**The new BMW R 1250 RT, BMW R 1250 R, and BMW R 1250 RS.**
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**1. Overall concept.**

 Short version.

**The new BMW R 1250 RT, the new BMW R 1250 R and the new BMW R 1250 RS – Touring, Roadster and Sports Touring in optimised form and in a new drive dimension.**

For more than 35 years, the flat-twin boxer engine in the BMW Motorrad RT, R and RS models has stood for powerful and reliable propulsion when it comes to setting off on an extended tour or a long-distance journey. With the extensively further advanced boxer engine with BMW ShiftCam technology, the latest boxer models now also achieve a whole new level of performance, culture and efficiency.

For more than 25 years, BMW Motorrad has used four-valve technology, combined with electronic fuel injection and closed-loop catalytic converter technology in order to achieve the best possible power and torque delivery, efficiency and environmental compatibility.

**Further advanced boxer engine with BMW ShiftCam Technology for an additional increase in power across the entire engine speed range, reduced emission and fuel consumption levels, optimised running smoothness and refinement.**

With the extensively further advanced boxer engine, the new R 1250 RT, R 1250 R and R 1250 RS models not only achieve a whole new level of power and torque. It was also possible to significantly optimise refinement and running smoothness – especially within the lower engine speed range. What is more, the new engine offers improved emission and fuel consumption levels as well as a particularly satisfying sound. BMW ShiftCam Technology, previously seen for the first time in the serial production R 1250 GS and R 1250 GS Adventure models, enables variation of the valve timings and valve stroke on the intake side. In addition, the intake camshafts are designed for asynchronous opening of the two intake valves, resulting in enhanced swirl of the fresh, incoming mixture and therefore more effective combustion. Other technical changes to the engine relate to the camshaft drive – now taken care of by a toothed chain (previously a roller chain) – an optimised oil supply, twin-jet injection valves and a new exhaust system.

**Two riding modes, ASC and Hill Start Control as standard.**

There are two riding modes available as standard in order to be able to adapt the motorcycle to individual rider preferences. The standard Automatic Stability Control ASC ensures a high level of riding safety due to the best possible traction. The set-off assistant Hill Start Control is likewise a standard feature in all models, enabling convenient set-off on slopes.

**Riding Modes Pro, featuring additional riding modes, Dynamic Traction Control DTC, ABS Pro, Hill Start Control Pro and Dynamic Brake Assistant DBC, available as an optional equipment item ex works.**

"Riding Modes Pro" is now available as an optional equipment item, featuring the additional riding mode "Dynamic” and “Dynamic Pro” (configurable), and Dynamic Traction Control DTC. DTC enables even more efficient and safe acceleration, especially when banking. ABS Pro offers even greater safety when braking, even in banking position. The new Dynamic Brake Control DBC provides additional safety when braking, also in difficult situations, by avoiding unintentional accelerator activation. By means of intervention in the engine control, drive torque is reduced during braking so as to make full use of the braking power at the rear wheel. This keeps the motorcycle stable and shortens the braking distance.

**Electronic suspension Dynamic ESA "Next Generation" with fully automatic load compensation, now also for the R 1250 RT.**

With the optional equipment item BMW Motorrad Dynamic ESA “Next Generation”, damping automatically adapts to the situation according to riding state and manoeuvres, and there is also automatic compensation in all load states. This allows finely tuned adaptation of the motorcycle to riding states, achieving optimum damping comfort and a very stable ride response – this is now also available for the R 1250 RT.

LED headlamp for the R 1250 RS as standard. In addition to this, the LED daytime riding light is available as an optional equipment item for the R 1250 RS, as well as the R 1250 RT and the R 1250 R, which have halogen headlamps.

**Connectivity: Multifunctional instrument cluster with 6.5 inch full-colour TFT display offering many features as standard.**

The three new boxer models now have the equipment feature Connectivity as standard including a 6.5-inch full-colour TFT screen, on the R 1250 RS and R 1250 R models, and a 5.7-inch TFT colour screen on the R 1250 RT. In conjunction with the standard BMW Motorrad Multi-Controller, this means the rider can access vehicle and connectivity functions particularly swiftly and conveniently.

The R 1250 RT’s TFT colour screen is supplemented with an analog speedometer and rev counter.

**BMW Motorrad Spezial – high-quality customisation features as optional equipment items ex works.**

BMW Motorrad Spezial offers a range of iconic customisation features that enhance both performance and value, available as optional equipment items ex works. The focus is on harmonious integration in the vehicle as a whole, use of the very highest-quality materials, elaborate manual workmanship and characteristic attention to detail.

The new R 1250 RT can be additionally enhanced with Option 719 wheels Classic or Sport, an exclusive seat and one of two Spezial paint finishes. The new R 1250 R and R 1250 RS can also be equipped with the Option 719 Classic or Sport Wheels as well as the exclusive paintwork and the Option 719 seat. The new R 1250 R is a dynamic naked bike character in one basic colour, two style variants and Option 719 Spezial finishes. On the other hand, the new R 1250 RS has a sport and touring character in one basic colour, two style variants and Option 719 Spezial finishes.

An HP sports silencer is likewise available for the three new boxer models.

**The highlights of the new BMW R 1250 RT, BMW R 1250 R and BMW R 1250 RS:**

• Further developed boxer engine with BMW ShiftCam Technology for variation of the valve timings and valve stroke on the intake side.

• Even more power across the entire engine speed range, optimised fuel consumption and emission levels, increased running smoothness and refinement.

• Increased output and torque: 100 kW at 7 750 rpm and 143 Nm at 6 250 rpm (previously: 92 kW at 7 750 rpm and 125 Nm at 6 500 rpm).

• Capacity increased to 1 254 cc (previously: 1 170 cc).

• Asynchronous valve opening on the intake side for optimised swirl and therefore more effective combustion.

• Camshaft drive now via toothed chain (previously roller chain).

• Optimised oil supply and piston base cooling.

• Knock sensor system for optimised travel suitability.

• Latest generation of BMS-O engine control and use of twin-jet injection valves for even more effective carburetion.

• New exhaust system for optimum performance characteristics.

• New additional front spoiler on the R 1250 RT.

• Two riding modes, ASC and Hill Start Control as standard.

• Riding Modes Pro, featuring additional riding modes, Dynamic Traction Control DTC, ABS Pro (standard in the R 1250 RT), Hill Start Control Pro and Dynamic Brake Assistant DBC, available as an optional equipment item ex works.

• Electronic suspension Dynamic ESA “Next Generation” with fully automatic load compensation.

• New optional Sports Handlebars for R 1250 R for a more dynamic riding position.

• In addition to standard adjustability of seat height, wide range of seat height variants ex works.

• LED headlamp for the R 1250 RS (completely new design) as standard; LED daytime riding light for all models as an ex works optional equipment item.

• Connectivity: Multifunctional instrument cluster with 6.5 inch full-colour TFT display offering many features as standard.

• BMW Motorrad Spezial – customisation features as optional equipment items ex works.

• Extended range of optional equipment items and original BMW Motorrad Accessories.

• New front spoiler and cockpit cover (R 1250 R and R 1250 RS).

• Newly designed upper trim (R 1250 RS).

**Prices:**

**R 1250 R**

Full Spec R212.000,00

Style Elegance R220.500,00

Style HP R222.500,00

**R 1250 RS**

Full Spec R227.000,00

Style Elegance R234.000,00

Style HP R236.000,00

**R 1250 RT**

Full Spec R252.400,00

Style Exclusive R260.900,00

Style HP R262.900,00

2. Technology.

**Further** **developed boxer engine with new top levels for output, torque, ridability and refinement.**

While the previous boxer power unit itself provided supreme forward thrust in all situations, the boxer engine in the new BMW R 1250 RT, R 1250 R and R 1250 RS takes this a significant step further.

In the latest generation it has a capacity of 1 254 cc (previously: 1 170 cc). The ratio between bore and stroke is now 102.5 to 76 mm (previously: 101 to 73 mm). It has an output of 100 kW at 7 750 rpm and develops a maximum torque of 143 Nm at 6 250 rpm (previously: 92 kW at 7 750 rpm and 125 Nm at 6 500 rpm). With a 7% capacity increase, the new boxer engine offers 14% more torque and 9% more output than its predecessor, making it the most powerful BMW boxer engine ever to be manufactured in serial production.

At its latest stage of development too, the boxer engine uses the well-established system of air/liquid cooling. So-called precision cooling means that the cooling fluid flows through the engine elements that are more heavily exposed to heat – namely the two cylinder heads and parts of the cylinders. Heat is dissipated via two radiators positioned at the left and right of the front vehicle section.

**BMW ShiftCam Technology for increased power across the entire engine speed range, enhanced running smoothness and refinement as well as further optimised fuel consumption and emission levels.** The objectives in developing the new boxer engine in these models were to further enhance the already impressive output and torque figures of the predecessor model. This also involves a significant increase in refinement and running smoothness as well as optimised emission and fuel consumption levels.

It was possible to achieve these enhancements by means of BMW ShiftCam Technology. This is a technology that is completely new to BMW motorcycles: its function is to vary the valve timings and valve stroke on the intake side. The core of the technology is a single-unit shift camshaft with two cams per valve to be activated: one partial-load cam and one fullload cam, each featuring cam geometry in optimised design. While the partial-load cam has been configured to ensure optimised fuel consumption and refinement, the full-load cam is designed for optimised output.

Axial shift of the intake camshaft means the intake valves are activated by either the partial-load or the full-load cam, depending on load and engine speed. The axial shift of the intake camshaft and the use of the partial-load or full-load cam are effected by means of a shifting gate on the camshaft and an electronic actuator which intervenes at this point.

**Variation of the intake valve stroke and asynchronous valve opening.**

The varied configuration of the cam geometry also enables variation of the intake valve stroke. While the full-load cam provides maximum valve stroke, the partial-load cam delivers reduced valve stroke. There is also a difference between the intake cams for the left and right-hand intake valve in stroke and angular position. This phase shift means that the two intake valves are opened to different degrees and on a time-staggered basis.

The effect of this phase shift is to create a swirl and therefore greater agitation of the fuel-air mixture flowing into the combustion chamber. This results in particularly effective combustion and better utilisation of the fuel as a result. Given the appropriate riding style, BMW ShiftCam Technology enables a reduction of fuel consumption by up to 4 % as compared to the already economical predecessor model.

**The benefits of BMW ShiftCam Technology:**

• Increased torque and pulling power across the entire engine speed range.

• Enhanced refinement and more even engine running when travelling at a constant speed due to optimum configuration of the partial-load cam geometry for the lower load range and engine speed range.

• Significant increase in peak output to 100 kW (previously: 92 kW / 125 Nm at 6 500 rpm).

• Reduction of load change loss in the partial load range.

• Reduction of idling engine speed by 100 rpm.

• Reduction of exhaust emissions and optimised sound.

• Reduction of fuel consumption by 4 % as compared to the predecessor model.

**Even more supreme ridability due to increased torque as well as tangibly improved running smoothness and refinement.**

In practical terms, BMW ShiftCam Technology results in an even further significant improvement in ridability for the new R 1250 GS and R 1250 R BMW R 1250 RT, R 1250 R and R 1250 RS in comparison to the predecessor models. In addition to the considerable boost in peak output from the previous figure of 92 kW to the current level of 100 kW, it is the drastic increase in torque and therefore pulling power that is particularly noticeable.

In the range from 2 000 to 8 250 rpm, for example, the level of torque now available is 110 Nm. Within the range that is especially relevant in terms of riding dynamics, namely 3 500 to 7 750 rpm, the impressive level of over 120 Nm is now available. This gives the new BMW R 1250 RT, R 1250 R and R 1250 RS even greater supremacy and pulling power than before, combining absolutely superior power delivery with remarkable top performance – whether riding alone or with a passenger, on winding country roads or covering long stages of a journey at a high average speed. In short: never before has a boxer engine provided this level of riding fun and refinement.

**Cylinder head with vertical flow and camshaft drive now by means of toothed chain. Optimised oil supply and piston base cooling.**

The engine of the new BMW R 1250 RT, R 1250 R and R 1250 RS also features vertical flow. The advantage here is that the configuration of the intake channel no longer depends on the camshaft control, so it was possible to realise identical intake lengths for both cylinder sides. What is more, the fuel injector is now arranged so that the fuel is injected as directly as possible in front of the intake valves for optimum carburetion.

As before, the two camshafts per cylinder side are powered by a chain running in the shaft behind the cylinders (on the right-hand side of the engine via the counterbalance shaft and to the left via the crankshaft). The timing chain drives an intermediate shaft between the intake and exhaust camshaft and it is from here that power is transmitted to the camshafts via spur gear pairs. The control chain is now a toothed chain (previously: roller chain) with the aim of further reducing running noise. As before, the four valves are arranged at close angles to one another in order to achieve an optimum combustion chamber shape. The valve angle is 8 degrees on the intake side and 10 degrees on the exhaust side, while the disc diameters of the valves are 40 mm on the intake side and 34 mm on the exhaust side. The valve shaft diameter is 5.5 mm. As before, the valves are operated via light, speed-resistant rocker arms, the design of which was derived from the high-performance 4-cylinder engine of the BMW S 1000 RR. The valve clearance settings are made by means of replaceable shims.

The increase in output and torque and therefore riding dynamics as a whole also involves two back-up measures to ensure maximum operating reliability: the two pistons have base cooling using splash oil and the lubrication system has been fitted with variable oil intake. By means of a shifting piston in the intake area of the oil sump, the latter ensures optimum oil supply in all riding states.

**Knock sensor system for optimised travel suitability. BMS-O engine control and twin-jet injection valves for even more effective carburetion.**

Unlike their predecessor models, the new BMW R 1250 RT, R 1250 R and R 1250 RS have a knock sensor system in the form of two knock sensors. This allows the use of fuels with a rating of less than RON 95 – a particular advantage when travelling in the more remote corners of the planet. They are also fitted with a new digital engine control, the so-called

BMS-O. Its main features are fully sequential injection, a compact layout and low weight. Carburetion is carried out by an electronic fuel injection system via throttle bodies with an opening width of 52 mm. Injection is via new twinjet injection valves that support even greater refinement and further improved emission levels.

**Counterbalance shaft for perfect mechanical running smoothness.**

As in the previous models, the new engine also has a counterbalance shaft which runs at crankshaft rotation speed so as to eliminate unwanted vibrations. The counterbalance shaft is configured as a hollow intermediate shaft, inside which the clutch shaft runs at the same time. This ensures that the new engine runs comfortably and with low levels of vibration across the entire engine speed range. Nonetheless, the essential earthy boxer characteristics are still preserved.

**Gearbox integrated in engine housing, including wet clutch with anti-hopping function.**

The gearbox and clutch are integrated in the engine housing in the new boxer engine, too. This provides benefits in particular in terms of overall weight due to the omission of numerous bolt connections and sealing surfaces, but also in terms of the torsional response of the unit as a whole. In addition to a design that saves both space and weight, this concept means that no additional gearbox volume is required.

Power transmission to the six-speed gearbox, which has been further optimised in terms of gear shifting, is via a multi-plate wet clutch with eight friction discs. The clutch system is fitted with an anti-hopping mechanism. With this new drive generation, BMW Motorrad has thus especially addressed the wishes of riders with sporty ambitions who prefer country roads. The brake torque of the engine is now passed to the rear wheel at a reduced level during coasting. This prevents brief blocking or hopping of the rear wheel due to the dynamic wheel load distribution when applying the brakes heavily and changing down at the same time. In this way, the motorcycle remains stable and safely controllable during the braking phase.

**New exhaust system for optimum performance characteristics.**

Made completely out of stainless steel, the exhaust system of the new

BMW R 1250 RT, R 1250 R and R 1250 RS is designed entirely for optimum output and torque in conjunction with BMW ShiftCam Technology and works according to the 2-in-1 principle. In this development area, a homogeneous output and torque curve and thus excellent rideability were once again regarded as requirements for supreme performance on country roads and extended touring activity.

The two manifold tubes and the interference pipe were redesigned in terms of shaping, length and diameter. Exhaust gas purification is taken care of by a closed-loop catalytic converter controlled by an oxygen sensor. In this way, the new boxers meet current exhaust standards and are excellently equipped for future requirements.

**Two riding modes, ASC and Hill Start Control as standard.**

Even in standard trim, the new 1250s offer two riding modes for adaptation to individual rider preferences. Here, the standard Automatic Stability Control ASC ensures a high level of riding safety due to excellent traction. What is more, the riding modes “Rain” and “Road” allow adaptation of the bike's properties to most road surface conditions. The set-off Assistant Hill Start Control is likewise a standard feature in both models, enabling convenient set-off on slopes.

**Riding Modes Pro, featuring additional riding modes, Dynamic**

**Traction Control DTC, ABS Pro, Hill Start Control Pro and Dynamic**

**Brake Assistant DBC.**

The new BMW R 1250 RT, R 1250 R and R 1250 RS models can be fitted with "Riding Modes Pro". It features the riding modes “Dynamic” and "Dynamic Pro”, and Dynamic Traction Control DTC. DTC enables even more efficient and safe acceleration, especially in banking position. The “Dynamic Pro” riding mode is activated by means of a coded plug and further customisation options allow the character of the motorcycle to be adapted to individual needs, thereby further enhancing the fun of riding.

ABS Pro also offers even greater safety when braking, especially in banking position, while Dynamic Brake Control DBC provides the rider with extra support on brake manoeuvres. DBC increases safety when braking, even in difficult situations, by avoiding unintentional accelerator activation. By means of intervention in the engine control, the drive torque is reduced during braking, making full use of the braking power at the rear wheel. This keeps the motorcycle stable and shortens the braking distance. With the dynamic brake light, vehicles to the rear are made more aware of the fact that the motorcycle is decelerating.

Hill Start Control Pro goes beyond the functions of a comfort system such as Hill Start Control to facilitate stopping and setting off on a slope. Hill Start Control Pro offers the additional Auto HSC function. The settings menu allows this additional function to be individualised in such a way that the parking brake is automatically activated on a gradient (greater than +/- 5%) when the hand or foot brake lever has been activated, shortly after the motorcycle comes to a standstill.

**Electronic suspension Dynamic ESA "Next Generation" with fully automatic load compensation.**

An even higher level of riding safety, performance and comfort is achieved with the BMW Motorrad Dynamic ESA “Next Generation” (Electronic

Suspension Adjustment. Here, the damping automatically adapts to the situation depending on riding state and manoeuvres, and there is also automatic riding position compensation in all load states. In terms of the technical background, signals from the rotational speed sensor and the two travel sensors at the front and rear enable comprehensive data collection and therefore finely tuned adaptation of the motorcycle to riding states. Based on additional parameters, riding states are detected such as compression, acceleration and deceleration, and these are incorporated in the adaptation of damping forces, both at the rear spring strut and Telelever front wheel control. This adaptation is applied by means of electrically actuated regulation valves within the millisecond range. As a result, optimum damping comfort and a very stable ride response is ensured even in banking position.

Dynamic ESA “Next Generation” is pre-set to the “Road” damping characteristics in the standard set-up of the riding modes “Rain”, “Road” and

“Dynamic”. At the press of a button – conveniently positioned on the handlebars so it can even be operated during travel – the rider can switch to the damping characteristics “Dynamic” in the riding modes “Rain” and “Road”, thereby selecting a tighter damping setup.

**See and be seen even more effectively – LED headlamp standard on the R 1250 RS.**

For decades now, BMW Motorrad has been regarded as a frontrunner when it comes to safety in connection with motorcycling. One shining example in the truest sense of the word is the LED headlamp which is now offered as a standard feature on the R 1250 RS. The LED headlamp illuminates the road with a hitherto unrivalled clarity, thereby ensuring additional perception in traffic. In addition to this, the LED daytime riding light is optional on the R 1250 RS, R 1250 R and R 1250 RT models.

**Connectivity: multifunctional instrument cluster with 6.5-inch full-colour TFT screen and numerous features as standard in the R 1250 GS.**

The new boxer models now have the equipment feature Connectivity as standard including a 6.5-inch full-colour TFT screen on the R 1250 RS and R 1250 R models, and a 5.7-inch TFT colour screen on the R 1250 RT. In conjunction with the standard BMW Motorrad Multi-Controller, this means the rider can access vehicle and connectivity functions particularly swiftly and conveniently.

This means it is possible to enjoy the convenience of making a phone call or listening to music during travel. If a smartphone and a helmet with the BMW

Motorrad Communication System are connected via Bluetooth to the TFT screen, for example, the rider can conveniently access media playback and telephone functions. These functions can also be used without the need to install an app. With an active Bluetooth connection to any standard smartphone, the rider can enjoy the pleasures of listening to music during travel. In addition, the freely available BMW Motorrad Connected App offers handy arrow-based navigation suitable for day-to-day use directly via the TFT screen.

The R 1250 RT’s TFT colour screen is supplemented with an analog speedometer and rev counter.

The **BMW Motorrad Connected App** can be downloaded free of charge from the Google and Apple app stores. It also comprises attractive additional functions such as route logging and the display of other travel statistics and information. In this way, logged routes can also be shared directly with other motorcyclists via the REVER community. The basic navigation system will be of particular interest to motorcyclists since it enables convenient organisation of day-to-day travel and short trips without the need for additional equipment.

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| **R 1250 RT (Base Price incl ABS)** | R 199 900,00 |
| **230 - Comfort Package** | R 15 000,00 |
| Chrome Plated Silencer, Central Locking, TPC, Anti Theft Alarm System, Socket |  |
| **233 - Touring Package** | R 22 000,00 |
| Dynamic ESA, Heated Seat, Cruise Control, GPS Prep |  |
| **235 - Dynamic Package** | R 7 500,00 |
| Daytime Riding Lights, Headlight Pro, Ride Modes Pro |  |
| **455 - Style Elegance** | R 8 500,00 |
| Carbon Black Metallic |  |
| **451 - Style Sport** | R 10 500,00 |
| Mars Red Met./Dark Slate Met. Matt |  |
| **182 - Dynamic Traction Control** |  |
| **222 - Gear Shift Assist** | R 8 000,00 |
| Total - Full Spec | R 252 400,00 |
| Total - Style Elegance | R 260 900,00 |
| Total - Style Sport | R 262 900,00 |

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| **R 1250 R** **(Base Price incl ABS)** | R 161 400,00 |
| **230 - Comfort Package** | R  8 500,00 |
| Chrome Plated Silencer, Heated Grips, TPC |  |
| **233 - Touring Package** | R 25 600,00 |
| Dynamic ESA, Keyless Ride, Cruise Control, GPS Prep, Main Stand, Pannier Brackets |  |
| **235 - Dynamic Package** | R 16 500,00 |
| Daytime Riding Lights, Gear Shift Assist, Ride Modes Pro, LED Turn Indicators White |  |
| **452 - Style Exclusive** | R  8 500,00 |
| Tank cover Pure, N2c Pollux Metallic Matt |  |
| **456 - Style HP** | R 10 500,00 |
| HP Motorsport, Tank cover Pure, Engine Spoiler |  |
| **182 - Dynamic Traction Control** |  |
| **5AC - ABS Pro** |  |
| Total - Full Spec | R 212 000,00 |
| Total - Style Elegance | R 220 500,00 |
| Total - Style HP | R 222 500,00 |

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| **R 1250 RS (Base Price incl ABS)** | R 176 400,00 |
| **230 - Comfort Package** | R  8 500,00 |
| Chrome Plated Silencer, Heated Grips, TPC, Hand Protectors |  |
| **233 - Touring Package** | R 25 600,00 |
| Dynamic ESA, Keyless Ride, Cruise Control, GPS Prep, Main Stand, Pannier Brackets |  |
| **235 - Dynamic Package** | R 16 500,00 |
| Daytime Riding Lights, Gear Shift Assist, Ride Modes Pro, LED Turn Indicators White |  |
| **455 - Style Exclusive** | R 7 000,00 |
| Tank cover Pure, N2c Pollux Metallic Matt |  |
| **451 - Style HP** | R 9 000,00 |
| Tank cover Pure, Engine Spoiler, Austin Yellow Metallic Matt |  |
| **182 - Dynamic Traction Control** |  |
| **222 - Gear Shift Assist** | R 8 000,00 |
| Total - Full Spec | R 227 000,00 |
| Total - Style Elegance | R 234 000,00 |
| Total - Style Sport | R 236 000,00 |

4. History of the BMW 4-valve boxer engines.

The R 100 RS saw its debut in September 1992, almost exactly 70 years after the R 32 – the first ever BMW motorcycle – and featured a completely reworked boxer engine. While serial production motorcycles with a boxer engine had been mainly air-cooled up to that point, BMW was now branching out into new territory with air/oil cooling.

**1992: With the R 1100 RS, it was the first time BMW Motorrad put a 4-valve boxer into serial production.**

There were a number of technical reasons why the decision was made to revise the existing design. Increasingly stringent noise limits were forcing motorcycle manufacturers not only to muffle air intake and exhaust noise as efficiently as possible but also to reduce the mechanical noise of the power unit itself to a technologically feasible minimum. Another technical reason for the change was the increased stability of the engine in conjunction with a higher output. The oil cooling system was significantly more effective, particularly around the cylinder head where heat exposure was at its greatest. What is more, liquid cooling meant the engine was heated more evenly. A particular advantage of oil/air cooling was also to be seen during the cold-run phase: the use of oil as a coolant meant the engine heated up much more quickly than an air-cooled engine. The welcome result of this was reduced wear-and-tear and a longer lifetime.

The new boxer engine in the R 1100 RS had a displacement of 1 085 cc, with a bore of 99 mm and a stroke of 70.5 mm. The peak output was 66 kW at 7 250 rpm. For the first time in a volume-production boxer engine, BMW Motorrad applied four valves per cylinder in this engine. Designed in CIH (camshaft-in-head) configuration, one camshaft per cylinder was activated by means of a timing chain running behind the cylinders powered by a countershaft which was positioned underneath the crankshaft. The cam followers – now very short as compared to the previous design – ensured a much stiffer and thus more speed-resistant valve gear, providing the leeway required for increased output in the future. What is more, this configuration further reduced the level of mechanical noise. At the same time, the existing system of carburetion using a constant depression carburettor was replaced by a modern intake pipe injection system in conjunction with a Bosch Motronic. Together with the oxygen sensor, this now allowed the use of a closed-loop three-way catalytic converter, ensuring the boxer was well equipped for the years to come in terms of emissions. The 5-speed, 3-stage planetary gear with separate oil supply was flange mounted in the traditional BMW manner.

**The air/oil-cooled 4-valve boxer demonstrated its enormous development potential over a period of 15 years.**

This air/oil-cooled engine was developed successively in the course of the next 15 years. Displacement was increased from 1999 onwards to 1 130 cc in the R 1150 models, and from 2004 onwards the displacement volume available was as much as 1 170 cubic centimetres in the R 1200 models. The increase in displacement to 1 170 cc involved a significant reworking of the engine with a view to improving refinement and comfort even further. For this reason, it was the first time a BMW boxer engine was fitted with a counterbalance shaft: this rotated in the opposite direction from that of the crankshaft, virtually entirely eliminating first-order inertia torque by means of two equalizing weights offset by 180 degrees. No BMW boxer engine before had ever run as smoothly as that of the R 1200 models.

Three years after its debut – in autumn 2007 – this power unit underwent technological fine-tuning. Instead of the previous level of 72 kW, an output of 77 kW was now available to the R 1200 GS. With maximum torque increased to 8 000 rpm and an even broader engine speed range, it demonstrated even greater dynamic performance and sprint capacity in the upper half of the rotation speed range. The revised secondary ratio also gave it a good deal more pulling power than before. In order to do justice to this increased torque, the 6-speed gearbox was revised with enlarged bearing diameters.

**2007/2009: The evolution from CIH to DOHC engine with overhead camshafts.**

The next major step in the development of the R 1200 engine followed in 2009. It was fitted with a DOHC boxer engine which, in terms of design principle and basic structure, was very similar to the one that had powered the 98 kW HP2 Sport back in 2007. The new boxer engine now had two overhead camshafts per cylinder, having undergone selected revision and optimisation for its debut in the R 1200 GS. While the previous engine had provided supreme forward thrust in all conditions, the new R 1200 GS took a significant step further in this regard. With an output of 81 kW at 7 750 rpm, a maximum torque now increased by 500 to 8 500 rpm and thus an even broader engine speed range, the boxer exhibited even greater dynamic performance, sprint capacity and pulling power across the full engine speed range.

**2012: The boxer switches to water cooling and has a shared housing for the engine and gearbox.**

Three years later in 2012, BMW Motorrad presented for the first time in the R 1200 GS a successor engine that had finally been redesigned in all points, now with water as the coolant rather than oil – right on time to mark the 90th anniversary of the BMW Motorrad boxer engine with which it all began.

A change in the cooling system ensured the required level of performance as well as adhering to anticipated requirements of the future in terms of noise and exhaust emissions. The 92 kW boxer engine still featured air/liquid cooling, but here engine oil was replaced as a coolant by a glycol/water mixture. This ensured a high level of heat absorption capacity for more efficient heat dissipation. This so-called precision cooling involved only those engine elements that are particularly exposed to thermal stress. All in all, however, the engine still mainly used air cooling in addition, thereby preserving the characteristic appearance of the boxer engine. Two radiators were small and inconspicuously integrated in the vehicle as a whole for this purpose.

This was the first volume-production BMW Motorrad boxer engine in which the DOHC cylinder heads featured vertical rather than horizontal flow, however. Other world firsts in the history of the BMW Motorrad boxer engine at this point also included the integrated gearbox with wet clutch and anti-hopping function, together with a universal shaft now positioned on the left-hand side. With an output of 92 kW at 7 700 rpm and 125 Nm at 6 500 rpm, the new engine offered supreme engine and performance figures. Finally in 2018, the consistent, logical further development of this successful engine makes its debut in the new BMW R 1250 GS and R 1250 RT.

7. Engine output and torque. 

