

TEAM:	FSS Racing Team
UNIVERSITY:	University of Spain
CAR NUMBER:	300
FUEL TYPE:	Ethanol
STROKE:	42.5
HYBRID CAR:	Hybrid
<hr/>	
SES PASSED:	✓
IAD PASSED:	✓
HSF PASSED:	-
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ASF PASSED:	✓
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Present the vehicle for inspection in the following order:

1. Pre-Inspection / Egress
Mechanical Inspection *
Driverless Inspection
2. Tilt Test *
3. Noise Test *
4. Brake Test *
5. Emergency Brake System Test *

* The vehicle is marked with a sticker if this part has been passed successfully

Used Symbols:

- Information
- ▶ Action
- Check
- Check in responsibility of the team

Notes:

- The order of point 1 will be given by the Organization
- To enter the Tilt Test vehicle must show Mechanical sticker and Pre-Inspection successfully passed
- The Driverless sticker will be given after successfully pass of both Driverless Inspection and EBS Test
- **This form must always stay with the vehicle!**
- If there is a conflict between this form and the rules, the rules prevail

PART I – PRE-INSPECTION

The time limit for this part of the inspection is **20 minutes**. Continuation of the inspection is only possible on free slots. During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

STATUS UPDATE

► Set online status to **Present**

► Write down Scrutineer(s) name(s), sign when passed

DRIVER GEAR & SAFETY

- | | |
|---|---|
| <p>1 ○ FACE SHIELDS – Made of impact resistant material</p> <p>2 ○ UNDERWEAR – Nomex or equivalent, fire-resistant under-wear (no cotton, polyester, or bare skin). No holes</p> <p>3 ○ SOCKS – Nomex or equivalent, fire-resistant socks (no cotton, polyester, or bare skin). No holes</p> <p>4 ○ GLOVES – Fire resistant material. Leather allowed only over fire-resistant material. No holes</p> <p>5 ○ ARM RESTRAINTS – SFI Standard 3.3 or equivalent</p> <p>6 ○ HELMETS – Snell K2010, K2015, K2020, M2010, M2015, M2020, SA2010, SAH2010, SA2015, SA2020; EA2016. (or newer), SFI 31.1/2010, 2015, 2020; SFI 41.1/2010, 2015, 2020 (or newer); FIA 8860-2010, 2018, 8859-2010 (with SAH2010 or newer), 8859-2015 (with SA2015). Closed-face, no open-face, must have integrated shields (no dirt-bike helmets). No camera mounts</p> | <p>7 ○ DRIVER SUITS – Single piece SFI 3-2A/5 (or higher), SFI 3.4/5 (or higher), FIA 8856-2000/2018 (or higher) rating and labeled as such. No holes</p> <p>8 ○ HAIR COVER – Fire resistant (Nomex or equiv.) balaclava of full helmet skirt REQUIRED FOR ALL DRIVERS. No holes</p> <p>9 ○ SHOES – SFI 3.3 or FIA 8856-2000/2018</p> <p>10 ○ FIRE EXTINGUISHERS – Two (2) hand-held, 0.9kg (2lb) min., dry chemical (10BC, 1A10BC, 34B, 5A 34B, 20BE or 1A 10BE), with pressure / charge gauge, Aqueous Film Forming Foam (AFFF) fire extinguishers are prohibited, 1 WITH CAR securely installed on push-bar, 1 in paddock (must see both at Tech.). On-board fire system possible</p> <p>11 ○ SEWING OR STITCHING – Teams must show compliance to T 13.3 if driver's clothing is embroidered. Fire-resistant material must be used (e.g., Carbon X, Indura, Nomex, Polybenzimidazole (PBI) and Proban)</p> |
|---|---|

TIRES

- | | |
|--|---|
| <p>12 ○ DRY TIRES – Make:</p> <p>13 ○ DRY TIRES – Size:</p> <p>14 ○ DRY TIRES – Compound:</p> | <p>15 ○ RAIN TIRES – Make:</p> <p>16 ○ RAIN TIRES – Size:</p> <p>17 ○ RAIN TIRES – Compound:</p> <p>18 ○ RAIN TIRES – 2.4 mm min. tread depth molded by tire manufacturer</p> |
|--|---|

EGRESS PROCEDURE

- All drivers must be able to exit the vehicle in less than 5 s
- Driver must be seated in Ready-to-Race condition
- Wings must remain fixed in position
- ▶ Both hands on the steering wheel (in all possible steering positions)
- ▶ Press cockpit shutdown button
- ▶ The time will stop when the driver has both feet on the ground

Driver 1 (Tallest): _____

Signature: _____

Driver 2: _____

Signature: _____

Driver 3: _____

Signature: _____

Driver 4: _____

Signature: _____

Driver 5: _____

Signature: _____

Driver 6: _____

Signature: _____

NON-COMPLIANCE / COMMENTS

STATUS UPDATE

- ▶ Set online status to **Pass** or **Fail**

APPROVAL

Scrutineer/s name/s	Date, Time	Signature/s when PASSED
_____	_____	_____

PART II – MECHANICAL INSPECTION

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

STATUS UPDATE

- ▶ Set online status to **Present**
- ▶ Write down Scrutineer(s) name(s), sign when passed

CAR WITH TALLEST DRIVER READY-TO-RACE

- | | |
|--|---|
| <ul style="list-style-type: none"> 19 ○ PUSH BAR (RED COLOR) – With car, securely attached to car, detachable, push & pull function for 2 people standing erect. The push bar must be attached to the rear of the vehicle for moving it. Fire extinguisher must be installed 20 ○ GROUND CLEARANCE – At least 30 mm in any condition 21 ○ CAMERAS – Must be secured by two points [see T 11.11] and inside the surface envelope. No cameras mounted on the helmet 22 ○ VISIBILITY – 100 ° min. field either side. Head rotation allowed or mirrors. If mirrors, must be firmly installed and adjusted 23 ○ VEHICLE CONTROLS – All controls, including shifter, must be inside the cockpit. No arms or elbows outside the side impact system to actuate 24 ○ OTHER SIDE TUBES – Design prevents driver's neck hitting bracing or other side tubes 25 ○ WHEELBASE - At least 1525 mm | <ul style="list-style-type: none"> • DRIVER FLUID PROTECTION – A firewall must extend sufficiently far upwards and / or rearwards such that any point, less than 100 mm above the bottom of the helmet of the tallest driver, is not in direct line of sight with any of the following parts: <ul style="list-style-type: none"> 26 ○ ...cooling system 27 ○ ...low voltage battery 28 ○ ...fuel system 29 ○ ...engine oil system 30 ○ MAIN HOOP & FRONT HOOP HEIGHTS – Helmet of tallest 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 31 ○ ROLL BAR PADDING – Roll bar or bracing that could be hit by driver's helmet must be covered with 12 mm thickness, SFI 45.1 or FIA 8857-2001 padding. Pipe insulation and foam not acceptable 32 ○ SUSPENSION – Fully operational with dampers front and rear; 50 mm min. wheel travel (min. 25 mm jounce) with driver in vehicle |
|--|---|

DRIVER RESTRAINT SYSTEM

- | | |
|---|--|
| <ul style="list-style-type: none"> 33 ○ ARM RESTRAINTS – Must be installed so the driver can release them and exit unassisted regardless of vehicle's position <ul style="list-style-type: none"> • HEAD RESTRAINT... 34 ○ ...near vertical, SFI 45.2 standard and must take 890 N load (may be changed for different drivers) 35 ○ ...150 x 150 mm min. and 40 mm thickness, 25 mm max. from helmet with contact point 50 mm min. from any edge <ul style="list-style-type: none"> • DRIVER RESTRAINT HARNESS... 36 ○ ...SFI 16.1, 16.5, 16.6, FIA 8853/2016. 6- or 7- point system and be labeled 37 ○ ...two-piece lap belt (width 500 mm min.) 38 ○ ...two shoulder straps (width 75 mm min, 50 mm OK with HANS) 39 ○ ...two leg or anti-submarine straps (width 50 mm min.) (7- point system must have three anti-submarine straps) 40 ○ ...all lap belts must have Quick Adjusters | <ul style="list-style-type: none"> 41 ○ ...must be securely attached to Primary Structure (25.4 x 2.4 mm or equivalent) <ul style="list-style-type: none"> ▶ Define if driver is in upright or reclined driving position [see T 5.1.3 & T 5.1.4] • LAP BELT MOUNTING... 42 ○ ...reclined: 60 ÷ 80°, upright: 45 ÷ 65 ° (to be measured in the pelvic area diagonally in the leg) 43 ○ ...pivoting mounting with eye bolts or shoulder bolts securely attached to Primary Structure. Tab thickness 1.6 mm min. • SHOULDER HARNESS MOUNTING... 44 ○ ...mounting points 180 ÷ 230 mm apart with an angle from shoulder between 10 ÷ 20° down to horizontal 45 ○ ...attached to Primary Structure (25.4 x 2.4 mm or 25 x 2.5 mm steel tube min.) 46 ○ ...not to put bending loads into MHB without extra bracing and additional braces if not straight to the MH 47 ○ ...cannot pass through a firewall |
|---|--|

CAR WITHOUT DRIVER

- **SEAT...**
- 48 ○ ...insulated against heat conduction, convection and radiation [see T 4.6.2]
- 49 ○ ...lowest point no lower than bottom of side rails or must have longitudinal 25.4 x 1.65 mm steel tube underneath
- 50 ○ **SCHOOL NAME & OTHER DECALS** – School Name, or recognized initials - 5 cm tall min. on both sides in Roman letters. Must be clearly visible
- 51 ○ **CAR NUMBERS** – On front & both sides of vehicle, 15 cm min. tall, 20 mm stroke & spacing, 25 mm min. between number and background edge. Black on White or White on Black only, specified background shapes. Must be clearly visible
- 52 ○ **TECH STICKER SPACE** – 7.5 x 15 cm on centerline of front of car in front of the cockpit opening
 - **BRAKES...**
- 53 ○ ...dual hydraulic system & reservoirs, operating on all four wheels, (one brake on limited slip is OK)
- 54 ○ ...system must be protected by structure or shields from drivetrain failure or minor collisions
- 55 ○ ...no plastic brake lines
- 56 ○ ...no brake-by-wire
- 57 ○ ...no parts below chassis / tub in side view
- 58 ○ ...brake pedal capable of 2000 N, no failures if official exerts maximum force (seated normally in vehicle)
- 59 ○ **BRAKE OVER-TRAVEL SWITCH (BOTS)** – Must constantly open the shutdown circuit if one brake circuit fails for the brake balance bar in all possible positions. Not resettable by driver
- 60 ○ **COCKPIT OPENING** – Template passes down from above cockpit center line to top SIS tube or to 320 mm above lowest inside chassis point between FH and MH [see T 4.1.1 fig. 12 left]. Steering wheel column, seat & padding can be removed. No removing of firewall
- 61 ○ **COCKPIT INTERNAL CROSS SECTION** – Template passes forward from cockpit to 100 mm rear of rearmost pedal contact area in most forward position [see T 4.1.1 fig. 12 right]. Steering wheel and padding removable with no tools & driver-in can be removed
- 62 ○ **ROTATING PARTS** – Finger guards are required to cover any parts (e.g., fans) that spin while the vehicle is stationary. No holes > Ø 12 mm

BODYWORK & AERODYNAMIC DEVICES

- 63 ○ **EDGES** – Bodywork and aerodynamic edges that could contact a pedestrian must have a radius of 1 mm min. (3 mm min. when forward facing edges) (safety requirement)
- 64 ○ **BODY & STYLING** – Open wheeled, open cockpit, formula style body. Vertical keep out zones 75 mm in front and behind tires (no aero exceptions), tires unobstructed from sides [see T 2.1.3 fig. 4]
- 65 ○ **BODYWORK** – No external concave radii in any side view in front of the cockpit. 38 mm min. radius on nose [see T 2.3.4]. No large openings in bodywork into the driver compartment in front of or alongside the driver (except cockpit opening)
 - **WINGS...**
- 66 ○ ...securely mounted and not extending further than the rear portion of the head restraint in the rearmost position
- 67 ○ ...deflection may not exceed 10 mm when a force of 200 N is applied over a surface of 225 cm²
- 68 ○ ...deflection may not exceed 25 mm with a point force of 50 N is applied
- 69 ○ ...permanent deflection < 5 mm
- **HEIGHT DEVICES** [see T 8.2.1]...
- 70 ○ ...forward of a vertical plane through the rearmost portion of the front face of the driver's head restraint support, excluding any padding, and set to its most rearward position, must be lower than 500 mm from the ground
- 71 ○ ...rearward of mentioned plane before must be lower than 1.2 m from the ground (including end plates)
- 72 ○ ...in front of the front axle and extending further outboard than the most inboard point of the front tire / wheel must be lower than 250 mm from the ground
- **WIDTH DEVICES** [see T 8.2.2]...
- 73 ○ ...lower than 500 mm from the ground and further rearward than the front axle, must be not wider than the outside plane of the wheels / tires
- 74 ○ ...higher than 500 mm from the ground, must not be wider than the inside plane of the rear wheel / tire [see T 8.2 fig. 16]
- **LENGTH DEVICES** [see T 8.2.3]...
- 75 ○ ...250 mm max. rearward of rear tires
- 76 ○ ...700 mm max. forward of front tires

REMOVE BODY PANELS

- 77 ○ **JACKS** – Up to two devices that lift up all driven wheels 100 mm min. above the ground. In a lifted position it is safe to enter and exit the vehicle and the devices must not extend out of the footprint of the four tires.
- 78 ○ **WHEELS** – Ø 203.2 mm min. (8"). No Aluminum or hollow wheel bolts. Single retaining nut must incorporate a device to retain the nut. Aluminum wheel nuts must be hard anodized

- 79 ○ **PERCY** – Helmet of 95th percentile male to be 50 mm below the lines between top of MH & FH and between top of MH to rear attachment point of MHB [see T4.3.1 fig. 13 and fig. 14]. Center of the bottom circle placed 915 mm min. from pedals
- 80 ○ **DRIVER'S FOOT PROTECTION** – Feet must be rearward of the FBH and no part of shoes or legs above or outside the Primary Structure (25 x 1.2 mm or equivalent) in lateral or front views when touching pedals
- 81 ○ **DRIVER'S LEG PROTECTION** – Covers inside cockpit over sharp and moving suspension & steering components
- **FIREWALL** – Fire resistant material (must meet UL94-V0, FAR25 or equivalent). Passthroughs OK with grommets. Multiple panels OK if gaps sealed. No gaps at sides or bottom. Must be rigidly mounted to the chassis and separate...
- 82 ○ ...driver compartment from cooling, oil system & LV battery
- 83 ○ ...**[CV HYBRID ONLY]** HSC from fuel tank

SES, IAD & REQUIRED TESTS

- ▶ Team must show an APPROVED SES and all relevant test specimen(s), labeled (non-removable) with structure acronym & date and width, skin & core thickness according to SES
 - ▶ Team must show an APPROVED IAD and test piece same as IA on vehicle (if applicable)
- 84 ○ **SES TUBING & MATERIALS** – No Magnesium tubes in Primary Structure
- 85 ○ **BOLTED JOINTS** – In Primary Structure, distance of hole centerline to the nearest free edge > 1.5 x Ø hole (e / D > 1.5) [see T 10.1.4]
- 86 ○ **MONOCOQUE** – Must see laminate test specimen. Steel backing plates more than 2 mm thick are used at attachment points. According to SES if two panels are bolted together
- 87 ○ **INSPECTION HOLES** – Ø 4.5 mm required in non-critical areas of MH and FH. Inspectors may ask for holes in other tube(s)
- **MAIN HOOP (MH)...**
- 88 ○ ...must be made of one piece and extend to the lowest frame member. Above Major Structure, within 10 ° of vertical plane (dimension as shown in approved SES)
- 89 ○ ...must be steel, smooth bends without wrinkles
- **MAIN HOOP BRACING (MHB)...**
- 90 ○ ...attached within 160 mm from the top, 30 ° min. included angle with MH (if MH is not vertical, bracing must not be on the same side of the vertical plane) (dimension as shown in approved SES)
- 91 ○ ...must be steel, one brace each side, no bends, no rod-ends. Proper design for removable braces (capping etc.) on both ends
- 92 ○ ...must take load back to bottom of MH and node of upper SIS tube thru proper triangulated structure (25.4 x 1.2 mm or equivalent)
- **FRONT HOOP (FH)...**
- 93 ○ ...20 ° max. vertical, no lower than the top of the steering wheel and longitudinal distance 250 mm max. (dimension as shown in approved SES)
- 94 ○ ...must be a closed section metal tube. Can be multi-piece with gussets or extra attachments to the monocoque. Must extend down to the lowest frame member
- 95 ○ **FRONT HOOP BRACING (FHB)** - Two straight forward-facing braces, 25.4 x 1.65 mm, 25 x 1.75 mm or 25.4 x 1.6 mm wall steel or equivalent, attached within 50 mm of top. Extra rearward bracing is required if FH leans backwards > 10 °
- **SIDE IMPACT PROTECTION (SIS)...**
- 96 ○ ...minimum of two tubes + diagonal must connect the MH and FH in a straight line (dimension as shown in approved SES)
- 97 ○ ...upper tube must be between 240 ÷ 320 mm above the lowest inside chassis point between FH and MH
- 98 ○ ...lower tube can be the lower frame member
- 99 ○ **FRONT IMPACT PROTECTION** – No non-crushable objects forward of the bulkhead
- **IMPACT ATTENUATOR (IA)...**
- 100 ○ ...forward of bulkhead with no wing support through the IA and must be securely fastened directly to AIP capable of taking transverse or vertical loads (no tape, etc.)
- 101 ○ ...min. volume dimensions of 200 mm long x 200 mm wide x 100 mm high and cannot be more than 350 mm above ground (measured with driver seated)
- 102 ○ ...standard IA requires diagonal or X-brace if FBH dimensions larger than 400 mm width and / or 350 mm height
- 103 ○ **ANTI INTRUSION PLATE (AIP)** – A 1.5 mm solid steel metal or 4 mm solid aluminum metal sheet (same size as outside dimensions) must be welded or minimum 8 screws M8 8.8. A CFRP plate is accepted if SES / IAD is approved
- 104 ○ **FRONT BULKHEAD SUPPORT (FBHS)** – Support back to front roll hoop; 3 tubes per side, all 25 x 1.5 mm wall steel tube or equivalent. 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

CAR LIFTED AND WHEELS REMOVED

- 105 ○ **SUSPENSION PICK-UP POINTS** – Inspected thoroughly for integrity
- **FASTENERS** – Must use SAE grade 5, M8.8 or higher specs (AN / MS) with visible positive locking mechanisms [see T10.2.2], no Loctite or lock washers. Min. 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 button head cap, pan head or round head screws in critical locations (e.g., cage structure or harness mount). It must be complied with in the Primary Structure and...
- 106 ○ ...driver's harness
- 107 ○ ...steering
- 108 ○ ...braking (no nylon lock nuts for caliper or discs)
- 109 ○ ...suspension
- 110 ○ ...air intake [see CV 1.3.3]
- 111 ○ ...fuel rail [see CV 2.5.1]
- 112 ○ ...**[CV HYBRID ONLY]** motor(s) attachments [see EV 2.1.2]
- **STEERING...**
- 113 ○ ...all steerable wheels must have positive stops to prevent linkage lock up or tires from contacting any part of the car
- 114 ○ ...7 ° max. free play at the steering wheel, mechanical joints to steering rack [see T 3.2.8 for bonded joints]
- 115 ○ ...no Steer-by-Wire on front wheels. For rear wheel steering, 6 ° max. and mechanical stops installed
- 116 ○ ...mechanically attached to Primary Structure and stationary parts within rollover protection envelope
- 117 ○ **STEERING WHEEL** – Continuous perimeter, near round (no concave sections) with driver operable quick disconnect. 25 cm max. from the FH and no higher than the FH top-most surface
- 118 ○ **FLOOR CLOSEOUT PANEL** – Required from foot area to Firewall. Solid, non-brittle material. Multiple panels are OK if gaps < 3 mm
- 119 ○ **GAS CYLINDERS** – Proprietary manufacture & labeled, Non-flammable gas, regulator on tank, securely mounted, axis not pointed at driver, to rear of MH within the frame envelope, or in structural side pod, but not in cockpit, insulated from exhaust, appropriate lines & fittings. Positively retained (e.g., no tie-wraps)
- 120 ○ **GAS CYLINDER'S LOCATION** – Axis not pointed at driver, within the rollover protection envelope, insulated from any heat source, must be shielded from the driver.
- The shields must be steel or aluminum with a 1 mm min. of thickness
- **SCATTERSHIELDS GENERAL** – No holes. Ø 6 mm grade 8.8 min. End parallel to lowest part of the sprocket / pulley in front and rear. Required for...
- 121 ○ ...clutches, chains, belts, etc.
- 122 ○ ...**[CV HYBRID ONLY]** Motor casing(s) [see EV 2.1.3]
- **SCATTERSHIELD MATERIAL...**
- 123 ○ ...chains: 2 mm min. thickness solid steel, 3 x chain width, belts: 3 mm min. thickness Al 6061-T6, 3 x belt width
- 124 ○ ...finger guards: cover all drivetrain parts that spin while the car is at rest and no holes > Ø 12 mm
- 125 ○ **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 T 1.1.16]. Grounded to chassis; hot terminal insulated; protected for short circuits (fused). No circuits > 60 V_{DC}
- 126 ○ **STUDENT BUILD LV BATTERY** – Proper insulation of internal connections; proper mounting of cells
- 127 ○ **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; overtemperature 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
- 128 ○ **HIGH PRESS HYDRAULICS** – Pumps and lines must have 1 mm thickness steel or aluminum shields to protect drivers and workers
- 129 ○ **COOLANT** – Only 100 % water. No additives whatsoever
- 130 ○ **CATCH TANKS** – Any coolant overflow, crankcase breather or lube system vents must have separate catch tanks. 0.9 L min. each, 100 °C material, behind the firewall, below shoulder level. Ø 3 mm min. vent away from the driver down to the bottom level of the frame. Transmission or differential, unless sealed, requires 100 ml catch bottle
- 131 ○ **FLUID LEAKS** – None permitted (e.g., oil, grease, coolant, fuel, brake fluid)
- 132 ○ **BELLYPANS** – Must be vented to prevent accumulation of volatile fluids. Must have at least two holes (Ø 25 mm min.). These holes must be positioned in the lowest part of the structure

ENGINE & AIR INTAKE SYSTEM

- 133 All parts of the engine air and fuel control systems (including throttle and complete air intake system, including the air filter and any air boxes) must lie within the surface envelope
- 134 **ON-BOARD STARTER** – Required
- 135 **ENGINE** – Four cycle piston engine. Waste heat recovery allowed
- 136 **ENGINE LUBRICATION SYSTEM** – The lowest point of the engine lubrication system must be no lower than the lowest frame part without a protection structure mounted to the chassis [see T 7.3.1]
- **RESTRICTOR...**
- 137 ...must be circular and cannot be movable
- 138 ...gasoline: Ø 20 mm max., ethanol: Ø 19 mm max.
- 139 **AIR INTAKE SYSTEM** – Any portion < 350 mm above ground must have SIS protection [see CV 1.3.2] and be supported if cantilevered (isolated to frame, rigid to engine)
- 140 **INTAKE MANIFOLD** – Securely attached to block or head with mechanical fasteners (positive locking!). Rubber bushings or hoses are not sufficient
- 141 **THROTTLE PEDAL** – Must have positive stop to prevent overstressing cable
- **THROTTLE BODY...**
- 142 ...must have a minimum of 2 springs at the TB (TPS not acceptable as a return spring)
- 143 ...cable must have smooth operation with no binding or sticking
- 144 ...cable is located 50 mm min. from any exhaust component
- ▶ Disconnect spring 1
- 145 Throttle returns to idle position
- ▶ Disconnect spring 2
- 146 Throttle returns to idle position
- ▶ Ask to the team to press throttle pedal fully
- **COMPRESSORS...**
- 147 ...must be between restrictor and throttle body [see CV 1.8]
- 148 ...carburetors are not allowed if compressors are used
- 149 ...compressor recirculation valves allowed if located downstream of restrictor
- 150 ...intercooler allowed after throttle body

FUEL & FUEL SUPPLY SYSTEMS

- 151 All parts of the fuel system that may come into contact with the fuel must be rated for permanent contact with fuel
- 152 All parts of the fuel storage and supply system must lie within surface envelope [see T 1.1.18], adequately protected against any heat sources and located at least 50 mm from any exhaust system component
- ▶ Ask to the team if they use LPI, HPI or DI [see CV 2.5.2]
- 153 **FUEL RAIL** – Securely attached to block (no nylon nuts), head or intake manifold with brackets and mechanical fasteners (min. grade 8.8). Plastic, carbon fiber or rapid prototyping flammable materials are prohibited
- **FUEL TANK(S)...**
- 154 ...must be located within the rollover protection envelope [see T 1.1.16]
- 155 ...securely attached to the vehicle structure with flexible mounts to not carry structural loads
- 156 ...flexible material (bladders or bags) is allowed and must be enclosed within a rigid container securely attached to the vehicle structure (may be carry loads)
- **FUEL LINES...**
- 157 ...no plastic connector(s) and lines between fuel tank and engine
- 158 ...fuel injection systems must use metal braided hose with threaded fittings or reinforced rubber with approved hose clamps
- 159 ...must be securely attached and protected from possible rotating equipment or collision failure
- 160 ...must be fitted in such a way that any leakage cannot result in the accumulation of fuel in the cockpit
- **FUEL FILLER NECK...**
- 161 ...must be located within the rollover protection envelope [see T 1.1.16], except if it is 350 mm above the ground
- 162 ...inner Ø 35 mm min., within 30 ° from the vertical
- 163 ...with a clear sight tube of 125 mm min. vertical height visible to fueller with vehicle fully assembled (clear filler neck tube may be used as a sight tube) and fuel resistant (material must be rated for at least 120 °C)
- 164 ...with non-moveable fuel level line 12 ÷ 25 mm below top of sight tube (must not run below the top of the tank)
- 165 ...must prevent fuel spillage contacting the driver, exhaust, or ignition
- 166 ...fueled without manipulating the vehicle in any way
- 167 ...with cap secure and capable of withstanding pressurization (e.g., threads or latch)

168 **REFUELING** – Must be able to be accomplished without the removal of any body parts of the car

169 **FUEL VENTS** – Must exit outside of the bodywork and have a check valve to prevent leakage if car inverted

ONLY FOR HYBRID CARS

HYBRID SYSTEM (HS)

170 All components of HS are located within the surface envelope

171 Maximum 60 V DC (75 V DC for motor controller/inverters internal lower control signals)

172 The LVS must not use orange wiring or conduit, grounded to chassis

173 The HS may only be activated when the combustion engine is running or during engine start

174 All electrical parts of the HS must be covered at least according to IPxxB when energized (except ground terminals)

175 Soldered connections in high current path allowed only in connections on PCB(s) and if connected devices are not cells or wires and are additionally mechanically secured against loosening

MOTOR(S)

176 Only electric motor(s) are allowed

177 HS motor(s) must be connected to the HSC through a motor controller

178 Motor casing made of 2 mm min. Aluminum 6061-T6 (may be split into two equal sections, each 1 mm thickness)

HYBRID SYSTEM CONTAINER (HSC)

179 Must be securely attached to the Primary Structure and located within the rollover protection envelope (as described in SES)

180 Attachments brackets must be made of steel 1.6 mm or aluminum 4 mm thick with gussets [see EV 5.5.13]

181 AIR integrated into HSC to disconnect the positive pole. "Normally open" type

182 Moving energy into the HSC from a different electrical storage system is prohibited

183 HSC must be removable to be inspected and weighted

184 Weight < 3 kg of all HS elements to store electrical energy (e.g.: battery cells or supercapacitors), including all casing and tabs integral to them

NON-COMPLIANCE / COMMENTS

STATUS UPDATE

► Set online status to **Pass** or **Fail**

APPROVAL

Scrutineer/s name/s

Date, Time

Signature/s when PASSED

PART III – DRIVERLESS INSPECTION

The time limit for this part of the inspection is **20 minutes**. Continuation of the inspection is only possible on free slots. During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

STATUS UPDATE

- ▶ Set online status to **Present**
- ▶ Write down Scrutineer(s) name(s), sign when passed

REQUIRED RESOURCES

- 185 ○ An ASR must attend
 - RES remote control
 - Tools / equipment needed to arm the brake system
- At least all non-passed parts of the ASF (printed or properly sorted on one laptop, not on a cell phone)
- Photographs of all inaccessible ASB parts

SENSORS FOR AUTONOMOUS SYSTEM

- 186 ○ **CHECK SENSORS** – Check if all sensors are fulfilling the legal requirements (mainly radar and laser). The teams must provide the according certifications
- 187 ○ **SENSOR POSITION** – Sensors must be positioned within the surface envelope or the envelope for aerodynamic devices
- 188 ○ **SENSOR MOUNTING** – Sensors must be securely and rigidly mounted to the vehicle's structure. May not come into contact with the driver's helmet when normally seated
 - ▶ **SENSOR MARKING** – Mark all sensors

ACTUATORS FOR AUTONOMOUS SYSTEM

- 189 ○ **DECOUPLING** – Check if the team uses a decoupling mechanism for the brake / steering actuators
- 190 ○ **PART REMOVAL** – Parts like including bolts, clips, etc. must not be removed for disconnection (e.g.: they must never lose the physical contact to the disconnection mechanism)
- 191 ○ **MANUAL OPERATION** – The disconnection mechanism must not block manual operation of steering / braking in any position
- 192 ○ **LOCKING** – The disconnection mechanism must be securely locked in both positions
- 193 ○ **AUTONOMOUS SYSTEM MASTER SWITCH** – Must be in proximity to the low voltage master switch, at the 95th percentile male driver's shoulder height, in the middle of a completely blue circular area of $\geq \varnothing 50$ mm. Marked with "AS". Level horizontal when in the "ON" position. "ON" and "OFF" positions must be marked. ASMS must have locking mechanism for "OFF" position

AUTONOMOUS SYSTEM STATUS INDICATORS (ASSI)

- 194 ○ Both side ASSI(s) are mounted behind the driver's compartment, minimum. 160 mm below the top of the main hoop and 600 mm above ground
- 195 ○ The rear ASSI is mounted on the vehicle centerline, near vertical, 160 mm min. below the top of the main hoop and 100 mm above the brake light
- 196 ○ Round, triangle, or rectangular on black background
- 197 ○ 15 cm² min. illuminated area or LED strips with a total length > 150 mm with elements < 20 mm apart

REMOTE EMERGENCY SYSTEM (RES)

- 198 ○ Remote Emergency System installed
 - The relay must...
- 199 ○ Rigidly mounted to the chassis
 - ▶ Check if RES bypass is implemented correctly (as per ASF form "Actuator Power Supply")
- 200 ○ ...be normally closed
- 201 ○ ...be directly supplied by the ASMS
- 202 ○ ...have a safety certified forcibly guided or a mirrored normally open contact which is directly connected in series to the ASMS

AUTONOMOUS SYSTEM BRAKE (ASB)

- | | |
|--|---|
| <p>203 <input type="radio"/> Autonomous System Brake is identical to the system described in the ASF</p> <p>204 <input type="radio"/> MOUNTING – All parts are properly mounted. No lateral forces acting on the pistons of pneumatic / hydraulic actuators</p> <p>205 <input type="radio"/> LEAKS – No leaks in pneumatic / hydraulic circuit</p> <p>206 <input type="radio"/> PUSH-IN FITTINGS – None used</p> <p>207 <input type="radio"/> OVERPRESSURE PROTECTION – Must have overpressure protection in function critical pneumatic circuits, if parts of the circuit exceed 10 bar</p> | <p>208 <input type="radio"/> The release points are marked with "Brake release"</p> <p>209 <input type="radio"/> No more than two release points are used</p> <p>210 <input type="radio"/> All release points are in proximity to each other and are either mounted in proximity to the ASMS or on the top side of the vehicle between front bulkhead and front hoop close to the vehicle's center line</p> <p>211 <input type="radio"/> The release points are operable by maximum two simple Push-Pull and / or turning actions. The order and direction of these actions are shown next to the deactivation points</p> |
|--|---|

AUTONOMOUS SYSTEM TEST

- | | |
|--|---|
| <p>212 <input type="radio"/> The vehicle must be equipped with an additional start button next to the master switches</p> <p>213 <input type="radio"/> There must be a green light next to the engine start button, that indicates the gearbox is in neutral, marked with N letter with a height of 25 mm</p> <p style="padding-left: 20px;">▶ Switch on LVMS and select inspection mission (AMI)</p> <p>214 <input type="radio"/> Autonomous Mission Indicator (AMI) is easily readable and shows the correct mission</p> <p>215 <input type="radio"/> The ASSI(s) remains off</p> <p style="padding-left: 20px;">▶ Switch on ASMS and TSMS</p> <p>216 <input type="radio"/> Activating the TS using the cockpit activation button is not possible</p> | <p style="padding-left: 20px;">▶ Activate TS via external activation button and press RES "Go" button within 5 s after "AS Ready"</p> <p>217 <input type="radio"/> The ASSI(s) light up in yellow continuously after a self-check ("AS Ready")</p> <p>218 <input type="radio"/> "AS Driving" (ASSI(s) yellow flashing) has not been entered</p> <p>219 <input type="radio"/> Vehicle is still not in Ready-to-drive</p> <p>220 <input type="radio"/> All three ASSI(s) (yellow color) are clearly visible in very bright sunlight. At least one ASSI is visible from any angle of the vehicle</p> <p>221 <input type="radio"/> Brakes are closed at least on one axle during the initialization and in the "AS Ready" state</p> |
|--|---|

!! CAUTION WHEELS AND STEERING SYSTEM WILL MOVE !!

- ▶ Press RES "Go" button
- 222 ○ Transition from "AS Ready" to "AS Driving", ASSI(s) is yellow flashing
- 223 ○ Drivetrain is slowly spinning, and steering system is actuating with a sine wave
 - ▶ Wait for the transition from "AS Driving" to "AS Finished"
- 224 ○ The ASSI(s) light up in blue continuously within 25 to 30 s and brakes are engaged ("AS Finishes"). ASSI(s) must not start flashing
- 225 ○ All three ASSI(s) (blue color) are clearly visible in very bright sunlight. At least one ASSI is visible from any angle of the vehicle
- 226 ○ TS is deactivated
 - ▶ Turn off ASMS and release the brakes via the deactivation points
- 227 ○ Brakes are disengaged, manual steering is possible, ASSI(s) are off
 - ▶ Re-enter "AS Ready" state
 - ▶ Press one shutdown button while autonomous state is "AS Ready"
- 228 ○ ASSI(s) start flashing blue ("AS Emergency")
- 229 ○ Brakes are closed
- 230 ○ Intermittent sound for 8 to 10 s (1 Hz to 5 Hz, 50 % duty cycle)
- 231 ○ **Sound level is 80 dB min. (2 m around the vehicle)**
- 232 ○ TS is deactivated
 - ▶ Turn off ASMS and release brakes (manual actions may be required)
 - ▶ Re-enter "AS Driving" state with inspection mission selected before each of the following tests
 - ▶ Press RES
 - ▶ Switch off ASMS
- 233 ○ TS is deactivated
- 234 ○ Transition to "AS Emergency", ASSI(s) are blue flashing, brakes are closed and intermittent sound for 8 to 10 s
 - ▶ Test all operating errors (e.g.: manual valves) and some (choose randomly 1 to 3) ASB failure modes (e.g.: disconnect sensors, energy supply, pneumatics, hydraulics...)
- 235 ○ System has detected a failure
- 236 ○ When ASSI is "AS Ready" or "AS Driving" state, the system enters "AS Emergency"

NON-COMPLIANCE / COMMENTS

STATUS UPDATE

- ▶ Set online status to **Pass** or **Fail**

APPROVAL

Scrutineer/s name/s

Date, Time

Signature/s when PASSED

PART IV – TILT TEST

STATUS UPDATE

- ▶ Set online status to **Present**
- ▶ Write down Scrutineer(s) name(s), sign when passed

FLUID LEVELS

- 237 **FLUID LEVELS** – All vehicle fluids are at their maximum fill level
- ▶ Ask the team to move the vehicle
- 238 **FUEL LEVEL** – Fuel level line remains to the scribe line. If not, the vehicle must be refueled and moved again

TEST

- ▶ Weight the vehicle
- 239 **FLUID LEAKAGE** – No fluid leaks
- ▶ Lift the tilt table to an angle of 60 ° in the direction most likely to create spillage
- 240 **VEHICLE STABILITY** – All wheels in contact with the tilt table surface

NON-COMPLIANCE / COMMENTS

STATUS UPDATE

- ▶ Set online status to **Pass** or **Fail**

APPROVAL

Scrutineer/s name/s	Date, Time	Signature/s when PASSED

PART V – NOISE TEST

The time limit for this part of the inspection is **3 attempts**. Continuation of the inspection is only possible on free slots. During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

STATUS UPDATE

- ▶ Set online status to **Present**
- ▶ Write down Scrutineer(s) name(s), sign when passed

TEST

- 241 ○ **EXHAUST OUTLET** – Outlet 45 cm max. behind the rear axle centerline and 60 cm max. above the ground
- 242 ○ **EXHAUST SHIELDING** – Components outside the body forward of the rear axle must be shielded from people approaching the car. No fibrous / cloth wraps around exhaust tubes
 - **BRAKE LIGHT...**
- 243 ○ ...working red brake light, clearly visible from the rear
- 244 ○ ...located on vehicle centerline, height between wheel centerline & driver's shoulders
- 245 ○ ...round, triangle, or rectangular on black background with 15 cm² min. illuminated area
- 246 ○ ...LED strips OK if elements closer than 20 mm apart and total length > 150 mm
- ▶ The sonometer should be placed 0.5 m from the end and at 45 ° of the horizontal plane for each exhaust outlet. For exhaust with active tuning or throttling device [see IN 10.1.6]
- ▶ Ask the team to start the engine
- ▶ Gearbox in neutral and throttle at idle
- 247 ○ Noise level is 103 dB max. (fast weighting). Movable tuning or throttling device must be in "worst condition"
 - To calculate test speed, use the following formula, rounded to the nearest 500 rpm [see CV 3.2]: $457.500 / \text{Stroke [mm]}$
 - ▶ Test speed = _____ rpm
 - ▶ Up to specified rpm
- 248 ○ Noise level is 110 dB max. (fast weighting)

CIRCUIT SHUTDOWNS

- **COCKPIT MASTER SWITCH...**
- 249 ○ ...Push-OFF & Pull-ON type
- 250 ○ ...alongside and unobstructed by the steering wheel, easily reached by belted-in driver
- 251 ○ ...must kill ignition & fuel pump(s)
- 252 ○ ...marked with the international symbol
- **LOW VOLTAGE MASTER SWITCH...**
- 253 ○ ...must be located on the right side of the vehicle, in proximity to the main hoop, and at the 95th percentile male driver's shoulder height
- 254 ○ ...in the middle of a completely red circular area of Ø 50 mm
- 255 ○ ...marked with "LV" and the international symbol
- 256 ○ ...level horizontal when in ON position
 - ▶ Up to 5.000 rpm and actuate Cockpit Master Switch
- 257 ○ Must kill all electrical systems (e.g., ignition, fuel pump(s)) and stop the engine
 - ▶ Up to 5.000 rpm and actuate LV Master Switch(es)
- 258 ○ Must kill all electrical systems (e.g., ignition, fuel pump(s)) and stop the engine
- **INERTIA SWITCH...**
- 259 ○ ...rigidly attached to the vehicle and demountable for functionality check
- 260 ○ ...must open the shutdown circuit and kill ignition & fuel pump(s) when accelerated between 6 g and 11 g [see T 11.5]
- 261 ○ ...must cause engine to stop when actuated
 - ▶ Up to 5.000 rpm and actuate Brake Pedal Over-Travel Switch
- 262 ○ Open the shutdown circuit
- 263 ○ No restart if released or actuated a second time
- 264 ○ Push-Pull or Flip type must not rely on programming to work
- 265 ○ **INTAKE SYSTEM LEAKAGE / BYPASS** – There is no air leakage or bypass of the intake system permitted
 - ▶ Close the intake completely
- 266 ○ The engine should almost immediately stall

BRAKE SYSTEM PLAUSIBILITY DEVICE (BSPD)

- 267 **Must directly supplied from the LVMS, no additional functionality implemented on all required Printed Circuit Boards (PCB(s)) and the interfaces must be reduced to the minimum necessary signals**
 - ▶ Disconnect brake system encoder from BSPD while throttle is open
- 268 Power to ignition & fuel pump(s) must shut down
 - ▶ Disconnect throttle position sensor from BSPD while throttle is open
- 269 Power to ignition & fuel pump(s) must shut down
- ▶ Team simulates a throttle position > 25 % over idle position
- ▶ Press brake representing hard braking (> 0.5 s)
- 270 Shutdown circuit opens and kill ignition & fuel pump(s)
- 271 Reactivation by the driver is not possible. May reset itself if the opening condition is no longer present for more than 10 s
 - ▶ Power cycle vehicle (reset BSPD)

ONLY FOR ETC INSPECTION

ACCELERATOR PEDAL POSITION SENSOR (APPS)

- 272 Accelerator Pedal returns to original position if not actuated
 - ▶ Disassemble one spring
- 273 At least two sensors with different transfer function are installed (for digital sensors, a checksum is required)
- 274 Sensors do not share supply or signal lines
- 275 Sensors are protected from being mechanically overstressed (positive stop of pedal)
- 276 Minimum of two springs installed to return pedal
- 277 Each spring still returns pedal with the second one disconnected (springs in the APPS not counted)
 - ▶ Open throttle and disconnect APPS(s)
- 278 Power to ETC system shuts down after 100 ms and throttle goes to idle position if less than two APPS are connected

THROTTLE AND THROTTLE POSITION SENSOR (TPS)

- 279 Two sources of energy to return the throttle to idle position. One must be a return spring (springs in the TPS not counted)
 - ▶ Disconnect electronic throttle connector while throttle is open
- 280 Throttle must return to idle position in one second
- 281 At least two Throttle Position Sensors (TPS) installed
 - ▶ Open throttle and disconnect TPS(s)
- 282 Power to ETC system shutdown after 100 ms and throttle goes to idle position if less than two TPS are connected

PLAUSIBILITY CHECKS

- ▶ Activate fuel pump and verify it is running
- ▶ Open throttle, insert a blocking device and command throttle to fully close
- 283 After 1 s, power to ignition, injection and fuel pump shut down and throttle goes to idle position. This action must remain active until the TPS signals indicate the throttle returned to idle position for at least 1 s

NON-COMPLIANCE / COMMENTS

STATUS UPDATE

- ▶ Set online status to **Pass** or **Fail**

APPROVAL

Scrutineer/s name/s

Date, Time

Signature/s when PASSED

PART VI – BRAKE TEST

The time limit for this part of the inspection is **3 attempts**. Continuation of the inspection is only possible on free slots.
During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

STATUS UPDATE

- ▶ Set online status to **Present**
- ▶ Write down Scrutineer(s) name(s), sign when passed

TEST

- **BRAKING PERFORMANCE...**
- 284 ...must lock-up all four wheels on dry asphalt at any speed
- 285 ...stop the vehicle in a straight line without stalling the engine
- 286 **BRAKE LIGHT** – Must be clearly visible even in bright sunlight
- 287 **BOTS** – It has not been activated after the brake test

NON-COMPLIANCE / COMMENTS

STATUS UPDATE

- ▶ Set online status to **Pass** or **Fail**

APPROVAL

Scrutineer/s name/s

Date, Time

Signature/s when PASSED

PART VII – EMERGENCY BRAKE SYSTEM TEST

The time limit for this part of the inspection is **3 attempts**. Continuation of the inspection is only possible on free slots. During technical inspection all work carried out on the vehicle must be approved by a technical inspector.

STATUS UPDATE

- ▶ Set online status to **Present**
- ▶ Write down Scrutineer(s) name(s), sign when passed

TEST

- ▶ Use the RES dongle
- ▶ Apply EBS adapter device to team’s RES sender, if available
- ▶ Switch on LVMS and select mission “EBS test”
- 288 ○ AMI shows the correct mission
- ▶ Switch on ASMS
- ▶ Check for neutral gear and press engine start button
- 289 ○ ASSI is yellow continuous
- ▶ Press RES “Go” button
- 290 ○ ASSI is yellow flashing and vehicle accelerates
- ▶ EBS gets automatically triggered by the EBS adapter device at the brake point. If the EBS adapter device is not available press RES “Stop” button when vehicle is at brake point
- 291 ○ Vehicle must stop within 10 m and must stay stable
- 292 ○ Speed at brake point must be around 40 km/h
- 293 ○ ASSI is blue flashing, intermittent sound is clearly noticeable for 8 to 10 s
- 294 ○ Engine stopped

NON-COMPLIANCE / COMMENTS

STATUS UPDATE

- ▶ Set online status to **Pass** or **Fail**

APPROVAL

Scrutineer/s name/s	Date, Time	Signature/s when PASSED

PART VIII – DYNAMIC EVENTS INSPECTION

This is a guideline of points to be checked during dynamic events. Random inspections could be done arbitrarily and at the technical inspector discretion, even if they are not specified in this section.

PRE-INSPECTION

REQUIRED	ACC.	SKIDPAD	AUTO-X	ENDUR.
ROLL BAR PADDING – Securely attached and in direction of driver’s helmet				
WINGS – Securely attached and properly marked				
FIREWALL – Securely attached and properly sealed				
SUSPENSION – Securely attached and check possible loose joints				
TYRES – Check clearances inside the rim, white marking tyre-rim and possible displacement				
ASB – Enter “AS Ready” state, press RES and check “AS Emergency” state is activated, and brakes are closed				

OPTIONAL

FLUID LEAKS – Oil, grease, coolant, fuel, brake fluid -> none permitted				
GROUND CLEARANCE – At least 30 mm min. in any condition				
BODYWORK EDGES – Edges that could contact a pedestrian must have a minimum radius of 1 mm				
BODY & STYLING – Vertical keep out zones 75mm in front and behind tires (no aero exceptions), tires unobstructed from sides				
AERODYNAMICS – Securely attached				
BOTS – If failure in one or both brake circuits the brake pedal over travel will open the shutdown circuit				

POST-INSPECTION

REQUIRED	ACC.	SKIDPAD	AUTO-X	ENDUR.
GROUND CLEARANCE – At least 30 mm min. in any condition				
FLUID LEAKS – Oil, grease, coolant, fuel, Brake fluid -> none permitted				
BOTS – If failure in one or both brake circuits the brake pedal over travel will open the shutdown circuit				
AERODYNAMICS – Check height, width or length randomly				

OPTIONAL

NOISE LEVEL – Check at max. RPM				
WINGS – Securely mounted				
FIREWALL – Securely attached and properly sealed				