



# SENSOR+TEST 2009

The Entire Sensor, Measuring, and Testing Technology at a Glance



**The 16th International Trade Fair for Sensor, Measuring, and Testing Technology will be held from 26 to 28 May on the fair grounds in Nürnberg. This worldwide biggest event in the sensor industry, complemented by numerous conferences and forums, is expected to be attended by 550 exhibitors (and almost 20,000 m<sup>2</sup> of floor space), including the major technology and market leaders of most product groups.**

Projections show that there are about 800 manufacturers of industrial measuring systems in Germany. Together with exclusive importers of sensor products they have a turnover of approximately 24 billion euros per year. Moreover, about 2,300 companies and institutes operate in the area of sensor technology. All in all they have about 2,300 employees, who generate revenues amounting to 30 billion euros.

Based on various definitions and allocations, estimates by commercial market researchers indicate a world market potential of 60 to 90 billion euros. About 35 to 40 % of the sensor systems produced in Germany are direct exports. If indirect exports are added – which depend of course on the export quota of the machines, systems, and products in which they are integrated – the actual export quota of German measuring systems amounts to 60 to 70 %.

## Geometric Parameters

Displacement, angle, inclination, position – the evaluation of geometric data provides information on the location and orientation of an object. The measuring tasks comprehend dimensions ranging from nanometres to kilometres with the most diverse, application-specific boundary conditions –

and thus a plethora of sensors are available for these tasks.

### ■ Displacement

For displacements of 50 to 500 mm, contactless foil potentiometers with wear-free pickup are presented at the SENSOR+ TEST. Considering the high processing speeds and robust design, the producers see areas of application in industry in general and in vehicle series production in particular.

Inductive transducers for linear displacement can now handle a nominal pressure of up to 200 bar. The plunger moving the NiFe core is sealed with an o-ring. The integrated signal conditioning provides a linearized current or voltage signal output. As opposed to this more mechanical-engineering oriented device, designs used for chassis control employ the magneto-resistance effect for fully assembled, encapsulated, pressure-proof displacement sensors. Fully contactless is the function of an encoder kit comprising a separate inductive sensor and a linear or disc scale. Both parts can be flexibly adapted to the application at hand and jointly attain a resolution of less than  $\mu\text{m}$  at speeds of up to 10 m/s and a scanning gap of up to 1 mm. Among the plethora of transducer principles draw-wire sensors should not be left out, as the SENSOR+TEST provides a comprehen-

sive offer of these devices. A rather unorthodox solution is presented by a producer who packs the entire transducer into a hydraulic cylinder, transferring the measuring signal of travel up 0.5 m through the cylinder wall to the outside. Here, the electronics and a CAN interface enable integration in the vehicle machine network for instance. Besides these specialties, the trade fair offers the typical designs for industrial assembly and handling technology, plant construction, crane trucks, forklifts, etc. Measuring distances of a number of metres, IP67 ratings, and indeed temperatures ranging from -40 to +85 °C are specified.

A completely different design is provided by high-precision, highly-dynamic capacitive position sensors for gaps of up to 0.5 mm. The linearity attains values of less than 20 nm at a resolution of less than 1 nm. With a dynamic bandwidth of over 6 kHz these devices can be used for vibration tests on machines and other equipment.

### ■ Rotation

Speed sensors and rotary encoders are state of the art from ABS to high-speed positioning systems – and of course in measuring technology. Such a device is a steering-system sensor to detect the angle of the steering shaft and its torque. The module is placed between the steering shaft and the steering wheel transmitting its measuring data contactless per telemetry. Thus the operation can be examined during real-time car or truck operation. A variety of rotary encoders use Hall sensors. The advantage lies in the contactless transmission of



angle values, which in turn allow high protection ratings. At the fair in Nürnberg absolute multi-turn encoders based on hall elements will be presented without any gears or a counter mechanism. Further, hermetically sealed speed sensors using the magnetoresistive effect are exhibited.

## Chemical Sensors, Gas Sensor Technology

To monitor the chemical components of an end product measuring systems are used that automatically evaluate the lines of a spectrometer with a CCD array. A simpler and thus less expensive alternative are spectrometers that work with a single receiver (NIR diode) and analyze the spectrum with a mirror scan. A wavelength range of 1,000 nm can be scanned within 10 ms to identify and evaluate the absorption bands of diverse compounds. Typical applications of portable devices are the detection of the degree of decay of meat, identification of polymers in recycling, and the analysis of unidentified liquids at airports. For NDIR (non-dispersive infrared) gas analysis, a two-channel measuring chamber with an IR emitter is presented at the SENSOR+TEST. Its distin-

ctive feature: the utilization of high-temperature resistant thermopiles for detection, which enables ambient temperatures up to 190 °C. Also shown in Nürnberg are durable sensors with suitable interfaces for the processing industry manufactured by means of spiral-wound filaments as a broadband IR emitters and interference filters for wavelength selection.

### ■ Gas Sensor Technology

The SENSOR+TEST is an established centre for gas sensor technology with diverse detection principles. This year the exhibition focus is sharpened by relevant papers at the SENSOR Conference. Just a few examples: a hydrogen cyanide (HCN) sensor with a response time of less than 20 s and a sensitivity of 600 nA/ppm and stable base line; a highly selective hydrogen sensor without cross-sensitivity to H<sub>2</sub>S and also cross-sensitivity to CO; and a new sensor to measure concentrations of ethene (ethylene or C<sub>2</sub>H<sub>4</sub>) up to 2,000 ppm. Represented this year is the new European MINIGAS Consortium, in which leading European research institutes are developing gas sensors for greenhouses, to detect explosive fumes, nerve gases (for homeland security), or for air con-

ditioning in buildings. The big improvement potential in chemical sensors is the long-term behaviour. Oxygen sensors, for example, have a service life of about one year. In Nürnberg sensors will be exhibited that are equipped with a new electrolyte, the passivation of which is considerably reduced. The maker specifies a maximum sensitivity reduction of 30 % over a period of ten years. Other manufacturers have also improved and upgraded the product designs in regard to PCB layouts and signal conditioning, for instance, so that now two photometric IR sensors for different gases can be joined in a single measuring head. Additional pressure compensation is optional.

Despite the focus on gas sensor technology, visitors to the SENSOR+TEST ([www.sensor-test.com](http://www.sensor-test.com)) will certainly find other chemical sensors for determination of pH values or conductivity, for example. Just one specialty is an oil-humidity transformer for determination of the water content in oil from 0 to 1 aw (water activity) in a temperature range of -40 to +80 °C. The sensor element is produced in thin-film technology, comprises a temperature sensor, and is contained in a sealed measuring head (100 bar).

## Nominations for SENSOR Innovation Award 2009

On occasion of SENSOR+TEST, to be held May 26-28, 2009 in Nürnberg, Germany, AMA Association for Sensor Technology has announced its international competition for the SENSOR Innovation Award, which is endowed with 10,000 €. »We had more submitted entries than ever before, and their quality was very high. This gave the jury a tough time reaching this year's decision for the first round nominations to the Award,« said jury chairman Prof. Andreas Schütze from Saarland University. A record of 63 innovations were submitted.

Intention of the SENSOR Innovation Award is to reward to the individual developers themselves rather than companies or institutes. Most important judgment criteria are degree of innovation and usefulness for applications. After thorough deliberation, the jury decided on the following finalist contenders for the award:

- Hamburg University of Technology: »PIMMS – Planar Integrated Micro Mass Spectrometer« (Team speaker: Prof. Jörg Müller)
- Owlstone Ltd., Cambridge, England: »MEMS Fabricated Programmable

Chemical Sensor« (Team speaker: Billy Boyle)

- Siemens AG, Vertilas GmbH, Technische Universität München: »Compact and Calibrationless Carbonmonoxide Sensor with 2.3 µm Vertical Cavity Surface Emitting Laser (VCSEL)« (Team speakers: Rainer Strzoda, Andreas Hangauer)

The SENSOR Innovation Award 2009 will be bestowed by AMA Association for Sensor Technology during the opening ceremony of its trade fair, the SENSOR+TEST on May 26, 2009 in Nürnberg, Germany.