PORSCHE

Taycan factory opening

FACTORY
Taycan
OPENING

Contents

We are responsible for the environment and society. We are already producing our first purely electrically powered sports car in a CO_2-neutral manner, quite deliberately in our parent plant in Stuttgart-Zuffenhausen, the heart of Porsche. There, where the 911 and the 718 models are at home. So we combine our tradition with the future.

Oliver Blume, CEO

1 **Electric mobility is for Porsche a job engine**

1,500 new jobs are being created at the Stuttgart-Zuffenhausen site with the Porsche Taycan and Cross Turismo. Overall, Porsche will invest more than € 6 billion by 2022 in electric mobility, new vehicles, new production facilities and jobs.

2 **Together in the future**

The first purely electric sports car is **deliberately created in Stuttgart-Zuffenhausen, where the heart and soul of the brand have their home,** the birthplace of icons such as the Porsche 356 and 911. This is also made possible by a **staff pact** with which the workforce participates in the project.

3 **The Taycan is produced in a factory of the future**

Porsche Production 4.0 is smart, lean and green.

smart	flexible, networked production with 4.0 technology
lean	responsible use of resources and few handling stages
green	sustainability and environmental protection

4 **Porsche removes the assembly line**

Instead of a traditional, rigid assembly line with shear plates embedded in the ground, Taycan's production uses a **FlexiLine** with **driverless transport systems (AGVs).** This makes the production even more flexible, individual customer requirements are even easier to implement. And it simplifies the architecture of the new building as well as the setup of the new assembly.

5 **Naturally CO_2 neutral**

The emission-free Porsche Taycan is **produced CO_2-neutrally** at the Zuffenhausen site. In addition to the use of natural electricity and biogas for heat generation, the new production buildings are designed to be even more energy-efficient. Other examples include: increasing electrification of logistics vehicles (trucks, vans, industrial trucks), holistic view of resources saving, use of waste heat (in paint shop) and greening of roof areas.

6 **Porsche implements successfully large-scale projects**

Porsche is ready for the step into electric mobility. On **September 9, 2019** Porsche has opened the new factory as planned. The new building was completed while Porsche produced daily 250 two-door sports cars of the model series 718 and 911 – more than ever before.

7 **Quality comes from qualification**

In addition to the new vehicle and new factory building, it is also important to **qualify** the employees for the step into electric mobility and to **integrate** new employees **into the team.** For this purpose, Porsche has set up the **qualification initiative.** This involves know-how on the topics of digitization, electric drives, the handling of high-voltage technology and the Porsche brand.

At a glance

The factory of the future – smart, lean and green

The premiere of Porsche's first all-electric sports car is also accompanied by major changes to the traditional location in Stuttgart. Of the six billion euros that Porsche is investing in electric mobility by 2022, more than 700 million euros go into the construction of new production facilities for the Taycan. Parallel to the tightly balanced production of sports cars – with 250 Series 911 and 718 automobiles, more vehicles leave the plant than ever before – a new factory is being built in the existing factory in Zuffenhausen.

The spatial distribution of the various lines of work across the entire company premises is necessary because of the urban location. For example, the new body shop, which was commissioned with the premiere of the 911-Generation 992 and placed at the heart of the site, will be joined by the buildings erected to the west for the electric drive and component production as well as a new paint shop. In the northeast is the Building 70 a multistory assembly. The painted bodies and drive components reach the assembly building by means of a 900-meter connecting conveyor bridge – unaffected by weather and without impairing public transport. The loading logistics for the finished Taycan are located east of the Building 70.

The large-scale project becomes reality within record time. After the trade fair premiere of the Mission E Study in September 2015, almost four years pass from the Supervisory Board's decision on the construction of the new electric sports car in December 2015 to the official factory opening on 9 September 2019. 21 individual projects with over 6,000 relocations are needed alone to prepare for the new construction. For the assembly building on a slope, a 25-meter-deep construction pit is excavated. In the process, 240,000 m^3 of soil are moved. The material of the demolished old halls will be processed on site and reused for the basic construction of the new buildings.

Porsche pays the highest attention to sustainability in all its aspects. Production on the site is CO_2-neutral, the energy-efficient buildings are well below the statutory energy requirements, all roofs of the new buildings are landscaped and partly equipped with photovoltaic systems. The electrical energy used at Porsche comes from renewable sources. Biogas-powered combined heat and power plants supply the site with heat and additional electricity. Increasingly electrified logistics vehicles and rail transport powered by green electricity reduce CO_2 emissions in logistics. Added to this there are a host of other measures, with which Porsche is pursuing the goal of the "Zero-Impact-Factory", a production without environmental influences.

Sustainability is one of the three pillars of the Porsche Production 4.0: smart, lean and green are the buzz words for the modern production methods of the sports car manufacturer. In addition to the ecological aspects (green) and the responsible and efficient use of resources (lean), Porsche Production 4.0 stands out for its transparency and networking (smart). People continue to be at the center of production. Modern technologies facilitate their work and support their craft.

Porsche is committed to the traditional corporate headquarters and combines tradition with future.

"I possess 30 years of automotive experience and had the chance to master many tasks. To integrate a new production with new technology and new processes at maximum capacity in a brownfield location – i.e. a location in an urban environment – is my biggest challenge so far."

Albrecht Reimold, Production and Logistics Board Member

This includes new, up to 110 degrees pivoting swivel, thanks to which the unergonomic overhead work belongs to the past. The driverless transport systems, so-called AGVs, of the FlexiLine replace the classic assembly line. They offer flexibility in production and in the architecture of the new plant.

What started with the brick building called Plant 1 has today grown into a site that covers an area of 614,000 m^2 and on which around 12,000 employees produce four-wheeled enthusiasm. In total, more than 33,000 people work now for Porsche.

The step into electric mobility is a job engine for the company: The Taycan and its CUV offshoot Taycan Cross Turismo will create 1,500 additional jobs. At the same time, the sports car manufacturer is establishing an unprecedented qualification initiative, in which the topic of electric mobility at Porsche is introduced to Porsche employees. All employees are offered a four-day qualification program in addition to extensive e-learning opportunities. For the colleagues which are directly involved in the production of the Taycan a multi-week training is planned.

smart, lean and green

Albrecht Reimold

Mr. Reimold, what does the launch of the first electric sports car from Porsche mean for you?

With the Taycan we open a new chapter. Porsche has deliberately decided to produce this new icon at its headquarters in Zuffenhausen – heart and home of the brand. The Taycan is something very special: power, range, the innovative 800-volt technology for shortest charging times and the entire vehicle concept are unique. He is a thoroughbred sports car, at the same time suitable for everyday use – a typical Porsche. More than 30,000 serious prospective buyers from all over the world have already registered with Porsche – without having ever seen the car. That's overwhelming. What happens here is well above what we could have expected.

The Taycan is considered the most demanding project that Porsche has ever tackled. In Zuffenhausen, a completely new plant was created. Porsche invested around one billion euros in this.

Yes, because the Taycan is very important to us. All you have to do is take a look at the enormous pace with which we are realizing the project: in September 2015, we presented the Mission E Study at the Frankfurt Motor Show. In November, the groundbreaking ceremony for the new body shop took place, in which we are already producing the body of the current 911. Six months later we started clearing the construction site for the new assembly. At the same time, the production facilities for the Taycan were planned. Twelve months later, the first prototypes and development vehicles were created in the pilot center. This is all very sporty.

What are the biggest challenges?

With the Taycan we are reinventing our parent plant, creating a factory in the factory: we are integrating a completely new production with new technology and new processes – and this while our existing factory is working at full capacity. After all, we already produce more vehicles than ever before in Zuffenhausen with 250 two-door sports cars a day. It's like an open-heart surgery and has an impact on all the relevant areas: from the smooth running of the current production, to the preparations for the Taycan's start of production, and the preservation of local residents' interests. After all, our main plant borders on residential and commercial areas, is criss-crossed by numerous roads and a railway line. All this requires sophisticated logistics and is the reason why we also produce the Taycan over several floors and building complexes.

Wouldn't it have been easier to manufacture the Taycan in Porsche's Leipzig plant? There is more free space there than in Zuffenhausen.

Zuffenhausen is the cradle of our sports cars. The Taycan is our clear commitment to this traditional location, which we lead into the future by securing existing jobs and even creating new ones. Through a staff pact we have made the Taycan "our project". In addition to a good neighborhood, the decision of the Supervisory Board and corporate management, it also takes the support of employees for such a unique step. And they also financially support the project by contributing one-quarter of their collective salary increase to a fund. This is unique in the automobile industry. In addition, we establish with the Taycan highly innovative production methods and make a step towards the factory of the future. We call this Porsche Production 4.0 – smart, lean and green. Smart stands for flexible, networked production. Lean means responsible and efficient use of resources. And green refers to sustainability and environmental protection. After all, we also want to constantly improve the environmental performance of our products. In the area of production and logistics, we have reduced CO_2 emissions per manufactured vehicle by more than 75 percent since 2014.

Goal thus achieved?

No. Because we will produce the Taycan CO_2-neutral in Zuffenhausen. And our vision is even more far-reaching: a production where we leave no ecological footprint – in terms of the supply chain and product lifecycle.

What is the difference between the production of a purely electric and a conventionally powered sports car – are there any similarities?

It's not that we simply use a battery instead of the tank or an electric drive instead of an internal combustion engine. And of course, it's different to mount a battery, an electric motor and the associated cooling in comparison to a combustor with its exhaust system. Nevertheless, the Taycan is a car whose body also wants to be assembled and painted. The assembly order is largely the same. When dealing with high-voltage technology, however, new expertise is required, which is why we qualify all our employees accordingly. After all, we want to guarantee for the Taycan the same high-quality standards that Porsche has always been known for. In addition, it should be possible to individualize the purely electrically powered sports cars // to the same extent as it is the case today with our current models. Our customers appreciate the high degree of customization that Porsche offers. Everyone gets exactly the vehicle they want. We build, if you like, unique pieces in series. That is also true of the Taycan.

There is no classical assembly line in the Taycan production anymore.

Yes, we were able to completely redesign the Taycan production from the beginning. This has the advantage that we are now establishing highly innovative production standards in Zuffenhausen. We assemble the Taycan on a so-called Flexi-Line with driverless transport systems that move independently from station to station. This not only gives us new freedom in the production plant, but also in the architecture of the new plant. The Flexi-Line offers huge benefits in terms of investment and flexibility. By dispensing with conveyor belts that are firmly integrated in the foundation, we save around 30 percent on investment costs. And without the rigid assembly line we can modify the production at any time, integrate something new or drive a bypass to implement special customer requests.

The Taycan production also sets new standards in digitization.

That's true, even if in connection with Industry 4.0 is often spoken of a "revolution". I do not think so. Because today we continue to develop what we have already created in the past through automation, simulation and virtual product and production planning. Digitization helps us, on the one hand, with the ergonomic design of the working world. It also helps colleagues analyze complex processes and workflows, and gives us transparency, for example, to check where and why a digital flow may not be on the most ideal path. In this way we are shown potential that we otherwise might not recognize.

Is that the precursor to the factory without staff?

No, our focus is still on the people. That will not change. We automate to relieve our colleagues and help them in their work, but still rely on highly skilled professionals. For the demanding task of putting high-quality, individual and powerful sports cars on the wheels, the combination of using the latest technologies and the know-how of our specialists is indispensable.

No jobs are lost?

We have almost doubled our workforce in just a few years – now to more than 33,000 employees. For the Taycan and Cross Turismo alone, we get an additional 1,500 colleagues on board. Electric mobility is a job engine for Porsche.

The arc of tension

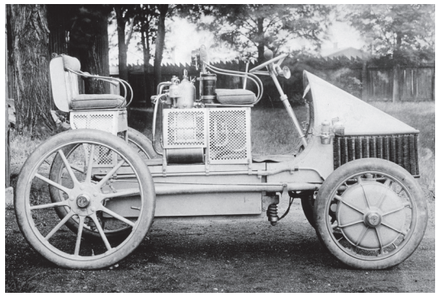
The Porsche employees are an integral part of the project.

Project milestones

September **2015**	Fair premiere of the Porsche Mission E in Frankfurt (IAA)
November **2015**	Ground-breaking ceremony for the new body shop
December **2015**	Supervisory Board decision on mass production of the four-door electric sports car
December **2015**	Decision for the location Stuttgart-Zuffenhausen
Mid- **2016**	Site clearing
from July **2016**	Planning of the production facilities for the Taycan
February **2017**	Excavation for the new assembly hall
May **2017**	Production of the first test vehicles in the pilot center Plant 2 Zuffenhausen (construction stage)
March **2018**	Fair premiere of the Porsche Mission E Cross Turismo in Geneva
May **2018**	Prototype production in pilot center Plant 2 in Zuffenhausen (first pre-production)
October **2018**	Decision to mass-produce the Taycan Cross Turismo
December **2018**	Construction of the first vehicles in the new assembly (17.-21.12.2018)
January **2019**	Start pre-production in the new assembly
September **2019**	World premiere of the Porsche Taycan
September **2019**	"Start of Production" and Taycan production factory opening

The path to electric mobility

1900 | **Lohner-Porsche Semper Vivus – the first functional full hybrid in history**

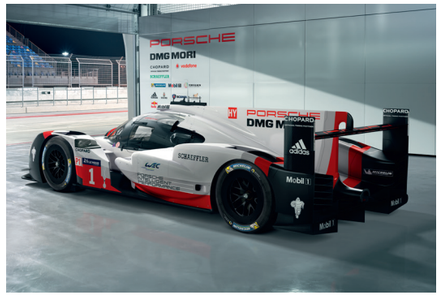


At the beginning of the 20th century, the powertrains of the young automobile are still diverse, and the dominance of the combustion engine is not yet apparent. Ferdinand Porsche (1875-1951) attracts attention with an electric vehicle – with innovative wheel hub drives. In the Lohner-Porsche Semper Vivus, Ferdinand Porsche extends the range of the vehicle with internal combustion engines, which are used as generators for electricity production. This makes the Semper Vivus the first hybrid vehicle in the world. The two-wheel hub motors provide each 1.8 kW (2.5 PS), the power of the two water-cooled gasoline engines is 2.6 kW (3.5 PS) each, the top speed is 35 km/h. One year later, the production-ready version appears as the Lohner-Porsche Mixte.

2010 | **Porsche 918 Spyder – Hybrid for more performance**

Porsche presents 2010 at the Geneva Motor Show three hybrid models at the same time. With the 918, the genre of super sports cars is being reinvented: The combination of internal combustion engine and e-machines mobilizes 652 kW (887 PS) system performance. If required, the plug-in hybrid can be driven electrically. Switched to the combustion engine, the hybrid offers a unique performance. The series version of the high-performance hybrid sports car, which is released in 2013, is the first production vehicle to circle the Nürburgring Nordschleife in less than seven minutes. The top speed of the 918 Spyder is 320 km/h.

2014 | **Porsche 919 Hybrid – High-tech laboratory for the sports car of the future**



As the fastest research lab and, to date, the most complex Porsche racing car of all time, the Porsche 919 Hybrid wins the title in the Sports Car Endurance World Championship (EWC) three times in a row from 2015 to 2017 in both the driver and team rankings. In addition, the car also wins the 24 Hours of Le Mans race three times in a row. Following the successes in Le Mans and the EWC, Porsche sets new records in Spa Francorchamps and on the Nürburgring Nordschleife. With the 919 Hybrid, Porsche gains extensive knowledge for the production sports car of the future. The 800-volt technology of the Taycan, for example, was first used in the 919.

2019 | **Porsche Taycan – the first all-electric sports car from Porsche**

On 4 September 2019, the Taycan experienced its world premiere. The Taycan is powered by two permanently energized electric motors (one per axle). For the first time, a two-speed gearbox is used in an electrically powered mass-production vehicle, enabling fast acceleration and high speeds with low energy consumption. The range of the

Electric mobility

Porsche is taking the step into a new chapter in the company's history.

Taycan is more than 500 kilometers (NEDC). The charging time is very short: Thanks to the 800-volt system voltage, the energy required to travel 100 kilometers is loaded in just over four minutes.
The Taycan Turbo S has a system performance of 625 PS. This accelerates the four-door sports car from zero to 100 km/h in just 2.8 seconds, the 200 km/h mark falls in less than 10 seconds. And the Taycan can accelerate repeatedly without loss of performance. Innovative technology reveals itself in every detail: from the battery modules, which are safely housed in their own frames, with underfloor garages for the passengers in the rear seats, to an exceptional cooling concept, to the electrically adjustable air vents of the air conditioning system and the practical equipment with an on-board charger.

2019 | **Porsche 99X Electric – the first all-electric Porsche Formula E racing car**

Emission free through the city at well over 200 km/h – only the ABB FIA Formula E Championship can do that. The Formula E provides the vehicle chassis and the unit battery. All drive components, on the other hand, are in-house developments from Porsche. These include the electric motor, inverter, brake-by-wire system, transmission, differential, drive shafts, the load-bearing structure and the associated chassis parts on the rear axle, as well as the cooling system and control unit. The maximum permissible power in racing mode will be 200 kW (272 PS) at the entry time of Porsche in the Formula E. With the factory entry into Formula E in November 2019, Porsche is writing a new chapter in its motorsport history. After almost 30 years, Porsche returns to Formula racing.

Porsche implements successfully highly demanding large-scale projects.

A factory arises

A factory arises

While Zuffenhausen produces 250 two-door sports cars of the 718 and 911 series every day – and thus more than ever before – a new factory is being built in parallel at the plant. The spatially close urban location makes a distribution of the individual buildings over the entire area necessary. And it calls for creativity, meticulousness, planning competence and ongoing dialogue with the neighbors.
In total, ten project managers from Porsche's own construction department as well as 30 project controllers, 150 planners and site managers led the major project. A total of 130 companies and suppliers as well as 2,050 construction workers were involved in the construction phase. The construction site clearance organized in 21 subprojects alone made more than 6,000 relocations necessary. Construction logistics included the erection of 530 construction containers, the issuing of 10,000 construction site passes, the erection of three kilometers of construction fence and the laying of 35 kilometers of construction site cables.
In total, 300,000 m³ of earth were excavated, 35,000 tons of steel processed and 130,000 m³ of concrete used. With the amount of steel installed, the Eiffel Tower could be reproduced five times. In total, the newly created area of all buildings and floors measures 170,000 m².

1. The body shop

The bodywork, which is 30 meters high, produces the stiff yet lightweight material mix body with its all-aluminum outer shell. The building consists of 20,000 tons of steel and 35,000 cubic meters of concrete. Inside, robots are moving like ballet dancers, skillfully choreographed by humans. Also in the body show new types of human-robot cooperation are demonstrating pioneering paths for the labor-coexistence of man and machine.
In total, the green space on the building constructed for the production of the Taycan measures 42,000 m², the equivalent of six soccer fields.

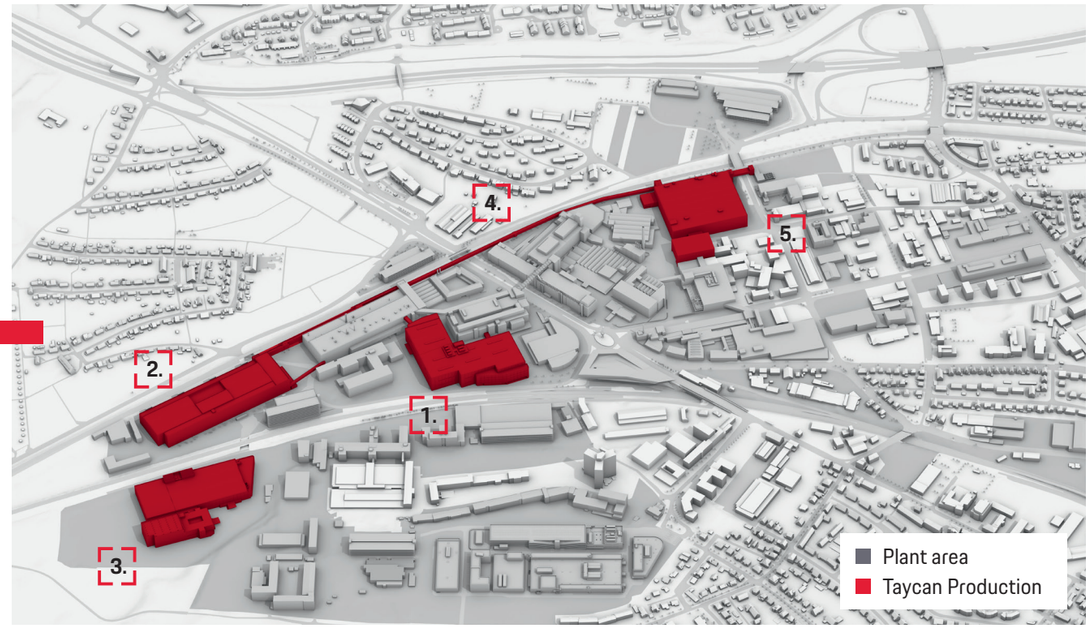
2. New paint shop

Built on a 26,000 m² plot, this is the first paint shop to follow the new 2015 Industrial Construction Directive. Environmental protection and energy efficiency were the main focus when planning the building and the plant. This includes, for example, the efficient use of energy and other resources in the heating of the body dryer with direct heating in the individual process steps and the cleaning of the exhaust air from the dryers together with the paint booth exhaust air. Upstairs are the process areas such as the dipping baths for cathodic dip painting (CDP) and the paint booths. The manual workstations are all located on the ground floor. This keeps the paths for employees short. It also simplifies the communication and the cooperation between the colleagues.

"Stuttgart-Zuffenhausen is the cradle of sports car construction. And with the production of the Taycan, Porsche is now also writing the chapter Future at the traditional location. "

Christian Friedl, Head of Production Location Stuttgart-Zuffenhausen

Porsche sets new standards in terms of innovation and implementation as well as in terms of production and sustainability.



3. E-engines and component manufacturing

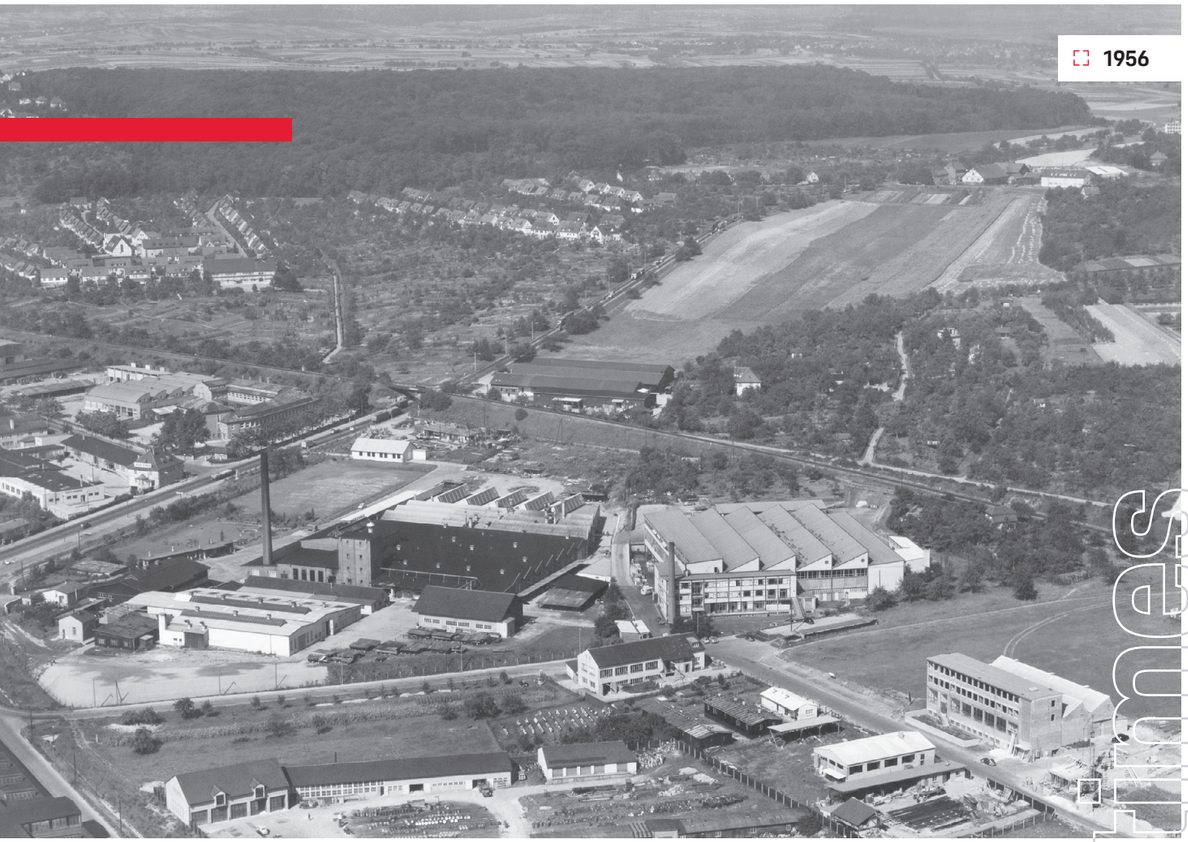
The first series production of electric drives at Porsche is being created in the vicinity of the V8 combustion units production, which are also used, among others, in the hybrid models of the Panamera and Cayenne. In the building arise both the e-machines including assembly of the gears and axles, which together represent the drive units for the all-electric four-door sports car with four-wheel drive. Also housed in the building is efficient logistics with state-of-the-art warehouse technology, which also uses driverless transport systems (AGVs) for automatic material provision. The modern building was awarded the highest grade "Platinum" by the German Sustainable Building Council (DGNB).

4. The conveyor bridge

The conveyor system measures 900 meters, with which the painted bodies, electric drives and components find their way across several streets into the assembly hall. The roof of the conveyor bridge – like the roofs of all new buildings – is green.

5. The assembly and quality assurance

To create space in the midst of a well-established, city-based location, the 62,000 m² production, logistics, testing and staff space is spread over four floors. From the foundation to the roof, the probably largest building complex in Stuttgart-Zuffenhausen measures 38 meters. They are partly hidden through the hillside towards the railway embankment. Therefore, a construction excavation depth of considerable 25 meters resulted.



1956

Changing times

Site development Zuffenhausen

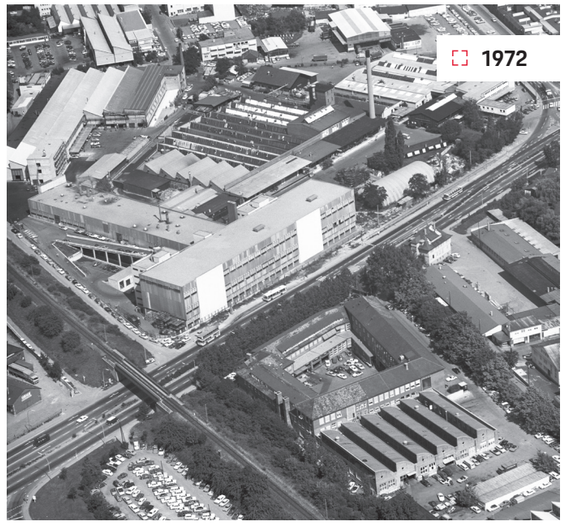
The beginnings

The first Porsche 356 produced in Stuttgart leaves the plant in Zuffenhausen on April 6, 1950. Already the following year, the one thousandth of the sports car with a sheet steel body is produced. The first 52 examples were made in Austria in 1948 and 1949 - by hand and with an aluminum bodywork. Originally Ferry Porsche and his team thought of a series of 500 vehicles. In fact, until the end of production in 1965 about 78,000 Porsche 356 were put on wheels.

In the mid-fifties, the company has around 500 employees, who produce eleven 356 a day. The bodies come from the neighboring company Reutter. Porsche production and engine construction are housed in the Sheddach-Halle, which today is the heart of the area designated as Plant 2. The production is located in the vicinity of the brick building known as Plant 1, built in 1938, and which at that time was used by both the management and the design department.
With increasing production figures, the plant is undergoing appropriate adjustments. But body shop, paint shop, engine assembly, saddlery and final assembly are still in spatial proximity.

Growth with the 911

The 911 is successfully following in the footsteps of the 356. Global demand is increasing, requiring several factory extensions. And the spatial conditions in the growing Stuttgart district of Zuffenhausen call for new solutions: Building 41 is in 1969 the site of a multi-storey production building.



1972

Engine construction has already been outsourced to a separate, south-facing building, and Plant 2 has been expanded to include a further hall. The new assembly building makes it possible to spatially separate individual production areas. This creates space for optimizing the production flow and enables the increase of production capacities. Instead of the former 70 vehicles, around 90 sports cars can now be produced. In 1973 Porsche employs a good 4,000 people. The two-storey assembly is still in operation – in a constantly modified form. Among other things, Building 41 is extended and modernized in the late 1970s and mid-1980s. In the Schwieberdinger Street, the heart of the site, the two-door sports cars are produced today.

Expansion in Zuffenhausen

At the end of the eighties more than 8,000 people work for Porsche. The workplaces are distributed over the production in Zuffenhausen, the development department in Weissach and further offices in Ludwigsburg.
In Zuffenhausen, an automated high-bay warehouse (1982), the once again extended assembly (1985) and a new paint shop (1986) were put into operation. In the paint shop built on the grounds of Plant 2, fully automated transport systems and – for the application of PVC underbody protection – painting robots are used. Just in time for the start of the 911 Generation Type 964, in 1988, a new body shop is added in the immediate vicinity of the Plant 1. The freshly produced bodies reach the paint shop by means of a connecting conveyor bridge – relieving the heavy traffic on the site.

1990

Zuffenhausen

The factory of the future

The premiere of Porsche's first all-electric sports car is also accompanied by major changes to the traditional location. The urban location makes the spatial distribution of the various lines of work across the entire company premises necessary. For example, the new body shop, located at the heart of the site, will be joined by the buildings erected to the west for the electric drive and component production as well as a new paint shop. In the northeast is the Building 70 a multistory assembly. The painted bodies and drive components reach the assembly building by means of a 900-meter connecting conveyor bridge – unaffected by weather and without impairing public transport. The loading logistics for the finished Taycan are located east of the Building 70.

Zero-Impact-Factory

Porsche pays the highest attention to sustainability in all its aspects. Production on the site is CO_2-neutral, the energy-efficient buildings are well below the statutory energy requirements, all roofs of the new buildings are landscaped and partly equipped with photovoltaic systems. Biogas-powered combined heat and power plants supply the site with heat and additional electricity. Increasingly electrified logistics vehicles and rail transport powered by green electricity reduce CO_2 emissions in logistics. Added to this there are a host of other measures, with which Porsche is pursuing the goal of the "Zero-Impact-Factory", a production without environmental influences.

Site development

Porsche is setting standards in terms of sustainability with CO_2-neutral production at the Zuffenhausen site.

Zero Impact Factory

"Sustainability is the sum of many individual elements," says Albrecht Reimold, Production and Logistics Board Member at Porsche AG. "At the Zuffenhausen site, we produce the Taycan from the outset CO_2-neutral. Our goal, however, is to avoid any environmental footprint in the sense of a Zero Impact Factory."

Since 2014, Porsche has already reduced vehicle-specific CO_2 emissions from production by more than 75 percent. The sports car manufacturer reduced the energy consumption per manufactured vehicle by more than 30 percent in its plants, and the water consumption by almost 20 percent. The use of solvents decreased by a third over the same period. "We are committed to the climate goals agreed on in Paris in December 2015 and clearly have a responsibility to reduce polluting emissions. Our commitment to sustainability goes well beyond decarbonization", says Albrecht Reimold.

All in all, twelve fields of action must be considered for the "Zero Impact Factory".

Twelve action fields of the "Zero-Impact-Factory"

Environmental management / Organization

This field of action combines external and internal certification procedures and corporate guidelines that provide a framework for organizational measures and environmental management. This is an important step in identifying and preventing negative effects in all spatial forms.

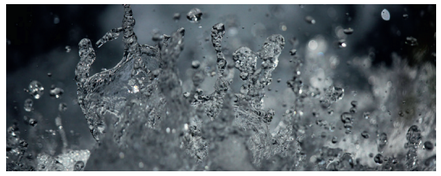
Technology & Processes

This field of action includes the technical facilities of production as well as the production supporting devices. An important aspect is the flexibility of the production system, which should allow adaptation to changing requirements and improved production technologies. This includes the digital infrastructure.

Perception of the factory

The perception of a factory takes place in several dimensions and includes both the visual appearance as well as the social environment and ecological parameters.

Efficient water use



The factory is part of the local water cycle and influences the available water resources through water abstraction, cleaning and pollution.

Planning

The requirements placed on the factory during the planning phase and its operation influence the effects over the entire life cycle. Important parameters can be already determined here, which enable a production without negative effects on the environment.

Energy efficiency and climate protection

Efficient use of energy in production enables cost savings and avoidance of environmental impacts while maintaining or increasing production output. Reduced energy demand can reduce the negative effects associated with energy provisioning.

Resource / material efficiency

Resource efficiency requires the careful and efficient use of resources such as materials, water or energy. Increasing resource efficiency can reduce negative environmental impacts and save resources. Important parts of this field of action are waste prevention and recycling.

Pollutants

Pollutants exert negative effects on ecosystems and their elements, such as plants and living things. The release of such harmful substances should be avoided in order to prevent negative effects.

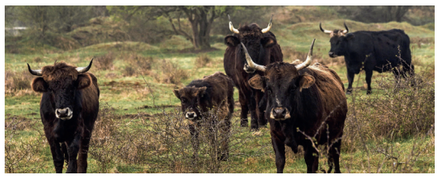
Soil

Soil is a valuable resource for humans and the environment, while being a naturally limited commodity. The soil use of a factory should be in line with the area requirements of the environment and should not cause any negative effects due to competitive situations around areas.

Logistics

The need of a factory is ensured by the logistics. With the initiative "Green Logistics" as well as measures such as parking management and the fine dust ticket, Porsche bundles the traffic volume to counteract the burden on the infrastructure.

Biodiversity

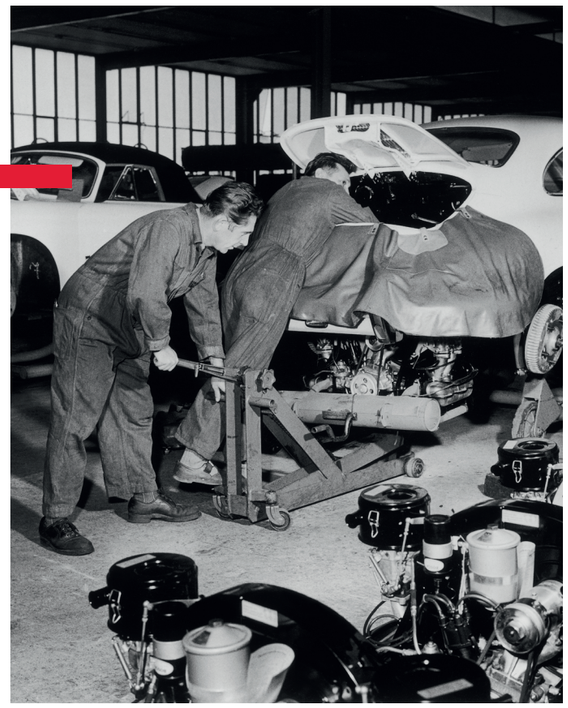


Biological diversity describes the diversity of species, ecosystems, genetic diversity, the function of ecosystems and the natural resources within individual animal and plant species. The aim is the protection of wild animals, plants, fungi and microorganisms as well as their habitats and their functions.

Operational disruptions

Operating faults and faults in a factory can lead to uncontrolled and undesired effects on the immediate environment. Therefore, it is important to prevent them.

Industrial eras of production



Mass production

From mass production to Porsche Production 4.0

Mass production

Beginnings in Zuffenhausen

"In the beginning, I looked around but could not find the car I dreamed of: a small, lightweight sports car that uses energy efficiently. So I decided to build it myself", said Ferry Porsche. Beyond the clear idea of what the first sports car of the Porsche brand should look like, the focus of the company founder is right from the start on production. The beginnings are marked by the early post-war period. This is how the Porsche 356 "No. 1" Roadster and a small series of 52 manually manufactured rear-engine sports cars of the 356 series. The production plant is a sawmill converted into a workshop in the Austrian town of Gmünd. The Porsche employees can fall back on a few machines saved by the war. First and foremost, their manual skills are in demand. Since mass production is not possible there, Ferry Porsche organized in 1949 the move to Stuttgart-Zuffenhausen, which was since 1938 the seat of the design office founded by Ferdinand Porsche in 1931. Together with the Stuttgart Bodywork Reutter mass production of the 356 begins in 1950. One of the various investments in the fifties was the construction of a modern paint shop in 1953. 1956 arise between 18 and 20 bodies a day.

Until well into the sixties, work is carried out in a small space in the immediate vicinity of the individual buildings. The production has a manufactory character. Behind it lie clear ideas of efficient production. Short distances for the individual components, cleanliness and order as well as the profound skills of the employees become the foundation for the worldwide, to this day highly respected Porsche quality.

However, a look into the production also shows how the bodies of individual bent and pressed sheets are welded by hand. In addition, there is the planing and tinning of the welds before painting. So, each body becomes unique. And not only are the process and ergonomics still far from today's standards. An example of this is the transmission installation on the 356: Three colleagues take the component pre-assembled with the axle into their hands. One of them rolls on the back onto the ground under the jacked-up rear of the vehicle, he braces the transmission with his shin in the direction of the vehicle floor and – while his two colleagues hold the component to the axle halves – screws it to the car. In the early sixties this is done 30 times a day. The pre-assembled and painted bodies are moved on the factory premises with electric luggage trolleys – similar to the ones used on train platforms. During assembly, they rest on trolleys, which are manually pushed from one assembly area to the next. An accompanying card contains the necessary information about color, interior design details, extra equipment ordered and other individual customer requests. This ensures even then that every customer receives their own individual Porsche.

Continuous growth

Continuous growth

Mass production through labor division

1969 – six years after the trade fair premiere of the 911 – the sports car assembly moves into new premises. The two shed roof halls at Plant 2 have long been too narrow for the production of the worldwide popular sports car. Porsche has had its own body shop since the end of 1963 thanks to the purchase of the bodywork specialist Reutter. The new assembly building on the Schwieberdinger Street offers space on three floors. On the second floor the bodies are completed, on the floor below there is the final assembly and on the ground floor quality assurance and final acceptance. This division has been kept to this day. The construction of the building follows the idea of the production flow and the assembly line is introduced. Meanwhile, the individual areas – such as body construction, saddlery, engine construction and assembly – are spatially separated and well-structured. This creates space to optimize the production flow and it increases the production capacity. So, it is now possible to produce 50 bodies a day and assemble 86 vehicles. In order to realize additional quantities, cooperation with well-known suppliers, such as the coachbuilder Karmann in Osnabrück, has been established. There, the four-cylinder version of the 1969 featured mid-engine sports car is assembled next to the bodies of the 911 and the 914. The six-cylinder sister model is created in Zuffenhausen. The 914 is followed by the four-cylinder transaxle models 924 and 944. Porsche moves their production to Neckarsulm. The 928, which appears in 1977, is in turn manufactured at the headquarters.

As early as the sixties, it is foreseeable that electronic data processing will play an increasing role. The naming of the 911 is – apart from the change of name from 901 to 911 – also due to the fact that Porsche traditionally uses the dealer and service network of Volkswagen. All other 100 number identifications for spare parts organization and logistics are occupied by models of other brands. Accordingly, Porsche decides to use the 900s.

Production and manufacturing process are increasingly merging. An example of this is the body structure of the 911, in which – unlike the 356 – the front fenders are bolted to the car body. Porsche employees are still working manually in the body shop to assemble the large-format sheets, such as the roof and the floor of the car. In addition to the assembly line, assembly slides continue to be used, with which the vehicles in production are pushed by hand to the individual assembly stations. Furthermore, pragmatism still counts at Porsche: for example, to simplify the pressing of rubber bearings in the axle suspension, commercially available skin cream is used.

The skills of the colleagues remain the guarantor of the vehicles' esteemed quality. With innovations such as the use of hot-dip galvanized – and thus stainless – body panels, Porsche set further standards in terms of sustainability in the mid-1970s.

Efficiency and ergonomics

Efficiency and ergonomics with robot assistance

Automation of production facilities through the use of electronics and IT

For large-scale manufacturers, automation will increase until the 1980s. More and more robots are being used in production. But a high level of automation is no guarantee for success. In terms of degree of automation, Porsche has a lot of catching up to do in the late eighties. At the beginning of the nineties, Porsche brings production specialists from Japan into the company to make up for lost steps, which in the meantime brought the brand into economically turbulent times. From this, the Porsche Improvement Process (PVP) is developed, which, in a short time, becomes a benchmark in the Far East. From now on, Porsche stands for exemplary efficiency and outstanding quality. The "lean turnaround" makes Porsche quickly profitable and fit for the future.

In 1985, the expansion of the assembly takes place, in which today the two-door sports cars run off the assembly line. Production now takes place in two-shift operation. In the same year, the number of Porsche employees increased by 1,403 to 7,915. The goal at the time was the jump from 81 to 100 vehicles per day. The following year, a new paint shop is put into operation. Both employee-friendly workplace design and environmental protection play an important role in the planning. The transport of the painted bodies into the assembly takes place fully automatically via a connecting conveyor system, which relieves the busy streets in Zuffenhausen. From now on, cathodic dip painting (CDP) is just as standard, as are coatings with lower solvent content and other environmentally friendly processes. And robots are also being used by Porsche: In the paint shop, they are taking over the job of PVC underbody protection. Just in time for the premiere of the Type 964, the third generation of the 911, the new body shop is put into operation.

15 years later, Porsche produces daily 110 vehicles of the 911 and 40 Boxster series in Zuffenhausen. In the body shop, 105 welding robots are now being used. Nevertheless, craftsmanship expertise remains in demand there as well. The sports car manufacturer describes a production route in which automation helps the people, who still remain the focus. The company not only achieves a worldwide reputation thanks to the quality and performance of its sports cars, but also through efficient production processes, the meticulous interaction between partners, suppliers and logistics as well as production-oriented vehicle development. In Zuffenhausen, Porsche is perfecting its system of line production, in which a string of pearls is used to run different series and models in a colorful sequence over the same belt. Initially, these are the models 928 and 911. Today all variants of the 911 – including its motorsport derivatives – as well as the models Cayman and Boxster of the series 718 run through the same system.

As in 2002 with the Cayenne, the 911 and Boxster a third, in 2009 with the Panamera a fourth, and in 2015 with the Macan even a fifth model series was added, Porsche expands in Leipzig. In the middle of Germany, a modern factory is being built in a convenient location, with short distances, optimal production processes and nature conservation measures. Here is sustainability also very important.

“We call our way into the new production age Porsche Production 4.0. We use digitization as an assistance system. We use the latest technologies to network the digital world with the mechanical world. People continue to be the focus of Porsche. We build vehicles from people for people.”

Albrecht Reimold, Production and Logistics Board Member

Factory of the future

Porsche Production 4.0

Hand in hand – flexible and efficient thanks to intelligently networked production

With the start of the Taycan production, the first electric Porsche, the company takes a big step towards the "factory of the future". In total, the company will invest € 6 billion in electric mobility by 2022. Over 700 million will be used to build the Taycan production in Zuffenhausen. The workforce participates in this future commitment of the brand to the traditional location through a staff pact.

The production in the new factory is named Porsche Production 4.0, and it follows three principles: smart, lean & green. "Smart" stands for flexible, intelligently networked production through the use of new technologies. For example, wide-coverage, radio-based and battery-powered screwdriving tools are used. Thanks to integrated networking through real-time positioning, these work with the right torque every time they are screwed in position. Instead of a rigid production line, Porsche is the first automaker in the world to use driverless transport systems for the assembly of the Taycan. These offer a previously unknown flexibility in the workflow, but also for the architecture, which can be done without complex foundations with double floors, because the flexibly controllable AGVs only require flat surfaces.

"Lean" means the most efficient factory design that minimizes waste and handling. Even the factory planning follows the approach of lean production: for example, digital planning methods were used for the conception of the Taycan production. This allows the individual areas to be digitally imaged in advance and the operation of all systems to be virtually simulated. This is one of the reasons that, after the trade fair premiere of the Mission E Study, the opening of the factory for the first electric Porsche happens only after barely four years. The new factory is built in parallel to a full-capacity production facility at the Porsche headquarters with 250 vehicles of the 718 and 911 series per day.

The new production also sets standards in terms of resource efficiency and sustainability, the third basic principle of Porsche Production 4.0 – "green". For the sports car manufacturer, it is a stated goal from the outset to set standards in terms of environmental friendliness with the brand's first electric sports car. Porsche follows the vision of a "Zero-Impact-Factory", a production without environmental impact. Accordingly, it is self-evident for the brand to also produce the locally emission-free vehicle in a CO_2-neutral manner.

The focus is always on people at Porsche. And for the foreseeable future, highly individual vehicles will be built by people for people. Modern technologies and digital assistance systems support and relieve the colleagues in their daily work. This also includes human-robot cooperations in which employees are supported by robots and ergonomically relieved. In the paint shop and assembly, the topic of ergonomics is also very important, proof being for example the 110-degree rotatable and infinitely height-adjustable vehicle hanger or electronic car accompanying cards that inform employees continuously about equipment details and work steps on screens on the vehicle. An attractive work environment promotes the potential and creativity of the employees and thus also makes a significant contribution to the typical Porsche quality.

Layout principles of Porsche Production 4.0

- AI-based decisions
- Adaptable processes and structures
- Situationally adaptable factory control
- Flexible employee deployment
- Assisted and ergonomic workplaces
- Networked, communicating means of production and products
- Resource-saving processes and technologies
- Problem solutions close to the shopfloor
- Proactive qualification and active regeneration
- Transparent, live and experienceable for customers

connected
versatile
flexible

Porsche Production 4.0 plays a pioneering role in modern production.

Worth knowing

"The pioneering spirit and unconditional will to push the limits of what is technically feasible has always characterized Porsche."

Michael Steiner, Research and Development Board Member

Facts and Figures

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Porsche manufactures CO_2-neutral in Zuffenhausen.

1,800,000 m³

The structurally created volume of the new Taycan factory measures 1,800,000 m³. This corresponds to about 75 percent of the volume of the pyramid of Cheops.

170,000 m²

is the sum of newly created space on each floor in the different buildings. Thus, the area for the production of the Taycan in Zuffenhausen measures half of the Vatican State.

4 km

of road were newly created within the factory.

more than 6,000

relocations must be organized as part of the construction preparations. In total, 21 sub-projects are needed for the construction preparations.

35,000 t

of steel areused to build the new factory. This corresponds to the amount that Porsche needs for 140,000 coupe bodies of the 911 type 991.

more than 6,000,000,000 €

investment by Porsche for electric mobility (until 2022).

4.5 months

between the beginning of the production facility and the first produced vehicle.

1,500

new employees in Zuffenhausen for Taycan and Taycan Cross Turismo.

2,050

construction workers work on the construction sites at peak times.
In total, the team responsible for the construction work consists of 150 planners and site managers, 30 project controllers and 10 project managers from the construction department of Porsche. In total, 130 companies and suppliers are involved.

530

construction containers were erected as part of the construction work, three km of construction fence were erected, and 35 km of construction power cables laid in order to supply the 1,000 linear luminaires, among other things, with electricity.

more than 700,000,000 €

investment for the Taycan factory in Zuffenhausen.

around 1,000,000,000 €

is the investment sum including the new body shop.

less than 48 months

between the trade fair premiere of the Mission E Concept Study and the opening of the Taycan factory.

"Porsche can and should build anything. The product just has to be better than anything comparable."

Ferry Porsche, company founder

/ opening

Newsroom
Latest texts, pictures and further information on the Porsche Taycan Factory Opening can be found at
newsroom.porsche.com

Achim Stejskal
Head of Public Relations & Press (acting)
Tel.: + 49 (0)711 / 911 27096
achim.stejskal@porsche.de

Jörg Walz
Spokesman Production & Logistics, Procurement and Sustainability
Tel.: + 49 (0)711 / 911 22155
joerg.walz@porsche.de

Frank Jung
Head of Historical Archive

Tel.: + 49 (0)711 / 911 25985
frank.jung@porsche.de

Mayk Wienkötter
Spokesman for Electromobility and the Taycan Series
Tel.: + 49 (0)711 / 911 20764
mayk.wienkoetter@porsche.de

Social Media
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FACTORY Taycan OPENING