

# Push Your Limits.

Speed Towards Success.



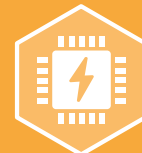
E-Mobility



Battery



Electric Motor



Power Electronic



Charging Plug

## YAGEO Nexensos

Platinum temperature sensors and solutions for electromobility.  
Innovative strength and agility to succeed in the market.

# Push Your Limits.

## An Appealing Growth Market with Barriers.

The electromobility market is extremely appealing and holds great promise, offering interesting opportunities to grow with the market and to profit from it. Economies and policy exert time and profitability pressure on electromobility advancements. Manufacturers also face critical barriers that threaten to derail necessary market breakthroughs. On one hand, consumer requirements for quality and performance in electric vehicles are not being met due to technology and demand bottlenecks. On the other hand, development is frequently reaching the design limits of current technology.

Tapping into the mass market in electromobility requires that manufacturers rapidly dismantle existing barriers to growth while simultaneously reaching the highest levels of efficiency in innovation and production:

#### Barriers to broad market acceptance:

- limited range
- high purchase price
- limitations in comfort
- lack of charging infrastructure

#### Development hurdles:

- resource bottlenecks
- lack of specialized expertise in interdisciplinary development
- exhausted potential in currently available materials and technology
- inadequate cost efficiencies and competitiveness of the applications

### Driving Your Successful Market Establishment.

Whoever wants to be at the forefront of the promising future of electromobility needs to be fast and highly innovative – and those who aim to remain on top need to put reliable products on the road right from the start.

Precarious structures, extreme pressure to innovate and high interdisciplinary standards characterize the dynamic market. YAGEO Nexensos, as a developer and supplier of platinum temperature sensors, supports you in realizing crucial competitive advantages by:

- **increasing your room to innovate**
- **breaking through technical design limits**
- **accelerating your development speed**
- **optimizing your process and cost efficiency**
- **guaranteeing your performance quality**
- **minimizing risks**

The product solutions, development skills and industry experience provided by YAGEO Nexensos help to secure the favourable conditions and quality assurance needed to successfully develop the market and establish your sustainable market presence.

*"We support our business partners to push for innovation in e-mobility. Our development expertise enables sensor products to operate at the limits of technical feasibility, which opens more growth and added-value opportunities for our customers."*



Ralph Meschkat,  
President of YAGEO Nexensos GmbH

# Speed Towards Success.

## A Partner that Puts You in the Pole Position.

In order to expand and secure your position in the growth market, you can draw on **our innovative strength and the resources of a global market and technology leader.**

As an **established and experienced solution partner in the automotive area**, we also possess expertise in large-scale production and knowledge of the particular requirements of the automotive industry.

Take advantage of platinum sensor solutions, as well as **our interdisciplinary development expertise in the areas of materials, integrated circuit and mounting technologies, housing technology and integration.** Leverage our expertise to better utilize new technology concepts and to accelerate the marketability of your products.

Our **development and manufacturing homeland Germany** ensures that you will always have stable and dependable performance and quality in line with German standards for precision and safety.

### Solutions to Put You in the Passing Lane.

Precise sensors, accurate data and reliable controls are fundamental requirements for the **rapid development and testing of high-performance and dependable products.** These factors temperature sensor technology an elementary technology that is key in determining the competitiveness of applications in electromobility.

Essential competitive advantages can be gained through the specific performance benefits of platinum temperature sensors, such as an extended temperature range, the highest degree of precision and reliable long-term stability. These benefits provide **better conditions for product optimization.** They create room for innovative technology advancements, for instance, by making it possible to use new materials and material combinations or alternative handling processes and installation options.

In addition, the profitability of a sensor system depends heavily on the innovative strength within each of the individual value creation steps. This explains why **cost reduction** can be realized by selecting suitable sensors, allowing savings in the use of materials and improvements in the handling processes in packaging and integration.

**Exact customization to the respective requirements of the application** is generally needed in order to achieve the necessary functionality, precision and reliability. Therefore, our experts work closely with application developers.

YAGEO Nexensos develops and supplies **standardized and customer-specific platinum temperature sensor solutions** for applications in electromobility with the highest quality standards **"Made in Germany"**. Whether for monitoring the electrical drive or the battery cell, test procedures for electric motors or the temperature management in the charging cycle and in the modules of power electronics – the innovative development fields are as diverse as their application areas.

*These represent new opportunities to stretch the limits of what can be achieved and to gain essential competitive advantages in the electromobility market.*

### The Challenge

The quality and reliability of charging plugs must be guaranteed over an assumed service life of at least ten years. At the same time, charging performance should also remain unchanged over the long term. That calls for precise, drift-free measurements throughout the service life. In addition, elevated temperatures must be detected quickly in order to reliably protect the user and equipment.

### Our Innovation – Your Advantage

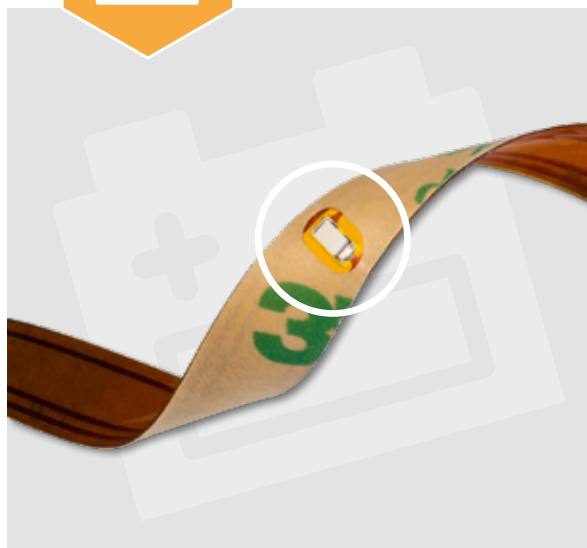
Platinum thin-film sensors have proven long-term stability, providing the required measurement accuracy for the expected service life. The platinum sensor using the SMD design is pre-applied on a PCB and, due to the potential-free reverse side, is simply positioned on the existing pin design using heat shrink tubing or metal springs. This flexible connection opens up new, advantageous design and thermal connection options. Placement directly on the metal pin guarantees the best response time for optimal protection.



### Charging Plug Example



### Battery Example



### The Challenge

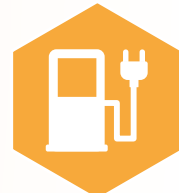
The goal to operate batteries close to the specification limits requires a high degree of measurement precision for long periods of time. In addition, the automotive environment demands the highest degree of reliability. Temperature information for charge and discharge processes must be provided without significant time delay. Simultaneously, measurements are made directly at the cell.

### Our Innovation – Your Advantage

Platinum thin-film sensors are characterized by extremely high stability/low drift, allowing the entire working potential of the battery to be used risk-free for the long-term. Temperature sensors are positioned and connected on flex boards. Using self-adhesive film, the elements can be positioned directly on the hot spots in order to achieve excellent response behaviour. Plug and play assembly is made possible through using AEC Q200 compliant SMD chips in combination with standard connectors.

# Our Senses Are Right on Target. To Put You at the Pole Position in the Electromobility Market.

## Application Areas and Advantages of Platinum Temperature Sensors in Electric Vehicles.



### Charging Plug

With regard to safety aspects in particular, the primary goal of optimized charging times has reached its limits. Platinum sensors' characteristics in drift stability, response behaviour and precision make it possible to meet stringent safety requirements for people and materials and open the door for progressive developments and performance improvements.

#### Push Your Limits:

- + charging time
- + safety for people and material
- + stability
- + long life

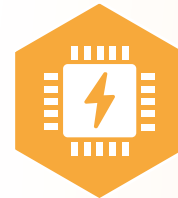


### Battery

Imperfections in measuring the temperature of batteries require larger safety buffers, which in turn reduces the range and performance efficiency. The precision of platinum sensors and their optimized connection with the ideal selection of housings and the reliable regulation of the system in the high and low temperature ranges – over the long term – create greater security, better performance and a longer service life.

#### Push Your Limits:

- + range
- + long life
- + charging performance
- + productivity improvements (at stable system safety)
- + cost optimization



### Power Electronic

Power electronic modules are responsible for energy distribution and the energy management in electric vehicles. The long-term stability and precision of platinum sensors in the measurement range of up to 300°C make it possible to operate close to the load limits of the power chip. As a result, performance is significantly higher at lower energy consumption. At the same time, the higher application temperature presents new opportunities for using future-oriented materials systems based on SiC and GaN. In addition, specially designed sinterable temperature sensors in SMD format support innovative production methods and more compact designs.

#### Push Your Limits:

- + power efficiency
- + range
- + long life
- + cost optimization

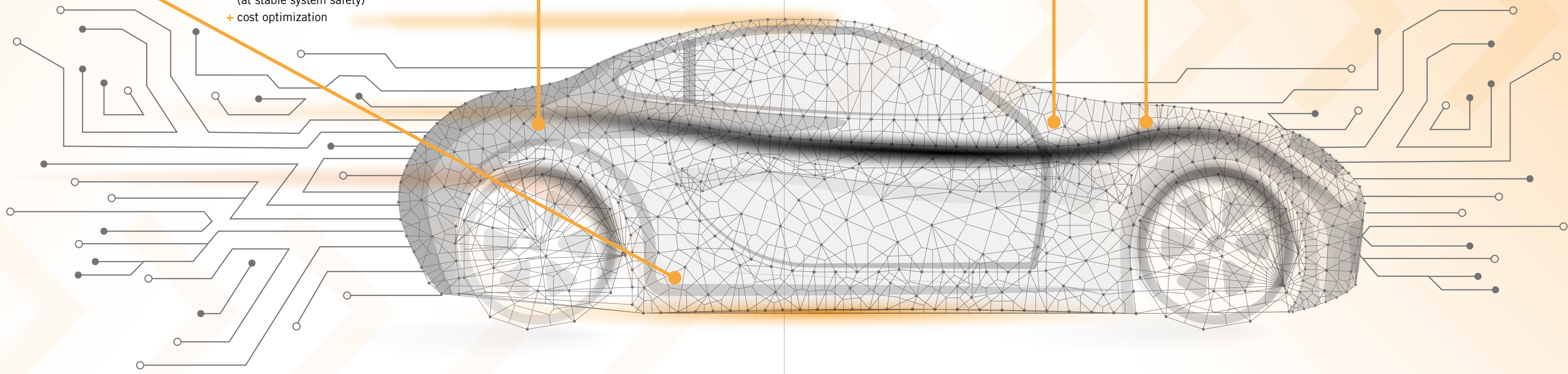


### Electric Motor

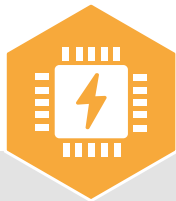
The electric motor is a critical component, a trouble spot besides being very expensive. The large range of temperatures measured, the linear characteristic curve and the stable drift characteristics of platinum sensors make it possible to optimally protect it over the complete life cycle without artificially reducing the power output on precision grounds.

#### Push Your Limits:

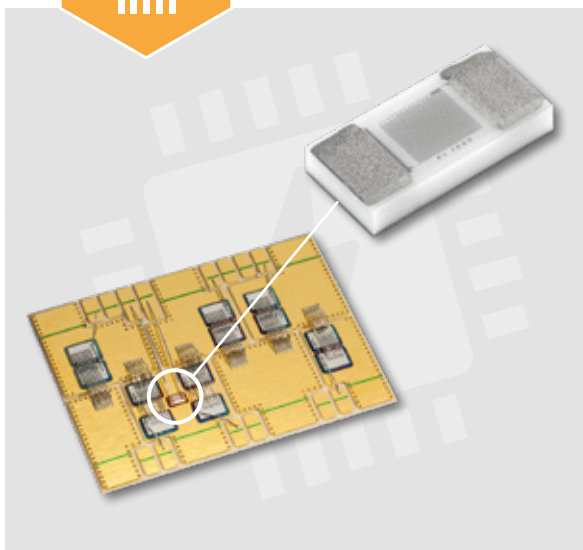
- + range
- + stability
- + long life
- + power output







### Power Electronic Example



#### The Challenge

The automotive industry presents a special challenge for power electronics when it comes to long-term stability and reliability. In addition to more compact designs, development goals also include more efficient production processes that allow, for example, all of the components to be mounted in a single process step. That calls for innovative assembly and connection technology, as well as temperature sensors for operating conditions over 200 °C.

#### Our Innovation – Your Advantage

Platinum temperature sensors can be positioned directly on the power electronics substrate, compactly and potential free, using soldering, adhesive or sintering processes. Temperature is measured at the precise critical location, with a fast response time. Additional structuring and insulation steps are unnecessary due to the insulated functional layer, resulting in maximum design freedom. Long-term stability and precision of the platinum sensor supports the performance of the total system.

#### The Challenge

Electric motors require a high level of protection, particularly under a full load. Temperature overloads must be reliably prevented throughout the entire service life; especially during exposure to mechanical stresses, such as vibration, that occur during driving.

#### Our Innovation – Your Advantage

A “semi-flexible” housing technology provides the sensor element with optimal mechanical protection. The platinum thin-film sensor technology used has proven high stability, and maintains the necessary measurement precision over the entire service life of the electric motor. A variety of available assembly options provide design freedom, including the capability to position the sensor within the motor housing, adjacent to the coil, resulting in faster response times.



### Electric Motor Example



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