The Porsche Mission R

Press Kit

Contents

Fuel consumption and emissions

Taycan models

NEDC: Electricity consumption combined 28.7 – 28.0 kWh/100 km; CO_2 emissions combined 0 g/km

WLTP: Electricity consumption combined 25.4 – 20.4 kWh/100 km; CO_2 emissions combined 0 g/km

The fuel consumption and emission values stated were determined in accordance with the test procedures prescribed by law. All new vehicles offered by Porsche are type-approved in accordance with the WLTP and is the reason why the NEDC values indicated were derived from the WLTP values.

Further information on the official fuel consumption and the official specific CO_2 emissions of new passenger cars can be found in the "Guide to fuel consumption, CO_2 emissions and electricity consumption of new passenger cars", which is available free of charge at all points of sale and from DAT, Hellmuth-Hirth-Straße 1, 73760 Ostfildern.

Highlights

The Porsche Mission R

- **A look into the future of customer motorsports.**

The Porsche Mission R is the vision of an all-electric vehicle for customer motorsports. The development of a brand-linked, all-electric customer racing platform is yet another logical step being taken by Porsche on the way to a sustainable motorsports future. With 30 one-make series worldwide, more than 4,400 911-based Cup cars produced to date and with the Carrera Cup Germany now in its 31st year, Porsche is currently the most successful brand in customer motorsports. Motor racing has traditionally been used by the company as a testing ground, where innovative solutions and technologies have to prove themselves under the toughest conditions before they go into series production.

- **Sustainability as an essential part of corporate strategy.**

Porsche aims to be CO_2 neutral by 2030. By then, the sports car manufacturer plans to offer more than 80 per cent of its vehicles equipped with an electric motor. To achieve this goal, the company will be investing more than one billion euros in decarbonisation in the course of the next ten years. The measures to be taken include the development of high-performance batteries and eFuels with significantly reduced CO_2 emissions. Porsche is currently testing these synthetically produced fuels in motorsports together with ExxonMobil. Why? Because motorsports are also becoming increasingly more sustainable.

- **Future-driven: drive concept with innovative electric motors.**

The Porsche Mission R matches the performance level of the current Porsche 911 GT3 Cup. Power output remains constant throughout the entire duration of the race – a major benefit of using the electric motors with direct oil cooling developed by Porsche. The capacity of the battery, which incorporates high-end cells and also has direct oil cooling, is designed to complete an entire race in the new sprint qualifying format (30 minutes). Thanks to 900-volt technology and fast-charging capability, it is possible to charge the

battery from 5 to 80 per cent SoC (State of Charge) in about 15 minutes during a break from racing.

- **Packed to the gills with signs that hint of a future production model.**

The Mission R is very compact and sits low on the road. The puristic design approach is defined by the sleek cabin, the roof line that slopes sharply to the rear and the pronounced shoulders of the wings. In typical Porsche fashion, the car bonnet slopes downwards between the two sharply curved wings, while the large air intakes on each side, the visible natural fibre front splitter and the flat four-point LED headlights dominate the front end. The look of the rear end is characterised by a large diffuser and a free-standing spoiler – the standard arrangement for racing cars. The typical Porsche light strip is the link to the production cars.

- **Body parts made from renewable raw materials.**

Many of the Mission R's add-on parts are made of natural fibre reinforced plastic (NFRP), the basic material of which is made from flax fibres obtained from farming. In the production of the renewable fibre, 85 percent less CO_2 is generated than is the case when producing carbon fibre. The natural fibre material is visible on the car’s exterior, such as the front splitter, the side skirts and the diffuser, while in the interior, natural fibres are used in virtually all areas. The rear bulkhead and the seat shell, for example, are made of natural fibre reinforced plastic.

- **Innovative cage structure made of carbon fibre composite.**

A new type of cage structure made of carbon fibre reinforced plastic (CFRP) is used to protect the driver. This so-called "exoskeleton" combines high protection potential with low weight and a distinctive look. The protective structure forms the roof section and is visible from the outside. Like a half-timbered construction, it provides a framework around six transparent segments made of polycarbonate. One of them is a removable escape hatch placed directly above the driver.

- **Maximum driver focus.**

Key displays and controls are all placed along the same axis. The information is clustered on three levels: the race display between the steering wheel controls has the highest priority. This is where all the key driving data are displayed. A larger second screen is mounted on the steering column behind it, allowing the driver to see the images from the side-mounted cameras and the central rear-view mirror camera. To the right of the driver is a control panel with an integrated screen. This is where the driver's biometric data are displayed. Other special features: the innovative 3D-printed bodyform full-bucket seat with upholstery produced using 3D knitting technology, cameras integrated in the car's interior to provide a live stream transmission and a new type of helmet holder/dryer combination.

- **Driver module doubles as a racing simulator.**

Genuine motorsports and esports merge in the Mission R. This is due to its monocoque type driver cell that is designed as a self-contained module and can be used in exactly the same form outside the vehicle as a simulator. This allows the racing driver to prepare virtually for his next race in a familiar environment, while the racing drivers of tomorrow can also take part in esports events.

- **Aerodynamics designed to deliver more downforce.**

The Mission R features a further development of Porsche Active Aerodynamics (PAA) with its Drag Reduction System (DRS) on the nose section and spoiler. It comprises three louvres in the air intakes on each side of the nose section as well as an adjustable, two-section spoiler. For maximum downforce, the louvres are closed and the spoiler is deployed to its steepest position. Fitted with smooth-surfaced carbon aeroblades, the light-alloy wheels are also flow-optimised.

The vision of all-electric customer motorsports

All-electric, high-performance and efficient: the Mission R

With the Mission E (2015) and Mission E Cross Turismo (2018), Porsche presented unmistakeable previews of its first all-electric sports car model series to come. Both visually and technologically, the Porsche Taycan sports saloon (2019) and the Taycan Cross Turismo cross-utility vehicle (2021) closely resembled the two concept studies and have since been launched successfully on the world markets – mission accomplished in other words. The next vision has now arrived with the Porsche Mission R: with this study of an all-electric GT racing car, the pioneer of sustainable mobility is revealing what customer motorsports could look like in the future. The show car will celebrate its world premiere at the IAA MOBILITY in Munich (from 7 to 12 September 2021).

"Porsche is the brand for people who fulfil their dreams. This is also true in motorsports. We experience our innovative strength on the race track, demonstrate courage in pursuing new avenues and delight car owners with sporting performance," says Oliver Blume, Chairman of the Executive Board of Porsche AG. "In addition to our involvement in the Formula E World Championship, we are now taking the next big step forward in electric mobility. The concept study is our vision of all-electric customer motorsports. The Mission R embodies everything that makes Porsche strong: performance, design and sustainability.“

Performance: on a par with the Porsche 911 GT3 Cup

The electric all-wheel drive delivering over 800 kW (1,088 PS) in so-called qualifying mode takes the Mission R to a top speed of more than 300 km/h. The power output remains constant, so there is no thermally induced derating – a major benefit of using the electric motors with direct oil cooling developed at Porsche. The electric motor on the front axle develops as much as 320 kW (435 PS) in racing mode, while the motor on the rear axle produces a maximum of 480 kW (653 PS). The all-electric racing car, which weighs in at around 1,500 kilograms, accelerates from zero to 100 km/h in less than 2.5 seconds.

Design: unique "exoskeleton" cage structure and driver cell doubles as a simulator

"Every Porsche has to be clearly recognisable as a Porsche. Many elements that we envisage in studies find their way later into production cars. This also applies to motorsports. Moreover, our customer sports vehicles are always based on production sports cars," explains Michael Mauer, Head of Style Porsche. "What this means in the case of the Mission R is that the car is packed to the gills with signs that hint of a future production model, and that, of course, means: pure racing! “

The Mission R features the typical racing design of the marque and is future driven at the same time. At first glance, the extreme compactness is very apparent: it has a length of 4,326 millimetres and a width of 1,990 millimetres. Typical of racing cars, the electric racer sits very low on the road (height: 1,190 millimetres). The wheelbase: 2,560 millimetres. The narrowly shaped cabin reduces the frontal area of the racing car and contributes to the outstanding e-performance due to the lower air resistance.

The exoskeleton is the name Porsche engineers and designers have given the Mission R's eye-catching carbon cage. The carbon fibre composite cage structure combines high protection potential for the driver with low weight and a distinctive look.

The protective structure forms the roof section and is visible from the outside. Like a half-timbered construction, it provides a framework around six transparent segments made of polycarbonate. This means that racing drivers can now enjoy a new feeling of generous space. There are also some transparent surfaces, including a removable escape hatch for the driver, which is based on the FIA requirements for racing vehicles used in international competitions.

Genuine motorsports and esports merge in the Mission R. This is due to its monocoque type driver cell that is designed as a self-contained module and can be used in exactly the same form outside the vehicle as a simulator. This allows the racing driver to prepare for his next race virtually in a familiar environment. It also means that the racing drivers of tomorrow can also take part in esports events.

The seat, steering wheel, controls, adjustable pedals and screens form a compact unit and lie along the same axis. The full bucket seat offers high protection potential for the driver. It also has an innovative design and is produced in part using additive manufacturing processes as a so-called 3D-printed bodyform full bucket seat. The upholstery is created in a computer-controlled 3D knitting process that minimises fabric waste in production.

Sustainability: innovative natural fibres and highly efficient electric motors

"As a car manufacturer, Porsche aims to achieve a CO_2 neutral balance sheet overall by 2030. This means that a low carbon footprint, closed-loop recycling and sustainability are increasingly becoming the prime focus," explains Michael Steiner, Member of the Executive Board for Research and Development at Porsche AG. "Motorsports of the future will be more electric, more digital and more connected. And it must become more sustainable.“

Many of the Mission R's add-on parts are made of natural fibre reinforced plastic (NFRP), the basic material of which is made from flax fibres obtained from farming. In the production of the renewable fibre, 85 percent less CO_2 is generated than is the case when producing carbon fibre. The natural fibre material is visible on the side skirts and diffuser, and is also used in the interior – such as the seat shell, for example.

With the Mission R, Porsche is presenting a preview of the next generation of electric motors. Back in 2018, a team of Porsche engineers and technicians from Zuffenhausen and Weissach began developing extremely powerful and highly efficient electric motors.

The most important innovation of these permanently excited synchronous machines (PESM) is the direct oil cooling of the stator, which enables very high peak and continuous power output levels to be achieved, in addition to delivering a very high level of efficiency. While in conventional electrical machines the cooling fluid flows through a jacket outside the stator, in the case of direct cooling, the oil flows directly along the copper windings. This allows more heat to be dissipated directly at source. In addition, the slots in the stator

can be made smaller, which leads to greater efficiency in real driving cycles. An innovative stator seal is used to prevent the coolant from entering the rotor chamber.

The capacity of the battery, which also incorporates high-end cells and direct oil cooling, is designed for sprint racing. Thanks to 900-volt technology and fast-charging capability, it is possible to charge the battery from 5 to 80 per cent SoC (State of Charge) in about 15 minutes during a break from racing.

Customer motorsports at Porsche

Innovative racing laboratory and continuing technology transfer

The Mission R is the first step towards an all-electric customer motorsports vehicle. Developing such an all-electric customer motorsports platform owned by Porsche is yet another logical step the company has taken towards a sustainable motorsports future.

Porsche is the most successful brand in customer motorsports. The current figures speak for themselves: 30 one-make cups worldwide with around 500 participants and more than 4,400 911-based Cup cars produced. As a result, the 911 Cup is the world’s top-selling racing car today. The Carrera Cup Germany has been running now for 31 years, and there are currently 13 local support programmes in place for talented young drivers.

At Porsche, however, motorsports not only mean excitement, but also innovative strength and the courage to go one's own way: competing in the Porsche Mobil 1 Supercup with emotionally charged sports cars powered by an internal combustion engine, the sports car manufacturer is currently testing synthetically produced fuels for use in series production (for details, see separate section on sustainability). Beginning in 2023, Porsche will be competing for overall victories in the new LMDh category (so-called hypercars) with hybrids at endurance classics such as Le Mans and Daytona, also using synthetic fuels. And since 2019, Porsche has participated with a works team in the ABB FIA Formula E World Championship.

Technology transfer from motorsports to series production

Competing in motorsports benefits every Porsche driver. This is quite simply because race tracks are important development laboratories for the brand's technologies, such as electric mobility.

There is no other car manufacturer actively participating in an exchange of technology between motorsports and series production vehicles as intensively as Porsche. The company has traditionally used motor racing as a testing ground, where innovative solutions and technologies have to prove themselves under the toughest conditions. Every current Porsche therefore contains more race-proven technology than ever before. Lightweight bodies and driver environments, chassis and powertrains are the direct result of this guiding principle at Porsche.

The long-term and future-oriented focus of this strategy is clearly demonstrated in the development of electric mobility at Porsche. Core components and control algorithms of the electric drive system have been the focus of technology trials on the race track for some time now. In 2010, for example, Porsche competed in the 24-hour race at the Nürburgring with its highly promising 911 GT3 R Hybrid and almost caused a sensation: this GT3 with a six-cylinder engine in the rear and two electric motors driving the front axle was leading the entire field until two hours before the finish. Instead of the battery common in hybrid road cars, an electric flywheel generator supplies the power to the electric motors. Depending on the racing situation, the hybrid drive can be used in a performance or consumption-based mode.

The findings from the 911 GT3 R Hybrid went directly into the development of the 918 Spyder, which went on to create sensations of its own from 2013 onwards. The technological key of the super sports car is the drive concept based on a high-performance combustion engine combined with two electric motors. The operating strategy is one of the core competencies of the 918 Spyder – and indeed of Porsche. In an optimum manner, it takes into account the different requirements of an efficiency-based driving profile on the one hand and maximum performance on the other.

The 919 Hybrid was created with what was learned from the 918 Spyder. The LMP1 race car, which won the 24 Hours of Le Mans three times in a row from 2015 onwards, demonstrated the robustness of the components and the intelligence of the control

strategy. The plug-in hybrid drive system of today's production models has subsequently benefited from all this. The racing engineers are now involved in pioneering work to improve batteries and for the Taycan’s 800-volt network: what works in racing can also hold its own in everyday life.

Sustainability

Battery cells are the combustion chamber of the future

Porsche is taking on responsibility for future generations. As early as 2030, more than 80 per cent of the sports car manufacturer's vehicles are to be offered with an electric motor. Sustainability is firmly anchored in the company's strategy as a basic principle: "As a car manufacturer, Porsche aims to achieve a carbon neutral balance sheet overall by 2030. This means that a low carbon footprint, closed-loop recycling and sustainability are increasingly becoming the prime focus," says Michael Steiner, Member of the Executive Board for Research and Development at Porsche AG.

Over the next ten years, Porsche will invest over one billion euros in decarbonisation through the use of wind turbines, solar energy and other climate protection measures. Investments are also being made in the sustainability of the vehicles themselves, of course: the batteries used in models that are fully or partially powered by electricity as well as eFuels for vehicles with combustion engines play key roles in sustainable mobility:

- The battery cell is the combustion chamber of the future. Even today, high-performance cells for the Taycan are being produced using renewable energy sources. The suppliers have also committed themselves to doing this. In mid-2021, Porsche announced the next step: together with its joint venture partner Customcells, the company is to start production of high-performance battery cells.

- eFuels are synthetic fuels produced using renewable energy from hydrogen and captured carbon dioxide. With the eFuel-based Esso Renewable Racing Fuel, which is to be used during the Porsche Mobil 1 Supercup season in 2022, a

reduction in CO_2 emissions of up to 85 per cent is possible, if it complies with the current fuel standard after the blending required for this purpose.[1]

Powerful lithium-ion batteries with silicon anodes

Porsche is at the forefront of the development of high-performance batteries. The company is investing a high double-digit million euro amount in the new Cellforce Group GmbH. Cellforce's production facility is scheduled to go into operation in 2024 with an initial annual capacity of at least 100 MWh and will produce batteries for around 1,000 motorsport and high-performance vehicles.

The chemistry of the new high-performance cells is based on silicon as the anode material, which makes it possible to significantly increase the energy density compared with current standard batteries. This means that the battery can be more compact with the same energy content. The new chemistry also reduces the internal resistance of the battery, which allows the battery to absorb more energy during recuperation. Fast charging can also be carried out more efficiently. Another special feature of the Cellforce battery cell is that it will be better able to tolerate high temperatures. These are all qualities that are of utmost importance in motorsports.

BASF, the world's leading chemical company, has been acquired as a cell development partner for the next generation of lithium-ion batteries. As part of the collaboration, BASF is to be the exclusive supplier of high-energy HED™ NCM cathode materials for high-performance cells that provide fast charging and high energy density. BASF's production facilities for precursor cathode active materials in Harjavalta, Finland, and for cathode active materials in Schwarzheide, Brandenburg, Germany, will enable BASF to provide

[1] The reduction in greenhouse gas emissions stated here refers to the comparison between the calculated Product Carbon Footprint (PCF) of the renewable components in PMSC racing fuel and a baseline of 94 grams CO_2 e/MJ in accordance with the EU's renewable energy directive. The reduction in emissions of up to 85 per cent through the use of renewable components instead of conventional components is based on PCF calculations in accordance with ISO 14067 (well-to-wheel considerations along the entire value chain of the fuel). The emissions associated with raw materials, production, transport and combustion are taken into account in the production of the blend with renewable components mentioned here. A functional unit of 1 MJ of fuel was applied for the comparison.

battery materials with a low carbon footprint from 2022 onwards that will set standards for the industry to follow.

The production waste from the Cellforce Group's future battery production facility will be recycled at BASF's prototype battery recycling plant in Schwarzheide, thus closing the loop. Lithium, nickel, cobalt and manganese will be recycled in a hydrometallurgical process and re-introduced into BASF's production process for cathode active materials.

Development of eFuels with significantly reduced CO_2 emissions

ExxonMobil and Porsche are testing synthetic fuels in motorsports. During the Porsche Mobil 1 Supercup, all the new 911 GT3 Cup racing cars have been running on a mainly bio-based Esso Renewable Racing Fuel blend prepared by ExxonMobil since the 2021 season started. In the course of the 2022 season, eFuels produced from hydrogen and captured carbon dioxide will then be used. Porsche and ExxonMobil are using the international one-make series to demonstrate the suitability of renewable, synthetic fuels under the toughest racing conditions. In addition, the intention is to use the experience the companies have gained for the joint development of fuels in the future.

The eFuels will be sourced from the Haru Oni pilot plant in Chile, where green hydrogen is generated using wind power and water, which is then combined with captured carbon dioxide to produce methanol. ExxonMobil is providing the license for the technology, which will enable the methanol to be converted into synthetic petroleum in the next step in the process, the so-called methanol-to-gasoline synthesis. In the pilot phase, over 130,000 litres of eFuels are to be produced per year from 2022 onwards. As the main customer for this fuel, Porsche will use the eFuels from Chile not only in the Porsche Mobil 1 Supercup in the 2022 season, but also in its Porsche Experience Centres, for example.

The exterior

Visionary outlook with Porsche DNA

"Every Porsche has to be clearly recognisable as a Porsche. Many elements that we envisage in studies find their way later into production cars. This also applies to motorsports. Moreover, our customer sports vehicles are always based on production sports cars," explains Michael Mauer, Head of Style Porsche. "What this means in the case of the Mission R is that the car is packed to the gills with signs that hint of a future production model, and that, of course, means: pure racing!“

At first glance, the extreme compactness is very apparent: it has a length of 4,326 millimetres and a width of 1,990 millimetres. Typical of racing cars, the electric racer sits very low on the road (height: 1,190 millimetres). The wheelbase: 2,560 millimetres. The narrowly shaped cabin reduces the frontal area of the racing car and contributes to the outstanding e-performance due to the lower air resistance. Cameras are mounted on the edge of the roof as a digital replacement for conventional wing mirrors.

The colour concept is dominated by Porsche's standard Carrara White Metallic satin finish. By contrast, the front bonnet and front wings are painted in a high-gloss bright metallic red. This new shade extends into the doors, where it ends with a dynamic sweep. The spoilers are in black to provide a sharper contrast.

Dynamic proportions

Due to the transparent surfaces of the exoskeleton roof (see body and chassis section), the silhouette of the Mission R appears even flatter than it actually is. The puristic design approach is defined by the sleek cabin (the greenhouse), the roofline that slopes sharply downward to the rear (the flyline) and the pronounced shoulders of the wings. Much like the Porsche Cayman, the window graphics (daylight opening) end at the C-pillar with a counter-sweep.

The A-pillars are in black and visually blend the side window surfaces into a single unit, reminiscent of a helmet's visor. Another characteristic Porsche feature is the curved windscreen, which extends slightly around the corners. Form follows function – the driver benefits from better all-round visibility as a result.

Below the waistline, things get technical and functional: the sills are recessed, which makes the aero underbody even more effective. As is the case with the front splitter and the large diffuser at the rear, the underbody panels are not painted so that the natural fibres are visible.

The Mission R runs on 18-inch Cup wheels featuring a five twin spoke design with central locking. With polished carbon aeroblades in high-gloss black, they are also flow-optimised.

There are panels located in front of and behind the wheel arches. If they become damaged as a result of contact with other vehicles during the race, they can be replaced quickly. Yellow arrows indicate where their quick-release fasteners are located. Other functional parts that must be quickly accessed are identified with yellow arrows, too: they include levers, pins and panels, for example, and the compress air connections for the lifting system located in the C-pillars.

The roof module is reminiscent of the profile of a submarine: among other things, it incorporates a pitot tube to measure speed and an LED display to indicate the operating status of the high-voltage system.

Striking look with light emblem in the style of the electric Porsche

In typical Porsche style, the front bonnet slopes down between the two sharply curved wings. The large side air intakes, each with three louvres, the front splitter with its visible natural fibre mix and the flat LED headlights dominate the nose. The four-point light emblem is based on the design of the headlights on the Taycan electric sports car. Two towing lugs as vertically aligned components link up the front splitter and bumper visually. As functional parts, they are also painted yellow.

Wide rear with light strip

The rear view is dominated by the two aerodynamic components – the diffuser and the two-section spoiler, which is made of carbon. The designers have integrated the brake and rain lights into the profile of its wing plates. This makes them easily seen by following drivers, even in spray.

At the rear, there is the typical Porsche light strip. It consists specifically of a large number of illuminated vertical elements to the right and left of the lettering, which also illuminated.

The towing lugs at the rear are highlighted in colour, which is usual practice for racing cars. What makes them special is that they have been seamlessly integrated into the supporting structure of the vehicle.

The charging connection for the battery is located in the middle of the rear window behind a flap.

The interior

Driver module doubles as race simulator

Genuine racing and esports merge in the Mission R. This is due to its monocoque type driver cell that is designed as a self-contained module and can be used in exactly the same form outside the vehicle as a simulator. This allows the racing driver to prepare virtually for his next race in a familiar environment. And the racing drivers of tomorrow can also take part in esports events.

The interaction possibilities offered by the Mission R are also aimed at a young and enthusiastic motorsports community: it is pre-equipped to provide a livestream broadcast from inside the car, and the driver can connect with his fans at the touch of a button. They in turn can communicate directly with him by sending him likes, for example.

Particularly realistic race training on the simulator

The seat, steering wheel, controls, adjustable pedals and screens form a compact unit in the Mission R and lie on the same axis, i.e. the driver's axis. This allows the driver to concentrate on essentials during the race.

At the same time, this driver module design enables a second driver's cell to be used outside the Mission R as a racing simulator. With the aid of movable, electrically controlled supports, the dynamic forces that impact on the driver can be simulated – when braking, for example, or as a result of rolling motions during fast cornering. Due to the familiar surroundings with identical display and control elements and the same full bucket seat, this kind of training would be extremely realistic and highly effective.

Additively manufactured, ventilated full bucket seat

The full bucket seat offers high protection potential for the driver. At the same time, it has an innovative design and is produced in part using additive manufacturing processes as a so-called 3D-printed bodyform full bucket seat. The seat shell is made of the same natural fibre-reinforced material as the add-on parts in the exterior. The centre section of the seat, i.e. the cushion and backrest, is partly produced by a 3D printer.

Porsche initially showed this alternative to the conventional upholstery used for bucket seats as a concept study in 2020 and conducted tests with selected customers during a test phase. As part of the new Performance Parts range, the 3D-printed bodyform full bucket seat is now available from Porsche Tequipment for all 911 and 718 models for which the current full bucket seat (order number Q1K) is offered. Beginning in February 2022, it will also be possible to order the seat ex works and it will then be integrated into the Porsche Car Configurator.

In the Mission R, the driver's seat is actively ventilated and upholstered in breathable fabric that is made using a resource-saving 3D knitting process. The 3D-printed lattice structure also contributes to a good seat climate. These black, coarse-meshed elements are located in the area between the cushion and the backrest, for example.

Driver-focused, staggered arrangement of displays based on importance

Maximum driver focus is the credo of the Mission R. The key displays and controls are located along the same axis. This reduces distraction and helps the driver to improve his performance by speeding up his reaction time. The information is hierarchically clustered into three levels:

- Top priority is given to the 6-inch multifunction OLED racing display. It sits directly between the steering wheel controls and is thus placed in the driver's immediate field of vision. This is where key data such as speed, lap time, tyre pressures or State of Charge (SoC) are displayed. Information on ABS and traction control is also included.

- A second screen is mounted on the steering column behind it. Its curved shape is reminiscent of the Taycan's large central display. This is where the images from the two exterior cameras are combined into a single image. Through this digital rear-view mirror, the driver can see what is happening on both sides and behind his racing car. A third, centrally positioned, rear-facing camera is mounted below the rear window. If radar sensors and cameras detect an imminent collision during the race, the Collision Avoidance System (CAS) alerts the driver to the danger by means of coloured markings on the edges of the race display.
- To the right of the driver and inclined towards him is a control panel with buttons and an integrated screen. It represents the third information level. This is where the driver's biometric data are displayed. This includes his body temperature, for example, which is detected by sensors in the seat.

Livestream broadcast from inside the car

Two cameras mounted on the roof frame and on a rail above the passenger seat show what is happening inside the car during a race in real time. The live images can be transmitted directly to the community using a livestream button in the control panel.

The fans can also communicate directly with the driver by sending him likes, for example.

Integrated helmet ventilation and disinfection

It goes with saying that motorsports equipment, such as a six-point safety harness, longitudinally adjustable pedals, safety nets and an extinguisher system, are also on board. A new feature is the combination of helmet holder and dryer. In the Mission R, the helmet can be placed on a specially designed holder, which is positioned where the passenger headrest would be in a standard vehicle. During a break from racing, the helmet is first disinfected and then dried.

Porsche has once again come up with something special for the interior ventilation system: fresh air now enters the cockpit directly via an adjustable inlet in the windscreen. This is a

very effective and sustainable solution, therefore, compared with conventional designs with centrifugal fans and long air ducts routed from the front of the vehicle into the interior.

For taxi races, a second seat can be mounted on the passenger side. The control units, including cooler, which are combined into one electronic module, are located in the footwell. The driver's water bottle is also integrated into the seating arrangement.

The expansion tanks for battery coolant, brake fluid and dampers are all neatly arranged beneath the rear window.

The drive

Innovative e-motors, high-end battery and 900 volts

"It's indescribable, the immediate surge of power from the two electric motors is something you simply have to experience for yourself," says Timo Bernhard, discussing the drive system of the Mission R. The Porsche brand ambassador and former works driver knows the technical basis behind the concept study and has already been on the race track with the technology platform as a test driver. "The only time I've ever experienced such an amazingly powerful boost was in the Le Mans-winning Porsche 919 Hybrid car.“

The Mission R is on a par with the performance level of the Porsche 911 GT3 Cup. The power output remains constant over the duration of the race, so there is no thermally induced derating – a major advantage of the electric motors with direct oil cooling developed by Porsche. The electric motor on the front axle produces up to 320 kW (435 PS) in race mode.

In qualifying mode, the all-wheel-drive car has a peak system output of over 800 kW (1,088 PS). The continuous system power in race mode is 500 kW (680 PS). Top speed is over 300 km/h. The lightweight electric racing car, which tips the scales at around 1,500 kilograms, accelerates from zero to 100 km/h in less than 2.5 seconds.

The capacity of the battery, which also incorporates high-end cells and direct oil cooling, is designed for sprint racing. Thanks to 900-volt technology and fast-charging capability, it is possible to charge the battery from 5 to 80 per cent SoC (State of Charge) in about 15 minutes during a break from racing. Another highlight is the very high recuperation output of up to 800 kW.

The power output from the two electric motors is transmitted to the front and rear wheels via straight-toothed input gearboxes and mechanical differential locks. The modular design of the drive system also helps to improve cost efficiency in customer motorsports: the

gearbox, electric motors and pulse-controlled inverters (PCI) on the front and rear axles are identical.

The Mission R is pre-equipped for over-the-air technology. It is conceivable, therefore, that, in the event of problems occurring during the race, Porsche Motorsport experts from Weissach would be able to access data from the customer cars via a remote interface and thus help with troubleshooting.

Highly efficient e-motors with direct oil cooling

In the Mission R, Porsche is offering a preview of the next generation of electric motors. In 2018, a team of Porsche engineers and technicians in Zuffenhausen and Weissach began to develop extremely powerful and highly efficient electric motors.

The most important innovation of these permanently excited synchronous machines (PESM) is the direct oil cooling of the stator, which enables very high peak and continuous power output levels to be achieved, in addition to delivering a very high level of efficiency. While in conventional electrical machines the cooling fluid flows through a jacket outside the stator, in the case of direct cooling, the oil flows directly along the copper windings. This allows more heat to be dissipated directly at source. In addition, the slots in the stator can be made smaller, which leads to greater efficiency in real driving cycles. An innovative stator seal is used to prevent the coolant from entering the rotor chamber.

As with the Taycan's electric motors, the so-called hairpin winding contributes to a high yield of power and torque while maintaining compact dimensions. The coils consist of rectangular wires that are bent and then inserted into the stator's laminated core. Their shape is reminiscent of hairpins, hence the name "hairpins". The open ends are welded together by laser beam.

An optimisation algorithm was used to determine the optimum shape and position of the magnets in the rotor. The resulting geometry eliminates an old conflict of objectives: it combines excellent electromagnetic properties with high mechanical strength at very high

speeds. During production, the magnets are inserted into the rotor laminations and extrusion-coated with plastic. As a result, they do not move, despite high centrifugal forces, and the balancing quality of the rotor remains stable. At the same time, the plastic helps to dissipate the heat generated in the magnets.

High-end battery and 900-volt technology

The battery sits behind the driver in an e-core layout. Its total capacity is 82 kWh. This means it is designed for a sprint race format distance of 25 to 40 minutes. High-end cells are used to benefit from the high power density. Here again, direct oil cooling offers tremendous thermal advantages – because it makes use of the entire surface of the cells, a large amount of heat can be transported from the battery into the cooling system.

Based on the 800-volt technology of the three-time Le Mans winner, the 919 Hybrid, the Porsche Taycan was the first production car to enter competition using this system voltage instead of the 400 volts normally used in electric cars. In the Mission R, Porsche is raising the bar a notch higher again with a voltage rating of over 900 volts. Using 900-volt technology will result in further improvements in continuous power, weight and charging time.

At DC fast charging stations, the Mission R can be charged from 5 to 80 percent SoC (State of Charge) within approximately 15 minutes. The maximum charging capacity is 350 kW. The charge port is located beneath the middle of the spoiler.

Special high-voltage alert system for the pit crew

As a matter of principle, the high-voltage safety concept of the Mission R meets the same high standards of safety as those required for the series production vehicles. This means that, in the event of a collision, the battery connections to the vehicle and the high-voltage consumers are automatically disconnected to ensure no voltage is present.

There is also an alert system designed specifically for the pit crew: special LEDs behind the windscreen and on the roof provide fast and detailed information on the operating

status of the high-voltage system. If the LEDs light up green, the Mission R is high-voltage safe. If the LEDs are red, on the other hand, only high-voltage trained personnel should approach the vehicle. There is also a light in the roof module behind the pitot tube for measuring speed, which is included in this colour coded warning system.

The body and chassis

With natural fibre components and carbon cage

Many of the Mission R's add-on parts are made of natural fibre reinforced plastic (NFRP), the basic material of which is made from flax fibres obtained from farming. In the production of the renewable fibre, 85 percent less CO_2 is generated than is the case when producing carbon fibre. The natural fibre material is visible on the car's exterior, such as the front splitter, the side skirts and the diffuser.

The electric racing car also has a new roll-over protection concept: instead of a conventional steel cell welded to the bodyshell, in this case a cage structure made of carbon fibre reinforced plastic (CFRP) protects the driver. The carbon cage is integrated directly into the roof and is visible from the outside through the use of transparent segments. This means that racing drivers can now enjoy a new feeling of generous space.

Sustainable natural fibre-reinforced plastic

On the exterior, the Mission R's doors, front and rear wings, sills/side panels and centre section in the rear are made of natural fibre reinforced plastic (NFRP). The sustainable materials are based on flax fibres obtained from farming – without coming into conflict with the cultivation of food crops. The natural fibres are roughly as light as carbon fibres and deliver the stiffness required for semi-structural components with a low additional weight of less than ten percent. Compared with conventional plastics, natural fibres have an ecological benefit: 85 percent less CO_2 is generated in the production of these fibres than in the comparable process used for carbon fibres.

A collaboration between Porsche, the Federal Ministry of Food and Agriculture (BMEL), the Fraunhofer WKI and Swiss-based Bcomp began back in 2016, the aim being to make biofibre composite material suitable for automotive use. At the beginning of 2019, the Porsche 718 Cayman GT4 Clubsport was the first series produced racing car to feature biofibre composite body panels.

Innovative cage structure made of carbon fibre composite material

The exoskeleton is the name Porsche engineers and designers have given to the Mission R's eye-catching carbon cage. The carbon fibre composite cage structure combines high protection potential for the driver with low weight and a distinctive look.

The protective structure forms the roof section and is visible from the outside. Like a half-timbered construction, it provides a framework around six transparent segments made of polycarbonate. This means that racing drivers can now enjoy a new feeling of generous space. There are also some transparent surfaces, including a removable escape hatch for the driver, which is based on the FIA requirements for racing vehicles used in international competitions.

The roof solution with the exoskeleton is a modern interpretation of the Porsche Targa, in which the solid roll bar is also combined with a removable roof section.

Aerodynamics designed for maximum downforce

With its advanced Porsche Active Aerodynamics (PAA), the Mission R can adapt its aerodynamic characteristics optimally to the driving situation on the race track. Its DRS (Drag Reduction System) comprises three louvres in the air intakes on each side of the nose section as well as an adjustable, two-section spoiler. For maximum downforce, the louvres are closed and the spoiler is deployed to its steepest position.

To deflect as much air as possible in a race, the wheel arches are vented via openings at the top of each front panel. Furthermore, the front wheels are almost completely free in the rear area.

Magnesium wheels with aeroblades and tyres

The Mission R rolls on 18-inch magnesium Cup wheels with central locking. With smooth-surfaced carbon aeroblades, the alloy wheels are also flow-optimised. Their five twin spokes are also milled, which saves weight.

Michelin, long-standing tyre partner of Porsche, has developed new slicks exclusively for the Mission R with a 30/68 (front) and 31/71 (rear) tyre format. They consist of bio-based and renewable materials, which means it is a key component with regard to the overall sustainable concept of the Mission R. The tyres also have a high resistance to wear and are protected against damage caused by deposits on the race track.

The collaboration with Michelin also included networking with the vehicle: the tyres can be fitted with sensors that communicate with the on-board electronics during a race in real time and provide the driver with information relating to tyre wear. Based on this data, a time for the next pit stop will be suggested to the driver.

Michelin produces its tyres entirely from renewable raw materials. In line with the French company's holistic sustainability strategy, all Michelin tyres are manufactured in CO_2-neutral plants and transported using a CO_2-optimised logistics chain. At the end of their life cycle, the used tyres are recycled into new tyres.

Brake-by-wire braking and power steering

With a double wishbone axle at the front and McPherson struts at the rear, the Mission R has independent suspension all round. Ball joints on all control arms ensure the chassis is connected to the suspension system with no play. Steel subframes also contribute to high-performance driving dynamics.

In the brake-by-wire braking system, a control unit models the interaction between the hydraulic and electric brakes, which is known as brake blending. Due to the high recuperation output of up to 800 kW, the conventional brake is subjected to a significantly lower load and could thus be made smaller. The diameter of the brake discs is now 380 and 355 millimetres at the front and rear, respectively. On the front axle, the pads are forced against the disc with six pistons, while four-piston callipers are fitted at the rear.

The car is started with a battery status of 85 percent (SoC). Recuperation is possible therefore in almost every driving situation. This means that, depending on the race track, more than 50 percent of the energy can be recovered and is available for use.

The steering is also electrified. With Electric Power Steering (EPS), a torque sensor receives the driver's intended directional change as a signal. On this basis, the control unit calculates the optimum steering assistance required. This information is passed on to an electric motor, which then provides the amount of power needed to complete the change in direction.

The integrated air jack system facilitates quick tire changes or repairs. The compressed air connections are located in the C-pillars.