

Field Report

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Técnico Solar Boat

TRACO POWER DC/DC usage for solar boat electrical system

Introduction

Técnico Solar Boat is a university project consisting of cross-degree engineering students from Instituto Superior Técnico, the major engineering university in Portugal, that work together on the development of a solar powered boat. Our main purpose is to participate in worldwide university competitions, such as Monaco Solar & Energy Boat Challenge.

In July 2018 we participated in two competitions, first in the Netherlands and then in Monaco. These international competitions tested our boat to the limit, challenging its performance in speed, control and endurance. Pretty much everything in the boat was made by us, from the hull to the electrical system to everything that is mechanical. To build the whole electrical system from scratch, we used many high power DC/DC converters from TRACO.

Electrical System

Our electrical system has many different components that need different voltages. We divided our system into two main parts, the battery box and the electronics box.

The battery box contains the main battery, which is rated at 44.4 V, MPPTs (maximum power point trackers) for the solar power and all our DC/DC converters.

The electronics box contains all the control and monitoring parts. We have a hydrofoil control system, a motor control system and a Raspberry Pi which collects all the data from the microcontrollers and sends it to our database through our 3G module. These control systems need to be powered at 24V and also 12V. As can be seen in figure 1 we used TRACO POWER DC/DC converters to get the voltages needed to our electronics box.

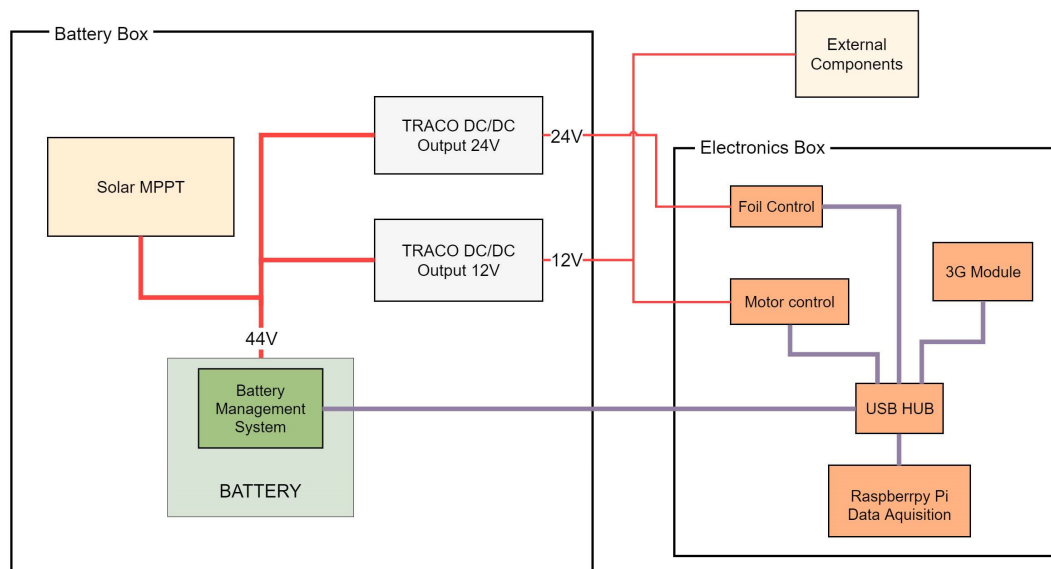


Figure 1: Simplified illustration of the system

TRACO POWER converters

TRACO POWER has a very large range of DC/DC converters, from high to low power, from DIN-Rail to SMD mount, with larger or smaller input ranges, customized solutions, etc. So we had a lot of option, in this case we wanted to use the 100 Watt TEP 100 series converters because of their great 93% efficiency but these had an input range of 36 - 75 volt. This would be risky to use since our battery has a voltage range that goes from 35 V to 50.4 V due to it's discharge curve.

So we opted to use TRACO's 100 Watt TEP 100WIR series, these have an incredibly large input range but are slightly less efficient. The TEP 100-48xxWIR are 48 V nominal but can work from 18 V to 75 V as input voltage.

In our system we have used one TEP 100-4812WIR which has a 12 V output voltage and a TEP 100-4815WIR which has a 24 V output. The TEP 100-4812WIR was used for a part of the motor control and also to power many external components such as fans for cooling and the bilge pump. Finally the TEP 100-4815WIR was used for the stepper motors that actuate on the foil control system.

Finally, for testing prototypes, components, PCBs or even full systems we have acquired a 600 Watt AC/DC power supply from the THX 600 series. We got the TXH 600-148 which has a nominal output voltage of 48 VDC and a maximum current of 12.5 A and an efficiency of 92 %.



Figure 2: Our boat competing in Monaco in July 2018

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