



## **THE SUN TRIP**

### **Technical Regulation**

# 1. Overview

These "Technical Regulation" are provided by the organization to serve as a design guide for solar bicycles on The Sun Trip 2025 so as to ensure fairness between participants. Its content is written in good faith and must be interpreted as such. Amendments may be issued by the organization to clarify or adjust minor elements of design for technical inspection.

**The more general “Adventure Regulations” are published separately.**

The Sun Trip is an experience of freedom starting from bicycle design. Each participant is free to design his or her own bike or to seek the help of professionals or experts. However, participants must follow the rules set out in these regulations, as well as any other instructions that the organisation may issue.

A preliminary technical check will take place approximately three months before the start by means of the crew's technical booklet, which must be completed and handed over to the technical team. This technical booklet must contain

- Photos of the vehicle and its accessories or plans or sketches if the vehicle does not yet exist.
- Dimensions
- Technical characteristics
- Detailed description

The organisation's technical team will carry out a conformity check of all the machines a few days before the start. Other conformity checks will also take place during the adventure as well as at the finish, notably by local commissaires authorised by the organiser to inspect the luggage of participants in the Solar Challenge to ensure that the regulations are respected.

Before the start, the technical team may allow exceptions to the present technical regulations for participants with disabilities or illnesses, or for cases of force majeure.

In the event of a physical or material accident to which the participants and their equipment may be victims, as well as in the event of damage caused to a third party or to any property belonging to a third party, the rules of common law on civil liability may be applicable. The notion of third party also applies between participants.

Furthermore, the organizer cannot be held responsible for any problems that may be caused by a participant's solar bike, before, during or after The Sun Trip 2025 event.

## **2. Types of Cycles**

### **2.1 Cycles**

The Sun Trip is an adventure open to a variety of human powered and electric vehicles: upright and recumbent cycles, upright and recumbent tricycles or quadricycles, hand-bikes, tandems and velomobiles.

Teams may choose to equip one cycle per person or to use a tandem. Unless otherwise indicated, the technical specifications of these Regulations apply to each cycle individually.

### **2.2 Trailer and Definition of a Machine**

The bike may be equipped with a trailer fitted with no more than two wheels. A cycle and its potential trailer are what we define as a “machine” hereafter.

### **2.3 Dimensions**

The overall width of the machine in running order and when the machine is in motion must not exceed 100 cm in any possible configuration. The width is unrestricted when the machine is stationary. The total length of the machine must be less than 6 m.

There are no constraints on the height of the machine, but experience shows that very low machines are not very visible in road traffic and are therefore potentially more prone to traffic accidents.

### **2.4 Bodywork and Fairing**

The bike may be equipped with an aerodynamic fairing, provided that the face of the pilot remains exposed (i.e. not enclosed in a cockpit).

### **2.5 Breaks**

The cycle must be equipped with at least two distinct braking systems impacting on two wheels. Those breaks must be controlled mechanically or hydraulically. A regen system on an engine isn't considered a braking system.

It is the participant's responsibility to check that the braking system is effective enough for the weight of the machine. For information purposes, the participant may check that the braking distance of his machine at 30km/h remains below 15m.

## **2.6 Weight**

The total mass of the machine when unladen (with batteries) must be less than 80kg for a solo machine and 120kg for a tandem machine.

# **3. Solar-Electric System**

All cycles shall be equipped with one or more assisting engine, one or more batteries and one or more solar panels.

The vehicles must be powered by the muscle power of the only person(s) on board and by electricity from the batteries on board the vehicle.

Cycles must retain pedals (or equivalent for handbikes) as a mode of propulsion and the crankset must be physically linked:

1. either to one or more of the cycle's wheels via a chain, strap or universal joint (parallel transmission)
2. an electrical power generator (serial transmission)
3. a combinations of both is possible possible for tandems.

## **3.1 Engines**

The machines are equipped with one or more electric motors.

The choice of motor type is left to the discretion of the participants.

By design, the electric assistance must not be able to assist the cycle beyond 45 km/h regardless of the electronic and software control modes.

The verification of this limit will be carried out before the start, potentially at any time during the adventure and afterwards by analysing the GPS and databox records.

It will be carried out in the following way whatever the type of motor and wheel drive:

- The driving wheel(s) are lifted
- Any software limitations are inhibited
- The highest gear ratio is engaged if required.

- The motor is activated at its maximum speed
- Wheel speed is measured
- Battery voltage is measured.

The actual speed at nominal voltage is calculated according to the formula:

- $V_{max} = V_{ctrl} * T_{nom} / T_{ctrl}$
- $V_{ctrl}$ : wheel speed at the time of the test
- $T_{nom}$  : nominal battery voltage
- $T_{ctrl}$ : battery voltage at the time of the test
- $V_{max}$  must not exceed 45km/h

## 3.2 Batteries

Battery voltage when full shall not exceed 60 V.

Participants are free to choose the type of battery they wish to use. However, they must be full aware of the inherent risks for each type of technology and take responsibility for their choice in case of problem (explosion, fire... ). The location of batteries on the vehicle should be chosen to minimise the risk of impact and exposure to the weather. If the batteries are attached to the vehicle, the attachment must be able to withstand the stresses of being torn off in the event of an impact or accident. The use of a fireproof bag or case is strongly recommended.

Batteries must be equipped with a battery management system (BMS) adapted to the battery pack and allowing to ensure the safety of the batteries in charge and discharge. Each battery must have a visible and accessible fuse of the correct rating for the system and a simple and easily accessible means of disconnection.

## 3.3 Solar Charging

Participants are free to design their solar cells, panels and their structure however they wish.

Machines designed for one rider must be fitted with solar arrays of at least 0.75 m<sup>2</sup> and up to 2,50 m<sup>2</sup> of exposed solar cells when moving.

Machines designed for two riders must be fitted with solar arrays of at least 1 m<sup>2</sup> and up to 3.25 m<sup>2</sup> of exposed solar cells when moving.

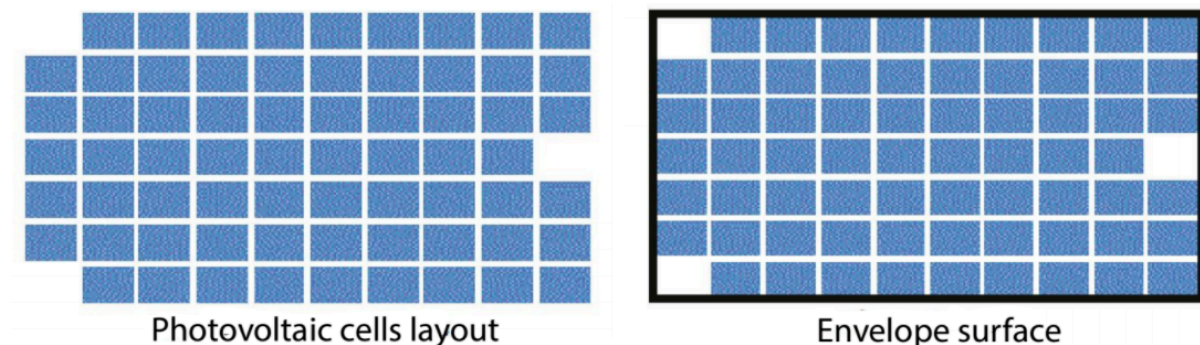
Participants are allowed to add stacked solar panels that can be deployed when at a stop. In such case, the total surface of all carried panels should not exceed 4 m<sup>2</sup>. The active surface of

the additional panels must not be visible when the vehicle is moving, otherwise it is counted in the visible surface.

Solar panels voltage is limited to 60 V for safety reasons.

In the case of an assembly of several panels, the sum of the rectangular enveloped areas of each of the panels is considered.

The enveloped area of a panel is the minimum rectangular area covering the entire surface of the cells of the panel.



The solar-electric system must include a charge controller between the panels and the battery, suitable for the battery pack technology and voltage.

### 3.4 Measurement Tools

The organisation may equip the machines with an automatic data collection tool, called "Databox". The recorded data will be used by the organisation for statistical purposes on the progress of the Suntrip and to check that participants in the 100% solar challenges comply with the rules. The Databoxes may be checked by the organisation at the checkpoints or at any time during the journey.

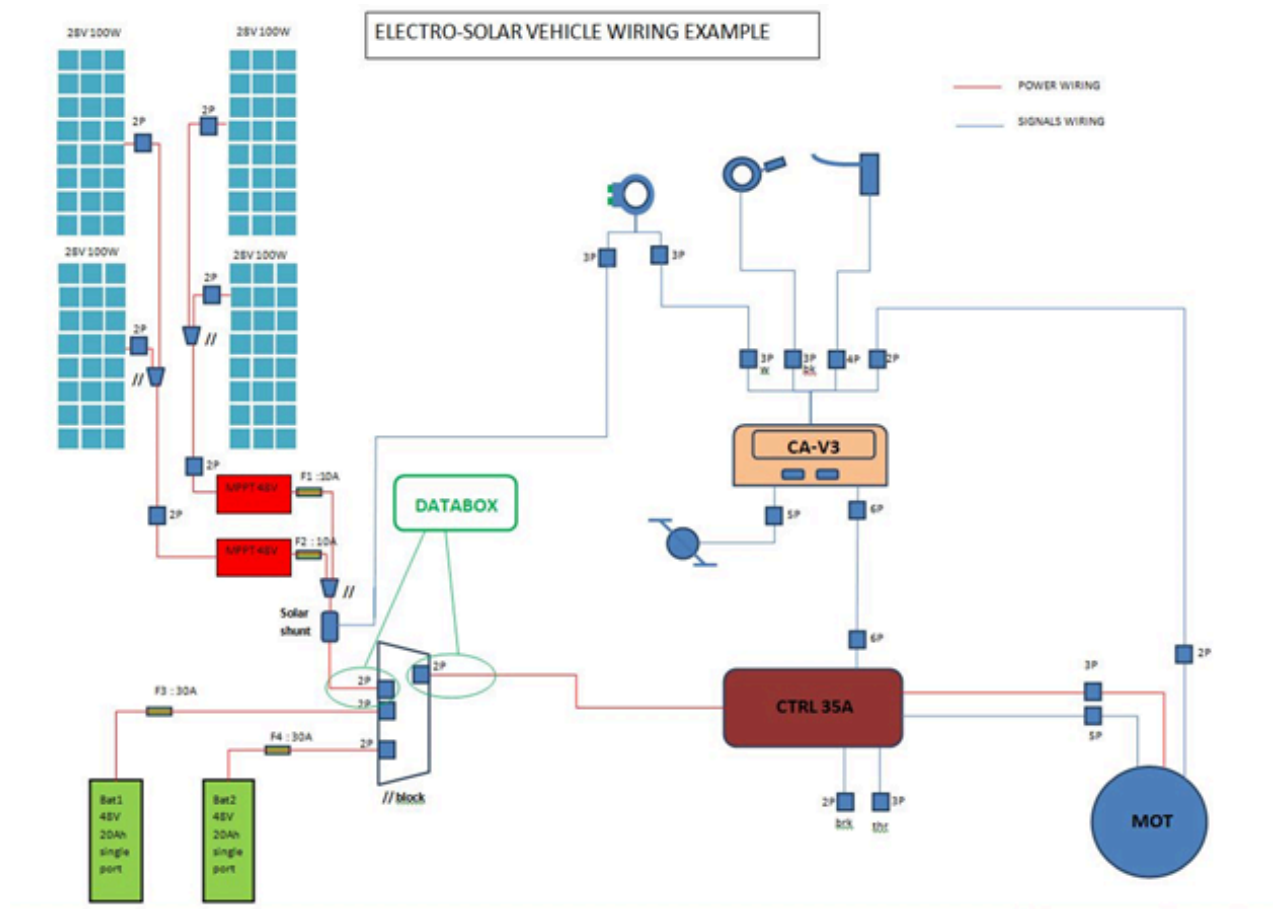
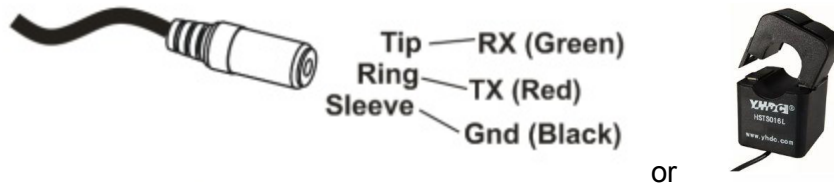
The organisation reserves the right not to classify a competitor in the 100% solar challenge if the data on the Databox shows that the rules have not been respected or if the Databox connection has been modified or if the Databox is missing. The loss or theft of a Databox may result in a financial penalty.

The Databoxes will be installed by the organisation during the technical inspection of the vehicles. Competitors must provide for the possibility of integrating the Databox into their system. To this end, competitors are asked to provide a place on their vehicle to house the Databox as well as the compatibility of its connection with the following constraints:

Location: the Databox must be able to be fixed to the vehicle with plastic collars in a position that allows it to receive the GPS signals correctly. The dimensions of the Databox are approximately 120mm x 60mm x 60mm.

Connections: Competitors must provide an available and accessible anderson powerpole socket with the vehicle's battery voltage.

#### Communication Cable:



### 3.5 Mains Charger

The Sun Trip is a solar cycles adventure. Solar recharging must be functional at the moment of the departure. All participants should make a reasonable effort to live this adventure using only solar energy.

However, in case of solar recharging failure or of an exceptional situation, participants are allowed to finish the course with the help of a mains charger and must notify the organizer on the same day.

Failure to comply with the information provided by the organisation will disqualify the solar challenge in case of a mains charge detected and not reported.

The use of a recharge other than solar disqualifies from the Solar Challenge and will be penalised for the Jury Prize.

The candidates to the Solar Challenge will sign before the start a commitment on honour to use exclusively solar recharging and their mains charger will be put in a sealed bag, which will have to be handed over to the organiser as soon as they cross the finish line.

It is specified that the arbitration committee may, in particular, request baggage checks from the marshals mobilised on the course and decide on the basis of the data recorded by the databox during the course.

## **4. Mandatory Accessories**

### **4.1 Mirrors**

Every machine must be fitted with at least one rear view mirror.

### **4.2 Horn**

Each cycle must be equipped with at least one bicycle bell. An additional horn is possible.

### **4.3 High visibility waistcoat**

A high visibility waistcoat must be present and easily accessible on each vehicle. It must be worn by the rider as soon as he is stopped at the roadside in case of breakdown, repair or other reason. The waistcoat must be kept in a clean condition that maintains its high visibility conditions.



## **4.4 Helmet**

Participants are required to be equipped with a helmet and its wearing is strongly recommended.

## **4.5 Lighting and Reflective Apparel**

Each vehicle must be equipped with a white reflector at the front and a red reflector at the rear. In the case of a vehicle with a trailer, both the vehicle and the trailer must be equipped with a red reflector at the rear.

Each vehicle must be equipped with a white light at the front. It can be powered by an independent battery, dynamo or by the vehicle's battery.

Each machine shall be equipped with two red rear lights. At least one of the red rear lights must be flashing with 25 Lumens or more and visible at 150m in daylight. (Manufacturer's data will be requested for verification). One of the rear red lights must be powered by the vehicle battery and the second by a secondary battery, internal or dynamo. The two rear red lights must be located at least 50 cm from the ground.

In the case of a vehicle with trailer, at least one light must be present on the vehicle and one on the trailer.

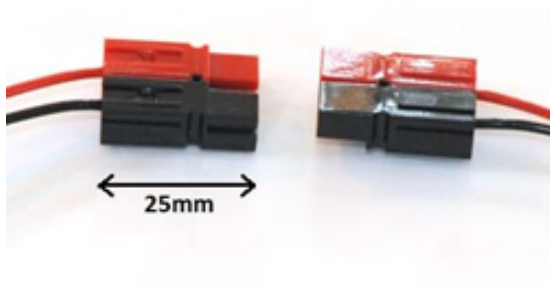
Front and rear lighting must be permanently active when the vehicle is in motion, whatever the situation.

A high visibility area of at least 100cm<sup>2</sup> must be present at the rear of the vehicle and at the rear of the trailer in the case of a vehicle with trailer.

## **4.4 GPS Positioning Beacon**

Participants will be equipped with a geolocation system, installed by the organisation, which they will have to keep in working order throughout the adventure. This will be powered by the vehicle's battery. Participants must provide an adequate connection from the battery with an Anderson type connector (see photo) to power the beacon. This power supply will be arranged so that the beacon can be installed in close proximity, with a direct view of most of the sky.

The beacons may be checked by the organisation at the checkpoints or at any time on the course, and it will be the responsibility of the competitors to check their proper functioning on a daily basis or at the request of the organisation. During the daily check by the competitor, in case of suspicion of malfunction or if the beacon is missing (lost or stolen), the competitor must inform the organisation as soon as possible. The loss or theft of a beacon could lead to a financial penalty.



## 5. Technical Inspection

A Technical Team will be responsible for upholding the current regulations. The composition of the team will be detailed in the Adventure Regulation, as well as its modalities of action and its links to the Arbitration Panel.

Participants will be required to fill in a Technical Datasheet detailing their machines specifications such as the engines (make, model, RPM / Volt, etc), batteries, solar panels and more generally the bike dimensions. The Technical Datasheet should be sent to the organization by email **before January 31, 2025**, supported by photographic evidence when necessary. Delays in sending the Technical Datasheet may result in exclusion from the Sun Trip.

A few days prior to departure, a real-life inspection will be performed by the Technical Team. In the case of non-compliance found during inspection, the participant will need to implement the necessary changes up to 24 hours prior to start proper.

***Sun Trip 2025 Technical Regulation.***