

# LIQUI-FLOW®

Series L10 / L20 Digital Mass Flow Meters / Controllers for Liquids

## > Introduction

Bronkhorst High-Tech B.V., the European market leader in thermal Mass Flow Meters/Controllers and Electronic Pressure Controllers, has 25 years experience in designing and manufacturing precise and reliable measurement and control devices. With a wide range of instruments, Bronkhorst High-Tech offers innovative solutions for many different applications in many different markets. The instruments are made to customers' specification, in various styles, suitable for use in laboratory, industrial environment, hazardous areas, semiconductor processing or analytical equipment.

## > LIQUI-FLOW® series L10 / L20

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. The digital LIQUI-FLOW® Mass Flow Meter was designed to cover the range between 5 and 1000 g/h (Full Scale) in a compact instrument with a fast response. The Flow Meter is basically a stainless steel tube without any moving parts or built-in obstructions. The heater/sensor assembly is arranged around the tube and, by following the anemometric principle: a constant difference in temperature ( $\Delta T$ ) is created and the energy required to maintain the  $\Delta T$  is dependent of the mass flow rate. Due to the benefits of the unique patented sensor, the fluid will be warmed to a maximum of 5°C, thereby making the L10/L20 series suitable for fluids with low boiling points.

## > 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.

## > Multi-Bus technology

Bronkhorst High-Tech developed their latest digital instruments according to the "multi-bus" principle. The basic pc-board on the instrument contains all of the general functions needed for measurement and control. It has analog I/O-signals and also an RS232 connection as a standard feature. In addition there is the possibility of integrating an interface board with DeviceNet™,



Profibus-DP®, Modbus-RTU or FLOW-BUS protocol. The latter is a fieldbus based on RS485, specifically designed by Bronkhorst High-Tech for their mass flow metering and control solutions, and through which the company already has over ten years of experience with digital communication.

## > General LIQUI-FLOW® features

- ◆ fast and accurate measuring signal
- ◆ insensitive to mounting position
- ◆ very small internal volume
- ◆ 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)	: ±1% FS
Turndown	: L10 Series 1 : 20 (5 ... 100%) L20 Series 1 : 50 (2 ... 100%)
Reproducibility	: ±0,2% FS typical H <sub>2</sub> O
Settling time (controller)	: < 2 seconds
Operating temperature	: 5...50°C
Temperature sensitivity	: ±0,1% FS/°C
Attitude sensitivity	: negligible
Warm-up time	: 30 min for optimum accuracy; 10 min. for accuracy ±2% FS

### Mechanical parts

Material (wetted parts)	: stainless steel 316L / 320; other on request
Process connections	: 1/8", 1/4" or 6 mm OD compression type; 1/8" or 1/4" face seal male; other on request
Seals	: Kalrez-6375; other on request
Weight	: meter: 0,2 kg; controller: 0,3...0,5 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 options: 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; PN100 (pressure rating 100 bar)

Model	min. flow	max. flow
L13	0,1...5 g/h	5...100 g/h
L23	2...100 g/h	20...1000 g/h

### Liquid Mass Flow Controllers; PN100 (P-max 100 bar)

Model	min. flow	max. flow
L13V02	0,25...5 g/h	5...100 g/h
L23V02	2...100 g/h	20...1000 g/h

Indicated ranges are based on H<sub>2</sub>O.

Higher pressure ratings are available on special request.

### Calibration

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



L23 Mass Flow Meter for Liquids