

Our Background

Our team designed, built and operated already 2005 the first German pico-satellite in orbit. Based on that experience, subsequently crucial satellite functionalities were implemented and tested in orbit to realize leading edge advanced satellite systems. This expertise is here offered to our customers to bring their missions or payloads efficiently into orbit.

Our customers appreciate the long lifetime, the pointing accuracies and the very small size of our satellites for a cost efficient realization of their objectives. Challenging applications were addressed in missions for innovative

- Earth observation (computed tomography, photogrammetry)
- telecommunications (Internet of Space, secure communication)
- navigation systems and in-orbit tests.

Special emphasis is on provision of advanced small satellites, as well as on multi-satellite formation systems for our customers. The high-performance facilities of S⁴ for small satellite tests are offered also as service. Our customers appreciate the S⁴ elaborated subsystems and development kits as starting point for their own developments.

Why pico- or nano-satellites ?

Launcher costs have a major impact on the total budget to place a satellite in orbit and scale proportional to the mass delivered. Thus, due to smaller launch costs more investment remains for the satellite.

How can you realize a satellite so small ?

We take advantage of commercial electronic components. Here in huge commercial markets, by example regarding cellular phones, high performance components with minimum power needs were developed. To protect against the hostile space environment, our satellites use advanced fault detection, identification and recovery (FDIR) software to enable long lifetime in orbit.

When high performance is needed ?

A traditional satellite provides of course better performance than a small one due to more resources (power, size, ...) available. Nevertheless, at the cost of a classical satellite, a fleet of hundreds of pico-satellites can be combined to realize distributed networks for challenging applications. Thus excellent integrated performance by sensor data fusion can be achieved. Advantages are better robustness and fault tolerance, excellent scalability, higher temporal and spatial resolution.

Our Products

Starter Kit for flexible UNISEC bus

The UNISEC bus provides the basis for an efficient, modular picosatellite realization.

For own development of payload or satellites, the Starter Kit provides all necessary interfaces to computers and to test equipment.

After launch, this kit serves as EGSE and thus supports the full satellite lifecycle.

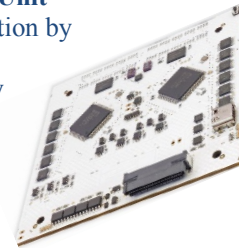


Robust On-Board Data Handling Unit

The new concept of radiation protection by software, using advanced FDIR and redundancy approaches, proved very reliable performance in orbit.

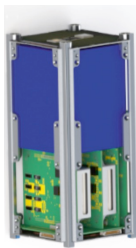
Despite only use of commercial chips, it handles polar LEO radiation (more than 5 years without any interruption of service).

The OBDH comes with standard UNISEC bus electrical interfaces for easy satellite integration.

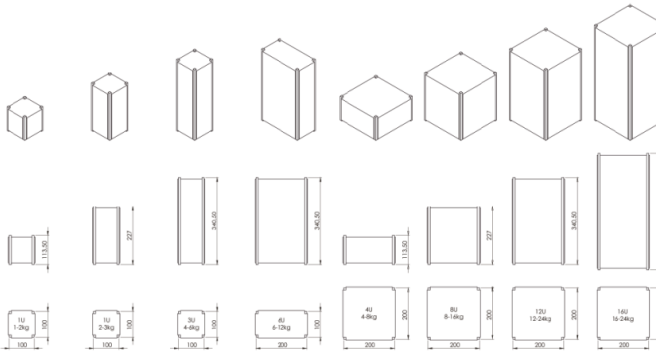


Satellite systems

S⁴ delivers satellite systems tailored to the needs of our customers to accommodate appropriately their payloads and instruments at a minimum mass for best cost efficiency. Our standard CubeSats cover different sizes according to payload needs. Typical masses are between 1 kg and 20 kg.



Range of standard dimensions



Our Services



Advanced Dynamic Test Facilities

S⁴ operates a equipment for all crucial tests for small satellites. In particular, precision turntables enable at a high dynamics range accurate testing of

- inter-satellite links to realize networks in orbit
- photogrammetric observation simulation
- characterization of attitude determination and control components and systems

Thus unique test capabilities for key functionalities of formation flying are provided.



Full Satellite Service Provider

On customer demand S⁴ can provide a full service package to place the complete satellite system with integrated customer payloads in orbit and to operate it.

Our “Small Satellite Design” training classes are frequently offered and are popular in Europe, Asia, Africa, North and South America.

Our Mission Contributions

NetSat Formation Demonstration

S⁴ contributes crucial components for attitude control and on-board computing to this European top science ERC Advanced Grant. The formation is composed of 4 small satellites with the objective to analyze different 3D-topologies for scientific measurements. S⁴ turntables were used for testing activity strategies for instruments, inter-satellite links and self-organization for best observation results.

Secure Communication by Quantum Key Distribution

In the CUBE mission Quantum keys are generated on-board a small satellite and distributed to the communication partners via secure optical links with entangled photons. S⁴ contributions include the satellite precision pointing devices and crucial tests for optical links.



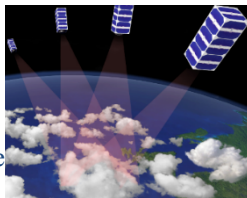
TOM -

Telematics earth Observation Mission

3 satellites point their cameras to the same area to generate by sensor data fusion 3-dimensional surface features. These photogrammetric observations require accurate pointing and tracking capabilities, tested by S⁴. Also OBDH and AOCS subsystems were contributed.

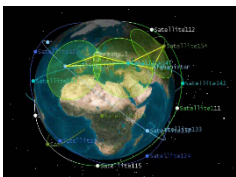
CloudCT – Computed Tomography to Characterize Clouds

Inspired by medical Computed Tomography (CT), a formation composed of 10 satellites reveals internal 3D structures of clouds for improved climate predictions. This mission is realized with an ERC Synergy Grant, one of the European top science awards, addressing challenging and outstanding interdisciplinary topics. S⁴ contributions for robust on-board computing, accurate AOCS and instrumentation design, as well as high precision pointing in imaging are considered.



Internet of Space

In Internet of Things low bandwidth connectivity between sensors on ground can be provided via small satellites in a cost efficient way for large, poorly populated areas.



Contact

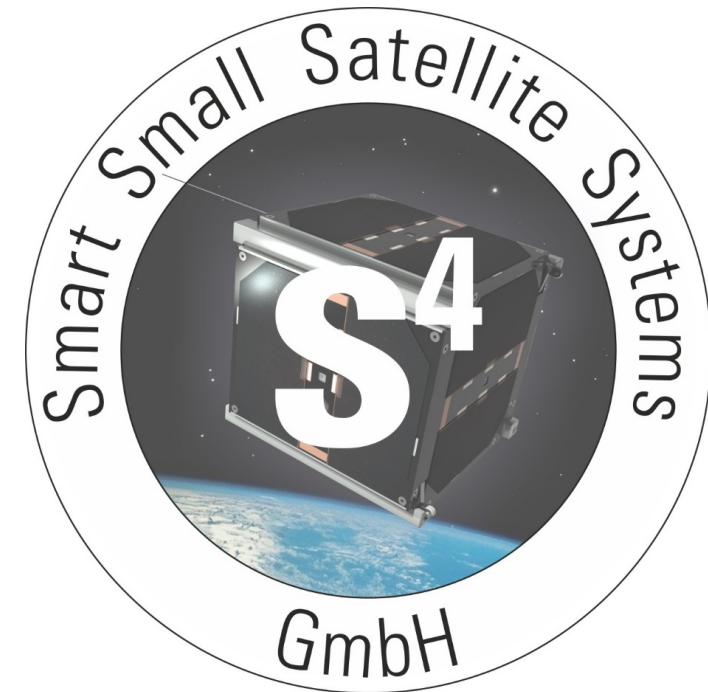


Würzburg is a crossing point of highways, as well as of high speed train lines ICE. Thus it can easily be reached by direct ICE trains from Frankfurt Airport in less than 90 minutes. Also the highway A3 connects directly to the Airport.

When you exit Würzburg train station, you find on your left the Taxi stand or at your right the bus station. From there Bus 29 stops directly in front of our building. The more frequent Bus 14 (exit “Philosophisches Institut” or “Am Hubland”) stops in 300 m distance. You recognize our building immediately by the antenna dish on top.

If you come by car, you find the visitor parking in the patio of the building, accessible from Landsteiner Str. 2 (turn right and enter directly after the stairs).

Our Reference Customers



Our ambition:
High quality space products
at smallest size possible for
best value to our customers

S⁴ – Smart Small Satellite Systems GmbH
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