**For Sodium Hypochlorite Solution and Sodium Hydroxide Solution**

Small-Size Electromagnetic Sensor VNS

Handling Manual

CE–Compliance

| | |
|---|---|
| **Danger** | This indicates that if you ignore this instruction, danger which may result in death or serious injury can occur. |
| **Warning** | This indicates that if you ignore this instruction, danger which may result in serious injury can occur. |
| **Caution** | This indicates that if you ignore this instruction, a physical damage (e.g., defect of the product) can occur. |

## Notes on use

**Danger**

1. Do not use this product for a purpose which requires safety, such as atomic power generation, railways, aviation, vehicle, or playground equipment.
2. Do not alter the product.
3. Do not use this product for food, beverage, and/or medical fluid because it does not conform to the sanitary specifications.
4. Do not use in an explosive atmosphere such as a combustible gas because it is not explosion-protected.
5. If you measure a fluid not intended for a specific model, it may leak from the O-ring. Be sure you are using the correct model for the correct fluid.

## Use environment and target fluid

**Caution**

1. The target fluids are sodium hypochlorite solution and sodium hydroxide solution. Observe the rated density (conductivity).
2. Never mix a fluid of which conductivity is extremely low (e.g., oil) even if the quantity is very small.
3. Never install the sensor unit where the fluid can freeze or its temperature can exceed 40°C.
4. The product may malfunction if it is used in a fluid where a stray current is flowing.
5. Observe the permissible pressure range (1 MPa or less) and flow rate range. Do not use the product under the condition of the load exceeding the permissible value.
6. Since the product is not water-proof (IP64 or equivalent), do not install it where it can be submerged.
7. Keep the product away from a strong magnet or magnetic field.
8. When mixing the solution with water, do it at the downstream of the product
9. When storing the product after passing the fluid through it, be sure to wash it thoroughly.
10. When changing the setting of the product, stop the whole of equipment before doing it.
11. Do not place the product where it is exposed to a direct sunlight or heat radiated from a heat source.

## Notes on operation

**Caution**

1. This product cannot be used for billing application.
2. Do not use any display or output during 20 seconds after power because it is the time the operation becomes stable.

## Notes on piping

**Caution**

1. Do not use the product where air can ingress. Also, do not install it where an air pocket can easily occur (e.g., the upstream side of a falling pipe). Before starting to use the product after installation, drain air sufficiently.
2. It is recommended to install the sensor as the fluid flows from bottom to top in order to avoid influence of bubble, dust, and/or dirt.
3. Install something that disturbs the flow such as flow adjustment value at the downstream of the product.
4. Do not install the product on a piping system where an impact pressure such as a water hammer can occur.
5. Provide 5D or longer straight pipe at the upstream of the sensor.
6. Provide a straight pipe at the downstream of the sensor as long as possible.
7. Do not install the product where a strong compression or tension force or a strong load is applied to it.
8. Put and install the sensor in accordance with the flow direction indicated on the product.
9. Do not drop, hit, or apply an excessive impact to the product. Hold the body when you handle the product (never hold the cable).
10. Provide a maintenance space where the product is installed.
11. If there are foreign substances, oil, etc in the pipe, wash the pipe before installing the sensor.

**Warning**

1. Observe the specified torque for capnut shown below. Do not apply an excessive torque. An excessive torque may break the sensor sleeve screw section and cause leakage.
   VNS05R: 2.8 N·m
   VNS10R: 2.8 N·m
   VNS20R: 4.2 N·m
   If the fluid still leaks after tightening the torque with the above torque value, do not tighten them with a higher torque but check for dust adhered to the seal and damage of the O-ring.
2. Do not install the product in locations used as footholds.

## Notes on cabling

**Danger**

1. This products operates with 24VDC. Connecting it to a AC power supply may cause a fire.
2. Observe the instructions given in this manual for cabling.
3. Observe the rated range. Do not use a load exceeding the permissible value.

**Caution**

1. Keep the cables away from the power, motor cables, etc.
2. Keep the product away from noise sources as far as possible.
3. It is recommended to electrically isolate power supply and receiving instruments from other equipment.
4. Do not use a power supply of which voltage is unstable or of which capacity is lower than the rated value.
5. It is recommended to ground the FG terminal of the power supply.
6. Do not apply an excessive tension to the cables.
7. Be careful so that the cable tip is not soaked in water during the cabling work.



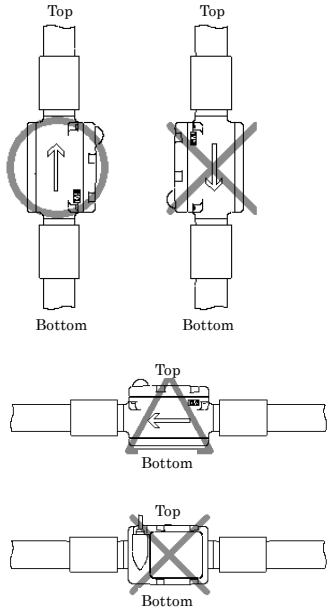


## Piping and installation

1. Piping

The installation position is not restricted as far as the sensor is always filled with the fluid. However, it is recommended to install the sensor as illustrated below so that it may not be affected by bubbles.

○: Recommended
△: Attention must be paid to bubbles
×: Must be avoided

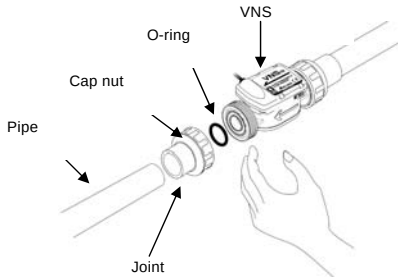



2. Mounting

Attach the O-ring to VNS, put the cap nut of the joint over the sleeve screw of VNS, and then tighten the nut at the specified torque.

The standard torque is 2.8 N·m for VNS05R and VNS10R, and 4.2 N·m for VNS20R.

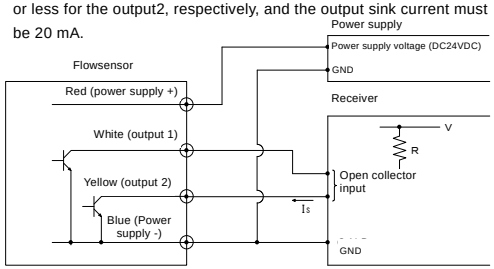
Apply adhesive to the connection point of the pipe and joint to fix them.




## Wiring

Refer to the figure below for electrical connection.

Keep the pull-up voltage at 28VDC or less for the output1 and 30VDC or less for the output2, respectively, and the output sink current must be 20 mA.




$$I_S \text{ (Output sink current)} = \frac{\text{V (Pull-up voltage)}}{\text{R (Pull-up resistance)}} \leqq 20\text{mA}$$

## Specifications

| Model | | | VNSOORF | VNSOORE |
|---|---|---|---|---|
| Accuracy-guaranteed flow rate range | VNS05R | | Constant flow mode: 0.05~1 [L/min]<br>Pulsating flow mode: 0.01~1 [L/min] | |
| | VNS10R | | Constant flow mode: 0.5~10 [L/min]<br>Pulsating flow mode: 0.1~10 [L/min] | |
| | VNS20R | | Constant flow mode: 3.0~60 [L/min]<br>Pulsating flow mode: 0.6~60 [L/min] | |
| Low-flow-cut flow rate | | | 2.5% F.S. (in constant flow mode) | |
| Accuracy | Constant-flow characteristics | Output pulse | Flow rate ratio against the upper limit of the accuracy-guaranteed flow rate (F.S. value) | |
| | | | 100-20% | 20%-5% |
| | | Unit pulse | ±2.0%R.S. | ±0.4%F.S. |
| | | Frequency pulse | ±2.5%R.S. | ±0.5%F.S. |
| | Pulsating-flow characteristics* | Output pulse | Flow rate ratio against the upper limit of the accuracy-guaranteed flow rate (F.S. value) | |
| | | | 100-20% | 20%-1% |
| | | Frequency pulse | ±5.0%R.S. | ±1.0%F.S. |
| Fluid type | | | Sodium hypochlorite solution | Sodium hydroxide solution |
| Density | | | 1~12% | 10~25% |
| Conductivity | | | 14~110mS/cm | 340~360mS/cm |
| Fluid temperature | | | 0 to 40°C (no freezing) | |
| Pressure range | | | 1 MPa or less | |
| Output | Output format | | NPN open collector | |
| | Maximum current | | 20 mA | |
| | Inter-terminal withstand voltage | | Output 1: 28 VDC, Output 2: 30 VDC | |
| | ON time residual voltage | | 1 VDC or less | |
| | Flow rate output | Frequency pulse | 20 to 400 [Hz] | |
| | | Unit pulse VNS05R | 0.001 (standard) [L/P] | |
| | | Unit pulse VNS10R | 0.01 (standard) [L/P] | |
| | | Unit pulse VNS20R | 0.1 (standard) [L/P] | |
| | Switch output | | Level judgment, window judgment | |
| | Alert output | | Dry sensor, meter abnormality, excessive flow noise, reverse flow, excessive flow | |
| Power supply voltage | | | 24 VDC ± 10% | |
| Current consumption | | | 60 mA or less | |
| Protection structure | | | IP64 (equivalent) | |
| Environment al durability | Working temperature | | -20 to +60°C | |
| | Humidity | | 35 to 85% (no dewing) | |
| | Storage temperature | | -20 to +70°C | |
| Material | Wetted part | Main body | PEEK | |
| | | Electrode | Titanium | Hastelloy C22 (equivalent) |
| | | Earth ring | | |
| | | O-ring | Fluorine-contained rubber | Ethylene-propylene rubber |
| | Non wetted part | | Top and bottom covers: PPS, Cable: Vinyl chloride | |
| Weight | VNS05R | | Approx. 200 g | |
| | VNS10R | | Approx. 200 g | |
| | VNS20R | | Approx. 300 g | |

* Flow rate characteristics for measuring pulsating flow from an electromagnetic metering pump

## LED indication

A bicolor (green/red) LED indicates the flow rate or alert. An alert by detection of abnormality is prioritized, and only an alert with the highest priority is indicated.

Green: Indicates the flow rate with four blinking and lighting patterns in three levels.

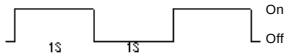
Red: Indicates an alert (fault detection) with six blinking and lighting on/off patterns in four levels.

1. Flow rate (green)

- Display pattern for the Flow Rate Range

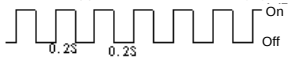
| Flow rate range | Display pattern |
|---|---|
| Less than low-flow-cut flow rate | Turns on continuously. |
| Low-flow-cut flow rate to 1/3 of the upper limit of the accuracy-guaranteed flow rate | Blinks at 2-second interval by turning on and off for 1 second respectively. |
| 1/3 to 2/3 of the upper limit of the accuracy-guaranteed flow rate | Blinks every second turning on and off for 0.5 seconds respectively. |
| Higher than 2/3 of the upper limit of the accuracy-guaranteed flow rate | Blinks every 0.4-second turning on and off for 0.2 seconds respectively. |

(Low-flow-cut flow rate to 1/3 of the upper limit of the accuracy-guaranteed flow rate)




(1/3 to 2/3 of the upper limit of the accuracy-guaranteed flow rate)


(Higher than 2/3 of the upper limit of the accuracy-guaranteed flow rate)




・Display pattern for pulsating flow

Blinks every 0.4-sec when there is a pulsatory flow and turns on continuously when there is no pulsating flow.

(Blinks when pulsatory flow is detected.)


2. Alert (red)

- Alert items

| | |
|---|---|
| Excitation failure | Current does not flow through the excitation coil correctly. |
| Memory error | Error has been detected with memory data. |
| Voltage drop | Power supply voltage has dropped. |
| Dry sensor | Measurement fluid has gone out of the flowsensor and the sensor is not filled with it. |
| Excessive flow noise | Normal measurement is not possible since an abnormal current is flowing through the measurement fluid or air ingress. |
| Reverse flow | Measurement fluid is flowing in the reverse direction. |
| Excessive flow | 125% or more of the maximum flow rate for the model has been detected. |

- Alert items and display pattern

| Alert item | Priority | Display pattern |
|---|---|---|
| Voltage drop | 1 | Turns off continuously for both green and red. |
| Excitation failure or memory error | 2 | Turns on continuously. |
| Dry sensor | 3 | Turns on and off for 0.3 seconds respectively for one cycle, then turns off for 1.7 seconds and repeat them. |
| Excessive fluid noise | 4 | Turns on and off for 0.3 seconds respectively for three cycles, then turns off for 1.7 seconds and repeat them. |
| Reverse flow | 5 | Turns on and off for 0.3 seconds respectively for two cycles, then turns off for 1.7 seconds and repeat them. |
| Excessive flow | 6 | Turns on and off for 0.3 seconds respectively for four cycles, then turns off for 1.7 seconds and repeat them. |

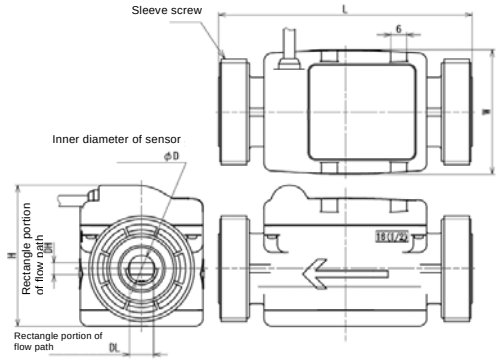
Dry sensor


Excessive flow noise


Reverse flow


Excessive flow


## External dimensions




Cable length: 500 mm, Termination: Peel cable coating and twist core wire (12 mm) Unit:[mm]

| | | VNS05R | VNS10R | VNS20R |
|---|---|---|---|---|
| Dimension | φD | φ5.2 | φ10 | φ20 |
| | DL | 4.6 | 9 | 18 |
| | DH | 2.4 | 4.4 | 8.7 |
| | L | 95 | 95 | 110 |
| | W | 47 | 47 | 48 |
| | H | 51 | 53 | 64 |
| | Sleeve screw | For joint (16A) | For joint (16A) | For joint (20A) |



7178-485

## Warranty

- Warranty period

One year after the dispatch date from Aichi Tokei Denki facility.

- Warranty scope

We are making every effort to produce our products with high quality, however if a defect which is subject to our liability should occur during the warranty period under normal use, we shall repair the product or replace it with a normal product for free.
Please understand that we shall determine whether the free remedy shall apply to your situation after our investigation of the product.
Also please understand that the free remedy shall not be applied to a defect:

(1) Caused by use which does not follow the instructions given in our catalog, product specifications, and/or handling manual,
(2) Caused by disaster such as a fire, earthquake, storm, flood, or lightening, or a destructive act such as a crime,
(3) Caused by corrosion due to use in a corrosive environment,
(4) Caused by acts of animals such as a dog, cat, rat, or insect,
(5) Caused by a factor other than our product,
(6) Which could not be foreseen with the science and technology levels at the time of shipment,
(7) Caused by a repair or alteration other than done by or specified by us, and/or
(8) Caused by an inappropriate inspection and/or maintenance or replacement of a consumable.

Please note that "warranty" in this context means warranty for our product alone and we shall not reliable for any damage resulting from a defect of our product, including but not limited to a damage to equipment other than our product, loss of profit, loss of opportunity, transportation fee, and construction fee.

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The product specification might be changed without prior notice.

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