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# INSTRUCTION MANUAL

## DIFFERENTIAL PRESSURE FLOW NOZZLE

### HFN Series



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You shall be well-informed of the contents where **WARNING** is marked before carrying out the work.



You shall be careful where **CAUTION** is marked to carry out the work.



You shall be aware of where **NOTICE** is marked to carry out the work.

## Summary

This section briefly explains each chapter in this manual.

In *Installation* section, it explains the check points before installation and direction for installation, location selection, and installation method for Flow Nozzle of HFN Series.

In *Inspection & Maintenance* section, it explains the checkup of the connection parts after installation, and maintenance method of Flow Nozzle of HFN Series.

## Installation

Below information is for the direction for installation, location selection, and installation method of flow nozzle (HFN Series).

### 1. Warning



**Failure to install in accordance with the instructions in this manual may result in system accidents and serious injury. Therefore, skilled workers shall perform the installation after well informing of this manual.**

### 2. Check Points before Installation

The following is a brief description to installation the HFN Series.

- Decide where to install the HFN Series on the pipeline.
- Decide the direction of flow nozzle installation subject to service condition
- Determine the proper straight length refer to [Table 1] of *Straight Length Requirements* section.
- Check the installation configuration of the flow nozzle.
- Install the flow nozzle and hardware in accordance with *Installation of Hardware* section.
- Check if there is any leakage of fluid.

### 3. Precautions for receiving inspection

The following points shall be surely checked after receiving of instrument.

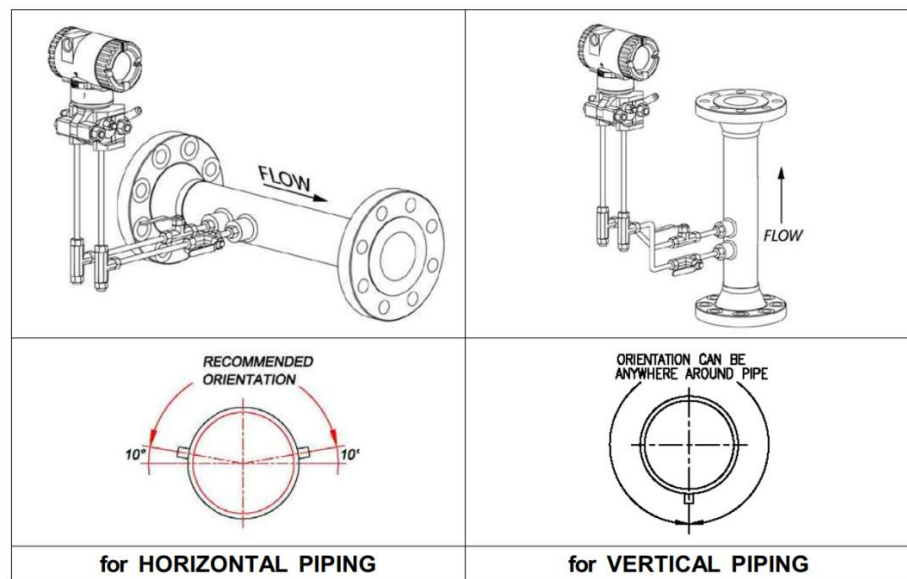
- Check the specification of received product as same as ordered specification.
- Make sure the inner diameter of the pipeline for installation shall be same as pipe I.D which described on the nameplate of flow nozzle.
- Carefully check any damage on the orifice during the transportation.

#### 4. Installation Configuration

The flow nozzle shall be installed by selecting proper direction according to counter pipe and measured fluid.

##### ■ Gas Applications

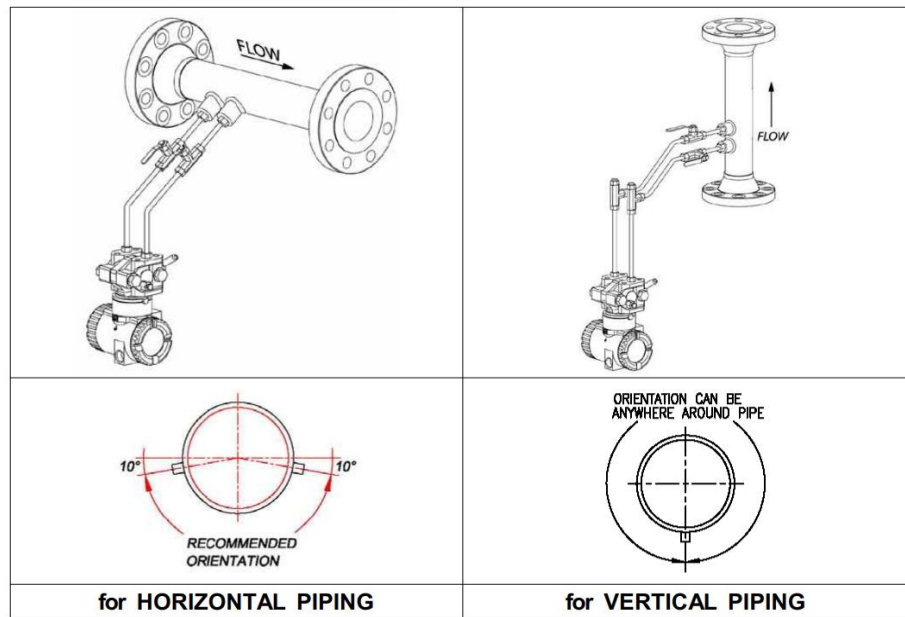
Please adjust the direction of pressure taps to the recommend direction of below <Figure 1>, and install the differential pressure transmitter above flow nozzle.



<Figure 1>

##### ■ Liquid Applications

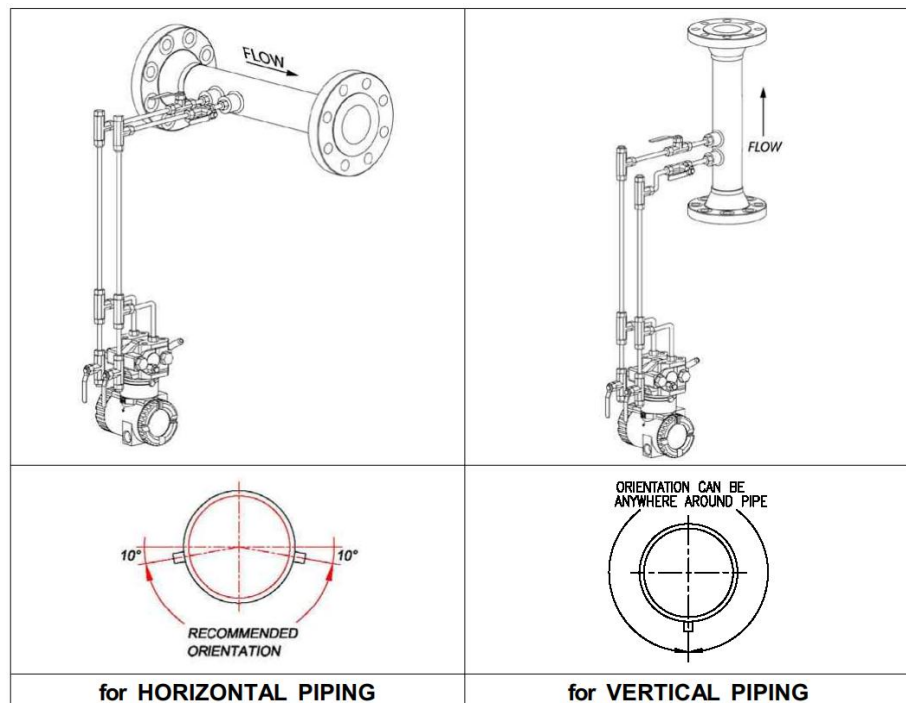
Please adjust the direction of pressure taps to the recommend direction of below <Figure 2>, and install the differential pressure transmitter below flow nozzle.



<Figure 2>

■ Steam Applications

Please adjust the direction of pressure taps to the recommend direction of below <Figure 3>, and install the differential pressure transmitter below flow nozzle.



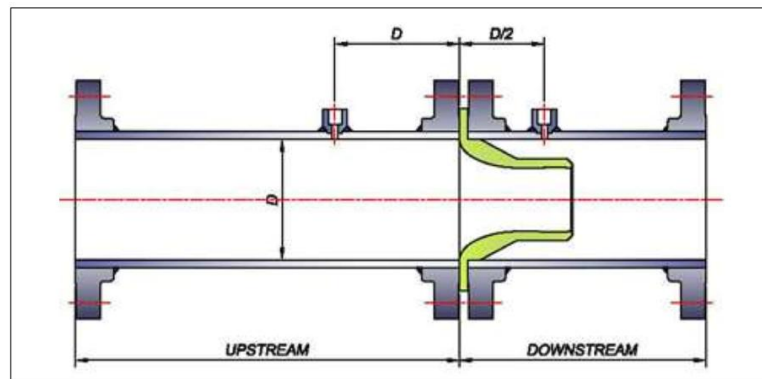
<Figure 3>

■ Others

- The flow conditioners or straighteners shall be installed at upstream of flow nozzle.
- It shall be installed that the flow arrow mark of flow nozzle shall be matched with flow direction of fluid in the pipeline

5. Straight Length Requirements

In order to accurately measure the flow rate using a flow nozzle, the minimum straight length as shown in below <Figure 4> is required under the condition that the medium is full and flows in the pipeline. Refer to below <Table 1> to determine the straight length to be secured, and if the ratio of upstream and downstream is shorter, it shall be contacted us to determine a better accurate installation point.



<Figure 4>

■ Required Minimum Straight Pipe Length(ISO-5167-3:2003)

Table 3 — Required straight lengths for nozzles and Venturi nozzles

Values expressed as multiples of internal diameter, *D*

Diameter ratio $\beta^a$	Upstream (inlet) side of the primary device											Downstream (outlet) side of the primary device										
	Single 90° bend or tee (flow from one branch only)		Two or more 90° bends in the same plane		Two or more 90° bends in different planes		Reducer 2 <i>D</i> to <i>D</i> over a length of 1.5 <i>D</i> to 3 <i>D</i>		Expander 0.5 <i>D</i> to <i>D</i> over a length of <i>D</i> to 2 <i>D</i>		Globe valve fully open		Full bore ball or gate valve fully open		Abrupt symmetrical reduction		Thermometer pocket or well <sup>b</sup> of diameter < 0.03 <i>D</i>		Thermometer pocket or well <sup>b</sup> of diameter between 0.03 <i>D</i> and 0.13 <i>D</i>		Fittings (Columns 2 to 8)	
	1	2	3	4	5	6	7	8	9	10	11	12										
	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>	A <sup>c</sup>	B <sup>d</sup>
0.20	10	6	14	7	34	17	5	e	16	8	18	9	12	6	30	15	5	3	20	10	4	2
0.25	10	6	14	7	34	17	5	e	16	8	18	9	12	6	30	15	5	3	20	10	4	2
0.30	10	6	16	8	34	17	5	e	16	8	18	9	12	6	30	15	5	3	20	10	5	2.5
0.35	12	6	16	8	36	18	5	e	16	8	18	9	12	6	30	15	5	3	20	10	5	2.5
0.40	14	7	18	9	36	18	5	e	16	8	20	10	12	6	30	15	5	3	20	10	6	3
0.45	14	7	18	9	38	19	5	e	17	9	20	10	12	6	30	15	5	3	20	10	6	3
0.50	14	7	20	10	40	20	6	5	18	9	22	11	12	6	30	15	5	3	20	10	6	3
0.55	16	8	22	11	44	22	8	5	20	10	24	12	14	7	30	15	5	3	20	10	6	3
0.60	18	9	26	13	48	24	9	5	22	11	26	13	14	7	30	15	5	3	20	10	7	3.5
0.65	22	11	32	16	54	27	11	6	25	13	28	14	16	8	30	15	5	3	20	10	7	3.5
0.70	28	14	36	18	62	31	14	7	30	15	32	16	20	10	30	15	5	3	20	10	7	3.5
0.75	36	18	42	21	70	35	22	11	38	19	36	18	24	12	30	15	5	3	20	10	8	4
0.80	46	23	50	25	80	40	30	15	54	27	44	22	30	15	30	15	5	3	20	10	8	4

NOTE 1 The minimum straight lengths required are the lengths between various fittings located upstream or downstream of the primary device and the primary device itself. All straight lengths shall be measured from the upstream face of the primary device.

NOTE 2 These lengths are not based on modern data.

a For some types of primary device not all values of  $\beta$  are permissible.

b The installation of thermometer pockets or wells will not alter the required minimum upstream straight lengths for the other fittings.

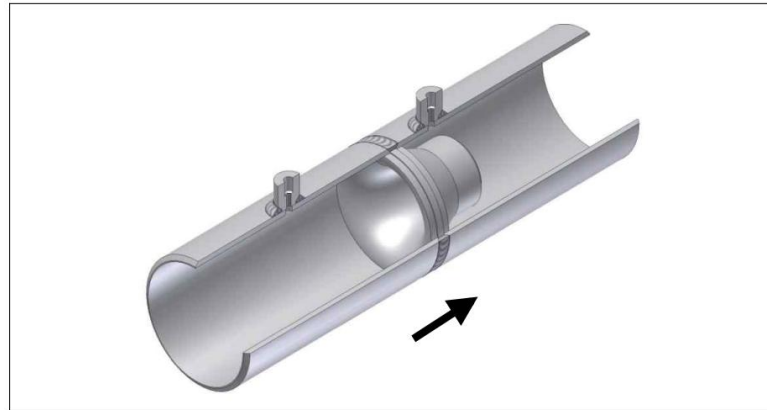
c Column A for each fitting gives lengths corresponding to "zero additional uncertainty" values (see 6.2.3).

d Column B for each fitting gives lengths corresponding to "0.5 % additional uncertainty" values (see 6.2.4).

e The straight length in Column A gives zero additional uncertainty; data are not available for shorter straight lengths which could be used to give the required straight lengths for Column B.

<Table 1>

## 6. Installation of Hardware



<Figure 5>

- Install the flow nozzle same as <Figure 5>.
- In order to install the flow nozzle, it shall be completely remove the pressure in the pipe and drain all.
- All assembly shall be performed after cleaning to prevent impurities from entering.
- After check the flow arrow mark of the flow nozzle, it shall be matched with fluid flow in the pipeline.
- According to the *Installation Configuration* section, determined the direction of pressure tap and install it in a position considering the minimum straight length require in the *Required Minimum Straight Pipe Length* section.

### Inspection & Maintenance

#### 1. Inspection of Connection Parts

- Check whether the installation is carried out against service condition according to the *Installation Configuration* section
- Check whether the straight length is sufficiently secured according to the *Required Minimum Straight Pipe Length* section.
- Check whether the connection parts such like flange, pressure pipe line, 3-way-valve, differential pressure transmitter, etc. are correctly connected.
- Check if there is a leakage after allowing of the fluid to flow in the pipeline.

## 2. Maintenance

- Regularly check if the pressure tap is clogged with foreign substances.
- Regularly check if the bore value of the flow nozzle is changed caused by erosion or abrasion
- Regularly check if the foreign substances accumulated on the upstream of the flow nozzle affect the pipe I.D (inside diameter).

## Warranty & Contact

### ■ Warranty and Service

This product is subject to the warranty for 2 years of shipments and unpaid service will be provided for any damage found under normal operating conditions. If it is not about the failure of product, the service charge will be payable.

You can request A/S at our website or by contacting our headquarters.

### ■ Headquarters . Factory . Laboratory Contact Number

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