Fact Sheet XXL

SCHAEFFLER

FIA Formula E Mexico City

March 3, 2018

Round 5

#MexicoCityEPrix

Formula E is now holding a race in the Mexican megacity for the third time

This is Formula E +++ Mexico City +++ All races +++ Team +++ Drivers +++ Car +++ Technology +++ The energy chain +++ Electrified powertrain architectures from Schaeffler +++ History: Formula E and e-vehicles +++ Strategy: mobility for tomorrow +++ Facts and figures +++ Race track +++ Schedule +++ Contacts

Editorial

Formula E visits megacities like Mexico City – proving how hot a topic electric mobility has become around the globe. *As pioneers in e-mobility we from Schaeffler, together with Team Audi Sport ABT Schaeffler, have been on board of the innovative electric racing series since day one. In spite of compelling performances in practice, qualifying and the races, we're still lacking a top result this season. That's what we're shooting for this weekend. Please join us for another exciting – and literally electrifying – Formula E event. We've summarized pertinent information, facts and figures for you in this brochure. Enjoy!*

Jörg Walz
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Schaeffler Automotive

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Motorsport of the *future*

With a bold concept that is unique in the world, ABB FIA Formula E Championship has been fascinating fans, drivers and manufacturers

A visionary idea has turned into a hot and booming racing series: Welcome to Formula E. Its success formula? Fully electric racing on spectacular city street circuits in the world's largest metropolises, a tight event schedule – and all this with a commitment to environmental compatibility and sustainability. This concept has been well-received, not only by the fans but also by the participating teams. More and more manufacturers and suppliers regard Formula E as a suitable platform for presenting their brand. Welcome to the future!

Involved from day one

Schaeffler recognized the potential of Formula E at an early stage and has been partnering with Audi Sport ABT Schaeffler since the inaugural season. In the 2017/2018 season, the team is competing with Champion Lucas di Grassi, Daniel Abt and a new race car. The Audi e-tron FE04 is running with powertrain technology "made by Schaeffler."

#MexicoCityEPrix

Mexico City–Herzogenaurach 9,730 km

Mexico City suffers from one of the most chaotic mobility situations in the world. However, creative ideas progressively provide relief

Country and people

With nearly nine million residents (metropolitan area: more than 20 million) Mexico City, alongside New York City, ranks among the most populous megacities in North America. The Mexican capital is located on an elevation of 2,310 meters, surrounded by the Popocatépetl and Iztaccíhuatl twin volcanoes and the Sierra Nevada.

8,900,000
inhabitants

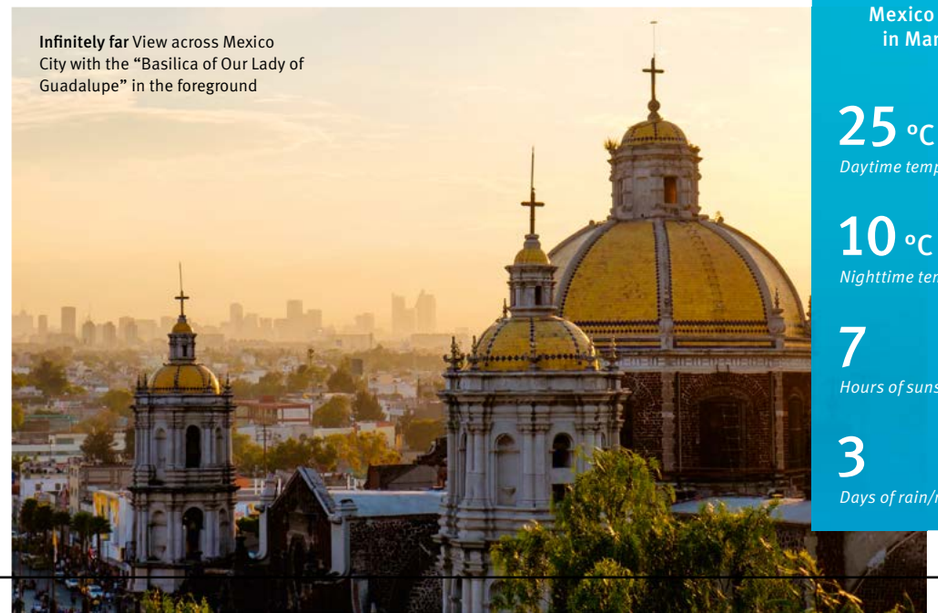
1,485 km² *of area*

More air to breathe

Four million passenger cars, 120,000 taxis, 28,000 buses and tens of thousands of trucks travel in and around Mexico City per day. 300,000 inhabitants commute to work in privately owned passenger cars. As a result, the Mexican capital has always been struggling with high air pollution. In 1992, Mexico City ranked at the top of the list of the most heavily polluted cities. Since then, the situation has slightly improved. The government has invested in sustainable metro buses and bike rental systems and the population has developed an awareness of the ubiquitous issues.

Silent solution

An unusual, albeit highly efficient, mobility alternative is the "El Mexicable" cable car service that was inaugurated in 2016. Two cableways carry a total of 3,000 people per hour across Ecatepec de Morelos, one of the city's most populous districts. Passengers can enter and exit the cars at seven stations along the entire five-kilometer route. Mexico City's residents have been responding favorably to the cable car service providing them with a 19-minute stress-free and eco-friendly ride instead of 50 minutes spent in a traffic jam.



Infinitely far View across Mexico City with the "Basilica of Our Lady of Guadalupe" in the foreground

Mexico City in March

25 °C *Daytime temperature*

10 °C *Nighttime temperature*

7 *Hours of sunshine/day*

3 *Days of rain/month*

Around the *globe*

Africa, Asia, Europe, North and South America – Formula E stops on five continents on its world tour. The calendar has twelve races at ten events in store

5

Goose bump moments

March 3, 2018

Fans experience a unique stadium atmosphere at Autódromo Hermanos Rodríguez.

Drivers' standings

Pos.	Driver	Team	Points
1	Jean-Éric Vergne (F)	Techeetah	71
2	Felix Rosenqvist (S)	Mahindra Racing	66
3	Sam Bird (GB)	DS Virgin Racing	61
4	Sébastien Buemi (CH)	Renault e.dams	37
5	Nelson Piquet jr. (BR)	Panasonic Jaguar Racing	33
6	Edoardo Mortara (CH)	Venturi Formula E Team	24
7	Mitch Evans (NZ)	Panasonic Jaguar Racing	21
8	Nick Heidfeld (D)	Mahindra Racing	21
9	André Lotterer (D)	Techeetah	18
10	**Daniel Abt (D)**	**Audi Sport ABT Schaeffler**	**12**
20	**Lucas di Grassi (BR)**	**Audi Sport ABT Schaeffler**	**0**

Teams' standings

Pos.	Team	Points
1	Techeetah	89
2	Mahindra Racing	87
3	DS Virgin Racing	69
8	**Audi Sport ABT Schaeffler**	**12**

1 & 2

Misfortune at season opener

December 2/3, 2017

After coming fifth on Saturday, Daniel Abt as the winner of race two is excluded due to an administrative error. Lucas di Grassi remains without points.

3

Demonstrated potential

January 13, 2018

Following best times in the free practice sessions and a solid qualifying performance, Team Audi Sport ABT Schaeffler has to settle for only one point.

4

Double disappointment

February 3, 2018

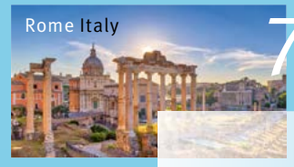
At Formula E's inaugural event in Chile, both campaigners of Team Audi Sport ABT Schaeffler are forced to retire.

6

Welcome back

March 17, 2018

The round at the Uruguayan seaside resort replaces the event in São Paulo. Punta del Este was previously part of the calendar in the first two Formula E seasons.



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Back then …

April 14, 2018

2,500 years after chariot races à la Ben Hur were held there in antiquity, Formula E makes its debut.

8

Mobility in transformation

April 28, 2018

In 2015, the UN countries reached an accord here on improving environmental protection. With a wealth of ideas, Paris attempts to counteract daily gridlock.

9

Schaeffler's home round

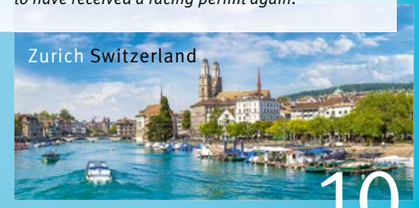
May 19, 2018

The race track, the former Tempelhof airport, is only about ten kilometers away from the government district in Berlin.

Premiere

June 10, 2018

Circuit races have been prohibited in Switzerland for more than 60 years – as a result of the 1955 tragedy at Le Mans. Formula E is the first series to have received a racing permit again.



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11 & 12

Big Apple

July 14/15, 2018

Formula E was the first ever single-seater series to bring motorsport directly into the heart of New York City. Last season, Lucas di Grassi started his comeback drive toward the title win in the U.S. metropolis.

Teamwork

Technology partner Schaeffler, manufacturer and entrant Audi, fielding team ABT, drivers Lucas di Grassi and Daniel Abt and two Audi e-tron FE04 race cars – these are the protagonists making up Team Audi Sport ABT Schaeffler

Titles and victories
Schaeffler has celebrated triumphs in series such as: Formula E, WEC, 24 H Le Mans, DTM, 24 H Nürburgring, Dakar Rally and endurance rallies

SCHAEFFLER

Innovative technology group +++ Motorsport as a platform for technology transfer between road and race track +++ Commitments in diverse racing series +++ Contributes know-how as an electric mobility pioneer to Formula E +++ Developed powertrain for Audi e-tron FE04

Formula E
1 x drivers' champion
DTM
5 x drivers' champion
4 x teams' champion
ADAC GT Masters
1 x drivers' champion
1 x teams' champion

Founded in 1896 as a smithy +++ Allgäu-based family business +++ Leading tuner for automobiles from the Volkswagen Group +++ Firmly established in motorsport since the 1990s +++ Formula E racing team since season one +++ Daniel Abt is CEO Hans-Jürgen Abt's son

Active in motorsport with factory-backed commitments since the 1980s +++ Successes in rally, sports car and touring car racing +++ In Formula E, initially gave its name to the team +++ In 2016/2017, partnership with Schaeffler and ABT intensified +++ Manufacturer and entrant from 2017/2018 season on

Formula E
1 x drivers' champion
WEC
2 x drivers' world champion
2 x manufacturers' world champion
13 x 24H Le Mans winner
DTM/Super Touring Cars
10 x drivers' champion (DTM)
4 x manufacturers' champion (DTM)
12 x drivers' champion (STW)
8 x manufacturers' champion (STW)
Rally
2 x drivers' world champion
2 x manufacturers' world champion

#66 Daniel Abt

Date of birth *December 3, 1992*
Place of birth *Kempten (D)*
Residence *Kempten (D)*
Height *1.79 m*
Weight *72 kg*

2009	1st ADAC Formel Masters
2012	2nd GP3 Series
2015	1st 24 Hours of Le Mans (in class)
2016	7th Formula E
2017	8th Formula E

Good luck Daniel Abt (left) and Georg F. W. Schaeffler, Supervisory Board Chairman

The car's transformation into the new Audi e-tron FE04

#1 Lucas di Grassi

Date of birth *August 11, 1984*
Place of birth *São Paulo (BR)*
Residence *Monaco (MC)*
Height *1.80 m*
Weight *75 kg*

Champion

2007	2nd GP2 Series, Formula 1 test driver
2014	2nd 24 Hours of Le Mans, 4th WEC
2015	3rd Formula E
2016	2nd Formula E
2017	1st Formula E

Audi e-tron FE04

5,000 mm ***Length***
1,790 mm ***Width***
1,070 mm ***Height***

880 kg
weight *including driver*

200 kW
output *in qualifying*

180 kW NEW
output *in race (2016/2017: 170 kW)*

Powertrain NEW
Motor generator unit (MGU), 1-speed transmission

Bodywork
Specification spark-carbon body, specification front and rear wings

Battery
Available amount of energy: 28 kWh. Charging time: approx. 45 min.

Steering wheel
With shifting and recuperation paddles

Electrifying

Formula E proves that racing also works without the sound of engines and the smell of gasoline. A technology overview

The sound on the race track is a new one, and it's a sound of silence. Yet anyone who's ever been to a Formula E race knows that the human senses are stimulated – electrified – in every respect nonetheless. The high-tech race cars are on a par with their counterparts powered by IC engines and deliver highly thrilling motorsport where, in addition to pure speed, management of the energy from the battery with maximum efficiency plays a key role.

In terms of technological development, Formula E follows a technical roadmap. It includes specifications for teams and manufacturers designed to prevent a technological arms race. In the 2014/2015 inaugural season, identical electric race cars were used. Since season two, the teams have been able to develop the powertrain themselves. To the ABT Schaeffler FE01 and the FE02 – the race cars fielded in the 2015/2016 and 2016/2017 seasons – Schaeffler contributed its know-how as a pioneer in electric mobility and as the team's official technology partner. In the new Audi e-tron FE04, technology "made by Schaeffler" operates as well. Schaeffler engineers together with Audi again developed the combination of the motor and transmission including the control electronics.

"Motorsport is emotion – and emotion is what we need in electric mobility as well"

Prof. Peter Gutzmer,
Deputy CEO and Chief Technology Officer
of Schaeffler AG

1 *The new high-efficiency transmission of the Audi e-tron FE04 has one forward speed*

Result of a joint project The motor-generator-unit designed by Schaeffler and Audi

The spectacle intensifies

In the coming years, the technical roadmap provides for adjustments to make Formula E even more attractive. For the 2018/2019 season, for instance, the amount of energy available from the lithium-ion battery will increase from the current 28 to 54 kilowatt hours so that the vehicles will be able to cover a full race distance, eliminating the currently customary car change. The maximum power output will be raised from 200 to 250 kilowatts.

Interview

On the hunt for hundredths
Dr. Simon Opel (34) is Director Special Projects Motorsports at Schaeffler

3 *questions for ...*

... Dr. Simon Opel

What thoughts come to your mind when looking back on three seasons that have culminated in the Formula E Champion's crown?
That it was a very exciting period, from the very first second when we created the concept for the powertrain together with ABT. It was a continuous learning process of how to find the best compromise between performance and energy efficiency.

What is the technical and emotional motivation for season four?
As engineers, we're always striving to come up with the best possible technical solution. However, in terms of time and money, that's not always feasible. However, in collaboration with Audi and their resources, we've significantly enhanced our powertrain yet again. In Formula E, details and hundredths matter with respect to the components and the setup. Plus, our motivation is obviously unbroken, with victories and titles continuing to be the name of the game ...

As a Schaeffler engineer, what is your assessment of the electric mobility megatrend?
For me, electric mobility is a technology that has to be communicated to people via emotions. This is the only way to show that electric mobility can be fun as well. Motorsport and Formula E are perfectly suited for this. And as engineers, we learn a lot from developments for Formula E. Still, I don't believe that electric mobility is the cure-all for everyone. The various questions about mobility require answers that best meet the respective need, in other words: what type of powertrain is truly suitable for what purpose?

Schaeffler know-how for *energy chain and powertrain architectures*

Sustainable mobility begins with renewable production of primary energy and includes the entire energy chain, culminating in diverse and smart solutions for locomotion. Schaeffler develops innovative solutions for a wide variety of powertrains

1 Hybrid module
2 Wheel hub drive in the People Mover
3 E-Axle
4 Bio-Hybrid
5 E-Board

Energy production

Sustainable mobility can only be successfully achieved if the primary energy for locomotion is produced from renewable sources as well, for instance by wind and hydropower, solar or geothermal energy. ***Schaeffler develops powerful components*** *for wind farms and hydropower stations and supports their operators with services such as remote diagnosis. Together with its partners, Schaeffler also conducts research into new approaches to developing renewable sources, for instance with wave and tidal power stations for predictable supply of economically produced electricity.*

Energy storage and conversion

Before electrical energy can drive a wheel it has to be placed into intermediate storage. There are various possibilities to do so, starting with the ***charging current for batteries.*** *In the field of* ***hydrogen/fuel cells,*** *Schaeffler engineers are conducting research into surface coatings for efficiency improvements. In addition, renewable electricity can be used to produce* ***synthetic fuels*** *for internal combustion engines which, under specific circumstances, can be near-CO_2 neutral across the entire energy chain.*

Energy utilization

Also with respect to utilizing energy for the powertrain, there are diverse solutions for which Schaeffler develops a wide range of special technologies. In addition to ***optimizing the internal combustion engine*** *and mated transmission, Schaeffler engineers are working on solutions for the* ***electrification of the powertrain,*** *optimal interaction of the IC engine and the electric motor for* ***hybrid vehicles*** *and tailor-made* ***electric powertrains (battery-electric and fuel cell systems).***

Electrified powertrain architectures

Fully electric and hybrid electric vehicles will be playing an important part in mobility of the future. From ***high-voltage hybrid modules to electric axles through to visionary wheel-hub drive systems,*** *Schaeffler offers an extensive and innovative product portfolio. Also in focus of the globally active technology group are solutions for the "last mile." They include the* ***Bio-Hybrid*** *that shows an all-new approach to urban micro-mobility and E-Boards that can be stowed and carried along without requiring a lot of space.*

The *success* story

Involved from day one and now the reigning champion – a brief look at Schaeffler's first three seasons in Formula E

2014/2015

Cooperation signed and sealed

*At the time of Formula E's debut, Schaeffler and ABT Sportsline with drivers Lucas di Grassi and Daniel Abt are **the only German team.** The season starts sensationally: Di Grassi wins the inaugural race in Beijing. After five additional podiums, the Brazilian finishes third overall, Abt eleventh overall.*

2015/2016

Schaeffler inside

*Schaeffler contributes the **know-how for the powertrain** of the race car, the ABT Schaeffler FE01. In terms of racing, Team ABT Schaeffler Audi Sport continues to run on the highest level. Following three wins, Lucas di Grassi finishes the season in position two overall with a deficit of only two points. Daniel Abt, on finishing runner-up in front of his home crowd in Berlin, achieves his best result to date and ends the season in seventh place overall.*

More than a century of electric vehicles

1899 La Jamais Contente

Electric vehicles dominate the early days

*There are more e-cars on the road than cars with IC engines and Porsche manufactures e-powertrains for Lohner. First car traveling **at more than 100 km/h: "La Jamais Contente"**.*

1972 Mercedes-Benz E-Transporter

Club of Rome: "The Limits to Growth"

*IC engines come under pressure, plus an oil crisis emerges. Industry responds with **premature e-powertrains.** Batteries are too heavy and deliver insufficient range.*

1996 General Motors EV1

Range: 250 km; 0.19 cd

*The EV1 is a purpose-designed electric vehicle. The next quantum leap: Sony invents the lithium-ion battery with which **Tesla** stirs up the auto industry in 2008.*

1997 Toyota Prius

Hybrid with electric motor and IC engine

*Prius becomes **a million-seller.** E-drive works with hydrogen and oxygen even without a traction battery: Mercedes in 2003 showcases the world's first fuel cell passenger car.*

2014 FIA Formula E

Motorsport with e-drive

*July 2009: McLaren-Mercedes wins with hybrid drive for the first time in Formula 1. In September 2014, Formula E debuts – **as the first electrically powered racing series.***

2016/2017

Champion!

*Formula E has long become established as **a staple in motorsport.** At the top of the standings, a well-known duel begins to unfold. Halfway through the season, Sébastien Buemi seems to be the sure champion. Then Lucas di Grassi embarks on a comeback drive which he crowns with the title win at the finale in Montreal.*

Mobility for *tomorrow*

For Schaeffler, innovation has been part of its corporate DNA ever since the company was founded. Lateral and interdisciplinary thinking is part of the program

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

"Progressive climate change, increasing urbanization and globalization, as well as digitalization will have a substantial impact on our lives and work. This particularly applies to the field of mobility"

Klaus Rosenfeld,
Chief Executive Officer Schaeffler


Energy chain


Eco-friendly powertrain technologies


Urban mobility


Interurban mobility

Compact *info*

Lucas di Grassi

#1

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Daniel Abt

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- AbtDaniel

Audi e-tron FE04

Aerodynamics
Adjustable front and rear wings

Electric motor
Audi Schaeffler MGU02

Battery
Lithium-ion battery from Williams
(34 kWh, 28 kWh of which is usable)

Transmission
High-efficiency 1-speed racing transmission

Brakes
Hydraulic dual-circuit braking system, adjustable brake force distribution, plus braking effect due to recuperation via e-drive

Suspension
Independent front and rear

Weight
880 kg minimum (including driver)

Dimensions
Length 5,000 mm, width 1,790 mm, height 1,070 mm

*The **Audi e-tron FE04** accelerates from 0 to 100 km/h in*

3.5 *seconds*

200 kW *output in **qualifying***

180 kW *output in **race***

3 *drivers with the largest number of #FanBoost votes have **100 kJ more energy***

1 *#FanBoost in **second car***

FAN BOOST

fanboost.fiaformulae.com

Schaeffler facts

89,400 *employees worldwide*

13.3 bn *euros of sales in 2016*

> 2,300 *patent applications filed in 2016*

25,000 *active patents and patent applications*

170 *locations in 50 countries*

75 *plants worldwide*

60 *Schaeffler components in automobiles worldwide (average)*

17 *research and development centers worldwide*

Schaeffler in Formula E

1 *drivers' title*

37 *races*

4 *fastest race laps*

4 *pole positions*

6 *victories*

33 *#FanBoost*

24 *podium positions*

The *race track*

Autódromo Hermanos Rodríguez

2,093 m
Track length

1 Finish
2 Start
3 Pit lange
4 Media Center
5 E-Village

March 3, 2018 (local time)

08:00 – 08:45	Free practice 1	15:00	Driver parade
10:30 – 11:00	Free practice 2	15:23	Pit lane open
12:00 – 12:36	Qualifying (4 groups)	16:04	Race (47 laps)
		17:05	Podium
12:45 – 13:00	Super Pole	17:25 – 17:40	Press conference (Media Center)
14:00 – 14:30	Autograph session (E-Village)		

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