

SENSOR+TEST 2010: Sensor, Measuring, and Testing Technology to the Point

From the 18th to the 20th of May 2010, the 17th International Trade Fair for Sensorics, Measuring, and Testing Technology will be held on the Nürnberg exhibition grounds. Reflecting the growing economic significance of these cross-cutting thematic areas, the AMA Association counts with about 500 exhibitors despite the recent economic downturn in the major supplied industries. The great demand for innovation by the users is seen as a special challenge for supplier presence.

Focus: Energy Efficiency

For the first time, this year the trade fair will be held under a motto. Reflecting the worldwide discussion, the Exhibitor Committee of the SENSOR+TEST and the Executive Board of the AMA Association have decided to focus on energy efficiency.

Sensors in devices and machines, in plants, buildings, and cars make it possible to find and maintain energy-optimized operating modes. And it is measuring and testing technology which provides the process information required in the research-and-development phase. The thematic spectrum of the SENSOR+TEST agrees to an extraordinary extent with the topics and tasks that result from the demand for greater energy efficiency. There is no optimization – and today this can only mean reduction – of energy consumption without sensor technology.

This contribution aims to give you a taste of the products, services, and trends to be presented. It is based on information obtained by the AMA Service, the fair organisers, from the exhibitors up to the end of January 2010. The structure follows the Directory of Products and Services published by the AMA Association.

Geometric Parameters

Not only position and orientation of an object is detected by sensors for geometric parameters, but also angles of inclination, fill level, or surface roughness. The fields of application are manifold and thus the pertinent sensor technology presented at the SENSOR+TEST as well.

This year we have great number of announcements regarding new tilt and inclination sensors. For instance TMR sensors (tunnelling magneto-resistance) for a com-



plete revolution (360°) providing a sine/cosine output signal of 160 mV (pp) at an exactitude of <1 % at an ambient temperature range of -40 °C to +125 °C as required for automotive engineering (Hy-Line Sensor-Tec Vertriebs-GmbH, Unterhaching). Also contactless are rotational angle sensors, controlled by an external magnet, for industrial application with a radiometric 5-V output signal. They can cope with air gaps of up to 5.5mm. One version with a redundant, secondary output for fault detection is designed for applications with rough operating conditions. Designed especially for solar tracking, inclination sensors in an IP67 housing with an accuracy of $\pm 0,1^\circ$ that allow networking can also be seen in Nürnberg. The USD CAN protocol permits the connection of 64 sensors with 200 m of cable to a host (Pewatron AG, Zürich, Schweiz). Besides these kinds of dedicated designs, a plethora of rotary encoders and speed sensors of various dimensions as used in mechanical and plant engineering will be on display at the SENSOR+TEST. Distance and travel measurement for construction machinery or mobile equipment has always been a problem. Under such rough ambient conditions many sensors have a relatively short service life. To overcome this drawback, diverse developments were undertaken for example to measure within hydraulic cylinders. In Nürnberg, an integrated cable-pull sensor can be seen that transmits its signals through the wall of an enclosed cylinder. The electronics on the outside provides standard signals and can be connected via a CAN interface (Sensor Technik Wiedemann, Kaufbeuren). For application in non-conductive and non-corrosive liquids or gases, linear path sensors with measuring distances of up to ± 100 mm and integrated signal conditions are available (Pewatron AG, Zürich). Suppliers are also focussing on applications in hydraulics, borehole inspections, and test chambers. Designed mostly for oil mist, slush, rain, or dust are inductive travel sensors or

position encoders for distances of up to 20 mm, cased in IP68 housings (a.b.jödden gmbh, Krefeld). Sensor modules for scanning tooth structures make use of the GMR (giant magneto resistive) effect and supply sine/cosine signals or digital AB signals. Besides rack and pinions, toothed wheels (for inclination measurement) can be scanned at a relatively great distance. A very special application in this context is the accurate length measurement of fabrics, metal sheets, cables, and the like. Errors due to slippage are prevented by the use of contactless laser-Doppler velocimeters that operate on practically any surface at distances of up to 1.5 m (Polytec GmbH, Waldbronn).

Mechanical Parameters / Pressure

The measurement of pressures of liquid or gaseous media is one of the most common measuring tasks in industry. Under the heading of »Sensor technology for Advanced Resistors«, a novel chip technology is presented that can reduce non-calibratable measuring errors, such as drift and hysteresis on piezoresistive sensor elements by a factor of 5 (First Sensor Technology GmbH, Berlin). Through the application of SOI (silicon on insulator) electronics, highly integrated pressure transmitters can be used at temperatures up to 250 °C in geothermal applications, such as in oil prospecting or the aerospace industry. With the combination of a dynamic differential pressure sensor for small measuring ranges and a high pressure sensor for system pressure, high-frequency pressure oscillations can be detected for monitoring high-speed turbines (Kulite Semi-Conductor GmbH, Kaiserslautern).

Pressure sensors with thin-film strain gauges were subjected to further improvements. Especially the concept of strict modularity ensures just-on-time delivery despite the broad variety of designs (Kavlico GmbH, Minden). The concept of active compensation leads to exceptional accuracy classes. For measuring ranges from 0...100 mbar to 0...100 bar it is now possible to guarantee an overall error of <0.4 % at temperature ranges of -40 °C to +125 °C (STS Sensoren Transmitter Systeme GmbH, Sindelfingen). Based on this concept are differential pressure transmitters and switches for the mbar range and the high-pressure range of up to 2,000 bar. These are also available as battery-operated manometers (Prignitz Mikrosystemtechnik GmbH, Wittenberge). A patented ceramic pressure-measuring cell for barometric measurement can attain an accuracy of $\pm 0,02$ % and a zero-point drift of 0.008 %. An internal microprocessor with a multitude of functions and interfaces makes this

device a reference for instance for test rigs (Synotech Sensor und Messtechnik GmbH, Linnich).

Thermal Parameters

Besides the most varied designs and quality grades of temperature probes (platinum probes, NTCs, PTCs, silicon probes, thermo-elements, etc.), the SENSOR+TEST is traditionally the meeting point for suppliers of pyrometers and infrared cameras for contactless temperature measurement. In the low-cost segment there are semiconductor temperature sensors with integrated signal conditioning and a continuous, pulse-width modulated output signal, used in household appliances for temperature regulation or for overheating protection. Their electrical power consumption is <1 mW (Hy-Line Sensor-Tec Vertriebs-GmbH, Unterhaching). For application in environments with strong magnetic fields, power transformers, generators, or microwave systems, fibre-optical thermometers show their advantages: they are completely non-metallic and potential-free. A portable device can record the temperature over time. The smallest sensor diameter is 0.55mm and the measuring range is between -200 °C und +300 °C (Optocon AG Optical Sensors and Systems, Dresden).

Optical Parameters

Photo-detectors, spectrometers, light sources, colour-measuring equipment, etc. are not only part and parcel of the SENSOR+TEST, when the biannual OPTO and IRS² parallel conferences are held.

For critical intensity measurements there are diverse optical edge or notch filters with a low ripple transmission or interference filters with good edge steepness and extreme signal suppression in the respective blocking region. A linear-array sensor with up to 256 pyroelectric elements is designed for spectrometric applications in the infrared range (Dias Infrared GmbH, Dresden). For fluorescence measurements in microscopy or special layer thickness measurements in the semiconductor industry, new spectrometer modules with a high thermal stability and a spectral pixel distance of 0.8nm/pixel will be presented (Carl Zeiss MicroImaging GmbH, Jena). There is also a sensor for detection of reference marks in the UV and white-light range. Both light sources can be adjusted directly for the marks by means of light conductors and focussing optics. Teaching is carried out during slow movement so that the machine does not need to be stopped (Sensor Instruments GmbH, Thurmansbang).

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