

PORSCHE

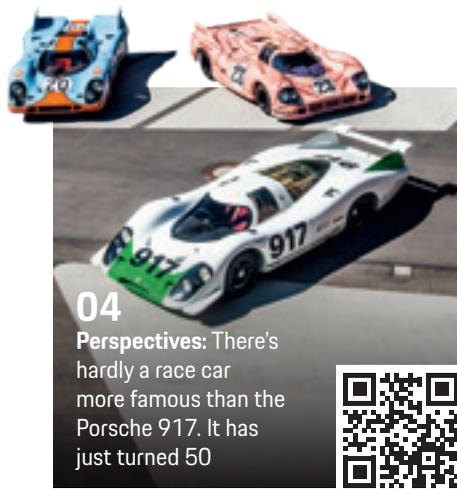
# CAMPUS

Winter semester  
issue  
2019/20

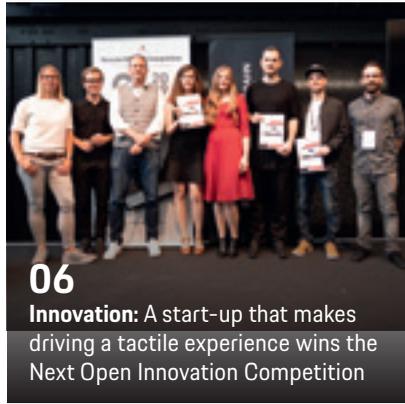
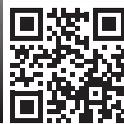
**CHARGED UP**

FOR AN  
ELECTRIFYING FUTURE

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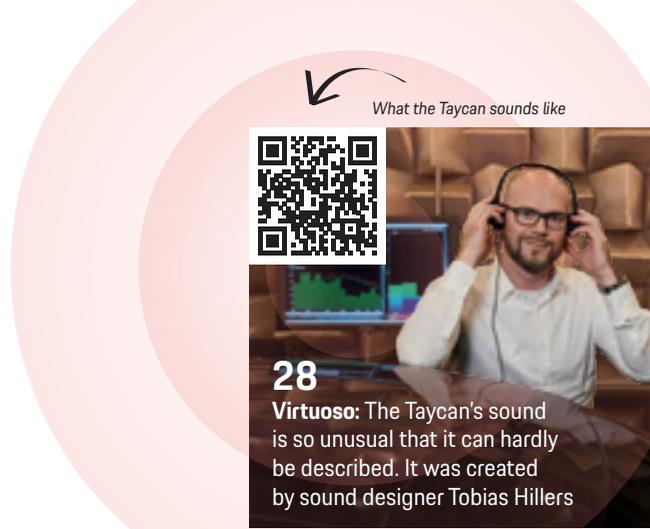
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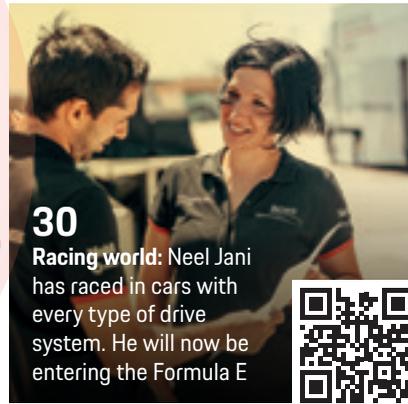
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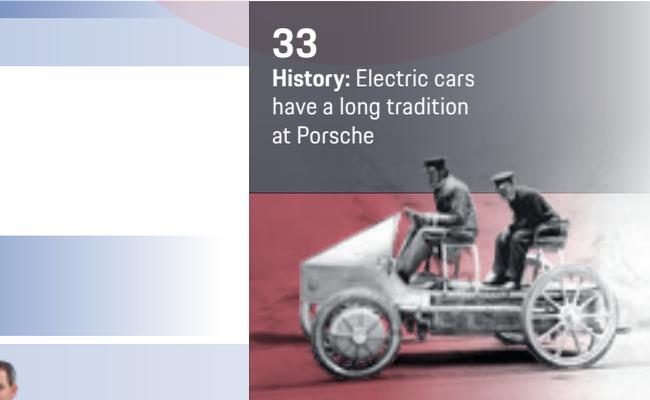
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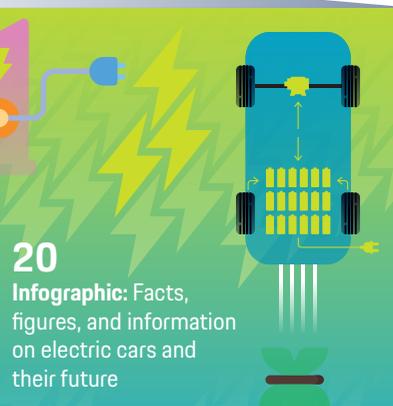
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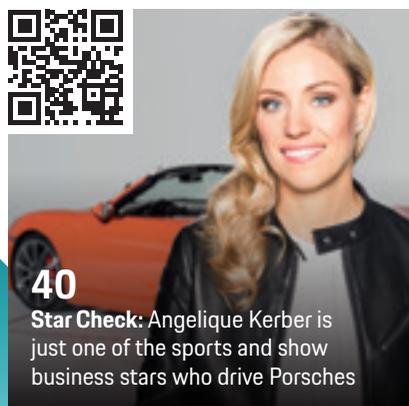


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## HIGH FLYER TURNS FIFTY

Historical backdrop for eleven legendary cars: Porsche is celebrating the fiftieth anniversary of the 917, one of the strongest three-digit combinations from Zuffenhausen. Plant 1's brick building provides the perfect stage to choreograph this serial winner. What is arguably the most famous race car of all time debuted at the Geneva Motor Show on March 12, 1969. Just one year later, Hans Herrmann and Richard Attwood drove the 917 with its air-cooled twelve-cylinder mid-engine to a coveted overall victory for Porsche at the 24 Hours of Le Mans—the sports-car manufacturer's greatest racing success at the time. Many more would follow.

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Photo: Klaus Hepp

Spaniard Alejandro Sarró (23) started learning German in 2016. Just for fun, he says. At the time he didn't know that he would be living in Germany and working for Porsche three years later.

at the Karlsruhe Institute for Technology. But Porsche was always like an unattainable dream.

**But now your dream has come true. What was your first day like?**

On the first day I felt a little lost. I wasn't even familiar with the site because my interview had been by phone. My team leader wasn't there, so another intern picked me up, and as luck would have it, he was a member of another Formula Student team. I was happy to know someone, and he showed me around a lot. My department also gave me a warm welcome right away.

**What is special about being an intern at Porsche?**

You're a real member of the team here as an intern, you're not just standing around at the copy machine. I attend meetings, and have been allowed to drive on the test course and also in the climatic wind tunnel. I've even been able to work on the Taycan. Porsche offers me the perfect combination of conventional automotive industry and motorsports: you're building cars for the road as well as sports cars. In addition, the company organizes regular gatherings for all the interns, and we also meet a lot on our own to talk. We're like a little family.

**In your case, not only is the work new but also the country and the people. How different is it from your life in Spain?**

Very different. I have some problems with the weather—even on warm days, the mornings feel really cold. And I miss the ocean. A lake is not the same thing. The rhythm of daily life is also very different. In Spain it would be unthinkable to start work at 6:30 in the morning. The lunch break is much shorter, and the food is different. Here people eat a lot of meat and sauces.

**What do you like about Germany?**

The people are open, and I feel welcomed. And I like *käsespätzle* (a cheesy noodle dish) and *maultaschen* (ravioli).

Interview Julia Bayer

THE FIRST DAY OF WORK FOR ALEJANDRO SARRÓ

AS AN INTERN IN THE FIELD OF

COOLING CIRCUITS AND BATTERY CONDITIONING

**“PORSCHE WAS LIKE AN UNATTAINABLE DREAM”**

**Alejandro, you were essentially discovered by Porsche. How did that happen?**

I took part in the Formula Student with a team from my university in Barcelona. Among other things, we designed a driverless electric car and were quite successful with it. At the competition on the Hockenheimring, an employee from Weissach came to us and wanted to know if any of us spoke German. I was the only one, and he encouraged me to apply for an internship. And it worked out.

**Could you have anticipated that when you started your studies in mechanical engineering?**

No. I come from a family that loves racing. As a child I went to many Formula One races with my father. Becoming a driver was out of the question, but working in the automotive industry was a realistic possibility. Because the big manufacturers are based in Germany, it made sense to do a semester abroad



INNOVATION COMPETITION

**FEEDBACK FROM THE BACK**

A feel for driving: the start-up GHOST—feel it. won this year's Porsche Next Open Innovation Competition with technology that could give Porsche drivers tactile feedback on their driving performance in the future. The team came out ahead of more than 150 projects with 750 participants from more than fifty countries.

GHOST—feel it. was founded in 2017 by neuroscientist Isabella Hillmer and engineer Laura Bücheler. Based in Berlin, the start-up aims to improve the interaction between people and machines. It focuses on technology that can be used for purposes like enabling amputees to feel their prostheses.

For the competition, the team integrated this technology into Porsche seats so drivers can feel on their backs how to operate their cars in the best and safest ways. The open innovation competition for digital developments, which Porsche organizes with the Berlin-based start-up High Mobility, was held for the second time in 2019. It showcased future-oriented applications relevant to all aspects of sports cars. Porsche will work together with the top three finishers. "We look forward to launching a project with the Porsche Digital Lab," says Laura Bücheler.

 [www.porsche-next-oi-competition.com](http://www.porsche-next-oi-competition.com)

Neuroscience meets engineering: Isabella Hillmer (right) and Laura Bücheler combined their respective areas of expertise in GHOST—feel it., the winning start-up from Berlin.



# BETWEEN HYPE AND REVOLUTION

Electric cars will bring fundamental changes to mobility in the future—and therefore also to car makers, in the form of new opportunities.

**S**omewhere along the line, every innovation reaches a turning point. The triumphal march of cars with combustion engines took off in 1912 when Charles Kettering, a teacher from Ohio, installed an electric starter motor in place of the troublesome crank. That invention abruptly decided the head-to-head race between gasoline- and electricity-powered cars at the time. But precisely the system that was once left behind is now making a comeback. More powerful than before, more sophisticated than ever, for many people it represents the cleanest solution for the mobility needs of tomorrow. Suddenly everyone is charged up. Not only the established car makers are electrified. New players like computer manufacturers and software giants are entering the field as well. But everyone is still waiting for the crucial breakthrough, the initial spark. The milestone that enables a major revolution to emerge from the hype and the dream. The Taycan could play an important role here. Porsche's first all-electric sports car is leading the development of electric vehicles on the road to a new era. The three individuals profiled on the next few pages—Teuta Demaili, Otmar Bitsche, and Alexander Pollich—are examples of how Porsche is charting a new course.

Electromobility is already present in many forms. Electric trains, subways, streetcars, car-sharing fleets, bicycles, and scooters are a common sight on the roads, especially in cities. For now, cars are still crucial to individual mobility. More than three million electric cars were registered around the world in 2018. While Germany accounted for “only” 36,062 of these, the United States cracked the one-million mark. And the worldwide demand for cars continues to rise. In 2010 the European Union was showing passenger transportation statistics of 6.5 billion kilometers a year. By 2030, that already huge number is expected to increase by as much as 30 percent. Around one-quarter of these kilometers are covered by car, and that will probably remain the case over the next two decades. One billion cars on the world's roads are therefore not nearly enough. The drive system will not be the only critical factor. Charging infrastructure, battery capacity, lower weight, innovative parking models, creative services, and greater connectivity up to and including self-driving cars are megatrends, all with the aim of enabling people to choose different types of mobility for different situations. May everyone enjoy a pleasant journey!

Texts Michael Thiem



Photo: Victor Jon Goico

**Otmar Bitsche,**  
Director of Development Electronics,  
Electronics, Electromobility

## THE VETERAN

If you think Otmar Bitsche (62) is doing the same thing today that he did at the age of six, you wouldn't be far off the mark. He presses the starter button. The electric motor responds within milliseconds. Torque available right from the start enables perfect acceleration before the loop and precisely dosed power before the chicane. The man at the center of all development activities related to the mega-topic of electromobility at

Porsche stands at the Carrera slot car course and beams. “Yes, this is a good example of what the drive technology can do,” he says. Bitsche already put an electric car onto the roads back in 1990 with the Fiat Panda. When asked whether he is tackling what might be the biggest task in the automotive industry right now, this electrical engineer nods. “That could well be,” he says modestly. “The great thing about Porsche is that you always have the feeling you're not just contributing a component but that you're an integral part of an overall strategy.”

He goes on to explain that Porsche's decision to promote electromobility laid the foundation for a completely new strategy at the company. At the end of this year the

Taycan—a lighthouse project—will go onto the market. In addition to working to expand the range, the company has consistently sought to encourage customer enthusiasm for a purely electric sports car. “We always wanted the charging process to be like fueling,” says Bitsche. “And we've achieved that. Increasing the voltage to 800 was what made that possible. Uncharted territory. Many people are watching closely to see if it works. It does. And amazingly well. For inductive charging, however, there are still some hurdles to overcome. “People tend to underestimate that because it's so complex,” Bitsche remarks as he pushes the controller to full power. An excellent metaphor for the development of electromobility at Porsche.

### Otmar Bitsche

**First Carrera (or model) car**  
*Yes, I had one, but can't remember which model anymore*

**First experience with electronics**  
*Electronics module in high school*

**First job at Porsche**  
*Director of Electronics, Electronics, Electromobility since 2012*

**Teuta Demaili,**  
Process planner

## THE NEWCOMER

Sometimes a focus on details can obscure a view of the results. Which is why Teuta Demaili enjoys the photo session right in the middle of the production processes she helped to plan. She now has a photo of the Taycan on the wall in front of her eyes at all times. If she wants, she can also admire the first Porsche with a purely electric drive—when it rolls from the line at station 94. “It’s a privilege to work on a project like this right when I’m starting my career,” says this

twenty-six-year-old who joined Porsche one and a half years ago as a process planner. She had already gathered experience with the company in internship, work/study, and bachelor programs. “This job is incredibly fun and I’m learning an enormous amount,” she says. The biggest achievement has been putting the project itself into practice at Zuffenhausen in such a short amount of time. A little over a year ago, the assembly building was just a shell when work began on installing its systems. And the first complete vehicle was already being produced there by the end of 2018.

In the meantime, every part of the Taycan production process runs flawlessly, the tools have been optimized, and the logistics are running as well. There were times during preliminary series production when Demaili could have carried out nearly every step herself. “Because of the change in product sub-

stance, we have a different assembly sequence than that for the sports cars, a complex cooling system, and the first high-voltage system in Zuffenhausen,” she explains. The assembly facilities were finished within five months. The assembly facilities were finished within five months, and various innovative solutions were found along the way. For example, the sixty-eight automated guided vehicles that transport the cars enable a high degree of flexibility. Three fully automated stations were developed, including one for the “marriage” of the drivetrain and the car body. “Sometimes I feel like a building caretaker who goes around making sure everything is running well,” she says with a smile. What counts at the end is the result. And she can hardly wait to drive that result herself very soon.

 <https://www.youtube.com/watch?v=pINVk1zfkME>

Photo: Rafael Krötz



### Teuta Demaili

**First Carrera (or model) car**  
*A red sports car*

**First experience with electronics**  
*During work at Porsche for a bachelor's degree*

**First job at Porsche**  
*Process planner*



**Alexander Pollich**  
CEO of Porsche Deutschland GmbH

## THE STRATEGIST

Driving the right car is how many people express their way of life. No one is more aware of this than Alexander Pollich, the CEO of Porsche Deutschland GmbH. He and his team support the eighty-eight Porsche Centers in Germany. And these centers have a very good idea of what their customers want. They are constantly selling properties like performance and passion. But with the appearance of the Taycan—the first purely electric sports car—everything will change. Or will it? “Certain things will change, of course, because the Taycan stands for a new vehicle concept,” says Pollich. “But we base our product portfolio firmly on the wishes of our customers. Which means there’s a huge

amount of excitement in advance—on the part of customers, fans, and our staff.” The 20,000 people who have already expressed interest in buying the car speaks for itself, he adds, and then ventures to predict that by 2025, more than 50 percent of Porsche’s overall product range could be sold in the form of electric or hybrid vehicles.

The sales organizations are facing enormous challenges. That’s because introducing the Taycan means presenting not just a new model series but also represents a shift in strategy for the whole company. The success of electromobility will depend not only on vehicle performance, driving pleasure, and automotive design, but also on charging times and the ranges they allow. Sales staff need to be trained. As with everything else, Porsche thinks in holistic terms. The company is not only bringing an electric sports car onto the market, but also working together with partners to ensure the requisite

### Alexander Pollich

**First Carrera (or model) car**  
*A 911 Carrera 4, series 996*

**First experience with electronics**  
*Fischertechnik construction toys*

**First job at Porsche**  
*Director of strategic projects (July 2001)*

charging infrastructure and the training programs needed for team members. Comprehensive high-speed charging systems are being installed at Porsche Centers. In order to making charging a pleasurable experience, the new “Destination Porsche” corporate architecture is turning Porsche Centers into attractive meeting points for the community. The IONITY joint venture is building a network of high-speed charging points on European freeways. And The Mobility House tech company is helping Porsche put charging options into practice in private garages. Porsche is electrified. Which actually is nothing new.

Photo: Rafael Krötz

# “I’M THRILLED WITH THIS CAR”

The Porsche Taycan was presented to the world just days ago. CEO Oliver Blume talks about his first test-drive, Porsche’s take on the Paris climate agreement, and the new working world brought about by the Mission E.

**Mr. Blume, does the Taycan fulfill your expectations, i.e., is it a real Porsche?**

Absolutely! That’s also what my expert chassis colleagues say, who’re very hard to please and whose critical mindsets have brought Porsche to where it is today. You should see their sparkling eyes and big smiles when they get out of the Taycan.

**Are your eyes sparkling too?**

I’ll say! I’m completely thrilled with this car. It drives superbly.

**Can you imagine that the focus on electromobility could be a culture shock for a lot of Porsche customers?**

We’re aware of that. But I can assure them that a Porsche with a purely electric drive will have everything they expect from our brand: extremely sporty dynamics, outstanding performance, and not least of all, a huge amount of emotional appeal. I’m convinced that the more attractive electric cars are, the sooner electromobility will be accepted. However, in order to keep giving all of our customers what

they want from our brand, we’ll be focusing on three drive systems in the future: further optimized gasoline engines, advanced plug-in hybrids, and pure electromobility.

**More than 60 percent of Panamera customers in Europe are opting for the plug-in hybrid version. Does that surprise you?**

Not in the least. We’ve designed our plug-in hybrids for high performance. Those cars don’t give you the slightest sense of missing out on anything.

## “Porsche backs the Paris climate commitments—wholly and without exception.”

**Did the increasingly strict CO<sub>2</sub> regulations and the Paris climate agreement affect your decision to develop electric cars?**

One thing is clear: Porsche backs the Paris climate commitments—wholly and without exception. As car makers, we are clearly

## “The more attractive electric cars are, the sooner electromobility will be accepted.”



responsible for lowering CO<sub>2</sub> emissions on the road. Even though we as a high-end manufacturer have a very small share of the market, it wouldn’t occur to me or my colleagues on the Board to point fingers. Instead, the reputation of our brand means that we want to lead the way and set a good example. I’m optimistic that we’ll be able to meet the goals by 2030 and quite possibly do even better. Porsche is committed to reaching these targets.

**So the shift to electromobility was the next logical step?**

If we as manufacturers want cars to make local trips without any CO<sub>2</sub> emissions, we have three options: electricity, hydrogen, or synthetic fuels. If you take a well-to-wheel approach, which encompasses the entire energy balance from producing the fuel to moving the car, electromobility is three times better than hydrogen and six times better than synthetic fuels. This advantage will only increase as the batteries are developed further. For a sports-car maker like Porsche, those are compelling arguments—not to mention the outstanding performance levels you can get with electric drive systems.

**Will Porsche be making additional electric cars besides the Taycan?**

The first Taycan derivative will enter series production early in the next decade. The

new generation of the Macan will also be all-electric. Further decisions have not yet been made. But rest assured that we already have many good ideas on how we’ll be shaping mobility in the future—to make it sporty, sustainable, and completely in keeping with Porsche.

**How is work at Porsche changing with the launch of the Taycan?**

We’re in the middle of transitioning from a hardware producer to an integrated hardware, software, and service company. We’re training our employees to handle the new technologies while also recruiting new skilled workers and experts in fields like digitalization, electromobility, and smart mobility. We’ve created 1,500 new jobs and increased the number of apprentice-

ship positions from 150 to 220. Generally speaking, the training requirements for people working on the Taycan have changed markedly. In our training programs we now have more apprentices who will become, let’s say, automotive mechanics with a specialty in high-voltage systems or electronics technicians specializing in operating systems. As for our employees with college degrees, 60 percent used to come from mechanical engineering. Now there’s an ever increasing percentage of IT experts and electrical engineers. These people are very much in demand on the market. We want to bring them to Porsche by offering exciting jobs, cool working environments, the greatest possible scope for their creative energies, and even better work/life options than ever before.

**Panamera E-Hybrid models:** Fuel consumption (combined): 3.4–2.5 l/100 km; CO<sub>2</sub> emissions combined: 79–56 g/km; Electrical consumption (combined): 20.8–15.9 kWh/100 km  
**Taycan Turbo S:** Electrical consumption (combined): 26.9 kWh/100 km; CO<sub>2</sub> emissions (combined): 0 g/km  
**Taycan Turbo:** Electrical consumption (combined): 26.0 kWh/100 km; CO<sub>2</sub> emissions (combined): 0 g/km

# CAR, FACTORY, AND SITE: NEW ERA, OLD FRIENDS

Porsche is making a sports car in Zuffenhausen. That sounds familiar. Yet in fact, the company is reinventing itself with the Taycan electric car and setting higher benchmarks than ever.



It accelerates like a Porsche, pulls through curves like a Porsche, and grips the road like a Porsche—but the Taycan is not your average Porsche. The first all-electric car from Zuffenhausen is the harbinger of a new era. The car maker is reinventing itself in the wake of this swift electric sports car, entering new fields of business, and playing a major role in advancing the future of electromobility and automotive production. The first models in this new series are the Taycan Turbo S and the Taycan Turbo. Fifty percent of Porsche's model range is expected to have electric drives by 2025. But that doesn't

mean everything will change. As is typical of Porsche, the new era is starting with a sports car from the company's main factory in the north of Stuttgart, home to one of Europe's most modern car plants. Zuffenhausen is setting new standards once again. That too is like a trustworthy old friend.

## The car

The Taycan Turbo S generates up to 560 kW (761 hp) overboost power with launch control, while the Turbo version produces up to 500 kW (680 hp). The Taycan Turbo S accel-

erates from 0 to 100 km/h in 2.8 seconds, and the Taycan Turbo in 3.2 seconds. The Turbo S has a range of up to 412 kilometers and the Turbo up to 450 (both according to WLTP). The Taycan is the first production vehicle with an 800-volt system architecture instead of the usual 400 volts for electric cars. That means it can be charged for up to 100 kilometers in a mere five minutes, using direct current from the high-speed network. Under ideal conditions, charging time from 5 to 80 percent SoC (state of charge) takes 22.5 minutes, and the maximum charging power is 270 kW. Overall capacity of the

# THE CAR

Foundation for the Taycan: The Mission E design study



The next step: The Mission E Cross Turismo design and concept study was presented in Geneva in 2018



Up to  
**450**

kilometers of range (WLTP): The Taycan Turbo is not only sporty but also strong and suitable for everyday use..

A good  
**5**

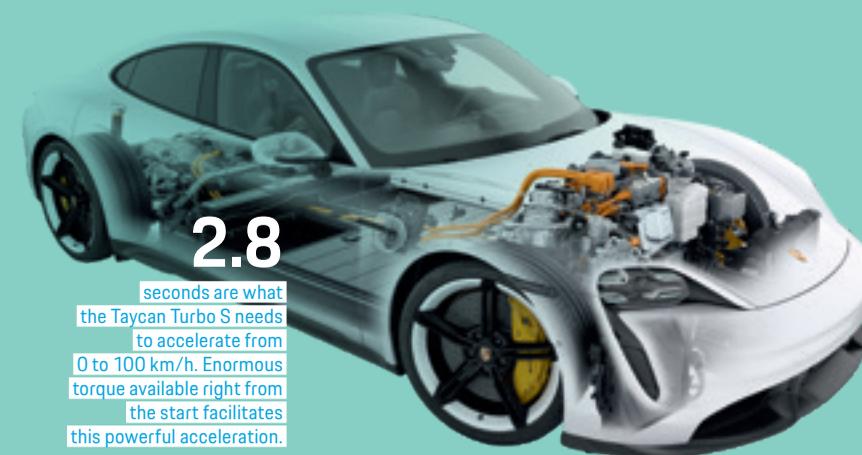
minutes are needed to charge the car for up to 100 km (WLTP) at an 800-volt rapid-charging station.

**560**

kW (761 hp) give the Taycan Turbo S a peak speed of up to 260 km/h.

**800**

volts power the components in the Taycan's drivetrain.



**2.8**

seconds are what the Taycan Turbo S needs to accelerate from 0 to 100 km/h. Enormous torque available right from the start facilitates this powerful acceleration.

Performance Battery Plus is 93.4 kWh. Taycan drivers can conveniently charge their cars at home with up to eleven kilowatts of alternating current. Porsche broke new ground with its rapid-charging technology.

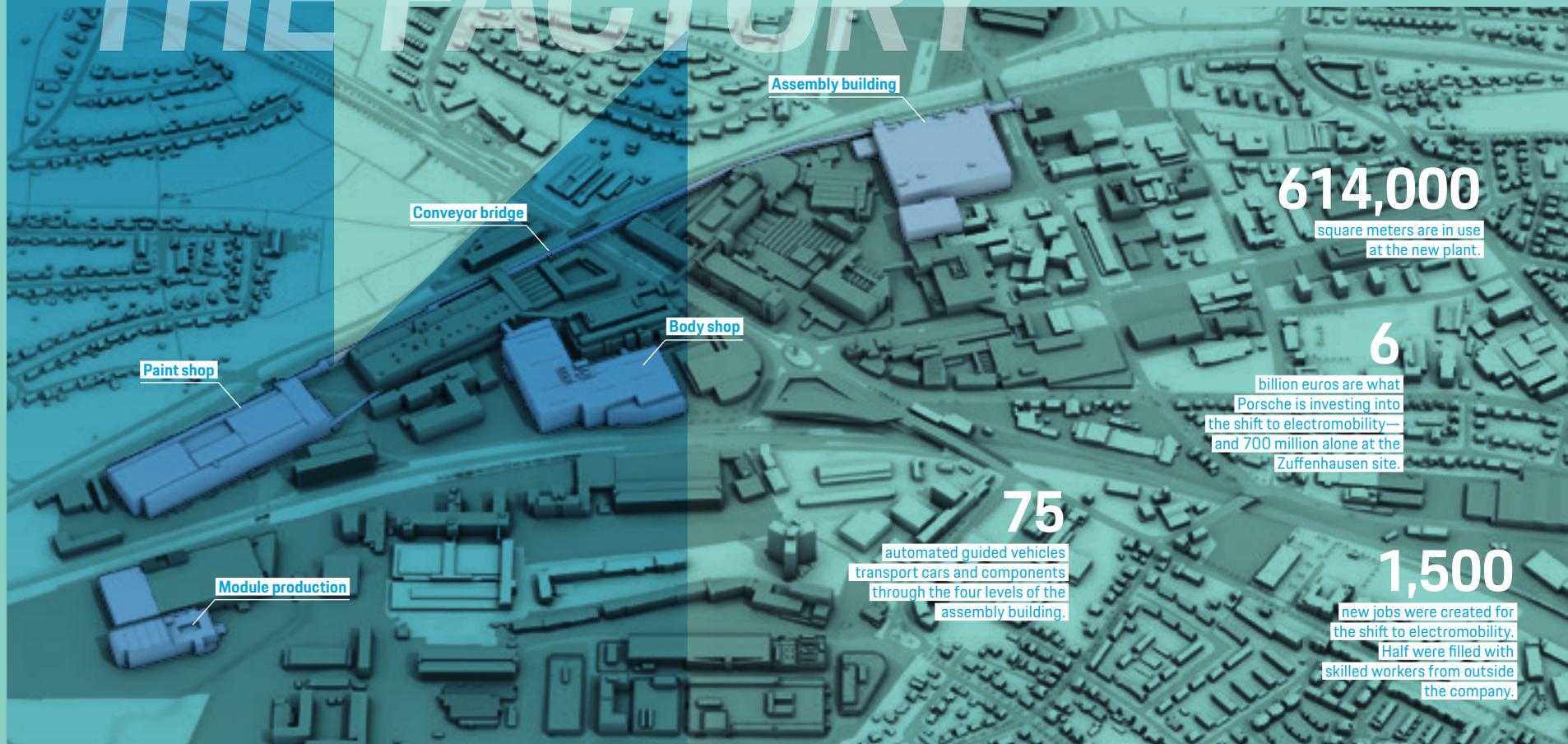
It had to develop some of the Taycan's electronic components itself, and joined in constructing the charging infrastructure. Porsche Engineering developed completely new 250-kilowatt charging columns, which

are later expected to reach 350 or 450 kilowatts and work with up to 800 volts. Plans call for it to help install thousands of charging stations at hotels, filling stations, and Porsche dealerships worldwide. Zuffenhausen's experts are also involved in the IONITY project, which is setting up 400 parks with rapid-charging stations along Europe's major highways.

With so much talk about modern charging technology, it's easy to forget that the Taycan's first job is to drive. And that's what it does, with all the dynamism typical of a Porsche. Powered by permanently excited synchronous motors (PSMs) on its front and rear axles, the all-wheel-drive models hit a peak speed of 260 km/h. Thanks to PSM technology and liquid cooling for the lithium-ion battery, the Taycan transfers its power to the road with efficiency, stability, and endurance. A series of full accelerations will not decrease its output. Installed between the axles, the battery block substantially lowers the center of gravity and enables the car to veritably stick to the road. The contoured silhouette with merging surfaces and a sloping roof line is Porsche in its purest form. As is the height, which is unusually low for an electric car. In order to maintain a comfortable seating position, the designers created "foot garages" in the battery block. The driver and front

Taycan Turbo S: Electrical consumption (combined): 26.9 kWh/100 km; CO<sub>2</sub> emissions (combined): 0 g/km  
Taycan Turbo: Electrical consumption (combined): 26.0 kWh/100 km; CO<sub>2</sub> emissions (combined): 0 g/km

# THE FACTORY



Assembly building

Conveyor bridge

Body shop

Paint shop

Module production

614,000

square meters are in use at the new plant.

6

billion euros are what Porsche is investing into the shift to electromobility—and 700 million alone at the Zuffenhausen site.

75

automated guided vehicles transport cars and components through the four levels of the assembly building.

1,500

new jobs were created for the shift to electromobility. Half were filled with skilled workers from outside the company.



The car bodies are transported through the hall by automated guided vehicles



A transport bridge connects the body and paint shops to the assembly building

passenger sit low, but still relatively upright. The clear, puristic design heralds the dawn of a new age. Clearly structured and with completely new architecture, the cockpit does its part to signal the start of a new era. The free-standing, curved instrument cluster forms the highest point on the dashboard. Most of the controls are operated by touch or voice.

## The factory

The Taycan is intended to be fully CO<sub>2</sub> neutral, starting from the first assembly step. Porsche has built a future-oriented factory to do precisely this. It is smart, lean, and green. In addition to flexible and connected production with Industry 4.0 technologies, it features responsible use of resources, fewer handling steps,

and a focus on sustainability and environmental protection throughout all the processes involved. Modern technologies reduce employee fatigue. Thanks to new suspension systems that can be rotated up to 110 degrees, non-ergonomic overhead procedures are now a thing of the past. Automated guided vehicles (AGVs) and a flexible assembly line have replaced the conventional conveyor system. They make not only the production operations but also the architecture of the new factory more flexible. The site now covers 614,000 square meters—on which approximately 12,000 employees produce a continuous flow of driving pleasure.

Of the €6 billion that Porsche will invest in electromobility overall by 2022, more than

700 million are flowing into the construction of new production facilities for the Taycan. The new factory is being built in parallel to what are already peak levels of sports-car production—the 250 units of the 911 and 718 model series leaving the site every day are its highest levels yet.

The factory's location in the city of Stuttgart makes it necessary to spread the different production processes throughout its premises. In addition to the new body shop that started operations with the premiere of the 992 generation of the 911, new buildings have been erected to produce the electric drivetrains and other components, as well as a new paint shop. Building 70 in the northeastern part of the site is a multi-story

assembly plant. Painted car bodies and drivetrain components reach it via a 900-meter conveyor bridge—protected from the weather and without disturbing the traffic on a public road below. Porsche opened the new factory as scheduled on September 9, 2019. It was built in record time—less than four years after the premiere of the Mission E study at the Frankfurt Motor Show in September 2015.

In every respect, Porsche places a premium on sustainability. Production at the Zuffenhausen site is CO<sub>2</sub> neutral. The energy-efficient buildings more than comply with the relevant regulations. All the roofs of the new buildings are green, and some have solar panels. The electricity Porsche uses comes

## Taycan production in Zuffenhausen should be fully CO<sub>2</sub> neutral.

from renewable sources. Combined heat and power plants operated with biogas supply the site with heat and additional electricity. Green power fuels an increasing number of electric transportation vehicles and trains to reduce the CO<sub>2</sub> emissions from logistics. These are just a few of the measures Porsche has instituted in pursuing its aim of a zero-impact factory, namely, production with no negative effects on the environment.

# THE PEOPLE

## Jasques Gnassounou

Production foreman



Everything has changed for Jasques Gnassounou since he joined the Taycan production team

The Taycan has made Rastislav Turčan's work more varied

## Rastislav Turčan

Takt module assembler



## Bernd Würsching

Director of e-car assembly



Bernd Würsching has worked at Porsche for twenty years

## Meryem Demir

Paint shop assistant



Porsche means family for Meryem Demir. Not just because her father has worked for the company for nearly forty years

Many different people and areas of expertise contribute to the production of every Taycan.

Rastislav Turčan is a very long way from counting his career at Porsche in decades. He finished his training as a car body assembler two years ago. And one year ago he started working on the Taycan as a takt module assembler. Car bodies are car bodies—whether or not their drivetrains are electric. But even Turčan's work has changed. He is no longer responsible for just a single step. Instead, he accompanies each Taycan through several steps, which are referred to as takts, along the production line. "I enjoy the work even more than before because you're not repeating the same things as often," he says. Despite having joined the team only a short time ago, he already feels very close to the Taycan. He knows the car has competitors. "But I'm convinced that the Taycan is head and shoulders above the rest."

Text Benjamin Büchner, Julia Bayer

## The people

Around 1,500 new jobs were created for the Taycan. About half of them were filled by applicants from outside the company. Both they and the existing employees need to master entirely new responsibilities, because an electric motor functions differently from a gasoline engine. To prepare everyone for the new era, Porsche introduced a training and further education program. It has 350 modules and can last up to six months for complex production processes. Many different people and areas of expertise contribute to the production of every Taycan. We present four of them:

**Bernd Würsching** has been there from the start. As the head of Taycan assembly, he began working "in the top-secret stage of the project," as he puts it. As project director he helped build the new production facility and supervised assembly of the Taycan prototypes and preliminary series. "I have always liked being a pioneer and leading the way when it comes to building new things," he says. He is truly no newcomer in that regard, having also helped guide the Macan and the Panamera from the initial idea to production readiness at Porsche in Leipzig. And now he's doing it with Porsche's first electric car. Würsching is proud of what the company has achieved in the short period of

time from breaking ground for the new assembly hall to producing the first Taycan, which rolled from the line when the hall was still a construction site. "We've done a great job," he says. "And that's only possible if you have a strong and expert team."

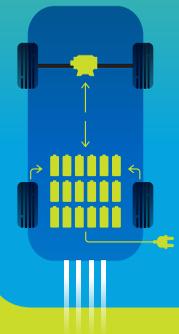
One of his team members is **Jasques Gnassounou**. A production foreman and industrial mechanic from Togo, Gnassounou does reworking at the Taycan assembly plant. "We test the quality of the components and send them back if we don't think they'll work," he says in explaining his contribution to the electric Porsches. A sharp and experienced eye is one of the main qualities need-

ed for his job, because the first thing he does is conduct a visual inspection of the components. "We immediately see if something isn't right," he says. The measuring systems usually just confirm their initial analyses. Gnassounou started working at the Taycan plant in 2016. After joining Porsche in 2014 and working on V8 engine production, shifting to the new car and its processes was a big step. "Everything is different," he remarks. "The product is new, the dimensions are new, the processes are new, and our tasks are new as well." But he was happy to take on the challenge and be part of the transition from the start. "Because what we're making here is the future."

A hands-on approach is crucial for paint shop assistant **Meryem Demir**. As a member of the shop's seam-sealing department, she is responsible for procedures that robots are not sensitive enough to do. For example, sealant has to be applied by hand there. Demir started working at Porsche right after completing her training as a automotive paint specialist. "The company is like a second family to me," she says. It has also been part of her first family for as long as she can remember. "My father has worked at Porsche for nearly forty years," she says. "He encouraged me to apply."

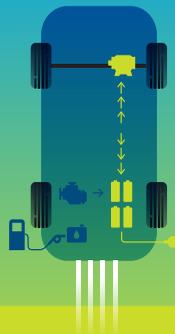
## What different types of electric drives are there?

### All-electric car



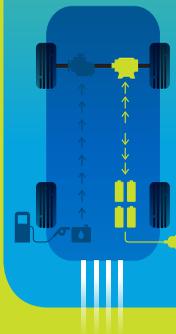
These vehicles don't have combustion engines and are driven by electric motors instead. The requisite power comes from a battery that's charged from the electricity grid. It can also store energy recovered from braking.

### Range Extender



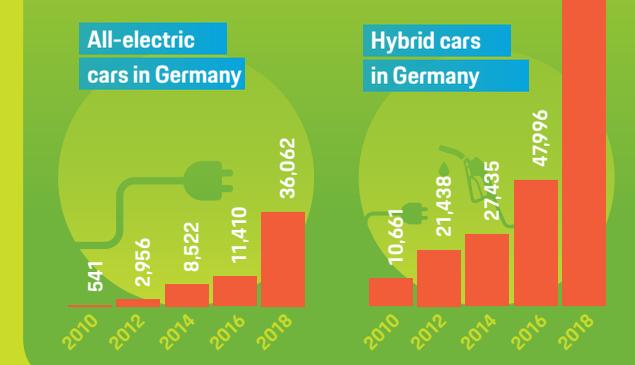
Range extenders are modules that let electric cars drive farther on a single charge. They often take the form of a combustion engine that powers a generator, which in turn supplies power to the car's battery and electric motor.

### Plug-in-hybrid



These cars combine combustion engines with electric motors in intelligent ways to expand their range. They can cover short distances solely on electric power and longer ones with gasoline.

## How is the e-car market developing?



Source: Federal Motor Transport Authority (KBA)

## What growth opportunities does the market offer?



Source: Foundry Chemistry Industrial Association (IVG) study

### FACTS AND FIGURES

# ELECTRIFIED WORLD

CAMPUS

Electric mobility is here to stay. But before the big breakthrough takes place, numerous obstacles need to be overcome, standards put in place, and drivers convinced. Here are some current facts and figures.

## What do people think about electric cars?



## So why aren't more people buying electric cars?

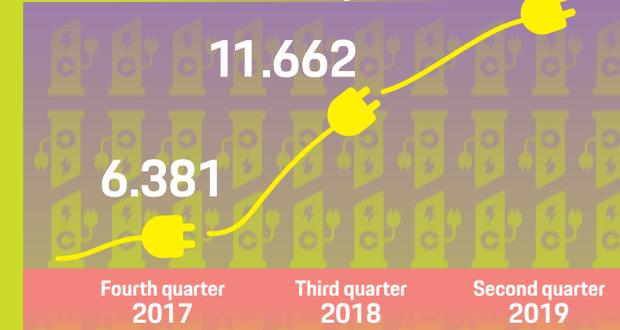


## The right connection: how do I charge?

	Household plug	CEE blue plug	CEE red plug	Type 1 plug	Type 2 plug	Tesla supercharger	CHAdeMo-plug	CCS combo 1 plug	CCS combo 2 plug
Type of current	AC (alternating current)					AC and DC	DC (direct current)		
Plug and socket shapes									
Maximum charging power	Single-phase up to 2.3 kW	Single-phase up to 3.7 kW	Three-phase up to 22 kW	Single-phase up to 7.4 kW	Three-phase up to 43 kW	Up to 120 kW	Up to 150 kW Taycan Japan	Up to 350 kW Taycan USA up to 270 kW	Up to 350 kW Taycan Europa up to 270 kW

Source: home&smart

## Positive trend 1: Number of charging stations in Germany



Source: Statista

## Positive trend 2: Battery cost



Source: CarGurus, BloombergNEF

TAYCAN TESTS

# FULL POWER

Porsche has not spared the Taycan any challenge. The company's first all-electric sports car has proved itself on snow and ice, defied desert sands, and mastered endurance trials under extreme conditions. After six million test kilometers on freeways, country roads, race courses, and city streets, one thing is clear: this car gives full power under any and all conditions.



## Italy

After twenty-four hours of driving in circles, the team led by measurement engineer Dr. Matthias Gebhard remains right on course. The Taycan goes through tough extensive trials on the circuits of the Nardò test facility. Over the course of twenty-four hours, it clocks precisely 3,425 kilometers in an impressive demonstration of its endurance qualities.



## Sweden

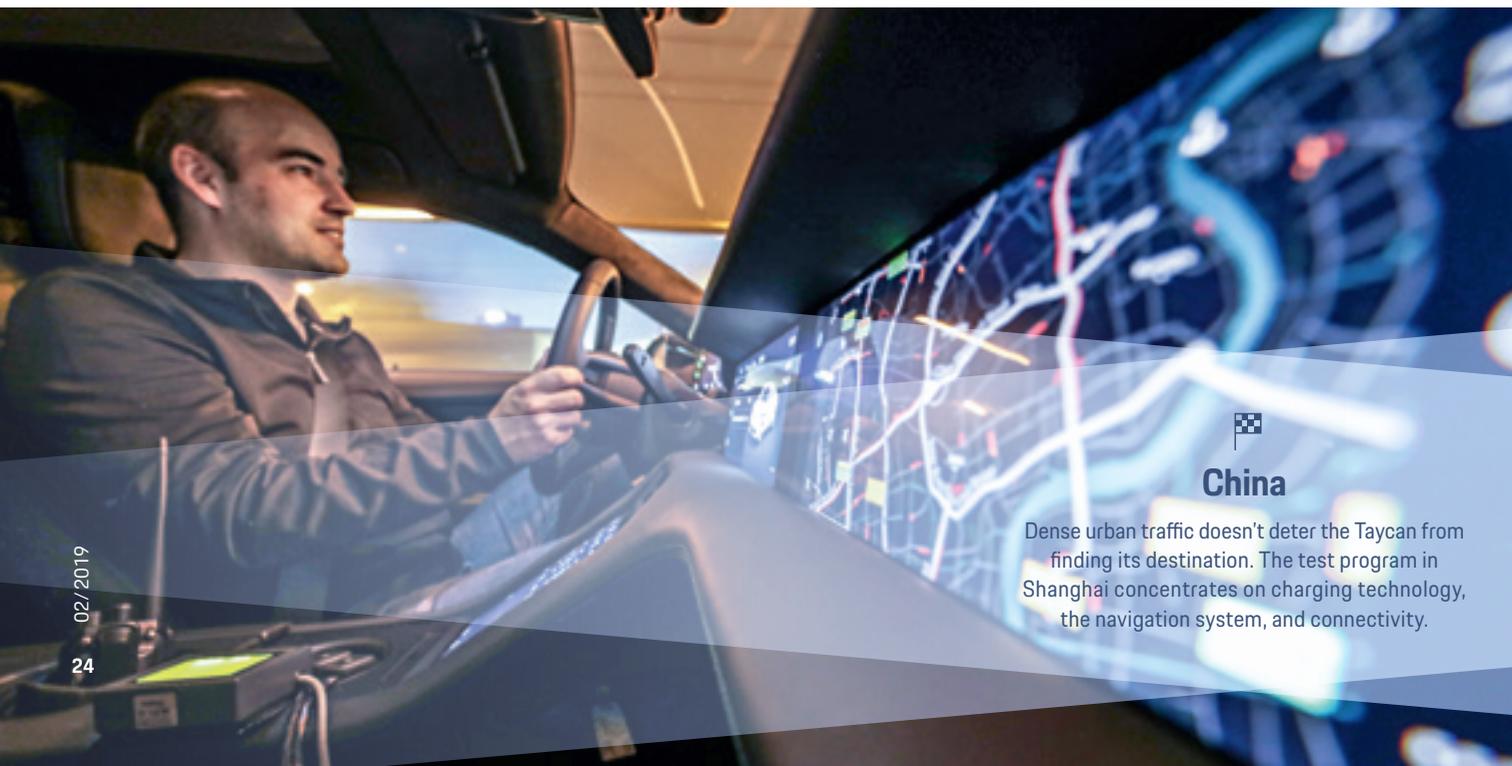
The temperature drops to minus 40 degrees Celsius but the Taycan just keeps on going. Major focuses of the cold-weather trials include suspension tuning, brake performance at low friction values, and thermal management.





### South Africa

A tough tour, but the Taycan masters every challenge that comes its way. Hot-weather trials are run from Upington, near the border with Namibia. At high temperatures and humidity levels, the focus is once again on thermal management.



### China

Dense urban traffic doesn't deter the Taycan from finding its destination. The test program in Shanghai concentrates on charging technology, the navigation system, and connectivity.



### Italy

Twenty courses and one long-term guest. The Taycan undergoes regular trials on the Nardò testing grounds. And the "Soul, electrified" marketing slogan is now a familiar sight in Apulia.

# CROATIAN MASTERMIND

Right outside Zagreb, Rimac Automobili makes super-fast electric automobiles that beat out the competition by more than the length of a car. That's one of the reasons Porsche started investing in this technology and sports-car company a good year ago. Experts in Zuffenhausen are interested in the expertise from Croatia and the ideas of company founder Mate Rimac, who has long since made the future of mobility a reality.

**A** man walks into a garage. The car recognizes its owner's face and opens its doors. The man takes a seat, and the car starts moving fully automatically and zooms into the future. This is a scene from the teaser video for the new Rimac C\_Two. The hypercar from the Croatian manufacturer can already do most of this if allowed. The only things standing in the way of fully autonomous operation are reservations on the part of other road users, and the desire by some people to drive themselves.

The rise of this vision of the future just twenty minutes from the city of Zagreb has

a lot to do with the mindset of company founder Mate Rimac. The thirty-one-year-old is not one to let purely economic concerns stand in his way. Where other people see risks, he sees potential. Whenever he pursues a project, he pushes the limits of what is possible

This approach has taken Rimac Automobili from a two-person enterprise ten years ago to a company with 500 employees. What started out as tinkering in a garage by a highly talented whippersnapper is now a business with an estimated value of €500 million. The founder is no longer a Gyro Gearloose type but a visionary who is shaping the future of the automotive industry.

He has been compared to Apple founder Steve Jobs or Tesla head Elon Musk, but there are some crucial differences. Jobs preached the importance of a few chosen areas of expertise, whereas Rimac is happy to try everything and wants to make all of it perfect. And Musk was already very wealthy before starting to produce electric cars.

Born in Bosnia in 1988, Mate Rimac was a child when his family fled from the war in the Balkans to Frankfurt. As a teenager he moved to Croatia and started from scratch. As fate would have it, car troubles were what launched Rimac's career. At the age of eighteen he bought a 1984 BMW E30 for drift races, but in his second contest its

Resolutely electric:  
Mate Rimac sees a charged  
future for mobility

engine exploded. Because a new combustion engine would have been too expensive, he rebuilt the car with electric motors in 2007 and kept improving it over the years. The bright green BMW ended up being able to accelerate from 0 to 100 km/h in 3.3 seconds, and broke all the relevant FIA records in its class in 2011. However, the vehicle was heavy, had low initial power, and a short range. But even before the record drive, the resolute young entrepreneur founded Rimac Automobili in 2009 and built up a team of experts to develop his own components. "I was convinced that electric drives could do much more than what was currently available on the market," he says.

Rimac's aim at the time was to make the world's fastest car for series production. This vision of the future attracted his first investors. Their funding and his company's craftsmanship led to the Rimac Concept\_One. The world's first electric super sports car celebrated its premiere at the 2011 Frankfurt Motor Show (IAA). It was a 1,088-hp behemoth that broke the 100-km/h barrier in 2.8 seconds. Faster than all the other cars of its time. But its peak speed was throttled at 300 km/h.

The Concept\_One cost around €1 million and was limited to just under one hundred units. And Rimac scarcely even sold twenty of them. That was not enough to sustain the company for long. Nonetheless, the car contained all manner of highly developed technology that fascinated not only drivers but also other car makers. And here was where Rimac began thinking in economic terms. His team essentially took the Concept\_One apart. Rimac Automobili has since become a supplier that develops and builds high-voltage battery systems, electric motors, telemetric and assistance systems, digital user interfaces, and infotainment systems for other vehicle manufacturers. Plans also call

for licensing more patented technology to other manufacturers in the future.

Porsche entered into a partnership with the Croatian company around a year ago, acquiring a 10 percent share. "We consider the ideas and approaches of this young company to be very promising and are therefore seeking close collaboration with Rimac in the form of a development partnership," said Lutz Meschke, the Porsche Board Member in charge of Finance and IT, when the contract was signed in June of 2018.

"Our goal is to become a leading module and systems supplier for car makers in the fields of electrification, connectivity, and driver assistance systems," is how Rimac explains the partnership. And the dream of building the world's fastest series-production car has come to fruition with the C\_Two. The car has 1,900 hp, accelerates from 0 to 100 km in 1.8 seconds, and has a peak speed of 412 km/h—plus a range of 650 kilometers. Some 150 units are expected to be built starting in 2020.

Text Benjamin Büchner



Porsche CEO Oliver Blume (left) talks with Mate Rimac. Porsche acquired shares of Rimac Automobili one year ago



At the age of eighteen, Rimac converted his old 1984 BMW E30 to an electric drive system

PORTRAIT

# THE SOUND PIONEER

CAMPUS

Tobias Hillers quickly realized how important the sound of electric cars would be. Now his team has created an unmistakable sound—that of the new Porsche Taycan.

Actually, I had no intention of moving to southern Germany, but then I got a call from Porsche," says Tobias Hillers. That call came eight years ago, when he was a research associate at the Institute for Automotive Engineering at RWTH Aachen University. And it was successful. In 2012, Hillers started working at the Porsche Development Center in Weissach.

If you met Hillers and his girlfriend at a sidewalk café somewhere in Stuttgart, it wouldn't take long to guess what field he works in. Whenever an unusual engine comes into earshot, he tilts his head slightly. He can usually tell what cars are approaching without even looking. Hillers is a specialist in acoustics. To be precise, he is a section head in active sound design. For the past five years he has devoted his profes-

sional energies to creating sounds for the Taycan, Porsche's first all-electric sports car. Would he be able to pick out this sports car from amidst the noise of traffic in general? "I would certainly hope so," he says with a laugh.

In Weissach Hillers lets the Taycan speak. Even to the ears of a layperson, the car's sound is clearly distinguishable from that of all other electric vehicles—at least when the standard "Porsche Electric Sport Sound" on the Taycan Turbo S is activated. Is it a mixture of a jet fighter taking off and an intercity express train in full acceleration? The sound is so unusual, one is hard put to describe it. The smallest common denominator is its incredible power. What's noteworthy is that even pedestrians can distinguish it clearly. It's also present inside the car, without requiring passengers to raise their voices.

Driving an electric car without any sound is "all well and good," according to Hillers, "but acoustic feedback is part of the experience." The noises produced by the drivetrain provide feedback on acceleration and speed, and also on energy recovery in this age of electromobility. "We've created an instrument and the driver is the conductor," says Hillers in summarizing five years of work on the acoustics of the Taycan.

Hillers's home town of Dülmen in Münsterland is just under 200 kilometers from Aachen. There, he began studying mechanical engineering in 2000 at the age of twenty, specializing in automotive engineering and combustion engines. His choices of both education and profession were anything but random. "If you look at the books I read as a child, you'll find an awful lot of cars," he admits. Even in the early years of his studies, he was focusing his attention on

the subject of acoustics. An internship at Porsche in 2005 brought him to the sound department. At that point, of course, the cars all still had combustion engines.

Some time after the internship, Hillers narrowed his specialty further. "Electric cars have always exerted a powerful attraction on me, but without the sound they didn't have quite the right kick," he says. Hillers takes a broad view of the field. "Sound will play a huge role for electric cars," he predicts. That applies to all of them. As of July 1, 2019, all new electric cars in the EU are required to emit a minimal level of sound.

But that's not enough for someone like Hillers. Very much in keeping with his own tastes, Porsche decided early on that the Taycan should have powerful acoustics. "The sound has to fit the car and be authentic," Hillers says. By authentic he means that the

engineers only use sounds that come from the car itself: those from the electric motor and the transmission, along with a touch of how the tires roll on the road. "We take the parts of these noises that sound really good," he says. "And then we filter out anything that suggests a dentist's drill or a streetcar."

Hillers stands totally relaxed in Weissach's acoustic test chamber. Everyone here speaks more softly than usual. Hillers' eyes sparkle as the sound of the Taycan becomes ever clearer and more penetrating in the chamber. Does the Taycan sound make people as happy as that of the Porsche Boxer? Hillers' answer leaves no doubt: "Yes, absolutely!"

Text Michael Petersen



The Taycan sound: [newsroom.porsche.com/taycan-sound](https://newsroom.porsche.com/taycan-sound)

Sound is key to the kick: Tobias Hillers has provided the Taycan with very special acoustics

## Tobias Hillers

1980 born in Marl

2000–2007 studied mechanical engineering at RWTH Aachen University

2005 internship at Porsche

2007–2012 research associate, Institute of Automotive Engineering, RWTH Aachen University

2012–2014 development engineer, Porsche Engineering

2014–2017 development engineer, active sound design, Porsche AG

Since 1/2018 section head, active sound design

Photo: Rafael Krötz

02/2019

02/2019

# “PORSCHE FEELS LIKE HOME”

When Neel Jani first started racing, the cars had combustion engines. He then won Le Mans in a hybrid vehicle. And now he will be entering the Formula E for Porsche. The career of this thirty-five-year-old professional race-car driver reflects the transformation currently underway in motorsports.



CAMPUS

### Many children dream of becoming race-car drivers. How can they actually become one?

Basically all sports start off as hobbies. I was given my first go-kart at the age of five and entered my first race at eight. My parents invested a lot of time and money, and I was quite successful, but the focus was always on having fun. When I turned eighteen, it was time to decide whether to put all my efforts into a professional career. After passing my college entrance exams, that's what I did.

### The Formula One in a classic car, winning Le Mans with Porsche in a hybrid, and now the Formula E—your career reflects

### the changes that racing has been going through.

That's true. When I started racing it was all about speed, for example, in events like the Formula One. For Le Mans, the idea was to develop cars that are really robust and reliable. And today the priority is on efficiency. That's the guiding principle for the Formula E. You can only win with efficient cars. Racing is changing, just like private cars are. There too the goal is no longer to make engines with 2,000 horsepower; that doesn't help you anymore. Instead, our goal at some point is to be able to drive from Switzerland to Kiel and back without stopping to charge the battery.

### Ten years ago, could you have imagined entering races with a fully electric car?

No. Ten years ago I couldn't have imagined that. The possibility hadn't even occurred to me. Regulations in the Formula E limit development to keep the costs down. But we're starting from square one. That means the opportunities are wide open, but it also really means a lot of work.

### What does your work look like during the preparation stage?

Mainly we're talking long hours. In fact, I'm putting in more time with the Formula E than I ever have in racing. There's fitness training to do; I spend a lot of hours on the simulator in Weissach. And then there are many long days on the race course with the whole team when we do test drives and evaluations.

### So you're fully involved in developing the Formula E car?

Yes. Drivers don't just go zooming around in circles without a thought in their heads, to be a little glib about it. The dialogue between me and the engineers is extremely important. That's because a lot of things work well in theory, but less so in reality. At any rate we still have a lot to do if we want to reach the level we've set for ourselves. Our goal for the first season is to be competitive. The challenge in the



Neel Jani is living his childhood dream of being a race-car driver

## “We'd be pleased about a spot or two on the winners' platform.”

electric motor doesn't exactly sound infernal, its noise is still an important factor that I work with a lot, for example, in connection with motor speed or the properties of the track.

### The Formula E is reaching out to new target groups, also in its choice of racetracks.

That's right. The courses are all located in cities, so many more people who are not all

#### Neel Jani

**First Carrera (or model) car**  
Sauber-Mercedes C9

**First electric automotive experience**  
Carrera slot cars—they were his favorite toy

**First job at Porsche**  
Factory driver since 2013

Formula E lies in the fact that 80 percent of the cars are the same. The details will therefore be crucial. So the first thing we have to do is acquire a base level of experience. But if that also means an occasional spot on the winners' platform, we'll be pleased.

### How big is the switch to electric power—for example, in engine sound?

Of course we all love the sound of a V12 engine, which is incredible. Although an

Neel Jani drove the 919 Hybrid to overall victory for Porsche in Le Mans in 2016



CAMPUS



Porsche will enter its first Formula E season this year on November 22 in Saudi Arabia

**Now you're concentrating on the Formula E. What are your plans for the distant future?**

Race-car drivers have to think in the short term. The next race is always the most important one. But probably I'll be sitting at the wheel of a race car until I retire. However, I hope to remain involved in racing as long as possible.

**You became a father in 2018. What will you do if your son wants to become a race-car driver?**

If he's good enough, then he can do that. My parents never tried to stop me from doing anything I was totally committed to. That's something I want to pass on.

Interview Julia Bayer

**What is it like to work for Porsche?**

When I was a child, I could only think of two categories of fast cars: Porsches and the red ones. And then when I started to enter races for Porsche in 2013, I was really proud. But I could also see that this world-famous brand is still a family-run company. That's not at all the case for other manufacturers. I identify strongly with Porsche and feel at home.

that interested in motorsports will see the races. But mobility is something that affects us all. The Formula E shows people that new technologies are being developed and that racing has entered a new age.

**Apropos new age, how was your first drive with the Taycan?**

On that I can only repeat what Walter Röhrl said: you know it's still a Porsche.

CAMPUS



**"Organization is the end-all and be-all"**

The Formula E encompasses more than just drivers and engineers. Team coordinator Katharina Kaess gives us an idea of her job.

**Ms. Kaess, what is your everyday work as a team coordinator like?**

In two words: traveling and organizing. We'll be on the road around eighteen-weeks a year for the Formula E. I'm responsible for things like making sure the team arrives at the racetrack, and arranging for shuttles and catering. I'm also in contact with marketing and press people, and look after the drivers. Organization is the end-all and be-all.

**What is special about your job?**

There's a never a dull moment, and there are always new things to do. What I'm looking forward to the most with the Formula E is getting to know

a lot of the world's big cities, thanks to the urban racetracks.

**How does one become a Formula E team coordinator?**

I studied business administration with a specialty in the automotive industry, and then joined Porsche as an intern. I did project and event management, and in 2013 joined the organizational team for the LMP1 project. It was there that I got my first taste of racing. Since leaving the WEC in 2018, we're now getting ready for the Formula E.

All further information on the Formula E: [www.fiaformulae.com/en](http://www.fiaformulae.com/en)



02/2019

**PIONEERING SPIRIT THEN AND NOW**

Electromobility features prominently in Porsche's past, present, and future. Ferdinand Porsche designed his first electric vehicle with rear-wheel drive back in 1898. More than a century later the sports-car manufacturer is returning to its roots.

**The beginnings**



**1893 Ferdinand Porsche**  
The company founder was interested in electricity as a boy. At the age of eighteen he installed a lighting system in his parents' home.

**1898 Egger-Lohner C.2 Phaeton**

Ferdinand Porsche's oldest car that still exists today is powered by an Oktagon electric motor. Technical data: 2.2–3.7 kW (3–5 hp); peak speed (V<sub>max</sub>): 25 kmh



**1900 La Toujours Contente electric race car**  
The "always content" is the world's first passenger car with all-wheel drive. Technical data: 4 x 10 kW (14 hp)

**1900 Semper Vivus Lohner-Porsche**

This car is known as the world's first hybrid vehicle. A combustion engine supplements its wheel-hub motors. Technical data: combustion engine 2 x 2.6 kW (3.5 hp), e-motor 2 x 1.8 kW (2.5 hp); V<sub>max</sub>: 35 kmh



**1902 Mixte Lohner-Porsche**  
Ferdinand Porsche wins the hill-climbing race on Mount Exel with the production-ready version of the Semper Vivus. Technical data: 2 x 10 kW (14 hp)

**Revisiting an early idea**



**2010 Cayenne S Hybrid**  
Porsche presents the first standard-series hybrid car in the company's history. Technical data: electric motor 34 kW (47 hp), combustion engine 245 kW (333 hp); V<sub>max</sub>: 242 kmh

**2010 911 GT3 R Hybrid**

This race car with electric front-wheel drive and a flywheel energy storage system is Porsche's first hybrid vehicle developed for motorsports. Technical data: combustion engine 353 kW (480 hp), electric motor 2 x 60 kW (81 hp)



**2011 Panamera S Hybrid**  
The most fuel-efficient Porsche thus far, it consumes 6.8 liters per 100 kilometers. Technical data: electric motor 34 kW (47 hp), combustion engine 245 kW (333 hp); V<sub>max</sub>: 270 kmh

**2013 918 Spyder**

This high-performance hybrid sports car posts a record lap time of 6:57 minutes on the Nürburgring's Nordschleife (north loop). Technical data: system output 652 kW (887 hp); V<sub>max</sub>: 343 kmh



**2014 919 Hybrid**  
Porsche wins the drivers' and manufacturers' WEC titles from 2015 to 2017 with the most complex race car of all time. Technical data: combustion engine 370 kW (503 hp), electric motor 184 kW (250 hp)

## TOOLMAKING

# FIRST THE TOOL, THEN THE FORM

Who made the deep-drawn fender on the Taycan possible in the first place?  
Who created the conditions for the amazing concave and convex combinations on its outer shell?  
That's right—Michael Mohe and his team in the Saxon town of Schwarzenberg.

**A** developer comes up with plans for a component. And you are the one who says, "Wait a minute, there are some problems in a few areas; we won't be able to make it exactly like this, we'll need some modifications!" As a specialist in process planning and concurrent engineering, you have a cool analytic mind. You are well versed in how the big tool systems operate, and you know what works. And what doesn't.

That is all part of a day's work for Michael Mohe (34). While an employee of KUKA Werkzeugbau, a Porsche supplier, he worked on side components for the Cayenne and the latest Macan. In 2015 Porsche acquired the supplier, and in 2016 Mohe joined the Taycan team in Schwarzenberg. Three years later he can hardly wait for the upcoming official premiere of the Taycan.

"It's an incredibly exciting time," he says, scarcely containing his enthusiasm. For this

## Michael Mohe

**1984** born in Annaberg-Buchholz in the Ore Mountains, married, two children

**2007**  
Engineering degree (BA), work/study program at the Riesa vocational academy (partner with KUKA Werkzeugbau Schwarzenberg)

**2007–2013**  
CAD specialist at KUKA Werkzeugbau Schwarzenberg

**2013–2014**  
Design department

**Since 2014**  
Process planning, closely involved in the product development process

coolheaded analyst, who usually spends his days working on deep drawing and metal-forming properties and thinking about qualification and tool efficiency processes, the premiere is clearly a matter of the heart. It is also obvious how much he loves his job.

Schwarzenberg lies 120 kilometers southwest of Dresden, just down the road from the home of the Erzgebirge Aue club in Germany's second-division pro soccer league. The town has been making tools for the past 120 years—and eighty years ago it developed tools that helped form the tops, rear windows, and cowls of the VW Beetle from single sheets of metal for the first time. And—even during the post-war division of Germany—Schwarzenberg continued to supply tools to VW in Wolfsburg.

Michael Mohe comes from the region around Schwarzenberg. As a schoolboy he already knew he wanted to work on cars and drive systems. "In high school you don't really know what toolmaking consists of. You pic-

ture people making cordless screwdrivers," he remarks. In 2004, he began a work/study program in Schwarzenberg and at the vocational academy in Riesa. At the time, the toolmaking business belonged to KUKA, the huge industrial robotics manufacturer. "In the first year of my studies I spent three weeks at the training workshop with a file in my hand, learning the basics to get a sense of what this field is all about."

He earned his degree, was offered a job at the company, and worked in the design department. There he learned to design tools of all categories, to produce them, and to evaluate the quality of designs from outside the company. A promotion to process planning expanded his tasks and increased his responsibilities. He was now in charge of the complete process and the associated metal-forming systems: rolling, deep drawing, cutting, and remolding. "You accompany your tool through all the stages until it's ready for production," he says. "We're in charge of efficiency and qualification, and then give the finished unit to the stamping plant. Our job finishes when series production starts."

And what exactly does concurrent engineering mean? It consists of early, close coordination among different departments in the production process. As Mohe explains, "During the Taycan development phase, there were regular meetings every two weeks. People from development, planning, tool supply, and the body shop sat at the same table, gave progress reports, and went home with a whole package of new tasks." Even when he was working for KUKA, he would still drive to

meetings with his colleagues in Stuttgart. "But today, as a part of Porsche, we're much closer to the heart of it all."

There's the "heart" again. But seriously, does it make a difference for a toolmaker if he's producing something for a car with a combustion engine or an electric motor? Mohe laughs. Yes, it does! First of all, the motor in an electric car is small. Or it's located on the rear axle. "That opens up a lot of room in the front, which means I can completely redesign the shape and the outer shell. For the Taycan we've created a beautiful combination of concave and convex forms. That lets you bring out the design—the Porsche DNA—even more strongly."

If you tinker around enough, you'll find a solution: Michael Mohe is a specialist in process planning. He was closely involved in product development for the Taycan.

## Michael Mohe

**First Carrera (or model) car**  
*Porsche 935, Matchbox*

**First experience with electronics**  
*Connecting the transformer on an electric train set at the age of five*

**First job at Porsche**  
*Process planning*

Second: fuel efficiency. To maximize the electric Porsche's range, it was necessary to reduce its wind resistance. Third: lightweight construction. The Taycan's shell is made entirely of aluminum. All the steel components are gone. As Mohe notes, "Aluminum behaves in more complex ways when it's formed, and it's also harder to predict its behavioral patterns." It's a good thing that the team in Schwarzenberg has many years of experience working with aluminum. "The site has lots of expertise, which is very helpful to us."

Around 480 people in Schwarzenberg work on systems solutions for metal-forming and cutting tools. Using the latest simulation systems, a complete CAE process chain, and efficient production procedures, they make large-scale tools for shell components of Porsche cars. All the tools needed to produce the shell components of the Taycan—including the top, side walls, front flaps, and doors—were made at the site. Mohe waxes positively euphoric when talking about the fenders. "Some of those deep-drawn values had never been attained before."

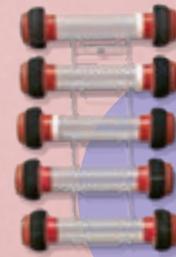
There's no doubt about it—Michael Mohe has Taycan fever. "You're absolutely right," he says. "We know what the car looks like. But still it's like waiting for a child to be born. Everyone is totally excited. We've worked so many years on this car, and now we'll be seeing it on the roads! We did the first design studies in 2016 ..." Time sometimes feels like a Porsche.

Text Jo Berlien



## SLIDE VIEWER

A new photo with every click. A new world with every slide. Also known as transparency viewers, these devices used daylight. They gave viewers a glimpse of famous cities, figures from fairy tales, and animals at the zoo.



## PNEUMATIC TUBE MAIL

At first glance this mail delivery system looks old-fashioned, to say the least. But sometimes we want to send not only data but also objects. That can't be done virtually, even in the digital age. These cylindrical containers are a charming alternative. They can be sent up, down, and across buildings by pressurized air in a system of tubes.



## CASSETTE TAPE

If the tape comes out of the cassette you can roll it back in with a pencil. Everyone from the cassette generation remembers doing that. These days cassette tapes have achieved cult status. Many people still treat themselves to an episode of *The Three Investigators* before falling asleep.



## JUKEBOX

It's not exactly the radio you'd want in a small apartment. But despite its size and comparably poor sound quality, the jukebox too has achieved cult status. Put a coin in the slot, push a stiff button, and watch with childlike pleasure as the record is loaded. Then step onto the dance floor, close your eyes, and dop to your heart's content.

A LOOK AT THE PAST

# ONCE UPON A TIME

New technologies tend to replace old ones. But not always. Some things are simply too useful to disappear. Others acquire cult status. We present a selection.

## ADDING MACHINE

Some members of bookkeeping and controlling departments are still familiar with the monotonous clacking sound of these machines. You type in the numbers and tear off the paper strip of calculations. Adding machines used to do only basic types of arithmetic. Then they morphed into miniature computers. Electronic spreadsheets are now the more modern approach.

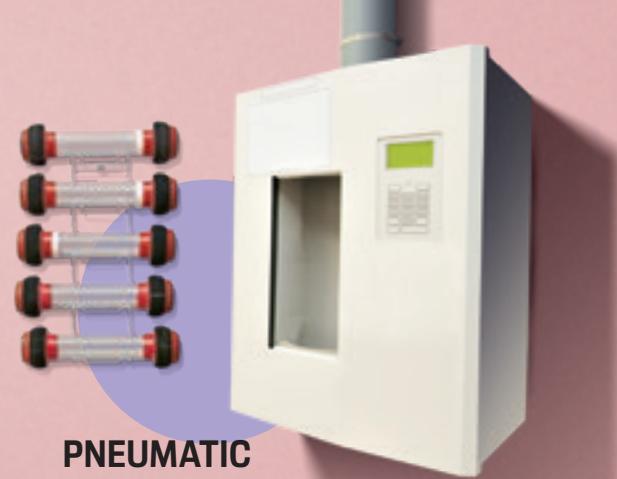


## ENCYCLOPEDIA

Looking up information in books instead of on Google—analogue research takes a little longer and can on occasion lead to somewhat outdated results. The thirty-two volumes of the *Encyclopædia Britannica* contain around 75,000 articles and 44 million words, and the printed version reflects the state of knowledge in 2010. The EB went completely digital in 2012.



CAMPUS



TEST YOUR KNOWLEDGE

# ARE YOU CHARGED UP?

The future belongs to electromobility. Are you ready for this step? Test your knowledge of electricity and electronics with this quiz.

**1** What do you call the movement of charged particles?

- A) Current
- B) Voltage
- C) Resistance

**2** Which of these vegetables can be used best to generate electricity?

- A) Onion
- B) Potato
- C) Cucumber

**3** In a closed conventional three-wire circuit, which color wire carries the current?

- A) Yellow-green
- B) Blue
- C) Black or brown

**4** Which type of motor is the most common in electric cars?

- A) Wheel-hub motor
- B) Permanently excited synchronous machine
- C) DC motor

**5** Which household appliance uses the most electricity?

- A) Freezer
- B) Washing machine
- C) Lighting

**9** What could the average energy of a bolt of lightning do?

- A) Operate a 100-watt lamp for ten days
- B) Meet the energy needs of a household for a year
- C) Meet the energy needs of a town for a year

**8** What unit is used for the power rating of electrical devices?

- A) Volts
- B) Kilowatt hours
- C) Watts

**7** How fast do electrons move at 230 volts in a typical copper wire?

- A) At the speed of light
- B) Less than 1 mm per second
- C) They don't move

**6** Which of these devices changes the voltage in electrical systems?

- A) Rectifier
- B) Generator
- C) Transformer

**0 to 3 correct answers:** Electricity comes from a socket in the wall. But you should definitely build on this level of knowledge—because electromobility also offers you the chance for a cleaner future.

**4 to 7 correct answers:** You've already flipped the switch and are going with the flow. You've made a start. But electromobility offers many things to discover. Be ready to take the next step.

**8 to 9 correct answers:** The bulbs are not the only bright thing in your apartment. You're charged up, an electricity freak, and a role model for everyone else. You're very interested in electromobility-related innovations.

Illustration: www.weardme.com

Photos: Shutterstock (5), Adobe

# FINDING COMMON GROUND

Christian Wellmann (31) is a psychologist who does development work. A specialist in the interaction between humans and machines, his job after completing the trainee program will be to help design the next generations of cockpits for car models.

CAMPUS

Starting out in the automotive industry was not actually on the agenda. "But the job ad was a perfect fit for my interests, and was exactly what I was looking for," says Christian Wellmann. He wanted the job, and Porsche wanted him. And now this psychologist sits right in the thick of things with all manner of engineers and has no intention of leaving because Porsche offers him incredible opportunities. Following his twelve-month trainee program, he'll join the driver experience department, where he'll be charged with developing a display and operating concept that transcends all model series, is as intuitive and distraction-free as possible, and offers drivers a positive user experience.

Christian's knowledge of human behavior and his outside perspective automatically put him in the position of a negotiator who needs to unite opposites on common ground: automotive machines and human beings, the different requirements of major markets in the USA, Europe, and China, sports-oriented amateur racers and comfort-oriented road users, and different generations of Porsche drivers. All of their desires, expectations, and evaluations will flow into the Porsche cockpit and operating elements that Christian's future department is designing with other teams.

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Photo: Klaus Hepp

Before the first day of work it's already clear what role the trainee will later play at Porsche

Work in the future department and two related areas provides superb preparation for the job

## Trainee in product and concept

### Responsibilities

- Introduction to the product and concept area as part of the Porsche international trainee program, with a focus on "driver experience: Porsche operating concepts of the future"
- Completion of diverse project work at various departments in the course of a twelve-month trainee program
- Work on an interesting task as part of an assignment abroad
- Exciting practical experience in production and at a Porsche branch office
- Participation in seminars, workshops, and personnel development modules
- Assumption of a substantial task in the product and concept area following completion of the trainee program



### Trainee: Focus on the Goal

The task of trainees is essentially to prepare for what they will later be doing at Porsche. To gain the requisite specialized knowledge, they spend the first few months in their future department, do multiple-week stints in related departments, and complete an assignment abroad. They also do brief internships in production, sales, and with the works council.

This task is a big challenge. But Christian feels he's well equipped to meet it. He has a master's degree from Ulm University with a specialty in human factors and is well versed in the interaction between humans and machines. He knows what tools and methods can be used to study customer behavior and experience. While other people at Porsche work with screwdrivers and CAD programs, Christian uses eye trackers that register the eye movements of the drivers who test cars.

With all due respect to the specialized knowledge gained during a course of studies, no university degree can perfectly prepare graduates for their jobs. That was also the case with Christian when he began his traineeship in October of 2018. Despite a weakness for cars and some work/study experience in the automotive industry, he lacked comprehensive knowledge of the technology. "In the beginning I often had to look up terms," he says with a smile. This newcomer to Porsche also didn't know much about its customers. But the trainee program, which is familiarizing him with the wide world of Porsche, is filling the gaps in his knowledge. Christian and his fellow trainees only spend the first few months of their program in their actual departments. They go on several-week stints in related departments with which they will be working closely in the future and also have an assignment abroad. The program includes short traineeships in production, with the works council, and at a branch office, as well as seminars and workshops.

At the beginning of the program, trainees select their individual stages with their mentor and future department. "My boss and I were very much in agreement on which stages to choose," says Christian. The first one was with Porsche Design Studio/Style Porsche (interior design), which concentrated on visual and technical designs for the Porsche cockpit. At the second stage with market and customer analysts, he became better acquainted with how Porsche drivers think and what they want. His assignment abroad is in Shanghai to learn more about the growth market in China. No other market in the world is attracting as many new and especially young customers to the Porsche world.

A diverse program awaits trainees. "You gain so many impressions, acquaintances, and new knowledge and so much experience that the year just flies by," says Christian with a little regret in his voice. But that also means he can soon join his team and put a lot of exciting projects into practice with related departments.

Text Benjamin Büchner

# TOP 5

Porsche offers many different internships. Here is a selection of the latest exciting fields. It's always a good idea to apply!

Internship in purchasing; Hemmingen, Rutesheim, Weissach  
Reference number: PAG-P-6101550-E

Internship in billing, accounting, and taxes; Weilimdorf  
Reference number: PAG-P-6306010-E

Internship in chassis/suspension; Weissach  
Reference number: PAG-P-6201111-E

Internship in smart mobility sales; Ludwigsburg  
Reference number: PAG-P-6701500-E

Internship in exclusive and special vehicle project management; Weissach  
Reference number: PAG-P-6200052-E

[www.jobs.porsche.com](http://www.jobs.porsche.com)

**"We promised a genuine Porsche for the age of electric mobility—a fascinating sports car that is not only thrilling in terms of technology and driving dynamics, but fascinates people around the world just as its legendary predecessors have done. Here it is."**

Michael Steiner,  
Member of the Executive Board,  
Research and Development

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# STAR CHECK

Famous people around the world drive, collect, and love Porsches. Some like to appear in the media with their cars, others prefer to be alone with their engines. But they all have one thing in common: their cars are as unique as their fingerprints. A Porsche department fulfills the exclusive wishes of VIP customers.

Discretion is his middle name. Regardless of how cleverly the question is phrased, Wolfgang von Dühren provides not a single detail that could reveal too much about his famous customers. The head of the international direct sales department and his seven-member team sell around fifty cars a year to showbiz personalities, monarchs, and sheikhs. Each of these Porsches is designed to meet the individual wishes of its future owner. "Our customers don't buy a car, they buy their car," says von Dühren in summing up his department's philosophy. In color, decoration, engraving, and more, the team fulfills a very wide range of unique desires. But there are a few limits to individualization. It's taboo to use leather from endangered species in car interiors, for example.



**Wolfgang von Dühren**  
Manager, International Direct Sales

Born in Stuttgart on July 26, 1962, von Dühren has worked for Porsche for nearly forty years. He started as an automotive electrician, earned a degree in business administration and switched to customer service, and ended up in special sales. Today he heads a department that works together with the technical experts at Porsche Exclusive Manufaktur to serve an exclusive group of customers, including brand ambassadors and prominent Porsche enthusiasts.

Photos: Archive

## Angelique Kerber

Game, set, superstar: this German tennis player became a Porsche brand ambassador in 2015—and proceeded to win contests including the Australian Open, US Open, and Wimbledon. A two-time winner of the Porsche Tennis Grand Prix, she was the proud recipient of a Porsche car each time.

<http://por.sc/3qUICu>



## Mark Webber

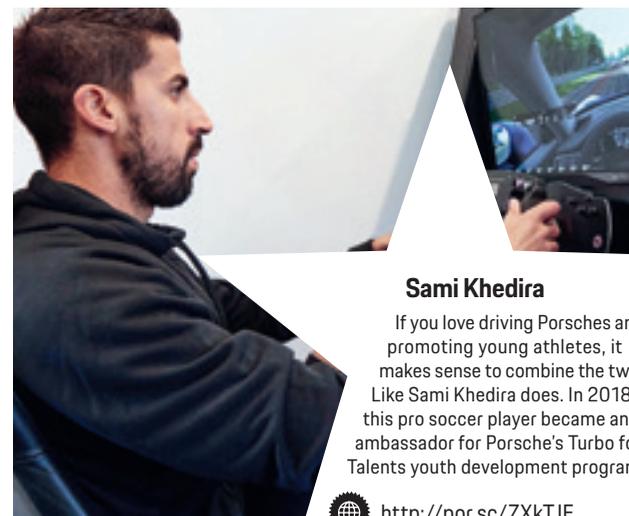
Both his professional and private lives revolve around Porsche. Webber ended his racing career in 2016, but remains a Porsche representative and collector.

<http://por.sc/hdwuEd>



## Richy Müller

Many people know him as Inspector Thorsten Lannert from the *Tatort* series in Stuttgart. Müller is not only an actor but also a race-car driver and Porsche fan. Even in *Tatort*, this brand ambassador drives an old 911.



## Sami Khedira

If you love driving Porsches and promoting young athletes, it makes sense to combine the two. Like Sami Khedira does. In 2018 this pro soccer player became an ambassador for Porsche's Turbo for Talents youth development program.

<http://por.sc/ZXkTJE>



## Jean Pierre "JP" Kraemer

The career of this YouTube host and producer (JP Performance) started with Porsche. In the early 2000s he did an apprenticeship as an automotive clerk at the Porsche Center in Dortmund.



## Udo Lindenberg

He used the revenue from his first major concert to buy a 911 in 1973. Like music and art, Porsche is part of Lindenberg's life. This musician and Porsche enthusiast is also one of Germany's most successful Pop artists. The Porsche Museum has presented a special exhibition of his work.

<http://por.sc/GVQ51v>

# MAGAZINE

## TAYCAN STARS AS SECRET AGENT'S CAR



The Porsche Mission E has come to movie theaters. Secret agent Rex Dasher, one of the main figures in *PLAYMOBIL: THE MOVIE*, a family-friendly animated film, drives this concept study for the Porsche Taycan. The movie project is the first from Porsche and Playmobil, which started developing play sets and marketing strategies together in 2014. "Porsche was Playmobil's first

licensed product," says Kjell Gruner, the head of marketing at Porsche AG. "We've been bringing a new beautifully designed set onto the market every year to delight children, teenagers, and their parents. And now these successful shared projects have been joined by a movie." The play set that the two companies are presenting along with the movie is Playmobil's first remote-controlled Porsche. In the movie, the Mission E driven by the intrepid secret agent is not only a purely electric sports car but also has some extraordinary abilities. Even in the future, however, those special abilities will only be found in the world of Playmobil.

 <https://movie.playmobil.com/en/home>

### WINTER SEMESTER EVENTS

2019

Meet Porsche representatives and find out in person about the many ways to join the sports-car company:

- October 13 **Porsche Sportscar Together Day**/Stuttgart
- October 23 **MeetIT**/Heilbronn University of Applied Sciences
- November 6 **Bonding Firmenkontaktmesse**/RWTH Aachen
- November 7 **HOKO**/Munich University of Applied Sciences
- November 12 **Car Connects**/Motorworld Stuttgart
- November 13 **CareerDays**/University of Hohenheim
- November 13 **Tag der Informatik**/University of Stuttgart
- November 14 **automotive TopCareer**/Wagenhallen Stuttgart
- December 2 **Lecture series**/University of Stuttgart
- December 12 **Futures Day for Women Students and Doctoral Candidates**/RWTH Aachen

## UNDERSTAND PORSCHE—AT A GLANCE

NARDÒ

These testing grounds, which opened in 1975 in Nardò in the southern Italian region of Apulia, are one of the most important automotive trial centers in the world. Porsche Engineering assumed responsibility for the Nardò Technical Center in May 2012. More than twenty test courses and facilities, including four spectacular circuits, are available for use on the site's more than seventy hectares.

911 Carrera: Fuel consumption, city: 11.2 l/100 km, highway: 7.7 l/100 km, combined: 9.0–8.9 l/100 km, CO<sub>2</sub> emissions (combined): 206–205 g/km

CONVEYOR BRIDGE

The company's main production site in Zuffenhausen, with facilities built and modified over time, features a number of conveyor bridges: within the plant itself and across public roads. Because of the limited space at the site, cars have to be moved to different buildings and levels. For the new Taycan, for example, a two-story conveyor bridge was built that measures a good 800 meters in length.

HERBERT LINGE

From apprentice to legend: Herbert Linge (91) has enjoyed quite an impressive career with Porsche. As a factory driver and as operations manager of the Weissach Development Center, he posted countless racing victories and helped guide the expansion of the company. In 1970, he was a double for Steve McQueen in the movie about the world-renowned twenty-four-hour race in Le Mans, France.

PORSCHE DRIVE

Why not rent a Porsche instead of buying or leasing it? A number of Porsche Centers now offer this attractive option: the Porsche Drive program, which gives customers the chance to rent current models for up to twenty-eight days. Their fleets contain select model series, including the new 911. Porsche Drive is now also available from dealerships in Germany, France, Switzerland, and the US.



### HOW TO JOIN US

## JOBS AND CAREERS

Would you like to join us? Check the job locator at [www.porsche.com/jobs](http://www.porsche.com/jobs) to see all the positions—from internships to direct openings.

### STUDENTS

#### INTERNSHIPS

Internships are available in nearly all company divisions and at international subsidiaries. They can start at any time, run three to six months, and consist of thirty-five hours/week. Apply four to six months before you would like to start. Prerequisite: ideally three semesters plus initial practical experience.

#### WORKING STUDENT

Join everyday company operations at any time. Duration: at least six months. Working time: ten to twenty hours a week. Prerequisite: ideally three semesters with good grades.

#### COLLEGE THESIS

An ideal combination of theory and practice. Duration: three to six months.

### HIGH SCHOOL STUDENTS

#### COLLEGE AND NON-COLLEGE CAREER ORIENTATION

High school students on both college and non-college tracks can do a one-week career orientation internship.

#### VOCATIONAL TRAINING

Technical and commercial apprenticeships for positions like automotive mechatronic technicians or industrial clerks. The application period starts in summer for the following year (e.g., July/August 2020 for September 2021).

#### WORK/STUDY PROGRAM

Three-year bachelor's program at the Baden-Württemberg Cooperative State University (DHBW) combined with periods of practical training at the company. Eight different courses of study: IT, automotive IT, economic IT, economic engineering, mechanical engineering, electrical engineering, mechatronics, and digital business management. Prerequisite: very good general or subject-oriented college preparation. Apply in July/August for the following year. Permanent job contract possible following successful completion of the program.

### HOW TO REACH US

 [www.porsche.de/karriere](http://www.porsche.de/karriere)

 [www.facebook.com/porschekarriere](http://www.facebook.com/porschekarriere)

 [porschecareers](https://www.instagram.com/porschecareers)

 Hotline: +49 711-911-22911  
(Monday through Friday,  
2 to 5 pm)

### PUBLISHING DETAILS

**Porsche CAMPUS**  
02/2019 issue. CAMPUS appears twice a year in German and English with a total circulation of 9,000.

**Publisher, editorial direction**  
Dr. Ing. h.c. F. Porsche Aktiengesellschaft  
Personalmarketing und Recruiting, Porscheplatz 1  
70435 Stuttgart; phone: 0711-911-2885

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**Translation**  
RWS Group Deutschland GmbH,  
Joachimsthaler Straße 15, 10719 Berlin

**Design**  
campra GmbH, Büro für Kommunikation,  
Hauptmannsreute 23, 70192 Stuttgart

**Cover photo**  
campra, VisualMind

**Production and printing**  
Offizin Scheufele Druck und Medien GmbH + Co. KG,  
Tränkestraße 17, 70597 Stuttgart

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there when the car was invented:  
here's your second chance.**

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