Reliability Creation Service

Proposal of Aichi's small flowsensor

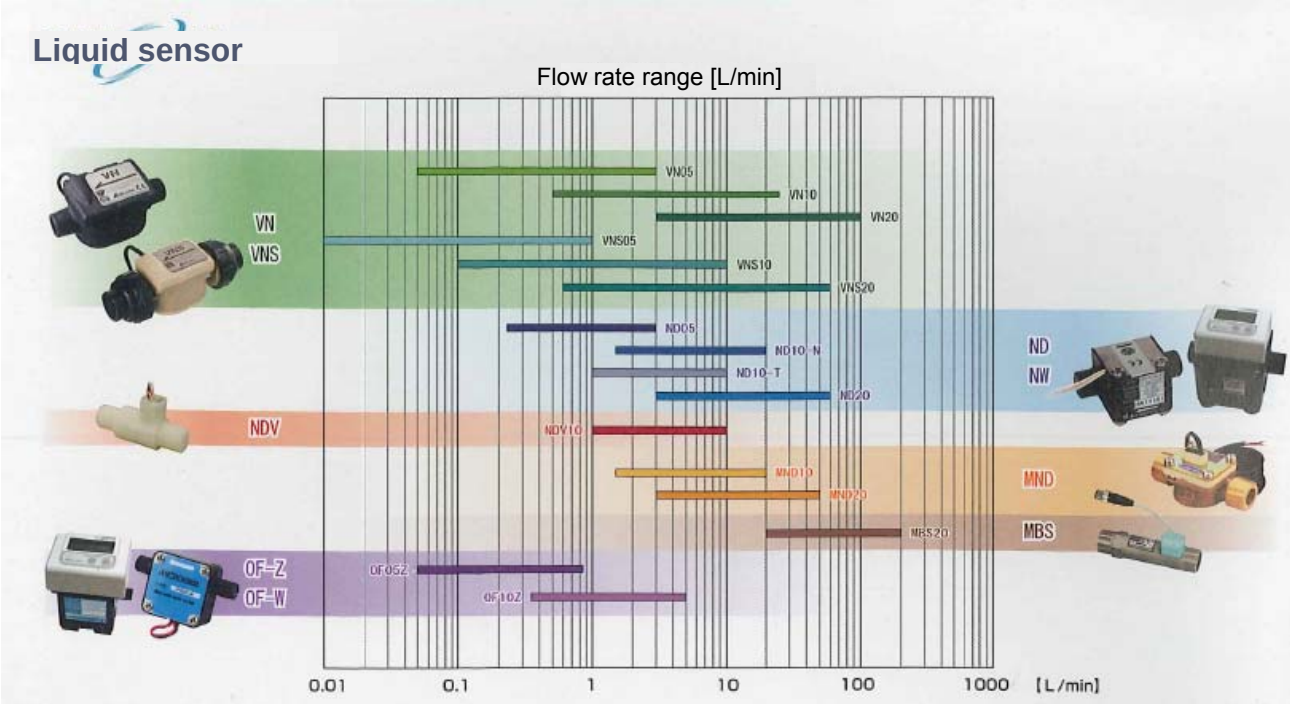
Flowsensor Series

S&S Sensors System and Service

Aichi tokei denki co., ltd.

Line-up of extensive variations
Please use our flowsensors for use in various machines and a great range of applications

Flowsensor plays an active part in automatic control and monitoring of liquid flow rate. We will respond to various demands in different industries with our knowledge built-up over many years and extensive variations. In case of use in machines, a precise control can be achieved with enhancing additional value.



Selection keywords	High Durability		With Display				With Display Battery-powered				
Sensor Name	VN	VNS	VN+ASI	VNS+ASI	ND	OF-Z	NW	OF-W	NDV	MBS	MND
High accuracy	○	○	○	○	○	○	○	○			
High durability	○	○	○	○							
Compact	○	○			○	○			○	○	○
Use in machines	○	○			○	○			○	○	○
On-site power supply not required							○	○			
Display function			○	○			○	○			
Low price					○	○			○		
Micro flow rate	○	○	○	○		○		○			
Chemical proof		○		○		○		○			
Pulsating flow	○	○	○	○		○		○			
Batch control	○	○			○	○			○		
High water pressure										○	
Warm water	○		○		○		○	○			○
Page	P3	P5	P17	P17	P7	P9	P11	P12	P13	P14	P15

*Compared to our products

*Concerning with liquid to be measured, select carefully product by considering each specification before use or contact us directly.
There may be a liquid which is not able to be applied due to the nature of liquid.
Some flowsensor series have moving parts. Then, continuous use near maximum flow rate may threaten the shortening of machine life.

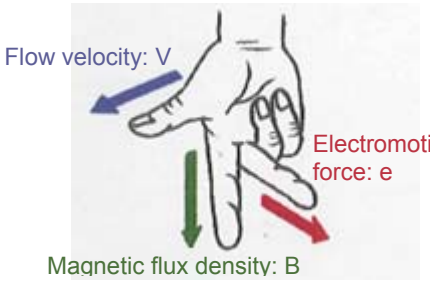
Important safeguards	Please use the liquid with which flowsensor materials are compatible. Use of incompatible liquid makes risk of injury and physical damage.

Measurement principle of various flowsensor

Electromagnetic

For the electromagnetic flowsensor, please refer to

Sensor name	Page
VN	3
VNS	5



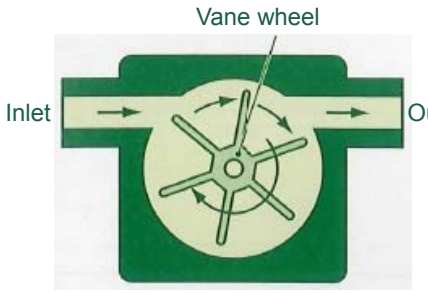
When magnetic flux is applied in perpendicular direction to the flow of conductive liquid, electromagnetic force is generated by electromagnetic induction effect (Fleming's right-hand rule) in perpendicular directions to flow and magnetic flux, respectively. Electromagnetic force becomes signal which is proportional to flow velocity, and this voltage is measured to convert it to flow rate. In absence of moving parts, high accuracy and long time measurement is possible.

Electromagnetic type

Tangential flow vane wheel type

For the tangential flow vane wheel type flowsensor, please refer to

Sensor name	Page
ND	7
NW	11
MND	15



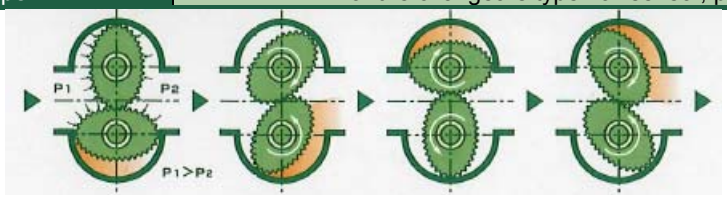
The flow from the inlet jets to the vane wheel and spin it. The spin is proportional to the flow rate. A magnet is put in the vane wheel and the number of spins is detected by magnetic sensor and it is output.
Structure of this flowsensor is simple and indestructible. This flowsensor operates smoothly from low flow rate range. In addition, the performance is excellently reproducible.

Tangential flow vane wheel type

Oval gears type

For the oval gears type flowsensor, please refer to

Sensor name	Page
OF-Z	9
OF-W	12
OF-P	16



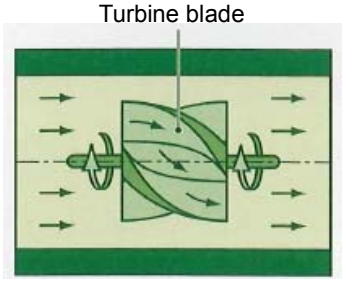
The structure is such that a pair of oval gears is integrated in an elliptical measurement chamber. Oval gears rotate due to the difference in pressure between inlet and outlet sides, the liquid equivalent to the space formed by the measurement chamber and oval gears is discharged and measurement is performed. Magnet is attached to the oval gears and the number of spins is detected by the magnetic sensor and it is output.
As this is an actual measurement type by repeating the discharge of constant volume and feature of this sensor is strong in pulsation of pump.

Oval gears type

Axial turbine type

For the axial turbine type flowsensor, please refer to

Sensor name	Page
NDV	13
MBS	14



The structure is such that a turbine shaft is placed on the same axis as a flow, and this sensor is designed as stable rotation force being generated by dynamic pressure of liquid flow.
Magnet is attached to the turbine blade, and the number of spins is detected by the magnetic sensor and it is output.
Low pressure loss and high flow rate are noteworthy feature and this flowsensor is excellently durable. In addition, downsizing of flowsensor itself is achieved.

Axial turbine type

Display units for various flowsensors

Please select the display unit tuned to the use

For the display unit, please refer to

Compatible flowsensor	Input signal	Display	Display unit name	Page
VN / VNS	Open collector	Instantaneous flow rate/Integrating flow volume	ASI	17
ND / OF-Z	Open collector	Instantaneous flow rate/Integrated flow volume (For NK, instantaneous flow rate only)	NH/NK	19
ND / OF-Z / NDV / MND / MBS	Open collector	Instantaneous flow rate/Integrated flow volume	TI	21

Display unit

Electromagnetic flowsensor without moving parts suitable for use in machines as well.

Small Electromagnetic Flowsensor VN

Feature

- With absence of moving parts, there is less failure due to its contaminants
- Closely no pressure loss and excellent durability
- Reduced cost as a result of limiting necessary functions design
- Compact design, easy to install
- Piping with both straight and bended is available.
- As this flowsensor has 2 contact outputs, various functions are selectable
  - Frequency pulse output (Span frequency is selectable)
  - Unit pulse output
  - Abnormal condition detection is displayed by LED in top face of sensor main body
  - Switch output (Level judgment/window judgment is available)

Specification

In addition, for the special specification, please contact us.

Model			VN05	VN10	VN20
Guarantee-flow rate accuracy range (Minimum flow rate to Maximum flow rate)			0.05~1L/min	0.5~10L/min	3.0~60L/min
Maximum operating flow rate			3L/min	25L/min	100L/min
Low flow cutoff			0.025L/min	0.25L/min	1.5L/min
Accuracy (Liquid temperature at 25°C)	Frequency pulse		±2.5RS% (100% to 20% of maximum flow rate) ±0.5FS% (20% to 5% of maximum flow rate)		
	Unit pulse		±2.0RS% (100% to 20% of maximum flow rate) ±0.4FS% (20% to 5% of maximum flow rate)		
Piping connection (Thread size)			R1/4	R1/2	R1
Fluid temperature range			0 to 60°C (No freezing)		
Fluid conductivity rate			50μs/cm or more		
Type of liquid			Conductive liquid that does not corrode the material contacting to liquid		
Working pressure			1Mpa or less		
Pressure loss			0.02Mpa or less		
Ambient temperature/humidity			Temperature: -20°C to 60°C Humidity: 35% to 85%RH (No condensation)		
Responsiveness			63% response Damping time: 2s (Standard)		
Signal cable			Length: 0.5m 4 core Red: Power supply + wire White: Output 1 Blue: GND Yellow: Output 2		
LED display			One LED display in the main body Green: Flow rate display Display in three-step speed Red: NG status is displayed with number of blinks		
Installation position			Free (Vertical piping is recommended)		
Common specification of output			NPN Open collector Current capacity: 20mA or less Voltage: 30VDC or less Residual voltage at turning ON: 1V or less		
Output 1*2	Frequency pulse*1	Duty ratio: 50%	Standard 200Hz (Settable in steps of 0.1Hz between 20 and 400Hz)		
	Unit pulse		0.001L/P (Standard)	0.01L/P (Standard)	0.1L/P (Standard)
	Alarm*3		Selectable between Normal Open (Standard) and Normal Close Details of alarm (Low source voltage/Meter error/Dry moisture/Excessive flow rate/Excessive liquid noise/Reverse-flow)		
	Switch*4		Selectable between Normal Open (Standard) and Normal Close Level judgment value: Settable in steps of 1% from 0 to 100%. (Convert the maximum flow rate 100%)		
Output 2*2	Unit pulse		The same as output 1		
	Alarm*3		The same as output 1		
	Switch*4		The same as output 1		
Protection level			IPX4 (Equivalent to IP64)		
Consumption current			100mA or less		
Power supply			12-24 VDC (±10%) We recommend the power supply is supplied with isolated power supply and 1 unit of power supply is connected to one unit of VN		
Wetted materials			Main body: PPS resin Electrode: SUS316L O-ring: FKM Earth ring: SUS316		

*1: Frequency at maximum flow rate
*2: For the set value and choice of Output 1 and Output 2, all are factory setting, and setting change after installation is not available.
*3: Alarm is selectable only either one of Output 1 or Output 2.
*4: For the window judgment, Output 1 and Output 2 are used.
(Note) CE mark certification for lightening surge has not obtained.

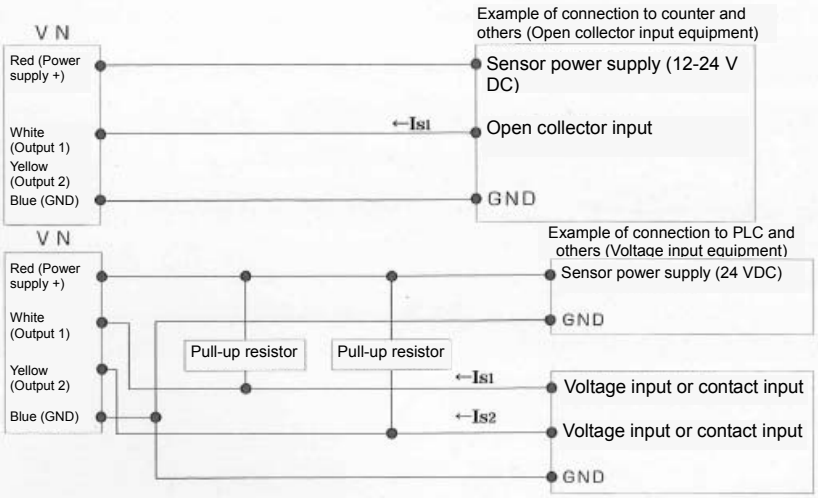
Wiring diagram (As to the wiring technique of attached cord)

Please set the sink current for open collector output of output 1 and output 2 to 20mA or less. For your reference, the recommendation for pull-up resistor becomes [10 to 20kΩ]

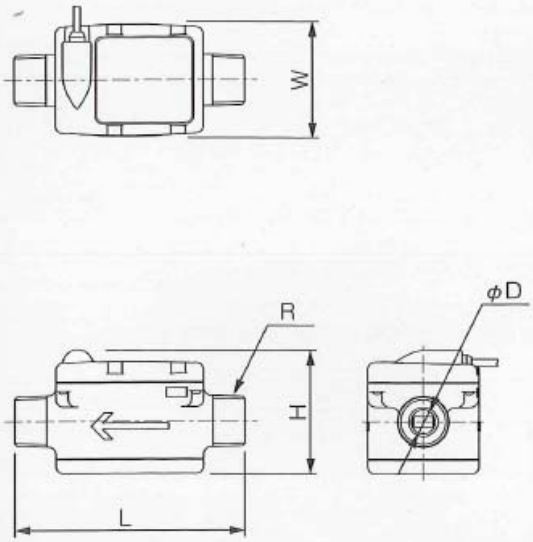
Sink current calculation formula

$$Is = \frac{V}{R} \leqq 20[mA]$$

V: Power supply (V)
R: Pull-up resistor (Ω)



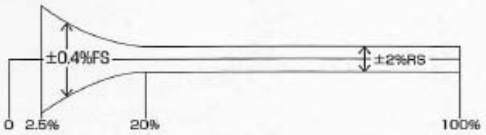
External dimensions



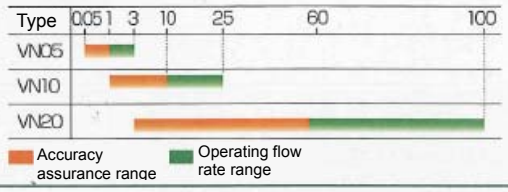
Unit: mm

Model	VN05	VN10	VN20
L	85	95	110
W	47	47	49
H	49	52	62
φD	5.2	10	20
R	1/4	1/2	1

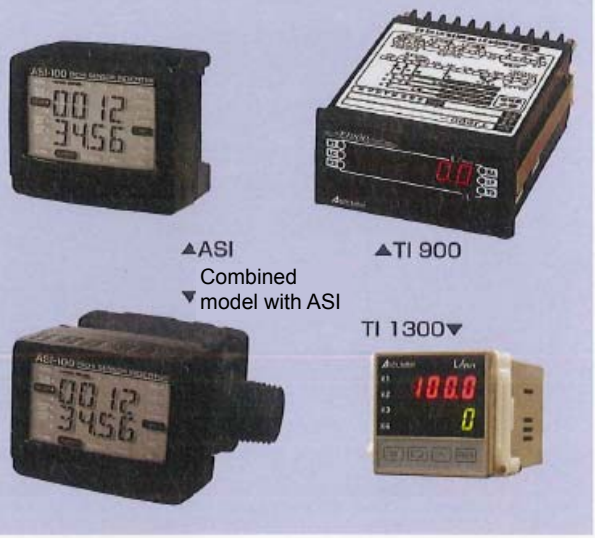
Accuracy



Flow rate range



For the receiver, please refer to pages 17, 18, 21 and 22



Electromagnetic flowsensor for chemical flow capable of measuring even pulsating flow.

Small Electromagnetic Flowsensor VNS

Feature

- Measurement of pulsating flow of diaphragm electromagnetic metering pump is achieved.
- Measurement of sodium hypochlorite and caustic soda is available.
- Grasping of gas lock through the interlocking with pump operation signal.
- Usable for steady flow besides pulsating flow.

Specification

Other special specifications, please contact us.

Classification	Item			Details		
Pulsation measurement mode specification	Model			VNS05-F/E	VNS10-F/E	VNS20-F/E
	Accuracy assurance-flow rate range ( )			0.01~1	0.1~10	0.6~60
	Accuracy (Liquid temperature at 25°C)	Unit pulse		±5.0%RS (100% to 20% of maximum flow rate) ±1.0%FS (20% to 1% of maximum flow rate)		
Stationary flow measurement mode specification	Accuracy guarantee-flow rate range (L/min)			0.05~1	0.5~10	3.0~60
	Low flow cutoff (L/min)			0.025	0.25	1.5
	Accuracy (Liquid temperature at 25°C)	Frequency pulse		±2.5%RS (100% to 20% of maximum flow rate) ±0.5%FS (20% to 5% of maximum flow rate)		
		Unit pulse		±2.0%RS (100% to 20% of maximum flow rate) ±0.4%FS (20% to 5% of maximum flow rate)		
Common specification for each mode	Pipe installation			Socket end union joint 16A		Socket end union joint 20A
	Fluid temperature range			0 to 40°C (No freezing)		
	Fluid conductivity rate			14ms/cm or more		
	Nature of object liquid			VNS□□-F: For sodium hypochlorite [Concentration 1 to 12%]		
				VNS□□-E: For caustic soda [Concentration 10 to 25%]		
	Working pressure			1Mpa or less		
	Pressure loss			0.02Mpa or less		
	Ambient temperature/humidity			Temperature: -10°C to 60°C Humidity: 35% to 85%RH (No freezing)		
	Responsiveness			63% response Damping time: 2s (Standard)		
	Signal cable			Length: 0.5m 4 core (Red: Power supply + wire / Blue: GND / White: Output 1 / Yellow: Output 2)		
	LED display			Two-color 1 light (Green: Blinks during measurement Red: Lights up or blinks in the event of error)		
	Installation position			Free (Vertical piping is recommended.)		
	Common specification of output			NPN Open collector Current capacity: 20mA or less Voltage: 30VDC or less Residual voltage at turning ON: 1V or less		
	Output 1*2	Frequency pulse*1	Duty ratio: 50%	Standard 200Hz (Settable in steps of 0.1Hz between 20 and 400Hz)		
		Unit pulse		0.001L/P (Standard)	0.01L/P (Standard)	0.1L/P (Standard)
		Alarm*3		Selectable between Normal Open (Standard) and Normal Close Details of alarm (Low source voltage/Meter NG/Non water/Excessive flow rate/Excessive liquid noise/Reverse-flow)		
		Switch*4		Selectable between Normal Open (Standard) and Normal Close Level judgment value: Settable in steps of 1% from 0 to 100%. (Convert the maximum flow rate 100%)		
	Output 2*2	Unit pulse		Same as output 1		
		Alarm*3		Same as output 1		
		Switch*4		Same as output 1		
	Protection level			IPX4 (Equivalent to IP64)		
	Consumption current			60mA or less		
	Power supply			24VDC (±10%) Power supply shall be supplied with isolated power supply and 1 unit of power supply is connected to one unit of VNS. In addition, in the case of pulsating flow mode measurement, grounding of power supply FG terminal (Class D or more) is required.		
	Wetted materials			VNS□□-F: Main body (PEEK resin) / Electrodes・earth ring (Titanium) / O-ring (FKM) VNS□□-E: Main body (PEEK resin) / Electrodes・earth ring (Equivalent to hastelloyC22) / O-ring (EPDM)		

*1: Frequency at maximum flow rate
*2: For the set value and choice of Output 1 and Output 2, all are factory setting, and setting change after installation is not available.
*3: Alarm is selectable only either one of Output 1 or Output 2.
*4: For the window judgment, Output 1 and Output 2 are used.
(Note) CE mark certification for lightening surge has not obtained.

Feature

Capable of detecting the gas lock of sodium hypochlorite

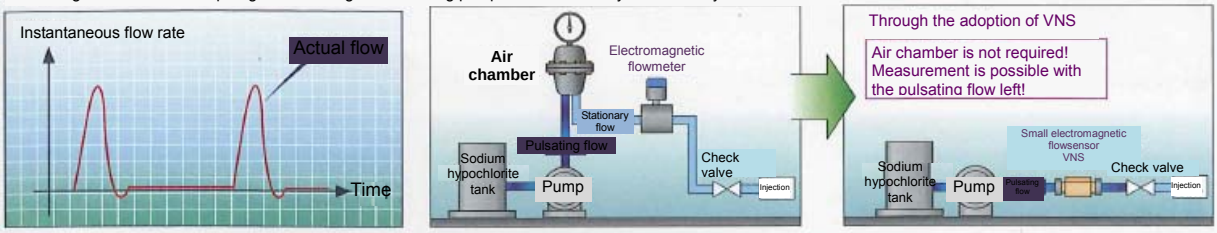
Gas lock detection is possible through the interlocking with actuating signal of pump.
Gas lock is a phenomenon under which gas accumulates in a certain chamber of diaphragm of the metering pump and sodium hypochlorite is not transferred.

Air chamber is not required

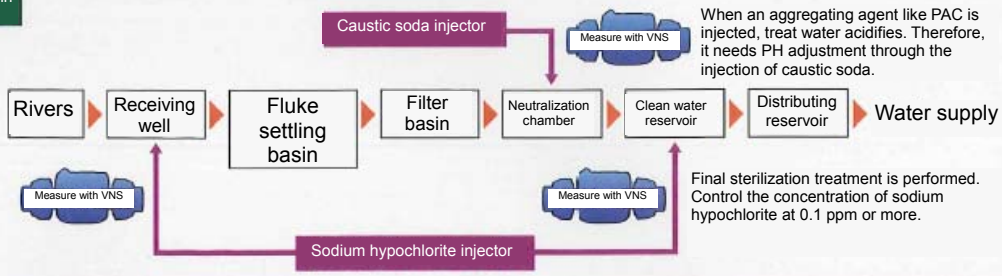
Is a measurement performed eliminating the pulsation with air chamber?
In the air chamber, time lag arises up to the buildup of pressure, therefore, a delay occurs in the measurement of flow rate.

Image of discharge flow from diaphragm electromagnetic metering pump

*Pulsating flow other than diaphragm electromagnetic metering pump is not covered by our accuracy assurance.



Example of how VNS is used in the water treatment plant



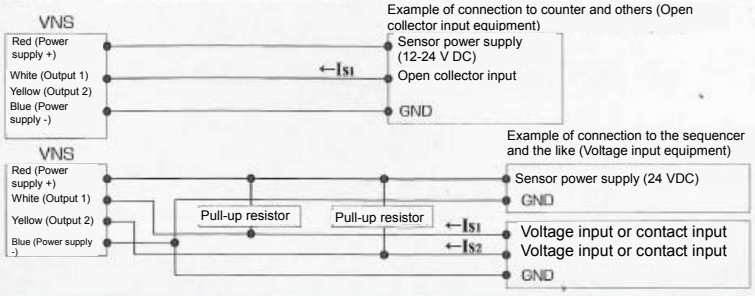
Wiring diagram (As to the wiring technique of attached cord)

Please set the sink current for open collector output of output 1 and output 2 to 20mA or less. For your reference, the recommendation for pull-up resistor becomes [10 to 20kΩ]

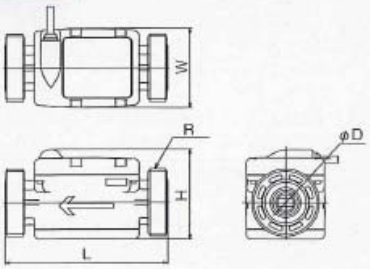
Sink current calculation formula

$$Is = \frac{V}{R} \leqq 20[mA]$$

V: Power supply (V)
R: Pull-up resistor (Ω)



Full view



Unit: mm

Model	L	W	H	φD	R (Note)	Weight
VNS05	95	47	51	5.2	16A union (Male)	210g
VNS10	95	47	54	10	16A union (Male)	210g
VNS20	110	49	64	20	20A union (Male)	310g

Note: Exclusive of union
Cable length: 0.5m

For the cooling water control, please check page 3

VN

For the receiver, please refer to pages 17, 18, 21 and 22

▲Combined model with ASI

▼ASI

▲TI 1300

▼TI 900

ND flowsensor is ideal for measuring a variety of liquids and this is a low cost, high quality and bestselling product.

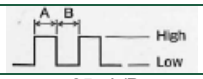
Flowsensor ND Type

Feature

- Excellent reproducibility.
- Built-in magnetic sensor which is noise tolerant, outputs a proportional signal to the flow velocity.
- Pulse output by means of open collector
- Wide flow rate range and high accuracy.
- Measurement principle is tangential flow vane wheel type and structure is simplified.
- Compatible with various type of liquids
- CE marking certified
- RoHS-ready

Specification

In addition, for the special specification, please contact us.

Model		ND05-N ATAAC	ND05-P ATAAC	ND05-T ATAAA	ND10-N ATAAA	ND-10P ATAAA	ND10-T ATAAA	ND20-N ATAAA	ND20-P ATAAA
Flow rate range		0.3~3.0L/min			1.5~20L/min		1.0~10L/min	3.0~60L/min	
Accuracy*1		±2%RS (Standard installation position)							
Liquid to be measured		Compatible with various kinds of liquids (Please select the model after checking main wetted materials below)							
Maximum working pressure		1MPa (Liquid temperature at 20°C)							
Pressure loss		12 kPa or less (At 3L/min)			20 kPa or less (At 20L/min)		15 kPa or less (At 10L/min)	60 kPa or less (At 60L/min)	
Liquid viscosity range		0.5~1.5mPa·s (Equivalent to water)							
Liquid temperature range		0~+70°C	0~+60°C		0~+70°C	0~+60°C		0~+70°C	0~+60°C
Ambient temperature/humidity		-10~+70°C 35~85%RH (No condensation)							
Output signal		Open collector pulse 4-wire, lead-wire length: About 600mm Duty ratio: 3:7 < A:B < 7:3 							
Pulse factor		2.5mL/P			7.69mL/P			25mL/P	
Maximum frequency		20Hz			About 44Hz		About 22Hz	40Hz	
Minimum pulse width		0.015s			About 0.007s		About 0.014s	0.0075s	
Applied voltage range		3~24 VDC*2							
Power consumption		0.2VA or less							
Structure		IP X4 (indoor specification)							
Connection		R1/2						R3/4	
Weight		About 150g			About 120g			About 360g	
Main materials of wetted part	Case	Modified PPO	PP	ETFE	Modified PPO	PP	ETFE	Modified PPO	PP
	Vane wheel	POM		ETFE	POM		ETFE	POM	
	Pivot	SUS304	PA	ETFE	SUS304	PA	ETFE	SUS304	
	O-ring	NBR	FKM		NBR	FKM		NBR	FKM
	Magnet	Sa-Co*3			Ba-Fe		Sa-Co*3	Ba-Fe	

●For the details of material marks, refer to the back cover

*1 Installation position other than standard installation position does not cover accuracy assurance. In addition, ND05-TATAAA, ND10-TATAAA cannot be used for the installation position other than standard position.

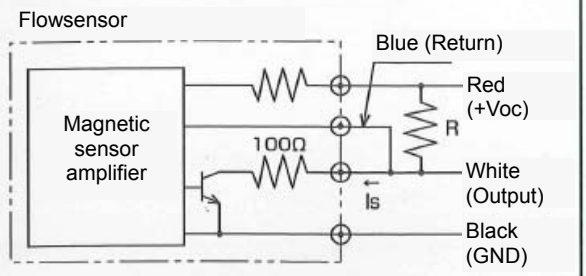
*2 Sensor power supply (Red – Black) and pulse output (Blue/White-Black) shall be the same. *3 Triple magnet does not touch the liquid.

Model code

When placing an order, please place an order in reference to this model code

ND	**	-	*	ATAA	*	-	RC	Details
Model								ND
	Nominal diameter							05, 10, 20
		-						-
			Constituent material					N, P, T
				ATAA				ATAA
					*			**C: ND05-N/P A: In other cases**
						-		-
							RC	RC

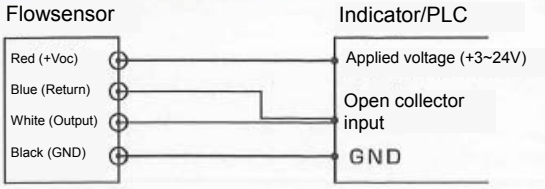
Wiring technique [Open collector output]



Pull-up resistor on the output side of open collector shall be 50Ω or less.
However, please arrange so that output sink current falls within 6mA.

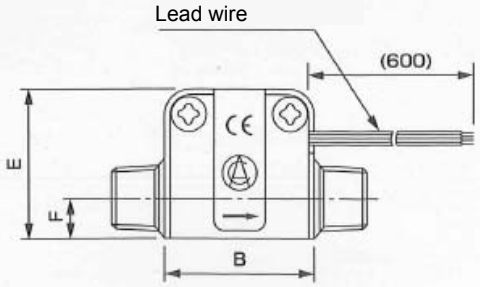
$$\text{Is (Output sink current : mA)} = \frac{\text{V (Power supply voltage: Volt)}}{\text{R (Pull-up resistor: kΩ)}} \leq 6\text{mA}$$

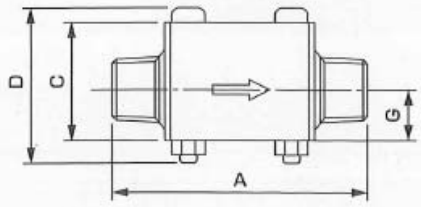
Wiring with general indicator/ PLC



Applied voltage of sensor power supply (Red – Black) and pulse output (Blue/White-Black) should be the same.

External dimensions

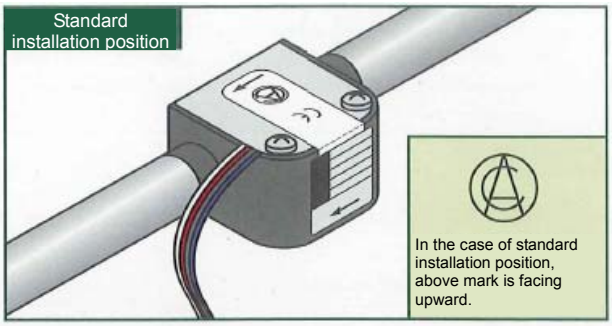




Unit: mm

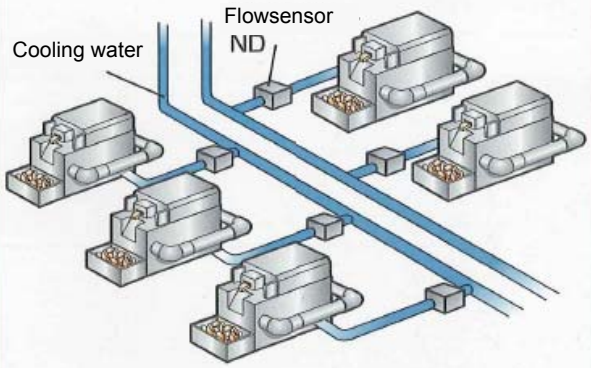
Model	ND05	ND10	ND20
A	80	80	110
B	47	47	68
C	37.5	37.5	50
D	49	49	65
E	47	47	68
F	12.5	12.5	18
G	16	16	23

Standard installation position

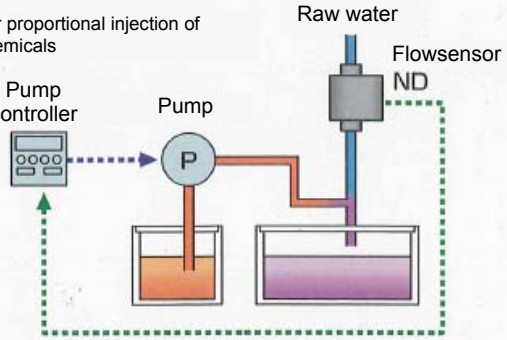


Application example

- For switching and monitoring of the flow of cooling system
- Detection of clogging in the cooling system
- Grasp of circulating volume in the system



- For proportional injection of chemicals



For the receiver, please refer to pages 19~22

Microstream sensor OF-Z is ideal for measuring a variety of liquids and it is capable of measuring micro flow rate accurately.

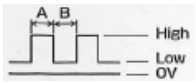
Microstream sensor OF-Z

Feature

- Excellent manufacturing technique enables the measurement in micro flow rate range.
- Tolerant to pulsation flow.
- Magnet sensor with built-in amplifier which is resistant to noise, outputs proportional signal to the flow velocity.
- Pulse output is selectable by open collector or voltage pulse
- Wide flow rate range and high accuracy
- Measurement principle use oval gears type and the structure is simplified.
- Compatible with various type of liquids
- RoHS-ready

Specification

In addition, for the special specification, please contact us.

Model		OF05ZAT	OH10ZAT	OF05ZZT	OF10ZZT
Flow rate range	Liquid viscosity 0.3~0.8mPa·s	0.085~0.85L/min	0.7~5L/min	0.085~0.85L/min	0.7~5L/min
	Liquid viscosity 0.8~2.0mPa·s	0.05~0.85L/min	0.35~5L/min	0.05~0.85L/min	0.35~5L/min
	Liquid viscosity 2.0~5.0mPa·s	0.017~0.85L/min	0.17~5L/min	0.017~0.85L/min	0.17~5L/min
	Liquid viscosity 5.0~200mPa·s	0.0085~0.85L/min	0.085~5L/min	0.0085~0.85L/min	0.085~5L/min
Accuracy		±2%RS (Standard installation position)			
Liquid to be measured	Compatible with various kinds of liquids	Please select the model after checking main liquid-contact materials below			
	Major liquids to be measured	Hot and cold water/Kerosene/Light oil/heavy oil		Weak acid/Weak alkali	
Maximum working pressure		0.5MPa (Liquid temperature at 20°C)			
Pressure loss		4 kPa or less	10 kPa or less	4 kPa or less	10 kPa or less
Liquid temperature range		-10~+70°C (No freezing)			
Ambient temperature/humidity		-10~+70°C 35~85%RH (No condensation)			
Output signal	Voltage pulse output	Voltage pulse 3-wire (Load resistance 10kΩ or more) Lead wire length: About 480mm Duty ratio of voltage pulse: 2:B < A :B < 8:2		Applied voltage at 12 VDC High: 10VDC or more Low: 1VDC or less 	
	Open collector output	Open collector pulse (Capacity: 6mADC or less) 4-wire Lead wire length: About 600mm			
Pulse factor		0.46mL/P	2.5mL/P	0.46mL/P	2.5mL/P
Maximum frequency		About 30Hz	About 33Hz	About 30Hz	About 33Hz
Minimum pulse width		About 0.0065s	About 0.006s	About 0.0065s	About 0.006s
Applied voltage range		3~24VDC*1			
Power consumption		0.2VA or less			
Structure		IP X4 (indoor specification)			
Connection		R1/4	R1/2	R1/4	R1/2
Weight		About 100g	About 140g	About 100g	About 140g
Main materials of wetted part	Case	PPS			
	Rotor	PPS			
	O-ring	NBR		FKM	
	Shaft	SUS304		SiC	

- For the details of material marks, refer to the back cover. ● If a fluid might get mixed with some particulate, install a filter of which mesh is #80 or more at upstream of flowsensor.
- Measurement of gasoline, sodium hydroxide (Caustic soda), hydrogen peroxide solution (Oxydol) and hydrochloric (strong acid) is not adapted. ● For the viscosity unit, refer to the back cover.

*1 Sensor power supply (Red – Black) and pulse output (Blue/White-Black) should be the same. (Open collector output only).

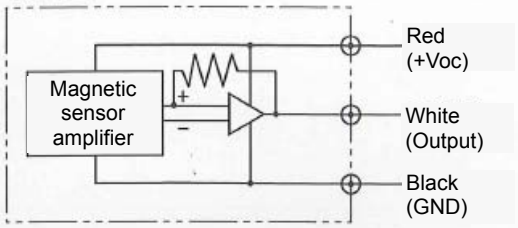
Model code

When placing an order, please place an order in reference to this model code

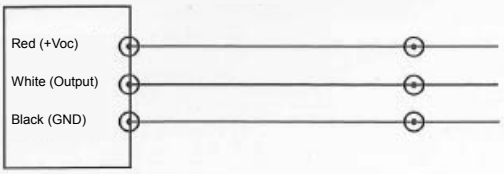
OF	**	Z	*	T	-	*	R	Details
Model								OF
	Nominal diameter							05, 10
		Z						Z
			Constituent material					A, Z
				T				T
					-			-
						Output signal		A: Voltage pulse M: Open collector
							R	R

Wiring technique [Voltage pulse output]

Flowsensor



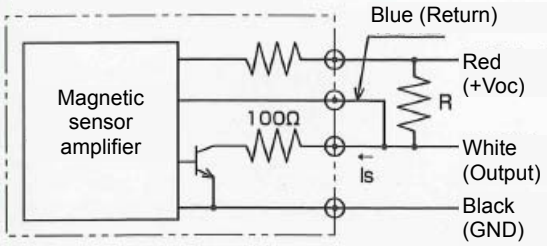
Flowsensor



Use the product with load resistor of 10Ω or more.

Wiring technique [Open collector output]

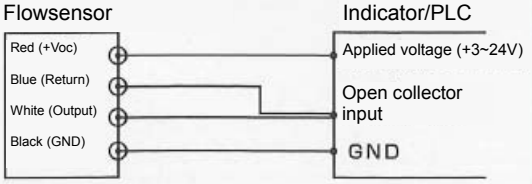
Flowsensor



Pull-up resistor on the output side of open collector should be 50Ω or less.
However, please arrange so that output sink current should be less than 6mA.

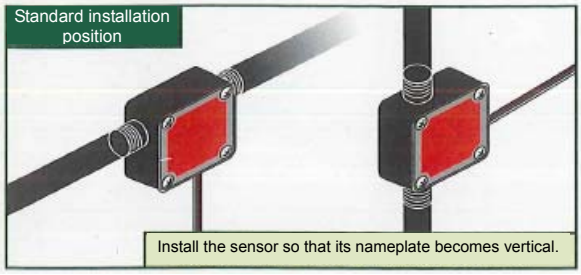
$$Is\ (\text{Output sink current : mA}) = \frac{V\ (\text{Power supply voltage: Volt})}{(\text{Pull-up resistor: k}\Omega)} \leq 6\text{mA}$$

Wiring with general indicator/ PLC



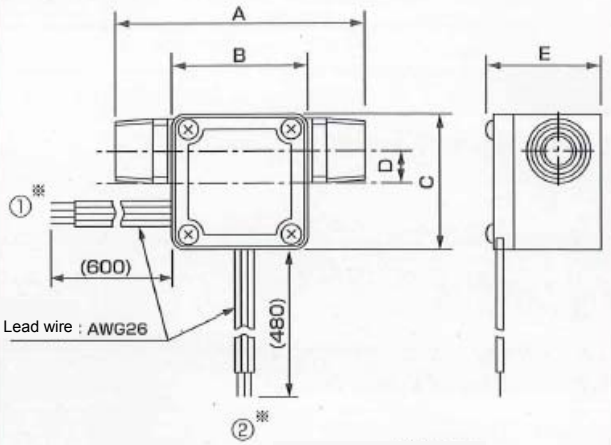
Applied voltage of sensor power supply (Red – Black) and pulse output (Blue/White-Black) shall be the same (Open collector output only).

Standard installation position



Install the sensor so that its nameplate becomes vertical.

External dimensions



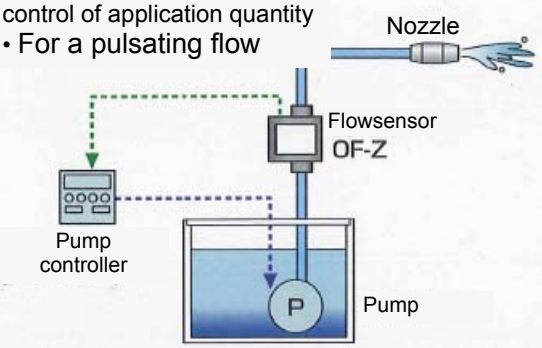
Unit: mm

Model	OF05	OF10
A	80	90
B	46.9	46.9
C	46.9	46.9
D	8	8.5
E	27.3	40.3

*About the drawing direction of lead wire
(1) for open collector output type and (2) for voltage pulse output type

Application example

• Capacity monitoring and control of application quantity
• For a pulsating flow



For the receiver, please refer to pages 19~22

Electromagnetic type

Tangential flow vane wheel type

Oval gears type

Axial turbine type

Display unit

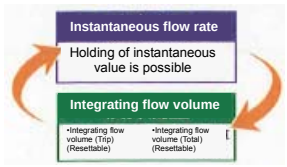
Indicator type of flowsensor ND.

Instantaneous flow rate /Integrating flow volume flowsensor NW/NW-P (with pulse output*)

*Option

Feature

- Built-in lithium batteries, no external power supply is required.
- Excellent feature of ND type flowsensor is left as it is and instantaneous flow rate and integrating flow volume can be displayed by only one flowmeter.
- Revolving display unit (it can be fixed to an easy-to-see orientation)
- Measuring principle is tangential flow vane wheel type and structure is simplified.
- Compatible with various type of liquids
- Reset function for the display of integrating flow volume (Total) and integrating flow volume (Trip).
- Holding value function for instantaneous flow rate
- Pulse output function (Optional)
- CE marking certified



Specification In addition, if there is anything unclear, please contact us.

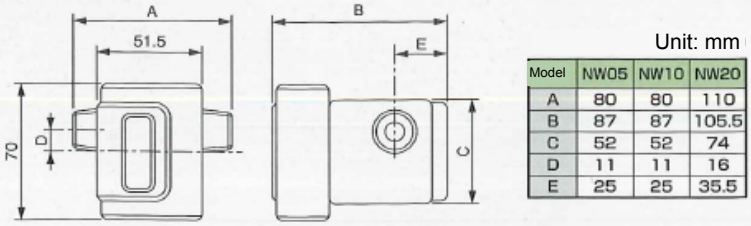
Instantaneous flow rate/integrating flow volume flowmeter NW type			NW05-NTN	NW05-PTN	NW05-TTN	NW10-NTN	NW10-PTN	NW10-TTN	NW20-NTN	NW20-PTN
Instantaneous flow rate/integrating flow volume flowmeter (with pulse output) NW-P type			NW05-NTP	NW05-PTP	NW05-TTP	NW10-NTP	NW10-PTP	NW10-TTP	NW20-NTP	NW20-PTP
Flow rate range			0.3~3L/min			1.5~20L/min		1.0~10L/min	3.0~60L/min	
Accuracy*1		Instantaneous flow rate display	±2%RS±0.05L/min			±2%RS±0.2L/min			±2%RS±0.5L/min	
		Integrating flow volume display	±2%RS							
Liquid to be measured			Compatible with various kinds of liquids (Please select the model after checking main wetted materials below)							
Maximum working pressure			1MPa (Liquid temperature at 20°C)							
Pressure loss			12 kPa or less (At 3L/min)			20 kPa or less (At 20L/min)		15 kPa or less (At 10L/min)	60 kPa or less (At 60L/min)	
Liquid viscosity range			0.5~1.5mPa·s							
Liquid temperature range			0~+60°C							
Ambient temperature/humidity			0~+60°C 35~85%RH (No condensation)							
Output signal			Open drain output (Equivalent to open collector) ON time: 10ms Maximum rated voltage 30VDC Output capacity: 150Ωor less, OFF resistance: 100kΩ or more (Residual voltage shall be 1.5V or less at input voltage of 10mA or less)							
Pulse output unit			10mL/p			1L/p				
Liquid crystal display	Instantaneous flow rate	Smallest scale	0.05L/min			0.2L/min			0.5L/min	
		Display digits	00.00L/min			000.0L/min				
	Integrating flow volume	Display digits	000000.00L			0000000.0L				
Power supply			Built-in lithium battery (Battery life: About 4 years Not replaceable)							
Structure			IP X4 (indoor specification)							
Connection			R1/2						R3/4	
Weight			About 280g			About 250g			About 500g	
Main materials of wetted part		Case	Modified PPO	PP	ETFE	Modified PPO	PP	ETFE	Modified PPO	PP
		Vane wheel	POM		ETFE	POM		ETFE	POM	
		Pivot	SUS304	PA	ETFE	SUS304	PA	ETFE	SUS304	
		O-ring	NBR	FKM		NBR	FKM		NBR	FKM
		Magnet	Sa-Co*2			Ba-Fe		Sa-Co*2	Ba-Fe	

●For the details of material marks, refer to the back cover.

*1 Installation position other than standard installation position is not covered by our accuracy assurance. In addition, NW05-TT, NW10-TT cannot be used for the installation position other than standard position.

*2 Double magnet does not touch the liquid.

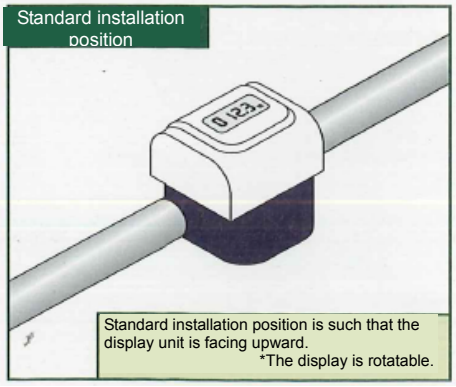
External dimensions



Unit: mm

Model	NW05	NW10	NW20
A	80	80	110
B	87	87	105.5
C	52	52	74
D	11	11	16
E	25	25	35.5

Standard installation position



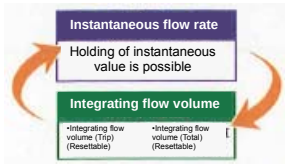
Display type of Microstream sensor OF-Z.

Instantaneous flow rate /Integrating flow volume flowsensor OF-WN/OF-WP (with pulse output*)

*Option

Feature

- Built-in lithium batteries, no external power supply is required.
- Excellent feature of OF-Z type flowsensor is left as it is and instantaneous flow rate and integrating flow volume are indicated by only one flowmeter.
- Revolving display unit (it can be fixed to an easy-to-see position)
- Simplified structure with oval gears type measuring principle.
- Compatible with various kinds of liquids
- Reset function for the display of integrating flow volume (Total) and integrating flow volume (Trip).
- Value holding function for instantaneous flow rate display
- Pulse output function (Optional)
- CE marking certified



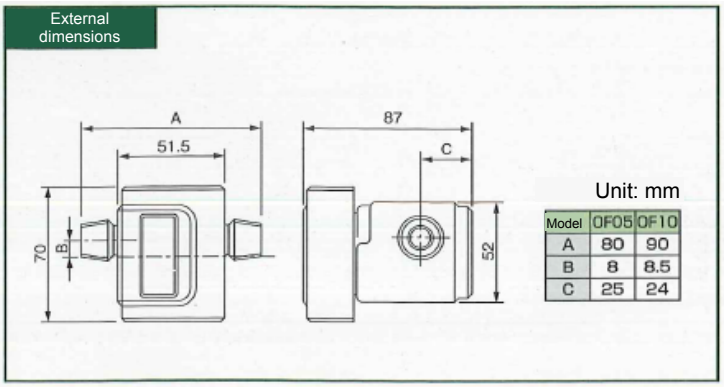
Specification In addition, if there is anything unclear, please contact us.

Instantaneous flow rate/integrating flow volume flowmeter OF/WN type			OF05ZAWN	OF10ZAWN	OF05ZZWN	OF10ZZWN
Instantaneous flow rate/integrating flow volume flowmeter (with pulse output) OF/WP type			OF05ZAWP	OF10ZAWP	OF05ZZWP	OF10ZZWP
Flow rate range	Liquid viscosity 0.3~0.8mPa·s		0.085~0.85L/min	0.7~5L/min	0.085~0.85L/min	0.7~5L/min
	Liquid viscosity 0.8~2.0mPa·s		0.05~0.85L/min	0.35~5L/min	0.05~0.85L/min	0.35~5L/min
	Liquid viscosity 2.0~5.0mPa·s		0.017~0.85L/min	0.17~5L/min	0.017~0.85L/min	0.17~5L/min
	Liquid viscosity 5.0~200mPa·s		0.0085~0.85L/min	0.085~5L/min	0.0085~0.85L/min	0.085~5L/min
Accuracy*1	Instantaneous flow rate display		±2%RS±0.007L/min	±2%RS±0.04L/min	±2%RS±0.007L/min	±2%RS±0.04L/min
	Integrating flow volume display		±2%RS			
Liquid to be measured	Compatible with various kinds of liquids		Please select the model after checking main wetted materials below			
	Major liquids to be measured		Hot and cold water/Kerosene/Light oil/heavy oil		Weak acid/Weak alkali	
Maximum working pressure			0.5MPa (Liquid temperature at 20°C)			
Pressure loss			4 kPa or less	10 kPa or less	4 kPa or less	10 kPa or less
Liquid temperature range			0~+60°C			
Output signal			Open drain output (Equivalent to open collector) ON time: 10ms Maximum rated voltage 30VDC Output capacity: 150Ωor less, OFF resistance: 100kΩ or more (Residual voltage shall be 1.5V or less at input voltage of 10mA or less)			
Pulse output range			10mL/p			
Ambient temperature/humidity			0~+60°C 35~85%RH (No condensation)			
Liquid crystal display	Instantaneous flow rate	Smallest scale	0.007L/min	0.04L/min	0.007L/min	0.04L/min
		Display digits	0.000L/min	00.00L/min	0.000L/min	00.00L/min
	Integrating flow volume	Display digits	00000.000L	000000.00L	00000.000L	000000.00L
Power supply			Built-in lithium battery (Battery life: About 4 years Not replaceable)			
Structure			IP X4 (indoor specification)			
Connection			R1/4	R1/2	R1/4	R1/2
Weight			About 240g	About 260g	About 240g	About 260g
Main materials of wetted part	Case		PPS			
	Rotor		PPS			
	O-ring		NBR		FKM	
	Shaft		SUS304		SiC	

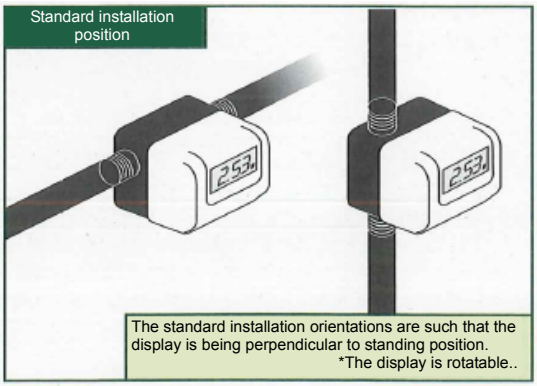
- For the details of material marks, refer to the back cover. ● If a fluid might get mixed with particulate, install a filter of which mesh is #80 or more at an upstream side of flowsensor.
- Measurement of gasoline, sodium hydroxide (Caustic soda), hydrogen peroxide solution (Oxydol) and hydrochloric (strong acid) is not adapted.

*1 At Standard installation position

External dimensions



Standard installation position



The standard installation orientations are such that the display is being perpendicular to standing position.
*The display is rotatable..

Compact, easy, high-quality, and low-cost flowsensor

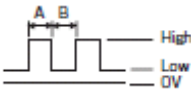
Compact Flowsensor NDV

Features

- Excellent reproducibility
- Low pressure loss
- Noise-resistant magnetic sensor with a built-in amplifier provides output in proportion to the flow rate
- Simple structure
- Flexible mount position
- Compact and light-weight design
- RoHS-enabled

Specifications

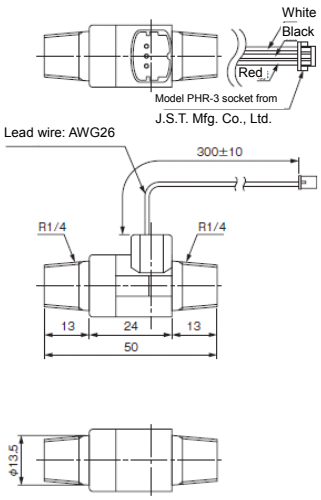
Contact us for special specifications.

Model		NDV10-STD1	NDV10-STD2
Flow rate range		1 - 10L/min	
Precision		±7%RS	
Target fluid		Tap water *1	
Maximum use pressure		0.75MPa (at the fluid temperature of 20°C)	
Pressure loss		27kPa or less	
Fluid temperature range		0 to +40°C	
Environmental temperature/humidity		0 to +40°C 35 to 85%RH (no dewing)	
Output		Voltage pulse (connect load resistance of 10kΩ or more.) Duty ratio 2:8 < A:B < 8:2 	
Pulse constant		1.12mL / P	
Applied voltage range		3 to 30 VDC	
Structure		IP X4 (indoor use)	
Connector	Connector type	Model PHR-3 socket from J.S.T. Mfg. Co., Ltd.	
	Signal type	Red: +VCC White: Output Black: GND (UL1061 AWG26)	
Connection		R1/4	Tube connection type (tube inner diameter Φ14) *2
Weight		Approximately 12g	
Fluid contact portion material	Case	Glass fiber reinforced ABS	
	Vane	Carbon fiber reinforced POM	
	Shaft	SUS304	
	Magnet	Sa-Co	

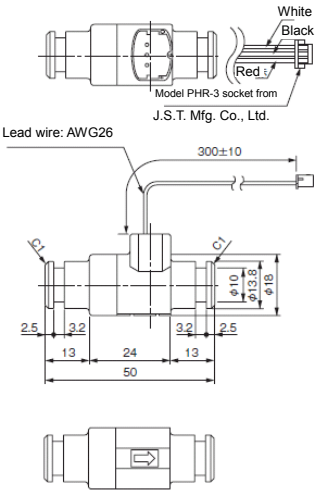
Applied voltage	High	Low
3VDC	2 VDC or higher	1 VDC or lower
12VDC	10 VDC or higher	
30VDC	27 VDC or higher	

- Refer to the back cover for the meaning of material symbols. *1 Contact us for use with other than tap water. *2 O-ring is not supplied with the flowmeter. Recommended O-ring: JIS B 2401 Nominal P10A inner diameter 9.8, thickness

External dimensions NDV10-STD1 Unit: mm



NDV10-STD2 Unit: mm



This unit displays the instantaneous flow rate and integrating flow volume and outputs 4 to 20mA immediately after receiving an open collector signal from small electromagnetic flowsensor VN or VNS.

Display unit ASI

Compatible flowsensors						
VN	VNS	ND	OF-Z	NDV	MND	MBS

Feature

- Display instantaneous flow rate/integrating flow volume and 4 to 20mA output function
- Output specification (3 systems)
  (1) 4 to 20mA
  (2) Open collector pulse with 2 systems
  (Flow rate signal/Status output and etc.,)
- Usable applications are such as flow rate controler/recorder through the analog output (4 to 20mA).
- RoHS-ready

Specification

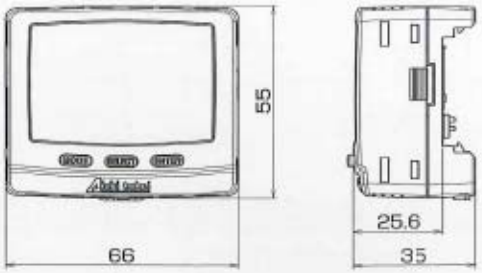
In addition, if there is anything unclear, please contact us.

Item			Specification
Display	Display		Reflective liquid crystal
	Details of display		Instantaneous value display/integrated value display (Total integration, Excess integration, Shortage integration, Trip integration, Preset integration)/item display/unit display/operation display *Switching display between instantaneous flow rate value and integrated value
	Instantaneous value display	Measurement accuracy	±0.02% ±1 digit
		Display digits	4 digits
		Display sampling	Standard 2 seconds 0.25 to 10 seconds (20 steps)
		Low cutoff function	Initial value: 2.5%
	Integrated value display	Measurement accuracy	±0.02%±1 digit
		Display digits	Total integrated value: 8 digits Other integrated values: 7 digits (Excess integration/Shortage integration/Trip integration/Preset integration)
		Reset	Trip integrated value only
Status judgment function			Window judgment/Upper and lower limit judgment /Clip/Timeout/Preset/Low cut
Input	ch1	Open collector pulse	NPN open collector Current capacity: 5mA or less Residual voltage at turning ON: 1V or less Wire length: 10m or less (AWG28)
		Input response (Maximum frequency)	Standard: 1.1kHz Lowspeed: 50Hz
	ch2	Open collector pulse	NPN open collector Current capacity: 5mA or less Residual voltage at turning ON: 1V or less Wire length: 10m or less (AWG28)
		Input response	Minimum ON width: 1s Minimum OFF wide: 1s
Output		Analog output	4 to 20mA Load resistance: 520Ω or less
		Accuracy	±1.0%FS±1000ppm/°C
		Open collector output (2 systems)	NPN open collector Voltage capacity: 30VDC or less, Current capacity: 10mA or less Residual voltage at turning ON: 1V or less When frequency pulse is selected: Maximum frequency 1kHz When unit pulse is selected: Maximum frequency 50Hz (pulse width: 10ms fixed)
		Others	Alarm, upper/lower limit judgment and others
Power supply		Input voltage/current capacity	DC24V ± 10% 150mA or more (5.0W or more)
		Consumption current	50mA or less (Exclusive of sensor power supply)
		Sensor power supply	DC 24V ± 10% 100mA or less
Wiring	Input	Connection with sensor (*1)	e-con-compliant plug (attached)
	Output	Connection with respective receiver	Cable for output signal wire: 2m or 5m (Optional)
	Power supply	Connection with power supply	Screwless terminal block (AWG 22-28)
Others		Structure	IP 50 (Indoor specification)
		Usage environment	-10 to 50°C 80%RH or less (No condensation)
		Storage environment	-20 to 60°C 85%RH or less (No condensation)

*1. When you place an order of this unit as a combined unit with our flowsensor (VN/VNS), we shall ship the flowsensor with e-con plug mounted.
However, cable length is 15cm.

External dimensions

Unit: mm



*Possible to make a combined unit with VN/VNS

Details of display function

① Bar display of instantaneous value
② Display item
③ Operation display
④ Unit display
⑤ Integration display
(Total integrated value: 8 digits / Excess integration/Shortage integration/Trip integration/Preset integration: 7 digits)
Instantaneous value display (Instantaneous value 4 digits)

For VNS, check pages 5 and 6.

Combined unit with VNS

For VNS, check pages 3 and 4.

Combined unit with VN

Receives open collector signals from the flowsensor ND and micro flowsensor OF-Z and displays the momentary and accumulated flow rates.

Indicator NH/NK

Supported flowsensors: VN | VNS | ND | OF-Z | NDV | MND | MBS

Features

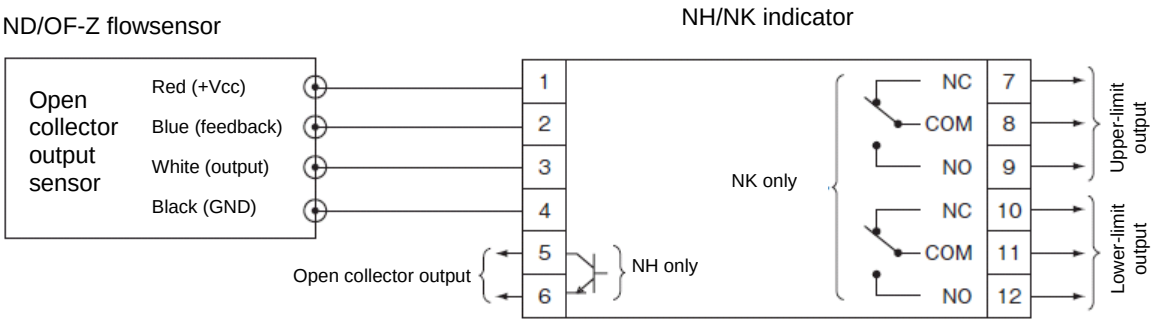
- Contains a lithium battery and does not require a power supply.
- Indicator dedicated for the flowsensor ND and micro flowsensor OF-Z (open collector)
- RoHS-enabled

Specifications

Contact us for any questions.

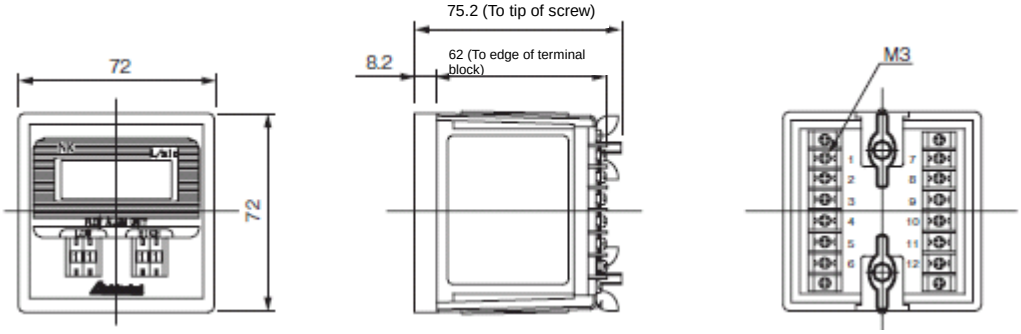
Model	NH	NK
Display	Total accumulated flow rate LCD 8 digits Trip accumulated flow rate LCD 6 digits Momentary flow rate LCD 3 digits * Displayed when switched to each mode	Momentary flow rate LCD 4 digits
Display unit	L and L/min	L/min
Pulse input	Open collector (supports four-wire type of ND and OF-Z flowsensors)	
Sensor power supply	3VDC	
Output	Open collector unit pulse Load capacitance: 30VDC, 10mADC, or less Pulse unit NH005 : 10mL/P NH05M : 10mL/P NH010 : 1L/P NH10M : 10mL/P NH020 : 1L/P	N/A
Alarm	N/A	No voltage c-contact Contact capacity 110VAC 0.3A/20VDC1A or less Upper/lower limit 2-digit digital setting for alarm
Display delay	4 to 6 seconds for momentary flow rate	4 to 6 seconds
Manual selection	Total accumulated, trip, momentary flow rate	Momentary hold
Power supply	Built-in lithium battery (battery life: 10 years, not replaceable)	
Mounting method	Panel attachment	
Environmental temperature and humidity	0 to 60℃ 40 to 90%RH (no dewing)	
Available reception distance	30 m	
Recommended transfer wire	Shielded cable with nominal cross section 0.5mm^2 or more (CVV-S), 4-core * Transmission cable is not supplied with the product.	
Weight	210g	250g

Wiring method



External dimensions

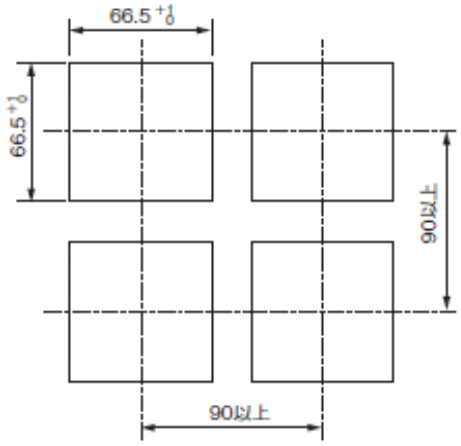
Unit: mm



* NK is shown in the figure but the external dimensions are same for NH.

Panel cut dimensions

Unit: mm



Model code

Use these codes for order.

N	*	***	-	4	0	Description
N						N
	H-k					H: Momentary accumulated flow rate indicator K: Momentary flowmeter with alarm
		Connected flowsensor				005：ND05 010：ND10 020：ND20 05M：OF05Z 10M：OF10Z
			-			
				4		4
					0	0

TI900 and TI-1000 receives signals output from various flowsensors and displays the momentary and accumulated flow rates.

Indicator TI <<Advanced Type>>

Supported flowsensors: VN | VNS | ND | OF-Z | NDV | MND | MBS

Features

- Works just by connecting to the flowsensor. No configuration is required. (Constants for flowsensors are already set at factory.)
- Choose one depending on the purpose.
  - TI900 is suitable for output pulse constants from ND, OF-Z, and other flowsensors while TI-1000 conforms to RoHS and CE.
  - TI900 displays the momentary and accumulated flow rates while TI-1000 displays the momentary flow rate.
- Analog output and alarm output functions
- Supports arbitrary pulse constant input by the scaling function

Specifications

Contact us for any questions.

Model		TI 900	TI-1000
Display		Momentary flow rate or accumulated flow rate display (selectable) Red LED (character height 10.2mm) 6 digits	Momentary flow rate display Red LED (character height 14mm) 5 digits
Display interval		Selectable from hour, minute, and second (momentary flow rate display)	
Display precision		Within ±0.05%RS±1 digit against pulse input (momentary flow rate display) Within ±1 digit against pulse input (accumulated flow rate display)	Within ±0.05%FS±1 digit against pulse input (when display sampling time is 0.5 seconds or longer)
Input	Input signal	Count: 1 NPN open collector pulse input (capacity 12VDC, 1.2mA or more) No-voltage a contact pulse input (capacity 12VDC, 1.2mA or more) Voltage pulse input (voltage range L: 2VDC or less, H: 3.5 to 35VDC) 4/10mA current pulse input (set at factory and selectable with bit switches on site)	Count: 2 inputs of A and B NPN open collector pulse input (10mA or more), or no-voltage contact
	Input frequency	Selectable with DIP switches from 0 to 150Hz FS (ON time: 3.3ms or more), 0 to 300Hz FS (ON time: 1.7ms or more), and 0 to 500Hz FS (ON time: 1.0ms or more)	Selectable with DIP switches from 0.01 to 50Hz (LOW) and 0.01 to 1kHz (MID), and 0.01Hz to 10kHz (HI)
	Accumulated reset	Terminal block reset input ON for 1 second (rated at 12VDC, 10mA)	-
	Alarm reset		Front reset key ON for 2 seconds or longer and terminal block reset input ON for 50ms or longer
	Hold	-	Selectable from hold, peak hold, bottom hold, and reverse rotation signals. Works while the terminal block is ON/ (Accepts NPN open collector pulse output or contact output.)
Output	Alarm output	(optional) x 2 a contact relay output (rate at 250V/DC30VAC, 1A or less) Upper and lower limits can be set arbitrarily.	2 + 2 (optional) NPN open collector pulse output (standard), PhotoMOS relay output (K optional)
	Analog output	(optional) x 1 4 to 20mADC, maximum load resistance 500Ω or less	(optional) x 1 4 to 20mADC, maximum load resistance 500Ω or less
	Pulse output	(optional) x 1 PhotoMOS relay output (rated at 35VAC/35VDC, 0.3A or less) Output unit: Selectable from 0.01, 0.1, 1, 10 [L, m^3]	-
Detector power supply		30VDC±5%, 15mA max, and 12VDC±5%,50mA max	12VDC 100mA max (standard), 24VDC 60mA max (optional)
Environmental temperature		0 to 50℃	
Power supply		85 to 264VAC(50/60Hz)	AC100 to 240V (standard), DC12 to 24V (optional)
Power consumption		Approximately 8VA	Approximately 20VA or less
Weight		Approximately 400g	Approximately 400g

Model code

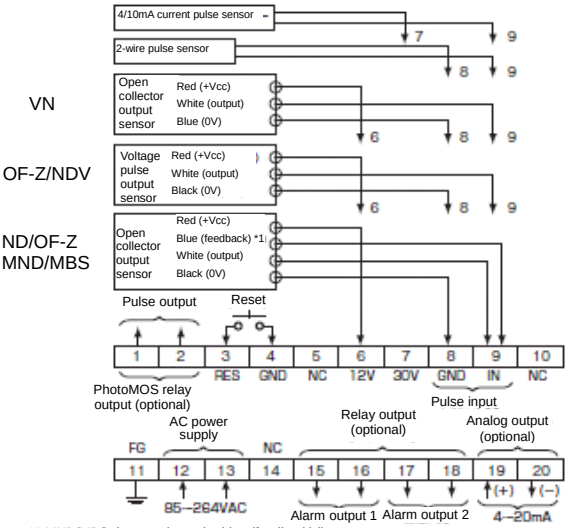
Use these codes for order.

TI900	-	*	*	*	*	*	-	****	Description
Model									TI900
	-								-
		Analog output							N: No A: 4 to 20mADC, (optional)
			Pulse output						N: No P: Yes (optional)
				Alarm output					N: No K:Yes (optional)
					Display unit				1: Momentary value m^3/h accumulated value m^3 2: Momentary value L/min accumulated value L 3: No momentary value No accumulated value
						Input signal			C: Open collector pulse R: No-voltage a contact pulse D: Voltage pulse A: 4/10mA current pulse
							-		-
								Connected flowsensor	005 : ND05 010 : ND10 020 : ND20 05M : OF05Z 10M : OF10Z 10V : NDV10 20B : MBS20 20N : MND20

TI-1000	-	*	*	*	*	*	Description
Model							TI-1000
	-						-
		Analog output					N: No A: 4 to 20mADC, (optional)
			Output alarm				N: No P: Yes (optional)
				Input signal			C: Open collector pulse F: Voltage pulse
					Sensor power supply		1: DC12V 2: DC24V
						Power supply input	A: AC100-240V D: DC12-24V

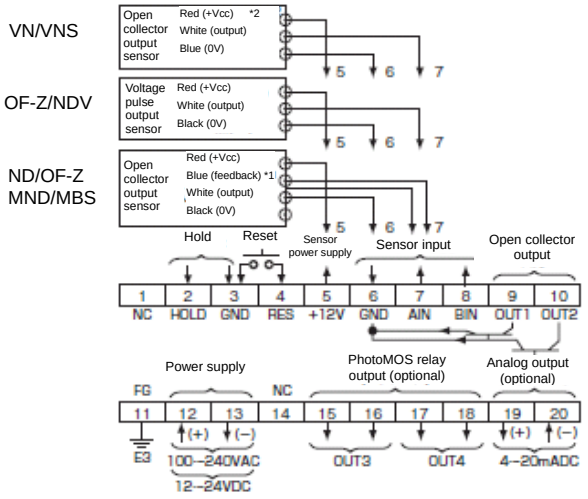
Wiring method

TI900



*1 MND/MBS does not have the blue (feedback) line.

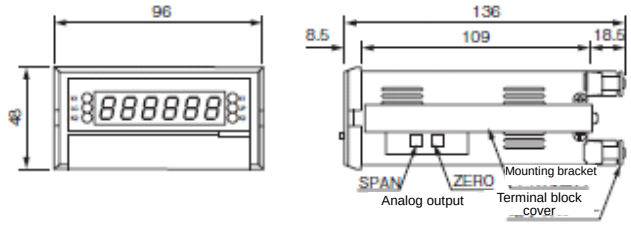
TI-1000



*1 MND/MBS does not have the blue (feedback) line.
*2 For VNS, choose DC24V power supply for the sensor.

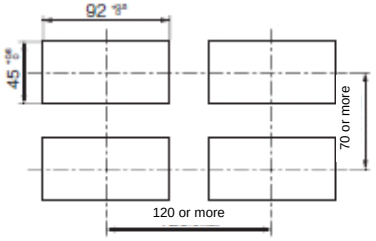
External dimensions TI900

Unit: mm



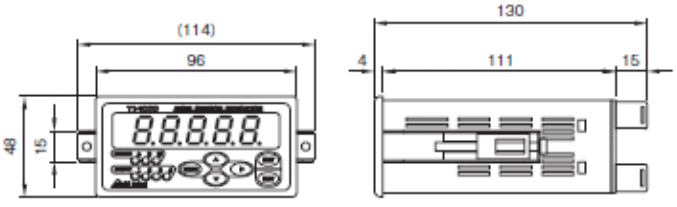
Panel cut dimensions

Unit: mm



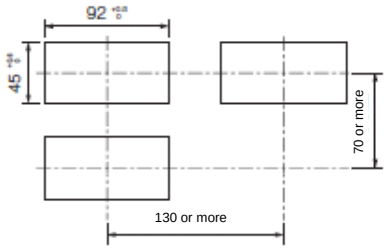
External dimensions TI-1000

Unit: mm



Panel cut dimensions

Unit: mm



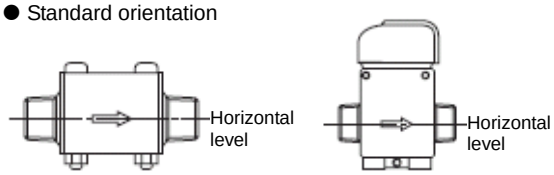
Notes on Installation

To ensure maximum performance and functionality of the flowsensor, observe the following precautions to handle the flowsensor correctly.

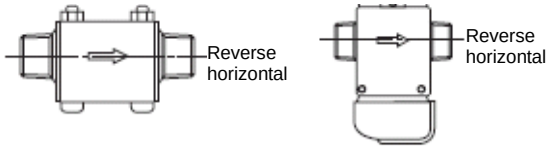
For flowsensor ND

(1) Make sure to align the flow direction of the fluid with the arrow on the case indicating the flow direction.
(2) Provide a straight portion on the pipe connected to the inflow side. If the pipe immediately before the flowsensor bends two- or three-dimensionally or its diameter changes radically, the measurement precision may be affected.
(3) Make sure to make the pipe diameter on the inflow side larger than the nozzle diameter of the flowsensor.
(4) If the flow within the pipe has pulsation, the measurement precision may be affected. When feeding the fluid with a quantitative pump which can cause pulsation, cancel the pulsation using an accumulator.
(5) Make sure not to apply excessive stress to the flowsensor when mounting it.
(6) Keep warm the entire system where the fluid can freeze in winter. If the fluid leaks due to freezing, the measurement precision may be affected.
(7) Avoid mounting the flowsensor where it is exposed to a direct sunlight (indoor specifications).
(8) Observe the appropriate conditions for the flow rate range, pressure, and fluid temperature as indicated on the seal attached to the side of the flowsensor body. Avoid mounting the flowsensor where it is exposed to excessive pressure such as water hammer.
(10) An air pocket in the flowsensor affects its measurement precision. Use the flowsensor with its measurement chamber filled with the fluid. Air passing through the chamber also affects the precision. Be careful not to allow air to get mixed in the fluid.
(11) Do not get a strong magnet or magnetic field close to the flowsensor.
(12) The flowsensor can be mounted in any orientation except for those shown in the figure to the right, however, mount it in the standard orientation as far as possible to ensure the maximum precision. Note that the models ND05-TAAA, ND10-TATAAAA, NW05-TTN, and NW10-TTN must be mounted in the standard orientation only.

● Standard orientation



● If mounting in the standard orientation is not possible (the mark or electronic indicator must face down)



For flowsensor OF

(1) Make sure to align the flow direction of the fluid with the arrow on the case indicating the flow direction.
(2) Ensure that no foreign material (e.g., shavings of pipe, cut piece of sealing tape) enters inside the flowsensor.
(3) The flowsensor can be mounted horizontally or vertically (i.e., in the horizontal and vertical orientation). Make sure that the front plate is perpendicular to the ground. (Never mount the flowsensor so that the front plate is parallel to the ground.)
(4) Observe the appropriate conditions for the flow rate range, pressure, and fluid temperature as indicated in the specifications.
(5) No straight portion is required.

Symbol

Modified PPO:	Polyphenyene oxide
PP:	Polypropylene
PPS:	Polyphenylene Sulfide
ETFE:	Ethylene-tetrafluoro ethylene
POM:	Polyacetal or polyoxymethylene
PA:	Polyamide
SUS304:	Stainless
SCS13:	Stainless steel castings

FKM:	Fluoro Rubber
SiC:	Silicon Carbide Ceramics
Sa-Co:	Samarium-Cobalt
EPDM:	Ethylene propylene Rubber
Ba-Fe:	Barium-Ferrite
O.C.:	Open Collector
NBR:	Acrylonitrile-Butadiene Rubber

Viscosity units

Viscosity: 1[cP]=1[mPa•s] Kinematic viscosity 1[cSt] = 1[mm^2/s] Kinematic viscosity[cSt] = Viscosity[cP]/ Density[g/cm^3]

* Water density: 1[g/cm^3] @4°C

Safety caution Be sure to read the Handling Manual before using the product to ensure your safety.

Specifications in this catalog are correct as of September 2014.

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VEGETABLE OIL INK

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Note The product specifications are subject to change without notice for improvement. If you have a catalog or material which is not up-to-date, contact us for the latest catalog or material or for the detailed information.

Update No. 2.6
MK-SENSOR-020H