



Linkam Scientific Instruments

**LTS420**

**Temperature Controlled Stage**

**USER GUIDE**

## Contents

Before Setting Up your Equipment.....	3
Important Notice.....	4
Warranty.....	4
Technical Support.....	4
Equipment Maintenance.....	4
Handling Liquid Nitrogen.....	4
Feedback.....	4
Safety Precautions.....	5
Symbol Reference.....	5
Introduction.....	6
LTS420 Stage Specifications.....	6
LTS420 System.....	6
Stage Anatomy.....	7
Lid Assembly.....	7
Stage Assembly.....	7
Mounting Stage to Microscope with Dovetail Substage.....	8
Setting up the Condenser.....	8
Setting up ECP Water Circulator Pump.....	9
Connecting the Instruments.....	10
T95 System Controller Cable Connections.....	10
LNP95 Cooling Pump Connection.....	10
Remove Transit Screws.....	10
Back Panel Cable Connection.....	10
Sample preparation.....	11
Loading a Sample.....	11
Using the Heat Shield.....	12
Cooling Connections.....	13
Purging Procedure.....	14
Use LinkPad to set the LNP95 to Manual Mode.....	14
Filling the Liquid Nitrogen Dewar.....	14
Purging the Stage Method 1.....	15
Purging the Stage Method 2.....	16
Appendix.....	17
Window Assembly.....	17
Lid Window Assembly.....	17
Bottom Window Assembly.....	17
Replacing the Microscope Slide Holder.....	18
LTSE420 with Internal Electrical Contacts.....	19
Using the Internal Electrical Contacts.....	20
Lemo Connector.....	21
Liquid Crystal Stage Pro.....	22
Using the Liquid Crystal Cell.....	22
Spares and Accessories.....	23
Troubleshooting.....	25
Contact Details.....	28

## **Before Setting Up Your Equipment**

Please register your products by going to [www.linkam.co.uk](http://www.linkam.co.uk) and click on the product/software registration button.

You will need to register your equipment with us to:

- Activate your warranty and technical support
- Access the online setup videos
- Permanently unlock the Linksys32 software (if purchased)

If you have purchased Linksys32 software, please install the software first. This process will guide to register all of your products.

See Linksys32 manual for further installation instructions.

A CD with a setup videos is supplied with your system.

## **Important Notice**

Please check that your Linkam equipment has not been damaged during transit. 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 using it.

## **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**

Use a small quantity of isopropyl alcohol with a soft cloth and gently wipe the surface. To clean the stage, use isopropyl alcohol (IPA) 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.

## **Handling Liquid Nitrogen**

To cool samples below room temperature a LNP95 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 LNP95 has a safety release valve built into the siphon assembly. Always use in a well ventilated room.

## **Feedback**

Your feedback will be greatly appreciated, please go to [www.linkam.co.uk](http://www.linkam.co.uk) to fill in the Feedback form.

## 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.
- 8) The equipment is not intended to be used outdoors.
- 9) 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)

- 10) If any problems occur then unplug the equipment from the mains outlet and contact Linkam Scientific Technical Support.
- 11) 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 References*

#### **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.

## Introduction

Thank you for purchasing the LTS420 Heating and Freezing stage system. Please take the time to read through the manual as it will help you to make the most out of the equipment.

### *LTS420 Stage Specifications*

Maximum temperature: 420°C  
Minimum temperature: -196 °C with LNP95  
Maximum heating rate: 40°C/min  
Objective Lens WD: 6.0mm  
Condenser lens WD: 13.2mm  
XY-Manipulators travel: 15mm  
Aperture hole: 2.5mm



LTS420 System with LNP95

## LTS420 System

The system consists of a LTS420 stage, a T95-LinkPad System Controller and optional LNP95 liquid nitrogen cooling pump system.

Linksys32 System control software and digital video capture can be added as an option to control from PC.

If you have Linksys32, please first install the software on the PC and activate Linksys32 within 10 days.

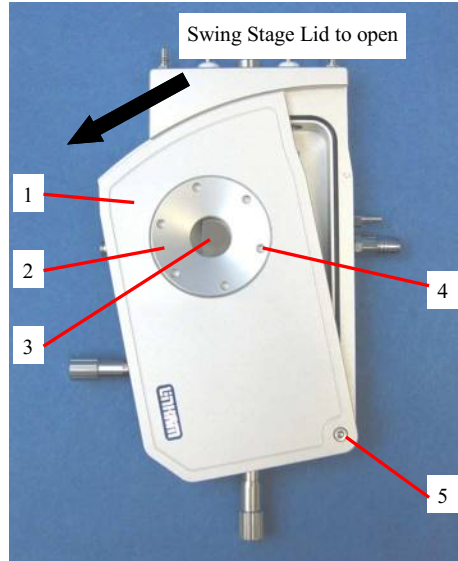
The LTS420 stage is mounted onto the microscope by using either specific stage clamps, an adaptor plate or by simply placing on the XY table of the microscope, using double sided adhesive tape.

## Stage Anatomy

### Lid Assembly

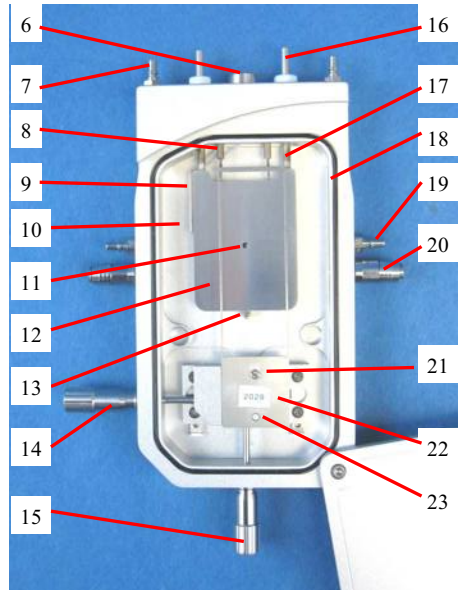
Swing the Stage Lid (1) to open the Stage.

1. Stage Lid
2. Lid Insert
3. Viewing Window
4. Holes for Tube Clip Holder or window removal tool
5. Hinge

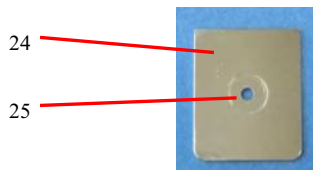


### Stage Assembly

6. Lemo connector for Stage Lead
7. Bypass Stage body water cooling connector
8. Heating element wire
9. PT100 platinum temperature sensor
10. Stage Chamber
11. Aperture hole (2.5mm)
12. Pure Silver Heating / cooling block (43x53mm)
13. Heating/Cooling Block Support
14. Y-manipulator
15. X-manipulator
16. Liquid nitrogen cooling connector
17. Stainless steel cooling tube for liquid nitrogen
18. Rubber sealing o-ring
19. Stage body water cooling connector
20. Gas purge valve
21. Fixing screw for microscope Sample Slide holder
22. Microscope Sample Slide Holder
23. Alignment peg for Sample Slide Holder



24. Pure silver Heat Shield
25. Aperture hole (5mm)



## Mounting Stage to Microscope with Dovetail Substage

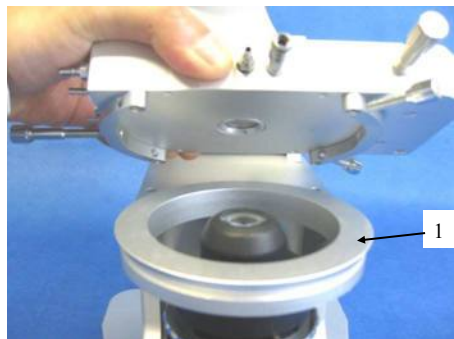
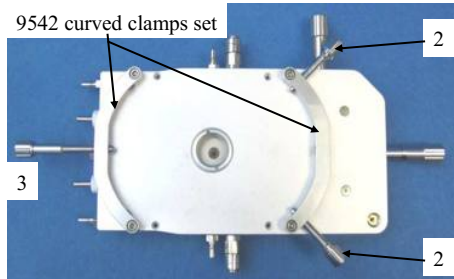
The following description is for mounting the stage on to microscopes which have a circular dovetail substage assembly (1).

Attach the curved stage clamps (part no. 9542) to the base of the stage using the supplied hex screws and the outer most holes in the base plate.

Adjust the two positioning screws (2) so that approximately 5mm of thread is exposed on the inside edge of the clamp. This will roughly position the stage in the centre of the dovetail.

Place the stage onto the dovetail, then focus a 10X objective lens on the aperture of the heating element. Using the two positioning screws (2) ensure that the aperture is in the centre of the field of view and lock the stage in place by tightening the Locking Thumbscrew (3).

For other types of microscope substage, refer to the diagram included with the stage adaptor.



Linkam Imaging Station with dovetail substage

### *Setting up the Condenser*

Place a small sample on a microscope slide and place onto the surface of the microscope slide. Use a 10X lens to focus on the sample. Now close down the microscope field diaphragm and adjust the condenser focus so that the edges of the diaphragm are in focus. Now use the condenser positioning screws to centre the condenser in your field of view. Open the diaphragm so that it just fills the field of view.

For more information about Koehler illumination see the extremely informative 'Microscopy Primer' on the Molecular Expressions website.

<http://micro.magnet.fsu.edu/primer/index.html>



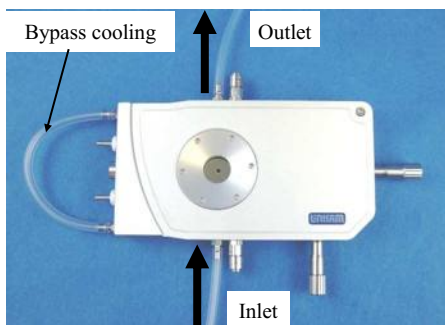


### Setting up ECP Water Circulator Pump

If you have purchased the ECP with your system, read the following to set up the ECP (1) with the LTS420 stage. Refer to the ECP manual for more details.



When heating the stage above 300°C for more than a couple of minutes, the metal body of the stage can get quite hot. The ECP is used to cool the metal casing. Connect the tubing as shown in the opposite picture.



**Note:** If you have an LNP95 Liquid Nitrogen Cooling system, the tubing from the Dewar must not be connected to the LTS420 stage when heating above 300°C. The thin black capillary tube will melt inside the heater and damage it.

## Connecting the Instruments

### T95 System Controller Cable Connections

For more details on the T95 System Controller please refer to the T95 System Controller manual.

Connect the Stage Cable to the Lemo Connector on the stage and connect the other end to the Stage Connection Socket (1).

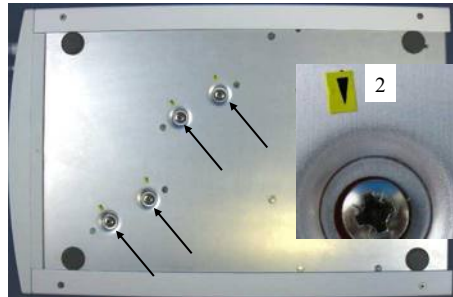


### LNP95 Cooling Pump Connection

If your system is supplied with a LNP95 Liquid Nitrogen Cooling Pump System, setup the LNP95 as described below.

#### Remove Transit Screws

Before using the LNP95 remove the 4 transit screws, marked by small yellow labels (2), from the base of the LNP95. Transit screws shown by arrows in the adjacent image. These screws hold the pumps in place for shipping.



Keep the screws safe by screwing them into the holes on the back panel as shown by the arrows.

The screws must be replaced back into the transit holes on the base, when shipping back to Linkam for service or repair.



#### Back Panel Cable Connection

Connect the Instrument Bus Cable (3) between the LNP95 and T95 as shown.

Note: either of the purple coloured Instrument Bus Sockets on the LNP95 can be used.

**LNP95 MUST BE SWITCHED ON BEFORE T95 SYSTEM CONTROLLER**



## Sample Preparation

Note: Temperature control performance is easily compromised. Therefore it is very important to keep the Heating/Cooling block and microscope glass slide clean. Use a soft cloth and IPA (isopropyl alcohol) to clean.

The Heating/Cooling block is made from pure silver, a soft metal. Please take extra care when cleaning the block to avoid scratching the surface and therefore compromising the temperature accuracy of the sample.

### *Loading a Sample*

The Microscope Slide Holder is fitted on to the LTS420 and the holder is not touching the silver heating/cooling block, it should hover just above it.

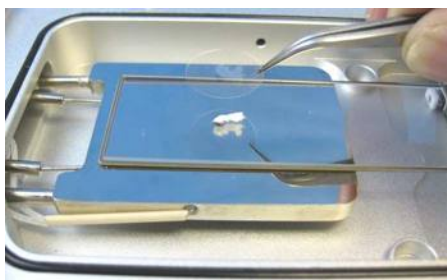
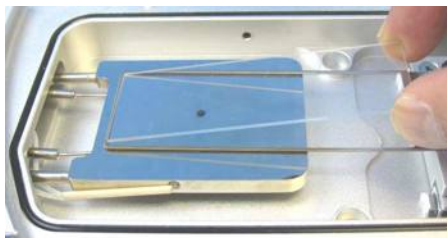
Note: if necessary the Microscope Slide Holder can be bent with a little force into shape to help it to hold the microscope glass slide.

Place a standard microscope glass slide (26x76mm) in the Microscope Slide Holder, use a spatula and tap on the microscope glass slide to make sure that it is sitting flat on the heating block.

Place the sample on top of the microscope glass slide. Ensure that the sample is as small as possible and that it is as flat as possible. Heat flow into or out of the sample is affected by the amount of sample area in contact with the temperature controlled surface.

Place a W16G (16 x 0.17mm) or a W22G (22 x 0.17mm) glass cover on top of the sample and gently tap the top with the back of the tweezers to disperse powder samples. Doing this to ensure good thermal contact of irregularly shaped samples and to create a flat surface for the microscope lens to focus on.

Accurate temperatures can be obtained by keeping the sample as small and flat as possible.



## Using the Heat Shield

If the temperature controlled experiment requires extra temperature stability, use the supplied Heat Shield to cover the heater.

Use the Y-manipulator (1) to move the Microscope Slide Holder to the middle of the heating block and use the X-manipulator (2) to move the Microscope slide holder to the home position (8mm from the edge).

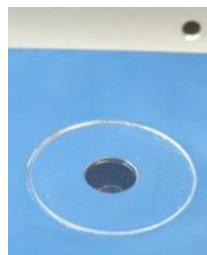
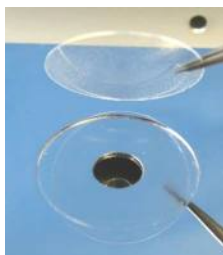
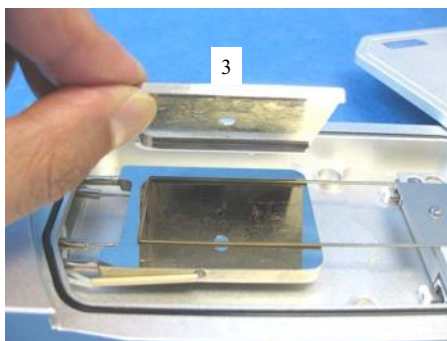
The Heat Shield (3) is very precisely made with the Microscope Slide Holder in this position, it will ensure that the edges of the Heat Shield make good thermal contact with the edge of the heating element and a thermal oven around the sample is created.

Place the Heat Shield over the microscope slide so that it rests on the heating element. The sample is now heated from all sides enabling a very even temperature throughout the sample. Heating rates may be slightly compromised due to the extra thermal mass but sample temperature accuracy will be improved.

Note: the Heat Shield is made from pure silver, a soft metal. Please take extra care when handling the heat shield and DO NOT bend it out of shape. When not in use always store the Heat Shield in the plastic casing provided for the stage.

To increase temperature stability even further, place a (W16G) 16mm cover slip on the heat shield to prevent heat escaping from the 5mm aperture.

Note: This may slightly compromise your image if high NA lenses are being used. Experiment to see if this extra cover slip has a detrimental effect on the image.



## Cooling Connections

These connections need only be made if the experiments are to be carried out below room temperature using the LNP95 system.

The Dewar siphon (1) is the thick white foam tubing and is attached to the liquid nitrogen Dewar. The thin black capillary tube inside the white foam tube must be inserted into the liquid nitrogen cooling connector on the stage.

The white tubing slides on to 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.

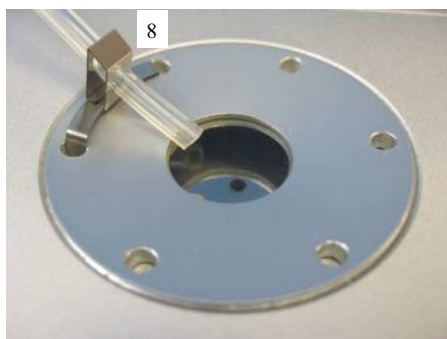
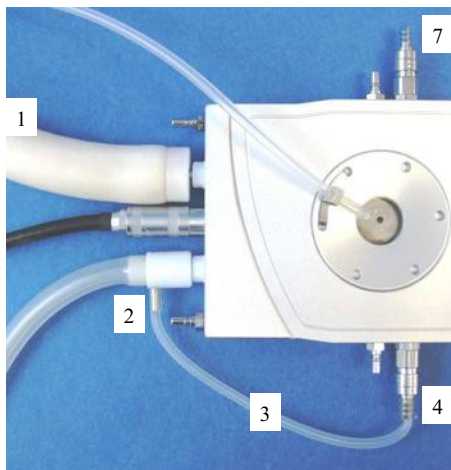
The thicker silicon tube from the LNP95 cooling pump ends in a white PTFE connector (2), this is pushed over the end of the other stainless steel connector as seen in the image.

The short tube branching from the side of this white connector is the Gas Purging Tube (3). There is a valve opening Insert connector (4) inserted into the end of this tube. During the purging procedure, insert this connector into the Gas Purge Valve (5) on the side of the stage to open it.

The Gas Purge Valve (5) is opened when the Gas Insert (6) is pushed firmly into the connector, a “click” is heard when the two parts are connected properly. To remove the Gas Insert, push the outer sleeve of Gas Purge Valve toward the stage and the Gas Insert (6) should drop out.

There is a second Gas Purge Valve on the opposite side of the stage to allow the gas to leave the stage. A Gas Insert must also be inserted into this Gas Purge Valve (7) when purging.

The smaller tube from the outlet on the LNP95 should be placed in position on the top of the lid using the Tube Clip Holder (8). This tube blows warm recycled nitrogen gas across the lid window to prevent condensation on the viewing window surface.



## Purging Procedure

Before starting a cooling experiment, you will need to purge air from the stage chamber with dry nitrogen. This will remove the water in the air which would otherwise condense and freeze on the sample disrupting your image quality.

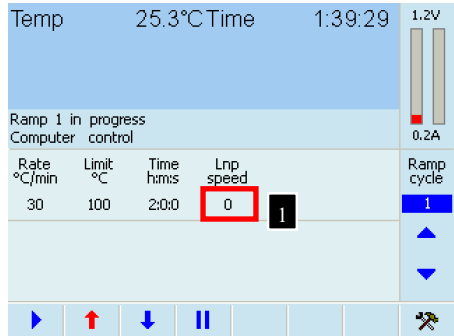
Before you can start purging, the LNP95 must be set to manual mode.

You can either use the LinkPad touch screen or Linksys32 software.

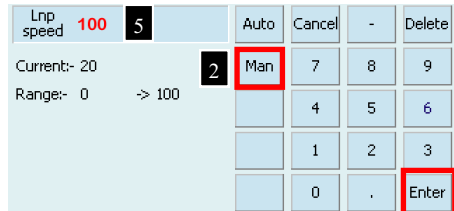
### Use LinkPad to set the LNP95 to Manual Mode

Touch the active area (1) under 'Lnp Speed' to change to the LNP Screen Menu. Touch 'Man' (2) to switch the LNP95 to manual mode.

The word 'auto' is changed to 'speed' to indicate the LNP95 is functioning in manual mode.



Using the Keypad type in 100 (max pump speed) and touch the 'Enter' button (4) to start the LNP95 at the programmed speed (5).



### 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.

Fill the Dewar approximately 2/3 full and replace the lid with siphon attached.

**DO NOT FASTEN THE CATCHES**

Wait for the nitrogen to stop bubbling before fastening the catches.

Take care when placing lid on a table to always have the black capillary pointing upwards. It is easily damaged which will impair N<sub>2</sub> flow.



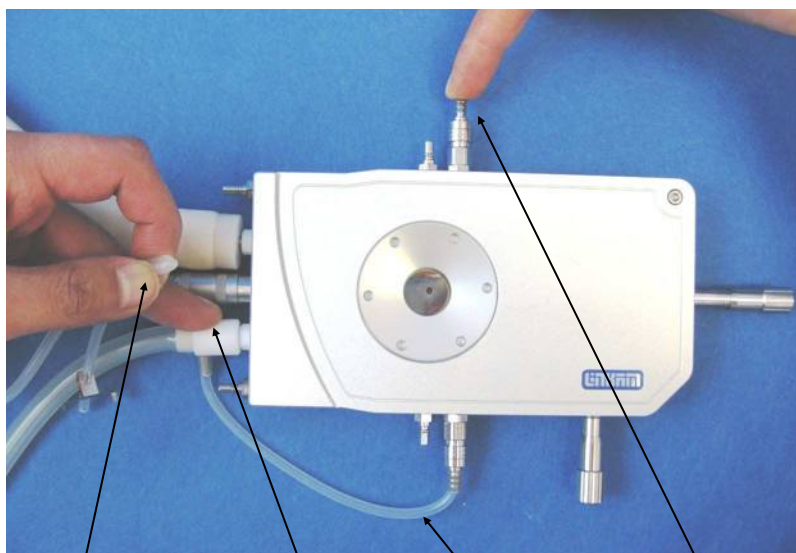
4



### *Purging the Stage Method 1*

There are two methods for purging the stage. Method 1 uses recycled nitrogen gas produced by the LNP95 from the 2L Dewar.

1. Make sure the stage lid is in place and the stage door is closed.
2. Switch on the temperature programmer and set the limit to 40°C. Press the START button and wait until the temperature limit is reached. Press HOLD to hold the temperature at 40°C.
3. Switch on the LNP95 cooling system and set it to manual mode, (see page 13) and set the speed to maximum of 100.
4. Check that the Gas Inserts are locked into place
5. Using a finger on the left hand, block the hole in the white plastic pump connector found on the perpendicular side to the purging tube. Still working with the left hand, pinch the narrow window tube to block it. This action will divert all of the nitrogen gas to the Purging Tube and through the Stage Chamber.
6. With the nitrogen gas flowing through the Sample Chamber, use a finger on the right hand to block the gas outlet for a few seconds to allow pressure build, then release the gas. Repeat this for a few minutes to purge the stage.
7. The purging procedure allows mixing of nitrogen gas with the residual air inside the Sample Chamber. By pressurising the chamber with nitrogen gas and releasing it, the air inside the Chamber is being diluted with the nitrogen gas.
8. Remove the two Gas Inserts and unblock the pump connector and window tube.
9. Change the LNP95 to **AUTOMATIC** mode so that the T95 automatically controls pump speed during your cooling experiment
10. Go to [www.linkam.co.uk](http://www.linkam.co.uk) and register your equipment to see videos of how to purge and more.



Pinch window tube  
with left hand

Block hole in  
Connector with finger

Purging  
tube

Block and release outlet  
valve with finger

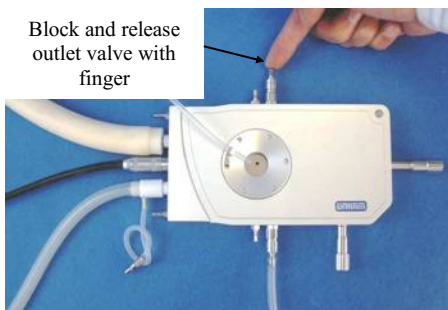
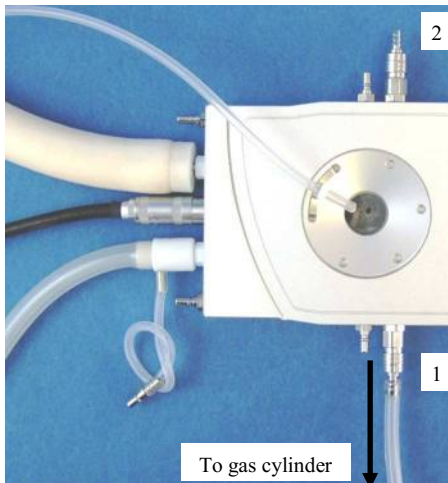
### *Purging the Stage Method 2*

This method uses an inert gas from a gas cylinder to purge the stage at temperatures above ambient when the LNP95 is not required.

1. Make sure the Stage Lid is in place and the Stage Door is closed.
2. From a gas cylinder connect the Gas Insert with a tubing 3mm inner diameter and 6mm outer diameter to the Gas Purge Valve (1).
3. Connect a Gas Insert to the opposite side Gas Purge Valve (2).
4. Use the gas regulator to set a gas flow rate of 1L/min.
5. With the gas flowing through the Sample Chamber, block the gas outlet for a few seconds and releasing the gas outlet valve with a finger. Repeat this for a few minutes to purge the stage.

Reduce the gas flow rate to 20cc/min to continuously purge the stage or remove the two Gas Inserts to keep the chamber under closed inert atmosphere.

Note: Helium gas is not recommended for continuous purging. This gas has a very high thermal conductivity and will cool the silver heating block too much during an experiment and may cause the temperature to fluctuate.





## Appendix

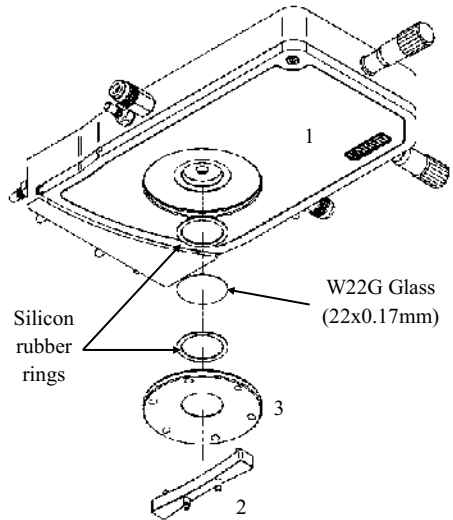
### Window Assembly

#### *Lid Window Assembly*

To replace the windows in the Stage Lid (1) use the Window Tool (2) and align the two wide spacing pins to the Tube Clip Holder holes and unscrew the Lid Insert (3).

The Stage Lid and Lid Insert should be turned upside down as shown in the diagram opposite and reassembled in the order indicated.

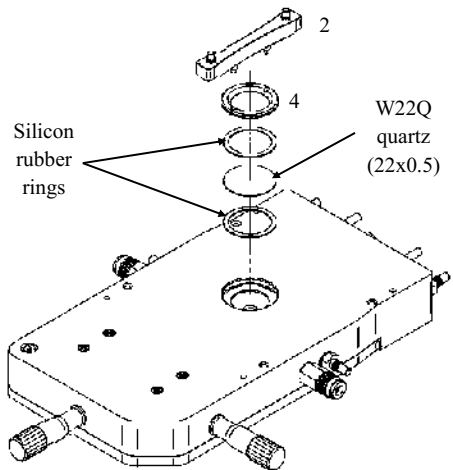
The Lid Insert should be screwed down until the cover slips are held firmly, then turn the assembly over and screw down the Lid Insert until it is felt to come to a stop.



#### *Bottom Window Assembly*

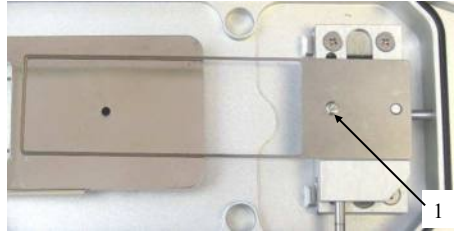
Use two narrow spacing pins of Window Tool (2) to align it to the two holes of Window Locking Ring (4) and unscrew.

Reassemble the bottom window as shown in the opposite diagram.



## Replacing the Microscope Slide Holder

Use a flat screw driver and remove the screw (1). Take out the Microscope Slide holder from the XY Manipulator Assembly(2)

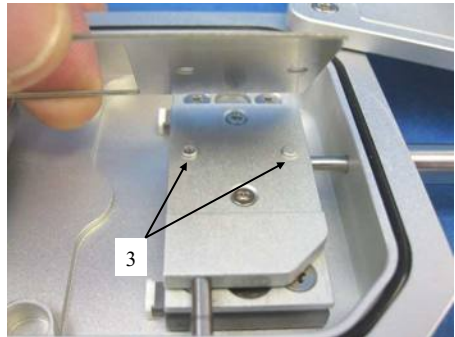


Do the reverse to replace the LTS420 with a new Microscope Slide Holder. Make sure the 2 holes on the holder are lined up with the two notches (2) on the XY Manipulator Assembly.

Note: when fitted properly the Microscope Slide Holder should not touch the silver heating block (4), the holder should hover about 1mm above it.

If the holder is touching the heating block or hovers too high, remove screw (1) and turn the Microscope Slide Holder over.

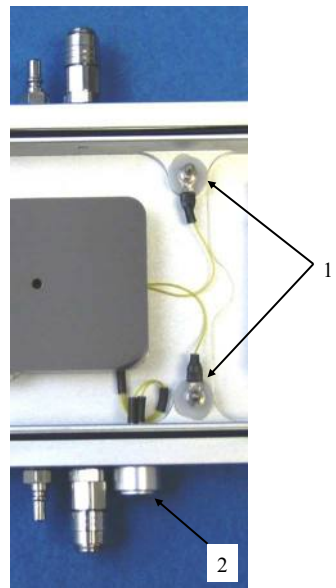
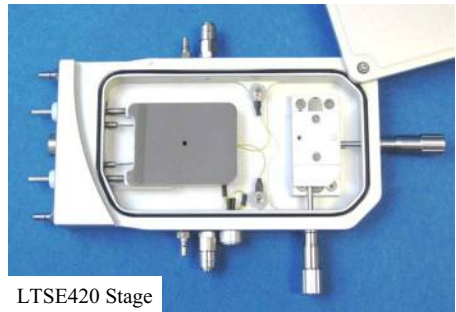
Note: the Microscope Slide Holder can be bent with a little force into shape to help.



## LTSE420 with Internal Electrical Contacts Option

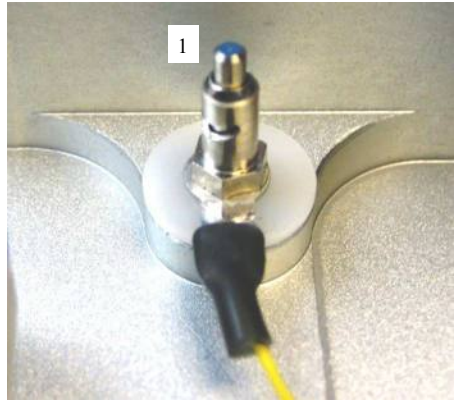
Only read the following if the stage is supplied with internal electrical contacts for the LTSE420 or Liquid Crystal Pro Stage.

The stage is supplied with two internal electrical contact connectors (1) wired to an external Lemo connector (2).

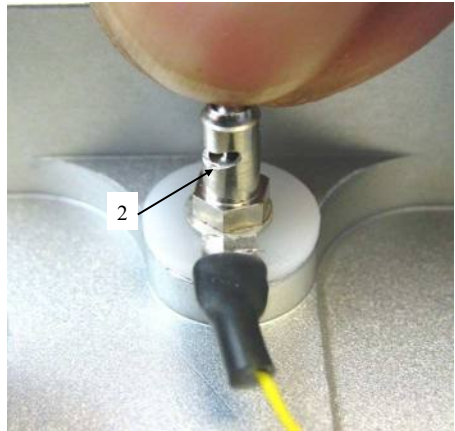


### *Using the Internal Electrical Contact*

The internal electrical contact has a self-closing spring loaded pin (1).



Using a finger tip push in the pin to open the electrical contact and insert a wire into the contact (2).



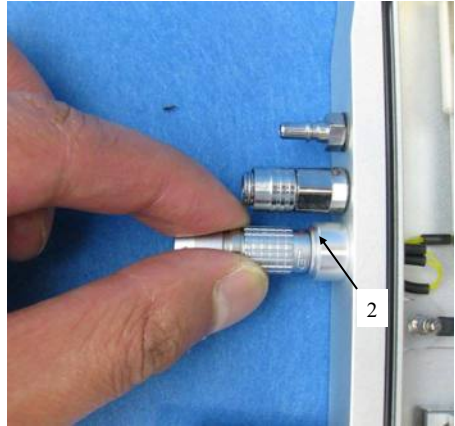
Release the finger when the wire is in place.



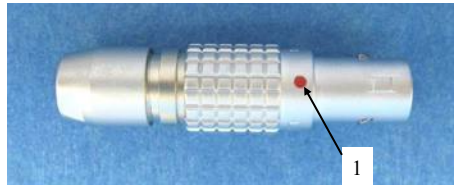
### *Lemo Connector*

Remove the Lemo plug by holding it firmly and pull it gently away from the Stage.

Wire up the Lemo to your instrument.



To reconnect the Lemo, line up the red dot on the Lemo plug (1) to the red dot on the Lemo socket (2) and push the Lemo firmly into place.



## Liquid Crystal Stage Pro

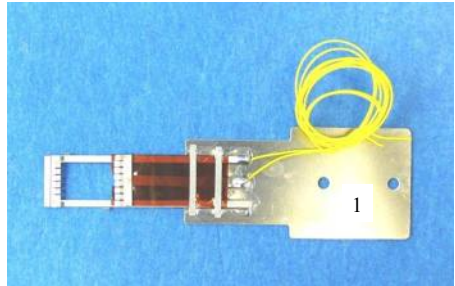
Only read the following if your stage is a LTSE420 Liquid Crystal Pro Stage.

The Liquid Crystal System Pro is supplied with a Liquid Crystal Slide Holder (1) and 5x Liquid Crystal Cells (5um gap, capillary fill, ITO coated and anti parallel aligned).

Assemble the Liquid Crystal Holder (1) to the XY Assembly as shown on page 22.

Note: make sure the Liquid Cell Holder is the right way up as shown in the opposite picture.

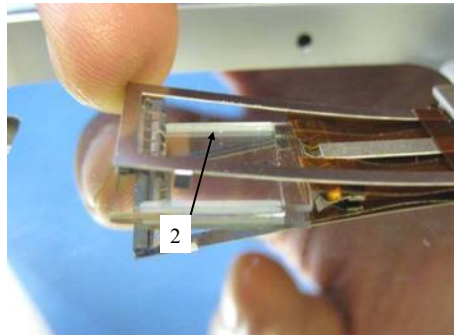
Connect the two wires from the Liquid Cell Holder to the Internal Electrical Contacts as shown on page 17.



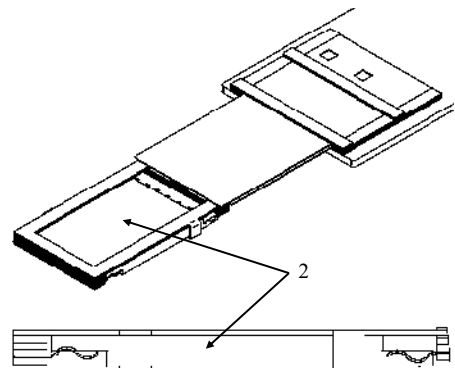
### *Using the Liquid Crystal Cell*

Fill the Liquid Crystal Cell (2) with your sample.

Lift the Liquid Cell Holder and slide in the Liquid Crystal Cell.



Make sure the Liquid Crystal Cell is seated correctly as seen in the opposite diagram.



## Spares and Accessories

These spares are organised into convenient kits. Purchase a spares kit to avoid downtime with your stage and eliminate future shipping costs.

The LTS420 heating element is extremely durable if used carefully. However it can be easily scratched, which will compromise the heat flow to the sample and reduce accuracy. The platinum temperature sensor is brittle and can be broken if cleaning is not carefully performed. We recommend a spare heating element to avoid downtime with your stage while element is being repaired.

Part No.	Part Name	Part Description
22222	LTS Kit	Full Replacement Spares Kit
	WGI	Water/Gas Valve Insert x2
	WVC	Water/Gas Valve Connector x2
	SSR	Silicon Rings for Lid and Base (Set of 4)
	TUBE	3x6x150mm Clear PVC Tube
	WT	Window Tool (for unlocking lid insert and base locking ring)
	TCH	Tube Clip Holder (for Nitrogen de-fogging stage lid tube)
	ORLTS	Set of O-rings for the Body and Lid
	ACCE	Box of Glass for Windows / Sample: 22x0.17mm (x50); 16x0.17mm (x50); 22x0.3mm (x10)
	LTS/MS	76x26mm Microscope Slide Carrier
	LTS/MS	Microscope glass slide (76x26x1mm) Box of 100
	COPP	Nickel Plated Heater Shield Cover for LTS350

Part No.	Part Name	Part Description
22222	LTS Spare Windows Kit	Spare windows for Lid, Base and samples
	SRR	Silicon Rings for Lid and Base (Set of 4)
	ACCE	Box of Glass for Windows / Sample: 22x0.17mm (x50); 16x0.17mm (x50); 22x0.3mm (x10)
	LTS/MS	Standard microscope glass slides (76x26x1mm) Box of 100

Part No.	Part Name	Part Description
2908	LTSB	Spare LTS420 Heating Element with Platinum Temperature Sensor

## Spares and Accessories

Part No.	Part Name	Part Description
22222	LTS/LCC	Liquid Crystal Cell Carrier
	LCC5	Liquid Crystal Cell (5um gap, anti parallel aligned, capillary fill) x20

Part No.	Part Name	Part Description
2149	LCC5	Liquid Crystal Cell (5um gap, anti parallel aligned, capillary fill) x20



## Troubleshooting

### *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.*

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 LNP95 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 LNP95. 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 silver block is not constricted. This can be checked, simply by blowing through one of the steel cooling tubes using a compressed air line.

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

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

3. *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 sealed correctly and that the silicon seals are in position.

Please visit [www.Linkam.co.uk](http://www.Linkam.co.uk) for more FAQ for the stage and instruments.

This page is intentionally Blank

This page is intentionally Blank

