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Model Range '90  
La Gamme '90  
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Programma '90  
موديلات عام ١٩٩٠  
Программа 90г.  
'90年モデル

Stand: 12/89

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Summary of new models and innovations in 1990

The K 100 RS,  
BMW's highly successful sports tourer,  
rides again:  
K 1 technology combined  
with proven all-round qualities

One of the most successful motorcycles of the 80's is now to be re-introduced as one of the absolute highlights of BMW's 1990 model range: the K 100 RS.

Launched in 1983, the sports tourer model of BMW's 1000-cc four-cylinder generation has won the title of Motorcycle of the Year in Germany no less than five times running, not to mention many international awards and prizes that have also gone to this outstanding machine. With sales totalling more than 35,000 units, the K 100 RS has indeed become an absolute best-seller.

Now, entering the 90's, the new K 100 RS is even more powerful, dynamic and safer - but without making any concessions in terms of riding comfort and touring quality. All the essential design features which make this possible come from BMW's most dynamic and sporting motorcycle in recent times, the K 1. This sports machine with its futuristic, highly aerodynamic styling first launched in Germany in May 1989, not only caused a major upheaval of the market and heated debates, but also resulted in delivery periods of several months due to the large number of orders that came in immediately for the K 1.

Spontaneously voted Motorcycle of the Year in Germany, France and the USA, the innovative K 1 now serves not only as the image leader in the BMW range but also as the High-Technology trendsetter providing components and concepts for BMW's other models, too.

Hence, the 1990 K 100 RS now also comes with the 100-horsepower four-valve power unit of the K 1 developing a superior torque of 100 Nm or 74 ft/lb (previously it was fitted with the two-valve engine developing 90 bhp and 86 Nm or 63 ft/lb). Another asset of this new power unit is Digital Motor Electronics engine management based on the same principle as in BMW's sophisticated cars and the round stainless-steel exhaust pipe of the K 1. Power transmission is by the proven five-speed gearbox featured in all K models. Like on the K 1, however, the fifth gear of the K 100 RS has been adjusted to the top speed of the K 100 RS of more than 220 km/h (136 mph).

Other components also come straight from the K 1 - for example the extra-strong front-wheel fork, highly efficient front-wheel four-piston brake system and the reinforced rear-wheel brake. It almost goes without saying that the new K 100 RS is available with BMW's unique electronic/hydraulic anti-lock brakes (ABS) introduced by BMW in spring 1988 and still available exclusively from Germany's white-and-blue marque. As on the K 1, the rear wheel now features the BMW Paralever to keep the shaft drive in perfect balance.

## More comfort-oriented suspension

The reinforced tubular space-frame and the extra-wide three-spoke light-alloy wheels have also been taken from the K 1, just like the entire suspension geometry. Only the rear wheel features the modified spring strut of the K 75 S which - together with the front-wheel fork - gives this sporting tourer a higher standard of riding comfort than the sports model. Taking the wide handlebar of the K 1 as an example, the handlebar of the K 100 RS has been increased in width from 574 to 610 mm (22.60 - 24.02") in the interest of even better handling. It now also features a central handlebar and ignition lock.

The sports tourer fairing developed in the wind tunnel did not require any modification and has therefore been taken over as it was from the former model, simply because this sophisticated fairing which set new standards in 1983 in terms of protection from wind and weather as well as riding stability remains unmatched to this very day. The seat opening to one side is now even more comfortable and has a height of 800 mm or 31.5". A removable seat is of course once again available as an option for shorter riders, reducing seat height to 760 mm (29.92").

The new K 100 RS once again sets standards in terms of luggage space, the tank bag, pannier cases and luggage rack being fitted in their usual position.

In a nutshell, therefore, the new K 100 RS has become even more powerful and dynamic, but also safer for the rider. And in its outstanding all-round qualities, it is now better than ever before.

## Classic looks

Compared with the striking avantgarde styling of the K 1 sports machine, the new K 100 RS is almost reserved - and definitely very classical - in its appearance. This exceptional style is also a result of the colour scheme, with the K 100 RS being available in pearl-silver metallic and yucca-green metallic. Both of these paintwork versions come with silver-painted three-spoke rims, an additional feature on the pearl-silver metallic model being the dual blue lines painted on by hand. The engine cover and drive train are finished in black.

In addition to the ABS anti-lock brake system, lower seat, luggage rack and case holders already mentioned, the K 100 RS is available ex works with further options such as heated handles, hazard warning flashers, engine spoiler, engine protection bar, anti-theft warning system, temperature gauge and fuel gauge.

Looking at the top end of BMW's model range in 1990, the discerning purchaser now has a choice that is not too easy: either the K 1 thoroughbred sports machine or the versatile K 100 RS sports tourer. Two models with unique assets from a unique manufacturer.

## ABS also for the K 75 models from 1990

Now many a purchaser should find the decision in favour of the K 75 and K 75 S even easier and more sensible, since from 1990 BMW's three-cylinder models will also be available with ABS.

Entering the 90's, BMW therefore remains the world's only motorcycle manufacturer not only to offer ABS, but now also to extend this highly significant safety feature to all K models and, accordingly, to about half of the entire model range.

In the course of the last two years, ABS has not only been acknowledged worldwide as an outstanding BMW achievement in the field of riding safety, but has also become a genuine success in the market. In 1990, for example, more than 70 per cent of all K 100 purchasers were willing to pay a premium for the extra safety offered by ABS.

Apart from sheer riding pleasure, BMW motorcycles therefore also offer a unique combination of superior performance and equally superior safety, plus a high standard of environmental care which will become increasingly important in future.

## Electronics for greater environmental care

Currently, BMW is the only motorcycle manufacturer to offer the discerning purchaser an entire range of machines not only with ABS, but also with electronic engine management. This ensures a high standard of fuel economy and is also the technology required for the fully controlled three-way catalytic converter BMW

plans to launch for the first time ever on a motorcycle at the Cologne International Bicycle and Motorcycle Show in September 1990.

## GS models with sports suspension

With the exception of some minor technical improvements, the R Series flat-twins are now entering the 67th year of their unique and proven concept. Every other machine that came off the assembly line at BMW's Berlin-Spandau factory in 1989 had a flat-twin engine. Particularly the GS enduro models - which from 1990 will also be available with sports suspension as a conversion kit - remain extremely popular in the market.

Hence, the increase in BMW motorcycle production in 1989 from approximately 24,000 to 26,000 units (which equals a growth of 8 per cent) is attributable not only to the K models, but also to BMW's legendary Boxers.



## From the K 100 via the K 1 to the new K 100 RS

### The successful career of the K-generation

BMW are not changing their policy, but rather planning for the future ...! In accordance with this maxim, Europe's largest and Germany's only manufacturer of big bikes proudly launched the new K 100 model series in autumn 1983, thus taking up the Japanese challenge and starting to pursue a dual product strategy: Precisely on their 60th anniversary, the R Series motorcycles with their air-cooled twin-flat Boxer engines built and constantly improved since 1923 were supplemented by BMW's all-new 90-bhp liquid-cooled 1000-cc four-cylinder model generation with electronic ignition and fuel injection. Then, two years later in 1985, BMW made the next step by adding the three-cylinder 75-bhp 750-cc K 75 model series.

The first six years of the K 100 Series became an incomparable story of success. In Germany, the K 100 RS was voted "Motorcycle of the Year" no less than five times running. It won similarly significant popularity contests in other countries and received a supreme styling award from the strictest state officials in Japan of all countries. But the K 100 Series not only became the subject of exceptional praise and recognition - rather, and even more importantly, it has become a unique success in the market, some 80,000 units being built by the end of 1989. And the K 75 Series in the meantime also accounts for a production of more than 25,000 units.

## The come-back of the big Boxer

The Boxer hearts continue to beat strongly in BMW's new and larger range of motorcycles. Using components adopted from the K Series in some cases, the R-models have been modernised and the 1000-cc Boxers have experienced an outstanding come-back to satisfy the great demand from customers. Finally, the new R 80 GS and R 100 GS enduros launched in autumn 1987 have become best-sellers from the very beginning, their popularity remaining undaunted in 1989.

This is why production of the R and K-models at BMW's motorcycle factory in Berlin-Spandau is just about equal, each series accounting for about half of the total motorcycle output.

### Production adjusted to the trend in the motorcycle market

#### Increase in market share

With sales of new motorcycles decreasing worldwide throughout the 80's by more than 50 per cent, even BMW have not been able to escape this negative trend in the long run. Hence, production has been adjusted to this decline. But despite the fact that the motorcycle business has become tougher and more challenging, BMW have fared relatively well, not least thanks to the introduction of the K Series. In the Federal Republic of Germany, for example, which accounts for about one-third of all BMW motorcycle sales, the Company's market share has increased from 7.7 per cent in 1981 - the climax of the motorcycle boom - to about 10 per cent. And in the same period BMW's worldwide share was even up from 1.8 to 3.6 per cent.

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## Exceptional safety provided by ABS - a very popular asset

In 1988 BMW hit the headlines all over the world by introducing electronic/hydraulic anti-lock brakes (ABS), a very special option for the K 100 models that remains absolutely unique to BMW also in the 1990 season, and which is now also available for the K 75 models. The fact that more than 70 per cent of all K 100 purchasers opt for ABS proves that safety-minded motorcyclists are obviously willing to pay a - worthwhile and sensible - premium for extra safety on the road.

## From the touring to the sports segment

As the old saying goes, a standstill actually means a step down on the ladder. Accordingly, even when launching the K 100 and K 75 model series, BMW started to carefully consider the more distant future of the K-generation, the Company's far-sighted engineers and stylists already drawing sketches of the next generation on their drawing boards. Their brief was definite: To once again take the same step as with the K-generation and to move on into an important segment of the market previously not occupied by BMW. Hence, BMW decided to move on from their classic market segment of touring machines into the dynamic and rapidly expanding segment of sports motorcycles.

This did not mean in any way, however, that BMW were giving up their old principles and joining the rat race for more power and performance all the time. Rather, BMW have decided to give discerning customers the extra power and sportiness they desire within the framework of the 100-bhp performance limit voluntarily agreed by all manufacturers in the Federal Republic of Germany. And, as a result, the output of the K 1 is restricted to 100 bhp (74 kW) in all markets the world over.

## **Top performance without compromises in safety and comfort**

As BMW's engine specialists very quickly realised, the best way to achieve more power without any disadvantages was to design and introduce a four-valve engine. Apart from striving for extra performance and sportiness, BMW's development team naturally had other objectives typical of BMW's philosophy: To make this power and performance realistic and controllable by the rider, without any compromises in terms of safety or road comfort.

## **Traditional values and progressive design in the wind tunnel set new standards**

One of the tasks was therefore to adjust the suspension, brakes and body of the motorcycle to the even greater demands made of a machine like the K 1. It was also obvious that the fairing had to be further improved, in this way consistently taking up and promoting an important BMW heritage. After all, BMW was the first manufacturer to launch a fairing model produced in large numbers back in 1976: the R 100 RS, which even today still represents the state of the art in motorcycle technology. The job given to BMW's motorcycle stylists, designers and wind tunnel aerodynamicists was now to design a fairing with even better streamlining than the already excellent fairing of the K 100 RS, at the same time setting new standards for a sports machine in efficient protection from wind and weather and superior riding stability at all speeds.

## **Harmonious concept**

The new concept was naturally also required to offer well-known BMW benefits such as optimum ergonomics, ample

seating comfort also for the passenger, ease of maintenance, all-round economy and a long running life. And all these benefits had to be blended with superior performance on the one hand plus optimum handling, supreme riding precision and safety on the other.

### **Unique, functional design with dynamic, sporting looks**

One of the major tasks given to the styling team was to provide the logical continuation to the unique and functional design of the K 100 Series, in this way creating a motorcycle with distinctive new looks to match its dynamic riding characteristics.

### **As exclusive as its name**

The three models in the K 100 Series, the "basic" K 100 model without fairing, the K 100 RS sports tourer and the K 100 LT luxury tourer, all of which remain unchanged, were therefore supplemented by a special sports model in summer 1989. And like BMW's exclusive high-performance four-valve automobiles, the M 1, M 3 and M 5 as well as the Z 1 roadster, the name alone of this new motorcycle confirms its top position in the range: the BMW K 1.

### **Different views and outstanding awards**

The focal point of public interest and different views not least because of its bold, progressive styling, the K 1 was certainly a challenge for the conservative motorcyclist to begin with, requiring quite a bit of getting used to.

Be it as it may, the K 1 is nevertheless first choice among the majority of riders and motorcycle enthusiasts, being voted Motorcycle of the Year by the riders of MOTORRAD in Germany, Bike of the Year by the readers of

Motorrad, Reisen & Sport, and Motorcycle of the Year by the editors of Motorcyclist in the USA.

Even better news for BMW is the fact that the number of K 1s ordered for the 1989 season was far greater than the Company's limited production capacity for such an exclusive top-of-the-range model. Unforeseen delays in the first two months of production then resulted in additional waiting periods for proud purchasers of a K 1. In many countries the K 1 was however presented and launched according to plan towards the end of 1989, that is in good time for the 1990 season.

### Conveying the technology of the K 1 to the new K 100 RS

With a production output of almost 4,000 units in 1989, the top-of-the-range K 1 is not only a significant image builder for BMW, but also a technological spearhead for BMW's proven modular motorcycle components concept.

It was therefore an obvious step to update the K 100 RS built 35,000 times with hardly any changes throughout a period of exactly 6 years by introducing many of the innovative components first featured on the K 1.

Accordingly, the new 1990 version of the BMW K 100 RS comes with BMW's 100-bhp four-valve power unit, the brakes, front-wheel fork, Paralever system and wheels of the K 1. This represents a substantial step forwards in terms of dynamic performance and riding safety, without making any compromises when it comes to comfort and touring quality.

So it is also with the new K 100 RS that BMW enters the 90's well prepared for the toughest competition.

## The power unit of the K 1 and K 100 RS<sup>1)</sup> Four-valve technology for even better performance and riding culture

The development of an even more dynamic high-performance version of the four-cylinder power unit started back in 1983, the first year of the K 100 on the market. BMW's strategy of progress was clear from the outset: To consistently and logically apply the four-valve concept, a technology acknowledged the world over, for even greater power and performance. Martin Probst, at the time Head of Engine Development at BMW Motorrad GmbH, was definitely the right man to steer the destiny of the Company in this direction, since he was able to look back on years of experience with four-valve engines in his former job with BMW Motorsport GmbH, where BMW's standard-production four-cylinder power unit was ultimately converted into a Formula 1 World Championship winner.

While supreme power was the overriding objective in the development of the Formula 1 engine, the motorcycle power unit, while based on the same concept, was developed from the outset for BMW's traditional assets of superior motoring refinement, practical everyday value, all-round economy and a long running life. The designers' brief was to revise the engine in such a way so as to provide superior torque and output even better than the two-valve power plant throughout the entire speed range. Given this objective, BMW's engineers naturally increased engine power to the 100 bhp (74 kW) limit voluntarily agreed by all motorcycle manufacturers in the Federal Republic of Germany. A comparison of the output and torque curves of the two-valve K 100 versus the K 1 four-cylinder clearly shows that the new four-cylinder reaches its objective in every respect: Output is up from 90 to 100 bhp (in both

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1) Any differences between the K 100 RS and K 1 are described in the text where applicable.

cases at 8000 rpm) and torque has been increased from 86 Nm/64 ft-lb (at 6000 rpm) to 100 Nm/74 ft-lb (at 6750 rpm).

The engine of the K 1 refutes the common prejudice that four-valve power units simply have to be unflexible and one-sided. For in this case the more sophisticated technology with twice the usual number of valves serves to provide a more rapid, thorough and efficient charge cycle with a better cylinder charge at low and medium engine speeds. The mean operating pressure often applied as a yardstick for determining the quality of an engine's design amounts to a magnificent 12.7 bar in the power unit of the K 1.

With this new concept and design, BMW's four-cylinder provides even greater refinement and smoothness despite its extra power. Even without constantly using the engine speed available and thus maintaining a cool, calm and collected style of riding, the K 1 ensures high performance at its best.

The modifications made are very impressive even though the cylinder head looks quite similar from the outside. After all, any change in the number of valves also means that they must change in size. Inlet valve diameter is therefore 26.5 mm (1.04") in both cases instead of 34 mm (1.33") on the former single inlet valve, outlet valve diameter is 23 mm (0.91") in either case instead of 30 mm (1.18") with the conventional engine.

The combustion chamber geometry and valve angles have also been modified for the new engine. Thanks to this modification and the central position of the spark plug, it is now possible to increase the compression ratio from



10.2:1 to 11:1 (running on 95 ROM Euro super). This means not only extra power and torque, but also greater efficiency and fuel economy.

BMW's engineers deliberately decided not to change the valve opening times despite the extra power this would have provided at high engine speeds. Accordingly, the four-valve power unit intentionally has the rather conservative valve opening angle of 284° serving to provide extra torque throughout the entire speed range.

Positive experience gained with the valve clearance remaining unchanged even in endurance tests for tens of thousands of kilometres induced BMW's engineers to modify the tappets of the four-valve engine in order to further reduce the volume of moving parts and ensure even greater reliability. Hence, the new engine does not require the valve adjustment spacers still needed for the two-valve unit. Instead, adjustment of valve clearance now called for only in exceptional cases can be carried out by choosing the tappets from a wide range of individual components of pre-defined size.

The K 1 has inherited the light-alloy water-cooled cylinder block of the K 100 without any fundamental modifications. The cylinder bore of 67 mm (2.64") and the stroke of 70 mm (2.76") chosen right from the beginning ensures superior torque thanks to the particular configuration of the engine. It also ensures very compact combustion chambers contributing to the specific qualities of the K 1's engine, thus providing superior fuel economy, a high standard of engine flexibility and exceptional refinement when running under part load, an asset not that common with high-performance engines.

A number of detailed modifications in the engine of the K 1 again spell out genuine progress and an even higher power potential. Benefitting from a new process of calculation based on the Finite Element Method, the weight of the forged crankshaft has been reduced by 1.3 kg (2.87 lb). The same process has also served to optimise the weight of the conrods. Then there are also the new, slightly lighter pistons with a special labyrinth system in the area of the piston rings to prevent oil from being drawn into the combustion chambers whenever the motorcycle is parked on its side stand. As a result, the blue smoke characteristic of BMW in-line engines when restarted after parking now becomes a thing of the past. Incidentally, this modification has also been introduced for all K 100 models in 1989.

### Digital Motor Electronics like in all BMW cars

The electronic engine management of the K 1 features a fundamental innovation. While the ignition and fuel injection of the K 100 are operated by separate engine management systems, the K 1 has fundamentally the same Digital Motor Electronics to be found in all of BMW's car engines (petrol models) ranging from the four-cylinder all the way to the V 12.

Another new feature of the K 1 is that it no longer has the conventional butterfly-type air volume meter, which inevitably represents a kind of obstacle in the intake manifold. Instead, Digital Motor Electronics determines engine load via a potentiometer in the throttle butterfly shaft and informs the computer in the control unit of the exact throttle butterfly opening angle. To determine the injection volume required, the engine management system also picks up and processes data on engine speed, intake

air temperature, coolant temperature and atmospheric pressure (altitude factor). This new, low-resistance intake system contributes 4 - 5 horsepower to the higher output of the K 1. Comparative measurements have also shown that it helps to reduce fuel consumption.

A further asset of Digital Motor Electronics is the substantial ease of service provided by the built-in defect memory for retrieving defect information in the workshop with the help of the BMW Diagnostic Tester. Superior dependability at all times is ensured by fail-safe functions enabling the engine to keep on running even if certain components should fail to operate.

One look at the exhaust system of the K 1 reveals that here there have been conspicuous changes: The exhaust pipe made of high-grade stainless steel features a round muffler not extended that far to the rear. The extra silencer volume thus required is provided by an expansion chamber beneath the gearbox.

The rest of the K 1's drive train differs from the two-valve K 100 power transmission by various reinforcements catering for the machine's extra power and performance. With most components being strong enough to cope with 100 bhp and 100 Nm (74 ft-lb), the only modifications required were on the final drive and the 5th gear ratio, which is now "longer" than before.

The new K 100 RS also features the five-speed gearbox that has already proven its merits on all K models. But like on the K 1, fifth gear has been modified to suit the higher top speed of more than 220 km/h or 136 mph (previously 1.67, now 1.61 like on the K 1). The final drive transmission ratio, on the other hand, remains unchanged at 2.81 (2.75 on the K 1).

The running gear and suspension of the K 1 and K 100 RS <sup>2)</sup>

## The same BMW Paralever as on the GS models

While the suspension and running gear has remained largely unchanged, it has obviously been adapted wherever necessary to the superior performance of the K 1. This progress is most evident on the rear wheel: Although the rear wheel features a single swinging arm as before, it is now BMW's worldwide patented Paralever fitted on the R 80 GS and R 100 GS enduro models since autumn 1987. The smooth balance of forces ensured by this unique component provides significant advantages not only with long spring travel and on rough off-road terrain, but also with a road machine. Even if the spring travel of such a machine is not that long, the Paralever reliably prevents the acceleration reactions otherwise inevitable, particularly with a high-performance engine.

## Strong front-wheel fork and even more efficient brakes

The new wheel fork of the K 1 also shows a resemblance to the enduro models, since both units come from the same manufacturer: Italian specialist Marzocchi. Extra-sturdy with a diameter of 41.7 mm (1.64") and featuring reinforced fork bridges, this telescopic fork ensures optimum torsional rigidity. In cooperation with another specialist supplier, BMW have selected shock absorbers with a highly progressive damper curve under compression for optimum roadholding. On 50 per cent of the spring travel totalling 135 mm (5.31"), that is up to the position of the fully laden motorcycle at rest, these shock absorbers thus have minimum damper action but then become much harder upon further compression of the springs

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2) Any differences between the K 100 RS and K 1 are described in the text where applicable.

up to the hydraulic stop point. The very sensitive response of the wheel fork ensured in this way is further enhanced by the teflon-coated bushes for minimum friction and wear. Otherwise identical with that of the K 1, the telescopic fork on the new K 100 RS is somewhat softer for extra comfort on the road.

The new fork comes with a Brembo brake system fully capable of handling the K 1's superior performance. The two brake discs are spirally perforated to save weight and measure 305 mm (12.00") in diameter and 5 mm (0.20") in thickness. Applying a technology developed in motor racing, the brake discs are mounted in floating arrangement on roller-shaped supports. Four-piston brake callipers round off this High-Tech brake system. To ensure consistent wear of brake linings, the brake pistons vary in diameter (32 and 34 mm, 1.26" and 1.34", respectively).

Precise application of the front wheel brakes has been improved substantially by optimising the transmission ratio of the hydraulic system (piston diameter in the master cylinder versus piston diameter in the brake calliper) and designing the brake lever with highly ergonomic contours.

The rear wheel of the K 1 features the proven brake of the K 100. To ensure even better thermal stability, however, the brake disc has been increased in thickness from 4 to 5 mm (0.16 to 0.20").

It almost goes without saying that the highly efficient brakes of the K 1 are available as an option with ABS, like all the K 100 models. Given the different suspension geometry, the new front wheel fork and brakes as well as the wider tyres, the anti-lock brake system nevertheless had to be thoroughly adapted to the K 1. To

achieve optimum weight distribution and keep the brake lines as short as possible, the ABS pressure modulator for the front-wheel brake has been moved to the front beneath the fairing of the K 1 (not applicable to the K 100 RS).

### **New spring strut and sports wheels**

To ensure optimum roadholding of the rear wheel, the Paralever swinging arm is supported on the frame by a new, specially-rated gas-pressure spring strut (140 mm/ 5.51" spring travel). Two special features of the spring strut are its progressive-action spring and travel-related damping effect. To adjust to the load the motorcycle is carrying, the spring can be set to four different positions by means of the tools in the toolkit, and is easily accessible.

The K 100 RS features the modified spring strut of the K 75 S, providing a somewhat higher standard of riding comfort. Spring travel is 120 mm (4.72").

Featuring new light-alloy wheels in sporting three-spoke design, extra-wide rims and radial-ply tyres (120/70 VR-17 at the front, 160/60 VR-18 at the rear), the K 1 provides a clear visual testimony to its superbike qualities.

## Reinforced frame and modified suspension geometry

Since research conducted by BMW's Test Department shows that suspension and running gear loads increase at the squared root of road speed, the frame of the K 100 was modified accordingly to match the greater power and performance of the K 1. All the tubes in the load-bearing centre section are even stronger and wider in diameter. Additional stability is also provided by the extension of the wheelbase by 54 mm (2.13"), which is mainly attributable to the longer Paralever swinging arm and, to a lesser extent, to the modified wheel fork geometry. Since road tests of the K 1 showed right from the beginning that directional stability was very good, handling has been optimised by keeping front wheel castor very short at a mere 90 mm (3.54").

To maintain this superior handling also on winding roads, the K 1 deliberately breaks with the tradition of slender handlebars on high-performance machines. The handlebar grab points are therefore 670 mm (26.38") apart (new K 100 RS: 610 mm/24.02").

## K 1 features and model fitments

### Unconventional through and through

Launching the R 100 RS in 1976 and the K 100 RS in 1983, BMW already set new standards in aerodynamic motorcycle styling. Now the Company is continuing this tradition with the K 1. Although the K 1 is designed to a greater extent for dynamism and performance, the objective was not only to reduce air drag but also to enhance rider comfort. In designing the body of the K 1, BMW's stylists were therefore required to ensure relaxed and fatigue-free riding even at high speeds as well as sensible protection from wind and weather.

To fulfill even more demanding objectives, the designers and stylists then had to introduce some unconventional solutions. One particularly striking example is the shape of the front wheel fender designed as an integral part of the new aerodynamic concept and thus standing out clearly from the traditional mudguard design. Air vents for cooling the new brake system obviously became a necessity in the light of this brand-new concept.

### Record-breaking streamlining for even greater safety and road comfort

The voluminous and, as seen from above, wedge-shaped contours of the front-wheel fender provide a complete, symmetrical fairing profile and, as a result, a turbulence-free flow of air along the fairing, past the rider's legs and back to the rear end of the tapered tail section. The product of frontal area (A) and drag coefficient (cd) essential to road performance is far below  $0.4 \text{ cd} \times A$  in the case of the K 1 - or, in more precise terms, 0.38 with the rider sitting upright and



0.34 with the rider leaning forward. This outstanding sleekness reduces fuel consumption and increases road performance. The top speed of more than 230 km/h (143 mph) is nevertheless largely a theoretical entity on public roads.

In search for optimum ride stability, BMW's designers and engineers spent weeks of painstaking effort in the wind tunnel, seeking above all to further reduce lift forces on the front wheel. Know-how gained in endurance tests then resulted in the final optimisation measures in early 1989: To provide optimum weight distribution, the coolant reservoir and toolkit storage box were moved to the front beneath the fairing. Air intake openings were furthermore provided in the upper and central sections of the fairing in order to reduce heat dissipation from the engine particularly unpleasant for the rider in hot weather.

Special attention has been given to ensuring optimum ergonomics of the handlebar, seat and footrests, which must all be perfectly matched for absolute rider comfort. Independently mounted to avoid vibrations, the rider's footrests have been moved back some 150 mm (5.91") and up by 20 mm (0.79") versus the K 100. Seat height is 780 mm (30.71") and the seat itself measures 700 mm (27.56") in length.

The knee pads in the fairing serve to absorb kinetic energy in the event of a head-on collision. In conjunction with the padding on the diagonally contoured fuel tank, the knee pads also help the rider to move upwards over an obstacle in the event of a collision. Precisely this configuration meets the requirements made by accident researchers.

## Not built for touring under all circumstances

Through its striking looks and the rider's seating position alone, the K 1 clearly shows that it does not seek to provide the same touring qualities as all of BMW's motorcycles so far. Indeed, the concept of the K 1 to be more of a sports machine than a tourer is also expressed by the fact that the K 1 is deliberately designed not to carry touring cases. Passenger comfort, on the other hand, has not been sacrificed to this dynamic style, a comfortable passenger seat behind the rider becoming available after removal of the seat "hump".

And since even the most dynamic machine requires certain practical values, there are two small lockable storage boxes in the wide rear section (with a capacity of 6 litres/0.21 cu ft each) for carrying the most important odds and ends which do not fit into the BMW tank bag (capacity: 28 litres/0.98 cu ft) that naturally also fits on to the K 1.

Motorcyclists riding without a passenger may also fit the baggage system specially developed for the K 1 with another 42 litres (1.47 cu ft) capacity. Consisting of three bags interconnected by zippers and made from water-repellant nylon, this baggage system is protected even in the worst of weather by a special rain hood. All the rider has to do is remove the seat "hump" and fit the baggage system on to the rear section and passenger grab handle by means of elastic straps. He can even remove the two side bags individually and put them together to form a carrier bag with shoulder strap.

A practical and convenient feature is the new central lock combining the ignition and handlebar lock functions.

Choosing the colours of this new super sports machine, BMW's designers again expressed their clear commitment: The purchaser has the choice of Marrakesh red or Lagoon blue metallic. The powder-coated wheels, drive train, K 1 markings on the fairing and the individual sections of the seat come in bright yellow as a striking contrast, clearly underlining the sheer performance and sporting elegance of this unique new BMW.

## THE 4-CYLINDER K 100 SERIES

### The new K 100 RS: now even more dynamic and safer

Ever since they were launched in autumn 1983 the BMW K 100 models have been best-sellers in the motorcycle market. Within six years, more than 80,000 units of this 4-cylinder have been produced in BMW's Berlin-Spandau factory. Unchanged in their suspension and engine output of 90 bhp, the K 100 (no longer available in all countries from 1990) and K 100 LT two-valve four-cylinder models are now entering their seventh year of production.

The new four-valve K 100 RS now developing 100 bhp, on the other hand, presents an entirely different story. As of 1990 this model comes with the innovative components of the K 1 and therefore moves up to a far higher level - above all in its technical features - than the previous version of the K 100 RS.

Since 1988, all the models in the K 100 Series have been the world's first and so far only production motorcycles to feature electronic/hydraulic anti-lock brakes (ABS) available as an option (for more details, see the article on ABS in this press folder). In 1989 more than 70 per cent of all K 100 purchasers were willing to pay a premium for this extra safety not available from any other manufacturer.

The K 100 RS sports tourer may be regarded as one of the most successful motorcycles of the 80's. The readers of MOTORRAD, Europe's largest motorcycle journal, have voted the K 100 RS Motorcycle of the Year no less than five times running, a truly unique event in the history of this popularity vote.

In other European countries, in America, Australia and even in Japan, the K 100 RS has also received many coveted awards. Selling more than 35,000 units worldwide, it is the best-selling K model. Now, after 6 years of production without major changes, the K 100 RS enters the 1990 model year with some fundamental modifications, in this way meeting the demand for improved performance and sportiness currently to be observed in the sports tourer market, without making any concessions in terms of touring capacity (riding comfort, luggage space and service load). More sportiness in the case of the new K 100 RS also means more engine power and, as a result, even better performance - which, as a consequence, implies greater safety ensured by the optimised suspension and brake system.

All the essential "ingredients" for this higher standard stem from the most dynamic of all BMW motorcycles in recent years, the K 1 launched in 1989. Apart from its role as an image leader, this innovative top-of-the-range model also serves as the technological spearhead in BMW's modular motorcycle components concept.

Starting with the 1990 model year, the new K 100 RS therefore now comes with BMW's four-valve power unit developing 100 bhp and 100 Nm (74 ft/lb) of torque. It features Digital Motor Electronics and the round stainless-steel exhaust pipe, brakes, front wheel fork (with somewhat more comfort-oriented tuning), Paralever suspension, wheels as well as the central handlebar and ignition lock of the K 1. Accordingly, all of these components are absolutely identical on both models. The suspension geometry as well as the reinforced tubular space-frame of the new K 100 RS are now also the same as on the K 1. The technical description of the K 1's engine and running gear in Chapters 3 and 4 of this press folder therefore now applies in every respect also to the K 100 RS.

The only exceptions and differences are as follows:

## 1. Handlebar

Following the example set by the K 1 with its wide handlebar measuring 670 mm or 26.4" from one end to the other, the handlebar of the K 100 RS has also been enlarged in width from 574 mm (22.6") to 610 mm (24.0"). This means even better ergonomics, a more comfortable seating position and improved touring qualities. Yet another advantage is that the wider handlebar ensures even better handling. The optimised handlebar bearing and newly designed foam plastic handles also help to dampen vibrations to a minimum.

This wider handlebar and the central lock for both the handlebar and ignition adopted from the K 1 also required a new impact boss. In addition, the K 100 instruments on the RS now come in a new colour scheme.

To maintain the hand protection function of the rear-view mirrors with integral direction indicators, the mirrors have been adapted accordingly to go together with the wider handlebar, thus once again ensuring optimum visibility to the rear.

## 2. Rear-wheel spring strut

On the rear wheel the K 100 RS features the modified spring strut of the K 75 S. Spring travel is 120 mm (4.72") and the spring setting is more comfortable than on the K 1.

## 3. Gearbox ratios and final drive

The new K 100 RS features the proven 5-speed gearbox highlighted on all K models. As on the K 1, however, fifth gear has been adapted to the higher top speed of more than 220 km/h (136 mph) (previously 1.67, now

1.61 as on the K 1). The final drive transmission ratio, on the other hand, remains unchanged at 2.81 (whereas it is 2.75 on the K 1).

#### 4. Vibration damping

Unlike the K 1, the new K 100 RS features rubber dampers on the front connection points between the frame and engine, which have been optimised over the former versions in terms of both riding stability and vibration damping. The exhaust silencer of the K 100 RS is now suspended on the left-hand footrest plate where it cannot transmit any vibrations.

All other modifications versus the former model are detailed changes which became necessary as a result of technical development. Examples are the modified rear wheel cover, the new number plate support, the front wheel mudguard adopted from the K 75 S and the modified footrest plates.

The almost classical sports tourer fairing of the K 100 RS, on the other hand, remains unchanged. Optimised in the wind tunnel, this multi-piece sports tourer fairing is fastened to the handlebar centrepoint by a multi-arm support and rests on vibration dampers. It incorporates rear-view mirrors which also serve to protect the rider's hands, integral direction indicators and leg protection covers made of integral foam around the rear end of the fairing. An adjustable spoiler on the upper edge of the fairing ensures a well defined flow of air above the rider's helmet.

The exemplary fairing of the K 100 RS not only offers very good protection from wind and weather but also provides a very high standard of efficient streamlining as a guarantee for excellent performance, superior fuel

economy and reduced front-wheel lift. The final result is optimum stability at high speeds and even greater riding safety.

The hinged seat now comes with even more comfortable upholstery (seat height 800 mm/31.5"). It almost goes without saying that a detachable seat is once again available as an option for smaller riders, reducing seat height to 760 mm (29.9"). Another almost natural feature is that the new K 100 RS again features the wide range of cases and bags available for all K 100 models, the tank bag, pannier cases and luggage rack being fitted in their usual position.

Becoming more powerful and more dynamic, the new K 100 RS has of course also become safer. Ultimately, this means a further improvement of the already excellent all-round qualities of this magnificent machine.

Compared with the striking avantgarde styling of the K 1 sports machine, the new K 100 RS is almost reserved - and definitely very classical - in its appearance. This exceptional style is also a result of the colour scheme, with the K 100 RS being available in pearl-silver metallic and yucca-green metallic. Both of these paintwork versions come with silver-painted three-spoke rims, an additional feature on the pearl-silver metallic model being the dual blue lines applied by hand. The engine cover and drive train are finished in black.

In addition to the ABS anti-lock brake system, lower seat, luggage rack and case holders already mentioned, the K 100 RS is available ex works with further options such as heated handles, hazard warning flashers, engine spoiler, engine protection bar, anti-theft warning system, temperature gauge and fuel gauge.



### K 100: relaxed riding with your face in the wind<sup>3)</sup>

The K 100 has always been a "grassroots" motorcycle - the down-to-earth no-fairing model. It was also the first model in BMW's four-cylinder series to receive a styling facelift for the 1988 model year. The specific modifications were to drop the kidney-shaped radiator grille as well as the headlight fairing, the headlight now being chrome-plated just like the exhaust cover and front brake hose sleeves. The engine cover, wheels and footrest plates are finished in black, the edges and engine cover fins are polished.

The K 100 features the 21-litre (4.6 Imp gal) fuel tank of the K 75 with integral knee-pads and side covers. It has a high-rise handlebar and - last but not least - a special feature (like the K 75) particularly for somewhat smaller riders: the detachable black seat with its standard height of 760 mm (29.9") and optional height - for the taller rider - of 800 mm (31.5"). Like the "basic" version of the K 75 without fairing, the K 100 also comes as standard with a digital clock from the 1990 model year.

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3) As of 1990 the K 100 is no longer available in all countries.

## The K 100 LT: the luxury tourer

Like the sports tourer fairing of the K 100 RS, the multi-piece luxury touring fairing of the K 100 LT is fastened by a multi-arm support to the handlebar centrepiece and rests on vibration dampers. With the detachable windshield plus spoiler extending far to the rear, the fairing gives the rider and passenger optimum protection in wind and weather. It also includes a rear-view mirror housing to protect the rider's hands, while the direction indicators are integrated directly in the fairing itself. As on the K 100 RS, the fork opening is fully sealed and the rear edges of the fairing serve to protect the rider's legs.

Standard features include integral cases also designed in the wind tunnel and a small topcase to be fitted on the luggage rack. Since one key fits all locks, the rider requires only one and the same key for the ignition, handlebar lock, fuel tank filler cap, seat, topcase and integral case locks. The covers on the integral and top-cases are incidentally finished in the same colour as the motorcycle itself. The standard equipment featured by the K 100 LT includes hazard warning flashers, an additional socket in the handlebar impact boss and soft rubber handles.

A special range of options available specifically for the K 100 LT offers even more riding comfort and, indeed, luxury: Instead of the standard windshield, this model is also available with a higher windshield (530 mm/21") with and without side flaps. In the Federal Republic of Germany only a low version (430 mm/16.9") of this windshield without side flaps is available, since under German law the rider must be able to look over the windshield.

In conjunction with the new windshield (both the high and the low version) there is also an additional instrument panel above the standard controls and instruments. It comprises a fuel and coolant temperature gauge, a map reading light, socket and cigar lighter.

Riders who wish to tune in to traffic reports or enjoy their favourite music while out on a tour may also order the radio installation kit with suppressor and aerial together with a Clarion cassette radio available from their dealer, which fits perfectly into the left-hand stowage box in the fairing. The radio can be operated while riding by special controls on the left-hand handlebar.

## THE 3-CYLINDER K 75 SERIES:

Also available with ABS from 1990

Launched in autumn 1985, BMW's three-cylinder K 75 Series has already been sold more than 25,000 times worldwide. Both models, that is the K 75 and the K 75 S, are available from 1990 with BMW's unique electronic/hydraulic anti-lock brakes (ABS) as an optional extra, thus following in the footsteps of the K 100 Series, which has had this option since 1988.

### K 75:

An attractive model for achievers with an extra-low seat

In terms of both price and styling, the "basic" K 75 without fairing is a very attractive model for achievers moving into the BMW K Series. With its seat height of 760 mm (29.9") (optional: 800 mm/31.5") it is also just right for the somewhat smaller rider. As of the 1990 model year, the K 75 comes with a number of features so far available only on the K 75 S: First, the front-wheel fork with 135 mm or 5.31" spring travel (previously 185 mm/7.28"), sports tuning and fork stabiliser. Second, the rear-wheel disc brake replacing the old drum brake - and providing the technology required for the use of ABS. This also means that the K 75 now has a smaller 17" wheel at the rear (previously 18"), just like the K 75 S, K 100 and K 100 LT.

## K 75 S:

### Sports suspension and dynamic looks

The sports version of the K 75 has been available since summer 1986. It features a sports fairing with integral direction indicators styled in BMW's wind tunnel. The relatively slender but nevertheless efficient fairing offers not only good protection from wind and weather but also increases the dynamic riding characteristics and safety of this machine by considerably reducing lift forces on the front wheel and air resistance. Accordingly, the top speed of the K 75 S is about 10 km/h (6 mph) higher than the top speed of the K 75, which is capable of about 200 km/h (124 mph).

The engine spoiler fitted as standard blends very harmoniously with the overall styling of the K 75 S awarded a special prize in 1986 by the Stuttgart Design Center. From the 1988 model year the short, sporty handlebar has been 3 cm wider, further improving the handling of the K 75 S.

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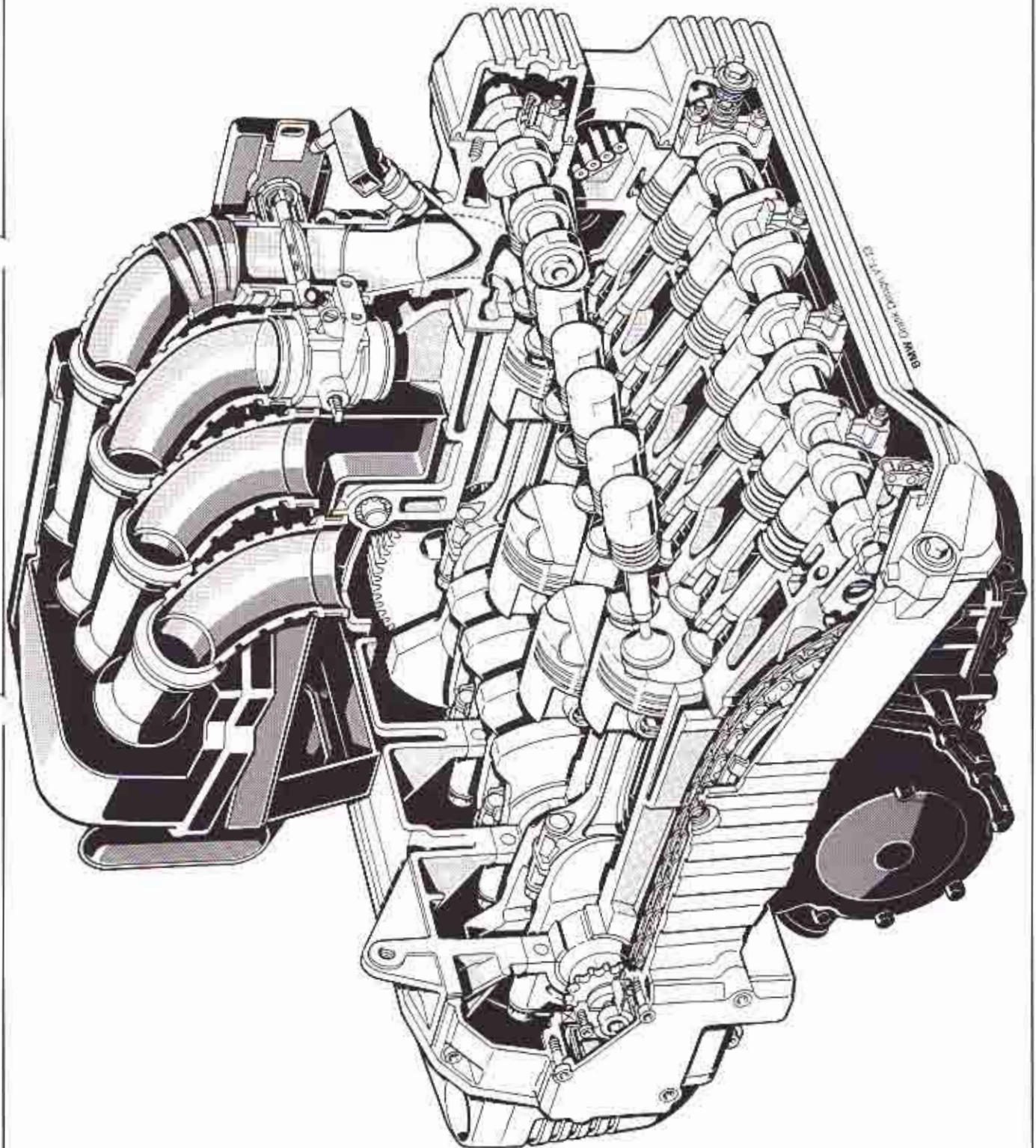
	SPECIFICATIONS BMW MOTORCYCLES		K 75	K 75 S			
Motor	Cubic capacity	cc <sup>3</sup>	740	740			
	Bore/stroke	mm	67/70	67/70			
	Max output	kW/bhp	55/75	55/75			
	at	/rpm	8500	8500			
	Max torque	Nm	68	68			
	at	/min	6750	6750			
	Design		inline	inline			
	No of cylinders		3	3			
	Compression ration/fuel grade (also unleaded)		11,0 S	11,0 S			
	Valve control		DOHC	DOHC			
	Valves per cylinder		2	2			
Intake/outlet dia	mm	34/30	34/30				
Fuel supply		LE-Jetronic with coasting cut-off					
Electrical system	Ignition		VZ-51 L digital ignition				
	Alternator	W	460	460			
	Battery	V/Ah	12/25	12/25			
Headlight		W	H 4 55/60	H 4 55/60			
	Starter	kW/	0.7	0.7			
Power transmission, Gearbox	Gearbox		5-speed gearbox with dog-type shift				
	Gear ratios	I	4,50/3,20	4,50/3,20			
		II	2,96/3,20	2,96/3,20			
		III	2,30/3,20	2,30/3,20			
		IV	1,88/3,20	1,88/3,20			
	V	1,67/3,20	1,67/3,20				
Suspension	Rear-wheel drive		Encapsulated drive shaft with universal joint and integrated torsion damper				
	Clutch		Single-plate dry clutch rotating in opposite direction				
	Type of frame		Tubular space, engine serving as loadbearing component				
	Spring travel front/rear	mm	135/110	135/110			
	Wheel castor	mm	101	101			
	Wheelbase	mm	1516	1516			
	Brakes(asbestos-free)	Front:		dual-disc brake, dia 285 mm			
		Rear:		single-disc brake, dia 285 mm			
	Wheels	front		Light-alloy wheels	Light-alloy wheels		
		rear		2,50 - 18 MTH 2	2,50 - 18 MTH 2		
Tyres	front		2,75 - 17 MTH 2	2,75 - 17 MTH 2			
	rear		100/90/H 18	100/90/V 18			
			130/90/H 18	130/90/V 17			
			tubeless	tubeless			
Dimensions and weights	Length, overall	mm	2220	2220			
	Width with mirrors	mm	900	810			
	Handlebar width without mirror	mm	710	650			
	Seat height	mm	760*	810			
	Weight, unladen with full tank	kg	228	235			
	Max permissible weight	kg	450	450			
	Fuel tank	l	21	21			
	Performance	Fuel consumption					
90 km/h (56 mph)		ltr	4,5	4,3			
120 km/h (68 mph)		ltr	5,2	5,0			
Acceleration							
0-100 km/h (62 mph)		sec	4,6	4,6			
standing-start km	sec	25,6	25,2				
Top speed	km/h	200	210				
Model features	Fairing			Glass-fibre-reinforced plastic sports fairing fitted to frame, glass-fibre-reinforced engine spoiler			
	Standard features		Repair kit, toolkit	Repair kit, toolkit, digital clock			

\* alternatively 800 mm

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SPECIFICATIONS BMW MOTORCYCLES		K 100	K 100 LT	K 100 RS	K 1	
Engine	Cubic capacity	cc	987	987	987	987
	Bore/stroke	mm	67/70	67/70	67/70	67/70
	Max output	kW/bhp	66/90	66/90	74/100	74/100
	at	rpm	8000	8000	8000	8000
	Max torque	Nm	86	86	100	100
	at	rpm	6000	6000	6750	6750
	Design		inline	inline	inline	inline
	No of cylinders		4	4	4	4
	Compression ratio/fuel grade (also unleaded)		10.2 N	10.2 N	11.0 S	11.0 S
	Valve control		DOHC	DOHC	DOHC	DOHC
Valves per cylinder		2	2	4	4	
Intake/outlet dia	mm	34/30	34/30	26,5/23	26,5/23	
Fuel supply		LE-Jetronic	LE-Jetronic	Motronic	Motronic	
Electrical system	Ignition		VZ-51 L digital ignition	VZ-51 L digital ignition	Motronic	Motronic
	Alternator	W	460	460	460	460
	Battery	V/Ah	12/25	12/25	12/25	12/25
	Headlight	W	H 4 55/60	H 4 55/60	H 4 55/60	H 4 55/60
Starter	kW	0.7	0.7	0.7	0.7	
Power transmission, Gearbox	Gearbox		5-speed gearbox with dog-type shift			
	Gear ratios	I	4.50/2.91	4.50/2.91	4.50/2.81	4.50/2.75
		II	2.96/2.91	2.96/2.91	2.96/2.81	2.96/2.75
		III	2.30/2.91	2.30/2.91	2.30/2.81	2.30/2.75
		IV	1.88/2.91	1.88/2.91	1.88/2.81	1.88/2.75
	V	1.67/2.91	1.67/2.91	1.61/2.81	1.61/2.75	
Suspension	Rear-wheel drive		Encapsulated drive shaft with universal joint and integrated torsion damper		BMW Paralever	BMW Paralever
	Clutch		Single-plate dry clutch rotating in opposite direction, dia 180 mm			
	Type of frame		Tubular space frame, engine serving as load-bearing component			
	Spring travel front/rear	mm	185/110	185/110	135/120	135/140
	Wheel castor	mm	101	101	90	90
	Wheelbase	mm	1511	1511	1564	1565
	Brakes	Front:	dual-disc brake, dia 285 mm		∅ 305 mm	∅ 305 mm
		Rear:	disc brake, dia 285 mm		∅ 285 mm	∅ 285 mm
	Wheels		Light-alloy wheels	Light-alloy wheels	Light-alloy wheels	Light-alloy wheels
	front		2.50 - 18 MTH 2	2.50 - 18 MTH 2	3.50 - 17 MTH 2	3.50 - 17 MTH 2
rear		2.75 - 17 MTH 2	2.75 - 17 MTH 2	4.50 - 18 MTH 2	4.50 - 18 MTH 2	
Tyres	front	100/90 V 18	100/90 V 18	120/70-VR 17	120/70-VR 17	
	rear	130/90 V 17 tubeless	130/90 V 17 tubeless	160/60-VR 18 tubeless	160/60-VR 18 tubeless	
Dimensions and weights	Length, overall	mm	2220	2220	2230	2230
	Width with mirrors	mm	960	916	800	760
	Handlebar width	mm	755	770	610	670
	Seat height	mm	760	810	800	780
	Weight, unladen with full tank	kg	240	263	259	259
	Max permissible weight	kg	480	480	480	480
	Fuel tank	ltr	21	22	22	22
	Performance	Fuel consumption				
90 km/h (56 mph)		ltr	5.0	4.4	4.7	4.2
120 km/h (75 mph)		ltr	5.7	5.4	5.3	5.0
Acceleration						
0-100 km/h (62 mph) standing-start km		sec	4.0	4.1	3.9	3.9
Top speed	km/h	23.6	24.1	22.9	22.3	
		215	215	more than 220	more than 230	
Model features	Fairing			Multi-piece aerodynamically optimized sports-touring fairing	Multi-piece-aerodynamically optimized touring full fairing	Multi-piece-aerodynamically optimized sports fairing
	Standard features		Repair kit, toolkit	Repair kit, toolkit, digital clock, integral cases with support and standard key Additional K 100 LT features: hazard warning flashers, 2 sockets, soft rubber handlebars, luggage rack, topcase	Repair kit, toolkit, digital clock, Central locking	Repair kit, toolkit, digital clock, Central locking

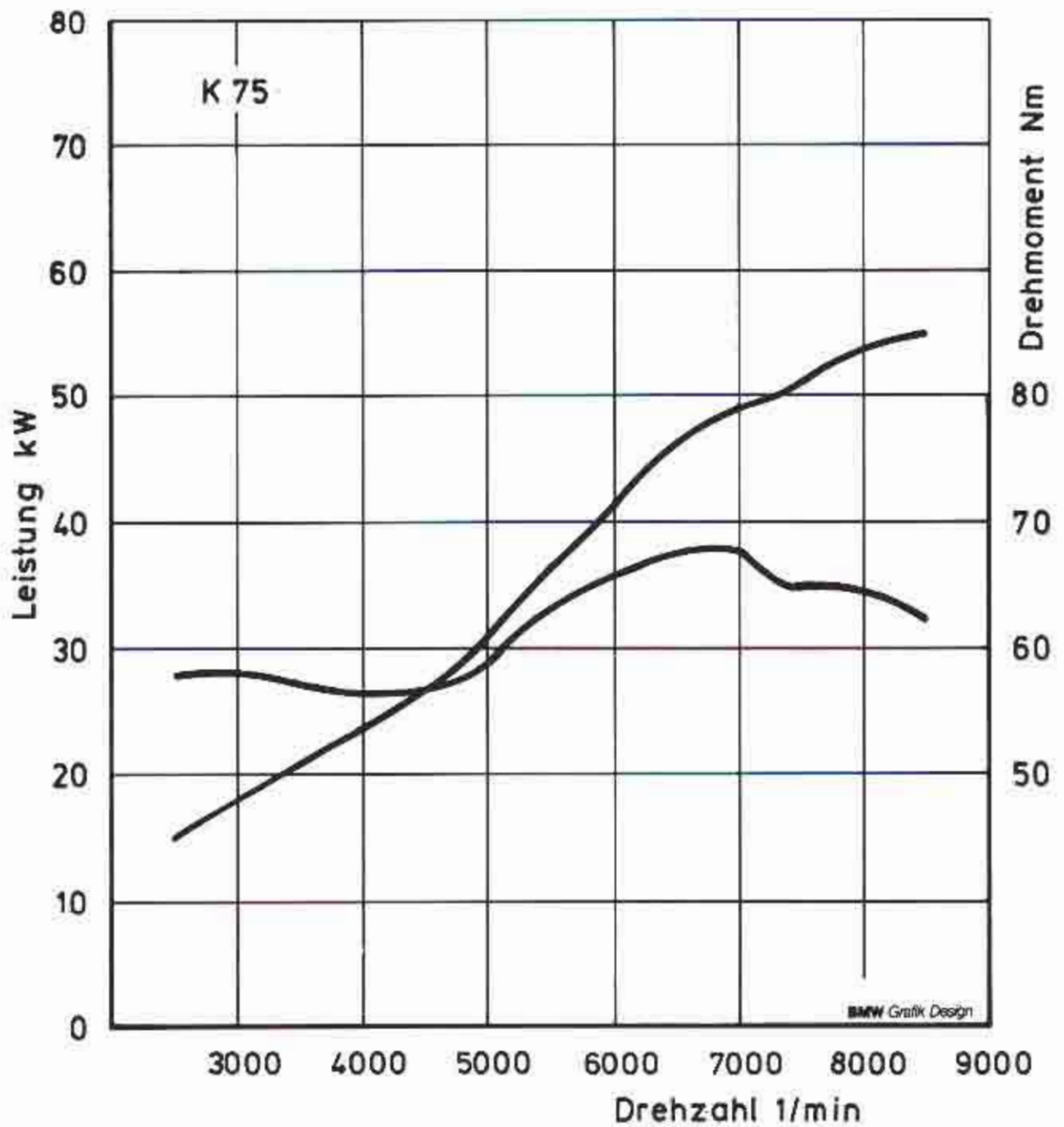
BMW K 1 und K 100 RS





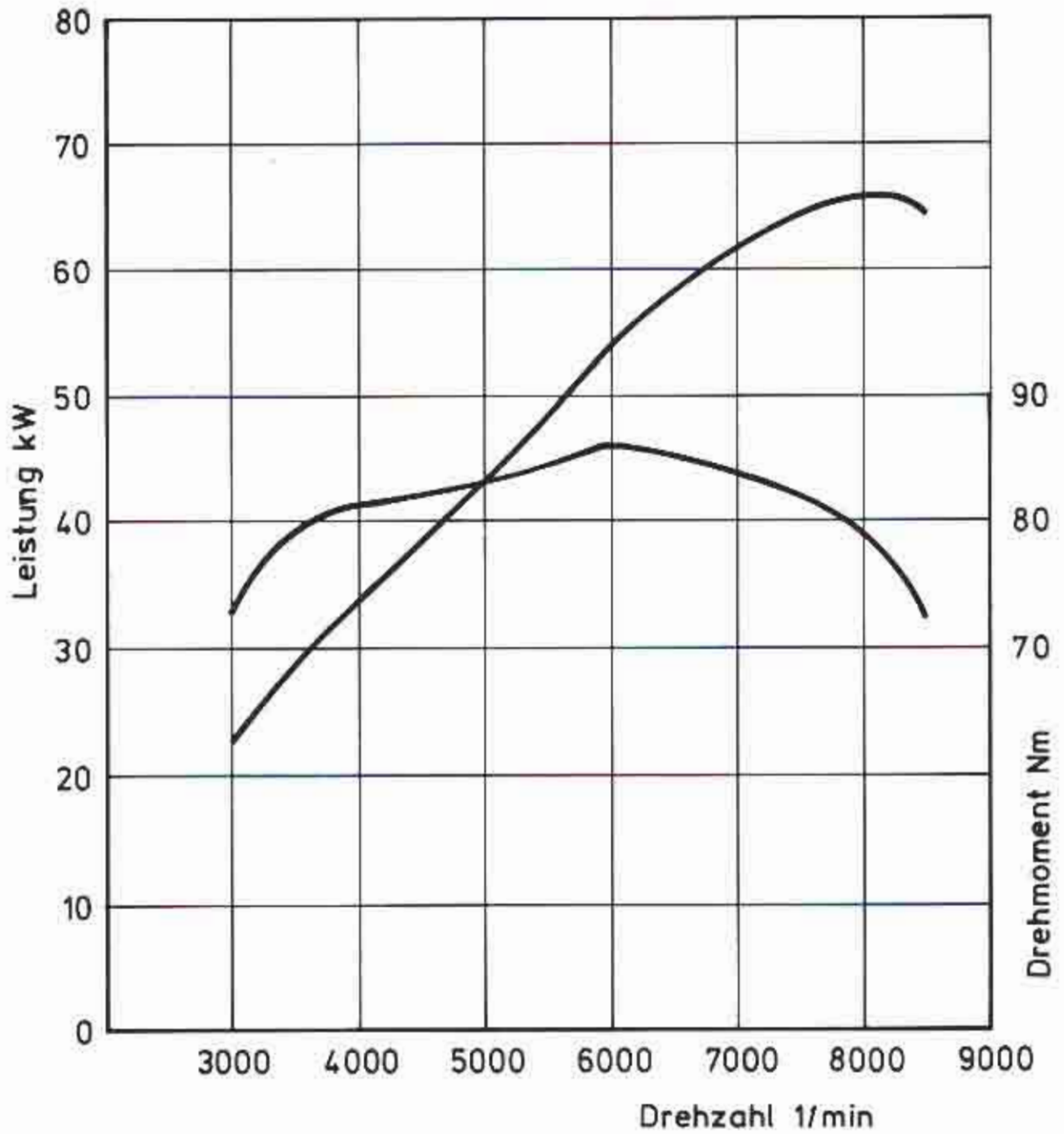


BMW K 75



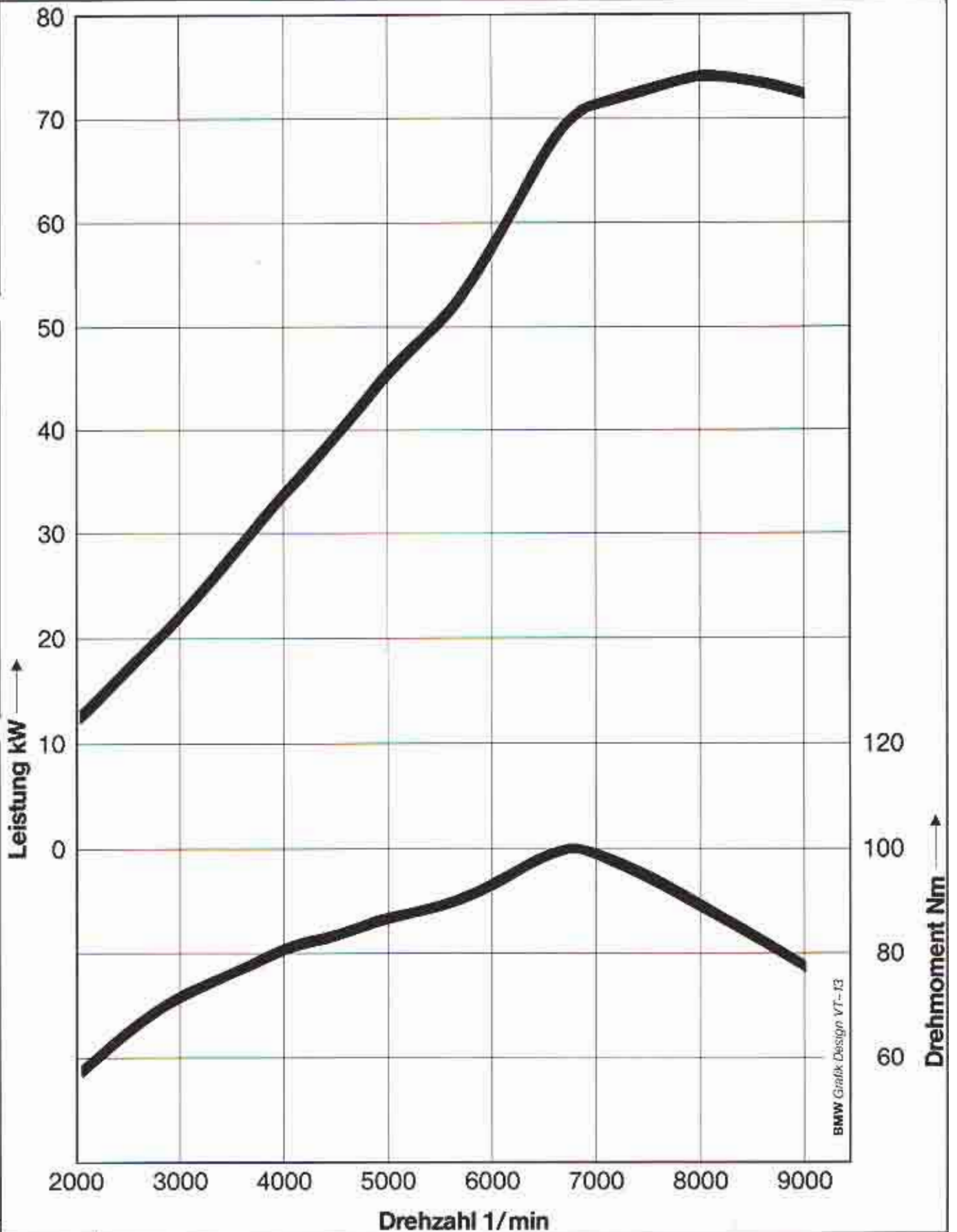


BMW K 100 und K 100 LT

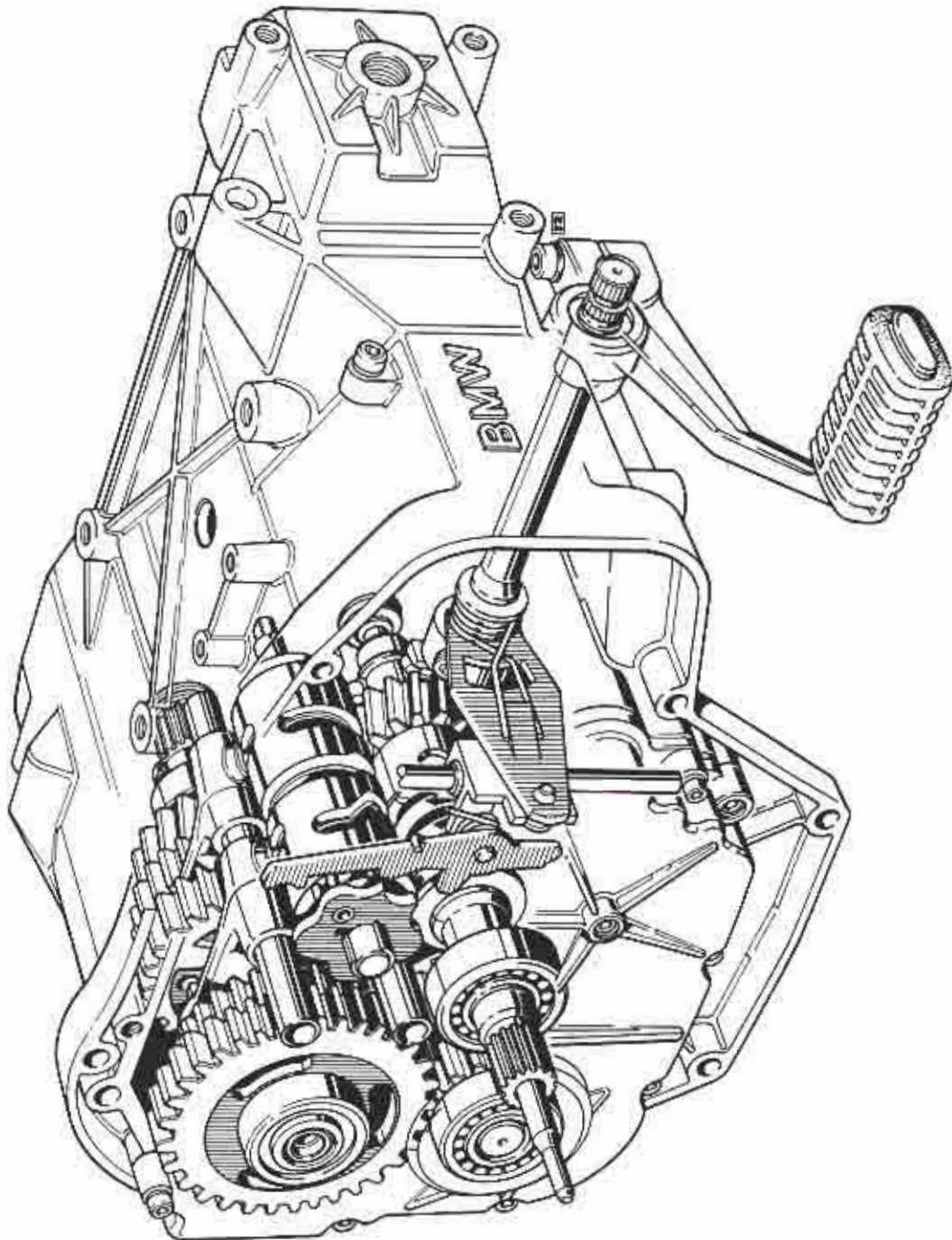




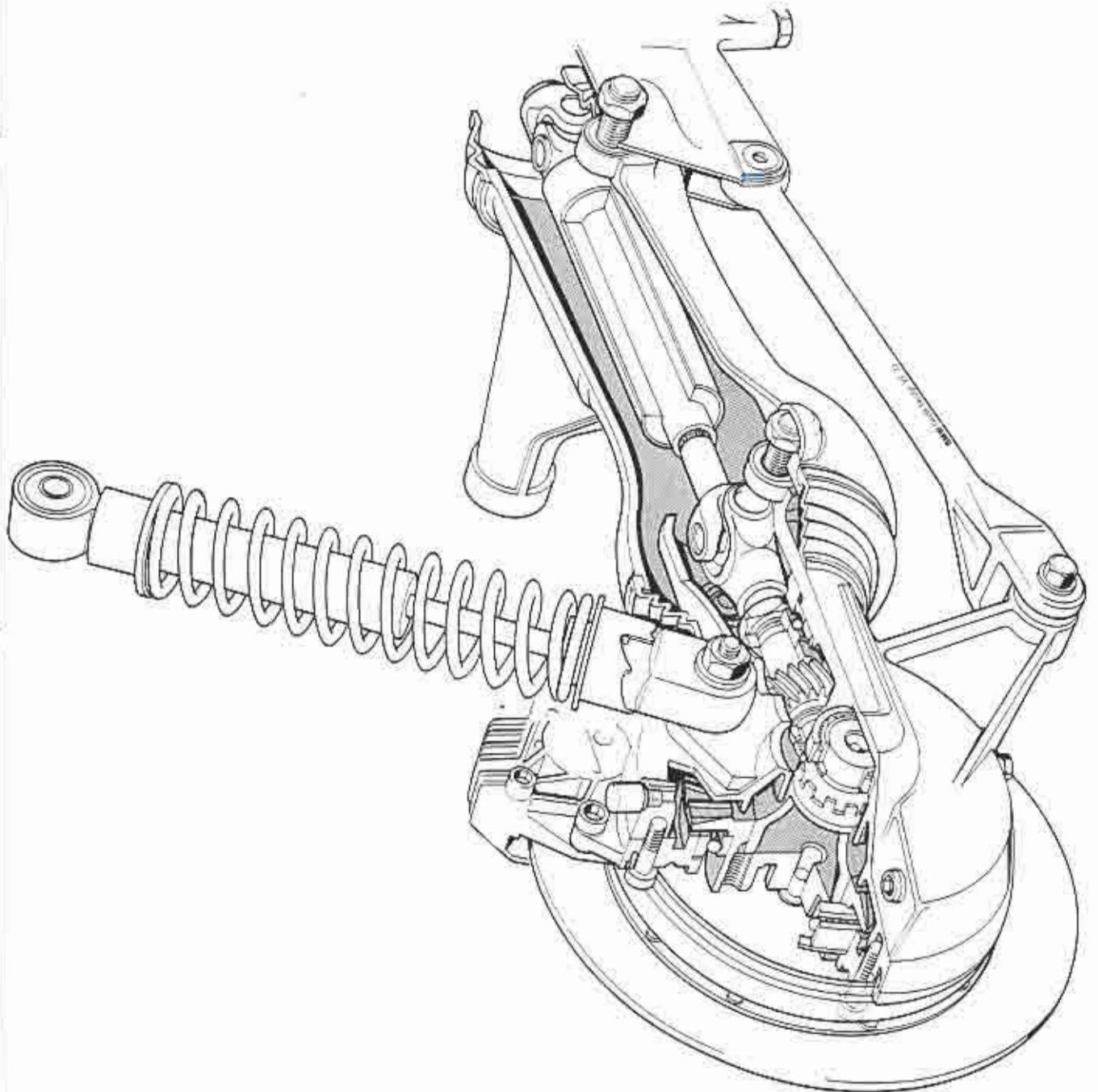
BMW K 1 und K 100 RS



BMW K-Modelle



BMW K 1 und K 100 RS



## THE BMW FLAT-TWIN R SERIES MODELS

### BMW's enduro machines remain the market leaders

Despite the overwhelming success of the BMW K-generation, the BMW flat-twin built since 1923 has maintained its superior position in the market. Just to brush up your memory: When the K 100 Series was launched in autumn 1983 the R 100 Series was withdrawn in order to provide room for BMW's new top models. With exhaust emission and noise standards becoming stricter all the time, BMW felt that in future the boxer would only serve for a power range up to 60 bhp.

Initially, 800 cc and 50 bhp were the new upper limit for the flat-twin series. Two modernised 800-cc models, the R 80 and R 80 RT, were therefore introduced in autumn 1984. When supporters of the big boxer called for the re-introduction of the one-litre model, BMW presented the modernised 60-bhp R 100 RS in autumn 1986. Since the R 100 RS then proved to be most successful the world over, BMW decided in autumn 1987 to add the R 100 RT to the existing model range. Without doubt, however, the completely new R 100 GS represents the highlight of this renaissance of the big boxer, continuing together with the new R 80 GS the successful 7-year history of the old R 80 G/S since autumn 1987. Indeed, the new GS models have proved to be even greater best-sellers, substantially improving on their predecessor's sales figures even at the best of times.

BMW's range of enduro models became even more attractive in spring 1989 through the introduction of a newly developed Paris-Dakar version of the R 100 GS. All the special components on this model are also available individually or as a kit and may therefore be retrofitted on the R 100 GS and R 80 GS.

### **From 1990: sports suspension for the new GS models as a conversion kit**

Special accessories for really tough off-road riding are available as a brand-new feature from 1990. With these accessories the genuine enthusiast can convert all new GS models to a sophisticated sports suspension developed jointly by BMW and the Dutch company, White Power. This conversion kit consists of a complete set of long, progressive-action telescopic springs with improved load-bearing capacity plus a sports-tuned rear-wheel spring strut adjustable to several different settings.

### **Improved rear-wheel brake**

All 1990 Boxers feature an improved drum brake on the rear wheel: Brake pad width has been increased from 25 to 27.5 mm (0.98 - 1.08") and the brake shoes are now fitted on new mounts.

## R 65 and R 65 GS:

### Attractive entry-level models exclusively for the German market

The R 65 is still available exclusively for the German market with an output of 27 bhp (20 kW) in accordance with German motor insurance requirements (lower insurance premium). With its maximum torque of 45 Nm (33 ft/lb) at just 3500 rpm, this machine offers the same superior performance as all of BMW's larger Boxers. Unusually dynamic for a 27-horsepower motorcycle, the R 65 has a top speed of over 150 km/h (93 mph). With the exception of its engine specifications, the R 65 is identical to the R 80 in terms of looks, technical fitments and model features.

Another special model for the German market is the 27-horsepower R 65 GS with almost exactly the same engine specifications as the R 65. With the exception of its engine, this entry-level enduro is almost identical to the former R 80 G/S in terms of both suspension, running gear and styling.



## R 80: the classic sports machine

The R 80 without fairing is a classic road machine for the sporting rider - a "grassroots" motorcycle at its very best. The superior 800-cc power unit develops 50 bhp (37 kW) and offers an exceptional torque curve: the maximum torque of 58 Nm (43 ft/lb) comes at an engine speed of just 4000 rpm.

The engine of the R 80 is arranged in the usual way. Via a lightweight clutch and a directly connected 5-speed gearbox power is transmitted directly through the low-maintenance drive shaft to the rear-wheel drive also running in bevel gears (like on the K 100). Like all BMW motorcycles, the R 80 also features the BMW monolever system. The decisive advantages of this suspension are good wheel guidance, low weight and simple removal of the rear wheel.

Featuring 18" cast light-alloy wheels with Y-shaped spokes, tubeless low-profile tyres, a large telescopic fork with a tube diameter of 38.5 mm (1.52") and an integrated fork stabilizer, the highly efficient anti-fading single-disc brake with a disc diameter of 285 mm (11.2") and a reinforced double-loop frame, the R 80 now offers the same high technical standard as the K Series.

Two conventional circular dials for road and engine speed as well as a large 22-ltr (4.8 gal) tank give the R 80 timeless elegance and classic styling. Other features that add to this classic look are the comfortable seat with grab handles for the passenger and the rear section with stowage box.

Weighing a mere 210 kg (463 lb) with full tank, the R 80 is a lightweight in its class. With a maximum permissible weight of 440 kg (970 lb) and a maximum load of 230 kg (507 lb), this BMW flat-twin is really ideal for touring.

## **R 80 RT: the comfortable tourer**

Otherwise identical with the R 80, the R 80 RT features the large touring windshield for optimum protection in wind and weather. This windshield is ideal for comfortable long-distance touring in conjunction with the high-rise touring handlebar.

The multi-piece tourer fairing has a large adjustable windshield extending to the rear, direction indicators integrated in the fairing and two lockable storage boxes. Air inlet nozzles on both sides with adjustable nozzle openings provide a good supply of fresh air in hot weather. Dual disc brakes now come as standard.

The R 80 RT weighs only 227 kg (500 lb) with full tank - very little for a touring machine.

**The new R 80 GS: with the exception of the engine,  
almost the same supreme standard as the R 100 GS**

With the exception of the engine, the cylinder protection bars with side-stand not standard on this model and the small windshield, the new R 80 GS is virtually identical to the new R 100 GS. Its 800-cc power unit develops 50 bhp at 6500 rpm and generates its maximum torque of 61 Nm (45 ft/lb) at just 3750 rpm. All further information on the new R 80 GS is to be found in the text on the R 100 GS. Starting with the 1989 model year, the front mudguard of the R 80 GS and R 100 GS has also been available fitted in a lower position above the wheel. Another important modification of both models from 1989 is the softer spring strut now fitted as standard, although the former spring strut is still available as special equipment. Now, from the 1990 model year, a new foot brake lever on the R 80 GS and R 100 GS helps to optimise the lever transmission forces.

Based on vast experience in tough racing:  
Retrofittable Paris - Dakar kit for the R 80 GS and  
R 100 GS and the special R 100 GS Paris - Dakar model

The Paris - Dakar Rally, the world's toughest endurance race, has always been one of the absolute highlights in the successful 9-year history of BMW's enduro models. The competition version of the BMW R 80 G/S won the motorcycle category no less than four times - with Frenchman Hubert Auriol in the saddle in 1981 and 1983, and with Belgian Gaston Rahier taking over in 1984 and 1985. This obviously gave BMW sufficient reason to introduce a special Paris - Dakar model with a 32-litre tank in 1983 (the tank was also retrofittable on the standard R 80 G/S).

The supreme performance and endurance of BMW's flat-twin motorcycles was then proven once again early in 1988: Munich rider Eddy Hau won the marathon category for private riders in the Paris - Dakar Rally, riding a BMW R 80 G/S modified by the Bavarian tuning company HPN and available to enthusiasts in a small, special series of limited-edition models. Unlike the overall rating, the marathon category for private riders is far stricter, prohibiting the replacement of virtually all essential motorcycle components.

In the light of this racing success and in view of the experience gained in the process, it was an obvious decision by BMW to develop another Paris - Dakar kit for the new GS generation. This new machine is intended above all to meet the greater requirements made of a long-distance adventure motorcycle, efficiently protecting the rider from wind and weather, keeping the engine out of harm's way (stone-throw, etc), providing a longer range thanks to the larger tank and offering a larger luggage rack.

The new Paris - Dakar kit, which is also available in individual components, has been available since 1989 for conversion of the new R 80 GS and R 100 GS models. At a later point in time the kit will also become available in modified form for installation on the old R 80 G/S model and the R 65 GS.

Also since spring 1989, the R 100 GS Paris - Dakar model has been in production in Berlin.

The Paris - Dakar kit consists of the following features:

## **1. The fuel tank**

The 36-litre (7.9 Imp gal) fuel tank made of a special plastic for subsequent painting is based on the Paris - Dakar competition tank and offers optimum ergonomics for the rider. It also features a lockable stowage box with a capacity of 5 litres (0.18 cu ft).

## **2. The fairing**

The fairing is mounted on the handlebar centrepoint by a four-bolt connection piece and to the frame by a two-bolt connection. Unlike conventional fairing supports hidden behind the fairing and not visible from outside, the new tubular fairing support featured by the BMW Paris - Dakar kit is visually integrated in the fairing as an outstanding functional and styling highlight (form follows function). This new concept offers three practical advantages: It protects the fairing from damage in the event of an accident, facilitates transportation and lifting up of the motorcycle thanks to the clearly defined fastening and holding points, and keeps the fairing free of vibrations while on the road.

The standard instruments and warning lights of the GS models are fitted in the central fairing section, together with additional instruments such as the rev counter and quartz clock (which will be standard on the R 100 GS Paris - Dakar model). The central section of the fairing also accommodates the high-intensity rectangular headlight already featured on the K 75 S. In accordance with the general nature of this machine and its specific requirements, the direction indicators are mounted on rubber bushes. The side sections of the fairing provide a direct connection to the fuel tank, while the tinted, efficiently streamlined windshield on the fairing protects the rider from wind and weather.

### **3. Engine protection, engine housing and flared mudguard**

This new machine not only seeks to protect the rider from wind and weather, but also keeps the engine and oil sump out of harm's way when riding under tough off-road conditions. The extremely stable aluminium engine protector is fastened to the oil sump from below by means of silent blocks and also covers the underside of the frame and the exhaust manifold. The engine housing made of impact-proof plastic fitted on to the cylinder protection bars serves to keep the rider's feet and legs dry, at the same time adding to the overall visual impression of the machine. The wider mudguard also serves to keep the rider and his machine clean in rain and on muddy terrain - it is simply bolted on to the standard front-wheel mudguard and efficiently copes even with heavy pieces of dirt thanks to the aluminium reinforcement on the bottom of the mudguard.

When featuring the Paris - Dakar kit, the R 80 GS and R 80 G/S models also need the oil cooler fitted as standard on the R 100 GS, since the fairing makes such a modification necessary.

#### 4. Solo seat with large luggage rack

The large solo seat offers extra comfort particularly on long trips, while the longer luggage rack provides ample space even for heavy luggage. The R 100 GS Paris - Dakar is nevertheless also available with the normal GS double seat with the smaller luggage rack at the back.

#### 5. Paintwork colours

The Paris - Dakar kit including the tank with the lettering "Paris - Dakar" on both sides is finished either in Alpine-white/Marrakech-red (eg the R 100 GS Paris - Dakar) or only with primer for subsequent application of the proud owner's individual colour scheme.

## The R 100 GS: the world's largest enduro

BMW's second enduro generation, the R 80 GS and R 100 GS, took over one all-important task in late 1987: to continue the successful career of the former model. Just about everything on these motorcycles is new - you can count the unchanged components taken over from the "old" model on the fingers of one hand. Two examples are the headlight with all its interior fittings and the handlebar including the levers and switches.

One item dropped in the model designation is the stroke between the letters G and S. Following the example set by BMW's other model designations, the new enduros have since been called the R 80 GS and R 100 GS.

The suspension certainly features the most dramatic and eye-catching modifications. The frame has also been modified with the oval tubes inside the tank tunnel being reinforced for even greater rigidity. The rear frame section supporting the seat and the built-in luggage rack has also been made even stronger than before.

You will see at first sight that the front wheel fork is brand-new. It is made by Marzocchi, the Italian specialist for off-road suspension components that already provided the wheel forks for the Paris-Dakar racing machines. The new fork was nevertheless carefully developed by BMW and Marzocchi together before the final decision was made to fit this fork on BMW's new off-road machine. Among other things, the fork features a particularly hard-wearing anti-friction surface between the inner and outer tubes. This surface consists of sleeves with a multi-layer metal bearing and teflon coating providing perfect conditions for smooth and consistent action of the light-alloy tube.

Spring travel of the Marzocchi fork is 225 mm/8.86" (previously 200 mm/7.87"), the diameter of the main tube is 40 mm/1.57" (previously 36 mm/1.41"). The damper units inside the fork operate with a larger oil volume, a higher oil throughput and larger holes and cross-sections. This ensures an active damping effect even under tough off-road conditions.

The fork is fitted as standard with a stabilising bridge between the sliding tubes (fork stabiliser). The front axle has the same dimensions as the K-models (diameter 25 mm/0.98") and is hollow in order to save weight.

Being much stronger and sturdier, the wheel fork prevents the machine from pulling to one side when braking, even though the forces acting at the front are larger than before. The diameter of the brake disc has been increased to 285 mm/11.22" (previously 260 mm/10.24") and the Brembo brake calliper is now one size larger than on the R 80. The hydraulic transmission of the brake has been modified to ensure lower operating forces. Now the rider only requires a moderate effort on the road to brake the machine up to the point where the wheels will lock. Off-road the rider only needs one or two fingers to apply the brakes smoothly and efficiently.

The rear swinging arm is really brand-new. Patented as the BMW Paralever, it replaces the well-known Monolever. Being the most significant innovation featured by the new GS models and now also on the K 1 and the new K 100 RS, the BMW Paralever is described in its development and function in a separate section of this press folder. It is made of a light alloy cast under low pressure and naturally retains the proven bevel roller bearing re-adjustable to virtually every position. Two further bevel needle bearings of this type are fitted in the joint bet-



ween the swinging arm and the drive housing and are also adjustable.

The use of light alloy helps to reduce the weight of the Paralever. Torsional stability was further increased by calculating the profile of the Paralever by way of the finite-element method. Despite its more sophisticated design involving two bevel roller bearings and an additional joint, the Paralever weighs only 1.6 kg more than the old swinging arm. To keep unsprung masses at a minimum the GS models feature the lighter drum brake (with a diameter of 200 mm/7.87") on the rear wheel. For kinematic reasons, this rear-wheel brake is no longer operated via a linkage bar, but rather by a cable.

Like the front wheel, the rear wheel also has longer spring travel now increased to 180 mm/7.09" (previously 170 mm/6.69"). The inclined Monoshock featuring a Boge gas pressure shock absorber provides a slightly progressive response, is adjustable to four different settings and now rests directly on the final drive housing. A softer spring strut has been fitted since autumn 1988, but the spring strut previously used remains available as special equipment.

The wheels of the second GS generation stand out immediately through their completely new cross-spoke styling. This new, patented solution offers numerous benefits: The position of the spokes running through the rim hump provides a closed, self-contained rim base and, accordingly, allows the use of tubeless tyres. Another advantage is that the threaded end of the spokes is on the hub, allowing the spokes to be replaced both with the tyre and the wheel fitted in position. Last but not least, the crosswise arrangement of the spokes enhances the torsional rigidity of the wheel, giving it the same strength and stability as even the very best cast wheels.

Being less wide at the junction point of the spokes, the wheel provides extra space that is really very helpful - for example for the larger brake callipers at the front and also at the rear for the wider Paralever mounts extending out towards the wheel. With a conventional spoke wheel this would have considerably reduced the width of the spoke base, thus inevitably making the rear wheel unstable. Applying an entirely new concept, BMW's engineers have solved this problem and re-invented the wheel, as it were. Another advantage of this new design is that a 130/80-17 tyre can be fitted on the wider rear rim (instead of the 4.00-18 tyre fitted so far), such a wider tyre obviously being able to cope with more substantial drive forces. An advantage of the old wheel retained with the new one is that the rear wheel is extremely easy to change - the only difference being that now you have four bolts to undo instead of three.

The model designation alone - R 100 GS - signifies that BMW's new top enduro moves up to a much higher class in terms of engine size and output. Now the enthusiast can ride off-road or even tour the world with a whole litre of engine capacity, enjoying an ample 60 bhp (44 kW) at a moderate engine speed of just 6500 rpm. The torque of 76 Nm (56 ft/lb) at 3750 rpm provides an even better description of the outstanding character of this machine.

On its way to becoming an enduro, the 1000-cc flat-twin re-born in 1986 in the R 100 RS had the benefit of various design improvements. It now breathes even more freely through the two Bing constant-depression carburettors with a cross-section of 40 mm/1.57" (previously 32 mm/1.26"). These are precisely the carburettors that already proved their value in BMW's Paris-Dakar machines.

With an improved rocker arm guide, the valve drive of the flat-twin has become even smoother and more reliable. Reflecting the signs of the times, modifications to the valve seats enable the engine to run permanently on unleaded fuel, which is however not obligatory. Although the R 100 GS does not have quite the same top speed as the other one-litre boxers and will probably not be used that often for covering long distances at high speeds (due to the wide handlebar and the absence of a large fairing), the enduro model naturally comes with an oil cooler, just like the R 100 RS and R 100 RT fairing models.

Another new feature of the engine - which is now also available on all Boxer models - is the starter. As with the K-models, this is a so-called layshaft starter weighing 2 kg less thanks to its smaller electric motor, but nevertheless providing the same torque by way of the intermediate transmission. And while the starter requires less power when starting the engine, the GS is now fitted with a higher-output 25 Ah battery.

The pre-silencer beneath the gearbox is much larger but hardly heavier than before. With an increase in volume from 1.5 to 3.8 litres it not only reduces the noise level but also serves to improve the torque curve.

It goes without saying that all these features and improvements have also gone into the smaller BMW R 80 GS.

The new GS generation also offers a wide range of other useful and highly practical features. With a capacity of 26 litres (5.7 Imp gals) and a reserve of 4.7 litres (1.03 Imp gals), the new tank provides excellent conditions for long-distance riding.

Without fuel, oil and tools the new R 80 GS and R 100 GS weigh 187 kg (412 lb); their weight in road trim is 210 kg (463 lb). This is also the maximum load they are allowed to carry, as the maximum permissible weight of BMW's enduros has been increased from 398 to 420 kg (878 to 926 lb). Clearly, this offers ideal conditions for touring with a passenger and a lot of luggage.

The seat has not only been re-styled but also offers new inherent qualities. Having become longer and wider, it is also more comfortable. Despite the longer spring travel, the seat height of 850 mm (33.5") is quite acceptable for an enduro. The quality of the seat upholstery has been substantially improved by using polyurethane and latex foam in sandwich arrangement. A higher seat (880 mm/34.6") is also available for the taller BMW rider. A smaller windshield encompassing the cockpit and efficiently reducing wind pressure at speed is standard on the R 100 GS and available as a retrofittable option on the R 80 GS.

BMW's objective in developing the new GS models was to offer the enthusiast first-class enduro riding. The Paralever system eliminates undesired effects of the drive shaft and its reaction to changes in load, thus providing an even higher standard of riding safety and suspension comfort. The reinforced frame, the new forks and wheels, and the new generation of tyres certified for speeds up to 190 km/h (118 mph) underline these virtues and ensure supreme directional stability at all speeds, eliminating the last difference between road machines and enduros.

Last but not least, the one-litre engine opens up two entirely new perspectives for an enduro: First, it gives the fast rider a top speed of 181 km/h (112 mph) (R 80 GS: 168 km/h/104 mph), whisking him along like an express from one place to another; second, it offers superior torque at low engine speeds for riders who wish to travel to distant countries with a passenger and lots of luggage.

## R 100 RS: come-back of a classic <sup>4)</sup>

Re-introducing the R 100 RS in a new edition limited initially to 1,000 units, BMW catered in the 1987 model year for the great demand among flat-twin enthusiasts for the one-litre flat-twin engine. This model then became a regular member of the range in 1988. The new version of this engine, incidentally, is also suited for running on unleaded regular-grade fuel. Like all other BMW motorcycles, it fulfills the ECE R 40 European emission limit which took effect in 1988. In all other respects, the engine has also been modified to provide the low noise level of the 650 and 800-cc flat-twins. As an example, it features the two-in-two exhaust system of the R 80 with pre-muffler.

Designed for even better protection of the environment, the one-litre engine of the new R 100 RS develops 60 bhp at 6500 rpm (versus the 70 bhp at 7000 rpm of the old R 100 RS). The maximum torque of 74 Nm (55 ft/lb) now comes at just 3500 rpm (versus 76 Nm or 56 ft/lb at 6000 rpm with the old R 100 RS). Accordingly, the new one-litre engine offers supreme power from low speeds, thus providing a feature which has always made the large flat-twins so fascinating.

The R 100 RS therefore represents the come-back of a classic machine. Originally introduced in 1976, the R 100 RS was the first motorcycle available as standard with a fairing optimised aerodynamically in the wind tunnel. The sporty touring fairing, which protects the rider from wind and weather, is now available again in its proven form.

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4) As of 1990 the R 100 RS is no longer available in all countries

## R 100 RT: the large touring Boxer rides again since 1987

Launched in 1977 one year after the R 100 RS, the R 100 RT also experienced its come-back exactly 10 years after its original premiere and a four-year interruption. Naturally, it has been modernised in the meantime to meet the latest requirements. In 1977 the R 100 RT was the first motorcycle equipped as standard with full touring fairing styled in the wind tunnel. Unlike the sports fairing of the R 100 RS, the fairing of the R 100 RT has remained in use on the R 80 RT without any changes to this very day, even after the discontinuation of the R 100 RT in autumn 1983. The reason is simply that this wind-and-weather-proof fairing is still one of the best in the market, together with the large touring fairing of the K 100 LT.

The engine and suspension of the R 100 RT are identical with that of the R 100 RS. Particularly touring riders out on a long trip with a pillion and luggage will appreciate the extra performance and higher torque versus the R 80 RT. The R 100 RT, which offers remarkable handling for a large tourer, is fitted as standard with an oil cooler, a dual disc brake, quartz clock, voltmeter and touring cases with one standard key for the ignition, handlebar, fuel tank, seat and touring case locks.

# BMW AG Presse

SPECIFICATIONS BMW MOTORCYCLES		R 80	R 80 RT	R 80 GS
Engine	Cubic capacity	cc 798	798	798
	Bore/stroke	mm 84/70,6	84/70,6	84,8 x 70,6
	Max output	kW/bhp 37/50	37/50	37/50
	at	/rpm 6500	6500	6500
	Max torque	Nm 58	58	61
	at	/rpm 4000	4000	3750
	Design	flat-twin	flat-twin	flat-twin
	No of cylinders	2	2	2
	Compression ratio/fuel grade (also unleaded)	8,2 N	8,2 N	8,2 N
	Valve control	OHV	OHV	OHV
	Valves per cylinder	2	2	2
Intake/outlet dia	mm 42/38	42/38	42/40	
Fuel supply	Bing carburetors	Bing carburetors	Bing carburetors	
No of carburetors/dia	2/32	2/32	2/32	
Electrical system	Ignition	contactless transistorized coil ignition		
	Alternator	W 280	280	280
	Battery	V/Ah 12/25	12/25	12/25
	Headlight	W H 4 55/60	H 4 55/60	H 4 55/60
		dia 180 mm	dia 180 mm	dia 140 mm
Starter	kW/ 0,7	0,7	0,7	
Power transmission, Gearbox	Gearbox	5-speed gearbox with dog-type shift		
	Gear ratios	I 4,40/3,20	4,40/3,20	4,40/3,09
		II 2,86/3,20	2,86/3,20	2,86/3,09
		III 2,07/3,20	2,07/3,20	2,07/3,09
		IV 1,67/3,20	1,67/3,20	1,67/3,09
	V 1,50/3,20	1,50/3,20	1,50/3,09	
Suspension	Rear-wheel drive	Encapsulated drive shaft with universal joint and helical-gear follower plate, torsion damper in drive shaft		BMW Paralever
	Clutch	Single-plate dry clutch with diaphragm springs		
	Type of frame	Double-loop tubular steel frame with bolted-on tail section		
	Spring travel front/rear	mm 175/121	175/121	225/180
	Wheel castor	mm 120	120	101
	Wheelbase	mm 1447	1447	1513
	Brakes	Front: single-disc fixed-caliper brake, dia 285 mm	dual-disc brake dia 285 mm	single-disc fixed-caliper brake, dia 285 mm
		Rear: drum brake, dia 200 mm	drum brake, dia 200 mm	drum brake, dia 200 mm
	Wheels	Cast light-alloy wheels	Cast light-alloy wheels	Cross-spole wheels
	front	MTH 2 2,50 x 18 E	MTH 2 2,50 x 18 E	1,85 - 21 MT
rear	MTH 2 2,50 x 18 E	MTH 2 2,50 x 18 E	2,50 - 17 MT	
Tyres: front	90/90 - 18 H	90/90 - 18 H	90/90 - 21 F	
rear	120/90 - 18 H low-profile	120/90 - 18 H low-profile	130/80 - 17 T low-profile	
Dimensions and weights	Length, overall	mm 2175	2175	2290
	Width with mirrors	mm 800	960	1000
	Handlebar width without mirrors	mm 635	714	830
	Seat height	mm 807	807	850
	Weight, unladen with full tank	kg 210	227	210
	Max permissible weight	kg 440	440	420
	Fuel tank/reserve	ltr 22/2	22/2	26/4,7
	Performance	Fuel consumption	ltr 4,6	4,8
90 km/h (56 mph)		ltr 6,3	7,2	6,6
120 km/h (75 mph)				
Acceleration		sec 6,0	6,4	6,0
0-100 km/h (62 mph) standing-start km		sec 27,6	29,0	28,3
Top speed	km/h 178	170	168	
Model features	Fairing		Full fairing fixed positively to frame, adjustable windshield and integral stowage boxes (glass-fibre-reinforced plastic)	
	Standard features	Toolkit Repair kit	Toolkit, Repair kit	Toolkit, Repair kit Luggage rack

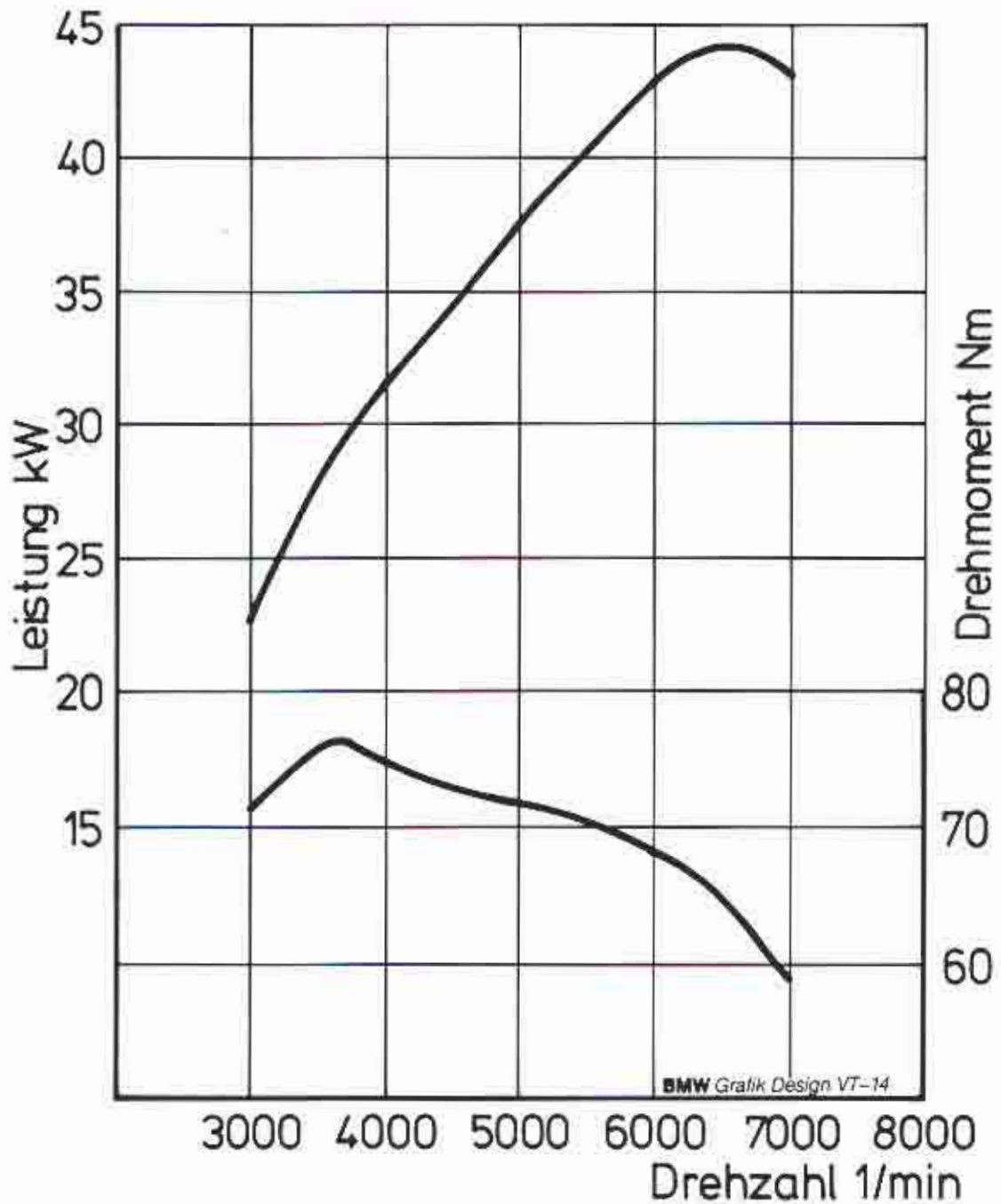


# BMW AG Presse

SPECIFICATIONS BMW MOTORCYCLES		R 100 GS	R 100 GS Paris-Dakar	R 100 RS	R 100 RT
Engine	Cubic capacity	cc	980	980	980
	Bore/stroke	mm	94 x 70.6	94 x 70.6	94 x 70.6
	Max output	kW/bhp	44/60	44/60	44/60
	at	rpm	6500	6500	6500
	Max torque	Nm	76	76	74
	at	rpm	3750	3750	3500
	Design		Flat-twin	Flat-twin	Flat-twin
	No of cylinders		2	2	2
	Compression ratio/fuel grade		8.5 N	8.5 N	8.45 N
	Valve control		OHV	OHV	OHV
	Valves per cylinder		2	2	2
	Intake/outlet dia	mm	42/40	42/40	42/40
	Fuel supply		Bing carburetors	Bing carburetors	Bing carburetors
	No of carburetors/dia		2/40	2/40	2/32
Electrical system	Ignition		contactless transistorized coil ignition		
	Alternator	W	280	280	280
	Battery	V/Ah	12/25	12/25	12/30
	Headlight	W	H 4 55/60 dia 140 mm	H 4 55/60 dia 140 mm	H 4 55/60 dia 180 mm
Power transmission, Gearbox	Starter	kW	0.7	0.7	0.7
	Gearbox		5-speed gearbox with dog-type shift		
	Gear ratios	I	4.40/3.20	4.40/3.20	4.40/3.0
		II	2.86/3.20	2.86/3.20	2.86/3.0
		III	2.07/3.20	2.07/3.20	2.07/3.0
	IV	1.67/3.20	1.67/3.20	1.67/3.0	
	V	1.50/3.20	1.50/3.20	1.50/3.0	
Suspension	Rear-wheel drive		BMW Paralever	BMW Paralever	Encapsulated drive shaft with universal joint and helical-gear follower plate, torsion damper in drive shaft
	Clutch		Single-plate dry clutch with diaphragm springs		
	Type of frame		Double-loop tubular steel frame with bolted-on tail section		
	Spring travel front/rear	mm	225/180	225/180	175/121
	Wheel castor	mm	101	101	120
	Wheelbase	mm	1513	1513	1447
	Brakes	Front:	single-disc brake: dia 280 mm	single-disc brake: dia 280 mm	dual-disc brake: dia 285 mm
		Rear:	drum brake, dia 200 mm	drum brake, dia 200 mm	drum brake, dia 200 mm
	Wheels		Cross-spokes	Cross-spokes	Cast light-alloy wheels
	front		1.85 - 21 MT	1.85 - 21 MT	MTH 2.50 x 18 E
rear		2.50 - 17 MT	2.50 - 17 MT	MTH 2.50 x 18 E	
Tyres: front		90/90 - 21 T	90/90 - 21 T	90/90 - 18 H	
rear		130/80 - 17 T low-profile	130/80 - 17 T low-profile	120/90 - 18 H low-profile	
Dimensions and weights	Length, overall	mm	2290	2290	2175
	Width with mirrors	mm	1000	1000	960
	Handlebar width without mirrors	mm	830	830	580
	Seat height	mm	850	850	807
	Weight, unladen with full tank	kg	210	236	229
	Max permissible weight	kg	420	420	440
	Fuel tank/reserve	ltr	26/4.7	35/5	22/2
	Performance	Fuel consumption			
90 km/h (56 mph)		ltr	4.9	4.9	4.3
120 km/h (75 mph)		ltr	6.9	6.9	6.1
Acceleration					
0—100 km/h (62 mph) standing-start km		sec	4.8	4.8	5.0
Top speed	km/h	180	180	185	
Model features	Fairing			Glass-fibre-reinforced plastic sports fairing	Glass-fibre-reinforced touer fairing
	Standard features		Toolkit, repair kit, luggage rack, oil cooler windshield	Flared mudguard, solo seat, large luggage rack, engine protection, revolution indicator, quartz clock	Toolkit, repair kit, oil cooler, dual-tone, fanfare, voltmeter, quartz clock
				Toolkit, repair kit, oil cooler, voltmeter, quartz clock, cases with standard lock	

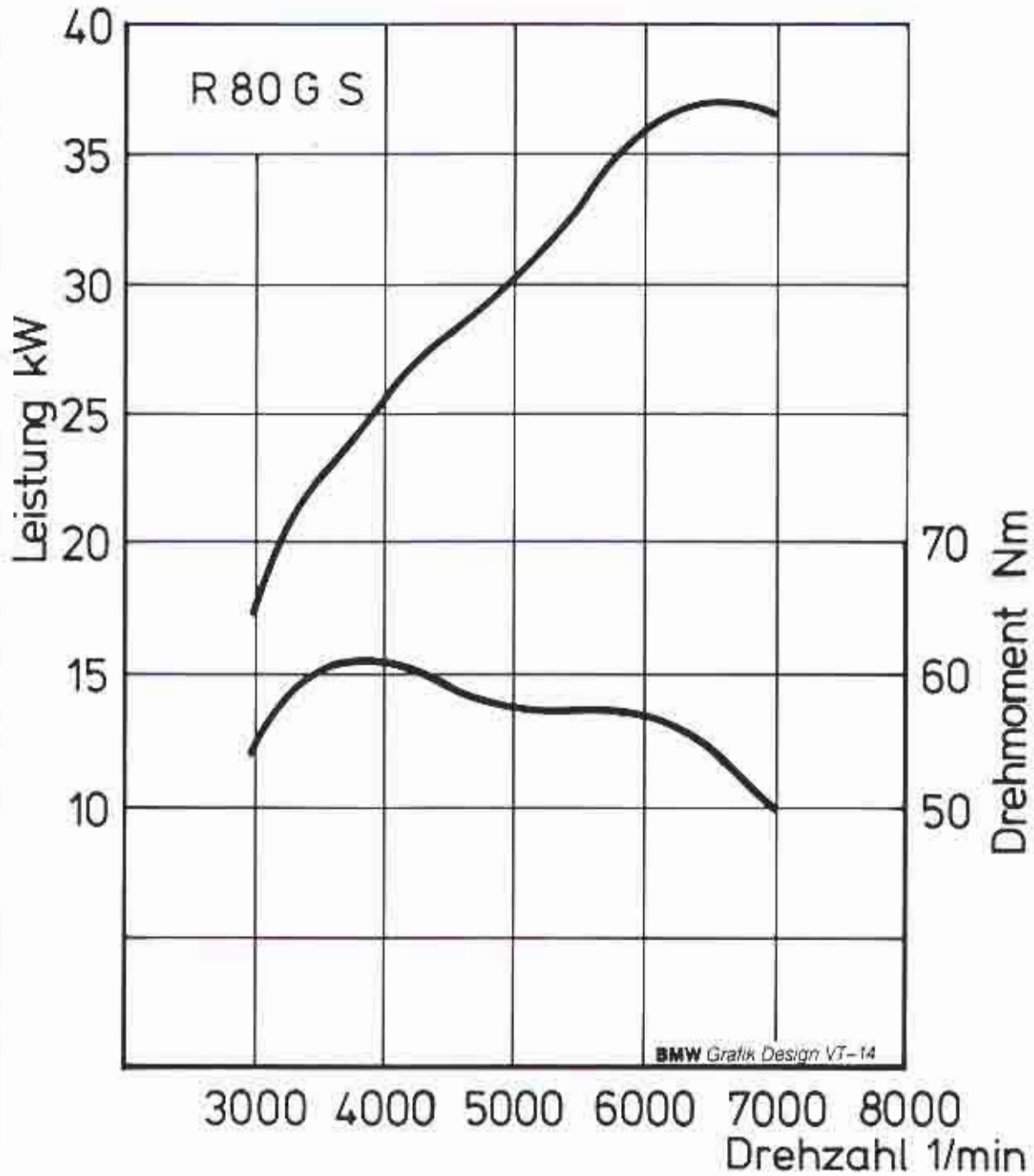


BMW R 100 GS, R 100 RS, R 100 RT



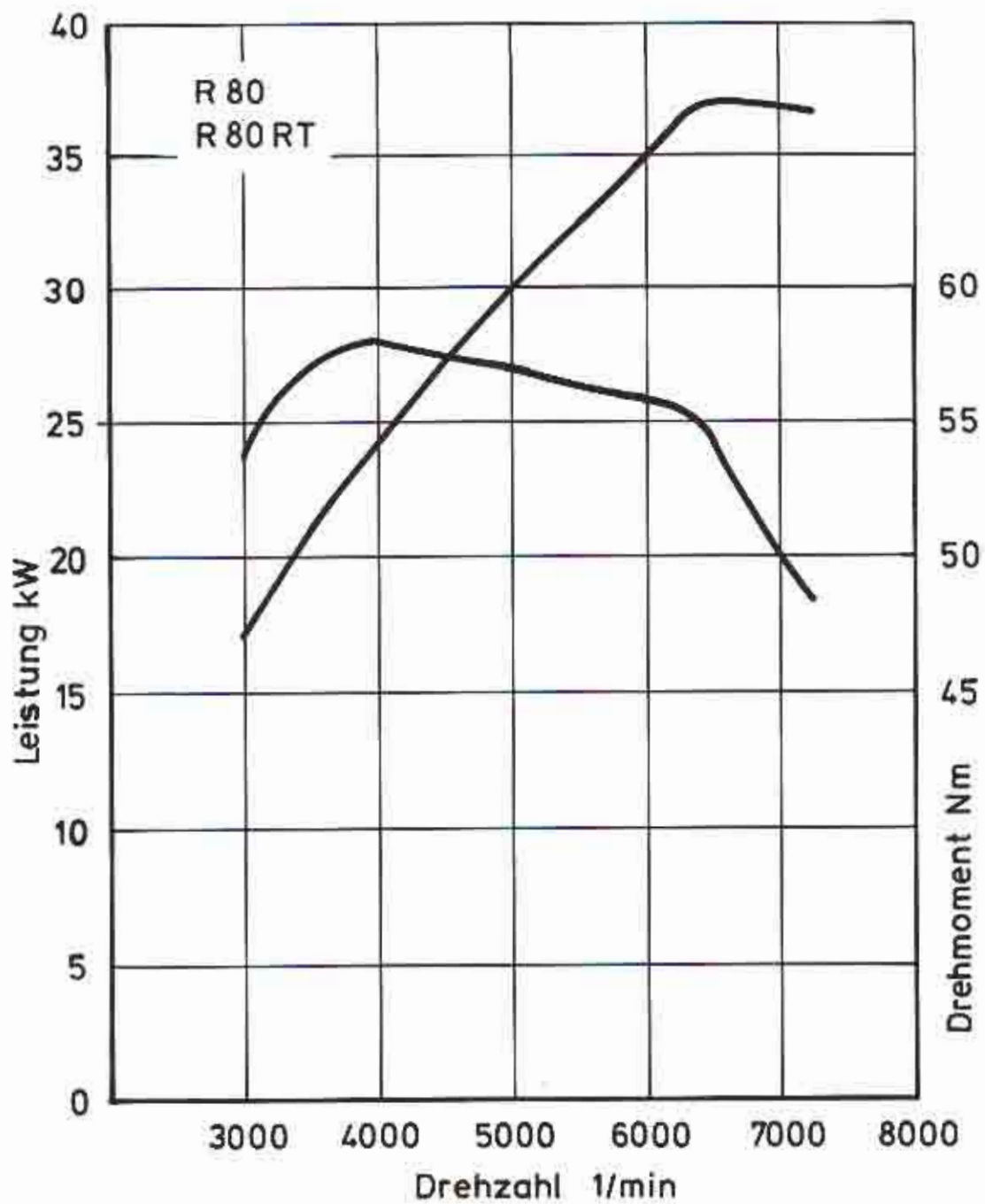


BMW R 80 GS

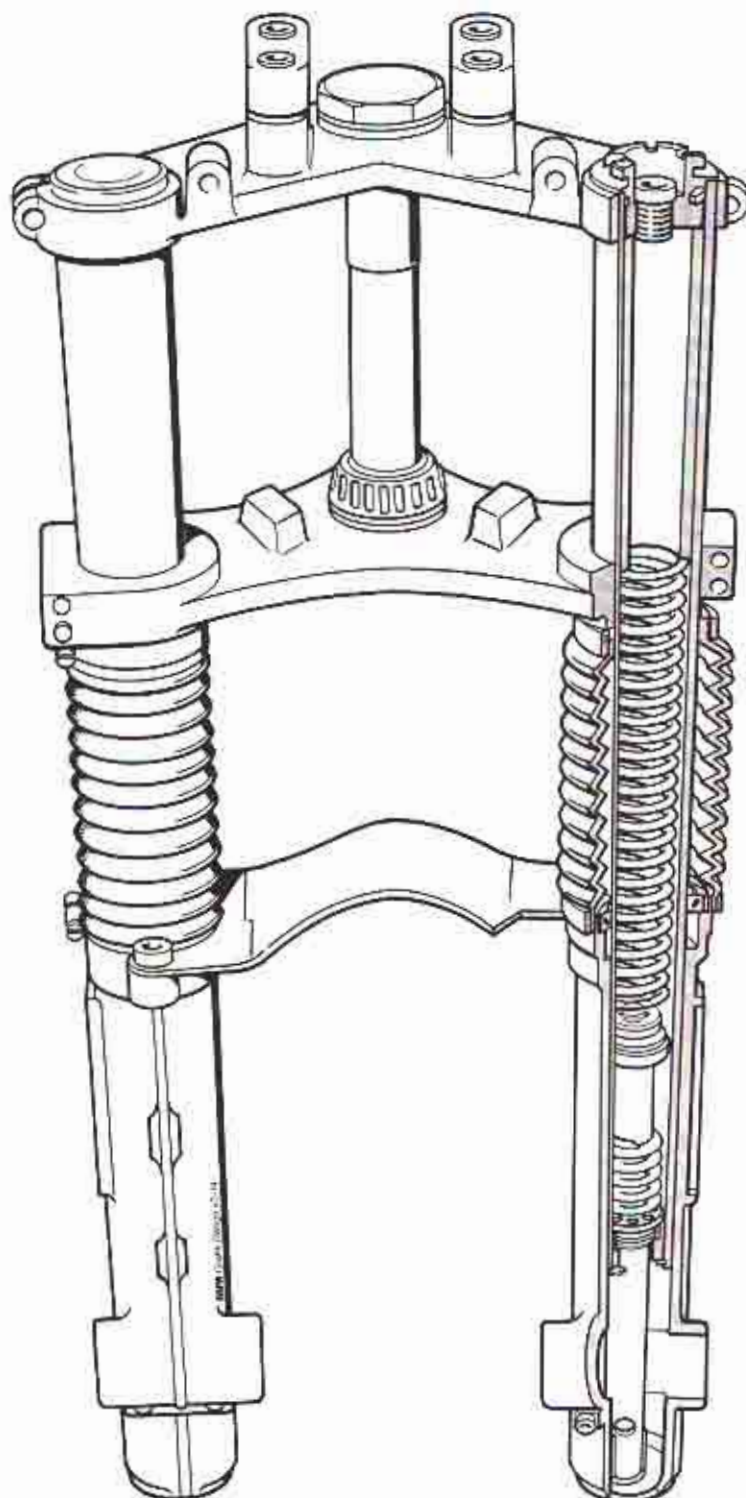




BMW R 80 und R 80 RT



BMW R 80 GS und R 100 GS



## The history of BMW shaft drive: From the simple shaft to the Paralever

Right from the beginning the history of the motorcycle drive shaft was written in Munich. It started in 1896 - 92 years ago - long before the foundation of Bayerische Motoren Werke. Indeed, not even the term "motorcycle" was known at the time, since Alois Wolfmüller from Munich only thought of this term a year later, when he had it patented by the authorities. It was one of his employees, however, who had the idea to use a drive shaft: Ludwig Rüb, a part-time employee of the Hildebrand & Wolfmüller Motorcycle Works, provided the first design of a motorcycle with drive shaft in 1896 and completed a second design in 1897, paving the way for BMW's subsequent designs with a longitudinally fitted drive shaft.

Rüb's designs, which never went any further than the drawing board, were obviously based on the Belgian FN shaft-drive bicycles. Indeed, at the beginning of this century FN became the first manufacturer to successfully apply the shaft drive concept (which had never really made it with the bicycle) to motorcycles.

In 1922 the drive shaft concept returned to Munich, the city where it had originally been born. Director General Franz Josef Popp of Bayerische Motoren Werke had taken the historical decision to build more than "just" horizontally-opposed engines for aircraft, small cars and motorcycles. Having experienced complaints from annoyed customers, he decided to take over motorcycle production entirely: Engineer Max Friz was given the order to design the first BMW machine. In response, Friz wrote motorcycle

history on the drawing board, developing the immortal concept of the BMW flat-twin with shaft drive and the idea of the straight drive train with the crankshaft, transmission shaft and propeller shaft all aligned in one row facing towards the rear-wheel drive.

This early drive concept was referred to as the "cardan drive" on account of its shaft to the rear wheel. Originally inspired by Italian scholar Geronimo Cardano (1501 - 1576), this power transmission was initially not even considered in the context of the motorcycle. For Cardano had invented the so-called cardan suspension for compasses, the principle of which was subsequently used for drive shaft joints. BMW's early machines such as the R 32 nevertheless did not require such joints. They had rigid frames without any rear-wheel suspension, meaning that the drive shaft to the rear wheel did not need the cardan joint invented shortly after the days of Columbus. Instead, a rubber disc (Hardy disc) was quite sufficient as a shock absorber.

It was only 14 years after the R 32 that the flow of power to the rear wheel required the use of a joint. BMW's racing machines already featured the vertical shaft engine with compressor which had become so powerful in the course of time that it could no longer be tamed even by a skilled rider without the help of a genuine rear-wheel suspension. In 1937, therefore, BMW's works racing machines were fitted with a suspension featuring straight guide sleeves on vertical tubes. The drive shaft now required for the rear wheel was equipped for the first time with a universal joint. In 1938 BMW introduced this rear-wheel suspension also on the R 51, R 61, R 66 and R 71 production models. This design principle with straight guide sleeves and short spring travel was then retained

until 1955, at least with BMW's standard-production machines.

The first ideas for further refining the BMW concept evolved in design offices in the early 50's. At the time the trend in motorcycle engineering was to move away from the wear-prone straight-travel rear-wheel suspension towards the swinging arm offering not only less friction but also longer spring travel. Even then, however, BMW's engineers realised that this principle applied very successfully with chain-drive machines is subject to physical limits when combined with a drive shaft. The reason is simply that the drive forces create a certain lifting action when starting off and accelerating, causing the rear wheel to move up and hardening the suspension. Quite logically, this effect becomes greater with increasing engine power and spring travel.

In 1954 Alex von Falkenhausen, a motorcycle rider by passion, the designer of the first rear-wheel suspension in 1936 and later the creator of BMW's successful car engines, took up a proposal made by motorcycle specialist Helmut Werner Bönsch: He patented a pivoted rear-wheel drive housing with a driving force support. Soon von Falkenhausen's idea became reality where it proved absolutely essential, on BMW's racing machines. The works version of the BMW RS used by Walter Zeller in the World Championships from 1955 had a correspondingly modified drive system with two drive shafts for conveying the power of the RS engine.

As of 1955 BMW's standard-production machines were equipped with a swinging arm suspension based on that of the RS racing machine: The housing of the drive shaft leading to the rear wheel was fitted positively to the



swinging arm. With engine power still being quite modest at the time (the R 69 S developed 42 bhp) and with spring travel on the rear wheel being relatively short (80 mm/3.15"), there was no reason to make any efforts.

Providing more power and longer spring travel, the next generation of BMW motorcycles launched in 1969 started to show a greater reaction of the drive shaft than before. Applying full throttle on the 50-bhp R 75 and later on the 70-bhp R 100, the rider really had the feeling that he was going up a lift: BMW's machines rose up a bit when accelerating, even though most riders regarded this more as a typical characteristic than as a shortcoming. Experts even advised other riders to simply give a bit of gas in bends for more ground clearance whenever their BMW touched the surface.

Off-road riders, however, did not feel so happy about this "lift action", while they certainly appreciated the long spring travel and soon also the superior power of BMW's enduros. The problem in their case was that the rear wheel rising up largely eliminated the spring travel whenever the rider really opened up the throttle.

When BMW launched the first white-and-blue standard-production enduro in 1980, the R 80 G/S, the existing concept with one joint started approaching its limit, although the remaining margin was still quite sufficient. While the 50-bhp of the standard model still allowed a reasonable compromise, it was obvious that any further increase in engine output would start to create problems. And precisely this was the experience of those enthusiasts who, more or less secretly, converted their R 80 G/S into a 1000-cc machine. BMW also had to learn this lesson with the competition machines raced in the Paris-Dakar Rally:

Despite their longer swinging arm they presented certain problems with the physically induced lift forces, although this did not stop them from winning the Rally no less than four times.

The first plans to introduce a new and even better concept date back to 1981, inevitably resulting in the reinstatement of the pivoted swinging arm. Now, however, conditions were different from what they had been 30 years before with von Falkenhausen's design. For with the introduction of the R 80 G/S BMW had once again revolutionised the drive shaft concept, introducing the Mono-lever single swinging arm. Now the task was to fit the swinging arm with a joint able to work efficiently without play and distortion even under the toughest off-road conditions.

Developments carried out along these lines by BMW suspension engineers René Hinsberg and Horst Brenner were reflected by a patent registered in November 1983. The final design was then a direct consequence of this development: The Paralever double-joint swinging arm is made of cast aluminium, as on the K 100. Despite its more sophisticated design it is therefore hardly heavier than the former steel-tube version.

The new, refined version of the drive shaft concept then debuted in 1987: Just like the R 80 G/S became BMW's first model with the Mono-lever in 1980, the new enduro models R 80 GS and R 100 GS again became pacemakers in technology with the new Paralever. The K 1 was the first K-model to feature this unique technology, and is now followed by the K 100 RS.

## The BMW Paralever: idea and effect.

Drive forces conveyed to the wheels inevitably cause a certain reaction of the vehicle. This applies both to motorcycles and to cars. An effect of this kind will always occur when all the wheels are unsprung, in which case it causes a dynamic shift in wheel load. Sprung wheels, on the other hand, react additionally to the drive forces, the extent of this reaction depending on the geometric arrangement of the suspension components. It is therefore possible both in theory and in practice to compensate both drive and brake forces either in full or in part.

With motorcycles this reaction of the suspension depends of the type of drive system. Machines with chain drive tend to move down at the rear on the sprung wheel when starting off. Machines with a drive shaft, on the other hand, show exactly the opposite reaction: the rear wheel will move up.

The simplest and most obvious way of compensating this effect is to use a longer rear-wheel swinging arm. But even this solution only provides a partial improvement. With a BMW, for example, the swinging arm required to fully compensate such reactions would have to be longer than the bike's wheelbase - to be precise exactly 1700 mm or 66.9". A double-joint swinging arm, on the other hand, provides the same effect as an extremely long single unit, but takes up much less space. This is simply because the parallelogram arrangement increases the radius of the wheel elevation curve.

BMW's Paralever provides the same effect as a swinging arm measuring 1400 mm or 55.1" in length, thus providing a compensation of 70 per cent. This is sufficient to reduce the effects of acceleration forces to an insignificant minimum and also ensures that when decelerating there is no significant brake dive. Indeed, the Paralever substantially improves the motorcycle's braking characteristics, totally eliminating the otherwise hardly avoidable judder effect of the rear wheel when braking hard or shifting down suddenly.

**A PIONEERING ACHIEVEMENT BY BMW BECOMES AN OVERWHELMING  
SUCCESS:**

**70 PER CENT OF ALL K 100 MODELS ORDERED WITH ABS  
NOW ALSO AVAILABLE FOR THE K 75 MODELS**

Experts call it a "technical revolution" and a "revolutionary milestone" in the second centennial of the motorcycle. In spring 1988 BMW became the world's first manufacturer to introduce an electronic/hydraulic anti-lock brake system (ABS) for motorcycles, available as an option for all K 100 models.

At the 1986 Cologne International Bicycle and Motorcycle Show (IFMA), BMW first presented the ABS prototype developed in cooperation with FAG Kugelfischer. Due to delays in the subsequent endurance tests, BMW then decided in the interest of absolute riding safety to postpone the production start of the new system originally scheduled for early summer 1987.

BMW motorcycle ABS has not only been lauded by the media all over the world, but has also become a great success in the market: In 1989, for example, 70 per cent of all purchasers of the K 100 ordered their machine with ABS, thus proving that extra safety is really worth the money. Given this overwhelming success, BMW has decided to offer ABS also for the K 75 models as of 1990. Hence, entering the 90's, BMW remains the world's only motorcycle manufacturer to offer ABS, which is now available for half of the entire model range.

**ABS can achieve more than even the best rider**

While the technical standard of motorcycle brakes, running gear and tyres has certainly been able to keep up with the increasing output of modern motorcycles in the last 20 years, the human factor has remained the weak point in the

brake/control system. To this very day, driving schools rarely teach young riders how to apply the brakes properly in an emergency - and it goes without saying that riders will hardly want to "try out" such an emergency on public roads. Whereas applying the brakes all-out on a dry road is relatively easy in an automobile even for a beginner, applying the brakes all-out on a motorcycle presents far greater risks for physical reasons alone.

Since a single-track vehicle is not balanced in itself, it only remains stable at low speeds due to the force exerted by the rider holding the handlebar, and at higher speeds due to the gyroscopic effect of the two wheels - above all the front wheel. Accordingly, whenever the wheels stop turning for more than 0.5 seconds the motorcycle will suddenly become unstable.

Often when the rear wheel stops turning - and almost always when the front wheel stops -, the rider will take a nasty (and perhaps even a very severe) fall. Accordingly, it takes a lot of practice and feeling on the part of the rider to "dose" brake power properly. Indeed, just how difficult it is for the rider to apply the brakes all-out in an optimum manner, is underlined by the fact that the rider has to brake the front wheel by hand and the rear wheel by foot at the same time. And, as mentioned, he must do this with a lot of feeling.

Studies have shown that roughly one out of ten riders fall off their machines due to over-braking. And the number of accidents attributable to the fact that the rider failed to apply the brakes all-out and thus required a longer stopping distance, is unknown - but it's certainly a substantial number.

Now ABS adds optimum brake safety to the high degree of efficiency already achieved by modern brake systems in

minimising the stopping distance required. In simple terms, ABS now allows the rider - as long as he is riding straight ahead - to apply the brakes as hard as he can without running the slightest risk of the wheels (or one wheel) locking. This enables even the relatively inexperienced rider to achieve the shortest possible stopping distance.

On roads with a low frictional coefficient - such as wet roads, gravel, dirt, sand or oil - ABS is far superior to even the most skilled and experienced rider. Particularly on surfaces with a sudden change in frictional coefficients - such as dry/wet - no human being could ever hope to react quickly enough to cope with the situation. ABS, on the other hand, responds quickly and safely without giving up any stopping distance.

**ABS does not allow full application of the brakes in bends**

Even ABS cannot override certain laws of physics. Braking in bends always presents a problem due to the complex interplay of longitudinal and transverse acceleration. A wheel subject to maximum lateral stability forces cannot convey longitudinal forces - and, accordingly, brake forces - at the same time.

When the motorcycle is at an angle in a bend, the tyre/road contact point will move over from the middle of the tyre. Should the rider brake in such a situation, the motorcycle will automatically move upwards from its inclined position and thus start to run straight ahead. Hence, the rider cannot apply the brakes all-out when riding at an extreme angle under maximum transverse forces. For even ABS cannot change the laws of physics.

With or without ABS, therefore, the brakes cannot be fully applied in bends. While an automobile equipped with ABS still responds to the steering when the brakes are applied all-out, a motorcycle does not.

## ABS checks itself

Here's how motorcycle ABS works: Monitoring the 100-tooth impulse generator gears on the front and rear wheel, a sensor compares their speed of rotation and informs the control unit fitted in the rear section when a wheel is about to lock. Within fractions of a second the electronic control unit will then activate one of the two pressure modulators fitted at the side above the footrests. The pressure modulator, in turn, will reduce the hydraulic pressure in the wheel brake cylinder until there is no further risk of locking, then increasing brake pressure once again. This process is repeated up to 7 times a second, as long as the rider maintains the necessary brake pressure and road speed does not drop below 4 km/h (2.5 mph). Unlike ABS on a car, motorcycle ABS operates without any noticeable effect on the brake lever or pedal, as a valve interrupts the reflow of brake fluid.

The aim to build a system with optimum safety is also reflected by the electronic control unit supplied by Hella in Lippstadt, West Germany. The two control lines for the front and rear wheel, for example, are both fitted twice for absolute redundancy. Operating alternatively in 10-second cycles, one control line monitors or controls the system while the other is supervised for proper operation by a central processor. In the event of a deficiency ABS switches off automatically and a warning system comes on: Two red flashlights in the cockpit will inform the rider immediately that while his "normal" brakes still work, he will have to do without ABS until



the deficiency is repaired (and must therefore modify his style of riding accordingly). Even before the rider starts out, the electronic control unit checks ABS to make sure it is working and shows via the two red lamps in the cockpit that all systems are operating properly.

### **Riders must get used to ABS**

Unlike automobile ABS, the control process generated by motorcycle ABS makes both the front and rear wheel respond far more significantly, with the rider literally being able to hear and feel ABS in operation. While this feeling is quite harmless, it is something the ABS novice must first get used to. It is therefore advisable - for example in an empty car park - to make oneself acquainted in peace and quiet with the automatic "pumping" of ABS brakes. Riders who get used to ABS this way will not make mistakes when they really have to apply the brakes in an emergency, while the inexperienced rider without the right "feeling" for ABS might possibly release the brakes in such a situation and thus require a longer stopping distance. Particularly on wet and slippery surfaces, riders can therefore overcome their natural inhibitions about applying the brakes all-out, thus gaining confidence in the additional safety potential ABS has to offer.

### **Braking in an emergency with a "safety net"**

Even on an ABS-equipped motorcycle, riders should ride with due care on public roads, always considering the current situation and trying to avoid the need of braking in an emergency. But when such an emergency arises and the

rider has to instinctively - or even in panic - apply the brakes all-out within fractions of a second, ABS provides the "safety net" that can save the rider from a nasty fall when riding straight ahead. In many cases ABS can even help to avoid a crash, since the rider trusting in his anti-lock brakes can apply full brake pressure right from the start, reducing the stopping distance required to an absolute minimum.

### **A safety factor to be appreciated and not wasted**

ABS enables the rider, as the "weak link" in the man/machine system, to make full use of the substantial efficiency offered by modern brakes. However, this extra safety offered by ABS should not induce riders to ride too fast or apply the brakes too late, thus foolishly wasting the extra safety they now have. In particular, the rider must still consider that stopping distances are much longer on wet and slippery surfaces. ABS cannot work miracles. But it can increase the active safety offered by a motorcycle - and, accordingly, the sheer riding pleasure you can experience on the road.