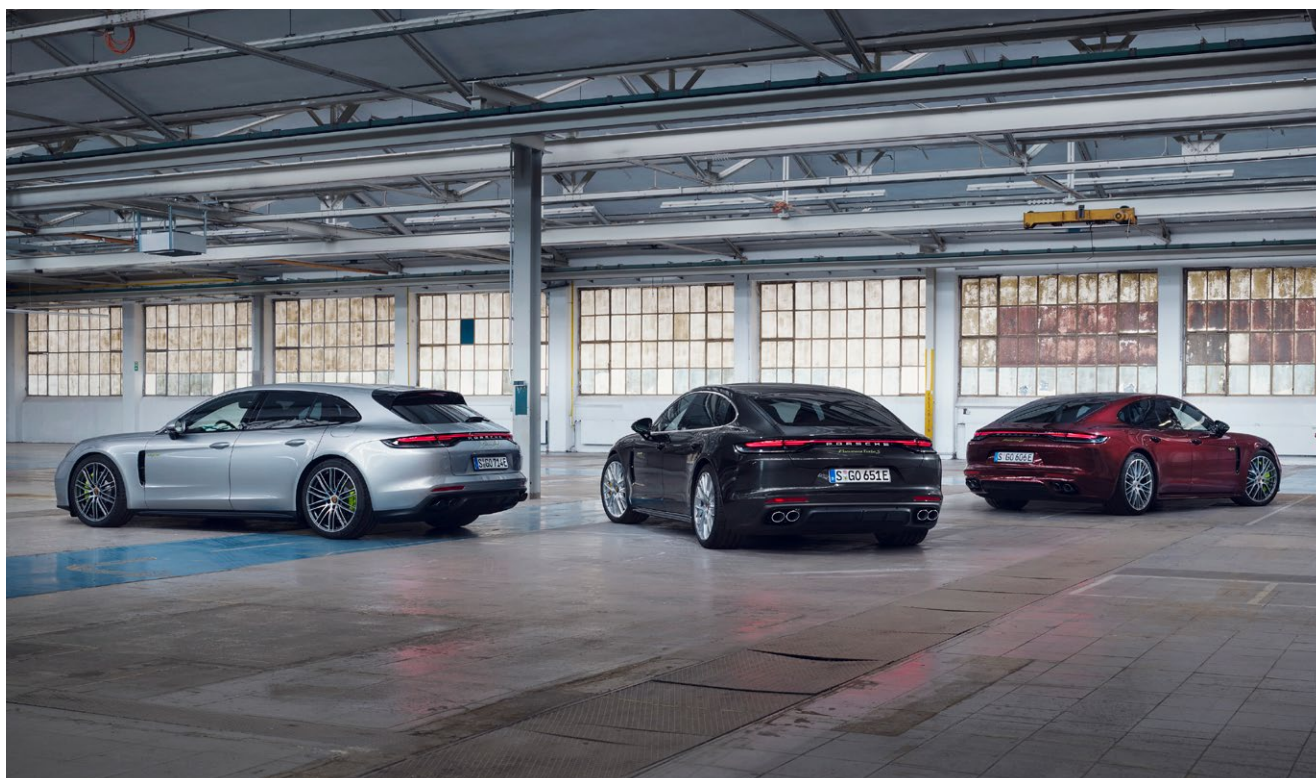




PORSCHE



# The new Panamera hybrid models

Press Kit

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# Contents

## Highlights

**Three new plug-in hybrid Panamera models underpin the Porsche drive strategy** 5

## A trio of drive technologies

**Porsche is systematically focusing on sustainable mobility** 7

## Summary

**Systematic extension of e-performance strategy** 10

## Powertrain and performance

**Efficient hybrid trio with up to 700 PS** 12

## Chassis and chassis systems

**Even sportier, even more comfortable** 16

## Connectivity and infotainment

**Even better connected** 18

## E-fuels: petrol from air, water and green electricity

**Porsche is conducting intensive research into tomorrow's fuel** 23

## Porsche Destination Charging

**Porsche is accelerating the expansion of the charging infrastructure** 26

## Glossary

**The most important technical terms relating to charging** 28

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## Fuel consumption and emissions

**Panamera Turbo S E-Hybrid models:** combined fuel consumption 2.8 – 2.7 l/100 km,  
combined power consumption 22.8 – 21.8 kWh/100 km, combined CO<sub>2</sub> emissions 63 – 62 g/km

**Panamera 4S E-Hybrid models:** combined fuel consumption 2.3 – 2.0 l/100 km,  
combined power consumption 19.5 – 17.4 kWh/100 km, combined CO<sub>2</sub> emissions 53 – 47 g/km

**Panamera 4 E-Hybrid models:** combined fuel consumption 2.3 – 2.1 l/100 km,  
combined power consumption 18.2 – 17.0 kWh/100 km, combined CO<sub>2</sub> emissions 51 – 47 g/km

**Panamera Turbo S E-Hybrid:** combined fuel consumption 2.7 l/100 km,  
combined power consumption 21.8 kWh/100 km, combined CO<sub>2</sub> emissions 62 g/km

**Panamera Turbo S E-Hybrid Executive:** combined fuel consumption 2.8 l/100 km,  
combined power consumption 22.7 kWh/100 km, combined CO<sub>2</sub> emissions 63 g/km

**Panamera Turbo S E-Hybrid Sport Turismo:** combined fuel consumption 2.8 l/100 km,  
combined power consumption 22.8 kWh/100 km, combined CO<sub>2</sub> emissions 63 g/km

**Panamera 4S E-Hybrid:** combined fuel consumption 2.2 – 2.0 l/100 km,  
combined power consumption 18.1 – 17.4 kWh/100 km, combined CO<sub>2</sub> emissions 51 – 47 g/km

**Panamera 4S E-Hybrid Executive:** combined fuel consumption 2.3 – 2.2 l/100 km,  
combined power consumption 19.5 – 17.6 kWh/100 km, combined CO<sub>2</sub> emissions 53 – 50 g/km

**Panamera 4S E-Hybrid Sport Turismo:** combined fuel consumption 2.2 – 2.1 l/100 km,  
combined power consumption 19.3 – 17.4 kWh/100 km, combined CO<sub>2</sub> emissions 52 – 49 g/km

**Panamera 4 E-Hybrid:** combined fuel consumption 2.2 – 2.1 l/100 km,  
combined power consumption 17.5 – 17.0 kWh/100 km, combined CO<sub>2</sub> emissions 49 – 47 g/km

**Panamera 4 E-Hybrid Executive:** combined fuel consumption 2.2 l/100 km,  
combined power consumption 18.0 – 17.4 kWh/100 km, combined CO<sub>2</sub> emissions 51 – 49 g/km

**Panamera 4 E-Hybrid Sport Turismo:** combined fuel consumption 2.3 – 2.2 l/100 km,  
combined power consumption 18.2 – 17.5 kWh/100 km, combined CO<sub>2</sub> emissions 51 – 49 g/km

All information refers to the EU model.

The consumption and CO<sub>2</sub> emission values were calculated according to the new Worldwide Harmonised Light Vehicle Test Procedure (WLTP). The NEDC values derived from this must continue to be specified for the time being. These values cannot be compared with the values calculated on the basis of the previously used NEDC test. Further information on the official fuel consumption and official, specific CO<sub>2</sub> emissions of new passenger cars is available in the publication entitled "Guidelines on fuel consumption, CO<sub>2</sub> emissions and power consumption of new passenger cars", which is available free of charge from all sales outlets and from Deutsche Automobil Treuhand GmbH (DAT).

## Highlights

# Three new plug-in hybrid Panamera models underpin the Porsche drive strategy

## **A trio of drive technologies.**

Porsche is developing future-oriented drive concepts: the sports car manufacturer is playing a pioneering role here with product offensives such as the extended and fundamentally enhanced Panamera hybrid family, rapid expansion of the charging infrastructure and its participation in the development of e-fuels.

## **Efficient trio**

Porsche is offering three different plug-in hybrid models in a product line for the first time: with a system power of 412 kW (560 PS), the 4S E-Hybrid is positioned as a completely new derivative between the 4 E-Hybrid (340 kW/462 PS) and the Turbo S E-Hybrid (515 kW/700 PS).

## **DNA of the 918 Spyder**

The most powerful Panamera model is a plug-in hybrid: the Turbo S E-Hybrid now delivers 515 kW (700 PS) of system power and 870 Nm of torque. Its performance boost strategy has been adopted from the 918 Spyder super sports car.

## **Even further electrically**

The all-electric range of the Panamera hybrid models has been increased by up to 30 per cent thanks to a new 17.9 kWh high-voltage battery (previously 14.1 kWh) and optimised driving modes. The luggage compartment capacity of the Panamera hybrid models is unaffected by this.

## **Enhanced driving experience I**

Its optimised driving modes bring an even greater focus on highly-efficient charging while driving. The battery now charges faster while intelligent energy recuperation allows even more efficient use of the electric drive.

## **Enhanced driving experience II**

All chassis components and control systems have seen further development, benefitting both the driving comfort and cornering stability of the new Panamera models. The balance between sportiness and comfort has been enhanced yet further.

## **E-fuels as a contribution to reducing CO<sub>2</sub> emissions.**

Alongside electromobility, Porsche is also conducting research in the area of e-fuels: With these fuels, pure combustion engines and plug-in hybrids can run almost CO<sub>2</sub>-neutrally. E-fuels are synthetic fluid fuels made from hydrogen and carbon dioxide taken from the air. They are ideally produced with only renewable energy.

## **Further expansion of the charging infrastructure.**

Porsche will invest further in the Porsche Destination Charging network. This part of the charging network will include charging points with three-phase 400-volt alternating current (AC) and 11 kW power output.

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A trio of drive technologies

## **Porsche is systematically focusing on sustainable mobility**

As a pioneer in sustainable mobility, Porsche has taken important steps over the past few years, not least with the successful launch of its electric sports car, the Taycan, and the commencement of production of the new model in the CO<sub>2</sub>-neutral factory in Zuffenhausen. Porsche is remaining true to its pioneering role with product offensives such as the extended and fundamentally enhanced Panamera hybrid family, rapid expansion of the charging infrastructure and its participation in development of e-fuels.

“Half of our new cars will already have an all-electric or partially electric drive in 2025,” says Dr. Michael Steiner, Member of the Executive Board for Development at Porsche AG. “The Porsche strategy is based on a trio of drive systems. In addition to all-electric vehicles such as the Taycan, this also still includes highly emotive combustion-engine cars as well as plug-in hybrids with zero local emissions. We are convinced that these three drive technologies will hold their own in the market over a medium term period.”

The potential of efficient combustion engines has not been fully exploited yet. It is still possible to increase the efficiency of petrol engines. As an accompanying measure alongside the all-electric future, Porsche is also focusing on the use of e-fuels. These synthetic fuels allow for almost CO<sub>2</sub>-neutral operation of petrol engines, as the only CO<sub>2</sub> that is emitted is that which was previously taken from the air in the production of the e-fuel. Steiner: “We are very proud of the fact that 70 per cent of all Porsche cars ever built are still on the road. The majority of these could be driven with reduced CO<sub>2</sub> emissions through the use of e-fuels. In motor sport also, fully synthetic fuels would make a sustainable difference.”

Porsche sees sustainability holistically and is active in ecology as well as social and economic spheres. The goal is to ensure value-adding growth on this basis: Porsche wants to remain profitable while expanding its social responsibility and reducing negative effects on the environment. Sustainability is a central pillar of the company's strategy: the company is taking measures along the entire value-added chain so that operations are more sustainable on all levels of the company's activities.

Detailed information on sustainability management and the company's strategy and on aspects of stakeholder dialogue and KPIs can be found in the current Porsche AG Annual and Sustainability Report and in the Porsche Newsroom.

### **Plug-in hybrids: up to 30 per cent more range**

With the Panamera, Porsche is offering three different plug-in hybrid models in a product line for the first time: with a system power of 412 kW (560 PS), the 4S E-Hybrid is positioned as a completely new derivative between the 4 E-Hybrid (340 kW/462 PS) and the Turbo S E-Hybrid (515 kW/700 PS).

The all-electric range of the Panamera hybrid models has been increased by up to 30 per cent thanks to a new 17.9 kWh high-voltage battery (previously 14.1 kWh) and optimised driving modes.

With the optimised driving modes, there is now an even greater focus on highly-efficient charging while driving. The battery now charges faster. In addition, intelligent energy recuperation allows even more efficient use of the electric drive.

### **E-fuels: petrol from air, water and electricity**

Porsche is conducting intensive research into e-fuels: With these synthetic fuels, pure combustion engines and plug-in hybrids can drive almost CO<sub>2</sub>-neutrally. E-fuels are synthetic fluid fuels made from hydrogen and carbon dioxide taken from the air. Power produced from renewable sources is used for this purpose. The conventional infrastructure can be used for the storage and distribution of these fuels. E-fuels can contribute to the reduction of CO<sub>2</sub> emissions and this is an important element in the sustainability strategy pursued by Porsche.

Porsche is also supporting development of these fuels as part of the research initiative "reFuels – Rethinking Fuels". In this, the Karlsruhe Institute of Technology (KIT) is investigating the efficient production and use of renewable fuels together with the Baden-Württemberg Ministry of Transport, three other state ministries, and numerous partners from the automotive, automotive supply and mineral oil industries.



## **Porsche Destination Charging: further expansion of the charging infrastructure**

Porsche is setting a fast pace: the company will invest further in its Porsche Destination Charging network. This part of the charging network will include charging points with three-phase 400-volt alternating current (AC) and 11 kW power output.

Porsche Destination Charging is one component in the integrated Porsche Charging Service concept. It combines all the important requirements for a charging service in an app: the search for and navigation to charging stations, authentication once there, payment and support.

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## Summary

# Systematic extension of e-performance strategy

Porsche continues to systematically pursue its e-performance strategy. With a system power output of 515 kW (700 PS) and 870 Nm of torque, the new Panamera Turbo S E-Hybrid is the most powerful variant in the completely revamped product line, combining a four-litre V8 biturbo engine with 420 kW (571 PS) and a 100 kW (136 PS) electric motor. Its all-electric range has been increased by up to 30 per cent thanks to a new 17.9 kWh battery and optimised driving modes. This also applies to the new Panamera 4 E-Hybrid, where the electric motor is complemented by a 243 kW (330 PS) 2.9-litre biturbo V6, resulting in a system power of 340 kW (462 PS). Alongside the new Panamera 4S E-Hybrid, which boasts a system power output of 412 kW (560 PS), Porsche is now offering three Panamera plug-in hybrid models for the first time – each in the three available body variants of sports saloon, Executive (long-wheelbase version) and Sport Turismo.

At the heart of the drive architecture underpinning all Panamera hybrid models is the electric motor, which is integrated into the eight-speed dual-clutch transmission (PDK) and produces 100 kW (136 PS) and 400 Nm. Together with each model's combustion engine, this delivers outstanding performance. In combination with its standard Sport Chrono package, and powered by a four-litre V8 biturbo engine that now delivers 420 kW (571 PS) instead of 404 kW (550 PS), the new Panamera Turbo S E-Hybrid now completes the sprint from zero to 100 km/h in 3.2 seconds – 0.2 seconds faster than its predecessor. It reaches a top speed of 315 km/h, which is an improvement of five km/h. The Panamera 4 E-Hybrid takes just 4.4 seconds (-0.2 s) to reach 100 km/h from a standing start on its way to a top speed of up to 280 km/h (+2 km/h).

The gross capacity of the high-voltage battery has been increased from 14.1 to 17.9 kWh using optimised cells, and the driving modes have been adapted for even more efficient energy utilisation. The new Panamera Turbo S E-Hybrid has an all-electric range of up to 50 kilometres according to WLTP EAER City (NEDC: up to 59 km), the Panamera 4 E-Hybrid can be driven with zero local emissions for up to 56 km according to WLTP EAER City (NEDC: up to 64 km), while the 4S E-Hybrid can cover up to 54 km in all-electric mode according to WLTP EAER City (NEDC: up to 64 km). The Porsche plug-in

hybrid models are preferably charged at home – either via a standard domestic outlet or a power socket. A model-specific charging capacity of up to 7.2 kW is possible with the standard Porsche Mobile Charger. Charging is also possible at public charging points using a Mode 3 cable.

The new Panamera plug-in hybrid models benefit from all the enhancements of the latest model update. The 4 E-Hybrid and 4S E-Hybrid are equipped with the previously optional Sport Design front end as standard. This features striking air intake grilles and large side cooling air openings at its sides as well as a single-bar front light layout. The completely newly designed front end of the Panamera Turbo S E-Hybrid is differentiated by its dual C-shaped Turbo front light modules as well as its larger side air intakes. The revamped light bar at the rear now runs seamlessly across the luggage compartment lid with an adapted contour. Options available include darkened Exclusive Design tail light modules with dynamic coming/leaving home animation, three new 20- and 21-inch wheels and two new exterior colours (Cherry Metallic and Truffle Brown Metallic).

The Porsche Communication Management (PCM) now boasts a higher display resolution and includes additional digital functions and services such as improved Voice Pilot online voice control, Risk Radar for road sign and hazard information, wireless Apple® CarPlay and many other Connect services.

The chassis and control systems have been tuned for both sportiness and comfort in all new Panamera models. In some cases, a completely new control strategy has been implemented. A new steering control generation and new tyres ensure improved lateral dynamics and greater precision. The flagship Panamera Turbo S E-Hybrid leaves the factory fitted as standard with all currently available chassis and control systems such as the Porsche Dynamic Chassis Control Sport (PDCC Sport) electric roll stabilisation system, which includes Porsche Torque Vectoring Plus (PTV Plus), rear axle steering with Power Steering Plus as well as the Porsche Ceramic Composite Brake (PCCB) system.

## Powertrain and performance

# Efficient hybrid trio with up to 700 PS

The new Panamera E-Hybrid models continue to use the same powertrain architecture as their predecessors. The heart of this is the electric motor, which has a power output of 100 kW (136 PS) and 400 Nm of torque. In combination with the respective combustion engine fitted to each model and the boost strategy derived from the 918 Spyder super sports car, this results in a unique high-performance driving experience. The electric motor is integrated into the eight-speed dual-clutch transmission (PDK) and all plug-in hybrid models from Porsche are equipped as standard with the Sport Chrono package.

## **Panamera 4S E-Hybrid**

The new Panamera 4S E-Hybrid joins the Porsche hybrid line-up as a completely new model. With a system power output of 412 kW (560 PS) and a maximum torque of 750 Nm, the third E-Hybrid model is positioned between the completely revamped 4 E-Hybrid and Turbo S E-Hybrid derivatives. In the 4S E-Hybrid, the electric motor cooperates with the 324 kW (440 PS) 2.9-litre V6 biturbo engine. In combination with the standard Sport Chrono package, this results in outstanding performance: the standard sprint to 100 km/h is achieved in 3.7 seconds and maximum speed is 298 km/h.

## **Panamera 4 E-Hybrid**

With a system power output of 340 kW (462 PS), the Panamera 4 E-Hybrid is the entry-level model in the hybrid family of this product line. The electric motor works together with a 2.9-litre V6 biturbo engine with an output of 243 kW (330 PS) and performance has been improved compared with its predecessor: the Panamera 4 E-Hybrid accelerates from a standing start to 100 km/h in just 4.4 seconds (-0.2 s); top speed is 280 km/h (+2 km/h).

## Panamera Turbo S E-Hybrid

The most powerful model in the Panamera line-up is still a plug-in hybrid: the system power of the Panamera Turbo S E-Hybrid has been increased from 500 kW (680 PS) previously to 515 kW (700 PS). This is due to the four-litre V8 biturbo engine now delivering 420 kW (571 PS) instead of the previous 404 kW (550 PS). In perfect interaction with the electric motor, this results in a maximum system torque figure of 870 Nm. The car sprints from zero to 100 km/h in 3.2 seconds – 0.2 seconds faster than its predecessor. It reaches a top speed of 315 km/h – an improvement of five km/h.

## Plug-in technology and driving modes

All new Panamera hybrid models benefit from a more powerful high-voltage battery and optimised driving modes. There is now a much greater focus on highly efficient charging while driving and, depending on the selected driving mode, the battery charges faster. At the same time, intelligent energy recuperation allows an even more efficient use of the electric drive.

The electric motor draws its energy from a high-voltage battery installed at the rear of the car. To achieve a long electric range and extend the reserve capacity for electric boosting, the battery's gross capacity has been increased from 14.1 to 17.9 kWh compared with the previous hybrid models thanks to optimised battery cells. This corresponds to an increase of exactly 27 per cent. The installation space for the battery beneath the load compartment floor remains compact, providing spacious luggage capacity from 403 to 1,242 litres in the sports saloon (Sport Turismo: 418 to 1,287 litres). The additional optimisation of its driving modes has made it possible to increase electric range by up to 30 per cent. The new Panamera Turbo S E-Hybrid can be driven with zero local emissions for up to 50 km according to WLTP EAER City (NEDC: up to 59 km), while the 4S E-Hybrid can cover up to 54 km according to WLTP EAER City (EDC: up to 64 km). The new Panamera 4 E-Hybrid is particularly efficient and has an all-electric range of up to 56 km according to WLTP EAER City (NEDC: up to 64 km).

## Optimised modes for electric driving experience

Four driving modes, E-Power, Hybrid Auto, Sport and Sport Plus, are selected using the mode switch that is part of the standard Sport Chrono package. Two additional modes, E-Hold and E-Charge, are activated via the Porsche Communication Management (PCM).

To further enhance the electric driving experience, the modes in which the high-voltage battery is charged during driving have been optimised. The new Panamera hybrid models start in E-Power mode as standard. As usual, the ideal mix of interaction between electric motor and combustion engine is controlled with the accelerator. The Hybrid assistant, which is accessible in the left-hand side of the instrument cluster display, visualises in real time the relationship between the torque currently used and the maximum available. The electric motor's maximum torque is reached when the accelerator pedal is depressed to an angle of approximately 50 per cent. In E-Power mode, the combustion engine is activated only with pedal angles from approximately 60 per cent. The noticeable free pedal travel between 50 and 60 per cent of the accelerator pedal angle ensures optimum electric driving control. If the high-voltage battery falls below the minimum charge level for the E-Power mode, the system automatically switches to the Hybrid Auto mode.

The intelligent Hybrid Auto mode offers the greatest operating efficiency for urban and cross-country driving. For the best possible combination of electric motor and combustion engine, the optimum operating strategy is continuously derived from information relating to driving profile, state of charge, topography, speed and navigation destination. All-electric driving is used in situations where, in terms of overall efficiency, it is the most appropriate option. Hybrid Auto mode also adapts optimally to the driver's habits. When route guidance is activated, the electric drive is used more intensively during urban driving in particular. The high-voltage battery is charged more on sections of road where the combustion engine is active.

In E-Hold mode, the state of charge of the high-voltage battery is maintained at the level recorded when the mode is selected. This means that the battery energy can be used at a later time for electric driving or boosting. In E-Charge mode, the combustion engine charges the battery when driving by generating a higher output than required for the current driving situation. This so-called load point shift provides the driver with the option of predictively increasing the electric range. The E-Charge mode of the new hybrid models follows an adapted charging strategy for the battery. The target charge level of the battery was reduced from the previous 100 to 80 per cent. The reason for this is due to the fact that the car's battery, like the one in a smartphone, charges significantly more slowly and less efficiently from a charge level of around 80 per cent. This also ensures that full recuperation

power is available at all times. Specification of a constant charging power of 7.2 kW means that the battery is charged quickly and in a reproducible way. Overall, E-Charge mode is therefore now more efficient and can be experienced more directly than before.

In both the performance-oriented modes, Sport and Sport Plus, the combustion engine is always in operation. Sport mode offers extremely sporty vehicle characteristics for fast driving on country roads and motorways; in this mode, the drive system and chassis are switched to the Sport setup. The battery is charged to a minimum level to be able to provide a sufficient amount of boost for a sporty driving style. In Sport Plus mode, the focus in all Porsche models is on maximum sportiness: the drive and chassis are adapted for high performance. On the Panamera hybrid models, Sport Plus mode additionally differs from Sport mode due to the fact that the battery is charged as quickly as possible to 80 per cent. This takes place with a constant high charging power of 12 kW.

## Chassis and chassis systems

### **Even sportier, even more comfortable**

Chassis comfort and cornering stability benefit equally from further-enhanced chassis components and control systems in the new Panamera. For example, the revamped Porsche Active Suspension Management (PASM) brings a noticeable improvement in damping comfort. Control of the 48-volt Porsche Dynamic Chassis Control Sport (PDCC Sport) roll stabilisation system now ensures enhanced body stability while grip and traction are also even better. The new generation steering control system, which features software derived from the 911 Carrera and Taycan models, improves steering response and intensifies driver feedback for even greater precision and directness. Consequently, the new Panamera once again sets performance benchmarks within the segment despite also being significantly more comfortable.

### **New tyres and wheel designs**

Since tyres have such a significant influence on a car's handling, great importance is always attached to them in chassis development at Porsche. An improved generation of tyres is fitted to the new Panamera models. The new 20 and 21-inch summer tyres are both more comfortable and sportier, while simultaneously developing less rolling resistance. Sport tyres with a softer rubber compound and optimised tread have been developed especially for the Panamera and are offered for the first time. These tyres improve lateral performance and are particularly suitable for dynamic cornering.

A total of ten wheel designs is now available with the new 20-inch wheel and two new 21-inch wheels. These also include the Exclusive Design 21-inch alloys, which feature bright-polished areas, painted rim bases and wheel hub covers with coloured Porsche crests. The latest generation of multifunction steering wheels is fitted. With their visual cut-outs, they evoke the lightweight steering wheels found in racing cars.



## Optimised electromechanical brake booster

All Panamera models are equipped with generously dimensioned and powerful brakes that are matched to the power that each model develops. The new Panamera Turbo S E-Hybrid is fitted with the track-tested Porsche Ceramic Composite Brake (PCCB) as standard. The brake discs measure 420 millimetres on the front axle and 410 mm at the rear.

The electromechanical brake booster used in the Panamera hybrid models provides a variable combination of electric recuperation braking and mechanical braking – with a constant brake pedal characteristic. The pedal feel has been further optimised for improved feedback and precise control.

## Connectivity and infotainment

### **Even better connected**

The Porsche Communication Management (PCM) system incorporates new digital functions and services such as upgraded Voice Pilot online voice control, Risk Radar, Radio Plus or wireless Apple® CarPlay. The range of Porsche Connect services has also been revamped and extended. In combination with standard online connectivity, the new Panamera underlines its absolute superiority in this vehicle segment.

### **Connect Plus**

The Connect Plus module in the new Panamera extends the infotainment and connectivity system to include the following features:

- LTE communications module with SIM card reader and integrated LTE-compatible SIM card
- Porsche Connect app
- Porsche Car Connect app
- Services packages: Navigation & Infotainment package, Safety, Security & Remote functions
- Data packages
- Concierge service (in China only)

The LTE communication module included in the Connect Plus module with SIM card reader ensures optimum voice quality and data transmission. An LTE-compatible SIM card is integrated in the vehicle in order to use selected Porsche Connect services so the customer no longer requires their own SIM card. Customers can also opt to use their own external SIM card for data transmission with the integrated card reader. If customers use their own SIM card for making telephone calls, it offers optimised sound quality by using the external antenna.

## Apple® CarPlay

Apple® CarPlay enables access to individual functions and apps on the connected iPhone® in the Porsche Communication Management (PCM). In order to use Apple® CarPlay, the iPhone® is connected via the USB port in the smartphone tray or connected wirelessly. The CarPlay menu item can then be selected from the Home screen. Apps can be operated conveniently using the Siri® voice recognition function.

## Smartphone tray with inductive charging function

Smartphones with a charging power of five watts can be charged wirelessly with the inductive charging function in the smartphone tray. All that needs to be done to start charging is to place a smartphone on the dedicated charging area. The inductive charging function uses the Qi standard, which ensures interoperability for wireless energy transfer. This means that smartphones from different manufacturers can be charged, provided they support the inductive charging function.

## Connect services with new functions

The Connect services contained in the Connect Plus module significantly enhance the functional scope of the new Panamera. Thanks to an online connection, up-to-date data is always available for fast route calculation, while swarm-based data enables an exchange of information between vehicles, for instance about current hazards on the selected route.

Further services and functions include the Porsche Connect app, Porsche Car Connect app, Internet radio including automatic changeover between FM, DAB and Internet radio sources, improved voice control and a finder for quickly finding navigation destinations using Car Connect services, remote functions as well as security and emergency services. An online connection is required in order to use Connect services. This can be established with an LTE-compatible SIM card integrated in the car or a SIM card belonging to the customer.

## Always the best reception with Radio Plus

A new feature in the Panamera is the Radio Plus service – a combination of integrated Internet radio and hybrid radio function. Thanks to the integration of Internet radio in the PCM, drivers can now access global online channels of their favourite radio stations. Radio stations can be sorted by popularity, country, genre and language while podcasts can also be streamed using the Internet radio. If the terrestrial signal (FM) or the digital signal (DAB) of a radio station cannot be received due to the environmental conditions, the PCM in the new Panamera can automatically change to the relevant online radio station channel without any manual adjustment necessary thanks to the hybrid radio function. This enables the driver to continue listening to the desired radio station via an online connection. The availability of online radio station information depends on whether the radio station provides this information.

## Voice Pilot with further enhanced voice recognition

With the help of the Voice Pilot already familiar from other model ranges, the voice control of the PCM has been extended to include online support. The recognition accuracy of the natural voice input system has been further improved for the new Panamera so that complex inputs are now also recognised and the desired interaction performed. Communication with the vehicle can take place freely and flexibly without the need for fixed expressions thanks to the intelligent speech comprehension functionality of the Voice Pilot. For example, the air conditioning in the new Panamera can be controlled with voice commands such as 'I'm cold' or 'I'm hot'. The system's online connection always keeps the speech recognition function up to date and ensures natural language interaction with the driver. It also optimises voice output at the same time. The Voice Pilot is used by the online speech recognition, online text-to-speech, dictation as well as speech dialogue functions for apps and services. If no data connection is available, the Voice Pilot uses the PCM (offline) voice control as a back-up.

## Navigation: always on the right road, whether on or offline

Route calculation by the navigation system in the new Panamera models is carried out in parallel both online as well as in the PCM. The driver thus gains the best of both worlds: the online navigation takes into account all traffic information on the entire route and accesses the latest maps. In contrast, the

PCM navigation is always available with or without an online connection. The PCM independently decides which navigation system has calculated the optimum route, but always starts with the result that was calculated fastest. Destinations can also be conveniently created before a journey not just in the PCM but also using the Porsche Connect app or on My Porsche. Destinations are synchronised by identification with the Porsche ID. Real-time traffic data information helps to provide more dynamic route guidance. With this information, the roads in the map view are highlighted in green, yellow or red – depending on the traffic situation. The online connection icon in the status bar informs the driver if real-time traffic data is available. Besides the normal two-dimensional or perspective map presentation, satellite data can also be used to display aerial images of buildings, roads and premises. If available at the location, the system additionally offers a panoramic view in the detail list on the right-hand edge of the PCM once the search has been entered in the finder, so drivers can get an impression of the destination.

With the help of the Personal Routes function, the PCM can learn from frequently driven routes (those driven at least three times) and gives the driver navigation suggestions. This predictive navigation extends the function by providing any additional traffic notifications for the relevant routes. Online updates are used to always keep the map material up to date for navigation. To reduce the data volume required, only relevant changes are downloaded so that existing, up-to-date navigation maps do not need to be loaded again.

By linking vehicles, the new Panamera can make use of shared information that has been provided anonymously by other vehicles – so-called swarm data. Just like with real-time traffic data, information from the road sign recognition function is used for system optimisation. The vehicle also informs the driver about local hazards based on the available data and ensures increased safety.

The finder is the central navigation search function and can be accessed at any time using a search icon at the top of the PCM screen. Search requests can be inputted directly in the navigation menu using the full HD touch display, or alternatively by voice command. If an online connection is available, all information is provided via the Internet so that the data is as up to date as possible. The user can select between the online search of the PCM and a GOOGLE® browser search. Petrol station

and parking space POI information has been extended to include restaurants, charging stations and hotels. Besides detailed information such as opening times and prices, ratings for the POI are also displayed in the PCM.

POI can be searched for either near the current location, along the route, at the destination or at any address. User-friendliness is also improved because the POI are integrated in the navigation menu.

## **Car Connect app**

The Porsche Car Connect app provides access to Car Connect services. These can be used to control selected vehicle functions with the app. Security Services help to protect the vehicle against theft and to find it again if the worst happens. The emergency breakdown call and airbag alarm functions further increase safety.

E-fuels: petrol from air, water and green electricity

## **Porsche is conducting intensive research into tomorrow's fuel**

E-fuels are synthetic, liquid fuels. They are produced from water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>). The electricity needed for their production should be obtained from renewable energies (solar and wind power). Porsche is conducting intensive research into these fuels: e-fuels allow practically carbon-neutral operation of combustion engines because the CO<sub>2</sub> emissions correspond to the amount of CO<sub>2</sub> that was previously taken from the atmosphere for e-fuel production. This is known as a closed cycle.

E-fuels reduce CO<sub>2</sub> emissions immediately because they can replace fossil fuels. Depending on availability, e-fuels can also be initially added to conventional fuel. Other advantages include the possibility of storage and transport using the existing infrastructure. In addition, the potential of green electricity, which is found in abundance in some regions of the world, can be stored in e-fuels and transported over long distances.

In this way, e-fuels can contribute to reducing CO<sub>2</sub> emissions and are an important element in the drive strategy pursued by Porsche: the sports car manufacturer will offer a trio of drive systems in the medium term. Alongside the electric models, this still includes emotive, optimised combustion engines and plug-in hybrids with zero local emissions. E-fuels substantially reduce the CO<sub>2</sub> footprint of combustion engines and plug-in hybrids.

### **Raw materials: water and carbon dioxide**

E-fuels require only the two raw materials, water and carbon dioxide, for their production. The hydrogen that is needed is extracted from water by electrolysis. For this purpose, a direct current is passed through water, whereby hydrogen is split off and collected at the negative pole (cathode). The energy efficiency of this process is around 70 per cent. In order to protect drinking water supplies,

sustainable concepts provide for the construction of production installations close to the sea and the use of desalinated seawater where possible. Two litres of water are required per litre of re-fuel within the process chain.

The carbon dioxide is extracted straight from the air using the Direct Air Capture process. Large fans blow ambient air through filters in which the carbon dioxide contained in the atmosphere is deposited. Depending on the process, the filters are treated with different substances from which the CO<sub>2</sub> is separated during further processing. Such facilities are already in operation, for example in Canada and in Switzerland. The reduction and recovery of CO<sub>2</sub> from the ambient air can become a key technology for climate protection in the future. It is therefore crucial to further industrialise these technologies and make them economically viable.

### **Green electricity in windy and sunny regions for local production of e-fuels**

The economically and ecologically optimum regions for production of electricity from wind and solar energy are located mainly close to the coast where there is plenty of wind or intensive solar radiation. Such regions can be found, for example, in Morocco, the United Arab Emirates (UAE) or South Africa, in Chile in South America or in Australia. It is currently estimated that electricity can be produced there with a three to four times higher degree of utilisation of the power generation plants compared to Central Europe. The transmission of this energy in electric form over long distances to consumers would result in great losses while being expensive. It therefore makes sense to produce e-fuels locally at energy-rich sites with renewable power generation set up specifically for this purpose. For this reason, a wind farm or a solar park is integrated directly in the chemical plant to produce e-fuels. As expensive and complex transport via cables is therefore not necessary, electricity cost benefits that far exceed a factor of four can be achieved. In addition, the advantages of liquid fuels, such as storage and transport capability, can be used to the full. The whole world can thus be supplied with CO<sub>2</sub>-neutral energy sources by pipeline or by ship. The situation is different in Central Europe. Here, electricity produced from wind power or photovoltaic systems can be used more efficiently if it remains as electricity. Distribution via power lines, storage in batteries and use in electric vehicles is much more efficient than via e-fuels. Depending on the geographical distance between energy production and demand, different approaches are therefore possible.



## Via e-methanol to a low-emission fuel suitable for universal use

The manufacturing process of e-fuels starts with the production of e-methanol; from hydrogen and CO<sub>2</sub>. Various processes are used for this, including some that utilise a catalyst. This e-methanol can be used directly in many industrial sectors worldwide as a green substitute for methanol made from fossil crude oil or natural gas. In only one synthesis step, known as the methanol-to-gasoline (MtG) process, e-methanol can be further processed into e-fuel (e-petrol). Through further refinement, this fuel achieves an octane rating comparable to that of super-unleaded petrol and can then be used in all conventional petrol engines.

If e-fuels are produced using only renewable energy, emissions of fossil CO<sub>2</sub> from pure combustion vehicles and plug-in hybrids in operation can be substantially reduced. This is something that applies to the entire vehicle pool. Depending on initial availability, it can be mixed with conventional fuel, and later used in pure e-fuel form. In addition, the existing infrastructure for storage and distribution of fuel can still be used. Manufacturing e-fuels synthetically also makes it possible to develop a fuel with properties that reduce emissions and increase efficiency. For example, e-fuels produce less pollutant and fine dust emissions than petroleum-based fuels as they contain no contamination and therefore result in cleaner combustion. This means that the raw emissions – of particles, for example – from many existing engines can be significantly reduced simply by using e-fuels.

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## Porsche Destination Charging

# **Porsche is accelerating the expansion of the charging infrastructure**

In addition to the development of truly engaging vehicles, a customer-friendly charging infrastructure and intelligent charging solutions are the keys to the success of electromobility. This is why Porsche is setting a fast pace in this area: and investing further in its Porsche Destination Charging infrastructure. This part of the charging network will include charging points with three-phase 400-volt alternating current (AC) and 11 kW power output. There are currently more than 1,800 charging points in over 50 countries, with stations located at selected hotels, airports, museums, shopping malls, sports clubs and marinas. Porsche customers with a plug-in hybrid model or Taycan can charge their car at them for free.

The two chargers, which are available as genuine accessories, now offer more power and thus a shorter charging time when connected to a household or industrial socket: the Porsche Mobile Charger Plus has a charging capacity of up to 11 kW. An on-board AC charger with 22 kW is also available as an option for Taycan customers. With this unit, the battery charges in around half the time it takes the standard 11-kW charger with alternating current. This option will be available from the end of 2020.

## **Support for the home charging solution**

Porsche equips each hybrid model with a charging cable for mobile use as standard. However, most charging operations take place at home. Porsche supports customers with competent advice and safe installation of the different types of charging equipment, and also with the Porsche Home Energy Manager intelligent charging management system.

The manufacturer offers a multi-step check of each individual charging situation. In the Porsche Charging Pre-Check, interested parties can find out at an early stage whether charging at their home is generally possible. In a short online survey, information on the living and parking space situation,

existing power connections and Internet availability is collected. Based on the responses, the potential customer will receive an initial forecast. If an individual consultation is requested, prospective customers can forward their Pre-Check-ID to a Porsche Centre.

The Porsche Centres also make it possible to have a Home Check performed before the vehicle is purchased. An electrician will check the conditions on site and can also install the charging station at a later date. The Porsche Centre receives a report from this home visit in order to be able to provide the customer with the best possible advice on the choice of charging equipment.

### **Porsche Mobile Charger Plus**

The Porsche Mobile Charger Plus, the successor to the Porsche Mobile Charger, is available for connection to a household or industrial socket in order to charge the Porsche hybrid models. This charger is now especially powerful and can charge the vehicle even faster.

### **Home Energy Manager and intelligent charging functions**

The Home Energy Manager can be integrated into the domestic power grid by an electrician and ensures problem-free and convenient charging at home. Its intelligent control centre optimises the charging process in terms of power output, time and costs. It also offers protection against overloading the domestic network (blackout protection) by reducing the charging power of the vehicle as required in the event of an imminent overload – preventing the domestic fuse from being blown.

### **The loyalty programme “&Charge”**

“&Charge” is a digital platform where users receive electric mobility credits for their online purchases. Users are credited with “kilometres” for all purchases, bookings and other transactions handled through the online platform. These can then be redeemed as charging credit for electric vehicles or free journeys with public e-scooters and car sharing services, for example.

With “&Charge”, Porsche Digital has founded its own company in the electromobility sphere and has therefore extended its digital business portfolio. The “&Charge” platform is currently available in Germany, Austria, Belgium and the Netherlands and other countries will follow in the near future.

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## Glossary

# The most important technical terms relating to charging

**AC charging:** Charging using alternating current. Electric cars store direct current (DC) in the battery. Alternating current must therefore be converted into direct current. This is done by the on-board charger in the vehicle.

**Combined Charging System (CCS):** The CCS plug is a combined plug for AC and DC charging. Normal alternating current (AC) flows through the upper, round part, direct current (DC) is transmitted through the two contacts in the lower part and is also used for high-power charging. Porsche uses the Combined Charging System as standard in Europe (CCS2) and the USA (CCS1). For Japan and China, Porsche offers the local standards (IGBT, Chademo).

**DC charging:** Charging using direct current (DC). Here, the current is charged directly into the battery without further conversion, the rectifier is installed in the charging station.

**Home Check:** An electrician checks the possibilities for home charging and produces a no-obligation quotation for installation. Porsche works together with The Mobility House for the Home Check.

**Mode 3 charging cable:** Connecting cable between the electric car and public charging station or wallbox. This permits faster charging at a domestic (Schuko-type) socket than with a Mode 2 charging cable.

**Plug & Charge:** Taycan drivers merely have to plug in the charging cable and charging is underway. Authentication data is saved in the vehicle. As a result, the charging station automatically identifies the connected vehicle. ISO standard 15118 ensures that the communication between infrastructure and the vehicle is tamper-proof. Payments are also processed automatically. Plug & Charge is already operational at Ionity charging stations in Germany, Norway, Denmark, Sweden, Finland, Italy and the Czech Republic. Twelve more European countries will follow at the start of 2021. In the US and Canada, Plug & Charge will also be available from Electrify America and Electrify Canada at many charging points as of the start of 2021.

**Porsche Charging Pre-Check:** First online-based assessment of home charging options. The customer receives a personal Pre-Check ID. This can be shared with a Porsche Centre or an electrician for more in-depth advice, such as with the Home Check.

**Porsche Home Energy Manager:** The intelligent energy management system optimises the home charging process in terms of power output, time and costs.

**Porsche Mobile Charger Plus/Porsche Mobile Charger Connect:** Chargers for charging at household or industrial sockets. Available with a power rating of 9.6 or 11 kW (Porsche Mobile Charger Plus) and 7.2 or 22 kW (Porsche Mobile Charger Connect). The Porsche Mobile Charger Connect can be configured and operated via Wi-Fi and has a five-inch touch display. The two units are supplied with both cables. A basic-version wall holder for installation is also included in the scope of delivery.