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Closer to the Sun

Without the Sun, there would be no Earth and no life. However, our knowledge about our home star is still very limited. This is about to change. In 2018, ESA will send its Solar Orbiter into space, equipped with a thick heat shield.

It is a cautious approach. Step by step, the Solar Orbiter will change its trajectory and swing by Earth and Venus to reduce its distance from the Sun to only 45 million kilometers. No other human-made object was ever this close. The way back to Earth would be thrice as long.

Not a pleasant place for the Solar Orbiter: At the front, temperatures rise up to 520 °C under the ceaseless pounding by solar radiation. All other sides are surrounded by the eternal cold of outer space. This combination makes for an incredibly challenging environment.

The secret of solar eruptions

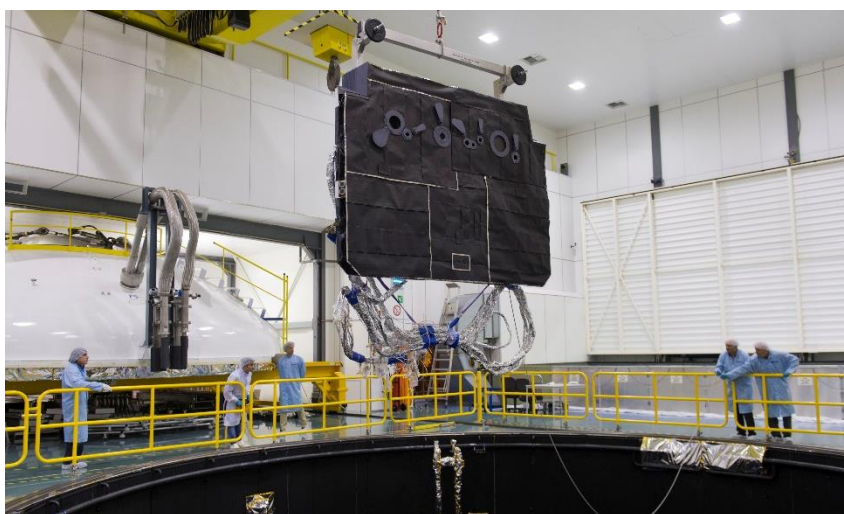
Solar Orbiter is a joint project of the European Space Agency ESA and the US agency NASA. It is going to be an important milestone in the exploration of the Sun. Even though the Sun is responsible for the development of the planets in our solar system, and even though it influences the weather as well as life in general, we know far too little about it. For example, what causes the solar winds? Or solar eruptions? What forces are behind the formation of the heliosphere, the cloud of charged particles that extends past the outer reaches of our solar system?

It is going to take a while until scientists will have answers to these questions. In 2018, an American rocket will take the probe into space. Then it will travel for three years until it can begin its work. Solar Orbiter is going to provide a new perspective of the Sun, its surface, and the polar caps. For this purpose it is equipped with around a dozen cameras and measuring instruments.

Some of these systems and subsystems are being developed and built in Lausanne, Switzerland. The company Almatech is involved, for example, in the development of STIX, an X-ray telescope for the observation of solar eruptions. It is expected to yield new insights into the acceleration of electrons and their projection into the depths of outer space.

Sunglasses for instruments

Just like people should not look directly at the Sun, measuring instruments also need protection. After all, the intensity of the radiation on board the Solar Orbiter is 13 times higher than on Earth. The primary means of protection is a state-of-the-art heat shield that remains directed at the Sun at all times. A few holes can be opened for measurements. However, the instruments need to be protected too. In the case of STIX, this is provided by permanent beryllium protective filters and the use of an aluminum grid during solar eruptions. This grid can be placed in front of the 32 X-Ray detectors by means of two maxon RE 13 motors. The brushed DC drives are wired in parallel, enabling them to be used together or individually. This ensures a service life of ten years – the planned duration of the mission.



The Solar Orbiter's heat shield has apertures that briefly let the instruments look at the Sun.
Image ©ESA

At Almatech, four engineers are continuously working on the detector system, which is called STIX-DEM. “It’s a challenge to develop a device that has never been built before and to test it to prove that it is going to function reliably,” says Senior Project Manager Fabrice Rottmeier. “At the same time, it’s a great experience and very motivating to be part of a scientific research program that investigates questions about the origin of the universe and the origin of life.”

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Lightweight drives as an advantage

Weight is a critical factor for space projects. maxon motors come into their own here. Rottmeier: “With maxon drives we were able to build a shield that weighs less than 200 grams and survives vibrations, for example during the launch, without problems.” The renowned reliability and high quality of maxon motors were another selection criterion. He adds: “The support from their engineers is very flexible and all around great.”



maxon RE 13 – made for space

With the RE 13 DC motor, maxon has a proven drive for space applications, since its bigger brothers (RE 20 and RE 25) already have been used in NASA's rover missions. The ironless winding and the high-quality magnet provide an efficiency well above 90 percent. The drive was customized for the Solar Orbiter project with special lubrication and cables.

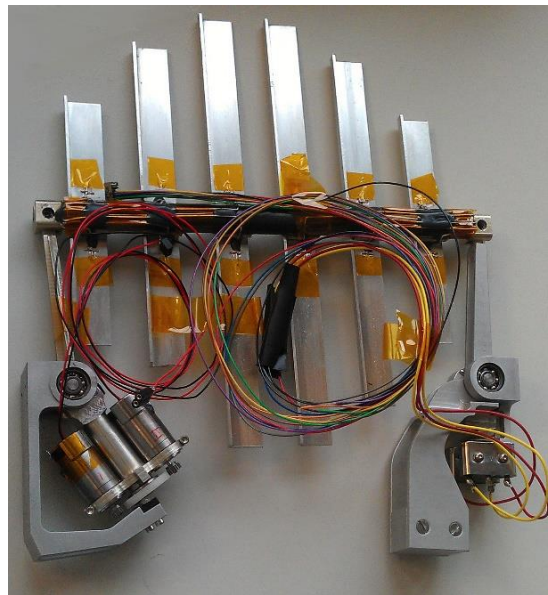


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