Flow measurement of liquids at extreme temperatures

The WaveInjector extends the application range of the ultrasonic clamp-on flow measurement to temperatures of over 200 °C and below -40 °C.

The patented mounting fixture thermally separates the ultrasonic transducers from the hot or cold pipe and at the same time ensures good acoustic contact. Therefore, FLEXIM's standard transducers are suitable for long-term operation even at extreme temperatures.

Because the transducers are mounted on the outside of the pipe, it is not necessary to cut the pipe or interrupt the operation of the facility for the setup of a flow measuring point.

Features

• Use of FLEXIM's standard clamp-on transducers at extreme temperatures of up to 400 °C
  – Special solutions for temperatures of max. 600 °C possible
  – Special solutions for temperatures of min. -200 °C possible
• Transducers available for flow measurement in explosive atmospheres
• Installation without cutting the pipe and without interrupting the production process
• Permanent and reliable coupling of the transducers to the pipe
• Operation without wear and therefore maintenance-free, no drift

Applications

Flow measurement in the chemical industry and petrochemical industries, e.g.
• Bitumen
• Vacuum distillate
• Pressurized water
• Heat transfer oils
### Order code

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<tr>
<th>Waveinjector</th>
<th>transducer</th>
<th>measurement arrangement</th>
<th>size</th>
<th>fixation</th>
<th>outer pipe diameter</th>
<th>coupling foil</th>
<th>tool</th>
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1 outer pipe diameter > 1000 mm on request
Application ranges

- **WI-400, transducers FS*-N****, coupling foil 400 °C**
- **WI-400, transducers FS*-N****, coupling foil 280 °C**
- **WI Cryo (see Technical specification TSFLUXUS_CYO_Vx-x)**
  - transducers FSM-E****1, FSP-E****2
  - transducers FSQ-E****3, FS*-E****4
  - transducers FS*-N****

Fluid temperature [°C]

-200 -100 0 100 200 300 400 500 600

Recommended: depending on application, on request

FS*-N**** - shear wave transducer, normal temperature range
FS*-E**** - shear wave transducer, extended temperature range

1 technical type: CDM2E5*, CDM2EZ7
2 technical type: CDP2E5*, CDP2EZ7
3 technical type: CDQ2E5*, CDQ2E5*, CDQ2EZ7
4 technical type: CDM1E5*, CDP1E5*, CDQ1E5*, CDM1EZ7, CDP1EZ7, CDQ1EZ7

For LNG, others on request
Transducer mounting fixture

Pipe mounting fixtures and chains WI-400*-L-C

Dimensions:
- Length: $2 \cdot l + l_{cp}$
  - WI-400K: $l = 279$ mm
  - WI-400M, WI-400Q, WI-4001, WI-4004: $l = 243$ mm
  - $l_{cp}$ depending on application
- Width:
  - Outer pipe diameter + 32 mm
    - (min. 200 mm)
- Height:
  - Outer pipe diameter + 2 $h$
  - WI-400K: $h = 178$ mm
  - WI-400M, WI-4001, WI-400Q, WI-4004: $h = 200$ mm
- Material: Stainless steel 304 (1.4301)

Pipe mounting fixtures with threaded rods WI-400*-T

Dimensions:
- Length: $2 \cdot l + l_{cp}$
  - WI-400K: $l = 279$ mm
  - WI-400M, WI-400Q, WI-4001, WI-4004: $l = 243$ mm
  - $l_{cp}$ depending on application
- Width $b$:
  - WI-400*-S: 170 mm
  - WI-400*-M: 270 mm
  - WI-400*-L: 420 mm
- Height: Outer pipe diameter + 2 $h$
  - WI-400K: $h = 178$ mm
  - WI-400M, WI-4001: $h = 151$ mm
  - WI-400Q, WI-4004: $h = 147$ mm
- Material: Stainless steel 304 (1.4301)

Outer pipe diameter:
- WI-400*-S: 35...120 (130) mm
- WI-400*-M: 35(80)...230 mm
- WI-400*-L: 35(80)...380 mm
Weather protection (by customer)
If the WaveInjector is used outdoor, it has to be protected against rain and humidity. The weather protection must not cover the WaveInjector completely. Min. 2 sides of the weather protection have to be opened for the exchange of heat with the environment. None of the parts within the scope of delivery of the WaveInjector must be used for the installation of the weather protection.
vertical pipe

**Fluid temperature ≤ 400 °C:**
- a ≥ 100 mm
- b ≥ 100 mm
- c ≥ 100 mm

**Fluid temperature > 400 °C:**
- a ≥ 300 mm
- b ≥ 300 mm
- c ≥ 300 mm