PORSCHE

# Press Information

Motor Show Geneva 2014

# Contents



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Porsche at the 2014 Geneva International Motor Show

# World premiere: 919 Hybrid for Le Mans

Porsche returns to the great motorsport stage. The sports car brand is sending a cutting-edge technology platform, the new 919 Hybrid, to race in the top category of the World Endurance Championships, which include the 24 Hours of Le Mans. On the race track and at the Geneva International Motor Show, the LMP1 prototype will be accompanied by the new Porsche 911 RSR, another world premiere. Other vehicles making their debut include the Macan S Diesel and 911 Targa production models.

## Technology transfer from race course to streets

Motorsport is as much a part of Porsche as the numeric sequence 911. The first sports car from Zuffenhausen was sent to race at Le Mans back in 1951, i.e. shortly after the company was founded. Ever since, knowledge acquired in competition has always benefited the company‘s production models. Developments such as dual ignition, disc brakes, the dual-clutch transmission and powerful hybrid drives were first proven out on the race course before they were introduced into street models. As a result, there is always a race car within every Porsche.

In 2014, Porsche is returning to the top class of endurance racing after 16 years. So the engineers had to develop the new Porsche 919 Hybrid from scratch. The WEC‘s new regulations for LMP1 race cars gave them an unusual degree of freedom, while focusing on such technologies with great future potential such as hybridisation, engine downsizing and a systematic approach to lightweight design. Instead of pure power, the focus is now on clever ways to enhance fuel efficiency: only those with fuel-efficient cars are competitive. For a long time now, Porsche has called this “Porsche Intelligent Performance.”

The 919 Hybrid is the most complex race car that Porsche ever put on wheels. It benefits from the know-how that Porsche acquired in producing the 918 Spyder super sports car as well as the hybridised production versions of the Panamera and Cayenne. At the same time, the LMP1 racer – as a unique test laboratory that is subjected to the unrivalled innovative and competitive pressures of motorsport – has maximum relevance when it comes to the future of sports cars.

**Porsche also continues its commitment to GT racing**

In tandem with the LMP1 project, Porsche is also taking on the intense competition in the GTE classes at Le Mans and in the WEC. It is once again sending its own GT factory team to the races with two 911 RSR race cars that boast 470 hp of power output. The successor to the successful 911 GT3 RSR – with which Porsche customer teams have earned numerous victories and titles in international endurance championships since 2004 – crowned its racing debut last year at the 24 Hours of Le Mans, placing first and second. The rear-wheel drive 911 RSR is based on the 911 Carrera type 991 – the seventh generation of the sports car icon. It is distinguished by its intelligent lightweight design and refined aerodynamics. In preparation for the new racing season, Porsche engineers further improved it in many aspects.

**Porsche 911 Targa: modern renaissance of a 911 classic**

After its world premiere in Detroit, Porsche is presenting the new 911 Targa to the European public for the first time at the Geneva International Motor Show. A key element of this latest 911 version is its fixed Targa bar. Its design recalls the characteristic form of the original model of 1965, including its wrap-around rear windscreen. Just as impressive as the new design‘s eye-catching appearance is the elegant way in which it is fully automatically transformed from a closed top to an open top Targa and back. The soft top threads its way spectacularly beneath the rear glass windscreen, which is lifted in coordination with the cover to the soft top box and is tipped towards the rear. The entire process takes just 19 seconds in either direction.

Porsche is offering the new generation Targa exclusively with all-wheel drive. In the 911 Targa 4, the 350 hp (257 kW) 3.4-litre flat engine enables fast fresh-air pleasure. In combination with PDK and the Sport Chrono package, it accelerates from zero to 100 km/h in 4.8 seconds and has a top speed of 282 km/h. Its NEDC fuel consumption figure is between 9.5 and 8.7 l/100 km (223-204 g/km $CO_2$) depending on which transmission is used. The top model is the 911 Targa 4S that develops 400 hp (294 kW) from 3.8 litres of displacement. It attains a top speed of 296 km/h and handles the standard sprint to 100 km/h in 4.4 seconds with PDK and the Sport Chrono package. Its fuel consumption figure ranges from 10.0 to 9.2 l/100 km (237-214 g/km $CO_2$) depending on which transmission is used.

**Macan S Diesel:**
**6.1 litres per 100 km fuel consumption and PDK transmission as standard**

Another highlight making its appearance in the Palexpo halls of Geneva is the new Macan. Porsche is introducing the first sports car among compact SUVs with this fifth model series. The focus here is on the Macan S Diesel, which is celebrating its public debut. The exceptionally torque-strong diesel model impresses with a maximum torque of 580 Nm, 258 hp (190 kW) and a combined NEDC fuel consumption figure of 6.3 to 6.1 litres per 100 km. That equates to $CO_2$ emissions of 164 to159 grams per km. Other facts about this Macan: it combines extreme agility and maximum steering precision with spirited acceleration and impressively short braking distances. It also exhibits a styling whose key design elements such as its coupe-like roofline come from Porsche sports cars.

The new Macan model series unites typical Porsche driving performance with a high level of comfort and everyday practicality. The exceptional positioning of this all-wheel drive on-road and off-road vehicle is reflected in its engine range. Both the 400 hp (294 kW) Macan Turbo with a 3.6-litre V6 and the Macan S with a 3.0-litre six cylinder engine, which also features biturbo charging and 340 hp (250 kW), are pressing forward into performance regions hitherto unknown in this segment. In this trio, the Macan S Diesel car assumes the role of the powerful long-distance cruiser.

Porsche 919 Hybrid

# Pioneer technology for World Sportscar Championship

Porsche is returning to the top category of the famous endurance race classic at Le Mans and the World Endurance Championships (WEC) for sports cars with its newly developed 919 Hybrid. The LMP1 prototype, which is designed for extreme efficiency, is the most complex race car that Porsche ever put on wheels. It serves as a research platform for fundamental technology to be used in future production models, with its combination of two different energy recovery systems and a downsizing turbocharged engine. So the real winner of Porsche factory racing is already clear: it is the customer.

The World Endurance Championship (WEC) for sports cars launches into a new era, beginning on 20 April at Silverstone in Great Britain. The season highlight, Le Mans, follows in June. The newly formulated regulations for the top class of this World Championship has completely changed in focus. From now on, the sporty performance of the LMP1-H prototypes will be rated in direct relationship to their energy efficiency. While the allowable fuel quantity per lap was reduced by around 30 per cent compared to the prior year, the amount of energy of the obligatory hybrid systems that can be used in the race was dramatically increased. This shifts technologies into the limelight that are most significant for future production vehicles. From the perspective of Porsche, that is a decisive argument for a return to the top league of sports car racing.

### Maximum efficiency of all elements as development goal

Porsche engineers are taking on the challenges of the WEC regulations with innovative solutions and all the creativity they can muster. The development of the Porsche 919 Hybrid began in mid-2011 – literally on a blank sheet of paper. As newcomers, the developers had to do without the greater experience that their competitors in the LMP1 category enjoyed. However, they were able to access the know-how that Porsche had acquired in its racing success with the 911 GT3 R Hybrid and the 918 Spyder super sports car, which is also hybrid-driven.

The exceptional efficiency of the highly complex technology of the Porsche 919 Hybrid is the result of a carefully balanced overall concept. From the combustion engine to the energy recovery systems, chassis and running gear, aerodynamics and driver ergonomics, the sum of all individual components forms an exceptionally effective unit. It all serves one goal: a maximum of sporty performance within tight fuel economy constraints.

In choosing a hybridised drive concept, the newly formulated WEC regulations gave Porsche developers great freedom. The drive system of the new LMP1 race car is based on a four-cylinder petrol engine that is as compact as it is lightweight. It performs load-bearing functions within the chassis based on its V-construction, which also offers thermodynamic advantages. The petrol engine, which reaches a maximum engine speed of around 9,000 rpm, is a frontrunner in terms of its downsizing philosophy with its 2.0 litres of displacement, direct injection and monoturbo charging.

It also features two different energy recovery systems. Fundamentally new and especially innovative is the recovery of thermal energy from exhaust gases. An electric generator is used here, which is powered by the exhaust gas stream. The functionality of the second hybrid system is known from the Porsche 918 Spyder. Here, a generator on the front axle utilises braking phases to convert kinetic energy into electric energy. It is also stored in highly-advanced water-cooled lithium-ion battery packs until the driver needs the extra energy. Then the front generator is operated as a single electric motor and drives the two front wheels via a differential in the acceleration phases. This gives the Porsche 919 Hybrid a temporary all-wheel drive system, because the petrol engine directs its power to the rear wheels in a conventional way.

**Powerful hybrid drive for the 8 megajoule premiere class**

Intelligent management of this additional available energy assumes a special role here. Of course, the strategic focus of the racing engineers is always on the most efficient use of available power. This means an optimal lap time. The driver can choose from several automated drive modes that have an effect on vehicle dynamics as a function of the traffic situation, course layout and weather conditions. At this point, the developers made use of knowledge gained by Porsche with the 911 GT3 R Hybrid, including at the 24-hour race on the Nürburgring.

The allowable petrol fuel consumption depends directly on the amount of electrical energy that the driver can call up per lap in what is known as the Boost function. Race rules distinguish between four levels ranging from 2 to 8 megajoules (MJ). Porsche is developing the 919 Hybrid for the "Premiere class" with an energy recover capacity of 8 MJ. This requires the use of high-performance energy recover and storage systems, which need to be sized larger and heavier. A flow meter device also limits the amount of fuel flow. Example of Le Mans: Here, the turbocharged petrol engine, which is driven at full load for 75 per cent of the 13.65 kilometre lap, only has 4.64 litres of fuel available. In the 2-MJ class, the figure is 5.04 litres.

**Factors for success: Low weight and efficient aerodynamics**

In motorsport and in the production models, Porsche has always devoted a lot of attention to the theme of lightweight design. This continues to be the case with the Porsche 919 Hybrid. Despite the addition of many new technical systems, race regulations have reduced the specified minimum vehicle weight by 30 kg to 870 kg compared to the prior year. This is definitely an ambitious requirement. The specialists at Porsche are approaching this target value by intensive optimisation of even the smallest of details. As is done for the production sports cars of the traditional brand, the following applies to the 919 Hybrid as well – and very undogmatically: the right material is always used in the right place for the intended purpose.

As in Formula-1 racing, the chassis of the new Porsche 919 Hybrid consists of a carbon fibre monocoque with a sandwich construction. It combines low weight with a very high degree of torsional rigidity and safety. As a result, it offers a foundation for precise wheel positioning by multi-link wheel suspensions – an important prerequisite to exploit optimally under all conditions the full potential of race tyres from development partner Michelin that are just 14 inches wide (previously 16 inches).

According to the race regulations, the Porsche 919 Hybrid must not exceed a length of 4,650 mm and a height of 1,050 mm, and vehicle width must be between 1,800 and 1,900 mm. The car's aerodynamics have been fine-tuned in over 2,000 hours of wind tunnel testing since February 2012. Aerodynamics make an important contribution to the overall efficiency of the race car and reduce air drag while supplying the increased cooling air needed for the hybrid drive and the downforces needed for high speeds in bends. The aerodynamic design of the Porsche 919 Hybrid can be modified for different course characteristics.

**Safe and functional: Optimal working conditions for the driver**

Driver ergonomics play a crucial role, especially in endurance races like the 24 Hours of Le Mans. The motorsport experts therefore devoted a lot of attention to the layout of the cockpit. The drivers have a good view of race events thanks to their somewhat higher seat position in the chassis compared to the previous LMP1 rules. In night-time hours, LED four-point headlights that were specially designed for Porsche provide for clear visual conditions. Their distinctive form was created in cooperation with Style Porsche, the design studio for production models. Here too, this modern lighting technology will benefit all Porsche customers in the future.

**Countdown:**
**Around 200 employees and 6 drivers excitedly look forward to the season start**

In mid-May 2011, Porsche decided to return to the World Endurance Championship and the 24 Hours of Le Mans with a LMP1 factory team. Consequently, the motorsport centre in Weissach was expanded considerably, and a service garage and administration building were added. Today, around 200 employees participate in the engineering, construction and use of the Porsche 919 Hybrid. Fritz Enzinger (age 57) assumes overall management of the LMP1 project. Responsible for technology is engineer Alexander Hitzinger (Dipl.-Ing., age 42). Andreas Seidl (age 38) is team leader.

The cockpits of the two Porsche 919 Hybrid cars are shared by experienced Le Mans Porsche driver Timo Bernhard (Germany, age 33), Romain Dumas (France, age 36) and Marc Lieb (Germany, 33) as well as Brendon Hartley (New Zealand, age 24), Neel Jani (Switzerland, age 30) and former Formula-1 driver Mark Webber (Australia, age 37).

The WEC year 2014 includes seven 6-hour races and the world famous 24 Hours of Le Mans (14th and 15th of June) as a season highlight. On Easter Sunday, the racing begins in Silverstone. After Spa-Francorchamps in Belgium (3rd of May), there are other world championship races on the programme in Austin (Texas, 20th of September), Japan (Fuji, 12th of October), China (Shanghai, 1st of November), Bahrain (Sakhir, 15th of November) and Brazil (São Paulo, 30th of November).

# Porsche LMP1: a look at the team for the 919 Hybrid

The LMP1 team in Weissach includes over 200 people. It's the mixture that does the trick: endurance racing experience, company expertise and fresh Formula-1 know-how. This also applies to the team leaders and the six factory drivers.

**Fritz Enzinger, Vice President LMP1 (Austria, age 57)**

This native of Styria was employed in the services of BMW for thirty years. He was in positions of responsibility in touring car victories at Le Mans 1999 and in Formula-1 successes. At the end of 2011, he switched to Porsche and began to build up the LMP1 project in Weissach. Building, personnel, vehicle – organising everything from scratch was an irresistible challenge. Two goals spur him on: first, to create sustainable top sports organisational structures for the company. Second, to score a 17th overall victory for Porsche at Le Mans as quickly as possible. Raising Iceland ponies is his hobby for unwinding, a passion that he shares with his wife and daughter.

**Alexander Hitzinger, Technical Director of LMP1 (Germany, age 42)**

At the end of 2011, he turned his back on the Formula-1 world championship team to join Porsche. He was fascinated by the opportunity to be part of the brand's continuing great motorsport history. As technical director of the LMP1 team, the Bavarian was responsible for the development of the 919 Hybrid – a vehicle of high complexity with a lot of potential for genuine innovations. The engineer has a long résumé of experience in various high-class motorsport categories. His positions included "Head of F1 Development" for the English race car engine builder Cosworth and most recently "Head of Advanced Technologies" at Red Bull Racing. He is married and has two children.

**Andreas Seidl, Team Principal (Germany, age 38)**

What is fascinating about motorsport to Seidl, an engineer, is the immediate feedback that it offers. Every modification undergoes a stress test in competition, and the test bench is public. This Bavarian can handle the pressure. It is the results that count. He is enthusiastic about the team spirit and the perfect staging of a race weekend – in both its technical and

organisational aspects. At BMW, Seidl was responsible for testing and race events in Formula-1 racing. When the company returned to DTM racing, he was racing director and immediately attained the championship title. Mission completed. At Porsche, the father of two found a new challenge.

## Drivers of the Porsche 919 Hybrid

### Timo Bernhard (Germany, age 33)

He knows how it is to win the most famous sports car race in the world. In 2010, he was part of the victorious Audi team at Le Mans together with Romain Dumas and Mike Rockenfeller. He wants to do that again. “To do this with Porsche would be awesome. It‘s impossible to describe my enthusiasm for the brand.” Bernhard, who began his Porsche career in 1999 as a junior, has attained seven overall victories in 24 hour races – five times on the Nürburgring and once each at Le Mans and Daytona. Endurance racing is not his only passion: In 2013, he won a stage of the German Rally Championship in his homeland of Saarland, driving a 911 GT3.

### Romain Dumas (France, age 36)

He lives and breathes Porsche. When the Swiss citizen by choice is not driving on the Porsche factory team, he is off on a private mission. Such as at Pikes Peak, in Macau or in the French Rally Championship, where he won four stages in 2013, driving a 911 GT3 RS. His resume includes seven overall victories in 24-hour races – the Le Mans win in an Audi along with Timo Bernhard and Mike Rockenfeller in 2010, four times at the North Loop of the Nürburgring and twice at Spa in Porsche cars. The Mediterranean is not far from his birthplace of Alès, and boats are another of his long cherished passions. Dumas’ most recent passion, however, is named Gabin, who was born in late 2013.

**Brendon Hartley (New Zealand, age 24)**

From the generation of computer kids, a highly sought-after simulator driver with Formula-1 experience – a genuine racer. As a teenager, he left his home down under to pursue a professional career in Europe, which really took an upward swing in 2007 with the championship title in the World Series by Renault. As a Formula-1 test driver, he lacked competition, so Hartley turned to sports car racing. To him, the most emotional race in the world is the 24 Hours of Le Mans. "A rollercoaster of feelings; never have I seen so many grown-up men with tears in their eyes."

**Neel Jani (Switzerland, age 30)**

A Swiss citizen with Indian roots, an experienced endurance driver, who was hooked on Porsche even as a child. Sunday excursions on the back seat of his father's 911 shaped his future. Formula Renault, Champ Car World Series, victory in the A1GP series, several years as a Formula-1 test driver – for a long time, Formula racing took centre stage. Jani, who lives in the Swiss city of Port with his wife Lauren, drove in his first Le Mans race in 2009. In 2011, he won the Le Mans Series with Rebellion; in 2012, he just missed the podium at Le Mans, finishing in overall fourth place, once again in the LMP1 Rebellion. "At Le Mans, it is only possible to compete for the overall victory with a top factory team."

**Marc Lieb (Germany, age 33)**

As a 20-year-old, the native of Stuttgart won the Porsche Junior Driver Selection. Ever since, he has celebrated Porsche victories across the globe, including five overall victories at 24-hour races: four times at the Nürburgring and once in Spa. At Le Mans, he won in the GT class with Porsche – now he wants to compete in the top category there as well. The young father of two has not only applied his talents to the development of race cars; the services of the vehicle technology engineer were also highly appreciated in the development of the 918 Spyder. In autumn 2013, he set the course record on the North Loop of the Nürburgring with the super sports car.

**Mark Webber (Australia, age 37)**

This Formula-1 star – with 215 Grand Prix races, 13 pole positions and nine victories – has taken up the challenge of sports car racing. Born in Queanbeyan (New South Wales), he moved to England in 1996. Formula Ford, Formula 3, sports cars, Formula 3000, Formula 1. The outdoor sports enthusiast still has a score to settle at Le Mans. In 1999, he rolled over twice in his AMG Mercedes CLR due to an aerodynamic problem. What Porsche means to him: “Super highly developed sports cars that can make do without overstatement – perfect in every mood and in every scenario.” He lives with Ann Neal (and their many dogs) in Aylesbury (UK).

The Porsche 911 RSR

## 2014 season begins with class victory in Daytona

What an incredible premiere: In its first appearance in the 24 Hours of Le Mans, the Porsche 911 RSR shone last year with magnificent first and second place finishes (GT-Class). The GT racer from Weissach, which is distinguished by its systematic lightweight design and refined aerodynamics, has been further improved in many aspects for 2014. And with success: it started the 2014 season impressively as class victor at the 24-hour race at Daytona.

The 911 RSR, which is used in the 24 Hours of Le Mans and the new United Sports Car Championship in the USA and Canada as part of the WEC World Sportscar Championship series, made its appearance in 2013 as a successor to the successful 911 GT3 RSR. It is based on the seventh generation of the 911 sports car icon. As in its production car counterpart, its wheelbase was lengthened by a full ten centimetres. A new wishbone front suspension replaces the previously used MacPherson sprint strut suspension. The lightweight racing gearbox is also a special new development by Porsche Motorsport. Its six gears are shifted by shift paddles on the steering wheel. The 470 hp four-litre flat six engine was taken from the previous model and optimised in its details.

One of the central focuses in developing the 911 RSR was to attain a balanced weight distribution. The vehicle‘s centre of gravity is also significantly lower than in the previous model. Carbon fibre material assumes a special significance here. The front and rear fenders, front and rear lids, the doors, underbody, wheel arch panels, rear wing, dashboard and centre console are made of this exceptionally lightweight and strong material. In addition, all windows are made of very thin and lightweight polycarbonate. The familiar lightweight lithium-ion battery of the GT street models also makes a contribution towards weight savings.

### More service-friendly for shorter pit stops

The look of the new 911 RSR is marked by broad flared wings and a deep cooling air channel at the front end. The new air flow system enables a centrally located radiator at the front end, which operates even more efficiently than in the previous model. Climate control of the interior was also made more efficient. For enhanced service friendliness and shorter repair times, a quick-change concept for body parts was tuned for long-distance racing. The nose, front lid and rear apron are attached with quick-action clamps and can be replaced within just a few seconds.

The static cornering lights that are positioned very low in the front end improve the driver‘s view in bends. This improves night-time driving safety. The reflective labels on cockpit controls, combined with anti-glare interior lighting, provide for optimal legibility in darkness. The layout of switches on the new steering wheel was developed together with the Porsche factory drivers. From the outset, they contributed their wealth of experience in GT motorsport to the design of the 911 RSR.

### Numerous improvements

The 911 RSR was systematically further improved for the 2014 season. The redesigned front end, for example, and the new rear wing provide for optimal aerodynamic balance and therefore for greater stability in fast driving through bends. Even more precise steering response, which leads to better vehicle handling in bends at slow and moderate speeds, was attained by optimising front suspension kinematics. Further improvements to the car‘s structural rigidity result in more precise steering response. Also new is the engine air induction system, which was optimised in its details, such as in its air filter geometry, which contributes towards reducing the effects of contamination on power output. The new FT3 safety fuel tank with a lowered centre of gravity enables improved filling under race conditions.

Live telemetry that is permanently transmitted to the command station via the car‘s roof antenna ensures that engineers are always well informed of all relevant vehicle data with over 200 measurement values. In addition, all data is stored on a memory card in the vehicle.

**“The most spectacular 911 ever”**

“The 911 RSR was further optimised in many aspects. The wide rear wheel rims and refined aerodynamics have improved consistency over a sprint,” says Porsche factory driver Jörg Bergmeister. “This is undoubtedly the best 911 that I have ever driven. It still always feels like a 911, but it can do practically everything better than the previous model. And on top of that, it is also in my eyes the most beautiful and most spectacular 911 ever.” His team-mate Patrick Pilet adds this: “Last season, we strove constantly to develop the car further. The better weight distribution, in particular, has had a positive effect on performance. The 911 RSR is now more stable over the rear axle and gives the driver a greater sense of trust. This allows the driver to probe performance limits faster.”

# Porsche GT: a look at the team for the 911 RSR

**Hartmut Kristen, Vice President Motorsport (Germany, age 59)**

He had already worked at Porsche for 20 years before he became head of the Motorsport division in 2004 after ten years of heading up the customer sport and GT vehicles programmes. Ever since, he has not only been successful in making his mark in top motorsport racing, such as with the RS Spyder and the 911 GT3 R Hybrid; today he is also responsible for the global activities of Porsche in the GT classes – including global customer sport activities, which are "the backbone of Porsche Motorsport." He creates opportunities for promising talent. Under his aegis, Porsche has certainly developed the most extensive programme of support for new motorsport drivers. In 2013, he led the factory team of the new 911 RSR to first and second place finishes in its class at Le Mans, while he and his team kicked off the 2014 season with a victory of the further advanced 911 RSR at the 24 Hours of Daytona.

**Dieter Georg Steinhauser, Director Motorsport Development (Germany, age 55)**

He sees new tasks primarily as a challenge. As manager for all technology in motorsport and in GT street vehicles (except LMP), he and his team have already initiated many projects that have attracted attention. The GT3 R Hybrid was such a project: "highly innovative and exciting." The veteran Porsche manager – who has been with the company since 1984 and also worked on Indy and Formula-1 engines – has advanced the development and successful implementation of the RS Spyder sports car prototypes in the USA and at Le Mans in his role as overall project manager. And then there was the GT1 as well, the car that Porsche used to achieve its most recent overall victory at Le Mans in 1998.

**The drivers:**

**Jörg Bergmeister (Germany, age 38)**

Of all the successes that Jörg Bergmeister has already celebrated with Porsche, it is primarily the victories in the major endurance races that make him especially proud. Le Mans, Daytona, Sebring, Nürburgring, Spa – they are all part of the success statistics of the tall fair-haired driver, who, in 2000, won the Carrera Cup Germany and in 2001 the Porsche Supercup. Afterwards, he was named a factory driver. His collection of titles speaks for itself. He may have even set a record with five wins in the popular American Le Mans Series; in 2006, he even won championship titles in both the Le Mans and Grand-Am series – a feat that only he has ever pulled off.

**Marco Holzer (Germany, age 25)**

In motorsport, as in other disciplines, the training years are not always the winning years. Marco Holzer, who was sponsored as a Porsche Junior in 2008 and joined the Porsche factory team in 2011, certainly knows a thing or two about it. The golden boy, who celebrated an overall victory at the 24-hour race in Dubai in 2010 and a year later successfully drove the first hybrid race car from Porsche at the endurance classic on the Nürburgring, showed maximum flexibility in his racing efforts with customer teams across the globe. Now he is getting the opportunity of his life. He says: “I have always dreamed of driving for the Porsche factory team at Le Mans.”

**Richard Lietz (Austria, age 30)**

His victory with the 911 RSR at the 24-hour race in Daytona was a season opener entirely to his liking. The Austrian, who has been a Porsche factory driver since 2007 and participates in rallies and ice races in his free time with as much virtuosity as in the classic races, is familiar with success. In the previous year, he celebrated his third Le Mans victory since 2007 and 2010 and is looking towards a fourth victory to follow in June. This time, starting at Le Mans would be icing on the cake for him, because his primary goal is to win the championship title for Porsche at the new Tudor United Sports Car Championship in the United States and Canada. He has already made a good start with his victory in Daytona.

**Frédéric Makowiecki (France, age 33)**

His ambitious efforts and patience in trying to win the Porsche Carrera Cup in France show just how much his heart beats for Porsche. Twice he had to settle for second place and once he finished third, before finally winning the long sought-after title in 2010. Even back then, he had a reputation as one of the world's fastest GT drivers. He gave proof of this in high-calibre championships such as the FIA GT1 world championship, where he finished second in 2012, and in the WEC. He now returns to his roots as a Porsche factory driver. "To drive for Porsche," he says, "is exactly what I have always wanted to do."

**Patrick Pilet (France, age 32)**

He is a man for all seasons. Regardless of which championship Patrick Pilet is racing in, he is always good for a victory. In the American and European Le Mans Series as well as the International GT Open. He won the 24-hour race in Daytona in 2014 and the race in Dubai in 2010. He was also named Carrera Cup France champion in 2007. Only at the WEC has he not climbed to the top step of the victor's podium yet. This season, he wants to remedy the situation, preferably at Le Mans, of course. "For a Frenchman," he says, "a victory at Le Mans is as valuable as a victory at Wimbledon for an English tennis player. There is nothing greater."

**Nick Tandy (Great Britain, age 29)**

The Brit started the new season just like he ended the last one – with a great victory. In October 2013, he won the Petit Le Mans at Road Atlanta – a race course steeped in tradition; and in January 2014, he won the 24 Hours of Daytona, together with Patrick Pilet and Richard Lietz. This season, he is sharing the 911 RSR with the Austrian driver in the Tudor United Sports Car Championship. In 2011, he was the overall victor in the Carrera Cup Germany and, in 2012, he won the Porsche Cup for the most successful private driver of the 911. In the following year, he was named a factory driver. He wants to fulfil his next race car driver's dream at Le Mans.

Technology transfer as a concept

# In the heart of every Porsche, there is a race car

Sporty ambition is what has inspired Porsche engineers from the start. The race course has been the merciless test platform for sports car technology for seven decades now. Examples of technology transfer include the mid-engine, aerodynamics, turbocharging, PDK, regulated all-wheel drive and hybridisation.

### Mid-engine, synchronisation, dual ignition

The Porsche 550 was created for the company‘s first factory racing programme, and it immediately won the Nürburgring race in 1953. Positioning of the four-cylinder flat engine in front of the rear axle made the Spyder very agile. In 1996, the mid-engine concept was continued in the Boxster. A five-speed transmission with Porsche synchronisation was used in the 550; it is similar to the transmission introduced to 901/911 production cars in 1963. For good measure, two spark plugs were used per combustion chamber in the 550 for optimised combustion – this type of dual ignition was introduced to Porsche production cars in 1988 in the 911 Carrera (type 964).

### Trailing edge, duck tail, active aerodynamics

Ferdinand Alexander Porsche sketched the 904 Carrera GTS Coupé of 1963 with a trailing aerodynamic edge at the rear of the car. The first front spoiler was introduced on the 911 S in 1971. It accelerated air flow under the vehicle and diverted a portion of the air to the sides; this reduced lifting force at the front of the car. In 1972, the Carrera RS 2.7, which was designed for motorsport, set new standards: not only was it equipped with a front apron that extended low to the ground; it also had a distinctive spoiler over the engine lid – the legendary “duck tail.” However, the really phenomenal technology platform of the 1970s – in terms of its aerodynamics too – was the Porsche 917. The twelve-cylinder race car was built in two versions: one with a short rear section and high downforce for race courses with lots of bends, and one with a long rear section that was optimised for low air drag intended for high-speed race courses. To increase downforce in bends, adjustable flaps were

added at the rear, which were connected via rods to the wheel suspensions. When the driver steered into a bend, the flap above the unloaded rear wheel at the inside of the bend would be extended to increase wheel load by wind pressure, improving stability. The first step had been taken towards active aerodynamics, which Porsche introduced to production cars in 1988 with the automatically extending rear spoiler of the 911 Carrera. On the 911 Turbo presented in 2013, the Porsche Active Aerodynamic (PAA) system was used to adjust the rear wing and for the first time the front spoiler. The extensive system of adjustable aerodynamic elements in the 918 Spyder represents pure racing technology on the street.

**Turbocharging and intercooling**

For the American Can-Am series, Porsche further developed the 917 Coupé into the convertible Spyder, but the 560 hp output of the 4.5-litre V12 engine was inferior to the 750 hp engine displacement giants of the U.S. competition. Porsche reacted and developed both a sixteen-cylinder engine and a forced induction system for the twelve-cylinder engine. The pressure buildup of the charging air would be regulated to make it suitable for high dynamic load changes and speed changes in the racing engine. The engineers turned away from increasing charge pressure in the induction air, opting instead for the use of turbocharging. Undesirable excess pressure was diverted from the charger via a bypass valve. The 917/10, initially with 850 hp, was the dominating race car of the Can-Am series, and the introduction of turbocharging to Porsche production sports cars became legendary. The 911 Turbo went into production in 1974. Meanwhile, turbocharging technology in the 917/10 went one step further: intercoolers reduced the temperature of the compressed air for better cylinder filling and increased power. The 911 Turbo 3.3 benefited from this technology in 1977.

**Porsche Doppelkupplungsgetriebe**

Back in 1964, Porsche worked on a powershifting dual-clutch transmission. Four years later, tests were conducted on an automatic four-speed transmission based on the dual-clutch principle, and other designs followed in 1979. Finally, the Porsche Doppelkupplungsgetriebe (PDK) was created in 1981. In 1986, the electronically-controlled powershifting spur gear transmission was tested in the Group C Porsche 956 race car as well as in production sports

cars. The ability to offer shifting without interruption in the flow of power was especially advantageous for turbocharged engines, because the driver could continue to push the accelerator pedal during shifting to avoid a drop in charge pressure. Initial tests of the direct shifting transmission were conducted in 1983 in the Group C Porsche 956.003 race car. In 1986, the 962 C PDK won the World Championship race in Monza. Progress in the engineering of the control electronics finally enabled the introduction of the PDK to production cars. In 2008, Porsche introduced PDK in the 911 Carrera.

### All-wheel drive control

The 959, developed in 1983 for what was known as Group B at that time, had an advanced all-wheel drive system with variable control of the centre differential lock; it controlled the distribution of torque between the two axles as a function of load and friction values at the wheels. This control strategy proved to be so successful that Porsche developed it further and adapted it for use in the Carrera 4 in 1988. To optimise vehicle dynamics further, the engineers equipped it with a basic torque distribution of 31 to 69 per cent (front to rear axle) via a planetary distribution gear. The system also had a hydraulically activated centre differential lock and transverse differential lock for nearly stepless adjustment of the distribution ratio. Its operation was controlled by electronics that embodied technical know-how from the 959.

### Race cars with hybrid drives

In 2010, Porsche nearly achieved a sensational race upset with its 911 GT3 R Hybrid that embodied promising future technology: this GT3 – with a power output of 465 hp from a four-litre six-cylinder rear engine and two electric motors at the front axle, each producing 75 kW of power – was in the lead until just two hours before the end of the 24-hour race on the Nürburgring. This innovative front wheel drive was also an object of testing: the hybrid concept of the 918 Spyder, which also included an electric motor drive at the front axle, is a direct advanced development of the system used in the 911 GT3 R Hybrid. The highly innovative 919 Hybrid, with which Porsche will return to the top category of the World Sportscar Championship series in 2014, will write a new chapter of this tale.

**Porsche motorsport innovations for production cars (excerpt)**

| Technology | First use in a race car | | First use in a production model | |
|---|---|---|---|---|
| Ring synchronisation | 1952 | 356 | 1952 | 356 |
| Dual ignition | 1953 | 550 | 1955 | 356 A 1500 GS Carrera |
| Five-speed gearbox | 1955 | 550 A Spyder | 1963 | 901/911 |
| Mid-engine | 1955 | 550 Spyder | 1963 | 904 Carrera GTS |
| Disc brakes, internally gripping | 1959 | 356 B 1600 GS Carrera GT | 1961 | 356 B Carrera 2 |
| Multi-joint rear axle | 1961 | 718 RS 61 Spyder | 1977 | 928 |
| Fuel injection | 1964 | 904/8 | 1968 | 911 E, 911 S |
| Internally ventilated brake discs | 1965 | Porsche 906-8 Mountain Spyder | 1966 | 911 S |
| Polymer fuel tank | 1967 | 911 R | 1973 | 911 E, S, RS, 2.7 |
| Active aerodynamics | 1969 | 917 | 1988 | 911 Carrera |
| Disc brakes, perforated and internally vented | 1970 | 908/03 | 1974 | 911 Carrera RS 3.0 |
| ABS | 1968 | 908/02 | 1983 | 928 S |
| Adjustable stabiliser | 1971 | 917 | 2007 | Cayenne Turbo (PDCC) |

| | | | | |
|---|---|---|---|---|
| Turbocharging with bypass valve | 1972 | 917/10 | 1974 | 911 Turbo |
| Four-piston aluminium brake callipers | 1973 | 917/30 | 1977 | 911 Turbo 3.3 |
| Intercooling | 1974 | 917/10 | 1977 | 911 Turbo 3.3 |
| Four-valve cylinder head, water-cooled | 1978 | 935-78 | 1985 | 928 S |
| Tyre pressure monitoring system (TPM) | 1980 | 924 GTP Le Mans | 1988 | 928 S4 |
| Aluminium monocoque (mixed construction) | 1981 | 956 | 2011 | 911 Carrera |
| Monoblock aluminium brake calliper | 1982 | 956 | 1996 | Boxster |
| Motronic | 1982 | 956 | 1983 | 911 Carrera 3.2 |
| Porsche Doppelkupp-lungsgetriebe (PDK) | 1984 | 956 | 2008 | 911 Carrera |
| All-wheel drive control | 1983 | 959 | 1988 | 911 Carrera 4 |
| Damping and levelling control | 1983 | 959 | 2005 | 911 Carrera S |
| Titanium connecting rods | 1983 | 959 | 1983 | 911 Carrera |

| | | | | |
|---|---|---|---|---|
| Metal catalytic converter | 1990 | 944 turbo Cup | 1990 | 911 Turbo |
| Ceramic brakes | 1991 | 962 | 2001 | 911 Turbo S |
| Carbon fibre monocoque | 1998 | 911 GT1 | 2003 | Carrera GT |
| Hybrid drive with e-motor on front axle | 2010 | 911 GT3 | 2013 | 918 Spyder |

A proud history

# Porsche at the 24 Hours of Le Mans

Porsche is Le Mans – and Le Mans is Porsche. No other brand has put its mark on the most famous endurance race in the world so enduringly. From 1951 to today, Porsche has raced at the 24 Hours of Le Mans without interruption. It is still the record holder on the Sarthe with 16 overall victories. Porsche is continually reasserting its claim of proving the performance capabilities of technical innovations in motorsport and transferring them to production cars.

When the new Porsche 919 Hybrid vehicles roll towards the starting line on June 14, 2014, at 3 p.m., they will be following in some mighty big tracks. On the Le Mans circuit course, which is over 13 kilometres long, chapters of history were written that became a part of the Porsche legend. Winning models like the radical 917, the nearly indestructible 935 and the 956/962 series winners have long become motorsport icons.

The history of Porsche at Le Mans begins long before these rockets dominated in their respective eras. In June 1951 – just three months after the first production vehicles were assembled in Stuttgart-Zuffenhausen – Porsche launched the 356 SL (Super Light). Its premiere was a total success: Auguste Veuillet and Edmond Mouche won in their class. 101 other class victories have followed to date.

In 1968, the 908 with its 370 hp would be the first Porsche to take the pole position. In 1970, this was followed by the celebrated first overall victory for the legendary 917, when Hans Herrmann and Richard Attwood got the chequered flag after completing 4,607.811 kilometres or 343 laps of the circuit course. 28 years later, Porsche scored its most recent win with Allan McNish, Laurent Aiello and Stéphane Ortelli in the endurance classic in a 911 GT1.

The new Macan S Diesel

# Top performance in savings and sprints: the sportiest long-distance cruiser

Porsche presents the new Macan S Diesel at the Geneva International Motor Show. Its 258 hp (190 kW) three-litre turbocharged engine makes it the sportiest compact SUV in a fuel-efficient version. As with the Macan S and Macan Turbo, Porsche is using its Doppelkupplungsgetriebe (PDK) transmission exclusively for the Macan S Diesel – the first time it is being used with a diesel engine. This means that the new Porsche model series not only offers the most powerful turbocharged petrol engine vehicle; but also a long-distance diesel with exceptional sprinting qualities. The Macan S Diesel also secures its unique positioning within the segment by offering a unique range of options that include an air suspension. This feature offers the greatest possible bandwidth between sporty driving performance and comfort.

Zero to 100 km/h in 6.1 seconds, 6.1 litres of diesel per 100 km – these are the opposites that the Macan S Diesel can resolve. This bandwidth makes it a genuine long-distance sport vehicle, which combines good driving performance with great fuel economy. Its high torque of 580 Newton metres from 1,750 to 2,500 rpm makes it possible to accelerate impressively in all situations. To conform to the Euro-6 emissions standard, the emissions control system of the Macan S Diesel has an integrated SCR converter in addition to its oxidation catalytic converter and diesel particulate filter.

### Gear shifting like in a sports car: Doppelkupplungsgetriebe as standard

Unique in the compact SUV segment: all versions of the Macan have a Doppelkupplungsgetriebe (PDK) as standard. Its benefits include very high drive-off performance, extremely fast gear shifts without any interruption in power flow, low fuel consumption and excellent shifting comfort. In off-road operation, PDK demonstrates its advantages – especially in its gear shifts without power interruption in both climbing steep hills and descending them. The stop-start function is integrated in PDK as well as a coasting function. When the driver takes the foot off the accelerator pedal, PDK automatically decouples the engaged gear, and the vehicle coasts in neutral. In practice, coasting can offer fuel savings of up to one litre per 100 km depending on the driving profile.

### Optimal traction and vehicle stability: Porsche Traction Management (PTM)

The all-wheel drive concept of the Porsche 911 Carrera 4 makes its way into the segment of compact SUVs with Porsche Traction Management. PTM flexibly distributes drive torque via a hang-on all-wheel drive unit. The rear axle is always driven. The front axle gets its drive torque as a function of the degree of locking by the electronically controlled multi-plate coupling. This translates into excellent traction and driving stability for typical Porsche driving fun with an emphasis on rear-wheel drive. The off-road mode is a standard feature; it can be activated at vehicle speeds between zero and 80 km/h by pushing a button on the centre console. This switches all relevant systems to a traction-oriented off-road driving mode.

### Sport button as standard, Sport Chrono package is optional

The Macan S Diesel is equipped with a Sport button as standard. When it is pressed, the electronic engine management system gives more direct control of the engine, and the PDK shifts later and quicker. Performance can be further increased at the push of a button with the optional Sport Chrono package. It enables even sportier tuning of the chassis, engine and transmission – accompanied by an even more emotional sound.

### Extensive features, unique options

The range of standard features in the Macan S Diesel is extensive. They include a multifunction sport steering wheel with shift paddles, large wheels, high-performance audio system and electrically activated boot lid. The list of possible optional features includes additional highlights, such as an air suspension; the Macan is the only vehicle in its segment to offer this option. Another option specially tuned to the Macan is Porsche Torque Vectoring Plus, which offers variable distribution of the drive torque to the rear wheels in conjunction with an electronically controlled rear differential lock. Another Porsche option that is frequently requested is the dynamic main beam headlight as part of Porsche Dynamic Light System Plus (PDLS Plus), which variably adapts the light range to traffic ahead and oncoming traffic. The optional sound systems from Burmester® and Bose give customers audio systems with excellent quality to choose from.

The new Porsche 911 Targa

# A 911 with an innovative Targa roof: rebirth of a modern classic

Porsche is extending its current generation of 911 cars and is positioning the new 911 Targa beside its coupés and cabriolets. The latest generation of this extravagant 911 version is the first to combine the classic idea of the Targa roof conceived by Porsche with highly advanced roof convenience. Like the legendary original Targa, the new model has the characteristic wide bar in place of B pillars, a moving roof section over the front seats and a wrap-around rear windscreen without C pillars. Unlike the classic car, the roof section of the new Targa can be opened or closed at the push of a button. The fully automatic roof system can make the roof element disappear behind the rear seats in a spectacular fashion. The Porsche-typical, rear-load layout of the PTM all-wheel drive guarantees a maximum degree of dynamic performance also in this latest 911 version – on a wide variety of road surfaces and in all weather conditions.

So the new 911 Targa represents a highly innovative new edition of the classic car of 1965. It shares the most similarities with the 911 Carrera 4 Cabriolet models. Its technology and body are quite similar up to the level of the windows. The combination of the broad rear section, which is typical of all-wheel drive models, and the Targa bar and dome-like rear windscreen give the latest 911 a crouching and exceptionally sporty appearance.

### Two model versions exclusively with all-wheel drive

Like the previous model, the new generation Targa is launching on the market in two versions and exclusively with all-wheel drive. The heart that beats in the 911 Targa 4 is a 3.4-litre flat six engine with 350 hp (257 kW). With PDK and the Sport Chrono package, it accelerates from zero to 100 km/h in 4.8 seconds and has a top speed of 282 km/h. Its NEDC fuel consumption ranges between 9.5 and 8.7 l/100 km (223-204 g/km $CO_2$), depending on the transmission type. The top model is the 911 Targa 4S that develops 400 hp (294 kW) from 3.8 litres of displacement. It boasts a top speed of 296 km/h and, with PDK and the Sport Chrono package, it accelerates to 100 km/h in 4.4 seconds. Its fuel consumption ranges between 10.0 and 9.2 l/100 km (237-214 g/km $CO_2$), depending on which transmission is used. So its engine and driving performance and efficiency are all on the very high level of the 911 Carrera 4 Cabriolet. Both sports cars are certified according to the Euro 6 emissions standard.