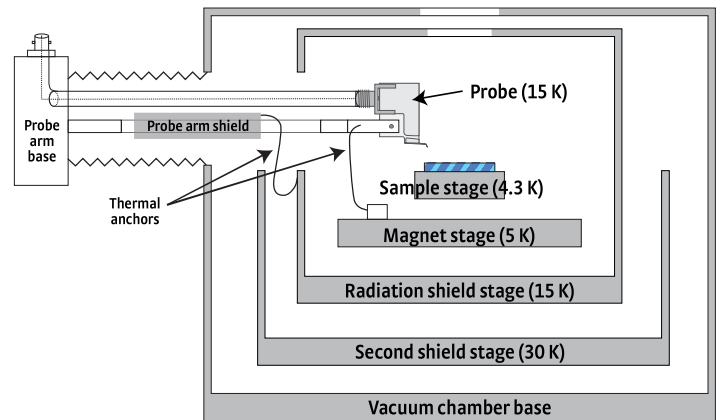


CPX-VF

Superconducting magnet-based vertical field probe station



- Standard probing plus out-of-plane vertical field superconducting magnetic measurements
- Multiple radiation shields for best low temperature performance
- Minimizes sample condensation during cooldown
- True 90° probing
- Customizable for Hall measurements
- Customizable up to 3 T with specialized probes

The Lake Shore CPX-VF probe station enhances the standard probe station capabilities with the addition of a ± 2.5 T vertical field superconducting magnet. It can do all the standard C-V, I-V, microwave, and electro-optical probing of the CPX, plus out-of-plane vertical field superconducting magnetic measurements. Researchers can use it for performing Hall effect measurements and testing magneto-transport parameters. The CPX-VF is one of Lake Shore's premium probe stations for combining microwave measurements with magnetic field.

Description and specification

Sample cooling assembly

Type: 1 + 3-stage split flow cryostat (sample + magnet + 2 radiation shields); dual exhaust ports with independent flow control of sample and magnet

Radiation shielding: Magnet radiation shield; main radiation shield with top viewport surrounds sample; outer second (partial) radiation shield

Cooling source: Liquid helium (LHe)

Magnetic field

Magnet type: Superconducting solenoid
 Field orientation: Vertical (perpendicular to the sample plane)
 Field control: Current control
 Field capability: ± 25 kOe (± 2.5 T)
 Field homogeneity: 0.5% over 10 mm diameter; 1.0% over 25 mm diameter
 Landed probe tip movement: $< 5 \mu\text{m}$ full field ramp

Temperature¹

Base temperature	Control range	Configuration
4.3 K	4.4 K to 420 K	Up to 6 probe arms installed
1.9 K	2 K to 420 K	with PS-LT option

Control stability

Sample stage temperature	Helium stability
Base temperature (no heater control)	± 15 mK
< 10 K	± 50 mK
10 K to 100 K	± 20 mK
100 K to 250 K	± 15 mK
251 K to 350 K	± 15 mK
351 K to 420 K	± 50 mK

The CPX-VF is designed to enable true 90° wafer probing on wafers up to 51 mm (2 in) in diameter. The sample can be maintained at elevated temperature during cooldown reducing the potential for condensation, a critical requirement for measuring organic materials. The continuous refrigeration station uses liquid helium and can be operated with liquid nitrogen; however, the superconducting magnet requires liquid helium to operate. The CPX-VF operates over a temperature range of 4.2 K to 420 K with the option to extend the base temperature to 2 K.

Vacuum

	Standard TPS-FRG	PS-HV-CPX option
Pump down time	30 min (to reach $<1 \times 10^{-3}$ Torr)	10 min (to reach $<1 \times 10^{-3}$ Torr)
Room temperature	$<5 \times 10^{-4}$ Torr	$<5 \times 10^{-6}$ Torr
Helium base temperature	$<1 \times 10^{-5}$ Torr	$<5 \times 10^{-7}$ Torr
Maximum temperature	$<5 \times 10^{-6}$ Torr	$<5 \times 10^{-7}$ Torr

Cycle time (LHe):	4 h
Pump down time:	0.5 h
Station cooldown:	2 h
Station warmup:	1.5 h

Vibration at sample

	Standard	PS-PVIS option
X axis	<300 nm (11.8 μ m)	<30 nm (1.18 μ m)
Y axis		
Z axis		

Sample

Maximum sample size:	51 mm (2 in) diameter
Sample backside optical access:	Not an option
Sample rotation:	$\pm 5^\circ$ in-plane rotation

Probing

Maximum probes:	6
Probe arm sensor:	Included for monitoring probe temperature
Cooled probe mounts:	<20 K with sample at base temperature
Probe mount:	Thermally anchored to magnet radiation shield
Probe arm:	Thermally anchored to radiation shield
DC/RF probes:	Electrical isolation >100 G Ω for low leakage measurements
Microwave probes:	Frequency range DC up to 67 GHz for RF measurements
Fiber optic probes:	Available for electro-optical measurements
Probe landing:	All probes can land at single point in a 25 mm (1 in) diameter circle

Cryogen consumption²

Room to base temperature (total):	15 to 20 liquid L helium
Helium at 5 K:	1 to 2 liquid L/h

¹ Base temperature assumes heat load for probes thermally anchored as listed in probing section

² Assumes maximum number of probe arms installed

Station details

Temperature equipment

Sample stage sensor/heater power:	CX-1050-CU-HT-1.4M calibrated Cernox®/50 W
Magnet stage sensor/heater power:	CX-1030-CU calibrated Cernox®/100 W
Radiation shield sensor/heater power:	DT-670C-CU silicon diode/100 W
2nd radiation shield sensor/heater power:	DT-670C-CU silicon diode/50 W
Probe arm:	DT-670C-SD silicon diode (on one probe arm)/no active control

Electronics console:	
Temperature controllers:	Two Model 336s
Magnet power supply:	Model 625
Helium transfer line:	Large bore helium/nitrogen transfer line with flow control 12.7 mm (0.5 in) top port withdrawal

Included sample holder:	Removable SH-1.25-G, 31.8 mm (1.25 in) maximum sample size, grounded
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Station footprint:	800 mm (31.5 in) width \times 670 mm (26.4 in) depth (does not include instrument console)
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Vacuum chamber

Material:	Electroless nickel-plated aluminum
Overall size:	280 mm (11 in) outer diameter \times 343 mm (13.5 in) tall
Chamber access:	229 mm (9 in) diameter opening
Viewport:	63.5 mm (2.50 in) diameter fused quartz
Viewing area:	54.0 mm (2.13 in) diameter
Pump port:	NW 40 with included vacuum isolation valve
Gauge port:	NW 25 (two ports)
Gas port:	0.25 in NPT with valve
Over pressure safety:	3.5 kPa (0.5 psi) pressure relief valve

Radiation shielding

Material:	Electroless nickel-plated aluminum
Sample access:	194 mm (7.6 in) diameter lid
Viewport:	50 mm (1.97 in) diameter IR absorbing window
Viewing area:	50 mm (1.97 in) diameter

Included kits

Tool kit:	Included tools for standard operation
Spares kit:	Included kit for common consumable items
Probe starter kit:	ZN50R-25-W (qty 2), ZN50R-25-BECU (qty 2), and ZN50R-CVT-25-W (qty 2) for training

Utilities

1-phase voltage:	100/120/220/240 VAC (+5%, -10%), 50/60 Hz
1-phase power:	2 kVA recommended
3-phase voltage:	Not required
3-phase power:	Not required
Cooling water:	Not required

Approval	All instruments CE marked
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Optional configurations

See pages 26 – 29 for option descriptions

 Load lock (PS-LL-CPX)

 Vibration isolation (PS-PVIS)

 12:1 microscope (PS-Z12)

 High vacuum (PS-HV-CPX)

 LT Low temperature (PS-LT-CPX)