

# Programm '94





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## SUMMARY OF BMW INNOVATIONS FOR THE 1994 MODEL YEAR

**"A European on two wheels": The F 650  
entry-level model re-introduces BMW's heritage  
in the single-cylinder market**

**R 1100 GS: The new Boxer in off-road guise**

BMW is entering the 1994 model year with no less than two really appealing new machines. Their world debut will be at the Frankfurt Motor Show in September 1993, where motorcycles will be on show for the first time in 54 years. First, there's the F 650, an all-new entry-level model to the BMW world. Then there's the new R 1100 GS, the off-road version of BMW's new Boxer generation launched earlier this year.

**An ideal blend of fun-bike and enduro:  
the F 650 "funduro"**

Almost 30 years after the legendary R 27, BMW is once again taking up its heritage in the single-cylinder market by presenting the new F 650, a unique blend of fun-bike and enduro referred to quite appropriately by BMW as a "funduro".

**Targeted above all at young riders and beginners**

Highly attractive also in terms of its low price, this entry-level BMW appeals above all to young riders and beginners of any age and is available with an output of either 48 bhp (35 kW) or 34 bhp (25 kW), following the new European rider's license regulations. Being light and easy to handle, the F 650 is also an interesting option for the increasing number of lady riders and re-entrants into the motorcycle market.

**Four valves per cylinder and superior torque**

Featuring four valves per cylinder and liquid cooling, the 652-cc engine excels in particular through its impressive torque of 57 Nm or 42 ft/lb (throttled version 48 Nm or 35 ft/lb. With the four valves being controlled by two overhead camshafts and cup tappets, the engine runs smoothly and reliably even at high speeds while a compensation shaft ensures superior refinement and riding culture. Long service intervals of 10,000 km or 6,200 miles help to reduce the cost of maintenance. In the interest of environmental protection, the F 650 is also available with a standard (non-controlled) catalytic converter.

**Delta-box swinging arm and adjustable spring strut**

The "backbone" of the F 650 is formed by a single-loop frame made of square steel tubing. The upper section of the frame incorporates the oil reservoir for the engine's dry sump lubrication with a capacity of 1.5 litres. Suspension is provided by a telescopic fork up front and a delta-box swinging arm at the rear, spring travel being 170 mm/6.70" on the front wheel and 165 mm/6.50" at the back. The centrally mounted spring strut on the rear wheel can be infinitely adjusted to meet the rider's particular needs. Diameter of the wire spoke wheels featuring a single-disc brake (disc diameter 300 mm/11.81") with two-piston floating calliper, the rear wheel a single-disc brake (disc diameter 240 mm/9.45") with single-piston floating calliper.

**Extra-low seat**

The F 650 comes with a cockpit fairing mounted directly to the frame, a handlebar measuring 880 mm/34.65" in width, a plastic tank with a capacity of 17.5 litres (3.85 Imp gals), a luggage rack, and a very comfortable seat also for the passenger. Despite ample spring travel, the rider's seat is very low for a machine of this type at just 810 mm or 31.89".

The range of optional extras includes touring cases, a topcase, heated handles, and an anti-theft warning system, to name just a few examples.

**The F 650 funduro:****Riding pleasure and practical value in one**

The F 650 weighs a mere 189 kg (417 lb) in road trim. Two of its most outstanding fortes are excellent handling and riding stability also at high speeds of more than 160 km/h or 100 mph, and the availability of all features for riding with a passenger even on long tours. Being highly agile and nimble, the F 650 feels at home particularly on winding country roads and dirt tracks as well as in dense city traffic. For the F 650 is both a country and city bike, and provides an ideal combination of riding pleasure and practical value. So it is, quite simply, a real funduro or what you might call the trekking bike among motorcycles ...

**BMW styling with soft and smooth contours**

The soft and smooth contours of the F 650 consistently continue BMW's design philosophy, this new machine once again excelling through its harmonious and well-balanced looks enhanced by truly unique and unmistakable styling.



Reflecting its young, dynamic and sporting image, the F 650 comes in highly appropriate, youthful and fresh colours: flame red (with charchoal-grey seat) or aura white (with flash-seat).

**Taking an entirely new approach  
in development and production**

To have this entry-level motorcycle ready for the market as quickly as possible, BMW has taken an entirely new approach in the development and production of the F 650: the Company cooperates with other manufacturers in various European countries. Applying the technical concept and design provided by BMW, the F 650 was developed in just 2 1/2 years in close cooperation with two system suppliers: Italian motorcycle manufacturer Aprilia and Austrian engine manufacturer Bombardier-Rotax. In full compliance with all of BMW's test and quality standards, the F 650 is assembled in Aprilia's modern production plant in the Italian town of Noale, the engines being supplied by Rotax in the Austrian town of Gunskirchen. Starting towards the end of 1993, sales of the new machine will be handled exclusively by BMW dealers.

**A chain replacing the drive shaft**

Consistently taking a new approach, BMW was quite prepared with this new machine to make even revolutionary changes, as one sees, for example, from the drive concept of the F 650: For the first time in BMW's 70-year motorcycle history, the rear wheel is not propelled by the usual drive shaft, but rather by an O-ring-chain - a logical decision in the light of this engine concept with the crankshaft facing crosswise to the direction of travel.

**The "first European on two wheels"**

Commemorating Europe '93, the F 650 combines the best ingredients of European motorcycle design to become the first-ever "Euro bike". You might even call it the "first European on two wheels" ...

**The R 1100 GS: Combining the virtues of the R 80 G/S  
with the technical features of the R 1100 RS**

BMW's second innovation for the 1994 model year continues another heritage of the Company without the slightest interruption: The new R 1100 GS features all the virtues and characteristics which in the '80s made the R 80 G/S the trendsetter in the large-volume adventure and touring enduro market. The second model in BMW's new generation of Boxers, the R 1100 GS enduro is based largely on the technical design and features of the R 1100 RS sports tourer successfully launched in spring of this year. The introduction date of the GS will be spring 1994.

**Less power - more torque**

The "heart" of this new off-road model is once again BMW's air and oil-cooled 1100 cc flat-twin Boxer with four valves per cylinder and high-camshaft control. Conceived less for top performance and more for extra torque and pulling force, the engine of the enduro model has been modified accordingly. Output of the R 1100 GS is 80 bhp (59 kW) at just 6750 rpm, the mere 5250 rpm. For comparison, the R 1100 RS develops a maximum output of 90 bhp or 66 kW at 7250 rpm and has a peak torque of 95 nm (70 ft/lb) at 5500 rpm.



This makes the R 1100 GS not only the largest off-road machine currently available in terms of engine size, but also the most "torquey" of all comparable machines in the market.

**BMW Telelever provides its merits  
also with the enduro model**

Like the R 1100 RS, the R 1100 GS again features a three-piece frame concept with the engine and transmission housing forming a load-bearing unit. Front wheel suspension is provided by BMW's innovative Telelever able to contribute all its advantages also with the enduro model: Superior stability under all riding conditions, excellent smoothness and response, and efficient anti-dive maintaining adequate spring travel even when applying the brakes very hard. With this anti-dive and superior longitudinal rigidity, the Telelever offers ideal conditions for ABS anti-lock brakes. For like the R 1100 RS, the R 1100 GS is naturally available as an option not only with fully controlled catalytic converter, but also with BMW's further improved ABS II.

**ABS may be switched off when riding off-road**

Since, unlike general riding conditions on the road, it may prove beneficial and worthwhile to lock the wheels from time to time when riding off-road or on loose gravel, ABS II on the R 1100 GS may be deactivated by the rider whenever desired.

This the rider can only do before setting out by pressing the ABS cancellation switch and firing the engine at the same time. Then the rider is informed by the ABS telltale light that the anti-lock brake system

has been switched off. It is automatically re-activated by subsequently switching off the ignition and turning it on again.

**Front and rear spring struts fully adjustable**

With an enduro running under all kinds of different conditions, the centrally mounted spring strut (with 190 mm/7.48" spring travel) may be adjusted to five different levels of spring pretension by means of a hook spanner included in the toolkit.

The rear wheel of the GS is once again mounted on a Paralever swinging arm with a centrally positioned spring strut (200 mm/7.87" spring travel). The spring strut itself offers infinite hydraulic adjustment of spring pretension by means of an easily accessible wheel, while outward-stroke damping is infinitely adjustable by a separate setting bolt.

**19" cross-spoke wheels at the front, 17" at the rear**

Like the "conventional" GS models, the new R 1100 GS again features highly stable, patented cross-spoke wheels measuring 19" in diameter at the front and 17" at the rear.

The front wheel comes with a double-disc brake incorporating four-piston callipers and floating discs measuring 305 mm (12.00") in diameter, the rear wheel features a single-disc brake (diameter 276 mm/10.87") with two-piston floatin callipers.

Made of plastic, the fuel tank of the R 1100 GS has a capacity of 25 litres or 5.5 Imp gals. The front wheel cover is fitted directly to the frame as an extension

of the cockpit fairing and contributes to the striking looks of the machine.

## **Windshield and seat adjustable as a standard feature**

As on the R 1100 RS the R 1100 GS is equipped with BMW's ergonomics package, which incorporates here a windshield infinitely adjustable by 13° and a rider's seat which may be set to a height of either 860 mm (33.86") or 840 mm (33.07"), this latter height of 840 mm being remarkably low for an off-road machine.

## **Enlargeable luggage rack**

In all other respects, the various model features, controls and instruments are the same as on the R 1100 RS - with the exception of the rider information display. Additional standard features on the R 1100 GS are aluminium protection plate beneath the engine, and the luggage rack. A particular advantage is that the luggage rack may be enlarged by removing the rear half of the two-piece seat.

It almost goes without saying that the R 1100 GS is available with a wide range of options an special equipment extending from the rider information display through heated handles and baggage cases all the way to an anti-theft warning system.

## **Clear and "powerful" styling**

In designing the clear, "powerful" and very impressive styling of the R 1100 GS, BMW's specialists focused in particular on the requirements of both off-road and road riding, the resulting ergonomic features, and the need to limit this kind of machine to the essential.

The R 1100 GS emanates a flair of power and performance in every respect. It therefore comes in three appropriate colours reflecting this special style: marrakech red, alpine white, and avus black. The seat is yellow in all cases, but is also available in black as an option.

**A new original with a great heritage**

Like the R 80 G/S in 1980, the 1994 R 1100 GS once again sets standards in the large long-distance enduro market. Fitted with BMW's unique Telelever, the suspension ensures optimum riding stability, excellent comfort and equally supreme handling. The R 1100 GS is moreover the only enduro in the world available as an option with ABS and fully controlled catalytic converter, in this way meeting maximum demands in terms of both safety and environmental compatibility. The R 1100 GS - a new original with a great heritage and a very promising future.

**Ergonomics package and rider information display  
now part of the R 1100 RS standard specification**

Starting model year 1994, the R 1100 RS will come standard with the ergonomics package (adjustable windshield, handlebar and seat), the rider information display (oil temperature, fuel level, gear selected and time of day) as well as a warning flasher light.

**R 80 models with either 50 or 34 bhp**

Reflecting the new driving licence regulations in Europe, all R 80 models will be available as of the 1994 model year with an output of not only 50 bhp (37 kW) but also 34 bhp (25 kW). Conversion kits for reducing or encreasing the output of these 800-cc power



units are also available. The R 100 R now comes standard with a dual-disc brake on the front wheel and SAS (secondary air system for emission control).

**An even greater classic:**

**The R 100 R Mystik special model**

Supplementing the R 100 R, a special model to be launched in spring 1994 is the R 100 R Mystik targeted above all at the connoisseur of classic motorcycles. And indeed, this new machine presents the classic look of the R 100 R even more consistently, boasting the following features, among others:

Paintwork in mystik red metallic, new chrome cover for the instrument console with new telltales, a new handle-bar as well as a new, even more dynamic and compact seat plus a new rear tail section.

**ABS II now also featured on the**

**K 1100 RS and K 1100 LT**

BMW's newly developed ABS II launched in the R 1100 RS is available as an option not only on the new R 1100 GS, but now also with the K 1100 RS and K 1100 LT.

**The K 100 series in its 10th year**

**K 1100 LT special edition**

On the occasion of the 10-year anniversary of the K-100 series, model year 1994 will feature a special model, the K 1100 LT special edition.

It is offered with silver-lined fjord-grey metallic special paint and boasts such standard features as ABS II, an even more comfortable seat in saddle-brown



colour as well as radio with cassette player and two speakers each integrated in the fairing and backrest at the topcase.

**BMW's new rider's wear even more comfortable and safer:**

**Madison Gore-Tex suit and Marathon leather suit**

The range of BMW rider's wear in the 1994 model year is larger and more versatile than ever before. Two of the most outstanding innovations without doubt are the Madison Gore-Tex suit and the Marathon leather suit.

The special feature about the Madison Gore-Tex suit is the new top material code-named BMW Schoeller K 300. Developed exclusively for BMW in cooperation with Schoeller, this material combines all the advantages of polyamide and aramide fibres. It is highly tear- and abrasion-proof and hardly takes up any moisture. The new Suprotect protectors on the shoulders, elbows/lower arms, knees and hips offer the special advantage of excellent damping and shock absorption.

Made of 1.4-mm-thick, extremely abrasion- and tear-proof cowhide and with double protection padding at particularly exposed points, the Marathon leather suit again comes with BMW's new Suprotect protectors on the shoulders, elbows/lower arms, knees and hips. As with the Madison Gore-Tex suit, an additional back protector may be inserted into this suit, too. There are even new leather boots and gloves to match the Marathon leather suit.

**THE NEW F 650**

**From BMW's heritage in the single-cylinder market to the "Euro bike" for newcomers to the world of BMW**  
From 1925 to 1966, the total output of single-cylinder BMW machines ranging in size from 200 to 400 cc amounted to approximately 230,000 units. These were the days when motorcycles in general and single-cylinder models in particular were still primarily an inexpensive means of transport. It was only in later years that the motorcycle took on its new role as a pastime and leisure occupation.

Adjusting to demand in recent years, BMW constantly enlarged its model range in the course of the '80s: The traditional flat-twin Boxers were first joined by BMW's entirely new three- and four-cylinder K-models. And it was obvious to specialists at the Company what kind of machine would one day round off the model range at the bottom end: A single-cylinder motorcycle as the entry-level model into the BMW world.

**Reaching the objective with an entirely new approach**  
To introduce this entry-level machine as quickly and efficiently as possible, BMW took a new, previously almost unthinkable approach, applying entirely unconventional strategies and proceeding along completely new lines.

Following initial talks with potential system suppliers in the late '80s, an initially vague idea slowly but surely materialised into a fully-fledged project agreed by contract in Munich on 5 June 1992 and announced to the public in the following press release:

**BMW Plans Entry-Level Motorcycle  
European Cooperation with Aprilia and Bombardier-Rotax**

All the details have now been finalised for a German/Italian/Austrian joint venture in the motorcycle market: BMW Motorrad GmbH in Munich, Aprilia S.p.A., a motorcycle manufacturer in Noale, Italy, and Bombardier-Rotax GmbH, a manufacturer of engines in the Austrian town of Gunskirchen, have now signed the contracts for a new initiative in the motorcycle industry.

The target of this joint venture is to implement BMW's long-pursued and quite unconventional concept for the development and production of an entry-level motorcycle. Also suited for off-road riding under moderate conditions, this new model will be an entirely unique but typical BMW machine. This is why BMW is responsible not only for its styling, but also for the technical concept.

The new motorcycle is to be developed by Aprilia in cooperation with BMW and produced in Aprilia's modern plant in Noale. Power will be provided by a Rotax 650-cc single-cylinder engine modified according to BMW's design criteria. Obviously, the contracts specify that all BMW test standards and quality requirements must be fulfilled in every respect. Sales of this new BMW motorcycle will presumably start in the 1994 season through BMW's network of motorcycle dealers.

Introducing this highly attractive single-cylinder machine in terms of both product features and price, BMW are rounding off their existing range of two-, three- and four-cylinder models, moving down to a lower level in the market and gaining access once again to the important mid-sized engine segment. BMW's last single-cylinder motorcycle, the R 27, was produced from 1960 to 1966.

The cooperation of BMW and Aprilia involves two very successful motorcycle manufacturers: In 1991 BMW built approximately 34,000 motorcycles in the 650 - 1100 cc range, while Aprilia's total production last year was 50,000 machines with an engine capacity between 50 and 650 cc. Together with BMW's increasing cooperation with systems suppliers, this first genuine European joint venture in the motorcycle market represents a further step in the new strategy of BMW Motorrad GmbH to expand its market and hold its own against the competition.



**Developed in only 2 1/2 years**

Somewhat more than a year after signing of the contract, the F 650 is now making its world debut in September 1993, entering the market as BMW's new single-cylinder motorcycle to be sold before the end of this year exclusively by BMW dealers the world over. The first road-going prototype saw the light of day in June 1992, development of the F 650 taking no less than 2 1/2 years in all and therefore showing what kind of potential such a joint venture is able to offer also in terms of all-round efficiency.

Launching the F 650 27 years after the legendary R 27, BMW is returning to the Company's long tradition of single-cylinder machines. And reflecting the new status of Europe in 1993, this motorcycle definitely combines the best ingredients of European motorcycle design to provide the very first "Euro bike" under the BMW stamp of quality and high technology. You might indeed call the F 650 the "first European on two wheels" ...

**A new concept - the "funduro"**

The F 650 clearly stands out from other motorcycles not only through its heritage and unmistakable looks, but also through its unique concept. And being both fully compatible with the environment (available as an option with standard, non-controlled catalytic converter) and ideally suited for touring, it is a genuine BMW in many other respects, too. The engine and running gear provide an ideal blend of a funbike and an enduro, which is why BMW refers to the new F 650 as the "funduro".

**A chain replacing the drive shaft**

Looking at the drive concept of the F 650 the knowledgeable observer will see right away that BMW has been most consistent with this new machine in crossing old borders: For the first time in 70 years of BMW motorcycle history, the rear wheel is driven not by the "obligatory" drive shaft, but rather by an O-ring chain - a logical decision for this kind of engine with its crankshaft arranged crosswise to the direction of travel.

**Targeted above all at young people and beginners**

Highly attractive also in terms of its low price, this entry-level BMW is aimed primarily at young people and beginners of any age, and therefore comes with an output of either 48 bhp (35 kW) or 34 bhp (25 kW). A further benefit making the F 650 particularly attractive to the growing number of lady riders and re-entrants is that this new BMW weighs only 189 kg (417 lb) in road trim, while the seat is very low for a machine of this type at just 810 mm (31.89").

Last but not least, the F 650 is also the ideal country and city bike, that is a motorcycle providing a perfect blend of riding pleasure and practical value. It is indeed a genuine funduro or what you might call the trekking bike among motorcycles ...



**THE ENGINE**

**Water-cooled four-valve power unit with superior torque**  
Like the R 27, BMW's last single-cylinder produced until 1966 (250 cc, 18 bhp, air cooling), the F 650 again features a single-cylinder four-stroke power unit in upright arrangement. Developed jointly by BMW and Rotax in accordance with the original concept from BMW, the new liquid-cooled four-valve engine displaces 652 cm (39.77 cu in) and develops an output of 48 bhp (35 kW) at 6500 rpm. Maximum torque is 57 Nm (42 ft/lb) at 5200 rpm. In accordance with the new two-tier driving licence regulations in Europe, the F 650 is naturally also available with an output of 34 bhp (25 kW) at 5700 rpm (in which case it has a maximum torque of 48 Nm or 35 ft/lb at 4200 rpm).

**Gearbox integrated in the engine housing**

The five-speed gearbox is integrated within the two-piece light-alloy engine housing separated vertically into two halves. The engine housing covers with the clutch at the rear left and alternator at the rear right are also made of light alloy, while the chain pinion cover is plastic.

**Coated cylinders**

Like all BMW motorcycle engines, the cylinder liners on the F 650 are finished in highly stable, low-friction and low-wear nickel-silicon coating.

**Box-type piston optimised for low weight**

Made of cast light-alloy and designed in box configuration, the low-weight piston features three piston rings and is cooled at the bottom by splash oil.

**Crankshaft and connecting rod running  
in anti-friction bearings**

Vibrations of the weight-optimised crankshaft made of heat-treated nitrided steel are minimised in advance by careful balancing. The crankshaft runs in two high-efficiency anti-friction bearings, as does the forged connecting rod.

**Overhead camshafts and cup tappets**

The two overhead camshafts (DOHC) made of forged steel run in anti-friction bearings on the cylinder head and are driven by a timing chain straight from the crankshaft. A plastic tensioning bar and a hydraulic chain tensioner ensure a smooth and unproblematic flow of power. Direct power transmission from the camshaft via cup tappets to the valves allows fast valve acceleration and keeps the engine revving smoothly even at high speeds.

**Compensation shaft for superior smoothness  
and refinement**

To reduce engine vibrations and increase running smoothness accordingly, the F 650 comes with a special compensation shaft. This shaft runs in two grooved ball bearings and is driven by gear drive with a direct 1:1 transmission ratio straight from the crankshaft. The drive gear on the compensation shaft is designed as a spur gear to compensate for any gear flank tolerance and thus efficiently reduce any noise.

**Oil reservoir in tubular frame**

Oil is supplied to the engine by an intake pump and a high-pressure pump. Featuring dry sump lubrication, the engine of the F 650 does not have an oil sump as such. Instead, the oil reservoir required of about 1.5 litres is incorporated in the upper part of the tubular frame.

**Easy-to-service intake system**

Intake air is drawn into the engine behind the rear side panel and beneath the seat. The foam-material filter is easily accessible, fully washable and therefore easy-to-service. The air intakes leading into the intake air silencer (which also serves to bleed air from the engine) have been carefully designed for extra torque and minimum noise; the overall capacity of the intake air silencer is approximately 6.5 litres.

**Two Mikuni carburettors**

Fuel is supplied through two Mikuni constant-depression carburettors with a venturi measuring 33 mm (1.30") in width. Identical in design and configuration, the two carburettors have an idle, part load and full throttle system. The automatic choke is integrated in the left-hand carburettor.

**Two spark plugs for better combustion**

The contact-free high-tension capacitor ignition is masterminded by a special control map and features electronic ignition feedback control. Ignition timing is also controlled electronically as a function of engine speed. The use of two spark plugs serves to shorten flame travel, minimising pre-ignition, improving combustion under part load, and reducing the emission of pollutants.

**Stainless-steel exhaust system**

As on all BMW motorcycles, the exhaust system is made of stainless steel polished at all visible points. Silencer volume is approximately 7.5 litres.

**Gearbox and clutch**

The dog-type five-speed gearbox is integrated within the engine where the shafts and gears are lubricated by splash oil. Engine power is transmitted by a multi-plate clutch running in an oil bath.

**Standard, non-controlled catalytic converter  
available as an option**

As an option the F 650 is available with a standard, non-controlled catalytic converter fitted at the entry gate leading into the silencer for an optimum temperature level. This ensures a long service life and quick catalyst response, in this way converting pollutants quickly and efficiently into harmless substances.

The catalytic converter does not in any way affect engine output, torque and fuel consumption. And like all the catalysts on BMW motorcycles, the catalytic converter on the F 650 can be recycled at the end of its running life through BMW dealers, ensuring in this way that precious materials are preserved and used again.

**10,000-km (6,200-mile) service intervals**

Like the new Boxer generation and all car models, the F 650 comes with service intervals of 10,000 km or 6,200 miles substantially reducing the cost of ownership.



**THE SUSPENSION****Single-loop frame with load-bearing engine**

The "backbone" of the F 650 is formed by a single-loop frame made of pressed section pieces and square tubing, the upper half of the frame housing the oil reservoir for dry sump lubrication of the engine. The frame is further reinforced by bolted-on round tubing, and the engine serves to provide an additional load-bearing function.

**Rear wheel fitted on delta-box swinging arm**

The front wheel runs on a conventional telescopic fork with stabiliser and a fixed tube diameter of 41 mm or 1.61". The rear wheel, in turn, is suspended on a delta-box swinging arm combining supreme rigidity with low weight.

**Hydraulically adjustable spring strut**

The centrally mounted spring strut supplied by Showa (just like the telescopic fork) is infinitely adjustable for spring pretension and outward-stroke damping. Spring pretension is adjusted hydraulically by means of an easily accessible adjustment wheel. The spring strut itself is connected to the rear-wheel swinging arm at its lower mounting point by way of a system of levers, the kinematic conditions obtained in this way providing progressive spring action.

Overall wheel travel is 170 mm or 6.69" on the front wheel and 165 mm or 6.50" at the rear.

The F 650 runs on wire spoke wheels, wheel diameter being 19" at the front and 17" at the back. Tyre dimensions are 100/90 - 19 57 S on the front wheel and 130/80 - 17 65 S on the rear wheel.



**Driven by a low-wear O-ring chain**

The rear wheel of the F 650 is driven by an O-ring chain running at a transmission ratio of 1:2.93 (teeth ratio 16:47). This specific type of drive chain comprises a permanent lubricant filling in the rollers, O-rings between the rollers and the outer covers preventing the lubricant from escaping. Properly maintained, an O-ring chain therefore guarantees optimum smoothness and minimum wear. Rubber mounts for compensating load change forces are integrated in the rear wheel chain gear support.

**Disc brakes front and rear**

The brake system consists of a single-disc brake (diameter 300 mm/11.81") with two-piston floating calliper at the front and a single-disc brake (diameter 240 mm/9.45") with single-piston floating calliper at the rear. The entire brake system was designed for the F 650 by Brembo from a clean sheet of paper.

With full tank and in road trim, the F 650 weighs a mere 189 kg (417 lb). And with its maximum permissible weight of 371 kg (818 lb), it offers a service load of 182 kg or 401 lb. Particular strengths of the F 650 are its excellent handling and superior riding stability also at high speeds (160 km/h or 100 mph plus) as well as its outstanding qualities in carrying a rider and passenger even on long tours. And this new machine is really at home on winding country roads as well as dirt tracks and in dense city traffic.

**MODEL FITMENTS****Same headlight as on the R 100 GS**

The F 650 features a stable cockpit fairing fitted directly to the frame and incorporating both the wind-shield and headlight (which is the same as on the R 100 GS). The cockpit houses the speedometer and rev counter, a coolant temperature gauge and telltales for oil pressure, the idle indicator, direction indicators and high beam. The steel tube handlebar measures 880 mm (34.65") in width and is specially reinforced by a transverse bar for riding off-road.

**17.5-ltr (3.85 Imp gal) fuel tank for a range  
of 300 km (190 miles)**

The plastic fuel tank has a capacity of 17.5 litres or 3.85 Imp gals, including two litres reserve. This gives the F 650 a range of approximately 300 km or 190 miles before refuelling. The fuel supply tap is on the left side of the tank.

**Seat height only 810 mm (31.89")**

Measuring 710 mm or 27.95" in length, the stick-on seat offers ample space for both rider and passenger. Despite very generous spring travel, seat height is only 810 mm or 31.89" - very low indeed for a machine of this type.

The F 650 comes with a central ignition and steering lock, the key fitting in either way round and also serving for locking and unlocking the tank filler cap and seat storage compartment.

The front wheel is covered by a low mudguard with an integral sliding tube cover. Directional flow of air along the brake calliper efficiently cools the brake fluid. The rear-wheel cover directly fastened to the swinging arm serves both as a mudguard and a built-in chain protector. Further standard features on the F 650 are the luggage rack with grab handle function, a side-stand, the engine protection cover made of flexible plastic, and the on-board toolkit.

#### **Wide range of special equipment**

Apart from the non-controlled catalytic converter available as an option, the F 650 - as you would expect of a BMW - comes with a wide range of special equipment: The items available range from a main, central stand through case supports, city and integral cases, a separate socket, cylinder protection hoops, hand protectors, heated handles, a handlebar impact protector, all the way to the 22-ltr (0.77 cu ft) topcase and an anti-theft warning system.

#### **Typical BMW styling: unique and unmistakable**

To make sure the F 650 is recognised immediately as the youngest member of BMW's motorcycle family, the Company's designers attached particular significance to the styling and looks of this new machine.

With its soft and sleek contours, the F 650 consistently continues BMW's design philosophy. It also excels through its well-balanced and harmonious appearance enhanced by logical, unique and unmistakable features.

In designing this new machine BMW's stylists sought to keep its looks clear and compact, deliberately avoiding

any uncluttered caps, covers and surfaces. Accordingly, the technical components form one harmonious entity with the body of the motorcycle as such.

Reflecting the topmost objective of the F 650, that is easy and nimble handling under all conditions, the machine's ergonomics have also been optimised accordingly, making full use of the frame concept to keep the seat as low as possible. As a result, the rider is virtually integrated within the F 650.

#### **Fresh colours**

Fresh colours clearly accentuate the young and sporting image of BMW's new machine, the F 650 being available either in flame red (with charcoal-grey seat) or auro white (with the seat in flash-green).



**FROM THE R 32 TO THE R 259****The 70 years of the BMW Boxer****A dynamic heritage and a great future**

Bayerische Motoren Werke was established in 1916, initially concentrating on the production of aircraft engines. The history of BMW as a manufacturer of road-going vehicles - and today BMW is the only manufacturer of both cars and motorcycles in the Western hemisphere - began in 1923 on two wheels. The car only followed in 1928, meaning that in 1993 BMW motorcycles are celebrating their 70th anniversary.

The first motorcycle with the white-and-blue stylised propeller on the tank was the R 32 launched at the 1923 Paris Motor Show. The great-grandfather of all BMW motorcycles, the R 32 featured a 500-cc two-cylinder power unit developing 8.5 bhp later to become world famous as the BMW Boxer. The name "Boxer", incidentally, comes from the simple fact that the two pistons "punch" against each other, like fighters in a ring.

**Max Friz and his ingenious idea**

In creating the R 32, Max Friz, BMW's chief designer, introduced an ingenious idea: Instead of fitting the two-cylinder Boxer longitudinally into the frame, he installed the engine in flat, transverse arrangement to the direction of travel, placing it within an extra-strong double-tube steel frame and connecting it via a direct drive shaft to the rear wheel.

The particular advantages of this concept were obvious from the beginning:

- The Boxer is the only two-cylinder engine able to offer very good compensation of masses and moving forces without requiring a compensation shaft. Accordingly, the engine does not suffer from any unsmoothness otherwise caused by free first- and second-order mass forces.
- Intentionally exposed to the flow of air, the cylinders have optimum air cooling, avoiding the need to use a water cooling system and thus saving both weight and the extra parts otherwise required.
- Fitted longitudinally, the crankshaft provides a direct flow of power to the adjacent gearbox, from where drive forces are further transmitted without any power-consuming pivots or joints through an easy-to-service propeller shaft straight to the rear wheel.
- The flat arrangement of the cylinders provides a low centre of gravity beneficial to the motorcycle's handling on the road.
- With all parts and components of the engine being very easily accessible from virtually all sides, service is very easy and efficient.
- The entire drive unit of the R 32 was simple in design and very compact, all sensitive components being protected by full encapsulation of the engine.

#### **Robust and reliable**

This new concept provided two virtues in particular, which riders and engineers alike could only dream of at the time: robustness and reliability. And it was no coincidence that Max Friz, the "father" of the BMW Boxer, was out to reach these objectives first and foremost - after all, he had previously spent all his time working on aircraft engines.

**The concept of the R 32 as a guarantee  
for ongoing success**

All BMW Boxers built to this very day have followed in the footsteps of the concept introduced for the R 32. In all, this means more than 650,000 machines with over 60 different models and variants ranging from 450 to 1000 cc. And from 1925 to 1966 there were also some 230,000 single-cylinder machines with an engine capacity between 200 and 400 cc.

**Successful coexistence of the Boxer and K-generation**

In 1983 BMW moved over from the Boxer-only strategy to a dual product strategy, successfully launching the K Series as an entirely new generation of motorcycles. In terms of its concept, the patented BMW Compact Drive System featured for the first time on the K 75 and K 100 models with their liquid-cooled three- and four-cylinder power units fitted in flat, longitudinal arrangement, is just as unique as the Boxer engine, while again providing the essential advantages of BMW's two cylinder through the low centre of gravity, direct camshaft drive, torque-oriented performance, and convenient access for exceptional ease of service. Total production of K models so far amounts to more than 173,000 units.

However, even these more modern and far more powerful models never meant the end of the road for the Boxer. On the contrary - the R Series and K Series have developed a successful coexistence in the meantime, both concepts benefitting from one another. This is also why the Boxer's share in BMW's overall motorcycle production has remained consistently between 40 and 50 per cent in recent years.

**The BMW Boxer writes motorcycle history**

BMW's indefatigable Boxer can now look back at an exciting history of almost 70 years - a period in which this unique machine has written motorcycle history itself. The BMW Boxer was one of the first reliable means of transport on two wheels. It was the subject of research and ongoing development for numerous engineers and pioneers, broke the world speed record time and again, and has scored innumerable successes in motor racing. It made the post-war generation mobile and has become the No 1 police motorcycle the world over.

On the occasion of its 60th birthday in 1983, the BMW Boxer gave itself the most wonderful present when winning the Paris-Dakar Rally the second time (out of a total of four wins). Once again, it showed greater endurance than all its competitors in the treacherous deserts of Africa.

**BMW is the Boxer - the Boxer is BMW**

Riding the Boxer, great men have become famous the world over - men such as Ernst Jakob Henne, Schorsch Meier, Hubert Auriol or Gaston Rahier. The inimitable blend of history, heritage and unmistakable character has indeed made the BMW Boxer a legend in its own time; many already refer to the Boxer as nothing less than a myth. The truth of the matter certainly is that BMW and the Boxer now represent a symbiosis of make and product: BMW is the Boxer - the Boxer is BMW. One can rightly claim that the Boxer has more "soul" than any other BMW on two and four wheels. It is one of the most important roots of BMW's image and heritage.



### **Forever young**

The BMW Boxer has not only outlived nearly all European and German motorcycle manufacturers, but is still extremely popular today - a machine which is truly forever young in every respect. As an example, the off-road GS models have been absolute best-sellers in recent years, particularly in Germany. And the most recent "conventional" Boxer, the classic R 100 R, achieved a sales volume of more than 4,300 units in 1992 in the German market alone, thus becoming BMW's best-selling individual model ever since the R 45 in 1980. Almost one out of every four machines which came off the production lines at BMW's Berlin factory in 1992 was an R 100 R, every second motorcycle produced being a Boxer.

### **A centennial event in the history of BMW**

#### **The birth of a new Boxer generation in 1993**

While the BMW Boxer looks back at a great heritage and an equally strong position in today's market, its future has already begun: It had been no secret for a long time that under the internal development code R 259 BMW had been working on an all-new generation of Boxer motorcycles. This brand new machine then saw the light of day, as planned, in early 1993, entering the history of BMW motorcycles as a genuine centennial event.

Following the launch of the R 32 in 1923 and the K models in 1983, BMW thus presented an entirely new generation of motorcycles for the third time. While all Boxer machines introduced in the past had been further developments of their predecessors, the R 259 generation comes from a clean sheet of paper in every respect, having been designed as an all-new machine from the ground up by BMW's Motorcycle Development Division.

**Combining a proven concept with up-to-date technology****The new Boxer as an expression of a new philosophy**

BMW's fundamental principle in business has always been action, not actionism. Accordingly, the new Boxer generation combines the best of two worlds: On the one hand it is based on BMW's proven technical concept and traditional philosophy, featuring all the well-known strengths of the Boxer such as reliability, robust design, unique character, ease of service, and lasting value. On the other hand, however, BMW's new Boxer generation also represents the latest state of the art in motorcycle technology, for example when it comes to performance and the running gear. And not least, this new generation of Boxers by BMW guarantees the future of the motorcycle in its ability to meet the strictest demands in terms of the environment and road safety. Just one example in this context is the reduction of noise, fuel consumption and exhaust emissions, the new Boxer naturally coming with innovations such as four-valve technology, Digital Motor Electronics, and, as an option, fully controlled catalytic converter and ABS, just like BMW's K 100 Series.

It is therefore quite appropriate to regard BMW's new Boxer as the expression of a new spirit. It is a motorcycle attuned to a new age - a successful blend of rational and emotional features, of common sense and riding pleasure. In a nutshell, it is once again a genuine BMW designed and built for the joy of motoring.

**The R 1100 RS sports tourer  
came first**

The first machine introducing the new range of BMW Boxers is the R 1100 RS launched in spring 1993. The well-known model designation alone shows quite clearly what kind of motorcycle this is: a sports tourer. Clearly, most motorcyclists when hearing this name will immediately think of BMW's previous machine in conventional Boxer design, the R 100 RS.

Launched in 1976, the R 100 RS was the first motorcycle produced in large numbers to feature a special fairing developed in the wind tunnel to give the rider superior protection from wind and weather. The R 100 RS underlined BMW's pioneering role in fairing design and is widely acknowledged as a milestone in the history of the motorcycle.

"Introducing the R 100 RS", wrote America's No 1 motorcycle journal, Cycle World, in June 1993 in a road test of the R 1100 RS, "BMW practically invented the concept of the sports tourer and planted the seeds of a two-wheeled category that has grown steadily ever since."

Sales of the R 100 RS from 1976 to 1984 amounted to 33,648 units. In 1987 the bike was re-introduced for the motorcycle aficionado, sales amounting to more than 6,000 additional units by 1993 (most of these motorcycles incidentally being sold in Japan).

**The R 1100 GS enduro follows in the footsteps  
of the R 1100 RS**

Following the successful introduction of the R 1100 RS into the market, this new machine will now be joined, as announced, by the second model in BMW's new range of Boxers: the R 1100 GS (see Chapter 4).

This off-road machine will be making its debut at the Frankfurt Motor Show in September 1993, entry into the market scheduled for spring 1994. And more model variants are in the pipeline ...



**THE NEW R 1100 GS**

**The traditional virtues of the GS models combined  
with the technology of the new Boxer generation**

Launching the R 80 G/S in 1980, BMW introduced a new, unprecedented type of motorcycle soon to become the trendsetter for an entirely new range of machines. The off-road segment previously consisting exclusively of single-cylinder models with an engine capacity of not more than 500 cc, was raised to a new dimension through the introduction of the 800-cc two-cylinder Boxer developing 50 bhp. Indeed, the R 80 G/S became the original large-volume, high-performance off-road machine for adventures and long trips - a motorcycle perfectly suited for all the world's roads and tracks as well as for off-road terrain not taken to the extreme.

**More than 62,000 GS models produced**

In competition trim, the R 80 G/S ridden by Frenchman Hubert Auriol and the Belgian "Tom Thumb" Gaston Rahier won the Paris-Dakar Rally, the world's toughest endurance race, no less than four times. And it also proved its robust design, perseverance and reliability time and again in the most extreme tours. Just one example is Norwegian enthusiast Helge Pedersen, who rode all over the world for 10 whole years, covering 350,000 km or almost 220,000 miles on his BMW R 80 G/S.

In 1987 BMW launched the R 100 GS displacing 1000 cc and developing 60 bhp - once again, the world's largest and most powerful enduro. Featuring the all-new Paralever swinging arm, the R 100 GS and R 80 GS continued BMW's story of success with off-road machines reflected also by most impressive sales figures, total production up to autumn 1993 amounting to more than 62,000 units.

In planning BMW's new generation of Boxers, it was therefore no question from the very beginning that there would once again be a GS version: A truly unique machine combining the virtues and characteristics of the "conventional" GS models with the modern technology of the new Boxer generation. A motorcycle, therefore, with even more power and torque, even greater fuel economy ensured by Digital Motor Electronics, improved environmental friendliness thanks to a fully controlled catalytic converter, and with the extra comfort and riding safety provided by the Telelever and ABS.

As the second model in the new generation of Boxers, the R 1100 GS is therefore making its debut at the Frankfurt Motor Show in September 1993. And as announced, it will be appearing at the dealerships in spring 1994, at exactly the right time for the new season.

#### **Less power - more torque**

By and large, the R 1100 GS is based on the technical concept and design of the R 1100 RS successfully launched in spring 1993. The heart of this new machine is therefore once again the air/oil-cooled two-cylinder Boxer with four valves per cylinder, high-camshaft control and 1100 cc displacement. The engine has nevertheless been modified for somewhat less power at high speeds, but more torque and pulling force in the medium range. Accordingly, output of the R 1100 GS is 59 kW (80 bhp) at just 6750 rpm, the maximum torque being 97 Nm (72 ft/lb) at a low 5250 rpm. This makes the R 1100 GS not only the largest enduro in the market, but also the most powerful off-road machine in terms of its torque.

This modification of the model's torque and power is made possible by an adjustment to the Motronic MA 2.2 engine management system, modified camshafts, different valve timing, modified exhaust manifolds and silencers (now made of stainless steel), different pistons also providing a reduction in the compression ratio from 10.7 to 10.3:1, and a final drive ratio of 1:3.00 instead of 1:2.81 (as with the R 1100 RS starting in the 1994 model year).

Like the R 1100 RS, the R 1100 GS comes with a three-piece frame concept on the same scale as before, the engine and transmission housing forming one load-bearing unit. Front wheel suspension is once again ensured by BMW's novel Telelever with its central spring strut also offering all its benefits in the enduro version (see also Chapter 5).

#### **Front spring strut adjustable on the GS model**

Due to the very different conditions under which an off-road machine must prove its merits, the front, centrally mounted spring strut with 190 mm/7.48" spring travel allows spring pretension to be adjusted to five different levels by means of a hook spanner in the on-board toolkit.

#### **Separately mounted handlebar**

The 820-mm (32.3") wide handlebar of the R 1100 GS is mounted separately, the fork bridge and handlebar being connected with the fixed-position tubes of the Telelever through two ball joints in the fork bridge and thus not following any tilt motion of the Telelever. Unlike the handlebar of the GS model rising upwards at a steeper angle, such tilt or swivel motions are hardly



perceptible, anyway, with the sports-style handlebar of the R 1100 RS, which therefore does not have to be mounted separately.

#### **Hydraulic adjustment of the rear spring strut**

Like its RS counterpart, the GS comes with its rear wheel running in a Paralever swinging arm with central spring strut and (200 mm/7.87") spring travel. Spring pretension is infinitely adjustable by way of a hydraulic adjustment wheel, outward-stroke damping also being infinitely adjustable by means of a setting bolt.

Applying the same principle as BMW's previous GS models, the R 1100 GS again comes with patented cross-spoke wheels, this specific arrangement of the spokes providing the same kind of strength and stability as cast wheels. Apart from superior riding stability, cross-spoke design (wheel size is 19" at the front and 17" at the rear) offers the further advantage of making the spokes individually exchangeable and allowing use of tubeless tyres. Tyre dimensions are 110/80 x 19 at the front and 150/70 x 17 at the rear.

#### **Modified brake system**

While the front wheel features the double-disc brake of the R 1100 RS with four-piston fixed callipers and floating stainless-steel discs measuring 305 mm or 12.00" in diameter, the brake system of the rear wheel had to be modified due to the different fitting of the cross-spoke wheel: The R 1100 GS features a single-disc brake measuring 276 mm or 10.87" in diameter and equipped with two-piston floating callipers.

#### **ABS with optional deactivation for riding off-road**

As an option the R 1100 GS is available with BMW's further improved ABS II (see Chapter 9) already featured on the R 1100 RS.



Contrary to regular riding conditions on the road, where ABS always offer the advantage of preventing the wheels from locking and thus helping the rider to avoid a fall, it may well be desirable when riding off-road or on loose gravel to lock the wheel completely. Precisely this is why ABS II, as featured on the R 1100 GS, may be deactivated by the rider.

Deactivation is only possible before setting out by pressing the ABS deactivation switch and firing the ignition at the same time. The rider is then informed by the ABS telltale that the anti-lock brake system is currently not in operation. To re-activate the system, all the rider has to do is switch off the ignition and then switch it on again.

#### **Model features**

The R 1100 GS comes with a 25-litre (5.5 Imp gal) plastic fuel tank. The front wheel cover is fitted directly to the cockpit fairing and makes a significant contribution to the motorcycle's exceptional looks. The lower wheel cover, in turn, is fitted to the lower fork bridge, thus following the steering and acting as a mudguard. The rear wheel, in turn, is covered by a separate plastic mudguard fitted directly to the rear wheel drive.

**Fitted as standard: adjustable windshield and seat**

As on the R 1100 RS the R 1100 GS is equipped with a special ergonomics package. This includes that the windshield may be adjusted infinitely by 13° (using the toolkit) and the two-piece seat may be set at a height of either 860 mm (33.86") or 840 mm (33.07"), this latter height being remarkably low for an off-road machine. Again, seat height can be varied very easily simply by fitting the seat into fixed supports at various levels.

Another feature common to the R 1100 GS is the integrated ignition and handlebar lock allowing the rider to lock the handlebar also when it is facing to the left or right. The ignition key, which may be turned round and used on both sides, also locks the tank cap, seat and helmet fastening catch.

The instruments, controls and switches are - with the exception of the rider information display, which is here no standard feature - the same as on the R 1100 RS, while the handbrake lever may be set to four different positions (again as with the R 1100 RS). Further standard features are the main stand and side support with starter interruptor function, the plastic cylinder protector, the aluminium protection plate beneath the engine, the hazard warning flashers and luggage rack.

### **Luggage rack enlargeable**

A special feature is that after removing the rear half of the two-piece seat normally intended for the passenger, the rider may enlarge the luggage rack accordingly. The grab handle for the passenger may also be removed and there is a separate box for the on-board toolkit beneath the luggage rack. This separate box may also be locked with the seat key after removal of the rear seat section.

Comprising a luggage rack and toolkit, cylinder protection hoops and underfloor protection, the R 1100 GS therefore has another range of standard features than its R 1100 RS counterpart. Together with the increase in fuel tank capacity by two litres, the separately mounted handlebar, modified silencer, heavier tyres and spring struts (longer spring travel, rear spring strut hydraulically adjustable), this gives the R 1100 GS an unladen weight in road trim of 243 kg or 536 lb (R 1100 RS: 239 kg/527 lb).

### **Options and special equipment**

Reflecting BMW's usual philosophy, the R 1100 GS is available with a wide range of options and special equipment. The options available straight from the factory range from ABS II, a fully controlled catalytic converter, the rider information display all the way to case supports and heated handles. Special equipment includes various cases and panniers, a tank bag, an anti-theft warning system, soft-foam handles, hand protectors and a handlebar impact protector.

### **Colour range**

As with the R 1100 RS, the purchaser of the R 1100 GS has the choice of three different colours: marrakech red, alpine white or avus black. The standard seat colour is yellow, but as an option the seat is also available in black.

As a special feature already offered with the R 1100 RS, various suspension and engine parts may be finished in black paintwork: the Telelever, alternator cover, crankcase, gearbox, oil cooler pipes, final drive cover and starter cover.

### **The unique design of the R 1100 GS:**

#### **Powerful and unmistakeable**

The R 1100 GS consistently carries forward the design philosophy of the BMW Boxer.

The unique, unmistakeable character of this equally unique machine is emphasized by the clear-cut "language" of its design. The styling and ergonomics result directly from the wish to create a motorcycle ideal for both off-road and road use.

The R 1100 GS deliberately does without any exaggerated fairing components, thus limiting its concept to the essential.

- To ensure smooth and harmonious styling all round, the engine, suspension and body panels have been consistently revised to provide a perfect match. And applying BMW's usual philosophy, all accessories and special equipment were included in the development process from the start.



- Indicators, instruments, switches and functions have been reduced to the essential, also in the interest of optimum perception.
- Through its looks alone, the R 1100 GS creates a touch of power and control ease, making do entirely without short-lived features which would merely express fleeting fashion trends. Everything in the design and styling of the machine follows the needs of the rider.

## **The R 1100 GS: Setting new standards in the big enduro class**

Just like the R 80 G/S in 1980, the R 1100 GS launched for the 1994 model year sets new standards in the big enduro class. It features not only the largest engine, but also more torque than any of its competitors. With the unique Telelever, the suspension ensures optimum riding stability, comfort, and excellent handling. And the R 1100 GS is the world's only off-road machine available with both ABS and fully controlled catalytic converter, meaning that it fulfils even the most stringent demands in safety and environmental compatibility. The R 1100 GS - a new original with a great heritage and a promising future.

## THE R 1100 RS

Introducing the 1994 model year:

**Ergonomics package and rider information display  
now fitted as standard.**

From model year '94, the ergonomics package, rider information display and a warning flasher light will be part of the standard specification (see section on equipment).

**Front spring strut even firmer and more dynamic**

To place even greater emphasis on the sporting character of the R 1100 RS, the front spring strut is now a bit firmer and harder in its compression stage.

In all other respects the R 1100 RS is entering the 1994 model year without any changes. Like the R 1100 GS, it is however available as an option with specific suspension and engine components finished in black (see Chapter 4).

**The first model in BMW's new Boxer generation  
starts successfully into the market**

"BMW's new R 1100 RS, it wouldn't be too hard to argue, is the most advanced streetbike ever made ...". This is how Cycle World, the largest motorcycle journal in the USA, summed up its report on the launch of the "Wunder-Boxer" (another original quote by Cycle World) on the island of Lanzarote in January 1993. And indeed, world-wide media response to the R 1100 RS sports tourer, the first model in the new Boxer generation, was absolutely excellent.

This highly positive response has continued in further test reports following the launch of the new machine in

spring 1993. Features lauded particularly are the powerful engine, the highly efficient brakes in conjunction with BMW's new ABS, the high standard of environmental care, and the motorcycle's ergonomics package. And of course everybody praises the suspension with the BMW Telelever, our newly developed front-wheel suspension unit.

A further highlight emphasised time and again is the successful synthesis of heritage, character, and advanced technology. As a typical example of many test reports, just consider the following extract from "Tourenfahrer", a leading motorcycle magazine in Germany:

"Hardly anybody believed it was possible - but now it has become reality. The 1993 BMW Boxer looks almost exactly the same as its predecessor built and sold so successfully for many decades. BMW is thus defending a concept niche no Japanese manufacturer has dared to venture into so far. This not only reflects BMW's wish to remain independent and uphold its traditions, but also emphasises the many technical considerations in favour of the "boxing" flat-twin. And these technical advantages have never come out as clearly and convincingly as in BMW's latest power unit ... The sheer muscle of the engine combined with playful agility on the road and exceptional safety reserves making the BMW R 1100 RS a genuine trendsetter in every respect ... Right now there is no other motorcycle able to match the R 1100 RS in all of its features and product fortes - not even another BMW!"

**POWER UNIT:****More power and torque****Environmentally compatible and easy to service**

Shortly after the successful introduction of the K 75, BMW's motorcycle managers and engineers started considering in the mid-eighties what an all-new BMW Boxer for the future should look like. And naturally, this also meant an all-new engine.

One point obvious from the very beginning was that the new Boxer was to offer more power and torque than its predecessor. Accordingly, there was no doubt that it had to have four - and no longer two - valves per cylinder. Top priority was also given to the improvement of fuel economy, the minimisation of exhaust emissions and engine noise, as well as the ease of maintenance offered by the new machine.

**90 bhp from 1100 cc**

The new, air- and oil-cooled two-cylinder Boxer combines even more power with an even better torque curve from low engine speeds. Its specifications are therefore most impressive: 1100 cc capacity, 90 bhp (66 kW) at 7250 rpm, maximum torque 95 Nm (70 ft/lb) at 5500 rpm.

**The engine housing**

The engine housing consists of two cast aluminium shells joined together in the middle. BMW's engineers decided quite deliberately not to use a single-piece tunnel housing as on the old Boxers, since the two shells can be cast economically and with maximum efficiency.



The shells are almost identical, the only difference being that on the right side there is a flange for the oil pressure check valve, while the oil level inspection window is on the left. The two shells are sealed by an elastic, silicon-based compound offering the advantage of being temperature-resistant and easy to remove. The oil sump is integrated into the two halves of the two-piece shell housing and has a capacity of approximately 4.5 litres or 1 Imp gal.

#### **Drive unit with load-bearing function**

Opting for the design just described, BMW's engineers have ruled out the possible problem of oil leakage, which might present itself if the oil sump were fastened to the engine block by a simple connection. Similarly, the responsible engineers decided not to use the time-consuming chill-casting procedure with sand moulds, since the middle-pressure aluminium casting process used in this case serves to substantially reduce the reject rate.

With the drive unit being the motorcycle's main load-bearing component - you might even call it the motorcycle's "backbone" - the engine and transmission components have been designed for optimum strength and rigidity with the help of the computer-based finite-element method (FEM).

The front end of the engine is sealed off by the alternator cover made of pressure-cast light alloy and housing the alternator itself driven by a poly-V-belt. Another cover then comes right at the end, integrating the engine and alternator and forming the final section at the front.

**Four valves per cylinder it had to be!**

With the engine being required to fulfill demanding standards, there was no doubt from the very beginning that only a four-valve power unit would be able to provide the superior performance, emission management and fuel economy taken for granted in this case. Accordingly, two intake valves in each cylinder guarantee an optimum cylinder charge and fuel/air flow.

Thanks to the symmetrical arrangement of the two outlet valves, the spark plugs with their three electrodes have ample room in the middle of the cylinder head. Featuring specially contoured pressure edges at the sides, the roof-shaped combustion chambers are extremely compact.

Through its very design, a four-valve power unit offers far more output and torque than a two-valve engine. Providing a better cylinder charge, a four-valve engine capitalises on the energy yield provided by the fuel, thus helping to maximise engine output or, alternatively, reduce fuel consumption for the same output.

**Three- or five-valve power units cannot do the trick**

A three-valve engine is not able to offer these advantages - and tests carried out by BMW with five-valve cylinder heads also failed to provide any benefits worth mentioning. Almost inevitably, therefore, the final choice was a cylinder head with two intake and two outlet valves.

**Oil cooling along the cylinders between  
the outlet valves**

To ensure optimum cooling particularly of the hot exhaust section, the outlet valves in the cylinder head are tilted to the front in the direction of travel, thus having the full benefit of the air flowing around the cylinders. For even greater efficiency, the cylinder bank developing temperatures up to 300°C (570°F) is cooled by oil flowing between the two outlet valves.

**Longer adjustment intervals**

The advantage of this additional oil cooling is that both the valves and valve seat rings now have a much longer service life. In addition, the intervals between valve adjustment are up from 7500 to 10000 km (this also applies to all K models. To avoid coking along the hot cooling ducts after switching off the engine, the ducts are designed to remain filled with cooling oil at all times.

Thanks to this efficient combination of air and oil cooling, the engine is far more resistant to high temperatures and hot weather, runs more quietly, and offers an even longer service life.

**New valve control keeping the engine slender  
and compact in design**

Since the valve control system used on the former Boxer (featuring a central camshaft, tappets, very long push rods and rocker arms) would have been quite unsuitable for a four-valve power unit on account of its inadequate strength and stiffness, BMW's engineers had to take a new approach in designing the valve drive system.

Classic valve drive systems with one overhead camshaft (OHC) or a double overhead camshaft (DOHC) and cup tappets, as used on BMW's K Series engines, had to be ruled out from the start since they would have increased the width of the Boxer engine by approximately 4 centimetres, in this way making it quite impossible for the rider to take bends at an angle of up to 49°, as required in the brief given to BMW's engineers.

A vertical drive shaft, in turn, would have been too elaborate, difficult to service and expensive. Accordingly, BMW's engineers eventually opted for the following solution:

**One auxiliary shaft and a separate camshaft  
on either side**

Via a chain, an auxiliary shaft with a reduced ratio of 2:1 is driven directly from the crankshaft. Located deep within the engine beneath the crankshaft, this auxiliary shaft running at half the crankshaft speed incorporates a further chain on either side driving the respective camshafts running within the right and left-hand cylinder heads at the back next to the inlet valves.

The decision to use chains for this purpose was based on their strength and endurance, the precision a chain is able to offer and, in particular, the slim, compact design of such a drive chain taking up very little space.



While the use of an auxiliary shaft may appear to be a kind of "detour", the advantage in this case is that the sprocket within the cylinder head is smaller than usual and therefore keeps the cylinder head slender (although even so, space within the cylinder head is very limited). A light-alloy sub-frame is bolted directly to the cylinder head to accommodate the valve drive.

**The camshaft: a steel structure with sintered cams**

The camshaft and rocker arms run directly on the sub-frame. Contrary to the conventional design, the camshaft is no longer made in one single piece - instead, the cams are sintered and forced on to the specially hardened and heat-treated steel shaft.

Working against the cup tappets, the rotating cams transmit the forces converted from a rotary to an up-and-down motion via push rods to the forged rocker arms. The rocker arms, in turn, transmit this drive force to the valves to be opened with a pressure of 27 kg or 59 1/2 lb. They also feature adjustment bolts for the pivoting slides driving the valves in pairs.

**The engine even looks dynamic**

This special valve control system sometimes referred to as a high-camshaft design offers yet another advantage with the new Boxer: It makes the engine look particularly dynamic with its wedge-shaped cylinder heads pointing downwards like an arrow.

**The cylinder cooling fins - unconventional  
in every respect**

The two typical Boxer cylinders sticking out at the sides are made of cast light alloy. To obtain a larger outside surface and thus to dissipate heat more efficiently, they have cooling fins on the outside specially designed to avoid the usual hissing noise such fins often cause on other motorcycles. As a further feature, the fins are reinforced by connection pieces obviating the need to subsequently instal rubber silencing blocks. The fins and connection pieces are as long as necessary to provide optimum heat dissipation, at the same time preventing vibrations and eigenfrequencies otherwise audible as a distinct noise around the engine.

**Friction reduced to a minimum inside the cylinders**

Inside, the cylinders are finished with a high-strength, low-wear, extra-smooth layer of Gilnisil, a special nickel silicon lining ("Gil" stands for the manufacturer, the Italian company Gilardoni) minimising frictional losses on metal surfaces running against each other. Further advantages of this design are minimum oil consumption, high strength and stability also at high speeds and, as a result, a long running life.

**Modern piston design**

Each featuring three piston rings (one for removing the oil, two for compression and sealing), the two pistons in box shape are made of cast light alloy. Measuring 99 mm (3.9") in diameter, the pistons weigh almost a third less than the former pistons in the old Boxer. This slim design reduces mass forces and allows higher running speeds, a pleasant side-effect being the reduction of vibrations.

#### **Sintered connecting rods for less vibration**

The connecting rods link the pistons with the crankshaft and are made of sintered and forged steel with BMW's new R 259 power unit. Compared with the old steel conrods merely forged but not sintered, the new conrods have much more accurate dimensions, a better surface contour and, quite generally, a higher standard of quality at the surface. Precisely this gives the connecting rods one of their main advantages, sintered conrods having virtually exactly the same weight following production, without any deviation from one rod to another. While the old steel connecting rods had to be subsequently machined and then categorised in 7 weight groups, the new far more precisely manufactured sintered rods all come in one and the same weight group. Thanks to this almost perfect balance of weight from one connecting rod to the other, the counterweights on the crankshaft ensure optimum compensation of all mass forces.

#### **A world innovation in motorcycle technology: the intentionally fractured conrod boss**

The connecting rods of the new Boxer are made with the fracture or crack technology introduced for the first time on BMW cars. Accordingly, this is the first time in the history of motorcycle engine production that the large conrod boss encompassing the crankshaft is intentionally fractured and not simply sawn in half.

The advantage is that the two surfaces along this intentional fracture fit together perfectly when subsequently re-joined.

Indeed, when subsequently bolted together the fracture lines provided by this cracking technology form a larger

common surface with even better alignment of the two halves than with a sawn conrod. Unlike the former design, there is no need for adjustment pins or bolts to provide a perfect fit. The substantial advantages of this new crack technology are therefore greater precision, a better fit, lower weight, quicker machining, and easier fitting.

#### **The crankshaft running in two bearings**

Representing the "heart" of the new engine, the crankshaft is made of one piece of top-quality heat-treated steel and runs in two slide bearings, the rear bearing being of double collar design. The advantage in the event of repairs is that there is no need for time-consuming alignment of the bearing and crankshaft.

BMW's engineers deliberately decided to do without a third crankshaft bearing, since this would have required the two cylinders opposite each other to be moved too far to the side.

The crankshaft drives the alternator and the layshaft controlling the valves and the two oil pumps, and extends directly into the five-speed gearbox.

#### **Lubrication**

The two inner-serrated oil pumps are housed in a separate unit at the front end of the layshaft - the cooling oil pump at the front, the lubrication oil pump at the rear. The circulation of lubricant is controlled by a pressure valve fitted directly behind the pump, compressed oil first flowing through the oil filter and then up to the distributor chamber with its various ducts and connection pipes. Here, in the pre-cast main



oil duct, the lubricant flows past the oil pressure switch and is siphoned off for lubricating the layshaft bearings and left-hand cylinder head.

Another duct inside the chamber leads to the front and rear main bearings for the crankshaft. One hole is sufficient in each bearing to ensure ample lubrication. From the main bearings of the crankshaft the oil flows through additional ducts to the conrod bearings also requiring lubrication. To lubricate the cylinder head on the right-hand side, oil is siphoned off through a set bolt duct from the main oil stream, flowing to the rear main crankshaft bearing and then being forced through the control sub-frame into the hollow-drilled rocker arms and camshaft. The cup tappets are lubricated by splash oil.

#### **Circulation of cooling oil**

The cooling oil pump has an open circuit, its task being to turn around as much oil as possible and circulate it into the system. Accordingly, the cooling oil pump is a volume pump, and not a pressure pump.

Flowing through a distributor pipe, the cooling oil is fed into the drilled riser pipes of both cylinders and flows to the cylinder heads. In the cooling duct itself the oil flows round the outlet valve seat rings and from there runs back into the housing, where the two oil streams from the right- and left-hand cylinder meet once again. The reflow pipe enters the housing on the left-hand side below the surface of the oil.

**Bleeding the engine housing and "washing" the oil  
in the interest of a clean environment**

Efficient extraction of air from the crankcase is essential to engine performance and helps to minimise oil consumption while extending the intervals from one oil change to another. The process of bleeding air efficiently from the housing is necessary because pistons moving up and down might also be regarded as a kind of pump. Each time the pistons move down to their bottom dead centre, either on the intake or compression stroke, the air in the housing beneath the pistons is forced out. This air is enriched by blowby gases - exhaust gases forced into the crankcase between the walls of the cylinders and the pistons and past the compression rings.

This exhaust gas is contaminated by oil residues which have to be collected and removed. This, in turn, is done first by a labyrinth integrated in the crankcase and then by an external oil separator further downstream, where even the last traces of oil contained in the exhaust gas are retained. Oil particles in the blowby gas oil mist impinge on the walls of the cyclone separator and are removed from the gas by means of centrifugal forces.

The oil "washed" in this way flows back into the engine through an external pipe leading out of the oil separator. The gas is fed into the intake silencer from where - mixed with fresh air - it flows back into the combustion chambers. This sophisticated design minimises oil consumption throughout the engine's entire running life and therefore makes an important contribution to the cause of environmental protection.

### **Intake system**

Through a snorkel beneath the tank, fresh air is drawn into the intake system air chamber, where it is cleaned by a paper filter. From the pure air chamber downstream of the filter, the air then flows on through two specially designed intake manifolds via the intake valves into the two combustion chambers. In their length and shape, the intake manifolds are designed to provide superior output and an optimum torque curve thanks to the resonance within the intake system.

### **Digital Motor Electronics**

To further enhance engine output and torque while at the same time reducing fuel consumption and exhaust emissions, it was obviously necessary from the start to equip the engine with an electronic management system. Doing this, BMW's engineers were able to resort to the Digital Motor Electronics already featured on the four-valve power units of the K 100 - to be more precise, they have decided to use Bosch Motronic MA 2.2 also featured on the K 1100 RS and K 1100 LT as of the 1994 model year.

Compared with the old Boxer fitted with two Bing carburettors, the advantages of the new R 259 engine with electronic fuel injection are obvious:

- Improved performance thanks to the special design of the intake system
- Better engine response ensured by the significant reduction of flow losses within the intake manifold
- Superior economy and reduction of fuel consumption: whenever the throttle butterfly is closed and when the engine is in overrun above 2000 rpm, the supply of fuel is totally interrupted

- Grid control for extra smoothness and refinement
- Superior ease of service provided by a diagnostic chip memorising any defects subsequently read out by the BMW Diagnostic Tester
- Superior reliability and failsafe functions built into the Motronic system, allowing further - albeit restricted - operation of the engine in the event of a deficiency
- Absolutely no wear in the case of electronic systems
- Ideal conditions for using a fully controlled catalytic converter

### **Motronic and its systems**

#### **The fuel supply system**

Housed in the fuel tank, the electric fuel pump conveys fuel to the electromagnetic injection valves within the throttle butterfly manifold, a pressure regulator keeping the pressure required for the injection process consistent. Fuel is discharged into the two intake manifolds through the two electronically controlled intake valves. It is injected intermittently, ie, once every rotation of the crankshaft simultaneously into the two intake manifolds. The compression ratio of 10.7:1 requires unleaded premium fuel (95 ROM).

#### **The ignition**

The ignition system consists of the terminal stage and coils. The ignition angle specified by the control unit is communicated by the system as a high-voltage pulse to the two spark plugs.



### **The control unit and sensors**

The sensors determine the engine's current operating conditions, the information obtained in this way being fed into the control unit where it is compared with the data stored in the CPU's (Central Processing Unit's) EPROM. This comparison of data shows the exact amount of fuel required and the duration of the injection period.

### **The supply of data to the Motronic engine management system**

The following sensors serve to supply the data required to the Motronic Central Processing Unit:

#### **- Throttle butterfly angle**

To determine the engine's current load conditions, throttle butterfly angle  $\alpha$  is measured by a potentiometer located on the throttle butterfly shaft and serving to determine dynamic driving conditions, ie, any change in the position of the throttle butterfly. Applying the throttle butterfly angle and speed signals, the Motronic then determines the basic data for the ignition angle and injection period subsequently adjusted by additional consideration of the intake air and engine oil temperature.

#### **- Engine speed**

Two Hall detectors on the crankcase also serve as sensors providing data to the Motronic management system. They incorporate two magnets determining the rotational speed of the crankshaft without direct contact.

#### **- Intake air temperature**

The temperature of the fresh intake air is measured in

the air filter housing, the sensor changing its electrical resistance as a function of temperature.

**- Oil temperature**

The oil temperature sensor is fitted at the outlet from the cooling oil circuit to the oil cooler itself. It records the information required and passes on this information to the Motronic control unit and - if fitted - to the oil temperature gauge.

**- Air pressure**

The air pressure sensor - a pressure socket incorporating a diaphragm measuring air pressure on a piezo-crystal via a vacuum - measures ambient air pressure and thus makes any adjustments required for the elevation at which the motorcycle is travelling. This system is only required, however, on models with a "simple" catalytic converter without electronic control, since the oxygen sensor takes over this function on machines fitted with a fully controlled three-way catalytic converter.

**Three-way catalytic converter**

BMW was the first manufacturer in the world to build motorcycles with a fully controlled three-way catalytic converter (these were the K 100 Series). Now Bayerische Motoren Werke is continuing this active policy of protecting the environment with the new Boxer, the three-way catalytic converter being the most efficient emission control system available today. The process of conversion, reduction and oxidation is however only possible as long as the lambda 1 engine data are strictly observed.

This stoichiometric ratio between the amount of fuel actually supplied and the amount of fuel theoretically required is based on an air:fuel mixture of 14:1. To maintain this mixture regardless of running conditions, the oxygen sensor (sometimes also referred to as the lambda probe) measures the amount of oxygen in the exhaust gas emitted by the engine.

#### **Oxygen sensor fitted in front of the catalytic converter**

On the engine of the R 259 the oxygen sensor is fitted upstream of the catalytic converter (while on the K 100 models it is downstream of the converter) and is therefore activated quickly and efficiently. The optimum operating temperature of the ceramic probe is 600°C or 1112°F, temperatures in the region of 300°C ensuring that the sensor will be activated within seconds. To provide an even faster response, the sensor is heated by a 12 W heating system.

Immediately after the engine has been started, the oxygen sensor is switched off until the engine reaches its normal operating temperature, the fuel/air mixture being enriched in this start or warm-up phase in order to make the engine run smoothly. When the engine is in this operating condition, engine speed is increased by the choke adjusting the position of the throttle butterfly. As soon as the engine has reached its normal operating temperature, this assistance is of course no longer required.

#### **Fuel enrichment when accelerating**

The oxygen sensor control system is also deactivated whenever the engine is enriched during acceleration. This is essential in order to compensate for the leaner

fuel/air mixture during acceleration, in this way allowing the engine to run smoothly and without jolts.

Monitoring the throttle butterfly angle, the rate at which the throttle butterfly angle changes, the absolute change of angle, engine temperature and engine speed, the computer is able to determine any sudden need for power. A quick turn of the gas handle by the rider, therefore, means a complicated calculation process within the computer.

To obtain spontaneous engine power all the same without the slightest delay, the injection period required by the electronic control system is "bridged" by short, interim bursts of fuel enriching the mixture injected. This power enhancement process starts immediately after any change in engine load.

#### **Overrun control to reduce fuel consumption**

Overrun control serves to reduce both emissions and fuel consumption. It is activated at engine speeds above 2000 rpm, as long as the throttle butterfly is closed.

To avoid engine damage the injection signals are interrupted as of approximately 8000 rpm, such speed governing function reliably ensuring that the engine will not be over-revved.

#### **The catalytic converter is recyclable**

The three-way catalytic converter used on the new engine is already well known from the K 100 Series, the precious metals required for oxidation (platinum and palladium) as well as reduction (rhodium) being applied



to a metal substrate. As is generally known, oxidation converts carbon monoxides into carbon dioxide, and hydrocarbons into carbon dioxide and water. The withdrawal of oxygen then allows the breakdown of nitric oxides into nitrogen and carbon dioxide.

Compared with a ceramic-based catalytic converter, the metallic converter offers advantages in terms of both space and time: it is smaller and responds more quickly, since the metal substrate is more efficient in absorbing the heat from the exhaust gas.

The catalytic converters are recyclable and are taken back after their service life by BMW workshops.

#### **Catalytic converter available as an option and retrofittable**

The fully controlled three-way catalytic converter is available as an option. The engine also comes in an additional version prepared for subsequent installation of the catalytic converter, meaning that all technical modifications have already been made for retrofitting the fully controlled catalytic converter relatively easily.

#### **Stainless-steel exhaust system**

Made completely of stainless steel and chrome-plated in addition, the exhaust system is extremely resistant to corrosion. The two manifolds are designed as a resonance pipe for the exhaust gases, providing maximum torque and output. They come together upstream of the silencer.

On models fitted with a fully controlled three-way catalytic converter, the oxygen sensor is located directly at the point leading into the pre-silencer, thus ensuring maximum efficiency.

In the standard version of the silencer with a volume of 10 litres or 0.35 cu ft, the exhaust gas flows through an intake pipe with a special absorber. On the catalytic converter model this absorber is replaced by the metallic substrate.

The rear end of the exhaust system identical on both models houses the tail muffler in reflection design. Through its configuration the silencer allows the motorcycle to outperform current noise emission limits and comply with future standards, without forfeiting any power in the process. Measured according to the ECE standard, the new engine develops a noise level of 79 dB(A), the current limit being 82 dB(A). The new standard applicable in the EC is 80 dB(A). (An increase by 3 dB(A) means that the noise pressure level is doubled - and vice versa.)

#### **The clutch**

The clutch is a single-plate dry clutch with the lowest possible inertia for a smooth and easy gearshift. Made of metal plate, the flywheel incorporates the starter gear.

#### **The gearbox**

The dog-shift five-speed gearbox is derived from the gearbox already featured on the K models.

## **ELECTRICAL SYSTEM**

### **New 700-W alternator**

The new generation of BMW Boxers comes with a new alternator combining compact dimensions with superior output and ideal installation within the motorcycle itself. Operating with a regulator voltage of 14 V, the new alternator develops 50 amps equal to an output of 700 Watt. For comparison, the alternator on BMW's "old" Boxers had an output of 240 Watt, the alternator on the K models an output of 480 Watt. A particularly important point is that the new alternator generates a surplus output of up to 70 Watt even at idling speed, in this way ensuring a very good battery charge at all times. This, in turn, makes sure that the motorcycle will always start easily and smoothly, at the same time giving the battery an extra-long service life. The superior efficiency of the alternator allows the use of a smaller and lighter battery (19 Amps/hr), while the matte-white battery housing enables the rider to easily read the battery fluid level whenever necessary.

### **Easy access to the central electrical system**

The entire electrical system of the R 1100 RS is conceived as one centrally controlled unit, meaning that all important components such as the relays, fuses and connectors are located at one easily accessible central point beneath the seat.

**RUNNING GEAR:****The BMW Telelever -****a brand-new front wheel suspension concept**

The progressive design of the running gear is hardly visible from the front, but stands out clearly from the side, where the first thing to catch your eye is the BMW Telelever, an all-new front-wheel alignment and bearing system providing a synthesis, as it were, of the telescopic fork and the swinging arm.

**Design and function of the BMW Telelever**

With its main tube measuring only 35 mm or 1.38" in diameter, the telescopic fork pivots on a ball joint in a slide tube on the longitudinal control arm at the bottom and a fork bridge within the frame of the motorcycle at the top. A central spring strut providing 120 mm (4.72") spring travel measured perpendicular to the road, connects the longitudinal control arm with the front section of the frame.

The telescopic fork shafts now only contain fluid to lubricate the two tubes running inside one another, and no longer comprise any spring or damper components. As a result, the response of the telescopic fork to road and riding conditions is particularly smooth and soft, the fixed tubes running in slide bushes with teflon coating for minimum friction.

The maintenance-free ball joints running without any play within the slide tube and fork bridge efficiently transmit the steering movements on the telescopic fork. The other ball joint bolted on to the longitudinal control arm feeds most of the forces generated when applying the brakes into the stable engine housing. The longitudinal control arm, in turn, is fitted on a swivel



mount on either side of the engine housing, meaning that the telescopic fork on the BMW Telelever system is only required for guiding the front wheel and, of course, for steering (maximum lock angle 32° on each side).

#### **The advantages of the BMW Telelever**

- o Compared with conventional wheel guidance systems, the wheel alignment geometry achieved in this way substantially reduces the dive effect of the telescopic fork. In fact, it works like a mechanical anti-dive system, ensuring that spring travel remains adequate even when braking in an extreme situation.
- o Even with the springs strongly compressed, the wheelbase and castor remain largely unchanged throughout the motorcycle's spring travel. This guarantees superior stability in all situations, ie, also when applying the brakes in a bend.
- o The substantial overlap of the fixed-position tubes and long slide tubes further enhances the Telelever's outstanding stability.
- o The absence of fork springs no longer required helps to minimise frictional forces and ensures an excellent response of the telescopic fork.
- o Compared with a conventional telescopic fork, the centrally mounted spring strut allows greater flexibility in tuning the springs and dampers and provides a progressive kinematic response of the entire spring and damper system.
- o With its anti-dive and superior longitudinal rigidity, the BMW Telelever offers ideal conditions for anti-lock brakes and excellent ABS control.

- o Since the space between the front wheel and the engine is smaller than with a conventional telescopic fork, the entire power unit has been moved further to the front to provide optimum front-to-rear weight distribution (52.7 per cent at the front, 47.3 per cent at the rear).
- o The entire Telelever system requires no maintenance or oil change. Only the ball joints have to be checked after 100,000 km or 62,000 miles.

#### **The BMW Paralever - proven rear wheel geometry**

The rear wheel suspension is already well-known to the connoisseur, since it features BMW's proven Paralever concept. The double-joint swinging arm made of aluminium, which debuted in BMW's new off-road GS models in 1987 and is now also featured in the R 100 R and R 80 R as well as the K 100 models with four-valve technology, largely reduces the load change response of the drive shaft and therefore ensures optimum rear wheel grip at all times. Overall length of the swinging arm system is 520 mm or 20.47".

Unlike BMW's existing models with Paralever technology, the spring strut is now mounted in a central position. It comes complete with coil pressure spring and a single-sleeve gas-pressure shock absorber. Outward damping is infinite, the pre-tension of the spring can be set to 7 different positions. Supplied by Showa, the Japanese manufacturer from which BMW also obtains the front spring strut, the rear spring strut allows overall spring travel of 135 mm (5.31").

**The frame:****Engine and transmission housing with a load-bearing function**

The entire front end of the frame is made of chill-cast aluminium for extra stability. Securely fastened to the engine housing, the front sub-frame holds the central spring strut of the Telelever in position. The frame itself is very light, easy and inexpensive to produce, and allows maximum precision in production. It also offers ideal conditions for the Telelever, as only direct forces have to be transmitted at this point (and not any twisting forces generating torque in one or the other direction).

The big advantage of this concept is that it allows numerous variations of the motorcycle's suspension geometry, the front subframe being additionally supported by two steel tubes leading to the rear end of the engine housing.

The rear subframe is a steel-tube structure connected both to the transmission and engine housing. A transverse bridge between the upper tubes of the frame supports the spring strut at the top, while at the bottom the spring strut is connected directly to the monolever swinging arm.

The rear subframe is also easy to manufacture and therefore allows inexpensive production. Another advantage is its superior ease of repair.

**The same wheels and brakes as on the K 1 and K 1100 RS**

The R 1100 RS comes on cast light-alloy wheels in three-spoke design, as on the K 1 and K 1100 RS. Wheel diameter is 17" at the front, 18" at the rear. The rims and

tyre dimensions are also the same as on the two four-cylinder models, 120/70 ZR 17 tyres being fitted at the front, 160/60 ZR 18 tyres at the rear.

The highly efficient Brembo brake system is the same as on the K 100 models, meaning that the front wheel features the same hydraulically operated double-disc brake with four-piston fixed callipers. Mounted in floating arrangement, the stainless-steel discs with compensation for uneven wear and sintered metal brake linings to eliminate fading even in wet conditions, measure 305 mm (12.00") in diameter and 5 mm (0.20") across. The swept area is 100 cm<sup>2</sup>, brake piston diameter is 32 and 34 mm (1.26 and 1.34"), respectively. Operation of the front-wheel brake is by a handbrake lever adjustable to three different positions.

The rear wheel features a single-disc brake with two-piston fixed callipers (diameter: 38 mm/1.50"). The disc measures 285 mm (11.22") in diameter and 5 mm (0.20") in width; its total swept area is 40 cm<sup>2</sup>.

#### **Side stands with automatic starter interruption**

Fitted to the bottom of the engine housing, the main side stand comes complete with a conveniently located support base and a grab handle on the left beneath the seat, allowing the rider to park his motorcycle with maximum ease. The side support pivoting on the bearing block of the main stand is easy to operate even when sitting on the machine. A switch on the support bearing interrupts the power supply to the fuel pump whenever the side stand has been swivelled down, in this way automatically interrupting the starter. As a result, it



is impossible for the rider to inadvertently set off with the side stand extended, with the risk of the stand hitting the ground and thus causing an accident when cornering.

#### **Excellent riding characteristics**

The ideal centre of gravity of the Boxer engine, the relatively low weight for a sports tourer of just 216 kg/ 476 lb (239 kg/527 lb with tools, tyre service set, fuel and oil), the light but ultra-stable frame, and the new Telelever combined with the proven Paralever and its centrally mounted spring strut, all come together to provide excellent riding characteristics. Handling is smooth, crisp and secure, tracking stability absolutely excellent.

As is appropriate for a sports tourer of this calibre, the R 1100 RS allows a sporting style of riding without requiring the rider or passenger to compromise on riding comfort or touring amenities. The maximum load of 211 kg/465 lb is another outstanding feature, again making the machine very suitable even for long tours.

Thanks to the Telelever and the highly efficient brakes, these excellent riding characteristics are further enhanced by superior stability when applying the brakes. ABS available as an option then provides the final touch in superior safety even in extreme situations.

**FEATURES, STYLING AND COLOURS:****Sports fairing and ergonomics package**

True to its concept as a sports tourer, the new BMW R 1100 RS comes with a newly developed fairing optimised for perfect streamlining in BMW's wind tunnel. The particular advantage of this fairing is that it combines relatively small dimensions with very low air drag and relatively good protection from wind and weather. Fitted as standard, the fairing improves the motorcycle's drag coefficient ( $C_d \times A$ ) to 0.400 with the rider leaning forwards, and to 0.439 with the rider sitting upright.

In its design and features, the fairing is based consistently on ergonomic considerations, particularly when it comes to riding comfort and the need to avoid fatigue on the road. Safety aspects have also been taken into account, special features being the smooth edges all round the fairing and the windshield designed to break loose easily in the event of an accident in order to avoid injury.

All the painted components are made of high-quality thermoplastics: a combination of PBT and PC natural rubber. The big advantage of this material is that it is very tough, stable and light all in one.

Like all the other plastic components, the fairing is made without any CFCs (chlorofluorohydrocarbons). Each component is marked to indicate the specific type of synthetic material used, and can be fully recycled.

To facilitate maintenance, the large side panels of the fairing can be removed easily and quickly with the help of rapid-action catches and velcro fastenings.

**Full fairing available as an option**

As an option the R 1100 RS is also available with a full all-round fairing extending down beneath the cylinders and largely encompassing the engine housing. In this case there is also an additional panel in front of the slide tubes.

**Attractively designed front wheel mudguard**

The attractively designed front wheel mudguard not only covers the wheel in accordance with statutory requirements but also protects the rider from splashwater. A further advantage is that it minimises the lift forces acting on the front wheel. As already indicated, an additional panel on top of the slide tubes is available as an option together with the full, all-round fairing.

**23-litre fuel tank made of plastic**

The fuel tank is made of polyamide 6 G in a special rotational casting procedure. The fuel pump is fitted into the tank itself, complete with the fuel level sensor and fuel filter. Designed and built as a lightweight component, the tank cap opens with the same standard key used on all the locks. Tank capacity is 23 litres or 5.1 Imp gals.

**Combining sporting style with superior comfort:  
the handlebar**

Again reflecting its concept as a sports tourer, the R 1100 RS comes with a special handlebar designed for sporting performance plus superior comfort on the road. Handlebar width at the grip points is 668 mm or 26.3", the overall width including the handlebar weights is 738 mm or 29.1". Made of an ultra-strong steel tube, the handlebar is designed for ideal ergonomics and rests on elastic mounts in order to reduce vibration. The handlebar instruments are the same proven units already used on the K 100 models. The handbrake lever, in turn, is adjustable to four different settings.

**Central lock with two-sided key**

Another feature carried forward from the K 100 Series is the combined ignition/handlebar lock in the upper fork bridge, allowing the front wheel to be secured both in left and right-hand lock after removing the key. A new improvement is the two-sided key, which may be inserted into the lock on either side. The same key also fits the tank cap and seat lock, and touring cases may also be ordered with the same locks allowing the rider to use one key all round.

**Ergonomics package to suit the rider's personal needs**

One of the salient novelties featured by the R 1100 RS is undoubtedly the ergonomics package which will be fitted as standard from model year '94 (it was previously offered as a special option).

In all, the ergonomics package comprises three components:

**1. The adjustable fairing windshield**

The fairing windshield is adjustable throughout a range of 20° and is streamlined to minimise drag resistance. The lowest position is intended above all for cruising on highways and country roads, the topmost position offers optimum wind protection at high speeds. To keep the styling of the machine really "clean" in every respect and to enhance the high standard of passive safety, the wheel for adjusting the windshield is recessed between the instruments.

**2. The adjustable handlebar**

The adjustable handlebar is made of forged aluminium segments and is connected to an ultra-strong



aluminium tube to which the controls and instruments are fastened. Like the standard handlebar, the adjustable handlebar rests on special anti-vibration mounts in the interest of smooth riding. As an option, it can also be fitted with heated handles.

Incorporating forged precision teeth, the adjustment mechanism allows adjustment of the handlebar in 7 stages by up to 20 mm (0.79"), plus three adjustment angles at increments of 6° each. The adjustment mechanism is easily accessible, requiring the rider to merely loosen the bolt.

### **3. The adjustable seat**

Contrary to the standard seat, the adjustable seat is subdivided into two sections. The rider's section may be adjusted in three stages by a total of 40 mm (1.57"), thus allowing the rider to choose a seat height of 780 mm (30.71"), 800 mm (31.50") (standard) or 820 mm (32.28"). Such variation of seat height is achieved very easily indeed, without requiring any tools, simply by inserting the elastic seat frame into rigid supports resting on the motorcycle frame itself.

### **High-power headlight**

Using the high-output headlight reflector of the K 100 Series, the R 1100 RS features a new headlight housing with a specially developed lens. The entire unit blends harmoniously with the fairing, giving the motorcycle a very slender and, indeed, unique look together with the two direction indicators integrated at the side. The stylish line of the motorcycle is then rounded off by the specially designed rear light cluster.

**Easy-to-read instruments and warning lights**

Clearly standing out as the two most important instruments, the speedometer and rev counter are fitted directly on the frame of the R 1100 RS, exactly in the rider's line of vision. The speedometer is driven by a flexible shaft leading up from the front wheel, while the rev counter converts the control pulse from the coil electronically into an easy-to-read speed signal.

An instrument cluster with numerous functions comes just below these two dials, providing a clear indication of the following items:

- Direction indicator right/left
- Idling speed
- High-beam headlight
- Fuel reserve (as soon as the fuel level has dropped to approximately 5 ltr/1.1 Imp gals)
- Oil pressure
- Battery on charge (from the alternator)
- ABS telltale

**Rider information display for oil temperature,  
fuel level, gear selected and time of day**

From model year '94, the standard features of the R 1100 RS will also include the so-called rider information display (previously offered as a special option). In a special housing fitted in the right-hand interior fairing panel, this liquid-crystal display indicates the oil temperature, fuel level, time, and the gear currently in mesh.

Three additional switches come in the interior fairing cover on the left-hand side, serving for the hazard warning flashers, heated handles, and ABS control switch fitted as standard as of the 1994 model year.

#### **On-board toolkit and tyre service set**

The on-board toolkit and tyre service set, in turn, both come as standard in the rear storage compartment. Like all BMW motorcycles, the R 1100 RS also features an electric socket (power take-off) as another standard feature.

#### **Wide range of options and special equipment**

Following BMW's usual philosophy, the new R 1100 RS is available with a wide range of options and special equipment available from the factory. The range starts with features already mentioned, such as the full fairing with slide tube panel, the ergonomics package, and the rider information display, and extends all the way to heated handles, cylinder protectors, case supports, and a luggage rack. Two very special options - the catalytic converter and anti-lock brake system - are described in detail in the Power Unit and ABS sections of this press folder.

Apart from these many options available from the factory, the customer also has the choice of a wide range of special equipment. Examples are BMW's touring cases, inner bags to be put into the cases, a suitable tank bag, and an anti-theft warning system.

#### **Unique styling all round**

The unique character of BMW's new Boxer generation is also expressed through the motorcycles' special design. In its appearance, the R 1100 RS consistently continues BMW's philosophy of motorcycle styling maintained over so many years and even decades.

Inter alia, the following features are particularly important in this context:

- Harmonious styling all round with components blending with one another
- Clear, characteristic lines and shapes
- Logical design also in the interest of streamlining and ergonomics
- Unique, unmistakable character
- Design concentrating on the essential
- No short-lived, merely fashion-oriented concepts
- Clear arrangement of all instruments, warning lights, switches and handlebar controls
- Full integration of all accessories, such as the touring cases
- Design clearly showing that the rider is in control of his machine, and not vice versa

To convey a pleasant feeling of safety while at the same time "integrating" the rider into the machine itself, the R 1100 RS has particularly smooth and soft contours around the tank. The front wheel mudguard and fairing components, on the other hand, are striking and dynamic in their design, while nevertheless enhancing the rider's position.

#### **A choice of three colours**

The young, fresh and lively colours available for the R 1100 RS underline the motorcycle's youthful and innovative appearance. In all, the rider has the choice of three colours: Marrakech red (seat in charcoal grey), turquoise green metallic (light grey seat), and pearl silver metallic (flash green or charcoal grey seat).



**ENVIRONMENTAL COMPATIBILITY AND EASE OF SERVICE:****From the catalytic converter  
all the way to efficient recycling**

As already mentioned with reference to specific examples, environmental compatibility and ease of service were given top priority in developing the new generation of BMW Boxers. Accordingly, the various features to be noted in this context are summed up only briefly in the following.

Given increasing environmental awareness in our modern world, and considering the need to focus on future requirements, BMW's new Boxer generation offers the most advanced solutions also in terms of environmental protection.

- o Emission control:  
Fully controlled catalytic converter available as an option
- o Fuel economy:  
Superior fuel efficiency ensured by Motronic with overrun control
- o Noise control:  
With a maximum noise limit of 79 dB(A), the R 1100 RS remains below the future EC standard of 80 dB(A)
- o Recyclability:  
- At the end of its service life, the catalytic converter can be returned to any BMW dealer together with the silencer for further processing by recycling plants. This allows the recovery of valuable raw materials subsequently used in new catalytic converters. Apart from being environmentally friendly, this helps to minimise the cost of a new catalyst.

- All fairing components of the R 1100 RS are made of fully recyclable thermoplastics produced like all the other plastic components without any CFCs (chloro-fluorohydrocarbons) and designated accordingly (ie, each type of plastic is clearly specified).

Use of environmentally friendly materials was indeed a general rule in choosing all of the motorcycle's components and the materials they are made of.

#### **Superior ease of maintenance**

In designing and developing the new generation of BMW Boxers, particular attention was given to the need for easy service and maintenance. Accordingly, all parts and components are easily accessible, and all the components used require only very little maintenance or no maintenance at all.

- o The new Boxer engine is once again a perfect example of easy accessibility.
- o The fairing components are fastened to the frame by means of rapid-action catches.
- o The side panels of the fairing on the tank are secured by velcro fastenings once again easily removable.
- o The battery only requires inspection of the fluid level, easily performed through the white-coloured battery housing.
- o Thanks to the Paralever system, the rear wheel is easy to remove and re-install.

- o The front-wheel Telelever requires absolutely no maintenance or oil change.

**Less service**

- o Service intervals, ie, the period between service, have been extended to 10,000 km (previously 7,500 km).
- o Compared with the R 100 R, the amount of work required when servicing the R 1100 RS is down by 20 per cent. Compared with the K 1100 RS, it has even been reduced by 30 per cent.

## THE TWO-CYLINDER R SERIES BOXERS WITH TWO-VALVE POWER UNITS

Introducing the 1994 model year:

**All 800-cc models available alternatively  
with 34 or 50 bhp**

Reflecting the new licence regulations in Europe, all 800-cc models are now available not only with an output of 50 bhp (37 kW), but as an alternative also with 34 bhp (25 kW). Whenever necessary, these reduced-power engines can be upgraded to 50 bhp (37 kW) with relatively little effort, just as there is also a kit for converting 50 bhp (37 kW) power units to 34 bhp (25 kW).

### **The R 100 R with dual-disc brake and SAS**

The R 100 R now comes standard with a dual-disc brake on the front wheel and SAS (secondary air system for emission control).

### **An even greater classic:**

#### **the R 100 R Mystik special model**

In spring 1994 the R 100 R will be joined by a special model, the R 100 R Mystik targeted above all at the connoisseur of classic motorcycles. For this very special machine emanates the classic flair of the R 100 R with even greater style and perfection.

Compared with the R 100 R, the R 100 R Mystik stands out clearly through the following distinctive features:

- o Paintwork in mystik red metallic
- o Modified, chrome-plated headlight support



- o New metal cover for the instrument cluster, chrome-plated and with new telltales
- o New direction indicator supports, chrome-plated
- o New handlebar
- o New, even more sporting and dynamically styled seat, new tail section
- o New rear frame in black
- o New battery covers
- o New, shorter number plate support
- o Tailpipe turned to the inside by about 3 cm along the side of the pipe

**The very successful R 100 R  
now also available as the R 80 R**

BMW's most recent conventional Boxer, the R 100 R launched in the 1992 model year, is already the absolute best-seller within BMW's entire range of motorcycles. By the end of 1992 production amounted to 8,041 units, giving the R 100 R a share of 22.4 per cent in BMW's total production output.

In Germany alone, sales of the R 100 R amounted to 4,337 units in 1992, making the new machine BMW's best-selling model in the domestic market ever since the R 45 in 1980. And in the plus-750 cc category it was the bestselling model overall, beating the entire competition.

Entering the 1993 model year, the R 100 R was joined by a "smaller" brother, the R 80 R. In terms of its features and model fitments, the R 80 R - which replaces the R 80 - only differs from the larger 1000-cc machine through the fact that it does not require an oil cooler.

**The R 100 R: The classic road version of the R 100 GS**  
The R 100 R is a classic "grassroots" machine, that is a motorcycle without any kind of fairing or additional equipment to impair its clean looks. The second "R", incidentally, stands for roadster.

To put it in a nutshell, you might regard the R 100 R roadster as a road version of the R 100 GS enduro in the classic look of yesteryear still so appealing today. Its "heart" is the 60 bhp one-litre power unit developing its maximum torque of 76 Nm (56 ft/lb) at just 3750 rpm. In this case, however, the oil cooler is not fitted on the cylinder protection bar, but rather right in the middle in front of the engine protection cover. And contrary to the GS models, the R 100 R comes with the round muffler of the K 100 models made from stainless steel.

#### **The Showa telescopic fork and spring strut**

Like the GS models, the R 100 R also features cross-spoke wheels measuring 17 inches at the front, but 18 inches at the rear for even better handling and behaviour on the road. The patented cross-spoke wheels are particularly stable and are fully suited for tubeless tyres.

Other features taken over from the GS are the rear drum brake and the rear-wheel single swinging arm with the BMW Paralever helping to reduce drive shaft reactions to a minimum. An all-new feature is the gas-pressure spring strut adjusted to the shorter spring travel of 140 mm (5.51"). Its base spring is adjustable to six different positions, the outward stroke damping effect is infinitely variable.

Yet another innovation is the substantially improved telescopic fork with a much better reaction ensured by double-action hydraulic damping and a progressive spring curve. Like the spring strut, the telescopic fork comes from Showa in Japan. Its spring travel is 135 mm (5.31"), tube diameter 41 mm (1.61").

**Front wheel brake with four-piston fixed calliper**

Featuring the two floating brake discs (diameter 285 mm/11.22") and the four-piston fixed callipers of the four-cylinder K models, the front wheel brake guarantees maximum efficiency.

**Another new feature: the round valve cover of the R 68  
plus the additional chrome kit**

The classic looks of the R 100 R are enhanced significantly by the chrome-plated housing of the round headlight (from the K 75) and instruments (from the GS) as well as the round valve cover introduced no less than 40 years ago on the legendary R 68 and seen last on the /6 Series produced until 1976.

The aficionado of glossy looks also has the choice of a special chrome kit available as an option from autumn 1992 and comprising the following components: fork stabiliser, valve cover, upper carburettor section, rear grab handle, tank cap, rear-view mirrors, exhaust fastening nut, instrument console, and handlebar weights.

As on the GS models, the handlebar houses the rider-friendly controls and instruments of the K models, in this case however without automatic direction indicator cancellation.

Measuring 800 mm (31.5") in height, the seat is now even more comfortable thanks to its new foam-plastic core and cover. The tank taken from the GS model has a capacity of 24 litres (5.3 Imp gals) to provide a range of 300 km (200 miles) plus.

**Particularly agile and just perfect for touring**  
Weighing only 218 kg (481 lb) in road trim with full tank, the R 100 R is one of the lightest machines in its class. Another outstanding feature is its supreme handling and agility, making it just perfect for riding in town and on winding country roads. And with its service load of more than 200 kg (441 lb) plus BMW's well-known range of bags and cases (integral cases, tank bag), the R 100 R has everything it takes for long tours with a passenger carrying lots of luggage.

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

The R 80 RT features the proven large touring windshield of the R 100 RT offering optimum protection in wind and weather simply 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 stowage boxes. Air inlet nozzles on both sides with adjustable nozzle openings provide a good supply of fresh air in hot weather.

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

#### **R 100 RT: the large touring Boxer**

Particularly touring riders out on a long trip with a passenger 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.

#### **The GS machines remain on the road to success**

Following their revision for the 1991 model year, the GS models remain on the road to success. Their most important innovation is to be seen clearly at first sight - an entirely new look. Like the R 100 GS Paris-Dakar launched in 1989, the R 80 GS and R 100 GS have come with a cockpit fairing fitted directly to the frame as of autumn 1990. The "heart" of the fairing is the tubular spaceframe serving as the support element. In conjunction with the newly designed windshield the fairing offers very good protection from wind and weather, the windshield itself being adjustable for angle as a function of rider size. Like the R 100 GS Paris-Dakar, the new models now also feature the high-intensity rectangular headlight of the K 75 S. In the cockpit itself there are two new, extra-large dials: The

speedometer on the left, the rev counter on the right. The warning lights and telltales are located at the top centre beneath a glass cover.

#### **Same handlebar controls as on the K Series**

The handlebar controls taken directly from the K Series ensure an even higher standard of comfort and superior ease of operation. The only feature not adopted from the K models is the automatic direction indicator return, as the GS models do not have an electronic speedometer.

#### **New individually adjustable spring strut**

The rear wheel features an all-new spring strut developed together with Bilstein. Apart from being able to pre-tension the spring to four different settings, the rider can now also adjust the expansion - ie, damping - stroke to no less than 10 different positions. This means individual adjustment to all loads, riding conditions and road surfaces.

#### **Lowered front-wheel mudguard**

The front-wheel mudguard has been lowered closer to the tyre, but is also available as an option at its former, elevated position.

#### **Floating front-wheel brake disc**

Like all other Boxers with a single-disc brake, the GS models now also feature a brake disc in floating arrangement as of the 1991 model year.

The R 100 GS differs from the R 80 GS only through its larger engine and increased output, as well as the oil cooler and cylinder protection bars with integral side-stand fitted as standard on this model.

The following innovations introduced for the R 80 GS and R 100 GS are also featured by the R 100 GS Paris-Dakar: adjustable windshield, instruments, handlebar controls, handlebar centre bearing, spring strut and tail-end muffler.

**Sports suspension for the GS models as a conversion kit**  
Special accessories for really tough off-road riding have been available as a brand-new feature from spring 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.

**THE THREE-CYLINDER K 75 SERIES**

Introducing the 1994 model year:

**New 700 W alternator**

As of the 1994 model year, all K 75 models are equipped with the alternator specially developed for the new generation of Boxers. Combining compact dimensions with a particularly high output, this alternator develops 50 Amps at 15 volts, equal to a total output of 700 W as opposed to the 480 W of the alternator used so far.

Thanks to this superior performance of the new alternator, the K 75 models can now make do with a smaller and lighter battery (19 Ah).

Otherwise, the K 75 models are entering the 1994 model year without any changes or modifications.

**Production exceeding 55,000 units**

Introduced in autumn 1985, the three-cylinder K 75 Series now looks at a total production volume of more than 55,000 units by the end of the 1993 model year. All three models in the series are available with electronic/hydraulic anti-lock brakes (ABS) and a catalytic converter fitted as an option (the latter also being retrofittable, see Chapter 10). As of the 1993 model year, the K 75 models have furthermore been fitted with a Showa telescopic fork providing an even better and smoother response. Standard features include hazard warning flashers and an automatic side-stand returned to its resting position via the clutch lever.



**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") it is just right for the somewhat smaller rider.

**K 75 S: Sports suspension and dynamic looks**

The sports version of the K 75 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.

As of the 1991 model year the K 75 S has had silver-painted wheels in three-spoke styling like the K 100 models. These wheels are also available for the K 75 and K 75 RT as an option.

**K 75 RT: Now available with adjustable windshield**

Starting with the 1991 model year the K 75 Series has also had a superior touring model with the same large tourer fairing as the K 100 LT replaced in the meantime by the K 1100 LT. The silky-smooth refinement of the three-cylinder power unit combined with the superior handling of the K 75 make the new K 75 RT already sold successfully in the USA and Spain since the beginning of the 1990 model year an interesting alternative for the touring enthusiast. As of the 1993 model year, the K 75 RT has also been available as an option with the electrically adjustable windshield featured on the K 1100 LT.

## THE FOUR-CYLINDER K 100 SERIES

Introducing the 1994 model year:

**Now also available with ABS II**

**The K 100 Series in its 10th year:**

**K 1100 LT Special Edition**

After the introduction of BMW's second-generation improved anti-lock brake system in the new R 1100 RS in spring 1993, ABS II (see Chapter 9) will also be available as an option as of the 1994 model year on the K 1100 RS and K 1100 LT.

Another new feature of these two four-cylinder models is Bosch Motronic MA 2.2 already to be admired in the new R 1100 RS.

Like the K 1100 RS, the K 1100 LT is now also equipped with the special alternator developed for BMW's new generation of Boxers, combining compact dimensions with particularly good performance. At 14 volts, this new alternator develops 50 Amps of electric power equal to an overall output of 700 W (the alternator previously used had an output of 480 W).

Thanks to this superior performance offered by the new alternator, a smaller and lighter battery (19 Ah) is now quite sufficient.

The K 1100 RS standard features now also include a pannier frame as well as temperature gauge and fuel gauge.

As on the K 1100 RS, the handbrake lever of the K 1100 LT is adjustable to four different positions. The final drive ratio of the K 1100 LT, again following the example of the K 1100 RS, is now 2.81:1 (previously 2.91:1).

In all other respects both models are entering the 1994 model year without any changes.

**K 1100 LT Special Edition  
with ABS II, radio and backrest**

On the occasion of the 10-year anniversary of the K 100 Series, model year 1994 will feature a special model, the K 1100 LT Special Edition.

This special model differs from the production-line model of the K 1100 LT in the following areas:

- Silver-lined fjord-grey special paint
- Increased comfort of seat in saddle-brown colour
- Radio with cassette player and remote control on handlebar as well as two speakers in the fairing
- Script on the side of the fairing: K 1100 LT Special Edition No. 0001 to ...
- New instrument dials, sticker marked K 1100 LT Special Edition at the centre of the tachometer
- Fitted with ABS II

**Ten years of success with the K 100 models**

Launching the all-new K 100 Series in autumn 1983, BMW started a dual product strategy, four-cylinder liquid-cooled models supplementing the proven two-cylinder Boxers and being joined in 1985 by the K 75 Series featuring three-cylinder power units derived from the K 100. The K models were also the first motorcycles to be produced in large numbers featuring both electronic ignition and fuel injection.

In spring 1984 the K 100 and K 100 RS were supplemented by the K 100 RT re-named the K 100 LT in 1986.

In 1989 these three models with their 90 bhp two-valve power units were joined by the K 1 supersports machine powered by a 100 bhp four-valve engine.

Early in 1990 the K 100 RS also received the technical innovations introduced with the K 1, such as the four-valve power unit, Paralever swinging arm, and the upgraded brake system.

In 1988 BMW became the world's first motorcycle manufacturer to introduce ABS (on the K 100 models), followed in 1991 by the fully controlled catalytic converter. Setting new standards in motorcycle technology in terms of both riding safety and environmental compatibility, both of these innovations received a very positive response from customers. In 1992, for example, 94 per cent of all K 100 purchasers in Germany opted for ABS, and 66 per cent had their machine fitted with a catalytic converter. The corresponding figures for the world market were 89 per cent (ABS) and 41 per cent (catalyst).



Launching the K 1100 LT in February 1992 and the K 1100 RS in December of the same year, BMW very successfully updated the K 100 Series to an even higher standard. Numerous test reports all over the world show clearly that the K 1100 LT and K 1100 RS can live up to virtually any comparison.

The 10-year success story of the K 100 Series is also expressed by a proud figure, total production of K 100 models up to the end of the 1993 model year exceeding 118,000 units.

#### **The K 1 has served its purpose**

After four years of production, the K 1 was withdrawn from BMW's motorcycle range at the end of the 1993 model year. With its avantgarde styling, this supersports machine really hit the headlines at the 1988 Motorcycle Show in Cologne, being voted Motorcycle of the Year right from the start not only in Germany. Featuring an extra-large fairing developed in the wind tunnel, the K 1 set up a new record in motorcycle streamlining (0.34 Cd x A with the rider leaning forwards and 0.38 with the rider sitting upright).

In the meantime the K 1 has fulfilled its role as BMW's image and technology spearhead. Although this machine was never to be produced in large numbers, the production output from 1989 to 1993 amounted to almost 7,000 units.

**BMW's successful sports tourer:****Production exceeding 52,000 units**

The K 100 RS sports tourer may be regarded as one of the most successful motorcycles of the '80s. 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 achievement 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. Following the model update in early 1990, the K 100 RS was thoroughly revised once again for the 1993 model year, taken on a new designation - the K 1100 RS - and featuring a totally revised fairing, engine and running gear. And with sales now amounting to more than 52,000 units, this sports tourer is also BMW's best-selling K 100 model.

**Now the K 1100 RS also features the high-torque  
power unit of the K 1100 LT**

Almost exactly one year after the launch of the K 1100 LT, the successor to the K 100 RS also received a new power unit: the 1000-cc four-valve engine of the K 1 was replaced by the ultra-powerful 1100-cc engine of BMW's luxury tourer, the new model designation being K 1100 RS.

While the engine of the K 1100 RS (see the K 1100 LT for all specifications) has the same output as so far of 100 bhp (74 kW), the speed at which this output is generated is 7500 rpm and no longer 8000 rpm. The increase in engine size helps to boost torque from 100 Nm or 74 ft/lb at 6750 rpm to 107 Nm or 79 ft/lb at 5500 rpm. Unlike the K 1 (2.75) and K 1100 LT (2.91), the final drive ratio of the otherwise identical five-speed gear-

box is 2.8l on the K 1100 RS, thus giving this new model much better acceleration and traction than the former K 100 RS.

Even at first sight, the K 1100 RS clearly bears testimony to its thorough modification: The almost classic upper part of the fairing has been combined with new side panels and an engine spoiler, providing a very attractive and stylish combination of individual features. Together with the new battery panels, this creates an - almost - brand-new, appealing look.

The suspension has also been modified to suit the new fairing and engine features, the Marzocchi telescopic fork and Showa spring strut on the rear wheel being re-tuned accordingly. In the interest of even greater riding stability, the frame has been reinforced by adding v-shaped tiebars connected to the handlebar centre-point and the rear support bar.

The new alternator combines extra power with even more compact dimensions and is also featured in BMW's new generation of Boxers. The specifications of this new three-phase alternator are indeed very impressive: 14 V, 50 Amps, 700 W (previously 12 V, 25 Amps, 460 W). There is also a new 12 V, 19 Amp battery, while some other new features are the redesigned gearshift lever and an innovative brake lever adjustable to four different positions depending on the size of the rider's hand. A further feature is the footrest support plate separated from the motorcycle itself to reduce vibrations (also on the K 1100 LT).

In the light of all these changes, it is quite appropriate to call the new K 1100 RS a new machine with new looks, even more power and better riding stability. The bottom line, of course, is that the excellent all-round qualities of this outstanding sports tourer have been improved even further.

**Optionally available with ABS and catalytic converter**

The K 1100 RS is available as an option with BMW's new ABS II and fully controlled catalytic converter.

**The K 1100 LT:**

**A larger engine for extra torque**

Even the model designation - K 1100 LT - shows that in updating this luxury tourer for the 1992 model year BMW went a step beyond the K 1 and K 100 RS: Engine capacity of the four-cylinder power unit was increased by more than 10 per cent from 987 cc (60.2 cu in) to 1092 cc (66.6 cu in) by increasing engine bore from 67 mm (2.64") to 70.5 mm (2.78"), the largest increase in engine size so far in the history of BMW motorcycles.

Otherwise identical with the 16-valve power units of the K 1 and K 100 RS, the four-valve power unit also develops 100 bhp (74 kW), this time however at a relatively low 7500 rpm. More importantly, the increase in engine size helped to boost torque significantly - a particularly important factor with a luxury tourer of this calibre: Compared with the 100 Nm (74 ft/lb) developed by the K 1 at 6750 rpm, the engine of the K 1100 LT offers a maximum torque of 107 Nm (79 ft/lb) at just 5500 rpm.



The K 1100 LT features Digital Motor Electronics for optimum fuel efficiency and as the ideal technology for the fully controlled three-way catalytic converter available as an option (as with the K 1 and K 100 RS since spring 1991).

Another outstanding feature of the K 1100 LT is BMW's proven five-speed gearbox. The 5th gear transmission ratio, as on the K 1 and K 100 RS, is 1.61 (K 100 LT: 1.67), while the final drive ratio is 2.81:1 as of the 1994 model year, as on the K 1100 RS (previously 2.91:1).

In creating the K 1100 LT, BMW's engineers followed the same policy as two years before when updating the K 100 RS, thus taking over important innovations and features from the K 1. Examples are the BMW Paralever, the highly efficient double disc brake with four-piston fixed calipers on the front wheel, the three-spoke light-alloy wheels (in this case, however, measuring 18" at the front and 17" at the rear), the slightly modified telescopic fork with 135 mm (5.31") spring travel already featured on the K 100 RS, the stainless-steel silencer, and the central ignition and handlebar lock.

Yet another special feature of the K 1100 LT is the spring strut from Showa in Japan with progressive spring action, infinitely variable outward stroke damping and base spring pretension adjustable to five different positions. Spring travel is 120 mm or 4.72".

Apart from the foot lever, front-wheel mudguard, side covers and battery panels, the handlebar (now measuring

765 mm/30.11" in width versus 755 mm/29.72" on the K 100 LT) and handlebar cover are also new. As of the 1994 model year, the handbrake lever is adjustable to four different positions (in the same way as on the K 1100 RS).

#### **Fairing with electrically adjustable windshield**

The fairing, seat and storage compartments of the K 1100 LT present the most conspicuous innovations. Indeed, BMW's large tourer fairings developed in the wind tunnel have always set standards in the luxury touring range, for example on the R 100 RT in 1978 and the K 100 RT in 1984.

In the meantime the fairing has been optimised to provide the best conceivable protection from wind and weather. First, it comes with new panels at the side supplemented as the second new feature by electric adjustment of the windshield itself: By means of two adjustment rails arranged at an angle to one another, the transparent windshield can be moved up and down by 75 mm (2.95") and swivelled for angle by 24°, in this way providing a total height adjustment range of 112 mm (4.41"). The electric adjustment system is comparable to an electric sunroof in a car and is controlled by a push button automatically cutting off the power supply when the windshield has reached its final position.

As a result, windshield height can be chosen individually as a function of rider size and road speed, weather and temperature. And on the road this means not only better protection from wind and weather, but also a significant reduction of wind noise.

The instruments of the K 1100 LT are no longer fitted on the handlebar unit, but now directly on the frame of the motorcycle, in this way being protected even more efficiently from vibrations of any kind. A feature the rider will appreciate in particular is that the fairing has been moved 30 mm (1.2") to the front in order to provide extra kneeroom. And all riders will benefit from the extra seating comfort provided by new seat upholstery and the extension of the rider's seat by 20 mm (0.79") in length.

**Topcase and touring cases even larger  
and more functional**

The new topcase offers extra capacity, being increased in size from 22 ltr (0.77 cu ft) to 35 ltr (1.23 cu ft). A special feature is that the carrier handle for the topcase now also serves for fastening the case to the motorcycle itself.

Increased in size to 33 ltr (1.16 cu ft) from 31 ltr (1.09 cu ft) and significantly improved in terms of watertightness, stability and convenience, the touring cases fitted as standard just like the topcase offer even greater practical value. As an example, a newly developed labyrinth system efficiently seals the lower part of the case and the lid.

The lower part of the touring cases features an integral, folding handle, but otherwise remains unchanged and is fastened to the motorcycle - as in the past - by a profile carrier. The lid, on the other hand, has been completely redesigned and is made of ABS (acrylnitrile butadiene styrene) plastic suitable for painting. The lid also comprises locks turned 180° to the outside and with improved function.

The new design of the single-piece double-wall lid can also be seen from the two foam plastic sections at the outside, serving to protect the case from damage in the event of an impact.

Applying a standard BMW principle, all the locks on the K 1100 LT (ignition, handlebar, tank cap, seat, touring cases and topcase) can be opened and closed with one single key.

Weighing in at 290 kg (639 lb) with full tank, touring cases and topcase, the K 1100 LT is certainly not a lightweight, but is still the lightest machine in the luxury tourer market. It also offers a standard of superior handling one might not expect at first sight. And it does not present any weight problems, either, when it comes to service load: With the maximum permissible weight being increased from 480 to 500 kg (1058 - 1103 lb), the K 1100 LT's service load is now a very adequate 210 kg (463 lb).

**The world's only luxury tourer available with ABS  
and catalytic converter as an option**

There can be no doubt about it: When it comes to the engine, running gear, brakes, fairing, riding comfort or luggage space, the new K 1100 LT is a significant improvement in nearly every respect. And not least, it is the world's only luxury tourer available as an option with BMW's new ABS II and fully controlled closed-loop catalytic converter.



**BMW's SECOND GENERATION OF ABS**

Now available in additional models as of the 1994 model year

**The world's first ABS featured so far  
in approximately 50,000 motorcycles**

Motorcycle experts called it a "technical revolution" and the "most outstanding technical achievement since the introduction of the disc brake". The great event to receive such attention was the pioneering introduction of the world's first electronic/hydraulic anti-lock brake system (ABS) for motorcycles by BMW in spring 1988, when this unique feature became available as an option for all K 100 models.

Developed in cooperation with FAG Kugelfischer, BMW's anti-lock brake system was not only broadly acknowledged by the media worldwide, but also proved immediately successful in the market. Even in 1989, for example, approximately 70 per cent of all K 100 purchasers opted for ABS, clearly showing in this way that they were willing to spend more money on extra safety. Then, in consideration of this great demand, BMW decided in spring 1990 to offer ABS also for the K 75 models.

In 1992 an impressive 70 per cent of all K 75 models delivered to customers in Germany were equipped with ABS (worldwide: 50 per cent), while with the K 100 Series the corresponding figure was even a staggering 94 per cent (worldwide: 89 per cent). By the end of 1992 approximately 50,000 K models equipped with ABS were sold to customers the world over.

**The development of ABS II started in early 1990**

This outstanding success not only showed BMW's development engineers that they were going in the right direction, but also gave them an incentive to continue their work on ABS - the straightforward philosophy being that even the best concept is open to further improvement. This is why development of a second generation of ABS - referred to internally as ABS II - started in early 1990.

Among other things, the most important objectives to be achieved by the second generation of anti-lock brakes were as follows:

- o Even better utilisation of brake force
- o Improved control comfort
- o Application of the most advanced digitalised control technology
- o Even better operating reliability
- o More compact dimensions and less weight
- o Better adaptation to all BMW models

ABS II was developed in close cooperation with FAG Kugelfischer over a period of three years. In spring 1993 it debuted according to plan in the R 1100 RS, the first model in BMW's new Boxer generation.

**ABS II now also available for the R 1100 GS,  
K 1100 RS, and K 1100 LT**

As of the 1994 model year, ABS will also be available as an option for the K 1100 RS and K 1100 LT, just as it also comes optionally on the R 1100 GS. Given the particular riding conditions in off-road use, ABS II may be deactivated by the rider on BMW's enduro model (see Chapter 4).

### **The design and functions of ABS II**

ABS II is made up of the following components:

- o A gear-wheel with 100 teeth and a sensor on the front and, respectively, rear wheel (as already featured on ABS I).
- o A central, two-channel pressure modulator operated by an electric motor and equipped with an integral control unit and ABS relay. To ensure a perfect centre of gravity, the modulator is fitted in front of the battery beneath the tank.
- o For comparison, ABS I has two separate pressure modulators fitted on either side of the motorcycle above the passenger footrests. The control unit, in turn, is housed in the rear seat compartment.
- o Brake lines and cables.

All together, the ABS II components weigh a mere 6.9 kg or 15.2 lb, and are therefore much lighter than the ABS I components (11.1 kg/24.5 lb).

### **How the various components work**

#### **Sensors and gear sets**

The sensor is made of an iron core surrounded by a coil. A magnetic field is generated by the direct current flowing through the coil, the gear set connected directly to the wheel running past the sensor and modulating direct current into sinusoidal current by way of its geometric pattern (the base of each tooth versus its peak). The frequency of this sinusoidal current, in turn, serves as a direct yardstick for measuring the speed of the wheel, and is registered and processed accordingly by the control unit.

The electromagnetic sensor is switched off together with the ignition, any metal particles possibly attracted by the magnet falling off in the process. This ensures that the sensitivity of the sensor always remains at the same consistent level.

#### **Pressure modulator and drive system**

The hydromechanical pressure modulator provides the brake pressure required through two pistons (for the front and rear-wheel brake, respectively), changing their volume accordingly. Within predetermined limits, the pressure modulator operates independently of the pressure and temperature prevailing within the brake system.

The two pistons in the pressure modulator are driven by an electric motor rotating a transverse shaft. Two electrically controlled friction clutches on this shaft are directly connected with the pistons through a chain.



### **Piston travel determined by the sensor**

The level of current acting on the clutches serves as a direct yardstick for determining the force moving the pistons and thus creating a change in piston volume. A separate sensor determines piston travel and transmits the data measured to the control unit for subsequent processing. All commands for activating the pressure regulator are generated by the control unit as such.

### **Three microcomputers in the control unit to ensure maximum safety**

To maintain maximum safety standards with ABS II, the "heart" of the control unit comprises three - and not the usual two - microcomputers: Two operating computers and an additional computer monitoring the first two. Being of the same type and having the same specifications, the two operating computers perform the same computer operations and consistently compare the data obtained in the process. Should there be any discrepancy in data while the motorcycle is on the move, the anti-lock brake system will switch off automatically.

Should such a discrepancy in computer data occur while the anti-lock brake system is active, the monitoring computer will check the situation and decide which of the two operating computers is intact. The intact computer still operating properly will then finalise the braking process already initiated, after which the system will switch itself off. Here again, the rider is informed by the ABS telltales flashing on and off that the anti-lock brake system is no longer operative and must be checked by a BMW workshop. The brakes as such naturally remain fully functional in this case meaning that safety is not impaired in any way.

### **The ABS control procedure**

As soon as the control unit receiving information from the sensors determines the risk of a wheel locking, it will switch on the clutch shaft motor in the pressure modulator, the friction clutch of the respective brake circuit being activated at the same time. The piston is then pulled by the chain over an exactly defined distance against the spring pressure built up within the piston, the larger volume thus generated above the piston resulting in a decrease in pressure in the brake circuit and preventing the wheel from locking.

While this is happening, the travel sensor informs the control unit of the exact movement of the piston, thus ensuring that the control unit knows the piston's exact position and thus has a reference value as to the relative brake pressure within the circuit. As soon as the wheel starts to accelerate again after locking, pressure is re-increased step-by-step as the wheel runs faster. The amount of pressure built up in this way is determined by a calculation model incorporating the travel signal. The level of pressure achieved in the process is then maintained in order to keep the wheel running with ideal slip as long as possible. A new control cycle then starts once the wheel is about to lock again.

Pressure is controlled by several factors determined by an internal algorithm, ensuring in this way that during the brake process the wheel remains close to the positive engagement point for the longest possible period. The travel measuring system used with ABS II for the first time provides very accurate information on the relative pressure acting on the wheel, as well as the pressure curve and gradients.

A further advantage is that the risk of the rear wheel possibly lifting off the road can now be detected, appropriate pressure control in the front wheel brake circuit keeping the rear wheel resting smoothly on the surface. Since it is also possible with this piston system to reduce brake pressure to 0 bar, the brakes can be controlled with maximum precision and reliability also on very slippery surfaces, such as gravel, oil or black ice (as was also the case with ABS I).

**Four different verification procedures  
to ensure maximum safety**

Following BMW's strict safety requirements, ABS II must allow adequate retardation with the "normal" brakes in the event of a defect, immediately informing the rider where applicable that ABS is not operating (so that the rider can adjust his style of riding accordingly).

Various tests are carried out in order to meet these requirements: The first verification procedure is provided by the two ABS telltales flashing concurrently once the ignition has been switched on. Then the start-off test is conducted as soon as the rider sets out and exceeds a speed of approximately 5 km/h. Following these two verification procedures - and assuming that no deficiency has been recorded - the ABS telltales switch off and ABS is ready to operate. All ABS components and their functions are additionally supervised either by permanent or cyclical tests.

Any deficiency in the system is brought to the rider's attention by the two ABS telltales flashing on and off alternatively. Since these lights may disturb the rider if they keep on flashing in the dark, he can switch them

on permanently by pressing the ABS confirmation button. To make sure the rider does not forget the defect, however, the lights will once again start flashing on and off alternatively after 4 1/2 minutes at the latest, until the rider presses the button yet another time.

### **Troubleshooting with the diagnostic tester**

Like virtually all electronic systems used by BMW, ABS II allows an efficient diagnosis of operating conditions: All defects determined by the system - whether they occur sporadically or permanently - are memorised and can then be retrieved easily and quickly at the workshop with the help of the BMW diagnostic tester.

### **The benefits and strengths of ABS II**

- o Excellent control efficiency and simple use
- o Safe brakes even on very slippery roads
- o Very short stopping distances thanks to optimum use of the retardation forces available
- o Three computers to provide maximum safety
- o More compact and lighter (6.9 kg/15.2 lb), well-positioned within the motorcycle
- o Self-diagnosis for easy service and maintenance



### **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. And whereas applying the brakes all-out on a dry road is relatively easy in an automobile even for a beginner, using 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 re-

quired a longer stopping distance, is unknown - but it's certainly a substantial number.

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 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 leaning over 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.

#### **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.



**CONTINUING BMW's '91 ENVIRONMENTAL OFFENSIVE****Fully controlled catalytic converter also for the  
new Boxer generation**

Studies, data, facts and figures clearly prove that widespread interest in the motorcycle remains undaunted into the '90s. But to ensure their freedom and sheer riding pleasure on two wheels also in future, conscientious motorcyclists now give increasing attention to the cause of safety and the environment.

Although motorcycles account for less than 2 per cent of the total volume of exhaust emissions generated by all road users (due to the relatively small number of motorcycles and their greater fuel economy), a representative survey conducted in Germany in 1988 showed that even then one out of five riders regarded the catalytic converter or alternative emission management systems as "a particularly important and meaningful technical innovation". As we now see from recent reports in motorcycle journals and other technical publications, this environmental awareness among motorcycle riders is continuing to increase.

Even though BMW motorcycles currently fulfill all emission control regulations worldwide even without requiring a catalytic converter, BMW moved to the forefront of the environmental protection campaign as far back as in 1988 at the Cologne Bicycle and Motorcycle Show, and was the world's first motorcycle manufacturer to announce the introduction of fully-controlled catalytic converter technology for the motorcycle at the 1990 Show. In other words, BMW has taken these steps not

under pressure from lawmakers, but rather in full recognition of the fact that action of this kind is necessary and meaningful. This was also the case when BMW introduced motorcycle ABS in spring 1988, thus taking on a pioneering role in the area of safety, too.

The announcement first made at the 1988 Motorcycle Show has now developed into a full-scale campaign: BMW's 1991 offensive to protect the environment. Three major innovations that have become reality in 1991 allow the reduction of exhaust emissions on all BMW motorcycles by applying different technological solutions: The fully-controlled three-way catalytic converter as an option on the 16-valve K 100 models, retrofittable standard catalytic converters on all other K models, and the SAS emission afterburning system as special equipment for all R models with flat-twin power plant.

#### **The three steps in BMW's 1991 environmental offensive**

##### **1. Fully-controlled three-way catalytic converter**

As of May 1991 the K 1 and K 100 RS four-cylinder models have been available as an option with fully-controlled three-way catalytic converter. And it goes without saying that this special equipment is also available on the K 1100 LT and the new K 1100 RS. This is made possible by the Digital Motor Electronics featured by these 16-valve power units as the prerequisite for the most efficient type of emission management to be found in the market today. First, exact maintenance of all engine tuning data guarantees absolute efficiency in the process of catalytic conversion;

second, engine tuning remains stable and consistent throughout a long running life, the adaptive control system largely compensating any general ageing effects such as engine wear. Not even fuel consumption changes noticeably throughout the entire service life of the catalytic converter.

Since the technical requirements to be fulfilled by a catalytic converter on a motorcycle differ substantially in some cases from the technical requirements to be fulfilled by a catalytic converter on an automobile, various problems had to be considered and solved in developing a suitable motorcycle technology. Examples are the space available and installation requirements, the question of catalyst endurance and service life considering the greater vibrations coming from the power plant and the rigidly fastened exhaust system, as well as the exposure to much higher temperatures and gas pulse effects.

Seeking to solve all these problems, BMW's specialists opted for a metal-based catalytic converter with relatively compact dimensions (length 75 mm (2.95")/diameter 85 mm (3.35")) fitting exactly into the standard exhaust without even touching its outer skin. The air layer thus formed between the catalytic converter and outer skin acts as an insulator not allowing any additional heat to escape and warm up the rider's or passenger's legs.

The "heart" of the catalytic converter is the oxygen sensor. For reasons of space, the sensor is not fitted upstream of the catalytic converter (as in automobiles), but rather immediately behind the catalyst. Measuring the amount of oxygen remaining in the exhaust emissions,

the oxygen sensor generates an exactly defined voltage signal then processed by the control unit within the Digital Motor Electronics. This ensures that the fuel/air mixture never becomes too rich or too lean, but rather remains at an optimum ratio of 14:1 ( $\lambda = 1$ ) at which it is ignited and burnt.

The degree of accuracy achieved by the oxygen sensor depends on its own temperature and the temperature of the exhaust emissions. If the sensor is too far away from the engine it will take relatively long to warm up to its optimum operating temperature. If it is too close to the engine, on the other hand, it may well overheat particularly when riding long distances full-throttle.

To avoid these drawbacks, the oxygen sensor in the BMW motorcycle catalyst is heated and thus achieves its optimum operating temperature even while the engine itself is still warming up.

BMW's fully-controlled three-way catalytic converter achieves roughly the following levels of efficiency with the most critical emission components:

HC down by approx 70 per cent  
NOx down by approx 60 per cent  
CO down by approx 80 per cent

While the K 1's engine power remains unchanged at 100 bhp (at 8000 rpm) despite the introduction of the catalytic converter, the maximum torque of 100 Nm (74 ft/lb) at 6750 rpm is down by about 2 Nm. The K 1100 LT and K 1100 RS with catalytic converter also have a maximum output of 100 bhp (74 kW), in this case however



at 7750 rpm (without catalyst at 7500 rpm). Similarly, installation of the catalytic converter reduces these machines' maximum torque only slightly from 107 to 105 Nm (79 to 77 ft/lb), in both cases at 5500 rpm. Fuel consumption also remains virtually unchanged.

A study carried out by Allgemeiner Deutscher Automobil Club (ADAC) with these two models shows that harmful emissions are reduced by up to 84 per cent. And summing up their first road test of these new machines, the experts of MOTORRAD, the German motorcycle journal, express a clear opinion: "Through its dedication to the environment, BMW has proven that the fully-controlled catalytic converter, properly tuned, can reduce exhaust emissions very efficiently without forfeiting engine power or increasing fuel consumption. And another advantage of this solution is that it is not too expensive." In Germany, for example, 66 per cent of all K 100 purchasers opted for a fully controlled catalytic converter in 1992. And worldwide in the same year, no less than 41 per cent of all K 100 purchasers made this important choice.

## **2. Standard (non-controlled) catalytic converter for the K 75 Series**

As of autumn 1991, a non-controlled catalytic converter has been available as an option for all three-cylinder K 75 models. In this case the catalyst is not equipped with an oxygen sensor.

Depending on engine tuning, the conversion rate of this non-controlled catalytic converter is approximately 50 per cent in the case of HC, roughly 30 per cent with NOx, and about 70 per cent with CO.

Mufflers with pre-assembled, non-controlled catalytic converters are available for retrofitting on the more than 100,000 two-valve car models already on the road. With the K 75 models the catalytic converter comes in the triangular silencer and on the K 100 models it is housed in the round silencer of the K 1 made from stainless steel.

### **3. SAS for all flat-twin boxer models**

Since September 1990 all BMW R models have been available with BMW's SAS secondary air system. Applying the principle of exhaust emission afterburning, this unique technology reduces HC emissions by about 30, CO emissions by roughly 40 per cent. And it has absolutely no influence whatsoever on engine power, torque or fuel consumption. It cannot be fitted subsequently, however, since this would be too complicated in technical terms.

In some countries such as Germany nearly 100 per cent of all BMW boxers are now fitted with SAS at the factory.

Already used successfully by BMW in the USA and Switzerland in order to fulfill local emission standards, SAS uses the pressure pulses generated in the exhaust system of the flat-twin engine by the four-stroke combustion process. These pressure pulses move two diaphragm valves in the air filter housing, drawing in fresh air when open. The air surplus generated in this way together with the high temperature of the exhaust emissions ensures direct combustion of HC and CO.

Misfiring from the exhaust is avoided by interrupting the secondary air supply whenever the machine is coasting. For this purpose the left-hand SAS valve features an additional valve for controlling pressure in the intake manifold and switching off the air supply whenever necessary. Since the right-hand valve draws in fresh air through a connection hose from the left-hand valve, the supply of air to both SAS valves is interrupted as long as the motorcycle is coasting without engine power.

**BMW remains the spearhead in environmental protection**  
While the motorcycle world has been waiting in vain for other manufacturers to introduce the fully controlled catalytic converter, BMW is continuing its unique pledge to the environment: The new generation of Boxers is also available as an option with a fully controlled catalytic converter, and the new F 650 can be supplied optionally with a standard (non-controlled) catalyst.

#### **Full recycling of catalytic converters**

All catalytic converters used in BMW motorcycles are fully recyclable and are taken back by BMW dealers.

**THE 1994 COLOUR RANGE**

**R models**

**R 80 RT:** classic black metallic, mystik red metallic,  
turquoise green metallic

**R 80 R and R 100 R:** classic black metallic,  
turquoise green metallic

**R 100 RT:** classic black metallic, mystik red metallic,  
turquoise green metallic

**R 80 GS and R 100 GS:** avus black/yellow,  
mystik red metallic, velvet violet

**R 100 GS Paris-Dakar:** alpine white/marrakech red,  
alpine white/flash green, alpine white/velvet violet

**R 1100 RS:** marrakech red, turquoise green metallic,  
pearl silver metallic

**R 1100 GS:** marrakech red, alpine white, avus black

**K models**

**K 75, K 75 S and K 75 RT:** classic black metallic,  
mystik red metallic, silk blue metallic,  
astral blue metallic

**K 1100 RS:** classic black metallic, mystik red metallic,  
silk blue metallic, astral blue metallic

**K 1100 LT:** classic black metallic,  
mystik red metallic, silk blue metallic,  
astral blue metallic, pine green metallic

**F 650**

**F 650:** flame red, aura white



**BMW RIDER WEAR**

**Committed to safety and comfort:**

**The new Madison Gore-Tex suit and the  
Marathon leather suit**

BMW's 1994 range of rider wear and equipment is larger and more diverse than ever before. And without doubt, both the Madison Gore-Tex suit and the Marathon leather suit are among the most outstanding highlights in this new range.

**New top material**

Introducing the very first windproof and watertight Gore-Tex suit with an active breathing effect back in 1986, BMW initiated a new trend in motorcycle wear. Now, introducing the Madison Gore-Tex suit, BMW is presenting its fourth suit of this kind heralding a new generation of protective motorcycle wear. The very special feature of this two-piece zippered suit with many improved details, modern, sporting style and trendsetting design, is the new top material code-named BMW Schoeller K 300. Developed exclusively for BMW in cooperation with the Schoeller company, this revolutionary material combines the advantages of polyamide and aramide fibres. It is highly tear- and abrasion-proof and hardly takes up any moisture. The Suprotect protectors on the shoulders, elbows/lower arms, knees and hips offer a particularly good damping and shock absorbing effect.

The Madison Gore-Tex suit, which also features two removable and watertight outer pockets, therefore ensures not only optimum comfort and protection from wind and rain, but also a considerable improvement in rider protection and, as a result, even greater passive safety.

**Matching gloves and boots**

Safety is also the No 1 priority with BMW's new Marathon leather suit, the further improved successor to the BMW Protec suit for the sporting rider.

This two-piece suit zippered in the middle and made of 1.4-mm, extremely abrasion- and tear-proof cowhide with double padding at highly exposed points, also features BMW's new Suprotect protectors on the shoulders, elbows/lower arms, knees and hips. And like the Madison Gore-Tex suit, it comes with an additional back protector to be inserted for even greater safety. Stretch zones on the back, knees and calves ensure maximum wearer comfort. The cuffs and trouser bottoms are held in position to prevent them from slipping up. There are also new leather boots and gloves matching the Marathon leather suit.

**New Miami city overalls with Gore-Tex inserts**

Another new highlight in BMW's range of rider wear is the single-piece Miami city overalls featuring abrasion-proof Cordura as its top material, weather-proof Gore-Tex and Suprotect protectors on the shoulders, elbows/lower arms and knees.

Over and above these innovations, BMW's range of rider's suits, jackets and trousers has been upgraded and supplemented by other new products for the 1994 model year.

SPECIFICATIONS BMW MOTORCYCLES			F 650	F 650 25 kW/34 bhp		
Engine	Cubic capacity	cc	652			
	Bore/stroke	mm	100/83			
	Max output	kW/bhp	35/48	25/34		
	at	rpm	6500	5700		
	Max torque	Nm	57	48		
	at	rpm	5200	4200		
	Design					
	No of cylinders		1			
	Compression ratio/fuel grade (also unleaded)		9.7/S			
	Valve control		DOHC			
	Valves per cylinder		4			
	Intake/outlet dia	mm	36/31			
	Fuel supply		Mikuni-Carburettor			
	No of carburettors/dia		2/33			
Electrical system	Ignition		contact-free high-tension capacitor ignition			
	Alternator	W	280			
	Battery	V/Ah	12/12			
	Headlight	W	H 4 55/60			
Power trans- mission, Gearbox	Starter	kW	0.9			
	Gearbox		5-speed gearbox with dog-type shift			
	Gear ratios	I	2.75/2.94			
		II	1.75/2.94			
		III	1.31/2.94			
Suspension		IV	1.05/2.94			
		V	0.88/2.94			
	Rear-wheel drive		O-ring chain 5/8 x 1/4			
	Clutch		Multi-plate clutch in oil bath			
	Type of frame		Single-loop tabular frame			
	Spring travel front/rear	mm	170/165			
	Wheel castor	mm	110			
	Wheelbase	mm	1480			
	Brakes	Front	single disc brake, dia 300 mm			
		Rear	single disc brake, dia 240 mm			
	Wheels	front	wire spoke wheels 2.15 x 19			
		rear	3.00 x 17			
Dimensions and weights	Tyres	front	100/90-19 57 S			
		rear	130/80-17 65 S			
			pneumatic tyre			
	Length, overall	mm	2180			
	Width with mirrors	mm	880			
	Handlebar width	mm	880			
	Seat height	mm	810			
Performance	Weight, unladen with full tank	kg	189			
	Max permissible weight	kg	371			
	Fuel tank (reserve)	ltr	17.5/2			
	Fuel consumption					
	90 km/h (56 mph)	ltr	3.8	3.8		
	120 km/h (75 mph)	ltr	5.3	6.3		
	Acceleration					
Model features	0-100 km/h (62 mph)	sec	6.2	-		
	standing-start km	sec	28.9	-		
	Top speed	km/h	163	145		
Model features	Fairing					
	Standard features		tool kit			

	SPECIFICATIONS BMW MOTORCYCLES		R 80-models 25 kW/34 bhp	R 80 RT	R 80 GS	R 80 R
Engine	Cubic capacity	cc		798	798	798
	Bore/stroke	mm		84/70.6	84.8/70.6	84.8/70.6
	Max output	kW/bhp	25/34	37/50	37/50	37/50
	at	rpm	6000	6500	6500	6500
	Max torque	Nm	50	58	61	61
	at	rpm	3750	4000	3750	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	42/40	42/40
Fuel supply			Bing carburettors	Bing carburettors	Bing carburettors	
No of carburettors/dia			2/32	2/32	2/32	
Electrical system	Ignition		contactless transistorized coil ignition			
	Alternator	W		240	240	240
	Battery	V/Ah		12/25	12/25	12/25
	Headlight	W		H 4 55/60 dia 180 mm	H 4 55/60	H 4 55/60 dia 180 mm
Power trans- mission, Gearbox	Starter	kW		0.7	0.7	0.7
	Gearbox		5-speed gearbox with dog-type shift			
	Gear ratios	I		4.40/3.36	4.40/3.20	4.40/3.20
		II		2.86/3.36	2.86/3.20	2.86/3.20
Suspension		III		2.07/3.36	2.07/3.20	2.07/3.20
		IV		1.67/3.36	1.67/3.20	1.67/3.20
		V		1.50/3.36	1.50/3.20	1.50/3.20
	Rear-wheel drive			BMW Monolover	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	225/180	135/140
	Wheel castor	mm		120	101	101
	Wheelbase	mm		1447	1513	1513
	Brakes	Front		dual-disc brake, dia 285 mm	single-disc brake, dia 285 mm	single-disc brake, dia 285 mm
		Rear		drum brake, dia 200 mm	drum brake, dia 200 mm	drum brake, dia 200 mm
	Wheels	front		Cast light-alloy MTH 2 2.50 x 18 E	Cross-spoke 1.85 – 21 MT	Cross-spoke 2.50 x 18 MTH 2
	rear		MTH 2 2.50 x 18 E	2.50 – 17 MT	2.50 – 17 HTH 2	
Tyres	front		90/90 – 18 H	90/90 – 21 F	110/80 V 18	
	rear		120/90 – 18 H	130/80 – 17 T	140/80 V 17	
			low-profile	low-profile	low-profile	
Dimensions and weights	Length, overall	mm		2175	2290	2210
	Width with mirrors	mm		960	1000	1000
	Handlebar width	mm		714	830	720
	Seat height	mm		807	850	800
	Weight, unladen with full tank	kg		227	215	217
	Max permissible weight	kg		440	420	420
	Fuel tank / reserve	ltr		22/2	24/4.7	24/4.7
	Performance	Fuel consumption	ltr	4.5	4.8	4.7
90 km/h (56 mph)		ltr	6.4	7.2	6.6	5.5
120 km/h (75 mph)						
Acceleration						
0–100 km/h (62 mph) standing-start km		sec	8.6	6.4	6.0	6.0
Top speed	sec	–	29.0	28.3	28.3	
	km/h	148	170	168	168	
Model features	Fairing			Full fairing fixed positively to frame, adjustable windshield and integral stowage boxes (glass-fibre- reinforced plastic)	Glass-fibre- reinforced fairing	
	Standard features			Toolkit, repair kit	Toolkit, repair kit, luggage rack	Toolkit, repair kit, luggage rack



	SPECIFICATIONS BMW MOTORCYCLES		R 100 GS	R 100 GS Paris-Dakar	R 100 R	R 100 RT
Engine	Cubic capacity	cc	980	980	980	980
	Bore/stroke	mm	94/70.6	94/70.6	94/70.6	94/70.6
	Max output	kW/bhp	44/60	44/60	44/60	44/60
	at	rpm	6500	6500	6500	6500
	Max torque	Nm	76	76	76	74
	at	rpm	3750	3750	3750	3500
	Design		flat-twin	flat-twin	flat-twin	flat-twin
	No of cylinders		2	2	2	2
	Compression ratio/fuel grade		8.5/N	8.5/N	8.5/N	8.45/N
	Valve control		OHV	OHV	OHV	OHV
	Valves per cylinder		2	2	2	2
	Intake/outlet dia	mm	42/40	42/40	42/40	42/40
	Fuel supply		Bing carburetors	Bing carburetors	Bing carburetors	Bing carburetors
	No of carburetors/dia		2/40	2/40	2/40	2/32
Electrical system	Ignition		contactless transistorized coil ignition			
	Alternator	W	240	240	240	240
	Battery	V/Ah	12/25	12/25	12/30	12/30
	Headlight	W	H 4 55/60	H 4 55/60	H 4 55/60	H 4 55/60
					dia 180 mm	dia 180 mm
	Starter	kW	0.7	0.7	0.7	0.7
Power transmission, Gearbox	Gearbox		5-speed gearbox with dog-type shift			
	Gear ratios	I	4.40/3.09	4.40/3.09	4.40/3.09	4.40/3.0
		II	2.86/3.09	2.86/3.09	2.86/3.09	2.86/3.0
		III	2.07/3.09	2.07/3.09	2.07/3.09	2.07/3.0
		IV	1.67/3.09	1.67/3.09	1.67/3.09	1.67/3.0
		V	1.50/3.09	1.50/3.09	1.50/3.09	1.50/3.0
Suspension	Rear-wheel drive		BMW Paralever	BMW Paralever	BMW Paralever	BMW Monolever
	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	135/140	175/121
	Wheel castor	mm	101	101	101	120
	Wheelbase	mm	1513	1513	1513	1447
	Brakes	Front	single-disc brake; dia 285 mm	single-disc brake; dia 285 mm	dual-disc brake; dia 285 mm	dual-disc brake; dia 285 mm
		Rear	drum brake, dia 200 mm	drum brake, dia 200 mm	drum brake, dia 200 mm	drum brake, dia 200 mm
	Wheels	front	Cross-spokes 1.85 - 21 MT	Cross-spokes 1.85 - 21 MT	Cross-spokes 2.50 x 18 MTH 2	Cast light-alloy MTH 2.50 x 18 E
		rear	2.50 - 17 MT	2.50 - 17 MT	2.50 x 17 HTH 2	MTH 2.50 x 18 E
	Tyres	front	90/90 - 21 T	90/90 - 21 T	110/80 V 18	90/90 - 18 H
		rear	130/80 - 17 T low-profile	130/80 - 17 T low-profile	140/80 V 17 low-profile	120/90 - 18 H low-profile
Dimensions and weights	Length, overall	mm	2290	2290	2210	2175
	Width with mirrors	mm	1000	1000	1000	960
	Handlebar width	mm	830	830	720	714
	Seat height	mm	850	850	800	807
	Weight, unladen with full tank	kg	220	236	218	234
	Max permissible weight	kg	420	420	420	440
	Fuel tank / reserve	ltr	24/4.7	35/5	24/4.7	22/2
Performance	Fuel consumption					
	90 km/h (56 mph)	ltr	4.9	4.9	4.9	4.4
	120 km/h (75 mph)	ltr	6.9	6.9	6.1	6.6
	Acceleration					
	0-100 km/h (62 mph) standing-start km	sec	4.8	4.8	4.8	5.0
Model features		sec	26.5	26.5	26.5	26.0
		km/h	180	180	180	185
	Fairing		Glass-fibre-reinforced fairing	Glass-fibre-reinforced fairing		Glass-fibre-reinforced tourer 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, luggage rack, SAS	Toolkit, repair kit, oil cooler, voltmeter, quartz clock, cases with standard lock

	SPECIFICATIONS BMW MOTORCYCLES		R 1100 RS	R 1100 GS		
Engine	Cubic capacity	cc	1085	1085		
	Bore/stroke	mm	99/70.5	99/70.5		
	Max output	kW/bhp	66/90	59/80		
	at	rpm	7250	6750		
	Max torque	Nm	95	97		
	at	rpm	5500	5250		
	Design		flat-twin	flat-twin		
	No of cylinders		2	2		
	Compression ratio/fuel grade (also unleaded)		10.7/S	10.3/S		
	Valve control		HC	HC		
	Valves per cylinder		4	4		
Electrical system	Intake/outlet dia	mm	36/31	36/31		
	Fuel supply		Motronic	Motronic		
	Ignition		Motronic	Motronic		
	Alternator	W	700	700		
	Battery	V/Ah	12/19	12/19		
Power trans- mission, Gearbox	Headlight	W	H 4 55/60	H 4 55/60		
	Starter	kW	1.1	1.1		
	Gearbox		5-speed gearbox with dog-type shift			
	Gear ratios	I	4.16/2.81	4.16/3.00		
		II	2.91/2.81	2.91/3.00		
Suspension		III	2.13/2.81	2.13/3.00		
		IV	1.74/2.81	1.74/3.00		
		V	1.45/2.81	1.45/3.00		
	Rear-wheel drive		BMW Paralever			
	Clutch		Single-plate dry clutch rotating in opposite direction, dia 180 mm			
	Type of frame		Tubular space frame, engine serving as loadbearing component			
	Spring travel front/rear	mm	120/135	190/200		
	Wheel castor	mm	111	111		
	Wheelbase	mm	1473	1499		
	Brakes	Front	dual-disc brake, dia 305 mm	dual-disc brake, dia 305 mm		
		Rear	single-disc brake, dia 285 mm	single-disc brake, dia 276 mm		
	Wheels		Light-alloy wheels	Cross-spoke wheels		
		front	3.50 – 17 MTH 2	2.5 x 19		
		rear	4.50 – 18 MTH 2	4.0 x 17		
Dimensions and weights	Tyres	front	120/70 – ZR 17	110/80 H 19 TL		
		rear	160/60 – ZR 18 tubeless	150/70 H 17 TL tubeless		
	Length, overall	mm	2175	2196		
	Width with mirrors	mm	920	920		
	Handlebar width	mm	738	820		
Performance	Seat height	mm	780/800/820	840/860		
	Weight, unladen with full tank	kg	239	243		
	Max permissible weight	kg	450	450		
	Fuel tank	ltr	23	25		
	Fuel consumption					
Model features	90 km/h (56 mph)	ltr	4.3	4.6		
	120 km/h (75 mph)	ltr	5.2	5.9		
	Acceleration					
	0–100 km/h (62 mph)	sec	4.1	4.3		
	standing-start km	sec	23.7	24.7		
	Top speed	km/h	215	195		
	Fairing		Multi-piece aerodynamically optimized sports-touring fairing	adjustable head-lamp fairing		
	Standard features		Repair kit, toolkit, central locking	Repair kit, toolkit, central locking		

SPECIFICATIONS BMW MOTORCYCLES		K 75	K 75 S	K 75 RT	
Engine	Cubic capacity	cc	740	740	740
	Bore/stroke	mm	67/70	67/70	67/70
	Max output	kW/bhp	55/75	55/75	55/75
	at	rpm	8500	8500	8500
	Max torque	Nm	68	68	68
	at	rpm	6750	6750	6750
	Design		inline	inline	inline
	No of cylinders		3	3	3
	Compression ratio/fuel grade (also unleaded)		11.0/5	11.0/5	11.0/5
	Valve control		DOHC	DOHC	DOHC
	Valves per cylinder		2	2	2
Electrical system	Intake/outlet dia	mm	34/30	34/30	34/30
	Fuel supply		LE-Jetronic with coasting cut-off		
	Ignition		VZ-51 L digital ignition		
	Alternator	W	700	700	700
Power trans- mission, Gearbox	Battery	V/Ah	12/19	12/19	12/19
	Headlight	W	H 4 55/60 dia 180 mm	H 4 55/60	H 4 55/60
	Starter	kW	0.7	0.7	0.7
Suspension	Gearbox		5-speed gearbox with dog-type shift		
	Gear ratios	I	4.50/3.20	4.50/3.20	4.50/3.20
		II	2.96/3.20	2.96/3.20	2.96/3.20
		III	2.30/3.20	2.30/3.20	2.30/3.20
		IV	1.88/3.20	1.88/3.20	1.88/3.20
Dimensions and weights		V	1.67/3.20	1.67/3.20	1.67/3.20
	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	135/110
	Wheel castor	mm	101	101	101
	Wheelbase	mm	1516	1516	1516
	Brakes	Front	dual-disc brake, dia 285 mm	dual-disc brake, dia 285 mm	dual-disc brake, dia 285 mm
		Rear	single-disc brake, dia 285 mm	single-disc brake, dia 285 mm	single-disc brake, dia 285 mm
	Wheels	front	Light-alloy wheels 2.50 - 18 MTH 2	Light-alloy wheels 2.50 - 18 MTH 2	Light-alloy wheels 2.50 - 18 MTH 2
Performance		rear	2.75 - 17 MTH 2	2.75 - 17 MTH 2	2.75 - 17 MTH 2
	Tyres	front	100/90/H 18	100/90/V 18	100/90/V 18
		rear	130/90/H 18 tubeless	130/90/V 17 tubeless	130/90/V 17 tubeless
Model features	Length, overall	mm	2220	2220	2220
	Width with mirrors	mm	900	810	916
	Handlebar width	mm	710	650	770
	Seat height	mm	760*	810	810
Performance	Weight, unladen with full tank	kg	228	235	258
	Max permissible weight	kg	450	450	480
	Fuel tank	ltr	21	21	22
Performance	Fuel consumption	ltr	4.5	4.3	4.5
	90 km/h (56 mph)	ltr	5.2	5.0	5.2
	120 km/h (75 mph)				
	Acceleration				
Model features	0-100 km/h (62 mph)	sec	4.6	4.6	4.6
	standing-start km	sec	25.6	25.2	25.2
	Top speed	km/h	200	210	210
Model features	Fairing			Glass-fibre-reinforced plastic sports fairing fitted to frame, glass-fibre-reinforced engine spoiler	Multi-piece aerodynamically optimized sports-touring fairing
	Standard features		Repair kit, toolkit, digital clock	Repair kit, toolkit, digital clock	Repair kit, toolkit, digital clock
* alternatively 800 mm					

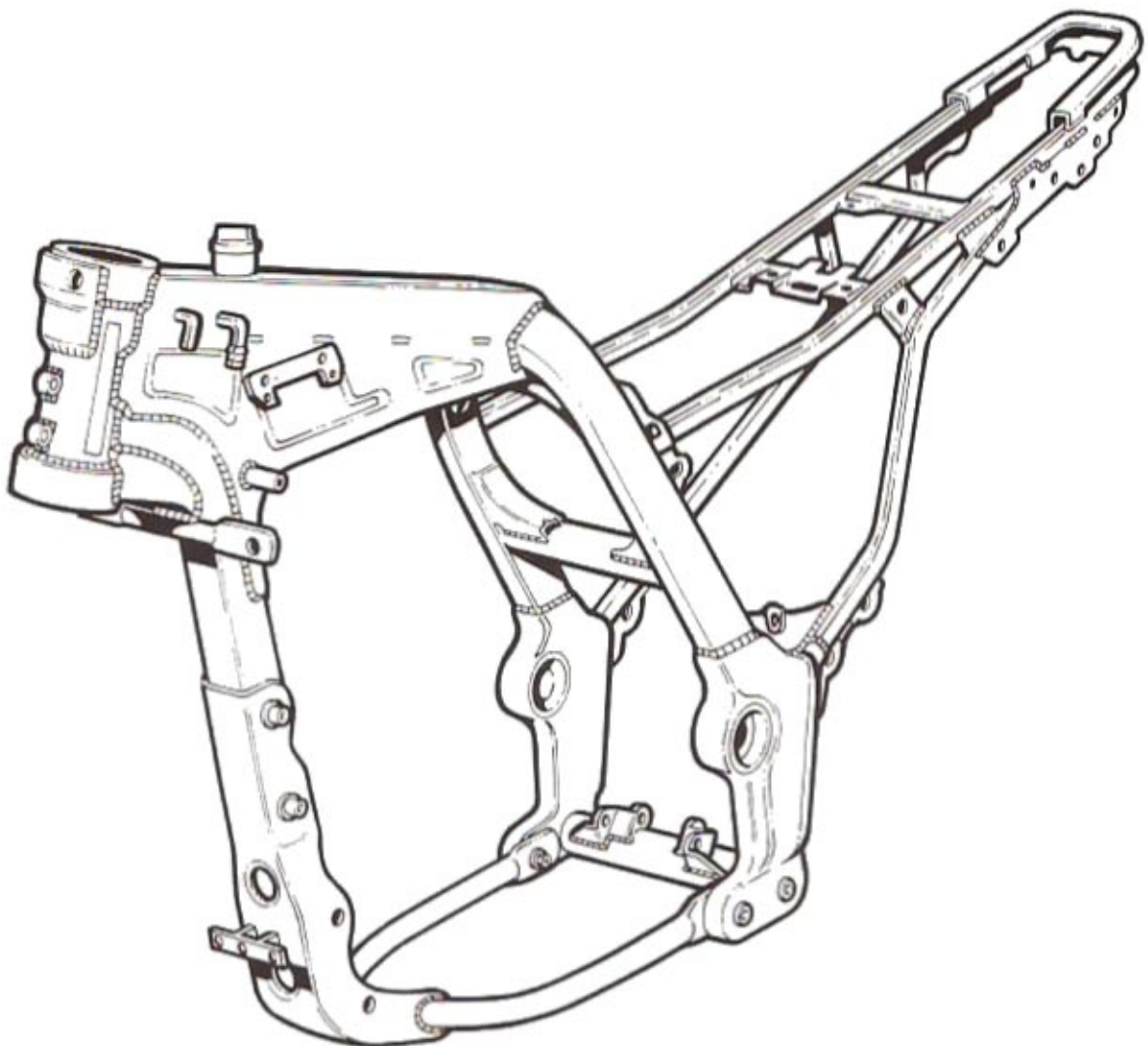


	SPECIFICATIONS BMW MOTORCYCLES		K 1100 RS	K 1100 LT		
Engine	Cubic capacity	cc	1092	1092		
	Bore/stroke	mm	70.5/70	70.5/70		
	Max output	kW/bhp	74/100	74/100		
	at	rpm	7500	7500		
	Max torque	Nm	107	107		
	at	rpm	5500	5500		
	Design		inline	inline		
	No of cylinders		4	4		
	Compression ratio/fuel grade (also unleaded)		11.0/S	11.0/S		
	Valve control		DOHC	DOHC		
Electrical system	Valves per cylinder		4	4		
	Intake/outlet dia	mm	26.5/23	26.5/23		
	Fuel supply		Motronic	Motronic		
	Ignition		Motronic	Motronic		
Power trans- mission, Gearbox	Alternator	W	700	700		
	Battery	V/Ah	12/19	12/19		
	Headlight	W	H 4 55/60	H 4 55/60		
	Starter	kW	0.7	0.7		
Suspension	Gearbox		5-speed gearbox with dog-type shift			
	Gear ratios	I	4.50/2.81	4.50/2.81		
		II	2.96/2.81	2.96/2.81		
		III	2.30/2.81	2.30/2.81		
		IV	1.88/2.81	1.88/2.81		
		V	1.61/2.81	1.61/2.81		
Dimensions and weights	Rear-wheel drive		BMW Paralever			
	Clutch		Single-plate dry clutch rotating in opposite direction, dia 180 mm			
	Type of frame		Tubular space frame, engine serving as loadbearing component			
	Spring travel front/rear	mm	135/120	135/120		
	Wheel castor	mm	90	101		
	Wheelbase	mm	1565	1565		
	Brakes	Front	dual-disc brake, dia 305 mm	dual-disc brake, dia 305 mm		
		Rear	disk brake, dia 285 mm	disk brake, dia 285 mm		
	Wheels	front	Light-alloy wheels 3.50 - 17 MTH 2	Light-alloy wheels 2.50 x 18 MTH 2		
		rear	4.50 - 18 MTH 2	3.00 x 17 MTH 2		
Performance	Tyres	front	120/70 VR 17	110/80-VR 18		
		rear	160/60 VR 18 tubeless	140/80-VR 17 tubeless		
	Length, overall	mm	2230	2250		
	Width with mirrors	mm	800	915		
Model features	Handlebar width	mm	610	765		
	Seat height	mm	800	810		
	Weight, unladen with full tank	kg	268	290		
	Max permissible weight	kg	485	500		
Performance	Fuel tank	litr	22	22		
	Fuel consumption					
	90 km/h (56 mph)	litr	4.9	4.9		
	120 km/h (75 mph)	litr	5.8	5.8		
Performance	Acceleration					
	0-100 km/h (62 mph)	sec	3.8	4.3		
	standing-start km	sec	22.7	24.3		
	Top speed	km/h	more than 220	more than 210		
Model features	Fairing		Multi-piece-aero-dynamically optimized sports-touring fairing	Multi-piece-aero-dynamically optimized touring fairing		
	Standard features		Repair kit, toolkit, digital clock, central locking	Repair kit, toolkit, digital clock, central locking, luggage rack, topcase		



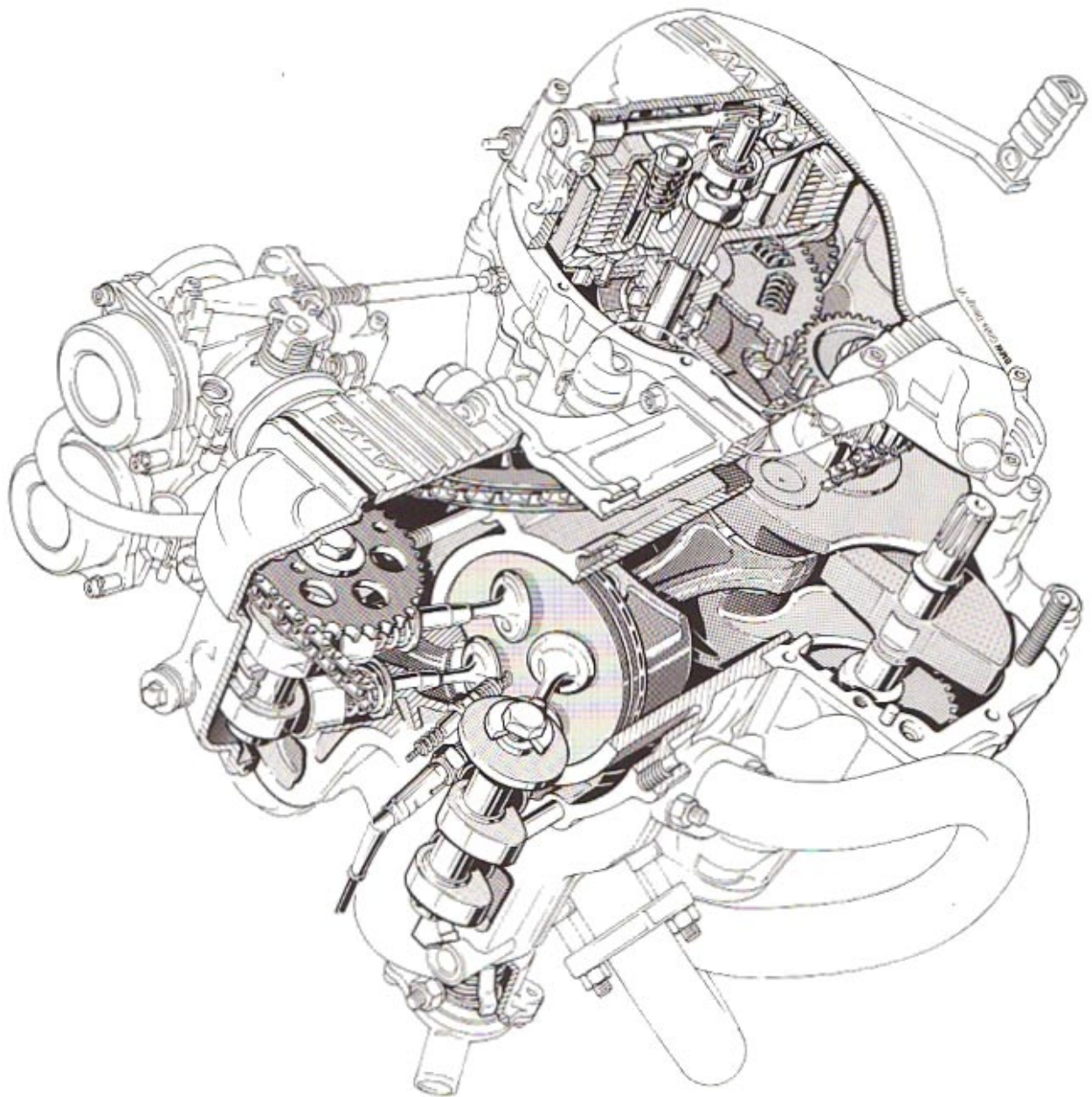
BMW F 650

M 94/1



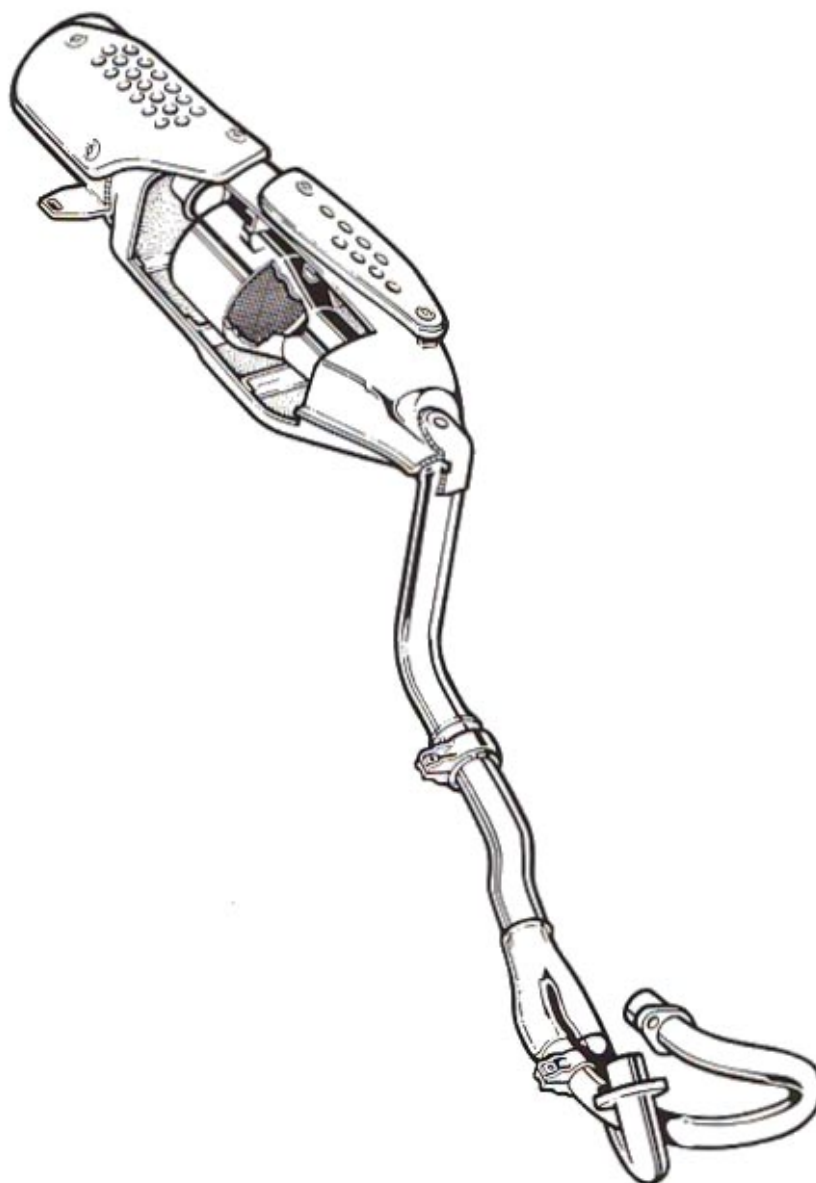
BMW F 650

M 94/2



**BMW F 650**

M 94/3

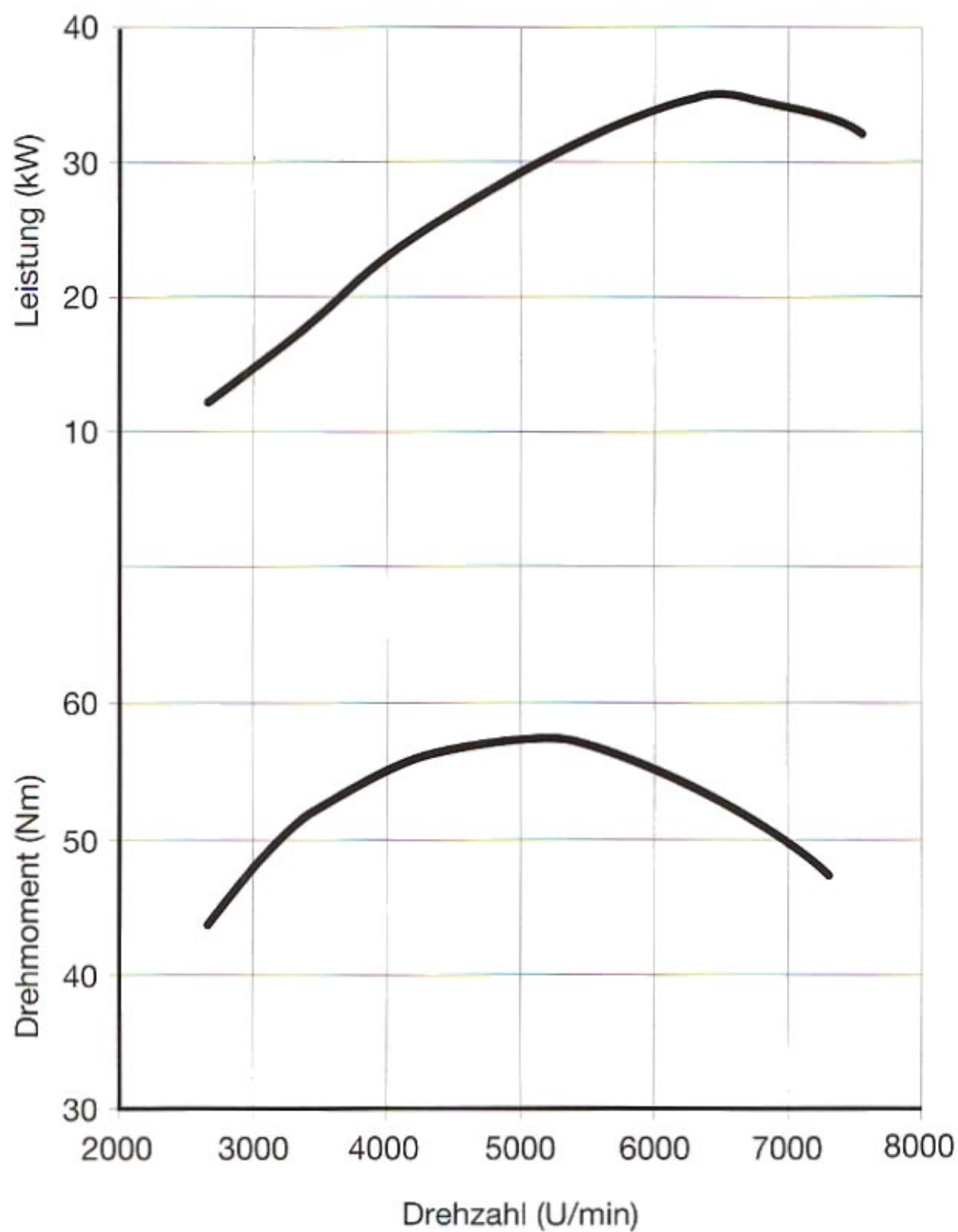




BMW F 650

35 kW/48 PS

M 94/4

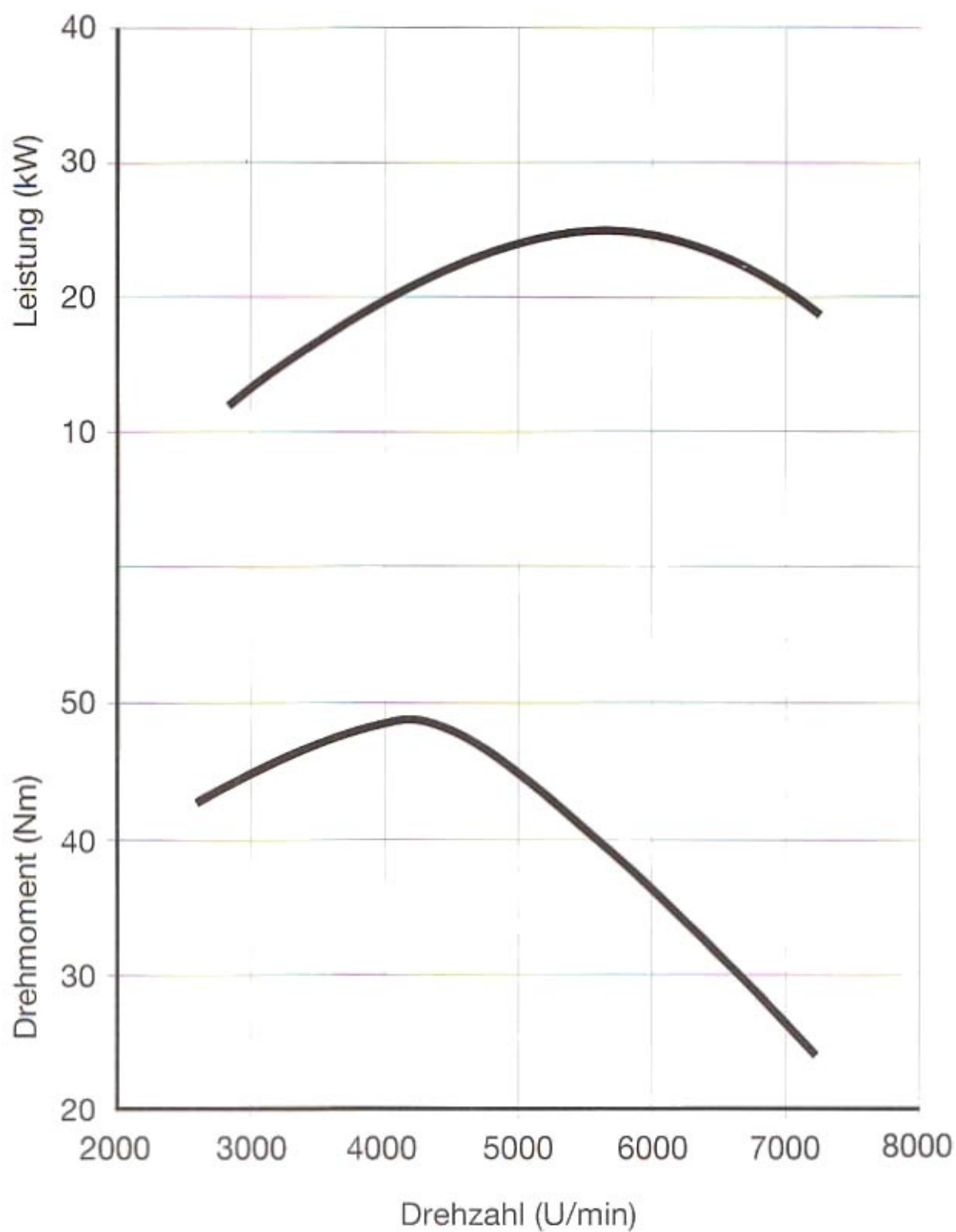




BMW F 650

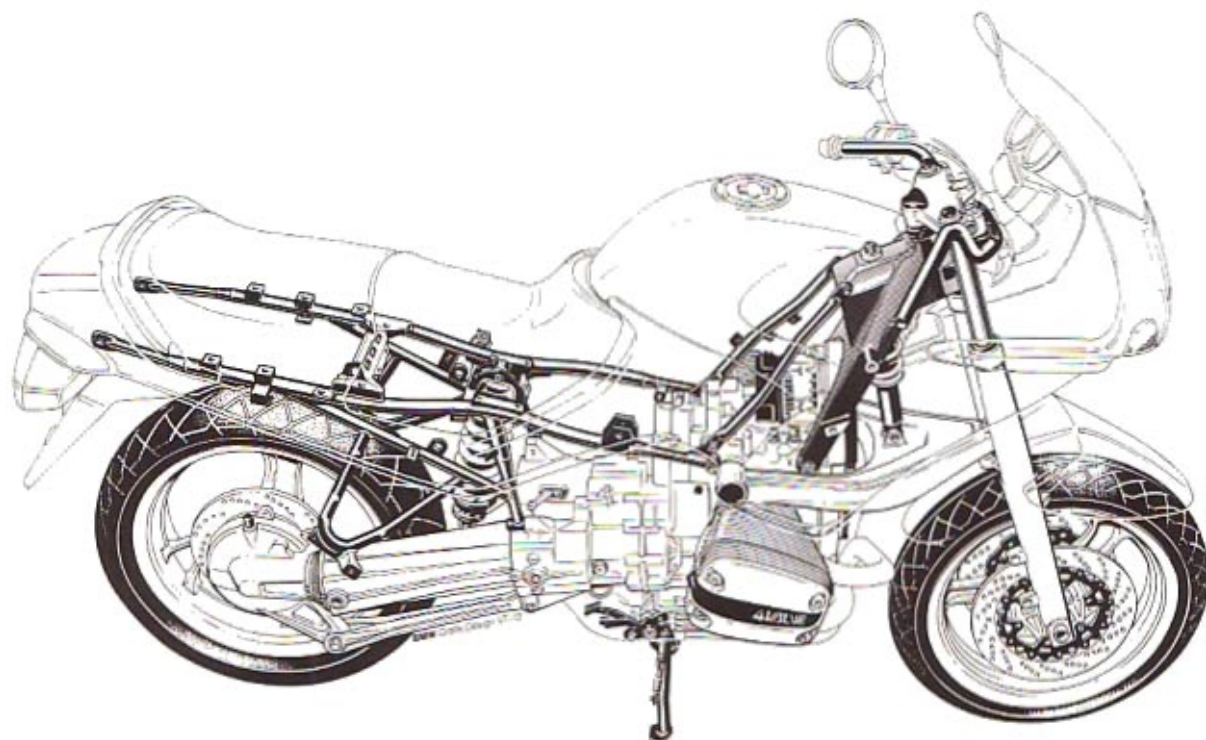
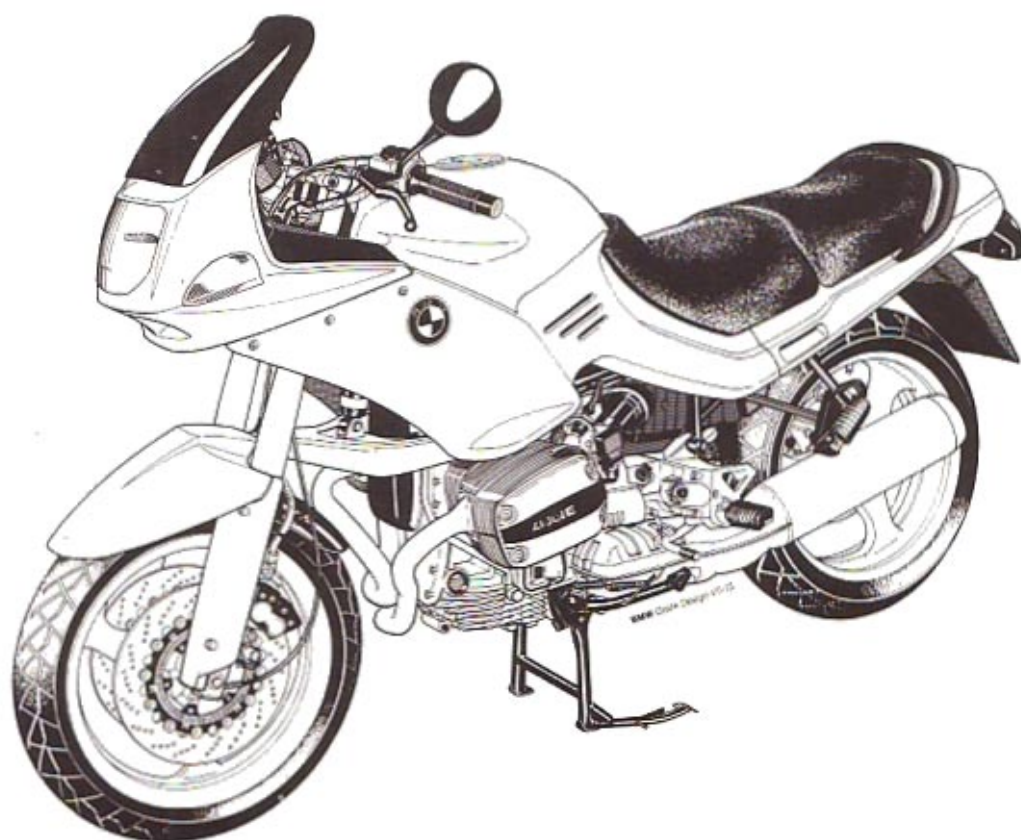
25 kW/34 PS

M 94/5



BMW R 1100 RS

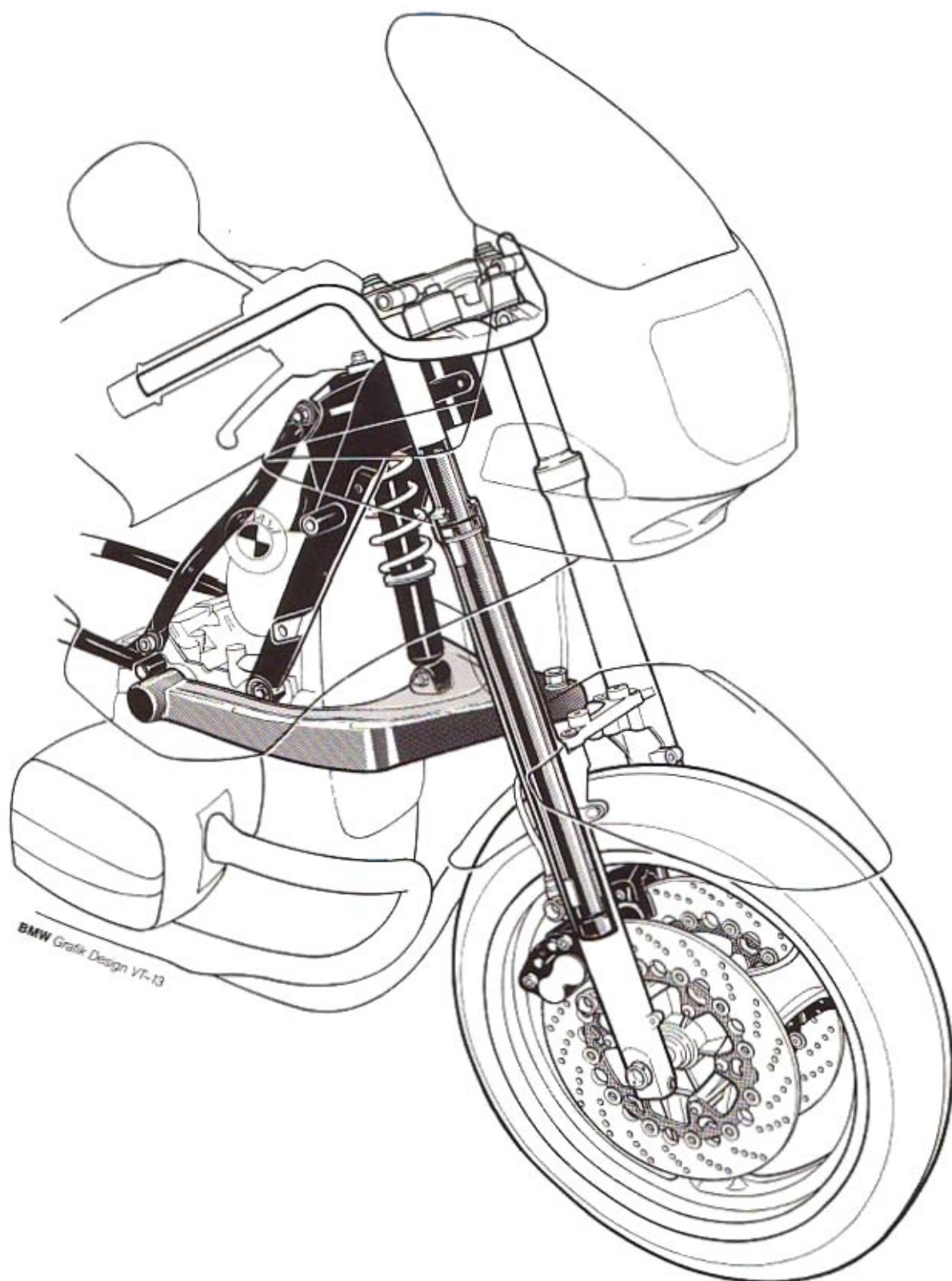
M 94/6



**BMW R 1100 RS**

Telelever

M 94/7



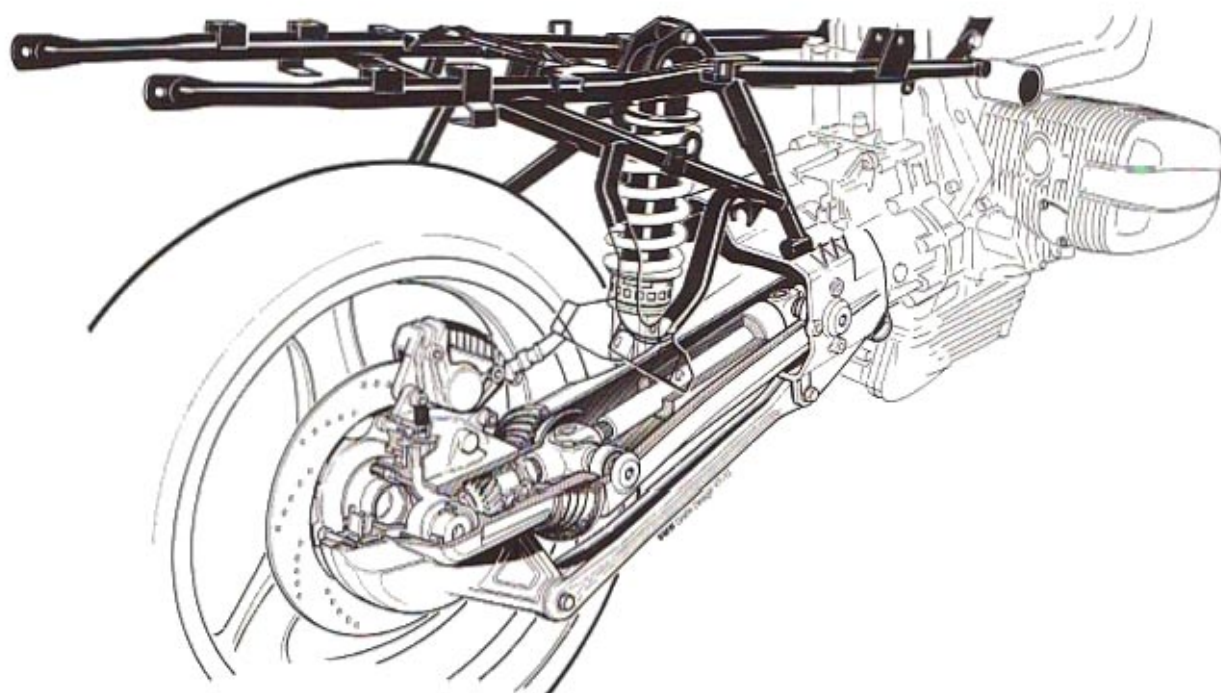
BMW Grafik Design VT-13



**BMW R 1100 RS**

Paralever

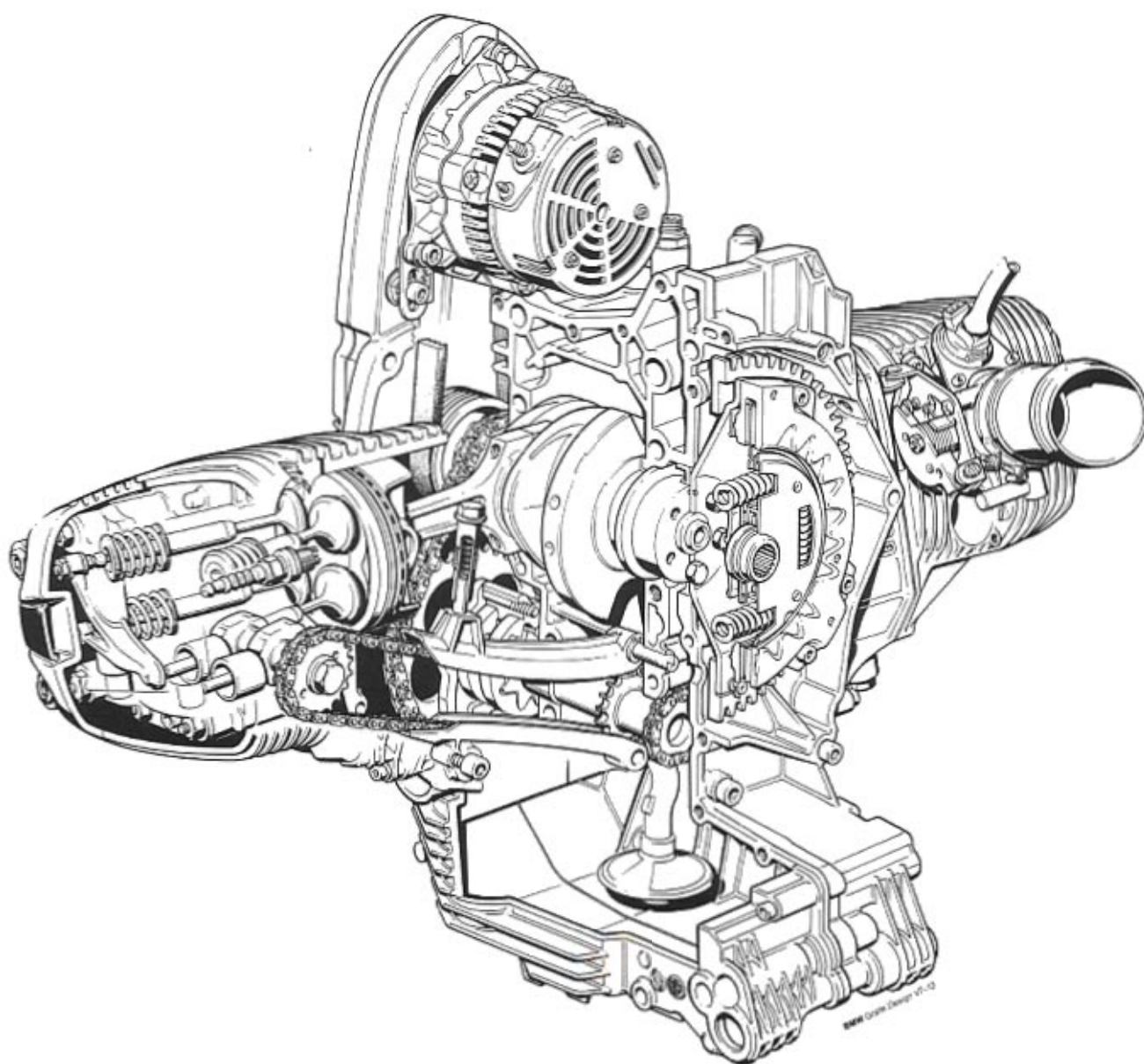
M 94/8





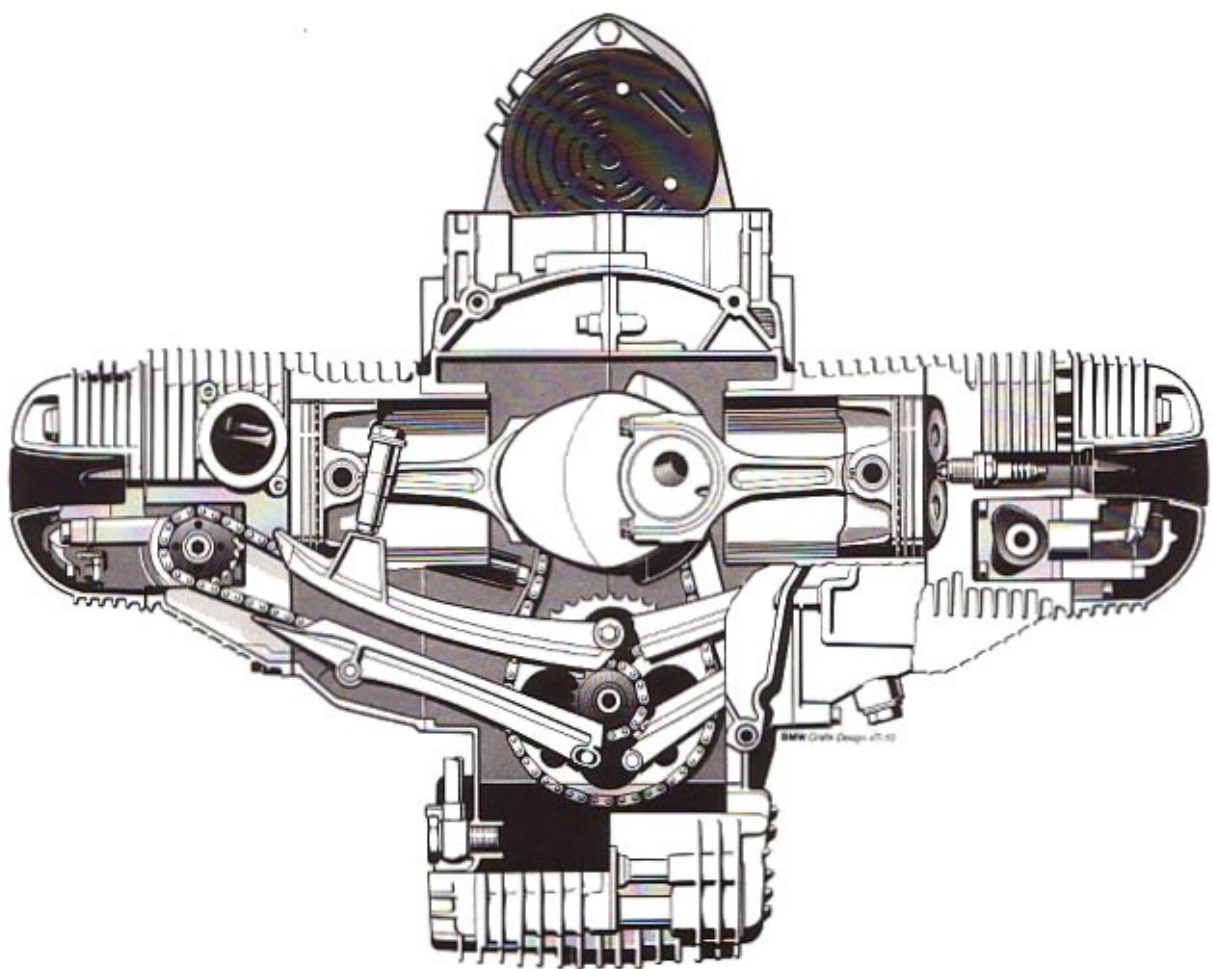
BMW R 1100

M 94/9



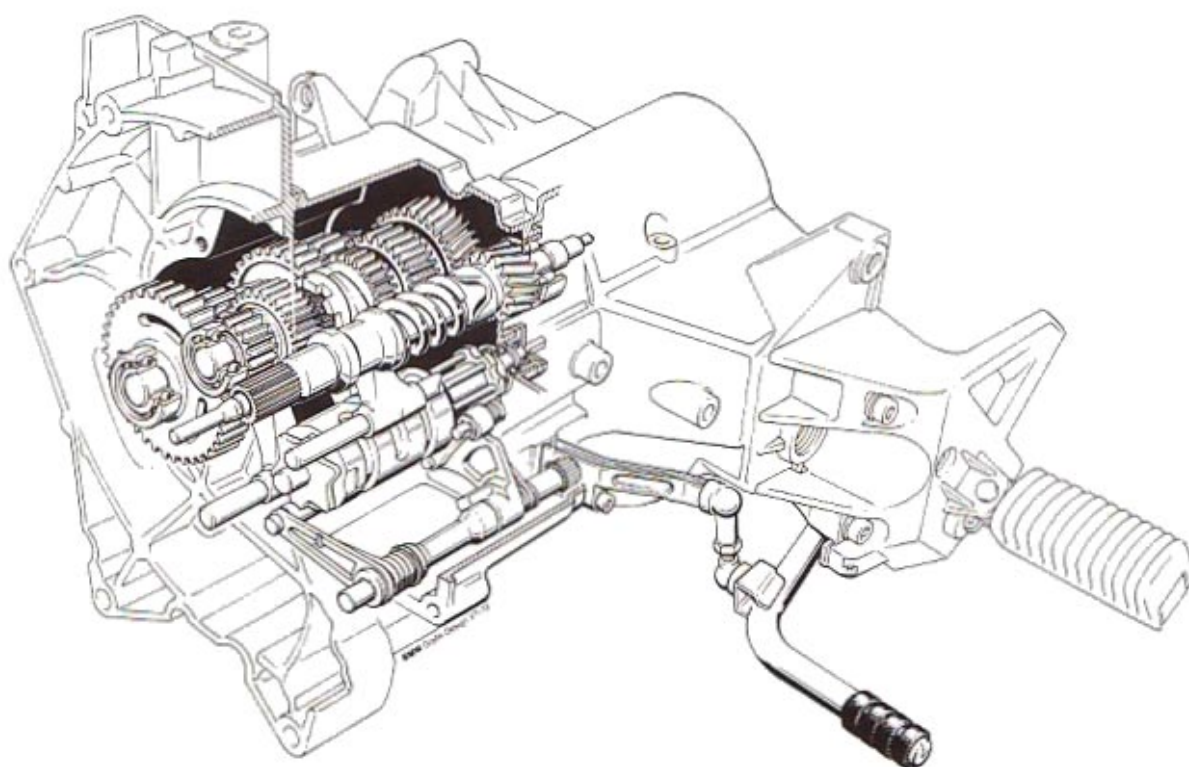
BMW R 1100

M 94/10



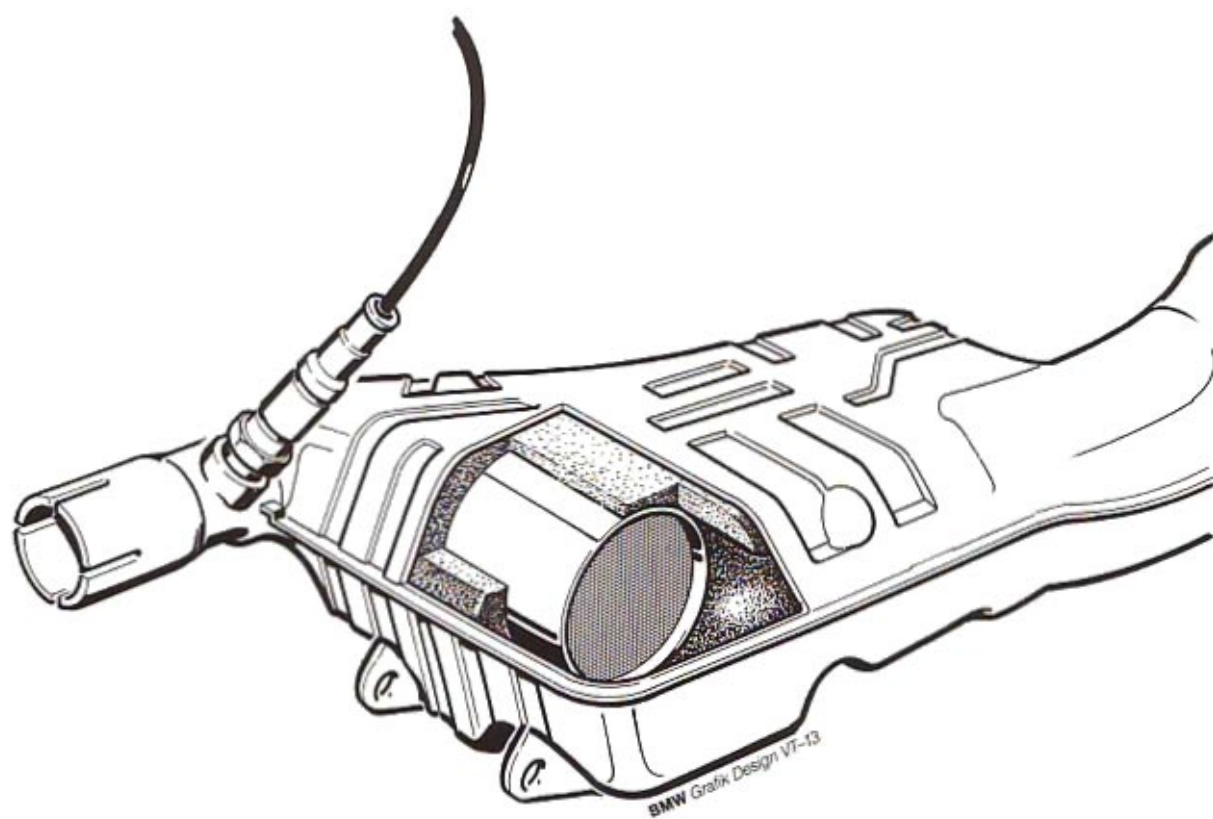
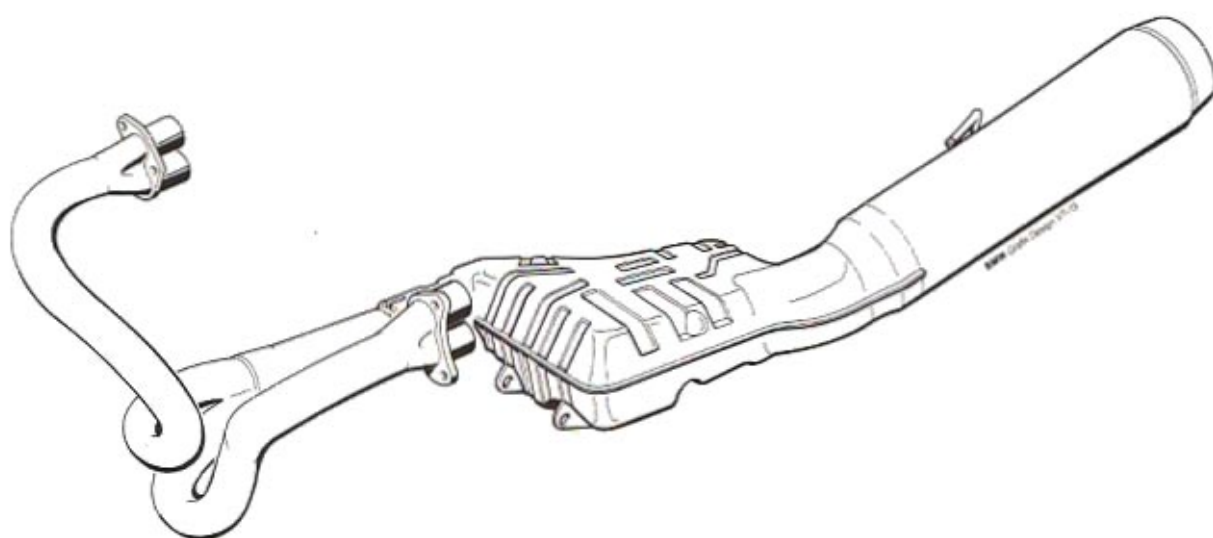
**BMW R 1100**

M 94/11



BMW R 1100 RS

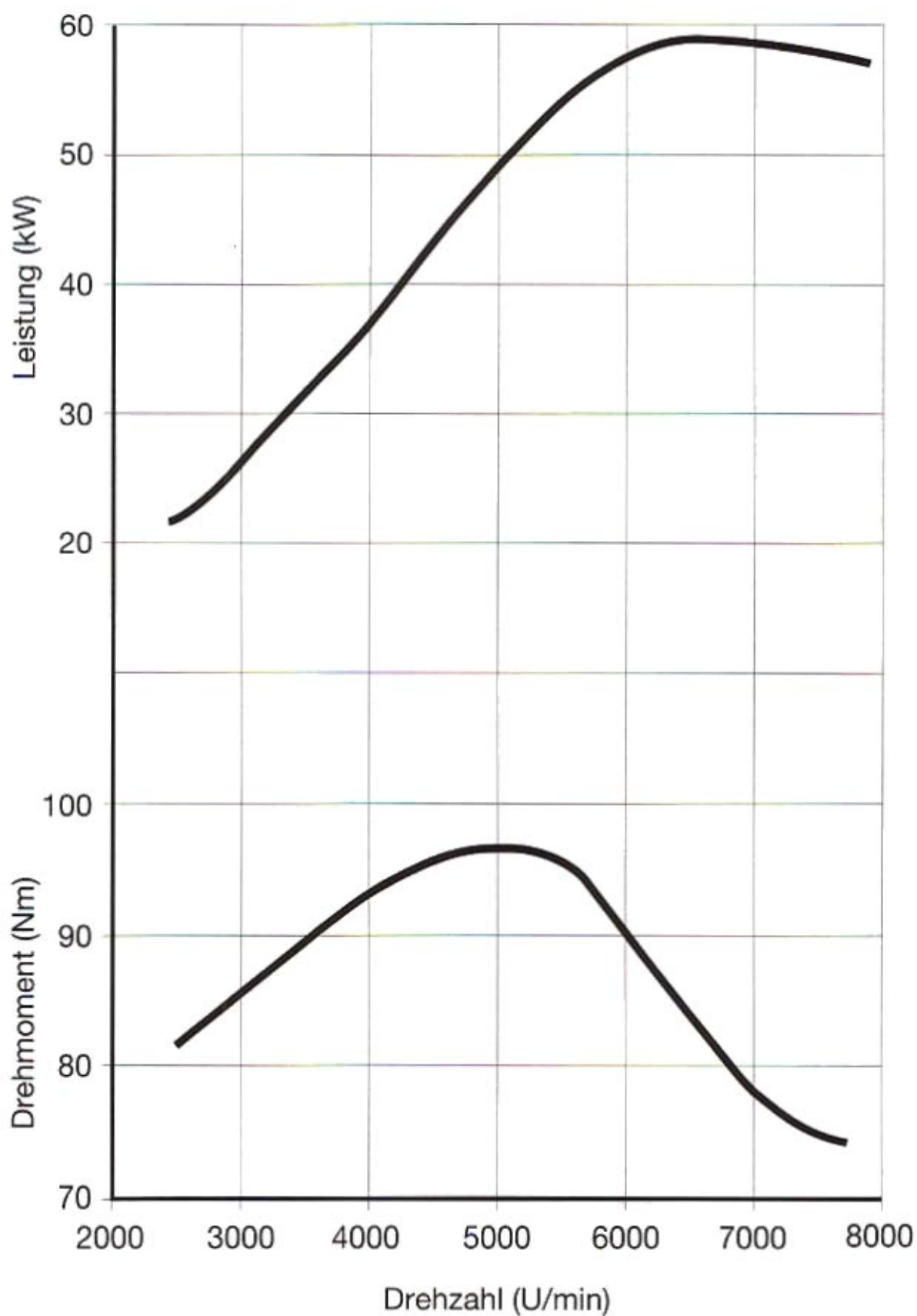
M 94/12





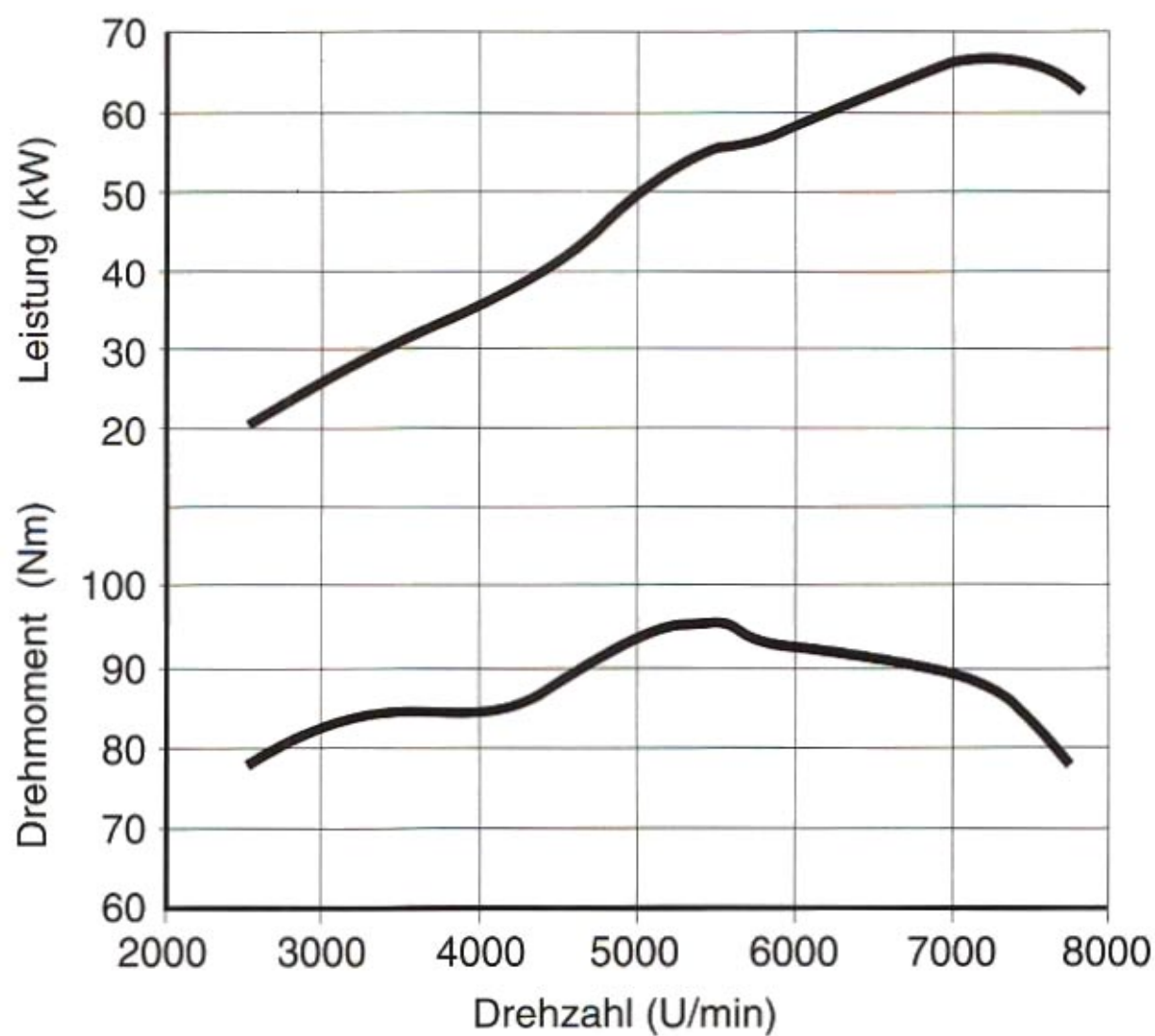
BMW R 1100 GS

M 94/13



BMW R 1100 RS

M 94/14

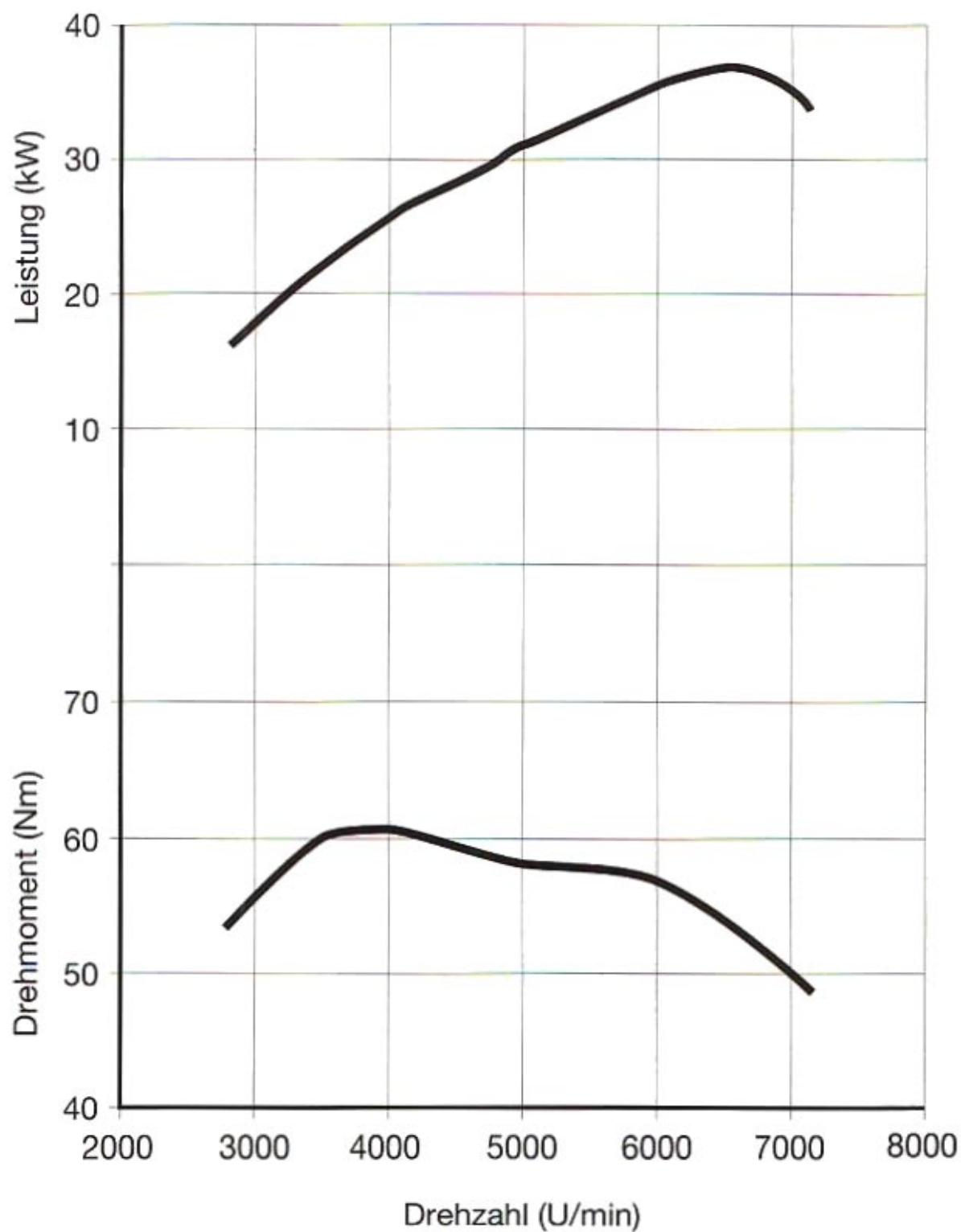




BMW R 80 – Modelle

37 kW/50 PS

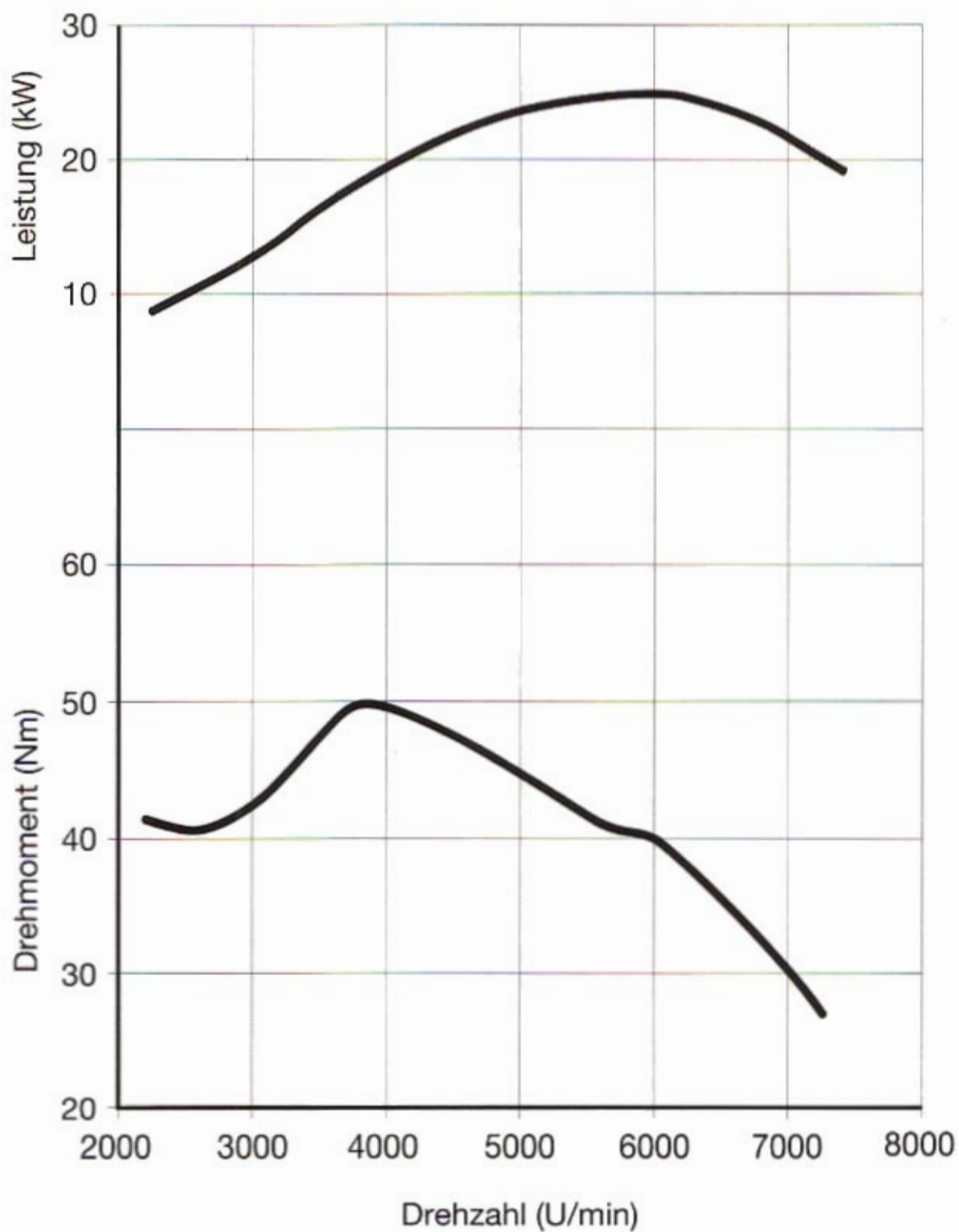
M 94/15



BMW R 80 – Modelle

25 kW/34 PS

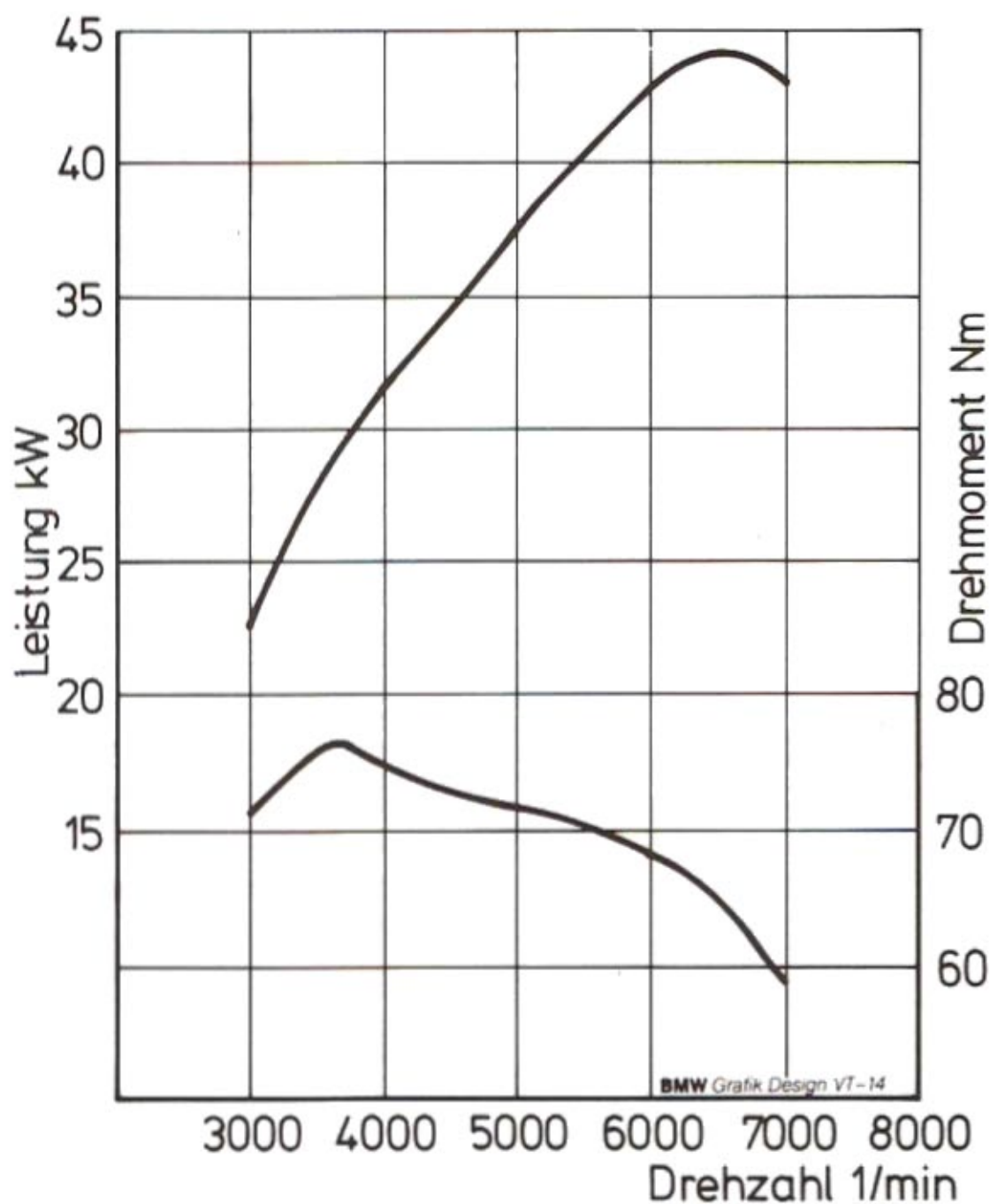
M 94/16





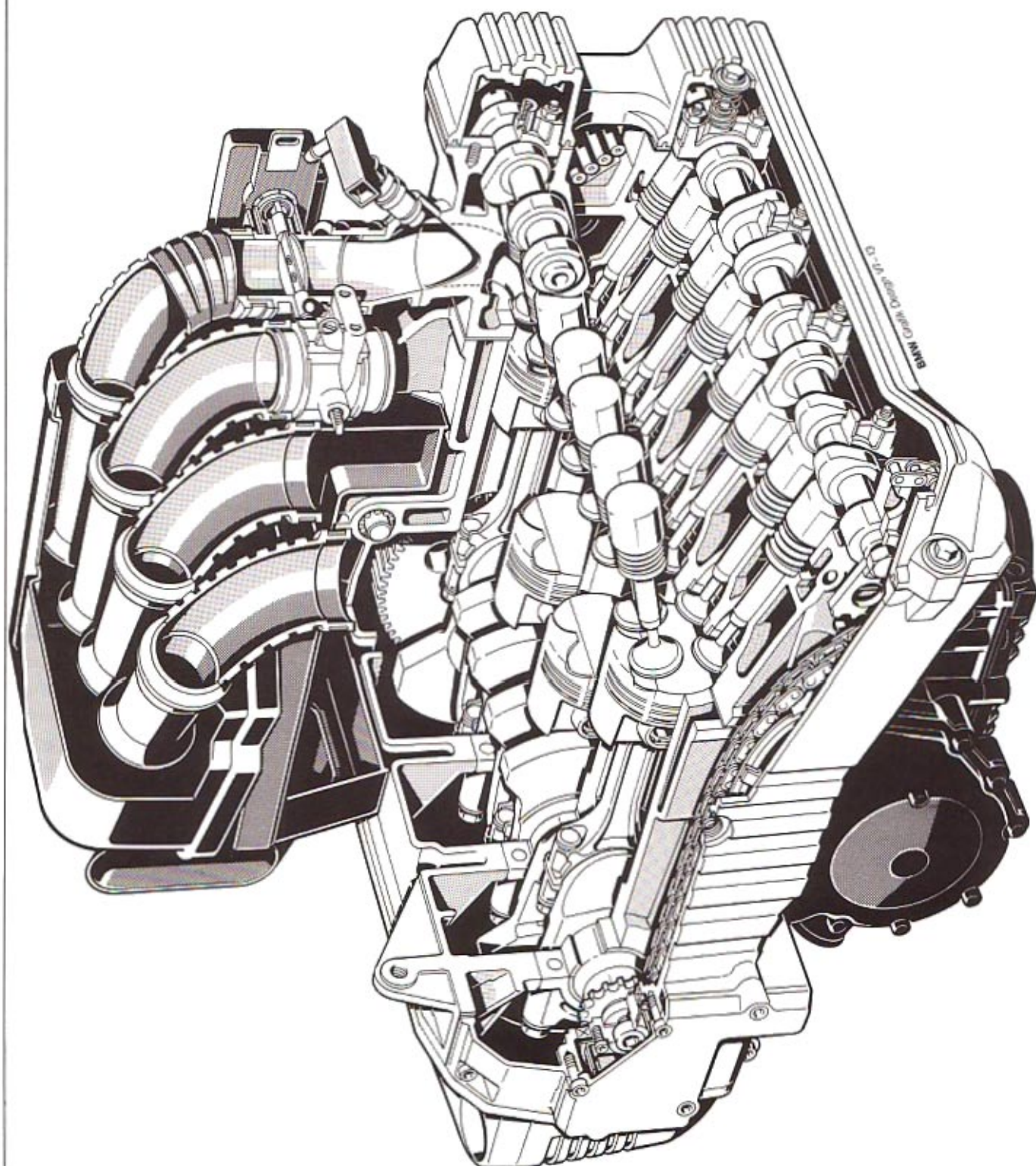
BMW R 100 R, R 100 GS und R 100 RT

M 94/17



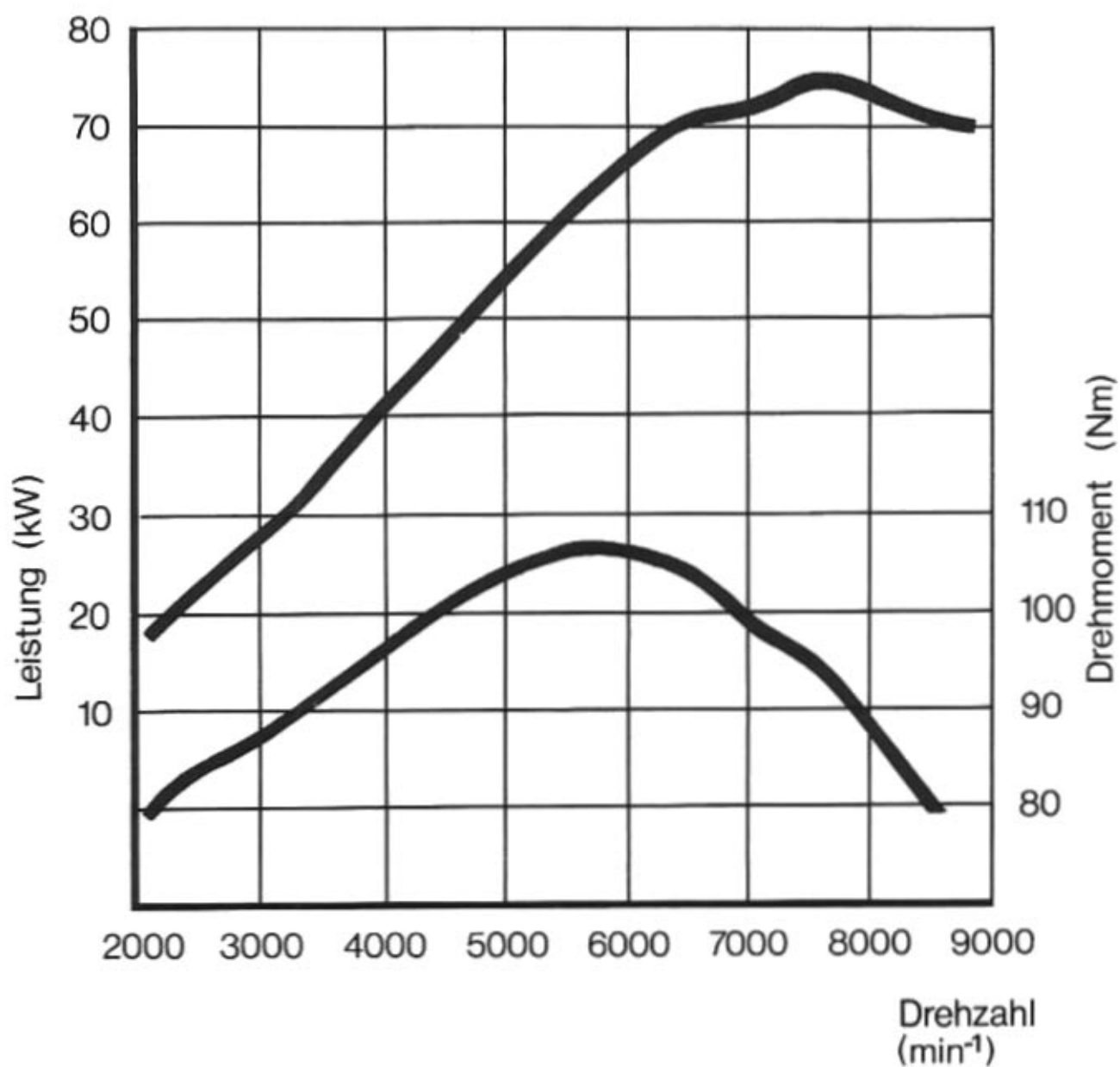
BMW K 1100 RS und K 1100 LT

M 94/18



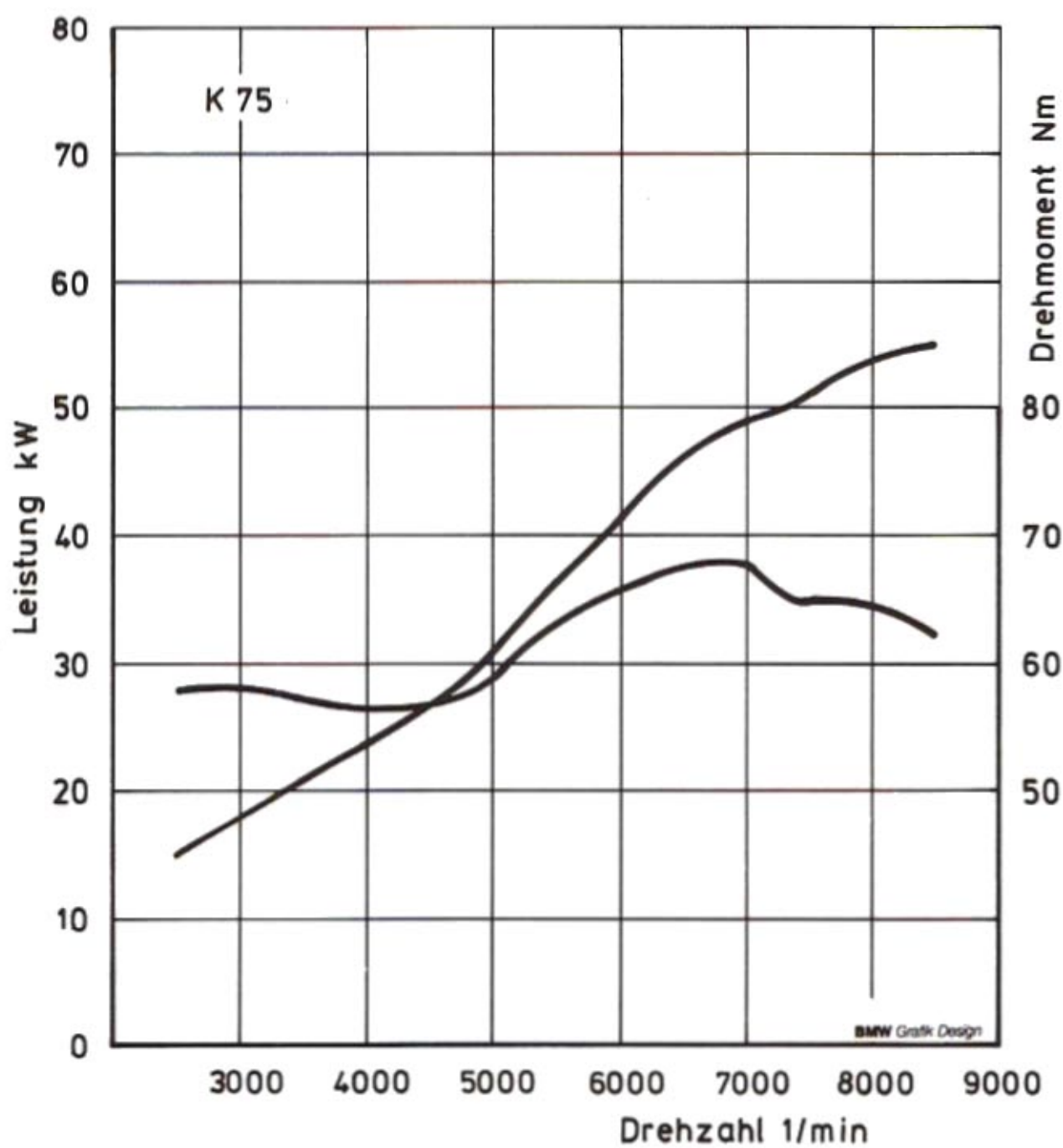
BMW K 1100 LT und K 1100 RS

M 94/19



BMW K 75

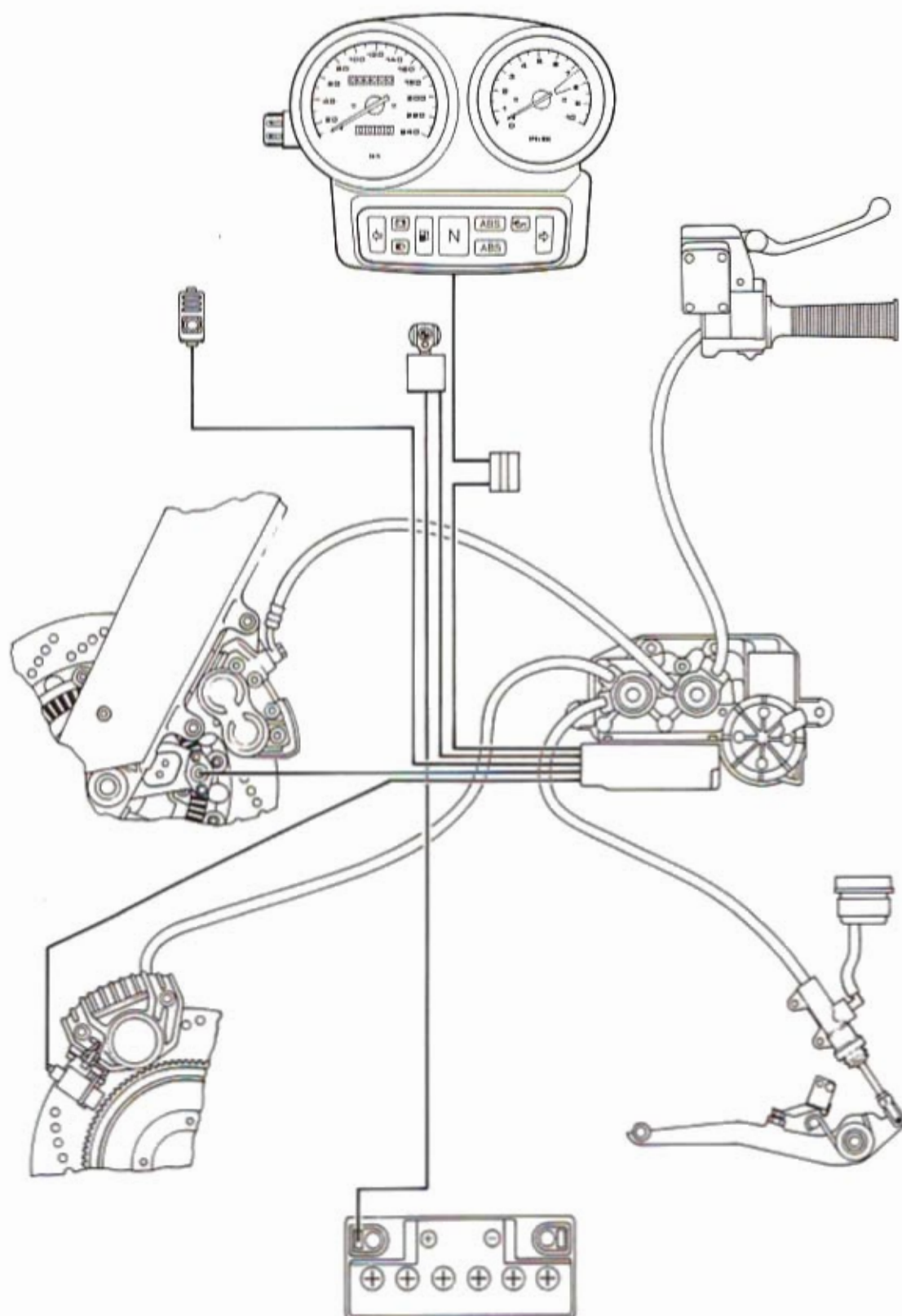
M 94/20





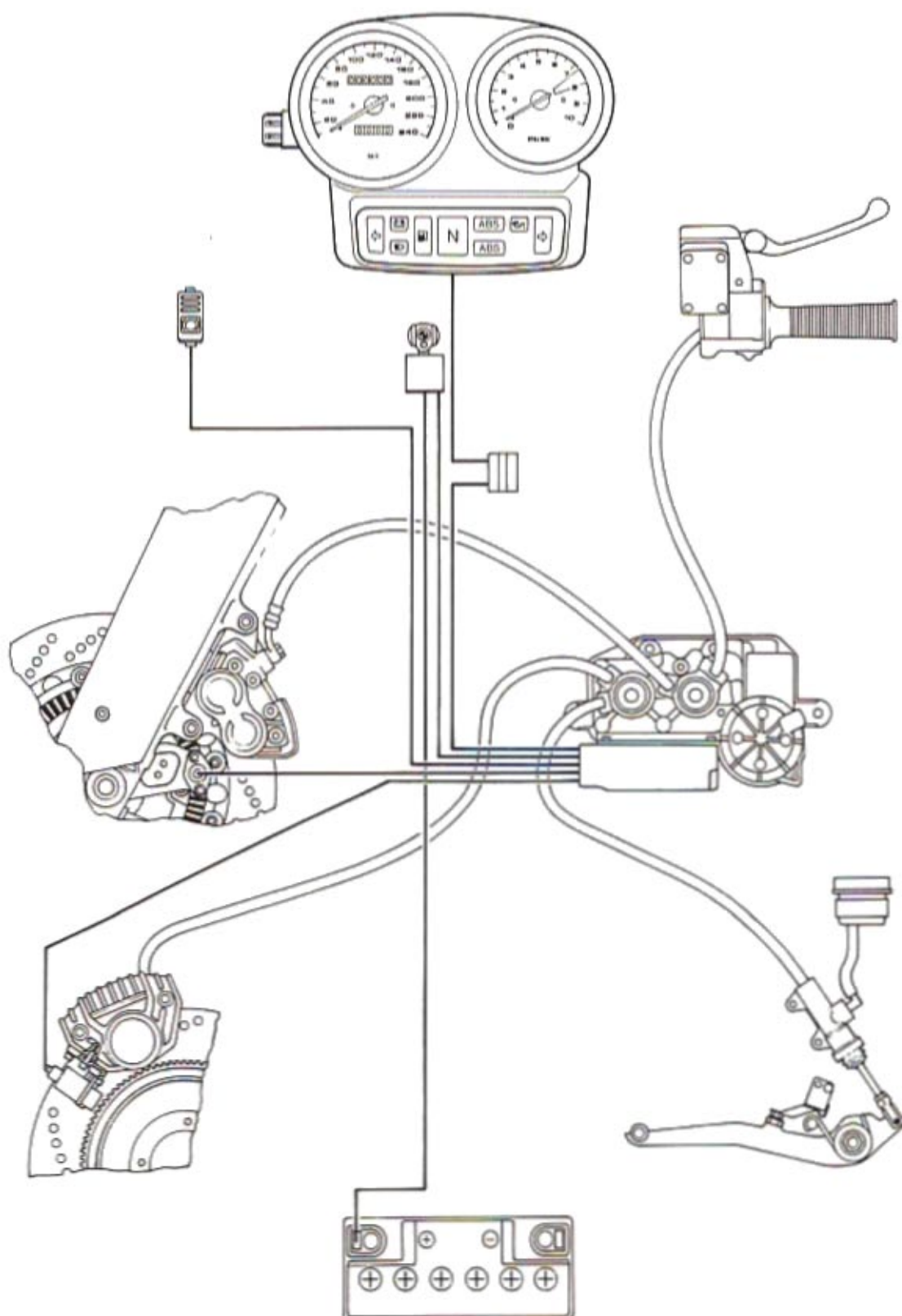
BMW ABS II

M 94/21



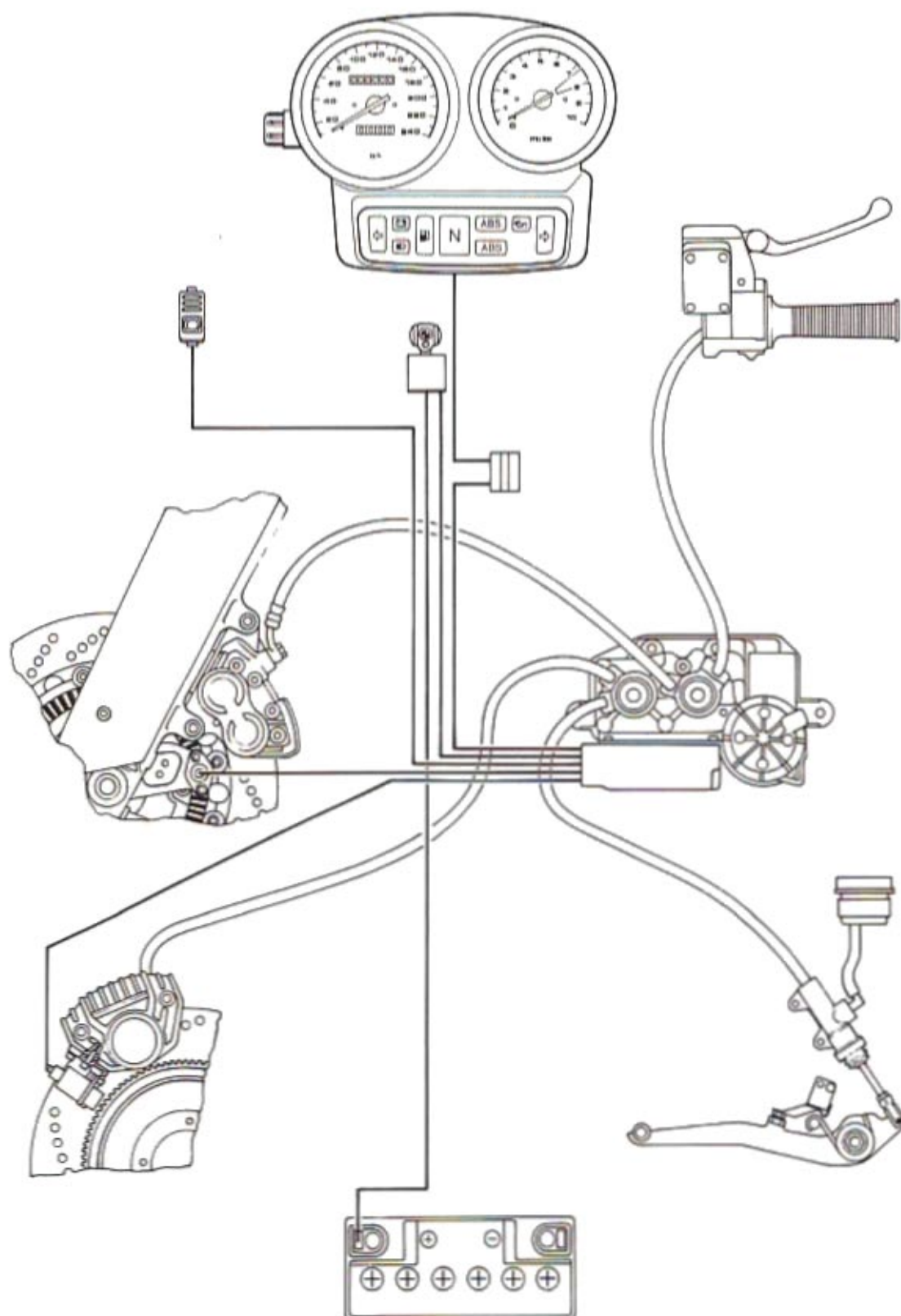
BMW ABS II

M 94/21



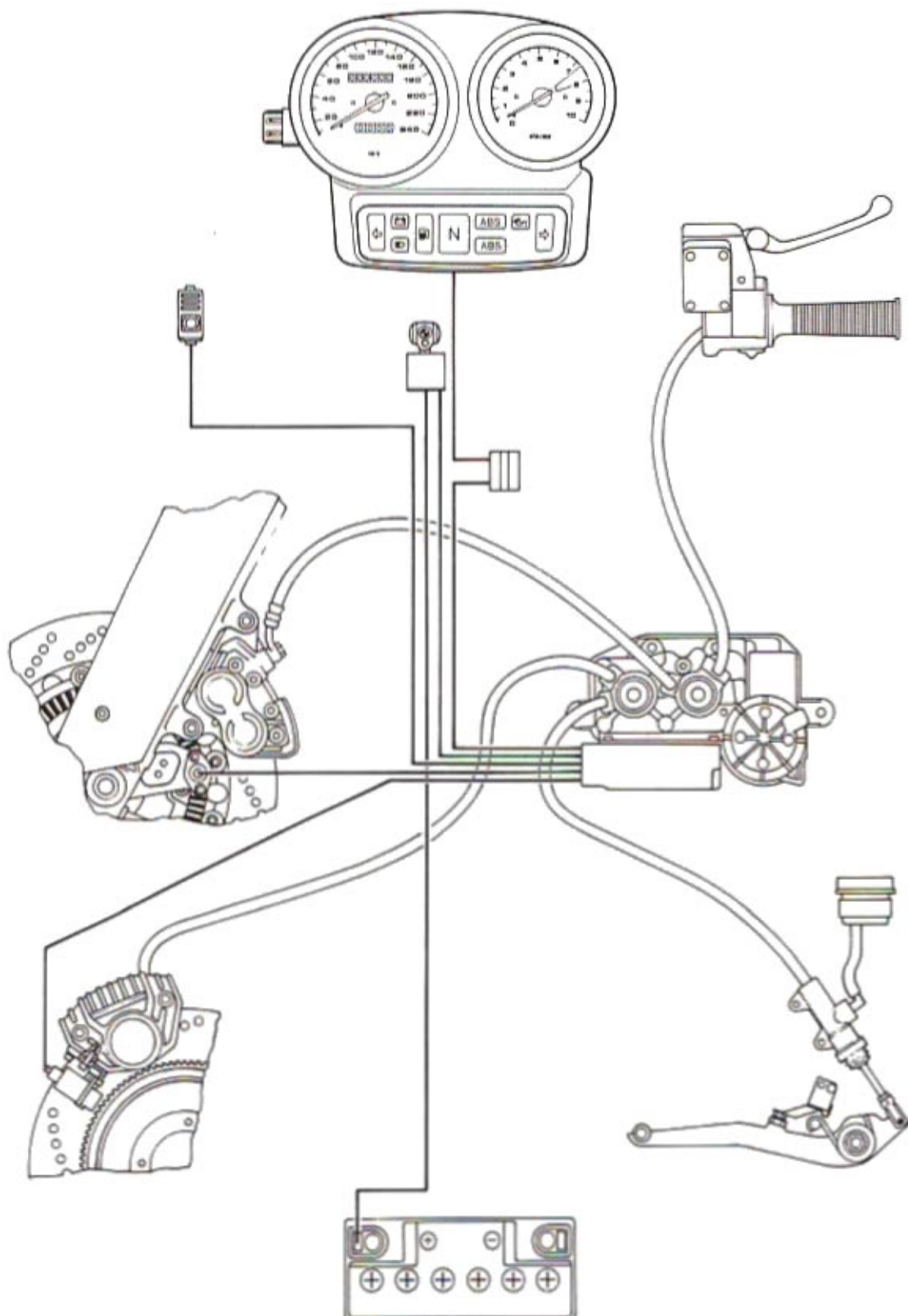
BMW ABS II

M 94/21



BMW ABS II

M 94/21





BMW ABS II

M 94/22

