THERMAL STRAPS

High-Performance Thermal Management

Thermal straps efficiently transfer heat from a heat source to a temperature sink while minimizing the transfer of mechanical loads. The Space Dynamics Laboratory (SDL) has been pioneering solderless flexible thermal straps (also known as thermal links) since 1994.

SDL's dedicated thermal strap experts work closely with customers to meet their specific needs, including complex end-block and foil/braid geometry, gold/nickel coating, multi-layer insulation (MLI) blanketing, tight schedules, large quantities, and demanding quality assurance requirements.

FEATURES

- Clean fabrication process with no fillers, fluxes, etc.
- High mechanical flexibility
- Heat conductance with minimal temperature loss
- Weight minimization
- Fragile component protection
- Adaptable to new design parameters
- TRL-9

SPECIFICATIONS	
Conductance	0.005–10 W/K
Stiffness	Varies by design
Mass	5 g–10 kg
Material	Copper, aluminum, PGS*, etc.
Type	Foil or braid
Transfer Lengths	2 mm–2 m

**See PGS Thermal Solutions brochure for more information.*

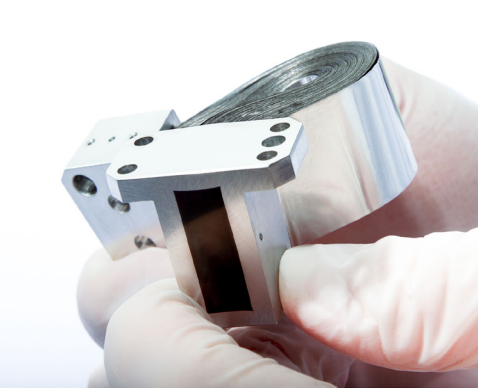
HERITAGE & EXPERIENCE

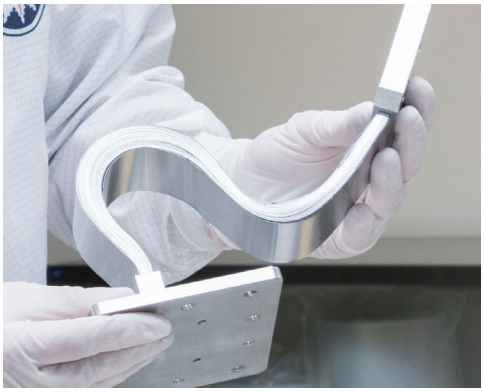
SDL designed, built, and tested the Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) instrument, which is still on orbit and has performed flawlessly since 2001. SDL developed thermal strap technology in 1994 to connect the sensitive SABER focal plane to its mini pulse-tube cryocooler and has been fabricating straps ever since. In addition to the SABER instrument, SDL has designed, built, and tested space and airborne instruments since 1959.

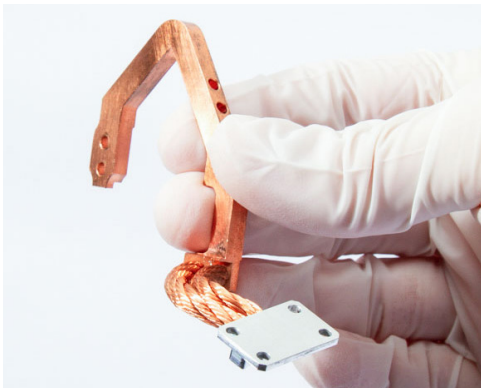
SDL has built straps for a wide range of customers, programs, and applications, including the following:

- James Webb Space Telescope (JWST)
- Wide-field Infrared Survey Explorer (WISE)
- Mars Science Laboratory's Curiosity rover
- Ionospheric Connection Explorer (ICON) MIGHTI
- Joint Polar Satellite Program (JPSS) VIIRS
- Landsat 8 OLI & TIRS
- Geostationary Operational Environmental Satellite (GOES) GLM
- ESA's Copernicus Sentinel missions
- Mars Reconnaissance Orbiter (MRO)
- Numerous commercial programs & defense applications
- Airborne instruments, terrestrial applications & GSE (Ground Support Equipment)

SDL employs expert engineers and technicians with decades of experience working on spaceflight programs ranging from large instruments to small satellites. Engineers and machinists work closely from the initial request for quote through delivery to ensure manufacturability and full requirement compliance.







UTAH STATE UNIVERSITY
SPACE DYNAMICS LABORATORY®

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SDL/11-224 Rev. H

THERMAL STRAPS High-Performance Thermal Management

ON-SITE TESTING & SERVICES

Our on-site end-to-end solutions include design, fabrication, and testing.

Thermal Testing

- Conductance tests simulating end-use conditions
- Sink temperature range: 4 K to 318 K (–269°C to 45°C)
- Typical vacuum pressures: 10^{-6} to 10^{-7} Torr
- Interface filler: indium, gold, dry, or custom
- Lakeshore DT-670-CU silicon diode & CX-1070-CU Cernox temperature sensors
- Lakeshore 218 & 224 temperature monitors
- Thermal cycling (vacuum, air, or inert gas) from 4 K to ≥398 K (–269°C to ≥125°C), depending on environment

Mechanical Testing

- Vibration testing with force- & moment-limiting capability
- Flexibility/stiffness
- Mechanical cycling/fatigue for >100,000 cycles

Contamination Control

- Cleanliness verification per IEST-STD-CC1246 & specifications
- Outgassing testing per ASTM E595 & custom specifications
- Custom vacuum bakeout & QCM-based outgassing measurements
- Chemical analysis (FTIR & GCMS) of NVR samples
- Prohibited materials screening using x-ray fluorescence

MLI Blanketing

- Design
- Fabrication & installation
- Thermal strap-specific blankets
- Particulate filtration
- Electrical grounding

Fabrication & Inspection

- 73+ combined years of experience machining thermal straps
- CMM measurement for verification of GD&T per ASME Y14.5
- Dimensional inspections traceable to NIST standards

IN-HOUSE FACILITIES

SDL has the expertise, in-house facilities, and support services to meet the most stringent link requirements.

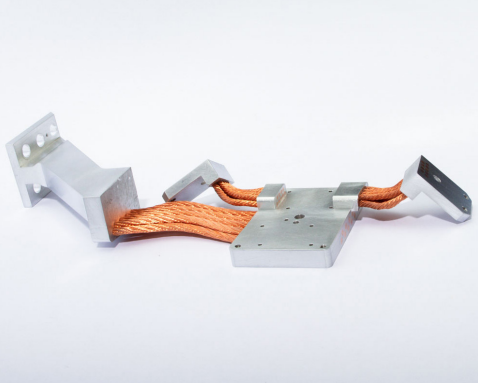
- State-of-the-art machine shop
- Class 10,000 (ISO 7) & Class 100 (ISO 5) clean work areas
- Multiple vacuum conductance test chambers
- Standardized or custom flex testing equipment
- 13,000 lbf shaker table & slip table for vibration testing with state-of-the-art vibration controller
- High-vacuum chambers with quartz crystal microbalances (CQCM & TQCM) for bakeout & outgassing testing
- Multiple precision cleaning facilities dedicated to spaceflight hardware with particulate & NVR certification capabilities

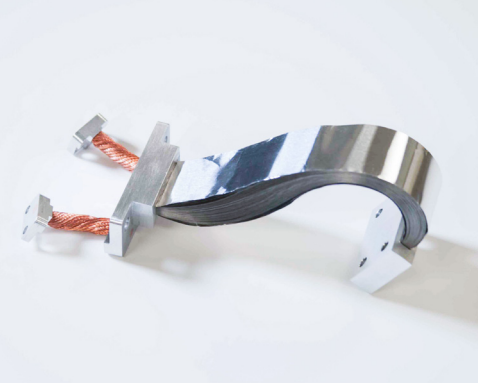
HIGH-QUALITY DELIVERABLES

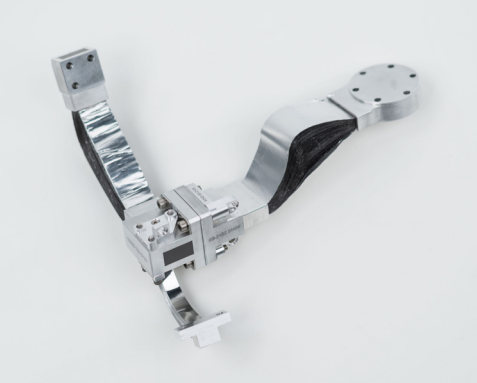
We are committed to high-quality engineering practices. Our quality management system is certified to the AS9100D standard, and our thermal strap quality control provides the following:

- Two-way material traceability
- GIDEP supply chain supplier
- Vetted material suppliers
- Certified data packages

For more information about SDL's thermal strap solutions, please contact:
thermal@sdl.usu.edu
435.999.7877







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