



# Meet **OPUS-Inertial** Series!

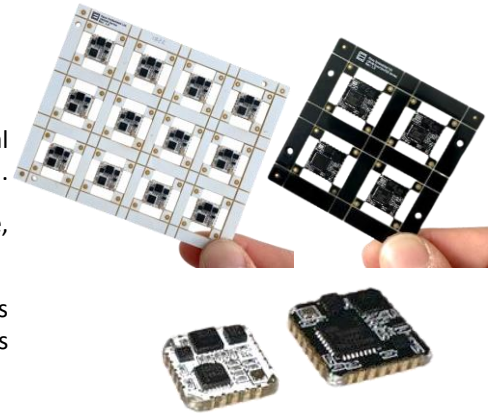
## Tiniest SMD IMU / AHRS

OPUS-Inertial family is a small form-factor surface mount device (SMD) with industrial IMU / AHRS functionality. While P20 option is ~10 x 10 mm, P28 option is ~12 x 12 mm.

Having industry standard interfaces, small dimensions and flexible voltage input range, they provide easy integration to various systems.

P20 and P28 form factor options have similar infrastructure with different focuses leading a perfect trade-off with power consumption and performance which enhances the flexibility on users' end.

Rich interface capability, low power consumption and cost-efficient structure make OPUS-Inertial devices a perfect match for unmanned or battery powered devices.



## KEY FEATURES

- Precise **Calibrated Inertial Measurements**
- Precise **Roll / Pitch / Heading**
- Up to 1kHz **processed output data rate (ODR)**
- Smart hardware with **tiny dimensions**
- Industry standard **interface capability** (SPI/I2C/UART)
- **Ultra low power** design
- Easy **firmware interface** for device control
- Each device is **temperature compensated**

## APPLICATIONS

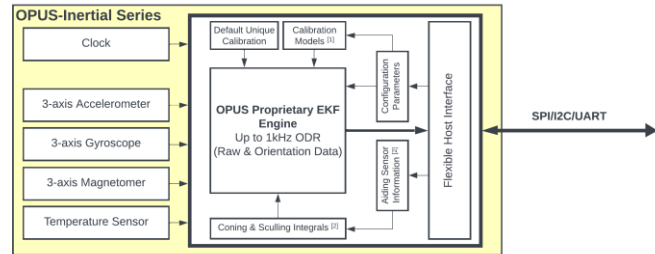
- Indoor / Outdoor Navigation Systems
- Robotics
- Mini / Micro Drones
- UAV's / UGV's
- Wearable Technologies
- Battery Powered Systems

## FUNCTIONAL FEATURES

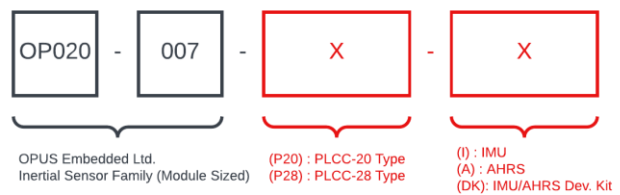
OPUS-Inertial series have very efficient Firmware Interface for device access and control. Some features can be configured with single line commands. Please request our firmware interface, EN\_FL\_OPUS-Inertial document from [technical@opusembedded.com](mailto:technical@opusembedded.com) for further information.

- Calibrated IMU Outputs
- Precise 3D Attitude Information
- Adaptive Filtering
- World Magnetic Model (in P28 option)
- Magnetic North / True North Options (in P28 option)
- From 1Hz to 1kHz ODR Selection
- Coning & Sculling Integrals ( $\Delta\theta$ ,  $\Delta V$  Vectors)
- Manual Magnetic Calibration
- Runtime Automatic Magnetic Calibration
- Sensor On & Off
- External Sensor Support (in P28 option)

## BLOCK DIAGRAM



## ORDER INFORMATION



Order Option	Product Detail
OP020-007-P20-I	PLCC-20 size SMD IMU.
OP020-007-P20-A	PLCC-20 size SMD AHRS.
OP020-007-P20-DK	PLCC-20 size SMD IMU/AHRS Development Kit.
OP020-007-P28-I	PLCC-28 size SMD IMU.
OP020-007-P28-A	PLCC-28 size SMD AHRS.
OP020-007-P28-DK	PLCC-28 size SMD IMU/AHRS Development Kit.

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# TECHNICAL SPECIFICATIONS

## IMU Sensor Specifications

Specification	Accelerometer	Gyroscope	Magnetometer
Range	±2 g, ±4 g, ±16 g	±250 °/s, ±500 °/s ±2000 °/s	±2 G, ±4 G, ±8 G ±16 G
Non-Linearity	0.5 %FS	0.1 %FS	0.25 %
Bias Stability	TBD	TBD	--
Scale Factor Stability	TBD	TBD	TBD
Noise Density	130 µg/√Hz	0.005 °/s/√Hz	1.5 mG RMS
Alignment Error	0.08°	0.08°	0.08°
Bandwidth	350 Hz	250 Hz	--
Sampling Rate	1000 Hz	2000 Hz	100 Hz
IMU Output Rate	1 Hz to 1000 Hz		



## Data Outputs

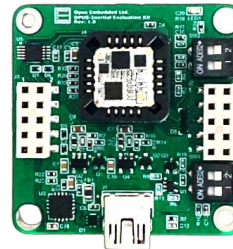
	Data Output	P20-I	P20-A	P28-I	P28-A
Filtered IMU	Acceleration	•	•	•	•
	Angular Rate	•	•	•	•
	Magnetic Field	•	•	•	•
	Ambient Temperature	•	•	•	•
	Δθ, ΔV Vectors	•	•	•	•
	Compensated Acceleration & Angular Rates	•	•	•	•
	Manual Magnetic Calibration	•	•	•	•
	Runtime Automatic Magnetic Calibration	•	•	•	•
	External IMU Sensor Input Support	•	•	•	•
	EKF Outputs	Euler Angle (Roll & Pitch & Yaw)		•	
Quaternions			•		•
Orientation Matrix			•		•
Filtered Output Uncertainties			•		•
True & Magnetic North Information			•		•
General	OPUS Proprietary Firmware Interface	•	•	•	•
	NMEA0183	•	•	•	•
	Main I2C, SPI and UART	•	•	•	•
	Auxiliary UART / SPI			•	•

## AHRS Performance

Specification	Value
Pitch / Roll (Static)	0.5°
Pitch / Roll (Dynamic)	0.8°
Heading (Static)	1°
Heading (Dynamic)	2°

## DEVELOPMENT KITS

Both versions have development kits available for customers. The kits have all the options available on-board which allow users to evaluate and develop with the tiniest detail of the products.



### OPUS-Inertial-P20-DK:

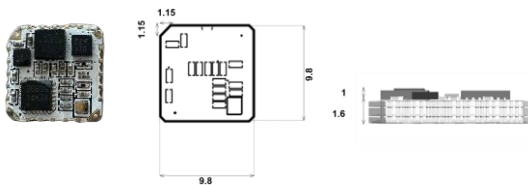
- USB Mini-B connection option
- Power source selection
- VDDA / VDDIO selection
- UART / SPI / I2C header interface
- Only 40 x 40 mm!

### OPUS-Inertial-P28-DK:

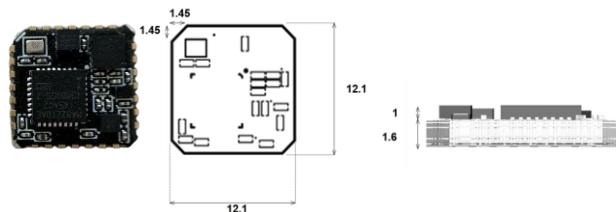
- USB Type-C connection option
- Power source selection
- VDDA / VDDIO selection
- UART / SPI / I2C header interface
- Interface selection (PSEL)
- Only 45 x 45 mm!

## Integration & Operating Conditions

Specification	Condition
Input Voltage	VDDA: 1.8V or 3.3V VDDIO: 1.8V or 3.3V (must be ≤ VDDA)
Power Consumption	P20: 50 mW typ. P28: 100 mW typ.
Operating Temperature	-40°C to 85°C
Temperature Compensation	TBD
Interfaces	I2C, SPI and UART
Output Data Rate (ODR)	Up to 1kHz
Protocol	OPUS Proprietary Firmware Interface, NMEA0183
SDK Support	ROS2 Drivers C/C++ API's for Embedded Development
Dimensions	P20: ~10 x 10 mm P28: ~12 x 12 mm
Weight	TBD
Mounting	SMD or PLCC Sockets



Device View and Drawing (OPUS-Inertial-P20)



Device View and Drawing (OPUS-Inertial-P28)

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