

Summary

The Audi TT RS – the purist driving machine

Five-cylinder engines are in Audi's DNA. The company is once again building such an engine – this time a high-performance engine. The Audi TT RS, developed by quattro GmbH, sports a turbocharged 2.5-litre engine with FSI direct injection under the hood that produces 250 kW and 450 Nm of torque, yet consumes only 9.2 litres/100 km. In conjunction with quattro permanent all-wheel drive, the powerful five-cylinder model offers explosive performance, making the compact Audi TT RS Coupé a purist driving machine.

Potent five-cylinder petrol engines enjoy a long tradition at Audi, powering cars like the “Ur-quattro” (original quattro) to the head of the pack. Audi has resumed using this recipe. The newly developed engine combines a turbocharger with FSI direct petrol injection to make the TT RS an uncompromising sports car.

The TFSI delivers 250 kW from a displacement of 2,480 cc: an output of 137.1 hp per litre. Weighing only 1,450 kilograms, the Coupé boasts a power-to-weight ratio of only 4.3 kilograms per hp – the low value is made possible by the extremely lightweight bodies utilising the Audi Space Frame (ASF). They are made of aluminium up front and steel sheet at the rear.

The TT RS Coupé rockets from 0 to 100 km/h in 4.6 seconds. The governed top speed of 250 km/h is merely the official figure; as an option, it can be increased to 280 km/h. Peak torque of 450 Nm is available between 1,600 and 5,300 rpm, providing tremendous pulling power. The TT RS Coupé requires only 9.2 litres of fuel per 100 km – another example of how Audi combines dynamics and efficiency.

The powerful five-cylinder unit is very compact and particularly lightweight. Its large turbocharger generates up to 1.2 bar of relative boost pressure. At full load, the intercooler reduces the temperature of the compressed air and achieves an efficiency of more than 80 percent. When the driver pushes the standard Sport button on the centre tunnel, a flap installed in the left exhaust tailpipe renders the exhaust noise even more intense while making engine response more direct.

Purist character: drivetrain and suspension

A manual six-speed transmission characterised by high efficiency and tightly spaced gears of a sporty nature distributes the tremendous power of the five-cylinder engine to the quattro permanent all-wheel drive system, which gives the TT RS enormous traction, superb dynamics and supreme stability.

The innovative mix of materials in the body provides an exquisitely balanced axle load distribution and outstanding rigidity. This rigidity is the basis for the car's precise handling. The standard sports suspension lowers the body by 10 millimetres (compared to a standard TT Coupe). As standard is the Audi magnetic ride adaptive damping system, which offers two basic characteristics: Comfort and Sport.

The Audi TT RS rolls on 19-inch wheels shod with 255/35 tyres. The internally ventilated brake disks measure 370 millimetres in diameter up front and 312 millimetres at the rear. The front friction rings are perforated. They are connected by hollow pins to the aluminium brake disks, which are encircled by black four-piston brake calipers bearing RS logos. The ESP stabilisation system has a Sport mode and can be completely deactivated.

The full potential of the Audi TT RS driving machine is obvious at first glance. The front and rear skirts and the side of the car have been distinctively modified. A stationary rear spoiler is standard.

The dynamic image of the TT RS carries over into the all-black interior. Standard equipment includes Audi exclusive front bucket seats upholstered in Black fine Nappa leather with contrasting stitching in Silver, seat inserts with TT perforation and TT RS embossing on the front seats, standard leather package featuring fine nappa leather covering the handbrake grip, door pull handles, Navigation plus, DVD based with MMI operating logic including a glove box-mounted CD changer, brushed aluminium inlays, a flat-bottomed leather multifunction sports steering wheel, a boost pressure indicator, an oil temperature gauge, a lap timer, automatic air conditioning, and xenon plus headlamps with LED daytime running lights.

Delivery of the TT RS begins this month, with the Coupé priced at \$133,700*.

* Manufacturer list price includes GST and LCT where applicable, dealer delivery and government statutory charges are not included.

At a glance

The Audi TT RS

Engine

- Newly developed, 2.5-litre five-cylinder unit with turbocharging and FSI direct fuel injection
- 250 kW and 450 Nm of torque
- Exceptional performance: 0 – 100 km/h in 4.6 seconds, top speed 250 km/h, with 280 km/h available as an option (carbon package – carbon on engine)
- Average combined fuel consumption only 9.2 litres/100 km

Transmission

- High-efficiency six-speed manual
- quattro permanent all-wheel drive with hydraulic multi-plate clutch

Chassis

- Advanced suspension mountings, four-link design in the back
- High-performance brakes with four-piston calipers up front
- 19-inch wheels with 255/35 tyres standard
- Audi magnetic ride adaptive damping (standard)

Body and design

- Lightweight and very strong ASF body of aluminium and steel, weighs only 206 kilograms
- Larger air intakes up front, distinctive diffuser insert in the rear, stationary rear spoiler

Equipment

- Comprehensive standard equipment, including xenon plus headlamps with LED daytime running lights, driver information system with indicators for boost pressure and oil temperature as well as a lap timer, Navigation plus with glove box mounted CD changer, Audi exclusive bucket seats

Full version

Taking dynamics to a whole new dimension The Audi TT RS

Audi is once again building a five-cylinder – a very special one: Arriving at dealerships this summer, the TT RS has a turbocharged 2.5-litre engine with FSI direct gasoline injection; it produces 250 kW and 450 Nm of torque. The potent five-cylinder engine provides outstanding performance. In conjunction with quattro permanent all-wheel drive and a high-performance chassis, the engine makes the compact Audi TT RS a top-notch sports car.

Performance

The Audi TT RS is the first classic sports car in the RS family. Like the RS 4 and the RS 6, the Audi TT RS was developed by quattro GmbH. Its key data is outstanding: 4.6 seconds for the sprint from zero to 100 km/h and 15.9 seconds from zero to 200 km/h on the way to an optional top speed of 280 km/h – the TT RS is the fastest production sports car in the compact class. And it is a purist driving machine – powerful, lightweight, efficient, conceived and implemented without compromise.

The 2.5-litre TFSI five-cylinder unit has two faces. When driven with restraint, the turbo conveys the composure that comes from having 450 Nm of torque available in practically any situation – from the bottom of the torque curve almost to the very top, from 1,600 to 5,300 rpm. With this tremendous pulling power, the TT RS overtakes with casual ease.

When the driver pushes the five-cylinder they experiences its other side – the raw power of 250 kW; the skin-tingling music as the engine revs enthusiastically up to 6,800 rpm; the unmistakable, throaty roar is the classic five-cylinder sound from Audi. A glance under the hood reveals the engine in all its glory, with no engine cover – an impressive piece of technology.

Winding rural routes or a few laps around a racetrack allow the superior handling to shine. The TT RS turns spontaneously, almost greedily, into curves and passes through them with aplomb, precisely guided by its responsive steering. As the car approaches its very high limits, it begins to understeer ever so slightly. This effortless controllability is another character trait of the compact driving machine from Audi.

As the car exits the curve, the quattro technology safely transfers the tremendous power to the road in situations where competitor vehicles with their two powered wheels struggle to find grip. All of these strengths and the stirring power of the engine make the TT RS the epitome of pure, essential dynamism.

Engine

Turbocharged gasoline engines are a traditional Audi domain, and the five-cylinder turbo in the Audi TT RS is a high-performance engine. With a displacement of 2,480 cubic centimetres, it produces 250 kW between 5,400 and 6,500 rpm. Peak torque of 450 Nm is already available at 1,600 rpm and remains constant up to 5,300 rpm.

The basic concept makes an Audi five-cylinder unit an unusual engine. It has a firing interval of 144 degrees and a firing order of 1-2-4-5-3, alternately between directly adjacent cylinders and cylinders that are far apart. This produces the distinctive rhythm and musical sound, which are also the result of the intake and exhaust geometry. A specially designed torsional vibration damper at the front end of the crankshaft compensates for the free moments of the engine.

The 2.5-litre TFSI is extremely compact. Its cylinder spacing measures 88 millimetres; the external main bearings were moved inside. Only 494 millimetres long, the long-stroke engine (bore x stroke 82.5 x 92.8 millimetres) is suitable for transverse installation in the TT RS.

Its low weight of only 183 kilograms is also a top figure. It helps keep the total weight of the TT RS low and also offers significant advantages for the distribution of axle loads and thus for the car's handling.

The crankcase is made of vermicular graphite cast iron. This high-tech material that made its name in the large TDI engines combines the ultimate in rigidity with low weight. Audi is the first automaker to use this material for a gasoline engine. Targeted reinforcements on the main bearing seat and the main bearing cover further increase the load-bearing capacity of the block.

The pistons are made of cast aluminium; each of them together with the rings and pins weighs only 492 grams. Just like the forged connecting rods, they are designed to withstand the highest of loads; systematically minimized asymmetries and slightly angled box walls enhance their strength. Sodium-cooled exhaust valves and hardened valve seat rings are used in the cylinder head, which is cast from a high hot-strength aluminium alloy.

TFSI – the winning technology from Le Mans

The powerful five-cylinder engine is surprisingly frugal, with an average of just 9.2 litres/100 km in the Coupé. Its high efficiency can be attributed to the combination of FSI direct fuel injection and turbocharging, two of Audi's core technologies. This TFSI pairing harmonises perfectly in motorsports, the world's most demanding test ground: It has powered the R8 race car to five victories in the 24 Hours of Le Mans and 63 victories in 80 other races.

Loads are measured for the injection unit's controller by means of a pressure sensor in the intake manifold – a particularly precise method of measurement. Pneumatically actuated flaps generate a controlled rotation of the inflowing air in the combustion chamber. The common rail unit injects the gasoline into this roller-shaped "tumble" at a pressure of 120 bar. The fuel is intensely swirled in the combustion chamber and cools the walls, solving a long-standing problem of turbo technology: the risk of knock during combustion. TFSI technology enables a high 10.0:1 compression ratio and correspondingly good efficiency.

The two camshafts also do their part to ensure that the combustion chamber is well filled: They can be hydraulically moved through 42 degrees of crankshaft rotation. They are driven by a two-stage chain drive comprising a particularly quiet sprocket chain, a roller chain and an intermediate timing gear.

The turbocharger is large, with its compressor wheel measuring 64 millimetres in diameter at the outlet. It can theoretically compress 335 litres of air at full load; the relative boost pressure can be up to 1.2 bar. The turbocharger casing has a separate oil supply and a cooling system serviced by a separate water pump. At full load, the intercooler reduces the temperature of the compressed air and achieves an efficiency of more than 80 percent. The entire admission tract has been optimised for minimal pressure loss and the development engineers succeeded in reducing the exhaust backpressure in the dual exhaust tract.

There is a flap in the left tailpipe. When it is closed, the exhaust is rerouted through the rear muffler and exits through the right tailpipe. The flap opens when accelerating at higher loads and engine speeds. The exhaust now takes the direct route to the outside, producing a fuller, more intense sound.

The driver can open and close the flap as desired by pressing the standard Sport button on the centre tunnel, which also makes the engine response more direct or more comfortable. Audi also offers an optional sports exhaust system with black tailpipe trim, including the sound flap, for an even more distinctive sound.

Drivetrain

A new manual six-speed transmission is responsible for transferring the power in the Audi TT RS. Its shafts and gears can easily accommodate the high forces. A constant-velocity joint able to withstand high temperatures replaces the usual Hardy disk between the bevel box and the cardan shaft. Gear changes are performed swiftly, with precision and ease – just as you would expect on an Audi. The gear throws were shortened and the shift lever and knob have been matched to the interior design of the TT RS.

The version of the quattro permanent all-wheel drive for transverse engines is standard in the TT RS. The central component of this system is an electronically controlled, hydraulically actuated multi-plate clutch. To further improve the already good axle load distribution, the clutch is mounted on the end of the cardan shaft upstream of the rear axle differential, another newly developed, particularly compact component designed for high loads.

A package of plates running in an oil bath within the centre clutch housing can be steplessly pressed together by controlled hydraulic power. The controller constantly analyses the driving conditions. If the front wheels begin to slip, an electric-powered rotary piston pump instantly builds up oil pressure, which the clutch uses to divert a large portion of the torque to the rear wheels. Thanks to a high-performance pressure accumulator, this process takes just a few milliseconds.

In the TT RS, quattro permanent all-wheel drive offers all of the superior capabilities that have long come to characterise Audi – added grip, slip-free acceleration, driving dynamics, safety and straight-line stability. The TT RS driving machine is dynamic and confidently stable no matter what the driving style or weather conditions.

Chassis

When it comes to the suspension, the TT RS takes advantage of all of the excellent qualities the basic design of the TT has to offer. The front wheel suspension, with a track of 1,555 millimetres, is a McPherson structure with triangular lower wishbones. The pivot bearing, the subframe and the control arms are made of aluminium; the subframe is bolted to the body at six points for greater rigidity.

The modified characteristic of the variable-assist rack-and-pinion-steering matches the dynamic character of the TT RS. Because the electromechanical system does not require any energy when travelling straight, it is extremely efficient and saves approximately 0.2 litres of fuel per 100 km. The 16.9:1 ratio is sporty and direct.

Thanks to its sophisticated design, the four-link rear axle (track: 1,546 millimetres) can provide longitudinal and lateral support separately. The longitudinal links absorb the driveline and braking forces, and their relatively soft mounts provides good ride comfort. On the other hand, the three wishbones per wheel – the spring link, the upper wishbone and the tie rod – are attached very rigidly to the subframe, for optimum handling characteristics.

The elastokinematics of the rear links – all made of high-strength steels – are slightly modified from the technical foundation. Separate coil springs and newly developed dampers provide vertical support. The TT RS is 10 mm lower than the high-volume TT. The developers perfected the setup in exhaustive testing, including many fast laps around the North Loop course at the Nürburgring.

The TT RS is equipped with an electronic controller for the shock absorbers – the high-tech Audi magnetic ride system. Circulating within the damper pistons is a synthetic hydrocarbon containing tiny magnetic particles between three and ten micrometres in size. When a current is applied to a coil, a field is generated in which the alignment of the particles changes. They align perpendicular to the flow of the oil and thus prevent it from flowing through the piston channels. The characteristic of the damping thus changes within just a few milliseconds.

The system's controller analyses the driver's style and the condition of the road constantly and adapts the function of the system accordingly. The driver can use the Sport button to switch between the normal characteristic and Sport mode. In standard mode, when oil viscosity is high, the TTS offers a well-balanced, comfortable ride. In Sport mode – with restricted flow – the ride is uncompromisingly stiff with practically no lateral roll. The targeted support of the wheels provides for more neutral self-steering behavior and more precise steering response.

A solid basis: 19-inch wheels

TT RS comes standard from Audi with large, 5-arm rotor design aluminium wheels in the size 9J x 19 shod with 255/35 tyres.

The large wheels have room for powerful brakes. All four disks are internally ventilated and measure 312 millimetres in diameter at the back and 370 millimetres up front. The front friction rings are perforated for maximum heat dissipation and connected by hollow pins to the aluminium brake disks. Four-piston calipers, painted black and decorated up front with RS logos, firmly grip the disks. These are also manufactured of aluminium to reduce the unsprung masses.

The ESP electronic stabilisation program is designed for dynamic driving and can be deactivated in two stages. In Sport mode, the engine does not intervene to control traction, and the brakes engage later than otherwise. In the second mode, the ESP is fully deactivated.

Design

From a purely visual standpoint, the TT RS Coupé is a charismatic athlete. When standing still, they both appear to be pushing forward. The strong sheet-metal body and the tautly curved surfaces, delimited by sharp lines, give the impression of a sculpture in motion. A series of design highlights impart the TT RS with that air of concentrated power that characterises a top-of-the-line model.

As always with Audi, the front end is characterised by the single-frame grille, which is encircled by a matt aluminium-look frame. The grille insert, which bears a TT RS badge, features a shiny black rhombus design – a design mirrored by the large side air intakes. Their widely extended edges draw air into the engine compartment – the left intake routes the air across the gearbox; the right intake routes air to an additional water cooler. The turbocharger draws its intake air through the upper section of the single-frame grille, while the intercooler sits behind the lower segment of the grille.

The front skirt has been redesigned. Its splitter and the rear spoiler work together to provide perfect aerodynamic balance. Audi offers the splitter, the lip of the diffuser insert and the mounting for the rear spoiler in aluminium look as an option.

The headlight design is an identifying feature of all current Audi models. Xenon plus headlights are standard on the TT RS. They are accentuated by daytime running lights, whose 12 light-emitting diodes form a straight line. Together with the “wings” (dual plastic wings), the LEDs make the headlamps seem like little technical works of art.

The most striking aspects of the Audi TT RS when viewed from the side are the 19-inch wheels with the large brakes and the flared side sills. The outside mirror housings come standard in matt aluminium look, and optionally in carbon. Those looking for something special can choose the black styling package, in which the frame of the single-frame grille is also black.

The rear bumper includes an integrated diffuser insert that surrounds the two large, oval tailpipes. A TT RS logo also adorns the rear of the car. The TT RS comes standard with a wide, fixed spoiler that increases the downforce on the rear axle and thus improves stability at high speeds. Available as an option is an electronically retractable spoiler which automatically extends at 120 km/h and retracts again at 80 km/h.

Regardless of which rear spoiler is chosen, the TT RS has a drag coefficient of approx. 0.32. The front face measures 2.09 square metres in all versions – a low value that contributes to the high dynamism in the upper speed range. The Coupé is 4,198 millimetres long and 1,842 millimetres wide, 1,342 millimetres high.

Body

A true sports car is always a light car, and the TT RS shines in this discipline as well. The Coupé weighs only 1,450 kilograms. The power-to-weight ratio of 4.3 kilograms per hp speaks volumes about the dynamic potential.

The decisive factor is the construction of the two bodies. Up front they are made of lightweight aluminium components assembled using Audi Space Frame ASF technology. Extruded sections, die-castings and aluminium sheets form an impact-resistant structure of exceptional strength. The joint between the roof and the sidewalls of the Coupé are laser-welded as an invisible joint – a visual expression of the precision demanded by Audi. Steel is used at the rear of the floor pan, the doors and the trunk lid. This hybrid construction results in excellently balanced weight distribution.

The body-in-white of the Coupé weighs only 206 kilograms, comprising 140 kilograms of aluminium (68 percent) and 66 kilograms of steel (32 percent); an all-steel structure would have weighed almost half as much again.

The Coupé is equipped with front airbags that discharge in two stages depending on the severity of the accident. Belt tensioners and force limiters protect the driver and passenger. In the event of a rear-end collision, headrests support the back of the head.

Interior

The neatly sporty interior design, the perfect ergonomics and the unique selection and build quality of the materials are hallmarks of an Audi. In the TT model series, special features provide that extra emotional touch – the curved cupola above the instruments, the instrument faces recessed into tubes, the large control knobs of the automatic air conditioning system and the round air vents.

The TT RS includes additional, lovingly arranged details. A special menu including digital displays for boost pressure and oil temperature as well as a lap time for recording lap times on the racetrack is integrated into the standard driver information system. The display of the navigation system plus greets the driver with a special TT RS screen when the ignition is turned on. The leather multifunction sports steering wheel has three spokes and an extra thick ring. It is flattened at the bottom like in a racing car and is wrapped with perforated leather with silver seams.

The entire interior is dressed in dynamic black. Matt brushed aluminium inlays are standard; the footrest and pedals are in aluminium look. TT RS logos adorn the door sill trims, the tachometre and the steering wheel, silver welts frame the floor mats, and the door openers – typical for an Audi RS model – comprise two narrow bars.

The TT RS is a sports car with good everyday usability – a major strength of the entire model series. The backs of both rear seats fold down in the Coupé, increasing trunk space from 290 to 700 litres.

Equipment

The TT RS is sportily and generously equipped by Audi. Among the highlights of the standard equipment are quattro permanent all-wheel drive, the large 19-inch alloy wheels, the xenon plus headlamps with LED daytime running lights. The interior is dominated by the leather multifunction sports steering wheel and the TT RS bucket seats upholstered in fine Nappa leather. An automatic air conditioning system and Navigation with glove box mounted CD changer are also standard equipment.

Additional standard features are exclusive to the TT RS, such as the bucket seats with fold-down backrest. They are covered in black Fine Nappa leather with contrasting silver seams. The inserts of the seat side sections and the top centre strip of the backrest are perforated in the shape of the letters TT. Audi offers as a no cost option sport seats in Silk Nappa leather with perforated embossing – in either black or silver with contrasting seams and perforated inserts in the centre strips and on the seat side sections.

Audi is scheduled to begin delivering the TT RS Coupe this month.

The five-cylinder model from Audi

The 2.5-litre engine in the Audi TT RS follows a long tradition: Audi was the brand most noted for its five-cylinder engines in the 1980s. The powerful engines sharpened the new, sporty profile and made a decisive contribution to *Vorsprung durch Technik*.

The five-cylinder unit was a stroke of engineering genius, unifying the efficiency of a four-cylinder with the cultivation of a six-cylinder at a lower weight and compact dimensions that permitted transverse mounting in front of the front axle. It debuted in spring 1977 in the Audi 100 5 E and was a hit from the very beginning. Fed by a hypermodern fuel injection system, the 2.1-litre engine produced 100 kW to offer strong performance with good fuel economy.

The family grew quickly. A five-cylinder, normally aspirated diesel with a displacement of two litres and producing 51 kW was released in the fall of 1978. A year later saw the debut of the first turbocharged, five-cylinder gasoline engine – another pioneering feat from Audi. With an output of 125 kW and 265 Nm of torque, the new top model, the Audi 200 5 T, was one of the fastest sedans of its day. The principle of downsizing – the use of turbocharging to replace displacement – already resulted in good power and high efficiency 30 years ago.

High-flying engine: The five-cylinder unit in the Audi quattro

A year later, the new engine had its biggest impact yet – in the 1980 Audi quattro. The two technologies, turbo and all-wheel drive, quickly formed a dynamic duo of success on the road and on the racetrack. The turbocharged five-cylinder produced 147 kW when it first went on sale. In the 1984 Sport quattro, a direct motorsports derivative, it produced 225 kW – and was thus the high-flying engine of the 1980s.

The strength and ruggedness of the Audi design was proved in the World Rally Championship competition cars, where the highly-boosted five-cylinder churned out a good 350 kW. The high point in the motorsports career was marked by two extreme racing cars. The Audi Sport quattro S1, with which Walter Röhrl won the Pikes Peak (USA) mountain race in 1987, produced roughly 440 kW. And the IMSA-GTO, a touring car based on the Audi 90, dominated the US racing scene with 530 kW from only 2.2 litres of displacement.

In series production, Audi continuously refined its range of five-cylinder gasoline engines, which had displacements ranging from 1.9 to 2.3 litres. The engine concept also enjoyed great success in the diesel sector. The 1989 Audi 100 TDI, a 2.5-litre model putting out 88 kW and 261 Nm, is a milestone of automotive history.

In the mid-1990s, the five-cylinder engines were gradually replaced by the new V6 units, but not without one last hurrah: The 1994 RS 2 produced 232 kW. As a sophisticated Avant with the power of a sports car, it established an entirely new class of automobile.