

**4erC GmbH**  
**CREATIVE - CLEAN - CAR - CONCEPTS**  
**the company of Peter Kägi**

Since 16 years, Peter Kägi is the leading project manager and the technical father of the Rinspeed motor show projects, Frank M. Rinderknecht and him connect many creative moments.

For 29 Years, the owner of 4erC works with electric vehicles, the range goes from a power of a few kilowatts up to several hundred kilowatts.

The consulting and development company 4erC works on vehicle projects for OEM and industry. Focus on: concept, project management, package, lightweight construction and fiber composite.  
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## **BUDII GOES FOR BORBET**

With the „Budii“ the Swiss company Rinspeed presents a car which redefines the relationship between man and machine: the concept study of a learning and personified “friend on wheels” – on exceptionally particular wheels to be exact, as they originate from the German light alloy specialist BORBET and are also a path breaking innovation.

Rinspeed and BORET – they match. Even for the project XchangE the federal masterminds trust in the unique design and product skills of the wheel expert from the Hochsauerland region – as well as 30 car producers and manufacturers all over the world for which BORBET is an Original Equipment Manufacturer (OEM). The family owned company in its fourth generation can review to over 100 years of tradition and experience in the metal processing industry. Since 1977 BORBET focused on the construction of high quality light alloy wheels with which the company expanded to one of the leading international producers in only four decades.

## **PASSION FOR LIGHT ALLOYS**

Behind the success story of BORBET, not only long-time experience and concentrated know-how is important but also a big portion of passion: No matter if cooperation with academic institutions, the voluntary observation of tight certifications or internal research – traditionally BORBET always tries to satisfy the high requirements. To combine attractive design with highest technical quality and robust reliability is the target for every new product.

## **MARVELLOUS INNOVATIVE CAPACITY**

For this BORBET promotes the further education of its employees and moves the development of new innovative manufacturing processes. E. g. NatureWheel – developed from BORBET - combines the cast metal in use with a mineral skeleton. This special combination allows an up till now not suspected weight reduction – a milestone in the production of efficient and stabile light alloy wheels. Thanks to such innovations and internal developments BORBET now is a member of the pioneers and pulse generators of the branch. Awards like the ‘Porsche Supplier Award’, the ‘VW Group Award’, the ‘Innovation Award from the Tyre Fair’ or the nomination for the ‘Brand of the Century’ show the wide tribute for the excellence of BORBET.

## **Distinctive design language**

Beneath the technological expertise BORBET also convinces through its distinctive design language and its certain sense for trends. The 1987 presented BORBET A- wheel is the best example – a timeless classic which is due to the high demand still available. This 5-spoke-wheel impresses through its uncompromising clear alignment, hidden bolts and especially through the iconic and extreme rim lip. This deep lip design grants the car an optimal road holding as well as a high profile.

## **A DEEP LIP RIM FOR BUDII: THE SPORTS-EVOLUTION WHEEL**

To underline the innovative spirit of Rinspeed "Budii" BORBET make use of a wheel prototype which picks up and reinterprets the legendary deep lip design as a central design element. The SPORTS-EVOLUTION wheel – the name of the not yet available design study – establishes ties between classic, present and future. The wheel owes its expressiveness the conscious taper ratio of different elements: The seven double spokes arise from the depth of the rim and lightly curve to the wheel hub. Level contrasts to the mounting accents also the depth of the wheel. The perfect balanced wheel dimensions for the "Budii" are 8x18 on the front axle and 9x18 with an even deeper lip on the rear axle – respectively in big tread widths (ET).

The extraordinary present rim flange accentuates a counterpart to the bolt elements and intensifies the impressive mass alive appearance of the wheel. This creates a burly and powerful impression without a clumsy appearance. Quite the contrary: The SPORTS-EVOLUTION prototype distinguishes through a sporty, dynamic and lively appearance despite its massive presence. The polished rim well completes the facets of this 18" study perfectly. The prototype from BORBET will only have unique use on the Rinspeed "Budii" in classic silver and deep black glossy.

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### **Through space and time with your best buddy.**

#### **Carl F. Bucherer in the new "Budii" concept car by Rinspeed.**

The Swiss innovation lab Rinspeed exhibited its new concept car, the Budii, at the 2015 Geneva Motor Show. The car is designed to make driverless travel even more comfortable. Carl F. Bucherer is supporting the innovative project run by Friend of the Brand Frank M. Rinderknecht with an exclusive, next-generation watch winder.

Frank M. Rinderknecht and his team have been realizing futuristic concepts for more than 35 years. The Swiss company is changing the mobile world with visionary mobility concepts, amphibious vehicles and its use of sustainable materials and drive systems. Just last year, Rinspeed grabbed the spotlight with its XchangE, a concept car designed to make driverless travel possible. Now the innovation lab has gone one step further with the Budii; this new car again has an autopilot, yet also adapts to the driver's habits and preferences. The Geneva Motor Show is the first time that the Budii will be exhibited in public.

### **The learning car**

The transurban concept car is equipped with innovative hardware and software, which the Budii uses to collect, process and store information from its environment.

The car relies on more than its own experience, however; it also observes the behavior of others on the road along its route and takes it into account in the future. For one thing, this ensures more safety in street traffic, as the forward-looking driving behavior of the Budii can avoid accidents. For another, following the Rinspeed tradition, the concept revolves around humans and their needs. The autopilot can handle unpleasant trips in complex city traffic, whereas the driver can take the wheel on fun weekend trips.

### **Always on time**

The steering wheel is mounted on a sensitive robotic arm and can be positioned in the middle when needed. The driver will appreciate another technological highlight. The MANERO PowerReserve built by Carl F. Bucherer is mounted

on the steering wheel. This sophisticated, highly functional clock combines an integrated power reserve display with a precise CFB A1011 manufacturing movement, making it the perfect match for this innovative concept car. The status of the power reserve is monitored by video to ensure that the automatic clock never runs out of energy. When the display slips down into the red, the robotic arm of the steering wheel is engaged to function as a watch winder to recharge the power reserve. By helping to ensure that the driver is always on time, Budii proves to be a real "friend on wheels".

### **Partnership with a future**

These concept cars are the product of a creative spirit unhindered by typical conventions that prefers to blaze its own ambitious trails. This is a philosophy shared by Rinspeed and Carl Friedrich Bucherer, the founder of the

renowned watch brand from Lucerne. Outstanding technologies, premium materials and enormous passion for their own products are what unite the two innovative companies. This made it easy for Carl F. Bucherer to decide in favor of supporting the new Budii project by Rinspeed.

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### **About Carl F. Bucherer**

The name Carl F. Bucherer has been synonymous with quality, innovation, and passion since 1888. Founded in Lucerne, this modest Swiss family business has grown into the internationally renowned Bucherer brand with its own worldwide chain of stores. The Bucherer Group remains family-run today and is currently in its third generation, managed by the owner and Chairman of the Board of Directors, Jörg G. Bucherer. In homage to founder Carl Friedrich Bucherer, the manufacturing brand of the same name was repositioned in 2001. Watches and their movements are developed and manufactured in the company's own workshops in Switzerland. The breakthrough innovation was the manufacturer's own CFB A1000 movement, which is driven by an external rotor. Bold design and technically sophisticated inner workings are the hallmarks of Carl F. Bucherer watches, which show more than just the time.

BOUND TO TRADITION – DRIVEN BY INNOVATION.

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### **STIMULATING EXPERIENCING**

#### **In the Rinspeed Study Budii, the Dr. Schneider Unternehmensgruppe shows new possibilities of air conditioning of the vehicle interior**

Kronach-Neuses (Germany/Bavaria), January 16th 2015. The world is changing rapidly; the speed both in the professional as well as in the private life is constantly increasing. Thus, time is becoming a decisive factor. Scarce resources have to be deployed in a particularly considerate way. It is therefore required that every place and room where human beings are staying has to flexibly adjust to the individual needs. This is also true for the automobile which is now after having offered freedom and individuality first and foremost able to offer its users precious times of wellbeing. Decisive in this context is the vehicle interior for which the automotive supplier Dr. Schneider located in Kronach has been providing innovative ideas and highest-quality product developments for decades. Dr. Schneider's objective is to make the car a mobile oasis of well-being and the best place in the world to be in.

Just like Rinspeed is regarded as the pioneer for the automotive future, the family-owned enterprise Dr. Schneider is known in the industry as a reliable, flexible and innovative partner, in particular when it comes to the topic of air conditioning in the vehicle interior. Apart from this, the almost 88 year old group has established its reputation as a specialist for highly complex, elaborate and high-quality products in the field of storage boxes, bezels and trims, loudspeakers and for kinematic components. Therefore it is a logical operation of visionary ideas that the family-owned company which has more than 3000 employees worldwide has participated in the new Rinspeed Study Budii.

In the study, Dr. Schneider mainly demonstrates its core competence concerning STIMULATING EXPERIENCING. In doing so, the interior of the car is emotionalized and made into an oasis of well-being by means of which the pure travel time is converted into moments of well-being. An optical as well as functional eye catcher in the instrument panel of the Budii are two broadband air vents developed by Dr. Schneider which are named "slim line air vents"

due to their long slim design. Those vents are „fanning“ the air draft-free to the passenger by means of an oscillating „breeze“ function. The two round comfort air vents at the drivers/passengers side (Two Face Afterburner) either provide for a direct – by means of a spot- or an indirect – set to diffuse - comfort ventilation of the interior.

The control of the Slim Line and Two Face Afterburner air vents may be performed mechanically but may also be electrified. Both design and function elements have been developed to such an extent that they are able to intuitively sense the atmosphere and the desires of the car occupants for the suitable ambient lighting. As an additional air conditioning component, Dr. Schneider has integrated two air vents called AC shower in the roof module of the Budii which, thanks to a diffuse or pinpoint control, provide for an atmosphere of well-being adjusted to every individual seat in the car. Thanks to the option of a varying ambient lighting, the AC shower bolsters the stimulating and emotionalizing effect of the ventilation components.

The center console as the future control center of the car is, after all, a multifunctional Dr. Schneider product. The multimedia storage box has an inductively working charging station for any kind of mobile terminals. The air conditioning, the ambient lighting and other functions may comfortably be controlled by means of the integrated touch panel screen. This is done via an app which was also developed by Dr. Schneider. Additional comfort offers an integrated cup holder which is covered with a fine foil (foil cup holder) which, thanks to its construction, optically recedes into the background but which is all the more present in its possible functions and which is for example able to heat or cool beverages as a thermo cup holder.

The objective of the functional Dr. Schneider products is to provide the driver and passengers with the comfort and functionalities he/she is accustomed to at home. And all of this with a minimum of space which will, thanks to an intelligent use of the dimensions and elegant design lines, also become an optical eye catcher.

The well thought-out innovations of the group domiciled in Kronach-Neuses which currently has six other locations in Germany and abroad combine a high degree of functionality with quality and a more than sophisticated and changeable ambience. Thanks to their compactness, those innovations additionally provide the automobile manufacturers with more scope for an intelligent and forward-looking use of the interior of the cars which will, in the years to come, be as flexible as never before. Thus, the car will more and more become an oasis of well-being which will enable STIMULATING EXPERIENCING for the passengers.

Dr. Schneider Unternehmensgruppe (Kronach-Neuses) is a specialist for high-quality products made of plastics around the automobile – from the innovative ventilation system to highly integrated interior trims as well as esthetically as functionally sophisticated modules for instrument panels and center consoles. Dr. Schneider is one of the world market leaders in the field of ventilation systems (air vents and nozzles) and window frame trims. The supplier which is in demand worldwide is an experienced development partner for the premium automobile industry. The demanding clientele for example includes Audi, BMW, Jaguar/Land Rover, Lamborghini, Mercedes, Porsche and Rolls– Royce. Dr. Schneider also produces for VW, Ford, GM, Volvo, Toyota, Fiat Chrysler, Ferrari and Maserati, to name just a few.

Dr. Schneider – founded in 1927 by Franz Schneider Sr – employs a global workforce of more than 3000 employees and has production sites in Germany, China, Poland, Spain and the USA as well as sales offices around the globe. The company’s general managers are Günter Murmann (chairman) and Wilhelm Wirth.

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## Get in and feel good – Eberspächer shows how it's done

For years, Frank M. Rinderknecht has been providing new impetus for the industry with his exciting concept vehicles. Time and again, he demonstrates what the future of mobility could look like. Optimization of comfort and the interior climate is one of the important factors here. This is where the Swiss automotive visionary has long entrusted Eberspächer's expertise. This thermal management specialist from Esslingen near Stuttgart is among the leading experts when it comes to ensuring the right temperature in the vehicle – irrespective of the drive concept. With its comprehensive portfolio of fuel operated and electrical heating solutions, Eberspächer can offer a suitable product for any requirement.

With the "Budii" electric concept car from Rinspeed, to be presented at the 2015 Geneva Motor Show, Frank M. Rinderknecht and Eberspächer are continuing their collaboration with the latest model as well. The "Budii" stands for autonomous driving; it is intended to be a "friend on wheels." The driver and passengers will especially enjoy traveling in it if the interior temperatures are right, providing the proper conditions for a relaxing driving experience.

### Electric heating power

For this scenario, Eberspächer equips the "Budii" with a third-generation PTC coolant heater. This electric heating element has an output of up to 7 kW and offers a convincing efficiency value of nearly 90 percent. The device emits this heating power into the interior through stylish vents, which were developed specially for the "Budii" and extend across the entire front area. Through their layout cleverly integrated into the vehicle, the vents assist in effective distribution of heated air to the windshield and into the passenger compartment.

The climate experts at Eberspächer additionally equipped the PTC coolant heater with a special highlight: an electric pre-heating function. This feature was included because the battery capacity would suffer if occupants in the "Budii" were to turn the heater in the Swiss concept car all the way up when starting. Thanks to the practical pre-heating function, the compact electric runabout can already start the heating process when it is parked at home or when it is connected to the power grid on the road. This ensures the proper state of charge for the battery and provides enough power to operate the PTC coolant heater from the very beginning. The interior is pre-heated to a pleasant temperature, the windows are reliably cleared of ice in the winter and the batteries are fully charged and at the right temperature. The last advantage is especially important in order to ensure that the "Budii" can use its full recuperation potential right away to achieve the best possible range. This would not be possible with cold batteries.

In order to keep the temperature in the "Budii" constant throughout an urban trip, the Eberspächer PTC coolant heater can be set to maintain a temperature accurate to the degree using the climate control unit. The PTC coolant heater in the "Budii" offers many more capabilities: If the emphasis is solely on range, it is also possible to adapt the heating power to the battery state of charge during the trip. Automatic battery heating en route extends the range. If the climate control unit measures values that are too low, the PTC coolant heater warms the batteries to the ideal operating temperature again via the water circuit.

### Autonomy? Gladly!

Heat in the "Budii" at any time? Eberspächer offers a solution to this challenge too. After all, the PTC heater in the vehicle has to "know" when it is needed. This is exactly when the "EasyStart Call" remote control comes into play. Its control unit in the "Budii" features a SIM card and can be programmed from any telephone or cell phone. Programming is even more convenient with the app for Android or Apple smartphones. This free app employs the GPRS standard to communicate with the PTC coolant heater, turning the touchscreen into an intuitively operable control tool for the heater in the "Budii." Autonomy is facilitated through the ability to define fixed start and operating times in advance for the PTC coolant heater using the app's scheduling function. This is very advantageous if the "Budii" is repeatedly used at fixed times, such as the commute to work.

What if something unexpected should arise and the “Budii” has to be ready for spontaneous trips? Eberspächer thought of this too: the PTC coolant heater can be operated virtually at the push of a button from almost anywhere thanks to the app. And with the stylish Gear Smartwatch from Samsung, it isn’t even necessary to take out the smartphone first. The Smartwatch is linked to the smartphone via Bluetooth, allowing its wearer to check the current operating state with a brief glance at the wrist or to switch the PTC heater on or off by pressing on the display.

Innovative, pioneering and autonomous are the key characteristics of the heating components from Eberspächer in the new Rinspeed concept car. These components perfectly complement Frank M. Rinderknecht’s conception of the “Budii,” because the electric car is intended to operate largely autonomously, in particular on routine drives. If fun is more important, the driver can take the wheel at any time. The heating equipment from Eberspächer is just as versatile. It reliably provides utmost comfort in day-to-day use. And – thanks to state-of-the-art control via app and connection to the Samsung Smartwatch – it can be easily and quickly operated from anywhere when taking the car out for a spin.

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**“Holy cow, the car has lost its luster – what counts are the intrinsic values.”  
How autonomous driving is redefining the relationship of man to car.**

Self driving cars may soon be a common sight on our roads. The industry is working at breakneck speed to produce cars that can run on the road without human intervention and are investing billions in this pioneering technology. The question whether robotic cars will spoil people’s fun of driving is no longer even an issue. Depending on whether a person enjoys driving or finds it tedious – it is and should always be left up to individuals to decide whether to give up the steering wheel, for instance in city traffic, or to steer the car, because the road conditions on an empty stretch of highway or over an alpine pass grant them the enjoyment of automotive freedom.

One of the key factors behind autonomous driving is the issue of safety: avoiding traffic accidents and ultimately fatalities by eliminating the human (error) factor. As soon as we hand over the steering wheel – and responsibility – to the autopilot, we give a machine control over subsequent events. The question that arises as a result is how much room for error we allow a robotic car. Here, it helps to distinguish between critical errors and other errors. A defective ATM or a machine manufacturing faulty products may be annoying, but their performance is not critical to our survival. But we will be entrusting our most treasured earthly possession, the life and limbs of persons, to bits and bytes – knowing full well that we are bound to be disappointed as there is no such thing as absolute safety.

So, if a driverless car malfunctions, who will be at the receiving end of our disappointment and anger? Should we be furious at the developer of the autopilot? The car manufacturer? The software programmer? When human beings fail, they bear the brunt of our anger. The autopilot, ultimately the machine, has no emotions (as yet) and displays no reaction or aggression. As such, unlike human beings, direct punishment of the machine upon failure makes no sense. What is the significance for the relationship between man and car with regard to autonomous driving?

For decades, the car’s design and powertrain were dominated by emotional considerations – in colloquial terms, but also emotionally, the car evolved into a “holy cow” for generations of people. Man and car formed a close tie because the car represented an asset for man that needed protection. There was to be no scratch to mar its sheen. But what will be the “holy cow” of the future? Trends towards integrated mobility concepts such as car sharing lead to “estrangement” between man and machine or an abstraction of the fond relationship, ultimately

resulting in a devaluation of the car. On the other hand, the relationship between man and car must shift to a bond of trust – especially when control is relinquished to the autopilot. A completely new type of relationship between man and car will emerge as a result of autonomous driving.

Whereas man has always protected his “holy cow” in the past, the car must now protect man – by working error free. As such, the car will become man’s “best budii,” reliable, trustworthy and therefore (subjectively) safe. The reversal of the relationship between man and machine means that the way cars are viewed will also change: external luster such as design or power drive will take a backseat to the more intrinsic values of a car such as safety, reliability, but also connectivity. Other industries, such as the music and photo industries, have already experienced this shift from purely “extrinsic” product orientation to an “intrinsic” benefit orientation such as functionality. The automotive industry is now facing this largely painful transformation.

Ultimately, autonomous driving describes a totally new tension between man and car: the relationship between freedom, common sense and life is shifting. Common sense tells us as drivers that we should drive a maximum speed of 30km/h to avoid accidents and even fatalities on the road – i.e., to protect life and limb. However, the desire for automotive freedom sometimes urges us to drive at speeds in excess of 200km/h, putting human lives at great risk. Don’t we as drivers constantly follow a middle path between these two extremes, for instance, when we want to get home quickly? In its consummate form, autonomous driving means the journey itself is the destination; the journey becomes irrelevant because the persons being transported in this way have the benefit of the journey in that they can use the journey and transport for other activities such as reading, working or sleeping.

What is the upshot for the automotive industry with its 129 year old roots and especially for automotive manufacturers? The shift to autonomous driving will force automotive manufacturers – in a symbolic sense – to relinquish the steering wheel while still remaining in charge of the car. In effect, the automotive industry must make a business model out of “steering without a steering wheel” to intensify the experience of the intrinsic value of the car for the future mobility customer as opposed to the past lustrous design and power drive. This will require a new set of skills, new cooperations between car manufacturers and companies not related to the automotive industry. They will no longer be able to follow the old, well traveled roads.

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**Swiss made**

**ESORO – your experienced and innovative engineering partner for product developments, clean car developments and lightweight composite parts.**

As learning and personalized systems future vehicles could become our “friend on wheels” for personal transportation. Beside environmental friendly and convenient electric driving autopilot functions will be introduced step by step in the near future.

By keep learning preferences of the driver and acquire data from the environment and “experiences” from other vehicles and users each day, as a result the system will get better and better at mastering the complex challenges of modern day private transport.

Budii is the 16th project, ESORO realized for Rinspeed. ESORO was responsible for the manufacture of the composite exterior body panels and has been responsible for mechanical and electrical integration aspects of the novel steering wheel with its state-of-the-art sensitive robot arm, which enables both the driver and the passenger to steer or folds back in a space saving middle position if the vehicle is in autopilot mode. Additionally, ESORO implemented and adopted several different technologies and innovations of the project partners. Last but not least, ESORO was responsible for the final assembly of the interior and exterior of the Budii.

ESORO has now 24 years of experience as engineering partner for product developments, concept vehicles and components focused on lightweight construction, alternative drivetrains and mobility. During this time ESORO has gained a well-deserved reputation for excellent efficiency and innovative solutions, which is demonstrated by numerous prototypes and serial products.

Since 1990 ESORO has been working intensively in the field of conception, implementation and tests of clean car concepts and drive systems. ESORO is thus one of the few companies in the world with well-founded experience in development and operation of electric, plug-in-hybrid and fuel cell drives. These activities are our core competence. ESORO therefore realizes EV projects in close cooperation with well known OEM's starting with the initial conception and the prototype through to the serial project phase.

ESORO is also developing fiber reinforced components from initial conception up to pre-production samples. In-house specialists optimize the component properties and characteristics throughout the entire development process. Important steps are non-linear, orthotropic Finite Element Analysis and crash simulation.

Another development from ESORO is the E-LFT production technology developed for Weber Automotive. E-LFT makes large scale production of high-strength and lightweight composite parts affordable. E-LFT composite parts weigh more than 30 percent less than comparable steel parts. For the development of the smart fortwo tailgate, which now has been produced 800'000 times with the E-LFT process, ESORO received the highly recognized JEC Innovation Automotive Award 2008.

> more: [www.esoro.ch](http://www.esoro.ch)

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## **Evonik for Automotive Solutions / Innovations for Cars of Today and Tomorrow**

Evonik and its Automotive Industry Team (AIT) are – together with the automotive industry and further project partners - consistently working on new trends for future mobility. Specialists of different Business Units are developing innovative solutions for the automotive market in the development areas Lightweight Design, Fuel Savings and Emission Reduction as well as Lighting- and Surface Technologies.

### **Lightweight Design**

The acceleration of heavy cars requires a larger consumption of fuel. With Lightweight Design technologies, Evonik paves the way for the eco-friendly and energy saving car of the future, developing weight saving structural parts. Ultra light structural foams, innovative polymer glazing, structural hybrid parts and adhesive products of Evonik can reduce the vehicle weight by up to 60 percent per structural element.

### **Fuel Saving and Eco-friendly**

Innovative technologies of Evonik play an important role to reduce the fuel consumption of vehicles, starting from efficiency-upgrades of engine and drive train by the use of oil additives, products for tires with low rolling resistance, which can be combined into full weight reduction concepts.

### **Functional Surfaces**

Key technology for vehicles: High gloss surfaces with enhanced abrasion resistance, materials for pillar covers and mirror housings, materials for decorative panels for automotive interior as well as materials which minimize the abrasion and avoid the adhesion of dirt.

Evonik provides innovative colorsystem-solutions for the architectural and industrial coating and painting industry. Our competencies are not only in the manufacturing and commercialization of solutions for coatings, but also in the support of our customers worldwide.

### **Innovative Lighting Technologies**

Today, modern light guides are not yet standard technology in vehicles. Evonik has developed a special system for the production of silica glass to manufacture lenses of high optical clarity and outstanding density against water vapour.

SAVOSIL™ lenses for high power LEDs have been developed for use in the automotive industry.

LEDs (light-emitting diodes) are meanwhile a ubiquitous light source. They offer higher luminous efficiency paired with lower energy consumption, come in a wide range of colors, and enable new design options due to their small size. But all of these advantages only come to the fore when the light fixtures are adjusted to the LED technology. Evonik Industries AG developed PLEXIGLAS® LED, a light-diffusing, transparent acrylic glass (PMMA) with special light-guiding properties, for precisely this purpose. It can be used to produce crystal-clear, structured or light-diffusing lighting covers.

### **Efficient Light Guiding**

PLEXIGLAS® guides light efficiently to the point where it is needed. Lighting applications serve different purposes. Street lights are designed to light up the street, not the space around the light source several meters up in the air. For this, light fixture manufacturers use covers that guide the light through fine structures in the material. The crystal-clear grade of PLEXIGLAS® offers extremely accurate mold surface reproduction for manufacturing these structures.

### **Uniform Light Output despite Flat Shape**

In other types of lighting, though, light needs to be diffused in order to distribute brightness uniformly throughout the room. PLEXIGLAS® LED was optimized for this purpose. It contains special embedded diffuser particles, which ensure that the light fed in via the edges is evenly emitted across the surface. This edge lighting enables slimmer structures and requires smaller fitting depths, as in the panel lights that are becoming more and more popular. These are ultra-flat light fixtures that can be installed directly in the ceiling as recessed lights. PLEXIGLAS® LED is also highly suitable for transparent applications. When the material is unlit, it looks crystal-clear. As soon as light is fed in via the edges into the material, it appears as a uniformly illuminated surface in the same color as the LEDs.

With the described technologies, attractive lighting concepts can be realized for interior and exterior parts in vehicles.

For the “Budii” project PLEXIGLAS® in optical quality was used for the lightguides of the panel lights in the front and rear area of the new concept car. With an additional special microstructure – based on a technology development of WEIDPLAS – panel lights with most different lighting effects could be realized. Therefore it was possible to integrate the signal light function in the rear panel light.

A smoke-grey PLEXIGLAS® cover hides the lighting technology when the lighting is switched off and the components appear as neutral elements. Beside these applications in the exterior area PLEXIGLAS® is used inside of the “Budii” and contributes thus to the interesting design of the vehicle interior.

® = registered trademark

PLEXIGLAS is a registered trademark of Evonik Röhm GmbH, Darmstadt, Germany.

Certified to DIN EN ISO 9001 (Quality) and DIN EN ISO 14001 (Environment)

Evonik Industries is a worldwide manufacturer of PMMA products sold under the PLEXIGLAS® trademark on the European, Asian, African and Australian continents and under the ACRYLITE® trademark in the Americas.

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## Rinspeed Budii Partner Book Text HARMAN

### The next big thing

Self-driving cars. Experts the world over agree that this is the next big thing for the automotive industry. It can therefore come as no surprise that news on this topic is coming thick and fast right now. Mercedes, BMW, VW, Toyota, Ford, GM and Hyundai just presented the latest iterations of their autonomous technologies at the CES. According to the "Frankfurt Allgemeine Zeitung", German Transport Secretary Alexander Dobrindt wants to establish a permanent test route for autonomous vehicles in public traffic on the A9 in Bavaria. Google also recently announced its plans to build 150 autonomous cars for testing this spring in California on public roads. "Networking and autonomous driving are the major future trends," says Stefan Bratzel from the Bergisch-Gladbach School of Economics. "This technology will revolutionize individual mobility," says Jan Burgard from strategy consultants Berylls. Alongside classic values like performance and fuel consumption, a number of new criteria will play an increasingly important role in future. In his keynote speech in Las Vegas, Daimler CEO Dieter Zetsche stated, "The car is growing beyond its role as a means of transport and will ultimately become a mobile living space," In an interview with "Spiegel Online", Hamburg traffic planner Konrad Rotfuchs said, "Society is noticing that the fun of driving in the city and on the highway is diminishing considerably. In 80 percent of situations, the driver is already no longer actively in control." According to studies conducted by the US military, up to four times more cars could travel on the highways if they were driving autonomously. While the effects would be less significant in city traffic, a reduction of 10 to 20 percent would certainly take a great deal of pressure off city streets.

The HARMAN "Next-Generation Scalable Infotainment Platform" in the Rinspeed Budii was developed specifically for the challenges presented by the autonomous future: The first objective was to ensure the usability of the solutions and services provided by the autonomous vehicle over its entire lifespan.

The second objective was the uncompromising protection of the autonomous vehicle against cyber attack. Last but not least, it must be possible to integrate the assistance and safety systems essential for autonomous driving into the infrastructure easily, safely and in a way that conserves resources. The broad scalability of the platform ensures that as many customers as possible are able to profit from the numerous benefits of highly professional HARMAN infotainment solutions.

The software can be adapted to the specific demands of the respective vehicle manufacturers and is so generically designed that it can be integrated into any vehicle architecture. It also supports all standard interfaces and thus enables the straightforward integration of a diverse array of sensors, programs and services.

HARMAN's Next-Generation Scalable Infotainment Platform uses Automotive Grade Linux – or alternatively Android – as its operating system and connects it with an HTML5 user interface to deliver a number of different benefits. Linux brings the possibilities of Open Source into the automotive environment, while HTML5 is broadly used worldwide. One particular achievement of the HARMAN IT experts is in the optimization of HTML5 performance to enable the language to be used in automotive environments in the first place. Based on the new software infrastructure of the Next-Generation Scalable Infotainment Platform, applications can be developed using common standards such as HTML, JavaScript and CSS. This means that a whole host of applications would only have to be developed once and could then be used in a wide variety of vehicle types. At the same time, the open architecture means that applications and programs in the new HARMAN platform can be kept constantly up-to-date. All relevant functionalities thus remain current throughout the entire lifetime of the vehicle.

HARMAN has also secured its Next-Generation Scalable Infotainment Platform against possible cyber attack with a multi-layer security system, making it the first in its sector to transfer a wide range of safety standards and applications from the IT and telecoms industry into the automotive environment as part of a holistic security approach. All functions, data and files critical to the security and integrity of the vehicle and system are held in a QNX operating system within a so-called "Trusted Execution Environment Partition".

Third-party applications run in a completely separate, ring-fenced area known as the "rich partition". This isolates them from all critical processes and means they cannot cause damage either by accident or intentional action. The platform uses an internal type 1 hypervisor and a firewall to assure the strict separation of the two partitions. Because the Next-Generation Scalable Infotainment Platform will have four or more process cores in future, an array of new safeguard options are possible here. One core can be used specifically and fully independently of the others for all security-relevant processes. Other benefits include a special "trusted zone" within the chip set for keys and

other sensitive data, as well as for standard safety processes such as certificates, encryption and boot performance monitoring for identifying system changes.

The apps operated within the system hold only the information specific to them. Their communication with the outside world is monitored. Continual updates and over-the-air software updates are nevertheless still possible for all functions, ensuring that applications remain future-proof. The Next-Generation Scalable Infotainment Platform is based on proprietary HARMAN computing modules, with hardware upgrades also possible through dealerships. Thanks to Open Source, the platform's open architecture also facilitates additional applications and software upgrades via third-party providers. Security is guaranteed here, too, as these codes do not leave the "rich partition". Why, in future, should you drive yourself on the daily, often tiring commute? Why spend ages searching for a parking space, when Buddi can do that autonomously? Why not let yourself be chauffeured home by a good, always helpful and constantly available friend when the law forbids you from driving yourself after a few drinks too many? But Buddi's potential extends well beyond the willing execution of frequently tiresome driving tasks - it is also equipped with a tailor-made premium sound system from Harmon Kardon to cosset passengers with top-quality HD music. With the latest HARMAN audio technologies – ISZ (Individual Sound Zones) for individual listening pleasure at all seating positions and HALOsonic RNC (Road Noise Cancellation) for minimizing road noise in the already quiet electric car – Buddi ultimately becomes a concert hall on wheels.

Although Buddi represents the systematic expansion of that home-away-from-home feeling and will largely drive itself under computer control, there will always be the option of taking back the wheel, when driving yourself becomes a pleasure rather than a pain.

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Interior visions by Hornschuch

### **We are Buddi!**

"You have to attempt the impossible in order to achieve what is possible." This quote perfectly fits Frank M. Rinderknecht and the manner in which he once again amazes the automobile world with his creations at the Geneva Motor Show. The Rinspeed Buddi is already the fifth cooperation that the Swiss automobile visionary Frank M. Rinderknecht has entered into with Hornschuch, the globally active specialist for sophisticated design, high-quality materials, and fascinating surfaces in vehicle interiors. Hornschuch was a partner for the Rinspeed Concept Cars sQuba (2008), Bamboo (2011), Dock+Go (2012), and MicroMax (2013). And as is always the case when two like-minded people meet and mutually respect one another: the better they know each other, the greater the trust, and the greater the scope and intensity of the cooperation. A cooperation that has reached a new dimension with the Rinspeed Buddi.

"The reasons for the renewed partnership are obvious", says Lothar Machule, Chief Sales Officer der Hornschuch Group: "It is a classic win-win situation: Rinspeed profits from our know-how, our design competence, our innovation power. And we use the neutral platform that Buddi represents to show our visions of automobile interiors to our customers on-site in Geneva." Machule continues: "This year too, the new Rinspeed Concept Car will once again be given enormous attention. Everyone is fired up about the Buddi, they can hardly wait to get to know the 'buddy'. All of the excitement brings global publicity to our products and results in an overall image boost to Hornschuch."

The concept of the Buddi anticipates the future. In three aspects. Autonomous driving, sporty-masculine attitude, and high-tech robot solutions, who but Frank M. Rinderknecht could combine these elements in one vehicle? And as is usual for Rinderknecht, just a couple of months pass between the first lines of the sketch and the finished vehicle. Naturally, partners must be able to keep this pace. "We know from previous years what awaits us", grins Ralf Imbery, Head of Product Design at Hornschuch. "A cross-departmental team from design and marketing worked on the project furiously: From the briefing to the final draft, from coordination with Frank M. Rinderknecht and other partners to inspection of the manufacturing and final equipping of the vehicle, we dealt with all of the project steps in the available timeframe. The result exceeds our expectations. It is simply magnificent."

"When Frank M. Rinderknecht came to the first meeting at the Hornschuch Design Center to explain the idea of the new vehicle, his briefing was very open", Imbery remembers. "We had a great deal of freedom to develop the overall concept. He wanted a manly, fun-oriented sportiness to be communicated for the interior design. The Buddi interior

wasn't supposed to have the character of an elegant limousine, but was to be a dream come true for all those who love sporty cars." From the beginning, the topics of autonomous driving and robotics were included in the design.

The basis for the interior concept of the Rinspeed Budii was the parallel developed Hornschuch Trend Guide 24/7. The design concept – with a color, structure, and printing concept – and the material concept were developed from it. The dominant colors underscore the masculine character of the Budii: intense blue and silver, which are trendy colors in 2015. They decorate the steering wheel, seats, door paneling, and dashboard of the concept car, supplemented by cognac and orange as accent colors. The slightly glossy, textured surfaces of the newly developed Hornschuch materials – with metallic crosshatching or rhomboid quilting – underscore the sporty and technical orientation of the design. In the interior of the Budii, the individual materials combine to create a dynamic whole – it is the unification of the various elements into a coherent concept. The coherence in particular is decisive when making a strong design statement. The whole is also more than the sum of its parts in the Budii.

Because this is a concept car, the innovative materials used – with the exception of the proven floor material **skai® Lorrytec** – are not yet utilized in automobiles at this time. But they can become high-quality automobile materials as the result of a developing partnership.

**skai® Soroma Stars** in midnight blue (seat, seat back, door) > arrow-straight, diagonal seams form a regular pattern of rhombi. The perfect quilting is the result of an innovative embossing process; no threads pass through the material. The surface is decorated by a delicate grain with subdued vintage traces. The metallic color radiates a fine shimmer. Recognized with the Interior Innovation Award – Winner 2015.

**skai® Tokio** in silver (seat, seat back, headrest, door, steering wheel) and midnight blue (dashboard, door, seat, steering wheel) > This surface is inspired by a technical application in automobile construction – crosshatching. Highly precise laser engraving makes it possible to portray the detailed and contoured grinding look with never before seen sharpness. Precision on a nano level leads to the deceptively realistic, delicate structure, which gives the upholstery material a very lively, yet technical-dynamic look. The metallic colors have an iridescent effect; the light refraction changes depending upon the viewing angle. Recognized with the Interior Innovation Award – Selection 2015, nominated for the AIT-Trend 2015.

**skai® Tundra** in orange (seat back, door) > this particularly robust surface in the signal color orange is impressive due to a fine calf leather grain and a subdued matte gloss effect. The material additionally creates sporty accents.

**skai® Lorrytec** with sketch design (floor mats) is a proven TPO floor material, which is used in transporters, for example. It is particularly robust and easy to care for.

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**ibeo Automotive Systems –  
Passion for scanning**

Ibeo is the market leader in developing the high-tech laser scanners used by the automotive industry for environmental detection. Our engineers use their expertise to develop algorithms that process raw laser scanner data and provide a high-level, object-based interface. This object-based representation of the environment is the basis for advanced driver assistance and active safety systems such as autonomous driving, automatic emergency breaking, adaptive cruise control, and pre-crash. Automotive OEMs and tiers typically install Ibeo's high-end laser scanners as reference systems on their test vehicles during test track and public road testing in

order to verify the performance of their production sensors. Ibeo's overall objective is to make our scanners available to the mass market, in order to maximize safety and comfort for road users.

### **ibeo.ADAS – Intelligent scanners for smart drivers**

Ibeo develops combined laser scanner and software systems for ADAS applications. The systems are installed on-board a vehicle and support the driver in certain driving situations. Ibeo ADAS products generate real-time knowledge of the current driving situation and can suggest specific actions (for example pre-crash warnings) or perform an action (for example automatic emergency braking and highly automated driving).

### **ibeo.Reference – The benchmark in ADAS sensor development**

Ibeo also develops combined laser scanner and evaluation software systems for automatic reference scenario generation. Ibeo.Reference products facilitate the ADAS development process by providing a benchmark reference for third-party ADAS systems. They generate real world scenarios using high-resolution laser scanners and Ibeo Evaluation Suite software, which provides object tracking for dynamic as well as static objects, lane-marking and curbstone detection.

### **Project Budii – fused technologies for reliable driver assistance systems**

In Budii, two SCALA laser scanners are integrated within a driving assistance system, one on the front of the vehicle, and one on the roof. The laser scanners observe the vehicle's environment, detecting other vehicles, motorcycles, pedestrians, and static features such as trees, slopes, potholes, etc. Based on the observed objects, a map of the environment is created, including relevant data for all classified objects.

In addition, the data is fused with information from a Kappa camera for a real-time 3D view, with the scanners providing 3D depth information. The camera provides image data and color information. A periscope adaptor ensures optimum positioning of the camera on the vehicle. All static and dynamic environmental information is mapped and displayed graphically. This allows the Budii system to be used in off-road applications for obstacle identification for automatic obstacle avoidance manoeuvres or driver warning.

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## **Thinking ahead to meet tomorrow's expectations: VISION SYSTEMS FOR THE CARS OF THE FUTURE**

The German camera developer and manufacturer Kappa optronics GmbH serves numerous industries, from aviation to medicine, with application-specific cameras. In the automotive sector, Kappa has made a name for itself as a pragmatic yet visionary camera company with an innovation-driven portfolio. Kappa propels innovations for concept cars and series forward with a breadth of projects spanning from safety-related applications subject to regulatory approval through to cameras in demanding driver assistance systems. Kappa's camera systems offer excellent performance, making future driving safer, more energy efficient, and more ergonomic – and thus, more comfortable and relaxing.

**KAPPA IS THE CAMERA EXPERT, FROM DEVELOPMENT TO MASS PRODUCTION.**

**Master of integration:** For maximum overall performance, the vehicle of the future relies on the fully tuned and synchronized interplay of all its high-tech components. With a multifaceted and comprehensive portfolio, Kappa can react to all applicative aspects, ensuring perfect camera integration into higher-level systems.

**Often better than the eye:** Kappa provides application-specific signal processing and adaptive algorithms far beyond today's customary camera standards, specializing in the areas of HDR imaging, maximization of representation range, and tone mapping. Specific light relationships in vehicle traffic are highly complex and must be fully mastered in all driving situations — slow, fast, bright, dark, forwards, backwards and in the presence of disruptive optical frequencies such as pulsed light, highlights, and sun low on the horizon are all readily addressed.

Robust, compact cameras: For cameras on vehicles, function under all environmental conditions must be guaranteed safe, secure, and stable. Kappa's cameras withstand bone-chilling cold, blistering heat, jarring gravel roads and even car washes. For use in passenger vehicles, Kappa develops not just shock-vibration-temperature-resistant and waterproof cameras, but space saving ones as well that easily fit into the limited available area within the vehicle.

Safe, secure technology all the way through to mass production: Quality management ensures Kappa products' functional safety using standardized (ISO 26262) processes; relevant procedures are followed in all phases of development and production, with the objective that these cameras will secure approval for use as safety-related components in vehicles anywhere in the world. All concepts are designed for realization in industrial production environments. The technologies used in these cameras can be manufactured and tested using automated procedures.

## KAPPA CAMERAS IN THE BUDII

Autonomous driving with innovative 3D real-time view of the surroundings: A very light-sensitive Ethernet camera module by Kappa is integrated into the Budii driver assistance system. It combines data from an IBE0 laser scanner with data from the camera, creating a real-time 3D view. The camera delivers image data including color information, while the scanner provides depth information for the 3D representation. For optimal positioning, the system is integrated into a digital telescope assembly. All static and dynamic information on the surroundings are displayed completely, calculated and graphically mapped — allowing the Budii to autonomously recognize and avoid all obstacles in off-road use.

### German Precision Meets Swiss Precision:

A second Kappa camera is installed in the Budii's interior with a precise view of the clock face of the world's most intelligent watch winder, the „Manero Power Reserve“ from exclusive Swiss timepiece manufacturer Carl F. Bucherer in Lucerne.

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## Kiekert AG

### **A Shining Example of Safety and Comfort: The Kiekert e-Latch with integrated LED in the New “Budii” from Rinspeed**

The invention of the automobile revolutionized individual mobility and became a symbol of freedom. In future, autonomous driving will lift the relationship between man and machine to a whole new level. The car will become a “buddy”, a reliable chauffeur, who takes over the wheel on request, freeing up the driver to do something else instead. At the 2015 Geneva Motor Show, Rinspeed is presenting its study “Budii”, a forward-looking concept for individual mobility that unites an exceptionally high degree of safety and comfort. “Budii” makes a highly compelling case from the word go.

The driver gently strokes the touch sensors on the “outer door skin”. The door opens as if by magic and greets the user with a feeling of newly won freedom. The innovative Kiekert e-latch allows doors to be opened electrically without the use of handles. The opportunity to dispense with outer door handles also offers a new scope of freedom in vehicle design. Furthermore, the e-latch's innovative system architecture offers high-quality and individual acoustics when opening and closing the door. Its operation is rounded off in conjunction with a Kiekert soft-close system. When the car door is leant against the frame, the mechanism pulls it closed automatically and almost silently, ensuring it is safely secured. Closing the door becomes a peaceful pleasure. Kiekert has long been a leader in

the design of door-closing acoustics. Together with vehicle makers, Kiekert is developing individual sounds that make the acoustics of a car door unmistakable and convey the specific image of a brand.

### **Doors without handles for maximum comfort and visibly greater safety**

The comfortable future of autonomous driving calls for the very finest engineering skills applied consistently to ensure fulfillment of uncompromising safety requirements. A shining example of automotive safety is the new Kiekert LED latch. Integrated directly into the heart of the door latch, the LED warning light is clearly visible to all road users through the full swing of the door's opening angle. The latch can be used in any vehicle and can be equipped with additional signal functions. One example is child locks on the rear doors, which, when activated, can be signaled with green LEDs and when deactivated with red LEDs. The door warning light, which was previously a separate component within the car, will become an integral part of the locking system in future. Assembly work for the vehicle maker is thus significantly reduced.

### **Kiekert door latches for high-quality vehicle design**

The high-tech products from Kiekert open up new design opportunities for vehicle manufacturers. With the Kiekert e-latch, auto makers enjoy considerably more design freedom in conceiving door handles, with a subsequent positive impact on car buyers. The spectrum of possibilities ranges from the visually attractive integration of the handle into the door to dispensing with it entirely. The car door is opened using state-of-the-art sensors or possibly even a smartphone.

### **Kiekert sets new benchmarks in the lightweight design of locking systems**

Two motors are usually required for a door latch to function electrically. By temporarily using the motor that electrically opens the door for central locking, too, Kiekert's e-latch saves the use of one motor. The resulting benefits for the vehicle manufacturer are clear – a smaller package, lower weight and less cost. As the technology leader for automotive locking systems in every vehicle class, Kiekert has successfully achieved a reduction in the weight of its products of 40 to 50 percent over two vehicle generations compared with other latches with the same functionality commonly available on the market. In so doing, Kiekert makes use of lightweight materials, new production processes and increased functional integration paired with a reduction in packaging space.

### **Kiekert – the technology leader in automotive locking systems for exclusive comfort and the very highest levels of safety**

Kiekert, founded in 1857, offers locking systems of exceptional technical quality and compelling economy for vehicles in all segments from entry level to premium. Today, with its headquarters in Heiligenhaus, Germany, and 5,100 employees in nine countries, Kiekert is the first choice among leading auto makers the world over. Kiekert's core product – the side door latch – covers all functions. These include groundbreaking inventions like comfortable and convenient central locking and electro-mechanical soft-closing, as well as safety innovation "inertia protect latch" and electrical child safety locks. One in three side door latches worldwide is based on a Kiekert product design. With more than 1,200 patents in the field of locking systems, Kiekert is an innovative driving force and the go-to name in the sector. To date, the automotive supplier has developed and produced well in excess of 1.5 billion latches for the international automotive industry. The technology leader holds a market share of around 20 percent.

Kiekert AG

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### **ii am safe - ii follow you**

KUKA is concentrating on advanced solutions for the automation of industrial production processes. Since its founding more than 100 years ago, the company stands for innovation and quality. KUKA with its two divisions Robotics and Systems is world leader in robotics, medical and automation.

**Innovation happens when new ideas and inventions are converted into products and are placed with their applications in the market.**

As a global leader in robotics and automation, KUKA faces challenges to future-robot-based automation. As a first mover KUKA sees the global megatrends such as demographic changes, resource scarcity and volatile markets as drivers for new innovations. A new kind of automation in production is hereby required to stay competitive.

One result of KUKA's innovation is the LBR iiwa, which is the first move into the direction of these new requirements of production automation. It combines the latest technologies and applications with an attractive and functional design.

A system - made in Germany -.

**Competence needs experience. KUKA has both.**

„LBR“ means lightweight robot, „iiwa“ stands for „intelligent industrial work assistant“.

As the first in series manufactured sensitive robot, suitable for human-robot collaboration, the LBR iiwa penetrates into areas that were previously closed to automation.

The kinematics of seven axes allows maximum flexibility of movement. The use of joint torque sensors in all axes combined with the innovative control technology allows direct collaboration with human beings. Basis of the new robot concept is the controller technology Sunrise developed by KUKA, which combines movement and sensing.

„To make the new possibilities of LBR iiwa tangible, you have to experience it.“

The kinematics of the LBR iiwa is based on the human arm. Thus, the position and orientation of the tool can be achieved with different axis positions. LBR iiwa encompasses interfering contours easy. Consequently, workflows can be programmed extremely space saving. Especially with narrow and difficult installation situations in manufacturing plants the LBR iiwa proves to be a highly flexible operating work assistant.

The LBR iiwa also makes it possible to automate processes and areas that are today characterized by a low use of machinery. Especially the product features of safety and sensitivity allow direct cooperation between human beings and the LBR iiwa - the robot as a flexible worker.

Through the LBR iiwa an optimum degree of division of labor can be achieved. Now men and robots can choose the tasks which are best suited for them. Therefore the man is relieved by the automation and remains sustainable as a worker.

In cooperation with Rinspeed AG further opportunities to use robotics in daily life are realised in the presented study. How can the LBR continue to support the people. In Budii it acts as an adjustable steering column. But beside this there are further functions possible, like to ensure the comfort and make the ride enjoyable. Besides the steering function there would be also tasks conceivable such as making coffee, spending drinks and many more.

In the area of environmental sustainability, the LBR iiwa demonstrates its conceptual advantages. Due to the lightweight kinematics and control logic its energy consumption is significantly lower than robot systems with comparable load.

For questions, please do not hesitate to contact us. For further information, please have a look on our website: <http://www.kuka-lbr-iiwa.com>.

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Led by the industry visionary, Frank M. Rinderknecht, Rinspeed has been pushing the technology envelope for over 30 years. This year is no exception as Rinspeed's Budii concept redefines the relationship between man and machine. This relationship is defined through the Human Machine Interface or HMI - key to the car user experience. Luxoft was chosen to create the HMI for this innovative lab on wheels and we're extremely proud to join in this quest for building the ultimate automobile.

### **HMI - the Center of Consumer Experience**

Driven by innovation and passion, the human-centric Budii is an electric-powered self-driving vehicle that is capable of learning a driver's habits and preferences and becoming his or her best buddy. Driver and passenger communicate with the car using a digital instrument cluster and head unit display – both designed by Luxoft. We use the design language to create unique car HMIs that are efficient, intelligent, reliable, non-distractive, and user-friendly.

Your car is quickly becoming a full-fledged digital native and the user experience is increasingly defined by the uniqueness and quality of HMI. The leading brands will differentiate themselves by the distinct user experiences they create in their vehicles. Smart HMI combines connectivity, anti-distraction factors, and context adaptation with strict ergonomic requirements. It is situation-aware and constantly optimizes a driver's workload. We are bombarded by information when driving, but the intelligent HMI makes a driver's job easier and helps us stay focused on the road. Well-designed HMI seamlessly combines multiple screens in the car – whether in-dash or brought-in - from the digital instrument cluster to smart devices.

### **Digital Cockpit of the Future**

The trans-urban Budii concept car features the electrically powered eye-catcher that, along with its autopilot, quickly adapts to the habits and preferences of the driver. The entire cockpit is designed around humans and their needs. The digital instrument cluster and navigation screen are augmented by the head-up display. The intelligent car understands gestures and interacts with its environment and other vehicles along its route.

The digital instrument cluster is quickly becoming the main screen in the car and may merge with the center stack display in the future as both continue to increase in size. It provides the ultimate flexibility, displaying what is needed exactly when it is needed. It naturally brings out the "car-ness" and is quickly replacing analog gauges in almost all new vehicles – no longer limited to just the luxury car segment. Luxoft helps drive this digital transformation with its design tools and development services.

### **Software – The Heart and Brains of the Modern Vehicle**

A modern high-end car contains over 100 million lines of software code. This is more software than in the Windows Vista operating system or F-35 fighter jet! Only a few years ago that number was measured in thousands. Complex software powers many important systems in a car - from drivetrains to telematics and infotainment systems. Smart devices and apps can now be seamlessly integrated with a car's head unit. As cloud connectivity enters more and more cars, the role of software skyrockets. Realizing the competitive advantage of software and the value it brings to drivers and passengers, automakers are trying to close the gap with the consumer electronics industry.

With over 10 years of experience in creating automotive software for the leading global car manufacturers, Luxoft offers a wide range of embedded software development and integration for in-vehicle infotainment and telematics systems, digital instrument clusters, head-up displays and more. There are millions of cars on the road today with User Experience (UX) and HMI designed by Luxoft. We create cutting edge technology such as situation-aware HMI, computer vision, augmented reality, and mobile device connectivity. Luxoft's "know-how," the Populus and Teora UX and HMI design tool chains, power the development of award-winning automotive HMIs, significantly reducing time to market. These tools dramatically cut the time from an initial brainstorming session to the production-ready HMI and ensure a bug-free operation.

### **The Biggest Wearable**

Today's cars have come a long way from being a mere means of transportation. With cloud connectivity and smart HMI, cars are becoming the ultimate gadget – the biggest wearable device. The repercussions for the industry are immense. Smartphones and smart watches are already part of the car experience. Soon, the cars will be communicating to each other, the road infrastructure, and the larger Internet of Things (IoT). Vehicles will generate enormous amounts of data, which need to be analyzed and can be visualized as well. Big data processing will no

longer be the domain of banks and telcos. With our unparalleled expertise in financial data analytics and telecom domain, Luxoft is up to the challenge.

As more cars become connected, automotive telematics is transforming into the full-scale Internet of Cars. Automotive user experience and HMI is the focal point where the automotive and IoT worlds meet. Big data processing, data analytics, and visualization will deliver a wealth of valuable information to drivers, car manufacturers, and the entire automotive ecosystem.

### **Building the Future Together**

Rinspeed's Budii is giving us a glimpse of the not-so-distant future. The Automotive industry is going all out digital, and the industry players are rethinking their strategies and business models. To succeed in this brave new world, a unique combination of skills is required. With thought leadership, industry expertise, resource scalability, and prebuilt solutions, Luxoft has become one of the world's leading automotive software integrators helping its partners to thrive in the digital future.

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### **MANSORY – more than tradition, more than racing.**

British luxury cars and their special style have always been the passion of Kourosh Mansory, the owner and namesake of MANSORY. This enthusiasm made him spend many years in England and personally commit himself to automobile values such as tradition, craftsmanship and well-engineered technology. Already when the company was founded in 1989, special attention was therefore given to the brands Rolls Royce, Bentley, Aston Martin and Ferrari. Mid 2001, the company moved from Munich to the Fichtelgebirge. At its new location in Brand in the vicinity of Bayreuth which is famous for its Wagner Festival, the skilled team produces high-end tuning in all disciplines of individual automobile manufacturing. The main focus is developing and selling a customizing- and accessory programme for luxury car brands on an international basis. In addition, MANSORY has established itself as a reliable development partner and supplier to the automotive industry.

Production on the highest technical level combined with masterly craftsmanship and most precious materials – this is the quality standard of the MANSORY corporations. Harmonically designed aerodynamics programmes, ultra-light aluminium rims and powerful engine performance enhancements are the basis of the MANSORY technology programme. High-quality accessories and stylish interior fittings complete the assortment. Whether dynamically striking or extravagant and noble, MANSORY interiors render comfort and confidence.

Today MANSORY employs more than 200 members of staff and fulfils nearly every automobile dream of its exclusive clientele. In Germany, Switzerland and via selected sales partners all over the world..

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### **NXP: Enabling the future of connected vehicles**

The number of people living in cities is expected to double by 2050, meaning congestion and pollution will increasingly be a problem for city dwellers. As a result the cities of the future will demand smarter traffic management solutions and more intelligent vehicles.

This transformation is already well underway. The car as we know it is transforming from a simple mode of transport to a personalized mobile information hub – fully connected to the outside world. Innovations are helping to create a more entertaining, customized experience for consumers as well as making driving safer and easier. But this is just the beginning, let NXP Semiconductors, pioneers of the connected car, give you a glimpse of what the future of driving looks like and the technology that will enable it.

MONDAY, 7.00 AM

You have a big meeting at 08:30 AM outside of the city meaning public transport options are limited. Luckily, the day before your smart calendar advised you to book a rental car. In just a couple of clicks the car is booked and scheduled to arrive at your door, and your alarm clock is synced to wake you up in time based on traffic conditions.

The car navigates its way safely through the streets using NXP driver assistance technology (e.g. Radar and V2X) which gathers information about its surroundings, providing the on-board computers with an image of obstacles and dangers the driverless system must avoid.

A notification on your smartphone lets you know that the car is outside and ready to enter. The car will automatically detect the embedded NXP Smart Key technology in your phone as you approach, enabling it to securely identify you as the correct driver of this rental car. All that's needed is for you to pull the handle and enter.

Once inside the car you place the smartphone on the wireless charging pad where not only does it begin charging but using the NXP automotive grade technology it syncs with the car. Temperature and seating is adjusted to your preferences, your desired news site is displayed on the console and it also plays your favourite DAB radio station which comes through crystal clear thanks to NXP's software-defined radio solution.

MONDAY, 7.30 AM

The car knows the route and automatically streams onto the motorway to 'platoon' - hooking itself to another group of cars heading in the same direction. Safe speed and distance is maintained via the on-board Vehicle-to-X (V2X) technology based on the NXP RoadLINK™ chipset. As well as communicating with vehicles around it the device also speaks to other connected infrastructure. You lean back in the seat and the car asks you what you would like for breakfast, after making a selection it sends your order to the en route cafe. All you need to do is reach out and take the order as they know exactly when you'll arrive.

As you leave the city, travelling along a countryside road a deer leaps out at the last moment, the car takes automatic evasive action and prevents an accident allowing both you and the deer to safely carry on.

MONDAY, 07:45 AM

Arriving at the destination you've checked in with security before you arrived so the barriers to the parking lot open instantly after reading your NXP powered RFID license plate. The license is linked with your payment details so no need to collect a ticket or find coins. Right on time you pull into an available space ready for your presentation.

## REALIZING THE FUTURE

While such a scenario may seem futuristic every aspect of what has been portrayed is based on technology that already exists today. NXP has been a driving force behind the connected car since the very beginning and is dedicated to enabling car makers to provide the best connected car experience for drivers and passengers, today and in the future.

Working with a range of partners in the automotive industry, NXP is now closer than ever to bringing the connected car vision to reality. NXP brings car-to-x communications into the car, as well as wireless technologies for vehicle access, Near Field Communication (NFC), and multi-standard digital broadcast reception. NXP is also driving innovation in advanced technologies, such as car radars.

## SECURITY IN THE CONNECTED CAR

NXP has secured its position as a leader in connected car technology because of its expertise in security – the foundation of any connected automotive solution. Connected car technology, in particular V2I and V2X works by creating ad hoc data exchange networks between the vehicle and environment — in other words, independent, self-organising networks of mobile users.

As with any other wireless LAN, communication is exposed to security risks that must be guarded against in order to prevent access from hackers and other potential threats. To do this, firstly the quality and integrity of data has to be ensured. Intelligent vehicles must be able to detect whether data has been altered and falsified for any reason when collected or transmitted. Wrong or defective data can block the applications on which they are based or render them ineffective — in the worst case becoming a genuine safety risk.

For instance, if inaccurate data misleads a vehicle into incorrectly recognizing the speed of the vehicle driving ahead of it, there could be fatal consequences. So mechanisms need to be integrated that can detect bad data, remove it from the communication circuit, or destroy it entirely. NXP's automotive solutions encrypt, authenticate and secure data at a chip level. Using a set of security keys the car can determine if the data really originates from a specific, trustworthy vehicle.

Another important element is privacy; NXP's security elements randomize the signature of vehicles so that an individual's driving behaviour cannot be tracked by other vehicles. Addressing these issues of security and privacy will be essential if the scenarios described are to be made into a reality. NXP is confident that with its secure automotive technology we will all soon be leading more connected, safer and more fulfilling lives.

NXP SEMICONDUCTORS GERMANY GMBH  
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## **RACEMARK**

**Global leading tier one OEM supplier & designer of automotive interiors for over 50 years..**

RACEMARK began in 1964 as a partnership between Porsche of America team world class racecar drivers Bob Bailey and Mark Donohue. Racemark was founded on the principals of engineering excellence into every product we make. It is our philosophy to design and engineer the most innovative interior trim parts to meet and exceed the styling expectations of our international OEM customers.

In 1973, we were the first company in the world to create a custom fit carpet car mat. Racemark is recognized as the reference point for innovative and stylish car mats in the automotive market. High material standards, competitive manufacturing processes and our dedication to quality result in optimized product life cycle cost. Starting from high volume, mass production components into premium and luxury designs all the way to unique, customized products we support a wide range of vehicle segments. Our flexibility ultimately results in individual solutions as specified by the customer or consumer.

Racemark International includes manufacturing plants located in the United States, Hungary and Switzerland. With our strong presence in North America and Europe we follow international market trends of the highest quality brands in the automotive and textile industries. This enables us to introduce attractive, functional and safe products. We deliver features and product enhancements to always achieve "best in class" parts for the global automotive industry. We have grown globally expanding to supply just in time delivery to our customer's assembly plants. This enables us to provide the shortest vertically integrated lead-times possible at a very competitive price. Our plants are dedicated to the production of the finest automobile floor mats in the world, supplying the premier brands in the automotive industry.

You will find our products at your feet in the most luxurious automobiles in the world.

RACEMARK  
[www.racemark.com](http://www.racemark.com)

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## **New fiber-matrix combinations**

The Schoeller portfolio with more than 100 different types of fibers offers a wide range for most innovative composite solutions for a large number of technical fields. Part of the interior of the latest Rinspeed „Budii“ is now made of thermoplastics. The composite is based on a DREF yarn. It has a Kevlar core and a polyamide sheath

thus opening a broad range of design applications while maintaining the desired functionality. The thermoplastic yarns from Schoeller allow an easy processing, feature a high strength and may be separated according to type. Apart from Kevlar, other fibers can also be used for reinforcement purposes, e.g. glass fibers, carbon, Tencel, sisal, hemp and further natural fibers. Different materials can be used for the thermoplastic matrix fibers, e.g. polyamide, polypropylene, PET or PEEK. For specific or unusual applications, Schoeller may choose from a large variety of fibers and most different spinning technologies. Schoeller is even able to offer sustainably innovative solutions thus meeting the highest standards in aerospace. In close cooperation with its industrial partners, Schoeller develops innovative yarns for i.a. innovative seat covers, door linings, composite and roof linings.

The Schoeller Spinning Group from Hard in Austria is one of the world's leading worsted yarn producers. Some 500 employees produce approx. 3,500 tons of yarn per year in different locations in Europe. One-and-a-half century of experience and an innovative research and development department assure that the technological lead is not only maintained but continuously enhanced. The course of development is marked by the principle of sustainability firmly enshrined in the corporate philosophy. And that's why Schoeller was the first worsted yarn spinning mill to have been awarded the comprehensive „bluesign“ label, an environmental and ecological certificate. Moreover, Schoeller has been distinguished by the much coveted „bluesign Award“, is actively involved in the International Association of Natural Textile Industry (IVN) and produces according to the Global Organic Textile Standards (GOTS). In a nutshell: sustainability + innovation = sustainnovation.

Schoeller GmbH & CoKG

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## **BETTER VEHICLES START WITH SIKA**

AT SIKA, WE BELIEVE that a truly innovative company is one that starts with a culture within which a passion for innovation and creativity thrive. An innovative company should also take a customer-focused view; one that anticipates customer needs with a thorough understanding of key market trends.

### **LIGHTER WEIGHT**

We have a full range of products which enable our customers to make their vehicles lighter. For example, we were the first to engineer body shop adhesives (SikaPower®), which enable mixed-material bonding of lighter materials such as aluminum, carbon fiber reinforced plastic, as well as traditional and high strength steel.

### **STRONGER AND SAFER**

We were the pioneer in vehicle body reinforcements with our SikaStructure® and SikaReinforcer® products, which not only help stiffen the vehicle for better overall dynamics but also improve crash performance and increase vehicle occupant safety.

### **QUIETER**

We provide solutions that make vehicles quieter; SikBaffle® seals noise pathways while SikaDamp® reduces the body panel vibration that contributes to audible noise in the vehicle. Both products are engineered for best-in-class weight-to-performance ratio. Used together, or separately, our industry leading acoustics solutions improve vehicle occupant comfort.

### **GREENER**

We were the first to develop glass bonding pre-treatment systems which, when in use, contain and release fewer volatile organic compounds – a more environmentally friendly approach that easily outperforms the industry's previous generation of products.

Sika, located in Baar, Switzerland, is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing and protecting in the building sector and the motor vehicle industry. Sika has subsidiaries in 90 countries around the world and

manufactures in over 160 factories. Its more than 16,000 employees generated annual sales of CHF 5.6 billion in 2014.

SIKA Automotive AG | [www.sikaautomotive.com](http://www.sikaautomotive.com)

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### **High value, quality and comfort in the car. Special technical textiles for interiors from STRÄHLE+HESS.**

Since it was founded almost 90 years ago, the company has developed from a conventional producer of circular- and warp-knitted fabrics to an innovative supplier of special technical textiles and exclusive fabric surfaces for the automotive industry.

With more than 200 employees in Althengstett, Bisingen and Auburn (USA), the company specifically targets innovations and attaches considerable importance to its development and design department, its fully-equipped laboratory and engineering services.

On the basis of current trend analyses, STRÄHLE+HESS constantly develops textile solutions for its clients as part of holistic material and design concepts. The refined textiles can be used in a whole range of completely new ways inside the vehicle.

Trend-setting developments for noise absorption, compensatory tolerance and seat attachment systems as well as customised solutions are implemented in the Solutions division.

Virtually all well-known car manufacturers worldwide are customers of STRÄHLE+HESS.

### **Friend on wheels**

Budii – my car, my companion, my friend. Budii is more than just a car. Vehicle and driver get to know each other, the electric vehicle adapts to suit its driver's preferences and learns from environmental information and its own experience.

The interior underlines the fact that Budii is really a kind of mate. The friendship is lived to the full inside. To make this happen, the driver has to feel safe and at ease in a modern environment. The choice of colour in cognac and dark blue ensures a feel-good atmosphere: a touch of technology and metal is brought in as a contrast with a range of silver focal points.

This effect is achieved with the iridescent STRÄHLE+HESS surfaces, as well as the sporty-looking, contrasting piping in orange/black which is used, for example, on seats, headliners, head restraints, pillars and door panels.

To make the interior look more roomy, as well as exude sportiness and dynamism, the material was divided strictly with lines taking a horizontal direction, a pattern which can be found throughout the interior.

Thanks to the unity of the seam pattern the interior features a stylishly casual elegance and transmits a feeling of safety.

The diamond pattern of the seats is reflected in the headliner. The quilting ensures a direction of pattern that visually enlarges the vehicle interior, creating a cosy and modern ambience.

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**CREATIVE IDEAS. ELABORATE DESIGN. REAL RESULTS.**

OUR PHILOSOPHY

As an owner-operated advertising agency, the people at VOLLMOND understand the importance of preserving long-lasting relationships. This is why we base all of our customer-relations on understanding, trust, and reliability. At VOLLMOND, we have made honesty, loyalty, and fairness our first priority and we follow these principles in everything we do, whether this be consulting, planning, designing, or making ideas a reality. Our clients range from small companies, to corporations, to well-known companies from different economic sectors. No matter what your budget may be, we will happily work with you to reach a plausible solution. More than anything, we want to help you achieve your goals because our top priority is to see our clients succeed.

“Success can be measured – Our clients have proven it!” Torsten Jost, Managing Director

## **STRATEGY**

At VOLLMOND, advertising begins with strategy development. In advertising, nothing is more powerful and effective than communication. A message doesn't only have to be conveyed, it needs to be understood, as well. This is why we aim to communicate with our clients and the advertising's target group at a level both understandable and relatable. Thereby, we rely on the concept of integrated marketing communications.

## **PRINT**

If you are looking to have your advertising printed, we can also assist you in creating a corporate design, the advertising, image campaigns, brochures, and much, much more.

We believe in working efficiently while skillfully combining creativity, technical expertise and personal commitment. We will provide you with the necessary professional support you need for your projects. If you already have an existing design, we can either work with you to improve it or assist you in creating something completely new.

When creating an effective well-structured concept or design for our clients, we always ask ourselves what will best represent our client and what will best support our client's objectives.

In other words, we orientate all of our actions and plans towards the needs of our clients. However, a long-lasting business relationship cannot be established by blindly catering to all of the customer's demands. This is why we actively consult our clients. We offer them reliable service, find sensible solutions, and turn ideas into a visual reality.

## **ONLINE**

We will professionally plan, design and program your online-solution. We are well-experienced in this line of work. It is often the fine details that makes successful advertising stand out the most! This is why we aim to have a clearly defined goal and detailed planning when tackling our projects. To make our clients and their advertising as successful as possible, we ask questions, give honest answers, put ourselves in the shoes of the company, and think about how to make the advertising successful in the future, as well.

## **In short:**

Every one of us at VOLLMOND does his or her best to exceed your expectations.

**You can take us by our word!**

VOLLMOND Werbeagentur

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## **Create visual accents with innovative LIGHTING technology**

WEIDPLAS is a leading manufacturer of highly engineered and technically complex plastic components for the automotive and sanitary industry, with its headquarters, development and technical center in Rapperswil, Switzerland. It has manufacturing facilities in Europe, Asia, South Africa, and South and North America.

Since May 2014, WEIDPLAS (formerly WEIDMANN Plastics Technology) has been part of the TECHNIPLAS Group, a privately held group of specialized plastics manufacturing companies with headquarters in North America, which primarily serves the automotive, industrial and medium and heavy truck industries. The TECHNIPLAS Group has 11 production facilities as well as 11 sales and technical centers with almost 2,000 employees worldwide.

Utilizing smart and sophisticated injection molding solutions, WEIDPLAS develops and implements performance-

enhancing solutions for its innovative customers. Unique and sometimes Unconventional combinations of product technologies, production processes, plastics and other materials have made WEIDPLAS a wellknown worldwide innovation leader.

For several years there has been a trend in the automotive industry to repeatedly implement novel and creative product ideas. High-quality materials, sophisticated surfaces and lighting concepts play a key role in this, and they increasingly act as brand recognition factors. Implementing unusual lighting effects is becoming increasingly important, creating a demand for new technologies and imaginative solutions to meet the need for these innovations.

LEDs have become established as a contemporary light source. Modern, future-oriented lighting applications frequently require homogeneous planar light sources, which are very difficult to achieve with LEDs, they are point sources. Here WEIDPLAS offers an innovative solution with its two key lighting technologies: OPTIBACK simulation software and microstructuring.

The scattering characteristics of each microstructure point is precisely defined by its geometrical form and size using OPTIBACK software. Depending on the application, light outcoupling elements with sizes from 12 µm to 50 µm are applied. An advantage of using microstructures is that a homogeneous light surface i.e. light distribution; results directly from the structure, eliminating the need for additional diffuse filter materials. Another major advantage is that shadowing effects are minimized by the individual outcoupling points in the light guide, so very long or very thin light guides (less than 1mm) can be implemented.

Based on the specified brightness distribution and optical properties of the material used, our OPTIBACK software, developed specifically for this purpose, computes the distribution of these microstructure points within the light guide to produce a homogeneous lighting surface. Of course, targeted inhomogeneities can also be defined for purposes such as selective lighting, symbols that are invisible when not lit, or precisely specified brightness gradients.

The BUDII concept vehicle combines two mobility modes – rational and emotional – and highlights the selected mode with innovative lighting technology. At the front and rear of the vehicle, flat light panels made of PLEXIGLAS® by EVONIK and dot-matrix elements create colored lighting effects. A single light guide between the headlamps enlivens the vehicle, while lighting elements integrated into the hatchback reflect the vehicle's character in a highly differentiated manner with a combination of fine structures, uniform light areas and animations in the dot-matrix area.

The freely controllable combination of several structured light guides with both homogeneous light distribution and finely structured graphics enables a wide range of effects to signal the status of the BUDII vehicle. The color and position of the illumination are independently adjustable for each light guide. The dot-matrix elements enhance the effect with animations and act as the tail lights of the vehicle. The light-guide structures and dot-matrix elements are only visible when active and are concealed by a smoke-gray acrylic panel when quiescent.

If you would like to know more, please contact us for additional information.

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## **The specialist for development and marketing of area-forming systems**

The corporation Zypalis AG is predominantly focused on the development and marketing of area-forming systems. Preferably, a motor is utilized to change the system from a stacked or folded state into an area-covering functional state and vice-versa and is able to form various free-form surfaces in the functional state.

A large variety of products resulted out of these developments which are applicable in all kinds of industry segments. One of these products is called PLUS X – a fan system, which allows car windows to be fully covered, independent of their window form or size.

The electromotive version allows PLUS X to completely and fully cover all car windows – side windows, rear window, as well as the windshield – within seconds, so that the passenger room can be shielded completely from outside view and sun. This results in a multitude of advantages of which the most important ones are listed as follows:

#### Heat Protection

While parking, all car windows can be completely shielded against sunlight. This leads to a significant reduction in heat retention of all components in the passenger room, which was proven by comparative gauging.

#### Consumption Reduction

Due to the significant heat reduction in the passenger room, the air conditioning unit needs much less cooling power to operate. Therefore, in places exposed to extreme sunlight, vehicles using a combustion engine consume less fuel and produce less CO<sub>2</sub>. Vehicles using electric engines can extend their range or reduce their needed battery capacity.

#### Privacy

PLUS X may cover the windows in the rear completely while driving, and all windows while parking. This allows passengers to safeguard against prying eyes and protect their privacy in each and every situation.

#### Glare Protection

As explained in Privacy, one has the option to use PLUS X to either shield all windows completely or only those in the rear of the car. Sunlight or artificial light is blocked from having a disturbing effect on screens used in the passenger room, thus allowing everyone to fully enjoy all sorts of infotainment without impairment.

#### Individualization

PLUS X as a fan system can feature individual high-quality imprints that potentially cover its inner and outer surface completely. In this fashion PLUS X becomes a style element offering entirely new design possibilities and makes each car unique.

Protection against prying eyes may become the most outstanding feature in self-propelled and self-steering cars like Budii because, by using PLUS X, all windows can be fully covered while in motion; therefore, guaranteeing full privacy of its passengers.

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