

# LS32-1500 Liquid Flow Meter

## Compact Flow Meter for Low Flow Rates

- Liquid flow rates up to 40 ml/min
- 20 ms response time
- Excellent repeatability
- High chemical compatibility



### Product Summary

The LS32-1500 enables precise, non-invasive measurements of dynamic liquid flow rates up to 40 ml/min bi-directionally. Excellent biocompatibility is ensured by the exclusive use of high-performance stainless steel, PTFE and PEEK for the wetted parts. The flow path of the LS32-1500 liquid flow sensor is formed by an especially thin-walled, straight tube which assures excellent sensitivity.

### Interface Options

#### Digital

- I2C-Bus

For more information on communication, please refer to page 2 of this document.

## 1 Sensing Performance

Table 1: Performance of LS32-1500 (all data for medium H<sub>2</sub>O, 23°C, 1 bar<sub>abs</sub> unless otherwise noted)

Parameter	LS32-1500	Unit
Full scale flow rate	40	ml/min
Sensor output limit <sup>a</sup>	65	ml/min
Accuracy <sup>b</sup> (whichever error is larger)	5	% of measured value
	0.25	% of full scale
Repeatability <sup>b</sup> (whichever error is larger)	0.5	% of measured value
	0.025	% of full scale
Temperature coefficient (additional error per °C; whichever is larger)	0.25	% measured value / °C
	0.00625	% full scale / °C
Mounting orientation sensitivity <sup>c</sup>	<0.1	% of full scale
Flow detection response time $\tau_{63}$	20	ms
Response time on power-up	25	ms
Operating temperature	+5...+50 (+41...+122)	°C (°F)
Ambient storage temperature <sup>d</sup>	-10...+60 (+14...+140)	°C (°F)
Recommended maximum operating pressure	12 (175)	bar (psi)
Burst pressure	25 (360)	bar (psi)

<sup>a</sup>Flow rate at which the sensor output saturates, see section 2 for performance specification between full scale and saturation point.

<sup>b</sup>Accuracy respectively repeatability below  $\pm 20$  ml/min. See the charts in section 2 for the accuracy respectively repeatability specifications between  $\pm 20$  ml/min and full scale.

<sup>c</sup>Maximum additional offset when flow channel is vertical.

<sup>d</sup>Non-condensing, flow path empty.

## 2 Specifications Charts

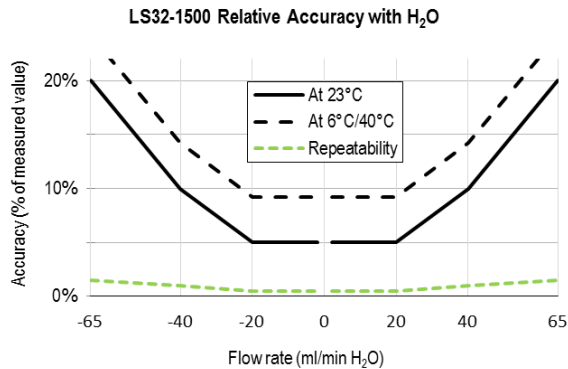


Figure 1: Sensor accuracy and repeatability (% of measured value) across the sensor's flow range

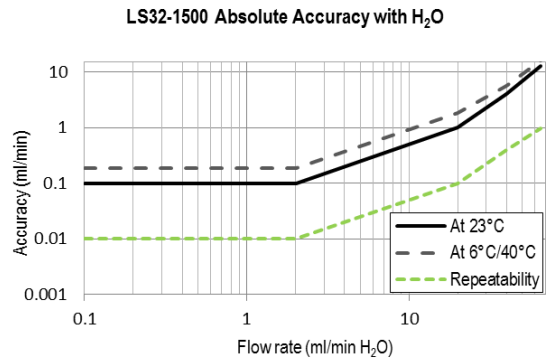


Figure 2: Sensor accuracy and repeatability (ml/min) across the sensor's flow range

## 3 Communication with the Sensor

The OEM flow sensor LS32-1500 shows bidirectional, linear transfer characteristics. The product comes fully calibrated for water.

Digital sampling time, 16 bit	74 ms
Digital sampling time, 9 bit	1 ms

### 3.1 Electrical Specifications

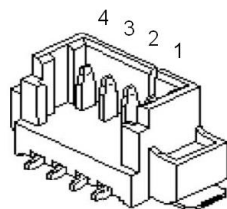
Table 2: DC Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Power supply DC, VDD		4.0	5.0	6	V
Operating current	VDD = 4.0-5.5 V		5.1		mA

### 3.2 Electrical Connector and Sensor Pinout

Connector Type: PCB Header Molex 4 Pin Vertical  
Art.-No. 0533980471.

Pin	
1	SCL (bi-directional)
2	VDD
3	GND
4	SDA



### 3.3 Digital Communication via I<sup>2</sup>C-Bus

Digital communication between a master and the LS32-1500 sensor runs via the standard I<sup>2</sup>C-interface. The physical interface consists of two bus lines, a data line (SDA) and a clock line (SCL) which need to be connected via pull-up resistors to the bus voltage of the system. By default, the I<sup>2</sup>C address is set to 64 (hexadecimal: 40, binary: 1000000).

These lines can be used on 3.3V or 5.0V level with a clock frequency of 100 kHz. For the detailed specifications of this I<sup>2</sup>C communication, please refer to specific I<sup>2</sup>C Application Notes from Sensirion.

## 4 Fluidic Connection

Table 3: Fluidic Specifications and Pressure Rating

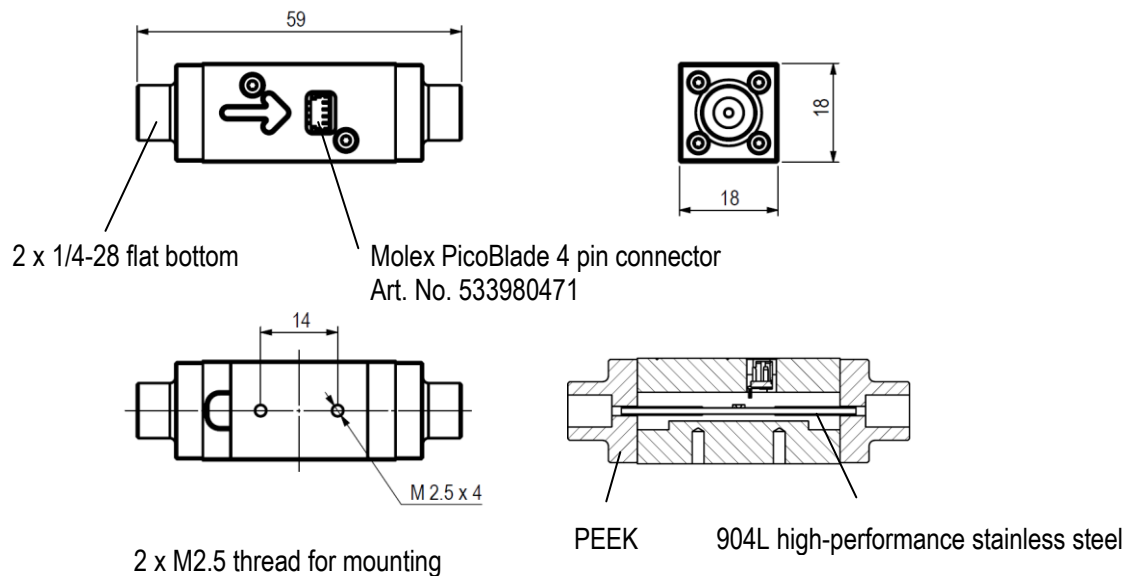
Parameter	LS32-1500
Wetted materials:	
<ul style="list-style-type: none"> <li>Internal sensor tube material</li> </ul>	904L high-performance stainless steel
<ul style="list-style-type: none"> <li>Fitting material</li> </ul>	PEEK
<ul style="list-style-type: none"> <li>Sealing material</li> </ul>	PTFE
Fluid connector ports (Fittings)	1/4-28 flat bottom 1/8" OD tubing (recommended: min. 2 mm ID)
Pressure drop (at 40 ml/min, H <sub>2</sub> O, 23°C)	2.15 mbar
Total internal volume	~70 µl

For more information on the fluidic connection please find: "Application Note Sensor Ports and Tubing Connections" in the Download Center on our homepage.

## 5 Mechanical Specifications

Table 4: Mechanical Specifications

Parameter	LS32-1500
Largest dimensions	59 x 18 x 18 mm
Total mass	~30 g
Inner diameter flow channel	1.5 mm



All dimensions in mm

## 6 Ordering Information

Standard shipment includes only the sensor, neither cables nor fluidic connection material. Preassembled 4-pin Molex to pigtail ribbon cables (Molex 4-pol Type no. 51021-0400, 30 cm) can be ordered optionally.

Product	Article No	MOQ	Packaging Unit
LS32-1500 40 ml/min	1-101127-01	10	10
4-pin Molex to pigtail ribbon cable, 30 cm	1-101121-01	10	n/a

## Important Notices

### Warning, personal injury

**Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury (including death). Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please consult the datasheet and application notes. Failure to comply with these instructions could result in death or serious injury.**

If the Buyer shall purchase or use SENSIRION products for any unintended or unauthorized application, Buyer shall defend, indemnify and hold harmless SENSIRION and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if SENSIRION shall be allegedly negligent with respect to the design or the manufacture of the product.

### ESD Precautions

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take customary and statutory ESD precautions when handling this product.

### Warranty

SENSIRION warrants solely to the original purchaser of this product for a period of 12 months (one year) from the date of delivery that this product shall be of the quality, material and workmanship defined in SENSIRION's published specifications of the product. Within such period, if proven to be defective, SENSIRION shall repair and/or replace this product, in SENSIRION's discretion, free of charge to the Buyer, provided that:

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- such defects shall be found, to SENSIRION's reasonable satisfaction, to have arisen from SENSIRION's faulty design, material, or workmanship;
- the defective product shall be returned to SENSIRION's factory at the Buyer's expense; and
- the warranty period for any repaired or replaced product shall be limited to the unexpired portion of the original period.

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### REACH, RoHS and WEEE Statement

The LS32-1500 complies with requirements of the following directives:

- EU Directive 1907/2006/EC concerning Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)
- EU Directive 2002/96/EC on waste electrical and electronic equipment (WEEE), OJ13.02.2003; esp. its Article 6 (1) with Annex II.
- EU Directive 2002/65/EC on the restriction of certain hazardous substances in electric and electronic equipment (RoHS), OJ01.01.2011