Description

It can be extensively applied to the supply, transmission, distribution of most dry gas in fields such as underground air storage, power stations, petrochemical industry, aluminum smelters etc. A wide range of gas can be measured by SONICNAG including natural gas, compact gas, air, fuel gas, corrosive gas, poisonous gas, high-purity gas, etc.

![Image of DN300 Ultrasonic gas flowmeter]

DN300 Ultrasonic gas flowmeter

![Image of DN100 Ultrasonic gas flowmeter]

DN100 Ultrasonic gas flowmeter

Principle

Ultrasonic gas flowmeter is based on the theory of acoustic transit time to calculate the average gas move velocity by measuring upstream and downstream time, in which the ultrasonic waves generated by a pairs of bi-directional transducers assembled with an angle respect to axis.

1. Flow velocity is calculated by

\[ v = \frac{D}{\sin \theta \cos \theta} \left( \frac{1}{t_1 - \tau} - \frac{1}{t_2 - \tau} \right) \]

2. Sound velocity is

\[ C = \frac{D}{\sin \theta} \left( \frac{1}{t_1 - \tau} + \frac{1}{t_2 - \tau} \right) \]

3. Flow volume is

\[ Q = 3600 \times \frac{\pi D^2}{4} \times v = 900 \times \pi D^2 \times v \]

Where:
- \( v \): Gas velocity, m/s;
- \( C \): Sound velocity, m/s;
- \( Q \): Volume of flowing medium, m³/h;
- \( D \): Diameter of pipe (m);
- \( \theta \): Angle of path to the flow (°);
- \( t_1, t_2 \): Upstream and downstream transit time (s);
- \( \tau \)

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Features
No moving parts, low pressure drop, long life span;
Bi-directional measurement;
Simple installation, easy maintenance;
High accuracy and good reliability;
Ex-proof: Exd(ib)IBT4(exclude ecetylene);
Temperature and pressure compensation;
Suitable for small flowrate and large size pipe.

<table>
<thead>
<tr>
<th>Size (mm)</th>
<th>0.5%</th>
<th>1.0%</th>
<th>1.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Velocity: 1.25~25 m/s</td>
<td>Velocity: 1~25 m/s</td>
<td>Velocity: 0.8~25 m/s</td>
</tr>
<tr>
<td>25</td>
<td>2.5~45</td>
<td>1.8~45</td>
<td>1.4~45</td>
</tr>
<tr>
<td>40</td>
<td>5.5~115</td>
<td>4.5~115</td>
<td>3.6~115</td>
</tr>
<tr>
<td>80</td>
<td>9~180</td>
<td>7~180</td>
<td>5.5~180</td>
</tr>
<tr>
<td>100</td>
<td>23~450</td>
<td>18~450</td>
<td>14~450</td>
</tr>
<tr>
<td>150</td>
<td>35~700</td>
<td>28~700</td>
<td>23~700</td>
</tr>
<tr>
<td>200</td>
<td>80~1600</td>
<td>64~1600</td>
<td>50~1600</td>
</tr>
<tr>
<td>250</td>
<td>140~2830</td>
<td>115~2830</td>
<td>90~2830</td>
</tr>
<tr>
<td>300</td>
<td>220~4420</td>
<td>180~4420</td>
<td>140~4420</td>
</tr>
<tr>
<td></td>
<td>320~6360</td>
<td>250~6360</td>
<td>200~6360</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Turndown ratio</th>
<th>1:20</th>
<th>1:25</th>
</tr>
</thead>
<tbody>
<tr>
<td>M x x Error</td>
<td>+0.5%</td>
<td>+1.0%</td>
</tr>
<tr>
<td>Qmin&lt;x&lt;Qm</td>
<td>+2.0%</td>
<td>+3.0%</td>
</tr>
</tbody>
</table>

Note:
1. Q is the transition flow to 1 velocity of m/s
2. For PN≥4.0MP the flowmeter must work under pressure ≥1.0MP

Installation

1. Installation type
   Generally, the flowmeter should be installed horizontally. The length of pipe line both up stream and down stream of flowmeter is no less than 10 DN. When install flowmeter in other mode, it should be installed where pipe upward, in case of water to be left in meter body. Direction of medium flow should be the same as marked arrow. No leakage is allowed at joints between pipes and the sealing washer can’t protrude into the pipe which would change the current flow and give rise to vortex that would influence the accuracy of flowmeter.

![Diagram of flowmeter installation](Image)
2. Pipe requirements
   Make sure the straight pipes upstream and downstream is clean inside without any dents, rust, and delamination etc.
   There should be no obstacles or branch pipes except pressure tap, and thermowell in those pipes. Plus, flanges and
   pipes upstream and downstream should have same inside diameter and be smooth at joints.

   Installation Notes:
   A. Installation of intrusive transducer: It should be installed by specialists with professional tool, transducers
      should be installed at 45° to the pipe. After installation, there should be no gas leakage where transducers are
      inserted.
   B. Two transducers are not interchangeable and they are in match with the meter. And it should be recalibrated
      when the transducer is changed.
   C. To ensure the performance of Sonicnag, the pipe length upstream should not be less than 10DNs, and same with
      downstream.
   D. Cable length of transducer is not allowed to change except by specialists. And flowmeter shall be recalibrated
      after changing cable length.
   E. Ultrasonic gas flowmeter shall be installed by specialist and be fixed with pipes by flanges and the arrow
      marked on meter shall be the same to flow direction.
   F. The meter should be protected from being interfered because the signal received by transducer is very small.
      Non-professional staff shall not touch elements on circuit board.

5.5 Outline Dimension (See picture 3 and table 2)

<table>
<thead>
<tr>
<th>DN (mm)</th>
<th>Dim i PN≤4MP</th>
<th>Wight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>B</td>
</tr>
<tr>
<td>25</td>
<td>500</td>
<td>230</td>
</tr>
<tr>
<td>40</td>
<td>500</td>
<td>270</td>
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<tr>
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<tr>
<td>100</td>
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<tr>
<td>150</td>
<td>600</td>
<td>360</td>
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<tr>
<td>200</td>
<td>700</td>
<td>410</td>
</tr>
<tr>
<td>250</td>
<td>700</td>
<td>460</td>
</tr>
<tr>
<td>300</td>
<td>800</td>
<td>480</td>
</tr>
</tbody>
</table>

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Model Selection

SONICNAG - [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Explanation:
0. Nagman ultrasonic gas flowmeter
1. DN (mm): 025-25, 032-32, 040-40, 050-50, 065-65, 080-80, 100-100, 125-125, 150-150, 200-200, 250-250, 300-300;
2. Medium: Q - Gas
3. Electricity Shield: A - General Type, B - Ex-proof Type Exd[ib] IIB T4 (exclude acetylene)
4. Power Supply: 1-24VDC, 2-12VDC;
5. Modbus Output: R2 - RS232, R4-RS485, R0-NO
6. Structure: 1-Integrate Type, 2 - Separate Type (to be developed), 3 - Flush-mounted type (to be developed), 4 - Portable Type (to be developed)
7. Compensation Function: W - with temperature and pressure compensation, N - no compensation
8. Nominal Pressure (MPa): 1-0.6, 2-1.0, 3-1.6, 4-2.5, 5-4.0, 6-6.3;
9. Output signal: F - pulse signal, J-(4-20)mA current signal
10. Accuracy: 0.5-0.5%, 1.0-1.0%, 1.5-1.5%

e.g. SONICNAG 200 Q B R4 J W 61 0.5

Nagman ultrasonic gas flowmeter, DN200, to measure gas, ex-proof type, power supply is 24VDC, output port is RS485, Integrate type, with temperature and pressure compensation, Nominal Pressure is 6.3MPa, output signal is current (4-20)mA, accuracy is 0.5%.

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