We. Create. Space.

SPACE SYSTEMS

SATELLITE PLATFORMS

MEDIUM AND LARGE PLATFORMS

PLATFORMS
MEDIUM AND LARGE PLATFORMS BY OHB

OHB System provide satellites suitable for your application. As one of the three European Large Systems Integrators, we offer reliable and cost-effective turnkey solutions based on our successful satellite platforms. The modular and scalable design of our platforms offers a broad spectrum of possible configurations to fulfil various mission objectives. These include Earth Observation, Navigation, Telecommunications, Science, In-Orbit Verification as well as Space Exploration. The high modularity of our platforms gives additional flexibility during the entire Assembly, Integration and Test phase and allows short lead times. Combined with their compatibility with several launch vehicles and the possibility to select an early launch opportunity, the time between mission requirements specification and mission operational availability can be minimized.

Our platforms cover missions with a satellite mass between 600 kg and 3,800 kg, whereby the permitted payload can vary from 200 kg up to 900 kg, in Low Earth Orbit, Medium Earth Orbit, Geostationary Orbit as well as in interplanetary missions.

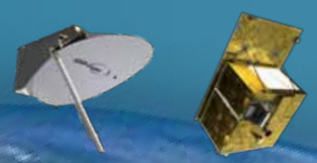
Our satellite platforms are implemented and used in institutional (ESA, DLR) and military (BAAINBw) programms, and comply with the stringent quality standards from the European Cooperation for Space Standardization (ECSS). The OHB platforms rely on space-proven designs with more than 58 years of flawless operation. They are employed very successfully in in-orbit programs like SAR-Lupe, Galileo, Hispasat 36W-1 and ExoMars Trace Gas Orbiter.

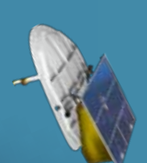
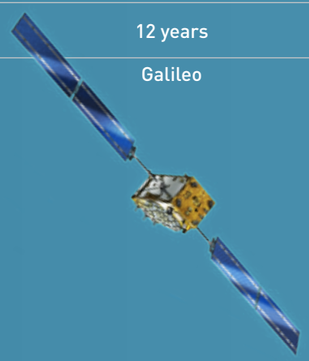
As a provider of turnkey space systems, OHB will support you at all stages of your space program, from mission analysis up to design, procurement, payload integration and satellite level testing. In addition, OHB can provide the ground segment for monitoring, control and payload data processing, as well as for the satellite launch, LEOP (Launch and Early Orbit Phases) and support for the system operation phase. Thus, OHB System is ideally positioned to act as a full service provider for your space mission.

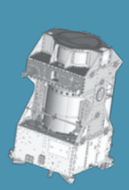
	SmartLEO	SmartLEO Agile	SmartMEO	SmallGEO	Interplanetary
Agile Earth Observation		✓			
Atmosphere Observation	✓		✓	✓	
Carbon Observation	✓		✓	✓	
Communication	✓		✓	✓	✓
Cloud / Cloud Coverage	✓		✓	✓	
Earth Observation	✓	✓	✓	✓	
EO Hyper Spectral	✓	✓	✓	✓	
EO Optical	✓	✓	✓	✓	
EO Panchromatic	✓	✓	✓	✓	
EO Super Spectral	✓	✓	✓	✓	
EO Thermal	✓	✓	✓	✓	
Fire / Ashes / Vulcano	✓	✓	✓		
Flooding	✓	✓	✓		
Heat Signature Detection	✓	✓	✓		
Ice / Ice Coverage	✓	✓	✓	✓	
Interplanetary					✓
Mars / Moon / Planetary					✓
Navigation			✓		✓
Radar	✓	✓	✓		✓
Rapid Response	✓	✓	✓	✓	
Safety Applications	✓	✓	✓	✓	
Science	✓		✓	✓	✓
Space Situational Awareness	✓			✓	✓
Space Weather	✓			✓	✓
Store & Forward	✓				✓
Weather	✓		✓	✓	

OHB platforms at a glance

	SmartLEO	SmartLEO Agile	SmartMEO	SmallGEO	Interplanetary
Orbit	Low Earth Orbit	Low Earth Orbit	Medium Earth Orbit, Low Earth Orbit	Geostationary Orbit, High Earth Orbit	Interplanetary, Sun/Earth Langrange Points
Typical Applications	Earth Observation, Reconnaissance and Science	Agile (multi-targeting, fast slewing) Earth Observation, Reconnaissance and Science	Navigation and Series Production	Telecommunication, Earth Observation and Meteorology	Interplanetary Transfer, Carrying of Lander and Mars Orbiting
Launch Mass	600 – 1,100 kg	1,900 – 2,100 kg	700 – 800 kg	2,400 – 3,800 kg	up to 4,400 kg
Payload Mass	up to 400 kg	up to 600 kg	up to 300 kg	up to 900 kg	up to 800 kg
Payload Power	up to 500 W	up to 1 kW	up to 1,1 kW	up to 10 kW	up to 2 kW
Lifetime	3 – 12 years	3 – 12 years	12 years	8 – 15 years	2 – 8 years
Heritage	SAR-Lupe, EnMAP	SARah	Galileo	Hispasat 36W-1, EDRS-C, Electra, MTG	ExoMars TGO



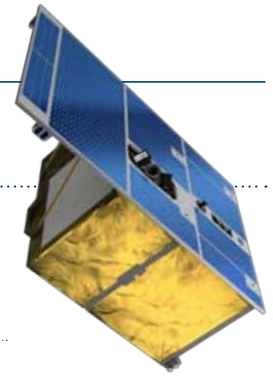


SMARTLEO
LAUNCH MASS 600 – 1,100 KG

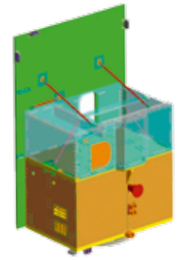
The OHB SmartLEO platform family is a space-proven solution that relies on more than 45 flawless years in orbit and represents the perfect choice for accurate Earth observation with high resolution. SmartLEO can carry ample types of payloads, such as the Synthetic Aperture Radar (SAR), multi-, super- and hyperspectral optical instruments, spectrometers, radiometers, or altimeters. SmartLEO's compact, scalable and modular design ensures a highly accurate three-axis stabilized attitude and orbit control and a high-rate payload data processing chain with state-of-the-art on-board storage and downlink capacity.

SmartLEO was designed for small series production and represents an attractive solution for satellite constellations requiring high reliability and high performance. The further development of SmartLEO is realized together with our partners and customers ESA and DLR. The SmartLEO platform family will support also missions with demands for bigger and more powerful payloads and – as SmartLEO Agile – fast slewing or multi-targeting applications.

EnMAP - Platform at OHB facilities in Bremen



General	Typical Orbit:	Low Earth Orbit
	Launch Vehicle:	Vega, PSLV, Falcon 9, Soyuz
	Launch Mass:	600 – 1,100 kg
	Design Lifetime:	Up to 12 years
Payload	Type:	Ample Configuration (SAR, Optical, Multi-, Super-, Hyper-Spectral Spectrometer, Radiometer, Altimeter)
	Maximum Mass:	Up to 400 kg
Energy Supply	Average Power Payload:	500 W
	Solar Generator:	Up to 1 kW
Data Processing	On-Board Processor:	LEON II FT
	Standard Data Bus:	MIL-STD-1553, CAN, SpaceWire
Communication	TM/TC:	S-Band 128/256 kbps
	Data Downlink:	Ka-Band: 4 Gbps X-Band 800 Mbps
	Secure Datalinks:	Optional Full Encryption and Authentication
Attitude Control System	Attitude Control:	3-Axis Control Star Tracker, Gyroscopes and Reaction Wheels (Gyro-Less Option)
	Pointing Accuracy:	Typical 0.01° (Scalable)
	Pointing Agility	Typical 1°/s Slew Rate (dependent on selected AOCS Package)
Orbit Control System	Propulsion:	Mono-Propellant
Structure	Structure Design:	Aluminum Sandwich Panel with Internal Shear Frame
	Panel Design:	Aluminum Honeycomb
Thermal System	Main Elements:	MLI, Heaters, Sensors, Heat-Pipes



SmartLEO: Flight-Proven Platform Design

SmartLEO inherits the flight-proven SAR-Lupe platform, with a design for small series production. SAR-Lupe is Germany's first satellite-based radar reconnaissance system. It is essential for the Federal Government to identify and monitor regions of latent crisis at an early stage and to assure independence in reconnaissance. OHB System as prime contractor developed five identical satellites equipped with highest-resolution radar systems for providing worldwide information under all weather conditions at day and night time. The system is operational since December 2007, and OHB operates the highly automated SAR-Lupe Satellite Ground Segment.

SAR-Lupe

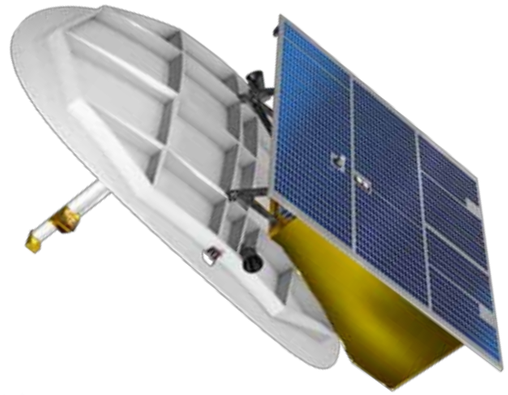
SmartLEO: The Versatile Platform

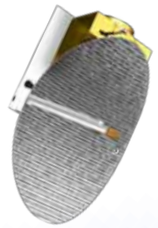
SmartLEO is used in the Environmental Mapping and Analysis Program (EnMAP) for the hyper-spectral imaging satellite. The EnMAP instrument will measure the solar radiance reflected from the Earth's surface as a continuous spectrum. The spectral range covers more than 200 spectral channels in the range from 420 nm up to 2,450 nm with a high spatial resolution of 30 m. OHB System as the prime contractor of DLR is responsible for the overall EnMAP mission as well as for the instrument. The SmartLEO platform is the evolutionary further development of OHB's highly successful SAR-Lupe mission.

EnMAP - Platform at OHB facilities in Bremen

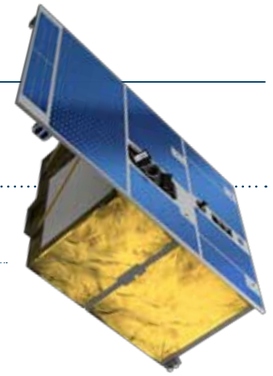
SMARTLEO AGILE
LAUNCH MASS 1,900 – 2,100 KG

Expanding on the SmartLEO heritage there is now also the SmartLEO Agile Platform. While SmartLEO is aiming as general-purpose platform for ample payload configurations, Smart LEO Agile is the more ambitious evolution being the platform for larger and/or more agile spacecraft. The platform provides the perfect solution for Earth observation missions with stringent requirements for pointing accuracy, agility and data volume. Control Moment Gyroscopes enable very fast slew rates required for stereo acquisitions as well as successive acquisition of different regions of interest within one orbital pass. SmartLEO Agile covers the same type of missions as SmartLEO and allows best of class performance in terms of agility as well as possible payload mass and power. SmartLEO Agile also represents an attractive solution for constellations requiring high agility, high reliability and high performance.

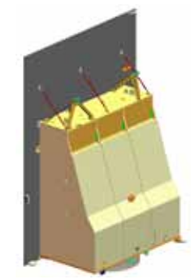




SARah

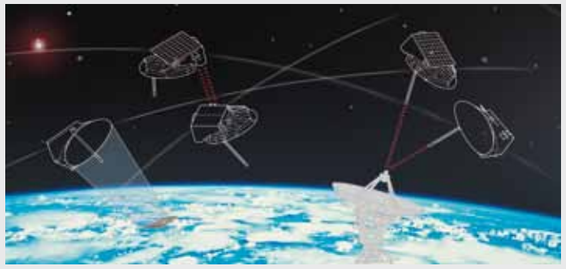


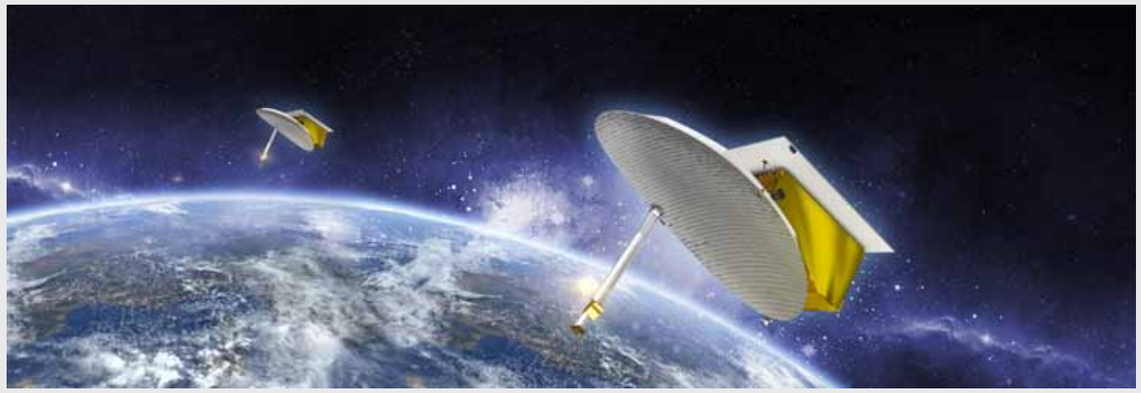
General	Typical Orbit:	Low Earth Orbit
	Launch Vehicle:	Vega, PSLV, Falcon 9, Soyuz
	Launch Mass:	1,900 – 2,100 kg
	Design Lifetime:	Up to 12 years
Payload	Type:	Ample Configuration for High Agility (SAR, Optical, Multi-, Super-, Hyper-Spectral Spectrometer, Radiometer, Altimeter)
	Maximum Mass:	Up to 600 kg
Energy Supply	Average Power Payload:	1 kW
	Solar Generator:	1 – 3.5 kW Various Configurations
Data Processing	On-Board Processor:	LEON II FT
	Standard Data Bus:	MIL-STD-1553, CAN, SpaceWire
Communication	TM/TC:	S-Band 128/256 kbps
	Data Downlink:	Ka-Band: 4 Gbps X-Band: 800 Mbps
	Secure Datalinks:	Optional Full Encryption and Authentication
Attitude Control System	Attitude Control:	3-Axis Control Star Tracker, Gyroscopes and Control Moment Gyros (Gyro-Less Option)
	Pointing Accuracy:	Typical 0.01° (Scalable)
	Pointing Agility:	Typical 3°/s slew rate and 0.2°/s² slew acceleration (dependent on selected AOCS Package)
Orbit Control System	Propulsion:	Mono-Propellant
Structure	Structure Design:	Aluminum Sandwich Panel with Internal Shear Frame
	Panel Design:	Aluminum Honeycomb
Thermal System	Main Elements:	MLI, Heaters, Sensors, Heat-Pipes



SmartLEO Agile for Extra High-Resolution Agile SAR Missions
The SmartLEO Agile platform is based on the successful SmartLEO platform used for SAR-Lupe and EnMAP with major improvements in agility and performance. In order to maintain its all-weather and day and night reconnaissance capabilities in the future, the Federal Republic of Germany ordered the SAR-Lupe follow-up system SARah, which will be based on SmartLEO Agile due to its higher effectiveness in terms of image quality, resolution, daily data volume and system response time.

The space segment of SARah is made of three satellites, two based on a reflector antenna and one on a phased array antenna. OHB System is responsible for implementing the entire system as prime contractor. In addition, OHB will be providing the two very agile reflector satellites and the main elements of the ground segment comprising the two ground stations, which are optimized for high-speed data downlink. The ground segment also includes a high capacity data archive.





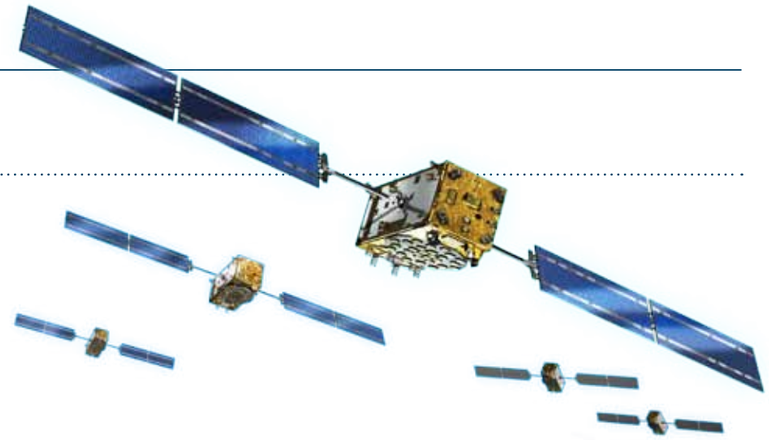
SMARTMEO
LAUNCH MASS 700 - 800 KG

The OHB SmartMEO Platform is a highly reliable and space-proven solution that derives directly from the platform built for the satellites of the Galileo constellation. The scalable, flexible and modular design of SmartMEO enables a high production cadence of one satellite every six weeks within the Galileo project. Inspired by the automotive industry, this can be achieved by using assembly islands set up within the OHB System cleanrooms. SmartMEO satellites consist of pre-assembled and tested panels for easy integration to assemble the spacecraft. This approach provides the basis for a hierarchical assembly system using accumulative test processes.

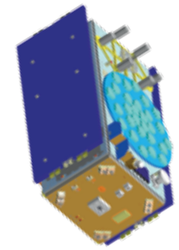
The avionics of Galileo FOC satellites offer large processing resources around modern Single Event Upset tolerant processors, the MIL-1553 data buses, MEO radiation qualified components and a 3-axis reaction wheels-based attitude control system.

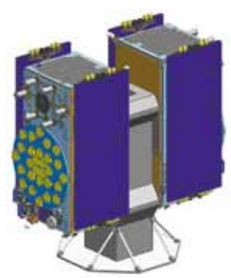
SmartMEO can carry ample payloads such as navigation or telecommunication payloads. Further developments of SmartMEO foresee the possible application for large constellations in MEO or LEO, e.g., to provide global internet or communication links.

Galileo FOC satellites 11 and 12



General	Orbit:	Medium Earth Orbit, Low Earth Orbit
	Launch Vehicle:	Ariane 5, Falcon 9, Falcon Heavy, Soyuz, H3 and Ariane 6.2/6.4
	Launch Mass:	700 - 800 kg
	Design Lifetime:	12 years
Payload	Type:	Navigation, Communication
	Maximum Mass:	Up to 300 kg
Energy Supply	Average Power Payload:	1.1 kW
	Solar Generator:	2.3 kW
Data Processing	On-Board Processor:	LEON II FT
	Standard Data Bus:	MIL STD-1553
Communication	TM/TC:	S-Band
	Data Downlink:	C-Band
	Secure Datalinks:	Optional Full Encryption and Authentication
Attitude Control System	Attitude Control:	3-Axis Reaction Wheel Control
Orbit Control System	Propulsion:	Mono-Propellant
Structure	Structure Design:	Aluminum Sandwich Panel with Internal Shear Frame
	Panel Design:	Aluminum Honeycomb
Thermal System	Main Elements:	MLI, Heaters, Sensors, Heat-Pipes





SmartMEO: the Galileo Platform

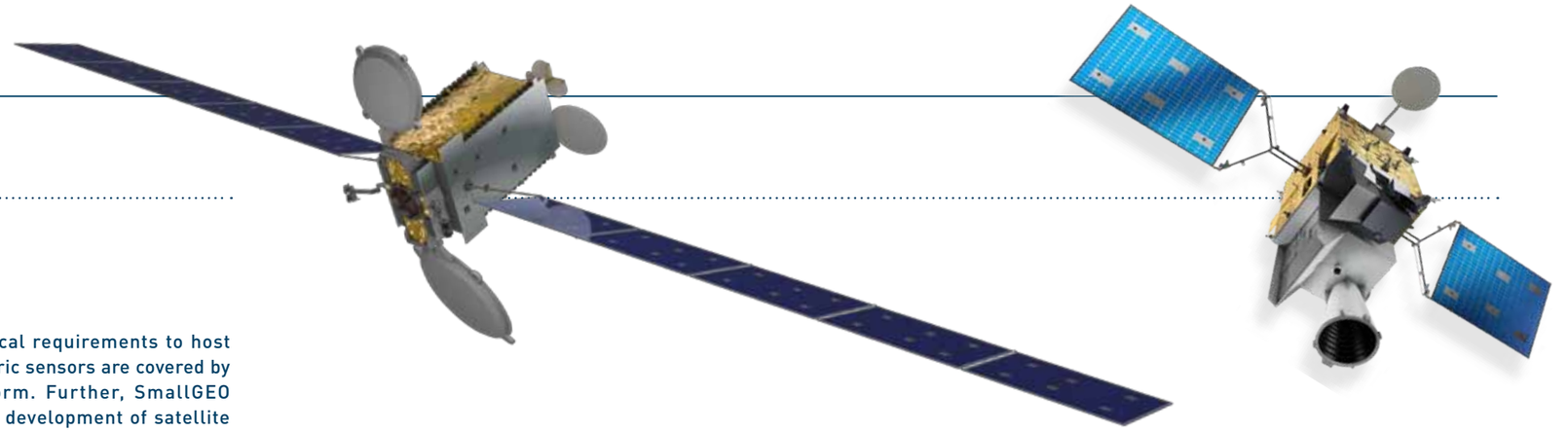
OHB System as prime contractor for the production of the 22 Galileo FOC (Full Operational Capability) satellites is responsible for the system, the satellite platforms and the satellite level integration and test. The Galileo satellites are distributed in three orbital planes with one spare satellite per plane. The constellation allows global position determination and navigation. In addition, the satellites support a global Search and Rescue service (COSPAS-SARSAT).

Navigation signals are broadcasted in four frequency bands. The Open Service (OS) is free for anyone to access, while the encrypted Commercial Service (CS) offers an enhanced accuracy, and the encrypted Public Regulated Service (PRS) provides robustness against jamming and is used by security authorities and safety-critical transport applications.

Galileo Initial Services are available since December 2016.

Galileo Inspection

SMALLGEO
LAUNCH MASS 2,400 - 3,800 KG



The SmallGEO product line is the OHB solution for versatile geostationary satellites. It was designed in close cooperation with commercial and institutional satellite operators and offers very competitive cost and performance. SmallGEO is built to highest OHB manufacturing standards in partnership with ESA and DLR and fulfils telecommunication operators' quality requirements. The product line offers a unique capability for flexible launch options and thus a best-in-class solution for geostationary satellite systems. Electrical propulsion enables the customers to optimize their costs as a balance between launch mass, orbit transfer time and payload performance in an unparalleled way.

The highly efficient electrical propulsion system saves up to 70% of propellant mass compared to traditional chemical propulsion systems. With SmallGEO this mass capacity is available for the payload and thus offers the performance of much larger systems in a smaller package at lower cost. The opportunities to utilize lower cost launch systems with possible single, dual or stacked launch options in addition to different injection scenarios contribute to the overall flexibility and attractiveness of our SmallGEO Platform.

SmallGEO features a modular structure and product philosophy to allow the satellite to be fitted to individual mission scenarios. Attractive production times make it possible to react swiftly to new market needs and thus reduce costs. The optimized complexity of the system ensures high reliability in tandem with reduced program risk.

With its modular design, SmallGEO is not only the perfect platform for geostationary telecommunication applications, but also provides an attractive basis for applications in future GEO high-resolution Earth observation missions and meteorology. The specific technical requirements to host optical instruments and atmospheric sensors are covered by the specifications of the platform. Further, SmallGEO represents a strong basis for the development of satellite platforms for interplanetary missions, as it has been the case for the ExoMars TGO.

Trace Gas Orbiter

Generals:	Orbit:	Geostationary Orbit
	Launch Vehicle:	Ariane 5 lower position, Ariane 6, Falcon 9 & Heavy (single or dual) & Reusable, Proton light, New Glenn
	Launch Mass:	2,400 - 3,800 kg
	Lifetime:	8 - 15 years
Payload:	Type:	Communication, Meteorology, High Resolution Earth Observation
	Maximum Mass:	Up to 900 kg
Energy Supply:	Average Power Payload:	Typical 1 kW (EO), up to 10 kW (Telecom)
	Solar Generator:	Typical 2 kW (EO), up to 11kW (Telecom)
	Battery:	Lithium-Ion Technology
Data Processing:	On-Board Processor:	Leon-II FT
	Standard Data Bus:	MIL-STD-1553, Spacewire
Communication:	TM/TC:	S-, Ku- and the Ka-Band
	Data Downlink (EO):	Ka-Band up to 280 Mbps
	Secure Datalinks:	Full Encryption and Authentication
Attitude Control System:	Attitude Control:	3-Axis Control Star Tracker, Gyroscopes, and Reaction Wheels
Orbit Control System:	Propulsion:	Fully electrical
Structure:	Structure Design:	Central Tube Based
Thermal System:	Main Elements:	MLI, Heaters, Sensors, Heat-Pipes

Telecommunication with SmallGEO

The SmallGEO pioneering mission H36W-1 was realized in a public private partnership between the Spanish satellite operator Hispasat, OHB System and ESA. With H36W-1, Hispasat provides media services for the next 15 years. The satellite was successfully launched in January 2017 from Kourou (French Guiana) using a Soyuz rocket and has been handed over to the customer beginning of June 2017. The next missions for SmallGEO are the European Data Relay Satellite (EDRS) for ESA, Electra for the satellite operator and service provider SES, and the Heinrich Hertz mission. Electra will be the first mission with full electrical propulsion. Heinrich Hertz will be used for in-orbit verification of innovative payload and platform technologies as well as for providing additional infrastructure for German governmental use with a hosted payload of the German Federal Ministry of Defence (BMVg).

A dedicated brochure on SmallGEO for Telecommunication Applications is available.

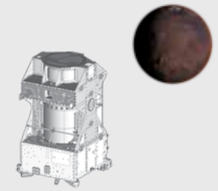
Earth and Atmospheric Observation with SmallGEO

The six satellites of the third generation of the European weather observation satellites, Meteosat Third Generation (MTG), are based on the SmallGEO platform. MTG customer EUMETSAT, with ESA as partner in the realization of the space segment, selected SmallGEO for the two configurations of the satellites with different sets of Earth and atmospheric observation sensors: Flexible Combined Imagers and Lightning Imagers on the four MTG-Imager spacecraft, and Sounder payloads on the two MTG-Sounder spacecraft. MTG operations will ensure continuous meteorological services at least until 2040.

SmallGEO, an Enabler for Interplanetary Missions

The Trace Gas Orbiter (TGO) is an integral part of the ExoMars program and the Orbiter Core Module is the major German contribution to ExoMars 2016. OHB System delivered the TGO Core Module, which strongly relies on SmallGEO design and consists of structure, propulsion system, thermal system and central parts of the electrical harness.

The Trace Gas Orbiter performs various tasks in the ExoMars program. It carried the entry and descent module of the ExoMars 2016 mission to Mars. The TGO has been used for communication with the entry and descent module of the ExoMars 2016 mission. Now, its tasks are analyses of Marsian atmospheric trace gases in order to get information on the biological and geological processes and the communication with the Rover of the ExoMars RSP (ExoMars Rover and Surface Platform Mission).



Trace Gas Orbiter Core Module





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About OHB System AG

OHB System AG is one of the three leading space companies in Europe. It belongs to the listed high-tech group OHB SE, where around 2,800 specialists and system engineers work on key European space programs. With two strong sites in Bremen and Oberpfaffenhofen near Munich and more than 35 years of experience, OHB System AG specializes in high-tech solutions for space. These include small and medium-sized satellites for Earth observation, navigation, telecommunications, science and space exploration as well as systems for human space flight, aerial reconnaissance and process control systems.

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