

**FEATURES**

- Compact design
- Fast response to bubbles
- Detection of very small bubbles
- Low power
- High accuracy – low probability of missed bubbles
- Interface to existing control modules

**APPLICATIONS**

Fluid flow, Air bubble, air-in-line, and end-of-sample sensing for

- Chemical Processing Equipment
- Food and Beverages Processing
- Medical equipment
- Pharmaceutical Instruments
- Research and Lab Equipment

**GENERAL DESCRIPTION**

Instrumems flow sensing technology uses a revolutionary MEMS nanowire, which can be used as an air bubble detector. It is used to detect air or gas bubbles in plastic tubes filled with liquid and is intended to prevent air infusions. The sensor has an extremely low thermal mass, which gives the sensor a fast response time, low power consumption, and high accuracy.

Many of the variables affecting the accuracy of amplitude during continuous wave ultrasound are also eliminated. The sensor is in contact with the liquid delivering the lowest number of “missed” bubbles. The sensor is capable of measuring bubbles >50% tube diameter.

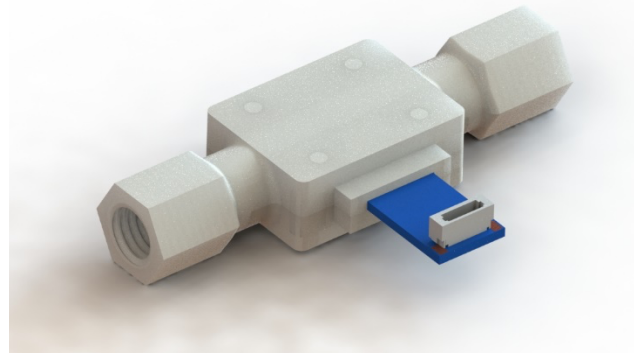


Fig 1. Bubble detection sensor

The sensor comes integrated with an external electronics module with digital outputs. The electronics module output connects to data acquisition systems for advanced control and analysis.

The sensor can also be used as a liquid flow sensor capable of measuring a wide range of flow rates. All measurement data is fully calibrated for water and temperature compensated by means of an internal micro-controller.

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**ORDERING GUIDE**

Part number	Description
IM-21LQ000BD	Liquid Flow and Bubble sensor

## SPECIFICATIONS

$T_F = 5-40^{\circ}\text{C}$ ,  $T_A = 25^{\circ}\text{C}$ , unless otherwise noted.  $T_A$  is the ambient temperature of the IM-21LQ000BD and reference circuit;  $T_F$  is the temperature of the fluid being measured.

**Table 3. Fluidic Specifications and Connections**

Parameter	Value	Unit
Min Bubble Volume Detectable	0.5	$\mu\text{L}$
Wetted materials	UV cured SLA resin, epoxy-based adhesive	
Fluid connector ports (fittings)	UNF 1/4" - 28 flat bottom	
Compatible fluid	Any non-corrosive liquid	
Recommended tubing ID	5	mm
Operating fluid temperature	5 – 40	$^{\circ}\text{C}$
Temperature Increase at Output	<0.14 $^{\circ}\text{C}$ @1ml/min	

**Table 4. Mechanical specifications**

Parameter	Value	Unit
Dimensions	49 x 29 x 9	mm
Inner diameter	5	mm
Tubing outer diameter	1/4	in
Inner Channel Diameter	1.4	mm
Operating pressure	3	bar
Burst Pressure	5	bar

**Table 5. Electronics specifications**

Parameter	Value	Unit
Supply Voltage	5 – 32	V
Maximum Power consumption	15	mW
Logic High	5 - 32	V
Logic Low	0 - 5	V
Operating temperature	5 – 40	$^{\circ}\text{C}$
Digital Response time	<200	ns
Operation indicator	Blue LED indicates bubbles	

**Table 6. Absolute Maximum rating**

Parameter	MIN	MAX	Unit
<b>Sensor module</b>			
Storage temperature	-20	+70	°C
ESD – human body model		±500	V
ESD- charge device model		±1000	V
<b>Electronics module</b>			
Supply Voltage	-0.3	+15	V
Digital I/O Voltage	-0.3	+40	V
Analog I/O Voltage	-0.3	+3.3V	V
Storage temperature	0	+70	°C
ESD – human body model		±8000	V
ESD – charge device model		±3000	V

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

## ESD CAUTION



**ESD (electrostatic discharge) sensitive device**  
 Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

**PIN ASSIGNMENTS AND THE PHYSICAL FORM FACTOR OF THE SENSOR**

**PIN ASSIGNMENTS**

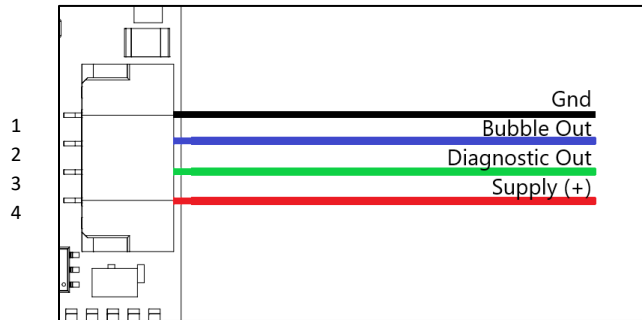


Fig 2. Pin configuration on the IM-21LQ000BD-2 module side of the 4-pin connector

**Table 7. Pin Function Descriptions**

Pin No.	Type	Description
1	Power/Gnd	Gnd
2	Output	Bubble Out – Pulled Low when Bubble is detected
3	Output	Diagnostic Out – Pulled Low when Sensor is non-functional / broken
4	Power/Gnd	Supply

**Table 8. LED Function Description**

Sr	LED	Description
1	Yellow	LED ON = Power good
2	Blue	LED ON = Bubble is detected, Default: OFF
3	Red	LED ON = Sensor is damaged or broken. Please replace the module. Default: OFF

### DRAWING AND DIMENSIONS OF SENSOR

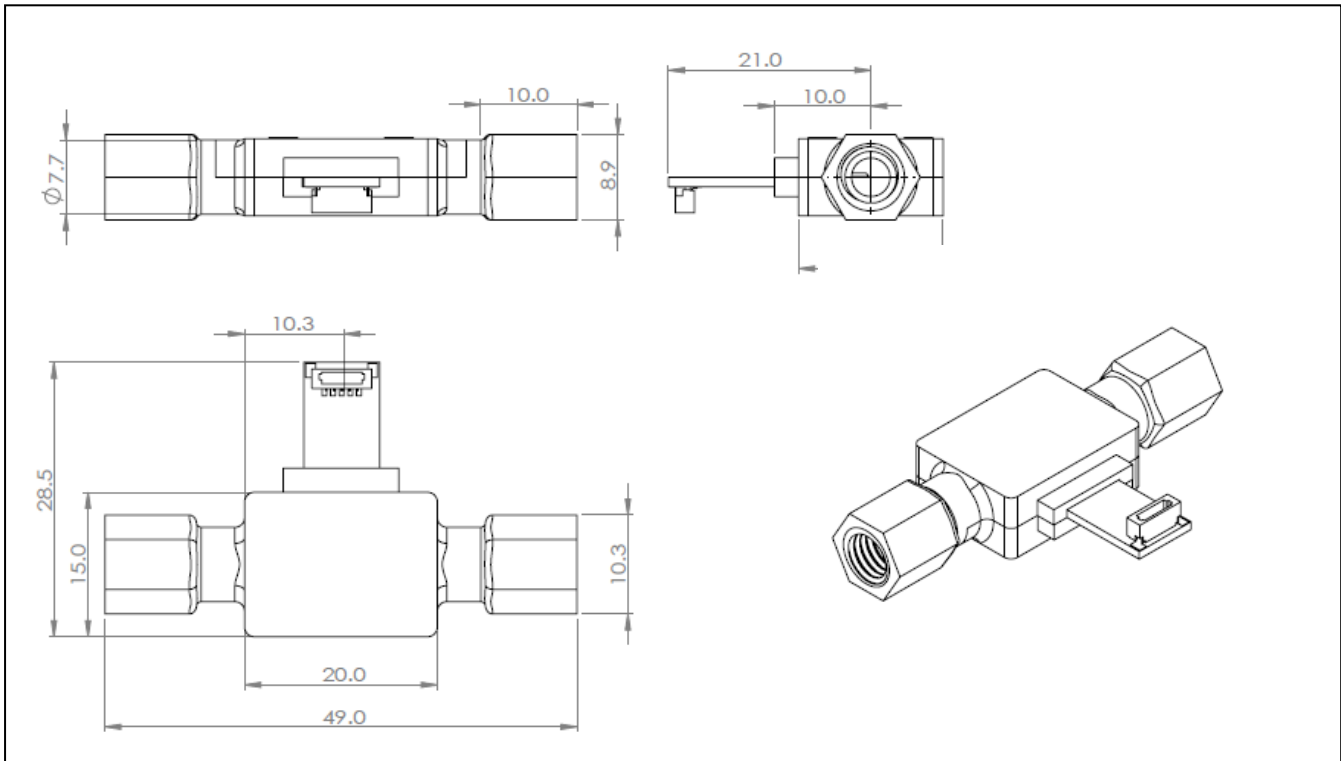
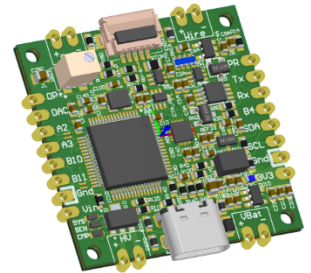


Fig 3. 3-view drawing and the dimensions of the sensor component. All dimensions in [mm]

## ANALYTICS ADD-ON

Our add-on module offers advanced analytics capabilities with the Bubble Detector. This module is an MCU board with built-in firmware that allows a user to:

- Measure bubble size and volume
- The ability to set alarms triggered when a bubble surpasses a predetermined threshold is detected
- Generate bubble histograms
- Data Logging and Storage



With our module, you have a powerful tool for understanding and optimizing bubble behavior and analyzing foam.

Parameter	AVG	Unit
Bubble Volume Accuracy	±5	%
Module Power Consumption (Max)	10	mW

### Sample Histogram

