Engine and gearbox

Full speed ahead: The most powerful Turbo for road use in the 911’s history

In the new 911 GT2 RS, the 3.8-litre engine from the 911 Turbo earns itself a place in the top flight of high-performance engines. As a reminder: The 3.8-litre flat engine, which made its debut back in 2009, precompresses its process air through two turbochargers with variable geometry (VTG turbochargers). Porsche was the first manufacturer to implement this technology in a petrol engine. The engineers at Porsche have now developed the original power rating of 368 kW (500 hp) into a staggering 515 kW (700 hp) – an increase of 40 per cent while retaining the same level of displacement. With this power at its disposal, the new 911 GT2 RS trumps its predecessor with a 3.6-litre engine by 59 kW (80 hp). The increase in displacement is also a factor that contributes to the enormous 750-Nm torque (an increase of 50 Nm).

The high-performance engine builds on the engine fitted in the 911 Turbo S, which delivers 427 kW (580 hp) to the double-clutch transmission. The modifications include the traditional techniques for enhancing performance that are commonly used in the field of motorsport. However, the developers also implemented a number of innovative ideas. Bigger turbochargers force more process air into the combustion chambers, which in turn increases the energy conversion rate – particularly with the very short gas exchange cycles in the high-speed range. In parallel to this, specific pistons reduce the compression ratio by 0.5 units. The engine, which approximates that seen in the field of motorsport, is designed to achieve 7,200 crankshaft rotations a minute – something of a record among turbo engines.

Further down the air guide, an expansion intake system optimises the air flow. The functional principle of this expansion intake system is different to that of conventional intake systems: The distribution pipe is longer and smaller in diameter, while the intake manifolds themselves are shorter. As a result of this design, the air vibrations are different and the mixture in the combustion chamber is cooler. This, in turn, allows the mixture to be ignited to optimum effect in terms of performance.

Water for the air cooler: Innovative additional cooling of the charge air

Intermediate charge-air coolers reduce the temperature of the process air heated by the turbines through an innovative feature: A new water cooling system sprays the heat exchangers with liquid during load peaks. This lowers the gas temperature in the overpressure range by up to 20 degrees more than would be possible using the airstream alone. By delivering this reduction in temperature, the system ensures that the flow of charge air is thermally stable – even under extreme conditions. The water cooling system comes into action when, among other factors, the temperature of the process air in the intake manifold is above 50 degrees, the driver depresses the accelerator pedal by more than 90 per cent and the engine is running at a speed in excess of 3,000 rpm. The system is supplied by a five-litre tank filled with distilled water. With this system, the vehicle is able to achieve extremely fast lap times – such as on the Nürburgring Nordschleife – with maximum power output, even at high outside temperatures.

The burned gases pass from the two VTG turbochargers into the specially developed

exhaust system made of extra-lightweight titanium. This system weighs approximately seven kilograms less than the one in the 911 Turbo. An automatically controlled flap system reduces the counter-pressure when load requirements are high, thereby increasing the power output and reducing fuel consumption.

The first 911 GT2 RS equipped with a double-clutch transmission

The Porsche Doppelkupplung (PDK) is an invention from the field of motorsport and has now found its way into the 911 GT2 RS. For the first time, the high-performance engine transmits its power via an automatically switching seven-speed gearbox on the rear axle, without interrupting traction. The PDK designed specifically with the GT in mind also offers special features that support the driver when using the vehicle on the race track. The Intelligent Shift Program (ISP) offered by the electronic transmission control system ensures faster and more spontaneous traction upshifts and extremely dynamic downshifts in overrun with sporty bursts on the throttle. In “PDK SPORT” mode, the downshifts during braking are even punchier, while the shifting points move to higher engine speeds during acceleration.

Designed specifically for use on the race track, the PDK also offers the special “Paddle Neutral” function, which Porsche reserves solely for its GT sports cars. If the driver pulls back on both gearshift paddles at the same time, the clutches of the PDK release, and the power delivery from the engine to the powertrain is interrupted. As soon as the driver lets go of both gearshift paddles, the clutch re-engages at lightning-fast speed if PSM is deactivated. If PSM is activated, the clutch re-engages quickly, but less spontaneously.

Using this function, the driver can bring an understeering vehicle back under control or conversely apply the propulsion force spontaneously to deliberately destabilise the rear of the vehicle. “Paddle Neutral” can also be used for acceleration from a standstill. As with a vehicle equipped with a manual transmission, the driver alone can determine the preferred acceleration characteristics using the clutch and gas pedal.