Pressure sensors

STMicroelectronics MEMS
Absolute pressure sensors technology

Fully molded package parts
LPS22DF
ILPS22QS

Water-resistant package options
LPS28DFW
ILPS28QSW

Qvar™ Technology

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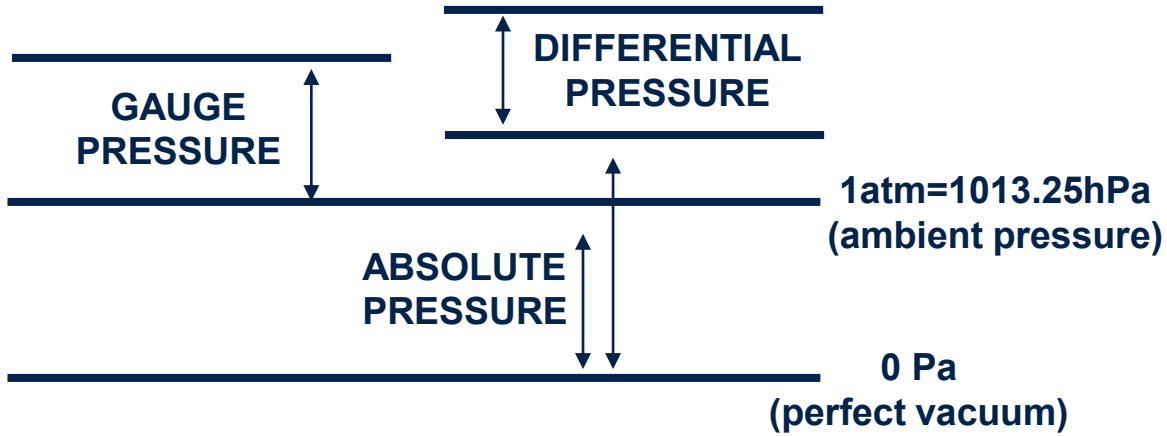
Types of pressure measurements

3 different types of pressure sensing measurements

- **Absolute pressure** is defined as the pressure measured relative to a perfect vacuum
- **Differential pressure** is the pressure difference measured between two pressure sources
- When one source is the ambient pressure, this is then called **gauge or relative pressure**



ST is offering absolute pressure sensors
Other use cases are covered using two pressure sensors

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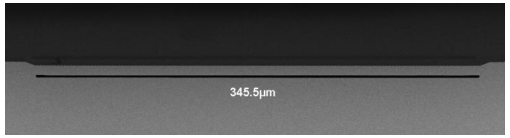
ST technology

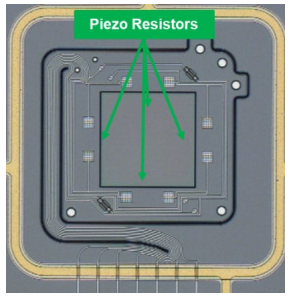
MEMS absolute pressure sensors

MEMS sensing element

Suspended membrane manufactured using a proprietary process

When pressure is applied, the membrane deflection induces an imbalance in the Wheatstone bridge piezo-resistances





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ASIC

Output signal is converted by the IC interface

Digital output for connection to host microcontroller / processor

Factory calibration (trimming parameters stored on the device)

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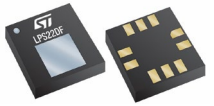
Package

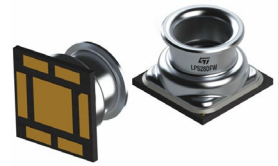
Unique fully-molded package

- Ultra-thin package
- Shock and vibration suppression
- Improved dust/moisture resistance



Water-resistant package option

- Cylindrical design & O-ring compatibility
- Potting gel & grounded metal cap
- Low-stress encapsulation



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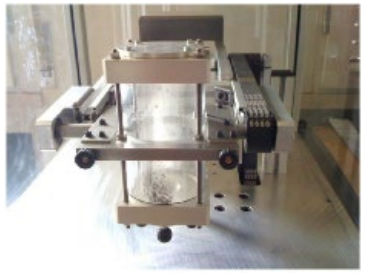
ST advantages
Dust resistant and water-resistant packages

Dust contamination test

100 cycles (dust particles down to 50µm)**, all parts passed showing no significant output drift**

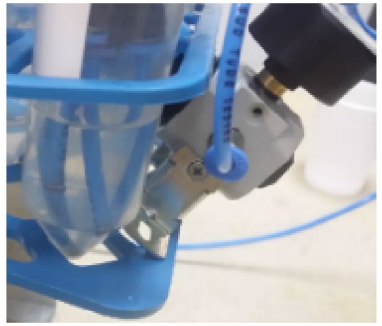


Small vent holes: 6x holes for redundancy & small hole to avoid contamination inside IC

Robustness to high air overpressure stress tests

the device demonstrated robustness under specific conditions, with **no failures**

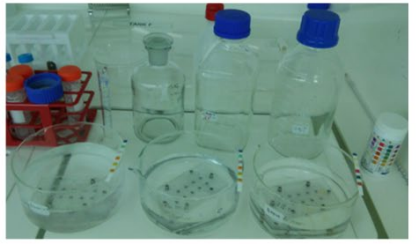
Figure 17. LPS27HHW immersed in water for air overpressure



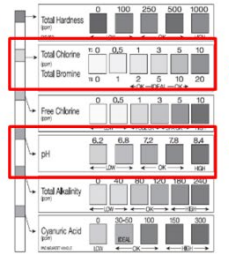
Robustness to corrosive agents

Hot chlorine, bromine, saltwater and detergent tests showed high stability, with **no impact on accuracy or other performance issues**, robustness to potential corrosive agents

Figure 16. Chlorine, bromine, saltwater and detergent tests

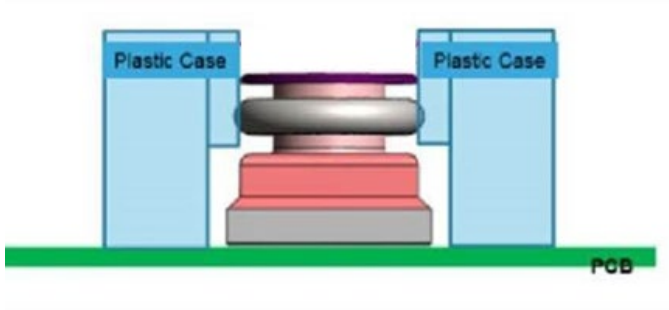


❖ Test under each bottle of Chlorine , Bromine and Salt water



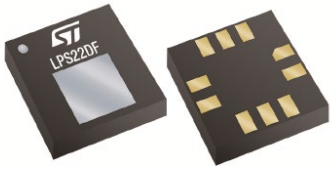
❖ Aqua check strip & measurement scale

❖ Test strip using to confirm test condition.



LPS22DF

Low-power, High-precision, Absolute digital output barometer



HLGA-10L
2.0 x 2.0 x 0.73 mm

HIGHLIGHTS

- **Greater than 20% reduction in power** vs previous generation
- Better Absolute Pressure Accuracy
- **Supports 1.08V digital interface**
- Fully factory calibrated
- E911 compliant

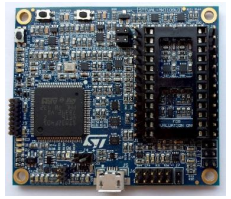
KEY FEATURES

- 260 to 1260 hPa absolute pressure range
- Current consumption down to 1.7 µA
- Absolute pressure accuracy 0.5 hPa
- Low noise 0.34 Pa
- High performance TCO 0.45 Pa/°C
- Embedded temperature compensation
- Unique Full-molded package

TARGET APPLICATIONS

GPS applications | Altimeters and barometers | Sport Watches and Wearables | Drones | Vacuum cleaners Floor type / Bag level

EVALUATION BOARDS



STEVAL-MKI109V3
ProfiMEMS motherboard

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STEVAL-MKI224V1
DIL24 adapter kit

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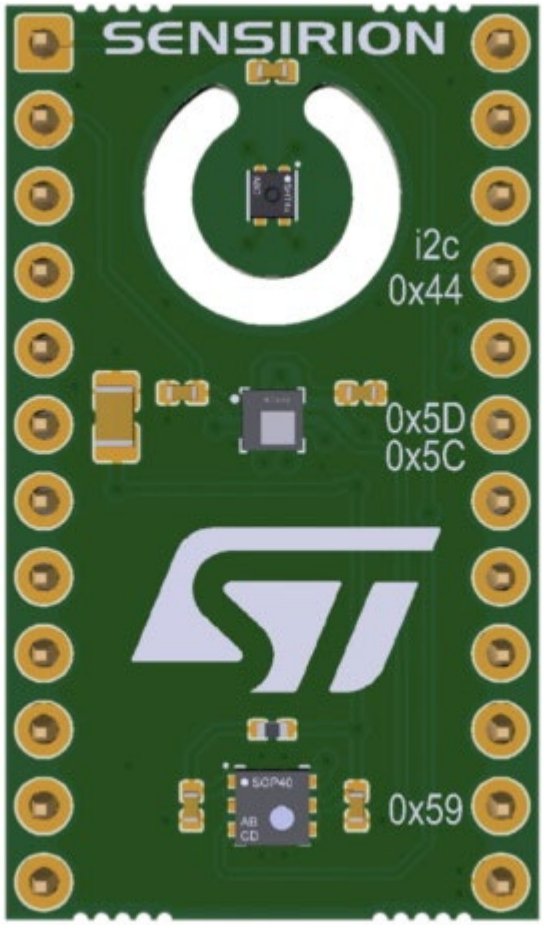
SENSIRION

SENSEVAL-SCB4XV1

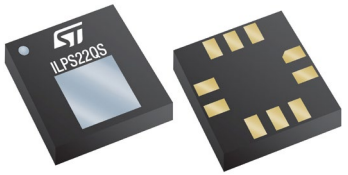


- Unique combination:
  - **Sensirion SHT40** humidity and temperature sensor
  - **Sensirion SGP40** VOC sensor
  - STMicroelectronics LPS22DF barometric pressure sensor
- Measure and understand the indoor air quality around them and easily identify potentially harmful events.
- Compatible with the STMicroelectronics DIL 24 socket and ecosystem of tools
  - supported by the STEVAL-MKI109V3 motherboard and UNICO-GUI
  - compatible with the X-NUCLEO-IKS01A3 and X-NUCLEO-IKS02A1 expansion boards

life.augmented Partner Program

ILPS22QS

Dual full-scale, absolute digital output barometer for industrial applications



HLGA-10L
2.0 x 2.0 x 0.73 mm

HIGHLIGHTS

ST's 1st industrial pressure sensor (temp. range -40 °C to **+105 °C**)

Analog hub sensing functionality to implement the **QVAR technology** for **sensing charge variation** (implement water leakage detection and user interface gesture like tap, double tap, long press, and L/R - R/L swipe)

The device is **factory calibrated & unique fully molded package.**

KEY FEATURES

- Selectable **dual full scale** absolute pressure range
  - Mode 1: 260 to 1260 hPa // Mode 2: 260 to 4060 hPa
- **Current consumption** down to 1.8 µA
- Absolute pressure **accuracy** 0.5 hPa (Mode 1) / 0.28% (Mode 2)
- **Low noise** 0.34 Pa (Mode 1) / 0.57Pa (Mode 2)
- High performance TCO 0.45 Pa/°C (Temperature coefficient offset)
- Embedded temperature compensation

TARGET APPLICATIONS

Altimeters and barometers

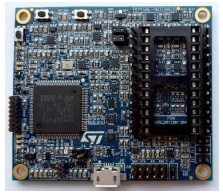
Smart filters

Ventilators and CPAP equipment

Gas metering
Leakage detection

Man-down detection

EVALUATION BOARDS



STEVAL-MKI109V3
ProfiMEMS motherboard

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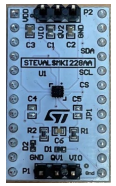

STEVAL-MKI228KA
DIL24 adapter kit

+

STEVAL-MKE001A
Qvar Electrode board

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LPS28DFW

Dual full-scale, Absolute digital output barometer with water-resistant package

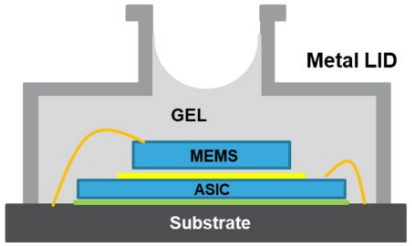
CCLGA-7L
2.8 x 2.8 x 1.95 mm

HIGHLIGHTS

- **Greater than 20% reduction in power** vs previous generation
- Better Absolute Pressure Accuracy
- 10 ATM Water Resistant package
- Fully factory calibrated

KEY FEATURES

- Selectable **dual full scale** absolute pressure range
  - Mode 1: 260 to 1260 hPa
  - Mode 2: 260 to 4060 hPa
- **Current consumption** down to 1.7 µA
- Absolute pressure **accuracy** 0.5 hPa
- **Low noise** 0.32 Pa
- Embedded temperature compensation



TARGET APPLICATIONS

GPS applications

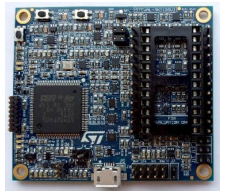
Altimeters and barometers

Sport Watches and Wearables

Water depth monitoring

Water level management

EVALUATION BOARDS



STEVAL-MKI109V3
ProfiMEMS
motherboard

+

STEVAL-MKI225A
DIL24 adapter kit

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ILPS28QSW

Dual full-scale, absolute digital output barometer with water-resistant package for industrial applications

CCLGA-7L
2.8 x 2.8 x 1.95 mm

HIGHLIGHTS

ST's 1st industrial pressure sensor (temp. range -40 °C to **+105 °C**)

Analog hub sensing functionality to implement the **QVAR technology** for **sensing charge variation** (implement water leakage detection and user interface gesture like tap, double tap, long press, and L/R - R/L swipe)

The device is **factory calibrated & Potting gel** to protect the electronics components inside the sensor

KEY FEATURES

- Selectable **dual full scale** absolute pressure range
  - Mode 1: 260 to 1260 hPa // Mode 2: 260 to 4060 hPa
- **Current consumption** down to 1.8 µA
- Absolute pressure **accuracy** 1 hPa (Mode 1) / 0.43% (Mode 2)
- **Low noise** 0.32 Pa (Mode 1) / 0.57Pa (Mode 2)
- Embedded temperature compensation

TARGET APPLICATIONS

Altimeters and barometers

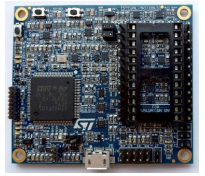
Smart filters

Home appliance

Gas metering
Leakage detection

Water depth monitoring

EVALUATION BOARDS



STEVAL-MKI109V3
ProfiMEMS motherboard

+

STEVAL-MKI223V2
DIL24 adapter kit

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Water depth monitoring

Home appliance

Scuba

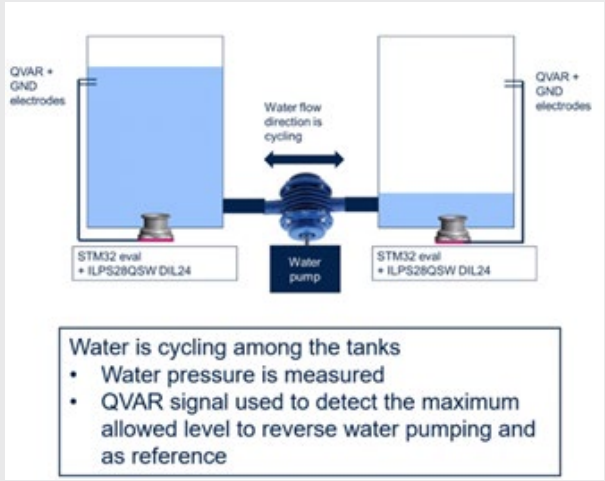
Pressure sensors to measure liquid levels

Liquid level application description

Selectable scale for depth in deep water and presence out of water

Dual full-scale mode to provide wide coverage on both altimeter and water depth (up to 30 meters)

Current consumption and noise features



Key application requirements

	Current consumption	Noise Package
ILPS28QSW	Supply current @ 1Hz output data rate **1.7 µA**	**1 hPa (Mode 1)** **0.6% of input pressure (Mode 2)**
	Supply current in power-down mode **1 µA**	Water-proof package

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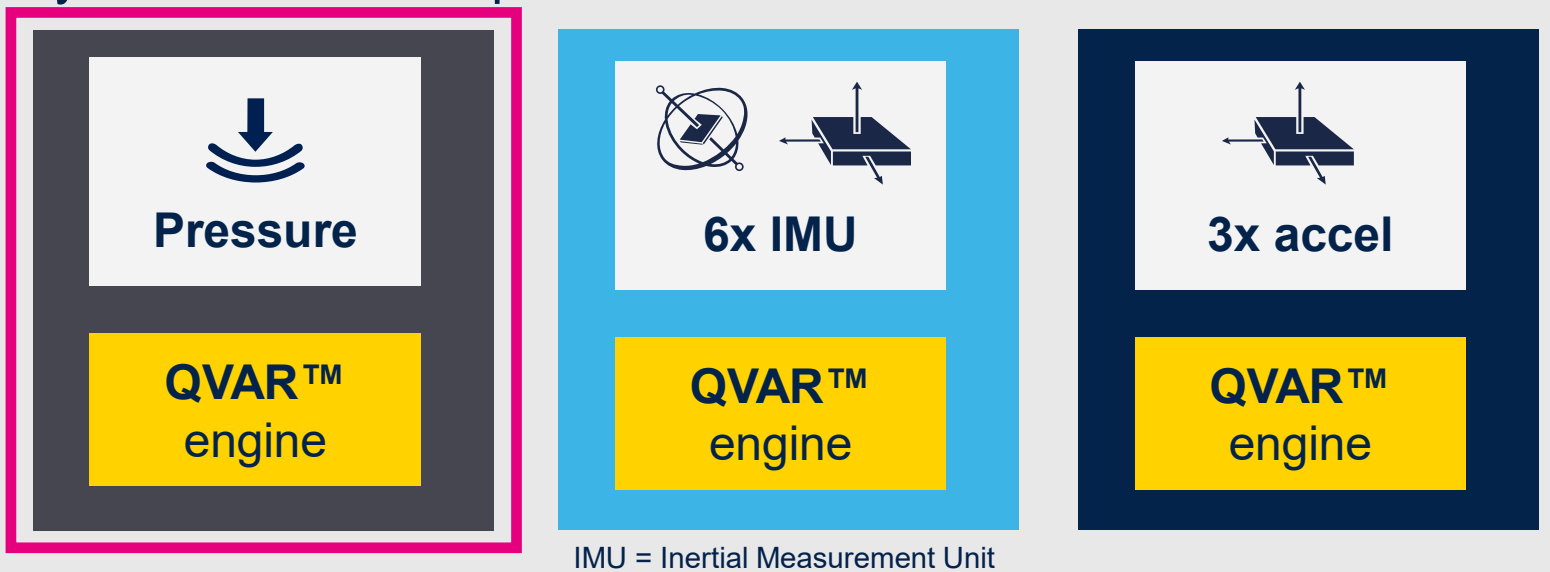
Qvar - Introduction and working principle

Qvar stands for: Electric charge (Q) variation (var)

Qvar senses variations in the electrical fields in proximity or contact of the product via electrodes

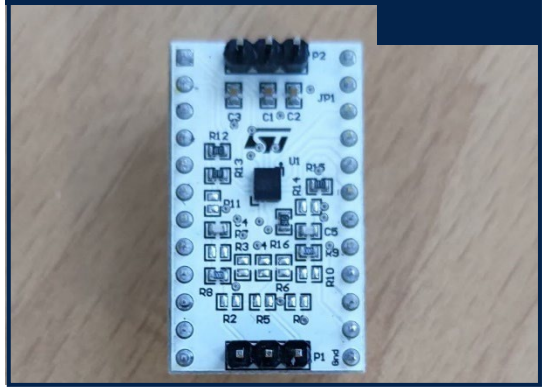
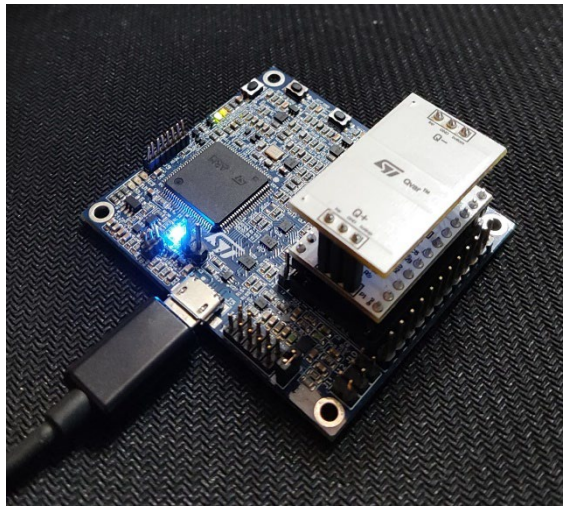


IMU = Inertial Measurement Unit

Added functionality of an existing sensor

ST Qvar combined sensor

Sensor fusion to improve user experience

Device adapter	Electrode adapter	
		

Evaluation board	**Profi MEMS Tool (USB)**
Adapters	**DIL24 device adapter + Electrode's adapter**
Sensors' availability	**ILPS22QS / ILPS28QSW (Pressure sensors)** **LSM6DSV16X / LSM6DSV32X (IMU)** **LIS2DUXS12 (XL)**

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