Sensors for Wind Turbines
Measurement Specialties knows how to support OEMs

**Superior Performance & Reliability....**

As a global designer and manufacturer of sensors and sensor-based systems Measurement Specialties provides support to wind engineers in both the development and operation of wind turbines. Our operations in the US, Europe and China provide resources close to our customers. This global footprint allows us to offer the lowest cost of ownership to OEMs.

We offer a broad range of sensing technologies to manufacturers, system integrators, wind farm operators, R&D labs and universities. Among others, they include vibration sensors for gear box monitoring, oil level sensors, tilt sensors for tower installation and accelerometers for tower sway and blade monitoring. There is significant interest in our piezo film sensors for energy harvesting, miniature pressure sensors for blade monitoring and our LVDTs for facilitating emergency prop feathering and shutdown. Our temperature sensors are found in hundreds of wind turbines throughout the world. All sensors are shipped with industry-standard warranties and extended warranties when required.
# Position Sensors

| **Package** | PCB board |
| **Type** | Inclination board module |
| **Range** | ±2° to ±30° |
| **Output** | Voltage / RS 232 / SPI |

### Unique Features
- High resolution
- Minimal temperature drift
- User configurable

### Accuracy
±0.05° to ±0.8°

### Operating Temp.
-40°C to 85°C

### Dimensions (mm)
45 x 45 x 14

### Typical Apps
Tower leveling

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| **Package** | AL housing IP 67 |
| **Type** | Inclinometer |
| **Range** | ±5° to ±30° |
| **Output** | Voltage / Current / Switch / PWM / CAN open |

### Unique Features
- High accuracy
- Rugged housing
- Programmable
- CE approved

### Accuracy
±0.04° to ±0.8°

### Operating Temp.
-40°C to 85°C

### Dimensions (mm)
84 x 70 x 46

### Typical Apps
Tower leveling

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| **Package** | AISI-400 series stainless steel |
| **Type** | LVDT |
| **Range** | 0 - 0.1 to 0 - 6 inches |
| **Output** | 0 - 5 VDC (4 wire) / 1 - 6 VDC (3 wire) |

### Unique Features
- CE mark
- Low current consumption (6 mA typical)
- Synchronous demodulation
- Shielded cable

### Accuracy
±0.25% of range

### Operating Temp.
-25°C to 85°C

### Dimensions (mm)
Tower leveling

### Typical Apps
Monitor vibration to facilitate emergency prop feathering and shutdown

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# Vibration Sensors

<table>
<thead>
<tr>
<th><strong>Model</strong></th>
<th><strong>Ingress Protection</strong></th>
<th><strong>Static/Dynamic Response</strong></th>
<th><strong>Full Scale Range</strong></th>
<th><strong>Full Scale Output</strong></th>
<th><strong>Unique Features</strong></th>
<th><strong>Power Excitation</strong></th>
<th><strong>Operating Temp.</strong></th>
<th><strong>Dimensions (mm)</strong></th>
<th><strong>Typical Apps</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>IP65</td>
<td>Static and Dynamic</td>
<td>±2g, 5g, 10g, 20g, 30g, 50g, 100g</td>
<td>±2V</td>
<td>- High resolution</td>
<td>5 - 30 Vdc</td>
<td>-40°C to 125°C</td>
<td>25.4 x 21.59 x 9.65</td>
<td>Tower sway</td>
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<tr>
<td>4332</td>
<td>IP68</td>
<td>Static and Dynamic</td>
<td>±2g, 5g</td>
<td>±2V</td>
<td>- Triaxial (3-axis)</td>
<td>-40°C to 125°C</td>
<td>34.5 x 34.5 x 31.2</td>
<td>Seismic motion</td>
<td></td>
</tr>
<tr>
<td>8011/8021-01</td>
<td>Hermetically Sealed Dynamic</td>
<td>±10g, 80g, 500g</td>
<td>±5V, 8V, 5V</td>
<td>- Voltage output - Stainless steel housing - MIL-5015C connector - Thru-hole option: 8021</td>
<td>18 - 30 Vdc</td>
<td>-55°C to 125°C</td>
<td>48.3 x 22.23</td>
<td>Gearbox monitoring</td>
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<tr>
<td>8011/8021-AR/AP</td>
<td>Hermetically Sealed Dynamic</td>
<td>±5g, 10g, 20g, 50g</td>
<td>4 to 20mA RMS or Peak</td>
<td>- Current output - Stainless steel housing - MIL-5015C connector - Thru-hole option: 8021</td>
<td>12 - 30 Vdc</td>
<td>-40°C to 85°C</td>
<td>48.3 x 22.23</td>
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<td>8011/8021-VR/VP</td>
<td>Hermetically Sealed Dynamic</td>
<td>0.5, 1.0, 3.0, 5.0 in/sec</td>
<td>4 to 20mA RMS or Peak</td>
<td>- Velocity transmitter - Stainless steel housing - MIL-5015C connector - Thru-hole option: 8021</td>
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# Piezo Film Sensors

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<th><strong>Type</strong></th>
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<td>DT1 &amp; SDT1</td>
<td>Unshielded element or shielded element</td>
<td>Flexible film, adhesive mount</td>
<td>±250 g (typical)</td>
<td>Voltage / RS232 / SPI / Current / Switch / PWM / CAN open</td>
<td>- Thin, flexible, robust - Withstands up to 1% strain - Ultra-low power (self generating)</td>
<td>±20% (typical)</td>
<td>-40°C to 125°C</td>
<td>Application dependent</td>
<td>Energy harvesting to power sensors</td>
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<tr>
<td>ACH01</td>
<td>Ceramic base, plastic cover, shielded cable</td>
<td>Adhesive mount</td>
<td>±20% (typical)</td>
<td>0 - 5 VDC (4 wire) / 1 - 6 VDC (3 wire)</td>
<td>- Extremely high bandwidth - Low cost - Ultra-low power</td>
<td>±250 g (typical)</td>
<td>-40°C to 85°C</td>
<td>18.80 x 13.21 x 6.10</td>
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Temperature Sensors

**Surface Mount Probe**
- **Package**: Silicone rubber or kapton laminated element
- **Type**: Flat, flexible, rectangular sensor - Variety of designs available
- **Sensor Range**: RTD: Pt, Ni, Cu Thermocouple: J, K, T, E
- **Unique Features**: Surface sensing for round or uneven surfaces - Noninvasive, simple installation - Adhesive backing option
- **Accuracy**: RTD: ± 0.06%, ± 0.12% and ± 0.5% at 0°C
- **Operating Temp.**: Varies by design - Standard: -50°C to 200°C (-58°F to 392°F) Available up to 220°C
- **Dimensions (mm)**: Custom dimensions available
- **Typical Apps**: Monitor end windings of stator coils

**Embedment Probe**
- **Package**: Stainless steel or tin plated copper case - Four case styles
- **Type**: Miniature design
- **Sensor Range**: RTD: Pt, Ni Thermocouple: J, K, T, E
- **Unique Features**: For use where space is limited - Simple installation - Custom designs - Feedthrough options
- **Accuracy**: RTD: ± 0.12%, ± 0.36% and ± 0.5% at 0°C
- **Operating Temp.**: -50°C to 250°C (-58°F to 482°F)
- **Dimensions (mm)**: Case specific dimensions
- **Typical Apps**: Bearing monitoring

**Bolt-On Probe**
- **Package**: Threaded bolt, tube style, flat rectangular style
- **Type**: Quick response time
- **Sensor Range**: RTD: Pt, Ni
- **Unique Features**: For use where space is limited - Retro fitting - Simple installation - Custom designs
- **Accuracy**: DIN Class B (IEC 75) and ± .5% at 0°C
- **Operating Temp.**: -50°C to 250°C (-58°F to 482°F)
- **Dimensions (mm)**: Case specific dimensions
- **Typical Apps**: Generator

**Transformer Probe**
- **Package**: Pt element embedded into Ceramic tube and cover with PTFE shrinkable sleeve
- **Type**: Push-in probe
- **Sensor Range**: RTD: Pt100
- **Unique Features**: Dielectric strength 3KV - 4 wires measurement - Various length of cable
- **Accuracy**: Cl.B according to IEC 751
- **Operating Temp.**: -40°C to 250°C (-40°F to 482°F)
- **Dimensions (mm)**: Ø5mm Lg 50mm (Custom cable lengths available)
- **Typical Apps**: Temperature monitoring in low voltage Transformer's windings

**Bearing Probe**
- **Package**: Copper alloy tip - Stainless steel, isolated stainless steel or epoxy glass case
- **Type**: Rigid sheath - Tip sensitive - Cable / leadwire options
- **Sensor Range**: RTD: Pt, Ni, Cu Thermocouple: J, K, T, E
- **Unique Features**: Cut-to-length - Copper tip for fast time response - Assemblies with fluid seal and sprint loading - Explosion-proof assemblies available - Single or dual elements
- **Accuracy**: RTD: DIN Class B (IEC 75) and ± 0.5% at 0°C
- **Operating Temp.**: Sheath specific, up to 250°C
- **Dimensions (mm)**: Custom lengths - Standard sheath diameters: 0.188", 0.215", 0.250"
- **Typical Apps**: Bearing monitoring

**Stator Winding Probe**
- **Package**: Epoxy glass laminated, Class F and Class H
- **Type**: Rigid / flat slot sensor - Cable / leadwire options
- **Sensor Range**: RTD: Pt, Ni, Cu Thermocouple: J, K, T, E
- **Unique Features**: Extended sensitive length - FM and ATEX ratings - Single or dual elements - Elastomer filled cable - Smackproof design - Calibration available
- **Accuracy**: RTD: ± 0.2% and ± 0.5% at 0°C
- **Operating Temp.**: Max. temp: Class F, 155°C and Class H, 180°C Available up to 200°C
- **Dimensions (mm)**: Custom dimensions available
- **Typical Apps**: Monitor between stator coils

**Stator Winding Probe**
- **Package**: TPE / CPME
- **Type**: Rigid flat / slot sensor with cable prolongation
- **Sensor Range**: Pt100 sensor
- **Unique Features**: Dielectric strength 3KV(TPE), 5KV (CPME) - ATEX EExi according to type - Class B, A according to IEC60751
- **Accuracy**: ± 0.12%
- **Operating Temp.**: -20°C to 180°C
- **Dimensions (mm)**: 150 x 8 x 2 (TPE) - 60 x 10 x 2, 80 x 10 x 2.3, 80 x 7.5 x 2 (CPME)
- **Typical Apps**: Monitor between stator coils - Stator monitoring
Fluid Property Sensors

**HTM2500B3C4 OIL**

- **Package**: Fully integrated, stand-alone module combines sensor and processing electronics for in-situ monitoring
- **Type**: Water content in oil and temperature sensor
- **Operating Range**: 0 to 1 aw (aw, activity = water content / water content in saturated oil)
- **Operating Temp**: -40°C to 85°C
- **Unique Features**:
  - Full interchangeability
  - High reliability and demonstrated long term stability in oil
  - Ratiometric to voltage supply
  - Sensitive elements with unique mechanical and chemical robustness
- **Calibration**: Factory calibrated and tested
- **Dimensions (mm)**: 76.2 x 30 x 30
- **Typical Apps**: Gearbox oil

**FPS2802**

- **Package**: Fully integrated, stand-alone module combines sensor and processing electronics for in-situ monitoring
- **Type**: Gear oil quality sensor in high viscosity conditions
- **Operating Range**: Viscosity up to 10,000 mPa-S
- **Operating Temp**: -40°C to 150°C
- **Unique Features**:
  - Rugged construction for high pressure and high flow environments
  - Proprietary corrosion and contaminant resistant coating for wetted parts
  - On-board microprocessor for real-time data analysis with 12-24 volts supply
  - High reliability and long term stability
- **Calibration**: Factory calibrated and tested
- **Dimensions (mm)**: 81 x 30 x 30
- **Typical Apps**: Gearbox oil

Level Sensor

**EVS312-51N**

- **Housing Material**: Nylon 6.6
- **Float Material**: Glass filled Nylon 6.6
- **Contact Material**: Ruthenium
- **Float SG**: 0.74
- **Operating Temp**: -30°C to 110°C
- **Medium**: Fuel / Oil
- **Housing Color**: Blue
- **Float Color**: Blue
- **Shock**: 50 g for 11mS duration
- **Vibration**: 35 g up to 500 Hz
- **Maximum Pressure**: 4.7 Bar
- **Float Diameter**: 22 mm
- **IP**: IP65
- **Typical Apps**: Gearbox oil level

Pressure Sensors

**M5100, U5100**

- **Package**: Industrial stainless steel housing with a large selection of threaded fittings, electrical connectors, cable options and customized housings for T&M applications
- **Type**: Gage (M5100)
  - Gage, sealed gage, absolute (US100)
- **Pressure Range**: 0 - 50 psi thru 0 - 30K psi (M5100)
  - 0 - 1 psi thru 0 - 5K psi (US100)
- **Output / Span**: 0.5 - 4.5 Vdc, 1 - 5 Vdc, 0 - 5 Vdc, 0 - 10 Vdc, 4 - 20 mA
- **Unique Features**:
  - Microfused™ technology (M5100)
  - UltraStable™ technology (US100)
  - High performance at a low cost
  - Solid state reliability
  - 1% total error band (-20°C to 85°C all possible errors combined) (M5100)
  - 0.75% total error band (-20°C to 85°C all possible errors combined) (US100)
- **Accuracy**: 0.25% FSO (M5100), 0.1% FSO (US100)
- **Operating Temp**: -40°C to 125°C
- **Dimensions (mm)**: M5100: 22.23 x 22.23 x 80.77
  - US100: 22.23 x 22.23 x 98.04
- **Typical Apps**: Hydraulic and oil pressure measurement
- **Agency Approvals**: CE, UL 508

**M7100, U7100**

- **Package**: Automotive grade, stainless steel hermetic pressure ports and integral electrical connector
- **Type**: Gage, sealed gage, absolute
- **Pressure Range**: 0 - 15 psi thru 0 - 43K psi
- **Output / Span**: 0.5 - 4.5 Vdc
- **Unique Features**:
  - 1% total error band (-20°C to 85°C)
  - 2% total error band (-20°C to 125°C)
  - Solid state reliability
  - Survives high vibration and immersion
  - Microfused™ technology (M7100)
  - UltraStable™ technology (U7100)
- **Accuracy**: 0.25% FSO (M7100), 0.5% FSO (U7100)
- **Operating Temp**: -40°C to 125°C
- **Dimensions (mm)**: M7100: 26.7 x 26.7 x 50.0
- **Typical Apps**: Hydraulic and oil pressure measurement
- **Agency Approvals**: CE

**EPIH**

- **Package**: Various housings: cylindrical body from diam. 1.27 to 2.36 mm, low profile housing or threads M4x0.7, M5x0.8, 6-32UNC, 10-32UNF
- **Type**: Gage, absolute
- **Pressure Range**: 0 - 5, 10, 15, 25, 50, 75, 100, 200, 300 psi
- **Output / Span**: 0.5 - 4.5 Vdc
- **Unique Features**:
  - Diffused silicon diaphragm with a large variety of sizes and shapes available as small as 0.05” outside diameter
  - High frequency response(to 1.7 MHz)
- **Accuracy**: ±1.0% FSO
- **Operating Temp**: -40°C to 120°C
- **Dimensions (mm)**: Application dependent
- **Typical Apps**: Dynamic pressure measurement on turbine blade

**Agency Approvals**: CE, UL 508
Our sensors often play mission critical roles within the end device in which they are embedded. Accordingly, our customers rely on MEAS sensors to operate accurately, every time. At MEAS, we place the highest emphasis on quality in terms of design standards, process control and customer feedback/integration and back up our products with an industry leading warranty.

MEAS maintains the highest quality certifications, including:

Quality Statements:

- AS/EN 9100
- ATEX
- ATEX 949EC
- CE-MDD
- CMDR – Health Canada
- EN 13980
- ESA 266
- ESCC266E
- ESCC 400C
- FDA
- ISO 13485
- ISO 14001
- ISO 9001
- MID
- Measuring Instruments Directive 2004/22/EC annex D
- NASA Qualified
- NSF-61 Water Quality
- PART21G
- TS 16949