

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 unique series of low-flow mass flow meters and controllers based on the Coriolis measuring principle, providing high accuracy, fast response and fluid independence. With the development of the Bronkhorst® **ES-FLOW™** Flow Meter a new Ultrasonic Wave Technology has been added to our family of flow meters.

> Ultrasonic flow meter for low flow rates

The **ES-FLOW™** Ultrasonic Flow Meter was designed to measure tiny volume flows from 4 up to 1500 ml/min with high precision, high linearity and low pressure drop, using ultrasound in a small bore tube. Liquids can be measured independent of fluid density, temperature and viscosity. Thanks to the combination of a straight sensor tube with zero dead volume the flow meter is self-draining. The orbital TIG-welding allows hygienic connections so the instrument can be used for hygienic applications. For non-hygienic applications, the flow meter can also be equipped with compression type fittings. Wetted parts are made of stainless steel, the exterior design is rated to 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.



Example for chemical industry

> Fields of application

Typical applications for the new low-flow liquid flow meters and controllers can be found in Food, Beverage & Pharma (e.g. additives, sterilisation), Medical and Chemical (e.g. catalysts, reagents) and many other markets which require precision fluid handling e.g. fuel consumption measurement and dosing of colorants or lubricants in many industries.

> Benefits of the ES-FLOW™

- ◆ Direct volume flow measurement, independent of fluid properties
- ◆ Lowest flow ranges on the market (ultrasonic principle): 4...1500 ml/min (based on H₂O), on-site re-rangeable
- ◆ Also suitable for non-conductive fluids
- ◆ Very small internal volume, no dead volumes
- ◆ Hygienic design, IP67 rating, CIP cleanable (sanitary standard certificate pending)
- ◆ Self-drainable, due to straight SS316 sensor tube
- ◆ Easy to install, low risk of gas bubble inclusion
- ◆ Integrated digital controller for accurate flow or batch delivery
- ◆ Fast response time
- ◆ High accuracy
- ◆ Additional temperature output
- ◆ Bi-directional measurement
- ◆ Excellent repeatability and long-term stability
- ◆ Integrated counter/monitoring function
- ◆ Saves expensive fluids at repetitive dosing and filling processes
- ◆ Reduced downtime: no recalibration required after fluid change

Technical specifications

> Flow ranges

Minimum full scale	200 ml/min
Maximum full scale	1500 ml/min
Minimum flow	4 ml/min

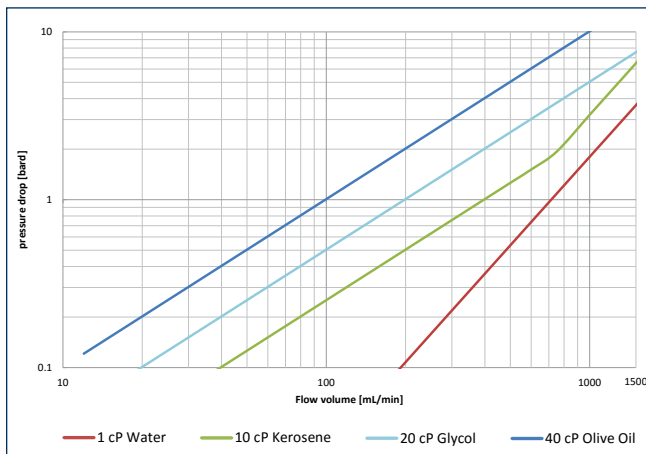
> Performance

Volume flow accuracy	$\pm 1\% \text{ Rd} \pm 1 \text{ ml/min}$
Repeatability	$\leq 0.1\% \text{ Rd} \pm 0.05 \text{ ml/min}$
Warm-up time	approx. 1/2 hour after power up for optimum performance
Fluid temperature accuracy	$\pm 1 \text{ }^\circ\text{C}$
Mounting	Any position, attitude insensitive
Ambient temperature	10...60°C
Response time, meter (t98%)	$\leq 200 \text{ msec}$
Refresh (cycle) time	$\leq 10 \text{ msec}$

> Mechanical parts

Material (wetted parts)	Stainless steel 316L
Sensor	Straight tube
Process connections (welded)	3 mm, 6 mm, 1/8", 1/4" OD compression type, 1/4" face seal male or 1/4" Triclamp flanges
Seals (internal)	None
Ingress protection (housing)	IP67
Pressure rating	100 bara at $T_{\text{AMB}} = 15...35^\circ\text{C}$, $ T_{\text{AMB}} - T_{\text{MED}} \leq 25^\circ\text{C}$; for elevated temperatures please consult factory

> Flow rate vs Pressure drop



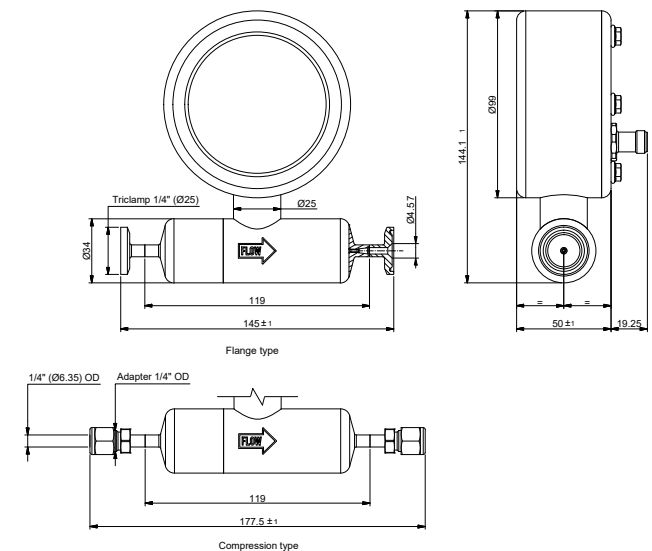
> Electrical properties

Power supply	+15...24 Vdc $\pm 10\%$ Max. ripple recommended: 50 mV tt
Power consumption	Max. 2.8 W
Analog output	0...5 (10) Vdc, min. load impedance > 2 k Ω ; 0 (4)...20 mA (sourcing), max. load impedance < 375 Ω
Analog setpoint	0...5 (10) Vdc, min. load impedance > 100 k Ω ; 0 (4)...20 mA, load impedance $\sim 250 \Omega$
Analog control signal output	0...10 Vdc or 4...20 mA (Pin 5 option)
Pulse output	Available (Pin 5 option)
Digital communication	Standard RS232; Options: PROFIBUS DP, DeviceNet™, Modbus RTU/ASCII, FLOW-BUS

> Electrical connections

Analog/RS232	M12 connector (male)
PROFIBUS DP	bus: M12 connector (female); power: M12 connector (male)
DeviceNet™	5-pin M12 connector (male)
Modbus (RTU/ASCII)/FLOW-BUS	M12 connector (male)

> 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.