

# *Automotive Technologie in Bavaria + e-Car*

GLOBAL PARTNER





*Dear readers,*

„Vorsprung durch Technik“ thrives on innovative ideas: the ideas of our employees and of our suppliers. Many innovations from Audi would not have been possible without good cooperation with our partners over many years. This is why we search all over the world for the most innovative startups and suppliers to team up with and turn ideas into reality.

With issues like alternative drive systems and digitization, the automobile is currently undergoing the biggest transition in its history. We want to actively advance these trends and be the first to bring innovative solutions to the market. To do this, we must create and procure the right technologies. It is increasingly important for us to work closely with our partners from the very earliest stages of development.

We want to be the preferred customer of our suppliers. This is why the Volkswagen Group initiated “Future Automotive Supply Tracks” (FAST), an exclusive supplier program, this spring. The goal is to work with FAST suppliers to bring innovations to market more quickly and to

cooperate with them at our international sites as well. We therefore provide our partners with insight into the new models and sites we are considering. This provides them with especially high planning reliability, transparency and commitment.

FAST qualifying is currently underway and we will be selecting partners for the program until midyear. I am confident that these will also include suppliers from Bavaria. After all, Bavaria is a highly innovative location for technology. Many suppliers with superior technological know-how are headquartered here.

I am also certain that in the future, success will go to those who have the best partners at their side. For this reason, we are strategically integrating selected suppliers today as a way to set the course for tomorrow. We are working together to secure the future of individual mobility with innovation.

Dr. Bernd Martens

Member of the  
Board of Management of AUDI AG,  
Procurement

# Automobiltechnikum Bayern GmbH in Hof



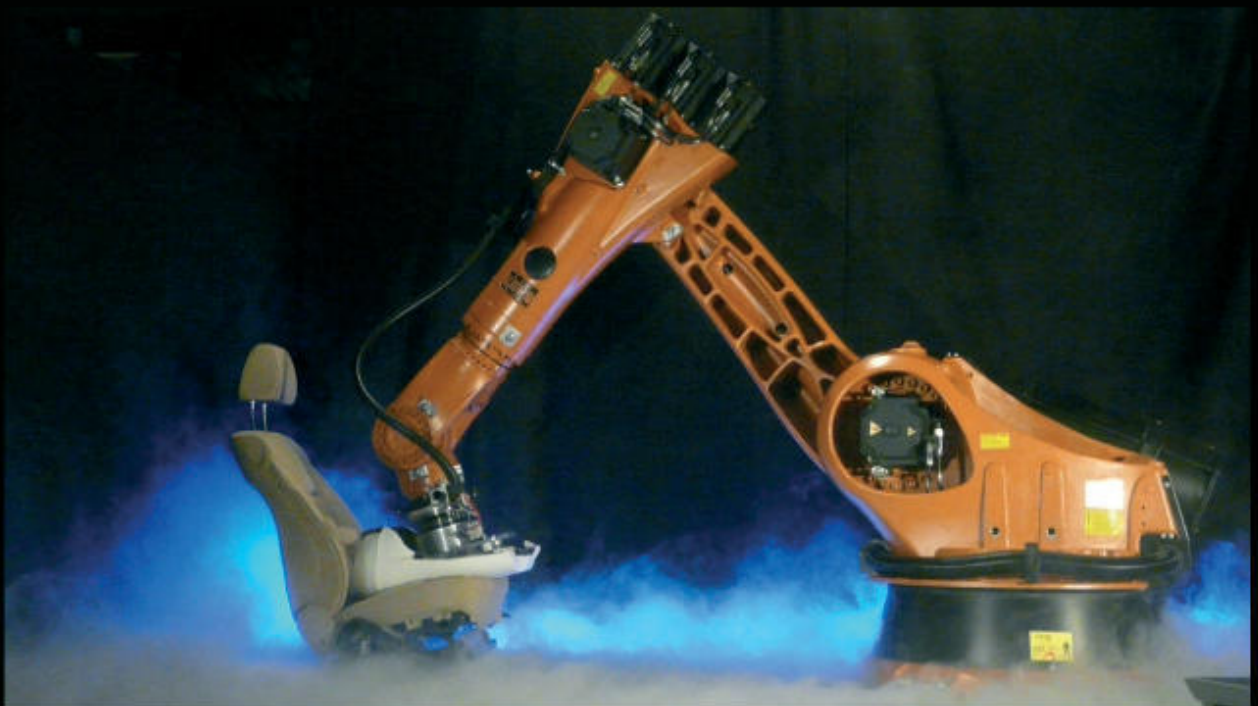
Founded by the Bavarian Ministry of Economic Affairs, Infrastructure, Transport and Technology, the test laboratory is accredited according to EN 17025 and situated within the Automobilzulieferpark (= Automotive Supplier's Park) Pole Position at Hof-Gattendorf. It performs tests and experiments in accordance with customerspecific test instructions and requirements. As regards concepts, the tests are supervised by competent staff. Engineering services and solutions to problems as well as constructional adjustments are offered individually.

Concerning service strength, three Occubot seat test robots made by KUKA are available at ATB. Using a system for changing test dummies does not only provide an automated programme process, but a continuous picture documentation as well. At the same time the test loads are constantly observed and readjusted. The area of service strength comprises as well four spring testing machines, versions "Schenck" and "Reicherter Short and Long Stroke". The servo-hydraulic testsystem with a total of 8 hydro-pulse cylinders operates with loads of up to 40 kN and maximum strokes of 400 mm.

Two electric stroke cylinders with loads of up to 20 kN and maximum strokes of up to 350 mm can also be operated in connection with a climate chamber of 1,5 m<sup>3</sup>. Tests with lower loads may be run by using various pneumatic stroke cylinders.

The area environmental simulation disposes of 10 climate chambers with sizes ranging from 240 litres to 30 m<sup>3</sup>, the latter being accessible by vehicles. Temperature ranges lie between -70 °C and 180 °C, the relative humidity can be programmed continuously between 10 % and 97 %.

Forschung und Entwicklung





The two heating furnaces with a volume of up to 720 litres allow tests up to 300 °C. The salt spray fog chamber with a test volume of 2 m<sup>3</sup> complies with all established test standards, also for condensation tests.



The measuring laboratory contains a material testing machine for tensile and pressure tests, several digital tracers by HBM

with up to 8 measuring channels per system, an infrared camera and a digital light optical microscope with up to twohundredfold enlargement. Furthermore, photogrammetric surveys are offered, thereby using a system produced by AICON respectively a stripe light scanner produced by Steinbichler.

The 90 kN shaker is fitted with a Head expander measuring 150 cm x 150 cm. The frequency range goes from 5 Hz to 3000 Hz. Maximum acceleration is achieved at 150 g. In addition, the control system enables tests in multisinus mode.

In addition, a climate chamber of 15 m<sup>3</sup> may be positioned over the support plates.

For further informations please see our homepage:

[www.atbayern.de](http://www.atbayern.de)



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# Piloted driving



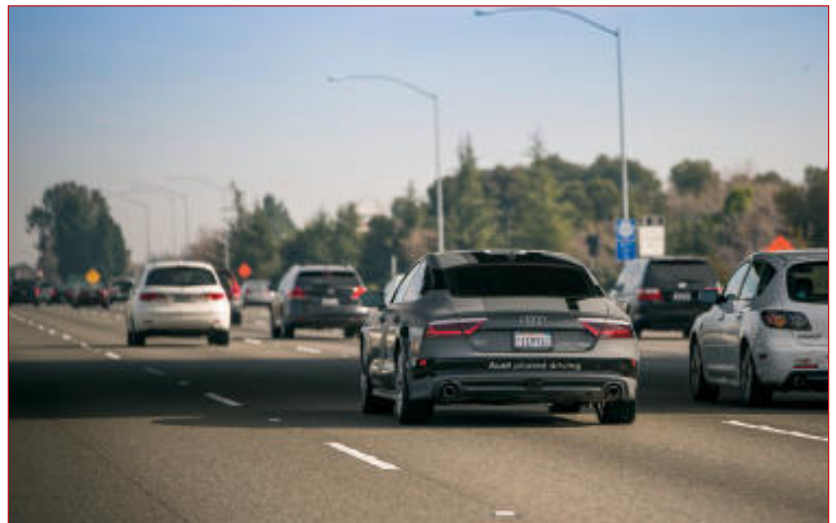
## Taking the fun of driving to a new dimension

Audi pioneered piloted driving and has repeatedly documented technical progress in spectacular demonstrations. A TTS without a driver grooved the brand's four rings into the surface of a salt lake and sped up Pikes Peak in drift mode without a driver. On a race track, an RS7 Sportback with an empty driver's seat drove at the limit of driving dynamics. Audi has demonstrated the next steps in piloted driving on public roads as well. The most recent highlight is a piloted journey spanning two day under real-life traffic circumstances on the highway from the West Coast all the way to Las Vegas.

### *Piloted driving in traffic jams*

The function for piloted driving in traffic jams, which Audi is currently developing, builds on the Audi adaptive cruise control system including congestion assistance. In the future, the congestion assistant will provide support to the driver in slow-moving traffic on expressways, taking over the steering between 0 and 65 km/h (40.4 mph) and also automatically accelerating and braking. When the system reaches its limits, such as when the traffic jam dissolves or at the end of a divided highway, it will prompt the driver to take over the wheel again. Should he not do so, the system will bring the car into a state of minimum risk, that is to say to a standstill.

An important sensorics component is the radar system. Just as does the current adaptive cruise control with stop&go function, it will monitor the area ahead of the car. A video camera with a wide angle of aperture detects the lane markings as well as pedestrians and objects, such as other vehicles and guard rails. Up to twelve



Audi A7 Sportback piloted driving concept ■

ultrasonic sensors monitor the car's perimeter.

A new addition to the sensor portfolio is the laser scanner, which delivers highly precise data at a distance of up to 80 meters (262.5 ft). Every second, its laser diode emits nearly 100,000 infrared light pulses invisible to the human eye. The controller computes a highly detailed perimeter profile from the light reflections. The laser scanner covers a 145-degree field on four levels. The laser scanner has great strengths:

thanks to its wide opening angle, it will very quickly detect cars merging in ahead. It is also fully functional in the dark and detect any kind of objects, even ones such as fences presenting a regular pattern or ones, such as white walls, that have no visible structure. ■

### *Piloted driving and parking*

Parking maneuvers in tight situations are unpleasant – conventional parking spaces or narrow garages often make it difficult for



Audi Park Assist ■

the driver to get in and out of the car. Audi's "parking pilot" system enables a drivers to get out of the car and park it remotely using the radio key fob or a smartphone. The system uses twelve ultrasound sensors, four top-view cameras and a laser scanner to monitor the car's perimeter, securing the parking process with multiple redundancy.

As soon as the perimeter sensors detect a suitable parking space or garage, the parking pilot will offer the piloted parking function to the driver. If the driver then gets out of the car, all he or she needs to do is to press the key fob or the corresponding button on the smartphone to initiate the process, the driver retaining responsibility for the entire parking process until the car comes to a safe and complete stop.

The system requires the key to be in the immediate vicinity of the car, thus ensuring that the driver is close enough to the car to assess the situation at any time. If the car's onboard sensors detect obstacles in the car's path, the system will interrupt the parking process until the obstacle has been removed. The system will lock the car's doors at the beginning of the parking process and maintain them locked until

the car has reached its final position. On reaching its parking position, the system will shut down the engine, secure the car against unintentional motion and provide the driver with a confirmation message. Leaving the garage or parking space is just as simple.

Audi first demonstrated fully functional piloted parking in garages at 2013 CES. This involved dropping off a car at the entrance and using a smartphone to send it to its parking space. An app enabled the driver to retrieve it later or to select a time at which to pick up the car at the garage's exit. ■

## *Functional centerpiece: the driver assistance master control unit (zFAS)*

Today's driver assistance systems mostly are managed by discrete controllers. In the future, Audi will deploy a centralized domain architecture in which all available sensor information converges in a central driver assistance controller (zFAS). This computes a comprehensive model of the car's perimeter which is then served to all assistance and all piloted driving systems.

The zFAS board uses cutting-edge multi-core processors which taken together achieve a processing power equal to that of the entire electrical architecture of a well-equipped medium-segment automobile. The new board currently is about the size of a tablet PC, but its form factor is set to shrink further. Its modular concept means the board is flexibly scalable and thus protected against obsolescence. Audi will introduce the central driver assistance control module to production along with the systems for piloted driving before the end of this decade.

Interaction with Audi connect enables Audi's piloted cars to gather information while driving. The data generated by the zFAS is routed to an IT backend in the



Central driver assistance control unit (zFAS) ■



550 mile piloted drive from Silicon Valley to Las Vegas ■

Cloud via the mobile phone network, using LTE where available. In the backend, the data is processed using machine learning and artificial intelligence algorithms and then transmitted back to the car. The car thus continuously expands its ability to master complex situation. Every situation Audi's piloted cars experience adds to their intelligence. ■

### ***2015: Silicon Valley – Las Vegas***

In conjunction with CES, Audi will demonstrate the advanced capabilities of its future technologies for piloted driving. The brand will be organizing a long-range journey involving the Audi A7 piloted driving concept completing a piloted voyage from Stanford in Silicon Valley to CES at Las Vegas. Participating journalists received appropriate training a few weeks ahead of the event at Volkswagen's testing track in Arizona. Drivers will take turns on the trip from the West Coast to Las Vegas. A professional test driver from Audi will be sitting in the front passenger seat to provide added safety.

The journey is an event jointly organized by Volkswagen's Electronics Research Laboratory (ERL), Volkswagen Group research and development and Audi. It consists of two day-long stages.

Bakersfield, California, will serve as a midway stop. The journey will see the Audi A7 piloted driving concept covering a distance of more than 550 miles (round about 900 kilometers).

The system deployed in the A7 Sportback represents the most recent level of technology and is capable of assisting a driver even in higher speed ranges. The car is capable of managing lane changes and overtaking, it can also automatically accelerate and brake. Before switching to the lane on the left or – as is permissible in the United States – on the right, the system will align the car's speed with that of surrounding vehicles. If it determines that

distance and available time are sufficient, it will initiate a swift and assured change of lanes.

This experimental vehicle uses various series and close-to-series sensors. The long-range radar sensors that are part of the adaptive cruise control (ACC) and Audi side assist (ASA) systems monitor the area ahead of the car and behind it. Two mid-range radar sensors at the front and rear, oriented left and right, complement the 360-degree surround vision. Laser scanners with close-to-series technology are installed in the singleframe grille and in the rear apron. They provide redundant information to facilitate fine-tuning of static and dynamic objects during piloted driving.

A high-resolution 3D video camera, a prototype of the upcoming device generation made by Audi's partner Mobile Eye, looks ahead across a wide angle. Four small cameras at the front, the rear and in the side mirrors observe the car's perimeter. Navigational data provides general orientation.

For safety reasons, when the system comes up against its limits – In urban areas, say – it will prompt the driver to press two keys on the multifunction steering wheel. This returns the driv-



Long-distance test drive successfully completed: Audi A7 Sportback piloted driving concept arrives in Las Vegas following 560 mile drive piloted driving concept ■



Audi piloted driving @ the limit - Audi RS7 piloted driving concept and Audi RS7 Sportback ■

er to active control of the car's longitudinal and lateral motion. The prompt is issued in due time before the car reaches the relevant zone.

Several warning signals act together in these cases: colored LEDs in the windshield base, messages in the driver information system and in a special display, the Central Status Indicator (CSI) and an acoustic prompt to take control. If the driver should ignore all these warnings, the system will activate the hazard flashers and bring the car into a status of minimum risk, in this case, standstill in its current lane. ■

## 2014: Hockenheimring

Piloted driving can be extremely dynamic and thrilling, for example Audi's demonstration drive on Hockenheimring speedway in the fall of 2014. At the season's finale of the German Touring Car Masters (DTM), the Audi RS7 piloted driving concept completed a lap at racing speed without a driver present. Its designers named the car "Bobby," a tribute to ex-Audi driver Robert William "Bobby" Unser who won at Pikes Peak, Colorado, in 1986.

The 412 kW (560 hp) Audi RS7 piloted driving concept used in this demonstration had specifications broadly identical with series production. However, the car automatically

controlled its electromechanical power steering, its brakes, its throttle valve and the eight-speed Tiptronic automatic gearboxes feeding the power to the mechanical quattro drive.

This experimental vehicle used specially corrected GPS signals for orientation on the 4.6 kilometer (2.9 mi) track with its 17 turns. Accurate down to a centimeter, these differential GPS data were transmitted to the vehicle via automotive-standard



Audi RS7 piloted driving concept "Bobby" ■

WLAN and redundantly via high-frequency radio. In parallel, a rapid image-processing software constantly matched current 3D camera images with image information stored onboard.

Comprehensive networking and ultraprecise control of all systems relevant for driving allowed Audi's engineers to drive this technology carrier to the limits of vehicle dynamics. The world's sportiest piloted driving car completed its lap at

Hockenheim following an extremely precise racing line, going full throttle on the straightaways, accurately braking ahead of curves, all with exact steering and perfectly measured accelerator actuation at the end of a curve. Deceleration forces exceeded 1.3 g, while lateral acceleration in curves was up to 1.1 g. Top speed was 240 km/h (149.1 mph), while lap time was just over two minutes, or about what it would be with a professional race driver at the wheel. ■

## 2014: piloted driving in Florida and California

Audi is rapidly expanding its competence in piloted driving in the USA. In Florida, the brand became the first vehicle manufacturer to be granted a testing license for piloted driving in this state. In the summer of 2014, the brand was once again the world's first automobile maker to conduct a public test with government representatives and journalist on Lee Roy Selmon Expressway outside Tampa, Florida. In fall, the company obtained the first testing license under new regulations in California. ■

## 2013: Nevada and Las Vegas pioneer piloted driving

In 2012, Audi became first automobile maker to receive permission to operate piloted driving cars in public traffic from authorities in the US state of Nevada. In January 2013 and 2014, Audi unveiled new systems for piloted driving in traffic jams and for piloted parking at the International Consumer Electronics Show (CES) in Las Vegas. ■

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# Plug 'n' Play for doors!



*Brose helps their customers reach their ambitious weight-saving goals and focuses on components made of innovative lightweight materials such as a glass-fabric reinforced polypropylene matrix, for instance. The company plans to use this thermoplastic composite, among other applications, for door systems. Intensive tests and validations have been carried out to meet the comprehensive requirements profile and ensure smooth high-volume production.*

The EU regulations for CO<sub>2</sub> emissions are still hanging like the sword of Damocles over the automotive industry. By 2021, CO<sub>2</sub> emissions must be reduced to 95 g/km. Otherwise, carmakers risk penalties of 95 euros for each gram that exceeds this threshold. In this context, the vehicle weight is pivotal to meeting these requirements.

A weight reduction of 100 kg represents fuel savings of between 0.3 to 0.5 liters for every 100 km driven and reduces CO<sub>2</sub> emissions by between eight and eleven grams per kilometer.

However, economic constraints also play a major role in the necessity to reduce weight. Overly expensive materials and highly complex production processes would drive up vehicle prices.

These aspects already define some of the key parameters for developing an innovative door system: it must be significantly lighter than current modules without costing much more and comply with current safety standards. This raises the bar for crash safety in particular. ■

### *Door systems made of thermoplastic composite: around 40 percent lighter*

In an effort to meet these challenging requirements, Brose's engineers in development thoroughly tested different materials and concluded that thermoplastic composite consisting of a continuous glass fiber reinforced polypropylene matrix is the material with the greatest potential. Compared to current plastic door sys-

tems, the thermoplastic composite modules are 40 percent lighter. The carrier plate consists of glass fabric reinforced polypropylene combined with functional elements made of the same material with glass fiber reinforcement. Consequently, the component wall thickness is just 0.5 mm. Although the glass fiber reinforced thermoplastic composite also holds some minor disadvantages compared to the carbon fiber variant regarding bending stiffness and tensile strength, the price comparison speaks for itself. Intensive tests have shown that the material properties are more than adequate for the intended weight reduction of 350 to 500 grams compared to the current standard.

Door systems



*Affordable lightweight design for high-volume manufacturing: the heated mat of glass fabric reinforced polypropylene (thermoplastic composite) is thermoformed into shape in the injection-molding machine while the functional elements of glass fiber reinforced polypropylene are injection-molded ■*



Also true for future door systems: it must be possible to implement one-to-one package space definitions and technical specifications of current series production standards ■

One of the OEMs' core requirements of future door systems is the Plug 'n' Play feature: it must be possible to implement one-to-one package space definitions and technical specifications of current series production standards. This means that component parts such as wire harness, window regulators and control units can be easily integrated into the thermoplastic composite door system. In addition, it must also be possible to actively influence noise produced by the window regulator or suppress undesired vibrations emanating from audio loudspeakers, for example. ■

### *Production similar to traditional injection molding process*

Thanks to a new process flow, series production is also uncomplicated since the thermoplastic composite door systems are manufactured in a single step, similar to the traditional injection molding process. The best part: the one-shot process combines several production steps in one process, namely thermoforming

and injection-molding. A pre-punched, heated mat of glass fabric reinforced polypropylene is thermoformed into shape while the functional elements of glass fiber reinforced polypropylene are injection-molded. In this context, it was crucial that Brose succeeded in maintaining almost the same cycle time for the thermoplastic composite and traditional injection-molding process to ensure the door module's suitability for high-volume production. ■

### *Multiple tests and simulations*

Brose's specialists also initiated a series of tests and complex simulations to bring the production process to series production level. The draping process in particular, that is the forming of the thermoplastic composite parts, had to be analyzed in detail since every change to the fiber angle also affects the fiber properties, which could be crucial in the event of an accident.

Adjusting the fiber orientation in crash-relevant areas ensures improved strain-to-failure and hence

safety. The new material even provides additional benefits in crash tests: the use of glass fabric increases the impact resistance compared to glass fiber reinforced materials. Thus, more energy can be absorbed in the event of a car accident, and fracture failures almost eliminated. The modules made of thermoplastic composite scored even better than current door systems in intensive impact resistance tests, absorbing between three to four times more energy. Furthermore, the components neither chip nor splinter.

What's more, by providing plenty of design potential for the high-precision shaping of the wall thickness, fiber orientation and layer structure, additional strength-relevant functions can be transferred to the module: where more strength is required, the material can be reinforced or the fiber orientation adjusted; in all other places the carrier plate remains ultra-thin. ■

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#### Turnover 2014

About 5.2 billion euro

#### Clients

About 80 automotive manufactures and more than 30 suppliers

#### Employees 2014

More than 23,000

# Methodical requirements management



## Prerequisite for efficient and successful development in the automotive sector

### How much requirements management does a company – my company – need?

Basically, requirement management methods are used today in every business—either consciously or unconsciously. After all, the customers' requirements on a product or service have to be met. Apparently companies can successfully survive on the market without ever explicitly dealing with the issue of requirements management. Under certain factors, however, this attitude can also prove to be a fallacy and can make target-oriented and structured requirements management indispensable. This fact is becoming increasingly recognized, so that ultimately the issue has acquired the necessary significance in most companies. ■

### Factors for the use of requirements management methods

When considering the necessity of using requirements management methods, it is helpful to regard its primary aim as the „creation of a common understanding regarding the object of development between all the parties concerned (stakeholders)“.

It is thus clear that two factors are decisive for the use of structured method of requirements management: on the one hand the num-



*The ESG experts take on the operational and conceptual requirements management in product development and offer support and consulting services ■*

ber of stakeholders and on the other the complexity of the object of development. ■

### Methods, processes, and tools in requirements management depending on the factors

The table on the following page lists some methods of requirements management and shows how they depend on the relevance of the two factors mentioned above.

This table, however, must not be generalized in any way. Therefore, it does not indicate that a method is inappropriate in a particular constellation of factors. Rather,

the table gives an indication as to when a method gains importance. ■

### Methods, tools and processes in requirements management – an investment in the future

Many projects usually start small, in other words, with a limited number of people involved in development and with a relatively simple object of development. Even if the number of stakeholders and the complexity of the object of development increase over time, sometimes investment in structured requirements management methods appears to be unnecessary. This is unfortunately often the opinion of even experienced

Methods 0 : = neutral + : = important ++ : = very important	Low number of stakeholders	Low number of stakeholders	High number of stakeholders	High number of stakeholders
	Low complexity	High complexity	Low complexity	High complexity
Stakeholder analysis	0	0	++	++
Documented requirements	0	+	+	++
Review of requirements	0	+	+	++
Prioritization of requirements	0	+	++	++
Collection techniques	0	+	0	++
Defined product development processes	0	0	+	++
Version/configuration/change management of requirements	0	++	+	++
Modeling techniques	0	++	0	++
Traceability of requirements	0	++	+	++
Scoping	0	++	+	++

Table 1: Necessity of requirement management methods depending on the factors "stakeholder number" and "complexity of the object of development" ■

developers. Since they usually witnessed the beginning of the development, the requirement management methods do not seem necessary to them.

Occurring deficits in requirements management become apparent only slowly and over time, for example, when experienced developers leave the project. Errors pile up that are caused by changes to the object of development, and maintainability becomes increasingly problematic. A good practical example here is the elec-

trical/electronic systems in the automotive sector, which have become increasingly complex over the decades, at the same time as the number of development engineers involved has grown.

After sometimes massive quality problems and an associated explosion of costs in this area since the end of the 1990s, requirements management has overcome initial acceptance problems and has now found its way to almost all automobile manufacturers. Structured methods that, among other things,

determine, specify, model, and review requirements are therefore indispensable in their development departments today.

ESG has supported this development for many years in a wide variety of projects of well-known OEMs. Our experts design and implement process, method and tool-based solutions in requirements engineering. ESG takes on the operational and conceptual requirements management in product development and offers support and consulting services. ■

## ESG. Engineering in the fast lane.

*As your partner for complex electronics and IT systems we are working at top speed on the automotive future. Our technological expertise and special customer focus enables us to deliver tailored and intelligent system solutions for the mobility of tomorrow. ESG is an engineering partner, process expertise provider, technology consultant and IT expert all in one.*

*In order to guarantee maximum customer benefits and optimal project implementation, we have set up eight Competence Clusters within the ESG Automotive Division which focus on the following topics:*

*ADAS & Embedded Software, HMI & Infotainment, Connected Car, Training & Learning Solutions, Diagnostics, Process Management, eMobility and Test & Integration.*

*Together we are putting the future on the road. ■*



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# Network of Automotive Excellence:



## The Cross-Sector Network

NoAE is a free, open initiative for the mobility sectors and their cooperation partners. The starting point was ten years ago with the automobile and supplier industries. This led to the development of an international and cross-company expert network.

The objective is the exchange of ideas on

- strategic
- organizational and
- technological

questions and challenges for the company within and beyond the sectors.



Eine Initiative von  
NoAE Network of Automotive Excellence



NoAE was founded in 2002 by well-known personalities of the automotive branch and with the collaboration of the European Commission. The ever increasing market demands for cross-sector solutions lead to necessary adjustments in the network. ■

## FutureCityFactory – Project Launch 2014

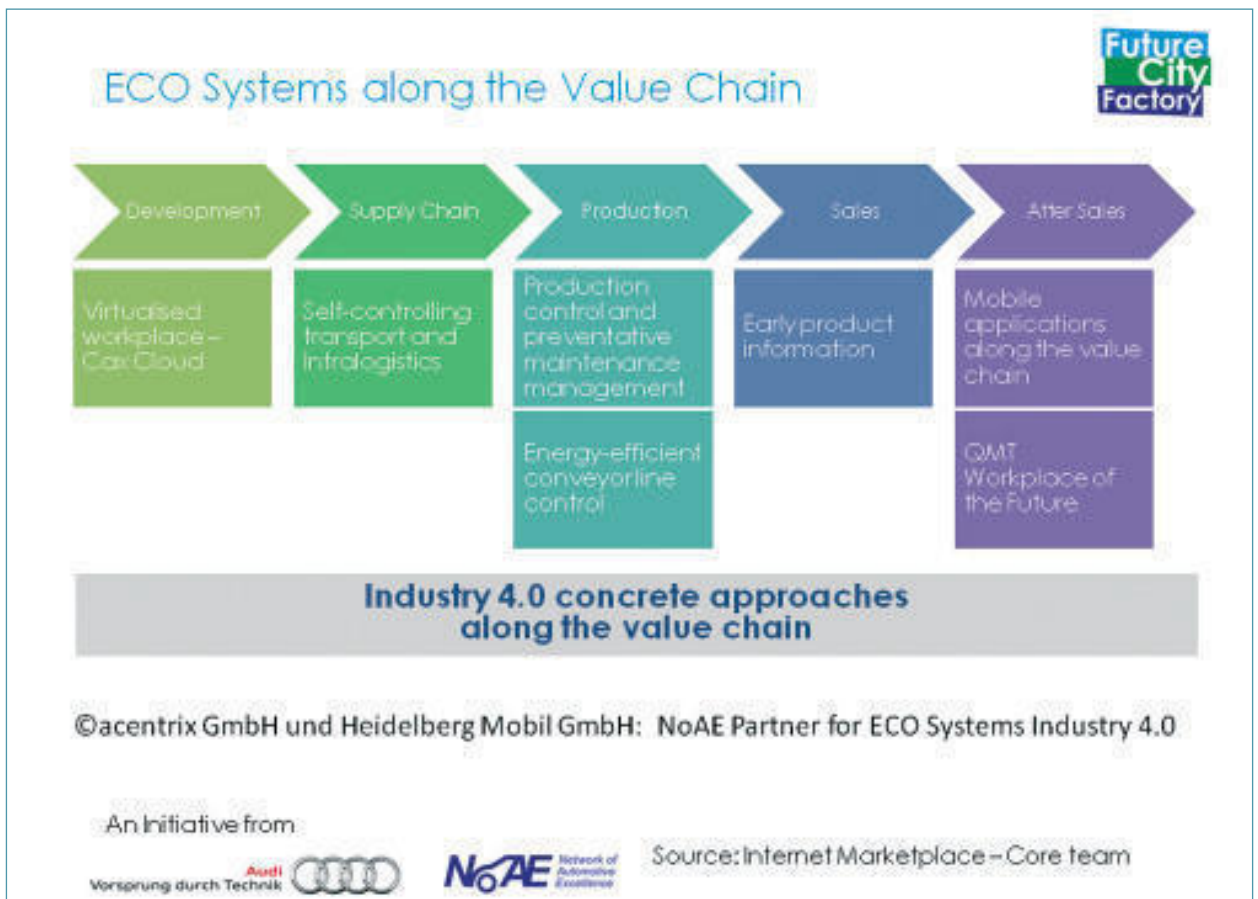
In the Spring of 2014, the Audi factory and Network of Automot-

ive Excellence (NoAE) created the FutureCityFactory Initiative.

Invited to the Kickoff-Event on April 28, 2014 were 140 experts from the industry, science and municipalities, who discussed the tasks of the future with regard to living, working and production in the City of the Future.

As a result of the feedback from participants as well as from the discussions in the following months, in particular with municipalities and pro-

Network of Automotive Excellence



## Project Approaches for Urban Districts

### City districts and new settlements



### Conversion spaces, e.g. former military barracks



### Business and commercial parks



### Plant facilities in and around urban areas



An Initiative from



ject partners, the project developed two main focal points, which are to be implemented the same as the procedure for the initiative “Transforming Ideas Into Projects” ■

### Industry 4.0: Implementation in ECO Systems

The successful launch of Industry 4.0 is only possible with the cooperation of various partners and interdisciplinary technologies:

The challenges along the value chain must be identified and the first use cases defined:

During customer workshops, the demands are analysed and solutions are provided in terms of ECO Systems, i.e. constructing individual modules into solutions. ■

### Working and Living in Districts: Implementation in ECO Systems

Business parks, commercial and technology parks, city districts,

new settlements and the reuse of old industry and military sites are especially suitable for starting the mobility and energy transition in a specific location as well as for implementing it into concrete, integrated projects.

The decisive factor for success within the scope of district development is interlinking IT infrastructure, energy and mobility into integrated solutions for industry, trade and municipalities.

The system technical district commitment begins with the bundling of individual innovations, solutions or technologies into ECO systems.

The merging of these ECO systems to integral district solutions results in significant resource savings (time, money) and the reduction of risks. ■



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Additional Information in the internet

Platform for FutureCityFactory  
www.future-city-factory.de

Social Networks  
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Technical areas. Mechanical engineering, electrical engineering, IT engineering, physics, chemistry, biotechnology, pharmacology, life sciences.

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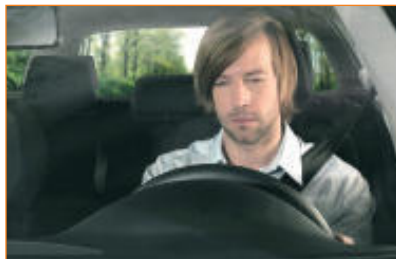


# Osram Opto Semiconductors: an innovation driver in automotive lighting

## Advanced optical semiconductors for headlights and safety systems

*Osram Opto Semiconductors is a leading player in opto-electronic semiconductors thanks to its unique know-how. For more than 40 years this high-tech company has been developing and producing state-of-the-art light emitting diodes, laser diodes and sensors that meet the highest quality standards for use in vehicle lighting (including infrared light) and optical sensor systems in cars. As the world's number one in automotive lighting, Osram bases its success on constant innovation leading to such products as adaptive headlights and head-up displays, and makes use of close partnerships with other companies and research institutes to deliver these innovations.*

Light emitting diodes (LEDs) are being used more and more in cars thanks to their numerous advantages. Their small size in particular is of great interest to car manufacturers because it opens up a wide range of design options. Headlight designers, for example, are limited only by their own imagination. The arrangements of LEDs on daylight running lights that look like eyes complete with eyebrows are a familiar sight on our roads. From design to functionality. In October 2014, Osram Opto Semiconductors presented the prototype of a new LED designed to be used in headlights. Its luminance is three times greater than that of its predecessor. This opens up the possibility of creating extremely compact headlights because the reflectors and lenses can be made much smaller. Adaptive lighting solutions are also playing an important role in forward lighting. In the BMBF-sponsored  $\mu$ AFS project, the Regensburg-based high-tech company is developing a new class of energy-efficient adaptive LED



front lighting systems together with its partners Daimler, Hella, Osram Specialty Lighting, Infineon and the IZM and IAF Fraunhofer Institutes. In autumn last year the partners presented the important first milestone, a new type of LED chip that has not one but a staggering 256 light points.

Greater and greater importance is being attached to safety systems in cars, such as pre-crash sensors for avoiding collisions and driver monitoring systems for preventing critical situations arising because of fatigue or lack of attention. Such systems require fast-response sensors and high-performance infrared light sources or IR lasers that can flood the relevant areas with invisible light even over large distances. Depending on the particular appli-

cation, wavelengths of 850 nm or 940 nm are used, which the human eye can barely see and which therefore do not dazzle or detract. LEDs and laser diodes enable high-quality head-up displays to be developed which will be able to project important information, such as navigation instructions or pictures of the area in front of the vehicle captured by a video camera, directly onto the windshield, thereby making driving even safer. ■

[www.osram-os.com](http://www.osram-os.com)

**ABOUT OSRAM OPTO SEMICONDUCTORS**  
OSRAM, with its headquarters in Munich, is one of the two leading lighting manufacturers in the world. Its subsidiary, OSRAM Opto Semiconductors GmbH in Regensburg (Germany), offers its customers solutions based on semiconductor technology for lighting, sensor and visualization applications. OSRAM Opto Semiconductors has production sites in Regensburg (Germany), Penang (Malaysia) and Wuxi (China). Its headquarters for North America is in Sunnyvale (USA). Its headquarters for the Asia region is in Hong Kong. OSRAM Opto Semiconductors also has sales offices throughout the world. For more information go to [www.osram-os.com](http://www.osram-os.com).

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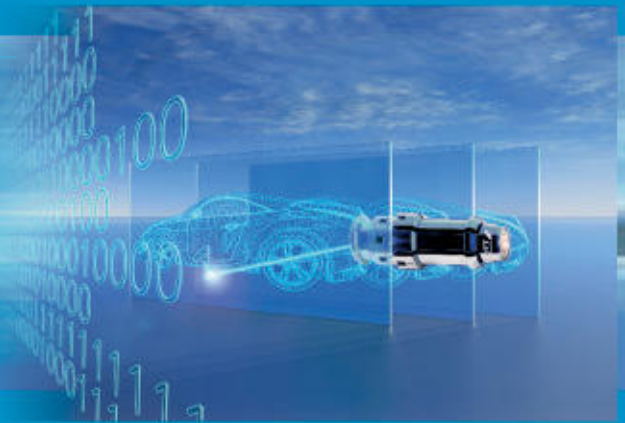
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# Enthusiasm for tomorrow's Technologies



The automotive industry convinces their customers with enthusiasm and innovation. The most innovative automakers are from Germany and those are important for the industry's growth engine because they lead to a significant customer benefit. „Be innovative or die“ this evergreen-sentence of management literature has lost none of its validity.

OTT-JAKOB as the leading global manufacturer of tool clamping units, faces up to the challenges of the future and develops technology that offers new perspectives for users of modern machine tools to work with highest productivity and manufacture quality products which contribute to the enthusiasm of customers. If a tool interface, the turret of a lathe as a major carrier of the tool cutting edges, became obsolete it needs good ideas and partners to initiate a change.

The use of a variety of alternative solutions for clamping tools installed at users and manufacturers shows alike that it is urgent to promote an innovation that allows standardization in the tooling-turret and at the same time consider all current requirements.

OTT-JAKOB, as the leading manufacturer of tool clamping technology, strikes on this goal. Together with the WZL, RWTH Aachen and other project partners, a research project was



*With the Ott-JAKOB Chip-Control-Sensor-System it is possible to measure each dirt between the tool holder and the spindle nose which is bigger than 0,01 mm. Thereby you can guarantee a permanent high class production ■*

initiated, target a new, unified tool interface in lathes.

In two years of intensive research and development, the new PTI interface (Polygonal Turning Interface) was created, which meets all the requirements of the market in aspects of economy, precision and innovation and is now preparing to replace conventional, often outdated or inefficient solutions.

In practice, very different tools are used on turret disks: One-piece turning tools, adapters for tool holder, modular tooling systems and power tools. This variety of tool types requires different demands on the tool clamping system. The new interface thus should cover all possible requirement profiles.

The detailed requirements are a high torsional and bending stiff-

ness, a superior repeatability and the ability to preset the cutting edge outside the machine. The fact that a highly productive manufacturing with the highest precision and quality and the utmost efficiency and flexibility must be possible is obvious. Driven tools require beyond that a large shaft diameter of the interface, so that a high torque power can be transferred to the tools.

Another important point is the compact dimensions to obtain sufficient working space for equipment manufacturers and thus to expand the processing options for the workpiece.

The ultimate objective of the project group is a standardization of the new PTI interface. It is important to take into account the respective market conditions. In particular, it should be possible to include other interfaces,

# Tool clamping units

in order that the customer existing tool technology can be used.

At AMB 2014, OTT-JAKOB showed that with the right tool carriers it is possible to use HSK- and PSC-Capto™-tools. The new system must be flexible for the quick change and, of course, more economical than tool clamping systems currently used.

The PTI-turret plate is equipped with side holes which serve on the one hand the operating parts for a clamping system and if this system is not installed you can actuate through these holes the quick-change systems of HSK and PSC (Capto™ tools).

The tools with manual tool clamping systems of OTT-JAKOB are operated with an Allen wrench. For HSK-tools the pullback force is produced by a Archimedean clamping bolt. This achieves a constant tension force of the HSK tools.

In PSC-Capto™ tools the insertion force is achieved by spring force. With the geometry of the



*A regularly measurement of the pull in force guaranteed a safe process of machining ■*

collets and the clamping cone we are able to achieve high forces despite large tolerances of the clamping grooves in the tool. The release and ejection of the tools is ensured with an eccentric bolt.

Both tool clamping systems offer compact design and are very

user-friendly because the functions of clamping and releasing the tools are possible with little effort.

Especially in the production of small batch series using turning milling center, tool changing times are a very important efficiency criterion. If there is no fully automatic tool changer possible, manual tool change must be possible quickly and without much effort with precision + process reliability. This is regardless whether the tool interfaces HSK-T or a version of PSC (Capto) is used. Clamp your tools with a PTI turret in future, and you will be excited about the high product quality.

The research project REVOSIT was launched on January 1st 2013 with the first section. From 2015 the Sub-section 3 starts as REVOSIT 2 with the companies MIMATIC, SAUTER, WEISSER and OTT-JAKOB under the leadership of WZL-Aachen. This is supported by an extended group of experts with the goal to win the market and customers, as



*This new turret model shows a PTI Interface. Efficiency, precision and innovation distinguish this technology ■*



Power drawbar with integrated spring force, temperature and vibration monitoring ■

well as all necessary process partners for the introduction of a new technology on the market for PTL.

The market will show if there is a possibility to push the enthusiasm into the field of lathes.

Efficiency and flexibility gain an ever-growing importance in machining centers for the production of high-quality series products worldwide.

The heart of a machining center, the spindle, is an important machine element. The heart of a spindle is the automatic clamping system and needs to fulfill high demands.

The constantly increasing requirements on spindles and thus clamping systems affect the speed, torque and load capacity as well as the media supply with coolant, minimal quantity lubrication, cryogenic or high pressure use. For efficient processing of different materials stable process management is to ensure, though the spindle will often operate almost in extreme physical situations. The clamping technology needs to be at the highest state of the art. Ott-Jakob perceived the trend of recent years to the use of surveillance systems, so-called condition monitoring systems, and even developed the first diagnostic systems.

OTT-JAKOB has developed intelligent clamping technology around

the actual clamps that provide the monitoring and measurement systems information about the condition of the power drawbar system. Expensive downtimes can be prevented and targeted preventive maintenance is possible. The availability and reliability of the machine tool is significantly increased.

Systems have been developed, used in manually or in automatic mode to control exactly the tool clamping systems. Pull in force meter, chip control and power measurement and -monitoring right up to piston and position monitoring systems in unclamping units and leakage sensors in rotary units, anything is possible. Thus the entire power flow of the clamping system is monitored and measuring systems are available to contribute to a high functional reliability. From clamping systems an eternal life is expected, but physics cannot always be cheated. Like other systems clamping systems are not completely wear-free and should be monitored specifically for the continuous correct use. This technology is of great importance for the future with industry 4.0.

From the range of monitoring options we especially want to point out the proven and now also developed for automatic application clamping force meter POWER CHECK, which can be automatically exchanged like a

tool in each machine magazine. The Power Check electronics provides clamping force values which characterize the condition of the main spindle. Thus the application of complicated and expensive tools can be ensured, for example.

In all areas, the automatic tool clamping of spindles, as well as the manual clamping for quick change, Ott-Jakob continues its targeted developments and is constantly developing throughout the coming years and will bring new products corresponding to the increased demands of the market.

In the field of the spindle- and machine tools, the consumers as well as the direct partner, appreciate the innovation and customer orientation of the Allgäu specialists. ■

Author:



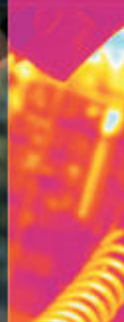
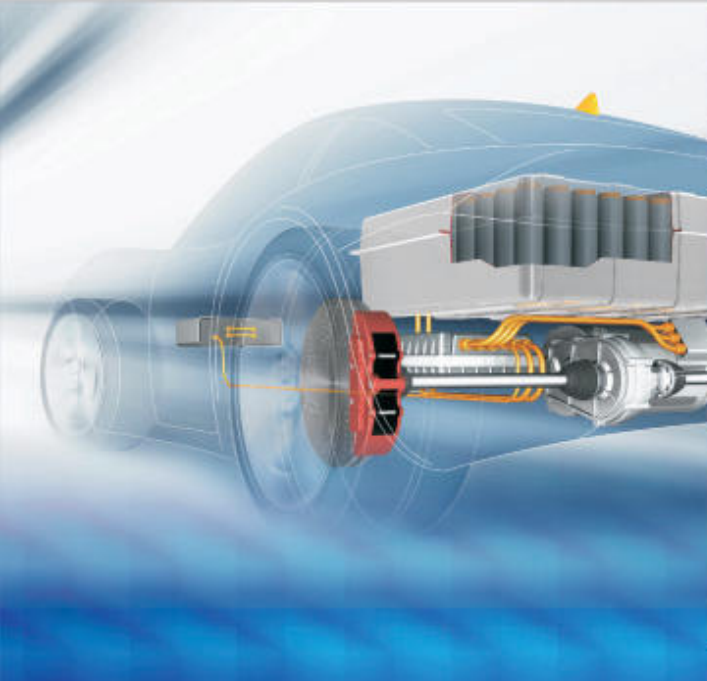
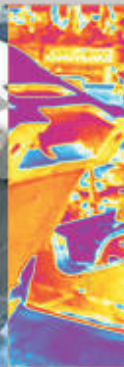
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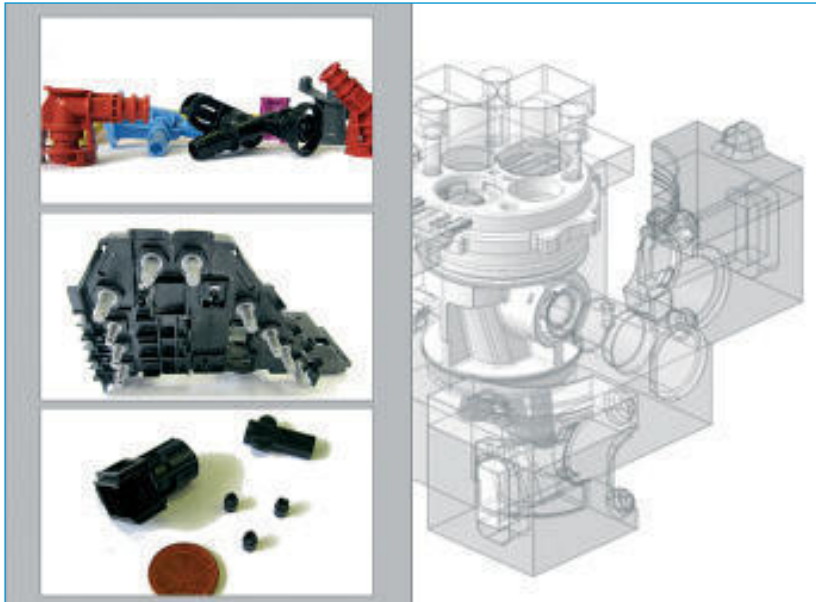


# *Special e-Car*





# Plastics in automotive engineering – Lighter, more economical, more sustainable



acad prototyping: Express injection moulding prototypes in original serial materials ■

While the German market reacts still hesitant, Norway shows us what the trends in the automotive industry are. Here electric cars have a market share of 13% in new registrations, and rising. However, this new technology reveals major challenges in terms of lightweight construction. Only the consequent material saving can lower energy consumption and extend the range of the EVs. Due to more sophisticated materials plastic is becoming increasingly important as a metal replacement. This is made possible by high-performance polyamides such as long-glass & carbon fibre. In terms of material properties plastics are in no way inferior to aluminium, particularly because with new additives the service life has been increased and cycle times have been reduced during production. As increasing

throughput and decreasing material consumption go hand in hand with low production costs new plastics are even more economical. In order to go to limits of material usage a mature design that is suitable for plastics is essential. acad engineering provides this & can fall back on 24 years of experience in the field of automotive interior. Thanks to a well thought out process chain and high plastic Knowhow we create innovative & trend-setting results. In order to minimize the development risk and to identify potential vulnerabilities acad counts on the FEM analysis as preliminary step to the prototype phase. Good prototypes save cash. Crash tests, installation tests and functional tests are very demanding for the parts. They should be serial quality in the original material but still be flexible to changes.

With a standard procedure these requirements can not be fulfilled. Due to a specially developed tool system acad prototyping copes with the balancing act. The high segmentation is a decisive advantage, especially for very complex parts. Also geometry changes are possible in a fast and cost-effective manner. Because risks can be minimized in advance the gained experiences are an advantage at latest when series tools are made. ■

## acad engineering

*driven by evolution*

- Express injection moulding parts in original serial quality
- High testing capability
- Early product confirmation
- very complex parts with various directions of remoulding

## acad prototyping

*driven by improvement*

- 24 years development experience with important OEMs
- Focus on automotive interior
- Cost-oriented development
- Functional models

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# The new Audi Q7 e-tron 3.0 TDI quattro



## Great class, minimal emissions

- **First diesel plug-in hybrid with quattro drive in its segment**
- **Best value in the segment: up to 56 kilometers (34.8 mi) electric range**
- **Maximum efficiency with hybrid management**

The Audi Q7 e-tron quattro is the first plug-in hybrid car in the world to combine a six-cylinder diesel engine with quattro drive. With a system output of 275 kW (373 hp) and 700 Nm (516.3 lb-ft) system torque, it accelerates from 0 to 100 km/h (62.1 mph) in just 6.0 seconds, and continues up to a top speed of 225 km/h (139.8 mph). According to the relevant standard for plug-in hybrid vehicles, however, the large SUV needs no more than 1.7 liters (138.4 US mpg) of fuel in the NEDC cycle (46 g CO<sub>2</sub> per km (80.5 g/mi)). This value too sets new standards.

Like all Audi hybrid models, the Q7 e-tron quattro has also been designed as a parallel hybrid. The 3.0 TDI, a highly efficient latest-generation V6 diesel engine, delivers 190 kW (258 hp) of power and 600 Nm (442.5 lb-ft) of torque. Active engine mounts – a world first for a diesel engine – eliminate unwanted vibrations through selective counter pulses. The disk-shaped electric motor provides 94 kW and 350 Nm (258.1 lb-ft) of torque. Together with a decoupler, it is integrated into the eight-speed tiptronic. The automatic transmission is outstanding for its high efficiency and low weight. The quattro permanent all-wheel drive,



Audi Q7 e-tron 3.0 TDI quattro, side view left ■

also compact and lightweight, transmits power to all four wheels. During fast cornering, its center differential works closely with the wheel-selective torque control system, an intelligent software feature. ■

**56 kilometer (34.8 mi)  
electric range: best value  
in the segment**

The lithium-ion battery consists of 168 high-quality battery cells and is fluid-cooled. With a capacity of 17.3 kWh, it allows a 56 kilometer (34.8 mi) range in electric mode – another record in the segment. The total range with the TDI engine is 1,410 kilometers (876.1 mi).

Another efficiency component is the standard thermal management system with integrated heat pump, specially developed for the Q7 e-tron quattro. This makes it possible for the waste heat from the electrical drive components to be made available to the interior of the Q7 e-tron quattro. Audi is the first manufacturer worldwide to introduce this technology in series production in a plug-in hybrid and is thus setting new standards in the areas of interior comfort, climate control efficiency and range in EV mode. As well as heating up the interior more quickly, the customer also benefits from a far-reaching electric

# Audi Q7 e-tron 3.0 TDI quattro

driving experience. The new two-phase charging technology installed in the new Q7 e-tron quattro allows charging with up to 7.2 kW of power. Depending on the infrastructure (appropriate high-performance industrial socket) and the charging cable, full charging of the battery takes about two-and-a-half hours. A power charging cable is standard equipment. Audi offers its customers an optional package of e-tron services. They range from changeover to renewably generated electricity (Audi Energy) to installation and customer service. A convenient solution is also provided by the standard e-tron services in the Audi connect portfolio, for controlling functions like charging and air conditioning via smartphone. ■

## Maximum efficiency: hybrid management

The hybrid management system controls the operating states of the Audi Q7 e-tron quattro intelligently, flexibly and with high efficiency. The driver can choose between four modes. The EV mode prioritizes electric driving, while in hybrid mode hybrid management decides on the type of drive for the most part freely. In battery hold mode, the system stores the available electrical

energy, and charges the battery in battery charge mode.

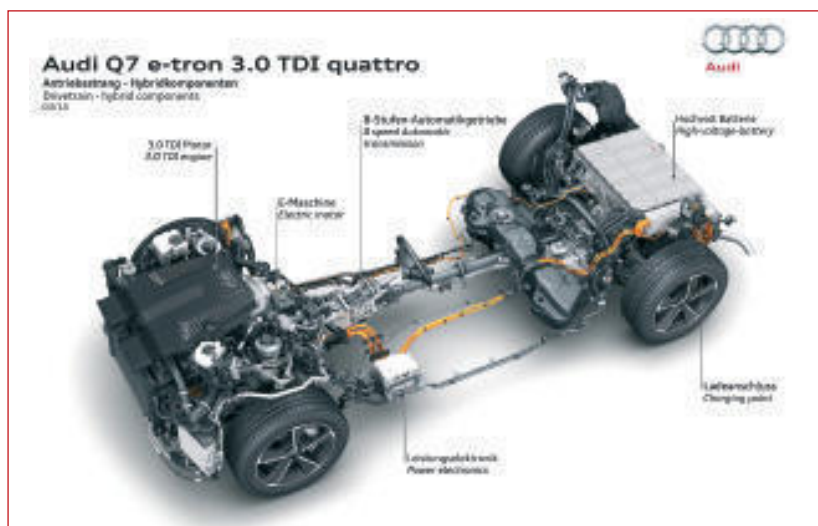
The large SUV generally starts in electric mode. To activate the TDI, the driver has to press down on the active accelerator pedal (another innovation from Audi) beyond a certain point of resistance, which depends on the requirements of the hybrid management system. A pressure point must also be overcome for boosting, in which case both the engine and motor work together. When the hybrid mode is active and the eight-speed tiptronic with integrated electric motor is in shift position D, the Audi Q7 e-tron quattro changes to coasting mode once the driver takes his foot off the accelerator. The TDI and electric motor are then deactivated. Should the Audi Q7 e-tron quattro approach a slower vehicle ahead or a traffic circle or the city limit, the coasting mode ends in favor of controlled regenerative deceleration. To detect the traffic situation ahead, the data from MMI navigation plus, the front camera and (if adaptive cruise control is on board) the radar sensors are used.

When driving in shift position S and in the battery charge mode, energy recovery begins as soon as the driver releases the accelerator. The driver can progressively

influence the degree of recuperation by operating the shift paddles on the steering wheel. The majority of all brake applications in everyday use also occur via the electric motor. In the event of moderate or sharper deceleration, the hydraulic brakes come into play.

The standard MMI navigation plus is closely integrated in the hybrid management system in the Audi Q7 e-tron quattro. Based on the navigation data and real-time traffic information, the most fuel-efficient choice of four modes can be calculated along the route to the destination as soon as the car is started, even for long distances. The predictive efficiency assistant facilitates a forward-looking hybrid strategy, and is another new and breakthrough technology from Audi.

During driving, the predictive efficiency assistant supplies highly precise information on the near surroundings – creating a detailed picture of up to three kilometers (1.9 mi) ahead along the route from the navigation and camera data as well as from the radar information. On approaching traffic signs with speed limits, town signs, bends, traffic circles and intersections, the system visually signals to the driver to release the accelerator pedal. At the same time, the active accelerator pulses once against the sole of his or her foot. ■



Audi Q7 e-tron TDI quattro, drivetrain - hybrid components ■

## New technologies: top comfort and sporty handling

The new Audi Q7 e-tron quattro is a long-distance car with great sporting talent and yet suitable for everyday use. The new electromechanical power steering is highly efficient as well as sensitive. The five-link wheel suspensions, also newly developed, on the front and rear axles are lighter by 60 kilograms (132.3 lb) compared with the predecessor



Audi Q7 e-tron TDI quattro, cockpit ■

model, and greatly contributes to the high driving dynamics. The lowered center of gravity also plays an essential role here. Even the basic version of the large SUV rolls along gently and smoothly, while comfort is further enhanced by the optional adaptive air suspension with controlled damping.

The driver can regulate the mode of operation via the standard Audi drive select dynamic handling system. It offers up to seven modes and integrates further technical components such as the steering, accelerator and automatic transmission.

As an all-rounder for leisure, family, sports and business, the Audi Q7 e-tron quattro also effortlessly masters easy terrain. A tilt angle display, hill descent control, an off-road mode for the Electronic Stabilization Control (ESC) and off-road navigation are standard. ■

## *Elegant design and top quality: the interior*

The Audi Q7 e-tron quattro has the most spacious interior in its segment. The three rear seats have adjustable backrests and can be moved fore/aft as desired. The lithium-ion battery is accommodated in a space-saving way: The

luggage compartment has a capacity of 890 liters (31.4 cu ft) in its basic configuration, with a maximum of 2,075 liters (73.3 cu ft). An electrically operated tailgate is standard.

Design elements like the wrap-around – the long arc around the driver and front passenger – the trim strips and the panel of air vents emphasize the generosity of the interior. The two-part trim areas allow many individual combinations; the range of upholstery is of luxury-class standard. Numerous materials from the elegant Audi design selection are new to the Q family. The workmanship makes no compromises – typical Audi. ■

## *State of the art: operation and displays*

A highlight in the Q7 e-tron is the standard Audi virtual cockpit – the fully digital instrument cluster with its 12.3-inch diagonal presents all the important information in fascinating graphics of brilliant quality. The driver can retrieve different levels of information, including specific e-tron displays such as the power meter.

The large display makes it possible to switch to a conventional tachometer or to display it simultaneously with the power meter. In addition, the instrument cluster depicts the displays for the energy flow, the range (with numbers and graphs) and the charge level of the battery.

Audi also uses the latest technology from consumer electronics in the area of infotainment. Its main element is the second-generation modular infotainment platform, which utilizes the enormous computing power of the Tegra 30 graphics chip from NVIDIA. Operation is by voice, with the multi-function steering wheel or with the completely newly developed MMI terminal, the MMI touchpad. On request, Audi will integrate the MMI all-in-touch, the touchpad with haptic feedback. Audi has added specific items to



Audi Q7 e-tron 3.0 TDI quattro, vehicle operation ■



# Audi Q7 e-tron 3.0 TDI quattro

infotainment for displays in electric mode. Consumption statistics are available, for example, along with a graphic display of the electric range in the navigation map. Charging as well as the preliminary air conditioning can also be time-controlled and adapted to the customer's requirements, such as departure time, so as to save resources and costs.

The standard Audi connect component links the Q7 e-tron quattro to the internet using the fast LTE standard – another unique selling point of the large SUV. Passengers can surf and email with their mobile devices via the Wi-Fi hotspot, while the driver can make use of numerous new online services and apps in the car.

The additional elements are also highly attractive – the Audi tablet, which serves as Rear Seat Entertainment, the 3D sound systems from Bose and Bang & Olufsen and the new Audi phone box that inductively charges cell phones. ■

## *The equipment: typically top of the line*

The Audi Q7 e-tron quattro comes with the standard equipment of a top model. Its special features include the Audi virtual

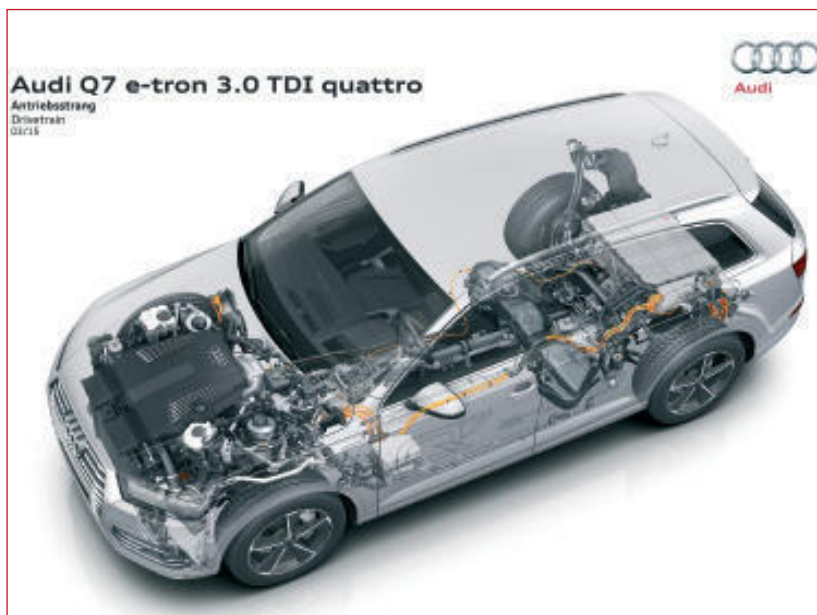


Audi Q7 e-tron 3.0 TDI quattro, interior ■

cockpit, MMI navigation plus, predictive efficiency assistant and 19-inch wheels. The automatic air conditioning is also a tailored solution. It operates in unison with a heat pump that utilizes the waste heat of the electrical drive components for the thermal management. As an important efficiency element, it is another great innovation in the Audi Q7 e-tron quattro, heating up the interior faster at low temperatures, for example, to extend the electric range by up to 20 percent.

The new Audi Q7 e-tron quattro also sets standards in assistance systems. New, for example, are collision avoidance assist, turn assist, cross-traffic assist and trailer assist. The adaptive cruise control including traffic jam assist takes over the steering from the driver on well-paved roads at speeds of up to 65 km/h (40.4 mph) if the traffic is slow-moving. In combination with the predictive efficiency assistant, speed is automatically adjusted when entering built-up areas and to observe speed limits as well as on bends and at intersections, once again using the coasting mode.

The Audi Q7 e-tron quattro will arrive at dealers in Germany in the spring of 2016. ■



Audi Q7 e-tron 3.0 TDI quattro, drivetrain ■

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# FTE automotive – Innovation drives

*The FTE automotive Group is your competent partner in the sector of development and production of drive train and brake system applications for the automotive industry. The company is located in all important continents and one of the leading OE-suppliers for passenger cars and commercial vehicles worldwide.*

*With the development and production of hydraulic clutch and brake systems, FTE automotive helps increase safety and comfort in vehicles. We assume a high level of responsibility for the functionality, quality and reliability of our products. We have more than 60 years of experience to ensure a successful future.*

## Research and Development

Our products are the result of intensive research and development work. In close collaboration with leading vehicle manufacturers, we are continuously developing new technically and economically trend-setting system solutions for brakes and hydraulic clutch actuations.

To meet this challenge, FTE automotive places great emphasis on having highly qualified employees. Our engineers find new ways of making driving even more comfortable and safe – for



*Lubrication Oil Pump - Intelligent material choice for cost and weight benefits ■*

certified according to the standards in the automotive industry and are subject to continuous further development.

High quality and durability characterize the demands of our customers with regard to our products and processes. The quality of our benefits and our products is an absolute requirement or a trusting relationship with our customers, for stability and for the long-term safeguarding of our company. ■



*Gear Shift Actuator Module: Innovative technology with several features and simplified assembly ■*

pure driving pleasure at a high level. In competition, it is not the big firms that assert themselves over the small firms in the long term, but the fast who stand their ground against the slow. Innovative product developments and program extensions are therefore characteristic of FTE automotive. The aim is always to be faster, more flexible, and better than the competition.

## Quality *as a basic Requirement*

Our organization, our processes, and our management system are



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# Design protection for vehicle repair parts in the EU?

## *A legal patchwork!*

### **The market of vehicle replacement parts is a competitive one**

According to statistics of the Kraftfahrt-Bundesamt (German Federal Motor Transport Authority), on January 1st 2015 the vehicle fleet in Germany alone amounted to 60.4 million vehicles with an average age of 9.0 years. In other words, the average car in Germany has reached an age where it needs to be serviced and repaired on a regular basis. Especially the demand for visible automotive replacement parts, such as car doors, bonnets, bumpers, headlights, windcreens and wings (hereinafter spare parts) – with an estimated market volume of € 13 bn within the EU - continues to be high.

Such spare parts which are intended to restore the original appearance of a vehicle, e.g. after an accident, must necessarily have the same shape - i.e. design - as the “original parts” - in order to be a perfect fit. In design law they are called “must match” parts. These spare parts are traded on the so-called “secondary market”, which is generally/basicly independent of the preceding “new vehicle market”.

### **Monopolization of the secondary market for spare parts by design protection?**

Do customers inevitably need to buy such spare parts, e.g. after an

accident, from the original manufacturer or is it also allowable for third-party suppliers to offer and distribute such spare parts on the secondary market in accordance with the principles of free competition? The question of whether this secondary market for spare parts can be monopolized by means of design protection is politically highly controversial and differently regulated within the EU, to the detriment of all parties.

### **What is protected by design law?**

Design law protects the outward appearance of a product for a maximum protection period of 25 years. A registered design gives the right holder the exclusive right to use the design and to prevent third-parties from using it without his consent. In case of design infringement, the right holder has, besides the “classic” claim for injunctive relief, further claims, e.g., for removal, compensation, recall and destruction of the unlawfully produced goods. Design protection constitutes a monopoly for a specified period of time. However, the time restriction on design protection to a maximum of 25 years is no consolation, especially for medium-sized manufacturers of spare parts who intend to produce and distribute design-protected spare parts, for example in Germany, as the average age of

vehicles in Germany is – as stated above – 9 years. After 25 years, most of the cars will already have been scrapped and therefore no longer need any spare parts. Design protection exists both on the European level (Community design as a unitary EU design) and on the national level (e.g. as Italian design, French design, German design, etc.). The different design protection systems exist parallel to each other and are in principle independent of each other.

EU design law is uniformly regulated in the Council Regulation on Community Designs (Community Design Regulation (CDR) which is directly applicable in all 28 EU Member States. The national design laws, on the other hand, are not fully harmonized. In order to create legal certainty and to strengthen the European internal market, the national legislation on design protection is to be harmonized by the so-called Community Designs Directive which the respective Member States need to implement at the national level.

As a conclusion it can be said that by means of design law (on the European Community or the national level) the secondary market for spare parts can in principle be monopolized for a maximum duration of 25 years. Whether this is also politically intended is another question.

## **‘Repairs Clause’ to limit design protection - a solution at the European level?**

Article 110 of the Council Regulation on Community Designs (CDR) contains a limitation for Community designs. Spare parts, such as fenders, can in principle be still protected as Community designs. The right holder, however, cannot take legal steps against the use of his registered design provided that this design is used by a third-party for the purpose of repair to restore the vehicle's original appearance. For national designs within the EU there is no comparable harmonized repairs clause.

### **What is the situation in Germany?**

In Germany, the situation is – in simplified form – the following:

**Community Designs:** Despite an existing EU design registration there is no design protection for spare parts provided they are necessary to restore the vehicle's outer appearance. The situation is different regarding tuning-parts which are not intended to restore the outer appearance of the vehicle (such as a wheel rim, cf. Higher Regional Court Stuttgart, decision of September 11, 2014, Case No. 2 U 46/14).

**National German Designs:** When the infringement of a German design patent is asserted, the “repairs clause” of Art. 110 CDR cannot be applied, neither directly nor analogously. As the German legislator deliberately has not introduced a comparable provision, a gap in legal protection vis-à-vis Community law must be accepted (cf. Higher Regional Court Stuttgart, decision of September 11, 2014, Case No. 2 U 46/14 and Regional Court Dusseldorf, decision of November 28, 2013, Case No. 14 c O 304/12 U). However, in Germany a so-called

self-commitment of the car manufacturers exists with the guarantee not to impede competition in the retail sector and not to challenge the market share of independent garages and free parts trade, by not asserting claims based on industrial property rights, so that a comfortable coexistence of the market participants is not compromised. Is there in fact a repairs clause in Germany after all? No.

In the meantime, first court decisions exist which classify this self-commitment as a mere lobbyists' declaration and therefore do not ascribe any binding legal effect to it (cf. Regional Court Dusseldorf, decision of November 11, 2013, Case No. 14 c O 304/12 U). As far as spare parts or replacement parts are also patented products involving a technical invention, the rights of the patent holder also need to be considered, who is generally solely authorized to manufacture patented products. However, patent protection does not cover the authorized use by the buyer. This also includes, besides putting into service, measures for maintaining and restoring their usability provided that the authorized use of the patented vehicle components has been cancelled due to wear or damage.

According to the case law of the Supreme Court, in order to distinguish between an admissible repair and an inadmissible new production, on the one hand, the interests of the patent owner in the unimpeded exploitation of his invention, and the buyer's interests in the unimpeded use of his acquisition, on the other hand, must be weighed against each other. The replacement of wear parts which is usually to be expected during the lifetime of the device, speaks for an authorized use.

### **Prospect:**

The current legal uncertainty – which is unsatisfactory for everyone concerned – will remain for the time being. In view of the complex legal situation it is advisable to consult specialized attorneys before promoting or distributing replacement parts or tuning parts for vehicles in Germany, since they may be protected by a patent or a design registration. ■



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