

Porsche Classic News

GOODWOOD REVIVAL 2016

EARLY 911 BUMPER

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For a while, the bumpers of the early Porsche 911 were “reinforced” with grey cast iron. Find out why, in the best sports car in the world, we put 22 kilograms of additional weight behind the bumper.

Back in 1963 – inside and outside of the development department – people were strongly convinced that, as the successor of the 356 model, the Porsche 901 would be a great step forward. The prototypes had indicated impressive driving characteristics and Helmuth Bott, as head of chassis development, had left no stone unturned in proving this supremacy to the more critically minded as well.

That is how race-experienced test engineer and journalist Paul Frère came in to make an assessment before any other journalists. He was invited to apply his expert hand to driving the 901 prototypes over the test tracks of the time.

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PORSCHE CLASSIC BRINGS OUT NEW NAVIGATION RADIO FOR CLASSIC SPORTS CARS

Classic on the outside yet ultra modern on the inside: with its newly developed navigation radio Porsche is responding to the growing demand for a built-in device for classic sports cars.

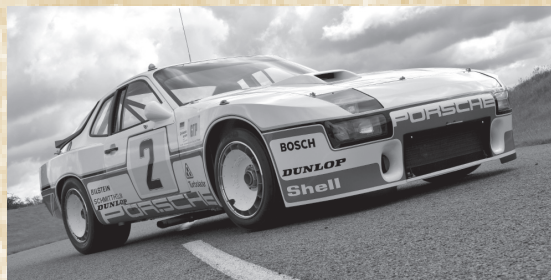
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4 PORSCHE CLASSIC PARTNERS FROM THE UK ARE RESTORING A 924 CARRERA GTP

In cooperation with the Porsche Museum and the Porsche Archive, the British Porsche Classic Partners are demonstrating a completely new form of collaboration between individual specialists with the restoration of the 924 Carrera GTP Le Mans works race car “002”.

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ANYONE WHO OWNS AN HISTORIC PORSCHE IS IN THE BEST HANDS WITH PORSCHE CLASSIC

Anyone who owns a classic Porsche – and according to the plant definition, that’s every one of its series-produced cars that were introduced over ten years ago – places the greatest importance on maintaining its performance and value. So it is essential to receive specialist care, and have maintenance and repair work carried out professionally and, above all, with genuine parts and for restoration work to be performed with great love and enthusiasm.

Today, the range of classic Porsche cars includes the 356, 914, all air-cooled 911 models, from the F-model to the 993, the 959, transaxle models 924, 944, 928 and 968 and the Boxster 986 as well as the first water-cooled 911, the 996 series. And a new addition this year is the Carrera GT super sports car. An essential contribution to the maintenance of all of these precious Porsche classics is made by the production and supply of Porsche Classic Genuine Parts.

Porsche Classic has more than 52,000 spare parts items in their modern warehouse ready to be sent through the worldwide Porsche sales network direct-

ly to the Porsche Centres. Porsche Classic obtains the genuine parts from former series suppliers or look for new sources of supply. The work is always based on original drawings, detailed descriptions, an extensive stock of sample parts and, not least, the expertise of our employees. This ensures that the Porsche standard of technology, safety and quality is always met – even with new parts editions.

With around 300 new parts editions every year, Porsche Classic is constantly endeavouring to close the gaps in the spare parts range. This means extensive commitment to one thing: driving.

The latest information on new editions, highlights and accessories can be found at www.porsche.com/classic – just click on your model. You will also find a collection of original colour charts for classic Porsche cars. You can also play an important part in the product origination process by means of a feedback form on the availability of Porsche Classic Genuine Parts on the Porsche Classic homepage. ■

PORSCHE SHOWCASES “CAR OF THE FUTURE” AT EARLS COURT MOTOR SHOW

Get your sneak preview



Two lumps the stories say: two cast nuggets, together weighing 22 kilograms, solved the problem



The driving characteristics of the 901 prototypes were impressive. The first series-produced cars however responded viciously and were prone to oversteering.

The development centre in Weissach had not yet been built. In those days they used to say “we’re driving to Gäu“, when the area between Bissingen and Sinsheim was temporarily disturbed by test drives being performed in public. Or they would drive the “old route“, an assortment of peripheral roads around the Black Forest, sprinkled with steep inclines, which could be reached via the bumpy, much-patched A8 Autobahn from Pforzheim. The story of the “old route” goes back to the time when test drives with the first Beetle prototypes started out from the Porsche base at the Feuerbacher Heide. That was in the thirties.

So, in 1963, Le Mans winner Paul Frère, who had been a racing driver since 1948 (born 30th January 1917), came in and took part in the final set-up drives with design number 901. The new model’s change of name to the Porsche 911 was then still to come, as was the world premiere of the new Porsche at the IAA in Frankfurt in 1963. Experts Helmuth Bott, Herbert Linge and Paul Frère all completely agreed: the driving characteristics of the new prototypes cast the 901 as a real sensation. The sales department still had no idea about the power of words that would be applied by the future marketing generation and wrote honestly: “The comfortable car for sport and travel.”

Paul Frère, in his knowledgeable way, agreed with the copywriters: “The new 901 has a much softer suspension than its predecessor the 356 and lets you travel faster very comfortably.” Only later did the first series-produced models, built after the world premiere at the Frankfurt show, arrive on the scene. It was a shock for the new company when Helmuth Bott sent his letter to the board strongly criticising the first series-produced vehicles. They differed from the impressive handling of the prototypes all too clearly: “The first series-produced cars respond too viciously to steering corrections and oversteer. The front axle has obviously been incorrectly set up.”

The engineers promptly got to work, which quickly turned into a very comprehensive analysis of the chassis data. It was good to have seasoned professionals like Herbert Linge and Paul Frère on the team. In some cars, the handling problem went so

far, that, whenever a load change occurred, they veered slightly off track even on the straight. And, when cornering at speed, a load change resulted in such a dramatic change in handling, from understeer to oversteer, that many a test driver recommended that “it would be better if the new Porsche had to have a weapons licence.”

Of course customer complaints were quickly pouring into the plant as well because the models in the first series were conspicuously inconsistent to drive. They sometimes took right- and left-hand bends in critically different ways, always much too far on the sensitive side. The 911 test cars were partly under control, but these were quasi-special editions which needed hours of adjustment and had to be checked time and time again to ensure they were behaving properly. With series-produced cars, the same amount of attention was simply inconceivable. The engineers working with Helmuth Bott therefore hit upon a recipe from basic physics. More mass around the vertical axis has a calming effect on spin, just as the gyroscopic principle states. We therefore came to a surprisingly simple solution, the idea of putting weights in the bumpers.

It was really simple because it was a trick that could be used here and it could be quickly applied to a lot of cars. They started off with test drives, in which lead weights applied far forward in the vehicle had a much greater effect than expected.

The calming effect was really amazing when the lead weights were mounted right out on the front bumper. Only of course, you couldn’t appear in public with a car looking like this. After night-time test drives, the drivers came back into the factory at daybreak with tired faces and good news: “It looks awful but it helps.” At the same time it was clear that the weights had to be placed extremely far out on the vehicle.

Test experts Herbert Linge and Paul Frère were practically enthusing as soon as the lead weights were mounted right out at the front of the 911, so well did this measure work. Only, in those days, lead was a material that should not be used in production for reasons of compatibility. On the other hand, grey cast iron, although not much lighter, was much more fitting. And the important thing was that a series of bumper corners, each one filled out from the horns with 11 kilograms of heavy iron, when tested, proved just as effective as the lead filling used previously.



The solution was given the almost innocent-sounding pseudonym of “bumper reinforcement”

While the experts were still discussing whether the cause was to be found in the change of wheel load or the increased moment of inertia around the vertical axis, the first crates of grey cast iron bumper fillings, each weighing 11 kg, were rolling into the spare parts warehouse. The official component description for part numbers 90150591120 and 90150591220 was “bumper reinforcement”. Any customers who came into their garage to complain – in addition to a very careful adjustment of the axle geometry – quite often had these two “reinforcements” bolted to their car, neatly disguised behind the actual bumper of course. The success was astonishing, the effect almost resounding. The 911 with the grey cast iron reinforcements held the road and cornered much better than before.

The real cause was found almost at the same time unexpectedly in the form of a badly designed steering bearing beneath the suspension strut which, under the influence of swelling plastic, was able to interfere very negatively with the harmony of the fine steering movements. The problem was, however, not only identified but soon after remedied, tested and cleared. Its more smooth-running successor from Boge-Fertigung went quickly into production. And, in a very short time, even cars that were with customers and had been initially fitted with “reinforced bumpers” could be invited back into the workshops to be promptly returned, 22 kilograms lighter, to their proud owners – in quite a lot of cases without them having found out too much about the addition and removal.

Bumpers for the original models of the 911 series still exist today however, for a start for the 911 era from model year 1965. Porsche Classic supplies solid quality without any separate grey cast iron filling. The bumper today weighs no more than two kilograms and is made from 1.2-millimetre deep drawn sheet steel with cut-outs and sealing caps for the openings for the fog lights. Paul Frère died a few years ago but told us the story of the lumps of cast iron in great detail in his book “The 911 Story”. And he provides an intimate account of the relief we all felt when the “infernal cast iron weights” (as Helmuth Bott kept calling his unpopular solution) were finally thrown on the scrap heap of history, “where, in my opinion, they should have been from the start,” said Paul Frère in a quiet moment at that time. ■





Time for an oil change The Porsche Classic Motoroil



Porsche Classic is launching its own engine oil for air-cooled flat-four and flat-six engines: the Porsche Classic Motoroil. And if it says Porsche on the label, then you can be sure that there is Porsche inside.

In collaboration with the Porsche Development Centre in Weissach, the engine oil has been developed by the Porsche Classic experts with the specific aim of meeting the demands of the 356 and 911 models, including the 993 model range. Its operating behaviour and lubricating properties were put to the test in extensive laboratory-based tests and practical trials.

The Porsche Classic Motoroil oil comes in two different versions: 20W-50 for all 356, 914 and 911 models up to the 2.7-litre G model and 10W-60 for flatsix engines from a displacement of 3.0 litres up to the 911 (type 993).

For example, the thermal load is higher than in water-cooled units, which means that the engine oil has to work harder to cool the engine down.

The larger oil volume firstly entails a longer oil heating time, and secondly calls for optimum cold running behaviour. The traditionally high power output per litre of the engines also results in high compression and high pressures. Together with the different temperature zones which are characteristic of air-cooled engines, this means that the oil

needs a high “hidden” performance reserve. A compact and lightweight engine design means that the connecting rods will be short in relation to the piston stroke, which in turn means high lateral piston forces and correspondingly high demands on the lubricating film stability of the oil. In short, the older flat engines in particular can’t just use any old oil.

The development of an engine oil for classic air-cooled flat engines has therefore been something akin to a balancing act between tradition and innovation: as advanced as possible and as traditional as necessary.

Although modern oils are better from a technical point of view, this is not the case when it comes to classic air-cooled flat engines.

For example, the low viscosity of a 0W-30 oil means optimum cold-start behaviour, low engine resistance and other benefits in modern engines. In a 356, however, an oil of this kind can result in leaks and increased oil consumption due to the engine’s higher production tolerances and lower oil pressure during operation. Modern oils also use highly efficient detergent / dispersant agents to thoroughly clean the engine and reliably remove dirt, which can be too

much of a good thing for a classic Porsche engine.

It is true that additional deposits should be prevented and oil-soluble contaminants such as soot, water and dust kept suspended until they are drained off through the oil filter or removed during the next oil change.

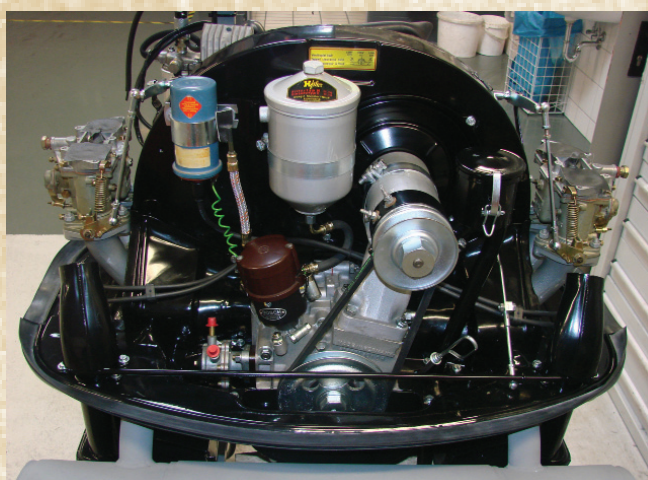
At the same time it is important that the deposits which have built up over decades are not suddenly dissolved and that seals are not corroded. Since not every classic Porsche is in everyday use, the engine oil also had to meet other demands: classic vehicles are often left stationary for long periods of time and only moved intermittently and for short journeys, which means that condensation can form in the oil if the engine does not heat up fully.

Aggressive combustion residues can cause acidification of the oil fill, resulting in the corrosion of engine components. The alloys, metals and sealing materials which were used at the time are at particular risk. Porsche therefore paid particular attention to this aspect when developing its Porsche Classic Motoroil. The special formulation incorporates a high alkaline reserve, which neutralises any acids that may form.

Additional corrosion inhibitors also protect vulnerable components, even during longer stationary periods. ■

The engine – getting the heart revved up

There’s nothing more important to us than the heart of a Porsche – the engine. That’s why we treat it with the utmost care when restoring it at Porsche Classic. Some things are a complete one-off. They are unique, individual and of considerable importance. At the core of the work carried out on the engine of a Porsche 356 Speedster was the task of restoring it to its original condition. In order to do so, Porsche Classic disassembled the entire engine. The crankshaft, camshaft, crankcase and other individual parts were examined, measured and exchanged where necessary. Investigations revealed that the pistons and cylinders had reached their wear limit and had to be replaced with new ones. After being refurbished, the cylinder heads were ready for use again. In addition, the experts used new bearings, gasket sets



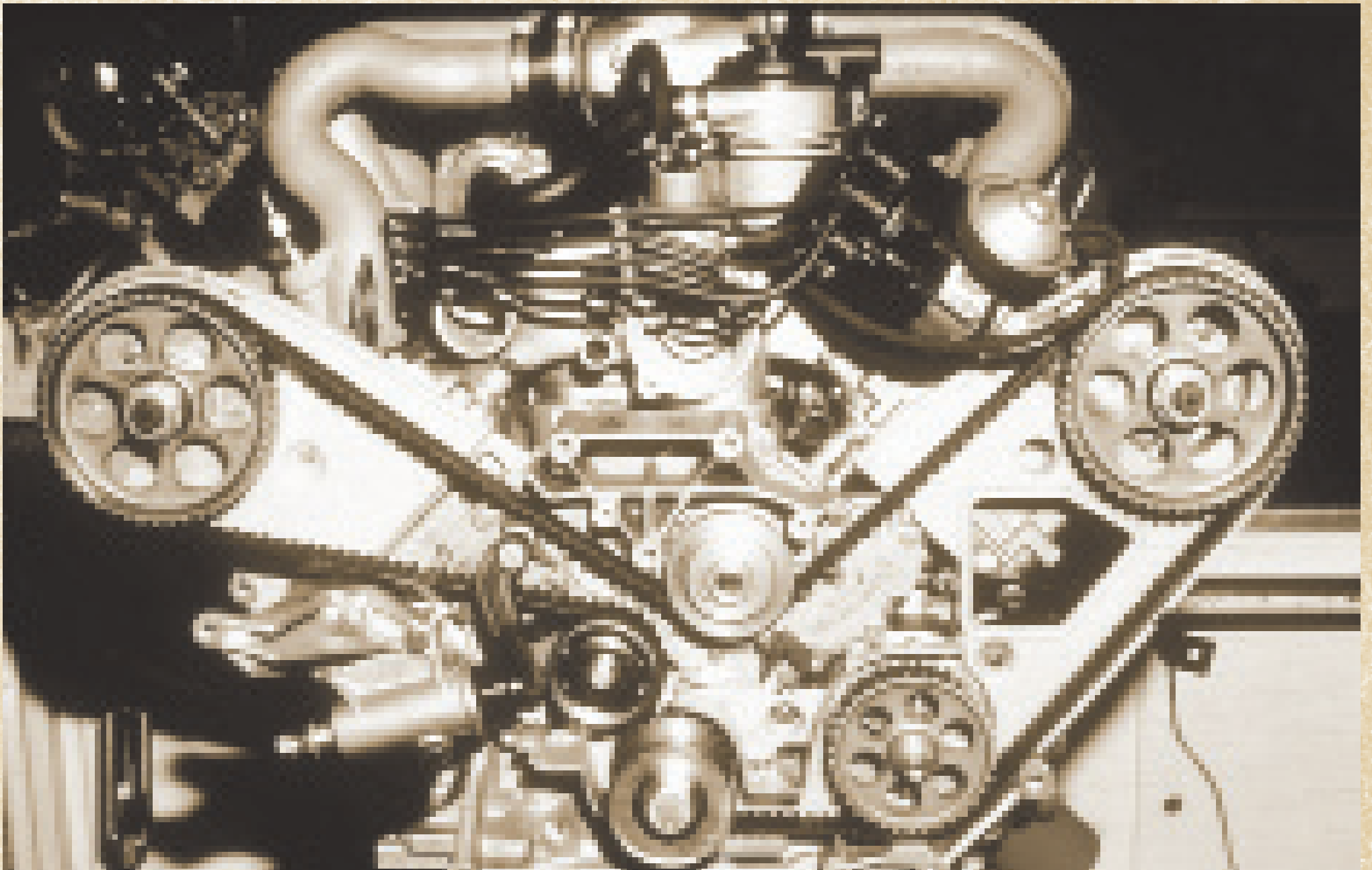
and piston rings, for example, when rebuilding the engine.

In addition to the work Porsche Classic carried out on the engine mechanics, they also restored the engine to its original state visually. For this purpose, all of the sheet metal parts were stripped of paint and powder coated, and many smaller parts and bolts were galvanised.

An in-depth overhaul of the fuel system will ensure an optimum fuel supply. The carefully re-engineered carburetors provide the right air/fuel mixture in the combustion chamber, while the ignition system with new ignition cables, refurbished ignition distributor and new spark coil will help to get the 356 Speedster started. ■

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A timing belt to drive the camshaft – then as now, a vital original spare part



Quiet running, small contact angle and resistant to high engine speeds; these are the benefits of the camshaft being driven by a timing belt, with which, a good four decades ago, the Porsche 924 marked the beginning of the Porsche transaxle series.

When Porsche AG introduces the 924 model to the world press at the French La Grande Motte in November 1975 the experts were astounded. After all, the new Porsche, coming below the 911 in the model hierarchy, has nothing, either technically or visually, in common with its siblings that have been produced so far, such as the 911, 356 or 914/6. The styling of the bodyshell designed by Harm Lagaaay, with lowering main headlights, is quite new, determined largely by aerodynamic qualities. Originally developed for Volkswagen under type code EA 425 in 1970 as the successor to the 914, however, the sports car ultimately ended up in the Porsche model range and, since autumn 1975, was built at Audi in Neckarsulm.

But even more impressive than an extremely streamlined outer skin with a drag factor of only 0.34, is the drive technology of this new Porsche sports car. Unlike all previous Porsche vehicles since 1948, the 924 has a longitu-

dinally mounted four-cylinder in-series engine at the front, and is fluid-cooled. What's more, a good weight distribution, appropriate for a sports car, is ensured by the transaxle principle which places the four or five-speed or automatic gearbox on the rear axle and connects it to the engine and clutch at the front via a rigid transaxle pipe.

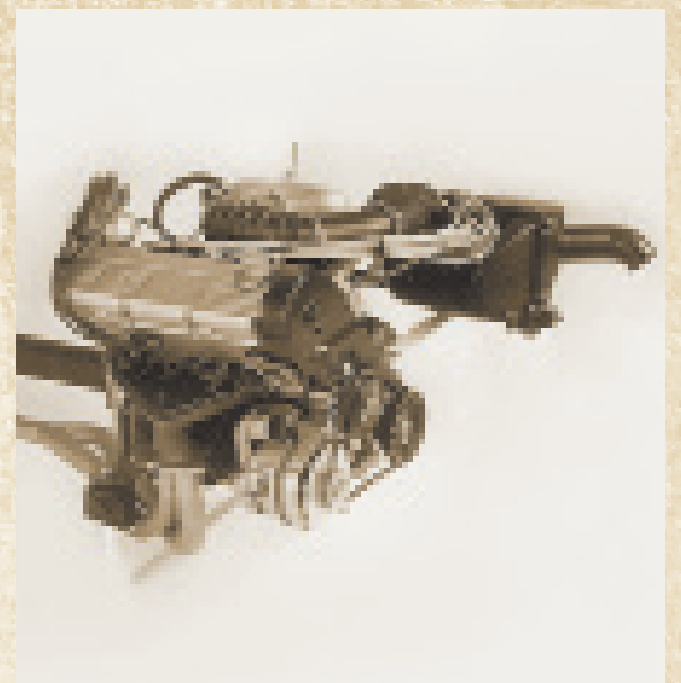
The 924 is the first Porsche to have a timing belt to drive the camshaft

From a displacement of 1,984 cc, the four-cylinder engine develops 125 hp at 5,800 rpm, accelerates the car, which weighs only 1,080 kg, from 0 to 100 km/h in 9.9 seconds and enables a top speed of 200 kilometres an hour. The engine is based on the Audi 100, but has been refined for use in the Porsche 924, for instance by using the K-Jetronic fuel injection system from Bosch. Moreover, this four-cylinder engine is also the first Porsche engine ever to have a timing belt instead of a timing chain to drive the overhead camshaft. This drive belt combines the properties of a traditional chain with those of a flat belt.

Made from rubber, plastic and reinforced with glass and aramide fibre (Kevlar), which is extremely resistant to tear in the direction of pull, this belt has fabric-reinforced formed teeth on the inside which engage in the positive fit drive wheels on the crankshaft and camshaft. The advan-

tages of this new kind of timing belt are that, compared to a roller or toothed chain, it runs much more quietly and, because of its low mass, it is also particularly well suited for high engine speeds.

Plus the fact that the timing belt works without lubrication, unlike chain drives it requires no lubricating oil and is easily accessible from the top for maintenance work and

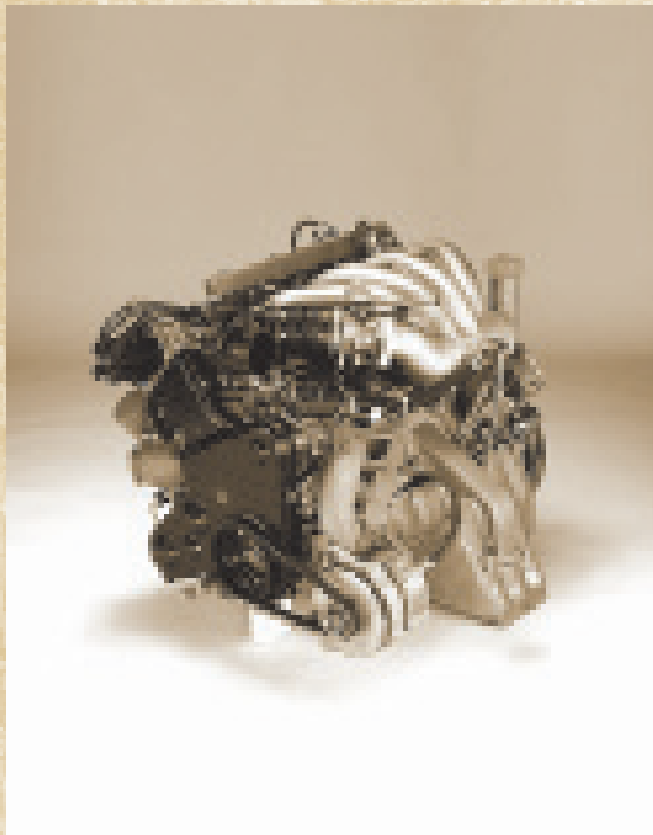


inspection. And, from the engine designer's point of view, thanks to the smaller angle of contact, it also enables a more compact construction and, in a lot of engine designs, it can use spring-loaded tensioning rollers instead of expensive, oil pressure activated chain tensioners. Last but not least, it undergoes only very slight elongation over the whole of its service life, therefore ensuring precise valve opening times over a long period of time.

It is crucially important for the service life of the timing belt, and therefore the engine, for the tension to be correct. During servicing, this is tested in the 924 by the mechanic turning the tensioning roller to the left and, with thumb and index finger, ensuring that the timing belt can turn exactly another 90 degrees in the centre between camshaft and crankshaft. There is also the visual inspection. A check which must never be overlooked because the timing belt determines how great and good the engine is. If it should tear while in operation, major engine damage with bent valves and damaged pistons will be the expensive consequence. For this sole reason, Porsche Classic places the greatest importance on ensuring that the highest quality timing belt, belt wheels and tensioning rollers remain available for the corresponding engines. So that even a transaxle Porsche like the 924, for example, will always run reliably.

What starts at the end of 1975 as a way of driving the camshaft, over the next two decades, becomes the accepted thing in other Porsche models. The next engine in which the timing belt is used for the drive is the 928, presented at the Geneva Motor Show in March 1977 as the “great new sports car from Porsche”. Like the 924, its drive concept follows the transaxle principle, with the engine installed at the front, but with the gearbox on the rear axle.

While the 924 rounds off the bottom of the Porsche model range hierarchy, the 928 is placed in exactly the opposite direction, With more space than the 911, an unusual design and a 240-hp V8 engine with 4,474 cubic centimetre displacement and 90-degree bank angle, it now takes on the role of the “Gran Turismo” at Porsche – the sports car that expertly combines great agility, exciting dynamics and the best possible capacity for touring with a high level of comfort.



The 1,450 kg 928 comes with either a five-speed gearbox or, by special request, a three-speed automatic gearbox. So the 928 sprints from zero to one hundred kph in 6.8 or 8.0 seconds and reaches top speeds of 230 and 225 kph respectively.

Like the whole of the vehicle, the V8 engine in the 928 is a completely new design. Engine housing and cylinder heads are made from light alloy material and the two valves in each combustion chamber are actuated with bucket tappets with hydraulic valve play compensation directly by an overhead camshaft for each cylinder bank.

As in the 924, the two camshafts are driven by a timing belt, which in the 928, simply because of the V-type engine construction and its one-piece design, has an impressive overall length. The spacing of the teeth is 9.525 millimetres. Because of the long total length and also the overall much larger engine dimensions, the drive, with continuous timing belt in the 928 has a total of six belt wheels and, as well as driving the two camshafts it also drives the water pump and the oil pump. In addition to a stabilising roller, an innovative tensioning roller with spring-loaded tensioning mechanism is used here. The latter has eight (later to become seven) bi-metallic plates which expand as the engine temperature increases so that the tension of the timing belt is automatically adjusted as the engine block expands under heat. For the 1983 Model Year, this tensioning mechanism is optimised by giving it a hydraulic damping system. The profile and the before the shape of the teeth is also altered at this time. There is a change to the so-called HTD profile (Heavy torque Drive) which has already proven itself in the Porsche 944.

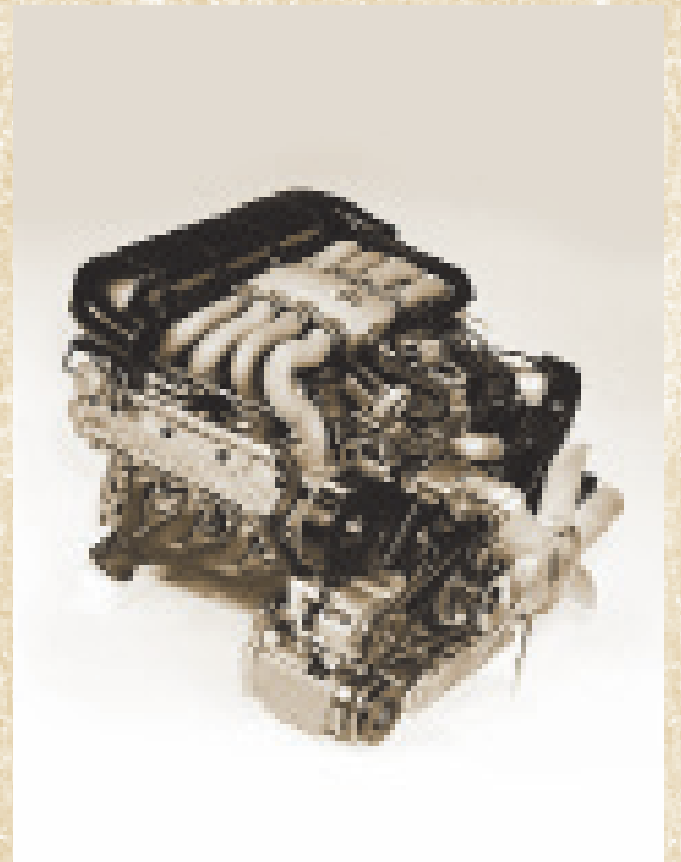
The 944 is the third example that Porsche designed according to the transaxle principle and is presented to the public in autumn 1981. It is based on the 924 and is considered as the model that comes between the 924 and the 911 SC. It differs from the 924, from the point of view of appearance only, with its flared wings, the wider track and overall more sporty appearance. However, the most striking difference from the 924 is its engine. Like the 924, it does have four cylinders, but in this case it is a thoroughbred Porsche design with all kinds of technical refinements – and again the timing belt for the non-positive connection between the crankshaft and the overhead camshaft which, in turn actuates two valves per combustion chamber directly via hydraulic bucket tappets. The basic dimensions of cylinder block and cylinder head are the same as the V8 engine in the 928.

Nevertheless, in the 163-hp, 2.5-litre engine of the 944, the timing belt is given yet another task, calling for a particular interpretation of the belt drive. For the greatest running performance, the engine has two height-offset balance shafts to balance the constantly changing forces of inertia and alternating torque values that occur.

Because of the design, secondary vibrations occur in the direction of the cylinders and also in the crankshaft's direction of rotation due to the oscillating movements of pistons, piston pins and connecting rods. Neither can be balanced, by compensating weights on the crankshaft or by balancing the camshaft flywheel. The 944 engine counters these undesired oscillations – which can be felt as vibrations by the driver – with two differential shafts which produce corresponding counter-oscillation, thereby greatly reducing the occurrence of oscillation.

In the power plant that is made almost entirely of light alloy material, the differential shafts – in the technical jargon of the engine builders, the so-called Lanchester balancer with height offset – serve to reduce the vibration level by about 20 dB and therefore ensure exemplary running. They too are driven by a timing belt which is driven by the outer belt wheel on the crankshaft and therefore, for the first time in a Porsche engine has teeth on both sides.

In addition to a tensioning roller, a starter roller and the two differential shaft wheels and the crankshaft wheel



determine the rolling path of this timing belt. A second timing belt, with teeth on one side, drives the camshaft and water pump via the crankshaft and camshaft wheel and a tensioning and stabilising roller. In the 944 engine, the differential shaft timing belt can apply its full design advantages and speeds of 12,000 rpm and more can be reached here because the two shafts rotate at twice the crankshaft speed.

The timing belt drives of the first generations of the 924 928 and 944 engines are the forerunners of all subsequent drives in the Porsche transaxle era. The 924 Turbo and 924 Carrera GT have the same timing belt drive as the 924 while – apart from some slight changes – the 924 S, introduced in autumn 1985, has the engine technology of the 944. The 944 Turbo is also based on this concept.

The 968 marked the high point of transaxle development

Even when four-valve technology, and therefore the use of two overhead camshafts, appeared in the 944 and 928 series, nothing was changed in this successful basic design. The 928 S4, 928 GT and 928 GTS rely on the established timing belt drive just as much as the 944 S and 944 S2, in which the displacement has now risen to 2.7 and 3.0 litres respectively. The end is finally marked by the 968 series, based on the 944 concept. In the 968, the refined four-cylinder flat engine from the 944 S2 now delivers 240 hp. And with a torque of 305 Nm at 4,100 rpm, its maximum torque is higher than any other series-produced naturally aspirated engines of this capacity. Added to this is the variable camshaft adjustment system, VarioCam which, by creating a variable overlap of the valve control times in the 1,500 to 5,000 rpm range, provides it a particularly generous power and torque characteristic.

Today, exactly 40 years after the timing belt drive made its debut in Porsche vehicles, and a good 20 years after production of the transaxle concept ended, we can look back on more than 325,000 specimens built of the 924, 944 and 968 series and more than 61,000 units of the type 928.

Today, they are all classics with a great technical past for which Porsche Classic, with the original components of the timing belt drives, has provided all of the prerequisites to ensure a continuing long (engine) life. Customers are, of course, responsible for ensuring the crucial replacement interval is scrupulously observed. Competent specialists will be pleased to do everything else. At the Porsche Classic Partner, in the nearest Porsche Centre or in the Porsche Service Centre. ■

Porsche Classic develops dedicated car care range

New shine for classic sports cars



Leather bag - classic Pepita pattern



Owners of classic Porsche sports cars attach the greatest of importance to preserving their vehicles original condition. Porsche Classic has therefore put together a car care kit that has been developed specifically for the characteristics of earlier paints, softtop fabrics and other materials.

The total of 17 products and implements cover the full gamut of exterior care.

These include shampoo and cleaning clay for stubborn grime, polish and hard wax, synthetic materials cleaner and acid-free wheel rim cleaner. Also included are the appropriate sponges, cloths and brushes for each.

Every product has been tested in the Porsche development centre in Weissach for compatibility with the relevant materials, with tests run both in the lab and in practical application.

The car care kit is available in an appropriately configured leather bag featuring the classic Pepita pattern. In Great Britain it costs £396, inclusive of value added tax. ■



It is back

Porsche Classic is reproducing the dashboard for vintage 911 models from years 1969 to 1975. A sophisticated manufacturing process combines high quality meeting today's standards and a design that is true to the original. The new dashboard consists of a modern substructure and the original surface design.

The fluted texture, tactile feel, gloss and shade of black are designed to be as close as possible to the original. The new part is now available to be ordered from any autho-

ritized Porsche Classic Partner or Porsche Centre.

Like the technical equipment, the classic vehicles' interiors are subject to normal wear. Solar radiation as well as fluctuations in temperature and humidity attack the surface and materials over time.

Today's materials hold up better; therefore, to help preserve the long-term value of classic Porsche cars, Porsche Classic reengineered the dashboard.

Extensive tests conducted to modern standards assure precision fit and quality. As an original equipment part, the dashboard, which contains the loudspeaker cover, can only be installed by the original assembly procedure – which involves removing the windshield. This is why Porsche Classic recommends the replacement be performed by authorized Porsche dealer partners who have trained experts. The dashboard is available for £802.18 including VAT. ■

True-to-style upgrade device with state-of-the-art technology

Porsche Classic brings out navigation radio for classic sports cars

Classic on the outside yet ultra modern on the inside: with its newly developed navigation radio Porsche is responding to the growing demand for a built-in device for classic sports cars. The purpose-built unit combines the style of yesteryear with the benefits of modern technology. It fits perfectly into the DIN-1 slot that has been used in the sports cars for decades and is operated by means of two knobs, six discreetly integrated buttons and a touchsensitive 3.5-inch display. Thanks to the appearance of the black surface and the shape of the knobs, which are supplied in two authentically styled versions as standard, the navigation radio blends harmoniously into the dashboard of classic Porsche models. It bears the Porsche lettering and is suitable for the sports car generations between the first 911 from the 1960s and the last of the 911 series with air cooling from the mid 1990s (993 series), including the earlier front-engine and mid-engine models.

The new navigation radio comes with all the key features of today's systems. In addition to low-interference radio reception and precise navigation, it has interfaces for a variety of external music sources that can be controlled from the display. A smartphone can be connected via Bluetooth. In addition, the classic radio not only has a built-in microphone but also comes with an external microphone. The integrated amplifier delivers 4x45 watts and can be connected either directly to the loudspeakers or to the original sound system using an optional adapter cable.

Exclusively developed and adapted for classic Porsche sports cars the new navigation radio has been exclusively developed for Porsche Classic and specially for the classic sports cars. Radio reception, for instance, has been optimised for the built-in aerial supplied ex-works, which is generally only a single telescope. The operating concept of the device is based on Porsche Communication Management (PCM) and has undergone extensive testing at the Technical University in Munich to verify its user friendliness. Numerous trial journeys have been undertaken in Europe to test the country-specific navigation. Drivers have a choice of arrows and two-dimensional or three-dimensional maps to display the route. The maps are stored on a microSD card with eight gigabytes of memory and are updated regularly. The new navigation radio is available immediately from Porsche Classic Partners or Porsche Centres and costs £910 including VAT. ■



993 343 041 40

Shock absorbers for the Porsche 993 ... as if upside down

The shock absorbers installed as standard for the particular chassis of the Porsche 993 were no longer available. Modern technology for a new generation of shock absorbers had made a new factory approval possible. Result: with new shock absorbers from Porsche Classic, the almost 20-year-old Porsche 993 holds the road and drives better than ever.

With new shock absorber technology, better than ever Waldi Hoffmann performs his magic at the wheel and with a steady hand controls the incipient tendency to oversteer which his silver test car is just starting to display. On the slightly slippery track, he steps hard on the gas pedal and forces the Porsche 993 through the hanging right-hand corner known as the “Aremberg”. This lies between the Schwedenkreuz and Fuchsröhre on the Nürburgring, the most difficult test track in the world. Waldi Hoffmann has been driving here for 25 years and has not forgotten to pay the tricky route the respect it deserves: “What proves itself on the Ring will work anywhere in the world.”

Waldi Hoffmann is a Porsche test engineer from the thoroughbred dynasty of those who have, for decades, given every Porsche “the run”. Yet, he is currently really happy with how his Porsche is holding the road and, on leaving the critical bend section, dictates “That makes the 993 today better than ever before. The shock absorbers respond more subtly, traction is noticeably increased and when the suspension changes, the movements of the body remain milder and therefore better controlled than with the standard suspension. And today’s latest tyres provide a lot more grip than ever before.”

The test car is nearly 20 years old. The new shock absorbers have upside-down technology in the front struts and thus shape the characteristics of a well-established car for which spare parts were threatening to run out. Which is why the classic car is undergoing a brand new acceptance test of the highest level: anything new that comes on board gets tested. Waldi Hoffmann: “We work out the whole set-up just as elaborately as for a new car. In the end, the classic Porsche cars should be extremely fast and very safe to handle, just like the new cars.”

Trying to set up full reproduction for the road-worthy models was not that easy given that the former manufacturer had stopped producing the shock absorber valve bodies for the standard shock absorbers. Rescue came from the shock absorber experts at Bilstein, who used to be involved in equipping the 993 series at Porsche back in the 90s. In those days, their delivery list included the dynamically tuned RS models, which were still equipped with twin-tube gas pressure shock absorbers, and so they were bringing their highly technical rituals from proven experience in different racing applications onto the road.

To make the distinction, a mono-tube shock absorber is the design that is typically used in racing, generally with high gas pressure (up to 35 bar) inside, which very consistently helps reduce the tendency of shock absorber oil to produce foam under high shock absorber loads. The inside of the shock absorber is separated from the airflow beneath the car by just one steel tube approximately two millimetres thick, and is therefore optimally cooled. In the other design, the contemporary twin-tube shock absorber provides a double steel wall in the same place because of the concentrically positioned tubes. In this case, the transfer of heat from the



inside to the outside of the shock absorber is relatively slower. The principle is the same as in a thermos flask, the contents of which do not cool down as quickly as in a normal container. For the coffee and its temperature, the high temperature inside the thermos flask is an advantage. In the case of shock absorber oil, which works better when cooled, exactly the opposite applies. As was learned on the roads between Sebring and Le Mans and, as is customary at Porsche, the lesson flowed cautiously over the years from racing to series-production.

Twin-tube shock absorbers are less expensive and prove to be excellent in everyday use – the preferred choice off the racetrack, which is also the normal situation for the majority of cars. The art of tuning was also successful in the case of the Porsche 993, which was the second model after the 964 to have its suspension design include gas pressure shock absorber struts with coil springs on the outside. This design had already proven itself previously, while the Porsche 911 was still making do with horizontal torsion front and rear for both axles, at first in racing applications. The advantage of a torsion bar – its relatively compact design – was gradually out-weighed by the disadvantage of torsion bars only operating linearly and not being able to offer progressive tuning. As the first models in the 911 series, the Porsche 964 and 993 series had progressively wound coil springs in the suspension. The 993 actually has a separate cradle at the front and rear and was considered the most comfortable Porsche of all time, without therefore having had to make any concessions to sports performance. Earlier, when the 993 model came off the production line in Zuffenhausen, equipping it was divided between the two manufacturers Monroe and Bilstein, with Bilstein providing gas pressure shock absorbers for the RS sport model while Monroe dealt with the standard equipment for all other models. Specifically, the 993 Turbo model had a special set-up which took account of the higher engine power, with a 20 mm lower suspension configuration

Incidentally, Porsche option code M030, corresponding to a sports calibration for 993 Carrera models, was very popular. Here, the shock absorbers and suspension of the turbo version were also used in the normal Porsche 993. The skilful tuning, where the harder springs of the Turbo system were combined with the proportionally stiffer shock absorbers was thus safeguarded. The M030 system therefore provided the turbo suspension in the normal Porsche 993 – and is highly esteemed by many customers. A combination of the two sets was represented by the so-called factory lowering kit which was offered under the abbreviation M033: in this case, the standard shock absorbers were quasi-crossed with the shorter and harder springs of the turbo variants.

Once shock absorber expert, Bilstein, had converted the technology for the new front axle set-up to upside-down technology, together with mono-tube gas pressure shock absorbers, the basic characteristic for both suspension versions was immediately inspiring. The engineers in the Porsche test drive practically had to be held back from boosting the 993 into the rocket age with the new technology. Waldi Hoffmann explains, “We concentrated on keeping to the basic charac-

teristic of the tried and tested model. For all its sportiness, in those days, the 993 was a very comfortable model and it had to stay that way.”

Because the new technology is able to clear large valve cross sections in the shock absorber in a particularly quick and well measured way, the new 993 shock absorber set-up with the standard tuning works even more subtly and precisely than before. According to Waldi Hoffmann, “you can feel it, especially when there are horizontal joints in the road, as are particularly typical of US highways. On these kind of joints, the 993 is now felt to be much smoother, and there is a lot less vibration. The new set-up drives relatively softer and more comfortably – and yet is still suitable for a visit to the racetrack where an enormously high level of driving safety is provided, right up to the limits.”

Rainer Popiol is one of the Bilstein experts who created the new technology within the set-up tests: “We made refinements which until then had been used almost exclusively in racing.” And, by the way, this is a process that runs like a red thread through Porsche history.

The Bilstein engineers provided the mono-tube gas pressure shock absorber in its conventional design at the rear but were guided by the strict Porsche specifications for the characteristics. To this end, bundles of small round steel plates, which looked a bit like wafer-thin coins, were stacked together and installed as valve bodies in the shock absorbers. However, the composition of the high-alloy spring steel grade is a secret that could provide a fitting story line for a James Bond thriller.

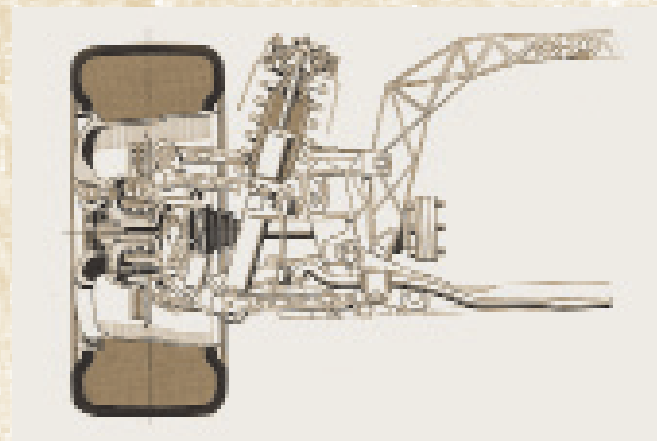
On the rear axle of the 993 there are – being used for the first time at Porsche – double wishbones driving the wheels, so that the strut does not have to take any lateral forces. The Bilstein gas pressure shock absorber is fitted in the conventional position here, with the thick chromium-plated rod at the top and the gas cushion at the bottom, as learnt from decades on the world’s racetracks.

On the front axle there is a strut design driving the 993 front wheels where, at high cornering speeds, considerable lateral forces can act on the strut – as is the case for all front axles that work according to the McPherson principle, which accounts for about 90 percent of all cars on the road worldwide. There are usually bending forces acting on the strut in corners, which increases friction for the shock absorber elements. The result is that the easiness of the spring movement is reduced, and the delicate clearance over any unevenness in the road suffers.

To remedy this in the 993, where high cornering speeds can sometimes be part of the daily use of the car, in principle the Bilstein experts simply turned their strut upside down: the piston rod now rests at the bottom of the shock absorber

And the shock absorber cartridge in the working cylinder, which also contains the gas cushion, operating at a pressure of up to 35 bar, protrudes at the top. The company’s uncompromising sports models have had this principle since it was introduced in 1996 for the Porsche 993 GT2. And in the case of retro-fitting, it has been taken to new heights by Bilstein for new and old Porsche models.

A quite marginal aspect of the new development is the long service life of this kind of mono-tube shock absorber: because there are special slide bearings with clever constant lubrication inside the shock absorbers, a shock absorber practically doesn’t get old any more. The desirable side effect is that anyone who changes their 20-year-old Porsche to the new generation of shock absorbers should not have to worry about replacing them again for a long time. ■



Four Porsche Classic Partners from the UK are restoring the 924 Carrera GTP Le Mans works race car “002”

Experienced specialists and trainees are working hand in hand to pass on their skills to the next generation.

In cooperation with the Porsche Museum and the Porsche Archive, the British Porsche Classic Partners demonstrated a completely new form of collaboration between individual specialists with the restoration of the Le Mans Porsche 924 Carrera GTP 002.

This is the first time ever that responsibility for the restoration of a historically significant Porsche works race car has been entrusted to several Porsche Classic Partners who coordinated their individual disciplines in the restoration of the car. In addition to experienced members of staff from Porsche Classic Partners in Glasgow, Hatfield, Leeds and Swindon, trainees from those Partners have also been included in the project so that passion, capabilities and skills can be passed on to the next generation of Porsche Classic specialists.

Once completed, the 924 Carrera GTP 002 – with its original finish maintained as sympathetically and authentically as possible, but completely revised from a technical point of view – had been presented at the main classic car events in Europe as testimony to the exceptional sporting capabilities of the Porsche transaxle models.

Forty years after the presentation of the first transaxle model, it made sense to choose a 924 for this project.

Of course, not just any 924, but one of the three works race cars that were at the start in Le Mans in 1980. Introduced at the end of 1979 as an internal development project, the race department in Weissach, under project code ‘937’, was to transform three series 924 Carrera GT cars, at reasonable expense, into high performance race cars for the prototype class in Le Mans. Modifications to the series-produced body, suspension and engine finally ensured that, a few months after the project began, three simple series 924s had

become competitive 924 GTP prototypes which, on 14 June 1980, were racing on the Circuit de la Sarthe. At the end, the 924 GTP cars took 6th, 12th and 13th place in the overall placings.

At the suggestion of Porsche Cars Great Britain, the three race cars were driven at the time by teams from Germany, England and the USA and had the corresponding national flags painted on the engine hood.

The Porsche 924 GTP 002, the car now being restored, was driven by British team Tony Dron and Andy Rouse.

Since its racing experience and subsequent use in development testing it has stood undisturbed in the collection at the Porsche Museum. The fact that Porsche Classic Partners from Great Britain have now chosen to revive it is therefore only logical and is enabling the Porsche Classic Partners to demonstrate their experience and expertise in the restoration and maintenance of classic Porsche cars. ■

