

Técnico Solar Boat

Weipu connectors for solar boats

Lisbon 2023

1 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 solar and hydrogen powered boats. Our main purpose is to participate in worldwide university competitions, such as Monaco Energy Boat Challenge, and promote Sustainability.

We count already with three solar powered boats (SR 01, SR 02 and SR 03) which stands for São Rafael, one of the carracks that Vasco da Gama took in his fleet to India, and one Hydrogen powered boat (SM 01) which stands for São Miguel, also from Vasco da Gama's fleet. In 2019 SR 02 became second in the Monaco Solar & Energy Boat Challenge competition.

In the summer of 2022 we participated in two competitions, one of them organized by us, *Madeira Solar Race*, in the Madeira Archipelago. The first competition was in Monaco, where we got a third place overall with our SR03 and then we had the Madeira Solar Race which gave us a first place. These international competitions tested our boat to the limit, challenging its performance in speed, maneuverability and endurance. SM01 on the other hand, only competed in Monaco.

Pretty much everything in the boat was made by us, from the hull to the electrical system to everything that is mechanical. The majority of the connectors that are inside the vessel are from Weipu. We have used these connectors already for 3 years in different vessels and for different applications.

2 Weipu connectors

The Weipu connectors, more specifically the SF12, SA12 and WAC3 series, are essential in order to connect all the systems in a safe and easy way. They are used for data and power in a variety of applications, guaranteeing the modularity of our systems making it easier to debug and upgrade parts when needed.

2.1 Electronics Box

The Electronics box is one of the most complex systems of the vessel since it controls the majority of components in the vessel and therefore needs to receive and send signals all across the network with different protocols.

It receives power from the battery using a WAC3 connector. This connector has 3 contacts providing the flexibility we need to deliver both 24V and 48V in the same connector and [making sure the ground connection is always connected until the positive leads are disconnected. This makes the system safer since all the components get a chance to discharge any energy still stored in them before we touch them.]

The rest of the sides of the box are filled with different SF12 connectors with different purposes. Some provide power and data to our hydrofoil control motors, making sure we can communicate with them assuring a stable connection in order to make the boat fly with our control system. There are also connectors for the ultrasound sensor and the pilot's throttle, all necessary to guarantee the full functionality of the vessel.



Figure 1: Connector Contacts

The stunning brass made shell for the SF12 series when in contrast with the dark carbon fiber hull gives the interior of the boat a sleek and professional finish.

2.2 Ease of assembly

Every year we need to change cables and make new ones since we are always improving and developing the systems in our prototypes. The Weipu connectors make it easier to complete this task since they are extremely easy to desolder from a cable and salvage to be used in different applications. This is not only a huge time saver but also a way to prevent waste and give second live to our connectors without the need to crimp new contacts or buy different pieces.

The gold plated contacts provide an excellent protection against excessive heat exposure during soldering and enhance the overall durability of the connector. Gold plating also serves as an effective barrier from oxidation and corrosion, both very important for marine environments.

The connectors can be fully opened, giving easy access to the contacts on the inside and still managing to achieve a IP67 and IP65 rating for the SF12 and WAC3 respectively. This feature is even more important in our application since in a vessel there is always the risk of water to reach the connectors.



Figure 2: Electronics Box

3 Conclusion

To conclude, Weipu connectors had a key role in the development of our prototypes throughout the 2022 season. From power to data transmission, they ensured a good contact and easy development which lead to the success of the team in different competitions.



Figure 3: SR03 competing in Monaco in July 2022.