



BMW MOTORSPORT MEDIA GUIDE.

THE BMW iFE.21 AND BMW i ANDRETTI MOTORSPORT.
SEASON 7, ABB FIA FORMULA E WORLD CHAMPIONSHIP.



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INTRODUCTION.



BMW i Andretti Motorsport is set to contest its third season as a works team in the ABB FIA Formula E World Championship, which has achieved official FIA World Championship status for the first time ahead of its seventh season. In its maiden season, with a win, two pole positions and several podiums, the team showed that it's able to bring home top results in Formula E. Three more wins followed in Season 6, Alexander Sims' triumph at the second race of the season in Diriyah being followed by successes for Maximilian Günther in Santiago de Chile and on home soil in Berlin. His victory in Chile made Günther the youngest race winner in the history of Formula E.

For the seventh Formula E season, which starts at the end of February, BMW i Andretti Motorsport will be competing with BMW iFE.21s. Their core is the BMW i drivetrain Racing eDrive03, which is a result of unprecedented close collaboration between production and motorsport engineers. The technology transfer between

motorsport and production development is more intensive in the Formula E project than ever before in the history of BMW.

Maximilian Günther will once again be appearing in the #28 car. Jake Dennis will take over the cockpit of the #27 car as he celebrates his Formula E debut at the first races in Diriyah. The team and both drivers have enjoyed a successful preparation period ahead of the season. During the test drives at the end of 2020 at Valencia, both BMW iFE.21s completed more than 500 laps and Günther recorded the best time of the week.

Season 7 will be the last one to feature BMW Motorsport competing with a works team in the ABB FIA Formula E World Championship. As a partner from the word go, BMW has consistently supported the Formula E project and been instrumental in the series' success story. From Season 5, BMW has enjoyed victories and podiums with the BMW i Andretti Motorsport team. BMW Group has always used Formula E

as a tech lab for production. When it comes to the development of e-drivetrains, the opportunities for this form of technology transfer in the competitive environment of Formula E have essentially been exhausted.

Furthermore, the strategic focus of BMW Group is shifting within the field of e-mobility. In the future, greater emphasis will be placed on the comprehensive scaling of the offering and global production. BMW Group plans to have put one million electric vehicles on the roads by the end of 2021. The goal is to increase this figure to seven million by 2030, of which two-thirds will be fully-electric.

As has been the case since the first Formula E race in 2014, BMW i will once again provide the complete fleet of safety cars for Formula E as the 'Official Vehicle Partner' for Season 7.



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FORMULA E: WHAT WE LEARNED.

For BMW i and BMW Motorsport, the driving force has always been the development of innovative technologies in the field of electromobility, with relevance to series production. The same experts who are developing production drives for BMW i models also worked on the drivetrain for the Formula E car, sometimes in the same production facilities. That's how the Formula E drive benefitted from the experience of production engineers during its development. A development cycle hitherto unprecedented in the BMW Group saw knowledge gained from Formula E flow directly back into the development of new BMW i series drivetrains. Motor racing makes it possible to test new materials, technologies

and working methods under extreme conditions without having to take limiting factors into consideration. In the seventh year of the partnership with Formula E and the third year racing with the BMW i Andretti Motorsport team, BMW Group has essentially exhausted the opportunities for this form of technology transfer in the competitive environment of Formula E. The learning effects are enormous for the fifth generation of E-drives, which are already on the road in the BMW iX3 (Power consumption in kWh/100: 17.8-17.5 (NEDC); 19.0-18.6 (WLTP), electric range in km: 450-458 (WLTP))* and will also be used in the BMW iX and in the BMW i4, as well as other fully-electric car models.

SOME EXAMPLES.

- The control software in the high-voltage range, which controls the e-motor after the inverter, is used in the BMW Formula E car, as well as in the current BMW i3, MINI Cooper SE, BMW iX3, and the coming models, including the BMW iX and the BMW i4.
- Knowledge gained from the highly complex energy management in Formula E can also be transferred to series vehicles when considering how much energy to apply at which point in the driving cycle, to generate maximum efficiency and range.
- Tests, competitive racing and further development of extremely effective cooling technologies and materials in Formula E contribute to a significant improvement in energy efficiency for series drivetrains.
- Power density of the e-motor, thanks to very compact design.
- Advance development of silicon carbide technology for future generations of inverter.
- Advantages of the silicon carbide technology:
 - Maximum efficiency through MOSFETS with minimal switching and conducting losses and an effective cooling system).
 - High gravimetric power density.
 - Reduced weight thanks to kevlar housing.
- Increased experience with high-powered transmissions in Formula E results in the development of a bandage for the rotor, which also enables increased revs in series.
- Optimised use of the constructed space in the vehicle thanks to new knowledge about functional integration and packaging of the drivetrain, including auxiliary units.
- Experience in the handling and operation of 800V voltage level including safety concepts.

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BMW iFE.21.

The regulations have remained consistent when compared to Season 6 and the BMW iFE.21 boasts further detailed optimisations. It has a uniform chassis as stipulated by Formula E regulations. Some areas have enjoyed continuous improvement over the course of the past two seasons. For example, the rear structure was modified significantly thanks to innovative lightweight construction. The development of parts using generative design methods or 3D printing technology saved a considerable amount of weight compared with conventional development and production procedures, and gave the engineers more room to manoeuvre in terms of the centre of gravity of the car and weight distribution. For the first time, parts made of fibre-reinforced plastics, which were manufactured using fibres from sustainable raw materials, are being used in a race car competing on a works basis for BMW. In the BMW iFE.21, these are parts in the cooling circuit of the drivetrain, which are made of flax.

KEY SPECS OF THE GEN2 CAR.

- Length: 5,200mm
- Width: 1,800mm
- Height: 1,050mm
- Max. power: 250kW
- Race mode: 200kW
- Acceleration: 0-100 in 2.8 seconds
- Max. power regeneration: 250kW
- Minimum weight (incl. driver and battery): 903kg

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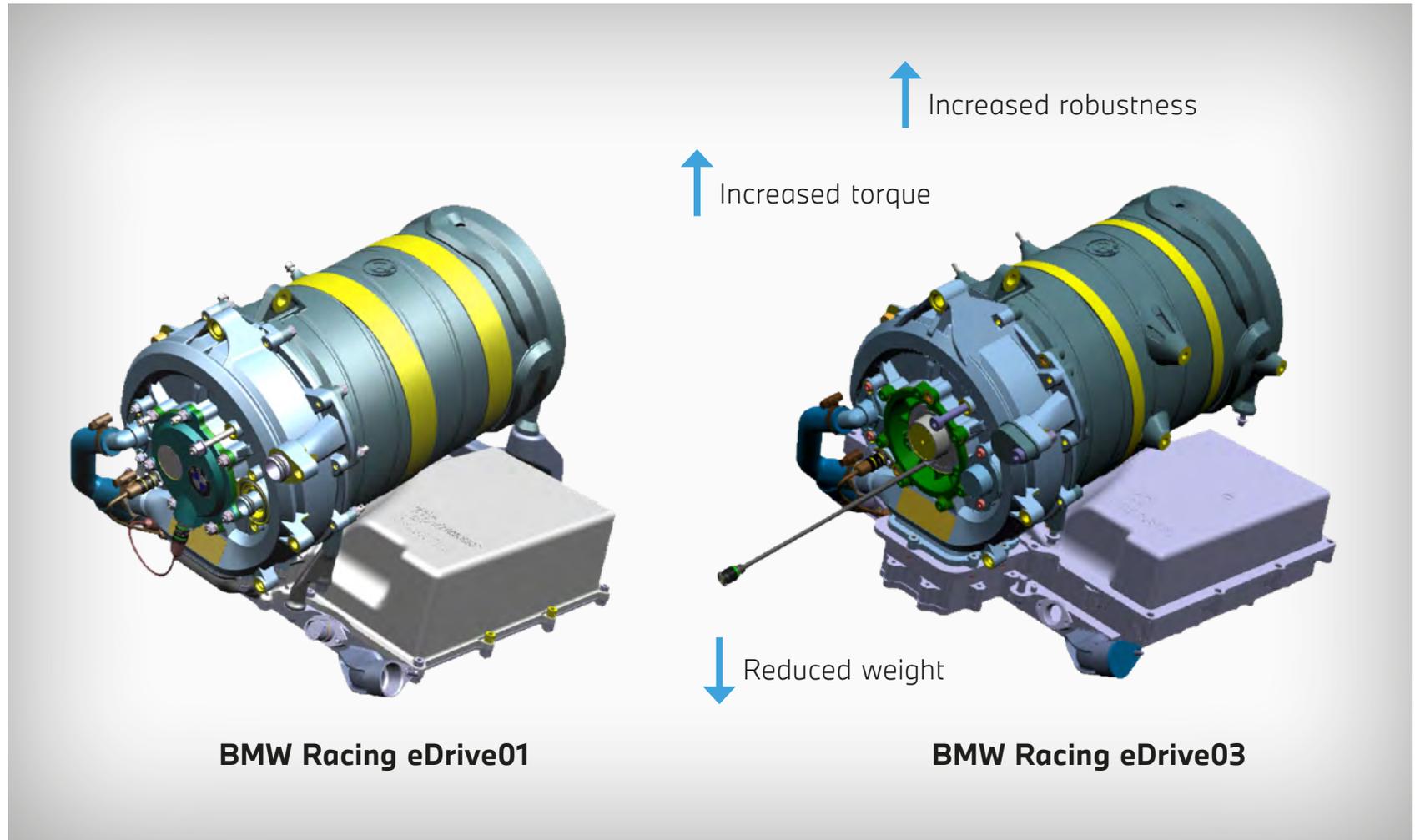
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BMW Racing eDrive01

BMW Racing eDrive03

BMW i DRIVETRAIN.

BMW expertise lies primarily in the core of the car, the drivetrain. The characteristic of the BMW Racing eDrive03 was revised based on the detailed information on the individual racetracks that the team gathered in the last two seasons, and modified to suit the specific challenges of Formula E races. The main goal of the modifications is to improve the efficiency of the drivetrain.

The E engine attains a maximum efficiency of 98 percent and its power density is higher than 14kW/kg. Its maximum rotational speed is more than 30,000 rpm. The inverter works with a direct current of up to 900 volts and achieves a power density of more than 45 kW/kg.

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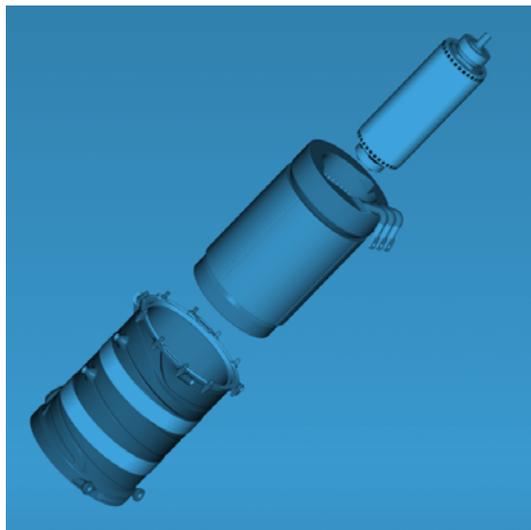
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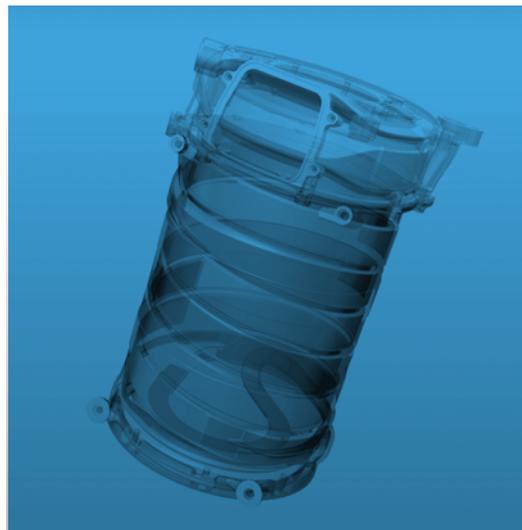
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FACTS ON THE BMW RACING eDRIVE03.



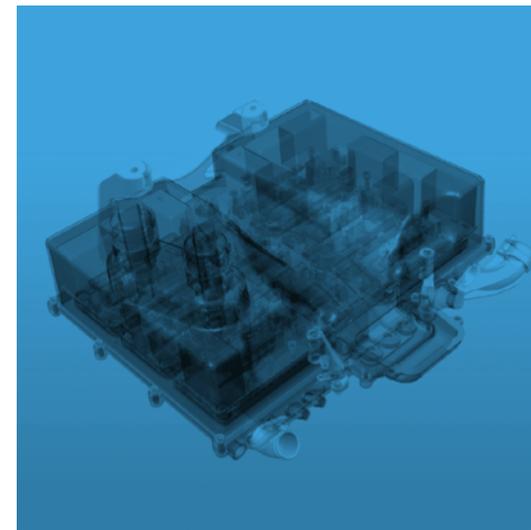
ELECTRIC MOTOR.

- Maximum efficiency (e.g. highly effective cooling technologies and materials).
- Cutting-edge materials (carbon fibre, resins with high thermal conductivity, titanium, ceramic).
- Design for high engine speeds.
- High gravimetric energy density (kW/kg).
- Very compact construction (kW/l).



COOLING SYSTEM.

- 360° cooling allows constant operation in longer races and higher temperatures.
- Minimal pressure loss thanks to CFD optimisation.
- Use of materials with high thermal conductivity (e.g. ceramic, casting compound).
- Objective: minimisation of losses for maximum efficiency.



INVERTER.

- State-of-the-art SiC technology (MOSFETs with minimal switching and conduction losses).
- Latest materials (SiC, kevlar housing).
- High gravimetric energy density.
- Maximum efficiency (e.g. latest SiC MOSFETs, effective cooling system, low-loss circuit layout).

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DRIVETRAIN COMPARISON: BMW i3 vs. BMW iFE.21.

Numbers of the BMW Racing eDrive03 compared to the series production drivetrain.



Weight
-50 %



Volume
-66 %



Torque density
+100 %



Efficiency improvement
+50 %



Performance
+100 %



Energy density
+300 %



Max. revs
+100 %



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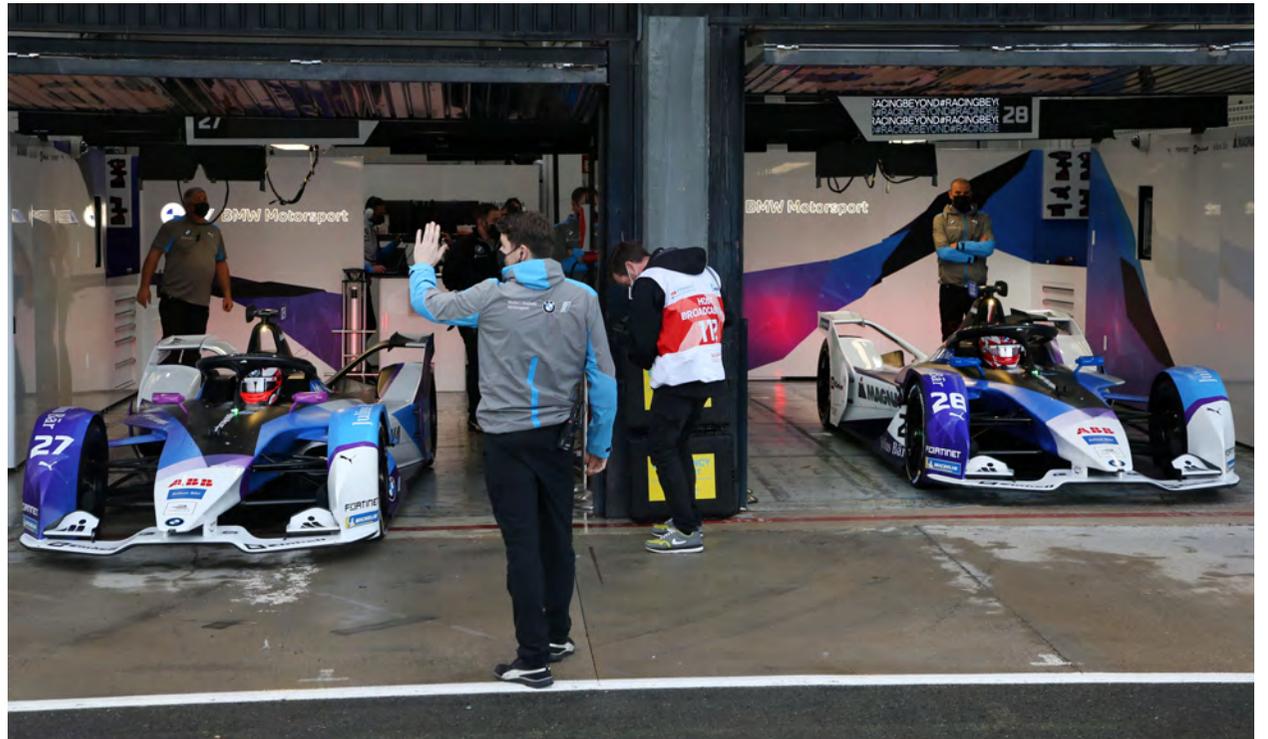
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BMW i ANDRETTI MOTORSPORT.

BMW i Motorsport's expertise and decades of motor racing experience within Andretti Autosport come together in the BMW i Andretti Motorsport team. Andretti has been part of the Formula E field from day one and has a successful history in motor racing, particularly in North America, including three wins in the iconic Indy 500. BMW i Andretti Motorsport contests Formula E with a US licence, but has its team HQ in Banbury, England. The team places great emphasis on continuity. Most of the members from Seasons 5 and 6 are still part of the team.



KEY PERSONNEL.



MICHAEL ANDRETTI
Team owner
Andretti Autosport



J-F THORMANN
Executive Vice President
Andretti Autosport



ROGER GRIFFITHS
Team Principal
BMW i Andretti Motorsport



CAMPBELL HOBSON
Team Manager
BMW i Andretti Motorsport



VALENTINO CONTI
Chief Engineer
BMW i Andretti Motorsport



LOIC DESCHAMPS
Race Engineer
Jake Dennis



BRICE GAILLARDON
Race Engineer
Maximilian Günther



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#27 JAKE DENNIS.

Date of birth	16 th June 1995
Place of birth	Nuneaton (GBR)
Place of residence	Leicester (GBR)
BMW driver since	2020
Greatest successes	– Formula 1 test driver for Red Bull Racing – Formula Renault 2.0 NEC Champion 2012 – McLaren Autosport Award winner 2012 – World Karting Champion 2010
First race	Formula BMW at Silverstone 2011
First win	Formula BMW at Silverstone 2011
Most important race	2 nd place at Bathurst 12 Hour 2019
Hobbies	Training, sim racing
Favourite Formula E location	New York
Favourite city	London
What I like most about Formula E is...	...that we drive in such a wide variety of locations.
To be successful in Formula E,...	...drivers and teams must be very consistent. To do that, I really need to understand the package of engineers, vehicle and software that surrounds me.
This is how I envision the mobility of the future:	I think that Formula E's focus on electromobility is spot on. There is nothing I love more than the sound of a V12 engine, but in the future we will all have to try to get our CO ₂ footprint as close to zero as possible.



CAREER.

2020:	Blancpain Endurance Series
2019:	DTM, 2 nd place Bathurst 12 Hour
2018-2020	Aston Martin Red Bull Racing simulator and development driver
2018	Formula 1 test drives for Aston Martin Red Bull Racing
2016	4 th place GP3
2015	3 rd place FIA Formula 3 European Championship
2013	4 th place Eurocup Formula Renault 2.0
2012	1 st place Formula Renault 2.0 NEC, McLaren Autosport BRDC Award winner

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#28 MAXIMILIAN GÜNTHER.

Date of birth	2 nd July 1997
Place of birth	Oberstdorf (GER)
Place of residence	Monaco (MON)
BMW driver since	2019

Greatest successes	<ul style="list-style-type: none"> – Winner of Santiago E-Prix and Berlin E-Prix 2020 – Winner of Pau Grand Prix 2017, – Runner-up in FIA Formula 3 European Championship 2016
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First race	Karting at six years of age, first single-seater race in Formula BMW in Sturup 2011
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First win	Formula BMW in Monteblanco 2011
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Most important races	First Formula E win in Santiago 2020 and win at Pau Grand Prix 2017
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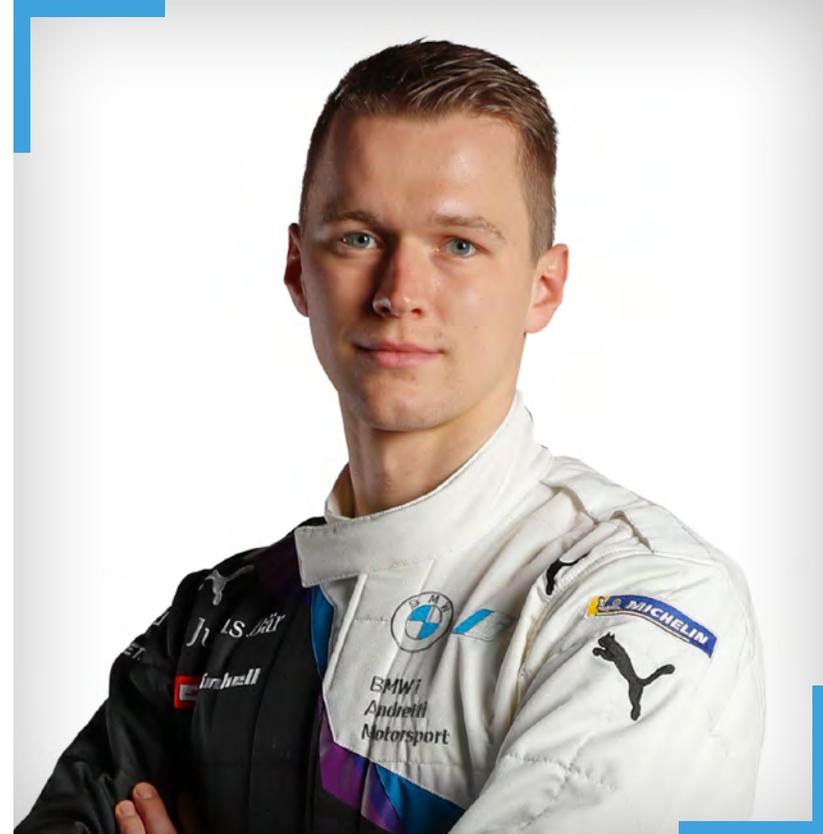
Hobbies	Cycling, triathlon, golf, cross-country skiing
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Favourite Formula E location	Rome
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Favourite city	New York
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What I like most about Formula E is...	...that the cars are so futuristic, the competition between drivers and teams is really top-class and that the entire championship has such a progressive attitude.
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To be successful in Formula E,...	...you really have to be a complete driver. You have to adjust quickly to new conditions, deal well with street circuits, stay smart inside and outside the cockpit and continually work on further development of the whole package with the team.
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This is how I envision the mobility of the future:

I feel that electromobility has a great future. I think that we will see green technology in use for all means of transport. We will have to wait and see whether this will be a battery or a hydrogen fuel cell, but e-mobility will be the future.

CAREER.

2020	9 th place Formula E, 2 wins
2019	17 th place Formula E
2018	14 th place FIA Formula 2, 1 win, 2 podiums
2017	1 st place Formula 3 Grand Prix de Pau 3 rd place FIA Formula 3 European Championship
2016	2 nd place FIA Formula 3 European Championship
2014	2 nd place ADAC Formula Masters
2013	2 nd place ADAC Formula Masters

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SEASON 7 OF THE ABB FIA FORMULA E WORLD CHAMPIONSHIP.

Formula E has now achieved official FIA World Championship status, meaning that Season 7 will take place as the ABB FIA Formula E World Championship. Combined with the ongoing global pandemic, this makes it a very significant season indeed. The unpredictable situation turns the organisation of a complete season with races on several continents into an immense challenge. The Formula E management has thus far been able to schedule the first eight races of the season, depending on how the pandemic situation develops. Further events are to be scheduled accordingly.

The season kicks off with a double-header in Diriyah, where BMW i Andretti Motorsport celebrated two pole positions and a win for Alexander Sims in season 6. Now it is time for the first night races in the history of Formula E. Two races are also set to take place in Santiago de Chile, where Maximilian Günther recorded his first win in Season 6. The event in Chile's capital city had been envisioned as the season-opener but was put back to early June. The permanent racetrack near Valencia, where Günther recently recorded two consecutive best times for BMW i Andretti Motorsport during pre-season test drives, has been added to the calendar.

RACE CALENDAR, SEASON 7*.

26th February 2021	Diriyah, Saudi Arabia
27th February 2021	Diriyah, Saudi Arabia
10th April 2021	Rome, Italy
24th April 2021	Valencia, Spain
8th May 2021	Monaco, Monaco
22nd May 2021	Marrakesh, Morocco
5th June 2021	Santiago, Chile
6th June 2021	Santiago, Chile**

*Subject to changes due to the pandemic

**Further races will be announced by Formula E at a later date

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BMW i SAFETY CAR FLEET.

As has been the case since the first Formula E race in 2014, BMW i will once again provide the complete fleet of safety cars for Formula E as the 'Official Vehicle Partner' for Season 7.

Spearheading the fleet are two safety cars: the BMW i8 Roadster safety car (combined fuel consumption: 2.0 l/100 km; combined power consumption: 14.5 kWh/100 km; combined CO₂ emissions: 46 g/km)*, which has been specially modified for use at the racetrack,

and the BMW i8 Coupé Safety Car (combined fuel consumption: 1.8 l/100 km; combined power consumption: 14.0 kWh/100 km; combined CO₂ emissions: 42 g/km)*. The BMW i fleet also includes the BMW i3s (Power consumption in kWh/100: 14.6-14.0 (NEDC); 16.6-16.3 (WLTP), electric range in km: 278-283 (WLTP))* as 'Race Director Car' and the BMW iX3 (Power consumption in kWh/100: 17.8-17.5 (NEDC); 19.0-18.6 (WLTP), electric range in km: 450-458 (WLTP))* in its roles as 'Medical Car' and 'Rescue Car'.

*Official data on power consumption and electric range were determined in accordance with the mandatory measurement procedure and comply with Regulation (EU) 715/2007 valid at the time of type approval. In case of a range, figures in the NEDC take into account differences in the selected wheel and tire size; figures in the WLTP take into account any optional equipment. WLTP values are used for assessing taxes and other vehicle-related charges that are (also) based on CO₂ emissions, as well as for the purposes of vehicle-specific subsidies, if applicable. Where applicable, the NEDC values listed were calculated based on the new WLTP measurement procedure and then converted back to the NEDC measurement procedure for comparability reasons. For more information on the WLTP and NEDC measurement procedures, see www.bmw.de/wltp. For further information about the official fuel consumption and the specific CO₂ emission of new passenger cars can be taken out of the 'handbook of fuel consumption, the CO₂ emission and power consumption of new passenger cars', which is available at all selling points and at <https://www.dat.de/angebote/verlagsprodukte/leitfadenkraftstoffverbrauch.html>.

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THE PARTNERS.

PRIMARY PARTNER.



"The Formula E Championship is the only race series that puts forward-looking technologies on the road - and in cities around the world that face complex mobility challenges. It serves as a competitive platform for evaluating and developing technologies and solutions for future vehicles," said Swamy Kotagiri, CEO Magna.

As a mobility technology company, Magna is focused on delivering what's needed today while creating technologies society doesn't even know they need yet. With over 157,000 entrepreneurial minded employees and more than 60 years of experience, we are helping bring freedom to mobility. The freedom to go greener, safer, faster and without constraints.

For further information about Magna, visit www.magna.com.

MAIN PARTNER.



Julius Baer is the leading Swiss wealth management group and a premium brand in this global sector, with a focus on servicing and advising sophisticated private clients. Our client-centric approach, our objective advice based on the Julius Baer open product platform, our solid financial base and our entrepreneurial management culture make us the international reference in wealth management.

We support projects and activities that have a visionary approach and share our values with regards to innovation, sustainability and forward-looking pioneering spirit.

Therefore, we are proud to be the founding Global Partner of the world's first fully electric racing series, the ABB FIA Formula E World Championship and to support the BMW i Andretti Motorsport Team as their Main Partner. The innovative approach of Formula E and BMW i resonate deeply with our corporate values, which is why it is an ideal sponsorship platform for the Bank.

Identifying and exploring the global megatrends set to affect our lives in years to come is a vital part of staying ahead of the curve and is the basis for our Next Generation investment philosophy. We firmly believe that how we invest today determines how we live tomorrow.

For current partnerships and initiatives as well as for more information visit our website. www.juliusbaer.com/en/about-us/our-company/sponsoring

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Einhell is the leading manufacturer of cutting-edge tools for home and garden. By constantly developing our innovative battery platform, Power X-Change, we are already an internationally successful company and a pioneer in the field of battery-powered tools and garden equipment. More than 200 tools and garden tools can now be operated with just one type of battery. For years, our products have set standards in terms of endurance, performance and safety. Our customers also appreciate the cordless freedom for all do-it-yourself projects, the attractive price-performance ratio and the first-class customer service.

We are Main Partner of BMW i Motorsport in Formula E, ensuring we have our finger on the pulse when it comes to future technologies, which we can incorporate in our tools. Furthermore, we supply the BMW i Andretti Motorsport Team with our Power X-Change battery tools, offering its mechanics wireless freedom in the garage.

OFFICIAL PARTNER.



Fortinet secures the largest enterprise, service provider, and government organisations around the world. Fortinet empowers our customers with complete visibility and control across the expanding attack surface and the power to take on ever-increasing performance requirements today and into the future. Only the Fortinet Security Fabric platform can address the most critical security challenges and protect data across the entire digital infrastructure, whether in networked, application, multi-cloud or edge environments. Fortinet ranks #1 in the most security appliances shipped worldwide and more than 440,000 customers trust Fortinet to protect their businesses.

OFFICIAL SUPPLIER.



PUMA is one of the world's leading sports brands, designing, developing, selling and marketing footwear, apparel and accessories. For more than 70 years, PUMA has relentlessly pushed sport and culture forward by creating fast products for the world's fastest athletes. PUMA offers performance and sport-inspired lifestyle products in categories such as football, running and training, basketball, golf, and motorsports. It collaborates with renowned designers and brands to bring sport influences into street culture and fashion. The PUMA Group owns the brands PUMA, Cobra Golf and stichd. The company distributes its products in more than 120 countries, employs about 14,000 people worldwide, and is headquartered in Herzogenaurach/Germany.

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