Summary Sheet

University:

Vehicle Number:

Number of drivers:

Tallest driver: Height:

TS Voltage:

LV Voltage:

Body Protection Resistor:

NOTES:

- This form must stay with the vehicle at all times!
- If there is a conflict between this form and the rules, the rules prevail
- This sheet is just a guideline for the scrutineers!

PART I: Electrical Inspection I.

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART II: Mechanical Inspection

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART III: Accumulator Inspection

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART IV: Electrical Inspection II.

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART V: Driver Egress and Safety Test

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART VI: Tilt Table Inspection

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART VII: Vehicle Weighing

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART VIII: Rain Test

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART IX: Braking Performance Inspection

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

PART X: Post Event Inspection

Inspector Names | Date, Time | Signature

_____/_____ _____ _____

ELECTRICAL INSPECTION I. (Low Voltage)

The time limit for this part of the inspection is 60 minutes. Continuation of the inspection is possible after requeuing.
During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

Required Resources

- An ESO must attend
- LV battery or cell datasheet
- For self developed LV battery packs: an opened battery pack, laptop and cables to display data of the AMS
- Datasheets for used wiring, insulation materials, and TS components
- Fully assembled spare boards of all inaccessible TS boards outside the accumulator (printed photographs are sufficient if spares are not available)
- Photographs of all inaccessible TS connections
- Print-out of rule questions, if necessary
- Printed or digital version of the ESF
- HVD is disconnected

LV Battery (if any)

► Following checks only for Li-Ion batteries other than $LiFePO_4$
◯ Voltage ≤ 60VDC
◯ Rigid and sturdy casing
◯ Behind Firewall
◯ Short circuit protection (e.g. fused)
◯ Grounded to the chassis
◯ Proper insulation of internal electrical connections
◯ Proper mounting of cells
◯ Overcurrent protection that trips below max. discharge current
◯ Overtemperature protection of at least 30% of the cells (max. 60C or datasheet, whichever is lower)
◯ Voltage protection of all cells
◯ Signal failures electrically disconnect the LV battery (SCS)
► Ask the team to connect their laptop to the AMS
◯ Cell voltages and temperatures can be displayed

Self Developed PCBs

► Ask for spare PCB of self developed PCBs. Printed photographs are also sufficient if spares are not available
◯ Sufficient spacing regarding system voltage and implementation
◯ Sufficient insulation and temperature rating of coating if used, datasheet available
◯ Coating process according to datasheet
◯ BSPD PCB is standalone with only minimum interface

Voltage	Over Surface	Through Air (cut-out)	Under Coating
0VDC to 50VDC	1.6mm	1.6mm	1.0mm
50VDC to 150VDC	6.4mm	3.2mm	2.0mm
150VDC to 300VDC	9.5mm	6.4mm	3.0mm
300VDC to 600VDC	12.7mm	9.5mm	4.0mm

Vehicle Movement

► Try to move the vehicle with deactivated TS
◯ Vehicle movement possible

Master Switches

◯ Two master switches installed on the right side of the vehicle
◯ Not mounted on removable bodywork
◯ LVMS located above 80% of shoulder height of percy
◯ TSMS located directly next to LVMS
◯ Rotary type with removable handle (50 mm)
◯ "ON" and "OFF" positions marked
◯ "ON" position in horizontal
◯ TSMS with locking mechanism for “OFF” position
◯ LVMS marked with “LV” and symbol showing a red spark in a white edged blue triangle
◯ LVMS mounted on an red circular area on high contrast background
◯ TSMS marked with “TS” and triangle with black lightning bolt on yellow background
◯ TSMS mounted on an orange circular area on high contrast background
◯ Circular area diameter ≥ 50mm for both

Measurement Points

◯ Two TS measuring points on exclusive orange background
◯ A black LVS ground measuring point installed
◯ Next to the master switches
◯ 4 mm shrouded banana jacks
◯ Non conductive cover
◯ Cover removable without tools
◯ Correctly marked (TS+, TS-, GND)

Tractive System (TS) Shutdown Devices

- ◯ Two shutdown buttons installed next to the main hoop
- ◯ Right and left on the vehicle at approx. height of drivers head
- ◯ Push-Pull or Push-Rotate-Pull functionality
- ◯ Diameter ≥ 40 mm
- ◯ Marked with red sparked sticker
- ◯ One cockpit shutdown button installed
- ◯ Push-Pull or Push-Rotate-Pull functionality
- ◯ Marked with red sparked sticker
- ◯ Easy actuation by the driver
- ◯ Diameter ≥ 24 mm
- ◯ Inertia switch installed
- ◯ Inertia switch is rigidly mounted to the chassis and can be demounted for functionality test
- ◯ Brake Overtravel Switch installed
- ▶ Check interlocks on the followings:
- ◯ TS accumulator container(s)
- ◯ Inverters
- ◯ HVD
- ◯ Power distribution boxes (if any)
- ◯ EM box
- ◯ Outboard wheel motors (Interlocks must act before a TS wiring failure.)

TS Voltage

- ▶ Measure voltage at TS measuring points
- ◯ Equal or less than 60 VDC

Dis-Charge Circuit and Body Protection Resistors

- ▶ Switch off LV. Measure resistance between TS+ and TS- measuring points
- ◯ Resistance is higher than 2xBPR[1] (+ discharge resistor)[2]
- ◯ Total Body Protection Resistor power rating is _____W (sufficient for handling short circuit between TS+ and TS-)
- ◯ Discharge power rating is sufficient for continuous dis-charge (check in ESF)

TS Voltage	Resistor at 1 TSMP	Minimum total power rating (short circuit between TS+ and TS-)
U_{max} ≤ 200 VDC	5 kΩ	4 W
200 VDC < U_{max} ≤ 400 VDC	10 kΩ	8 W
400 VDC < U_{max} ≤ 600 VDC	15 kΩ	12 W

TS Wiring

- ◯ All TS wiring and components (including the HVD) has to be in the envelope and behind the impact structures
- ◯ TS wires of outboard wheel motors must not be able to reach the cockpit opening in case of a wire break
- ◯ All TS wires and connectors have proper overcurrent protection
- ◯ Visible TS wiring channels are orange
- ◯ No other wires than TS wires are orange
- ◯ TS wiring outside electrical enclosures in separate non-conductive enclosure or orange shielded cable
- ◯ Securely anchored to withstand at least 200 N, if outside of enclosure
- ◯ Located out of the way of possible snagging or damage
- ◯ Shielded against rotating/moving parts
- ◯ No wire lower than the chassis
- ◯ TS and LV wires separated (n/a for interlock)
- ◯ Marked with gauge, temperature rating ≥85°C and voltage rating ≥ maximum TS voltage
- ◯ Suitable temperature rating for the use case
- ◯ Positive locking mechanism on every screwed connection
- ◯ Insulation is not insulating tape or rubber-like paint

TS Warning Stickers

- ▶ Check for warning stickers on TS containing enclosures (triangle with black lightning bolt on yellow background)
- ◯ Battery/batteries
- ◯ Inverter(s)
- ◯ Motor(s)
- ◯ Power Distribution box(es)
- ◯ Energy meter box
- ◯ Other TS containing enclosures

Tractive System Protections

- ▶ Check opening in TS enclosures, try to reach TS potentials with insulated test probe (100mm length, 6 mm diameter)
- ◯ Not possible to reach any TS potentials
- ◯ TS components and containers protected from moisture
- ▶ Check materials and thickness of motor housings
- ◯ Thickness ≥ 3 mm (Aluminium) or ≥ 2 mm (Steel)

[1] Body Protection Resistor, value on the first page.
[2] There are some teams with not resistive discharge circuit.

High Voltage Disconnect (HVD)

- ◯ Clearly marked with "HVD"
- ▶ Distance to ground greater than 350 mm
- ◯ Inside roll-over protected envelope
- ◯ Easily visible while standing behind the vehicle
- ◯ No remote actuation (e.g. through wires)
- ◯ Integrated interlock
- ▶ Ask the team to connect the HVD
- ▶ Stand next to the vehicle, remove HVD
- ◯ Removed within 10 s without tools
- ◯ TS protection still given (insulated test probe). If dummy connector is used, it must be stored at the push-bar.

Tractive System Active Light (TSAL)

- ◯ Mounted below highest point of the main roll hoop and within the roll-over protected envelope.
- ◯ Visible by a person standing 3 m away from TSAL (1.6m eye height).
- ◯ A device logically replacing an accumulator container is available
- • Cockpit indicator light …
- ◯ … is inside the cockpit and marked with “TS off”
- ◯ … is visible for the driver

Energy Meter

- ◯ Energy meter is enclosed in a housing
- ◯ All energy from accumulator flows through the energy meter

Firewalls

- • Separates any point of the driver (less than 100mm above the bottom of the helmet of the tallest driver) from any TS component (including TS wiring)…
- ◯ . . . behind the driver’s back
- ◯ . . . at the sides of the driver
- ◯ . . . at the front of the vehicle
- ◯ First layer, facing TS must be made of Aluminum with a thickness of at least 0.5mm
- ◯ Second layer, facing driver must be made of electrically insulated material (no CFRP)
- ◯ Material meets UL94-V0, FAR25 or equivalent
- ◯ Can withstand a 250 N, 4 mm screwdriver penetrating test.

Accelerator Pedal Position Sensors (APPS)

- ◯ Returns to original position if not actuated
- ◯ At least two separate sensors are used as APPSs. If analog sensors are used, they must have different, non-intersecting transfer functions. For digital sensors, a checksum is necessary.
- ◯ Sensors do not share supply or signal lines
- ◯ Sensors are protected from being mechanically overstressed (positive stop of pedal)
- ◯ Minimum two springs installed to return pedal
- ◯ Each spring still returns pedal with the second one disconnected (springs in the torque encoders not counted

Brake light

- ◯ Only one brake light
- ◯ Clearly visible from behind the vehicle
- ◯ Located on vehicle centreline
- ◯ Height between wheel centreline and drivers shoulder
- ◯ Round, triangle, or rectangular on black background
- Δ 15 cm^2 minimum illuminated area or LED strips with a total length greater than 150 mm with elements closer than 20 mm apart

Visibility check of Lights

- ▶ Ask the team to connect the device logically replacing an accumulator container
- ▶ Ask the team to activate the LV system
- ◯ The TSAL is continuously green
- ◯ The TSAL is visible in bright sunlight
- ◯ The Cockpit indicator light is green
- ◯ The Cockpit indicator light is visible in bright sunlight
- ▶ Ask the team to press the brake pedal
- ◯ The brake light is red
- ◯ The brake light is visible in bright sunlight

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

MECHANICAL INSPECTION

Motors:	**ABS:**

Dry Tyres:	**Rain Tyres:** (2,4 mm min. tread depth molded)

VEHICLE WITH TALLEST DRIVER IN AND READY TO RACE

SCRUTINEER LEADER'S SHEET

◯ **MAIN HOOP & FRONT HOOP HEIGHTS** - Helmet of driver to be **50 mm** below line between top of front and main roll hoop AND between top of main hoop to rear attachment point of main hoop bracing.

◯ **DRIVER FLUID PROTECTION** - A firewall must extend sufficiently far upwards and/or rearwards such that any point, less than **100mm** above the bottom of the helmet of the tallest driver, is not in direct line of sight with any of the following parts: fuel system, engine oil system, cooling system and low voltage battery.

◯ **HEAD RESTRAINT**- Near vertical. Must take 890 N load. **40 mm** thick**, SFI 45.2** standard. Max**. 25 mm** from helmet. Helmet contact point **50 mm** min. from any edge. May be changed for different drivers. Minimum **150x150mm** and SFI Standard 3.3 or equivalent material.

◯ **ARM RESTRAINTS** - Must be installed so the driver can release them and exit unassisted regardless of vehicle's position.

◯ **SHOULDER HARNESS MOUNTING** - Mounting points **180 - 230 mm** apart. Angle from shoulder between **10 deg**. Up and **20 deg**. down to horizontal. Attach to Primary Structure - 25,4 x 2.4 mm or 25.0 mm x 2.5 mm steel tube min. NOT to put bending loads into Main Hoop Bracing without extra bracing. Additional braces if not straight to main hoop. Cannot pass through a firewall. Attachment brackets to the monocoque must be steel.

◯ **OTHER SIDE TUBES** - Design prevents driver's neck hitting bracing or other side tubes.

◯ **DRIVER RESTRAINT HARNESS** - **SFI 16.1, SFI 16.5 or FIA 8853/98 spec 6 or 7** point and be labeled. 50 mm wide shoulder belts OK with HANS. 50 mm lap belts OK for **FIA 8853/98 & SFI 16.5**, not OK for **SFI 16.1**. All lap belts must have Quick Adjusters. Reclined drivers must have a 6 or 7 point, and Quick Adjuster sub-belts or 2 sets of sub belts. Must be securely attached to prim. structure (25,4x2,4 or equal.)

◯ **LAP BELT MOUNTING** - Must pass over pelvic area between **45 - 65 deg**. to horizontal for upright driver, **60-80 deg.** For reclined. The lap belts must not be routed over the sides of the seat. Pivoting mounting with eye bolts or shoulder bolts attached securely to Primary Structure. Min. tab thickness **1,6 mm**. Attachment brackets to the monocoque must be steel,
see T5.3.2.

▶ **BRAKE PEDAL** - Ask the driver to **kick** the brake pedal with max force

◯ Brake pedal capable of 2000N, no failures if driver exerts max force (seated normally in vehicle).

NON-COMPLIANCE / COMMENTS

VEHICLE WITH TALLEST DRIVER IN AND READY TO RACE

◯ **AERODYNAMIC DEVICES** - Securely mounted. The deflection may not exceed **10 mm** when a force of **200 N** is applied over a surface of **225 cm2** and not more than **25 mm** with a point force of **50 N** is applied. Not extending further than the rear portion of the head restraint (in rearmost position).(permanent **deflection < 5 mm).**

◯ **AERODYNAMICS** - ALL aerodynamic devices maximum **250 mm** rearward of rear tires, maximum **700 mm** forward of front tires. Devices lower than **500 mm** from the ground rearward of the front axle must be no wider than vertical plane from the outside of the front and rear tires. Devices higher than **500 mm** behind the front axle must not be wider than the inside of the rear tires. No power ground effects.

◯ **AERO VERTICAL HEIGHT** - Devices forward of a vertical plane through the rearmost portion of the front face of the driver head restraint support, excluding any padding, set to its most rearward position, must be lower than **500 mm** from the ground. Rear device max **1.2 m** above ground (incl. end plates); Front device max **250 mm** above ground outside of the inside plane of the front tires inside this plane max **500 mm**

◯ **REAR WING TO BRACING ATTACHMENT -** attachment to the main hoop bracing needs a support back to the main hoop except if an attachment is next to the main hoop bracing attachment (no more than **50 mm**).

◯ **VISIBILITY** - Minimum of **100 deg**. field either side. Head rotation allowed or mirrors. If mirrors, must be firmly installed and adjusted.

◯ **ROLL BAR PADDING** - Roll bar or bracing that could be hit by driver's helmet must be covered with **12 mm** thick, **SFI spec 45.1 or FIA 8857-2001** padding.

◯ **CAMERAS** - Must be secured by two points, see T13.5. No cameras mounted to the helmet.

NON-COMPLIANCE / COMMENTS

VEHICLE WITH TALLEST DRIVER IN AND READY TO RACE

◯ **PUSH BAR (red color)** - With vehicle, securely attached to vehicle, detachable, push & pull function for 2 people standing erect. The push bar must be attached to the rear of the vehicle for moving it

◯ **QUICK JACK (red color)** - One device must be available to lift up all driven wheels min. **100 mm** above the ground. Lifting the car must be possible by one person. In lifted position the quick jack must be locked/secured and function without the support of a person or additional weights.

◯ **FIRE EXTINGUISHERS** - Two (2) hand-held, 0.9 kg (2 lb.) minimum, dry chemical (**10BC, 1A10BC, 34B, 5A 34B, 20BE or 1A 10BE**), with pressure/charge gauge, 1 WITH VEHICLE securely installed on push-bar, 1 in paddock.

◯ **SUSPENSION** - Fully operational with dampers front and rear; **50mm** minimum wheel travel (**25 mm** jounce and **25 mm** rebound) with driver in vehicle.

.◯ **VEHICLE CONTROLS** - All controls, including shifter, must be inside cockpit. No arms or elbows outside the SIS plane.

NON-COMPLIANCE / COMMENTS

VEHICLE WITHOUT DRIVER
SCRUTINEER LEADER'S SHEET

PRIMARY STRUCTURE

◯ **PERCY** - Helmet of 95th percentile male (PERCY) to be **50 mm** below the lines between top of front and main roll hoops and between top of main hoop to rear attachment point of main hoop bracing. Center of bottom circle placed minimum **915 (865 for DV only) mm** from pedals

◯ **COCKPIT OPENING** - Fig. 8 template passes down from above cockpit center line of top SIS tube or to **320 mm** above lowest inside chassis point between FH and MH. Steering wheel, seat & padding can be removed. No removing of firewall.

◯ **COCKPIT INTERNAL CROSS SECTION** - Fig. 9 template passes from the cockpit opening to **100 mm** rear of rearmost pedal contact area (in most forward position). Steering wheel and padding removable with no tools & driver-in can be removed.

◯ **SEAT** - Insulated against heat conduction, convection and radiation. Lowest point no lower than top of of the upper surface of the lowest SIS member OR must have longitudinal, 25.4 x 1.65mm steel tube underneath.

◯ **TUBING & MATERIALS** - Team must show an APPROVED SES. No Magnesium tubes in primary structure.

◯ **MONOCOQUE** - Must see laminate test specimen. Steel backing plates (**2mm** thick) used at attachment points.

◯ **MAIN HOOP** - MUST BE STEEL. Check dimension as shown in approved SES. Must be made of one piece and extend to lowest frame member. Above Major Structure, must be within **10 deg**. of vertical plane. Smooth bends without wrinkles.

◯ **MAIN HOOP BRACING** - MUST BE STEEL. One straight brace on each side. Attached within **160 mm** from the top. **Min. 30 deg**. Included angle with hoop. If main hoop is not vertical, bracing must not be on same side of the vertical plane as the main hoop. No bends. No rod-ends. Must take load back to bottom of main hoop and node of upper side impact tube through proper triangulated structure. (25.4 mm x 1.2 mm or equivalent)

◯ **BOLTED JOINTS** in primary structure - Distance hole centerline to the nearest free edge **> 1.5 x** hole diameter.

◯ **FRONT HOOP** - Must be closed section metal tube. Can be multi-piece with gussets or additional attachments to the monocoque. Must extend down to lowest frame member. No lower than top of steering wheel. Max**. 20 deg**. to vertical. Check dimension as shown in approved SES.

◯ **BELLYPAN VENTING HOLES** - Enclosed chassis structures and structures between the chassis and the ground must have two venting holes of at least **25mm** diameter in the lowest part of the structure to prevent accumulation of liquids. Additional holes are required when multiple local lowest parts exist in the structure.

◯ **FRONT HOOP BRACING** - Two straight forward facing braces, **25.4 x 1.65mm or 25.0 x 1.75mm or 25.4 x 1,6mm** wall steel or equivalent, attached within **50 mm** of top. Extra rearward bracing required if Front Hoop leans backwards more than **10 deg**.

◯ **DRIVER'S FOOT PROTECTION** - Feet must be rearward of the Front Bulkhead and no part of shoes or legs above or outside the Major Structure (25x1.2 or equivalent) in side or front views when touching the pedals.

◯ **SIDE IMPACT PROTECTION** - Min. of 2 tubes + 1 diagonal must connect the main and front hoops in straight line. Upper tube must be between **240 mm** and **320 mm** above lowest inside chassis point between FH and MH. Lower tube can be lower frame member. At least one diagonal per side must connect the upper and lower members between the main and front hoops. Dimension as shown in approved SES.

◯ **FRONT BULKHEAD SUPPORT** - Support back to front roll hoop; 3 tubes per side, all 25 mm x 1.5 mm wall steel tube or equiv. 1 bottom; 1 top within **50 mm** of top of bulkhead, and connecting within 100 mm above and **50 mm** below upper SIS tube; 1 or more node-to-node diagonal to completely triangulate connections to upper and lower SIS tubes.

◯ **INSPECTION HOLES** - **4.5 mm** inspection holes required in non-critical areas of front & main hoops. Inspectors may ask for holes in other tube(s).

◯ **FRONT IMPACT PROTECTION** - Feet must be completely within Major Structure & rearward of the Front Bulkhead. No non-crushable objects forward of bulkhead. IMPACT ATTENUATOR forward of bulkhead, 200mm **long x 200mm wide x 100mm high.** No wing supports through the IA. IA must be securely fastened directly to AIP capable of taking transverse & vertical loads (no tape, etc.) Test piece presented and same as IA on vehicle. Standard IA: Requires diagonal brace if bulkhead
>1" from IA on any side.

◯ **ANTI INTRUSION PLATE** - A **1.5 mm** solid steel metal or **4.0 mm** solid aluminium metal sheet (same size as outside dims.) must be welded or **min. 8 screws M8 Grade 8.8** (critical fasteners T10). CFRP plate is accepted if SES approved.

◯ **DRIVER'S LEG PROTECTION** - Covers inside of cockpit over any sharp edges or moving suspension / steering components.

◯ **CATCH TANKS** - Any coolant overflow or lube system vents must have separate catch tanks. **0.9 l** minimum each, **100 deg. C** material, behind firewall, below shoulder level. **3 mm min**. dia. vent away from driver down to the bottom level of frame. Trans or diff., unless sealed, requires **100 m**l catch bottle.

◯ **COOLANT** - 100% water. NO ADDITIVES WHATSOEVER or oil for engines.

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

VEHICLE WITHOUT DRIVER

◯ **SCATTERSHIELDS GENERAL** - Required for clutches, chains, belts, etc. No holes**. 6 mm** diam. Grade 8.8 minimum. End parallel to lowest part of the sprocket/pulley in front and rear. For chains, **2 mm** min. thick solid STEEL**, 3 x** chain width. For belts, **3 mm** min. thick Al 6061-T6, **3 x** belt width. Finger guards: cover all drivetrain parts that spin while vehicle is stationary. No holes **>12 mm** dia.

◯ **GAS CYLINDERS** - Proprietary manufacture & labeled, Nonflammable gas, regulator on tank, securely mounted, axis not pointed at driver, to rear of Main Hoop within the frame envelope, or in structural side pod, but not in cockpit, insulated from exhaust, appropriate lines & fittings. Positively retained, i.e. no tie-wraps.

◯ **HIGH PRESS HYDRAULICS** - Pumps and lines must have **1 mm** steel or aluminium shields protecting driver and workers.

BRAKE SYSTEM

◯ Dual hydraulic system & reservoirs

◯ operating on all four wheels, (one brake on limited slip differential is OK).

◯ System protected by structure or shields from drivetrain failure or minor collisions.

◯ No plastic brake lines. No brake-by-wire except in DV cars in autonomus mode. No parts below chassis/tubes in side view.

◯ Brake pedal made out of steel, aluminium or titanium.

SUSPENSION

◯ **SUSPENSION** - Fully operational with dampers front and rear; **50mm** minimum wheel travel (**25 mm** jounce and **25 mm** rebound) with driver in vehicle

◯ **STEERING WHEEL** - Continuous perimeter, near round (no concave sections) with driver operable quick disconnect**. 250mm** max from front hoop.

◯ **WHEELS** - **203.2 mm** (8") min. diam. No Aluminium or hollow wheel bolts. Single retaining nut must incorporate a device to retain the nut. Aluminum wheel nuts must be hard anodized.

◯ **STEERING** - All steerable wheels must have positive stops placed on the rack to prevent linkage lock up or tires from contacting any part of the vehicle. **7 degrees** max. free play at the steering wheel. NO STEER-BY-WIRE on front wheels. Rear wheel steering, max. 6 deg. and mechanical stops installed. No bonded joints in steering column.

◯ **SUSPENSION PICK-UP POINTS** - Inspected thoroughly for integrity

◯ **FASTENERS** - Steering, braking, harness and suspension systems must use SAE Grade 5 or Metric Grade M8.8 or higher specs (AN/MS) with visible positive locking mechanisms, no Loctite or lock washers. Minimum of 2 exposed threads with locking nuts. Rod ends in single shear are captured by a washer larger than the ball diameter. Adjustable tie-rod ends must have jam nuts to prevent loosening. **No Nylon lock nuts** for Brake calipers or Brake discs and closer than 50 mm. No button head cap, pan head or round head screws in critical locations, e.g cage structure or harness mount. Primary structure e/D > 1.5.

◯ **WHEELBASE** – **minimum 1525 mm** (60 in)

TRACTIVE SYSTEM PROTECTION

◯ **ACCUMULATOR CONTAINER POSITION** - All accumulator containers must lie within the primary structure of the frame lower than the top of the SIS. All accumulator containers must be protected from side or rear impact collisions. If an accumulator container or parts of it are mounted outside of the primary structure (EV.3.5.1, EV 3.5.3) an additional impact structure according to T2.3.1 must be build to protect the accumulator..

◯ **ACCUMULATOR CONTAINER ATTACHMENT** – Accumulator container must be attached to the primary structure with fasteners min. Grade 8.8. Fasteners have to follow T9. Mounting as designed in SES. Brackets 1.6 mm steel or **4 mm** aluminium with gussets to withstand bending loads. Monocoque needs **2 mm** steel backing plates or equivalent, mentioned inSES.

◯ **PROTECTION OF TRACTIVE SYSTEM PARTS** - In side view no part of the tractive-system can project below the lower surface of the frame or the monocoque, whichever is applicable

◯ **PROTECTION OF TRACTIVE SYSTEM PARTS** - All parts of the tractive system including cables and wiring must be contained within the envelope of the frame. If tractive system parts are mounted in a position where damage could occur from a rear or side impact (below **350mm** from the ground), they have to be protected by a fully triangulated structure with tubes of a minimum outer diameter of **25.4mm** and a minimum wall thickness of **1.25mm** or equivalent

◯ **MOTOR CASING** - 3 mm Aluminium 6061-T6 or 2 mm steel.If rotating around the stator or the motor case is perforated a scatter shield around the motor should be installed of 1 mm 6061-T6 aluminium or steel.

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

VEHICLE WITHOUT DRIVER

EXTERIOR, GENERAL

◯ **SCHOOL NAME & OTHER DECALS** - School Name, or recognized initials - **5 cm** tall min. on both sides in Roman letters. Must be clearly visible.

◯ **VEHICLE NUMBERS** - On front & both sides of vehicle, minimum **15 cm** tall, **20 mm** stroke & spacing, **25 mm** min. between number and background edge, Black on White, White on Black only, specified background shapes. Must be clearly visible.

◯ **TECH STICKER SPACE** – **12.5 cm x 10 cm** on centerline of front of vehicle in front of the cockpit opening.

◯ **BODY & STYLING** - Open wheeled, open cockpit, formula style body. Vertical keep out zones **75mm** in front and behind tires (no aero exceptions), tires unobstructed from sides.

◯ **BODYWORK** - Min. **38 mm** radius on nose. No large openings in bodywork into driver compartment in front of or alongside driver, (except cockpit opening).

◯ **EDGES/RADII** - Horizontal leading edges min **5 mm** radius; vertical forward facing edges min **3 mm** radius.

◯ **BODYWORK EDGES** - edges that could contact a pedestrian must have a minimum radius of **1.0 mm** (safety requirement)

ELECTRONICS

◯ **ON-BOARD STARTER** - Required.

◯ **SHUT DOWN BUTTON –** - Pull-ON, Push-OFF, electric symbol
COCKPIT - alongside & unobstructed by steering wheel, easily reached by driver. Must kill ignition & fuel pump(s). Marked with international symbol.
OUTSIDE - One button located on each side of the vehicle behind the driver's compartment at the level of the driver's head.
Rotary type, no relay, must kill ALL electrical systems.

◯ **STUDENT BUILD LV BATTERY -** Proper Insulation of internal connections; proper mounting of cells.

◯ **INERTIA SWITCH -** Rigidly attached to the vehicle, demountable for functionality check. Must open the shutdown circuit and kill ignition, injection & fuel pump(s) when accelerated between **6g and 11g**

◯ **BRAKE LIGHT** - Only one RED brake light, clearly visible from the rear; on vehicle centerline; height between wheel centerline & driver's shoulders. Round, triangle, or rectangular on black background. **15 cm2** minimum illuminated area. LED strips OK if elements closer than **20mm** apart and total length **> 150 mm.**

◯ **LOW VOLTAGE MASTER SWITCH** - Must be located on the right side of the vehicle, in proximity to the main hoop, at the 95th percentile male driver's shoulder height, in the middle of a completely red circular area of > **50mm** diameter. Marked with LV and international symbol. Level horizontal when in ON position.

◯ **BRAKE PEDAL OVER-TRAVEL SWITCH** - Must constantly open the shutdown circuit if one brake circuit fails for brake balance bar in all possible positions. No re-start if released or actuated a second time. Push pull or flip type Must NOT rely on programming to work. Not resettable by driver.

◯ **LV BATTERY** - Rigid and sturdy casing and attached securely to frame or chassis. Battery behind firewall; wet-cells in **IPX7** rated and acid resistant casing if inside cockpit. Must be contained within the rollover protection envelope, see T1.1.15. Grounded to chassis; hot terminal insulated; protected for short circuits (fused). No circuits >60VDC.

◯ **LI-ION LV BATTERY** (only applicable if other than LiFePO4)- Has a fire retardant casing according to UL94-V0. Battery pack includes: an overcurrent protection that trips below maximum discharge current; over temperature protection of **>30%** of the cells; voltage protection of all cells; it must be possible to display all cell voltages and measured temperatures on a team laptop.

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

ACCUMULATOR INSPECTION

The time limit for this part of the inspection is 90 minutes. Continuation of the inspection is possible after requeuing.
During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

!!! ACCUMULATORS ARE ALWAYS ENERGISED !!!

Required Resources

- An ESO must attend
- All accumulator containers to be used during the event
- Accumulator Container Hand Cart
- Charger
- Tools needed for (dis-)assembly of Accumulator Container
- Datasheets for used wiring, insulation materials, and TS components. (printed or properly sorted on one laptop, not on a cell phone)
- Print-out of rule questions, if necessary
- Pictures of accumulator internals, if necessary
- Printed or digital version of the ESF
- Spare PCBs, Stacks, Modules, Cells (stored in an electrically insulated, fire retardant container) etc.
- Samples of all wire types used inside the accumulator container
- Samples of all used accumulator container material
- Laptop and cables to display data of the AMS

Safety Briefing

- no jewellery, no rings
- no cell phone
- no batch / no necklace
- no sources of distraction
- do not wear synthetic clothes
- wear safety glasses
- wear safety gloves
- use only insulated tools

Basic Set of TS-Proof Tools

◯ Insulated cable shear
◯ Insulated screw driver
◯ Insulated spanners (n/a if no screwed connections in TS)
◯ Multimeter with protected probe tips

Safety Equipment

◯ Face shield
◯ Safety glasses (minimum three)
◯ At least two pairs of HV insulating gloves (not expired)
◯ HV insulating blankets (two) (min 1 m^2)(datasheet)

Charger Assembly

◯ Completely closed (no open TS connections)
◯ Interlock integrated
◯ TSMP integrated
◯ Emergency shutdown button integrated ≥ 24 mm diameter (clearly labeled)
◯ TS wiring is orange, marked with gauge, temperature rating ≥ 85 °C and voltage rating
◯ Conductive parts of charging equipment and accumulator are connected to protective earth (PE) while charging

Discharge Circuit and Body Protection Resistors

▶ Switch off Charger. Measure resistance between TS+ and TS- measuring points
◯ Resistance is BPR[3] + discharge resistor
◯ Total Body Protection Resistor power rating is _____ W (sufficient for handling short circuit between TS+ and TS-)[4]

TS Voltage	Resistor at 1 TSMP	Minimum total power rating (short circuit between TS+ and TS-)
U_{max} ≤ 200 VDC	5 kΩ	4 W
200 VDC < U_{max} ≤ 400 VDC	10 kΩ	8 W
400 VDC < U_{max} ≤ 600 VDC	15 kΩ	12 W

[3] Body Protection Resistor, value on the first sheet
[4] U_{max}^2 / BPR

Insulation Measurement Test

- ▶ Choose test voltage to _____ V[5]
- ▶ Connect insulation tester to charger TS+ and LV ground
- ▶ Connect charger (do not activate charger) to accumulator
- ▶ Measure resistance: R_{iso+} = _____ kΩ
- ◯ Resistance is much higher than _____ kΩ[6]
- ▶ Connect insulation tester to TS- MP and LV ground
- ▶ Measure resistance: R_{iso-} = _____ kΩ
- ◯ Resistance is much higher than _____ kΩ[6]
- ◯ Resistances are nearly equal

Accumulator Container

- ▶ Team must show approved SES for accumulator container
- ▶ Team must show SES test samples for accumulator container if alternative materials are used
- ◯ Accumulator container manufactured according to SES
- ◯ Vehicle number, university name and ESO phone number(s) written on a high contrast background
- Δ Roman Sans-Serif characters of at least 20mm high are used
- ◯ Warning stickers with side length of 100mm and text "Always Energized" and "High Voltage" (if TS >60 V) installed (triangle with black lightning bolt on yellow background)

Housing

- ◯ The accumulator must be mechanically fixed to the handcart while on the handcart
- ◯ Check if all parts and the cover/lid of the housing are rigidly fastened
- ▶ Open container housing, remove maintenance plugs
- ▶ Check if no voltage is present
- ◯ Internal vertical walls have to be rigidly fastened to the container. Minimum 75% of the height of the external walls. Divide the accumulator in sections of max. 12 kg

Assembly

- ◯ All components and parts of the accumulator container need to be properly fixed
- ◯ All used fasteners must be secured by the use of positive locking except they are non-conductive and non-structural
- ◯ TS potentials are insulated against inner wall of accumulator container if container made from conductive material
- ◯ Cells securely fastened towards all 3 directions
- ◯ Cell tabs must not be mechanically loaded
- ◯ No soldering in high current path
- ◯ Every container contains at least one appropriately sized and rated fuse
- ▶ Check datasheet of fuse and compare to ESF
- ◯ If the fuse uses a bolt to disconnect there must be sufficient space for the bolt to move into
- ◯ Every container contains at least two appropriately sized and rated isolation relays
- ◯ Isolation relays and fuses are separated from cells by barrier according UL94-V0, FAR25 or equivalent
- ◯ Pre-charge relay is of mechanical type with appropriate voltage rating
- ▶ Check datasheet of precharge and compare to ESF
- ◯ Maintenance plugs are located at both poles of each stack (including first and last stack)
- ◯ Maintenance plugs removable without tools
- ◯ Maintenance plugs have positive locking mechanism
- ◯ Maintenance plugs must not be able to unintentionally create circuits or short circuits
- ◯ Maintenance plugs must be designed such that it is clearly visible whether the connection is open or closed
- ◯ Stacks separated by Maintenance plugs ≤ 120 VDC and 6 MJ
- ◯ Stacks are insulated and separated by a rigid fire resistant barrier according to UL94-V0, FAR25 or equivalent
- ◯ Internal vertical walls have to be rigidly fastened to the container
- ◯ Holes in container only for wiring harness, ventilation, cooling or fasteners, if mechanical properties are not influenced.
- ◯ If fully closed, equalizing valve implemented
- ◯ Spare accumulators of same size, weight and type

Wiring

- ◯ All TS wires have proper overcurrent protection
- ◯ TS and LV wires separated (not valid for Interlock)
- ◯ Every wire used in the Accumulator container (TS and LV) is rated for maximum TS voltage
- ◯ No other wires than TS wires are orange
- ◯ Located out of the way of possible snagging or damage
- ◯ TS wires are marked with gauge, temperature rating ≥ 85 °C and voltage rating
- ◯ Positive locking mechanism or automotive certified components
- ▶ Check if insulated tools needed for the assembly of certified components are available
- ◯ Insulation is not only insulating tape or rubber-like paint

[5] Voltage selection: U_{max} < 250 V ⍰ 250 V, else 500 V
[6] 500 Ω/V x U_{max} + BPR

Indicator Light or Voltmeter

- ◯ Red indicator light or voltmeter installed
- ◯ Marked with “Voltage Indicator”
- ◯ Visible while disconnecting the TS accumulator container from the vehicles
- ◯ Hard wired electronics, supplied by TS
- ▶ Connect power supply with 60 VDC or half the maximum TS voltage, whichever is lower, to the accumulator TS connector
- ◯ Indicator light on or voltmeter showing present TS voltage
- ◯ Visible in bright sunlight

Accumulator Management System

- ◯ A minimum of 30% of cells are monitored with temperature sensors
- ◯ Every temperature sensor placed on negative terminal of monitored cell or in < 10 mm distance on busbar
- ▶ Disconnect AMS current sensor
- ◯ The AMS must open the shutdown circuit within 0.5 s
- ▶ Disconnect an AMS internal connector
- ◯ The AMS must open the shutdown circuit within 1 s
- ▶ Ask the team to connect their laptop to the AMS
- ◯ Cell voltages and temperatures can be displayed
- ◯ Check the accuracy of at least 5 cell voltage measurement. Maximum deviation: _____ mV

Charger Shutdown Circuit

- ◯ IMD is integrated into the charging system
- ▶ Connect charger to battery/batteries, start charging process
- ◯ Battery indicator shows that TS voltage is present
- ▶ Press shutdown button
- ◯ AIRs open
- ◯ Battery indicator shows voltage < 60 V
- ▶ Start charging, unplug TS battery connector
- ◯ AIRs open
- ◯ Charger disabled, no voltage at charger connector

Insulation Monitoring Device

- ◯ One IMD ground line is connected to the accumulator container and one ground line is connected to the charger casing by a separate wired connection.
- ▶ R_{Test} = max Voltage x 250 Ω/V – BPR = _____kΩ
- ◯ IMD indicator light is at the accumulator container or the charger, is red, marked with IMD and visible in bright sunlight
- ▶ Activate charger output, connect R_{Test} between TS+ and LV GND
- ◯ Shutdown circuits opens within 30 s
- ◯ IMD indicator light illuminates
- ◯ TS voltage decreases below 60 VDC within 5 s after shutdown circuit opens
- ◯ Reactivation of charger output is not possible
- ▶ Push the reset button, if any
- ◯ Reactivation of charger output is not possible
- ▶ Remove R_{Test}. Wait 40 s until IMD resets status output
- ◯ Reactivation of charger output is not possible
- ▶ Push the reset button
- ◯ Reactivation of charger output is possible
- ▶ Activate TS, connect R_{Test} between TS- and LV GND
- ◯ Shutdown circuits opens within 30 s

Handcart

- ◯ Accumulator Handcart brakes are normally closed
- ◯ Accumulator Handcart has four wheels
- ◯ Vibration protection required on Handcart
- ◯ Handcart must not hide TS accumulator labels
- ◯ The overall floor space used by the fully loaded hand cart must not exceed 1200 mm x 800 mm

Weighing of Accumulator

- ▶ Weight of each used accumulator: _____ kg
- ▶ Spare 1: _____ kg Spare 2: _____ kg

Sealing of Components

- ▶ After all tests have been passed successfully seal the inspected TS housings:
- ◯ Accumulator container(s) including spares
- ◯ Charger
- ◯ Additional Parts:

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

ELECTRICAL INPECTION II. (Tractive System)

The time limit for this part of the inspection is 60 minutes. Continuation of the inspection is possible after requeuing.
During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

Required Resources

- An ESO must attend
- Datasheets for used wiring, insulation materials, and TS components
- Fully assembled spare boards of all inaccessible TS boards outside the accumulator (printed photographs are sufficient if spares are not available)
- Photographs of all inaccessible TS connections
- Print-out of rule questions, if necessary
- Printed or digital version of the ESF
- Printed or digital version of the ASF (DV only)
- RES remote control (DV only)

Insulation Measurement Test

- ▶ Choose test voltage to 250 or 500V[7]
- ▶ Connect insulation tester to TS+ and LV ground
- ▶ Measure resistance: R_{iso+} = _____ kΩ
- ◯ Resistance is much higher than _____ kΩ[8]-
- ▶ Connect insulation tester to TS- and LV ground
- ▶ Measure resistance: R_{iso-} = _____ kΩ
- ◯ Resistance is much higher than _____ kΩ[8]
- ◯ Resistances are nearly equal

Grounding Checks

Part (if applicable)	**Conductive** (max. 300 Ωm@1 A)	**May become conductive** (max.5 Ω@1 A)
Frame / Monocoque	☐	☐
Firewall(s)	☐	
Accumulator container	☐	☐
Seat mounting points	☐	
Driver harness mounting points	☐	
Conductive housings with TS parts inside	☐	☐
Steering wheel surface	☐	☐
Pedal box	☐	☐
Main Roll Hoop	☐	☐
Suspension Front left	☐	☐
Suspension Front right	☐	☐
Suspension Rear left	☐	☐
Suspension Rear right	☐	☐
Driver Controls / Switches / Etc.	☐	☐
Carbon-fiber parts typically touched when trying to move the vehicle with TS deactivated		☐
Accumulator Management System Data Connector	☐	☐
Radiator	☐	☐
Additional Part:	☐	☐
Additional Part:	☐	☐
Additional Part:	☐	☐

[7] U_{max} < 250 V ⍰ 250 V, else 500 V
[8] 500 Ω/V x U_{max} + BPR

!!! HIGH VOLTAGE TESTS !!!

Tractive System Power-Up

- ▶ All driven wheels are off the ground, driven wheels removed
- ▶ Ask the team to connect the HVD
- ▶ Connect multimeter between TS+ and TS-
- ▶ Switch on TSMS with LVMS deactivated
- ◯ Voltage at TS measurement points less or equal 60 VDC
- ▶ Switch on LVMS with TSMS deactivated
- ◯ IMD and AMS indicator light illuminate for 1 to 3 s for visible check
- ◯ Voltage at TS measurement points less or equal 60 VDC
- ▶ Switch on TSMS and all shutdown buttons (to close the Shutdown Circuit)
- ▶ Reset any IMD or AMS errors
- ◯ TS still deactivated
- ▶ Activate TS with TSMS, measure TS voltage during TS power-up
- ◯ System is precharged before second AIR closes
- ▶ Switch off TSMS
- ◯ TS voltage decreases below 60 VDC within 5 s
- ▶ Try to power-up TS with switched off TSMS (by pushing buttons, etc)
- ◯ TS still deactivated
- ▶ Switch on TSMS
- ◯ TS still deactivated

Tractive System Shutdown

- ▶ Connect multimeter between TS+ and TS-
- ▶ For every of the following switches, deactivation leads to TS shutdown, voltage decreases below 60 VDC within 5 s
- ◯ LVMS
- ◯ Shutdown button left
- ◯ Shutdown button right
- ◯ Cockpit shutdown button
- ▶ Unmount Inertia switch if necessary, with deactivated TS
- ◯ Inertia switch
- ◯ Break-over-travel-switch
- ▶ Show schematic of TS with all interlocks (ESF)
- ◯ Interlocks

Tractive System Active Light

- ▶ Activate LV system
- ◯ TSAL and Cockpit Indicator (CI) is green only
- ▶ Activate TS
- ◯ TSAL flashes red with freq 2 Hz - 5 Hz, and CI is off
- ◯ TSAL is clearly visible (horizontal position)
- ▶ Disconnect AIR state detection circuitry (disconnect data connection to accumulator container), activate LV
- ◯ TSAL is off (red must be explained) and CI is off
- ▶ Deactivate TS, deactivate LV, connect power supply > 60 VDC to TS (Do not use measuring points. Disconnect the TS connector of the Accumulator and connect the power supply to the cable pins.)
- ▶ Connect AIR state detection circuitry (connect data connection to accumulator container)
- ▶ Activate LV and enable the output of the power supply
- ◯ TSAL is off and CI is off
- ▶ Disconnect power supply, remove HVD, override HVD interlock (!! cover TS potentials !!), activate LV and activate TS
- ◯ TSAL is off and CI is off

Insulation Monitoring Device

- ◯ One IMD ground line is connected to the accumulator container and one ground line is connected to the main hoop by a separate wired connection
- ▶ R_{test} = _____ kΩ (*250 Ω/V x TS_{max}*)
- ▶ Activate TS, connect R_{test} between TS+ and LV GND
- ◯ Shutdown circuits opens within 30 s
- ◯ IMD indicator light illuminates
- ◯ TS voltage decreases below 60VDC within 5 s after shutdown circuit opens
- ◯ Reactivation of TS is not possible
- • IMD indicator light . . .
- ◯ . . . is inside the cockpit and marked with IMD
- ◯ . . . is red and visible in bright sunlight
- ◯ . . . is visible for the driver
- ▶ Push the reset button which is not accessible to the driver, if any
- ◯ Reactivation of TS is not possible
- ▶ Remove R_{test}. Wait 40 s until IMD resets status output
- ◯ Reactivation of TS is not possible
- ▶ Push all reset buttons in the cockpit, if any
- ◯ Reactivation of TS is not possible
- ▶ Push the IMD reset button which is not accessible to the driver, if any
- ◯ Reactivation of TS is possible
- ▶ Push and hold the reset button which is not accessible to the driver, if any. Connect R_{test} between TS+ and LV GND
- ◯ Shutdown circuits opens within 30 s
- ◯ IMD indicator light illuminates
- ▶ Activate TS, connect R_{test} between TS- and LV GND
- ◯ Shutdown circuits opens within 30 s

Accumulator Management System

- ▶ Ask the team to connect their laptop to the AMS
- ◯ Cell voltages can be displayed
- ◯ Cell temperatures can be displayed
- ▶ Disconnect TS accumulator
- ◯ AMS light is illuminated
- • AMS indicator light . . .
- ◯ . . . is inside the cockpit and marked with AMS or BMS
- ◯ . . . is red and visible in bright sunlight
- ◯ . . . is visible for the driver

Ready To Drive Activation Sequence

- ▶ Activate TS, press torque pedal
- ◯ No turning of motors
- ▶ Let the team set the vehicle to ready to drive mode
- ◯ Pressing brake pedal WHILE activating is necessary
- ◯ Ready to drive sound duration is 1 s to 3 s continuously
- ◯ Ready to drive sound is min 80 dBA (2 m around the vehicle)
- ◯ Ready to drive sound is easy recognizable and no animal sound or song part
- ◯ Sufficient brightness of the brake light even in bright sunlight
- ▶ Repeat the activation sequence, but push the brake pedal only once before finally pushing the activation button
- ◯ No ready to drive mode possible
- ▶ Disconnect the brake sensor
- ◯ No ready to drive mode possible

Implausibility Checks

- ▶ Set vehicle to ready to drive state. Press accelerator pedal > 25 %. Push brake pedal
- ◯ Motors stop turning
- ▶ Release brake, while accelerator pedal still activated
- ◯ Motors do not turn
- ▶ Release accelerator pedal slowly
- ◯ Motors turn again when APPS position is < 5 %
- ▶ Get motors turning, disconnect ≥ 50 % of APPS while motors are turning
- ◯ Motors stop turning
- ▶ Disconnect all APPS
- ◯ Motors do not turn
- ▶ Reconnect all APPS, disconnect any communication connection between APPS and inverter while motors turn
- ◯ Motors stop turning
- ▶ Team simulates 5 kW power, press brake representing hard braking (>0.5 s)
- ◯ TS shuts down
- ◯ Reactivation of TS is not possible
- ▶ Reactivate TS. Disconnect current sensor, press brake representing hard braking (>0.5 s)
- ◯ TS shuts down
- ◯ Reactivation of TS is only possible after 10 s without implausibility

Regenerative Braking

- ▶ Ask the team to mount wheels
- ▶ Set vehicle to ready to drive state and ask the team to select a driving mode where regenerative braking is used
- ▶ Press brake slightly without activating hydraulic brake system. Do not press the Accelerator Pedal!
- ◯ Turning a driven wheel by hand is possible

Sealing Of Components

- ▶ After all tests have been passed successfully seal the inspected TS housings:
- ◯ Motor Controller housing
- ◯ Energy Meter housing
- ◯ IMD housing
- ◯ TSAL circuitry housing
- ◯ BSPD casing /BSPD calibration
- ◯ Additional Parts: _____
- ◯ Additional Parts: _____
- ◯ Additional Parts: _____
- ◯ Additional Parts: _____

Energy Meter

- ▶ Check data logger functionality and connectivity
- ▶ Set the date & time, assign the datalogger to the team

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

DRIVER GEAR & SAFETY

◯ **FACE SHIELDS** - made of impact resistant material.

◯ **UNDERWEAR** - certified to SFI 3.3 or FIA 8856-2000

◯ **SOCKS** - Nomex or equivalent, fire resistant socks. No cotton. No polyester. No bare skin.

◯ **GLOVES** - Fire resistant material. No holes. Leather allowed only over fire resistant material.

◯ **DRIVER SUITS** - Single piece FIA 1986 or 2000, or SFI 3-2A/5, FIA 8856-2000 minimum rating, and LABELED AS SUCH

◯ **HAIR COVER** - Fire resistant (Nomex or equiv.) balaclava of full helmet skirt REQUIRED FOR ALL DRIVERS.

◯ **SHOES** - SFI 3.3 or FIA 8856-2000

◯ **HELMETS** - Snell K2005, K2010, K2015, M2005, M2010, M2015, SA2005, SA2010, SAH2010, SA2015, EA2016, SFI 31.1/2005, 31.1/2010, 31.1/2015, 41.1/2005, 41.1/2010, 41.1/2015, FIA 8860-2004, FIA 8860-2010, FIA 8860-2018, FIA 8859-2015. Closed Face, no Open Face, must have integrated shield (no dirtbike helmets). No camera mounts.

EGRESS TEST

◯ **EGRESS** - **5 seconds** max. to exit to side of vehicle from fully seated position with all safety equipment; wings must remain fixed in position. ALL DRIVERS.

Both hands on the steering wheel. (in all possible steering positions)
Pressing cockpit-mounted shutdown button.
The egress time will stop when the driver has both feet on the ground

#	DRIVER'S NAME	EGRESS TIME
1.		:
2.		:
3.		:
4.		:
5.		:
6.		:
7.		:
8.		:

APPROVAL

Inspector Names Date, Time Signature

_____/_____ _____ _____

TILT TABLE INSPECTION

►*Accumulator is in the car, tallest driver seated in, wearing **every** piece of driver equipment (**inc**.wrist)!*

◯ **TILTING DIRECTION** - towards the side, where the water cooling catch can located

◯ **COOLANT SPILLAGE** - No coolant spill permitted when car is tilted to **60 degrees** in the direction most likely to create spiliage.

◯ **VEHICLE STABILITY** - All wheels in contact with tilt table when tilted to **60 degrees** to the horizontal

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

VEHICLE WEIGHING

►*Accumulator must be in the car*, *driver wearing every piece of driver equipment (exc.wrist)!*

◯ **WEIGHT MEASURING** - The weight of the cars must be written with permanent method on the tech sticker on the nose.

◯ **GROUND CLEARANCE** - At least **30mm** min. in any condition.(Also with the driver in.)
The checker specimen must freely slide without jamming and any kind of resistance under the whole car. Ground clearance must also be checked under all the aerodynamic elements.

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

RAIN TEST

▶ *Vehicle jacked up, driven wheels removed, without driver, TS activated (TSAL ON)*

▶ **Tra**ctive system voltage is present at TSMPs.

◯ **RAIN PROOF** - No driver is allowed in the car during the test. Water like rain will be sprayed at the vehicle for **120 sec**. Another **120 sec** of waiting without water spray.

◯ **INSULATION** - The insulation Monitoring Device does not react and not shut down the tractive system.

▶ Connect *RTest* between any TSMP and LVS GND.

◯ **SHORT CIRCUIT** - Shut down circuits opens within **30 sec**.

◯ **MASTER SWITCH / SHUTDOWN BUTTONS** - Must cause Tractive System shutdown.

◯ **INTAKE SYSTEM LEAKAGE/BYPASS** - There is no air leakage or bypass of the intake system permitted. When the intake is closed completely, the engine should almost immediately stall
Choke Test - Engine should stop after chocking the air inlet. (After noise)

◯ **INERTIA SWITCH -** Rigidly attached to the vehicle, demountable for functionality check. Must open the shutdown circuit and kill ignition, injection & fuel pump(s) so cause engine to stop when actuated.

◯ **INPLAUSIBILITY CHECK -** BSPD - Brake system plausibility device must shut down fuel pump(s), ignition during high brake system pressure and <5% throttle actuation.

◯ **BRAKE OVER-TRAVEL SWITCH -** A switch must be installed behind the brake pedal so that in the event of a failure in at least one of the brake circuits the brake pedal over-travel will result in the shutdown. Repeated actuation must not close the shutdown circuit, cannot be reset by the driver.

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

BRAKING PERFORMANCE INSPECTION

◯ **BRAKING PERFORMANCE** - Must lock all four wheels and stop the vehicle in a straight line at the end of an acceleration run.
No additves can be applied to the tires! Should be checked and demand tire change, if noticed slipperiness or odour!

◯ **BRAKING METHOD -** test must be performed without electrical braking from motors.

◯ **TRACTIVE SYSTEM -** The tractive system has to be shut down by the driver before braking. The Tractive System Active Light has to be Green during breaking or shortly after the vehicle stopped. This may take up to 5 sec. after shut down.

◯ **BRAKE LIGHT** - has to be clearly visible even in bright sunlight.

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____

POST EVENT INSPECTION

WITH DRIVER SEATED IN

► *Driver seated in and wearing every piece of driver equipment (exc.wrist)!*

◯ **AERODYNAMICS** - ALL aerodynamic devices maximum **250 mm** rearward of rear tires, maximum **700 mm** forward of front tires. Devices lower than **500 mm** from the ground rearward of the front axle must be no wider than vertical plane from the outside of the front and rear tires. Devices higher than **500 mm** behind the front axle must not be wider than the inside of the rear tires. No power ground effects.

◯ **AERO VERTICAL HEIGHT** - Devices forward of a vertical plane through the rearmost portion of the front face of the driver head restraint support, excluding any padding, set to its most rearward position, must be lower than **500 mm** from the ground. Rear device max **1.2 m** above ground (incl. end plates); Front device max **250 mm** above ground outside of the inside plane of the front tires inside this plane max **500 mm**

◯ **GROUND CLEARANCE** - At least **30mm** min. in any condition.

► *Vehicle jacked up*

◯ **INPLAUSIBILITY CHECKS**
BOTS - Pedal over-travel switch activating must result in a shutdown.
BSPD - If hard braking occurs and accelerator pedal actuated at once for min. 0.5 seconds, BPSD must switch off the Tractive System
For a duration of 10 seconds the TS cannot be activated.

◯ **BRAKE LIGHT -** The brake light must work correctly after the Endurance event! Located on vehicle centerline; height between wheel centerline & driver's shoulders.

◯ **SHUTDOWN BUTTONS AND SWITCHES -** The cockpit mounted shutdown button must switch off the Tractive System.
The main hoop mounted ones must switch off the Tractive System.

◯ **LEAKAGE CHECK** - Any kind of fluid leakage under the car, or on the belly pan/diffusor will result in a DNF for the Endurance event.

◯ **(RERAIN TEST) -** If the scrutineer found the car exceptionally worn and teared (like cables are rubbed or torn) compared to others after the Endurance event, a repeated Rain Test can be demanded.

◯ **RE-WEIGHING** :

Mass of the car:	kg	Difference from before:	kg

NON-COMPLIANCE / COMMENTS

APPROVAL

Inspector Names	Date, Time	Signature
_____/_____	_____	_____