FORMULA STUDENT GERMANY 2010

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Hockenheim, August 4th – 8th 2010

FORMULA STUDENT GERMANY | PROGRAMME 2010

FORMULA STUDENT GERMANY

INTERNATIONAL DESIGN COMPETITION

August 4th – 8th 2010
Hockenheim

formula student germany

PROGRAMME 2010

presented by VDI

WE WOULD PARTICULARLY LIKE TO THANK THE SPONSORS OF FORMULA STUDENT GERMANY 2010 FOR ALL THEIR SUPPORT

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A SPECIAL THANKS GOES TO THE NUMEROUS VOLUNTEERS WHO CONTRIBUTED SIGNIFICANTLY IN THE REALISATION OF THE FOURTH FORMULA STUDENT GERMANY

Dr. Ludwig Vollrath (VDI e.V.), Tim Hannig (FSG e.V.)

Formula Student Germany defines international standards

2010 is the fifth year in which Formula Student Germany takes place at the Hockenheimring, and it will be another year for the record books. This is not just because the number of represented nations is larger than ever before or because the number of participating students has risen well over 2,000. First and foremost, 96 teams are present, of which 18 are competing with fully electric race cars in the all new Formula Student Electric (FSE).
It was only possible to realise this through the continued engagement of the different groups of sponsors and supporters, which effectively support the competition and workshops throughout the year.

FSE is the most noticeable innovation of Formula Student Germany in the past five years. It shows our successful efforts to adjust continuously the competition and its regulations to reflect communal and industrial trends, setting international standards along the way. We can therefore announce with some proud, that Formula Student Electric is the worldwide first construction competition for fully electric racing vehicles. FSE completes the overall idea behind Formula Student.

Students learn what will matter to them in their future career through conception, construction, testing and building – irrespective of electric propulsion or combustion engine – and of course through the competition itself. They acquire team spirit, planning-, deadline- and budget awareness, and most important of all, they learn that everything goes easier when you put your heart and soul into it.
And not only the participating students learn, but also the audience, organizers and visitors as well as sponsors can learn from the student's achievements. We are all very curious what the students will render possible this year. And thereby accomplish what we all held for impossible, until now.

That is the very essence of Formula Student. Anyone who is there for the first time simply cannot believe that the outstanding feats of performance are real, but they are.

Share our excitement and experience an actually almost impossible and nevertheless very real Formula Student Germany 2010.

Dr. Ludwig Vollrath (VDI e.V.)
Tim Hannig (FSG e.V.)
and the Formula Student Germany Team

Formula Student Germany setzt internationale Maßstäbe

2010 ist das fünfte Jahr, in dem die Formula Student Germany am Hockenheimring ausgetragen wird. Es ist wieder einmal ein Jahr der Rekorde. Nicht nur, weil wir diesmal so viele unterschiedliche Nationen wie nie zuvor begrüßen können, oder weil die Zahl der teilnehmenden Studierenden auf weit über 2.000 angestiegen ist. Sondern vor allem wegen der 96 Teams vor Ort, von denen ganze 18 mit rein elektrisch angetriebenen Boliden in der neuen Formula Student Electric (FSE) konkurrieren.
Dass dies möglich wird, liegt einmal mehr am Engagement der verschiedensten Sponsoren und Unterstützer, die den Wettbewerb und die Veranstaltungen so nachhaltig unterstützen.

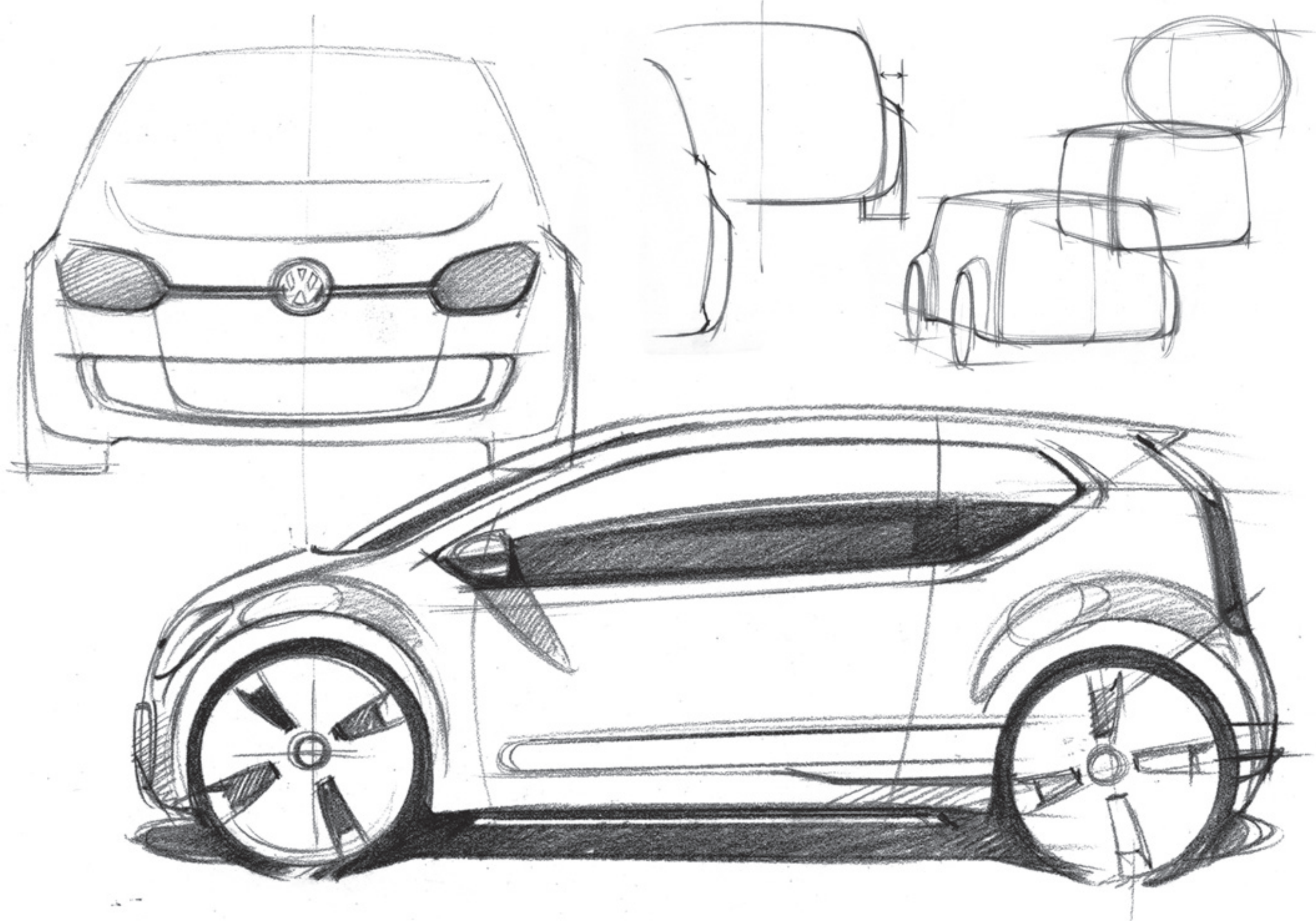
Die FSE ist die sichtbarste Neuerung der Formula Student Germany der letzen 5 Jahre. Sie zeigt unsere erfolgreichen Bemühungen, den Wettbewerb und das Reglement ständig an die gesellschaftlichen und industriellen Trends anzupassen und dabei internationale Maßstäbe zu setzen. So können wir mit einigem Stolz verkünden, dass die Formula Student Electric der erste Konstruktionswettbewerb für rein elektrische Rennfahrzeuge der Welt ist. Und dass die FSE das Gesamtkonzept der Formula Student optimal abrundet.

Mit Begeisterung lernen die Studierenden bei der Konzeption, Konstruktion, Erprobung, dem Bau – unabhängig ob elektrischer Antrieb oder Verbrennungsmotor – und natürlich im eigentlichen Wettbewerb, worauf es später im Berufsleben ankommt. Sie eignen sich Teamgeist, Planungs-, Termin- und Budgettreue an und vor allem, dass mit Herz bei der Sache alles leichter geht.
Aber nicht nur die Teilnehmer und Teilnehmerinnen lernen, auch Zuschauer, Veranstalter und Besucher sowie Sponsoren können lernen. Wir alle sind gespannt darauf, was die Studierenden dieses Jahr alles möglich machen werden. Dabei auch Leistungen, die wir alle bisher für unmöglich hielten.

Genau das ist das Wesen der Formula Student. Wer auch immer das erste Mal dabei ist glaubt, diese herausragenden Leistungen können doch nicht möglich sein. Sind sie aber.

Freuen Sie sich mit uns, und erleben Sie eine eigentlich fast unmögliche und doch so reale Formula Student Germany 2010.

Dr. Ludwig Vollrath (VDI e.V.)
Tim Hannig (FSG e.V.)
und das Formula Student Germany Team



Nowhere else will a line you draw move so many people.

Jump on board a truly unique company. It all began with the Beetle, which soon became a legend in its own right. Then came the Golf, which defined a class of its own. In the meantime, Volkswagen continuously grew to the internationally important company it is today, a company with a diversity of incomparable dimensions. We deliver innovative ideas for sustained mobility in every automotive class, from economical small vehicles to top-of-the range luxury sedans and breathtaking sports cars.

We are looking for the smartest minds to help us continue our success story. If you want to be one of them and bring your ideas to life, Volkswagen will make sure you get every opportunity to do so. You can join the company as an intern, work for us as you write on your thesis or sign up for our trainee programmes, StartUp. If your ambition is to make a contribution to the next generation of mobility, we are the right people for you. We do not just build vehicles. We build: The Car.

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Das Auto.

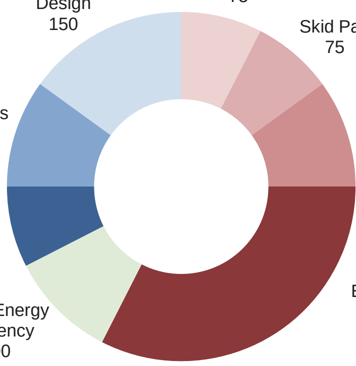
CONTENTS
INHALT

This year Formula Student Germany comprises of two competitions: the Formula Student Combustion – with combustion engines – and the Formula Student Electric – with electric motors. Both competitions have in common that students, in a team effort, build a single seat formula-style race-car with which they compete against teams from all over the world. The competition however is not simply won by the team with the fastest car, but rather by the team with the best overall package of construction and performance, cost management and sales planning. To succeed, interdisciplinary teamwork and an efficient team structure are crucial.

The Formula Student competitions complement the students' education by incorporation of a challenging and intensive experience in designing and manufacturing as well as considering the economic aspects of the automotive industry in their studies. For the competition the teams are to assume that they are contracted by a manufacturer to develop a production prototype. The target group is the non-professional weekendracer, for whom the race-car must offer very good driving characteristics regarding to acceleration, braking and handling. Furthermore, it should be offered at a reasonable price and be reliable and dependable. Additionally, the car's market value increases due to other factors such as aesthetics, ergonomics and the use of available standard purchase components.

Seit diesem Jahr gibt es bei der Formula Student Germany zwei Wettbewerbe: die Formula Student Combustion – mit Verbrennungsmotoren - und die Formula Student Electric – mit Elektromotoren. Doch beiden ist gemeinsam, dass Studenten in Teamarbeit einen einsitzigen Formelrennwagen bauen und damit beim Wettbewerb gegen Teams aus der ganzen Welt antreten. Es gewinnt jedoch nicht unbedingt das schnellste Auto, sondern das Team mit dem besten Gesamtpaket aus Konstruktion und Rennperformance, Finanzplanung und Verkaufsargumenten. Dazu sind interdisziplinäres Teamwork und eine effiziente Teamstruktur von besonderer Bedeutung.

Die Formula Student Wettbewerbe ergänzen das Studium um herausfordernde und intensive Erfahrungen mit Konstruktion und Fertigung sowie mit den wirtschaftlichen Aspekten des Automobilbaus. Im Sinne dieser Zielsetzung sollen die Studenten in Vorbereitung auf den Wettbewerb annehmen, eine Produktionsfirma habe sie engagiert, um einen Prototypen zur Evaluation herzustellen. Zielgruppe ist der nicht-professionelle Wochenendrennfahrer. Der Rennwagen muss unter anderem sehr gute Fahreigenschaften hinsichtlich Beschleunigung, Bremskraft und Handling aufweisen und sollte wenig kosten, zuverlässig und einfach zu betreiben sein. Zusätzlich wird sein Marktwert durch andere Faktoren wie Ästhetik, Ergonomie und den Einsatz üblicher Serienteile gesteigert.



The competition

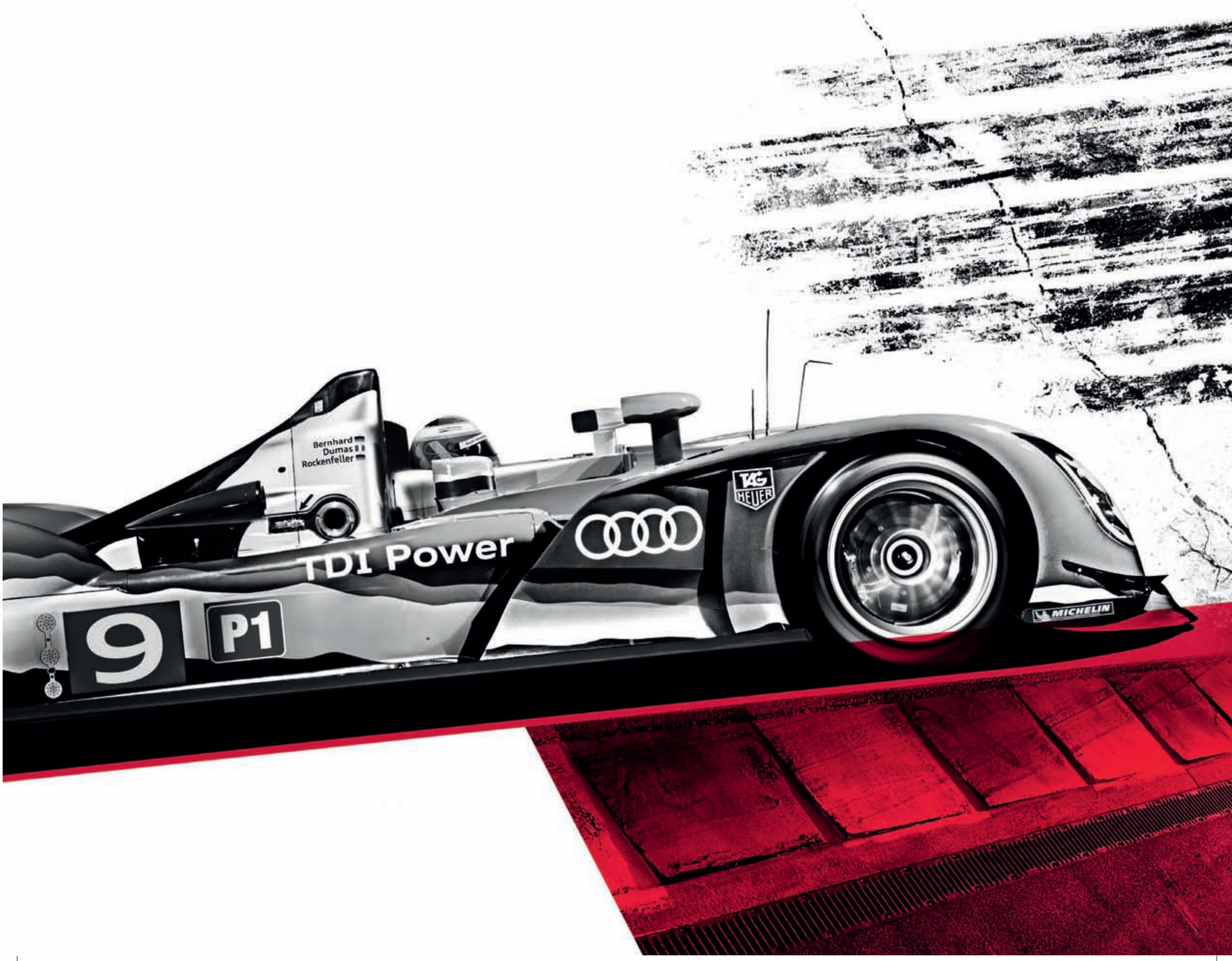
The challenge the teams face is to construct and build a prototype that best matches these given criteria. To determine the best car a jury of experts from the motorsport, automotive and supplier industries judge every construction, cost planning and business plan in comparison to the other teams. Furthermore, the performance out on the racetrack is decisive, where the students self-built single-seater demonstrate how well they hold up under real life conditions, in a number of different disciplines.

With different disciplines the competition reflects all aspects which have to be kept in mind while constructing and building a car.

Der Wettbewerb

Die Herausforderung für die Teams besteht darin, einen Prototypen zu konstruieren und zu bauen, der diesen Anforderungen am besten entspricht. Zur Bestimmung des besten Fahrzeugs bewertet eine Jury aus Experten der Motorsport-, Automobil- und Zulieferindustrie jede Konstruktion, jeden Kostenplan und jede Verkaufspräsentation im Vergleich zu den konkurrierenden Teams. Außerdem beweisen die Studenten auf der Rennstrecke in unterschiedlichen Disziplinen, wie sich ihre selbstgebauten Monoposti in der Praxis bewähren.

Der Wettbewerb spiegelt mit seinen verschiedenen Disziplinen alle Aspekte wider, die bei Konstruktion und Bau eines Fahrzeugs bedacht werden müssen.


Bernhard
Dumas
Rockenfeller
TDI Power
9
P1
MICHELIN

THE DISCIPLINES AT A GLANCE
DIE DISZIPLINEN IM ÜBERBLICK

Altogether, there are eight disciplines. Of these, three are static in which the team and its car are judged based on reports, discussions and presentations. The other five disciplines are the dynamic disciplines involving a moving car and thus evaluating different performance aspects of the car.

The static disciplines

During the three static disciplines the students present their construction, cost planning and business plan. These are discussed with a jury of experts from the motorsport, automotive and supplier industries.

Engineering Design: In the Design Report the students set their constructive solutions and the resulting advantages out in writing. Eight pages of text and technical drawings have to convince the judges of the construction of the car and its qualities for the sales market of the non-professional weekend autocross driver. At the competition the judges examine the constructive solutions and discuss them with the students. The scoring regards the written report, the answers in the discussion and the inspection of the car.

Cost Analysis: Costs are an important factor in building a race car. Hence, the students have to deal with cost estimations, different manufacturing techniques and processes in the Cost Event. The discipline consists of a written report (the Cost Report) and a discussion with the judges around the manufactured prototype. The Cost Report contains a list of all components of the car: from wheels to process labour costs for special tooling. The judging comprises the organisation of the Cost Report, the comprehension of manufacturing processes and the price as well as the performance of a real case task for reducing costs.

Business Plan Presentation: The teams present their business plan for the built prototype to an assumed manufacturer represented by the judges. The goal is to convince the judges that their car meets the demands of the target group of the non-professional weekend autocross driver best and that it can be produced and marketed profitably. Usually, one or two members of the team give a presentation for ten minutes and answer the judges' questions for an additional five minutes. Content, structure, organisation and performance of the talk are judged as well as the answers the students give.

At the competition Cost and Design Judges take a closer look at the prototype and discuss the solutions with the students. Both events are based on written reports.
Beim Wettbewerb betrachten die Cost und die Design Juroren die Prototypen genau und diskutieren die Lösungen mit den Studenten. Beide Events basieren auf schriftlichen Berichten.

Insgesamt gibt es acht Disziplinen. In drei dieser Disziplinen wird das Team und sein Auto in Präsentationen und Diskussionen bewertet. Dies sind die statischen Disziplinen. Die anderen fünf Diziplinen sind dynamisch und bewerten verschiedene Aspekte des fahrenden Autos.

Statische Disziplinen

In den drei statischen Disziplinen präsentieren die Studenten ihre Konstruktionen, ihre Kostenplanung und ihr Geschäftsmodell. Diese werden mit einer Jury aus Experten der Motorsport-, Automobil- und Zulieferindustrie diskutiert.

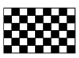
Engineering Design: Im Design Report dokumentieren die studentischen Konstrukteure ihre konstruktiven Lösungen und deren Vorteile. Acht Seiten Text und technische Zeichnungen sollen die Juroren von den Konstruktionen und ihren Vorzügen für die Zielgruppe des nicht-professionellen Wochenendrennfahrers überzeugen. Beim Wettbewerb werden die Konstruktionen von den Juroren am Fahrzeug begutachtet und mit den Studenten diskutiert. Die Bewertung erfolgt anhand des Design Reports, der Antworten in der Diskussion und der Begutachtung des Fahrzeugs.

Cost Analysis: Die Kosten sind für den Bau eines Rennwagens ein entscheidender Faktor. Beim Cost Event beschäftigen sich die Studenten mit Kalkulation, Fertigungstechniken und -prozessen. Die Disziplin besteht aus einem schriftlichen Bericht (dem Cost Report) und einer Diskussion mit den Juroren am gebauten Prototypen. Der Cost Report enthält eine Auflistung aller Teile: vom Reifen bis zu den Herstellungskosten für Spezialwerkzeuge. Bewertet wird die Aufbereitung des Cost Reports, das Verstehen von Fertigungsverfahren zur Kostenoptimierung, der Preis sowie die Lösung einer Real Case Aufgabe zur Kostenreduktion.

Business Plan Presentation: Die Teams stellen einer fiktiven Herstellerfirma, vertreten durch die Juroren, ihren Geschäftsplan für den gebauten Prototypen vor. Mit diesem wollen sie die Juroren davon überzeugen, dass ihr Fahrzeug am besten die Anforderungen der Zielgruppe, des nicht-professionellen Wochenendrennfahrers, erfüllt, gewinnbringend produziert und vermarktet werden kann. Die Präsenation der Teams dauert zehn Minuten, gefolgt von einer fünfminütigen Frage- und Diskussionsrunde mit den Juroren. Bewertet werden Inhalt, Aufbau, Aufbereitung und Darbietung des Vortrags sowie die Antworten des Teams auf Fragen.

Flags
Flaggen

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



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

The dynamic disciplines

During the dynamic disciplines the cars have to prove the road capability of the students' design on the race track. The disciplines demand different qualities of the car. In each discipline two drivers have two runs (except in the endurance). The best run of the four will be counted as the optimum the car can achieve.

Acceleration: The race cars prove their accelerating abilities over a distance of 75 meters from a standing start. The fastest cars cover the distance in less than 4 seconds and achieve a maximum velocity of more than 100km/h.

Skid Pad: The student-built cars drive on a course in the shape of an eight. Two consecutive laps on each circle are driven, with the second lap being timed. The cars demonstrate the steady-state lateral acceleration they can generate (up to 1.4g).

Autocross: The monoposti drive on a course of perhaps one kilometer through straights and turns, chicanes and slaloms. The lap time serves as an indicator for driving dynamics and handling qualities. The results of the Autocross discipline also determine the starting order in the Endurance.

Endurance: Providing the highest number of points, the Endurance is the main discipline. Over the course of 22 kilometres the cars have to prove their durability under long-term conditions. Acceleration, speed, handling, dynamics, fuel efficiency, reliability, the cars have to prove it all. The Endurance also demands handling skills of the driver as the course can only be walked in preparation. Up to four cars are allowed on the track at the same time. Each team has only one attempt, the drivers change after 11 kilometres. Teams that are more than one third slower than the fastest team or are not able to complete the whole Endurance distance will not get any points.

Fuel Efficiency: During the Endurance the fuel consumption (FSC vehicles) / energy consumption (FSE vehicles) is measured. The points' calculation does not only evaluate fuel / energy consumption, but puts it in relation to speed. The calculation is based on an average per completed lap which enables an evaluation of teams that did not finish as well. However, to be evaluated and to get points the driver change has to have been completed.

Dynamische Disziplinen

In den dynamischen Disziplinen müssen die Fahrzeuge die Praxistauglichkeit der studentischen Konstruktionen auf der Rennstrecke unter Beweis stellen. Mit jeder Disziplin werden unterschiedliche Eigenschaften des Autos getestet. Grundsätzlich starten zwei Fahrer mit je zwei Versuchen (außer im Endurance-Rennen). Gewertet wird der beste Versuch als das Optimum, das das Fahrzeug erzielen kann.

Acceleration: Auf einer 75 Meter langen Geraden müssen die Rennwagen beweisen, wie schnell sie aus dem Stand beschleunigen können. Die Besten bewältigen die Strecke in einer Zeit von unter vier Sekunden und erreichen dabei eine maximal Geschwindigkeit von mehr als 100km/h.

Skid Pad: Die selbstgebauten Rennwagen durchfahren einen Parcours in Form einer Acht. Jeder Kreisring wird zweimal nacheinander umrundet, gemessen wird jeweils die zweite Runde. Die Rundenzeit zeigt, welche statische Querbeschleunigung das Fahrzeug erreichen kann. Diese kann bis zu 1,4 g betragen.

Autocross: Über eine etwa 1 Kilometer lange Runde fahren die Monoposti durch Geraden, Kurven und Schikanen. Eine schnelle Rundenzeit ist sowohl Indikator für eine gute Fahrdynamik als auch für gute Handling- und Beschleunigungseigenschaften. Die Platzierung im Autocross entscheidet zudem über die Startreihenfolge im Endurance.

Endurance: Das Endurance-Rennen stellt mit der höchsten erreichbaren Punktzahl die Hauptdisziplin dar. Über eine Renndistanz von 22 Kilometern muss sich die Gesamtkonstruktion unter Dauerbelastung beweisen. Hier sind alle Eigenschaften von der Beschleunigung bis hin zu Handling und Fahrdynamik gefragt. Das Endurance-Rennen erfordert auch Renngeschick des Fahrers, da die Strecke als Vorbereitung nur abgeschritten werden darf. Darüberhinaus sind bis zu vier Fahrzeuge gleichzeitig auf der Strecke. Jedes Team hat einen einzigen Versuch, die Fahrer wechseln nach 11 Kilometern. Die Teams erhalten nur dann Punkte, wenn sie die komplette Endurance-Distanz absolvieren und höchstens ein Drittel langsamer waren als das schnellste Team.

Fuel Efficiency: Während des Endurance-Rennens wird der Kraftstoffverbrauch (FSC Fahrzeuge) / Energie Verbrauch (FSE Fahrzeuge) gemessen. Mit einer neuen Formel zur Berechnung zählt nicht einfach der Verbrauch, sondern vielmehr der Verbrauch in Relation zur Geschwindigkeit. Neu ist dabei außerdem die Rechnung mit Durchschnittswerten pro gefahrener Runde, die auch die Bewertung von Teams ermöglicht, die nicht das Ziel erreichen. Der Fahrerwechsel muss allerdings erfolgt sein.

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

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 passing zone to be passed by a faster competitor! Fahr in der Überholzone, damit ein schnelleres Fahrzeug überholen kann!

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.

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. Feststehend: Gefahr! Fahr langsam, sei bereit zum Ausweichen. Geschwenkt: Große Gefahr! Fahr langsam, Ausweichen wird erforderlich sein. Sei bereit anzuhalten.

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!

There is a slow moving vehicle on the course. Be prepared to approach it at a cautious rate. Es ist ein langsames Fahrzeug auf der Strecke. Nähere dich vorsichtig an.

Formula Student Combustion	Formula Student Electric
Formula Student Combustion Champion	Formula Student Electric Champion
Formula Student Combustion – 2nd	Formula Student Electric – 2nd
Formula Student Combustion – 3rd	Formula Student Electric – 3rd
FSC Engineering Design Award – 1st	FSE Engineering Design Award – 1st
FSC Engineering Design Award – 2nd	FSE Engineering Design Award – 2nd
FSC Engineering Design Award – 3rd	FSE Engineering Design Award – 3rd
FSC Cost Analysis Award – 1st	FSE Cost Analysis Award – 1st
FSC Cost Analysis Award – 2nd	FSE Cost Analysis Award – 2nd
FSC Cost Analysis Award – 3rd	FSE Cost Analysis Award – 3rd
FSC Business Plan Presentation Award – 1st	FSE Business Plan Presentation Award – 1st
FSC Business Plan Presentation Award – 2nd	FSE Business Plan Presentation Award – 2nd
FSC Business Plan Presentation Award – 3rd	FSE Business Plan Presentation Award – 3rd
FSC Endurance Winner	FSE Endurance Winner
FSC Acceleration Winner	FSE Acceleration Winner
FSC Skid Pad Winner	FSE Skid Pad Winner
FSC Autocross Winner	FSE Autocross Winner
Most Fuel Efficient Car powered by Kautex Textron GmbH & Co.KG	Most Energy Efficient Car powered by HARTING Electronics
FSC 1st place Overall Dynamic Events powered by VDI e.V.	FSE 1st place Overall Dynamic Events powered by Mercedes-AMG GmbH
Best Newcomer Award presented by Formula Student Germany Academy	Best E-Drive Packaging Award powered by Daimler AG
Best Use of Electronics Award powered by Bosch Engineering GmbH	Best Energy Management Award powered by Bosch Engineering GmbH
Most Innovative Powertrain Award powered by BMW Group	E/E Architecture Award powered by Continental AG

Formula Student Germany

Best Lightweight Concept Award powered by AUDI AG	Best Prepared Car for Scrutineering powered by DEKRA Automobil GmbH
FSG Sportsmanship Award presented by Formula Student Germany Steering Committee	Best Use of Adhesives Award powered by Henkel

SCHEDULE 2010
ZEITPLAN 2010

Wednesday, 4th of August 2010

08:30	Scrutineering and Registration Order Available	
11:00 – 13:00	FSE Team Registration	1 Ticket Center
12:00 – Sun 20:00	FSE Pits available	20 FSE Pits
13:00 – 15:00	FSC Team Registration	1 Ticket Center
13:00 – 19:00	FSE Scrutineering / Tech Inspection	9 Scrutineering
14:00 – Sun 20:00	FSC Pits available	4 FSC Pits
14:00 – 19:00	Event Control, Driver & Safety Responsible Registration	2 Event Control
15:00 – 19:00	FSC Scrutineering / Tech Inspection	9 Scrutineering
15:00 – 19:00	Ticket Center	1 Ticket Center
20:30	Team Welcome	5 Marquee above pits

Thursday, 5th of August 2010

07:30 – 19:00	Ticket Center & Event Control	1 Ticket Center 2 Event Control
08:00 – 08:30	Team Briefing	5 Marquee above pits
09:00 – 19:00	Scrutineering / Tilt, Brake, Noise	9 Scrutineering 10 Tilt Table 11 Brake 12 Noise
09:00 – 18:00	Fuel / Engine Test / Testing	17 Big dynamics area
10:00 – 12:00	FSE Judge Briefing: Design & Cost	8 BW Tower
12:00 – 13:00	Lunch Break & Staging for Panoramic Photograph	17 Big dynamic area
13:30 – 18:00	FSE Engineering Design & FSE Cost Analysis	6 Marquee above pits
18:30 – 20:00	FSG Judge Briefing: Design & Cost	8 BW Tower
20:00 – 21:00	Reception for Faculty Advisors, Team Captains & Judges powered by BOSCH	3 FSG Forum

Friday, 6th of August 2010

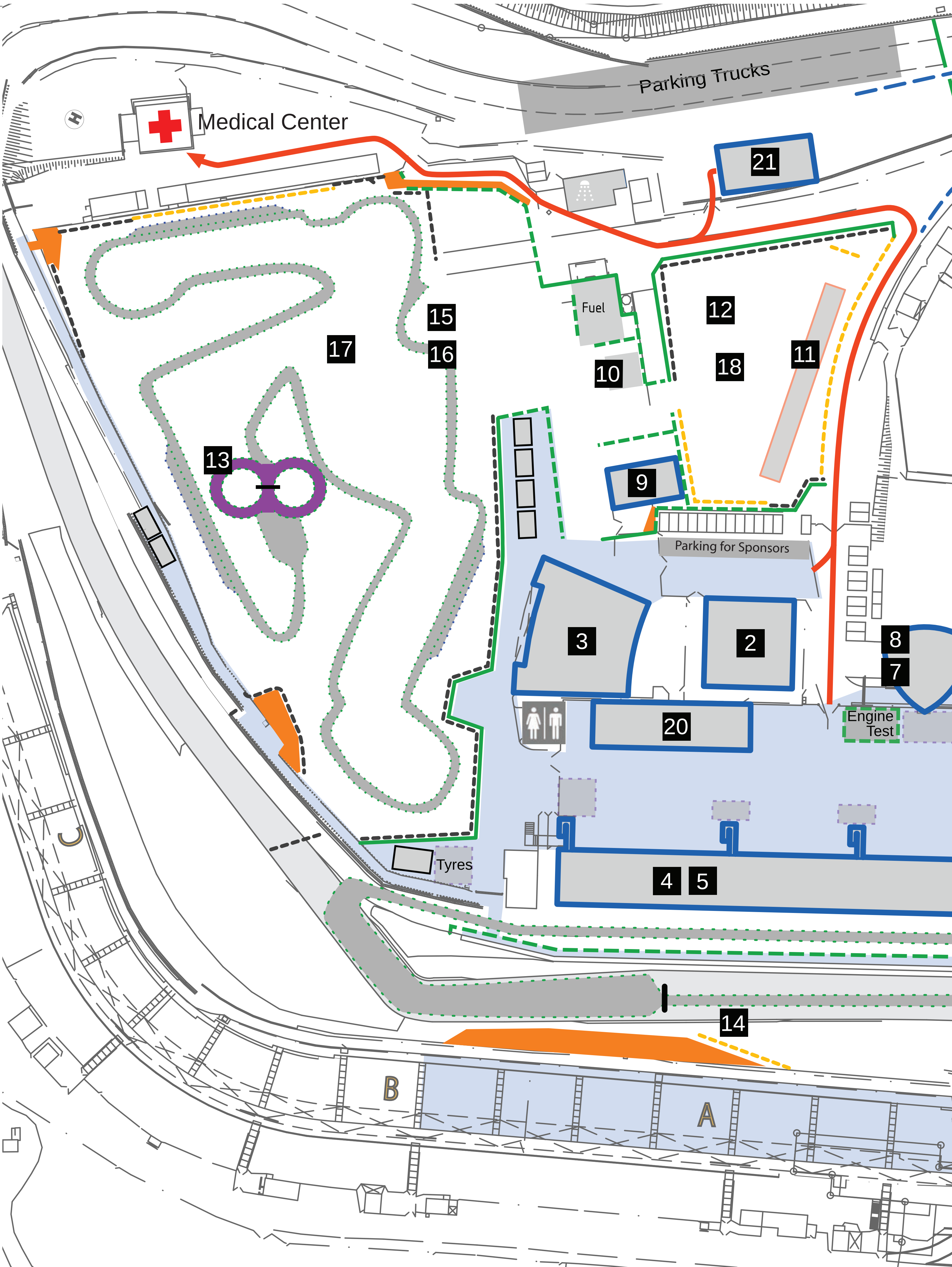
07:30 – 19:00	Ticket Center	1 Ticket Center 2 Event Control
08:00 – 08:30	Team Briefing	5 Marquee above pits
08:00 – 08:45	Judge Briefing: Business Plan Presentation	8 BW Tower
09:00 – 18:00	Scrutineering / Tilt table, Break test, Noise test	9 Scrutineering 10 Tilt Table 11 Brake 12 Noise
09:00 – 18:00	Fuel / Engine Test / Testing	17 Big dynamic area
09:00 – 18:30	FSC Engineering Design, FSC Cost Analysis	6 Marquee above pits
	FSC & FSE Business Plan Presentation	7 BW Tower 7 Mobil-Tower 19 South Stand
13:00 – 14:00	Lunch Break	
20:00 – 21:00	Business Plan Presentation Finals	5 Marquee above pits
21:00 – 22:00	Awards Ceremony – Part I	5 Marquee above pits
22:00 – 23:00	Get-together for all Judges & Redshirts	8 BW Tower

Saturday, 7th of August 2010

07:00 – 19:00	Ticket Center & Event Control	1 Ticket Center 2 Event Control
07:30 – 08:00	Team Briefing	5 Marquee above pits
08:30 – 20:00	Fuel / Engine Test / Testing	18 Small dynamic area
08:30 – 13:00	Skid Pad and Acceleration	13 Big dynamic area 14 Start/Finish Line
11:30 – 14:00	Press & VIP Reception with guided tour	3 FSG Forum
13:00 – 14:00	Lunch Break	
13:30 – 14:00	Coursewalk	17 Big dynamic area
14:00 – 15:00	FSE Autocross	17 Big dynamic area
15:00 – 20:00	FSC Autocross	17 Big dynamic area
20:00 – 22:30	Engineering Design Finals (not public)	3 FSG Forum
22:00 – 01:00	FSE Endurance & Parc Fermé	17 Big dynamic area

Sunday, 8th of August 2010

07:00 – 19:00	Ticket Center & Event Control	1 Ticket Center 2 Event Control
07:30 – 08:00	Team Briefing	5 Marquee above pits
08:00 – 08:30	Coursewalk	17 Big dynamic area
08:30 – 16:30	Fuel / Engine Test / Testing	18 Small dynamic area
08:30 – 13:00	Endurance Morning Session & Parc Fermé	17 Big dynamic area
13:00 – 14:00	Lunch Break	
14:00 – 19:30	Endurance Afternoon Session & Parc Fermé	17 Big dynamic area
19:30 – 20:30	Design Review	3 FSG forum
21:00 – 22:00	Awards Ceremony – Part II	5 Marquee above pits
22:00 – 01:00	Party powered by MAHLE	5 Marquee above pits


Parking Trucks
Medical Center
21
Fuel
15
16
17
12
18
11
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13
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Parking for Sponsors
3
2
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Engine Test
Tyres
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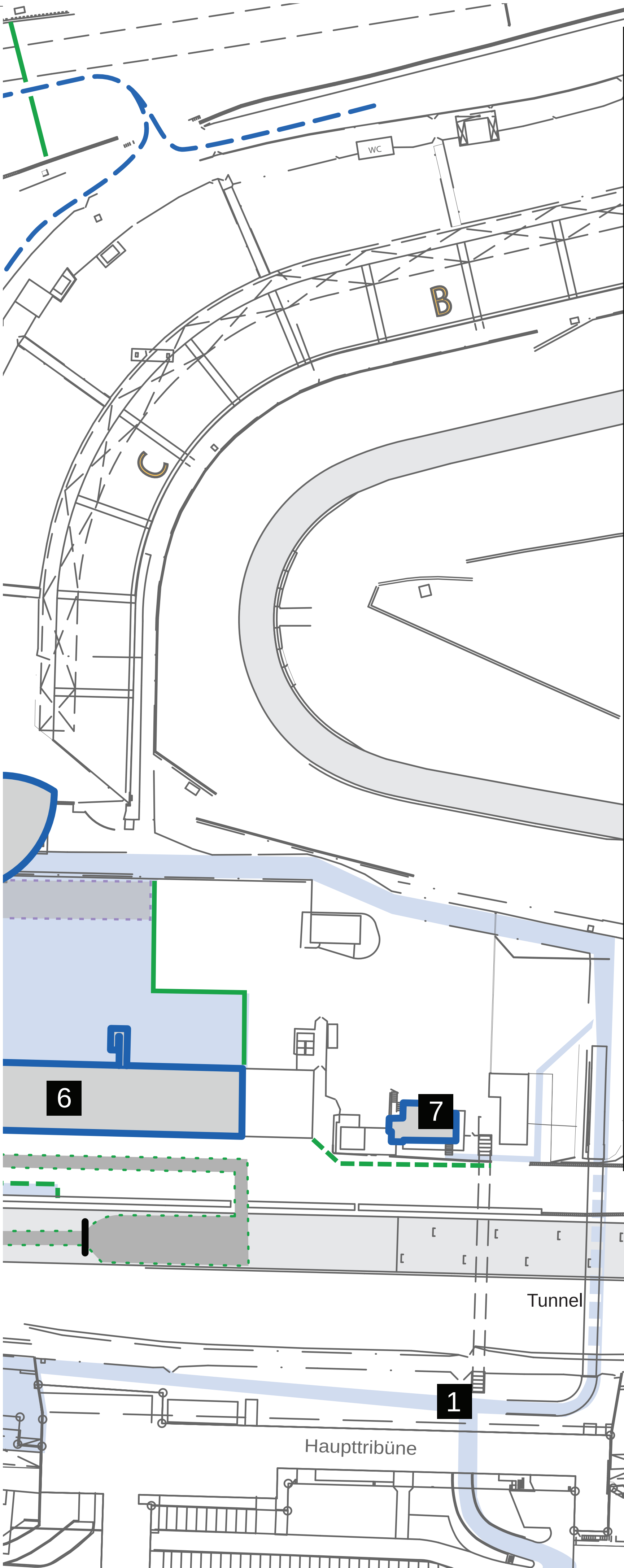
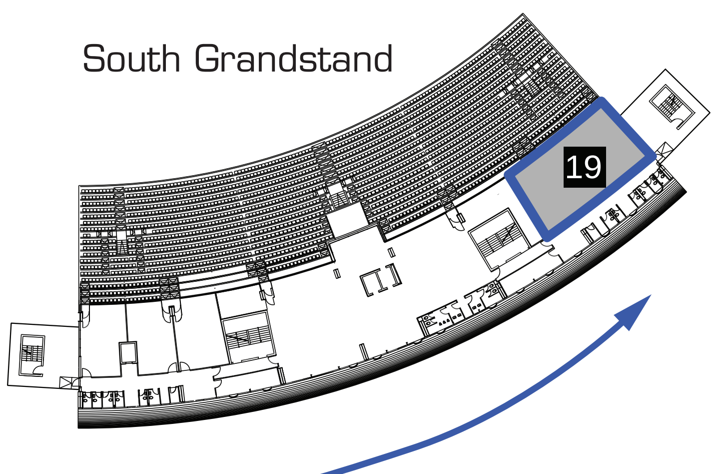


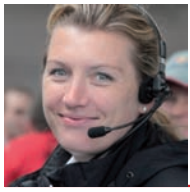
1	Ticket Center	11	Brake test
2	Event Control	12	Noise test
3	FSG forum	13	Skid Pad (7th of August)
4	FSC Pits (ground floor)	14	Acceleration (7th of August)
5	Marquee above pits (first floor)	15	Autocross (7th of August)
6	Engineering Design Event & Cost Analysis Event (first floor)	16	Endurance (7th / 8th of August)
		17	Test track (6th of August)
7	FSC Business Plan Presentation Event	18	Test track (7th / 8th of August)
8	FSG Lounge	19	FSE Business Plan Presentation Event
9	Scrutineering	20	FSE Pits
10	Tilt table / Rain test	21	FSE Charging Area
	Visitor's Area		Press Area
	Tribunes		



FORMULA STUDENT GERMANY TEAM

Tim Hannig
Board (Chairmen)
KION Group GmbH

Ludwig Vollrath
Board (FS Academy & VDI)
VDI Society for Automotive and Traffic Systems Technology



Christine Hannig
EC (Communications)
Hessian State Chancellery

Barbara Schlögl
EC (Statics)
CarboTech Composites GmbH

Matthias Brutschin
Event Support
reinisch AG

Robert Fromholz
Cost Analysis Event
Hönigsberg und Düvel IT Solutions GmbH

Johanna Scheider
Communications (FSG Forum / Redaktion)
Zalbertus New Media GmbH

Karsten Stammen
Dynamics
KLK Motorsport GmbH

Rainer Kötke
Board (Finance)
Executive Committee (Dynamics)
Brunel GmbH

Board

The Board is responsible for the Formula Student Germany and its cooperations as well as for sponsoring, finances and strategy.

Das Board trägt Verantwortung für die Formula Student Germany und ihre Kooperationen sowie für Sponsoring, Finanzen und Strategie.

Peter Jakowski
EC (Scoring, Time Keeping)
2D Debus & Diebold Meßsysteme GmbH

Ulf Steinfurth
EC (Scrutineering)
University of Applied Sciences Stralsund

Julien van Campen
Communications (Webseite)
Delft University of Technology

Henning Nissen
Communications (Guided Tours)
Beuth Hochschule für Technik
Robert Bosch Gmbh

André Schmidt
Scrutineering
Caterpillar Inc.

Karl Weinreich
Scrutineering
Bosch Engineering GmbH

Daniel Mazur

Board (Event Manager)
mazur | events + media

Matthäus Decker

EC (Personnel Support)
Event Support
Siemens Transportation Systems GmbH & Co.KG

Tobias Michaels

EC (Formula Student Electric)
Braunschweig Institute of Technology

Executive Committee (EC)

The Executive Committee stands for the design of the competition and the rules. Each member is responsible for a field, its preparation and realisation.

Das Executive Committee verantwortet Ausgestaltung von Wettbewerb und Reglement. Jedes Mitglied ist für Vorbereitung und Durchführung eines Bereiches verantwortlich.

Daniel Deussen

Dynamics, Scrutineering
Weber Motor GmbH

Sven Renkel

Communications (Press)
Verein Deutscher Ingenieure e.V. (VDI)

Tim Schmidt

Event Control (Back Office)

Christopher Zinke

Engineering Design Event
Braunschweig Institute of Technology

Frank Röske

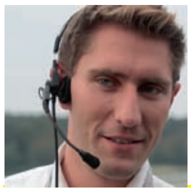
Board (Rules)
Executive Commitee (Rules FSC)
Porsche Leipzig GmbH

Lukas Folie

EC (Formula Student Electric)
Audi Sport

Konrad Paule

EC (FS Academy)
Pit Marshal
Volkswagen Motorsport GmbH



Daniel Ahrens

Event Control (Front Desk)
Aegis Media

Leona Ehrenreich

Registration, Visa
Sassenberg Secondary Modern School

Günther Riedl

Dynamics
Stangl & Co. GmbH

Sebastian Seewaldt

Pit Marshal
University of Stuttgart

Operative Team

The Operative Team completes the management team by bearing responsibility for preparations and smooth processes at the event and during the year.

Das Operative Team komplettiert das Management Team, indem es beim Event und übers Jahr Verantwortung für Vorbereitung und reibungslosen Ablauf übernimmt.

Engineering Design Event

Design Judges 2009

Balnus, Christian	AUDI AG
Bayer, Bernward	Continental
Beck, Erhard	Continental
Becker, Dietmar	Dr. Ing. h.c. F. Porsche AG
Böhme, Nikolai	IAV GmbH
Borchardt, Jan	Caterpillar Motoren GmbH & Co.KG
Böttcher, Karsten	Mercedes AMG
Brenner, Peter	ZF Lenksysteme GmbH
Clarke, Pat	Hyundai Australia
Crosby, Paul	Crosby Composites
Daman, Paul	BMW AG
Dawson, Craig	CRS Racing
Deckers, Jean-Noel	TR Engineering powered by IAV
Diebold, Rainer	2D Debus & Diebold Meßsysteme GmbH
Dittrich, Rudolf	BMW Motorsport
Dölle, Norbert	Daimler AG
Domann, Nils	TU-Braunschweig
Enning, Norbert	Audi AG
Euler, Magnus	Bertrandt
Ewert, Sebastian	MAHLE GmbH
Fox, Steven	PowerTrain Technology, Inc.
Fries, Benedikt	Audi AG - Audi Sport
Frommer, Armin	MAHLE
Gaubatz, Karl-Heinz	BMW AG
Gesele, Frank	Audi AG
Glose, Martin	Mercedes-AMG GmbH
Goddard, Geoffrey	oxford brookes university
Gould, David	Gould Engineering
Halter, Josef	Stromaufwaerts GmbH
Hanigk, Martin	BMW AG
Hellwig, Patrick	BMW Group
Hickson, Alex	Lockheed Martin UK INSYS Limited
Himmler, Florian	Carbo Tech Composites GmbH
Höfflin, Florian	HWA AG
Hölzgen, André	euro engineering AG
Hornig, Claus	Stromaufwaerts GmbH
Hurmer, Paul	Porsche AG
Huy, Sascha	euro engineering AG
Jelden, Hanno	Volkswagen AG
Kerber, Michael	Audi AG
Kerscher, Alexander	BMW M
Knipp, Christian	AUDI AG
Kraft, Ryan	Kaz Technologies
Kratzsch, Matthias	IAV GmbH
Krueger, Markus	Caterpillar Motoren Gmbh & Co. KG
Kube, Oliver	Kube GmbH Ingenieurbüro
Ladda, Josefine	Robert Bosch GmbH
Maas, Gerhard	IAV GmbH
McLean, Brian	BMW AG
Meier, Thomas	Dr. Ing. h.c. F. Porsche AG
Milke, Burkhard	Adam Opel GmbH
Missler, Christian	Continental AG
Neidlein, Daniel	Audi AG
Neumann, Bernd	IAV GmbH
Nowicki, Daniel	BMW
Pälmer, Oliver	DaimlerAG
Peti, Philipp	OPEL
Petz, Andreas	Audi AG
Reimann, Wolfgang	IAV GmbH
Riefstahl, Dominique	BMW AG
Rieke, Johannes	TU-Braunschweig
Rinland, Sergio	Epsilon Euskadi
Risch, Hendrik	Audi AG
Rouelle, Claude	OptimumG LLC
Sachse, Michael	BorgWarner Inc
Schäffler, Klaus	BMW AG
Schaufer, Thomas	BMW AG
Schiele, Peter	BMW AG
Schmidt, Ralf	BMW Motorrad
Schneider, Thomas	Volkswagen AG
Schulz, Achim	Dr. Ing. h.c. F. Porsche AG
Stammen, Karsten	KLK Motorsport GmbH
Stange, Michael	ThyssenKrupp Presta München/ Esslingen GmbH
Straßer, Roman	AUDI AG
Strycek, Volker	Adam Opel GmbH
Sturm, Michael	Universität der Bundeswehr
Underberg, Victor	AUDI AG
Völkl, Timo	AUDI AG
Weiss, Johannes	Daimler AG
Wenckel, Mathias	Dolmar GmbH
Wunschheim, Lukas	Adam Opel GmbH
Zanetti, Igor	General Motors Powertrain Europe

Cost Analysis Event

Cost Judges 2009

Ammann, Juerg M.	ammann projekt management	Müller, Jens- Thomas	Bombardier Transportation
Ankert, Detlef	Kautex Textron	Pälmer, Reinhard	rp-plastics consulting services GmbH
Brendel, Sebastian	Daimler	Piltzing, Roger	Continental Automotive GmbH
Broser, Michael	DOK GmbH	Schallner, Sascha	Festo AG & Co. KG
Dietachmayr, Walter	BMW AG	Scharff, Robert	Daimler AG
Grundner, Harald	InnoVAVE - Harald Grundner	Schmidt, Timo	LuK GmbH & Co. oHG
Hagl, Markus	BMW Group	Schnabel, Matthias	D.O.K. GmbH
Hein, Michael	Michael Hein	Steinmeier, Frank	Continental Automotive GmbH
Herth, Martin	Continental Automotive GmbH	Timm, Martin	Faurecia Autositze GmbH
Lieber, Thomas	Volkswagen AG	Unger, Herbert	VDI
Metz, Simon	Continental	Walzer, Regina	Continental
Möll, Winfried	Dipl. Ing. W. Bender GmbH	Wigger, Tobias	Universität Siegen
Morel, Romain	Continental Mechanical Components Germany GmbH	Wörz, Wolf	Daimler AG

Business Plan Presentation Event


Business Plan Presentation Judges 2009

Bjekovic, Robert	Hochschule Ravensburg - Weingarten	Herrmann, Jesko	Bertrandt AG
Boutaris, Konstantin	Daimler AG	Holz, Patrick	S. & V. Consult GmbH
Busler, Andreas	BMW Group	Krueger-Eppstein, Albrecht	Mercedes-Benz
Dorfner, Barbara	Daimler AG	Lange, Stephan	Accenture GmbH
Esser, Klaus	Kautex Textron	Mueller, Andreas	Kautex Textron GmbH & Co KG
Frank, Detlef	Detlef Frank	Nottbrock, Claus	Yazaki Europe Ltd.
Gampfer, Michael	MiGa Vertriebs- und Handelsagentur	Richter, Ralf	IAV GmbH
Gross, Wolfgang	BMW Group	Schmidt, Axel	Porsche Consulting GmbH
Hannig, Peer	DWP Bank	Schmidt, Stefan	Consulting4Drive GmbH
Hayn, Bernhard	IAV GmbH	Tabatabai, Stefan	Porsche Consulting GmbH
Hein, Daniela	VDI e.V.	Wolf, Alexander	Continental Automotive GmbH
Heinrich, Olaf	DekaBank		

Audi

Michael Groß
Leiter Personalmarketing, AUDI AG

Audi stands for sporty cars, high-quality craftsmanship and progressive design – for „Vorsprung durch Technik". Strong innovation skills are one of the reasons why the company is successful. We are therefore particularly keen to help creative, innovative and committed students to take part in the Formula Student project.
The teams that enter the Formula Student competition have already put in a great deal of work and effort – and have experienced success as well as suffering setbacks. It is obvious that everyone involved is enthusiastic about the cars. Impressive technical know-how, team spirit and commitment are other outstanding features of the teams.
It is exactly these characteristics that we would like our staff to have. And anyone who succeeds in applying our brand values – sporty performance, progressive design and high quality – on the racing track, either with electrical or combustion engine, is just what we are looking for at Audi.

Audi steht für sportliche Fahrzeuge, hochwertige Verarbeitung und progressives Design – für „Vorsprung durch Technik". Die hohe Innovationskraft ist einer der Erfolgsfaktoren des Unternehmens. Daher freuen wir uns besonders, im Rahmen des Projekts Formula Student kreative, innovative und engagierte Nachwuchskräfte zu unterstützen.

Die Teams, die bei der Formula Student starten, haben einen langen Weg mit viel Arbeit, Leidenschaft, Etappenerfolgen – aber auch Rückschlägen hinter sich. Man spürt bei jedem einzelnen förmlich die Begeisterung für die Fahrzeuge darüber hinaus können die Teams mit ihrem Fachwissen, ihrem Teamgeist und ihrem Engagement überzeugen.
Genau diese Eigenschaften wünschen wir uns von unseren Mitarbeitern. Und wer es schafft, unsere Markenwerte – Sportlichkeit, Progressivität und Hochwertigkeit – auf die Rennstrecke zu bringen, sei es mit elektrischem oder Verbrennungsmotor, passt auch gut zu Audi.

Autodesk®

Don Carlson
Education Director, Europe, Middle-East, Africa, Autodesk

Autodesk supports students and educators by providing design software, innovative programs and other resources designed to inspire the next generation of professionals. By supporting educators to advance design education and science, technology, engineering and math (STEM) skills, Autodesk is helping prepare students for future academic and career success. Autodesk supports schools and institutions of higher learning worldwide through substantial discounts, subscriptions, grant programs, training, curriculum development and community resources.

For more information about Autodesk education programs and solutions, visit autodesk.com/education-emea.

Studenten von heute sind die Spezialisten von morgen. Autodesk unterstützt mit verschiedenen Programmen Nachwuchskräfte beim Erreichen ihrer beruflichen Ziele und bereitet sie auf ihre zukünftigen Tätigkeiten vor. Gleichzeitig können Dozenten mit dem Angebot von Autodesk die Fähigkeiten ihrer Schüler in den Fächern Gestaltung und Wissenschaft, Technik und Mathematik fördern.

Weitere Informationen zu der Autodesk Student Community unter www.autodesk.de/education.

Martina Eissing
Head of HR Marketing International and Recruiting, BMW Group

It is with great pleasure that the BMW Group supports initiatives such as Formula Student which combine acquired theory with practical experience in an exemplary manner. The acquisition of skills and key expertise such as interdisciplinary thinking, problem-solving and business knowledge is realized in an exemplary fashion in this competition.

We are only too familiar with these requirements of teams from our own company. We therefore welcome applications from qualified Formula Student participants both from Germany and abroad for practical internships as well as job vacancies. We are looking for enthusiastic young engineers in various departments such as research and development who, like our own staff, enjoy being involved in innovative projects at the very highest level.

Mit großer Freude unterstützt die BMW Group die Formula Student Initiative, da sie Studenten auf einzigartige Weise die Möglichkeit gibt, theoretisches Wissen mit gelebter Praxis zu verbinden. Hier, in der praktischen Anwendung, werden mit Begeisterung Fähigkeiten und Schlüsselkompetenzen wie z.B. fächerübergreifendes Denken, Problemlösefähigkeit oder wirtschaftliche Kenntnisse erlernt und erweitert.

Diese Anforderungen an Teams kennen wir in der BMW Group nur zu gut. Daher freuen wir uns, wenn sich qualifizierte Teilnehmer aus dem In- und Ausland bei uns für Praxiseinsätze oder auf offene Stellen bewerben. Verschiedene Bereiche wie z. B. Die Forschung und Entwicklung suchen begeisterte Nachwuchsingenieure, die genauso wie unsere Mitarbeiter Spaß daran haben, auf höchstem Niveau an innovativen Themen mitzuwirken.

Bernhard Bihr
President, Bosch Engineering GmbH

As an innovative engineering service provider we at Bosch Engineering GmbH implement complex development tasks for international vehicle and engine manufacturers worldwide.

Thus we know the importance of young talents with fresh ideas and extraordinary engagement for future mobility. Formula Student gives students the chance to prove their abilities in different categories and cope with interdisciplinary challenges in a team. For these reasons we support the Formula Student.

Furthermore the Formula Student is a great opportunity to get in contact with highly motivated and well educated students.

We are looking forward to an exciting competition and wish all teams good luck!

Als innovatives Ingenieurdienstleistungsunternehmen realisieren wir von der Bosch Engineering GmbH komplexe Entwicklungsaufgaben für Fahrzeug- und Motorenhersteller im In- und Ausland. Daher wissen wir, wie wichtig junge Talente mit frischen Ideen und außerordentlichem Engagement für die Zukunft der Mobilität sind.

Formula Student bietet Studenten die Chance, ihre Fähigkeiten in verschiedenen Kategorien unter Beweis zu stellen und interdisziplinäre Herausforderungen im Team zu meistern. Dies zu unterstützen ist uns ein großes Anliegen.

Für uns ist die Formula Student zudem eine sehr gute Möglichkeit, mit hochmotivierten und qualifizierten Studenten ins Gespräch zu kommen.

Wir freuen uns auf einen spannenden Wettbewerb und wünschen allen Teams viel Glück!

Brunel

Dr. Ralf Napiwotzki
General Manager, Brunel GmbH

The Formula Student Germany offers young, enthusiastic engineers an excellent platform to present their extraordinary knowledge and engagement.
In this construction competition students gain practical experiences and have to solve complex tasks as a team taking economic aspects into account. Brunel specialists work out detailed solutions in the same way based on our customer requirements. For our technologically sophisticated and exciting projects we are looking for engineers, who share our passion for challenges. Brunel offers qualified engineers and developers challenging tasks with prospects and several opportunities for their professional and personal future. As part of the FSG, Brunel would like to introduce itself as an attractive employer and to get in contact with individual participants.

Die Formula Student Germany bietet jungen, engagierten Nachwuchsingenieuren eine exzellente Plattform, ihr außergewöhnliches Fachwissen und Engagement zu zeigen. Die Studenten sammeln bei diesem Konstruktionswettbewerb praktische Erfahrungen und müssen in Teamarbeit komplexe Aufgaben unter betriebswirtschaftlichen Maßgaben lösen. Die Spezialisten von Brunel erarbeiten exakt nach diesem System skalierte Lösungen auf Basis der vom Kunden gestellten Anforderungen. Für unsere technologisch anspruchsvollen Projekte suchen wir Ingenieure, die unsere Leidenschaft für Herausforderungen teilen. Brunel bietet qualifizierten Ingenieuren und Entwicklern ein spannendes Aufgabenfeld mit Perspektiven und breitem Raum für die eigene berufliche und persönliche Entwicklung. Im Rahmen der FSG möchte sich Brunel als attraktiver Arbeitgeber vorstellen und mit den einzelnen Teilnehmern ins Gespräch kommen.

Continental

Sehnaz Özden
Global Head of Corporate Employer Branding & Recruiting Continental AG

We are aware that the future of cars depends largely on operation ability and the innovation ability of the future generations of engineers. That is the reason why we support this year - besides the traditional competition Formula Student - the new Formula Student Electric Challenge. Especially with regard to the reduction of CO2 emissions this competition is a project looking to the future.

Both competitions offer participants the possibility to prove their interdisciplinary abilities. During the development of a single-seat formula racing car the new generation engineers can gain knowledge in construction as well as in economic management. Furthermore, such a large international project also shapes the factors of social competence challenging all our newcomers.

We are proud of the worldwide success achieved by the teams under the sponsorship of Continental and look forward to the further cooperation with the engineer elite of tomorrow.

Good luck at Hockenheim!

Uns ist bewusst, dass die Zukunft des Automobils sehr stark von der Einsatzbereitschaft und Innovationsfähigkeit der kommenden Ingenieurgenerationen abhängt. Daher unterstützen wir - neben dem traditionellen Wettbewerb Formula Student – in diesem Jahr auch die erstmals ausgetragene Formula Student Electric. Denn: Gerade vor dem Hintergrund der Reduktion von CO2 Emissionen ist dieser Wettbewerb ein zukunftsweisendes Projekt.

Beide Wettbewerbe bieten den Teilnehmern die Möglichkeit, ihre interdisziplinären Fähigkeiten unter Beweis zu stellen. Die Nachwuchsingenieure eignen sich beim Bau eines einsitzigen Formelrennwagens sowohl Kenntnisse in Konstruktion als auch in Betriebswirtschaft an. Zudem schärft ein derartiges internationales Großprojekt die Sozialkompetenzfaktoren, die wir bei allen unseren Einsteigern suchen.

Wir sind daher stolz auf die weltweiten Erfolge der von Continental geförderten Teams und freuen uns auf die weitere Zusammenarbeit mit der Ingenieurelite von Morgen.

Viel Glück für Hockenheim!

DAIMLER

Güland Cölkesen
Corporate HR Marketing, Daimler AG

Enthusiasm and passion for innovation and technology are the driving force of the Automotive Industry.

This eagerness is felt among the participants that show enormous engagement and endurance when working on their racing cars. Excellent knowledge of their field of activity, the comprehension of complex dependences and team work are decisive qualities shown in this competition. This exactly matches our requirements of gaining qualified junior staff.

With our engagement we wish to make a contribution to bring forward the innovation force and enhance the passion of young talents for the Automotive Industry. At the Formula Student event we are looking forward to interesting discussions with the participants in order to show them the possibilities of starting their career with Daimler.

We wish all participants a huge amount of energy and a successful event!

Begeisterung und Leidenschaft für Innovationen und Technik sind der Motor der Automobilindustrie.

Diesen Enthusiasmus spüren wir bei den Teilnehmern, die mit viel Engagement und Ausdauer an ihren Rennwagen arbeiten. Exzellentes Fachwissen, das Erfassen komplexer Zusammenhänge und Teamwork sind entscheidende Qualitäten, die bei diesem Wettbewerb unter Beweis gestellt werden. Diese entsprechen genau unseren Anforderungen bei der Gewinnung qualifizierter Nachwuchskräfte.

Wir möchten mit unserem Engagement einen Beitrag dazu leisten, die Innovationskraft der jungen Talente und ihre Begeisterung für die Automobilindustrie zu fördern. Bei dem Formula Student Event freuen wir uns auf interessante Gespräche mit den Teilnehmern, um ihnen Möglichkeiten zum beruflichen Einstieg bei Daimler aufzuzeigen.

Wir wünschen den Teilnehmern eine ganze Ladung Energie und eine erfolgreiche Veranstaltung!

DEKRA

Clemens Klinke
Chairman of the board of managing directors, DEKRA Automobil GmbH
Member of the board, DEKRA SE

DEKRA supports Formula Student Combustion and Formula Student Electric from the outset as the technical partner. Our engineers have well grounded know how and expertise in professional motor racing, for example as technical supervisors in the German Touring Car Masters (DTM) championship.

In 2010 again the structure of all vehicles has been proven at the DEKRA Technology Centre regarding safety in rollover, side and frontal impacts. Approx. two dozen teams brought the frontal crash attenuators of their bolides for testing directly to the DEKRA Technology Center. This way Formula Student provides the students the opportunity to make their first personal contacts with DEKRA.

As Europe's largest organisation of technical experts, DEKRA is constantly on the lookout for highly motivated employees who have a high level of knowledge, teamwork skills and initiative - and, as we say in Germany, "who have petrol in the veins".

DEKRA unterstützt die Formula Student Combustion und die Formula Student Electric seit ihrem Beginn als technischer Partner. Unsere Ingenieure verfügen über umfangreiches Know-how und Erfahrungen im professionellen Rennsport, unter anderem als Technische Kommissare der Deutschen Tourenwagen Masters (DTM).

Das DEKRA Technology Center hat auch im Jahr 2010 alle Fahrzeugstrukturen im Hinblick auf die Sicherheit beim Fahrzeugüberschlag, beim Seitenanprall und beim Frontalanprall überprüft. Rund zwei Dutzend Teams ließen die energieabsorbierenden Frontalaufprallstrukturen ihrer Boliden direkt im DEKRA Technology Center testen. So bietet die Formula Student den Studierenden die Möglichkeit, erste persönliche Kontakte zu DEKRA zu knüpfen.

Als Europas größte Sachverständigen Organisation ist DEKRA ständig auf der Suche nach motivierten Mitarbeitern mit hohem Wissensstand, Teamfähigkeit und Eigeninitiative, die „Benzin im Blut" haben.

Anne Bentfeld
General Manager Communication and Public Relations, HARTING KGaA

HARTING technology group develops innovative solutions and technologies for connectivity and networks. Highly motivated young professionals are necessary to create innovations for our customers. Formula Student is considered by HARTING as an outstanding opportunity to encourage the young generation of engineers we regularly seek as an employer.

In Formula Student, the participants can prove in practice their professional knowledge and management by developing new solutions through team work. We are also proud that our students from the dual-study program take part and can actively apply the skills gained with HARTING.

When technical aspects of a solution are addressed, energy efficiency and conservation of resources should play a central role. Therefore, HARTING will award the team that will realise a solution with the best energy efficient values.

Die HARTING Technologiegruppe entwickelt innovative Lösungen und Technologien in der Verbindungstechnik. Damit wir auch zukünftig unsere Kunden mit Innovationen versorgen können, braucht es junge, motivierte Menschen. Die Formula Student ist eine hervorragende Möglichkeit, um den technischen Nachwuchs zu fördern, den wir als Unternehmen suchen. Hier können die Studenten in der Praxis demonstrieren, wie sie in Teamarbeit neue Lösungen entwickeln – und dabei ihr technisches Fachwissen und betriebswirtschaftliches Know-how unter Beweis stellen. Wir sind stolz darauf, dass auch unsere dualen Studenten dabei sind und zeigen werden, was sie bei HARTING gelernt haben.

Wenn es um neue technische Lösungsansätze geht, sollten auch immer Energieeffizienz und Ressourcenschonung eine zentrale Rolle spielen. HARTING wird deshalb einen Preis an das Team verleihen, das bei der Formula Student Electric den geringsten Energieverbrauch realisiert.

Rudolf Neumayer
Manager Technical Customer Service, Henkel AG & Co. KGaA

Heinz Siggemann
Sales Manager Industry, Henkel AG & Co. KGaA

Anyone who can create fascinating solutions from limited resources has the potential to do great things. More than ever before, in all technology-driven industries, we need young, curious engineers – people with a passion to master future challenges innovatively and sustainably.

This is precisely why we at Henkel, the world market leader in adhesives and sealants, are committed to fostering young engineers and this competition in particular. Conventional joining techniques, such as screw-fastening, welding and riveting, are being reviewed for fundamental fitness in many industries. Often, adhesive bonding proves to deliver superior results. It can join very dissimilar materials and also offer powerful additional features, thus turning out to be a real innovation driver, especially for engineers. For all of these reasons, we will be glad to advise contestants anywhere in the world.

Wer mit überschaubaren Mitteln in der Lage ist, faszinierende Lösungen zu erarbeiten, der kann Großes schaffen. In allen technologiegetriebenen Branchen brauchen wir heute mehr denn je junge, neugierige Ingenieure mit Leidenschaft, um die Aufgaben der Zukunft innovativ und nachhaltig meisten zu können.

Deshalb empfinden wir von Henkel, als Weltmarktführer im Bereich der Kleb- und Dichtstoffe, die Förderung des Nachwuchses und dieses Wettbewerbs geradezu als Verpflichtung. Speziell konventionelle Fügemethoden wie Schrauben, Löten und Schweißen werden in vielen Industriezweigen grundsätzlich überdacht. Oft erweist sich die Klebetechnik dabei als überlegen: Sie verbindet verschiedenartigste Materialien, bietet leistungsstarke Zusatzeigenschaften und entpuppt sich so gerade für Ingenieure als Innovationstreiber. Daher stehen wir allen Teilnehmern weltweit jederzeit gerne beratend zur Seite.

Christian Willenberg
Public Relations, IAV GmbH

With over 3,000 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 25 years of experience in developing innovative concepts and technologies for future vehicle generations. Core competencies include perfected, production-ready solutions in all fields of powertrain, electronics and vehicle development.

IAV supports Formula Student and individual teams to produce interest to take part in the engineering departments of the company. To name one example from the motorsport segment: IAV was involved in developing a 2-liter four-cylinder high-speed engine for mass production. Powered by this engine, the BMW 320si went into mass production as the base vehicle for touring-car racing.

For further information about IAV, go to www.iav.com and our careers portal at www.iav-inside.com.

Die IAV ist mit über 3.000 Mitarbeitern weltweit einer der führenden Engineering-Partner der Automobilindustrie. Das Unternehmen entwickelt seit 25 Jahren innovative Konzepte und Technologien für zukünftige Fahrzeuggenerationen. Zu den Kernkompetenzen gehören perfekte, serientaugliche Lösungen in allen Bereichen der Antriebsstrang-, Elektronik-, und Fahrzeugentwicklung.

Die IAV unterstützt Formula Student und einzelne Teams – auch um das Interessen einer Mitwirkung in den Fachabteilungen zu erwecken. Um ein Beispiel aus dem Bereich Motorsport zu nennen: Die IAV war bei der Serienentwicklung eines 2-Liter-Vierzylinder-Hochdrehzahlmotors beteiligt. Als Grundlage für den Tourenwagensport ging der BMW 320si mit diesem Motor in Serie.

Weitere Infos zur IAV erhalten Sie über www.iav.com und unser Karriereportal www.iav-inside.com.

Christina Schulte
Head of Management Development and HR Marketing
MAHLE International GmbH

The MAHLE Group is one of the top 30 automotive suppliers and the globally leading manufacturer of components and systems for the internal combustion engine and its peripherals. Around 43,000 employees work at over 100 production plants and eight research and development centers.

MAHLE has enjoyed close ties to motor sport activities since the early days. Thus we know: if you want to do something decisive, you need a vision, topped with courage, perseverance, and drive. When the environment fits and the team is right, ambitious projects and convincing solutions emerge from innovative ideas.

As a company with a passion for the automobile, we are proud to be part of the Formula Student Germany. We support formula student teams who are fascinated by the automotive world and who want to bring about change - in the same way we are. We are happy to support talented and enthusiastic engineers in reaching their ambitious goals and we wish you all an exciting and successful event!

Der MAHLE Konzern zählt zu den 30 größten Automobilzulieferern und ist der weltweit führende Hersteller von Komponenten und Systemen für den Verbrennungsmotor und dessen Peripherie. MAHLE beschäftigt rund 43.000 Mitarbeiter an über 100 Produktionsstandorten und in 8 Forschungs- und Entwicklungszentren.

Als ein von Anfang an dem Motorsport verbundenes Unternehmen wissen wir: Wer Entscheidendes bewegen will, braucht eine Vision. Und dazu Mut, Ausdauer und Biss. Wenn dann noch das Umfeld stimmt und das Team das richtige ist, werden aus innovativen Ideen ehrgeizige Projekte und überzeugende Lösungen.

Als ein Unternehmen mit einer Leidenschaft für das Automobil, sind wir stolz, ein Teil der Formula Student zu sein. Wir unterstützten dabei Teams, die – genauso wie MAHLE – fasziniert sind von der Automobilindustrie und gemeinsam mehr bewegen wollen. Wir freuen uns, talentierte und enthusiastische angehende Ingenieure bei der Erreichung ihrer ehrgeizigen Ziele zu unterstützen und wünschen allen Teilnehmern ein erfolgreiches Event!

Tognum
HOME OF POWER BRANDS

Dr. Ulrich Dohle
Chief Officer Technology & Operations, Tognum AG

All over the world, Tognum propulsion systems and energy plants stand for power, efficiency and versatility. MTU diesel engines can be found on offshore tugboats and luxury yachts, in off-highway dump trucks and harbour cranes, aboard fast trains and armoured combat vehicles. Our plants ensure the power supply of the Olympic arena in Beijing as well as the lighting of the Eiffel Tower in Paris.

What makes us successful is our ambition to always go that extra mile when it comes to advancing today´s technology. It is this very ambition – developing fascinating ideas into the best possible solution – that we appreciate in the FSG participants. We are glad that with the recent introduction of the classes "Formula Student Combustion" and "Formula Student Electric", our two main fields of excellence are for the first time present in the event. As sponsor of six teams we are once again looking forward to exciting moments between test stand, race track and finishing line.

Antriebssysteme und Energieanlagen der Tognum AG stehen weltweit für Kraft, Effizienz und Vielseitigkeit. MTU-Dieselmotoren finden sich auf Hochseeschleppern und Luxusyachten, in Muldenkippern und Hafenkränen, an Bord von Schnellzügen und Schützenpanzern. Unsere Aggregate sichern die Stromversorgung von Sportarenen ebenso wie die Beleuchtung des Pariser Eiffelturms.

Was uns erfolgreich macht, ist unser Anspruch, Technologie stets das entscheidende Stück weiterzutreiben. Es ist dieser Anspruch, faszinierende Ideen in die bestmögliche Lösung zu verwandeln, den wir auch an den Teilnehmern der FSG schätzen. Wir freuen uns, dass 2010 mit den neuen Klassen „Formula Student Combustion" und „Formula Student Electric" erstmals beide unserer großen Kompetenzfelder vertreten sind. Als Sponsor von sechs Teams freuen wir uns wieder auf spannende Momente zwischen Prüfstand, Rennstrecke und Ziellinie.

Hanno Jelden
Head of Drive Technology, Volkswagen AG

Thomas Lieber
Head of Electrical Traction, Volkswagen AG

Volkswagen supports Formula Student Germany because the participants possess exactly the characteristics that we are looking for: automotive enthusiasm, inventiveness, commitment and technical competence, with a forward-looking approach. In addition, the students are obliged to take into account aspects of business such as financial planning and sales. Formula Student Germany thus demands the key qualifications that are important for working successfully in an automotive company that promotes innovative mobility concepts.

We look forward to an exciting design competition, successful racing and an exchange of expertise with the students.

We wish all the participants the best of luck!

Volkswagen unterstützt Formula Student Germany, weil die Teilnehmer hier genau die Eigenschaften beweisen müssen, die wir suchen: automobile Begeisterung, Erfindungsgeist, Engagement und Technikkompetenz mit dem Blick nach vorne. Dazu kommt, dass die Studenten und Studentinnen unternehmerische Aspekte wie Finanzplanung und Verkauf berücksichtigen müssen. Formula Student Germany fordert damit Schlüsselqualifikationen, die für eine erfolgreiche Arbeit in einem Automobilunternehmen wichtig sind, das innovative Mobilitätskonzepte vorantreibt.

Wir freuen uns auf einen spannenden Konstruktionswettbewerb, erfolgreiche Rennen und den fachlichen Austausch mit den Studenten.

Wir wünschen allen Teilnehmern viel Erfolg!

Dr. Hans-Jörg Domian
Senior Manager Advanced Engineering, Innovative Chassis and Driveline, ZF Friedrichshafen AG

As a leading worldwide automotive supplier for Driveline and Chassis Technology, ZF is permanently looking for highly qualifed, creative and motivated junior staff. Team players with organizational skills as well as well-founded knowledge in project management and cost optimization are just what we need. It is exactly these key qualifcations that can be found with the teams of Formula Student. For us, the event provides the ideal platform to engage in a dialog with the students and get them enthusiastic about our company and our products. The design engineering contest here in Hockenheim, is a kind of ‚playground' for young engineers that have skills and qualifcations going way beyond functional engineering training.

Like no other student project, „Formula Student" sets an example in promoting young engineering talents – a target group that we urgently need as an innovation driver.

ZF als ein weltweit führender Automobilzulieferkonzern in der Antriebs- und Fahrwerktechnik ist permanent auf der Suche nach qualifzierten, kreativen und motivierten Nachwuchskräften. Gefragt sind Fähigkeiten wie Teamfähigkeit, Organisationstalent und solide Kenntnisse in Projektmanagement und Kostenoptimierung. Genau diese Schlüsselqualifkationen fnden wir bei den Teams von „Formula Student". Die Veranstaltung bietet uns eine ideale Plattform, um den Dialog mit Studierenden zu eröffnen und sie für unser Unternehmen und unsere Produkte zu begeistern. Der Konstruktionswettbewerb hier in Hockenheim ist ein Tummelplatz junger Menschen, die über Fähigkeiten verfügen, die weit über die fachbezogene Ingenieursausbildung hinausgehen.

Wie kaum ein anderes studentisches Projekt fördert Formula Student den ingenieurwissenschaftlichen Nachwuchs – eine Zielgruppe, die wir als Innovationstreiber so dringend benötigen.

THE NEW CLASS: FORMULA STUDENT ELECTRIC

DIE NEUE KLASSE: FORMULA STUDENT ELECTRIC

An interview with Tobias Michaels and Lukas Folie, both in charge of the FSE within the Formula Student Germany Executive Team, and Tim Hannig, Chairman of the Formula Student Germany.

For the first time, a Formula Student Electric (FSE) competition will take place at the Hockenheimring at the same time as the well-established Formula Student Combustion (FSC) competition. Both competitions form the well known Formula Student Germany event. The electric class expects the teams to face the FSG competition with racecars powered by an electric drive train in contrast to their combustion-powered colleagues.

In 2008, the concept of FSE was set in motion and in 2009 the rules were presented to the public at the Hockenheimring. Now, the time has come. The first electric cars are constructed and are going to be presented to the judges and the public during this year's event at the Hockenheimring.

What is the motivation for the FSG to invest in the field of electrics?

HANNIG: All around the world, we observe the trend towards alternative drive concepts and we discovered early that young engineers with appropriate technical experience are needed. As we promise our patrons and sponsors to prepare students for their professional duties of the future, it was a logic step to introduce the electric FSG competition, logic but yet challenging.

Early? The subject has already been widely discussed for quite a while.

HANNIG: We started developing the competition concept in 2008. In 2009, the first version of the rules were released and now, the first cars are constructed and built and are going to be racing at the Hockenheimring. We consider this early.

Ein Interview mit Tobias Michaels und Lukas Folie, beide FSE-Verantwortliche im Formula Student Germany Executive Team und Tim Hannig, Chairman der Formula Student Germany.

In diesem Jahr findet am Hockenheimring parallel zur Formula Student Combustion (FSC) die Formula Student Electric (FSE) statt. Beide Wettbewerbe bilden gemeinsam die bekannte Formula Student Germany (FSG). Bei der neuen Disziplin gehen eigenständige Teams mit Rennwagen in den Wettbewerb, die im Gegensatz zu Ihren verbrennungsmotorischen „Combustion-Kollegen" einen rein elektrischen Antriebsstrang haben.

2008 wurde das Konzept auf den Weg gebracht und im Jahr 2009 auf dem Hockenheim das Reglement der Öffentlichkeit präsentiert. Jetzt ist es soweit. Die ersten Elektroautos sind gebaut und präsentieren sich in Hockenheim der Jury sowie der Öffentlichkeit.

Mit welcher Motivation „investiert" die FSG in das Thema Electric?

HANNIG: Wir sehen den weltweiten Trend zu alternativen Antriebskonzepten und haben sehr früh erkannt, dass dafür dringend junge Ingenieure mit der entsprechenden technischen Expertise benötigt werden. Da unser Versprechen an unsere Förderer und Sponsoren ist, Studierende auf ihre beruflichen Aufgaben der Zukunft vorzubereiten, war der Schritt, einen Elektrowettbewerb einzuführen, nahe liegend aber dennoch herausfordernd.

Früh? Das Thema Elektro ist doch schon länger in aller Munde.

HANNIG: Wir haben ja auch bereits in 2008 mit der Wettbewerbskonzeption begonnen, 2009 das Reglement veröffentlicht und nun sind die ersten Autos von Teams konstruiert und gebaut worden und fahren hier. Wir betrachten das schon als früh.

The FSE is the first competition of its kind all over the world. How is the competition structured?

FOLIE: The competition is very similar to the FS combustion competition. The teams need to compete in 8 disciplines as well. Only the evaluation of the fuel efficiency is different, as not fuel but electric energy is used. But this kind of consumption is measured and evaluated as well.

A true FS competition then! Why did you not choose hybrid driven cars as a new discipline?

FOLIE: This question was discussed heavily! The reason we focused on purely electric drivetrains was very simple. A hybrid contains the complexity of an electric and a combustion drivetrain. We do not want the students to cope with the most complex technology, but to be best prepared for their career entry. Apart from that, the hybrid is only an intermediate step on the way to pure electric driving we overleap.

What does this mean for the cars? Obviously, the rules must be very different?

MICHAELS: The actual changes of the cars are not that enormous. We tried to develop the rules to allow transferring a lot of knowledge from combustion driven cars. Originally, we aimed at introducing a single body of rules with two different drive trains so that the cars could compete with each other directly. However, this idea could not be realized.

Why is the body of rules still so extensive, if the differences are not that major?

FOLIE: The main focus of the whole concept was and still is safety. Our society is not sufficiently aware of the danger of handling high voltage constructions. In contrast, everybody knows that you should not throw a burning match into a fuel tank. Most of the rules and instructions concern the safety during construction, maintenance and operation, much more than the actual technical design of the cars.

Could you name relevant aspects of the construction of the FSE cars?

FOLIE: On the one hand, there are the batteries. The batteries must be embedded in a crash-suitable and padded container. These containers must be built into the car in a way that makes sure the batteries are protected from direct collisions. In case of a crash, the container with the battery may never enter the area of the driver's seat.
Another example are the rules concerning the electrical system. It must be possible to shut the high voltage down from the outside. Furthermore, all vehicles need to have a light at the highest point of the car to show the activity of the high voltage system, which can be seen from all sides. Additionally, we also demand a central interface in order to install the energy meter which measures and records the electric current as well as the voltage. This way, we can gather data for the evaluation of the energy efficiency.

What are the power limitations for the electric motors etc. in FSE?

Die FSE ist der erste Wettbewerb dieser Art weltweit. Wie ist dieser Wettbewerb aufgebaut?

FOLIE: Der Wettbewerb an sich ist sehr ähnlich zur Formula Student mit verbrennungs-motorischen Antrieben. Die Teams müssen auch in der FSE die acht Disziplinen absolvieren. Einzig die Fuel Efficiency ist entsprechend anders, da hier kein Kraftstoff, sondern elektrische Energie verbraucht wird. Aber auch dieser Verbrauch wird gemessen und bewertet.

Also ein echter Formula Student Wettbewerb. Wären denn Hybrid-Antriebe nicht nahe liegender gewesen?

FOLIE: Wir haben viel darüber diskutiert. Der Grund, uns auf rein elektrische Antriebe zu konzentrieren war einfach: Ein Hybrid beinhaltet die Komplexität eines elektrischen und eines verbrennungsmotorischen Antriebs. Wir wollen aber nicht, dass die Studierenden sich mit möglichst komplexer Technik auseinandersetzen, sondern dass sie bestmöglich auf den Berufseinstieg vorbereitet werden. Außerdem ist der Hybrid nur ein Zwischenschritt auf dem Weg zum rein elektrischen Fahren, den wir überspringen.

Was bedeutet das denn für die Autos? Das Reglement muss doch deutlich anders sein?

MICHAELS: Eigentlich sind die Änderungen für die Autos gar nicht so groß. Wir haben absichtlich versucht ein Reglement zu erarbeiten, welches so gestaltet ist, dass viele Erfahrungen aus den verbrennungsmotorischen Autos übernommen werden können. Genau genommen hatten wir ursprünglich das Ziel, die Regeln so zuzuschneiden, dass die Fahrzeuge direkt miteinander konkurrieren können, also ein einziges Reglement mit zwei Antriebsarten. Es hat sich aber als nicht umsetzbar herausgestellt.

Warum ist das Reglement dann dennoch so umfangreich, wenn die Unterschiede gar nicht so gravierend sind?

FOLIE: Das Haupt-Augenmerk lag und liegt bei der gesamten Konzeption auf der Sicherheit. Wir haben gesellschaftlich gesehen kein weit verbreitetes Bewusstsein für die Gefahren im Umgang mit Hochvoltanlagen. Im Gegensatz dazu weiß fast jeder, dass man kein brennendes Streichholz in einen Benzintank werfen sollte. Die meisten der Regeln und Bestimmungen betreffen daher die Sicherheit bei Bau, Wartung und Betrieb, vielmehr als das eigentliche technische Design der Fahrzeuge.

Was gäbe es denn Relevantes für die Konstruktion der Fahrzeuge zu benennen?

FOLIE: Zum einen ist da das Thema Batterien. Die Batterien müssen in einem Crash-Geeigneten und gepolsterten Kontainer verbaut sein. Zusätzlich müssen diese Kontainer wiederum derart am Fahrzeug verbaut sein, dass sie vor Aufprällen geschützt sind. Gleichzeitig ist die Struktur der Fahrzeuge derart auszulegen, dass im Crash-Falle diese Container keinesfalls in die Fahrerzelle eindringen können.
Ein anderes Beispiel sind sicherlich die Vorgaben zur elektrischen Anlage. Das Fahrzeug muss sich von außen vollständig spannungsfrei schalten lassen. Außerdem haben die Fahrzeuge eine von allen Seiten sichtbare Leuchte, die die Aktivität der Hochvoltanlage anzeigt. Wir haben zusätzlich


Safety measures: Tractive System Active Light on top of an FSE car (left) and high voltage sticker (right).
Sicherheitsvorkehrungen: Hochspannungssystem Aktivlicht am höchsten Punkt eines FSE Fahrzeugs (links) und Hochspannungsaufkleber (rechts).

MICHAELS: There are almost no restrictions. Only the maximum voltage used is limited, again for safety reasons.

So the teams could start with 1000 kW or use 20 electric engines?

MICHAELS: In theory, yes. But, anticipating the next question, we carried out a simulation in advance. More drive power means a higher energy demand which again leads to a significantly higher weight of the vehicle, especially due to the batteries. But more weight needs a higher drive power for the same dynamic driving performance. At the same time, a heavier car is less agile on the track. Eventually, it is more important to find the best solution for the whole concept of the car than to build the car with the highest drive power. The same is valid for the number of engines. Each concept has its advantages and disadvantages. A concept that uses four wheel hub motors is possible as is a single motor with differential and drive shafts. We want the students to find the best concept for their electric car.

HANNIG: And this is the central aspect of the whole competition. The students develop a concept and realise it. The body of rules is best, when different concepts can be successful. That's why the rules must definitely be developed further. We are still at the beginning of Formula Student Electric. We are going to analyse the results and findings of 2010 meticulously to include them into the rules for 2011.

How much outward influence was included during the development and constitution of the rules?

FOLIE: I would like to replace influence by support. We talked to partners of the FSG right at the beginning and involved them in the process. The support was enormous and meant a great help. On the other hand, we had to decide which way to take, so that we could not take into account all of the different opinions and annotations.

Does the introduction of the FSE put an end to the competition of combustion powered cars, or was this your original wish?

HANNIG: Not at all. We assume that both drive concepts are going to be further developed at the same time. This will be a thrilling comparison: watching which drive train competes better.
Looking at your Event-Layout, one can see that FSE imposes certain challenges. Why do you need, e.g. an independent charging tent far away from the competition track?

eine zentrale Schnittstelle vorgegeben, in die wir unser Energy Meter einsetzen. Dieses Gerät misst die durchfließenden Ströme und die anliegende Spannung und zeichnet diese auf. Auf diese Weise erhalten wir auch die Daten für die Bewertung der Energieeffizienz.

Und wie sind die Beschränkungen für Antriebsleistung etc. bei der FSE?

MICHAELS: Beschränkungen gibt es fast keine. Wir haben lediglich die maximale Spannung begrenzt. Auch das aus Sicherheitserwägungen.

Dann könnten die Teams mit 1.000 kW an den Start gehen oder 20 Elektromotoren verbauen?

MICHAELS: Theoretisch ja, aber um die nächste Frage vorwegzunehmen: Wir haben vorher eine Simulation durchgeführt. Mehr installierte Antriebsleistung bedeutet mehr Energiebedarf und als Folge daraus ganz erheblich mehr Gewicht, insbesondere durch die Batterien. Mehr Gewicht führt wiederum zu mehr benötigter Antriebsleistung für gleiche fahrdynamische Leistungsfähigkeit. Gleichzeitig bedeutet mehr Gewicht weniger Fahrdynamik. In diesem Spannungsfeld gilt es, das beste Gesamtpaket zu schnüren, nicht einfach das Fahrzeug mit der höchsten Antriebsleistung zu konstruieren. Wir haben das absichtlich gemacht, um möglichst viele unterschiedliche Konzepte zuzulassen.
Das gleiche gilt entsprechend für die Anzahl der verbauten Motoren. Jedes Konzept hat seine Vor- und Nachteile. Ein Konzept von vier Radnabenmotoren ist ebenso denkbar wie ein einzelner Motor mit Differentialgetriebe und Antriebswellen. Wir wollen, dass die Studierenden sich mit der Konzeption befassen, und das aus Ihrer Sicht beste Paket schnüren.

HANNIG: Und das ist der zentrale Aspekt dabei. Die Studierenden erarbeiten ein Konzept und setzen es um. Ideal sind die Regeln dann, wenn unterschiedliche Konzepte erfolgreich sein können. Daher wird sich das Reglement auch weiterentwickeln müssen. Wir sind schließlich nicht am Ende, sondern am Anfang der Formula Student Electric. Wir werden die Ergebnisse und die Erkenntnisse von 2010 sehr genau analysieren und dann in das Reglement für 2011 einarbeiten.

Wie groß war denn die Einflussnahme von Außen auf die Gestaltung und Ausarbeitung des Reglements?

FOLIE: Ich würde gern das Wort Einflussnahme durch Unterstützung ersetzen. Wir haben sehr früh mit mehreren Partnern der FSG gesprochen und sie einbezogen. Die Unterstützung war immens und hat enorm geholfen. Andererseits mussten wir uns letztendlich für einen Weg entscheiden und konnten nicht alle Anmerkungen bzw. unterschiedlichen Meinungen insbesondere von Außen immer voll berücksichtigen.

Bedeutet die Existenz der FSE nicht das Ende der Verbrennungsmotoren in diesem Wettbewerb, oder ist das von Ihnen sogar gewollt?

HANNIG: Keineswegs. Wir gehen davon aus, dass sich beide Antriebsarten parallel weiter entwickeln werden. Und es wird ein spannender Vergleich sein, welches Antriebskon-

FOLIE: Again, this is for safety reasons. Especially while charging the battery, there are high currents. This is a dangerous process, during which the temperature of the battery increases as well as the risk of fires. For this reason, the cars are going to be charged in a secured tent, equipped with fire detectors which can shutdown the electric charging by themselves.

MICHAELS: This may be the most noticeable at the event set up. However, it is more complex to coordinate all competitions and disciplines during our tight time schedule. Furthermore, the cars also have to be judged by the jury and a business concept has to be prepared and presented, too. This was and is a real challenge. And do not forget, more than 90 teams are going to take part in the competition; more students and cars at the Hockenheimring than ever before.

Is it possible to carry this out without difficulty?

HANNIG: Not without difficulty, but with a capable team! We possess more than 5 years of experience and almost all of the officials were team members in former times, bringing along a lot of knowledge of taking part in the competition. That's why the number of volunteers increases every year without losing quality. But this year is going to be tough! We have the claim to offer every team, no matter if FSC or FSE, the best and fairest conditions in order to be a professional and perfect host, just as the teams are. Sometimes, it is not easy, and sometimes we are not able to fulfill this promise, but we try very hard. And "we" means the whole FSG team, everybody dedicates his heart to FSG.

Thank you very much for the interview!

Tim Hannig, Lukas Folie, Tobias Michaels (f.l.t.r.)
Tim Hannig, Lukas Folie, Tobias Michaels (v.l.n.r.)

zept die Nase vorn haben wird.

Man kann an Ihrem Event-Layout sehen, dass die FSE sie vor Herausforderungen stellt. Warum brauchen Sie z.B. ein eigenständiges Ladezelt weit ab vom restlichen Wettbewerbsgelände?

FOLIE: Auch das ist ein Tribut an die Sicherheit. Gerade beim Laden der Batterien fließen extrem hohe Ströme. Das ist ein gefährlicher Prozess, bei dem in den Batterien hohe Temperaturen entstehen können und grundsätzlich erhöhte Brandgefahr besteht. Daher haben wir ein extra abgesichertes Zelt mit Brandmeldeanlagen und automatischer Ladestromabschaltung aufgebaut. Dort können die Fahrzeuge sicher geladen werden.

MICHAELS: Das ist vielleicht das Sichtbarste am Setup des Wettbewerbs. Viel komplexer war es jedoch, all die Wettbewerbe und Disziplinen mit im Zeitplan unterzubringen. Die Fahrzeuge müssen ja auch von Juroren bewertet werden und es muss ein Business-Konzept erstellt und präsentiert werden. Das war und ist eine echte Herausforderung. Nicht zu vergessen, dass wir nunmehr mit mehr als 90 Teams so viele Studierende und Autos wie noch nie zuvor vor Ort haben!

Und das geht so problemlos?

HANNIG: Nicht problemlos aber aufgrund eines starken Teams. Wir haben jetzt über 5 Jahre Erfahrung und fast alle aus der Organisation sind ehemalige Teammitglieder und haben daher auch noch Erfahrungen als Teilnehmer an anderen Wettbewerben. Wir sind bisher jedes Jahr im Umfang gewachsen, und das jeweils ohne die Qualität zu verlieren. Aber dieses Jahr wird hart. Unser Anspruch ist es, jedem Team, egal ob FSC oder FSE Team die bestmöglichen und fairen Bedingungen zu bieten, und ein so professioneller und perfekter Gastgeber zu sein, wie die Teams selbst es sind. Das ist manchmal nicht einfach und wir schaffen es möglicherweise nicht immer, aber wir versuchen es. Und mit wir meine ich das gesamte FSG Team, jeder Einzelne hier ist mit ganzem Herz bei der Sache.

Vielen Dank für das Gespräch!

FSE NIGHT RACE

Don't miss! Nicht verpassen!

Saturday night, starting 10:00 p.m. the FSE Endurance will take place as the worldwide first discipline after dark.

Am Samstag abend ab 22.00 wird die Endurance-Disziplin der Formula Student Electric ausgetragen. Als weltweit erster Formula Student Wettbewerb bei (fast) völliger Dunkelheit.

POWER TRAINS FOR FSC
ANTRIEBSSTRÄNGE FÜR FSC

This year, the Formula Student Germany competition is taking place in Hockenheim for the 5th time. Every year and every competition poses new challenges to the participating students. Especially the well-established and balanced rules for the power train of the Formula Student Combustion (FSC) cars involve a few tricky challenges for the future engineers. At this competition the students cannot only show their expertise as well as their skills as future engineers; instead, they are also prepared for their tasks in real working life in the automotive industry in a fun way.

Mit der diesjährigen Veranstaltung findet bereits zum 5. Mal ein Wettbewerb der Formula Student Germany statt. Trotzdem stellt jedes Jahr, jeder Wettbewerb eine neue Herausforderung für die Studierenden dar. Insbesondere das erprobte und ausgewogene Reglement für den Antriebsstrang der Formula Student Combustion (FSC) Fahrzeuge bietet den Jungingenieuren einige knifflige Herausforderungen. Hier sollen sie nicht nur Kompetenz und Engagement beweisen, sondern auch mit Spaß auf die Aufgaben im wahren Berufsleben in der Automobilindustrie vorbereiten werden.

The pursuit of high efficiency while keeping CO_2 emissions at a very low level is a common goal for both the FSC as well as the automotive industry, where development and improvement of combustion engines is of central importance for current research. The combustion engine still plays a central role for automotive drives despite the growing electrification of power trains.
The rules of FSC set the framework for the technical development of the cars at this competition. Their general conditions guarantee the required safety without limiting the scope for technical innovation.

Rear assembly of engine and transmission of an FSC car using a one-cylinder engine.
Heck eines FSC Fahrzeugs mit Einzylindermotor.

The 4-stroke engines that are being used may have a displacement volume of up to 610 cm³ and may run on either unleaded gasoline or E85 (85% ethanol, 15% gasoline). These engines need to obtain their intake air through a restrictor that limits the maximal available air for combustion and as such the overall performance potential of the car. The rules prescribe a circular constriction at the intake system of maximal 20 mm (gasoline) or 19 mm (E85). The number of cylinders is, however, open to choice. Supercharging of engines via an exhaust gas turbocharger or a mechanical charger is also allowed. Further regulations serve the purpose of safety while giving the students a high degree of freedom with regard to the design of the intake system, the exhaust system, the cooling as well as the fuel system. The teams are also free to decide on the transmission, which offers room for

Das Streben nach hoher Leistungsfähigkeit bei geringen CO_2 Emissionen ist FSC und Automobilindustrie gemein; die Weiterentwicklung und Optimierung des Verbrennungsmotors ist für die aktuelle Forschung dabei von zentraler Bedeutung. Denn auch bei einer zunehmenden Elektrifizierung des Antriebsstranges, spielt der Verbrennungsmotor eine elementare Rolle bei automobilen Antrieben.
Das Reglement der FSC stellt den Rahmen für die technische Entwicklung der Fahrzeuge dar. Die hier aufgestellten Rahmenbedingungen sorgen dabei für Sicherheit ohne den Spielraum für technische Innovationen einzuschränken.

Die zum Einsatz kommenden 4-Takt Ottomotoren dürfen einen Hubraum bis zu 610 cm³ haben und können wahlweise mit Super Plus oder E85 (85% Ethanol, 15% Benzin) betrieben werden. Sie müssen ihre Ansaugluft durch einen Luftmassenbegrenzer beziehen, der die maximal zur Verfügung stehende Verbrennungsluft und somit die erreichbare Leistung begrenzt. Das Reglement schreibt hier eine Engstelle im Ansaugtrakt von maximal 20 mm Durchmesser (Benzin) bzw. 19 mm (E85) vor. Die Zylinderzahl ist jedoch freigestellt. Eine Aufladung der Motoren über Abgasturbolader oder mechanische Lader ist erlaubt. Weitere Reglementierungen dienen vor allem der Sicherheit, lassen den Teams aber ansonsten freie Hand für die Auslegung des Ansaugtraktes, der Abgasanlage, der Kühlung oder auch des Kraftstoffsystems. Die Art der Kraftübertragung ist freigestellt, was sowohl bei der Art des Getriebes als auch bei der Wahl der angetriebenen Achsen Gestaltungsfreiraum lässt.

Den zweiten Pfeiler für die Auslegung der Fahrzeuge stellt die Definition der einzelnen Fahrdisziplinen und der dort vergebenen Punkte dar. Um die maximale Punktzahl zu erzielen, muss das Fahrzeug in jeder Disziplin konkurrenzfähig sein, wobei jede ihre eigenen Anforderungen an den Antriebsstrang stellt. So steht für den Skidpad eine gute Fahrbarkeit im Vordergrund, während für den Accelerationlauf vor allem Spitzenleistung gefragt ist. Beide Anforderungen sind auch für die Rundstreckendisziplinen Autocross und Endurance wichtig. Im Endurance kommt zudem die Ermittlung der Effizienz hinzu, wobei der Kraftstoffverbrauch ins Verhältnis zur Performance auf der Strecke gesetzt und schließlich bewertet wird. Durch den Stellenwert dieser Disziplin wird die Bedeutung der Reduktion von Kraftstoffverbrauch und CO_2 Emissionen besonders in den Fokus gestellt.

picture: DUT Formula Student Racing Team, TU Delft

choice of the type of gearbox as well as the driven axles.
The definition of the individual driving disciplines and the points awarded are the second pillar for the design of the vehicle. The car has to be competitive in every discipline in order to reach the maximum score. In each discipline, however, the power train is involved differently: for the skidpad, for example, a good drivability is vital while the acceleration race requires high power. Both of these requirements are also of importance when it comes to the circuit disciplines, autocross and endurance. The fuel used during the endurance is measured and set into relation to the cars' performance. This way the teams' efficiency score is calculated. Because of the central role this discipline plays in the entire competition, a special emphasis is put on the importance of the reduction of fuel consumption and the CO2 emission.

The design event should also be mentioned: the team presents and explains the process of their car's development. The teams can receive valuable points here as well, so a comprehensive documentation and a clear presentation of the processes are essential.

The above mentioned requirements for the power train give directions for the technical development in the several modules. In the following, the modifications that are typical for the FSC as well as the main emphasis for the design of the individual parts of the power train will be illustrated.

The first question a team needs to consider is which engine is suitable for their car. Motorcycle engines seem to be a good compromise between efficiency, packaging and weight on the one hand and cost and availability on the other. At this point, it needs to be considered whether a light and compact 1-cylinder concept should be pursued or a 4-cylinder concept, which is possibly more powerful but heavier and more fuel consuming at the same time. Both concepts have proven to be competitive as well as successful in the past.

The intake system of the FSC cars is dominated by the restrictor required by the rules. It is situated behind the throttle body and has a diameter of 20 mm (gasoline-operating cars) or 19 mm (E85-operating cars): this way the different characteristics of the fuel are taken into account. The incorporation of the restrictor as well as the design of the intake manifold including the runner lengths, necessary for an optimal cylinder charge in the relevant engine speed range, are among the main tasks the students have to deal with.

The most important task of the exhaust system at competition is the reduction of the engine's noise emission to less than 110 dB – only then teams are allowed to participate in the subsequent dynamic events. Further challenges are the design of the runner lengths as well as the interaction with the entire car.

The fuel system has to supply the car with enough fuel to finish the 22 km of the endurance race on the one hand, while being as compact and light as possible on the other. The guidelines of permitted materials as well as the construction guidelines ensure

Nicht vergessen werden sollte auch das Design Event, in dem das Team seine Entwicklungen vorstellt und erläutert. Auch hier werden wichtige Punkte vergeben, so dass eine gewissenhafte Dokumentation und verständliche Präsentation der Entwicklung gefragt sind.

Den oben beschriebenen Anforderungen hinsichtlich des Antriebsstrangs wird in der Entwicklung auf technischer Seite in den verschiedenen Bereichen Rechnung getragen. Im folgenden Teil werden die für die FSC typischen Modifikationen vorgestellt sowie die Schwerpunkte bei der Auslegung der einzelnen Teilpakete des Antriebsstranges beschrieben.

Zunächst stellt sich für die Teams die Frage nach einem geeigneten Basisaggregat. Als guten Kompromiss aus Leistungsfähigkeit, Bauraum und Gewicht sowie Kosten und Verfügbarkeit haben sich Motorradmotoren herausgestellt. Dabei muss zunächst die Frage geklärt werden, ob auf ein leichteres und kompakteres Einzylinderkonzept gesetzt wird oder ob ein tendenziell leistungsstärkeres aber auch schwereres Vierzylinderkonzept verfolgt wird. Beide Konzepte haben sich in der Vergangenheit als konkurrenz- und siegfähig herausgestellt.

Der Ansaugtrakt bei FSC Fahrzeugen wird geprägt vom reglementseitig vorgeschriebenen Luftmassenbegrenzer. Dieser sitzt hinter der Drosselklappe, der Durchmesser beträgt für benzingetriebene Fahrzeuge 20 mm, für E85 getriebene Fahrzeuge 19 mm: auf diese Weise werden die unterschiedlichen Kraftstoffeigenschaften berücksichtigt. Die Integration des Luftmengenbegrenzers sowie eine Auslegung der Ansauglängen für eine optimale Füllung im relevanten Drehzahlbereich gehören hier zu den Hauptaufgaben der Studenten. Die wichtigste Aufgabe der Abgasanlage beim Wettbewerb ist zunächst die Begrenzung der Geräuschemissionen des Motors auf unter 110 db - nur dann ist den Teams eine Teilnahme an den folgenden dynamischen Disziplinen erlaubt. Weitere Herausforderungen bei der Auslegung der Abgasanlage liegen in der Auslegung der Lauflängen sowie im Zusammenspiel mit dem Gesamtfahrzeug.

Das Kraftstoffsystem muss das Fahrzeug einerseits bis zum Ende der 22 km des Endurance sicher mit Kraftstoff versorgen können und dabei andererseits so kompakt und leicht wie möglich sein. Die Vorschrift der erlaubten Materialien sowie konstruktive Vorgaben sorgen für größtmögliche Sicherheit.

picture: Lions Racing Team, TU Braunschweig

CAD modell of an FSC vehicle using a four-cylinder motorcycle engine.
CAD Modell eines FSC Fahrzeugs mit Vierzylinder Motoradmotor.

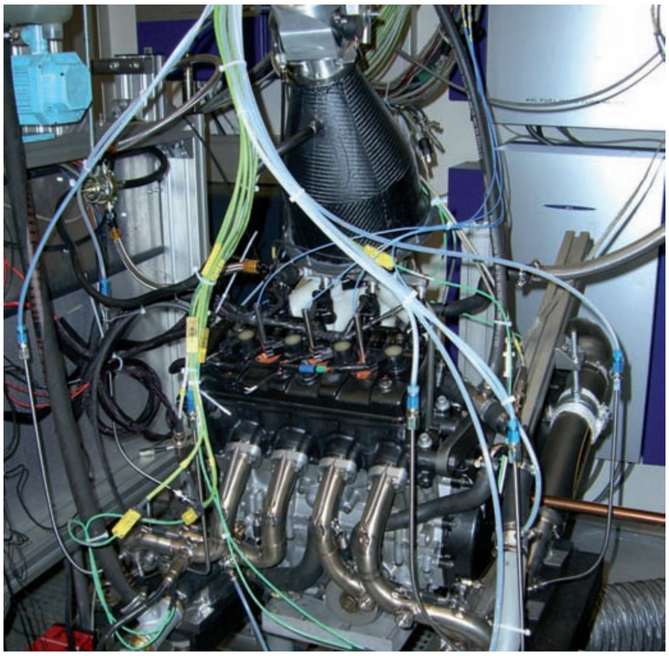
greatest safety possible.
The design of the cooling system is concerned with the solution of the same problem as the fuel system: the classic conflict between performance and reliability, in this case the demands for low weight and small frame size contrast with the safe engine operation even at high outdoor temperatures. The FSG driving profile with a high full throttle percentage at comparatively low driving speeds places great demands on the cooling system.
With regard to the engine electronics, almost all teams work with freely programmable engine control units (ECUs). The teams deal with the entire mapping of ignition angles, the quantity of injected fuel, etc. themselves. Next to the coordination of the pure engine functionalities, the teams have the freedom to develop automated gear shifting systems, traction control as well as further technical details.
An important part of the drive train development is the work on the engine dynamometer. Depending on the facilities of the teams and their sponsors, various dynamometers are in use ranging from roller type dynamometers to highly dynamic engine test benches. With the mapping of engine electronics as well as the tests of various components, students constantly face new challenges and are thus able to enrich their knowledge and expertise.
Besides the practical tasks at the dynamometer the use of simulation tools such as one-dimensional and three-dimensional flow simulations allow a better understanding of the motor processes and an optimization of the entire engine, especially in the area of charge exchange.
The power transmission offers the students additional freedom for construction and design. The gearbox, which often comes with the engine (at least in the case of motorcycle engines), is commonly used as a basis in order to drive the differential of the rear axle via a chain or belt; however, the use of self developed gearboxes or of a CVT (continuously variable transmission) can also be found.

Even in its 5th year, the concept of the FSC is still highly relevant. The versatile technical challenges due to constant developments focusing on performance and efficiency of the cars extend the competition and the academic studies in a practical way. Incorporated in an exciting competition concept, students gain valuable experience that is essential for their future working life.

Ähnlich wie beim Kraftstoffsystem gilt es auch bei der Auslegung der Kühlung den klassischen Zielkonflikt zwischen Performance und Betriebssicherheit zu lösen - den Forderungen nach niedrigem Gewicht und kleiner Baugröße steht ein sicherer Motorbetrieb auch bei hohen Außentemperaturen gegenüber. Das Fahrprofil mit einem hohen Volllastanteil bei vergleichsweise geringen Fahrgeschwindigkeiten stellt dabei hohe Anforderungen an die Kühlung.
Auf Seiten der Motorelektronik wird bei fast allen Teams mit frei programmierbaren Motorsteuerungen gearbeitet. Die gesamte Abstimmung der Einspritzmengen, Zündwinkel etc. wird dabei von den Teams selbst übernommen. Neben der Abstimmung der reinen Motorfunktionalitäten haben die Teams alle Freiheiten zur Entwicklung von automatisierten Schaltungen, Traktionsregelungen sowie weiteren technischen Details.

Ein wichtiger Anteil bei der Entwicklung des Antriebsstranges ist die Abstimmung auf dem Prüfstand. Je nach Möglichkeiten des Teams und seiner Sponsoren kommen dabei die verschiedensten Prüfstände vom Rollenprüfstand bis hin zum hochdynamischen Motorprüfstand zum Einsatz. Bei der Abstimmung der Motorelektronik sowie den Tests verschiedener Bauteile, lernen die Studierenden stets neue technische Herausforderungen kennen und können so ihr Knowhow erweitern.
Neben der praktischen Arbeit führt besonders die Verwendung von Simulationswerkzeugen, wie eindimensionalen und dreidimensionalen Strömungssimulationen, zu einem besseren Verständnis der motorischen Vorgänge und einer Optimierung des Gesamtmotors, insbesondere im Bereich des Ladungswechsels.
Auch auf Seiten der Kraftübertragung bietet sich den Studierenden ein hohes Maß an Gestaltungsfreiheit. Häufig dient das serienmäßig im Motorverbund enthaltene Getriebe als Basis, um über eine Kette oder Riehmen ein Differential der Hinterachse anzutreiben, aber auch die komplette Eigenentwicklung von Schaltgetrieben oder stufenlosen Getrieben ist möglich.

Auch im 5. Jahr hat das Konzept der FSC damit nichts an Aktualität verloren. Die vielseitigen technischen Herausforderungen, bei der stetigen Weiterentwicklung mit den Schwerpunkten Leistungsfähigkeit und Effizienz, erweitern den Wettbewerb und das Studium um eine praktische Komponente und bereiten, verpackt in ein spannendes Wettbewerbskonzept, auf spätere berufliche Aufgaben vor.



Engine test bench with a four-cylinder motorcycle engine.
Motorprüfstand bestückt mit einem Vierzylinder Motorradmotor.

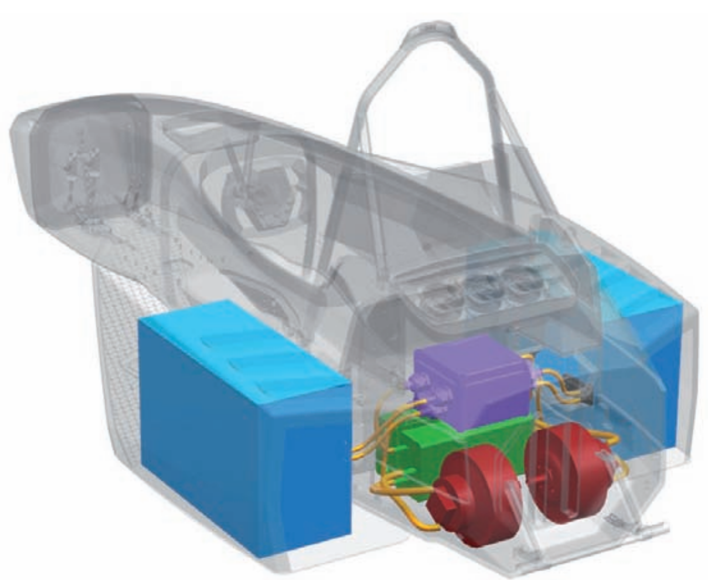
picture: TU Graz Racing Team, Technische Universität Graz

FSE - FROM BATTERY TO ASPHALT
FSE - AUS DER BATTERIE AUF DEN ASPHALT

Automotive industry is working feverishly on the development of hybrid and electric vehicles. Reasons are the increasing ecological necessity for zero-emission or low-emission drives and the demise of fossil fuels. There seems to be no other option than a complete change to new technologies if we want to maintain the degree of mobility for future generations, which we take for granted today.
This technological change-over can only be achieved in a successful and sustainable manner when engineers and specialists from a whole range of disciplines are prepared for the upcoming task through comprehensive and interdisciplinary education. The organisers of Formula Student Germany introduce Formula Student Electric (FSE), with precisely this goal in mind.
Students will develop a thorough understanding of all-electric drives by participating in FSE. They will be prepared for the professional challenges of the future and have the chance to gain experience with electric mobility in a creative and fun way.

The drivetrain of an FSE vehicle differs in key points from the drivetrain of a conventional Formula Student Combustion (FSC) vehicle. The FSE rules only allow the use of electric motors, which may only be powered by means of batteries. The central idea behind the FSE rules is to restrict a team's freedom as little as possible whilst ensuring the electrical safety of its vehicle at all times. The main differences when comparing FSE to FSC vehicles can be seen in the picture to the right. Batteries (blue) to store the energy in instead of fuel, power control by one or more motor controllers (green) instead of a throttle valve and supply of mechanical drive power by one or more electric motors (red) instead of an internal combustion engine.

In an FSE vehicle the energy needed for propulsion is stored chemically in the traction battery, which thereby substitutes the fuel tanks and the fuel in a vehicle with a conventional internal combustion engine. An important battery characteristic for batteries to be used in mobile applications is the energy density, i.e. a measure that describes how much



Gegenwärtig entwickeln Automobilhersteller mit Hochdruck Hybrid- und Elektroautos. Grund dafür sind die immer dringlicher werdenden ökologischen Notwendigkeiten für emissionsfreie beziehungsweise -reduzierte Antriebe und das absehbare Ende fossiler Rohstoffe. Es scheint, dass nichts an einem umfassenden Technologiewechsel vorbeiführt, wenn wir den Grad an Mobilität, wie wir ihn heute für selbstverständlich erachten, auch für zukünftige Generationen garantieren wollen.
Dieser Technologiewechsel kann nur dann erfolgreich und nachhaltig erreicht werden, wenn Ingenieure sowie Spezialisten anderer Fachrichtungen mit einer modernen, umfassenden und interdisziplinären Ausbildung auf diese Aufgabe vorbereitet werden. Dieses Ziel verfolgen die Organisatoren der FSG mit der Einführung der Formula Student Electric (FSE). Durch die Teilnahme an der FSE erwerben die Studierenden umfassendes Knowhow über rein elektrische Antriebe. Auf diese Weise werden sie auf die beruflichen Herausforderungen der Zukunft vorbereitet und können sich kreativ und mit viel Spaß in das Thema Elektromobilität einarbeiten.

Der Antriebsstrang der FSE Fahrzeuge unterscheidet sich in einigen wesentlichen Punkten vom Antriebsstrang eines konventionellen Formula Student Compustion (FSC) Fahrzeugs. Das FSE Reglement erlaubt ausschließlich den Antrieb mittels elektrischer Motoren, die ihre Energie zum Antrieb des Fahrzeuges aus Batterien beziehen müssen. Darüber hinaus werden die technischen Freiheiten der Teams möglichst wenig eingeschränkt. Weitere Regeln dienen in erster Linie der Gewährleistung der Sicherheit der Fahrzeuge und ihrer Fahrer. Die Bauteile, die die Unterschiede zum FSC Fahrzeug ausmachen, sind im nebenstehenden Bild zu sehen. Batterien (blau) zur Energiespeicherung, einen oder mehrere Motorcontroller (grün) für die Leistungsregelung und einen oder mehrere elektrische Motoren (rot) zur Bereitstellung der mechanischen Antriebsleistung.

Die Traktionsbatterie speichert in einem FSE Fahrzeug die zum Antrieb benötigte Energie in chemischer Form und nimmt damit die Aufgabe des Kraftstofftanks bzw. des Kraftstoffs bei FSC Fahrzeugen wahr. Eine wichtige Kenngröße der verwendeten Batterietypen ist die Energiedichte, die bezeichnet wie viel Energie pro Gewicht bzw. Bauraum gespeichert werden kann. Der aktuelle Stand der Technik sind Batterien auf Lithium-Basis, die eine spezifische Energiedichte von etwa 100Wh/kg erreichen.
Die Energiemenge, die für eine Endurance benötigt wird, beträgt etwa 7 bis 8kWh. Lithium-Batterien die diese Energiemenge speichern können, wiegen etwa 70kg und nehmen einen Bauraum von ca. 125 Litern ein. Das Gewicht der Batterien ist damit im Vergleich zu den gefüllten Kraftstofftanks der FSC Fahrzeuge etwa zehnmal höher. Zusätzlich sind möglicherweise noch aufwendige Kühlungssysteme erforderlich, um die hitzeempfindlichen Batterien innerhalb eines optimalen Temperaturfensters zu betreiben.
Allerdings ergeben sich deutliche Vorteile durch die Möglichkeit die Batterien frei und verteilt im Fahrzeug positionieren zu können. Dadurch kann unter anderem ein niedrigerer

picture: AMZ Racing, ETH Zürich

energy per mass and installation volume can be stored. The current state of the art lithium-based batteries achieve a specific energy density of 100Wh/kg.
The amount of energy needed for the Endurance discipline is about 6-8kWh. Lithium-ion batteries that can store the needed amount of energy weigh about 70kg and require an installation volume of about 125 litres – the typical fuel tank volume of an FSC vehicle is about 5 litres. Battery weight is therefore about ten times higher than that of a full fuel tank containing the same amount of energy on an FSC vehicle. Additionally, it might be necessary to use extensive cooling systems in order to be able to operate the heat-sensitive batteries within an optimal temperature range.
There are clear advantages, however, as the batteries can be positioned freely and independently within the vehicle. This can result in a lower centre of gravity compared to an FSC vehicle which in turn allows higher cornering speeds.
Another distinctive characteristic of traction batteries is their nominal voltage. The voltage requirement on the used battery is predetermined by the construction of the used electric motor; at this year's FSE event voltages up to 600V are allowed.
Since in the FSE competition there are only about six hours between the Autocross and the Endurance, two of the main dynamic disciplines of any Formula Student competition, a short charging time is another important characteristic to consider in the choice for a battery type. Optionally, the FSE rules allow the use of replaceable batteries (see picture) where longer charging times can be compensated for by exchanging the battery pack and charging the second battery pack outside of the vehicle.
Safety has always been and will continue to be an important part of Formula Student Germany. With the introduction of the electric class there are new aspects to be considered. Some battery types can catch fire in the event of failure, as a result strict requirements, similar to those for the fuel systems of FSC vehicles, are necessary. For this reason, the driver has to be protected from the batteries by fire-resistant materials. Additionally, an electronic battery monitoring system is required by the rules. The battery is connected directly to the motor controller(s), which regulate and monitor the motor performance.

The motor controller regulates the drive power based on complex algorithms. Usually, the motor controller combines power electronics with an electric control unit. The power electronics control – like a valve – the power output of the electric motors. Challenges arise with the power electronics when electric motors are used which require an AC operating voltage. In this case the power electronics have to convert the DC voltage of the batteries into an AC voltage.
The integrated electronic control unit computes the amount of energy going to the motors based on driver input combined with various parameters. The basis of these parameters for the motor controllers is determined on a specific motor test bench – similar to the approach for an internal combustion engine on an engine test bench.
The main parameter to determine the needed drive power is the accelerator pedal position. FSE rules prescribe this position as monitored by a minimum of two sensors, which are constantly checked on accuracy and plausibility by the electronic control unit. Other key characteristics that influence the drive power output may include wheel slip, lateral acceleration and battery condition.

An FSE vehicle with an exchangeable battery system. Parts of the rear suspension and motor wires have to be disconnected to pivot subframe including motors, differential and rear suspension downwards to be able to remove the battery pack.
Ein FSE Fahrzeug mit einem austauschbaren Batteriesystem. Zum Austausch müssen Teile des hinteren Fahrwerks sowie Motorkabel demontiert werden, um den Hilfsrahmen inklusive Motoren, Differential und Fahrwerk hinunterzuschwenken und so das Batteriesystem ausbauen zu können.

picture: UH Racing, University Of Hertfordshire

Schwerpunkt im Vergleich zu einem FSC Fahrzeug erreicht werden, dieser wiederum ermöglicht eine höhere Kurvengeschwindigkeit.
Eine weitere charakteristische Kenngröße der Traktionsbatterie ist die Nennspannung. Die Nennspannung der verwendeten Batterie wird durch die Konstruktion des eingesetzten Elektromotors vorgegeben und darf beim diesjährigen FSE Event maximal 600V betragen.
Da beim FSE Wettbewerb zwischen dem Autocross und der Endurance nur etwa sechs Stunden liegen, ist auch eine geringe Ladezeit eine wichtige Kenngröße des Batteriekonzepts. Zusätzlich erlaubt das Reglement die Verwendung von mehreren austauschbaren Batterien, so dass im Zweifelsfall durch den schnellen Austausch einer Batterie (siehe Abbildung) eine längere Ladezeit außerhalb des Fahrzeugs in Kauf genommen werden kann.
Die Sicherheit spielt in jedem Jahr eine wichtige Rolle. Durch die Einführung der Electric Klasse ergeben sich neue Aspekte, die bei unserem Sicherheitskonzept berücksichtigt werden müssen. Unter anderem können bestimmte Batterietypen im Fehlerfall in Brand geraten, daher gelten für sie ähnlich strikte Anforderungen wie für den Kraftstofftank der FSC Fahrzeuge. Aus diesem Grund wird der Fahrer u.a. durch feuerfeste Materialien vor den Batterien geschützt. Zusätzlich wird ein elektronisches Batterieüberwachungssystem durch das Reglement gefordert. Die Batterie ist direkt an den oder die Motorcontroller angeschlossen, welche die Motorleistung regeln und überwachen.

Der Motorcontroller regelt auf Basis von komplexen Algorithmen die abgegebene Motorleistung. Dazu wird in einem Motorcontroller in der Regel Leistungselektronik mit einem elektronischen Steuergerät kombiniert. Die Leistungselektronik ist in der Lage – ähnlich wie ein Ventil – die Leistung der elektrischen Motoren zu kontrollieren. Weitere Herausforderungen an die Leistungselektronik entstehen, wenn Elektromotoren verwendet werden, die mit Wechselspannung betrieben werden. In diesem Fall muss die Leistungselektronik zusätzlich aus der Gleichspannung der Batterien eine Wechselspannung für den Motor erzeugen.
Die Vorgaben für die angeforderte Motorleistung werden von dem integrierten elektronischen Steuergerät auf Basis von verschiedensten Parametern berechnet. Die Basispara-

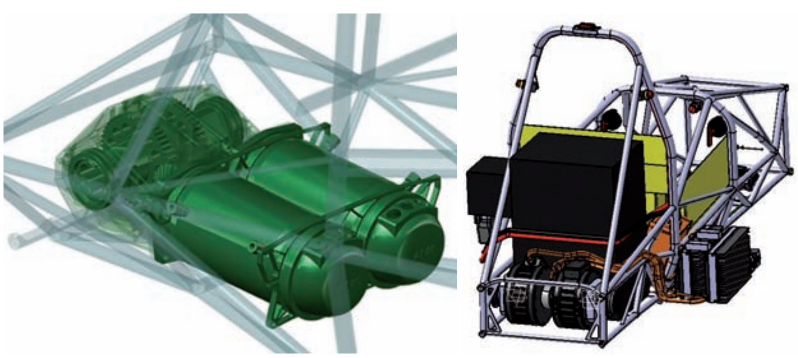
Not only does the motor controller control the power flowing to the motors; but also, the recovery of braking energy is controlled by the motor controller operating the motors as generators when braking. In case multiple motors are used, it is common practice to use multiple motor controllers linked via a data bus. If the used motor controllers are very small or in case high-power motors are used, it is often necessary to integrate a water-based cooling system for the power electronics.
Overall, the motor controller occupies more space and adds more weight to the car than the comparable engine control unit on an FSC vehicle. The motor controller is connected on one side with the traction battery, and on the other side with the electric motor.

Choice of motor type and number are central to the drive train of an FSE vehicle. At present the FSE rules allow the use of DC and AC motors. DC motors are cheaper and easier to control by a motor controller than AC motors. AC motors in contrast have a higher efficiency and a higher power density than DC motors. Motors with a higher power density, however, often need water cooling, similar to power electronics for high-power motors. Thus both engine types have their advantages.
The rated speed of the electric motor is the rotational speed at which the motor delivers its maximum power. This is central to the concept of an FSE vehicle as the rated speed of the motor determines whether or not a transmission is necessary to convert the rotational speed of the motor into a useable speed range of the driven wheels. This transmission does not come in the form of a gearbox as known from FSC vehicles, but often has only one unchangeable gear. This is possible because the torque curve of electric motors is more usable than that of an internal combustion engine. Torque is available over a much wider RPM range.
The FSE combination of motor and transmission for the same power output is usually lighter than its counterpart on an FSC vehicle. Furthermore, there is more freedom to position the different components. This freedom can be used to realize an overall lower centre of gravity.

The FSE rules do not regulate the number of motors. It is therefore possible that two or even four independent motors are used in an FSE vehicle. This freedom makes it possible to omit the mechanical differential that usually is part of the rear axle of an FSC vehicle and to have a separate transmission for each driven wheel. As a result it would be possible to transmit torque of different magnitude to each driven wheel, depending on the current driving state of the vehicle. Using an appropriate control mechanism, it would be possible to implement a fully adjustable electronic differential. Considering vehicle dynamics such a set-up has numerous advantages compared to the mechanical differential on an

meter für die Motorsteuerung werden – ähnlich wie beim Verbrennungsmotor – auf einem speziellen Motor-Prüfstand ermittelt. Bei der Nutzung im Fahrzeug ist die Haupteinflussgröße auf die abgegebene Motorleistung die Gaspedalstellung. Diese wird dabei aus Sicherheitsgründen durch mindestens zwei Sensoren ermittelt, die ständig durch das elektronische Steuergerät auf Fehlerfreiheit überprüft werden. Weitere maßgebliche Einflussgrößen auf die Motorleistungssteuerung können u.a. der Radschlupf, die Querbeschleunigung und der Batteriezustand sein.
Der Motorcontroller steuert allerdings nicht nur den Leistungsfluss zu den Motoren, sondern auch die Rückgewinnung von Bremsenergie, wenn die Motoren als Generatoren betrieben werden. Bei Einsatz mehrerer Motoren ist es durchaus üblich mehrere per Datenbus gekoppelte Motorcontroller zu verwenden. Wenn die verwendeten Motorcontroller sehr geringe Abmessungen haben oder Motoren mit sehr hoher Leistung verwendet werden, ist oftmals eine Wasserkühlung der Leistungselektronik notwendig.
Insgesamt nimmt der Motorcontroller mehr Raum und Gewicht in Anspruch als das vergleichbare Motorsteuergerät der FSC Fahrzeuge. Der Motorcontroller ist auf der einen Seite mit der Traktionsbatterie verbunden, und auf der anderen Seite mit dem zu steuernden Elektromotor.

Das verwendete Elektromotorenkonzept stellt den Kern des Antriebssystems der FSE Fahrzeuge dar. Unterscheiden lassen sich die Motoren prinzipiell nach Gleichstrom- und Wechselstrommotoren. Motoren, die mit Gleichstrom betrieben werden, sind günstiger und einfacher durch den Motorcontroller zu steuern als Wechselstrommotoren. Diese haben dafür in der Regel einen besseren Wirkungsgrad und eine höhere Leistungsdichte als Gleichstrommotoren. Motoren mit einer hohen Leistungsdichte sind jedoch häufig, wie auch die Leistungselektronik, auf Wasserkühlung angewiesen.
Die Nenndrehzahl des Elektromotors ist die Drehzahl, bei der der Motor seine höchste Leistung abgibt. Diese ist ebenfalls wichtig für das Antriebskonzept, da abhängig von der Nenndrehzahl des Motors gegebenenfalls ein Getriebe notwendig ist, um die Drehzahl in einen nutzbaren Bereich abzusenken. Dieses Getriebe ist dann allerdings kein Schaltgetriebe, wie es von FSC Fahrzeugen bekannt ist, sondern hat häufig nur einen einzelnen, nicht veränderbaren Gang. Dies ist möglich, da der Drehmomentverlauf der Elektromotoren deutlich besser nutzbar ist als der eines Verbrennungsmotors.
Die Kombination aus Motoren und Getriebe ist bei gleicher Leistung häufig leichter als bei den FSC Fahrzeugen. Außerdem ist die Positionierung weniger eingeschränkt und die Bauhöhe flacher. Dadurch lässt sich auch hier ein günstigerer Fahrzeugschwerpunkt erreichen.
Das Reglement stellt es den Teams frei, wie viele Motoren eingesetzt werden. Daher ist es durchaus denkbar, dass zwei oder sogar vier unabhängige Motoren in einem FSE Fahrzeug zum Einsatz kommen. Bedingt durch diese Freiheit ist es beispielsweise möglich an der Hinterachse auf ein, bei den FSC Fahrzeugen übliches, mechanisches Differential zu verzichten und jedes Hinterrad durch eine eigene Motor-Getriebe-Kombination anzutreiben. Dies eröffnet die Möglichkeit in Abhängigkeit vom aktuellen Fahrzustand unterschiedlich große Leistungen bzw. Drehmomente auf die unterschiedlichen Antriebsräder zu übertragen. Durch eine



Two different FSE motor concepts: longitudinal assembly with transmission (top) and xxx motors without any transmission (bottom).
Zwei verschiedene FSE Motorenkonzepte: Längseinbau mit einem Getriebe (oben) und Quereinbau ohne Getriebe (unten)

pictures: GreenTeam Uni Stuttgart, Universität Stuttgart; mosTEC.racing, DHBW Mosbach

FSC vehicle, especially in corners. Even electronic stability systems, similar to the famous ESP of production vehicles would be possible.

The electrical connection between battery, motor controller and motor is established by the wiring harness. The used cables must be able to withstand the allowed maximum voltage of up to 600V and resist the high currents of temporarily up to 1000A as efficiently as possible. Both copper wires and aluminum wires can be used.

To protect the participants from the possibly high operating voltage of FSE vehicles, the rules demand the use of an insulation-monitoring device. Such a device constantly monitors the insulation of the entire high-voltage system and immediately safely cuts off the high-voltage system if an insulation fault is detected. These measures ensure high safety standards against electrical accidents. In addition to the described components a device for measuring the used energy is installed between battery and motor controller during the FSE Scrutineering. The function of this device is described on the next page of this magazine.

Because of all the mentioned differences, an FSE vehicle will have an additional weight of about 30 to 50kg on average when compared to an FSC vehicle. This disadvantage, however, can surely be compensated by a lower centre of gravity and intelligent use of control technology, and may even be transformed into a vehicle dynamic advantage.

entsprechende Regelung ist es möglich ein verstellbares elektronisches Differential zu realisieren. Dies hat im Gegenteil zu den mechanischen Differentialen der FSC Fahrzeuge deutliche fahrdynamische Vorteile, insbesondere bei der Kurvenfahrt. Denkbarer wären sogar elektronische Fahrstabilitätshilfen, ähnlich dem bekannten ESP von Serienfahrzeugen.

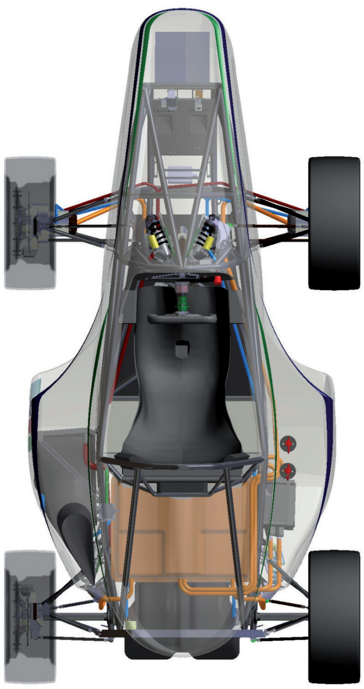
Eine weitere Besonderheit der Elektromotoren besteht in der Möglichkeit sie in Überlast zu betreiben. Dies bedeutet, dass bestimmte Elektromotoren kurzzeitig, etwa 10% der Betriebszeit, bis zum Doppelten ihrer Nennleistung abgeben können. Dies kann bei der Acceleration oder auf den Geraden der Autocross- oder Endurance Strecke zu einem deutlich verbesserten Beschleunigungsverhalten im Vergleich zu den FSC Fahrzeuge führen.

Die elektrische Verbindung zwischen Batterie, Motorcontroller und Motor wird durch den Leitungsstrang hergestellt. Die verwendeten Leitungen müssen unter anderem der maximal verwendeten Spannung von bis zu 600V standhalten können und außerdem die hohen Ströme von kurzzeitig bis zu 1000A möglichst effizient leiten. Zum Einsatz kommen sowohl Kupfer- als auch Aluminiumleitungen.

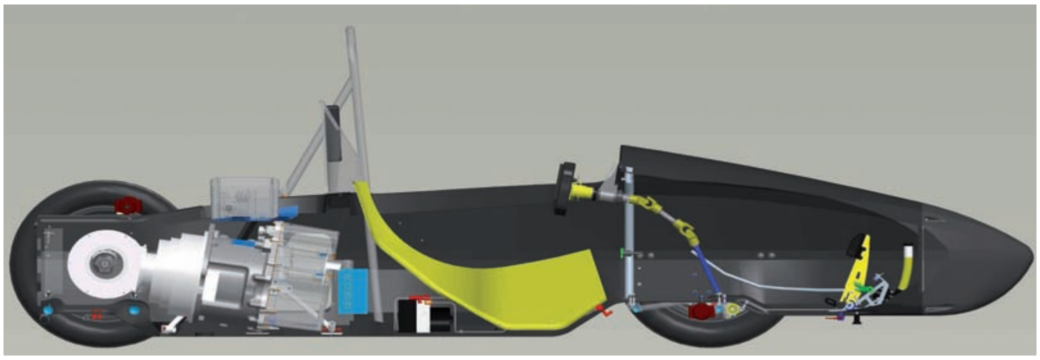
Um die Teilnehmer vor der hohen Betriebsspannung der FSE Fahrzeuge zu schützen, schreibt das Reglement zwingend den Einsatz eines Systems zur Isolationsüberwachung vor. Dieses System überwacht ständig die ausreichende Isolation des gesamten Hochspannungssystems und schaltet bei Isolationsfehlern sofort das gesamte Hochspannungssystem sicher ab. Dadurch ist eine sehr hohe Sicherheit vor Elektrounfällen gewährleistet.

Zusätzlich zu den hier beschriebenen Komponenten wird den FSE Fahrzeugen beim elektrischen Scrutineering ein Gerät zur Energiemessung zwischen Batterie und Motorcontroller eingesetzt. Die Funktion dieses Gerätes wird in diesem Heft auf der nächsten Seite gesondert beschrieben.

Auf Grund der dargestellten Unterschiede werden die FSE Fahrzeuge ein im Schnitt etwa 30 bis 50kg höheres Gesamtgewicht im Vergleich zu den FSC Fahrzeugen aufweisen. Dieser Nachteil kann allerdings durch die Absenkung des Fahrzeugschwerpunktes und den intelligenten Einsatz von Regelungstechnik mindestens kompensiert, vermutlich sogar in einen fahrdynamischen Vorteil verwandelt werden.



An FSE vehicle with four motors, two at the rear axle (the torque is transmitted via drive shafts) and two wheel hub motors at the front axle.
Ein FSE Fahrzeug mit vier Elektromotoren, zwei an der Hinterachse die das Drehmoment über die Antriebswellen an die Reifen geben und zwei Radnabenmotoren an der Vorderachse.

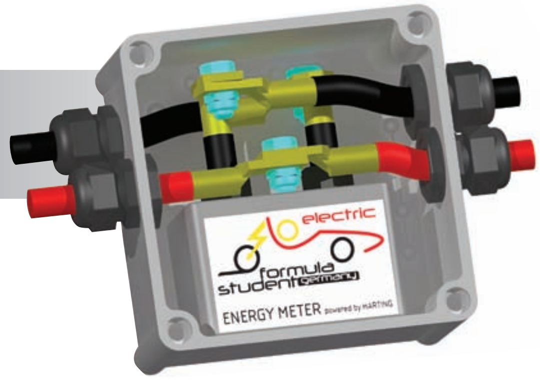


Longitudinal section of an FSE vehicle, showing the different components of the electric drive train.
Ein Längsschnitt durch ein FSE Fahrzeug mit den Komponenten des elektrischen Antriebsstranges.

One of the wheel hub motors at the front axle.
Einer der Radnabenmotoren an der Vorderachse.

pictures: WHZ Racing Team Electric, Westsächsiche Hochschule Zwickau; KA-Raceing, Karlsruhe Institute of Technology

FSE ENERGY METER
FSE VERBRAUCHSMESSUNG



The previously used calculation for fuel consumption rating was changed for the Formula Student Combustion (FSC) vehicles in 2009. From then on, the focus was placed on fuel efficiency rather than fuel economy, offering a new and important challenge to the students. This meant for the scoring that for the first time fuel use was put into relation with the average lap time. Since this emphasis on fuel consumption reflects one of the current trends in automotive industry it is considered particularly important. In addition, this newly posed challenge forces students to take a detailed look at this difficult subject and to find individual solutions for their vehicle concept.

The general definition of efficiency is the ratio between the achieved result and the employed means. To increase efficiency has become one of the dominant problems in any engineering discipline, in order to use finite resources as well as possible. As this problem is therefore always present, important and challenging, at Formula Student Germany a total of 10% of all available points is awarded to the efficiency since the year 2009.
Formula Student Electric (FSE) addresses the issue of energy efficiency as well, because energy consumption is one of the focal points in the ongoing development of electric vehicles, too. The evaluation of energy efficiency for the electric vehicles puts the consumed electrical energy into relation to the achieved average lap time in the Endurance. In contrast to FSC vehicles the measurement of the consumed energy in FSE vehicles is more complex. For technical reasons, it is not possible to simply recharge the battery after the Endurance discipline to determine the consumed energy, as it is common practice to refill the fuel tank of FSC vehicles. Therefore a mobile and rugged device for measuring the consumption of electrical energy was developed specifically for FSE, the FSE Energy Meter.
The Energy Meter will be installed between traction battery and motor controller during the electrical safety inspection of the FSE vehicles. To ensure a smooth installation, the mounting dimensions required for the installation of the Energy Meter were made available to the teams in the form of CAD data at an early stage of the development of their cars.
The Energy Meter constantly measures both current and voltage, in a similar way to the electric meters in homes, and stores these values.
From the stored values the electrical power is calculated by multiplying voltage and current. The summation of electrical power over time gives the electrical energy consumption over the course of the Endurance discipline. The physical unit of electrical energy is the kilowatt hour (kWh). The energy consumption of an FSE vehicle during the 22km of the Endurance discipline is expected to be between 6 and 8kWh. With this amount of energy you could also operate a standard refrigerator for about 10 days.

Bereits im Jahr 2009 wurde die bis dahin übliche Kraftstoffverbrauchswertung bei FSC Fahrzeugen umgestellt. Von nun an wurde der Fokus bei der Bewertung auf Effizienz gelegt. Im Wettbewerb bedeutete dies, dass während der Endurance die verbrauchte Kraftstoffmenge zum ersten Mal ins Verhältnis zur Rundenzeit gesetzt wurde. Dies war eine neue und wichtige Herausforderung an die Studenten. Wichtig vor allem, da sie eine der aktuellen Tendenzen der Automobilentwicklung widerspiegelt; herausfordernd, weil die Studenten sich mit diesem schwierigen Thema bis ins Detail auseinandersetzen mussten, um individuelle Lösungen zu finden.

Die allgemeine Definition von Effizienz beschreibt das Verhältnis zwischen dem erzielten Ergebnis und den eingesetzten Mitteln. Die Effizienzsteigerung ist daher in jeder ingenieurswissenschaftlichen Disziplin mittlerweile das vorherrschende Problem, um die begrenzten Ressourcen bestmöglich nutzen zu können. Weil dieses Problem und Thema so präsent, wichtig und herausfordernd ist, gibt es seit dem Jahr 2009 in der Formula Student Germany 10% der Gesamtpunktzahl für die Effizienzbewertung.
Die FSE greift das Thema der Energieeffizienz ebenfalls auf, denn auch bei elektrischen Fahrzeugen steht der Verbrauch von Energie im Fokus der Wissenschaften. Die Bewertung der elektrischen Fahrzeuge setzt die verbrauchte elektrische Energie im Verhältnis zur erzielten mittleren Rundenzeit in der Endurance. Im Gegensatz zu FSC Fahrzeugen ist die Messung des Energieverbrauchs bei FSE Fahrzeugen allerdings ungleich komplexer, da es aus technischen Gründen nicht möglich ist einfach die verbrauchte Energie durch Wiederaufladen des Akkumulators nach der Endurance-Disziplin zu bestimmen, analog zum Wiederauffüllen des Kraftstofftankes bei FSC Fahrzeugen. Deshalb wurde speziell für die FSE ein mobiles und robustes Gerät zur Messung des elektrischen Energieverbrauchs entwickelt, das FSE Energy Meter.
Das Energy Meter wird während der elektrischen Abnahme der FSE Fahrzeuge zwischen der Traktionsbatterie und dem Motor Controller eingebaut. Um einen problemlosen Einbau zu gewährleisten, wurden die benötigten Anschlussmaße des Energy Meters den teilnehmenden Teams bereits frühzeitig in Form von CAD Daten zur Verfügung gestellt. Das Energy Meter misst an seiner Einbauposition kontinuierlich sowohl den Strom als auch die Spannung, ähnlich den Stromzählern in Haushalten, und speichert diese Messwerte.
Aus den gespeicherten Messwerten wird durch Multiplikation von Strom und Spannung die elektrische Leistung berechnet. Durch Summierung der elektrischen Leistung über die Zeit ergibt sich dann der elektrische Energieverbrauch während der Endurance-Disziplin. Die physikalische Einheit der elektrischen Energie ist die Kilowattstunde (kWh). Der erwartete Energieverbrauch eines FSE Fahrzeugs während der 22km der Endurance-Disziplin beträgt etwa 6 bis 8kWh. Mit dieser Energiemenge kann man einen handelsüblichen Kühlschrank etwa 10 Tage lang betreiben.

NEW AT SCRUTINEERING
NEUIGKEITEN BEIM SCRUTINEERING

This year, the FSG is breaking new ground. For the first time Formula Student racing cars with purely electric power trains will compete at Hockenheim alongside with their combustion-powered challengers.
Due to this innovation the FSG organization committee has to deal with the safety concept of the event once again considering the new focus. Of course on track the same safety conditions apply to the Formula Student Electric (FSE) race cars as to the Formula Student Combustion (FSC) cars. However, a few new aspects have evolved with regard to the safety in the FSE that have to be met with the necessary precautions.

Which basic safety standards are there to ensure the safety of all Formula Student racecars?

Safety experts: Before the FS racecars may actually be tested on the asphalt of the track in Hockenheim, they have to face a range of safety inspections. During brake and noise test, on the tilt table and during scrutineering, it will be checked whether the car actually meets the strict safety regulations of the FSG in order to be approved to race.
For every test the car passes successfully, the teams receive a sticker and only when they have collected all of them the car is permitted to participate in the dynamic disciplines. The scrutineering is obligatory for all cars; however, FSE cars will already have passed a specific scrutineering beforehand.
Often the scrutineering is the greatest hurdle for the teams during the entire competition. At a major event such as the FSG, that attracts many spectators to the event site as well as next to the race track on the weekend, it is of vital importance that the cars are being examined for their design and functionality in order to avoid any kind of possible risk.
The number of students allowed in the dynamic area is also limited to make sure that the work of officials and teams is not distracted. Thus, a maximum of four members per team are allowed to be present during scrutineering.

In diesem Jahr beschreitet die FSG einen neuen Weg: neben den bisher startenden Fahrzeugen mit Verbrennungsmotoren werden erstmals Formula Student Rennfahrzeuge mit reinem Elektromotorenantrieb an den Start gehen.
Aufgrund dieser neuen Herausforderung muss sich das Organisationsteam der Formula Student Germany (FSG) auch mit dem Sicherheitskonzept des Events neu auseinander setzen. Natürlich gelten für die Formula Student Electric (FSE) Fahrzeuge die gleichen Sicherheitsbedingungen im Rennbetrieb wie für die Formula Student Combustion (FSC) Fahrzeuge. Jedoch gibt es in der FSE Klasse einige neue Sicherheitsaspekte, denen mit gezielten Vorkehrungen begegnet werden muss.

Welche grundlegenden Standards im Sicherheitskonzept sollen die Sicherheit aller Formula Student Rennfahrzeuge gewährleisten?

Sicherheitsexperten: Bevor die Formula Student Rennfahrzeuge überhaupt den Asphalt der Rennstrecke am Hockenheimring austesten dürfen, müssen sie sich zunächst den verschiedenen Sicherheitsinspektionen stellen. Dabei wird mit Hilfe eines Bremstests, eines Lärmtest, dem Kipptisch und der technischen Abnahme überprüft, ob das Fahrzeug den strengen Sicherheitsbestimmungen der FSG entspricht und für den Rennbetrieb zugelassen wird. Für jeden bestandenen Test erhalten die Teams dann einen Aufkleber und nur bei Vorhandensein aller Aufkleber ist das Fahrzeug zugelassen für die dynamischen Disziplinen. Diese technische Abnahme ist Pflicht für beide Fahrzeugtypen, jedoch durchlaufen die FSE Rennfahrzeuge im Vorfeld bereits eine spezielle FSE Abnahme.
Oftmals stellt die technische Inspektion für die Teams die größte Hürde im Wettbewerb dar. Auf einer Großveranstaltung wie der FSG, bei der sich am Wochenende viele Zuschauer auf dem Gelände und in der Nähe der Rennstrecke befinden, ist es zwingend notwendig, die Fahrzeuge auf ihre Konstruktions- und Funktionsweise genauestens zu untersuchen, um mögliche Gefahrenquellen zu beseitigen.

Which additional tests do the FSE cars have to pass?

Safety experts: Previous to the general scrutineering, the FSE cars undergo a specific FSE scrutineering. During the examination, the proper operation of electric components as prescribed by the official FSE rules is in focus.
The extra scrutineering starts off with examining battery mounts, laying of power lines as well as setup and function of the main switch. Furthermore, spare batteries and chargers used are inspected just as utilized tools with mandatory insulated handles. Additionally, the condition of working gloves and safety glasses are checked. During scrutineering, the judges particularly check up on accurate function of procedures as instructed by the rules, such as the insulation monitoring system.
Another innovation is the rain test substituting the noise test of the FSC. This test checks the reliability of the car in the case of rain. Even though these additional checks might suggest it, no higher danger potential is to be expected from the FSE cars than from the FSC ones.

What are the subsequent tests the FSE cars have to undergo?

Safety experts: The next step is the scrutineering. We expect the FSE cars to be heavier due to the battery. What will especially be inspected is therefore the main structure of the frames or monocoques, the steering, the wheel suspension, the brake system, the belt system and necessary protective covers in the power train.

After that the cars will be inspected at the tilt table. They are tilted to an angle of 45° to the side in order to assure leak tightness of all systems containing liquids. Then, the cars are tilted to 60° to inspect the tilting stability. During the entire test the four wheels have to keep constant contact to the ground.

What else is new?

Safety experts: New regulations also concern the clothing of the driver. For the first time, fireproof underwear is strongly recommended. Drivers are even prohibited to wear underwear or socks made of synthetic fabric. Additionally, the norms for racing overalls have been revised: so called „single-layered racing overalls" are no longer allowed at this year's

Um die Arbeit der Organisatoren und der technischen Mitarbeiter nicht zu stören, wird durch einen limitierten Zugang zum Dynamikbereich die Anzahl der anwesenden Studenten insgesamt begrenzt. So dürfen bei der technischen Abnahme maximal 4 Mitglieder pro Team im Scrutineering-Bereich dabei sein.

Welche zusätzlichen Prüfungen durchlaufen die FSE Fahrzeuge?

Sicherheitsexperten: Die Fahrzeuge durchlaufen vor der allgemeinen technischen Abnahme noch eine technische FSE Abnahme, bei der im Wesentlichen die Sicherheit der elektrischen Komponenten überprüft wird. Das beginnt mit der Begutachtung der Befestigung der Akkumulatoren, der Verlegung der Hochspannungsleitungen, der Installation und Funktion der Hauptschalter. Ebenfalls überprüft werden die Ersatzakkus und die verwendeten Ladegeräte sowie das von Teams verwendete Werkzeug, das isolierte Griffe haben muss. Es wird die Beschaffenheit der Arbeitshandschuhe sowie der Schutzbrillen überprüft.

Bei der Abnahme wird insbesondere auch die fehlerfreie Funktion der im Reglement vorgeschriebenen Maßnahmen überprüft, dazu gehört u.a. die Überprüfung der Isolationsüberwachung. Eine weitere Besonderheit stellt der Regentest dar, der statt des Lärmtests erfolgt und die einwandfreie Funktionssicherheit des Fahrzeugs bei Regen überprüft. Obwohl die zusätzlichen technischen Abnahmen dies vermuten lassen, geht von den FSE Fahrzeugen grundsätzlich keine höhere Gefahr aus als von den FSC Fahrzeugen.

Was wird nach dem FSE Scrutineering bei den Fahrzeugen noch überprüft?

Sicherheitsexperten: Die nächste Station ist dann die technische Abnahme. Wir rechnen bei den FSE Fahrzeugen durch die Batteriepacks mit erhöhten Fahrzeuggewichten. Darum werden hier speziell die Hauptstruktur des Rahmens oder Monocoques, die Lenkung, die Radaufhängung und die Bremsanlage sowie das Gurtsystem und notwendige Schutzabdeckungen im Antriebsstrang kontrolliert.
Anschließend müssen die Fahrzeuge zum Kipptisch mit dem das Fahrzeug zunächst seitlich bis 45° angekippt wird, um die Dichtheit der flüssigkeitsführenden Systeme zu überprüfen. Alle Fahrzeuge werden anschließend zur Überprüfung

event. Instead, the drivers have to wear double-layered racing overalls to ensure the highest fire protection possible. Of course, the Driver Egress Test plays an important role again. It is tested whether the driver can exit the cockpit and therefore leave the car within maximally 5 seconds.

What does the safety concept look like for the dynamic events in particular?

Safety experts: The dynamic events propose particular challenges to safety during the FSG competition. It is here that the cars actually go out on the track to prove their capabilities in disciplines such as acceleration, skid pad and endurance. Therefore, right from the beginning of all dynamic events, all track marshals are briefed with regard to the special safety conditions that apply. This includes, for example, how they should proceed in case of an accident or fire and what specific guidelines they have to follow in order to rescue a car. Also, we draw their particular attention to the fact that FSE cars move almost entirely without sound so that special concentration is necessary when they are on track. Due to the first participation of FSE cars at this year's FSG event, another novelty is the prohibition of foam fire extinguishers on the entire event site since the foam can be electro conductive.

der Kippstabilität auf 60° angekippt. Dabei müssen alle Räder mit der Bodenfläche in Kontakt bleiben.

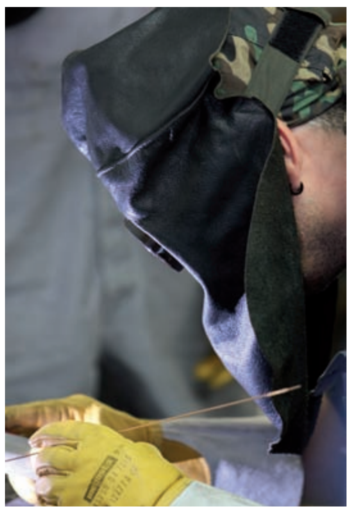
Was gibt es sonst noch Neues?

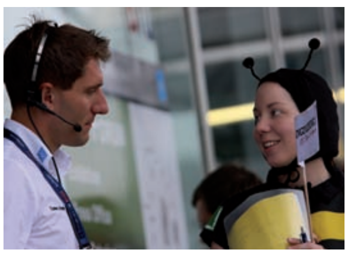
Sicherheitsexperten: Neuigkeiten gibt es unter Anderem in den Kleidungsvorschriften für die Fahrer. Erstmalig ist in diesem Jahr der Einsatz feuerfester Unterwäsche dringend empfohlen. Synthetische Materialien sind bei Unterwäsche und Socken für Fahrer sogar verboten.
Außerdem wurden die Normen der zulässigen Rennanzüge überarbeitet, die Benutzung sogenannter „einlagiger Rennanzüge“ ist daher ab diesem Jahr nicht mehr erlaubt. Stattdessen müssen die Fahrer mit zweilagigen Rennanzügen gekleidet sein, um für einen größtmöglichen Feuerschutz beim Fahren zu sorgen. Natürlich gilt auch weiterhin der 5-Sekunden-Ausstiegs-Test, bei dem getestet wird, ob der Fahrer innerhalb von maximal 5 Sekunden aus dem Cockpit aussteigen und das Fahrzeug verlassen kann.

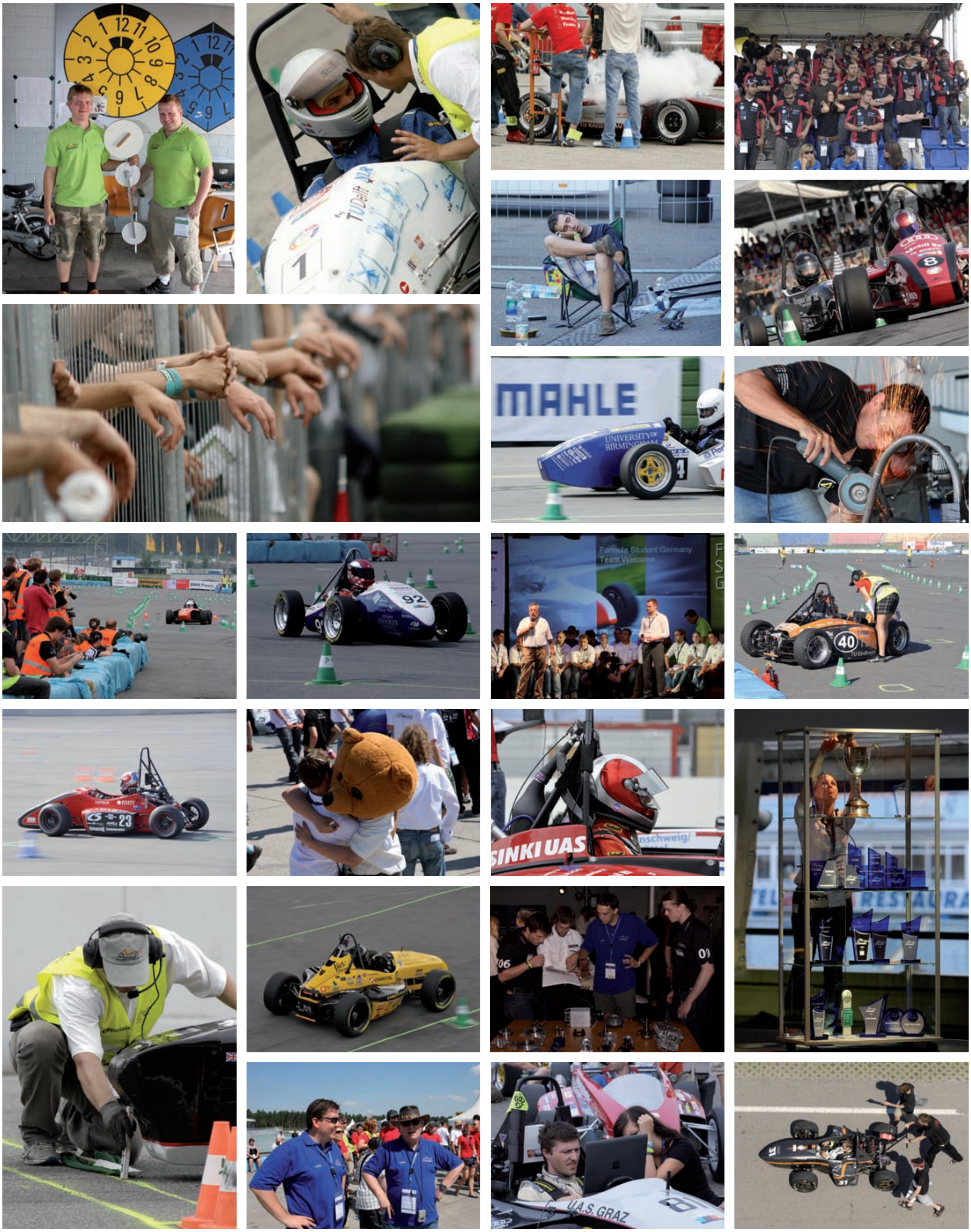
Wie sieht das Sicherheitskonzept speziell für die dynamischen Events aus?

Sicherheitsexperten: Die dynamischen Events stellen auf dem FSG-Wettbewerb eine große Sicherheitsherausforderung dar. Zu diesem Zeitpunkt nehmen die Fahrzeuge ihren Rennbetrieb auf und beweisen ihre fahrdynamischen Fähigkeiten bei Disziplinen wie Beschleunigung, Skid-Pad und Endurance.
Alle Streckenposten werden daher vor Beginn der dynamischen Events hinsichtlich der besonderen Sicherheitsvorkehrungen unterwiesen. Dazu gehört, wie sie sich im Falle eines Unfalls oder Brandes zu Verhalten haben und welche besonderen Maßnahmen ergriffen werden müssen, um die verschiedenen Fahrzeuge zu bergen. Außerdem werden die Streckenposten darauf hingewiesen, dass die FSE Fahrzeuge sich nahezu geräuschlos bewegen und daher erhöhte Aufmerksamkeit beim Bewegen auf der Strecke notwendig ist. Wegen der erstmaligen Teilnahme von FSE Fahrzeugen bei einem FSG Event ist in diesem Jahr als Neuheit die Benutzung von Schaum-Feuerlöschern auf dem gesamten Eventgelände verboten, da der Schaum elektrisch leitend sein kann.

FSG 2009 - IMPRESSIONS
FSG 2009 - IMPRESSIONEN



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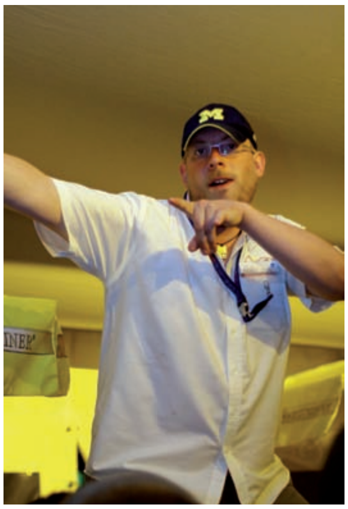


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More pictures on
www.formulastudent.de/events/event-2009/gallery/

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Editorial and Typesetting
Johanna Scheider
scheider@formulastudent.de
Ann-Christin Bartoelke
bartoelke@formulastudent.de

Translation
Johanna Scheider
Ann-Christin Bartoelke
Julien van Campen
Gloria Pagouras
Constanza Pagouras

Proofreading
Johanna Scheider
Ann-Christin Bartoelke
Julien van Campen
Gloria Pagouras
Constanza Pagouras

Photos*
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Ingo Reichmann
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Klaus Bergmann
Harald Almonat
Ole Kroeger
* if without reference; excluding team profiles

Team profiles
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Advertising
mazur | events + media
Daniel Mazur
Eimsbütteler Straße 113
22769 Hamburg
Mobile: +49 (175) 5085001
Phone: +49 (40) 2380-6868
Fax: -6848
mazur@formulastudent.de

Print, Processing
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www.formulastudent.de
contact@formulastudent.de

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Johanna Scheider
scheider@formulastudent.de
Ann-Christin Bartölke
bartoelke@formulastudent.de

Übersetzung
Johanna Scheider
Ann-Christin Bartölke
Julien van Campen
Gloria Pagouras
Constanza Pagouras

Korrektur
Johanna Scheider
Ann-Christin Bartölke
Julien van Campen
Gloria Pagouras
Constanza Pagouras

Fotos*
Formula Student Germany:
Ingo Reichmann
Kimmo Hirvonen
Klaus Bergmann
Harald Almonat
Ole Kröger
* wenn ohne Angabe; Teamprofile ausgenommen

Team-Profile
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Anzeigen
mazur | events + media
Daniel Mazur
Eimsbütteler Straße 113
22769 Hamburg
Mobile: +49 (175) 5085001
Phone: +49 (40) 2380-6868
Fax: -6848
mazur@formulastudent.de

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GUIDED TOURS
FÜHRUNGEN

Formula Student Germany responds even more adequately to the information demand of each visitor by upgrading the range of guided tours in 2010. A total of three different guided tours guarantees the right tour for every visitor.

Mit einer Erweiterung des Führungsangebots wird die Formula Student Germany beim Event 2010 noch umfangreicher und detaillierter auf den Informationsbedarf der Besucher eingehen. Die insgesamt drei verschiedenen Führungsangebote gewährleisten für jeden Besucher die optimale Tour.

Basic Tour
During the 45-minute basic tour the visitor gains a comprehensive insight into Formula Student Germany and its two competitions: Formula Student Combustion and Formula Student Electric. In addition to explanations of the event's fundamental ideas and the different disciplines of both competitions the basic tour also allows the interested visitor to take a closer look at the racecars' safety inspection. While touring the exhibition area and the pit lane, remarkable characteristics of the racecars are explained and the visitor can taste the event's unique and fascinating racing atmosphere. The basic tour suits all visitors interested in an authentic insight into the world of Formula Student Germany.

FSE Tour
For this year's first-time Formula Student Electric competition a separate guided tour is available. This guided tour systematically familiarizes the visitor with electrically powered racecars and the competitions' specific characteristics. The FSE tour is especially interesting for visitors with basic knowledge of Formula Student or those who are particularly interested in electrically powered racecars.

Technical Deep Dive
This year's second improvement with regard to FSG guided tours constitutes the so called "technical deep dive". For our "technical deep dive tour", a specialist once a day prepares and accurately explains a specific aspect of the Formula-Student-type racecar. The main focus will be on different powertrain concepts of both electrically powered cars and cars with a combustion engine. The Deep Dive tour caters for the visitor with a special interest in technical detail.

All guided tours start from the information desk in the FSG Forum. Exact starting times are displayed at the ticket offices and inside the FSG Forum.
Alle Führungen starten am Infoschalter im FSG Forum. Die genauen Führungstermine können den Aushängen an den Kassen entnommen oder am Infoschalter des FSG Forums erfragt werden.

Basic Tour
Während der 45 minütigen Basic Tour erhält der Führungsteilnehmer einen umfassenden Einblick in die Formula Student Germany mit ihren zwei Unterklassen, der Formula Student Combustion und der Formula Student Electric. Dem interessierten Besucher wird, zusätzlich zu der Grundidee und den Disziplinen des Wettbewerbs, ein hautnaher Einblick in die technische Abnahme der Boliden ermöglicht. Bei der Tour über das Gelände und durch die Boxengasse können die Besucher sich Besonderheiten der einzelnen Boliden direkt erläutern lassen und die Faszination der Rennatmosphäre aufsaugen. Die Basic Tour richtet sich an alle interessierten Besucher die einen grundlegenden Einblick in die Welt der Formula Student Germany wünschen.

FSE Tour
Für die erstmalig startende Klasse der Formula Student Electric Fahrzeuge wird dieses Jahr zusätzlich eine separate Führung angeboten. Der Besucher wird hierbei gezielt in das Thema elektrische Fahrzeuge und die damit verbundenen Besonderheiten des Wettbewerbs eingeführt. Die Führung ist so konzipiert, dass sie insbesondere für die Besucher einen interessanten Mehrwert bietet, die bereits über Grundkenntnisse der Formula Student verfügen oder aber ein spezielles Interesse an den Elektroboliden besitzen.

Technical Deep Dive
Die zweite Neuerung bei den Führungen stellt der sogenannte „technical deep-dive" dar. Hierbei wird einmal am Tag ein spezielles Thema für technisch besonders interessierte Besucher von einem Speziallisten aufbereitet und im Detail erklärt. Für den Formula Student Germany Event 2010 steht der Fokus auf den unterschiedlichen Antriebskonzepten der Formula Student Combustion und der Formula Student Electric.

	FORMULA STUDENT COMBUSTION		FORMULA STUDENT ELECTRIC	
Energy storage *Energie-speicherung*	gasoline / ethanol E85	Benzin/E85	accumulator battery	Akkumulator
Power limitation *Leistungs-begrenzung*	Displacement smaller than 610cm³, air-restrictor with a diameter of 20mm (gasoline) or 19mm (E85).	Hubraum kleiner als 610cm³, Luftmengen-begrenzer von 20mm (Benzin) oder 19mm (E85) Durchmesser.	No direct power limitation, but the ratio of battery weight to engine power leads to an ideal engine power area.	Keine Leistungsbegrenzung, aber durch das Verhältnis Batteriegewicht zu Motorleistung ergibt sich ein optimales Leistungsfenster.
Propulsion *Antrieb*	Four-stroke Otto engine + necessary peripheral equipment (cooling-system, gas-tank, transmission, air-intake- and exhaust-system).	Viertakt - Ottomotor + notwendige Peripherie (Kühlsystem, Tanksystem, Getriebe, Ansaug- und Abgastrakt).	Electromotor(s), majority of peripheral Otto engine equipment disappears, as the case may be cooling-system necessary, usually disappearing of transmission.	Elektromotor(en), Großteil der Peripherie des Verbrennungsmotors fällt weg, ggf. Kühlung notwendig, dafür i.d.R. Wegfall des Schaltgetriebes.
Scrutineering *Technische Abnahme*	Technical inspection of the racecar, scrutiny of the passenger cabin and of the driver's protection against dangers from powertrain or chassis.	Technische Abnahme des Autos, Prüfung der Konstruktion der Fahrgastzelle und Sicherung des Fahrers vor Gefährdungen aus dem Bereich des Antriebs und Fahrwerk.	Prefixing of the E-Scrutineering as the first part of the technical inspection, scrutiny of the required safety devices' correct function, afterwards normal FSC-scrutineering (Tech&Safety).	E-Scrutineering als erster Schritt der technischen Abnahme vorangeschaltet, Überprüfung der Funktion der vorgeschriebenen elektrischen Sicherheitseinrichtungen, anschließend normales Verbrenner-Scrutineering (Tech&Safety).
Brake-Test *Brems-Test*	To show the operative readiness of the brake-system an emergency stop is simulated. The brake-system must be capable of locking all four wheels of the racecar. Brakes are activated by a hydraulic-system only.	Um unter Beweis zu stellen, dass das Bremssystem funktions- und lesitungsfähig ist wird eine Vollbremsung simuliert. Das Bremssystem muss in der Lage sein alle vier Räder des Autos zu blockieren. Die Bremsen werden nur von einem hydraulischen System aktiviert.	To prove brake-system's operative readiness without activated electric signal, the Brake Test has to take place with a deactivated electric system (disconnection of the high-voltage system after acceleration). All four wheels must lock.	Um unter Beweis zu stellen, dass das Bremssystem ohne aktiviertes elektrisches System voll funktions- und leistungsfähig ist, muss der Brake Test mit deaktiviertem elektrischen System erfolgen (Abschalten des Hochvolt-Systems nach der Beschleunigung). Alle vier Räder müssen blockieren.
Noise Test ***Rain Test*** *Geräusch Test* *Regen Test*	At a distance of one meter to the exhaust the noise at specified revolutions per minute must not exceed 110dB.	Bei einem Abstand von einem Meter von dem Enddämpfer des Abgassystems darf die Lautstarke bei einer vorgegebenen Drehzahl nicht mehr als 110dBA betragen.	Noise Test is replaced by a non-mandatory Rain Test. With activated electric system the racecar gets watered for 2 minutes. During the "artificial shower of rain" no safety feature must switch off the high voltage system. A team which has not passed the Rain Test is not allowed to take part in the dynamic disciplines during rain.	Der Noise Test wird durch den freiwilligen Beregnungstest ersetzt. Fahrzeug wird 2min lang bei eingeschaltetem elektrischen System beregnet, und keine der im e-Scrutineering überprüften Sicherheitsvorkehrungen darf während dessen das System abschalten. Ein Team das nicht am Test teilnimmt darf bei Regen nicht an den dynamischen Disziplinen teilnehmen.
Tilt Table *Kipptisch*	Simulates turns with high lateral g-force. At a tilt of 45° degrees around the long axis no liquids must pass out the racecar, at a tilt of 60° the racecar must keep contact with all four wheels to the ground.	Simuliert Kurven mit hoher laterale Beschleunigung. Bei eine Neigung von 45° um die Längsachse des Autos dürfen keine Flüßigkeiten austreten, und bei einer Längsneigung von 60° darf das Auto nicht kippen.	Similar to the FSC-competition the height of the center of gravity as well as passing out of liquids (brake- and cooling-system) has to be checked.	Wie bei Verbrenner-Wettbewerb, da Schwerpunktshöhe, Sicherheit und evtl. Austreten von Flüssigkeiten (Brems-, Kühlsystem) überprüft werden muss.
Chassis ***Frame*** *Chassis* *Rahmen*	2010 Chassis / Frames are allowed only. The rules regulate the dimensions as well as the minimal structural requirements of the racecar's passenger cabin.	Nur 2010 Chassis/ Rahmen sind erlaubt. Das Reglement schreibt die Abmessungen der Fahrgastzelle sowie die minimalen Anforderungen der Struktur vor.	To make the participation in the FSE easier frames / chassis of the 2008/2009 season are allowed as well.	Alte Chassis/Rahmen der Saison 2008 und 2009 zugelassen, um den Einstieg in die FSE für die Teams zu erleichtern.

	FORMULA STUDENT COMBUSTION		FORMULA STUDENT ELECTRIC	
Possible or expected specialities ***Mögliche oder erwartete Besonderheiten***				
Driving dynamics I ***Fahr-dynamik I***	The average weight of a racecar is between 180 and 220 kg. With little weight and a low center of gravity FSC racecars have an advantage in the competition.	Im Durchschnitt wiegen die Autos zwischen 180 und 220 kg. Mit niedrigem Gewicht und Schwerpunkt sind im Wettbewerb Vorteile zu erwarten.	Based on the applied technologies FSE racecars are most likely 30–50kg heavier than comparable FSC racecars. However the center of gravity will be lower and the lateral acceleration (speed though turns) is expected to be higher.	Auf Grund der eingesetzten Technologien werden die Fahrzeuge voraussichtlich 30-50kg schwerer sein als vergleichbare FSC Fahrzeuge. Allerdings wird der Schwerpunkt niedriger sein und die erreichbare Querbeschleunigung (Kurvengeschwindigkeit) höher.
Driving dynamics II ***Fahr-dynamik II***	Due to the mechanic connection of the propelled wheels the differential effect is also mechanically limited.	Die angetriebenen Räder sind mechanisch miteinander verbunden, womit die Differentialwirkung auch mechanisch begrenzt ist	The use of several independently controllable electric engines results in the possibility of many favorable interventions in the racecar's driving dynamics, e.g. electronic differential, torque vectoring etc.	Durch den Einsatz mehrerer unabhängig voneinander regelbarer Elektromotoren ergibt sich die Möglichkeit vieler vorteilhafter Eingriffe in die Fahrzeugdynamik, z.B. elektronisches Differential, Torque Vectoring usw.
Acceleration ***Beschleu-nigung***	At standstill the acceleration is limited by the grip of the tires and at higher speeds the acceleration is limited by the torque of the engine.	Aus dem Stand wird die Beschleunigung begrenzt durch den Grip der Reifen, und bei höheren Geschwindigkeiten durch das Drehmoment des Motors.	With a corresponding realization through the teams a better acceleration capability may be expected. The reason for this should be the, despite comparable engine power, a wider torque band.	Es ist zu erwarten, dass die FSE Fahrzeuge bei entsprechender Umsetzung durch die Teams ein deutlich besserers Beschleunigungsvermögen haben als die FSC Fahrzeuge, trotz vergleichbarer Motorleistung (Drehmomentverlauf der Elektromotoren).
Special challenges ***Besondere Herausforderungen***				
Safety ***Sicherheit***	The racecar has no high-voltage system. The engine sound of a combustion engine is audible during operation.	Das Fahrzeug hat kein Hochvoltsystem. Das Motorengeräusch eines Verbrennungsmotor ist im Betrieb hörbar.	Due to a permitted potential of 600V max the rules demand many safety systems and monitoring systems, which protect the drivers, team members and the visitors from the dangers of high voltage. Examples: monitoring of the accumulator battery, monitoring of the correct isolation, clear display of an active high-voltage system (safety light at the most elevated point of the racecar: "optical engine sound").	Aufgrund der maximal zugelassenen Spannung von 600V fordert das Reglement sehr viele Schutz- und Überwachungsvorrichtungen, die sowohl den Fahrer, die Teammitglieder und die Zuschauer vor den Gefahren der hohen Spannung schützen. Beispiele: Überwachung des Zustandes des Akkumulators, Überwachung der ordnungsgemäßen Isolation, deutliche Anzeige eines aktiven Hochvoltsystems (Warnlicht am höchsten Punkt des Fahrzeugs: „optisches Motorgeräusch")

PARTICIPATING FSC TEAMS 2010
TEILNEHMENDE FSC TEAMS 2010

Car	City / University	Country	Pit	Page
1	Stuttgart U	Germany	42	91
2	Hatfield UH	United Kingdom	49	71
4	München TU	Germany	36	80
5	Ann Arbor U MI	United States	25	58
6	Montréal ETS	Canada	31	78
7	Köln UAS	Germany	43	74
9	Graz TU	Austria	48	70
10	Ravensburg DHBW	Germany	30	85
12	Darmstadt TU	Germany	60	64
13	Toronto U	Canada	56	92
14	Helsinki UAS	Finland	8	72
15	Glasgow U Strath	United Kingdom	12	69
16	Braunschweig TU	Germany	11	61
17	Karlsruhe KIT	Germany	71	75
18	Stralsund UAS	Germany	47	90
19	Roma U Sapienza	Italy	44	86
20	Loughborough U	United Kingdom	29	76
21	Aachen RWTH	Germany	50	56
23	Amberg UAS	Germany	59	57
24	Wrocław TU	Poland	55	95
25	Cagliari U	Italy	74	62
26	Hannover U	Germany	15	71
28	Madrid PT	Spain	45	77
31	Ilmenau TU	Germany	64	72
32	Mannheim UAS	Germany	75	78
33	Wolfenbüttel UAS Ostfalia	Germany	33	94
35	Prague CTU	Czech Republic	61	84
36	Karlsruhe UAS	Germany	52	75
39	Pisa U	Italy	14	84
41	Weingarten UAS	Germany	62	93
42	Siegen U	Germany	2	89
43	Uxbridge U Brunel	United Kingdom	65	93
44	Dresden TU	Germany	4	66
45	Sankt Augustin UAS	Germany	77	88
46	Turin PT	Italy	24	92
47	Alexandria U	Egypt	73	57
48	Dortmund TU	Germany	51	66
50	Saarbrücken UAS	Germany	32	87
51	München UAS	Germany	67	81

Car	City / University	Country	Pit	Page
52	Moscow MAMI	Russia	68	79
53	Kiel UAS	Germany	46	74
54	Barcelona UPC	Spain	53	58
55	Rijeka U	Croatia	13	85
58	Nevers ISAT	France	22	81
60	Bochum U	Germany	69	60
61	Birmingham U	United Kingdom	41	60
62	Paderborn U	Germany	6	83
63	Aachen UAS	Germany	9	56
64	Kaiserslautern TU	Germany	57	73
65	Wiesbaden UAS	Germany	10	94
66	Rochester IT	United States	26	86
67	Osnabrück UAS	Germany	34	82
69	Madison U	United States	35	77
70	Coburg UAS	Germany	16	63
71	Stockholm KTH	Sweden	18	89
72	Hamburg HSU	Germany	40	70
73	Deggendorf UAS	Germany	38	65
74	Erlangen U	Germany	17	68
75	Moscow MADI	Russia	76	79
76	Freiberg TU	Germany	21	69
77	Stuttgart DHBW	Germany	28	90
78	Tampere UAS	Finland	39	91
80	Berlin TU	Germany	54	59
82	Cambridge U	United Kingdom	20	62
83	Cottbus TU	Germany	27	63
85	Delft TU	Netherlands	19	65
86	Patras U	Greece	3	83
88	Bologna U	Italy	5	61
89	Norman U Oklahoma	United States	37	82
94	Esslingen UAS	Germany	23	68
95	Isfahan TU	Iran	78	73
96	Zwickau UAS	Germany	66	95
97	Schweinfurt UAS	Germany	58	88
99	Mumbai Somaiya	India	72	80
101	Lemgo UAS	Germany	70	76
103	Bayreuth U	Germany	63	59
108	San Sebastián TECNUN	Spain	1	87
109	Darmstadt UAS	Germany	7	64

PARTICIPATING FSE TEAMS 2010
TEILNEHMENDE FSE TEAMS 2010

Car	City / University	Country	Pit	Page
E11	Berlin TU	Germany	E5	97
E12	Köln UAS	Germany	E4	103
E13	Hatfield UH	United Kingdom	E7	101
E14	Deggendorf UAS	Germany	E6	99
E15	Graz TU	Austria	E2	100
E16	Diepholz UAS	Germany	E9	99
E17	Karlsruhe KIT	Germany	E14	101
E21	Aachen RWTH	Germany	E8	97

Car	City / University	Country	Pit	Page
E22	München UAS	Germany	E13	104
E23	Darmstadt TU	Germany	E11	98
E26	Stuttgart U	Germany	E3	104
E33	Zürich ETH	Switzerland	E1	105
E40	Eindhoven TU	Netherlands	E15	100
E62	Zwickau UAS	Germany	E16	105
E69	Mosbach DHBW	Germany	E10	103
E90	Bratislava TU	Slovakia	E12	98

AACHEN
RWTH Aachen University

Ecurie Aix – innovation and passion Ecurie Aix was founded in 1999 as one of the first European teams in the Formula Student. Since then it has adopted a worldwide unique CVT (Continuously Variable Transmission) in three of its racing cars (eac02, eac03 and eac04) and has been the only team to conduct several crash tests of their monocoques each year. In 2010, the team will compete both with a conventionally powered car (the eac07) propelled by a modified GSX-R 600 engine running on E85 ethanol, and with an electrically powered car (the eace1). Apart from the tractive system, the two cars share the same innovative components: the frame, which is a hybrid construction consisting of a carbon fiber monocoque in the front and a tubular steel frame in the rear as well as a unique multi-link-front axle with a mono-shock-absorber. Last but not least, both cars feature a typical Ecurie Aix-ingredient: passion.

Car 21 Pit 50 Germany

FRAME CONSTRUCTION Hybrid-Design, Front: Monocoque, Rear: tubular space frame

MATERIAL Monocoque: reinforced carbon fibre, rearframe: steel tubing S355

OVERALL L / W / H (mm) 2715 / 1411 / 1288

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1598 / 1250 / 1176

WEIGHT WITH 68kg DRIVER (Fr / Rr) 138 / 168

SUSPENSION Multilink Suspension. Push rod actuated horizontally oriented monoshock and rollspring

TYRES (Fr / Rr) 20.5x7 R13 R25B Hoosier / 20.5x7 R13 R25B Hoosier

WHEELS (Fr / Rr) 7.5x13, -20mm offset, 3 pc Al Rim / 7.5x13, -20mm offset, 3 pc Al Rim

ENGINE Modified Suzuki GSX-R 600 SRAD (1997-2000)

BORE / STROKE / CYLINDERS / DISPLACEMENT 66mm / 45mm / 4 cylinders / 600cc

COMPRESSION RATIO 16,0:1

FUEL SYSTEM Student designed fuel injection System with Continental injectors, Motec M800 ECU

FUEL E-85 ethanol

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE Chain #520

DIFFERENTIAL GKN visco Lok, speed sensitive LSD

COOLING Student designed 220x270 water radiator with controlled electric fan mounted in the left

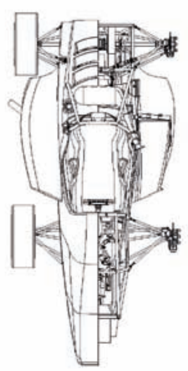
BRAKE SYSTEM Student designed 4-Disk System, floating, stainless steel, hub mounted, 240mm front, 230mm rear

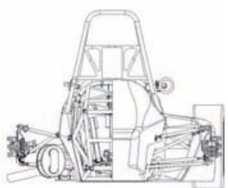
ELECTRONICS CAN-Bus-System, Student designed fusebox, hydraulic actuation shift and clutch system,

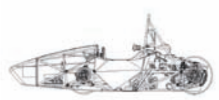
AACHEN
University of Applied Sciences Aachen

Aixtreme Racing represents the UAS Aachen in Formula Student events. Founded in May 2007 and consisting of around 30 members, the team now comprises 40 students from the departments mechanical and electrical engineering, computer science and design. During the past 8 months, strenuous day and night shifts have led to the design of our new and almost fully re-designed car – the „AIX FS610“. For instance, a much stiffer, yet lighter steel space frame was built. The suspension system features a precise, stiff and play-free kinematic at a significantly lower weight, for example due to the use of carbon fiber rods. However, not only technical improvements have been made. Our newly established knowledge data base has helped us, but more importantly will help future teams keep track of the many influences that affect this complex project. We are looking forward to the challenges that are still to come and we feel confident that our car can take it on with the top racers in the field.

Car 63 Pit 9 Germany







FRAME CONSTRUCTION Tubular space frame. 12-25 mm outer diameter tubes with various wall thicknesses

MATERIAL S355

OVERALL L / W / H (mm) 2853 / 1275 / 1105

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1250 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 149 / 149

SUSPENSION Double unequal length A-Arms. Pull/Push rod (front/rear), longit./laterally oriented spring

TYRES (Fr / Rr) Hoosier 20.5x7.0-13 R25B

WHEELS (Fr / Rr) Braid two-piece aluminium split rims

ENGINE Modified CBR600RR PC37

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.0:1

FUEL SYSTEM Fully programmable Trijekt ECU. Full sequential injection. Alpha-n ignition map.

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 13000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Sequential 6 gear, 525 chain final drive

DIFFERENTIAL Drexler torque sensitive limited slip differential. Clutch style.

COOLING Side mounted custom made radiator. Core size 0.09 m^2. 225mm electrical fan.

BRAKE SYSTEM 4-Disk system, adjustable brake balance.

ELECTRONICS Wiring harness sealed to IP67. Multifunctional Steering Wheel. Electrical shifting actuator.

ALEXANDRIA
University of Alexandria

Car 47 Pit 73

Egypt

Alexandria University Motorsports team (AUMotorsports). Year 2010 will mark our first entrance into Formula Student and we hope that it would be a good base for future progress. The current team is formed by 16 senior mechanical engineering students and is done as a graduation project too.As first timers we opted to work as simple as possible, the engine is nearly 100% stock and its tuning would be done with a piggy-back fuel control system. Frequent well known errors are avoided as much as possible. It was a tough and experience from which we have learned a lot and we consider ourselves lucky and privileged to work on such a project against all hurdles we encounter in our country. Looking forward to Germany and wish us luck!

FRAME CONSTRUCTION Tubular steel spaceframe

MATERIAL Mild Steel

OVERALL L / W / H (mm) 2847 / 1562 / 1234

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1675 / 1350 / 1100

WEIGHT WITH 68kg DRIVER (Fr / Rr) 119 / 119

SUSPENSION Unequal length double wishbone. Push rod actuated horizontally oriented spring and damper.

TYRES (Fr / Rr) 20x7.2 R13 Avon A45

WHEELS (Fr / Rr) 20x7.2 R13 Avon A45

ENGINE Suzuki GSXR 600 K7.

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM Stock fuel system with PowerCommander.

FUEL 95 octane unleaded gasoline.

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 9800

DRIVE TYPE 6 speed sequential manual

DIFFERENTIAL Quaife torque sensing helical gear differential

COOLING

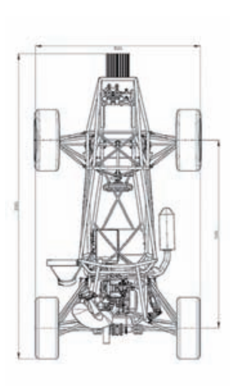
BRAKE SYSTEM 4- Disk system, self-developed steel rotors with 270 diameter, adjustable brake balance.

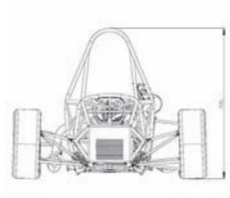
ELECTRONICS

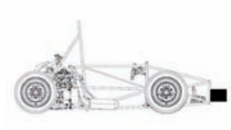
AMBERG
University of Applied Sciences
Amberg-Weiden

Car 23 Pit 59

Germany







The Running Snail Racing Team was established in August 2004. Since then, we participated with sustained success at the Formula Student Events in England, Germany and Italy. This year we will take part at the Formula Student event in Gyoer (Hungary) for the first time. The RS10-LC4 is our 6th car, based on the results of the tests and competitions of our first five cars. Our aim was again to reduce the weight to now 165 kg (wet), to keep our high quality standards, give the car a good drivability, and reach better ergonomics for the drivers. One of the greatest awards we received so far at the FSG Events, was the Sportsmanship Award in 2008. More information about our team and our cars are available on www.running-snail.de

FRAME CONSTRUCTION Steel tube space frame with CFRP seat

MATERIAL S355J2H round imperial tubing

OVERALL L / W / H (mm) 2585 / 1398 / 1135

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1590 / 1200 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 108 / 123

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented Oehlins FSAE Spec spring/damper

TYRES (Fr / Rr) 20,5x7-13 R25B Hoosier

WHEELS (Fr / Rr) 13x7 inch wide, Al/CFRP Rim, 10mm Offset

ENGINE 2010 KTM LC4 690

BORE / STROKE / CYLINDERS / DISPLACEMENT 102mm / 74,6mm / 1 cylinders / 610cc

COMPRESSION RATIO 14:01:00

FUEL SYSTEM Student designed/built fuel injection system using Bosch MS4 ECU

FUEL 100 octane petrol (Shell Optimax)

MAX POWER DESIGN (rpm) 9000

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE double o-sealing-ring chain

DIFFERENTIAL Drexler limited slip differential

COOLING side mounted radiator with electric fan

BRAKE SYSTEM 4-Disc system with C/SiC brake discs , 220 mm outer and 160 mm inner diameter

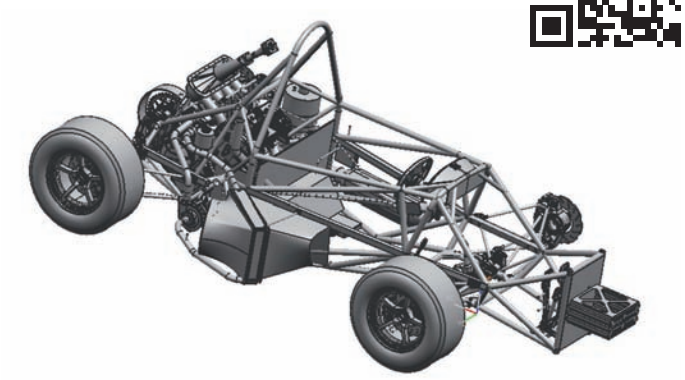
ELECTRONICS multifunctional steering wheel, electric shifting system, selfdesigned live-telemetry system,

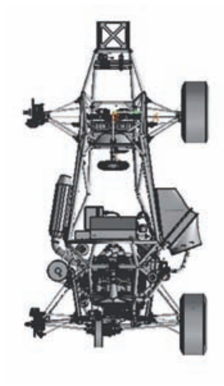
ANN ARBOR

University of Michigan - Ann Arbor

Car 5 Pit 25

United States





FRAME CONSTRUCTION Tubular steel spaceframe with composite reinforcments

MATERIAL 4130 ChroMoly Steel

OVERALL L / W / H (mm) 2590 / 1422 / 965

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1575 / 1219 / 1194

WEIGHT WITH 68kg DRIVER (Fr / Rr) 108 / 143

SUSPENSION Double unequal length A-Arms, pull rod front, push rod rear, adjustable u-bar front and rear

TYRES (Fr / Rr) Hoosier 10in

WHEELS (Fr / Rr) Student designed forged single piece aluminum

ENGINE Honda CBR600RR

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,5:1

FUEL SYSTEM Bosch ECU, sequential fuel injection

FUEL E85

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE 6-speed sequential with no lift shift.

DIFFERENTIAL Salisbury with adjustable ramp angles and external preload adjustment

COOLING Single radiator and thermostat-controled fan

BRAKE SYSTEM Front: student designed 2 piston radialy mounted calipers. Rear: 2-piston axially mounted calipers.

ELECTRONICS Bosch ECU and sensors

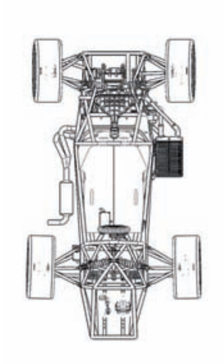
MRacing was founded in 1986, and has competed in every Formula SAE MIS/East event since 1988. The team has traveled abroad on three previous occasions, visiting Formula SAE Japan in 2006, Formula Student UK in 2007, and Formula Student Germany in 2009. The MR10 competed in the Formula SAE MIS 2010 competition, placing 2nd overall, 1st in Acceleration, 2nd in endurance, 1st for the FEV Powertrain Development Award, and 1st for the Joe Gibbs Spirit of Innovation Award. The MR10 follows in a long line of Michigan cars featuring the rare combination of 10in wheels and a four cylinder engine, allowing a very high power-to-weight ratio. The vehicle design places a premium on reliability and serviceability, while still maintaining a light weight. The team's design schedule allows for a large amount of testing time to ensure the vehicle is reliable and has a proper set up. The team is traveling to Germany early to test the vehicle at Ramstein Air Force Base.

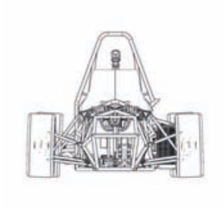
BARCELONA

PT University of Catalonia - Engineering School of Barcelona

Car 54 Pit 53

Spain





FRAME CONSTRUCTION Tubular space frame

MATERIAL ST-52 tubes, diameters between 16mm and 25mm

OVERALL L / W / H (mm) 2733 / 1392 / 1140

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1200 / 1100

WEIGHT WITH 68kg DRIVER (Fr / Rr) 148 / 160

SUSPENSION Double unequal lenght A-Arm. Push rod actuated horitzontally oriented spring and damper.

TYRES (Fr / Rr) Front and rear: 20.5 x 7.0-13 R25A Hoosier

WHEELS (Fr / Rr) 7 inch wide, 1pc Al Rim (OZ), 22mm neg. offset

ENGINE Honda CBR 600cc RR 4 cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 58mm / 57mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,2:1

FUEL SYSTEM Student designed and built, fuel injection, sequential

FUEL 98-RON

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain, #520

DIFFERENTIAL Drexler 2009 clutch pack limited slip

COOLING Single radiator, fan ECU controlled

BRAKE SYSTEM 4 floating disk system, hub mounted, adjustable brake balance

ELECTRONICS Selfdesigned multifunctional steering wheel and electropneumatic shifting system

With CAT03, ETSEIB Motorsport faces its third Formula Student Germany season with great enthusiasm and hope. The vehicle is completely new, but it inherits all the technical background from the last season's car. Some problems have been solved and we are proud to present a much more efficient and reliable vehicle. This year, the team has worked with an special interest in the engine, trying to avoid the problems we had last year. A new intake has been designed and built in rapid prototyping.But there has been an improvement in many parts of the car: differential, shifting system, frame... All of them are little but let us in a good position to get to the end of the endurance. Half part of the team members are new and work side by side with the older ones, ensuring a high grade of information transference. Our desire is to have a good competiton and show all the potential of CAT03 at Hockenheim.

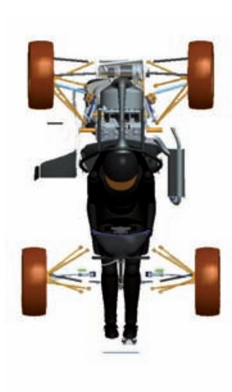
BAYREUTH

University of Bayreuth

The team's name is derived from the Faculty of Applied Sciences' abbreviation FAN which shares its letter string with the clever and powerful animal. Founded in 2004, Elefant Racing competes in Germany for the fifth time. After having achieved higher places in static competitions for marvellous engineering design, this year's focus lays on reliability and maintainability combined with moderate evolution. Using experiences collected in over five years of development this season's vehicle features concepts developed in the past seasons as well as finely tuned successors whenever needed. Use of advanced composites for all major components as well as an extremely light drive train design combined with flexible electronics results in a car not only light in weight and well to handle, but also assisting the driver whenever possible. As a consequence goal for 2010 is a successful participation in all static and particular dynamic events to achieve a place in the upper midfield.

Car 103 Pit 63

Germany



FRAME CONSTRUCTION CFRP Monocoque with aluminium honeycomb and tubular steel roll bars

MATERIAL CFRP prepreg and aluminium honeycomb with 8 mm and 5 mm

OVERALL L / W / H (mm) 2621 / 1500 / 1040

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1550 / / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 131 / 142

SUSPENSION Double unequal length CFRP composite A-Arm. Pullrod actuated vertically oriented Oehlins DB shocks

TYRES (Fr / Rr) 20.5x7/13 Hoosier

WHEELS (Fr / Rr) 6x13, single piece CFRP/Aluminium honeycomb rim

ENGINE 2000, Honda CBR600F PC35

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,0:1

FUEL SYSTEM proprietary design sequential injection using Bosch Motorsport MS3 Sport ECU

FUEL 100 octane petrol

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 8900

DRIVE TYPE Secondary Gear

DIFFERENTIAL Torsen

COOLING Single side pod mounted radiator with OBC - controlled electric fans

BRAKE SYSTEM Axial floating, Student-designed C/SiC disc front, hub mounted, 200mmx5mm dia., steel discs rear

ELECTRONICS Custom Steering Wheel with custom Electro-pneumatic Shifting System, Live telemetry system,

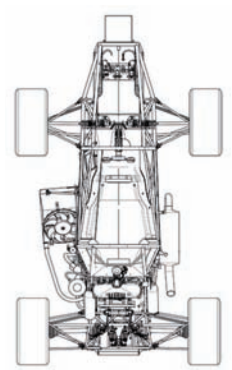
BERLIN

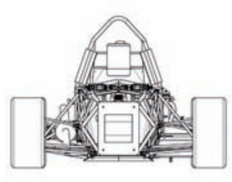
Technical University of Berlin

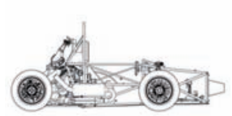
2010 is the fifth season of the Formula Student Team of the Technical University of Berlin. Since our first year in this design competition, we are participating in the Formula Student Germany. Ever since we started developing a student-built racing car, our team gained a lot of experience throughout the seasons. Five years of passion, commitment, fun, effort and night shifts. Everything we learned in the past results in the FT2010. Therefore we came up with „Visible Efficiency" as the new concept for our fifth racing car. Our aim was to improve our last year's transparent bodywork which provides the look into the car's technology and combine it with an efficient drive concept in 2010. We are proud of being a part of the event at the Hockenheimring again and looking forward to see many exciting racing cars, ambitious teams and fast laps on the track!

Car 80 Pit 54

Germany







FRAME CONSTRUCTION Tubular space frame

MATERIAL 25CrMo4 steel round tubing

OVERALL L / W / H (mm) 2701 / 1536 / 1090

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1575 / 1300 / 1280

WEIGHT WITH 68kg DRIVER (Fr / Rr) 150 / 158

SUSPENSION Double unequal length carbon tube A-Arm. Pushrod actuated 4-way-adjustable dampers on front & rear.

TYRES (Fr / Rr) Hoosier R25B 20.5x7.0-13

WHEELS (Fr / Rr) 7.0x13 OZ Racing Aluminium Rims

ENGINE 2003 Suzuki GSX-R 600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14:01:00

FUEL SYSTEM ECU with sequential injection and ignition. Adhesive bonded fuel tank.

FUEL RON98 or E85 (two maps and restrictors available)

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain drive, flank pitch: 520

DIFFERENTIAL Drexler differential, limited slip.

COOLING Left side mounted radiator with air intake and thermostatic controlled electric fan and water pump.

BRAKE SYSTEM Floating discs, 230mm (front) & 196mm (rear) diameter, 4 callipers, adjustable brake balance.

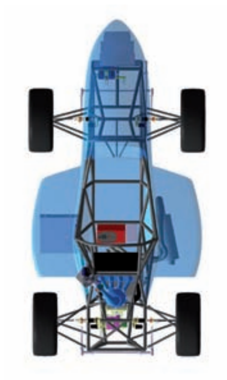
ELECTRONICS Multifunctional steeringwheel, electropneumatic shifting system, self developed sensor CAN unit.

BIRMINGHAM
University of Birmingham

Car 61 Pit 41

United Kingdom

In 2010, UBRacing enters its 13th Car into the Formula Student competitions. UBRacing hopes to improve on the results gained in last year's competitions with a large continuation of team members and development in key areas of the vehicle, including Engine Electronics, Engine Gas Flow and the Drivetrain system. A continuation of sponsorship from McLaren Electronic Systems has allowed for the development of the TAG400 ECU using Matlab/Simulink, which has also been kindly sponsored by Mathworks.The ECU provides engine management as well as controlling the custom designed active differential and the pneumatic gear shift system. The differential, which has had several components manufactured with help from this year's new sponsor Mazak, has allowed UBR13 to optimise traction in all dynamic conditions. With continued support from McLaren Racing, an improved intake design has increased volumetric efficiency and driveability, with increased mid-range torque. In conjunction with a



FRAME CONSTRUCTION Tubular Steel Spaceframe

MATERIAL Cold Drawn Mild Steel Seamless Hydraulic Tube and T45 Steel Tube

OVERALL L / W / H (mm) 2700 / 1380 / 1065

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1200 / 1137

WEIGHT WITH 68kg DRIVER (Fr / Rr) 127 / 158

SUSPENSION Double unequal length A-Arm.Push rod actuated spring with 2 way adjustable Dampers, Fr and Rr ARB

TYRES (Fr / Rr) Dunlop Motorsport 175/505 R13

WHEELS (Fr / Rr) 178 mm wide, 3 pc Al/Mg Keizer Rim

ENGINE Yamaha YZF-R6 5SL 2003-2005

BORE / STROKE / CYLINDERS / DISPLACEMENT 66mm / 45mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.4:1

FUEL SYSTEM Bespoke sequential fuel injection, McLaren TAG400 ECU

FUEL 98 Octane Unleaded Gasoline

MAX POWER DESIGN (rpm) 11800

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain Drive to Active Differential

DIFFERENTIAL Student designed active differential. ECU controlled. 14 plate clutch pack arrangement.

COOLING Single, side-mounted aluminium radiator with bespoke ducting and thermostatic fan control

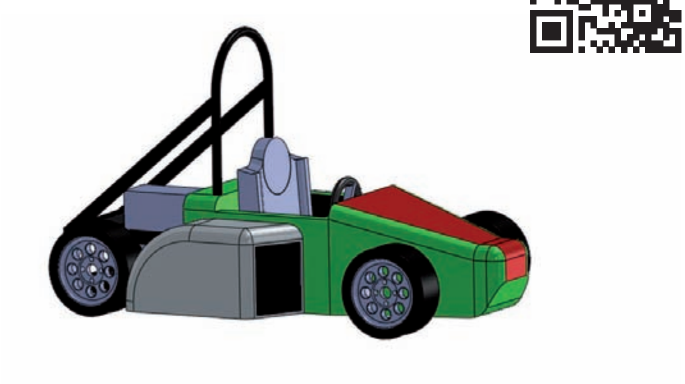
BRAKE SYSTEM Stainless Steel Hub mounted Floating Disks, 220mm OD, 97mm Eff Rad Fr:186mm OD, 80mm Eff Rad Rr

ELECTRONICS McLaren TAG400 ECU with Deutsch connectors controlling pneumatic shift system and active diff.

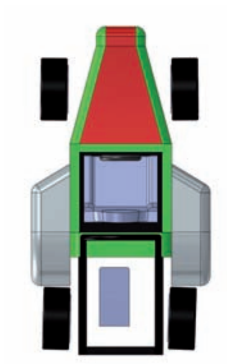
BOCHUM
Ruhr University Bochum

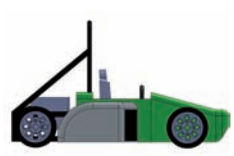
Car 60 Pit 69

Germany



Our Team from the RUB consists of a little more than 10 members, which constructed a car with following features: steel tubular frame; Suzuki GSX R600 engine (K4) with Bosch MS4 ECU, paralyzation of half of the valves; BMW E30 limited slip differential, no chain in powertrain! Aluminium foam Impact Attenuator; Fox Dampers. Our aim was to build a car that pioneers the next cars from the RUB. Very important: We thank our sponsors and supporting companies!





FRAME CONSTRUCTION Cubic steel construction

MATERIAL

OVERALL L / W / H (mm) 2735 / 1415 / 135

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1850 / 1150 / 1280

WEIGHT WITH 68kg DRIVER (Fr / Rr) /

SUSPENSION Double unequal suspension arms

TYRES (Fr / Rr) Conti Slicks

WHEELS (Fr / Rr) ATS Classic, 7 x 13 ET20

ENGINE Suzuki GSX R600

BORE / STROKE / CYLINDERS / DISPLACEMENT mm / mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,16

FUEL SYSTEM

FUEL 98

MAX POWER DESIGN (rpm) 8500

MAX TORQUE DESIGN (rpm) 7200

DRIVE TYPE

DIFFERENTIAL BMW

COOLING beside mounted Honda radiator, Spal fan, 280mm

BRAKE SYSTEM Honda, 4 disc system.

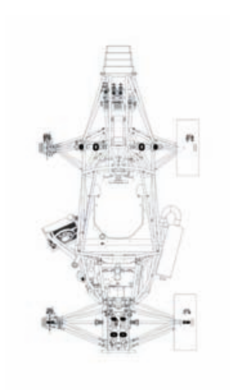
ELECTRONICS

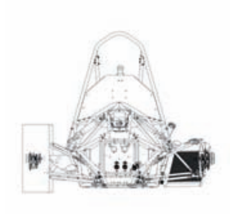
BOLOGNA

University of Bologna

Car 88 Pit 5 Italy

The most ancient University of the world, Alma Mater Studiorum of Bologna, has now a Formula SAE team: UniBo Motorsport. Founded in 2008 by 10 enterprising students, UniBo Motorsport joins students' passion for races and their will to put their studies into practice. From the very first, the team appeared in the Italian sector organizing its first Formula SAE stand in one of the most important fairs of Italy and Europe: the Motorshow of Bologna. In that occasion, 14 European teams were invited to take part in the exhibition. Within two years, the team grew from 10 to 30 members who after a long work carried out the "ep2010", the first Formula SAE prototype of UniBo Motorsport. ep2010 is an academic project that involved several innovative ideas like the system for vehicle and engine's control that has been installed on board to offer a wide range of control strategies. FSG10 is our first competition. We hope to be among the most competitive newcomer teams in the challenge.





FRAME CONSTRUCTION Steel Tubular Space Frame with Aluminum structure at the rear

MATERIAL 25 Cr Mo 4 / EN AW 6082-T6

OVERALL L / W / H (mm) 2895 / 1449 / 1303

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1580 / 1250 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 141 / 159

SUSPENSION Double Unequel Length Wishbone. Push-Rod Actuated Spring and Damper

TYRES (Fr / Rr) 20 x 7-R13 Racing Slick

WHEELS (Fr / Rr) R13 Aluminum Rims

ENGINE Modified Suzuki GSX-R600 K6-K7

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM Student built, return - less fuel - injection system

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 11000

DRIVE TYPE Drive Chain and Sprockets

DIFFERENTIAL Limited Slip Salisbury type Differential. 6 different Bias Ratio adjustment

COOLING Left side pod mounted radiator, PWM controlled electric water pump, controlled electric fan

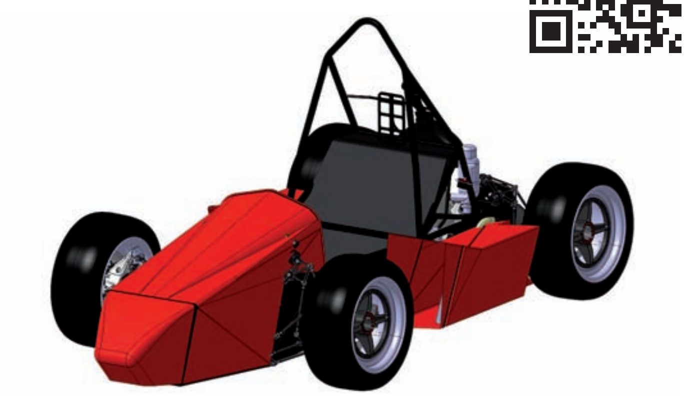
BRAKE SYSTEM Floating, Steel, hub mounted, 218 m outer diam., 158mm inner diam., drilled

ELECTRONICS Student designed: Engine & Vehicle Control Strategies, Dashboard, Signal Conditioning Circuit

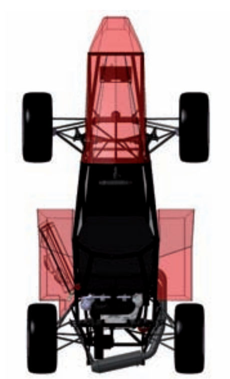
BRAUNSCHWEIG

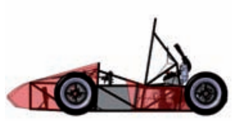
Technical University of Braunschweig

Car 16 Pit 11 Germany



This year on the Hockenheim Racetrack, the Lions Racing Team of the TU Braunschweig will present its current competition vehicle, the LR10. After last year's competition – mainly caused by the economic crisis and the Bachelor/Master system being introduced – the team found itself with fewer sponsors as well as team members than in the previous season. Because of this, the team decided to improve last year's vehicle in detail, mainly focusing on ergonomics, the engine's fuel consumption, steering and the electronics system, which were to cause the most trouble in the LR09. Traditionally, the LR10's design is based on a steel space frame. The suspension has not changed much and traction control as well as an ABS system will also be applied. Furthermore, the seat now accommodates tall drivers too and to the electronics system, a data logging box was added. Despite the setbacks the team encountered this season, we are highly motivated and looking forward to meeting the FS community in August.





FRAME CONSTRUCTION Tubular space frame with supporting frame and hollow nodes

MATERIAL 25CrMo4 steel round tubing 10 to 25mm diameter

OVERALL L / W / H (mm) 2642 / 1318 / 1172

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1525 / 1140 / 1072

WEIGHT WITH 68kg DRIVER (Fr / Rr) 130 / 146

SUSPENSION Double wishbone with steel a-arms. Pushrod actuated Cane-Creek Double Barrel, 4-way adjustable.

TYRES (Fr / Rr) Continental Formula Student Tires 205/500R13

WHEELS (Fr / Rr) 3pc. Al-Mg Rim, BBS Rims, self designed center, 7.0x13 0mm offset

ENGINE modified Suzuki GSX-R 2004 (K4)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM Student designed/built fuel injection system using MoTeC M400 ECU, sequential

FUEL 100oct. unleaded gasoline

MAX POWER DESIGN (rpm) 13500

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE chain drive 11/42

DIFFERENTIAL modified Torsen University Special limited slip diff.

COOLING side pod mounted radiators seperate for water and oil, with electronically controlled electric fans

BRAKE SYSTEM Brembo P32/AP CP7003 w. self designed rotors. Adj. bias bar, FTE motorcyle cylinders, Race-ABS

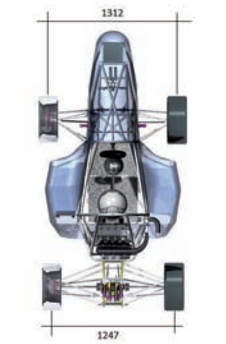
ELECTRONICS Self-Developed Gearbox Controlling Unit, Self-Developed Data Acquisition System, Live Car Data Strea

CAGLIARI
University of Cagliari

Car 25 Pit 74

Italy

The team was founded in 2007 and has competed in events in Italy (F-ATA) for 3 years. In 2007 and 2009 winning first place. In 2008 we built the first car of the University of Cagliari, Class 1 debut, performing well on track. Team 2010 is composed of 11 students from the departments of Mechanical Engineering and Electronics and of two Faculty Advisors.The design approach was influenced by scarce economic resources available, so the design choices were more focused on achieving the best compromise between performance and innovation costs. The team consists of eight operating segments that follow the breakdown of the project made in cost reports, and given the small number of members, there are some students that take multiple roles.



FRAME CONSTRUCTION Steel tube space frame with bolted Al rear structure. Carbonfibres panels

MATERIAL 4130 Cromo-Moly Alloy Steel

OVERALL L / W / H (mm) 2850 / 1550 / 1190

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1705 / 1300 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 175

SUSPENSION Double unequal length A-Arm. Pull rod system actuated vertical oriented spring and damper

TYRES (Fr / Rr) 19.5x6.5 - R13 A53 - AVON

WHEELS (Fr / Rr) OZ 7x13

ENGINE 2004 Yamaha FZ6-SS

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.2:1

FUEL SYSTEM Yamaha motorbike stock fuel system

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain #520

DIFFERENTIAL Quaife automatic torque biasing differential. 3:1 torque bias ratio

COOLING Electric Water Pump

BRAKE SYSTEM 3-Disk system, front 2disk 220mm dia., rear single steel rotor, differential housing mounted, 240mm

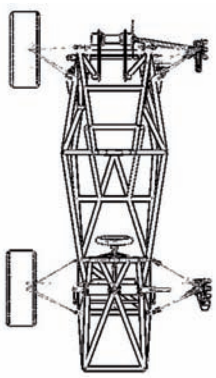
ELECTRONICS wiring harness sealed to IP67, Multifunctional Steering Wheel, Electromeccanic Shifting System

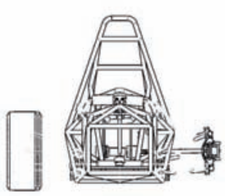
CAMBRIDGE
University of Cambridge

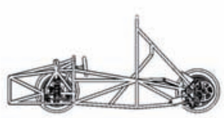
Car 82 Pit 20

United Kingdom

Full Blue Racing is delighted to be attending FSG for the 4th time, with its 4th car - FBR10. Hard work from the whole team has produced a vehicle that meets the aim for 2010 of ‚reliability without sacrificing performance‘. This is achieved through the design of a simple, low maintenance vehicle with exceptional handling and acceleration performance. The team feels that this offers the ideal package for the weekend racer whilst making the most of the facilities available to it. The FBR10 would not have been possible without the help and support of all the sponsors and supporters who have offered advice, facilities and vital encouragement - thank you to all those involved!







FRAME CONSTRUCTION Steel tubular space frame, MIG welded

MATERIAL Mild steel to BS 6323 (Pt 5)

OVERALL L / W / H (mm) 2500 / 1422 / 1150

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1250 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 161 / 182

SUSPENSION Double unequal length. Front push, rear pull rod actuated spring and damper.

TYRES (Fr / Rr) 20" x 7.0" Avon

WHEELS (Fr / Rr) 13" x 60", Al rims, -12mm offset

ENGINE Yamaha Fazer FZ6 5VX R6 , four stroke in line four

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,1:1

FUEL SYSTEM Yamaha emi sequential fi, controlled by Megasquirt

FUEL 95 RON unleaded

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain #520

DIFFERENTIAL fixed 7075T6 spool with EN24T tripod housing

COOLING Custom aluminium radiator mounted in left sidepod, electric water pump

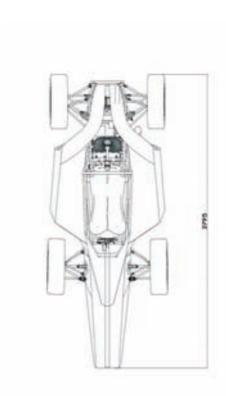
BRAKE SYSTEM outboard front, inboard rear, Brembo calipers with EBC pads and AP cylinders

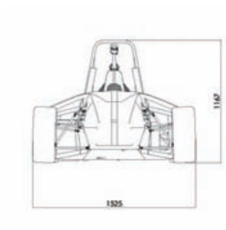
ELECTRONICS Cosworth Electronics data acquisition system

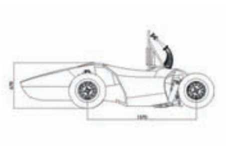
COBURG

University of Applied Sciences Coburg

Car 70 Pit 16 Germany







Founded in 2007, CAT-Racing enters the FSG competition with a strong third car called C10 Tiger. Our team has more than 50 members from nearly all courses of study. This season's biggest challenge was to build a new race car, considering the fact that most founder members finished their study. Almost 80 percent of our team consists of rookies. After last years weight reduction of nearly 100kg, we now focused on an improved engine, as well as on ergonomics. One of our main goals was to grant all potential drivers the best possible comfort. We've achieved that with an ergonomically shaped seat as well as with a multiple adjustment of the driving controls (pedals, steering system,etc.). CAT-Racing thanks everyone who made this project possible. We are looking forward to the 2010 racing series. For more information, please visit our website. (www.cat-racing.net)

FRAME CONSTRUCTION Tubular space frame with gusset plates

MATERIAL S255 JR steel round tubing

OVERALL L / W / H (mm) 2674 / 1524 / 1167

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1570 / 1290 / 1220

WEIGHT WITH 68kg DRIVER (Fr / Rr) 139 / 145

SUSPENSION Double unequal length A-Arm. Push rod actuated, horizontally orientated spring and damper

TYRES (Fr / Rr) 20,5 x 7,0-13 Hoosier R25B

WHEELS (Fr / Rr) 7,0 x 13, 5mm offset, 3pc Al/Mg rim

ENGINE Modified Yamaha R6 (RJ09)

BORE / STROKE / CYLINDERS / DISPLACEMENT 65,5mm / 44,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14,5:1

FUEL SYSTEM Student designed/built fuel injection system using Trijekt ECU

FUEL RON 98

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Chain pitch 520

DIFFERENTIAL Drexler FS Differential (clutch style), Universtiy Special modified

COOLING Student built radiator with one fan (pulling), electrical waterpump

BRAKE SYSTEM Floating, Cast Iron, hub mounted, 218mm OD 135mm ID

ELECTRONICS Electromagnetic shifter, CAN Bus communication

COTTBUS

Brandenburg University of Technology

Car 83 Pit 27 Germany

The development of the BTUtwo took our team two years and is our second race car. During the design process our main goal was to reduce weight. In comparison with our first car we saved over 100 kg of weight. In addition we increased the power of our engine to 90 PS. That was only possible with the powerful support of our sponsors. We would like to thank our sponsors for this season and hope work with all of them together in the next season as well.

FRAME CONSTRUCTION Tubular space frame

MATERIAL S355

OVERALL L / W / H (mm) 2698 / 1482 / 1180

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1610 / 1220 / 1140

WEIGHT WITH 68kg DRIVER (Fr / Rr) 139 / 169

SUSPENSION Double unequal length A-Arm. Pull (front), Push (rear) rod actuated spring and damper

TYRES (Fr / Rr) 7.0x20.5 R13 Hoosier R25A

WHEELS (Fr / Rr) 7.0x20.5 R13 Hoosier R25A

ENGINE Suzuki GSX-R 600 K5

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,5/1

FUEL SYSTEM Student des/built fuel injection, sequential using Walbro ECU

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 13000

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Chain Drive

DIFFERENTIAL Visco Lok limited slip differential

COOLING single sidepot mounted radiator

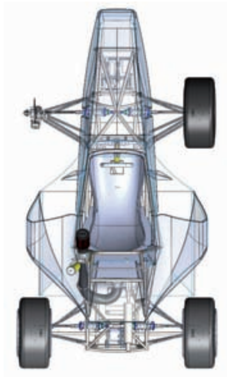
BRAKE SYSTEM 4- Disc system, adjustable brake balance, ISR 4-piston calipers front, 2-piston calipers rear

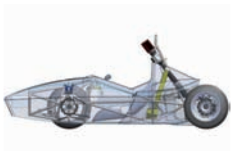
ELECTRONICS IP67 connectors, Multifuntional Steering Wheel, Electropneumatic Shifting System

DARMSTADT
University of Applied Sciences Darmstadt

The Formula Student Team Darmstadt (FaSTDa) will attend this year's Formula Student Germany event for the first time with its completely new race car, the „F10". Despite a budget cut by nearly 70% and a reduction of man-power we were able to design and build a completely new vehicle. Our major achievements were a significant weight reduction down to approximately 250kg (-20% compared to last year's car) and an increase in engine power and torque. Furthermore, the vehicle features a variety of innovative components, such as a completely revamped suspension geometry with carbon fibre A-Arms and bespoke uprights/wheel hubs, an optimized tube frame with increased stiff-ness and a custom pedal unit and steering wheel for top-level driver ergonomics. The whole team would like to thank all our sponsors for this year's great support!Regards FaSTDa

Car 109 Pit 7 Germany





FRAME CONSTRUCTION cold drawn steel tube construction

MATERIAL Stainless Steel 1020

OVERALL L / W / H (mm) 2688 / 2080 / 1138

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1250 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 121 / 138

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper

TYRES (Fr / Rr) 180/530-13 Kumho

WHEELS (Fr / Rr) 180/530-13 Kumho

ENGINE KTM LC4

BORE / STROKE / CYLINDERS / DISPLACEMENT 101mm / 78mm / 1 cylinders / 609cc

COMPRESSION RATIO 10,5:1

FUEL SYSTEM MPI, 1 injector, Bosch fuel pump, Trijekt ECU

FUEL 98 Octane Gasoline

MAX POWER DESIGN (rpm) 7500

MAX TORQUE DESIGN (rpm) 4000

DRIVE TYPE Chain

DIFFERENTIAL Qaife TorSen LSD

COOLING

BRAKE SYSTEM

ELECTRONICS

DARMSTADT
Technical University of Darmstadt

DART Racing participates in the Formula Student Germany since 2006. Over 40 highly motivated students are working on this years car, the epsilon2010. We hope to show the potential of our vehicle at the national competition in Hockenheim. Besides that sustainability and the sucessful enhancement of DART Racing as well as the further establishment of the project at TU Darmstadt are main drivers. Thorough analysis of the existing concepts lead to targeted designs which consider cost efficient manufacture while remaining high quality level. As in the years before DART Racing stands for innovative and progressive engineering design: The use of E 85 containing bioethanol for example does not only improve the fuel consumption but shows furthermore our dedication to sustainability and reduces our carbon footprint. DART Racing is looking forward to an interesting and hopefully successful Formula Student Germany competition.

Car 12 Pit 60 Germany

FRAME CONSTRUCTION CFRP Monocoque

MATERIAL carbon fibre / epoxy composite, aluminium honeycomb

OVERALL L / W / H (mm) 2815 / 1415 / 978

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1220 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 127 / 156

SUSPENSION „Double unequal length CFRP-wishbone. Pull rod actuated Cane Creek Double Barrel spring/damper units

TYRES (Fr / Rr) 185/40 R15 Pirelli student designed

WHEELS (Fr / Rr) 7 inch wide, 1 pc Al Rims student designed, 10 mm neg. offset

ENGINE Modified 2002 Suzuki GSX-R 600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14:01:00

FUEL SYSTEM Student designed and built; fully sequential, cylinder-selective dual stage fuel injection

FUEL E-85 ethanol

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain

DIFFERENTIAL Drexler Formula SAE special, limited slip

COOLING water cooled with ECU-controlled electric water pumps

BRAKE SYSTEM Student designed, water-jet cut, C-SiC, hub mounted, 200mm outer dia., 160mm inner dia.

ELECTRONICS Multifunctional Steering Wheel, Electropneumatic Shifting System, selfdesigned Telemetry System

DEGGENDORF

University of Applied Sciences Deggendorf

Car 73 Pit 38

Germany

Fast forest represents the UAS Deggendorf in formula student events. Founded in june 2008 our second season team consists of 30 active team members from every faculty of our university. Being in the second season the team put much effort into improving the dynamic characteristics of the first year car, the FF01 without accepting compromise in terms of reliability. Besides optimized power weight ratio we tried to the serve the driver with the most comfortable cockpit design possible: completely electronic operated gear shifting system, a lot of ellbow room and low steering forces. The car is developed to be driven by either gas or electrical power without having to make changes to the frame, the suspension or the cockpit. As we presented the best german business plan at the austrian formula student event last year our economic team is working really concentrated on an outstanding business idea to tie in with that success. You'll find further information on www.fastforest.de !

FRAME CONSTRUCTION Turbular space frame with carbon floor plate

MATERIAL 1020 and 4130 steel round tubing 5mm to 25mm dia

OVERALL L / W / H (mm) 2896 / 1358 / 1090

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1610 / 1236 / 1215

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 174

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally/vertical oriented spring and damper

TYRES (Fr / Rr) 205/510 R 13 34M Continental

WHEELS (Fr / Rr) Braid Formrace 16, 13x7J ET 18 one pice, alloy

ENGINE 2008 Yamaha YZF R6 RJ15 4 cylinder 599ccm

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13.1:1

FUEL SYSTEM Continental Injectors/Rail, sequential

FUEL fuel, 100 Ron

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 12000

DRIVE TYPE chain

DIFFERENTIAL Drexler limited slip

COOLING side pod mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM Magura cylinders, student designed disks, floating, hub mounted, 240mm diameter

ELECTRONICS free programmable BOSCH ECU, CAN-BUS system and self-developped steering wheel display, datalogging

DELFT

Technical University of Delft

Car 85 Pit 19

Netherlands

After ten years of evolution and revolution, the Delft University of Technology has designed the DUT10. Its predecessor won both (!) the design events in FSUK and FSG and also gained a second place at FSUK, so the expectations are quite high for the tenth car of the DUT Racing Team. With its carbon-fibre monocoque, one-cylinder fuel-efficient engine and student built data-acquisition system; the DUT10 is up for the challenge! Centered around the end-user, the amateur weekend racer, the design focuses on the needs, wants and limitations of this particular driver. The design of this year is based on performance, safety and fuel-efficiency. The sixty students working on the DUT10 are eagerly waiting for the competition to show what they have built and learned this year!

FRAME CONSTRUCTION Vacuum infused three piece full monocoque, integrated carbon front bulkhead

MATERIAL Carbon and Twaron fibres, Axson 5015 Epoxy resin, Corecell T400 and Rohacell RIST51 foam

OVERALL L / W / H (mm) 2507 / 1407 / 1081

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1540 / 1200 / 1175

WEIGHT WITH 68kg DRIVER (Fr / Rr) 100 / 113

SUSPENSION Unequal length A-Arms. Pull rod actuated Öhlins TTX 25 FSAE spring/damper units

TYRES (Fr / Rr) 18x6-10 LC0 Hoosier

WHEELS (Fr / Rr) Student designed 10 inch x 170mm -17mm offset, 7075 aluminum centers bolted on CFRP shell

ENGINE 2007 Yamaha WR450F

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 63mm / 1 cylinders / 449cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM Student designed/built dual injector sequential fuel injection system based on VEMS

FUEL E-85 Bio-Ethanol

MAX POWER DESIGN (rpm) 8000

MAX TORQUE DESIGN (rpm) 6500

DRIVE TYPE Chain #520

DIFFERENTIAL Drexler Formula Student limited slip differential

COOLING Chassis mounted Yamaha Grizzly quad radiator in sidepod with ecu controlled electric fan

BRAKE SYSTEM 4-Disk system, full-floating rotors with 191mm diameter, adjustable brake balance, AP 4226 calipers

ELECTRONICS Multifunctional Steering Wheel, Electropneumatic Shifting System, student designed DAQ system

DORTMUND

Technical University of Dortmund

Car 48 Pit 51 Germany

The GETracing team has been an inherent part of the University of Technology Dortmund for four years now. Originally started as a project with a strong relationship to the department of mechanical engineering it has developed into a team not only consisting of mechanical engineers but also electrical and industrial engineers. Right now, it has thirty highly motivated graduate and undergraduate members of all semesters. The first two cars that entered competition from 2006 till 2008 were driven by single piston engines, but in 2009 the team dared to do a complete redesign featuring the four cylinder engine from a Yamaha R6 motocycle. This year, the evolutionary design process has been continued. Especially the frame construction has been optimized in order to save weight. Moreover, telemetry development has been pushed on, leading to better car setup possibilities. All in all, the FS210 is expected to be our best performing car with a net weight of 230kg and 60kW engine power.

FRAME CONSTRUCTION Tubular steel space frame optimized for torsional stiffness using evolutionary algorithms.

MATERIAL 25CrMo4 tube, TIG welded, annealed. Aluminium honeycomb crashbox with aluminium Anti-Intrusion-Plate

OVERALL L / W / H (mm) 2840 / 1365 / 1198

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1208 / 1130

WEIGHT WITH 68kg DRIVER (Fr / Rr) 125 / 188

SUSPENSION Double unequal length A-Arm. Push rod actuated. Horizontally oriented spring and damper.

TYRES (Fr / Rr) 20.5x6-13 R25B Hoosier

WHEELS (Fr / Rr) 20.0x7.5-13 R25B Hoosier

ENGINE Yamaha YZF-R6 RJ05, 16VDOHC, watercooled

BORE / STROKE / CYLINDERS / DISPLACEMENT 65,5mm / 44,5mm / 4 cylinders / 600cc

COMPRESSION RATIO 12,4:1

FUEL SYSTEM Full-sequential injection & ignition,

FUEL Gasoline 100 RON

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE 4-speed stock gearbox & 520 chain

DIFFERENTIAL Drexler limited slip multiplate/clutch pack differential, 35Nm preload, adjustable

COOLING right side pod mounted radiator with electrical controlled electric fan

BRAKE SYSTEM Student-built floating & vented brake discs, calipers front: 2 piston, rear 4 piston, balance bar

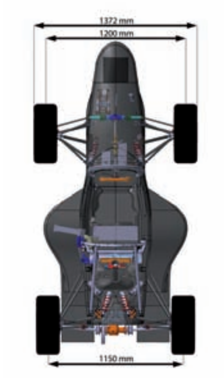
ELECTRONICS Driver information system via OLED-Display, Datalogging for all sensors, CAN-bus for communication

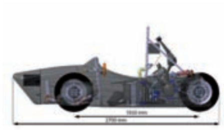
DRESDEN

Technical University of Dresden

Car 44 Pit 4 Germany

It's the third racing season for Elbflorace, the Formula Student Team of Dresden University of Technology. Our team is named after our home town's namesake "Elbflorence", which assigns Dresden as one of the most beautiful cities along the river Elbe. The dream of constructing and manufacturing a racing car started in 2006 by just 18 people. Now the team consists of more than 50 students. After successfully participating in several formula student events in 2008 and 2009 we proudly present the 2010 car: "Ardor". The style is defined by the one-piece monocoque. Furthermore it is without any varnish and the surface is only polished. Many other components, such as the airbox, the wishbones and the steering wheel, are made of extra light carbon fibre reinforced plastic as well. One more highlight is our progressive steering system. Manufacturing "Ardor" was only possible with a dedicated team and the help of our sponsors and supporters. Be anxious to take a look at car No. 44!





FRAME CONSTRUCTION CFRP Sandwich Monocoque

MATERIAL T700, Carbon Twill 200g/m² fabric; Carbon UD 140g/m², Nomex/Alu - honeycomb sandwich panel

OVERALL L / W / H (mm) 2700 / 1372 / 1119

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 142 / 142

SUSPENSION Double unequal length A-Arm. Fr: Pull - Rr: Push rod actuated horizontal oriented spring and damper

TYRES (Fr / Rr) 205/510 R13 Continental / 205/510 R13 Continental

WHEELS (Fr / Rr) 7x13, 0mm offset, 1pc Al Rim / 7x13, 0mm offset, 1pc Al Rim

ENGINE Honda CBR 600 PC 37

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,2

FUEL SYSTEM student designed/built fuel injection system using Trijekt plus ECU sequential

FUEL petrol RON 100

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE chain

DIFFERENTIAL Drexler limited slip differential formula student 2010

COOLING side pod mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4 Disk system, Husqvarna Rotors 220mm outer diameter, 160mm inner diameter, adjustable brake balance

ELECTRONICS Electronic Shifting System, Datalogging with self developed CAN-BUS,

ERLANGEN

University of Erlangen-Nuremberg

Car 74 Pit 17 Germany

The “FAUmax gamma” is the result from consist refinement and two years experience of competing at formula student events. In fact, our Team designed an entire new race car, as no part remained unchanged. We placed a lot of emphasis on improving the package of all assemblies to keep the car compact while concentrating and lowering masses. As a result, our E85 fuelled V2 engine is mounted transverse on a milled aluminium structure which also acts as rear end carrying the rear suspension while a conventional tubular steel frame forms the front end. This way we could also replace the fault-prone chain drive with a highly reliable hypoid gear drive with integrated limited slip differential. We also improved our skills in light weight engineering, designed and made several parts from CFRP, e.g. wishbones, pull-rods, drive shafts and bodywork.

FRAME CONSTRUCTION Front: Tubular space frame with various thickness, Rear: milled aluminium design

MATERIAL Front: S355, rear: aluminium

OVERALL L / W / H (mm) 1600 / 1367 / 1167

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1580 / 1240 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 126 / 142

SUSPENSION Unequal length A-Arms. Pull rod actuated ZF Sachs racing dampers with H&R springs

TYRES (Fr / Rr) 20x7.5-13 R25B Hoosier

WHEELS (Fr / Rr) Braid 13

ENGINE 2008 Aprilia SXV 550

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 54mm / 2 cylinders / 553cc

COMPRESSION RATIO 13.5:1

FUEL SYSTEM Student designed/built fuel injection system using DTAfast S80Pro ECU

FUEL E-85 ethanol

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Cardan shaft, flexible disc, hypoid gear

DIFFERENTIAL Drexler limited slip differential

COOLING Student designed aluminium radiator in left sidepod

BRAKE SYSTEM student design adjustable adjustable bias bar, 4 CSiC rotors, 4 Behringer Calipers

ELECTRONICS Traction Control, electronical shift & clutch, electrical driven super charger, bluetooth system

ESSLINGEN

University of Applied Sciences Esslingen

Car 94 Pit 23 Germany

The Rennstall Esslingen was founded in 2006 and it is now one of the largest projects at the University of Applied Sciences Esslingen. Stallardo ,10 – the name of the 4th race car of Rennstall Esslingen will be a milestone in the history of the team. A new era starts with the choice of a new engine concept. The 4 cylinder transversely mounted engine forced a completely new car. With a team of almost 90 students the Rennstall designed and built the new car to be at least as successful as its predecessor. The 4th race car out of the hands of the Rennstall is the next step in the tradition of high quality manufactured, technical unique and stunning race cars from Esslingen. The Stallardo ,10 is the consequence of hard work, experience, smart ideas, reducing weight, passion for beautiful racecars, interdisciplinary cooperation and an unique team spirit combined with aplenty of good mood!

FRAME CONSTRUCTION Tubular Space frame

MATERIAL 1020 steel round tubing 10mm to 30mm diameter /carbon fibre floor pan

OVERALL L / W / H (mm) 2830 / 1435 / 1120

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1630 / 1240 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 138 / 144

SUSPENSION Double unequal length A-Arm. Pull rod actuated Ohlins TTX 25 4-way adjustable dampers

TYRES (Fr / Rr) 178x50 R13, Hoosier R25B / 178x50 R13, Hoosier R25B

WHEELS (Fr / Rr) 7x13, 31mm positive offset, 2 pc Al Rim / 7x13, 31mm positive offset, 2 pc Al Rim

ENGINE Honda CBR600 RR (PC37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.7:1

FUEL SYSTEM intake tube injection, 100mm from valves,

FUEL 95 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10100

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE 520 chain

DIFFERENTIAL Salisbury type clutch pack differential from Drexler

COOLING Student designed system, aluminum radiator left side, electric fan

BRAKE SYSTEM 4-Disk, self developed rotors, front: 4-piston CRG Caliper, rear; 2-piston CRG caliper

ELECTRONICS BOSCH MS4 ECU, Electro mechanical shifting system, Souriau motorsport connectors,

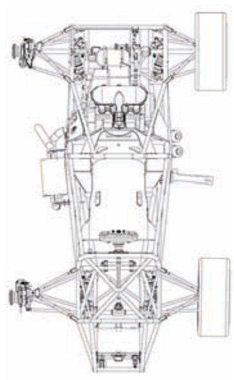
FREIBERG

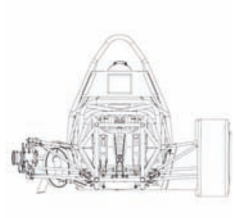
Technical University of Freiberg

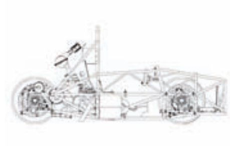
Car 76 Pit 21

Germany

Per May 2010, the Racetech Racing Team introduced its fourth racecar to the public. 45 students were involved in the design of the RT04. The overall design strategy was to gain stiffness and power while saving weight. All parts within the suspension assembly where designed with the help of CAE-tools, while greater focus was laid on kinematic issues. The body shell is made of magnesium sheets as a unique and reasonable feature within the Formula Student. Intense simulation and validation activities around the engine unit lead to increased power. The drivetrain is based on self designed tripod joint shafts, using electron beam technology for joining and hardening. To ease up the handling of all electronic devices, they were modularized through the help of CAN Bus technology. A Live-Telemetry System is installed and helps to survey the car's performance. We are looking forward to a great competition and discussing our solutions with judges and competing teams.







FRAME CONSTRUCTION tubular Spaceframe

MATERIAL 25CrMo4 steel, round tubing, 12 to 30mm in diameter

OVERALL L / W / H (mm) 2715 / 1420 / 1070

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1240 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 144 / 144

SUSPENSION double unequal length A-Arms. Pull rod actuated spring-damper unit (Ohlins TTX 25)

TYRES (Fr / Rr) 20.5x7.0-13, Hoosier R25B

WHEELS (Fr / Rr) 20.5x7.0-13, Hoosier R25B

ENGINE 2006 Honda CBR600RR (PC 37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,2:1

FUEL SYSTEM sequential intake tube injection

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE 525-chain

DIFFERENTIAL Drexler Formula Student, 25Nm preload

COOLING single side pod mounted radiator with pwm-regulated fan

BRAKE SYSTEM 4-disc system, brake bias electronically adjustable, Tilton mastercylinders, ISR calipers

ELECTRONICS Multifunctional Steering Wheel, Traction Control, CAN Bus, electropneumatic shifting, Live-Telemetry

GLASGOW

University of Strathclyde

Car 15 Pit 12

United Kingdom

University of Strathclyde Motorsport are pleased to present USM X. With a team currently consisting of 40 members and running on a purely extra curricular basis, substantial work has been put in to make USM X a more competitive package than the solid base laid out by USM 09. The team is overseen by senior experienced members that encourage younger students to design smaller components in sub-systems. This ensures that USM has a continuous progression of knowledge within the team to maintain a high standard. Validation of components on USM X has been achieved through dynamic testing. New developments for the team this year include aluminium hubs with steel inserts, resulting in a 50% reduction in mass and a Drexler differential with custom sprocket carrier. Other highlights of USM X include increased compression ratio.USM would once again like to thank all our sponsors for backing the project.

FRAME CONSTRUCTION TIG welded steel spaceframe

MATERIAL Mild steel

OVERALL L / W / H (mm) 2533 / 1386 / 1136

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1535 / 1200 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 146 / 146

SUSPENSION Unequal length double wishbone suspension with push and pull rod actuated spring-damper units.

TYRES (Fr / Rr) 20x7-13 R2696 Goodyear/20x7-13 R2696 Goodyear

WHEELS (Fr / Rr) OZ Superleggera 13x7/OZ Superleggera 13x7

ENGINE Honda CBR 600 F4i

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,8:1

FUEL SYSTEM DTA S60 Pro engine management with sequential injection

FUEL 98 octane petrol

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE 525 chain

DIFFERENTIAL Drexler clutch pack limited slip differential

COOLING Single radiator with fan on left hand side

BRAKE SYSTEM 4 disk system with 4-piston calipers at the front and 2-piston calipers at the rear.

ELECTRONICS Shift and rpm dash display with warning lights. Launch control from ECU

GRAZ

Technical University of Graz

Car 9 Pit 48 Austria

We mainly focus on designing and building a lightweight, powerful, innovative and aesthetic car, which is competitive in every discipline, easy adjustable for changes of driver, track, weather, etc., easy maintainable and safe. Therefore advanced materials such as carbon fibre, titanium, aluminium alloys and high alloyed steels are used for designing and developing the single parts. For getting closer to the limit of the materials, many simulations and calculations as well as physical tests are done. Innovative systems invented by its predecessors where further improved and new solutions where found for better maintainability, easier setup adjustments and ergonomics. Reliability and different setups are the reason for a certain period of testing prior the competitions. The TU Graz Racing Team can look back to 6 years of experience, which mainly influenced the development of our 7th car, the TANKIA 2010 alias „Lucky #7", which will compete in all four European competitions.

FRAME CONSTRUCTION Carbon monocoque, two piece rear end

MATERIAL Carbon fibre prepregs, Nomex and aluminium honeycomb and carbon inserts

OVERALL L / W / H (mm) 2784 / 1453 / 980

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1570 / 1220 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 121 / 127

SUSPENSION Unequal length A-Arms, Push/Pull rods and bell crank actuated KW damper and spring units

TYRES (Fr / Rr) 20.0x7.5 R13, Hoosier R25B/20.0x7.5 R13, Hoosier R25B

WHEELS (Fr / Rr) 7.0x13, self designed and built one piece carbon fibre rim

ENGINE Modified Yamaha R6 (RJ11)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13.7:1

FUEL SYSTEM student designed and built, fuel injection, 2-spray preparation

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE chain #520

DIFFERENTIAL multiplate limited slip differential, preloaded

COOLING twin side pod mounted radiators with thermostatic controlled electric fans

BRAKE SYSTEM 4-Disk system, carbon ceramic (C/SiC)brake discs, adjustable brake balance, AP Racing break calipers

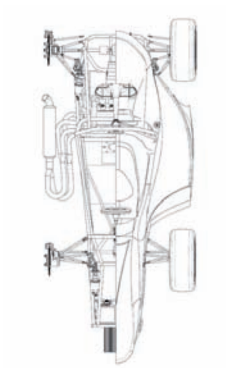
ELECTRONICS high sealed wiring harness, Multifunctional Steering Wheel, Electronical Shift and Clutch Actuator

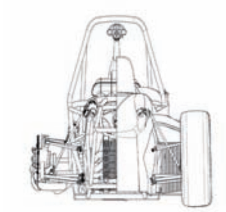
HAMBURG

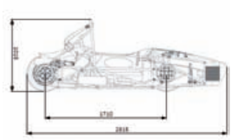
Helmut Schmidt University of Federal Armed Forces Hamburg

Car 72 Pit 40 Germany

Hamburg Helmut Schmidt University – University of the Federal Armed Forces Germany In November 2006 the Eleven-O-Six Racing Team was founded. Today our team represents one of the largest projects at our university. Our Eleven-O-Six Racing Team takes part in the FSG the third time. This year we proudly present the R.U.S.H.10, an operational race car with best driving performance. The team worked hard on the development. This year special attention was paid to the uprights, light weight construction and engine performance. More overall perfection will enrich the race experience. Our frame is only one example for our highly developed components of the R.U.S.H.10. We constructed a multi-tubular frame made of S235 steel which is also light weight, easy to produce and maintain. Also a new feature is the integrated iPhone Dashboard. Every year our race car sets new standards in performance which would not have been possible without the help of all supporters. Thanks to all those involved.







FRAME CONSTRUCTION Tubular space frame

MATERIAL 235 Steel

OVERALL L / W / H (mm) 2815 / 1325 / 1015

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1710 / 1125 / 1138

WEIGHT WITH 68kg DRIVER (Fr / Rr) 146 / 157

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 205/510 R13 Continental 34M FORM.STUD. DRY/205/510 R13 Continental 34M FORM.STUD. DRY

WHEELS (Fr / Rr) 6x13 ET 10,8 Braid Formrace 8/6x13 ET 10,8 Braid Formrace 8

ENGINE Honda CBR600 FS4i

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:01:00

FUEL SYSTEM student des/ built, fuel injection

FUEL 100 octane

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Chain drive

DIFFERENTIAL GKN Driveline bevel gear differential

COOLING single radiator with thermostatic controlled electric fan

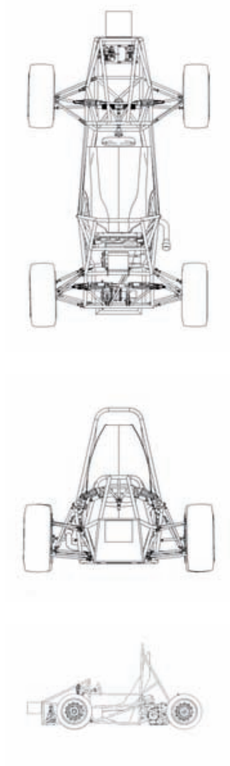
BRAKE SYSTEM 4x250mm stainless steel rotors, adjustable break balance, AP Racing break caliber

ELECTRONICS Multifunctional steering wheel, Electronic Shifting System, integrated iPhone self designed Dashboar

HANNOVER

University of Hannover

Car 26 Pit 15 Germany



HorsePower Hannover founded in 2007 is the Formula Student Team of the University of Hannover in Lower Saxony, Germany. After having some technical difficulties in the last year's season we start this year with the second car of our team and hope to improve our result. Because we have at least three times as many members than in 2009, we had enough manpower to design a whole new car. Improvements of the RH10 have been made in nearly every component. The most important ones are completely new suspension kinematics, a lighter tubular steel space frame, a pneumatic clutch system and more powerful Yamaha YZF-R6 engine. Also the body work was totally redesigned to get a more individual and recognizable appearance. We are really looking forward to this event and are full of belief and hope of having more success this year.

FRAME CONSTRUCTION One piece tubular steel spaceframe

MATERIAL E355

OVERALL L / W / H (mm) 2558 / 1380 / 1206

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1540 / 1220 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 136 / 167

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper

TYRES (Fr / Rr) 205 R13 Continental

WHEELS (Fr / Rr) 7.0x13 BBS Al-Mg Rim, central locking

ENGINE Yamaha YZF-R6 R05 four stroke in line four

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,4:1

FUEL SYSTEM Yamaha multi point fuel injection

FUEL 98/100

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 7340

DRIVE TYPE Chain

DIFFERENTIAL Drexler limited slip differential

COOLING single water-to-air heat exchanger with thermostatic controlled electric fan

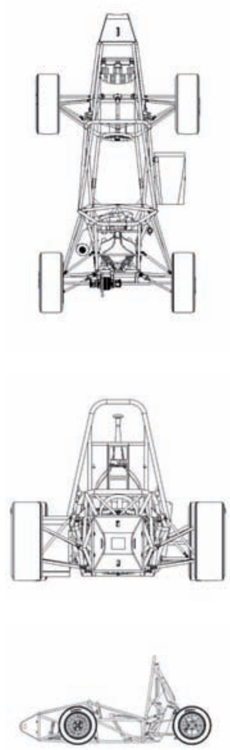
BRAKE SYSTEM Steel alloy, hub mounted, 220/210 mm dia. Lasered

ELECTRONICS self-designed multifunctional steering wheel, electropneumatic shifting system

HATFIELD

University of Hertfordshire

Car 2 Pit 49 United Kingdom



UH Racing returns to FSG for the 3rd year running. 2009 saw the team take second overall - the highest placing for a UK team at FSG ever.UH13, UH Racings 2010 competitor sees improvements to the suspension, with new Penske shocks and wider Hoosier tyres along with completely revised geometry and all-round ARB's. Further engine development, including a new plenum design and further dynometer testing has yielded a more usable power range and more reliable engine package. A more reclined driver position and better driver control ergonomics mean improved driver performance. A completely new inhouse designed differential accompanies last years drivetrain developments to make the best drivetrain combination yet seen on a UH racing car.UH Racing again comes to Germany with strong hopes for another top 5 result!

FRAME CONSTRUCTION Two piece steel space frame with removable rear subframe. Bonded fibrelam floor

MATERIAL CDS steel tube

OVERALL L / W / H (mm) 2595 / 1357 / 1196

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1540 / 1200 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 131 / 143

SUSPENSION Unequal length wishbones. Push rod actuated Penske spring/damper units.

TYRES (Fr / Rr) 20.5 x 7 - 13 R25B Hoosier

WHEELS (Fr / Rr) Barnby 3-piece al rim with 6082-T6 billet machine centre, 13" x 178mm, 40.5mm offset

ENGINE 2006/07 Yamaha YZR-R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.8:1

FUEL SYSTEM Student designed/built fuel injection system using Life Racing ECU

FUEL 98 octane

MAX POWER DESIGN (rpm) 13500

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Chain #520

DIFFERENTIAL Student designed Salisbury type limited slip differential.

COOLING Single side pod mounted radiator 360x260x30mm core 10" temp controlled electric fan

BRAKE SYSTEM Student designed, laser cut and milled from 304 stainless steel, hub mounted, 220mm dia.

ELECTRONICS Flat shift, Variable traction control, Variable launch control, wireless telemetry.

HELSINKI

Helsinki Metropolia University of Applied Sciences

Car 14 Pit 8 Finland

HPF010 is the 8th Formula Student Car designed and engineered by Metropolia Motorsport. The new car uses more composite materials in order to increase the torsional stiffness of the frame and to make parts even lighter. Power is produced by modified Yamaha R6 engine. The engine has been tested and tuned on the engine dyno to verify the great results got from the simulations. The variable length intake system provides wide powerband and great torque. The dry sump system guarantees lubrication even in hard corners. Increased power and torque are transferred to a Drexler LSD via modified 4-speed pneumatic gearbox. A steeltube space frame is reinforced with a carbonfibre/nomex-honeycomb floor panel, sideplates and carbonfibre rear-end monocoque. Composite materials can also be found in components like the drivers seat, steering wheel and driveshafts. Design of the bodywork was as challenging as always. The bodywork was designed using the philosophy we always have, style and smoothness.

FRAME CONSTRUCTION Steel tube space frame with bonded carbon fiber floor panels

MATERIAL Ruukki FORM 800 steel tube

OVERALL L / W / H (mm) 2715 / 1430 / 1225

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1610 / 1215 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 122 / 144

SUSPENSION Unequal length A-Arms. Pull rod/push rod actuated Cane creek double barrel spring/damper units

TYRES (Fr / Rr) Hoosier R25B 20.5 x 7.0-13

WHEELS (Fr / Rr) 13

ENGINE Yamaha R6 2009

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,1:1

FUEL SYSTEM Motec M880, sequential fuel injection

FUEL 99 octane gasoline

MAX POWER DESIGN (rpm) 10700

MAX TORQUE DESIGN (rpm) 8300

DRIVE TYPE 428 Single row chain drive

DIFFERENTIAL 2010 Drexler limited slip differential, 6 different ramp angle setups

COOLING Single aluminium radiator on sidepod, PWM controlled fan and water pump

BRAKE SYSTEM Student designed, modified 7075-T6-Al, laser cut and ground from ST52 steel, hub mounted, 195mm dia.

ELECTRONICS Multifunctional steering wheel, electropneumatic shifting system, Motec PDM, CAN bus

ILMENAU

Technical University of Ilmenau

Car 31 Pit 64 Germany

The TSC-01B was designed by Team Starcraft, the Formula Student team of the Technical University of Ilmenau. Thirty-five active members from all kind of semesters from engineering graduation courses as well as from economical ones are involved in that association. Its mutual intention is to enrich the students life with a challenging and practical activity, which also involves fun. Our first vehicle, the TSC-01, was already accomplished in October 2009, which has been improved until now to the TSC-01B. It is distinguished by its reliability and safety as well as its exchangeable rear frame with drive chain. This frame can be removed by only four screws and is so laying a foundation for the conversion to an electric vehicle. The current drive concept represents a light weight, but yet powerful 450ccm single cylinder engine. We are glad to be free to represent the Technical University of Ilmenau as well as our sponsors in the Formula Student and are eager for success at the competition in 2011.

FRAME CONSTRUCTION tubular space frame made of steel

MATERIAL S235JR mild steel tube cold drawn seamless

OVERALL L / W / H (mm) 2790 / 1524 / 1154

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1646 / 1524 / 1471

WEIGHT WITH 68kg DRIVER (Fr / Rr) 149 / 139

SUSPENSION Double unequal length A-Arm. Push rod (Rr), pull rod (Fr) actuated angular oriented spring & damper.

TYRES (Fr / Rr) 20.5x7.0-13 D79 Dunlop / 20.5x7.0-13 D79 Dunlop

WHEELS (Fr / Rr) 5,5 inch wide, 1 pc Al Rim, 38mm offset / 5,5 inch wide, 1 pc Al Rim, 38mm offset

ENGINE Modified KTM 450 SMS

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 64.4mm / 1 cylinders / 449cc

COMPRESSION RATIO 12.0:1

FUEL SYSTEM Student built, fuel injection

FUEL 95 octane unleaded

MAX POWER DESIGN (rpm) 8500

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE Chain #520

DIFFERENTIAL Torque sensitive limited slip bevel Torsen typ B

COOLING Twin side pod mounted radiators with thermostatic controlled electric fans

BRAKE SYSTEM 3-Disk System,adjustable brake balance, Tokico 45150-MEL-023 calipers

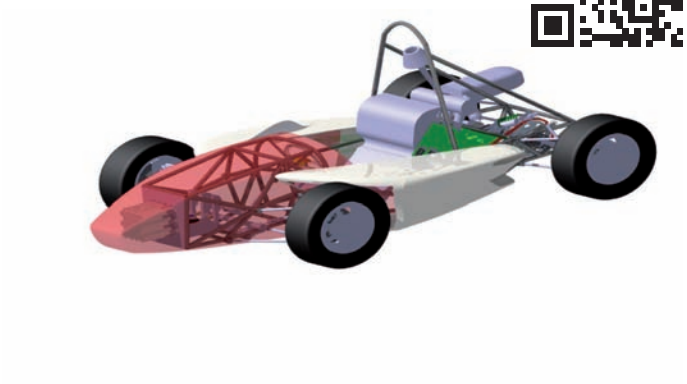
ELECTRONICS wiring harness sealed to IP67, multifunctional steering wheel and dash, electronic shifting system,

ISFAHAN

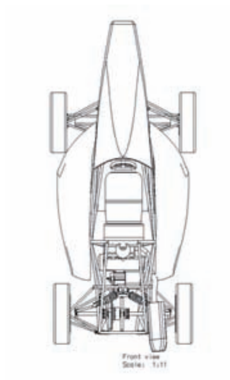
Technical University of Isfahan

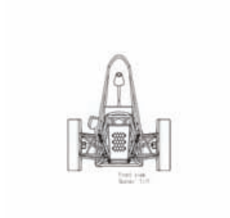
Car 95 Pit 78

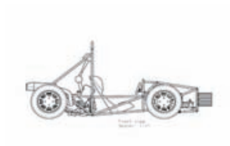
Iran



IUT Racing Team consists of 9 eager Bs students and some teammates, studying mechanical , electrical and industrial engineering. After discussions in subgroups about technical and non-technical matters , finance manager , technical advisors will observe it and finally the team leader will make the final decision. Key points of our car : lighter frame and body, reducing drag, improving torsional stiffness, better suspension and steering specifications , adjustable Ackerman and Camber .Better engine performance and good handling. Our main goal in designing the car was safety and respecting new rules. We tried to learn workgroup, time and budget managing, improving our knowledge in designing and manufacturing, making ourselves more efficient skillful engineers with enough ability for industrial projects.







FRAME CONSTRUCTION Steel tube space frame with aluminium floor panels

MATERIAL 1020 steel tube - Different Thicknesses (2.5 mm , 2mm , 1.5 mm & 1mm),TIG and MAG welded

OVERALL L / W / H (mm) 2798 / 1402 / 1162

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1250 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 140 / 180

SUSPENSION Unequal length A-Arms. Pull rod actuated Cane Creek spring/damper units

TYRES (Fr / Rr) 20.5x6-13 Hoosier/20.5x7-13 Hoosier

WHEELS (Fr / Rr) 6 inch wide, 13 inch diameter, one piece Aluminium

ENGINE Honda CBR RR 600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:01:00

FUEL SYSTEM Student designed/built fuel injection sequential system using Haltech PS1000 ECU

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain #530

DIFFERENTIAL Chain-drive sealed Quaife ATB Helical LSD differential

COOLING One side Honda CBR600 radiator mounted in duct

BRAKE SYSTEM 4-Disk system, self developed rotors with 220mm diameter, adjustable brake balance,

ELECTRONICS

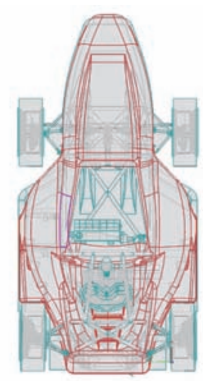
KAISERSLAUTERN

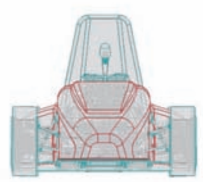
Technical University of Kaiserslautern

Car 64 Pit 57

Germany

The Kaiserslautern Racing Team was founded in the year 2007 at the Technical University of Kaiserslautern. Today, we are working as a cooperation between students of Technical University and University of Applied Sciences Kaiserslautern. In the first year, we competed in the events in Silverstone, Hockenheim and Fiorano and were able to finish endurance in Hockenheim and Fiorano. In our second year, we took part in the events in Hockenheim and Varano de' Melegari, which will also be the events we will take part in this year. This season, we are using a trijekt-ECU in order to get full control over injection and ignition of our engine. Our airbox is CFD-optimized and has no moving mechanical parts.Our suspension is fully adjustable to the specific race conditions and to find the best setup during testing. Instead of a normal Battery, we are using a FeLiPo-accumulator, which provides a high power-density at very low weight. We thank all our sponsors for supporting us!





FRAME CONSTRUCTION Tubular space frame

MATERIAL S355J2+N steel round tubing 10mm to 25mm dia

OVERALL L / W / H (mm) 2763 / 1342 / 1201

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1558 / 1190 / 1160

WEIGHT WITH 68kg DRIVER (Fr / Rr) 169 / 169

SUSPENSION Double unequal length A-Arm. Push-/Pullrod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20,5x7 R13, Hoosier R25B

WHEELS (Fr / Rr) 6x13, 2,5 in backspacing, 3 pc Al/Mg rim

ENGINE 2005 Suzuki GSX-R 600 4 Cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 15:01:00

FUEL SYSTEM Student designed/built fuel injection system using Trijekt ECU, sequential

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE 13 mm chain drive

DIFFERENTIAL Drexler, clutch pack limited slip, 125Nm preload

COOLING side pod mounted radiator with thermostatic controlled electric fan, electrical water pump

BRAKE SYSTEM brembo calipers: - 4 piston caliper / front, 2 piston caliper / rear, water-cutted brake discs

ELECTRONICS RealTime operating system CAN-bus Sensors: Acceleration, Gyration, GPS, etc

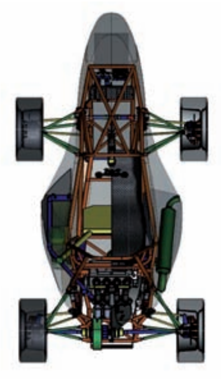
KIEL

University of Applied Sciences Kiel

Car 53 Pit 46

Germany

Raceyard Kiel, the northernmost of the German Formula Student Teams, started to participate in Formula Student Events in 2006, when the Team made an impressive debut to the Hockenheim ring. In 2009, the team completed its most successful season so far, finishing 11th in Silverstone and winning the acceleration event both in Silverstone and Hockenheim. Having proven that Raceyard can build vehicles that go fast in a straight line, our goal for the 2010 competitions is to improve cornering capabilities. The team had gained a lot of knowledge in this competition, so we are confident to achieve our goals and get our footprint among the top 10 teams in the European FS events. In order to improve the performance in dynamic events , the suspension of the vehicle had to be changed drastically. The main changes include the choice of new tyres and the reduction of the wheelbase. We would like to thank all our sponsors for their magnificent support! And always remember: we are NORDISH BY NATURE



FRAME CONSTRUCTION Tubular spaceframe

MATERIAL Steel 25CrMo4/AISI 4130

OVERALL L / W / H (mm) 2785 / 1405 / 1053

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 133 / 145

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper (coilover).

TYRES (Fr / Rr) 7.0 / 20.0 - 13, Avon A50 front and rear

WHEELS (Fr / Rr) 7.0x13, 18mm offset, 5 pc hollow Al Rim front and rear

ENGINE Modified Honda CBR600RR (PC37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14:01:00

FUEL SYSTEM Student designed full sequential fuel injection system using Kawasaki Injectors and Walbro ECU

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8300

DRIVE TYPE Chain drive

DIFFERENTIAL GKN Salisbury type limited slip differential in lightweight aluminium housing

COOLING Single radiator with dual fans mounted in left sidepod

BRAKE SYSTEM 4-Disk system with identical calipers and brake cylinders for all wheels, balanced by disc diameters

ELECTRONICS Temperature and enigine monitoring via Bluetooth, electric shifting system

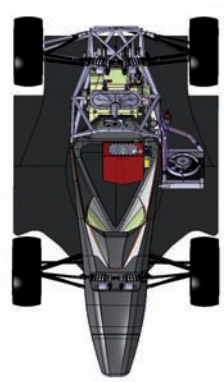
KÖLN

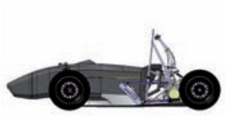
University of Applied Sciences Köln

Car 7 Pit 43

Germany

After mean success in 2007 and 2008, the 2009 Season of Formula Racing Cologne was very successful. While competing in Silverstone the CC09 made its first meters in the home of British Motorsport. During the endurance run we saw a fast and nearly reliable car, and won the „Best individual Driver" Award. For Hockenheim we merged out the problems noticed in England and finally reached our aim - the overall top 10. With the most powerful engine we won the „Best Dynamometer Performance" Award. We are very happy with the other results and look forward to the next season. For 2010 the CC-X will be a straight evolution of the 2009 car. The main goals are: saving weight, increasing reliability, reinforcing the engine and tuning the suspension. At least we want to defend the results of 2009, raise our performance and our professional appearance. In 2010 the UAS Cologne also attends in the Formula Student Electric for the first time with the 2008 car modified to the rules of FSE.





FRAME CONSTRUCTION CFRP Monocoque front, Tubular space frame rear

MATERIAL 15CDV6, Prepreg with aramid honeycomb

OVERALL L / W / H (mm) 2710 / 1420 / 1055

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1216 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 133 / 151

SUSPENSION Double unequal length A-Arms. Push rod actuated efficently oriented spring and damper

TYRES (Fr / Rr) 20.5 x 7.0-13, Hoosier R25B / 20.5 x 7.0-13, Hoosier R25B

WHEELS (Fr / Rr) 7x13, -1,9mm offset, 3 pcs. BBS Al Rim / 7x13, -1,9mm offset, 3 pcs. BBS Al Rim

ENGINE 2005 Yamaha R6 5SL

BORE / STROKE / CYLINDERS / DISPLACEMENT 66mm / 45mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.4:1

FUEL SYSTEM Bosch MS4 Sport fuel injection, sequential

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10800

MAX TORQUE DESIGN (rpm) 9600

DRIVE TYPE Single 428 chain

DIFFERENTIAL Drexler Clutch Pack Limited Slip Differential

COOLING side pod mounted radiator with thermostatic controlled electric fan

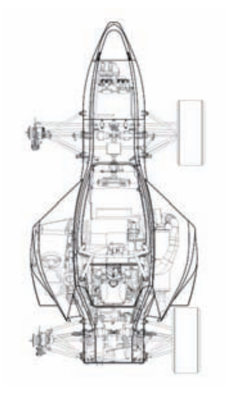
BRAKE SYSTEM 4-Disks, floating, Iron, hub mounted, 220mm diam., adjustable brake balance, 4 AP Racing Calippers

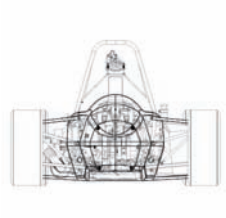
ELECTRONICS Multifunctional Steering Wheel, Electronic Shifting System

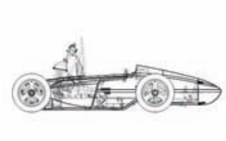
KARLSRUHE
Karlsruhe Institute of Technology

KA-RaceIng is the Formula Student Team of the KIT – Karlsruhe Institute of Technology, the former University of Karlsruhe (TH). The Team consists of 53 students from different fields of study, mainly mechanical, electrical and industrial engineering. Organised into mechanical or organisational sub teams, every team member has a task for which he is fully responsible. The KIT10 is the forth car of KA-RaceIng. The highlight of the KIT10 is the direct injection fuel system which we developed in the last two years. It is the first direct injection system in a Formula Student race car. With this system, we can reduce the fuel consumption and increase the torque in the middle rpm range KA-RaceIng would like to thank all its supporters which made it possible to build this race car. The Team is looking forward to another exciting and successful competition in Hockenheim.

Car 17 Pit 71 Germany







FRAME CONSTRUCTION Monocoque

MATERIAL Carbon fibre reinforced plastic

OVERALL L / W / H (mm) 2790 / 1425 / 998

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1220 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 122 / 149

SUSPENSION Unequal length A-Arms. Push/Pull rod actuated ZF Sachs damper with torsion springs

TYRES (Fr / Rr) 20.5x7-13 R25B Hoosier

WHEELS (Fr / Rr) Student made CFRP rim 7x13

ENGINE 2003 Honda CBR 600 PC 35

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 11,5:1

FUEL SYSTEM Student designed and built direct injection fuel system using Bosch ECU, fuel pressure up to 200 bar

FUEL 95 octane petrol

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE pneumatic actuated 4 speed gearbox

DIFFERENTIAL Drexler clutch pack limited slip differential, adjustable bias ratios

COOLING One side pod mounted radiator, electric fans and water pump w/ student des controller

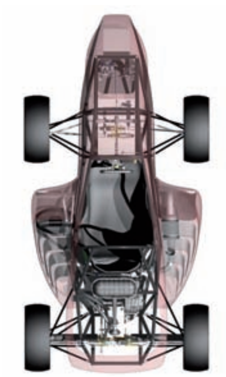
BRAKE SYSTEM Floating steel rotors, ISR 6 Pistons (front) / ISR 4 Pistons (rear), Continental ABS

ELECTRONICS Studend built modular and extensible, control units. Integrated telemetry functions. Easy to use.

KARLSRUHE
University of Applied Sciences Karlsruhe

Founded in 2006, High Speed Karlsruhe is entering its fourth year of competition in Formula Student Germany, and the third year in Formula ATA in Italy. About 40 students from different departments, mostly new to the project, worked together to develop the new car, the F-104.The design process of the F-104 focused on retaining and optimizing the strengths of last year's F-103, whilst improving the weaker points of the 2009 season. In order to achieve this objective, the team was restructured to improve the quality and speed of the concept and design phase of the project. The new car itself features several new ideas concerning its frame structure, suspension design and drivetrain, allowing for lower weight and better drivability.The F-104's attractive bodywork styling can already be called a trademark of the team.We would like to thank our sponsors and supporters, whose efforts are greatly appreciated, and are looking forward to a great competition in Hockenheim.

Car 36 Pit 52 Germany



FRAME CONSTRUCTION Tubular space frame

MATERIAL 1.0161, 1.0037 and 1.0570 steel round tubing 16mm to 26mm dia

OVERALL L / W / H (mm) 2730 / 1400 / 1140

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1585 / 1208 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 144 / 149

SUSPENSION Double unequal length A-Arm. Pull (front) / push (rear) rod actuated spring and damper (coil over).

TYRES (Fr / Rr) 20.0/7.0-13, Avon A50 / 20.0/7.0-13, Avon A50

WHEELS (Fr / Rr) 7x13, 18mm offset, 2 pc Al Rim / 7x13, 18mm offset, 2 pc Al Rim

ENGINE Modified Honda CBR 600 RR 4 cylinder (PC37)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13:01:00

FUEL SYSTEM OBR Euro-4, full sequential injection

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE Chain 520VM with X-Ring

DIFFERENTIAL Clutch pack limited slip, adjustable preload and bias ratio

COOLING Left side pod mounted water and oil radiator with PWM controlled electric fan and water pump

BRAKE SYSTEM 4-Disk, self developed rotors, 240mm diam., driver adjustable brake balance, AP-Racing calipers

ELECTRONICS Electropneumatic clutchless shifting, adjustable traction control, multifunctional dashboard

LEMGO

University of Applied Sciences
Ostwestfalen-Lippe

Car 101 Pit 70

Germany

The OWL Racing Team is a team of young, motivated and ambitious students of various specializations, whose main goal was and still remains to construct easily accessible racing car able to compete on the highest levels of Formula student competitions. The project was launched in early 2009 by the group of young engineers. In spite of this being our first season, the team has managed to get the place in top 20 at the event in Italy and gain the title of the best newcomer team. None of it would have been possible without the dedicated support of the sponsors that the team has managed to acquire, among which are the HS OWL, BSS. After the successful run in the 2009 season, the OWL racing team was determined to do all in its power to improve in every aspect. This year we've managed to create a more diverse team; gain the support of new companies like K&E and H&R; improve the major technical issues in creating a new car, while still keeping the innovative and easily affordable approach.

FRAME CONSTRUCTION Front and rear tubular space frame

MATERIAL E355 +N / E355 +C diameter from 20 to 25 mm

OVERALL L / W / H (mm) 2700 / 1270 / 1108

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1558 / 1250 / 1207

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 175

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 160 530 R13 , Avon

WHEELS (Fr / Rr) 7x13, 18mm offset, 3 pc Al Rim / 8x13, 32mm offset, 3 pc Al Rim

ENGINE 2006 Suzuki GSX-R 600 4 cylinder, modified

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,5:1

FUEL SYSTEM Student designed and built ,fuel injection (single)

FUEL gasoline ROZ 98

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 6000

DRIVE TYPE chain 5/8 x 5/16

DIFFERENTIAL torsen limited slip

COOLING one water to air cooler with thermostatic controlled electric fans left side before rear wheel

BRAKE SYSTEM Fixed, Steel, hub mounted, 220mm outer diam., 105mm inner diam.

ELECTRONICS Student designed powermanagement, electromechanical gear and live telemetry system

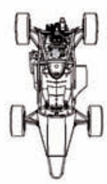
LOUGHBOROUGH

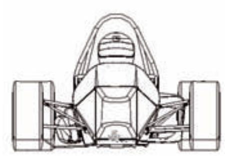
Loughborough University

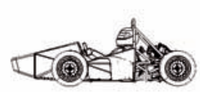
Car 20 Pit 29

United Kingdom

LUMotorsport is now entering its 8th year of competition and is now establishing itself as one of the top formula student teams in the UK. It is made up of 10 highly motivated individuals who fit designing, manufacturing and testing the car around their individual degree courses. Needless to say this involves lots of late nights, many pizzas and lots of fun along the way. This year's car LFS10 is based upon last year's excellent performing car LFS09 which was by far LUMs most reliable car to date. The main focus this year has been to remove over 20Kg from the car, improve performance and increase fuel economy. To achieve these targets, every component designed for LFS10 has been scrutinised to remove the most amount of weight. These components include new front uprights, new inlet manifold, simpler pedal box, improved chassis and suspension. With these improvements based upon a successful recipe we hope that LFS10 will become one of the top cars in this year's competition.







FRAME CONSTRUCTION Tubular Space Frame with Bonded Panels

MATERIAL 4130 Mild Steel Frame and CFRP Panels

OVERALL L / W / H (mm) 2758 / 1487 / 1005

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1574 / 1300 / 1130

WEIGHT WITH 68kg DRIVER (Fr / Rr) 140 / 148

SUSPENSION Double unequal length A-Arm Pull rod actuated horizontal Cane Creak dampers and springs

TYRES (Fr / Rr) 20.5x7.0 R13 Hoosier R25B

WHEELS (Fr / Rr) Braid 2-piece alloy 13"x8J 45mm negative offset

ENGINE Honda CBR600RR05

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:01:00

FUEL SYSTEM 4 Fittings used, bespoke 4 point sequential injection, MoTec M800 ECU

FUEL 98 Octane Petrol

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE Single Chain

DIFFERENTIAL Drexler Formula Student Multi-disk Differential

COOLING Side mounted radiator with CPRF duct with fn

BRAKE SYSTEM x2 outboard AP Racing CP4227 4-pot calipers front, x2 outboard AP Racing CP4226 calipers for rear

ELECTRONICS MoTec M800 ECU, driver display steering wheel

MADISON
University of Wisconsin-Madison

Car 69 Pit 35

United States

The University of Wisconsin-Madison is competing with a light, tube-frame, turbocharged, single-cylinder powered vehicle for 2010. Wisconsin Racing has been competing in Formula SAE for over 20 years, achieving 2 overall victories and 9 top ten finishes in the last 10 years. 2010 marks the second time that the team will compete at Formula Student Germany, the last being in 2007. The car, named the 210 is the second year of the single cylinder cars for Wisconsin. For this car, the team placed priority on improving the power and drivability of the turbocharged KTM engine as well as lowering the center of gravity of the car, while still maintaining the advanced electronics and speed that the team is well known for. Of course, none of this could be possible without the team's Gold sponsors: United Wisconsin Grain Producers, Midwest Composite Technologies, C.ideas, and Goodyear.

FRAME CONSTRUCTION Tubular Space Frame

MATERIAL 4130 Steel

OVERALL L / W / H (mm) 2558 / 1372 / 1080

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1524 / 1194 / 1168

WEIGHT WITH 68kg DRIVER (Fr / Rr) 119 / 140

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) Goodyear D2696 20x7x13 / Goodyear D2696 20x7x13

WHEELS (Fr / Rr) 6x13 3 Piece Al Rim, 25mm pos offset / 6x13 3 Piece Al Rim, 25mm pos offset

ENGINE KTM 525 XC

BORE / STROKE / CYLINDERS / DISPLACEMENT 100mm / 72mm / 1 cylinders / 565cc

COMPRESSION RATIO 10.4:1

FUEL SYSTEM Student des/built ,fuel injection, Bosch 5 deg offset pencil injectors, sequential

FUEL E85

MAX POWER DESIGN (rpm) 7600

MAX TORQUE DESIGN (rpm) 6000

DRIVE TYPE 520 X-Ring Chain

DIFFERENTIAL Drexler Formula Student

COOLING Twin side pod mounted radiators, dual pass, single fan

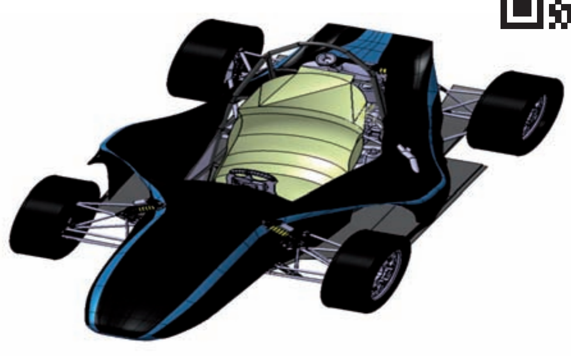
BRAKE SYSTEM Floating, Cross Drilled Cast Iron Rotors. Hat Mounted Front, CV Mounted Rear. AP Calipers

ELECTRONICS CAN enabled steering wheel, 2 way telemetry, electric brake bias, electropneumatic shifting, TC, LC

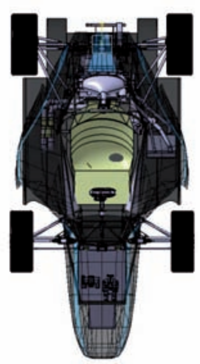
MADRID
Polytechnic University of Madrid

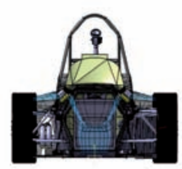
Car 28 Pit 45

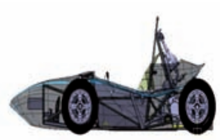
Spain



The Universidad Politecnica de Madrid Racing Team is one more time fighting in the Formula Student competition. This year we made an equilibrium between the things from past year and new items in order to develop the car. One of the radical changes in this car is the new pneumatic shifting system with the gears on the steering wheel including the clutch. The new car also incorporates a traction control adjustable in various positions from the cockpit. In suspension matters we achieved an anti-squad geometry and adjustable front RC. In order to reduce weight a lot of composite materials have been used like the new carbon fiber economical seat that gives more comfort to the driver. In the engine division we designed a new plenum and with many tests we´ve tried to smooth the torque-rpm curve. In the brakes aspect we made new fully student-designed up-rights in aluminum cast. Also we've include a Drexler and lighten end.







FRAME CONSTRUCTION cold drawn steel tube construction

MATERIAL Stainless Steel 1020

OVERALL L / W / H (mm) 2688 / 2080 / 1138

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1250 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 121 / 138

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper

TYRES (Fr / Rr) 180/530-13 Kumho

WHEELS (Fr / Rr) 180/530-13 Kumho

ENGINE KTM LC4

BORE / STROKE / CYLINDERS / DISPLACEMENT 101mm / 78mm / 1 cylinders / 609cc

COMPRESSION RATIO 10,5:1

FUEL SYSTEM MPI, 1 injector, Bosch fuel pump, Trijekt ECU

FUEL 98 Octane Gasoline

MAX POWER DESIGN (rpm) 7500

MAX TORQUE DESIGN (rpm) 4000

DRIVE TYPE Chain

DIFFERENTIAL Qaife TorSen LSD

COOLING

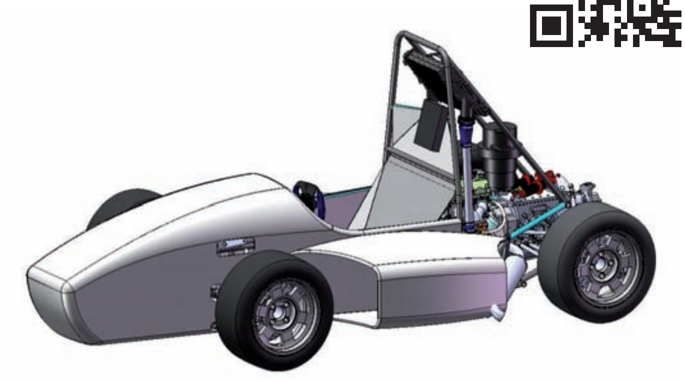
BRAKE SYSTEM

ELECTRONICS

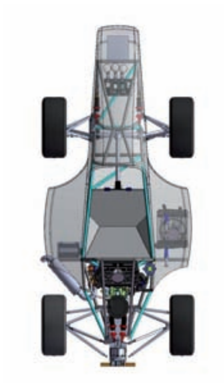
MANNHEIM

University of Applied Sciences
Mannheim

Car 32 Pit 75 Germany



Delta Racing is the Formula Student Team of the Mannheim University of Applied Science. The Team was founded in December 2008 and has ever since worked towards the completion of the DR 10 TC, the first prototype. Our objective for the 2010 season is to achieve the title of "Best Newcomer" at the Hockenheimring. The concept is simple: dependability is paramount, drive train and suspension our mainstays for good pace. Breaking with formula student conventions our first car is powered by a turbocharged two cylinder in-line engine. The power is distributed by a sturdy transaxle racing transmission with a Salisbury type differential. Another highlight is the suspension system which features anti dive and anti squat. The kinematics were optimized for agility in the tight circuits common to formula student competitions. The Team is very excited for the competition and hopes for good results.



FRAME CONSTRUCTION Tubular space frame

MATERIAL 25CrMo4 steel round tubing (25mm*2,5-1,5)

OVERALL L / W / H (mm) 2865 / 1359 / 1202

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1665 / 1200 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 168 / 232

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) Avon 7,0 x 20 - 13 A50

WHEELS (Fr / Rr) 8x13, 5mm offset, 1 pc Al Rim

ENGINE 2010 Weber Motor MPE 610

BORE / STROKE / CYLINDERS / DISPLACEMENT 85mm / 53,5mm / 2 cylinders / 607cc

COMPRESSION RATIO 10,2:1

FUEL SYSTEM Map based, multipoint electronic fuel injection

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 7000

MAX TORQUE DESIGN (rpm) 4000

DRIVE TYPE Transaxle gearbox

DIFFERENTIAL Salisbury type limited slip differential, 60 degree ramp angle

COOLING One side mounted radiator with thermostatic controlled electric fans

BRAKE SYSTEM 4-Disk system, rotors with 240mm diameter, adjustable bias bar

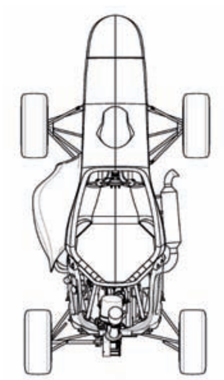
ELECTRONICS wiring harness sealed to IP67, selfdesigned high-power LED-Backlight

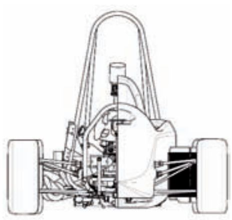
MONTRÉAL

University of Québec - ETS

Car 6 Pit 31 Canada

Our team is comprised of 20 engineering students. We take great pride in the fact that the entire vehicle is designed, fabricated and developed by our team in order to absorb the most from this great engineering exercise. We are well known in the FS-World for our innovative design approach that is validated by the development of a race car with a high standard of quality, workmanship and emphasis on details such as packaging, ergonomics and weight reduction.





FRAME CONSTRUCTION 2 pieces carbon/epoxy composite

MATERIAL

OVERALL L / W / H (mm) 2542 / 1321 / 1233

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1530 / 1143 / 1092

WEIGHT WITH 68kg DRIVER (Fr / Rr) 113 / 109

SUSPENSION Double unequal length A-Arm Pull-rod actuated coil-over damper

TYRES (Fr / Rr) 18x6.0-10 Hoosier LC0

WHEELS (Fr / Rr) 6.0x10, 12mm offset, 2 pc Al rim

ENGINE WR450F

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 62mm / 1 cylinders / 449cc

COMPRESSION RATIO 12:01:00

FUEL SYSTEM Motec M800 fuel injection with non-wasted spack ignition

FUEL 95 octane

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain

DIFFERENTIAL ETS Salisbury

COOLING Fan-less radiator in left side-pod

BRAKE SYSTEM 4 floating disks, driver adjustable bias bar and proportioning valve

ELECTRONICS Electropneumatic shifting system, configurable dash, permanent data acquisition

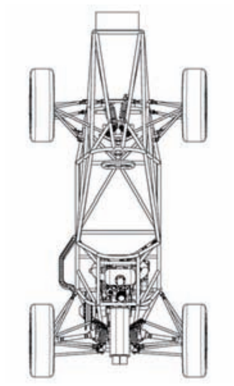
MOSCOW

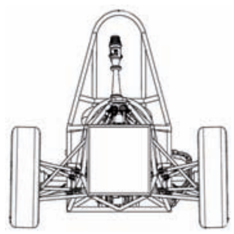
Moscow State Technical University (MADI)

Car 75 Pit 76

Russia

Students' Engineering Group is the first Russian team in Formula Student history. SEG-MADI was founded in 2005 and since that time, the team had already released two FSAE cars: FSM-600-1 and FSM-500-2 a.k.a. "Adrenaline". During these years team members learned how to survive in complicated conditions. For the last year, our team has done great management work and obtained more support from the university and sponsors. Absolutely,the team has proved its right to existence. So now the team is ready to show higher quality level.This year SEG presents a new car FSM-500-2 a.k.a. "IndiGO!". Our team applied to the whole accumulated experience and tried to improve most shortages and defects of previous cars. The main idea of the project includes simplicity of construction and simplicity of vehicle operation that allows low-experienced racers to drive and maintain the car. We are proud to take part in the FSG event, so we want to thank our beloved sponsors because it could not have happened without them.





FRAME CONSTRUCTION Tubular space frame

MATERIAL steel with 0.2% carbon

OVERALL L / W / H (mm) 2717 / 1300 / 1147

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1690 / 1140 / 1140

WEIGHT WITH 68kg DRIVER (Fr / Rr) 119 / 179

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper.

TYRES (Fr / Rr) 155x60 R13, Hoosier R25A C2000 / 155x60 R13, Hoosier R25A C2000

WHEELS (Fr / Rr) 5.5x13, 35mm offset, Al Forged Rim

ENGINE Yamaha PZ-50

BORE / STROKE / CYLINDERS / DISPLACEMENT 77mm / 53,6mm / 2 cylinders / 500cc

COMPRESSION RATIO 12,4:1

FUEL SYSTEM Yamaha fuel injection, sequential

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11200

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE CVT

DIFFERENTIAL Torsen T2

COOLING One side pod mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4-Disk system, self developed rotors with 230mm diameter, adjustable brake balance, mono-block calipers

ELECTRONICS Adjustment fuel map and fuel ignition system by Power Commander USB III

MOSCOW

Moscow State Technical University (MAMI)

Car 52 Pit 68

Russia

Our team represents Moscow TU MAMI, the largest Russian university specializing in mechanical engineering. 2010 competition is our third entry.IGUANA-3 is an attempt to combine non-standard solutions and developments used in our previous cars. The special attention is paid to original suspension design, improved electronic system and overall weight minimizing. Emphasis on safety, reliability and handling characteristics response to the main team's goal of 2010 season – to complete successfully all dynamic events. Despite of time restrictions, we want to bring IGUANA-3 to the track well-tested and ready for race. We believe that building a racecar requires lots of skills and patience, but there will be no success without passion. That is why our motto is „The passion for engineering"!

FRAME CONSTRUCTION Tubular space frame

MATERIAL Steel (outer diameter 25 to 30 mm, walls 2 mm)

OVERALL L / W / H (mm) 2637 / 1400 / 1207

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1205 / 1137

WEIGHT WITH 68kg DRIVER (Fr / Rr) 185 / 185

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented single spring and damper

TYRES (Fr / Rr) 205/510 R13, Continental

WHEELS (Fr / Rr) 5.5Jx13, forged Al rims

ENGINE Honda CBR600F4i

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:1

FUEL SYSTEM Denso, high pressure fuel injection

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain

DIFFERENTIAL Torsen limited slip differential

COOLING One side pod mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4-Disk system, 216 mm outer diam., 130 mm inner diam., drilled

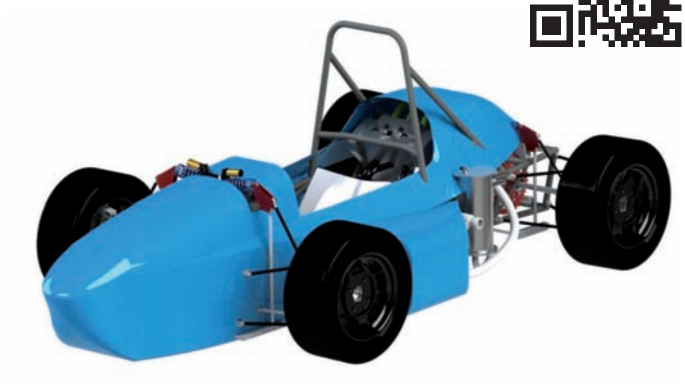
ELECTRONICS Electropneumatic Shifting System, Power Commander Engine Control, ignition module

MUMBAI

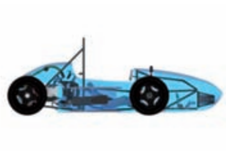
K. J. Somaiya College of Engineering

Car 99 Pit 72

India



Orion Racing India is an experienced team with three previous appearances at Formula Student Germany. Our latest car, ORI10 is a result of our effort of meticulously analyzing our strengths and weaknesses. With this car our team reaches a whole new level of technical competence. It is the next cog in our master plan of first completing the competition and then moving onto technical excellence. It features a few firsts for our team, viz. Slick tires, Carbon Fibre body work and After Market Programmable ECU. It is a completely new design with no parts being carried over from ORI2009. Also, we carry forward our self-developed electronics legacy with a Colour LCD screen on the steering wheel, a self developed data acquisition system with a GPS module electronically adjustable brake bias, telemetry and CAN. At FSG 2010 we aim to radically improve our ranking and then move steadily up the rankings in the future years.



FRAME CONSTRUCTION Tubular space frame and Alternative tubing

MATERIAL AISI1020 steel round tubing 25.4 mm OD , variable thickness

OVERALL L / W / H (mm) 2630 / 1500 / 980

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1580 / 1300 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 139 / 171

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper (coil-over).

TYRES (Fr / Rr) 205/510 R 13, Continental Tire / 205/510 R 13, Continental Tire

WHEELS (Fr / Rr) 7x13, +25mm offset, 3 pc Mag Rim, Keizer / 7x13, +25mm offset, 3 pc Mag Rim, Keizer

ENGINE 2001 Honda CBR 600 F4i

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 600cc

COMPRESSION RATIO 12.01.10

FUEL SYSTEM Stock Single Stage Electronic Fuel Injection

FUEL 95 Octane (Shell Optimax)

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Chain

DIFFERENTIAL Drexler Limited Slip Differential, Max Torque: 1200nm, Preload:45nm. Mounted on adjustable mechanism

COOLING Single Radiator with Electric water pump and fan controlled by microcontroller

BRAKE SYSTEM 4-Disk System, adjustable balance, rotors with 240mm dia., wilwood fixed calipers (2piston)

ELECTRONICS Self developed DAQ module+GPS,MMC datalogging,colour LCD,Electrical gear shifting,CAN bus,telemetry

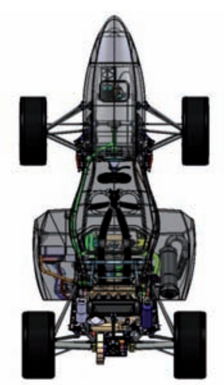
MÜNCHEN

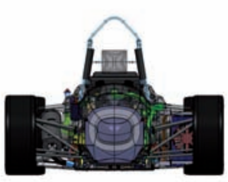
Technical University of München

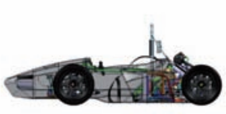
Car 4 Pit 36

Germany

With an almost completely new team of 35 Members, TUfast has now built the seventh racecar. We refined the concept of the nb09 and are proud to present the nb010:The nb010 has a new lighter monocoque, a stiffer rear frame, redesigned kinematics and suspension, the powerful 4-cylinder Kawasaki engine and a lot of other awesome parts, all put together in a very tight package. To find out, have a look on our car in the pits to discuss about it or visit us on the campground to have a beer and a chat with us!We had a great time designing and building this car and now we're looking forward to celebrating with you guys at the competition!







FRAME CONSTRUCTION CFRP Monocoque with tubular steel rear space frame bolted to Monocoque

MATERIAL prepreg laminate with aluminium honeycomb sandwich material, 1.4462 stainless steel tubing

OVERALL L / W / H (mm) 2736 / 1423 / 1037

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1610 / 1220 / 1140

WEIGHT WITH 68kg DRIVER (Fr / Rr) 123 / 140

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 178x54 R13, Hoosier R25B / 191x47 R13, Hoosier R25B

WHEELS (Fr / Rr) 7x13, 23,5mm offset, 1 pc CFRP Rim / 7.5x13, 4mm offset, 1 pc CFRP Rim

ENGINE 2007 Kawasaki ZX-6R

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14,0:1

FUEL SYSTEM Student designed dual Multipoint fuel injection system using Motec M800 ECU

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE 4-speed sequential, Chain #520

DIFFERENTIAL Drexler, clutch pack limited slip differential with internal preload adjustment

COOLING Custom aluminium radiator in sidepod, electrical pump controlled by student designed contol unit

BRAKE SYSTEM 4-Disk system, floating drilled rotors, ISR calipers, adjustable brake balance

ELECTRONICS Custom multifunctional steering wheel, electro-pneumatic shifting, Motec ADL3 DAQ,

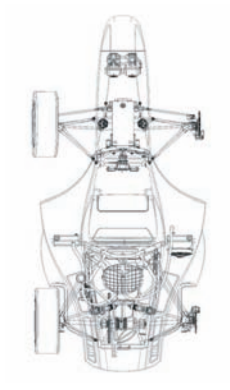
MÜNCHEN

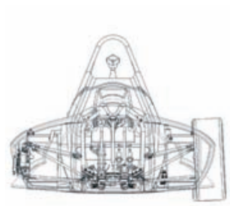
University of Applied Sciences München

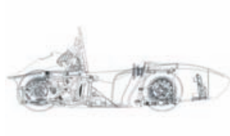
The municHMotorsport Racing Team was founded as FHM Racing Team in summer 2005. This year we will participate at the Formula Student Events in Germany, Austria, Hungary and Japan. We started the year with building up a strong team of 40 motivated students with special team events. To have a competitive car at the Events we set clear goals. One important goal we achieved was to finish the car at the end of April. Therefore we have enough time to take a well tested car to the competitions and have trained drivers. The new PW 5.10 is an evolution of our old cars with a carbon-fiber monocoque and a steel tube rear car section. With a new suspension kinematic and a new engine setup we improved the cars performance in the dynamic events. According to our principle „Passion Works" we are looking forward to the Formula Student competitions.

Car 51 Pit 67

Germany







FRAME CONSTRUCTION Monocoque with steel tube space frame rar car section

MATERIAL CFK with 10mm honeycomb core / 22mm steel tubes

OVERALL L / W / H (mm) 2830 / 1450 / 1120

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1200 / 1160

WEIGHT WITH 68kg DRIVER (Fr / Rr) 120 / 180

SUSPENSION Double unequal length A-Arm. Front pull rod actuated; Rear push rod actuated

TYRES (Fr / Rr) Hoosier 20.5x7.0-13

WHEELS (Fr / Rr) 7.0x13 Al rim

ENGINE Honda CBR600RR (PC40)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,2:1

FUEL SYSTEM Student designed/built fuel rail and tank, stock Honda injection valves, sequential injection

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE Chain #520

DIFFERENTIAL Drexler limited slip differential with clutch pack

COOLING Two side mounted kart radiators, two electric fans

BRAKE SYSTEM 4-disk system, self developed rotors with 220mm/200mm, adjustable brake balance, 4 piston caliper

ELECTRONICS Segmented wiring harness in motorsport quality. Advanced data acquisition with over 30 sensors. Electromechanical shifting.

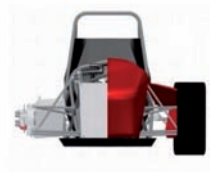
NEVERS

Institute of Automotive and Transport Engineering

ISAT Formula Student team was created in 2003, and is composed of 15 students in 3rd year. The whole team is renewed each year, and team members work on this project in parallel with attending mechanical engineering course. The main purpose of this project is to enable students to discover how to design and build an entire car, and how to work in an autonomous way. This year, we decided to concentrate mostly on making a big step on weight reduction: chassis, uprights and many components were redesigned and the use of brand new wheels enabled a total saving of 20kg with lower unsprung masses. We also worked on comfort and ergonomics, in order to get the car easier to drive and to handle for the driver. Our self developed data acquisition system was of great use, helping us to know a lot of parameters, by adding new sensors, and using telemetry to see data in real time.The result of all these efforts is that TASIA10 is our most achieved car since we have been competing.

Car 58 Pit 22

France



FRAME CONSTRUCTION One piece tubular spaceframe

MATERIAL E35 steel with differents thickness

OVERALL L / W / H (mm) 3032 / 1403 / 1028

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1550 / 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 139 / 139

SUSPENSION Double unequal length A-Arms. Push rod actuated horizontally oriented spring and damper (coil-over).

TYRES (Fr / Rr) 178x54 R13, Hoosier R25B/ 178x54 R13, Hoosier R25B

WHEELS (Fr / Rr) 7.0x13, 31mm offset, 3 pc Al Rim / 7.0x13, 31mm offset, 3 pc Al Rim

ENGINE Yamaha WR450 2003

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 63mm / 1 cylinders / 499cc

COMPRESSION RATIO 13,1:1

FUEL SYSTEM Student designed/built fuel injection system using Haltech ECU Sodemo

FUEL 95 octane petrol

MAX POWER DESIGN (rpm) 9000

MAX TORQUE DESIGN (rpm) 8100

DRIVE TYPE Single 520 chain

DIFFERENTIAL Student design Torsen limited slip differential

COOLING One radiator New-line XL, exchange surface: 690 cm2,

BRAKE SYSTEM Beringer 4 disk system self developed 201mm diameter, hub mounted

ELECTRONICS Multifonctional Steering wheel, Electropneumatic Shifting System, selfdesigned Live-Telemetry System

NORMAN
University of Oklahoma

Car 89 Pit 37

United States

The Sooner Racing Team's 2010 entry, affectionately known as Hayley, employs an Aprilia RXV 5.5 engine, a SLA suspension with pushrod-actuated coil-over dampers, and a lightweight aerodynamics package. The team focused on mass properties, specific stiffness, ease-of-adjustment, and vehicle reliability during the design of the 2010 car. First drive took place on February 28th, 2010. Target vehicle weight is 385 lbs.

FRAME CONSTRUCTION Tubular space frame

MATERIAL 4130 Chromoly Steel

OVERALL L / W / H (mm) 2718 / 1486 / 1077

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1638 / 1270 / 1194

WEIGHT WITH 68kg DRIVER (Fr / Rr) 114 / 128

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper

TYRES (Fr / Rr) 20.5x7 - 13 Hoosier R25B

WHEELS (Fr / Rr) 7x13, 3 pc Al Rim, 127mm neg. offset

ENGINE Aprilia RXV550

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 553cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM batch fire, wasted spark, dual fuel pumps

FUEL 95 Octane

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain

DIFFERENTIAL WRD1000 differential with adjustable ramp angles

COOLING Dual Parallel radiators, fully-bled system

BRAKE SYSTEM 4 outboard rotors, dual piston calipers

ELECTRONICS EFI Euro4 with integrated data logging and closed-loop fuel control

OSNABRÜCK
University of Applied Sciences Osnabrück

Car 67 Pit 34

Germany

For the current Formula Student season of 2010 the Ignition Racing Team designed the IR 10. Founded in 2006 the Team now starts with its new racing car into the fourth season. Thanks to the support of many new and experienced team members we were able to design and manufacture the new IR 10. 51 students majoring in different courses analyzed but also optimized and solved last years defects and problems. The result is a car that is not only faster and lighter but also satisfies with its easy maintenance. We optimized our self-constructed chassis from last year's season considering its weight and shape. Due to a longer testing period we reached some of our main goals: Optimization concerning weight and reliability. We continuously work on the improvement of our results. Due to our increased efficiency rates we expect to improve our performance of last year. The team is looking forward to the upcoming racing season and strives for successful results in all kinds of disciplines.

FRAME CONSTRUCTION Hybrid construction/ Carbon Monocoque with rear subframe made of steel

MATERIAL Monocoque: Carbon Subframe: 25CrMo4 steel round tubing

OVERALL L / W / H (mm) 2853 / 1420 / 1045

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1220 / 1195

WEIGHT WITH 68kg DRIVER (Fr / Rr) 160 / 138

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20x6.0-13 R25B Hoosier / 20x7.0-13 R25B Hoosier

WHEELS (Fr / Rr) BRAID 6 inch wide, 2 pc Al Rim / BRAID 7 inch wide, 2 pc Al Rim

ENGINE Suzuki GSX-R600 K7

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,5:1

FUEL SYSTEM Suzuki SDTV fuel injection, primary and secondary injectors

FUEL ROZ 98

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE two step helical gear box

DIFFERENTIAL Drexler limited slip

COOLING Twin side pod mounted radiators with electric fans; external oil cooling system

BRAKE SYSTEM 4-Disk-System, Floating Rotors, hub mounted 220 dia., AP Racing Cylinders/Calipers

ELECTRONICS wiring harness, electromagnetic shifter actuated with padels,gear position LED-display, MM ECU,

PADERBORN
University of Paderborn

Car 62 Pit 6

Germany

In fall 2006, students of the University of Paderborn decided to start a Formula Student Team. For the first time the different departments work together on this project. Also new is the creation of a Formula Student team by the students. Currently, up to 70 students are in each department. Business tasks take over the marketing work groups, IT, Accounting, and PR. On the technical implementation of the areas of chassis, body, engine, powertrain and brake are involved. Next to our university and sponsors, also many other companies are cooperating with our team. In this season our car has an effective concept, so we aim for success.

FRAME CONSTRUCTION Steel tube space frame; carbon fibre a-arms

MATERIAL 1.7734.5 steel

OVERALL L / W / H (mm) 2660 / 1427 / 1116

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1236 / 1199

WEIGHT WITH 68kg DRIVER (Fr / Rr) 129 / 158

SUSPENSION Unequal length A-Arms. Pull rod actuated Eichbach spring, koni damper units

TYRES (Fr / Rr) 21x7.0-13 R065 Hoosier / 21x7.0-13 R065 Hoosier

WHEELS (Fr / Rr) BBS rimbase, selfmade rim centers / BBS rimbase, selfmade rim centers

ENGINE 2006, Suzuki GSR 600, Modified for E-85, modified

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14:01:00

FUEL SYSTEM Student des/built ,fuel injection, sequential, aluminum tank w/fuel bladder

FUEL E85 (fuel with 85 % ethanol)

MAX POWER DESIGN (rpm) 11200

MAX TORQUE DESIGN (rpm) 9100

DRIVE TYPE double-stage gear drive

DIFFERENTIAL Drexler FormulaStudent limited slip differential

COOLING one side pod mounted radiator with thermostatic controlled electric fans

BRAKE SYSTEM Student designed,laser cut and ground from 1040 steel, hub mounted, 220mm dia.; 4mm thickness

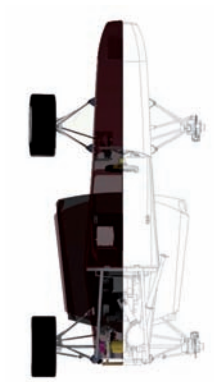
ELECTRONICS CAN-Bus System / freely programmable MegaSquirt engine control unit

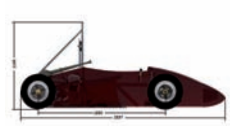
PATRAS
University of Patras

Car 86 Pit 3

Greece

The UoP Racing Team was founded in 2002 and participates the second time in the FSG with the UoP 3 competitor. The main goal for our new car was to reduce overall weight while maintaining high reliability. That was achieved by using composite materials and aluminium in almost every part of the car. Some of the 2010 car's main features are the two-piece CFRP chassis, the Yamaha WRF450 engine and the aluminium CNC machined uprights and rim centers. Also, every part of the car was optimized concerning functionality and weight. In general, it is a lightweight race car specially designed for the Formula Student disciplines. University of Patras Racing team wants to thank all of its sponsors for their valuable support and is looking forward to this year's competition.





FRAME CONSTRUCTION Two piece monocoque

MATERIAL Carbon fiber

OVERALL L / W / H (mm) 2537 / 1431 / 1146

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1240 / 1220

WEIGHT WITH 68kg DRIVER (Fr / Rr) 126 / 125

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 457.2 x 190.5-254 Hoosier R25B

WHEELS (Fr / Rr) 457.2 x 190.5-254 Hoosier R25B

ENGINE 2008 Yamaha WRF450 single cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 95mm / 63.4mm / 1 cylinders / 449cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM Custom designed fuel injection system

FUEL 100 RON unleaded

MAX POWER DESIGN (rpm) 9000

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE 5 speed sequential gearbox

DIFFERENTIAL Drexler FSAE LSD

COOLING Liquid-cooled, 200mm electric fan, ecu controled

BRAKE SYSTEM Cast Iron, hub mounted, 180 mm dia. Drilled rotors with ISR 4 piston calipers

ELECTRONICS Haltech E6X ECU, electomagnetic shifting system, aim data-loggin system, st. wheel mounted dashboard

PISA
University of Pisa

Car 39 Pit 14

Italy

E-Team Squadra Corse is the Formula Student team of the Università di Pisa (Italy). It was established in 2007 and, currently, it has 50 members and this is our second participation in FSG. In 2010 we have built with passion our third car, the „ET3", aiming at reliability, good drivability, safety and lightweight. The ET3 was designed to be lighter, faster and with better handling than the 2009 car (ET2ev), yet with the same reliability. The entire team worked with the same goals to achieve this objective: weight reduction and optimal weight balance in order to benefit from the improved engine performance and dynamic behaviour. A new on-board data acquisition system together with self-developed vehicle dynamics models (one of them also running in our driving simulator) provide real-time monitoring of the vehicle and extremely useful tools to quickly set up the car during the race. The team also managed to reduce the manufacturing costs. For information visit www.eteamsquadracorse.it.

FRAME CONSTRUCTION Tubular Space Frame, TIG welding

MATERIAL AISI 4130 steel round tubing, 1.125" dia / 1" dia / 5/8" dia, various thickness

OVERALL L / W / H (mm) 2650 / 1388 / 1020

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1640 / 1220 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 145 / 133

SUSPENSION Double unequal length A-Arm. Push rod actuated laterally oriented spring-dampers; anti-roll bar

TYRES (Fr / Rr) 20x6.2-13 A54 Avon / 20x6.2-13 A54 Avon

WHEELS (Fr / Rr) 7" wide, 43,25 mm offset, 1 pc Al Rim / 7" wide, 43,25 mm offset, 1 pc Al Rim

ENGINE 2010 Aprilia 550 SX

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 549cc

COMPRESSION RATIO 12,0:1

FUEL SYSTEM 2 Delphi injectors coaxial with intake manifold, Port Injection

FUEL 100 Octan, Gasoline

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Aprilia 520 chain size

DIFFERENTIAL Drexler, clutch pack limited slip

COOLING Single side pod mounted radiator with thermostatic controlled electric fan

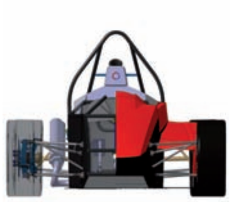
BRAKE SYSTEM 4-Disk system, Fixed Rotors, Steel, hub mounted, 240 mm outer dia., 180 mm inner dia.

ELECTRONICS Athena HPUH4 ECU, student-built Electropneumatic GCU and Telemetry, RT DL1+DASH3 Logger/Display

PRAGUE
Czech Technical University in Prague

Car 35 Pit 61

Czech Republic



The CTU CarTech, team of 25 students at Czech Technical University in Prague is presenting second race car, the FS.02. Race experiencies with first FS.01 car resulted in goal to build lighter and fuel economic vehicle. Therefore main changes in chassis design are visible - hybrid steel/composite structure. With identical engine (Yamaha YZF-R6), mass of FS.02 was reduced by 23% and dynamic performance is significantly better. The lightweight concept influenced all other parts of the car, e.g. drivetrain (Drexler diff.), electro-pneumatic shifting system, cockpit and body. Although many changes were done, we hope the new FS.02 is still attractive and well sounding car as FS.01 and spectators will like it.

FRAME CONSTRUCTION Steel tubes with composite sandwich reinforcements

MATERIAL 15CDV6, carbon/epoxide sandwich

OVERALL L / W / H (mm) 2873 / 1437 / 1195

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1660 / 1280 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 156 / 189

SUSPENSION Double unequal length A-Arm. Pull(Fr)/push(Rr) rod actuated long. oriented shock unit.

TYRES (Fr / Rr) Hoosier 20.5x7.0-13 R25A

WHEELS (Fr / Rr) Hoosier 20.5x7.0-13 R25A

ENGINE Yamaha YZF-R6 (2007)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.8:1

FUEL SYSTEM Carbon manifold, fuel injection with 4 injectors

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 11500

DRIVE TYPE Chain

DIFFERENTIAL Drexler Limited Slip Differential v2010

COOLING 1 side radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4-Disc system, self developed rotors, 251mm dia. front, 220mm dia. rear. Adjustable brake biasing

ELECTRONICS Multifunctional steering wheel (student built), electropneumatic shifting system (student built)

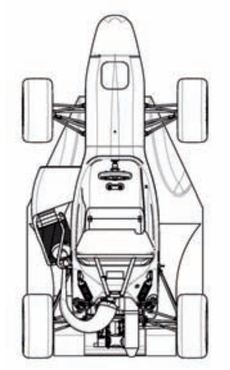
RAVENSBURG

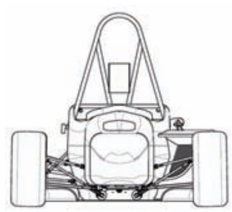
Baden-Württemberg Cooperative State University Ravensburg

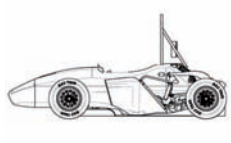
Car 10 Pit 30

Germany

Global Formula Racing is the first innovative global collaboration of its kind in the history of both the US-based Formula SAE and EU-based Formula Student programs. The former BA Racing Team from the Duale Hochschule Baden-Württemberg-Ravensburg (DHBW-R), Germany, and the Beaver Racing Team from Oregon State University (OSU) have combined forces to compete as a single entity. The two universities will share physical and intellectual resources to create a highly competitive vehicle worthy of international reputation.Design, manufacturing, and testing will occur at both schools. The collaboratively developed GFR 2010 design will be used to manufacture two identical cars—one at the OSU campus in Corvallis, Oregon, USA, and the other at the DHBW-R campus in Friedrichshafen, Baden-Württemberg, Germany.







FRAME CONSTRUCTION Full Monocoque / Steel Roll Hoops

MATERIAL Toray T700SC-12k-50C#2510 Plain Weave Fabric, Flexcore nomex honeycomb, 1020 DOM mild steel

OVERALL L / W / H (mm) 2474 / 1328 / 1191

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1555 / 1120 / 1120

WEIGHT WITH 68kg DRIVER (Fr / Rr) 101 / 114

SUSPENSION Double unequal length A-Arm. Pull and push rod actuated springs and dampers

TYRES (Fr / Rr) 6.0/18.0-10 LC0 Hoosier

WHEELS (Fr / Rr) 10

ENGINE Honda CRF450x

BORE / STROKE / CYLINDERS / DISPLACEMENT 96mm / 62.2mm / 1 cylinders / 449cc

COMPRESSION RATIO 12:01:00

FUEL SYSTEM Honda fuel pump, Bosch 945 injector, custom rail, full sequential

FUEL 98 octane

MAX POWER DESIGN (rpm) 9100

MAX TORQUE DESIGN (rpm) 9100

DRIVE TYPE 520 chain

DIFFERENTIAL Fully lockable custom clutch pack limited slip differential with adjustable preload

COOLING Single sidepod mounted cooler with ECU controlled fan

BRAKE SYSTEM 3 brake system, custom cast iron front rotors, single mountain bike rear brake.

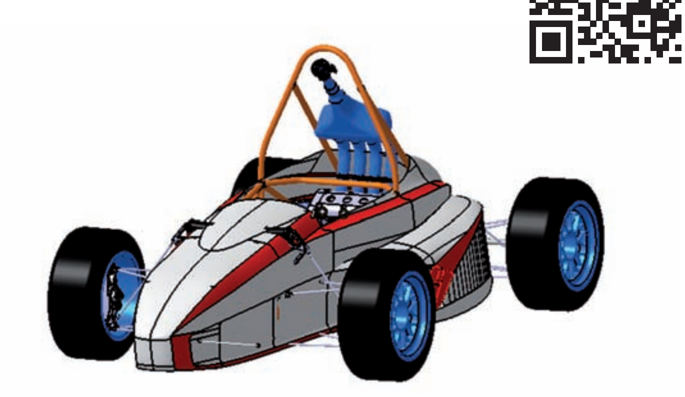
ELECTRONICS Student designed computer, launch and traction control, multifunctional steering wheel, telemetry

RIJEKA

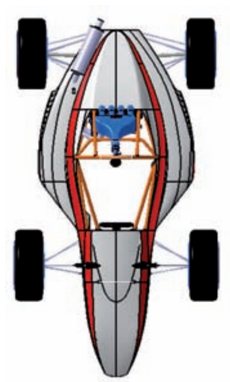
University of Rijeka

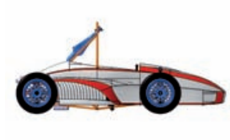
Car 55 Pit 13

Croatia



The University of Rijeka has a very long tradition in naval architecture. There are nine of us spread over the second, third and fourth years of studies and we would like to be the first to start a new tradition: building Formula Student cars to enrich the theoretical knowledge that our university provides us with and to implement FS as part of our educational program. We don't have experience with projects such as Formula Student so we decided to build a simpler car. Steel tubular chassis, double A-arms with pushrod actuated dampers, O.Z. Racing wheels with Hoosier tires, naturally aspired Yamaha R6 engine with VEMS ECU, our own patent protected differential and fiber glass body shell. We have tried to replace lack of experience with good benchmarking but have also applied our own ideas. As rookies, we are well aware of our imperfections, but we are willing and eager to learn. We are looking forward to the competition and meeting racing fans like ourselves.





FRAME CONSTRUCTION Tubular space frame

MATERIAL DIN 4130

OVERALL L / W / H (mm) 2680 / 1409 / 1170

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1580 / 1270 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 133 / 145

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented RockShox Vivid 5.1 dampers

TYRES (Fr / Rr) 178x55 R13 Hoosier R25B / 178x55 R13 Hoosier R25B

WHEELS (Fr / Rr) 7.0x13 O.Z. Racing Superleggera Competition/ 7.0x13 O.Z. RAcing Superleggera Competition

ENGINE YAMAHA YZF-R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 66mm / 46mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,5: 1

FUEL SYSTEM Open-source VEMS v3 ECU

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 13000

MAX TORQUE DESIGN (rpm) 10500

DRIVE TYPE EK chain #525

DIFFERENTIAL Student design, Geared(Torsen) with preload

COOLING Twin Yamaha WR450 radiators mounted in sidepods

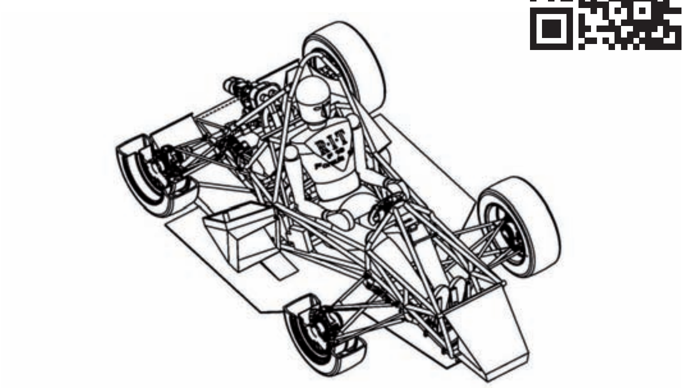
BRAKE SYSTEM 4-Disk system, 200mm floating rotors. Fr Student des/man 4 piston calipers/ Rr Wilwood PS-1

ELECTRONICS Steering wheel with shift light and push butons to actuate Kliktronic Shifting system

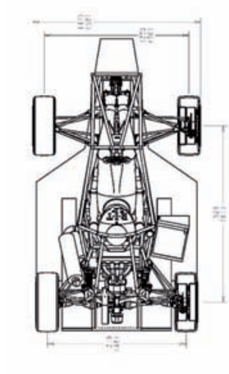
ROCHESTER

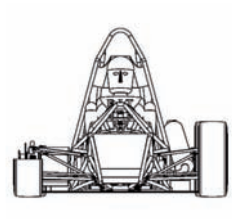
Rochester Institute of Technology

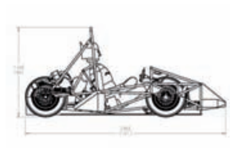
Car 66 Pit 26 United States



Rich with history the RIT FSAE Racing Team has competed in 34 FSAE and FS competitions on three different continents. In 18 years, RIT has been awarded numerous accolades, including overall titles in the US, England, and Australia. The goal of the RIT FSAE Racing Team is to design and build a fast, simple, and reliable prototype racing car for the non-professional weekend autocrosser. The car needs to be affordable, easy to maintain, and dependable on race day. Safety systems and ergonomics must ensure a secure and comfortable environment for the driver. In addition, aesthetics, fit and finish are critical to attracting the potential buyer. To fulfill these needs, the race car was modeled in Pro/Engineer and iterative analysis was conducted using Pro/Mechanica, ANSYS, and CFdesign. Many components were also physically tested using both destructive and non-destructive methods. The car then underwent extensive testing and tuning to validate design aspects and guarantee reliability.







FRAME CONSTRUCTION Welded spaceframe with stressed composite side skins and floor

MATERIAL 4130 Chromoly / carbon with core

OVERALL L / W / H (mm) 2565 / 1473 / 1168

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1549 / 1270 / 1219

WEIGHT WITH 68kg DRIVER (Fr / Rr) 127 / 144

SUSPENSION Double unequal length A-arms. Pull/Push rod actuated coilovers. Ohlins 4-way adjustable dampers

TYRES (Fr / Rr) Goodyear D2696 20.0x7.0-13

WHEELS (Fr / Rr) Three piece, Keizer shells with RIT designed centers

ENGINE Modified Honda CBR 600 F3

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 45.2mm / 4 cylinders / 609cc

COMPRESSION RATIO 14.0:1

FUEL SYSTEM RIT designed/ built multiport sequential injection, Motec ECU

FUEL 95 Octane unleaded gasoline

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE Chain

DIFFERENTIAL Torvec Isotorque

COOLING Custom sized water to air with aluminum hardlines, electric fan

BRAKE SYSTEM RIT designed two piston calipers, floating rotors, and bias bar

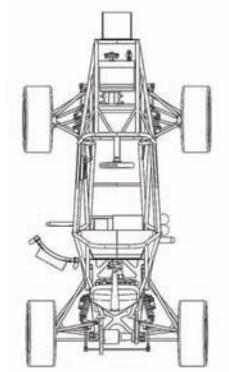
ELECTRONICS Motec ECU, traction/ launch control, electro-pneumatic shifting, wireless telemetry

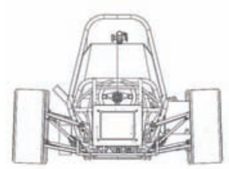
ROMA

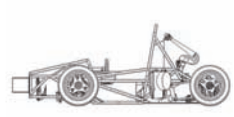
Sapienza University of Rome

Car 19 Pit 44 Italy

“Sapienza Corse” was born in 2008, established by a group of Mechanical Engineering students of the University of Rome La Sapienza. They wanted to find the best way to apply their studies to practical subjects: “why not build a racing car?” What began almost like a game, became something completely different. In three years of racing competitions, the Team constantly evolved together with its prototype: Gajarda. Its first coming out was in the event FSAE Italy 2008 held on Fiorano racetrack, where Gajarda started to catch many people’s attention. In 2009, a new revisited and improved Gajarda took part in events such as FSG09 in Hockenheim and FSAE Italy in Varano. In 2010, after some very useful tests on Monza racetrack (ATA’s First Test Drive), a new Gajarda is ready to race. Sapienza Corse will be in Hockenheim for FSG2010 and in Varano for FSAE Italy 2010, being confident that this year Gajarda will be able to show its racing skills in the best way ever.







FRAME CONSTRUCTION Tubular steel structure reinforced with aluminium and carbon fiber panels

MATERIAL Steel, aluminium (8mm under the engine)

OVERALL L / W / H (mm) 2475 / 1350 / 995

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1610 / 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 139 / 170

SUSPENSION Double unequal length A-Arm. Pull rod actuated longitudintally oriented spring and damper

TYRES (Fr / Rr) 205/510 R13, Continental, Soft Compound

WHEELS (Fr / Rr) 205/510 R13, Continental, Soft Compound

ENGINE Honda CBR 600 F sport

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:01:00

FUEL SYSTEM Originale equipment fuel injection, sequential

FUEL Unleaded gasoline 98 octane

MAX POWER DESIGN (rpm) 10600

MAX TORQUE DESIGN (rpm) 10300

DRIVE TYPE 520 Regina chain drive

DIFFERENTIAL Torsen T1 limited slip differential

COOLING Single radiator, electtric pump, electronic flow controller, thermostatic controlled fan.

BRAKE SYSTEM 4-Disk system (220mm front diameter, 190mm rear diameter), calipers CRG 2 dual piston (26 mm)

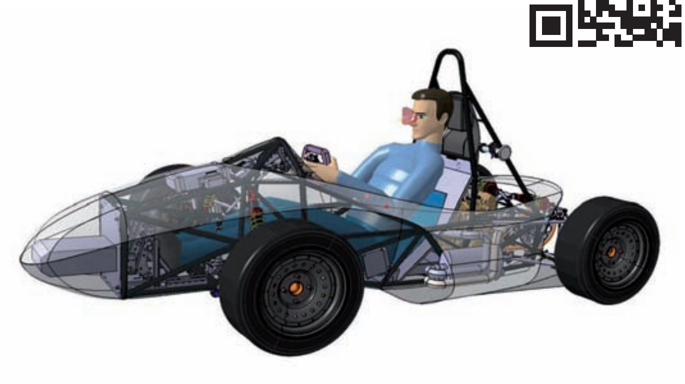
ELECTRONICS

SAARBRÜCKEN

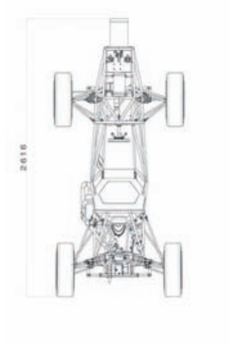
University of Applied Sciences Saarbrücken

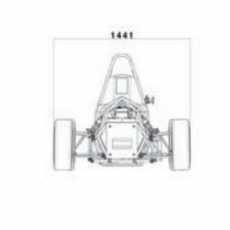
Car 50 Pit 32

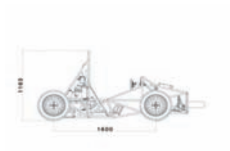
Germany



Saar Racing Team (Saar Racing Car 04 – SRC04) Our team, the Saar Racing Team, consists of 20 Students. We designed and built our 4th car, the SRC04 (Saar Racing Car 04). The goal of the 4th season was to design a car, which has a good driveability, reliability and low weight. Using the same engine as last year we could increase the power output by improving the exhaust and intake system. In general, the previous car has been the base for the new one. We tried to improve most of the parts and to keep as many parts as possible. This year we reorganized and improved our project management. We managed to reduce the manufacturing costs and time. This year's racing car was built more manufacturing-friendly. We tried to complete the car very early in order to have enough time for testing and tuning our car. This season, we are trying to get better placing in dynamic events, but we also concentrate on the static events, to reach a better overall placing.







FRAME CONSTRUCTION Steel tube space frame with carbon fibre floor panels and firewall

MATERIAL steel for precision applications E235

OVERALL L / W / H (mm) 2670 / 1441 / 1163

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1250 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 131 / 137

SUSPENSION Unequal length A-Arms. Push rod actuated Sachs/ZF RD36-2 spring/damper units

TYRES (Fr / Rr) Dunlop SP Sport 175/505 R13 / Dunlop SP Sport 175/505 R13

WHEELS (Fr / Rr) Braid Formrace 13"x7", -18mm offset / Braid Formrace 13"x7", -18mm offset

ENGINE 2007 Aprilia SXV 550

BORE / STROKE / CYLINDERS / DISPLACEMENT 80mm / 55mm / 2 cylinders / 553cc

COMPRESSION RATIO 12.5:1

FUEL SYSTEM EFI Technology ECU, semi sequential

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE Chain Drive

DIFFERENTIAL Drexler Motorsport Formula Student Limited Slip Differential, adjustable

COOLING One side pod mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4-Disk system, floating, hub mounted, 220mm dia.,2 x Pretech P440, two piece, four pistons, fixed mo

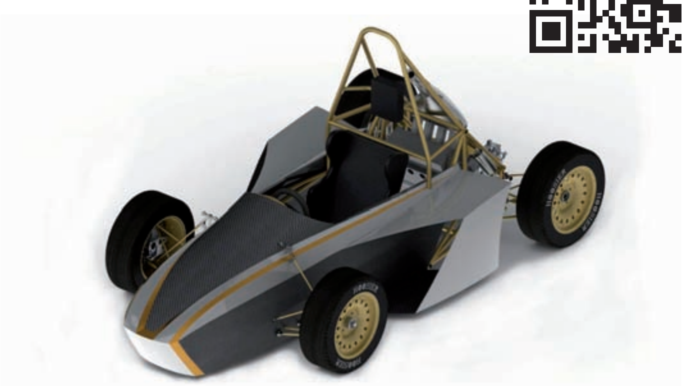
ELECTRONICS Electronic Shifter System, 2D-Data Acquisition System

SAN SEBASTIÁN

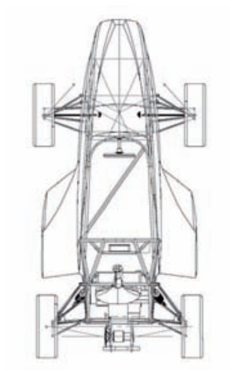
TECNUN - University of Navarra

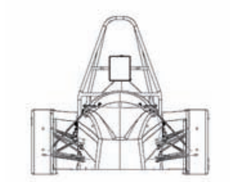
Car 108 Pit 1

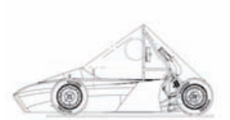
Spain



FSTEC 10' is the second vehicle of Tecnun MotorSport team. The main objetives of this year are: Improve the reliability, reduce the overall weight and construct a more effective car. To acomplish these points the experience acquired during the last competition has been invaluable, as well as some components that we have incorporated this year, like the AP brakes and Drexler Limited Slip differential. Great efforts have been done to design a high performace suspension, a modular chassis, a dry sump lubrication system and a optimized drive shafts design. A secondary but very important objective has been to improve the team management. To sum up, this year we, Tecnun MotorSport Team, want to materialize our illusion building a good car. Formula Student competition brings us an great opportunity to achieve it.







FRAME CONSTRUCTION One piece tubular spaceframe with steel roll bars

MATERIAL TIG welded AISI 1020 Steel

OVERALL L / W / H (mm) 2950 / 1450 / 1300

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1750 / 1250 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 136 / 181

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper.

TYRES (Fr / Rr) 6.2/20.0-13 Hossier

WHEELS (Fr / Rr) 6" x 13" Braid Formrace

ENGINE Suzuki GSX-R 600 K4 with dry-sump lubrication

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,5:1

FUEL SYSTEM Open-source MegaSquirt multi point fuel injection and wasted-spark ignition

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11500

MAX TORQUE DESIGN (rpm) 9500

DRIVE TYPE 520 chain drive

DIFFERENTIAL Drexler FS2009 LSD

COOLING Water & Oil radiator

BRAKE SYSTEM AP racing calipers with Galfer Wave cast iron discs

ELECTRONICS MegaSquirt fully programmable ECU with LCD digital touchscreen dash

SANKT AUGUSTIN

University of Applied Sciences Bonn-Rhein-Sieg

Car 45 Pit 77 Germany

The goals for our second Formula Student car, the [d i]10 (pronounced “G TEN”) was to develop a comparably simple and economical sports car. The weaknesses of the car from last year were given special attention. The following objectives were particularly aimed for:- Reduction of the weight by 50 kgs to 250 kgs, in particular a reduction of the unsprung mass. Increase of the agility and decrease of the understeering tendency. And finally, an increase in the engine performance of about 10% to 85HP. Our concept is looking at a rather classical construction with an open tubular steel frame, a double wishbone suspension and a four cylinder combustion engine. The technical highlight is, amongst other things, our own developed DARS-System (Dual – Active – Rear – Steering), with which the driving dynamic is actively influenced.

FRAME CONSTRUCTION Tubular steel space frame

MATERIAL ST37

OVERALL L / W / H (mm) 2670 / 1460 / 1050

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1590 / 1240 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 124 / 186

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper

TYRES (Fr / Rr) 205/510 R13,Continental

WHEELS (Fr / Rr) 205/510 R13,Continental

ENGINE 2003 Yamaha YZF R6 4 cylinder

BORE / STROKE / CYLINDERS / DISPLACEMENT 65,5mm / 44,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,6:1

FUEL SYSTEM Lambda controlled semi-sequential injection

FUEL

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 80000

DRIVE TYPE Chain drive

DIFFERENTIAL Torque sensitive multiplate limited slip differential

COOLING One side pod mounted radiator with thermostatic controlled electric fan

BRAKE SYSTEM 4-Disk system, adjustable brake balance

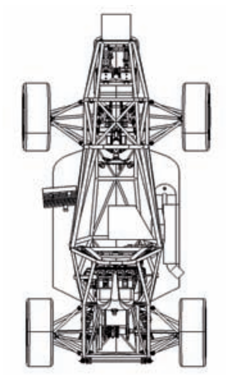
ELECTRONICS DARS - Dual Active Rear Steering, Multifunctional Steering Wheel, electromagnetic shifting System.

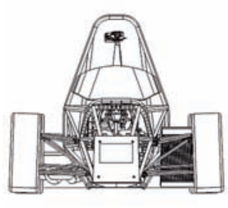
SCHWEINFURT

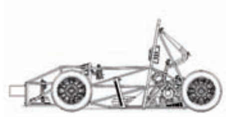
University of Applied Sciences Würzburg-Schweinfurt

Car 97 Pit 58 Germany

Mainfranken Racing e.V. was founded in September 2006, born out of the idea of some motor sport enthusiastic students. Currently, the team consists of 30 motivated students who develop and build the fourth Formula Student racecar. Driven by ambition and realizing ideas in creative ways, the team manages to upgrade the vehicle's performance. Besides increasing the power of the engine, we reduce the fuel consumption and the overall weight by substantial value. The incremental know-how of dealing with fiber-reinforced plastic enables us to build a streaming-optimized and eminently light-weight panelling. Through cumulative applications of the rapid prototyping process we are able to manufacture remarkably fast and economically. In the tournament, we therefore can also participate competitively in delicate economic-conditions. Furthermore, we want to create a basis for future FSG-seasons at our university.







FRAME CONSTRUCTION Tabular steel frame

MATERIAL S235 / S355

OVERALL L / W / H (mm) 2822 / 1399 / 1169

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1210 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 149 / 155

SUSPENSION Double unequal length A-Arm, Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) Hoosier 43162; 20.5x7.0 - 13; R25B

WHEELS (Fr / Rr) Hoosier 43162; 20.5x7.0 - 13; R25B

ENGINE Modified Yamaha YZF-R6

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 14.5:1

FUEL SYSTEM Bosch fuel pump, injection and valves from Yamaha, self made rail, fuel injection

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE Modified sequential gearbox

DIFFERENTIAL Limited slip differential

COOLING Single, left side pod mounted radiator with regulated electric fan

BRAKE SYSTEM 4-Disk system, self designed rotors 240/200mm, cockpit adjustable brake balance, Pretech/AP calipers

ELECTRONICS Semiconductor supply system, multifunct. steering wheel, can-bus, electro-mechanic shifting system

SIEGEN

University of Siegen

Car 42 Pit 2

Germany

Founded in 2008, the Speeding Scientists Siegen participated in 2009 for the first time in a Formula Student competition. With an almost complete new team, consisting of 27 students, the conception of the S3-10 started in autumn 2009.Main target for the new car was to improve blemished parts of the S3-09 and reduce the weight of the car by 15 percent. To get detailed information about the behaviour of the car while driving and recording an accurate load spectrum, the S3-10 has been equipped with several sensors in suspension and drivetrain. This measurement technique is also to pioneer the development of an electric race car for the newly founded FSE competition.The frame is built up as a hybrid construction, consisting of a tubular space frame and a vehicle rear in integral construction. The S3-10 is powered by a Yamaha R6 engine with a student built airbox for improved airflow. A conventional double A-Arm suspension ensures good cornering and a well controllable race car.

FRAME CONSTRUCTION Hybrid construction with spaceframe and seperated vehicle rear as integral construction

MATERIAL S355, 20-25 mm OD, 1.0-2.5 mm wall thickness; EN AW 7075 plates, CNC milled

OVERALL L / W / H (mm) 2701 / 1475 / 1185

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1630 / 1220 / 1175

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 168

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper (coil-over). Anti roll bar at fr/rr

TYRES (Fr / Rr) 20.5x6.0-13 Hoosier R25B / 20.5x6.0-13 Hoosier R25B

WHEELS (Fr / Rr) 6.5x13, -7,4mm offset, 3 pc Al rim / 6.5x13, 5mm offset, 3 pc Al rim

ENGINE Yamaha YZF-R6 (2005)

BORE / STROKE / CYLINDERS / DISPLACEMENT 65,5mm / 44,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,6:1

FUEL SYSTEM Student designed & built, sequential multipoint fuel injection

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 7000

DRIVE TYPE chain #520

DIFFERENTIAL limited slip differential

COOLING radiator and electric fan mounted in left side pot

BRAKE SYSTEM 4-disk brake system, modified rotors with 254/22 mm, front with floaters, adjustable brake balance

ELECTRONICS electric shifting and coupling, self designed data acquisition, complete system sealed to IP67

STOCKHOLM

KTH Royal Institute of Technology

Car 71 Pit 18

Sweden

KTH Racing presents its 7th Formula Student car – KTHR7. After a 3rd overall place 2005 and the "Most Innovative use of electronics"-award 2008 at Silverstone, the team has great expectations this year. Compared to forerunners, the car is lighter and more reliable. The focus was also placed on the driver's comfort and safety, which includes such details as electro-pneumatic shifting and multifunctional steering wheel. This, together with improved steering, allows good handling and drivability on the track and good results in the competition!

FRAME CONSTRUCTION Two piece CFRP Monocoque

MATERIAL Carbon fiber prepreg non crimp weave, Over expanded nomex honeycomb and balsa end grain inserts

OVERALL L / W / H (mm) 2750 / 1525 / 1200

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1252 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 122 / 148

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) Hoosier 20.5x7.0-13 R25B / Hoosier 20.5x7.0-13 R25B

WHEELS (Fr / Rr) 7x13, 14mm offset, 3 pc CF/Al Rim / 7x13, 14mm offset, 3 pc CF/Al Rim

ENGINE 2005 Suzuki GSX-R 600

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13.5:1

FUEL SYSTEM DTA S60 pro,fuel injection, sequential

FUEL E85

MAX POWER DESIGN (rpm) 10000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Three speed sequential gearbox

DIFFERENTIAL Drexler clutch pack limited slip, 10Nm preload, adjustable bias ratio

COOLING Single side pod mounted radiator with electronic controlled electric water pump and fan

BRAKE SYSTEM Four high carbon steel rotors 230 mm diameter, Four 4 piston calipers, adjustable brake balance

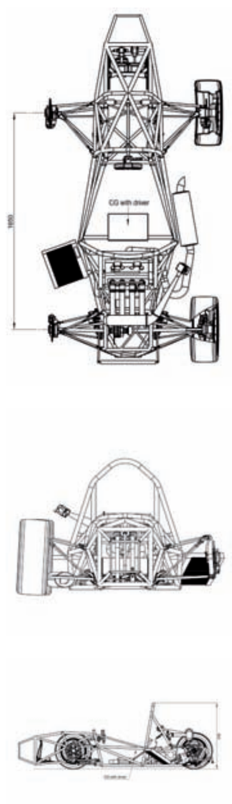
ELECTRONICS Electronic semi and fully automatic pneumatic gear shifting system and full telemetry data logging

STRALSUND

University of Applied Sciences Stralsund

Car 18 Pit 47

Germany



FRAME CONSTRUCTION tubular space frame

MATERIAL AISI 4130

OVERALL L / W / H (mm) 2780 / 1410 / 903

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1240 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 128 / 139

SUSPENSION Double unequal length A-Arm. Pull-Rod actuated Dampers

TYRES (Fr / Rr) 205/510 R13 Continental Formula Student Tire 2010

WHEELS (Fr / Rr) 7.0x13, 12.5mm offset, 3pc Al-Mg Rim

ENGINE Honda CBR 600 PC35

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.0:1

FUEL SYSTEM fuel injection system using Walbro ECU

FUEL 100 octane

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE modified gear box

DIFFERENTIAL torque biasing Torsen B (Quaife), self-designed housing, adjustable preload

COOLING aluminium radiator mounted in left sidepod, electronic fan integrated in nozzle of sidepod

BRAKE SYSTEM 4 Disc System with ISR Brake Calipers, adjustable brake balance

ELECTRONICS electronic Gear-Shifting, self-designed Telemetry, self-developed Data-Display in Steering Wheel,

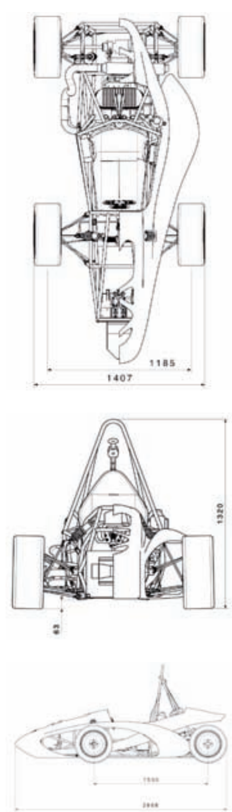
Being the very first German Formula Student Team, the Baltic Racing Team combined all their experience and knowledge of 10 years into their new car, the „TY2010“.Since the very beginning, race cars manufactured in Stralsund were known for their robustness and simplicity, but also for their great driveability and speed. With the huge increase of professionalism in Formula Student over the last years, the team began to focus on lightweight design to stay competitive in 2007. However, we remained faithful to our concept: a 4 cylinder engine, 13 inch wheels and a tubular steel space frame chassis! As a result, we reached a respectable wet car weight of only 185kg in 2008. Naturally, compromises had to be made concerning durability, and Murphy's Law hit us several times right at the events. For the „TY2010“, we think we finally found the right compromise between performance and reliability! We made the car as fool-proof and paved our way for a successful event in Hockenheim 2010!

STUTTGART

Baden-Württemberg Cooperative State University Stuttgart

Car 77 Pit 28

Germany



FRAME CONSTRUCTION Tubular space frame

MATERIAL E355

OVERALL L / W / H (mm) 2868 / 1407 / 1320

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1550 / 1185 / 1185

WEIGHT WITH 68kg DRIVER (Fr / Rr) 153 / 165

SUSPENSION Double unequal length A-Arm. Push rod actuated vertically oriented spring and damper

TYRES (Fr / Rr) 205x70 R13, Hoosier R25A

WHEELS (Fr / Rr) 7x13, 18mm offset, 3 pc Al Rim

ENGINE 2004 Honda CBR 600 RR

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12:01:00

FUEL SYSTEM Student des/built ,Denso fuel injectors

FUEL ROZ 98

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 9000

DRIVE TYPE 1120mm x 30mm Polychain Carbon Belt

DIFFERENTIAL clutch pack limited slip, adjustable between 0 and 80%

COOLING Single side pod mounted radiator with thermostatic controlled electric fan and water pump

BRAKE SYSTEM 4-Disk system, rotors with 220mm diameter, adjustable brake balance,RIT designed mono-block calipers

ELECTRONICS Multifunctional Steering Wheel, Electromagnetic Shifting System

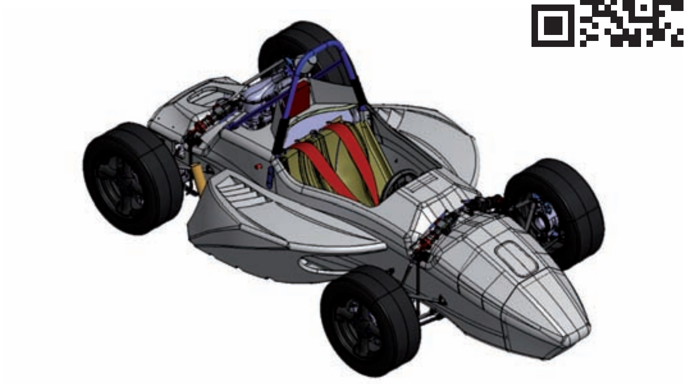
DHBW Engineering is the Formula Student team of the DHBW Stuttgart, last year named BA Engineering. In line with the concept of cooperative education all our members are pursuing theoretical studies and at the same time working for a company of the region. In our rare spare time we constructed and built SLEEK10, our second racing car. Having chosen the goal „With lightweight construction to the TOP 20 at the Formula Student Germany 2010“ for the 2010 Formula Student Season, the aim was to minimize as much weight as possible. Therefore, we want to achieve a 20% reduction of the weight of last year's car which weighed 314 kg. Furthermore, the car should be reliable and easy to handle. These criteria were the specifications for designing and developing assemblies and parts during the last months. Our Sleek10 is based on a space frame made of steel and at the heart of our car a Honda CBR600RR engine is beating. Furthermore, we have some new inventions like a body shell with a bionic structure.

STUTTGART

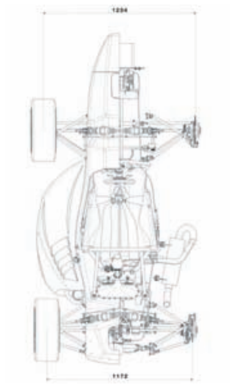
University of Stuttgart

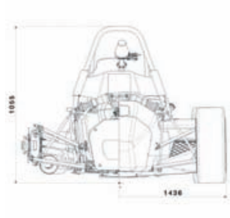
Car 1 Pit 42

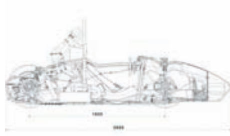
Germany



Right from the beginning of building our first race car we worked according to some basic principles. Set clear goals and milestones. Get the car done in time. Finish the endurance and win the competition. Keeping the time schedule tight allows us to have the first test run in the middle of April. So our 2010 car, the F0711-5, was actually tested for more than two months before it took part at the first competition. Our technical goals for the F0711-5 have been to reduce weight of our CFRP monocoque and to improve our engine design to save fuel and to have higher torque at lower rpms. The self built 4 speed gear box improves drivability and a strict lightweight design forced every detailed part to raise performance. So we are really looking forward to be competitive again and to be able to repeat last year's success. Thanks to all our sponsors who gave us the opportunity to compete at FSG once more. We will try our best to defeat our overall victory from 2009.







FRAME CONSTRUCTION Monocoque

MATERIAL carbon fibre

OVERALL L / W / H (mm) 2685 / 1436 / 1055

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1620 / 1234 / 1172

WEIGHT WITH 68kg DRIVER (Fr / Rr) 120 / 141

SUSPENSION Double unequal length A-Arm. Push rod actuated ZF Sachs Dampers

TYRES (Fr / Rr) Hoosier, R25B, 13

WHEELS (Fr / Rr) Aluminium Rim, 13

ENGINE 2003 / Honda CBR600RR

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM Sequential fuel injection system

FUEL 98 ROZ unleaded

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain #520

DIFFERENTIAL Drexler clutch pack differential

COOLING custommade single radiator, mounted in left sidebox, ECU and thermostatic controlled fan

BRAKE SYSTEM Steel floating disc, hub mounted, 240/200 mm dia.

ELECTRONICS Electropneumatic shifting system, CAN-bus, data acquisition system, adjustable ARB

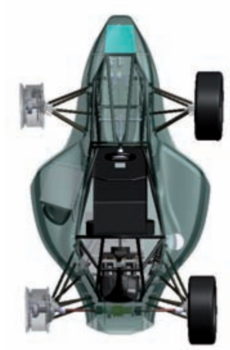
TAMPERE

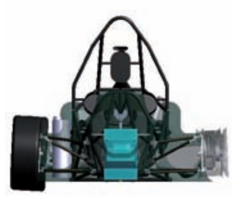
University of Applied Sciences Tampere

Car 78 Pit 39

Finland

What comes to racing, development is vital to gain success. In our second appearance in Hockenheim, we will reveal our 3rd Formula Student –class racing car, FS010, which is by far the most advanced and the most competitive car we have ever built. All 24 members of our team have worked hard with this project to make the designs come to life. With the help of our sponsors we have been able to build a car with some of the finest components out there, resulting in a package high on quality and performance. Every aspect has been evaluated and redesigned in the designing process of the new car. As a result we managed to reduce weight and improve handling capabilities compared to our previous car. New features such as telemetry and electric shifting system makes the car easier to drive and adjust. The combination of great technical quality solutions with a practical and cool appearance makes this car worth looking for.





FRAME CONSTRUCTION Tubular space frame

MATERIAL Ruukki Form 500 high strength steel

OVERALL L / W / H (mm) 2510 / 1520 / 1210

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1555 / 1294 / 1220

WEIGHT WITH 68kg DRIVER (Fr / Rr) 132 / 161

SUSPENSION Double unequal carbon fibre A-Arms, Pull/push rod actuated spring and damper

TYRES (Fr / Rr) 20,5x7-13, Hoosier R25B/ 20,5x7-13, Hoosier R25B

WHEELS (Fr / Rr) 7x13, 31mm offset, 3 pc Keizer CL-1 Al Rim

ENGINE Yamaha FZ6

BORE / STROKE / CYLINDERS / DISPLACEMENT 65.5mm / 44.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,0:1

FUEL SYSTEM Tatech T32 engine management system with sequential fuel injection and direct fire

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain #520

DIFFERENTIAL Drexler LSD

COOLING Radiator mounted in sidepod, electric waterpump, electric fan

BRAKE SYSTEM 4-disc system, floating rotors with 240/220mm diameter, AP Racing calipers and main cylinders

ELECTRONICS Race Technology data acquisition, telemetry, multifunctional steering wheel, electric shifter

TORONTO
University of Toronto

Car 13 Pit 56

Canada

The University of Toronto Formula SAE Racing Team is a student-run Engineering design team that designs, builds and races an open-wheel, open-cockpit race vehicle. Founded in 1997, we built our first competition vehicle (UT99) in 1999 and in the past years have won numerous awards and three Formula Student Championship titles gaining international recognition amongst our peers.

FRAME CONSTRUCTION Full composite monocoque / Rear steel tube space frame support structure

MATERIAL 4130 steel tubing/.46mm to 2.75mm thk carbon skins/ 6.35mm to 25.4mm thk honeycomb & foam cores

OVERALL L / W / H (mm) 2921 / 1408 / 1067

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1701 / 1198 / 1168

WEIGHT WITH 68kg DRIVER (Fr / Rr) 117 / 127

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20.5x7-13 R25B Hoosier

WHEELS (Fr / Rr) 152 inch wide, 2 pc Al Rim, 19mm neg. offset

ENGINE Honda TRX450ER, CRF camshaft, SOHC

BORE / STROKE / CYLINDERS / DISPLACEMENT 96mm / 62.1mm / 1 cylinders / 449cc

COMPRESSION RATIO 13.5:1

FUEL SYSTEM Student designed, EFI controlled 300cc/min injector

FUEL Gasoline 94 Octane (98 RON)

MAX POWER DESIGN (rpm) 9500

MAX TORQUE DESIGN (rpm) 6500

DRIVE TYPE Chain Drive (520 Chain)

DIFFERENTIAL Clutch pack, preload: 2.8 ft-lb; TBR: 2.0, 3.0 or 4.0, externally adjustable

COOLING Single side-mounted radiator with sealed shroud, ECU controlled fan for target temp. of 90°C

BRAKE SYSTEM 4-Disk system, self designed rotors front 240mm, rear 228mm dia. aluminum MC, 32mm Calipers

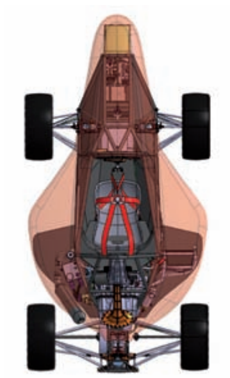
ELECTRONICS STACK data acquisition

TURIN
Polytechnic University of Turin

Car 46 Pit 24

Italy

When taking shape in 2005, the project SquadraCorse was gathering no more than ten people and could count on a very small amount of funding and resources. This year, for the development of the SCX, sixth prototype of the team, SquadraCorse may rely on more than fifty students and boast collaborations with internationally well-known sponsors. Moreover a strong renewal in the organizational structure of the team has created all the conditions for a more effective and strong collaboration between the divisions. This season's car is a natural child of the passion of the group and for this reason we are sure that it is not going to leave us disappointed under any circumstances. Following the development history of SC cars, we have chosen to keep the tubular steel frame architecture, the Honda CBR 600cc engine and the traditional rear aluminum "box" while implementing some new solutions such as the ELSD and the pneumatic actuation of the clutch.



FRAME CONSTRUCTION Tubular space frame, carbon fibre floor panels and aluminium rear box

MATERIAL 25CrMo4 tubes

OVERALL L / W / H (mm) 2840 / 1368 / 980

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1590 / 1200 / 1190

WEIGHT WITH 68kg DRIVER (Fr / Rr) 135 / 153

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 178x48 R13, Hoosier R25B / 178x48 R13, Hoosier R25B

WHEELS (Fr / Rr) Magnesium alloy 13

ENGINE 2005 Honda CBR600RR

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,1:1

FUEL SYSTEM Magneti marell multi point fuel injection

FUEL 100 RON unleaded

MAX POWER DESIGN (rpm) 12000

MAX TORQUE DESIGN (rpm) 8000

DRIVE TYPE Chain transmission

DIFFERENTIAL Quaife automatic torque biasing differential

COOLING Rear mounted single-side radiator, electric fan

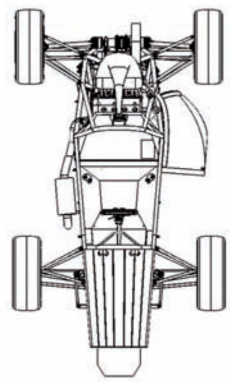
BRAKE SYSTEM 4 disk system, 218 mm OD, 158mm ID, mild steel thickness 4 mm, adjustable brake balance

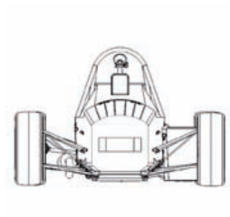
ELECTRONICS Multifunctional Steering Wheel, Electropneumatic Shifting System, Live-Telemetry System, ELSD

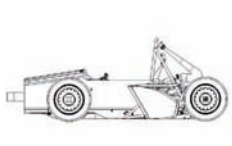
UXBRIDGE

Brunel University

Car 43 Pit 65 United Kingdom







FRAME CONSTRUCTION Aluminium sandwich panel front monocoque with rear steel spaceframe

MATERIAL Aluminium honeycomb sandwich panel. Core: 23.6mm 3.4-1/4-15N-3003. Skins: 0.7mm 6082T6

OVERALL L / W / H (mm) 2406 / 1475 / 980

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1300 / 1250

WEIGHT WITH 68kg DRIVER (Fr / Rr) 128 / 145

SUSPENSION Unequal length A-Arms. Pull rod actuated Kaz Technology spring/damper units.

TYRES (Fr / Rr) 20.5x7.0-13 R25b Hoosier / 20.5x7.0-13 R25b Hoosier

WHEELS (Fr / Rr) Braid Alloy 13

ENGINE 2007 Yamaha R6 with modified inlet cam

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.8:1

FUEL SYSTEM MoTeC M800 controlled, student designed fuelling system with 4 injectors

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 10000

DRIVE TYPE Chain #520

DIFFERENTIAL 2010 Drexler Formula SAE limited slip differential

COOLING Student designed radiator mounted in left side-pod

BRAKE SYSTEM 4-Disk system, student designed 220mm rotors with AP racing calipers, 4-pot front, 2-pot rear

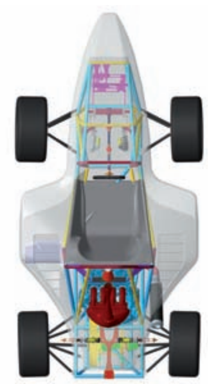
ELECTRONICS Student designed wiring loom, servo clutch and solenoid gear shifting via wheel mounted paddles

Brunel Racing has competed at every Formula Student Germany event to date and the team has become an integral part of Brunel University's Motorsport Engineering degree course. The 2010 car, BR-XI, is the team's 11th consecutive entry to Formula Student competitions and builds upon the experiences and successes of previous years. BR-XI carries over a similar concept from 2009 with an aluminium honeycomb sandwich monocoque with rear steel spaceframe. The extremely high stiffness to weight ratio of the honeycomb sandwich monocoque has allowed the team to produce a fully equipped 4-cylinder car weighing only 205kg. Driveability and ergonomics have been high priorities for 2010 and BR-XI features a proven electronic gear shifter and a new servo actuated clutch system with steering wheel mounted paddles. BR-XI aims to improve upon the success of 2009 and the team is excited about this summer's competitions. For more information please visit us at www.brunelracing.co.uk.

WEINGARTEN

University of Applied Sciences Ravensburg-Weingarten

Car 41 Pit 62 Germany



FRAME CONSTRUCTION Stainless steel tubular space frame

MATERIAL 01.01.01

OVERALL L / W / H (mm) 2820 / 1448 / 1242

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1654 / 1221 / 1475

WEIGHT WITH 68kg DRIVER (Fr / Rr) 131 / 197

SUSPENSION Double unequal length A-Arm. Hand-made CFRP-wishbones.

TYRES (Fr / Rr) 178x36 R13 Hoosier R25B racing slicks/178x36 R13 Hoosier R25B racing slicks

WHEELS (Fr / Rr) 7 inch wide, 1pc. Aluminium O.Z./7 inch wide, 1pc. Aluminium O.Z.

ENGINE Honda CBR 600RR PC40

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 43mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,2:1

FUEL SYSTEM Bosch Motorsport ECU with sequential injection

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 13000

MAX TORQUE DESIGN (rpm) 11000

DRIVE TYPE Sequential five-speed gear unit

DIFFERENTIAL Limited slip differential

COOLING Motorcycle radiator and 247 mm electric fan

BRAKE SYSTEM 4-disk system; 240mm rotors; ISR brake calipers

ELECTRONICS Electropneumatic Shifting System

The FORMULA STUDENT TEAM WEINGARTEN is looking forward to its second season and its first participation in the German event.After a satisfying year 2009, the team - grown up to 18 members - starts to work on a new car. From a technical point of view, we are aiming for three main targets to be more competitive this year: Reducing the car's weight by at least 30 kg, improving the suspension for a maximum of mechanical grip on the track and getting our engine more powerful. We put great efforts on improving the project and time management and we also want to increase the enthusiasm for this project at the University. We're looking forward to a great competition and the opportunity to meet students from all over the world.

WIESBADEN

University of Applied Sciences Wiesbaden/Rüsselsheim/Geisenheim

The Scuderia Mensa Racing Team is proud to present their third Formula Student car, SPR10. Our team consists of 32 students from various courses of studies. Last year we took part in the Formula Student Events in Silverstone and Hockenheim. This year we will start at Events in Germany, Austria and Italy. Our new car SPR10 is based on the experience we gained in the last 3 years. The change between SPR08 and SPR09 seemed to be a revolution and SPR10 is an evolution. Our goals this year were reducing weight, improving the driver's comfort and safety and the most important thing: getting a more reliable car. Therefore we optimized e.g. our frame, the fuel feed system, electric system and the shaft drives. Also the engine management system was changed to MoTeC M400. We would like to thank our supporters and sponsors whose efforts are greatly appreciated and we are looking forward to a good competition in Hockenheim and the other events.

Car 65 Pit 10 Germany

FRAME CONSTRUCTION One piece tubular spaceframe

MATERIAL E355 steel round tubing

OVERALL L / W / H (mm) 2695 / 1433 / 1091

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1230 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 133 / 157

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20.5x7.0-13 R25B C2500 Hoosier

WHEELS (Fr / Rr) 7 inch wide, 1 pc Al Rim, 28mm neg. offset

ENGINE Suzuki GSX-R 600 K3

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42.5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12.9:1

FUEL SYSTEM Intake-manifold fuel injection, full sequential

FUEL 100 octane unleaded gasoline

MAX POWER DESIGN (rpm) 12500

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE Chain drive (D.I.D. 520 ert2)

DIFFERENTIAL Drexler (formula student 2010)

COOLING Single radiator, controlled by engine ecu

BRAKE SYSTEM 4-Disk system, floating steel Water-Cut hub mounted rotors with 220/220 mm diameter, opposing piston

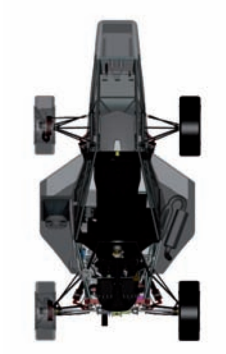
ELECTRONICS

WOLFENBÜTTEL

University of Applied Sciences Ostfalia

With this year's car, the WR06, Team wob-racing participates for the 5th time in the FSG Event. As its preceding model the WR06 is powered by a Honda PC 40 engine. This year we tried to reduce the weight, in some places we reached half of the weight compared to the year before. For the first time we use a dry sump lubrication system to guarantee a constant oil pressure during high lateral acceleration. In this way we also reduced the centre of gravity of the car. Another new feature is the rear module at the end of the frame. Besides a good maintenance, it ensures a high accuracy for suspension and for the drive train because it is referenced and fastened on the engine. The seat is developed under the target of better ergonomics. Furthermore it is completely removable so all control units and the battery can be reached easily. The WR06 is one of the most engineered cars of our team. With this fabulous new race car we hope to improve the last years' results in Hockenheim!

Car 33 Pit 33 Germany



FRAME CONSTRUCTION tubular space frame, bolted rear module

MATERIAL E355, E275

OVERALL L / W / H (mm) 2770 / 1445 / 1092

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1260 / 1220

WEIGHT WITH 68kg DRIVER (Fr / Rr) 140 / 153

SUSPENSION Double unequal length A-Arm. Pull rod actuated spring and damper,

TYRES (Fr / Rr) 20.5x7.0 R13 Hoosier R25B / 20.5x7.0 R13 Hoosier R25B

WHEELS (Fr / Rr) 7.0x13, 20mm neg. offset, 1 pc Mg Rim/ 7.0x13, 20mm neg. offset, 1 pc Mg Rim

ENGINE Modified Honda CBR600RR (PC40)

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM MPI, twin spray, spray angle: 15°, Bosch EV6, injection angle 10° against flow, student des. rail

FUEL unleaded gasoline, 100 octane

MAX POWER DESIGN (rpm) 11000

MAX TORQUE DESIGN (rpm) 8500

DRIVE TYPE chain drive, 520 chain

DIFFERENTIAL Drexler Formula Student limited slip differential

COOLING leftside mounted radiator with thermostatic controlled fan, electrical water pump

BRAKE SYSTEM 4-disk system, self developed rotors with 220/200 mm diam., adj. brake balance, Beringer/AP-calipers

ELECTRONICS electronical Power-Management, electropneumatic shifting, Live-telemetry over WLAN, logging system

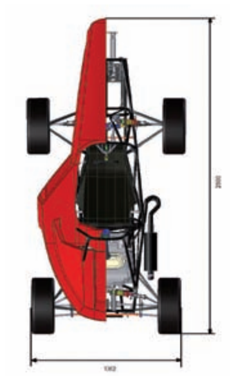
WROCŁAW

Technical University of Wrocław

PWR Racing Team is a group of 20 students from Wroclaw University of Technology. In 2009 as a new team, our virtual car RT09 achieved a 7th place in the third class competition in Silverstone. These results show that our team can be one of the main favorites this year. The new RT01 car is built on knowledge gained from previous year. We are aware that as newcomers in class 1 it is a great challenge to design and build a car that can compete with the best teams. That is why we put emphasis on mass reduction and innovation. In a four cylinder engine of Honda CBR 600 we found the heart of our vehicle. Our custom-made shock absorbers allow us to obtain the desired suspension characteristics. Despite mechanical advantages we cooperate constantly with a designer from Academy of Fine Arts to achieve modern body shape. We would like to thank our University, our Sponsors and everyone who helps us to build this car. We wish all Formula Students teams the best of luck.

Car 24 Pit 55

Poland



FRAME CONSTRUCTION One piece tubular spaceframe

MATERIAL Steel S355

OVERALL L / W / H (mm) 2788 / 1428 / 1139

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1220 / 1160

WEIGHT WITH 68kg DRIVER (Fr / Rr) 135 / 165

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and custom damper

TYRES (Fr / Rr) Hoosier 20,5x6.0x13/20,5x7.0x13

WHEELS (Fr / Rr) Braid 13x6.0/13x7.0

ENGINE Honda CBR600 RR, PC40

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 12,2:1

FUEL SYSTEM Honda multi point fuel injection

FUEL 98 octane unleaded gasoline

MAX POWER DESIGN (rpm) 10500

MAX TORQUE DESIGN (rpm) 7500

DRIVE TYPE Single 525 chain

DIFFERENTIAL Drexler Differential 2010 v2

COOLING Single radiator with fan

BRAKE SYSTEM ISR Callipers, hub mounted, brake disc ISR 230mm/220mm

ELECTRONICS MoTeC M800 ECU + multifunctional steering wheel with data logger

ZWICKAU

University of Applied Sciences Zwickau

Innovation meets Tradition: If you look at Zwickau's automotive history you can easily find out why we picked this slogan for our team. Zwickau is the birthplace of Horch and Audi, and furthermore in the 1930s, it was the home of the Auto Union race cars which dominated the race tracks in Europe. Almost 70 years later, our WHZ Racing Team was founded. Now in 2010, we bring our fourth car, the FP410, to the tracks. The FP410 is based on our last year's car. This time we concentrated on weight reduction, calibration and driver training. We created a fast and reliable car for the Formula Student. Nowadays, our team consists of about 40 members from different departments of the UAS Zwickau. This team has worked hard and efficiently to upgrade its results for the season 2010. If you would like to know more about our car, we are looking forward to meeting you at the competition. For more information visit our homepage www.whz-racingteam.de

Car 96 Pit 66

Germany

FRAME CONSTRUCTION tubular spaceframe with bolted rear assembly

MATERIAL 25MnCr4, outer diameter 25mm, wallthickness 2,5/2,0/1,5/1,0mm

OVERALL L / W / H (mm) 2695 / 1440 / 1120

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1550 / 1200 / 1140

WEIGHT WITH 68kg DRIVER (Fr / Rr) 123 / 150

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20,5 x 7,0 - 13 Hoosier

WHEELS (Fr / Rr) 8 inch wide, 1 pc carbon fibre rim

ENGINE optimized Honda CBR600F - PC35

BORE / STROKE / CYLINDERS / DISPLACEMENT 67mm / 42,5mm / 4 cylinders / 599cc

COMPRESSION RATIO 13,5:1

FUEL SYSTEM student designed and built Carbon tank / Bosch fuel injection fully sequential

FUEL ROZ 100 unleaded

MAX POWER DESIGN (rpm) 9973

MAX TORQUE DESIGN (rpm) 8660

DRIVE TYPE single 428 chain, self developed sprocke

DIFFERENTIAL Drexler limited slip differential

COOLING 210mm powerful SPAL fan, Davies Craig electrical water pump, restricted water outlet

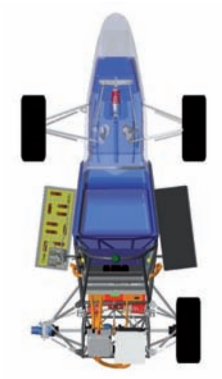
BRAKE SYSTEM 4-Disk system, self developed 4-piston callipers, brake discs and floaters, adjusable brake balance

ELECTRONICS Self designed driver information system, Sensors and electrical central unit including TCU

AACHEN
RWTH Aachen University

The Ecurie Aix Electric Team of the RWTH Aachen was founded in 2009. The team is fully integrated into the Ecurie Aix Association in order to minimize costs and to maximize time efficiency. Due to the synergy between the Ecurie Aix Electric and the already established Combustion Team, which is one of the oldest teams of the Formula Student in Europe, it was possible to design a new racecar with the same high standards regarding safety, enhanced drivability and performance. The eace01 (Ecurie Aix Car Electric 01) comprises a CFRP Monocoque in the front and a tubular steel frame in the rear as this hybrid structure benefits the maintenance and safety at the same time. The car is propelled by an AC induction motor that uses the energy provided by low-weight LiFePo4 batteries. This year, the students from Ecurie Aix will be rolling out with two competitive race cars due to their passion and commitment to motorsport to set high standards in both competitions.

Car E21 Pit E8 Germany



FRAME CONSTRUCTION Hybrid Design: Monocoque with tubular steel space frame in the rear

MATERIAL Monocoque: CFRP & Rohacell Core, Rearframe: S355

OVERALL L / W / H (mm) 2643 / 1403 / 1316

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1525 / 1245 / 1129

WEIGHT WITH 68kg DRIVER (Fr / Rr) 189 / 189

SUSPENSION Front: Multilink Suspension. Push rod actuated horizontally oriented monoshock and rollspring.

TYRES (Fr / Rr) 205/510 R13 P 034 M Continental / 205/510 R13 P 034 M Continental

WHEELS (Fr / Rr) BBS, 3 pc Al Rim 7.5x13, 20mm neg. offset / BBS, 3 pc Al Rim 7.5x13, 20mm neg. offset

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 1 / Rear Center / 35kW

MOTOR TYPE HPG AC20-05-1

MAX MOTOR RPM 7500

MOTOR CONTROLLER Curtis 1238-7501

MAX SYSTEM VOLTAGE 103V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFePO - graphite / 10kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:5,6 / -

DRIVE TYPE Chain #520

DIFFERENTIAL GKN Visco Lok, speed sensitive LSD

COOLING Air cooling

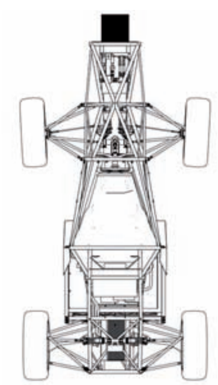
BRAKE SYSTEM 4-Disk system, self developed rotors with 240mm(f) & 230mm(r) dia., adjustable brake balance

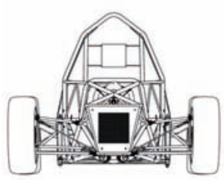
ELECTRONICS CAN-Bus System, mulitfunctional driver interface, WLAN-Data-Transfer

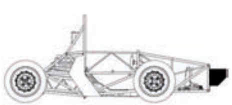
BERLIN
Technical University of Berlin

Since 2006 the year of foundation of FSG, the students of the TU Berlin have been participating in this contest. With ambition they face a new challenge this year - the newly established FSE.zedX - zero emission drive 2010 - the name of the FSE team of the TU Berlin, which was founded in autumn 2009 by a group of former Formula Student participants. The base of the racing car builds the chassis of the car of 2008, which is modified to be equipped with a state-of-the-art e-drive. Therefore the team has designed an efficient and reliable e-drive with a high level of integration, like a differential directly integrated into the torque motor. Yet, the goal of zedX is not only to build a competitive electric racing car, but to make motorsport sustainable, to make sure that passion for racing does not compromise the environmental needs. To reach that, different attempts were taken for the design of the car and in other parts of the project, like a bodywork and seat made of jute-fiber.

Car E11 Pit E5 Germany







FRAME CONSTRUCTION tubular steel space frame

MATERIAL 25CrMo4

OVERALL L / W / H (mm) 2751 / 1400 / 1105

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1575 / 1200 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 174 / 174

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally oriented air-damper.

TYRES (Fr / Rr) Continental 205/510 R13

WHEELS (Fr / Rr) BBS 6.0x13, -10.8mm offset, 3 pc Al rim

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 1 / rear / 55kW

MOTOR TYPE EMB torque motor

MAX MOTOR RPM 1100

MOTOR CONTROLLER Unitek Bamocar

MAX SYSTEM VOLTAGE 470V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY / 9kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) none / none

DRIVE TYPE direct drive

DIFFERENTIAL Drexler differential, limited slip

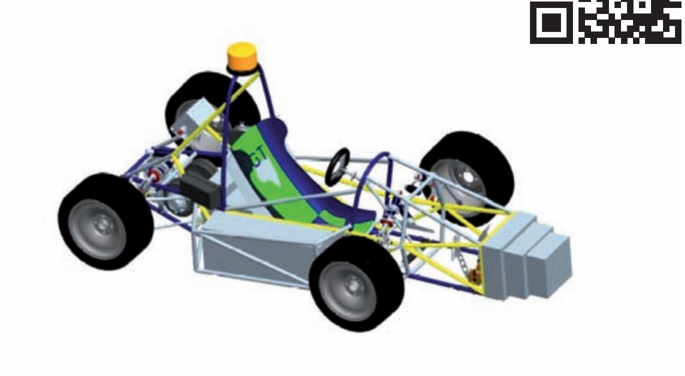
COOLING air-cooling with 60mm electric fans

BRAKE SYSTEM 4-Disk system; 210mm floating brake disks; front: ISR brakes; rear: MQ brakes; Brembo mastercylinder

ELECTRONICS wiring harness sealed to IP65, multiinformation display in dashboard, one central car control unit

BRATISLAVA

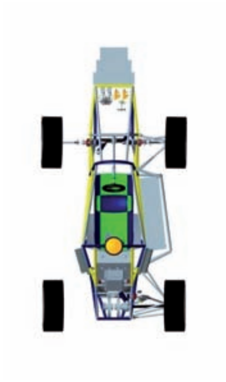
Slovak University of Technology in Bratislava



In September 2009 the idea to build an electric racing car was born. A new group of students started to think about the concept of the future racing car. The most difficult part of the car was the electric propulsion system, which was not a well known field for us. The propulsion system is based on two DC brushless electric motors. The electric energy is stored in LiFePO4 battery cells, with 84 V nominal voltage. The control unit controls both motors and realizes the function of clutch and differential. The mechanical part of the car is based on a tubular space frame, welded from high strength steel. The suspension is a double wishbone, with unequal length and non parallel arms at front and rear. Dampers and springs are actuated trough pushrods on both axles. To design and optimize the amount of relevant quantities, software like ANSYS, ADAMS, MATLAB and CATIA spared us a lot of time. We hope that all teams have a successful start at Hockenheim and the weather will be with us.

Car E90 Pit E12

Slovakia



FRAME CONSTRUCTION Tubular space frame

MATERIAL high strength steel

OVERALL L / W / H (mm) 3000 / 1400 / 1070

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1580 / 1200 / 1175

WEIGHT WITH 68kg DRIVER (Fr / Rr) 176 / 184

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper. Adjustable compresion and rebound.

TYRES (Fr / Rr) 205x44 R13 Continental

WHEELS (Fr / Rr) 205x44 R13 Continental

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / rear right and left / 29,04 together

MOTOR TYPE LMC 200 D 135, BLDC

MAX MOTOR RPM 3780

MOTOR CONTROLLER EVCONTROLER

MAX SYSTEM VOLTAGE 84V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFePo4 / 8,4kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) N/A / 3.33

DRIVE TYPE Belt Poly Chain Carbon 8M

DIFFERENTIAL Realised with Control electorncs

COOLING Passive cooler on both motor controllers

BRAKE SYSTEM 4-Disk system, self developed rotors with 220mm diameter, adjustable brake balance

ELECTRONICS Self build electronic differential, wirings harness sealed to IP67, Live Telemetry System

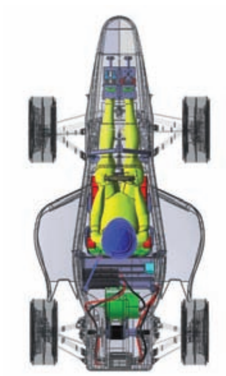
DARMSTADT

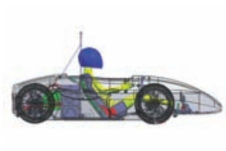
Technical University of Darmstadt

Two project teams - two cars - one year. We set ourselves that challenge in the end of 2009. The goal of DART Electric: developing TU Darmstadt's first electric race car with a solid performance and a high drivetrain efficiency, providing a reliable basis for the next year. To reach our targets we decided to use last year's delta2009 as a base vehicle. We put the main focus on developing a completely new electric drive system with a high level of safety and similar performance compared to the internal combustion engine concept of the delta2009. Due to the fact that there are no existing solutions in this performance sector, we faced many difficulties, and some of them forced us to radically alter our concept during the design phase. It was a tough job but we gathered so much experience in the field of electro mobility that it will help us in the future. Our team is already working on new concepts with upcoming features like wheel hub motors and recuperation. The future is electric!

Car E23 Pit E11

Germany





FRAME CONSTRUCTION CFRP monocoque with drivetrain integration

MATERIAL carbon fibre / epoxy composite, aluminium honeycomb

OVERALL L / W / H (mm) 2803 / 1415 / 1211

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1220 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 176

SUSPENSION Double unequal length CFRP-wishbones. Pull rod actuated Cane Creek Double Barrel spring and damper

TYRES (Fr / Rr) 190/40 R-15 Pirelli, student designed

WHEELS (Fr / Rr) 7 inch wide, 1 pc Al rims, 10 mm neg. offset, student designed

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Rear / 35kW each, combined 70kW

MOTOR TYPE LMC D135RAG brushed DC

MAX MOTOR RPM 4200

MOTOR CONTROLLER Kelly Controller KHD14101E

MAX SYSTEM VOLTAGE 101V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFePo4 / 9,41kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:5.17 / 1:4.5

DRIVE TYPE Chain

DIFFERENTIAL Drexler Fromula SAE special, limited slip

COOLING Air cooled, 120mm electric fans

BRAKE SYSTEM Student designed 4-Disk system, 200mm diameter, adjustable brake balance, mono-block calipers

ELECTRONICS Student designed multifunctional steering wheel and CAN bus system

DEGGENDORF

University of Applied Sciences
Deggendorf

Car E14 Pit E6

Germany

Fast Forest represents the UAS Deggendorf in formula student events. Founded in June 2008 our second season team consists of 30 active team members from every faculty of our university. 2009, when it was announced that there also will be a FSE racing series in Germany, it was immediately clear that there will be two teams and two cars of the Fast Forest team, the FF02 the further development of the FF01 and the FF02e the electrically powered version of the FF02. By means of the close cooperation between the two teams it was feasible to develop a car that can be driven by two completely different drive technologies. The members of the electric team developed an alternative drivetrain which is operated through two mechanically connected permanent magnet motors working with a voltage of 96V. 26 LiPo flat cells provide enough power to generate 2x34kW peak power. You'll find further information, pictures and videos from the team and our cars on www.fastforest.de !

FRAME CONSTRUCTION Turbular space frame with carbon floor plate

MATERIAL 1020 and 4130 steel round tubing 5mm to 25mm diameter

OVERALL L / W / H (mm) 2896 / 1358 / 1090

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1610 / 1236 / 1215

WEIGHT WITH 68kg DRIVER (Fr / Rr) 143 / 183

SUSPENSION Double unequal length A-Arm. Pull rod actuated horizontally/vertical oriented spring and damper

TYRES (Fr / Rr) 205/510 R 13 34M Continental

WHEELS (Fr / Rr) Braid Formrace 16, 13x7J ET 18 one pice, alloy

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Rear / 2x 34,32kW

MOTOR TYPE 2x Lynch LEM D135 RAG

MAX MOTOR RPM 4000

MOTOR CONTROLLER Kelly Controller KDH12121E

MAX SYSTEM VOLTAGE 110V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiPo / 9,6kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:4 /

DRIVE TYPE Chain drive

DIFFERENTIAL Drexler limited slip

COOLING Thermostatic controlled electric fan for controller, motor and accumulator

BRAKE SYSTEM Magura cylinders, student designed disks, floating, hub mounted, 240mm diameter

ELECTRONICS CAN-BUS system, self-developped steering wheel display, datalogging, special designed headlights

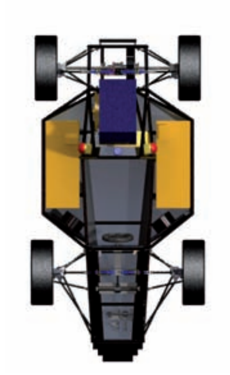
DIEPHOLZ

University of Applied Sciences
Diepholz/Oldenburg/Vechta

Car E16 Pit E9

Germany

The FHWT Racing Team is proud to present its new electric FHWT-03e-Racer. This electric FHWT-03e-Racer, based on its predecessor, the combustion engine FHWT-02, is totally in keeping with modern energy concepts. This year's team motto is to create a new driving experience, to revolutionize the driving characteristics like acceleration and cruising range while reducing environmental pollution. In addition, the two technical highlights, the water-cooled electric motor and the frequency converter, both in-house student developments, contribute towards achieving this ambitious goal. The motor is characterized by its ideal construction form, low weight, best possible power adjustment and high efficiency as is found in comparable electric motors. Moreover, the water-cooled frequency converter is, due to the light-weight compact construction, unique in its performance category. This year, an unprecedented 37 students from all FHWT-faculties are united for one reason - to score at Hockenheim.



FRAME CONSTRUCTION Tubular space frame

MATERIAL S235JR steel round tubing 27mm diameter, wall thickness 1.5mm and 2mm

OVERALL L / W / H (mm) 2760 / 1400 / 1130

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1622 / 1200 / 1155

WEIGHT WITH 68kg DRIVER (Fr / Rr) 194 / 274

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20.5x6.0 R13, Hoosier R25B

WHEELS (Fr / Rr) 6.0x13, 3 pc AlMg Rim (BBS)

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 1 / Rear / 62 KW

MOTOR TYPE permanent-magnet synchronous machine

MAX MOTOR RPM 10000

MOTOR CONTROLLER dSPACE DS1401/1501

MAX SYSTEM VOLTAGE 432V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFePo4 / 6,48kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:5 / -

DRIVE TYPE chain-drive with 5/8x1/4 chain pitch

DIFFERENTIAL Drexler limited-slip differential

COOLING 2 radiators with thermostatic controlled fans for frequency converter and motor in each side box

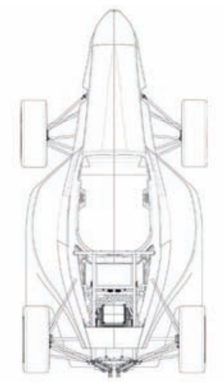
BRAKE SYSTEM 4-Disk system, wave rotors from Magura (180mm dia. front, 160mm dia. rear), adjustable brake balance

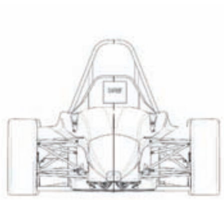
ELECTRONICS self-developed electric motor and frequency converter, monitoring system with LCD-Display

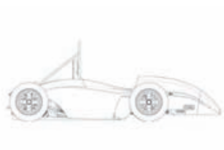
EINDHOVEN
Technical University of Eindhoven

Car E40 Pit E15 — Netherlands

The URE05e is the team's first electric Formula Student car. University Racing Eindhoven has focused on developing a reliable electric powertrain. To realize the URE05e, the chassis and suspension design of the previous year's car have been used and the URE05e has been equipped with a completely new electric powertrain and electronics. The new powertrain consists of two independent 30kW electric motors; one for each rear wheel. This enables the use of an active electronic differential in the URE05e. This is a full student designed differential that performs torque vectoring resulting in faster cornering. To lower the weight of the URE05e University Racing Eindhoven has decided to use Lithium Polymer cells with an energy density of 133 Wh/kg. The powertrain, including the self designed battery, has been extensively tested in a special test bench. In this test bench simulation runs of the German Formula Student track have been run to increase the performance of our electric motors.







FRAME CONSTRUCTION Prepreg carbon fibre/epoxy monocoque with steel tube space rearframe

MATERIAL Prepreg carbon fibre/epoxy monocoque, cold-drawn seamless st.37

OVERALL L / W / H (mm) 2745 / 1334 / 1062

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1225 / 1175

WEIGHT WITH 68kg DRIVER (Fr / Rr) 152 / 165

SUSPENSION Full multilink. Push/pull rod actuated vertically oriented Koni 2612 dampers, fully adjustable.

TYRES (Fr / Rr) 20.5X7-13 R25B / 20.5X7-13 R25B

WHEELS (Fr / Rr) 6 inch wide, 3 pc AL/Mg Rim / 6 inch wide, 3 pc AL/Mg Rim

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Rear Left, Rear Right / 30kW, 30kW

MOTOR TYPE DC-Motors

MAX MOTOR RPM 6000

MOTOR CONTROLLER Kelly KDH14651B

MAX SYSTEM VOLTAGE 109V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY Lithium Ion Polymer / 9kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:6 / 1:6

DRIVE TYPE 2x Chain #428

DIFFERENTIAL torque vectoring by active electronic differential

COOLING self cooled motors + brush fans

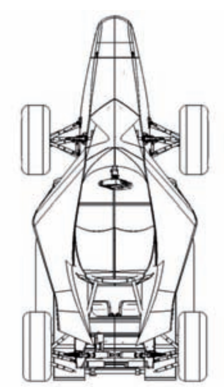
BRAKE SYSTEM Student designed, laser cut from steel, hub mounted, 232 mm dia.

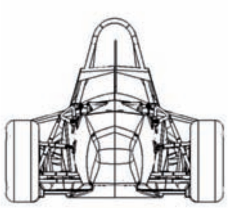
ELECTRONICS multi functional steering wheel, live telemetry, active electronic differential

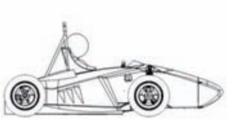
GRAZ
Technical University of Graz

Car E15 Pit E2 — Austria

„Since the Graz University of Technology already has a highly successful Formula Student racing team, other ambitious students keen on developing a competitive electric racing car were easily found. The TU Graz e-Power Racing team was born. Our mission is to put our knowledge of electric automotive construction into practice and furthermore to highlight the benefits of zero-emission cars for the environment. We want to demonstrate that racing cars, constructed on the basis of the innovative electric technology, are without any doubt able to compete with traditional petrol-engined racing cars.







FRAME CONSTRUCTION carbon fibre monocoque and rear end

MATERIAL monocoque and rear end: carbon fibre, NOMEX and Al honeycombs, carbon-inserts

OVERALL L / W / H (mm) 2720 / 1390 / 1105

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1575 / 1200 / 1180

WEIGHT WITH 68kg DRIVER (Fr / Rr) 167 / 160

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and ZF Sachs damper

TYRES (Fr / Rr) 20,5x7-13 Hoosier R25B

WHEELS (Fr / Rr) 6.5x13, 3 pc Al Rim

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Rear left/right / 2x 45kW

MOTOR TYPE permanent excitated watercooled synchronous m

MAX MOTOR RPM 8500

MOTOR CONTROLLER selfmade

MAX SYSTEM VOLTAGE 302V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY Li NMC / 12,31kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:5,05 /

DRIVE TYPE Chain drive

DIFFERENTIAL No mechanical differential, electronically controlled torque vectoring.

COOLING motors and controllers water-cooled

BRAKE SYSTEM Rotors: floating, steel Callipers and Master Cylinders: AP Racing

ELECTRONICS CAN-BUS system, student-designed steering wheel, datalogging, torque vectoring, traction control.

HATFIELD
University of Hertfordshire

Car E13 Pit E7

United Kingdom

FRAME CONSTRUCTION 2 piece steel tubular space-frame with bonded Fiberlam floor panel

MATERIAL C350 mild steel tube, cold drawn seamless

OVERALL L / W / H (mm) 2620 / 1357 / 1280

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1535 / 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 162 / 175

SUSPENSION Unequal length wishbones. Push rod actuated Cane Creek spring/damper units

TYRES (Fr / Rr) 20.5 x 7 - 13 R25B Hoosier / 20.5 x 7 - 13 R25B Hoosier

WHEELS (Fr / Rr) Barnby 3-piece aluminium rim with 6082-T6 billet machine centre, 13" x 178mm, 40.5mm o/s

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / In front of rear axle / 41.6kW

MOTOR TYPE Lynch Motor Company LEM D127 2x2

MAX MOTOR RPM 3600

MOTOR CONTROLLER Kelly Control KDH14850B

MAX SYSTEM VOLTAGE 160V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFe PO4 / 7,25kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 4,25:1 / N/A

DRIVE TYPE Single Speed, chain drive

DIFFERENTIAL Student Designed Salisbury type limited slip differential

COOLING Air cooled using 6 x 120mm 12v fans

BRAKE SYSTEM AP Racing 19.1mm master Cylinders, 4 pot front / 2 pot rear calipers with adjustable bias bar

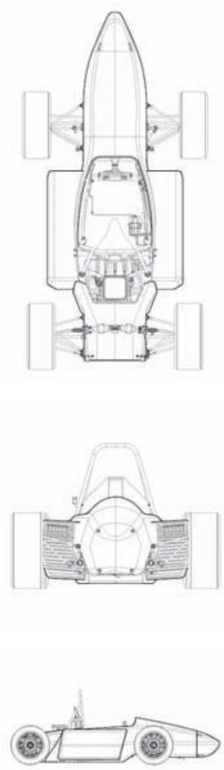
ELECTRONICS Harness sealed to IP66. Seperate high and low voltage systems with student built data logger

UH Racing are entering the inaugural event of Formula Student Electric with their second generation of electric car after success last year with both electric and petrol cars. The cohesive team structure encompassing both petrol and electric teams has enabled improvements in productivity and brought a great deal of experience to the team. UH13A, the team's electric car, has been designed based on the experience gained from last year's cars with the core principal of building low cost high performance race cars. Powered by two Lynch Motor Company motors and LiFeBatt cells, whilst incorporating large advances in packaging and electronics, the university's first entry into Formula Student Electric is looking to leave quite the impact this summer. www.racing.herts.ac.uk

KARLSRUHE
Karlsruhe Institute of Technology

Car E17 Pit E14

Germany



FRAME CONSTRUCTION Monocoque

MATERIAL Carbon fibre reinforced plastic

OVERALL L / W / H (mm) 2790 / 1425 / 998

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1220 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 153 / 185

SUSPENSION Unequal length A-Arms. Push/Pull rod actuated ZF Sachs damper with torsion springs

TYRES (Fr / Rr) 2009 Continental 205x510 R13

WHEELS (Fr / Rr) 7x13, 22mm offset, 1 pc alu OZ center lock

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 1 / Rear / 55kW

MOTOR TYPE Zytek IDT 120-55

MAX MOTOR RPM 12000

MOTOR CONTROLLER Integrated into the unit

MAX SYSTEM VOLTAGE 385V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY Continental 20 Ah Li-Ion Pouch Cell / 7,5kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 10,5 /

DRIVE TYPE Single speed gear box, student built

DIFFERENTIAL Drexler clutch pack limited slip differential, adjustable bias ratios

COOLING Twin side pod mounted radiators with thermostatic controlled electric fans

BRAKE SYSTEM Floating steel rotors, ISR 6 Pistons (front) / ISR 4 Pistons (rear), Continental ABS

ELECTRONICS Studend built modular and extensible, control units. Integrated telemetry functions. Easy to use.

KA-RaceIng is the Formula Student Team of the KIT – Karlsruhe Institute of Technology, the former University of Karlsruhe (TH). The team consists of 53 students from different fields of study, mainly mechanical, electrical and industrial engineering. Organised into mechanical or organisational sub teams, every team member has a task for which he is fully responsible. The KIT10e is the fifth car made by KA-RaceIng and the first one incorporating an electric power train. It is based on the chassis of the KIT10. Using one common platform for more than one power train increases the efficiency during designing, testing and set up. The power train of the car consists of a longitudinal mounted Zytek motor with integrated inverter and a self-made gearbox. Lithium ion cells are mounted in the side pods. KA-RaceIng would like to thank all its supporters who made it possible to build this race car. The team is looking forward to another exciting and successful competition at Hockenheim.

KÖLN
University of Applied Sciences Köln

Car E12 Pit E4

Germany

After the announcement of the organizers at the Formula Student Germany 2009 that Formula Student Electric would be coming, seven students were enthused and said: "This is it!" From then on Kick-Off meetings were held, other faculties were visited and many more students became impressed/involved. After a short time enough human beings were found to be part of this project, so the Team eMotorsports Cologne was born. In January 2010, we were invited to the "Audi Contest FSE 2010", which gave us the chance to present and verify our concept in front of a well-staffed jury. After this "confidence booster" we focused at the usage of dynamic advantages that only an electric driven racing car provides. The main concentration is on energy storage and driving dynamics such as "Torque Vectoring" which are very important parts to be up-to-date or even a leader of its genre. We wish our combustion team Formula Racing Cologne a great season.

FRAME CONSTRUCTION Tubular Space frame

MATERIAL 15CDV6, 18 to 30 mm diameter, 1 to 2 mm wall thickness

OVERALL L / W / H (mm) 2704 / 1377 / 1027

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1553 / 1199 / 1224

WEIGHT WITH 68kg DRIVER (Fr / Rr) 157 / 167

SUSPENSION Double unequal length A-Arm. Pull rod/push rod actuated horizontally oriented spring and damper

TYRES (Fr / Rr) 20.5x7 R13, Hoosier R25B

WHEELS (Fr / Rr) 20.5x7 R13, Hoosier R25B

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Rear Right, Rear left / 34 kW, 34 kW

MOTOR TYPE RR, RL: LMC D135RAGS (PM brushed DC)

MAX MOTOR RPM 4200

MOTOR CONTROLLER Kelly KDH14601E

MAX SYSTEM VOLTAGE 146V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFePo4 / 6,14kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:4,1 / -

DRIVE TYPE Belt, PolyChain GT Carbon

DIFFERENTIAL -

COOLING Air cooling

BRAKE SYSTEM 4-Disk system, dia: 220 mm; front 4 piston; rear 2 piston AP Racing calipers, ABS

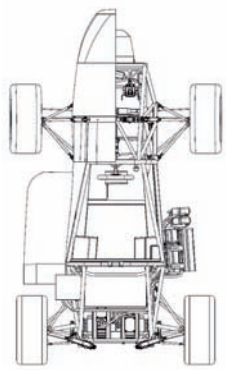
ELECTRONICS

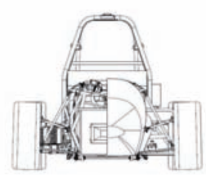
MOSBACH
Baden-Württemberg Cooperative State University Mosbach

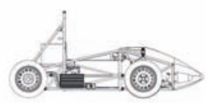
Car E69 Pit E10

Germany

>mosTEC.racing - the formula student team of the Baden-Wuerttemberg Cooperative State University Mosbach - was founded in summer 2009. The first competition mosTEC.racing will participate in is the Hockenheim Event in 2010. The team consists of 23 team members from different fields of study. Our first year car bases upon a tubular space frame and features two synchronous motors. The maximum power output of one inserted motor amounts 23.3 kW. The motor torque is transferred to the sideshafts by planetary gears. Because each motor directly transfers its power to the rear tires, there is no differential splitting the torque while cornering. Due to this, the controllers have to adapt the function of a differential. We would like to thank our sponsors and everyone supporting us. For further information please visit us at www.mostec-racing.de.







FRAME CONSTRUCTION tubular space frame

MATERIAL 25CrMo4

OVERALL L / W / H (mm) 2676 / 1444 / 1280

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1254 / 1126

WEIGHT WITH 68kg DRIVER (Fr / Rr) 155 / 232

SUSPENSION Double unequal length A-Arm. Push rod actuated spring and damper.

TYRES (Fr / Rr) 20,5 x 7 -13 Hoosier R25A

WHEELS (Fr / Rr) 20,5 x 7 -13 Hoosier R25A

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Rear Right, Rear Left / 25kW

MOTOR TYPE Perm PMS 126W

MAX MOTOR RPM 6600

MOTOR CONTROLLER Sigmadrive 950T01

MAX SYSTEM VOLTAGE 96V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFePO4 / 8,76kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:5 / -

DRIVE TYPE planetary drive

DIFFERENTIAL electronic differential

COOLING Side mounted radiator an electric fan

BRAKE SYSTEM steel, hub mounted, 240mm/220mm diam., ISR 4 piston calipers

ELECTRONICS wiring harness sealed to IP67

MÜNCHEN

University of Applied Sciences München

Car E22 Pit E13 Germany

In 2010, the newly founded municHMotorsport electric team participates in the start-up Formula Student Electric event at Hockenheim. The team consists of about 40 students, who are facing the challenge of building a pure electric race car, the PWe1.10. Set up on the PW5.10 of the municHMotorsport racing team, we changed and adapted certain parts of the combustion engine driven car and implemented an electrical drivetrain. In addition to the carbonfiber monocoque and the steel tube rear car section we added a double-stage chain drive on the mechanical section of the car. The electrical drivetrain consists of one Brushless DC motor (Magnet Motor) with the dedicated power electronic and a self-developed battery containment with LiFePO4 cells. One central processing unit (dSpace) controls the car via two CAN bus systems. Keeping track of building a reliable first year car we realized a solid solution together with our strong partner community.

FRAME CONSTRUCTION Monocoque with steel tube space frame rear car section

MATERIAL CFK with 10mm honeycomb core / 22mm steel tubes

OVERALL L / W / H (mm) 2830 / 1450 / 1120

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1600 / 1200 / 1160

WEIGHT WITH 68kg DRIVER (Fr / Rr) 180 / 220

SUSPENSION Double unequal lenght A-Arm. Front pull rod actuated, rear push rod actuated

TYRES (Fr / Rr) 20.5x7-13 R25B Hoosier / 20.5x7-13 R25B Hoosier

WHEELS (Fr / Rr) 7 inch wide,1 pc Al Rim, 20mm pos. offset / 7 inch wide,1 pc Al Rim, 30mm pos. offset

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 1 / Rear center / 44kW

MOTOR TYPE Magnet Motor M68 Brushless DC

MAX MOTOR RPM 6600

MOTOR CONTROLLER Magnet Motor S30

MAX SYSTEM VOLTAGE 600V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFePO4 / 6kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:6 /

DRIVE TYPE two chain drives

DIFFERENTIAL Drexler limited slip differential with clutch pack

COOLING Liquid cooled motor and power electronics, heat exchanger left, Accumulator pack air colled, 4 fans

BRAKE SYSTEM 4-disk system, self developed rotors with 240mm/220mm, adjustable brake balance, AP-racing calipers

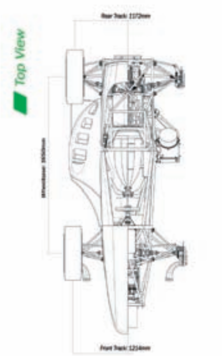
ELECTRONICS Central processing unit (dSpace), 2 CAN Bus Systems, Infineon BMS, Self designed Switch-Box

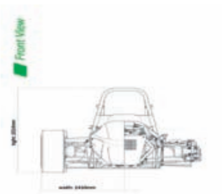
STUTTGART

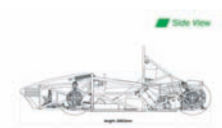
University of Stuttgart

Car E26 Pit E3 Germany

The GreenTeam Uni Stuttgart: There is a new competition for cars with fully electrical drivetrains. Of course the Stuttgart Team did not want to miss this oppurtunity. In a very short time a small group of former members of the Rennteam Uni Stuttgart and a handful greenhorns formed a new team - the GreenTeam, where green symbolizes not only ecological clean but also alternative concepts besides and on the race track. In only seven months the team developed a race car without CO2 emissions on the basis of the former world championship chassis. The EO711-1 is a race car of pure breed with two electrical motors in the rear serving each wheel separately. A tubular space frame, powerful Lithium polymere accumulators combined with a self-developed battery management system and the benefits of the torque vectoring technique are the highlights of the EO711-1. We are looking forward to the exciting FSE competition and hope you are keeping your green fingers crossed for us!







FRAME CONSTRUCTION Tubular space frame with carbonfibre sandwich floor panels

MATERIAL 25CrMo4 tubes, multiaxial carbonfibre sandwich floor panels

OVERALL L / W / H (mm) 2665 / 1415 / 1005

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1650 / 1214 / 1172

WEIGHT WITH 68kg DRIVER (Fr / Rr) /

SUSPENSION Double unequal length A-Arm. Push rod actuated horizontally oriented spring and adjustable damper.

TYRES (Fr / Rr)

WHEELS (Fr / Rr)

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Rear Right and Rear Left / 2 x 47kW

MOTOR TYPE AMK / DP7-60-10-POW-7200

MAX MOTOR RPM 12500

MOTOR CONTROLLER AMK KW60

MAX SYSTEM VOLTAGE 597V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY Lithium Polymere / 8,5kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:5,5 / 1:5,5

DRIVE TYPE

DIFFERENTIAL

COOLING Single side pod mounted radiator with digital temperature controlled electric fan via PWM signals.

BRAKE SYSTEM

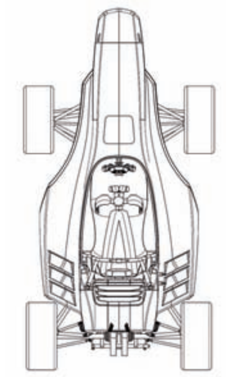
ELECTRONICS wiring harness sealed to IP67, selfdesigned Live-Telemetry System, selfdesigned BMS

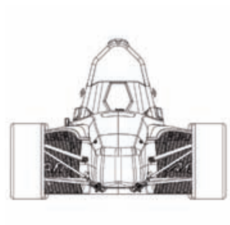
ZÜRICH
Swiss Federal Institute of Technology Zurich

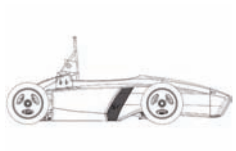
Car E33 Pit E1

Switzerland

After three successful Formula Student cars with combustion engines, the AMZ Racing Team decided to concentrate on developing an electric car in the summer of 2009 . By designing not only a new drivetrain, but also new chassis and suspension, our goal is to outperform the ICE cars in every dynamic discipline. furka's monocoque is an evolution of our 2009 chassis simplon, with a completely redesigned rear section. The suspension geometry was further optimized with extensive simulation of tire data, while the components' weight was reduced. The LiPo batteries are contained in composite boxes, mounted to the sides of the chassis. Safety is maintained by our selfmade battery management system and the central vehicle control unit. To achieve a high power to weight ratio, two DC motors are used. Each of them is linked to one rear wheel, which allows active torque vectoring and recuperation.







FRAME CONSTRUCTION Full carbon fiber monocoque in prepreg technique, front and rear part with steel roll bars

MATERIAL Sandwich with 4 to 7 layers 200gsm carbon fiber prepreg face sheets and up to 15mm nomex core

OVERALL L / W / H (mm) 2720 / 1420 / 1050

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1625 / 1200 / 1150

WEIGHT WITH 68kg DRIVER (Fr / Rr) 134 / 146

SUSPENSION CFRP double unequal length A-Arm, pullrod actuated, four-way adjustable Öhlins spring/damper unit

TYRES (Fr / Rr) Front: 20,5 x 7,0 R13, Hoosier 25B. Rear: 20,0 x 7,5 R13, Hoosier 25B.

WHEELS (Fr / Rr) 7,5 x 13 CFRP 3-spoke Rim, -1" offset

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 2 / Inside rear monocoque / 2x 30 kW

MOTOR TYPE Agni 95R

MAX MOTOR RPM 6000

MOTOR CONTROLLER 2x Kelly KDH12101E

MAX SYSTEM VOLTAGE 126V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiPo / 8,7kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) 1:1 / 1:5,3

DRIVE TYPE 2x 415 chain, split aluminum sprocket

DIFFERENTIAL No mechanical differential, electronically controlled torque vectoring

COOLING Air-cooled motors, water-cooled controllers with radiator in right side pod

BRAKE SYSTEM 4-Disk system, full floating, cast iron, hub-mounted, vented rotors

ELECTRONICS Self-programmed VCU, self-developed mini CAN modules, BMS and multifunctional steering wheel.

ZWICKAU
University of Applied Sciences Zwickau

Car E62 Pit E16

Germany

Three years after the foundation of the WHZ Racing Team in Zwickau, we have picked up the new challenge of building a full electric race car for the Formula Student Electric. With our new founded WHZ Racing Team Electric, eleven team members combine experience with the zest for action. We all stick together as colleagues who share work and free-time as friends. The result is a completely new designed race car with four electric motors as a fast connection between high vehicle dynamics and innovative technology. The FP410e, a.k.a. "E-Horst" combines the knowledge of three Formula Student years in one car and will demonstrate that a full electric race car can be on a par with internal combustion cars. The Formula Student Electric opens a door to a new dimension of racing so let us all have fun and create the future together in a fantastic event. See you at Hockenheim!

FRAME CONSTRUCTION Steel tube space frame

MATERIAL S355 mild steel tube - cold drawn seamless

OVERALL L / W / H (mm) 2657 / 1403 / 1166

WHEELBASE (mm) / TRACK (Fr / Rr) (mm) 1550 / 1218 / 1200

WEIGHT WITH 68kg DRIVER (Fr / Rr) 141 / 177

SUSPENSION Double unequal length A-Arm.Push/Pullrod actuated horizontally oriented Cane Creek spring and damper

TYRES (Fr / Rr) 20.5x7 R13, Hoosier R25B

WHEELS (Fr / Rr) 20.5x7 R13, Hoosier R25B

NUMBER OF MOTORS / LOCATION / MAX MOTOR POWER 4 / Hub Motors,Central Motors / 6,5kW,6,5kW,30kW,30kW

MOTOR TYPE FL,FR:Siemens 1FE1;RR,RL: student build PMSM

MAX MOTOR RPM FL,FR: 18000; RR,RL: 6000

MOTOR CONTROLLER Siemens S120

MAX SYSTEM VOLTAGE 370V

ELECTRODE MATERIALS / COMBINED ACCUMULATOR CAPACITY LiFeO - graphite / 5,9kWh

TRANSMISSION RATIO (PRIMARY / SECONDARY) F:14,40 / R:4,92

DRIVE TYPE axial to wheel mounted motors,planet set

DIFFERENTIAL Electronic differential

COOLING Left side pod mounted radiator, no fan

BRAKE SYSTEM 4-Disk system,self developed rotors with 250mm/230mm diameter,adjustable brake balance,AP calipers

ELECTRONICS wiring harness sealed to IP67, Multifunctional Steering Wheel

FSG DICTIONARY
FSG WÖRTERBUCH

acceleration	Beschleunigung
accessories	Zubehörteile
accumulator	Akkumulator
adhesive	Klebstoff; kleben
angle	Winkel
autocross / sprint	eine schnelle Runde auf dem Rundkurs
battery	Batterie
bearing	Lager
bodywork	Verkleidung
bolt	Bolzen, Schraube
bore	Bohrung
brake	Bremse; bremsen
business model	Geschäftsmodell
business plan	Geschäftsplan
caliper	Bremssattel
camber	Sturz
camshaft	Nockenwelle
carbon fibre	Kohlefaser
caster; caster angle	Nachlauf; Nachlaufwinkel
centre of gravity	Schwerpunkt
chain	Kette
charge	Ladung; laden
charging station	Ladestation
chassis	Fahrwerk, Fahrgestell, Rahmen bzw. Monocoque
clutch	Kupplung; kuppeln
component	Bauteil
composite materials, composites	Verbundwerkstoffe
compression ratio	Verdichtungsverhältnis
control system	Steuerungssystem
cooling	Kühlung, Kühlsystem
crankshaft	Kurbelwelle
current	Strom
cylinder	Zylinder
damper	Dämpfer
dashboard	Armaturenbrett
design	Entwurf, hier: Konstruktion; konstruieren
differential	Differential (-getriebe)
displacement	Hubraum
drive shaft	Antriebswelle
drive train	Antriebsstrang
efficiency factor	Wirkungsgrad
(driver) egress test	5-Sekunden-Ausstiegstest
electronic control unit (ecu)	elektronisches Steuergerät
emergency switch	Notaus-Schalter
endurance	Ausdauer, hier: Langstreckentest
energy efficiency	Energieeffizienz
energy meter	Messgerät für elektrische Energie
engine	Motor
evaluation	Bewertung
executive summary	Zusammenfassung des Geschäftsplans
exhaust	Auspuff
exhaust system	Abgasanlage
fire extinguisher	Feuerlöscher
firewall	Feuerschutzwand
force	Kraft
frame	Rahmen
fuel consumption	Kraftstoffverbrauch
fuel economy	Kraftstoffverbrauch
fuel efficiency	Kraftstoffeffizienz
fuel injection	Kraftstoffeinspritzung
fuse	Sicherung
gear	Gang
gearbox	Getriebe
glass fibre	Glasfaser
glue	Klebstoff; kleben
ground	Masse
handling	Fahrverhalten
hub	Nabe
HV (high voltage)	Hochspannung
impact attenuator	Crashbox
insulation monitoring device (IMD)	Isolationsüberwachungssystem
intake manifold	Ansaugtrakt
intake system	Ansaugsystem
in-wheel motor	Radnabenmotor
jack	Wagenheber
judge	Juror, Jurymitglied; bewerten
lap	Runde
lateral forces	Seitenkräfte
LV (low voltage)	Niederspannung
manufacture	Fertigung, Herstellung; fertigen
marshal	Streckenposten
monocoque	Karosserie in Schalenbauweise
motor	elektrischer Motor
nut	Mutter
peak power design (rpm)	Entwicklungszieldrehzahl für Spitzenleistung
peak torque design (rpm)	Entwicklungszieldrehzahl für Spitzendrehmoment
petrol	Benzin
penalty	Strafe
piston	Kolben
pit	Box
power design (rpm)	-> peak power design (rpm)
push bar	hier: Vorrichtung zum Schieben des Fahrzeugs
push rod	Druckstab, insbesondere an der Radaufhängung
rain test	Beregnungstest
range	Reichweite
regenerative braking	Rekuperation
restrictor	Restriktor, Luftmengenbegrenzer
rim	Felge
rivet	Niete; nieten
rocker arm	Umlenk-, Kipphebel
roll hoop	Überrollbügel
rpm	U/min
safety harness	Rückhaltesystem
scatter shield	Kettenschutz
scrutineering	technische Sicherheitsüberprüfung
shift	schalten
shim	Rückhaltesystem
side impact	Seitenaufprall
Skid Pad	Skid Pad, Befahren einer Acht
slick	profilloser Reifen
spaceframe	aus Profilen zusammengesetzter Rahmen
spring	Feder
sprint	-> autocross
steel tube space frame	Gitterrohrrahmen aus Stahl
steering	Lenkung
steering lever	Spurhebel
steering rack	Zahnstange
steering wheel	Lenkrad
stiffness	Steifigkeit
strenght	Festigkeit
stroke	Hub
suspension	Fahrwerk, insb. Federungssystem
suspension arms	Fahrwerksstreben
suspension loads	Fahrwerkslasten
technical inspection	technische Abnahme
throttle	Drosselklappe; drosseln
tie rod	Spurstange
toe	Vorspur
torque	Drehmoment
torque curve	Drehmomentverlauf
torque design (rpm)	-> peak torque design (rpm)
torque encoder (throttle pedal position sensor)	Gaspedalpositionsgeber
torque vectoring	Lenkungsunterstützung durch Antriebsmoment
track	Spurweite
traction control	Traktionskontrolle
tractive system	Antriebssystem
tractive system active light (TSAL)	Hochspannungswarnleuchte
transmission	Getriebe (insb. bei elektrischen Fahrzeugen)
tube	Rohr
tyre	Reifen
valve	Ventil
voltage	Spannung
washer	Unterlegscheibe
weld line	Schweißnaht
wheel	Rad
wheelbase	Radstand
wheel hub motor	Radnabenmotor
wing	Flügel, Spoiler
wiring harness	Leitungsstrang

In the team profiles, you find so called QR Codes, a two-dimensional bar code. It includes a link to the team page on the FSG website. In order to use it you need to install a reader on your mobile phone. We recommend the i-nigma reader, which supports over 250 devices. Please browse with your mobile phone to www.i-nigma.mobi.