TELSONIC ULTRASONICS

Successful ultrasonic welding connection for space application

PLASTIC WELDING | METAL WELDING | CUTTING | CLEANING | SIEVING

Bronschhofen (CH), 07/2023

In 2018, we reported on the significant role of ultrasonic welding technology in the manufacturing of the CLARA radiometer for the Norwegian nanosatellite NorSat-1. Today, we are pleased to provide you with an update on the current operational status of the instrument.The CLARA radiometer, developed by the Physikalisch-Meteorologisches Observatorium in Davos (PMOD/WRC), is a remarkably lightweight and compact device for measuring the total solar irradiance (TSI) in space. With high accuracy and long-term stability, it can measure temperature differences resulting from absorbed solar radiation.

The production of such a measurement setup, which reliably detects the smallest deviations in TSI under space conditions, poses some challenges. One of them was to find a suitable joining technique for connecting the small, 0.13mm thick cavities to the thermal resistors.

After extensive testing, the torsional ultrasonic technology by Telsonic was ultimately chosen. This method enables a firm and mechanically stable connection that can withstand high vibrations. The torsional motion of the sonotrode introduces only minimal vibrations around the weld seam, thus protecting sensitive components and surfaces.

The CLARA instrument is still in operation and functioning well. However, the satellite has encountered early issues with the gyro-wheels, leading to inaccuracies and partial inability to align with the sun. In such cases, valid radiation measurement values cannot be obtained. Nonetheless, there are still correct measurement phases, and so far, nothing indicates a poor or degraded connection of the welded parts.

"Yes, our CLARA instrument is still in operation and functioning well," says Silvio Koller, Electrical Engineer and Co-Leader of the Technical Department at the Physikalisch-Meteorologisches Observatorium Davos. "However, we require a precision of

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01 Three cone-shaped body elements made of a 0.13mm thick silver substrate, blackened on the inside and gold-plated on the outside. With high accuracy and long-term stability, it can measure heat flow differences resulting from absorbed solar radiation.

approximately +/- 0.5° for sun alignment, which is usually not a problem with larger satellites. NorSat-1 is a small satellite, more cost-effective, and therefore potentially slightly less reliable."

Despite these challenges, torsional ultrasonic welding technology has proven to be a reliable and reproducible method.

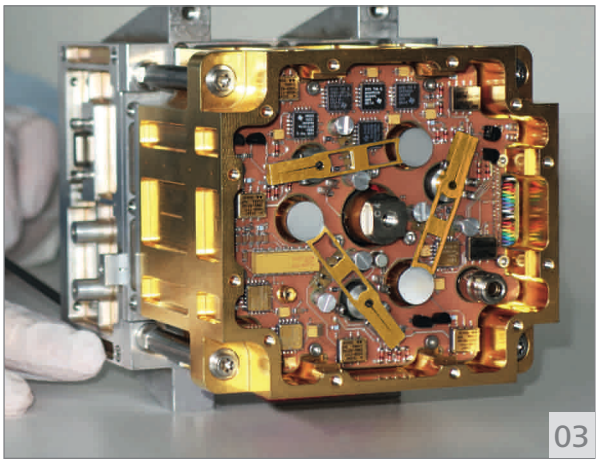
About the Physikalisch-Meteorologisches Observatorium Davos (PMOD/WRC):

The Physikalisch-Meteorologisches Observatorium Davos (PMOD/WRC) is a renowned research institute specializing in the study of solar radiation and its impact on climate. Through the development of highly precise measurement instruments and collaboration with international partners, the observatory contributes significantly to understanding the climate system.

Press contact: Name: Silvio Koller Position: Electrical Engineer and Co-Leader of the Technical Department Company: Physikalisch-Meteorologisches Observatorium

By Christian Huber, Market Manager Metal Welding at Telsonic AG in Bronschhofen

02 The torsional welding process developed and patented by TELSONIC greatly reduces the unwanted vibration input into the welded object.



03 The CLARA radiometer was developed by the Physico-Meteorological Observatory in Davos.

04 Norwegian Nanosatellite NorSat-1