Meggitt Sensing Systems
Monitoring the future
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Meggitt Sensing Systems

The world's leading provider of high performance sensing and condition monitoring solutions for extreme environments

Meggitt Sensing Systems, a Meggitt group division, has operated through its antecedents since 1927 under the names of Endevco, Wilcoxon Research, Sensorex, ECET, Vibro-Meter, Lodge Ignition and Ferroperm Piezoceramics. Today their operations are integrated under one strategic business unit called Meggitt Sensing Systems, headquartered in Switzerland and providing complete systems with these renowned product brands from a single supply base.

We are leaders in the aerospace, power generation, nuclear, oil and gas, industrial, laboratory measurement, automotive and medical markets: in fact anywhere where sensing and condition monitoring are deployed in difficult environments. Meggitt Sensing Systems deploys a wide array of technologies, including piezoelectric, piezoresistive, capacitive, resistive, inductive, magnetic, microwave and optical, to address its customers’ key challenges in high temperature, high shock, limited space and weight, biocompatibility and communications.

With our nine development and manufacturing sites located in Switzerland, France, the UK, Denmark and the USA, we have unmatched capabilities to deliver more critical sensing solutions. An extensive sales and support network extends across Europe, Asia and the Americas, to serve our customers worldwide.

Monitoring and sensing solutions for high value machinery: Our facilities in Fribourg, Switzerland, in Rugby and Basingstoke, UK, in Angoulême, France and in Londonderry, New Hampshire, were all formerly known as Vibro-Meter. These facilities specialise in ignition, sensing and condition monitoring equipment for gas and steam turbines, hydro turbines and auxiliary machines. Our facility in Basingstoke supplies integrated sensor packages and sensors for aerospace.

Industrial sensing and simplified condition-based maintenance: Our facility in Germantown, Maryland, formerly known as Wilcoxon Research, specialises in highly reliable industrial vibration sensors, for condition monitoring and predictive maintenance applications. The facility produces a wide range of vibration sensors for industrial, energy, process control, military and test measurement.

Displacement sensors and inertial systems: Our facility in Archamps, France, formerly known as Sensorex, specialises in linear and rotary displacements, inertial sensors and systems, hybrids and [micro]electronics for aerospace and industrial markets.

Sensing for challenging measurement applications: Our facility in San Juan Capistrano, California, formerly known as Endevco, specialises in mission-critical measurement in the aerospace, defence, automotive, industrial and medical sectors.

Piezoceramic components production: Our facility in Kvistgaard, Denmark, formerly known as Ferroperm Piezoceramics, specialises in manufacturing advanced piezoelectric ceramic components and integrated piezoelectric thick film devices.

Integrated Vehicle Health Management (IVHM) is a multi-sector discipline applied to a wide range of vehicles that can transform system data into information to support operational decisions on vehicle condition, leading to improved availability and minimised maintenance. Cranfield University, Britain’s premier postgraduate, research intensive university and The Boeing Company launched the IVHM Centre in 2008, together with leading IVHM players covering the value chain, such as Meggitt, BAE Systems and Rolls-Royce.
Machinery monitoring systems

Why monitor your machinery?

Monitoring is fundamental to plant asset management. If you are an operator of critical machinery then understanding its condition brings you the following benefits.

Safety
Avoids catastrophic failures protecting your personnel and your investment.

Return on assets
- Reduce unplanned outages and costly breakdowns
- Higher availability
- Maintenance planning is optimised
- Improved machine efficiency
- Lower spare parts inventory
- Better decision making

Emissions and environment
Performance and emissions monitoring can reduce fuel consumption as well as CO₂ and NOₓ emissions, in order to comply with environmental regulations.

VM600 online advanced monitoring system

The VM600 systems from Meggitt’s Vibro-Meter® product line provide protection, condition and performance monitoring for high value rotating machinery such as: gas and steam turbines, hydro generators, large pumps, compressors and fans.

This powerful system for machinery monitoring has received SIL1 certification from TÜV Nord. It meets the highest industry standards for reliability and safety (IEC 61508 and EN ISO 13849-1). The VM600 has been certified to operate reliably as a safety related system for the broadest range of safety functions: helping to prevent injury to people and damage to machinery while safeguarding the environment.

For more detailed product data, refer to Meggitt’s Vibro-Meter® product catalogue.
VM600 system architecture

Software

Meggitt’s machinery protection and condition monitoring software are dedicated to the support of technicians, operators and engineers, enabling them to identify a problem rapidly, evaluate the situation and determine the appropriate action to take.

Protection software

The machinery protection software has an easy-to-use graphical user interface for the protection of critical rotating machinery. It allows stand-alone hardware configuration and data display through a serial connection to the VM600. It provides on-line protection of vibration, speed, displacement, temperature, dynamic pressure in GT combustors and many other machine parameters.

For more detailed product data, refer to Meggitt’s Vibro-Meter® product catalogue.
Condition monitoring and performance software

Together with the highly reliable VM600 system and a wide range of sensor products, Meggitt offers a software platform that allows monitoring and analysis of machinery state. All condition and performance monitoring functions are truly integrated in one single software environment.

Meggitt’s software comprises of several monitoring and performance modules. It runs under Windows, uses an SQL database and can be remotely accessed through the web. Standard communication interfaces enable data transfer to and from any third-party systems.

Technical highlights:

- Ergonomic graphical interface, designed in collaboration with OEMs and end users
- Gigabit data communications
- Correlation of dynamic parameters and process parameters
- Data search and sorting functions
- Hardware fully configurable through software
- Highly responsive

For more detailed product data, refer to Meggitt’s Vibro-Meter® product catalogue.
Complete monitoring solutions

Turbine health management
Safety, return on assets and environment impact

Blade tip clearance
Efficiency optimisation

Structural damages
Combustion humming, outer segments

Bearing
Defect detection

Turbomachinery operation
Safety, maintenance optimisation, lower spare parts inventory, improved efficiency, reduced emissions

Turbine health management system
VM600
Protection, condition and performance monitoring

Portable vibration meter

Meggitt’s PVM 100 vibration meter is highly portable and can be carried in your shirt pocket. Its one-button operation switches between acceleration, velocity, and displacement – or click and hold for a digital reading. The PVM 100 is supplied in a convenient carrying case with all the necessary accessories.

Intelligent vibration transmitter series

Meggitt’s iT series product line starts with a vibration transmitter to convert the dynamic sensor data to a 4-20 mA signal proportional to overall vibration. This 4-20 mA signal interfaces directly with a PLC, DCS, or SCADA system for cost effective 24/7 condition based maintenance. Pair the Intelligent Transmitter with the programmable iT Alarm for continuous alarming capability or add the iT communication module to interface with a PC or laptop.

For more detailed product data, refer to Meggitt’s Wilcoxon Research® product catalogue.
Sensors

Whether measuring acceleration, displacement or dynamic pressure, Meggitt offers the most accurate, reliable and cost-effective solutions available. Our solutions are standard with numerous OEMs and have been adopted by major plant operators worldwide.

General purpose accelerometers

Meggitt’s IEPE product line offers the widest selection of hazardous area rated sensors for industrial condition monitoring. Options include top exit, side exit and integral cable sensors; dynamic vibration output or 4-20 mA overall vibration output, standard and compact size sensors; dual output of vibration and temperature data; Class I Division 1 (Zone 0) and Class I Division 2 (Zone 2) ratings, and explosion proof models. FM, CSA, ATEX, IECEx, and other certifications make these sensors available for use in hazardous areas.

Meggitt’s general purpose accelerometers allow vibration measurements for monitoring most industrial machinery such as: motors, fans, pumps, compressors, moderate speed gearboxes and machine tools.

<table>
<thead>
<tr>
<th>Model</th>
<th>786A-M12</th>
<th>786F</th>
<th>787A, B</th>
<th>785A</th>
<th>780A, B, C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Standard accelerometer with M12 connector</td>
<td>Integral cable accelerometer</td>
<td>Standard side exit accelerometer</td>
<td>Compact side exit accelerometer</td>
<td>Compact accelerometer</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>100 mW/g</td>
<td>100 mV/g</td>
<td>100 mV/g</td>
<td>100 mV/g</td>
<td>100 mV/g</td>
</tr>
<tr>
<td>Frequency</td>
<td>0.5 to 14000 Hz</td>
<td>0.5 to 13000 Hz</td>
<td>0.7 to 10000 Hz</td>
<td>1 to 12000 Hz</td>
<td>0.4 to 14000 Hz</td>
</tr>
<tr>
<td>Temperature</td>
<td>to 120 ºC</td>
<td>to 120 ºC</td>
<td>to 120 ºC</td>
<td>to 120 ºC</td>
<td>to 120 ºC</td>
</tr>
<tr>
<td>Product line</td>
<td>Wilcoxon Research</td>
<td>Wilcoxon Research</td>
<td>Wilcoxon Research</td>
<td>Wilcoxon Research</td>
<td>Wilcoxon Research</td>
</tr>
</tbody>
</table>

Low frequency accelerometers

Low frequency accelerometers to monitor slow turning machinery like wind turbines and cooling towers.

<table>
<thead>
<tr>
<th>Model</th>
<th>793L</th>
<th>799LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Premium low frequency accelerometer</td>
<td>Low frequency accelerometer</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>500 mV/g</td>
<td>500 mV/g</td>
</tr>
<tr>
<td>Frequency</td>
<td>0.2 to 2300 Hz</td>
<td>0.1 to 2500 Hz</td>
</tr>
<tr>
<td>Temperature</td>
<td>to 120 ºC</td>
<td>to 120 ºC</td>
</tr>
<tr>
<td>Product line</td>
<td>Wilcoxon Research</td>
<td>Wilcoxon Research</td>
</tr>
</tbody>
</table>

High frequency accelerometers

High frequency accelerometers for monitoring machinery with high frequency gear mesh or early bearing failure.

<table>
<thead>
<tr>
<th>Model</th>
<th>997</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>High frequency ring type accelerometer with integral cable</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>10 mV/g</td>
</tr>
<tr>
<td>Frequency</td>
<td>0.5 to 29000 Hz</td>
</tr>
<tr>
<td>Temperature</td>
<td>to 125 ºC</td>
</tr>
<tr>
<td>Product line</td>
<td>Wilcoxon Research</td>
</tr>
</tbody>
</table>

For more detailed product data, refer to Meggitt’s Wilcoxon Research® product catalogue.
High temperature accelerometers (without electronics)

Meggitt’s CA series work in the most severe environments. These piezoelectric sensors have sensitivities from 10 to 100 pC/g, for the widest range of temperatures: from cryogenic (-196°C) up to extreme (700°C).

Vibration monitoring of heavy duty, industrial and aeroderivative gas turbines, steam turbines, gear boxes, compressors and marine applications.

<table>
<thead>
<tr>
<th>Model</th>
<th>CA202</th>
<th>CA280</th>
<th>CA306</th>
<th>CA134</th>
<th>CA901</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Heavy duty gas and steam turbines</td>
<td>Gas turbines, gear boxes and marine applications</td>
<td>Aero-derivative and industrial gas turbines</td>
<td>Cryogenic applications and gas turbines</td>
<td>Heavy duty gas turbines</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>100 pC/g (400g)</td>
<td>100 pC/g (500g)</td>
<td>50 pC/g (100g)</td>
<td>10 pC/g (500g)</td>
<td>10 pC/g (500g)</td>
</tr>
<tr>
<td>Frequency</td>
<td>0.5 to 8000 Hz</td>
<td>0.5 to 10000 Hz</td>
<td>5 to 3000 Hz</td>
<td>0.5 to 6000 Hz</td>
<td>3 to 3700 Hz</td>
</tr>
<tr>
<td>Note</td>
<td>Work with IPC704 external electronics conditioners</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>-55 to 260°C</td>
<td>-55 to 260°C</td>
<td>-55 to 500°C</td>
<td>-196 to 500°C</td>
<td>-196 to 700°C</td>
</tr>
<tr>
<td>Product line</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
</tr>
</tbody>
</table>

High temperature accelerometers (with electronics)

Meggitt’s CE and SE series include conditioners and are hence more economical and simpler to integrate. CE piezoelectric sensors measure vibration in harsh industrial conditions, with temperatures from standard (120°C) up to high (350°C).

The CE series are for monitoring of heavy duty, industrial and aeroderivative gas turbines, steam turbines, gearboxes, compressors and auxiliary machines. SE piezoresistive sensors are for slow speed rotating machines, hydro turbines and fans.

<table>
<thead>
<tr>
<th>Model</th>
<th>CE134</th>
<th>CE281</th>
<th>CE311</th>
<th>CE680</th>
<th>SE120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Heavy duty and aero-derivative gas turbines, compressors</td>
<td>Gear boxes, compressors, pumps and fans</td>
<td>Heavy duty gas and steam turbines</td>
<td>Auxiliary machines, balance-of-plant</td>
<td>Slow speed machines, hydro turbines and fans</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>5 μA/g (400g)</td>
<td>10 μA/g (200g)</td>
<td>50 μA/g (40g)</td>
<td>100 mV/g (80g)</td>
<td>2 mA/g (4g)</td>
</tr>
<tr>
<td>Frequency</td>
<td>5 to 10000 Hz</td>
<td>3 to 10000 Hz</td>
<td>2 to 8000 Hz</td>
<td>0.5 to 9000 Hz</td>
<td>0.2 to 750 Hz</td>
</tr>
<tr>
<td>Temperature</td>
<td>-55 to 350°C</td>
<td>-55 to 260°C</td>
<td>-55 to 125°C</td>
<td>-55 to 120°C</td>
<td>0 to 75°C</td>
</tr>
<tr>
<td>Product line</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
</tr>
</tbody>
</table>

For more detailed product data, refer to Meggitt’s Vibro-Meter® product catalogue.
Nuclear certified accelerometers

Meggitt’s nuclear certified accelerometers are for the widest range of temperatures: from cryogenic (-196°C) up to extreme (780°C). They have over 25 years proven reliability in primary circuits on fifty PWR/VVER nuclear reactors in Europe and Asia.

<table>
<thead>
<tr>
<th>Model</th>
<th>CA952</th>
<th>CA962</th>
<th>CA602</th>
<th>CA606</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application</strong></td>
<td>Primary circuit of PWR, BWR, FBR and HTGR</td>
<td>Transverse sensor, In-core measurement, primary circuit of PWR, BWR, FBR and HTGR</td>
<td>Biaxial sensor, Primary circuit of PWR, BWR, ABWR, FBR and HTGR</td>
<td>Miniature biaxial. In-core measurement. Permanent measurement in primary circuit, contaminated water. Start-up and hot functional test.</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>50 pC/g (200g)</td>
<td>250 pC/g (200g)</td>
<td>5 pC/g (500g)</td>
<td>2 pC/g (100g)</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>2 to 2500 Hz</td>
<td>0.5 to 400 Hz</td>
<td>5 to 700 Hz</td>
<td>5 to 300 Hz</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>Work with IPC629 external electronics conditioners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>-196 to 650°C</td>
<td>-196 to 650°C</td>
<td>-196 to 650°C</td>
<td>-196 to 780°C</td>
</tr>
<tr>
<td><strong>Product line</strong></td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
</tr>
</tbody>
</table>

For more detailed product data, refer to Meggitt’s Vibro-Meter® product catalogue.
Loop powered accelerometers

Meggitt’s 4-20 mA Loop Powered Sensors (LPS™) allow vibration trending for basic condition based maintenance applications: output signal proportional to overall vibration, peak, RMS, peak-to-peak, or true peak-to-peak, within frequency range. Optional dual output of vibration data. Applications include motors, fans, pumps, gearboxes, and reciprocating compressors.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Full scale, acceleration versions</th>
<th>Frequency</th>
<th>Temperature</th>
<th>Product line</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC420</td>
<td>LPS, top exit connector</td>
<td>5, 10, 20, 50 g</td>
<td>10 to 1000 Hz</td>
<td>to 105 °C</td>
<td>Wilcoxon Research</td>
</tr>
<tr>
<td>PCC421</td>
<td>LPS, side exit connector</td>
<td>5, 10, 20 g</td>
<td>10 to 1000 Hz</td>
<td>to 105 °C</td>
<td>Wilcoxon Research</td>
</tr>
<tr>
<td>PCC423</td>
<td>LPS, side exit, integral cable</td>
<td>5, 10, 20 g</td>
<td>10 to 1000 Hz</td>
<td>to 105 °C</td>
<td>Wilcoxon Research</td>
</tr>
<tr>
<td>PC425</td>
<td>LPS with temperature sensor and side exit connector</td>
<td>5, 10, 20 g</td>
<td>10 to 1000 Hz</td>
<td>to 105 °C</td>
<td>Wilcoxon Research</td>
</tr>
<tr>
<td>PC427</td>
<td>LPS, with temp sensor, side exit, integral cable</td>
<td>5, 10, 20 g</td>
<td>10 to 1000 Hz</td>
<td>to 105 °C</td>
<td>Wilcoxon Research</td>
</tr>
</tbody>
</table>

For a comprehensive product list and more detailed product data, refer to Meggitt’s Wilcoxon Research® product catalogue.

Submersible accelerometers

Underwater accelerometers for deep water vibration measurements up to 450 meters in depth.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Sensitivity</th>
<th>Frequency</th>
<th>Temperature</th>
<th>Product line</th>
</tr>
</thead>
<tbody>
<tr>
<td>746</td>
<td>Integral cable underwater accelerometer</td>
<td>100 mV/g</td>
<td>1 to 15000 Hz</td>
<td>to 80 °C</td>
<td>Wilcoxon Research</td>
</tr>
<tr>
<td>757</td>
<td>Biaxial low profile underwater accelerometer</td>
<td>100 mV/g</td>
<td>1 to 4000 Hz</td>
<td>to 80 °C</td>
<td>Wilcoxon Research</td>
</tr>
</tbody>
</table>

For more detailed product data, refer to Meggitt’s Wilcoxon Research® product catalogue.

Biaxial and triaxial accelerometers

Biaxial and triaxial sensors measure vibration in multiple perpendicular directions.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Sensitivity</th>
<th>Frequency</th>
<th>Temperature</th>
<th>Product line</th>
</tr>
</thead>
<tbody>
<tr>
<td>993B-7</td>
<td>Triaxial accelerometer</td>
<td>100 mV/g</td>
<td>2 to 7000 Hz</td>
<td>to 120 °C</td>
<td>Wilcoxon Research</td>
</tr>
</tbody>
</table>
Eddy current displacement sensors

Meggitt’s TQ series are eddy current transducers for contactless measurements of relative vibration or axial displacement in turbines, alternators, turbo-compressors and centrifugal pumps. They are API 670 compliant, available for high-pressure and watertight applications, with measuring ranges up to 12 mm.

Velocity sensors

Meggitt’s CV series are widely installed on all types of low speed turbomachinery, especially hydro turbine-generator sets. The CV series measure absolute vibration down to very low frequencies, thanks to the conditioner’s low frequency linearization function.

Meggitt’s PV102 PiezoVelocity sensors are internally integrated to output velocity. Optional certifications are available: CSA certified, intrinsically safe, and Class I Div 2 ATEX certified, Class I Zone 0 and Class I Zone 2.
Linear displacement LVDT sensors

Meggitt’s LVDT sensors are designed to measure linear displacements in harsh environments like offshore platforms and radioactive tanks. Rotary sensors (RVDT) complete the product line. Some available options: Submersible sensors, long strokes (up to 300 mm), rugged versions for hydraulic jacks.

<table>
<thead>
<tr>
<th>Model</th>
<th>SX12 CKW serie</th>
<th>SX CER serie</th>
<th>SX 36 RV serie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Compact LVDT, high performance</td>
<td>LVDT for harsh environments, inox and ball joint</td>
<td>Rugged RVDT</td>
</tr>
<tr>
<td>Measurement ranges</td>
<td>+/- 3 mm to +/- 150 mm</td>
<td>+/- 3 mm to +/- 150 mm</td>
<td>+/- 10° to +/- 60°C</td>
</tr>
<tr>
<td>Environment</td>
<td>ATEX IP 66 or IP 67</td>
<td>ATEX IP 67 Intrinsically safe</td>
<td>ATEX</td>
</tr>
<tr>
<td>Temperature</td>
<td>-40 to 200°C</td>
<td>-40 to 80°C/200°C</td>
<td>-40 to 125°C</td>
</tr>
<tr>
<td>Product line</td>
<td>Sensorex</td>
<td>Sensorex</td>
<td>Sensorex</td>
</tr>
</tbody>
</table>

Airgap sensors

The LS systems measure the air gap between rotor and stator, using a capacitive technology. LS are an important indicator of machine condition in hydroelectric generators.

<table>
<thead>
<tr>
<th>Model</th>
<th>LS 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>For large hydro generators</td>
</tr>
<tr>
<td>Measurement range</td>
<td>2 to 33 mm Longer ranges avail. on request</td>
</tr>
<tr>
<td>Note</td>
<td>Works with ILS 730 conditioner</td>
</tr>
<tr>
<td>Temperature</td>
<td>-15 to 125 °C</td>
</tr>
<tr>
<td>Product line</td>
<td>Vibro-Meter</td>
</tr>
</tbody>
</table>

Inclinometers

Submersible servo-inclinometers are designed to measure angular tilt with respect to the horizon or boom angle in harsh environments. Applications are in offshore, marine (LNG transport) and petroleum industry.

<table>
<thead>
<tr>
<th>Model</th>
<th>SX41170</th>
<th>SX41600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>1-axis submersible servo-inclinometer</td>
<td>2-axis submersible servo-inclinometer</td>
</tr>
<tr>
<td>Measurement ranges</td>
<td>+/- 3° to +/- 90°</td>
<td>+/- 1° to +/- 90°</td>
</tr>
<tr>
<td>Environment</td>
<td>ATEX IP 68 100 bar Intrinsically safe</td>
<td>IP 67</td>
</tr>
<tr>
<td>Temperature</td>
<td>-40 to 200°C</td>
<td>-40 to 80°C/200°C</td>
</tr>
<tr>
<td>Product line</td>
<td>Sensorex</td>
<td>Sensorex</td>
</tr>
</tbody>
</table>

For more detailed product data, refer to Meggitt’s Sensorex® and Vibro-Meter® product catalogues.
Turbine combustor dynamic pressure

Meggitt’s CP series are qualified by major OEMs for combustor pulsation monitoring in gas turbines. They use a patented technology and reach the highest sensitivity in the industry, with an extreme temperature capability (up to 777°C) and a very high frequency response range.

<table>
<thead>
<tr>
<th>Model</th>
<th>CP103</th>
<th>CP235</th>
<th>522M17</th>
<th>CP211</th>
<th>CP50x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Extreme temp, standard with numerous OEMs</td>
<td>High temp, highest sensitivity, standard with numerous OEMs</td>
<td>High temp, use with single-ended charge amplifiers</td>
<td>Extreme temp, compact, used in laboratory measurements</td>
<td>Outstanding linearity. No pyroelectric effects from temp changes. Cooperation with Piezocryst.</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>232 pC/bar (20 bar)</td>
<td>750 pC/bar (20 bar)</td>
<td>12 pC/psi</td>
<td>25 pC/bar (250 bar)</td>
<td>90 pC/bar (50 bar)</td>
</tr>
<tr>
<td>Frequency</td>
<td>2 to 10000 Hz</td>
<td>2 to 10000 Hz</td>
<td>to 45000 Hz</td>
<td>2 to 15000 Hz</td>
<td>2 to 10000 Hz</td>
</tr>
<tr>
<td>Temperature</td>
<td>-196 to 700 °C</td>
<td>-55 to 520 °C</td>
<td>to 538°C</td>
<td>-196 to 777 °C</td>
<td>-70 to 560°C</td>
</tr>
<tr>
<td>Product line</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
<td>Endevco</td>
<td>Vibro-Meter</td>
<td>Vibro-Meter</td>
</tr>
</tbody>
</table>

For more detailed product data, refer to Meggitt’s Vibro-Meter® product line catalogue.

Turbine blade tip clearance

Meggitt’s microwave product line is designed especially to measure blade tip clearance in turbomachinery. Turbine blade and disc failures often provide advance warning through subtle changes in blade tip clearance or blade time-of-arrival. Meggitt’s microwave system enables closed-loop control and predictive maintenance in the turbine hot section. Probes are designed for operation at extreme temperatures and can be installed in the first stage turbine. The turbine tip clearance system can be an integral part of a complete VM600 online monitoring system (see page 4).

Turbine ignition systems

Meggitt’s ignition products offer low voltage, high-energy igniters and complementary ignition leads for gas turbine engines.

**High energy systems** are designed to ignite gasses and heavier oils in damp and otherwise adverse conditions with stored levels of up to 16 joules.

**High tension systems** are designed to ignite medium distillate fuel oils and most gas installations and generate up to 18000 volts.

**Flameproof ignition equipment** provides special protective measures to avoid accidental combustion in hazardous environments, including flammable gases, vapors, dust, and volatile liquids.
Flame monitoring systems

Omniguard fire detection

Meggitt’s Omniguard® series are designed to detect unwanted fires and output appropriate alarm information. Omniguard® flame detectors are widely used in fuel transfer stations, natural gas compressor stations and petrochemical storage facilities.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Operating temp.</th>
<th>Field of view</th>
<th>Features</th>
<th>Product line</th>
</tr>
</thead>
<tbody>
<tr>
<td>660</td>
<td>Ultraviolet flame detector</td>
<td>-40°C to +125°C</td>
<td>120°</td>
<td>- FM, CSA and ATEX approved</td>
<td>Vibro-Meter</td>
</tr>
<tr>
<td>760</td>
<td>Multi-spectrum infrared flame detector</td>
<td>-40°C to +85°C</td>
<td>90°</td>
<td>- Patented Fire Event Analysis (FEA) algorithm for superior false-alarm immunity, FM, CSA and ATEX approved</td>
<td>Vibro-Meter</td>
</tr>
<tr>
<td>860</td>
<td>Ultraviolet-infrared flame detector</td>
<td>-40°C to +85°C</td>
<td>120°</td>
<td>- Patented Fire Event Analysis (FEA) algorithm for superior false-alarm immunity, FM, CSA, ATEX approved</td>
<td>Vibro-Meter</td>
</tr>
</tbody>
</table>

Edison UV flame scanners

Meggitt’s Edison® flame scanner is an ultraviolet-based detector used to indicate the presence or absence of a flame within the combustor of an industrial gas turbine.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Wavelengths</th>
<th>Suitable for supervision of</th>
<th>Product line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edison</td>
<td>Flame scanners</td>
<td>Between 1900 and 2900 angstroms</td>
<td>Gas-fired, oil-fired or combination industrial burners, or turbines</td>
<td>Vibro-Meter</td>
</tr>
</tbody>
</table>
Customer services

Are you looking for support services for your power generation plant or industrial process facility? At Meggitt Sensing Systems, our focus is on customer service.

Maintenance solutions

Meggitt Sensing Systems’ technical support group has a comprehensive understanding of system applications and operational requirements, and will work with you to ensure cost-effective solutions for:

- Calibration and repair services
- Sensor and monitor system installation and commissioning
- Factory and/or site acceptance tests
- On-site system troubleshooting and repairs
- Annual system checks
- New system requirement and scope definition
- Project management and turnkey installation services
- System upgrades and retrofit solutions
- Remote system diagnostics

World-class support services

Meggitt Sensing Systems not only supports single-event service or turnkey project needs, but will also partner with you to provide on-going maintenance services including:

- Diagnostics services on machinery issues, regardless of manufacturer
- Regularly scheduled sensor and monitoring system verification
- Condition monitoring system configuration, optimization and machinery auditing
- Factory or site-based technical training
Training

Meggitt’s courses are open to plant operators, equipment manufacturers, or any user starting to work with our monitoring systems.

These hands-on training sessions course are especially designed to provide users with the fundamental knowledge required to operate our systems. After a training program, participants will feel at ease with all main protection and monitoring functionalities.

List of courses:

- VM600 system installation and commissioning
- VM600 system operation and maintenance
- Condition monitoring software basic user course
- Condition monitoring software advanced user course
- Condition monitoring and machinery diagnostics

Our regional training centres are located in

- Europe: Fribourg, Switzerland
- Asia: Bangalore, India, Shanghai, China, Singapore
- North America: Montreal, Canada, Londonderry NH, USA

We organise customised training for our customers on their sites. For further information, please contact your local Meggitt representative, or:

- Europe, Middle-East, Africa mss.europe-mea@meggitt.com
- North America mss.north.america@meggitt.com
- Latin America mss.latin-america@meggitt.com
- Asia mss.asia@meggitt.com
Worldwide sales and support

We offer customer support through our world-wide sales organisation, present in more than 50 countries.

Meggitt Sensing Systems sites are located in: San Juan Capistrano and Sunnyvale, California; Londonderry, New Hampshire; Germantown, Maryland; Angoulême and Archamps, France; Fribourg, Switzerland; Rugby and Basingstoke, United Kingdom; Kvistgaard, Denmark; Xiamen, China and Singapore.

Energy support centres

Representatives and agents

www.meggittsensingystems.com

If you have not done business with us yet, or do not have a direct contact with our representative in your country, please contact one of our Energy support centres.

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Headquartered in the UK, Meggitt PLC is a global engineering group specialising in extreme environment components and smart sub-systems for aerospace, defence and energy markets.

Some 7,500 people are employed across manufacturing facilities in Asia, Europe and North America and regional bases in India and the Middle East.

Meggitt’s civil aerospace presence covers large commercial transports, regional aircraft, business jets, helicopters and general aviation.

Its defence markets cover all military aircraft types, land systems, naval platforms and aerial, land-based and marine threat simulation training and weapons systems development. The firearms element of this capability extends into law enforcement and security organisations.

The group’s growing presence in energy is driven by our core fluid controls, heat management and sensing and monitoring capabilities, many of which are deployed to help reduce the maintenance costs, fuel consumption and carbon emissions of industrial gas and steam turbines.

www.meggitt.com

Meggitt Sensing Systems is the world’s leading provider of high performance sensing and condition monitoring solutions for extreme environments

Meggitt Sensing Systems, a Meggitt group division, has operated through its antecedents since 1927 under the names of Endevco, Wilcoxon Research, Sensorex, ECET, Vibro-Meter, Lodge Ignition and Ferroperm Piezoceramics. Today their operations are integrated under one strategic business unit called Meggitt Sensing Systems, headquartered in Switzerland and providing complete systems with these renowned product brands from a single supply base.

www.meggittsensingsystems.com