2010 Formula Student Electric
Rules

1 Important Dates

1.1 Competition Dates and Place

August 04, 2010 to August 08, 2010
Formula Student Electric (FSE) will take place in Hockenheim/Germany.

1.2 Registration

January 8, 2010 1200 CET

Registration forms will be accepted in the order in which they are received, starting January 8, 2010 at 1200 CET and ending on April 30, 2010 1200 CEST or when the 12 cars registration limit is reached. Registration will be online at the FSE Website.

1.3 Structural Equivalency Form

May 03, 2010 1200 CEST

IMPORTANT: ALL TEAMS MUST SUBMIT A STRUCTURAL EQUIVALENCY FORM. A blank copy of this form is supplied in FSE Appendix A-A.

Structural Equivalency Form must be uploaded to the 'My Team' area on the FSE website no later than May 03, 2010 till **1200 CEST**.

Late submissions will be penalized with -10 (ten) points per day, up to a maximum of 70 points, which will be taken off the team's Total Score.

Teams which missed the SEF deadline by more then 7 days will be de-registered from the FSE 2010 competition.

In the event that the Formula Student Germany (FSG)/FSE Technical Committee requests additional information or calculations, teams have 14 days from the date of the request to submit the requested information. Late submissions will be penalized with -5 (five) points per day, up to a maximum of 50 points, which will be taken off the team's Total Score.

1.4 Impact Attenuator Data

May 03, 2010 1200 CEST

IMPORTANT: ALL TEAMS MUST SUBMIT AN IMPACT ATTENUATOR DATA FORM. A blank copy of this form is supplied in FSE Appendix A-B.

Impact Attenuator Data must be uploaded to the 'My Team' area on the FSE website no later than May 03, 2010 till **1200 CEST**.

Late submissions will be penalized with -10 (ten) points per day, up to a maximum of 70 points, which will be taken off the team's Total Score.

Teams which missed the IAD deadline by more then 7 days will be de-registered from the FSE 2010 competition.

In the event that the FSG/FSE Technical Committee requests additional information or calculations, teams have 14 days from the date of the request to submit the requested information. Late submissions will be penalized with -5 (five) points per day, up to a maximum of 50 points, which will be taken off the team's Total Score.

1.5 Electrical Safety Form

June 08, 2010 1200 CEST

IMPORTANT: ALL TEAMS MUST SUBMIT AN ELECTRICAL SAFETY FORM.

The Electrical Safety Form must be uploaded to the 'My Team' area on the FSE website no later than June 08, 2010 till **1200 CEST**.

Late submissions will be penalized with -10 (ten) points per day, up to a maximum of 70 points, which will be taken off the team's Total Score.

Teams which missed the ESF deadline by more then 7 days will be de-registered from the FSE 2010 competition.

In the event that the FSG/FSE Technical Committee requests additional information or calculations, teams have 14 days from the date of the request to submit the requested information. Late submissions will be penalized with -5 (five) points per day, up to a maximum of 50 points, which will be taken off the team's Total Score.

1.6 Failure Modes and Effects Analysis

May 03, 2010 1200 CEST

IMPORTANT: ALL TEAMS MUST SUBMIT A FAILURE MODES AND EFFECTS ANALYSIS.

The Failure Modes and Effects Analysis must be uploaded to the 'My Team' area on the FSE website no later than May 03, 2010 till **1200 CEST**.

Late submissions will be penalized with -10 (ten) points per day, up to a maximum of 70 points, which will be taken off the team's Total Score.

Teams, which missed the FMEA deadline by more then 7 days will be de-registered from the FSE 2010 competition.

In the event that the FSG/FSE Technical Committee requests additional information or calculations, teams have 14 days from the date of the request to submit the requested information. Late submissions will be penalized with -5 (five) points per day, up to a maximum of 50 points, which will be taken off the team's Total Score.

1.7 Engineering Design Report and Design Spec Sheet

June 11, 2010 1200 CEST

The FSE Engineering Design Report and the FSE Engineering Design Spec Sheet must be uploaded to the 'My Team' area on the FSE website no later than June 11, 2010 **1200 CEST**.

Late submissions will be penalized with -10 (ten) points per day, up to a maximum of - 100 points, which will be taken off the team's Engineering Design Event Score. No report submitted will result in a score of zero for the Engineering Design Event.

1.8 Cost Report

June 11, 2010 1200 CEST

The Cost Report consists of 2 parts, the Written Report and the Electronic Copy of the Bill of Materials (BOM). The electronic BOM must be submitted as a Microsoft Excel® file. The file must be uploaded to the 'My Team' area on the FSE Website no later than June 11, 2010 **1200 CEST**.

The written Report must be present during Cost Event judging.

Late submissions will be penalized with -10 (ten) points per day, up to a maximum of – 80 points, which will be taken off the team's Cost Event Score. No report submitted will result in a score of zero for the Cost Event.

1.9 Business Plan Executive Summary

June 11, 2010 1200 CEST

The Business Plan Executive Summary must be uploaded to the 'My Team' area on the FSE website no later than June 11, 2010 till **1200 CEST**.

Late submission or non submission will be penalized at the discretion of the judges up to -5 (five) points. These penalty points will be taken from the Presentation Judging Form.

1.10 Charging Type

May 03, 2010

Teams must inform FSE how their car is to be charged no later than May 03, 2010. The charging type can be chosen after registration in the 'My Team' area.

1.11 Safety Responsible(s) Certification Upload

May 03, 2010 at 1200 CEST

Teams must upload the certified proof of their chosen SR(s) being at least a bachelor in electrical engineering or an academic equivalent . This should be done in the form of a multiple page Adobe Acrobat® file (*.pdf) no later than May 03, 2010 1200 CEST in the 'My Team' area on the FSE Website.

1.12 Team Member Designation

July 01, 2010 at 1200 CEST

Participating team members must be designated prior to the event. To designate a team member, please visit "My team area" on the FSE Website. Team members can only be designated as FSE participants if they have entered the following personal information in their user profiles:

- Personal Address (required for insurance purposes)
- ZIP code (required for insurance purposes)
- City (required for insurance purposes)
- Clothing size (required for Event T-Shirts)
- Emergency contact person (parents e.g.)
- Emergency contact phone (parents e.g.)
- FISITA organisation you belong to
- FISITA organisation member number

1.13 Health Insurance Certificate

July 01, 2010

Collect and scan all health insurance certificates of the event participants and upload them in the 'My Team' area on the FSE Website as a multiple page Adobe Acrobat® file (*.pdf) no later than July 01, 2010.

2 General

The principle of Formula Student Electric is to allow the development of fully electric vehicles within the Formula Student framework. The competition for Formula Student Electric cars will be the same as Formula Student with some slight modifications due the special needs of fully electric vehicles.

The Formula Student Electric (FSE) competition will comply with the Formula SAE® 2010 rules, located here: http://students.sae.org/competitions/formulaseries/rules/2010fsaerules.pdf
The Formula Student Electric Rules include some specific rule changes and additions to allow the development of safe, fully electric vehicles with electro-chemical energy storage.

Those changes and additions are located within this document, which supersedes the specific sections of the published Formula SAE® rules for 2010. Any questions or ambiguities concerning the rules for Formula Student Electric will be resolved by the Formula Student Electric Rules Committee (FSE-Rules@FormulaStudent.de).

2.1 Official time

The Formula Student Germany/ Formula Student Electric official time:

From	Till	Time
25.10.2009	27.03.2010	CET
28.03.2010	30.10.2010	CEST

To convert CET or CEST to your local time you may use following website:

http://www.timeanddate.com/worldclock/converter.html

2.2 Registration

2.2.1 Registration deadline

The registration deadline for Formula Student Electric is listed in the Important Dates section of this document. (Please refer to FSE Rules, section 1.2)

2.2.2 Registration Capacity Limit

Registrations will be given out, in the order in which they are received. The 2010 Formula Student Electric competition will be limited to 18 teams.

2.2.3 Registration Fee

The registration fee of 750 Euros is for a 20-person team. More team members can be registered for 20 Euros per additional team member.

2.2.4 Registration required information

Once the team has officially been registered for FSE, each team member and faculty advisor is required to add his/her identifying information online. All participants must provide their name and individual emergency contact information.

Participants may only be added (registered) by the team's official contact person (the person who registered the team for the event) until July 1, 2010.

2.3 Society Membership

Every participating team member must be a member of one of the FISITA (www.fisita.org) engineering societies.

2.4 Official Language

The Formula Student Electric official language is English.

2.5 Safety Responsible

Every participating team has to appoint at least one safety responsible (SR) for the event. This person is responsible for all electrical operations of the vehicle during the event. The SR is also responsible for every kind of work at the car during the event. The SR is the only person in the team that is allowed to declare the car electrically safe, so that work on any system of the car may be performed by the team.
The SR must be reachable at all times during the event.
The SR is not allowed to be a driver, if no second SR is named by the team who is not a driver.
The SR must be at least a bachelor in electrical engineering or an academic equivalent. In order to register for the event, the SR must prove this by uploading appropriate confirmation thereof, see 1.11.
It is recommended that the SR is certified for working with high voltage systems in automotive vehicles.

2.6 Extension of the Rules

Due to continuous development of the FSE rules, extensions or additions may be integrated at any time.
Any significant rule changes or additions will occur only once a year and will be published before the 30th of November.
Small rule changes, additions or rules for event specific operations will be published on the FSE Homepage. Discussions about upcoming rule changes and additions will take place in the official FSE Forum.

2.7 Faculty Advisor

FSE recommends that all participating teams have a Faculty Advisor present with them at the competition. In the event that no Faculty Advisor is present during the competition, the Team Captain or Safety Responsible will take over all responsibilities of the Faculty Advisor.

2.8 Event Handbook

The event handbook may contain special event procedures and restrictions for example regarding working on the car etc. It has to be read and understood by all event participants.

3 Vehicle Requirements and Restrictions

3.1 Impact Attenuator

3.1.1 Anti Intrusion Plate (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule 3.20.6)

On all cars, a 1.5 mm (0.060 in) solid steel or 4.0 mm (0.157 in) solid aluminium “anti-intrusion-plate” must be integrated into the Impact Attenuator. Alternative materials/designs are prohibited.

3.2 Securing Fasteners (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule 14.2)

3.2.1 Brake System Components mounting

Nylon lock nuts are not allowed for mounting brake callipers or brake discs. All critical bolts, nuts, and other fasteners on the brake system, must be secured from unintentional loosening by the use of FSG/FSE approved positive locking mechanisms.

3.2.2 Steering System and Suspension System Components mounting (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule 14.2)

Pins and lock plates or snap rings are not accepted as positive locking mechanisms in the Steering and Suspension System.

3.3 Brake System

3.3.1 Brake System Master cylinder actuation

The brake system master cylinder must be direct actuated or by a mechanical connection. The use of bowden cables or push-pull bowden cables is not allowed.

The first 50% of the brake pedal travel may be used to regenerate brake energy. The brake energy recovery is only permitted when the brake pedal is actuated by the driver. Automatic brake energy recovery is prohibited.
The remaining brake pedal travel must actuate the hydraulic brake system.

3.3.2 Brake Light

The brake light must be turned on when the driver actuates the brake pedal.

3.4 Drive Train

3.4.1 Drive Train Shields and Guards (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule B 8.13)

In case of using a chain or belt the drive train shield must cover the chain or belt from the sprocket till the sprocket/belt pulley, around the sprocket/belt pulley and end parallel to the lowest point of the sprocket/belt pulley, see Figure 1.

Note: Even if the chain or belt is covered by the structure, a drive train shield is required.

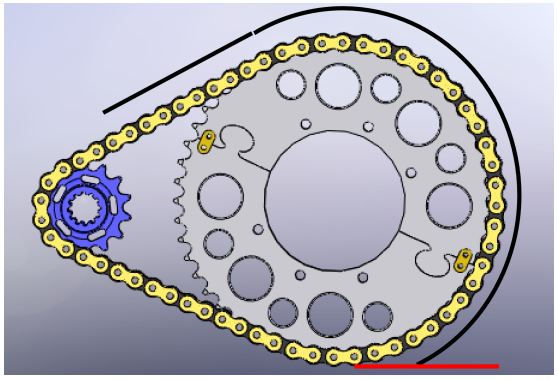

Figure 1: Example for a drive train shield

3.5 Driver Egress (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule B 4.8)

The driver egress, required by Formula SAE® 2010 Part B Rule B4.8 must be possible in each steering wheel position.

3.6 Vehicle Identification

3.6.1 School Name (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule 16.2)

Following school type abbreviations are accepted. The city name must be written fully.

Technical University - TU + City
University of Applied Sciences – UAS + City
University - Uni + City
Berufsakademie - BA + City

If the university uses a shortcut in their proper name, this shortcut is acceptable + city.

Example:
real name: Rheinisch-Westfälische Technische Hochschule Aachen -
proper name: RWTH Aachen

3.6.2 Technical Inspection Sticker Space (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule 16.4)

The technical inspection sticker will be placed on the nose of the car directly in front of the cockpit opening. A space 75 mm tall x 150 mm wide (3” tall x 6” wide) must be made available for this sticker.

3.6.3 Transponders (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule 15.2 and 15.3)

Transponders will be provided by FSG/FSE. Only provided Transponders will be accepted. The allowed mounting position and orientation will be published on the FSE website and/or the event handbook.

3.6.4 Driver's Suits and Undergarments (Specific FSG/FSE change of Formula SAE® 2010 Part B Rule 17.1)

Each driver must wear a fire resistant suit that covers the body from the neck down to the ankles and the wrists. The suit must be in good condition, i.e. it must have no tears or open seams, or oil stains that could compromise its fire resistant capability. The suit must be certified to one of the following standards and be labelled as such:

- SFI 3-2A/10 (or higher)

- FIA Standard 1986

- FIA Standard 8856-2000

Approved long underwear made of fire resistant material must be worn with all suits except those carrying a rating of SFI 3.2A/10, 3.2A/15, 3.2A/20 or FIA Standard 8856-2000.

Underwear certified to SFI 3.3 or FIA 8856-2000 is strongly recommended in all cases.

Socks, shirts, and other undergarments made of synthetic material (including Nylon, Orlon, Spandex, etc.) will melt into the skin in a fire and are strictly forbidden. Nomex socks are strongly recommended.

3.7 Chassis

An existing FS chassis may be used for 2010. This chassis must fulfil at least the 2007 FSAE Rules. If an existing chassis is used, the primary structure as defined per FSAE rule 2010 B3.2 must not be changed. Modification of tubes that do not belong to the roll hoops, the side impact structure, the front bulkhead or the front bulkhead support is allowed, if needed to fulfil the FSE rule 6.19.
It must be proven that the chassis was used during the year that such rules were in place by submitting the old SEF and the current SEF.
A completely new designed chassis must conform to the current FSAE 2010 rules.
The requirements for the IAD are not affected by using an old chassis. Therefore the IAD has to comply to the FSAE Rules 2010 and the FSG/FSE additions.

3.8 Firewall

A firewall must separate the driver compartment from all tractive system components and any oil or liquid cooling systems.
In case of using a non-metal material for the firewall (i.e. carbon fibre, fibreglass, etc.) a fire resistant heat protection shield with a metal surface must be fitted to that side of the firewall on which the tractive system components are. The metal surface part of the firewall must have a low resistance connection to control system ground.
The driver side of the firewall must be made of an electrically insulating material being suitable for the maximum operation voltage of the vehicle.

3.9 Brake Test

During the brake test the car must be accelerated on a short straight. Afterwards the tractive system has to be switched off by the driver and the brake pedal must be actuated as far as possible. The brake test is successful if all four wheels lock.

3.10 Brake Over-Travel Switch

Instead of switching off the ignition and fuel pumps the brake pedal over-travel switch must shut down the tractive system by opening the accumulator insulation relay(s), see also 6.12.

3.11 Tractive System

3.11.1 Replacement of FSAE Rules 2010

Articles B8.1 until B8.9, B9 except B9.9, B10 and B11except B11.4 of the FSAE 2010 rules are superseded by the following FSE rules. Articles B8.10 and B8.11 are only valid if a cooling system is in use.

3.11.2 Motors

Only electrical motors are allowed.
Any type of electrical motors is allowed. The number of motors is not limited.
Hybrid systems are prohibited.

3.11.3 Torque Encoder (throttle pedal position sensor)

Drive by wire is permitted.
The torque encoder must be actuated by a foot pedal.
The foot pedal must return to its original position when not actuated.
At least two sensors must be fitted as torque encoder. The purpose of the second sensor is redundancy. Both sensors must have different supply and ground wiring. A plausibility check is recommended to verify that both sensors give the same pedal position.

4 Pit Rules

4.1 Electrical Power during pushing

It must be possible to push the car around with all electrical systems deactivated.

4.2 Push Bar (Specific FSG/FSE change of Formula SAE® 2010 Part D Rule 13.2)

The push bar must be a separate, detachable device. Rear wings will not be accepted as push bar. The push bar must be located behind the rear axle when the car is moved. One fire extinguisher has to be attached to the push bar by a quick release fastener in an easily accessible position.

4.3 Activating the tractive system

The Event Handbook will define where and under which conditions the tractive system may be activated.

4.4 Quick Jack

Each team must present a quick jack to lift up the car by using the jacking point during Technical Inspection. The quick jack must be able to lift up the car, so that the driven wheels are at least 10.2 cm (4 in) off the ground.

4.5 Fire Extinguishers

Foam fire extinguishers are not allowed.
Only CO2 and powder fire extinguishers are allowed as described in the FSAE Rules.

5 SEF and IAD Documents

5.1 Structural Equivalency and Structural Equivalency Form

All teams must submit the FSE Structural Equivalency Form, supplied in FSE Appendix A-A.

The use of alternative materials or tubing sizes to those specified in Part B Rule 3.3.1 “Baseline Steel Material” of the Formula SAE® 2010 Rules is allowed, provided they have been judged by a technical review to have equal or superior properties to those specified in Part B Rule 3.3.1 “Baseline Steel Material” of the Formula SAE® 2010 Rules.

Equality must be demonstrated by providing calculations and/or test results. All calculations must compare the alternative material with S235Jr (Material number 1.0037). At least tensile strength and yield stress of the alternative material must be compared with the same attributes of S235Jr.

All used algebraic symbols and abbreviations have to be defined.

5.2 Impact Attenuator Data

All teams must submit the FSE Impact Attenuator Data Form, supplied in FSE Appendix A-B, along with their test results, description of the test setup, the used test equipment and photo documentation of the IAD before and after the test. The Impact Attenuator Data must be submitted no later than the specified date. (Please see FSE Rules, section 1.4).

6 Electrical Rules

6.1 Electrical Safety Form (ESF)

Prior to the event all teams must submit clearly structured documentation of their entire electrical system (including control and tractive system) similar to the SEF called electrical safety form (ESF).
The ESF must visualize the interconnection of all electric components including the voltage level, the topology, the wiring in the car and the construction and build of the accumulator(s).
Teams must present data sheets with rated specifications for all tractive system parts used and show that none of these ratings are exceeded (including wiring components). This includes stress caused by the environment e.g. high temperatures, vibration, etc.
Design judges will have access to the submitted ESF and will take the ESF into account for design judging.
A template including the required structure for the ESF will be made available on the FSE website.
The ESF must be submitted as Adobe PDF-File. The minimum allowed font size is 11pts. The used font must be Arial. Pictures and schematics must be put inside the text, not in the appendix. Data sheets must be put in the appendix.

6.2 Failure Modes and Effects Analysis (FMEA)

Teams must submit a complete failure modes and effects analysis (FMEA) of the tractive system prior to the event.
Design judges will have access to the submitted FMEA and will take the FMEA into account for design judging.
A template including required failures to be described will be available on the FSE website. Do not change the format of the template. Pictures, schematics and data sheets to be referenced in the FMEA have to be included in the ESF.

6.3 Control and Tractive System

The tractive system of the car is defined as every part that is electrically connected to the motor(s) from the system's point of view.
The control system of the car is defined as every electrical part that is not part of the tractive system.
The tractive system must be completely insulated from the chassis or any other conductive parts of the car.
The control system must be a low-voltage-system, see 6.4. The control system must be grounded to the chassis. The entire tractive and control systems must be completely galvanically separated.
The border between tractive and control system is the galvanic insulation between both systems. Therefore some components may be part of both systems.
Bypassing the control system and connecting the tractive batteries directly to the motor(s) is prohibited.
The control system must have been powered up properly before it is possible to activate the tractive system. This means also that a failure causing the control system to shut down must deactivate the tractive system.

6.4 High-Voltage (HV) and Low-Voltage (LV)

Whenever a circuit carries more than a nominal operation voltage of 60V DC or 25V AC RMS it is defined as part of the High Voltage system. 600V DC or AC RMS is the maximum permitted nominal

operation voltage that may occur between any two electrical connections. Low voltage is defined as any voltage below 60V DC or 25V AC RMS.

The electrical layout of self developed devices must be documented accurately.
It is allowed to charge a LV battery with the HV system.

The LV and HV systems of the car must be separated.

- Using the same cable channel(s) for both systems is prohibited except for pilot or interlock circuits at the accumulator connectors.
- If a housing contains parts of the HV and LV system, an insulation boundary with a non conductive material must separate both systems.
- If a printed circuit board (PCB) contains both HV and LV systems, they must be separated by sufficient space to avoid accidental flashover and they must be galvanically separated. Furthermore the HV and LV areas have to be clearly marked on the PCB. All self developed PCBs containing HV must be easily accessible during scrutineering.

6.5 Grounding

All electrically conductive parts of the vehicle (e.g. pedalbox, steering wheel, suspension) must have low resistance to control system ground, see 6.7.

6.6 Insulation Monitoring Device

Every car must have an insulation monitoring device (IMD) installed in the tractive system. This must be a Bender A-ISOMETER ® iso-F1 IR155, IR486, IR475LY3 or an FSE approved equivalent. In case of an insulation failure, the output of the IMD must break the holding current flow of the accumulator insulation relay(s) to shut down the tractive system.

The status of the IMD has to be shown to the driver by a red indicator light in the cockpit that is easily visible even in bright sunlight. This indicator has to light up, if the IMD detects an insulation failure or if the IMD detects a failure in its own operation e.g. when it looses reference ground.
The IMD indicator light has to be clearly marked with the lettering “IMD”.

6.7 Insulation Monitoring Device Test (IMDT)

The insulation monitoring device will be tested during E-Scrutineering. This is done by connecting a resistor between several parts of the tractive system and electrically conductive vehicle parts while the tractive system is active. (See example in Figure 2) The size of the resistor is defined as 500 Ohm/V related to the maximum tractive system operation voltage. The test is passed if the insulation monitoring device shuts down the tractive system whenever the resistor connects the tractive system to grounded parts.
The IMDT may be repeated at any time during the event. After the car passes the test for the first time, critical parts of the tractive system will be sealed. The vehicle is not allowed to take part in any dynamic event if any of the seals are broken until the IMDT is successfully passed again.

6.8 Rain test

Teams may choose to try and pass a special rain test during Scrutineering to be allowed to compete in any dynamic event under damp or wet conditions. The car has to pass the IMDT, see rule 6.7, before the rain test can be conducted.

During the rain test the tractive system has to be active and none of the driven wheels are touching the ground. It is not allowed to have a driver seated in the car during the rain test.
Water will then be sprayed at the car from any possible direction for 120 seconds. The water spray will be rain like. Therefore there will be no direct high-pressure water jet shot at the car. The test is passed if the insulation monitoring device does not react during the test.

If any of the seals that were applied during E-Scrutineering is broken, the rain test must be redone after the IMDT was successfully passed again.

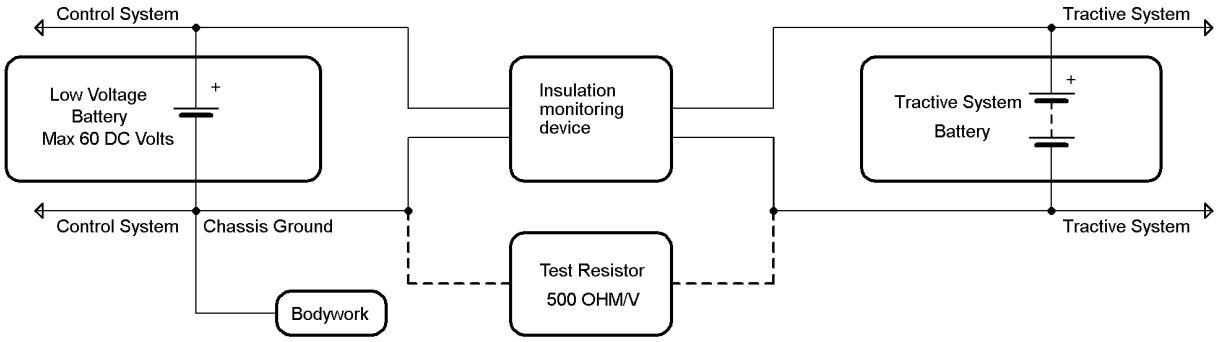

Figure 2: insulation monitoring device test example

6.9 No exposed tractive system connections except for measuring points

All parts especially live wires, contacts, etc. of the tractive system need to be isolated by non-conductive material or covers to be protected from being touched even with small tools. A protection degree of IP67 is recommended for the rain test.
Two tractive system voltage measuring points must be installed on the car next to each other in an easy to reach position (without removing bodywork or other parts of the car). These measuring points must be circular and must have a minimum diameter of 6mm. The measuring points must be made of conductive material and must be sealed in a housing that can easily be removed. They must be connected to the positive and negative motor controller/inverter supply lines with a maximum wire diameter of 0,35mm².
These measuring points will be used to check that the tractive system is shut down properly in the given time during E-Scrutineering, see rule 6.12. They are also needed to ensure the safety of the vehicle for possible rescue operations after an accident or when work on the vehicle is to be done.

6.10 Insulation, wiring and conduit

Only insulation material that is appropriate for the expected surrounding temperatures shall be used.
All wires and terminals used in the tractive system must be reasonably sized and the wires must be marked with wire gauge, temperature rating and insulation voltage rating. Alternatively a serial number or a norm printed on the wire is sufficient if this serial number or norm is clearly bound to the wire characteristics for example by a data sheet.
Data sheets documenting material data for the used insulation materials and wires must be brought to E-Scrutineering.
The complete tractive system wiring harness must be professionally built and secured against loosening and/or mechanical stress.

All HV wires that are not protected by housings or enclosures must run in orange non-conductive cable channels. Cable channels must be securely attached.
The tractive system wiring must be shielded against damage by rotating and / or moving parts.
Mounting wires lower than the chassis is prohibited.
If external heat sinks are used, they must be properly grounded.
The use of shielded wires is recommended for the tractive system.

6.11 Tractive-system-active light

It must be clearly visible when the tractive system is set to active (ready to drive). The car is defined as active whenever the accumulator insulation relay is closed or the voltage outside the accumulator containers exceeds 60V DC or 25V AC RMS. For this the car must be equipped with a light mounted on the highest point of the main roll hoop which lights if the car's tractive system is active and which is off when the tractive system is not active. This light must be clearly visible from every horizontal direction even in very bright sunlight.

6.12 Master Switches

A system of three shut-down buttons must be installed in the vehicle.
Pressing one of the shut-down buttons must separate the tractive system from the accumulator block.
After separating the system, the voltage in the tractive system must decrease to under 60V DC or 25V AC RMS in less than **five** seconds.
Each shut-down button must be a push-pull or push-rotate emergency switch where pushing the button opens the circuit of the holding current of the accumulator insulation relays. The shut-down buttons must not act through logic.
One of the buttons must be located on each side of the vehicle behind the driver's compartment at approximately the level of the driver's head.
One shut-down button is equivalent to the cockpit-mounted Master Switch and must be easily accessible by the driver in any steering wheel position.
The control system Master Switch is equivalent to the Primary Master Switch.
The tractive system Master Switch must be located near the control system Master Switch and break the current flow holding the accumulator insulation relays. The handle or key of the tractive system Master Switch has to be removable.
The function of both switches must be clearly marked. The "ON" position of both switches must be in the horizontal position.
Setting any of the 2 master switches or the 3 shut-down buttons to the "Off"-Position, activating the brake-over-travel-switch or an insulation failure detected by the insulation monitoring device must open all accumulator insulation relay(s) and, as stated before, the voltage in the tractive system must decrease to under 60V DC or 25V AC RMS in less than **five** seconds after such event.

6.13 Fusing

The tractive system must be appropriately fused. Fusing of the control system is recommended.
Any wiring of the tractive system must be fused with a smaller fuse value than the maximum rated constant current value for the used wiring.

6.14 Energy Storage

All types of accumulators except molten salt and thermal batteries are allowed. E.g.: Batteries, Supercaps, etc.
Fuel cells are prohibited.

The data sheets with rated specifications of the used accumulator(s) must be part of the ESF.

The used accumulator stack(s) must be enclosed in (an) accumulator container(s), see 6.19. The cells and/or stacks must be appropriately secured against loosening inside the container.
The poles of the accumulator stack(s) and/or cells must be insulated against the inner wall of the accumulator container, if the container is made of electrically conductive material.
Every accumulator container must contain at least one fuse and at least one accumulator insulation relay as shown in Figure 3.

Each accumulator container must have a prominent indicator, such as an LED that will illuminate whenever a voltage greater than 60 volts is present at the outer connector. Alternatively an analogue voltmeter may be used which is clearly visible from outside of the container.
If multiple accumulators are to be used as spare parts than they all have to be of the same size, weight and type.
Spare accumulator packs have to be presented at E-Scrutineering.

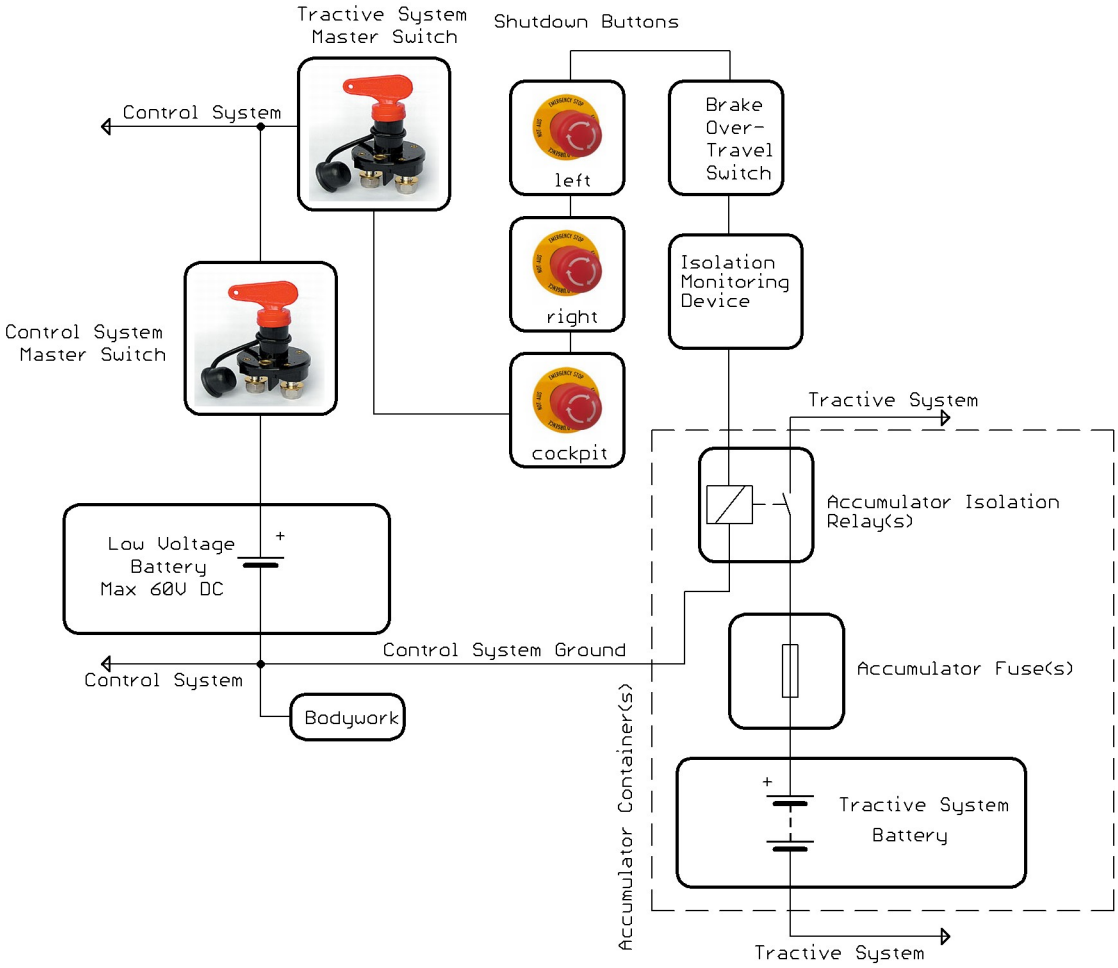

Figure 3: Schematic overview of the car's shutdown system

6.15 Battery Management System (BMS)

Each accumulator must be monitored by a battery management system. The BMS must measure the cell voltage of every cell to keep the cells inside the allowed minimum or maximum cell voltage of any cell with respect to the data sheet . The BMS must also continuously measure the temperatures of critical points of the accumulator to prevent the accumulator from thermal runaway. The BMS must be active whenever the accumulator is electrically connected to a charger.
FSE recommends to monitor every cell voltage and cell temperature whenever the accumulator is charged or discharged.

6.16 Accumulator Insulation Relay(s)

In every accumulator container at least one insulation relay must be installed. It is recommended to limit the switch on current. If the relay is open, no HV may be present outside of the accumulator container. The insulation relay(s) must be of a “normally open” type. The maximum switch-off-current of the used accumulator insulation relay must be higher than the used accumulator fuse value. The accumulator insulation relay(s) must cut both(!) poles of the accumulator.
The accumulator insulation relay(s) must be wired in a way that they are de-energized whenever the tractive system supply connector of the accumulator is open and not connected to a charger or the tractive system.

6.17 Wiring of the tractive system supply

All accumulator containers must be wired to a single point. It does not matter if they are wired in series or parallel but all the energy supplying the tractive system must flow through this single point and must pass the energy meter position, see article 6.18.

6.18 Energy meter

In the tractive system supply wires, see article 6.17, a calibrated energy meter provided by the FSE organization must be inserted at the event. The type and size of the connector(s) and the energy meter will be published on the FSE website. The energy meter is used to calculate the efficiency score by measuring the total energy being sourced by the accumulator(s).
The energy meter is sealed by officials before the dynamic events. Any manipulation or broken seals of the energy meter result in a DNF for the efficiency scoring.
The recorded data is downloaded by the officials after the Endurance Event to calculate the efficiency score. The recorded data is only accessible by officials and will be made available to the team on request.

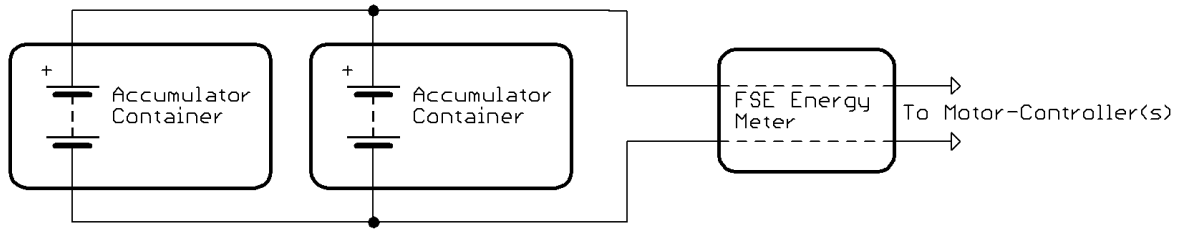

Figure 4: Energy Meter Wiring

6.19 Accumulator Container

All accumulator containers must be rugged and rigidly mounted to the chassis to prevent the containers from loosening during the dynamic events or possible accidents.

All accumulator containers must lie within the surface defined by the top of the roll bar and the outside edge of the four tires (See Figure 13 in the FSAE rules).
All accumulator containers must be protected from side or rear impact collisions.
Any accumulator container must be shielded by an impact structure built to FSAE rules B3.24 or B3.26 except the location limitation.
If an accumulator container is mounted next to the driver a side impact structure must protect the driver and the accumulator container. Therefore two impact structures are necessary.

The accumulator container must be built of mechanically robust and fireproof material. If the container is made of CFRP, GFRP or similar a resin system has to be used that is self-extinguishing. The data sheet of the used resin system has to be shown at scrutineering.
If the material is electrically conductive the outer side of the container must have a low-resistance connection to control system ground.
Breakthroughs or holes in the container are only allowed for the wiring-harness and for ventilation. These holes must be sealed according to article 6.9.
A sticker with an area of at least 750mm² and a red or black lightning bolt on yellow background or red lightning bolt on white background must be applied on every accumulator container. The sticker must also contain the text “High Voltage” or something similar if the battery voltage is greater than 60V e.g. Figure 5.

Figure 5 : High Voltage Sticker

All kinds of accumulators that may vent explosive gas must have a ventilation system to prevent the vented gas from reaching an explosive concentration.
Every accumulator container which is completely sealed must have an equalizing valve to prevent high-pressure in the container.

6.20 High-Voltage Enclosures

Every housing or enclosure containing parts of the high-voltage system except motor housings must be labelled with a reasonably sized sticker with a red or black lightning bolt on yellow background or red lightning bolt on white background. The sticker must also contain the text “High Voltage” or something similar if the voltage is more than 60V, see Figure 5. All of the HV-housings or HV-enclosures except motor housings and accumulator containers must be orange in colour. If the housing material is electrically conductive, it must have a low-resistance connection to control system ground.

6.21 Charging

There will be a separated charging area on the event site. Charging tractive system accumulators is only allowed inside this area.
Accumulators may be charged inside the car.

It is also possible to charge the accumulators outside the car with a removable accumulator container.
The accumulator containers or the car itself, depending on whether the accumulators are charged externally or internally, must have a label with the following data: Team name, Safety Responsible and approximate time at which the charging period ends.
Only chargers presented and sealed at E-Scrutineering are allowed. All connections of the charger(s) must be isolated and covered. No open connections are allowed.

Charging accumulators is allowed at all times during the event in the charging area, but there may be assigned time slots for charging accumulators inside the car due to the limited space on the event site. The time slots will be team specific.
Charging accumulators in a removable accumulator container will not be restricted by time slots.
NO WORK IS ALLOWED ON ANY OF THE CAR'S SYSTEMS DURING CHARGING, IF THE ACCUMULATORS ARE CHARGED INSIDE THE CAR.
Moving accumulator cells and/or stack(s) is only allowed inside an accumulator container.
The provided electrical connection will be one 3P+N+PE, 6h, 400V/16A 50Hz socket according to IEC 60309 per team.
Details regarding the available electrical infrastructure in the charging area will be published on the FSE website.

6.22 Accumulator Container Hand Cart

If removable accumulator containers are used for charging a hand cart equipped with a brake has to be presented at E-Scrutineering. The brake must be capable to stop the fully loaded accumulator container hand cart.
The hand cart must be able to carry the load of the accumulator container(s).
The hand cart(s) must be used whenever the accumulator container(s) are transported on the event site.

7 Technical Inspection

7.1 Inspection & Testing Requirement

The Technical Inspection will be divided in an electrical inspection and a mechanical inspection. The electrical inspection will declare the car as electrically safe and must be the first inspection. Before passing E-Scrutineering the car may only be moved around on the event site with all Master Switches and shutdown buttons in the off-position. Therefore the CS-Master Switch, the TS-Master Switch, the right, the left and the cockpit shutdown button have to be off! Furthermore the detachable handle or key of the tractive system Master Switch has to be removed and kept safe by a Safety Responsible.

Scrutineers will mark or seal various different approved parts (i.e. insulation monitoring device, accumulator containers, energy meter, tires, rims etc.). The car can be disqualified from any dynamic event by using unmarked parts or substituting marked parts. Parts with broken seals are equivalent to being unmarked.
Broken seals can only be replaced by a scrutineer.

After passing E-Scrutineering the car can be presented for the normal mechanical scrutineering.

7.2 Insulation test

The insulation test is composed of the insulation monitoring device test, see article 6.7, and the rain test, see article 6.8.

7.3 Equipment

For the electric part of the technical inspection each team must present the following equipment:

- accumulator charger to be used during the event
- all accumulator containers to be used during the event
- data sheets for all used parts in the tractive system
- Copy of the ESF
- Copy of the FMEA
- Accumulator Container Hand Cart, if needed

If the car contains a HV-system:

- Insulated cable shear
- Insulated screw drivers
- Multimeter with protected probe tips
- Insulated spanners, if screwed connections are used in the tractive system
- Safety goggles
- HV isolating gloves
- HV isolating blanket of at least 1,5m²

7.4 Car weighing

All cars will be weighed prior to Engineering Design Judging. All cars are to be weighed in ready to race condition. All fluids and coolant must be in the car. This weight will be the car's Official Technical

Inspection weight. There will be a penalty if the car weight changes during Dynamic Competition. The allowable weight tolerance is ± 5.0 kg. In the case of overweight or underweight in comparison to the Technical Inspection weight, the team will be penalized -20 (twenty) points for each kg (or portion of a kg) of additional or missing weight. This point penalty will be deducted from the Engineering Design Event score. (Each 0.1 to 1.0 kg = -20 points)

Example:

If the car is 5.3 kg underweight: 5.3 kg minus the 5.0 kg tolerance = 0.3 kg equals -20 Points

If the car is 7.8 kg overweight: 7.8 kg minus the 5.0 kg tolerance = 2.8 kg equals -60 Points

If the car weight changes due to replacement of broken parts, the car must be presented for tech inspection and then re-weighed. It is the team's responsibility to have the car re-weighed before entering a dynamic event after changing parts.

8 Static Events

8.1 Business Plan Presentation (75 Points)

8.1.1 Executive Summary

Judging will start with an Executive Summary before the FSE Competition. The principal document submitted prior to the Business Plan Presentation is an Executive Summary. The Executive Summary must not exceed one (1) page, team name and car number must be written on the Executive Summary. The Executive Summary should contain a brief description of the team's Business Plan. Included in the Summary the two most outstanding technical features of the car have to be listed. The Summary has to include the anticipated production cost, per vehicle, in a production run of 1000 cars per year.

The Executive Summary must relate to the specific prototype car entered in the FSE competition. The costs of the prototype car entered will not be considered as part of the Business Plan judging.

Even though the Executive Summary is only judged by the presentation judges, all Engineering Design and Cost judges will have access to the file and may refer to it.
The Executive Summary must be submitted in Adobe Acrobat® format (*.pdf file) online, no later than the specified date.

Late submission and non submission will be penalized. It is at the discretion of the judges to deduct between -5 (five) points from the Presentation Judging score.

Note: Consider your Executive Summary to be the first impression of your Business Plan to the Executive Board of a major auto manufacturing company.

8.1.2 Deep dive topic

After submission of the Executive Summary the teams will receive a specific deep dive topic from the presentation judges prior the competition. The task will be sent via email on the date specified in the Action Deadlines, to the team's responsible person's email address.

Every team has to present this special deep dive topic in a detailed way as a part of the team's business plan presentation to the judges.

NOTE: A team must not describe only this deep dive topic in the business plan presentation. It's important that a team presents the business plan.

8.1.3 Data Projection Equipment

Video Projectors will be provided by Formula Student Electric. These Projectors will have VGA Input Connectors.

The organizers will, not provide any other presentation equipment needed. Teams planning to use other presentation equipment, as a part of their presentation, are responsible for bringing, or otherwise arranging for their own equipment.

8.1.4 Scoring Formula

The scoring of the event is based on the average of the two or three presentation judging forms.
There is a maximum of seventy-five (75) points from the FSG Presentation Judging Form.

Non finalist:

PRESENTATION SCORE = 70 x (Pyour/Pmax)
Where:
“Pmax``” is the highest score awarded to any team not participating in the finals
“Pyour” is the score awarded to your team

Finalists:

1st Place 75 points
2nd Place 74 points
3rd Place 73 points
4th Place 72 points
5th Place 71 points

It is intended that the scores will range from near zero (0) to seventy-five (75) to provide good separation. The Presentation Event Captain may at his/her discretion; normalize the scores of different judging teams.

8.2 Engineering Design Event (150 Points)

8.2.1 Engineering Design Report Files File Format and Size

The FSE Engineering Design Report must be submitted in Adobe Acrobat® format (*.pdf file) online, no later than the specified date. The size of the document must not exceed 5MB. A responsibly sized document will be much smaller than 5MB in file size. Please ensure that photos within the Acrobat file are of an appropriate resolution.

8.2.2 Engineering Design Spec Sheet File Format and Units

The FSE Engineering Design Spec Sheet must be submitted in Microsoft Excel® format (*.xls file) online, no later than the specified date. The Formula Student Electric Engineering Design Spec Sheet template can be found on the FSG website under following link:

http://www.formulastudentelectric.de/events/event-2010/rules-important-documents/

The template is for *metric* units only. **DO NOT alter or re-format the template prior to submission. Simply fill in the blanks.**

8.2.3 Penalty for late submission

Penalties for late/non submission of the Engineering Design Reports and/or Engineering Design Spec Sheets is as follows:

Late arrival of one or both documents: -10 (ten) points for each day, up to a maximum penalty of -100 points.

Failure to submit one or both documents will automatically result in zero points for the Engineering Design Event.

The penalty points will be deducted from your final Engineering Design Scores. The minimum allowable Engineering Design Score will be 0 Points. (Points will not go negative.)

8.3 Cost Event (100 Points)

8.3.1 Cost Event Scoring (Specific FSG/FSE change of Formula SAE® 2010 Part C Rule 3.7)

The points for the Cost and Manufacturing Event will be broken down as follows

$20\ x\ \frac{(P_{max}/P_{your}) - 1}{(P_{max}/P_{min}) - 1}$	20 Points	Lowest cost - each of the participating schools will be ranked by total adjusted retail cost from the BOM and given 0-10 points based on the formula on the left. P_{your} is the adjusted cost of your car and P_{min} is the adjusted cost of the lowest cost car. P_{max} is the cost of the most expensive car.
	40 Points	Real Case Situation – Teams will receive a task covered a "Real Case in Industry"
	40 Points	Event Day/Visual Inspection - The cars will be reviewed for part content and manufacturing feasibility. The submitted process descriptions will be discussed.
Total	**100 Points**	

8.3.2 Late submission of Cost Report (Specific FSG/FSE change of Formula SAE® 2010 Part C Rule 5.15)

Teams that submit reports later than the specified date will be penalized -10 (ten) points per day, up to a maximum penalty of -80 points. Teams that do not submit a Cost Report will receive 0 (zero) points for the Cost & Manufacturing Analysis score. Minimum Event score is 0 (zero) points.

8.3.3 Addenda (Specific FSG/FSE change of Formula SAE® 2010 Part C Rule 5.15)

For changes in your corrections made after the submission of the cost report please use the FSE cost addendum form given in the FSAE Rules Appendix C-5. For all new parts, which are manufactured, a drawing must be attached to the addendum form.

8.3.4 Cost Report Penalties Process (Specific FSG/FSE change of Formula SAE® 2010 Part C Rule 5.17)

Only penalty method A will use for FSE, described in Part C Rule 3.18 "Penalty Method A- Fixed Point Deductions" of the Formula SAE® 2010 Rules. The Formula SAE® 2010 Rules 3.19 "Penalty Method B – Adjusted Cost Deductions" is not valid for the FSG competition.

9 Dynamic Events

9.1 Dynamic Events and Maximum score (Specific FSE change of Formula SAE® 2010 Part D Article 1)

Skid Pad	75
Acceleration	75
Autocross	100
Efficiency	100
Endurance	325
Total	**675**

9.2 Skid Pad Scoring (Specific FSE change of Formula SAE® 2010 Part D Rule 6.8.2)

The following equation is used to determine the scores for the skid-pad event:

$$SkidPadScore = 71{,}5x\frac{(6.184/T_{your})^2 - 1}{(6.184/T_{\min})^2 - 1} + 3{,}5$$

Where:
"**Tyour**" is the average of the left and the right timed laps on your best run including penalties.
"**Tmin**" is the elapsed time of the fastest car

9.3 Autocross Scoring (Specific FSE change of Formula SAE® 2010 Part D Rule 7.8.1)

The following equation is used to determine the scores for the autocross event:

$$AutocrossScore = 95{,}5x\frac{(T_{\max}/T_{your}) - 1}{(T_{\max}/T_{\min}) - 1} + 4{,}5$$

Where:
"**Tmin**" is the lowest corrected elapsed time recorded for any competitor in either heat
"**Tmax**" is 125% of Tmin
"**Tyour**" is the lowest corrected elapsed time in either heat for the team being scored.

9.4 Endurance Scoring (Specific FSE change of Formula SAE® 2010 Part D 8.19.2 and D 8.18.3)

The following equation is used to determine the scores for the endurance event:

$$EnduranceScore = 275x\frac{(T_{\max}/T_{your}) - 1}{(T_{\max}/T_{\min}) - 1} + 50$$

Where:
"**Tmin**" will be the lowest corrected time of the fastest team of the event.
"**Tyour**" will be the combined corrected times of both of your team's drivers in the heat.
"**Tmax**" will be 1.333 times "**Tmin**".

9.5 Efficiency Scoring (Specific FSE change of Formula SAE® 2010 Part D 8.22 and D 8.23)

The following equation is used to determine the scores for the endurance event

$$Efficiency = 100x\frac{\left(EfficiencyFactor_{\min} / EfficiencyFactor_{your}\right) - 1}{\left(EfficiencyFactor_{\min} / EfficiencyFactor_{\max}\right) - 1}$$

$$EfficiencyFactor = \left(\frac{T_{\min/laptotal}}{T_{yours/lapyours}}\right) x \left(\frac{E_{\min/laptotal}}{E_{yours/lapyours}}\right)$$

Where:
"$\mathbf{T_{min}}$" will be the lowest corrected time of the fastest team of the event.
"$\mathbf{T_{yours}}$" will be the combined corrected times of the drivers in your heat. Vehicles whose corrected time exceeds 1.333 times the corrected time of the fastest team, will receive zero (0) points for efficiency.

"$\mathbf{E_{min}}$" per Lap is the lowest consumed endurance energy by any competitor
"$\mathbf{E_{yours}}$" is the consumed endurance energy of the team being scored.

Lapyours will be the number of driven laps, at least 50% of the total endurance distance.

Laptotal will be the number of the full endurance distance.

The energy is calculated as the time integrated value of the measured voltage multiplied by the measured current logged by the energy meter. Only energy flowing from the accumulator to the motor(s) will be taken into account.

Efficiency factor min is the minimum factor reached by a team.
Efficiency factor max is the maximum factor reached by a team.

Before the endurance event, every energy meter memory storage is cleared by an official. The energy meter data is read out when the car is in Parce Fermé.

10 Changelog

V1.5.0:

4.3:
The Event Handbook will define where and under which conditions the tractive system may be activated.

6.4:
The LV and HV systems of the car must be separated.

- Using the same cable channel(s) for both systems is prohibited except for pilot or interlock circuits at the accumulator connectors.

6.9:
Deleted: The connection wires must be fused with a fast acting fuse of 0,5A maximum.

6.10:
Alternatively a serial number or a norm printed on the wire is sufficient if this serial number or norm is clearly bound to the wire characteristics for example by a data sheet.

6.11:
For this the car must be equipped with a light mounted on the highest point of the main roll hoop which lights if the car's tractive system is active and which is off when the tractive system is not active.

6.12:
The handle or key of the tractive system Master Switch has to be removable.

6.21:
The accumulator containers or the car itself, depending on whether the accumulators are charged externally or internally, must have a label with the following data: Team name, Safety Responsible and approximate time at which the charging period ends.

6.22:
The brake must be capable to stop the fully loaded accumulator container hand cart.

7.1:
Before passing E-Scrutineering the car may only be moved around on the event site with all Master Switches and shutdown buttons in the off-position. Therefore the CS-Master Switch, the TS-Master Switch, the right, the left and the cockpit shutdown button have to be off! Furthermore the detachable handle or key of the tractive system Master Switch has to be removed and kept safe by a Safety Responsible.

7.3:
If the car contains a HV-system:

- Insulated cable shear

- Insulated screw drivers
- Multimeter with protected probe tips
- Insulated spanners, if screwed connections are used in the tractive system
- Safety goggles
- HV isolating gloves
- HV isolating blanket of at least 1,5m²

V1.4.7:

1.5:
ESF Deadline changed to June 08, 2010 1200 CEST.

V1.4.6:

1.5:
ESF Deadline changed to July 01, 2010 1200 CEST.

6.1:
Added/Changed:
A template including the required structure for the ESF will be made available on the FSE website.

V1.4.5:

8.3.5:
This rule has been deleted without replacement.
Therefore teams have to treat electric motors and accumulator cells like any other item not listed in the cost table, i.e. submit an Add-Item-Request.

V1.4.4:

1.11:
Added/Changed:
Teams must upload the certified proof of their chosen SR(s) being at least a bachelor in electrical engineering or an academic equivalent . This should be done in the form of a multiple page Adobe Acrobat® file (*.pdf) no later than May 03, 2010 1200 CEST in the 'My Team' area on the FSE Website.

2.5:
Added/Changed:
The SR must be at least a bachelor in electrical engineering or an academic equivalent. In order to register for the event, the SR must prove this by uploading appropriate confirmation thereof, see 1.11.
It is recommended that the SR is certified for working with high voltage systems in automotive vehicles.

V1.4.3:

6.6:

Added/Changed:
Every car must have an insulation monitoring device (IMD) installed in the tractive system. This must be a Bender A-ISOMETER ® iso-F1 IR155, IR486, IR475LY3 or an FSE approved equivalent. In case of an insulation failure, the output of the IMD must break the holding current flow of the accumulator insulation relay(s) to shut down the tractive system.

The status of the IMD has to be shown to the driver by a red indicator light in the cockpit that is easily visible even in bright sunlight. This indicator has to light up, if the IMD detects an insulation failure or if the IMD detects a failure in its own operation e.g. when it looses reference ground.
The IMD indicator light has to be clearly marked with the lettering “IMD”.

7.1:
Added/Changed:
Before passing E-Scrutineering the car may only be moved around on the event site if the accumulator is electrically disconnected from the rest of the HV-system in a safe way. Open accumulator insulation relays are not sufficient. Therefore all connectors on the accumulator have to be detached to be allowed to move the car around before passing E-Scrutineering.

Added 10 Changelog

Formula Student Electric - Appendix A-A

STRUCTURAL EQUIVALENCY FORM

This form must be completed and submitted **no later the date specified** in the Action Deadlines. The FSG Technical Committee will review all submissions which deviate from the FSAE® and FSG rules for Roll-over or Side Impact Structure. This form must also accompany the vehicle to Technical Inspection.
Structural Equivalency Forms (SEF) and supporting calculations must be submitted electronically in Adobe Acrobat Format (*.pdf) and must be upload on the FSG-Website.
In the event that the FSG Technical Committee requests additional information or calculations, teams have **14 days** from the date of the request to submit the requested information.
Late submissions will be penalized with -10 (ten) points per day.

Contact Details

Car Number

University Name

Team Contact Person

Last Name, First Name

Telephone Number

E-mail Address

Rule Deviated?

(ALL teams must answer this question.)

○ YES, rule(s) deviated ○ NO, chassis is compliant to the rules

Check all that apply:

- ☐ B3.10 Main Roll Hoop Material
- ☐ B3.10.6 Main Roll Hoop Attach. to Monocoque
- ☐ B3.11 Front Roll Hoop Material
- ☐ B3.12 Main Roll Hoop Bracing
- ☐ B3.13 Front Roll Hoop Bracing
- ☐ B3.14 Monocoque Bracing Attachment
- ☐ B3.16 Mechanically Attached Roll Hoop Bracing
- ☐ B3.18 Front Bulkhead
- ☐ B3.18.4 Monocoque Front Bulkhead
- ☐ B3.19.4 Front Bulkhead Support
- ☐ B3.19.5 Monocoque Front Bulkhead Support
- ☐ B3.20.3 Impact Attenuator Attachment
- ☐ B3.20.6 Impact Attenuator Anti-intrusion Plate
- ☐ B3.24 Tube Frames Side Impact Structure
- ☐ B3.25 Composite Monocoque Side Impact
- ☐ B3.26 Metal Monocoque Side Impact
- ☐ B5.2.2 Monocoque Safety Harness Attach.
- ☐ B5.4.4 Shoulder Harness Bar

Attachment Checklist (make sure all are included in your report)

- ☐ Receipt, letter of donation or proof for non-steel materials (composite, honeycomb, resin, etc).
- ☐ Properties for all non-steel materials
- ☐ Monocoque laminate testing data and pictures
- ☐ Holes drilled in any regulated tubing require a deviation, include area and moment of inertia

Attach Proof of Equivalency

Roll bar documentation should include material type(s), material certification(s), properties, heat treatment, and strength calculations showing equivalency. Side impact documentation should include material type(s), material certification(s), properties, heat treatment, cloth weights, resin type, fiber orientation, number of layers, core material, lay-up technique, and strength calculations showing equivalency.

Formula Student Electric - Appendix A-B

Impact Attenuator Form

This form must be completed and submitted no later the date specified in the Action Deadlines. The FSG Technical Committee will review all submissions which deviate from the FSAE® and FSG/FSE rules for Impact Attenuator. This form must also accompany the vehicle to Technical Inspection.
Impact Attenuator Form (IAF) and supporting calculations must be submitted electronically in Adobe Acrobat Format (*.pdf) and must be upload on the FSE-Website.
In the event that the FSG/FSE Technical Committee requests additional information or calculations, teams have **14 days** from the date of the request to submit the requested information.
Late submissions will be penalized with -10 (ten) points per day.

Contact Details

Car Number	
University Name	
Team Contact Person	
Last Name, First Name	
Telephone Number	
E-mail Address	

Attach Proof of Impact Attenuator