

ES-FLOW™

Ultrasonic Volume Flow Meter / Controller for Liquids

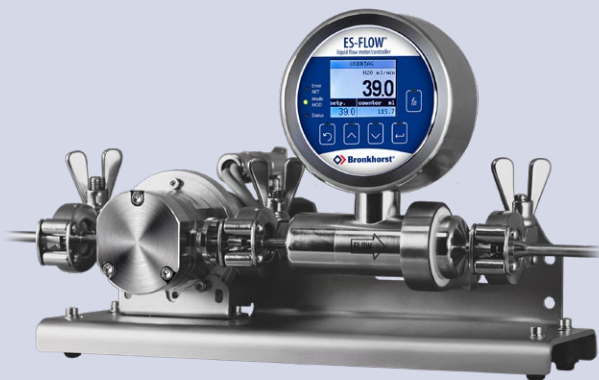
> Introduction

Bronkhorst is the leading provider of low-flow fluidics handling equipment. The company is a pioneer in the field of micro to low flow liquid metering instruments. In addition to our series of instruments based on the thermal measuring principle, we introduced a series of low-flow Coriolis mass flow meters and controllers. With the development of the Bronkhorst® **ES-FLOW™** Flow Meter/Controller a new Ultrasonic Wave Technology has been added to our family of flow meters.

> Ultrasonic flow meter for low flow rates

The innovative **ES-FLOW™** Ultrasonic Liquid Flow Meter/Controller is designed for measuring volume flow ranges between 4 and 1500 ml/min with high precision, high linearity and low pressure drop using Ultrasonic Wave Technology in a small bore tube. Liquids can be measured independent of fluid density, temperature and viscosity, therefore recalibration per fluid is unnecessary. Thanks to the combination of a straight sensor tube with the actuators at the outer surface the flow meter is self-draining, easy to clean and contains zero dead volume. All wetted parts are made of stainless steel and the exterior design is rated to IP66 as well as IP67.

The user interface is a capacitive touchscreen with a TFT display to operate and readout the instrument. The on-board PID controller can be used to drive a control valve or pump, enabling users to establish a complete, compact control loop.



Combination of flow meter with dosing pump



> Fields of application

The **ES-FLOW™** can be used for a wide variety of applications. Typical applications can be found in Food, Beverage & Pharma for measurement/control of: natural additives, solvents, carbonated liquids, H₂O₂ sterilization, demineralized water and liquids with suspended particles. The instruments find also application in the Medical, Chemical, Surface Treatment, Analytical & Automotive market for measurement/control of: catalysts, reagents, hydrocarbons, fuel, oil and consumption measurement and dosing of colorants, lubricants, non-conductive fluids or unknown mixtures.

> Benefits of the ES-FLOW™

- ◆ Direct volume flow measurement, independent of liquid properties
- ◆ Lowest flow ranges on the market (ultrasonic principle):
4...1500 ml/min on-site re-rangeable
- ◆ Integrated counter/totalizer and batch dosing functionality
- ◆ Additional measurement of temperature and speed of sound
- ◆ Bi-directional measurement
- ◆ Hygienic design, self-drainable, CIP cleanable, EC1935/2004
- ◆ Wetted parts of stainless steel 316L
- ◆ Very small internal volume, no dead volume
- ◆ Reduced downtime: no recalibration required after fluid change
- ◆ Integrated PID controller
- ◆ Fast response/cycle time
- ◆ High accuracy, excellent repeatability and long-term stability
- ◆ Saves expensive fluids at repetitive dosing and filling processes
- ◆ Easy to install, insensitive for external vibrations

Technical specifications

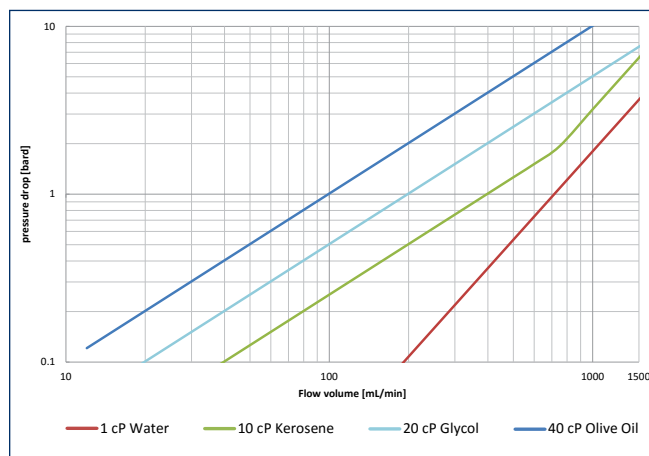
> Measurement / control system

Minimum full scale flow	200 ml/min
Maximum full scale flow	1500 ml/min
Minimum flow	4 ml/min
Volume flow accuracy	≤1% Rd ± 1 ml/min
Repeatability	≤ 0.1% Rd ± 0.05 ml/min
Fluids	liquids with sound speed between 1000 and 2000 m/s
Response time, meter (t98%)	≤200 msec
Refresh (cycle) time	≤10 msec
Ambient temperature	10...60°C
Fluid temperature	-10...90°C
Fluid temperature accuracy	±1 °C
Attitude sensitivity	negligible; mounting in any position
Warm-up time	approx. 1/2 hour after power up for optimum performance

> Mechanical parts

Material (wetted parts)	Stainless steel 316L
Surface roughness (wetted parts)	≤ 0.8 µm
Sensor	Straight tube
Process connections (welded)	ES-103I: ½" or ¼" Triclamp flanges ES-113I: 3mm, 6 mm, ⅛", ¼" OD compression type or ¼" face seal male
Seals (internal)	None
Weight	Meter: 1.3 kg; Controller: on request
Ingress protection (housing)	IP66 and IP67
Pressure rating	ES-103I: 10 bar(g) ES-113I: 100 bar(g)

> Flow rate vs Pressure drop



> Electrical properties

Power supply	+15...24 Vdc ±10%
Power consumption	Max. 2.8 W
Analog output	0...5 (10) Vdc, min. load impedance > 2 kΩ; 0 (4)...20 mA (sourcing), max. load impedance < 375 Ω
Analog setpoint	0...5 (10) Vdc, min. load impedance > 100 kΩ; 0 (4)...20 mA, load impedance ~250 Ω
Analog control signal output	0...10 Vdc or 4...20 mA (I/O option)
Customised I/O (pin 5 options)	Analog control signal output: 0...10 Vdc or 4...20 mA; Pulse output
Pulse output	Available as programmable I/O option
Digital communication	Standard RS232; Options: PROFIBUS DP, DeviceNet™, Modbus RTU/ASCII, FLOW-BUS

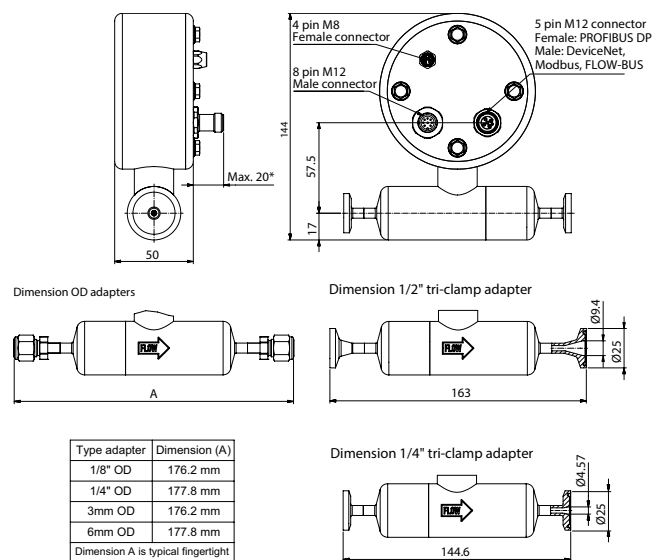
> Electrical connections

Analog/RS232	M12 8-pole connector (male)
PROFIBUS DP	M12 5-pole connector (female)
DeviceNet™	M12 5-pole connector (male)
Modbus (RTU/ASCII)/FLOW-BUS	M12 5-pole connector (male)
Actuator Output	M8 4-pole connector (female)

> Approvals

Food contact	EC 1935/2004
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> Dimensions (in mm)



Although all specifications in this leaflet are believed to be accurate, the right is reserved to make changes without notice or obligation.
Patents pending.



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