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INSTRUCTION MANUAL

Averaging Pitot Tube

HAPT - Series



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1. Scope of application

Averaging Pitot Tube Sensors are used to measure the flow rates of liquids, gases, etc. that are being processed in horizontal or vertical pipelines which are applied in order to measure the differential pressure on Differential Pressure Transmitters or Differential Pressure Gauges for process control.

2. Technical specification of Averaging Pitot Tubes

Pitot Tubes manufactured by HITROL are produced under the following conditions.

- Fluids to be measured: liquids, gases, etc.
- Material : Stainless Steel 304
(316 SS, 316L SS, Monel, etc. are also used depending on orders.)
- Pipe diameters to be measured : between DN 50 and DN 1800 (2" to 72")
- Pipeline pressure: maximum 10 kgf/cm² (up to 150 kgf/cm² may be used depending on orders.)
- Pipeline temperature: -50 – +300°C, varies with Sensor materials. (maximum 600°C)
- Accuracy: ±1.0% FS
- Repeatability : ±0.1% FS
- Measuring range: 4:1 (expandable depending on orders.)

3. Matters that require attention when receiving the instrument

The following matters should be checked without fail after receiving the instrument.

- Check whether the product ordered and the product received are the same.
- Check whether the mounting hardware for installing the sensor is correct.
- Check whether the inner diameter of the pipeline in which the Pitot Tube will be installed is identical to the inner diameter (ID) applied to the name plate of the sensor.
- Check whether the sensor has been damaged in the process of transportation.
※ If the sensor has been damaged, large errors may occur in flow rate values.

4. Matters that require attention when installing the instrument

The following matters should be considered when installing a Pitot Tube.

- Check whether the maximum measurement condition set forth in the name plate of the Pitot Tube exceeds the maximum measurement condition of the pipeline.
If the Maximum Pressure, Temperature, or Flow Rate has exceeded, please contact our company.
- Before installing the Pitot Tube, check if the pressure in the pipe has been removed and if the water has been drained.
- If a Pitot Tube should be installed when the pressure is maintained, please contact our company because some separate parts should be added which should be sufficiently reviewed before being manufactured.
- Before operating the system, water pressure tests should be conducted on the pipeline to prevent fluid leaks. If water pressure tests cannot be conducted, make sure to check and inspect to see whether all parts have been properly assembled.

4.1 Selection of a Pitot Tube installation position

To measure flow rates accurately using a Pitot Tube, a minimum straight run is required under a condition that the pipeline is filled with a flowing fluid. In cases where the straight run is long, if the upstream length is shorter than the downstream length, contact our company to grasp an accurate installation position. When a flow conditioner or straightener has been installed, the straight run can be reduced, as shown in Figure 1, after discussing with our company.

| Minimum Length of a Straight Run | Upstream | | | | | Down stream B |
|----------------------------------|---------------|--------------|------------|---|----|------------------|
| | Without vanes | | With vanes | | | |
| | In plane | Out of plane | A' | C | C' | |
| | A | A | | | | |
| | 7 | 9 | | | | 3 |
| | | | 6 | 3 | 3 | |
| | 9 | 14 | | | | 3 |
| | | | 8 | 4 | 4 | |
| | 19 | 24 | | | | 4 |
| | | | 9 | 4 | 5 | |
| | 8 | 8 | | | | 3 |
| | | | 8 | 4 | 4 | |

<Figure 1>

4.2 Installation configuration

The Pitot Tube should be installed after checking the fluid flow direction set forth on the Pitot Tube Head so that the fluid flow direction in the Pitot Tube is identical to the fluid flow direction in the pipeline and should be installed as shown in Figure 2 or Figure 3 depending on the kinds of the fluid.

4.2.1 In the case of horizontal piping (Refer to Figure 2; HORIZONTAL PIPING)

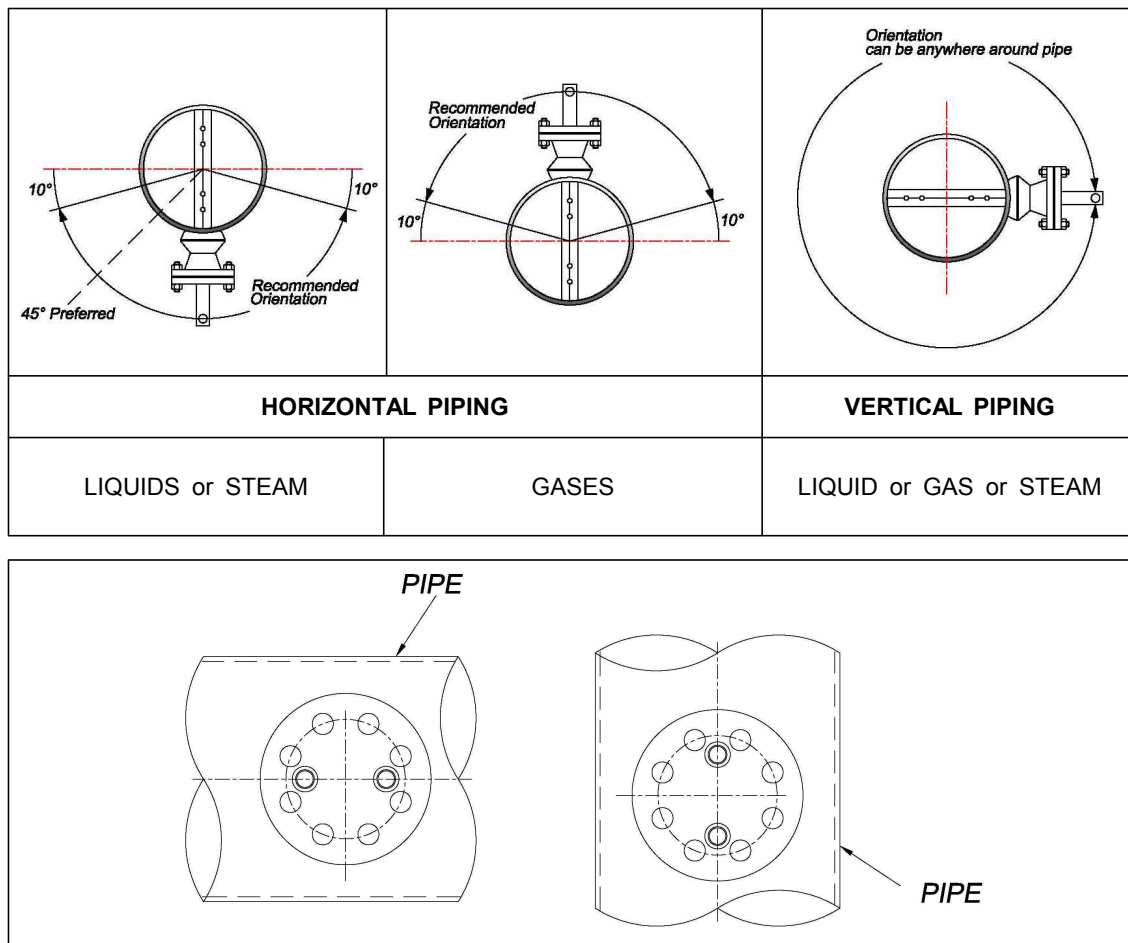
In the case of air or gas piping, the Pitot Tube should be installed at the 12 o'clock direction so that condensate water can be drained and in the case of liquid piping, the Pitot Tube should be installed between the 3 o'clock and 9 o'clock direction below the pipe to prevent air or residues from flowing into the leading-in pipe.

4.2.2 In the case of vertical piping (Refer to Figure 2 VERTICAL PIPING)

When applying to vertical pipes, the Pitot Tube may be installed at any position around the pipes.

4.3 Positions of the transmitter(Local indicator)

Differential Pressure Transmitter that is connected to the Pitot Tube to measure flow rates should be installed as follows. If the fluid to be measured is a liquid or steam(with seal pot), the transmitter should be installed below the Pitot Tube and if the fluid to be measured is a gas, the transmitter should be installed above the Pitot Tube as shown in the Figure.



<Figure 2>

5. Installation method

5.1 Boring holes on pipes

- To install a Pitot Tube, completely remove pressure in the pipe and drain the pipe.
- Mark the position of a hole on which the Pitot Tube will be installed.
 - In the case of HAPT-1F, mark the region for processing a hole using a punch on the selected position.
 - In the case of HAPT-2F, punch a hole the same as HAPT-1F and mark the position on the other side of the pipe (180° direction) in the same method.
- ※ Accurately mark positions for processing holes using a punch.
- Process holes of appropriate sizes on the pipeline according to Table 1.

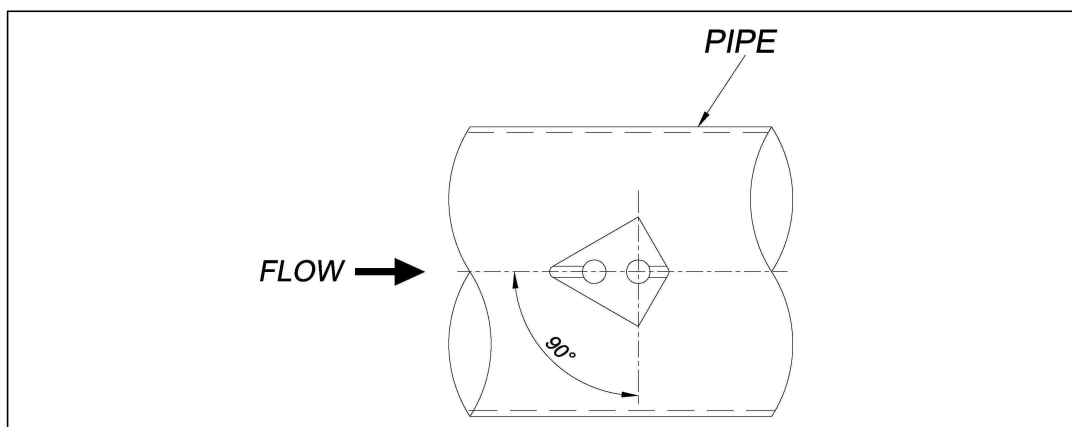
| Sensor size | | Hole on the pipeline (mm) |
|-------------|--------|---------------------------|
| CODE | SIZE | |
| A | 1" | Ø26.0 + 0.5 |
| B | 1-1/2" | Ø40.0 + 0.7 |
| C | 2" | Ø52.0 + 1.0 |

5.2 Method of installing flanges on pipes

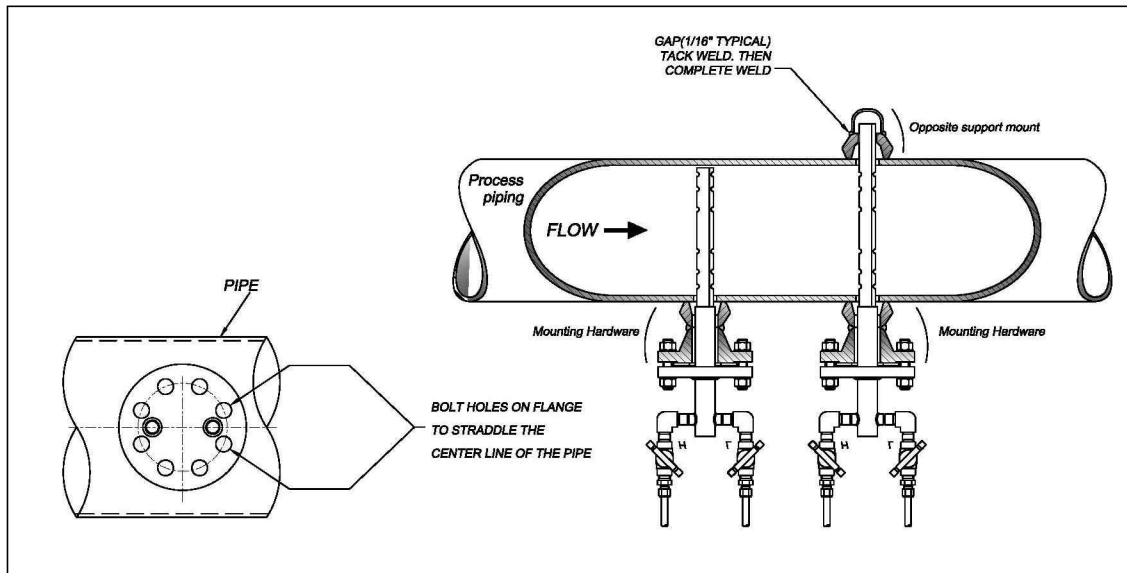
- Assemble the sensor, gasket, and flange mounting hardware together.
- Insert the assembled Sensor into the pipeline.
- In this case, the surface of the weldolet should come into contact as the surface of the pipeline.
- Tack weld the flange mounting hardware at an appropriate weld gap (generally 1/16"). Refer to figure 4 for the flange direction. In the case of HAPT-2F, tack weld the mounting hardware for an end support to the end of the sensor in the same method as used for the flange set forth above.
- Remove the sensor and weld the mounting hardware.
- Before all assembling work, clean up the parts to prevent impurities from going into any part.

5.3 Sensor assembling method

- Insert the gasket and sensor into the flange, ensure that the fluid flow direction mark ("flow → ") conforms to the direction of the fluid flow direction (using a level, etc.), and firmly fasten the gasket and sensor to the flange using bolts & nuts.



<Figure 3>



<Figure 4>

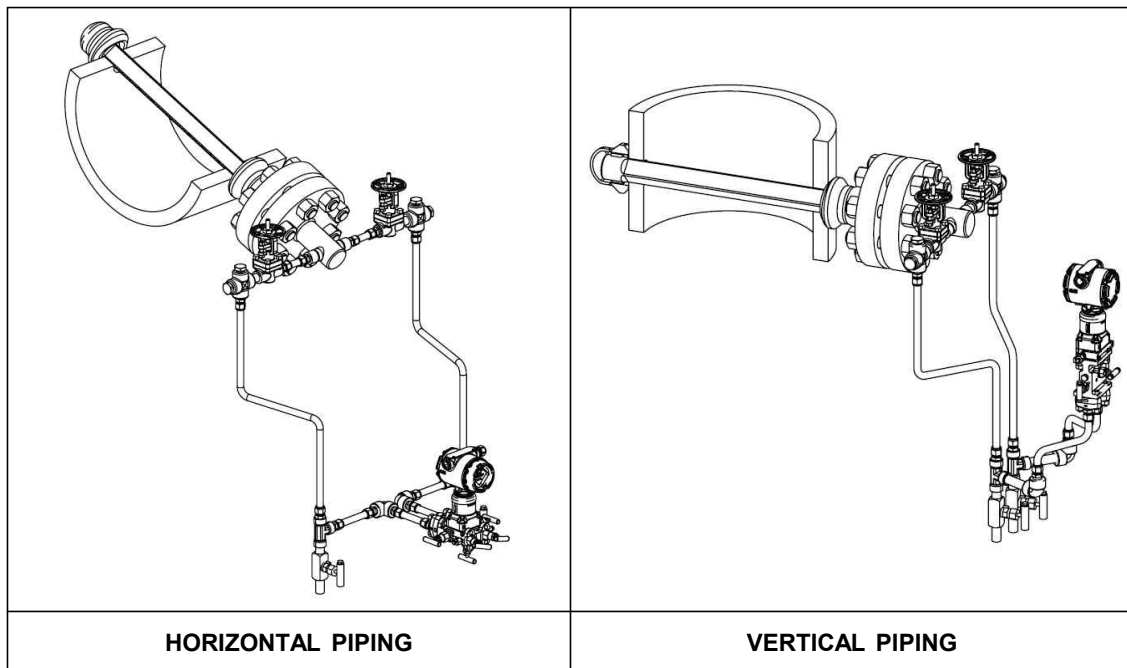
5.4 Instrument valve installation method

Install an instrument valve on the Pitot Tube using appropriate thread sealant. Instrument Valves are supplied only when requested.

※ Before applying pressure to the piping, check if the instrument shut-off valve has been installed and closed.

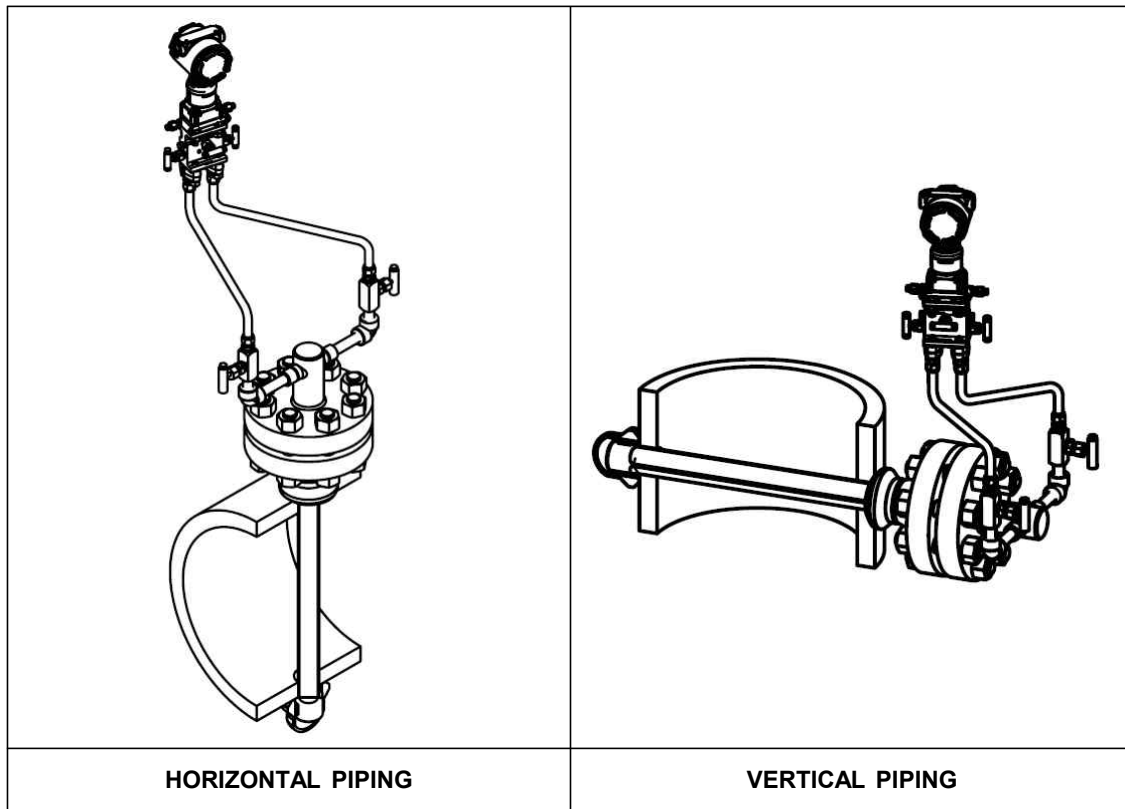
6. Installation of Differential Pressure Transmitters

6.1 When the fluid is a liquid or steam (with seal pot), the differential pressure transmitter should be installed to be positioned as shown in figure 5.



<Figure 5>

6.2 When the fluid is a gas, the differential pressure transmitter should be installed to be positioned as shown in figure 6.



<Figure 6>

7. Inspection of Process Connection

Flow rates should be measured after checking whether the process connection of the sensor flange, instrument valves, each impulse pipeline, 3-way valves, and differential pressure transmitters have been accurately connected, checking whether the fluid leaks, calibrating the differential pressure transmitter in accordance with its calibration method, and having the fluid flow through the pipeline to be measured.

8. Inspection period

Since any foreign substance that has flowed in and has been caught while the Pitot Tube has been used or if scaling that has formed due to other suspended solids should be removed, the sensor should be separated from the pipeline and checked at least once a year. At this time, the shape of the sensor should be checked to see if its size is not different from that when it was first installed. If the sensor has been deformed due to erosion or otherwise, the sensor should be recalibrated.