

## *SuperTran Cryostats*

# **ST-500 and ST-500UC** optical microscopy cryostats

The Lake Shore **ST-500** and **ST-500UC** are the premier low-vibration cryostats for microscopy, imaging, and high spatial resolution photoluminescence. Both models offer short working distance (for use with high magnification optics), nanometer-level vibration and positional drift, and convenient mounting to common microscope stages. They can be combined with the RGC4 recirculating cooler for cryogen-free operation.



## ST-500 and ST-500UC optical microscopy cryostats

The Lake Shore SuperTran ST-500 and ST-500UC cryostats from Lake Shore Cryotronics provide variable temperature sample cooling combined with nanometer-level vibrations, and are ideal for microscopy applications including micro-Raman and micro-PL. The ST-500 is optimized for use with either LHe or LN<sub>2</sub>, while the ST-500UC is ideal for routine LN<sub>2</sub> use, with occasional operation using LHe.

Both cryostats offer working distance (from microscope objective lens to sample) as small as 1 mm. The sample can be accessed and exchanged from the top of the cryostat without the need to disassemble the cryostat or remove it from the microscope. The ST-500 offers transmission geometry, and both models can be equipped with a variety of window materials.

The ST-500 or ST-500UC can be combined with the RGC4 recirculating gas cooler for fully cryogen-free operation throughout the entire temperature range. The RGC4 enables unattended cryostat operation, ideal for extended duration measurements.

A vacuum shroud extension option permits the ST-500 and ST-500UC to fit within restricted spaces (such as in a superconducting magnet bore or electromagnet pole gap), while the LGV large vacuum shroud option enables mounting very large samples (such as semiconductor wafers) or multiple samples simultaneously.

### Key features

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Sample-in-vacuum configuration, with continuous operation using the included high-efficiency transfer line

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Optional DC and RF wires and cables for electrical measurements

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Sample is easily accessed from the top of the cryostat

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Top window provides optical access, with objective lens to sample working distance as little as 1 mm

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Continuous temperature range from 3.5 K to 475 K (ST-500) or 6 K to 475 K (ST-500UC)

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Compatible with RGC4 recirculating gas cooler for cryogen-free operation

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Spare o-ring sealed ports accept DC and RF electrical feedthroughs

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Variable temperature sample mount and sample holder, with temperature regulated by internal heater and calibrated silicon diode (and external temperature controller)

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## ST-500/ST-500UC

### Featured components

19 mm (0.75 in) diameter copper sample mount

Integrated control heater and calibrated silicon diode control sensor

High-efficiency, flexible LHe/LN<sub>2</sub> transfer line

152 mm (6 in) vacuum shroud with epoxy-sealed UV-grade fused silica top window, 25 mm (1 in) clear view by 1.6 mm thick

Epoxy-sealed UV-grade fused silica bottom window, 25 mm (1 in) clear view by 1.6 mm thick (ST-500 only)

Integrated supply and return bayonets

10-pin electrical feedthrough, spare o-ring sealed feedthrough port, evacuation valve, and safety pressure relief valve (ST-500-UC); ST-500 top plate can lift in the case of over-pressure

## Selections

### Working distance

ST-500: 1 mm to 31 mm

ST-500UC: 1 mm to 7 mm

### Transfer line

6 ft (182.8 cm) standard flex length

Custom flex length [consult Lake Shore](#)

Right angle leg(s) [consult Lake Shore](#)

## Easily add DC, AC, and mixed DC+AC measurement capabilities to your cryostat with an M81-SSM

This modular, multichannel system provides highly synchronized DC, 100 kHz AC, and mixed DC + AC sourcing and measuring — including both voltage and current lock-in measurement capabilities — for low-temperature material research performed in your cryostat. It supports up to three remote-mountable source and three measure modules per a single M81-SSM-6 instrument and, owing to its modularity, allows signal and source amplifiers to be located as close as possible to the sample being characterized. This minimizes the signal wiring to the sample, reduces noise, and increases measurement sensitivity. The modules also leverage patent-pending MeasureSync™ real-time sampling technology to ensure synchronous sourcing and measuring across all channels. Plus, by having both DC and AC sourcing and measurement in one instrument, the M81-SSM can eliminate the need for mixed-instrument setups, greatly simplifying the setup of complex characterization configurations.



M81-SSM synchronous source measure system

Real-time sampling architecture for synchronous sourcing/measuring

All source and measure channels are capable of DC and AC to 100 kHz signals

100% linear circuitry for the lowest possible source/measure noise

Optimized for fundamental, harmonic, and phase AC plus DC biased measurements

Unique, flexible instrument/distributed module architecture

Provides the absolute precision of DC plus the detection sensitivity performance of AC instrumentation

Uses a clean, simple UI and common programming API for fast setup

Included MeasureLINK software enables full end-to-end measurement and cryostat temperature control

# MeasureLINK™

## Options

### Windows

Custom window options are available, including IR-grade fused silica, diamond, polyethylene, beryllium (dome or disc), KBr, or KRS-5. Contact Lake Shore for more information.

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UV-grade fused silica: 10 mm clear view by 0.5 mm thick  
[WT-ST-500-020-FS](#)

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ZnSe: 25 mm clear view by 1.6 mm thick [WT-ST-500-062-ZNSE](#)

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Sapphire: 25 mm clear view by 0.5 mm thick  
[WT-ST-500-020-SAPPHIRE](#)

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CaF<sub>2</sub>: 25 mm clear view by 2 mm thick [WT-ST-500-080-CAF2](#)

### Snout extension

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For permanent magnet [ST-500-EXT-PM](#)

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For bore of superconducting magnet [ST-500-EXT-SCON](#)

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For pole gap of electromagnet [consult Lake Shore](#)

### Other options

The modular ST-500 cryostat can be customized with different vacuum shroud designs to suit your unique application. Options include adding a large vacuum shroud extension (ST-500-LGV) for added space inside the sample area, or the addition of nanopositioners (ST-500-NANO). Contact Lake Shore to discuss your specific requirement

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Cooled radiation shield window (ST-500 only)  
[WT-ST-500-SHIELD](#)

### Sample holders

Special sample holders are also available, including diamond anvil cell (DAC) and resistivity options. Contact Lake Shore for more information.

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DIP (with cooled radiation shield window)

## For total control of measurements performed in a cryostat, add our MeasureLINK software

Our optional MeasureLINK software enables a wide range of capabilities including charting and logging, system monitoring with a cryostat-specific process view, and even controlling Lake Shore equipment as well as some third-party instrumentation, in a non-programming environment. You can also create unlimited functionality using the scripting development environment.

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Create multiple configurations to support separate measurements

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Monitor temperature and change setpoints with the monitor pane

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Easily create nested, multi-level measurement loop sequences

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See real-time internal cryostat temperatures in Process View

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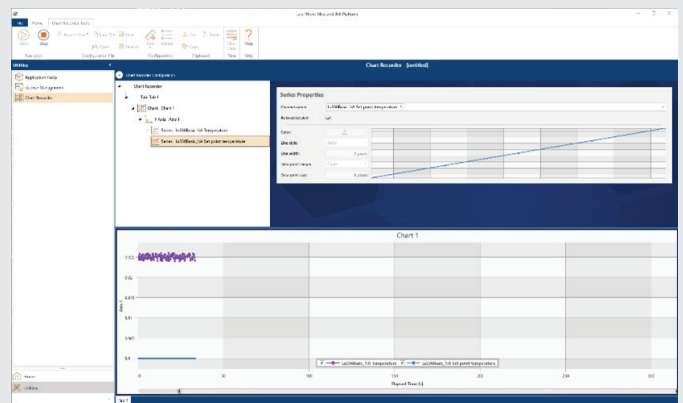
Charts and log all system variables with Chart Recorder

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No programming required — drag and drop to create temperature sweeps, access measurements, and add third-party instruments

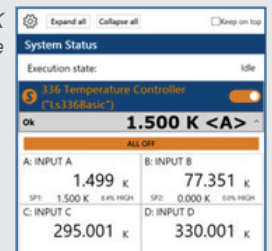
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Custom scripting function allows you to construct new and edit existing measurement scripts



The chart recorder utility enables charting and logging of all system variables, for example, so you can keep a close eye on temperature trends in a cryostat experiment in real-time; it also helps you determine when steady-state conditions have been reached.

MeasureLINK  
Monitor Pane



# MeasureLINK™

## Options

### Electrical feedthroughs

(1) BNC grounded	EF-BNC-1-B-AL
(2) BNC grounded	EF-BNC-2-S-AL
(6) BNC grounded	EF-BNC-6-G
(1) BNC insulated	EF-BNC-1-B-NC
(2) BNC insulated	EF-BNC-2-S-NC
(6) BNC insulated	EF-BNC-6-I
(1) triaxial grounded	EF-TRIAX-1-B-AL
(6) triaxial grounded	EF-TRIAX-6-G
(1) triaxial insulated	EF-TRIAX-1-B-NC
(6) triaxial insulated	EF-TRIAX-6-I
(2) SMA grounded	EF-SMA-2-B-AL
(6) SMA grounded	EF-SMA-6-G
(2) SMA insulated	EF-SMA-2-B-NC
(6) SMA insulated	EF-SMA-6-I
10-pin	10P-ASSEMBLY
19-pin	19P-ASSEMBLY
26-pin	26P-ASSEMBLY
32-pin	32P-ASSEMBLY

### Additional temperature sensors

**One Lake Shore calibrated diode is now included on every cryostat as the control sensor**

Silicon diode, calibrated	DT-670-CU-HT-1.4L
Cernox® magnetic field independent, calibrated	CX-1050-CU-HT-1.4M

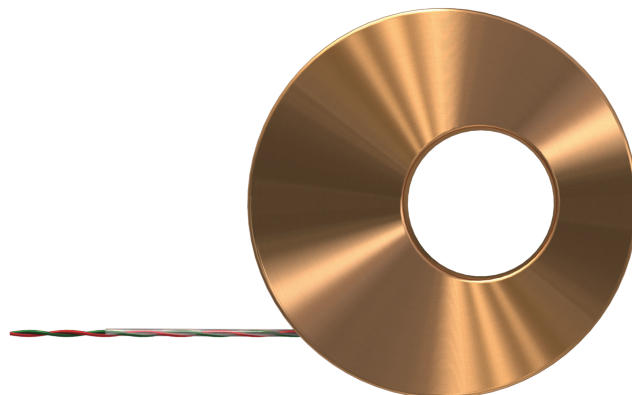
### Installed wiring

(1), (2), or (6) coaxial cables, SMA	CABLEASSY-63340
(1), (2), or (6) coaxial cables, BNC	CABLEASSY-63342
(1) or (6) triaxial cables	CABLEASSY-63341
(10), (19), (26), or (32) PhBr wires	WIRE-PHBR

## Accessories

Available at [www.lakeshore.com](http://www.lakeshore.com)

LHe storage Dewar	CF-100
LN <sub>2</sub> storage Dewar	LN-50
Vacuum pumping station	10RVP, 10DDP, or TS-85-D
Temperature controller	325, 335, or 336

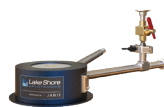


Cernox CU-HT sensor

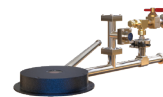


336 temperature controller

## Specifications



ST-500



ST-500UC

Initial cooldown time (LHe to 5 K)	~30 min	
Temperature range	3.5 K to 475 K	<6 K to 475 K
Typical temperature stability <sup>1</sup>	±50 mK	
Orientation <sup>2</sup>	Any	
Cryogen consumption (LHe room to base temp)	~1 L	
Cryogen consumption (LHe at 5 K)	1.1 L/h	2.5 L/h (at 6 K)
Cryogen consumption (LHe at 10 K)	0.5 L/h	0.8 L/h
Cryogen consumption (LHe at 20 K)	0.2 L/h	0.4 L/h
Cryogen consumption (LN <sub>2</sub> at 80 K)	0.1 L/h	0.1 L/h
Initial vacuum level requirement <sup>3</sup>	~10 <sup>-4</sup> Torr	
Typical base pressure during operation	~10 <sup>-5</sup> Torr	
Nominal vibration amplitude	±10 nm	
Positional drift	±2 nm/min	

## Size

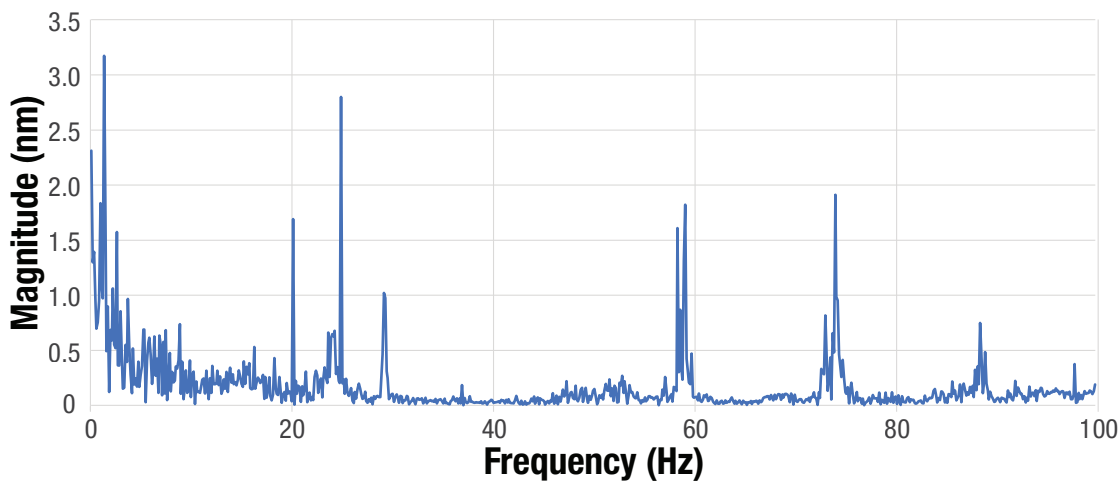
Height	67 mm (2.62 in)	29.5 mm (1.16 in)
Inner diameter (at sample region)	73 mm (2.9 in)	59 mm (2.3 in)
Sample mount diameter	19.05 mm (0.75 in)	
Weight (excluding transfer line)	3.2 kg (7 lb)	2.3 kg (5 lb)
Shipping weight (cryostat only)	8.6 kg (19 lb)	
Shipping weight (transfer line)	9.1 kg (20 lb)	
Shipping dimensions (cryostat only)	762 × 508 × 508 mm (30 × 20 × 20 in)	
Shipping dimensions (transfer line)	2057.4 × 660.4 × 127 mm (81 × 26 × 5 in)	

<sup>1</sup> Measured with temperature controller

<sup>2</sup> Cryogen consumption may be higher during non-vertical operation

<sup>3</sup> Pressure measured at room temperature, prior to adding cryogens

## Typical vibration of an ST-500 sample mount at 4.2 K





## Ordering information

### Options

#### Windows

Custom window options are available, including IR-grade fused silica, diamond, polyethylene, beryllium (dome or disc), KBr, or KRS-5. Contact Lake Shore for more information.

<b>WT-ST-500-062-FS</b>	UV-grade fused silica, 10 mm clear view by 0.5 mm thick
<b>WT-ST-500-062-ZNSE</b>	ZnSe, 25 mm clear view by 1.6 mm thick
<b>WT-ST-500-020-SAPH</b>	Sapphire, 25 mm clear view by 0.5 mm thick
<b>WT-ST-500-080-CAF2</b>	CaF <sub>2</sub> , 25 mm clear view by 2 mm thick

#### Snout extension

<b>ST-500-EXT-PM</b>	For permanent magnet
<b>ST-500-EXT-SCON</b>	For bore of superconducting magnet
<b>CONSULT</b>	For pole gap of electromagnet

#### Other options

The modular ST-500 cryostat can be customized with different vacuum shroud designs to suit your unique application. Options include adding a large vacuum shroud extension (ST-500-LGV) for added space inside the sample area, or the addition of nanopositioners (ST-500-NANO). Special sample holders are also available. Consult Lake Shore sales to discuss your specific requirement.

<b>WT-ST-500-SHIELD</b>	Cooled radiation shield window (ST-500 only)
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#### Sample holders

<b>CONSULT</b>	DIP (with cooled radiation shield window)
<b>CONSULT</b>	Diamond anvil cell (DAC) or resistivity options

#### Electrical feedthroughs

<b>EF-BNC-1-B-AL</b>	(1) BNC grounded
<b>EF-BNC-2-S-AL</b>	(2) BNC grounded
<b>EF-BNC-6-G</b>	(6) BNC grounded
<b>EF-BNC-1-B-NC</b>	(1) BNC insulated
<b>EF-BNC-2-S-NC</b>	(2) BNC insulated
<b>EF-BNC-6-I</b>	(6) BNC insulated
<b>EF-TRIAx-1-B-AL</b>	(1) triaxial grounded
<b>EF-TRIAx-6-G</b>	(6) triaxial grounded
<b>EF-TRIAx-1-B-NC</b>	(1) triaxial insulated
<b>EF-TRIAx-6-I</b>	(6) triaxial insulated
<b>EF-SMA-2-B-AL</b>	(2) SMA grounded
<b>EF-SMA-6-G</b>	(6) SMA grounded
<b>EF-SMA-2-B-NC</b>	(2) SMA insulated
<b>EF-SMA-6-I</b>	(6) SMA insulated
<b>10P-ASSEMBLY</b>	10-pin
<b>19P-ASSEMBLY</b>	19-pin
<b>26P-ASSEMBLY</b>	26-pin
<b>32P-ASSEMBLY</b>	32-pin

#### Additional temperature sensors

<b>DT-670-CU-HT-1.4L</b>	Silicon diode, calibrated (one included with cryostat)
<b>CX-1050-CU-HT-1.4M</b>	Cernox® magnetic field independent, calibrated

#### Installed wiring

<b>CABLEASSY-63340</b>	(1), (2), or (6) coaxial cables, SMA
<b>CABLEASSY-63342</b>	(1), (2), or (6) coaxial cables, BNC
<b>CABLEASSY-63341</b>	(1) or (6) triaxial cables
<b>WIRE-PHBR</b>	(10), (19), (26), or (32) PhBr wires

### Accessories

#### M81-SSM electronic synchronous source measure system

Contact us for standard/optical sample mounts or for interface cables/adapters for M81-SSM system/cryostat integration. Also available: specially priced preconfigured M81-SSM/cryostat packages for certain cryostat models—contact Sales for details.

<b>M81-SSM-2</b>	M81-SSM instrument with 1 source and 1 measure channel, including M81-SSM accessory kit (USB-A to USB-C adapter, USB-A male to USB-B male cable, terminal connectors for digital I/O, terminal connectors for chassis ground, quick-start guide) and a 2 m (6.6 ft) LEMO to BNC adapter cable
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<b>M81-SSM-4</b>	M81-SSM instrument with 2 source and 2 measure channels, including M81-SSM accessory kit (USB-A to USB-C adapter, USB-A male to USB-B male cable, terminal connectors for digital I/O, terminal connectors for chassis ground, quick-start guide) and a 2 m (6.6 ft) LEMO to BNC adapter cable
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<b>M81-SSM-6</b>	M81-SSM instrument with 3 source and 3 measure channels, including M81-SSM accessory kit (USB-A to USB-C adapter, USB-A male to USB-B male cable, terminal connectors for digital I/O, terminal connectors for chassis ground, quick-start guide) and a 2 m (6.6 ft) LEMO to BNC adapter cable
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<b>ML-MCS</b>	MeasureLINK-MCS software with scripting development license. Includes complete MeasureLINK installation with Lake Shore instrument drivers, chart recorder functionality and drag-and-drop measurement sequences. Some application packs sold separately.
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#### Other accessories

<b>CF-100</b>	100 L LHe storage Dewar
<b>LN-50</b>	50 L LN <sub>2</sub> storage Dewar
<b>10RVP</b>	Vacuum pumping station
<b>10DDP</b>	Vacuum pumping station
<b>TS-85-D</b>	Turbomolecular pumping station
<b>336</b>	Model 336 temperature controller
<b>335</b>	Model 335 temperature controller
<b>325</b>	Model 325 temperature controller



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[www.lakeshore.com](http://www.lakeshore.com)



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