

**Linkam Scientific Instruments
HFS350X-GI
Temperature Controlled Stage**

USER GUIDE



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Safety Precautions

- 1) Read this guide before using the equipment. Save these instructions for later use.
- 2) Follow all warnings and instructions which may be placed on the programmer or stage.
- 3) If for any reason the mains fuse needs to be replaced then it must be replaced by one of the same type and rating as shown in the equipment ratings.
- 4) To prevent electric shock, do not remove the cover of the controller or associated electronics.
- 5) Never use the equipment if a power cable has been damaged. Do not allow any heavy objects to rest on the power cables. Never lay the power cables on the floor.
- 6) Do not obstruct any ventilation holes. Do not attempt to insert anything into these openings. Provide adequate ventilation of at least 75mm all around the equipment.
- 7) Do not expose the equipment to water. If for any reason it gets wet then unplug it from the mains and contact Linkam Scientific Technical Support.
The equipment is not intended to be used outdoors.
- 8) Each product is equipped with a 3-wire grounded (earth) mains plug or a free-end 3 wire mains lead. The plug only fits into a grounded-type outlet. The free-end mains lead should be connected to a correctly grounded 3-wire mains outlet. Do not defeat the purpose of the grounded (earth) type plug.

Free - end mains leads are colour coded as follows :

Colour	Function
Brown	Live
Blue	Neutral
Green/Yellow	Earth (Ground)

- 9) If any problems occur then unplug the equipment from the mains outlet and contact Linkam Scientific Technical Support.
- 10) Do not remove the cover from the equipment unless the mains inlet has been removed. Any servicing should be carried out by qualified service personnel.

Symbol Reference



Caution -

This safety symbol is on the back panel of the equipment and warns:-
The user must not make or remove any connections while the unit is powered on.
To avoid electric shock do not remove the cover. Refer servicing to qualified service personnel.



Caution -

This warning symbol indicates that the surface labelled with this symbol may be hot.

Handling Liquid Nitrogen

To cool samples below room temperature a LNP94/2 liquid nitrogen pump is required. Please refer to your health and safety manual for instructions on how to handle liquid nitrogen safely. The dewar supplied with the LNP94/2 has a safety release valve built into the siphon assembly. Always use in a well ventilated room. See LNP94/2 manual for further instructions on how to use pump correctly.

Important Notice

Please check that your Linkam equipment has not been damaged during transport. If there is any evidence of external damage **DO NOT SWITCH ON ANY ELECTRICAL ITEMS**.

Contact LINKAM SCIENTIFIC or their appointed distributor immediately. Your warranty may be impaired if Linkam is not informed of any transport damage within 7 working days of delivery.

NO attempt should be made to repair or modify the equipment in any way, as there are **no user replaceable parts**.

No attempt should be made to open the case except by qualified personnel as hazardous voltages are present.

In order to use this equipment successfully, please take time to read this manual all the way through before starting to work.

Warranty

This equipment has a warranty against defects in material and workmanship for a period of 12 months. Linkam will either repair or replace products that prove to be defective. For warranty service or repair, this product must be returned to Linkam or a designated service facility.

The warranty shall not apply to defects resulting from interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

Technical Support

Any technical questions or queries should be addressed to the Technical Support Department at the address shown on the back of this manual.

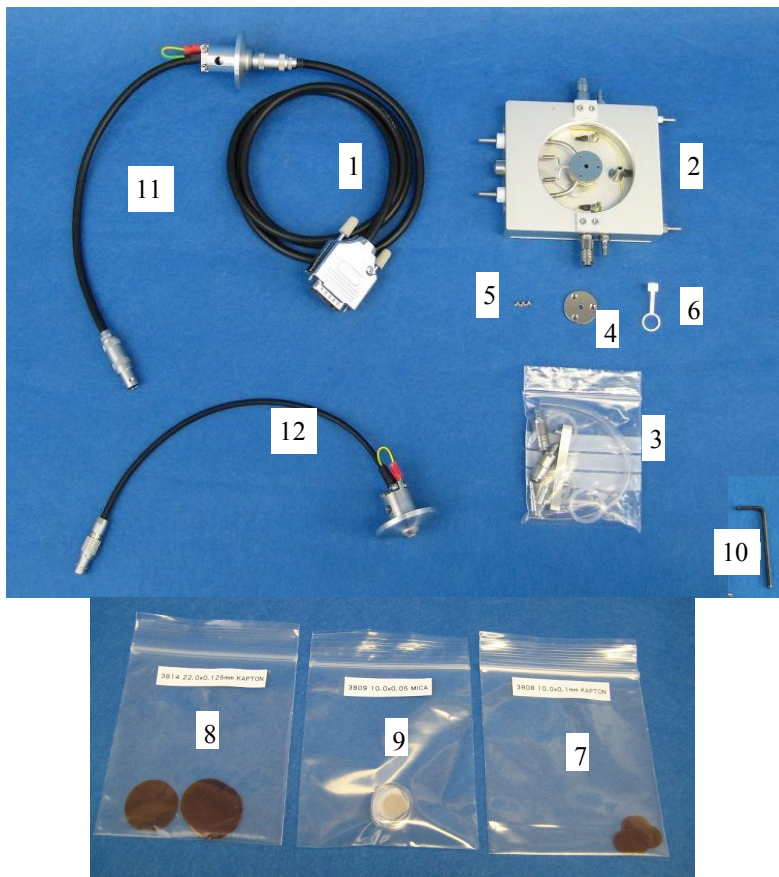
Equipment Maintenance

The programmer does not require any regular maintenance. If for any reason it is necessary to check the electronic calibration then contact Linkam for procedure.

Before cleaning the case or front panel of the programmer, remove the mains lead from the wall outlet. Use a small quantity of isopropyl alcohol with a soft cloth and gently wipe the surface. To clean the hotstage, use isopropyl alcohol and cotton swabs. Take great care not to touch the platinum temperature sensor protruding from the side of the heating element. The sensor is very fragile. The stage can be sent back to Linkam on an annual basis for general maintenance and cleaning.

Spares and Accessories

The HFS350X-GI is supplied with some spares and accessories to enable you to start working immediately. Here is a list of spares you may require in the future.

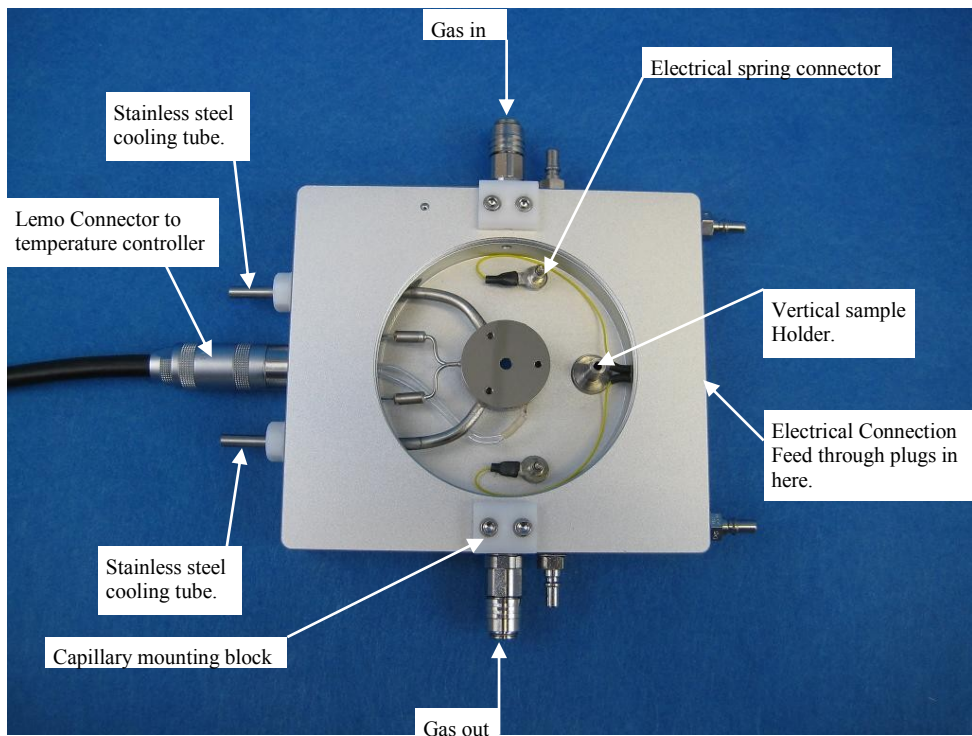


Pic No.	Part No.	Part Description
1	9521	HFS350X-GI Stage connection lead
2	11081	HFS350X-GI Stage
3	2015	Std accessory bag consisting of:
4	2896	HFS91 Heater Capillary Lid x1
5	2548	M2x3 Pozi Csk x3
6	N/A	Custom G10 Vertical Sample Holder x1
7	3808	Kapton window for HFS350X-GI 10.0mm diameter 0.1mm thick x10
8	3814	Kapton window for HFS350X-GI 22mm diameter 0.1mm thick x10
9	3809	Mica window for HFS350X-GI 10.0mm diameter 0.05mm thick x4
10	3060	2.0 mm ball-nosed hex key x1
11	9768	Lemo to NW25 Assembly x1
12	9858	2-Pin Lemo to NW25 Assembly x1

Technical specification:

Maximum temperature: 350°C
Minimum temperature: -196°C
Maximum heating rate: 30°C/min
Maximum cooling rate: 30°C/min
Vacuum tested to: 0.01mbar
Heating block conical angle: 90°
Condenser light approach angle: 93°

Stage Anatomy



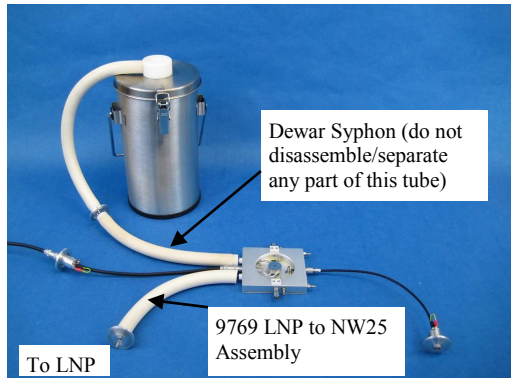
Cooling Connections

Liquid nitrogen connections

These connections need only be made if the experiments are to be carried out below room temperature.

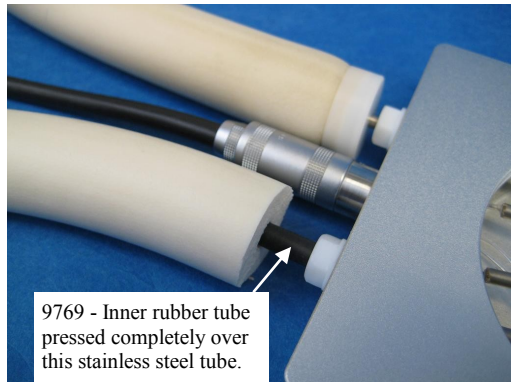
The thin black/white capillary tube inside the Dewar Syphon (labelled) must be inserted into the liquid nitrogen cooling connector on the stage as shown. The white tubing slides on the outside of the connector. Twist the siphon whilst sliding it on and push until it comes to a stop. It does not need to go all the way to the base of the connector.

The 9769 LNP to NW25 assembly is connected to the other stainless steel cooling tube. Make sure that the inner rubber tube of 9769 LNP to NW25 assembly is pressed completely over this tube. See image.



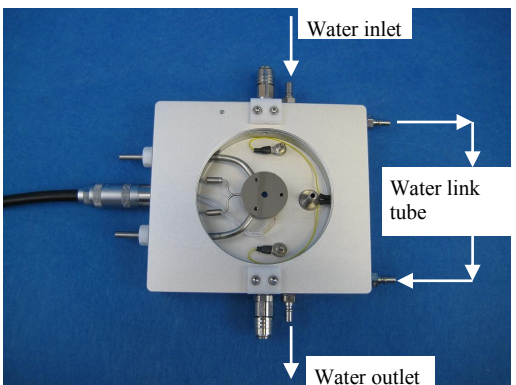
Filling the Liquid Nitrogen Dewar.

Please follow your health and safety manual for directions on how to handle liquid nitrogen and ensure that you have the correct safety equipment including gloves and safety goggles.



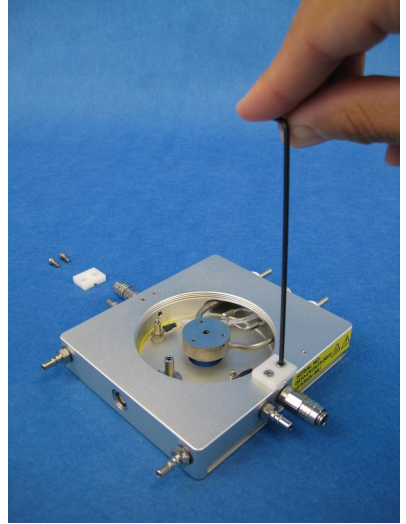
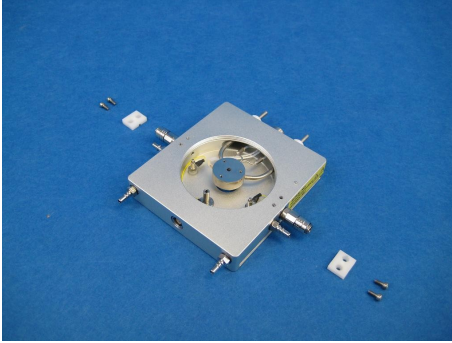
Water Cooling For High Temperature Work

When using the stage at temperatures above 200°C for a prolonged period of time, the stage body may become too hot to touch. In this case you need to connect tubes to the water connectors as shown in the image. The inlet and outlet tubing can be purchased from Linkam (part number 7017) or sourced locally, (6mm outer diameter, 3mm internal diameter). The water pump can also be purchased from Linkam (part number: 0998 for 240V, 0997 for 110V), otherwise mains supply or another water circulator with a flow rate of less than 20CC/min is suitable.



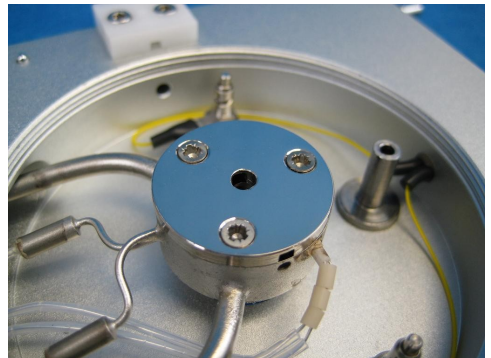
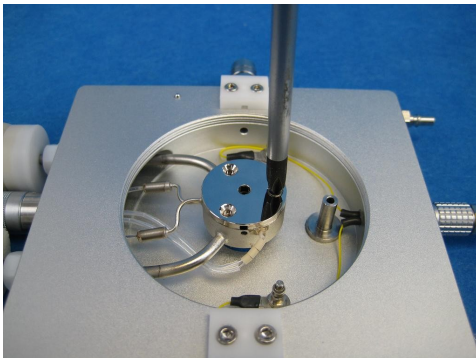
Removing/Replacing the Capillary Mounting Blocks

Use the hex key provided to remove the capillary blocks. Place the capillary in position and secure the mounting blocks as shown.



Removing/Replacing the Heater Capillary Lid

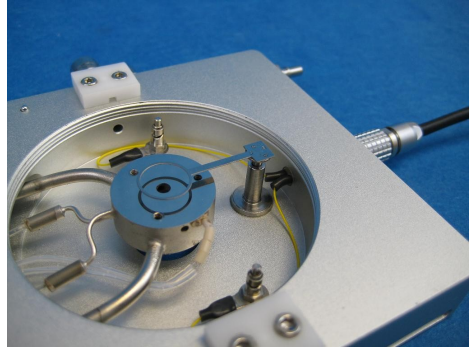
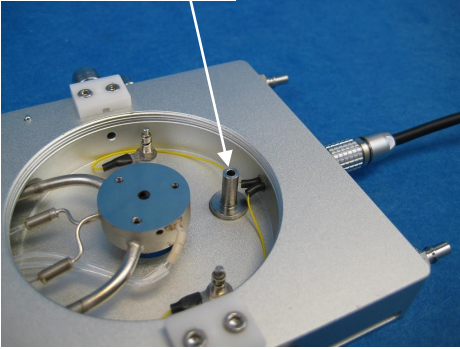
Secure the heater capillary lid over the capillary. There are three screws provided to secure the heater capillary lid as shown. Use a pozi drive screw driver to secure the capillary lid to the heating block. **Care must be taken not to damage the heating block when assembling/disassembling the capillary lid.**



Removing/Replacing the Vertical Sample Holder

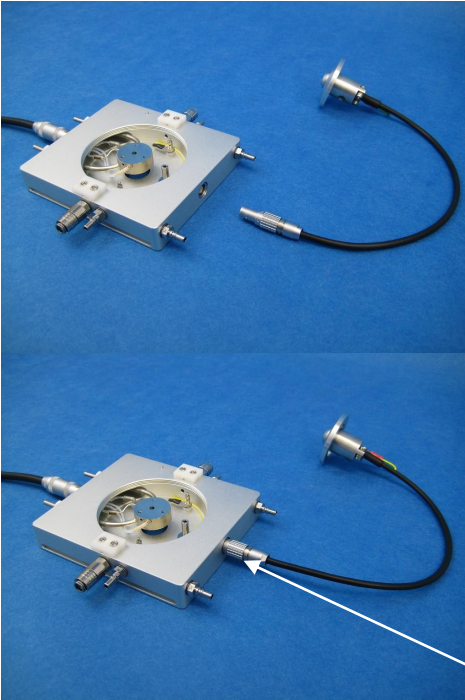
Windows provided can be secured within, and under, the vertical sample holder.

Place the vertical sample holder into this post



Removing/Replacing the Electrical Connection Lead

The electrical connection lead plugs into a small connector on the opposite side to the stage lead for the temperature controller. This is a keyed connector and will only snap in when the slot and key are aligned.



Pull the connector shell backwards to release the cable assembly

Trouble shooting

Cooling fault diagnosis

Ensure that all connections to the stage and Dewar are as described in the specific manual and that the stage lid and top windows are properly sealed.

1. *The cooling rate is less than programmed.*

Use the manual setting on the LNP94-2 or Linksys32 software to achieve this. There can be several causes of this problem, the most likely being that one of the connectors has become blocked or damaged. Check that each tube is fitted tightly to the connector and that none of the tubing is twisted or has come loose. The larger diameter tube leading from the LNP consists of a tube within a tube, check that the internal tube is connected, it may have come loose. Any constrictions of either the tubing or the connector will have a drastic effect on the cooling ability of the LNP. If the connectors and tubing are OK, check that the capillary tubing to the Dewar flask is not bent or damaged and that the filter is intact and unblocked. If any damage has occurred to any of these items then it will be necessary to replace them. If no damage is found, check that the heating block is not constricted. This can be checked, simply by blowing through one of the steel cooling tubes using a compressed air line.

2. *Stage will not cool down to -150 °C.*

Check that the stage lid is not touching the heating block when screwed down. Check that the heating block has not been pushed down so that it touches the base of the stage. This faults will cause a substantial loss of cooling ability.

3. *Condensation and ice forming on the upper side of window.*

Realign the window gas tube clip to the required position in the stage lid.

4. *Condensation on the sample and/or the underside of lid window*

This is due to the stage not being sealed properly and therefore allowing moisture in during purging or cooling. Check that the lid and bottom window are seated correctly and that the silicon seals are in position. When going through the lid it is important that the lid insert is not screwed down too tightly on the PTFE seal (LSR) so that it cannot move freely. This is so that when going through the lid, the ring may locate around the objective and seal against it.

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