

ST industrial sensors overview

Overview of Industrial Sensors



ST Industrial Motion Sensors Portfolio



Sensor applications and components



Development tools



The Industry 4.0 revolution

Revolution boosted by sensors, edge processing & connectivity



ST sensors for industry 4.0

10 years longevity commitment
ST focuses on markets requiring long lifecycles



life.augmented

State-of-the-art sensors for industry 4.0

Deep expertise in Automotive

Leadership in consumer MEMS



10-year
longevity
from product
introduction date

Design and
manufacturing
for higher
robustness

Calibration &
testing
for higher
accuracy & quality

Higher
endurance
to shock and
vibration

Extended
temperature
range





Industrial 10y sensors

6-axis IMU / Accelerometers

6-axis IMU

I3G4250D



4 x 4 x 1 mm

- 3-axis digital gyroscope
- High linearity and stability over temperature & time

ISM330DLC



2.5 x 3 x 0.86 mm

- Dual-channel output
- Low power
- Smart features
- Accelerometer with wide bandwidth (3 kHz) and low noise

- Cur Cons HP: **0.75 mA** combo
- FS: **gyro** up to **2000 dps**; **axel** up to **16 g**

ISM330DHCX



2.5 x 3 x 0.86 mm



- Enhanced machine Learning Core and FSM

- High accuracy and stability: (BI : 3°/hr)
- Accelerometer with wide bandwidth and low noise

- Cur Cons HP: **0.90 mA** gyro; **1.2 mA** combo
- FS: **gyro** up to **4000 dps**; **axel** up to **16 g**
- Extended Top: **-40°C +105°C**

Accelerometer

IIS2DH



2 x 2 x 1 mm

- Low power
- Wide bandwidth (2 kHz)

IIS2DLPC



2 x 2 x 0.7 mm

- Ultra-low power
- High versatility: on-the-fly changes from ultra low power to high resolution/high performance modes

IIS3DWB



2.5 x 3 x 0.86 mm

- 3-axis digital accelerometer
- Ultra-wide and flat bandwidth (> 5 kHz)
- Low noise (75 µg/√Hz) / Low power (1.1mA)
- Extended temperature: **-40°C +105°C**
- Ideal for vibration monitoring

IIS328DQ



4 x 4 x 1.8 mm

- Extended temperature : **-40°C +105°C**
- QFN Package

IIS3DHHC



5 x 5 x 1.7 mm

- 3-axis digital Inclinometer
- High resolution and stability over temperature and time
- High-end ceramic package

IIS2ICLX



5 x 5 x 1.7 mm



- 2 axis digital Inclinometer
- Enhanced machine Learning Core and FSM

- Ultra high resolution and stability over temperature & time
- Low power
- Extended temperature: **-40°C +105°C**

- Cur Cons: **0.42 mA**
- FS: **± 0.5/1.0/2.0/3.0**

Coming soon





Industrial 10y sensors Magnetometers / Microphones

Magnetometer

IIS2MDC



2 x 2 x 0.7 mm

- **3 axis magnetometer**
- High dynamic range and high-resolution magnetic sensing
- **AMR technology**

- Dynamic range: ± 50 Ga
- Noise RMS [HP] = 3 mGa

ISM303DAC



2 x 2 x 1 mm

- **3 axis magnetometer + 3 axis accelerometer**
- Dynamic switch between High resolution / High frequency and Low Power modes
- **AMR technology**

Microphone

IMP34DT05



3 x 4 x 1 mm

- Top-port digital microphone
- High performance

- Sensitivity -26 ± 3 dB
- AOP 122.5 dB_{SPL}
- SNR 64 dB

New product



Under development



IMU in industrial applications

5G antennas



5G antenna condition
monitoring

Industrial IoT



Robotics and industrial
automation.
Predictive Maintenance

Dynamic inclinometers



Dynamic inclinometers for
industrial vehicles

Positioning, Tracking & Navigation



Positioning & navigation for
robots and autonomous
vehicle

Stabilization



Camera, lens, platform and
antenna stabilization



6-axis Inertial
Measurement Unit



6-axis IMU with
Machine Learning Core

ISM330DHCX

6-axis IMU with Machine Learning Core

Key Features

- **Configurability**
 - Angular rate range: from ± 125 dps up to ± 4000 dps
 - Axel Full Scale: from ± 2 g up to ± 16 g
 - Low power and high-performance modes
- **High Accuracy, Stability and linearity over temperature and time**
 - Gyro Offset vs T ± 0.005 dps/ $^{\circ}$ C (typ)
 - **Gyro Bias Instability 3 $^{\circ}$ /hr (typ)**
 - Rate Noise Density 5 mdps/ $\sqrt{\text{Hz}}$ (typ)
 - Axel Noise Density 60 $\mu\text{g}/\sqrt{\text{Hz}}$ (typ) – ODR up to 6.6kHz
- **Programmability & digital features**
 - **Programmable Machine Learning Core & Finite State Machines to integrate AI algorithms**
 - 9 kB Embedded FIFO
 - Sensor Hub
- **Extended operating temperature range from -40 to +105 $^{\circ}$ C**



LGA 14L
2.5x3x0.86 mm



Inclinometers in industrial applications

Pointing, levelling
and stabilization



Antenna pointing,
platform leveling and
stabilization

Robotics and IIoT



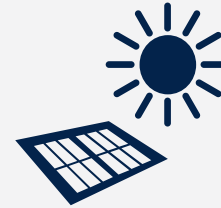
Robotics and Industrial
automation

Inclinometers for
industrial vehicle



industrial vehicles and
construction machines

Equipment
installation and
monitoring



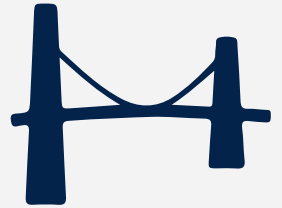
Installation and
monitoring of equipment,
solar panels

Leveling
instruments



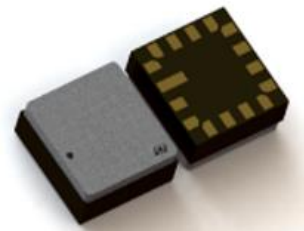
Precise leveling
instruments

Structural health
monitoring



Building and
infrastructure condition
monitoring

IIS3DHH
3-axis digital
Inclinometer



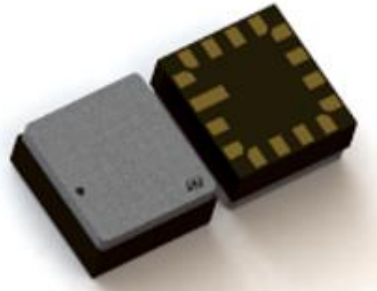
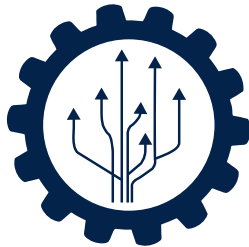
IIS2ICLX
2-axis digital
Inclinometer

Coming soon

High-accuracy 2-axis digital inclinometer

Key Features

- 2 axis, digital plug & play
- **Top notch performance: accuracy, stability over Temperature & Time & resolution**
- **Accuracy better than 0.5° over full temperature range and over time**
- Ultra low noise (15 $\mu\text{g}/\sqrt{\text{Hz}}$)
- Low power
- Programmable Machine Learning Core & Finite State Machines to integrate AI algorithms
- Extended operating temperature range: from **-40 to +105 °C**



Ceramic Cavity LGA 5x5x1.7 16L

Parameter	Value
N. of axis	2-axis
Full Scale [g]	$\pm 0.5/1.0/2.0/3.0$
Output i/f	Digital I2C/SPI
Bandwidth (-3dB) [Hz]	Programmable, up to 260
ODR [Hz]	12.5 - 833 Hz
Noise Density [$\mu\text{g}/\sqrt{\text{Hz}}$]	15
Offset change vs Temp [$\text{mg}/^\circ\text{C}$]	<0.075
Current Consumption [mA]	0.42
Features	MLC(Machine Learning Core) FSM (Finite State Machine) Sensor HUB FIFO (3kbyte), Interrupts Embedded Temp. Sensor
Operating Temp [$^\circ\text{C}$]	-40 ; +105
Operating Voltage [V]	1.71 ÷ 3.6

Coming
soon



Microphones in industrial applications

Smart Medical Tools



Smart stethoscope,
breath monitoring

Human to Machine Interface



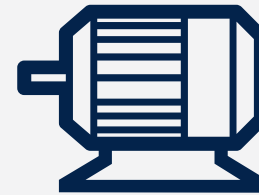
Voice command

Building Automation & Security



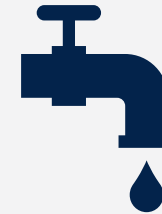
Alarm, voice command

Condition Monitoring



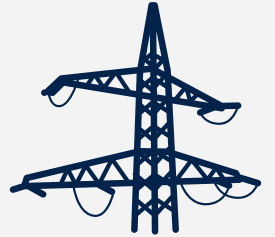
Fan, motor, bearing
condition monitoring

Leak Detection



Gas and fluids leak
detection

Electrical arcing



High voltage wires
condition monitoring



IMP34DT05
Top port digital
microphone



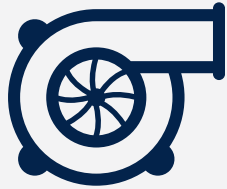
Temperature sensors in industrial applications

Asset Tracking



Monitor temperature during storage and transportation of sensitive goods

Condition monitoring



Motor, fan, blowers, Condition Monitoring

Building automation



Thermostat, heating/air conditioning systems

Power electronic protection



Temperature monitoring to avoid overheating of power electronics or battery

Industrial automation



Calibration, drift compensation

Medical equipment



Smart medical instruments, thermometers, Ventilators, CPAP





STTS22H

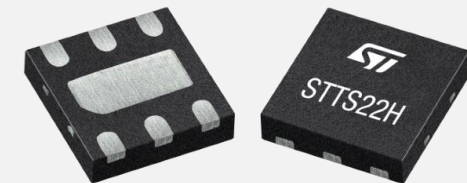
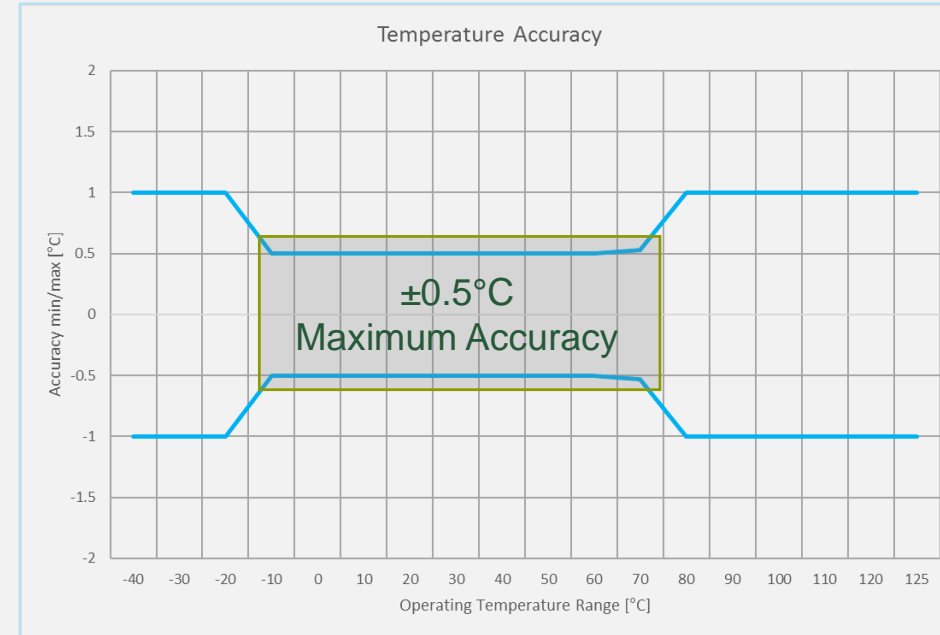
The highest temperature accuracy at lower power

Key Features

- Temperature Range: **-40°C to +125°C**
- Accuracy: **±0.5°C (max) [-10°C – 60°C]**
- Current consumption:
 - **1.7 uA** in one shot mode
 - 2.0 uA at 1Hz ODR
- Supply voltage: **1.5V – 3.6V**
- Output interface: **I²C / SMBus 3.0**
- Programmable interrupt & I²C address (up to 2)
- SMBus **ALERT** support
- **Selectable ODR** (down to 1Hz)
- **One shot reading mode**
- Package: UDFN-6L 2.0 x 2.0 x 0.5mm with **exposed pad** down



Accuracy



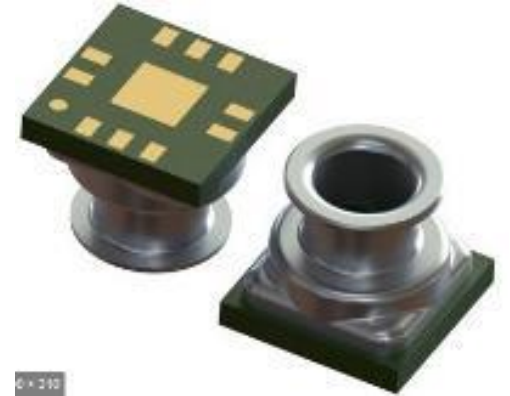


LPS27HHW

Waterproof pressure sensor

Key Features

- Absolute accuracy 1 hPa @ 0 ~ 65°C
- **Low power consumption: 4 μ A**
- Low power-down current 0.9 μ A
- Relative Pressure accuracy 0.025 hPa @ 800~1100 hPa
- High stability TCO : 0.75 Pa @ 20~65°C
- **0.7 Pa (5.6 cm) RMS noise**
- Embedded FIFO & Temperature compensation
- OTP for one-point calibration capability in customer
- ESD Robustness with Cap Grounding
- Faster Pressure recovery after high pressure stress (<10sec @ 10Bar)
- Dedicated NV registers for OPC.
- **Small and thin form factor: 2.7 x 2.7 x 1.7 mm**

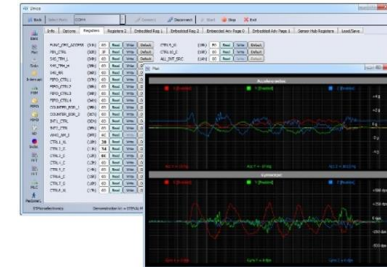
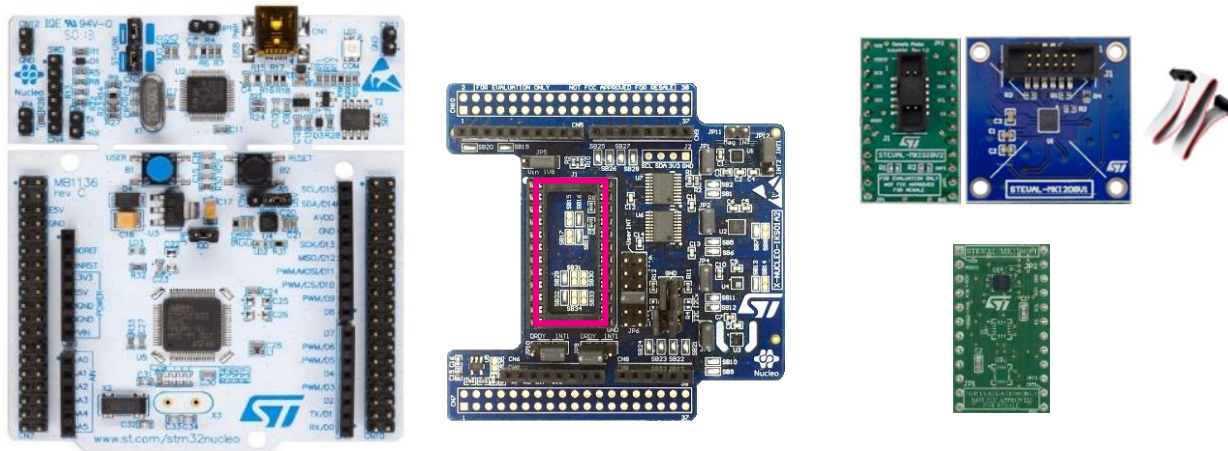


Small & thin form factor
2.7 x 2.7 x 1.7mm



Quick & modular prototyping

STM32 Nucleo with expansion board, tool and Unicleo GUI



Software package:
UNICLEO GUI
with X-CUBE-MEMS1

Included sensors:

IMU	ISM330DHCX
Accelerometer	IIS2DLPC
Magnetometer	IIS2MDC
Microphone	IMP34DT05
DIL socket	Various

STM32 NUCLEO with X-NUCLEO EXPANSION
X-NUCLEO-IKS02A1
and optional dedicated Adapter Board

Process



Sense



Connect



Power



Move /
Actuate



Translate

