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### Electromobility:

### All-electric vehicle conversion with Space Drive and joysticks for steering and accelerator/brake - challenges and advantages

*Svenja Gluth's Skoda Enyaq has been in the PARAVAN production halls for vehicle adaptation for a good two months. It is one of the first all-electric vehicles currently being adapted for the disabled using the Space Drive digital driving and steering system. The customer is dependent on a wheelchair and transfers to the car. The active wheelchair with electric assistance, which weighs a good 30 kilograms, is then loaded fully automatically from the driver's seat into the trunk of the vehicle using a wheelchair loading aid.*



Photo:

PARAVAN

"Actually, the conversion is not much different from that of a combustion engine," reports PARAVAN technician Daniel Haberbosch, who specializes in the handicapped-accessible conversion of passenger cars. Especially there, very sophisticated and individual solutions are always in demand. "However, you should always be aware that you are working on an electric car. There it goes above all around clearly more care to ensure the own security as well as with the examination of the electrical devices." To be able to work on a battery-powered vehicle (BEV), you need the expert certificate for working on high-voltage vehicles. All PARAVAN technicians who are entrusted with such work have this. In the meantime, electric vehicles from Mercedes, Peugeot, Tesla, BMW and Volkswagen, among others, have been converted.

The on-board power supply is 12 volts, as in the case of combustion vehicles, and Space Drive is still powered by this supply. Energy consumption is minimal, unlike conventional steering. In addition, there is also the backup battery in case the power supply is disrupted. The only peculiarity is that the electric car does not have a starter motor. To put the Space Drive system into operation, the car sends an appropriate signal to the system via the software in the control unit. In this area, the Space Drive software has been adapted to the special features of the electric drive.

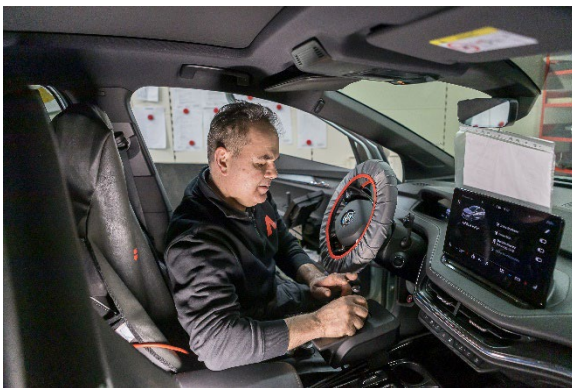
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"There should be no loss of range due to steering," says Daniel Haberbosch. "There is no quiescent current. When the CAN bus, which is responsible for reliable data transmission in the car, is switched off, the PARAVAN system also automatically goes into standby mode." The Space Drive team came to the same conclusion when it participated in the ADAC 24h e-competition at the Hockenheimring in February with a VW ID3. There, one fully electric vehicle with Space Drive and a second with conventional steering were used as a reference.

The Robot 3000 Maximum electric wheelchair loading system is another external current collector installed in the vehicle. The loading aid ensures that Svenja Gluth can not only travel from A to B, but can also be mobile on the road without outside assistance. For the young mother, it is the second adapted car and the first PARAVAN.

Often, retrofitters reach their limits when adapting larger electric vehicles with the payload of 3.5 tons, when a cassette lift, electric wheelchair or a transfer console has to be on board. This could be remedied by a similar regulation, which has already been applied to commercial vehicles in Germany since 2019 (Driver's License Ordinance (FeV) §6): according to this, holders of a B driver's license are entitled to drive vehicles with alternative propulsion, such as electricity or hydrogen, with a permissible gross weight of 4.25 tons. If this regulation were to be applied to mobility for the disabled, customers as well as PARAVAN GmbH and other vehicle converters would be greatly helped. In order to find a sustainable solution, however, the problem would have to be clarified at the European level. Installing a cassette lift is also sometimes difficult because an electric vehicle has less ground clearance and the battery is attached to the underbody.

In Svenja's conversion, payload is not a major consideration. She will be driving with the Space Drive drive-by-wire system. She will steer with her right hand using a joystick, and operate the gas and brake with her left hand, also using a joystick. To ensure that everything runs smoothly during the adaptation, the positions of the input devices were already precisely measured on delivery and the primary functions, such as lights, power windows, horn or sun visor, were selected for voice control. Svenja will soon be coming to Pfronstetten-Aichelau and will then be able to take delivery of her new electric vehicle at PARAVAN.



*Fine-tuning before the adaptation with the customer. PARAVAN technician Daniel Haberbosch checks the Space Drive System and the adjustments to the vehicle once again. Photo: PARAVAN*

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*Before the conversion, the customer comes in for a vehicle fitting. At this appointment, the input devices to be installed are already positioned so that everything fits during the final fitting. Photo: PARAVAN*



*The joystick for the steering is mounted on the center console. The optimum position is identified in advance. Photo: PARAVAN*



*Svenja Gluth uses a wheelchair to get to the car and then moves it independently. The Robot 3000 Maximum then stows the wheelchair in the trunk. Photo: PARAVAN*



*A sophisticated design: from the trunk, the transport arm of the Robot 3000 Maximum moves up to the driver's door to pick up the wheelchair. Photo: PARAVAN*

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### Contact:

Anke Leuschke, Public Relations Officer, Paravan GmbH,  
Tel.: +49 7388/ 99 95 81, e-mail: [anke.leuschke@paravan.de](mailto:anke.leuschke@paravan.de)

### About Paravan GmbH:

Paravan GmbH is the world market leader for highly customized vehicle solutions for the disabled. Around 180 employees develop and produce individually adapted automobile conversions, power wheelchairs. Paravan pursues a holistic approach with the "all-in-one concept". The technological highlight is Space Drive, an intelligent digital control system based on the drive-by-wire principle. Thanks to the active redundancy of the servo motors, it is completely fail-safe and the first in the world to be approved for road use. With the help of this innovation, severely disabled people, some without arms or legs, can drive independently and safely. It is not possible for these drivers to simply intervene in the steering wheel. Worldwide, Space Drive has proven itself on over one billion road kilometers in the last 18 years and is used by numerous industrial customers for test vehicles in the field of autonomous driving. The system is available as a retrofit kit with an open interface for all known vehicle types. [www.paravan.de](http://www.paravan.de)