

FACT SHEET XXL Round 7/8 FORMULA E BERLIN

SCHAEFFLER

June 10/11, 2017



Season highlight

Team ABT Schaeffler Audi Sport's home round in Berlin to feature two races



Innovative

Many details improved:
the ABT Schaeffler FE02

p. **8**



Historic

Electric mobility in
automotive design

p. **20**

Editorial



Jörg Walz
Vice President
Communications and
Marketing Schaeffler
Automotive

The Berlin ePrix is the great highlight for Schaeffler. It's the first event in the 2016/17 Formula E season to feature two races, one each on Saturday and Sunday at the Tempelhof airport, giving our Team ABT Schaeffler Audi Sport two chances for victory. In addition, the seventh of nine Formula E race weekends marks our home round.

Some 400 Schaeffler employees will get to enjoy a live on-site experience of gripping motorsport in an electrifying setting.

Contact

Schaeffler Technologies AG & Co. KG
Communications and Marketing
Schaeffler Automotive
Industriestr. 1-3
91074 Herzogenaurach
presse@schaeffler.com
www.schaeffler.com

Contents

- 2 Schaeffler and the FIA Formula E
- 4 2016/2017 race calendar
- 6 A role model for urban mobility: Berlin
- 8 FIA Formula E technology
- 10 ABT Schaeffler FE02 powertrain
- 12 Tech talk: data analysis
- 14 #ProjectIce
- 15 Team ABT Sportsline
- 16 The drivers: Lucas di Grassi and Daniel Abt
- 18 Electric mobility at Schaeffler
- 20 Electric mobility in automotive engineering
- 22 The Schaeffler Group
- 23 Schaeffler and Formula E facts & figures
- 24 Info about Berlin ePrix

Videos



Racing for a reason



Down to the wire

Electrifying Team ABT Schaeffler Audi Sport

Welcome to the *fu* *ture!*

Electric, in the heart of cities, all over the globe – this is Formula E. Forget everything that you knew about motorsport, and experience the world of the first ever fully-electric international race series

Formula E offers a number of distinct motor racing specialties. The most obvious feature is that, unlike conventional internal combustion engines (as in the DTM) or hybrid drives (as in the WEC), Formula E race cars are one hundred percent electrically-powered. The development of the electric motor as well as the transmission and subsequent software is unrestricted. Schaeffler and the team joined forces to design the entire powertrain, and this successful combination laid the foundation for clinching the vice-championship in the second season. The energy for all teams comes from identical batteries weighing approx. 320 kilograms and positioned in the rear of the car.

A second special feature is that Formula E races are not contested on conventional, per-

manent race tracks, but rather on temporary courses set up right in the heart of major cities. So, rather than the fans having to travel to events, racing is brought straight to the fans. Competing in these unusual locations is possible thanks to the low noise level of the Formula E racing cars and their zero emissions. Even the electricity that is used to charge the batteries is generated at the track using a glycerine-powered Aquafuel generator.

Electrifying around the world

In the motor racing scene, the venues are unique and exotic: Hong Kong, Marrakesh, Buenos Aires, Paris, Berlin and New York are just some of the metropolises where the ePrix are held, with backdrops such as Les Invalides, the skyline of Kowloon or the Statue of Liberty.

The grid line-up is studded with interesting names, including Nelson Piquet Jr, Nico Prost, Nick Heidfeld and, of course, the defending champion Sébastien Buemi.

As the sole German team, ABT Schaeffler Audi Sport again tackles the series with its regular drivers Daniel Abt and reigning vice-champion Lucas di Grassi. The other nine squads include outright factory teams such as Renault, Jaguar and DS Virgin as well as other top international teams from China, the USA and India.

The Formula E format is clear and concise: The practice, qualifying and race are all run on a single day. The race itself takes about 50 minutes – with pilots coming into the pits at around halftime to switch cars. ■

Around the *globe*

On its ten-month world tour covering four continents, the Formula E race calendar features one highlight after the other. Four new metropolises – Hong Kong, Marrakesh, Montreal and New York – are playing host to a round of the fully electric racing series for the first time

1 **Kicking off with a podium**
Hong Kong China

October 9, 2016
Lucas di Grassi made an almost perfect start to the new season with a second place finish – and this from second last on the grid. A tactical masterstroke.

2 **First time in Africa**
Marrakesh Morocco

November 12, 2016
Positions five and six at the African premiere of Formula E after a strong fight-back from Lucas di Grassi and a spotless race from Daniel Abt.

3 **Pole premiere**
Buenos Aires Argentina

February 18, 2017
First pole position for Lucas di Grassi in Formula E – on seeing the checkered flag, he celebrates a third place. Daniel Abt, in seventh, again scores points.

4 **Sensational win**
Mexico City Mexico

April 1, 2017
Grid position 15, last after one lap – and finishing as the winner thanks to a brilliant strategy. Lucas di Grassi makes motorsport history. Following a great battle, Daniel Abt still comes in seventh.

5 **The string of success continues**
Monaco

May 13, 2017
Third consecutive podium finish – in Monaco, Lucas di Grassi celebrates second place in front of sold-out grandstands. His teammate, Daniel Abt, in position seven, completes the good result for ABT Schaeffler Audi Sport in the principality.

6 **Lean diet**
Paris France

May 20, 2017
For the first time this season, both Lucas di Grassi and Daniel Abt scored no points. The drivers' and teams' classifications continue to reflect position two.



9 & 10

City of dreams
New York USA

July 15/16, 2017
This is the first time a FIA automobile race is held in the middle of New York... with not only one but two races – on Saturday and again on Sunday – in the legendary port district of Brooklyn.

Home race Berlin Germany

June 10/11, 2017
Last season, in the German capital, a one-two podium was achieved for the first time. An encore will be welcome – with two opportunities available. The German fans will be seeing a race on both Saturday and Sunday.

7 & 8

Grand Finale Montreal Canada

July 29/30, 2017
Just like in New York, Montreal hosts a double-header at the final weekend of the 2016/2017 season. The multicultural metropolis on the St. Lawrence River, where French is the official language, is crazy about motor racing.



11 & 12

Driver Ranking

P	Driver	Team	Pts
1	Sébastien Buemi (CH)	Renault e.Dams	132
2	Lucas di Grassi (BR)	ABT Schaeffler Audi Sport	89
3	Nicolas Prost (F)	Renault e.Dams	58
4	Nick Heidfeld (D)	Mahindra Racing	47
5	Jean-Éric Vergne (F)	Techeetah	40
6	Felix Rosenqvist (S)	Mahindra Racing	40
7	Sam Bird (GB)	DS Virgin Racing	35
8	Nelson Piquet Jr. (BR)	NextEV NIO	33
9	José María López (RA)	DS Virgin Racing	28
10	Daniel Abt (D)	ABT Schaeffler Audi Sport	26
11	Robin Frijns (NL)	MS Amlin Andretti	16
12	Mitch Evans (NZ)	Panasonic Jaguar Racing	15
13	Oliver Turvey (GB)	NextEV NIO	15
14	Maro Engel (D)	Venturi	12
15	António Félix da Costa (P)	MS Amlin Andretti	10
16	Jérôme D'Ambrosio (B)	Faraday Future Dragon Racing	10
17	Loïc Duval (F)	Faraday Future Dragon Racing	9
18	Esteban Gutiérrez (MEX)	Techeetah	5
19	Adam Carroll (GB)	Panasonic Jaguar Racing	4
20	Tom Dillmann (F)	Venturi	4
21	Stéphane Sarrazin (F)	Venturi	2

Team Ranking

P	Team	Pts
1	Renault e.Dams	190
2	ABT Schaeffler Audi Sport	115
3	Mahindra Racing	87
4	DS Virgin Racing	63
5	NextEV NIO	48
6	Techeetah	45
7	MS Amlin Andretti	26
8	Panasonic Jaguar Racing	19
9	Faraday Future Dragon Racing	19
10	Venturi	18

CES: Schaeffler and Formula E in Vegas
Las Vegas USA

January 7, 2017
A successful premiere of a virtual Formula E race in Las Vegas that received worldwide attention: In the simulator race supported by Schaeffler, the Formula E campaigners were pitted against the ten best fans. Daniel Abt finished in ninth place.

Typically German

Germans are said to be tidy and thorough: a stereotype which, at least, is confirmed when looking at urban mobility in Berlin, the country's capital that has a reputation of being a very lively place

With a population of about 3.5 million, Berlin "only" ranks in position 58 of the world's cities with at least one million inhabitants – but within Germany, the federal capital is the country's major metropolis, followed in second place by the port city of Hamburg with a population of about 1.8 million. In terms of mobility, Berlin is at the republic's forefront in several respects as well.

1.7 million registered vehicles travel on Berlin's public road network covering a total of

5,400 kilometers, with 77 kilometers of federal "autobahns" alone being routed through the city: a heavy burden on humans and nature. The city has taken a constructive approach particularly to addressing the latter issue: by imposing speed limits. In Berlin, in terms of direction of travel, there are 164 kilometers of main traffic arteries where speed at night is limited to 30 km/h for noise protection. On an additional 372 kilometers, the maximum permissible speed is 30 km/h during the day for safety reasons. This means that 17 percent of

the main streets and roads have speed limits of 30 km/h at least some of the time. Transportation Senator Regine Günther would like to introduce additional 30 km/h zones in order to further reduce harmful emissions.

In spite of the large number of passenger cars in the city, Berliners cover four in ten distances on foot or on bicycles. Accordingly, non-motorized ways of getting around town are highly important. Since 2001, 340 new pedestrian crossing installations such as "zebra-marked" crosswalks have been created in Berlin. Cyclists by now are able to use more than 1,000 kilometers of bikeways. These actions have produced a measureable effect, as residents are now running more of their errands on foot than by car in downtown Berlin.

Those preferring to be "chauffeuré" in Berlin use public transportation. Verkehrsverbund Berlin-Brandenburg (VBB) with some 30,000 square kilometers is one of Europe's largest transportation associations in terms of area covered. Regional trains, commuter trains, the subway, streetcars and buses have more than 3,100 stops and a network length of some 1,900 kilometers – which roughly

equates to the distance between Berlin and Moscow.

Prompting transformation

New Mobility Berlin – this is the name of a promising initiative. The project analyzes and supports the roll-out of e-mobility solutions in Berlin's neighborhoods in combination with new types of space utilization concepts and mobility offerings. The objective is to sustainably upgrade residential areas by means of innovative mobility concepts. Residents are to be motivated to deregister their cars and to instead use a mix of car sharing, cargo bicycles, pedelecs and similar types of transportation. Berliners have already had opportunities to familiarize themselves with these alternatives during various weeks dedicated to the promotion of this campaign. ■

Panoramic view The Television Tower on Alexanderplatz on the right, and the Berlin Cathedral on the river Spree in the background on the left

€ 300 M

per year on road construction and on maintenance and energy costs incurred for the city's road network

20

production sites and four research and development centers are operated by Schaeffer in Germany

3

errands per day on average are run by every Berliner in public areas, with about 70 minutes spent in traffic

High-tech for the race track

The ABT Schaeffler FE02 is a purebred racer packed with high-tech. While most of the components, including the battery and the entire aerokit, are identical for all contenders, Schaeffler and ABT have developed the entire powertrain

Tires

18-inch wheels with Michelin control tires (same tread as for production cars)

Brakes

Hydraulic dual-circuit braking system, adjustable brake force distribution

Steering wheel

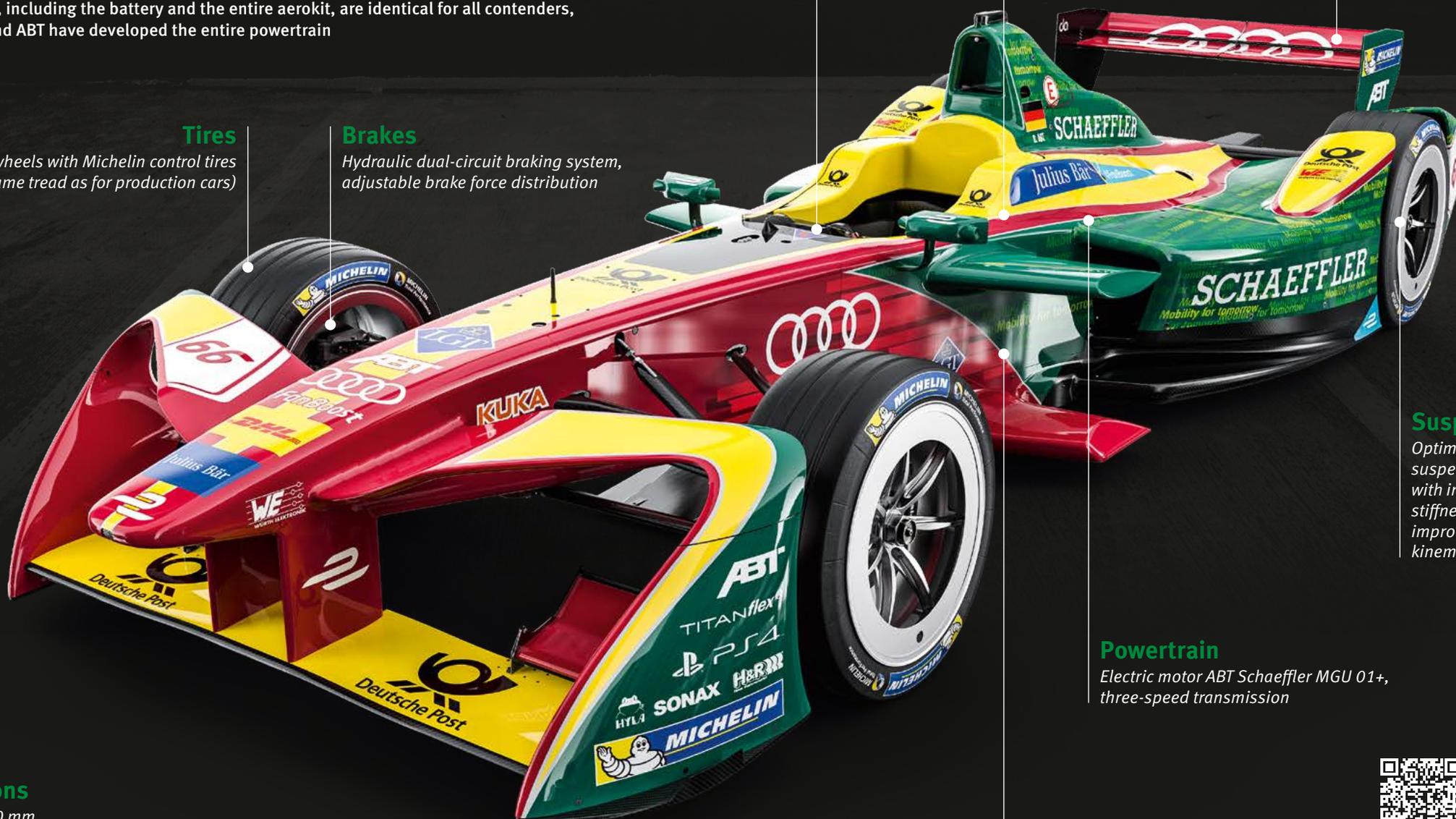
Standardized steering wheel with paddles for shifting and recuperation, controls for various engine settings and a display for all key information

Battery

Developed by Williams Advanced Engineering, charging time: approx. 45 minutes

Aerodynamics

Adjustable front and rear wing



Suspension

Optimized suspension with increased stiffness and improved kinematics

Powertrain

Electric motor ABT Schaeffler MGU 01+, three-speed transmission

Dimensions

Length 5,000 mm
Width 1,800 mm
Height 1,250 mm
Weight min. 880 kg including driver

Power output

Practice and Qualifying 200 kW (270 hp)
Races 170 kW (231 hp) plus FanBoost

Chassis

Specification carbon fiber-aluminum chassis from Dallara



Video
The powertrain of the ABT Schaeffler FE02



Top team performance
ABT Schaeffler Audi Sport
is in contention for victory
in every race

Well *equipped*

The basic concept for the powertrain of the ABT Schaeffler FE02 remains identical to last year. For the 2016/2017 season, the engineers focused on improving many details

ABT Schaeffler Audi Sport heads off on the Formula E tour around the world with a powertrain that has been improved in many aspects. ABT Schaeffler MGU01+ – even the name makes it clear that the powertrain is based on the combination of the electric motor and transmission from the successful season two model; in ten races the two pilots Daniel Abt and Lucas di Grassi scored ten podium positions, three of which were victories.

Improved details

The engineers of the exclusive technology partner, Schaeffler, have focused on further improving the torque and drive efficiency. Moreover, the weight has been further reduced. The transmission features three gears and

3,959

*test kilometers were
covered by the team in
preparation for the season*

has also been further optimized in its efficiency and gearshift times.

“We feel well equipped for the challenges of the third season,” says Prof. Peter Gutzmer, The Chief Technical Officer and Formula E project leader at Schaeffler. “In its first season, our powertrain played an important role in our many successes. So, it quickly became clear that we should not only continue to focus on our proven concept, but also to further develop all aspects of our components. I would like to thank all the engineers who have worked with complete commitment in parallel to our fight for the title, so that we stay competitive and are preferably winning in the future as well.” ■

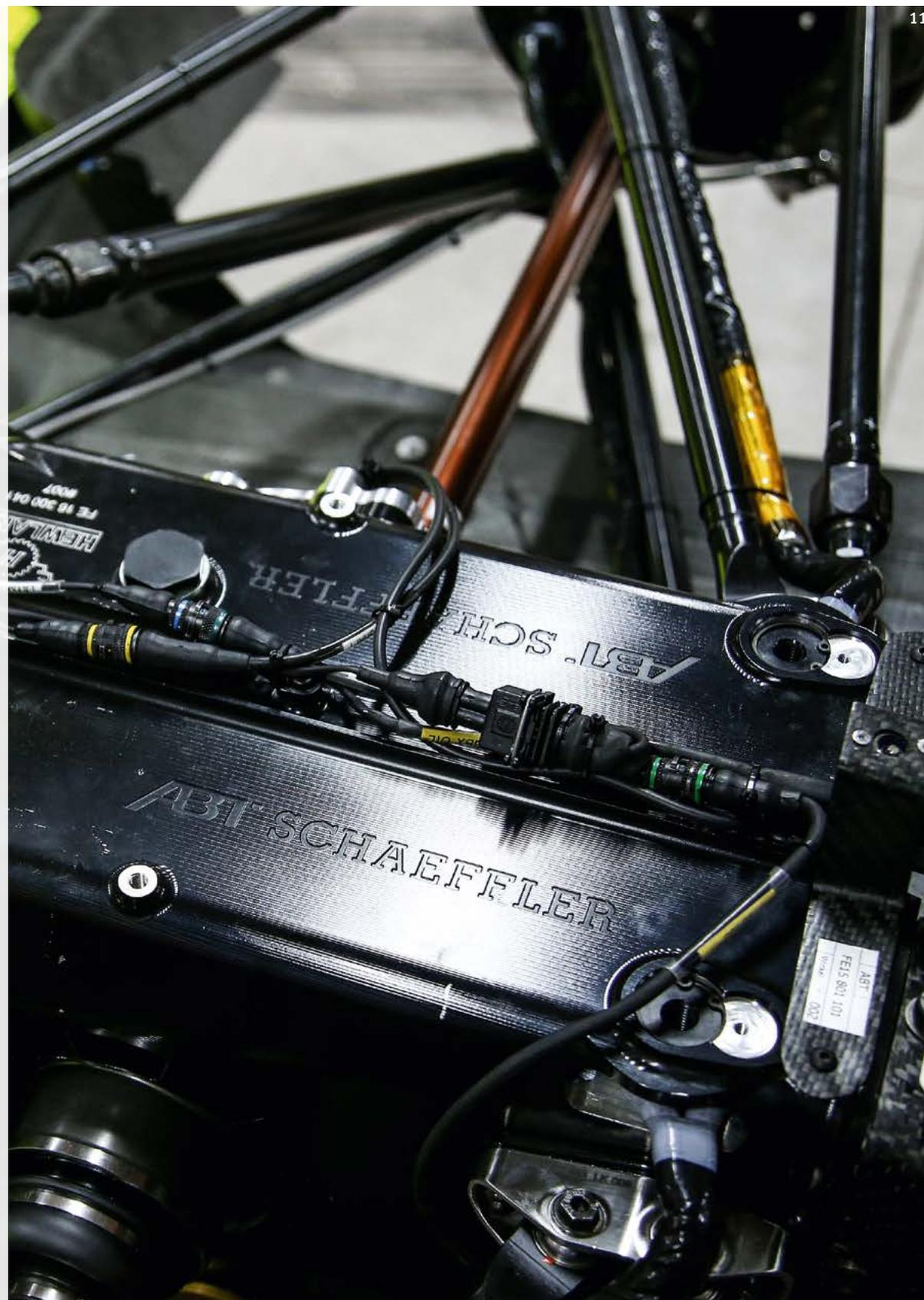


Chart discussion

Success in Formula E requires perfection in every detail. This equally applies to the work in the cockpit as to the data analysis between practice sessions. The objective is to find the crucial hundredths

The curves displayed on the screen at first glance look like stock charts that sometimes rise briskly, rarely stagnate for long, but frequently drop dramatically. Yet when Daniel Abt and Lucas di Grassi look at these charts the



Wire tapping The data from the car is read after each practice session

stakes to them are greater than those relating to mundane matters of money. The lines show the steering angle, brake pressure, speed or the position of the “gas” pedal. Plotted in color on a black background, they indicate where the two campaigners of Team ABT Schaeffler Audi Sport either lose or gain time. They can make the difference between victory and defeat.

40 megabytes in a race

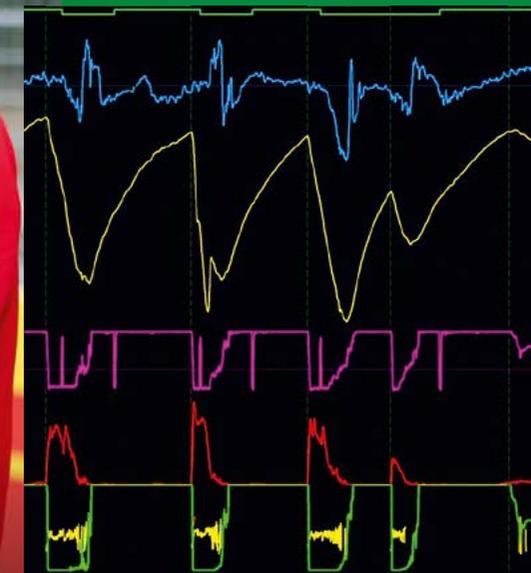
“We glean about 40 megabytes of data from an entire Formula E race,” says system engineer Rui Alves. At that time, though, the data serves only to follow up on the previous and to prepare for the next commitment. “Far more important are the analyses we provide to the drivers between practice sessions,” says Alves. For this purpose, the ABT Schaeffler FE02 is quickly connected to a network cable at each pit stop to download the data. The use of telemetry – in other words radio

transmission – is only permitted for other readings such as battery temperature.

Projecting the charts either on a laptop screen or plotting them in a printout takes about ten minutes. “Even a quick first glance at the data shows if any major issues like severe over- or understeer occurred,” says Alves. In the next step, Daniel and Lucas’s best laps are visually superimposed – this allows the drivers to immediately see where their teammate accelerates earlier, brakes later or drives a different line.

“Particularly due to the short time we have on track in Formula E, taking a look at the data is worth a mint,” says Daniel Abt and Lucas di Grassi confirms: “Sometimes you’re a little lost on a new race track. That’s when a direct comparison and a “best of” from our database often help you return to the racing line quickly.”

This is what the lines mean



The uppermost, green curve shows the respective gear used.

The blue curve shows the steering angle. The greater the upward slope, the more the driver steers to the right, the greater the downward slope, the larger is the steering angle to the left.

The most important curve: It plots the speed. The greater the upward slope, the faster the car is running.

This curve shows the electric motor’s power output. When the curve peaks it reflects maximum output of 200 kW, while the valleys show that energy is being recuperated.

This curve plots brake pressure. When the car is running faster, the driver is able to make heavier use of the brake, as more downforce is being generated and the wheels will not lock as fast. When the driver brakes on entering a turn, brake force decreases.

The green curve shows the position of the “gas” pedal. On the largest part of the track, the driver runs flat-out. When the slope of the curve hits rock bottom the driver is coasting to save energy.

This is where brake force distribution to the two brake circuits is depicted. Either the front or the rear one is subjected to a greater load, depending on the direction of the slope.

Spectacular statement against climate change



Eternal ice?
Formula E made a strong and spectacular statement in Greenland against global warming

In an unparalleled event, Formula E, Schaeffler and Lucas di Grassi have made a strong statement against global warming. In his Formula E car, the Brazilian turned laps on a glacier in Greenland

“Global warming is an issue that affects us all. The electric mobility can and will continue to play an important role against climate change in the future,” says Schaeffler’s CTO, Prof. Peter Gutzmer. “We regard Formula E with its innovations and new ideas as a driving force for mobility of the future and hence we were pleased to support this spectacular event.”

In conjunction with the Greenland government and environmental activists as well as teaming up with other partners such the Monegasque Prince Albert Foundation and the University of Southampton, the event required careful planning so that it could be implemented with the least possible input. Stunning images have attracted huge interest worldwide with around three million visitors on YouTube alone. The images also provided footage for a 48-minute documentary which was premiered on the occasion of the international climate change conference held in Marrakesh at the same time as the ePrix.



Lucas di Grassi
Formula E vice-champion in the ABT Schaeffler Audi Sport team (right) together with Formula E CEO Alejandro Agag



Unknown territory
The Formula E car is lowered onto the glacier

Global warming challenge

“The Greenland region is such a peaceful place. I was shocked to see how the landscape changes through global warming,” says Lucas di Grassi. “This experience gives me a completely new understanding of the challenge we face and what Formula E can contribute.” ■



#ProjectIce

A tradition of innovation



Hall of Fame
Success not only in single-seater racing

ABT Sportsline – the world’s leading tuner of vehicles from the Volkswagen Group and successful motorsport team in the DTM. Together with Schaeffler, the Allgäu-based squad enthusiastically tackles a new motorsport challenge in Formula E

ABT Sportsline is one of the most successful motorsport teams in Germany and Europe. Its history in racing dates back more than 60 years and began with initial victories scored by Johann Abt in the 1950s. The first recorded success took place in a dirt track race, followed by victories and titles in touring car, sports car and formula racing. 2009 has gone down in the company’s history as the most successful year to date: Timo Scheider won the DTM, Christian Abt the ADAC GT Masters in the Audi R8 and youngster Daniel Abt was victorious in the ADAC Formula Masters. Previously, in 2007, Schaeffler and ABT had jointly celebrated success as well: with the logos of LuK, INA and FAG

on his A4, Mattias Ekström won his DTM title number two.

Founded as a smithy in 1896, the ABT company has been continually developing ever since. Just one thing has never changed: the family still runs the company with about 170 employees and partners in 50 countries around the world. CEO Hans-Jürgen Abt now represents the fourth generation at the helm. For ABT Sportsline, the commitment in Formula E also marks a return to the roots, as the team celebrated success in formula racing as far back as in the early 90s – among others, with Ralf Schumacher in the cockpit back then. ■

Moments



1970

Johann Abt († 2003), father of Hans-Jürgen and Christian Abt, becomes European Touring Car Champion



2007

Sporting the logos of the Schaeffler Group, Mattias Ekström becomes DTM champion



2009

Christian Abt, Timo Scheider and Daniel Abt clinch three titles in a single year



2014

ABT and Schaeffler win the first ever Formula E race

A strong team in the *cockpit*

In Lucas di Grassi (32) and Daniel Abt (24) the squad of Hans-Jürgen Abt has its dream team filling the cockpits of the two Formula E race cars. The experienced Brazilian and youngster Daniel Abt are not only fast and technically adept but perfectly harmonize with each other off the race track as well



Lucas di Grassi #11

Highlights

- 2005 **1st** in Macau GP
- 2006 Formula 1 Test
- 2007 **2nd** GP2 series, Formula 1 test driver
- 2008 **3rd** GP2 series, Formula 1 reserve driver
- 2009 **3rd** GP2 series, Formula 1 reserve driver
- 2010 Formula 1
- 2013 **3rd** in Le Mans 24 Hours
- 2014 **2nd** in Le Mans 24 Hours, **4th** WEC
- 2015 **4th** in Le Mans 24 Hours, **3rd** FIA Formula E
- 2016 **3rd** in Le Mans 24 Hours, **2nd** FIA Formula E

Vita

- Date of birth** August 11, 1984
- Place of birth** São Paulo (BR)
- Domicile** Monaco (MC)
- Height** 1.79 m
- Weight** 75 kg

-  lucasdigrassi.com.br
-  [lucasdigrassiofficial](#)
-  [@LucasdiGrassi](#)
-  [lucasdigrassi](#)

Daniel Abt #66

Highlights

- 2007 **2nd** ADAC Kart Championship
- 2008 **8th** ADAC Formula Masters
- 2009 **1st** ADAC Formula Masters
- 2010 **2nd** ATS Formula 3 Cup
- 2011 **4th** FIA Formula 3 International Trophy, **7th** Formula 3 Euro Series
- 2012 **2nd** GP3 series
- 2013 GP2 Series
- 2014 GP2 Series, FIA Formula E
- 2015 **1st** in Le Mans 24 Hours (class), **11th** FIA Formula E
- 2016 **19th** ADAC GT Masters, **7th** FIA Formula E

Vita

- Date of birth** December 3, 1992
- Place of birth** Kempten (D)
- Domicile** Kempten (D)
- Height** 1.79 m
- Weight** 70 kg

-  danielabt.de
-  [abtdaniel](#)
-  [@Daniel_Abt](#)
-  [daniel_abt](#)
-  [AbtDaniel](#)





Race track >>> Road

An electric circuit

Motorsport has always been a driver of developments that subsequently make their way into production vehicles. This now applies to electrified powertrains as well. In the FIA World Endurance Championship (WEC) with Le Mans as its highlight, high-tech hybrid race cars are pitted against each other and in Formula E, all-electric single-seaters are. For Schaeffler, both racing series have become pioneering test beds for future technologies

“The commitments in the WEC and in Formula E have been helping us gain a better understanding of the environment and systems of electric mobility,” explains Prof. Peter Gutzmer, Schaeffler’s Chief Technology Officer. Be it in terms of systems knowledge, the development of new materials, recuperation (recovery of braking energy) or thermal management – these are important findings

which also advance the Schaeffler technology group aside from racing with respect to ideas, visions and technologies for networked mobility for tomorrow. Schaeffler has significantly increased the size of its development team for electric vehicle components and new mobility concepts within a short period of time and is working at full stretch on sustainable mobility solutions. Six examples ...



E-bike

On bicycle expressways, powerful pedelecs – with Schaeffler hardware and software on board – provide a particularly fast and eco-friendly means of transportation for shorter distances. Branded as SCHAEFFLER VELOSOLUTIONS, the company offers an extensive and innovative product range. See also: www.schaeffler-velosolutions.com

Electric car

Schaeffler’s electric axles (pictured) help make traffic noise in inner cities a thing of the past, moving forward with a wide product range from Herzogenaurach. In this context, Schaeffler has developed an innovative modular system for electric axles in various configurations and build levels.



Bio hybrid

The innovative and compact mobility solution for urban areas not only provides weather protection but, featuring four wheels including an electric pedelec drive, high driving stability and ample stowage space. In spring of 2016, Schaeffler unveiled this design and development concept that met with positive response around the globe.

E-board

In addition to its handy dimensions, this ideal means of transportation for short distances in urban areas boasts hydraulic brakes and a range of 25 kilometers. At CES in Las Vegas in January 2017, Schaeffler showcased this prototype. Integrated in the board is a battery that drives the rear axle via an electric motor. The e-board is controlled using a stick with an ergonomically shaped handle.



Robot taxi

Self-driving buses with integrated wheel hub motors (pictured) from Schaeffler could provide a means of demand-based zero-emissions short-range public transportation in the future. All the drive components except for the battery are completely installed in the wheel. They include the electric motor, power electronics, the brake and the cooling system. eWheelDrive makes all-new drive concepts possible.

Hybrid vehicle

Hybrid components will continue to make conventional IC engine based powertrains more efficient. Schaeffler offers solutions across the entire range of electrification potential – from the 48-volt hybrid to the plug-in hybrid for various mounting positions to all-electric axles that assist the IC engine or serve as the sole short-term source of propulsion.





1899 Electrifying beginnings

The car picks up speed. **The first car to exceed 100 kph:** the electric race car "La Jamais Contente" made by Camille Jenatton. That was 1899, the same year that the Baker Motor Vehicle Company began to build electric cars. Fully electric or hybrid drive from Ferdinand Porsche for the Lohner electric vehicle. The same idea with the Mercedes Électrique and Mercedes Mixte. Up to 1939, Detroit Electric models with more than a 100-kilometer driving range. Around the turn of the century there were **more electric cars on the road than combustion ones**. Only with the improvement of performance, range and gas station networks do petrol-powered vehicles take over.

1972 The limits to growth

Electric mobility means drive from a fixed electricity supply – trams, trains, trolley buses. But gasoline-power comes under pressure. The 1972

Club of Rome "limits to growth": Finiteness of resources. **1974 oil crisis.** The industry responds with **rudimentary electric drives:** A BMW 1602 for the 1972 Olympics only has 32 kW (43.5 HP).

In fleet tests, the electric transporters from Mercedes and VW, equipped with the batteries that were still very heavy in those days and with a capacity of approx. 22 kilowatt hours, merely had a range of 60 to 80 kilometers. And the electric models of Opel, Mercedes and VW in a large-scale project on the German island of Rügen are based on existing cars. This is the wrong path.



Fast currents

From the early alternative via public transport and back into the automobile: Electric cars have enjoyed a rapid history spanning more than 100 years and are only now coming of age



1996 Tailored for the future

Two things are needed: 1) A paradigm shift. In 1996, General Motors is the first major manufacturer to offer a car specifically designed for electric drive. Around 1,100 units of the EV1 are produced. Its cw value: 0.19. It reaches 130 kph with a range of around 250 km using 26.4 kWh from a nickel-metal hydride battery. 2) A technological leap, based on **lithium-ion batteries from Sony**. With these batteries, **Tesla joins** the car industry in 2008 with a roadster; 200 kph top speed, 350-kilometer range. In Japan, the Mitsubishi i-MiEV has been rolling off the assembly line since 2009. Today, there are many electric cars, and Schaeffler is a sought-after partner.

1997 Attractive alternatives?

The bridging solution comes from the **hybrid drive** using the combustion engine and electricity. Toyota makes the breakthrough in 1997: **The Prius is a million-seller**. Electric drive is also possible without a battery: hydrogen and oxygen generate electricity in a fuel cell that drives the car. In 2003, a Mercedes A-class F-Cell is the world's first fuel cell passenger car to go into small-scale production. Since 2015, Toyota has produced the hydrogen model, Mirai.



2009 Motorsport

The milestones of electric mobility in racing: In July 2009, the first victory for a McLaren-Mercedes with hybrid drive in Formula 1. In June 2012, the first Audi win with diesel-electric drive at Le Mans. **In September 2014, FIA Formula E is launched as the first race series with electric drive. Schaeffler is one of the pioneers with the ABT Schaeffler Audi Sport team.** June 2015 heralds the first overall victory of Rhys Millen's electric race car against petrol-powered vehicles at Pikes Peak. September 2016: World record for electric drive by Venturi with 549 kph in Bonneville.



Mobility for tomorrow

For Schaeffler, innovation has been part of its corporate DNA since the foundation of the company. It is based on lateral and interdisciplinary thinking

Schaeffler is known as an innovative leader delivering a wealth of technologies that make automobiles more fuel-efficient, environmentally friendly, and safer, as well as products for trains, aircraft, wind turbines, and many other industrial sectors. Schaeffler can be found wherever things are in motion – and motion also means mobility. The challenges facing mobility of the future are immense. That's why Schaeffler is committed to its holistic "mobility for tomorrow" concept, geared to finding sustainable solutions for the world of tomorrow.

Mobility for tomorrow Under this concept, Schaeffler concentrates on four focus areas: environmentally friendly drive systems, urban mobility, interurban mobility and energy chain



Compact info



#11 Lucas di Grassi

- lucasdigrassi.com.br
- lucasdigrassiofficial
- @LucasDiGrassi
- lucasdigrassi



#66 Daniel Abt

- danielabt.de
- abtdaniel
- @Daniel_Abt
- daniel_abt
- AbtDaniel



ABT Schaeffler FE02

- Aerodynamics Front and rear wing adjustable
- Electric motor ABT Schaeffler MGU01+
- Battery Williams Advanced Engineering
- Transmission ABT Schaeffler, 3 speeds
- Brakes Hydraulic dual-circuit braking system, adjustable brake force distribution
- Suspension Optimized suspension with higher stiffness and improved kinematics
- Weight 880 kg, minimum (including the driver)
- Dimensions Length 5,000 mm, width 1,800 mm, height 1,250 mm



The ABT Schaeffler FE02 accelerates from 0 to 100 km/h in

2.9

seconds

200 kW
Power output in qualifying

170 kW
Power output in the race

56 kWh

of energy may be used by a driver per race

=

Two-person household (6 days)

Refrigerator, 150 liters (210 days)

Light bulb, 60W (39 days nonstop)

Television (15 days nonstop)

Dish washing machine (70 wash cycles)

=

20,000
conventional AA batteries provide the same amount of energy

3

The 3 drivers with the most #FanBoost votes get 100 kJ more energy

1
FanBoost for second car

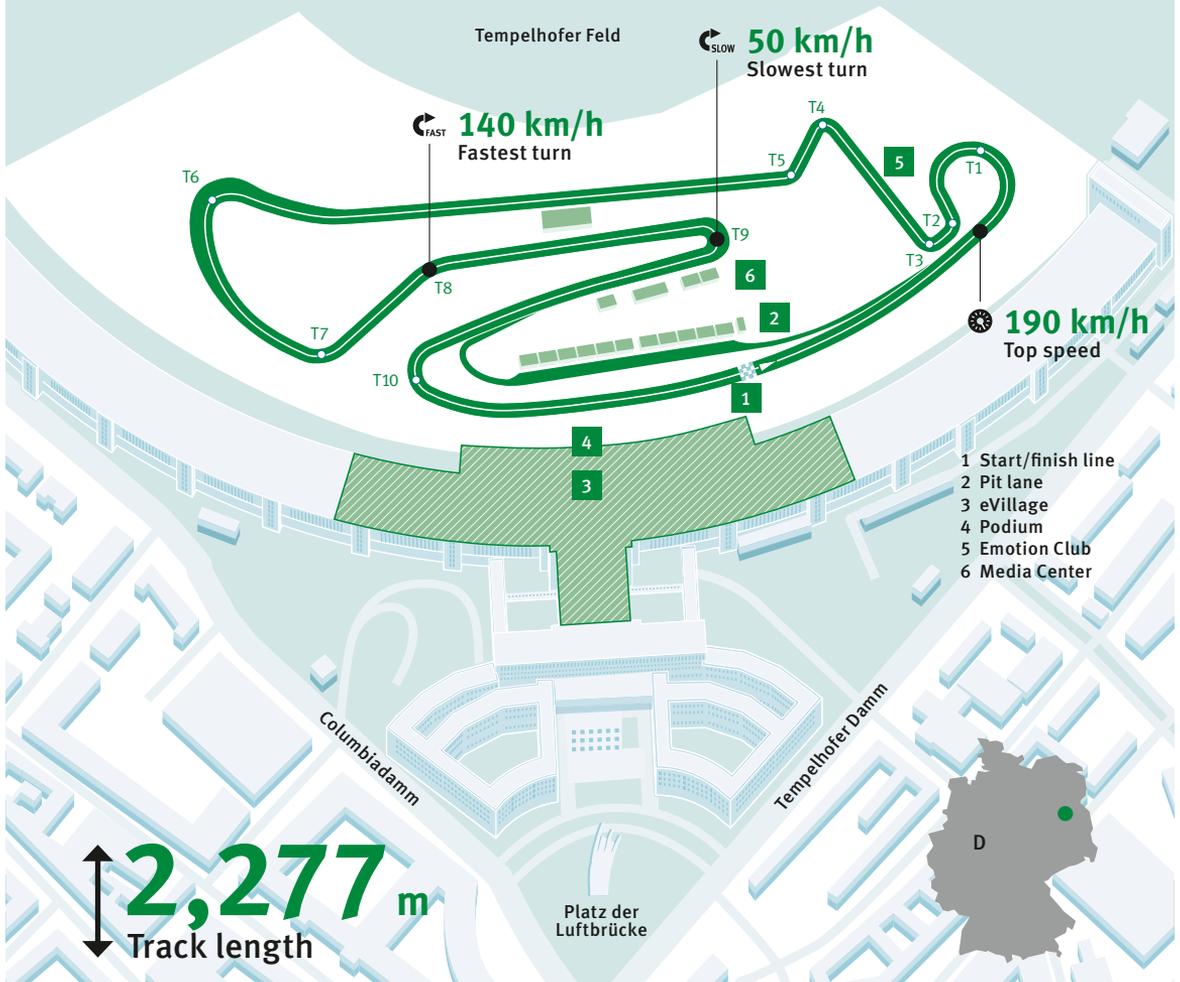
fanboost.fiaformulae.com

Schaeffler facts

- ≈ 87,000 employees worldwide
- 13.3 billion Euro turnover in 2016
- > 2,300 registered patents in 2016
- 25,000 active and pending patents
- 170 locations in 50 countries
- 75 factories worldwide
- 60 Schaeffler components in automobiles worldwide (average)
- 17 R&D centers worldwide

The race track

Berlin 



Schaeffler

-  [schaefflergroup](#)
-  [@schaefflergroup](#)
-  [schaeffler.com](#)
-  [Schaeffler](#)

Team ABT

-  [abtmotorsport](#)
-  [@abt_formula_e](#)
-  [abt-sportsline.de](#)
-  [ABTSportslineTV](#)
-  [abt_fe](#)

Schedule

 Sat (June 10) and Sun (June 11) identical

- 08:00–08:45 Free practice 1
- 10:30–11:00 Free practice 2
- 12:00–12:36 Qualifying (4 groups)
- 12:45–13:00 Super Pole
- 14:00–14:30 Autograf session (eVillage)
- 15:00 Driver parade
- 15:23 Pit lane open
- 16:04 Race (Sat 44 laps, Sun 46 laps)
- 17:05 Podium ceremony
- 17:15–17:30 Press conference (Media Center)



Learn more about
mobility for
tomorrow

Formula E

-  [@FIAformulaE](#)
-  [fiaformulae.com](#)