

Putting the new Macan through its paces in the name of performance and efficiency

11/01/2024 Porsche is putting the prototype of the all-electric Macan through an exacting and gruelling test programme to prepare the follow-up to the successful SUV for its upcoming world premiere. The vehicle is a completely new development. Porsche's engineers have spared no expense during its development and testing.

Ten years after its launch, the Macan is on the cusp of a second model generation, now in all-electric form. As the first Porsche model built on the new Premium Platform Electric (PPE), the SUV is a completely new development. The test process to ensure the perfect coordination of all components and systems is accordingly meticulous. Porsche places great importance on real-world testing with camouflaged prototypes. At the same time, simulations in both the virtual world and wind tunnel are increasingly precise and play an ever-greater role. This is particularly true when it comes to making a new Porsche not only sportier, but also more efficient.

Cd value of 0.25 – designers and aerodynamics engineers in lockstep

“When we develop a new model, it's always about the driving dynamics and precision. That's Porsche. It's in our DNA. But it's always about efficiency too. And design,” says Jörg Kerner, Vice President Product Line Macan. One challenge was to maintain the product identity of the successful Macan model series while at the same time meeting the aerodynamic requirements needed to ensure high efficiency and therefore also a high range. It was accordingly important to ensure close cooperation between the leaders of the two teams during the development stages in the Design department and the aerodynamic testing in Porsche's state-of-the-art wind tunnel. “Finding the optimal connection between our design principles and the specifications given to us by the aerodynamics engineers is certainly a challenge,” says Peter Varga, Director Exterior Design at Style Porsche. “We're working together on every millimetre to achieve the optimal balance between aesthetics and function.”

Through this teamwork, Porsche succeeded in combining its design DNA with range-optimised aerodynamics. This was achieved not only through a striking silhouette but also through the components of Porsche Active Aerodynamics (PAA) and other targeted measures. “The active aerodynamic elements all significantly contribute to range,” says Thomas Wiegand, Director Aerodynamics and Aeroacoustics. “We have an automatically extending rear spoiler and active cooling flaps on the front air intakes.”

There are also variable elements on the underbody. The vehicle floor is flat and closed like that of a racing car, even in the rear axle area. The fairings there are flexible and also ensure low air resistance when rebounding – an innovative solution in combination with the streamlined, largely closed wheels and the aerodynamically optimised tyre contours. During normal cruising on a country road, the Macan automatically assumes its ideal streamline. The rear spoiler moves into the eco position, the air flaps close and the chassis level lowers. In this situation, Wiegand and his team measured a drag coefficient of 0.25 (previously 0.35). All of which makes the new Macan one of the most aerodynamic SUVs – with a major impact on efficiency. The ranges according to WLTP will be more than 500 km for all variants.

Fast charging with up to 270 kW – for all markets

The electric motors in the new Macan draw their energy from a lithium-ion battery in the underbody, with a gross capacity of 100 kWh, of which up to 95 kWh can be actively used. The 800-volt architecture of the PPE in the new Macan enables high-performance fast charging, which is being tested worldwide as part of the development process.

“There are different charging standards in our main markets. A major focus of the testing has therefore been on checking these different framework conditions in the different locations with our prototypes and adapting the technology accordingly where necessary. Charging simply has to work, wherever and

whenever," says Kerner. The DC charging capacity for the new Macan at 800-volt charging stations is up to 270 kW. The charge level can be increased from 10 to 80 per cent in less than 22 minutes at 400-volt charging stations, a high-voltage switch in the battery enables bank charging by effectively splitting the 800-volt battery into two batteries, each with a rated voltage of 400 volts. This enables particularly efficient charging, without an additional HV booster, at up to 150 kW. AC charging is possible with up to 11 kW.

Driving dynamics testing under extreme conditions

Porsche developed the new Macan with a keen focus on the driving dynamics typical of the brand, and a familiar steering feel. These core competencies of the sports car manufacturer are a particular focus during testing. Through the various test stages, the objective is to coordinate the newly developed components and systems and to ensure the operational stability and smooth functioning of their interaction. In endurance tests, a vehicle's service life is simulated under the kind of harsh operating conditions that will later only be experienced by customers at the absolute limit. To date, the camouflaged prototypes of the all-electric Macan have completed more than three and a half million test kilometres on test tracks and public roads.

To test the interaction of all active driving components under extreme climatic and situational loads, the test cars are used all around the world. “We cover all temperature ranges. From minus 30 degrees Celsius in Scandinavia to plus 50 degrees Celsius, as we experienced in Death Valley in California," continues Kerner. “Of course, an SUV also has to work on any surface. That's why we test not only on roads, but also off-road, on gravel, snow and ice." The rear-focused all-wheel drive in the all-electric Macan models is always on home turf in this regard.

Porsche exclusively uses the latest generation of permanently-excited PSM motors on the front and rear axles. They provide overboost power of more than 450 kW (), offer excellent efficiency and enable optimum reproducibility of the power output. The electronically controlled Porsche Traction Management manages the distribution of the more than 1,000 Nm of torque with Launch Control in the top model in almost real time. To offer the broad spectrum between high performance and comfort for which the Macan is known, the engineers have deployed a Porsche Active Suspension Management system with two-valve damper technology, air suspension, rear-axle transverse lock and, for the first time, rear-axle steering with a steering angle of up to five degrees.

MEDIA ENQUIRIES



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