

# Fascination Volkswagen e-mobility



Volkswagen





# Welcome to the fascination of electric mobility at Volkswagen

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## What is special about the production of electric vehicles at Volkswagen?

All electric vehicles are produced bumper to bumper with the conventionally driven vehicles so we can respond quickly and flexibly when demand changes.

Volkswagen plans to reach figures with the MEB-based electric vehicles that will allow us to consider setting up separate electric vehicle factories.



## Volkswagen turns up the power.

Electric mobility, being the drive system of the future, is on everyone's lips. At CES 2016 in Las Vegas, Volkswagen presented a globally respected electric vehicle study in the style of the legendary Volkswagen bus. Above all, however, they are developing a modular electric drive matrix (MEB) as part of a long-term electric strategy that will provide the basis for a new generation of pure electric vehicles. One of the brand's four new product lines – the e-mobility product line – is responsible for this. With their support, we have put together data and facts about a topic that, alongside digitalisation, defines the debate about the car of the future like no other. You will see: Volkswagen turns up the power.

## Which vehicles currently belong to the Volkswagen brand electrified fleet?



**Pure electric vehicles**  
Electric motor, high-voltage battery:  
e-up!, e-Golf



**Plug-in hybrid**  
Combustion engine, electric motor, high-voltage battery:  
Golf GTE, Passat GTE



**Full hybrid**  
Combustion engine, small electric motor:  
Jetta Hybrid

## What is the sales target of the Volkswagen brand for electric vehicles and hybrids?

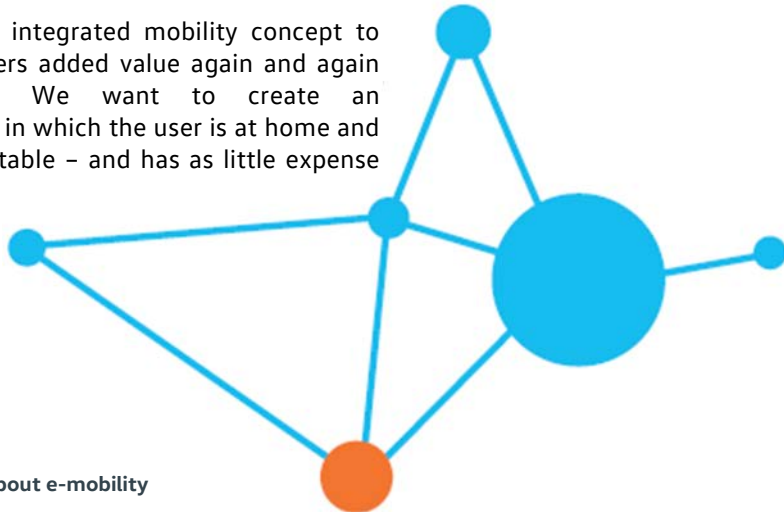
Volkswagen expects strong growth in the market for electric vehicles and will expand the range with 20 new electric models by 2020.



## What needs to be done in the actual cars so that electric mobility becomes interesting for the broad masses?

- An electric car needs to be more than purely a means of transport.
- The electric vehicle needs to develop into a multifaceted comfort zone no matter whether you are on the road or waiting for your children at the football pitch.
- It needs to be stylish, but have enough space at the same time.
- It needs to be fully networked, but always have enough energy whether it is being driven or is parked. A sufficient battery capacity is above all decisive because it is the only power source in an electric vehicle.

We need an integrated mobility concept to give customers added value again and again over years. We want to create an environment in which the user is at home and feels comfortable – and has as little expense as possible.



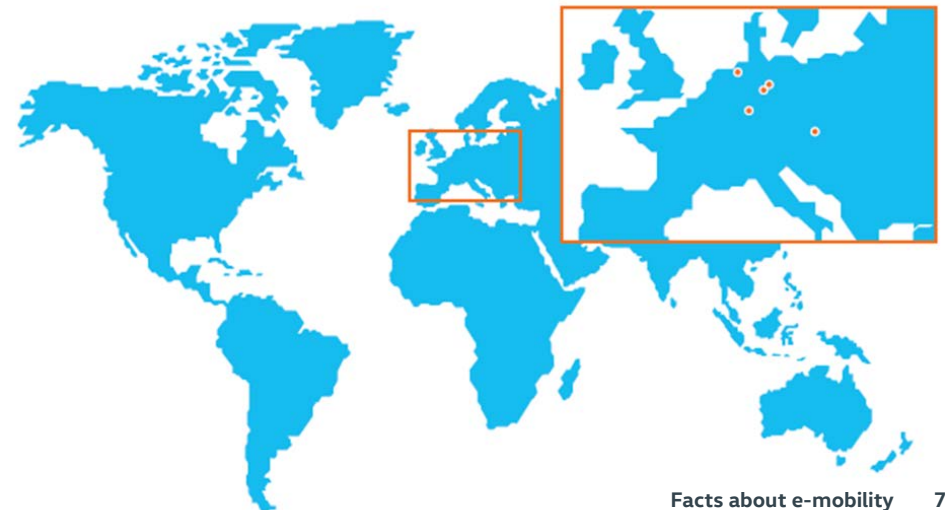
## Which electric and hybrid vehicles is the brand planning to put on the market?

Once Volkswagen has successfully established the Jetta Hybrid and the electric versions of the Golf and the up! as well as the Passat GTE and Golf GTE plug-in models on the US market, we will offer the Magotan GTE and provisionally the Tiguan GTE in China in the next step. Furthermore Volkswagen is currently developing its own platform (MEB) for pure electric vehicles that will allow affordable long-distance mobility.

## At which sites does the brand build electric vehicles? Also, from which sites do the components come?

**e-up!:** Bratislava  
**e-Golf:** Wolfsburg  
**Golf GTE:** Wolfsburg

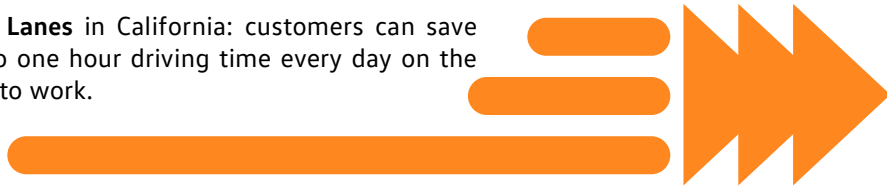
**Passat GTE:** Emden  
**High-voltage battery:** Braunschweig  
**Electric drive motor:** Kassel





## What incentives are exemplary in terms of infrastructure in order to push electric mobility?

**Fast Lanes** in California: customers can save up to one hour driving time every day on the way to work.



**Priority parking** in Lisbon: the most attractive parking spaces in the city are reserved for electric vehicles and are free of charge.

**Use of bus lanes** permitted in Norway: considerable time saving.



The **Charge & Fuel card** from Volkswagen provides customers with simple and standardised access to the charging infrastructure and can be charged for free until the end of 2016. In Norway, all electric vehicle drivers are given access via SMS and, in China, access is via "We Chat" with a QR code.

e-Golf: power consumption in kWh/100 km: 12.7 (combined), CO<sub>2</sub> emissions in g/km: 0 (combined)  
Golf GTE: fuel consumption in l/100 km: 1.7 to 1.5 (combined), power consumption in kWh/100 km: 12.4 to 11.4 (combined), CO<sub>2</sub> emissions in g/km: 39 to 35 (combined), efficiency class: A+  
e-up!: power consumption in kWh/100 km: 11.7 (combined), CO<sub>2</sub> emissions in g/km: 0, efficiency class: A+ \*\*  
Passat GTE: fuel consumption in l/100 km: 1.7 to 1.6 (combined), power consumption in kWh/100 km: 12.8 to 12.2 (combined), CO<sub>2</sub> emissions in g/km: 39 to 37 (combined), efficiency class: A+  
Jetta Hybrid: fuel consumption in l/100 km: 4.4 (urban), 3.9 (extra-urban), 4.1 (combined), CO<sub>2</sub> emissions in g/km: 95 (combined), efficiency class: A+

## What financial incentives are there against the background that, in Germany, there is a subsidy of 4,000 euros for electric vehicle buyers and 3,000 euros for plug-in hybrid buyers?

The **most extensive support for electric vehicles** across the world is in Norway. Import tax, which is around 30 percent, is waived for electric vehicles and plug-in hybrids.

The value added tax of 25 percent is also waived for purely electrically driven vehicles.

This results in a subsidy of around **55 percent** for battery-powered electric cars. In addition there are privileges for electric vehicles like usage of bus lanes and free usage of car parks and ferries.



In **China**, the **purchase incentive** for electric vehicles is obtaining registration plates faster. The number of new registration plates issued in cities like Peking or Shanghai is limited and there are therefore long waiting times. The assignment is also made using lottery systems.

Fast access to a number plate is therefore very valuable. In addition, there are other financial incentives from the state and various cities.



**Subsidy models** that are comparable with the German scheme are already used in **France and the USA**. There are privileges like special lanes also in the USA.

How many electric vehicles has the brand sold across the world so far? Which markets are the top buyers across the world?



## e-mobility at the Wolfsburg factory.

The factory grounds, which are located next to the Mittelland Canal, encompass an area covering more than six square kilometres. The developed hall area covers 1.6 square kilometres. The road network at the factory, which connects the production facilities, warehouses and administration buildings, is 75 kilometres long. Altogether, over 43 million vehicles have been produced at the Wolfsburg plant to date.

### Factory management

Since June 2016, Dr Stefan Loth has been in charge of the entire vehicle production and the Wolfsburg site.

### Production

The Volkswagen models Golf, Golf SV, Golf GTE, e-Golf, Touran and Tiguan are produced on four assembly lines in the world's largest connected car factory. The daily production capacity is 3,800 vehicles.

Component production is an important mainstay of the Wolfsburg factory alongside car production. The components produced here, for example, drive shafts or plastic parts, are partly fitted in Wolfsburg and also sent to other Group sites.

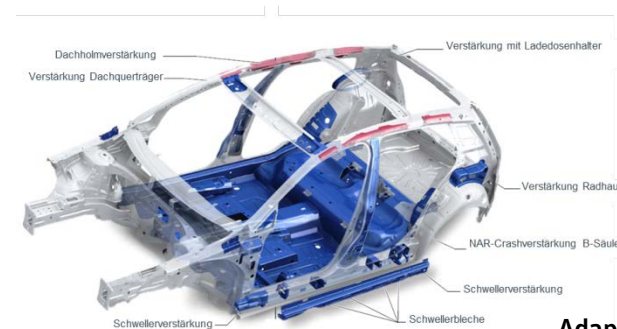
In 2015, Volkswagen's Wolfsburg factory produced more than 815,000 vehicles of which 500,000 were Golfs and Golf SVs. That is the second highest production figure of the past twenty years. The increased volume of electric vehicles also contributed to this figure. In total, around 60,000 electric vehicles have run off the production line at the Wolfsburg factory since 2014, of which e-Golfs and Golf GTEs mixed in with the other Golf models.

## Production of electric vehicles.

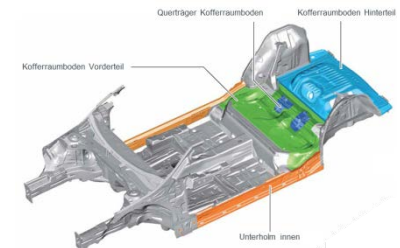
### Bumper to bumper vehicle assembly

The first e-Golf ran off the production line in March 2014 followed by the Golf GTE, the plug-in hybrid, in June. Since then the e-Golf and the Golf GTE have been produced more or less "bumper to bumper" with the other Golf models at the Wolfsburg factory. The mixed production allows us to further increase the production of electric vehicles and ramp it up at short notice.

Thanks to the modular transverse matrix (MQB) architecture, all drives can be fitted in the same model. The accompanying modular production matrix (MPB) allows the electric vehicles to be built in the same cycle and on the same line as vehicles with combustion engines due to the standardisation of joining and assembly sequences.



Adaptations for e-Golf and Golf



Adaptations for the Golf GTE

## Training

### Learning workshop

There are a total of 12 learning workshops at the Wolfsburg site for the different trades and manufacturing areas. Employees learn specific trade skills there under workplace-like conditions. Need-based and practice-oriented qualification helps detect and avoid errors at an early stage. There are learning workshops in the areas Press Shop, Body Construction, Paint Shop, Assembly, Quality Assurance, Logistics, Running Gear, Plastics and vehicle preparation for the Autostadt. Not only are all new colleagues trained in the workshops, but also long-standing employees receive training for new processes and equipment.



The Assembly learning workshop also gives employees the opportunity to qualify for assembly of electrical components in addition to learning basic skills and professional area training.

## Assembly.

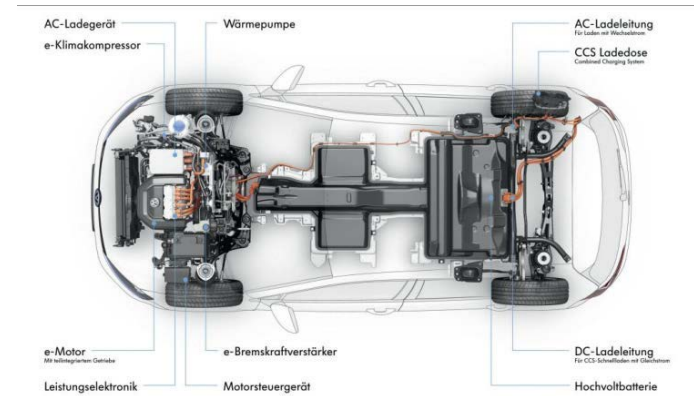
### Vehicle assembly in Golf segment

Around 4,300 employees form the main part of the whole assembly area. The latest generation of the Golf is produced in a wide range of variants by teams on the latest production facilities with a high level of automation. Up to 2,200 vehicles from the Golf family can therefore be produced on two production lines every day.

The production flow is divided into production sections (FA). The vehicles pass through the production sections in minute cycles. At present on assembly line three, every seventh vehicle is an electric vehicle that travels along the line together with other Golf models.



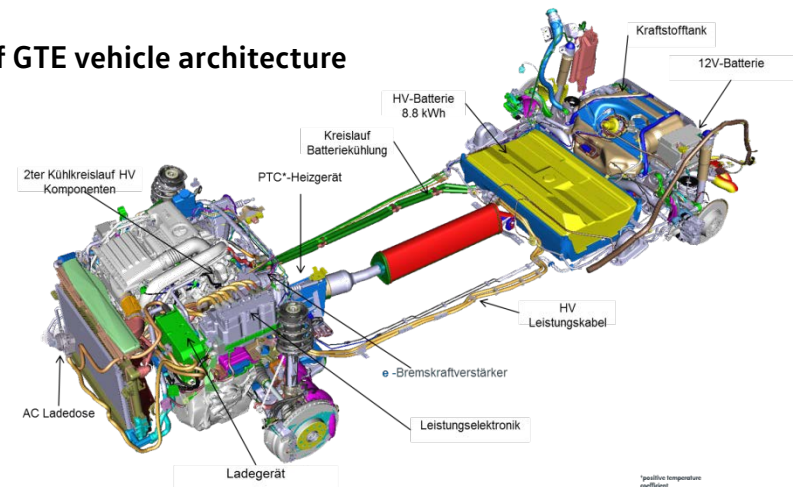
## e-Golf vehicle architecture



The painted vehicle bodies move from the body shelves to the first production section (FA0) – the doors are removed to allow economic assembly. Once the door and rear lid seals have been fitted by the automated system, the cockpit is installed. Next the wiring is laid out before the vehicle continues to the marriage.

The following are fitted behind the body panels: 1,535 metres of wire are used in a conventional Golf alone. 197 connectors and 1,253 contacts ensure trouble-free functioning of the assistance systems. A further 11.96 metres of high-voltage wires are added to this in an e-Golf.

## Golf GTE vehicle architecture





### Final drive gear set assembly

Individual engine components are delivered to the final drive gear set assembly. A fully automated driverless transport system takes all components to the employees on the assembly line. The colleagues bolt together the individual components of the final drive gear set. A mixture of conventional combustion engines and electric motors run along the assembly line. An engine is built ready for installation and transported to the next station via suspended conveyors.

### Marriage

The running gear and final drive gear set become one with the body at this stage. Bolting the running gear, final drive gear set and body together is known as the marriage. Thanks to the modular transverse matrix (MQB) and the modular production matrix (MPB), the systems and facilities have been standardised so that all different derivatives, whether combustion engine models, e-Golfs or Golf GTes, are married on one line.

### Assembly/fitting power electronics

The power electronics are an important component in the electric drive system. They control the flow of energy from the battery to the electric motor and from the electric motor to the battery. They also provide the 12-volt onboard supply voltage via a DC/DC converter.



## e-mobility at the Kassel plant

The Kassel plant is the Volkswagen brand's competence center for electric drives. The components plant is the Volkswagen Group's most important gearbox manufacturer and one of the key component suppliers for the vehicle plants. Apart from manufacturing gearboxes, other sections of the Kassel plant include Europe's largest light alloy foundry, engine reconditioning, forming, exhaust system production and the Group's After-Sales Service Center. More than 125 million gearboxes have left the production facilities since the foundation of the plant. 16,500 employees currently work in Kassel.

### Electric drive production

Thanks to its high level of expertise in the development, planning and series production of electric motors and hybrid transmissions, the Kassel plant makes a significant contribution to the Volkswagen brand's future-oriented projects. Products made in Kassel are fitted in all Volkswagen e-models as well as the Audi A3 e-tron. The plant can currently produce 150 electric motors/day and 300 DQ 400e hybrid drivers/day. Starting in 2018 the plant will also build the very successful DL382 transmission for Audi as well as the DL382e hybrid version.

