

# Amphenol Sensors

## Sensor Innovations

### Unmanned Aerial Vehicle (UAV) Applications

Amphenol Sensors serves the UAV industry by providing high-quality sensor and measurement solutions that are designed to meet the unique and demanding requirements of Consumer, Commercial, Medical, and Military drone applications.

Our sensors are used to monitor a range of parameters which are critical for the safe and efficient operations of drones. With our expertise in sensor design and manufacturing, Amphenol Sensors help drone manufacturers ensure that their drones perform reliably and accurately even in the most challenging environments.



# Amphenol Sensors

## UAV Sensor Solutions

### Pre-Flight Testing

From the initial design phase of a new vehicle to just moments before takeoff, our sensors are used to validate the functionality and safety of the equipment.

- Triaxial accelerometers
- Piezoresistive Pressure Sensors
- Microphones
- Blast Pressure Sensors
- Variable Capacitance Low-frequency Accelerometers
- Temperature (Operating Range Monitoring)
- Pressure Sensors (Lead Detection and Pressure Imbalances)

### In-Flight

Our sensors optimize the Flight Control Systems offering reliable and redundant monitoring from the battery to the engine function to air speed, wing position and altitude.

- Air Speed
- Pressure
- Wind Speed
- Altitude
- Temperature
- Tilt
- Humidity
- Vibration
- Position
- Current
- Hydrogen Detection
- Gas and Air Quality



### Application or Mission Specific Sensors

Increasing productivity, reducing risk, aiding in humanitarian efforts or simply providing a consumer convenience, our sensors support the successful execution of the UAVs mission

- Environmental Hazards
- Temperature
- Payload
- Pressure
- Humidity
- Infrared
- Gas and Air Quality

## PRE-FLIGHT TESTING

### Triaxial Accelerometers

These accelerometers are used for ground testing and flight testing to measure vibration in 3 axes.

- Industry standard ICP® (IEPE) power supply
- Measurement of x, y, z vibration in one sensor
- Adhesive mount for testing applications
- Screw mount for monitoring applications

### Piezoresistive Pressure Sensors

PCB's Endevco brand of piezoresistive pressure sensors are suitable for wind tunnel and flight testing.

- Aerodynamic measurements
- High intensity sound from engines or motors
- Fast response time
- Measure both static and dynamic pressure

### Microphones

Acoustic measurement of cabin noise for passenger comfort.

- Prepolarized with industry standard ICP® (IEPE) power supply
- Measurement ranges from 5 dB to 178 dB
- Frequencies from 4 Hz to 70 kHz

### Blast Pressure Sensors

Battery explosion testing for electric aircraft.

- Pressure sensors with quartz sensing elements
- For shock wave, blast, and explosive or detonation in closed chambers
- High frequency response

### Variable Capacitance Low-frequency Accelerometers

For flutter testing of wing tips during flight.

- Can be powered by direct aircraft DC voltage (no signal conditioner required)
- Gas-damped, silicon MEMS sensing elements offer high frequency overload protection
- Screw mount for permanent monitoring applications



## IN-FLIGHT SENSORS (Cont.)

### Barometric Pressure Sensor

Packaged in a QFN configuration, the NPB packaging contains the pressure sensing element and all necessary signal conditioning electronics. AEC-Q 100 Qualified with I2C and SPI interface.

- Pressure Ranges: 260 to 1260mBar, 50 to 200kPa
- 4x4mm QFN Package
- QFN package allows AVI to detect the solder joint
- Ultra low current consumption in sleep mode
- I<sup>2</sup>C interface (SPI available upon request)
- Operating range 1.7V to 3.6V



### Media Isolated Pressure Sensor

These sensors utilize stainless-steel media isolated technology, as well as backside absolute pressure technology to provide accurate and reliable measurements in harsh environments. The piezoresistive sensor chip is housed in a fluid-filled cylindrical cavity and isolated from measured media by a stainless-steel diaphragm and body.

- Range from 0 to 15,000 PSI
- Absolute, differential, and gauge
- Analog and digital output
- Available in ported and non-porting versions
- Waterproof options

### Current Sensor

Current sensors generate a ratiometric analog output voltage signal proportional to the current flowing through the conductor and provide accurate measurement of AC and DC currents in battery management and motor control applications.

- Based on Hall effect or TMR technology
- Busbar or cable mounting
- Measured current value from  $\pm 25A$  to  $\pm 4000A$
- Non-intrusive technology
- Galvanic separation between power and control
- Operating temperature from  $-40^{\circ}C$  to  $+125^{\circ}C$



### Tilt Sensor

The tilt sensors measure inclination, tilt and angle in harsh environmental conditions. With its ability to measure angles up to  $360^{\circ}$  with an accuracy of  $<0.5^{\circ}$  over the full temperature range, it is perfect for providing flight control systems with data to maintain stability in horizontal flight.

- Reliable and wear-free MEMS technology
- Inclination range:  $\pm 25^{\circ}$ ,  $\pm 45^{\circ}$ ,  $\pm 90^{\circ}$ ,  $\pm 180^{\circ}$ , and others tilt and acceleration ranges upon request
- Digital signal processing, filter algorithms
- Analog and CAN output
- Dual axis combined gyroscope and accelerometer
- Accuracy  $<0.5^{\circ}$  ( $-40^{\circ}C$  to  $85^{\circ}C$ )
- Fully sealed (IP69K) for use in harsh environments
- Operating temperature from  $-40^{\circ}C$  to  $+85^{\circ}C$

### eMotor Position Sensor

Accurate feedback on the angular position, direction, and speed of the rotor shaft to optimize control of the motor inverter and drive the electric engines with the best possible efficiency.

- Alternative to conventional resolvers
- Rotor position sensor for high-speed motor commutation
- High accuracy
- Up to 600,000 rpm (if only 1PP)
- Low power consumption
- Possibility to have an ASIL qualified sensor (D)
- Cost efficient and lightweight by design
- No need of magnetic target
- Stray field immune
- Robustness to misalignments and environmental conditions (IP, vibration, dust, high temperature)
- Flexible design (end of shaft, through shaft and arc)

## IN-FLIGHT SENSORS

### Single Axis Accelerometers

These accelerometers are used for Health and Usage Monitoring System (HUMS) to monitor vibration over the lifetime of the aircraft.

- Industry standard ICP® (IEPE) power supply
- Screw mount for monitoring applications
- Electrically case isolated for high EMI environments
- Integral cable to reduce weight



### Digital Barometric Pressure Sensor & Air Speed

AUAV Family - Dual pressure sensor. combines both Barometric (Altitude) and Air Speed Sensing in a single PCB mountable package.

- Wide array of PCB mountable Pressure Sensors for Digital or Analog interface
- Available I<sup>2</sup>C or SPI Digital, Amplified Analog or Basic mV outputs
- Configurable to meet specific design requirements
- Widely used in both Commercial and Military UAV applications



### Altitude

Family of pressure sensors for customized analog or digital high-performance measurement.

### Wind

Family of pressure sensors used to detect head wind, cross axis wind for flight stability control.

- PCB mount package configurations
- Analog, Digital I<sup>2</sup>C or SPI interface options
- Digital Sensors available with unique addressing for diagnostic use
- Available in Industrial Grade for rugged environments
- Available with Parylene protective coating

## IN-FLIGHT SENSORS (Cont.)

### Resistive Angle Sensor

The N-15 series offers you endless rotation, 340° wide electrical angle, SMD or through-hole mount, an extended working temperature range of -40°C to +120°C and a whole series of customization possibilities making it the most flexible resistive sensor on the market. The N-15 is ideal for drone camera gimbal angle position feedback.

- Long life
- Excellent performance (3% linearity)
- Up to 2.000.000 life cycles
- IP54 protection
- 360° endless rotation
- Low profile (4.4 mm) and footprint (15 mm)
- High operating temperature range

PIHER *sensing systems*

### Thermal Runaway Sensor

Measurement of hydrogen gases released from lithium-ion battery packs. Hydrogen gases leaking from battery packs indicate battery failure.

- Two options:
  - Surface mount sensor for mounting on the battery management module or independent device with BUS communications
  - Factory calibrated with automatic temperature compensation

Amphenol  
Advanced Sensors

### Hydrogen Gas Detection Sensors

To detect H2 leakages in fuel-cell operating drones or to detect off-gassing of H2 during Li-ion batteries Thermal Runaway event.

- Compact H2 sensors with different output signals. Small size.

SGX  
SENSORTECH

### Air Quality Gas Detection

Detection of various Toxic gases in air. H2, CO, HF, NO2, VOC, O3, SO2.

- Broad range of different gas sensors, small size, very low power consumption and low weight

## Temperature



### Type FL Sensor

- Flexible temperature sensor for battery cell temperature measurement or other temperature measurement where a thin flexible sensor is needed

### Ring / Tab Terminal Sensor

- Measures the surface temperature of what it is affixed to

### Motor Winding Temperature Sensor

- Measures the motor windings of the motor to ensure an over temperature condition is not reached

### PTC Heaters

- Prevents the lens of cameras from fogging over

### Interchangeable NTC Thermistors

- Temperature measurement NTC thermistor with high accuracy

## APPLICATION OR MISSION SPECIFIC SENSORS

### Infrared Sensors

Measures an objects temperature contactlessly.



THERMOMETRICS  
A COMMITMENT TO EXCELLENCE

### Barometric Pressure Sensors for Environmental Monitoring

Barometric sensors provide valuable data for altitude correction and atmospheric conditions. Monitoring and Detection of surrounding weather conditions can be an early warning system for remote users where predictive monitoring is crucial.



- Available in standard 15 PSIA ranges or customize for specific range use
- Intended for PCB mounting
- Available in a wide variety of packages and pressure port styles to fit a UAVs architecture
- Available in fully calibrated Digital I<sup>2</sup>C, SPI Interface, Amplified or Basic mV output version
- Digital Sensors available with unique addressing for redundant back up sensors or diagnostic use

### Humidity & Temperature

Fully-calibrated and temperature-compensated combined humidity and temperature sensor supplied in a water-resistant IP67 package, making it the most advanced and cost-effective sensing solution for virtually any type of harsh environment application.



- Ready to use - Fully-calibrated and temperature-compensated
- Water resistant - IP67 Certified
- Digital Output or Pulse Density Modulated (PDM) Output converted to Analog
- Available in multiple flexible cable lengths
- Precise and accurate ( $\pm 2\%$  RH,  $\pm 0.5^\circ\text{C}$ , 14 bit resolution)
- Low current consumption
- Reliable in harsh environments
- Flexible mounting options

### Air Quality Gas Detection

Detection of various Toxic gases in air. H2, CO, HF, NO2, VOC, O3, SO2.

- Broad range of different gas sensors, small size, very low power consumption and low weight



# Amphenol Sensors

[www.amphenolsensors.com](http://www.amphenolsensors.com)

© 2023 Amphenol Corporation. All Rights Reserved. Specifications are subject to change without notice.

Other company names and product names used in this document are the registered trademarks of their respective owners.

AAS-BR-264A - 10/2023