

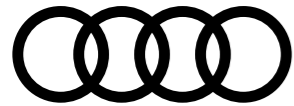
# Formula Student Germany



AN INTERNATIONAL DESIGN COMPETITION  
OF SKILLS, SPEED AND SPIRIT

6<sup>TH</sup> - 12<sup>TH</sup> AUGUST 2018 | HOCKENHEIM

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A special thanks goes to the numerous volunteers who contributed significantly in the realisation of the thirteenth Formula Student Germany.



For those working in the Automotive industry, or in other Advanced technology industries, you may, like myself, see advancements accelerating faster than ever before.

Formula Student Germany continues to push the limits. It provides students with an opportunity to fully develop their skills and continue to expand their knowledge. This can only benefit them when the time comes to plunge into the real world on graduation.

During the research in creating the articles we have provided you within this year's FSG Magazine, it has been so inspiring to see just how driven the Formula Student world is. Not only are the teams learning amongst themselves how to further develop their cars for the latest Formula Student Driverless competition, but they are also networking between the different universities to spread the knowledge. This can only improve the technology and the competition as a whole: sound ideas become proven reality.

The world is becoming a smaller place as rapid and economic transport between cities, countries and continents has increasingly become the norm. For example, one of our established teams from Monash in Australia is returning this year to compete at FSG. We decided to interview them (see page 130) to find out what pushes them to travel so far to Germany year after year.

FSG is very proud of the amount of innovation among our participants. Whether it is during their time as a team member, when they become a volunteer, or later as they develop their careers in pastures new. So many ideas have been turned to reality.

This year, as part of introducing our Time-Keeping team, we have looked to see what have been the most impressive inventions within Formula Student Germany (see page 74).

The Formula Student bug is still strong. One part of editing this magazine that I enjoy, is to search through all the FSG Media Team photos taken at last year's event. It is so great to spot all those people that I hadn't bumped into during the event, and to see that they keep coming back. I often hear the plans from my fellow FS friends, even as established engineers, to design and build another race car, years after they graduated. If you had the chance to build another race car, or to build a race car for the first time - what would you choose? Combustion? Electric? Driverless?

I hope you enjoy reading this magazine as much as the team and I had in putting it together.

I wish the teams competing at Formula Student Germany 2018 the best of luck and look forward to meeting you on stage at the Award Ceremony!

**Dipl.-Ing. Alia Pierce**





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Welcome to MTU in Friedrichshafen, Germany. We look forward to hearing from you.

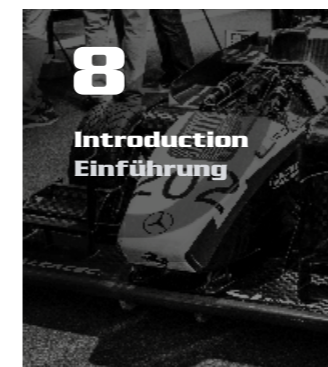
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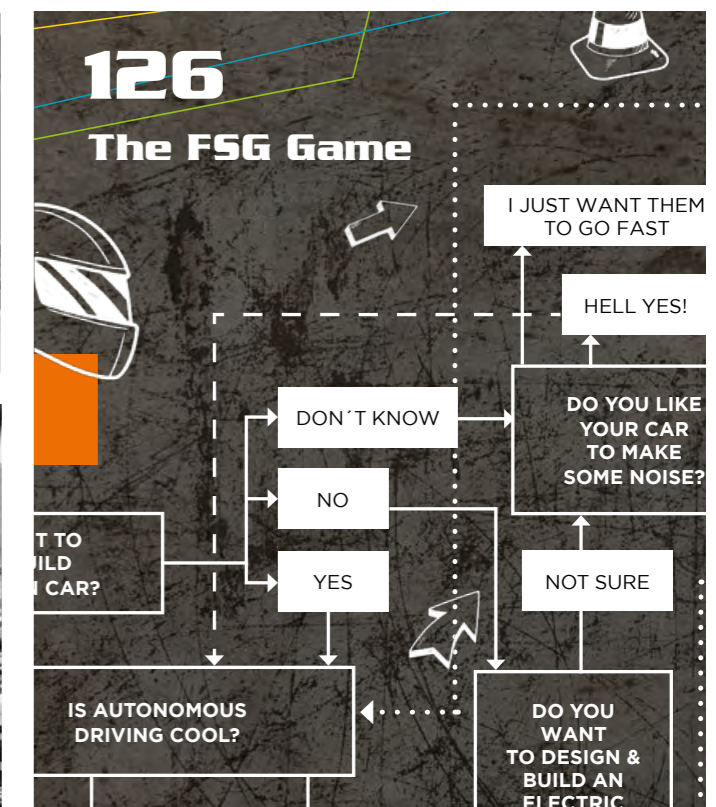
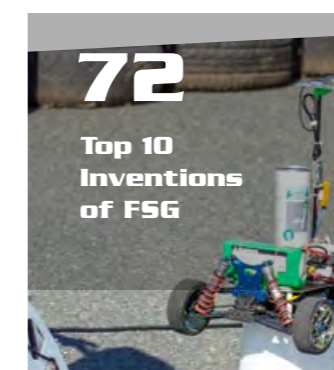
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# Introduction Einführung

## The Challenge

Formula Student Germany (FSG) is an international design competition for university students, based on the Formula SAE rules and guidelines. Teams from around the world have the task of designing a single-seated, formula car with either a combustion or electric drive train and to then manufacture a functional prototype. They can then also decide if it will have autonomous features, enabling them to compete in the Formula Student Driverless competition. Along with these technical aspects, the teams must develop a viable business plan and a marketing concept for batch production of the vehicle. The target group is amateur weekend racers, therefore, the racecar must not only have manageable handling and possess good acceleration and braking ability, but must also be inexpensive to buy and run. Thus, other important aspects of the vehicle that must be developed include aesthetics, ergonomics, and use of off the shelf components. The vehicle designs are judged by experts from the automobile, motorsport and supply industries. The teams are then able to score points in various static and dynamic events, which will ultimately decide the overall ranking. The team with the best overall scores from the combination of design, financial planning, marketing strategy and performance on the track will win Formula Student Germany.

## Practical Experience

FSG enriches the teaching content of a course of study with challenging and practical experience in the fields of manufacturing and production, whilst not neglecting the practice-oriented requirements relating to profitability and market relevance. The aspects assessed by the competition correspond directly to the demands of the different branches of the industry for new product development, which is why they are not merely restricted to vehicle design. By working as part of an interdisciplinary team of students from different fields of study and expertise, the competitors learn first-hand how to combine the economic and technical goals of product development and at the same time, how to defend the solutions they themselves have developed and assert these against competing developments.

## Herausforderung

Die Formula Student Germany (FSG) ist ein internationaler Konstruktionswettbewerb für Studenten, der sich an den Formula-Student-Wettbewerb der amerikanischen Society of Automotive Engineers (SAE) anlehnt. Die Aufgabe für die Teams aus der ganzen Welt besteht darin, ein einsitziges Formel-Fahrzeug mit einem Elektrik- oder Verbrennermotor zu konstruieren und einen fahrfertigen Prototypen herzustellen. Zudem können sich die Teams für die Implementierung von autonomen Funktionen in ihrem Fahrzeug entscheiden, was ihnen eine Teilnahme im neuen Formula-Student-Driverless Wettbewerb ermöglicht. Parallel zu der technischen Entwicklung müssen die Teams einen tragfähigen Businessplan und ein Vermarktungskonzept für eine Kleinserienfertigung des Fahrzeugs entwickeln. Zielgruppe ist der nicht-professionelle Wochenendrennfahrer. Daher muss der Rennwagen nicht nur ein beherrschbares Handling, sowie gute Beschleunigungs- und Bremswerte haben, sondern auch günstig in der Anschaffung und im Unterhalt sein. Wichtige Nebenaspekte des entwickelten Fahrzeuges sind Ästhetik, Ergonomie und die Verwendung von Serienbauteilen. Bewertet werden die Fahrzeugkonzepte von Experten aus der Automobil-, Motorsport- und Zulieferindustrie. In verschiedenen statischen und dynamischen Disziplinen können die Teams wichtige Punkte sammeln, die letztlich über die Gesamtplatzierung entscheiden. Den Sieg der Formula Student Germany erringt das Team mit dem besten Gesamtpaket aus Konstruktion, Finanzplanung, Verkaufsargumentation und Rennperformance.

## Praxisnahe Erfahrung

Die FSG bereichert die Lehrinhalte des Studiums um herausfordernde und praktische Erfahrungen in den Bereichen Konstruktion und Fertigung, ohne dabei die praxisrelevanten Voraussetzungen in Bezug auf Wirtschaftlichkeit und Marktrelevanz zu vernachlässigen. Die im Wettbewerb abgefragten Aspekte entsprechen den Anforderungen verschiedener Industriebereiche hinsichtlich Produktneuentwicklungen und sind daher nicht nur für den Fahrzeugbau anwendbar. Durch die Arbeit in einem interdisziplinären Team aus Studenten verschiedener Studien- und Fachrichtungen lernen die Teilnehmer, die wirtschaftlichen und technischen Ziele einer Produktentwicklung in Einklang zu bringen und dabei ihre selbst entwickelten Lösungen zu verteidigen und gegenüber konkurrierenden Entwicklungen durchzusetzen.





# An International Design Competition

## Ein internationaler Konstruktionswettbewerb

### Formula Student Combustion and Formula Student Electric

Formula Student Germany is an engineering design competition for students. Students work together in teams to design and manufacture a prototype racecar, based on a hypothetical manufacturing contract. In order for the competing teams to be compared, their designs, plans and cars are judged by experts. Each team has the chance to win in total a maximum of 1,000 points over the course of static events, dynamic events and through proving the efficiency of their car. The team with the best overall combination of design, track performance, financial planning and marketing strategy will be a winner of FSG. In theory it is possible to win the overall competition without being the best in (or even being eliminated from) one or more events. Similarly, teams can win the top prize in one or more of the categories and still have no chance at an overall victory.

### ► Static Events

The Formula Student Germany competition is designed to introduce the participating students to the interdisciplinary approach of today's automotive industry. This not only includes technical understanding, but also economic and communication abilities such as presentation techniques or financial planning skills. This is why the three static events demand collaboration across the team in the areas of design and layout, construction, marketing and pricing of a product. They also require specialised expertise from different technical and financial courses of study. The teams can win up to 325 points of the possible 1000 in the three static events, and each individual event is weighted differently. A panel of experienced experts from the automobile, motorsport, and supply industries judge the performance of each team.

Die Formula Student Germany ist ein Konstruktionswettbewerb für Studenten, bei dem unter der Annahme eines fiktiven Konstruktionsauftrags der Prototyp eines Rennwagens entstehen soll. Um einen Vergleich der startenden Teams zu ermöglichen, werden die Konzepte, Planungen und Fahrzeuge von Experten bewertet. Insgesamt kann jedes Team in drei statischen und fünf dynamischen Disziplinen maximal 1000 Punkte erhalten. Den Gesamtsieg über die FSG erringt das Team mit dem besten Gesamtpaket aus Konstruktion, Rennperformance, Finanzplanung und Verkaufsargumentation. Prinzipiell kann also auch ein Team den Gesamtwettbewerb gewinnen, das in einer oder mehreren Disziplinen nicht zu den Besten zählt oder sogar ausscheidet. Auf der anderen Seite können durch dieses Bewertungssystem auch Teams einen Titel in einer oder mehreren Disziplinen erringen, obwohl sie keine Chance auf den Gesamtsieg haben.

### Engineering Design - 150 points

At the start of the engineering design competition, the students must hand in an eight-page technical description of their car. It must show both their design and how the design will be applied to their chosen construction. On the basis of this document, the members of the jury will evaluate the layout, technical design, construction and implementation of the production of the actual vehicle. Then, there will be a discussion where the teams are questioned by the judges. These discussions focus on clarifying technical details, exploring the thinking behind the chosen design, as well as the corresponding technical understanding of the students. The evaluation will not only assess the quality of the technical solution in question but also the reasons behind it.

### ► Statische Disziplinen

Der Formula-Student-Wettbewerb soll die teilnehmenden Studenten an die interdisziplinäre Arbeitsweise in der Industrie heranzuführen. Dazu zählen nicht nur technisches Verständnis, sondern auch wirtschaftliche und kommunikative Fähigkeiten, wie z. B. Präsentationstechniken oder Kompetenzen in der Finanzplanung. Daher wird in drei statischen Disziplinen sowohl die teamübergreifende Zusammenarbeit bei Konzept, Auslegung, Konstruktion, Vermarktung und Preisung eines Produktes als auch spezielles Fachwissen aus verschiedenen technischen und wirtschaftlichen Studiengängen gefördert und abgefragt. In den drei statischen Disziplinen können die Teams maximal 325 Punkte erreichen, wobei die Einzeldisziplinen unterschiedliche Gewichtungen haben. Bewertet werden die Leistungen der Teams durch eine Jury aus erfahrenen Experten der Automobil- und Zulieferindustrie sowie dem Motorsport.

### Engineering Design - 150 Punkte

Zu Beginn des Engineering Design Wettbewerbs reichen die Studenten eine achtseitige technische Beschreibung zu ihrem Fahrzeug ein, um das Konzept sowie die besondere Konstruktion darzustellen. Die Juroren begutachten auf Basis der Unterlagen das technische Konzept, die Auslegung, Konstruktionen sowie Umsetzung in der Fertigung am realen Fahrzeug. Die Teams müssen ihnen dabei zu allen Fragen in einer Diskussion Rede und Antwort stehen. In den Gesprächen geht es um die Abfrage der technischen Details, die Hintergründe für die Wahl eines Konzepts und das dazugehörige technische Verständnis. In die Bewertung fließen also nicht nur die Qualität der vorliegenden technischen Lösungen ein, sondern auch die Gründe für die gewählten Lösungen.

► The cost judges go through the reports the teams have submitted, asking questions to ensure the team members can justify what they have presented

► Die Kostenjuroren gehen durch die von den Teams eingereichten Berichte und stellen Fragen, um sicherzustellen, dass die Teammitglieder das Eingereichte begründen können.



◀ The design judges take a deep dive into the design decisions the teams have made for their vehicle.

◀ Die Design Juroren tauchen tief in die Design-Entscheidungsfindung der Teams für ihre Fahrzeuge ein.

### Cost and Manufacturing

#### - 100 points

Cost is a decisive factor in the design of any product. In the cost analysis event, the teams must grapple with the calculative size of the vehicle, its components, and the necessary manufacturing steps and record all of this in a written cost report. The students must then answer questions from the judges relating to the cost report on their prototype. In addition to considering the thoroughness of the written report, the students' understanding of the manufacturing process and the total cost calculation will be assessed. The teams will also have to handle a real case scenario where they must react to product requirements being altered at short notice. The quality of their response to these changing circumstances will also form part of the overall point score.

### Business Plan Presentation

#### - 75 points

Each team presents their business plan for the constructed prototype to a fictitious manufacturing company represented by judges. During a ten-minute presentation, the team must demonstrate why their design best fulfils the demands of their target group of amateur weekend racers and show how their design can be successfully marketed. The presentation will be followed by a five-minute discussion and question round with the judges. In this event the content, structure, and editing of the presentation, as well as the team's performance in delivering it, will be evaluated alongside their answers to the panel's questions.

**Total: 325 points**

### Cost and Manufacturing

#### - 100 Punkte

Die Kosten sind für Auslegung eines Produktes ein entscheidender Faktor. Bei der Disziplin Cost Analysis müssen sich die Teams mit den kalkulatorischen Größen des Fahrzeugs, seiner Bauteile und der notwendigen Fertigungsschritte auseinandersetzen und diese schriftlich in einem Cost Report festhalten. Zu den eingereichten Unterlagen müssen sich die Studenten mit ihrem Prototypen einer Diskussion mit den Juroren stellen. Bewertet werden neben der Aufbereitung und Vollständigkeit des schriftlichen Reports auch das Verständnis der Fertigungsprozesse sowie der Gesamtpreis. Darüber hinaus müssen die Teams ein Real-Fall-Szenario bearbeiten, in dem es darum geht, kurzfristig auf veränderte Anforderungen an das Produkt zu reagieren. Die Ergebnisse werden ebenfalls benotet und fließen in die Gesamtpunktzahl ein.

### Business Plan Presentation

#### - 75 Punkte

Mit ihrem Business Plan präsentieren die Teams einem potentiellen Investor oder Partner, vertreten durch die Juroren, ihren Geschäftsplan für den gebauten Prototyp. Die Teams stellen in einem zehnmündigen Vortrag dar, weshalb ihr Konzept am besten für die Zielgruppe geeignet ist und eine gewinnbringende Investition darstellt. Der Präsentation folgt eine fünfminütige Diskussions- und Fragerunde mit den Juroren. Bei dieser Disziplin werden Inhalt, Aufbau und Aufbereitung des Vortrags sowie der Auftritt der Teams ebenso bewertet wie die Antworten auf die Fragen der Juroren.

**Gesamtpunktzahl: 325 Punkte**

▼ The teams must present their business plan to judges. The best plans will make it to the finals where they will be presented on the main stage.

▼ Die Teams müssen den Juroren ihren Businessplan präsentieren. Die Besten schaffen es bis ins Finale, wo sie auf der Hauptbühne präsentieren werden.



▶ During the endurance race, the teams compete to get the fastest lap times and the least number of penalties.

▶ Die Teams kämpfen um die geringste Gesamtzeit, welche sich aus den Rundenzeiten zzgl. der Strafzeiten für geworfene Hüthen etc. zusammensetzt.

### ▶ Dynamic Events

The cars that the students design will not only be assessed when stationary. Their performance on the racetrack will also be put to the test. Each dynamic event tests different features of the vehicles. In addition to the maximum longitudinal and lateral acceleration, race performance, efficiency and endurance of the formula cars will be examined and evaluated. For the Acceleration, Skid Pad and Autocross events, each car starts with two drivers, each of whom is allowed two attempts. The best attempt is the one on which the car will be scored. A maximum of 675 points can be scored over the course of the four dynamic events and the efficiency event.

#### Acceleration - 75 points

The vehicle's acceleration from a standing start is measured over a 75 metre straight. In addition to traction, the correct engine design is especially important, either in terms of greater power or for the highest possible torque. The fastest cars cross the line in less than four seconds and can reach speeds of over 100 km/h by the end of the stretch.

### ▶ Dynamische Disziplinen

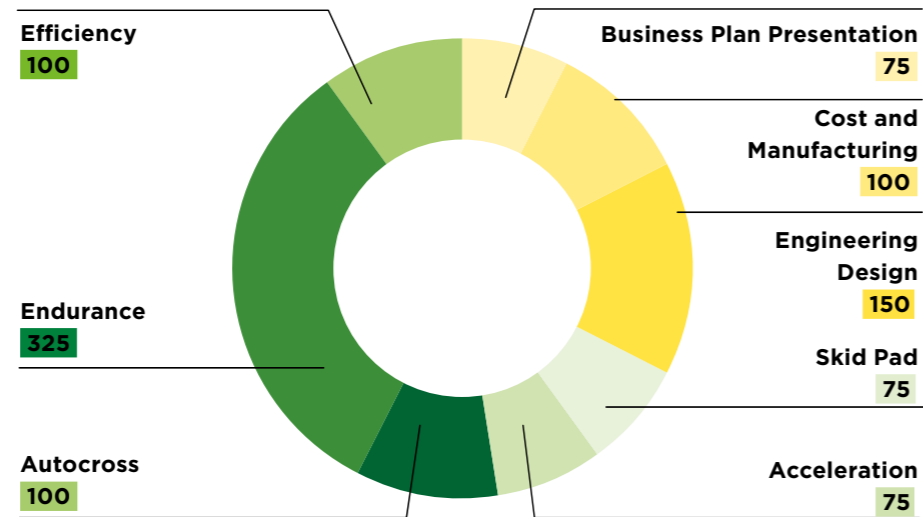
Die von den Studenten konstruierten Fahrzeuge werden natürlich nicht nur im Stand bewertet. Sie müssen ihre Performance auch auf der Rennstrecke unter Beweis stellen. In jeder dynamischen Disziplin werden andere Eigenschaften des Fahrzeugs getestet. Neben der maximalen Längs- und Querschleunigung werden auch die Rennperformance, Effizienz und Haltbarkeit der Formel-Rennwägen ermittelt und bewertet. Bei den Disziplinen Acceleration, Skid Pad und Autocross starten je Fahrzeug zwei Fahrer, die jeweils zwei Versuche haben. Gewertet wird das beste mit dem Fahrzeug erzielte Ergebnis. In den fünf dynamischen Disziplinen können maximal 675 Punkte erzielt werden.

#### Acceleration - 75 Punkte

Auf einer 75 Meter langen Geraden wird die Beschleunigung der Fahrzeuge aus dem Stand gemessen. Hier kommt es neben der Traktion vor allem auf eine richtige Auslegung des Getriebes und eine möglichst hohe Leistung, bzw. ein hohes Drehmoment an. Die schnellsten Fahrzeuge absolvieren diese Prüfung in einer Zeit unter vier Sekunden und erreichen am Ende der Messstrecke Geschwindigkeiten von mehr als 100 km/h.

► The points for FSC and FSE have the same distribution as the teams compete in 5 dynamic events and 3 static events.

► Die Punkteverteilung für FSC und FSE ist identisch, da die Teams in 5 dynamischen und 3 statischen Events konkurrieren.



#### Skid Pad - 75 points

During the Skid Pad event, the cars must drive a figure of 8 circuit lined with track cones, performing two laps of each circle. In each case, the second lap will be measured. The lap time gives a comparative value for the maximum possible lateral acceleration of the car. Most of the cars use aerodynamics to raise the contact pressure and thus, increase lateral acceleration. As with all the dynamic events, knocking over any of the cones results in a time penalty.

#### Autocross - 100 points

In the autocross event, the cars traverse a kilometre-long track with straights, curves, and chicanes. A fast lap time is a sign of high driving dynamics, precise handling and good acceleration and braking ability. Once again, time penalties occur for those who knock over any cones. The autocross rankings decide the starting positions for the endurance competition that follows.

#### Skid Pad - 75 Punkte

Beim Skid Pad durchfahren die Rennwagen einen mit Pylonen begrenzten Parcours in Form einer Acht. Jeder Kreisring wird zweimal umrundet. Gemessen wird jeweils die zweite Runde. Die Rundenzeit gibt einen Vergleichswert für die maximal erzielbare Querschleunigung der Fahrzeuge. Bei den meisten Fahrzeugen werden durch den Einsatz aerodynamischer Hilfsmittel der Anpressdruck und damit die Querschleunigung erhöht. Das Umstoßen von Pylonen wird mit einer Zeitstrafe belegt.

#### Autocross - 100 Punkte

Bei der Disziplin Autocross fahren die Rennwagen über einen etwa ein Kilometer langen Kurs mit Geraden, Kurven und Schikanen. Eine schnelle Rundenzeit ist ein Indikator für eine hohe Fahrdynamik, ein präzises Handling sowie gute Beschleunigungs- und Bremsseigenschaften. Auch hier werden umgestoßene Pylonen mit einer Zeitstrafe geahndet. Die Platzierung im Autocross entscheidet auch über die Startreihenfolge im nachfolgenden Endurance-Wettbewerb.

#### Endurance - 325 Punkte

Das Endurance-Rennen stellt mit fast einem Drittel aller erreichbaren Punkte die Hauptdisziplin des Formula Student-Wettbewerbs dar. Über eine Renndistanz von 22 Kilometern müssen sich die konstruierten Rennfahrzeuge unter Dauerbelastung beweisen. Bei dieser Disziplin sind alle Eigenschaften der Prototypen wichtig, von der Beschleunigung bis zum Handling und der Fahrdynamik. Zusätzlich ist auch das Geschick der Fahrer gefragt, da die Strecke vor dem Rennen nur abgeschritten werden darf (Course Walk). Jedes Team hat einen einzigen Versuch, wobei nach der Hälfte der Distanz ein Fahrerwechsel erfolgen muss. Es sind bis zu vier Fahrzeuge gleichzeitig auf der Strecke, wodurch es oft auch zu Überholvorgängen kommt. Diese werden von der Rennleitung veranlasst und finden in eigens dafür eingerichteten Überholzonen statt, an denen die Strecke breiter ist. Das langsamere Fahrzeug bekommt dafür von den Streckenposten durch blaue Flaggen signalisiert, dass es einen schnelleren Teilnehmer überholen lassen muss. Die Teams erhalten nur dann Punkte, wenn sie höchstens ein Drittel langsamer waren als das schnellste Team. Auch hier werden Pylonenfehler durch Zeitstrafen geahndet.

#### Endurance - 325 points

The endurance race represents almost a third of all available points and is consequently the most important event of the Formula Student Germany competition. The cars must demonstrate their capacity for endurance over a grueling track distance of 22 km and all of the prototypes' features are crucial for this event, from acceleration and handling to driving dynamics. The skill of the driver is also tested here, as they may only familiarise themselves with the track before the race by walking the length of the course (Course Walk). Each team gets just a single try and the drivers must be swapped at the halfway point. There can be up to four cars on the circuit at any given time and so overtaking manoeuvres must be performed frequently. Overtaking is signalled by a blue flag and is only permitted at specially marked sections of the track. A team will receive no points at the end if they are more than a third slower than the fastest team overall.

#### Efficiency - 100 points

During the endurance race, fuel consumption (FSC cars) or energy consumption (FSE cars) is precisely recorded. However, the absolute fuel and energy consumption is not what is used to calculate the efficiency score, but rather the consumption relative to speed. This is to prevent teams from driving particularly slowly in the endurance competition in order to score as highly as possible in the efficiency category.

**Total: 675 points**

#### Efficiency - 100 Punkte

Während des Endurance-Rennens wird der Kraftstoffverbrauch (FSC-Fahrzeuge), bzw. der Energieverbrauch (FSE-Fahrzeuge) gemessen. Bei der Berechnung der Effizienz und der Punkte wird allerdings nicht der absolute Kraftstoff-/Energieverbrauch gemessen, sondern der Verbrauch in Relation zur Geschwindigkeit. Dadurch wird verhindert, dass Teams während des Endurance-Wettbewerbs besonders langsam fahren, um eine möglichst hohe Punktzahl in der Efficiency-Disziplin zu erreichen.

**Gesamtpunktzahl: 675 Punkte**

► During the AutoX, the FSE/FSE teams need to get the fastest lap time to win the race. This is also their qualifying for the Endurance race.

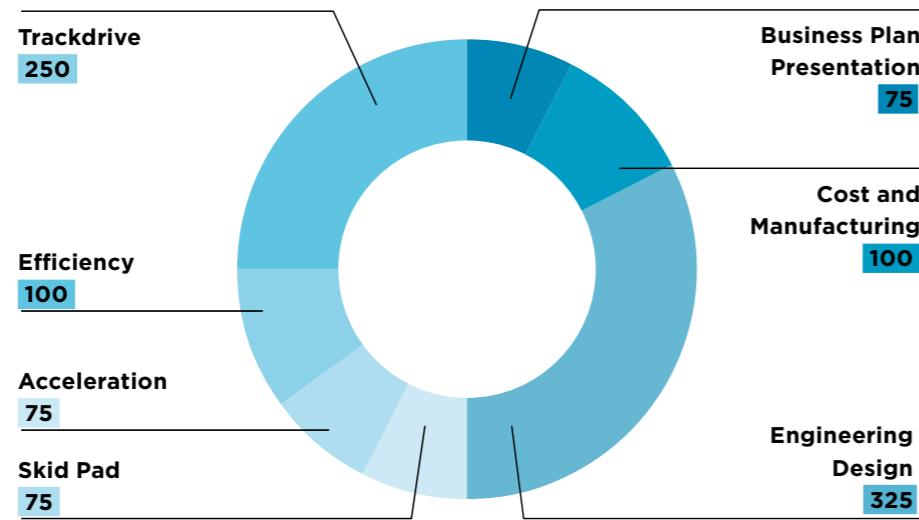
► Beim Autocross müssen die FSE / FSC-Teams die schnellste Rundenzeit erzielen, um das Sprint-Rennen zu gewinnen. Dies ist auch gleichzeitig ihre Qualifikationszeit für das Endurance-Rennen.





► The points for the FSD competition are more heavily weighted to the static disciplines.

► Bei der Punkteverteilung für FSD liegt mehr Gewicht auf den statischen Disziplinen.



## Formula Student Driverless (FSD)

As with the other two FSG competitions, the student racing teams at FSD compete with independently designed vehicles in dynamic and static disciplines. In contrast to FSC and FSE, the vehicles must cope with all dynamic disciplines completely autonomously with no driver sitting in the vehicle. In principle, however, "normal" driving with an FSD car is possible. The teams can freely select the type of drivetrain (electric or combustion), but must comply with the safety regulations of the respective vehicle category.

In the case of autonomous vehicles, the development focus shifts away from pure driving dynamics to an optimal adaptation of the autonomous vehicle system to the respective driving situation. FSG takes this into account when judging the FSD teams. This requires different static and dynamic disciplines, as well as a redistribution of the maximum achievable points. By maintaining as many disciplines as possible and maintaining the same maximum overall score, the comparability between all FSG competitions should at least be partially preserved.

### ► Static Disciplines

The Static Disciplines will give the teams the opportunity to gain 50% of the points. These are critical for the teams in order to gain a competitive overall position.

**Business Plan Presentation - 75 points and Cost Analysis - 100 points** are identical to FSC and FCE.

**Engineering Design - 325 points** The FSD Engineering Design event is considered more valuable for the teams as far as points. Not only will the design of the vehicle be judged, like it is in FSC and FSE, but the teams will also be judged on vehicle data from the dynamic disciplines.

**Total: 500 points**

### ► Dynamic Disciplines

The Dynamic Disciplines make up the remaining 50% of the points. In Formula Student Driverless, the Trackdrive replaces the Endurance and AutoX events.

**Acceleration - 75 points and Skid Pad - 75 points** will also be held for FSD as described above, but as a driverless event.

**Trackdrive - 250 points** The Autonomous Vehicles will race in a Track Race over 10 laps on a 300 to 500 metre long coned course.

**Efficiency - 100 points** As in the case of the FSC and FSE, consumption-related points for the efficiency are also added.

**Total: 500 points**

► The Remote Emergency Stop (RES) can be pressed at anytime when the Driverless race cars are running on track. The race car will stop

► Wenn sich die fahrerlosen Fahrzeuge auf der Strecke befinden, kann jederzeit ein Ferngesteuerter Not-Aus-Schalter (RES) aktiviert werden. Der Rennwagen wird anhalten.



► During the TrackDrive event, there is no pilot sitting in the race car.

► Während des TrackDrive-Events sitzt kein Fahrer im Rennwagen.



## Formula Student Driverless (FSD)

Wie bei den anderen beiden FSG-Wettbewerben konkurrieren die Teams bei FSD mit eigens entwickelten Fahrzeugen in den dynamischen und statischen Disziplinen. Im Gegensatz zu FSC und FSE müssen die Fahrzeuge alle dynamischen Disziplinen komplett autonom bewältigen - ohne Fahrer im Fahrzeug. Prinzipiell ist jedoch "normales" Fahren mit einem FSD-Auto durchaus möglich. Bei der Wahl der Art des Antriebsstrangs (elektrisch oder Verbrenner) sind die Teams völlig frei. Die Sicherheitsvorschriften der jeweiligen Fahrzeugklasse müssen jedoch eingehalten werden.

Bei autonomen Fahrzeugen verschiebt sich der Entwicklungsschwerpunkt von reiner Fahrdynamik hin zu einer optimalen Auslegung der autonomen Fahrzeugsysteme auf die jeweilige Fahr-situation. Dies berücksichtigt FSG bei der Beurteilung der FSD-Teams, was Unterschiede bei den statischen und dynamischen Disziplinen sowie eine Umverteilung der erreichbaren Punkte pro Disziplin erfordert. Durch die Beibehaltung möglichst vieler Disziplinen im Vergleich zu FSC und FSE sowie der selben maximal erreichbaren Gesamtpunktzahl bleibt die Vergleichbarkeit aller FSG-Wettbewerbe zumindest teilweise erhalten.

### ► Static Disciplines

In den statischen Disziplinen können die Teams 50 % der Punkte sammeln. Diese Disziplinen sind also entscheidend, um eine gute Gesamtposition zu erreichen.

**Business Plan Presentation - 75 points and Cost Analysis - 100 points** sind identisch zu FSC und FCE.

**Engineering Design - 325 points** Das FSD Engineering Design erhält in Bezug auf die erreichbaren Punkte ein größeres Gewicht und gewinnt damit an Bedeutung für die FSD Teams. Im Gegensatz zu FSC und FSE wird bei der Bewertung des Ingenieurwissens ein deutlicher Fokus auf die autonomen Systeme gelegt.

**Gesamtpunktzahl: 500 points**

### ► Dynamic Disciplines

In den dynamischen Disziplinen können die Teams demnach die anderen 50 % der Punkte einfahren. Bei der Formula Student Driverless ersetzt der so genannte "Track Drive" das Endurance-Rennen und die Disziplin Autocross.

**Acceleration - 75 points and Skid Pad - 75 points** werden wie oben beschrieben ebenfalls für FSD beibehalten, jedoch ohne Fahrer.

**TrackRace - 250 points** Die autonomen Fahrzeuge werden in einem Track Race über 10 Runden auf einem 300 bis 500 Meter langen Kurs fahren.

**Efficiency - 100 points** Wie bei FSC und FSE werden verbrauchsbezogene Punkte für die Effizienz vergeben.

**Gesamtpunktzahl: 500 Punkte**

# Safety Regulations

## Sicherheit und Regeln

A series of safety measures and regulations must be observed for every prototype car competing. This is to ensure safety and a levelled playing field between the teams. It is important as all teams are at different levels, whether it is be different qualifications in terms of experience, personal ability or financial resources. Every car must pass Scrutineering in order to be allowed to participate in the dynamic categories. Teams are awarded various stickers for each safety check they pass. They must be placed on the front of their cars to show it has passed a particular test. For the FSC and FSE series, there are also system-specific differences in terms of operation safety that have to be followed during scrutineering.

Da alle Fahrzeuge Prototypen sind, müssen die Teams eine Reihe von Sicherheitsmaßnahmen und Regeln einhalten. Auf diese Weise wird zudem eine Chancengleichheit zwischen den Teams gewährt, die mit unterschiedlichen Voraussetzungen in Bezug auf Erfahrung, personelle Kapazitäten und finanzielle Ressourcen an den Start gehen. Das erfolgreiche Absolvieren des sogenannten Scrutineerings ist die Grundvoraussetzung für die Zulassung eines Fahrzeugs zu den dynamischen Disziplinen. Für jeden erfolgreich absolvierten Check erhalten die Teams einen Aufkleber, der auf der Fahrzeugnase angebracht werden muss. Bei FSC und FSE gibt es Unterschiede bei der Betriebssicherheit, die beim Scrutineering berücksichtigt werden müssen.





**Accumulator (FSE)**

The 'Accumulator' is a technical term for the battery. It is built up of battery cells that can be connected in various series and parallel configurations. For the electrically powered Formula Student cars, the 'Accumulator' is the sole source of energy that enables the cars to drive. This is critical to safety if it is incorrectly designed or built. To protect for this, it is checked before the teams may compete in the dynamic events. Overheating of the cells can lead to fire. A temperature-logging device is installed by the FSG scrutineers, to ensure that the monitoring of the cell temperature is accurate. The batteries are sealed once the inspection has been carried out. The teams must transport their 'Accumulator' on a specially designed trolley so that it can be moved away should there be any risk of the cells overheating.

**Electrical Scrutineering (only FSE)**

During electrical scrutineering, the electrical safety of the electric car is tested. That means all systems required by the regulations are checked in regard to their functional capacity. For example, system checks include the insulation-monitoring device, correct operation of the signal light (the Tractive System Active Light, which displays the status of the high voltage system) and the sound that indicates that the vehicle is ready to race. In addition, general safety aspects are checked, such as whether the wires have been laid correctly mechanically and whether the high voltage energy storage device is assembled according to regulation.

**Tech and Safety (FSC and FSE)**

For this inspection, all the components and accessories of the racecar that are considered relevant to safety according to the regulations are checked. These include the framework, wheel suspension, steering, braking, rims, and tires. Other details, such as the layout of the fuel lines, the observance of appropriate cockpit size and the correct functioning of the kill switch are all checked. In addition to this, all drivers must show that when in a ready-to-race condition, i.e., strapped in to the driving seat wearing their full racing suit and helmet, they can exit their vehicle within five seconds.

**Tilt Table (FSC and FSE)**

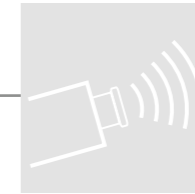
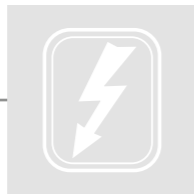
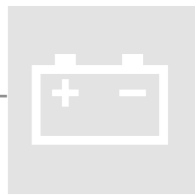
The tilt table test checks whether any operating fluids are leaking and roll-over protection regulations are met. The car must be brought to the test in a ready to race condition, with all fluids and a full tank of petrol. The driver is strapped in and the car is set at an angle of 45 degrees. No fuel or other fluids are allowed to leak out at this angle. After this, the angle is increased to 60 degrees, which corresponds to a lateral acceleration force of 1.7g. The race car only passes this test if the upper wheels remain on the floor.

**Noise Test (only FSC)**

The noise test checks that the car complies with the provisions for the acceptable noise level. In order to measure the volume, the engine is run in neutral at a rotation speed. The speed depends on the type of engine. In neutral, the noise level must not exceed 100 dBC or be any greater than 110 dBC at a specified rotation speed.

**Rain Test (only FSE)**

Rain can lead to critical situations for electric cars. In order to be allowed to operate during rainfall with no reservations, the FSE cars must undergo an artificial rain shower. During the artificial rainfall, the car's high voltage system is activated and the appropriate components can be checked to see if they are sufficiently insulated and protected from water.



**Batterie (FSE)**

Der Akkumulator, kurz Akku, ist der technische Fachbegriff für die Fahrzeugbatterie. Diese besteht aus einer Vielzahl an Zellen, die in Reihe oder parallel geschaltet sind. Für elektrische Formula Student Fahrzeuge ist der Akku die einzige Energiequelle, die das Fahrzeug antreibt. Daher ist der korrekte Aufbau des Bauteils essentiell für die Fahrzeugsicherheit. Um eventuelle Fehlfunktionen und Ausfälle zu vermeiden, werden die Akkus vor den dynamischen Disziplinen genau geprüft. Bei Überhitzung der Zellen kann ein Brand entstehen, weswegen für die genaue Überwachung der Zelltemperatur durch die FSG Scrutineers Temperatursensoren angebracht werden. Die Teams sind zudem dazu verpflichtet, ihre Akkus auf speziellen Wagen fortzubewegen, um im Falle einer Überhitzung schnell abtransportiert werden zu können.

**Electrical Scrutineering (nur FSE)**

Während des Electrical Scrutineerings wird die elektrische Sicherheit der Elektrofahrzeuge überprüft, d.h. alle durch das Regelwerk vorgeschriebenen Systeme werden auf ihre Funktionsfähigkeit getestet. Zu den geprüften Systemen gehören u.a. die Isolationsüberwachung, die korrekte Funktionsweise des Signallichts (Tractive System Active Light, das die Aktivität des Hochvolt-Systems anzeigt) und der Signalton, der die Fahrbereitschaft des Fahrzeugs signalisiert (Ready To Drive Sound). Es werden aber auch allgemeine Sicherheitsaspekte wie z.B. mechanisch einwandfrei verlegte Leitungen oder der regelkonforme Einbau des Hochvolt-Energiespeichers überprüft.

**Tech and Safety (FSC und FSE)**

Bei dieser Abnahme werden alle sicherheitsrelevanten Bau- und Zubehörteile des Rennwagens, die durch das Regelwerk vorgeschrieben werden, geprüft. Dazu gehören unter anderem die Rahmenstruktur, die Radaufhängung, Lenkung, Bremsen, Felgen und Reifen. Auch Details wie die Verlegung der Kraftstoffleitungen, die Befestigung des Ansaugsystems, die Einhaltung der Cockpitgröße oder die korrekte Funktionsweise der Not-schalter werden geprüft. Zusätzlich müssen alle Fahrer zeigen, dass sie in einem fahrfertigen Zustand, d.h. voll eingekleidet und angegurtet, das Auto innerhalb von fünf Sekunden verlassen können.

**Tilt Table (FSC und FSE)**

Beim Tilt Table Test wird überprüft, ob keine Betriebsflüssigkeiten austreten und die Regularien zum Überrollschutz erfüllt werden. Die Fahrzeuge müssen startklar, mit allen Flüssigkeiten und vollgetankt, zum Test gebracht werden. Das Fahrzeug mit angeschnalltem Fahrer wird bis zu einem Winkel von 45 Grad geneigt. Bei diesem Winkel dürfen kein Kraftstoff oder andere Flüssigkeiten austreten. Danach wird die Neigung auf 60 Grad erhöht, was einer Querbeschleunigung von 1,7 g entspricht. Nur wenn die oberen Räder auf dem Boden bleiben, besteht der Rennwagen den Tilt Table Test.

**Noise Test (nur FSC)**

Der Noise Test überprüft, ob das Fahrzeug den Vorschriften für die Einhaltung des Lärmpegels entspricht. Dazu wird bei laufendem Motor im Leerlauf, bei einer durch die Bauart des Motors vorgeschriebenen Drehzahl, die Lautstärke gemessen. Der Lärmpegel darf dabei im Leerlauf nicht höher als 100 dBC und nicht höher als 110dBC bei der vorgeschriebenen Drehzahl sein.

**Rain Test (nur FSE)**

Regen kann bei Elektrofahrzeugen zu kritischen Situationen führen. Damit die FSE-Fahrzeuge auch bei Niederschlägen vorbehaltlos fahren können, müssen sie sich einem künstlichen Regenschauer unterziehen. Während der künstlichen Beregnung des Fahrzeuges wird bei aktiviertem Hochvolt-System kontrolliert, ob die verwendeten Komponenten ausreichend isoliert und gegen Regen geschützt sind.

Tilt Table  
Kipptisch

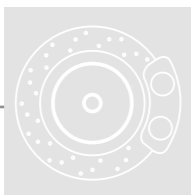




Brake test  
Bremstest

### Brake Test (FSC and FSE)

The brake test checks whether a braking system is able to lock all four wheels of the car simultaneously and bring the vehicle to a controlled stop. However, since the FSE cars can also use their electric motor braking system, if the driver is operating an electric vehicle, in addition they must deactivate the high voltage system after accelerating and then come to a complete stop with all four wheels locked in order to demonstrate that the mechanical braking system functions properly in the case of a fault in the high voltage system.



### Brake Test (FSC und FSE)

Der Bremstest dient zur Überprüfung, ob das Bremssystem in der Lage ist, alle vier Räder des Fahrzeugs gleichzeitig zu blockieren und dadurch das Fahrzeug zu einem kontrollierten Stillstand zu bringen. Die FSE-Fahrzeuge können den elektrischen Antrieb auch zum Bremsen verwenden. Um eine einwandfreie Funktion des mechanischen Bremssystems bei einem Fehler im Hochspannungssystem nachzuweisen, muss der Fahrer nach dem Beschleunigen das Hochvoltsystem deaktivieren und anschließend mit vier blockierenden Rädern zum Stehen kommen.

### Brake Test (FSD)

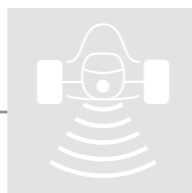
Formula Student Driverless cars are equipped with an Emergency Brake System (EBS). This is actuated via the Remote Emergency System (EBS). This must be tested in order for the FSD cars to pass the brake test.

### Brake Test (FSD)

Formula Student Driverless Fahrzeuge sind mit einem Notfallbremssystem (EBS) ausgestattet, welches durch eine Fernbedienung aktiviert werden kann. Um den FSD Brake Test zu bestehen, muss die Funktionsfähigkeit des EBS per Fernbedienung nachgewiesen werden.

### Driverless Inspection (FSD only)

In order to guarantee the safety of the autonomous vehicles in the operation and handling for all parties concerned, the team must fulfill some special requirements. Each vehicle must be equipped with a so-called RES (Remote Emergency System), which fulfills two functions. By means of this remote control, the required emergency brake system (EBS) can be triggered and the vehicle can be stopped in emergency situations. At the same time, the RES control system enables the "Go" signal to be sent to the vehicle at the start of the dynamic disciplines. Furthermore, all FSD vehicles are equipped with different coloured signal lamps, which indicate the respective operating states of the vehicle. In autonomous mode, a yellow signal is illuminated, whilst a blue light indicates the status of the RES. These systems must be tested during the Driverless Inspection.



### Driverless Inspection (nur FSD)

Um die Sicherheit der autonomen Fahrzeuge bei der Bedienung und Handhabung für alle Beteiligten zu gewährleisten, muss das Team einige besondere Anforderungen erfüllen. Jedes Fahrzeug muss mit einem sogenannten RES (Remote Emergency System) ausgestattet sein, das zwei Funktionen erfüllt. Mit dieser Fernbedienung kann das erforderliche Notbremssystem (EBS) ausgelöst und das Fahrzeug in Notsituationen angehalten werden. Gleichzeitig ermöglicht das RES-Steuerungssystem, dass das "Go"-Signal zu Beginn der dynamischen Disziplinen an das Fahrzeug gesendet wird. Darüber hinaus sind alle FSD-Fahrzeuge mit verschiedenfarbigen Signallampen ausgestattet, die die jeweiligen Betriebszustände des Fahrzeugs anzeigen. Im autonomen Modus leuchtet ein gelbes Signal, während ein blaues Licht den Status des RES anzeigt. Diese Systeme müssen während der Driverless Scrutineering getestet werden.

### Adherence to the Rules

Vehicles must conform to regulations and, from a technical point of view, be safe at all times, even after passing scrutineering. The authorised technical experts or the race stewards can remove a car from the competition at any time in the case of a breach of regulation or safety requirements, for example, if a car is leaking fluids, is too loud, or if the insulation is not up to standard.

The car cannot return to the competition until the fault has been repaired. Cars are also inspected again following the endurance race in order to exclude the possibility of a violation during the race. This is why the cars are placed in a parc fermé after the endurance competition, and the team members are not permitted to touch them until all the inspections have been successfully performed.

### Geltungsbereich

Die Fahrzeuge müssen auch nach bestandenerm Scrutineering zu jeder Zeit regelkonform und sicherheitstechnisch unbedenklich sein. Die offiziellen technischen Sachverständigen oder die Rennleitung können Fahrzeuge bei einem Verstoß gegen das Reglement oder die Sicherheitsanforderungen jederzeit aus dem Wettbewerb nehmen, z.B. wenn Flüssigkeiten austreten, das Fahrzeug zu laut oder die elektrische Isolation nicht gewährleistet ist. Die Fahrzeuge können erst dann wieder am Wettbewerb teilnehmen, wenn der

Mangel behoben wurde. Nach dem Endurance-Rennen werden die Fahrzeuge erneut geprüft, um Regelverstöße während des Rennens ausschließen zu können. Hierfür werden die Fahrzeuge in einem „Parc-Fermé“ abgestellt und dürfen von den Teammitgliedern solange nicht mehr berührt werden, bis die letzte Abnahme erfolgt ist.

Technical inspection  
Technische Abnahme



It is critical for safety that the students understand the meaning of the different flags.

Aus Sicherheitsgründen ist es essentiell, dass die Studierenden die Bedeutung der verschiedenen Flaggen kennen.



### ► Flaggen

Bei den dynamischen Prüfungen werden zur Kommunikation mit den Fahrern Flaggen eingesetzt. Die verschiedenen Farben und Muster haben unterschiedliche Bedeutungen. Alle Fahrer müssen die Flaggen kennen und beachten, wenn sie diese während des Wettbewerbs gezeigt bekommen. Verstöße gegen geschwenkte Flaggen können mit verschiedenen Sanktionen geahndet werden, die von Zeitstrafen bis zur Disqualifikation reichen können.

### ► Flags

During the dynamic events, flags are used to communicate with the drivers. The various colours and patterns have different meanings, and all drivers must understand and obey any flag signal they receive during the competition. Infringements of flag signals can be penalised with various penalties, ranging from time penalties to disqualification.



Your session has started, enter the course!  
Deine Fahrt beginnt. Fahr auf die Strecke!



Come to an immediate safe controlled stop on the course! Pull to the side of the course.  
Komm sofort kontrolliert zum Stehen. Halte die Strecke frei.



Your session has been completed. Exit the course!  
Deine Fahrt ist beendet. Verlass die Strecke!



Something is on the track that should not be there. Be prepared for evasive maneuvers to avoid debris or liquids!  
Es ist etwas Unerwartetes auf der Strecke. Sei bereit Flüssigkeiten oder Bruchstücken auszuweichen!



Pull into the passing zone to be passed by a faster competitor!  
Fahr in die Überholzone, damit ein schnelleres Fahrzeug passieren kann!



Something has happened beyond the flag station. No passing unless directed by the track marshals. Stationary: Danger! Slow down, be prepared to take evasive action. Waved: Great Danger! Slow down, evasive action is most likely required, be prepared to stop. Etwas ist jenseits der Flagge passiert. Fahr nicht vorbei ohne Anweisung der Streckenposten. Flagge gehalten: Gefahr! Fahr langsam, sei bereit zum Ausweichen. Flagge geschwenkt: Große Gefahr! Fahr langsam. Ausweichen wird erforderlich sein. Sei bereit anzuhalten.



Pull into the penalty box for discussion concerning an incident that may cause a time penalty!  
Fahr in die Kontrollzone zur Diskussion eines Vorfalls! Ggf. Zeitstrafe!



Pull into the penalty box for a mechanical inspection of your car!  
Fahr in die Kontrollzone für eine Untersuchung des Fahrzeugs!

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Lutz Bürkle, project manager driver assistance systems at Bosch

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## Autonomous Racing Workshop



### It's not only about going faster. It's about getting smarter!

In 2017 only three teams participated in the new driverless discipline at Formula Student Germany in Hockenheim. However, Formula Student is an event that is mainly characterized by the competition itself - that's what the "e-ognition" team from Hamburg thought when they decided to provide a creative environment for an intensive exchange between the Formula Student Driverless Teams. The result was the first "Autonomous Racing Workshop", which took place from 23rd to 25th February 2018 at the Technical University of Hamburg. It consisted of two days full of discussions, 35 exciting topics and 110 participants from 15 Formula Student Driverless Teams.

2017 sind bei der Formula Student Germany in Hockenheim in der neuen Driverless Disziplin drei Teams an den Rennstart gegangen. Allerdings ist Formula Student ein Wettbewerb, der von der Konkurrenz lebt - das dachte sich das Team „e-ognition“ aus Hamburg und entschied sich kurzerhand dafür, eine kreative Umgebung für einen intensiven Austausch unter den Formula Student Driverless Teams zu bieten. Heraus kam dabei der erste „Autonomous Racing Workshop“, der vom 23.-25. Februar 2018 an der TU Hamburg stattfand: Zwei diskussionsreiche Workshop-Tage, 35 spannende Themen und 110 Teilnehmer aus 15 Formula Student Driverless Teams.

The aim of the workshop was to create a solid platform for content exchange between the teams. Focus was not given on discussing finalised concepts, but on the exchange of ideas and open talks about whether their ideas and innovations are functional and feasible.

Ziel des Workshops war es, eine solide Plattform für den inhaltsstarken Austausch der Teams zu schaffen. Dabei stand nicht die Diskussion über ausgereifte Konzepte im Fokus - für die Studierenden sollten erste Ideen im Mittelpunkt stehen sowie das offene Gespräch darüber, ob die angebrachten Ideen und Impulse funktional und realisierbar sind.

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Technical lectures by the companies Ibeo and NXP also offered the students the opportunity to "think outside the box".

Wettbewerb persönlich – man kann in den direkten Austausch gehen und sich gegenseitig helfen.

Technische Fachvorträge von den Unternehmen Ibeo und NXP boten den Studierenden zusätzlich die Möglichkeit „über den Tellerrand hinaus zu blicken“.

The organizing team around Nils Albrecht looked back satisfied about the output of workshop and would like to provide the relaxed workshop atmosphere for the Formula Student Driverless Teams again next winter.

"Most of the participants were enthusiastic about the concept and were able to benefit a lot".



**„Wenn es im Wettkampf keine Konkurrenz gibt, wird man nie die Leistung bringen, die das technische Limit widerspiegelt – es ist einfach nicht notwendig.“**

Nils Albrecht,  
Leitung Driverless 2017, Team  
„e-gnition“ aus Hamburg



This success story shows that it is the team spirit that makes the FSG competition very special and unique. Competing with each other requires pushing each other to the limit in order to demand the ultimate challenge. Because as Nils Albrecht said: "Competition is encouraging the business" //

Das Organisationsteam rund um Nils Albrecht blickt auf einen zufriedenstellenden Workshop zurück und möchte auch im kommenden Winter erneut eine entspannte Workshop-Atmosphäre für die Formula Student Driverless Teams bereitstellen. „Die meisten Teilnehmer waren vom Konzept ziemlich begeistert und haben viel aus der Sache mitgenommen“.

Diese Erfolgsgeschichte zeigt, dass es der Teamgeist ist, der den FSG-Wettbewerb zu etwas ganz besonderem macht. Im Wettbewerb zueinander stehen, heißt auch, sich gegenseitig zu fördern – um sich

schlussendlich zu fordern. Denn wie Nils Albrecht so schön gesagt hat: „Konkurrenz belebt das Geschäft“ //

The agenda of the workshop was consciously held open thus giving the participants the opportunity either to participate on a topic as an expert or alternatively as someone, there to learn. As part of the registration, the students could offer to lecture on a topic, however, this did not prevent them from speaking up about their team concerns.

Der bewusst offen gestaltete Workshopcharakter bot den Teilnehmern die Chance, an einem Thema als Experte oder alternativ als Lernender teilzunehmen. Die Studierenden hatten die Möglichkeit, im Rahmen ihrer Registrierung ein Thema anzubieten, über das man referieren wollte – aber auch vor Ort bestand noch die Chance, Teambelange und Themenschwerpunkte einzubringen.

At the workshop, the competition was of secondary importance; it was about increasing the overall level for all Formula Student Driverless teams.



**„If there are no competitors, you will never perform at the technical limit - it is just not necessary.“**

Nils Albrecht,  
Head of Driverless 2017, team  
"e-gnition" from Hamburg



"Formula Student is a competition – and will continue to be so in the future. But if all the teams get a few more ideas to improve themselves and to become faster in the end, the competition will be even more exciting", said Nils Albrecht. The team from Hamburg gave great importance to the fact that the workshop is an event from teams for teams. The topics of the students and the discussion of solutions, as well as networking, were the focus. Thanks to the workshop, the teams will know each other in person even before the next FSG competition - they can have a direct exchange and help each other.

Für die Teams stand nicht der Wettbewerbsgedanke im Vordergrund. In erster Linie ging es darum, gesamtthaft das Niveau für alle Formula Student Driverless Teams zu steigern. „Formula Student ist ein Wettbewerb – und das bleibt auch so. Aber wenn man allen Teams ein paar mehr Ideen mitgibt und diese gemeinsam Inhalte erarbeiten lässt, die dabei unterstützen, dass alle besser und schneller werden, dann wird der Wettbewerb noch viel spannender“, so Nils Albrecht. Dabei hat das Team aus Hamburg Wert darauf gelegt, dass es sich bei dem Workshop um ein Event

von Teams für Teams handelt. Die Themen der Studierenden und das Besprechen von Lösungswegen stand im Vordergrund, ebenso wie das Netzwerken. Die Teams kennen sich dank des Workshops bereits vor dem nächsten FSG





Formula Student	Combustion	Electric	Driverless	
<b>OVERALL</b>	1st Place Overall	SUN	SUN	SUN
	2nd Place Overall	SUN	SUN	SUN
	3rd Place Overall	SUN	SUN	SUN
<b>DYNAMICS</b>	Acceleration Winner	SAT	SAT	SAT
	Autocross Winner	SAT	SAT	-
	Endurance Winner	SUN	SUN	-
	Most Fuel/Energy Efficient Car	SUN	SUN	SAT
	Skid Pad Winner	SAT	SAT	SAT
	TrackDrive Winner	-	-	SAT
<b>STATICS</b>	Business Plan Presentation Winner	SAT	SAT	SAT
	Cost and Manufacturing Winner	SAT	SAT	SAT
	Engineering Design Winner	SAT	SAT	SAT
<b>SPECIAL AWARDS</b>	FSC MTU Most Innovative Powertrain System Award	SAT	-	-
	FSE Daimler e-Drive Technology Award	-	SAT	-
	FSG BASF Best Use of Fiber Reinforced Plastics Award	SAT	-	-
	FSG Kube Best IAD Award	SAT	-	-
	FSG Siemens Digital Twin Engineering Excellence Award	SAT	-	-
	FSG Sportsmanship Award		SUN	

STATUS/STAND: 20.07.2018

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## Schedule 2018



### Mon, 6th of August

08:00	Technical Inspection-, Registration- & Entrance Order Available	14	Ticket Centre
08:30 - 10:00	Registration for 18 DV + 2 EV Teams, ASR, ESO, Drivers	14	Ticket Centre
10:00 - 12:00	Entrance for 18 DV + 2 EV Team Vehicles + 7 Members	8	Pits
10:00 - 22:00	Charging Tent available	2	Charging Tent
10:00 - 24:00	DV & EV Pits available	8	Pits
12:00 - 19:00	DV & EV Technical Inspections (A, D, E, M & P)	2 + 8	Charging Tent, Pits, Venue
13:00 - 15:00	Registration for 38 EV Teams, ESO & Drivers	14	Ticket Centre
15:00 - 20:00	Entrance for 38 EV Team Vehicles + 7 Members	8	Pits

### Tue, 7th of August

07:00 - 22:00	Charging Tent	2	Charging Tent
07:00 - 24:00	DV & EV Pits available	8	Pits
07:45 - 12:30	Event Control	5	Event Control
08:00 - 12:15	DV & EV Technical Inspections (A, D, E, M & P)	2 + 3	Charging Tent, Dynamic Area, Venue
13:00 - 19:00	DV Engine Test (on request)	3	Dynamic Area
13:00 - 19:00	Technical Inspections (A, D, E, M & P), Tilt, Rain, Noise, Brake	2 + 3	Charging Tent, Dynamic Area, Venue
14:00 - 16:30	Registration for 60 CV Teams	14	Ticket Centre
14:00 - 19:00	Event Control	5	Event Control
15:30 - 19:00	Entrance for all CV Team Vehicles + All Members		Venue
15:30 - 24:00	All Pits & Recreation Tent available	8 + 10	Pits, Recreation Tent
16:00 - 19:00	CV Driver Registration	5	Event Control
21:00 - 22:00	Team Welcome	7	Marquee above pits

### Wed, 8th of August

06:00 - 22:00	Charging Tent	2	Charging Tent
06:00 - 24:00	Pits & Recreation Tent available	8 + 10	Pits, Recreation Tent
07:45 - 12:30	Event Control	5	Event Control
07:45 - 18:00	Ticket Centre	14	Ticket Centre
08:00 - 13:00	Technical Inspections (A, D, E, M & P), Tilt, Rain, Noise, Brake	2 + 3	Charging Tent, Dynamic Area, Venue
09:00 - 19:00	DV Emergency Brake System (EBS) Test	12	Start/Finish Line
09:00 - 19:00	Engine Test	4	Engine Test Area
10:45 - 18:00	FSG Academy On Site	11	South Stand
11:00 - 17:30	DV & EV Business Plan Presentation	1 + 9	BW Tower, Ravenol Tower
11:00 - 18:00	CV Special Awards	6	FSG Forum
11:00 - 18:50	DV & EV Cost Analysis, Engineering Design	7	Marquee above pits
13:00 - 20:00	DV & EV Team Photos	7	Marquee above pits
14:00 - 19:00	Event Control	5	Event Control
14:00 - 19:00	Technical Inspections (A, D, E, M & P), Tilt, Rain, Noise, Brake	2 + 3	Charging Tent, Dynamic Area, Venue
20:00 - 21:00	DV & EV Business Plan Presentation Finals	7	Marquee above pits

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# MAHLE

## Schedule 2018



### Thu, 9th of August

06:00 - 18:30	Recreation Tent available	10	Recreation Tent
06:00 - 22:00	Charging Tent	2	Charging Tent
06:00 - 24:00	Pits available	8	Pits
07:45 - 12:30	Event Control	5	Event Control
07:45 - 18:00	Ticket Centre	14	Ticket Centre
08:00 - 13:00	Technical Inspections (A, D, E, M & P), Tilt, Rain, Noise, Brake	2 + 3	Charging Tent, Dynamic Area, Venue
09:00 - 16:00	DV Emergency Brake System (EBS) Test	12	Start/Finish Line
09:00 - 16:15	FSG Academy On Site	11	South Stand
09:00 - 19:00	Engine Test	4	Engine Test Area
09:00 - 20:00	CV, EV, DV Practice Track	3	Dynamic Area
09:15 - 16:35	CV Cost Analysis, CV Engineering Design	7	Marquee above pits
09:30 - 16:00	CV Business Plan Presentation	1 + 9	BW Tower, Ravenol Tower
09:30 - 17:15	EV Special Awards	6	FSG Forum
11:15 - 17:30	CV Team Photos	7	Marquee above pits
14:00 - 19:00	Event Control	5	Event Control
14:00 - 19:00	Technical Inspections (A, D, E, M & P), Tilt, Rain, Noise, Brake	2 + 3	Charging Tent, Dynamic Area, Venue
17:15 - 18:15	Staging for Panoramic Photograph	12	Start/Finish Line
19:15 - 21:45	DV Engineering Design Finals (not public)	10	Recreation Tent
19:15 - 21:45	EV Engineering Design Finals (not public)	6	FSG Forum
19:30 - 20:30	CV Business Plan Presentation Finals	7	Marquee above pits

### Fri, 10th of August

06:00 - 22:00	Charging Tent	2	Charging Tent
06:00 - 24:00	Pits & Recreation Tent available	8 + 10	Pits, Recreation Tent
07:15 - 12:30	Event Control	5	Event Control
07:15 - 18:00	Ticket Centre	14	Ticket Centre
07:30 - 07:50	Team Briefing	7	Marquee above pits
08:00 - 12:00	Inspections (A, D, E, M & P), Tilt, Rain, Noise, Brake (on request)	2 + 3	Charging Tent, Dynamic Area, Venue
08:30 - 12:30	CV & EV Practice Track	3	Dynamic Area
08:30 - 14:30	CV & EV Skid Pad	3	Dynamic Area
08:30 - 18:30	CV & EV Small Practice Track / Engine Test	3	Dynamic Area
09:00 - 10:00	Design Review	7	Marquee above pits
09:00 - 18:00	FSG Academy On Site	11	South Stand
09:30 - 13:30	DV Acceleration	12	Start/Finish Line
10:00 - 12:00	Design Feedback: Judges available	7	Marquee above pits
11:00 - 11:45	Press Guided Tour	1	Assembly at entrance BW Tower
12:00 - 12:45	Press Conference	1	BW Tower, 4.floor
12:30 - 14:00	DV Practice Track	3	Dynamic Area
13:00 - 14:00	VIP Reception	1	BW Tower, 5.floor
13:00 - 18:00	Inspections (A, D, E, M & P), Tilt, Rain, Noise, Brake (on request)	2 + 3	Charging Tent, Dynamic Area, Venue
14:00 - 18:30	CV & EV Practice Track	3	Dynamic Area
14:00 - 19:00	Event Control	5	Event Control
14:30 - 19:00	CV & EV Acceleration	12	Start/Finish Line
15:00 - 18:30	DV Skid Pad	3	Dynamic Area
18:30 - 20:00	DV Practice Track	3	Dynamic Area
18:30 - 21:00	CV Engineering Design Finals (not public)	6	FSG Forum

Jonas von Malottki Controlling Solutions and Business Intelligence, Germany (Stuttgart);  
 Hortense Denise Kirby HR Business Partner, USA (Dallas/Fort Worth);  
 Yu Chang Engineering Support Office, China (Beijing)



Every day a new chapter. That's how we write history. That's us.

Digitalization, electric mobility, autonomous driving, shared economy – all these factors change the industry tremendously. Therefore it is even more important to support top talents and to exchange ideas with them. We want to develop the best products together – today and in the future. For this, Formula Student offers a perfect platform.

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# Schedule 2018



## Sat, 11th of August

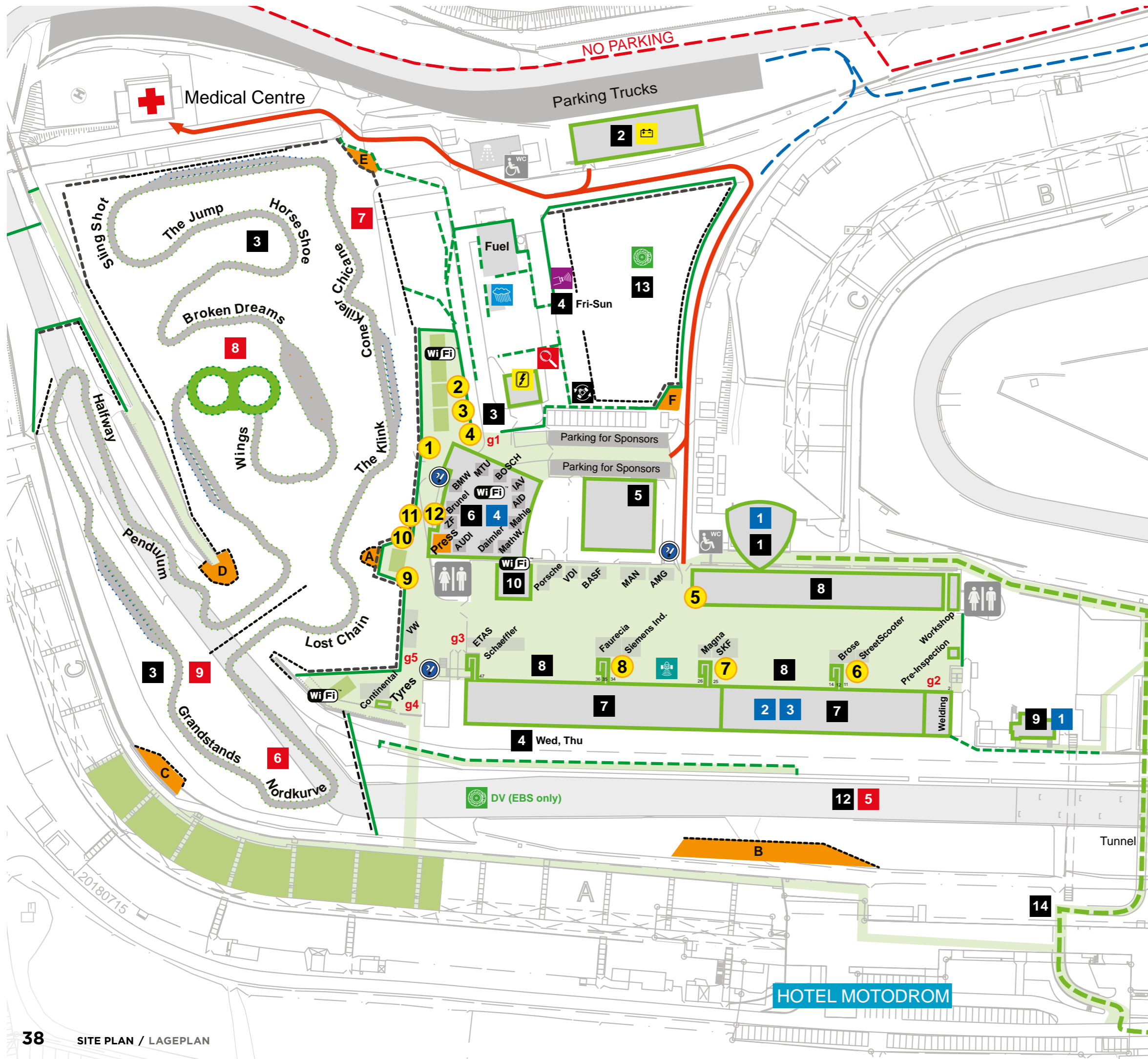
06:00 - 22:00	Charging Tent	2	Charging Tent
06:00 - 24:00	Pits available	8	Pits
07:15 - 12:30	Event Control	5	Event Control
07:15 - 18:00	Ticket Centre	14	Ticket Centre
07:30 - 07:50	Team Briefing	7	Marquee above pits
08:00 - 08:30	DV Course Walk Trackdrive	3	Dynamic Area
08:30 - 12:30	DV Trackdrive	3	Dynamic Area
08:30 - 18:30	on request: Technical Inspections / Tilt, Brake, Noise, Rain	2+3	Charging Tent, Dynamic Area
08:30 - 19:00	Fuel / Engine Test / CV & EV Small Practice Track	3	Dynamic Area
11:00 - 13:00	Worldwide Formula Student Officials Meeting	1	BW Tower, 4.floor
13:15 - 13:45	CV & EV Course Walk Autocross	3	Dynamic Area
14:00 - 19:00	Event Control	5	Event Control
14:00 - 19:30	CV & EV Autocross	3	Dynamic Area
19:30 - 20:30	Free BBQ powered by VW Group		Venue
21:00 - 22:30	Awards Ceremony - Part I	7	Marquee above pits

## Sun, 12th of August

06:00 - 19:00	Charging Tent	2	Charging Tent
06:00 - 20:00	Pits & Recreation Tent available	8+10	Pits, Recreation Tent
07:15 - 12:30	Event Control	5	Event Control
07:15 - 18:00	Ticket Centre	14	Ticket Centre
07:30 - 07:50	Team Briefing	7	Marquee above pits
08:00 - 08:30	CV & EV Course Walk Endurance	3	Dynamic Area
08:30 - 16:00	Fuel / Engine Test / CV & EV Testing	3	Dynamic Area
08:45 - 13:00	CV & EV Endurance Morning Session & Parc Fermé	3	Dynamic Area
12:00 - 20:00	Dismantling of pits	8	Pits
13:30 - 18:00	CV & EV Endurance Afternoon Session & Parc Fermé	3	Dynamic Area
14:00 - 20:00	Event Control	5	Event Control
21:00 - 22:00	Awards Ceremony - Part II	7	Marquee above pits
22:00 - 24:00	MAHLE-Party	7	Marquee above pits

### Abbreviations

CV - Internal Combustion Engine Vehicle, DV - Driverless Vehicle, EV - Electric Vehicle  
 Technical Inspections (A, D, E & M): Accumulator-, Driverless-, Electrical- & Mechanical Inspection



	Accumulator Inspection
	Electrical Inspection
	Mechanical Inspection
	Driverless Inspection
	Tilt Test & Vehicle Weighing
	Noise Test
	Rain Test
	Brake Test

	Business Plan Presentation
	Cost and Manufacturing
	Engineering Design
	Special Awards
	Acceleration
	Autocross
	Endurance
	Skid Pad
	Trackdrive

Smoking is only allowed in designated areas.

	BW Tower		Pits
	Charging Tent		Ravenol Tower
	Dynamic Area		Recreation Tent
	Engine Test Area		South Stand
	Event Control		Start/Finish Line
	FSG Forum		Test Area
	Marquee Above Pits		Ticket Centre

	Information Sign		Combustion Veh.
	Press Area		Driverless Vehicle
	Stands		Electric Vehicle
	Visitor's Area		Dynamic Gates

formula student germany

# Guided Tours Führungen



## Exploring Formula Student Germany by yourself or on a Guided Tour

Welcome to Formula Student Germany. To help you make the most of your visit, we have prepared a tour for visitors, press and sponsors. You can follow the tour by following the numbered signs across the event site (see map above). If you wish, for a more personal experience, you can also sign up to be guided by one of our experienced tour guides.

## Registering for a guided tour

If you would like to sign up for a guided tour, please head to the counter in the FSG forum, where you will be able to get more information on the timetable for the daily tours.

## Exploring on your own

The information signs are numbered 1 to 12. Following them in order will take you from the large dynamic area to the technical inspection and then on to the pit lane. Along the way you will learn about the history of the competition as well as the different competitions running in parallel (Combustion, Electric, Driverless). Don't be shy to ask team members anything you would like to know about their car, however, please remember they are participating in a competition, so make sure not to hinder them! From the pit lane, the tour takes you back to the large dynamic area. The tour will finish back at the FSG Forum, where you will be able to learn more about the background of the participants competing at Formula Student Germany 2017.

A special bonus for smartphone users: try scanning the QR-code on each sign to get more in-depth information, including an audio guide. //

## Entdecken Sie die Formula Student Germany auf eigene Faust oder gerne auch als geführte Tour.

Herzlich Willkommen bei der Formula Student Germany! Um das Beste aus Ihrem Besuch zu machen, haben wir verschiedene Touren für Besucher, Presse oder Sponsoren vorbereitet. Die Tour verläuft entlang nummerierter Event-Stationen, quer über das Wettbewerbsgelände (siehe Karte). Für eine noch persönlichere Erfahrung können Sie sich gerne für eine geführte Tour bei einem unserer erfahrenen Tourguides anmelden.

## Registrierung für eine geführte Tour

Wenn Sie sich für eine Führung anmelden möchten, wenden Sie sich bitte an den Counter im FSG Forum. Dort bekommen Sie weiterführende Informationen über die Uhrzeiten der täglichen Führungen.

## FSG auf eigene Faust

Wenn Sie den Schildern der Reihe nach folgen (1-12), gelangen Sie vom großen fahrdynamischen Bereich (Dynamic Area) über die technische Abnahme (Technical Inspection) in die Boxengasse (Pit Lane). Auf dem Weg werden Sie einiges über die Geschichte des Events sowie die unterschiedlichen parallel stattfindenden Wettbewerbe (Combustion, Electric und Driverless) in Erfahrung bringen können. Nutzen Sie die Gelegenheit und stellen den Teammitgliedern gerne jede Frage, die Ihnen auf der Seele brennt. Vergessen Sie dabei aber bitte nicht, dass sich die Studierenden im Wettkampf befinden und nicht behindert werden sollten. Von der Pit Lane führt die Tour zurück zum großen fahrdynamischen Bereich und endet am FSG Forum. Hier angekommen, warten noch weitere Informationen zum Hintergrund der Formula Student Teilnehmer auf Sie.

Ein kleiner Bonus für Smartphone Besitzer: Scannen Sie gerne die QR-Codes an den Event-Schild entlang der Tour, um zusätzliche Detail-Informationen zu erhalten. //



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## The Volunteers of FSG

### Die Ehrenamtlichen der FSG

It takes around 450 volunteers to bring Formula Student Germany to life every year. The team of volunteer's function like a well-oiled machine, tackling the ever-growing challenges of the annual event with honed skill and passionate dedication.

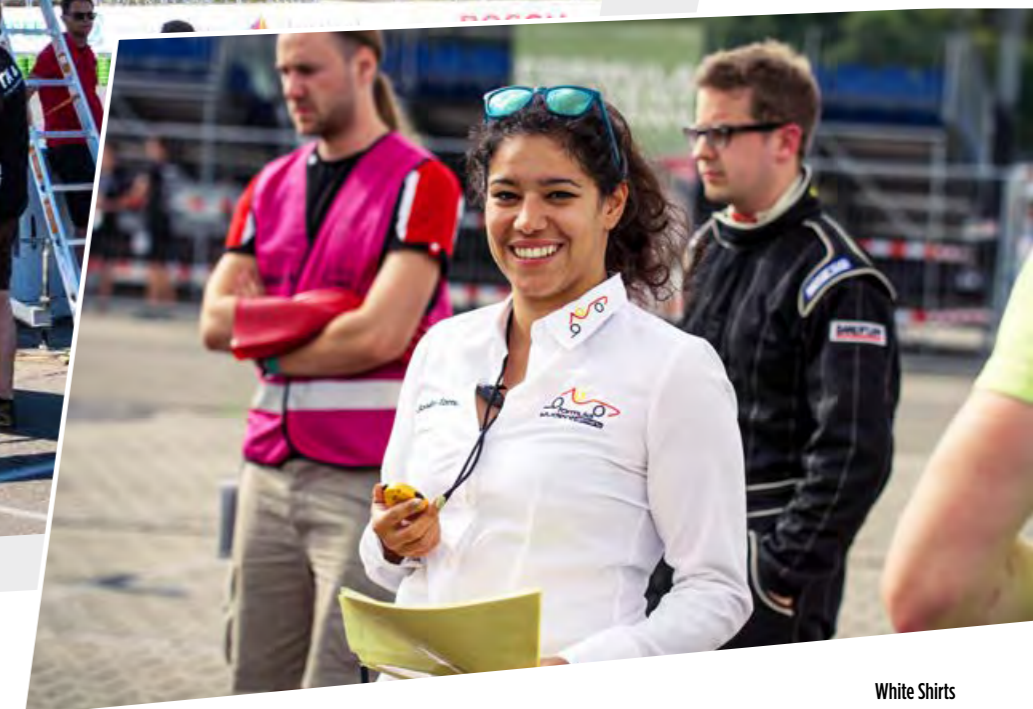
The volunteers are divided into different groups according to their skill set. For example, there are the *scrutineers*, the *judges*, the *red shirts* and the *white shirts*. These are people who handle the many tasks of planning, organising and running the event, as well as helping out and answering questions. The colour of their shirt will tell you what their role is at FSG.

Über 450 ehrenamtliche Helfer sind Jahr für Jahr an der Organisation und der Umsetzung der Formula Student Germany beteiligt. Wie eine gut geölte Maschine meistern sie mit Leidenschaft und Engagement die stetig wachsenden Herausforderungen, die das Event jedes Jahr aufs Neue mit sich bringt.

Das eingespielte Team setzt sich aus verschiedenen Funktionsbereichen zusammen. So gibt es beispielsweise die *Scrutineers*, die *Juroren*, die *Red-Shirts* und die *White-Shirts*, welche die Vielzahl an Aufgaben beim Planen, Organisieren und bei der Umsetzung vor Ort bewältigen und welche stets für Fragen rund um das Event zur Verfügung stehen. Anhand der Farbe ihres Shirts kann man leicht ihre Rolle bei der FSG erkennen.



TimeKeeping  
Die Zeitmessung



White Shirts

The **white shirts** are in charge of the yearlong task of planning the event and of ensuring that everything falls into place as it should on race day. They are the “go-to” people for sponsors, press, participants and visitors and they ensure that the competition runs without a hitch.

The **red shirts** have jurisdiction over event control and event support. The support team takes care of building up and taking down of every physical transformation that turns the

Die **White-Shirts** sind für die ganzjährige Planung der Veranstaltung und deren reibungslose Umsetzung an den Renntagen verantwortlich. Sie sind Ansprechpartner für Sponsoren, Medienvertreter, Teilnehmer und Besucher und stellen sicher, dass der Wettbewerb ohne Komplikationen verläuft.

Die **Red-Shirts** sind für die Bereiche „Event Control“ und „Event Support“ zuständig. Das Support-Team kümmert sich um den Auf- und Abbau aller infrastrukturellen Bestandteile, die den Hockenheimring in die Formula Student

Germany verwandeln. Sie sind die fleißigen Helfer, welche sicherstellen, dass das Event ohne Störungen verläuft. Darüber hinaus kommen die ehrenamtlichen Helfer als Streckenposten während der dynamischen Disziplinen zum Einsatz. Zudem besetzen sie das Event Control-Team und bilden damit die Schnittstelle zwischen Besuchern, Teammitgliedern, Sponsoren und Medienvertretern. Sie sorgen dafür, dass niemand hilflos auf dem Gelände zurückbleibt. Die **Red-Shirts** stellen insgesamt die größte Gruppe ehrenamtlicher Helfer bei der FSG dar. Nur durch ihre Hilfe ist es überhaupt möglich, die vielseitigen und mitunter spontanen Herausforderungen während des Events zu meistern.

Hockenheim Ring into Formula Student Germany. We need them to ensure that the event runs smoothly. They also act as the track marshals during dynamic events. They are in charge of the event control team, serving as intermediaries between visitors, team members, sponsors and press, so that nobody on the FSG grounds can get left lost or stranded. The **red shirts** are the largest group of volunteers at FSG and are the ones who will do what it takes to overcome any challenges that might be faced during the event.

The **scrutineers** - the folks in green- are there to guarantee that all the vehicles are safe. They accomplish this by meticulously checking the cars for potential safety hazards and patiently assisting the teams with any technical problems (at the event as well as throughout the year). A team may not participate in the dynamic events without receiving the go-ahead from our green-shirted volunteers.

Since FSG is essentially a design competition, a team's scoring in the static disciplines is a big factor in its overall standing. It is the job of the **judges** in their blue shirts to render these scorings. They look at the design, manufacturing quality and cost planning; they consider the economics of the project and whether the business plan is convincing. For this, they utilize their professional expertise, indispensable honesty and constructive criticism. Their feedback has resulted in the extensive improvements from the teams over the past years.

Behind the scenes we have the IT experts, who are tasked with timekeeping during the dynamic disciplines as well as ensuring that all teams are given a fair and equal assessment. Not only this, but it is thanks to them that everyone at FSG can enjoy a high-speed Internet connection throughout the entire event site!

Finally, we have the FSG media team, whose contributions through their video and image materials of exceptional quality and creativity, allow us to relive the most stunning and unforgettable moments of the event again and again, long after the smoke from the tires of the race cars has cleared.

It is our great pleasure to prepare a week of incomparable FSG excitement and entertainment for visitors and sponsors alike, for veteran participants and for those who are entering the event for the first time.

This year, we are happy to once again be at your service with advice and assistance!

Die **Scrutineers** - die „Jungs in Grün“ - stellen die Sicherheit aller teilnehmenden Fahrzeuge sicher. Sie überprüfen die Boliden der Teilnehmer akribisch genau auf etwaige Sicherheitsmängel und stehen den Teams bei technischen Problemen mit ihrer Expertise helfend zur Seite (sowohl am Event selbst, wie auch während des Jahres). Als Team darf man ohne die Freigabe unserer grün gekleideten Helfer nicht an den dynamischen Disziplinen teilnehmen.

Da es sich bei der FSG im Wesentlichen um einen Konstruktionswettbewerb handelt, tragen die statischen Disziplinen in erheblichem Maße zur Gesamtwertung bei. Die in blau gekleideten **Juroren** bewerten die Entwicklung, Fertigungsgüte sowie das Kostenbewusstsein der Studenten. Sie betrachten die Wirtschaftlichkeit des Gesamtprojektes ebenso wie die Präsentation der detaillierten Geschäftspläne und nutzen dabei ihre Expertise und unvergleichlich ehrlich sowie konstruktive Kritik, welche bereits in vergangenen Jahren positiv zur Weiterentwicklung der Studenten beigetragen hat.

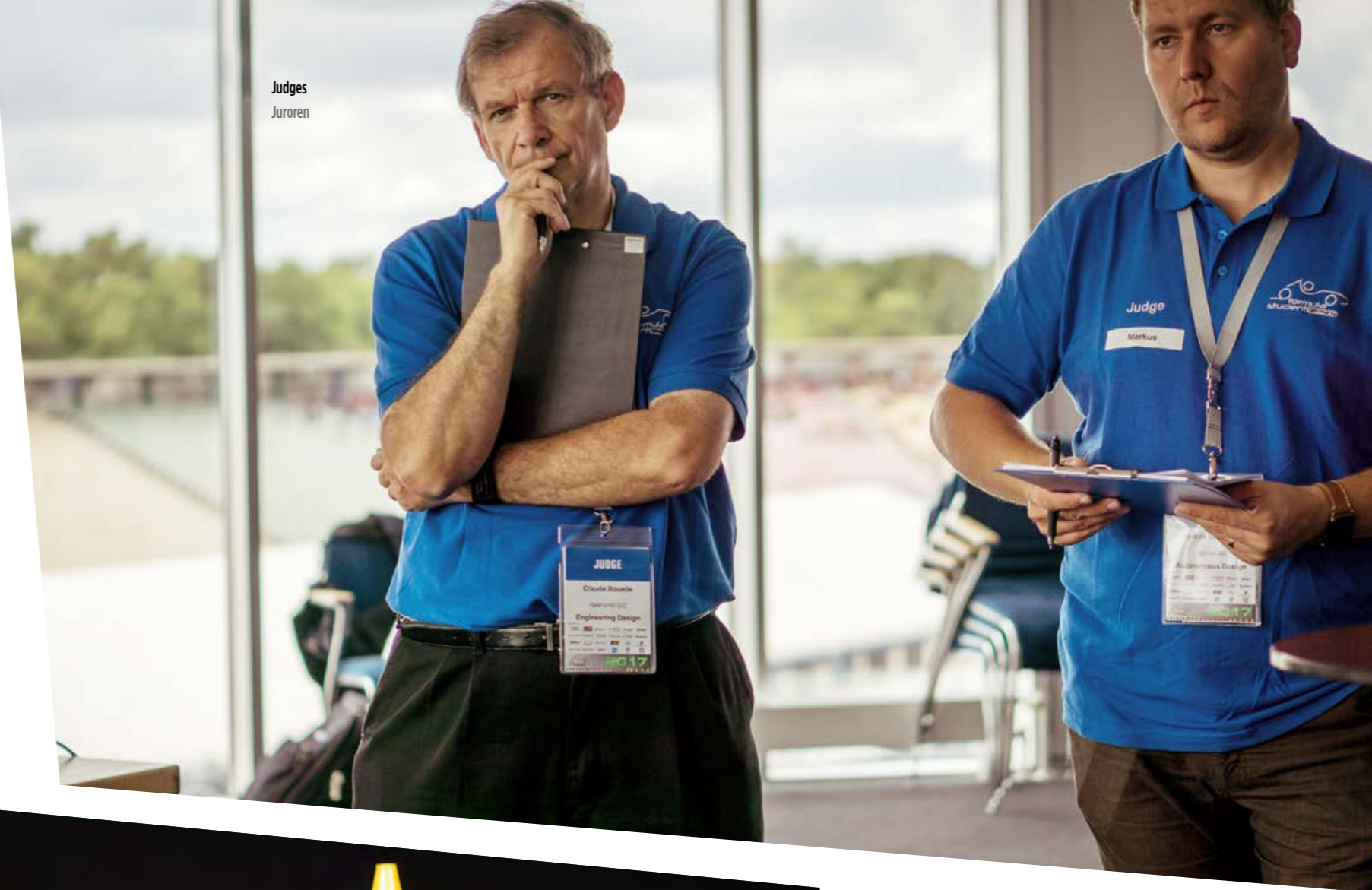
Ebenfalls oft im Verborgenen arbeiten unsere in schwarz gekleideten IT Spezialisten, welche für die Zeitnahme bei den dynamischen Disziplinen verantwortlich sind und sicherstellen, dass jedes Team eine faire und gerechte Bewertung erhält. Doch nicht nur das: Dank ihnen steht allen Anwesenden bei FSG über das gesamte Eventgelände eine Highspeed-Internet-Verbindung zur Verfügung!

Zu guter Letzt leistet das ebenfalls in schwarz gekleidete Media-Team in Form von Videos und Bildern seinen Beitrag, und sorgt mit beeindruckender Kreativität und Qualität dafür, dass wir die schönsten und unvergesslichsten Momente des Events auch lange nachdem sich der letzte Rauch qualmender Reifen verzogen hat, noch einmal durchleben können.

Es ist uns Jahr um Jahr ein großes Vergnügen diese Woche an unvergleichbarer FSG Begeisterung und Unterhaltung für Besucher und Sponsoren gleichermaßen wie für langjährige oder auch neuen Teilnehmern auf die Beine zu stellen.

Und so freuen wir uns, Ihnen auch in diesem Jahr wieder mit Rat und Tat zur Seite zu stehen.

Judges  
Juroren



Redshirts



Scrutineers





# Scrutineers and Redshirts 2017

## Scrutineers

BACHMEIR, Cornelius / BÄUERLEIN, Sonja / BERGMANN, Philipp / BÖCKLE, Bernhard / BRECHTMANN, Nick / CHARIF, Samir / CLAUSNITZER, Eric / CLEMENS, Oliver / DIETZEL, Michael / EPPLÉ, Nico / FETZER, Matthias / GEBHARDT, Mathias / GOLLOWITZ, Lena / GÖTZ, Oliver / GROH, Jonas / HADER, Stefan / HAEDÉCKE, Tobias / HEGEDUS, Miki / HÖRSCH, Moritz / JAKOB, Dominic / KARL, Florian / KREHER, Tina / LEEB, Matthias / LORENZ, Martin / MAUL, Ralf / MONN, Marcial / MÜLLER, Winfried / OCHSENDORF, Nils / PASEBAND, Ameya / RIES, Eveline / RITZ, Thomas / RÖMMELMAYER, Christopher / SANTIAGO SACRISTAN, Sergio / SCHMITZ-RODE, Benedikt / SCHNAARS, Andrea / SCHOLZ, Juergen / SCHÖNEWOLF, Stefan / SCHUCKMANN, Dennis / STEMLER, Alexander / STOLLBERGER, Martin / THOMASSEN, Kevin / TIEMANN, Maik / TORRES DA SILVA, Philipp / TRESP, Benjamin / TUITERT, Jet / VAN DEN BERG, Daniel / VAN DER PLOEG, Chris / VANDENHENDE, Wouter / VAUDLET, Oliver / VELZ, Nicolas / WAGNER, Florian / WALETZKE, Roman / WICHTERICH, Tobias / WISCHNEWSKI, Alexander / WITTICH, Mark / WOLFSBERGER, Stefan

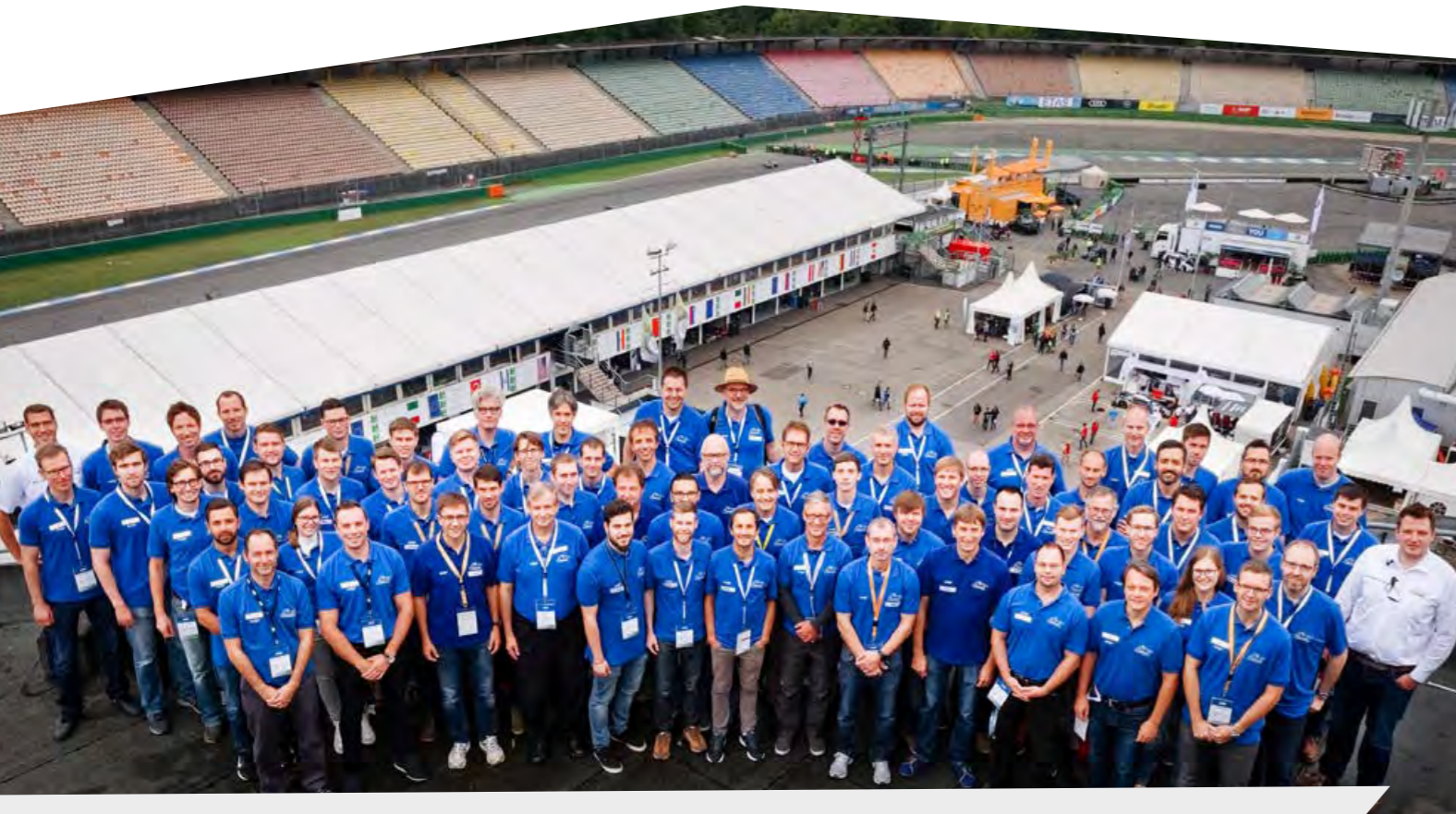


## Redshirts, Media, TK, IT & White Shirts

ABDELWAHAB, Kareem Gamal / ANDRES, David / ANDREWS, Marie-Lene / AST, Maximilian / AUST, Verena / BAKHTOVARSHOIEV, Tymur / BARRABAS, Sascha / BAUFELD, Aaron / BAYER, Konrad / BHASKAR, Narendran / BOEHM, Maximilian / BORRMANN, Daniel / BRAUSER, Austin / BRUNGS, Yamina / CARNICERO CORTÉS, Àlex / CHAWLA, Shashank / CHENNIAPPAN KUPPUSAMY, Boobalan / DC, Prajwal / DE, Shidhartha / DE JONG, Stef / DEMELE, Antonia / DEMEURICY, Paul / DESHMUKH, Siddhant / DIETRICH, Franziska / FINDEISEN, Jan / FLEMMING, Erik / FORMILAN, Vittoria / FRASSINE, Alessia / FREUDENBERG, Liz / FREY, Dennis / GALLETTI, Edoardo / GANDHI, Ronak / GARLICH, Keno / GEIER, Nicole / GERNERT, Björn / GREFE, Hinrich / GRUNENBERG, Kathrin / HÁJEK, Karol / AMZIĆ, Benjamin / HAUFFE, Björn / HENZEL, Judith / HIRSCHMANN, Jill / HOFMANN, Alina / HOFMANN, Peter / HURTIENNE, Denise / JANSSEN, Nele / JEITNER, Timo / JOHNSON, Kevin / JOSTEN, Jonas / KESHAVA REDDY SOPPAHALLI, Dhanush / KIRIT, Neel / KLEIN, Christian / KOPP, Alexandre / KRÄMER, Daniel / KRÜGER, Stephan / KÜHNE, Alexander / KULESZ, Dawid / LANSNICKER-DIETRICH, Bärbel / LEBKOWSKI JIMÉNEZ, Rosa / LERINGER, Nora / LESCHNIEWSKI, Ann-Catrin / LILIE, Ky Nam / LIMA DE CARVALHO, Luiz Fernando / LORENZEN, Morten / MARTYNUS, Oliver / MARU, Vivek / MEJLBJERG, Stig / MELLERGAARD, Simon Bach / MICHALOWSKI, Lars / MORGENROTH, Johannes / MÜLLER, Gábor / MÜLLER, György / MÜLLER, Lars / NEUHAUS, Marcel / PANDEY, Rahul / PAPHENHUIJZEN, Thijs / PATHNI, Charu / PÉREZ MENDOZA, Ana Cristina / PERIYASAMY, Boopathiraja / PETERS, Oliver / PETERS, Jannik / PITUELLO, Mauro / POKER, Katharina / POLT, Markus / R. NEUMANN, Hendrikje / RANKIN, Alastair / RATHSACK, Felix / REIMERS, Dennis / REN, Huawei / SANTOS, Giovana / SAUTTER, Nadine / SAYOVITZ, Steve / SCHÄFER, Bastian / SCHAIRER, Pascal / SCHEMEL, Michael / SCHILDT, Sebastian / SCHINDLER, Corvin / SCHRÖDER, Yannic / SCHULZ, Elena / SCHWARZER, Johannes / SCHWEITZER, Desirée / STACH, Theresa / STAMPRATH, Christoph / STEFANUTTI, Renan / STEINWEDE, Vanessa / STEPHAN, Eva-Maria / STOTZ, Maximilian / TEIXIDÓ SANGENÍS, Carlota / TEZOTO FIGUEIROA, Ana Clara / THALHÄUSER, Dana / TIMMERMANS, Tristan / TÓTH, Álmos Dávid / VAN BALEN, Johannes / VAN DER WIJST, Hugo / VAN LEEUWEN, Tom / VAN SCHIE, Sebastiaan / VAUDLET, Philipp / WEIEN, Mira / WEITZ, Klara / WIEDEMANN, Jana / WIESENTHAL, Marvin / WILDEBOER, Dominic / WINKELMANN, Daniel / ZHAO, Wan / ZHU, Hui / ZIPS, Stefanie



# Judges 2018



## Autonomous Design & Engineering Design

**AERTS**, Joris / **AHOLA**, Mikko / **AHRENHOLZ**, Benjamin / **ASCIUGLU**, Andreas / **BAENSCH**, Simon / **BANSAL**, Amar / **BECK**, Erhard / **BÖHNERT**, Andreas / **CZERWIONKA**, Paul / **DECKERS**, Jean-Noel / **DÖLLE**, Norbert / **DUDA**, Jürgen / **EBLI**, Sebastian / **ENDER**, Stefan / **ENZWEILER**, Markus / **ESTEVEZ ALBIERI**, Gustavo / **EVANS**, David / **EWERT**, Sebastian / **FELC**, Igor / **FISCHER**, Matthias / **FÖLLMER**, Patrik / **FRIEDMANN**, Felix / Friedrich, Linus / **FRIES**, Benedikt / **FROEMMIG**, Lars / **GARDUNO**, Luis / **GEMEINHARDT**, Sascha / **GERTH**, Hendrik / **GICKELEITER**, Michael / **GINETE**, Joao / **GOELLNER**, Julian / **GOLAKIYA**, Nirav / **GRAF**, Michael / **GROSVARLET**, Pascal / **GRUBER**, Gregor / **HAAG**, Alexandre / **HACK**, Oliver / **HAHN**, Christoph / **HAHNEMANN**, Kristina / **HANAUSKE**, Reinhard / **HANIGK**, Martin / **HANISCH**, Thomas / **HEIDRICH**, Stephan / **HENNINGS**, Thomas / **HERRMANN**, Andreas / **HO**, Victor / **HOLSCHUH**, René / **HÖLZGEN**, Andre / **HOMOCEANU**, Silviu / **JONES**, Pete / **KALANKE**, Philipp / **KAPELLOS**, Christos / **KASPAR**, Jakob / **KAUSSEN**, Martin / **KERBER**, Michael / **KLOSTERMANN**, Sandra / **KNIEBUSCH**, Olaf / **KOHNS**, Lukas / **KORTEN**, Mike / **KRAFT**, Oskar / **LECHTHALER**, Albrecht / **LENZ**, David / **LIEBST**, Fabian / **LIECHTI**, Stefan / **LOPEZ**, Jose / **MÄHLER**, Matthias / **MAILE**, Florian / **MALACK**, Sebastian / **MAREK**, Christian / **MARTIN**, Joe / **MICHAELS**, Tobias / **MISSLER**, Christian / **MUEHL**, Nils / **MUELLER**, Rolf / **MUEMLER**, Rainer / **MÜLLER**, Sebastian / **MUR**, Lukas / **MUUSERS**, Daniel / **NEYRINCK**, Christian / **NIEMEYER**, Constantin / **OEHLER**, Claus / **ORTH**, Felix / **PADBERG**, Jochen / **PAIER**, Michael / **PEETERS**, Matthias / **PETRY**, Markus / **PETZ**, Andreas / **PHERSSON**, Luke / **PLOOG**, Mareike / **RAAIJMAKERS**, Marvin / **RAFFEINER**, Florian / **REETZ**, Volker / **REMMLINGER**, Jürgen / **RETLINGER**, Sebastian / **RETTNER**, Cornelius / **RICHTER**, Alexander / **RICHTER**, Christian / **RIDERER**, Dominic / **ROUELLE**, Claude / **SANDER**, Udo / **SATTLER**, Steve / **SCHADE**, Michael / **SCHÄFER**, Michelle / **SCHIMMELS**, Juergen / **SCHOENBERG**, Christopher / **SCHÖNBORN**, Daniel / **SCHULZ**, Achim / **SEIB**, Timo / **SOENS**, Andreas / **SPEED**, Benjamin / **SPOIDA**, Thomas / **STEGMAIER**, Timo / **STEINMETZER**, Mathias / **TEUFEL**, Simon / **TORGOVNIKOV**, Eugen / **TSIOLAKIS**, Vasileios / **VELA**, Nicolas / **VÖLKL**, Timo / **WEBER**, Martin / **WEBER**, Thomas / **WEINGART**, Robert / **WEISHAUPT**, Harald / **WENGERT**, Jochen / **WÖHLER**, Konrad / **WUNSCHHEIM**, Lukas / **ZECHMANN**, Hannes / **ZEISLER**, Jöran / **ZHANG**, Chen / **ZINKE**, Christopher



## Business Plan Presentation

**BAMBACH**, Andreas / **BREWIG**, Jens / **BRUENN**, Katja / **COLLIGNON**, Cousin / **PIERRE**, Henry / **DÖBELE**, Franziska / **EICKHOFF**, Mathias / **ESSER**, Klaus / **FAHR**, Alexander / **FERKEN**, Reiner / **HAHN**, Thomas / **HARTHERZ**, Patrik / **HAYN**, Bernhard / **HEIDEMEYER**, Peter / **HERBERTH**, Helena / **HERRMANN**, Jesko / **HODGKINSON**, Philip / **HODGKINSON**, Raymond / **JAMAI**, Hichem / **KAHLE**, Philipp / **KARSCH**, Ulrich / **KEIM**, Sandra / **KINSKI**, Andreas / **KLUG**, Jens / **LANGE**, Stephan / **LENZEN**, Thomas / **LÖFFLER**, Maximilian / **MAAT**, Sarah / **MARX**, Anette / **MERKL**, Julia / **MOREL**, Romain / **MUELLER**, Andreas / **NÄTHER**, Sylvio / **NIEMEYER**, Reinhard / **NUSCHELER**, Barbara Christine / **OTT**, Tobias / **PETERS**, Jan / **PORSCH**, Stefan / **PRINZ**, Michael / **RICHTER**, Svenja / **RINKA**, Carsten / **SCHMIDLECHNER**, Matthias / **SLEDZINSKI**, Timo / **STOCKHEIM**, Andreas / **TABATABAI**, Stefan / **VADEHRA**, Bernhard Prem

## Cost and Manufacturing

**BERTRAM**, Michael / **BHARTI**, Devesh / **BRONTSCH**, Daniel / **BRUNNER**, Daniela / **BUOB**, Manuel / **CAVKA**, Natalija / **DEINHARDT**, Till / **DONDO**, Paolo / **EGENTER**, Vera / **GIORGIONI**, Carlo / **GÖHNER**, Lara / **GRUNDNER**, Harald / **HACKER**, Clemens / **HAGL**, Markus / **HANFELD**, Stefanie / **HANSSMANN**, Daniel / **HERTH**, Martin / **KESORE**, Kisnaduth / **KLEIN**, Thorsten / **KOCH**, Richard / **KOURTIDIS**, Apostolos / **KÜHNE**, Alexander / **KURZEN**, Michael / **LAUCH**, Kurt / **LERCH**, Carina / **LINDNER**, Thomas / **MEIER**, Peter / **MEINCK**, Wolfgang / **MONEGATTI**, Marco / **MÜLLER**, Karsten / **NEUMANN**, Bernd / **OEHLER**, Christoph / **PILTZING**, Roger / **PINTO**, Valerio / **RAU**, Fabian / **SCHLEPPI**, Roman / **SIBUM**, Alexander / **STRAUBERT**, Alexander / **STROHBACH**, Anja / **SZIGHETI**, Eva-Maria / **VERBÜCHELN**, Felix / **WANNEMACHER**, Christoph / **WILDEBOER**, Dominic / **WILLIAMS**, Dom



# Formula Student Germany Team 2018

The team behind Formula Student Germany is divided into three groups. The board is responsible for Formula Student Germany, its operations, finances, sponsoring and overall strategy.

Das Team der Formula Student Germany ist in drei Gruppen unterteilt. Das Board trägt die Verantwortung für die Formula Student Germany und ihre Kooperationen sowie für Sponsoring, Finanzen und Strategie.



## TIM HANNIG

Board (Chairman)  
Jaguar Land Rover Ltd.



## DANIEL MAZUR

Board (Management)  
Formula Student Germany GmbH



## RAINER KÖTKE

Board (Finance) & EC (Dynamics)  
Volkswagen AG



## DR. LUDWIG VOLLRATH

Board (External Relations)

The executive committee (EC) is responsible for the design and development of the competition. Each member of the EC is responsible for one of the fields of the competition and its organisation.

Das Executive Committee (EC) verantwortet die Ausgestaltung des Wettbewerbs. Jedes Mitglied ist für Vorbereitung und Durchführung eines Bereiches verantwortlich.



## STEFFEN HEMER

EC (FS-Driverless)  
TU Kaiserslautern



## ROB OPDAM

EC (Technical Inspection)  
Bosch Engineering GmbH



## TORSTEN RILKA

EC (Statics) & Scoring & VSV  
Volkswagen AG



## ULF STEINFURTH

EC (Mechanical Inspection)  
University of Applied Sciences Stralsund



## JOHANNES KRATZEL

EC (Event Support)  
Robert Bosch GmbH



## KONRAD PAULE

EC (FS-Academy) & Pit Marshal  
Dr. Ing. h.c. F. Porsche AG



## DR. SEBASTIAN SEEWALDT

EC (Rules) & Pit Marshal  
Dr. Ing. h.c. F. Porsche AG

The operative team (OT) supports the board and EC in the preparation and realisation of the event throughout the year.

Das Operative Team (OT) unterstützt das Board und das EC in der Vorbereitung übers Jahr und in der Durchführung des Wettbewerbs.



## DANIEL AHRENS

OT (Merchandising)  
Dentsu Aegis Network



## CHRISTIAN AMERSBACH

OT (FS-Driverless)  
TU Darmstadt



## PHILIPP BANDOW

OT (Data Protection Data Logger)  
Resonic GmbH



## SARAH BATTIGE

OT (Electrical Inspection)  
TU Dresden



## RAPHAELA BIHR

OT (Business Plan Presentation)  
MAN Truck & Bus AG



## MATTHIAS BRUTSCHIN

OT (Event Support)  
Daimler AG



## BARBARA DECKER-SCHLÖGL

OT (Event Support)  
Tesla



## SVEN GRUNDNER

OT (Back Office)



## SEBASTIAN HOPPE

OT (Cost Event)  
ZF Friedrichshafen AG



## PETER LEIPOLD

OT (Design Event)  
ZF Race Engineering GmbH



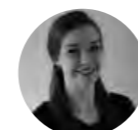
## BENJAMIN MÜLLER

OT (Mechanical Inspection)  
Makita Engineering Germany GmbH



## LENA PAULE

OT (Communications)  
ABB AG



## LEA PISSARRECK

OT (Event Control)



## HELENA REINKE

OT (Event Manager Assistant)  
Formula Student Germany GmbH



## JOCHEN SCHMIDT

OT (Dynamics)  
DLR



## DR. KARSTEN STAMMEN

OT (Dynamics)  
AUDI AG



## CHRISTOPH BEISSWANGER

OT (Mechanical Inspection)  
hsengineering



## MARIA BONILLA-TORRES

OT (Electrical Inspection)  
Technische Hochschule Köln



## MATTHÄUS DECKER

OT (Event Support)  
Siemens Industry Inc.



## SIMON DENSORN

OT (Electrical Inspection)  
University of Stuttgart



## TANJA HOFMANN

OT (Security)  
in-tech GmbH



## ANKE LACHMANN

OT (VIP Lounge & Culina)  
Step by Step - Studio für Ballett und Bewegung



## FABIAN LIESCH

OT (IT & TK)  
Alpha Sigma GmbH



## DOROTHEE NEBEL

OT (Communications)



## ALIA PIERCE

OT (Communications & Media Team)  
Continental Engineering Services



## JUST PHILIP PÖTTNER

OT (Design Event)  
Autonomous Intelligent Driving GmbH



## CATHARINA SCHIFFTER

OT (Guided Tours & Communications)  
The University of Edinburgh



## TIM SCHMIDT

OT (Back Office)  
Mankiewicz Gebr. & Co.



## ESTHER TROMP

OT (Event Manager Assistant)  
Formula Student Germany GmbH

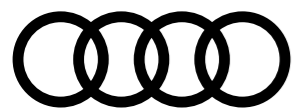
# Words from our Partners



**ALEXANDRE HAAG**  
CTO & Head of Technology,  
Autonomous Intelligent Driving GmbH

We're on a mission to develop a full stack for autonomous driving. AID combines the best of both worlds: the safety and scale of an automotive OEM and the agility of a software start-up. Our team is the key for solving this challenge, day by day. We're looking for people with the passion and technical expertise typical of FSG.

Unser Ziel ist es, ein Software-Modul für das fahrerlose Fahren zu entwickeln. AID verbindet das Beste aus beiden Welten: Stabilität und die Möglichkeiten eines Automobilherstellers sowie die Agilität eines Software-Startups. Unser Team ist der Schlüssel zum Erfolg. Bei der FSG treffen wir Talente, die wir für AID begeistern möchten.



**ANTJE MAAS**  
Director International HR Marketing, AUDI AG

The fascination of Formula Student Germany: to us, being there means being part of a truly special atmosphere that we would not want to miss for anything. This is where we meet young, ambitious people from all over the world who are just as enthusiastic about automotive technology as we are at Audi.

Faszination Formula Student Germany: Dabei zu sein bedeutet für uns, Teil einer ganz besonderen Atmosphäre zu sein, die wir um keinen Preis missen möchten. Hier treffen wir junge und ambitionierte Menschen aus aller Welt, die von automobilier Technik genauso begeistert sind wie wir bei Audi.



**HANS-PETER BERINGER**  
Vice President, Head of Business Management  
Transportation, BASF SE

BASF's engineering plastics are widely used in the automotive industry for example in vehicles range from bodywork and chassis to interior trim and engine components. We consider "Formula Student Germany" to be a great opportunity to get in contact with ambitious and well-educated young people. Good luck to all teams!

Die BASF bietet eine Vielzahl von Kunststofflösungen für die Automobilindustrie an, angefangen beim Karosseriebau, über das Fahrwerk bis hin zu Innenausstattung und Motoranbauteilen. „Formula Student Germany“ bietet uns die Möglichkeit, mit ambitionierten und gut ausgebildeten Nachwuchskräften in Kontakt zu kommen. Wir wünschen allen viel Erfolg.





**OLIVER FERSCHKE**  
Head of HR Marketing BMW Group

The BMW Group is very enthusiastic about its involvement in the Formula Student Germany. The challenges the teams face during the course of a season are also always faced by the BMW Group. We are, therefore, pleased when qualified participants from all over the world gain their first practical experience in the BMW Group.

Mit großer Begeisterung engagiert sich die BMW Group in der FSG. Die Herausforderungen, mit welchen sich die Teams im Laufe einer Saison konfrontiert sehen, beschäftigen auch uns bei der BMW Group immer wieder. Daher freuen wir uns, wenn qualifizierte Teilnehmer aus dem In- und Ausland ihre ersten Praxis-Erfahrungen in der BMW Group sammeln.



**MARTIN SCHNEIDER**  
Vice President Recruitment and Marketing Brose Group

We offer dedicated students who are technology enthusiasts the chance to take on responsibility at an international company and actively shape the future of the automobile. At FSG, we meet people who have what it takes to be successful: commitment, team spirit, and the will to win!

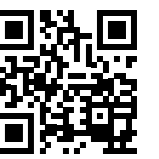
Wir bieten engagierten und technikbegeisterten Studierenden die Möglichkeit, in einer internationalen Firma Verantwortung zu übernehmen und die Zukunft des Automobils aktiv mitzugestalten. Bei der FSG treffen wir Menschen, die alles das mitbringen, was es braucht um erfolgreich zu sein: Einsatzbereitschaft, Teamgeist und den Willen zu gewinnen.



**HEIDI STOCK**  
Human Resources Management - Talent Management and Diversity

At Bosch, we're convinced: Diversity is enrichment and prerequisite for our strive to excellence. Behind these aspects stand associates with individual competencies, mindsets and experiences. Diversity is also what we're counting on at Formula Student: Hence we're supporting talents who work together in a team to master interdisciplinary challenges.

Bei Bosch sind wir davon überzeugt: Vielfalt ist Bereicherung und Voraussetzung für Spitzenleistungen. Dahinter stecken Mitarbeiterinnen und Mitarbeiter mit individuellen Kompetenzen, Denkweisen und Erfahrungen. Vielfalt zählt auch bei der Formula Student: Daher unterstützen wir Talente, die im Team die interdisziplinären Herausforderungen gemeinsam meistern.



**MARKUS ECKHARDT**  
General Manager

Brunel has been supporting the FSG since 2006. The aspiring engineers are especially important to us as they are full of imagination, passion and team spirit. Like us, they strive for technological advances in the automotive industry and together, we share the passion for realizing multifaceted engineering projects.

Bereits seit 2006 unterstützt Brunel die FSG. Denn die angehenden Ingenieurinnen und Ingenieure sind voller Ideenreichtum, Begeisterung und Teamgeist und leben den technologischen Fortschritt der Automobilindustrie ebenso wie wir. Gemeinsam teilen wir die Leidenschaft für die Umsetzung vielfältiger Projekte im Engineering.



**BARBARA TEXTER**  
Head of Employer Branding Germany, Continental AG

For over 140 years, Continental has been working on motorized individual mobility of the future. In order to continue this success story, we are constantly looking for qualified technical and management personnel. Top talent of the kind we are seeking can be found at the Formula Student competition.

Seit über 140 Jahren arbeitet Continental erfolgreich an der individuellen Mobilität der Zukunft. Um diese Erfolgsstory weiterzuschreiben sind wir ständig auf der Suche nach qualifizierten Fach- und Führungskräften. Diese Toptalente finden wir beim internationalen Konstruktionswettbewerb Formula Student.



**FRIEDHELM PICKHARD**  
President ETAS GmbH

Team spirit, commitment and the passion for technology and innovation - these are qualities that connect ETAS with all formula student teams. We share the thrills with our 30 teams as - with engineering skills and passion - they show their mettle under the toughest conditions. We wish all teams the success to be front-runners in the field!

Team-Spirit, Engagement und die Leidenschaft für Technik und Innovation - Eigenschaften, die ETAS und die Formula Student-Teams verbindet. Wir fiebern mit unseren 30 Teams mit, wenn sie mit Ingenieurskunst und Herzblut unter den härtesten Bedingungen zeigen, was sie können. Wir wünschen allen Teams viel Erfolg, um ganz vorne mit dabei zu sein!



**DR. ANNA-MARIA KARL**  
Head of Global Talent Sourcing, Daimler AG

Digitalization, electric mobility, autonomous driving, shared economy - all these factors change the branch tremendously. Therefore it is even more important to support top talents and to exchange ideas with them. Because we want to develop the best products together - today and in the future. Therefore Formula Student offers a perfect platform.

Digitalisierung, Elektromobilität, autonomes Fahren, Shared-Economy - all das verändert unsere Branche wie nie zuvor. Die Förderung von Top Talenten und der direkte Austausch mit ihnen sind umso wichtiger. Denn wir wollen heute und in Zukunft gemeinsam die besten Produkte entwickeln. Die Formula Student bietet dafür eine perfekte Plattform.



**MATHIAS MIEDREICH**  
Member of the Managing Board, Faurecia Automotive GmbH

FSG participants and automotive supplier Faurecia share some of the most important characteristics: A passion for innovation, ambition, determination and the courage to pursue unconventional and creative solutions. We are proud to be sponsor and are looking forward to meeting motivated and talented teams. Best of luck to everyone!

Die Teilnehmer der FSG und der Automobilzulieferer Faurecia haben vieles gemeinsam: Leidenschaft für Innovation, Ehrgeiz, Zielstrebigkeit und den Mut zu ungewöhnlichen und kreativen Lösungen. Wir sind stolz, als Sponsor der FSG dabei zu sein, und freuen uns auf den Austausch mit engagierten und talentierten Teams. Wir wünschen allen viel Erfolg!

**Leader in 3 activities**



#1 INTERIORS  
€4.8 billion sales



#3 SEATING  
€6.6 billion sales



#1 CLEAN MOBILITY  
€4.2 billion sales



**CHRISTIAN WILLENBERG**  
Talent Acquisition & Recruitment

With over 7,000 members of staff, IAV is one of the world's leading providers of engineering services to the automotive industry. The company can look back on more than 30 years of experience in developing innovative concepts and technologies for future vehicle generations. For further information about IAV, go to [www.iauv.com](http://www.iauv.com)

IAV ist mit über 7.000 Mitarbeitern weltweit einer der führenden Engineering-Partner der Automobilindustrie. Das Unternehmen entwickelt seit über 30 Jahren innovative Konzepte und Technologien für zukünftige Fahrzeuggenerationen. Weitere Infos zu IAV erhalten Sie über unser Karriereportal [www.iauv.com/karriere](http://www.iauv.com/karriere)



**JOACHIM REICHLER**  
Vice President Corporate Personnel Development and Learning

If you want to make a decisive move, you need to have innovative ideas, courage, endurance and drive. If the environment fits and the team is right, innovative and convincing ideas emerge from visions. Our aim is to support talented and enthusiastic specialists and future executives in achieving their ambitious goals.

Wer Entscheidendes bewegen will, braucht Ideen, Mut, Ausdauer und Biss. Wenn dann noch das Umfeld stimmt und das Team das Richtige ist, werden aus Visionen innovative und überzeugende Lösungen. Unser Ziel ist es, talentierte und begeisterungsfähige angehende Fach- und Führungskräfte bei der Erreichung ihrer ehrgeizigen Ziele zu unterstützen.



**DR. GERALD HARZL**  
Vice President Human Resources,  
Magna International Europe

Magna is focused on providing innovative solutions to help define the mobility of the future. We are active at Formula Student to inspire the best young talent for our company. Therefore it is indispensable for us to be directly on site, where new fresh ideas emerge and are turned into reality.

Magna konzentriert sich darauf, innovative Lösungen zu liefern, um die Mobilität der Zukunft mitzugestalten. Wir sind bei der Formula Student aktiv, um die besten Nachwuchskräfte für unser Unternehmen zu begeistern. Daher ist es für uns unabdingbar direkt vor Ort zu sein, wo sich neue frische Ideen herausbilden und in die Realität umgesetzt werden.



**MONIKA SCHMIDT**  
Head of Talentmanagement, New Work & Employer Branding

Respect, team spirit, determination, customer focus and integrity - these are the corporate values that our employees experience. For ideas that inspire. For changes that move. Every day we want to overcome borders and to continually make our products that little bit better. We are at home all around the world.

Respekt, Teamgeist, Entschlossenheit, Kundenorientierung und Integrität - das sind unsere Unternehmenswerte, die wir hier bei MAN leben. Für Ideen, die begeistern. Für Veränderungen, die bewegen. Tag für Tag möchten wir Grenzen überwinden und unsere Produkte noch ein bisschen besser machen. Dabei sind wir in der Welt Zuhause



**CHRISTOPH HAHN**  
Automotive Competition Technical Lead

Employing a Model-Based Design approach to the automotive design process enables teams to design, test, validate and share their models within one environment. Using industry-standard tools such as MATLAB and Simulink help students tackle real engineering problems. [www.mathworks.com/fsg](http://www.mathworks.com/fsg)

Mit MATLAB und Simulink lösen Teams der Formula Student Germany reale, automobiltechnische Probleme. Studenten, die modell-basierte Entwicklung einsetzen, entwickeln schneller und besser. Modell-basierte Entwicklung (Model-Based Design) erlaubt Lösungen zu testen und zu validieren bevor diese im Fahrzeug eingesetzt werden. [www.mathworks.com/fsg](http://www.mathworks.com/fsg)



**KONSTANZE MARINOFF**  
Director Human Resource Marketing

With more than 30.000 victories, Porsche, as the most successful manufacturer in motorsports, stands for Intelligent Performance and extraordinary team spirit. Become part of it and define the next chapter of the future of sportscar engineering - at the Formula Student competition and at Porsche. We wish good luck and success to all teams.

Mit mehr als 30.000 Rennsiegen steht Porsche als der erfolgreichste Hersteller im Motorsport nicht nur für Intelligent Performance sondern auch für einzigartige Teamleistungen. Werden Sie Teil davon. Schreiben Sie mit am nächsten Kapitel der Zukunft des Sportwagens - bei Formula Student und bei Porsche. Wir wünschen allen Teams viel Glück & Erfolg.



**MARKUS FISCHER**  
Manager HR Marketing and Employer Branding

MTU is one of the world's leading manufacturers of large diesel engines and complete propulsion systems. We are pleased to support this event and the upcoming engineers again in 2018. Karl Maybach, founding father of MTU and technical pioneer, would certainly love Formula Student Germany. And so do we. We wish all participants the best of luck!

MTU zählt zu den weltweit führenden Herstellern von Großdieselmotoren und kompletten Antriebssystemen. Wir freuen uns das Event und hochmotivierte Nachwuchingenieure erneut zu unterstützen. Karl Maybach, MTU-Gründervater und Technikpionier, wäre begeistert. Wir sind es auch! Wir wünschen allen Teams einen erfolgreichen Wettbewerb!



**CORINNA SCHITTENHELM**  
Chief Human Resources Officer

Team spirit, commitment, and a love of technology - those are the qualities that our employees and the Formula Student teams share. As a sponsor we are in close contact with the teams and support them financially and with our expertise. We want the participants to become passionate about our company, and applications from them are very welcome.

Teamgeist, Engagement und Leidenschaft für Technik - das sind Eigenschaften, die unsere Mitarbeiter und die Formula-Student-Teams verbinden. Als Sponsor stehen wir in engem Kontakt mit den Teams und unterstützen diese finanziell sowie mit unserem Know-how. Die Teilnehmer sind gern gesehene Bewerber, die wir für unser Unternehmen begeistern möchten.







**THORSTEN WALZ**  
Manager Academic Business Germany

Team spirit, an infectious enthusiasm and the impressive professionalism of all the teams – that is what distinguishes the FSG. Siemens PLM Software is very proud of being the sponsor of this extraordinary competition since 2015 and is looking forward to the week in Hockenheim, which is a real highlight for us. Come and talk to us – it's worth it!

Teamgeist, eine ansteckende Begeisterung und die beeindruckende Professionalität aller Teams – das ist es, was die FSG auszeichnet. Siemens PLM Software ist sehr stolz darauf, seit 2015 Sponsor dieses außergewöhnlichen Wettbewerbs zu sein und freut sich auf die Woche in Hockenheim, die für uns ein echtes Highlight ist. Kommen Sie mit uns ins Gespräch – es lohnt sich!



**SANDRA, WEISSGERBER**  
Head of HR & Organisational Development

Together we can achieve something exceptional - every single day. This mindset made us the European market leader in the electronic commercial vehicle segment. As a revolutionary car manufacturer with start-up dynamics, we develop new standards in efficiency, economy and functionality. Join our team and shape the future of mobility yourself!

Gemeinsam Außergewöhnliches leisten - und das jeden Tag. Dies macht uns zum europaweiten Marktführer im elektronischen Nutzfahrzeugsegment. Als revolutionärer Automobilhersteller mit Startup-Dynamik setzen wir neue Maßstäbe in Effizienz, Wirtschaftlichkeit und Funktionalität. Werde Teil unseres Teams und gestalte selbst die Zukunft der Mobilität!



A world of reliable rotation



**JANA HUEMMER**  
Business Communication Specialist

It requires courage and endurance but also creativity and teamwork to face the challenges in the Automotive Industry. Qualities that you demonstrate already today. We are pleased to support young students from all over the world with such an ambitious project like Formula Student. On behalf of the SKF team we wish all participants good luck!

Es benötigt vor allem Mut und Ausdauer aber auch Kreativität und Teamwork um sich den Herausforderungen der Automobilindustrie zu stellen. Fähigkeiten die Sie bereits heute demonstrieren. Wir freuen uns daher sehr, Studenten auf der ganzen Welt bei einem so ambitionierten Projekt wie Formula Student unterstützen zu können und wünschen viel Erfolg!

- Automotive technologies
- Railway technologies
- Aerospace technologies
- Marine technologies
- Drivetrain and energy management
- Automation, connectivity and electronic
- Safety, methods and processes
- Traffic systems technologies



**DIPL.-ING. CHRISTOF KERKOFF**  
VDI-Society Automotive and Traffic Systems Technology

VDI, the Association of German Engineers, is proud to be a partner and sponsor for Formula Student Germany since the very beginning. This competition is a model for other programs we run to stimulate interest in the engineering profession and to lend a hand to the future generation, and our members follow it keenly every year.

Der Verein Deutscher Ingenieure (VDI) ist stolz darauf, die Formula Student Germany seit Ihren Anfängen als ideeller Träger und Sponsor zu unterstützen. Dieser Wettbewerb ist ein Vorbild für andere Programme, mit denen wir das Interesse für Technikberufe wecken, den Nachwuchs fördern und er begeistert unsere Mitglieder jedes Jahr aufs Neue.



Volkswagen



**PROF. DR. STEFAN GIES**  
Leiter Baureihe Mid/Fullsize Vehicles,  
Volkswagen AG

For Volkswagen, the main focus in Formula Student Germany 2018 is on autonomous driving and e-mobility. We want to talk to tomorrow's engineers about the mobility of the future. We look forward to brilliant ideas and thrilling races. Visit us at the Volkswagen Race Truck. We wish the participants every success.

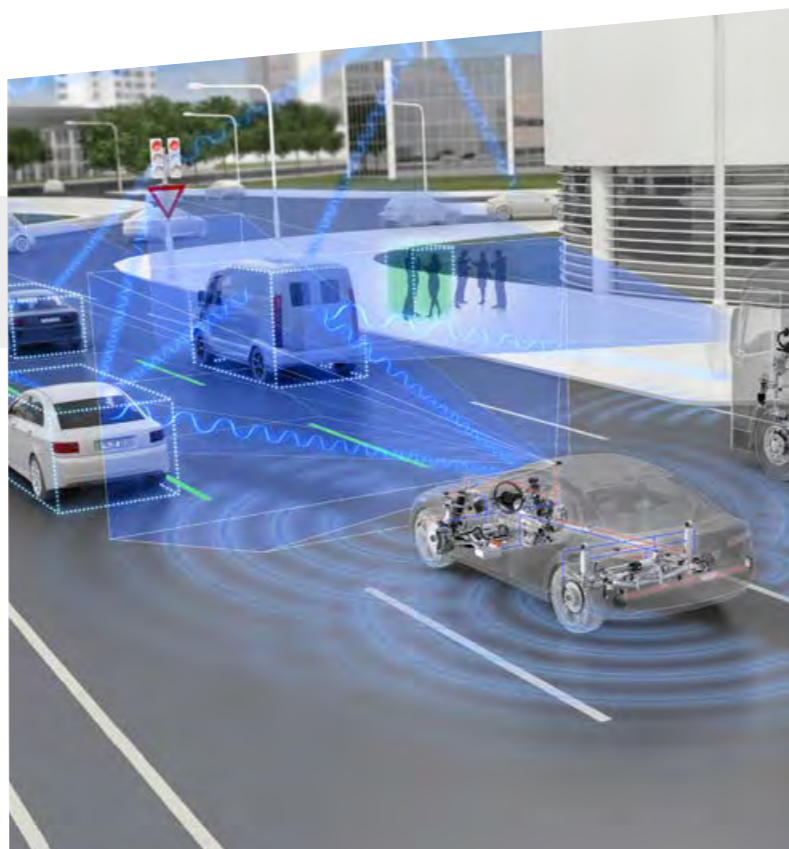
Für Volkswagen stehen bei der Formula Student Germany 2018 autonomes Fahren und Elektromobilität im Fokus. Wir wollen mit Ingenieurinnen und Ingenieuren von morgen über die Mobilität der Zukunft reden. Wir freuen uns auf zündende Ideen und spannende Wertungsläufe. Besuchen Sie uns im Volkswagen Race Truck. Wir wünschen den Teilnehmern viel Erfolg.



**MARTIN FRICK**  
Head of Talent Attraction

As one of the biggest automotive suppliers, ZF is dealing with digitizing mechanical systems, pushing forward e-mobility, and reducing road accidents and emissions. We support Formula Student to give the participants an early insight in our activities that shape the future of mobility.

Als einer der weltgrößten Automobilzulieferer beschäftigt sich ZF mit der Digitalisierung mechanischer Systeme, dem Forcieren der Elektromobilität und der Reduzierung von Verkehrsunfällen und Emissionen. Bei der Formula Student engagieren wir uns, um den Teilnehmern frühzeitig Einblicke zu geben, wie wir die Zukunft der Mobilität mitgestalten.



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# Impressions



Working on the car



FSG from above



Vroooooom!



Green flag!



Building FSG



Look at all those electronics



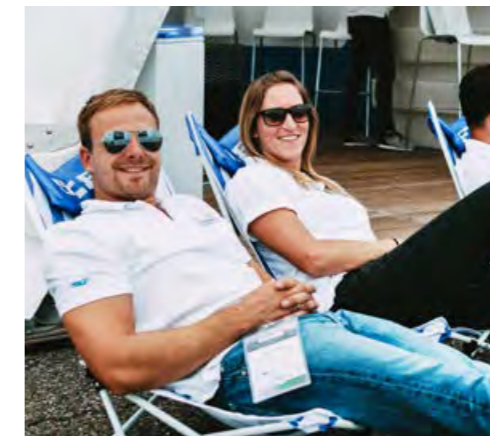
Check out the cool FSG merchandise!



Let's watch the race



Pre-race instructions



Some of our partners



Course Walk



Champions



Pano photo - waiting...



Fire extinguishing training



Team mascot



Sideways car





Fixing it



Focus...



This car has no driver



Endurance time!



Car Team	Left	Time	H
C292 GB Oxford Brook	5.76	5.72	2
E9 SE Göteborg Cha.	5.91	5.92	4
E9 SE Göteborg Cha.	5.85	5.89	3
C292 GB Oxford Brook	5.77	5.81	1
E54 ES Barcelona UPC	5.97	5.95	2
E54 ES Barcelona UPC	5.86	5.90	1
E9 SE Göteborg Cha.	5.88	6.01	2
E9 SE Göteborg Cha.	5.97	5.93	1



Driving in the rain



Car details



Meatball flag!



@FSGeV



@FormulaStudentG



formulastudentgermany

# From the Track to the Stage - Top FSG Inventions

At Formula Student Germany, the innovation doesn't stop with the impressive race cars that the teams from all around the world come to compete with. Formula Student Germany itself is pure innovation based on an initial existing concept.

The volunteers who organize the event consist of a group of experts from different fields. This combination is what drives the competition to continue to advance.

To give you an example, here are our Top FSG Inventions from the race track to the award ceremony.

## Development in the Dynamics area:



### The "track marking" robot.

In order to ensure the accuracy of the track that the teams race their cars on, FSG developed the "track marking" robot. This robot utilises GPS to locate where it is on the track and can accurately mark the track with the built in chalk spray.

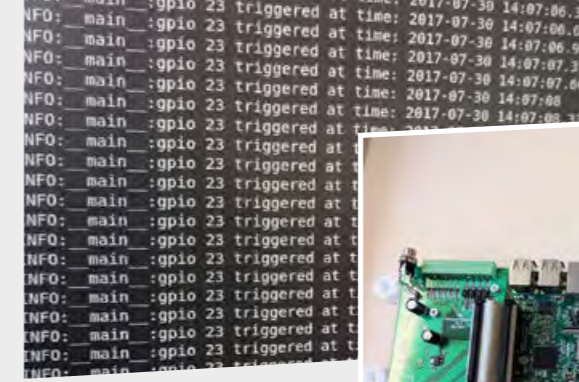


## Development of the Time-Keeping (TK) system:



### This year, there will be new "Main Boxes" and new RFID Readers implemented.

An interesting aspect of this system is the close attention that is paid to the redundancy. All data that the system records will be saved in three different locations simultaneously (in the box, in the Event Control and directly to the internet). In the case that the "Main Box" fails, there is a back-up box (that is configured and booted) that sits in the TK bus, and can be immediately implemented. The box has a car battery, so that in the case that the power fails, the race can keep going. All parts have a backup, just in case a car decides to crash into the TK equipment, it can be quickly replaced to prevent any delay.



### The new RFID readers

have a GPS module built in, so that the times of the cars can be measured to the nearest 100 micro-second. This innovation was developed together with the company u-blox.

### The Software

implemented for Formula Student Germany has been developed specially for this Competition and "understands" how the different disciplines function. Standard software for racing doesn't understand the FSG rules and therefore can not be implemented. The FSG Software identifies the cars automatically (for example during Endurance on the start-finish line and the entrance/exit from the driver change area. From this, the Software can automatically understand what is happening during the race, e.g. when there is a "Meatball" flag.



## Development in the Awards Ceremony:



### The slides know the winner first!

For those of you who have attended an FSG Awards Ceremony, you know that it NEVER starts on time! The reason is not because the FSG team are at the end of a very busy week and have given up, it is actually because of the time that is required after the Endurance is over in ensuring that the times that the TK team have recorded have been accurately turned into points, with the penalties deducted. Every year attempts are made to reduce this time, so that there is more time to party! The latest development automates the results directly onto the Awards Ceremony presentation. So when Tim and Alia say they don't know who the winner is, the information is so new that this is truly the case!



## From FSG to Start-up Von der FSG zum Start-Up



**After completing his degree in Automotive Engineering at the Technical University of Braunschweig, where he spent four years being part of Formula Student in the Lions Racing Team, Christopher Zinke followed a career via Audi Sport and found his way to the Start-Up: Autonomous Intelligent Driving GmbH (AID). He is very happy with his position and the environment that he works in.**

**As an Alumni of Formula Student Germany and someone who has followed the dream of many FSG competitors by working in a start-up. Do you feel like you have made it yet?**

Competing at FSG was an awesome experience. I still like to think back on all the ups and downs we had and how we eventually managed to shape the team and the car to be successful. After finishing my studies, I was concerned about being an engineer in a big cooperation responsible for only a small step in an overall lengthy development process with little feedback from customers. That's why I made the choice to work in environments with fast product iterations that provide quick feedback to my work. In retrospective I am very happy with my career path in that respect. I would not say "I made it" as this is just a choice that everybody can make.

**Christopher Zinke hat nach dem Studium der Fahrzeugtechnik an der TU Braunschweig und seiner vierjährigen Formula Student Zeit im Lions Racing Team den beruflichen Weg über Audi Sport zum Start-Up Autonomous Intelligent Driving GmbH (AID) gefunden. Dort ist er sehr zufrieden mit seinem Arbeitsumfeld und seinen Aufgaben.**

**Als Formula Student Germany Alumnus hast du den Traum vieler FSG-Teilnehmer wahr gemacht und arbeitest nun für ein Start-Up. Denkst du, dass du es nun geschafft hast?**

An der FSG teilzunehmen war eine unglaublich wertvolle Erfahrung. Ich denke immer noch gerne an all unsere Höhen und Tiefen zurück und wie wir letztendlich ein Team geformt und ein erfolgreiches Auto gebaut haben. Nach meinem Studium hatte ich wenig Interesse daran, als Ingenieur für einen kleinen Schritt in einem riesigen Entwicklungsprozess zuständig zu sein, ohne direkte Rückmeldung von Kunden zu bekommen. Daher habe ich mich dafür entschieden, in einer Umgebung mit schnellen Produktiterationen zu arbeiten, durch die ich schnelles Feedback für meine Arbeit bekomme. Rückblickend bin ich sehr zufrieden mit meinem bisherigen Karriereweg. Ich würde nicht sagen, dass „ich es geschafft habe“, da ja jeder für sich diese Entscheidung treffen kann.

**What are your current roles within the company?**

At AID our goal is to deliver an autonomous driving stack for the urban environment. My role is to build and run the technical product management based on the principles of agile development. That means we have self-organized engineering teams that strive to deliver the best possible value for the overall product. We develop the product in incremental steps to have fast feedback loops for everybody. Together with all teams my responsibility is to develop this incremental plan so that we build the best product possible.

**Instead of following the typical path of a Start-Up environment - out in the middle of nowhere, working on your ideas, AID has been built up within Audi AG. What benefits did you feel that you gained by taking this route?**

Working at AID certainly has the advantage that we have the financial backing of Audi while being completely independent in terms organization, processes and infrastructure. The financial backing allows us to make some long-term investments that are crucial for developing such complex technology like an autonomous driving stack. If we were a regular Start-Up we probably would focus more on short term results and suffer from a less sustainable approach in terms of design.

**Why was this the right career choice for you?**

I love having organizational and technologic challenges. Working at AID means building a team and developing all the necessary technology that is needed to build an autonomous driving stack for the urban environment.

Frage 5.: What is your message to the motivated students who are currently competing at FSG and who aspire to build up their own business in the future?

Competing at FSG equips you with the capability to build a team and a product that succeeds in a competitive environment. To be competitive you must make tradeoffs and find the right compromises on organizational, system and component level. Applying these principles in a professional business environment is a great step towards being successful with your product! /

**Was sind deine aktuellen Aufgaben im Unternehmen**

Unser Ziel bei AID ist es, eine Software für das automatische Fahren in städtischer Umgebung zu entwickeln. Meine Aufgabe besteht darin, auf Grundlage agiler Entwicklungsprinzipien das technische Produktmanagement aufzubauen und zu koordinieren. Wir haben selbst-organisierte Entwicklerteams, die alle ihren bestmöglichen Beitrag für das Gesamtprodukt leisten. Wir entwickeln das Produkt in inkrementellen Schritten und haben dadurch schnelle Feedbackschleifen für alle. Ich bin dafür verantwortlich, zusammen mit allen Teams diesen inkrementellen Plan zu entwickeln und kontinuierlich anzupassen, um das bestmögliche Produkt auszuliefern.

**AID bedeutet nun nicht die allgemein geläufige Start-Up-Umgebung, d.h. die Arbeit an deinen eigenen Ideen irgendwo im nirgendwo, sondern ist eine Tochter der Audi AG. Empfindest du das als Vorteil?**

Sicherlich profitieren wir bei AID davon, dass wir den finanziellen Rückhalt von Audi haben, aber in unserer Organisation, den Prozessen und der Infrastruktur komplett unabhängig sind. Durch die finanzielle Stütze können wir einige langfristige Investitionen tätigen, die entscheidend sind für die Entwicklung einer so komplexen Technologie wie das automatische Fahren in der Stadt. Wenn wir ein normales Start-Up wären, würden wir uns mehr auf kurzfristige Ergebnisse konzentrieren, statt Lösungen zu implementieren, die nachhaltig skalierbar sind.

**Warum war das die richtige Jobwahl für dich?**

Ich finde es großartig, organisatorischen und technologischen Herausforderungen gegenüber zu stehen. Bei AID bauen wir ein Team auf und entwickeln all die notwendigen Technologien für das automatische Fahren in der Stadt.

**Was möchtest du all den motivierten Studierenden mitgeben, die aktuell an der FSG teilnehmen und gerne in der Zukunft ihre eigene Geschäftsidee verwirklichen möchten?**

Durch die Teilnahme an der FSG lernt man sowohl ein Team aufzubauen als auch ein Produkt herzustellen, das absolut wettbewerbsfähig ist. Um das zu erreichen, muss man Abstriche machen und auf organisatorischer wie technischer

Ebene die richtigen Kompromisse finden. Wenn man diese Grundlagen in die spätere Arbeitswelt überträgt, ist das ein riesiger Schritt, um mit dem eigenen Produkt erfolgreich zu sein! /



# Participating Formula Student Combustion TEAMS 2018

Teams



Car	City/University	Country	Pit	Page
207	Milano PT	Italy	41-A	97
211	Corvallis OSU	United States	T-83	88
212	Birmingham U	United Kingdom	T-81	86
213	München UAS	Germany	44-B	98
215	Glasgow U Strath	United Kingdom	T-65	91
218	Graz UAS	Austria	38-C	91
219	Haifa Technion	Israel	37-B	92
220	Magdeburg OvGU	Germany	T-58	97
221	Gießen UAS THM	Germany	T-82	90
222	Napoli UNINA	Italy	T-59	98
223	Poznań PUT	Poland	T-69	100
228	St. Petersburg PT	Russia	T-54	101
229	Stuttgart U	Germany	40-C	102
239	Heilbronn UAS	Germany	37-A	93
242	Darmstadt UAS	Germany	37-C	89
243	Pisa U	Italy	T-63	99
244	Ulm UAS	Germany	46-B	103
247	Darmstadt TU	Germany	T-66	88
248	Bochum U	Germany	T-84	86
249	Erlangen U	Germany	46-A	90
250	Chennai IITM	India	T-75	87
253	Graz TU	Austria	T-62	91
258	Paderborn U	Germany	T-50	98
260	Plzen UWB	Czech Republic	44-C	100
261	Edmonton U Alberta	Canada	38-A	89
262	Regensburg OTH	Germany	T-78	100
266	Melbourne Monash	Australia	T-80	97
268	Karachi NUST	Pakistan	T-77	93
270	Coburg UAS	Germany	40-B	88
272	Dortmund TU	Germany	43-B	89

Car	City/University	Country	Pit	Page
274	Brno TU	Czech Republic	46-C	87
277	Lund U	Sweden	T-57	96
279	Győr U	Hungary	40-A	92
280	Kassel U	Germany	34-B	95
281	Aalborg U	Denmark	T-56	85
285	Padova U	Italy	35-B	99
288	Bologna U	Italy	T-71	86
294	Esslingen UAS	Germany	T-76	90
297	Schweinfurt UAS	Germany	41-B	101
299	Wien FHC	Austria	T-53	103
308	Karlsruhe KIT	Germany	43-C	94
309	Wrocław TU	Poland	38-B	104
310	Kempten UAS	Germany	35-A	95
312	Thessaloniki U	Greece	T-68	102
313	Berlin TU	Germany	T-52	85
318	Stralsund UAS	Germany	34-C	102
328	Changsha U Hunan	China	T-74	87
329	Shiyan HUAT	China	T-85	101
330	Akron U	United States	T-72	85
333	Koblenz UAS	Germany	T-51	95
343	Konstanz UAS	Germany	44-A	96
354	Karlstad U	Sweden	T-67	94
362	Linköping U	Sweden	43-A	96
363	Aachen UAS	Germany	T-55	84
365	Wiesbaden UAS	Germany	T-60	104
369	Hamburg UAS	Germany	41-C	93
372	Hamburg HSU	Germany	T-79	92
379	Pforzheim U	Germany	T-64	99
395	València UPV	Spain	T-70	103
399	Karlsruhe UAS	Germany	35-C	94



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# Participating Formula Student Electric TEAMS 2018

Teams



Car	City/University	Country	Pit	Page
3	München UAS	Germany	09-C	113
5	Stuttgart DHBW	Germany	07-B	116
11	Köln TH	Germany	04-B	112
13	Berlin TU	Germany	07-C	106
16	Diepholz UAS	Germany	07-A	108
18	Karlsruhe KIT	Germany	10-B	111
19	Braunschweig TU	Germany	14-B	106
23	Amberg OTH	Germany	20-C	105
25	Dresden TU	Germany	23-A	108
26	Stuttgart U	Germany	04-A	116
29	Shiyan HUAT	China	19-C	115
30	Saarbrücken U Saarland	Germany	23-B	115
31	München TU	Germany	16-B	113
33	Zürich ETH	Switzerland	20-A	117
34	Ingolstadt UAS	Germany	06-C	110
35	Wolfenbüttel UAS Ostfalia	Germany	17-C	117
40	Eindhoven TU	Netherlands	06-A	109
42	Quebec City U Laval	Canada	22-C	114
44	Deggendorf IT	Germany	22-B	107
45	Sankt Augustin UAS	Germany	16-A	115
53	Kiel UAS	Germany	19-A	111
54	Barcelona UPC	Spain	25-A	105
60	Nürnberg GSO UAS	Germany	16-C	114
61	Aalen HS	Germany	09-B	105
63	Trondheim NTNU	Norway	09-A	117
64	Kaiserslautern TU	Germany	12-B	111

Car	City/University	Country	Pit	Page
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71	Ilmenau TU	Germany	17-A	110
72	Bremen U	Germany	17-B	106
78	Hamburg TU	Germany	06-B	109
85	Delft TU	Netherlands	04-C	108
86	Patras U	Greece	12-A	114
99	Aachen RWTH	Germany	14-A	104
101	Mannheim DHBW	Germany	20-B	112
118	Hannover U	Germany	14-C	110
119	Mülheim a.d.R. HRW	Germany	12-C	113
123	Chemnitz TU	Germany	22-A	107
124	Tallinn TU UAS	Estonia	10-C	116
142	Clausthal TU	Germany	10-A	107
171	Göttingen HAWK	Germany	19-B	109

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# Participating Formula Student Driverless TEAMS 2018



Car	City/University		Country	Pit	Page
411	Dresden TU	ELECTRIC	Germany	25-B	120
413	München UAS	ELECTRIC	Germany	25-C	122
414	Budapest TU	ELECTRIC	Hungary	29-B	119
417	Hannover U	ELECTRIC	Germany	26-A	121
418	Karlsruhe KIT	ELECTRIC	Germany	26-B	122
426	Stuttgart U	ELECTRIC	Germany	26-C	123
431	München TU	ELECTRIC	Germany	28-A	122
433	Zürich ETH	ELECTRIC	Switzerland	28-B	123
442	Darmstadt TU	ELECTRIC	Germany	28-C	120
463	Trondheim NTNU	ELECTRIC	Norway	29-A	123
469	Augsburg UAS	ELECTRIC	Germany	29-C	119
471	Ilmenau TU	ELECTRIC	Germany	31-A	121
478	Hamburg TU	ELECTRIC	Germany	31-B	121
480	Göteborg Chalmers	ELECTRIC	Sweden	31-C	120
499	Aachen RWTH	ELECTRIC	Germany	32-A	119
538	Berlin HTW	COMBUSTION	Germany	32	118
560	Weingarten UAS	COMBUSTION	Germany	32-C	118
585	Kempten UAS	COMBUSTION	Germany	34-A	118

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**STREETSCOOTER**

# Formula Student Team profiles

23 nations  
3416 students

60 teams **Combustion**

40 teams **Electric**


18 teams **Driverless**

3 **Combustions** / 15 **Electric**

## AACHEN

University of Applied Sciences Aachen

Car 363 Pit T-55 WRL 420

Germany 

Aixtreme Racing is a team of young individuals with their minds full of ideas, united in this year's FS18. Coming from FH Aachen University of Applied Sciences, we are perfectly prepared for independently constructing a flawless car due to the mind-set of educating in a very practical way. We have the chance to use the garages and machines, tools and connections for being able to present a high standard race car. We're excitedly looking forward to this season!



**FRAME CONSTRUCTION** composite CFRP monocoque / steel rear-frame  
**MATERIAL** CFRP with wooden sandwich core / HSS rear-frame  
**OVERALL L / W / H** 2563mm / 1445mm / 1118mm  
**WHEELBASE / TRACK (Fr / Rr)** 1540mm / 1240mm / 1200mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 132kg / 148kg  
**SUSPENSION** Double unequal length A-arm, pullrod actuated  
**TYRES (Fr / Rr)** 205/470 R13, Continental C17  
**WHEELS (Fr / Rr)** 7.5x13, 32mm offset, single piece, casted Al-alloy  
**ENGINE** Yamaha YZF-R6 Rj09  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 65,5mm / 44,5mm / 4 cylinders / 597cc  
**COMPRESSION RATIO** 12.4:1  
**FUEL SYSTEM** sequential manifold injection  
**FUEL** ROZ 98  
**MAX POWER/TORQUE DESIGN** 12000 rpm/ 8500rpm  
**DRIVE TYPE** chain drive  
**DIFFERENTIAL** limited slip (Drexler) with preload adjustment  
**COOLING** electric water pump, sidemounted radiator  
**BRAKE SYSTEM** Custom rotors: 196mm front, 186mm rear. Hub mounted. ISR calipers 4 cyl front, 2 cyl. rear  
**ELECTRONICS** buy-solution with selfmade MIL-spec wiring loom and full-electric shifting

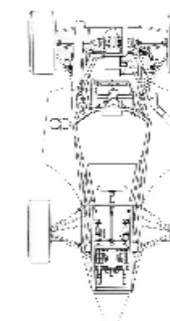
## AALBORG

Aalborg University

Car 281 Pit T-56 WRL 304

Denmark 

AAU Racing has had a big turn over during the last years and we are now proud to present our new car G8. The design goal has focused on getting a solid base that we can develop further on in the future. The team members are still gaining experience and we hope that this year will teach us a great deal about the design proces we have gone through and FSG will show that our hard work has paid off.



**FRAME CONSTRUCTION** Steel space frame  
**MATERIAL** Mild steel circular tubing  
**OVERALL L / W / H** mm / mm / mm  
**WHEELBASE / TRACK (Fr / Rr)** 1600mm / 1221mm / 1171mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** kg / kg  
**SUSPENSION** Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper  
**TYRES (Fr / Rr)** 20.5 x 6.0-13, R25B, Hoosier / 20.5 x 7.0-13, R25B, Hoosier  
**WHEELS (Fr / Rr)** 6.5x13, 40 mm offset, 3 pc Al / 7.0x13, 32 mm offset, 3 pc Al  
**ENGINE** Honda CBR600RR PC37  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 67mm / 42,5mm / 4 cylinders / 599cc  
**COMPRESSION RATIO** 12.1:1  
**FUEL SYSTEM**  
**FUEL** 98 octane unleaded gasoline  
**MAX POWER/TORQUE DESIGN** 11000 rpm/ 10100rpm  
**DRIVE TYPE** 520 chain drive  
**DIFFERENTIAL** Drexler limited slip  
**COOLING** Sidepod angle-mounted single pass radiator  
**BRAKE SYSTEM** Steel, hub mounted 222 OD 160 ID water cut  
**ELECTRONICS** Aftermarket ECU, in house designed dashboard and communication + data acquisition boards

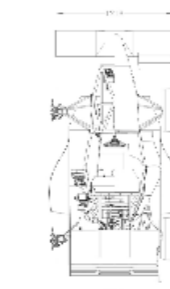
## AKRON

University of Akron

Car 330 Pit T-72 WRL 67

United States 

Zips Racing has been building car for competition since 1990. I those 28 year the team has seen the highs of 1st place overall finishes and the lows of DNF's on the last lap of endurance. Through it all Zips Racing has made a reputation for fast, well built cars. The ZR18 continues that tradition. With a focus on vehicle dynamics and tires. Akron's own Goodyear D2704's were selected as the tire of choice. Better team integration makes ZR18 more advanced than any before.




**FRAME CONSTRUCTION** Tubular Space Frame with Bonded CFRP Honeycomb Composite Panels  
**MATERIAL** 4130 Chromoly Steel, CFRP, Ti, Al, Polymers  
**OVERALL L / W / H** 2979mm / 1377mm / 1200mm  
**WHEELBASE / TRACK (Fr / Rr)** 1529mm / 1218mm / 1218mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 123kg / 123kg  
**SUSPENSION** Double Unequal Length A-Arms, Pull rod Actuated Coilover  
**TYRES (Fr / Rr)** 20x7x13, Goodyear D2704 / 20x7x13, Goodyear D2704  
**WHEELS (Fr / Rr)** 7.0x13, 50mm Offset, 3pc Al / 7.0x13, 50mm Offset, 3pc Al  
**ENGINE** Yamaha WR450F  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 95mm / 63,4mm / 1 cylinder / 449cc  
**COMPRESSION RATIO** 16.3:1  
**FUEL SYSTEM** Student Designed Fuel Pump Control With Sequential Staged Injection  
**FUEL** E85  
**MAX POWER/TORQUE DESIGN** 10500 rpm/ 9000rpm  
**DRIVE TYPE** 520 Roller Chain  
**DIFFERENTIAL** Drexler Formula Student, Salisbury Type  
**COOLING** Dual Side Mounted Single Pass Radiators With Controlled Fan  
**BRAKE SYSTEM** Grey Cast Iron Floating Discs, ISR Brake Calipers  
**ELECTRONICS** Motec M150 ECU, ACL, VIM, PDM,

## BERLIN

Technische Universität Berlin

Car 313 Pit T-52 WRL 42

Germany 

The FT18 Combustion is the 13th car in the evolution of FaSTTUBe racecars. It's focus is set on variability, reliability and aerodynamic design. The turbocharged one cylinder engine gives the car a boost of 85hp. As of this season our team has taken on the challenge of building two racecars simultaneously.



**FRAME CONSTRUCTION** Tubular Steel Frame  
**MATERIAL** 25CrMo4  
**OVERALL L / W / H** 2980mm / 1530mm / 1188mm  
**WHEELBASE / TRACK (Fr / Rr)** 1575mm / 1200mm / 1200mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 116kg / 133kg  
**SUSPENSION** Double unequal length A-Arm. Push rod (Fr) and Pull rod (Rr) actuated spring and damper.  
**TYRES (Fr / Rr)** 18.0x7.5-10 Hoosier R25B / 18.0x7.5-10 Hoosier R25B  
**WHEELS (Fr / Rr)** 7.5x10, 25mm offset, Blackwave Carbon Rim  
**ENGINE** 2007 BMW G 450 X  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 98mm / 59,6mm / 1 cylinder / 449cc  
**COMPRESSION RATIO** 12.5:1  
**FUEL SYSTEM** Self build aluminium tank, external fuel pump, two injectors, pressure regulator  
**FUEL** E85  
**MAX POWER/TORQUE DESIGN** 7500 rpm/ 7000rpm  
**DRIVE TYPE** Chain drive, original gearbox  
**DIFFERENTIAL** Self designed rigid axle  
**COOLING** Self build water-intercooler and cooler in the side box with fan mounted  
**BRAKE SYSTEM** 4-Disk floating syst, hub mounted, 143mm(FR), 113mm(RA), ISR Calipers, Cockpit adjustable  
**ELECTRONICS** Self developed Body Control Unit, Bosch MS4, electr. throttle, wastegate, shifting system













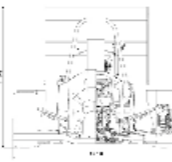
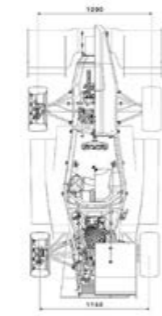


# MÜNCHEN

University of Applied Sciences München

**Car 213 Pit 44-B WRL 54** Germany

PassionWorks – not only the name of our cars but also our essential guiding principle! After a one-year break, we are finally back with more power and energy than ever before. Not even one part was left the same after revising our cars from the past. We are confident that our solutions make us more efficient, lighter and faster. Our new car combined with a strong team is fundamental to improve upon the past seasons and will surely let us set new personal records.



**FRAME CONSTRUCTION** Mono-coque / Tubular Space Frame  
**MATERIAL** CFRP, Rohacell Foam Core / 15CrMoV6  
**OVERALL L / W / H** 2891mm / 1410mm / 1194mm  
**WHEELBASE / TRACK (Fr / Rr)** 1540mm / 1200mm / 1150mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 115kg / 119kg  
**SUSPENSION** Double unequal length A-Arm, Pullrod actuated, separate roll and heave Spring and Damper  
**TYRES (Fr / Rr)** 205/470 R13, Continental C18  
**WHEELS (Fr / Rr)** 7x13, 30mm offset, CFRP rim with topology optimized aluminum rim star  
**ENGINE** KTM 450 SX-F  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 95mm / 63,4mm / 1 cylinder / 449cc  
**COMPRESSION RATIO** 13.95:1  
**FUEL SYSTEM** dead-end system, self-developed casted fuel rails, two Bosch EV14 injectors  
**FUEL** E85  
**MAX POWER/TORQUE DESIGN** 9000 rpm/ 7000rpm  
**DRIVE TYPE** chaindrive 428# chain, 4-speed gearbox  
**DIFFERENTIAL** Drexler, clutch pack limited slip, adjustable bias ratio and pre load  
**COOLING** custom core water and oil radiators mounted at the rear of the car, push fans  
**BRAKE SYSTEM** four X20Cr13 hub mounted floating rotors, AP Racing calipers, adjustable balance bar  
**ELECTRONICS** MoTeC M150, self developed BMS and Mainpower, selfdesigned Live-Telemetry, TC, LC, AU...

# NAPOLI

**Car 222 Pit T-59 WRL 398** Italy

The „UniNa Corse Squadra Corse Federico II“ was founded in 2010 and debuted in FSAE Italy with his first car in 2015. This year the team joins his first foreign event with the participation at FSG 2018. The 2018 car, improves the performance, reliability and lower the weight of the previous car. His goal for this season is to complete all the dynamic events.



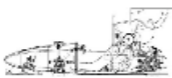
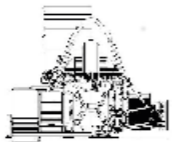
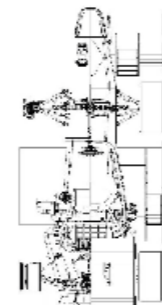
**FRAME CONSTRUCTION** Steel spaceframe  
**MATERIAL** AISI 4130 round tubing (from 16mm to 32mm diameter)  
**OVERALL L / W / H** 2945mm / 1485mm / 1270mm  
**WHEELBASE / TRACK (Fr / Rr)** 1565mm / 1200mm / 1190mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 145kg / 161kg  
**SUSPENSION** Double unequal A-Arms. Pull Rod actuated vertically oriented spring and damper  
**TYRES (Fr / Rr)** 180/530-13 Pirelli/ 180/530-13 Pirelli  
**WHEELS (Fr / Rr)** 7x13, 22mm offset, Aluminum Rim / 7x13, 22mm offset, Aluminum Rim  
**ENGINE** Honda CB600F 2007  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 67mm / 42,5mm / 4 cylinders / 599cc  
**COMPRESSION RATIO** 12:1  
**FUEL SYSTEM** SMPFI - Sequential Multipoint Fuel Injection  
**FUEL** 98 octane unleaded gasoline  
**MAX POWER/TORQUE DESIGN** 11000 rpm/ 7500rpm  
**DRIVE TYPE** Chain: length 776 mm, model 520  
**DIFFERENTIAL** Clutch Pack LSD, adjustable preload through ring nut.  
**COOLING** Side mounted 300 x 315 x 40 core aluminium radiator, 466 cfm fan mounted to rear side.  
**BRAKE SYSTEM** 4-Disk system, Steel floating drilled brake disk with 218mm diameter. 4-pistons calipers  
**ELECTRONICS** Gear and shift indicator, Electropneumatic Shifting System, SD Datalogger

# PADERBORN

University of Paderborn

**Car 258 Pit T-50 WRL 51** Germany

Since 12 years, the passion for engineering and motorsports attracts students from various faculties of the University of Paderborn to join the UPBracing Team. This season 46 students, diving into five departments, make up the team. Besides typical aims like minimizing the weight, increasing downforce and more power we focused on a good driveability to enable our driver to go faster.



**FRAME CONSTRUCTION** One-Piece CFRP Mono-coque  
**MATERIAL** Full CFRP with Aramid Honeycomb  
**OVERALL L / W / H** 2882mm / 1470mm / 1174mm  
**WHEELBASE / TRACK (Fr / Rr)** 1600mm / 1160mm / 1140mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 130kg / 146kg  
**SUSPENSION** double unequal wishbone pushrod suspension front and rear  
**TYRES (Fr / Rr)** Hoosier R25B 18,0x7,5 - 10 / Hoosier R25B 18,0x7,5 - 10  
**WHEELS (Fr / Rr)** CFRP Rim, 10" diameter, 7" width / CFRP Rim, 10" diameter, 7" width  
**ENGINE** Suzuki GSX-R 600  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 67mm / 42,5mm / 4 cylinders / 599cc  
**COMPRESSION RATIO** 13,0:1  
**FUEL SYSTEM** Student made tank and fuel rail with Bosch EV12 injectors  
**FUEL** 98 octane unleaded gasoline  
**MAX POWER/TORQUE DESIGN** 9500 rpm/ 6500rpm  
**DRIVE TYPE** chain drive 22,5mm  
**DIFFERENTIAL** Drexler Formula Student limited slip differential  
**COOLING** one coolant on each side of the car without scoop and fan  
**BRAKE SYSTEM** 4-disk system with self developed rotors and driver-adjustable brake balance  
**ELECTRONICS** self made cockpit display with LED-shifting lights and telemetry system

# PADOVA

University of Padova

**Car 285 Pit 35-B WRL 143** Italy

Race UP Team started participating in Formula SAE ruled competition since 2003. This year the team is coming back to Formula Student Germany with its 13th car, starting from the experience of the good project of last year. All the components are designed to be as light as possible and to reach the best integration in the car. The goal of this year is to improve reliability and to gain the maximum performance from the new car with an efficient testing phase.



**FRAME CONSTRUCTION** Tubular spaceframe  
**MATERIAL** Steel AISI4130 (25CrMo4)  
**OVERALL L / W / H** 2998mm / 1446mm / 1199mm  
**WHEELBASE / TRACK (Fr / Rr)** 1535mm / 1220mm / 1190mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** kg / kg  
**SUSPENSION** Double unequal length A-Arm. Pull-rod actuated.  
**TYRES (Fr / Rr)** 20.5 x 7.0 R13 Hoosier / 20.5 x 7.0 R13 Hoosier  
**WHEELS (Fr / Rr)** 7.0 x 13" / 7.0 x 13" OZ Racing magnesium  
**ENGINE** Honda CBR 600 RR PC40 2007/2008  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 67mm / 42,5mm / 4 cylinders / 599cc  
**COMPRESSION RATIO**  
**FUEL SYSTEM** Single injector per cylinder, low pressure  
**FUEL** 98 octane unleaded gasoline  
**MAX POWER/TORQUE DESIGN** rpm/ rpm  
**DRIVE TYPE**  
**DIFFERENTIAL** Limited slip, 15 Nm Preload, 51% drive - 29% decel interlock valve  
**COOLING** Left mounted 30 core aluminum radiator , 1200 cfm electric fan  
**BRAKE SYSTEM** ISR calipers, 4 self developed rotors with 250mm / 220mm diameter, adjustable brake bias  
**ELECTRONICS** Multifunctional steering wheel, electropneumatic clutch and shifting system

# PFORZHEIM

Pforzheim University

**Car 379 Pit T-64 WRL 309** Germany

Renschmiede Pforzheim presents RSP18 Ruby. Our 6th race car stands for a strong ambitious team bigger than ever. With the organizational structure of a company we were able to design, manufacture and test the RSP18 faster than ever before. Our goal is to build a reliable and cost efficient car. We did some major changes on our standard motor as well as enlarging our aerodynamic device. We decreased the weight and got about 50% more downforce compared to our RSP17 Onyx.



**FRAME CONSTRUCTION** Tubular steel space frame  
**MATERIAL** E355 from 25x2,5 to 20x1  
**OVERALL L / W / H** 2915mm / 1400mm / 1213mm  
**WHEELBASE / TRACK (Fr / Rr)** 1535mm / 1180mm / 1140mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 115kg / 119kg  
**SUSPENSION** Double A-Arm, Pullrod actuated spring/damper with rocker, adjustable Anti Roll Bar  
**TYRES (Fr / Rr)** 150x65 R10 (18 x 6.0 - 10)/150x65 R10 (18 x 6.0 - 10)  
**WHEELS (Fr / Rr)** 6,5x10  
**ENGINE** KTM SX-F 450  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 95mm / 63,4mm / 1 cylinder / 449cc  
**COMPRESSION RATIO** 13,6  
**FUEL SYSTEM** Welded aluminium fuel tank  
**FUEL** E85  
**MAX POWER/TORQUE DESIGN** 9400 rpm/ 7500rpm  
**DRIVE TYPE** chain drive 520 chain  
**DIFFERENTIAL** Drexler limited slip differential  
**COOLING** Two side pod mounted radiator , two fans each  
**BRAKE SYSTEM** Self designed, drilled and floating rotors with 182mm Diameter, ISR Brake calipers  
**ELECTRONICS** Multifunctional Steering Wheel, Electropneumatic Shifting System.

# PISA

University of Pisa

**Car 243 Pit T-63 WRL 151** Italy

E-Team Squadra Corse, the University of Pisa racing team, was born in 2007. This year we built our 10th car, Kerub H, outcome of the experiences and knowledge gained through the years. With it we aim to thank our University and our sponsors by getting a great result in FSG. Racing with number 243, it is a 55kW car powered by a Honda engine. It comes with enhanced aero-package and revisited suspensions and steering layout. Along with electric shift and clutch and lowered driver position.



**FRAME CONSTRUCTION** Tubular steel space frame  
**MATERIAL** AISI 4130 round tubing (19.05mm to 28.58mm)  
**OVERALL L / W / H** 3067mm / 1428mm / 1172mm  
**WHEELBASE / TRACK (Fr / Rr)** 1534mm / 1212mm / 1110mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 148kg / 160kg  
**SUSPENSION** Double unequal length A-Arm. Push rod (front) and pull rod (rear)  
**TYRES (Fr / Rr)** 13" - 180mm/530mm, DSS, Pirelli  
**WHEELS (Fr / Rr)** 7"x13", 43mm offset, 1 pc Al-Mg Rim  
**ENGINE** Honda CBR 600RR, 2003  
**BORE / STROKE / CYLINDERS / DISPLACEMENT** 67mm / 42,5mm / 4 cylinders / 599cc  
**COMPRESSION RATIO** 13:1  
**FUEL SYSTEM** 2003 Honda CBR 600RR, PC37  
**FUEL** 98 octane unleaded gasoline  
**MAX POWER/TORQUE DESIGN** 11500 rpm/ 9900rpm  
**DRIVE TYPE** 520 chain, 15,875mm pitch  
**DIFFERENTIAL** LSD, 30-35Nm preload after initial run in, ramp angle setup 40deg/50deg  
**COOLING** Twin side pod mounted radiators with electric fans  
**BRAKE SYSTEM** Self developed, inox, floating 230mm (front), fixed 210mm (rear), driver adj. balance bar  
**ELECTRONICS** Self developed PDU and A2CAN, Electric shift and clutch, GSM based Telemetry









## DELFT

Delft University of Technology

Car 85 Pit 04-C WRL 9 Netherlands 

The DUT18 is the latest in a long line of successful machines designed and built by Formula Student Team Delft. This season, the team's focus was to optimise the synergy between the car and the driver, which was achieved by specific focus on the ergonomics and aerodynamics of the vehicle. Coupled with the now-traditional 14.5" tyres and custom-designed cooling system, the DUT18 is ready to take on the competition at Hockenheim.



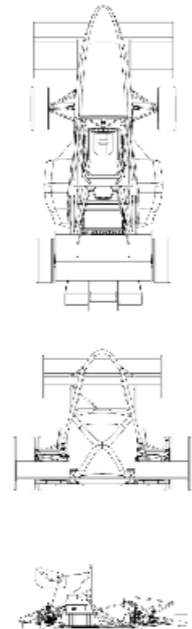
**FRAME CONSTRUCTION** Full monocoque  
**MATERIAL** CFRP with aluminum honeycomb core  
**OVERALL L / W / H** 2831mm / 1428mm / 1138mm  
**WHEELBASE / TRACK (Fr / Rr)**  
 1530mm / 1200mm / 1200mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 112kg / 116kg  
**SUSPENSION** Double unequal length A-Arm. Direct acting spring damper front, pushrod rear  
**TYRES (Fr / Rr)** 225x368-R10, Vredestein  
**WHEELS (Fr / Rr)** 214mm CFRP self-made two-piece rim  
**NUMBER OF MOTORS / LOCATION / MAX POWER**  
 4 / FL FR RL RR / 35 kW per motor  
**MOTOR TYPE** AMK DT5-14-10-POW-14000-B5  
**MAX MOTOR RPM** 20000  
**MOTOR CONTROLLER** AMK KW26-S5-FSE-4Q  
**MAX SYSTEM VOLTAGE** 600V  
**ELECTRODE MATERIALS** LiCoO2  
**COMBINED ACCUMULATOR CAPACITY** 6.8 kWh  
**TRANSMISSION RATIO (PRIMARY / SECONDARY)**  
 1:10.82 / -  
**DRIVE TYPE** 3 Planet single-stage transmission  
**DIFFERENTIAL** Electronic using own control systems  
**COOLING** Water cooled with radiator rearward of chassis  
**BRAKE SYSTEM** Rotor floating in hub, 3 & 2 mm steel, 161/119mm, integrated caliper half  
**ELECTRONICS** Multiple driver aids, Self designed data logging on ECU, UHF Band FHSS protocol telemetry

## DIEPHOLZ

University of Applied Sciences Diepholz/Oldenburg/Vechta

Car 16 Pit 07-A WRL 94 Germany 

We are Deefholt Dynamics, the racing team of the PHWT from Diepholz. As part of our stud-ies we participate since 2006 at formula student. The special thing about us: Our car is built every year by a first year team within only six months. This season 47 student's joined the project with one goal: Building a competitive car as fast as no one else can do. So within our long-term concept we optimize our car step by step, year by year. This season, for example, with new aerodynamic devices.



**FRAME CONSTRUCTION** steel tubing  
**MATERIAL** 25CrMo4  
**OVERALL L / W / H** 3207mm / 1510mm / 1199mm  
**WHEELBASE / TRACK (Fr / Rr)**  
 1590mm / 1300mm / 1200mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 165kg / 193kg  
**SUSPENSION** Double unequal length A-Arm. Push rod/pull rod with damper bridge on rear axle.  
**TYRES (Fr / Rr)** Hoosier 18.0 x 6.0 - 10 R25B  
**WHEELS (Fr / Rr)** 6.25 in contact patch  
**NUMBER OF MOTORS / LOCATION / MAX POWER**  
 2 / Rear Right, Rear Left / 40 kW  
**MOTOR TYPE** EMRAX 208 LV LC  
**MAX MOTOR RPM** 5500  
**MOTOR CONTROLLER** Emsiso emDrive 500  
**MAX SYSTEM VOLTAGE** 128V  
**ELECTRODE MATERIALS** LiFeYPO4  
**COMBINED ACCUMULATOR CAPACITY** 7.68kWh  
**TRANSMISSION RATIO (PRIMARY / SECONDARY)**  
 1:4 /  
**DRIVE TYPE** Brushless DC  
**DIFFERENTIAL** Electronically controlled torque distribution with limited slip  
**COOLING** Two radiators 180x120 mm mounted in sidepods.  
**BRAKE SYSTEM** self developed floated rotors with 190mm diameter, AP Racing calipers  
**ELECTRONICS** selfdesigned Live-Telemetry-System and different driving modes selectable via rotaryswitch

## DRESDEN

Technische Universität Dresden

Car 25 Pit 23-A WRL 23 Germany 

We proudly introduce LottE, the already eleventh Racecar in the history of Elbflorace to compete in the Formula Student. 60 students from the TU Dresden majoring in a wide variety of studies accomplished to build by far the most lightweight vehicle in club history. Especially our new Monocoque helped us get there. Weighing only 17,5kg including front and main hoop, it fulfills with ease the second-year requirements of our strict 3-year-plan, that is supposed to place us in the Top 5 of FSE this



**FRAME CONSTRUCTION** full size CFRP Monocoque  
**MATERIAL** CFRP with aramid core 15-20mm thick  
**OVERALL L / W / H** 2942mm / 1437mm / 1165mm  
**WHEELBASE / TRACK (Fr / Rr)**  
 1550mm / 1200mm / 1150mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 122kg / 122kg  
**SUSPENSION** double unequal length triangular A-Arm Suspension, double-spring and 4-valve-damper system  
**TYRES (Fr / Rr)** 205x470 R13 Continental C18  
**WHEELS (Fr / Rr)** 7x13, 30mm offset, 1pc Mg Rim  
**NUMBER OF MOTORS / LOCATION / MAX POWER**  
 4 / Wheel Hubs FL FR RR RL / 35kw per Motor  
**MOTOR TYPE** AMK / DD5-14-POW-19000  
**MAX MOTOR RPM** 20000  
**MOTOR CONTROLLER**  
**MAX SYSTEM VOLTAGE** 560V  
**ELECTRODE MATERIALS** Lithium-ion Polymer  
**COMBINED ACCUMULATOR CAPACITY** 6.53 kWh  
**TRANSMISSION RATIO (PRIMARY / SECONDARY)**  
 16.67 / n/a  
**DRIVE TYPE** 1.5 stage planetary gear integrated  
**DIFFERENTIAL** n/a  
**COOLING** 2 separated closed circulation water cooling systems for motor and inverter  
**BRAKE SYSTEM** 4 wheel recuperation, mechanically adjustable brake balance  
**ELECTRONICS** DRS System, driver accessible vehicle settings via cockpit buttons, torque vectoring

## EINDHOVEN

Eindhoven University of Technology

Car 40 Pit 06-A WRL 35 Netherlands 

University Racing Eindhoven is the largest student project of the Eindhoven University of Technology. The 2018 competitor, the URE13, features four custom URE/AE in-wheel electric motors controlled by a custom URE/Prodrive quad inverter. The power is transferred to the tarmac using custom Vredestein tires while the torque vectoring algorithm distributes torque between the wheels. Finally, the car is complemented with a lightweight aerodynamic package and one of the smallest final drives possible.



**FRAME CONSTRUCTION** CFRP sandwich full monocoque  
**MATERIAL** Textreme M30SC/CPV4 prepreg. NTPPT M40J UD, Bi- & Triaxial prepreg. Core: Al 5056  
**OVERALL L / W / H** 2928mm / 1413mm / 1175mm  
**WHEELBASE / TRACK (Fr / Rr)**  
 1536mm / 1207mm / 1162mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 115kg / 151kg  
**SUSPENSION** Unequal length double wishbones, pushrod actuated horizontal oriented dampers  
**TYRES (Fr / Rr)** 205x50 R10 Vredestein  
**WHEELS (Fr / Rr)** 7x10 inch, 46.8 mm offset, CFRP Rim / 7x10 inch, 46.8 mm offset, CFRP Rim  
**NUMBER OF MOTORS / LOCATION / MAX POWER**  
 4 / Wheelhub mounted / 4x30kW  
**MOTOR TYPE** URE&AE / Custom-developed PMSM  
**MAX MOTOR RPM** 18  
**MOTOR CONTROLLER** Custom quad motorcontroller  
**MAX SYSTEM VOLTAGE** 400V  
**ELECTRODE MATERIALS** LiCoO2  
**COMBINED ACCUMULATOR CAPACITY** 7  
**TRANSMISSION RATIO (PRIMARY / SECONDARY)**  
 1:11.61 / N/A  
**DRIVE TYPE** In-wheel compounded planetary gearbox  
**DIFFERENTIAL** Electronic torque vectoring differential  
**COOLING** Side mounted double radiator, water cooled, accumulator airducts and rear mounted electric fans  
**BRAKE SYSTEM** Floating, steel hub mounted, 182x3 mm, vented student designed rotors  
**ELECTRONICS** IO Nodes, 14 way fusebox settable via CAN, Live telemetry, 300W DC/DC converter

## GÖTTINGEN

Hochschule für angewandte Wissenschaft und Kunst Hildesheim/Holzwinden/Göttingen

Car 171 Pit 19-B WRL 49 Germany 

The Team Blue Flash Mobility Concepts was founded in 2015. 35 Students from three faculties of the HAWK Goettingen collaborate in realizing their third race car. In 2017 the team built an exceptionally safe vehicle. For the E\_HAWK18 this unique design was refined and paired with more reliability and increased power. The team stays pioneer in low Voltage technology in the Formula Student competition. We are looking forward to exciting days at FSG 2018.



**FRAME CONSTRUCTION** Front and rear Tubular space frame  
**MATERIAL** S235 +C, S355 +N ; 28x1.2, 26x1.2, 28x2  
**OVERALL L / W / H** 3000mm / 1400mm / 1206mm  
**WHEELBASE / TRACK (Fr / Rr)**  
 1535mm / 1200mm / 1200mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 128kg / 130kg  
**SUSPENSION** double A-arm, unequal length, Push rod, Spring and Damper horizontally  
**TYRES (Fr / Rr)** 205/470 R13, Continental C16 / 205/470 R13, Continental C17  
**WHEELS (Fr / Rr)** 7x13, 30mm offset, 1pc Al-MG Rim / 7x13, 30mm offset, 1pc Al-MG Rim  
**NUMBER OF MOTORS / LOCATION / MAX POWER**  
 1 / Rear / 80kW  
**MOTOR TYPE** EMRAX 208  
**MAX MOTOR RPM** 7250  
**MOTOR CONTROLLER** emsiso EmDrive 500  
**MAX SYSTEM VOLTAGE** 118V  
**ELECTRODE MATERIALS** LiPo - Cobalt Oxide  
**COMBINED ACCUMULATOR CAPACITY** 7.40kWh  
**TRANSMISSION RATIO (PRIMARY / SECONDARY)**  
 1:5.98 / N/A  
**DRIVE TYPE** Spur Gears  
**DIFFERENTIAL** none  
**COOLING** Two rear mounted self developed radiators  
**BRAKE SYSTEM** 4-Disk system, self dev. rotors with 207/207mm (f/r) diameter, adj. brake balance  
**ELECTRONICS** self design main control unit, self designed battery management system

## HAMBURG

Hamburg University of Technology

Car 78 Pit 06-B WRL 38 Germany 

The egn18-ev is the seventh car of the e-gniton Hamburg Team. We opted for an all-wheel drive, featuring a carbon fibre monocoque, a complete aerodynamic package and a completely improved accumulator system. With our strong team we managed to ensure a community in which everybody helped each other, and through which we got our car out on the testing track by mid may. We are excited to spend a great week with the Formula Student community at a sunny Hockenheim race track!



**FRAME CONSTRUCTION** Monocoque structure with prepreg and aluminium honeycomb material  
**MATERIAL** IMS65 UD Fibres  
**OVERALL L / W / H** 3000mm / 1400mm / 1130mm  
**WHEELBASE / TRACK (Fr / Rr)**  
 1530mm / 1200mm / 1150mm  
**WEIGHT WITH 68kg DRIVER (Fr / Rr)** 129kg / 133kg  
**SUSPENSION** Double unequal length A-Arm. Push rod actuated air spring and damper  
**TYRES (Fr / Rr)** Continental C18  
**WHEELS (Fr / Rr)** 13  
**NUMBER OF MOTORS / LOCATION / MAX POWER**  
 4 / Each Wheelhub / 30kW each  
**MOTOR TYPE** AMK DD5-14-10-POW  
**MAX MOTOR RPM** 21000  
**MOTOR CONTROLLER** AMK Wechselrichter KW26-S5-FSE-4Q  
**MAX SYSTEM VOLTAGE** 600V  
**ELECTRODE MATERIALS** LiCoO2 - Graphite  
**COMBINED ACCUMULATOR CAPACITY** 6,7kWh  
**TRANSMISSION RATIO (PRIMARY / SECONDARY)**  
 1:14,1 / N/A  
**DRIVE TYPE** One stage planetary gear system in wheel  
**DIFFERENTIAL** Software actuated electrical differential  
**COOLING** Water cooling. Two motors and one motorcontroller each.  
**BRAKE SYSTEM** Self developed rotors with 191mm diameter, adjustable brake balance  
**ELECTRONICS** ECU, AMS, IMU and sensor boards self designed.














## DARMSTADT

Technische Universität Darmstadt

Car 442 Pit 28-C

Germany 

DART Racing is the Formula Student Team of the Technical University of Darmstadt. The team was founded in 2005 as an IC Team. Since 2011 we build electric race cars and since 2017 two cars each year: one electric and one electric-driverless. The lambda-D2018 is the second fully autonomous race car of our team based on the lambda2016. The main changes to the last year's driverless car are a new lidar-sensor and a new, hydropneumatic braking-actuator.




### DRIVERLESS ELECTRIC

**FRAME CONSTRUCTION** Mono-coque  
**MATERIAL** CFRP-Prepreg, SGL SIGRAPREG C T24, Aluminium honeycomb  
**OVERALL L / W / H** 2966mm / 1345mm / 1182mm  
**WHEELBASE / TRACK (Fr / Rr)** 1525mm / 1183mm / 1162mm  
**WEIGHT WITHOUT DRIVER (Fr / Rr)** 106kg / 146kg  
**NUMBER OF MOTORS / LOCATION / MAX POWER** 2 / Rear Right, Rear Left / 51kW  
**COMBINED ACCUMULATOR CAPACITY** 6.35kWh  
**BRAKE SYSTEM** self developed rotors 240mm dia. front / 200mm dia. rear, adj. brake balance  
**PROCESSING UNITS** Nvidia Drive PX 2, dSPACE MicroAutoBox II  
**PERFORMANCE OF PUs** 9600 GFLOPS  
**POWER CONSUMPTION OF PUs** 416 W  
**CAMERAS** Autonomos Smart Stereo Camera, 110° opening angle  
**RADAR** -  
**LIDAR** Velodyne VLP-16 Hi-Res  
**OTHER SENSORS** VectorNav VN-300, Kistler Correvit SFII  
**HIGHLIGHTS OF THE DV SYSTEM** Neuronal network for computer vision (trained with 3000 pictures), self developed mapping algorithm, sensor fusion of LIDAR and camera, localization by differential GPS, control system with 2 degrees of freedom, pneumatic brake actuation

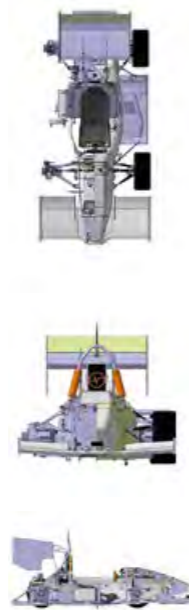
## DRESDEN

Technische Universität Dresden

Car 411 Pit 25-B

Germany 

This is the first season for Elbflorace Driverless. Because of that, we wanted to keep everything simple in order to have a solid basis for coming years. Our main focus is therefore on reliability and sustainability regarding a) the vehicles autonomous system, e.g. path planning and mapping and b) on the vehicles electric system.




### DRIVERLESS ELECTRIC

**FRAME CONSTRUCTION** full size CFRP Mono-coque  
**MATERIAL** Pre-impregnated CFRP with Aluminium honeycomb as core material  
**OVERALL L / W / H** 2955mm / 1407mm / 1146mm  
**WHEELBASE / TRACK (Fr / Rr)** 1550mm / 1200mm / 1150mm  
**WEIGHT WITHOUT DRIVER (Fr / Rr)** 110kg / 110kg  
**NUMBER OF MOTORS / LOCATION / MAX POWER** 2 / Rear / 35kW  
**COMBINED ACCUMULATOR CAPACITY** 7  
**BRAKE SYSTEM** 4-Disk system, self developed rotors and self developed front brake caliper  
**PROCESSING UNITS** Teensy 3.2, MicroAutoBox with Embedded PC  
**PERFORMANCE OF PUs** 345,6 GFLOPS  
**POWER CONSUMPTION OF PUs** 48 W  
**CAMERAS**  
**RADAR**  
**LIDAR** Velodyne Puck HiRes  
**OTHER SENSORS**  
**HIGHLIGHTS OF THE DV SYSTEM** Optimized version of Euclidean Clustering, 3d-Cone Detection using Machine Learning, recursive path planning using Delaunay Triangulation

## GÖTEBORG

Chalmers University of Technology

Car 480 Pit 31-C

Sweden 

It is the first year for Chalmers Formula Student Driverless and we present a reliable autonomous race car based on the 2017 electric car. The team consists of 15 second year master students: 7 members from last years electric team together with 8 new members with diversified background in both hardware and software engineering. The software platform for this car is a unique platform for Chalmers and all of the software used in the car is self-developed by the team during the past year.




### DRIVERLESS ELECTRIC

**FRAME CONSTRUCTION** CFRP single piece mono-coque with Al honeycomb core and integrated front hoop  
**MATERIAL** CFRP pre-pregs and Al honeycomb (1/2 and 1 inch) sandwich panels  
**OVERALL L / W / H** 2891mm / 1465mm / 1183mm  
**WHEELBASE / TRACK (Fr / Rr)** 1530mm / 1250mm / 1200mm  
**WEIGHT WITHOUT DRIVER (Fr / Rr)** 78kg / 138kg  
**NUMBER OF MOTORS / LOCATION / MAX POWER** 2 / Rear Right, Rear Left / 40kW, 40kW  
**COMBINED ACCUMULATOR CAPACITY** 7,66kWh  
**BRAKE SYSTEM** Toolex 33 steel, Floating 195x4(fr) 186x4(rr) rotors, 4(fr) & 2(rr) piston calipers  
**PROCESSING UNITS** AMD Ryzen 7 1700, Beaglebone Black, STM32  
**PERFORMANCE OF PUs** 42 GFLOPS  
**POWER CONSUMPTION OF PUs** 255 W  
**CAMERAS** Stereolabs ZED camera  
**RADAR** n/a  
**LIDAR** Velodyne Puck VLP-16, mounted on the front wing  
**OTHER SENSORS** SBG Ellipse-2N Inertial Navigation System  
**HIGHLIGHTS OF THE DV SYSTEM** Perception combines LiDAR and Camera using cone positions provided by the LiDAR to define Regions of Interest for a CNN. Steering is controlled by a velocity dependent aimpoint considering the number of cones seen and velocity is dependent on road curvature. The unique OpenDLV framework is used to realize the software as a suite of microservices.

## HAMBURG

Hamburg University of Technology

Car 478 Pit 31-B

Germany 

„Horst“ was built in 2017 and took part in several competitions this year. It is our first all-wheel drive vehicle and was able to complete the endurance in FSE17. After this eventful year Horst decided that it was time to take the next step. So he returned to our workshop for a few months to complete his transformation. With new skills and the newest drivers, he wants to face the challenges of the race track alone. But Horst, we will always sit on the grandstand and send our support and love.




### DRIVERLESS ELECTRIC

**FRAME CONSTRUCTION** Mono-coque structure with prepreg and aluminium honeycomb material  
**MATERIAL** IMS65 UD Fibres  
**OVERALL L / W / H** 2920mm / 1385mm / 1140mm  
**WHEELBASE / TRACK (Fr / Rr)** 1530mm / 1200mm / 1150mm  
**WEIGHT WITHOUT DRIVER (Fr / Rr)** 114kg / 116kg  
**NUMBER OF MOTORS / LOCATION / MAX POWER** 4 / In the Wheelhubs / 30 kW each  
**COMBINED ACCUMULATOR CAPACITY** 6,7 kWh  
**BRAKE SYSTEM** 4-Disk system, self-developed rotors, adjustable brake balance  
**PROCESSING UNITS** LPC 4337, Intel Core i7-6700K, Jetson TX2 module  
**PERFORMANCE OF PUs** 6573 GFLOPS  
**POWER CONSUMPTION OF PUs** 300 W  
**CAMERAS** 2 x Basler - daA1600-60ucArea Scan Camera with Global Shutter, USB 3.0, Res: 1600 x 1200 pixels  
**RADAR** n/a  
**LIDAR** 3x Ibeo Lux 2010, 4 Layer rotating mirror LIDAR scanner  
**OTHER SENSORS** 1x Xsens - MTI-G-710-GNSS/INS (IMU), self-developed angle sensor at steering rack  
**HIGHLIGHTS OF THE DV SYSTEM** In processing our LiDAR data we use Bundle Adjustment to retrieve both the car movement and a cone map, effectively using it for SLAM. The pneumatic EBS system, which is supplied by a compressor, can directly pressurize the hydraulic brake system. We have also a smooth integration of the dv components in the ev car. It is nearly invisible.

## HANNOVER

Leibniz Universität Hannover

Car 417 Pit 26-A

Germany 

HorsePower Hannover e.V. was founded in 2007 by a group of 10 engineering students. Our first events were FSUK and FSG in 2009 with the RacePony09, a combustion racecar. Step by step we learned about building an electric racecar. 2016 we build the first autonomous electric racecar. This year, our goal is to finish all dynamic events. To achieve this goal we focused on improving our autonomous system's reliability. Therefore we equipped our electric eH17 with technology for driving autonomously.




### DRIVERLESS ELECTRIC

**FRAME CONSTRUCTION** one-piece Mono-coque, CFRP-Aluminium honeycomb-sandwich  
**MATERIAL** K200K 1200 CP004 42 (CFRP Prepreg), PAMG-XR1-6.1-1/8-15-N-5056 (Alu Honeycomb)  
**OVERALL L / W / H** 2620mm / 1419mm / 1080mm  
**WHEELBASE / TRACK (Fr / Rr)** 1550mm / 1220mm / 1180mm  
**WEIGHT WITHOUT DRIVER (Fr / Rr)** 138kg / 107kg  
**NUMBER OF MOTORS / LOCATION / MAX POWER** 4 / wheel hub motors / 30kW, 30kW, 30kW, 30kW  
**COMBINED ACCUMULATOR CAPACITY** 6  
**BRAKE SYSTEM** Regenerative braking + 4-Disk system  
**PROCESSING UNITS** Sintrones ABOX-5000G1  
**PERFORMANCE OF PUs** 2000 GFLOPS  
**POWER CONSUMPTION OF PUs** 120 W  
**CAMERAS** 2 x Baumer - VLG-20C.I - 1/1.8  
**RADAR**  
**LIDAR** 2x Ibeo Lux 2010 4 layer scanner, range of 50m, 85 degree field of view  
**OTHER SENSORS** 1x IMU: iNAT-M200-SLC with Range +450 degrees and +18g, GPS and RTK support  
**HIGHLIGHTS OF THE DV SYSTEM** Fully redundant electro-pneumatic emergency brake system, self-developed Simulation environment with Unreal Engine, computing unit with gpu and gigabit network

## ILMENAU

Ilmenau University of Technology

Car 471 Pit 31-A

Germany 

Magazin UploadAfter last year's fire that destroyed our dreams for FSG 2017, we put all energy into renovating our workshop and regaining the lost equipment. Thanks to the support from our sponsors and fellow FS teams we were able to recover from the severe setback and embraced the opportunity to start with new ideas into this Season. Now we are back on track with a new accumulator, a new sensor and processing setup and the newly developed pneumatic braking system.



### DRIVERLESS ELECTRIC

**FRAME CONSTRUCTION** Mono-coque main section with detachable aluminium rear end  
**MATERIAL** carbon fiber sandwich with 10/20mm foam and wood core  
**OVERALL L / W / H** 2705mm / 1370mm / 1120mm  
**WHEELBASE / TRACK (Fr / Rr)** 1530mm / 1200mm / 1200mm  
**WEIGHT WITHOUT DRIVER (Fr / Rr)** 87kg / 141kg  
**NUMBER OF MOTORS / LOCATION / MAX POWER** 2 / Rear Right, Rear Left / 41kW per Motor  
**COMBINED ACCUMULATOR CAPACITY** 3.774kWh  
**BRAKE SYSTEM** 4-Disk system  
**PROCESSING UNITS** dSpace MicroAutoBox II embedded PC, Intel NUC7i7, Nvidia Jetson TX2, STM32 Board  
**PERFORMANCE OF PUs** 1600 GFLOPS  
**POWER CONSUMPTION OF PUs** 128 W  
**CAMERAS** one Stereolabs ZED Stereocamera, 110° opening angle  
**RADAR** n/a  
**LIDAR** Velodyne Puck vlp16 highres, 360 degree Laserscanner  
**OTHER SENSORS** VectorNav VN300 Inertial Navigation System  
**HIGHLIGHTS OF THE DV SYSTEM** Dynamic Window Approach, robust cone detection with deep neural network, sensor fusion of camera and LiDAR detections, highly adaptable framework





## How far they come



**It is amazing how far the teams are willing to travel and the amount of energy they are willing to invest in order to compete at Formula Student Germany (FSG).**

**Monash Motorsport, from Monash University in Australia explained to us their motivation to travel across continents to be part of the Engineering Design Competition.**

### **Please tell us a little bit about the history of your team?**

Monash Motorsport was established in the year 2000, and we have been competing in Formula Student competitions every year since then. We competed for the first time internationally at Formula Student Germany in 2006, and have been attending regularly since 2012. 2017 marked the first time we designed, manufactured and raced with both an electric and combustion car, and will be participating in the 2018 Formula Student Germany competition with both vehicles.

### **Do you develop combustion, electric or driverless race cars?**

Our team fields both a combustion and electric car in the Formula Student competition. Our combustion cars have achieved amazing success in recent years winning 8 out of the last 9 Australasian competitions. For the first time in 2017, we also fielded an electric entry to compete at the Formula SAE-Australasia competition and made history by becoming the first Australian team to place first overall in both combustion and electric classes at a single competition. We are also currently in the process of developing our autonomous systems with the aim to produce a functioning and reliable driverless car in 2019.

### **Please give us an overview of the team that will be competing at Formula Student Germany (FSG) 2018?**

In 2018, we will be bringing both our combustion and electric vehicles to compete at Formula Student Germany. We are bringing with us a team of 40 undergraduate students split across the two cars, most of whom will be competing at FSG for the first time.

### **What are the basic steps you go through to prepare the car for the competition?**

We aim to begin preparing our vehicles for competition as early as possible, carefully timelining our design and manufacturing periods to allow for sufficient vehicle testing and driver training. Our vehicles saw their first drive in July 2017, and following a gruelling initial testing phase leading up to the 2017 Formula SAE-Australasia competition, have been in their second testing phase through the Australian summer of 2018 to shakedown all the new components and systems to ensure their reliability, while also allowing for the final tweaks and tunes to vehicle setup. In the lead up to competition, testing sessions are conducted under realistic competition conditions, with team members taking on their competition specific roles. Sessions often include scrutineering checks, restricted Autocross runs on replica track layouts, full Endurance simulations with timed drivers swaps and strict post-Endurance technical inspections.

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**How far in advance do you have to ship the car?**

How far in advance do you have to ship the car? This year we were fortunate to have been supported by a local company with logistical support - they were to organise the shipping date of early May for arrival in late June. This gave us an opportunity to fit in quite a few testing sessions as well as being able to refine the cars as much as possible in Australia before arriving in Europe.

**Do you usually test the car once you arrive in Germany?**

We are lucky enough to have a number of host teams in Germany to help us setup a workspace, test and maintain our cars when we arrive in Germany. Given the long amount of time taken to ship the cars, we often start testing in Europe as early as possible to shake down the cars and get the drivers back into gear. This year, we will be looking to do some final driver training sessions, and a handful of final tuning tweaks in Germany before competition.

**What is your goal at FSG (to win, meet people, international experience, etc.)?**

Our team this year has a number of goals for the Formula Student Germany competition. Of course, a strong competition performance in both Static and Dynamic events is always something we strive towards, although we also place focus upon fostering our relationships with the international Formula Student community, particularly given we only compete internationally once every two years. We are also looking to provide our young team members with plenty of competition experience during our campaign, to give them the experience to lead the team in years ahead.

**This is not the first year that your team has competed at FSG, what is your motivation to come back?**

Our team vision is 'to be the most respected Formula Student team in the world'. Competing overseas at FSG and other European competitions helps us to further this goal, by giving us not only an opportunity to compete on the world stage but to further the team's knowledge and appreciation of the competition.

We always look forward to competing in Hockenheim - with such a large number of high quality participating teams and cars, there's so much to learn from. Of course, the great track facilities and brilliant event organisation by the FSG team help too!

**Is there any advice you would give to other teams who have not yet made the leap to travel internationally to compete at FSG or any other FS event?**

As one of the the only teams to regularly compete in both the European and Australasian competitions in recent years, together with Edith Cowan University at Silverstone, we would absolutely love to see more Aussie teams competing on international soil. Competing internationally not only opens up your team to a huge new Formula Student community, but also allows you to interact with many of the organisers and supporters of the competitions. Of course, you also get to take part in the best part of the Formula Student project multiple times a year too - the competitions!

”  
**Our team vision is 'to be the most respected Formula Student team in the world'. Competing overseas at FSG and other European competitions helps us to further this goal.**  
 ”

”  
 That being said, logistics are often the most difficult (and expensive) barrier to teams. We would highly recommend beginning your research early, and aim to lock down as many logistical points as early as possible. Of course, if your home competition runs off the Formula SAE ruleset, ensuring your vehicle meets all the rules requirements of all the competitions you plan to attend is absolutely essential too - make sure you don't underestimate the amount of work that this can take!

”  
**We would absolutely love to see more "Aussie" teams competing on international soil.**  
 ”

Lastly, the European competitions are unique in that they require a grueling quiz registration process typically unseen in other competitions, which requires another level of preparation and team organisation. This year we tackled this challenge by organising practice quizzes for the team, which resulted in us successfully registering with both our combustion and electric vehicles for all our planned competitions.

**Do you have anything else you would like to say?**

We can't wait to catch up with everyone at competition - make sure to swing by our pits or campsite to say hi! Unfortunately, the Formula Student Germany competition will be the last event of our 2018 European campaign, but this means that many of us will be looking to trade our Monash shirts - hunt us down before they're all gone! ▮



# EMERGENCY INFORMATION

## Minor Injury

### Medical Centre:

Please accompany the injured person to the Medical Centre.

**Emergency aid is provided there.**

The Medical Centre is occupied whenever the Pits are open.

## Severe Injury

### Contact someone with a two-way radio:

Every Official and Security has two-way radio.

Ask them to call the Medical Centre or an ambulance on channel 16.

### Call an ambulance:

Call an ambulance yourself if someone is severely injured and needs

urgent help. The Emergency Number for every phone and mobile phone is 112.

### During dynamics:

On the days that the dynamics are running, an ambulance is on site during the dynamic events.

They are located next to the Medical Centre and are marked on the Event Plan in blue.

To contact them, ask someone with a two-way radio (Official, Security) to call them.

### Hospital:

Krankenhaus (Schwetzingen), Bodelschwinghstrasse 10,  
68723 Schwetzingen, phone: +49 (0) 6202/84-30



## Emergency Numbers

In case of an emergency call 112.

This number works with each phone, also with mobile phone or coin-operated telephone as international GSM-standard. It is always free of charge.

# 112

### Officials

Pit Marshal - Konrad Paule	+49 (151) 560 747 00
Pit Marshal - Sebastian Seewaldt	+49 (151) 560 747 01
Event Control - Lea Pißbareck	+49 (151) 560 747 02
Back Office - Sven Grundner	+49 (151) 560 747 03

**(In case of an emergency please call one of them, no matter what time it is.)**

### Emergency Call Contents

The emergency control centre will ask you some questions to ensure proper help for you. To support you at your call, here are some standard questions and some hints for your answers in English and German.

### Who is calling? (Wer ruft an?)

Say your name and your telephone number for callbacks. Digits in German: 0 (null), 1 (eins), 2 (zwei), 3 (drei), 4 (vier), 5 (fünf), 6 (sechs), 7 (sieben), 8 (acht), 9 (neun)

### Where did it happen? (Wo ist es passiert?/Wo ist es geschehen?)

the event site has the adress "Hockenheimring, Sachshaus, Am Motodrom", make it more precise!:

pit lane (Boxengasse), dynamic area (Fahrerlager);

the adress for campsite C2 near the Motodrom Hotel " Hockenheimring, Zeltplatz C2 beim Motodrom Hotel"

and for campsite C3 on the other site of the highway "Hockenheimring, Zeltplatz C3 an der Continental Straße"

### What happened? (Was ist passiert?/Was ist geschehen?)

accident (Unfall), traffic accident (Verkehrsunfall), fire (Feuer), fall (Sturz), explosion (Explosion)

### How many people are affected? (Wie viele Personen sind betroffen?)

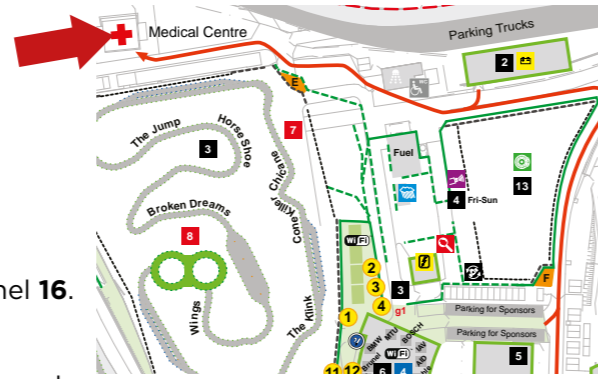
1 (eins), 2 (zwei), 3 (drei), 4 (vier), 5 (fünf), 6 (sechs), 7 (sieben), 8 (acht), 9 (neun), 10 (zehn)

### What kind of injury has happened? (Welche Verletzung liegt vor?)

fracture (Knochenbruch), bleeding (Blutung), unconsciousness (Bewusstlosigkeit), burn (Verbrennung),

electric shock (Stromschlag), suffocation (Ersticken), heart attack (Herzinfarkt), shock (Schock)

Don't hang up after answering these questions! Wait to hear if the control centre has further questions!



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