μs/cm or more. Fluids with low conductivity cannot be detected normally.
- Do not use with a positive ground.
- Do not use for applications in direct contact with beverages, foodstuffs, chemical liquids, etc.
- Do not use in flammable gas atmospheres.
- Observe the working fluid temperature and use. If using at low temperatures, take freeze prevention measures such as adding antifreeze.
- If a fluid with temperature lower than the ambient temperature flows, condensation may form inside the product, which may adversely affect performance. Use the product so that there is no condensation.
- Observe the working pressure range and use.
- Observe the rated flow range and use.
- This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. It cannot be calibrated, so use it as an industrial sensor.

2. Piping

⚠ WARNING

- Perform piping so that the flow path of the product is always full of water. If it is not full of water, a flow rate may be displayed even if the flow is halted.
- Only use the zero adjustment operation after confirming that the product's flow path is full and the flow is halted.

⚠ CAUTION

- Provide flow rate adjusting valve, etc. on the downstream side of the sensor.
- Do not wire together with the power wire/power cables.
- Keep this product away from high voltage components and power components such as motors for use.
- Do not bring this product near strong magnets or magnetic fields.
- Do not use the display and outputs for 10 seconds after power-on for a warm-up period.
- Although any mounting position is possible, in order to reduce the influence of air bubbles, it is recommended that the display surface be level with the ground in the case of horizontal piping.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (<https://www.ckd.co.jp/kiki/en/>) → "Model No." → Instruction Manual

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Ending

Ending