

# μ-FLOW

## Series L01 Digital Mass Flow Meters / Controllers for Liquids

### > Introduction

Bronkhorst High-Tech B.V. has been the pioneer in the field of micro to low flow liquid metering instruments based on a thermal measuring principle. A wealth of experience has been gathered over the past 25 years, which has resulted in three product series that cover Full Scale flow ranges from 30 mg/h up to 20 kg/h.

### > From MICRO- to NANO-flow ranges

Bronkhorst High-Tech works in very close contact with its customers to ensure constant improvement and innovation to its' product range. Today's market for liquid flow meters tends to develop into the very small flow ranges – even into nano-flow ranges. With the new generation of thermal liquid mass flow meters / controllers of the μ-FLOW Series, Bronkhorst High-Tech offers the solution for this complicated task. The result of the new development is a small, compact instrument with ranges from 25...500 nanolitres per minute (1,5...30 mg/h) up to 0,1...2 g/h. In addition, the new instrument offers a digital pc-board with optional on-board interface to Profibus®, DeviceNet™, Modbus-RTU or FLOW-BUS.

### > μ-FLOW series L01

The μ-FLOW L01 mass flow meter is basically a straight sensor tube without any moving parts or built-in obstructions. The heater/ sensor assembly utilises the heat transfer principle and is arranged around the tube. Upon flow, the  $\Delta T$  is sensed by the upstream and downstream temperature sensors and this  $\Delta T$  is a function of both the flow-rate and heat capacity of the liquid to be measured.

### > Liquid flow control

Flow control is achieved by integrating a control valve onto the body of the liquid flow meter. This control valve has a purge connection on top of the sleeve that enables easy elimination of air or gas when starting up the system. The electronic control function forms part of the normal circuitry in the liquid flow meter, so the need for an external controller is eliminated.



### > General features μ-FLOW series L01

- ◆ fast and accurate measuring signal
- ◆ insensitive to mounting position
- ◆ very small internal volume (using SS316 1,5...20 μl)
- ◆ stainless steel sensor; other materials, e.g. PEEK™ or Fused Silica are available on request
- ◆ suitable for liquids with low boiling points
- ◆ for laboratory and OEM applications

### > Digital features

- ◆ DeviceNet™, Profibus-DP®, Modbus-RTU or FLOW-BUS slave
- ◆ RS232 interface
- ◆ other fieldbus options on request
- ◆ alarm and counter functions

### > Fields of application

- ◆ Semiconductor industry
- ◆ HPLC applications
- ◆ Chemical industry
- ◆ Food & Pharmaceutical industry
- ◆ Analytical laboratories

## > Technical specifications

### Measurement / control system

Accuracy, standard (based on actual calibration)	: ±2% FS
Turndown	: 1 : 20 (5 ... 100%)
Reproducibility	: ±0,2% FS typical H <sub>2</sub> O
Settling time (controller)	: 2...4 seconds
Operating temperature	: 5 ... 50°C
Temperature sensitivity	: ±0,2% FS/°C
Attitude sensitivity	: negligible
Warm-up time	: approx. 10 min. for accuracy ±2% FS

### Mechanical parts

Material (wetted parts)	: stainless steel 316L; other (PEEK™, Fused Silica) on request
Process connections	: 30...100 mg/h: 10-32 UNF female only; >100 mg/h: 10-32 UNF female, 1/16" or 1/8" OD compression; other on request.
Seals	: meter: all metal controller: Kalrez-6375; other on request
Weight	: meter: 0,2 kg; controller: 0,3 kg
Ingress protection (housing)	: IP40; other on request

### Electrical properties

Power supply	: + 15 ... 24 Vdc
Power consumption	: meter: 100 mA; controller: 350 mA add 50 mA for Profibus, if applicable
Analog output/command	: 0...5 (10) Vdc or 0 (4) ... 20 mA (sourcing output)
Digital communication	: standard: RS232 option: Profibus-DP®, DeviceNet™, Modbus-RTU, FLOW-BUS
Electrical connection	
Analog/RS232	: 9-pin D-connector (male);
Profibus-DP®	: bus: 9-pin D-connector (female); power: 9-pin D-connector (male);
DeviceNet™	: 5-pin M12-connector (male);
Modbus-RTU/FLOW-BUS	: RJ45 modular jack

Technical specifications subject to change without notice.

## > Models and flow ranges

### Liquid Mass Flow Meters; PN400 (pressure rating 400 bar)

Model	min. flow	max. flow
L01	1,5 ... 30 mg/h	0,1 ... 2 g/h

### Liquid Mass Flow Controllers; PN100 (pressure rating 100 bar)

Model	min. flow	max. flow
L01V02	5 ... 100 mg/h	0,1 ... 2 g/h

Indicated ranges are based on fluids with thermal properties similar to H<sub>2</sub>O / IPA

### Calibration

References	: Verified by NK0, the Dutch calibration organisation, and traceable to Dutch and international standards.
Liquids	: Standard calibration fluids: H <sub>2</sub> O or IPA (Isopropyl Alcohol); for other liquids apply to factory.
System	: Precision laboratory balances.



L01 Mass Flow Meter for ultra low liquid flow ranges