



PRESSEBUCH  
PRESS-BOOK

metro   
**snap**

**RINSPEED**



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# RINSPEED

Rinspeed's "MetroSnap" displays innovative solution for the key question of modular vehicle systems and mobility options:

## Clever modular concept solves the issue of cost

Frank M. Rinderknecht: "The crucial step towards series production has now been taken."

As the first company in the world, Swiss powerhouse of ideas Rinspeed demonstrated the "Snap" and the "microSNAP" at the CES in Las Vegas in the past two years, vehicles whose chassis and bodies go their own ways. With the revolutionary separation of the two vehicle components, Rinspeed confronts the increasingly diverging life cycles of hardware and software. And by doing so, creates a sustainable foundation for the transport of people and goods in the world of tomorrow.

The future belongs to modular mobility systems. That is evident in the number of imitators in the industry that have picked up Rinspeed's ingenious idea. However, the systems also have to make economic sense in order to gain broad acceptance. And that is precisely where Rinspeed is now once more taking a crucial step ahead: In the "MetroSnap", Rinspeed presents a simple, fast, safe and inexpensive swapping system for the vehicle bodies for which the Swiss company has filed for patent protection.

Modular vehicles can help solve a majority of the problems and questions posed by modern mobility that arise as the result of new IT technologies such as autonomous driving and of traffic congestion and the associated inefficiency and air pollution. Due to the flexible use of different vehicle bodies, these vehicles not only reduce the number of tremendously expensive and systemically short-lived automated vehicles, they also satisfy - depending on the time of day and current needs - the different transport requirements of people and goods.

Thanks to the unique swapping system - inspired by aviation, and tried

and tested there around the world in all weather conditions - entirely new applications become possible. Among other things, the desired service now comes to the customer quickly and simply, regardless where he or she may be at the time - at home or at work. This can be customer-accessible parcel stations that are dropped off in the customer's neighborhood for a certain period. Even combinations with a "corner health food shop" are conceivable. Limited business hours, long drives and the endless and unpopular courier caravans are thus things of the past. And quite as an aside: no more unattended packages, no more thefts and failed delivery attempts - and no more associated pollution and traffic burden. And the really great thing about it is: This innovative way of getting parcels to the customer faster and easier can already be used today with a human driver.

Parcel stations on wheels, right around the corner.





Because the batteries are split up between the “Pod” (vehicle body) and the “Skateboard” (chassis), the vehicle does not need to be parked for charging. The charging process takes place elegantly and without wasted time while cleaning or loading the “Pod.” The Swiss drivers of innovation refer to this as “Hot Swap”, the swapping of the vehicle bodies including the batteries in a matter of seconds – the vehicle is ready to go almost as quickly as a racecar after a pit stop.

The unique “MetroSnap” concept, which fuses together smart city, supply chain and passenger transport, is meeting with very strong interest in the industry even before its actual premiere. The Rinspeed motto at the CES 2020 is ‘customer focus.’ The customer - and thus people - take center stage. Because Rinspeed boss Frank M. Rinderknecht is sure: “People

desire ever more convenience and simplicity in their lives, and we want to make this possible with our innovative transport solutions.”

The electric vehicle - as always when Rinderknecht is at work - is full of technical and visual treats contributed by a reputable network of companies from around the world. In keeping with a proven tradition, Rinspeed’s 26th concept car was designed by Swiss company 4erC and constructed and realized technically at Esoro.

When it comes to electric mobility, special attention is on the batteries. The heat conducting Kebablend/TC plastics from Barlog Group based in the German town of Overath ensure optimized battery cooling. The ‘Clean Energy Pack,’ the modular and scalable battery system of the “MetroSnap” skateboard, comes from Clean Energy Global based in

Berlin. Speaking of energy supply: Thermal management specialist Eberspächer controls the temperature in the “Pax Pod” with its heating and cooling solutions by app and provides powerful heated and refrigerated containers for the “Cargo Pod” - both with autonomous power supply thanks to accumulators. A clever interface/plug-in connector from Harting ensures the transfer of data, signals and power as soon as “Pod” and vehicle body are interlocked.

Various partners contribute the digital services for the “MetroSnap.” MHP focuses on the intelligent mobility ecosystem for automated multimodal transport solutions. SAP provides a digital platform, which orchestrates and optimizes future mobility concepts and transportation through data analysis, machine learning and the IoT. EY ensures the automated use-based settlement

of transactions between platform participants as well as transparency on and trust in the supply chains with solutions based on blockchain technology. ESG Mobility focuses on smart connectivity apps, a fleet management system supported by AI, and on the development of the electronics architecture for swappable vehicle components.

When it comes to easy, fast and secure payment and its processing, Wirecard from Aschheim comes into play. Thanks to state-of-the-art palm vein recognition, the access system is considered to provide ultimate security. Zürich Insurance Group is thinking intensively about new business models of the digital future. They include time- and use-dependent models for insurance premiums as well as insurance coverage as a service model.

Harman is actively helping to shape

the transformation of mobility with innovative user experiences. The focus of the advanced digital cockpit solutions is on greater safety and comfort as well as on productivity and entertainment.

The latest project, the “MetroSnap”, runs on Borbet wheels, too. The perfectly shaped Y design of the 18-inch rims captivates in every aspect. Also, not commonplace on a concept vehicle: The “MetroSnap” uses a ‘Space Drive’ drive-by-wire system from Schaeffler-Paravan Technologie Company. Street-legal and triple-redundant steering and braking systems guarantee maximum safety. Ibeo Automotive Systems, the world leader in laser scanner sensors for the automotive field, with its Lidar sensors ensures that obstacles and people are detected early and correctly – while the vehicle is moving and during the “Pod” swap - and that the

“MetroSnap” is traveling the roads safely in autonomous mode.

The lighting technology comes from Osram. The exterior lights – for example the digital license plate - are used to communicate with other road users. In addition to no-dazzle high beams, the micro-pixel LED Eviyos also make it possible to project warning symbols onto the road. The interior lights are adapted to the mood of the driver with the help of health tracking functions. With regard to the headlights of the “MetroSnap”, Rinspeed relies on state-of-the-art LED technology as well as on the innovative product solutions from Prettl Lighting & Interior based in Pfullingen, which also make the visual messaging with other road users possible.

Dekra, a globally leading experts’ organization, tested the security and proper functioning of the data



and information transfer. TTTech Auto from Vienna contributes crucial components: Their In-Car Compute Platform (ICCP) combines all vehicle functions in a single high-performance control unit and in this way advances the transition to the software-based vehicle of the future.

Rinspeed devotes great attention to the feel-good appointments of the interior. FoamPartner is the perfect address for this. The company contributes its expertise in acoustically and thermally effective foams. With Tencel fibers for automotive interiors in the "MetroSnap", Austrian company Lenzing commits to the joint creation of an innovative transport concept of the future that strikes out in new directions in matters of sustainability, while elevating comfort to a new level at the

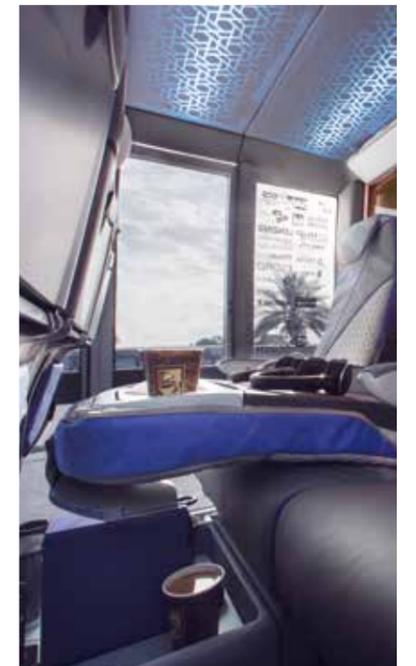
same time. South Korean manufacturer Kolon Glotech sets visually appealing highlights with traditional Korean Sanggam printing on the center console, the interior trim panels and on the "Skateboard" shrouds. Dutch chemical company Stahl, a specialist for sustainable leather, textile and various plastic surfaces in automotive interiors, likewise contributes its expertise.

When it comes to innovative textile products, Rinspeed has been justifiably relying on its coalition partner Strähle+Hess for years. The knitted fabric used in the vehicle seat was manufactured from recycled PES. Stratasys from Rheinmünster supplies innovative single-operation 3D printing on various materials for interior and exterior components.

The new mobility requires new

networks and innovative mobility trade shows. Hypermotion in Frankfurt is the innovative pioneer in matters of mobility and logistics.

The world premiere of the "MetroSnap" will be on January 7, 2020, at the CES in Las Vegas. The unusual creation of Swiss mobility visionary Frank M. Rinderknecht is on display on the Osram booth # 8516 in the North Hall of the LVCC (Las Vegas Convention Center / Tech East). In spring 2020, the "MetroSnap" can then be admired at the Mobile World Congress in Barcelona and at the Geneva Motor Show – professionally staged by Kern advertising and printing agency from Saarland.





TECHNISCHE DATEN

TECHNICAL DATA

MASSE BASISFAHRZEUG

MEASUREMENTS BASE VEHICLE

Länge	3'699 mm	Length
Breite	1'764 mm	Width
Höhe	1'800 mm	Height
Radstand Skateboard	2'700 mm	Wheelbase Skateboard
Leergewichte	Skateboard app. 690 kg Passenger Pod app. 500 kg Cargo Pod app. 580 kg	Empty Weights

ANTRIEB

POWERTRAIN

Elektromotor	Drehstrom-Asynchron-Elektromotor Three-phase Asynchronous Electric Motor	Electric Motor
Drehmoment	57 Nm	Torque
Kraftübertragung	Hinterachse / Rear Axle	Power Train
Batterien Pod/Skateboard	12.2 kW - Lithium-Ionen	Batteries Pod/Skateboard
Wärmeleitende Kunststoffe	Barlog	Thermal Conductive Plastics
Battery-as-a-Service	Clean Energy Global	Battery-as-a-Service

WERTE

PERFORMANCES

Höchstgeschwindigkeit	app. 85 km/h	Top Speed
Reichweite elektrisch	app. 130 km	Electric Range

FAHRZEUGAUFBAU

VEHICLE SETUP

Karosserie	Composite Struktur mit Stahl-Chassis Composite with Steel Chassis	Body
3D-Druck	Stratasys	3D Printing
Sitzplätze	6	Capacity
Sitze	Boeing 737 Aircraft	Seats
Innenraum-Design und -Materialien	Kolon / Lenzing Stahl / Strähle+Hess	Interior Design and Materials
LED-Technologien	Osram	LED Technologies
Front- und Heckleuchten	Prettl	Front and rear Lights

BEREIFUNG

TIRES

Bereifung vorne und hinten	225/35-18	Front and rear Tires
Felgen vorne und hinten	Borbet Type Y - 8 x 18"	Front and rear Wheels

VERSCHIEDENES

MISCELLANEOUS

Drive-by-Wire-System	Schaeffler Paravan	Drive-by-wire System
Akustik- und Wärmedämmung	Foampartner	Acoustic and Heat Shielding
Sound-System und Digital Cockpit	Harman	Sound System und Digital Cockpit
Thermomanagement	Eberspächer	Thermomanagement
Lidar-Sensoren	Ibeo	Lidar Sensors
AD-Compute-Plattform	TTTech	Autonomous Driving Platform
Energie - und Signalübertragung	Harting	Energy and Signal Transfer
Prüfungszertifikate	Dekra	Testing Certificates
MetroSnap Eco-System und -Management	ESG / EY MHP / SAP	MetroSnap Eco System and -Management
Versicherungsservices	Zürich	Insurance Services
Bezahlservices	Wirecard	Payment Services

Alle Angaben ohne Gewähr

All data without guarantee



4ERC GMBH  
CREATIVE - CLEAN -  
CAR - CONCEPTS  
the company of Peter Kägi.

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For 19 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 31 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.

Do you want to invest in this area and you have open question.

Ask us.

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# BARLOG GRUPPE

## Mehr aus Polymer.

### New Materials for Future Mobility

Technologies such as battery electric vehicles (BEVs), autonomous vehicles (AVs), passenger drones and connectivity are creating opportunities to transform mobility towards more safety, sustainability and inclusion.

This ongoing transformation poses many challenges to the industry. When changing from combustion engine powered vehicles to autonomous and connected BEVs, the need for new solutions in electric drives, thermal management, electromagnetic shielding and lightweight structures arises and solutions must be scaled to competitive mass production extremely fast.

In order to create components that provide the necessary competitive edge, engineers need cost-effective production processes and function integration on a high level. Injection molding of engineering plastics and high-performance plastics is a very cost-effective way of high-volume production, but today's standard materials do not provide the necessary thermal and electric properties for the uprising demands of AVs, BEVs and connectivity.

The Barlog Group develops, produces and provides new hybrid materials to master the challenges of future mobility, e.g. thermally conductive injection molding compounds, plastic-metal-compounds for electromagnetic shielding and flame-retardant, fiber-reinforced high-performance plastics for lightweight construction. As these new materials often require special material expertise and sophisticated production processes, Barlog Group goes beyond materials and offers engineering services to assist their customers throughout the whole development process – from co-creating innovative concepts to digitized product development using integrative simulation and digital twins, all the way to prototyping, testing and transfer to mass production.

In the battery pack of Rinspeed MetroSNAP, Barlog showcases stack-holders made from KEBABLEND / TC, an injection molding material that is thermally conductive, inherently flame retardant and electrically isolating. Finally, it bears all the mechanical loads of the battery stacks, allowing

a compact and lightweight design. The material combines four vital functions required in batteries in one material that can be processed cost-effectively and super-fast on standard injection molding machines starting from first prototypes to fully automated high-volume production processes.

The battery packs have been originally developed in collaboration with BRS Racing Team, the Formula Student Electric racing team of University of Applied Sciences Bonn-Rhein-Sieg in Germany. After proving their performance on the racing track, the battery packs have been evolved for the use in Rinspeed MetroSNAP.



### About the Barlog Group

The Barlog Group, with its two companies Barlog Plastics and Bahsys, provides comprehensive services starting with the idea and ending with the series production, including development services, such as the production of prototypes, as well as supplying the raw materials for plastics in series production and the training of production personnel.

Barlog Plastics is a competent business partner for plastic resins and compounds, specialized in engineering plastics, high-performance

polymers and hybrid materials. The focus is on customized solutions for cost and weight optimization, integration of functions, and accelerating the pace of product placement processes.

Bahsys is an innovative partner offering full-service engineering. No matter whether injection molded prototypes, small series injection molding, laboratory tests, product development, CAE-services or nylon conditioning are concerned – Bahsys offers the know-how and the technology for the best solution.

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# BORBET

## LEICHTMETALLRÄDER

## WITH METROSNAP, BORBET IS GETTING A NEW CAR WORLD ROLLING AGAIN.

Concept vehicles are the harbingers of a new car world - and the Swiss think tank Rinspeed has always been one step ahead. MetroSNAP shows that the future of the automobile not only depends on how the vehicle is driven, but also how efficiently it is used. The increase in congested roads in inner cities in particular requires completely new ideas - and the wheel of the future also plays a decisive role in this. It will certainly remain round, but the wheel in it will always reinvent itself. And as in many previous projects, also for MetroSNAP it was relied on the special design and product quality of the wheel experts from the Hochsauerland region.

### PASSION FOR LIGHT METAL

BORBET - a family business in the fourth generation - can look back on more than 130 years of tradition and experience in metal processing. Since 1977 the focus has been on the development of high-quality light alloy wheels, with which the company has developed into one of the leading international manufacturers within four decades. Today BORBET, with over 4,800 employees, eight state-of-the-art locations and approximately 18 million wheels produced annually, is the partner of over 40 automobile producers and manufacturers as well as international specialist dealers. BORBET attaches great importance to customer orientation and to the areas of engineering, production and sales processes. It is obvious that Rinspeed also relies on the experience, flexibility and innovative manufacturing processes of the light metal expert. For the

seventh time in a row, BORBET equips a Rinspeed concept study with wheels and shows how sustainable the same passion for the future of mobility can be.

### EXCELLENT INNOVATIVE STRENGTH

BORBET systematically promotes the further training of its employees and promotes the development of new, innovative manufacturing processes. For example, the NatureWheel process developed by BORBET combines metal casting with the use of a mineral skeleton. This special combination allows a weight reduction previously thought impossible - a milestone in the production of highly efficient and stable light alloy wheels. BORBET also continues to set a good example with other sustainable technologies such as the Undercut process, FlowForming or the ExaPeel laser process. The resulting contribution

to the automotive manufacturers' value chain has already been recognized in numerous supplier awards. A number of awards such as the "Porsche Supplier Award", the "VW Group Award" or the nomination as "Brand of the Century" reflect the broad recognition for BORBET's top performance.

### UNMISTAKABLE DESIGN LANGUAGE

In addition to its technological expertise, BORBET convinces with its unmistakable design language in the specialist trade and its keen sense of trends. The best example is the BORBET A wheel introduced in 1987 - a timeless classic which, due to the high demand, is still in the range today and which revives the legend of the tuning icon with the new A wheel.



### BORBET Y - THE IDEAL COMPANION

With the BORBET Y wheel in titan matt and the size 8.0 x 18 inch with offset 48 and bolt circle 112, Rinspeed's latest vision of the future has found an ideal companion. It has a weight-optimized design and is also a perfect match for MetroSNAP. The spokes of the BORBET Y-wheel run with a slight

bend from the wheel rim to the wheel centre, whereby the classic star shape of common light alloy wheels is broken and reinterpreted in the Y-style. The wheel hub sits low in the middle and focuses on the spokes. And these are the decisive design and distinguishing features of every wheel - which the BORBET Y impressively proves every day on a large number of vehicle models.

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## “Wherever, whenever”: Battery-as-a-Service through connected Clean Energy Packs

Clean Energy Global GmbH is the provider of the smart, modular, and scalable battery system for Rinspeed MetroSnap. Clean Energy Global’s innovative business model “Battery-as-a-Service” combines Clean Energy Pack battery systems with the Clean Energy Net cloud system. This guarantees permanent availability and uniquely cost-efficient charging of urban mobility fleets. The Clean Energy Global ecosystem provides a wide range of new opportunities for users and operators, as well as manufacturers and suppliers.

“Battery-as-a-Service” provides battery capacity on-demand, offering significant improvements in sustainability and efficiency of urban mobility. The business model answers three essential questions: Where is battery capacity needed? When is it required? How should it be provided?

In order to offer capacity wherever needed, Clean Energy Packs come with universal dimensions. Their size is slim to fit in vehicles, while also compatible with the 19-inch industry rack standard. The heat-conducting battery cell holders produced by Barlog Group limit their weight to less than 25 kg (55 pounds), allowing for manual transport.

A proprietary cloud system ensures capacity is available whenever required. Clean Energy Packs are connected to the Clean Energy Net

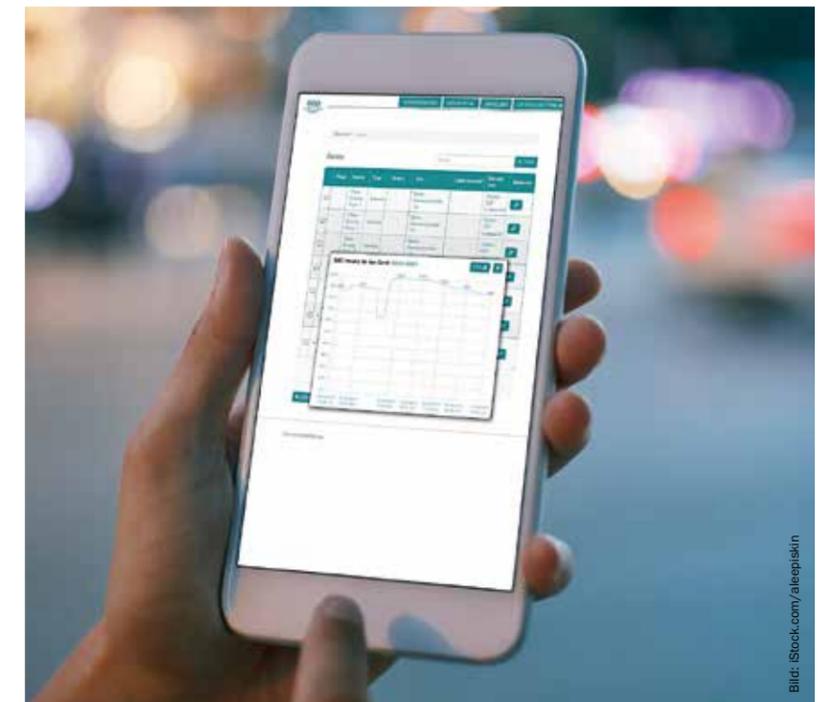
for remote diagnosis, preemptive maintenance, and remote-control functions. The use of Blockchain Technology (DLT) offers the highest level of data security. Users and operators have permanent monitoring and control options through interactive apps and central “watchtowers.”

With their scalable design, Clean Energy Packs provide capacity however it is needed. Each Clean Energy Pack has two independent battery management systems for either parallel or serial switching. The connecting voltage of only 48 volts guarantees safe handling in any environment. Clean Energy Packs combine to battery clusters for currents beyond 1000 amperes and voltages up to 800 volts.

These three capabilities solve the cost issues of electricity storage: today, fixed batteries massively increase the prices of vehicles,

machines, and battery-dependent systems. “Battery-as-a-Service” allows to offer electrical systems without batteries at a competitive price. Battery capacity is only fitted as users need it – and users only pay for what they actually use.

In passing, “Battery-as-a-Service” addresses the need of commercial-fleets to be permanently available. The exchange of empty Clean Energy Packs for full ones is the fastest way to charge an electric vehicle. With full automation, the swapping time can be reduced to less than one minute. This matches the loading or unloading of the freight module, the embarking and disembarking of passengers in the people module, or the complete exchange of modules on the Rinspeed MetroSnap. With Clean Energy Pack, the MetroSnap is always charged, without extra charging time.



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# Safety from a Single Source

DEKRA has been committed to safety since 1925. Founded as “Deutscher Kraftfahrzeug-Überwachungsverein e.V.”, DEKRA is today one of the world’s leading expert organizations. More than 45,000 employees in 60 countries ensure safety – on the roads, at work and at home.

In all this, the “Internet of Things” is getting increasingly important. So DEKRA is on board again with the latest Rinspeed concept car “MetroSnap”. Here, safety has to be ensured in a variety of ways. Key words in terms of automated and connected driving are secure wireless connections, interoperability, electromagnetic compatibility, cybersecurity and functional safety. First, however, it is the product safety of the individual components which is independently tested and certified by DEKRA experts in their laboratories around the world.

In Europe and Asia, DEKRA runs laboratories for testing the electromagnetic compatibility (EMC). Within a vehicle and in communication with its surroundings, it must be ensured that individual elements do not impair each other’s functioning, just as the system as a whole must not impair other products in the area.

The interconnected world depends on secure wireless connections. DEKRA offers – mainly from the site in Málaga, Spain – a comprehensive range of services for certifying and testing wireless connections. These cover the different relevant technologies and include conformance, regulatory and interoperability tests.

In addition to the individual analysis of various safety aspects, DEKRA experts also look at overall functional system safety in order to prevent injury risks caused by possible malfunctions of systems or controls, in the interaction of hardware and software.

DEKRA has systematically expanded its range of cybersecurity and data protection solutions. The DEKRA 360° CyberSafe method helps businesses to guard against IT threats and data theft. DEKRA draws from knowhow and experience in a diverse range of fields, as audits, consulting, product testing and training.

The DEKRA Lausitzring in Germany is becoming Europe’s biggest independent testing center for automated and connected driving. As an extension of the DEKRA Technology Center, the site offers the perfect environment for testing the mobility

of the future. It will be a central element of DEKRA’s international test network for automated and connected driving. It will be possible to test the entire range of automated driving functions up to level 5 – on flexible city courses, various country roads and a section of highway. For testing 5G-based connected driving functions. DEKRA started a cooperation with Deutsche Telekom.

Whatever future technological innovations we will see in the field of automation and connectivity, DEKRA’s expertise in the “conventional” automotive sector will remain as important as it ever was. Even automated vehicles need functioning brakes, intact suspension systems and suitable tires. In future, these will continue to be subjected to regular, independent testing. As the world’s number 1, DEKRA conducts around 26 million vehicle tests every year.

Future testing procedures will increasingly include electronic components. Also, and above all, electronic safety systems have to function reliably over the entire lifetime of the vehicle. The nature of periodic vehicle inspections will continue to evolve to take account of vehicle technology.



The same applies to homologation and type-testing. DEKRA experts in many different countries ensure that new vehicle models comply with regulations and are safe to drive on the roads. That is something that they will continue to do in the future, under the new conditions arising around digitalization.

Whether homologation or periodic vehicle inspections, functional safety or electromagnetic compatibility, automated driving functions or secure wireless connections and cybersecurity, the DEKRA experts really do offer “safety from a single source” – and not just in the Rinspeed “MetroSnap”.

## Thermal management solutions for all applications

**Eberspächer is providing perfect temperatures in the latest Rinspeed project, the MetroSnap. The heating and cooling solutions made by the thermal management specialists from Esslingen can be combined with an autonomous energy supply. Among other things, connectivity is provided to GPS tracking of a self-driving MetroSnap fleet.**

With approximately 10,000 employees at 80 locations worldwide, the Eberspächer Group is one of the automotive industry's leading system developers and suppliers. The family business, headquartered in Esslingen am Neckar, stands for innovative solutions in exhaust technology, automotive electronics and thermal management for a broad range of vehicle types. Eberspächer is using this expertise for its contributions to the new MetroSnap, for which it is supplying complete thermal management systems for both of the project's vehicle types, the MetroSnap Pax-Pod (a multi-seater Passenger-Pod) and the MetroSnap Cargo-Pod.

### A perfect climate inside the Passenger-Pod

Eberspächer provides the luxury of an interior that can be both deliciously warm or pleasantly cool. In order to provide the perfect climate inside the MetroSnap to suit every season, Eberspächer is combining a space-saving split air conditioning and its newest generation of electrical air heater. The conditioned air is blown into the interior through elegant, newly-designed air outlets, made especially for the MetroSnap. Cleverly integrated into the dashboard layout, they assist in efficient air distribution in the passenger compartment.

Eberspächer's solution not only comprises the Pax-Pod's climate components, but also ensures an autonomous energy supply for the heating and cooling system. An ESS (energy storage system) unit behind the seats provides sufficient climate-control power at all times, independently of the traction battery. No additional load is imposed on the traction battery, ensuring a longer range.

Thanks to Eberspächer's connectivity solutions, the climate-control functions are also suitable for fleets: using the Eberspächer fleet management app, fleet operators can benefit from access to important information relating to the connected devices and components.

This makes it possible to locate the vehicle's position using GPS tracking or to check the ESS unit's state of charge and the interior temperature. And that's not all: Eberspächer's solution allows all of the vehicle's essential functions to be coordinated and controlled centrally. This way, the MetroSnap's climate can be adjusted to suit the season, before and while it picks up passengers. This means a huge boost in comfort during hot summers and icy temperatures.

### Thermal management inside the Cargo-Pod

The MetroSnap Cargo-Pod was made specifically for the autonomous transport of goods. This means that in the future it could be used as a delivery vehicle for supermarkets or catering

services. Customers use an app to order food to their homes or workplaces – an ideal solution for target audiences such as single households, senior citizens, or people on a tight working schedule. Another possible scenario could see the MetroSnap being used as a mobile catering kiosk selling drinks, ice cream and fresh groceries in predefined locations near schools, offices or events. The combined freezer/cooler/heater built into the Cargo-Pod can be activated to suit the goods being transported and can be opened by the customer using an individual ID code. The app lists the goods on offer and provides a time-table of the various location stops.

Eberspächer is supplying the entire thermal management system used in the MetroSnap Cargo-Pod. This includes all heating and cooling units, as well as the cooling and heating containers, which Eberspächer manufactures from robust, rotomolded polyethylene. This special production process has the



Horizontal Evaporator



PTC Air Heater



Energy Storage System  
LiFePO4

advantage of preventing thermal bridges on the containers and of making them particularly easy to clean. An ESS unit provides an autonomous energy supply here, too. While goods are usually delivered to the distribution centers by large transport vehicles, the MetroSnap Cargo-Pod handles final transportation to the end customer. This self-driving delivery vehicle could be a simple, flexible and environmentally-friendly solution for delivering goods to the customer's doorstep. The Cargo-Pod, which is split into individually configurable boxes, is loaded at the central distribution center and then sent to its destination. The customer receives information on the time of arrival via the app and can then take their goods from the Pod using the ID code.

### Connectivity for fleet operation

Eberspächer connectivity solutions play an important role in all of the

transport scenarios mentioned above. Besides providing real-time information on the location of every MetroSnap via GPS tracking, they also make sure that the vehicle operates reliably using the battery monitoring and Keyless Go functions. The climate-control functions can also be monitored and controlled directly through the control unit for all the vehicle components – even in fleet operation.

### Safety measures for autonomous driving

One of the most crucial components for operating the self-driving metro-SNAPS, be it the Pax-Pod or the Cargo-Pod, is the use of electric sensors and switching systems, which must fulfill the strict requirements necessary for level 5 autonomous driving (where the vehicle takes over all driving functions). Eberspächer Automotive Electronics will be providing high-performance switches for the MetroSnap

from their ADSS product family (Autonomous Drive Safety Switches). These electronics, based on semiconductor technology, ensure fault-free operation of safety functions such as a redundant power supply, the sensing of error events and intelligent predictive diagnosis, while keeping switching times below 100 microseconds ( $\mu$ s).

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We are ESG Mobility. We are accelerating the global transfer into a new form of intelligent mobility. As experts in software and systems development, we give our customers the necessary impulses, the technical know-how and a helping hand to achieve this common goal.

For us, MetroSnap is not just a forward-looking concept to decorate the fairs of this world as a pure flagship project. For ESG Mobility, MetroSnap is a logical first step in solving day-to-day tasks for people in a demand-oriented and decentralized manner - and therefore satisfying the need exactly where it exists. As a partner of Rinspeed we stand for a pragmatic and fast proof-of-concept under real market conditions according to a lean startup process model. Our technical expertise in IT and all areas of automotive software development are important success factors in this joint project.

### Recommender systems with artificial intelligence

The POD of the MetroSnap is placed in the city area, for example, to enable food purchases on the spot or to be able to deliver the mail to relevant traffic junctions. The challenge of determining the right position in the city area, and constantly optimizing the position of the POD over the course of the day, can only be solved by machine learning. We have developed a recommender system for MetroSnap that predicts these optimal positions. The heart of the system is the so-called Deep Reinforcement Learning, which tracks the sales of PODs in the overall network as a target. Previous methods from machine learning require a large amount of historical data in order to derive and train the most optimal solution possible. Especially with new business models and product, ideas with different forms of monetization, historical data can only be acquired very cost-intensively, or not at all.

Our approach does not require

existing datasets to start, allowing new business models to be productive immediately. In simple terms, it can be said that over time it learns which solutions work best, in a playful way. Not with much effort and under laboratory conditions - but immediately, under realistic and actual existing conditions.

This system offers the potential, in a complex, digital world to quickly present data-driven business models to the market.

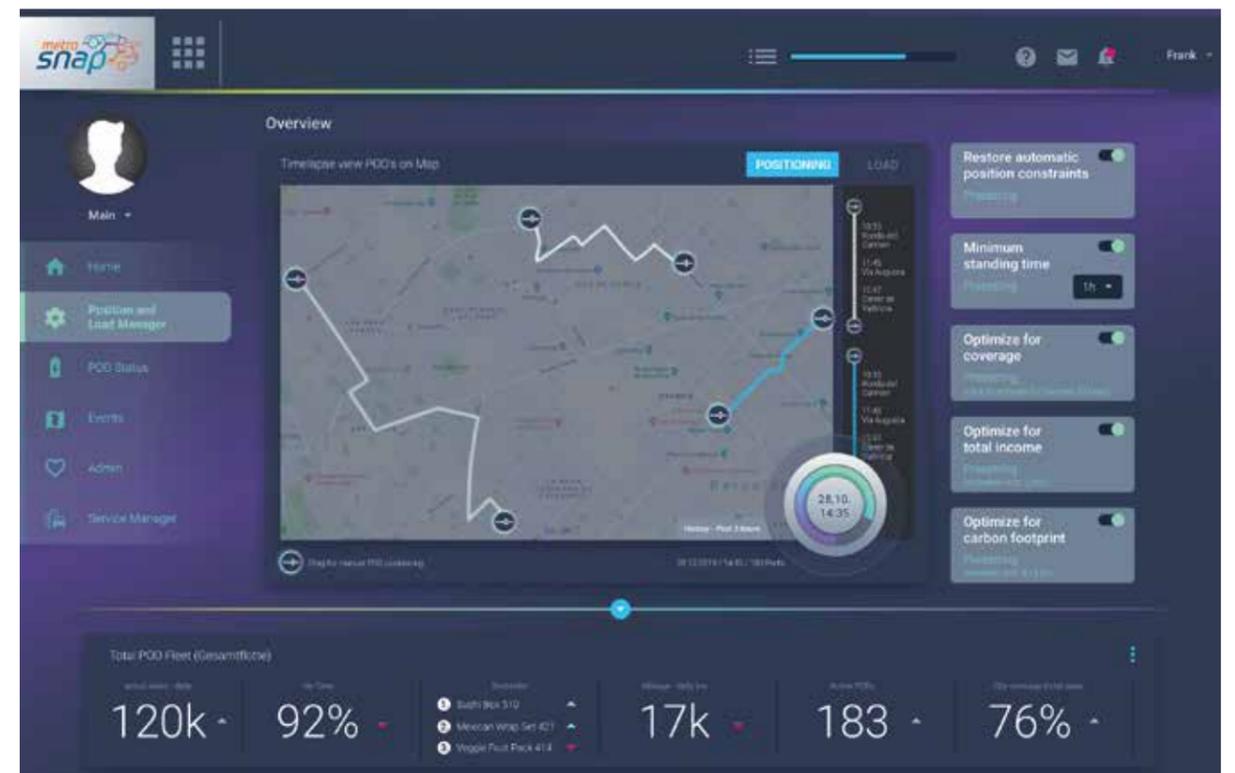
### Sophisticated end-to-end connectivity

Whether it's the realization of customer features or complex analysis functions - a large amount of data from the MetroSnap vehicle fleet is needed. The future operators of a MetroSnap-based business model would like to be able to use comfortable features in an appealing fleet management tool. However, instead of collecting data centrally from the vehicle fleet for analysis or customer functions, very specific search jobs are sent to a vehicle and executed locally.

Only the results find their way back to the backend. This approach is known as event-based data collection or campaign management. In the development phase, for example, we rely on our own connected data recorders to ensure data traceability and to recognize conspicuous behavior of the software in the vehicle.

### Extreme vehicle architecture

The definition of customer features is one thing, the translation into reliable and safe electric-electronic functions another. If, as with the MetroSnap, the most important vehicle components have to be exchangeable in live operation and completely new POD structures have to be adaptable to different operator models, this places unprecedented demands on the entire vehicle architecture. Therefore, we develop logical function architectures as well as technical architectures in order to map the demanding customer requirements to the respective hardware.



Since it is never exactly clear what the product and its functions should ultimately look like, and in order to be able to respond flexibly to changes and adjustments in the development process, we use state-of-the-art, agile methodologies to meet our requirements and those of our customers at all times. A modern, digital and highly flexible project like MetroSnap

requires just that: A modern, agile company like ESG Mobility - so that the dream of tomorrow becomes reality.

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## SWISS MADE

ESORO –your experienced development partner for innovations, product developments, light weight composite parts and BEV / FCEV developments for cars and trucks

### MetroSNAP

With the MetroSNAP the SNAP-idea presented in previous years, with the consistent separation of skateboard and pod, is taken to the next level in terms of form factor, utility value and interface. Highest flexibility with use adaption in shortest time is realizable. Thus, the intelligent and fully-automated electric chassis can be used practically around the clock for a wide range of application, while the design is optimally matched to the respective application with longevity, be it a delivery pod, for example as a moving market /parcel service or as a six-seater passenger cabin.

### ESORO's partner contribution to the MetroSNAP

The MetroSNAP is an entirely new built vehicle. ESORO was responsible for the complete realization of the MetroSNAP in this already 21st project for Rinspeed. This included the realization of the chassis and adaption of the drive, the complete composite bodywork components for the skateboard and both pods, the doors, the interior of the cargo pod as a driving market/parcel service and the interior of the six-seater passenger cabin with aircraft seating and the implementation of

the partner components.

In addition ESORO was responsible for the higher-level control with appropriate software and control of the drive train including the battery. ESORO also supervised various integration topics in the context of the implementation of new technologies delivered by other project partners for the interior and exterior. Finally ESORO was responsible for the complete assembly of the MetroSNAP.

### ESORO

ESORO has been developing products, cleantec concept vehicles and components with a focus on lightweight construction and sustainable mobility for over 29 years, where ESORO is well known for its efficiency and innovative solutions'. Several outstanding prototypes and series products have proven this several times impressively.

As one of the few companies worldwide, ESORO has decades of experience in the development and operation of electric, hybrid and fuelcell vehicles. This expertise is one of ESORO's most important pillars today. ESORO works closely with renowned OEM's to realize electric vehicle projects from the

first prototype to the start of production and supports the advanced development of OEM's with new concepts of electric and fuel cell vehicles, as well as with the conception and development of very powerful batteries.

In 2016 ESORO has developed for COOP world's first fuel cell truck in the 35t class (19t truck with a 16 t trailer) which has been presented on November 4th 2016 during the opening of Switzerland's first public Hydrogen fueling station, which is operated from COOP and get's delivered the Hydrogen from the close by CO2 free production from H2 Energy at a river power station. The ESORO 35t fuel cell truck has a range of 400 km and can be refilled in less than 10 minutes.

In addition 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 simulation. Another correlated 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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Building a better working world

## Sustainable urban mobility requires some bold approaches

Given the excitement about self-driving vehicles, many manufacturers have had to face up to reality: developing sensors and software for serial production eats up significant time and money. At the same time, ever-diminishing budgets are also flowing into the electrification and connectivity of vehicles. So is the Rinspeed MetroSnap no more than science fiction? We don't think so. As long as what we will need for sustainable urban mobility tomorrow is created today: a well-developed charging infrastructure, national 5G coverage and the cooperation of many players from different sectors in a single ecosystem.

The vision of sustainable mobility in the cities of tomorrow has become more tangible since the launch of the first Snap in early 2018. And critically, by 2050, 70% of the world's population will live in cities. Personal transportation in cities will double, and that does not even include goods transported by package services and delivery traffic. Europe's historic cities in particular will become gridlocked: there are not enough or zero bicycle lanes, delivery vehicles block the roads and motorists search for parking spaces.

### Is the next shuttle app really the solution?

There is no shortage of offers and pilot projects initiated by vehicle manufacturers, technology companies, cities and start-ups. But is the next shuttle app the solution? MetroSnap demonstrates that many different players need to work together to create an overarching mobility ecosystem: manufacturers to build the hardware, telecommunication companies to take care of

5G and technology companies to develop digital applications. At the same time, energy suppliers are opening charging stations and fleet operators are organizing the reloading of pods (bodies) and the routing of skateboards (chassis), as well as charging, servicing and teleoperating – just to name a few examples. Skateboards and pods might then belong to investors, or to many users collectively.

### Three prerequisites to achieve one goal

But how can this interaction work? What are the success factors?

**First: platforms.** Tesseract is an EY mobility platform based on blockchain technology. It logs all vehicles and trips and processes usage-based payments for hardware, parking and insurance with each owner, operator and service provider. With Tesseract, we want to



provide impetus and make it easier for our clients and other providers to enter the market and develop it.

**Second: rules.** To coordinate pods, skateboards, charging stations, service hubs, etc. seamlessly, and to help many players contribute to the ecosystem, reliable physical standards and digital interfaces are needed. The logistics of maritime freight containers can serve as a model, which also revolutionized an entire industry.

**Third: trust.** With many more players involved in the production and supply chains of food, clothing and other consumer goods, security and

transparency play an important role – both for the companies involved and for the end users. EY OpsChain, one of the world's leading blockchain applications, creates a “digital twin” of products, enabling all steps from raw material extraction to processing to delivery to be reliably traced in real time.

A vision or idea is always the beginning of everything. Today, we have the best opportunities and conditions to realize this vision for tomorrow and to implement bold approaches for sustainable urban mobility. Working together.

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# THE MOBILITY OF THE FUTURE IS WHAT DRIVES US

Worldwide mobility trends and emission requirements are influencing the automobile industry like never before. The industry is experiencing rapid change. Autonomous driving, digitization, not to mention alternative drive techniques and sustainability are subjects that not only pose new challenges, but also unlock new market opportunities.

As one of the world's leading specialists for polyurethane foam technology, FoamPartner is intensively engaged in developing the mobility of the future. In order not only to keep pace with the rapid developments in the industry, but also to be a decisive step ahead of them, trends must be identified at an early stage. This is exactly what the partnership between FoamPartner and Rinspeed, now going into its second year, is all about. What drives them: co-researching and developing groundbreaking concepts to actively help in shaping the future of mobility.

## Sustainable Progress

Good networking is indispensable in the automotive sector to turn visionary concepts into reality. FoamPartner works closely with OEMs and Tier 1 and 2 suppliers. In recent years, linking techno-

logical progress with environmental and climate protection has come to dominate the scene.

This is particularly obvious in the area of eMobility. Providing vehicle components for electric cars creates new demands for the automotive supplier industry. Compared to conventional vehicles, electric cars generally require fewer parts. They should be produced efficiently, in a sustainable manner, while at the same time satisfying the desire for minimized complexity. Ideally, the vehicle parts of the future should combine several functions in a single component.

## Less Complexity Thanks to New 2-in-1 Components

FoamPartner's mobility experts are intensively dealing with such challenges. Acoustic & Thermal Solutions, for instance, is addressing

the new requirements for acoustic parts since airborne noise needs to be reduced at higher frequencies in electric cars. FoamPartner has taken up this challenge and developed an ultra-light spring mass system based on the RegiSeal® product family, which combines efficient acoustic and vibration solutions in a single lightweight component. As this system represents an attractive alternative to the conventional two-component system, it has already reached production stage with a well-known OEM.

## Increased Mileage Range Thanks to Innovative Foams

In addition, e-vehicles require new thermal solutions, as the heat generated by a combustion engine is no longer being used. The heating and air conditioning system in an electric vehicle exerts a large



power demand on the battery, which directly influences how far the car can go on one charge. In a benchmark study on a Class A electric vehicle, FoamPartner has proved in theory that its range can be increased by six to eight per cent through the use of specific foams. In concrete terms, this means that the standard range could be increased from 200 km to 218 km. In the study, standard parts in the thermal-acoustic area were replaced by new optimized parts using RegiSeal® PUR foam. A concept vehicle is now being built in cooperation with external partners to verify the findings in a field test.

## Visionary Concepts to Benefit the Environment

FoamPartner's Automotive Rolls and Systems are also working at full speed on solutions that are both innovative and sustainable. The low-

emission OBoSky® foam, for instance, which is integrated into the vehicle's decorative roof lining, improves the interior climate, and is also easy to use, durable, and has low odor. The OBoSonic® product family does its part for climate protection with new waterborne 2K PUR systems that are used in the manufacture of effective acoustic and thermal vehicle parts. They are efficient, high-temperature resistant, and free of any physical blowing agents. Current fire protection requirements for near-motor applications are satisfied.

FoamPartner not only aims to hold a pole position in the area of future mobility, but also in sustainability. The combination of both will continue to be decisive for the successful implementation of visionary concepts in the future.

## FoamPartner

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# CREATING MOBILITY EXPERIENCES – WITH HARMAN

Technology is changing how we experience the world, and mobility means more than just getting from A to B. The car needs to be a space that enriches our connected lives. HARMAN transforms every journey into a highly personalized, effortless and immersive experience, turning time in the car into time well spent.

Connectivity and personalized applications are driving consumer demand and making experiences per mile far more important to many car buyers than horsepower or acceleration. HARMAN's approach is based on the need for seamlessly integrated, customer-centric experiences that offer greater opportunities for people to accomplish, connect and get more out of their journeys. Adaptability, flexibility and responsiveness are critical to achieving this, and to staying ahead of the competition.

## THE PERFECT FIT

The Rinspeed “MetroSnap” is a perfect fit with HARMAN's thinking. The VisionNext Cloud Edge Compute Concept removes the computing power from the vehicle. It uses a 5G Smart Antenna to provide each occupant with individual content and settings, as if they were sitting inside their own personal vehicle. Two Harman Kardon Citation soundbars deliver a high-quality, shared listening experience to the maximum of six passengers inside the autonomous vehicle. Anyone wishing to immerse themselves in their

own world of sound can do so with the AKG N60NC Wireless headphones featuring active noise cancellation. With HARMAN NatureScapes, for instance, they have a choice of meditative sound files from a selection of U.S. national parks. Alternatively, each passenger can, of course, enjoy their own individual playlist from the HARMAN Ignite Audio Marketplace, adapted to suit their mood.

## HYPER-INDIVIDUALIZED USER EXPERIENCE

High speed and low latency data connections ensure the autonomous “MetroSnap” runs smoothly and efficiently. HARMAN Connected Automotive technologies such as the Cybersecurity suite and Over-the-Air (OTA) updates mean all vehicle systems are kept fully up-to-date at all times, thus guaranteeing maximum security. Everything is controlled via natural voice commands, with passengers able to use their familiar and trusted Virtual Personal Assistant. The intelligent digital

cockpit automatically adapts to the front-seat passengers. In the “MetroSnap”, visual interaction is via two upright, curved 27-inch QLED HDR displays. Hyper-individualized experiences address real consumer needs and help people make better use of their time in the car – more productive, more enjoyable, more relaxed and, whatever they do, time well spent. It means that mobility is no longer merely a matter of travelling from one place to another. HARMAN is transforming the time from A to B into positive, individual, life-enhancing experiences.

## SOLUTIONS FOR EVERY VEHICLE

Using and enjoying the benefits of fully connected mobility is, of course, not exclusive to an autonomous vehicle such as the “MetroSnap”. For future vehicle generations, HARMAN also offers Advanced Driver Assistance



Systems (ADAS) such as Vehicle-to-Pedestrian (V2P) warning, drowsiness and distraction detection, monitoring of vital signs and much more besides. Even current cars, which are still “unconnected” can attain the next level of individualization with the HARMAN SmartAuto suite of products, which offer many of the benefits of connected travel such as personalization, vehicle diagnostics, WiFi and driver analysis. The spectrum extends from solutions for automakers and fleet operators to consumer products such as an OBD-2 telematics device – all aimed at giving each and every occupant more experiences per mile.

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Pushing Performance

## HARTING interface supplies power, data and signals for the “MetroSnap”

**HARTING is taking the next step in the direction of the mobility concepts of tomorrow with the Rinspeed “MetroSnap”. Whether passenger transport or freight logistics, the MetroSnap can be used in highly versatile manner.**

The HARTING module helps the driver use the vehicle for a wide range of tasks in an optimal, flexible manner. The MetroSnap’s design makes it ideal for this. Like its predecessors – the “SNAP” and “microSNAP” – the vehicle is divided into two elements. On the one hand, there is the skateboard as an optimised electric vehicle, on the other there is the pod, which can be switched out in flexible manner to accommodate different tasks.

Communication, signal transmission and the power supply must all work smoothly. This requires an interface customised for these processes that provides the infrastructure lifelines of power, signals and data. Since the connection and the separation of both parts is done in automated manner, the interface must also meet these challenging requirements.

This means that the interface must e.g. handle tolerance compensation as securely as it does the very high number of mating cycles. The HARTING docking solution in the “MetroSnap” offers all these features. A module that meets the requirements of this concept vehicle was able to be developed based on the requirements of highly flexible industrial



production that leverages the company’s digital services, for which HARTING has long offered suitable interface solutions. Even in the industrial production of the future, peripheral elements will need to be replaced as quickly as possible and often completely automatically. Here, these two applications barely differ. The interface’s modularity means it can be used flexibly, and if the power requirement needs to be adjusted, this can be done easily and without major modifications.

### **SURGING GROWTH AT HARTING AUTOMOTIVE**

Rinspeed has relied on HARTING’s reliable solutions in recent times. A charging solution from subsidiary HARTING Automotive has supplied

Rinspeed vehicles in both of the last two years. HARTING Automotive has long been at home in the automotive supplier industry and recently saw a sharp increase in demand for e-mobility solutions. The company develops and produces charging equipment for electric and plug-in hybrid vehicles on the basis of its decades of experience in the field of connection and transmission technology. Fast-charging technology is a convincing example of growing market demand and is leading to a continuous build-out of the portfolio of products and components. HARTING has long been an expert and reliable partner for almost all national automobile manufacturers and major OEMs in other European countries. At the end of 2016, HARTING became a direct supplier

to the VW Group for a specific e-mobility solution. HARTING supplies a range of charging equipment for various Group brands. HARTING is also a Tier 1 supplier for the BMW Group.

### **SUCCESSFUL COLLABORATION BETWEEN HARTING AND RINSPEED**

Rinspeed and HARTING have been working together successfully since 2016. The MICA, which garnered HARTING the prestigious HERMES AWARD at the HANNOVER MESSE in April 2016, was integrated into the “Etos” vehicle for autonomous emission and condition monitoring. In 2017, HARTING used its miniMICA – another component from the evolutionary MICA ecosystem – to support Rinspeed’s

“Oasis” car. In 2018, HARTING provided the fast charging technology for the “SNAP”. Last year, the “microSNAP” was charged using the fast-charging push, with HARTING thereby living up to its ambition to be an innovative driver of technological development. The technology group is represented worldwide in the form of 14 production sites and 44 sales companies. Around 5,300 employees generated sales of € 750 million in 2018/19 (as at 30 September).

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# hypermotion

## Networking Event for Pioneers in Mobility and Logistics

Hardly any other field is facing changes as massive as those confronting the mobility and logistics sectors: from alternative drive systems and autonomously driven connected cars to artificial intelligence, new technological possibilities are revolutionising the ways in which we are mobile. Messe Frankfurt organises some 50 trade fairs, conferences and other events around the globe for customers from the automotive, transport and logistics industries. These include events at 17 locations in 16 countries for 'Automechanika', the leading trade fair brand for the automotive aftermarket. Among the new additions to the portfolio are 'Festivals of Motoring' – racetrack events for petrolheads and their families. The newest format, however, is 'Hypermotion', a mix of trade fair, conferences, talks and pitches that is geared towards pioneers in the fields of mobility and logistics.

### Hypermotion networking event

Air taxis, hyperloops, human-machine interfaces, MetroSnap – what form will tomorrow's mobility take? This is but one of the many questions that is explored by Hypermotion. As both the first platform for the digital transformation in the fields of transport, mobility and logistics and an interface between these areas, the event is able to bridge existing divides between systems. The focus is on the search for new, networked, integrated and multimodal systems and solutions for the intelligent

transport systems of the future.

### On the road to the mobility transition

Megatrends such as digitisation and decarbonisation are bringing far-reaching changes to mobility and logistics. Electrification, incessant urbanisation, improved infrastructure and digital disruption are among the biggest challenges facing us today. Furthermore, growing mobility requirements call for traffic and transport systems that can meet the needs of the future and of the environment. Here, topics such as autonomous driving, artificial intelligence, electromobility, the sharing economy and supply chains for logistics play a key role.

### When science fiction becomes reality

Be it on land, on water or in the air – existing mobility concepts have had their day, and their limits are becoming clear to see. The search is on for environmentally friendly and cost-efficient mobility solutions for transporting people and goods. Innovative vehicles such as the Rinspeed MetroSnap are leading the way towards the mobility and logistics of the future. With their focus on the needs and requirements of users, these vehicles offer maximum flexibility and the rapid delivery of goods to any location. Travelling to work in an autonomously driven car, taking an air taxi to the airport or heading to the city centre in a cable car – these concepts could well be reality a few

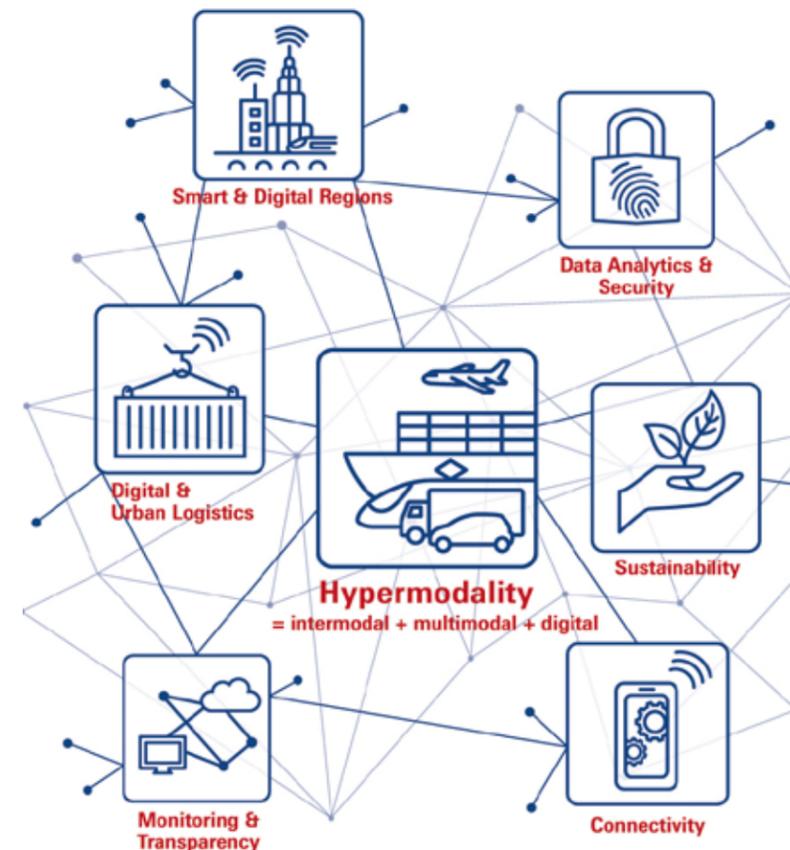
short years from now, presenting us with the megatrends of tomorrow.

### The knowledge advantage

Hypermotion offers more than the introduction and exhibition of new mobility concepts – it is also a hotbed of interaction between innovative young start-ups and established companies who are united by their urge to look ahead. The interfaces between logistics and mobility are sought in a series of conferences, workshops and pitches. Experts and newcomers take the opportunity to network, expand their horizons and see the bigger picture. This leads to the discovery of innovative technologies and transport systems that revolutionise logistics and pave the way to the mobility transformation.

### Next generation mobility

Hypermotion is targeted at all providers and users of new solutions in the fields of mobility and logistics: industry, mobility services providers, public transport companies, start-ups, capital ventures, science and research, municipalities, regulatory authorities, architecture and planning agencies, consulting firms and the providers of other services, such as tour operators. Creating networks across all systems and forms of transport is the foremost goal, and everyone is invited to shake up the mobility scene with new ideas and concepts.



### Hypermotion – Networking Event for Next Generation Mobility and Logistics

Exhibition, conferences, pitches and talks  
[www.hypermotion.com](http://www.hypermotion.com)

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# IBEO AUTOMOTIVE SYSTEMS: EYES AND BRAIN FOR RINSPEED METROSNAP



Ibeo's 4D Solid State LiDAR sensors are the eyes of Rinspeed MetroSnap. The Ibeo LiDAR sensors enable a 360° field of view for reliable perception of the static and dynamic environment around the vehicle platform in 4D resolution. Thus, MetroSnap is not only able to recognize other vehicles while driving long routes on highways, but it is also capable to perceive complex inner city scenarios with many traffic participants such as bikes and pedestrians. Rinspeed MetroSnap is a Level 5 Automation Vehicle, which means that no human driver is necessary anymore. To realize Level 5 Automation, Ibeo provides the software for the fusion of several "ibeo NEXT" Solid State sensors as well as autonomous driving and localization functions. The autonomous driving functions are the brain of the vehicle since they control the lateral and longitudinal functions, and thus they direct the vehicle's actuators. MetroSnap also uses Ibeo's localization approach which is more precise than standard GPS localization. In this approach, a digital map is applied containing land-marks which are recognized by the LiDAR sensors for ego positioning. This means that the environment perceived by the LiDAR sensors is permanently matched with the landmarks in the map to determine the vehicle's exact position.

## About Ibeo

Ibeo Automotive Systems GmbH has positioned itself as a global technology leader for LiDAR (light detection and ranging) sensors and the associated products and software tools. This technology is used in vehicle assistance systems and in the field of autonomous driving. Ibeo has made it its mission to reinvent mobility by transforming vehicles into cooperative partners, thus making road traffic even safer. Ibeo employs almost 400 people at its locations in Hamburg (Germany) Eindhoven (Netherlands) and Detroit (USA). Since 2016, automotive supplier ZF Friedrichshafen AG has held a 40 per cent share in Ibeo through Zukunft Ventures GmbH. In 2018, Ibeo has celebrated its 20th anniversary.

Further information is available at:

[www.ibeo-as.com/en](http://www.ibeo-as.com/en)

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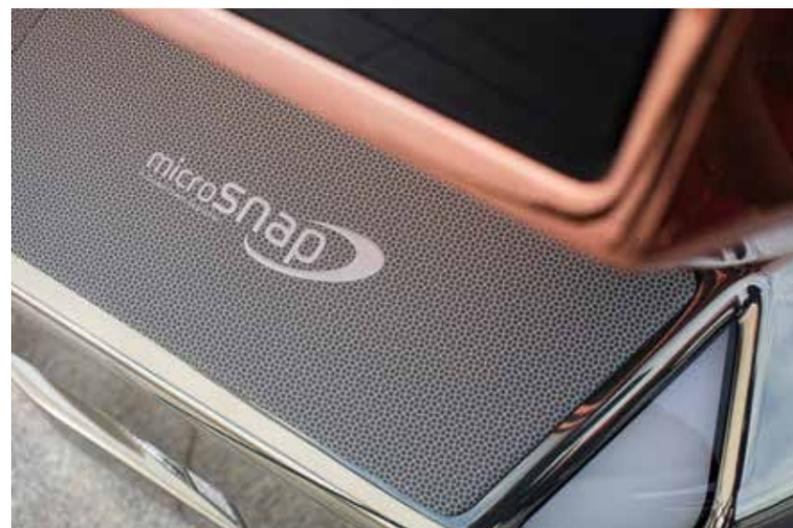
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**Lifestyle Innovator \_ KOLON GLOTECH**

KOLON GLOTECH has been established in 1987, and is a manufacturing company which focuses on automotive materials. While car seat fabric/coverings, and car mats are our main products, we are about to launch new products such as lighting modules and composite material parts/modules for automobiles. We have successfully applied a systematic production process throughout our entire manufacturing lines to obtain various quality standard certifications. Currently, we are focusing on developing eco-friendly and lightweight functional materials. By constructing a production base in multiple regions including Korea and China, lately we are looking to expand our business to the Indian market. We have also built a distribution channel throughout the North American region to provide our quality products to customers all over the world.

In 2018, through SNAP, KOLON GLOTECH successfully implemented a new logo within the interior leather seats by applying a unique inlay technique that was mainly used in traditional Korean ceramics. This new technique has enabled us to demonstrate a revamped design with a whole new feel. In addition, for a more luxurious and comfortable feel, 'Geonic' technology has been applied to areas such as the back of the seat and display devices, where many considered that the design was relatively less in quality compared to other parts of the automobile. In 2019, through MicroSNAP, 'Geonic' technology proved that it can be applied to exterior materials as well as luxurious interior materials to add more class to the overall design of vehicles. And finally in 2020, KOLON GLOTECH, once again reunited with Rinspeed, feels great pride to announce the fact that we will now be able to introduce such new technologies to the interiors/exterior of MetroSNAP.

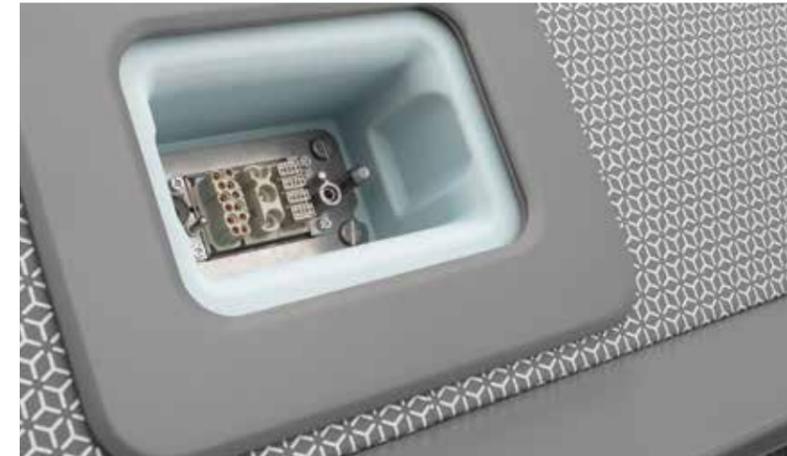


**Geonic "Bringing the designer's imagination to reality"**

As a company that always pursues to become a 'Lifestyle Innovator,' we have consistently offered various solutions for creating human-centric spaces. "Geonic" is a technology that makes it possible to freely adjust and control various aspects such as depth, color, texture, and design by layering multiple materials simultaneously. Plus, "Geonic" is an exceptional technology that allows the realization of mass-customization and can fulfill the design expectations of individual users. Based on its vivid colors, depth, and great freedom of design, "Geonic" helped us implement all kinds of designs -starting from simple patterns to complicated drawings-, opening up the possibility to meet (satisfy) the needs of our clients no matter what. It has been selected as the 'Best of the Best' at the 2013 Reddot Design Award.

Geonic can be used in a wide range of areas ranging from lifestyle products - clothing, furniture, interior decorations, etc. - to automobile products -seats, trims, etc.-. Moreover, you can apply the 'Geonic' technology not only on the textiles and fabric manufactured by KOLON GEOTECH, but also on various surfaces requested by other clients to create elegant, high-quality designs.

In MetroSNAP, 'Geonic' technology has been applied to the window frame, center console of the interior, and the skateboard of the exterior. The technology has also been implemented for household goods such as the bag and the shoes, which are displayed at the trunk of the vehicle.



**Artificial Leather "VOC Free Technology"**

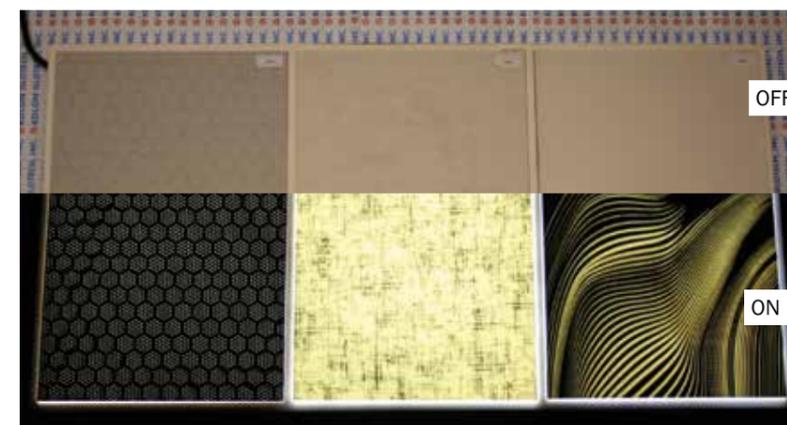
Artificial leather is the main product of KOLON GLOTECH. Based on the use of VOC Free Technology, the company has successfully overcome the disadvantages of PVC materials (cause of harmful substances), and is now continuously providing products to various clients thanks to our odor reduction technology and the implementation of various touch-sensitive settings. In the case of our product, artificial leather is mainly used for car seats and it is also used as the material for dashboards, door trims, and so on.

In MetroSNAP, VOC-Free leather has been applied to the rear section of the dashboard and the door frame. It has also been used as the base material for parts where 'Geonic' has been applied.

**LUNA "Transparent Artificial Leather"**

In particular, "LUNA" - a transparent artificial leather- has been applied in the Osram LED Lighting Panel, which is located at the front section of the dashboard of MetroSNAP. When the light source is OFF, "LUNA" looks like a luxurious artificial leather. But when the light source is ON, it can show a variety of luxurious patterns based on the user's design thanks to its transparent property. "LUNA" is basically compatible with LED, but it can also be applied for various light sources. In addition, the headliner of the MetroSNAP also shows certain patterns when the light source is ON. This is

because some of the technologies applied on LUNA have also been used for the headliner, allowing our products to collaborate with products from other companies.



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## TENCEL™ FOR AUTOMOTIVE INTERIORS



## A new green ride with fibers of TENCEL™ for Automotive Interiors

TENCEL™ is Lenzing's flagship brand for textiles. Used for a variety of highly specialized applications, the benefits of TENCEL™ fibers can be discerned instantly. Particularly, in the automotive industry there is a rapidly growing demand for sustainable solutions to reduce its environmental footprint. Lenzing offers fibers which are derived from sustainably grown wood sources and produced in environmentally sound production processes, making it the ideal solution for eco-friendly automotive interiors.

The partnership between Lenzing and Rinspeed last year was a great success, as it delivered a vision of futuristic, sustainable vehicles with the adoption of botanic fibers in the concept car, microSNAP. To further elevate the level of comfort of commute experience, and drive sustainability through revolutionary innovations, Lenzing and Rinspeed came together again on the latest

project, MetroSnap. Under this collaboration, TENCEL™ Lyocell and Modal botanic fibers are applied to a wide range of automotive interior components in MetroSnap, including carpet, interior trim, and battery separator, extending beyond car seat fabrics. Powered by REFIBRA™ technology and Eco Color technology, and moisture management properties, TENCEL™ Lyocell and Modal botanic fibers not only provide greater quality and sustainability, but also a more comfortable and holistic experience in every detail.

### Spearheading sustainability with botanic fibers for automotive interiors

Sourced from renewable raw material wood and manufactured in an environmentally-responsible production process, TENCEL™ Lyocell fibers and Modal fibers are certified as compostable and biodegradable under industrial, home, soil and marine conditions and can fully revert back to nature. Moreover, with Lenzing's Eco Soft technology, elemental chlorine-free bleaching is used in an integrated pulp-to-fiber process that has high recovery rates of process ingredients and generates very low air emissions.

Incorporated in the car seats and carpet of MetroSnap, TENCEL™ Lyocell fibers with a botanic origin and nature are structured to regulate the absorption and release of moisture, in turn enhancing fabric breathability that supports the body's natural thermal regulation. Thanks to the ability to absorb moisture, these fibers have no electrostatic charge, offering a premium touch and greater comfort to passengers.

To take the sustainability of MetroSnap to the next level, TENCEL™ Lyocell fibers are also adopted to produce thinner and stronger separator membranes for batteries, enabling more compact batteries and contributing to e-mobility.

This year's partnership also brings in an additional sustainable solution to the concept car, TENCEL™ Lyocell Powder, a supplementary product of TENCEL™ Lyocell. Used for compound and injection molding when producing the interior trim of MetroSnap, TENCEL™ Lyocell Powder helps enhance the reinforcement of the interior components.

### Give waste a second life to drive circular economy

Lenzing endeavors to stand at the forefront of sustainability and be an enabler of the circular economy in the industry value chain through eco-fiber innovations. Striving to safeguard resources for future generations, Lenzing develops pioneering technologies that can help reduce waste and utilize resources during fiber production processes. One of them is the award-winning REFIBRA™ technology, which involves upcycling cotton scraps from garment production and wood pulp to produce new TENCEL™ Lyocell cellulosic fibers in a closed-loop process.

Lenzing and Stahl have joined forces to develop a sustainable solution for coated textile materials for automotive interiors. Stahl, known within the automotive industry for its expertise in creating high-quality interior surfaces, is a world leader in specialty chemistry for coatings, processing, and treatments of many different materials. The use of genuine leather is controversial because of the environmental impact brought by the conventional tanning industry with its high water consumption and chemical use. As the automotive industry continues to seek for alternatives for wool and leather TENCEL™ Lyocell RB (REFIBRA™) is the ideal sustainable solution for producing sustainable coated fabrics for car interiors.

In the MetroSnap project, Rinspeed demonstrates its strong commitment to enhancing sustainability of the automotive industry and redefines the future of automotive. Lenzing has developed to be a co-creator of this innovative future concept of transportation, as it resonates well with the mission of the TENCEL™ brand to make a valuable contribution to building a better world with sustainable innovations.

### More information:

<https://www.tencel.com> and  
[https://www.lenzingindustrial.com/  
Application/automotive](https://www.lenzingindustrial.com/Application/automotive)

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A PORSCHE COMPANY

# Unbox the Future of Mobility



MetroSnap sets new standards as a physical mobility platform. But it takes more to move to the next level: digital platforms that disruptively shape business models and network all the players in the ecosystem. This is exactly where MHP sets the benchmark.

The mobility market has changed dramatically in recent years—and this is just the beginning. More and more digital players are pushing their way into the ecosystem. This situation is further compounded by climate change and rapidly growing metropolitan areas. OEMs and suppliers must radically change their approach. So must logistics and energy providers, insurance companies and cities. One thing is clear: our mobility of tomorrow will be characterized by platform-oriented services.

The MetroSnap provides perfect conditions for this. It can be used as a modular system, is electrically driven and drives autonomously. However, without sensible application scenarios and digital technologies even the best concepts fall by the wayside. This is where MHP comes into play and brings MetroSnap to life—with innovative MaaS, Vehicle2Grid and TaaS approaches.

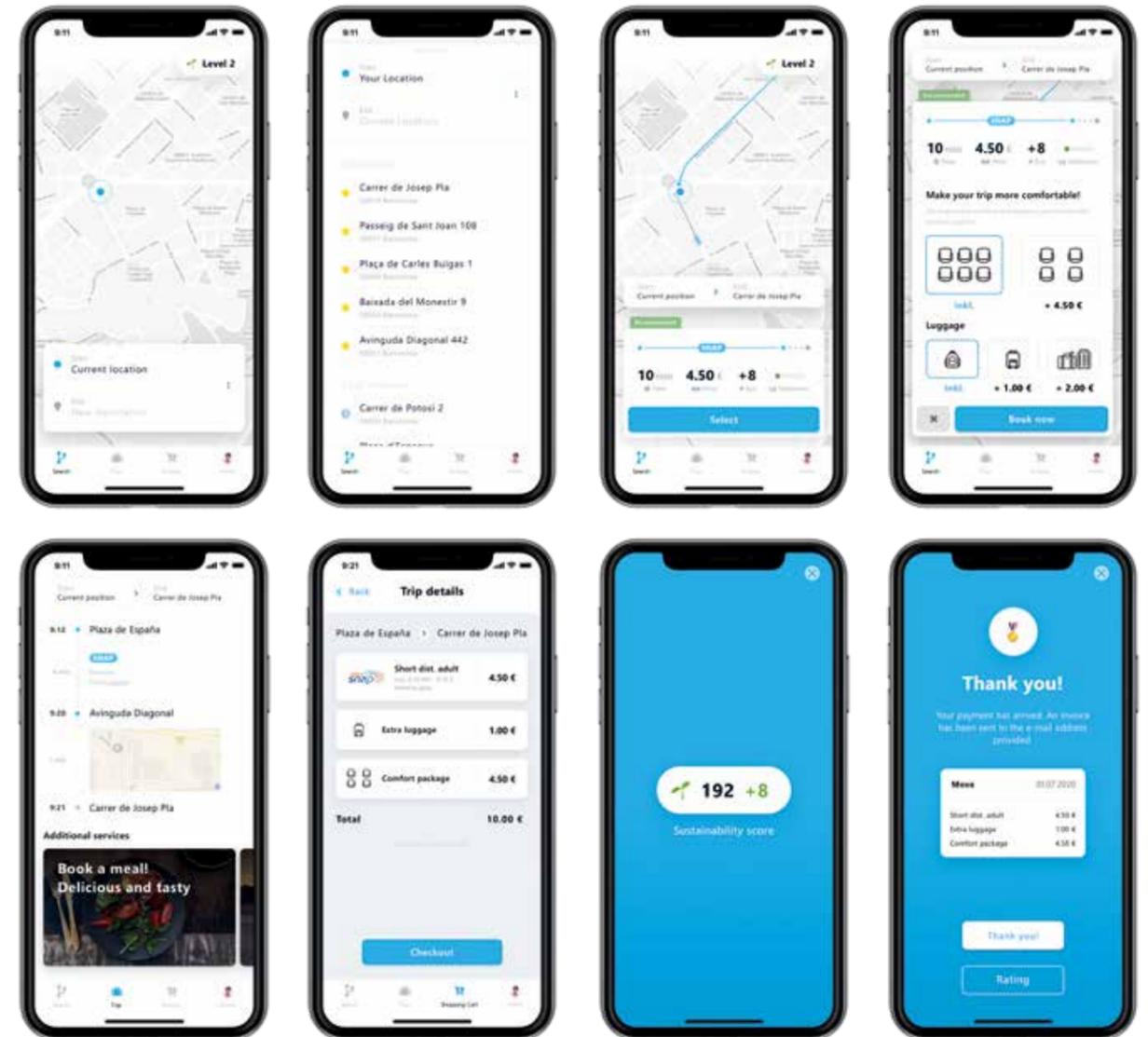
### Multimodal Mobility Service

One of them targets urban passenger traffic. As a shuttle, the MetroSnap creates a ride sharing service that enables individual mobility. Available at any time, for any distance and any occasion. MHP develops the necessary platform – it combines all services for booking and standardized billing. And it is embedded multimodally and specifically for each location. One of the key factors for the success of MetroSnap is its seamless networking with other means of transport, such as car sharing vehicles, air taxis, e-scooters, public transport and rental bicycles. The platform conceived by MHP suggests the best possible means of transport to each inhabitant and directly procures it. In order to motivate mobile citizens to adopt a sustainable mobility behavior, MHP developed the Sustainability Score. If environmentally friendly means of transport are chosen,

users earn more credits and higher benefits. MHP thus makes a contribution to the mobility and energy turnaround.

### MetroSnap as Energy Storage Device

Another future-oriented field of application is the increasingly overloaded power grids. MHP has developed an intelligent charging management system for MetroSnap that takes into account the energy requirements of the respective environment. With its energy capacity, the MetroSnap acts as a dynamic interface for future smart grids. If it is not traveling on the road, it functions either as a storage device or as a supplier of electricity. An example: During the day, solar cells in residential areas generate more energy than is needed. It could be stored in a MetroSnap and stabilize the local power grid in the evening when energy consumption is high. The



MHP solution also includes the remuneration of all energy services. It thus enables new business models for all actors in the mobility ecosystem.

Flexibility on the last mile  
In addition, MetroSnap has the potential to meet the challenges of covering the last mile of goods transport. To this end, MHP is working on a Liquid Logistic Network, which is intended to resolve the last mile bottleneck. The idea: the fixed starting and arrival points are replaced by flexible transfer stations. Optimal routes are determined in real time

and with the help of AI-based forecasts. Autonomously driving MetroSnaps then transport the parcels at the right time to the place where they can be actually handed over. With a digital solution for the MetroSnap, MHP thus helps CEP service providers increase their efficiency and at the same time reduces the impact on cities.

### A perfect Match – MHP and MetroSnap

These three scenarios of MHP clearly show how the idea of MetroSnap as a versatile concept will revolutionize the mobility ecosystem. With a multi-disciplinary

team, MHP develops solutions for the entire digital value chain. Always in keeping with the philosophy: Unbox the future of mobility.

### MHP Management- und IT-Beratung GmbH

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# OSRAM

## TOMORROW'S MOBILITY EXPERIENCED TODAY – WITH SMART LIGHTING APPLICATIONS FROM OSRAM

The use of artificial light has changed fundamentally in recent years. From static lighting towards light as an intelligently usable medium that opens up an enormous variety of application areas. The use of light particles (photons) promises future added value by revolutionising the transmission, storage and processing of information. For us, Photonics is therefore the key technology of the information age.

As innovation leader and lighting specialist with more than 100 years of experience, OSRAM is driving the development of photonics in the four future fields of well-being and health, mobility, safety and security and connection. A flagship project that combines innovations from these areas and shows OSRAM's contribution to the living environment of the future, is the concept car MetroSNAP of Swiss-based think tank »Rinspeed«.

For the fourth time already, Rinspeed is relying on OSRAM as

its exclusive lighting partner and thus on OSRAM's extensive experience and industry expertise. The jointly designed MetroSNAP shows what the autonomous vehicle and the mobility of tomorrow could look like.

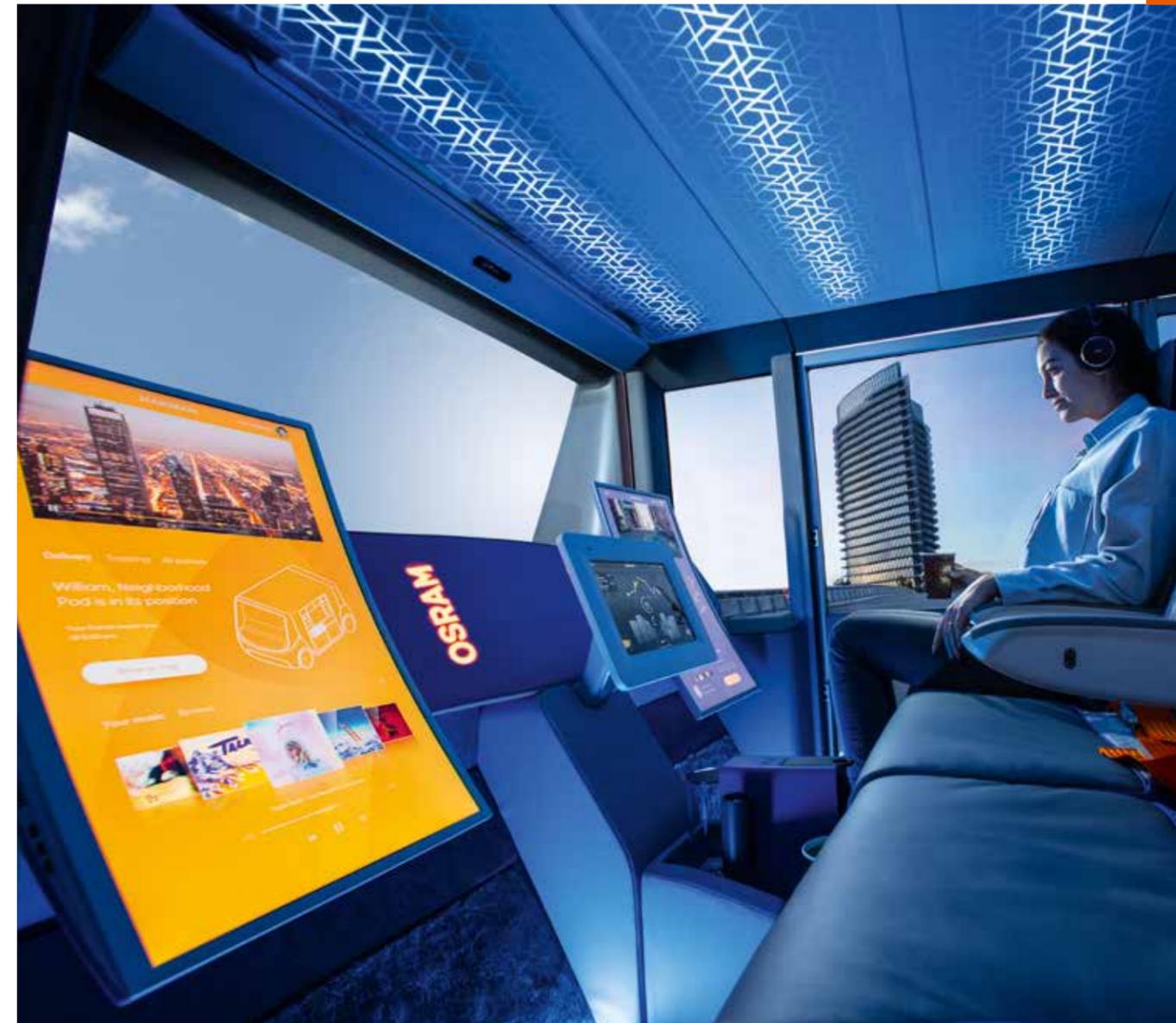
The interior design creates an individual driving experience: the driver is identified with the help of special biometric procedures such as **3D face recognition**, **palm recognition** or via **iris scan** as soon as he enters the vehicle. The intelligent **ambient lighting** with integrated iRGB solutions takes into account the brightness and colour temperature preferences of the passengers and adjusts the light accordingly. In conjunction with **human-centric lighting**, the interior lighting can therefore always adapt to the mood of the passenger. Special reading lights also ensure dynamic and optimum illumination of the reading area, thus creating additional comfort.

For more safety when driving, the

occupants' vital functions (so-called **vital signs**) are continuously measured with the aid of health tracking. When leaving the Pod, the **in-cabine-monitoring** scans the entire interior for forgotten objects and either emits an acoustic signal or sends a message to the last passenger.

Intelligent LED solutions are also integrated into the outdoor area of the MetroSNAP: For example, if the headlamp system detects other road users at night, the exact pixels of the LEDs (so-called **EVIYOS**) that would dazzle oncoming traffic or the driver in front are dimmed or switched off. In addition, EVIYOS acts as a lane assistant and navigation device, projecting the proposed route onto the road. Furthermore, EVIYOS can use projections to display relevant information for passengers boarding and alighting.

A crucial element of autonomous vehicles is the so-called **LIDAR technology** (Light Detection and



Ranging), which also provides orientation for the MetroSNAP. At very short intervals, an infrared laser sends light pulses into the vehicle's environment. When the light hits an object, it is reflected and finally registered by a sensor. The system can then calculate the distance from the light to the object and back again (»time-of-flight«) and initiate appropriate actions such as braking.

Intelligent **display systems** enable external communication with other road users (»car2x«) as with a situation-dependent **LED license plate**. Facing inwards, they serve as supporting human-machine-interfaces (HMI). The windows may also be transparent displays in the future. This creates the possibility of illuminating the entire vehicle (**car body illumination**) – which

provides further possibilities for individualisation.

Further information on our mobility concepts and photonics solutions can be obtained from [www.osram.com/os](http://www.osram.com/os).

## Communication of Intelligent Lighting Systems

Based on the development of predecessor model microSNAP, PRETTL Lighting & Interior GmbH has further developed exterior lighting in cooperation with Osram. These applications enable intelligent communication between road users.

A newly developed LED matrix solution makes it possible to use the front and rear lights as standard functions as well as a means of communication. The software control applied here allows simultaneous use of the rear lamp as a stoplight and taillight.

The lamp can be adapted to the vehicle contour by means of curved displays. Hence, this product solution offers a high degree of design freedom.

In today's vehicle construction, individualization has taken on high significance. Current technologies allow the user to design vehicle lights individually. For automobile manufacturers, this yields a multitude of design options without any hardware changes.

### About PRETTL Lighting & Interior

PRETTL Lighting & Interior (PLI) offers a complete package of sophisticated, high quality lighting and complex plastic modules and systems for vehicle interiors and exteriors. PLI serves mainly Tier 1 customers in the automobile industry.

From the initial idea and design stages all the way through to series production and spare parts delivery. Every sector benefits from the expertise gained at every stage. This expertise makes itself especially felt in the effective way in which the various value-added processes combine together.

### PRETTL Lighting & Interior For Your Success

The core competences of the company are development and manufacturing, finishing as well as assemblies for automotive lighting applications for interior and exterior. The affiliation to the PRETTL Group provides us with unique possibilities of using its group

synergies and make them accessible to our customers.

### Think Global. Act Local.

With the PRETTL Group you have a strong partner at your side – always and everywhere. Understanding cultural differences and the distinct features of regional markets is of vital importance for international activities. This understanding and the enjoyment we have in developing innovative technological solutions ensure our customers a competitive edge in national and international markets.

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# MetroSnap – Developing an Intelligent Mobility Ecosystem

## Delivering personalized mobility at scale and as a service through a customer-centric ecosystem

The automotive industry continues to evolve, responding to customer expectations and trends like CASE: connected, autonomous, shared mobility/services, electrified mobility providing new opportunities for growth. The shift toward sustainable energy in combination with integrated mobility and the need for livable cities requires convenient, fast, reliable, and cost-effective transportation.

Automotive companies will need to partner with technology providers, utilities, and municipalities to define and create solutions that satisfy the need for safe, sustainable, and convenient mobility while respecting citizens' desire for an urban environment that is tailored to humans, not vehicles.

For electric vehicles to be widely adopted in cities, charging infrastructures need to be in place and the current patchwork of providers needs to become more customer friendly. Connected cars, new business models, vehicle networks, and technology-driven services will define the future.

The CASE revolution will extend far beyond the vehicle. New kinds of connectivity will drive simpler logistics, cleaner energy, and smarter cities: an ecosystem of connectedness and capability. With the new MetroSnap concept, Rinspeed embodies this innovative trend and the modular approach of urban mobility. It also mirrors SAP's vision for digital transformation in the mobility environment and thus in the automotive industry. SAP offers the "Digital Platform" to illustrate future mobility concepts such as Shared Mobility, Autonomous Driving, Car Connectivity & electrification.

### Mobility as a Service (MaaS) for Urban Settings

Cities wanting to change citizen behavior to reduce congestion and pollution are moving towards mobility as a service (MaaS) offerings. Mobility as a service is the integration of various forms of public and private transportation options, such as train, tram, bus, ride-, car- or bike-sharing, and taxis, all combined into one single mobility service accessible on demand. For the user, MaaS offers the most suitable service based on their travel needs and a convenient single planning, booking and payment system.

A successful MaaS service could improve the efficiency and utilization of transit services and provide an alternative to the use of the private car that may be as convenient, more sustainable, efficient and even cheaper. SAP solutions help leverage data driven intelligence that combines technology, sensors, and vehicle data with applications and practices to improve customer ownership and transportation experiences, enhance vehicle safety and operations, and provide flexible and sustainable commuting options.

### Fleet Management and Operations for Mobility

As vehicle ownership declines and Mobility-as-a-Service usage increases, service providers need to manage and operate vehicles in fleets. Industry demand for fleet management capabilities, B2B vehicle transfers and one central vehicle data element for Car Sharing, Ride Sharing, Ride Hailing, Ride Pooling, MaaS, Subscription, Micro Mobility will increase. In a world of autonomous vehicles, management of self-driving fleets will become a critical aspect of many enterprises. Companies that craft their business models around the autonomous vehicle and the



revenue it generates will need to ensure the asset is functional without manual supervision. SAP solutions equip companies to gain real-time control over the location, movement, status, and behavior of any moving asset.

### Convergent Costing and Billing for Mobility

New business models such as vehicle subscription and 'Mobility as a Service' require a solution that can measure utilization and be able to monetize the services at scale. SAP has a solid robust solution for supporting such new complex business processes, which can integrate into industry specific solutions. The capabilities of 'utilization' and 'monetization' are prevalent in various scenarios such as car sharing, ride sharing, ride hailing, micro-mobility and 'Mobility as a Service' models. SAP provides solutions to address complex monetization models.

### Digital Supply Chain

Supply chains and manufacturing networks must be completely modular and flexible to respond to

variable and personalized customer demand. They must be able to execute seamlessly and respond directly to demand signals and customer orders. This will require increased automation on the shop floor, driving the use of technologies such as co-bots, drones, augmented reality, and machine learning. Higher levels of automation and autonomy will drive agility and visibility, not only into their own operations but the operations of their suppliers and logistics providers. There will be automated material handling and assembly, which will be tied together with predictive algorithms, supporting better and quicker decision-making when it comes to making changes in late-stage final assembly. In today's complex supply chains, logistics collaboration is mandatory for reducing total cost and improving service to the end customers. We follow this approach with SAP Logistics Business Network. It is an open, secure multi-capability, multi-modal network that connects business partners for inter-company logistics collaboration and insights. In tight integration with the relevant business processes, it allows

companies jointly managing logistics transactions and gaining insights across the complete value chain.

The new MetroSnap concept illustrates the art of the possible for the mobility of tomorrow. It is revolutionizing the last mile delivery approach by creating urban delivery hubs. Along the Mobility Value Chain, SAP offers all business processes to be digitally mapped and seamlessly interlinked for the best customer experience and delivering personalized mobility at scale and as a service through a customer-centric ecosystem. SAP is empowering automotive leaders to connect, automate, and innovate on their road to digital transformation – and to realize the art of the attainable for the automotive ecosystem.

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**Space Drive Inside:  
Redundant steering technology for fully automated  
and autonomous driving**

*In the future, vehicles which operate autonomously will need neither steering wheel nor pedals. These will be replaced by a joystick, automated/ autonomous driving functions, or smartphone apps. Operation will no longer be mechanical, but instead take place purely electrically via a drive-by-wire system.*

Space Drive by Schaeffler Paravan Technologie GmbH & Co.KG is a pivotal key technology for implementing this vision. With Space Drive, a mechanical connection between the steering wheel and steering gear is no longer required. In fully automated driving mode (level 5), even operating elements such as a steering wheel and pedals will ultimately not be needed. An important requirement for this step is that the system has to be absolutely fail-safe. This means that the overall system will continue to work, even if system components fail – in other words, the system is fail-operational.

**Key technology developed from the disabled mobility sector**

The origins of Space Drive can be found in the disabled mobility sector. Drivers with a very complex disease pattern such as paraplegia are reliant on the operation of the Space Drive system as they are unable to drive the vehicle in the conventional manner due to their disability. Paravan founder Roland Arnold has been developing innovative solutions in this area since 1998. The Space Drive system has been used in road traffic since 2004 and it has proven its worth over a billion accident-free kilometers in both the disabled mobility and industrial sectors. This niche product is now leading the way toward autonomous driving – a trend which will change the car industry of the future for the long term.

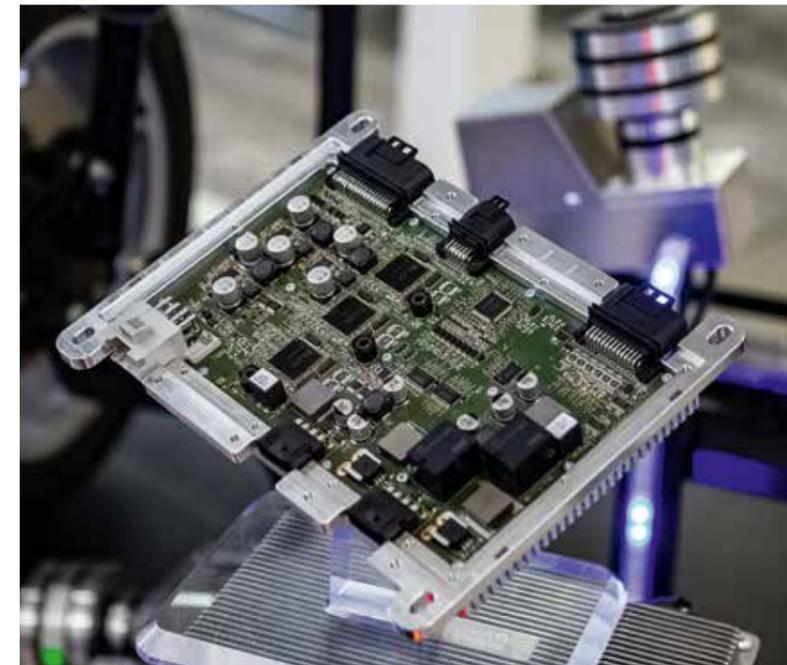
**Fail-operational thanks to innovative safety architecture**

Space Drive is an individually adaptable, fail-safe system which can be used in many different applications in the automotive or industrial sectors: from drive-by-wire solutions in vehicles for persons with disabilities to the driving of test, special and commercial vehicles, and scalable with up to 40 steering devices for driving in convoys. It doesn't matter whether the

driver sits on the right or the left or whether the vehicle is controlled by a digital steering system or driven fully autonomously by GPS signal.

The system has road approval in accordance with ECE-R13 (brake) and ECE-R79 (steering), and the processor unit (ECU) fulfills the highest requirements in accordance with the ISO 26262 ASIL D safety standards. It allows a real test environment to be used, thus giving rise to well-founded conclusions about the technology being tested. The safety concept is based on triple redundancy. Three processors handle digital (CAN/FlexRay/LIN) or analog input signals (joystick/ steering wheel) in real time and control redundant servo motors in accordance with a logical validity check based on the two-out-of-three majority principle to operate the gas and brake pedals or the steering.

Individual component failure does not result in overall functional failure because all the components which are relevant to the functioning of the system are available redundantly. The processors which monitor one another can detect errors as they occur and an appropriate compensatory response is activated.



**The future of autonomous driving**

This development is following the trend of recent years, whereby more and more control tasks are being given over to the vehicle. Space Drive, as the central control unit, takes over responsibility for the vehicle's primary functions. The

Schaeffler Paravan system is therefore an important foundation for semi-automated or highly automated driving. In addition, numerous new mobility concepts such as Schaeffler Mover will find their way into drive-by-wire systems such as Space Drive. Schaeffler Paravan focuses on the fail-safe electronic

control of the primary functions. The vehicle sensor technology, GPS and driver assist systems of the vehicle manufacturer or tier 1 supplier can be linked in via flexibly programmable interfaces.



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**Schaeffler Paravan Technologie GmbH & Co.KG** is a company specializing in the development of fail-safe drive-by-wire systems – Space Drive –and chassis system solutions. Its headquarters are in Herzogenaurach with premises in Pfronstetten-Aichelau. Schaeffler Paravan Technologie is a joint venture (90 percent Schaeffler and 10 percent Roland Arnold) and was founded in October 2018. The Space Drive system developed by Paravan founder Roland Arnold was assigned in full to the joint venture and is industrialized there. For the autonomously driving vehicles of the future, Schaeffler Paravan is also developing a rolling chassis with intelligent corner modules – with integrated Schaeffler wheel hub motors, brakes, Space Drive steering (90 degrees), and suspension in one system.  
<https://www.schaeffler-paravan.de/en/>



## A Responsible Chemistry partner for the New Mobility era

### Sustainable interior-surface solutions for synthetics, leather, and other evolving surface materials

Stahl, known within the automotive industry for its expertise in creating high-quality interior surfaces, is a world leader in specialty chemistry for coatings, processing, and treatments of many different materials. As a long-term partner to Rinspeed, Stahl has been involved in creating the interior surfaces of Rinspeed concept cars – from coatings that let leather glow in the dark to enhance its luxurious appeal, to the premium synthetics and edge-paint technology that enable design freedom and new forms of expression.

Our commitment to innovation, entrepreneurship, and excellence dates back to 1930, when Harry Stahl founded the business based on family values. Today, we aim to meet both our customers' and society's needs by listening to the world around us and anticipating emerging trends, and then making our ideas a reality.

The move to a fully sustainable supply chain and circular economy is a shift we have particularly welcomed, especially over the last 20 years. From as far back as 1978, when we introduced our first water-based polyurethane coating, we have aimed to lead our industry in Responsible Chemistry, using our expertise to improve the performance of both existing and new materials.

#### Hygienic, high-wearing premium surfaces with shared mobility in mind

Following the SNAP and microSNAP, we have now contributed to the MetroSnap, incorporating responsible chemistry more than ever before. Our approach works in several ways. First of all, we look at the world around

us and learn from other industries. Take the aviation industry, where interior materials have always been part of the shared mobility experience. Trims are exposed to the relentlessness of mass transportation while also being an integral part of the travel experience for passengers. We have taken inspiration from this case study by carefully listening to different perspectives from fleet operators. Based on the insights gained, we have built on our proven Best-in-Class surface coating technologies and evolved them even further.

Our next-generation technology platform, Stahl Stay Clean® lifetime+, is engineered with shared mobility in mind. Available for both leather and synthetics, it is currently being tested by renowned airlines under 'real-life', everyday conditions high up in the skies. The feedback we have gained so far is encouraging and the benefits for fleet operators convincing: "Interiors have an enhanced lifetime, easier maintenance, and reduced Total Cost of Ownership. Furthermore, passengers benefit from having a more hygienic, premium-quality travel experience."

#### Going circular with 100% biodegradable textiles

Secondly, we partnered with Lenzing, a fiber specialist with a botanical background, renowned for its 100% biodegradable, compostable and reusable materials. By combining Lenzing's REFIBRA™ technology with Stahl's new bio-based reactive High Solids PermaQure® PU technology, we're redefining the sustainability benchmark for the premium synthetic trim category in mobility applications, as two market leaders.



#### Pull-up automotive leather for a luxurious look and feel

Last but certainly not least, the interior components contain beautiful authentic blue pull-up leather for a crafted look and feel. This technology, long renowned in the high-end home interior segment, is now available for automotive use – a market-first innovation.

#### About Stahl

Stahl creates specialty chemistry for coatings, processing, and treatments of many different everyday materials. Our chemistry gives the things we use the

properties they require to last longer, feel softer, resist scratching, diffuse heat, and be recycled and upcycled. As a world leader, we use responsible chemistry that meets tomorrow's needs – for our customers and society. In particular, we serve high-end industries in mobility, fashion & footwear, architecture & construction, interior spaces and paint, ink & packaging. In close collaboration with our partners, we initiate activities that promote transparency and provide high-performing, low-impact solutions to drive the transition to a fully sustainable supply chain and circular economy.

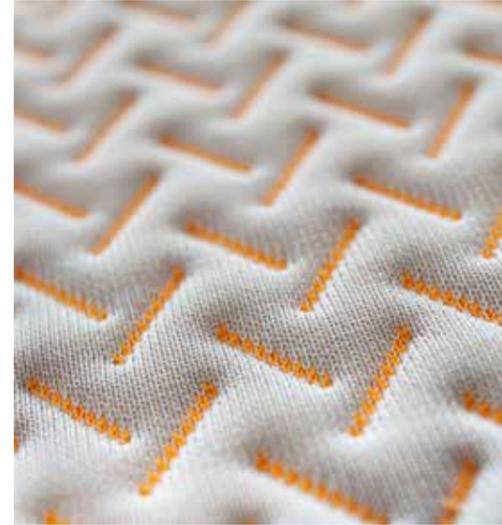
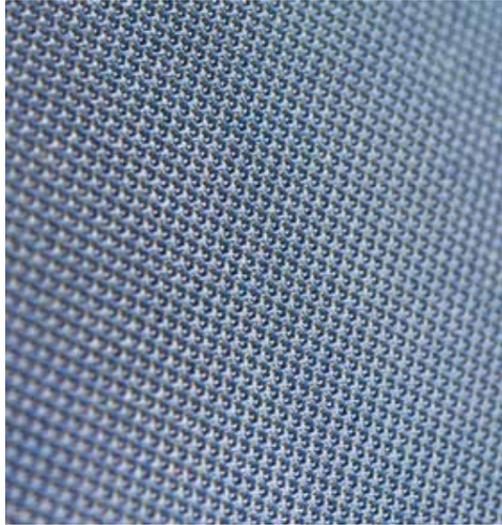
#### "If it can be imagined, it can be created."

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# STRÄHLE + HESS

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## **We live and breathe textiles. And have done for more than 90 years.**

Our desire to create exciting and emotional vehicle interiors never ends. Around 300 employees knit and warp knit with passion and expertise in Althengstett, Bisingen, Topol'čany (Slovakia) and Auburn (USA) for the unique character of your car. Our designers translate trends into textiles and develop attractive colour and material concepts. With our expertise and experience, we enrich the products of all well-known car manufacturers worldwide. As a Rinspeed partner, STRÄHLE+HESS is shaping textile interiors for the twelfth time.

### **Maturity**

Everyone knows that all good things come in threes. The MetroSnap is the peak of the continuous development which started with SNAP. The tried and tested idea of bundling hardware and software components susceptible to ageing into the widely used driving platform (skateboard) and separating them from the durable elements in the passenger compartment (pod) has been retained.

Inspired by cargo systems, the exchange of the cabin is uncomplicated. The Neighborhood Depot means long collection trips can be avoided. In many places, the pod is left at various small areas within the town district for this purpose and exchanged on a regular basis. The range of possible uses is virtually unlimited. They extend from warehousing and various service mobiles to car-sharing models.

### **Enthusiasm**

Together with interior partners, STRÄHLE+HESS develops a colour & trim concept which reflects the lifestyle of the young generation. The lightweight character is driven by optimism and vital energy. Luxury is increasingly seen as intangible and becomes manifest in the personal lifestyle. Time and sustainability are the new values. The car is becoming a social place which people prefer to use together, i.e. share, as opposed to own. With the resolute implementation of recycled polyester yarns, we are catering to the desire for a more sustainable life. A circular knit in vibrant blue crowns the dashboard. The fine, two-tone diamond structure has a delicate iridescent look. The vital braided piping – our product innovation – confidently surrounds the blue area. An unobtrusive, subtly structured, light grey circular-knit fabric covers the headliner. Orange accent lines decoratively enclose the light grey, padded flat-knitted material which resembles a quilted area. This technique makes it possible to replace process steps necessary in the past. Finely flecked flat-knitted fabric with

black Refibra yarn from Lenzing snugly fits the backrests. The blue textile piping with a touch of violet underscores the soft lines of the overall seat design.

### **Textile**

Your goals become attainable with the textile products from STRÄHLE+HESS. Be inspired by our creativity and the diversity of design and structure options in the knitting sector. Join us and rely on the positive characteristics of textiles. We are your experts whatever the knitting technology and will put all our efforts into finding solutions to your challenges.

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## Shaping the future of Mobility with 3D Printing

The mobility and automotive industries are well-known for being fast paced. For manufacturers, they require technologies that can enable them to keep up with industry changes and customer demands, without compromising on innovation. For over thirty years, Stratasys technologies have helped manufacturers achieve cost-effective, on-demand production of customized parts with no geometric limitation – eradicating the need for conventional tooling, which is inherently costly to produce and requires long lead times.

### Make it with Stratasys

Stratasys has been pioneering 3D printing technologies for over 30 years, solving design and manufacturing problems, and innovating how parts and products are made. Operating on a global scale, Stratasys supports key industry leaders across a plethora of industry sectors, among them automotive, mobility, aerospace, consumer goods and healthcare. Regardless of the industry, Stratasys' goal is to make design and production faster, easier, better and less expensive with 3D printing.

### An ideal technology for every application

Stratasys' core technologies consist of PolyJet™ 3D printing and Fused Deposition Modelling (FDM®). Both are used by leading automotive and mobility companies every day to

transform design and production in different ways.

**PolyJet technology** – the most advanced PolyJet system is the newly-launched Stratasys J850 3D Printer. The J850 is world's only full color, multi-material 3D printer, and the only technology able to produce PANTONE-Validated™ color parts. The J850 enables rapid creation of concept parts and functional prototypes that look and feel like the final product, thanks to its unique ability to combine up to seven different materials in one print. PolyJet materials range from rigid to flexible, transparent to opaque and more, with outstanding surface finish. Ultra-realism is the benchmark for PolyJet 3D printers.

**FDM technology** – enables engineers to produce tough and durable production parts with a range of industrial-grade materials, including those that meet ESD

(electrostatic discharge) standards, as well as smoke, fire and toxicity requirements for mobility. Other properties include extreme strength and lightweightness, such as Nylon material. Within mobility, FDM is particularly well-suited for creating low volume spare parts for vehicles, enabling cost-effective customization or rapid replacement of obsolete parts.

### Speed up production

Ideal for the mobility sector and particularly for the MetroSnap, Stratasys FDM and PolyJet 3D printing enables the fast production of customized automotive parts for vehicle interiors and exteriors without the need for tooling. The MetroSnap comprises a large amount of Stratasys 3D printed parts. These include the lighting fixtures, which are 3D printed in VeroClear material on the J850,



as well as structural components produced in Stratasys' Nylon12 material – supporting the MetroSnap's mission to combine lightweightness with durability. With Stratasys 3D printing, various elements of the MetroSnap can be produced quickly, cost-effectively, and to exacting requirements.

### 3D Printing: The mobile way to part production

Stratasys 3D printed parts featuring throughout the MetroSnap concept vehicle, include:

#### Interior 3D printed parts:

- Center console
- Inserts for center console
- Display frame
- Plug socket fixture
- Air vents

#### Exterior 3D printed parts:

- Lidar screens
- License plate holder
- Frame for display panel

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## A GAME CHANGING PLATFORM TO BOOST THE SAFE FUTURE OF MOBILITY

Current computing and network architectures in vehicles are built around several functional domains, e.g. for powertrain, chassis, infotainment, energy and autonomous driving as well as advanced driver assistance systems (ADAS). Although such a domain-based architecture presents the first step towards consolidation and the reduction of the number of ECUs (electronic control units), it still has a way to go.

Guaranteed safety of the autonomous vehicle requires close interaction and streamlining of all domains. It is not possible to reduce safety features to one domain only. Having multiple domains (and correspondingly domain ECUs) implies multiple development, testing and maintenance costs. Besides, it is difficult to adapt or add new cross-domain applications expected by the customer.

### Safety software expert in automated driving and beyond

TTTech Auto designs and implements safety-critical and future-proof, platform-centric solutions for the automotive industry. TTTech Auto supports OEMs and Tier 1 suppliers in maximizing their opportunities and streamlining their journey to highly automated driving by adopting a platform-centric approach. This helps them accelerate time-to-market for new functionality, guarantee safety compliance, and allow software investments to be re-used for highly automated driving projects in the future, as well as supporting software re-use across multiple SoCs (System-on-a-Chip), different vehicle lines and models.

### In-Car Compute Platform

TTTech Auto designed the so called In-Car Compute Platform (ICCP) that aims to consolidate the maximum of automotive functions from different domains inside a single highly integrated, high-performance ECU. This drives the transition from current, hardware-oriented vehicles to the

software-defined vehicles of the future. In particular, the requirements of these functions vary concerning their real-time response requirements as well as the automotive safety integrity level (ASIL) for road vehicles, as defined in the ISO 26262 standard. The orchestration also contains the Smart-I/O computation layer that is primarily responsible for the interaction with sensors and actuators.

### Highest safety through fail-operational capabilities

For fail-operational properties, the architecture will need to contain redundant ICCP ECUs connected over dual redundant, high-speed backbone links. The connection to (critical) smart-I/O should also be redundant. Fail-operational architectures are realized through



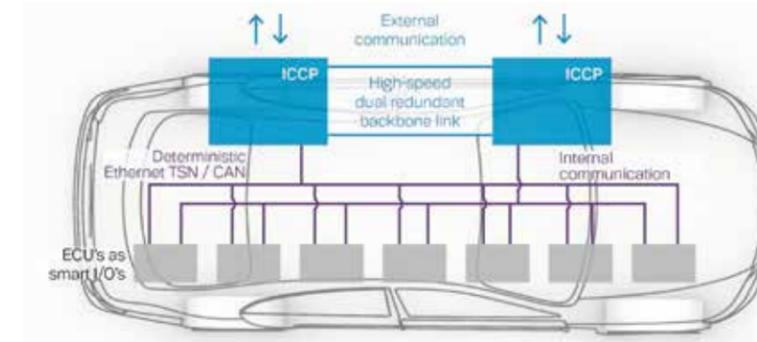
suitable redundancy and the interconnection of the replicas' redundant elements by means of a deterministic network. ICCP itself defines redundancy on multiple levels, for example, that the failover to a second (or third) ICCP ECU will only be triggered under extremely unlikely failure conditions.

### Real-time orchestration of applications coming from third party vendors

The high-level ICCP architecture can host applications from different functional domains (including cross-domain applications). The architecture includes shared services, e.g. for safe and secure integrated diagnosis, monitoring and logging, as well as for shared management capabilities, for safe and secure re-configuration and balancing.

### TTTech Auto - Accelerate your journey towards highly automated driving and beyond

TTTech Auto provides solutions for the challenges of future vehicle generations. TTTech Auto specializes in safe software and hardware platforms for automated driving and beyond, applicable in series



Graphic: In-Car Compute Platform architecture

production programs. With their leading technology solutions, TTTech Auto ensures safety and electronic robustness for a more automated world.

TTTech Auto operates under the umbrella of the TTTech Group, a technology leader in robust networking and safety controls, with cross-industry experience from more than 20 years of operation.

The TTTech Group is headquartered in Vienna, Austria and is also present in several locations in Europe, the USA and Asia.

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## AUTOMOTIVE SOLUTION

### Watergen's innovative water-from-air technology - now available in a new solution, tailored for in-vehicle use.

The proprietary technology which was originally developed to help solve the world's water shortage crisis has now been adapted for use in private cars, recreation and leisure vehicles, buses, trucks and vans.

#### Automotive Solution

The first company to integrate an atmospheric water generator into a vehicle, Watergen has tailored its patented GENius technology for use in three applications:



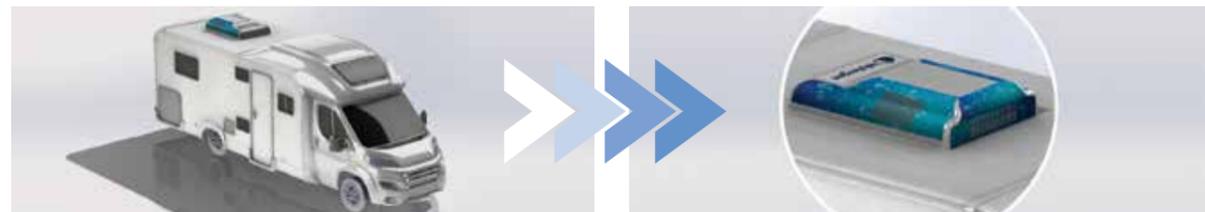
#### Watergen-on-Board

An integrated drinking water solution, which provides the driver and passengers of private vehicles, with clean drinking water



#### Watergen for Technical Water

An integrated technical water solution for use in washing sensors and cameras for autonomous vehicles, and other functionalities within vehicles that require water such as Water Injection technologies



#### Watergen-to-Go

An add-on drinking water system for the Automotive aftermarket that can be equipped on any vehicle, to provide the driver and passengers of private, vans, trucks, recreation and leisure vehicles with clean drinking water

## HOW IT WORKS

The proprietary patented GENius heat-exchange technology turns air into water in the following four-phase process:

### 01 | Air Intake

Air from outside the car is drawn into Watergen's atmospheric water generator, where it is thoroughly cleaned, removing any dust, dirt and other pollutants, leaving only pure air in the system.

### 02 | Water Generation

The clean air is then directed through the patented GENius heat exchange to the cooling process, bringing it to the temperature at which condensation occurs, thereby creating water.

### 03 | Purification\*

The water is channelled through a multi-stage filtering system: sediment filtration, mineralization, activated carbon and microbiological treatment by UV lamp, to give the water a fresh and healthy taste.

### 04 | Storage & Dispensing

When the water reaches its premium state, it is stored in a built-in tank, where it is kept fresh through continuous circulation. The water is dispensed directly from a built-in dispenser in the front console of the vehicle, as needed.

### Automotive Solution Advantages



#### Water on tap

An independent supply of clean, fresh, drinking-quality water



#### Standards compliance

Complies with all required World Health Organization (WHO), Environmental Protection Agency (EPA) and ASSE standards.



#### Convenience

Available right inside the vehicle, for use as and when required



#### Reduced carbon footprint

Green technology with minimal impact on the environment; no need for bottled water



#### Integrated dispenser

Cold and Hot water

### About Watergen

Founded in 2009, Watergen provides a game-changing water-from-air solution based on its proprietary patented GENius technology that uses humidity in the air to create clean and fresh drinking water to people everywhere. The company offers a range of water atmospheric generators (AWG) for various applications; the home-office scale GENNY can produce up to 30 liters of water per day, the medium-scale GEN-M that produces up to 800 liters of water per day and the industrial, large-scale generators that can make as many as 5,000 liters of water per day. Watergen's AWGs are installed in numerous countries around the globe.

### Contact us

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watergen.com



\* For technical water applications, this stage is not necessary.

# wirecard

## Wirecard shapes the future of mobility with Rinspeed

### Digital payment and authentication solutions for autonomous driving

Wirecard (GER:WDI) is one of the world's fastest growing digital platforms in the area of financial commerce and the global innovation leader for digital financial technology. We provide both business customers and consumers with a constantly expanding ecosystem of real-time value-added services built around innovative digital payments by using an integrated B2B2C approach. This ecosystem concentrates on the areas payment & risk, retail & transaction banking, loyalty & couponing, data analytics & conversion rate enhancement in all sales channels (online, mobile, ePOS). Wirecard operates regulated financial institutions in several key markets and holds issuing and acquiring licenses from all major payment and card networks. Wirecard AG is listed on the Frankfurt Stock Exchange (DAX and TecDAX, ISIN DE0007472060).

Wirecard is cooperating with Rinspeed as payment partner and thus actively shaping the future of mobility.

Wirecard technologies are integrated into Rinspeed's concept vehicles, which provide a stimulus for how autonomous driving will work in the mass market in the future. This enables completely new customer experiences true to the motto "Commerce on the Move".

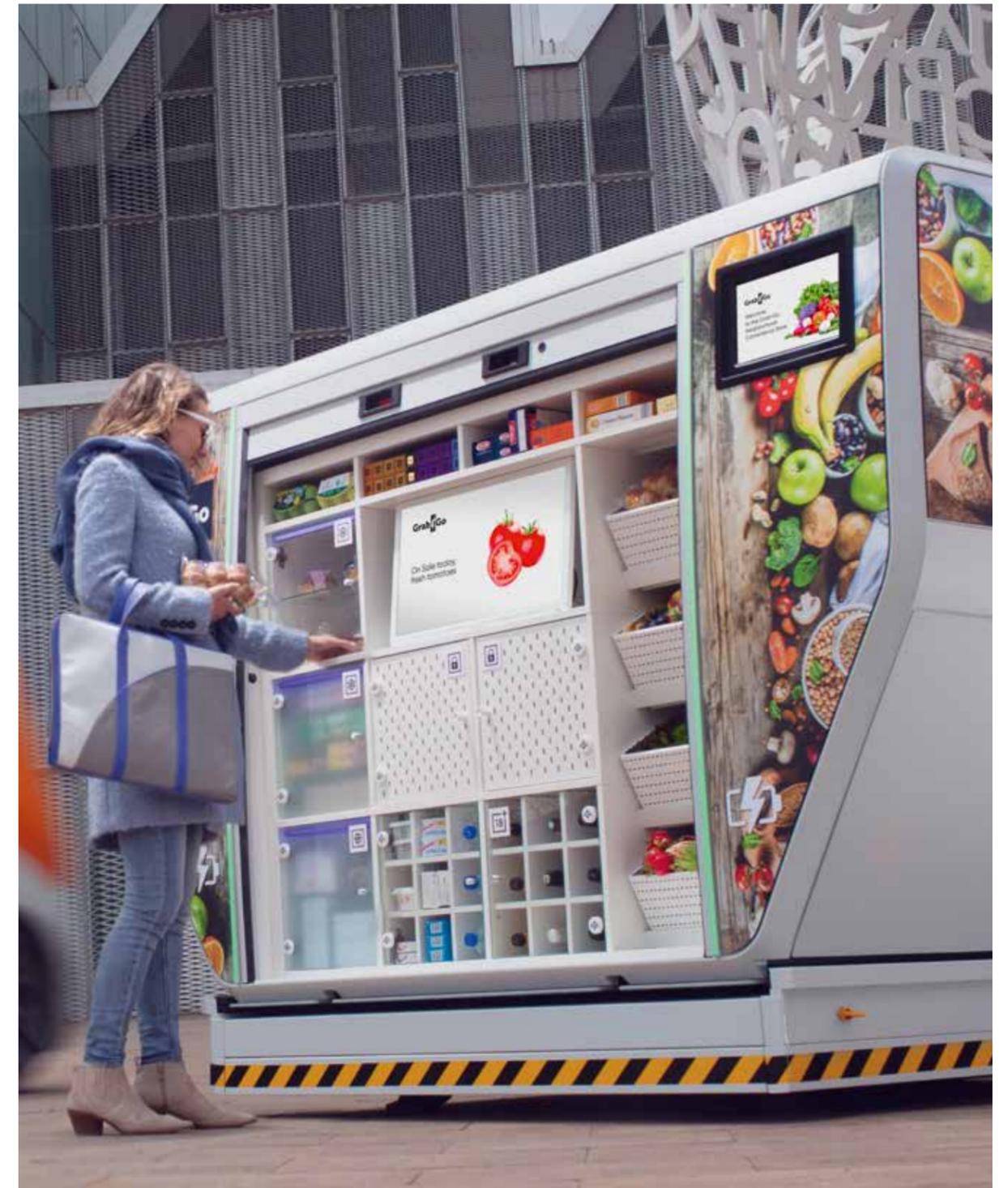
Wirecard is expanding the functionality and the possibilities of Rinspeed vehicles using solutions from its Innovation Labs, such as the Grab & Go Store or biometric hand scanner. In addition, Wirecard is providing the payment infrastructure for all deployment scenarios.

Together, Rinspeed, Wirecard and other partners want to turn the concept car into a shop on wheels. The Wirecard Grab & Go Store offers a convenient, seamless shopping experience: consumers are granted access to the goods via facial recognition, a shutter opens and customers select products. Thanks to so-called "computer vision", it is possible to identify

which products are missing and the payment process runs in the background when the shutter is closed. The system detects misplaced items, such as those that were first removed and then left on another shelf. These goods are not charged.

Rinspeed and Wirecard are also working on logistics scenarios in which the concept vehicle acts as a courier and delivers or picks up parcels. Wirecard's biometric hand scanner not only enables fast biometric payments without any further proprietary infrastructure, but is also ideal for access control and identification.

New forms of mobility open up completely new possibilities in the area of passenger transport, which will increasingly be electric, driverless and cashless. The way we travel, shop and work will change dramatically in the coming years. This change is made possible by the intelligent use of new technologies, with payment technologies and digital



identification methods playing a central role.

Thanks to the partnership with Wirecard, Rinspeed can offer entirely new deployment scenarios

for their concept vehicles.

Consumer behavior is completely changing and becoming increasingly independent of location and time. Everyday life – from shopping through to delivery – can happen autonomously and digitally.

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# Zurich Insurance Group and RINSPEED

## Usage-based insurance is smart protection for smart vehicles:

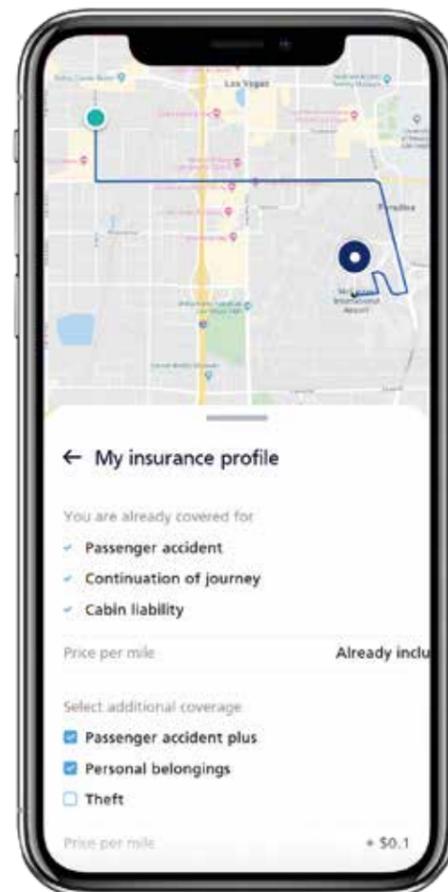
- **Mileage-based insurance** – Vehicle, passengers and goods coverage for the SNAP fleet owner and user, based on distance driven and other factors such as time of day and weather conditions
- **Time-based insurance** – Coverage for the pod when parked at a pre-determined location, based on the amount of time the SNAP is parked
- **Contextual insurance and services** – Convenient, personalized, on-demand insurance and services based on personal circumstances.

## Zurich and mobility

The future of mobility is here and Zurich is playing a leading role in this fast-evolving space. New forms of mobility are taking shape, driven by shifts in customer behavior and rapidly developing technologies. As vehicle owners and users see their mobility choices change, they will develop new kinds of relationships with insurers who must respond to the changing world of transportation with innovative coverage solutions.

MetroSnap is where mobility trends have converged: A driverless, electric vehicle provides mobility service for passengers and can be used to deliver goods - thanks to its modular design - making it an extremely efficient asset for fleet owners. In response, insurers must keep pace with products and services that address the emerging risks and opportunities that are created by such a disruption in the traditional world of transportation.

As the shifting mobility landscape demands new insurance approaches, risk solutions are evolving to meet customer needs. Zurich, meanwhile, is responding to expectations for greater convenience, speed of service and reasonably priced coverage options by introducing new ways of interacting with customers and mobility providers. This means creating innovative ways to meet their needs through digitalization and propositions that are modular and on-demand.



## Usage-based insurance

Considering the changing needs and behaviors of the thousands of vehicle users who will have access to such cutting-edge transportation as MetroSnap vehicles, Zurich looks to usage-based insurance to address the unique mobility exposure. Under such coverage, premiums will be calculated according to distance traveled when the SNAP vehicle is moving and the time it is parked in a predetermined public location. Other factors, such as weather conditions, time of day and road surfaces will also be considered.



Under usage-based coverage, a MetroSnap fleet owner will be able to purchase tailored insurance for such risks as vandalism, theft, cyber risk or product liability.

Among other coverages, the fleet owner will be able to provide accident insurance for users of the vehicle and protection for goods being transported.

The usage-based approach will also allow vehicle users to create a personalized insurance profile that will show their preferences for coverage in addition to that provided by the fleet owner.

For each trip, the user will be able to add coverage – insurance for personal belongings, for example

– or opt out of profile-based coverages. In addition, usage-based insurance will include prompts to alert customers to contextual coverages that can address their personal situation or circumstances. As an example, when an airport is a destination, travel insurance for an upcoming trip would be offered as an optional coverage.

## About Zurich

Zurich is a leading multi-line insurer that serves its customers in global and local markets. With about 54,000 employees, it provides a wide range of property and casualty, and life insurance products and services in more than 210 countries and territories.

Zurich's customers include individuals, small businesses, and mid-sized and large companies, as well as multinational corporations. We aim to create sustainable value for all our stakeholders: our customers, employees, shareholders and the communities in which we live and work. We create value by putting our customers at the center of all we do.

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