BOSCH

Product overview

For a better life

# Bosch Sensortec sensing solutions

Bosch Sensortec – At the core of your everyday life

Bosch Sensortec offers a broad portfolio of microelectromechanical systems (MEMS) based sensors and solutions that enable consumer electronic devices to sense the world around them. The product portfolio includes motion sensors such as 3-axis accelerometers, gyroscopes, magnetometers and integrated 6- and 9-axis sensors, smart sensor systems as well as environmental sensors for measuring barometric pressure, temperature, humidity and gases.
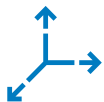
Motion sensors

Our portfolio of motion sensors includes products for motion, orientation and gesture detection. Motion sensors are designed for several consumer electronics and IoT applications in the field of smartphones, wearables, smart home, drones, toys, virtual and augmented reality, gaming, as well as industrial applications.

Smart sensor systems

Our portfolio of smart sensor systems is specifically designed for always-on sensor applications in smartphones, wearables and tracking devices. It offers you flexible, low-power solutions for motion sensing and sensor data processing.
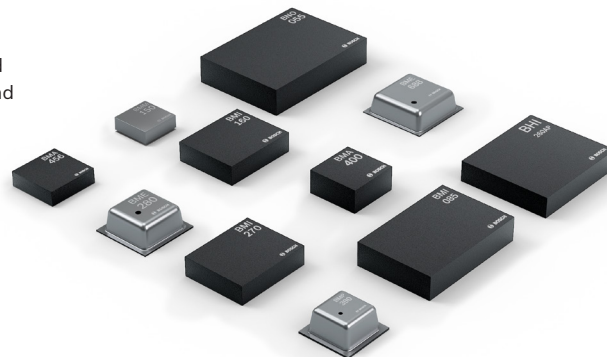
Environmental sensors

Our portfolio of environmental sensors includes barometric pressure sensors, as well as integrated environmental sensors. These integrated environmental sensors combine barometric pressure, relative humidity, gas and ambient temperature sensing functions. Environmental sensors are ideally suited for indoor air quality measurement, sport & fitness monitoring, weather forecast, home automation control, Internet of Things, GPS-enhancement and indoor navigation.

Application		Accelerometers				IMUs				Pressure sensors			
		BMA580	BMA530	BMA456	BMA400	BMI323	BMI270	BMI088	BMI085	BMP585	BMP581	BMP390	BMP384
Wearables	Fitness trackers	🟢	🔵	🟢	🔵	🟢	🔵			🔵	🔵		🔵
Wearables	Smart watches	🟢	🔵	🟢	🟢		🔵			🔵	🔵		🔵
Wearables	Hearables	🔵	🟢	🔵	🟢	🟢	🔵			🔵	🔵	🟢	🔵
Wearables	Other wearables	🟢	🔵	🟢	🔵	🟢	🔵			🔵	🔵	🟢	🔵
VR/AR	VR/AR glasses						🔵		🔵	🟢	🟢	🟢	🔵
VR/AR	VR remote control					🟢	🟢		🟢	🔵	🟢	🟢	🔵
Smart home	Env. monitoring	🟢	🟢	🟢	🔵							🟢	
Smart home	Security	🟢	🟢	🟢	🔵	🟢				🔵	🟢	🟢	
Smart home	Appliances	🟢	🟢	🟢		🟢		🔵		🔵	🔵	🔵	
Robots	Drones						🔵			🟢	🔵		🔵
Robots	CE robots (home)					🟢	🔵			🟢	🟢	🔵	🔵
Industrial	Telematics						🔵					🟢	🔵
Industrial	Asset tracking	🟢	🟢	🟢	🔵		🟢			🔵	🔵	🔵	🔵
Industrial	Predictive maintenance	🟢	🟢	🟢	🟢		🟢					🟢	🔵
Other CE	Remote control	🟢	🔵	🟢	🔵	🔵						🟢	
Other CE	Camera						🟢					🟢	
Other CE	Toys	🟢	🔵	🟢	🟢	🔵		🟢					

🔵 Recommendation from Bosch Sensortec   🟢 Also can be used

Application		Magnetometer		Smart sensor systems					Sensor node	Humidity & gas sensors		
		BMM350	BMM150	BHI360	BHI260AP	BHI260AB	BHI160B	BHA260AB	BNO055	BME688	BME680	BME280
Wearables	Fitness trackers	🔵	🔵	🟢	🔵	🟢	🟢	🔵				
	Smart watches	🔵	🔵	🟢	🔵	🔵	🔵	🔵		🔵	🟢	🟢
	Hearables	🔵	🟢	🔵	🔵	🔵	🔵	🔵				
	Other wearables	🔵	🟢	🔵	🔵		🟢	🟢		🔵	🟢	🟢
VR/AR	VR/AR glasses	🔵	🟢		🟢	🟢	🟢		🟢	🟢	🟢	🟢
	VR remote control	🟢		🔵	🟢	🔵	🔵					
Smart home	Env. monitoring		🟢							🔵	🔵	🟢
	Security		🟢	🟢		🟢		🟢		🔵	🔵	🔵
	Appliances		🟢	🟢		🟢		🟢		🔵	🔵	🟢
Robots	Drones	🔵	🟢							🟢		
	CE robots (home)		🟢	🟢		🟢			🔵	🟢	🟢	🟢
Industrial	Telematics		🟢									
	Asset tracking		🟢	🟢			🟢	🟢		🔵		🟢
	Predictive maintenance			🟢		🟢		🟢	🟢	🔵	🟢	🔵
Other CE	Remote control			🟢	🟢	🟢	🟢	🟢				
	Camera	🔵	🟢	🟢			🟢		🟢			
	Toys			🟢	🟢	🟢		🟢		🟢	🟢	🟢

🔵 Recommendation from Bosch Sensortec   🟢 Also can be used

Accelerometers

The BMAs are advanced, ultra-small, triaxial, low-g acceleration sensors with digital interfaces (SPI, I²C, interrupt pins) targeted for low-power applications. Featuring different digital resolutions (12-16 bit), the BMA family allows for very low noise measurement of accelerations (range programmable from 2...16 g) in three perpendicular axes and thus senses tilt, motion, shock and vibration in smartphones, man machine interfaces, wearables, smart home, as well as industrial applications.

The BMA family has 1 kB FIFO and integrates embedded intelligence which enables precise low current step counting and a multitude of other always-on features. BMA456 fits into wearable or hearable devices - depending on the feature set.

Product	Package	Description	Key performance parameters	Current consumption	Noise	Offset	TCO
BMA580	WLCSP 1.2 x 0.8 x 0.55 mm³	Smallest accelerometer on the market with unique voice activity detection and advanced feature set for hearable devices	• Different power modes and automatic power mode switching • Intgrated voice activity detection	High performance: 135 µA Low power: 19.5 µA at 100Hz	120 µg/√Hz	±50 mg	±0.5 mg/K
BMA530	WLCSP 1.2 x 0.8 x 0.55 mm³	Smallest accelerometer on the market with advanced feature set for wearables and toys	• Different power modes and automatic power mode switching • Integrated functionalities like step counter and generic interrupts	High performance: 135 µA Low power: 19.5 µA at 100Hz	120 µg/√Hz	±75 mg	±0.75 mg/K
BMA456	LGA 2.0x2.0x0.65 mm³	High performance accelerometer with integrated features for hearable and wearable applications and reduced height	• Low noise, low offset and low TCO • 16 Bit • Application specific feature sets can be programmed (hearables feature set, wearables feature set)	High performance: 150 µA Normal mode: 14 µA at 50 Hz	120 µg/√Hz	20 mg	±0.35 mg/K
BMA400	LGA 2.0x2.0x0.95 mm³	Ultra-low power accelerometer with integrated features for Internet of Things (IoT), smart home, wearables and hearables	• Self wake-up/sleep (sleep mode: 160 nA) • No duty-cycling and max. performance at lowest current consumption • Programmable interrupts (generic interrupts) • Low current step counter and tap feature	High performance: 14.5 µA Low power: 0.85 µA	X,Y: 180 µg/√Hz Z: 240 µg/√Hz	50 mg	±1 mg/K

Magnetometer

Bosch Sensortec low power and low noise magnetometer are to be used for many use cases, which include virtual reality, gaming and navigation devices such as VR/AR glasses, gaming consoles, smartphones, tablets and robots where magnetic heading information is required.

Product	Package	Description	Key performance parameters	Current consumption	Noise	Offset	Sensitivity
BMM350	WLCSP 1.28x1.28x0.5 mm³	• Newest generation low-power magnetometer • TMR magnetometer also for hearable and wearable applications	• Unique field shock recovery feature (400 mT) • High-performance and ultra-low noise due to innovative TMR technology • Very low current consumption	Low power preset: 130 µA Normal mode: 200 µA	± 180 and ± 450 nT (RMS noise)	± 2 µT (software calibrated)	0.08 µT/LSB
BMM150	WLCSP 1.56x1.56x0.6 mm³ 0.4 mm diagonal ball pitch	• 3-axis magnetometer for eCompass applications	• Robust against external magnetic shocks (e.g. >100 mT) • Low and predictable temperature dependency • Configurable noise and current consumption and ODR	Low power preset: 170 µA Normal mode: 500 µA	600 nT (RMS noise)	± 2 µT (software calibrated)	0.3 µT/LSB

Inertial Measurement Units

Bosch Sensortec optimizes its IMUs (Inertial Measurement Units) for advanced smartphones, wearables, AR and VR, drones, gaming and robots applications. They are designed to provide maximum flexibility to customers. An IMU combines a gyroscope with an accelerometer in one system-in-package (SiP). It enables for examples real-time motion detection, indoor navigation, gesture and activity recognition as well as optical image stabilization (OIS).

Product	Package	Description	Key performance parameters	Current consumption	Noise	Offset	TCO
BMI323	LGA 2.5x3.0x 0.83 mm³	• Newest member of Bosch's next-generation IMUs • Easy-to-use standard IMU • I3C, I2C, SPI Interface	• Motionless Component Retrimming (CRT) for gyroscope calibration • Low-noise gyroscope • Integrated features	High performance mode, A+G: 790 µA	(A): 180 µg/√Hz (G): 0.007 dps/√Hz	(A): ± 50 mg (G): ± 1 °/s	(A): ± 0.3 mg/K (G): ± 0.04°/s/K
BMI270	LGA 2.5x3.0x 0.83 mm³	• Very low power, smart features • Optimized for e.g. hearable and wearable applications	• Motionless Component Retrimming (CRT) for gyroscope calibration • High-performance accelerometer (low offset, TCO, TCS) • Features: context & activity / gesture recognition	Full operation: 685 µA	(A): 160 µg/√Hz (G): 0.007 dps/√Hz	(A): ± 20 mg (G): ± 0.5 °/s	(A): ± 0.25 mg/K (G): ± 0.015 °/s/K
BMI088	LGA 3.0x4.5x 0.95 mm³	• High-performance IMU featuring vibration robustness • Optimized for drones and robots	• High-g accelerometer (up to ±24 g) • Low sensitivity errors (over lifetime) • Extremely low gyro bias instability (< 2°/h)	Full operation: 5.15 mA	(A): 190 µg/√Hz (z) / 160 µg/√Hz (x,y) (G): 0.014 dps/√Hz	(A): ± 20 mg (G): ± 1°/s	(A): ± 0.2 mg/K (G): ± 0.015 °/s/K
BMI085	LGA 3.0x4.5x 0.95 mm³	• High-performance IMU featuring automotive proven gyroscope and low noise accelerometer • Optimized for augmented/virtual reality applications	• High stability and low latency • Low drift gyroscope • Outstanding temperature stability • Extremely low gyro bias instability (< 2°/h)	Full operation: 5.15 mA	(A): 135 µg/√Hz (z) / 105 µg/√Hz (x,y) (G): 0.014 dps/√Hz	(A): ± 20 mg (G): ± 1°/s	(A): ± 0.2 mg/K (G): ± 0.015 °/s/K

Sensor node

The BNO055 is a smart sensor implementing an intelligent 9-axis absolute orientation sensor, which includes sensors and sensor fusion in a single package. This smart sensor is significantly smaller than comparable solutions.

Product	Package	Description	Key performance parameters	Integrated MCU	Embedded software*	Interfaces	Current consumption
BNO055	3.8x5.2x1.13 mm³	Smart sensor system with integrated 9-axis (accelerometer, gyroscope, magnetometer) MEMS sensor, and MCU with sensor fusion software in a single package	• High bias stability gyroscope • Integrated sensor fusion software	32 bit cortex M0+ microcontroller	BSX 3.0 full fusion	I²C, UART, HID-I²C	Suspend mode: 40 µA 9DOF at 100 Hz ODR: 12.3 mA

*More information on BSX fusion can be found on page 19.

Programmable and AI sensor systems

Meet our programmable and AI sensor systems, which include a customer programmable 32-bit microcontroller and an IMU. This allows an even more versatile sensor application such as head orientation for 3D audio, step counting or activity recognition in smartphones, wearables, hearables, and other mobile devices. The extended software of the PRO versions additionally enable PDR navigation, swim analytics and self-learning AI fitness tracking.

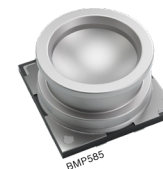| Product	Package	Description	Key performance parameters
BHI360	3.0x2.5x0.95 mm³	Highly integrated, ultra-low power, smart 6-axis IMU consisting of a 32-bit programmable micro-controller, an additional ultra-low power microprocessor, including pre-installed sensor fusion software and algorithms in a single package	• IMU footprint (2.5 x 3 mm) • Low power MCU (ARC EM4 at 20/50 MHz) • Integrated sensor fusion software • Open programmable platform
BHI260AP	4.1x3.6x0.8 mm³	Smart sensor system that includes multiple software functionalities, a 32-bit customer program-mable microcontroller and a 6-axis IMU, all in one package	• Self-learning AI function • Programmability
BHI260AB	4.1x3.6x0.83 mm³	Programmable low-power smart sensor system with an integrated 6-axis IMU (accelerometer, gyroscope) plus a MCU and including pre-installed sensor fusion software and algorithms in a single package	• Low power MCU (ARC EM4 at 20/50 MHz) • Integrated sensor fusion software • Open programmable platform with Software Development Kit
BHI160B	3.0x3.0x0.95 mm³	Low-power smart sensor system with an integrated 6-axis IMU (accelerometer, gyroscope) plus a MCU and including pre-installed sensor fusion software and algorithms in a single package	• Low power MCU (ARC EM4 at 10 MHz) • Integrated sensor fusion software
BHA260AB	2.7x2.6x0.8 mm³	Programmable low-power smart sensor system with an integrated 3-axis accelerometer plus a MCU and including pre-installed sensor fusion software and algorithms in a single package	• Low power MCU (ARC EM4 at 20/50 MHz) • Integrated sensor fusion software • Open programmable platform with Software Development Kit

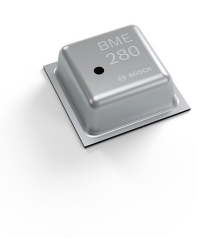| Product	Integrated MCU	Embedded software*	Interfaces	Current consumption
BHI360	• 32 bit floating-point ARC EM4 CPU running at 20 MHz OR 50 MHz (up to 3.6 CoreMark/MHz) with 256 kByte SRAM, 144 kByte ROM • Integrated ultra-low power MCU (Bosch Sensortec Core) optimized for always on algorithms	• BSX 4.2 low power fusion (up to 800 Hz): activity & recognition, step detector & counter • custom programmable MCU	Host interface configurable as SPI or I²C, 2 master interfaces (1 selectable SPI/I²C and 1 I²C), Up to 12 GPIOs	6DoF Fusion at 100 Hz ODR: 700 mA 6DoF Fusion at 50 Hz ODR: <600 mA Activity recognition: 50 µA
BHI260AP	32 bit floating-point ARC EM4 CPU running at 20 MHz OR 50 MHz (up to 3.6 CoreMark/MHz) with 256 kByte SRAM, 144 kByte ROM	Self-learning AI software for fitness tracking, swim analytics, pedestrian dead reckoning, relative & absolute orientation	Host interface configurable as SPI or I²C, 2 master interfaces (1 selectable SPI/I²C and 1 I²C), Up to 12 GPIOs	Self-learning AI function (25Hz): 249 µA Self-learning AI function (50Hz): 386 µA Standby current: 8 µA
BHI260AB	32 bit floating-point ARC EM4 CPU running at 20 MHz OR 50 MHz (up to 3.6 CoreMark/MHz) with 256 kByte SRAM, 144 kByte ROM	BSX 4.0 fusion (up to 800 Hz): activity & recognition, step detector & counter; custom programmable	Host interface configurable as SPI or I²C, 3 master interfaces (selectable out of 2× SPI master and 2 × I²C master), up to 25 GPIOs	6DoF Fusion at 800 Hz ODR: 1.2 mA 6DoF Fusion at 100 Hz ODR: 1.0 mA Step counter: 46 µA Activity recognition: 77 µA Standby current: 8 µA
BHI160B	32 bit floating-point ARC EM4 CPU running at 10 MHz (3.41 CoreMarks/MHz) with 48 kByte SRAM, 96 kByte ROM	BSX 3.0 fusion (up to 200 Hz): activity & gesture recognition, step detector & counter	I²C up to 3.4 MBit/s 3 × GPIO, 1 × Host-INT	6DoF Fusion at 100 Hz ODR: 1.2 mA Significant motion: 128 µA Step detector: 131 µA Suspend mode: 11 µA
BHA260AB	32 bit floating-point ARC EM4 CPU running at 20 MHz OR 50 MHz (up to 3.6 CoreMark/MHz) with 256 kByte SRAM, 144 kByte ROM	BSX 4.0 fusion (up to 800 Hz): activity & gesture recognition, step detector & counter; custom programmable	Host interface configurable as SPI or I²C, 2 master interfaces (1 selectable SPI/I²C and 1 I²C), Up to 12 GPIOs	Significant motion: 32 µA Step counter: 46 µA Activity recognition: 77 µA Standby current: 8 µA

Barometric pressure sensors

Bosch Sensortec's barometric pressure sensors enable a variety of smartphones, wearables and smart home applications. Our very small and low-power barometric pressure sensors stabilize the altitude of drones, enable accurate indoor navigation and improve precise calorie and distance counting in wearables. The pressure sensors work with the piezoresistive or the capacitive principle. For all BMPs, the operation range is between 300 and 1250 hPa, VDDIO is 1.2...3.6 V and VDD is 1.65...3.6 V. The interfaces are I2C, I3C, and SPI.

BMP585

Product	Package	Description	Key performance parameters	Supply current	Accuracy	TCO
BMP585	LGA 3.25x3.25x1.86 mm³	Robust and high-performance barometric pressure sensor	• Highest robustness against liquids, particles, dust etc. • High performance due to lowest noise and power consumption	1.3 µA at 1 Hz pressure and temperature	Relative accuracy of typ. ± 6 Pa at 700 ... 1100 hPa ...15 °C ... 55 °C) Absolute accuracy of typ. ± 50Pa at 300 ... 1100 hPa ...-.5° C ... 65 °C)	typ. ± 0.5 Pa/K (5 °C ... 65 °C at 300 ... 1100 hPa)
BMP581	LGA 2.0x2.0x0.75 mm³	Ultra high performance & accurate barometric pressure sensor	• Highest performance due to lowest noise and power consumption • Extreme accuracy at smallest size	1.3 uA at 1 Hz pressure and temperature	Relative accuracy of typ. ± 6 Pa at 700 ... 1100 hPa ...15 °C ... 55 °C) Absolute accuracy of typ. ± 30Pa at 300 ... 1100 hPa ...-.5° C ... 65 °C)	typ. ± 0.5 Pa/K (5 °C ... 65 °C at 300 ... 1100 hPa)
BMP390	LGA 2.0x2.0x0.8 mm³	Ultra-high performance barometric pressure sensor	• Outstanding temperature stability • Low noise and drift • High absolute and relative accuracy	3.2 µA at 1 Hz pressure and temperature	Relative accuracy of typ. ± 3 Pa at 700 ... 1100 hPa, 25 ... 40 °C Absolute accuracy of typ. ± 50 Pa at 300 ...1100 hPa, -0 ... +65 °C)	typ. ± 0.6 Pa/K (25 ... 40 °C at 900 hPa)
BMP384	LGA 2.0x2.0x1.0 mm³	Robust & high performance barometric pressure sensor	• Resistant against liquids, particles, dust etc. • Highest resolution mode at lowest bandwidth 0.016 Pa • Embedded temperature compensation • Embedded FIFO and interrupt	3.4 µA at 1 Hz pressure and temperature	(Relative accuracy of typ. ± 9 Pa at 700 ... 1100 hPa, 25 ... 40 °C Absolute accuracy of typ. ± 50 Pa at 300 ... 1100 hPa, -0 ... +65 °C)	yp. ± 1.0 Pa/K (25 ... 40 °C at 900 hPa)

Humidity sensor

The BME280 is a humidity sensor measuring relative humidity, barometric pressure and ambient temperature in one metal-lid package. The BME280 is developed specifically for mobile applications and wearables where size and low power consumption are key design parameters.
For BME280, VDDIO is 1.2...3.6 V and VDD is 1.71...3.6 V. The interfaces are I²C and SPI.

Product	Package	Description	Key performance parameters	Supply current	Accuracy	Measurement range
BME280	LGA 2.5x2.5x0.93 mm³	Combined absolute pressure (p), ambient humidity (h) and temperature (T) sensor	• Fast response time for humidity (tau63 = 1 s) • High accuracy for T, p and rH over wide temperature and pressure range • High long-term stability	0.1 µA in sleep mode 1.8 µA at 1 Hz (h,T) 2.8 µA at 1 Hz (p, T) 3.6 µA at 1 Hz (h, p, T)	±3 % relative humidity ±1.0 absolute accuraccy pressure (300...1100 hPa, 0...65 °C) ±0.5 at 25 °C for T	T: -40...85 °C p: 300...1100 hPa h: 0...100%

Gas sensors

The BME680 and BME688 are 4-in-1 environmental sensors combining barometric pressure, ambient temperature, relative humidity and gas measurement in one small package. They detect a broad range of gases including Volatile Organic Compounds (VOC) for air quality monitoring in smart homes to improve health and well-being.

The BME688 is the first gas sensor with Artificial Intelligence (AI). Additionally to all functions of the BME680, the BME688 can furthermore specifically detect Volatile Sulfur Compounds (VSCs) and other gases such as carbon monoxide and hydrogen in the part per billion (ppb) range. The BME688 comes with an application-specific gas scanner and BME AI-Studio software (see page 21).

For both BME680 and BME688, VDDIO is 1.2...3.6 V and VDD is 1.71...3.6 V. The interfaces are I^{2}C and SPI.

Product	Package	Description	Key performance parameters	Supply current	Accuracy	Measurement range
BME688	LGA 3.0x3.0x0.93 mm³	Same as BME680 + Suitable for the detection of various additional gases (VSCs, carbon monoxide, hydrogen, etc.) + Differentiation between multiple gases + Artificial Intelligence	Same as BME680 + BME AI-Studio tool enables customers to train the BME688 gas scanner on their specific application, like in home appliances, IoT products or smart home + BME688 development kit allows for testing and developing use cases based on temperature, humidity, barometric pressure and gas sensing	Same as BME680 + 3.96 mA in standard gas scan mode (configurable in AI-Studio between 0.1 - 12 mA)	±15% ±15 IAQ s2s deviation ±3 % relative humidity ±0.6 hPa absolute accuraccy pressure (300...1100 hPa, 0...65 °C) ±0.5 at 25 °C for T	0 ... 500 IAQ (equivalent to 0.2 ... 20 mg/m³ TVOC levels) T: -40...85 °C p: 300...1100 hPa h: 0...100%
BME680	LGA 3.0x3.0x0.93 mm³	Combined gas (VOCs), absolute pressure (p), ambient humidity (h) and temperature (T) sensor	• 4-in-1: All environmental parameters in one device • BME680/688 Software (BSEC) suite provides many air quality outputs with compensation and simplifies gas sensor integration in devices • Application specific operation modes with current consumption down to 90 µA	0.15 µA in sleep mode 3.7 µA at 1 Hz (h,p,T) 0.09-12 mA for h,p,T, gas depending on operation mode	±15% ±15 IAQ s2s deviation ±3 % relative humidity ±0.6 hPa absolute accuraccy pressure (300...1100 hPa, 0...65 °C) ±0.5 at 25 °C for T	0 ... 500 IAQ (equivalent to 0.2 ... 20 mg/m³ TVOC levels) T: -40...85 °C p: 300...1100 hPa h: 0...100%

BSX lite/BSX

Bosch Sensortec's sensor fusion software BSX is a complete 9-axis fusion solution which combines the measurements from 3-axis gyroscope, 3-axis geo-magnetic sensor and a 3-axis accelerometer to provide a robust absolute orientation vector. BSX features support for wide variety of applications including smartphones, wrist wearables, drones, home robots such as vacuum cleaners, AR/VR head mounted devices and gaming controllers. These virtual sensors are highly flexible and hence can be configured according to system architecture and target use case.

The BSXlite software is a feature reduced version of Bosch Sensortec's sensor fusion software. BSXlite provides dynamic and accurate orientation of the target platform. It is typically used to provide enhanced user experience for gaming, navigation systems, dead reckoning etc. BSXlite is available for download (after accepting the license agreements), and for the BSX full version software, please contact Bosch Sensortec directly.

Product	Key features									
	Axis remapping	Offset correction	Soft Iron Correction	Accelerometer calibration	Magnetometer calibration	Magnetic disortion check	Gyroscope calibration	9-axis orientation processing	Compass orientation processing	Data fusion models
BSXlite (as web-download)	x	√	x	x	Classic: based on figure-of-eight motion	Basic	√	Basic	Basic (tilt compensation)	9-axis
BSX (full library) in BHI/BNO055	√	√	√	√	Classic advanced (fast calibration)	Advanced	√	Advanced	Advanced (adaptive filtering, tilt compensation)	9-axis & 6-axis (IMU, M4G, eCompass)

Product	Outputs									
	Acceleration	Magnetometer	Gyroscope	Virtual gyroscope (M4G)	Quaternions	Orientation	Rotation matrix	Heading accuracy	Linear acceleration	Gravity
BSXlite (as web-download)	Raw	Raw, corrected	Raw, corrected	x	√	√ (unfiltered)	x	√	x	x
BSX (full library) in BHI/BNO055	√	√	√	√	√	√	√	√	√	√

Product	Outputs			Output date rates (ODR)		
	Gestures	Step counter and step detector	Significant motion	Accelerometer	Magnetometer	Gyroscope
BSXlite (as web-download)	x	x (in BMI160 Hardware)	x (in BMI160 Hardware)	100 Hz	25 Hz	100 Hz
BSX (full library) in BHI/BNO055	√	√	√	Multiple data rates	Multiple data rates	Multiple data rates

BME680/688 software (BSEC)

The BME680 library (BSEC 1.x) provides higher-level signal processing and fusion for the BME680. The library receives compensated sensor values from the sensor API. In order to fully provide the requested sensor outputs, BME680 software processes the BME680 signals and combines them with the additional phone sensors.

The BME688 library (BSEC 2.x) is running on the device microcontroller to operate the BME688, to analyze the sensor data and to calculate all sensor outputs like ambient humidity, index for air quality or gas scan results. The BME688 software can be configured by config strings generated by BME AI-Studio. Both BME680 and BME688 software offer a complete, easy to integrate software fusion solution out of one hand and thus eliminate the need for own fusion software development.

The BME AI-Studio software enables sensor configuration, data analysis & labelling, training and optimization of application-specific solutions. The software is designed very user-friendly and supports with a comprehensive documentation.

Product	Operating system	Key features	Operation modes	Software outputs	Link to website
BME680 library (BSEC 1.x)	Cortex-ARM, Cortex-A, AVR, ESP, MSP, Android, IAR, Rasperry Pi (+more on demand)	• Calculation of ambient air temperature, relative humidity, barometric pressure and index for air quality outside the device	• ULP mode (3.3 mHz) quick-ULP (0.33 Hz / 3.3 mHz) • LP mode (0.33 Hz) • HP mode (1 Hz)	Raw & compensated outputs for temperature, pressure, humidity and gas, IAQ, CO2-eq (ppm), bVOC-eq (ppm), gas (%), accuracy & stabilization status	
BME688 library (BSEC 2.x)	Same as above	• Same as above • Operate gas scan mode & AI-based model to directly output scan results • Can be configured with config string from BME AI-Studio	Same as above + gas scan mode (1/10.8 s in standard mode)	Same as above + gas scan results (%), intensity	
BME AI-Studio	Windows, Mac	• Sensor configuration, data analysis & labelling, training and optimization of application-specific solutions • Comprehensive documentation	Gas scan mode can be defined & optimized on specific application	BSEC 2.x config string to configure devices with trained AI model	

Development desktop software 2.0

The Bosch Sensortec application board 3.0 is a versatile, universal demonstration and development environment enabling the evaluation of the Bosch Sensortec sensor products. Used together with Bosch Sensortec's development desktop software, it allows to configure all sensor parameters and read-out, display and capture the data on the attached PC. The development desktop 2.0 user interface offers the possibility to configure sensor parameters of the Bosch Sensortec sensors and allows for data logging of the measured sensor signals. Its user interface displays the sensor signals and sensor interrupt signals in various graphical formats.

COINES

COINES ("COmmunication with INertial and Environmental Sensors") is a software package that provides a low-level interface to Bosch Sensortec's application board 3.0. The COINES library package contains the source code of sample applications and SensorAPI. The software can be used to see how to use the SensorAPI in an embedded environment and allows convenient data logging. COINES is intended for experienced embedded software developers with good knowledge of the programming language C and the appropriate build tools. The user can access Bosch Sensortec's MEMS sensors through a C interface and modify, compile and run the sample applications. COINES can be used with the SensorAPI of the sensor. The SensorAPI is available at https://github.com/BoschSensortec.
Source code of sample applications and SensorAPI are provided with the COINES library as a package. The user can modify, compile and run the sample applications.

COINES can be used to see how to use the SensorAPI in an embedded environment and allows convenient data logging.

Application board 3.0

Our application board 3.0 is a versatile and sensor independent development platform, enabling a fast and easy experience with our sensors. The combination of the application board 3.0 and shuttle board 3.0 can be used to evaluate the sensors and build prototypes to test use cases. The application board is a closed system that can be used to configure sensor parameters and to plot and log the resulting sensor readings by means of PC based software (Desktop Development) and COINES.
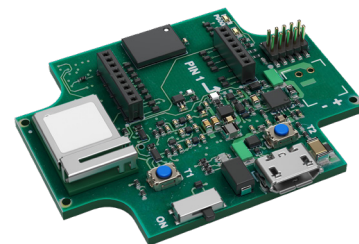
Arduino Nicla Sense ME

The versatile Arduino Nicla Sense ME featuring Bosch Sensortec sensors is a robust development board that enables users to develop smart sensing applications. Embedded in the Arduino-ecosystem, the tool comes with a simple and clear programming structure that is easy-to-use for enthusiasts, yet flexible enough for advanced users. The unique combination of highly integrated sensors on the board, including 9DoF smart motion and 4DoF environmental sensors with AI capabilities, allow a broad range of applications to address the different segments of the IoT market. The tool is ultra-compact, power-saving and suitable for rapid prototyping and deployment.
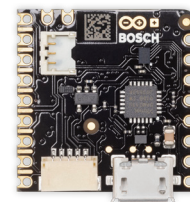
Community to foster and accelerate innovative IoT applications

Bosch Sensortec offers an ideation community to customers, partners, developers and makers to learn about sensing solutions and to accelerate the development of innovative IoT applications. The Bosch Sensortec Community provides useful information, best practice advice and allows developers to share their experience with others.

MEMS sensors forum

The forum is intended for developers, customers, partners and makers using Bosch Sensortec's sensing solutions. Ask your questions, share your ideas, and exchange with experts.

Knowledge base

The knowledge base is intended for developers, customers, partners and makers using Bosch Sensortec's sensing solutions.

Questions and answers

Find answers to frequently asked questions.

Join our Bosch Sensortec Community now!

Discuss, share and learn about sensor solutions by Bosch Sensortec.

Bosch

Sensortec

Community

LET'S GET IN TOUCH

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