

VOLKSWAGEN

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KONZERNFORSCHUNG

World premiere in Potsdam – Volkswagen's eT! research vehicle

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Notes:

You will find this press release as well as information,
graphic motifs and videos on the eT! research vehicle online at:
www.volkswagen-media-services.com. User-ID: etwn;
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World premiere in Potsdam:

Key aspects

Volkswagen eT! – the reinvention of the delivery vehicle

eT! is electrically powered and drives semi-automatically on command

Driver can steer the eT! by 'drive stick' from passenger's side as alternative

Wolfsburg / Potsdam, November 2011. For over 60 years now, commercial vehicles from Volkswagen have maintained a visual presence on the world's streets. They are helpers in everyday life, which bring us people goods, services, postal deliveries and occasionally emergency assistance as well. Volkswagen perfected the concept of the transporter over many decades and has long been considered one of the world's leading manufacturers of lightweight commercial vehicles. With the full weight of this competence, the company is now looking far into the future of small freight vehicles. Volkswagen Group Research, which is responsible for the world of tomorrow, together with the German Post Office ('Deutsche Post AG'), which is one of the largest customers of lightweight commercial vehicles – as well as the University of Art at Braunschweig – formed a think tank on future transport and mobility issues. Prof. Dr. Jürgen Leohold, Director of Volkswagen Group Research: "We analyzed process flows and customer needs in detail, and from these analyses we derived ideas on how the segment of delivery and courier vehicles could be further developed over the long term. In this context, we focused on zero-emissions driving and available space in urban areas, semi-automatic driving functions that offer relevant support and simplify work processes and the integration of new communication technologies. On top of that, we also set out to design a very emotionally appealing commercial vehicle. To attain these goals, our teams not only looked towards the future from the past, but also worked from a future perspective to implement an advanced development concept based on technologies available

today. Finally, these research activities led to a completely new vehicle concept for the delivery and logistics field: eT!”

Revolutionary. eT! could someday actually revolutionise the world of lightweight commercial vehicles. Completely reconceptualised, driven with zero emissions, thought through to the last detail and driving semi-automatically if necessary! Just how wide-ranging the significance of this research project could be for sustainability in the transportation field is underscored by the support for the eT! project by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. “The eT! research vehicle,” explains Dr. Wolfgang Schreiber, spokesperson for the Board of Management of Volkswagen Commercial Vehicles, “unifies a whole gamut of innovative functions, which will gain in future importance, specifically for logistics businesses. In particular, the possibility of driving the car semi-automatically – and electrically – in downtown areas unifies economical and environmental aspects more systematically than ever. As a vision of the future, the eT! is showcasing what is the maximum feasible technology for electric vehicles in the commercial market today with a special design that systematically addresses future customer needs.”

Concept

Zero emissions. “eT! is a pure electrically powered transporter that systematically transfers E-mobility to the area of commercial use,” says Dr. Rudolf Krebs, Group Manager for Electric Traction at Volkswagen AG. Dr. Krebs continues: : “As a transport specialist, the eT! is advancing to become the automotive building block for an innovative, future-oriented logistics concept, which not

only drives with zero emissions in urban areas – thanks to its electric wheel hub motors – but also offers maximum freedom in manoeuvring and turning as well as optimal utilisation of the vehicle’s interior space. If ‘refuelled’ with electricity generated from renewable energy sources, the eT! can indeed be operated with zero emissions. Naturally, the eT! is not a vehicle which – unlike the Golf or up! with an electric motor – could become available very soon. But we must make plans today for what the world of lightweight commercial vehicles might look like starting in the second half of this decade, including with regard to electrical drives.”

Variants of this lightweight transport vehicle could be implemented for all conceivable business uses. And these derived concepts are also the focus of research activities. Meanwhile, the eT! concept shown in a world premiere at the Design Centre of Potsdam was specially designed for delivery of mail shipments of all types. The research vehicle will now be integrated in a driving test study and further analysed.

Automated. To make the working world of mail delivery personnel and courier drivers simpler and safer, to optimise the logistics of delivery and to shorten delivery times, eT! can be operated semi-automatically in certain situations. The car can follow the delivery person from house to house (“Follow me”), or the car can return to the delivery person on command (“Come to me”) – driverless! As an alternative, the driver can direct the car’s movements via a ‘drive stick’ from the passenger’s side that also offers a standing seat and quick access to the vehicle. On the passenger’s side – the side that faces the sidewalk and therefore the working area of the delivery person – there is therefore an electrically opening sliding door that opens to 2 different stages; this enables extremely quick

entry into the vehicle as well as quick access to the mail parcels. This makes unnecessary walking movements around the vehicle a thing of the past (*for detailed information on driverless mobility, see page 11*).

Design

Functionally oriented. “The exterior of the eT!,” says Peter Wouda, who as Director of Exterior Design at the Volkswagen Design Centre in Potsdam is responsible for the research vehicle’s design, “was systematically tailored for use as a delivery vehicle. The Volkswagen design team set the goal of making a visual bridge – with a clean, monolithic, reduced and functional design – from the great history of the T1 into the future of the segment. And indeed with a fully independent concept. The inspiration for the new, progressive exterior design was the objective of melding a chassis to the container that is set upon it. This approach resulted in a very clean partitioning of the vehicle body into a lower area (driving relevant) and upper area (shipping relevant).” The front lower body area of the eT! displays the cooling openings for the electric drive, as well as sensors all around for semi-automatic driving functions; the upper area was systematically designed for optimal utility. The clean surfaces and precise edges lend the study a restrained visual image. This created a design that lets the conceptual advantages express themselves in an ideal way.

Transparent. The successful interplay of form and function runs like a common thread through the entire concept. Take the windscreen, for example: it wraps around for good all-round visibility; as a design element, this glass surface visually divides the body into cab and cargo area. The roof is offset in colour for additional visual structure.

Protective. The greatest possible safety is extremely important, especially for occupations in traffic. Therefore, the rear wing door of the eT! was not simply equipped with conventional rear lights, rather with a band of LEDs that has very good visibility from far away. The same applies to the headlights in front: here too, LEDs are used – for the hazard lights; like their counterparts at the rear, they require very little energy and yet they exhibit optimal signalling effect. These hazard light functions are also activated automatically as soon as the eT! is in motion in a semi-automatic driving mode or when it is being controlled via the drive stick.

Sized large. Also integrated in the overall design were rather large 18-inch wheels. Their styling is marked by a contrast between a visually and technically sturdy outer ring design and 5 relatively delicate black painted dual spokes. The rear wheels each offer a view of the hub motors lying behind them; the visible cooling ribs of the motors visualise the functionality of an electric drive (*for detailed information on the drive, see page 8*).

Dimensions

Space maximizing. eT! – if it were a production vehicle – would be classified as a commercial vehicle in the class up to 2,500 kg gross weight. The 4,090 mm long, 1,850 mm wide and 1,980 mm tall Volkswagen has a long wheelbase (2,780 mm) and therefore very short overhangs (622 mm front, 688 mm rear). The ratio of length to wheelbase already gives an indication of the vehicle's optimal space utilisation and cargo volume of 3,6 m³. Thanks to a special axle configuration, the eT! offers another invaluable advantage in

usually congested city driving conditions: a turning diameter of 8.5 metres. That is a top value, and not only in the area of commercial vehicles.

Drive system

Electrifying. The up to 110 km/h fast eT! is driven via its rear axle by the 2 lightweight wheel hub motors (each weighing 34 kg). Integration of the electric motors at the rear (total continuous power output of 70 kW, or peak power of 96 kW) enables the use of a special McPherson-type front suspension, which together with a new power-assist steering system makes the noted 8.5 metre turning diameter possible. In the underbody of the eT! there is a space-saving and crash-optimised storage space for the 33 modules of the lithium-ion battery with an energy capacity of 32.1 kWh. A power electronics unit manages the flow of high-voltage energy between the battery and the electric motors. The vehicle electrical system is supplied with 12 Volt voltage via a DC/DC converter.

Economical. The energy capacity of the battery enables a maximum range of approx. 100 km, depending on duty conditions. And that is more than adequate for a postal vehicle. The energy requirement in the conventional NEDC cycle – the standardised fuel consumption rating by which all other cars are measured in Europe – is 20.7 kWh per 100 km.

Specific solutions

Urban. eT! is more than just an electrically powered Transporter. In all of its design details, the entire research vehicle was specifically

tailored for use as a mail delivery or courier vehicle for urban areas. On this project, the researchers came up with innovative solutions for all conceivable aspects of the vehicle.

Doormatic. eT! is a vehicle with 3 different door systems. Along with the classic driver's door, there is a two-part automatic sliding door on the passenger's side. This door can be opened in 2 stages ('Doormatic'). Stage 1 is opened in less than 3 seconds, so it opens very quickly for access to the front passenger space. Since the interior floor was lowered on the passenger's side for easier entry and exit (to 315 mm above the road surface), the delivery person can not only quickly access the cargo area and the area next to the driver's seat and pick up small mail items there, but can also drive the vehicle from the passenger's side while standing using a 'drive stick' (*for detailed information on driving with 'drive stick', see page 10*). If larger freight items need to be unloaded or loaded, the delivery person can also open the second part of the sliding door. For convenient and safe access to the cargo space (side facing away from the roadway), the B-pillar of the eT! was moved inward. By the way, when the sliding door is fully opened, it does not protrude outward beyond the body any more than the right door mirror.

Easy Access. But why an electric door drive? To simplify the work of the delivery person and to save time. That is because the driver can not only open the sliding door by pressing a button on the vehicle, but can also open it remotely via the iPhone that delivery personnel carry on their arm. The iPhone can also be used to set the vehicle in motion and to call up logistical assistance for the delivery (*for detailed information on use of the iPhone and iPad, see page 12*).

Rain protection. The third ‘door’ is located at the rear; this was intentionally designed as a two-part wing door, which can be opened faster than a tailgate that opens upwards. The wing door is opened by a handle integrated in the rear VW logo. The highlight in this area: when the wing door is open, an auxiliary roof can be extended rearwards in response to a virtual pedal or control via iPhone or iPad – to protect the mail items and the delivery person from rain.

Drive Stick. Currently, there is no Transporter in the world that can be put into motion from the sidewalk side of the vehicle within seconds, with the exception of one: the eT! research vehicle. That is because the Volkswagen Group Research simply created a second driver’s position – not for a second driver, but for a new, additional interface between driver and car. Instead of ‘climbing in’ behind the steering wheel or even entering the vehicle via the driver’s door facing the street, the delivery person just takes a small step through the open sliding door and reaches his or her newly conceptualised standing seat on the passenger’s side. To the left of this standing seat, there are some buttons that the delivery person can use for such functions as opening and closing the doors, adjusting the mirrors, activating the electric parking brake as well as starting and stopping the electric motors. The crucial lever, however, is located to the right of the seat; it is the ‘drive stick’. Using this lightning-fast and intuitively operated ‘drive stick’, the delivery person can steer, accelerate and brake – at speeds up to 6 km/h. This matches the speed of a quick walking pace. For the delivery person, this further simplifies work tasks; in addition, the driver’s long-term health is safeguarded, because entering and exiting the vehicle is significantly less stressful ergonomically.

Come to me. The driver can also have the eT! drive to him or her at the same speed of 6 km/h, after the driver has already walked ahead a good distance. In this case, the semi-automatically driving vehicle is started via iPhone. Background: For years now, Volkswagen Group Research has successfully demonstrated that cars can be driven safely without drivers, e.g. in vehicles such as the fully autonomously driving Touareg ‘Stanley’ (won the international competition ‘Grand Challenge’ for autonomous vehicles initiated by the US government). With eT!, parts of these technologies are now flowing into a first vehicle in which innovative assistance systems that sense the surroundings can move a Volkswagen autonomously and thereby simplify everyday work.

Camera based. In detail, a camera near the rear-view acquires the carriageway including street edge (not only markings, but also visible surface differences such as public sidewalks or grass turf) and stays on course with the help of electro-mechanical power-assist steering. If objects stand in the way, such as a trash bin, the eT! drives around the obstacle, provided that it does not extend over a half metre into the driving lane. The car reacts to all other obstacles with an immediate stop. In addition, the eT! automatically stops 5 metres before a road intersection.

Follow me. In many city areas, the work day of a mail delivery person or courier driver runs like this: one or more deliveries are made, then the person must walk back to the vehicle, drive, make more deliveries, walk to the vehicle, etc. These walking paths take effort and are costly in terms of time. Therefore, Volkswagen Group Research and the Deutsche Post AG (German post office) sought a concept that would avoid these nonessential paths for delivery personnel. The solution is called Follow me! In this case, the driver is equipped with a transceiver; it is part

of a supplemental module of the iPhone that the driver always carries on his or her arm. This module communicates with a total of 6 transceivers permanently integrated in the eT! via W-LAN. The vehicle's 'stationary' transceivers measure the distance to the delivery person's 'mobile' transceiver. Since the eT! essentially always knows where the delivery person is located, it can literally keep pace with the deliverer's every step. And that saves time.

40 minutes saved per route. The semi-automatic driving functions 'Come to me' and 'Follow me', driving by 'drive stick' and easier personal access to the vehicle shorten the time needed per delivery area, delivery person and day by about 40 minutes according to internal calculations by the German Post Office. This makes eT! a genuine money-saver.

Mail container system. Volkswagen Group Research and the German Post Office tuned multiple parameters to attain perfect logistics – route guidance and access to parcels. The first and simplest yet very effective step by the experts was to systematically improve the storage of postal items in the vehicle. In the cargo space, the various sized containers that are used, and which contain the sorted mail items, can be simply and quickly snapped into lightweight alloy brackets on the vehicle walls. Up to 3 additional containers may be mounted in front of the driver's standing seat.

iPhone and iPad. Mobile computers like the iPhone and iPad are forever changing the work world. As already mentioned, in the eT! research project, the iPhone strapped to the delivery person's arm serves to operate a wide variety of vehicle functions, but it also provides important information related to the individual

delivery. Meanwhile, an iPad acts as the ‘host computer’ – which communicates with the mobile iPhone. In the eT! it replaces the classic centre console.

Networked. At the beginning of the drive, the iPad is simply snapped into a mounting bracket. Together with the iPhone it then performs a key function that could revolutionise the delivery of letters and parcels. The reason: the electronic helpers display the entire delivery route, including all addresses, such information as whether there are biting dogs and the optimal stopping place for the vehicle. Even the ideal walking paths to the house entrances and information on hidden mailboxes are shown by map. When the delivery person approaches a stopping point with the Volkswagen, all relevant information automatically appears such as the delivery address and even the type of shipment (letter, registered letter, parcel, weight, etc.). If the freight is particularly heavy (over 20 kg), a note is displayed that the parcel should be delivered using a hand cart. The iPad also lets the driver know which sections of the route are best suited for use of the ‘Follow me’ and ‘drive stick’ functions.

More flexible. Until now, delivery personnel who would need to become familiar with a new district would have to learn routes from experienced colleagues. However, the eT! eliminates this time-consuming step, because the iPhone and iPad show the delivery person the way. Even more: forms such as mail delivery receipts, which today are still carried in paper form and need to be filled out on the road, could in the future be processed electronically on the mobile iPhone. The eT! research vehicle brings this future much closer...

Technical data of the eT!	
Dimensions	
Length / width / height	4,090 mm / 1,850 mm / 1,980 mm
Wheelbase / overhang: fr. / rr.	2,780 mm / 622 mm / 688 mm
Drive system	
Type	2 wheel hub electric motors at rear axle
Continuous power	35 kW per motor
Total continuous power	70 kW
Peak power	48 kW per motor
Total peak power	96 kW
Continuous torque	500 Nm per motor
Peakdrehmoment	1,050 Nm per motor
Weight	34 kg per motor
Battery	
Type	Lithium-ion battery
Energy capacity	32.1 kWh
Continuous power	95 kW
Gross weight	480 kg
Charging time	4 h
Driving performance / range	
Top speed, Vmax	110 km/h
0-50 km/h	9.2 s
0-100 km / h	14.7 s
Range (NEDC)	approx. 100 km