

# FORMULA STUDENT GERMANY

## COMBUSTION INSPECTION SHEET



UNIVERSITY:	Metropolis TU
CAR NUMBER:	84
SES PASSED:	<input type="checkbox"/>
IADR PASSED:	<input checked="" type="checkbox"/>
NUMBER OF DRIVERS:	
TALLEST DRIVER:	HEIGHT:
ENGINE:	Honda / CRF450X
BORE/STROKE:	69 mm/64 mm
FUEL TYPE:	98
ABS:	<input type="checkbox"/> YES <input type="checkbox"/> NO
ETC:	<input type="checkbox"/> YES <input type="checkbox"/> NO

**IMPORTANT** - Present the vehicle for inspection in the following order:

1. Pre-Scrutineering
2. Mechanical Inspection\*
3. Tilt Table Test\*
4. Noise Test\*
5. Brake Test\*

\* the car is marked with a sticker if this part has been passed successfully.

**NOTES:**

- This form must stay with the car at all times!
- If there is a conflict between this form and the rules, the rules prevail.

### PART I: PRE-SCRUTINEERING

#### TIRES

- |  |  |
|--|--|
| 1 <input type="radio"/> <b>DRY TIRES</b> - Make:     | 4 <input type="radio"/> <b>RAIN TIRES</b> - Make:  |
| _____  | _____  |
| 2 <input type="radio"/> <b>DRY TIRES</b> - Size:     | 5 <input type="radio"/> <b>RAIN TIRES</b> - Size:  |
| _____  | _____  |
| 3 <input type="radio"/> <b>DRY TIRES</b> - Compound: | 6 <input type="radio"/> <b>RAIN TIRES</b> - Compound:  |
| _____  | _____  |
|  | 7 <input type="radio"/> <b>RAIN TIRES</b> - 2,4 mm (3/32 in.) min. tread depth molded by tire manufacturer |

#### DRIVER GEAR & SAFETY

- |  |  |
|--|--|
| 8 <input type="radio"/> <b>FACE SHIELDS</b> - made of impact resistant material.   | 13 <input type="radio"/> <b>DRIVER SUITS</b> - Single piece FIA 1986 or 2000, or SFI 3-2A/5, FIA 8856-2000 minimum rating, and LABELED AS SUCH   |
| 9 <input type="radio"/> <b>UNDERWEAR</b> - certified to SFI 3.3 or FIA 8856-2000   | 14 <input type="radio"/> <b>HAIR COVER</b> - Fire resistant (Nomex or equiv.) balaclava of full helmet skirt <b>REQUIRED FOR ALL DRIVERS.</b>  |
| 10 <input type="radio"/> <b>SOCKS</b> - Nomex or equivalent, fire resistant socks. No cotton. No polyester. No bare skin.  | 15 <input type="radio"/> <b>SHOES</b> - SFI 3.3 or FIA 8856-2000   |
| 11 <input type="radio"/> <b>GLOVES</b> - Fire resistant material. No holes. Leather allowed only over fire resistant material.   | 16 <input type="radio"/> <b>FIRE EXTINGUISHERS</b> - Two (2) hand-held, 0.9 kg (2 lb.) minimum, dry chemical (10BC, 1A10BC, 34B, 5A 34B, 20BE or 1A 10BE), 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. |
| 12 <input type="radio"/> <b>HELMETS</b> - Snell SA2005, SA2010, SAH2010, SA2015; M2005, M2010, M2015; K2005, K2010, K2015. BS 6658-85 Type A/FR (not Types A or B). SFI 31.2/2005,2010,2015; SFI 41.2/2005,2010,2015; FIA 8860-2004, 8860-2010, 8859-2015. Closed Face, no Open Face, must have integrated shield (no dirtbike helmets). No camera mounts. |  |

#### APPROVAL

Scrutineer Names	Date, Time	Signatures when passed
1. _____ / _____	_____	_____

### PART II: MECHANICAL INSPECTION

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

#### CAR WITH DRIVER READY TO RACE

- |  |   |
|--|---|
| 17 <input type="radio"/> <b>PUSH BAR</b> - With car, securely attached to car, detachable, push & pull function for 2 people standing erect. The push bar must be located behind the rear axle when the car is moved. FIRE EXTINGUISHERS must be installed | (hard) padding. Pipe insulation and foam NOT acceptable.  |
| 18 <input type="radio"/> <b>CAMERAS</b> - If >0.25 kg, must be secured by two points, see T14.15. No cameras mounted to helmet.  | 23 <input type="radio"/> <b>OTHER SIDE TUBES</b> - Design prevents driver's neck hitting bracing or other side tubes  |
| 19 <input type="radio"/> <b>VISIBILITY</b> - Minimum of 100 deg. field either side. Head rotation allowed or mirrors. If mirrors, must be firmly installed and adjusted  | 24 <input type="radio"/> <b>ARM RESTRAINTS</b> - Must be installed so the driver can release them and exit unassisted regardless of vehicle's position.   |
| 20 <input type="radio"/> <b>VEHICLE CONTROLS</b> - All controls, including shifter, must be inside cockpit. No arms or elbows outside side impact system to actuate.   | 25 <input type="radio"/> <b>HEAD RESTRAINT</b> - Near vertical. Must take 890 N load. 38 mm thick, energy absorbing padding. Max. 25.4 mm from helmet. Helmet contact point 50 mm min. from any edge. May be changed for different drivers. Minimum 150x150mm AND height adjustment of 175 mm; OR minimum 150 x 280mm |
| 21 <input type="radio"/> <b>MAIN HOOP &amp; FRONT HOOP HEIGHTS</b> - 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.                   | 26 <input type="radio"/> <b>GROUND CLEARANCE</b> - Sufficient to prevent any portion of the car from touching the ground during track events 30 mm min.   |
| 22 <input type="radio"/> <b>ROLL BAR PADDING</b> - Roll bar or bracing that could be hit by driver's helmet must be covered with 12 mm thick, SFI or FIA   | 27 <input type="radio"/> <b>EGRESS</b> - 5 seconds max. to actuate cockpit master switch and exit to side of vehicle, from fully seated position with all safety equipment; wings must remain fixed in position. ALL DRIVERS.   |



**CAR WITHOUT DRIVER**

- 28 ○ **BODYWORK EDGES** - edges that could contact a pedestrian must have a minimum radius of 1.0 mm (safety requirement)
- 29 ○ **BODY & STYLING** - Open wheeled, open cockpit, formula style body. Vertical keepout zones 75mm in front and behind tires (no aero exceptions), tires unobstructed from sides.
- 30 ○ **BODYWORK** - Min. 38 mm radius on nose. No large openings in bodywork into driver compartment in front of or alongside driver. (except cockpit opening).
- 31 ○ **AIR INTAKE SYSTEM ROLL OVER PROTECTION** - All parts of air intake system (including throttle body or carb, air intake ducting, air cleaner & air box) must be within a surface defined by the top of the roll bar and the outside top edge of the tires.
- 32 ○ **AIR INTAKE SYSTEM** - Any portion < 350 mm above ground must have Side Impact protection to rule IC 1.4.2 and be supported if cantilevered (isolated to frame, rigid to engine). No enlarged air chambers (< 60 mm diam.) before throttle. Inter-cooler after throttle body.
- 33 ○ **SEAT** - Insulated against heat conduction, convection and radiation. Lowest point no lower than bottom of side rails OR must have longitudinal, 25.4 x 1.65mm steel tube underneath.
- 34 ○ **DRIVER RESTRAINT HARNESS** - SFI 16.1, SFI 16.5 or FIA spec 5, 6 or 7 point and be labeled. 50 mm wide shoulder belts OK with HANS. 50 mm lap belts OK for FIA & 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 securely attached to prim. structure (25,4x2,4 or equal.)
- 35 ○ **LAP BELT MOUNTING** - Must pass over pelvic area between 45 - 65 deg. to horizontal for upright driver, 60-80 deg. for reclined. Pivoting mounting with eye bolts or shoulder bolts attached securely to Primary Structure. Min. tab thickness 1,6 mm.
- 36 ○ **SHOULDER HARNESS MOUNTING** - Mounting points 178 - 229 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.
- 37 ○ **SCHOOL NAME & OTHER DECALS** - School Name, or recognized initials - 5.1 cm tall min. on both sides in Roman letters. Must be clearly visible.
- 38 ○ **CAR NUMBERS** - On front & both sides of car, minimum 15.24 cm tall, 18 mm stroke & spacing, Black on White, White on Black only, specified background shapes. Must be clearly visible.
- 39 ○ **TECH STICKER SPACE** - 7.5cm x 15 cm on centerline of front of car in front of the cockpit opening
- 40 ○ **FUEL STICKER** - Appropriate sticker applied adjacent to fuel filler and must show the fuel type. Is in responsibility of the teams
- 41 ○ **BRAKES** - Dual hydraulic system & reservoirs, operating on all four wheels, (one brake on limited slip is OK). System must be protected by structure or shields from drivetrain failure or minor collisions. No plastic brake lines. No brake-by-wire. No parts below chassis/tub in side view. Brake pedal capable of 2000N, no failures if official exerts max force (seated normally in vehicle).
- 42 ○ **COCKPIT OPENING** - Fig. 8 template passes down from above cockpit centre line of top SIS tube or to 350 mm above ground for monocoque. Steering wheel & column, seat & padding can be removed. No removing of firewall.
- 43 ○ **SUSPENSION** - Fully operational with dampers front and rear; 50mm minimum wheel travel (25 mm jounce and 25 mm rebound) with driver in vehicle.
- 44 ○ **STEERING WHEEL** - Continuous perimeter, near round (no concave sections) with driver operable quick disconnect. 25cm max from front hoop.
- 45 ○ **FUEL SYSTEM ROLL OVER PROTECTION** - All parts of the fuel storage, supply and fuel control system systems (including fuel rail, throttle body or carburettor), must lie within a surface defined by the top of the roll bar and the outside top edge of the tires
- 46 ○ **FUEL FILLER NECK** - Min. 38 mm dia., within 30° of vertical. Fuel resistant, transparent sight tube, 6 mm min. ID, min 125 mm min. vert. height visible to fueler with vehicle fully assembled, with non-moveable fuel level line 12.7-25.4 mm below top of sight tube. Sight tube must NOT run below top of tank. Clear filler neck allowed. Must prevent fuel spillage contacting driver, exhaust or ignition. Fueled w/o manipulating car in any way. Cap secure and capable of withstanding pressurization (ie: threads or latch.)
- 47 ○ **REFUELING** - must be able to be accomplished without the removal of any body parts of the car.
- 48 ○ **FUEL VENTS** - Must exit outside of the bodywork, and have a check valve to prevent leakage if car inverted.
- 49 ○ **WINGS** - securely mounted, should not wiggle when gently touched, especially side-to-side. The deflection may not exceed 25 mm when a force of 200 N is applied Not extending further than the rear portion of the head restraint (in rearmost position).(permanent deflection < 5 mm).
- 50 ○ **WING EDGES** - Horizontal leading edges min 5 mm radius; vertical forward facing edges min 3 mm radius. Edges that could contact a pedestrian must have a minimum radius of 1.0 mm (safety requirement).
- 51 ○ **AERODYNAMICS** - ALL aero devices, wings, u/trays, splitters, maximum 70 cm forward of front tires, maximum 250 mm rearward of rear tires. Front wings no wider than outside of front tires. REAR WINGS no wider than INSIDE of rear tires. Undertrays no wider than line between front and rear tires. No power ground effects.
- 52 ○ **AERO VERTICAL HEIGHT** - Rear wing max 1.2 m above ground (incl. end plates); Front wing max 250 mm above ground but higher end plates are OK if < 25 mm thick. No bodywork or aero higher than 500 mm between axles (except center 800 mm of car ie: cockpit panels.).



REMOVE BODY PANELS

- 53 ○ **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 mm from pedals.
- 54 ○ **TUBING & MATERIALS** - Team must show an APPROVED SES. No Magnesium tubes in primary structure.
- 55 ○ **MONOCOQUE** - Must see laminate test specimen. Steel backing plates (>2mm thick) used at attachment points.
- 56 ○ **BOLTED JOINTS** in primary structure - Distance hole center-line to the nearest free edge > 2 x hole diameter.
- 57 ○ **MAIN HOOP** - MUST BE STEEL. 25.4 x 2.4mm or 25.0 x 2.5mm. Must be 1 piece & extend to lowest frame member. 380 mm apart (inside dim.) where attaches to the Major Structure. Above Major Structure, must be within 10 deg. of vertical. Smooth bends without wrinkles.
- 58 ○ **MAIN HOOP BRACING** - MUST BE STEEL. One straight brace on each side, 25.4mm x 1.65mm or 25.0 mm x 1.75mm or 25.4 mm x 1.60mm min., attached within 160 mm of top. Min. 30 deg. included angle with hoop. If main hoop is not vertical, bracing must not be on same side of vertical as main hoop. No bends. No rod-ends. Proper construction for removable braces (capping etc.) on BOTH 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)
- 59 ○ **FRONT HOOP** - Must be closed section metal tube. Can be multi-piece. Must extend down to lowest frame member. No lower than top of steering wheel. Max. 20 deg. to vertical. 25.4 x 2.4 mm or 25.0 x 2.5 mm wall steel or equiv. Longitudinal distance to steering wheel max. 250 mm
- 60 ○ **FRONT HOOP BRACING** - Two 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.
- 61 ○ **DRIVER'S LEG PROTECTION** - Covers inside cockpit over sharp and moving suspension and steering components.
- 62 ○ **COCKPIT INTERNAL CROSS SECTION** - Fig. 9 template passes forward from cockpit to 100 mm rear of pedals (in most forward position). Steering wheel and padding removable with no tools & driver-in can be removed.
- 63 ○ **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.
- 64 ○ **SIDE IMPACT PROTECTION** - Min. of two (2) tubes + diagonal must connect the main and front hoops in straight line. Upper tube must be between 300 mm and 350 mm above the ground with driver in car. 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. Monocoques require signed SES.
- 65 ○ **FRONT IMPACT PROTECTION** - Feet must be completely within Major Structure & rearward of the Front Bulkhead (25.4 x 1.65mm or 25.0 x 1.75 mm or 25.4 x 1.60 mm steel tube or equiv.) 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 car. Standard IAD: Requires diagonal brace if bulkhead >1" from IAD on any side.
- 66 ○ **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. four screws M8 Grade 8.8. CFRP plate is accepted if SES approved.
- 67 ○ **FRONT BULKHEAD SUPPORT** - Support back to front roll hoop; 3 tubes per side, all 25.4 mm x 1.65 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. (25.0 mm x 1.5 mm and 26.0 mm x 1.2 mm metric tubes OK)
- 68 ○ **INSPECTION HOLES** - 4.5 mm inspection holes req'd in non-critical areas of front & main hoops. Inspectors may ask for holes in other tube(s).
- 69 ○ **STEERING** - All steerable wheels must have positive stops to prevent linkage lock up or tires from contacting any part of the car. 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.
- 70 ○ **JACKING POINT** - an exposed tube at the rear perpendicular to the longitudinal axis 30 cm long by 2,5-2,9 cm O.D. Painted orange. Visible to person standing 1 metre behind car. Rear tires must come off the ground least 102 mm
- 71 ○ **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.
- 72 ○ **FIREWALL** - Fire resistant material; must separate driver compartment from fuel supply, cooling & oil systems. Pass-throughs OK with grommets. Multiple panels OK if gaps sealed. No gaps at sides or bottom. Must protect (line-of-sight up to 100 mm from bottom of driver's helmet) from cooling, oil and fuel systems. If used a non-metal material for the firewall (i.e. carbonfibre, fibreglass etc) a fire resistant heat protection shield with a metal surface must be fitted.



**CAR LIFTED AND WHEELS REMOVED**

- 73 ○ **SUSPENSION PICK-UP POINTS** - Inspected thoroughly for integrity.
- 74 ○ **FASTENERS** - Intake manifold, fuel rail, 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. 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. No button head cap, pan head or round head screws in critical locations, e.g cage structure or harness mount. Primary structure e/D >2.
- 75 ○ **FLOOR CLOSEOUT PANEL** - Required from foot area to fire-wall; solid, non-brittle material; multiple panels are OK if gaps less than 3.18 mm.
- 76 ○ **ENGINE** - Four cycle piston engine 610 cc maximum swept displacement. No hybrids. Waste heat recovery allowed.
- 77 ○ **ON-BOARD STARTER** - Required.
- 78 ○ **COMPRESSORS** - Turbo or super chargers allowed if not OEM to engine; must be between restrictor and throttle. Carburetors are not allowed, if compressors are used. Compressor recirculation valves are ok if located downstream of restrictor.
- 79 ○ **INTAKE MANIFOLD** - Securely attached to block or head with mech. Fasteners (positive locking!). OEM type rubber bushings not sufficient.
- 80 ○ **RESTRICTOR** - Must be circular; max. diam. 20.0 mm for gasoline fuelled cars and 19.0 mm for E85 fuelled cars. Cannot be movable. Placed before compressor.
- 81 ○ **THROTTLE** - Must have minimum of 2 springs at the TB, each capable of closing the throttle independently. TPS not acceptable as a return spring. Cable must have smooth operation with no binding or sticking; min. 50.8 mm (2 in) from any exhaust component.
- 82 ○ **ELECTRONIC THROTTLE CONTROLS** - ETC or "drive-by-wire" only permitted with pre-approval, requires special separate inspection.
- 83 ○ **THROTTLE PEDAL** - Must have positive stop to prevent over-stressing cable
- 84 ○ **ENGINE LUBRICATION SYSTEM** - The lowest point of the engine lubrication system must be no lower than the lowest frame part. Otherwise skid plate.
- 85 ○ **SCATTERSHIELDS GENERAL** - Required for clutches, chains, belts, etc. No holes. 6mm diam. M8.8 diam. or Grade 5 fasteners minimum. End parallel to lowest part of the sprocket/pulley in front and rear.
- 86 ○ **SCATTERSHIELD MATERIALS** - For chains, 2.7mm min. thick solid STEEL, 3 x chain width. For belts, 3mm min. thick Al 6061-T6, 1.7 x belt width. Finger guards: cover all drivetrain parts that spin while car is at rest. No holes >12 mm dia.
- 87 ○ **COOLANT** - Only 100% water. NO ADDITIVES WHATSOEVER
- 88 ○ **CATCH TANKS** - Any coolant overflow, crankcase breather 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. PCV allowed if routed to the intake system upstream of the restrictor. Cannot attach breather to exhaust. Trans or diff., unless sealed, require 50 ml catch bottle. Positively retained, i.e. no tie-wraps.
- 89 ○ **GAS CYLINDERS** - Proprietary manufacture & labeled, Non-flammable 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.
- 90 ○ **FUEL RAIL** - Securely attached to block, head or int. manifold with brackets & mech. Fasteners (grade min. 8.8). Plastic, carbon fibre or rapid prototyping flammable materials are prohibited.
- 91 ○ **FLUID LEAKS** - Oil, grease, coolant, fuel, Brake fluid -> none permitted
- 92 ○ **FUEL TANKS** - Must lie within major structure of the chassis with full side impact protection & firewall between fuel supply & driver. Rigid tanks CANNOT CARRY STRUCTURAL LOAD & must be flexibly mounted. Bladders or bags in rigid container.
- 93 ○ **BELLYPANS** - Must be vented to prevent accumulation of fuel. Must have at least two holes (minimum of 25 mm in diameter). This hole must be positioned in the lowest part of the structure
- 94 ○ **FUEL LINES** - No plastic lines between fuel tank & engine. Fuel injection systems must use metal braided hose with threaded fittings or reinforced rubber hose with approved clamps. Must be securely attached and protected from possible rotating equipment or collision failure. No plastic connectors in fuel line. High pressure injection systems see IC 1.9.2
- 95 ○ **HIGH PRESS HYDRAULICS** - Pumps and lines must have 1 mm thick steel or aluminium shields to protect driver and workers.
- 96 ○ **BRAKE PEDAL OVER-TRAVEL SWITCH** - Must cut ignition and fuel pump; 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.
- 97 ○ **BATTERY** - Attached securely to frame or chassis; hot terminal insulated; wet-cells in marine box if inside cockpit; must be identifiable as Pb (not Li batteries,) otherwise show mfr datasheet and mfr protection circuit info and meet enclosure requirements of IC4.4.4. No circuits > 60 VDC. Li battery behind firewall.
- 98 ○ **BRAKE LIGHT** - Working RED brake light, clearly visible from the rear; on veh. centerline line; height between wheel centerline & driver's shoulders. Round, triangle, or rectangular on black background. 15 cm<sup>2</sup> minimum illuminated area. LED strips OK if elements closer than 20 mm apart and total length > 150 mm Sufficient brightness for visible activation in bright sunlight.



**NON-COMPLIANCE / COMMENTS**

**APPROVAL**

Scrutineer Names	Date, Time	Signatures when passed
1. _____/_____	_____	_____
2. _____/_____	_____	_____
3. _____/_____	_____	_____

