

ST-500 series

Variable temperature cryostats



The Janis ST-500 series probe stations are high-performance research instruments designed to provide affordable vacuum and cryogenic probing of wafers and devices. The proven ST-500 cryostat is the platform for these probe stations and includes low vibration technology (originally designed for high spatial resolution optical microscopy) to provide outstanding sample positional stability. Researchers around the world are using these systems to conduct research in a wide variety of fields, including MEMS, nanoscale electronics, superconductivity, ferroelectrics, material sciences, and optics.

ST-500-EM

- Room temperature, water-cooled electromagnet with a variable horizontal magnetic field of up to 0.6 T (6000 G) with typical field homogeneity of 2% over a 25 mm diameter (1% over 10 mm diameter)
- Up to four interchangeable probe arms
- Open-cycle probe station option based on low vibration, microscopy ST-500 cryostat
- Closed-cycle (cryogen-free) probe station option
- Gaussmeter and Hall probe to measure magnetic field
- Optional, unipolar, high stability, air-cooled power magnet power supply
- Optional bipolar, high stability, water-cooled power magnet power supply
- Optional manually controlled, precision rotary stage with a minimum step size of 1°
- Note: Would increase the base temperature by a few degrees
- Optional attocube nano-positioner rotary stage with a minimum step of 1 millidegree
- Note: Would increase the base temperature by a few degrees
- Optional software to perform electrical measurements using cryogen-free horizontal field electromagnet probe system
- Optional special miniature vacuum chamber to transfer sample under vacuum from glove box to probe station

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UHV probe stations

Janis offers a complete range of probe stations suitable for making electrical measurements in a UHV environment. Several standard designs are available, and systems can be custom configured to meet a wide variety of user requirements.

ST-SCON

Superconducting magnets in the ST-SCON model offer a variable vertical magnetic field up to 3 T with typical field homogeneity of 5% over a 10 mm diameter.

ST-500-PM

ST-500-PM The ST-500-PM models incorporating permanent magnets are available for magnetic field dependent measurements. These systems are ideal for the study of magneto-optical and magneto-electrical properties in a variety of experiments, including quantum dots, spintronic devices, and nanoscale electronics. These are available in horizontal or vertical configurations.

Horizontal magnetic field parallel to the sample mount plane — two inexpensive cylindrical permanent magnets to create a variable horizontal magnetic field up to 1000 G.

Vertical magnetic field perpendicular to the sample mount plane — an inexpensive set of six permanent ring magnets create a vertical magnetic field that can be step varied between 2000 G and 300 G.

Optional Items for probe stations

- Additional interchangeable probe arms
- Additional vacuum chamber ports for a possible future upgrade with more probe arms
- Special miniature vacuum chamber to transfer sample under vacuum from the glove box to probe station
- Moveable sample holder
- attocube nano-positioner linear movement or rotary stages incorporated into probe station
- Additional electrical feedthroughs with cables and wires to sample area
- Special optical windows including side and bottom window configurations and different window materials
- Additional metering flow control valve with variable flow (3.6 to 72 Torr/s) to introduce different gases into the vacuum chamber
- System customization options
- Automatic temperature controllers
- Turbo pumping station including a with a back-up mechanical pump or oil-free diaphragm pump
- Pump-line vibration isolator between the pump and the probe station
- Pneumatic vibration isolation table with or without a portable ultra-quiet air compressor
- Mechanical pumping station for operation below 4.5 K by pumping helium vent port
- Liquid nitrogen storage Dewar with inlet adapter to accept the probe station transfer line
- Low vapor pressure thermal anchoring greases
- Looking for a cryogen-free option for your existing "wet" probe station? Optional recirculating gas cooler eliminates the use of liquid helium for "wet" systems.

UHV-ST-400 specifications	
Operating temperature	5 K to 700 K
Sample size	25 to 50 mm diameter (100 mm optional)
Vibration level	<1 μ m
Probe coverage	14 to 50 mm diameter (100 mm optional)

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ST-500 series specifications	
Vibration level	±25 nm
Positional drift	±150 nm in 30 min
Vacuum environment	Regular vacuum (~10 ⁻⁵ to 10 ⁻⁶ mbar)
	High vacuum (~10 ⁻⁶ to 10 ⁻⁷ mbar)
	Ultra-high vacuum (~10 ⁻⁸ to 10 ⁻⁹ mbar)
Temperature range	~3.5 K to 475 K (DC probes) (650 K optional)
	~3.5 K to 450 K (MW probes) (300 K to 535 K optional)
Cryogenic consumption	Helium: less than 1 L/h; nitrogen: less than 0.1 L/h
Temperature stability	±50 mK
Cooling time (for standard 2 in diameter sample mount)	~30 min to 10 K, ~60 min to 5 K
Warming up time	~45 min with quick warming up option (~4 h without)
Sample mounts	Grounded sample holder
	2 in (51 mm) diameter standard
	up to 8 in (203 mm) optional
	Electrically Isolated sample holder with bias voltage coaxial cable
	Special sample holder for light transmission experiments
	Leadless chip carrier (LCC) holder
Interchangeable probe arms	DC/LF probes: DC to 20 MHz with following tips available:
	Tungsten tips with 0.1 to 200 µm tip radius (optional gold plating)
	Special tungsten bendable shank and tip (cat whisker) tips
	Beryllium copper soft tip with low contact resistance
	Coaxial or triaxial (a few fA leakage current) wiring
Microwave probes	0 to 40 GHz
	0 to 50 GHz
	0 to 67 GHz
Fiber probes	Single mode
	UV-VIS or VIS-IR multimode
Multi-tip probes	
Optical top viewport access:	Standard 2.0 in (51 mm) clear aperture
	Optional up to 8 in (203 mm) clear view
Monoscopes with LCD 19 in monitor or USB camera and smooth travel stages	7.1 zoom, 5 µm resolution (216× magnification)
	12.5:1 zoom, 3.4 µm resolution (508× magnification)
	16.1 zoom 2.2 µm (626× magnification)

Probe travel	ST-500-1	ST-500-2
X-axis	1 in (25 mm)	2 in (51 mm)
Y-axis	1 in (25 mm)	2 in (51 mm)
	(15 mm with MW probes)	(45 mm with MW probes)
Z-axis	10 mm (18 mm optional)	10 mm (18 mm optional)
X-, Y-, Z-axes probe translation (incremental units of graduation)	10 µm	12.5 µm
Probe translation resolution: X-, Y-, Z-axes	5 µm	6.25 µm
Motorized stages with much higher translation resolution are available		

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ST-SCON specifications		
Vibration level	Less than 1 μm	
Vacuum environment	$\sim 10^{-5}$ to 10^{-6} mbar	
Temperature range	5 K to 420 K (with possible field limitation at the higher temperatures)	
Conductively cooled 3.0 T solenoid with vertical field direction	Homogeneity of 5% over a 10 mm diameter and an operating current of approximately 35 A	
Cryogenic consumption	Helium: ~ 2.5 L/h;	
	Nitrogen: less than 0.1 L/h (without magnetic field)	
Temperature stability	± 50 mK	
Cooling time (for standard 2 in diameter [50 mm] sample mount)	~ 2 h	
Warmup time	~ 3 h with quick warming up option (~ 5 to 6 h without)	
Sample mounts	Grounded sample holder	
	2 in (50 mm) diameter	
	Electrically isolated sample holder with bias voltage coaxial cable	
	Triaxially guarded sample holder with cryogenic triaxial cable	
	Special sample holder for light transmission experiments	
Up to 6 interchangeable probe arms	DC/LF probes: DC to 20 MHz with following tips available:	
	Tungsten tips with 0.1 to 200 μm tip radius (optional gold plating)	
	Special tungsten bendable shank and tips (cat whisker)	
	Beryllium copper soft tip with low contact resistance	
	Coaxial: recommended for currents higher than 1 pA	
	OR	
Microwave probes	Triaxial with leakage current of 1 fA to 2 fA at 1 V: recommended for currents lower than 1 pA	
	0 to 40 GHz	
	0 to 50 GHz	
Fiber probes	0 to 67 GHz	
	Single mode	
Optical top viewport access (different window materials available)	UV-VIS or VIS-IR multimode	
	Standard 2.0 in (51 mm) clear aperture window	
Radiation shield optical top viewport access (different window materials available including IR-absorbing)	Optional up to 3 in (76 mm) clear view window	
	Standard 2.0 in (51 mm) clear view window	
Ultra-high stability, bipolar, four-quadrant superconducting magnet DC power supply	Optional up to 3 in (76 mm) clear view window	
	1 mA/h stability, with programmable field sweep capabilities and IEEE-488 or RS-232 interface. Includes digital displays of magnet current (0.1 mA resolution), magnetic field, setpoint, sweep rate (as low as 0.1 mA/s) as well as a magnet or power supply voltage, a built-in persistent switch heater power source, and a quench protection/ramp-down circuit.	
Monoscopes with LCD 19 in monitor or USB camera and precise translation stages	6.4:1 zoom, 5 μm resolution (216 \times magnification)	
	12.5:1 zoom, 3.4 μm resolution (508 \times magnification)	
	16.1 zoom 2.2 μm (626 \times magnification)	
Probe travel	ST-1	ST-2
X-axis	1 in (25 mm)	2 in (50 mm)
Y-axis	1 in (25 mm)	2 in (50 mm)
	(15 mm with MW probes)	(40 mm with MW probes)
Z-axis	10 mm (18 mm optional)	10 mm (18 mm optional)
X-Y-Z axes probe translation (incremental units of graduation)	10 μm	12.5 μm
Probe translation resolution: X-Y-Z axes:	5 μm	6.25 μm
Optional motorized stages with translation resolution up to 0.1 μm		