Power distribution - Requirements

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I. Document overview

This paper defines the requirements for power distribution in the solar sustained vehicle developed by Mälardalen University Solar Team(MUST).

II. Purpose of this document

The purpose of this document is to state all of the requirements that the power distribution system needs to fulfill.

III. Requirement specification

The following list contains the requirements of the Power distribution.

A. External requirements

- The system shall have temperature protection implemented.
- The system shall have safety features to prevent current and voltage spikes from destroying components as well as under/over voltage protection and over current protection for the battery cells.
- The total amount of energy stored in capacitors shall be less than 10.0 Wh.
- The high voltage components of the vehicle should be able to be turned off individually.
- The power to the low voltage system should be able to be turned off.
- Outlet charging shall only be possible with a designated connector.
- It shall not be possible to connect charging devices to the system with reversed polarity.
- The system shall not allow outlet charging while the low voltage system is connected to the battery.
- The battery must be isolated from all other systems when outlet charging is preformed.
- High-voltage energy storage packs must be marked with the high-voltage symbol shown in fig: 1
- All cables shall have appropriate insulation. High voltage cables shall have a double barrier protection.
- The driver/luggage compartment must have Ingress Protection Code (IP)xxD for high voltage parts.
- All high voltage conductors outside of the driver/luggage compartment must have IPxxB for high voltage parts.
- A safe state shall be implemented such that when in the safe state there is no voltage potential over any of the terminals of the battery or from the solar collectors. The safe state button should be visible on the outside with following fig: 2

B. Internal requirements

- The system shall provide power from the battery to the high and low voltage parts of the Solar sustained vehicle (SSV).
- The system shall have low enough power losses for all components to work.
- The power losses of the system shall not lead to any electrical faults.
- The system shall follow a unified color system predefined by Mälardalen University Solar Team (MUST).
- The power in and out-flux shall be monitored.
- The system shall allow solar cell charging while the low voltage system is connected to the battery.
- The low voltage system storage containers shall have IP67.
- There shall be no cable joints present inside cable sleeves.
- The power distribution system must provide enough energy stored in capacitors to enable data logging from losing information.

C. Optional considerations

- The system is allowed contain batteries outside the main battery for real time clock, data retention and wireless pressure sensors. If the capacity is limited to 2.0Wh or less.

IV. Appendix

Figure 1. High voltage warning sign that must be present on storage units and compartments containing high voltage components

Figure 2. The emergency shutdown indicator that must be present on the outside of the car.