Hydrogen Rules 2026

version 1.2, 12.01.2026

Preface & Foreword

This version of the Hydrogen Rules 2026 was published after the first season with Formula Student vehicles powered by hydrogen on track and to improve the wording and clarify some rules. This document replaces the Hydrogen Rules 2026 Version 1.1.

In this document the wording is updated to use “discipline” instead of “event” because the latter is used to reference an instance of a competition, after that was done in the FS Rules 2026. These changes are not part of the changelog. All other changes are listed in the changelog.

In case of rules question or any other hydrogen-related topics please send a mail to: hydrogen@fs-world.org

In order to give an indication of where changes are most likely to be made for 26/27, these rules are labeled: TBD= to be discussed.

Changelog

Rule	Version	Change
G1.1.3	1.0	Each team is allowed to convert existing FS vehicles to hydrogen once
G1.1.4	1.0	Newest version of the Hydrogen Rules must be used for second year car
G1.1.5	1.0	Chassis must not be older than 5 years
G3.1.3	1.1	Update length of the judging of the Hydrogen Concept Challenge
G3.1.4	1.0	Updated deadline for concept paper submission
G3.1.4	1.2	Change EDR to TVSD
G3.1.6	1.0	Limited teams at Hydrogen Concept Challenge
G3.1.7	1.1	Each competition decides if they organize a Hydrogen Concept Challenge
G4.1.2	1.0	Updated deadline for H2SF submission
G4.1.2	1.1	Change from CEST to CET
G4.1.5	1.0	Deadline for submission of corrected H2SF is 168 hours
G5.1.4	1.0	Updated deadline for VSV submission
G5.1.5	1.0	Late submission of VSV
G6	1.0	Add use of Structural Equivalency Spreadsheet
F1.1.2	1.0	Add Nominal Working Pressure and update grade of hydrogen
F2.1.1	1.0	Changed wording
F2.1.1	1.1	Add parts to the rollover protection envelope and change T9 to T3.3.1
F2.1.2	1.0	Changed wording
F2.1.3	1.0	Changed tubes between structural sidepods and driver to T3.2.5
F2.1.3	1.1	Clarify height of upper member of the impact structure
F2.1.7	1.0	Change to perforated material
F2.1.8	1.2	Changed wording
F2.1.10	1.0	Clarify how to attach structural parts to existing frame
F2.1.10	1.1	Change T3.15 to T3.16
F3.1.1	1.0	Clarify how to deal with comparable standards to the hydrogen rules
F3.1.1	1.1	Add the standard GBT 35544-2025
F3.1.2	1.0	Add form from the tank manufacturer for harmlessness of damage

F3.1.2	1.1	Clarify how to deal with damages of hydrogen tanks
F3.1.3	1.0	Add 50 mm distance to surrounding primary structure
F3.1.4	1.0	Add analogue pressure gauge in the high-pressure section
F3.1.4	1.1	Combination of OTV and hydrogen tank must be tested together
F3.1.8	1.0	Add flexible protective cover for hydrogen tank
F3	1.1	Remove old rule F3.1.8
F3.1.8	1.0	Rigid gripping devices for hydrogen tanks
F3.1.8	1.1	Change to structurally sound means and change orange to pink
F3.1.9	1.0	Access to OTD without tools, operate the OTV only with tools
F3.1.10	1.0	Add vent tower connection
F3.1.10	1.1	Clarification of hydrogen tank bleeding
F3.1.11	1.1	Updated vent tower connection (old rule F3.1.10)
F3.1.12	1.1	Add power supply to open non manual valve
F3.1.12	1.2	Changed to grid independent power supply
F4.1.4	1.0	Change fueling nozzle to fueling valve
F4.1.1	1.1	Changed wording
F4.1.2	1.1	Changed compression fittings to double ferrule fittings
F4.1.5	1.0	The fuelling valve must be easily accessible with the fuel nozzle
F4.1.2	1.0	Clarify combinations of coupling components
C1.1.1	1.0	Changed to any type of 4 stroke cycle internal combustion engine
C1.1.1	1.0	Approval obtained for engine concept with over 1000 cc
C1.1.1	1.1	Change CEST to CET
C1.1.4	1.0	Exceptions for higher injection pressure
C1.1.4	1.1	Change CEST to CET
C1.1.6	1.0	Removed old rule
C1.1.6	1.0	Add crankcase ventilation system
C4.1.4	1.0	Changed wording
E2	1.0	Removed old rule E2.1.5
E3	1.0	Removed old rule E3.1.1
E3.1.1	1.0	Change T3.15 to T3.14 and change wiring to tubing, piping or flexible lines

E5.1.2	1.0	Changed wording
E5.1.4	1.0	Changed wording
E6.1.1	1.0	Add alternative place for Hydrogen System Measuring Points
E7	1.0	Removed old rules: E7.1.1, E7.1.2 and E7.1.3
E7	1.0	Update the design of the discharge circuit
old E8	1.0	Removed whole chapter about TSAL
E8.1.2	1.0	Removed Fuel Cell Isolation Relays
E10.1.1	1.0	Removed Fuel Cell Isolation Relays and update wording for fuse
E10.1.2	1.0	Removed Fuel Cell Isolation Relays and TSAL's green light circuitry
E10.1.4	1.0	Changed wording because no Fuel Cell Isolation Relays anymore
E10.1.5	1.0	Simplify rule
E11.1.2	1.0	Changed wording
E11.1.3	1.1	Change T3.15 to T3.16
E11.1.7	1.1	Add T3.5 for composite structures
E12.1.2	1.0	Updated required parts inside the FC HV-Box
old E13	1.0	Removed whole chapter about Fuel Cell Isolation Relays
E13.1.1	1.1	Use of special coolant limited to fuel cells
E13.1.1	1.2	Allow to deionized water
E14	1.0	Remove old rule E14.1.7 and add to chapter S10
S1.1.6	1.0	Removed 2025
S1.1.7	1.0	HSO certificate is valid for 2 years
S2.1.1	1.0	HSMS only for FCEV
S3.1.2	1.0	Updated list with Shutdown Circuit parts for H2CV and HYCV
S4	1.1	Updated figure 7
S4.1.1	1.0	Updated list with Shutdown Circuit parts for FCEV
S4.1.6	1.0	Removed Fuel Cell Isolation Relays
S4.1.7	1.0	Definition of OTV valve supply relay
S5.1.2	1.0	Definition of venting location
S5.1.3	1.2	Definition of how to rout piping of dedicated venting ports
S6	1.0	New chapter about grounding

S8.1.4	1.0	Tools used to remove the hydrogen tank must store in the SHYTTA
S9.1.3	1.0	Add refueling of the hydrogen tank
S9.1.5	1.0	Clarify hand cart
S9.1.7	1.0	Remove rule
S10	1.0	New chapter about H2 Safety Measurement Device
S10.1.1	1.1	Change 80 °C to 85 °C
H2.1.2	1.0	Add handles to the dummy of the hydrogen tank
H2.1.3	1.0	Tilt Test to both sides possible
H3.1.1	1.0	Add leak detection spray according to DIN DVGW standard
H3.1.1	1.0	Changed sign to “H2 system discharged”
H3.1.1	1.1	Change to gas, with less than 4% H2 for testing the leak detectors
H3.1.1	1.1	Add tank bleeding equipment
H3.1.1	1.2	Remove hose for connecting the tank to a hydrogen vent
H3.1.1	1.2	Add IAD and CoC of hydrogen tank
H4	1.0	Removed old rule H4.1.1
H4.1.1	1.0	Changed procedure of the hydrogen leak test
H4.1.3	1.0	Changed sign “H2 system discharged and inert” to “H2 system HOT”
H5.1.1	1.0	Changed procedure
H6.1.1	1.0	Update rule that it makes sense for removing the hydrogen tank
H7.1.1	1.0	Add outside SHYTTA
H7.1.2	1.0	Changed wording
D1	1.0	Removed old rules D1.1.1 and D1.1.2
D2	1.0	Removed old rule D2.1.2
D3	1.0	New chapter about Efficiency Procedure
old J2	1.0	Removes whole chapter about Business Plan
J2	1.0	Removed old rule J3.1.1
J2.1.4	1.0	Hydrogen related parts can be part of the changelog
J3.1.1	1.0	Changed wording
J3.1.2	1.0	Changed wording
J3	1.0	Removed old rule J3.1.3

Abbreviations

Shortcut	Full name
BOM	Bill of Material
BOTS	Brake Over Travel Switch
BSPD	Brake System Plausibility Device
CRD	Cost Report Documents
CV	Internal Combustion Engine Vehicle
CVMD	Cell Voltage Monitoring Device
DI	Direct Injection
EV	Electric Vehicle
FC	Fuel Cell
FCCU	Fuel Cell Control Unit
FCEV	Hydrogen Fuel-Cell Electric Vehicle
FCSC	Fuel Cell System Container
FS	Formula Student
HS	Hydrogen System
HSMP	Hydrogen System Measuring Point
HSMS	Hydrogen System Master Switch
HSO	Hydrogen Safety Officer
HV	High Voltage
H2CV	Hydrogen Combustion Vehicle
H2HY	Hydrogen Combustion Hybrid Vehicle
H2SF	Hydrogen System Form
H2SMD	H2 Safety Measurement Device
LHV	Lower Heat Value
LVMS	Low Voltage Master Switch
LVS	Low Voltage System
NWP	Nominal Working Pressure
OTD	On Tank Device

OTV	On Tank Valve
PFI	Port Fuel Injection
SDC	Shutdown Circuit
SES	Structural Equivalency Spreadsheet
SHYTTA	Safe Hydrogen Tank Transfer Area
TPRD	Thermal Activated Pressure Relief Device
TS	Tractive System
TSAL	Tractive System Active Light
TVSD	Technical Vehicle System Documentation

G: General

G1: Hydrogen vehicles

G1.1.1 In addition to the existing CV / CV hybrid class and EV class categories, Formula Student vehicles powered by hydrogen are also allowed to participate.

G1.1.2 Competition decides independently each year whether it will allow hydrogen-powered vehicles.

G1.1.3 For the initial implementation of a hydrogen powertrain, each team is allowed to convert an existing CV or EV Formula Student vehicle to run on hydrogen. This rule can only be used once per team. Eligibility will be determined on a case by case basis. Contact the following e-mail: hydrogen@fs-world.org as early as possible.

G1.1.4 A hydrogen vehicle may be used for two years, counting from the first day onsite of its first hydrogen competition. The newest version of the hydrogen rules must be used for any part that falls under the scope of the hydrogen rules.

G1.1.5 **TBD:** From 2027, chassis according to the rule G1.1.3 must not be older than 5 years.

G2: Scope

G2.1.1 For teams building a hydrogen-powered vehicle, the Hydrogen Rules and the FS-Rules apply, whereby the Hydrogen Rules take precedence in the case of a conflict.

G2.1.2 The Hydrogen Rules are aimed at teams in only one of the following classes:

- Hydrogen fuel cell technology within the existing EV class - short: [FCEV]
- Hydrogen combustion within the existing CV / CV hybrid class - short: [H2CV] / [H2HY]

G2.1.3 **TBD:** Vehicles powered by hydrogen may be scored in existing or separate classes at the competition organizers discretion.

G3: Hydrogen Concept Challenge 2026

G3.1.1 The Hydrogen Concept Challenges, which have been taking place since 2023, are used to introduce the teams to the topic of hydrogen.

G3.1.2 The Hydrogen Concept Challenge is a static discipline in which a hydrogen-powered powertrain is to be presented to the judges. The judging will be separate for each team.

G3.1.3 The judging lasts 60 minutes, with the team presenting their concept for the hydrogen-based powertrain in the first 30 minutes, followed by a 30-minute discussion with the Hydrogen Judges. A video may also be used for the presentation, whereby the teams themselves are responsible for the equipment required to play the video.

G3.1.4 Prior to the competitions, a concept paper in text form with images and/or diagrams must be submitted as a PDF (export Word file as PDF) by Friday 2026-06-19 13:00 CEST at the latest. It is a separate document and not part of the Technical Vehicle System Documentation (TVSD).

G3.1.5 Submission for all competitions takes place via the following e-mail: hydrogen@fs-world.org

G3.1.6 Teams that have already built hydrogen-powered vehicles are not allowed to participate in the Hydrogen Concept Challenge.

G3.1.7 Each competition decides independently each year whether it will organize a Hydrogen Concept Challenge.

G4: Hydrogen System Form

G4.1.1 All teams must submit a Hydrogen System Form (H2SF) using the H2SF template provided on the competition websites.

G4.1.2 The deadline for the submission of the H2SF is 2026-02-15 13:00 CET.

G4.1.3 Submission for all competitions takes place via the following e-mail: hydrogen@fs-world.org

G4.1.4 If no H2SF is submitted, the team can be deregistered and/or penalty points can be awarded.

G4.1.5 If the officials request a correction of the H2SF, the corrected version has to be submitted within 168 hours (7days) following the request.

G5: Vehicle Status Video

G5.1.1 The team must submit the Vehicle Status Video (VSV) that meets all points from the rule A5.6 of the Formula Student Rules.

G5.1.2 In the VSV it must be visible that the vehicle is running on hydrogen and FCEV must verify the function of the fuel cell.

G5.1.3 Submission for all competitions takes place via the following e-mail: hydrogen@fs-world.org

G5.1.4 The deadline for the submission of the VSV is 2026-06-23 13:00 CEST.

G5.1.5 If a rules conformal VSV submission on time is not possible, the team has to write an explanation of the current status to hydrogen@fs-world.org before the official deadline and ask for additional time. In parallel a submission of a short video is necessary, where the current status of the vehicle and the hydrogen components are shown.

G6: Structural Equivalency Spreadsheet

G6.1.1 The team must use the newest available Structural Equivalency Spreadsheet (SES).

G6.1.2 Teams with a chassis according to the rule G1.1.3 or G1.1.4 are not allowed to use old SES-templates.

G6.1.3 If a chassis according to the rule G1.1.3 or G1.1.4 is used the team has to explain in the SES the differences between the rules which have been used to build the vehicle and the current version of the Formula Student Rules. The team has to explain why their current design is a safe design or what must be updated in their vehicle.

F: Fuel and Fuel System

F1: Fuel

F1.1.1 The permitted forms of power in addition to those covered by the Formula Student Rules (Gasoline, E85 and Electric) are specified as Hydrogen Combustion Vehicle [H2CV], Hydrogen Combustion Hybrid Vehicle [H2HY] and Hydrogen Fuel-Cell Electric Vehicle [FCEV].

F1.1.2 Only hydrogen in the form of gaseous form compressed gas will be provided at the competition with a maximum Nominal Working Pressure (NWP) of 350 bar. For EV-H2 it will be hydrogen according to ISO 14687: 2025 - at least grade D. Cryogen, liquid or cryo compressed hydrogen is not allowed.

F1.1.3 Fuel supply of gaseous hydrogen at the competition will be arranged in cooperation with participating teams.

F2: Fuel System

F2.1.1 All parts containing hydrogen under normal operating conditions are considered critical components according to T3.3.1 in the Formula Student Rules and must be located within the rollover protection envelope according to T1.1.16 in the Formula Student Rules.

F2.1.2 All parts containing hydrogen including the hydrogen tank must be located behind a firewall as defined in T4.8 in the Formula Student Rules.

F2.1.3 The hydrogen tank or other components containing hydrogen may be mounted in the side pod if it is built as a structural side pod. The impact structure of the structural side pod must comply with T3.2 of the Formula Student Rules and must protect against front, side and rear impacts. The upper member must be at a height between 240mm and 320mm above the lowest inside chassis point between the front and main hoop. The original side impact structure (between driver and hydrogen tank) of the vehicle must comply with T3.2.5 of the Formula Student Rules and must be triangulated, if a structural sidepod is used.

F2.1.4 If a structural side pod is used, a firewall must shield the driver both in a seated position and while exiting the vehicle. This side pod must be sufficiently ventilated. The formation of hydrogen pockets must be prevented. See chapter S5.

F2.1.5 The hydrogen tank and other parts containing hydrogen must be shielded from any heat sources that can reach a temperature of more than 85 °C (e.g. brake discs or exhaust system) or the temperature rating of the hydrogen component - whichever is lower.

F2.1.6 Accumulation of the hydrogen in insulation or shielding materials must be prevented (e.g. foam or other porous materials are prohibited).

F2.1.7 The hydrogen tank, on tank device (OTD) and other parts containing hydrogen must be shielded from debris and other materials thrown up from the track and by the wheels. Shielding with a minimum thickness of 1 mm must cover any straight line between the wheels or the track and the aforementioned components. Shielding located less than 100 mm from the top of the firewall as defined in F2.1.4 must be perforated with a maximum hole diameter of 3 mm and a minimum hole spacing of 5 mm, measured center to center.

F2.1.8 The lowest point of any part of the hydrogen system may only be lower than the line between the lowest point of the main hoop and the lowest chassis member beyond the hydrogen system if it is protected from hitting the ground by a structure mounted directly to the chassis.

F2.1.9 No excess volume in the hydrogen supply lines with the intent of buffering may be installed.

F2.1.10 Wherever structural parts are attached to an existing frame structure, a minimum of four attachments compliant to T3.16 of the Formula Student Rules have to be used. Alternative joining methods may be used. Equivalency must be shown. Bonded joints are allowed according to T3.2.8 of the Formula Student Rules. Titanium bolts are not allowed.

F3: Hydrogen Tank

F3.1.1 The hydrogen tank must be designed and manufactured for at least 350 bar nominal pressure of hydrogen. It must be certified by an accredited body (typically in the country of origin) and marked or stamped accordingly. e.g. according to the international automotive regulations UNECE GTR No. 13 – Hydrogen and Fuel Cell Vehicles (UN GTR No. 13) like UNECE Regulation No. 134 – Hydrogen and Fuel Cell Vehicles (UN R134) or based on GB/T 35544-2025 – Safety requirements for fuel cell electric vehicles (GB/T 35544-2025) , CSA HGV 2 — Compressed Hydrogen Gas Vehicle Fuel Containers (CSA HGV-2) or the old EC Regulation (EC) No 79/2009 on type-approval of hydrogen-powered motor vehicles (EC 79/2009) or comparable. If a hydrogen tank with a comparable standard is to be used, the team must provide the relevant standard and work out the differences to the standards specified above. Both must be made available to the officials as early as possible by email (hydrogen@fs-world.org) so that a decision can be made on a case-by-case basis.

F3.1.2 Hydrogen tanks with visible defects, e.g. abrasion, cuts or chemical damage may not be used without clarification of the manufacturer. In case any kind of damage is detected, the tank must be emptied to low pressure and flushed with inert gas. After that the team must then contact the manufacturer and submit a form from the manufacturer to the competition organizer, where the harmlessness of the damage is confirmed. Any damage to the hydrogen tank must be dealt with according to the manufacturer's documentation. A questionable tank will be confiscated until the end of the competition or until there is a written clarification with the manufacturer. The hydrogen tank should be visually checked for damage before and after each use.

F3.1.3 The hydrogen tank must be securely mounted to the primary structure and must be assembled according to the manufacturer's specifications. The hydrogen tank has to be protected from mechanical stresses introduced by e.g. chassis deformation or engine vibration (e.g. flexible mounts). The hydrogen tank itself and its mounting to the chassis must adhere to T3.3.1 of the Formula Student Rules. Any components containing tank pressure must be mounted at a minimum distance of 50 mm from the inside of the surrounding outward facing parts of the primary structure except the floor.

F3.1.4 The OTD must be mounted directly to the hydrogen tank and it must include both an on tank valve (OTV) and a thermal activated pressure relief device (TPRD). All these must vent to a “safe venting location” (see S5.1.2). The hydrogen tank may be certified according to ISO 19881, which covers only the design validation and type testing of the tank itself. ISO 19881 does not cover the approval of the OTD, nor the approval of the combined assembly of hydrogen tank and OTD/OTV. Therefore, if the hydrogen tank holds only an ISO 19881 certification, the tank–OTD/OTV combination must undergo separate testing and approval according to the applicable requirements of e.g. UN Regulation No. 134. In standard practice, the hydrogen tank and the OTV are tested together as a combined unit in the configuration required by e.g. R134 and are certified accordingly. Safety against overpressure during the fueling procedure is ensured by the protective measures of the fueling system. The risk of overpressure in the vehicle due to excessive temperature is mitigated by the mandatory TPRD. An analogue pressure gauge must be installed between the OTD and the pressure regulator.

F3.1.5 A pressure regulator that limits the downstream pressure of the hydrogen to a maximum of 40 bar or the maximum operating pressure of the lowest rated component and must be mounted as close as possible to the OTD. Every pressure level in the system must be protected against overpressure by mechanical means (e.g. burst plate venting to a safe venting location see S 5.1.2). Excess pressure must also trigger the Shutdown Circuit using a N/C switch.

F3.1.6 The hydrogen tank must be equipped with a connector that is designed to be repeatedly reconnected. This has to be installed after all tank mounted components (see F3.1.4 and F3.1.5).

F3.1.7 The hydrogen tank must be protected against subcooling, i.e. if the temperature in the hydrogen tank falls below -40 °C due to gas extraction. If the temperature falls below this value, the OTD must close.

F3.1.8 Each hydrogen tank must be equipped with structurally sound means to be lifted from the vehicle by two people with both hands each (e.g. handles or easily accessible structural tubes). These means may be removable without tools. Gripping surfaces have to be clearly marked in pink.

F3.1.9 Access to the OTD must be possible without tools. It must **NOT** be possible to operate the OTV without tools. A label must be placed next to the access point indicating which tool is required and indicate the direction to close the OTV with an arrow.

Figure 1: Example: A 6 mm Allen key is needed to close the OTV clockwise

F3.1.10 The hydrogen tank system must be able to be bled down to the lowest pressure allowed by the manufacturer. This must be possible with the hydrogen tank system removed from the vehicle.

F3.1.11 For bleeding the hydrogen tank a manual valve and a female Maximator 6M connection must be provided after the pressure regulator. The port must be fully sealed with a pressure rated cap when not in use. This device may be removed from the vehicle during normal operation. A valve block with a manual valve and a port for the connector (see F3.1.6) between the hydrogen tank and the vehicle is recommended.

F3.1.12 A grid independent power supply for all non manual valves in the hydrogen tank system must be provided by the team. For electrically actuated valves the use of a lead acid battery with a fuse, waterproof container and connectors is highly recommended.

F4: Lines and Fittings

F4.1.1 **TBD:** All pipes, fittings, hydrogen tanks, regulators, solenoid valves, seals and other equipment exposed to pressurized hydrogen must be suitable for hydrogen and the pressure in use according to the manufacturer. Exceptions for fuel injectors can be granted on request by competition organizers.

F4.1.2 Double ferrule fittings certified to ANSI CSA HGV 3.1, HGV 3.1, ISO 19887 or ISO 12619 are recommended. The certification generally relates to the entire fitting + line system. If fittings are used with third-party lines, the certification may expire. All combinations of fittings may only be used according to either manufacturer's documentation.

F4.1.3 Lines carrying the unregulated tank pressure must be as short as possible in order to connect the hydrogen tank with the components of the rules F3.1.4, F3.1.5 and F3.1.6.

F4.1.4 The fuelling valve must be H35 (normal flow or designed for a maximum mass flow of 60 g/s) and specified in accordance with ISO 17268 - Connecting devices for refuelling gaseous hydrogen for land vehicles.

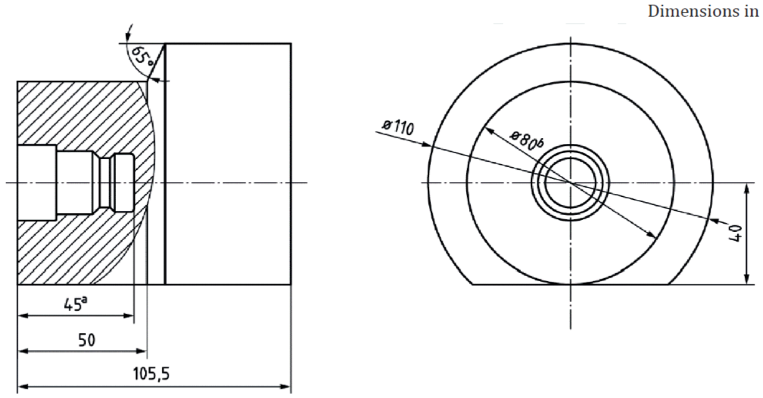
F4.1.5 The fuelling valve must be positioned in a way that it is protected but easily accessible with a fueling nozzle according to ISO 17268.

ISO/DIS 17268-1:2023(en)

Annex A
(normative)

Receptacle/nozzle interface envelope

Dimensions in millimetres



a Minimum length of the receptacle that shall be clear of provisions for attachment of receptacle or protective cap.

b For minimum coupling clearance only. System designers shall ensure that the dust or protective cap operates freely in the provided space,

NOTE 1 Depending on the vehicle design, the overall depth of the fuelling cavity doesn't need to be as large as indicated here.

NOTE 2 The flat side of the clearance should be downward toward the ground.

Figure 2: Screenshot of ISO 17268 with receptacle/nozzle interface envelope

C: Hydrogen Combustion Vehicles [H2CV] & [H2HY]

C1: Engine

C1.1.1 **TBD:** The vehicle may be driven by any four stroke internal combustion engine, irrespective of its mechanical layout (eg. reciprocating piston, Wankel, ...). The number of combustion chambers are not limited. The total displaced volume of the engine must not exceed 1600 cc. If an engine concept utilizing over 1000 cc is being considered, the concept must be submitted via email to hydrogen@fs-world.org by Friday 2026-12-19 13:00 CET at the latest and approval must be obtained.

C1.1.2 It is allowed to inject water or other non combustible substances into the intake and/or combustion chamber with the goal of reducing the tendency of abnormal combustion phenomena. This applies to H2CV/H2HY only.

C1.1.3 Direct injection (DI) and port fuel injection (PFI/MPI) is allowed.

C1.1.4 The injection pressure is generally limited to 40 bar. Exceptions may be requested with a full system documentation by Friday 2026-12-19 13:00 CET at the latest to hydrogen@fs-world.org.

C1.1.5 The pressure at direct injection must be below the limit specified by the manufacturer for the injection system used. The rail, the injector and any necessary connector must be properly dimensioned, designed, manufactured and assembled in order to withstand the expected loads, be positively locked and directly attached to the engine block or cylinder head using metal parts. Certification in accordance with ISO 19887, ISO 12619 or HGV 3.1 could also be useful for the injector.

C1.1.6 The crankcase must be equipped with an open crankcase ventilation system and it must vent to a safe location as described in S5.2.1.

C2: Boosting

C2.1.1 Boosting is permitted.

C2.1.2 Boosting systems may be driven by any means e.g. belts, gears, electrically or any combination of drive systems.

C2.1.3 In case of an even partially electrically power boosting system, electrical energy may only be supplied from a system that complies with the current Hybrid Rules.

C2.1.4 Belts, gears, chains etc. need a scatter shield as defined in T7.3 of the Formula Student Rules.

C3: Hybrid

C3.1.1 Building a combination of CV hybrid with hydrogen combustion is allowed, this is called H2HY.

C4: Power Limitation

C4.1.1 **TBD:** Currently there is no power limitation for H2CV/H2HY powertrains.

C4.1.2 **TBD:** The hydrogen mass flow is unlimited.

C4.1.3 The air mass flow is unlimited.

C4.1.4 **TBD:** The maximum overall fuel tank capacity for H2CV/H2HY is 2 kg.

E: Hydrogen Fuel Cell Electric Vehicles [FCEV]

E1: Hydrogen System definition

E1.1.1 Hydrogen System (HS) – every part that is related to the fuel cell. This includes the hydrogen tank, the Fuel Cell (FC), the fuel cell cooling system and the fuel cell HV electrical components.

E2: General Requirements

E2.1.1 The maximum allowed voltage that may occur between any two electric connections is 600 V DC and for internal low power control signals 630 V DC. See EV4.1.1 in the Formula Student Rules.

E2.1.2 All components in the HS must be rated for the maximum voltage in both HS and Tractive System (TS).

E2.1.3 All HS related PCB's must be compliant with the rules applied to TS PCB's. See EV4.3.6 in the Formula Student Rules.

E2.1.4 All components must be rated for the maximum possible temperature that may occur during usage.

E2.1.5 Same rules for grounding and for overcurrent protection as for TS, see EV3.1 in the Formula Student Rules.

E3: Positioning of Hydrogen System Parts

E3.1.1 Any part of the HS that is less than 350 mm above the ground must be protected from impacts, see T3.15 in the Formula Student Rules. Impact protection must follow T3.16 when having bolted attachments. HS tubings/ pipings/ flexible lines in front of the front hoop may alternatively be shielded by the front bulkhead support structure according to T3.14 in the Formula Student Rules.

E4: Insulation and cabling of the hydrogen system

E4.1.1 Same rules as for TS, see EV4.5 in the Formula Student Rules.

E5: Power Limitation

E5.1.1 The hydrogen mass flow and the air mass flow are unlimited.

E5.1.2 **TBD:** The maximum overall fuel tank capacity is 2 kg.

E5.1.3 The capacity of the HV accumulator is not limited, supercapacitors are allowed.

E5.1.4 Maximum power output of the TSAC must not exceed 80 kW (see EV2.2 in the Formula Student Rules) and is recorded with a data logger.

E5.1.5 Tractive energy is defined as the time integral over the Endurance run of the electrical power measured at the input of the inverter(s). This will be supervised by a second data logger placed at the TS motor-controller(s) input.

E5.1.6 Both data loggers will be identical to the current EV infrastructure.

E5.1.7 For the Endurance, a minimum of 40% of the tractive energy must come from the fuel cell.

E6: Hydrogen System Measuring Point

These measuring points must be connected to the HS circuit (between the FC and the DC/DC).

E6.1.1 Two Hydrogen System Measuring Points (HSMPs) must be installed directly next to the master switches, see T11.2 in the Formula Student Rules. Alternatively, the HSMP's can be located on the FCSC (or on the fuel cell HV box respectively) if available from outside the vehicle. The HSMPs must be directly connected, see T1.3.1 in the Formula Student Rules, to the intermediate circuit capacitors even if the fuel cell is disconnected.

E6.1.2 4 mm shrouded banana jacks rated for 600 V CAT III or better must be used for the HSMPs. The HSMPs must be marked "HS+" and "HS-" and mounted on an orange background.

E6.1.3 The HSMPs must be protected by a non-conductive cover that can be opened without tools. The cover must always be mechanically linked to the vehicle.

E6.1.4 Each HSMP must be secured with a current limiting resistor according to the following table. Fusing the TSMPs is prohibited. The resistor's power rating must be chosen such that they can continuously carry the current if both HSMPs are short-circuited.

Maximum HS Voltage	Resistor Value
Umax < 200 V DC	5 kΩ
200 V DC < Umax ≤ 400 V DC	10 kΩ
400 V DC < Umax ≤ 600 V DC	15 kΩ

E6.1.5 All electric connections needed to connect the HSMP to the intermediate circuit capacitors, including bolts, nuts, and other fasteners, must be secured from unintentional loosening by the use of positive locking mechanisms. Bolted connections must follow T10.2, soldered connections EV4.5.15 in the Formula Student Rules.

E6.1.6 Next to the HSMPs an Low Voltage System (LVS) ground measuring point must be installed. A 4 mm black shrouded banana jack must be connected to LVS ground and must be marked "GND". It could be the same as the one used for TS, see EV4.7.8 in the Formula Student Rules.

E7: Discharge Circuit

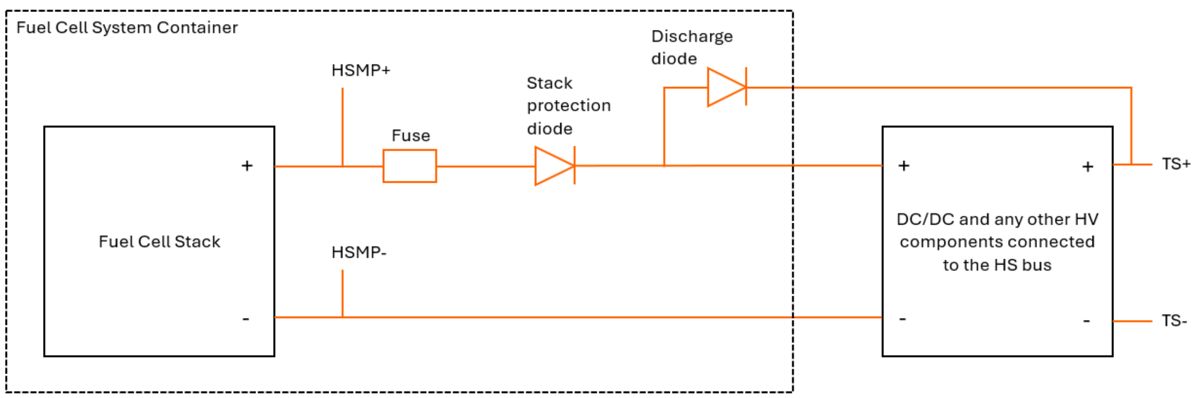


Figure 3: Schematic representation of discharge circuit

E7.1.1 The discharge circuit must be designed to discharge (depolarize) the fuel cell stack. Stack voltage must drop below 60 VDC in less than 30 sec.

E7.1.2 It must not be possible to activate (polarize) the fuel cell if the discharge circuit is not ready (temperature conditions, …).

E7.1.3 Fuel Cell Control Unit (FCCU) must open the shutdown circuit if nominal working conditions are not satisfied.

E7.1.4 The stack current fuse must be rated for the maximum of HS and TS voltage and for the maximum stack current.

E7.1.5 The stack protection diode must be rated for the maximum of HS and TS voltage and for the maximum stack current.

E7.1.6 The discharge diode must be rated for the maximum of HS and TS voltage.

E7.1.7 A current limiting resistor can be added to limit the current through the discharge diode. In case of emergency shutdown, stack voltage must decrease below 60 V within 5 s.

E7.1.8 It must be possible to check both diodes during scrutineering.

E:8 Activating the Hydrogen System

E8.1.1 It must not be possible to activate the HS if TS is not active.

E8.1.2 The HS may only be activated if all of the following conditions are met:

- Fuel Cell Stack is polarized
- Hydrogen supply is enabled and active
- Air supply is enabled and active

E8.1.3 Closing the Shutdown Circuit (SDC) by any part defined in the Formula Student Rule EV6.1.2 must not (re-) activate the TS.

E9: Fuel Cell System – General Requirements

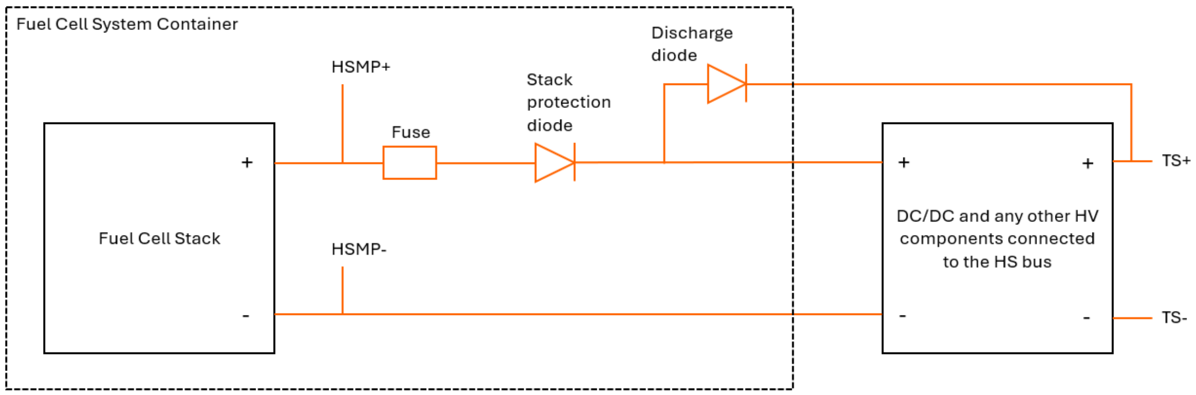


Figure 4: Schematic representation of fuel cell system

E9.1.1 The fuel cell stack must be enclosed in the Fuel Cell System Container (FCSC).

E9.1.2 The FCSC must be actively ventilated to avoid any accumulation of hydrogen. Minimum air mass flow must be guaranteed. Ventilation mass flow must be measured.

E9.1.3 There must be ventilation holes in the FCSC. These holes must follow the EV rules to avoid any access to the HV components and also S5.1.2.

E9.1.4 It must be possible to open the FCSC for technical inspection.

E9.1.5 FSCS must be labeled with reasonably sized stickers according to “ISO 7010-W012” (triangle with a black lightning bolt on a yellow background). Fuel cell container stickers must contain text ‘Fuel Cell Inside’. If the voltage is more than 60 V DC, the sticker must also contain the text “High Voltage”.

E10: Fuel Cell System Container – Electrical Configuration

E10.1.1 Every FCSC must contain at least one fuse on the stack current path (see Figure 4).

E10.1.2 LVS must not be included in the FCSC except where inherently required. Exceptions include the FCCU (if located within the FCSC) and cooling fans.

E10.1.3 Every wire used in a FCSC, regardless of whether it is part of the LVS or HS, must follow EV4.5.2, EV4.5.3, and EV4.5.5 in the Formula Student Rules.

E10.1.4 Each FCSC must have one prominent voltage indicator, voltmeter, or red LED visible even in bright sunlight that will continuously illuminate whenever a voltage greater than 60 V DC is present at the stack poles (before the fuse and the stack protection diode). This indicator must be clearly marked with "Stack Voltage Indicator”.

E10.1.5 The indicator must be hard-wired electronics without software control, directly and only supplied by the HS, and always working, even if disconnected from the LVS.

E11: Fuel Cell System Container – Mechanical Configuration

E11.1.1 The FCSC must be located behind a firewall as defined inT4.8 of the Formula Student Rules or must be made of these materials and must fulfill all other requirements of a firewall.

E11.1.2 The fuel cell itself and its mounting to the FCSC must adhere to T3.3.1 of the Formula Student Rules. The fuel cell must be mounted according to manufacturer's specifications.

E11.1.3 The FCSC itself and its mounting to the chassis must adhere to T3.3.1 of the Formula Student Rules. The FCSC must be protected from impacts, see T3.15. Impact protection must follow T3.16 when having bolted attachments. The FCSC must not be part of this structure.

E11.1.4 All FCSC materials as well all structural parts used must be fire retardant, see T1.2.1 of the Formula Student Rules. All calculations must be conducted for an ambient temperature of 60° except for metallic materials and continuous fiber-reinforced laminates.

E11.1.5 The design of the FCSC and its contents, calculations and/or tests must be documented in the H2SF. This includes materials used, drawings, images, fastener locations, segment weight, cell, and segment position.

E11.1.6 The FCSC must be constructed of steel or aluminium. With the following requirements:

- The bottom of the FCSC must be at least 1.25 mm thick if made from steel or 3.2 mm if made from aluminium
- The internal and external vertical walls, covers, and lids must be at least 0.9 mm thick if made from steel or 2.3 mm if made from aluminium.

E11.1.7 Alternative materials are allowed with proof of equivalency per T3.4 and T3.5 for composite structures of the Formula Student Rules. When alternative materials are used, test samples must be presented at technical inspection.

E11.1.8 Composite FCSC must satisfy the following requirements:

- Data obtained from the laminate perimeter shear strength test and three-point bending test, see T3.6, should be used to prove adequate strength is provided.
- Each attachment point requires steel backing plates with a minimum thickness of 2 mm. Alternate materials may be used for backing plates if equivalency is approved.
- The calculations and physical test results must be included in the H2SF.

E11.1.9 All fasteners used within or to mount the FCSC must comply with T10. Fasteners within the FCSC used for non-structural parts, e.g. PCBs, do not have to follow T10.1.2. Fasteners made of electrically non-conductive material within the FSCS used for non-structural parts do not have to follow T10 of the Formula Student Rules.

E11.1.10 The mounting of the FCSC requires a minimum of 4 attachment points. Any brackets used to mount the FCSC must be made of steel 1.6 mm thick or aluminium 4 mm thick and must have gussets to carry bending loads.

E11.1.11 The FCSC needs venting holes as described in S5.1.2.

E12: OEM Fuel Cell System Container

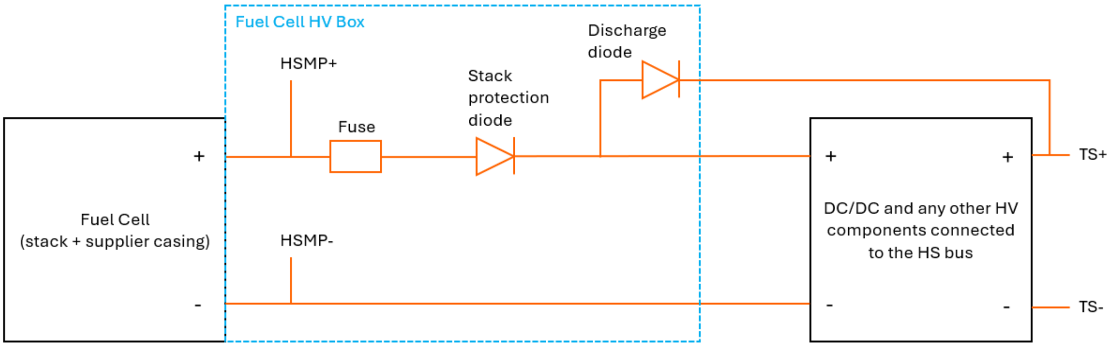


Figure 5: Alternative schematic representation of fuel cell system

E12.1.1 If the fuel cell is supplied with a casing (and in this case only), this casing (without any modification) can be considered to be the FCSC. This casing must fulfill all FCSC mechanical rules from E11.

E12.1.2 A FC HV Box is required to contain the fuse, the stack protection diode and the discharge diode. The stack voltage indicator must be on this box.

E12.1.3 The FC HV Box must be secured against the FCSC using positive locking. The FC HV Box must satisfy the same rules as any other powerbox.

E12.1.4 No HV wires and no HV connectors must be apparent between the FCSC and the FC HV Box.

Note : Interface between the FCSC and the FC HV Box must be sealed during scrutineering.

E13: Cooling

E13.1.1 Dedicated fuel cell coolant may be used (must refer to stack supplier requirements), whereby it´s use is limited to only cooling the fuel cell. Other cooling systems must only use plain water, air or oil as coolant, see T1.2.2 of the Formula Student Rules. Ions or non H2O components may be removed (e.g. minerals and deionization).

E13.1.2 Fuel cell coolant electrical conductivity must be measured at any time by the fuel cell control unit. The officials can ask for the value at any time. Teams have to show the value with a laptop.

E14: Fuel Cell System Management

E14.1.1 The FCCU must continuously measure the following parameter of the hydrogen tank:

- Hydrogen detection sensor at the top of the FCSC

E14.1.2 The FCCU must continuously measure the following HS electrical parameters (this is often done by a CVMD supplied with the stack from the stack supplier):

- All cell voltages
- Cells with minimum and maximum voltages position must be identified
- Stack current must be measured (if information not given by the DCDC)
- Stack voltage must be measured (if information not given by the DCDC)

E14.1.3 The FCCU must continuously measure the following anode parameters:
- Stack inlet pressure
- Stack outlet pressure (optional)

E14.1.4 The FCCU must continuously measure the following cathode parameters:
- Stack inlet pressure
- Stack outlet pressure (optional)

E14.1.5 The FCCU must continuously measure the following cooling and ventilation parameters:
- Coolant electrical conductivity
- Temperature at stack inlet
- Temperature at stack outlet
- Air mass flow dedicated to ventilation of containers

E14.1.6 The FCCU must open the HS related SDC, if any measurement reaches critical values according to the stack manufacturer's datasheet.

E14.1.7 FCCU signals are System Critical Signals, see T11.9 in the Formula Student . The loss of any safety or control related signal must result in an HS SDC opening.

E14.1.8 It must be possible to individually disconnect the current sensor during technical inspection if any wire is used.

E14.1.9 The FCCU must be able to read and display all measured values according to EV5.8.3 of the Formula Student Rules in a single overview e.g. by connecting a laptop to the FCCU at any place and any time e.g. inside the dynamic area.

E14.1.10 If CAN communication is used to communicate with the FCCU or the CVM, a dbc file must be available.

E15: Insulation Monitoring Device

E15.1.1 The vehicle must be equipped with a tunable isometer. When performing the EV testing, the isometer must be set to a 500 Ohm per Volt (to be calculated with the highest embedded voltage) measured between the powertrain and driver compartment.

E15.1.2 The IMD response may be tunable.
- If a non-tunable IMD is used, the IMD response value must be set to ≥500 Ω/V, related to the maximum voltage in the vehicle.
- If a tunable IMD is used, its response must be set to ≥500 Ω/V, related to the maximum voltage in the vehicle until the electrical inspection is finished. (Bender ISO 175C for example.) Once the team has been allowed to start their fuel cell, the response value must be set to a lower value (150 kΩ whatever the maximum voltage in the vehicle).

E15.1.3 The response value must not be changed after electrical inspection.

E15.1.4 If a tunable IMD is used, the team must be able to show the response threshold to any judge at any time (connected to a laptop is possible).

S: Safety

S1: Hydrogen Safety Officer

S1.1.1 Every participating team has to appoint two to four Hydrogen Safety Officers (HSO) for the competition. ESO and HSO may be the same person.

S1.1.2 The HSOs are responsible for all work on the hydrogen system carried out on the vehicle during the competition. The HSOs are responsible for all work on the vehicle that is carried out with the hydrogen tank installed.

S1.1.3 The HSOs are the only persons in the team who may declare the vehicle hydrogen safe and discharged, in order for work to be performed on any system of the vehicle by the team.

S1.1.4 A HSO must always be with the vehicle when the hydrogen tank is installed and must carry out the installation and removal themselves and then declare the vehicle safe for further work. At least one HSO per team must be included in the four members per team, if the vehicle is on track or in the dynamic area.

S1.1.5 At least one HSO must be reachable by phone at all times during the competition.

S1.1.6 The HSOs must be valid team members and must have a student status, see rule A4.2.6 of the Formula Student Rules. For 2026 the HSOs may also be somebody employed at the university.

S1.1.7 The HSOs must attend practical and theoretical training for working on hydrogen like DGUV FBHM-99 level E2 or comparable which must be held by an external expert. A certificate of the training must be shown at scrutineering. The certificate is valid for 2 years, after which a refresher course is required.

S1.1.8 The vehicle number, the university name and the HSOs phone numbers must be displayed and written in Roman Sans-Serif characters of at least 20 mm height on the hydrogen tank or its cover. The characters must be clearly visible and placed on a high-contrast background.

S2: Hydrogen System Master Switch (HSMS)

S2.1.1 An Hydrogen System Master Switch (HSMS) according to T11.2 must be part of the SDC of FCEV, see EV6.1.2 of the Formula Student Rules.

S2.1.2 The HSMS must be fitted with a “lockout/tagout” capability to prevent accidental activation of the Hydrogen System.

S2.1.3 The HSMS must be mounted in the middle of a completely orange circular area of ≥50 mm diameter placed on a high contrast background.

S2.1.4 The HSMS must be marked with “HS” and a symbol according to “ISO 7010-W012” (triangle with a black lightning bolt on a yellow background).

S3: Shutdown Circuit for H2CV and H2HY

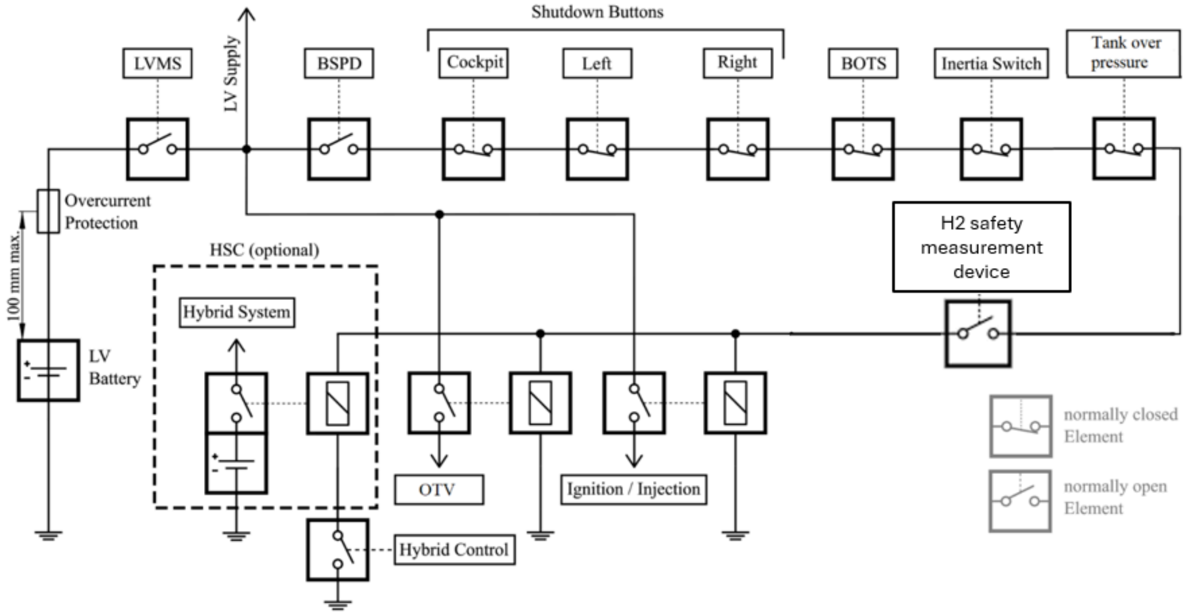


Figure 6: Schematic representation of a Shutdown Circuit for H2CV and HYCV

S3.1.1 The Shutdown Circuit (SDC) directly controls all electric power to the ignition, fuel injectors and OTV. It must act through a minimum of two mechanical relays. One relay for the OTV and at least one relay for injection and ignition.

S3.1.2 The SDC is defined as a series connection of at least the following:

- LVMS
- BSPD, see T11.6 of the Formula Student Rules
- three shutdown buttons, see T11.4 of the Formula Student Rules
- BOTS, see T6.2 of the Formula Student Rules
- inertia switch, see T11.5 of the Formula Student Rules
- H2 Safety Measurement Device, see S10

S3.1.3 All circuits that are part of the SDC must be designed in a way that in the de-energized/ disconnected state they open the SDC.

S3.1.4 When the Shutdown Circuit is triggered, no more gas may flow from the hydrogen tank into the low pressure part of the fuel system immediately. This must be ensured with the OTV being normally closed.

S3.1.5 When the Shutdown Circuit is triggered, the ignition of the engine must be switched off.

S4: Shutdown Circuit for FCEV

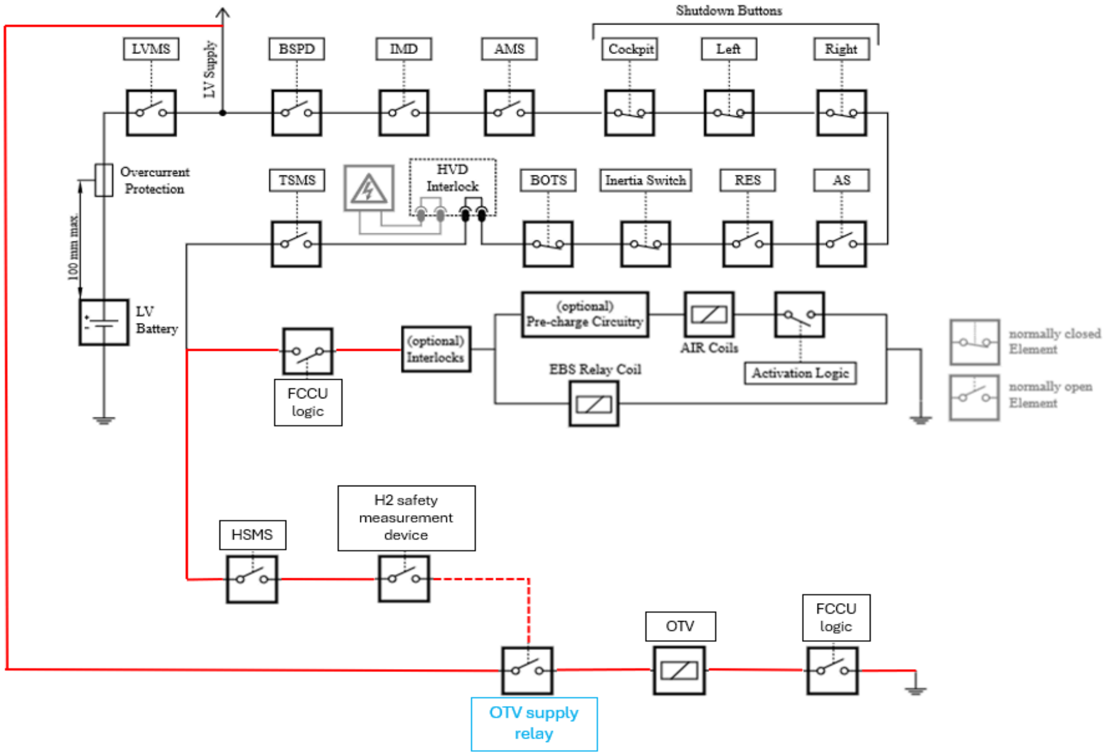


Figure 7: Alternative schematic representation of a Shutdown Circuit for FCEV.

Note: The part of the SDC in red is related to the HS and is denoted as the HS related SDC.

S4.1.1 There must be a Shutdown Circuit which must include the same equipment and parts as the Shutdown Circuit in EV6 of the Formula Student Rules. Additionally, it must contain the following hydrogen related components:

- HSMS, see S2
- H2 Safety Measurement Device, see S10
- FCCU activated relays
- OTV

S4.1.2 All circuits that are part of the HS related SDC must be designed in a way that in the de-energized/disconnected state they open the HS related SDC.

S4.1.3 When the Shutdown Circuit is triggered, no more gas may flow from the hydrogen tank into the low pressure part of the fuel system. This must be ensured with the OTV being normally closed.

S4.1.4 When the HS related Shutdown Circuit is triggered the hydrogen system must be switched off, all valves must return to their default position and the fuel cell HV-bus(es) must be passively or actively discharged.

S4.1.5 When any other part of the shutdown circuit (that is not HS related) is triggered, the hydrogen system and the HV-accumulator must be switched off.

S4.1.6 It is allowed to supply the OTV valves through an external normally open relay (with the command coming from the HS related SDC), no software must be involved.

S4.1.7 An OTV supply relay can be added. This must be a normally open mechanical relay. This can be a market available timed relay (saying closed for a maximum of 2 s after the command is removed).

S5: Ventilation

S5.1.1 In case of leakage all hydrogen components must be safely vented and hydrogen may not accumulate.

S5.1.2 All compartments containing hydrogen components that do not have an opening of at least 1900 mm² (e.g. 50 mm circle) in all high points have to be connected to a safe venting location. The connection from all these high points must be a sealed path of at least 1900 mm² internal cross section. Venting locations have to be:

- unobstructed from above
- be outside the cockpit
- behind the main hoop
- point away from the driver
- be clearly marked with a red circle and "H2 vent"
- must not terminate any lower than 100 mm from the highest point of the vehicle

Several connections may terminate in a common venting location.

S5.1.3 Dedicated venting ports of individual hydrogen components (e.g. OTD or FC emergency vents and over pressure protection devices) may be routed to a safe venting location with metallic piping of at least the dimensions specified in the manufacturers documentation.

S5.1.4 Any active ventilation system must push the air and not suck it and must be powered by LV and no software must be involved.

S6: Grounding

S6.1.1 All hydrogen components must be grounded to the low voltage system ground according to EV3.1 of the Formula Student Rules.

S6.1.2 A metal tab of at least 30x30x2 mm has to be connected to the grounding path of the tank system for connecting a grounding clamp during refueling or venting. Access must be not obstructed in a ready to race state. This grounding connection point has to be clearly marked with the earthing symbol according to IEC 60417.

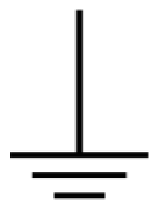


Figure 8: Earthing symbol according to IEC 60417

S7: Arrival and departure to the competition

S7.1.1 From departure, during transport and until arrival the hydrogen tank must be at a low positive pressure (lowest pressure permitted by the manufacturer). Keep positive pressure against humidity intrusion or corrosion. The hydrogen tank should not be transported in the passenger compartment of the vehicle lorry or other vehicle but can be mounted to the formula student vehicle during transport.

S7.1.2 The teams must comply with the laws and regulations for securing loads, in particular for hydrogen tanks, of the respective country. The transport regulations of dangerous goods must also be checked and adhered to by the teams.

S7.1.3 The teams must store the hydrogen tank at Safe Hydrogen Transfer Tank Area (SHYTTA) as soon as they reach the campsite or the event site.

S8: Pits and tools

S8.1.1 No hydrogen tanks or other devices containing hydrogen are allowed inside the pits. Vehicles have to be in the “H2 system discharged” state to enter any enclosed structure.

S8.1.2 The hydrogen tank has to be removed and stored at the SHYTTA prior to the vehicle entering the pits.

S8.1.3 Each team has to bring 2 hydrogen detectors to the competition. Both have to actively suck in the gas, passive detectors are not sufficient. The correct operation of these detectors has to be demonstrated during Hydrogen Scrutineering with calibration gas of a known concentration (provided by the team).

S8.1.4 Teams must provide a complete set of tools needed to remove the hydrogen tank during Hydrogen Scrutineering. This set has to remain at the SHYTTA at all times during the competition. It will only be returned after the venting of the tank following endurance.

S9: Storage of the hydrogen tank and refueling

S9.1.1 Hydrogen tanks must always be stored according to the manufacturer's requirements.

S9.1.2 The refueling of the hydrogen tanks is carried out by the competition organizer outside the vehicle in the SHYTTA. At least one HSO from the team must be present.

S9.1.3 The hydrogen tanks will only be fitted into the vehicle for:

- hydrogen-specific scrutineering
- refueling with hydrogen (optional)
- dynamic disciplines
- dynamic testing in the testing area
- static testing in the engine test area

S9.1.4 After any of the cases from S9.1.3 the tank has to be removed from the vehicle at a designated area and be returned to the SHYTTA as soon as possible. In any case the vehicle has a hydrogen tank on board, the vehicle will be accompanied by an official.

S9.1.5 Each team must provide a handcart according to EV8.1.2 to EV8.1.5 of the Formula Student Rules. The hand cart must comply with the following Formula Student Rules for transporting the hydrogen tank: EV8.1.6, EV8.1.8 to EV8.1.10. The cart may not contain any electronics to safely move the hydrogen tank on the event site. The vehicle number, the university name, and the HSOs phone number(s) must be displayed and written in Roman Sans-Serif characters of at least 20 mm high on the cart. The characters must be clearly visible and placed on a high-contrast background.

S9.1.6 If a team uses more than one hydrogen tank, they must all be safely stored on one hand cart or there must be as many hand carts as there are hydrogen tanks.

S10: H2 Safety Measurement Device (H2SMD)

S10.1.1 The H2 Safety Measurement Device (H2SMD) must be a standalone non-programmable circuit that opens the H2 related SDC under the following conditions:

- Tank temperature is too high (+85 °C or lower depending on tank specifications) or too low (-40 °C or higher depending on tank specifications)
- Tank pressure is too high or too low (depending on tank specifications)
- Excess pressure in low pressure system (40 bars or lower depending of the low pressure system expected pressure)

Standalone is defined as there is no additional functionality implemented on all required PCBs.

S10.1.2 If one or more sensor is disconnected from the H2 Safety Measurement Device, SDC must be and remain open.

S10.1.3 If the SDC is opened by the H2 Safety Measurement Device, it has to be latched open by a non-programmable logic that can only be manually reset by a person at the vehicle who is not the driver (same as for the AMS and the IMD, see EV6.1.6 of the Formula Student Rules.).

S10.1.4 The action of opening the SDC by the H2 Safety Measurement Device must occur if the implausibility is persistent for more than 500 ms.

S10.1.5 The H2 Safety Measurement Device must be directly supplied, see T1.3.1, from the LVMS, see T11.3.

S10.1.6 The interfaces must be reduced to the minimum necessary signals, i.e. power supply, required sensors and the SDC. Supply and sensor signals must not be routed through any other devices before entering the H2 Safety Measurement Device.

S10.1.7 It must be possible to separately disconnect each sensor signal wire from the H2 safety measurement device for technical inspection.

S10.1.8 All necessary signals for the H2 Safety Measurement Device are System Critical Signal (SCS), see T11.9 of the Formula Student Rules.

S10.1.9 A red indicator light in the cockpit that is easily visible from inside and outside the cockpit even in bright sunlight and clearly marked with the lettering “H2SMD” must light up if and only if the H2SMD opens the SDC. It must stay illuminated until the error state has been manually reset, see EV6.1.6. Signals controlling this indicator are SCS, see T11.9 in the Formula Student Rules.

S10.1.10 It must be possible to connect the tank pressure and temperature sensors to a dedicated device during scrutineering and refueling (instead of connecting them to the H2 safety measurement device).

H: Hydrogen Scrutineering

H1: Scrutineering Procedure for hydrogen-powered vehicles

H1.1.1 The technical inspection for a hydrogen combustion vehicle is divided into the following parts:

- Pre-Scrutineering
- Mechanical-Scrutineering
- Tilt Test
- Hydrogen Scrutineering
- Noise Test
- Brake Test

H1.1.2 The technical inspection for a hydrogen fuel cell vehicle is divided into the following parts:

- Pre-Scrutineering
- Electrical- and Accumulator-Scrutineering
- Mechanical-Scrutineering
- Tilt Test
- Hydrogen Scrutineering
- Rain Test
- Brake Test

H2: Differences to Scrutineering as from FS Rules

H2.1.1 Mechanical-, Electrical- and Accumulator Scrutineering is done without a mounted hydrogen tank.

H2.1.2 For the Tilt Test a dummy of the hydrogen tank must be supplied by the teams and mounted to the vehicle. The dummy must have the same mass and center of gravity as the real hydrogen tank system (+-1%). The dummy must have handles so that at least two people can handle it safely.

H2.1.3 Tilt Test may be performed on either or both sides of the vehicle.

H2.1.4 There are two Rain Tests for H2EVs:

- The 1st rain test is done as EV only (hydrogen system OFF). If the team is using a tunable isometer, the threshold value must be set to the same limit as an EV vehicle (500 Ω per volt).
- The 2nd rain test is done with the hydrogen system ON. If the team is using a tunable isometer, the threshold may be lowered (minimum limit is 150 kΩ).

H2.1.5 In case the team needs to empty their accumulator before this 2nd rain test, they may be allowed to drive in the practice area as EV if all EV scrutineering, Brake and Tilt Tests are passed.

H2.1.6 The Brake Test may be done with the fuel cell switched off.

H3: Hydrogen Scrutineering

H3.1.1 The following items must be presented at Hydrogen Scrutineering:

- Training certificates from all HSOs
- Copies of the H2SF and SES
- Copies of the IAD (only vehicles according to G1.1.3 und G1.1.4)
- Datasheets and documentation for all hydrogen components including certification and CoC of hydrogen tank and (if applicable) FC
- Manufacturer's specifications for installation (installation position, torques, commissioning procedures) of hydrogen tank and (if applicable) FC
- Copies of communications with officials and manufactures (if applicable)
- Tools needed for the (dis)assembly of parts for Hydrogen Scrutineering
- Tools to install and remove the hydrogen tank to the vehicle (to remain at the SHYTTA)
- [EV-H2] EV tools
- IT device for checking every mandatory sensors
- 2 hydrogen leak detectors with a pump
- Leak detection spray according to DIN DVGW standard
- A gas, with less than 4% H2 for testing the leak detectors
- New seals for all H2 connectors
- Signs “H2 system discharged” and “H2 system HOT”
- Tank bleeding equipment as described in T3.1.11 and T3.1.12

H4: Hydrogen system leak test

H4.1.1 Procedure of the hydrogen leak test:

- Flush the system with hydrogen from the tank connection until only hydrogen is detected at the furthest end of the hydrogen system
- Check all hydrogen components and connections with a hydrogen detector
- Apply seal stickers to all tested hydrogen components and connections

H4.1.2 The TS-System must be off during the hydrogen system leak test.

H4.1.3 After passing the hydrogen system leak test a sign “H2 system HOT" has to be installed on the main hoop. The sign must be readable from the the front and the back of the vehicle and the TSAL must be still visible.

H4.1.4 The hydrogen system leak test is part of the Hydrogen Scutineering and will be executed by Officials.

H4.1.5 The hydrogen system status signs must be visible from the front and the back of the vehicle. TSAL visibility can not not be impeded. See also rule S9.1.3 and S9.1.4.

H5: Installing the hydrogen tank and making vehicle ready to drive

H5.1.1 Procedure of mounting the hydrogen tank and making the “H2 system HOT":

- Team brings the vehicle to the SHYTTA
- Break the tank connection seal
- HSO and max. one helper install the tank under an officials supervision
- Close valve after pressure regulator, open tank valve
- Official checks for leaks in the hydrogen system with hydrogen detector
- The system is slowly flushed with hydrogen from the tank to the farthest most end of the hydrogen system. Test with hydrogen detector
- The vehicle is now confirmed, leak free and 100% filled with hydrogen
- Close tank valve
- Put sign “H2 system HOT” on the main hoop

H5.1.2 Vehicles in the state “H2 system HOT” must be escorted by an official at all times and must not be moved into any buildings or enclosed structures. (This includes for example: pushing the vehicle to dynamic disciplines, dynamic testing in the testing area, static testing in the engine test area).

H6: Removing hydrogen tank and making vehicle safe for work

H6.1.1 Procedure of removing the hydrogen tank and making the “H2 system discharged”:

- Team brings the vehicle to the SHYTTA
- The hydrogen system in the vehicle is depressurized through a vent line connected to a stationary vent tower
- The tank is disconnected from the hydrogen system in the vehicle
- Replace sign on the main hoop with “H2 system discharged”

H6.1.2 After the steps from H6.1.1 there must be a sign “H2 system discharged” attached to the main hoop.

H7: Modifications and Repairs

H7.1.1 Working on the hydrogen system is only allowed if the vehicle is in a “H2 system discharged and inert” state outside the SHYTTA. All tests done by the team must utilize an inert gas.

H7.1.2 The following steps must be followed for work on the hydrogen system (in this order only!)

1. Notify the responsible officials about what kind of work is planed
2. Official will remove the H2 inspection sticker (only after this point is the team allowed to start any work on the H2 system)
3. Perform the repairs
4. Hydrogen system leak test according to the rule H4 will be repeated and H2 inspection sticker reapplied.

H7.1.3 If any seals from the hydrogen system are broken, the team will lose the inspection stickers for Hydrogen Scrutineering.

D: Dynamics

D1: General

D1.1.1 Driverless vehicles powered by hydrogen are not allowed.

D2: Endurance

D2.1.1 A tank change or refueling during the driver change is not permitted.

D2.1.2 **TBD:** The driving distance may be adjusted at the competition organizers discretion.

D3: Efficiency Procedure

D3.1.1 Efficiency points based on the formula given in D9.4.1 in the Formula Student Rules.

D3.1.2 The efficiency factor is calculated similarly to D9.4.2 in the Formula Student Rules with differences defined in the following rules.

D3.1.3 **TBD**: The efficiency for Hydrogen Combustion Vehicles [H2CV] & [H2HY] will be measured and calculated as following:

- Notice the size of the hydrogen tank
- The pressure and internal temperature of the hydrogen tank is measured before the Endurance at the SHYTTA
- The pressure and internal temperature of the hydrogen tank is measured after the Endurance at the SHYTTA
- Calculate the different between the two measurements to get the consumption of hydrogen
- The determined hydrogen consumption in kg is divided through 3,748 to get equivalency to RON98. This factor includes the different properties of the fuels regarding lower heat value (LHV) and density.

D3.1.4 **TBD**: The efficiency factor for Hydrogen Fuel Cell Electric Vehicles [FCEV] will be measured and calculated as following:

- The tractive energy which is defined in E5.1.5 gives the database for the factor E
- This tractive energy is measured by the second data logger
- Each % that is more than 40% of the total tractive system energy which was produced by hydrogen, gives 1% reduction in the overall energy consumption
- Example: 43% of the tractive energy comes from the fuel cell -> E*0,97

J: Judging of the Statics

J1: General

J1.1.1 Vehicles may only be presented in the “H2 system discharged” state.

J2: Cost and Manufacturing

J2.1.1 In the Bill of Material (BOM) there is no special category for hydrogen related parts.

J2.1.2 All hydrogen related parts should be put in the category Engine and Tractive System of the BOM. For sensors and other electric parts the category Grounded Low Voltage System is also possible.

J2.1.3 **TBD:** If an existing old vehicle is used, it is allowed to use old and new prices in the BOM. For old parts it is allowed to put behind each old price the year, where the vehicle was manufactured. e.g. 56,20 € (2022).

J2.1.4 **TBD:** A changelog of the vehicle since the submission deadline of the Cost Report Documents (CRD) can be presented to the Judges at the beginning of the BOM discussion. Missing hydrogen related parts are allowed to be part of the changelog. The changelog must be a printed table.

J3: Engineering Design

J3.1.1 There will be no special additional category for hydrogen-based powertrain or similar in the Engineering Design.

J3.1.2 The competitions try to provide Design Judges with hydrogen expertise as Hydrogen Judges to evaluate the hydrogen-based powertrain.