# **SCHAEFFLER**

# FACT SHEET XXL Round 4 FORMULA E MEXICO CITY

April 1, 2017



# **Editorial**



Jörg Walz Vice President Communications and Marketing Schaeffler Automotive

Mexico City – a megacity and perfect showcase for the challenges encountered in shaping "mobility for tomorrow" – is the venue of round four of the season. At the modern Autódromo Hermanos Rodríguez, the whole team is looking forward to witnessing the only race on a permanent circuit this sea-

son. As the exclusive technology partner of Team ABT Schaeffler Audi Sport we are proud to present to you background information about the series, the drivers, the technology and our commitment.

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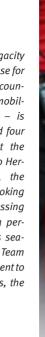
# **Videos**







Down to the wire



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 racetracks, 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.



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



October 9, 2016

Lucas di Grassi made an almost perfect



**Buenos Aires Argentina** 

February 18, 2017 First pole position for Lucas di Grassi lag, he celebrates a third place. Daniel



# Aim high

**Mexico City Mexico** 

April 1, 2017

Mexico City hosts the only race to run on a permanent racetrack, and at an altitude of 2,500 meters, it's the highest venue. Fans witnessed a spectacular debut here last season.



# Back on the calendar

In its very first season, Formula E raced through the streets of the Monegasque Principality. Now, in season three, the electric race cars are making a comeback. The course is a shorter version of the traditional world-famous Grand Prix track.



# Historic

**Paris France** 

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

#### 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.



# 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.



9&10

# **Driver Ranking**

Р	Driver	Team	Pts
1	Sébastien Buemi (CH)	Renault e.Dams	75
2	Lucas di Grassi (BR)	ABT Schaeffler Audi Sport	46
3	Nicolas Prost (F)	Renault e.Dams	36
4	Jean-Éric Vergne (F)	Techeetah	22
5	Felix Rosenqvist (S)	Mahindra Racing	20
6	Sam Bird (GB)	DS Virgin Racing	18
7	Nick Heidfeld (D)	Mahindra Racing	17
8	Daniel Abt (D)	ABT Schaeffler Audi Sport	14
9	Nelson Piquet Jr. (BR)	NextEV NIO	13
10	Oliver Turvey (GB)	NextEV NIO	12
11	António Félix da Costa (P)	MS Amlin Andretti	10
12	Jérôme D'Ambrosio (B)	Faraday Future Dragon Racing	10
13	Loïc Duval (F)	Faraday Future Dragon Racing	9
14	Robin Frijns (NL)	MS Amlin Andretti	8
15	Maro Engel (D)	Venturi	2
16	José María López (RA)	DS Virgin Racing	2
17	Stéphane Sarrazin (F)	Venturi	
18	Adam Carroll (GB)	Panasonic Jaguar Racing	0
19	Mitch Evans (NZ)	Panasonic Jaguar Racing	0
20	Ma Qing Ha (CN)	Techeetah	0

# **Team Ranking**

**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.

Р	leam	Pts
1	Renault e.Dams	111
2	ABT Schaeffler Audi Sport	60
3	Mahindra Racing	37
4	NextEV NIO	25
5	Techeetah	22
6	DS Virgin Racing	20
7	Faraday Future Dragon Racing	19
8	MS Amlin Andretti	18
9	Venturi	3
10	Panasonic Jaguar Racing	0



A picturesque view Behind the skyline of Mexico City towers the mighty Popocatépetl volcano

# Creative minds needed In terms of mobility, there's one thing that prevails in Mexico City - chaos. But there's

orevails in Mexico City – chaos. But there's hope: initial strategies are beginning to alleviate the megacity's major problem

José Castillo once described the urban portrait of Mexico City as huge, looking pretty chaotic and certainly being selfish. The Mexican Harvard professor is a renowned expert in the fields of urban planning and mobility. Together with his team he has developed a system that gathers and analyzes real-time traffic data in Mexico City, for which he received the prestigious Audi Urban Future Award in 2014 that recognizes mobility solutions for cities.

But in the case of Mexico City, a single good idea is not enough. 20 million people live in the metropolitan area and nearly nine million in the core of the city. More than four million passenger cars, 120,000 taxis, 28,000 buses and tens of thousands of trucks travel daily in and around Mexico's capital – these are the facts. And the result: It takes the 300,000 commuters nearly three hours per day to get to work in the business districts, according to the "IBM Commuter Pain Index." This means every one of them spends about a month per year caught in a traffic jam. There are no alternatives to passenger cars available to commuters. As a result of the privatization of the Mexican railroad system, service on all passenger train lines from and to Mexico City was discontinued in 1996.

By contrast, the situation in the center looks better. Local residents and tourists can choose from a variety of options available in a well-developed public transit system: radio taxis, buses or the metro with a total of 195 stations.

## **Unusual approaches**

So, what options are available now to master the great chaos? According to José Castillo, there is no single, all-encompassing solution, as mobility is made up of numerous factors for which equally diverse solutions must be found and coordinated. A very creative project was launched last year. The nearly five kilometer long cable car service "El Mexicable" with its two cableways and 190 cars carries some 3,000 passengers per hour across Ecatepec de Morelos, one of the most populous districts of Mexico City. Whereas other big cities are on a desperate hunt for additional parking space, Mexico City has more than enough. The total of 6.5 million parking places for passenger cars account for 42 percent of the entire developed area. The government now intends to reduce them, particularly at locations where public transit has been well-developed.



Schaeffler has production sites in Mexico. The most recent one in the state of Puebla was inaugurated at the end of 2015

vehicles per 1.000 residents in Mexico City. At the moment, the reaistration rate of new vehicles is twice as high as the birth rate

# High-tech for the Racetrack

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

# 18-inch wheels with Michelin control tires Hydraulic dual-circuit braking system, (same tread as for production cars) adjustable brake force distribution SCHAEFFLER Optimized suspension with increased stiffness and improved kinematics SONAX HERNI MICHELINI **Powertrain** Electric motor ABT Schaeffler MGU 01+, three-speed transmission

# **Length** 5,000 mm Width 1,800 mm Height 1,250 mm

**Power output** Weight min. 880 kg Practice and Qualifying 200 kW (270 hp) including driver Races 170 kW (231 hp) plus FanBoost

# Chassis

Standardized steering wheel with paddles for shifting and recuperation, controls for various engine settings

Developed by Williams

Advanced Engineering, charging time: approx. 45 minutes

and a display for all key information

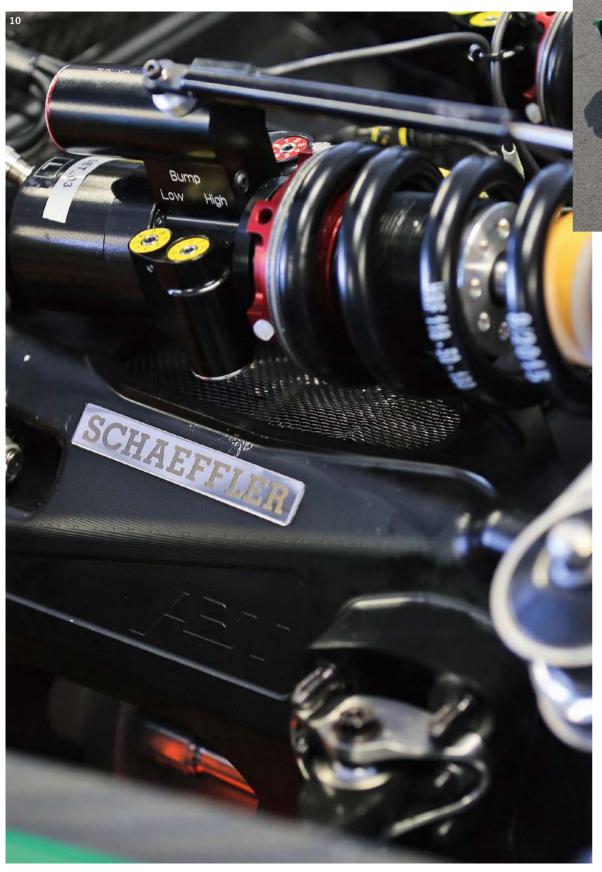
Specification carbon fiberaluminum chassis from Dallara



Adjustable front and

rear wing

Video The powertrain of the ABT Schaeffler FE02





Extensive tests

ABT Schaeffler Audi Sport is perfectly prepared for the 2016/2017 season

# 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 power-train 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 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."

3,959

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

# SCHAEFFLER

# Tech Talk

#### #What's the car's name?

Daniel Abt doesn't take pleasure in christening a race car: "Especially when the names are those of women. My race cars have never had any names." So, the German's two ABT Schaeffler FE02 are simply called by the chassis numbers assigned to them by their manufacturer, Spark: 34 and 52.

#### #Is there a favorite car?

"Absolutely, it's clearly 52," says Daniel Abt, laughing, although he can't really explain the reason for his preference. "It feels like this car handles better and it's easier for me to achieve a fast lap in it – even though I obviously know that, actually, both cars are identical." So it's clear that Chassis 52 is also the car Abt drives in qualifying.

# #How painful is it so see the beloved 52 being damaged in a crash?

Accidents in one of the practice sessions above all mean one thing: extremely hard work for the mechanics. That's why they're the ones Daniel Abt thinks of first. "One of the first thoughts that cross my mind after a crash goes to my guys in the pits," he says. Especially in Formula E there's extremely little time between the sessions, plus temperatures are often extreme – and in spite of this they pull it off again and again."

# #How can a race driver tell that his car is perfectly prepared?

It's not the car itself, but all the stuff going on around it. "When I arrive at the pits I can immediately sense what the story is," says Daniel Abt. If the mechanics and engineers project cool, professional composure, the racing pro knows everything's in top shape. Another good sign: the way the 34 and 52 look. "Even though, of course, it really says nothing: I get good vibrations when the red and the Schaeffler logos shine and sparkle."

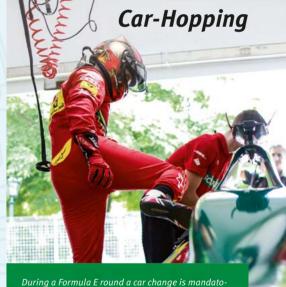
# #How comfortable is the car? Can you get bruised in it?

Very much so! "A single-seater is never comfortable – especially if you're pretty tall like I am," says Daniel Abt. Elbows and knees always take

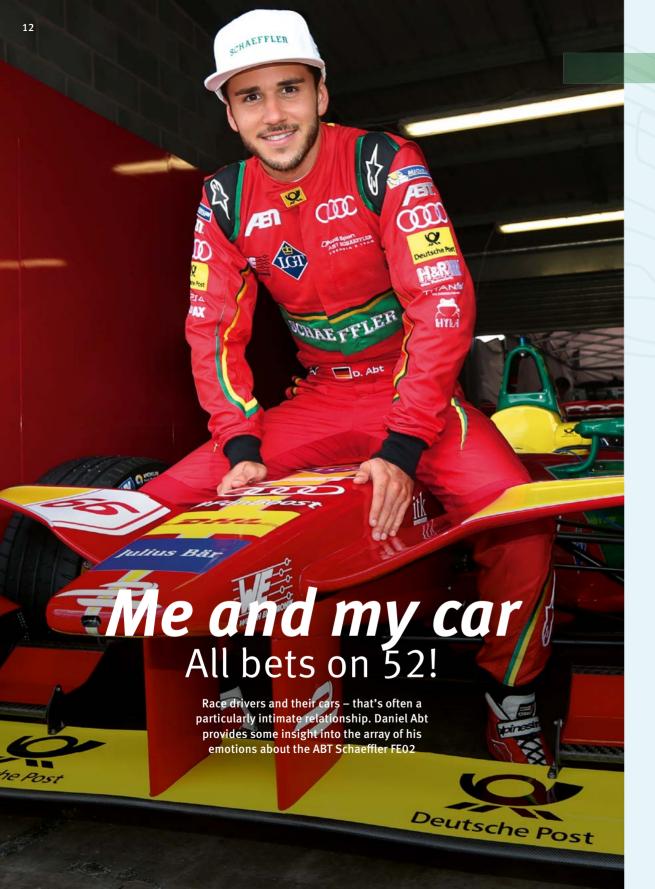
a beating. "The car change in Formula E is particularly challenging. Although during the race and because of all the adrenaline I don't notice it, I'll always find a sore on my leg at night that I got in the heat of the action."

# #Does the relationship between car and driver continue at home?

If it were up to Daniel Abt, it definitely would. "We have a museum in Kempten but, unfortunately, the only one of my cars in it is my Formula Masters winning car." But the youngster wouldn't be happy just looking at the cars anyway: "The coolest thing would be if every car was ready to run and you could drive around the house a little on weekends," dreams Daniel Abt.



ry. The reason is that the capacity of the battery – a little more than 28 kilowatt hours – does not yet suffice for a full race. Timing of the car change is up to the teams but for strategic reasons the pit stop stage is usually within a few laps of the race's midpoint. A minimum time from entering and exiting the pit lane is prescribed to ensure that the drivers are perfectly buckled up. Sensors on the harness will be checking this in the future. The seconds in the pits are show time for two mechanics: They take the steering wheel off and put it back on, adjust the harnesses and buckle the driver up again – all within a few seconds. In the battle for tenths on the track, this may decide the race. Front runners in terms of perfectly timed stops: ABT Schaeffler Audi Sport





"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

held in Marrakesh at the same time as the ePrix.

# 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."



# 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

1999



The **STW Championship** marks the first major title for Christian Abt and the team

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

18

# A strong team in the Cockpit

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 1 1

# **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 F

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)

1.79 m Height Weight 75 kg

lucasdigrassi.com.br

■ lucasdigrassiofficial

**梦** @LucasdiGrassi O 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) 1.79 m

Height Weight 70 kg

danielabt.de

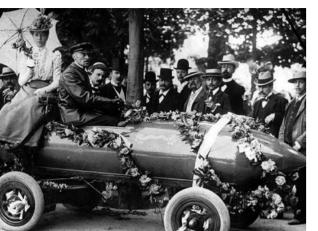
abtdaniel

@ daniel abt

AbtDaniel







# 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 Jenatzy. 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 Eléctrique 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 Electro for the 1972 Olympics puts out just 43.5 hp. In a fleet test, the e-Transporters from Mercedes and VW cover only 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?

Is it possible to have a million electric cars on the road in Germany by 2020? 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.





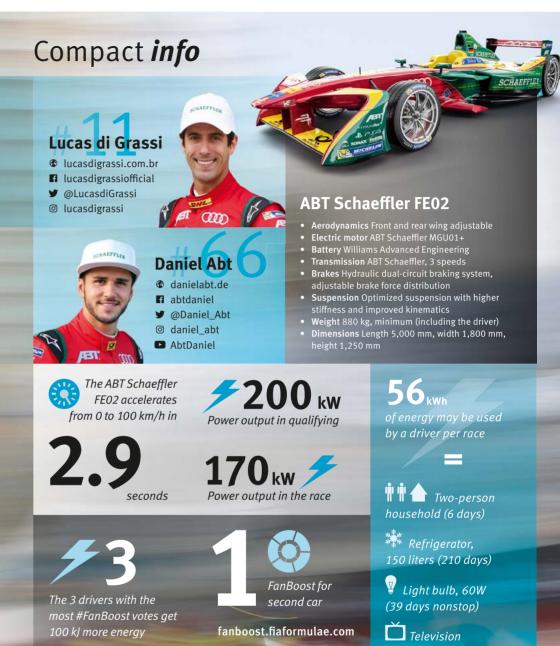


For Schaeffler, innovation has been part of its corporate DNA since the foundation of the company. It is based on lateral and interdisciplinary thinking

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.







# 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				
<b>60</b> Schaeffler components in automobiles worldwide (average)					
17	R&D centers worldwide				

(15 days nonstop)

On Dish washing machine (70 wash cycles)

20,000 batteries provide the same amount of energy

# The Race Track

Autódromo Hermanos Rodríguez 💽 **205** km/h
Top speed C 170 km/h Fastest turn 1 Pit lane T15 T5

12,092 m
Track length



# Schaeffler

- schaefflergroup
- schaeffler.com
- Schaeffler



Learn more about mobility for tomorrow

# **Team ABT**

- **f** abtmotorsport

- ABTSportslineTV

# Formula E

- fiaformulae.com

# Schedule Sat, Apr 1, 2017 (local time, CEST -8)

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

50 km/h \$\cong \text{SLOW} Slowest turn

14:05 – 14:35 Autograph session (eVillage)

15:00 Driver parade 15:23 Pit lane open

16:00 Race (45 laps)

17:05 Podium ceremony 17:15 – 17:30 Press conference (Media Center)