The new BMW M 1000 RR.

Contents.

"With the M RR we are presenting the first M model at BMW Motorrad. Based on the current S 1000 RR, the product contents of the M 1000 RR were consistently aligned with the motor sport requirements from customer sport to WSBK. This will be clearly measured in lap times from 2021 on." Rudi Schneider, Head of S and K model series.

The new BMW M RR: Pure racing technology for the highest performance requirements in motor sports and on the road. BMW Motorrad already introduced the successful M vehicle offer strategy at the end of 2018 for motorcycles and has been offering M optional equipment and M performance parts ever since. With the new BMW M 1000 RR - in the following referred to as M RR in short - the first M model from BMW Motorrad based on the S 1000 RR (RR for short) is now celebrating its world premiere. BMW Motorrad follows the philosophy of the strongest letter in the world: M stands worldwide for success in motor racing and the fascination of high-performance BMW models and is aimed at customers with particularly high demands relating to performance, exclusiveness and individuality.

With an engine output of 156 kW (212 HP), a DIN vehicle kerb weight of only 192 kg and a suspension and aerodynamics designed for maximum race track performance, the new M RR meets the main expectations in the top segment of Superbikes.

M RR four-cylinder engine based on the RR engine for racing sport. More peak power and increased maximum engine speed. The new M RR uses a water-cooled four-cylinder in-line engine based on the RR power train with BMW ShiftCam technology for varying valve timing and valve lift that has been modified

comprehensively in the direction of a racing sport engine. It achieves its peak output of 156 kW (212 HP) at 14,500 rpm. The maximum torque of 113 Nm is applied at 11,000 rpm. In addition to a maximum speed increased to 15,100 rpm, the M RR engine has extensive technical optimisations such as new 2-ring forged pistons from Mahle, adapted combustion chambers, compression increased to 13.5, longer and lighter titanium connecting rods from Pankl, slimmer and lighter rocker arms, fully machined intake ports with new duct geometry as well as optimisations on camshafts and intake area. The lightweight exhaust system is also made of titanium. The new M RR engine is even more powerful than the RR power train in the range from 6,000 rpm to 15,100 rpm, a range that is particularly relevant for race track driving dynamics, but without losing its qualities as a fascinating source of power for sporty driving on country roads.

M winglets and high windscreen: Braking later and accelerating earlier thanks to the aerodynamic downforce without any reduction in maximum speed.

The aerodynamics were a decisive point in the technical specifications for development work of the M RR. In addition to a maximum speed that is as high as possible and absolutely necessary for winning races, there was another objective in the technical specifications of the M RR: to establish the best possible contact of the wheels with the road - especially when accelerating. The M winglets on the trim front, which were developed during intensive testing on the race track and in the BMW Group's wind tunnel and are made of clear-coat carbon, take this into account as they produce aerodynamic downforce and thus additional wheel loads according to the speed. The additional wheel load on the front wheel counteracts wheelie inclination, traction control regulates less, more driving power is converted into acceleration and the driver achieves faster lap times. The effect of the winglets is also noticeable in curves and when braking, the downforce allows later braking and ensures increased cornering stability.

Chassis design trimmed for race track use with modified geometry, optimised wheel load distribution and extended adjustability of the swinging arm pivot point.
The chassis of the new M RR is based on the RR with the bridge frame made of aluminium at its centrepiece. It has an optimised upside-down fork as well as a revised central spring strut with blue spring and Full Floater Pro kinematics. The primary objective of the chassis design was to achieve the best possible lap times on the race track. The chassis of the M RR is therefore uncompromisingly designed for the race track, but also convinces with qualities for country roads. Special attention was paid to optimising drivability, the braking and anti-squat control as well as the best possible feeling of the driver for the front and rear wheel.

M brakes for the first time at BMW Motorrad as well as M carbon wheels as standard.
With the new M RR, there is a BMW motorcycle with an M brake for the first time – like the M vehicles of BMW M GmbH. It was developed directly from the experience with the racing brakes of BMW Motorrad company racing machines in the Superbike World Championship and provides maximum fading stability and controllability. Externally, the M brake callipers have a blue anodised coating in combination with the M logo. With the M carbon wheels, the new M RR has more high-tech components for maximum performance on the race track and road.

Instrument cluster with perfectly readable 6.5-inch TFT display and OBD interface that can be used with activation code for the M GPS data logger and M GPS laptrigger.

The instrument cluster of the new M RR has the same basic design as the RR and has an M start animation. As part of the optional equipment, an activation code (contents of M competition package) can be used to provide comprehensive data material for the use of the M GPS laptrigger and M GPS data logger (Original BMW Motorrad Accessories) via the OBD interface of the instrument cluster.

Born for racing: M design and dynamic form language of the M RR indicate ultimate race track performance.
The new M RR emphasises its racing genes with the light white solid paint/M Sport colour scheme in the basic colours light blue, dark blue and red. Further features of the M RR are the engine covers in granite grey and the fuel filler cap painted black.

Uncompromising in design and technology: The M RR with M competition package.
For those who are still not satisfied with the new M RR in standard trim, the M competition package provides a fascinating mixture of classy components for the racing technology gourmet and the aesthete at the same time. In addition to the M GPS laptrigger software and the corresponding activation code, the M competition package also includes the M milled parts package, the M carbon package as well as a silver 220 g lighter swinging arm, the friction-optimised, maintenance-free and DLC-coated M Endurance chain and the passenger package including tail-hump cover.

The highlights of the new BMW M 1000 RR.

"Our standard double R is a sign of real superiority - both in near-series motor sports and on the road. With the M RR we have managed to go one better in every single discipline. It is lighter, faster, simply consistently trimmed for performance - which you can feel from the first metre. Considering the new product content and the extremely short development time, I still can't believe it myself."
Stephan Loistl, M 1000 RR Overall Vehicle Development

• M RR four-cylinder engine based on the RR engine for racing sport. Even more peak power, higher torque in the medium range and 500 rpm more maximum speed.

• 156 kW output at 14 500 rpm and thus 4 kW more than in the RR. Maximum torque of 113 Nm at 11 000 rpm.

• New 2-ring forged piston 12 g lighter, adapted combustion chamber and compression increased to 13.5. In addition, slimmer and lighter rocker arms.

• Fully machined intake ports with new duct geometry and BMW ShiftCam technology for varying the valve control time and valve lift.

• Titanium valves, on the exhaust side with new spring assembly,

slimmer and 6 % lighter rocker arms and optimised camshafts.

• Very light, compact engine block with longer and 85 g lighter titanium connecting rods from Pankl for reduced friction power and less weight.

• Anti-hopping clutch without self-reinforcing for optimum Launch Control.

• Optimised differentiated intake system with shorter intake funnels for optimised gas exchange at high rotational speeds.

• New, 3,657 g lighter exhaust system with exhaust manifold, front silencer and rear silencer made of titanium.

• M winglets and high windscreen: Braking later and accelerating earlier and more stability when cornering thanks to the aerodynamic downforce without any reduction in maximum speed.

• “Rain”, “Road”, “Dynamic”, “Race”“ and “Race Pro1-3” riding modes and the latest generation of the Dynamic Traction Control (DTC) and DTC wheelie function with 6-axle sensor box.

• Two adjustable characteristic throttle curves for optimum response characteristics. Engine brake with threefold adjustable engine drag torque in “Race Pro” mode.

• Shift assistant Pro for shifting gears up and down without clutch. Simple reversibility of the shift pattern for race track use.

• Launch Control for perfect race starts and Pit-Lane-Limiter for precise speed in the pit lane.

• Hill Start Control Pro for convenient starting on slopes.

• Chassis design trimmed for race track use with modified geometry, optimised wheel load distribution and extended adjustability of the swinging arm pivot point.

• Optimised upside-down fork and revised central spring strut with Full Floater Pro kinematics.

• M brakes for the first time at BMW Motorrad: The M RR with maximum braking performance for the race track.

• M carbon wheels: Classy high-tech components for maximum performance on race track and road.

• Instrument cluster with large, perfectly readable 6.5-inch TFT display, starting animation with M logo and OBD interface that can be used with activation code for the M GPS data logger and M GPS laptrigger.

• Lightweight M battery, USB charging socket in the rear, powerful integrated LED light units and heated grips.

• M design and dynamic form language indicate ultimate race track performance.

• M competition package with M GPS laptrigger and activation code, M milled parts package, M carbon package, silver, 220 g lighter swinging arm, DLC-coated M endurance chain and passenger package including tail-hump cover.

• Comprehensive optional accessories and optional equipment ex works.

“The stringent focus on relevant race track attributes, and perfecting according to this, was both an exciting and motivating task for the engineers. It is not an easy task to optimise an S 1000 RR, but my team successfully mastered the challenge in a very short time. With great ambition, passion and technical sophistication, the metamorphosis into a measurably more powerful M 1000 RR was implemented, thus providing the basis for further racing success.” Christian Gonschor, Project Manager, M 1000 RR

M RR four-cylinder engine based on the RR engine for racing sport. Even more peak power, higher torque in the medium range and 500 rpm more maximum speed.
The new M RR uses a water-cooled four-cylinder in-line engine based on the S 1000 RR engine, which has been comprehensively modified in the direction of a racing engine. Its peak output is 156 kW (212 HP) at 14 500 rpm and thus 4 kW higher than in the RR. The maximum torque of 113 Nm is established at 11 000 rpm.

With the approach of creating an absolutely competitive basic engine for racing purposes as well as with vehicle type approval, the maximum speed of the M RR has been increased from 14,600 rpm to now 15,100 rpm compared to the RR.

In the engine speed range from 6,000 rpm upwards, which is relevant for super-sport operation as well as for use on race tracks, further significant increases were achieved compared to the already

very potent RR engine. Therefore in the range from 6,100 rpm to 9,500 rpm, noticeably more torque and thus acceleration force is available.

Above 13,200 rpm, the M RR's engine once again clearly demonstrates its advantages and provides more peak power and torque until the maximum speed is reached. Increased tensile force on the rear wheel in all gears is also ensured by a shorter secondary transmission by the use of a chain sprocket with 46 teeth (RR: 45 teeth).

New 2-ring forged piston, adapted combustion chamber and compression increased to 13.5. In addition, longer and lighter titanium connecting rods from Pankl and slimmer and lighter rocker arms.

The main objective in the development of the new M RR engine was to further enhance the already excellent performance values of the RR in terms of super-sport road and race track use. To do this, the engine developers of BMW Motorrad made significant changes to the power train.

For example, newly designed forged pistons from Mahle are used in the M RR engine. Compared to the forged pistons of the RR, they have two additional reinforcing crossbars in the box. With the same alloys, forged pistons have a finer and denser microstructure than cast pistons and therefore a higher strength. The pistons thus withstand the high loads of the M RR engine under the toughest racing conditions.

The design as 2-ring piston is not only due to friction loss, but also to the reduction of weight. An oil scraper ring is used like in the RR engine, however it is only a piston ring. This resulted in 12 g weight reduction per piston. In view of the very high rotational speeds of the M RR engine, this is a very decisive contribution to reducing the mechanical stress on the piston and crankshaft drive. The piston crown and combustion chamber shape have also been optimised with the aim of even higher peak power and an increased

maximum speed, and compression has been increased by 0.2 to now 13.5.

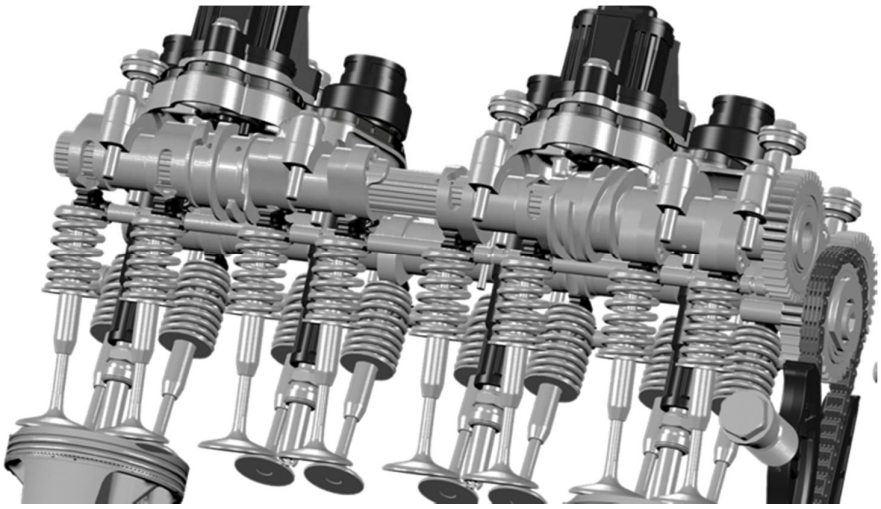
Fully machined intake ports with new duct geometry and BMW ShiftCam technology for varying valve timing and valve lift.
The intake ports have also been redesigned with the aim of significantly increased peak power and an optimum power indication in the speed range relevant for super-sport and race track use. Compared to the RR, they have a further developed duct geometry and are also fully machined for maximum accuracy and to achieve the best possible flow conditions.

Like with the RR, the M RR with BMW ShiftCam technology uses the technology to vary valve timing and valve lift on the intake side. It is a three-piece intake switching-cam sensor, which has two cams attached on a shift segment per valve to be actuated: one torque cam and one power cam, each with optimally designed cam geometry. The shift speed of the BMW ShiftCam of the M RR is 9,000 rpm, like with the RR.

Via an axial displacement of the switching-cam segment, the intake valves are actuated by either the torque cam or the power cam in only 10 ms, depending on the speed. The axial displacement of the switching-cam sensor and thus the use of torque or power cams is performed by two shift gates on the switching-cam segment and two electromechanical actuators. The different design of the cam geometry is used to vary valve timing and valve lift. Whereas the full load cam provides maximum valve lift, a reduced valve lift is provided via the torque cam.

Titanium valves, on the exhaust side with new spring assembly, slimmer and lighter rocker arm and optimised camshafts.
In the M RR, four valves made of lightweight titanium are also used in each combustion chamber. The shanks of the intake valves are also hollow-drilled to minimise weight. Like on the intake side of the RR engine, the M RR power train also has spring cups made of aluminium on the exhaust side. A modified valve spring assembly is also used on the exhaust side. The valves are operated using light, speed-resistant and DLC-coated rocker arms in the normal manner, which were designed even more favourably than the already very light RR models. The width of the rocker arm has been reduced from 8 to 6.5 mm, resulting in a weight reduction of 6 percent or 0.45 g per rocker arm. Reinforced bearing brackets of the camshafts take the increased maximum speed into account.

With the M RR, the camshafts are driven directly by the crankshaft



and without intermediate wheel. The reduction gear for halving the change in speed for the camshafts is directly in the cylinder head. For a significantly increased speed and peak power compared to the RR engine, the intake timing has been adjusted. On the exhaust side, the camshaft has been given a new elevation curve and 0.4 mm more valve lift.

Very light, compact engine block with longer titanium connecting rods from Pankl for reduced friction power and less weight.
The engine block of the RR provides the best possible requirements for the M RR engine. Like before, the cylinder barrels integrated in the upper crankcase half are polished and honed to reduce friction power and the oil and water pumps are combined in a compact module. The tubes of the water and oil cooling circuits are also

reduced to a minimum in the context of a racing engine and designed to be highly resistant to crashes. To achieve the smallest possible overall width, there is only one gear on the crankshaft, because the reduction gear of the starter motor meshes directly with the primary gear of the clutch. The starter is integrated behind the cylinders on the upper housing side. The crankshaft position is identified via the rotor/alternator.

The new connecting rods are also responsible for the weight reduction. While the four-cylinder engine of the RR has connecting rods made of tempered steel, the M RR four-cylinder engines are made of titanium by the Austrian manufacturer Pankl. They are shot peened and have a pressed-in bush made of bearing bronze as gudgeon pin bearing. Compared to the RR connecting rods, they are 2 mm longer and have a length of 101 mm (centre of crankshaft journal to centre of gudgeon pin). The longer connecting rods are particularly beneficial in terms of reduced lateral forces on the piston and the cylinder barrel, resulting in reduced friction power and mechanical stress. At the same time, the titanium connecting rods of the M RR are very much lighter than those of the RR. They have an impressive total weight of 340 g (85 g per connecting rod) and thus considerably reduce the oscillating masses. Especially also because of the light titanium connecting rods, the M RR engine revs up even more freely and vehemently than the already very direct and spontaneously acting four-cylinder engine of the RR.

Wet-sump lubrication, six-speed transmission and anti-hopping clutch without self-reinforcing for optimum Launch Control.
Like with the RR, oil is supplied in the form of a wet-sump lubrication. For maximum operational safety, the oil pan bottom and thus the suction point of the pump is very deep. Clutch control takes place on the right-hand engine end. On the M RR as well, the upper housing half accommodates the light, compact and precise six-speed transmission and the Shift Assistant Pro is already fitted as standard. Unlike the RR, the M RR has an anti-hopping clutch without self-reinforcing. It provides significant benefits in terms of Launch Control controllability. However, due to the omission of self-reinforcing, the preload force of the clutch had to be increased, resulting in a slightly higher hand force.

Differentiated intake system with shorter intake funnels for optimised gas exchange at high rotational speeds.
The new M RR also has a so-called full electromotive throttle controller system, i.e. an “electronic throttle grip” for pleasantly low operating forces and perfect engine controllability. The new M RR power train is equipped with variable intake funnels. A servomotor mounted on the intake silencer is used to vary the length of the intake funnels in two stages in a characteristic map-controlled manner. At a speed of 11,900 rpm, the short intake paths that are favourable for achieving maximum performance are released. For use in the new M RR, the intake funnels have been reduced in length to optimise gas exchange and thus power indication, especially at high engine speeds.

New, 3,657 g lighter exhaust system with front silencer and short, compact rear silencer made of titanium.
The primary objective of further enhancing the new M RR in terms of power and torque indication and at the same time significantly reducing the vehicle weight was also pursued by the BMW Motorrad developers when designing the new exhaust system.

It is made of titanium and has two three-way catalytic converters. Optimised gas exchange, further increased torque in the medium engine speed range and more peak power are the result. In addition to improved performance data, the new exhaust system enables a weight reduction of almost 3.7 kg. For example, the front silencer only weighs 5,630 g (RR: 9,158 g) and the rear silencer only weighs 2,150 g (RR: 2,279 g). The total weight of the M RR titanium system is only 7,780 g (RR: 11,437 g).

Drastically improved driving performance with even more acceleration and torque power.
The new M RR engine is even more powerful over the entire rotational speed range than the four-cylinder engine of the RR. Acceleration and torque power in particular have been increased drastically. The M RR accelerates to 100 km/h 0.1 to 0.2 seconds faster than the RR and to 200 km/h 0.0.4 seconds faster. The torque values produced a similar result, measured in 5th/6th gear. Whereas with the RR 2.9/3.3 seconds pass from 60 to 100 km/h, the M RR only requires 2.8/3.2 seconds. For a burst of speed from 100 to 140 km/h 2.2/2.5 seconds are required (RR: 2.5/2.9 s) and 2.4/2.6 seconds are achieved in the interval between 140 and 180 km/h (RR: 2.6/2.8 s).

The new M RR thus achieves the balancing act between racing motorcycle and fascination device for public country roads in a way never seen before. The new M RR engine is even more powerful than the RR power train in the range from 6,000 rpm to 15,100 rpm, a range that is particularly relevant for race track driving dynamics, but without losing its qualities as a fascinating source of power for sporty driving on country roads.

“Rain”, “Road”, “Dynamic”, “Race”” and “Race Pro 1-3” riding modes and the latest generation of the Dynamic Traction Control (DTC) and DTC wheelie function with 6-axle sensor box.
With the new M RR, a distinction is made between two riding mode worlds: For the country road and for the race track. The new M RR has the four standard riding modes, “Rain”, “Road”, “Dynamic” and “Race” as well as the additional riding modes “Race Pro 1”, “Race Pro 2” and “Race Pro 3”. The latest Dynamic Traction Control (DTC) generation with 6-axle sensor cluster, heel angle sensors and fine adjustment for even more safety and performance during acceleration is also standard.

The DTC has four fixed standard basic settings for the respective riding modes “Rain”, “Road”, “Dynamic” and “Race” as well as the DTC wheelie function. In addition, a fine adjustment (+/- Shift) option is available in “Race Pro” riding modes. The DTC wheelie function is also adjustable. It permits, via the front wheel lift-off detection, the suppression or limitation of wheelies with the aim of maximum acceleration.

Two selectable characteristic throttle curves for optimum response characteristics. “Engine brake” with threefold adjustable engine drag torque in “Race Pro” mode.
The new M RR has two standard characteristic throttle curves that are permanently linked to the corresponding riding modes, “Rain”, “Road”, “Dynamic”, “Race” and “Race Pro”. As another component, “Engine Brake” in “Race Pro” mode also provides triple adjustability of the engine drag torque in coasting overrun mode.

• Rain: Gentle throttle response, reduced drive torque in the lower gears.

• Road: Optimal throttle response, reduced drive torque in the lower gears.

• Dynamic: Optimal throttle response, reduced drive torque in the lower gears.

• Race: Optimal throttle response, maximum drive torque in all gears.

• Race Pro 1-3: Can be configured. Setting 3 can additionally be selected in Race Pro. The throttle response is gentle, the maximum drive torque is established in all gears.

Shift assistant Pro for shifting gears up and down without clutch. Simple reversibility of the shift pattern for race track use.
The shift assistant Pro enables upshifting without clutch control, thus providing perfect acceleration with virtually no interruption in tensile force. It also permits downshifting without clutch or throttle valve actuation in the load and engine speed ranges relevant to driving. That enables very fast shift operations and clutch control is reduced to a minimum. For operation on the race track, the conventional shift scheme (first gear down) can be converted with a few hand movements (first gear up).

Launch Control for perfect race starts.
The new M RR also offers its driver a Launch Control, which actively supports the driver during race starts. Activation takes place at a standstill with the engine running and in neutral gear by pressing the start button for more than three seconds. A corresponding indication appears on the display of the instrument cluster. From a technical point of view, Launch Control limits the torque of the engine in such a way that the maximum transferable drive torque is applied to the rear wheel when starting off in first gear. When the driver shifts into second gear, the torque of the engine is corrected according to the change in gear ratio, so that the maximum transferable drive torque continues to be applied to the rear wheel even in this phase.

Pit-Lane-Limiter for precise speed in the pit lane.
The Pit-Lane-Limiter also allows the driver of the M RR to limit the speed for driving into the pit lane in any riding mode.

Hill Start Control Pro for convenient starting on slopes.
The new M RR is already standard-equipped with the Hill Start Control Pro function. It goes beyond the properties of the standard Hill Start Control comfort system with the RR and offers the additional Auto HSC function. Using the settings menu, this additional function can be customised so that the holding brake on a gradient (greater than +/- 5 %) is automatically activated after the hand or footbrake lever is operated shortly after the motorcycle comes to a standstill.

Standard Equipment							
					Riding Mode Pro		
Riding modes:	**RAIN**	**ROAD**	**DYNAMIC**	**RACE**	**RACE Pro 1**	**RACE Pro 2**	**RACE Pro 3**
Throttle Response/ Toque:	**Soft** (Md reduced)	**Optimal** (Md reduced)	**Optimal** (Md reduced)	**Optimal** (Md max)	**Optimal/** soft **(Nm reduced/ Nm max.)	**Optimal/** soft **(Nm reduced/Nm max.)	**Optimal/** soft **(Nm reduced/Nm max.)
ABS: See race track*	**Road** (max. stability)	**Road** (stability for dry road)	**Road** (rear lift-off control reduced)	**(Road) Track** (rear lift-off control off)	**Road/Track:** selectable	**Road/Track:** selectable	**Road/Track:** selectable
ABS Pro:	**Road** (max./wet)	**Road** (medium/dry)	**Road dyn.** (min./dry)	**OFF**	**OFF**	**OFF**	**OFF**
Traction (DTC): Disengageable	**Road** (max./wet)	**Road** (medium/dry)	**Road dyn.** (min./dry)	**Track** (min./dry)	**Track** (+/- Shift)	**Track** (+/- Shift)	**Track** (+/- Shift)
Engine Brake: three adjustable steps	**Road** (max.)	**Road** (max.)	**Road** (med.)	**Road** (med.)	**Road** (min. **medium.** max.)	**Road** (min. **medium.** max.)	**Road** (min. **medium.** max.)
Wheelie (DTC):	**Road** (max. Stabilität 3)	**Track/** Road (performance 2)	**Track/** Road (performance 2)	**Track/** Road (performance 2)	**Track** (high W) (Off 0)	**Track** (high W) (Off 0)	**Track** (high W) (Off 0)
DBC: Disengageable (display)	**ON** (max)	**ON** (max)	**ON** (medium)	**ON** (min)	**ON** (Setting 1 Off) (min)	**ON** (Setting 1 Off) (min)	**ON** (Setting 1 Off) (min)
HSC Pro: Disengageable(display)	**HSC Pro** / Manuel / off→ not dependant on modes						

* Race track: On race track, the number plate carrier including turn indicators and mirrors normaly removed. This means the road approval „expires". ABS can only be deactivated in this state, see manual.
** Reduced torque in lower gears.

"The close cooperation with the M Sport department and a driving geometry that is strongly based on the current WSBK vehicle, have resulted in a significant increase in performance in race track operation. The brake callipers optimised for racing sport make a significant contribution to this. They are particularly characterised by their outstanding resistance point stability and the fast rear wheel change". Martin Keck, M 1000 RR Chassis Development

The enormous potential of the new M RR is not only reflected by the drive system designed for maximum performance. In fact, the outstanding driving dynamics are to a large extent the result of consistent development work with numerous race track tests on the chassis and aerodynamics.

M winglets and high windscreen: Braking later and accelerating earlier thanks to the aerodynamic downforce without any reduction in maximum speed.
The aerodynamics were a decisive point in the technical specifications for development work of the M RR. With the objective of achieving even faster lap times, it has played a central role in the top levels of motorcycle road racing, MotoGP and the Superbike World Championship for several years. For decades, the developers of racing machines concentrated almost exclusively on aerodynamic resistance ("drag") and thus essentially on the maximum speed to be achieved. Today, however, further aerodynamic aspects are the focus of attention for the well over 200 HP Superbikes and MotoGP fast bikes.

In addition to a maximum speed that is as high as possible, which is absolutely necessary for winning races, another objective of these extremely powerful motorcycles is to establish the best possible contact of the wheels with the road - especially when accelerating. Wheelies are absolutely not desired in terms of driving dynamics, since in this driving situation the driving force is not fully converted into driving power, but to a considerable extent also into the elevation of the front section of the motorcycle. Accordingly, traction control is applied to stop the wheelie and reduce the driving power. Valuable tenths of a second are lost in the process.

The M winglets on the trim front of the new M RR, made of clear-coat carbon, take this scenario into account as they produce aerodynamic downforce and thus additional speed-dependent wheel loads. The additional wheel load on the front wheel counteracts wheelie inclination when accelerating, traction control regulates less, more driving power is converted into acceleration and the driver achieves a faster lap time.

The development work for the M winglets took place during test drives on the race track and also in the wind tunnel of the BMW Group. The following downforce values were determined for the front and rear sections of the new M RR:

Downforce	**Front**	**Rear**	**Total**
50 km/h	0.4 kg	0.1 kg	**0.5 kg**
100 km/h	1.5 kg	0.3 kg	**1.8 kg**
150 km/h	3.3 kg	0.7 kg	**4.1 kg**
200 km/h	5.9 kg	1.3 kg	**7.2 kg**
250 km/h	9.3 kg	2 kg	**11.3 kg**
300 km/h	13.4 kg	2.9 kg	**16.3 kg**

This shows that the M winglets produce significant downforce at the front, but the overall aerodynamic design of the new M RR also results in an additional downforce component at the rear.

The BMW Motorrad developers responded to the slightly increased aerodynamic resistance caused by the small additional front area and the shape of the M winglets with a re-designed high windscreen. This resulted in an improved airflow around the driver's helmet, compensation of the slight increase in drag caused by the winglets and thus maximum speed being maintained.

Intensive test and comparison drives with the BMW Motorrad WSBK drivers Tom Sykes and Eugene Laverty and the World Endurance driver Markus Reiterberger.

The measured downforce values were verified by BMW Motorrad during intensive test and comparison drives on the race track in the form of lap times and statements on drivability. For example, even a semi-professional racer achieved lap times 0.5 to 0.7 seconds faster with the aerodynamically optimised M RR than without these aerodynamic effects.

At the same time, due to improved aerodynamics the M RR provides greater driving stability before, in and out of bends, as well as less rebound when accelerating and thus less control intervention by the Dynamic Traction Control, DTC. The additional downforce component at the rear also enables even later and more reliable braking.

Even for the BMW Motorrad developers, the comparison between

the new M RR and the BMW RR company racing machines for the Superbike World Championship was impressive. Equipped only with slick tyres, BMW Motorrad Superbike racer Markus Reiterberger with the otherwise fully standard M RR was only 2.101 s behind Superbike World Championship rider Tom Sykes and only 1.590 s behind his team mate, Eugene Laverty. That the company racing machines are about 15 kg lighter and 15 HP more powerful also needs to be taken into account.

Chassis design trimmed for race track use with modified geometry, optimised wheel load distribution and extended adjustability of the swinging arm pivot point.
The chassis of the new M RR is based on the RR with the bridge frame made of aluminium as the centrepiece. It is designed as a welded structure consisting of four elements made by gravity die casting and integrates the engine, which is tilted forward by 32 degrees, as a supporting element. A requirement when designing the main frame was to ensure that the force was applied directly to the engine structure by the shortest possible route. The main frame is supplemented by a light rear frame made of round aluminium tubes.

The frame, also called “flex frame” due to its optimum interaction in the overall combination of main frame, rear frame and swinging arm, provides further benefits due to its very slim design. This considerably reduces the vehicle width in the area of the part relevant for good knee movement. The driver benefits from significantly less spreading of his thighs and thus a more relaxed driving posture.

The primary objective of the chassis design of the new M RR was to achieve the best possible lap times on the race track. The chassis of the M RR therefore has an uncompromising race track-based design and special attention was paid to optimising

drivability, the braking and anti-squat control as well as the best possible feeling of the driver for the front and rear wheel.

In the area of suspension geometry, extensive changes have been made to the M RR for the focused application of the M RR. For example, the steering head angle is now slightly flatter at 66.4°, compared to the RR. The offset of the fork bridges has been reduced by 3 mm to 26.5 mm. Accordingly, the after-run of 93.9 mm of the RR has been extended to 99.8 mm for the M RR. At the same time, the wheelbase has been extended to 1,457 mm. The length of the new, single-piece rear wheel swinging arm with beams is 618.3 mm (RR: 606.6 mm). The enhanced adjustability of the swinging arm's pivot point is due to the field of application on the race track and the frequently necessary adjustments of the suspension geometry. The adjustment range now has the +/- 1 mm range and includes the values -2 mm/-1 mm /0 mm /+1 mm/+ 2 mm.

With a DIN vehicle kerb weight of only 192 kg when fully fuelled, the M RR weighs 5 kg less than the already very light standard RR and currently represents the spearhead in the field of Superbikes consistently designed for race track operation. The weight reduction was accompanied by an optimisation of the wheel loads. Compared to the RR, the front wheel load has been reduced from 53.8 % to 52.1 %.

The new chassis geometry as well as the weight reduction of the M RR result in maximum driving precision and absolutely transparent feedback from the front and rear-wheel guides. At the same time, the new M RR provides optimised driving stability at very high speeds and still excellent handling quality.

Optimised upside-down fork and revised central spring strut with Full Floater Pro kinematics.
The front and rear-wheel guides were also modified with the aim of consistently improving the chassis qualities of the M RR for race track operation.

As with the RR, an upside-down fork with a slider tube diameter of 45 mm is used for the front suspension. It is equipped with so-called closed-cartridge inserts, i.e. separate hydraulic piston-cylinder systems. Unlike the RR, the fork has fork bridges at the top and bottom milled from solid aluminium, black anodised and about 20 g lighter. The fork legs have been adjusted, which are now designed for holding the new M brake callipers. The fork projection has also been redefined for the M RR, which is now 9.8 mm (RR: 6 mm). The spring preload in the right fork leg is four revolutions.

The fork has ranges of adjustment for the spring base and 10 setting clicks each for the damping rebound and compression stages. The sensitive response, the wide adjustment range and the very high damping reserves provide maximum driving dynamics and individual tuning options on the race track. The spring travel is 120 mm.

The central spring strut and the Full Floater Pro kinematics were completely overhauled compared to the RR. It has an adjustable spring basis as well as adjustable damping rebound and compression stages. The rebound and compression stages are adjustable by a very easy-to-use scaling of 10 clicks each. The spring travel at the rear axle is 118 mm (RR: 117 mm).

For use in the M RR, the lever kinematics have been changed comprehensively compared to the RR. The adjustment strut of the RR (length: 87.5 mm) has been replaced in the M RR by a solid aluminium milled eccentric strut with 78 mm output length. A new option here is the length adjustment in a range of 6 mm in steps of 1 mm each (7 positions). Accordingly, the adjustment range is from 75 mm to 81 mm. The preset length is 76 mm. The previous threaded rod of the RR (length: 87.5 mm) has also been replaced by inserts in the M RR. The back ride height is +6 mm (5.78 mm). The gear ratio has been increased from 1.63:1 to 1.97:1. The spring rate is 100 N/mm. For weight reasons, a blue spring made of new spring steel is used in the M RR.

M brakes for the first time at BMW Motorrad: The M RR with maximum braking performance for the race track.

There is a BMW motorcycle with an M brake for the first time – like the M vehicles of BMW M GmbH. It was developed directly from the experience with the racing brakes of BMW Motorrad company racing machines in the Superbike World Championship.

BMW Motorrad uses brakes from Nissin in the Superbike World Championship. According to the experience gained with the front four-piston fixed calliper used there, BMW Motorrad and the BMW Development Center, the specialist department for brakes and control systems, in cooperation with Nissin, completely revised the previous four-piston fixed calliper for use in the M RR. That also resulted in a weight reduction of 60 g in each case compared to the RR brake callipers.

The entire previous knowledge of BMW Motorrad from all previous RR generations, from customer sport and from ABS race track functions was applied to the development of the M brake. In addition to internal BMW investigations such as volumetric flow and brake test stand measurements as well as intensive test drives with racing drivers from the Long-Distance World Championship, the Development department, in cooperation with the BMW Additive Manufacturing Centre (AMC), also carried out far-reaching mechanical changes to the brake calliper as well as subsequently restoring its function using laser deposition welding.

In addition to an outstanding braking power and excellent controllability, the focus of the developers was also on thermal stability and thus a constant resistance point. For this purpose, the brake fluid level of the brake calliper has been optimised and zinc/nickel-coated steel brake pistons developed with optimised pad contact surfaces (grooves) and additional convection cooling. The hydraulic gear ratio between handbrake fitting and brake callipers has been adjusted accordingly to generate optimum interaction between the required manual force, sensitivity of

metering and achievable braking power. As the front stand on the M RR is used via the steering shaft tube in the steering head, the brake lines have been re-routed and the aerodynamic partition adapted, which incidentally resulted in a weight reduction of 30 g.

The M brake was at the end of this sophisticated development work, which is now celebrating its début in the M RR. With a maximum of performance, resistance point and fading stability and excellent controllability. Externally, the M brake callipers have a blue anodised coating in combination with the famous M logo.

Together with two 320 mm brake discs with a thickness of 5 mm (RR: 4.5 mm) and black anodised brake disc holders made of aluminium, it currently represents the best of brake development in this area. Two brake pad versions are available for various applications. One brake pad compound for road use and another one from the Long-Distance World Championship for use on the race track. Both brake pad compounds are adapted to the ABS Pro functions, and in particular RACE ABS mode for race track use has again been significantly improved.

On the rear wheel, a blue anodised two-piston fixed calliper in the M design also ensures deceleration, in combination with a 220 mm steel brake disc. An optimised bearing concept enables a particularly fast wheel change - for example in qualifying or for applications in long-distance races.

M carbon wheels: **Classy high-tech components for maximum performance on race track and road.**

Carbon - once developed for the aerospace industry, this high-strength and super-light material first became established in racing and now also at BMW Motorrad. BMW Motorrad uses it wherever lowest possible weight is desired with maximum strength.

The M carbon wheels of the M RR are an ideal application for the material, which is processed in a highly complex process using high-pressure furnaces - called autoclaves, because the advantages are obvious. Less weight here means lower rotational masses and thus optimised handling in addition to improved acceleration and braking performance. In short: The M carbon wheels give the M RR even more agility and driving dynamics.

In addition, the carbon surface with high-gloss clear coat inspires with its classy, deep black shimmering structure. The M carbon wheels for the M RR are in total 1.7 kg lighter than the standard aluminium wheels that were already reduced in weight by 1.6 kg when the RR was redesigned last year.

Instrument cluster with large, perfectly readable 6.5-inch TFT display, starting animation with M logo and OBD interface that can be used with activation code for the M GPS data logger and M GPS laptrigger.
The instrument cluster of the M RR has the same basic design as the RR. The driver has four screens (Pure Ride with the most important information and 3 core screens) to choose from according to requirements. It follows a consistent design for super-sport purposes, including on the race track. The range of information, the display quality and also the ease of use of the new instrument cluster are currently unmatched in the super-sport segment.

In addition to a large range of functions and information, the BMW Motorrad developers attached particular importance to the best possible readability of the 6.5 inch TFT display. The display was therefore given a large design to make it easy to read, for an optimum display - even in difficult lighting conditions It is linked to the Multi-Controller on the left-hand handlebar controls with which it can be operated quickly, safely and conveniently. After switching it on, the M logo is highlighted on the display.

The TFT display of the M RR has customised screen masks for various applications. The Pure-Ride screen, for example, provides all the necessary information for normal operation on the road, whereas the three core screen masks are designed for the race track and provide a corresponding range of information. In addition, the rotational-speed sensor is displayed here, both in analogue form (cores 1 and 2) and also in the form of a bar chart (core 3). In addition to the digital indication of the speed, the rotational speed, selected riding modes, settings for ABS Pro and DTC as well as the menus, further information can be shown on the display:

- Currently driven heel angle, left/right.
- Maximum heel angle reached, left/right.
- Currently achieved deceleration in m/s^2.

• Maximum deceleration achieved in m/s^2.
• Torque reduction by DTC.
• Speed limit warning (“SPEED” indication when a previously defined speed is exceeded).
• Average speed.
• Average consumption.
• Trips 1 and 2.
• Remaining range.
• Total distance.
• Fuel tank level.

For drivers driving on the race track with the new M RR, the instrument cluster offers further, highly interesting data material that can be called up in various display formats:

• Lap time and lap distance.
• Lap-specific speeds (min, max, average).
• Active riding mode per lap.
• DTC setting per lap.
• Heel angle, left/right.
• Maximum heel angle, left/right per lap.
• Maximum DTC torque reduction per lap.
• Maximum deceleration per lap.
• Number of gear shift operations per lap.
• Average throttle grip position per lap.
• Total laps, overall duration and overall distance.
• Best ever lap.

And much more.

As part of the optional equipment, an activation code (content of M competition package) can be used to provide comprehensive data material for the use of the M GPS laptrigger and M GPS data logger (original BMW Motorrad accessories) via the OBD interface of the instrument cluster. In addition, the TFT menu provides a separately reserved menu item for the M GPS laptrigger. However, manual triggering using the headlight flasher button is still also possible. Using the M GPS laptrigger in combination with a GPS mouse, data is available for about 300 racing tracks all over the world.

Lightweight M battery, USB charging socket in the rear, powerful LED interior light units all around as well as electronic adaptive cruise control and heated grips.
The electrical system and electronics of the M RR are primarily based on the established RR systems. In the context of the highest possible performance, however, the M RR only has a 1,288 g battery with a capacity of 5 Ah. It still has a standard USB charging socket installed in the rear end that provides a maximum charge current of 2.4 A. It also has a standard electronic adaptive cruise control and heated grips for cold weather.

All interior light units of the new M RR are based on the latest LED technology, like with the RR. These include the headlights with high luminous intensity, the side light, the front indicator lamps, the rear light unit and the instrument cluster with its indicator lamps. The LED headlights not only give the M RR a highly dynamic look, but also illuminate the road perfectly. The side lights enhance the unmistakable appearance and their luminosity was selected so that they did not have to be homologated as daytime driving lights.

The front indicator lamps are integrated in the exterior mirrors. Due to this high position of the indicator lamps, the M RR is very well visible to other road users. On the other hand, the M RR can be made “ready for racing” in no time at all by removing the mirrors for race track operation. The “comfort turn indicator” is an additional feature. It automatically moves the turn indicator into the neutral position and can no longer be forgotten by the driver.

According to the “all in one” principle, the number plate carrier and the indicator and number plate lights at the rear form a unit, as with the RR, and the brake and rear light function is integrated into the indicator lamps. The C-shaped combination rear light signature makes the M RR instantly recognizable as a BMW, even at night. This extremely compact combination also allows the M RR to be made “ready for racing” in just a few steps.

5 Design and colour concept.

“The high aerodynamic efficiency of the winglets, their design and their noticeable impact on the overall vehicle performance fascinate me. This highly functional motor sports technology can be experienced by racing drivers and hobby drivers alike. By means of numerous prototype and wind tunnel tests, we have increased the effectiveness of the winglets to such an extent as to achieve an optimum balance of downforce and drag.” Tim Krych, M 1000 RR Body Development

Born for racing: M design and dynamic form language of the M RR indicate ultimate race track performance.
Even more than the RR, the new M RR, with its extremely compact layout, minimised weight, optimised chassis technology and the most powerful BMW Motorrad standard engine of all time, is uncompromisingly designed for use on race tracks and the hunt for record times. M RR – more is currently not possible. It is the ultimate Superbike from BMW Motorrad. Its proportions are ultra-compact between the M carbon wheels, and taut, powerfully modelled and three-dimensionally designed surfaces provide excitement and expressiveness. The M RR presents itself as slim and slender from the front with its characteristic split face, the black matt T-shaped fresh air flap and the new M winglets made of clear-coat carbon. In addition, a generous surface design with only one joint not only ensures a high-quality and competitive overall impression, but also optimum flow characteristics and thus a high aerodynamic quality.

The integrated front light design also makes the new M RR look like a racing machine, while still complying with all legal

requirements. Using LED technology without reflectors, low-beam and high-beam headlights can be combined in one compact element, which is the reason for the symmetrical design of the lights. Framed by the iconic side light in a dynamically interpreted U shape, the light signature makes the new M RR clearly recognizable as a BMW from the front - like the radiator grille in BMW vehicles.

The sporty low front and the short, slim rear are characterised by highly dynamic proportions, which may be extremely short and compact due to the transfer of the rear lighting functions to the number plate carrier. With a very short overhang, the vehicle body is almost completely between the wheels and thus has a very sporty silhouette. The characteristic subdivision of the side view into the upper area in the vehicle colour and the dark technical area below (“technical body split”) makes the M RR clearly identifiable as a super-sport vehicle by BMW Motorrad from this perspective as well. At the same time, the characteristic course of this DNA line ensures a dynamic forward orientation and makes the M RR appear very light even from the side.

The powerful surface language is aerodynamic, striking, racy and effective. It makes the dynamic side design look like an optical unit and the dynamics here develop primarily due to the tension of the surfaces. A very slim trim panel keel completes the compact proportions towards the road. Finally, the new M RR also has a sporty, slim appearance from a top view. A dynamic line flow goes from the cockpit via the tank to the rear. The striking tank design particularly highlights the longitudinal emphasis and sporting character.

The new M RR emphasises its racing genes with the light white solid paint/M Sport colour scheme and the corresponding basic colours light blue, dark blue and red. The interpretation of the three colours also corresponds to the order in which they are arranged on each side from left to right. This asymmetrical colour arrangement makes the M RR look like a different motorcycle when viewed from the side. Further identifying features of the M RR are the engine cover in granite grey, the fuel filler cap painted black and the blue spring of the spring strut.

Uncompromising in design and technology: The M RR with M competition package.

For those who are still not satisfied with the new M RR in standard trim, the M competition package provides a fascinating mixture of classy components for the racing technology gourmet and the aesthete at the same time. In addition to the M GPS laptrigger software and the corresponding activation code, the M competition package also includes the M milled parts package, the M carbon package as well as a silver anodised, 220 g lighter swinging arm, the DLC-coated M endurance chain and the passenger package including tail-hump cover.

Components of the M milled parts package are milled and anodised brake and clutch levers made of high-strength aluminium as well as the footrest system, a brake lever guard and engine protectors. The M carbon package includes covers for the front and rear wheels as well as the input pinion, a chain guard and the side and tank covers on the left and right, made of high-quality clear-coat carbon and with a clear coat.

6 Equipment package and customer sport concept.

Optional equipment and original BMW Motorrad accessories.
A comprehensive range of optional equipment and original BMW Motorcycle accessories is available for further individualisation of the new M RR. Optional equipment is supplied ex works and is integrated into the production sequence. The authorised BMW Motorrad Retailer or the customer will fit the original BMW Motorrad accessories. The motorcycle can also be equipped with them at a later date.

BMW Motorrad customer sports concept.
The new M RR is homologated according to the FIM regulations for the FIM Superstock class and the FIM Superbike World Championship and is produced in a minimum number of 500 units required for the World Championship and beyond. Within the price range defined by the regulations, the new M RR already has all the essential extras for M Sport homologation that must not be subsequently modified.

The M RR is thus an extremely powerful basic motorcycle for the Superstock and Superbike classes as well as for long-distance races for numerous teams in the world. For further measures for an increase in performance, the customer sports concept of BMW Motorrad includes the following racing parts for the M RR:

- Kit engines (type 5 -7)
- Kit electronics (STK & SBK)
- Race exhaust system
- Tank seat configuration
- Race body kit

Optional equipment

- **M competition package:** As well as the M billet pack and the M carbon package, also includes a swinging arm in silver anodized aluminium (-220 g), M GPS-Laptrigger (activation code), M Endurance chain, passenger package, passenger seat cover.
- **M billet pack*:** Brake and clutch levers, front footrest system, brake lever guard, engine protectors.

• **M carbon package*:** Clear-coated carbon covers for front and rear wheels as well as pinion, chain guard, side and tank covers, left/right.

• **Passenger package:** Passenger seat, passenger cover and rear footrests.

*: Cannot be ordered individually.

Individual optional equipment.

• Passenger package with passenger seat cover.

• Anti-theft alarm.

• M GPS laptrigger (vehicle software incl. activation code for operating the SZ hardware).

Original BMW Motorrad Accessories.

M performance parts.

- M GPS activation code.
- M GPS data logger including M GPS laptrigger.
- M endurance chain.
- M axle protectors.
- M carbon intake silencer cover.
- M carbon rear wheel.
- M carbon front wheel.
- M carbon chain guard.
- M carbon rear full-size wheel cover.
- M carbon front full-size wheel cover.
- M carbon pinion cover.
- M carbon tank trim, left/right.
- M carbon top fairing side panel.
- M data logger.
- M rider footrests.
- M footrest system.
- M seat.
- M seat high.
- M seat low.
- M passenger footrest, left/right.
- M handbrake lever, folding.
- M remote brake lever adjuster.
- M handbrake lever protector.

- M chain tensioner.
- M clutch lever, folding.
- M clutch lever protector.
- M assembly stand mounting.
- M engine protector.
- M oil filler neck.
- M cover kit.
- M fork clamp for stub handlebars, left/right.
- M forged wheel, rear.
- M forged wheel, front.
- M tyre heater.

Ergonomics and comfort.
- Passenger seat.
- Windscreen, tinted.
- Windscreen, high, tinted.
- Knee pads for tank.

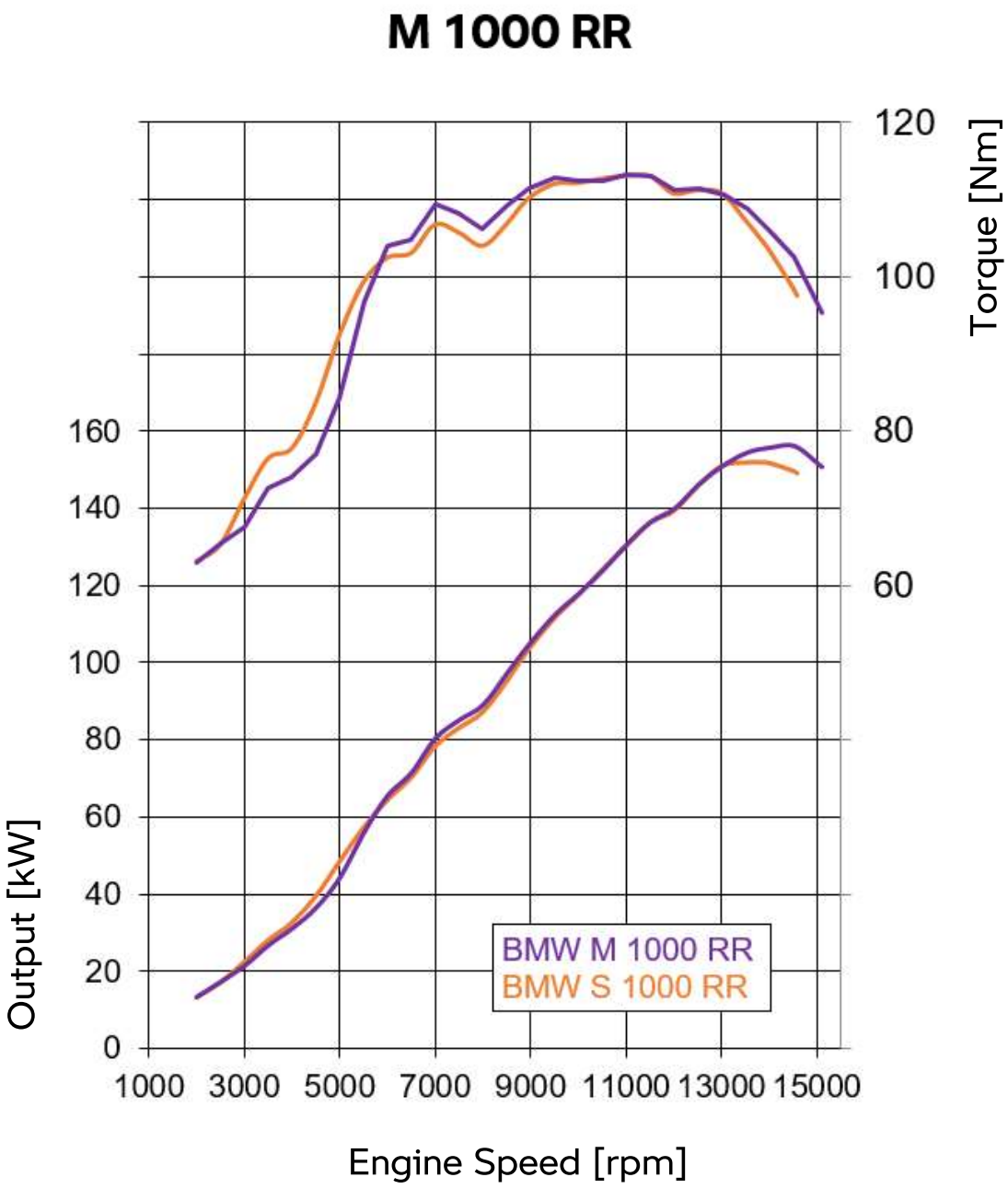
Design.
- Tank pad.

Safety.
- Radiator grille guards.
- Protective glass for 6.5-inch TFT display.

Stowage space.
- Rider's equipment organiser.

Service & technology.
- Motorcycle mat.
- BMW Motorrad battery charger plus.
- Sport auxiliary stand, rear.
- Sport auxiliary stand, front.

7 Engine output and torque.



8 Technical data.

			BMW M 1000 RR
Engine			
Displacement		cm^3	999
Bore hole/stroke		mm	80/49.7
Power		kW/HP	156/212
At rotational speed		rpm	14,500
Torque		Nm	113
At rotational speed		rpm	11,000
Design			Water-cooled in-line four-cylinder engine
Compression/Fuel			13.5:1 / Super (plus) petrol, unleaded, octane number 95-98 (RON) (knock control; nominal capacity at 98 RON)
Valve/throttle control			DOHC-(double overhead camshaft), Valve actuation via single rocker arm and variable intake camshaft control BMW ShiftCam
Titanium valves per cylinder			4
Ø intake/exhaust		mm	33.5/27.2
Throttle valve diameter		mm	48
Engine control unit			BMS-O
Emission control			Controlled three-way catalytic converter
Electrical system			
Alternator		W	450
Battery		V/Ah	M battery 12 / 5, maintenance-free
Headlight		W	Low-beam headlight LED twin circular headlights in free-form technology
			High-beam headlight LED free-form surface/modular system
Starter		kW	0.8
Power transmission, transmission			
Clutch			Multi-disc anti-hopping oil-bath clutch, mechanically operated
Transmission			Claw-operated six-speed transmission
Primary translation			1.652
Translation ratios	I		2.647
	II		2.091
	III		1.727
	IV		1.500
	V		1.360
	VI		1.261
Final drive			Chain 17/46
Secondary translation			2.706
Chassis			
Frame design			Aluminium composite bridge frame, engine supported

Wheel guide, front wheel		Upside-down telescopic forks, slider tube diameter 45 mm spring preload, rebound and compression stage adjustable
Wheel guide, rear wheel		Aluminium beam double-sided swinging arm with central spring strut, spring preload, rebound and compression stage adjustable
Spring travel, front/rear	mm	120/118
After-run	mm	99.8
Wheelbase	mm	1,457
Steering head angle	°	66.4
Brakes	Front	M twin disc brake, with floating mount, Ø 320 mm, radial four-piston fixed callipers
	Rear	Single disc brake, Ø 220 mm, two-piston fixed calliper
ABS		BMW Motorrad Race ABS Pro (partial integral)
Traction control		BMW Motorrad DTC
Wheels		Standard: M carbon wheels
	Front	3.50 x 17"
	Rear	6.00 x 17"
Tyres	Front	120/70 ZR17
	Rear	200/55 ZR17

Dimensions and weights		
Overall length	mm	2,073
Overall width with mirrors	mm	848
Seat height	mm	832
DIN vehicle kerb weight, fully fuelled and ready for use	kg	Standard: 192 With optional equipment: M competition package 192
Perm. total weight	kg	407
Fuel tank capacity	l	16.5

Driving data		
Fuel consumption (WMTC)	l/100 km	6.5
CO2	g/km	151
Acceleration 0–100 km/h	s	3.1
Maximum speed	km/h	306