

# FACT SHEET XXL Round 6 FORMULA E PARIS

May 20, 2017

SCHAEFFLER

## Non-stop to Paris

Just seven days after the round in Monaco, the electric series is going to race around the Dôme des Invalides



FIA  
FORMULA-E  
CHAMPIONSHIP

### 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

*Just seven days after the race in the motorsport mecca Monaco, the battle for the sixth winner's trophy of the season will be held about 700 kilometers further north, in the French capital. We have fond memories of last year's ePrix when Lucas di Grassi triumphed in the race around the world-famous Dôme des*

*Invalides. As the exclusive technology partner of Team ABT Schaeffler Audi Sport, we're pleased to present to you background information about the series, the drivers, the technology and our commitment in this Fact Sheet.*

## Contact

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

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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.

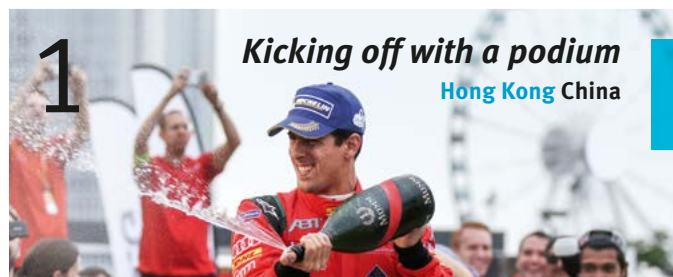
The Formula E format is clear and concise: The practice, qualifying and race are all run on a single day. The race itself takes about 50 minutes – with pilots coming into the pits at around halftime to switch cars. ■



# 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



**4** **Sensational win**  
Mexico City Mexico

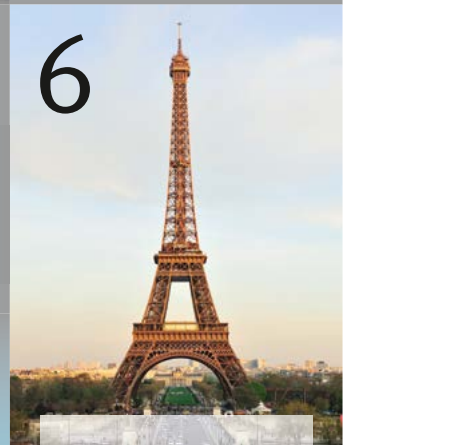


**April 1, 2017**  
Grid position 15, last after one lap – and finishing as the winner thanks to a brilliant strategy. Lucas di Grassi makes motorsport history. Following a great battle, Daniel Abt still comes in seventh.

**5** **The string of success continues**  
Monaco




**6**



**Historic**  
Paris France

**May 20, 2017**  
At just 1.9-kilometers in length, the race track around the historic Les Invalides is very short – ideal for the masses of fans. Lucas di Grassi won last year's race here.



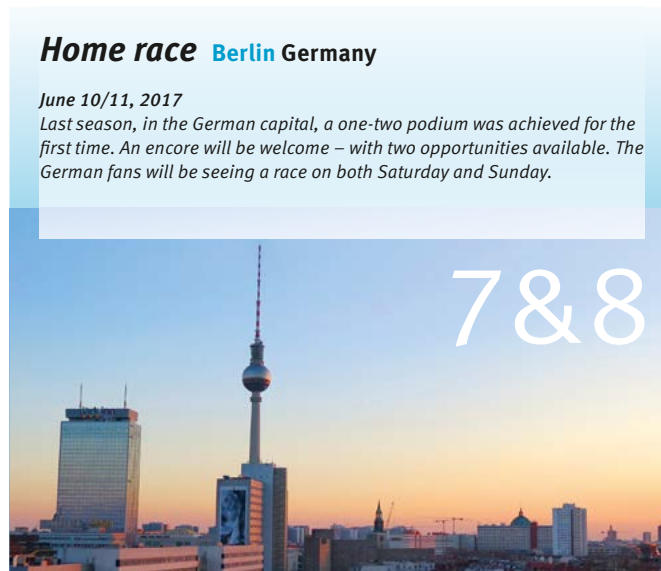
**9 & 10**

**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.




**Driver Ranking**

P	Driver	Team	Pts
1	Sébastien Buemi (CH)	Renault e.Dams	104
2	Lucas di Grassi (BR)	ABT Schaeffler Audi Sport	89
3	Nicolas Prost (F)	Renault e.Dams	48
4	Jean-Éric Vergne (F)	Techeetah	40
5	Sam Bird (GB)	DS Virgin Racing	34
6	Nick Heidfeld (D)	Mahindra Racing	32
7	Felix Rosenqvist (S)	Mahindra Racing	28
8	Nelson Piquet Jr. (BR)	NextEV NIO	27
9	Daniel Abt (D)	ABT Schaeffler Audi Sport	26
10	Oliver Turvey (GB)	NextEV NIO	15
11	Mitch Evans (NZ)	Panasonic Jaguar Racing	13
12	Maro Engel (D)	Venturi	12
13	António Félix da Costa (P)	MS Amlin Andretti	10
14	José María López (RA)	DS Virgin Racing	10
15	Jérôme D'Ambrosio (B)	Faraday Future Dragon Racing	10
16	Loïc Duval (F)	Faraday Future Dragon Racing	9
17	Robin Frijns (NL)	MS Amlin Andretti	8
18	Esteban Gutiérrez (MEX)	Techeetah	5
19	Adam Carroll (GB)	Panasonic Jaguar Racing	4
20	Stéphane Sarrazin (F)	Venturi	1
21	Ma Qing Ha (CN)	Techeetah	0

**Team Ranking**

P	Team	Pts
1	Renault e.Dams	152
2	ABT Schaeffler Audi Sport	115
3	Mahindra Racing	60
4	Techeetah	45
5	DS Virgin Racing	44
6	NextEV NIO	42
7	Faraday Future Dragon Racing	19
8	MS Amlin Andretti	18
9	Panasonic Jaguar Racing	17
10	Venturi	13

**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.



# Comme ci, *comme ça*

Cars in abundance in spite of a first-rate public transportation network – Paris, the capital of France, is a place where mobility's curses and blessings exist side-by-side

To a driver who is unfamiliar with the city, Paris poses a challenge. Obscure routing of streets, traffic jams galore, huge traffic circles and practically no parking places. Plus, there's the continually clogged "Boulevard Périphérique." The 35-kilometer ring road routes traffic around Paris and into the metropolis – and is undersized in spite of its eight lanes (in both directions).

Traffic in Paris not only puts a strain on the nerves of those caught in it but, above all, on the environment. In winter 2016, a huge cloud of smog robbed the "city of love" of its charm. Motorized traffic in Paris and the 22 surrounding communities was restricted for several days. Only vehicles with license plate numbers ending in specified digits were allowed to be used.

Those who'd like to contribute their fair share to environmental protection in Paris use public

transportation. The world-famous Métro is the ideal way to get around. 16 lines carry more than five million people per day back and forth between some 300 stations. Two lines are even operated automatically without a driver. Above ground, the bus network covering the entire urban center is the Métro's counterpart. The open-top hop-on hop-off double-decker buses that can be used to explore Paris are more of a tourist attraction than an effective means of transportation. Street cars provide another alternative.

Paris is a paradise and role model in terms of vehicle sharing as well. A public bike rental system has been in existence since 2007, with stations to be found practically every 300 meters. The same principle applied to automobiles is called "Autolib," which makes 3,000 electric cars available for rent in the Paris metropolitan area. No less a figure than the mayor of Paris

herself has declared war on the automotive madness in her city. Anne Hidalgo would like to create more room for pedestrians and cyclists and intends to achieve this by cutting individual transportation on the two main axes traversing the city from east to west in half.

## A top-tier activist

Environmental pollution is archaic, according to Hidalgo. At the end of last year, she had a 3.3-kilometer section of the street on the right bank of the Seine River closed to traffic. These and other actions have been successful, according to the city administration, which says the number of vehicles traveling in the center has dropped from 43,000 to 36,000. The introduction of an electric tram bus between Gare de Lyon and Pont du Garigliano to the tune of 35 million euros is another one of Hidalgo's forward-thinking projects. ■

La ville de l'amour The Seine in front and the Eiffel Tower in the background – Paris is world-famous for panoramas like this one

# 1–2 M

vehicles per day use Boulevard Périphérique, one of the world's most heavily traveled roads

# 18,000

bicycles at 1,300 stations are available to customers of the Paris bike sharing system "Vélib"

# 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

## Chassis

Specification carbon fiber-aluminum chassis from Dallara

## 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



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

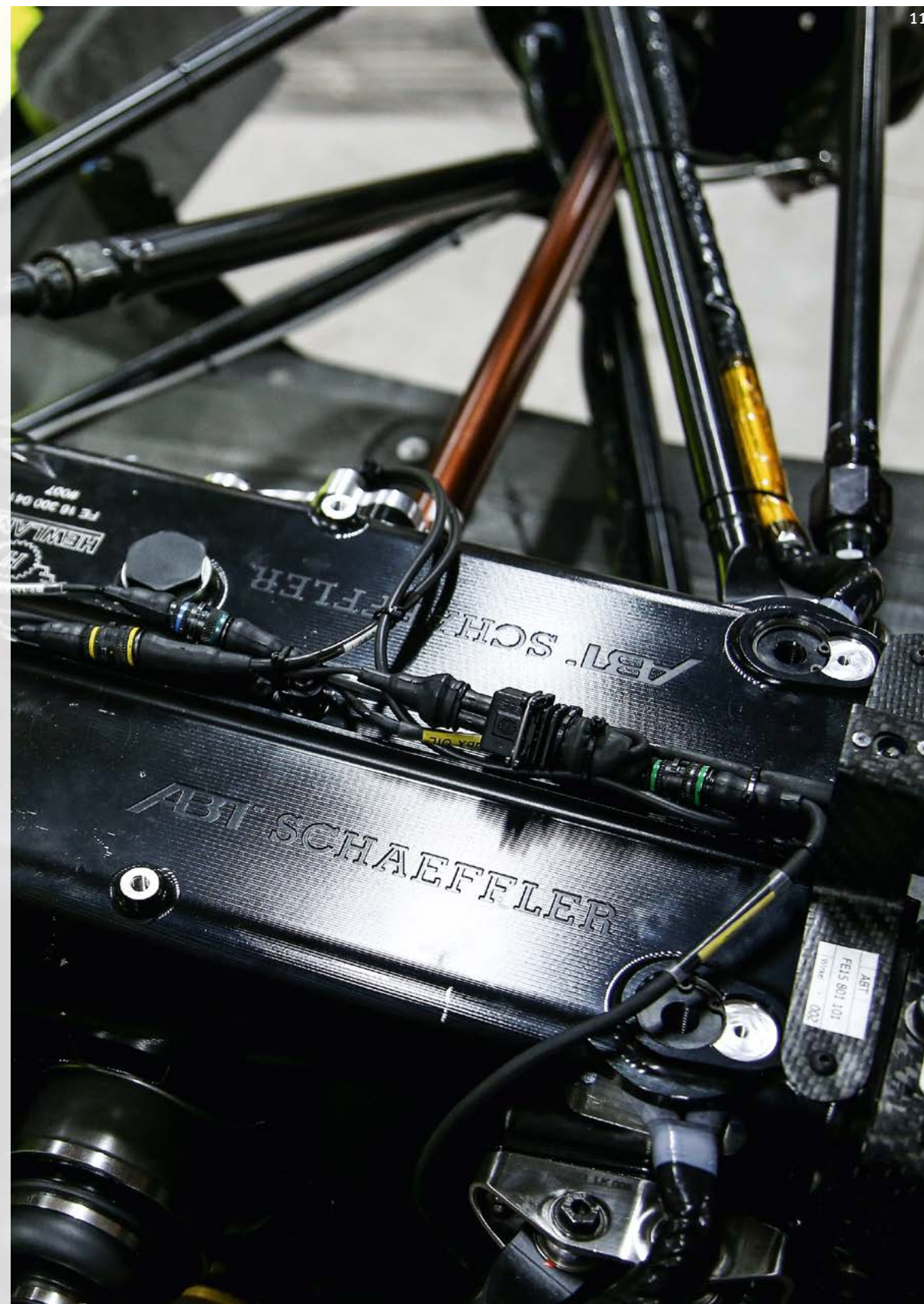
The engineers of the exclusive technology partner, Schaeffler, have focused on further improving the torque and drive efficiency. Moreover, the weight has been further reduced. The transmission features three gears and

# 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.” ■



# Clever energy saver

Speed paired with ingenious efficiency – Lucas di Grassi's victory in Mexico is a perfect example of the fascination exuded by all-electric motorsport. This is how this brilliant feat was achieved – and this is the important part that energy management plays in Formula E.

*Lucas, after your victory in Mexico, you said that this has arguably been the best race in your career. How did you feel being the hunted on so many laps who even had to fear running out of energy in the end?*

Well, this wasn't the first time for me to be in a situation like that – the one at the season opener in Hong Kong was similar. However, thanks to our simulations with the team we were really well prepared for any contingency and had a precise strategy. Plus, I managed to drive very, very efficiently, particularly on the last laps. To some extent, my performance even surpassed the computer's optimum simulation. That really surprised us and – as so often in Formula E – we learned something again. Obviously, the team and I were absolutely euphoric when we held the trophy in our hands.

*Could you explain what possibilities in terms of energy management you have as a driver in a race?*

Driving very efficiently is of paramount importance. In each of my two race cars, I have exactly 28 kilowatt hours of energy available. Assuming that I have to drive 28 laps on this amount before switching cars this means that I can consume exactly one kilowatt hour per lap. So, now I have to get around the circuit on this energy

**In Formula E, efficient energy management is totally crucial**

as fast as possible ... This includes a sensitive approach to driving because you can drive fast and waste energy in the process or drive fast while making efficient use of this energy. My car provides me with various ways to influence this. Every braking event produces energy which can be used to charge the battery – this is called recuperation. When I brake using the foot pedal part of the energy is automatically recuperated, about ten percent of the entire braking energy. This ten percent is very important because I can directly use it again for acceleration on the next long straight. In addition, I have a lever on the steering wheel that I use for braking strictly via the electric motor and for very efficient recuperation. Good energy management is a successful combination of driving style, vehicle setup and race strategy.

*How can you practice and perfectly prepare for this?*

We prepare before the events because in Formula E practice, qualifying and the race all take place on the same day. Computers assist us with the initial basics. And as drivers we then sit in the team's simulator to fine-tune all the details. It may take two or three days or even longer to optimize the suspension and the powertrain setup in terms of energy management for all possible scenarios.

*Are your team and your race engineer of any help to you during the race? After all, you have all the data on your display ...*

They're a big help. During the race, they give me pointers and recommendations precisely for the important items and keep an eye on energy management together with me. This has a major influence on my driving style and the settings I select from the various options on the steering wheel.

*As a race driver, doesn't the fact that you have to use energy as efficiently as possible instead of just driving flat-out bother you?*

No, it doesn't. Even in conventional race cars – whether they're powered by gasoline or diesel – you only have a limited amount of fuel

you can use. This is also the case at Le Mans, for example, where the LMP1 race cars as hybrid vehicles have to efficiently manage a specified amount of electrical energy and fuel energy. And off the race tracks, this applies to personal mobility using road cars as well. We'd like to, and have to, get from A to B as efficiently as possible. In the development of these technologies, Formula E with its regulations and strong focus on energy management is a great help.

*This has clarified a lot, but the question remains of how exactly, in this car, you're able to do something that others drivers don't achieve quite as precisely. What's your secret?*

If there was one, I'd like to keep it to myself ... ■

## Efficient powertrain

The development of the highly efficient powertrain in the ABT Schaeffler FE02 is the result of the cooperation between Schaeffler and ABT. The development objectives were to achieve an electric motor delivering high torque and high efficiency in combination with a transmission enabling short shift times for the three gears considered to be the optimum choice. In addition, the development was focused on lightweight design and lowering the center of gravity to the extent possible and on optimum tuning of the power electronics for the interaction of the motor, the transmission, the mechanical and the electric brake via the electric motor (recuperation). Last but not least, system management – i.e. the software – is the key to success in an electric powertrain. Software adjustments are the only modifications the regulations permit during the season. On page 18, you can read about the ways in which Schaeffler transfers the know-how gained in Formula E from the race track to production.



# 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

 <p><b>1970</b> Johann Abt († 2003), father of Hans-Jürgen and Christian Abt, becomes European Touring Car Champion</p>	 <p><b>2007</b> Sporting the logos of the Schaeffler Group, Mattias Ekström becomes DTM champion</p>	 <p><b>2009</b> Christian Abt, Timo Scheider and Daniel Abt clinch three titles in a single year</p>	 <p><b>2014</b> ABT and Schaeffler win the first ever Formula E race</p>
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# 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](http://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](http://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](http://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

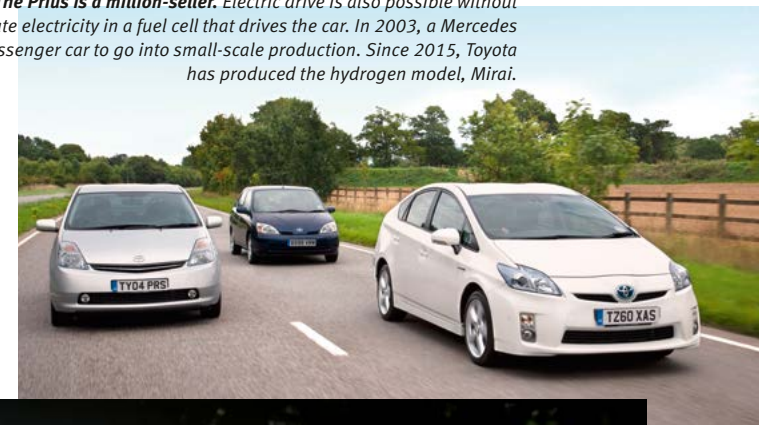


## 1996 Tailored for the future

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



### 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

#66 **Daniel Abt**

- danielabt.de
- abtdaniel
- @Daniel\_Abt
- daniel\_abt
- AbtDaniel

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)

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

**1** FanBoost for second car [fanboost.fiaformulae.com](http://fanboost.fiaformulae.com)

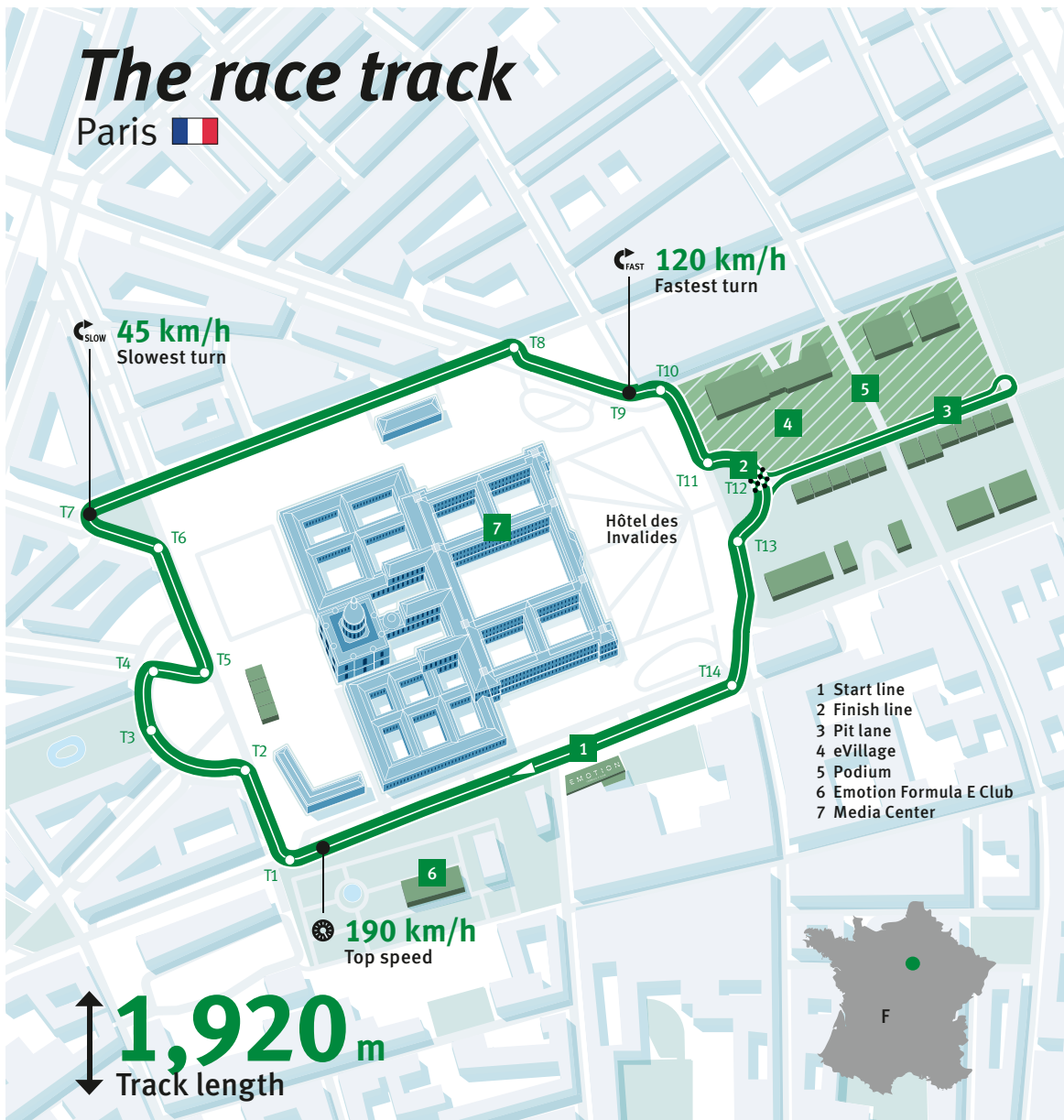
### Schaeffler facts

- ≈ 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




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

# The race track

Paris 








## Schaeffler

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Learn more about  
mobility for  
tomorrow

## Team ABT

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-  [ABTSportslineTV](#)
-  [abt\\_fe](#)

## Formula E

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

## Schedule Saturday, May 20, 2017

- 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 Autograph session (eVillage)
- 15:00 Driver parade
- 15:23 Pit lane open
- 16:04 Race (49 laps)
- 17:05 Podium ceremony
- 17:15–17:30 Press conference (Media Center)