

Porsche **Engineering** Magazine



Porsche engineering services

Porsche has placed its extensive knowledge at the disposal of external customers from the automotive and other branches of industry for more than seventy-five years.

Complete vehicles

The complete vehicle development has always been a strength and passion of Porsche Engineering.

Excellent design

Turning design dreams into reality for customers and for Porsche: such as the 911.

Porsche Engineering is a Porsche Group subsidiary specializing in contract development services. When contracted to support car manufacturers or original equipment suppliers, we offer design and development services, from individual components to complex

modular systems; we also take on planning and implementation of complete vehicles all the way to series production. What makes our offerings unique is our proven expertise as a volume vehicle manufacturer.

Whether you require a general automobile developer or specialized system-provider, Porsche Engineering can bring you the best of both worlds.

Editorial

Page 4



Complete Vehicle

Chassis

Testing

Engine

Insights

Seventy-five years of Porsche engineering services
Page 5

Complete vehicle competence at Porsche
Page 10

System Porsche
Page 13

From theory to confirmation
Page 16

Decades of engine power
Page 19

The entire knowledge base of Porsche Engineering converges in Weissach, Germany. Yet it is available globally. Which also means: directly on-site with you. Wherever our competence is required, it's always Porsche.

If you would like to know more about Porsche Engineering, please send an e-mail requesting our image brochure to the following address:
info@porsche-engineering.com

Special

Page 33
 Milestones in Customer Development from 1931 – 2006



Styling

Electrics & Electronics

Industrial Engineering

Drivetrain

Body and Safety

Production Engineering

The shape of the future
 Page 22

Hardware, software and system development from one source
 Page 24

Expertise from automotive development for other branches of industry
 Page 26

Accelerated power of innovation
 Page 28

Unconventional ways for body concepts
 Page 30

From designing to the start of production
 Page 32

Dear Readers,

The secret to the success of the Dr. Ing. h.c. F. Porsche AG is based on decades of experience that extends far beyond the development of sports cars. Seventy-five years ago, Ferdinand Porsche started his own independent engineering office in Stuttgart, which

managed centrally by the Porsche Engineering Group GmbH (PEG), founded in 2001 and based in Weissach. Thanks to the mature development network of Porsche, PEG can call on the services of other subsidiaries within the group. Where necessary, the resources of

The story of Porsche Engineering's success is based on decades of development experience in the automotive sector. Porsche has the reputation of being one of the world's most versatile providers of engineering services since 1931.

was to become a cradle of automobile technology. He used customer orders to develop vehicles such as the Auto Union racing car and the VW Beetle and made the name of Porsche a synonym of technical excellence. Porsche has continued the tradition established by company founder Ferdinand Porsche in 1931 up to the present day, and does not only develop sports cars, but also implements technical projects for customers around the globe.

Developing on behalf of car manufacturers, suppliers, and other industrial companies from around the world has always been an integral part of the services provided by the Porsche AG. All contract development projects worldwide are

the Porsche Research and Development Center in Weissach are available for customer development work. By networking all its locations and having a close exchange of information between its engineers, Porsche Engineering offers interface competence and across-the-board thinking for the smooth and productive management of customer projects.

The area of contract development services gives Porsche a unique position in the automobile sector. No other independent car manufacturer makes its know-how and test facilities available to external industrial customers. Porsche Engineering also supports its contractors during the entire product creation process, from the concept



Company founder Ferdinand Porsche with his son Ferry at the drawing board with a construction drawing of the Volkswagen Porsche Type 60.

phase to series production, with the customer continuing to receive customized solutions for his project.

We wish you an enjoyable read.

The Editorial Team

Seventy-five years of Porsche engineering services

Long before sports cars bearing the Porsche name caused a sensation among car enthusiasts on roads and race tracks around the world, the name of Porsche was already synonymous in specialist circles with innovation and technological competence. When Ferdinand Porsche dared to go independent on April 25, 1931 with “Dr. Ing h.c. F. Porsche GmbH, Konstruktion und Beratung für Motoren- und Fahrzeugbau” (“Dr. Ing h.c. F. Porsche GmbH, Construction and Consulting Company for Engine and Vehicle Production”), he had already many years of experience as an automotive engineer.

The young Ferdinand Porsche had already been occupied with constructing cars at the turn of the century. On behalf of the Lohner Coach Factory in Vienna, a purveyor to the Austrian Royal Family, he built cars with a combination of gasoline and electric drive – the first hybrid cars in the world. This was followed by pioneering activities such as the all-wheel drive and the four-wheel brake, which he introduced as innovations into the world of automobile production. This technical prowess did not go undiscovered: In 1906, Ferdinand Porsche was appointed Technical Director of Austro-Daimler, making



Ferdinand Porsche founded the construction office in the Kronenstraße 24 in Stuttgart in 1935.

Porsche has a long tradition of providing development services for other companies around the world. Regardless of whether these developments concern cars, motorcycles, commercial vehicles, shipping technology, or agricultural machines.



Door plate of the Dr. Ing. h.c. F. Porsche GmbH in 1931.

him responsible at the age of just 31 for the entire model range at one of Europe’s largest car makers. Following the victorious launch of his “Prinz Heinrich Car” at the race named after the prince in 1910, Porsche developed the “Sascha”, a lightweight compact car that made its international debut at the Targa Florio in 1922. Just one year later the by now well-known automotive engineer joined the Daimler-Motoren-Gesellschaft in Stuttgart. There it was above all the supercharged sports and racing cars



The Wanderer, the first contract development of Porsche (Type 7).

that continued to strengthen his reputation as a truly outstanding automotive engineer. Ferdinand Porsche left the Daimler-Benz AG in 1929 and decided to crown his career by establishing his own engineering office in December of 1930.

The pace of work initially endured by Ferdinand Porsche's team of

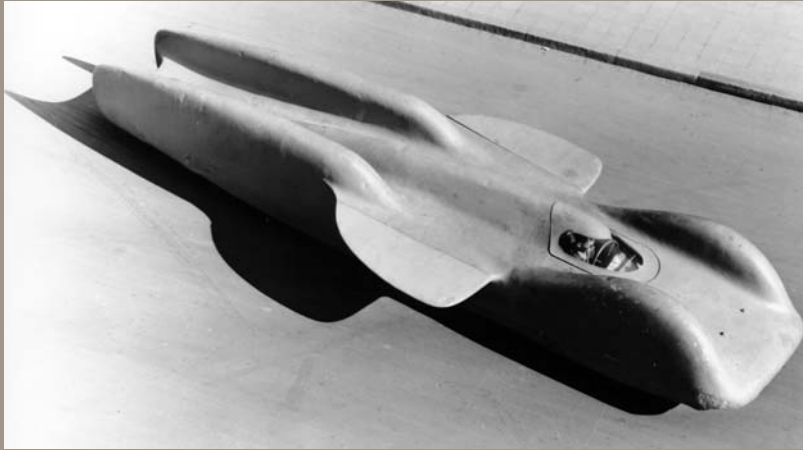
twelve people was enormous, even by today's standards. In its first year the engineering office developed a new midrange sedan and an eight-cylinder engine for the German car maker Wanderer. These projects were followed by a compact car on behalf of Zündapp, which paved the way for the later Volkswagen Beetle. Auto Union commissioned the construction and



The Porsche Type 64 is considered the ancestor of all Porsche sports cars.

development of a sixteen-cylinder racing car for the new 750 kg racing formula. The first test drives of the P racing car (the "P" stands for Porsche) were conducted as early as January 1934, and the new car wrote automobile history with its numerous racing victories and speed records.

When Ferdinand Porsche began designing an inexpensive compact car on behalf of NSU in 1933, this was already the seventh compact car he had constructed in the course of his career. With the air-cooled four-cylinder horizontally opposed engine in the rear and the Porsche torsion bar suspension on the rear axle, the prototypes already showed clear leanings towards the later Volkswagen Beetle. In June 1934, Porsche officially received the order from the "Reich Association of the German Automobile Industry" to design and build the Volkswagen or "People's Car". The first prototypes were assembled in the garage of Porsche's private villa in the north of Stuttgart in 1935. The decision to build a special Volkswagen plant was born in 1936, and Ferdinand Porsche was given the assignment to plan this new production facility. The Type 64 with its aerodynamic alloy body was created in 1938/39 for the long-distance race from Berlin to Rome. Although the start of the war prevented the Type 64



Mercedes-Benz record-breaking racing car T 80 in 1939.

from being used in motor racing, the elegantly designed coupé is the ancestor of all Porsche sports cars created since 1948.

Alongside the extensive Volkswagen project, the Porsche Engineering Office, based in Stuttgart's district Zuffenhausen since 1938, had been working on numerous other development orders. The Type 80 was a high-speed record-breaking car produced for the Daimler-Benz AG. The Type 110 compact tractor for farm use set the foundation for the subsequent "People's Tractor" and the Porsche diesel tractor built after World War II.



Workshop cabin of the Porsche factory in Gmünd/Carinthia (1944).

drive. The Porsche Engineering Office was also requested by the Armament Authority of the German Army to develop tanks, but these saw limited regular use in the war, due to technical problems and material bottlenecks.

Following the war, the Porsche Engineering Office, which had moved to the Austrian town of Gmünd in Carinthia in 1944, competed again for new orders from



Porsche Type 60 (V3) at the exit of the Porsche-Villa in Stuttgart-Feuerbach around 1936.

Following the outbreak of war in 1939, further models based on the Volkswagen were intended for military use. The company re-established later in 1937 as Porsche KG now mainly developed off-road vehicles such as the VW "Kübelwagen" jeep and the VW "Schwimmwagen" amphibian car fitted with all-wheel

the automotive industry. To begin with, however, the company was only able to develop water turbines, cable winches, ski-lifts, mowing rods, and various agricultural tractors that were now marketed for the first time under the name of Porsche. In 1946 the Italian company Cisitalia entrusted Porsche KG,



Ferdinand Porsche at the drawing board of the Porsche Engineering Office in the Kronenstraße 24.

now under the management of Ferdinand Porsche's son Ferry, with a number of extensive development contracts. Apart from a small tractor and a water turbine, the company developed and built the all-wheel-drive Type 360 Cisitalia Grand Prix racing car as well as a two-seater mid-engine sports car.

In July 1947, the Porsche Engineering Office started working under its own steam on the Type 356 VW Sports Car. Based on the Type 64 Berlin-Rome racing car, the design concept bearing the internal construction number 356 became reality in spring of 1948 and a ready-to-drive prototype was con-

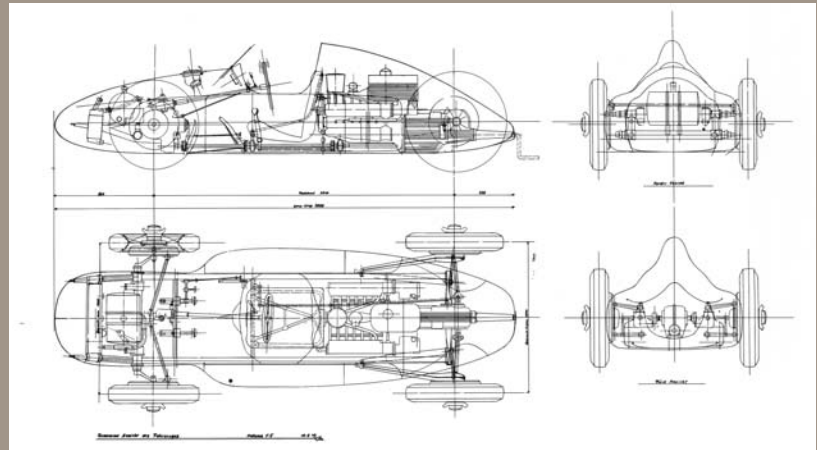
structed. This marked the birth of the Porsche sports car brand, with production of the rear-engined coupé and cabriolet versions of the 356 starting in the second half of 1948. After returning to Stuttgart in 1950, Porsche began regular series production of the 356 with a total production volume of some 78,000 units by the year 1965. The successor model, the Porsche 911, helped the company make its final breakthrough as one of the leading manufacturers of sports cars in the world not only in technical terms, but also in design. Despite this successful start as a car manufacturer, development assignments from customers

remained an important part of the company's overall range of activities. Until the 1970s, Porsche's most significant customer was the Volkswagen AG. The close cooperation of the two companies has been setting the pace in the development process ever since 1948.

Numerous detailed improvements were therefore developed for the VW Beetle built in Wolfsburg under a license fee paid to Porsche. Porsche was also involved in the development of various successor models to the highly successful Beetle. The company developed numerous prototypes for the Volkswagen Group which set the

trend for the wide range of passenger cars coming out of Wolfsburg for the coming years. The most famous customer developments were the VW-Porsche 914 presented in autumn 1969, and the Volkswagen Development Project EA 425, which made its appearance in 1976 as the Porsche 924.

The wide range of development at Porsche comprised nearly all areas of motorization over the last 75 years, including developments concerning cars, motorcycles, commercial vehicles, shipping technology, aircraft, agricultural machines, agricultural vehicles, construction machinery as well as comprehensive projects such as automotive studies for the future on behalf of the German Federal Ministry of



Technical drawing of the Cisitalia Grand Prix race car (Type 360).

Research and Technology. The customer base also came from almost the entire worldwide automobile industry and used Porsche's know-how ranging from individual technical solutions to complete vehicle developments.

The development on behalf of automobile manufacturers, suppliers, and other industrial companies from around the world is still far from being finished, and this business field will continue to be an integral component of Porsche in the future. This is ensured by some 400 employees at the Porsche Engineering offices. Porsche Engineering also has access to the full range of facilities and test stands at the Weissach development centre, and can also rely on the 2,400 employees in the development department.

Powered by the combined know-how of Porsche in the background, PEG is able to consistently focus not only on the smallest components, but also on the complete vehicle as a whole. The supreme objective in the future is therefore also to optimize the overall system, ensuring satisfied customers at all times. ■



Aerial photograph of the Porsche Development Centre in Weissach in autumn 2005.

Complete vehicle competence at Porsche



Four-door sedan by Porsche (Type 542) developed for the American car maker Studebaker.

Porsche has worked successfully on customer projects since the 1930s – from the concept phase to series production. The best example is the VW Beetle.



Alpine test drive in 1936 with two Volkswagen prototypes of the V3 range.

Since its beginnings in 1931, the range of tasks performed by the Porsche Engineering Office has covered the entire bandwidth of automotive technology. The work done by Ferdinand Porsche's hand-picked team ranged from drivetrain and suspension components to the production-ready complete vehicle. Even in the early 1930s, fully-functional prototypes of compact and midrange models were being creat-



Test car of NSU (Type 32) in front of the Porsche Engineering Office at Kronenstraße 24 in Stuttgart.

ed on behalf of renowned car manufacturers such as Zündapp, NSU and Wanderer. Porsche Engineering still continues this inheritance from the first days of Porsche. This wealth of experience together with the combined know-how of a series manufacturer gives Porsche a unique status in the automotive sector. Porsche Engineering makes its 75 years worth of complete vehicle knowledge available to its customers, and manages all areas of car making: from conception to design, prototype construction, testing, production planning, procurement, logistics, and production.

When Ferdinand Porsche presented his ideas on the design of a German “People’s Car” in an exposé in January 1931, not even the bravest optimists could predict that over 21.5 million units of this

vehicle would be built by 2003. The design that became known as the Beetle, due to its unmistakable shape, became a symbol of mass motorization across the world. When designing the vehicle known internally as the Type 60, Ferdinand Porsche and his engineers – includ-

ing masters of their trade such as Karl Rabe, Erwin Komenda and Josef Mickl – placed the VW Beetle’s characteristic air-cooled four-cylinder flat engine in the rear and divided the vehicle into base plate and body. The potential of this concept proved its reliability up to the end of the Second World War in numerous variants, such as the “Kübelwagen” jeep and “Schwimmwagen” amphibious vehicle.

After the war, Porsche remained linked to the Volkswagen AG as a development partner for many decades. Apart from countless detailed improvements to the VW Beetle, the Stuttgart-based sports car manufacturer repeatedly took on complete vehicle development projects from Wolfsburg, which went as far as the prototype stage of whole model families.



The VW 38 (Type 60) from 1938 already has the look of the later VW Beetle.

International customers, such as the American automobile manufacturer Studebaker, also relied on Porsche know-how. From 1952 to 1954, Porsche used the Type 542 to develop a modern four-door sedan with an integral body-frame that did not make it to series production only because of a lack of capital of the American contractor. The Soviet state-run Avto VAZ also relied on the experiences of Porsche when a complete compact car was ordered in the form of the



Development of the robust compact car Lada "Samara" with front wheel drive for the Russian state-run Avto VAZ in 1984.



The specification manual of the C88 concept car demanded comfortable driving, even on poor roads.

Lada "Samara", whose robustness was specially designed to cope with Soviet road conditions. For the Chinese market Porsche used the C88 family car to develop a vehicle study adjusted to Chinese requirements, which was presented at the Beijing World Trade Center in 1994 as part of an international presentation.



Opel Zafira – Complete vehicle development to a given concept for the Adam Opel AG.

In 1994, Porsche Engineering received an order from the Adam Opel AG to start on the complete vehicle development of the compact Opel Zafira van in line with a given concept. Presented for the first time at the Paris Motor Show in 1998, the Opel Zafira A was produced from 1999 to 2005. ■

System Porsche



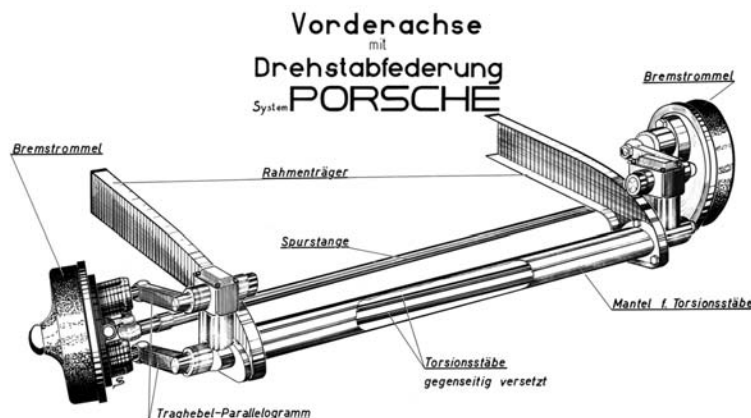
The first construction order for Porsche comes from Wanderer (Type 7).

From the start, the Porsche Engineering Office has pursued the objective of constantly improving automotive technology with trend-setting solutions. In its very first year of work, Ferdinand Porsche's team of technicians reached a milestone in the history of technology: the torsion-bar suspension known as the "System Porsche".

The innovative wheel suspension principle, which uses a torsion bar as a suspension element, came

about in connection with the Engineering Office's first contract development and was patented on

August 10, 1931. In early 1931 the German car maker Wanderer in Chemnitz assigned Ferdinand Porsche the project to construct a midrange sedan that was to become the Wanderer W21 and W22. Apart from having a new six-cylinder alloy engine, the vehicle known internally as Type 7 was noted for its special swinging axle system. The Porsche torsion bar suspension used here for the first time was to prove itself as one of the most significant detailed developments in automobile production. One special feature was the small amount of space needed for the



Drawing of the "System Porsche" torsion-bar suspension constructed under the Type 17 designation.



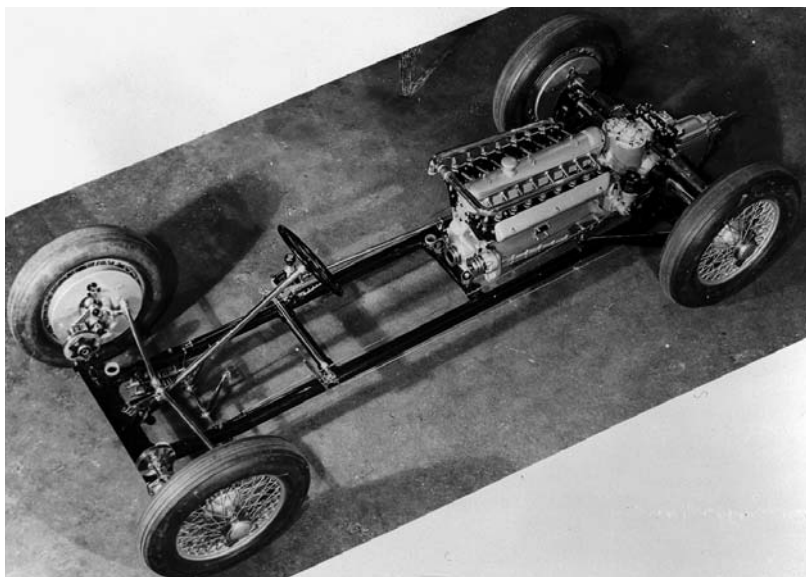
Test drive in 1937 with the W30 on the Katschberg.

torsion bar, which was arranged transversely below the vehicle without affecting the size of the cabin – unlike a coil spring. The damping forces were also absorbed by the platform framework and not by the

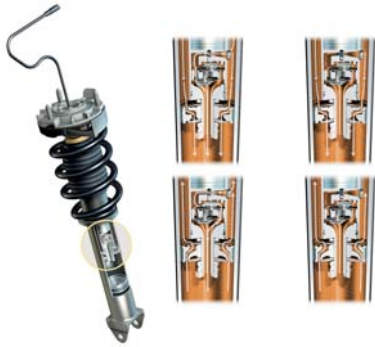
body – an important advantage in cars without an integral body-frame. Much of the development work carried out by the Porsche Engineering Office in the years that followed also had the new suspension sys-

tem, the best known of these without doubt being the Volkswagen Beetle, which first demonstrated its qualities during long test drives in the prototype phase in 1936. The system proved itself in motor racing in the Type 22 Grand Prix racing car developed by Porsche for Auto Union. After the war, the torsion bar suspension demonstrated its performance on all the world's race tracks in the Porsche 356.

Since then, the “System Porsche” torsion bar suspension has been used worldwide by millions in countless variations, and is still used today in passenger cars, commercial and special vehicles.



The chassis of the Type 22 Grand Prix racing car developed for the Auto Union.



The Porsche Active Suspension Management (PASM) electronic damping system actively and continuously regulates the damping force depending on the driving style and situation.

All suspension developers hope to achieve the ideal adjustment of the car to the current driving situation. Porsche engineers have moved a step closer to this goal with Porsche Active Suspension Management (PASM) introduced in the air-sprung Porsche Cayenne in 2002, and have again proven them-

selves as technological trendsetters in the development of vehicle suspension.

The variable suspension system on the Porsche Cayenne actively and continuously regulates the damping force by using acceleration sensors to determine the conditions of the roadway and the individual style of driving. For example, PASM kicks in during very dynamic driving with heavy phases of acceleration and braking or on particularly uneven terrain, in order to balance the rolling and pitching movements by stabilizing the individual shock absorbers. PASM also enables the Cayenne driver to perform individual shock absorber adjustments while driving. The driver can select one of three basic programs: "Comfort", "Normal" and "Sport".

PASM is always active in the background and checks the style of driving in the currently selected program. This system gives the sporty multi-purpose vehicle outstanding driving properties for its class.

Besides the Porsche Cayenne, the Porsche 911, Porsche Boxster, and Porsche Cayman models have also benefited from this new suspension technology since 2004. Thanks to PASM, the sports cars from Zuffenhausen combine two suspensions in one: one with equal measures of sportiness and comfort for long-distance driving and a tighter, markedly sporty one for the circuit. This achieves additional active driving safety in all situations with a tangible increase in the level of comfort.

Excellent driving dynamics are a feature of all Porsche sports cars. Porsche Engineering makes this core competence available to its customers and develops project solutions from conception to start of production in order to develop and optimize the handling of the vehicle in line with customer expectations. Porsche Engineering develops complete chassis, including all components such as steering, brakes, suspension and control systems, wheels, tires, pedals as well as axle and engine components. ■



All suspension components in the Cayenne are 100% adapted to the Third Porsche, in order to enable the typical handling of a Porsche on all roads.

From theory to confirmation



Cayman S in the climate wind tunnel at the R & D Center in Weissach. Real stretches of road can be simulated here under real climate conditions, such as the Townes Pass in the USA.

The Porsche Research and Development Center offers an incomparable range of services. State-of-the-art test benches, workshops and laboratories can also be used by customers.

The “idea factory” of the Porsche AG has been located in Weissach 25 kilometers west of Stuttgart since 1971. Alongside the skid pad and test track – whose construction started in 1961 – Porsche successively expanded the Research and Development Center with additional large technical facilities such as a

measurement center, a wind tunnel, and the safety test stands including a crash-test facility. The second phase of the development center in Weissach was finished in September 1974, and the new test stands, workshops and laboratories officially opened.



Ferry Porsche (center) with Helmuth Bott, Ghislaine Kaes and Hans Tomala (from left) on a visit of inspection of the test track in Weissach in 1962.



Crash test of a Porsche 904 Carrera GT in 1966.



The new Development Center in Weissach was built in 1971. The test track is in the background.

For example, the Porsche emissions testing department has been testing the export vehicles of other manufacturers on behalf of the American Environmental Protection Agency on its own rolling test stand since 1967. As not only the Porsche engineers, but above all

the worldwide development customers from the automotive industry were calling for greater capacity to measure and improve emissions, the “Measuring Center for Environmental Protection”, which has its own test building, was officially opened in late fall of 1982. An ideal

work environment with ultra-modern test stands was created for the emissions technicians over an area of 5,500 square meters. Here, the current emissions rolling test stands determine the real driving resistance of the respective car at any given moment using micro-processor-controlled systems, while the vehicles are driven automatically using statistically guaranteed measurement accuracy and various country-specific emission test cycles that can be reproduced at any time.



Porsche Type 911 T driving through the asphalt-patch curve on the test track at the Weissach Development Center in 1970.

A climate center with three test chambers and a climate tunnel with an all-wheel rolling test stand allow emissions and consumption tests, as well as many other development tests, to be performed across a



Porsche vehicles in the climate pressure chamber at the Emissions Center of the Development Center in Weissach.

wide range of climates and altitudes. The high level of emissions research at the Porsche Development Center was also a reason behind the decision of Porsche, Audi, BMW, DaimlerChrysler and Volkswagen to found a joint “Automotive Industry Emissions Center” (ADA) at Porsche in Weissach, which began operating in January 1996.

Investigations into the passive safety of automobiles using crash tests has a long tradition at Porsche which reaches back to the 1960s. The knowledge accrued in countless tests flowed directly into vehicle development, so that by 1964 Porsche was able to introduce a split safety steering system in the new Type 911. The Porsche 911 Targa presented in 1965 with its fixed roll-over bar was designed

from the outset as a safety cabriolet, thereby meeting the enhanced safety requirements of Porsche cus-

tomers. Other trendsetting, detailed and safety-conscious solutions from the house of Porsche included automatic three-point seat belts, head restraints integrated in the seats and a safety steering wheel with a crumple section.

In 1987, the Weissach Development Center was expanded by adding a modern crash facility with permanently installed control and monitoring technology. Apart from Porsche sports cars, vehicles and components of other manufacturers are tested for their crash behaviors and improved by Porsche engineers. ■

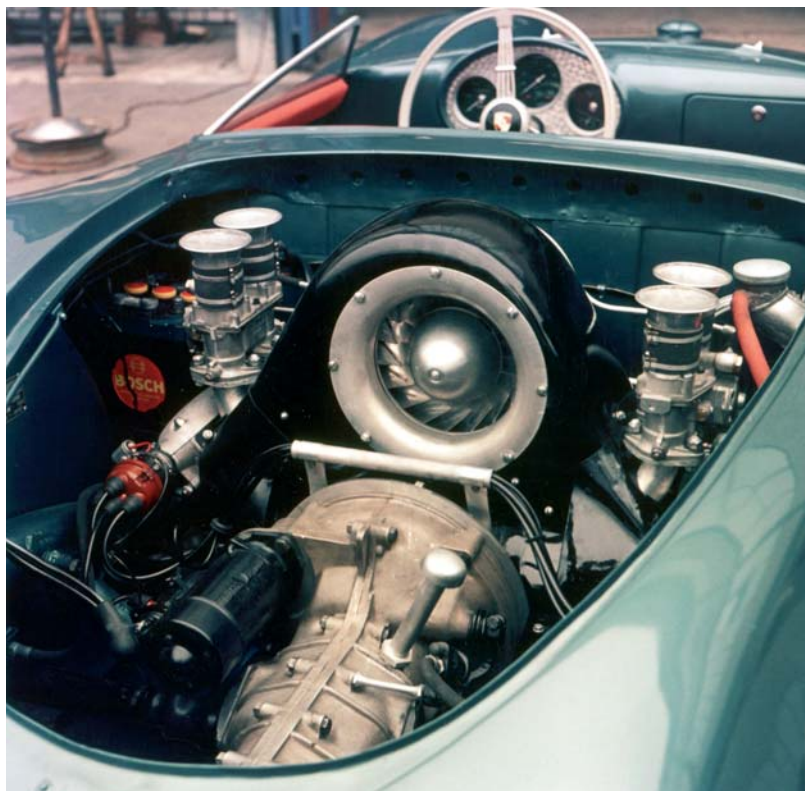


Porsche Study C88 for the Chinese market in the wind tunnel of the Development Center in Weissach.

Decades of engine power

As the smallest independent German car manufacturer, Porsche has special competence when it comes to building engines. Porsche Engineering makes the experience it has gained over decades of series production and motor racing exclusively available to its customers. Since its early days as an independent engineering office, Porsche has written automobile history with its engines.

Back in 1931, it was a Porsche six-cylinder alloy engine with a displacement of 1.7 or 2 liters that powered the newly developed Wanderer sedan W21/22 as well as the well-known "Audi Front". The six-cylinder compressor engine of the Type 22 Auto Union P racing car



The Porsche Type 550 Spyder with the Type 547 "Fuhrmann engine" constructed as a racing engine (1953).

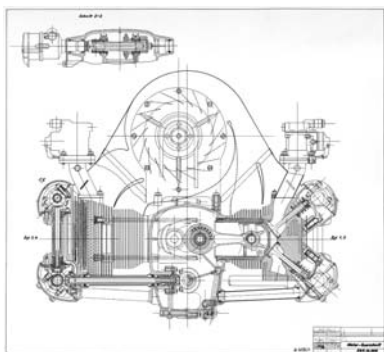
Porsche Engineering offers all areas of modern engine development and develops units from the single-cylinder engine to the multi-cylinder, high-performance engine. From the application to the completely new development.

had a legendary reputation. During its first racing season in 1934, the V-shaped 4.36-liter engine of the Grand Prix racing car generated 295 bhp and a powerful torque of 55 mkg at just 2,700 rpm. Driven by motor racing legends such as Hans Stuck, Bernd Rosemeyer and Achille Varzi, the Auto Union P racing car (P for Porsche) achieved no

fewer than 30 Grand Prix victories and 15 world records between 1934 and 1937.

When Ferdinand Porsche received the order to develop the Volkswagen in 1934, designing a new engine was also part of the project. Following extensive tests, the Porsche engineers developed an

air-cooled four-cylinder flatengine that was not only used in millions of VW Beetles, but was also to serve as the basis for the engine of the subsequent Porsche 356. With a double carburetor system and enhanced compression, the Porsche engineers helped the 1,100 cc unit of the first Porsche 356 achieve an output of 40 bhp.



Technical drawing of the four-cylinder engine with four overhead camshafts (Type 547).

Over the years, Porsche constantly increased the potential of the flat engine that would eventually be used in the Porsche 912 until 1968 by making numerous modifications and improvements. The engine in the racing version, described as the “Fuhrmann engine”, was ultimately enlarged to have a two-liter displacement and was fitted with a four-camshaft control driven by a vertical shaft. The lively flat engine



Ferdinand Porsche next to the Auto Union P-racing car (Type 22) in 1936.

became a permanent standard in international motor sports, in particular in the Porsche 550 Spyder, but also in the Carrera versions of the Porsche 356.

With the launch of the Porsche 911 Turbo in 1974, Porsche became a pioneer of engine charging using turbochargers. The technology, which was previously tested in the racing car types 917/10, 917/30 and the 911 Carrera RSR Turbo 2.1, reached a highpoint in the 1977 Porsche 935/78 “Moby Dick”, whose 6-cylinder flat engine was fitted with water-cooled four-valve cylinder heads for the first time. Aspirated by two turbochargers, the 3.2-liter engine generated up to 845 bhp. These comprehensive experiences became the basis of one of the most important customer development projects at Porsche Engineering: On behalf of the Saudi Arabian businessman Mansour Ojjeh, the engineers in Weissach developed the “TAG-Turbo made by Porsche” for the British racing team McLaren. This Formula 1 engine generated over 1,000 bhp from a mere 1.5 liter displacement. The Porsche engine dominated the supercar class of racing sport from 1984 to 1986, and helped McLaren win three World Championship titles.

Another high-powered engine was created in 1988 for the American CART racing series. In the Indy-Porsche, the methanol-fuelled V8 racing engine was placed among the top four in eight out of nine races in 1989, and won the 200 Miles Mid-Ohio. Porsche developed a 3.5-liter 12-cylinder naturally aspirated engine for the Footwork Arrows racing team, which was used during the 1991 Formula 1 season. However, financial difficulties at the end of the season resulted in a premature end to the cooperation.

Porsche engines not only made a name for themselves on roads and race tracks – the compact units also convinced in the air, thanks to their excellent power-to-weight ratio. Porsche presented an entire range of aero engines in 1959. The units were used in light aircraft and helicopters and had an initial power output of up to 75 bhp.



The Formula 1 engine “TAG-Turbo made by Porsche” was used for McLaren racing cars.



The 12-cylinder-suction engine was exclusively developed by Porsche for the Footwork-Arrows racing team.

Considerably more powerful was the PFM 3200 aero engine developed on the basis of the Porsche 911 flat engine. The 3.2-liter unit drew public attention when it proved its reliability during a round-the-world flight in 1985. Used in sports planes and airships, the PFM 3200 was noted for low fuel consumption, low noise emissions,

simple handling and long maintenance intervals.

As a development partner, Porsche Engineering developed a new V2 engine under the development name "Revolution Engine" for the "V-Rod" model of the American motorcycle manufacturer Harley-Davidson. Against the background



Harley-Davidson V-Rod V2 engine with 115 bhp.

of a cooperation that reached back to the 1970s, the Porsche engineers constructed a water-cooled, 1,131 cc unit based on a racing engine, whose power and engine sound enthused discriminating Harley-Davidson customers in equal measure. Another focus of the development project was the highly dynamic drivetrain relationship between the crankshaft and drive wheel. Of course, the production-side improvement was part of the order, as the engine was produced under common responsibility in a joint venture between Harley-Davidson and Porsche. ■



Porsche Type 3200 aero engine with 3.2-liter capacity.

The shape of the future



The Porsche 911, a unique and unmistakable design feature.

Design has been one of the core competences of Porsche ever since it started building sports cars. Porsche Engineering makes the skills of its stylists in the area of Automotive and Transportation Design available to its customers.

The styling that is so typical of Porsche has evolved over decades. Sports cars such as the Porsche 356, the 550 Spyder and the 904 Carrera GTS have written the history of design and exerted repeated influence on international car production. The Porsche 911 in particular is considered an icon of classic

design, thanks to its clear basic design concepts. The shape of this classic sports car has been carefully enhanced and interpreted in a contemporary fashion by Porsche stylists for more than four decades. The highest maxim of the in-house designers has been and remains the visualization of the innovative



Porsche 356 Coupé in the year 1951.



Ferdinand Alexander Porsche working at the drawing board.

technology found in the Porsche model family through its exterior design.

Porsche sets a high design and quality benchmark for its customers and develops cars for them with the same passion as it does its own vehicles. As a design partner, Porsche Engineering Styling represents far more than just pure product design. The significance of strategic design has long been known, and Porsche Engineering

offers international customers from the automotive industry and various industrial sectors extensive experience in the field of automotive and transportation design.

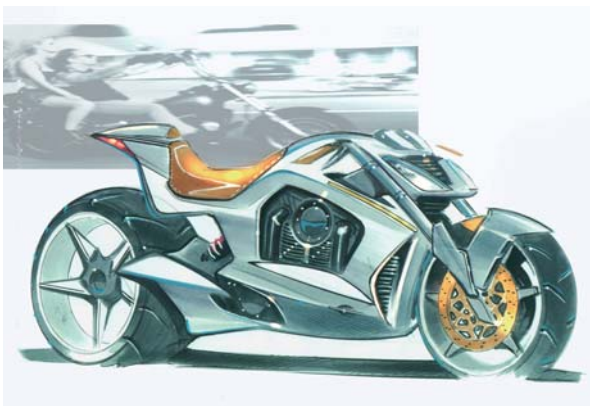
Designing in unfamiliar territory has long been one of the focal points of the work performed by Porsche stylists. The transfer of automotive designs to other vehicles often results in completely new aesthetic concepts. Consequently, the Porsche designers consider feasibility and the necessary manufacturing processes right at the design stage.

Pursuing new ways that go beyond the mainstream is a tradition at Porsche. The diversity of the range of products Porsche designs is almost unsurpassable: from cars to motorcycles, from construction

machinery to agricultural machinery or aircraft and commercial vehicles. Porsche styling lends products their own personality through clear design. A focal point of the company's competence lies in the area of ergonomics. Even in the early 1980s, Porsche engineers helped design the cockpit layout for Airbus passenger jets in cooperation with the Airbus industry, and set a trend by using displays instead of conventional instruments. ■

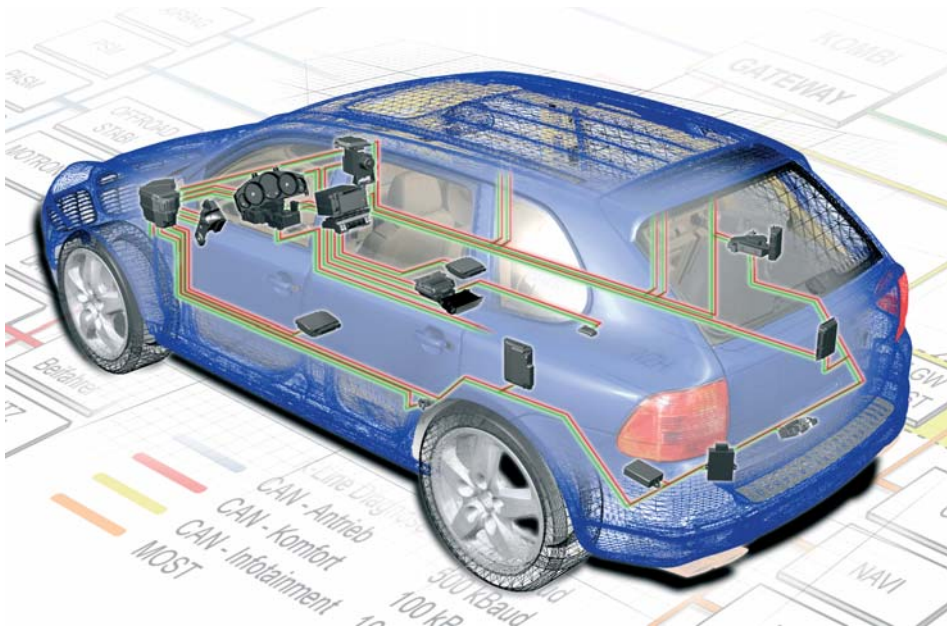


Porsche engineers designed the cockpit of the Airbus A 310 from an ergonomic perspective.



Apart from designing cars, Porsche stylists work on everything that moves. The range of designs is covering commercial vehicles, motorcycles and boats for example.

Hardware, software and system development from one source



A fully networked system takes care of all electronic data exchange in the Cayenne.

In terms of complete vehicle development, automotive electronics are among the most important aspects of Porsche Engineering.

No other area of automotive technology has such a high rate of innovation that lets us talk about a “smart revolution”. In particular, the intelligent networking of components and systems has a special significance that will continue to increase as time goes by. The core competence of the Electrics & Electronics area therefore lies in the system integration of electronic components and the exploitation of their potentials. Given the constantly increasing quantity of electronics

in the vehicle and the possibilities this presents, Porsche Engineering is occupied with the development and integration of electrical and electronic systems for the body, drivetrain and chassis. Other areas cover software and telematics, control and display components, the development of vehicle electrical systems and networking, multimedia, HMI (human-machine interface) and EMC (electromagnetic compatibility).

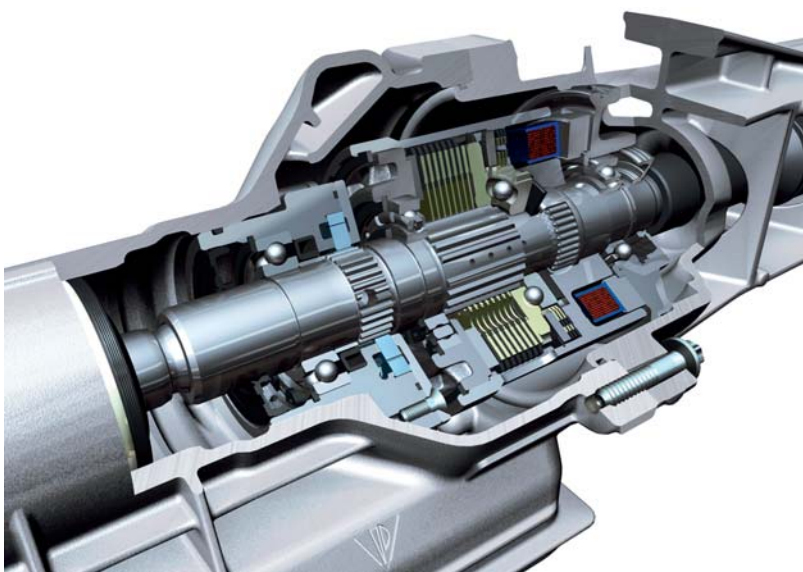
In the past the innovative power of Porsche in the area of electronics has manifested itself time and again in its own sports and racing cars. In 1985 the sports car manufacturer from Stuttgart showed what was possible when it presented the Porsche 959 with an electronically controlled chassis and program-controlled all-wheel drive. The technology platform 959 is still setting trends, as the drive management system of the current Porsche 911 Turbo shows.



Porsche Communication Management (PCM) in the Cayman S.

The redeveloped, controlled all-wheel drive enables the immense engine power of the 911 Turbo to be converted into propulsive power as the situation demands. The Porsche Traction Management (PTM) has an electromagnetically

controlled multi-disk clutch that provides the ideal distribution of power between the front and rear axles within fractions of a second. In 1989, Porsche offered a new, electronically controlled shift system under the name "Tiptronic", where-



Porsche Traction Management (PTM) of the 911 Turbo with electronically controlled multiple-disk clutch.

by the gears can be changed fully automatically as well as manually. With the "Tiptronic S" Porsche customers now also have the option to choose between manual operation and automatic mode. In automatic operation the shift points of the 5-speed converter are defined and controlled electronically, depending on the style of driving: A basic gearshift program supports economical driving and a sports program maximum driving performance.

Porsche is also a pioneer when it comes to electronic driver information systems: The first electronic instrument cluster with an information and diagnosis system worldwide was introduced in the Porsche 928 S4 in 1988. The current Porsche Communication Management (PCM) is the central control unit for the radio, CD player, sound settings, on-board computer, navigation, telephone and electronic logbook. Data transfer within the PCM takes place at the speed of light. A MOST data bus (Media Oriented Systems Transport) transports the data at high speed between the individual components via optical cables without loss of signal. ■

Expertise from automotive development for other branches of industry



The original of all tractors developed by Porsche: the "Volkstraktor" (Type 110).

Porsche has always been known for innovative and often unconventional solutions for non-automotive requirements.

The area of Industrial Engineering has also a long tradition as a key element of contract development services at Porsche. Since the first days of the company's existence, Porsche has served numerous branches of industry, which have benefited from the automotive know-how of this sports car manufacturer. These customer projects focus mainly on the areas of com-

mercial vehicles and agricultural machinery and, in former times, military engineering.

As for the Volkswagen, Porsche engineers constructed small agricultural tractors since 1937 (Types 110, 111, 112 and 113), which were noted for their low price, technical sturdiness and exceptional range of application. The scope of

the "Volkstraktor" (People's Tractor) project ranged from the design of agricultural machinery to the planning of its own tractor factory which was not realized due to the war. In the post-war years the tractor types 312 and 313 developed on the basis of the Type 113 were to become an important building block in the reconstruction of the Porsche KG, as it was called at the



Ferdinand Porsche (second from right) and his son Ferry (right) assess a trial wind power system in 1940.

time. The refined design was acquired in 1949 by agricultural machinery manufacturer Allgäier in Göpping, and more than 25,000 units were produced between 1949 and 1956. Constantly improved from 1956 to 1963 as the Porsche diesel tractor, more than 120,000 Porsche tractors in various levels were built at the Porsche-Diesel-Motorenbau GmbH in Friedrichshafen. Development orders from the area of agricultural technology still form a fixed part of the work done by Porsche Engineering. For agricultural machinery manufacturer



The lift truck designed by Porsche Engineering for Linde AG was awarded the "red dot: best of the best" in 2005.



ACGO GmbH also makes use of Porsche know-how for its Fendt tractor.

Claas, Porsche has developed technical solutions in transmission development as well as in the areas of acoustics and vibration technology for harvesting machinery. Tractor manufacturer Fendt has passed its styling projects to Weissach since the 1990s. American manufacturer John Deere also places its trust in the many years of Porsche Engineering experience in agricultural technology.

At the same time of the orders coming from the area of vehicle technology, the Porsche Engineering Office developed a series of wind power systems for generating electricity in the early 1940s. Three wind turbines were created in three power categories: 130 watt (Type 135), 736 watt (Type 136) and 4,500 watt (Type 137). In 2001 Porsche referred to the basic research done into wind power sys-

tems in the 1950s: On behalf of DeWind AG from Lübeck, Porsche Engineering created the design for a two megawatt wind power station.

To mark the milestone of the development of industrial vehicles, forklift truck manufacturer Linde awarded the order to design a new generation of ground conveyors to Porsche in 1981. A new family of forklift trucks was created which marked the beginning of a long cooperation. To this day Porsche Engineering develops trendsetting designs for industrial vehicles on behalf of the Linde AG. However, the convincing design is not a means to an end, but remains functional and combines the latest in technology and innovative ergonomics. ■

Accelerated power of innovation



The Porsche 962 C with Porsche double-clutch transmission was used successfully in racing in 1987.

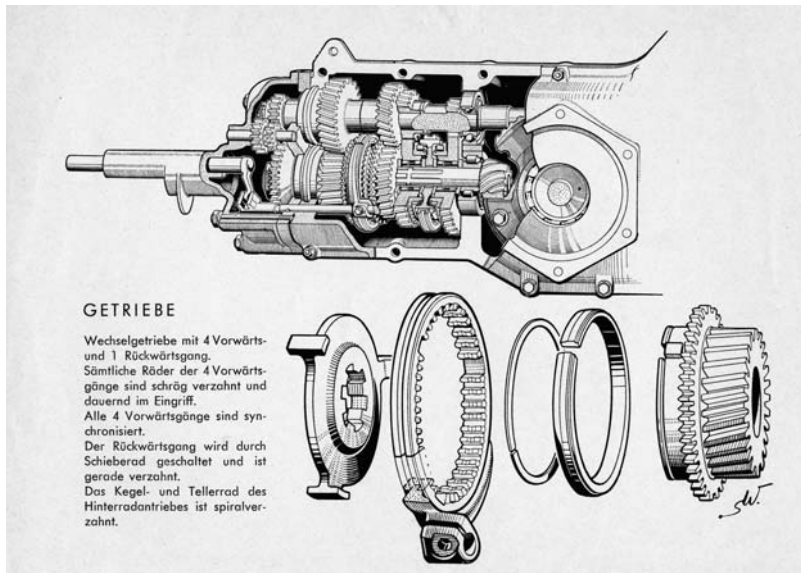
The Drivetrain section at Porsche Engineering offers its customers the broad knowledge of a complete vehicle developer with decades of competence.

The drivetrain technology is one of the most decisive technologies of the modern automotive industry. While a host of significant innovations have enhanced the performance of and possibilities for using the technologies, the engineering demands placed on vehicle and component developers have increased constantly. The Drivetrain section makes this accumulated knowledge available for customer projects. The spectrum of orders ranges from the technical modifica-

tions of individual components to the complete development of a new drivetrain and its electronic control systems.

The scope of application of vehicle projects undertaken by Porsche is not limited only to roads, but also covers the development of capable all-wheel systems for off-road driving. In 2003 Porsche presented a multi-purpose vehicle suitable for off-road use in the form of the Cayenne, whose technology amazed

customers and the trade in equal measure. The Cayenne series is the highpoint of the competence in the all-wheel drive sector which Porsche has built over decades. At the turn of the last century Ferdinand Porsche was the first automobile engineer to work on the four-wheel drive and even introduced the drive concept into series production. In the 1930s and 1940s Porsche technicians worked on the off-road military vehicles such as the VW "Schwimmwagen" amphibious vehicle and the VW "Kommandeurwagen" command vehicle, which were developed on the basis of the Volkswagen Beetle. The Porsche engineers made reference to these designs at the end of 1953 in the development of the Porsche "Jagdwagen" or Hunting Car.



The Porsche transmission with ring synchronization was to set the trend for automotive construction.

This amphibious all-wheel drive vehicle was created as part of a tender for the German Army and went into small-scale civil production in 1954.

Porsche is also a pioneer of all-wheel technology in motor sports. The Type 360 Cisitalia Grand Prix racing car completed in 1948 was

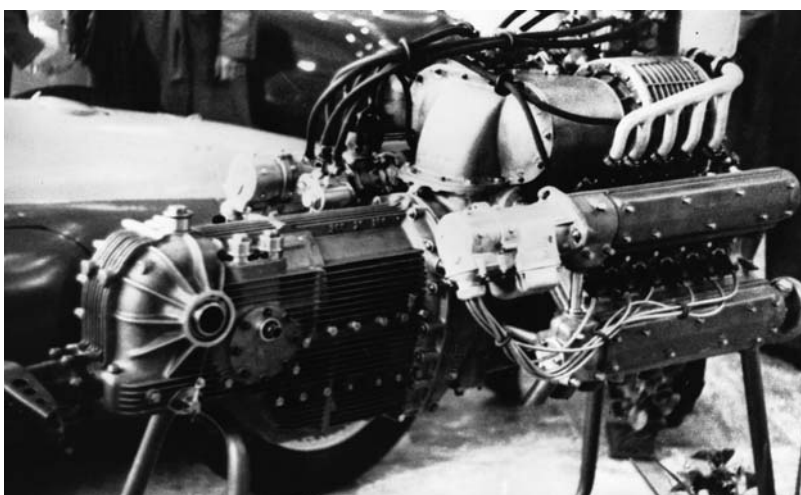
fitted with a switchable all-wheel drive. Porsche tested the drive technology of the Porsche 959 in the Porsche 911 Carrera 4x4 used in rallies in 1983 and 1984.

Electronically controlled, the all-wheel system which was fitted as standard in the 959 showed what

was technically feasible in car making at the time.

Porsche has also been a pioneer in the field of transmission technology for decades. In 1952, Porsche presented a fully-synchronized transmission with ring synchronization at the Geneva Motor Show which was to set the trend for automotive construction. The synchronous transmission from Zuffenhausen not only helped Porsche sports cars achieve dynamic driving properties; more than a million units were also built under license for other car manufacturers until 1968. The patented Porsche design was also used in Formula 1, when Mercedes-Benz used synchronous rings of the "System Porsche" for the transmission of the legendary W 196 racing car.

Another technological highlight was the Porsche double-clutch transmission (PDC) developed in Weissach. This first sequential transmission with two countershafts and double-clutch was initially tested in a Porsche Type 956 in 1983. For the first time the PDC allowed gears to be changed without a loss of acceleration, and is considered the technical forerunner of future generations of transmission, which can also be used in series production thanks to modern control technology. ■



The drive of the Type 360 Cisitalia Grand Prix racing car with an output of 385 bhp (1948).

Unconventional ways for body concepts



The Auto Union P-Racing car (Type 22) on the Nürburgring in 1936.

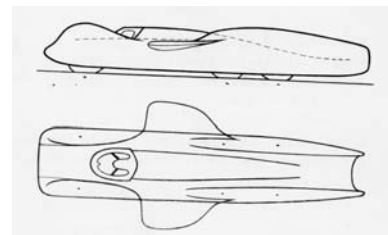
Developing the body is an important part of modern car production. At Porsche, individual concepts are guarantees of success for developing its own and its customers' cars.

The special interfacing competence of Porsche Engineering lies in the merging of styling, integration, packaging and functionality. As a series car manufacturer, Porsche also has years of experience in integrating components and sub-systems perfectly in the development and production of the complete vehicle.

Porsche already exhibited trend-setting engineering thinking during the 'Volkswagen' project in the

1930s. The shape of the VW Beetle came about from the fashion for streamlining and from the requirement in the specification to provide seats for four people. Unique design elements were engineered for the individual body areas, which formed an organic whole together. Even at that time, construction work was so clean that the Volkswagen had no welded seams that had to be concealed with solder. The VW Beetle was also one of the first cars to have the door hinges

attached to the A-pillar for safety reasons.



The targeted speed of the T 80 of more than 600 km/h necessitated special body geometry which was based on aircraft construction.

Porsche again exhibited technical farsightedness with the Auto Union P-racing car, which was developed alongside the Volkswagen, and showed how the technical conception of a vehicle could also have a positive influence on the external form. The mid-engine layout of the racing car did not only ensure an ideal distribution of weight and excellent centre of gravity, but also became a technological model for generations of motor sports vehicles. The high-speed record-breaking T 80 constructed by Porsche engineers on behalf of Daimler-Benz AG was built from 1937 until 1939. Powered by a 3,500 bhp aircraft engine, the T 80 should have broken the speed record for land vehicles, but this was prevented by the outbreak of war. The seat position of the pilot was located between two side rudders that were supposed to provide directional stability. Anhedral side wings generated the necessary down force.

Vehicle aerodynamics and wind tunnel tests were already a fixed part of Porsche's development work in the 1930s. Ferry Porsche and Erwin Komenda used the test results obtained before the war when they designed the shape of the Porsche 356 in 1948. Therefore it was no surprise that the early coupé version of the Porsche 356



First aerodynamic tests were carried out on the Porsche 356 using pasted woolen threads.

sparkled with a cd value of just 0.296.

Innovative concepts and combinations of materials have been a special element of Porsche's body development from the very beginning. The objective is the synthesis of maximum light-weight construction for the body and components, and maximum demands on safety and rigidity. The best example is the Porsche Carrera GT. For the first time in a production vehicle you find a monocoque chassis and the super-sports car's engine mount made from carbon-fiber reinforced plastic (CFRP). The material carbon creates after complex processing the ideal conditions for combining superb handling and driving dynamics with minimal weight. Apart from ideal performance the Porsche

Carrera GT also has excellent safety potentials.

To achieve the highest possible negative lift coefficients, the Carrera GT has a floor geometry usually found in racing cars. The fully clad underbody made from carbon has a rear diffuser and flow ducts that provide an unusually high suction effect for road vehicles. ■



Apart from the monocoque and engine mount of the Carrera GT, numerous other components were made from carbon-fiber reinforced plastic (CFRP).

From designing to the start of production



Building the engine for the Porsche 356 in 1953.

The services offered by Porsche Engineering range from the initial design sketches to the start of production.

The constantly increasing rate of innovation cycles and the accompanying diversity of products and variants are linked with development and product launch times becoming shorter and shorter. Through its Production Engineering area, Porsche Engineering makes the experience it has gathered on the production lines in Zuffenhausen and Leipzig available to its customers as a management service. As the most profitable car maker in the world, Porsche AG is considered the epitome in the planning of production processes and techniques for large and small-scale series production. A continuous process of improvement to technologies and processes carried out

over many years has given Porsche unique competence in the management of production, quality and logistics. Porsche Engineering offers this comprehensive know-how to its customers.

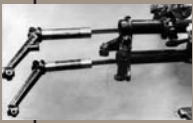
This area of performance is also based on a gamut of experience amassed over decades at Porsche. For the Porsche Engineering Office the order to build the Volkswagen contained not only the vehicle-related development, but also covered the planning of an independent plant from 1936 on, which exists to this day as the main VW plant in Wolfsburg. The production methods used in the current Porsche factories in Stuttgart-Zuffenhausen and

Leipzig are the result of a production process that has undergone decades of constant evolution. The company first moved into the Zuffenhausen factory in 1938, but the war forced a relocation to the Austrian town of Gmünd in Carinthia in 1944, where a total of 53 Type 356 cars were assembled by hand up to 1950. Since July of that year the production of Porsche sports cars has taken place in Zuffenhausen. Due to the expansion of capacity needed for the construction of the Porsche Cayenne, a new production site was built in Leipzig in 2000, which meets the very latest requirements. Apart from the high-performance Carrera GT sports car produced until 2006, the four-door Panamera sports coupé will roll off the production line there starting in 2009. ■



A total of 1,270 Porsche Carrera GT high performance sports cars were produced at the Leipzig site up to May 2006.

Milestones in Customer Development from 1931 – 2006



1931

Working on behalf of Zündapp GmbH, the Porsche Engineering Office develops the Type 12 compact car with many technical features paving the way for the subsequent Volkswagen Beetle.

Developing torsion bar suspension, Porsche creates a new suspension concept destined for successful use over many decades in international automobile production.



1933

The Type 32 compact car built on behalf of NSU-Werke features an air-cooled flat-four fitted at the rear and uses Porsche's torsion bar suspension concept.

The Auto Union P Type 22 racing car powered by a 16-cylinder mid-engine is built by Porsche engineers according to the rules and regulations of the new 750-kg Grand Prix racing formula.



1934

The Porsche Engineering Office receives the official assignment from the "Reichsverband der Deutschen Automobilindustrie" ("Reich Association of the German Automotive Industry") (RDA) to design and build the Volkswagen. The design and construction work for the Type 60 model, as it is called, is based on Ferdinand Porsche's "Study for the Construction of a German People's Car".



1937

Daimler-Benz AG gives the Porsche Engineering Office the assignment to build the T 80 World Speed Record Car. Powered by a 3500-bhp aircraft engine, the T 80 is to break the world land speed record. But the record attempt for 1939 had to be cancelled due to the War.

The Type 110 small farming tractor sets the foundation for the subsequent "People's Tractor" and the Porsche diesel tractor.



1939

Under the model designation Type 64 and, respectively, Type 60K10, Porsche develops a racing coupé with an aerodynamic aluminum body for the Berlin-Rome long-distance race.

Based on the "KdF Car", Porsche builds further models for military use such as the Type 82 VW "Kübelwagen" or the all-wheel-drive Type 87 "Kommandeurwagen" or "Commander's Car".



1942

Porsche KG receives the assignment to build the Type 205 "Maus" armoured car driven by a combined gasoline and electrical power system and weighing a total of 189 tonnes following completion of the design and drafts. In all, however, only two prototypes of this tank are ever built.



1947

The Type 360 Grand Prix racing car developed on behalf of Italian car maker Cisitalia is far ahead of its time: Power comes from a supercharged 1.5-litre twelve-cylinder and is transmitted to the wheels by manually activated all-wheel-drive.



1952

Porsche KG receives a major development assignment from US car maker Studebaker. During this two-year period of cooperation, Porsche develops Type 542, a modern four-door saloon regrettably never to enter series production due to a shortage of funds on the part of Porsche's US customer.



1954

As part of a tender from the German Army, Porsche develops the amphibian all-wheel-drive Type 597 "Jagdwagen" or "Hunting Car". And although the "Jagdwagen" is acknowledged to be technically superior, the assignment is awarded for market and political reasons to DKW, the German manufacturer of cars and motorcycles.



1955

Working on behalf of Volkswagen AG, Porsche's construction engineers develop Type 672, a compact concept car with rear-wheel drive. This prototype is powered by an extra-flat six-cylinder underfloor engine.



1959

Porsche presents a complete range of aircraft engines at the German Industrial Fair in Hanover. Engine output ranges from the 65-bhp Type 678/1 all the way to Type 678/4 developing no less than 75 bhp starter output.



1960

Conceived as the potential successor to the VW Beetle in both notchback and fastback design, Type 728 (Development Assignment 53) is completed in spring 1960 on behalf of Volkswagen.



1961

Following the assignment in 1958 to develop a battle tank, construction of the Type 814 Leopard tank starts in 1961, with a total of 2,400 units subsequently going to the German Army. Development of the Type 807 rescue tank extends from 1961 to 1966.



1971

In summer the Development Division complete with the Construction, Testing, and Design Departments starts to move to Porsche's new Development Centre in Weissach. In the years to come, the Weissach Development Centre completes not only numerous design and construction concepts for Volkswagen, but also projects such as a compact four-cylinder power unit for Spanish car maker Seat or a complete small car for state Russian car manufacturer AvtoVAZ (Lada).



1973

Porsche presents the Longlife Car Research Project at the Frankfurt Motor Show, a concept car designed for twenty years of reliable use.



1975

The SAVE (Rapid Ambulant Pre-Clinic Initial Treatment) project for the development of an innovative ambulance system is made up of a rescue vehicle complete with a mobile rescue unit and is consistently enhanced in an ongoing process and various project phases until 1984.

After development assignment EA 425 conducted on behalf of Volkswagen for a successor to the VW Porsche 914 is discarded, Porsche decides to launch this front-engined sports car under the name Porsche 924.



1977

On behalf of the German Federal Ministry of Research and Technology, the Weissach Development Centre completes the O.R.B.I.T. firefighting system. The purpose of this research project is to support the fire brigade by means of trendsetting technical equipment.



1979

Referred to within the Company as Type 995, the concept of a sports car of the future is developed in 1979 on behalf of the German Federal Ministry of Research and Technology. This four-door concept car focuses in particular on fuel economy, safety, and noise emissions.



1981

In cooperation with Airbus Industries, engineers in Weissach set out to design an ergonomic cockpit layout for the Airbus passenger aircraft.

Using the flat-six power unit carried over from the Porsche 911, engineers in Weissach create Porsche aircraft engine PFM 3200 conceived to power small aircraft.

From 1981 to 1984 Porsche develops an entirely new range of trucks. This marks the beginning of a joint venture lasting many years.



1982

The Measuring Centre for Environmental Protection, the first self-sufficient exhaust emission test centre in the world, is opened in late autumn 1982. Fully computerised, the test stands and dynamometers in Weissach simulate real-life driving conditions and thus serve to reproduce various test cycles. Test series under all kinds of climatic and altitude conditions can be carried out in the climate pressure chamber.



1983

The Porsche double clutch transmission (PDK) developed in Weissach enables the driver to shift gears without the slightest interruption of engine power and torque.

The TAG Turbo power unit developed on behalf of British Racing Team McLaren international makes its debut in the McLaren MP4 Formula 1 racing car. Output of this turbocharged 1.5-litre V6 is up to 1000 horsepower. The TAG Turbo made by Porsche becomes the dominating power unit in Formula 1 from 1984 to 1986.



1984

Porsche develops the Lada "Samara" on behalf of state Russian car manufacturer AvtoVAZ. This robust compact car with front-wheel drive is conceived particularly for the demands made by road conditions in the Soviet Union.



1987

The Weissach Development Centre is further enhanced and upgraded by a modern crash test facility with permanently installed control and supervision technologies. Apart from Porsche sports cars, models from other manufacturers are also tested here on behalf of various customers.



1988

The Type 2708 racing car developed for the US CART Series is an all-new construction with an aluminium-plastic monocoque body. The power unit is a 750-bhp V8 racing engine running on methanol.



1990

In spring Porsche AG starts assembly of the Mercedes-Benz 500 E. Apart from a wide range of development activities, this assignment from Mercedes-Benz AG includes the construction of the body-in-white as well as the final assembly process.



1991

The 3.5-litre twelve-cylinder Grand Prix power unit developed by Porsche is supplied exclusively to the Footwork Arrows Racing Team in the 1991 Formula 1 season.



1993

In a joint venture Audi and Porsche develop a high-performance sports estate, the Audi Avant RS2. Starting in October, the Avant RS2 is built in the Zuffenhausen Plant parallel to the Mercedes-Benz E 500.



1994

On behalf of Adam Opel AG, Porsche Customer Development starts the overall development of a compact van according to a pre-determined concept.

Porsche AG takes part in an international presentation at the Peking World Trade Centre, together with 19 other manufacturers. The C88 family car presented on the occasion is a concept vehicle developed by Porsche Engineering Services especially for the Chinese market.



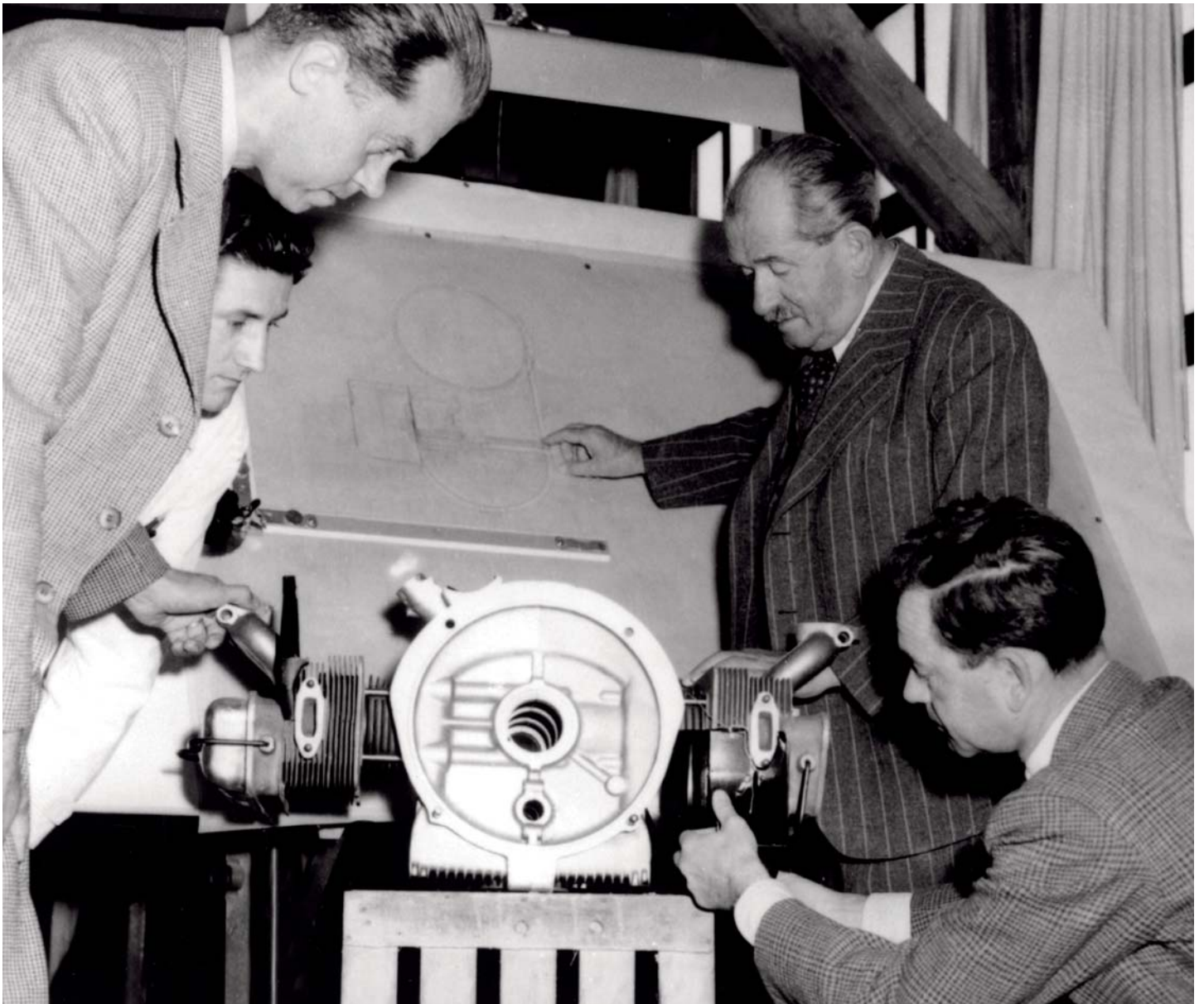
2001

Porsche Engineering Group GmbH (PEG), a wholly-owned subsidiary of Porsche AG, officially commences its business activities on August 1st.



2002

A highlight in the joint venture with US motorcycle manufacturer Harley Davidson conducted since 1997 is the completion of the Revolution power unit developed by Porsche to production standard and featured since 2002 in the Harley Davidson V-Rod.



Complete Vehicle · Styling · Body & Safety · Engine · Drivetrain · Chassis · Electrics & Electronics · Testing · Industrial Engineering · Production Engineering

**Since 1931 we tinkered.
And we're not finished yet.**

75 years of Porsche engineering services.

For more information on contract development services by Porsche:

Phone +49 711 911-88888, Fax +49 711 911-88999

Internet: www.porsche-engineering.com, e-mail: info@porsche-engineering.com

Porsche Engineering
driving identities



PORSCHE

Imprint

Publisher

Porsche Engineering
Group GmbH

Address

Porschestraße
D-71287 Weissach
Germany

Tel. +49 711 911-88888

Fax +49 711 911-88999

Email: info@porsche-engineering.com

Internet: www.porsche-engineering.com

Editor

Dieter Landenberger –
Historical Archive Porsche AG
Catja Wiedenmann

Production

Werking
Werbekonzeption & Realisation,
Bad Sobernheim, Germany

Print

Gulde Druck GmbH, Tübingen, Germany

Porsche Engineering
driving identities