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e-smartConnect: Volkswagen is conducting research on an automated quick-charging system for the next generation of electric vehicles

- **Automated direct-current charging with robot assistance**
- **Intelligent combination with automated parking (Valet Parking)**
- **High-capacity traction batteries enable a range of 500 km**

Wolfsburg, 13 July 2015 – Volkswagen AG is once again underscoring the leading role it plays in electric and automated drive systems — and is already looking ahead to the next generation of electric vehicles. The improvements Volkswagen has achieved with the energy density and capacity of its traction batteries will enable a range of more than 500 km in the foreseeable future. This will lead to “true electrification” of personal transport with a large volume of vehicles. In order to make charging times for such vehicles as short as possible — and the charging process as efficient and convenient as can be — engineers in Wolfsburg are working on an automated direct-current charging system, a so-called automated e-filling station “e-smartConnect”.

The next generation of electric vehicles will be equipped with higher-capacity batteries. Very high charging capability (from 80 to 150 kW or more) is needed if such energy storage devices are to be charged quickly. This can be achieved with rapid DC charging technology, but this approach also requires the use of thick cables. The weight and stiffness of such cables makes them difficult to handle. The research goal of the e-smartConnect project is therefore to automatically couple a DC connector to the vehicle. When such charging is carried out in conjunction with an automated parking feature, the process takes only a minimal amount of time and is extremely convenient and reliable.

The actual link between the DC connector and the vehicle is created via a low force/moment cable arrangement and the use of the “LBR iiwa” lightweight robot from Kuka. The robot’s seven drive axles and integrated torque sensors ensure a precise, force sensing, and reliable connection.

Automated parking: down to the last centimetre

The automated charging process begins with communication between the vehicle and the charging station. The electric vehicle transmits its profile data to the charging station, which then tells the vehicle’s automated parking system where it should park. In order to achieve the necessary precision (the DC outlet on the vehicle must be positioned within an area measuring 20 x 20 centimetres), the surrounding infrastructure is supported here by the vehicle’s own assistance systems. In addition, a camera mounted on the robot’s gripping

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device calculates the exact position of the socket down to the last millimetre. The robot then removes the DC connector from the charging unit and inserts it into the outlet. After this is done, the robot is automatically transported via a conveyor system to the next electric vehicle that needs recharging.

e-smartConnect ensures safe and reliable human-robot collaboration (HRC)

Once the charging process is complete, the robot receives a command to remove the DC connector. After this is done, the vehicle automatically leaves the charging area, making it available for the next car. This ensures optimal utilisation of charging station capacity.

The system is perfect for public use because e-smartConnect technology also monitors the entire process to ensure there is no danger of any harmful physical contact between the robot and people. Human-robot collaboration is thus made possible without any need for additional safety barriers.

Note: Text and photographs can be downloaded at: www.volkswagen-media-services.com.

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