Thermal Insulation for space and launcher applications

Portfolio

Our portfolio encompasses a comprehensive range of thermal solutions, addressing the challenging demands of space applications. This includes thermal hardware, such us Multi-Layer Insualtion (MLI), radiator foils, and Second Surface Mirrors (SSM). Additionally, we extend our expertise to lhigh temperature thermal insulation and thermal components such as heaters, thermistors, thermostats, doublers, and interfillers.

Thermal services are tailored to meet individual specifications, with the configuration of insulation designed and manufactured according to customer requirements. The development of multi-layer-insulation blankets involves incorporating all necessary design features such as fixation interfaces, grounding points etc. by solely, relying on electronic 3D models of satellites and/or instrument structures provided by the customer.

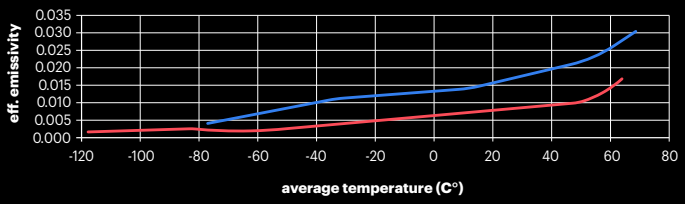
Space insulation performance

Crucial scientific and earth observation missions require reliable high performance insulation. BGA has successfully equipped a vast number of satellites with Multi-Layer Insulation protecting it from heat and cold.

BGA offers customer specified tailor made MLI layups as well as standard MLI layups as described in th examples below.

Our Standard Temperature MLI is characterized by a 10-layer package comprising polyester foils and non-woven polyester netting. Operating within a temperature range of -270 °C to +150 °C, it exhibits an area mass of 140g/m² to 160 g/m².

Heat Transfer in ESTEC Calorimeter



- Standard-Efficiency Insulation
- High-Efficiency Insulation

For applications demanding even higher temperature resilience, our High Performance MLI presents a 22-layer package featuring polyimide foils, a glass spacer in the hot section, and polyester netting in the medium temperature section. With a temperature range spanning from -270 °C to up to +350 °C, this advanced solution boasts an area mass ranging from 625 g/m² to 665 g/m².

Material	Component	Tmin °C	Tmax °C
Teflon (FEP)	Foil	-185	150
Polyethylene (PET)	Foil, Spacer	-180	185
PEEK	Foil	-185	250
Glass fabric	Foil	-196	260
Polyimide (PI)	Foil, Spacer	-270	350
Glass	Spacer	-200	600
Metall	Foil	-200	890
Ceramic	Foil, Spacer	-200	1500

Insulation for space launch vehicles

Beyond Gravity Austria develops and builds insulation for the launcher industry. From cryogenic tank insulation at liquid hydrogen and oxygen temperatures to protection of crucial high temperature exposed engine components, BGA delivers the solutions that will enable launchers to reliably achieve mission success.

Cryogenic temperature vacuum insulation

Insulation is typically installed on tank domes of cryogenically fueled stages and consists of coated polymer layers separated by thick polymer felt. Thermal insulation performance is given in ambient and vacuum conditions from approximately -250 °C to ambient temperatures.

High temperature vacuum insulation

Thermal insulation on upper-stages typically covers high temperature MLI made of glass-fabric and high-performance polymers for a temperature range up to 550 °C. Drawing from our broad experience in satellite MLI a wide variety of manufacturing techniques, materials and hardware attachment options can be offered to ideally suit your stage requirements.

Flexible thermal protection

Beyond Gravity Austria built flexible thermal protection is applied to areas in direct vicinity to rocket motors or nozzles. The insulation is suitable for temperatures up to 1500°C in ambient pressure condition and typically consists of coated or laminated ceramic fabric and ceramic felt insulators.

Depending on environmental and temperature conditions polymeric-, metallic- glass- or ceramic sewing yarns are chosen from our qualified portfolio. We apply these yarns in customized sewing machines which limit blanket compression resulting in improved insulation thermal performance.

Insulation for satellite constellations

Beyond Gravity Austria has all machinery and tooling available to supply multi-layer insulation for constellation projects with high volumes by optimizing blanket design for mass production or by industrializing built-to-print blankets designed by the customer.

As a proven supplier for industrial scale manufacturing of Multi-Layer insulation blankets, with two automated cutting systems in operation, we offer full manufacturing redundancy and thus very high reliability for required and committed delivery dates.

BGA has production and flight heritage by successfully delivering Multi-Layer-Insulation for constellations with a total of over 20 000 Blankets for 800+ Satellites.

Production Facility

The production facility for space and launcher insulation is located in Berndorf, Austria featuring:

- 300 m² of an ISO class 7 cleanroom for space insulation
- 1200 m² production hall for non-space and non-critical insulation
- 500 m² for high temperature insulation
- Automated layup winding
- Laser Cutters and cold cutting
- Semi-automated QA inspections

Our high cleanliness manufacturing processes for the cutting of blankets, electrical grounding and assembly of multi-layer insulation, Velcros/Stand-offs, attachments as well as advanced cleanliness are proven by many tests and extensive flight heritage.

A selection of successful missions with Beyond Gravity Thermal Hardware on board

Space Programms	Custiomers	Orbit
Cluster	Airbus Defence & Space	HEO
Soho Payload Module	Airbus Defence & Space	L1
Huygens	Airbus Defence & Space	Lander - Titan
Envisat Instruments	Airbus Defence & Space, Thales Alenia Space	SSO, LEO
Meteosat 2nd Generation	Thales Alenia Space	GEO
Integral Payload Module	Thales Alenia Space	HEO
Abrixas	OHB	LEO
Metop	Airbus Defence & Space	SSO, LEO
Rosetta	Airbus Defence & Space	Comet 67P
Mars Express	Airbus Defence & Space	Mars
Venus Express	Airbus Defence & Space	Venus
Rapid Eye	Jena Optronics; NASA, USA	SSO, LEO
Herschel	Airbus Defence & Space	L2
Planck	Thales Alenia Space	L2
Goce	Airbus Defence & Space	SSO, LEO
SAR-Lupe	OHB	LEO
GAIA	Airbus Defence & Space, SENER	L2
Lisa Pathfinder	Airbus Defence & Space	L1
Swarm	Airbus Defence & Space	LEO
Small GEO	OHB	GEO
EDRS-C	OHB	GEO
Iridium Next	Thales Alenia Space	LEO
Aeolus and Aladin	Airbus Defence & Space	SSO, LEO
Bepi Colombo	Thales Alenia Space	Mercury
Sentinel 3, SLSTR	Thales Alenia Space, Casa, Leonardo	SSO, LEO
EUCLID	Airbus Defence & Space	L2
Sentinel 1	Thales Alenia Space, Casa	SSO, LEO
Biomass	Airbus Defence & Space	SSO, LEO
Metop 2nd Generation	Airbus Defence & Space	SSO, LEO
Meteosat Third Generation	OHB	GEO
Galileo	OHB	LEO
OneWeb	Airbus OneWeb Satellites	LEO
Exomars TGO	OHB, Thales Alenia Space	Mars
Ariane 6	Ariane Group	Launcher
EarthCare	Airbus Defence & Space	SSO, LEO
ATLID Instrument	Airbus Defence & Space	SSO, LEO
JUICE	Airbus Defence & Space	Jupiter
SARah	OHB	LEO
James Webb Telescope	Antenna Beyond Gravity Sweden	L2