The New BMW S 1000 RR.
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1. Overall Concept and Features.

Introducing the new BMW S 1000 RR on the legendary Monza Racing Circuit, BMW Motorrad is for the first time launching an absolutely innovative supersports with a straight-four power unit.

With this world debut, BMW Motorrad is indeed establishing a true milestone in the world of sports machines, combining engine output of 142 kW (193 hp) with overall weight of just 204 kg (450 lb) including fuel (183 kg/403.5 lb dry weight, 206.5 kg/455.3 lb overall with Race ABS).

Specifications of this calibre make this supersports machine not only an absolute highlight in terms of its power-to-weight ratio and performance, but also, equipped with Race ABS and DTC Dynamic Traction Control, a new benchmark in terms of riding dynamics, safety and innovation.

The decision to present this unique performer in Monza was by no means a coincidence. For since the beginning of this year Team BMW Motorrad Motorsport has been playing an active role in the World Superbike Championship, the new S 1000 RR setting the foundation for the production-based racing machines ridden by BMW Motorrad's two works riders Troy Corser and Ruben Xaus. And obviously the Royal Park in Monza is the ideal place for a presentation of this calibre.

The Challenge for BMW Motorrad.
To successfully enter the World Championship with a Superbike today, a manufacturer needs a production model with the right kind of overall concept consistently applied in all areas. The essential factors, therefore, are supreme power, a wide range of engine speed, fast revving capacity also over a long period, optimum chassis stiffness, and perfect set-up of the engine.

Other features absolutely essential more than ever particularly in the top league of supersports motorcycles are simple and straightforward rideability, light-footed handling, and above all safety features such as rider assistance systems like ABS and traction control giving the customer precisely what he needs.

Developing the S 1000 RR, BMW Motorrad has entered completely new, unchartered terrain. Clearly, this meant a huge range of new challenges and responsibilities for the entire Development Team, but also gave the Team enormous motivation in seeking to set new standards.

The specific targets in developing the S 1000 RR were therefore clear:

- To achieve output and performance of the highest standard.
- To make the suspension absolutely stable, with top handling and supreme traction.
- To give the new machine that unmistakable, dynamic design of BMW Motorrad.
- To reduce the weight of the motorcycle to an absolute minimum.
- To ensure top quality typical of BMW .

Unique against the competition.
Over the years and decades, the principle of combining a straight-four power unit with an aluminium bridge frame has been consistently developed and has become the dominating technical concept particularly in the supersports segment. The reason, quite simply, is that a motorcycle of this kind offers significant benefits in terms of riding dynamics, long-distance endurance, and straightforward production.

Precisely this is why the new S 1000 RR also applies this concept with its proven fortes and advantages. But even while the S 1000 RR, in its concept teaming up a straight-four power unit and an aluminium bridge frame, may appear at first sight to have similarities with some competitors, the Development Team at BMW Motorrad has succeeded in enhancing the existing status of this concept in virtually every respect.

As a result, the S 1000 RR offers not only a wide range of USPs in terms of technology, performance, and design, but also, through its particularly compact overall layout, clearly demonstrates the high school of European engineering in the supersports four-cylinder segment.

Maximum performance and riding dynamics.
The consistent concept of the S 1000 RR supersports is borne out in particular by the truly fascinating, innovative high-performance technology and incomparable riding dynamics of this new machine. The result is an exceptional combination of supreme riding precision and agility, on the one hand, with unparalleled engine power and performance, on the other, providing an overall package truly unique in the market.

Never before has a BMW motorcycle been conceived and built more consistently for supersports riding in terms of its concept and overall construction. But at the same time the new S 1000 RR retains many of the virtues so typical of every BMW to this day: Extreme sportiness and riding dynamics combined with supreme everyday riding qualities, playful handling together with supreme riding stability, outstanding performance combined with unparalleled active safety, as well as dynamic, unmistakable design in conjunction with optimum ergonomics and aerodynamics.

Free choice of engine characteristics as well as Race ABS and DTC Dynamic Traction Control
The new S 1000 RR also excels through features and qualities typical of BMW such as a long running life, superior quality of production and optimum environmental compatibility thanks to the use of the most advanced exhaust management with two fully controlled three-way catalytic converters also able to fulfil future standards and requirements.

Active safety when braking is significantly enhanced by Race ABS developed especially for the S 1000 RR as a genuine supersports and available as an option straight from the factory. A further most significant feature likewise contributing to active safety of the highest standard is DTC Dynamic Traction Control also available as an option and masterminded electronically for supreme precision and practical value.

Facing various riding conditions such as wet roads (“Rain”), regular road conditions (“Sport”), a race track with supersport tyres (“Race”), or a race track with slicks (“Slick”), the rider also has the choice of various engine characteristics and set-ups available at the touch of a button. And last but not least, Race ABS and Dynamic Traction Control are combined with the respective riding modes and coordinated with one another to ensure a supreme standard of performance and safety all in one.

Valve drive like in a BMW Formula 1.
The primary objective in developing the new S 1000 RR was to create a super-sports with supreme engine power combined with optimum rideability for the highest conceivable standard of all-round performance.

The water-cooled four-cylinder inline power unit chosen to provide these qualities is brand-new from the ground up, developing maximum output of 142 kW (193 hp) at 13,000 rpm and revving up to a maximum speed of 14,200 rpm. Maximum torque of 112 Nm (82.5 lb-ft), in turn, comes at 9,750 rpm.

Following the example of BMW 's Formula 1 engines, the two intake and exhaust valves per cylinder made of extra-light titanium are operated by very small and equally light single cam followers. In conjunction with the short sprocket driving the camshaft via an intermediate gear, this ensures supreme revving qualities at the highest speeds as well as exact maintenance of valve timing combined with very compact dimensions.

The use of extremely small and light cam followers furthermore gives the engineer greater freedom in choosing the ideal valve lift curves and, accordingly, in selecting optimum performance characteristics on both road and track.

All engine components are particularly compact and light, limiting weight of the overall engine without ancillaries to 59.8 kg (131.8 lb) and keeping the entire power unit very slim and slender.

Innovative exhaust system with interference pipe butterflies for optimum power and performance.
Made completely of stainless steel, the exhaust system featured by the S 1000 RR is designed consistently for optimum power and performance. It works according to the 4-in-2-in-1 principle with four individual manifolds of equal length first merging into two pipes beneath the engine block and then extending into a large-volume pre-silencer. From there the exhaust emissions flow through a very short and dynamically designed rear-end silencer to the outside.

A homogeneous power and torque curve ensuring optimum rideability is acknowledged as the requirement for sporting performance on the road and fast lap times on the track. Precisely this is why the exhaust system featured on the S 1000 RR comes with two fully controlled interference pipe butterflies housed in two connection pipes for the two outer and two inner manifolds, in the immediate vicinity of the exhaust ducts. As a function of various parameters such as engine speed and the position of the throttle butterfly, an adjuster

opens or closes these flaps, allowing exhaust gas to flow freely between the two manifolds or, respectively, interrupting the flow of gas. This coordinates the sequence of oscillations in the exhaust gas mass flow, reducing exhaust gas counter-pressure at the decisive point (like on a racing muffler) and increasing the cylinder charge accordingly.

This factor alone makes a significant contribution to the very high standard of homogenous overall performance offered by the S 1000 RR.

Lightest supersports with ABS.
The new S 1000 RR offers the highest standard of technology also on its suspension and running gear. Weighing just 206.5 kg or 455.3 lb in road trim and with a full tank, BMW 's new supersports is by far the lightest machine of its calibre displacing 999 cc and featuring ABS brakes.

One of the features that ensures this light weight is the aluminium bridge frame integrating the engine tilted to the front at an angle of 32° as a load-bearing element for optimum torsional stiffness on minimum weight. The front wheel runs on an upside-down fork with a fixed tube measuring an ample 46 millimetres or 1.81" in diameter, while a torsionally stiff swing arm made of aluminium holds the rear wheel in position.

The spring and damping action required is provided by a central spring strut pivoting on a guide lever.

The rear frame section of the S 1000 RR is a welded light-alloy structure belted to the mainframe, combining low weight with superior stability and a high standard of robust strength particularly important to riders and teams on the race track.

Putting the rider right in the centre.
The rider's seating position leaning forward towards the front wheel for an active style of riding is simply ideal for the sporting rider with his particularly dynamic style.

Developing the S 1000 RR, BMW Motorrad has given particular attention to the superior ergonomics of the machine, providing ideal qualities for both small and tall riders and therefore focusing consistently on the rider's individual require-ments. The tank section is as slender as on a 600-cc machine, giving the rider the assurance of excellent control and handling at all times.

In the process of developing the S 1000 RR, BMW Motorrad focused not only on a lightweight structure, but also on minimum dimensions as an absolutely essential requirement. Cylinder bore of 80 millimetres or 3.15", for example, the largest bore in this segment, and the resulting width of the cylinder head, called for particularly attention on the part of the engineers in order to make the front silhouette of the S 1000 RR extremely slim and slender, on the one hand, while providing an efficient flow of cooling air, on the other.

Technical challenges of this kind as well as a development period of just four years made the S 1000 RR the ideal project for consistent, all-out use of CAD (Computer-Aided Design) technology as well as the most advanced calculation methods, for example for the machine's aerodynamics.

As the bottom line, the S 1000 RR is the absolutely ideal motorcycle for the customers of BMW Motorrad looking for new, unprecedented standards and qualities in the supersports segment.

Overview of technical highlights:

- Best-in-class performance and supreme riding dynamics in the supersports segment.

- Engine output 142 kW (193 hp) at 13,000 rpm, peak torque 112 Nm (82.5 lb-ft) at 9,750 rpm.

- Weighing 206.5 kg (455.3lb) in road trim and with a full tank, this is the lightest supersports in the 1000-cc class with ABS.

- Best power-to-weight ratio in this class of just 1.05 and, respectively, 1.06 kg (2.31 and, respectively, 2.34 lb) per horsepower without/with Race ABS.

- Optional Race ABS for outstanding brake performance and safety. Weight of the entire system just 2.5 kg (5.51 lb), while other systems of a similar kind weigh up to 10 kg.

- Optional DTC Dynamic Traction Control in conjunction with Race ABS for optimum performance and maximum active safety when accelerating.

- Only supersports machine with Race ABS and DTC Dynamic Traction Control.

- Various riding modes available at the touch of a button for wet surfaces, regular road requirements, race tracks with sports tyres and race tracks with slicks.

- All-round set-up, coordination and balance of Race ABS, DTC Dynamic Traction Control and engine management for all four riding modes.

- High-speed, extra-sturdy valve drive with individual cam followers and titanium valves following the example of BMW 's Formula 1 engines.

- Innovative exhaust system with a small and short rear-end muffler, pre-silencer and electronically controlled interference pipe flaps as well as a fully controlled exhaust gas manifold and two fully controlled three-way catalytic converters.

- Optimum gas dosage combined with maximum functional reliability ensured by E-gas (ride-by-wire), incorporating two bowden cables (opening and closing cable) leading to the throttle butterfly adjuster.

- Fulfilment of all environmental standards with the potential to meet future emission requirements ensured by two fully controlled catalytic converters and digital motor electronics.

- Damper elements with a wide range of adjustment on the spring base, the inbound and rebound stroke, as well as the greatest damping reserves, particularly for racing.

- New, clearly defined, simple and straightforward options to adjust the suspension and running gear.

- Aluminium tank unique in this segment for further reduction of overall weight.

- Supreme handling combined with best-in-class high speed and braking stability.

- Multi-functional instrument cluster with racing features such as a laptimer. The rider is able to set all functions directly from the ends of the handlebar.

- New generation of switches with optimised ergonomics.

- Supreme aerodynamics and sporting ergonomics ideal for both the tall and short rider.

- Optional HP Gearshift Assistant for shifting up without operating the clutch and without the slightest interruption of torque and pulling power.

- Wide range of equipment, special features and options tailored to the S 1000 RR and naturally offering full BMW quality.

2. Drivetrain.

High-output four-cylinder inline power unit for maximum performance.
As an absolutely new development from the ground up, the straight-four power unit featured in the S 1000 RR comes with displacement of 999 cc, with cylinder bore of 80 millimetres or 3.15" and stroke measuring 49.7 millimetres or 1.96". The particularly short stroke/bore ratio of just 0.621 provides the foundation for an absolutely outstanding high-output power unit with supreme performance at all times.

Maximum output is 142 kW (193 hp) at 13,000 rpm, peak torque is 112 Nm (82.5 lb-ft) at 9,750 rpm. So again, the power unit of the S 1000 RR sets new record standards in the supersports 1000-cc class also in this respect.

Optimum riding dynamics and supersports features combined with optimum rideability and compact dimensions together with minimum weight were the primary targets in developing the new drivetrain. And with its engine weighing just 59.8 kg or 131.8 lb, the S 1000 RR boasts the lightest 1000-cc four-cylinder in its entire segment.

Like all engines from BMW Motorrad, the power unit featured in the S 1000 RR excels through its supreme overall concept as well as the space-saving arrangement of all ancillaries and the integrated six-speed gearbox with its dog-type gearshift. Following the brief to build a thoroughbred supersports power unit, the engineers at BMW Motorrad have created a particularly compact engine with ideal concentration of masses around the machine's overall centre of gravity. Despite the large cylinder bore of 80 millimetres or 3.15", engine width at crankshaft level is only 463 millimetres or 18.23". And at 558 millimetres or 22.0", the engine is also very low in terms of its overall height.

The cylinder axis on the S 1000 RR power unit is tilted 32° to the front, providing an optimum centre of gravity as well as the front wheel-oriented weight distribution so essential on a supersports machine, with absolutely precise riding control and maximum clarity in terms of feedback from the front section.

The new straight-four on the S 1000 RR again lives up to the consistent principle of BMW Motorrad maintained over a period of no less than 85 years and applied throughout 25 years of four-cylinder development to provide superior and unique technical standards going far beyond the usual level of technology.

Largest cylinder bore in the segment measuring 80 millimetres or 3.15".
The crankshaft on the S 1000 RR is forged out of one single piece of heat-treated steel, runs in anti-friction bearings and comes with the traditional crank angle of 180° for a consistent firing distance at all times. Both the main and the conrod bearing journals measure 34 millimetres or 1.34" in diameter.

Running in anti-friction bearings, the connecting rods are forged out of extra-light heat-treated steel. Measuring 103 millimetres or 4.06" in length, they help to keep the engine low and compact, saving space and lowering the centre of gravity even further, with lateral forces on the pistons remaining within reasonable limits and the engine running smoothly and consistently under all conditions.

Together with their anti-friction bearings, the connecting rods weigh just 334 grams. The upper conrod opening comes without a bearing bush and measures 17 millimetres or 0.67" in diameter. Two lubrication openings in the upper eye of the conrod and positioned at an angle of 45° to the vertical axis of the rod ensure a reliable supply of oil to the piston pin bearings at all times.

The connecting rods are split horizontally by the proven cracking method, with the large conrod opening being cracked exactly as required on its centre level by a sudden pulling force applied hydraulically. The fracture formed in this way ensures extremely precise subsequent assembly without any further centring of the components being required.

The cylinder liners with their nikasil coating incorporate forged lightweight box pistons measuring 80 millimetres or 3.15" in diameter and featuring a very short piston skirt. Further highlights are the two narrow piston rings optimised for minimum friction and a three-piece oil scavenger ring.

Through their low and dynamic design and configuration, the combustion chambers, piston base and valve pockets make the entire combustion process very smooth and efficient in thermodynamic terms, with the contours of the piston base being optimised for minimum weight. The pistons themselves, together with their bolts and rings, weigh just 253 grams each.

To remove and dissipate heat, the pistons are cooled at the bottom under high thermal loads by oil injection nozzles in the crankcase. This ensures supreme reliability even under extreme running conditions and extends the overall running life of the pistons.

Ultra-compact, extra-stiff cylinder crankcase unit.
Split horizontally down the middle of the crankshaft, the cylinder crankcase is made of extra-strong aluminium alloys. The compact die-cast upper section forms an extra-stiff combination with the four cylinders and the upper bearing mounts for the crankshaft. The upper half of the crankcase also takes up the light and compact six-speed gearbox.

Together with its all-round coolant shell, the cylinder block is designed for maximum stiffness in closed-deck configuration and the cylinder liners come with a wear-proof, low-friction nikasil coating.

The lower section likewise die-cast forms the counter-piece for the main crankshaft bearing as well as the bearing on the gearbox drive shaft.

Cylinder head and cam follower valve drive based on BMW Formula 1 technology.
Overall output, performance characteristics, the quality of the combustion process and fuel consumption depend largely on the cylinder head and valve drive. In its design and overall configuration, the four-valve cylinder head featured on the S 1000 RR thus offers ideal duct geometry, compact dimensions, optimum thermodynamics, and an efficient heat balance. The narrow valve angles help to provide ideal intake ducts as well as a compact combustion chamber for high compression and optimum all-round efficiency.

Seeking to achieve maximum power and supreme running smoothness even at very high speeds while at the same time offering a very stiff structure, keeping moving masses to a minimum and optimising the timing overlap on the valves, the S 1000 RR comes with cam follower control on all moving valve components, with the cylinder head very compact in design, particularly in terms of its height.

Valve play is compensated by means of very small and light adjustment platelets running on the spring plates. On the intake side the spring plates are made of an extra-light aluminium-fibre material.

The moving masses of the cam followers featured on the S 1000 RR are approximately 50 per cent lower than with comparable cup tappets. Such reduction of oscillating masses to an absolute minimum allows fast valve acceleration for a power-oriented cam profile and a high level of free valve cross-sections.

This is also why the cam followers on the S 1000 RR are extremely short and light in their structure and configuration.

A further particular highlight in the design of the cylinder head is the arrangement of the cam follower axes, with both the intake and the exhaust cam followers facing to the rear in the direction of travel. This keeps the cylinder head even more slender as on the usual arrangement with the bearing shafts at the outside.

Tight valve angle and light titanium valves.
The valve angle is 11.2° on the intake side and 13.3° on the exhaust. The two camshafts made of heat-treated steel and arranged directly above the valves are driven by a toothed chain running on a secondary gear shaft just above the crankshaft. The intermediate gear used in this configuration helps to keep the toothed chain driving the camshafts shorter than would otherwise be the case, ensuring even greater precision in valve timing and keeping the engine slimmer on the level of the crankshaft.

The intermediate gear transmission also helps to keep the two drive wheels on the crankshafts very short, with the overall layout of the cylinder head remaining very compact.

Optimised valve springs as well as a hydraulic tightening mechanism for minimum friction serve, finally, to minimise both running and drag forces, enhancing the standard of power and performance once again.

Made of extra-light titanium, the intake and exhaust valves are operated by very small and light individual cam followers. The overall geometric layout of the cylinder head allows an ideal transmission ratio on the cam followers of approximately 1:1, reducing flexural forces and bending to an absolute minimum and therefore serving to keep the arms very light and almost filigree in their construction.

Use of such extremely small and light cam followers offers utmost freedom in choosing the optimum valve lift curves and, therefore, the very best power and performance characteristics both for the road and the race track.

Largest valve plate diameter in this segment.
The rev limit on the production version of the S 1000 RR is 14,200 rpm, while in purely mechanical terms the engine could run much faster.

Thanks to the large cylinder bore of 80 millimetres or 3.15", valve plate diameter is larger than on all other engines in this segment, providing the ideal basis for maximum output and performance: Valve plate diameter on the intake side is 33.5 millimetres or 1.32" and 27.2 millimetres or 1.07" on the exhaust side, setting a new record in the supersports 1000-cc segment in the interest of a maximum cylinder charge and an optimum charge cycle.

The valve shafts, in turn, measure 5 millimetres or 0.197" in diameter.

The intake ducts are machined asymmetrically at the transition point leading to the valve seat rings in order to improve the flow of gas and optimise the cylinder charge for even more power at high engine speeds.

The low and flat design of the combustion chamber guarantees a very high level of geometric compression with a thermodynamically optimised cylinder base largely smooth from one side to the other.

With its compression ratio of 13:1, the power unit of the S 1000 RR comes right at the top in terms of production engines, offering an ideal combustion process for optimum power yield and maximum efficiency.

Proven and compact wet sump lubrication.
The lubricating system on the S 1000 RR is a proven wet sump system using an Eaton oil pump.

Oil is cooled not by a heat exchanger, but rather by a separate oil cooler integrated beneath the radiator in the lower section of the fairing for superior flow conditions and aerodynamic qualities. Use of an oil cooler prevents any undesired, additional thermal exposure of the coolant and therefore allows the use of a smaller and lighter radiator reducing the amount of coolant required.

The oil level is checked in a very practical and simple manner by means of an inspection glass on the left side of the engine beneath the alternator cover. Engine oil capacity is 3.9 litres or 0.86 imp gals including the filter.

Perfect cooling concept for optimum flow conditions, good thermal balance and low weight.

An innovative cooling concept gives the power unit of the S 1000 RR an optimum thermal balance at all times: The coolant flows through the cylinder head in crosswise direction, the appropriately cooled coolant flowing into the cylinder head on the right-hand side, that is on the hotter exhaust section. So precisely where the temperatures are highest, intense cooling on the cylinder head ensures a fast flow of coolant and, accordingly, an optimum temperature balance for optimum power and performance.

Fitted on the right-hand side of the engine, the coolant pump, like the oil pump, is driven by a single roller chain running on the gearbox drive shaft. The amount of coolant (50 per cent water, 50 per cent anti-freeze) required is only 2.9 litres or 0.64 imp gals.

The radiator is in bent trapezoidal design and is fitted upfront of the engine beneath the cylinder head to provide optimum balance and superior aerodynamic flow conditions. Thanks to its high standard of efficiency as well as elaborate tests in the wind tunnel to optimise the fairing and flow conditions in terms of aerodynamics, the cooling surface required is relatively small at just 955 sq cm, sufficient to ensure reliable dissipation of heat under all conditions.

To provide an optimum flow of air to the radiator, BMW Motorrad has developed a patented air guidance concept ensuring maximum efficiency in the removal and dissipation of heat. In all, therefore, an elaborately calculated aerodynamic concept developed in the wind tunnel interacts perfectly with optimum removal of outgoing air from the fairing.

The engine spoiler helps to provide a sophisticated, highly aerodynamic flow of air effectively cooling both the oil sump and the manifolds.

Light and compact ancillary units.

Minimum width, compact and, above all, light structures were the essential points also in the design and arrangement of the electrical ancillaries on the engine and their drive systems. The alternator featuring a permanent magnet, for example, is fitted on the left end of the crankshaft, generating 434 W at 6,000 rpm and configured for a maximum speed of 16,000 rpm.

The layshaft starter arranged on the left of the upper half of the engine block behind the cylinders generates maximum output of 800 W and weighs 1,050 grams. The starter is connected to the engine by a free-wheel and acts at a transmission ratio of 1:24.61 on the outer left crankweb designed as a spur gear. To keep weight to a minimum, the left-hand side cover on the alternator and starter is made of extra-light magnesium.

Multi-disc anti-hopping oil bath clutch, six-speed gearbox and HP gearshift assistant (optional).
Torque is transmitted from the crankshaft via a straight-toothed primary drive at a ratio of 1:1.652 to the anti-hopping wet clutch with a total of ten friction plates (diameter 132.4 mm or 5.22").

Applying the anti-hopping principle, BMW Motorrad meets all the requirements of supersports riding, particularly on the race track. The braking power of the engine in overrun is transmitted to the rear wheel by the clutch only in part, that is only to a limited extent. When braking hard and shifting down at the same time, this prevents the rear wheel suddenly running under much less load due to the dynamic distribution of wheel loads from abruptly locking and juddering, keeping the motorcycle smooth, stable, and easy to handle also when applying the brakes.

The clutch is disengaged in overrun mechanically by a ramp mechanism, with clutch operation via a hand lever and with maximum manual forces limited to 80 Newton. The operating forces generated are transmitted via a cable to the disengagement lever on the left side of the engine and from there through a thrust rod to the clutch pressure plate.

This saves substantial weight compared with hydraulic operation of the clutch, just as the clutch cover made of extra-light magnesium serves to reduce weight to a minimum, again reflecting one of the most significant objectives in the design process.

The dog-shift six-speed gearbox is very compact and light. The individual gears are shifted by a light, composite steel shift cylinder and shift forks resting on three points.

To keep the gearbox and transmission system as compact and short as possible, the primary and secondary shafts are positioned on top of one another, thus saving a lot of space. Again, this reduces the overall length of the engine and allows the use of a long rear-wheel swing arm in the interest of optimum traction.

Kept hollow in its structure again in the interest of minimum weight, the gearshift cylinder runs in anti-friction bearings. The shift forks are made of steel and are lubricated by compressed oil. The gears themselves come with straight teeth, the gear claws and pockets being cut back within to ensure optimum gear mesh. The transmission of power to the rear wheel, finally, is ensured by a 525 O-ring roller chain on the left side of the engine.

The S 1000 RR offers the customer the option to choose the HP Gearshift Assistant featured for the first time on the HP2 Sport, thus enabling him to shift up without operating the clutch and therefore with hardly the slightest interruption of power and pulling force. In the process the ignition and fuel supply are interrupted for fractions of a second in order to keep the gearshift absolutely smooth and even very soft. The advantage, obviously, is even faster acceleration, with the rider gaining valuable fractions of a second.

The optional HP Gearshift Assistant may be combidrivetrainned with sports footrests available as special equipment.

Engine management with cylinder-specific anti-knock control for maximum power and performance.
The S 1000 RR comes with the most advanced and sophisticated digital motor electronics currently available on a motorcycle. The software incorporated in this sophisticated BMS-KP (short for BMW Engine Management with Anti-Knock Control) is an in-house development by BMW Motorrad specifically for motorcycle applications. Fully sequential, cylinder-specific fuel injection, integrated anti-knock control, ultra-fast processing of a wide range of sensor signals by the most advanced microelectronics, a compact layout, low weight and self-diagnosis are the most important features of this sophisticated system. And to meet the requirements of a supersports machine, the engine management unit comes on the S 1000 RR with an even faster central computer developed to an even higher standard and fully adapted to this unique machine.

Torque-based engine management takes a wide range of different parameters and criteria into account. The supply of torque and the sensitive adjustment of engine running conditions, for example, follow all kinds of requirements tailored to the rider's needs.

The main parameter in controlling the engine is the amount of air drawn in determined indirectly through the throttle butterfly angle and the running speed of the engine. Taking additional engine and ambient parameters (including engine temperature, air temperature, ambient air pressure) into account, the engine control unit, together with control maps integrated in the system and appropriate correction functions, determines the ideal injection volume and ignition timing.

Fuel grade is premium unleaded, that is at least 95 octane. And thanks to cylinder-specific anti-knock control, the power and performance of the engine may be raised to an even higher standard when running on higher-octane fuel.

Variable intake manifold length for an optimum torque curve and maximum power.
Fuel injection is fully sequential, meaning that fuel is injected individually in accordance with the intake stroke of the respective cylinder into the intake duct. To improve the torque curve, the S 1000 RR comes with highly elaborate intake manifolds varying in length according to current requirements: Depending on engine speed an adjuster motor fitted on the airbox varies the length of the intake manifolds through map control in two stages.

Serving to provide an optimum cylinder charge, the appropriate amount of fuel is fed into the engine at all times through four injection jets each on the throttle butterfly rail and above the intake manifold. Depending on engine speed and the power required, the injection jets are controlled either separately or together in one process.

Variable pressure control for an ideal supply of fuel.
Instead of a reflow pipe, the fuel supply system uses variable pressure control to deliver only as much fuel as the engine really requires at any given point in time. This sophisticated fuel supply management allows virtually any change or modification of fuel supply pressure for optimum fuel/air mixture formation ensured by operating the electrical and, for the first time, fully controlled fuel pump at a high pressure of 3–5 bar.

Such adjustment of fuel pressure as a function of current operating conditions is quite unique in the supersports segment.

The fuel/air mixture is controlled for environmental purposes by means of two oxygen sensors fitted at the junction points on the exhaust manifolds to precisely monitor the composition of exhaust gas.

The BMS-KP (BMW Engine Management with Anti-Knock Control) management unit on the S 1000 RR integrates the automatic idle control and cold start enrichment functions by way of electronically controlled throttle butterflies. Idle speed is automatically raised whenever required while warming up by increasing the level of engine speed by way of the engine management.

E-gas for optimum response and precise gas dosage.
The throttle butterflies measuring 48 millimetres or 1.89" in diameter are controlled by an electric motor forming an E-gas or ride-by-wire system. In this process the rider's commands are transmitted to a sensor from the cable on the gas handle.

All-electronic engine management then converts the rider's commands into an appropriate torque signal, with the throttle butterfly controlled electronically. With all torque factors being taken into account in this way, the system ensures optimum rideability under virtually all conditions until the traction control intervenes.

The E-gas system uses the three-level monitoring concept already proven in its qualities on BMW cars. As an additional feature, the S 1000 RR comes with a mechanical link connecting the cable to the electronic control unit and enabling the rider to close the throttle butterfly under all conditions.

Intake manifold with optimum air supply for the best cylinder charge.
The engineers at BMW Motorrad have used virtually every millimetre on the S 1000 RR to make the intake system as large as possible, giving it maximum volume. The airbox with its pure air capacity of 7.9 litres, for example, is directly above the engine and is likewise designed for maximum power and torque all in one.

Air intake is at the central point with maximum ram pressure on the upper section of the fairing between the two headlights. From there intake air flows on an ideal straight path through an air duct to the steering head shaft right and left, past the steering head, directly into the airbox and from there to the vertically arranged plate air filter.

While other manufacturers in the supersports segment all use a lying or horizontal plate air filter, the disadvantage in that case is that the flow of air has to be diverted. The S 1000 RR avoids such unfavourable diversion of intake air, with the air duct leading from the air intake opening to the steering head shaft serving at the same time as the support for the instrument cluster, rear-view

mirrors, headlights and horn. And made of extra-light pressure-cast magnesium, this component not only saves the need for separate supports, but also reduces weight to a minimum.

The air inlet in the upper section of the fairing uses the ram-air effect almost perfectly through its position, supporting the air supply process very efficiently at high speeds, with up to 30 mbar overpressure in the airbox, depending on the current speed of the machine.

At a speed of 250 km/h or 155 mph, for example, this means an extra 4 kW engine output. This is superior to all competitors in this segment and again clearly underlines the quality of airflow in and from the airbox and, quite generally, the supply of air to the engine in the S 1000 RR.

Innovative high-performance exhaust system with interference pipe butterflies.
The exhaust system on the S 1000 RR is likewise built for maximum performance. For this reason, to save weight and to centralise all masses, the development engineers at BMW Motorrad decided to fit the exhaust system beneath the engine, instead of choosing an under-seat solution.

The four individual manifolds of equal length first merge beneath the engine block into two pipes (4-in-2-in-1 principle) and then come together in an extra-large pre-silencer with three chambers working according to the reflection principle. From there the flow of exhaust gas goes out through a short, light and very dynamic absorption rear muffler.

Both the outer skin and the interior of the complete system are made of top-quality stainless steel.

To achieve optimum rideability as the prerequisite for sporting and dynamic performance on the road and fast laps on the track, a homogeneous power and torque curve is absolutely essential. The exhaust system on the S 1000 RR therefore comes with two interference- type butterflies within two connection tubes linking the two outer and the two inner manifolds in the immediate vicinity of the exhaust ducts. Depending on various engine map parameters such as engine speed and the position of the throttle butterfly, an actuator opens and closes both of these flaps, opening or, respectively, interrupting the connection between the two manifolds.

This coordinates oscillations in the flow of exhaust masses in order to reduce exhaust gas counter-pressure at exactly the right point (like in a racing muffler) and increase the cylinder charge accordingly.

This technology never seen before on a production motorcycle makes a significant contribution to the homogenous and "beefy" power and performance characteristics of the engine, ensuring very good torque and boosting the overall performance of the S 1000 RR to an even higher level.

The two metal-based catalytic converters with cell density of 100 cells/sq inch are fitted in the pre-silencers upfront of the manifold entry point. They come complete with a rhodium/palladium coating combining high temperature resistance with a long running life.

Small and light rear muffler thanks to the exhaust manifold.
Maintenance of the strictest noise and emission limits despite supreme engine power is ensured on the S 1000 RR by features such as an electronically controlled exhaust flap positioned upstream of the rear-end muffler, opening up the exhaust pipe to its optimum cross-section as a function of increasing engine speed. Varied in this way, the exhaust pipe cross-section provides a deep engine rumble at lower to medium engine speeds, while the larger cross-section opening up at higher speeds ensures maximum output and a very sporting sound.

The very small and compact rear-end silencer accentuates the slender look of the S 1000 RR and enables the rider to lean over to a very low angle in bends. So here again, the rear silencer helps to ensure not only a sporting and powerful sound, but also truly impressive output and performance on road and track.

Made of top-quality stainless steel, the complete exhaust system weighs a mere 10.7 kg or 23.6 lb. At the same time this is the most compact exhaust system with fully controlled emission management in this entire segment.

As an option the S 1000 RR is available with a very light slip-on muffler made of titanium and with a carbon trim cover at the rear. The supplier of this special muffler in its very sporting and dynamic design is Akrapović® .

Free choice of “Rain”, “Sport”, “Race” and “Slick” riding modes for optimum adjustment to road and track conditions.

At the simple touch of a button at the end of the right handlebar, the rider is able to choose among various riding modes for all kinds of different conditions and requirements such as riding on the road, on a wet surface, or the race track. To make his choice, all the rider has to do is press the Mode Switch on the right handlebar control unit until the display in the instrument cluster reaches the mode desired. Then, pulling the clutch lever and turning the gas handle to idle, the driver is able to confirm his request also while riding and the mode is switched accordingly.

The mode last chosen is always retained when re-starting the motorcycle.

When riding on a wet surface with reduced grip, the Rain Mode automatically reduces maximum output to 110 kW (150 hp). This mode also provides a particularly homogenous power and torque curve, with engine response and power build-up by the engine being extra-smooth and soft.

When riding on a dry surface the Sport Mode provides full engine output of 142 kW (193 hp) in combination with even more spontaneous and direct response to the gas lever. This mode is intended above all for use on country roads.

The Race Mode has been developed specifically for racing the S 1000 RR on race tracks using street-legal supersports tyres. Here again the rider benefits from the full power of the engine, with an even more direct and significantly more dynamic response at all speeds.

The Slick Mode is intended exclusively for racing on the track using slick tyres. Like the Race Mode, this mode not only provides full engine power, but also ensures maximum engine response for racing or riding under race-like conditions. Contrary to the Race Mode, the Slick Mode allows DTC Dynamic Traction Control to cut in permanently only from a side angle of 200. This, in turn, allows the rider to wheelie for up to five seconds when leaning over to an angle of less than 200, ensuring optimum acceleration and pulling force when accelerating out of a bend.

While the three modes Rain, Sport, and Race are activated by the rider directly from the end of the handlebar, the Slick Mode comes with an activation lock function provided by a code plug for the control unit beneath the rider’s seat of the S 1000 RR.

The rider is therefore required to first insert this plug before activating the Slick Mode, since apart from activating the even more dynamic engine set-up he also in this way activates different ABS and Traction Control settings for driving to the absolute limit on slick tyres. In this setting DTC is no longer suitable for surfaces with an extremely low frictional coefficient such as wet cobblestone or loose gravel.

Race ABS and DTC Dynamic Traction Control are combined individually with the various riding modes, thus harmonising perfectly with one another for maximum riding safety.

When required, the rider is able to deactivate the Race ABS and DTC Dynamic Traction Control functions separately from one another.

DTC Dynamic Traction Control for even greater safety when accelerating.

As an option available straight from the factory, the S 1000 RR comes with DTC Dynamic Traction Control reflecting the truly outstanding performance, riding dynamics, and supersports character of this new machine.

DTC Dynamic Traction Control is a development from motorsport featured, for example, on the Superbike racing version of the S 1000 RR in the World Superbike Championship. This important feature makes a significant contribution to the truly impressive overall performance and outstanding riding safety of the S 1000 RR.

Particularly under changing riding conditions, on slippery surfaces and with sudden changes in the frictional coefficient on the surface, BMW Motorrad's new DTC Dynamic Traction Control offers the rider significant support and assistance. This advanced system largely suppresses any undesired slip on the rear wheel when accelerating and, therefore, avoids the otherwise inevitable loss of lateral stability causing the rear wheel to break loose and, should the worst come to the worst, leading to an accident.

Using the ABS sensors to compare the running speed of the front and rear wheels as well as data supplied by the side angle sensor, the electronic control unit recognises whether the rear wheel is spinning and reduces engine power accordingly by taking back the ignition angle and intervening in the throttle butterfly position by way of engine management.

Unlike the former ASC systems used by BMW Motorrad, DTC Dynamic Traction Control therefore also determines the side angle of the motorcycle by way of an elaborate system of sensors, taking also this data into account whenever active.

Like BMW Motorrad Race ABS also available as a new feature, DTC Dynamic Traction Control is combined in each case individually with the engine management modes available.

In the Rain Mode for riding on a wet surface, traction control cuts in at a very early point before reaching the friction limit on the tyres, thus offering the rider maximum riding safety combined with significant riding pleasure even under difficult conditions.

In the Sport Mode, that is when riding on a dry road and, in particular, on cross-country routes, traction control cuts in a lot later, since here the tyres have a much better frictional coefficient on the surface. Under these conditions, DTC Dynamic Traction Control therefore allows the rider to accelerate safely but dynamically out of a bend, enjoying maximum riding pleasure on public roads.

In the Race Mode DTC Dynamic Traction Control goes much further to the extreme, allowing a very sporting style of riding on the race track with street-legal sports tyres.

In the Slick Mode DTC Dynamic Traction Control is again set up perfectly for the race track, but now considers the much greater grip provided by slicks and enables the rider to choose all-out racing performance.

Although DTC Dynamic Traction Control offers the rider valuable support and therefore represents a very significant safety factor when accelerating, it is obviously not able – just like Race ABS – to re-define, let alone change, the limits and laws of riding physics. In other words, the rider may still exceed these limits on account of misjudgment or a riding error, which in an extreme case may lead to an accident.

DTC Dynamic Traction Control does however help the rider to capitalise on the dynamic performance of the S 1000 RR much more safely and much closer to the limits of riding physics. And last but not least, the rider may also switch off DTC Dynamic Traction Control via a separate button if he wishes.

3. Suspension and Running Gear.

Innovative suspension technology for supersports performance of the highest standard.
Through its consistent concept, the S 1000 RR, as a genuine supersports machine, offers not only the most outstanding drivetrain technology for optimum performance at all times, but also comes with truly exceptional riding precision ensuring unparalleled riding dynamics and almost playful agility. So the suspension and running gear of the S 1000 RR likewise offers the highest standard of excellence and sporting performance.

The “heart” of the suspension is the aluminium bridge frame weighing just 11.98 kg or 26.42 lb, tilting the engine to the front at an angle of 32° as a load-bearing element.

While this type of frame is already state-of-the-art in large sectors of the supersports segment, the engineers at BMW Motorrad, in developing the S 1000 RR, focused consistently throughout the entire process on the need for maximum riding dynamics. And particularly through their close communication and cooperation with the departments responsible for drivetrain development and design, they ultimately created a suspension and running gear setting new standards in many respects.

Lightest supersports in the 1000-cc class with ABS.
Weighing just 206.5 kg or 455.3 lb in road trim and with a full tank, the new S 1000 RR is the lightest supersports with an engine capacity of 999 cc and Race ABS. But this alone is not sufficient to explain the outstanding handling qualities of the S 1000 RR quite in every respect. Rather, it is particularly the machine’s ideal centre of gravity carefully set-up in elaborate tests as well as the geometry of the running gear that makes handling of this kind possible in the first place. The steering head angle of 66.1°, for example, is very steep, wheel castor of 95.9 millimetres or 3.776" is appropriately short.

In the process of determining the ideal stiffness of the frame combined with minimum weight, BMW Motorrad – like in nearly all calculations and developments for the new S 1000 RR – focused consistently on computer models, simulations, CAD technology, and countless riding tests.

In conjunction with optimum ergonomics, the slender structure of the motorcycle also helps to provide a particularly good and safe riding experience as well as very smooth and easy handling.

Aluminium bridge frame with the engine serving as a load-bearing element.
The result of this development process is an aluminium bridge frame made up of four castings. This particularly configuration serves above all to meet the great challenges in designing a motorcycle with a very slim waist and a large airbox. The spread of stiffness values follows a wide range of calculations and simulations as well as many riding tests taking all kinds of variants into account.

The steering head and the two side sections with their integrated engine mounts are manufactured in a tip casting process, while the rear section with the rear engine mount, the swing arm supports as well as the mounting points for the footrests and kinematic elements are made in a low-pressure die-casting process. A high-precision welding robot then assembles the individual components in the Aluminium Competence Centre at BMW Motorrad's Berlin Plant to form an extra-stiff and sturdy unit all round.

The rear frame section on the S 1000 RR is a welded structure made up of square aluminium profiles bolted on to the frame. Again, this combines low weight with superior stability and robust strength appreciated particularly by competition riders and teams on the race track. A further advantage of this configuration is that it allows optimum access to the spring strut, for example when changing the set-up for specific requirements.

Long rear-wheel double swing arm for optimum traction.
Consistently seeking to give the S 1000 RR optimum performance in every respect, the development team at BMW Motorrad, in developing the suspension and running gear, concentrated in particular on the mechanical grip of the wheels and, accordingly, on the overall need for supreme traction. These requirements are fulfilled above all by the long rear-wheel swing arm helping to reduce lift-up and wheel relief forces on the rear wheel thanks to the drive and thrust forces conveyed by the upper and lower chain element. In practice this means optimum transmission of drive power, superior performance and a smooth and reliable response at the rear particularly while accelerating, with substantial advantages for the rider.

With its effective overall length between the swing arm rotation point and the rear wheel axle of 593 millimetres or 23.35", the S 1000 RR comes with one of the longest swing arms in the supersports segment. The swing arm mount in the frame also helps to promote supersports performance, particularly on the race track, with the inserts for the swing arm mounts in the frame serving to vary the height of the swing arm rotation point and, accordingly, the anti-squat effect when accelerating, thus meeting the rider's personal requirements and the particular requirements of a specific race track or stretch of road.

For reasons of weight and to ensure maximum torsional stiffness, the configuration chosen is a double swing arm made of deep-drawn aluminium plates with particularly thin walls as well as a cast dish at the bottom. This cast dish houses all components subject to high mechanical loads such as the kinematic pivot and junction points, the swing arm mount, and the rear wheel support. A further advantage of the cast dish at the bottom is the reduction of tolerances in production to an absolute minimum on all of these kinematically relevant points.

Together with the cast dish, three separate components made of deep-drawn aluminium plates with wall thickness of just 2.5 millimetres or 0.098" form a torsionally stiff and very light swing arm body weighing just 6.22 kg or 13.72 lb. On the left-hand side the drive chain runs through the swing arm in a shaft.

The wide range of adjustment on the rear axle support of 45 millimetres or 1.77" provides the option to change the position of the rear axle, moving forward by up to 17.5 millimetres or 0.69" and backward by up to 27.5 millimetres or 1.08", depending on whether the rider is looking for a reduced wheelie effect (adjustment to the rear) or more traction (adjustment to the front).

Wheelbase thus varies from 1,414.5 millimetres or 55.69" to 1.459.5 millimetres or 57.46", with the standard wheelbase under DIN unladen weight measuring 1.432 millimetres or 56.38".

Fully adjustable spring elements with very high damping reserves.
Seeking to give the new S 1000 RR optimum suspension qualities with perfect running gear, the engineers and specialists at BMW Motorrad decided to give the new machine a central spring strut with an adjustable spring base as well as adjustable damper inbound and rebound control. A further advantage is that this configuration allows the adjustment of low-speed damping (for example on long, stretched-out undulating surfaces) and high-speed damping (eg on short bumps) on the pressure stage (inbound), thus offering perfect set-up qualities with maximum precision.

The spring strut is activated by compact and light kinematic levers and makes allowance for the wide range of use also on the race track by offering a wide range of adjustment as well as very substantial damping reserves.

Overall spring travel on the rear wheel axle is 130 millimetres or 5.12", with 90 millimetres or 3.54" positive and 40 millimetres or 1.57" negative spring travel.

Using eccentric inserts on the upper spring strut support, the rider is able to raise the entire rear end of the S 1000 RR by 10 millimetres or 0.39" on the spring strut support, thus taking his individual requirements and the specific character of the respective route into account.

The S 1000 RR meets equally high demands in terms of riding dynamics also on the front suspension. The configuration used up front is an upside-down fork with its fixed tube measuring an ample 46 millimetres or 1.81" in diameter. This size alone is quite unique in the supersports segment, offering far greater braking stability and better feedback than the usual fixed tubes measuring 43 millimetres or 1.69" in diameter.

The fixed tube is mounted on the steering head by a light aluminium steering shaft tube running in two extra-large ball bearings as well as two fork bridges made of forged aluminium in the interest of minimum weight. To adjust the height of the motorcycle at the front to the personal needs and preferences of the rider as well as the route he is taking, the immersion tube at the front provides an appropriate overlap, overall adjustment travel of 15 millimetres or 0.59" allowing the front end to be lowered by up to 5 millimetres or 0.197" and raised by up to 10 millimetres or 0.394".

The upside-down fork comes with cartridge inserts inside, that is a separate hydraulic piston cylinder system, and allows adjustment of both the spring base as well as damper rebound and inbound action. Here again, the sensitive behaviour and response of the suspension, the wide range of adjustment and very significant damping reserves even on the race track offer superior flexibility and individual choice. Overall spring travel is 120 millimetres or 4.72", with 75 millimetres or 2.95" positive and 45 millimetres or 1.77" negative spring travel.

To allow simple and reliable control at all times, the individual settings on both the spring strut and the upside-down fork are clearly specified by numbers ranging from 1 to 10. So there is no need to count up to 30 clicks in the usual tedious process required on some other models in this segment.

A further advantage is that both the inbound and rebound stages are colour-marked, again – like many other features – confirming the very practical approach taken by the development engineers at BMW Motorrad.

Very light and extra-stiff aluminium wheels.
Designed and configured from the outset as a supersports machine offering supreme performance, the new S 1000 RR obviously also comes with appropriate wheels. These are filigree ten-spoke pressure-cast aluminium wheels in truly dynamic design offering optimum qualities in every respect.

Once again, one of the primary objectives in developing the wheels was to reduce weight to an absolute minimum while retaining a supreme standard of all-round strength and stability. Precisely this is why the brake discs do not come with a separate mount and the additional bolts which would be required for this purpose – instead, the brake disc rings are fitted directly around the wheel hubs. This alone and the particular construction of the wheels makes the wheels on the S 1000 RR the lightest in their segment.

On the front wheel the brake discs are connected directly to an extra-strong wheel star, without any additional mounting or attachment elements. The five radial arms of the star extending out of the hub form individual forks supporting the rim consistently by means of ten cast spokes.

This fork configuration gives the front wheel excellent radial stability in shape also under high wheel loads and at the same time caters for the significant circumferential forces acting on the wheel above all when applying the brakes.

This design of the wheel tailored to load conditions and requirements helps to keep the spokes very filigree and light, not only reducing the weight of the wheel, but also providing a very light and transparent look.

Drive and thrust forces are transmitted on the rear chain by means of an integrated thrust damper. Tyre dimensions of 120/70 ZR 17 at the front and, respectively, 190/55 ZR 17 at the rear represent the latest state of the art in the supersports segment.

Radial brakes for excellent stopping power.
The brake system on the new S 1000 RR lives up to the high standard of performance on the drivetrain and suspension in every respect. Here again, therefore, the development specialists at BMW Motorrad have given utmost attention to meeting all the demands and wishes of the most discerning supersports customers.

To fulfil these requirements, the front wheel comes with a double disc brake incorporating two steel brake discs in floating arrangement and measuring 320 millimetres or 12.60" in diameter and 5 millimetres or 0.197" across.

The hydraulic system incorporates a radial master cylinder with its master piston measuring 19.05 millimetres or 0.75" in diameter as well as two radially mounted four-piston fixed-calliper brakes from Brembo with brake pistons 34 millimetres or 1.34" in diameter and split friction pads made of sintered metal.

Brake lines in steel tissue cladding and therefore very strong and stable serve to convey the brake forces exerted by the rider with his hand in an optimum, smooth and absolutely reliable process.

The entire brake system on the S 1000 RR stands out, as a result, through its crystal-clear pressure point, optimum brake efficiency and clear dosage of brake power with maximum resistance to fading and high temperatures not only on the road, but also and in particular on the track.

The rear wheel comes with a hydraulically operated single-disc brake supporting the brake at the front. Diameter of the steel brake disc fitted firmly in position is 220 millimetres or 8.66", disc thickness is 5 millimetres or 0.197".

The rear-wheel brake is operated by the footbrake lever acting on the 12.7-millimetre (0.50") master piston in the main brake cylinder and from there, via the pressure-stable, steel-clad brake line, on an extra-light single-piston floating calliper likewise featuring sintered metal pads.

Race ABS with four pressure sensors for extra-precise control and dosage.
BMW Motorrad Race ABS specifically developed for supersports requirements and available as an option straight from the factory ensures maximum active safety when braking, again making allowance for the outstanding performance and unique character of the S 1000 RR.

To comply with various riding conditions such as a wet surface (“Rain”), regular road conditions (“Sport”), a race track with supersports tyres (“Race”) or a race track with slicks (“Slick”), the rider is able to adjust the characteristic features and performance of the engine simply by pressing a button, thus giving Race ABS the right configuration and input at all times. These characteristics interact with the respective riding modes and are carefully coordinated with one another for maximum safety at all times.

This new BMW Motorrad Race ABS is a brand-new development from the ground up, once again significantly lighter than all former partly integrated systems. With the control unit weighing just 1.65 kg or 3.64 lb and with overall weight of just 2.5 kg or 5.51 lb, BMW Motorrad Race ABS offers excellent qualities specifically for a supersports machine. And apart from its low weight, the system stands out in particular through its further improved control and operating functions.

Over and above the excellent overall set-up, this superior control, performance and brake management is ensured by the use of four pressure sensors which, in conjunction with the very elaborate rear-wheel lift-off detector, allows even better distinction than before between a bump on the road and the rear wheel locking.

Pulling the handbrake lever, the rider activates the double-disc brake at the front, while brake pressure on the rear-wheel brake remains at a low level. Pressing the footbrake lever, the rider then activates the rear-wheel brake as well. In the Race and Slick Modes, the rear-wheel lift-off detector does not intervene in the rider's braking action, allowing him to apply the brakes even harder whenever required, for example on slightly undulating surfaces and where the motorcycle has adequate grip.

In the Slick Mode the rider still has ABS on both wheels when pulling the handbrake lever alone. Then, pressing down the footbrake, the particularly experienced rider is able to go into a brake drift without having to forego the benefits of front-wheel ABS. In other words, ABS no longer cuts in on the rear wheel when pressing down the footbrake lever.

As soon as the rider pulls the handbrake lever, the pressure sensor integrated in the front-wheel control circuit switches on the brake light and the pump, the latter immediately delivering brake fluid through the open valve to the rear wheel circuit.

The pressure set in the rear wheel circuit is measured by a second pressure sensor and is controlled according to the distribution of brake power required and the brake force generated by the rider. The third pressure sensor in the rear control circuit, finally, measures the brake pressure activated by the rider‘s foot.

Use of a fourth pressure sensor in the front wheel circuit allows further improvement and even finer control of front-wheel brake pressure compared with former BMW Integral ABS II, since the system is able to compare the actual level of pressure in the control and wheel circuits.

As a result, there is now no need for the usual throttle blades, which serves to provide an optimum pressure point and allows perfect dosage of brake power. All pressure sensors are integrated in the pressure modulator and the overall configuration of the system with its integrated pressure sensors now also avoids the need for a brake light switch.

Yet a further option is to deactivate Race ABS completely for special purposes and requirements.

While Race ABS gives the rider valuable support and therefore represents a very significant safety factor when applying the brakes, it is not able to re-define or change the laws and limits to riding physics. Hence, even with this most sophisticated system, the rider may still misjudge a situation or make a mistake on his machine leading, should the worst come to the worst, to an accident.

Race ABS nevertheless helps the driver use the supreme stopping power and brake qualities of the S 1000 RR much better and more safely. But even Race ABS cannot provide maximum stopping power at the physical friction limit when leaning over to the side, and does not relieve the rider of his responsibility to ride safely and carefully.

4. Electric and Electronics.

Weight-optimised hybrid on-board network.
Contrary to most models from BMW Motorrad, the S 1000 RR does not come with central vehicle electronics (CVE) in the conventional sense, but rather features a hybrid on-board network where, thanks to the smaller range of equipment – for example no heated handles or no 12V power socket – there is no need for a central control unit.

Instead, the functions of CVE are integrated in the instrument cluster and there is a relay box at the rear of the motorcycle.

The S 1000 RR nevertheless uses a CAN (Controller Area Network) bus system to control and mastermind various functions of the motorcycle, networking the instrument cluster, the ABS and engine control units and, where fitted as an optional extra, the anti-theft warning system. Functions such as the direction indicator and headlight control are also integrated in the instrument cluster.

Reflecting the supersports character of the S 1000 RR, this intelligent concept again saves both weight and space. A further important point is that the overall system of electrics and electronics may be diagnosed evenly and comprehensively also of the S 1000 RR, since the BMS-KP digital motor electronics control unit is not only responsible for engine management, but also transfers all data to the diagnostic control unit, allowing quick and target-oriented location of any defects or deficiencies.

Compact and light alternator on the left end of the crankshaft.
Power is supplied by an alternator at the left end of the crankshaft equipped with a permanent magnet and measuring only 33 millimetres or 1.30" across. Maximum output is 434 Watt at 6,000 rpm, maximum speed 16,000 rpm. In order to minimise any loss of power and save weight, the control unit is positioned behind the engine block.

The S 1000 RR is available with a fall sensor as special equipment simply plugged in when required. Contrary to similar sensors used by the competition, however, this fall sensor is an electronic acceleration sensor able to detect the side angle of the machine, and does not work mechanically. In practice, this rules out the problems and misfunction of mechanical sensors encountered so often.

The S 1000 RR comes as standard with a light 10 Ah battery. Whenever fitted with an anti-theft warning system as an option, the machine features a 12 Ah battery offering a longer service life and practical benefits.

Again with the objective to ensure maximum engine performance, the S 1000 RR features a fully controlled fuel pump operating at a maximum pressure of 5 bar.

Multi-functional instrument cluster with racing features.
The instrument cluster comes with a large, easy-to-read LCD display as well as an analogue rev counter also with a clear scale very easy to read.

In developing the instrument cluster, the responsible engineers and other specialists attached utmost attention to clarity and the avoidance of any reflections in the display. Apart from the gear currently in mesh, the display also presents the mode currently chosen by the rider, that is Rain, Sport, Race, or Slick.

The rider is able to switch from one mode to the other from the right-hand end of the handlebar also while riding, simply pulling the clutch and turning the gas handle in idle to confirm the change in mode.

The instrument cluster featured on the S 1000 RR comes with a far wider range of functions than is generally the case in this class, making it absolutely unique in the supersports segment in terms of its wide range of options and practical use. As an example, the rider may switch over the display to the race track mode, receiving information on his current, best and latest lap times. And in conjunction with the lap-trigger likewise available as special equipment, he is able to make precise time measurements for the subsequent analysis of data.

A gearshift light flash integrated in the system and adjustable in terms of frequency and brightness allows the driver to achieve precisely the shift speed required. At the same time this flashlight may also be used as an engine speed indicator for starting in a race, flashing on and off at the appropriate speed – approximately 9,000 rpm – for an optimum start.

Whenever engine speed is too low, the light flash will go off. Whenever engine speed is too high, the light display will come on permanently.

A final important point is that the instrument cluster in the S 1000 RR is the lightest of its kind.

Dynamic, asymmetrically arranged lightweight headlights.
The asymmetric configuration and layout of the main and high-beam headlights comes from endurance racing, applying the principle of maximum effect on minimum weight. Precisely this is why the high-beam headlight is much smaller than the low-beam unit.

The front direction indicators come off easily and quickly for racing the S 1000 RR on the track. Similarly, the numberplate support including the rear direction indicators and numberplate light may be removed very quickly, simply by pulling a plug and unscrewing three fastening bolts.

LED direction indicators for further customisation are available as an option.

The LED rear light cluster comes as standard in clear glass design, use of LEDs instead of conventional bulbs ensuring reliable and maintenance-free operation and offering a much longer service life.

New electrical switches for optimum control.
The S 1000 RR features the new generation of switches and hand controls already introduced on the K 1300 S. Using MID (Moulded Interconnect Device) technology, these new switches are far smaller and more compact, offering supreme function, clear design and optimum accessibility.

Previously separated from one another, the switches for the direction indicators at the left and right are now combined in one function on the left handlebar, avoiding any confusion of the direction indicators and the horn. The hazard warning flashers are operated by a separate switch within easy reach on the left handlebar. Operation of the low and high beam as well as the light flash is controlled by one single switch the rider is able to operate conveniently with his left index finger.

A truly unique feature versus the competition and a very practical highlight is the selection and operation of all functions and settings on the instrument cluster from the left handlebar. A toggle switch also on the left handlebar enables the rider to conveniently operate both Race ABS and DTC. And to choose the appropriate engine mode, finally, the rider just has to use the Mode switch on the right handlebar.

5. Body and Design.

Supreme performance and dynamics from every angle.
The S 1000 RR comes in the unmistakable design language and look of BMW Motorrad. Asymmetries intentionally used in the design of the machine as well as the typical split of the front silhouette into two halves, the so-called Split Face, are design features characteristic of BMW Motorrad now also borne out proudly and distinctly on the new S 1000 RR.

The S 1000 RR stands out clearly from its competitors through the looks of the machine alone, the extremely slender fairing giving the S 1000 RR an extremely sporting appearance. Again, these attributes clearly follow the overall design of the machine with its short and low front end, the high and compact rear, as well as the intentional look of lightness.

The low-slung front fairing and the high-rising, muscular rear end are almost reminiscent of a hungry animal ready to pounce at any time. Slender, dynamic proportions clearly characterise this well-trained, athletic supersports. From the front the most outstanding features are the asymmetric split of the headlight as well as the large centre air intake clearly demonstrating that on this machine the wind rushing by is converted into additional performance.

Asymmetric headlights in endurance look.
The individual lines of the S 1000 RR reflect the design line of BMW Motorrad. The Split Face, for example, an enhancement of the design of existing BMW models, clearly expresses the technical functions of the machine with its highly efficient central air intake and the aerodynamically optimised windshield.

The Split Face, a black, grained surface on the upper section of the fairing around the headlights, divides the upper section of the fairing, as seen from the front, into two “halves of a face”, thus ensuring both excitement and a truly unique look.

In its design and size, the main headlight takes up the typical look of the starter numbers on an endurance racing machine, while for constructional reasons alone the high-beam headlight is much smaller. Apart from this asymmetry creating both excitement and dynamism, the Split Face serves to subdivide the large painted surface in visual terms, giving the upper section of the fairing an even lighter and more sporting look.

Yet another design feature of all BMW motorcycles is the clear separation of the upper and lower fairing sections also to be admired on the S 1000 RR. So while the Split Face so typical of BMW , in combination with the asymmetric headlights of the S 1000 RR reminiscent of endurance racing, creates a truly unmistakable face, the optical split dividing the upper and lower section of the fairing gives the entire motorcycle a particularly light and challenging look.

Light and dynamic design language.
The S 1000 RR will immediately catch your eye with its side fairing sections finished in the body colour of the machine. The dividing line down the side interacts with the dynamic lines of the motorcycle as a whole, extending upwards all the way to the rear end to ensure extremely light and dynamic design language.

The asymmetric shape of the headlights continues into the side fairings. While the left-hand side is dominated by a large opening for discharging hot air, the right-hand side stands out through its extremely dynamic and unmistakable fin look.

The frame, wheel guidance elements and wheels further emphasise the motorcycle's transparency and lightness, thus underlining the extreme level of technology BMW Motorrad has set out to achieve with the S 1000 RR.

The 50:50 split of the twin-tip engine spoiler is reflected as yet another sign of distinction by the rear light cluster in clear glass.

Striking rear silencer in racing look.
Full observance of even the strictest noise and emission standards despite supreme engine power was one of the objectives in developing the exhaust system for the new S 1000 RR. But at the same time the development engineers attached the same significance to maintaining the slender silhouette and the dynamic, light-looking appearance of the S 1000 RR, not wishing to spoil this unique look with an excessively large rear muffler.

Using sophisticated technology already described in detail in the Drivetrain Chapter, the engineers succeeded in developing a rear muffler with the design and dimensions formerly to be found only on racing machines. Short, slightly conical in shape and with a slanted rear end, the muffler accentuates the sporting performance and dynamic character of the S 1000 RR most impressively, blending perfectly with the overall design concept characterised by a light and truly dynamic look.

Intelligent lightweight construction with exceptional details and solutions.

The search for minimum weight is reflected throughout the S 1000 RR in virtually every feature. As usual, the overall concept developed by BMW Motorrad from the start provides the key to success, the front load-bearing section serving not only to hold the instrument cluster, the rear-view mirrors, the headlights, the horn and the upper section of the fairing, but also, through its duct-like design, guiding air through the ram-air system. And in order to reduce weight to an absolute minimum and concentrate all masses close to the centre of gravity, the front section is made of extra-light pressure-cast aluminium.

To achieve the truly demanding weight target of just 204 kg or 450 lb (without Race ABS) in road trim with a full tank, the S 1000 RR comes as the only supersports in this segment with a custom-built fuel tank made of deep-drawn aluminium and manufactured in close cooperation with BMW 's Eisenach Plant.

Wall thickness on the various fairing sections also reflects the rule to minimise the weight of the machine, the walls ranging in thickness, depending on their purpose, from less than 2 millimetres to a maximum of 2.5 millimetres (0.08–0.10"), thus ensuring efficient lightweight construction also in this respect.

Supreme aerodynamics on all features.

Not least, the development team responsible for the S 1000 RR also focused on the superior aerodynamics and streamlining of the machine. The big advantage is that this means not only a minimum drag coefficient, but also other, even more complex requirements such as the extraction of heat from the radiator and the exhaust gas system as a particularly challenging task, given the compact construction of the S 1000 RR.

The new S 1000 RR offers the rider the best protection from wind and weather available in the supersports segment. At the same time specifically applied, patented openings in the windshield prevent any undesired swirl effect, keeping pressure on the rider's helmet and upper body to a pleasantly low level even at high speeds.

Ideal overall ergonomics and a front wheel-oriented seating position.
One of the objectives in developing the S 1000 RR was to make the motorcycle particularly slender and compact. And precisely this is reflected not only by the overall dimensions of the machine, but also by specific parameters such as length, width, and height. Indeed, the rider can even feel the compact structure of the S 1000 RR, particular attention being given to keeping the machine as slender as possible around the rider's knees, following the principle that to ride well you have to sit well.

The benchmark set and achieved here was ensure compact dimensions otherwise to be found only in the 600-cc supersports segment. The active, cool, calm and collected, front wheel-oriented seating position is simply ideal for the rider and a sporting style of riding. From the start BMW Motorrad attached great significance to refined ergonomics, meeting the needs of both the short and the tall driver ideally and thus ensuring perfect riding conditions at all times.

Developing the new S 1000 RR, the engineers at BMW Motorrad were able to achieve optimum overall ergonomics from the start, without the need for all kinds of adjustments and different settings. However, BMW Motorrad still offers fully adjustable HP footrests as special equipment for greater customisation of the machine, making sure that the footrests allow a wide range of adjustment offered completely by the shift linkage bars extending through the frame and therefore avoiding the need for any subsequent change in gearshift kinematics.

Direct integration of the shift bars and the position of the pivot points on the production model ensure maximum shift precision right from the start, together with minimum operating forces and the best possible feeling when shifting.

The wide range of special equipment also includes folding HP brake and clutch levers for further customisation of the S 1000 RR to an even higher standard.

6. Range of Equipment.

Options and special equipment for a wide range of customisation.
The usual wide range of options, special equipment and other features offered by BMW Motorrad serves also to customise the new S 1000 RR Supersports.

Over and above the high-performance features already coming on the S 1000 RR in standard trim, the particularly sports-minded rider will find numerous options to enhance the performance and looks of the machine to an even higher standard.

Optional extras are supplied straight from the factory and are integrated in the production process. Special equipment is for assembly either by the BMW Motorcycle Dealer or by the customer himself, either right from the start or at a later point in time.

Optional extras.
- Race ABS.
- Race ABS plus DTC Dynamic Traction Control.
- HP Gearshift Assistant.
- Anti-theft warning system with remote control.

Special equipment.
Luggage and bags.
- Tank bag.
- Rear bag.

Maintenance and technology.
- Fall sensor.
- HP lap-trigger with wiring harness.
- Paddock stand.

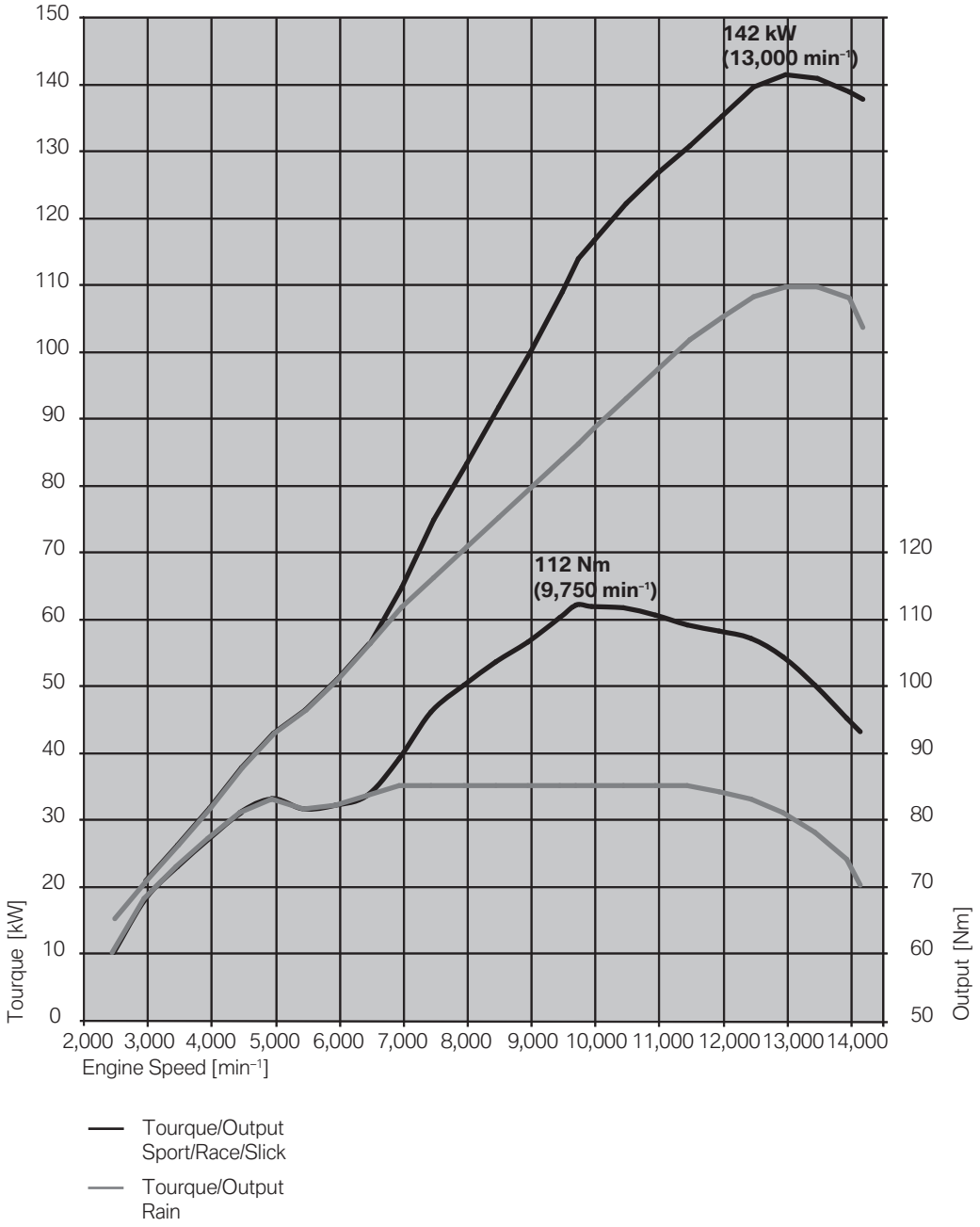
Ergonomics and comfort.

- Windshield, tinted.
- Windshield, high.
- Windshield, high, tinted.
- HP clutch lever, folding.
- HP brake lever, folding.
- HP footrests.

Design and sound.

- Hump cover, plastic, in body colour.
- HP Carbon placard mount, left.
- HP Carbon placard mount, right.
- HP Carbon tank cover, left.
- HP Carbon tank cover, right.
- HP Carbon chain protector.
- HP Carbon wheel cover, front.
- HP Carbon hump cover.
- HP Carbon wheel cover, rear.
- HP Carbon engine spoiler.
- HP Carbon heel protector.
- Akrapović® sports muffler.
- LED direction indicators.

7. Engine Output and Torque.



8. Specifications.

		BMW S 1000 RR
Power Unit		
Capacity	cc	999
Bore/stroke	mm	80.0/49.7
Max output	kW/hp	142/193
at	rpm	13,000
Max torque	Nm/lb-ft	112/83
At	rpm	9,750
Configuration		Straight-four
No of cylinders		4
Compression ratio/fuel grade		13:1/ min premium unleaded (95 RON)
Valves/charge cycle		dohc (double overhead camshaft) Valves operated by single cam follower beneath engine
Valves per cylinder		4
Intake/exhaust dia	mm	33.5/27.2
Throttle butterfly dia	mm	48
Fuel supply		(BMS-KP)
Electrical System		
Alternator	W	434
Battery	V/Ah	14/10 or 12, maintenance-free
Headlight	W	Low beam 1x H 7/55 W
		High beam 1x H 7/55 W
Starter	kW	0.8
Power Transmission		
Clutch		Multi-disc anti-hopping oil bath clutch, operated mechanically
Gearbox		Six-speed gearbox, dog-type shift
Primary transmission ratio		1:1.652
Gear ratios I		1:2.6471
II		1:2.091
III		1:1.727
IV		1:1.500
V		1:1.360
VI		1:1.261
Rear wheel drive		Chain
Final drive ratio		1:2.588
Suspension		
Frame		Bridge frame, aluminium
Wheel guidance, front		USD fork, fixed tube dia 46 mm
Wheel guidance, rear		Double swing arm with central spring strut in spring base, adjustable inbound and rebound action
Spring travel front/rear	mm	120/130
Castor	mm	95.9
Wheelbase	mm	1,432
Steering head angle	°	66.1
Brakes	front	Double disc brake with BMW disc mount, dia 320 mm, radial 4-piston fixed callipers
	rear	Single disc brake, dia 220 mm, single-piston floating calliper
ABS		Optional: BMW Motorrad Race ABS (partly integral, on-demand)
Wheels		Cast aluminium
	front	3.50 x 17“
	rear	6.00 x 17“
Tyres	front	120/70 ZR 17
	rear	190/55 ZR 17
Dimensions and Weight		
Length, overall	mm	2,056
Width, overall, with mirrors	mm	826
Seat height	mm	820
Weight, unladen, with full tank	kg	204 (206.5 with ABS)
Max permissible	kg	390
Tank capacity	ltr	17.5
Fuel Consumption/Performance		
Fuel consumption		
90 km/h	ltr/100 km	5.7
120 km/h	ltr/100 km	5.9
Acceleration		
0–100 km/h	sec	2.9
Standing-start km	sec	17.9
Top speed	km/h	>200

9. Range of Colours.

The colour concept emphasises the unique, dynamic character of the new BMW S 1000 RR.

In conjunction with the swing arms and wheels in Ostra Grey, Mineral Silver Metallic forms a very technical and clear contrast, giving the S 1000 RR an extremely light, compact and dynamic, but not exaggerated look.

Thunder Grey Metallic serves a different purpose, intentionally avoiding any strong contrast and, together with the swing arms and wheels in Ostra Grey, giving the machine a compact, muscular appearance.

Finished in bold Acid Green Metallic, the S 1000 RR presents a clear commitment to sporting performance, again bringing back the contrast of colours impressively underlining the dynamic character of the S 1000 RR. On this colour variant the swing arms are finished in eloxy Silver, the wheels come in glossy Black.

At extra cost the new S 1000 RR is also available in the colours of the BMW Motorrad Motorsport Team reminiscent of the colour scheme on the Superbike Works Racing Machines. In this case the paintwork is modern Alpine White Non-Metallic, Magma Red Non-Metallic, and Lupin Blue Metallic, with the swing arms also finished in eloxy Silver and the wheels in high-gloss Black.

The frame comes in Black on all colour variants.

An additional optical highlight on all colour variants is the red spring on the spring strut unit.