

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. SDL has been pioneering solderless flexible thermal straps (a.k.a. thermal links) since 1994.

Our dedicated thermal strap experts work closely with you to meet your specific needs, including complex end-block and foil/braid geometry, gold/nickel coating, MLI blanketing, tight schedules, large quantities, and demanding quality assurance requirements.

FEATURES

- Uses an inherently clean fabrication process with no fillers, fluxes, etc.
- Has a high degree of mechanical flexibility
- Conducts heat with minimal temperature loss
- Minimizes weight
- Protects fragile components
- Adapts easily to new design parameters
- TRL-9

STRAP SPECIFICATIONS

CONDUCTANCE	0.005 – 10 W/K
STIFFNESS	Typically <1 N/mm all axes
MASS	5 g – 10 kg
MATERIAL	Copper, aluminum, PGS*, etc.
TYPE	Foil or braid
TRANSFER LENGTHS	2 mm – 2 m

*see PGS thermal strap brochure for more information

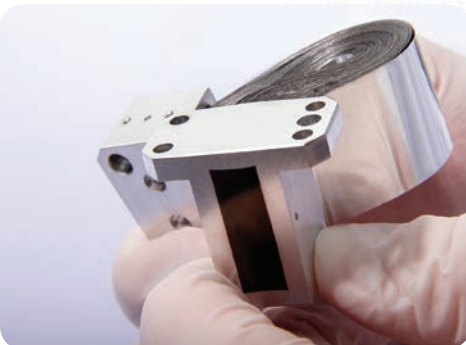
HERITAGE & EXPERIENCE

SDL designed, built, and tested the SABER instrument, which is still on orbit and performing flawlessly since 2001. We developed this thermal strap technology in 1994 to connect the sensitive SABER focal plane to its mini pulse-tube cryocooler, and have been fabricating straps ever since. In addition to the SABER instrument, SDL has been designing, building, and testing space and airborne instruments since 1959.

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

- 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

In addition to SDL's seasoned, full-time thermal strap staff, 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.



Space Dynamics
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THERMAL STRAPS

ONSITE TESTING & SERVICES

SDL provides end-to-end solutions including design, fabrication, and testing— all performed onsite.

• 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 bake out & 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+ man-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, including:

- 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 (QCM & TQCM) for bake out & outgassing testing
- Multiple precision cleaning facilities dedicated to spaceflight hardware with particulate & NVR certification capabilities

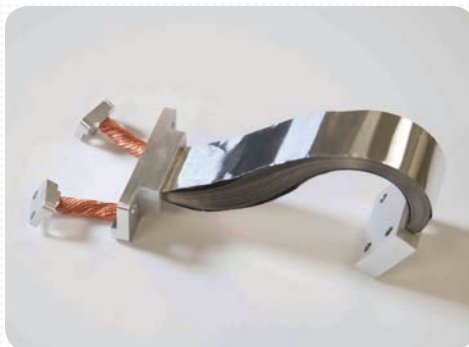
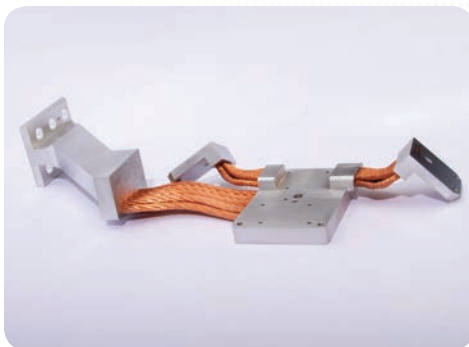
HIGH-QUALITY DELIVERABLES

SDL's established Quality Assurance (QA) procedures have been developed and proven over 50 years and have ensured the success of over 430 space missions and over 500 deployed hardware and software ground systems.

SDL is ISO 9001:2015 certified and has been ISO registered by DQS UL since 1999.

Thermal strap quality control provides:

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



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