Bronkhorst®

Ultrasonic Flow meter for very small flow rates

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Introduction Bronkhorst® ES-FLOW

Revolutionary Ultrasonic Flow Meter

- Innovative non-intrusive flow measurement technology
- Designed to measure low flow rates: 4…1500 ml/min
- Liquid independent
- Hygienic design
- Integrated PID controller

Introduction Bronkhorst® ES-FLOW

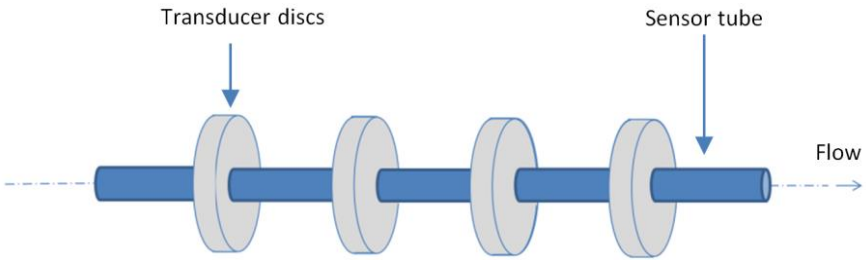
Ultrasonic Liquid Volume Flow Meter

- Low pressure drop
- CIP cleanable
- Straight sensor tube with zero dead volume
  - ID = 1.3 mm
  - Length = 11 cm
  - Surface roughness = 0.4 Ra
- Ability to measure temperature

How to measure low flow rates of liquids using ultrasonic waves?

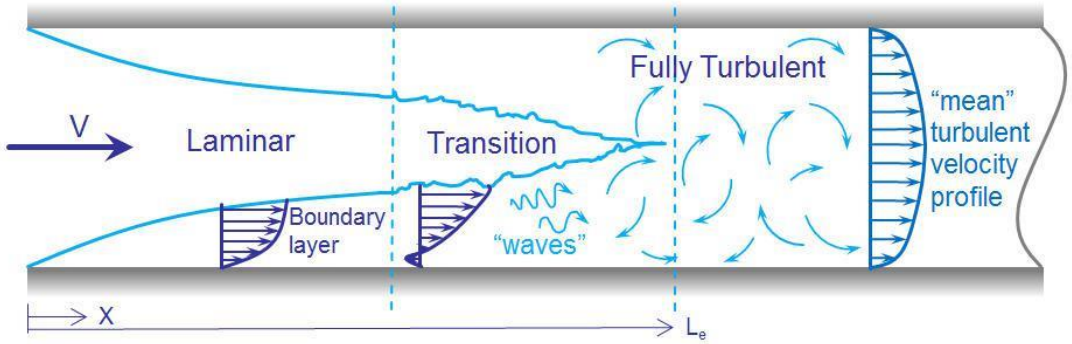
Ultrasonic Wave - innovative measurement technology

- Straight tube with multiple transducers at the outer surface
- Ultrasonic waves are generated by radially oscillation
- All up- and down-stream combinations are recorded and processed
- Measuring time difference in nanoseconds
- Calculations of flow velocity, speed of sound & volume flow



Benefits of the ES-FLOW™ Ultrasonic Wave Technology

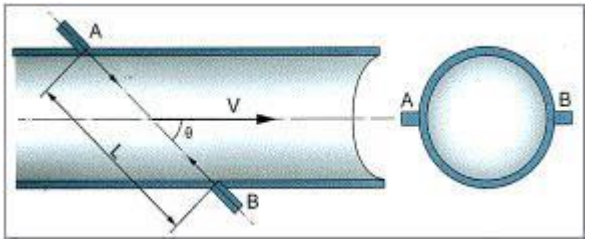
- Sound waves across the entire diameter
- Flow profile independent
- Actual speed of sound measurement (liquid independent)
- Calibration per fluid is not necessary



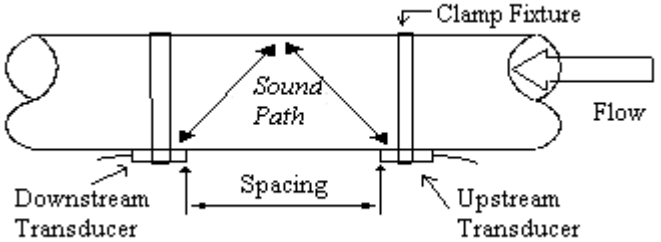
How do conventional ultrasonic flow meters work?

Transit Time

- Only possible in large bore tubes
- Signal must traverse the pipe
- Transducer configurations: Z, V and W
- Transducers are usually in contact with the fluid



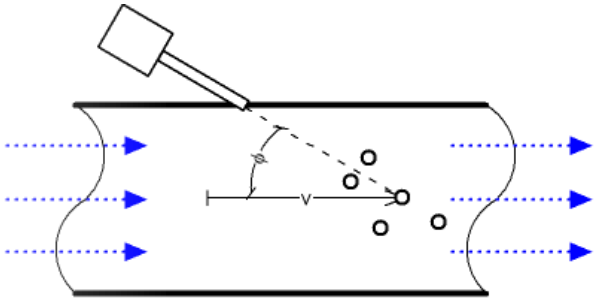
- Clamp-on method
- Installation
- Wall thickness



How do conventional ultrasonic flow meters work?

Doppler Effect

- Require particles or bubbles for reflection, cannot be used with pure fluids,
- Transducers are usually in contact with the fluid
- Accuracy is sensitive to velocity profile
- Flow rate must be high enough to keep the solids suspended



Five Key Features of the ES-FLOW

- One sensor for multiple liquids
- Hygienic design
- Vibration insensitive
- Integrated PID controller and fast response
- Installation in any direction and user friendly, ‘plug-and play’ device

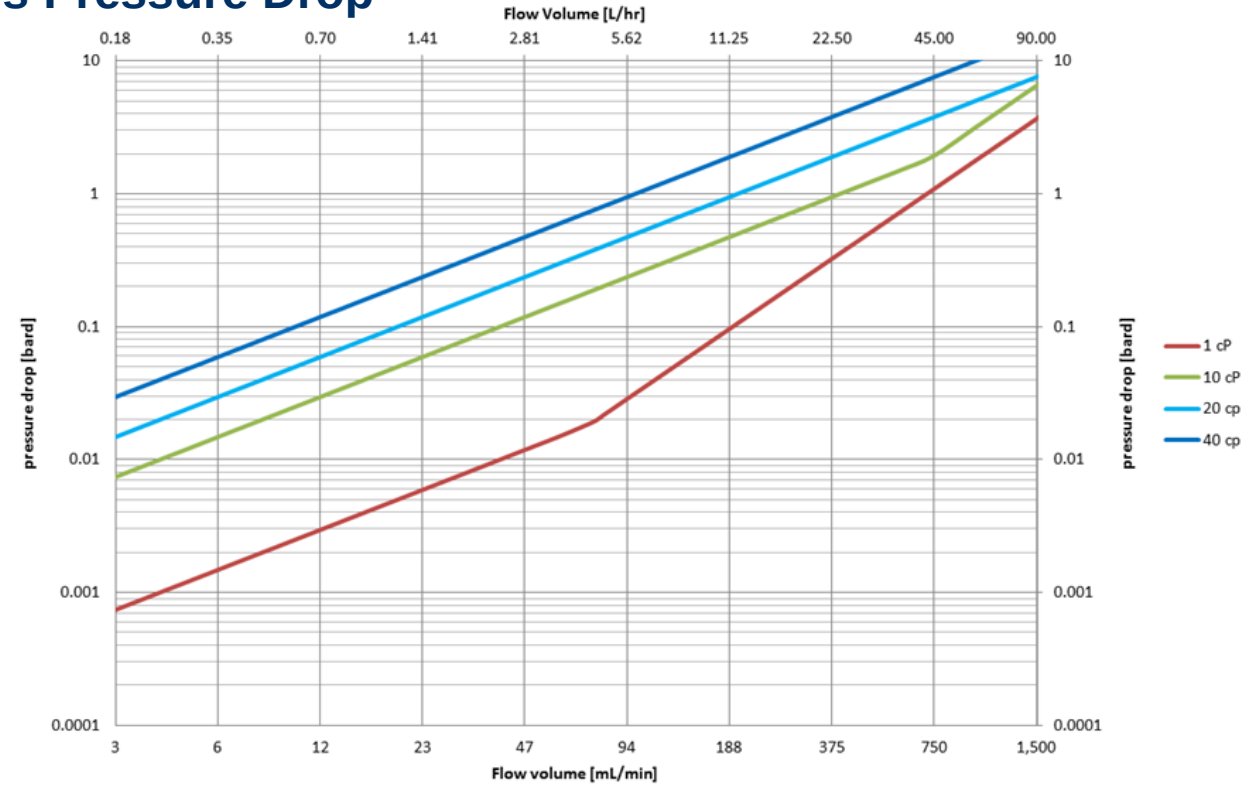
Key Features & Specifications

Current specifications

- Flow range : Capacity 4…1500 ml/min
- Accuracy : ± 1% Rd ± 1 ml/min
- Repeatability : ≤ 0.1% Rd ± 0.05 ml/min
- PC-board : Integrated PID Controller
- Outputs : Digital, Analog or Pulse
- Fieldbus : Modbus, Profibus DP, DeviceNet & Flowbus (M12 5-pin connector)
- IP class : IP67
- Material wetted parts : SS316L
- Seals : None
- Response time (t98%) : ≤ 200 msec
- Refresh (cycle) time : ≤ 10 msec

Key Features & Specifications

Flow Rate vs Pressure Drop



Applications & Opportunities

Advantages compared to other flow measurement technologies
Possibility of measuring non-conductive liquids
Low pressure drop
Easy installation & insensitive for vibrations
Medium independent & no conversion factors
Modest pricing and good accuracy level
Hygienic design and integrated PID controller

Applications & Opportunities

Food, Beverage & Pharma

H2O2 for sterilization
Concentrated additives
Water solutions & demineralized water

Applications & Opportunities

Chemical

Catalyst & Reagent Dosing
R&D & pilot-plant applications

Applications & Opportunities

Surface treatment

Thermal spraying
Powder in liquid

Applications & Opportunities

Miscellaneous

Fuel consumption
Colorant dosing for packaging

Bronkhorst®

Bronkhorst, Performance for Life

- Development & manufacturing of flow meters and controllers
- Leader in **low flow** fluidics handling technology
- HQ located in NL
- Over 450 employees world wide

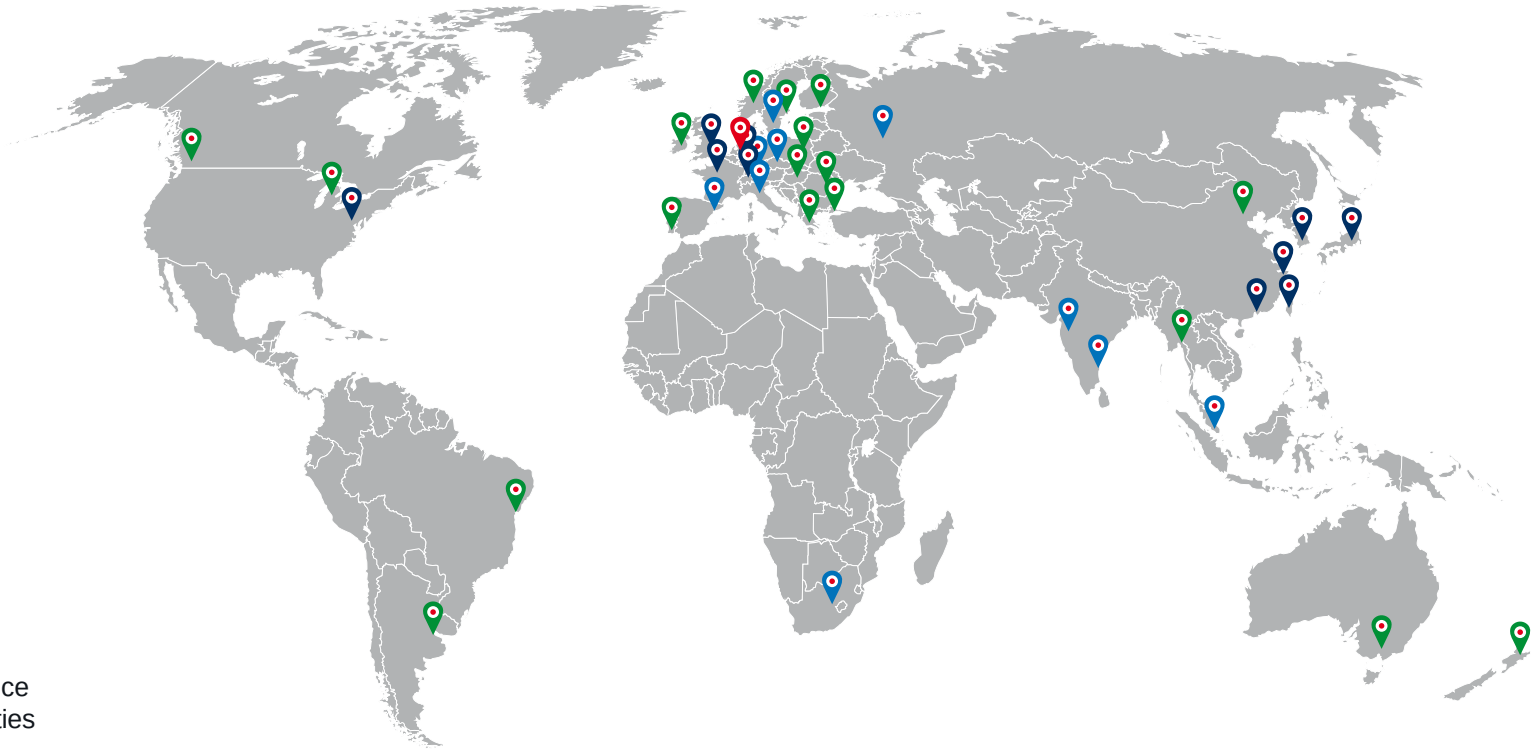
Innovation

- Market-driven approach in development and process improvement
- 20% of employees active in R&D and Engineering
- 15% of annual turnover is invested in R&D

Round the clock support

ISO 17025
ACCREDITED
LABORATORY

Global Presence



- Headquarter
- Bronkhorst office
- Distributor
- Distributor with service and calibration facilities

Flow Measurement Principles

Thermal Mass Flow

Coriolis Mass Flow

Ultrasonic Volume Flow

Conclusion

ES-FLOW

- Versatile & robust liquid flowmeter
- Suitable for low flow rates
- Liquid independent
- Straight sensor tube with zero dead volume

Bronkhorst®

- Your partner in low flow fluidics handling
- Helps innovating and optimizing your processes
- 35 years of knowledge & experience
- Wide range of products and multiple flow measurement techniques
- Complete solution from one supplier

Bronkhorst®
Performance for Life

Innovation - Experience - Responsibility

Please visit us at stand 244, hall 5

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