

# Liquid Flow Sensors

- For ultra-low flow rates
- Totally media isolated
- Bio-compatible, inert materials
- No moving parts
- Fast, small, reliable



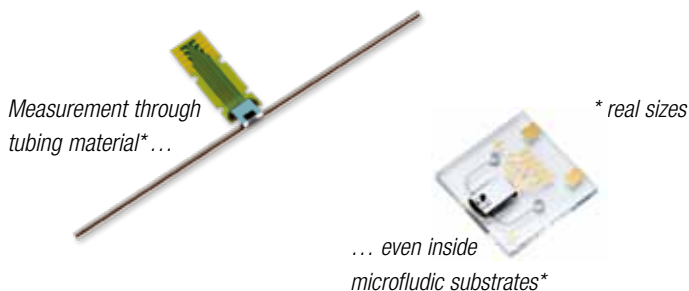
# OEM Sensor Solutions and Standard Flow Meters

## Inspiring Flow Sensor Technology

The lower the flow the better: in contrast to other technologies, Sensirion CMOSens® flow sensor technology is most effective at the lowest flow rates. Based on a thermal principle, our liquid flow products benefit from digital microsensor technology which offers totally media isolated flow sensing down to nanoliters per minute – including bubble detection. As a result, our customers obtain the world's smallest, most precise liquid flow sensors with the best price/performance ratio – and thus inspiration for new design approaches.

The key element of our products is an integrated digital CMOSens® microchip bonded to the outside of the sensor's flow channel. The chip precisely measures through the wall of this channel while assuring high reliability and perfect media compatibility.

In operation, Sensirion liquid flow sensors provide fully calibrated linear output signals for use in life sciences, factory automation and energy applications.



LG16/216

## Digital OEM Sensor Elements

The highly sensitive LG16/LG216 OEM sensor family is unique in the market. Initially developed for the medical sector, these small sized components are now used in a wide range of industries. These liquid flow sensors provide an exceptional price/performance ratio and enable you to reduce your investment in application-specific sensor development.

The flow path of the non-invasive LG16/LG216 sensor is formed by a simple, straight glass capillary and is fitted with PEEK™ fluid connectors. This ensures excellent chemical resistance and biocompatibility. For seamless integration, the sensor output is available via a digital I²C interface or as a 0–5V signal.

For more complex systems and high-volume applications, Sensirion is prepared to modify existing standard designs or develop totally new solutions according to your specific requirements. Our experience from countless projects in the automotive and medical device industries is your assurance of the highest standard of quality.

Standard Products	SLG1430	ASL1600	SLQ	LG16		LG216
Variant	-025/-150/-480	-10/-20	HC60	-0025/-0150/-0480	-1000/-2000	-0480
Available max. Flow Rates (peak)	1.5 µl/min 7 µl/min 40 µl/min	1 ml/min 4 ml/min	80 ml/min hydro-carbons	1.5 µl/min 7 µl/min 50 µl/min	1 ml/min 5 ml/min	20 ml/min
Minimum Flow	0	0	0	0		1 ml/min
Bi-Directional Operation	yes	yes	yes	yes		no
Accuracy of Reading	10 %	3 %	non calibrated	10 % / 10 % / 5 %	5 %	5 %
Response time	20 ms	20 ms	30 ms	30 ms		40 ms
Output	RS232, digital	RS232, digital	Analog, 0–10V (zero flow at 5V)	Digital I²C or analog 0–5V (zero flow at 2.5V)		Digital I²C or analog 0–5V
Output Validity	All media, calibration valid for H <sub>2</sub> O		Hydrocarbon based liquids only	All media, calibration valid for H <sub>2</sub> O		H <sub>2</sub> O based liquids only
Chemical Compatibility	All media compatible with PEEK™, glass and Teflon®					
Power Supply	7–15V	7–15V	24V ±10 %	3.3–12V (min 5.5V for analog output)		
Maximum Pressure	350/350/200 bar	5/3 bar	5 bar	200/200/100 bar	5/3 bar	20 bar
Maximum Cable Length	3 m	3 m	3 m	30 cm		30 cm
Tubing for Fluid Connection	capillaries outer diameter 360 µm	plastic tubing outer diameter 1/16"	plastic tubing outer diameter 1/16" or 1/8"	capillaries outer diameter 1/32"	plastic tubing outer diameter 1/16" or 1/8"	plastic tubing outer diameter 1/16" or 1/8"
Inner Diameters	25/150/480 µm	1/2 mm	1.8 mm	25/150/480 µm	1.0/1.8 mm	0.48 mm
Minimum Order Quantity	1 piece	1 piece	1 piece	100 pieces (OEM)		100 pieces (OEM)
Area of use	for OEM integration, factory automation, research & lab use			for OEM integration only		
Laboratory and Test Devices	LabKit including sensor, software, interface cable, power supply available		–	EvalKit available on request		

# Cost-Effective Design

## High-End Flow Meters

Sensirion's small liquid flow meters enable extremely sensitive and fast measurement of liquid flows down to nanoliters per minute, with a typical repeatability of 1 % of reading. Overpressure ratings up to 350 bar (5000 psi) are available in the microliter ranges. All flow meters measure non-invasively with exceptionally short response times in the millisecond range. The integrated straight flow channels are made of 100 % glass to ensure excellent chemical resistance and biocompatibility. The absence of any moving parts ensures maximum reliability.



SLG1430 / ASL1600

## Flow Meters for Oils, Acids and Solvents

The SLQ-HC60 low-flow meter with IP65 rating is specifically designed for use in industrial process automation and the semiconductor industry. It operates non-invasively without moving parts and provides superior reliability and chemical resistance. This small, fast, and highly sensitive flow meter enables precise and rapid measurement of dynamic volume dosing for production process monitoring. It can also be used to detect clogging, leaks and bubbles. The 0–10V output signal corresponds to flow rates up to 100 ml/min. The supply voltage is 24V.



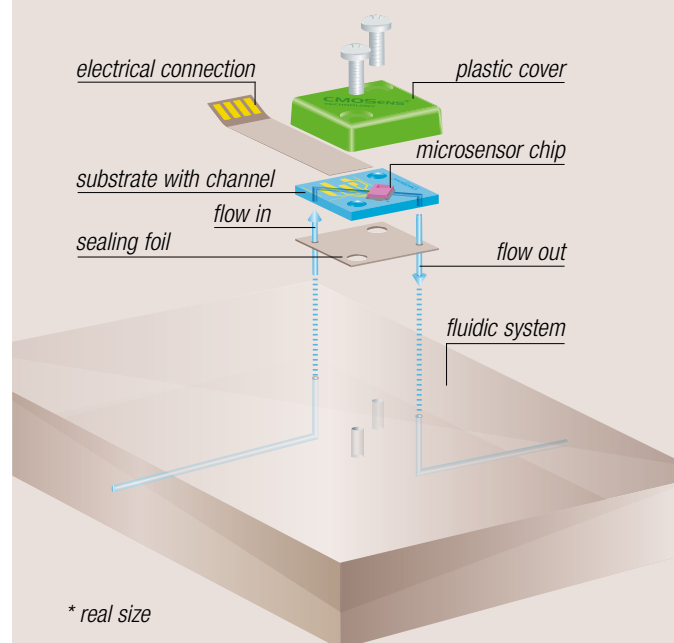
SLQ-HC60

For mass products, including single-use applications, effective sensor solutions are vitally important. Unique CMOSens® planar packaging technology allows for low fabrication costs by enabling non-invasive measurement of liquid flow inside a cost-effective planar substrate (US Patent 6813944). The flow channel passes through this planar substrate, which is made from glass, ceramic or plastic.

This simplified design provides high sensitivity for liquid flow measurement and bubble detection. A small digital CMOSens® microchip (typical size 2.2 x 3.5 mm) is bonded to a microfluidic channel substrate. Fluidic ports on the bottom of the substrate facilitate easy integration with fluid manifolds.

In addition to the sensor element, the chip houses the complete digital intelligence as well as the memory necessary for signal linearization, temperature compensation and self-test algorithms. It provides a fully digital I<sup>2</sup>C interface and can operate over a supply voltage range of 2.8 to 3.6V. The sensor elements boast a short flow sensing response time of around 40 ms, and sensor resolution down to 0.5 nl/min is feasible.

Customized prototypes are available upon request.



# About Sensirion

Sensirion AG, with headquarters in Staefa, Switzerland, is a leading manufacturer of CMOS sensor components and systems for a wide variety of OEM applications (e.g. in the medical, automotive, HVAC and consumer industries). Our current four business units focus on the following categories of high-quality products:

- **Humidity and temperature sensors**
- **Liquid flow sensors**
- **Gas flow sensor solutions (mass flow meters and controllers)**
- **Differential pressure sensors**

With a growing, highly qualified staff of more than 160 employees, Sensirion stands for continuous product innovation and excellent technical support. To provide international service with guaranteed high quality, we rely on a global sales and support network consisting of subsidiaries in the USA, China, Japan and Korea and about 10 independent distributors.

Our products are distinguished by their use of patented CMOSens® Technology, which integrates the sensor element and signal processing on a single chip. In the highly competitive global market, this system integration offers unbeatable customer benefits – in particular high reliability and precision at low cost.

Sensirion's competence as a reliable OEM partner is underlined by a distinct quality approach and a professional quality management system, which is certified in accordance with the ISO 9001 and ISO/TS 16949 standards.

**CMOSens®**  
TECHNOLOGY

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