

Gold for Platinum Sensors

Temperature sensors made to measure

In the choice of temperature sensors platinum temperature sensors are right at the top on the virtual winner's podium of the world's best players. The well-founded reasons here are the mass deployment in motor vehicles, household appliances, heating/ventilation/air conditioning (HVAC), in electronics or for precision applications in medicine, production or process technology. Reliability, a long service life, accuracy and simple signal processing are the key words here.

Heraeus Sensor Technology is one of the world's most renowned manufacturers of platinum temperature sensors. Through active co-operation with customers and users, projects progress through to mass production quantities counted in the millions. The foundation is the large scale production of sensors in thin-film technology under the watchful eye of a refined quality assurance system. A dependable process with a high level of automation is a prerequisite.

One of the company guidelines is also the contribution to the success of customised developments by using the company's own expertise for optimisation. Enquiries are not just tested for feasibility, but after comprehensive realisation tests they are subjected to the full expertise of in-house development and production specialists to give cost optimised, customer-specific temperature sensors. Also later – during the production phase and after customer consultation – current developments are integrated into running projects. In this way the products are continually maintained at the state of the art.

The primary factor in this respect is that with the expertise from Heraeus Sensor Technology the most important parameters can be adapted to special customer applications. Taking

into account the limits on the materials, these include the dimensions, nominal resistances, tolerances and the temperature coefficients.

LIQUID NITROGEN OR WHITE HEAT. Platinum temperature sensors in thin-film technology from Heraeus Sensor Technology cover measurement ranges from cryogenic ($-196\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$) and medium ($< +650\text{ }^{\circ}\text{C}$) through to high ($< +1000\text{ }^{\circ}\text{C}$) application temperatures. Depending on the type of construction, various resistance values (at $0\text{ }^{\circ}\text{C}$) are available as standard: 100, 500, 1,000, 2,000 and 10,000 ohms. For automatic placement various SMD styles can be recommended, whereby the smallest version (0603V) takes up an area of only $1.7 \times 0.9\text{ mm}^2$ and about half a millimetre in height. The standard version is an oblong chip in various geometries. Aluminium oxide ceramic is used as the carrier material. In contrast to the SMD style, contacting here usually takes place at one end of the component.

After the assembly, platinum temperature sensors in thin-film technology prove to be extremely rugged. Shock tests at 100 g over 8 ms (half sine wave) and vibration stressing with up to 40 g (10 Hz to 2 kHz) are passed with no problem.

Where the respective application demands it, the electrical re-



Fig. 1: In millions of ovens and hot-plates platinum temperature sensors in thin-film technology today control the most varied thermal processes from simmering to catalytic cleaning: Typical results from close co-operation with Heraeus Sensor Technology.



Fig. 2: Circulation pumps of thermal solar collectors are controlled with the signals of platinum temperature sensors (Pt1000) in thin-film technology. Customised products manufactured on a large scale are the speciality of Heraeus Sensor Technology.

sistance of platinum, which is slightly non-linear in relation to the temperature, can be very well described with a simple formula (refer to DIN EN 60751). In the era of signal conditioning with microprocessors high measurement accuracy is no problem – provided the properties of the temperature probe remain stable over a long period of time. In this aspect too, platinum temperature sensors are clearly superior to other temperature sensors. A further consequence of the stable material properties is the easy interchangeability. The characteristic of all platinum sensors is identical within close tolerances.

MASS PRODUCTS FOR INDIVIDUALISTS. «What can be said about Heraeus Sensor Technology,» we asked Stefan Dietmann, Divisional Manager for Thin-Film Sensors. «Tell your readers about our quality,» he replied quite simply. «Quality and large-scale production – no or.»

«You know, it's our experience with sensors for the automotive industry that makes us different. That puts us ahead, because we are good. Here, we are not talking about exotic manufacturing for space or similar applications. Although we can do that too, it doesn't demonstrate our real ability. That lies in our capability for large-scale production of high quality platinum sensors. That is the real requirement for applications such as for example in motor vehicles, kitchen hobs or in the HVAC sector.»

«In this respect we don't just mean the day-to-day business,» emphasises Dr. Martin Turwitt, Managing Director of Heraeus Sensor Technology. «We are continually taking on projects which we consider relevant in a future context. Sensor development can't stand still. This is reflected in our openness to new customers with new applications and in our experience in the development of mass-produced products. Because we are open, open to people with new ideas and application profiles.»

KEEPING FIT. «We can afford to do that, because we know our processes which are well under our control,» comments Dietmann without hesitation. «We know what is possible and

can therefore also assess risks very reliably. Despite that, we don't rest on our laurels. We often bring new technologies into the company where there is potential. Even when an actual project may not perhaps appear to be economical. In this regard we can be very bold, rather than say daring. This is because we want to be certain that our factory for technologies of the future keeps fit – and so we take our stand.»

«Here, we are not just talking about temperature sensors,» adds Dr. Turwitt. «We manufacture large quantities of sensors for air-flow measurement for the automotive industry. And one shouldn't forget our sensor platforms: Thin-film structures in platinum, which other manufacturers use, so to say, as the basic module or substrate for their own gas, moisture, biological or other sensors. Here too, our core expertise comes to bear: We develop, produce and market throughout the world products whose function is based on structured thin films... It is that we are best at. And best of all, of course, we develop together with our customers.»

THE SEAL OF QUALITY. When it comes to production, Dietmann refers later in the discussion – not without a certain amount of pride – to a whole series of guidelines which underline the quality of the thin-film production. For example, DIN EN ISO 9001: 2000 or ISO/TS 16949 for the automotive sector. Then there is also DIN EN ISO 14001. It describes an environmental management system with the aid of which possible environmental effects are analysed and assessed already in the product initiation phase. Dr. Turwitt explains, «That helps us to realise our obligation to society in optimising the production at Heraeus Sensor Technology also under the important aspects of environmental pollution.»

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Fig. 3: Partly because it is subject to calibration, thermal quantitative measurement is one of the most demanding tasks in temperature measurement technology. A domain where pairs of platinum thin-film sensors from Heraeus Sensor Technology demonstrate their long-term stability.

The high melting point at 1772 °C was the reason that pure platinum only became available as a material in its own right in the middle of the 19th century. It was in 1856 that the pharmacist, Wilhelm Carl Heraeus, was successful in obtaining suitable temperatures in a process through the controlled combustion of oxyhydrogen gas (a mixture of hydrogen and oxygen). For the first time, he was therefore able to produce larger quantities of pure platinum and he founded the company W.C. Heraeus GmbH based on this technological lead.

