

## Cryogenic Systems for Neutron Studies



HE-3-TLSV-NEUTRON

Cryogenic systems for neutron scattering have a thin-walled neutron zone surrounding the sample area. This neutron zone is most commonly made of aluminum, but is occasionally fabricated from vanadium. It is usually advantageous to locate these walls as far from the sample as possible, and for them to be as thin as possible, in order to minimize interaction of the neutrons with the cryostat. It is important that these walls be symmetric around the sample, with the same thickness of material at any point.

Some systems are self-supporting on a base plate that can be bolted to a goniometer, allowing the cryostat to be tilted by a few degrees. Other systems have a long tail that reaches down into a well, the bottom of which opens to the neutron beam.

The sample environment can either be vacuum or static exchange gas. Dynamic exchange gas is less common. Top loading static exchange gas systems offer advantages for a user facility because samples can be changed quickly and easily, and because poor thermally conducting samples can be cooled effectively.

A wide temperature range is often of interest. Janis has built systems for operation from as low as 300 mK to as high as 800 K.

Janis supplies both closed cycle and liquid helium cooled systems for neutron scattering, including top loading He-3 systems (He-3-TLSV – shown top left), helium cooled variable temperature cryostats (SVT-400T-XG – shown bottom left), 4 K closed cycle refrigerator systems (SHI-4T and SHI-950T – shown page 2), 10 K closed cycle refrigerator systems (CCS-250 and CCS-950T), and 4 K pulse tube-cooled systems (PT-950T).



SVT-400T-XG

# JANIS

JANIS RESEARCH COMPANY, INC.

2 Jewel Drive, P.O. Box 696  
Wilmington, MA 01887-0696 U.S.A.  
Tel: +1 978 657-8750  
[www.janis.com](http://www.janis.com)  
[sales@janis.com](mailto:sales@janis.com)

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Systems can incorporate detachable tails (including cold tails with indium-sealed joints), allowing tail sets to be exchanged for different experimental configurations.

One neutron facility utilizes a number of SHI-950T and SHI-950T-4 systems with different tail sets, so that they can be used with several different experimental stations at the facility. One such system is shown in the photograph bottom left, taken on-site. The configurations built for this facility include a tail set that allows the system to be used in a liquid helium cooled magnet, one for use in a superconducting magnet with room temperature bore, several self-supporting units that match different goniometers and a unit with a long narrow tail that reaches down into a neutron well. Most of these units have interchangeable tails and include spare sample positioners for maximum versatility. They are rated for operation from <math><5\text{ K}</math> to 800 K.



*SHI-950T-4  
at a User Facility*



*SHI-950T for  
Neutron Scattering*



*SHI-4-800*

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

[sales@janis.com](mailto:sales@janis.com)